White Paper

Mobile Network Operators
5G Networks

Wind River, QCT & Intel Deliver Optimized 5G vRAN platforms

The Quanta Cloud Technology (QCT) QuantaEdge EGX63IS-1U server is verified as an Intel® Select Solution for vRAN on Wind River Studio

5G is a new paradigm in mobile networking, offering a combination of low latency, high bandwidth, and other features such as network slicing. 5G is helping to meet the ever increasing bandwidth needs of consumers, but is also expanding into nearly every sector, providing the foundation for a diverse range of applications. Autonomous vehicles, robotics in manufacturing and warehouse management, military technologies, medical devices, and more will depend on 5G to create and expand access and capabilities.

This is why providers are embracing the technology including virtualizing network functions, building out services at the network edge and embracing cloud-delivered infrastructure. 5G will not work on yesterday's technology, and tomorrow's technology requires investment.

Controlling costs is another key consideration in building out the 5G network. The only way upgrading and reengineering processes to support 5G can be economically favorable is by keeping operating expenses (OpEx) and capital expenses (CapEx) within the mobile network operator's (MNO's) budgetary realities.

Economies of scale are critical in a network that is expected to add millions of new base stations and billions of new devices. Open vRAN is a new approach to building wireless networks that replaces closed, legacy baseband controllers with network elements connected via open-standard interfaces. These interfaces provide interoperability allowing MNOs to pick best of breed network elements such as RAN software, radios, servers, and others, from an ecosystem of providers. vRAN solutions attain cost savings through ecosystem competition, but also because vRAN software runs on commercial-off-the-shelf (COTS) servers that can be significantly less expensive than legacy proprietary servers. MNOs also have the option to run some of the software in the cloud, which provides on demand servers for scalability and service agility.

A virtual radio access network (vRAN) architecture strategy is a key to cost-effective agility within 5G environments because the RAN can account for up to 80%[1] of the cost of a mobile network. But the RAN can also be a very challenging workload for commercial off-the-shelf (COTS) server platforms.

Intel® architecture-based servers offer the performance, but optimal performance comes when a system is tuned—from the accelerators to the BIOS, firmware, operating system and virtualization stack. This provides the performance needed to meet the real-time needs of the application, while reducing the system integration required.

Wind River designed its cloud native Wind River Studio to be cost effective for edge deployments such as the vRAN workload. The QCT IronEdge server was also specifically designed and optimized for Open RAN deployments using 3rd generation Intel® Xeon® Scalable processors along with several acceleration offload options. This combined system affords the MNO:

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- **Low complexity and risk** as it provides MNOs with a validated hardware and virtualization platform based on reference designs validated for vRAN applications.
- **Low total cost of ownership** as Wind River Studio requires a smaller footprint and fewer deployments in a network and is cloud native.

Together, these Intel® Network Builders ecosystem partners have collaborated to build and validate an Intel Select Solutions for vRAN on Wind River Studio.

Wind River Studio: A Closer Look

Wind River Studio is the first cloud-native platform for the design, development, operation, and servicing of mission-critical intelligent edge systems that require security, safety, and reliability. Wind River Studio is architected to deliver digital scale across the full lifecycle through a single pane of glass to accelerate transformative business outcomes.

Wind River Studio delivers an integrated cloud platform unifying infrastructure, orchestration, and analytics capabilities that enables MNOs to deploy and manage globally distributed 5G edge networks, including the remote servers that will process vRAN traffic. The core capabilities of Wind River Studio include:

Cloud Platform: Studio provides a production-grade Kubernetes cloud platform for managing edge cloud infrastructure. Based on the open source StarlingX² project, Wind River Studio compiles optimal open source technology to deploy and manage distributed networks.

Conductor: Wind River Studio's comprehensive automation capabilities provide one platform to achieve multi-cloud automation and zero-touch operation. MNOs can use the app catalog to select applications, deploy them to a carrier-grade cloud platform, and orchestrate the resources needed for the applications at the edge network site. This orchestration allows scalability from a handful of nodes to thousands of nodes in a geographically dispersed, distributed environment.

Analytics: Using machine learning algorithms, Wind River Studio supports effective management of a distributed cloud system by consuming and processing data and producing meaningful insights for decision making. Wind River Studio uses full stack monitoring of the cloud infrastructure cluster to collect, analyze, and visualize cloud behavioral data to improve uptime and optimize operations.

In a vRAN with an Intel architecture compute infrastructure at each site in the network, Wind River Studio offers a single geo-distributed cloud operating multiple, individual distributed clouds with centralized management (see Figure 1).

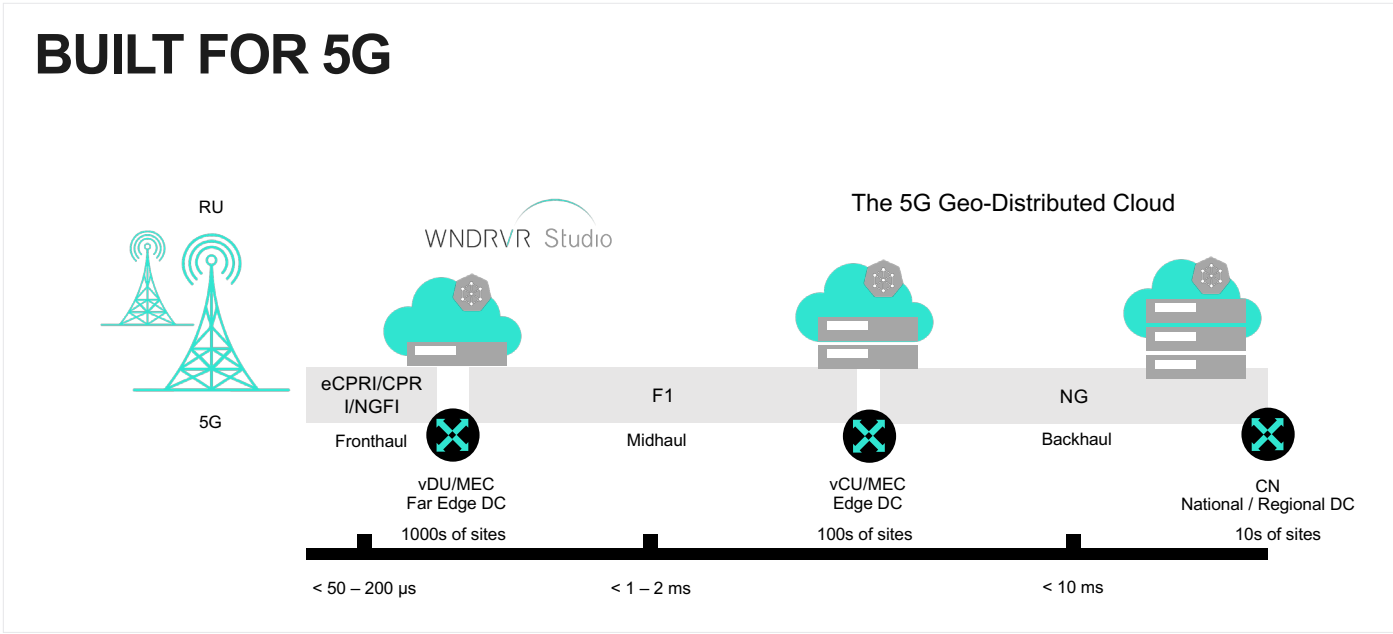

Figure 1. Wind River Cloud Platform deployed as a single geo-distributed cloud.

QCT Edge Servers Offer vRAN Performance

QCT's Iron product family (IronBox, IronEdge and IronCloud) was developed to meet the data center, wireline and wireless network needs of MNOs. The QCT Iron products deliver the performance needed for data center, core network, access network deployment, in addition to on premises applications.

The IronEdge server line optimized for 5G vRAN cabinet applications, is the single-socket QuantaEdge EGX63IS-1U that comes pre-validated with Wind River Studio. The servers are available with a range of 3rd generation Intel Xeon Scalable processors to provide the processing and cores needed for high-performance virtualized vRAN workloads.

The QuantaEdge EGX63IS-1U server has flexible I/O expansion slots needed for 5G Open RAN applications. In addition to up to four built-in 25GbE network ports and three 1GbE ports, the system offers three PCIe Gen4 x16 slots for expansion. These can be used to support 100GbE network connectivity via a 100GbE Intel® Ethernet Network Adapter E810 with TimeSync capability, or dedicated vRAN processing using Intel® vRAN Dedicated Accelerator ACC100 cards.

The server supports up to 512 GB of DDR4 RAM along with two built-in slots for NVME/SATA3 M.2 form factor storage drives. The system's modular design can also optionally support a storage SKU with two slots for 2.5'' SATA3 SSDs. For remote cabinet applications, the system has a short depth of only 420mm with front-access design for the constrained space inside a cabinet. The server also supports a wide temperature range of -5°C to 55°C.

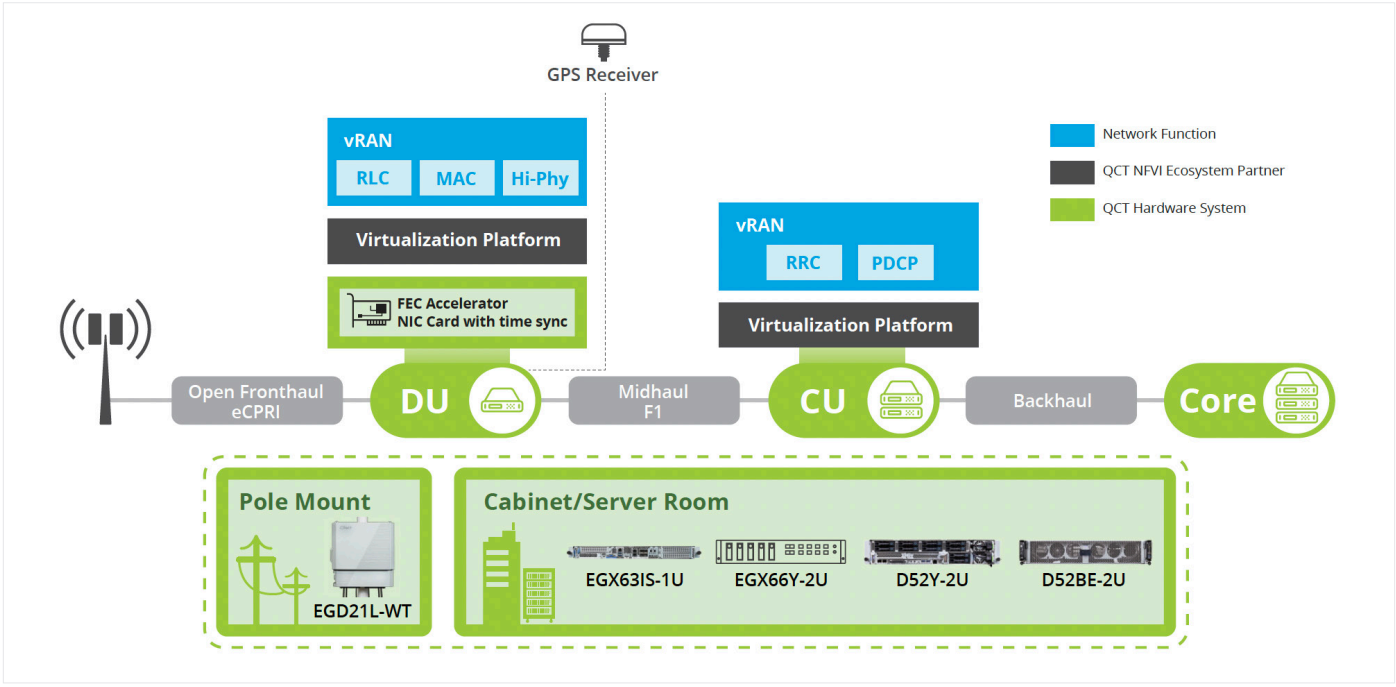

Figure 2. QCT IronEdge Product Architecture for vRAN.

QUANTAEDGE EGX63IS-1U PRODUCT

KEY FEATURE HIGHLIGHT

- 420mm Ultra Short Depth with Front-Access Design
- NEBS Level 3 Compliance and ORAN/OTII Compliance
- System validated with Open RAN accelerators and NIC cards
- Flexible I/O design supports up to three PCIe Gen4 expansion slots
- Supports AC or -48V DC power supply

3rd Generation Intel® Xeon® Scalable Processors

3rd Generation Intel Xeon Scalable processors offer the following features and advantages:

- **Flexibility from the edge to the cloud,** bringing AI everywhere with a balanced architecture, built-in acceleration, and hardware-based security.
- Part of a complete set of network technology from Intel, including accelerators, **Ethernet adapters**, **Intel® Optane™ persistent memory**, **Intel FlexRAN™ Reference Architecture**, **Open Visual Cloud**, and **Intel® Smart Edge**.
- **Engineered for modern network workloads,** targeting low latency, high throughput, deterministic performance, and high performance per watt.
- **Enhanced built-in crypto-acceleration** to reduce the performance impact of full data encryption and increase the performance of encryption-intensive workloads.
- **Hardware-based security** using **Intel® Software Guard Extensions** (Intel® SGX), enhanced crypto processing acceleration, and Intel Total Memory Encryption.

Intel® Select Solutions for vRAN on Wind River Studio

Intel Select Solutions for vRAN offer MNOs a streamlined path to vRAN deployment, with validated stacks of hardware and software built in conjunction with industry leading independent software vendors for flexible performance and rock-solid security. QCT, Wind River and Intel partnered to create a validated vRAN reference configuration (VRC) using the QCT QuantaEdge EGX63IS-1U platform.

An Intel team creates these reference designs, performing rigorous regression testing in the lab, ensuring that the various components- hardware, BIOS/firmware, drivers and operating system all integrate effectively and perform well in combination.

This workload optimized software and firmware stack utilizes Wind River Studio in order to deliver 5G requirements of ultra-low latency, high availability, security, and scale in an efficient and cost-effective way. A key part of this stack is a production-grade Kubernetes cloud platform for managing edge cloud infrastructure.

After going through this process, the QuantaEdge EGX63IS-1U server passed the rigorous testing requirements and meets or exceeds all elements of Intel Select Solution for vRAN.

INGREDIENT	INTEL SELECT SOLUTIONS FOR VRAN BASE CONFIGURATION HARDWARE	INTEL SELECT SOLUTIONS FOR VRAN PLUS CONFIGURATION HARDWARE
CPU	3rd Generation Intel Xeon Gold 5318N processor (one socket, 20 cores) or higher SKUs	3rd Generation Intel Xeon Gold 6338N processor (one socket, 32 cores) or higher SKUs
Memory	128 GB (16 GB DIMM/Channel recommended)	
Intel Ethernet Controller:	1x E810-CAM2 or CAM1 based NIC for 100Gb/s throughput: e.g., 1x E810-XXVDA4 or 1x E810-CQDA2	2x E810-CAM2 or CAM1 based NIC for 200Gb/s throughput: e.g., 2x E810-XXVDA4 or 1x E810-2CQDA2
Acceleration	1x Intel vRAN Dedicated Accelerator ACC100 Intel QAT (optional)	
Storage (SSD/NVMe)	At least 2x 480 GB for boot (Intel SSD, Intel Optane™ SSD, or M.2 equivalent)	

Figure 3. Hardware Requirements: Intel® Select Solutions for vRAN.

Conclusion

Wind River Studio offers the cloud functionality, automation, and analytics needed to solve the operational problem of deploying and managing distributed edge networks such as vRAN. The QCT QuantaEdge EGX63IS-1U was specifically designed and optimized for the vRAN workload where MNOs require a high I/O, short depth, ruggedized platform at the edge. Together, the Wind River Studio with the QCT QuantaEdge EGX63IS-1U Telco Server offer MNOs a powerful, cost effective, highly scalable, and flexible packaged solution for edge-deployed vRAN.

Learn More

Wind River Studio

QCT IronEdge for Open RAN

Intel® Network Builders

Intel® Select Solution for vRAN on Wind River Studio

Notices & Disclaimers

[1] https://www.rcrwireless.com/20200806/open_ran/open-ran-101-open-ran-adoption-in-different-regions-why-what-when-how-reader-forum
[2] https://www.starlingx.io/

Intel technologies may require enabled hardware, software or service activation.
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Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.
Your costs and results may vary.

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