

# NFV Solutions for the Telco Cloud

Leveraging NFV to Create a More Agile, Customized Subscriber Experience

## Challenge

Traditional methods for constructing network infrastructure—centralized network functions delivered as physical appliances—are inhibiting service providers' ability to grow cost effectively and react quickly to changing market, customer, and network requirements.

## Solution

Juniper Networks NFV solution features Contrail Cloud as a turnkey platform for building open, automated, service-ready Telco clouds leveraging industry-leading virtual network functions and programmable NFV Infrastructure (NFVI).

## Benefits

- Ability to dynamically adapt and geographically distribute capabilities based on performance and customer requirements.
- Flexible, cloud-delivered solution enables customizations to meet service needs while enabling fast, simple delivery models.
- Host of virtual and physical security solutions protect business-critical Telco cloud applications and services from evolving threats.
- Analytics engine monitors the health and performance of virtualized networks.
- Seamlessly integrates existing physical network elements with virtualized network elements.

Network service providers—those with access networks like DSL, cable, or mobile—continue to face a dual threat: rising operating expenses associated with explosive bandwidth growth and declining revenues driven by commoditization. A true Telco cloud, featuring automation and dynamic scalability, becomes a comprehensive delivery platform enabling network service providers to offer differentiated services that solve their customer's business demands.

## The Challenge

In October 2012, 13 of the world's leading service providers co-authored a seminal whitepaper, "Network Functions Virtualisation (NFV)," in which they issued a call to action to their vendors and suppliers.

Rather than rely on traditional monolithic systems, the paper describes how service providers wanted to adopt virtualization techniques and properties as the fundamental building blocks of their networks.

With this white paper, these network service providers effectively laid out a vision for the Telco cloud as a distributed, virtualized platform that could support a range of network services.

A Telco cloud is:

- Automated**—Built as a series of virtualized objects, a Telco cloud is automated and orchestrated to deliver network functions and capacity on demand. Rather than the typical three-plus months required to order, install, and configure a traditional network appliance, a Telco cloud can instantiate virtualized network elements on industry-standard, carrier-grade compute platforms in a matter of minutes.
- Scalable**—A Telco cloud supports scale-up with some of the highest performance routing and switching platforms available today, seamlessly combined with virtualized network scalability that leverages cloud principles of scale-up/scale-out to adaptively deliver capacity on demand. A Telco cloud can also scale down by employing smaller, often virtualized network objects that can be pushed closer to the subscriber edge to improve network responsiveness and deliver an improved customer experience.
- Flexible**—Traditionally, installing a new network function—particularly to generate new revenues—faced a restrictive CapEx/OpEx/time hurdle, limiting new functionality. With a Telco cloud, the network itself becomes a flexible service creation platform that enables new capabilities to be instantiated as virtual objects into the network with cloud network automation—all of which can be evaluated in a matter of minutes and at a fraction of the cost and complexity of previous manual methods.

*"The key benefit of this [NFV] transformation is that it will allow AT&T and our customers to share a common pool of resources to compose services on demand, with elasticity, and driven with orchestration techniques similar to those seen managing workloads in cloud data centers."*

- AT&T Domain 2.0 Vision Whitepaper, Nov. 13, 2013



With automation, scalability, and a flexible platform for creating and delivering new services, network service providers can begin to match the agility of cloud service providers. This is the true power of the Telco cloud.

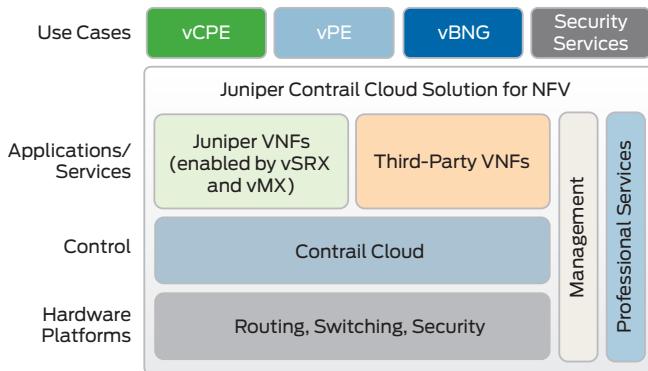


Figure 1: Juniper's NFV solution for the Telco cloud

## The Juniper Networks Architecture for Telco Cloud

Juniper Networks provides a complete end-to-end product portfolio for building NFV solutions for the Telco cloud. This solution consists of three main components: NFV Infrastructure (NFVI), a cloud network automation platform, and network applications and services

### Hardware Platforms

Juniper offers a wide range of industry-leading routing, switching, and security products for building a carrier-grade, programmable NFVI that delivers services from the Telco cloud.

The Juniper Networks® MX Series 3D Universal Edge Routers provide the ideal gateway for Telco cloud architectures. Each NFV cloud architecture or Telco cloud data center must interface with the transport network; the MX Series routers' ability to bridge physical and virtual environments is unparalleled.

With support for Multiprotocol BGP (MBGP), dynamic tunnels with MPLS over generic routing encapsulation (GRE), and Virtual Extensible LAN (VxLAN) encapsulation, as well as virtual routing and forwarding (VRF) tables and Ethernet VPNs (E-VPNs), MX Series routers can extend networking into the data center. Contrail Networking provides the NFV virtual infrastructure manager (VIM) which interfaces with VRFs to instantiate downstream service chains.

As a gateway device, the MX Series routers also support network services such as carrier-grade NAT (CGNAT), firewalling, load balancing, and deep packet inspection/traffic detection-steering function (DPI/TDSF) as embedded capabilities. DPI/TDSF enables identification of individual subscribers, device types, applications, and locations.

The MX Series also supports interfaces to a range of existing policy engines, including Policy and Charging Rules Function (PCRF) and authentication, authorization, and accounting

(AAA). The MX Series interfaces with the online charging system (OCS) within a mobile network; combined with DPI/TDSF, the MX Series also performs a Policy Control Enforcement Function (PCEF) to direct traffic on a per-flow basis into customized service chains.

Additionally, Juniper Networks EX Series and QFX Series switches deliver carrier-class, high-density, and high-performance platforms ideal for scaling the Telco cloud data center. Multilayer, multi-domain security is critical for a Telco cloud deployment, and Juniper Networks SRX Series Services Gateways for the high end have the capacity and scalability to protect the largest data centers. In addition, Juniper's virtualized security object, the vSRX, can be deployed as a virtualized network function to provide protection between network elements.

### Cloud Platform

Juniper Networks Contrail Cloud is an integrated Telco cloud platform built to run high-performance NFV with always-on reliability, allowing service providers to deliver innovative services with greater agility. The platform works seamlessly with supporting hardware to intelligently orchestrate and automate the provisioning, operation, and management of a wide range of virtualized network functions (VNFs) and physical network functions (PNFs) from Juniper as well as its ecosystem of partners.

Empowering service providers to deliver services with uncompromised cloud-grade performance and reliability, the Contrail Cloud platform is European Telecommunications Standardization Institute (ETSI) NFV-compatible and seamlessly interoperates with other standards-based solutions. With Contrail Cloud, service providers can quickly and easily build a dynamic and elastic cloud foundation based on commercial off-the-shelf (COTS) servers, whether in a distributed fashion in central office locations or in a centralized fashion in data centers. Hardware resources are abstracted, pooled, and presented to hosted network functions, where they are allocated on demand. Service providers can customize service chains and communicate them through Contrail Cloud using a set of high-level policies.

Contrail Cloud components are pre-tested and pre-integrated to guarantee interoperability, stability, and high performance. The platform is based on open source technologies such as OpenStack, OpenContrail, and Ceph with standard APIs, providing 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 compliant 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. This feature allows Juniper Professional Services teams to build and operate the entire Telco

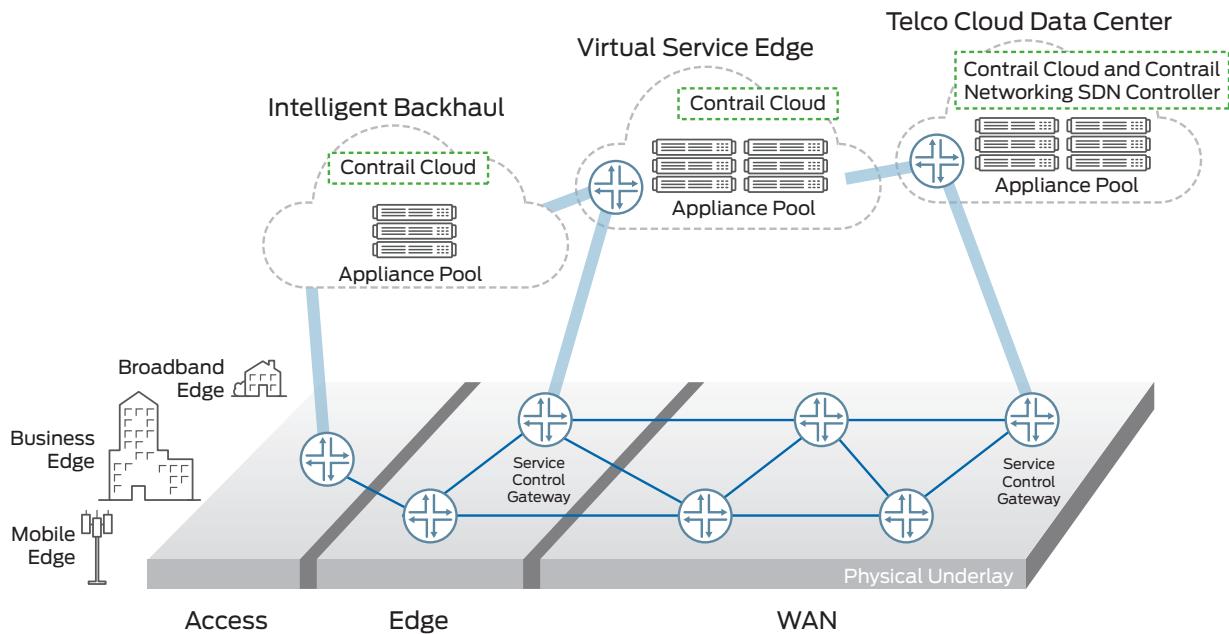


Figure 2: Distributed Telco cloud

cloud for NFV at the customer site, providing follow-on operational services and continuous remote managed services as requested to minimize downtime and guarantee SLA compliance.

### Applications and Services

Juniper provides several security-focused virtualized network functions (VNFs) such as the vSRX, a virtual application firewall that can be used to provide UTM services directly to consumers and enterprises, as well as protect applications and VNFs in the Telco cloud.

Additionally, network services like PE functions, which traditionally run on physical hardware, can now take advantage of a virtualized platform such as the Juniper Networks vMX, which delivers equivalent features as the MX Series hardware. The result: customers now have the freedom of choose between the agile scalability enabled by the virtual platform and the high performance offered by the physical devices.

Equally important, Juniper's open NFV platform supports both virtualized and physical network functions from third-party providers. With support for KVM, ESX, and Xen, Juniper solutions support a broad range of hypervisors; in fact, Juniper has tested/validated VNFs with vendors such as Checkpoint, Sandvine, Akamai, and Silverpeak. For a complete list, please visit the [Juniper VNF Partners](#) web page.

### Management

Juniper Networks Junos® Space Network Management Platform provides an open, programmable framework for managing both the physical and virtual network elements of a Telco cloud.

Junos Space provides standard fault, configuration, accounting,

performance, and security (FCAPS) for hardware elements. As a platform, it also supports applications developed to manage the configuration and provisioning of virtual network elements like Juniper's vSRX and vMX.

### Distributed Telco Cloud

Leveraging Juniper's leadership with network innovation in NFV, service providers can geographically distribute capabilities based on performance and customer requirements. Traditional Telco clouds are deployed in large, centralized data centers; however, while it is true that many network functions benefit from a centralized deployment as the number of subscribers grows and connections evolve into "things" rather than people, there emerges a need to push functionality closer to the subscriber edge. Caching, security, and even subscriber access can benefit from being deployed in smaller, more widely disbursed locations.

### Deployment and Operational Services

Professional services, available from Juniper as well as from selected partners, helps customers accelerate and optimize the use of these solution components to achieve a complete service automation solution. Customers can leverage planning services to assess and design a cloud that eases the transition to NFV; then, moving from planning to implementation, Juniper Professional Services will help users build, optimize and protect their Telco cloud architecture. Shifting to production, Juniper also provides the support and maintenance required to keep the cloud running smoothly. Education Services from Juniper help your staff better understand how to use the technologies incorporated in your NFV solution.

## Features and Benefits of Juniper's Telco Cloud

Juniper's Telco cloud offers a secure, policy-driven carrier-grade solution:

**Secure:** Juniper's Telco cloud architecture offers unmatched security—both horizontally and vertically. Juniper's high-end SRX Series Services Gateways provide front-end security to Telco cloud data centers around the world. Combined with Juniper's AppSecure and unified threat management (UTM) capabilities, the SRX Series provides an effective barrier between the outside world and sensitive Telco cloud applications and services.

Within the data center, Juniper provides multiple layers of security. By virtualizing specific objects with vSRX, service providers can tailor security to specific network elements. For instance, it's possible to wrap the DNS server in a UTM system with the vSRX to prevent targeted attacks, or create a virtual firewall with a custom policy specifically for the IP Multimedia Subsystem/Telephony Application Server (IMS/TAS).

Traditional cloud architectures rely on relatively unsecure VLANs, where rogue or compromised network elements can impact other workloads. By providing IP VPN connectivity between virtual objects, Contrail ensures that workloads and virtual machines (VMs) can only communicate with predetermined network elements, resulting in a highly secure virtualized network.

**Policy Driven:** Juniper leverages existing policy engines combined with powerful DPI capabilities to dynamically steer traffic to the appropriate service chains, providing maximum control and flexibility.

**Carrier Grade:** The new Telco cloud must meet the responsiveness and uptime requirements of traditional Telco deployments. Built from Network Equipment Building System (NEBS)-compliant x86 compute resources and a fault-tolerant switching architecture, Juniper's Telco cloud is designed with integrated physical and virtual reliability. Contrail's analytics engine monitors the health and performance of virtualized network objects, using native load balancing to quickly identify, isolate, and restart or repair unresponsive nodes.

## Use Cases Delivered with Telco Cloud

While service providers are excited about the prospects of a Telco cloud architecture, they realize it must address specific network functions or business objectives. The following use cases describe specific areas where a Juniper-based Telco cloud can add agility to optimize operating costs and drive new revenue streams.

While these use cases appear to be nearly identical architecturally, the virtualized network functions combined with the system—as well as the physical location of the services delivered—make them distinctly different.

## Virtual CPE

One of the most anticipated Telco cloud applications, virtual customer premises equipment (vCPE) enables enterprise and business service providers to offer virtualized versions of the functions customers are buying as appliances today. Rather than deploying a rack of equipment at the customer premise, the network service provider deploys virtualized versions of the same services as VMs running in the service provider's network. The ability to automate the ordering, configuration, and deployment of these network functions through NFV/SDN technology will transform the economics of network-based service delivery. Suddenly, service providers will be able to deliver services and agility similar to that of cloud providers.

## Virtualized Security Services

While security is critical for enterprises, it can be a high-maintenance and labor-intensive endeavor when deployed on hardware appliances distributed across many locations. By delivering these services in a highly customizable cloud model that can be centrally managed with automation, security services will be far more effective at thwarting threats, not to mention easier to maintain to defend against rapidly evolving threats. With the vSRX as the platform for virtualized security services, customers can develop a large suite of services including vFW, vIPS, virtual content/web filtering, virtual anti-virus and virtual AppSecure, all of which can be customized to form a UTM model that meets customer and application requirements.

## Virtualized Service Edge

While mobile service providers have an acute need for a virtualized service edge (Gi-LAN), all service providers (cable, fixed/DSL, enterprise) have a complex configuration of appliances/network functions that optimize network traffic as well as deliver services. Service providers need the ability to transform these appliance-based service chains into virtualized pools of applications that can be scaled up or out as virtualized network functions.

Initially, the virtualized service edge delivers OpEx savings, but this Telco cloud location is also ideally suited as the service delivery complex for new and innovative services. As service providers grow more comfortable with the agility afforded a virtualized service edge, they will begin to embrace the introduction of new VNFs that deliver an improved customer experience or other value-added capability.

Juniper's virtualized service edge is available today with existing VNFs, including vSRX and third-party partnerships.

## Intelligent Access

For network service providers, the access network is often viewed as a cost center—a necessary expense for bringing traffic from subscribers to the service edge. However, NFV/SDN technology and changing customer/technology requirements are pushing traditional data center services close to the subscriber edge.

Mobile service providers are beginning to expect access networking products to be extensions of the Telco cloud, with the ability to support virtualized network functions at the cell site or the first hop behind the cell site. It's clear that capabilities such as DPI, security, and caching can operate closer to the subscriber and ultimately deliver a better customer experience.

Juniper's access products support the delivery of VNFs close to the subscriber edge today.

### Third Party VNFs

Juniper's open NFV platform provides a foundation to easily evolve services in the Telco cloud. By leveraging best-in-class third-party VNFs to build virtualized solutions for evolved packet core, CDN, WAN optimization, IMS and SBC, among others, providing unlimited possibilities for developing and delivering new services with a partner committed to open standards, open APIs and open source.

## Summary—Juniper Unlocks the True Power of the Telco Cloud

The evolution from static, appliance-based network elements to a more agile, virtualized Telco cloud environment will dramatically impact the ability of service providers to drive down costs while establishing a platform for new service innovation.

Juniper Networks delivers a wide range of industry-leading routing, switching, and security products that provide a solid foundation for building a truly agile Telco cloud architecture. Juniper is uniquely suited to meet the demands of distributed

deployments, with an architecture that scales down to support small, localized configurations and scales up to address the needs of high-capacity services. Contrail, Juniper's cloud network automation platform, greatly simplifies service creation and management of virtual overlay networks; rather than creating disparate islands of network functions, Contrail automates the links between distributed sites, enabling them to function as one Telco cloud. If a remote cloud becomes overloaded, more capacity can be instantiated in the central cloud to seamlessly boost capacity throughout the network.

With automation, scalability, and a flexible platform for creating and delivering new services, network service providers can exceed the agility of cloud service providers. This is the true power of the Telco cloud enabled with NFV.

### Next Steps

For more information about Juniper's NFV solution for the Telco Cloud, please visit [www.juniper.net/us/en/solutions/nfv](http://www.juniper.net/us/en/solutions/nfv) or contact your local Juniper Networks representative.

## About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at [Juniper Networks](http://Juniper Networks) or connect with Juniper on [Twitter](http://Twitter) and [Facebook](http://Facebook).

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