

Wind River and Intel® Xeon® Scalable Processors Target 5G Readiness

Integrating Wind River Titanium Cloud™ NFV Infrastructure Software with servers based on Intel® Xeon® Scalable processors delivers low latency and VNF access to Intel® Advanced Vector Extensions 512.



Overview

The era of 5G promises new services that will transform our lives. From Internet of things (IoT) sensors that will provide data for new insights to automated vehicles that provide ultra-safe mobility for all, 5G will provide the wireless services that are critical to the next evolution of the data economy.

These new services will create new requirements for speed, latency, and scale in communications networks. As the next-generation of wireless networks, 5G will take advantage of the fundamental changes that communications service providers (CommSPs) are now making to their network infrastructure. On a global scale, CommSPs are beginning to shift from purpose-built, fixed-function hardware to solutions based on network functions virtualization (NFV). These new solutions will rely on the performance of network functions virtualization infrastructure (NFVI) platforms, which must meet new throughput and latency requirements and also increase network capacity and subscriber density.

To demonstrate that the Wind River Titanium Cloud™ NFVI portfolio is ready for the demands of coming 5G networks, the company worked with Intel to integrate the software with server boards based on the latest Intel® Xeon® Scalable processors.

Challenge

5G network technology is not envisioned as a single wireless service, but rather as a heterogeneous network that will work seamlessly with existing wireless technologies such as LTE, Wi-Fi, and mmWave. The use cases identified to date include next-generation mobile wireless network services and also fixed wireless broadband, wireless LANs, and low-speed wireless IoT services. The development of 5G networks will also speed the virtualization of mobile network infrastructure to both support these use cases and to ensure that these networks are agile and cost-effective.

This virtualization will impact the core of the network and also the edge, where multi-access edge computing (MEC) technology is providing cloud computing and mobile networking applications in a single server at a point of presence or on the customer premises. These “mini data centers” at the edge of the network will need telecom-class reliability and performance with support for cloud-computing class virtualization. 5G technology and MEC will require significant computing power, and in a virtualized environment that means a tight integration between the NFVI software and the server.

As a key contributor of NFVI technology to CommSP networks, Wind River recently integrated its Wind River Titanium Cloud NFVI platform on servers powered by new Intel Xeon Scalable processors to demonstrate its readiness for future 5G networks.

Solution

Wind River's Titanium Cloud is a complete NFVI software solution that includes:

- **Hardened Linux***: Wind River adds more than 700 patches to enterprise Linux to provide the reliability, security, availability, and performance needed for communications service providers' (CommSPs) networks.
- **Real-time KVM**: Wind River Titanium Cloud includes kernel virtual machine (KVM) hypervisor functionality with kernel and user space optimizations to deliver deterministic performance.
- **High Availability OpenStack***: For Titanium Cloud, Wind River has improved enterprise-class OpenStack with reliability and availability extensions that impact virtual machine (VM) migration time, detection of VM failures, automatic recovery of failed VMs, VM resource management, and host and controller node failover. These extensions make OpenStack suitable for the CommSP network environment.
- **Ceph***: Open source Ceph provides a highly scalable, highly available, highly performant distributed storage solution.

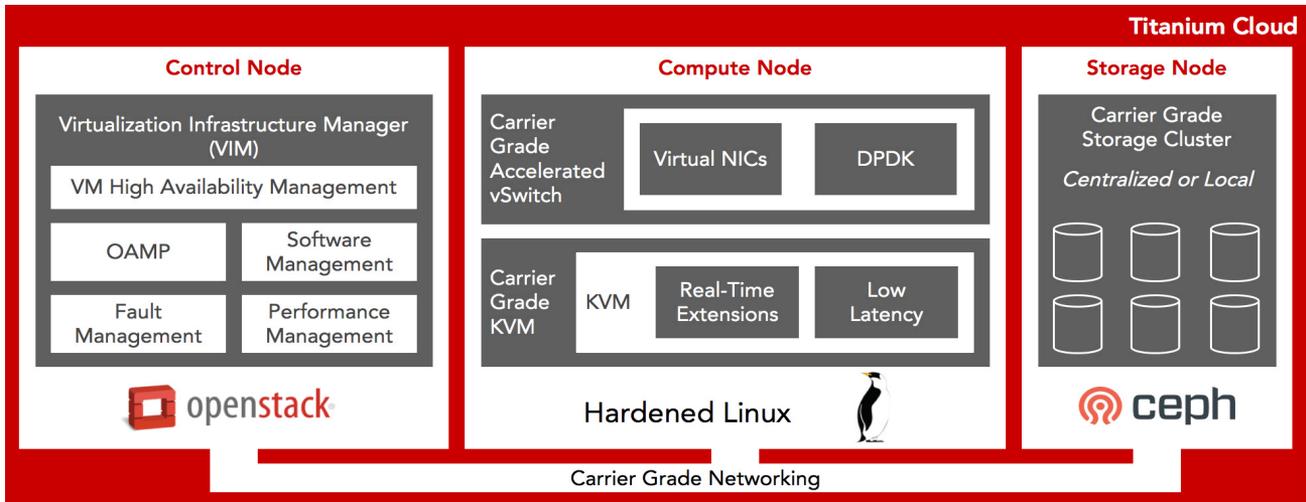


Figure 1. What's included in Wind River Titanium Cloud*¹

There are three Wind River Titanium Cloud products for service provider applications. Wind River Titanium Core is designed with the scalability and performance for CommSP core network applications, and Wind River Titanium Edge has the industry's smallest footprint for highly available network virtualization. The portfolio also includes Wind River Titanium Edge SX, a single-server configuration for minimum-footprint edge applications.

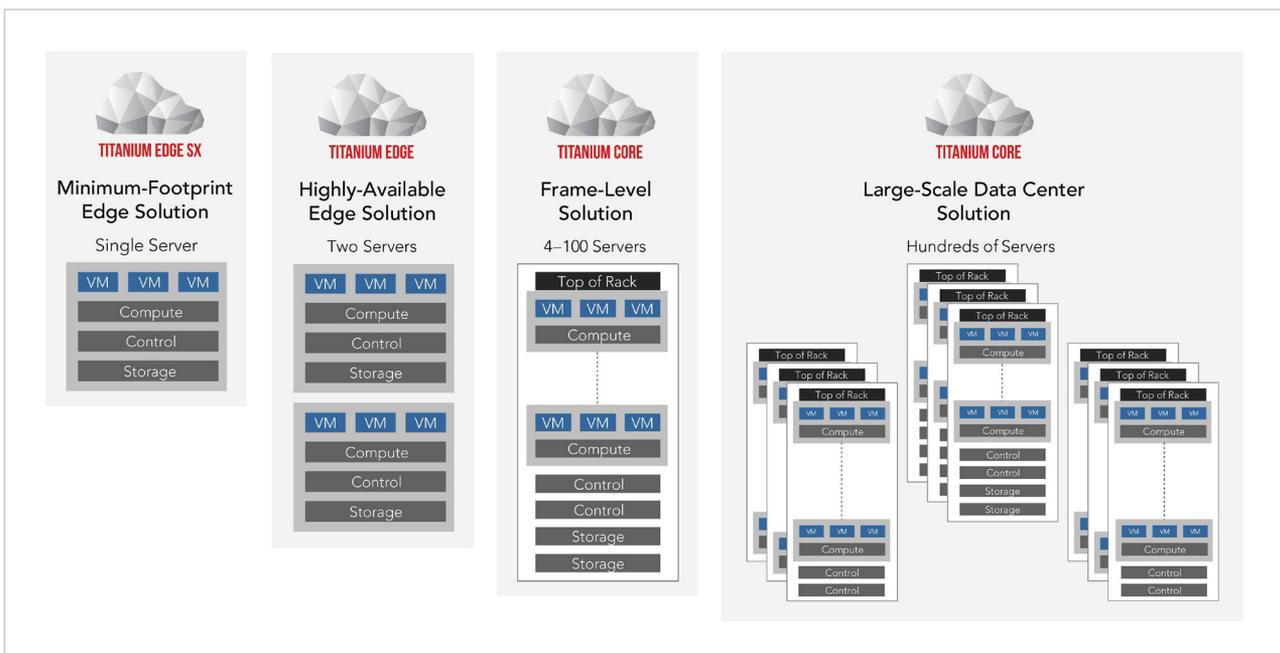


Figure 2. Fully scalable system-level architecture¹

To ensure performance in production network deployments, Wind River has developed the Wind River Titanium Cloud Ecosystem to validate network applications and server platforms. Intel is a member of the ecosystem and worked with Wind River to demonstrate NFVI performance on servers powered by Intel Xeon Platinum and Gold processors.

Intel® Xeon® Scalable Processors

Intel Xeon Scalable processors are the next-generation platforms for cloud-optimized, 5G-ready networks. With an open architecture, the platform can scale and adapt with ease to handle the demands of emerging applications. The platform also provides a future-ready foundation for agile networks that can operate with cloud economics, be highly automated and responsive, and support rapid and more secure delivery of new and enhanced services enabled by 5G.

The Intel Xeon Scalable processors are the successors to the Intel Xeon processor E5 and E7 product lines. Intel Xeon Scalable processors feature new technology for compute, network, and storage workloads. The family has also integrated a number of performance accelerators, the most important of which for NFV applications is Intel® QuickAssist Technology (Intel® QAT), which provides hardware-assisted acceleration for critical workloads such as data compression and cryptography across server, storage, and network systems.

The Intel® Xeon® Scalable Processors

The Intel Xeon Scalable processors are the future-forward infrastructure platform for agile digital services. This processor family offers:

- High scalability for cloud-optimized and 5G-capable communications networks
- Exceptional processing of encryption algorithms and acceleration for compression and other key workloads
- Performance and efficiency to allow convergence of key communications workloads such as applications and services, control plane, packet, and signal processing

Integration Results

The goal of the integration of Wind River Titanium Cloud on both server boards was to demonstrate complete NFVI functionality on the new hardware. The integration highlighted the low-latency interrupt and timer services that are built into Wind River Titanium Cloud. Latency is a critical performance metric for 5G applications where industry standards bodies have an end-to-end latency goal of less than 1 millisecond for 5G applications. In addition, the integrated solution offers low packet latency and minimal packet jitter—a requirement for real-time critical applications such as 5G.

The companies believe that the outstanding performance from the Intel Xeon Scalable processors plus the excellent efficiency of the Titanium Cloud Accelerated vSwitch will increase the number of cells sites that can be supported per processor core and lead to higher subscriber density for a virtualized base station.

The integration also showed how the NFVI solution can expose some of the key features of the Intel Xeon Scalable processors for use by VNFs. One critical feature is Intel® Advanced Vector Extensions 512 (Intel® AVX-512), a 512-byte instruction set that enables an application to achieve more work per CPU cycle and helps to minimize latency and overhead compared to the 256-byte instruction set of the Intel® Advanced Vector Extensions 2.0 (Intel® AVX2).²

Wind River anticipates that in 5G networks, Intel AVX-512 will speed up digital signal processing (DSP) tasks that are required for audio processing, call signaling, and massive antenna arrays. Wind River Titanium Cloud ensures that VNFs have access to Intel AVX-512 functionality, which in certain use cases may eliminate the need for specialized DSP chips.

Conclusion

NFVI is a critical component of future 5G networks, and a tight integration between the software and underlying hardware is important for the best performance. Wind River's work with Intel to demonstrate its Wind River Titanium Cloud on servers utilizing Intel Xeon Scalable processors shows how the combined platform is ready for next-generation wireless applications.

About Wind River

Wind River®, a wholly owned subsidiary of Intel Corporation (NASDAQ: INTC), is the world leader in embedded software solutions for the telecommunications and communications industries. Wind River offers a comprehensive, end-to-end portfolio of solutions ideally suited to address the emerging needs of NFV, IoT and 5G, from the secure and managed intelligent devices at the edge, to the gateway, into the critical network infrastructure, and up into the cloud. To learn more, visit Wind River at www.windriver.com.

About Intel® Network Builders

Intel® Network Builders is an ecosystem of independent software vendors (ISVs), operating system vendors (OSVs), original equipment manufacturers (OEMs), telecom equipment manufacturers (TEMs), system integrators (SIs), enterprises, and service providers coming together to accelerate the adoption of network functions virtualization (NFV)-based and software-defined networking (SDN)-based solutions in telecom networks and in public, private, and hybrid clouds. The Intel Network Builders program connects service providers and enterprises with the infrastructure, software, and technology vendors that are driving new solutions to the market. Learn more at <http://networkbuilders.intel.com>.



¹ Image provided courtesy of Wind River.

² <https://www.intel.com/content/www/us/en/architecture-and-technology/avx-512-overview.html>

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