

Juniper Networks Universal Edge and Access Network for Residential Services

Increase Scale, Automation, and Service Creation at the Broadband Edge

Challenge

Service providers with legacy broadband networks to increase ARPU must introduce compelling new residential services requiring new elements that increase network cost and complexity. At the same time, they must reduce costs by simplifying the network and streamlining operations to increase margins.

Solution

Juniper's universal edge and access solution helps network operations overcome these challenges by combining routing, switching, security, and services with advanced automation, orchestration, and management platforms to support efficient network service introduction and operations.

Benefits

- When compared with legacy edge network architectures¹, Juniper's universal edge and access solution offers:
- 49% reduction in total cost of ownership (TCO)
- 69% faster system deployment to accelerate time to service—and time to revenue
- 64% reduction in power consumption and carbon emissions
- 94% lower OS patch/upgrade costs
- 80% lower OAM costs
- 15X lower operational risk
- 80% floor space reduction

As broadband network operators add more bandwidth, subscribers, and services to their legacy edge and access networks, costs scale linearly and margins remain flat. A new network is needed, one that uses technical innovation to provide operational scale, increase automation, and improve service agility in support of today's business goals.

The Challenge

The enterprise services market is at a tipping point. Businesses have embraced hybrid cloud-based IT models that are agile and cost-effective, and are benefiting from the ability to dynamically scale resources up and down, paying only for what they use.

While you continue to invest in network capacity and service portfolios to attract and retain customers, you must also create an agile cloud-like network experience for your customers. This is impossible to achieve with legacy edge and access architectures:

- Legacy edge and access network architectures are artificially segmented, with business and residential services delivered from different network elements. This outdated division of networks is a wasteful artifact of legacy equipment and vendor limitations, and adds capital and operational expenses (see Figure 1).
- Legacy edge and access network architectures are hardware-centric and rely on single service elements—that is, some elements provide routing, others provide deep packet inspection (DPI), still others provide load balancing, and so on. In this approach, new services require new elements, which add risk and cost while constraining innovation.
- Legacy broadband edge and access network architectures require expensive, manually intensive operations to maintain, modify, and upgrade. Disparate elements and proprietary operating systems (OS), command-line interfaces (CLIs), and element management systems (EMS) make them difficult to operationalize and increase costs and the risk of human error during operations, administration, maintenance, and provisioning (OAMP) activities. And your network technicians must be extensively (and expensively) trained and certified to support these elements, making new service introductions time consuming and expensive.
- Legacy edge networks rely on an extensive customer premises equipment (CPE) catalog that requires sophisticated technicians to install and configure in a complex, months long process, and demands significant capital investment ahead of revenue for stocking and sparing.

The Juniper Networks Broadband Edge Solution

Service providers need a High-IQ Network that offers efficient operational scale and service agility while concurrently increasing automation. The High-IQ Network maintains deep insight into network policies, customer privileges, and application requirements in order to intelligently allocate resources where and when they are needed. A High-IQ Network provides secure and reliable high-quality customer experiences every time, all the time, connecting people with ideas, businesses with markets, and your network with your business goals.

¹ ACG Research: Optimizing the Network Edge with Juniper Networks MX Series 3D Universal Edge Router

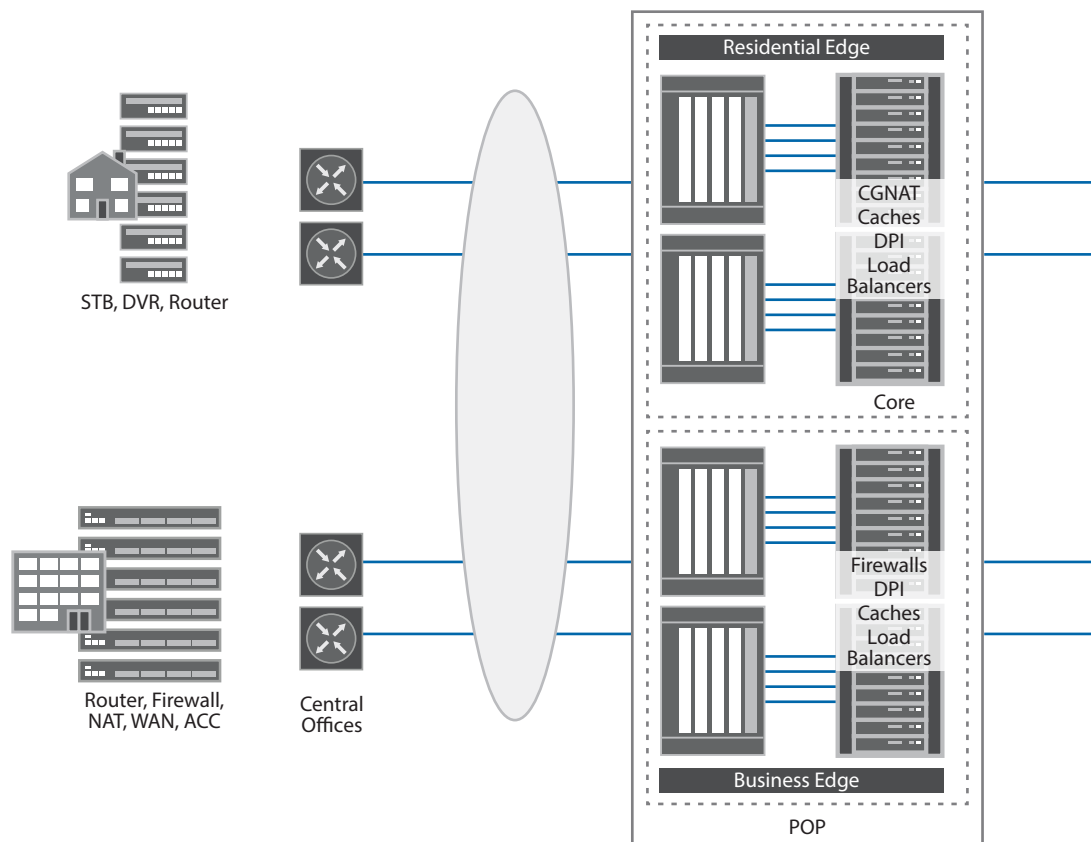


Figure 1: Legacy edge and access network design, in which the network consists of a wide variety of diverse equipment types, each with different operating systems from different vendors. Services are tightly bound to hardware; this constraint is even distributed out to the customer premise.

Juniper's universal edge and access architecture leverages the full breadth of our proven silicon, software, and systems expertise to help you create a High-IQ network that increases average revenue per user (ARPU) and average margin per user (AMPU) while reducing TCO by providing:

1. **Operational Scale:** The architecture provides the bandwidth, subscriber management, and services you need at the scale you want. The solution easily "scales up" to consolidate business, residential, and mobile access networks without compromising performance and easily "scales down" to allow capittally efficient entry into new markets.
2. **Increased Automation:** Juniper's solution reduces the number of elements, OS, and CLI that you need to maintain, not only making it possible to reduce the number of manual tasks required to run the network, but also providing mechanisms for customer self-provisioning and self-monitoring.
3. **Agile Service Creation:** Juniper's software-centric solution lets you deliver value-added services from our Network Equipment Building System (NEBS)-compliant platforms and from the cloud, with service orchestration that enables the bundling of services into a service chain for highly customized service delivery.

The software-centric universal edge and access architecture dramatically reduces network costs by consolidating your business, residential and mobile data infrastructure (Figure 2). New functions are non-disruptively implemented on Juniper elements and x86-based platforms as your business and technical requirements dictate, transforming your network into an agile service innovation platform. Our virtual services portfolio includes cloud-based firewall, content caching, and even CPE. With Juniper's cloud-based solution, services can be introduced and modified in minutes—rather than months—using self-provisioning models that give customers greater control over their services while reducing the burden on your staff.

Solution Components

The space efficient Juniper Networks® ACX Series Universal Access Routers support business Ethernet services, residential access and LTE, and 2G/3G mobile backhaul applications at three times the performance of the closest competitive platform—all in an environmentally-hardened small form factor. The ACX Series supports carrier Ethernet and IP/MPLS services with extensive fault management, call admission control (CAC), traffic engineering, network and service management features, 10 Gbps uplinks, L2/L3 VPNs, and seamless MPLS, as well as

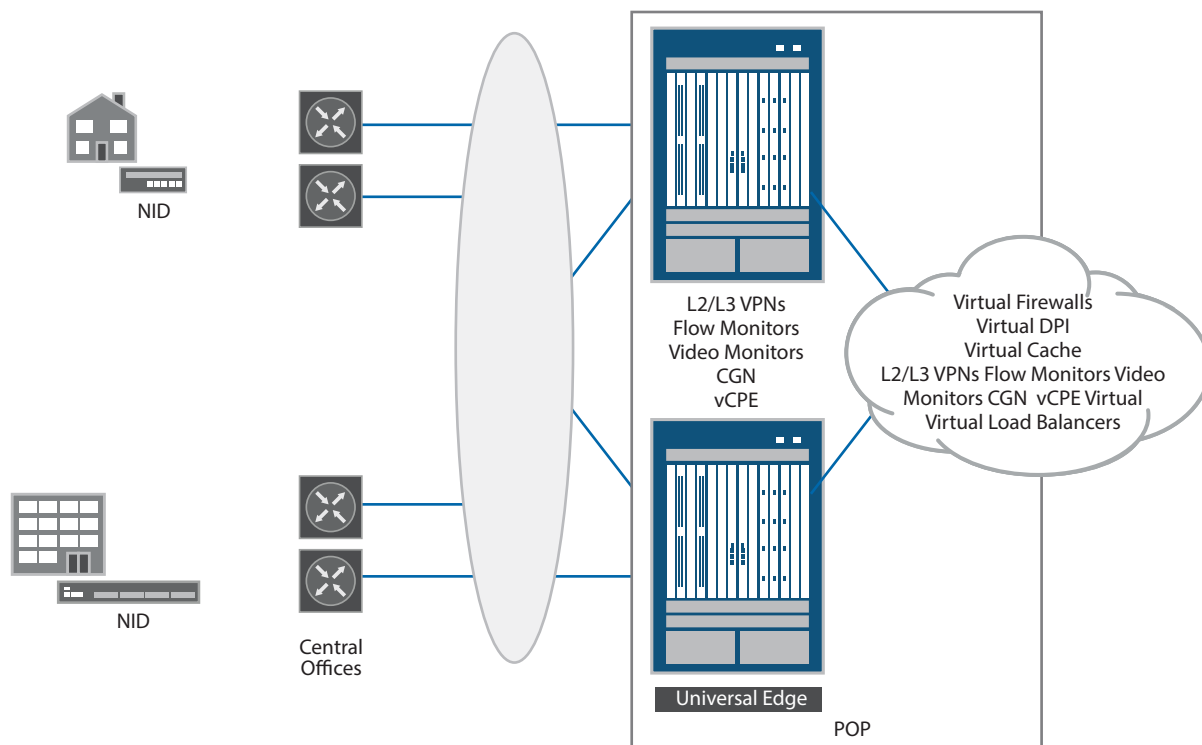


Figure 2: Juniper Networks universal edge, in which the universal edge platforms consolidate legacy elements. Services are decoupled from hardware and may be hosted on platforms themselves—further consolidating equipment types and operating systems—or distributed in the cloud. The customer premise is simplified by removing complex CPE and locating services in the cloud, increasing flexibility, speeding time to service revenue and reducing TCO.

integrated timing and synchronization. ACX Series devices can be connected in a ring, mesh, or hub-and-spoke fashion to upstream Juniper Networks MX Series 3D Universal Edge Routers, which are performing pre-aggregation and aggregation.

MX Series 3D Universal Edge Routers deliver carrier-class performance, reliability, scale, and services required in pre-aggregation, metro-aggregation, and edge service applications, as well as inter- and intra-data center applications. The portfolio offers extensive fault management, traffic engineering, network and service management features. It scales from 100 Mbps through an industry-leading 80 Tbps with support for up to 1,920 10GbE interfaces, 480 40GbE interfaces, and 320 100GbE interfaces per rack. The MX Series portfolio also supports legacy interfaces, integrated timing and synchronization, and is Metro Ethernet Forum (MEF) Carrier Ethernet (CE) 2.0 certified.

Juniper Networks SRX Series Services Gateways are next-generation security platforms with a revolutionary architecture that provides market-leading performance, scale, and service integration. The SRX5000 is ideal for edge networks, enabling up to 960 Gbps of data transfer and 300 Gbps firewall throughput using modular 1GbE to 100GbE interfaces that are easily tailored to specific network requirements.

Juniper Networks Contrail is an open and agile SDN 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 OSS/BSS, and provides advanced analytics capabilities for deep insight into application and infrastructure performance.

The universal edge and access all run the Juniper Networks Junos® operating system. Junos OS features a highly reliable modular architecture that runs each processing function in its own protected memory space. It also supports nonstop forwarding (NSF), nonstop routing (NSR), and unified in-service software upgrade (unified ISSU) to ensure continuous network operation, even during major upgrades.

Junos OS also supports services to help you reduce the number of appliances, operating systems, and layers of management in your network. These include:

- Junos Traffic Vision provides flow-level accounting.
- Junos Video Focus provides video quality assurance.
- Junos NetReflex provides a big data analytics dashboard.
- Junos BizReflex uncovers monetization opportunities using big data analytics.
- Junos Network Secure creates a layered network security perimeter.
- Junos VPN Site Secure provides secure remote site connectivity.

The Junos Space Network Management Platform offers a single interface for multilayer management (physical and virtual, security, routing, and forwarding), extensive automation features, GUI-based point-and-click provisioning, and full fault, configuration, accounting, performance, and security (FCAPS) support. An SDK facilitates custom application development and integration with third-party services and tools, and Junos Space applications manage and provision services across thousands of devices and workflow tasks. These include:

- Junos Space Security Director, which improves the reach, ease, and accuracy of security policy administration.
- Junos Space Services Activation Director, which offers a simple interface to design, validate, provision, and manage carrier Ethernet and MPLS services.
- Junos Space Service Now, a remote, automated troubleshooting client that increases Day 1 issue resolution by 40 percent.
- Junos Space Service Insight, which delivers proactive bug notifications specific to your network configuration, as well as thorough automated EOL/support analysis.
- Junos Space Content Director, which provides a centralized caching management solution for Junos Content Encore.
- Junos Space Virtual Director, which automates instantiation of virtual machines (VMs) for Juniper's virtual security services.
- Junos Space Edge Services Director, which speeds deployment and configuration of Junos Network Edge Services.

Features and Benefits

Juniper's High-IQ universal edge and access architecture offers a number of features and benefits (see Table 1).

Table 1: High-IQ Universal Edge and Access Architecture Features and Benefits

Feature	Highlights	Benefits
Operational scale	<ul style="list-style-type: none"> • Single OS for routing, switching, security, subscriber management, and services • Supports residential, business, metro-Ethernet, and mobile backhaul convergence • "Scale up/scale down" to address unique requirements and niche markets • Pre-tested solutions with published results, professional services practices • Comprehensive management tools 	<ul style="list-style-type: none"> • Reduce TCO by up to 49% over five years • Lower CapEx by 38% and OpEx by 57% compared to legacy networks • Reduce power and cooling costs by 64%; occupy 80% less floor space versus legacy networks • Reduce the time and expense associated with evaluation and qualification efforts • Gain deep insight into network behavior
Increased automation	<ul style="list-style-type: none"> • End-to-end service orchestration and service chaining • Dynamic application and subscriber-aware traffic steering 	<ul style="list-style-type: none"> • Reduce OS patch/upgrade costs by 94% compared to legacy networks • 80% lower OAM costs vs. legacy networks • 15X less operational risk than legacy networks • Single point of integration into your OSS/BSS
Agile service creation	<ul style="list-style-type: none"> • Support virtual and physical firewall, CPE, load balancing, antispam, antivirus, session border controller (SBC), content caching, and more • Open standards support that enables partner ecosystem, community-based innovation • Extensive support for IPv4/IPv6 transition technologies and services 	<ul style="list-style-type: none"> • 69% faster service creation than legacy networks • Easily scale services up and down • Reduce service qualification time • Multivendor physical and virtual interoperability

Summary—Transform Your Network with Operational Scale, Service Automation, and Agile Service Creation

Juniper recognizes that your network must be fully able to support your business goals. Enterprises have become used to the flexibility and simplicity of cloud-based IT services and want the same experience for their network services—instant availability, customization, usage-based payment models, and self-provisioning. Unfortunately, service delivery over hardware-centric legacy edge networks is labor intensive, notoriously difficult to customize, imposes long lead times, and is outside the control of the end user. Legacy network architectures which are inflexible and expensive stifle innovation and constrain

business growth. In short, your next broadband network shouldn't simply be a larger, more expensive version of your current broadband network.

Juniper Networks High-IQ universal edge and access architecture leverages the full breadth of our silicon, software, and systems expertise to help you succeed in the market. Operationally proven in hundreds of demanding networks globally, we combine the reliability, performance, and scale you need with the operational simplicity, agility, and automation you want.

Next Steps

For more information about Juniper's High-IQ Network and universal edge and access solution, please contact your Juniper Networks representative or visit www.juniper.net.

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.

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