We’re ready. Are you?
SP Virtual Managed Services (VMS) for IWAN

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Agenda

• Introduction
• IWAN Service
• VMS Technology Drivers
• VMS Definition
• VMS Demo
• Extending Virtualized Services To The Branch
• Conclusion
Introduction
Digital Innovation Overwhelming the Branch

- More Users: 80% of employees and customers are served in branch offices*
- More Devices: 73% growth in mobile devices from 2014 - 2018**
- More Apps: 20-50% increase in enterprise bandwidth per year through 2018**
- More Risk: 30% of advanced threats will target branch offices by 2016 (up from 5%) **

*Tech Target, Branch Office Growth Demands New Devices, 2013
**Gartner, Forecast Analysis: Worldwide Enterprise Network Services, Q2 2014 Update
Next generation network characteristics are more dynamic than in the past

<table>
<thead>
<tr>
<th>One Large Global WAN</th>
<th>Hybrid DC, Cloud WAN Connectivity On-demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Carrier</td>
<td>Multiple Carriers</td>
</tr>
<tr>
<td>Static Application Flow</td>
<td>New Traffic Patterns</td>
</tr>
</tbody>
</table>
What Are These New Traffic Patterns?

Traditional traffic

New traffic
MPLS is 5x the transport cost for traffic that ends up on the Internet anyway.
IWAN Service
Cisco Intelligent WAN
Solution Components

- Transport Independent
  - Provider Flexibility
  - Modular Design
  - Common Operational Model

- Intelligent Path Control
  - Load Balancing
  - Policy-Based Path Selection
  - Network Availability

- Application Optimization
  - Application Visibility
  - App Acceleration
  - Intelligent Caching

- Secure Connectivity
  - Scalable, Strong Encryption
  - App-Aware Threat Defense
  - Cloud Web Security

AX Router
The Challenge with IWAN: New **Complexity**

- Stateful firewall
- DNS logging
- URL Black listing
- AV in the cloud
- URL logging
- Netflow Collection
- IDS / IPS
- Anti-Malware
- Full Packet Capture
- Intellectual Property Protection
- Web Proxy logging for compliance

Today’s Enterprise WAN (e.g. Cisco)

e.g. Cisco: 16 IPoPs serving ~500 branch offices
Scaling Security Posture “How do I capture IWAN savings with this operational model?”

- Stateful firewall
- DNS logging
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“It would be great if an SP could help us with this challenge”
- John Manville, SVP Cisco IT
Intelligent WAN (IWAN)
A Hybrid WAN Solution - Built Exclusively for the Enterprise.

- Reduce Access Costs
- Achieve Network Diversity
- Intelligent path allocation
- Visibility, control and optimization
VMS Technology Drivers
VMS Market Drivers
Why Are Things Different This Time Around?

- The second half of the chessboard dynamics of processing power
  - Why Netconf and Yang are game-changers
  - Simplicity of user experience rules
What We’ve Learned From Exponential Growth

Second half of chessboard makes experience of first half irrelevant

iPad2 has more computing power than the Cray2 Supercomputer, at fraction of power consumption

AI is reaching human levels in some fields
Moore’s Law Applied To Network Equipment
Why Netconf and YANG are important

*From Complexity to Simplicity and Automation*
Why Netconf and YANG are important

*From Complexity to Simplicity and Automation*

FROM WEEKS TO MINUTES*

Architect It

Design It

Automated Self-Service On-Demand

Is It Ready?
Simplicity of user experience

- Anticipate user needs
- Click and drill
- Intelligently guide user
- User manual not required
Multiple Innovations Required For Big Leaps

Example: Internet

- IP Created
- HTML Invented
- Telco’s Deploy Broadband
- Internet

Virtual Managed Services:

- Simplified Overlay Networks
- Service Oriented Management
- Computing power
- Service Delivery Framework
VMS Definition
What is VMS?

Big Data Analytics Based Assurance

NSO
To get simplicity for the users, we need more intelligence in the system

• Separate intent from instantiation

• What is intent?

• What is instantiation?

• How do we tie instantiation to configuration?
Orchestration

From instantiation to deployment

YANG Model

Instantiation for Site 1

Instantiation for Site 2

Combine with template
Feed through NED
Deliver via NETCONF
VMS Network Services Orchestrator

- Service Model
- Service Model
- Service Model
- Service Manager
- Device Manager
- Network Element Drivers
- Transaction Database
- PnP Server
- Open PnP
- x86
- Virtual

Service Models written in Yang
Abstract Service from underlying physical devices

Service Manager Interprets Service Intent with Service Instantiation Rules and derives configuration

Supported by Netconf

Device Manager manages derived and validated configurations in a transaction manner towards infrastructure.

Network Element Drivers Abstract the interfaces to the devices allowing 3rd party infrastructure to participate in Service Instantiation

Open Method for ZTD Access

Zero Touch Deployment
True Zero Touch for devices with Internet Connections

1. New device is powered on and gets IP and internet connectivity from ISP
2. New device invokes web service API call to PnP Server and registers its UDI (serial number). Management channel established
3. User Activates Desired device (branch or hub router)
4. PnP server matches serial numbers and downloads the configuration

Assumptions:
- New device has internet connectivity (from the ISP)
- PnP server URL is hard coded
VMS Orchestration Component Mapping

- **CFS**
- **RFS**

- Service APIs
- NSO Orchestrator
- ESC Life Cycle Manager
- OpenStack Virtualization
- VNFs

Infrastructure
**VMS Elastic Service Controller**

- **Netconf**
  - Allows Modular Communication with NCS.
  - Data Model Driven.

- **Service Monitor**
  - Affinity Rules and Scale Requirements for the VNF components
  - ESC uses multidimensional approach to VNF Monitoring/Restartability

- **Elasticity**

- **Scale Up/Down**

- **Ganglia**

- **SNMP**

- **DHCP**

- **Custom**

- **VM Provisioning & Configuration Module**

- **Day 0 Config**

- **Custom**

- **VNS Bring-up & Initial Configuration Application. Multi-vendor Support.**

- **VM Provisioning & Configuration Module**

- **Service Provisioning**

- **Custom**

- **Service Monitor**

- **Custom**
Demo
Extending Virtualized Services to the Branch
Enterprise Network Functional Virtualization

James Sandgathe, Engineer Technical Marketing
The Current Enterprise Branch Landscape

Multiple Devices
Routers, Appliances, Servers

Difficult to Manage
Device integration and operation

Costly to Operate
Upgrades, refresh cycles, site visits

Horseman of the branch apocalypse
Why Virtualization of Branch Functions

- NFV can reduce the complexity of deploying and operating network services in the branch
- Network services run on x86 servers leveraging virtualization/technology proven in the data center / cloud
- Programmability to automate and simplify
Why Virtualization of Branch Functions
NFV Branch Software Stack

VNF Lifecycle Management Agent + Programmable APIs

- Cisco VNF
- Cisco VNF
- Cisco VNF
- 3rd Party VNF
- 3rd Party VNF

Local WebUI

Server Management

Licensing

PnP client

Hardware Accelerator

Platform Hardware drivers

Interface Drivers

Linux

Hypervisor

vSwitch

NFV Platform (Cisco/3rd Party)

WAN/LAN Network Interfaces

x86 + HW Accelerators

Storage
NFV Branch Software Stack

REST or NETCONF API
- Asset lifecycle
- Monitoring
- Service Configuration
Virtual Network Functions
- Cisco VNF (CSR, ASAv, vWAAS, etc)
- Server OS applications (Linux, Window)
- Non-Cisco 3rd Party application or network
NFV Branch Software Stack

Platform Services
- Individual device UI portal
- Health monitoring services
- Software license
- PnP for automated turn-up
- API for hardware acceleration such as inter VM switching

Cisco VNF
Cisco VNF
Cisco VNF
3rd Party VNF
3rd Party VNF

Local WebUI
Server Management
Licensing
PnP client
Hardware Accelerator

Platform Hardware drivers
Interface Drivers
Linux
Hypervisor
vSwitch

WAN/LAN Network Interfaces
\texttt{x86 + HW Accelerators}

NFV Platform (Cisco/3rd Party)
NFV Branch Software Stack

Operating System
- Hardware management
- Virtualization layer for service functions
- Virtual switching
NFV Branch Software Stack

Platforms
- Network interface and modules
- Hardware off-load
- Platform services resources
Branch Virtualization – On premise Options

1. **Fully virtualized Branch**
   - Standard x86 server hardware
   - All services (Route, Firewall, WAAS..) virtualized on integrated x86

2. **Physical Edge with integrated x86 L4-7 services**
   - Physical router performs transport functions (Routing, ACL, NAT, SNMP..)
   - Services (Firewall, WAAS..) virtualized on integrated x86 (ISR + UCS-E)

3. **Physical Edge + external virtualized L4-7 services**
   - Physical router for transport functions (Routing, ACL, NAT, SNMP..)
   - Services (Firewall, WAAS..) virtualized on separate x86
• Designed for a wide range of workloads

• Dense 1RU modular general compute platform
  • CPU: Single/Dual 4 to 18 cores each
  • Memory: 24 SLOTS with 32GB per slot
  • Storage: 4 or 8 drive bay

• External Interfaces:
  • Dual GE on-board
  • Two PCIe slots (Quad or Dual GE)

• Cisco integrated management controller (CIMC)
NFV Branch
Forwarding Path

Four Traffic Patterns

1. Go-Through: Service Chain:
   a. Route <-> WAN Opt
   b. Route <-> FW/IPS

2. Go-To: WLC, Windows, Monitoring

3. Divert-Between VNF

4. Copy-To: NAM
NFV Branch
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Service Chaining – Network Services Header Connectivity with NSH

- Policy sent to the Service Classifier
Service Chaining – Network Services Header

Connectivity with NSH

- Policy sent to the Service Classifier
- Inbound packets are classified/encapsulated
Service Chaining – Network Services Header Connectivity with NSH

- Policy sent to the Service Classifier
- Inbound packets are classified/encapsulated
- Packet forwarded to VNFs according to policy
NFV Branch
Modular Compute Platform

Revolutionary Platform Architecture

4000

WAN
LAN
Voice

4451 + UCS-E
4351+ UCS-E
4331+ UCS-E

Not all modules shown
# Enterprise NFV

## UCS-E Compute Blade

- Models 4331, 4351, and 4451

<table>
<thead>
<tr>
<th></th>
<th>UCS-E140S M2</th>
<th>UCS-E160D M2</th>
<th>UCS-E180D M2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processor</strong></td>
<td>Intel Xeon (Ivy Bridge) E3-1105C v2 (1.8 GHz)</td>
<td>Intel Xeon (Ivy Bridge) E5-2418L v2 (2 GHz)</td>
<td>Intel Xeon (Ivy Bridge) E5-2428L v2 (1.8 GHz)</td>
</tr>
<tr>
<td><strong>Core</strong></td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>8 - 16 GB DDR3 1333MHz</td>
<td>8 - 48 GB DDR3 1333MHz</td>
<td>8 - 96 GB DDR3 1333MHz</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>200 GB- 2 TB (2 HDD) SATA, SAS, SED, SSD</td>
<td>200 GB- 3 TB (3 HDD) SATA, SAS, SED, SSD</td>
<td>200 GB- 5.4 TB (3 HDD*) SATA, SAS, SED, SSD</td>
</tr>
<tr>
<td><strong>RAID</strong></td>
<td>RAID 0 &amp; RAID 1</td>
<td>RAID 0, RAID 1 &amp; RAID 5</td>
<td>RAID 0, RAID 1 &amp; RAID 5*</td>
</tr>
<tr>
<td><strong>Network Port</strong></td>
<td>Internal: 2 GE Ports External: 1 GE Port</td>
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New model for late summer CY16 doubles memory and 50% CPU
NFV – ISR-4K with UCS-E

Simple and high level flow through ISR-4K with UCS-E in NFV model.
NFV – ISR-4K with UCS-E

- ISR terminates VPN and MPLS
- CIMC fully manages the x86 UCS-E that runs orchestrated and automated OS
- Platform control right down to BIOS
NFV – ISR-4K with UCS-E
Conclusion
Conclusions

- Flows have changed
  - SaaS grows dramatically
  - Internet transport for Internet traffic significantly improves WAN economics

- WAN management requirements are changing
  - Simplicity is more important
  - Visibility into resource utilization more important
  - Deploying advanced features at scale is non-trivial

- Technology advances support new modes of operation
  - Simplified overlay networks
  - Exponential growth in computing power
  - Intelligent orchestration
    - Place services where you want
Call to action: other IWAN related sessions

- TECCRS-2004 – Implementing the Intelligent WAN
- BRKCRS-2000 – Intelligent WAN Architecture
- BRKRST-2043 – IWAN AVC/QoS Design
- BRKRST-2362 – IWAN Implementing Performance Routing (PfRv3)
- BRKRST-2514 – Cisco Intelligent WAN (IWAN) & Application Optimization
- BRKCRS-2007 – Migrating Your Existing WAN to Cisco’s IWAN
- BRKCRS-1244 – SP Virtual Managed Services (VMS) for Intelligent WAN (IWAN)
- BRKNMS-1040 – IWAN and AVC Management with Cisco Prime Infrastructure
- BRKSDN-2099 – IWAN Management via APIC-EM (SDN Controller)
- BRKARC-3004 – APIC-EM: Controller Workflow and Use Cases
Complete Your **Online Session Evaluation**

- Please complete your online session evaluations after each session. Complete 4 session evaluations & the Overall Conference Evaluation (available from Thursday) to receive your Cisco Live T-shirt.

- All surveys can be completed via the Cisco Live Mobile App or the Communication Stations
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FROM WEEKS TO MINUTES*

Architect It

Design It

Automated Self-Service On-Demand

Is It Ready?

FROM WEEKS TO MINUTES*
Thank you
We’re ready. Are you?