SOFTWARE DEFINED NETWORKING

Bringing Networks to the Cloud

Brendan Hayes
DIRECTOR, SDN MARKETING
AGENDA

- Market trends and Juniper’s SDN strategy
- Network virtualization evolution
- Juniper’s SDN technology
- Use cases & case studies
INDUSTRY LANDSCAPE AND TRENDS

WHY SDN
DYNAMIC BUSINESS NEEDS

CIO AND CTO GOALS & CHALLENGES

EMPOWER

RESOLVE

ADOPT

TCO

storage

legacy

integrated

business processes

consolidation

BYOD

environmental

security

planning/analytics

managing

expectations

Agility

Time-to-Market

Cost
INVESTING IN CLOUD AND VIRTUALIZATION

Cloud and virtualization driven by app performance (80%) and IT cost optimization (75%)

- Applications and App Development in the Cloud, spend in 2013: $25B, 67% CAGR*
- Hybrid Cloud Growth in 2014: 52% from 31% in 2013*
- Spend on private cloud in 2012: $11B, 16.2% CAGR*

*Cite Sources: Gartner, IDC, Forrester CAGR*
TO IMPROVE BUSINESS AGILITY
Need to create and deliver revenue opportunity faster and control cost

Services and Applications are Moving to the Cloud, infrastructure is not elastic.

Virtualization has Automated Compute and Storage, network is lagging.

BARRIER FOR CLOUD ADOPTION?

**POST VIRTUALIZATION**
- Spinning up Server Resources
- Provisioning the Network and Security

**PRE VIRTUALIZATION**
- Latency in Communications

<table>
<thead>
<tr>
<th>Time</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seconds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LIMITATIONS OF CURRENT APPROACHES TO NETWORKING IN THE CLOUD

SCALABILITY
Traditional solutions limit scale of the cloud.

AGILITY
Physical limitations to how services are deployed and connected.

AUTOMATION
Manual service provisioning and upgrade with appliance centric model

ORCHESTRATION
Lack of networking capabilities in orchestration stacks
JUNIPER’S SDN STRATEGY: 6-4-1

6 – General Principles
- Separate
- Centralize
- Use the cloud
- Common Platform
- Standard
- Apply Broadly

4 – Juniper Steps
- Centralize Management
- Extract Services
- Centralize Controller
- Optimize the Hardware

1 – Licensing Model

<table>
<thead>
<tr>
<th>JUNIPER SOFTWARE ADVANTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Use/Elastic</td>
</tr>
<tr>
<td>Transferable</td>
</tr>
<tr>
<td>Software Lifetime Assurance</td>
</tr>
</tbody>
</table>
# 6 GENERAL SDN PRINCIPLES

## Principles of SDN

<table>
<thead>
<tr>
<th>Principle</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate networking software in 4 planes – Forwarding, Control, Services and Management</td>
<td>Optimize each network element</td>
</tr>
<tr>
<td>Centralize Management, Services and Control planes</td>
<td>Simplifies network design and lowers opex</td>
</tr>
<tr>
<td>Adopt Cloud for elastic scale and flexible deployment, enabling usage-based pricing</td>
<td>Reduce time to services and correlates cost based on value</td>
</tr>
<tr>
<td>Common Platform for network and security applications and management integration</td>
<td>Enables new business solutions</td>
</tr>
<tr>
<td>Standard protocols for interoperability across vendors</td>
<td>Provides choice and lowers cost through interoperability</td>
</tr>
<tr>
<td>Broadly Apply to Network &amp; Security, Enterprise &amp; Service Provider networks, Mobile &amp; Wireline</td>
<td>Flexibility and new business opportunities</td>
</tr>
</tbody>
</table>

*These are the guiding principles behind Juniper’s SDN vision & product roadmap.*
JUNIPER’S 4-STEP APPROACH TO TRANSITION TO SDN

- Centralize Management
- Extract Services
- Centralize Controller
- Optimize The Hardware
NEW LICENSING MODEL FOR SDN

NETWORK APPLIANCE LICENSING

Stateful Firewall
Deep Packet Inspection
Policy & Charging Enforcement
Carrier Grade Network Address Translation

LICENSING FOR SDN

Evolved Packet Core
Stateful Firewall
Deep Packet Inspection
Policy & Charging Enforcement Function
Carrier Grade Network Address Translation

LICENSING FOR APPLIANCES

Restricted/Embedded
Non Transferable
Appliance Centric Software

JUNIPER SOFTWARE ADVANTAGE

Full Use/Elastic
Transferable
Software Lifetime Assurance
THE NETWORK VIRTUALIZATION JOURNEY

TECHNOLOGY APPROACHES
Manual configuration of VLANs at every switch.

Administration and configuration is complex and slow.

Scale: 4096 Tenant IDs.

Packets are not punted to controller

Controller proactively programs virtual overlay switches & gateways only

Existing protocols establish IP fabric underlay

No per-tenant state in physical network: Switches only know physical servers

Low latency. High scalability. Robust. Evolutionary.
THE JUNIPER SOLUTION

THE CONTRAIL APPROACH
CONTRAIL

BRINGING NETWORKS INTO THE CLOUD ERA

Highly scalable SDN Solution that automates creation of virtual networks

1. Simple integration with physical and virtual
2. Open approach using proven standards
3. Agile delivery of network and services
**CONTRAIL COMPONENTS**

**Contrail Controller**
- Open, Standards-based Controller configures vRouters and maintains control plane state

**Contrail Analytics**
- Real-time analytics engine facilitates trouble-shooting and diagnostics

**Contrail vRouter**
- Virtualized routing element handles localized control plane and forwarding plane work on the compute node

**Gateway Element**
- MX Series (or other router) or EX9200 serve as gateway, eliminating need for SW gateway & improving scale

---

**Contrail Controller**
- Orchestrator
- SDN Controller
- BGP Federation
- REST
- SDN Controller
  - Configuration
  - Analytics
  - Control

**Virtualized Server**
- VMs

**Virtual Environment**
- SDN Controller
- BGP Federation
- XMPP
- BGP + Netconf

**Physical Environment**
- Gateway Element
- MX Series (or other router) or EX9200

**Gateway**
- Mult-vendor Edge Routers e.g. MX, EX9200

- MPLS over GRE/UDP or VXLAN
KEY FEATURES

Routing and Switching
Load Balancing
Security
Elastic, Resilient VPN
Gateway Services
Service Chaining
High Availability
API Services
THE CONTRAIL ADVANTAGE

Juniper’s Contrail SDN solution increases business agility by automating and orchestrating the creation of highly scalable virtual networks to interconnect virtual services and clouds.

Simple
• Easily integrates with physical networks
• “SDN as a Complier” abstracts network
• Service chaining makes it easier to deploy virtualized services (NFV)

Open
• Wide ranging support for hypervisors, orchestration systems and physical networks
• Complementary open source initiative: Open Contrail

Agile
• Rapid deployment of new services and applications
• Workload mobility between public, private & hybrid clouds
• Robust analytics facilitates rapid troubleshooting
ALSO AVAILABLE AS OPEN SOURCE SOFTWARE

Get the code at [www.opencontrail.org](http://www.opencontrail.org)

Production-ready; uses proven, stable open networking standards

Open Source fosters innovation and adoption of SDN

Available via Apache 2.0 license
SDN AND CLOUD PARTNERSHIPS

Cloud Orchestration Partnerships

- cloudstack
- openstack
- redhat
- CITRIX
- MIRANTIS
- cloudscaleing
- CANONICAL
- IBM SmartCloud
USE CASES

HOW CUSTOMERS ARE USING SDN TODAY

USE CASES
Contrail enables enterprises to adopt private or hybrid virtual cloud strategies, with application and workload mobility.

**BENEFITS**

- Contrail enables enterprises to adopt private or hybrid virtualized clouds to increase business agility.
- Integration with Cloudscaling enables workload mobility between private and public clouds.
SECURE VIRTUAL PRIVATE CLOUD SERVICES
SERVICE PROVIDERS OFFER CLOUD SERVICES

- Public and enterprise cloud federation
- Extend L3 VPN service to SPs cloud
- Secure, always-on access to cloud(s)

Benefits:
- Brings SLA-backed security and availability to cloud services
- Value added service generates new revenue for the service provider
- Builds on SP expertise delivering VPN services
DYNAMIC SERVICE CHAINING & INSERTION

Dynamically provision and chain physical or virtual network services, and connect virtual networks without any downtime.

**BENEFITS**

- Increased agility and velocity of network services supporting critical business processes
- Reduced capital and operational expense via network simplification
- Simplified tenant isolation for security and regulation compliance
CASE STUDY: ISPRIME BETA EVALUATION

An Early Adopter Profile

Initial Challenge:
Moving to cloud-based business model and requires high-performance virtual networking solution.

Potential Solution:
- Leverage Contrail to enable dynamic provisioning of virtual networks.

Expected Improvements:
- New services will be flexible & cost-effective alternative to today’s dedicated hardware-based hosting services
- Contrail is key-enabler of new cloud service, enabling resources to be pooled, moved and connected to the network very rapidly

What they Like About Contrail:
- Using the MX series and Contrail together provides a rich set of networking capabilities
- Ease of integration with existing OpenStack-based orchestration toolkit
- Contrail’s scale out architecture delivers high-performance company requires

Company Profile:
- Leading hosting provider who differentiates on performance and high availability.
CASE STUDY: SUNGARD BETA EVALUATION

An Early Adopter Profile

Initial Challenge:
- Expanding portfolio with new cloud services
- Traditional approach for multi-tenancy restricted in scale & agility

Potential Solution:
Leverage Contrail to automate and orchestrate virtual network for new cloud service

Company Profile
- Leading provider of disaster recovery services, managed IT services, information availability consulting services and business continuity management software.

Expected Improvements
- Automated provisioning of new customers for much faster deployment
- Multi-tenant network segregation in the cloud with much higher scale and agility
- Integration with existing IP/MPLS backbone network

What they Like About Contrail
- Contrail’s Layer 3-based approach that allows them to easily integrate with existing IP/MPLS network
- CloudStack integration allows Contrail to interoperate with their orchestration tool of choice
- Advanced layer 3 routing capabilities while network complexity is hidden from server admins
Shaping the SDN Conversation with a comprehensive strategy

**OPTIMIZE HARDWARE**
**STANDARD-BASED OPEN SYSTEM**

- **Platforms**
  - Open, northbound APIs
  - Programmable
  - SDN protocol support

- **Orchestration**
  - Contrail
  - VMware
  - OpenStack
  - CloudStack
  - Puppet

**Platforms**
- SWITCHING EX, QFX
- ROUTING MX
- MANAGEMENT JUNOS SPACE
- SECURITY SRX, vGW

**Orchestration and Automation**
**Network API support**

**Differentiated Architectures**
**Operational Simplicity**
SUMMARY

- SDN promises to evolve networking for the cloud age
- Juniper has a clear & comprehensive SDN vision inclusive of both hardware and software
- Contrail is a simple, open and agile SDN solution
- SDN is real and customers are using it today
Are you ready to adapt to this new model?

SDN IS transforming Networking & Business Forever

- Agility
- Flexibility
- Intelligence
- Cost Savings
- Innovation
- Centralize
- Programmability
- Automation
- Dynamic
- Customization
- Deploy Faster
- Cloud Orchestration
- Agility
- Intelligence
- Flexibility