Automating Cloud Networking with RedHat OpenStack

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The New IP
The Foundation for the Digital Business

Our industry runs on 20 year innovation cycles, and we are on the forefront of the next wave, now is the time to embrace the new IP in order to improve business agility.

Can your Old IP handle a New IP world?

1/3rd of the world’s population is connected to the internet

16M Internet Users
2700 Websites
<100M Mobile Devices

2B Internet Users
1B Websites
7B Mobile Devices
## A Brief History of Networking

<table>
<thead>
<tr>
<th>Platform</th>
<th>Scale</th>
<th>Architecture</th>
<th>Compute</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Platform</td>
<td>Thousands</td>
<td>Closed, highly proprietary</td>
<td>Mainframe Systems</td>
<td>Systems Network Architecture (SNA)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Platform</td>
<td>Millions</td>
<td>Proprietary, standards-influenced</td>
<td>Client/Server PCs</td>
<td>IP, LAN/WAN</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Platform</td>
<td>Billions/Trillions</td>
<td>Open, virtualized, SW-defined</td>
<td>Mobile Cloud-based</td>
<td>“The NEW IP” = Network for the 3&lt;sup&gt;rd&lt;/sup&gt; platform</td>
</tr>
</tbody>
</table>

**Sources:** IDC
A new generation of Apps
Due to the rise of Social, Mobile, Cloud, Big Data, and Consumerization of IT

The next generation of business

Facebook, Twitter, Employees, Customers, Commerce

BYOD, M2M Communications, mCommerce

Big Data, Customer Insight, IT/OT Convergence

SaaS, PaaS, BPaaS, IaaS...

Security, Regulation, Compliance

Your Business, Your Network and IT Department
Cloud Apps are changing Data Center Networking

• Cloud Native Apps comprised of many services (Microservices)
  – High rate of change
  – Ephemeral configurations

• Microservices need to networked
  – Scale out architecture
  – Network virtualization
Microservices

Netflix

Gilt Groupe (12 of 450)

Twitter

From: http://www.slideshare.net/adriancockcroft/goto-berlin
Characteristics of Cloud Applications

Traffic Patterns
- East-West traffic, server to server

Scale
- Millions to billions of endpoints

Agility
- Infrastructure, workloads, and endpoints powered-up and onboarded in hours

Open & Flexible
- Open platform, open design, open architecture to run different applications on same infra

Resilience
- Cattle not Pets
Learning from Hyper-Scale adopters

Traditional networks fall short…

- Rigid architecture, north-south optimized
- Inefficient link utilization
- Individually managed switches, complex
- Scale-up
- VM-ignorant
New architectures stepping up...

Traditional

3-Tier Hierarchical

L2 Fabrics - Driven by Virtualization

- Topology freedom, east-west optimized
- Fabric managed as one logical switch
- Scale-out
- VM-aware
Driven by Cloud

IP Fabrics

- Cloud has brought scale far greater than virtualization
- Automation has moved from CLI and scripts to programmatic interfaces, tool chains, policy and controllers
- Multi-tenancy has gone from VLANs and VRFs to micro segmentation and virtual networks
- Mind share has moved from vendors to user community.

L3 CLOS

Spine

Leaf
Clos Architecture 101

Invented by Charles Clos in 1953

How to build large telephony networks without building large telephony switches

A Clos Architecture is made up of network switch elements bearing the
designations “spine” and “leaf” that identify the place in the network or “PIN”
as well as the function of the device and requirements, i.e. features, performance.

http://en.wikipedia.org/wiki/Clos_network
The Zen of Cloud Networking

Agility

Programmable

Automated

Simplicity

Minimal Configuration

Maximum Config. Reuse
L2 Overlay – Offloading tunnels to TORS

VxLAN Tunnels

- Same IP Subnet across Leafs
- VxLAN Tunnels carry L2 traffic between Leaf
- Full Mesh of VxLAN tunnels between Leaf’s
- Controller-based or controller-less architecture
Benefits of the new Cloud Networking architecture

- VM migration domain
  - Legacy layer 2 to overlay virtual technologies
- Scalability
  - Decouple underlay and overlay network technology
- Resilience
  - On-demand overlay
- Automation
  - OpenStack, SDN Controller-based, Netconf, Python
Video Demo
Auto-provisioning of IP Fabric & L2 extension with OpenStack
Questions
Demo Setup

- Basic Spine-leaf topology
- Orchestration using OpenStack
  - IP Fabric underlay
  - VxLAN tunneling on TORS
Offloading VxLAN tunneling on TORS

- VxLAN Tunnels between TOR
- Hardware based VxLAN Encapsulation
- Openstack Integration
  - Setup/Dismantling of tunnels
  - VNI(VLAN) mapping
Demo
Conclusion

• Automation of Underlay Network
  – Discovery of Spine Leaf Topology
  – Provisioning of links & BGP

• Automation of Overlay Network
  – Setup and cleanup of tunnels based on VM Lifecycles across Racks
  – VM traffic transiting through Spine Leaf topology.

• L3 ECMP