NOKIA AND WIND RIVER

Carrier Grade AirFrame Data Center Solution Powered by Titanium Cloud

Telecommunications service providers are on a journey to evolve their networks. This journey is headed toward transforming the network architecture and enabling new value-added services that require ultra-low latency and high broadband capacity. One of the main drivers behind this change is the expectation of billions of connected Internet of Things (IoT) devices serving our businesses and private lives.

But this journey does come with challenges, including enabling this higher degree of connectivity while keeping operational expenses (OPEX) down. To achieve this, it is imperative to combine an optimized hardware solution with advanced technologies such as Software Defined Networking (SDN) and Network Functions Virtualization (NFV).

The Nokia AirFrame Data Center Solution addresses these requirements by leveraging the latest advancements in x86 hardware technology and a complete portfolio of hardware accelerators. In addition, Nokia AirFrame is offered in variants, including the highly efficient Open Compute Project (OCP) form factor.

Especially for the Cloud Radio Access Network (Cloud-RAN), the stringent capacity and latency requirements of the mobile radio access technologies drive the need for an extremely powerful cloud infrastructure, tailored for real-time performance. In this scenario, the Wind River® Titanium Cloud™ virtualization software platform is a key complementary component of Nokia's Cloud-RAN solution.

Nokia's integrated solution, which comprises Titanium Cloud software running on AirFrame Data Center Solution hardware, has been proven to achieve best-in-class performance in the areas below that are critical for the cost-effective deployment of NFV:

- Virtual network functions (VNFs) powered by accelerated hardware
- Ultra-low latency
- Holistic cloud management and security solutions
- Best cost and power efficiency

This solution brief summarizes the features and benefits of Nokia's integrated AirFrame Data Center Solution, illustrating how it enables service providers to maximize their return on investment as they introduce Cloud-RAN.

MEETING HIGH QUALITY REQUIREMENTS IN CLOUD-RAN

By leveraging the Titanium Cloud virtualization platform, the AirFrame Data Center Solution meets key high quality requirements for telecom radio networks, which means real value for telecom operator customers:

NOKIA AIRFRAME DATA CENTER SOLUTION

Ecosystem Component
Standard server platform

Solution
Nokia AirFrame Data Center Solution

Value
- Virtual functions powered by accelerated hardware
- Ultra-low latency
- Holistic cloud management and security solutions
- Best cost and power efficiency

WHEN IT MATTERS, IT RUNS ON WIND RIVER

- Full compliance with IT standards and ability to run IT cloud applications in parallel to telco cloud network functions
- Ability for operators to not only implement their NFV strategy but also rent spare data center capacity for enterprise customers' IT applications
- Ability to run VNFs with 99.9999% reliability in Cloud-RAN in order to meet telecom service providers' requirements
- Accelerated virtual switching that maximizes VM density, thereby maximizing the number of subscribers per server and optimizing the usage of infrastructure assets
- Optimized, scalable Cloud-RAN solutions, leading to a total cost of ownership reduction through savings on maintenance, operation, power usage, staff, and facilities costs

NOKIA: AIRFRAME DATA CENTER SOLUTION

Nokia leverages decades of experience in software and hardware design and support services in the telecommunications space. Over the past few years, Nokia has proved its major role as an innovator in the next-generation telecom infrastructure, including telco cloud technologies.

The acceleration of telecom and IT convergence and the need to support a diverse range of demanding applications require an innovative solution that uses all the benefits from the IT and open source domains to create a scalable and distributed cloud-based architecture. More and more services enabled by 5G technology will need network functionalities and capabilities located at the most efficient point within a network. This will be necessary in order to address strict latency constraints and to process huge data demands that will be critical in delivering services with real-time responsiveness.

With Nokia AirFrame Data Center Solution you can:

- Deliver telecom VNFs and applications that demand low latency and high throughput
- Deploy state-of-the-art data center components that support open and interoperable cloud solutions
- Run IT cloud workloads in parallel with telecom VNFs
- Deploy flexible and innovative data centers that can be strategically located where they matter most

Nokia officially joined the OCP in November 2015, launching its AirFrame Data Center Solution based on OCP principles. Data center optimization is important for customers, and therefore Nokia offerings include two parallel data center form factors: ultra-dense rackmount servers with easy downward scalability for distributed data centers, and an OCP form factor for hardware optimization, reduced footprint and energy consumption, and enhanced serviceability. The Nokia AirFrame Data Center Solution also supports Cloud-RAN to add efficiency and flexibility to 5G technology. Cloud-RAN introduces centralized baseband processing that is automatically orchestrated with existing distributed baseband processing to support all kinds of traffic peaks, wherever they happen.

Figure 1. Nokia AirFrame Data Center Solutions: 19" ultra-dense rackmount form for unparalleled performance and 21" OCP form factor for reduced footprint and energy consumption

OCP is designed to lower the cost of infrastructure, leveraging the OCP ecosystem to develop new solutions. The design is fully vanity free, without any unnecessary components. The disaggregated rack-level solution eases operation and maintenance (e.g., power and storage units are clearly separated). Sharing innovative initiatives in the OCP ecosystem leads to many other cost- and operation-related advantages of the servers, such as lower weight and the ability to leverage multisource supply.

Another clear way of saving costs is to lower OPEX. Automation of operations, tool-less serviceability from the front end, and proven efficient cooling with strict hot aisle containment are key elements of the cost and energy savings.

Nokia, as a platinum member of the OCP community, is keen to serve customers with this innovative technology in the telecom and IT domains.

WIND RIVER: TITANIUM CLOUD

As the industry's only fully integrated, ultrareliable, and deployment-ready virtualization software platform, Titanium Cloud enables service providers to deploy virtualized services faster, at lower cost, and with guaranteed uptime.

Titanium Cloud comprises the following open components:

- **Linux:** An industry-leading, hardened Linux OS provides the foundation for the reliability, security, availability, and performance needed for the carrier network.
- **Real-time KVM:** Titanium Cloud adds kernel preemption support to the industry standard Kernel-based Virtual Machine (KVM) hypervisor, with 40x lower interrupt and high-resolution timer latency for deterministic, predictable performance.
- **OpenStack:** : Titanium Cloud adds the reliability and availability extensions required to use OpenStack in the carrier network. This includes VM migration in hundreds of milliseconds rather than minutes, faster VM failure detection, automatic recovery of failed VMs, VM resource management, and faster host and controller node failover.
- **CEPH:** CEPH provides a highly scalable, highly available, and highly performant distributed storage solution.
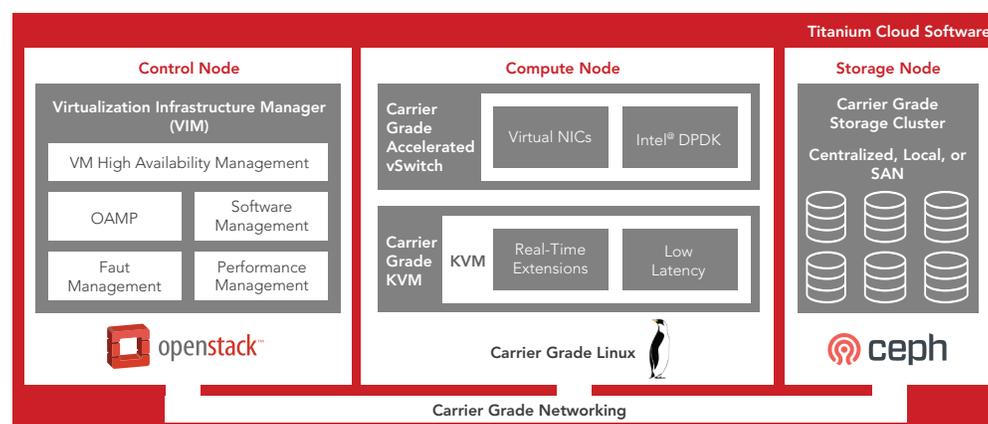

Figure 2. Wind River Titanium Cloud architecture

MORE INFORMATION

Detailed technical information about Nokia can be found at networks.nokia.com/solutions/airframe-data-center-solution.

Detailed technical information about Wind River Titanium Cloud can be found at www.windriver.com/products/titanium-cloud, or contact salesinquiry@windriver.com.

The key benefits of Titanium Cloud include:

- A high-performance accelerated vSwitch (AVS) based on the Data Plane Development Kit (DPDK) enables high-performance VM-to-VM communication without the need to use the Linux kernel, as well as high-performance packet processing from the network interface controller to applications in VMs.
- 99.9999% reliability means less than 30 seconds of annual downtime. The robustness and exceptional reliability of Titanium Cloud results in less need for human intervention in operation, resulting in lower OPEX achieved by effective use of highly qualified network operation staff.
- Titanium Cloud is a complete, turnkey product, ready for deployment on as few as two nodes up to hundreds of nodes across multiple geographies, with open APIs for provisioning and management, enabling thousands of VMs.

An Ecosystem Enabling the Promise of NFV for Service Providers

Nokia is a member of the Wind River Titanium Cloud Ecosystem. Through this ecosystem, Wind River has collaborated with industry-leading hardware and software companies to ensure the availability of interoperable standard NFV products optimized for deployment with Titanium Cloud. Nokia AirFrame Data Center Solution has been pre-integrated and validated with Titanium Cloud. By extension, through the ecosystem Nokia AirFrame is also pre-validated with dozens of other components, providing you with a proven end-to-end solution that spans multiple layers within the overall NFV architecture. Using the Titanium Cloud Ecosystem, AirFrame Data Center Solution accelerates time-to-market, reduces schedule risk, and significantly improves the deployment of an end-to-end NFV infrastructure.
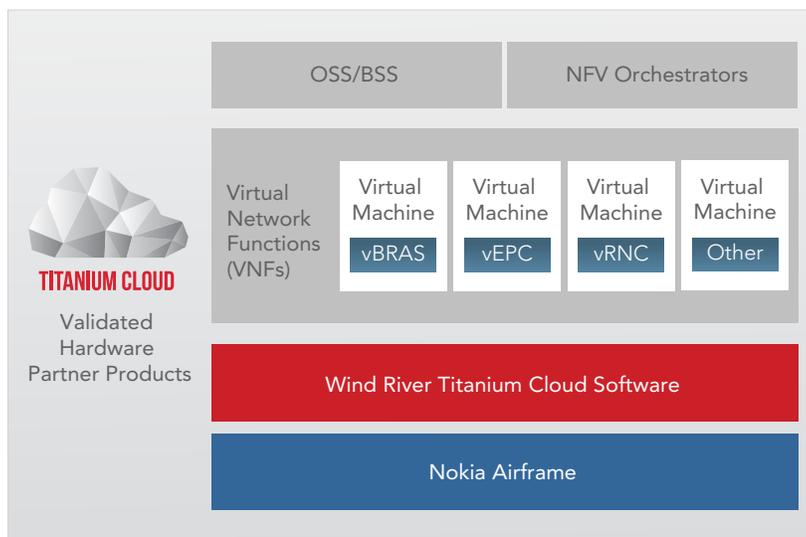

Figure 3. Wind River Titanium Cloud Ecosystem