WNDRVR

Wind River Cloud Platform

An open source, on-premises, private cloud solution for virtualized and containerized applications

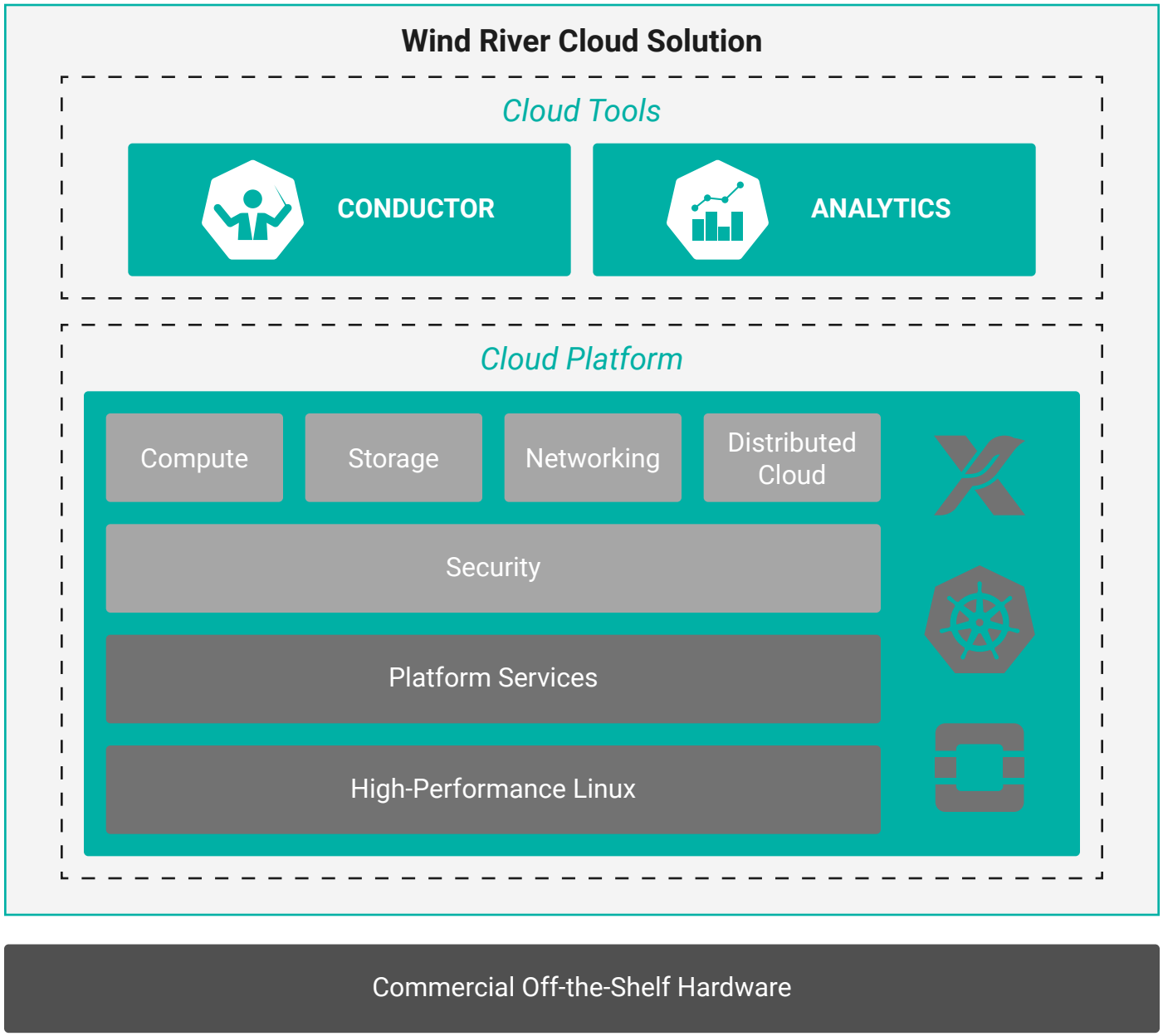
Enterprise IT and telecommunications infrastructure teams are rethinking how they operate their workloads across private, hybrid, and edge cloud environments. Rising cloud costs, rigid licensing, operational complexity, performance, and vendor lock-in are prompting organizations to seek more flexible, efficient, and scalable solutions.

Wind River® Cloud Platform provides a better way. Proven in some of the world's largest and most mission-critical cloud deployments, it's a commercially supported enterprise-grade solution, based on open source technologies, that enables enterprise IT organizations and telecommunications operators to deploy and manage virtualized and containerized workloads. It provides ultra-low latency, high availability, and full lifecycle management, all while offering one of the smallest footprints in the industry.

KEY BENEFITS

- **Cost efficiency:** Reduce total cost of ownership (TCO) for cloud infrastructure through simplified licensing, smaller footprints, and lower hardware and operational expenses.
- **Open source support:** Avoid vendor lock-in by using the commercialized open source technologies in Cloud Platform — such as StarlingX, OpenStack, and Kubernetes — fully supported by Wind River's award-winning customer support and services. Receive regular updates with expert support readily available to answer questions.
- **Virtual machine (VM) and container support:** Manage virtualized and containerized workloads from a single technology stack and management toolset.
- **Multi-level scalability:** Ensure scalability with Cloud Platform's ability to work for any organization, from small edge nodes to large enterprise data centers.
- **Edge and enterprise optimization:** Install a system optimized for mission-critical, low-latency, and highly distributed deployments with remote management and unparalleled reliability.

MISSION-CRITICAL CLOUD DEPLOYMENT



KEY FEATURES

Cloud Platform is a key infrastructure component of Wind River's private cloud solution, seamlessly integrating with Wind River Conductor and Wind River Analytics. The platform is designed to meet stringent requirements, including ultra-low latency, high availability, scalability, and security. To support deployments ranging from a single stand-alone cloud to geographically distributed edge clouds and all the way up to large-scale centralized data centers, Cloud Platform offers a wide range of features, including:

- Support for a single node with integrated compute, storage, and control functions at the edge
- Scalability from one to many nodes, from edge to core
- Enhanced performance optimized for each use case
- High availability with zero downtime for applications
- Security by design

INTELLIGENT INFRASTRUCTURE MANAGEMENT FOR DISTRIBUTED CLOUD

Cloud Platform provides comprehensive infrastructure management to simplify operations across distributed edge and core environments. Built on StarlingX, the platform enables centralized visibility and control of compute, storage, and networking resources with a lightweight, scalable architecture. It enables management of up to 5,000 nodes as a single distributed cloud, with features including zero-touch provisioning, automated node deployment, and seamless scaling that all reduce operational complexity. Advanced capabilities include hardware and software inventory tracking, self-healing orchestration, and rolling upgrades with near-zero downtime. Multisite management with subcloud grouping allows efficient oversight of geographically dispersed infrastructure, while API-driven automation and Kubernetes-native tools enhance operational efficiency. With built-in fault detection and secure lifecycle management, Cloud Platform allows deployment and maintenance of mission-critical infrastructure at scale.

Host management service offers full lifecycle control and availability of both hardware and host-level software. The platform detects and automatically recovers from hardware or software failures. It also performs monitoring, fault reporting, and auto-recovery for:

- Cluster connectivity
- Host failures
- Critical process failures
- Resource utilization thresholds and interface states
- Hardware and sensor faults
- Activity progress reporting

Cloud Platform also integrates with the baseboard management controller (BMC) to enable out-of-band management of server hardware. Using industry-standard protocols such as Intelligent Platform Management Interface (IPMI) and Redfish, the platform provides secure, remote access to hardware resources independently of the operating system. Functions are accessible via REST APIs and tightly integrated into the platform's fault-management framework, enabling automated detection and recovery across distributed environments. Key capabilities include:

- **Out-of-band reset** for recovering unresponsive systems
- **Power on and off** to manage server states remotely
- **Hardware sensor monitoring** for real-time insights into temperature, voltage, and other critical metrics

Fault management service delivers a robust framework for monitoring, reporting, and recovering from faults across distributed environments. The platform provides centralized detection and management of alarms and events to ensure high availability of mission-critical workloads. It offers comprehensive visibility and control through REST APIs, CLI, GUI, and SNMP, while automated policies and recovery actions enable rapid response to hardware and software issues at scale. Key capabilities include:

- **APIs** to set, clear, and query alarms and log significant events
- **Broad alarm coverage** for platform nodes, hardware resources, and hosted virtualized workloads through Wind River OpenStack
- **AlarmID alarm suppression** to reduce notification noise during known conditions
- **Multi-interface access** (REST API, CLI, GUI/Horizon, SNMP) for active alarms, historical events, and suppression status

Software management service orchestrates upgrades and patches to host software seamlessly across distributed environments. The platform streamlines the deployment of new functionality and security updates while minimizing operational impact through rolling and in-place upgrades. Key capabilities include:

- **Management of all platform host software,** including kernel, OS, StarlingX host services, containerized services, and system containers
- **StarlingX Unified Software Management (USM) framework** providing consistent REST API, CLI, and GUI workflows for both patches and major upgrades
- **Support for orchestrated rolling upgrades** enabling in-place updates without requiring additional hardware or extended downtime

Configuration management service automates inventory, commissioning, and system configuration of both hosts and infrastructure services. It streamlines deployment and setup for large-scale, distributed environments, making it an optimal choice for enterprise, telecommunications, and edge workloads. Configuration management service is tightly integrated with the platform's orchestration and fault-management frameworks, enabling seamless deployment and full visibility into the system state. Key capabilities include:

- **Automated hardware discovery** to locate processors (including CPUs, cores, and SMT processors), memory (including huge pages), storage, network ports, crypto/ compression devices
- **Service-level settings** to configure DNS, NTP/PTP clients, container registry access, and other platform services
- **Node commissioning and configuration** to assign roles (controller, worker, storage), CPU/memory profiles, and interface/storage mappings
- **Unified interfaces** to manage inventory and configuration via REST API, CLI, and Horizon GUI

Service management ensures continuous operation of critical infrastructure services. The platform employs a distributed, active election architecture and robust messaging to maintain service health. High-availability mechanisms are fully integrated into the platform's orchestration and fault management frameworks, ensuring seamless recovery, resilience, and scalable operations. Key capabilities include:

- **Multi-path messaging:** Allows up to three independent communication channels with a dual top-of-rack switch architecture, optionally aggregated using link aggregation, and with optional HMAC-SHA512 authentication to prevent split-brain scenarios
- **Heartbeat-based monitoring:** Provides periodic heartbeat messages through controllers, allowing peers to respond with cluster state, and enabling rapid failure detection
- **Active election process:** Permits on-state changes (e.g., controller failover) and allows for minimal disruption when controllers share cluster status and elect new active roles

SUPPORTING VIRTUALIZED WORKLOADS

Wind River OpenStack is a deployment-ready add-on to Cloud Platform, with commercial testing, hardening, lifecycle support, and maintenance. Packaged as a set of modular containers, OpenStack technology runs alongside the Kubernetes environment, allowing hosting of both virtualized and containerized workloads on the same server node, regardless of where it is located.

Deployment options range from single-node OpenStack, ideal for workloads requiring small edge clouds, to large distributed clouds with thousands of geo-distributed nodes. Among its many functions, it can:

- Create a containerized Kubernetes application to ease deployment and updates
- Provide a hybrid cluster for hosting both containerized and virtualized workloads for improved management
- Follow an upstream-first development model within the StarlingX project of the OpenInfra Foundation to ensure a true open source approach
- Support live migration of VMs
- Provide high availability, performance, and low latency for demanding mission-critical use cases
- Support a wide range of guest operating systems and deployment configurations, including stand-alone and highly distributed cloud configurations

In addition to OpenStack, Cloud Platform integrates KubeVirt to support both virtualized and containerized workloads. By running the KubeVirt within the same Kubernetes cluster, both VMs and containers can be managed on a single cloud infrastructure, reducing operational complexity, streamlining workload orchestration, and supporting a gradual transition to cloud-native architectures. The KubeVirt system application includes essential tools such as the Containerized Data Importer (CDI) for efficient data volume handling and the Virtctl client for managing VM lifecycles.

PERFORMANCE WITHOUT COMPROMISE

Cloud Platform, built on StarlingX, delivers ultra-low latency and high throughput optimized for mission-critical workloads. In production edge deployments, such as virtualized radio access networks (vRANs) for 5G, the platform consistently achieves consistent CPU thread scheduling performance required for real-time applications. With hardware acceleration technologies, including SR-IOV, DPDK, and Intel FEC offloading, and kernel tuning via low-latency profiles, the platform ensures predictable I/O performance for demanding workloads. This efficiency supports lightweight deployments with minimal CPU and memory resources, ensuring consistent, predictable operations across containerized and virtualized workloads at scale. Additional performance and management enhancements include the following:

- **Huge page** enables pods to allocate and consume huge pages of memory from a pre-allocated host pool.
- **Kubernetes CPU manager static policy** allows application pods to reserve exclusive ownership of CPUs and to ensure separation of platform pods from application pods.
- **Kubernetes Topology Manager** offers the option of ensuring that all CPU cores allocated to a pod are from the same NUMA zone.
- **Node Feature Discovery** detects hardware features available on each worker node and advertises those features using node labels.
- **Application-isolated CPUs** isolate CPUs completely from the host process scheduler and make them available to pods.

COMPUTE AND STORAGE MODERNIZATION IN ONE MOVE

Cloud Platform delivers a software-defined storage architecture optimized for both edge and centralized cloud environments. Built on StarlingX, it integrates Ceph-based distributed storage managed via Rook to provide seamless scalability and Kubernetes-native orchestration of block, object, and file storage. High availability and fault tolerance are ensured through data replication, erasure coding, and automatic failover, while AES-256 encryption at rest safeguards key sensitive data. With support for NVMe, SSD, and HDD devices, Cloud Platform provides tiered storage capabilities that are fully integrated into its lightweight, distributed architecture. Cloud Platform also supports the following external storage options:

- NetApp Trident integration for NetApp storage systems
- Dell CSI/CSM integration for Dell data storage products

ADVANCED NETWORKING

To simplify network provisioning and scaling across distributed sites, Cloud Platform delivers a software-defined networking framework for both edge and centralized cloud environments, offering ultra-low latency, high throughput, and enhanced performance — all essential for mission-critical workloads. With support for hardware acceleration and for IPv4/IPv6 dual-stack, VLAN-aware networking, the platform provides a unified platform for running both virtualized and containerized workloads. It supports advanced networking, enabling modernizing cloud infrastructure and emerging use cases such as IoT, real-time analytics, and 5G, with a full range of features including:

- **Multus CNI** for multiple network interfaces per Kubernetes pod
- **SR-IOV** for high-performance networking
- **Distributed Virtual Switch** for efficient traffic management for virtualized workloads
- **DPDK** for acceleration of packet processing

BUILT-IN SECURITY

Cloud Platform delivers a defense-in-depth security architecture designed to protect mission-critical workloads across distributed edge and core environments. Built on StarlingX, the platform integrates secure boot, role-based access control (RBAC), kernel-level hardening, and encrypted communications by default. Advanced features, such as signed and validated container images and automated vulnerability patching, further strengthen protection against evolving threats. Combined with real-time monitoring and anomaly detection capabilities, Cloud Platform ensures a robust security posture while minimizing operational overhead.

ENTERPRISE AND CARRIER SUPPORT

Wind River's private cloud solution is backed by an award-winning global support organization that offers live help in multiple time zones, with 24/7 emergency recovery and service restoration and standard Tier 1 and Tier 2 break/fix support. Premium services are available for even faster resolution.

For more information, visit **www.windriver.com/support**.

HOW TO PURCHASE

Transform how you deploy and manage resilient, scalable, and secure private clouds — with minimal operational overhead and maximum performance. Wind River Cloud Platform is the strategic choice to help you achieve cost efficiency, real-time capability, and long-term flexibility. Reach out to your Wind River account manager or visit us at **www.windriver.com/contact** to get started.

Wind River is a global leader of software for the intelligent edge. Its technology has been powering the safest, most secure devices since 1981 and is in billions of products. Wind River is accelerating the digital transformation of mission-critical intelligent systems that demand the highest levels of security, safety, and reliability.

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