

Solution Brief Broadband Edge

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This document describes Juniper Network's streamlined Broadband Edge architecture, designed to improve service delivery and reduce operational expenses. The Juniper Networks Broadband Edge architecture helps service providers increase network and service innovation through an efficient, consolidated edge network architecture that:

- Enables service differentiation using a comprehensive, tested solution.
- Delivers superior economics and greater operational efficiency to help improve operating margins.
- Provides service agility and innovation with faster time to market and time to revenue.

Overview

Broadband service providers are enabling a culture where everything is connected and our business and social lives are managed from a digital device. This trend toward universal connectivity is stimulating rapid network expansion, driven by subscriber growth, high-speed access networks, and bandwidth-hungry, media-rich applications such as online video.

At the same time, network operators want to increase the average margin per user in an environment that demands both competitive pricing and rapid new service introduction. Unfortunately, the traditional broadband edge network does not support this service agility or velocity.

Modern service-centric edge network architectures improve network economics, service agility, and service velocity. This creates the opportunity for operators to consolidate their separate business service, carrier Ethernet service, mobile backhaul, aggregation, and broadband edge networks into a single, scalable network edge that supports all of those functions.

Understanding the Challenge

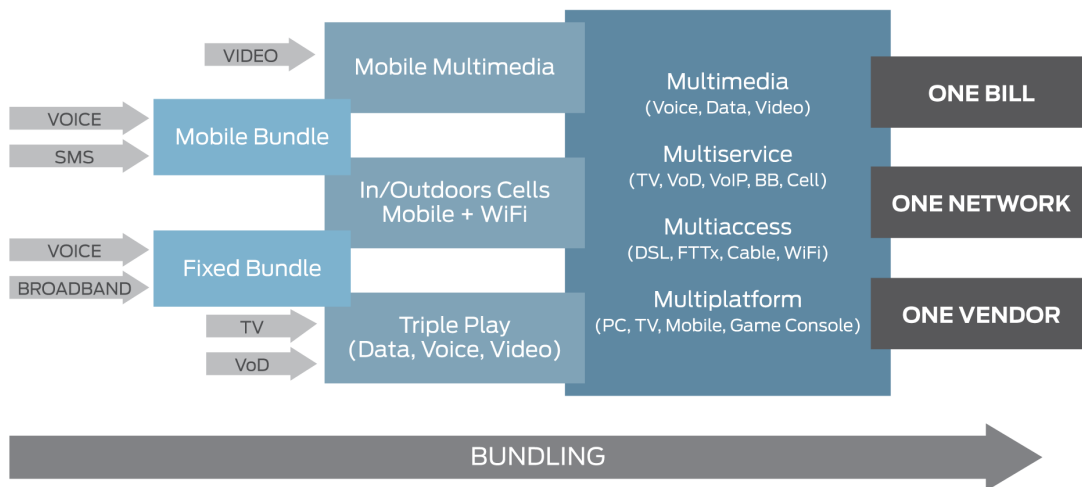
As a result of massive subscriber growth, broadband network operators worldwide are realizing increased revenue. This revenue comes at a cost, however, as service providers are experiencing margin erosion due to expensive network build-outs and service introductions, as well as increased competition.

On top of these challenges, operational expenses are rising, because legacy edge architectures cannot efficiently handle this growth. Some of the structural problems of legacy broadband edge architectures include lack of automation and complex provisioning processes for subscribers and services, the inability to efficiently scale, and the use of single service network elements.

Industry trends indicate that consumers prefer a bundled voice, video, and data service package and that they prefer getting a single bill from a trusted operator that can supply all of their service demands.

Figure 1 on page 2 illustrates how this preference has developed. Under these circumstances, broadband network operators have evolved from connectivity providers to all-inclusive solution providers. This business model evolution requires a multiplay-capable network that supports Internet access, voice, data, and video-on-demand services, as well as broadcast services, and all with operational simplicity that allows faster, efficient service introduction without compromising reliability. The adoption of multiplay services at scale has faced a wide array of technical barriers that have resulted in long deployment cycles and expensive roll-outs for new services.

Figure 1: The Evolution of Residential Broadband Multiplay



The Juniper Networks Broadband Edge Architecture

The Juniper Networks Broadband Edge architecture effectively addresses the challenges that exist in legacy broadband edge networks. It introduces a single point of service provisioning, where the operator can maintain existing service profiles and add new service profiles easily, accelerating time to market and time to revenue for new services and service modifications. The Juniper Networks Broadband Edge architecture also provides single-point bandwidth upgrade across multiple carrier services, and a proven, scalable system architecture that eliminates the *new service equals new element* requirements of legacy networks and removes the need for forklift upgrades. By deploying the Juniper Networks Broadband Edge architecture, network operators can consolidate multiple customer segments simultaneously. The architecture also provides service agility and prepares the network for future technology introductions, such as service virtualization and software-defined networking.

This new architecture is built upon the Juniper Networks MX Series 3D Universal Edge Router portfolio. The MX Series 3D Universal Edge Router portfolio provides a true universal edge platform capable of supporting all business, mobile, and residential services. The solution features full redundancy at the network edge, with support for nonstop active routing (NSR), unified in-service software upgrades (unified ISSU), and Virtual Chassis (VC):

- NSR allows a routing platform with redundant Routing Engines to preserve routing information on the backup Routing Engine and switch over from the primary Routing Engine to the backup Routing Engine without alerting peer nodes that a change has occurred.
- Unified ISSU enables upgrading between two different Junos OS releases with no disruption on the control plane and with minimal disruption of traffic.
- VC allows interconnected devices to function as one logical device, resulting in easier management and stateful redundancy.

These components enable an always available, reliable subscriber edge, with the *always on* delivery of a high-quality subscriber experience.

The final challenge addressed by the Juniper Networks Broadband Edge architecture is the introduction and implementation of new network service offerings. This architecture is optimized for new service introductions through the use of dynamic service profiles, router integrated services, and Network Function Virtualization (NFV). This architecture also supports the introduction of services at various layers throughout the network using a distributed services model (services are delivered as close to the subscriber edge as possible) or using centralized service chaining (services are delivered at consolidated points on the network). Services potentially supported by this model include content caching, HTTP proxy and redirection, network monitoring, media transcoding, and business connectivity services (IPsec). The solution is designed to enable service agility, allowing the introduction of new, revenue-generating services quickly, and reducing time to revenue.

The Benefit: Generate New Revenue While Reducing Operational Expense and Overhead

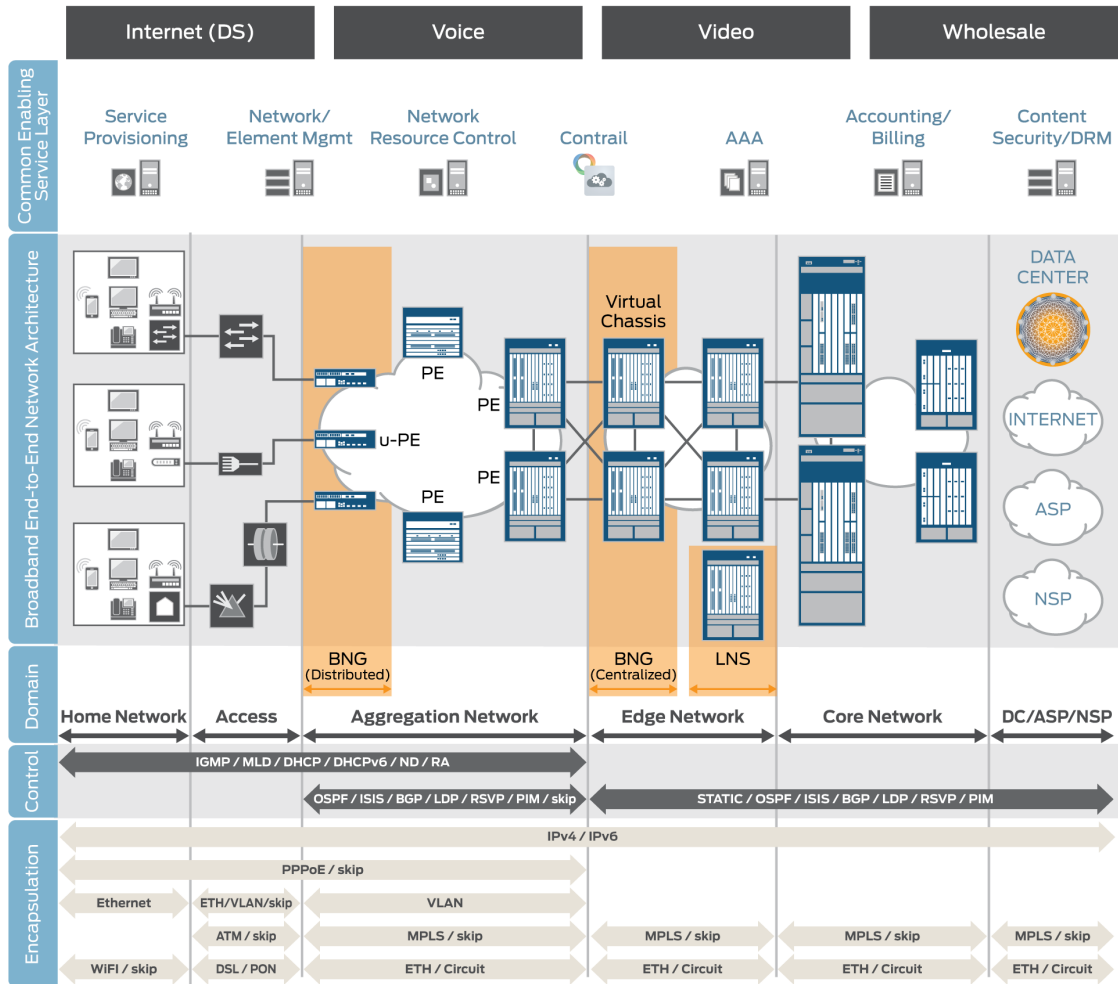
The effects of ever-increasing subscriber-generated traffic and services consumption on the service provider business cannot be overstated. Implementing a Juniper Networks Broadband Edge solution that can continue to effectively support legacy subscribers while migrating to a consolidated, converged, and simplified network architecture that accelerates future services adoption is vital to increasing revenue and controlling operating margins. The Juniper Networks Broadband Edge solution delivers the tools necessary to support both current and future broadband network requirements in a way that enables simple and agile network operation, enhancing the provider's ability to increase the revenue of the existing subscriber base, and to introduce new services that further increase the revenue potential of the broadband subscriber network.

Migrating to a universal edge also brings efficiency and cost savings as upgrade costs can be optimized and spread across both business and residential cost centers. Furthermore, the duplication of edge elements is eliminated.

Enhancing the Benefits

The Juniper Networks Broadband Edge architecture utilizes the MX Series as a broadband network gateway (BNG). The MX Series BNG supports legacy Point-to-Point (PPP) termination as well as Internet Protocol over Ethernet (IPoE) and graceful IPv4 to IPv6 transition mechanisms, and enables innovative multiplay support and service integration. [Figure 2 on page 5](#) shows the Broadband Edge solution architecture.

Figure 2: Juniper Networks Broadband Edge Solution Architecture



The following Juniper Networks offerings add more value to the Juniper Networks Broadband Edge solution:

- Junos Space Network Management Platform, a single point of deployment and management for the MX Series, introduces an application-driven platform from which new network services can be deployed. One of the applications, Connectivity Services Director, facilitates the design and provisioning of IP/MPLS and VPN services through service templates. It also enables enhanced monitoring and management of the network services, allowing the service provider to proactively recognize and repair issues that could affect the subscriber experience. Together, Junos Space and Connectivity Services Director simplify and automate service design, provisioning, monitoring and troubleshooting, which reduce the cost and complexity of Operation, Administration, and Maintenance (OAM), and offer centralized element management and service orchestration through a “single pane of glass.”

- The Network Edge Services portfolio of licensed software applications is supported on the MX Series, enabling element and service consolidation by integrating routing, switching, subscriber management, security, and services on a single platform and operating system. This helps to further simplify network and service design and reduce total cost of ownership by up to 42 percent over five years, when compared to traditional edge networks. Example services include carrier-grade NAT, stateful firewall, deep packet inspection (DPI), and flow monitoring, among others.
- The SRX5000 line of services gateways is a next-generation security platform with a revolutionary architecture that provides market-leading performance, scale, and service integration. The SRX5000 line is ideally suited for broadband networks that require *never-fail* security, enabling up to 960 Gbps of data transfer and 300 Gbps firewall throughput using modular 1 GbE to 100 GbE interfaces that are easily tailored to specific network requirements.
- Juniper Networks Contrail Cloud is an open and agile software-defined networking solution that automates and orchestrates the creation of highly customized services across physical and virtual network resources, including standards-based third-party network elements and applications, without any API integration or modifications. Contrail interoperates with operations support systems (OSS) and base station subsystems (BSS), and provides built-in advanced analytics capabilities for deep insight into application and infrastructure performance.
- Service Control Gateway (SCG) facilitates service innovation and network monetization by enabling access agnostic policy-based subscriber and application-aware services. It provides traffic treatment and intelligent traffic steering based on application and subscriber identity. When the SCG is used with Contrail Cloud, it enables complex service chains that can include “on-box” Juniper Networks applications as well as “off-box” virtualized network functions and appliances.

RELATED DOCUMENTATION

| [Reference Architecture: Broadband Edge Network Design](#)

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