



Scale management and orchestration in the telco cloud with Nokia CloudBand and VMware vCloud NFV

Deploy a unified NFV MANO solution that draws on decades
of telecom innovation and virtualization expertise

Application note

Abstract

Communications service providers (CSPs) want to use the cloud to add service agility, control costs, and take advantage of open-source innovations. But the telco cloud presents management and operations (MANO) challenges that make it hard for CSPs to scale their operations, meet reliability requirements, and deploy new services.

Nokia and VMware are helping CSPs address these challenges with a solution that combines Nokia CloudBand with VMware vCloud NFV for a reliable and proven MANO and NFV infrastructure platform. This joint solution provides the flexibility and automation that CSPs need to quickly and easily roll out new virtualized services.

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Addressing the challenges of the telco cloud

While the cloud has proven to enable service agility, cost control, and open source innovation, it is not without issues. In the telecommunications industry specifically, the cloud creates additional management and orchestration challenges for communications service providers (CSPs)—especially around operational scaling, stringent reliability requirements, and the need to interwork services across cloud and legacy networks.

Nokia CloudBand is a direct response to this challenge. A robust, scalable, and open MANO solution, CloudBand supports multiple virtualized network functions (VNFs) on a variety of cloud stacks. Running Nokia CloudBand on the VMware® vCloud® NFV™ platform blends the virtualization expertise of VMware and the telecom expertise of Nokia into one solid solution that helps CSPs overcome telecom's cloud management challenges—including fast onboarding of multivendor VNFs.

Nokia CloudBand (NFVO, VNFM)

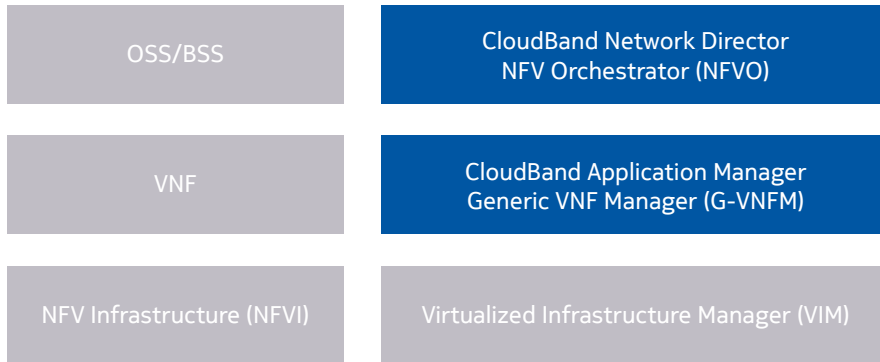
Nokia knows networking like no one else. It also keenly understands the requirements of CSPs. With Nokia CloudBand, the company has built an automated and flexible MANO layer that is exactly what CSPs need in a cloud deployment. CloudBand has proven its reliability, automation, repeatability, scalability, and security in many commercial deployments. Use cases include VoLTE, VoWiFi, SD-WAN, EPC, RAN, fixed and cable VoIP, and various applications, such as charging, deep packet inspection, PCRF, diameter routing agents, and government cloud.

CloudBand makes use of innovation coming from open source, but is implemented by a qualified team with a deep understanding of carrier and data center demands. CSPs benefit from the rapid pace of open source innovation while also getting a carrier-grade product ready for deployment. By using CloudBand, CSPs may obtain required features and bug fixes before they are available from open source distribution. The Nokia CloudBand team also contributes to open source upstream development to ensure that CSPs' requirements are met and that open source technologies evolve in the desired direction.

CloudBand supports multivendor networks with:

- Pioneering software that implements the ETSI NFV information models (IFA) and ETSI NFV interface specifications (SOL), for maximum openness and integration simplicity
- A true generic VNF Manager (G-VNFM), which includes an open templating system for accelerated VNF certification, enabling the broadest VNF ecosystem
- A third-party VNF ecosystem supported by Nokia professional services, including the integration of dozens of VNFs (partners, competitors) and the commercial deployment of third-party VNFs in many networks
- A widely deployed, ETSI NFV-compliant NFV Orchestrator (NFVO) and G-VNFM, which support a variety of NFV infrastructures (NFVIs) and virtual infrastructure managers (VIMs).

Figure 1. Nokia CloudBand



CloudBand’s NFVO and VNFM use the same software version over multiple VIM types to manage VMware vCloud NFV and OpenStack deployments, with appropriate APIs to the VIMs. A single CloudBand NFVO or VNFM operates over multiple VIMs, including a mixture of vCloud Director® and OpenStack. This market approach ensures CloudBand addresses the broadest set of commercial deployment scenarios with consistent and highly applicable features and capabilities.

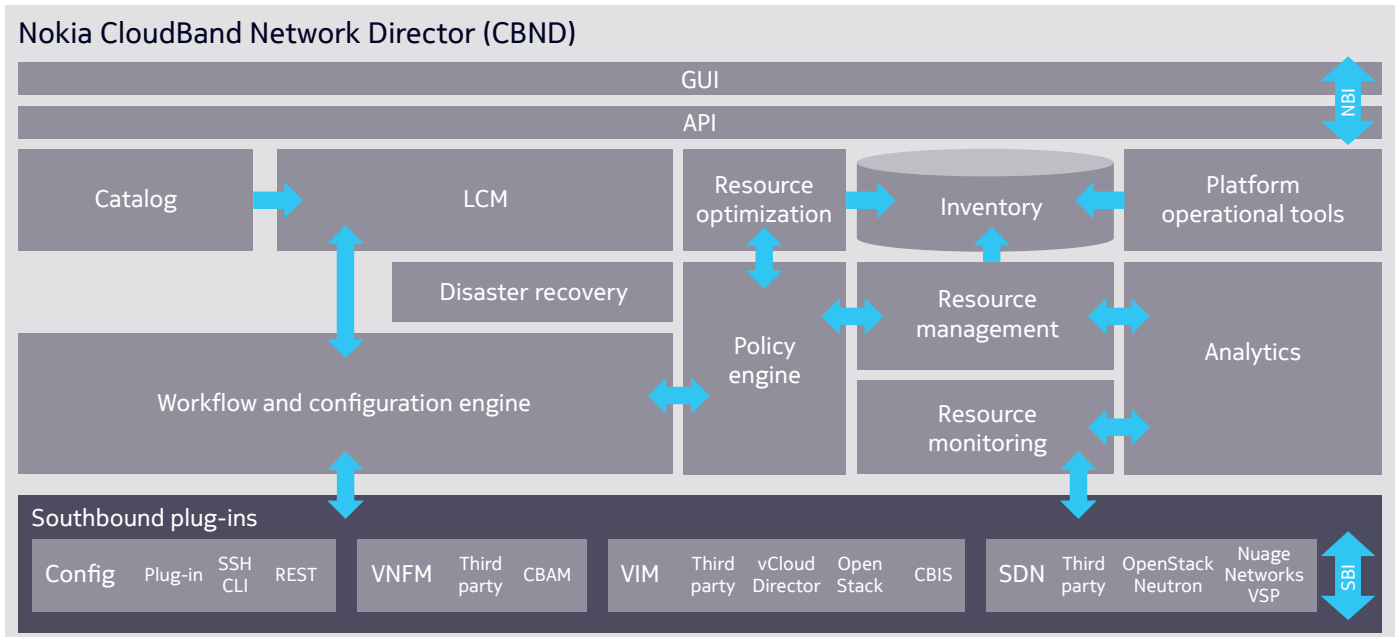
CloudBand Network Director as the NFVO

As the network service orchestrator, CloudBand Network Director (CBND) onboards network services, automates their lifecycles, and provides monitoring and troubleshooting tools. In addition, as a resource orchestrator, it administers, monitors, and optimizes NFV infrastructure resources across geographically distributed NFVI nodes.

Network services (SD-WAN, VoLTE, EPC and IoT, for example) are modeled and orchestrated using OASIS TOSCA templates and Mistral workflows. This includes network services onboarding, catalog management, lifecycle management, and monitoring and alerting. Once a network service or function has been onboarded, higher-level orchestrators or human operators can trigger the deployment, growth, or update as part of the service orchestration process, thereby helping to achieve scale and repeatability.

CBND is easily extended and integrates with many domain managers through plug-ins. Its ETSI NFV northbound interface simplifies integration with OSS systems.

Figure 2. Nokia CloudBand Network Director architecture



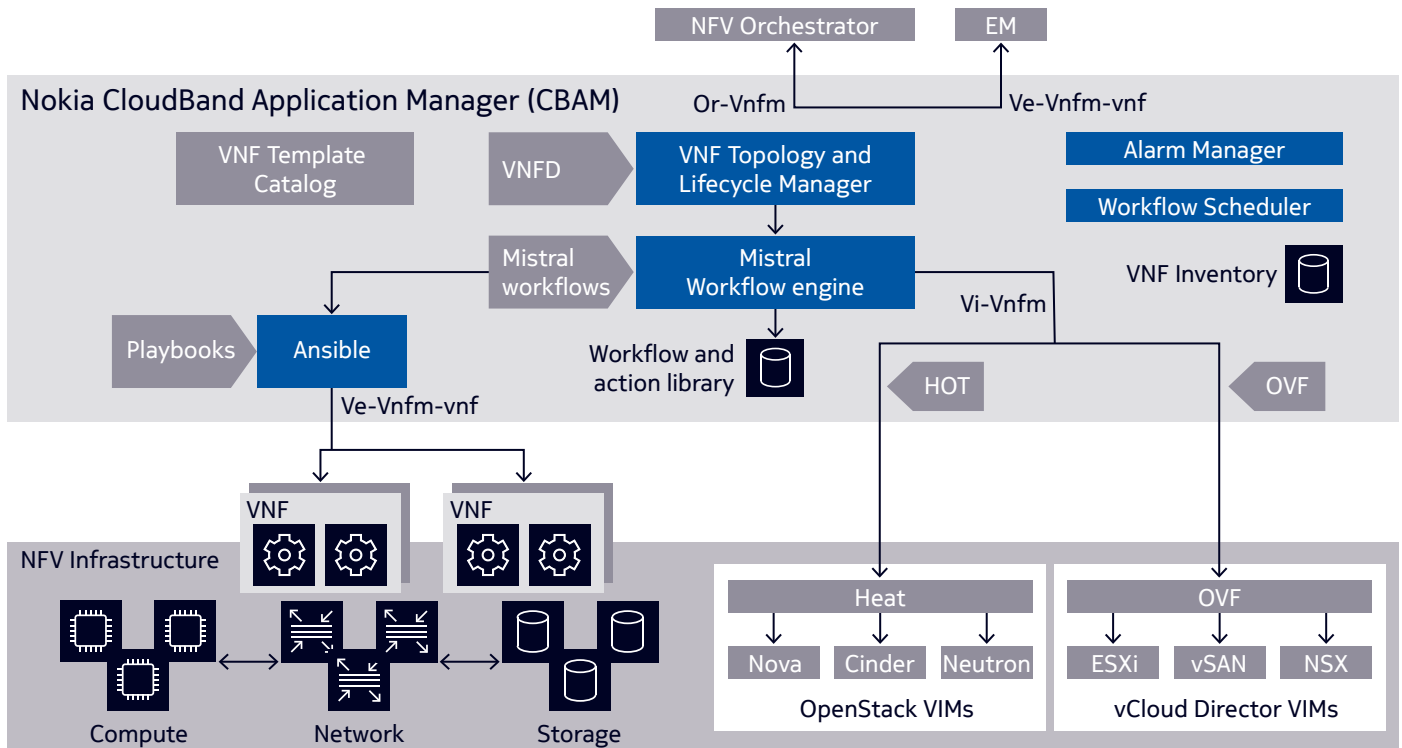
CloudBand Application Manager as the G-VNFM

CloudBand Application Manager (CBAM) automates VNF lifecycle management actions by managing resources and applying associated workflows. Operating as a G-VNFM, it manages VNFs from Nokia and its partners and competitors. Using an open templating system, it interprets complex VNF descriptor (VNFD) files and enables actions based on managed workflows and defined policies to ensure predictable deployments.

To achieve the widest interoperability and to simplify onboarding, Nokia developed, published, and implemented detailed guidelines for the creation of VNFD templates based on ETSI NFV specifications and widely adopted open technologies, including TOSCA, HOT, Mistral, and Ansible. Based on this open templating system, CBAM automates VNF lifecycles, including basic functions (create, instantiate, scale in/out, terminate, delete, query VNF, and modify VNF), and a framework for implementing advanced functions (such as healing, update/patching, upgrades, backup, and restore).

Lifecycle management is supported by a workflow engine using integrated catalogs with versioning support, described as a set of tasks and task relations, which together take care of state management, correct execution order, parallelism, synchronization, and high availability. Ansible-based commissioning of virtual machines is supported, where the parameters are calculated based on what is needed for deployment.

Figure 3. Nokia CloudBand Application Manager architecture



VMware vCloud NFV platform

VMware vCloud NFV is a modular, horizontal, common NFV infrastructure platform built on proven virtualization technologies for compute, storage, and networking, along with integrated dual multi-tenant VIMs. This solution enables cloud-centralized operations and management across the deployed topologies, and delivers an integrated set of NFV service delivery, operations, and management capabilities. VMware vCloud NFV Infrastructure (NFVI) augments Nokia CloudBand through:

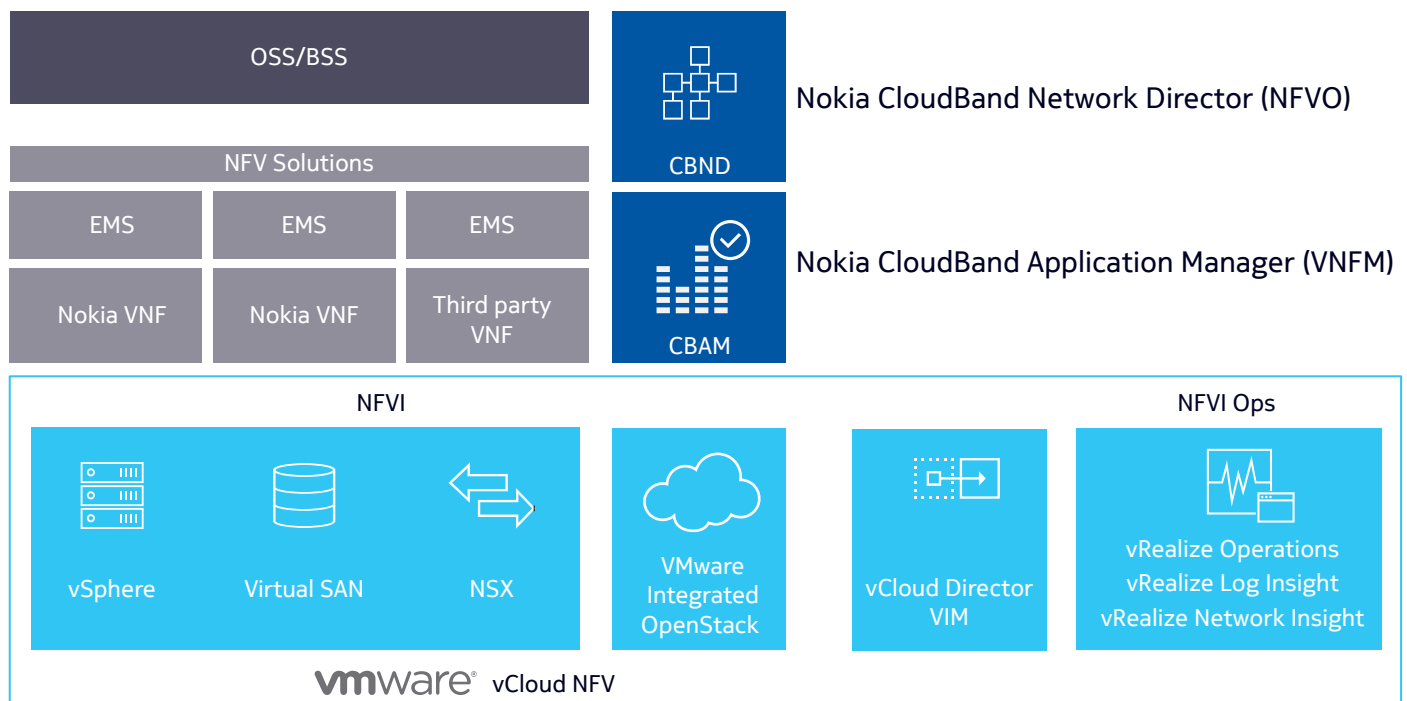
- **Services management automation** – vCloud NFV provides flexible, automated VNF onboarding and full-service lifecycle management through multi-VIM capabilities, greatly accelerating new service onboarding and expanding customers with faster time to market (TTM). With VMware vCloud Director (VCD) or VMware Integrated OpenStack (VIO)—a full OpenStack implementation—organizations can automate the process of deploying VNFs and NFVI resources, including the configuration and provisioning of compute, storage, and networking resources. With policy-based provisioning, vCloud NFV simplifies the resource allocation for VNFs, giving organizations a multi-tenant, robust VIM that automates and accelerates service deployment.
- **Carrier-grade performance and availability** – vCloud NFV provides proven carrier-class performance, extending control and data plane separated cluster design. Workloads can take advantage of the high-performance fabric with built-in dynamic high availability and scalability to meet application demands. Service-level agreement (SLA) guarantees are met through resource isolation, reservations, and dynamic workload placements with DRS and VMware vSphere vMotion® technologies. The platform can be scaled from a branch office virtual PoP to a large centralized data center to achieve micro-data center and multi-tenant network sliced designs.

- **Integrated operations management** – vCloud NFV is a fully integrated, single-pane-of-glass cloud solution that ensures and restores service levels using near real-time operation monitoring, analytics, automation, and remediation. The solution provides an overall integrated and correlated view across service, access, network, and virtual and physical tiers, with issue isolation and recommendations for RightScale Cloud Appliance (RCA). Northbound triggering closes the loop with service and resource orchestration remediation and network management systems/operations support systems (NMS/OSS) notifications. The solution can be extended with custom data feeds and third-party domain and technology expert analytics systems.

Key benefits of running CloudBand on vCloud NFV

Together Nokia and VMware make the process of delivering new services in the cloud faster, easier, and more effective because of the flexibility and automation enabled by Nokia CloudBand on VMware vCloud NFV.

Figure 4. Nokia CloudBand on VMware vCloud NFV



Ultimately, CSPs can:

- Quickly and simply onboard Nokia CloudBand on VMware vCloud NFV
- Integrate VNFs easily and automate their lifecycle management with CBAM capabilities and VMware vCloud NFV infrastructure to avoid error-prone manual processes
- Experience greater flexibility when building new services by using more VNFs from more suppliers (Nokia, partners, and competitors). CBAM is a true G-VNFM that has a track record of commercially deploying a wide variety of VNFs

- Rapidly deploy new network services with CBND and manage their lifecycle (including monitor, heal, and update) by using network service descriptors and catalog-based provisioning to create VNF service chains
- Ease multivendor integration with Nokia's pioneering of ETSI NFV interoperability APIs (IFA information models, SOL interface specifications)
- Achieve better scale and improve host utilization with minimal ESXi hypervisor overhead
- Experience balanced performance with scaling and dynamic resource scheduling on the VMware vCloud NFV platform
- Respond quickly with flexibility and agility to support today's VNF needs and future technology evolutions (without a forklift change)
- Rely on carrier-grade performance and availability that's built into Nokia CloudBand and the VMware vCloud NFV platform
- Rest easy with a joint solution that's proven in production: Nokia CloudBand has many commercial deployments around the world—including SD-WAN, VoLTE/VoWiFi, LTE capacity (RAN, EPC), public safety, government cloud, and other use cases. Similarly, vCloud NFV is deployed in Tier 1 networks across the globe, servicing over 250 million active mobile subscribers.

Nokia CloudBand and VMware vCloud NFV: A winning combination

CSPs can now take advantage of the many benefits the cloud has to offer while also overcoming telecom's cloud-specific challenges. The joint Nokia CloudBand/VMware vCloud NFV solution enables organizations to leverage a reliable and proven MANO and NFV infrastructure platform that delivers the flexibility and automation necessary to quickly, easily, and effectively deploy new services.

Together we bring joint value with decades of telecom innovation and virtualization expertise. Powered by the research and creativity of Bell Labs, Nokia has the industry's most complete, end-to-end portfolio of products and services. Likewise, VMware brings one of the most widely deployed and proven virtualization solutions on the market. The end result is a solid, unified solution that helps organizations address not only today's rapid technology shifts, but also new opportunities as they arise—ultimately positioning CSPs for success in the new era of telecommunications.

Acronyms

CBAM	CloudBand Application Manager	PCRF	Policy and Charging Rules Function
CBND	CloudBand Network Director	PoP	point of presence
CSP	communications service provider	RAN	radio access network
DRS	Distributed Resource Scheduler	RCA	RightScale Cloud Appliance
EPC	Evolved Packet Core	SD-WAN	software-defined wide area network
ETSI	European Telecommunications Standards Institute	SLA	service-level agreement
G-VNFM	generic VNF manager	SOL	solutions
HOT	Heat Orchestration Template	TOSCA	Topology and Orchestration Standard for Cloud Applications
IFA	interfaces and architecture	TTM	time to market
IoT	Internet of Things	VCD	vCloud Director
MANO	management and orchestration	VIM	virtual infrastructure manager
NFV	network functions virtualization	VIO	VMware Integrated OpenStack
NFVI	NFV infrastructure	VNF	virtualized network function
NFVO	NFV orchestrator	VNFD	VNF descriptor
NMS	network management system	VNFM	VNF manager
OASIS	Organization for the Advancement of Structured Information Standards	VoIP	voice over IP
OSS	operations support system	VoLTE	voice over LTE
		VoWiFi	voice over Wi-Fi

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Product code: SR1710017904EN (November)