DEFINING THE EDGE

An Essential Part of 5G Transformation

Challenge

Service providers have invested billions in edge infrastructure. While proximity to users should be a huge competitive advantage when delivering rich, low-latency applications, this high-value asset remains largely incapable of delivering compelling interactive applications like IoT, connected cars, and VR/AR.

Solution

Edge cloud starts with a small footprint optimized for low space and power constraints without sacrificing the functionalities of a multitenant secure cloud. Edge cloud balances the need for compute, service delivery, orchestration, intelligence, and security with the economics of 5G.

Benefits

- *Small footprint optimized for space/power constraints without sacrificing functionality*
- *Multitenant secure cloud that shares infrastructure applications and high-value customer services*
- *Centralized policy management with distributed enforcement at every endpoint*
- *Multilayer security with integrated visibility, telemetry, and policy enforcement*
- *Commitment to open source and interoperability between vendors with open APIs*

Traditionally, good performance of the mobile transport network could be maintained by simply overprovisioning the network equipment. However, with both the ongoing growth of mobile broadband usage and the new diverse applications enabled with 5G, transport networks of the future will need to become more intelligent, predictive, and agile if they are to keep up with ever-growing network traffic requirements and complexity. Also, transport networks and the radio networks they support must become more tightly integrated and complementary. New transport technologies and new approaches for designing transport networks will be necessary if service providers are going to succeed in building and monetizing end-to-end 5G networks.

The Challenge

Early edge computing efforts were focused on mobile infrastructure use cases, with specialized hardware that was tightly coupled with the mobile network to enable discrete services. With the massive growth in IoT, connected cars, interactive games, virtual reality/augmented reality (VR/AR), and similar applications, the edge needs greater agility, scalability, and flexibility.

Greater flexibility and lower cost of implementation enables providers to deliver on these use cases and monetize the edge footprint. Much like traditional hyper-converged cloud infrastructure, distributed edge clouds can leverage OpenStack and Kubernetes combined with highly scalable SDN platforms, as well as the same heightened level of integrated automation, virtualization, programmability, and security. The challenge is enabling all of this with a light footprint that fits within the edge's confined space/power envelope.

Edge cloud is more than an exercise in network architecture. There are clear business implications for service providers who need to include the edge as part of their overall 5G strategy. At the same time, many service providers are seeing a massive shift as their enterprise customers transition to the cloud. These two trends reinforce why virtualizing and operating an edge cloud will be fundamental to service provider transformation. When service providers choose to embrace the edge cloud, they will have the ability to drive data growth at a lower level investment and with a higher probability of revenue from their internal services, as well as hosted/managed services sold to the enterprise.

The Juniper Networks Contrail Edge Cloud Solution

Juniper® Contrail® Edge Cloud is a software-defined, virtualized solution that leverages a very small footprint optimized for space and power-constrained edge deployments without sacrificing the rich functionalities of a multitenant secure cloud. Contrail Edge Cloud is an agile SDN orchestrator for the edge that leverages Juniper Contrail Networking™, OpenStack, Kubernetes, Juniper Networks vSRX Virtual Firewall and cSRX Container Firewall, and Juniper Contrail

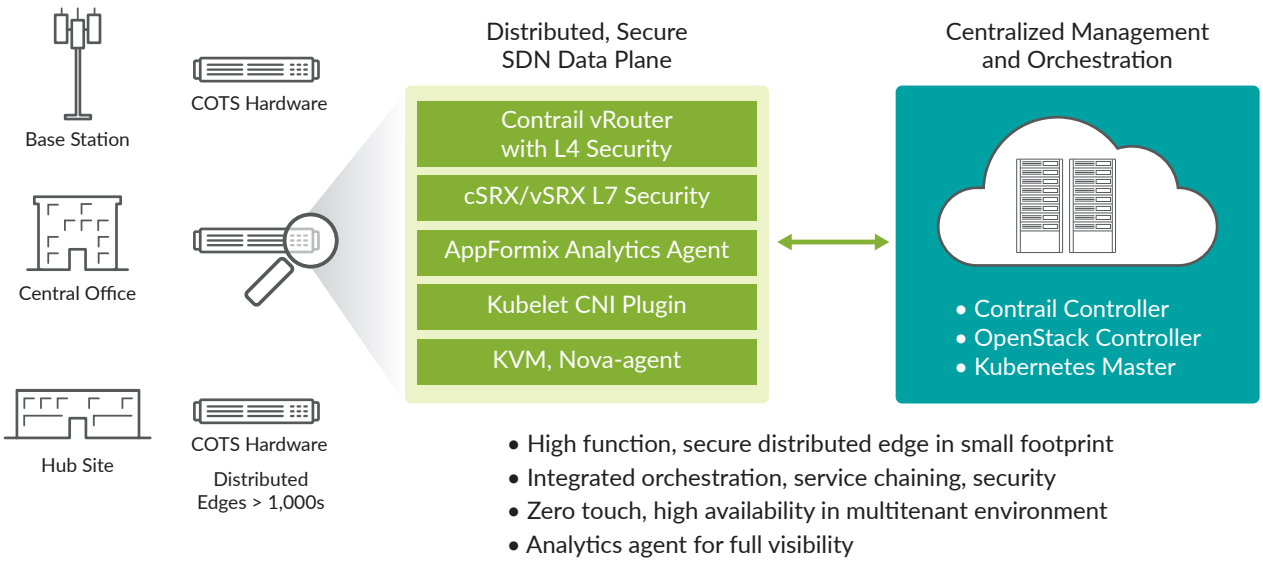

Figure 1: Contrail Edge Cloud extends a full suite of orchestration, automation, security, and analytics to deploy dynamic consumer and enterprise services in a cost and resource efficient manner.

Security, as well as Juniper AppFormix® for analytics. It features several industry-leading innovations that few production-grade edge solutions can match, such as the SDN capabilities of Contrail Networking. Contrail Security augments Kubernetes to provide advanced container networking, security and service chaining, and flow analytics.

With improved service delivery at the edge, service providers can deploy dynamic, low-latency applications closer to their customers, delivering the right amount of "stickiness" for retail subscribers and expanding new business offerings for their enterprise customers. Contrail Edge Cloud also delivers integrated security and analytics to help keep the entire network safe and reliable. Contrail Edge Cloud is an innovative offering for service providers who want faster, more agile, automated service delivery. With Contrail Edge Cloud, service providers of all types can unleash the enormous potential of the edge as they transition their networks to a secure and automated distributed cloud.

Contrail Edge Cloud allows service providers to:

- Leverage a very small footprint optimized for space/power-constrained edge deployments without sacrificing the rich functionalities of a multitenant secure cloud.
- Abstract and virtualize compute, storage, and networking resources efficiently and cost-effectively in space/power-constrained locations, such as base stations, hub sites, switching sites, and similar distributed infrastructure.
- Extend physical, virtual, and container network functions to edge locations for maximum flexibility.
- Deliver overlay network slicing by providing Layer 2 and Layer 3 multitenant networking across vastly distributed edge environments.
- Automate service provisioning and delivery with limited operational involvement for unstaffed edge locations.
- Enforce distributed security, leveraging stateful firewall enforcement with centralized policy management using Contrail Security to ensure end-to-end secure connections all the way to the edge. For added flexibility, next-generation security services can be delivered using cSRX containerized or vSRX virtual firewalls, depending upon application needs and customer security posture.
- Implement a single unified policy and enforcement mechanism from end to end, applying application security from Layer 2 to Layer 7.
- Leverage machine learning to monitor critical edge network performance, providing closed-loop remediation of deficiencies and issues.

Features and Benefits

- **Zero-touch operations:** Minimizes need for trained field support with highly fault-tolerant, robust design
- **High availability:** Provides high availability for multitenant traffic via controller clusters and health monitoring, with built-in load balancing, management, and orchestration elasticity to allow for rapid failure detection and recovery
- **Centralized orchestration**: Enables operators to define the policy once and apply it everywhere, monitoring all physical and logical elements (servers, switches, VMs, virtual networks, containers)
- **Integrated security**: Includes microsegmentation, encryption, Layer 4 firewall (Contrail Security), and Layer 7 firewall (cSRX)
- **Network intelligence**: Adapts to variable resource and connectivity restraints by spinning up virtual machines (VMs) and containers within the distributed edge cloud
- **Deployment flexibility**: Operates on standard x86 servers; centralized control plane resides in the data center

Solution Components

- **OpenStack with Edge Compute**: Orchestration of remote compute platforms providing Infrastructure as a Service (IaaS) automation for VMs and Kubernetes cluster hosting. This enables service providers to deliver a seamless fabric between VMs and container hosts using a single SDN solution. Nested SDN support optimizes K8S-on-OpenStack deployments for added performance and optimized service delivery.
- **Kubernetes:** Orchestration for containerized applications. Kubernetes and containerized workloads allow service providers to run their platforms denser and be more immediately responsive to service provisioning and introductions.
- **Contrail Networking**: End-to-end networking policy and control for any cloud, any workload, and any deployment from a single user interface. Contrail Networking also translates abstract workflows into specific policies, simplifying the orchestration of virtual overlay connectivity across all environments. A fabric management capability automates policies and life-cycle management of data center fabrics, enabling service providers to orchestrate network devices and bare-metal servers with a single solution. It also enables the application and control of end-to-end policies across physical and virtual environments. Contrail Networking is extended to the edge via Contrail vRouter remote compute, providing connectivity and service chaining for VMs and containers.
- **Contrail Security**: Visibility, telemetry, network policy enforcement, adaptive firewall policy generation, and a tag-based ability to enforce security policies across Kubernetes and OpenStack. Service providers expect to deploy a mix of VMs and containers, mandating a single unified security policy and enforcement mechanism.
- **Ceph**: 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.
- **AppFormix Analytics**: Machine learning-based performance and health monitoring, providing health and service insight into workloads, deployment health, and supporting infrastructure.
- **cSRX/vSRX**: Lightweight security enforcement point delivering AppSecure Layer 7 inspection and enforcement, and unified threat management in a container form factor. Provides core firewall, application inspection, full next-generation capabilities, and automated life-cycle management for containerized deployments. Can be deployed as part of a service function chain or on a per-application basis.

Summary—Giving Service Providers the Edge

With improved service delivery at the edge, service providers can deploy dynamic, low-latency services closer to their customers, delivering the right amount of "stickiness" for retail subscribers, and expanding new business services for their enterprise customers. Contrail Edge Cloud is an innovative offering for service providers who want faster, more agile, automated service delivery. With this solution, service providers of all types can now unleash the enormous potential of the edge as they transform their networks to a secure, automated distributed cloud.

Next Steps

For more information, please contact your Juniper representative, or go to www.juniper.net.

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
Fax: +1.408.745.2100
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
Fax: +31.0.207.125.701

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