Nokia CloudBand Infrastructure Software

Release 19

CloudBand Infrastructure Software is a ready to use, open source based virtual infrastructure that provides serviceability, operability and universal applicability for any type of workload, with a highly available, fully secure and protected solution that is simple to use and easily upgradeable.

Wherever you are on your evolution to a cloud native solution, CloudBand Infrastructure Software is with you.

CloudBand Infrastructure Software highlights

CloudBand Infrastructure Software virtualizes and manages compute, storage and network resources to enable VNFs to run, while meeting strict requirements for robustness, performance and security. Each instance of CloudBand Infrastructure Software manages one NFVI node across one or more equipment racks, typically at a single geographical location. CloudBand Infrastructure Software performs the virtual infrastructure manager (VIM) function and provides the virtualization software (hypervisor, virtual switch, monitoring) installed on each server.

CloudBand Infrastructure Software offers a rich array of features, including enhanced platform awareness (EPA) for high performance virtual network functions, robust security solutions, flexible hardware support, and rich monitoring capabilities.

CloudBand Infrastructure Software is easy to install, operate and manage, using the CBIS Manager, an intuitive and friendly dashboard, that assists in performing all manner of life-cycle management processes. In addition, CBIS Manager is also a launchpad to other OpenStack interfaces.

Serviceability and operability for all customers

CloudBand Infrastructure Software eliminates human error, with easy automation of every network related task, enabling swift deployment while keeping total cost of ownership low. By delivering a highly available and scalable architecture that supports containers at the infrastructure level, CloudBand Infrastructure Software takes cloud native upstream, providing a hybrid cloud support for any type of organization in transformation, and for any type of workload.

Universal applicability

CloudBand Infrastructure Software is an open source based solution, that enables operators to benefit from the latest in innovative open channels, including the flexibility to use their hardware of choice, while avoiding vendor lock-in, and supporting interoperability and multi-vendor deployments.
Full security and protection
CloudBand Infrastructure Software is designed bottom up for security and system hardening, and is fully compliant with ANSSI, GDPR, NSA and additional country-specific security protocols.

Architecture and main functions
At the resource layer, CloudBand Infrastructure Software virtualizes compute resources using a KVM hypervisor tuned for performance and supporting enhanced platform awareness. Multiple virtualized storage tiers are provided, including server-mounted disks and SSD, pooled via Ceph as well as supporting external mass storage arrays.

Support for fast pools ensures utilization of all storage capacity by allocating spare space on disks. When used together with Availability Zones, multiple pools enables definition of multiple security zones within a single cloud environment.

Software-based and hardware-accelerated (SR-IOV) virtualized network connectivity is provided via a tuned Open vSwitch or Nuage Networks Virtualized Services Platform, the Nokia SDN solution.

With its enhanced platform awareness, CloudBand Infrastructure Software supports high performance VNFs. This includes SR-IOV with bonding for protection, huge pages for guest VMs, DPDK, NUMA awareness, enhanced CPU pinning options and CPU isolation for host processes – all configured and ready for use.

CloudBand Infrastructure Software is pre-integrated and validated with Nokia’s AirFrame server. In addition, it provides tools and a blueprinting process for easy integration with server storage and network hardware from any vendor, offering customers the flexibility to select their hardware of choice for certification with the platform, based on defined prerequisites.

Figure 1: CloudBand Infrastructure Software Architectural Framework
Serviceability and operability for all types of customers

Monitoring & analytics
CloudBand Infrastructure Software provides extensive analytics and monitoring and also notifies higher management systems of events and alarms. The built-in root cause analysis service, based on OpenStack Vitrage, helps service providers to quickly identify the source of failures and looks for risks that could affect the performance of the entire network. The validated open source and standards-based north-bound APIs make it easy to work with higher-level managers and orchestrators from any vendor.

Configuration management
CloudBand Infrastructure Software supports configuration management of the physical and virtualized resources, automated installation and commissioning of NFVI nodes, addition and replacement of hardware elements, in-service software upgrades, patch management and backup and restore. An NFVI node can be installed with an automated process, achieving fully functional NFVI+VIM+SDN operation in less than three hours.

Fault management
Fault management and troubleshooting are supported with Zabbix and OpenStack Telemetry monitoring of software and hardware elements, including physical and virtual switches, host network interface cards, multiple storage devices and services. Alerts can be configured and delivered to higher layer management systems.

The OpenStack Vitrage root cause analysis service identifies the sources of faults and alerts, and generates Deduced Alerts for network resources elsewhere in the system, that may be affected by these failures.

Performance management is supported through metrics and threshold crossing alarms. A configuration validation tool helps ensure the infrastructure meets the requirements of the VNFs to be deployed.

In service upgrade
CloudBand Infrastructure Software can be upgraded to new releases, including new OpenStack releases, while remaining fully in service. Failed components are recovered automatically. CloudBand Infrastructure Software offers a configurable backup and restore function based on customer preferences.

Infrastructure validation
The function, performance and reliability of VNFs depend on the characteristics of the NFV infrastructure. A mismatch between these characteristics and the VNF requirements can lead to unexpected and hard-to-diagnose problems. To address this issue, CloudBand Infrastructure Software provides an infrastructure validation tool to be run before the deployment as well as during the lifetime of a VNF. The tool reduces technical and business risks and accelerates the service deployment cycle.

Hybrid Cloud
CloudBand Infrastructure Software supports a Hybrid Cloud architecture that empowers operators to evolve at their own pace from a virtualized platform to a truly cloud native platform. The hybrid cloud supports Virtual Machines and Containers running on Virtual Machines or bare metal, in the same cluster, and managed from the same platform. This unique capability provides operators with the ability to take control and test the waters of a cloud native platform, while relying on a single platform, enabling TCO reduction.

CloudBand Infrastructure Software Manager
The life of the cloud starts at installation, but its power is proven as it grows and shrinks, fails and recovers, and reliably and predictably serves its users wherever they are. 5G networks introduce a plethora of new challenges, including the need to support the federated cloud, with varying footprints. The CBIS Manager User Interface allows users to easily and automatically run all installation and operations, including easy scaling, patching, and securing of the CBIS Cluster.
Universal applicability

Solution level delivery
With CloudBand Infrastructure Software, operators benefit from the rapid pace of open source innovation while getting a carrier-grade product ready for production deployment. This is enabled through the extensive experience of the Nokia CloudBand team in building and deploying NFV platforms using open source and standard APIs, ensuring stability and streamlined operations.

The CloudBand team contributes to open source upstream development to ensure carrier requirements are met. For example, Nokia established the OpenStack Vitrage service to address the need for troubleshooting as well as for a fuller understanding of the effects that failures have on the entire network, through deduced alerts.

VNF compatibility
CloudBand Infrastructure Software is compatible with any standard VNF, and can be integrated with Nokia and non-Nokia VNFs. Live installations include integration with a variety of VNFs, running in the same platform.

Open Interfaces
CloudBand Infrastructure Software works with VNF managers, NFV orchestrators and operational support systems (OSS) from any vendor through OpenStack compliant north-bound APIs.

CloudBand Infrastructure Software interfaces seamlessly with any NFV Orchestrator, such as CloudBand Network Director, to provide information on the availability of resources and provisions them on request.

CloudBand Infrastructure Software interfaces seamlessly with any VNF Manager, such as CloudBand Application Manager, to provision VNFs based on Heat Orchestration Templates, upon request.

CloudBand Infrastructure Software is fully and seamlessly integrated with Nuage (by Nokia) SDN, and can interface with any SDN.

Hardware-agnostic
Customers can bring hardware of choice, subject to guidelines provided by Nokia. This hardware is then eligible for a certification program, following which CloudBand Infrastructure Software is fully
supported on this hardware. A variety of hardware programs exist, ranging from Nokia hardware certification, VNF-selected hardware certification, customer-defined hardware certification and partner hardware certification.

**Time to market / Optimizing the value chain**
Openness is achieved by giving to and taking from the community, in upstream first development. CloudBand Infrastructure Software is independent of any third party software or licenses, thus preventing vendor lock-in, while simultaneously introducing the ability to deliver with a quicker time-to-market, and at a lower total cost of ownership.

**Designed for security and system hardening**

**A secure NFVI/VIM solution**
CloudBand Infrastructure Software is designed for security and stringent system hardening, and has achieved compliance readiness with key security standards and regulations, including CIS, DoD (DISA), STIG, US NSA, EU GDPR & ANSI as well as additional standards and common security protocols. CloudBand Infrastructure Software provides automated hardening with Ansible security playbooks, encryption for all external OpenStack flows, vulnerability scanning, full integration with Nuage SDN for policy-based access control, integrity audit and security logging, and more.

CloudBand Infrastructure Software offers high availability with no single point of failure. Management functions including OpenStack components are redundant, using load sharing for stateless functions and active/standby for stateful functions or dedicated high availability mechanisms. To prevent inconsistencies, a three-party quorum failover procedure is used.

CloudBand Infrastructure Software does not guarantee high availability for guest VNFs but provides availability zones, anti-affinity placement policies and fully redundant networking to help VNFs achieve this goal.

### Product characteristics

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<tr>
<th>Turnkey solution</th>
<th>Pre-integrated and validated, configurable automated installation, tuned for NFV</th>
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<tbody>
<tr>
<td>High availability and carrier grade operations</td>
<td>In-service software upgrade; no single point of failure; quorum based; patch management; backup and restore; security hardened; live migration, host evacuate, log aggregator</td>
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<tr>
<td>Certified hardware options</td>
<td>Nokia AirFrame, HPE C7000 with NetApp E-Series or EMC²; Dell Power Edge R730. Customer hardware with defined prerequisites is eligible for certification</td>
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<tr>
<td>Analytics Suite</td>
<td>Monitoring and troubleshooting tools, root cause analysis based on OpenStack Vitrage</td>
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<td>Storage options</td>
<td>Distributed storage based on Ceph; hyper-converged or external storage nodes for high IOPs/capacity demands (EMC or NetApp)</td>
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<tr>
<td>Networking</td>
<td>OVS-DPDK, OVS, SR-IOV, IPv4/IPv6/dual stack, IPv6 only, MacVtap, VLAN, VxLAN, SDN (Nuage Networks VSP)</td>
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<tr>
<td>Built for Performance</td>
<td>Huge pages; NUMA awareness; SR-IOV with bonding; host CPU isolation; CPU pinning, DPDK</td>
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<td>Security</td>
<td>Post-installation security hardening, audit trails, endpoint encryption, RBAC, ANSSI compliance, GDPR compliance, DoD STIG, NSA compliance and compliance with additional country-specific security protocols, Nokia DFSEC 2.0</td>
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<td>Serviceability</td>
<td>Manager, multi-cluster upgrades, in-service upgrades,</td>
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### About Nokia

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Nokia Oyj
Karaportti 3
FI-02610 Espoo, Finland
Tel. +358 (0) 10 44 88 000

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