BRINGING NETWORKS TO THE CLOUD ERA

SDN enables new business models

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SOFTWARE DEFINED NETWORKING (SDN), JUNIPER NETWORKS
CIO DILEMMA

IT viewed as cost center

Transform IT into profit center & innovate

Line of business owner needs agility

Powered by Cloud
CLOUD DRIVES AGILITY

PRIVATE CLOUD

72%

Only 11% no plans to deploy private cloud**

APPS IN THE CLOUD

$54.5B

19% CAGR*

PUBLIC CLOUD

$131B

17% CAGR*

NEW ENTERPRISE APPS - NEW ARCHITECTURE

Technology architectures must better support increasingly dynamic operational and business processes

<table>
<thead>
<tr>
<th>APPLIED</th>
<th>SILOS</th>
<th>SCALE UP</th>
<th>SCALE OUT</th>
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<tbody>
<tr>
<td>APPLICATIONS</td>
<td>Tightly coupled Client/server</td>
<td>App performance</td>
<td>Big data, real-time analytics Self-service</td>
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<tr>
<td>COMPUTE</td>
<td>Specialized hardware</td>
<td>Virtualization, automation</td>
<td>Large &amp; dynamic workloads, VM mobility</td>
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<tr>
<td>STORAGE</td>
<td>Storage tied to physical infrastructure</td>
<td>SAN/NAS Converged Network</td>
<td>Distributed storage</td>
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<tr>
<td>NETWORK</td>
<td>Closed, Proprietary</td>
<td>Physical network Integration with cloud, mgmt tools</td>
<td>Dynamic network, Automation, x-domain virtualization</td>
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Last 10 years | Last 3 years | Now and future
Share of virtualized servers and storage is growing rapidly... but, networks are still designed to connect Physical Hosts and Physical Networking Services.

- **2011**
  - Virtual Compute: 46%
  - Physical Compute: 54%

- **2016**
  - Virtual Compute: 71%
  - Physical Compute: 29%
## Limitations of Current Approaches to Networking in the Cloud

<table>
<thead>
<tr>
<th>Category</th>
<th>Limitation</th>
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<tbody>
<tr>
<td><strong>Scalability</strong></td>
<td>Tying per-tenant information to physical network restricts scale</td>
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<tr>
<td><strong>Programmability</strong></td>
<td>No programmatic API at the network level for integrated orchestration</td>
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<tr>
<td><strong>Service Insertion</strong></td>
<td>Appliance-based network functions limits service velocity</td>
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<tr>
<td><strong>Inter-Cloud Orchestration</strong></td>
<td>Inability to orchestrate multi-cloud/hybrid cloud environments</td>
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THE QUESTION

How to get the best of both worlds?

ELASTIC. ON-DEMAND. AGILE.

SPEED. ALWAYS ON.
HIGH PERFORMANCE.

How to increase the agility of the network, without breaking what is good?
EVOLUTION OF NETWORK VIRTUALIZATION

- **Virtual Network Overlays**
  - **VLAN configured on physical switches**
  - Requires programming of flows
  - No impact to physical network

- **Reactive End-to-End**
  - VLAN configured on physical switches
  - Requires programming of flows

- **OpenFlow Reactive Approach**
  - Requires programming of flows

- **Proactive Software Overlay**
  - No impact to physical network
Manual configuration of VLANs at every switch

 Tenant state embedded in the physical network

 Performance Management, Scale - 4096 Tenant IDs

 Service insertion is complex

 NETWORK VIRTUALIZATION JOURNEY

 VLAN

 MANUAL. INEFFICIENT. LOW SCALABILITY.
OpenFlow requires programming of flows

First packet of every flow is punt to controller

OpenFlow needs to be supported in the physical network

HIGH LATENCY. LOW SCALABILITY. NEW FAILURE MODE. FORK-LIFT UPGRADE.
Packets are not punted to controller.

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

Controller proactively programs virtual overlay switches & gateways only.

Existing protocols establish IP fabric underlay.

LOW LATENCY. HIGH SCALABILITY. ROBUST. EVOLUTIONARY.
CONTRAIL

- SDN controller - Network software overlay
CONTRAIL – SDN CONTROLLER
Proactive virtual software overlay network which enables cloud

1. Dynamic Service Chaining
2. Inter-cloud orchestration
3. Interoperability
4. Programmability
5. Real-time analytics
CONTRAIL COMPONENTS

Accepts and converts orchestrator requests for VM creation, translates requests, and assigns network

Interacts with network elements for VM network provisioning and ensures uptime

vRouter: Virtualized routing element handles localized control plane and forwarding plane work on the compute node

Physical Network (no changes)

Physical Host with Hypervisor

vRouter

vRouter

Physical Host with Hypervisor

Gateway: MX Series (or other router) or EX9200 serve as gateway eliminating need for SW gateway & improving scale & performance

WAN, Internet

REST API

BGP Clustering

Real-time analytics engine collects, stores and analyzes network elements

vRouter:

Virtualized routing element handles localized control plane and forwarding plane work on the compute node

TODAY 2014

REST API

BGP + Netconf

XMPP

XMPP

vRouter

vRouter

VM

VM

VM

VM

VM

VM

VM

MPLS over GRE/UDP or VXLAN
CONTRAIL - FEATURES

ANY Open Cloud Platform

CONTRAIL CONTROLLER – VIRTUAL NETWORK OVERLAY

VIRTUAL NETWORK
- Routing
- Switching
- IPAM, Virtual DNS
- Load Balancing
- Security
- Elastic, Resilient VPN

VIRTUAL NETWORK
- Gateway
- Services
- Rich Analytics
- Service Chaining
- High Availability
- REST API

ANY Hypervisor

ANY Physical Network
NETWORK RESPONDS TO APPLICATION

- Analytics
- Infrastructure Events, Logs, Statistics
- Networking Services Orchestration
- Compute & Storage Provisioning
- Automated & Orchestrated Network
- Virtual Network Provisioning
- Resource Orchestration
- Policy & Security Framework

Continuous Network, Infrastructure Feedback
Get the code at www.opencontrail.org

Production-ready; open networking standards based controller

Open Source SDN Controller

Available via Apache 2.0 license

www.opencontrail.org
CLOUD ORCHESTRATION PARTNERS

- Citrix
  - Cloudstack, CCP

- IBM
  - SmartCloud Orchestrator

- Red Hat
  - Redhat Openstack (RHOS)

- Cloudscaling
  - OCS Openstack

- Mirantis
  - Mirantis Openstack, Fuel

- UnitedStack
  - UnitedStack Openstack

2014

VMware

Microsoft System Center Orchestrator
SUMMARY: WHY JUNIPER SDN SOLUTIONS?

**SIMPLE**
- Virtual Overlay Contrail seamlessly integrates with **ANY physical networks**
- Physical network supports **any Controller, open server management tools**
- Service chaining for **simple provisioning** and management

**OPEN**
- Open architecture **easily integrates with** **ANY open cloud platforms**
- Build on **standards protocols** and supporting **ANY Hypervisors**
- Ultimate transparency and openness with **OpenContrail.org**

**AGILE**
- **Automated** provisioning and creation of virtual and physical networks
- Enables **workload mobility** between private, public and hybrid clouds
- Unique **analytics** capabilities for planning and modeling
WHAT DOES IT MEAN TO YOU AS A PARTNER?
SDN IS RAPIDLY BECOMING CRITICAL TO SUCCESS

The number of partners offering SDN integration services will more than double in 3 years.

80% of Juniper partners believe SDN will be important or critical to customers in 3 years.

Source: Canalysis Research, October 2013. Survey of Juniper partners.
### 3 Types of Cloud Partner

<table>
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<tr>
<th><strong>Cloud Infrastructure Partner (CIP)</strong></th>
<th><strong>Cloud System Integrator (CSI)</strong></th>
<th><strong>Cloud Service Partner (CSP)</strong></th>
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<td>Sells Cloud solutions based on Juniper SW and Hardware products</td>
<td>Implements and delivers Cloud systems including Professional Services to CSPs or private cloud providers</td>
<td>Sell and provisions cloud based or managed services based on Juniper SW and hardware products</td>
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### 2 Selling Motions

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<th><strong>Cloud</strong></th>
<th><strong>Cloud MSP</strong></th>
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<td>Service based, leverages centrally based shared infrastructure</td>
<td>Service based CPE services leveraging dedicated customer infrastructure</td>
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RESOURCES

If you are interested in partnering with us on offering SDN services, Please reach out to:

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Follow on twitter: aruna13
SDN at Juniper IS transforming Networking & Business Forever

Bringing networks into the cloud era

CONTRAIL CUSTOMERS AND PARTNERS