

VIRTUALIZED SERVICES PLATFORM

Virtualized Cloud Services for SDN automation in the datacenter

THE NUAGE NETWORKS APPROACH: NETWORK CHOREOGRAPHY

Nuage Networks VCS allows enterprise administrators to outline their networking requirements in application terms, without being burdened by network implementation details.

Administrators can express security (firewall and ACL policies), load balancing and user access-right policies with domain and zone abstractions, instead of having to use tedious and error-prone IP address assignments. Such policies are subsequently used to dynamically govern network behavior on an as-needed basis, triggered by compute instance creation, migration or deletion.

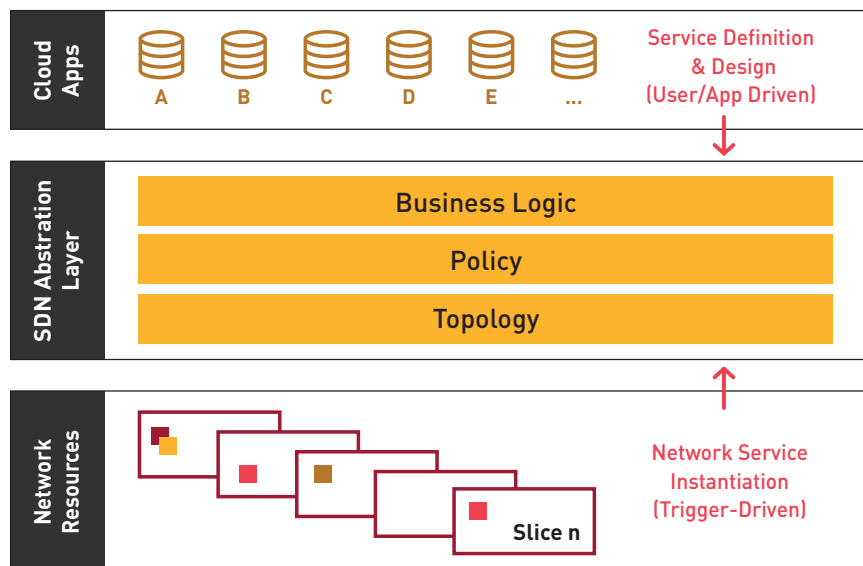
By using an event-driven model with a policy pull approach, VCS reserves network resources as they are required, avoiding the need to maintain network topology details. This ensures that the demands of cloud-based applications and services can be met across thousands of users in an efficient and timely manner. VCS also provides service insight by collecting and storing statistics on a per-tenant and per-VM/Container virtual port basis.

Nuage Networks™ Virtualized Services Platform (VSP) is a comprehensive solution that makes the network as readily consumable as compute resources across the datacenter, enterprise WAN and public cloud providers. It does this by providing the missing link to ensure rapid and efficient delivery of highly customizable application services, in and across multi-tenanted datacenters. Nuage Networks Virtualized Cloud Services (VCS) is the SDN platform for private cloud network automation in the enterprise datacenter. It enables the deployment of massively scalable cloud-based services with the agility and performance demanded by dynamic application environments.

What is Nuage Networks VCS?

Nuage Networks VCS is a Software-Defined Networking (SDN) solution that virtualizes any DC network infrastructure and automatically establishes connectivity between compute resources upon their creation. Leveraging programmable business logic and a powerful policy engine, VCS provides an open and highly responsive solution that scales to meet the stringent needs of massive multi-tenant DCs. VCS is a software solution that can be deployed over existing datacenter network fabrics and to public cloud providers.

FIGURE 1. The Nuage Networks VSP Approach



Cloud deployment of complex applications requires more than simple L2 connectivity. To meet these needs, VCS deploys the full range of L2-L4 networking services on a per-tenant or per-application basis using overlay technologies. This ensures each application gets the services required, and is not forced into a basic L2 VLAN connectivity.

Unlike other solutions that are restricted to the administrative domain of a single datacenter, VCS enables seamless interoperability across administrative domains and with existing VPN services. It does this by leveraging the power of mature MP-BGP technologies.

Nuage Networks significantly improves server utilization by allowing virtual machines (VMs), Docker containers and bare metal workloads to be freely placed wherever compute resources are available, within or across datacenters.

The Nuage Networks Solution in 7 points

The Nuage Networks VSP/VCS solution:

- Provides support for all major cloud management systems, hypervisors, and network gear. VCS leverages VMs on any x86-based hardware.
- Provides SDN-enabled virtualization with support of L2-L4 services
- Optimizes and scales datacenter connectivity and is deployable on heterogeneous networks
- Uses programmable business logic and policies to fully automate network service creation
- Offers unrestricted placement of VM, container or bare metal workloads to maximize efficiency of server resources
- Integrates public, private and hybrid cloud applications into managed VPNs
- Includes extensive data analytics and performance monitoring capabilities

Product components



Virtualized Services Directory – The Virtualized Services Directory (VSD) is a programmable policy and analytics engine. It provides a flexible and hierarchical network policy framework that enables IT administrators to define and enforce resource policies in a user-friendly manner.

VSD contains a multi-tenanted service directory that supports role-based administration of users, compute and network resources. It also manages network resource assignments such as IP and MAC addresses.

For service assurance, VSD allows the definition of sophisticated statistics rules such as collection frequencies, rolling averages and samples, as well as Threshold Crossing Alerts (TCAs). When a TCA occurs, it will trigger an event that can be exported to external systems through a generic messaging bus. Statistics are aggregated over hours, days and months and stored to facilitate data mining and performance reporting.

VSD can be deployed as a stand-alone or clustered solution depending on scaling needs.



Virtualized Services Controller – The Virtualized Services Controller (VSC) is the industry's most powerful and scalable SDN controller. It functions as the robust network control plane for datacenters, maintaining a full

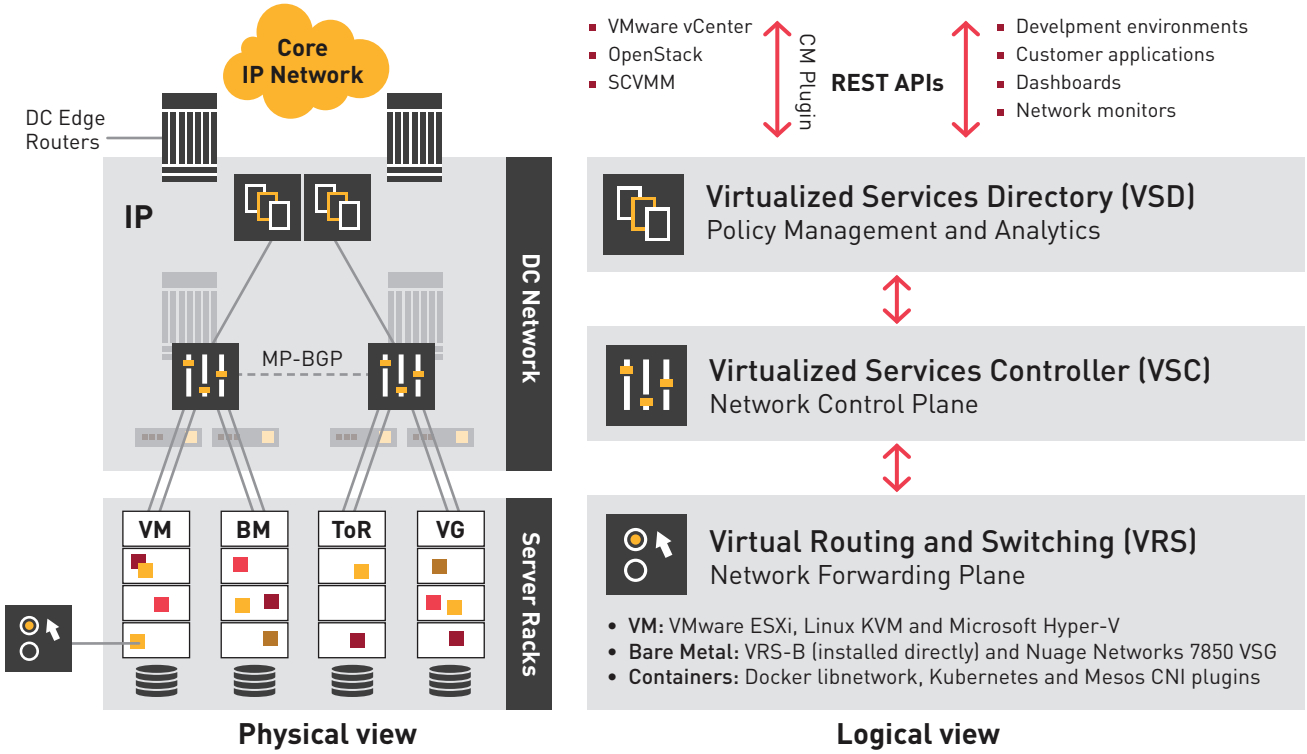
view of per-tenant network and service topologies. Through VSC, virtual routing and switching constructs are established to program the network forwarding plane using the OpenFlow™ protocol. Multiple VSC instances can be federated within and across datacenters by leveraging MP-BGP — a proven and highly scalable network technology.



Virtual Routing and Switching – The Virtual Routing and Switching (VRS) component is an enhanced Open vSwitch (OVS) implementation that constitutes the network forwarding plane. It encapsulates and de-

encapsulates user traffic, enforcing L2-L4 traffic policies as defined by VSD. VRS tracks VM creation, migration and deletion events to dynamically adjust network connectivity. VRS supports multiple hypervisors and container-ready platforms in virtualized server environments. It also operates as a gateway for bare metal servers or service appliances. VCS also includes a physical network appliance, the Nuage Networks 7850 Virtual Services Gateway (VSG) that serve as overlay network tunnel endpoints where needed, such as for integration with physical servers, as well as working with leading networking vendors' top-of-rack switches for VXLAN termination. To support bare metal applications, a software VRS-B (bare metal) may also be deployed directly on the physical server, avoiding the need for VXLAN-compliant top-of-rack switch.

FIGURE 2. Nuage Networks Virtualized Services Platform Architecture



Technical specifications

REQUIREMENT	SUPPORT
Cloud Platforms	<ul style="list-style-type: none"> ■ VMware® vCenter 5.5 and later <ul style="list-style-type: none"> □ VCIN security enhancements ■ Microsoft System Center Virtual Machine Manager (SCVMM) ■ OpenStack™ <ul style="list-style-type: none"> □ Supports all major vendor distributions □ Full ML2 support □ Ocata support □ Newton Monolithic plugin support □ Neutron project: Plug-in supported for open source OpenStack and all vendor distributions □ VLAN-aware Virtual Machines
Hypervisors and Container Platforms	<ul style="list-style-type: none"> ■ KVM, VMware ESXi, Microsoft Hyper-V, Docker, OpenShift, Kubernetes and Mesos ■ Kubernetes High-Availability support ■ Container Networking Interface (CNI) support on Kubernetes
Routing/Switching Hardware and Software	Any IP-capable device for datacenter networking (e.g., Arista, Cisco, HPE, and others)
Firewalls, Load Balancers, and DNS/DHCP Servers	Open ecosystem support through a CMS-programmable framework (e.g., OpenStack, FWaaS, LBaaS)
Linux	Compatible and tested with distributions from Red Hat, Ubuntu, and CentOS
OSS/BSS app integration	Northbound API access through RESTful APIs and HTML5-based web portal for user self-service
Support for Non-Virtualized (Bare Metal) Components	<ul style="list-style-type: none"> ■ Industry-first Layer 3 bare metal gateway support with the Nuage Networks 7850 VSG. Enables non-virtualized components to be managed along with virtualized components. ■ VRS-B virtual switch may also be deployed directly on the bare metal server.
Security	<p>In addition to standard network security, subset of additional functionality:</p> <ul style="list-style-type: none"> ■ Secure Microsegmentation ■ Access Control List (ACL) configuration ■ Access security includes a distributed policy-based L2-L4 firewall ■ Port Mirroring ■ OpenStack XaaS integration ■ VLAN Trunking
VPN integration	Seamless integration based on MP-BGP with use of standard BGP functionality
Network virtualization	<ul style="list-style-type: none"> ■ NV03 framework for DC Network Virtualization with L2/3 NVE support ■ IPv6 overlays
Architecture scalability	Federated SDN control architecture based on MP-BGP
Analytics engine	Fully programmable and extensible engine based on Hadoop clusters with real-time analytics support