Netsocket Virtual Network for Distributed Enterprises
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Introduction

Current software-defined networking (SDN) and virtualized networking (NV) solutions are focused on virtualizing network functionality within the data center and the metropolitan area network (MAN). While these solutions and their underlying technologies are optimized for the data center and metro content distribution networks, they are not optimized for the local area network (LAN) and wide area network (WAN) edge environments of a highly-distributed enterprise. **Netsocket Virtual Network (NVN) fills this void with a low-cost, efficient, centrally-managed virtual network specifically optimized for the enterprise LAN and WAN edge network deployment. Immediate benefits include capex savings of 3:1 and lifecycle opex savings of 5:1 over single-purpose, hardware-based legacy networking solutions. Longer-term benefits include network deployment agility, enhanced network service visibility and automated, policy-controlled network recovery on service degradation.**

Virtualized Networking—Distributed Enterprises Left Behind?

Software defined data center (SDDC) virtual networking solutions and the services they deliver are optimized for a data center environment in which east-west application traffic is predominant. These application transactions are triggered, for example, when an end user submits a north-south request for service through their browser or client user interface. A sequence of events is set in place that likely requires behind-the-scenes interaction between multiple independent databases and several disparate applications — all hosted within one or more data centers. The traffic pattern not visible to the end user is between these hosted applications and databases. After this complex choreography is complete, the composite service result is delivered to the end-user’s browser UI.

A second kind of service delivered by today’s virtual networking solutions is scalable, responsive content delivery. Consumers have come to expect immediate delivery of high-bandwidth streaming videos, images and other large files to their devices. The preponderance of traffic in these scenarios is north-south, as content is streamed from file or streaming servers to devices (typically mobile devices). Given the rapid proliferation of mobile devices, the most efficient deployment of network resources allows content server bandwidth to be allocated at or near real-time in order to satisfy consumer expectations. This content on-demand environment drives the north-south implementation of virtualized networks within metro area networks. An example of this is the various Evolved Packet Core (EPC) initiatives of mobile content providers.

However, neither the data center nor the content-on-demand virtualized networking implementations address the specific needs of enterprise campus and distributed office LANs and edge networking environments.
Problem Definition

A highly distributed enterprise, such as the 50-site company depicted in Figure 1 above, is composed of multiple inter-connected sites. The user and device capacity at any of these sites can vary by several orders of magnitude across the enterprise. An edge router connects its site to other sites through off-site WAN services (e.g. dedicated internet or MPLS) provided by a separate service provider.

Unique to enterprise office (campus, branch) sites is the preponderance of corporate end users and end devices requiring access to each other and to internet, intranet and extranet resources. Each site’s LAN provides access connectivity to a site’s users and devices. The LAN, while a shared resource, is normally implemented through highly-available, high-bandwidth layer 2 and layer 3 switches and wireless access points. Bandwidth into and out of the WAN edge is normally much more expensive, and therefore constrained, requiring resource sharing and prioritization of the services delivered over the edge.

“While most of the conversation about software-defined networks (SDNs) focuses on their impact on the data center—virtualizing networks to cut hardware and personnel costs, reduce on-site footprints, remove bottlenecks and traffic flow problems and make network management easier—the true benefit of SDNs may lie outside the data center. The true value of SDNs may be for the Managed Service Providers (MSPs) and for Enterprises with multiple branch offices.”

– Kurt Marko
Networking Consultant and Analyst
router. Each of the edge routers depicted in the diagram above is normally managed as an autonomous device, meaning that any other edge router has no awareness of the configuration of service state of every other router.

**CHALLENGES IN TRADITIONAL DISTRIBUTED ENTERPRISE NETWORKS TODAY**

Today’s legacy, hardware-based networking approach for the distributed enterprise is problematic because:

- The capital expense required to acquire network devices is excessive
- The lifecycle costs to deploy, install, provision and operate these individual, autonomous network devices are expensive and unpredictable, because the edge routers are separately administered devices
- Legacy networking hardware is not available to any other application, other than network functions due to the nature of its single-purpose hardware design
- Networking vendor innovation timelines are constrained by lengthy hardware development cycles

Today’s SDDC and metro content distribution SDN/NV-based solutions do not adequately address distributed enterprise use case requirements, as follows:

- Reduced and more predictable maintenance and support costs drive a requirement for centralized network management and more automated lifecycle network management processes (hands-free installation, simple GUI, no CLI, no truck rolls)
- Flexible logical addressing drives a requirement for integrated DHCP, NAT and port forwarding services
- Diverse off-net access per site drives a requirement for multiple routing interfaces to the site’s local internet/intranet/extranet connections
- Inter-site quality of service (QoS) and security/privacy needs drive requirements for DSCP marking, priority queuing, rate limiting, secure inter-site tunnels and site-specific VLAN flexibility
- Secure access to local networks by client and server devices, such as printers, laptops, local servers and BYOD, drives a requirement for network access control (NAC) and authentication, authorization and accounting (AAA)
In response to the network virtualization challenge, Netsocket introduced the Netsocket Virtual Network (NVN), a new SDN framework for network virtualization and advanced automation. A fully optimized, automated, and cost-effective network, the NVN transforms the network into an asset that is responsive to the needs of the business.

Key features of the Netsocket Virtual Network include:

- **Complete SDN Architecture functionality for:**
  - End-to-end virtual networking that is independent of physical infrastructure
  - Virtual Layer 2/3 Switching
  - Virtual Carrier-Grade Routing, Firewall and VPN/Tunneling

- **Centralized Network Automation Management that provides:**
  - Unified Network Management
  - Real-Time Network Service Analytics
  - Intelligent Network Remediation

- **Superior Interoperability and Integration with:**
  - Legacy routed networks
  - OpenStack™ & Microsoft System Center
The Netsocket implementation is optimized for the distributed enterprise network. NVN centralizes and automates enterprise-wide network management workflows through its network management application, vNetCommander.

All networking functions including routing, L2/L3 switching, firewall and tunnels, are completely virtualized—allowing them to be hosted on commodity X86 hypervisor-enabled servers at each site. There is no need for expensive, special-purpose router hardware. The same servers may be used to host other site-virtualized applications. Whether your enterprise network is managed by your own staff or through a trusted Managed Service Provider (MSP), the Netsocket approach drastically reduces both networking capex and opex, resulting in a 4:1 savings in total cost of ownership (TCO) over legacy edge network solutions.

NVN’s virtualized components are distributed among sites as shown in Figure 3 below. A single vFlowController with its closely-coupled virtual routing, firewall and tunneling functions is hosted on a commodity server at a head-end facility. The data plane component, vFlowSwitch, is hosted on an inexpensive server at each site, inheriting layer 2/3 forwarding, routing, firewall and tunneling functions from its parent vFlowController. vNetCommander, the web-based lifecycle management application, is hosted for authenticated access through a browser. The management UI contains no CLI. All network workflows are administered through its intuitive web GUI.

Ironclad inter-site security and privacy is provided through a set of fully-meshed IPSec tunnels between sites as well as stateful firewall access control lists (ACLs). End-to-end QoS is enabled through policing, priority queuing and rate limiting. Interoperability with legacy router components through routing protocols (OSPF/BGP/static/default) allows an at-your-pace, site-to-site infrastructure migration schedule. A full range of edge routing and LAN features including network address translation (NAT), port forwarding and network access control (NAC) are available. All of these features and capabilities are tailored to enterprise campus and remote branch office requirements.

“Existing SDN solutions haven’t recognized that operationalization of virtual networks cannot be done the same way as in the physical world. The proliferation of virtual devices and endpoints facilitated by virtual networking absolutely demands management automation. The network simply can’t be managed without it. Netsocket’s solution has finally emerged as an architecture for a true virtual network infrastructure with the necessary automation applications to manage it.”

– Tom Nolle, president of CIMI Corporation
Making The Business Case

COMPARATIVE BENEFIT: 50-SITE, 3-YEAR TCO, LEGACY NETWORK VERSUS NVN

The comparative benefit of Netsocket Virtual Network versus a legacy hardware network in a 50-site enterprise deployment is illustrated in Figure 3 below.

![Diagram of NVN network with vFlowController, vFlowSwitches, vNetCommander, and SP MPLS Network]

**CAPEX > 3:1 advantage**
- Virtual network distributed on commodity x86 servers

**OPEX > 5:1 advantage**
- >10:1 install/provision
- >5:1 power/cooling
- >4:1 ops policy/mgmt

The immediate summary benefits of NVN over a legacy routed network for a 50-site network are substantial and compelling:

- **Capex 3:1** savings by hosting NVN on commodity X86 server platforms
- **Opex 5:1** savings over the lifecycle of the network through:
  - Automation of site activation, software installation and initial provisioning — 10:1 savings
  - Reduction of power and cooling requirements — 5:1 savings
  - Reduction of daily operational and administrative costs, including move/add/change and system management costs — 4:1 savings through simplified workflows of the intuitive web GUI of vNetCommander. No CLI expertise is required

Combining capex and opex savings over a 3-year lifecycle, the TCO is reduced by 4:1. These savings scale for larger and smaller numbers of sites in the enterprise.
MORE BENEFITS

- Server platform is a multi-purpose virtual resource, not a dedicated network appliance vs. a dedicated hardware appliance for each function
- Greater network service visibility
- Quicker innovation from software vs. hardware development cycles
- Quicker and closer-coupling to other virtualized networking functions, such as session border controllers and load-balancers
- Opportunity to simplify campus/branch distribution network requirements to simple L2 VLAN switching versus more costly L3 switching
- Opportunity to make your campus/branch a "micro-cloud" extension of your existing enterprise private/public cloud infrastructure
- The commodity X86 server can be used as a platform to host non-network local services (e.g. directory services, DNS, VoIP)

Benefits to Managed Service Providers of Enterprise Networks

Managed Service Providers (MSPs) and Cloud Service Providers (CSPs) serving the managed networking needs of enterprise customers can exploit the same NVN advantages through a more efficient managed network practice. These service providers can host the vFlowController component in their own data center, terminating internet service in the data center and thereby more closely coupling managed internet service with the MSP/CSP’s hosted cloud services. There’s a consequent opportunity for more immediate integration of service provider data center-based services (for example, secure hosted DNS services, SP-based SaaS service and private/public/hybrid cloud hosting services). In addition, there are parallel opportunities to increase service margins and average revenue per user/subscriber by replacing existing edge services with a much less costly underlying technology.
Summary

Most or all existing SDN/NV products are designed for virtual data center and metro on-demand content distribution networks. These capabilities do not fit networking requirements unique to the enterprise campus, remote branch and edge deployment use case. The Netsocket Virtual Network is designed with the enterprise campus, branch and edge in mind and delivers substantial immediate benefits including a 3:1 capex, 5:1 opex, and 4:1 TCO advantage over legacy edge routing solutions. Visualize your network virtualized, through NVN.

For a free evaluation of Netsocket Virtual Network, download the NVN BASIC Early Experience Version at [www.virtualnetwork.com](http://www.virtualnetwork.com).

About Netsocket

Netsocket is a technology leader in virtualized, software-defined networking. The company’s flagship Netsocket Virtual Network (NVN) solution fulfills the promise of SDN today with powerful, robust automation applications running on a completely virtualized network infrastructure. NVN delivers a new framework for network virtualization and advanced automation that transforms the network into a highly responsive business asset.

To discover how Netsocket can virtualize your world, visit [www.netsocket.com](http://www.netsocket.com).