CONTRAIL CLOUD

Product Overview

Since the inception of NFV, service providers have been trying to reap its business and operational benefits.

However, the road to telco cloud is fraught with challenges, including the complexities of integrating disparate product components, coordinating support across multiple vendors, and filling the development and operational skills gap when deploying and operating an NFV solution.

Contrail Cloud simplifies the deployment and operation of telco cloud infrastructure, allowing service providers to navigate the complexities of cloud deployment and operations with a trusted, open, and integrated software stack—without compromising performance, scale, or availability.

Product Description

Juniper® Contrail® Cloud is a fully managed telco cloud solution for running Network Functions Virtualization Infrastructure (NFVI) with always-on reliability and service assurance for virtualized network functions (VNFs).

Contrail Cloud components are tested and integrated to guarantee interoperability, stability, and high performance. Based on open-source technologies such as OpenStack, OpenContrail, and Ceph with standard APIs, the platform provides the freedom to add third-party components as needed.

Contrail Cloud combines products from industry leaders in cloud infrastructure (compute, storage, networking virtualization) and application management software into a single solution that provides high scale, high availability, and high performance with always-on service reliability. The platform can be deployed over any compatible compute, storage, or networking hardware, including SmartNIC for transparent network offload acceleration.

Contrail Cloud can also be delivered with complete, end-to-end professional and advanced services for building and operating the service provider cloud infrastructure. Juniper Professional and Advanced Services teams can build and operate the entire telco cloud for NFV at a customer's site, providing follow-on operational services and continuous remote managed services as requested to minimize downtime and guarantee SLA compliance.

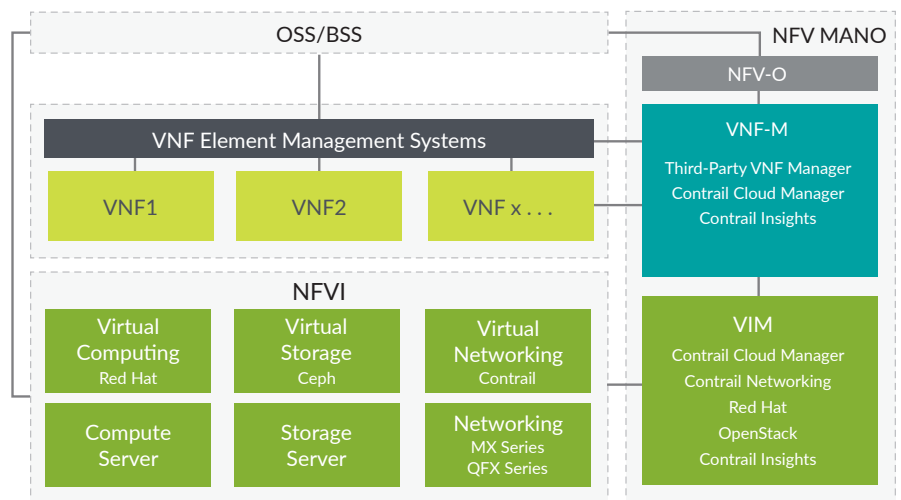## Architecture and Key Components

Figure 1: Contrail Cloud architecture

Contrail Cloud includes the following components:

- **Red Hat OpenStack:** OpenStack is the de facto standard for the Virtualization Infrastructure Manager (VIM) layer of NFV. Red Hat OpenStack Platform (RHOSP) is the leading OpenStack distribution developed by Red Hat, the world leader in open source and the largest contributor to the OpenStack community. RHOSP uses OpenStack director (OSPd), based on the OpenStack Triple-O project, to manage the RHOSP life cycle.

- **RHEL/KVM:** Red Hat Enterprise Linux (RHEL) host operating system, coupled with KVM hypervisor, provides a high-performance compute virtualization layer for virtual machines (VMs).

- **Red Hat Ceph:** Ceph is a massively scalable, open-source, software-defined storage system capable of auto-scaling to the exabyte capacity, providing a common OpenStack infrastructure for file, object, and block storage. Red Hat Ceph is a commercially available version of the Open Source Project.

- **Contrail Networking**: The leading SDN solution for service providers, Juniper Contrail Networking™ offers the highest level of scalability, availability, and performance for network virtualization in NFV infrastructure.

- **Contrail Insights:** Juniper Networks Contrail Insights is an optimization and management software platform for public, private, and hybrid clouds. This intent-driven software manages automated operations, visibility, and reporting in cloud and NFV use cases for Kubernetes, OpenStack, and Amazon Web Services. Contrail Insights introduces an NFV-centric service assurance capability that leverages machine learning to provide continuous response and learning capabilities for uninterrupted operation. Contrail Insights comes with an OpenStack, Ceph, and Contrail Networking adapter, which automatically discovers the infrastructure so that VNFs integrated on the Contrail Cloud platform are monitored, analyzed, and optimized in real time.

- **Contrail Cloud Manager:** This Ansible-based tool, which automates provisioning and configuration management, acts as an application deployment tool for the under/over cloud infrastructure.
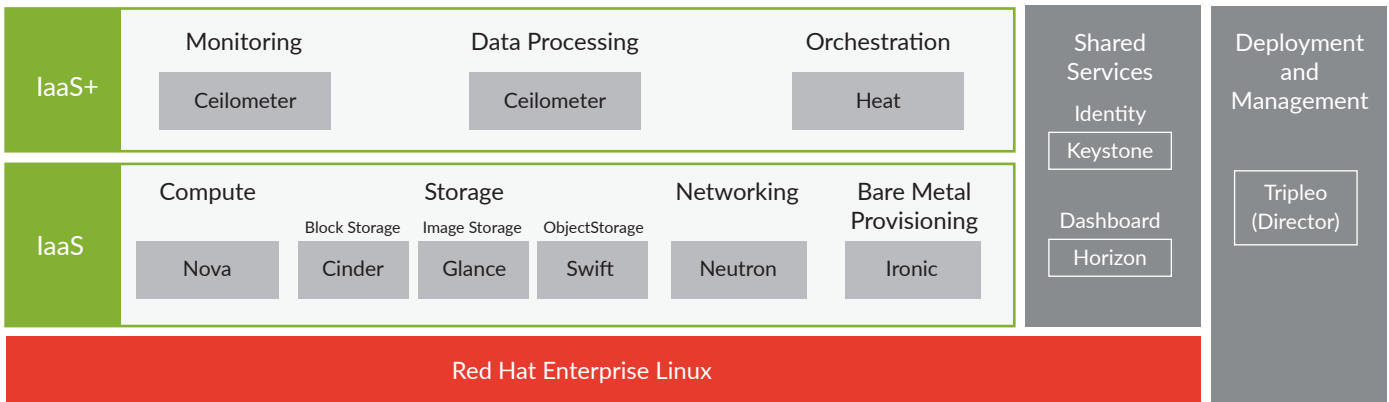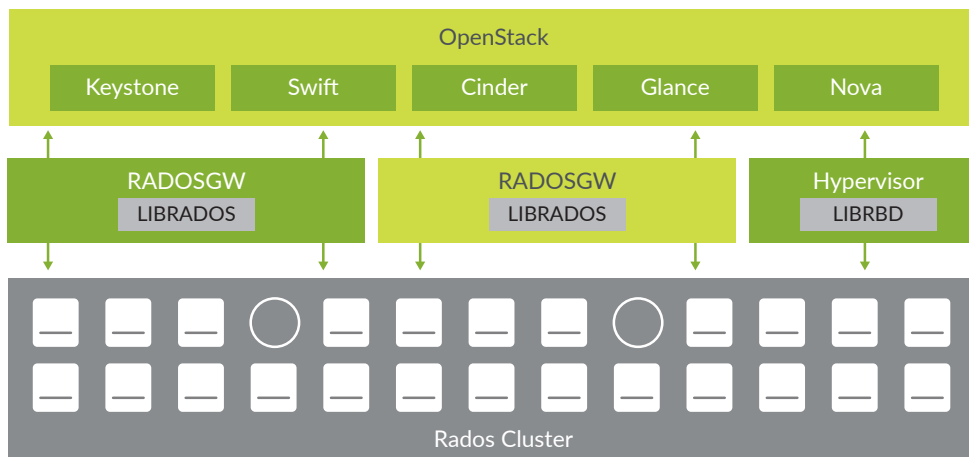

Figure 2: Red Hat OpenStack platform

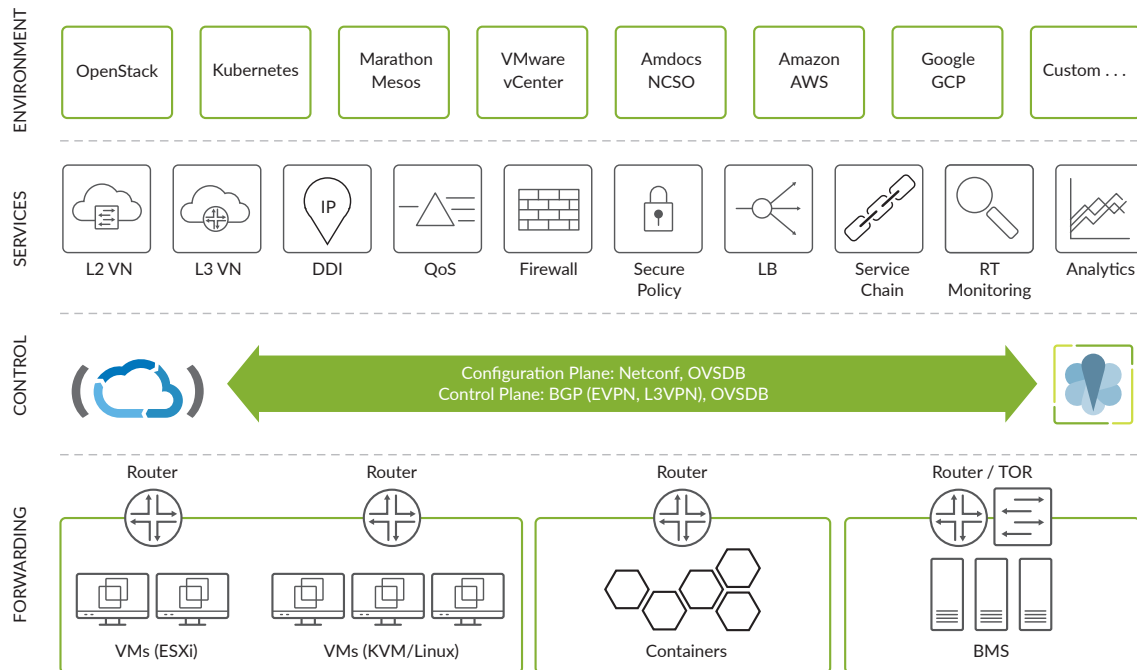*Figure 3: Red Hat Ceph architecture*

Figure 4: Contrail Networking architecture

Monitor health and performance of the clouds based on user and operator-defined policies

- Physical Infrastructure
- Virtual infrastructure and management services
- VNFs, virtual networking services (e.g. FW, LB, etc.)

Generate alerts for SLA violations and anomalies— both in real time and as a result of predictive analysis

Notifications are sent to the service orchestrator and perform corrective analysis to ensure service availability, e.g.:

- Migrate workload away from a failing host, or
- HA to back-up service-chain from unresponsive active path

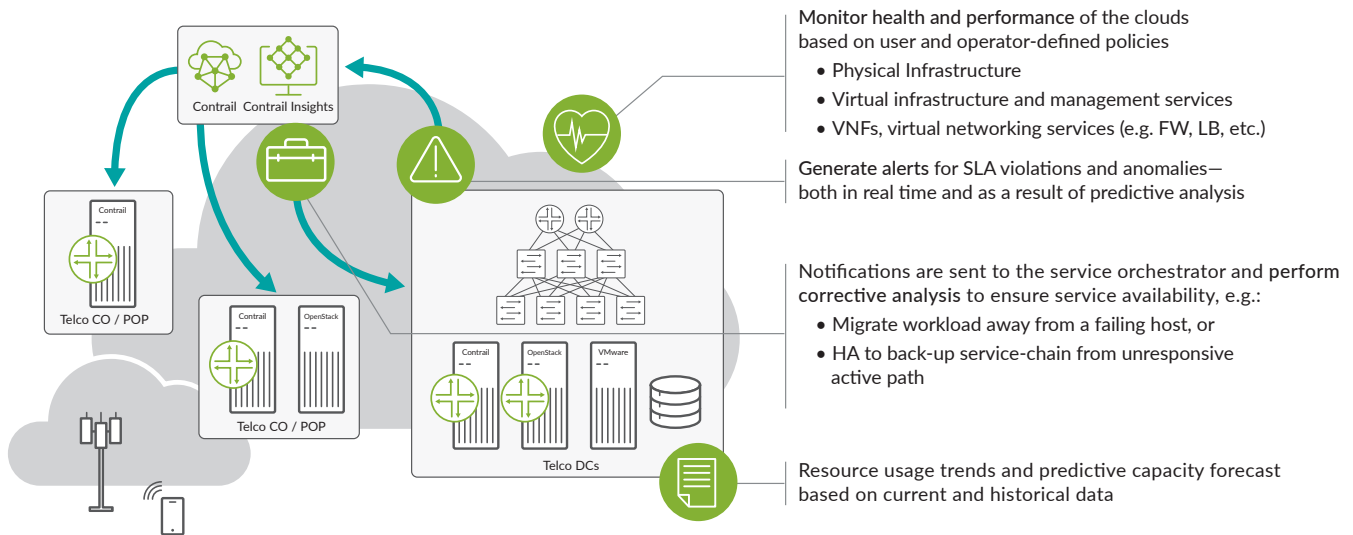Resource usage trends and predictive capacity forecast based on current and historical data

Figure 5: Contrail Insights Service Assurance for NFV

Use Cases

Contrail Cloud can be preconfigured on Juniper Networks QFX Series switches and MX Series 3D Universal Edge Routers along with a pre-vetted list of compatible servers, guaranteeing a rapid and efficient telco cloud deployment. Contrail Cloud can also be delivered with Affirmed Networks' Mobile Content Cloud (MCC), Juniper Networks vSRX Virtual Firewall, and other third-party VNFs.

When combining Contrail Cloud with validated VNFs, Juniper can deliver a complete end-to-end NFV solution for specific telco use cases such as virtual evolved packet core (vEPC) used to deliver mobile broadband services. New use cases will be added in future releases, including:

- Virtual IP Multimedia Subsystem (IMS)
- Wi-Fi offload
- Mobile edge computing
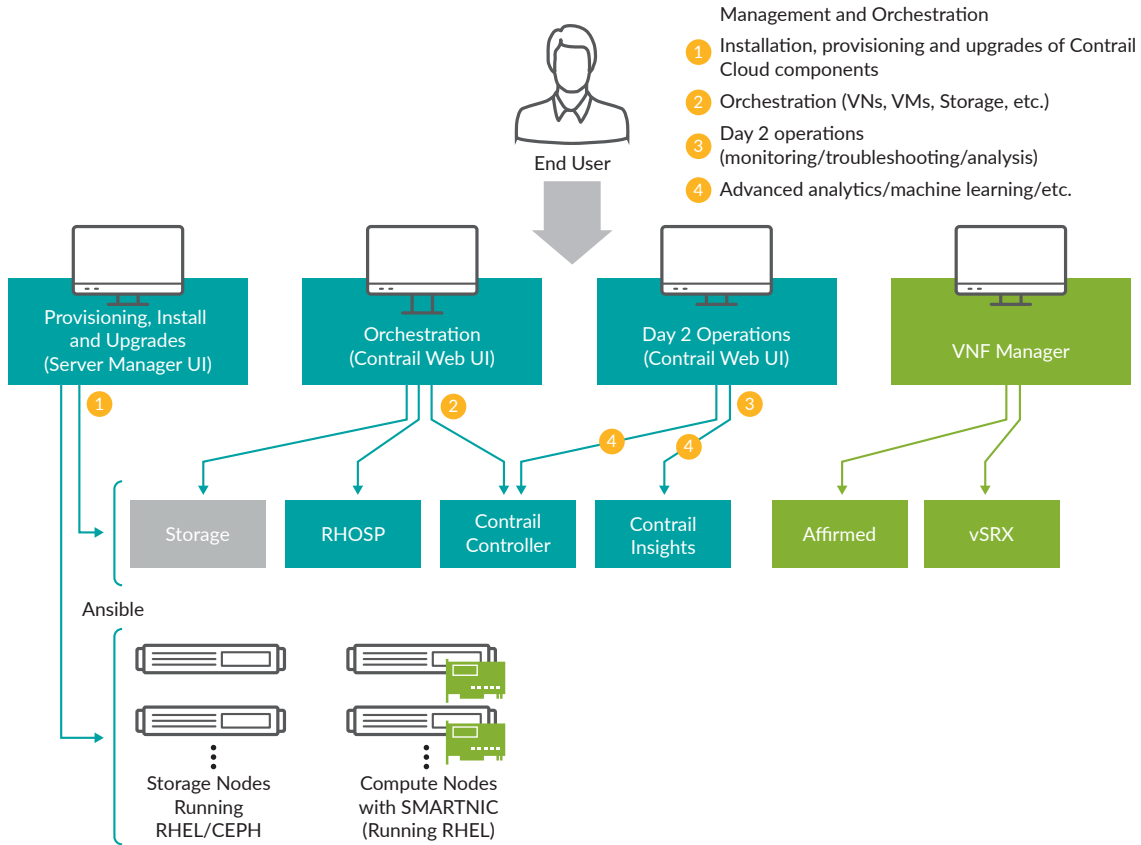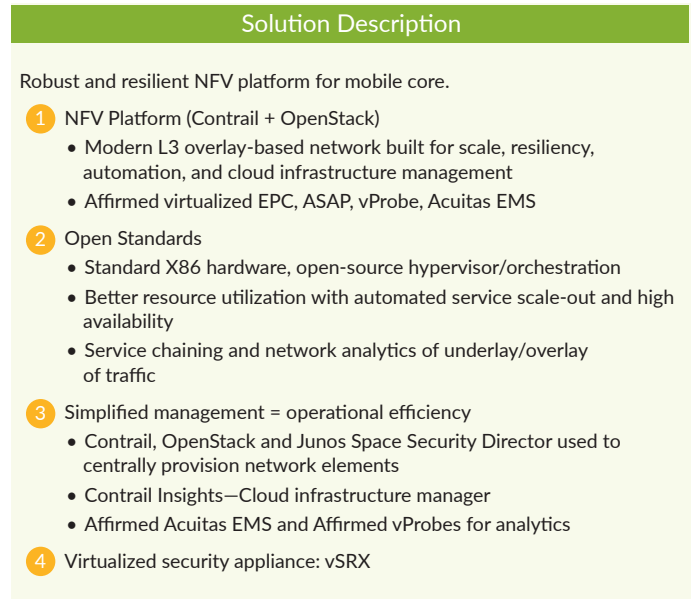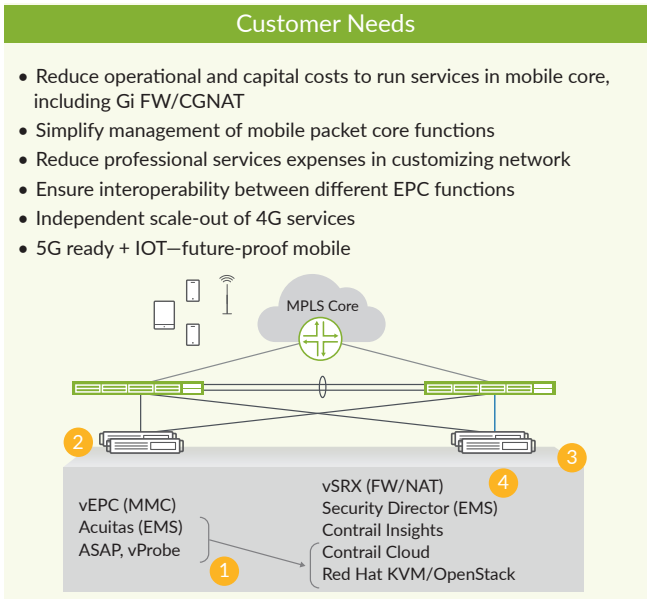- Narrow-band Internet of Things (IoT)

Management and Orchestration

1. Installation, provisioning and upgrades of Contrail Cloud components
2. Orchestration (VNs, VMs, Storage, etc.)
3. Day 2 operations (monitoring/troubleshooting/analysis)
4. Advanced analytics/machine learning/etc.

End User

Provisioning, Install and Upgrades (Server Manager UI)

Orchestration (Contrail Web UI)

Day 2 Operations (Contrail Web UI)

VNF Manager

Storage

RHOSP

Contrail Controller

Contrail Insights

Affirmed

vSRX

Ansible

Storage Nodes Running RHEL/CEPH

Compute Nodes with SMARTNIC (Running RHEL)

Figure 6: Contrail Cloud Manager

Customer Needs

- Reduce operational and capital costs to run services in mobile core, including Gi FW/CGNAT
- Simplify management of mobile packet core functions
- Reduce professional services expenses in customizing network
- Ensure interoperability between different EPC functions
- Independent scale-out of 4G services
- 5G ready + IOT—future-proof mobile

MPLS Core

vEPC (MMC)
Acuitas (EMS)
ASAP, vProbe

vSRX (FW/NAT)
Security Director (EMS)
Contrail Insights
Contrail Cloud
Red Hat KVM/OpenStack

Solution Description

Robust and resilient NFV platform for mobile core.

1. NFV Platform (Contrail + OpenStack)
   - Modern L3 overlay-based network built for scale, resiliency, automation, and cloud infrastructure management
   - Affirmed virtualized EPC, ASAP, vProbe, Acuitas EMS
2. Open Standards
   - Standard X86 hardware, open-source hypervisor/orchestration
   - Better resource utilization with automated service scale-out and high availability
   - Service chaining and network analytics of underlay/overlay of traffic
3. Simplified management = operational efficiency
   - Contrail, OpenStack and Junos Space Security Director used to centrally provision network elements
   - Contrail Insights—Cloud infrastructure manager
   - Affirmed Acuitas EMS and Affirmed vProbes for analytics
4. Virtualized security appliance: vSRX

Figure 7: vEPC for GI-LAN/firewall services

Features and Benefits

Table 1: Contrail Cloud Features and Benefits

Feature	Benefit
Single pane of glass automates the provisioning, configuration, and operation of compute, storage, and networking resources needed by cloud applications.	Unified GUI simplifies the application provisioning process while improving operational efficiency and reducing operational costs.
Scale-out software architecture along with in-service software upgrades provide high availability and scalability for both OpenStack and Contrail Networking.	Provides anytime cloud availability for the operation, activation, and management of new and existing application workloads.
SR-IOV- and DPDK-enabled vRouter performs hardware acceleration and vRouter data path offload on SmartNIC hardware.	Improves cloud performance over legacy OVS-based implementations through better resource utilization, reducing CapEx and OpEx.
Contrail Insights provides actionable, real-time optimization and continuous analysis of key metrics.	Guarantees efficient resource utilization.
Local optimizations for shared CPU resources and global optimizations for workload placement ensure high performance and reliability.	Accelerates prediction of potential failures, enabling proactive responses to prevent service impact.
Predictive analytics offer: • Comprehensive cross-layer monitoring of workloads, infrastructure, and services • Performance optimization and resiliency through state-driven automation and orchestration • Real-time visibility and alarms, as well as reporting and capacity planning tools	Utilizes predictive analytics powered by machine learning to issue alerts and take remedial action before performance problems impact users, ensuring SLA compliance.
Validated VNFs are integrated with proven, industry-leading components.	Accelerates telco cloud deployments to drive faster time to revenue.
Service instance model enables VM cluster horizontal scale out and load balancing for any service function.	High-performance vRouter and service model unleashes vEPC and Gi-Service performance.
Juniper offers managed services to plan, build, and operate the telco cloud.	Enables users to focus on delivering innovative services to customers, driving faster time to revenue.

Specifications

Server Specifications

Role	CPU	Memory	Disk	Network	Qty.	Benefit
Undercloud Host	Intel Xeon 2600v4 series	128 GB	1 x 480 GB SSD (Cassandra Journaling) 2 x 1 TB HDD (SW RAID)—Host OS 3 x 1 TB HDD—Data	2 x 10 Gbps: VM traffic 2 x 10 Gbps: Storage traffic 2 x 1 Gbps: IPMI and management	1	NA
Controller Host	Intel Xeon Platinum 8100 series	256 GB	1 x 480 GB SSD (Cassandra Journaling) 2 x 1 TB HDD (SW RAID)—Host OS 3 x 1 TB HDD—Data	2 x 10 Gbps: VM traffic 2 x 10 Gbps: Storage traffic 2 x 1 Gbps: IPMI and management	3	NA
Compute Host	Intel Xeon Platinum 8100 series	256 GB	2 x 1 TB HDD (SW RAID)—Host OS 4 x 1 TB HDD—Data	2 x 10 Gbps: VM traffic or 2 x 25 Gbps: SmartNIC (optional) 2 x 10 Gbps: Storage traffic 2 x 1 Gbps: IPMI and management	16	18
Storage Host	Intel Xeon Gold 6100 series	256 GB	2 x 1 TB HDD (SW RAID)—Host OS 5 x 480 GB SSDs—Ceph Journaling (1:8) 40 x 1 TB HDDs—Ceph OSDs 3 x Spares	2 x 10 Gbps: VM traffic 2 x 10 Gbps: Storage traffic 2 x 1 Gbps: IPMI and management	3	6

Network Specifications

Role	Model		Quantity (1 Rack)	Quantity (Additional Rack)
Leaf TOR Switches	Basic Network Fabric	QFX5110-48S	2	2
	Advanced Network Fabric	QFX5110-48S	4	4
	SmartNIC	QFX5200-32C	2	2
Spine Switches	Basic Network Fabric	QFX10002-72Q	2	2 for every 18 racks
	Advanced Network Fabric	QFX10002-72Q	4	4 for every 36 racks
Gateway Router	MX480		2	NA
Management Switch	EX4300-48T		2	2

Ordering Information

Product Number	Description
CNTR-CL-CTRL-1	Contrail Cloud Controller; includes OpenStack, 64 TB storage, Contrail Insights, 10 Compute nodes with Contrail Base and NFV Pack—1 Year (support included)
CNTR-CL-CMP-1	Contrail Cloud; license for 1 managed Compute includes Contrail Base, NFV Pack, OpenStack, Contrail Insights—1 year (support included)
CNTR-CL-256TB-1	Contrail Cloud Storage, up to 256 TB—1 year (support included)
CNTR-CL-1PB-1	Contrail Cloud Storage, up to 1 PB—1 year (support included)

Controller SKU is required; all other SKUs based on capacity consumption (compute, storage).

Controller SKU includes 10 Compute Nodes licenses, and 64 TB storage.

Contrail Cloud product SKUs for annual subscription licenses include support.

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

Corporate and Sales Headquarters

Juniper Networks, Inc.

1133 Innovation Way

Sunnyvale, CA 94089 USA

Phone: 888.JUNIPER (888.586.4737)

or +1.408.745.2000

www.juniper.net

APAC and EMEA Headquarters

Juniper Networks International B.V.

Boeing Avenue 240

1119 PZ Schiphol-Rijk

Amsterdam, The Netherlands

Phone: +31.0.207.125.700

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