Disaggregation & Virtualization
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
Challenges and Trends
Disaggregation & Virtualization

Business Challenges
- Transform the network to adapt to changing customers’ needs
- Deliver new services with agility and differentiation
- Enforce a high degree of security, performance and scale

Technology Trends

Standards & Open

- Network Functions Virtualization
- Software Defined Networking
- Open Innovation
Strategy - Vision for an Open Architecture
Disaggregation & Virtualization

The Last 20 Years

Closed & Proprietary
( Closed/Limited APIs, Closed Data Models and Protocols)

- OSS/BSS
- Services & Configuration Plane
- Management / Operational Plane
- Control Plane
- Data Plane
- Router / Switch
- Software/Services Lock-in
- Vendor OS Lock-in
- Hardware Lock-in
- Protocol Interoperable

Moving Forward: Juniper’s Vision

100% Swappable & Open
( Open APIs, Open Data Models and Protocols)

- OSS/BSS
- Services & Configuration Plane
- Management / Operational Plane
- Control Plane
- Data Plane
- Router / Switch
- Software/Services Swappable
- Vendor OS Swappable
- Protocol Interoperable
- Hardware Swappable

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• Mix and Match of HW and SW i.e. 3rd party SW to run on Juniper HW and vice-versa
• Leverage open-source applications
Strategy - Robust Partner Ecosystem of Integrated VNFs
Disaggregation & Virtualization

**AUTOMATION & VIRTUALIZATION**
- Ansible
- Canonical
- Chef
- Docker
- Ubuntu
- VMware
- Puppet

**CLOUD & NFV ORCHESTRATION**
- Amdocs
- Nutanix
- Dell EMC
- ThousandEyes
- Mirantis
- Cloudscaling
- IBM
- NEC/Netcracker
- Citrix
- Red Hat

**VNFs**
- Affirmed
- Riverbed
- Ruckus
- Lumeta
- RAD
- Gigamon
- Saguna
- SilverPeak
- Akamai
- SevOne
- ADVA
- Cedexis

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Virtualization and Cloud Networking with Contrail Cloud & Networking, SDN Gateway

- **Open-source** Cloud Network Automation initiative (Apache)
- Built using **standards-based** protocols for interoperability
- API driven → to enable **Automation**
- Scalable, performant, resilient, and **carrier-grade** network platform for Cloud infrastructure

### Contrail Cloud

#### Cloud Orchestration
- Server Management
- Distributed & Scale-out Storage
- Compute Orchestration (OpenStack)
- Server (Ubuntu)

+ Contrail Networking

### Contrail Networking

- Network Virtualization
- Virtualized Network Services
- Multiple Orchestration Support
  - OpenStack, VMware vCenter, Kubernetes, ...

### Contrail Cloud Reference Architecture

- Integrated Cloud PODs
  - Reference Architecture – PODs
  - Integrated Management
  + Contrail Cloud
Software-Defined Operations with **APP Formix** provides Hybrid Cloud Operators an automated, intent-driven solution to run and optimize their cloud infrastructure in real-time.

**Real-time Orchestration**
- Dynamic intelligence via Machine-learning
- Self-healing
- Self-pacing
- Self-scaling

**Real-time Visibility**
- Apps, Infrastructure (P+V) and Services
- Actionable alarms and events

**Real-time Analysis**
- Health, Risk and Performance Assessment

**Automatic Risk Mitigation and Performance Enhancement**

**References:**
- Rackspace
- ViaSat
- OpenStack
- Kubernetes
- AWS
- OpenContrail

**Monitoring of throughput, latency and jitter, ContainerFlow with integrated Intel RDT**
- 51% improved average response time
- 120% lower peak-latency
- 70% reduction in Jitter for VNFs
Use Case 1: Secure Mobile Virtualization
Virtualized & Orchestrated Security

SDSN, Software-Defined Secure Network
5G and IoT Ready

ORCHESTRATOR

CONTRAIL CONTROLLER
(Config, Control, Analytics, Svr Mgmt)

Physical IP Fabric (no changes)

5G Gateway

Data Center Micro-segmentation

vGiLAN Service Chaining

LTE Security Gateway
Gi/SGi Firewall and Service Delivery Gateway
Gp/S8 Firewall

Centralized Policy Definition

Distributed Policy Enforcement

Network / Storage orchestration

Compute orchestration

OVsDB

BGP

XMPP

TOR

(Windows, Linux ...) on BMS

SDN Gateway MX

Internet / WAN or Legacy Env.

vGiLAN

FW vSRX

vSRX

FW cSRX

vGiLAN

Virtual Network Blue

Virtual Network Red

Virtual Network

Blue

Red

ADVANCED THREAT PREVENTION

Centralized Policy Definition

Distributed Policy Enforcement
Use Case 1: Secure Mobile Virtualization
vSRX: Industry’s Fastest Virtual Firewall

vSRX VM

- Junos Control Plane
- Junos Kernel
- QEMU/KVM
- Linux
- Hypervisors
- x86 CPU, Memory, & Storage
- Advanced Services + Flow Processing + Packet FWD
- SRIOV
- Intel 82599 NIC RSS Hashing

Highest Performance and Lowest TCO:
- vSRX-S: **19Gbps** large packet FW and **4.8Gbps** IMIX
- vSRX-M: **24Gbps** large packet FW and **5.4Gbps** IMIX
- vSRX-XL: **100Gbps** large packet FW and **25Gbps** IMIX
Use Case 1: Secure Mobile Virtualization
cSRX: Industry’s First Containerized Firewall

- Industry’s **FIRST** containerized Firewall
- Key features – Firewall, VPN, NAT, IPS, AppSecure, Content Security
- Docker based
- Uniform management tools
- Contrail and Openstack integration

**cSRX**

- **Use Case 1: Secure Mobile Virtualization**
- **Industry’s First Containerized Firewall**
- **Key features** – Firewall, VPN, NAT, IPS, AppSecure, Content Security
- **Docker based**
- **Uniform management tools**
- **Contrail and Openstack integration**

**Designed for:**
- **Elasticity with micro-services**
- **Massive scale**
- **Greater agility**

**L2-L7 Security services**
- **Small footprint** (100MB memory, <150MB image)
- **Boot-up time:** less than 1s

**vSRX Virtual Machine**

- Junos Control Plane
- Junos Kernel
- QEMU/KVM
- Advanced Services + Flow Processing + Packet FWD
- SRIOV
- Linux
- Hypervisors
- x86 CPU, Memory, & Storage

**cSRX Docker Container**

- Single Sourced Code base
- 2.8 GB
- 100 MB

- CLI/Netconf/RESTCONF
- Mgmt
- System daemons
- NSD
- IPS
- AppId
- Flow
- Packet IO
- DST
- IN
- OUT
Use Case 2: Virtual Routing

**vMX: Versatile Virtual Router**

- **Flexible, Elastic, Carrier-grade**
  - Multiple deployment options
  - Pay as you grow

- **Platform for Innovation**
  - 3rd Party VNF
  - Micro-service

- **Cloud Deployment**
  - AWS marketplace
  - Junos Automation Stack
    - OpenConfig, JET, API

- **High Performance**
  - 100 Gbps per CPU socket @ 256bytes

- **MX Feature Parity**
Use Case 2: Virtual Routing
vMX: Virtual Routing Use Cases

vPE
Distributed Deployment
New Market/GEO PE
Hybrid Cloud Deployment
Cloud DC GW

L2/L3 VPN termination at regional sites/COs
Distribute PE regionally
SP provide services in new market/geography
Enterprise Cloud GW
VxLAN, L3 VPN, internet GW, MPLS/GRE

Common Building Blocks

vMX
Contrail
CSO
NFX
Use Case 3: Virtual Mobile Packet Core
SDN-enabled vEPC for a 5G-ready architecture

Complete End-to-End Solution Offering
Cloud-native, High-Performance, Scalable and Automated
Open Technology Framework
5G and IoT Ready

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SDN-enabled vEPC for a 5G-ready architecture

Complete End-to-End Solution Offering
Cloud-native, High-Performance, Scalable and Automated
Open Technology Framework
5G and IoT Ready
Services
Disaggregation & Virtualization

Customer Lifecycle
- Plan
  - Assessment
  - Design
- Build
  - Deployment
  - Migration
- Operate
  - Maintenance
  - Optimization

Juniper Service Offerings
- Juniper Professional Services
  - VNF On-Boarding & Lifecycle Services
  - Open Stack, Contrail Cloud and v/c SRX Architecture Design & Deployment Services
  - Security and SDSN Assessment & Deployment Services
  - Security VNF Testing & Deployment Services
- Juniper Care
- Juniper Care Plus
- Juniper Optimum Care

Juniper Education and Training
Proof Points
Disaggregation & Virtualization

“The AppFormix software aligns with our mission to help customers remove the complexity of deploying and operating OpenStack Private Clouds while driving benefits for their business.”
  Bryan Thompson, Rackspace

“In our independent evaluation, we found that Juniper’s virtualization portfolio - including Contrail Networking, Contrail Service Orchestration, Cloud CPE and the vSRX Virtual Firewall - is well integrated, enabling easily managed, highly available business VPN services at scale.”
  Carsten Rossenhoevel, EANTC

“Running Junos on a white box can save a significant amount of money while maintaining the rich Junos feature set.”
  Network World

“The big news was the announcement of the disaggregation of Junos software, which shows Juniper’s emphasis on software and confidence in the capabilities of Junos to stand on its own.”
  Dan Conde, ESG

Openness Pioneer
First network vendor to disaggregate its mature, feature-rich NOS & support an open framework

Industry Leader
Open and proven MANO platform with many tested/certified VNFs from 3rd party companies

Flexible Solution
Infrastructure and operations integration with other cloud platforms

Virtual Firewall
Industry’s highest performance and most efficient virtual firewall, which also supports 100G

Virtual Router
Industry’s first full-featured carrier-grade virtual edge router deployed with physical MX feature parity
1 of 5 Solutions within Juniper’s Mobile Cloud Architecture

Disaggregation & Virtualization

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Mobile Cloud Architecture

Automated Control & Orchestration

Security Everywhere

Disaggregation & Virtualization

Integrated Packet, Optical & Timing Solutions

Distributed Data Centers

Services

vSRX, cSRX, vMX & Contrail-integrated 3rd Party VNFs

Products

vSRX, cSRX
Virtual Firewall

vMX
Virtual Router

Contrail Service Orchestration
Service Orchestration

Contrail Cloud + Networking
SDN Overlay Controller

Junos Space
Connectivity
Services Director
Network Director
Security Director

Junos OS
Programmable, Disaggregated router/switching OS

Use Cases

Partners

Services

vSRX Onboarding & Lifecycle Services, Open Stack, Contrail Cloud and v/cSRX Architecture Design & Deployment Services

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

- **Automated Control & Orchestration**: Industry’s most deployed SDN solution for multi-vendor and multi-layer network automation.
- **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.

**Use Cases**

- **Het-Net Sites** (Macro & Small Cells)
- **Enterprise Site**
- **Access & Aggregation Network**
- **Core Network**
- **Regional Data Center**
- **Centralized Data Center**
- **Application Enablement Layer**
- **Compute Application**
- **NGCO**

**Partners**

- **Best-of-breed partner ecosystem**
- **Best-in-class life-cycle service & support**

**Services**

- **Key mobile use cases supported**
- **Residential**
- **Business**

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Thank you