THE TELCO CLOUD
Leveraging NFV to Create a More Agile, Customized Subscriber Experience

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 match the agility of cloud service providers.

The Challenge
In October 2012, thirteen 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 want 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 six-plus months required to order, install, and configure a traditional network appliance, a Telco cloud can instantiate virtualized network elements on industry-standard, Telco-grade compute platforms in a matter of hours.

• Scalable—A Telco cloud supports scale-up, with some of the highest performance routing and switching platforms available today, as well as virtualized network scalability that leverages cloud principles of scale-up/scale-out to meet the tremendous demand for capacity. 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 CapEx/OpEx/time hurdle, which ensured that only a handful of new functionality was ever tried. With a Telco cloud, the network itself becomes a flexible platform that enables new services to be instantiated as virtual objects that are dropped into the network with SDN technology, to be evaluated in a matter of hours and at a fraction of the cost and complexity of previous 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.

Contrail Cloud: The Juniper Networks Telco Cloud Solution

Contrail Cloud for NFV is Juniper’s solution for enabling the Telco cloud, consists of three main components: a hardware reference architecture, the Contrail Cloud software components, and network applications and services.

Hardware Platforms

Juniper’s wide range of industry-leading routing, switching, and security products provide a solid Telco cloud platform foundation.

The Juniper Networks® MX Series 3D Universal Edge Routers provide the ideal Service Control Gateway (SG) for Telco cloud architecture. Each cloud architecture (or NFV system or Telco cloud data center) must interface with the physical transport network, and the MX Series’ ability to bridge the physical and virtual network 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 can extend networking into the data center. Juniper Contrail Networking provides SDN control to VRFs to instantiate downstream service chains interfaces to 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 to the online charging system (OCS) within a mobile network; combined with DPI/TDSF, the MX Series performs a Policy Control Enforcement Function (PCEF), directing traffic on a per-flow basis into customized service chains.

Additionally, Juniper Networks EX Series Ethernet Switches and QFX Series switches deliver carrier-class, high-density, and high-performance platforms that are ideal for scaling the Telco cloud.

Contrail Cloud Platform Components

Contrail Cloud is a turnkey software system for creating, deploying and managing an ETSI-compatible, OpenStack-based NFV Telco cloud. The Contrail Cloud product provides cloud management, network virtualization and automation, and network management functionality through an open, modular and scale-out software architecture.

Contrail Cloud software includes an OpenStack cloud management platform, the Contrail Networking SDN Controller, and the Junos Space Network Management system.

Contrail Networking SDN Controller delivers:

• Dynamic service chaining through programmable, policy-driven network virtualization.
• Automated resource provisioning with OpenStack, Contrail Networking and service management components.
• Full life-cycle management of network functions including instantiation, updates, query, scaling and termination.
• High availability through built-in software deployment redundancy, providing non-stop cloud operations.
• Rich, prescriptive analytics powered by a high-speed data collection engine enabling granular infrastructure telemetry.

Applications and Services

Juniper provides several security-focused virtualized network functions (VNFs) such as Firefly Perimeter. Juniper’s application firewall, Firefly Perimeter can be used to protect between VNFs—for example, between evolved packet core (EPC) and IP Multimedia Subsystem (IMS) functions—as well as to provide a virtualized firewall service direct to consumers and small business.

Likewise, the new DDoS Secure appliance can secure critical network functions such as domain name system (DNS) and can be deployed as a physical or virtual application.

Most importantly, Juniper supports both virtualized and physical network functions from third-party providers. With support for KVM, ESX, and Xen, Juniper’s Telco cloud supports a broad range of hypervisors. Juniper has tested/validated with Checkpoint, Sandvine, Akamai, and Guavas.

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. And as a platform, it supports applications developed to manage the configuration and provisioning of virtual network elements like Firefly Perimeter.

Distribution

Beyond physical components, one of the key elements of Juniper’s Telco cloud architecture is the ability to 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 small, more disbursed locations.

**Features and Benefits of Juniper’s Telco Cloud**

Juniper’s Contrail Cloud for NFV is a secure, policy-driven, Telco-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 DDoS Secure 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 (Firefly Perimeter, DDoS Secure, and others), service providers can tailor security to specific network elements. For instance, it’s possible to wrap the DNS server in a high-performance DDoS Secure engine to prevent targeted attacks, or to 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 Networking 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.

**Telco 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. The Contrail Cloud 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.

**Telco Cloud Use Cases**

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 Contrail Cloud-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.

**Virtualized 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 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 Firefly 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.

Evolved Packet Core
The evolved packet core (EPC) is the heart of LTE mobile networks, encompassing subscriber access, mobility management, and billing/accounting. Virtualizing the functions of an EPC into a Telco cloud gives mobile service providers the ability to quickly scale up specific network functions. It also enables a more distributed mobile access network, pushing subscriber termination/access deeper into the network. Finally, the virtualized EPC, combined with the rise in enterprise mobile services, means mobile service providers can create scaled-down, dedicated EPCs for specific customer types or enterprise/machine-to-machine (M2M) applications.

Today, Juniper delivers a virtualized EPC with its Telco cloud architecture and EPC software from Nokia.

IMS/TAS/VoIP/VoLTE
Service providers are actively migrating foundational voice/messaging services to next-generation VoIP. Rather than deploying these new systems as monolithic appliances, service providers are expecting IMS/TAS/VoIP/VoLTE services to be delivered as virtualized objects that are part of the Telco cloud architecture.

Today, Juniper delivers a virtualized IMS/TAS/VoLTE solution with its Telco cloud architecture and application software from Nokia. Juniper has also partnered with Sonus, a leading VoIP/Session Initiation Protocol (SIP) company, to explore wireline and enterprise VoIP solutions.

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 a distributed deployment and its architecture scales down to support smaller, localized configurations. Contrail Networking greatly simplifies the creation and management of virtual overlay networks. Rather than creating disparate islands of network functions, Contrail Networking easily links these mini Telco clouds, enabling them to communicate seamlessly. 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 begin to match the agility of cloud service providers. This is the true power of the Telco cloud.

Next Steps
For more information about Juniper’s Telco cloud solution, please visit www.juniper.net or contact your local Juniper Networks representative.

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.