alepo

How private 5G helps industries tackle **critical challenges**

Table of
Contents

Why industries are embracing private 5G

The fourth industrial revolution (4IR or Industry 4.0) is transforming the way businesses operate, unleashing digital innovation across sectors. Many industries already use private WiFi or LTE networks. The next step for enterprises to unlock the potential of 4IR is implementing private 5G networks.

Private 5G, or non-public network (NPN) as it is called according to 3GPP, equips enterprises with next-gen connectivity over a secure and dedicated network, enabling the smart features of 4IR. It lets businesses gain the most benefits from implementing breakthrough Industry 4.0 technologies like artificial intelligence (AI), the Internet of Things (IoT), machine-to-machine (M2M) communication, robotics, AR/VR, and more. In addition to fully automating processes, private 5G provides high capacity, near-real-time high-speed connectivity, ultra-reliable infrastructure, and high-end computerization. In effect, enterprises of any size and operational capability can drastically improve their efficiency and lower OPEX.

Today, deploying a secure private 5G network is significantly easier owing to several factors. For one, Citizens Broadband Radio Service (CBRS) enables shared wireless spectrum in the United States, a model that's being replicated by many other countries. New 5G standards define how these networks can be implemented. And there's mature software as well as hardware, including an open ecosystem for RAN and core network components. Plus, with the growing number of connected devices on enterprise networks, private 5G assumes even greater relevance. It enables businesses to securely gather, analyze, and act upon data, leveraging AI, ML, and robotics.

Benefits of private 5G for enterprises

Businesses across sectors gain several unique benefits from deploying 4IR technologies over a private 5G network:

Enabling smart factories

Private 5G lets enterprises implement cutting-edge technologies such as AI, augmented reality, predictive analytics, robotics, autonomous vehicles, and a connected Industrial IoT (I-IoT) device ecosystem. Together, these technologies enable them to gather and analyze data in real time, streamline production and business processes, predict outcomes to refine and fine-tune activities, and ultimately boost productivity.

Deploying wireless infrastructure

A key benefit of private 5G is that it eliminates bulky cables and wires, delivering next-gen capabilities over an entirely wireless network. This is a game-changer for capital-intensive enterprises that can implement capabilities like low latency, high reliability, and consistent connectivity

while keeping operational costs low. Private 5G is also much more secure and reliable than WiFi or LTE. It enables enterprises to maintain an agile and flexible environment for their business-critical activities, with infrastructure that's easy to develop, configure, and maintain.

Improving operational efficiency

Private 5G helps minimize and eliminate delays or errors due to human intervention. It enables businesses to efficiently manage supply chains, improve quality checks, ensure worker safety, and more. For example, a smart factory with a private 5G setup can work faster with the help of robots and other connected devices than traditional factories that follow labor-intensive manual processes.

Gaining advanced data insights

Private 5G helps drive sound business decisions in real-time by leveraging data and advanced analytics to gain intelligent BI insights. For instance, 5G features such as high throughput, lower latency, and ultra-reliable communication, along with proven AI capabilities, help in building an intelligent transportation system that facilitates seamless planning, real-time alerts and notifications, coordinated driving, and flawless C-V2X communication.

Increasing security

Industrial IoT has massive volumes of connected devices, all of which are susceptible to new kinds of security threats. To keep them safe from cyberattacks, vulnerabilities, and other breaches, private 5G provides added layers of security and enhanced privacy protection. 5G also employs robust security algorithms, traffic encryption, and signaling and interface protection, making it safer and more secure than LTE and WiFi.

Optimizing network resources

Unlike other legacy networks (3G, LTE, or WiFi), 5G enables network slicing and optimization, which helps support mission-critical use cases such as drones, digitally connected device management, human-robot collaboration, digital twins, and much more. Each of these use cases has specific requirements, and slicing lets operators divide the network into multiple smaller fragments or slices, each of which caters to the demands of different use cases. To optimize resources, different slices can be allotted to separate enterprises.

Industry pain points and how private 5G will tackle them

Private 5G helps cater to data-heavy applications like augmented reality (AR) and virtual reality (VR) to remotely monitor systems, improves data security, and provides secure 3GPP-defined infrastructure for mission-critical services and government applications. It has the potential to provide reliable wireless connectivity to modern factories, ports,

warehouses, oil rigs, mines, sports stadiums, classrooms, hospitals, and broad-spectrum applications such as public utilities – the list is endless.

Here are some of the key industries expected to embrace the next-gen technology and the challenges it will help them overcome.

Manufacturing

Manufacturing units can benefit significantly from infrastructure and applications that provide high levels of reliability, ultralow latency, consistent and secure connectivity, and a low physical resource footprint. These capabilities help ensure they can smoothly run their business-critical activities. Private 5G delivers on all fronts.

Manufacturing units can leverage private 5G to implement innovative use cases like robotics, AI, I-IoT, AR, and more. These technologies transform production processes so manufacturers can improve operational efficiency, minimize production downtime and delays, streamline supply chain management, ensure more efficient quality checks, and improve the safety of factory staff.

Challenges faced by the industry	Solutions presented by private 5G networks
Poor internet connectivity, availability issues, and data leakage, primarily due to the increasing number of devices and applications.	Secure and high-speed connectivity, which is critical for factories with several connected I-IoT devices.
Inflexible production processes with limited mobility make it challenging to leverage the benefits of IR4 technologies.	Improved enterprise connectivity and more agile production capabilities, helping boost IR4-related productivity.
Big data generated from more connected equipment and processing data to perform physical tasks on the factory floor.	Automation helps streamline and accelerate data processing on the factory floor. Real-time data generated on the factory floor can be sent to AI/ML systems, enabling quick analysis and actions.

![alepo logo]

Device management and monitoring is tedious and time-consuming.	Connects all devices on the factory floor through use cases like I-IoT and M2M communication, so they can be remotely operated in real-time.
Difficulty managing smooth operations for time-critical processes.	Synchronizes all devices and enables them to communicate and work in real-time.
Inventory tracking is a slow and time-consuming process.	Automated and streamlined inventory tracking requiring no manual intervention.

Use cases:

Smart factories

Predictive maintenance

Real-time surveillance and diagnosis

Additive manufacturing or 3D printing

Industrial automation and the control of robots and smart factory solutions

Immersive remote operations like maintenance, service or assembly

Shop floor reconfiguration and layout changes

Connected drones, sensors, cameras

Human-robot collaboration

Remote asset control

Simulation of factory processes

Real-time M2M communication

AR applications for design, maintenance, and repair of machinery

Connected manufacturing ecosystem with unified supply chain

Transportation

Cities with 5G access will be able to transform their transport systems, reducing traffic congestion and improving vehicular as well as pedestrian safety. Private 5G will improve the overall efficiency of public transport, enabling real-time fleet monitoring and analyzing user demand to optimize management. In fact, public mobility-driven demand for advanced business models such as mobility-as-a-service (MaaS) will likely be an important 5G revenue stream for operators. At the same time, public transport commuters will have more control over their trips online, as well as access to contextual offerings.

Commuters will also be able to access safe and reliable public transport services, choosing the optimal option based on real-time traffic changes. While onboard, they will have access to information, infotainment, and entertainment, as well as improved connectivity to first-responder services in case of emergencies.

In addition, smart cities will be able to connect road infrastructure such as traffic lights to enable more streamlined traffic management.

Challenges faced by the industry	Solutions presented by private 5G networks
Poor traffic predictions + poor routing strategies.	Secure, reliable, real-time, and high-speed connectivity to ensure traffic infrastructure functions seamlessly.
Rising prices of fuel.	More efficient traffic routing to ensure fuel optimization.
Safety concerns and accidents with growing traffic, poor weather predictions, and not enough skilled drivers.	V2X communication so vehicles can avoid accidents with other vehicles, pedestrians, and road users. Real-time data insights on traffic, road blocks and accidents, and timely alerts and notifications to enhance safety measures.
Worsening environmental conditions due to high carbon footprints.	Connected energy-efficient vehicles to reduce fuel and/or electricity consumption. Insights on the shortest possible routes, helping save energy resources and reduce pollution by preventing traffic build-up. Connected transportation with in-vehicle infotainment to encourage people to use public transport instead of their vehicles.

Use cases:
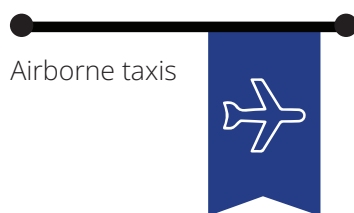
Airborne taxis	Digital twins
Intelligent traffic management	Mobility as a Service (MaaS)
Prognostic maintenance	In-vehicle infotainment
Remote vehicular health monitoring	V2X communications: vehicle-to-vehicle, vehicle-to-pedestrian, vehicle-to-infrastructure

Energy and utilities

Private 5G-IR4 deployments will be transformative for the public utilities and energy sector, which have long been struggling to overcome infrastructural issues. These next-gen deployments will combine ML, AI, and advanced analytics to enable more control over the way energy is stored and distributed. Implementing modern use cases such as smart metering, smart grid, smart energy management, and predictive maintenance, will help reduce operational and maintenance costs, securing revenue. They will also enhance the customer experience to meet and exceed expectations from an ever-evolving market.

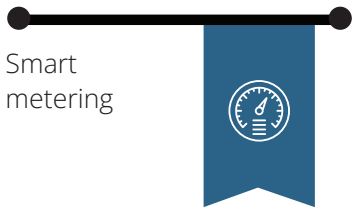| Challenges faced by the industry	Solutions presented by private 5G networks
Global shift towards renewable power.	Ultra-fast 5G connectivity and low latency make it possible to monitor millions of connected base stations and connected devices in real-time, helping design energy efficient systems. For example, smart street lighting works with the help of 5G and real-time monitoring via integrated sensors. It's able to detect when there are no pedestrians and vehicles, so power and energy resources are used efficiently.
Outdated infrastructure that's expensive to maintain.	A digitalized smart grid backed by AI, ML, and data analytics for real-time monitoring and protecting distributed energy resources with interactive load management.
Declining revenues due to increased adoption of renewables, grid congestion, and inflexible generators.	5G smart grid helps deliver better-integrated power services to customers, helping further to reduce cost and increase benefits and revenue.

Use cases:

Smart grid

Drone monitoring
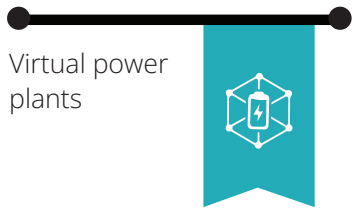
| Virtual power plants | | Smart metering | |
| Smart energy management | | Predictive maintenance | |

Healthcare

By leveraging private 5G, healthcare providers can give patients access to more efficient and personalized treatment. Teleconsultations and remote surgeries broaden the horizon of care options open to patients even in distant and underserved areas as they remove geographical barriers. Private 5G networks enable ultrafast speeds, uninterrupted connectivity, ultralow latency, and real-time streaming to enable these applications, broadly classified as the Internet of Medical Things (IoMT). These technologies will become more broadly available once IoT-enabled automation and private 5G become permeate.

Challenges faced by the industry	Solutions presented by private 5G networks
Vulnerability to data theft and concerns with keeping patient data secure.	Implementation of 3GPP standards ensures the highest levels of security, data safety, and protection from cybersecurity threats.
Network connectivity and availability issues, especially with a growing number of devices and apps.	High availability, ultra-low latency, and enhanced broadband speed ensure reliability, seamless connectivity, and scalability to support large volumes of connected IoMT devices simultaneously.

Escalating treatment costs, longer wait for medical assistance as well as disease detection.

Real-time data analytics, remote health monitoring, and advanced AI techniques enable early disease detection.

Remote treatment options such as remote surgeries enable swift and reliable patient care.

Inadequate medical assistance, either due to a lack of specialist doctors or because patients are in remote locations.

Using millimeter wave (mmWave) spectrum, 5G can deliver 10x performance and better information in real-time, and much needed by smart healthcare facilities including telemedicine, remote and robotic surgery assistance, home healthcare, remote patient monitoring, and more.

Use cases:

Remote surgeries

Remote patient monitoring

AR/VR-enabled healthcare

Wearables and ingestibles

Telemedicine

Connected ambulances

Robot-assisted minimally invasive surgeries

Implantable device monitoring

Banking and financial services

Today, the success of financial services such as banks, finance, and insurance (BFSI) companies is hinged, among others, on two important factors: security and customer experience. Private 5G helps fulfill these two requirements by providing ultra-high reliability, higher data capacity, and low latency. The adoption of private 5G and more widespread use of IoT systems and devices will help boost security and CX while driving ROI.

Challenges faced by the industry	Solutions presented by private 5G networks
Evolving customer expectations and demand for more digital services, coupled with growing competition from fintech companies introducing modern and digital service innovations.	High-speed transactions backed by robust processing using cloud infrastructure to enhance customer experience. Secured and smart banking on the go, real-time high-definition video conferencing, and biometric recognition for faster account management and issue resolution. Hyper-personalized IoT device-enabled banking services and products enable timely interactions with customers. Integrating with devices such as mobiles, wearables, and connected vehicles further helps banks remain connected to their customers across all touchpoints, ensuring a consistent and seamless experience.

Increasing information security concerns such as data breaches and frauds, identity theft, data leakage or loss, malicious software and hardware, and failed backups.

Security controls include new mutual authentication capabilities, enhanced subscriber identity protection, and additional security mechanisms.

5G's enhanced security protocols facilitate real-time fraud detection, enabling banks to update security vulnerabilities in real-time without any service disruptions, reducing the possibility of security breaches and identity theft.

Legacy infrastructure and manual processes that have a high cost of operations.

5G network automation, lightning-fast data connectivity, and AI, ML, and advanced data analytics function (NWDAF) enable banks to analyze data based on behavior and patterns. They can design real-time digital assistants and hyper-personalized offerings such as product recommendations, lending decisions, and loan processing. Further, 5G cloud will enable large processing, potentially eliminating the need for banking apps and resulting in significant OPEX and CAPEX savings.

Faster data transmission to and from the cloud, insightful real-time recommendations, and advanced customer segmentation based on demographics, geography, behavior, and more, helping operators save on OPEX and CAPEX.

Use cases:

Smart bank branches	Internet of Moving Things

Remote tellers	Payment-enabled wearables
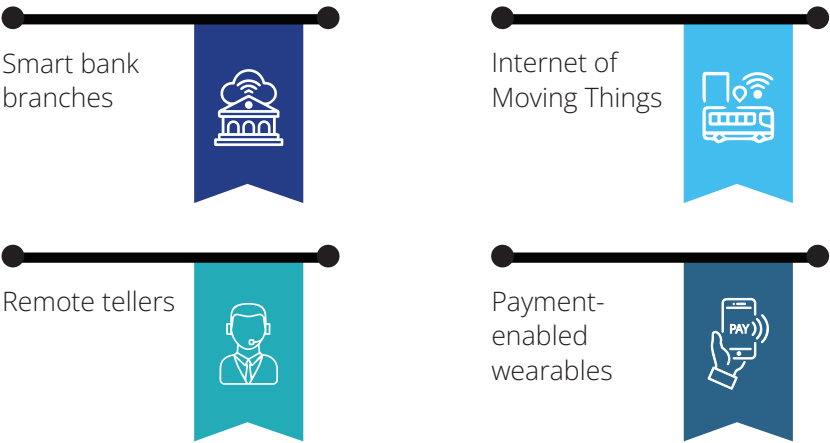
Entertainment and media

5G technology will change the face of entertainment and media, with multiple applications across broadcasting and media production. As more smartphones and consumer devices support rich media and advanced audio, video, and multimedia experiences, entertainment providers will be able to use the low latency and high bandwidth abilities of private 5G networks to enable more enriching experiences. These new media experiences can be exclusively developed to cater to different residential and enterprise clients through collaborations for shared live entertainment, interactive gaming, enhanced mobile advertising using videos and banners, and much more. Private 5G can also be deployed as a temporary network for live events such as sports and music festivals.

Challenges faced by the industry	Solutions presented by private 5G networks
Increasing churn with growing demand for improved CX.	High-speed internet enables faster upload and download, immersive media and innovative gaming experiences, and many other customer-centric solutions that help deliver a sophisticated customer experience.

Difficulty gauging audience interest and targeting the right customers with the right services and offers.

Using big data analytics will help to:

- Enable highly personalized and contextual offers for users.
- Gain accurate predictions from advanced data insights.
- Identify and reach out to relevant customers using granular and contextual targeting.

Use cases:

Temporary event networks

Enhanced mobile advertising

Immersive media

Enhanced mobile media

Smart stadiums

In-car entertainment

Connected haptic suits

Ultra HD video streaming

Education

The pandemic accelerated a massive digital revolution in education, with more students and educators adapting to the use of virtual classrooms and e-learning platforms. 5G will further bridge the education divide by overcoming the limitations inherent to legacy networks with ultrafast speeds, immersive experiences, seamless connectivity, and more. It will integrate IoT and robotics to empower educators to create unique experiences that are as good as or even better than the physical classroom.

Challenges faced by the industry	Solutions presented by private 5G networks
Lack of engaging and high-quality e-learning experiences.	Building interactive, personalized, immersive learning experiences.
More demand for quality digital learning options, as many students and instructors have limited access to physical classrooms.	Real-time and seamless connectivity to deliver uninterrupted remote learning experiences. Connecting more students and educators to classrooms to improve reach and penetration, especially in underserved and rural areas.

Use cases:

Smart classrooms

Remote learning

Holographic instructors

Robot educators
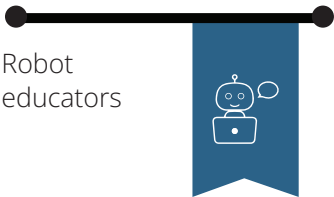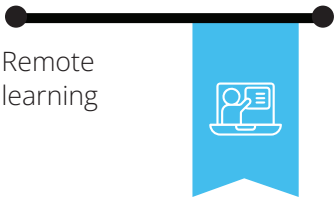
Personalized learning

Augmented reality and virtual reality

Agriculture

Private 5G will be revolutionary for agricultural communities, and streamlining agricultural practices will eventually benefit the end consumer with higher quality products at lower costs. Many agricultural experts are already monitoring and improving farming practices by implementing newer technologies along with devices like drones, sensors, and cameras. By introducing a private 5G network into the equation, they will be able to ensure more precise and efficient processes.

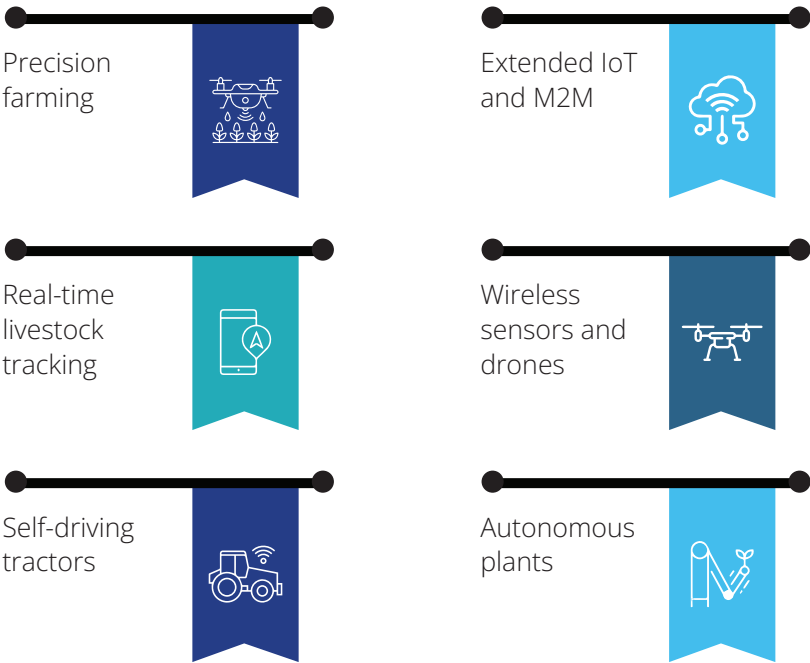| Challenges faced by the industry	Solutions presented by private 5G networks
Keeping a constant check on the location and eating habits of livestock and monitoring any potential decline in health, for example, if they've eaten something toxic like plastic.	A 5G-enabled IoT tracker device attached to collars of livestock helps ranchers track their livestock's location, chewing patterns, pasture management, and more in real-time, facilitating livestock safety and better overall health.
Climate change causing soil changes that require constant monitoring.	Real-time and centralized monitoring of soil quality, humidity, nutrients, temperature, and more.
Traditional farming has manual labor-intensive processes and lower productivity.	5G-fueled autonomous tractors facilitate precision and less labor-intensive farming practices. Smart farming applications that help segment fields using machine-to-machine (M2M) communications and AI, treating each section based on its unique needs.

![alepo]

Use cases:

Precision farming

Extended IoT and M2M

Real-time livestock tracking

Wireless sensors and drones

Self-driving tractors

Autonomous plants

Logistics

The applications of private 5G in the logistics sector are multifold. Logistics operators will be able to introduce autonomous vehicle fleets and streamline planning and processes by enabling more connected devices. They will be able to drastically reduce costs and increase operational efficiency. They will also be able to track goods in real time across the logistics chain. Further, they can streamline operations and improve monitoring across ports, logistics centers, and more.

Challenges faced by the industry	Solutions presented by private 5G networks
Heavy reliance on manual and lengthy processes and labor shortages.	Connected and automated vehicles, supply chain automation or bots, and human-robot collaboration help in swiftly performing repetitive, tedious, and labor-intensive tasks. Using connected drones streamlines asset monitoring and surveillance of large units.

Growing customer demand for faster delivery from logistics operators.	Connected sensors and vehicles with integrated communication systems facilitate location tracking so fleets can be monitored in real-time. Based on dynamically changing variables such as weather conditions, traffic, and more, goods can be redirected, helping ensure timely deliveries.
High capital and operational costs with lower margins.	Automated and streamlined management, along with real-time insights to improve speed and operational accuracy, helps to optimize resource use, cut costs, and drive revenue.
Dealing with large volumes of unstructured data.	Streamlined data management by integrating AI and ML, catalyzed by 5G's capabilities to gather and analyze large amounts of data in near-real-time.

Use cases:

Drone monitoring and video surveillance

Autonomous or connected vehicles and IoT devices

Remote maintenance and control

Preventive and predictive maintenance

alepo

Human-robot collaboration

Fleet management

Platooning or flocking

Asset performance management and tracking

Moving forward: how to monetize private 5G networks

Private networks deployed on licensed spectrum help ensure QoS over the wireless medium, and licensed spectrum can essentially be acquired through mobile operators. While larger enterprises are choosing to set up their own local 5G networks, many others, especially small and medium ones, will partner with operators. To attract more partners, 5G service providers will need to enable innovative next-gen use cases across sectors.

Over time, we can expect more standardization of NPNs, and while this will make deployments somewhat easier, what will be a differentiator for enterprises will be the operator's network design expertise in the sector. Zeroing in on a few specific verticals and specializations will likely be a profitable business approach.

Another monetization opportunity MNOs can consider is moving away from end-to-end network deployment and instead focusing on singular models such as leasing spectrum, providing multi-site network connectivity for government bodies or larger enterprises, offering guest 5G plans for hotels and cafes, and more.

Alepo has been an early mover in implementing 5G and private 5G networks. It provides key components of the 5G core and has partnered with global technology leaders to provide an end-to-end solution to fulfil diverse business requirements. It enables operators to deploy their NPN over the licensed spectrum and slice the network to support diverse industry applications.

Begin your 5G journey today: market.development@alepo.com

About Alepo

Alepo makes next-generation data opportunities a reality, delivering advanced software solutions and services that enable communications service providers to accelerate revenue growth, market share, and business success on fixed and mobile networks. Alepo helps accelerate digital enablement for networks of all sizes, including leading service providers globally. Known as the go-to partner for all things data, Alepo's innovations are highly scalable, cloud-agnostic, and enable digital-first customer experiences. Alepo is based in Austin, Texas, with a presence in all regions of the world.

For more information, please visit www.alepo.com

Alepo Global Offices:

**Corporate HQ &
North American Sales**
Austin, TX, USA
sales@alepo.com

LATAM Regional Sales
latam.sales@alepo.com

APAC Regional Sales
apac.sales@alepo.com

Research & Development
Mumbai, India
Pune, India

🌐 www.alepo.com   f AlepoUSA   🐦 @AlepoUSA   in Company/Alepo   📷 @AlepoUSA

alepo
www.alepo.com