intel.

Wind River, Hewlett Packard Enterprise, & Intel Deliver 5G vRAN

Wind River Studio and HPE ProLiant DL110 Gen10 Plus servers, based on Intel® architecture technology, combine to make a powerful platform for 5G virtualized radio access networks (vRAN).

Hewlett Packard Enterprise

WNDRVR

5G, in the popular imagination, is primarily about mobile devices, video streaming, and gaming—all thanks to low latency and high bandwidth. However, the technology is 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.

According to the Ericsson Mobility Report, 40% of all mobile subscriptions—3.5 billion—will be for 5G services by 2026. 5G will account for 80% of North American mobile subscriptions. Also by 2026, according to the report, the internet of things (IoT) will account for 26.9 billion connections.[1]

This is tomorrow's world, but that tomorrow is not far off.

This is why providers are rushing to virtualize network functions, to migrate infrastructure to distributed cloud platforms, and to provide more services at the network edge. Tomorrow's world 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 cell towers and billions of new devices.

A virtual radio access network (vRAN) architecture strategy is a key to cost-effective agility within 5G environments because the RAN can be up to 80% of the cost of a mobile network.[2] 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 optimized for edge deployments such as the vRAN workload. The HPE DL110 server was also specifically designed and optimized for Open RAN deployments using 3rd generation Intel® Xeon® Scalable processors along with several acceleration offload options. Together, these Intel® Network Builders ecosystem partners are collaborating with the network equipment providers (NEPs) to validate their respective vRAN software stacks on this Wind River and HPE platform solution.

Table of Contents

Together with the NEPs, this disaggregated vRAN solution enables mobile network operators (MNOs) to deliver key elements in their 5G strategy such as low latency, high throughput, service deployment mobility, and reliability. This combined system affords the MNO:

- **Help lower complexity and risk** as it provides MNOs with a validated hardware and virtualization platform based on reference designs validated for vRAN applications.

- **Help lower total cost of ownership** as Wind River Studio requires fewer deployments in a network and is cloud native.

Wind River Studio: A Closer Look

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 operator capabilities of Studio include the following:

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

Orchestration: Studio's comprehensive orchestration 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, Studio supports effective management of a distributed cloud system by consuming and processing data and producing meaningful insights for decision making. Studio uses full stack monitoring of the cloud infrastructure cluster to collect, analyze, and visualize cloud behavioral data to improve uptime and optimize operations.

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.

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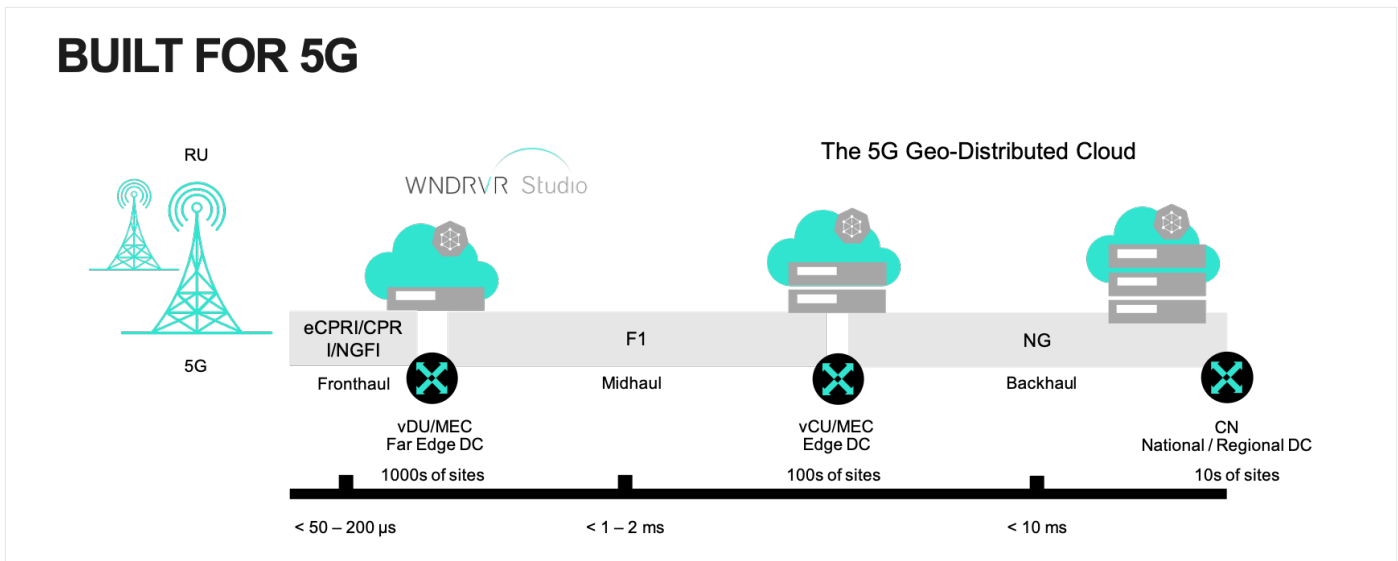

Figure 1. Wind River Cloud Platform deployed as a single geo-distributed cloud.

Open RAN Optimized HPE ProLiant DL110 Gen 10 Plus Telco Servers

The HPE ProLiant DL110 Gen10 Plus telco server is workload optimized for edge computing in 5G and Open RAN deployments. These optimizations meet the following MNO needs:

- Open, standards-based architecture that supports vRAN software from multiple vendors

- Reduced overall power consumption and footprint

- Highly dense platform supporting the functionality of baseband unit, fronthaul gateway, and cell site router in a highly optimized single short-depth 1U/1P server

- Accelerator options to drive performance-sensitive, packet-processing vRAN workload

- Consistency from core to edge that delivers more trusted HPE ProLiant security and manageability experience, including silicon root of trust

Figure 2. HPE's ProLiant DL110 Gen10 Plus Telco Server.

The server is built for edge deployment, featuring open-standards architecture and a carrier-grade ruggedized Network Equipment-Building (NEBS) Level 3-compliant platform. The rack-mounted server is a compact 1U high, minimizing physical infrastructure demands in the remote environment.

It is optimized for 3rd generation Intel Xeon Scalable processors and supports various accelerator options, including FPGAs, GPUs, and a host of Intel® network adapters to support narrow-band to midband fronthaul and appropriate midhaul interfaces.

To help reduce the risk and complexity of these edge workload deployments, HPE is working with partners to create a number of pre-validated Telco Infrastructure Blueprints and Intel-validated vRAN reference configurations (VRC) that will enable MNOs to quickly deploy these solutions without restricting an MNO's choice of software vendor.

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 other industry leading independent software vendors for flexible performance and

rock-solid security. HPE and Intel partnered together to create a validated vRAN reference configuration (VRC) using the HPE ProLiant DL110 platform. This VRC is the foundation for the Intel Select Solution for vRAN.

The Intel Select Solutions for vRAN utilize the 3rd generation Intel Xeon Scalable processor, Intel® vRAN Dedicated Accelerator ACC100 and Intel® Ethernet 800 Network Adapters. An Intel team tests these reference designs using rigorous regression testing in the lab, ensuring that the various components all integrate effectively and perform well in combination.

The workload optimized software and firmware stack built into the Intel Select Solutions for vRAN on Wind River Studio delivers 5G requirements of ultra-low latency, high availability, more security, and scale in a highly efficient, and cost effective way. A key part of this stack is a production-grade Kubernetes cloud platform for managing edge cloud infrastructure.

During the development of Intel Select Solutions for vRAN, Intel engineers paid particular attention to help reduce the overhead associated with Layer 1 forward error correction (FEC). The Intel vRAN Dedicated Accelerator ACC100 offloads high-bandwidth FEC processing, as well as rate matching and cyclic redundancy check functions from the CPU to free up resources for other workloads.

3rd Generation Intel® Xeon® Scalable Processors

- **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.[3]

intel.
XEON

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 HPE ProLiant DL110 was specifically designed and optimized for the vRAN workload where MNOs require a high I/O, short depth, ruggedized platform at the edge. Together, Wind River Studio with the HPE ProLiant DL110 Gen10 Plus telco server offer MNOs a powerful, cost effective, highly scalable, and flexible packaged solution for edge-deployed vRAN.

Learn More

Wind River Studio

HPE ProLiant DL110 Gen10 Plus Telco Server

Intel® Network Builders

Intel® Select Solutions for vRAN on Wind River Studio