

## GXC Uses Intel Technology for Onyx Private 5G Solution for Industry 4.0

**Onyx delivers high-performance and innovative mesh networking-based system using 4th Gen Intel® Xeon® Scalable processors, Intel® Arria® 10 FPGAs and other Intel technologies**



Industry 4.0 is the digital transformation of manufacturing, and it depends on seamless connectivity between high-performance cloud or edge computers and a range of machines and devices including IoT sensors, automated guided vehicles (AGVs), production equipment, and others.

To support early digitization efforts, enterprises utilized wired Ethernet for connectivity. And while bandwidth was high and latency low, the fixed cable plant made it challenging to reconfigure the factory floor and ruled out any mobile applications. The use of Wi-Fi addressed those issues, but Wi-Fi roaming is not deterministic, which hampered its use with AGVs, forklift trucks, and other mobile vehicles.

Private 5G networks provide a new solution to the data communications challenges of modern industrial facilities. Private 5G delivers ultra-reliable, low-latency data communication establishing real-time connectivity between devices. With average data rates of more than 100 Mbps, a private 5G network can quickly transfer large data sets.

Private 5G also supports network slicing allowing the physical network to be divided into multiple virtual segments that can be configured for different data flows. For example, a slice can be configured for video streaming that needs low latency and high throughput and another slice for IoT sensor data that needs to connect a lot of sensors but has lower latency and bandwidth requirements.

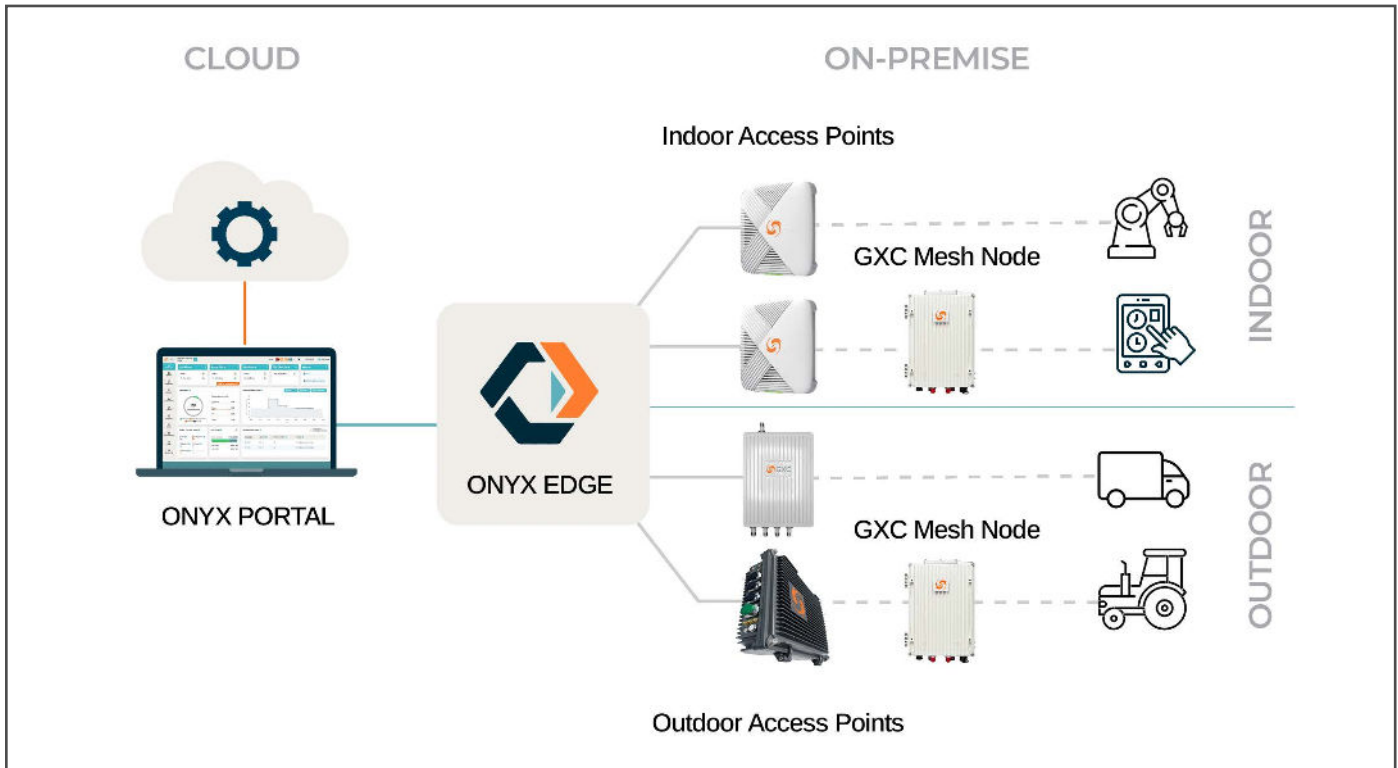
The use of subscriber identification module (SIM) cards provides secure network access. Virtualized or containerized security functionality can be run on the same server as a private 5G core offering embedded security protection.

GXC, an Intel® Industry Solution Builders' Network Builders Community member, has developed the GXC Onyx Private 5G, a groundbreaking solution engineered specifically for the unique demands of Industry 4.0.

### **GXC Onyx is a Complete Solution**

GXC Onyx is a comprehensive private 5G solution featuring radio access network (RAN), 5G core, mesh network access, full SIM support and network management system.

Figure 1 shows the key components of this system with the Onyx Edge server at the heart of the network. The Onyx Edge is a standalone 5G core and RAN server that needs no external network to provide wireless LAN services. It is also backward compatible to manage LTE and 5G access points.



**Figure 1.** Image of an Onyx Private 5G solution in an Industry 4.0 application.

Connected to the Onyx Edge are 5G access points that meet Open RAN standards and deliver industry standard performance and latency. A fronthaul multiplexer is also part of the solution and combines multiple data streams into a single, high-bandwidth front haul connection improving cell performance.

GXC provides two types of RAN nodes: wired APs and mesh nodes. Wired APs are integrated into the existing infrastructure using fiber / copper (CAT6) cabling, while the mesh nodes connect to wired APs over cellular connections. The innovative mesh node capability is enabled by GXC’s proprietary self-interference mitigation techniques that allow access and backhaul carriers to co-exist.

The entire solution is managed by the Onyx Portal, a unified and centralized management system with features for faster troubleshooting to minimize downtime and enhance operational efficiency. All management data is securely housed and accessed in the cloud through encrypted TLS tunnels from the Onyx Edge to the Onyx Portal.

For security, the Onyx Portal is designed to meet the Service Organization Control (SOC) type 1, 2 cybersecurity audit standards. With Security Assertion Markup Language 2.0 (SAML v2) single-sign-on support, enterprises can integrate existing identity providers for role-based access, ensuring compliance with security team-defined access control, password, and MFA policies.

This comprehensive system provides connectivity in critical industry sectors such as mining, manufacturing, and power generation.

Onyx Private 5G features a QoS-enforced, use-case driven performance delivery, achieving over 1.5 Gbps aggregate

throughput and extending beyond 1km outdoor range, facilitated by its unique and enhanced transmit power with directional antennas based on Intel® Arria® 10 field programmable gate arrays (FPGA). The Intel Arria 10 is the heart and brain of the RF system handling everything on the 5G radio.

### Designed for Rugged Enterprise Applications

Onyx is built from the ground up for enterprises, utilizing an Option 7 split for significantly superior 5G performance enhancement compared to LTE, alongside secure communication protocols including certificate-based authentication and comprehensive encryption.

Designed for scalability (see Figure 2), Onyx streamlines operations with zero-touch provisioning and self-organizing spectrum management. The APs and Mesh Nodes are IP67- and C1D2-certified so that the systems are durable in harsh industrial environments. The solution further boosts capacity with 4X4 multiple input / multiple output (MIMO) antennas. Support for network slicing offers flexible deployment options and minimizes latency in ultra reliable low latency communications (URLLC) services.

### Onyx Private 5G Key Features

#### Enhanced Coverage and Capacity

Compared to Wi-Fi, Onyx delivers expanded network coverage and capacity ensuring reliable connectivity across extensive industrial sites, including challenging and remote environments. For instance, a single cellular node can replace the coverage of four or five Wi-Fi access points indoors and between 12 to 16 Wi-Fi access points outdoors.

### Advanced Data Security

Onyx supports these data security protocols:

- **3GPP 5G Security Standards:** Delivers robust encryption and authentication designed for end-to-end encryption (E2EE).
- **Internet Protocol Security (IPsec):** Encrypts IP packets, securing communication between devices.
- **Transport Layer Security (TLS):** Provides secure communication channels, protecting data from eavesdropping and tampering.
- **SIM-based Authentication:** Ensures only authorized devices can access the network.
- **Public Key Infrastructure (PKI):** Uses cryptographic keys to verify the identity of devices and users.
- **Zero Trust Architecture:** Requires strict verification for every user and device accessing the network.
- **Network Slicing Security:** Isolates sensitive data and applications with unique security policies.

### Ultra-Reliable Low Latency

Onyx offers ultra-reliable low latency (URLLC) through the following key features and technologies:

- **Advanced Radio Technologies:** Techniques such as beamforming and MIMO-enhanced signal quality and strength, reducing latency and improving reliability.
- **Quality of Service (QoS) Mechanisms:** Prioritize network traffic to ensure that latency-sensitive applications receive the necessary bandwidth and low-latency connections.
- **5G New Radio (NR) Interface:** The new radio interface is designed to support low latency and high reliability, with features such as shorter transmission time intervals (TTIs) and faster retransmission protocols.

### Rapid Design and Deployment

Onyx’s agile mesh network capabilities, which use backhaul to add non-wired APs to the network, allows for quick design and deployment, enabling industries to swiftly adapt to

connectivity needs and reduce time-to-market for new innovations.

### Reduced Total Cost of Ownership

Onyx improves its initial and ongoing cost of operation through the following architectural features:

- **Scalable Infrastructure:** Onyx provides scalable network solutions that can grow with an organization’s needs. This flexibility eliminates the need for frequent overhauls or upgrades, reducing long-term capital expenditures.
- **Energy Efficiency:** Onyx uses energy-efficient hardware and protocols, which reduces power consumption and lowers operational costs. Sustainable practices also contribute to overall cost savings.
- **Centralized Cloud Management Platform:** A centralized platform allows for streamlined network management, reducing the complexity and cost associated with managing multiple disparate systems.
- **Remote Diagnostics and Updates:** Remote management capabilities enable Onyx to diagnose and resolve issues without the need for on-site visits. This reduces travel expenses, and the time required to fix problems.
- **Reduced Hardware Dependency:** Onyx’s reliance on software-defined networking (SDN) reduces the dependence on specialized hardware, lowering both initial and maintenance costs.
- **Enhanced Security:** By incorporating advanced security measures, Onyx reduces the risk and cost associated with data breaches and cyberattacks. A secure network minimizes potential financial losses and legal liabilities.
- **Training and Support:** Onyx provides comprehensive training and support.

### GXC Onyx Is Powered by Intel Technology

GXC incorporates Intel’s cutting edge technologies into the Onyx system to both enhance its technical capabilities, and to ensure the high performance needed for growing virtualized private cellular networks.

GXC Onyx System Specifications	
<b>Coverage</b>	16,000 sqft. per AP Indoor, 500,000+ sqft. per AP Outdoor
<b>Environment</b>	Indoor and outdoor
<b>Interference</b>	15 independent channels, managed network, cellular QoS
<b>Security</b>	End-to-end encryption
<b>Latency</b>	Consistent, lower latency
<b>Deployment</b>	Designed for complex environments, high (>200) number of devices supported per AP
<b>Hardening</b>	IP-67 enclosures for outdoor systems; extended temperature range
<b>Handover</b>	Controlled handovers based on decades of cellular development

Figure 2. Onyx Private 5G system specifications.

The GXC Onyx 5G Core server is powered by 4th Gen Intel® Xeon® Scalable processors. This processor family delivers compute agility and scalability, benefiting from decades of innovation for the most in-demand workload requirements. Intel® Xeon® Scalable processors have a balanced architecture that supports Open RAN, 5G core and other workloads with built-in acceleration and hardware-based security features. Other CPU features for private 5G network workloads target low latency, high throughput, and deterministic performance. In addition, the processors also have a range of features for managing power to further optimize performance per watt.

Other Intel components integrated into Onyx, include:

#### **Intel® vRAN Boost**

This on-chip accelerator offloads computationally heavy layer 1 tasks such as low-density parity check (LDPC) decoding and forward error correction (FEC). The integrated accelerator replaces a discrete accelerator card for a solution that reduces system complexity and consumes less power.

#### **Intel® Arria® 10 FPGA**

The Intel Arria10 FPGA delivers optimal performance, power efficiency and small form factor. The FPGA forms the wireless backbone of the GXC Onyx Edge server, delivering the performance needed for several of the system's GXC G105 indoor access points. The Intel Arria 10 also powers the 4x4 MIMO capability that enhances signal quality and bandwidth.

#### **Intel® QuickAssist Technology (Intel® QAT)**

This cryptography accelerator is built into the CPU and offloads computationally intensive encryption / decryption and compression tasks, freeing up compute cycles. In a private 5G network, it offers higher performance for security features while improving the CPU's compute capacity.

#### **Intel® Ethernet Converged Network Adapter (X710DA4FH / X710DA4G2P5)**

For 5G fronthaul connectivity, the GXC Onyx Private 5G Solution incorporates the quad-port Intel® Ethernet Converged Network Adapter X710 family (X710DA4FH and X710DA4G2P5). The adapter families deliver 10GbE / 40GbE connectivity and leverage Intel's advanced virtualization technology. Intel's hardware-based security enhancements protect networks from intrusions, ensuring that sensitive data is safeguarded.

#### **Intel® SFP+ Transceiver Module E10GSFPLR**

These modules are built into the fiber-optic versions of the Onyx Front Haul Multiplexer (FHM) and in the access points to ensure low-loss, high-quality transmission over fiber. The module offers 10 GbE / 1 GbE per port with Intel's advanced virtualization technology. This quad-port adapter ensures a secure and seamless connectivity experience, ideal for the backbone of an enterprise-class private 5G network.

#### **Intel® i350 Quad Port 1GbE BASE-T**

The Intel® i350 Quad Port 1GbE BASE-T provides reliable connectivity for the devices on the enterprise network. For foundational 1GbE connectivity, the Intel i350 Quad Port BASE-T adapter offers a reliable, secure, and cost-effective solution. It's well-suited for handling the voluminous and varied traffic typical in burgeoning private 5G networks.

### **Conclusion**

The GXC Onyx Private 5G Solution is a strategic investment for industrial organizations aiming to provide ubiquitous wireless connectivity in order to leverage the full potential of Industry 4.0 technologies. By enhancing operational efficiency and enabling innovation, Onyx is both a solution for today's challenges and a gateway to the future of industrial connectivity. As the technological landscape continues to evolve rapidly, Onyx offers a scalable, secure, and high-performing network infrastructure, equipping industrial enterprises with the tools they need to thrive in the evolving digital age.

### **Learn More**

[GXC homepage](#)

[GXC Onyx product page](#)

[4th Gen Intel® Xeon® Scalable processor with Intel® vRAN Boost](#)

[Intel® Ethernet Converged Network Adapter \(X710DA4FH / X710DA4G2P5\)](#)

[Intel® Arria® 10 FPGA](#)

[Intel® Network Builders ecosystem](#)

[Intel® QuickAssist Technology \(Intel® QAT\)](#)

[Intel® i350 Quad Port 1GbE BASE-T](#)



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