VNF PLATFORM FOR SERVICE PROVIDERS

Contrail Cloud Overview

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Juniper Summit Moscow 2019

JUNIPER NETWORKS | Engineering Simplicity

VIRTUALIZATION ECOSYSTEM

APPLICATIONS

VIRTUALIZATION ECOSYSTEM

APPLICATIONS

- Monolithic and Micro services
- Shared Infrastructure

VIRTUALIZATION ECOSYSTEM

APPLICATIONS

- Network Functions

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INFRASTRUCTURE

- Compute (CPUs and RAM)
- Storage – DAS, NAS, Distributed)

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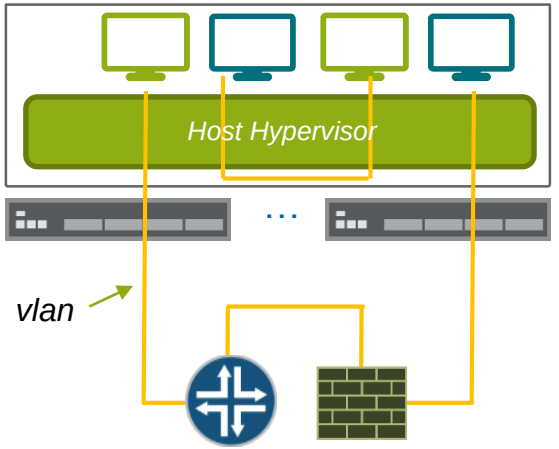
NETWORKING

- Virtual and Physical
- Built-in or External
- Features and Performance

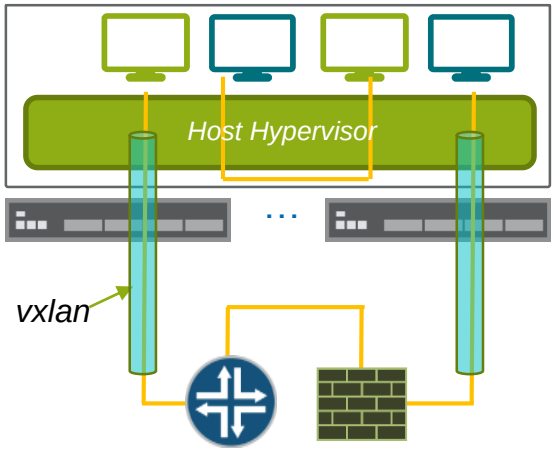
NETWORKING FOR HYPERVISORS

- Industry focused on compute and storage features and issues
- Most vendors still rely on external networking
- Underlay switches should have enough features and scale to route all traffic – Fabric is complicated and costly to operate



SDN INVENTION

- SDN solved some scaling issues (introduced overlays) and created new bottlenecks
- Overlay usually has separate control plane
- Still lack of Hypervisor networking features
- Hypervisor networking performance also an issue



CONTRAIL VROUTER FEATURES

Routing & Switching

IPAM, DNS, DHCP
SNAT, FIP, IPv6,
QoS

Load Balancing

Security Policy Enf.,
Distributed FW,
Security Groups

Gateway Services
(L2, L3 GW)

Multi-vendor System
Integration

Rich Analytics,
Overlay-Underlay
Correlation

Service Chaining
(incl. 3rd Party
Network Svcs)

High Availability

API Services

CONTRAIL NETWORKING

Acquired by Juniper Networks in 2012
Created for built-in networking
vRouter and SDN Controller
Standalone or bundled with VIM – Contrail Cloud

Contrail Networking

Any Cloud

Private cloud data centers, public clouds

Any Workload

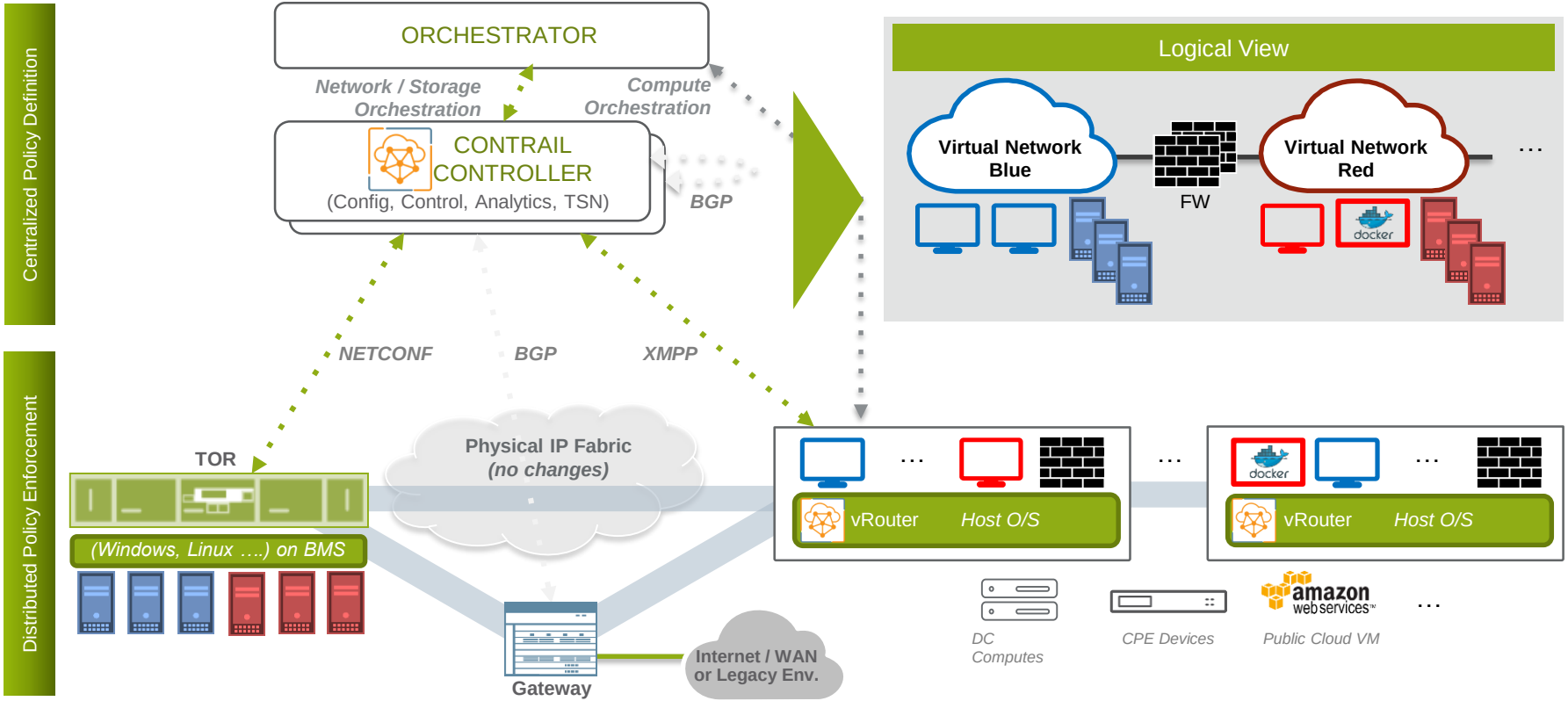
Bare metal servers, virtual machines, containers and physical networking devices

Any Deployment

Greenfield or brownfield, single- or multivendor

One, open platform for end to end policy and control with analytics

CONTRAIL NETWORKING ARCHITECTURE



VNF: PROS AND CONS

SGSN-MME Chassis
[aggregated design]

Advantages

- Utilize x86 price/performance advantage
- Fast roll out – no truck rolls, use common infra
- “Unfreeze code” - Agile, CI/CD for networking applications

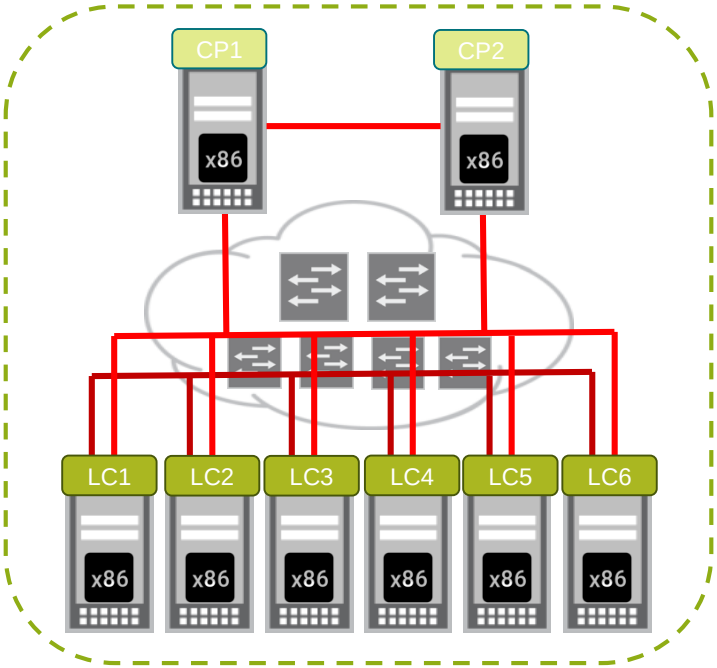
Concerns

- Work for transit traffic – need performance and smart routing

VNF: A COLLECTION OF VMS TO INTERCONNECT

SGSN-MME Chassis [aggregated design]

Cloudifying Magic Wand



Virtualized SGSN-MME [disaggregated design]

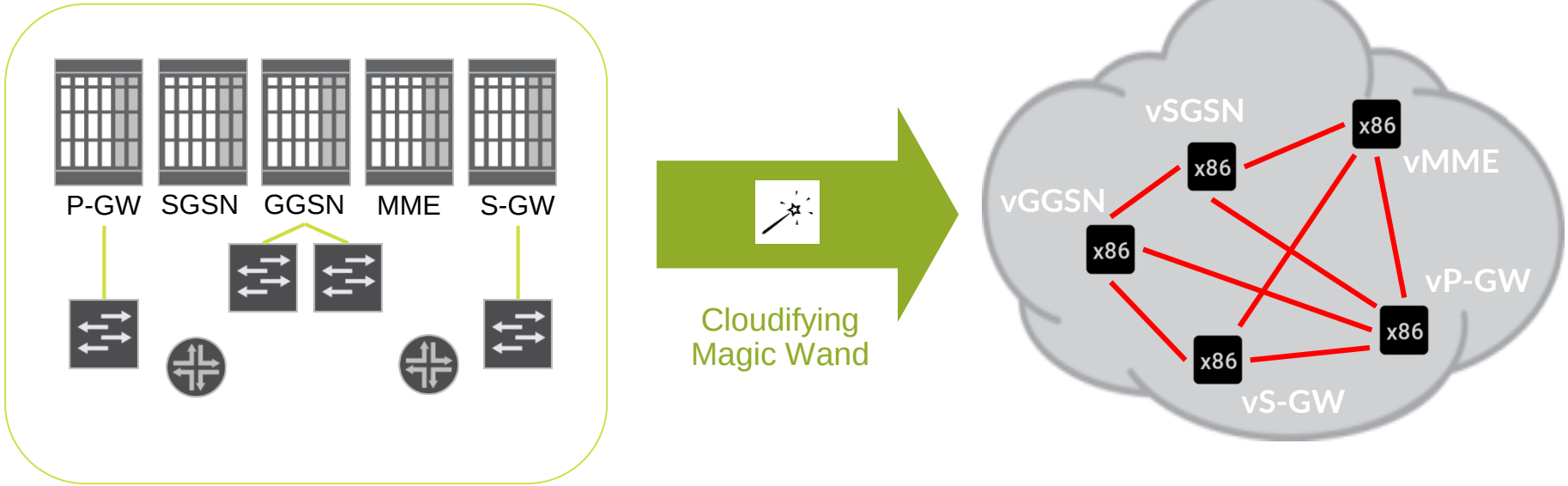
CP1 Control Plane VM (active)

LCx Line Card VM

Backplane for Control

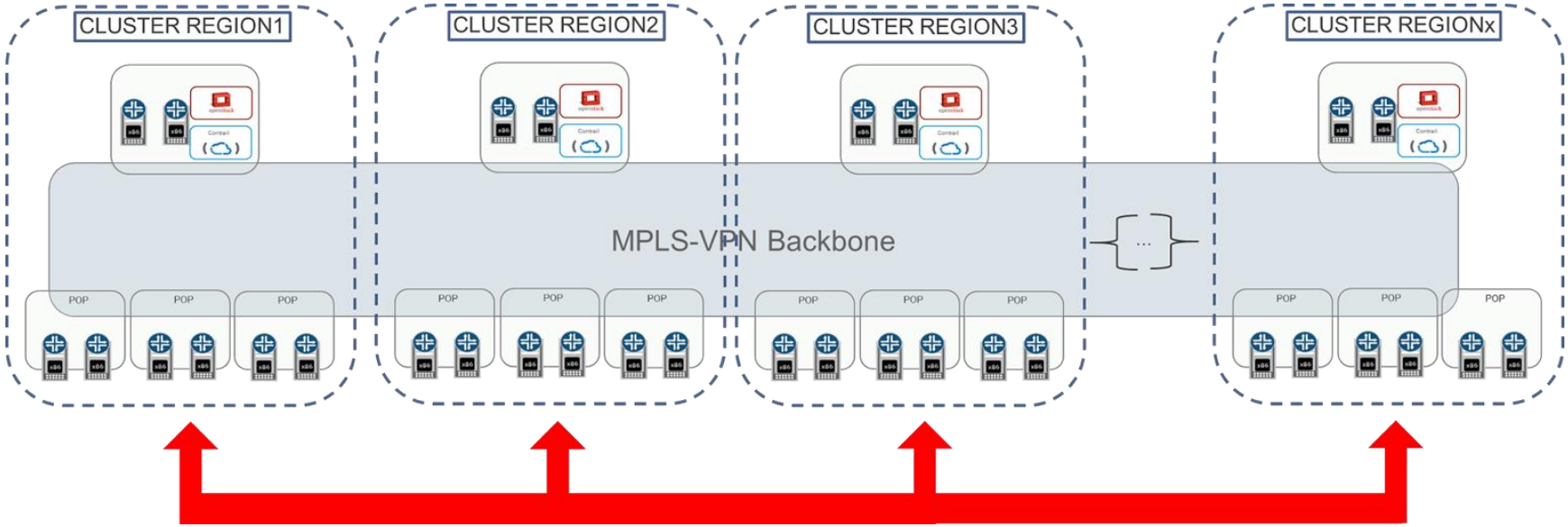
Fabric for Data Plane (East/West Traffic)

VEPC: A SET OF VNFS TO INTERCONNECT



5G WILL REQUIRE VNFS DISTRIBUTION

ORCHESTRATION/INTERCONNECT BECOMES KEY

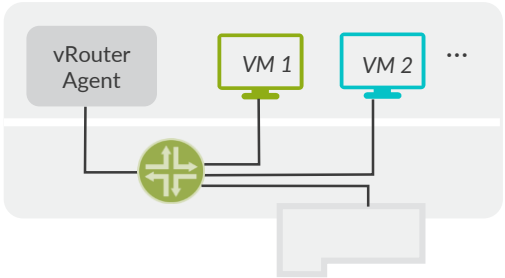


Single touch point orchestrating all networking end to end

- Compute, Top Of Rack, Gateway, Backbone
- Via standard BGP based control plane (vs a proprietary configuration plane)

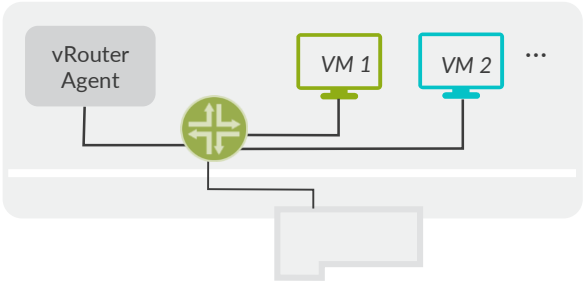
DATA PLANE PERFORMANCE OPTIONS

KERNEL VROUTER



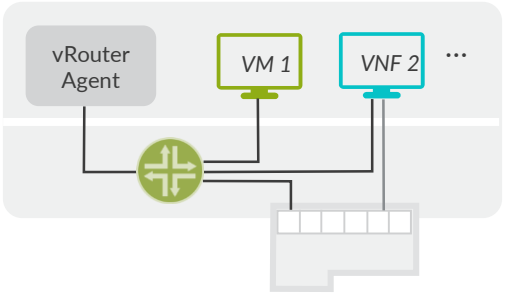
- *This the normal operation where fwding plane of vRouter runs in the kernel and are connected to VMs using TAP interface (or veth pair for containers)*
- *vRouter itself is enhanced using other performance related features:*
  - *TSO / LRO*
  - *Multi-Q Virtio*

DPDK VROUTER



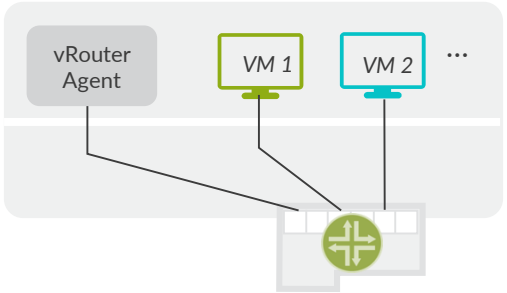
- *vRouter runs as a user space process and uses DPDK for fast path Packet I/O.*
- *Requires the VMs to have DPDK enabled for performance benefits*

SR-IOV – VROUTER COEXISTENCE



- *Some workloads can directly SRIOV into the NIC, while others go through the vRouter*
- *Sometimes a VNF can have multiple interfaces some of which are SRIOV-ed to the NIC*
- *The workloads / interfaces that are SRIOV-ed into NIC don't get the benefits / features of vRouter*

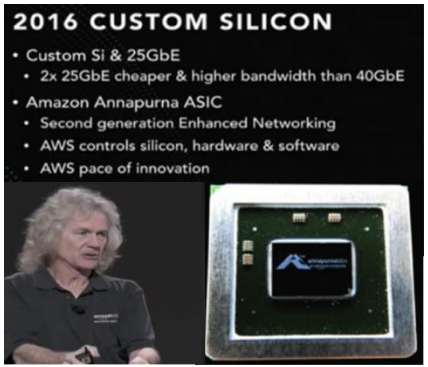
SMART NIC VROUTER



- *vRouter fwding plane runs within the NIC*
- *Workloads are SRIOV-connected to the NIC*

MARKET TRENDS FOR HARDWARE I/O ACCELERATION

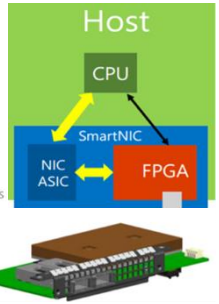
amazon web services



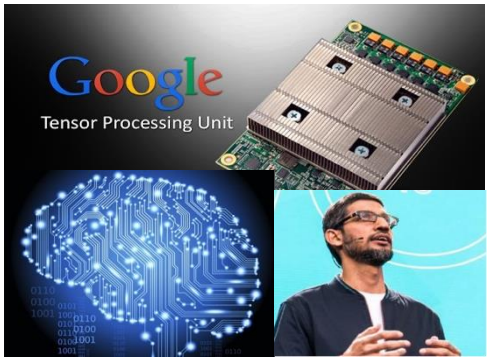
Microsoft Azure

Azure SmartNIC

- Use an FPGA for reconfigurable functions
  - FPGAs are already used in Bing (Catapult)
  - Roll out Hardware as we do software
- Programmed using Generic Flow Tables (GFT)
  - Language for programming SDN to hardware
  - Uses connections and structured actions as primitives
- SmartNIC can also do Crypto, storage acceleration, and mor



Google Cloud Platform



Large R&D budgets, deep acceleration software expertise
Proprietary silicon and hardware-based acceleration

Rest of the market deploying cloud technologies need off-the-shelf solutions

OVERLAY AND UNDERLAY

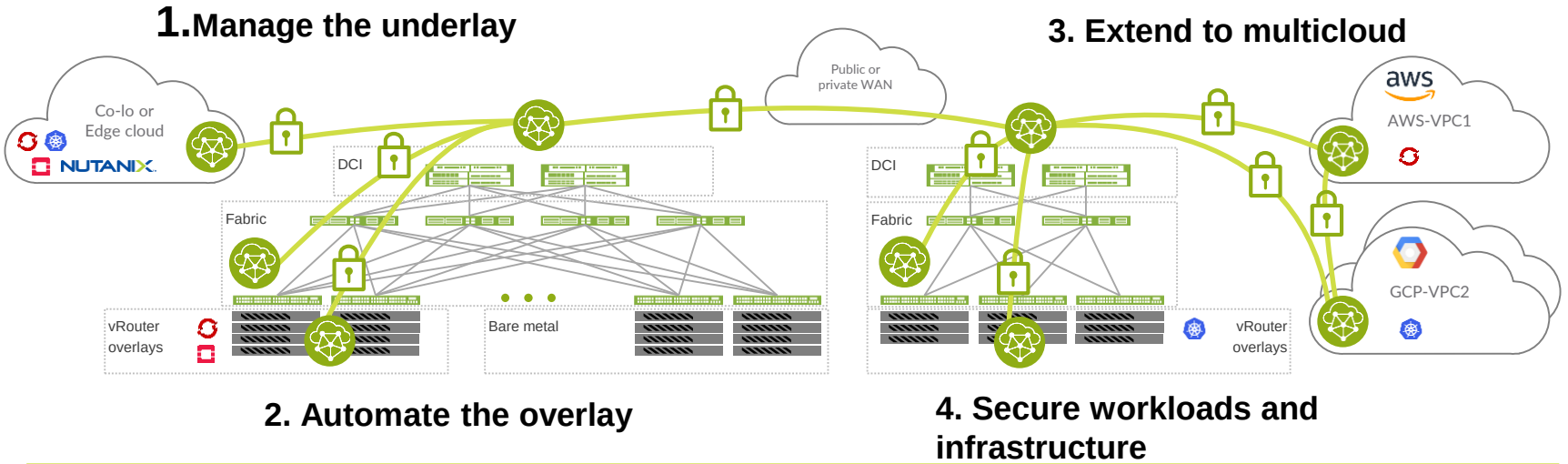
Single management plane for overlay and underlay required

- for traffic coming from underlay to overlay and vice versa
- for SRIOV interfaces (vRouter functions offloaded to switch)
- for BMS

Contrail Device Manager (component of Contrail Networking) manages physical devices

Contrail Command takes care of IP Fabric lifecycle (ZTP, Provisioning, Inventory etc) and standalone Hypervisors (Provisioning, Inventory)

SINGLE MANAGEMENT PLANE AND SECURITY

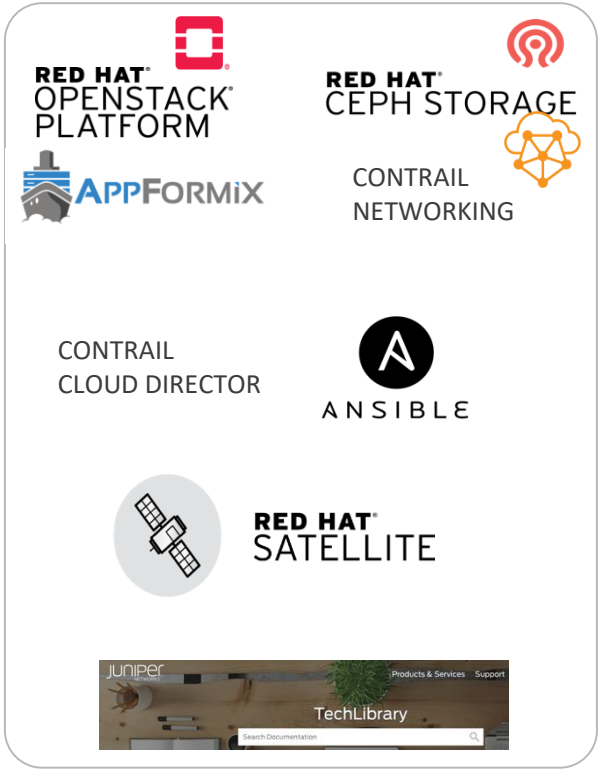


end-to-end CONNECT – SEE – SECURE – DELIVER end-to-end

Data Center

Public Cloud

WHAT IS CONTRAIL CLOUD



5 packages Released

- CC10.0.1 [Dec '17], CC10.0.2 [Feb'18], CC10.1 [June'18]
- CC13.0 [Aug'18], CC13.0.1 [Sept'18]

Contrail Cloud Director

- 8 Ansible playbooks for deployment automation
- 4 layers of automation : Infrastructure, UnderCloud, OverCloud, AFX

Satellites for SW distribution, Licenses & Release Management

Architecture Blueprints & Deployment guides

TURNKEY SOLUTION TO OPERATE TELCO CLOUD

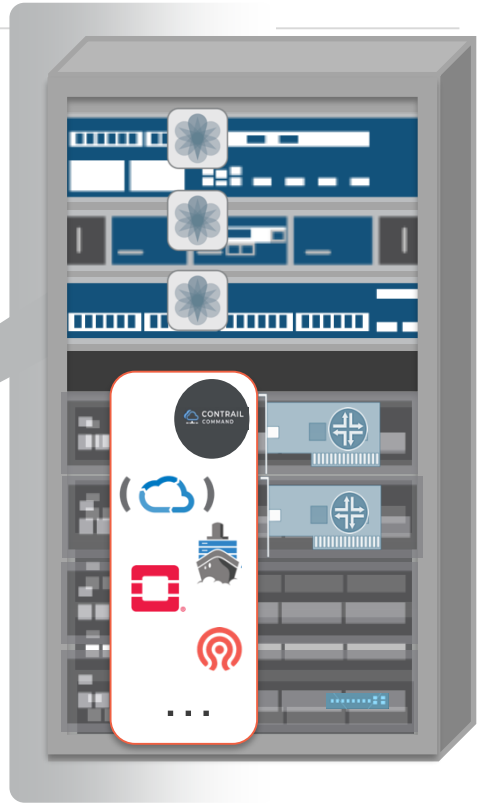
- **Compute**: Red Hat OpenStack & RHEL/KVM
- **Storage**: Red Hat Ceph
- **Networking**: Contrail Networking
- **Operations & Analytics**: AppFormix
- **Automated deployment, single pane of glass**: Contrail Command

- **Reference use cases**: Mobile Broadband, Virtual IMS [future], …
- **Pre-validated VNFs** : Affirmed Mobile Content Cloud [S/PGW, MME], vSRX [firewall/IPsec gateway]
- **Optimized performance** configuration blueprint

- **Reference Servers**: Dell, Quanta, HP, Supermicro, UCS Rack
- **Smart NIC** support for high performance VNFs

- **Pre-integrated underlay Network**: TORs & Spine [QFX], Gateway [MX]

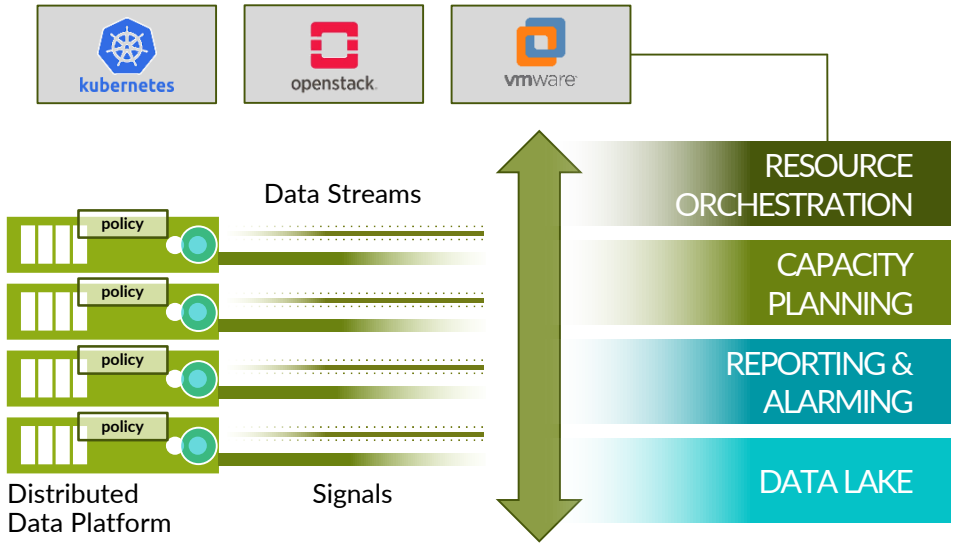
- **Build Services:** Rack, Server, Network design, …
- **Managed Services:** [PS / AS / NOC partners]



CO / POPs

APPFORMIX – Distributed Stream Analysis & Optimization

Fast! Efficient! Responsive!



REAL TIME

ACTIONABLE: REAL-TIME OPTIMIZATIONS

- Local Optimizations for shared CPU resources
- Global Optimization for workload placement to ensure high performance & high reliability!

CONTINUOS ANALYSIS OF METRICS

- Analyze more metrics
- Faster prediction of failures

SOLUTION SCALES WITH YOUR INFRASTRUCTURE

- No central choke-point!

EXTENSIBLE

- Use Nagios style plugins to add your own metrics

JUNIPER – RED HAT PARTNERSHIP

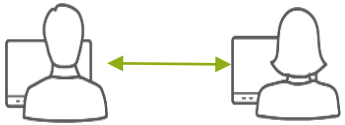
Pre-Sales / Design

- Commercial
- System/Sales Engineering
- PS
- (BU)

Product Integration Life-Cycle Management

- RHOSP OSP Director
- K8S Red Hat OpenShift

Support Collaboration



- JTAC
- Red Hat Support

TELCO CLOUD ADOPTION

- **Most large Service Providers opted for**
  - **Generic Horizontal Stacks** covering multiple use cases
  - Partially **disaggregated** architecture (Separate Openstack + SDN)
- **18-36 months overall life cycle to go through:**
  - NFVI build-up, qualification & roll-out
  - VNF onboarding & NFV Orchestration
- **Massive struggle to evolve & upgrade:**
  - Endless Requests for EOL extension, Maintenance Releases of legacy SW
  - Resulted in limited production growth
- **Vertically integrated stacks from VNF vendors**
  - Appealing to smaller SPs for targeted use cases:
  - Main vendors: Ericsson, Cisco, Huawei, Nokia

HOW JUNIPER IS DRIVING TELCO INDUSTRY WITH CONTRAIL

- Help SPs find balance between **DIY and Closed/Vertical stacks**
  - HORIZONTAL solution - supports multiple use cases / multiple VNF vendors
  - VNF agnostic allowing tight collaboration with VNF vendors
  - Fully integrated with best SDN solution in the market for NFVi use case

- Provides the right **tools & processes** to **Operationalize** NFV
  - Fully tested prescriptive blueprint architecture
  - Life Cycle Manager tools to automate deployment and upgrade
  - Pre-packaged Monitoring, Analytics & Optimization
  - CD/CD Toolchain allowing continuous integration with VNFs & NFV Orchestration

- Evolve Contrail Cloud stack to support future **5G and Edge Compute** use cases
  - Containerized VNFs orchestration with Kubernetes
  - Workload distribution to the Edge with Remote Compute, vRouter footprint reduction, ...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