Distributed Data Centers
Within Juniper Networks’ Mobile Cloud Architecture

Mobile World Congress 2017
Agenda

Challenges and Trends
Use Cases and Solutions
Products and Services
Proof Points
Juniper’s Mobile Cloud Architecture
Challenge: Monetize Assets with Distributed Data Centers

- Leverage last mile presence in 1,000s of locations to provide better QoE
- Leverage commercial relationship with millions of subscribers & businesses
- Converge cloud for mobile and wireline

New revenue stream:
Delivery capabilities for new, immersive content

Expense Savings:
Improved operational efficiency

Leverage last mile presence in 1,000s of locations to provide better QoE

Leverage commercial relationship with millions of subscribers & businesses

Converge cloud for mobile and wireline

Cloudify cell Sites, CO, POPs to run low latency/high performance VNFs and IOT/M2M workloads

Mobile & Fixed Line Consumers

IOT / M2M
New Apps

Telco VNF Apps
Network Services

OTT Providers
Existing Apps

OTT’s existing relationships with consumers
Trends Driving Distributed Data Centers

**Big Data**

**ATTRIBUTES**
- IOT and 5G
- East-West traffic
- Intra-data center

**REQUIREMENTS**
- Flatter topology
- Availability and performance
- Low latency/High bandwidth

**Virtualization**

**ATTRIBUTES**
- Virtualized coexisting with bare metal
- VMs and Containers

**REQUIREMENTS**
- P2V integration
- Underlay visibility
- Lower operating cost

**Cloud**

**ATTRIBUTES**
- Scale-out
- On-demand
- Automated

**REQUIREMENTS**
- Agility
- Multi-tenancy – Network Slicing
Q: When a bear fights a shark, who wins? A: It depends on whether the fight was on the beach or in the water. We should pick the location where we choose to invest our energy fighting.
Network Services Platform

uCPE is a fully distributed Data Center

**NFX250**

- Multi-core Intel processor
- 10GbE and 1GbE interfaces
- Zero Touch Deployment
- Linux with KVM
- Intel DPDK, SR-IOV for performance
- Service chaining VNFs
- Junos switching and security

**Benefits**

- Distributed Cloud CPE
- Juniper and 3rd party VNFs
- Service Chaining
- Centralized Management with Contrail Service Orchestration
Multi-tier MC-LAG with QFX10000
QFX10000 + QFX51000 @3:1 oversubscribed

Benefits

- Multi-vendor data center
- Large L2 domain
- High availability
- Scale to 13,824 10GbE servers @3:1 oversubscribed
Layer 2/3 Ethernet Fabric

Junos Fusion

**VCF Benefits**
- Single point of management
- Mixed 1GbE/10GbE/40GbE
- Scale up to 28 leaf nodes
- Overlay Support

**QFabric Benefits**
- Single point of management
- 10GbE and 40GbE optimized
- Scale up to 128 member switches
- Performance at scale
- Broad customer base

**Junos Fusion Benefits**
- Plug-and-play provisioning
- Multi-version support
- Open Standards & programmability
  - IEEE 802.1BR and JSON-RPC APIs
  - 1GbE/10GbE/40GbE/100GbE
- Scale up to 128 leaf switches
IP Fabric
QFX10000 + QFX5100

Benefits

- Scale up to 110,592 10GbE servers @3:1 oversubscribed
- Very large scale-out due to ECMP
- Extends across pods or across data centers
Contrail SDN Platform
Overlay Networking

Benefits

- Highly scalable SDN solution
- Open architecture - interoperates with a wide range of hypervisors, orchestration systems, and physical networks
- Simple policy control for service insertion and chaining
- Centralized Cloud CPE solution
Connect Physical and Virtual worlds
Universal SDN Gateway

- Spine
- Leaf
- Hypervisor
- Server

WAN Internet

Layer 2: Provide SDN-to-non-SDN translation, same IP subnet
Layer 3: Provide SDN-to-non-SDN translation, different IP subnet
USG: Provide SDN-to-SDN translation, same or different IP subnet
Provide SDN-to-WAN translation, same or different IP subnet

- Containers
- VM
- MX
- MX
- Bare Metal
- Linux

- Microsoft
- SAP
- Citrix
- Amazon
- Terremark
- Rackspace

Hypervisor

Server

VM VM VM VM VM VM VM
Containers
VM VM VM VM VM VM

Windows Server
vmware
Xen Server
docker
KVM

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Enterprise Connect Solution Architecture
Mobile and Fixed combined
## Juniper Enables the Service Aware RAN

**MEC: Multi-Access Edge Computing Partnership with Saguna**

### Value proposition

<table>
<thead>
<tr>
<th>Improved user experience</th>
<th>Better use of network resources</th>
<th>New network monetization opportunities</th>
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### Characteristics

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### Use Cases

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### Use Cases Details

- **Improved user experience**
  - Cloud computing and IT service environment at the edge
  - Local content cache
  - Compute offload for AR, Cognitive assistance

- **Better use of network resources**
  - Reduced latency
  - High bandwidth
  - IOT Analytics and Security
  - Device location tracking

- **New network monetization opportunities**
  - Real-time radio network information
  - Location awareness
  - Mobile Throughput Guidance for video delivery optimization
  - RAN optimization for video

### Diagram Elements

- **Local Breakout**
- **Orchestration**
- **MEC Server**
- **Sec-GW**
- **MEC Hosting Infrastructure**
- **FW/NAT**
- **Apps**
- **Cloud Services**
- **Internet**

### Awards

- **MEC Industry Award**
  - Biggest Contribution to R&D
  - Mobile Edge Computing Congress
Cloud CPE Architecture
Flexible Services in Software

Virtualization cost: More network/service touch points to coordinate end-to-end
Secured SD-WAN Infrastructure
Policy Awareness of traffic

- Application Aware (L7) Security
- Application Aware (L7) Routing
- Centralized Policy Control
- Secure and Managed VPN

Managed
OTT
Unmanaged

IT and Telco Cloud Consistency

Centralized Management
Automated Service Delivery

Juniper Sky ATP & Spotlight Secure Service

SRX Series
Centralized Cloud CPE

NFX Series
Distributed Cloud CPE

Local Branch
Regional Branch

Campus

VNFs

VPN & POS
Office 365
YouTube

Service Orchestrator/Controller
OPENCONTRAIL
openstack

vSRX
Ruckus
silver peak

Application Aware (L7) Security
Application Aware (L7) Routing
Centralized Policy Control
Secure and Managed VPN
Products: Cloud / DC Switching Portfolio
Distributed Data Centers

Spine-Leaf Platform Scale

DCI and DC EDGE
- EX9200
- MX Series
- QFX10000

SPINE
- QFX10000

LEAF
- EX Series
- OCX1100
- QFX5100
- QFX5200
- QFX5110

Multi-Gigabit Ethernet Flexibility | OCP Networking | 10/40 GbE | 10/25/40/50/100 GbE | 10G/40G/100G Deep Buffer
Services
Distributed Data Centers

Customer Lifecycle

Plan
- Assessment
- Design

Build
- Deployment
- Migration

Operate
- Maintenance
- Optimization

Juniper Service Offerings

Juniper Professional Services
- Automated Data Center Deployment Service
- Data Center Security Assessment
- Custom Engagements
- Customer On-Boarding

Juniper Care
Juniper Care Plus
Juniper Optimum Care

Juniper Education and Training
"We needed a vendor that could give us a well-tested, feature-rich BGP, firewall, and MPLS feature set on the switch. We needed a switch that was truly carrier-grade and Internet-scale. Anyone can make a wired switch for the closet that can speak Layer 2, but to do a switch that can do Layer 3 up to the host is a whole different ballgame. Other vendors’ pitches and feature sets started to fall apart when we looked at MPLS and Layer 3."

Adam Rothschild, SVP at Packet (customer)
1 of 5 Solutions within Juniper’s Mobile Cloud Architecture

**Distributed Data Centers**

- Automated Control & Orchestration
- Security Everywhere
- Disaggregation & Virtualization
- Integrated Packet, Optical & Timing Solutions

**Use Cases**
- Mobile Cloud Architecture
- Partners
- Services

**Products**
- NFX Series: Network Services Platform, Integrated x86 Processor for hosting VNFs
- QFX Series: Data Center Switches, Special purpose compute
- EX Series: Ethernet Switches
- MX Series: 3D Universal Edge Routers, Network timing enabled, Service Control Gateway
- Contrail Cloud + Networking: SDN Overlay Controller

**Services**
- Automated Data Center Deployment Service, Data Center Security Assessment

**Enterprise Site**

**Het-Net Sites** (Macro & Small Cells)

**Access & Aggregation Network**

**Core Network**

**Internet/Roaming**

**Application**
- Application Layer
- Compute
- Centralized Data Center

**Application Enablement Layer**

**Contrail Cloud + Networking**
- Networking
- SDN Overlay Controller

**Contrail Service Orchestration**
- Service Orchestration

**Network Services Platform**
- Integrated x86 Processor for hosting VNFs

**Data Center Switches**
- Special purpose compute

**Internet/ Roaming**

**Distributed Data Centers**

**MEC, SGW, PGW, FW, NAT, VPN**

**FW, NAT, VPN, IT Services**
Juniper’s Mobile Cloud Architecture

E2E Offering for your Next-gen Secure Distributed Telco Cloud from the Industry’s Most Trusted Vendor

**Use Cases**

- **Mobile Cloud Architecture**
  - Security Everywhere: Industry’s most innovative and comprehensive platform to secure the distributed telco cloud.
  - Disaggregation & Virtualization: Pioneer in utilizing an open framework to ensure a seamless migration to carrier-grade NFV.
  - Distributed Data Centers: Complete, automated and secure solutions for mini DCs at the edge and large DCs in the core.
  - Integrated Packet, Optical & Timing Solutions: Integrated solutions from a global leader and innovator in packet networking and optical DCI.

**Partners**

**Services**

- **Key mobile use cases supported**
- **Best-of-breed partner ecosystem**
- **Best-in-class life-cycle service & support**
Thank you