Automation in service delivery & policy implementation to enable SDN for carrier WAN’s

- Girish Saraph, Vegayan Systems
Strong growth drivers for SDN

• Strong growth drivers: *Related factors driving market dynamics*
  - Cloud computing
  - Data-hosting
  - Software as a service (SaaS)
  - Application-hosting

  → Remote delivery, virtualization & flexibility (pay-as-you-scale)

• Global SaaS market expected to reach $106B by 2016 w 30% growth
  ... Study by *Goldman Sachs (2015)*
  - Driving strong growth in *Datacenter* market
  - New business models: Infra as a Service (IaaS) or Platform as a Service (PaaS)

• Datacenters embracing SDN for flexibility & virtualization

  → Telecom carriers and ISP’s are exploring new revenue generation avenues through new platforms
SDN Market Opportunity

• SDN-enabled equipment market to exceed $35B by 2018
  - Report from SDN Central, Plexxi & Lightspeed Ventures (Apr, 2013)
  - Market led by data-center hardware; 46% HW to be SDN-enabled

• SDN products market expected to reach $2.45B by 2018
  - Report by Doyle Research & GigaOM (Feb, 2013)
  - Enterprise-WAN would be significant part of SDN market by 2018

• “Moving SDN out of the data-center and into the WAN is a big challenge for enterprises” - Light Reading (Apr, 2014)

→ Leveraging existing network infrastructure of carriers or ISP’s is key to delivering SDN-WAN services to enterprise customers
SDN Beginnings

• **SDN definition** *(GigaOM Pro report, 2012)*:
  - Packet forwarding or Data plane is separated from Control plane
  - Centralized intelligence and control of switching (network devices)
  - Central programmability to (i) change traffic flows
    (ii) switch network partitions (iii) control application-level quality
    (iv) provide network flexibility (iv) dynamically change priorities

• Data-center (DC) SDN: Initial driver of SDN market
  - On-demand application/data hosting (SaaS model) for Cloud services
  - On-demand, dynamic network connectivity between virtual servers, compute & storage resources

• Extension of SDN overlay to multiple DC sites for redundant access, geographic reach & mobility through data synchronization
SDN-WAN

- Enterprise customers require application performance delivery at remote delivery sites through private or hybrid WAN
  - SDN-DC is only one part, the other is WAN delivery
  - SDN-WAN allows on-demand, flexible service delivery

- WAN involves existing networks with diverse devices, technologies & services → Need effective SDN overlay for carrier NW’s

- “Achieving SDN in MAN/WAN is no trivial task. While DCs are simple, homogeneous and with essentially limitless bandwidth, carrier networks are complex, multi-vendor and subject to many technology and bandwidth constraints.”
  
**Evolution of OSS for SDN-WAN**

- “In a telecom network, the maturing and evolution of its OSS/BSS system would be a pre-requisite to an end-to-end SDN implementation.”
  
  *Light Reading article by Deepak Kumar “SDN: Can Telco’s do ....” (Dec, 2013)*

- “At the heart of Service Provider SDN is software & a major transformation of the OSS layer .... creating a good abstraction of the entire network in terms of resources available in order to start software-controlling the network.”
  
  *Ulf Ewaldsson, Ericsson CTO in Light Reading by Michelle Donegan (Oct, 2013)*

- “The promise of SDN for telecom industry includes automated traffic management, improved bandwidth engineering, and ability to tailor the network "on demand" to customer needs/applications.”
  
  *Doyle Research article in NetworkWorld (Dec, 2012)*
**SDN-WAN Solution Blocks**

Building policy intelligence & programmability above OSS layer

- SDN Control
- Openflow

**End-to-End Services - Control & Management**

**Policy Logic & Automation**

**Network Operations Control & Management**
E2E WAN circuits

SDN control overlay

Datacenter

Virtual Switch

End-to-end circuit from Datacenter to Site-2

Site-1

Virtual Switch

Site-2

Virtual Switch

Enterprise VPN
Automating service provisioning

- Multi-vendor configlets for provisioning different types of services; VLAN, L2/L3-VPN, VPLS, VPWS, etc.
- Pre-defined templates for each vendor & type of service
- Parametric view of configurable parameters
- Build logic for selecting parameters automatically
- Create configlets for provisioning new services w selected parameters
- Templates for configuring new routing/switching elements
- Provide variety of policy templates - security/access/QoS

→ Automated step-wise E-E circuit provisioning
Automating provisioning logic

Initiate auto-service provisioning from control layer or user-order

- Select service type, bandwidth & quality from controller/order info
- Select available interface, sub-interface or virtual interface
- Select WAN-IP address from available pool & register N/W info
- Select circuit-ID or interface description & aliases w policy logic
- Select vendor-specific provisioning template w given parameters
- Select network-specific parameters e.g. VRF, RD/RT, VLAN ...
- Ensure compliance to various policies e.g. security, access, QoS, ...
- Push / execute final provisioning configlet to routers/switches
- Verify execution success or log errors
Automated Service Provisioning

VPN provisioning template

Input parameters through DB/CSV/Excel or external API

Final configlet for VPN service provisioning
Patch/upgrade Management

- Patch for security vulnerability or OS upgrade
- New access/QoS policy implementation
- Transition to new network design policy (e.g. from SNMP-v2 to v3)
  - Configuration upgrade to 1000’s of devices as per policy or for patch
  - Devices listing selected based on vendor, model & OS number etc.
  - Policy compliance audit of entire N/W – List of noncompliant devices
  - Selective bulk push to dev-list – Auto-execute patch/upgrade in parallel
  - Intelligent summary of results – Success log & failure report

→ Simplifies task from multiple hours / days to few minutes
Push Command

Config View

Push Command Output

Command:
- show interface ethernet 3/2
- no switchport
- bandwidth 2000
- sh run int Ethernet 3/2

Command output:

Ethernet3/2 is up
Hardware is Ethernet 0050.5652.e9ba (bia 0050.5652.e9ba)
MIU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
reliability 0/5, load 0/255, reorder 0/255
Encapsulation ARPA
Port mode is trunk
Full-duplex, 1000 Mbps
Auto Negotiation is turned off
Bulk Push

Vendor specific list for bulk push

Summary Report
Rollback Config

Router output

Rollback config
Automation in provisioning & policy implementation to enable SDN

• Network set-up is abstracted by a vendor-neutral layer
• Network provisioning & policies are simplified in parametric form
• Decision-making & parameter value selection is automated by logic building block with preselected rules
• Logical rule selections capture N/W design criteria, human decision making steps & external information (through set interfaces)
• Allows fast execution with ability to scale to 1000’s of devices
• Allows network-wide changes in policy or patch roll-out

→ Automation provides dynamic & flexible WAN network control
   Hides complexity in config syntax & N/W design policy criteria
Thank You

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