FLEXIBLE NETWORK SERVICES TO DRIVE YOUR ENTERPRISE AT CLOUD SPEED

Solution Primer
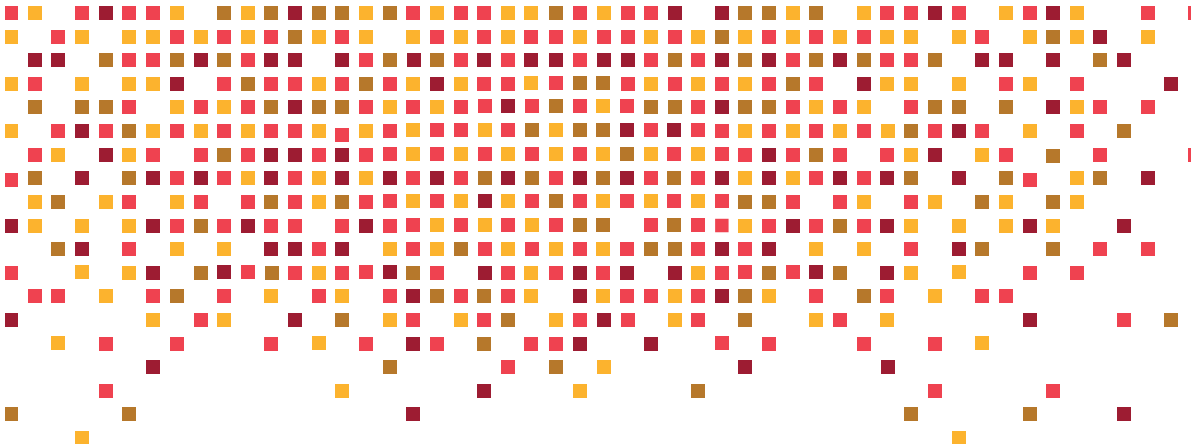
nuagenetworks

ABSTRACT

Software Defined Networking (SDN) has delivered significant benefits to datacenter networks, making it possible to unleash the true power of the cloud.

Nuage Networks brings the same benefits to wide area business networks with Nuage Networks Virtualized Network Services (VNS). With our solution, you will have the flexibility you need for your dynamic business environment.

With Nuage Networks VNS the wide area network that underpins your business locations is unshackled so you can deliver communication services where and when you need them. You'll finally have the flexibility and functionality you need to support your business.

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INTRODUCING NUAGE NETWORKS VIRTUALIZED NETWORK SERVICES

Traditional service provider Virtual Private Network (VPN) services are based on rigid functionality that can be deployed across the widest customer base with little room for per-enterprise customization. This forces enterprises into the complex world of customized branch networking to achieve the desired network capabilities to match their specific business needs.

This enforced customized networking can be achieved with assistance from a network integrator or via the internal network operations team. However, doing so results in additional expenditure and ongoing complexity that can hinder the network's ability to respond to the ever-changing business environment.

The most common VPN deployments are included in Table 1 below, along with the key benefits and limitations of each.

TABLE 1. Current VPN deployment choices

Service type	Investment	Contractual options	Service/site changes	Advanced network functionality
Managed VPN Services	High recurring service costs	Strong SLA for service availability and QoS	Complex change control processes required due to contractual obligations	High cost and complexity to add Layer 4+ functionality to the base service
Unmanaged VPN Services	Lower recurring service costs but higher internal operating cost	Strong SLA for service availability and QoS	High internal workload with coordination required for third-party suppliers	High investment cost for procurement and operation of standalone appliances
Do-it-yourself VPN Services	Low recurring service costs due to public IP-based connectivity services	Limited SLA deliverables for both availability and minimal QoS	Simpler process with all service aspects managed internally	High investment cost for procurement and operation of standalone appliances

Nuage Networks Virtualized Network Services (VNS) is a fresh approach to wide area networking that seamlessly links your enterprise locations regardless of size or geography while reducing the requirement for customized networking.

TABLE 2. Nuage Networks VNS

Service type	Investment	Contractual options	Service/ site changes	Advanced network functionality
Nuage Networks Virtualized Network Services	Flexibility to choose private or public IP services on a site-by-site basis	SLA profile to match site type (high SLA for large sites, lower for remote sites)	Simple process with all service aspects managed via service portal	Lower cost with integration of common Layer 4+ functionality built into service

Nuage Networks VNS provides a comprehensive networking service that removes the limitations that exist with traditional VPN service offerings, including:

■ Limited service functionality and inflexibility of standard VPN offerings

■ Geographic reach limitations of a single-carrier VPN service

■ Inability to adapt to the dynamic business environment and respond quickly to simple move, add and change requests

■ Need to augment the VPN service with additional hardware (firewalls and routers) and associated professional services

With a Nuage Networks VNS-based wide area network, the conversations within your business changes from, "We need to reconfigure the network, I'll need to start a new project up" to "Sure we can do that, I'll make the change right now." **Nuage Networks VNS is wide area networking on your terms.**

The key benefits of Nuage Networks VNS are:

■ You can choose the best-fit connection to each of your locations from all the service providers in the market

■ Moves, adds and changes are under your complete control and are centrally driven on a per-site or whole-of-network basis

■ Customizable network functions are included in the solution, reducing the need for dedicated elements such as firewalls and security

■ Service manageability improves and the complexity around auditing and compliance for industry bodies and regulators decreases

Later in this paper, we explore the many business benefits Nuage Networks VNS provides over traditional VPN service offerings. First, however, it's important to get an understanding of the core service attributes. The following section provides an overview of the key building blocks of Nuage Networks VNS and how they are implemented.

> Nuage Networks VNS will drive a significant reduction in the network infrastructure costs at each of your locations

HOW NUAGE NETWORKS VNS WORKS

Nuage Networks VNS is a new approach to private wide area networking services based on the Software Defined Networking (SDN) framework. The primary driver for Nuage Networks VNS is the need to deliver a business service that provides instant networking capability delivered to the remote sites of any enterprise regardless of their locations.

To achieve this, Nuage Networks adopts the leading technologies from the cloud service environment that are benefiting from SDN to create a comprehensive solution for wide area networking. These technologies include centralized policy management and common-off-the-shelf (COTS) x86 hardware.
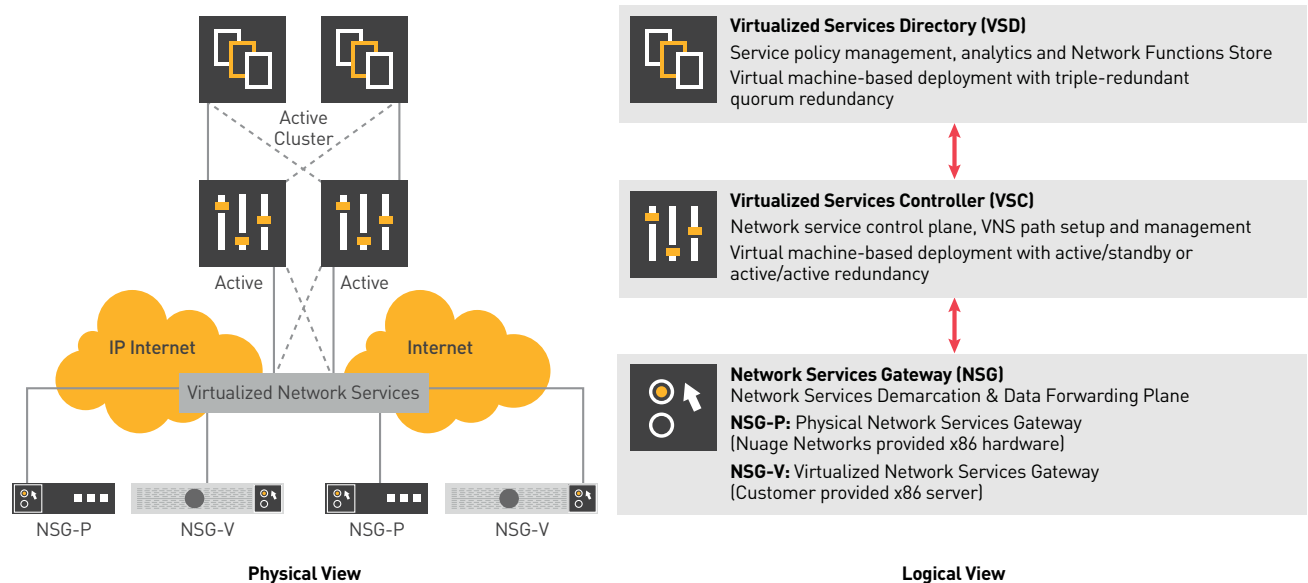
There are three key components to Nuage Networks VNS:

Virtualized Services Directory (VSD) — This is the centralized policy engine, which defines, deploys and enforces the overall Nuage Networks VNS platform's capability and delivers advanced service capabilities via a Network Functions Store.

Virtualized Services Controller (VSC) — The network controller programs the customer premises equipment with the network overlay paths to form the topology for the network service.

Network Services Gateway (NSG) — The gateway provides service demarcation and network functionality at the branch based on x86 COTS hardware.

FIGURE 1. Nuage Networks VNS Components

Virtualized Services Directory (VSD)
Service policy management, analytics and Network Functions Store
Virtual machine-based deployment with triple-redundant quorum redundancy

Virtualized Services Controller (VSC)
Network service control plane, VNS path setup and management
Virtual machine-based deployment with active/standby or active/active redundancy

Network Services Gateway (NSG)
Network Services Demarcation & Data Forwarding Plane
NSG-P: Physical Network Services Gateway (Nuage Networks provided x86 hardware)
NSG-V: Virtualized Network Services Gateway (Customer provided x86 server)

**Physical View**   **Logical View**

Traditional VPN services are tightly connected to dedicated network infrastructure from a service provider. Nuage Networks VNS are based on an overlay model that uses any IP network to provide underlay connectivity between sites. This gives you maximum flexibility for your locations and the support of multiple access/last-mile technologies including copper, fiber or mobile broadband.

With Nuage Networks VNS, you have the flexibility to mix and match available networks from multiple providers and to use any available access technologies. This gives you the freedom to use whatever technologies are most available in any particular location, so you can get a service where and when you need it.

For instance, if you need a temporary location set up and that site does not have immediate access to fiber or copper circuits, you can use a 4G mobile connection or even Wi-Fi® in the interim until fixed connectivity can be sourced. Nuage Networks VNS only requires an IP connectivity service to operate, so you have complete freedom to choose from multiple network infrastructure options.

Depending on the bandwidth you need into the site, you select the best match IP underlay service. For example, if the most cost-effective network to get the required bandwidth into the site is Internet you can select from the tiered service offerings of all Internet Service Providers within the region. You decide which offering is best for your needs — from basic Internet to a higher grade business class Internet service. With Nuage Networks VNS the sites that are connected over public IP networks, such as the Internet, can be centrally configured to encrypt all traffic in and out of the location.

FIGURE 2. Nuage Networks VNS in action across multiple service provider networks
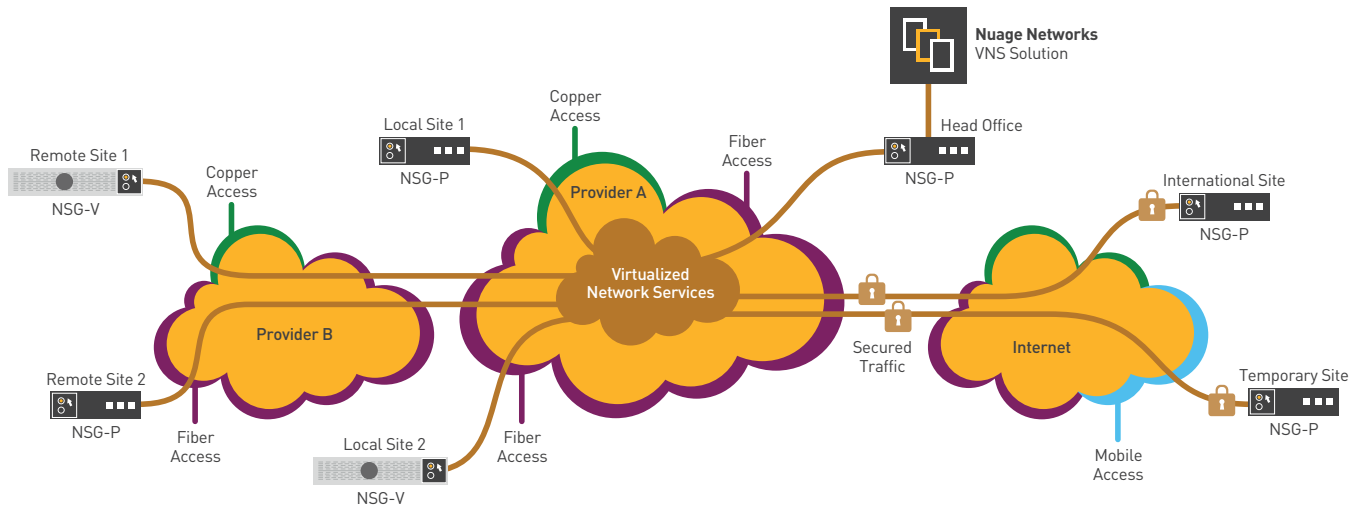
With IP services being prevalent across all major service providers, there is an increased scope of competitive pressure and ubiquitous reach that your enterprise can leverage to assure the responsiveness of the network service and deliver a cost-effective outcome.

The choice of underlay IP service type will be dependent on your site type and location. It can easily involve a mix of IP networks to provide the connections required. For instance a large enterprise may use a private IP service from the service provider for the majority of its locations but use either fixed or mobile broadband connections for smaller locations or a home-based workforce. In the latter case, the Nuage Networks VNS traffic can be encrypted and safely transported over the Internet.

The same flexibility can be applied to international locations. In general, providing connectivity to locations outside of the home country is expensive, complex, and requires an increased level of internal resourcing for network operations and contractual management.

With Nuage Networks VNS these locations can choose the most cost-effective IP network available and leverage the inherent security within Nuage Networks VNS to encrypt business traffic. With the investment in broadband networks and the inherent capacity of the Internet there are options to utilize business-grade Internet services as alternatives to costly dedicated E1/T1 connections. These business-grade Internet services can provide throughputs that are at least equivalent (and for most, superior) to that of dedicated E1/T1 circuits for a fraction of the per-megabit cost.

DELIVERING BANKABLE BUSINESS BENEFITS

There are many advantages to the Nuage Networks VNS approach — cost savings and efficiency advantages that you will see reflected in your bottom line. The overriding benefit is that with Nuage Networks VNS, you can build a network that is both customized and responsive to your enterprise's unique needs, without incurring the costs and complexities of a customized network in the traditional VPN world.

Extensive reach to match your business locations

Because all the rich network features are built into Nuage Networks VNS, the requirement of the underlying IP network is reduced to just connectivity and bandwidth. This lowers the requirement for specialized network services from service providers. It also increases the choice of providers and service offerings to those that meet the specific needs of your locations, whether those locations are local, national or even global.

This can provide increased flexibility in contractual terms. For instance, with a traditional VPN service the minimum term is based on yearly contracts; with Internet services this term can be monthly.

With the Nuage Networks VNS platform's flexibility, you can choose the right service type for each location, based on cost and service quality. An Internet-based service can offer high bursting connectivity but generally no guarantee of minimal or consistent throughput. The ability to deliver consistent service availability has traditionally been the domain of IP-VPN and Carrier Ethernet services, so the choice of which fits best will depend on your site requirements.

One option available with Nuage Networks VNS is to mix the connectivity types and direct branch traffic across the most appropriate uplink. As shown in Figure 3, a policy can be centrally created that forces certain traffic to use one of the two available uplinks. This is called "traffic steering." It can be used, for instance, to direct the more time-sensitive or mission-critical business data to the smaller (but QoS-enabled) private IP link. Higher throughput applications such as high-definition video conferencing or file transfer are directed to the larger Internet-based uplink. This provides the benefit of guaranteed performance for mission-critical applications and the use of higher throughput but lower cost-per-bit transport for non-mission-critical applications.

The network functionality around traffic steering is not new. However with standard VPN services, the complexity around managing and controlling the feature has inhibited its adoption. With Nuage Networks VNS, the feature is centrally controlled and automatically pushed to the relevant remote locations. This ensures a consistent service deployment across the business and an easily validated audit point.

> Nuage Networks VNS separates your wide area network service from the underlying connectivity. This enables you to choose the best-fit network provider for each of your sites.

FIGURE 3. Traffic steering to multiple networks at the branch
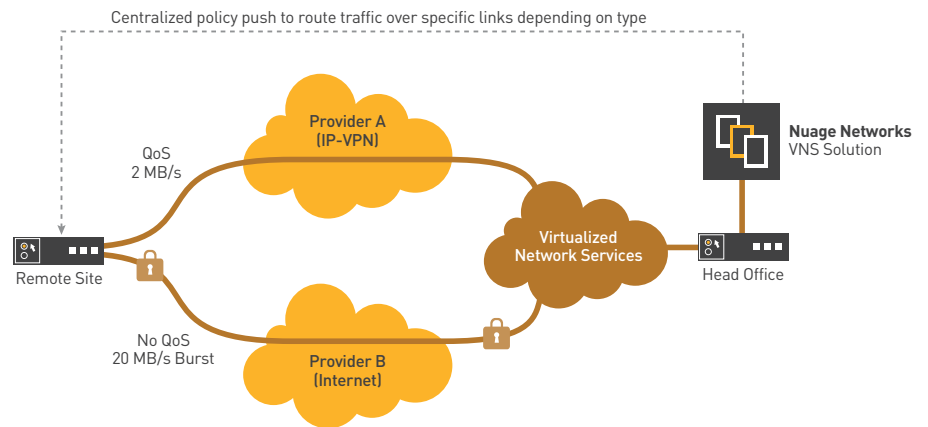
You control moves, adds and changes

Nuage Networks VNS puts you in complete control of your enterprise's service without the overhead of a large and highly skilled network team. This empowerment is delivered through the functionality of the central policy engine, the Virtualized Services Directory. The VSD provides the functionality to make any change to the overall service, any location-specific changes, and changes to add or remove sites.

The VSD has a comprehensive user authentication framework through which employees can be assigned roles for managing and maintaining the Nuage Networks VNS service. For instance, a security profile can be set up that gives the owner rights to create the business's network security conditions, such as firewall rules, branch equipment passwords or encryption levels for access circuits. Once this resource sets the security framework, it is distributed to the locations as required. No other users can change the security framework, so consistency of network access and information protection can be validated and audited as per any industry requirement, such as Sarbanes-Oxley.

Increased flexibility at the branch

The compute industry has transitioned from proprietary hardware systems to x86-based systems for the virtualized compute resources that power today's datacenters. It makes sense to adopt the same strategy for network services. There is an emerging trend of x86-based solutions as an alternative to proprietary hardware systems with their closed operating systems and inherent vendor lock-in at the branch.

Nuage Networks VNS has adopted the same open, virtual compute trend. The software images for Nuage Networks VNS are developed to run on the widest range of x86-based hardware platforms to drive maximum utilization of the available compute and memory resources.

The result is a service capability that is independent of the brand and model of the deployed customer premises equipment. The choice of x86 form-factor and manufacturer is open to a competitive procurement model that provides flexibility in the supply chain.

> You choose the right network service for your branch traffic. Premium VPNs can be used for mission-critical applications and encrypted Internet links for high volume non-mission-critical applications such as video conferencing

Nuage Networks VNS offers a number of branch equipment form-factors to meet service requirements based on location size and throughput needs. However, as Nuage Networks VNS has no direct tie to the manufacturer of the branch hardware, the solution is open to a "bring your own device" model. Nuage Networks can supply a minimum specifications table of CPU power, core and memory requirements so you can select equipment from your preferred IT supplier. We also provide a professional engineering service to validate and certify your selected platforms.

The software downloaded to the x86 branch equipment from the Nuage Networks VSD is based on an open framework. The image runs independently of the hardware manufacturer via a hardened hypervisor construct in a similar way to the virtual compute deployments in leading datacenters.

FIGURE 4. Flexible NSG functionality with a user-selectable advanced feature set across both physical and virtual branch hardware
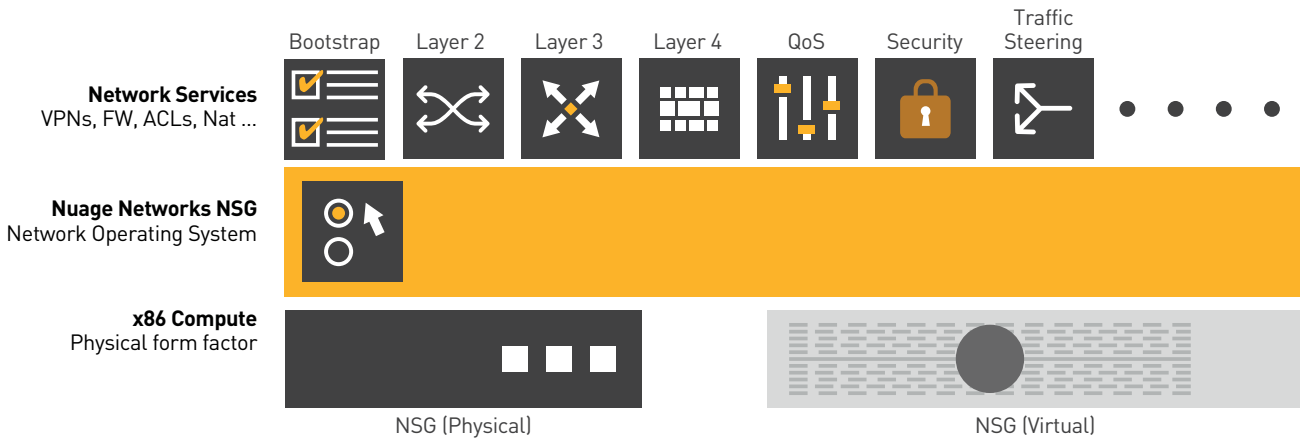
You select the functionality for the specific location via the VSD Network Functions Store. This provides a similar concept to the smartphone application stores we all use today. Your network team is presented with a catalog of network functions that they can select from depending on the site type and required features.

These include the most widely used network forwarding functions and parameters available on proprietary routers. You also have the ability to selectively implement advanced network functions including firewalls, load balancers and the like to create a feature-rich processing chain in the branch.

By selecting an x86-based network endpoint, Nuage Networks VNS provides the foundation to innovate the service functions independently to the physical hardware. This separation enables a fast innovation cycle to ensure that evolving network functions can be integrated into the feature set of the service with minimal impact to the underlying hardware platforms.

With functionality being integral to a network service, we envisage that Nuage Networks VNS will replace a number of the physical network appliances currently required at branch locations, including security gateways and firewalls. The benefit to the enterprise is a simplification of the overall network: less hardware translates into increased stability and an overall reduction in network complexity.

The Nuage Networks VNS approach provides a significant differentiator when compared with traditional VPN services and the use of dedicated network appliances. In today's environment the dimensioning of the appliance is based on a baseline and growth profile. If the profile changes downward, the enterprise may have invested in unused capacity. Alternatively if the profile trends upwardly, unscheduled capital expenditure can be forced on the business. Nuage Networks VNS mitigates this risk by converting functionality from dedicated appliances to software licenses within the network service.

SUMMARY

Nuage Networks VNS has the potential to significantly change the costs associated with delivering business services through:

- Customer-driven management

- Uncoupling of the business service from the underlying network

- Reliance on x86-based customer premises equipment

For enterprises, increased flexibility in deploying a service feature set that is tailored to their business needs will provide a better service experience. This will, in turn, translate into a higher level of experience for your network users and IT/Network team.

The emergence of Nuage Networks VNS as an alternative to traditional VPN services has been driven by the adoption of the cloud for business networking. Static networking models don't provide the flexibility required by today's businesses. The move to fully automated virtual networking with SDN has already been accepted as the right move to meet the demands of the cloud in the datacenter. It makes sense to adopt the same basic framework to unshackle the network between the datacenters and enterprise end-users, regardless of their locations.

Nuage Networks has taken its highly successful industry-leading network virtualization solution for datacenters and provided a fresh approach to wide area networking and the use of VPN services.

The solid framework provided by a feature-rich centralized policy engine and the use of open and contestable x86-based hardware for the branch breaks the vendor lock-in around proprietary routing platforms. Nuage Networks Virtualized Network Services puts the power of choice directly into your hands.

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