# OpenStack DevOps Cloud Reference Architecture 2.1

Nuage Networks Ecosystem Program
is a complete ecosystem of open
source community projects, networking
and systems integration partners,
developers, and customers. The program
accelerates the adoption of Development
and Operations (DevOps) OpenStack
clouds.

The program provides reference architectures based on existing, proven, and operational
models that have been deployed at customer sites. This reference architecture leverages
Nuage Networks Virtualized Services Platform (VSP), an industry-leading Software-
Defined Networking (SDN) solution, and includes a wide range of networking services
from partners that have been certified on the Nuage Networks VSP:

- **Cloud Management System (CMS):** Red Hat® OpenStack® Platform

- **Application Delivery Controllers/Load Balancers:** Avi Vantage, Citrix® NetScaler,
  F5® Big-IP, Radware® Alteon and Brocade VTM

- **Security:** CounterTack®, CheckPoint®, GuardiCore®, Fortinet™ FortiGate, Palo Alto
  Networks® VM-series next-generation firewall and vArmour®

- **DHCP/DNS/IPAM:** Infoblox and Nokia VitalQIP

FIGURE 1. Red Hat OSP networking is managed by Nuage Networks VSP with service insertion from leading vendors
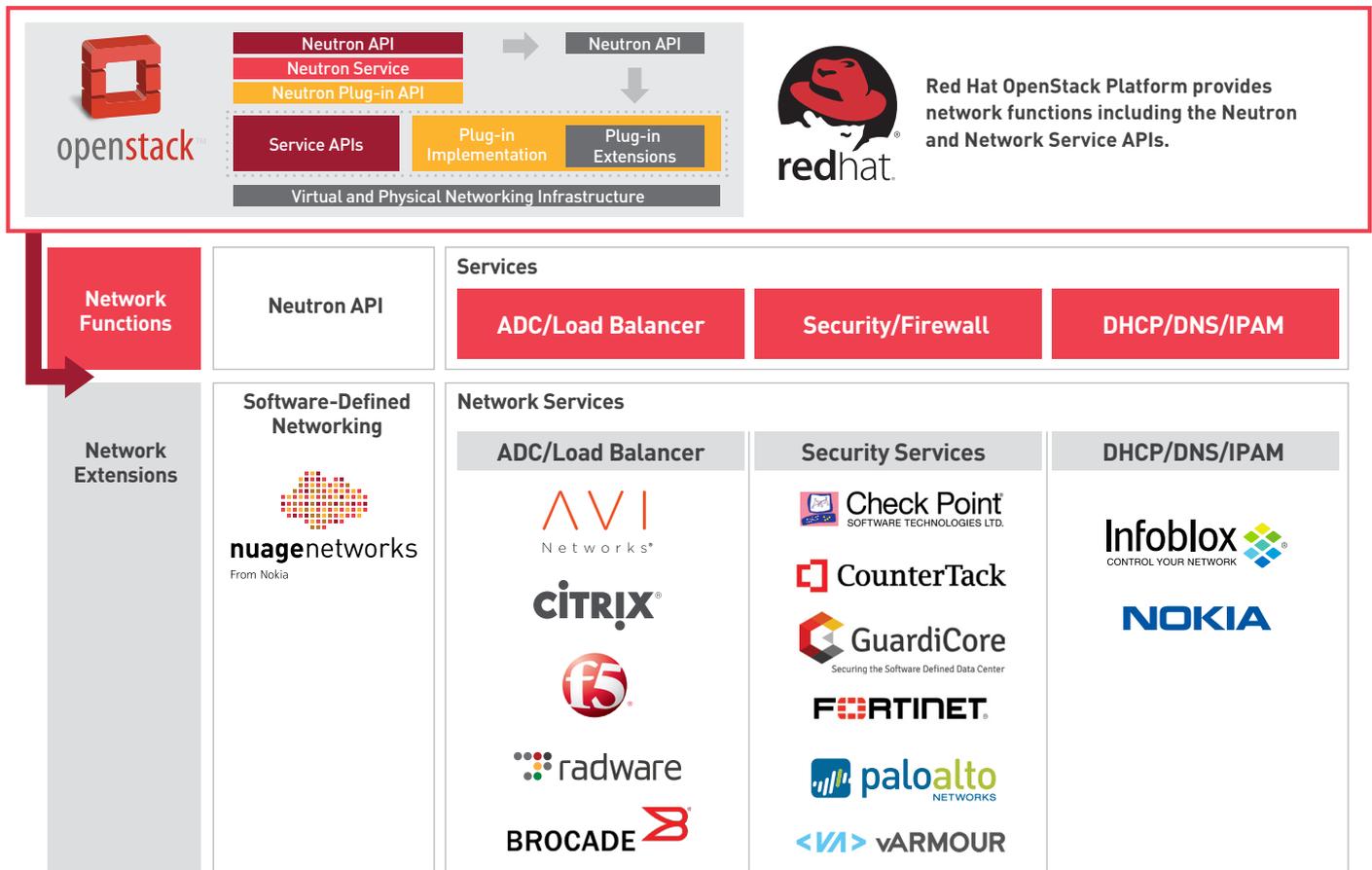
Ecosystem partners

Red Hat Enterprise Linux® OpenStack Platform combines the world's most trusted, secure, and proven Linux distribution — Red Hat Enterprise Linux — with Red Hat's rigorously tested OpenStack technology. To meet the enterprise need for a predictable lifecycle for support and maintenance, Red Hat Enterprise Linux OpenStack Platform brings together innovation across hypervisor, operating system, and OpenStack technologies while creating a stable platform for certified solutions from partners. Red Hat Enterprise Linux OpenStack Platform Version 7 was used for this reference architecture.

Check Point vSEC security gateway protects cloud environments from internal and external threats by securing virtual machines (VMs) and applications with the full range of protections of the Check Point Software Blade architecture. Check Point's vSEC delivers advanced threat prevention, dynamic service insertion, granular segmentation, automated security provisioning and visibility that is context aware. This reference architecture features Check Point R77.30 for vSEC security gateway and Check Point R80 for Smart Center Management.

CounterTack Sentinel is built on big data architectures to counter endpoint threats at-scale and to leverage tamper-resistant data collection for pure behavioral capture on enterprise endpoints (laptops, servers, workstations, mobile devices). CounterTack Sentinel dramatically reduces the impact of the most advanced attacks in real-time, giving teams an opportunity to defend the enterprise before incidents escalate. This reference architecture features Sentinel 5.4.

GuardiCore Data Center Security Suite provides advanced threat detection and visibility inside the data. Distributed per hypervisor or server, the Suite offers full coverage of all traffic inside datacenters at large scale with minimal impact on hypervisor/server performance. Using a unique combination of threat deception, semantics-based analysis and automated response, GuardiCore exposes attackers, provides quick and detailed insights into the nature of the attack and responds to it in real time.

Fortinet FortiGate™ virtual appliances offer protection from a broad array of threats, with support for all of the security and networking services offered by the FortiOS™ operating system. FortiGate virtual appliances allow you to mitigate blind spots by implementing critical security controls within your virtual infrastructure. They also allow you to rapidly provision security infrastructure whenever and wherever it is needed. FortiGate virtual appliances feature all of the security and networking services common to traditional hardware-based FortiGate appliances. This reference architecture features FortiOS 5.2 and later versions.

Palo Alto Networks VM-Series virtualized next-generation firewall automates security provisioning inclusive of firewall services and associated security policies as a means of segmenting virtual machines using zero-trust principles. This reference architecture features VM-100 Version 7.0.0.

Brocade Virtual Traffic Manager is a software-based Layer 7 application delivery controller (ADC) designed to deliver faster, high performance user experience, with more reliable access to public websites and enterprise applications, whether they run in a public cloud, private cloud or virtualized environment, while maximizing the efficiency and capacity of web and application servers. This reference architecture features Brocade vTM(Virtual Traffic Manager) 10.3 and above as well as Brocade Services Director 2.2 and above.

Citrix NetScaler® VPX provides the complete NetScaler web and application load balancing, secure and remote access, acceleration, security and offload feature set in a simple, easy-to-install virtual appliance. IT organizations, cloud and telecom service providers of any size can deploy NetScaler VPX on industry standard hypervisors — on demand — anywhere in the datacenter. This reference architecture features NetScaler VPX release 11.0 and Control Center 10.5.

F5 BIG-IP® Local Traffic Manager™ (LTM) delivers applications to users in a reliable, secure and optimized way. The benefits are extensibility and flexibility of application services with the needed programmability to manage the physical, virtual and cloud infrastructures. BIG-IP Local Traffic Manager Virtual Edition (VE) Version 11.6.0, per this reference architecture, provides the capabilities of BIG-IP LTM with the flexibility of a virtual platform.

Radware's Alteon Virtual Appliance (Alteon VATM) is a fully-functional Application Delivery Controller (ADC) solution. It provides an application-aware approach to deploying and managing applications to guarantee full availability, maximum performance and complete security while extracting more value from IT investments in Nuage VSP environments. Alteon VA provides identical functionality to Alteon physical ADC devices, including local and global server load balancing, layer 7 capabilities and application acceleration. This reference architecture features Alteon VA version 30.5.0 and the ADC Automation Controller (vDirect) version 3.30

Infoblox® DDI for DNS, DHCP and IP address management are available as virtual appliances for KVM-based OpenStack deployments. Infoblox DDI provides core network services such as DNS and DHCP, in a highly reliable enterprise-grade platform called the Infoblox Grid. This reference architecture features Version 7.1.0 of the Infoblox virtual appliance for KVM.

Nokia VitalQIP is an open, scalable DDI solution (DNS, DHCP and IP address management) available as software solution and optional hardware or virtualised appliances for large enterprise and service provider deployments. VitalQIP includes the Nokia DNS, Nokia DHCP and Nokia DHCPv6 high performance services; with industry-proven reliability and scalability, VitalQIP allows the enterprise to manage hundreds of DNS and DHCP servers supporting millions of IP addresses. This reference architecture features VitalQIP version 8.1.1

vArmour Distributed Security System is the industry's first distributed security system that transforms how organizations protect their virtualized and cloud assets in a world without perimeters. vArmour micro-segments every application in the datacenter by wrapping protection around every workload, delivering fine-grained visibility and control in dynamic multicloud environments. vArmour Distributed Security System is a single logical system composed of multiple autonomous, distributed sensors and enforcement points that are connected by an intelligent fabric.

Avi Vantage Platform is an Application Delivery Controller platform that has been architected on software-defined principles to deliver load balancing as a pool of distributed application services with central control in a data center or cloud environment. The unique architecture enables Avi Vantage to provide application services such as application insights, predictive autoscaling, policy-driven self-service for application owners, faster troubleshooting, application maps, and micro-segmentation, beyond load balancing. This reference architecture features v16.1.1

Nuage Networks Virtualized Services Platform

Nuage Networks VSP lays the foundation for an open and dynamically controlled datacenter network fabric to accelerate application programmability, facilitate unconstrained mobility, and maximize compute efficiency for cloud service providers, web-scale operators and leading tech enterprises across the globe. Nuage Networks VSP eliminates the constraints that have held back the responsiveness and efficiency of your datacenter network by:

- Making the datacenter network as dynamic and consumable as the compute infrastructure
- Eliminating cumbersome configuration-driven processes for datacenter networking
- Simplifying the definition of network service requirements and policies
- Scaling to meet the demands of thousands of tenants with unique application requirements, distinct security policies, and committed service levels

Nuage Networks VSP supports highly efficient hybrid clouds

Nuage Networks VSP is an overlay network for virtualized as well as non-virtualized network resources. You do not need any purpose-built networking hardware since all of the solution's components are virtualized. Nuage Networks VSP preserves network attributes (required network settings including security) no matter where the workload is placed. By replacing the tie to the physical network element with a set of required network attributes, Nuage Networks VSP provides full network roaming capabilities for all workloads.

Based on a unique, application-centric approach, the Nuage Networks VSP SDN solution abstracts application networking requirements from your physical network topology to streamline management operations and improve agility. Programmable business logic and a powerful policy engine let you define Layer 2-4 network requirements once in simplified application terms. This approach ensures compliance with resource policies across your infrastructure on a per-tenant and per-application basis.

FIGURE 2. Nuage Networks VSP open and dynamic datacenter network fabric
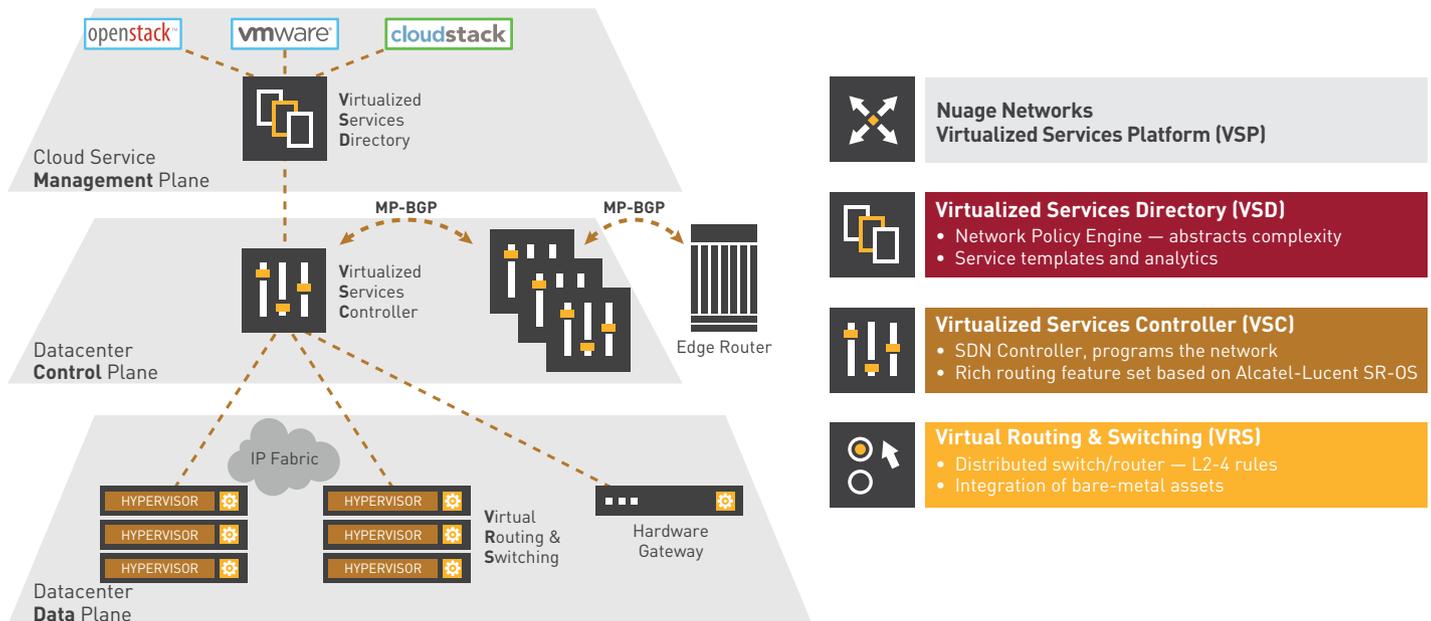
Using event-driven network service instantiation, network resources are instantiated as they are required and without manual intervention, allowing the demands of cloud applications to be quickly met for thousands of users. Seamless interoperability across multiple administrative domains and datacenters lets you place cloud workloads and services optimally across your infrastructure, improving server utilization and allowing cloud bursting and hybrid cloud services. This flexibility is not limited to virtual partner solutions, but also includes physical security and application delivery services.

Nuage Networks is committed to the partner and developer community and creating an open platform. As part of that commitment, the Company has

published a Virtualized Service Platform SDK (VSPK) on https://github.com/nuagenetworks to make the integration process easier and build a community for the benefit of customers, developers and partners. Many of the integrations with our partners have been completed using the Nuage Networks VSPK, dramatically cutting integration times.

Nuage Networks VSP self-certification infrastructure

To demonstrate the flexibility of the platform, the Nuage Networks Partner Program team has used Nuage Networks VSP and OpenStack to build the Nuage Networks self-certification infrastructure. Isolated

tenant environments were created, each hosting separate applications and multi-vendor security and application delivery controller solutions (one per application).

Each tenant's environment includes a dedicated instance of Nuage Networks VSP to provide separate overlay networks for that tenant. This enables each instance to have independent administrative and management access.

All of the solutions listed in this reference architecture have been certified to work with the Nuage Networks VSP.

To learn more about this reference architecture, our certified partner solutions or to be part of this ecosystem, visit www.nuagenetworks.net/partners or e-mail us at partners@nuagenetworks.net.

FIGURE 3. Multi-tenant isolation provided by dedicated Nuage Networks VSP instances