

# CoSPs Harness the Opportunity to Monetize Private 5G Networking

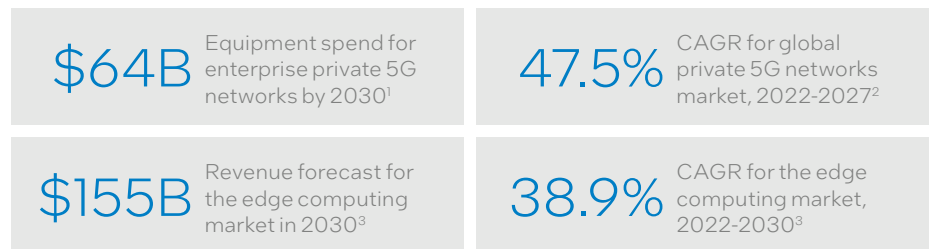
**Enterprises will capture the transformative power of 5G largely by deploying private 5G networks, complemented by edge computing. Alepo's Converged Core, combined with Intel® Smart Edge software, gives communication service providers (CoSPs) the means to deliver private 5G and edge topologies with high performance and quick, seamless deployment.**



Private 5G networks are a transformative force for enterprises in the next few years, which ushers in a tremendous opportunity for CoSPs. Particularly as they prepare to build out massive internet of things (IoT) implementations, business customers will seek guidance and expertise to take advantage of the new technology. High throughput, low-latency connections provided through private 5G networks are a critical engine for current technology roadmaps, particularly for real-time usages such as monitoring and safety applications.

Edge computing enables data to be processed close to its point of origin, without the latency, cost, and cyber-exposure associated with backhauling massive raw data sets back to the cloud or network core. Implementing the combination of private 5G and edge computing is therefore a high strategic priority for customers across sectors, including manufacturing, transport, utilities, entertainment, healthcare and many others. Both technologies are rapidly growing and will continue to do so for the foreseeable future, as represented in Figure 1.

As enterprises seek to adopt these technologies, many will look to CoSPs for solutions and expertise to help reduce risk, accelerate their paths to production and optimize the value they get from their investments. By acting as gateways to the 5G and edge computing ecosystems, CoSPs strengthen their positions as essential participants in their customers' technology roadmaps. The Alepo Converged Core leverages Intel Smart Edge software to deliver a proven, optimized solution for private 5G networking and edge computing.



**Figure 1.** Large spend and rapid growth for private 5G and edge computing.

A dedicated, secure 5G network enables enterprise deployment of modern, innovative use cases. With private 5G, enterprises can safeguard their critical infrastructure, streamline processes, optimize resources and drive revenue.

## The Scope of Private 5G Applications Across Industry Verticals

The core requirement to transport large amounts of data at high speed and low latency from massive numbers of endpoints makes the value of private 5G networks common across industry verticals. Distributed computing at the edge complements the capabilities of these networks to enable use cases across industries, as illustrated in Figure 2. Standards-based combinations of technologies can also be tailored to a range of enterprise needs that are less specific to individual industries, such as the following:

- **Critical communication networks** that demand high throughput and reliability, with low latency.
- **IoT and other machine-to-machine topologies** that include sensors, actuators, AR/VR and autonomous systems.
- **Facility and campus networks** with large, continually changing collections of endpoints.
- **Safety-critical applications** that require real-time or near-real-time operation.
- **Mobile endpoints** such as drones that constantly switch networks.

## Enabling Private 5G with Alepo’s Converged Core

Alepo’s Converged Core is a 5G stand-alone core designed specifically to enable CoSPs to deploy private 5G to their enterprise customers. It accelerates adoption for both CoSPs and end customers with a highly optimized, flexible solution that is easily adaptable to diverse business and technology needs.

Independent of the 4G core, the Alepo architecture enables forward-looking, end-to-end infrastructures that incorporate network functions (NFs) provided by industry alliances between Alepo and vendors across the ecosystem, as shown in Figure 3. Key functions include Subscriber Data Management (SDM), Authentication Function (AUSF), Unified Data Management (UDM) + Home Subscriber Server (HSS), Unified Data Repository (UDR), converged Policy Control (PCF + PCRF) and others. These network components work seamlessly with end devices and the RAN, and they have zero impact or dependence on external systems.

Alepo has forged partnerships with industry leaders for AMF, SMF, UPF, NRF, NEF and CHF to provide an end-to-end solution.



Figure 2. Cross-industry use cases for private 5G networks and edge computing.

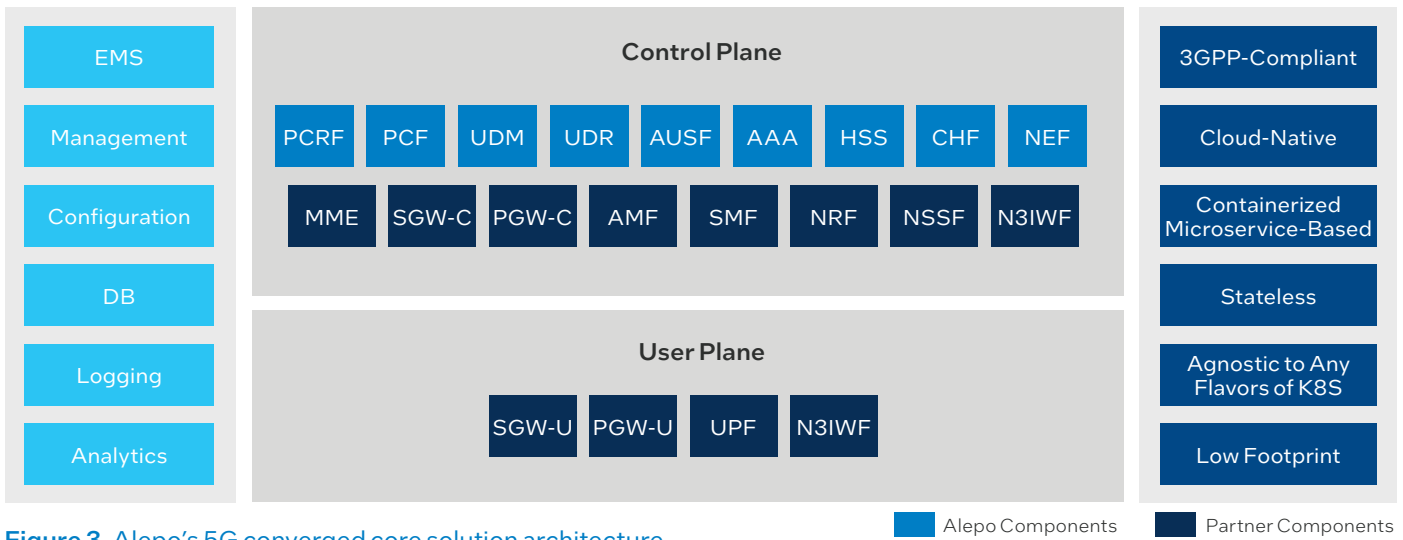


Figure 3. Alepo’s 5G converged core solution architecture.

### Advancing Strategic Imperatives with Private 5G and Edge Computing

The combination of Alepo’s Converged Core and Intel Smart Edge software provides the basis for differentiating CoSP service offerings. Building on this technology foundation, CoSPs can accelerate their roadmaps to innovate on offerings that combine private 5G networking and edge computing. These products and services can deliver a range of benefits to end customers, including those discussed in the remainder of this section.

### Offer Cloud-Native Capabilities with a Low Resource Footprint

The solution is fully compatible with cloud-native approaches such as containers and microservices, making it a ready fit with the transformation journeys of mainstream enterprise customers. It occupies a small resource footprint to help optimize costs, offers flexible deployment modes to meet diverse business goals and facilitates automation to drive operational efficiency.

### Swiftly Launch Private Networks

The plug-and-play solution enables data, voice and priority services such as Mission-Critical-Push-To-Talk (MCPTT), Mission Critical Video (MCVideo) and Multimedia Priority Services (MPS). The RAN and core network can plug into the operator’s network to support wide-area coverage.

### Accelerate Rollout of New Services

Ready profile templates allow bulk subscriber import and simplify management of large numbers of subscriber services in public and private networks. Operators can build and test subscriber service profile templates in their data centers and swiftly roll them out across multiple networks.

### Support Multi-Tenancy Deployments

The solution supports 3GPP-defined private network deployment models: PNI-NPNs (where private networks are dependent on public networks using a centralized core) and SNPNs (where a standalone core is deployed for each private network).

### Implement a Centralized Core for Multi-Tenancy

In accordance with 3GPP’s 5G Multi-Operator Core Network (5G MOCN) model, the solution offers a centralized core that allows network sharing among multiple private networks, including MNOs and enterprises.

### Gain Advanced Control Over Services

Enterprises can efficiently implement and manage next-gen high-value services such as edge computing, IoT, network slicing, large-scale streaming events and much more.

### Ensure Secure Access Based on CAG

Alepo’s Converged Core restricts UEs from accessing the devices belonging to the Closed Access Group (CAG), making the network experience more stable, secure and reliable.

### Deploy Agile Networks

Private 5G networks can be deployed entirely using wireless technology, enabling greater flexibility than traditional wired topologies.

### Optimize Network and Application

Leveraging Intel Smart Edge and Alepo Converged Core, CoSPs can optimize their network operations by adding intelligence at the network edge.

### Converged Core Deployment Modes

Enterprises can choose to deploy and manage their own infrastructure, recruiting in-house domain experts to help run and manage the network. The other option is to acquire a network-as-a-service (NaaS) from telecom operators or other vendors.

Operators can use different deployment modes depending on their objectives. They could have an on-site core in a box with RAN for a completely private network, or a cloud core with RAN, for example. Those providing private 5G in the NaaS model can use other spectrums for their deployments, helping optimize the network.

### On-Premises Deployment Model

In this model, the 5G core is deployed on-premises on private cloud infrastructure or using standalone servers; key benefits and use cases are shown in Table 1. Containerized 5G NFs are deployed on cloud-native infrastructure, with data processing and storage on-site.

**Table 1. Benefits and use cases for on-premises 5G core deployment.**

Benefits	Use Cases
<ul style="list-style-type: none"> <li>▪ High security with local control; no outside connection</li> <li>▪ Optimizes OPEX</li> <li>▪ One-box solution</li> <li>▪ Streamlines operations and maintenance, supporting integrated EMS and PaaS tools</li> </ul>	<ul style="list-style-type: none"> <li>▪ Manufacturing</li> <li>▪ Utilities</li> <li>▪ Public safety</li> <li>▪ Smart buildings</li> <li>▪ Education</li> <li>▪ Hospitals</li> </ul>

### Public Cloud Model

In this model, the 5G NFs are deployed on highly distributed public cloud infrastructure, corresponding to benefits and use cases including those shown in Table 2. The public cloud model enables one or more geographic locations, without extensive CapEx for infrastructure. It supports secure and reliable wireless operation, which is particularly beneficial for industrial applications.

**Table 2. Benefits and use cases for public-cloud 5G core deployment.**

Benefits	Use Cases
<ul style="list-style-type: none"> <li>▪ Reduces net work management complexities and ongoing IT maintenance</li> <li>▪ Lowers CapEx, deployment time</li> <li>▪ Simplifies deployments with automated orchestration and configuration</li> <li>▪ Streamlines traffic management</li> </ul>	<ul style="list-style-type: none"> <li>▪ Industrial IoT (IIoT)</li> <li>▪ Manufacturing automation</li> <li>▪ Events</li> <li>▪ 5G AR</li> <li>▪ Base station sites</li> <li>▪ Regional and/or national data centers for edge infrastructure</li> </ul>

### Hybrid Deployment Model

In this model, the User Plane Function (UPF) is deployed at the telco edge or enterprise premises, while the 5G core is deployed on private or public cloud at a centralized location. Key benefits and use cases for this model are given in Table 3. All devices are connected to a centralized server, and the data payload changes dynamically depending on edge location, providing low latency.

**Table 3. Benefits and use cases for hybrid 5G core deployment.**

Benefits	Use Cases
<ul style="list-style-type: none"> <li>▪ Enables low-latency data connectivity</li> <li>▪ The UPF is connected to 5GC using a secured tunnel to enable failproof security</li> <li>▪ Ensures a minimal resource footprint for all 5GC NFs</li> <li>▪ Enables focus on data control and access, with dedicated communications only where needed</li> <li>▪ Ensures smooth operations and maintenance through support for integrated EMS and PaaS tools</li> </ul>	<ul style="list-style-type: none"> <li>▪ V2X tracking</li> <li>▪ Centralized and distributed campus networks</li> <li>▪ 5G network slicing</li> <li>▪ Logistics</li> </ul>

## Enabling Intelligent Automation with Intel® Smart Edge

Advancements in virtualization techniques and 5G have accelerated the adoption of edge computing in many industry verticals. And with the advent of edge infrastructure and networking, telecom service providers and enterprises must reimagine their approaches to designing and developing their network and business solutions.

Intel Smart Edge software delivers a high-performance and optimized edge-native framework to develop edge solutions with cloud-like agility for on-premises or network edge deployment, enabling containerized network functions to co-exist with edge services, as shown in Figure 4.

Convergence of real-time 5G network analytics and edge compute capabilities enables service providers to automate their network operations with added intelligence. Likewise, enterprises can leverage real-time sensor and network analytics at the edge to add intelligence to their business application workloads.

At the edge location, data-driven intelligent applications can be developed by leveraging real-time subscriber and policy data from Alepo's 5G core network functions. Analytics on that data fuel predictions that can be fed into AI/ML-driven business logic, as illustrated in Figure 5. URLLC slice QoS prediction is an example use case, which can be used to enable emerging capabilities with robotics, autonomous vehicles and drones, using data related to factors such as location, data traffic type and latency requirements.

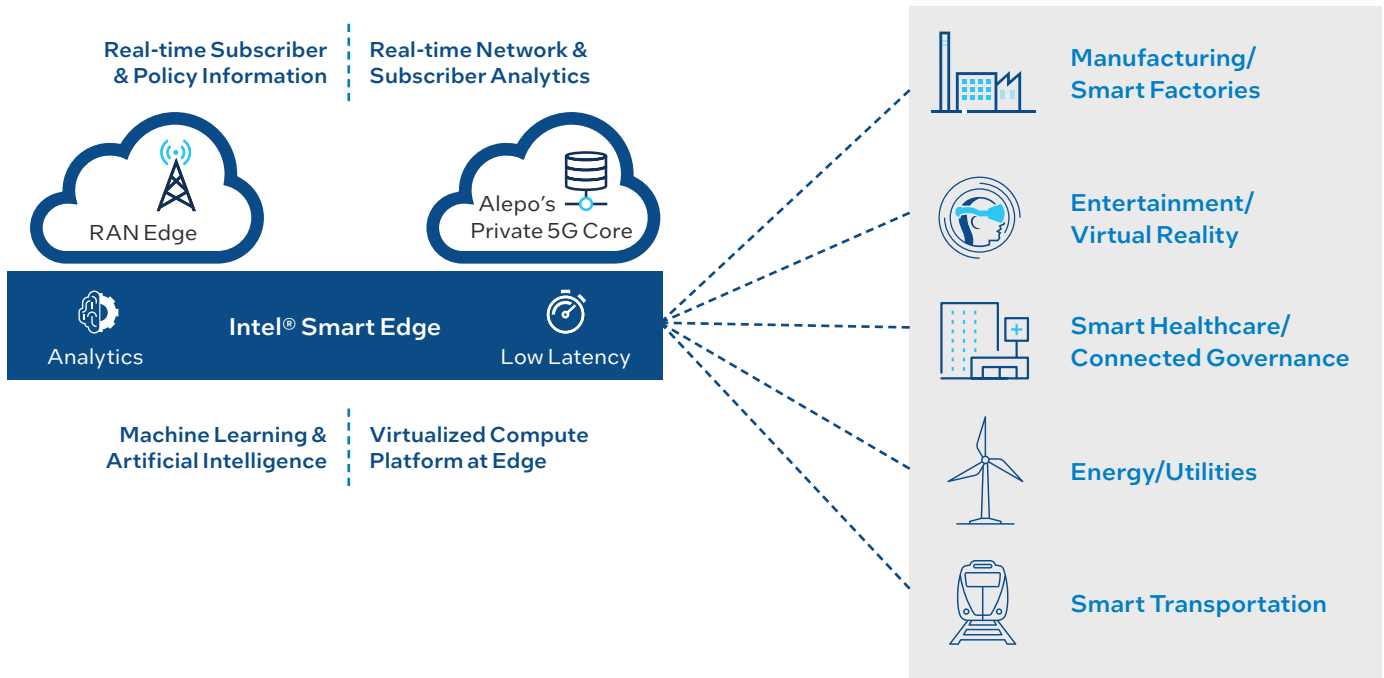


Figure 4. Private 5G ecosystem.

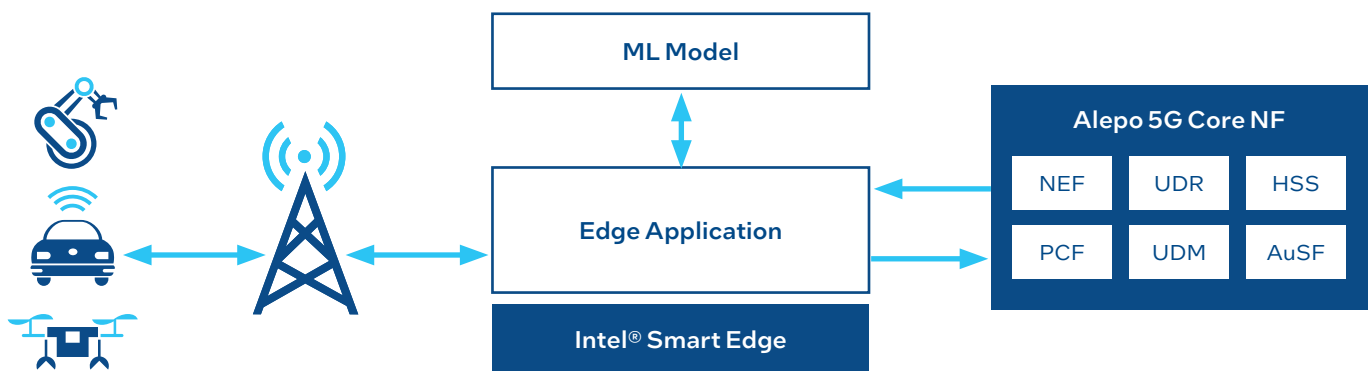


Figure 5. Traffic re-routing.

## Conclusion

The combination of Alepo's Converged Core and Intel Smart Edge software gives CoSPs a competitive advantage in meeting emerging customer requirements for private 5G networks and edge computing. This solution architecture leverages the industry ecosystem to deliver an end-to-end, standards-based solution. Through long-term collaboration, Intel Smart Edge enables CoSPs to offer robust intelligent edge solutions that relieves responsibility from their customers, allowing them to focus on innovation that advances their operational and business goals.

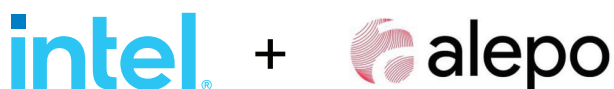
## More Information

Alepo 5G Core Network Solutions: <https://www.alepo.com/solutions/5g-core-network-solutions>

Intel® Smart Edge <https://www.intel.com/content/www/us/en/edge-computing/smart-edge.html>

Intel Private 5G infographic: <https://www.intel.com/content/www/us/en/wireless-network/5g-private-networks-infographic.html>

Solution provided by:



<sup>1</sup> ABI Research, October 20, 2020. "Private Cellular Networks to Generate Over US\$64 Billion in Equipment Revenues by 2030." <https://www.abiresearch.com/press/private-cellular-networks-generate-over-us64-billion-equipment-revenues-2030>.

<sup>2</sup> Grand View Research, "Private 5G Network Market Size Report, 2022-2030." <https://www.grandviewresearch.com/industry-analysis/private-5g-network-market/methodology>.

<sup>3</sup> Grandview Research, "Edge Computing Market Size, Share & Trends Analysis Report By Component (Hardware, Software, Services, Edge-managed Platforms), By Application, By Industry Vertical, By Region, And Segment Forecasts, 2022 - 2030." <https://www.grandviewresearch.com/industry-analysis/edge-computing-market>

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