CONTRAIL
Simple, Open, and Agile Networking for Cloud and NFV

Product Overview

Juniper Networks Contrail is simple, open and agile software defined networking solution that automates and orchestrates the creation of highly scalable virtual networks. These virtual networks let you harness the power of the cloud—for new services, increased business agility and revenue growth. Contrail is a scale-out virtual networking solution that seamlessly integrates with physical routers and switches to eliminate the challenges of private and public cloud networking. Service providers can use Contrail to enable a range of innovative new services, including cloud-based offerings and virtualized managed services. Enterprises can use Contrail to increase business agility by enabling the migration of applications and IT resources to more flexible private or hybrid cloud environments.

Product Description

Enterprise CIOs are under increasing pressure to meet the dynamic needs of their business by adopting cloud architectures and delivering Infrastructure-as-a-Service (IaaS) to internal departments. Transition to the cloud from legacy data centers requires adoption of an integrated architecture built around the orchestration of virtualized compute, virtualized storage, and virtualized network resources.

Service Providers are also under pressure to rapidly deliver innovative services while reducing CapEx and OpEx. For many traditional network service providers as well as new cloud service providers expanding their portfolio to meet the needs of XaaS (i.e. IT as a service, IaaS, SaaS, etc.) is increasingly seen as the path to increased monetization and differentiation. Yet offering these innovative services requires a new approach to networking the cloud.

Enterprise CIOs and Service Provider CTOs are expecting to seamlessly migrate their existing infrastructure that was built using millions of dollars of physical gear and years of operational experience to the cloud era—without the need to "rip-and-replace."

For Enterprises, Contrail interoperates with open cloud orchestration platforms such as OpenStack, CloudStack, to enable system-level automation and orchestration. It reduces the friction of migration to cloud architecture by providing a virtualized networking layer that seamlessly delivers switching, routing, and networking services (security, load balancing, VPNs, etc.) over an existing physical network. It also provides API compatibility with public clouds like Amazon Web Services (AWS) for seamless workload provisioning in hybrid environments.

For Service Providers, Contrail interoperates with operations and business support systems (OSS/BSS) and enables Network Function Virtualization (NFV) by service orchestration of any Juniper or third-party networking services, thereby removing the dependence on physical appliances that hinder agility and add cost for cloud deployments or service provider networks. In addition to managing the service virtual machines (VMs), Contrail provides additional capabilities like scale-out of service VMs, load balancing of traffic to the service VMs, monitoring of the VMs, and service chaining of traffic without any API integration or modifications to third-party networking services. It also ensures 100% uptime for your virtual networks.

Contrail's advanced analytics capabilities are built to provide deep insights into application and infrastructure performance for better visualization, easier diagnostics, rich reporting, custom application development, and machine automation.

Architecture and Key Components

Contrail is comprised of the following key components:

Contrail Controller integrates with open cloud orchestration solutions (i.e. CloudStack and OpenStack) and with SP OSS/BSS systems. It sits between the orchestration system and network devices (physical underlay, virtualized appliances) and communicates via published RESTful APIs. Contrail Controller has 3 software components:

- **Configuration**: accepts request from an orchestrator for provisioning a VM and assign a network to the same. It converts this high level request into a low level request that can be understood by network elements.
- **Control**: interacts with the network elements and directs the provisioning of network for a virtual machine, using XMPP protocol. This plane is logically centralized and physically distributed and is responsible for maintaining ephemeral state of a network. It interacts with its peer control planes using industry standard BGP and ensure network uptime at all times.
- **Analytics**: collects, stores, correlates and analyzes information across network elements. This information includes statistics, logs, events and errors, that can be consumed by end user or network applications through Contrail's northbound REST API and can be analyzed with SQL style queries.

Contrail vRouter is part of the compute node, which gets reachability information from the control plane and ensures native L3 services for host-based virtual machines. Each vRouter is connected to at least 2 control planes to optimize system resiliency.

Features and Benefits

Key Features

- **Switching and Routing:** Hypervisor forwarding plane provides line-rate routing and switching in a multitenant virtualized environment that is completely decoupled from the underlying physical fabric switches.
- **Load Balancing:** Load balancing is built right into the hypervisor' forwarding plane for balancing of traffic across application tiers or network services.
- **Security:** Policy enforcement and security groups are built directly into the hypervisor forwarding plane; application-aware firewall services are delivered in software using virtual Juniper Networks® SRX Series Services Gateways; and distributed threat prevention is delivered in software using Juniper Networks Junos® WebApp Secure.
- **Elastic, Resilient VPN:** L3VPN, E-VPN, site-to-site IPsec, and SSL VPN are all delivered in software.
- **Gateway Services:** Contrail interoperates with most routing equipment that supports L3VPN or E-VPN with appropriate data encapsulation standards, including Juniper Networks MX Series 3D Universal Edge Routers or QFX3600 Switches, to seamlessly connect to legacy workloads and non-virtualized physical services.
- **High Availability:** Contrail is configured in Active-Active cluster mode, and each vRouter is connected to a set of control planes and get same routing table and ACLs.
- **Analytics Services:** Rich visualization and diagnostics of virtualized and physical network enable real-time and historical infrastructure analytics that can be consumed through REST APIs.
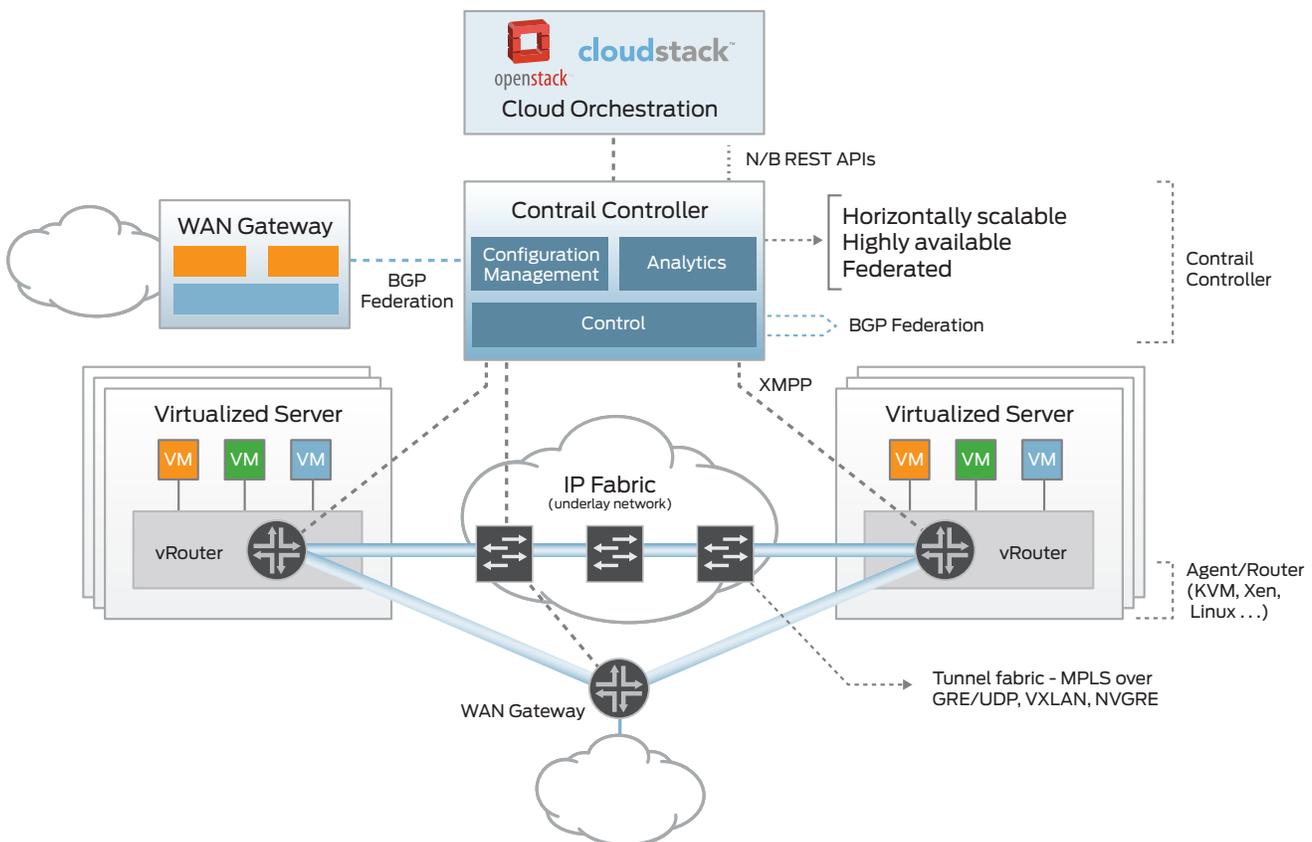

Figure 1: Contrail components for automating and orchestrating creation of virtual networks

- **API Services:** REST API for configuration, operation, and analytics provide seamless integration with cloud orchestration systems (CloudStack and OpenStack) or service provider OSS/BSS systems. Includes Virtual Private Cloud (VPC) API compatibility for seamless deployment of applications in a hybrid environment (e.g., private cloud and public cloud/AWS).

Key Benefits

- Provides simple way to connect physical networks with a virtual environment and provision underlying services, reducing the time, cost and risk for customers when configuring the network.
- Enables easy provisioning and management of network and security services, through service chaining, which enhances the efficiency and agility in how customers deploy and use network resources.
- Eliminates the risk of vendor-lock-in for customers by leveraging a standards-based architecture that integrates with a wide variety of hypervisors, physical networks and orchestration platforms including compatibility with both CloudStack and OpenStack platforms.
- Seamlessly integrates with most industry switches and routers today including Juniper's MX, EX and QFX Series, providing customers with a quick and easy migration path to SDN without any disruption to underlying physical network architecture and investment.
- Accelerates the connection of virtual resources and enables the federation of private, public or hybrid cloud environments, increasing the speed of business and service innovation for customers by making the network more dynamic, flexible and automated.
- Fast troubleshooting and diagnostics through unique analytics capability, enabling customers to more intelligently and efficiently manage their networks.

Key Functionality

- **Open Source, Open Standards for Seamless Interoperability:** Contrail eliminates the need for rip-and-replace by supporting many standards-based protocols to enable interoperability in a multivendor physical infrastructure, thus maximizing investment protection. In addition, complete source code and product binaries are available under the Apache v2.0 open source license for all of our customers and partners. For more details and latest status, please visit www.opencontrail.org.
- **Network Virtualization:** Contrail provides a robust network virtualization solution by leveraging the L3VPN standard for IP overlays, the E-VPN standard for L2 overlays, and a multitude of data encapsulation standards like MPLSoGRE, MPLSoUDP, VXLAN, etc. The VPN containers provide a clean approach to multitenancy and alleviate the challenges associated with a VLAN-based or L2-based segmentation approach (limited number of virtual tenant networks, instability associated with L2 switching technologies, extensibility across data center locations, and so on).
- **Network Function Virtualization (NFV):** Contrail is the industry's first NFV solution that provides comprehensive management of the infrastructure (compute, storage, and networking) and virtualized or physical networking services. In addition to support for both Juniper and any third-party service instantiation, the controller does scale-outs of the networking services based on network demand. It also load-balances the traffic to the multiple instances of the networking service, and monitors services for high availability. These networking services are then automatically chained using MPLS and BGP so that there is no disruption to the operational paradigm of the physical network.
- **Network Programmability and Automation:** Contrail exposes the concept of "software-defined networking (SDN) as a compiler" by translating abstract commands into specific rules/policies to automate the provisioning of workloads and enable service chaining of network and security services. The customer can request virtual machines without getting into the details of underlying elements like ports, VLANs, subnets, switches, routers, etc. In addition, a unified information model for configuration, operation, and analytics is exposed through REST APIs, as well as libraries in various programming languages such as Python, Javascript, and Java, to name a few.
- **Big Data for Infrastructure:** Contrail analytics engine is designed for very large-scale ingest and querying of structured and unstructured data and is exposed using REST APIs and a rich GUI. This allows the user to get better insights and easily diagnose issues in the infrastructure, as it provides both real-time and historical information on application usage, infrastructure utilization, system logs, network statistics like flows, latencies, jitter, etc. In addition, the user can employ REST APIs and modern techniques like Hadoop to write custom applications for reporting and/or infrastructure automation

Contrail Use Cases

Contrail provides both service providers and enterprises with a dynamic and scalable network architecture that helps to provision applications in a matter of seconds.

Enterprises and service providers can use Contrail to:

- **Deploy private or public clouds**
  - Provide multitenancy with complete isolation and full role-based access control (RBAC) capabilities
  - Automate for rapid network provisioning and services like routing and load balancing
  - Self-service for application developers and DevOps teams
- **Deploy hybrid cloud and create VPC** in a service provider public cloud
  - Move workloads seamlessly between private and public cloud
  - API compatibility with third-party cloud providers like AWS
- **Apply NFV and service chaining** to any network and security service
  - Service orchestration of any Juniper or third-party network and security service (physical or virtual)
  - Managed network services like security, guest access, etc. for service provider IP-VPN customers
  - Virtualized Evolved Packet Core for consolidation of services like deep inspection (DI), security, proxies, caching,

Specifications

System Recommendations and Operating Environment

- Orchestration systems: OpenStack, CloudStack
- Hardware: 64-bit dual x86 processor, minimum memory 12 GB RAM
- Storage: 30 GB Serial Advanced Technology Advancement (SATA), Serial Attached SCSI (SAS), or solid-state drive (SSD); Volume storage: 2 disks with 2 TB SATA
- Network: 1 GB interface card (1)
- OS: Linux OS (CentOS, RHEL 6.4, Ubuntu 13.x)

Ordering Information

What to Buy

This product adheres to the Juniper Software Advantage pricing model, thus please be advised of the following items that constitute an order:

- Select a software license based on the number of sockets required. The license is either subscription (fixed term) or perpetual (unlimited term).
  - **A subscription software license includes** Juniper Care Software Advantage, entitling you to software updates and upgrades, 24x7 remote technical support, and online support.
  - **A perpetual software license excludes** Juniper Care Software Advantage; the latter must be purchased.
- If your order includes a hardware product/platform, select a hardware license based on your networking, connectivity, and/or security requirements (e.g., interface options, I/O, services). You may need to purchase additional licenses in support of the base hardware license (e.g., power cables, network interface cards).

- If this is a virtual appliance/software product, you would not buy any hardware license from Juniper, but, instead, procure the hardware elsewhere. For information on supported hypervisor(s) and virtual machine (VM) requirements, please refer to the technical documentation for this product on our website (**www.juniper.net**) under the support section.

Juniper Networks products are sold directly as well as through Juniper partners and resellers. For more information on the Juniper Software Advantage business model, please visit **www.juniper.net/us/en/products-services/sdn/contrail/**

For information on how to buy, please visit: **www.juniper.net/us/en/how-to-buy**

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at **www.juniper.net**.

To purchase Juniper Networks solutions, please contact your Juniper Networks representative at 1-866-298-6428 or authorized reseller.

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