Carrier Cloud & Evolution in Virtualization

Sławomir Słowiński

Business Development Manager, CEE
slawomir.slowinski@nuagenetworks.net
+48 609 997 002
Agenda

• Evolution of the Data Center environments

• Nuage Data Center solution

• Addressing WAN / VPN challenges – SD-VPN

• How to monitor and troubleshoot overlay networks

• Nuage News
The Cloud Shift

**Physical & Manual**
- Single Tenant
- Bare Metal Workloads
- No-Mobility
- Manual

**Distributed & Automated**
- Multi-Tenant
- Virtual Workloads
- Dynamic
- API

nuagenetworks
Explosion

- More endpoints
- Dynamic connections
- Applications....
A Policy Approach

- Define in business terms what networking resources are available to applications
- Declare security policies in the applications context (not TCP port #)
- Enforce these policies in the vSwitch independently of the network equipment being used
- Central policies:
  - Better governance
  - Human errors minimized
  - Quicker time to service

APPLICATION ATTRIBUTES

TECHNOLOGY ATTRIBUTES

TOPOLOGY ATTRIBUTES

nuagenetworks
Life is not fair ....

for networking guys!
Life for servers administrators

- Dynamically provisioned
- Scalable capacity
- Abstracted HW complexity
- Highly utilized servers
Life for storage administrator

- Dynamically provisioned
- Scalable capacity
- Abstracted HW complexity
- Highly utilized *storage*
Life for the network administrator

- Statically provisioned
- Box level scale
- PhD in vendor hardware
- Under utilized
Current Data Center Network

- Compute is virtualized
  - Available in minutes
- Network is partially virtualized
  - Configuration takes days/weeks

Service velocity is hindered by manual network process
Nuage Networks policy templates and role-based workflow

Application Request

Compute request completed in minutes

Auto-instantiation

Nuage Networks VSP

Policy Instantiation
- IP address 10.x.y.z
- VLAN configuration
- WAN configuration
- Security / FW settings
- QoS parameters
- ...

Policy / Security Zones
WAN interconnect
L2/L3 Service AD
Service chaining

Network change completed automatically

Service velocity is not hindered by manual network process
From SR7750 to Nuage VSP

Proven 7750 SROS technology

Mixing proven SROS & cloud technologies

Management Policy engine

Director

Virtualized Services Controller (VSC)

Server 1

Server 2

Server n

NUAGE VIRTUAL SERVICE NODE (SROS)

Proprietary Protocol

Openflow

7750 (SROS)
How does it work?

Tunnels between endpoints allow for independent topologies.
Nuage Networks Virtualized Services Platform

- **Nuage Networks Virtualized Services Platform (VSP)**

- **Virtualized Services Directory (VSD)**
  - Network Policy Engine – abstracts complexity
  - Service templates and analytics

- **Virtualized Services Controller (VSC)**
  - SDN Controller, programs the network
  - Rich routing feature set

- **Virtual Routing & Switching (VRS)**
  - Distributed switch / router – L2-4 rules
  - Integration of bare metal assets
Open environment

Any Compute Virtualization Environment

Any Data Center Network Infrastructure

Any Server or Hypervisor

EXISTING DATA CENTER NETWORK

openstack  vmware  cloudstack

ESXi  KVM  Hyper-V*  XEN  Bare Metal

ANY APPLICATION, ANY CLOUD, EVERY TIME
Putting it all together

Cloud Management Plane

Network Service Control Plane

IP Network Data Plane

App Domain

Data Plane

Virtualized Services Controller

Virtualized Services Directory

openstack

DC1 Zone 1

DC Router

Network SP1 Control Plane

Business VPN Service

Private Data Center

Service Provider Data Plane

VPN Internet Domain

VPN Services

IP/MPLS

Internet

Policies

Subnets

Zones

Hypervisor

Virtualized Controller

Putting it all together
Putting it all together
Multiplexing the Network

- Modern networking protocols done in vSwitch instead of specialized hardware
- Extended the life of the networking assets by 12-18 months
- Deploying more virtual networks atop the existing network infrastructure increased the utilization by 40%
- Decoupling the tie between hardware vendor and software features – priceless!
BBVA – wanting to moves things around

- BBVA uses Nuage in their own DataCenter
- BBVA developed an architecture that will allow them to securely move workloads to public cloud provider
- Nuage provide a common Networking profile regardless of the physical location and networking equipment used
- For governance purposes, Nuage offer a single/centralized tracking infrastructure
Introducing Virtualized Network Services (VNS)

A better way to connect branch offices
Decades-old Branch Architectures are no match for today’s reality

Evolved Datacenter Infrastructure
- Automated
- Instantaneous modifications
- Simplified policy-driven management
- Freedom of choice
- Open

Status Quo at the Remote Location
- Manual provisioning
- Costly moves, adds and changes
- Complex management
- Limited choice
- Proprietary, vertically integrated
Imagine if...

ONE COHESIVE ENVIRONMENT: FROM BRANCH TO WAN TO DATACENTER

- Automated
- Instantaneous policy-driven modifications
- Simplified fulfillment & management
- Freedom of choice
- Open
VNS – A New Type of Network Services

Network services “App Store”
Customer Portal

Order Branch Equipment
Select VNS Service

Data Center
VNS – A New Type of Network Services

Operator Network
Customer Portal

VSD
VSC

Network Services Gateway NSG-P & NSG-V

nuagenetworks
Virtualized Network Services
Policy-driven network services for & by enterprises

VSP: Multi-tenanted Policy & Control

Virtualized Services Directory (VSD)
Virtualized Services Controller (VSC)

Network Services
VPN, FW, ACLs, NAT...

NSG
Network Services Endpoint

x86 Compute
Various form factors


NSG (Physical)

NSG (Virtual)
Architectural representation

Virtualized Services Directory (VSD)

Virtualized Services Controller (VSC)

Branch

Secured channels

MP-BGP

IP

Hypervisor

Secured channels
Release 3.1 recap: NSG

- Network Services Gateway is the VNS service delivery point for IP networking
  - Logical entity with physical and virtual appliances
  - Flexible physical form factors to meet different on-premises requirements
  - VM edition to support cloud CPE environments
  - Centrally managed through VSP environment as a fully automated endpoint
- Intel X86 based
  - Leverage off-the-shelf hardware components
  - Intel QuickAssist and AES-NI for encryption and forwarding acceleration
- Linux OS with Nuage VRS/NSG software
  - Flexible embedded network and management services
  - Secured, hardened management (SYSLOG, NTP, OF-TLS)
- Supports high scale L2 and L3 VPN service deployment
Our Solutions Portfolio

- **COMPUTING**
  - VIRTUAL AND NON-VIRTUAL COMPUTE
    - Hosted compute available on short term or long term contract with support for both virtualized and dedicated platforms.

- **STORAGE**
  - REMOTE BACKUP
    - Long term cloud storage for your off site back up requirements.
  - VIRTUAL DISK
    - On demand high speed storage to meet your short term IT needs.

- **COLLABORATION**
  - E-MAIL
    - Advanced email services hosted in the cloud and available across the world on all your business devices.
  - GLOBAL TELEPHONY
    - Advanced telephony services including unified communications.

- **WEB PRESENCE**
  - WEB SERVICES
    - Web services to ensure your presence on the Internet is professional and highly functional.
  - WEB HOSTING
    - Hosting services for your Internet presence all backed by our 24/7 uptime guarantee.

- **NETWORKING SERVICES**
  - CLOUD NETWORKING
    - Advanced networking for the cloud era. Includes private networking for branch to branch, business grade Internet services and private cloud connections.

- **ONLINE SECURITY**
  - INTERNET PRESENCE
    - Advanced security for your Internet communications including web presence DDoS protection, intrusion detection and Email filtering.
Empower your Network
Inter Site Network connections for office to office communications

- **Small Enterprises**
  - Services for enterprises with between 2-29 branches.
  - Starting at $99
  - Per month including hardware
  - START NOW

- **Medium Enterprises**
  - Services for enterprises with between 30-99 branches.
  - Starting at $3000
  - Per month including hardware
  - START NOW

- **Custom Solution**
  - Services for enterprises with over 100 locations.
  - Starting at $10,000
  - Per month including hardware
  - START NOW

Powered by nuagenetworks®

Welcome Mr. John Smith
Last Login: 23.05.2015
LOGOUT
Overlay vpn services

- A new way of delivering VPNs
- CPE forward directly between each other using VXLAN as overlay
  - 10.1.0.0/24 NEXT_HOP 192.0.2.1 VNI 123456
  - 10.3.0.0/24 NEXT_HOP 192.0.2.3 VNI xyz
- Underlay network sees only VXLAN traffic between endpoints
  - Traffic management = IP
  - Transport = IP
- Dataplane can be further encapsulated if needed
Value Added Services

Service Chaining enables VAS functions in VPNs

Nuage Enabled Datacenter
Introducing Virtualized Services Assurance Platform (VSAP)

The product formerly known as SAM-NV

A better way to monitor it all
The Underlay as a Network of Networks
The Solution: Principles

**CORRELATE**
physical & virtual topology

**MONITOR**
physical topology

Branch Offices

DC 1

ZONE 1

DC 2

ZONE 2

HQ

MONITOR physical topology
Because a good SW always need a good HW
Nuage current Fabric portfolio

**7850 Virtual Services Gateway**
- 960Gbps capacity in 1 RU, 32 x 10GigE + 16 x 40GigE
- Ultra-low latency – cut-through switching and routing
- Dual 10-core CPU
  - Proven SR-OS networking OS
  - Integrated Linux Sandbox
- Role = Leaf Router

**7850 Virtual Services Aggregator**
- 1.2Tbps capacity in 1 RU, 30 x 40GigE
- Ultra-low latency – cut-through switching and routing
- Single 10-core CPU
- Role = Spine Router
Introducing Nuage VSA 8

- Fully modular SPINE fabric switch
- 12x40GigE MDA (per-port switchable to 4x10G)
  - Total of 96x40G or 384x10G (or any combination)
- Cut-through switching on all stages
  - Sub 2µS latency for 40G-to-40G ports
Nuage Update – Year over Year

- Solid wins with marquee accounts
- 75+ trials successfully completed
- 20+ wins & deployments
- 2x the size of the Nuage team
- Across hyper-scale enterprises, cloud providers & service providers
- Major wins across all regions, to name a few: BBVA, Numergy, EvoNet, SingTel, CTCC, SKCC, Bloomberg, Telus, UPMC.....
Nuage completes 10 out of 10

- Open Networking User Group (ONUG) published 10 SDN use cases for vendors to certify
- Nuage completed all of them
- Unique position by completing the uses cases across all category: Overlay, Underlay & monitoring
- More details: We can See Clearly Now

High level Requirement

1. Virtual network overlay forwarding based on Open vSwitch and open documented encapsulation techniques, such as VXLAN, GUE, NVGRE, MPLSoE, etc.
   ✓
2. Virtual network overlay endpoint termination on hypervisors, Linux containers and physical switches
   ✓
3. Virtual network control plane scale and acceptable convergence for deployments scaling up to 100,000 endpoints
   ✓
4. Open documented southbound controller-to-endpoint interface(s) for virtual network overlay endpoint provisioning and traffic policy configuration
   ✓
5. Open documented controller-to-controller interfaces, enabling multi-domain federation of separate virtual overlay networks
   ✓
6. Open documented northbound virtual network controller interface to cloud orchestration systems
   ✓
7. Layer-2 and layer-3 traffic mapping and distributed virtual network overlay packet forwarding
   ✓
8. Networking Virtual Edge (NVE) monitoring capabilities, using standard management protocols and APIs
   ✓
9. End-to-end network overlay monitoring to validate network reachability and performance characteristics
   ✓
10. Correlation of virtual network overlays with physical network underlay state and performance (Vendor’s choice)
    ✓
Full-Fledged Partner Program

Core Partners
- accenture
- red hat
- HP

Differentiating Partners
- ARISTA
- VMware
- Avi Networks
- Infoblox

Strategic Enterprise Partners
- Citrix
- Palo Alto Networks
- Oracle
- F5

Ecosystem Partners
- Intel
- DELL
- Canonical
- SUSE
- Versa Networks
- Mirantis
- Mellanox
- Emulex
- Cumulus Networks

Industry Groups
- OpenStack
- CloudStack
- ONF
- Open Networking Foundation
- IETF
- Open Daylight
Nuage Reference Architectures

- Integrating Partners products & publishing reference architectures
- Nuage extensible framework makes on-boarding new partners much easier
- Certification process now in place
HP Update

- HP Distributed Cloud Networking (DCN) launch in October 2014

- HP integration of DCN (Nuage) in OpenStack Helion and VTEP certification on some HP Networking switches

- Eat your own dog food! Nuage being deployed for HP IT supporting 40,000 VM across 4x datacenter in the USA and hosting ALU VM in HP’s public cloud solution
Nuage Cookbooks for Public Clouds

- How to easily & quickly deploy Nuage on public clouds:
  - Nuage running on IBM Softlayer
  - Nuage running on Amazon AWS
Introducing the Nuage Networks Virtuoso Certification Program

**Professional – Datacenter (NNP-DC)**
Learn the technology and best practices for implementing Nuage Networks Software Defined Networking (SDN) solutions for datacenters

**Professional – Virtual Network Services (NNP-VNS)**
Learn the technology and best practices for implementing scalable SDN solutions using Nuage Networks Virtualized Network Services (VNS)

**Installation Specialist (NNIS)**
Acquire the specialized knowledge and skills required for software installation, verification, and troubleshooting of the Nuage Networks Virtualized Services Platform (VSP)

**Expert (NNE)**
Develop expert-level knowledge for planning, installing, and operating networks based on the Nuage Networks VSP

**Virtuoso (NNV)**
Master the complete set of end-to-end knowledge, skills, and best practices for planning and implementing cloud-based solutions across datacenters and branch sites using innovative Nuage Networks SDN technology
# Recommended Courses and Required Exams for Certification

## Courses and written exams

<table>
<thead>
<tr>
<th>Courses and written exams</th>
<th>NNPDC</th>
<th>NNPVNS</th>
<th>NNIS</th>
<th>NNE</th>
<th>NNV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuage Networks VSP Fundamentals*</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks VNS Fundamentals*</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks VSP Software Installation**</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks VSP Operations</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks API and Openstack Integration</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks VSP - Advanced Networking</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks VNS - Advanced Topics</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

## Practical lab exams

<table>
<thead>
<tr>
<th>Practical lab exams</th>
<th>NNPDC</th>
<th>NNPVNS</th>
<th>NNIS</th>
<th>NNE</th>
<th>NNV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuage Networks VSP Software Installation - Lab Exam</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Nuage Networks Virtuoso Lab Exam</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

## Third-party certifications

<table>
<thead>
<tr>
<th>Third-party certifications</th>
<th>NNPDC</th>
<th>NNPVNS</th>
<th>NNIS</th>
<th>NNE</th>
<th>NNV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Cloud</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

---

* Only one of the VSP/VNS Fundamentals exams are required for NNE and NNV certification. You do not need to complete both.

** There is no written exam for the VSP Software Installation course. The course is recommended for the NNIS, NNE, and NNV certifications.

*** Refer to the list of third-party certifications available online at [www.nuagenetworks.net/products/training](http://www.nuagenetworks.net/products/training)

Certifications are valid for two years. You must complete a recertification exam to keep your certification active.
Nuage Networks VSP Fundamentals course - 5 days

- Module 1 — Datacenter Network Architecture
  - Virtualization in the datacenter
  - Virtualized network in the datacenter
  - Nuage Networks datacenter

- Module 2 — Product introduction
  - Virtualized Services Directory (VSD)
  - Virtualized Services Controller (VSC)
  - Virtual Routing & Switching (VRS)

Module 3 — Use Cases
- Security and Forwarding policy
- Service chaining
- Datacenter interconnection
- QoS and statistics policy
- Shared network

Module 4 — Cloud Orchestration
- Cloud orchestration overview
- CMS
- NFV

Register today at www.Nuagenetworks.net/certification
MyNuageNetworksLab

- Remote access to a hosted Nuage Networks SDN lab
- Hands-on training and testing from any location
- Available 24x7

Reserve your lab at:
www.nuagenetworks.net/certification

Available Q4 2015