CloudBand Infrastructure Software: Tuning open source for production
**NFV infrastructure: Opportunities and challenges**

Network functions virtualization (NFV) is revolutionizing the way service providers build and operate telecommunications networks. It promises to deliver benefits in two main areas:

- Operational and capital expenditure (OPEX and CAPEX) savings obtained through the use of general-purpose hardware
- Increased automation, resulting in simpler operations, improved business agility, and faster time to market

To realize these benefits, service providers need solutions that can help them address the operational challenges associated with deploying and running an NFV-based network.

The first of these challenges is to roll out the new cloud infrastructure painlessly, avoiding the need for months of professional services support.

Once the NFV infrastructure (NFVI) is in place, service providers face challenges associated with maintenance, upgrades, replacements and extensions. The list of difficult tasks involved in operating an NFVI includes:

- Supporting a highly available, security-hardened infrastructure
- Ensuring the availability of virtualized network functions (VNFs)
- Optimizing VNF performance
- Troubleshooting VNFs
- Enabling the required insights into fault and performance management, and creating the correlation between the infrastructure and VNFs

**Nokia CloudBand: A production-grade NFV portfolio**

Nokia CloudBand is a cornerstone for the new world of lean NFV operations, where service providers run network functions on a federated, distributed cloud infrastructure and use DevOps to evolve their service offerings rapidly.

CloudBand provides a portfolio of production-grade software for hosting, orchestrating, automating and managing VNFs and services. This portfolio includes the CloudBand Infrastructure Software, CloudBand Application Manager and CloudBand Network Director. It features a modular design that supports single- and multi-vendor deployments.
CloudBand Infrastructure Software: Built on an open-source foundation

CloudBand Infrastructure Software is a complete NFVI and Virtual Infrastructure Manager (VIM), offering a ready-to-use software stack that optimizes and simplifies infrastructure virtualization and lifecycle operations. It gives service providers a turnkey solution for deploying NFV.

CloudBand Infrastructure Software components

The VIM element of the CloudBand Infrastructure Software is built on OpenStack core projects. It supports additional projects as required.

CloudBand Infrastructure Software: VIM OpenStack elements
CloudBand Infrastructure Software takes OpenStack to the next level

Achieving a working OpenStack setup requires expertise in a variety of domains, including configuration, dependencies, and support and maintenance requirements. The goal of any typical OpenStack distribution (or distro) is to enable its users to effortlessly set up and use OpenStack. However, distros often fail to meet this goal and have to be tuned to match production expectations.

Many vendors offer plain, or “vanilla,” OpenStack distros. CloudBand Infrastructure Software enhances vanilla OpenStack distro with value-added offerings that provide true end-to-end production readiness through carrier-grade operations, VNF validation and tuning, and enhanced NFV capabilities.
Enabling carrier-grade operations
CloudBand Infrastructure Software helps service providers achieve the high degree of automation required to support seamless NFV operations.

Pre-integration and validation
An OpenStack distro is a set of software elements that can be put together, using professional services, to create a solution. CloudBand Infrastructure Software enhances the basic distro by defining a unique design for networking and storage and by selecting the most suitable drivers, scripts and configuration parameters.

CloudBand Infrastructure Software offers pre-integration and validation support in several areas, including:
- Hardware choices such as Nokia AirFrame servers and EMC storage, which are not off-the-shelf compatible and require expertise and effort to support
- SR-IOV, which does not work off the shelf and requires dedicated configuration
- OVS-DPDK, which requires a dedicated networking design

Security hardening
The elements of the cloud infrastructure need to be security hardened to meet the strict standards of service providers and comply with applicable security audit requirements. The hardening process involves removing and replacing unsecure tools and configuring the end-to-end solution to block potential security breaches.

CloudBand Infrastructure Software provides security hardening that follows firm requirements, including:
- Software hardening based on US DoD Security Technical Implementation Guide (STIG) requirements (CAT 1–3)
- Public key infrastructure (PKI)
- Transport Layer Security (TLS) for all endpoints
- Lightweight Directory Access Protocol (LDAP) authentication

Automated installation
Different distros contain different levels of automation. CloudBand Infrastructure Software supports painless automated installation with the right parameters, including the undercloud and overcloud configuration.

CloudBand Infrastructure Software provides automated installation for a broad range of elements, including:
- Networking
- Storage
- MTU configuration
- SR-IOV
- Huge Pages
- CPU isolation

With CloudBand, users can control these and many other settings through the use of predefined templates.

Users can also design their own templates and apply them to specific hosts (different configuration for hosts in the same cluster). These capabilities are not available in OpenStack installers.

Support for performance enhancement and tuning
CloudBand Infrastructure Software enhances VNF performance by tuning and tweaking software elements such as the kernel and drivers. When Ceph performance is insufficient, the software provides external storage through the Cinder backend. The software uses CPU allocation, isolation and pinning to optimize security and performance.

Features that improve VNF operations
CloudBand Infrastructure Software adds features that significantly improve VNF operations. These features include:
- Storage volume force detach API
- vCPU placement extension for Nova
- SR-IOV diversity and bonding support (VNF link diversity)
- Port security for entire virtual networks (for user-managed IP addresses)

Optimizing performance of deployed VNFs
NFV focuses on software and creates an abstraction to the hardware layers. However, VNFs may still affect, and be affected by, a service provider’s hardware selection and network layout.

CloudBand combines hardware and software testing to help uncover VNF-related concerns such as suboptimal configuration, missing functionality and run-of-the-mill bugs. Combined testing boosts performance and adds features that improve VNF operations. It ensures that the end-to-end Nokia NFV offering is fully compatible and operational.
**Adding enhanced NFV capabilities**

CloudBand Infrastructure Software provides a full tool set of added functionality developed with NFV in mind. This set includes features such as Zabbix, a performance and fault management tool enriched with specialized NFV templates. Zabbix triggers host auto-evacuation that minimizes the impact of infrastructure failures by redeploying VNFs. The CloudBand Infrastructure Software also includes tools for alarm management, configuration validation, and network troubleshooting.

**Integration with OpenStack Vitrage**

The Vitrage Root Cause Analysis & Deduced Alarms Service is fully integrated into the CloudBand Infrastructure Software. Integration with Vitrage allows CloudBand to associate failures in the infrastructure with the affected VNFs. This makes it possible to mitigate potential damage and prevent an impact on service continuity.

**Realize the promise of NFV with CloudBand**

CloudBand Infrastructure Software leverages our experience in building and deploying NFV platforms using open-source and standard APIs. It will help you ensure stability and streamline operations as you make your move to NFV.

To learn how CloudBand can help your business, visit [https://networks.nokia.com/solutions/cloudband](https://networks.nokia.com/solutions/cloudband)
About Nokia
Nokia is a global leader in the technologies that connect people and things. Powered by the innovation of Bell Labs and Nokia Technologies, the company is at the forefront of creating and licensing the technologies that are increasingly at the heart of our connected lives.

With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things. http://nokia.com

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