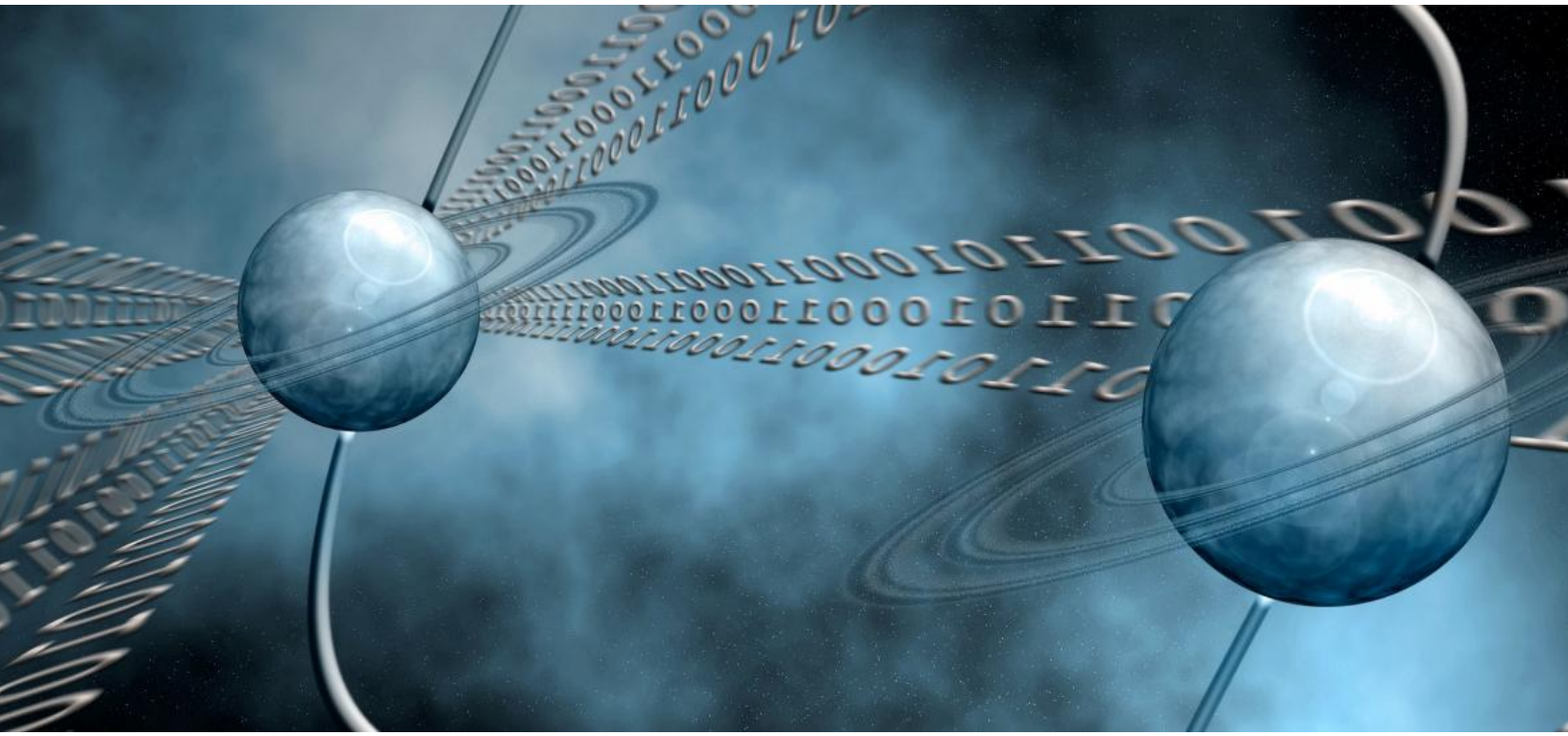
Juniper Networks Universal Edge: Scaling for the New Network



Executive Summary

End-user demand for anywhere and anytime access to rich media content is dramatically increasing pressure on service provider networks and business models. This content is bandwidth intensive for a number of reasons: it is usually delivered via unicast; video resolution is increasing faster than compression technologies; and this content is more often interactive. These changes are not limited to residential services but consistent across all wireless and enterprise domains. While bandwidth demand is growing exponentially, revenue growth is, at best, linear. Service providers are increasingly facing a situation where the profitability of providing network services could be compromised.

Juniper addresses this dilemma with its MX 3D Universal Edge router that provides an integrated and converged solution to deliver the quality of experience, service acceleration, and scalability necessary to resolve service providers' traffic issues, while providing a platform for greater monetization. ACG Research conducted a total cost of ownership (TCO) study that compares the MX3D Universal Edge router with two competing routers for a typical edge network passing 64,000 households and a proportional number of enterprise establishments and wireless cell sites. The study finds 45% to 60% lower TCO for the Universal Edge router. This advantage is primarily a result of the higher system capacity of the MX3D as well as its higher port and slot density.

Key Takeaways

Juniper Networks Universal Edge offers advanced features required to profitably deliver a new breed of service offerings. It provides these features while also delivering more compelling economics than its competitors.

- TCO is 45% to 60% lower
- CapEx is 39% to 60% lower than competitors' CapEx because of higher system capacity and port and slot density
- OpEx is 64% to 65% lower:
  - Lower CapEx and the need for fewer chassis
  - 45% to 80% lower power requirements
  - Advanced Junos features that simplify and streamline network operations

Universal Edge

Figure 1 depicts where the MX Series 3D Universal Edge router sits in the network.

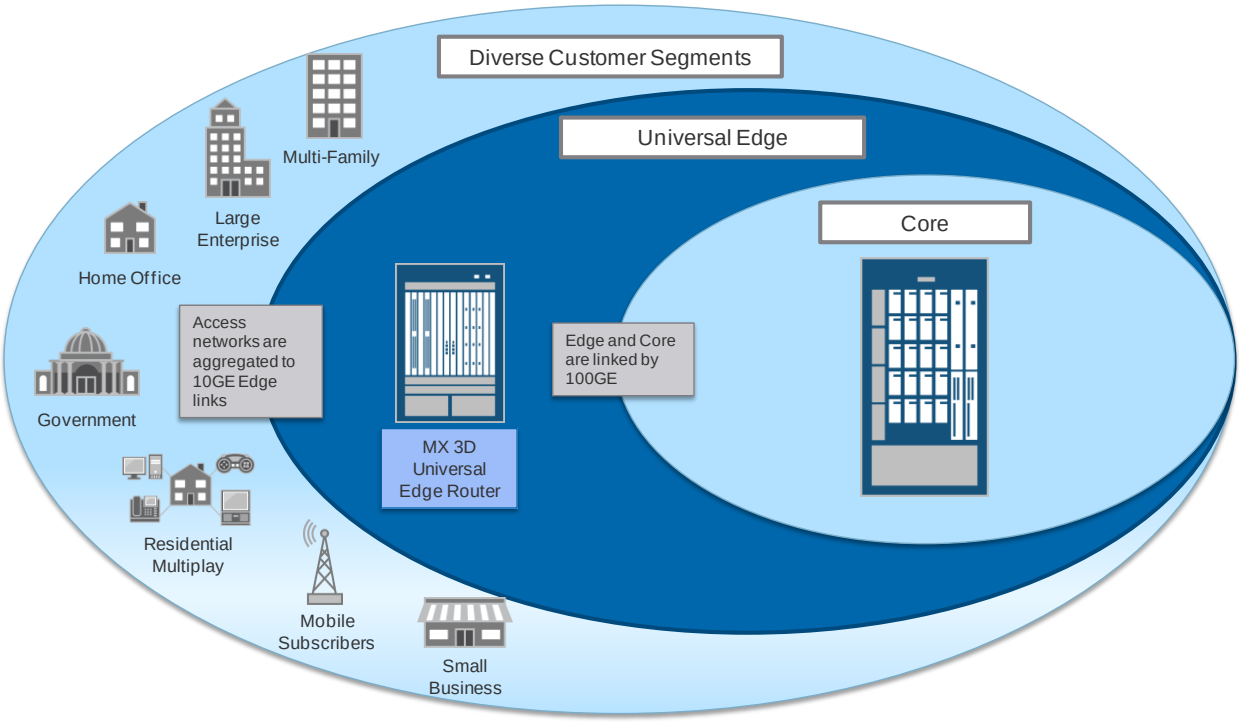


Figure 1. Universal Edge Schematic

Juniper Networks MX Series 3D Universal Edge router (Universal Edge), running on its open operating system Junos, is a single platform optimized for the convergence of business, residential, and mobile service delivery. It delivers the scale and advanced features that enable service providers to manage exploding traffic growth and sustain profitability in each market segment.

MX Series 3D Routing Platform

The Universal Edge supports the broadband, business and mobile edge as well as Carrier Ethernet, enabling fixed-mobile convergence to facilitate the convergence of network, services, and subscribers. In addition, the MX Series 3D platform offers unparalleled scale up to 3.84 Tbps across bandwidth, subscribers, and services. This scaling provides the capacity and flexibility to support exponential growth in bandwidth demand and continual service evolution across all market segments.

The MX Series is based on Juniper Networks Junos Trio chipset, which is the foundational, purpose-built silicon for a series of different form factors that range from Juniper Networks MX5 to the MX960 3D Universal Edge routers. With a single Junos operating system and release cycle, operational efficiencies result from the reduction in time and effort to deploy network infrastructure, a more stable process for the addition of new functionality and from a modular architecture. Juniper's open innovation and third-party collaboration of Junos and the Junos SDK make it easier for customers and partners to develop and commercialize new services and applications, thereby accelerating service delivery.

MX 960 Highlights:

- 11 router chassis slots with 3:2 fabric redundancy
- 160 full duplex Gbps per slot
- Hierarchical queuing and granular quality of service
- Interfaces including:
  - 16x10 GE line rate MPC
  - 4x10 GE MIC with subscriber management (2 per slot)
  - 1x100 GE MIC (2 per slot, one line rate, one failover)

The Universal Edge can flexibly and efficiently integrate a broad portfolio of industry-leading software, including next-generation Carrier Grade NAT (CGN) and IPv4/IPv6 coexistence and transition technologies; a suite of security applications; and application and subscriber-aware services. Combining advanced software with the MX Series creates a service delivery gateway that supports new, revenue-generating service offerings, while concurrently reducing operational cost and complexity.

TCO Model Framework

ACG Research constructed a TCO model that compares the Universal Edge to two competing edge routing platforms. For this study, the MX960 was modeled although every MX router is suitable as a Universal Edge router. The TCO model analyzes a network that provides residential, enterprise, and mobile backhaul services. It passes 64,000 households with a proportional mix of enterprise establishments and wireless cell sites. Figure 2 provides a block diagram of the modeling methodology.

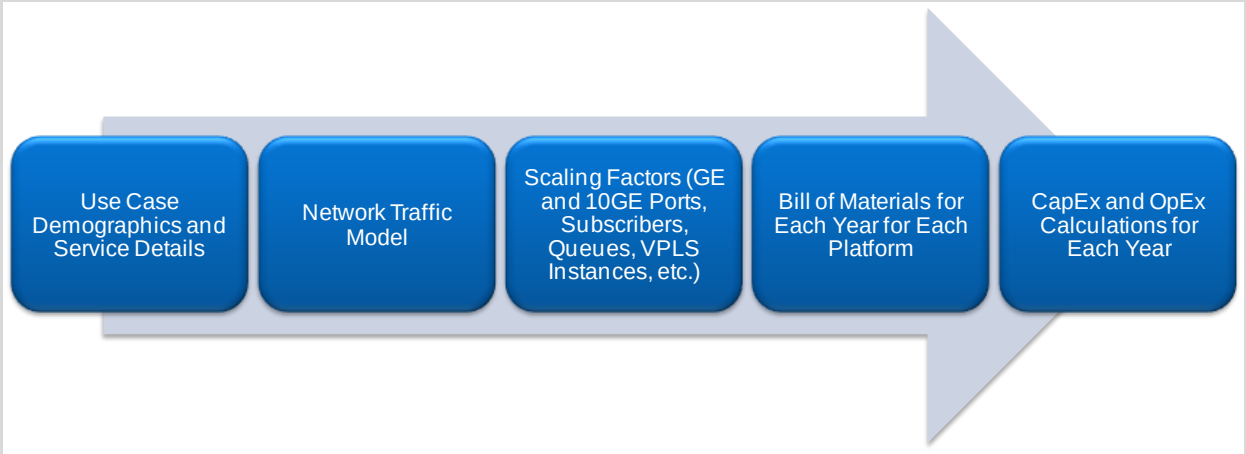


Figure 2. Modeling Methodology

The modeling process begins with a description of the number of households, enterprise establishments and cell sites for a typical use case. Services for each market segment are defined and service penetration projections are made. Service forecasts are prepared and used to model the traffic flows across the network. The traffic projections are used to compute scaling factors such as numbers of ports, queues and VPLS instances. Once the scaling factors are established a bill of material is prepared for each platform for each study year. Capital expenses (CapEx) and operation expenses (OpEx)

calculations are made for each year. Comparisons of TCO, CapEx and OpEx for the edge router solutions are then calculated. Residential services modeled are Internet access, IPTV with video on demand, and voice over IP (VoIP) services. Three enterprise services are modeled:

- Virtual Private LAN Service (VPLS): This is an Ethernet service that complies with the Metro Ethernet Forum's ELAN carrier Ethernet specifications. It is a Layer 2 service and offers low cost and high performance and is typically used by an enterprise to interconnect branch offices or data centers.

- Virtual Private Wire Service (VPWS): This is a Layer 2 pseudowire-based service and is widely used for mobile backhaul.

- Layer 3 Virtual Private Network (L3 VPN): This service is widely used for enterprise private networking. One of its advantages is that it can be offered over E1/T1 facilities when more modern transport facilities are not available.

Figure 3 depicts the total traffic handled by the model network.

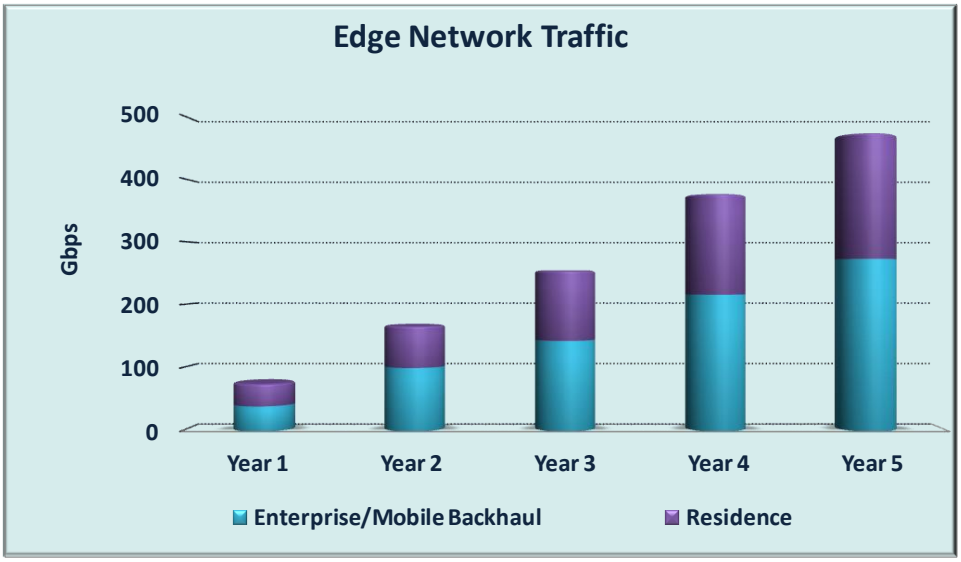


Figure 3. Edge Network Traffic

Enterprise, mobile backhaul and residential traffic had explosive growth over the study period, consistent with current market growth projections. Video content is a primary demand driver in all market segments.

TCO Results

Figure 4 compares the percentage cumulative TCO of two competing routers versus the Universal Edge.

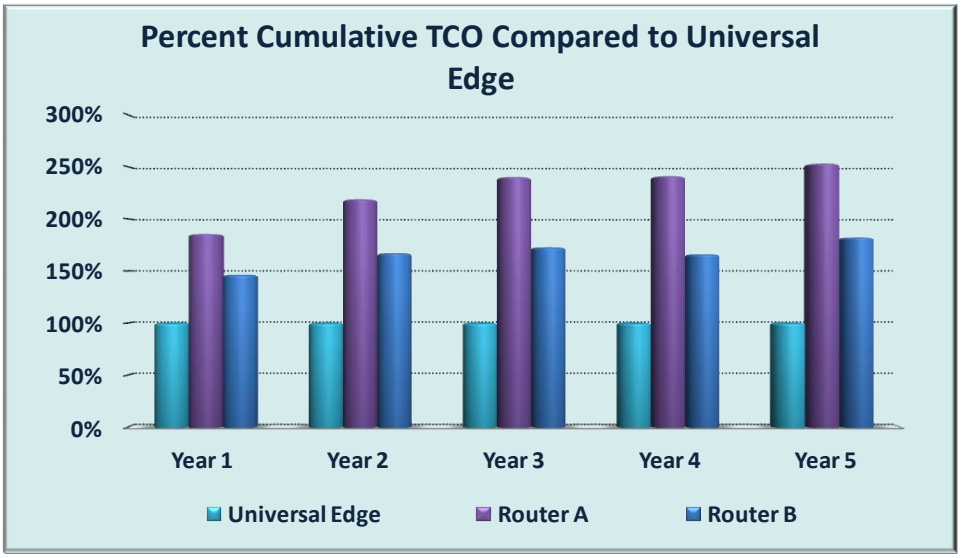


Figure 4. Percentage Cumulative TCO Compared to Universal Edge

The Universal Edge delivers 45% to 60% lower TCO over five years as compared to two competing edge routers. CapEx is 39% to 60% lower, and OpEx is 64% to 65% lower.

Figure 5 compares the percentage cumulative CapEx of the competing routers to the Universal Edge.

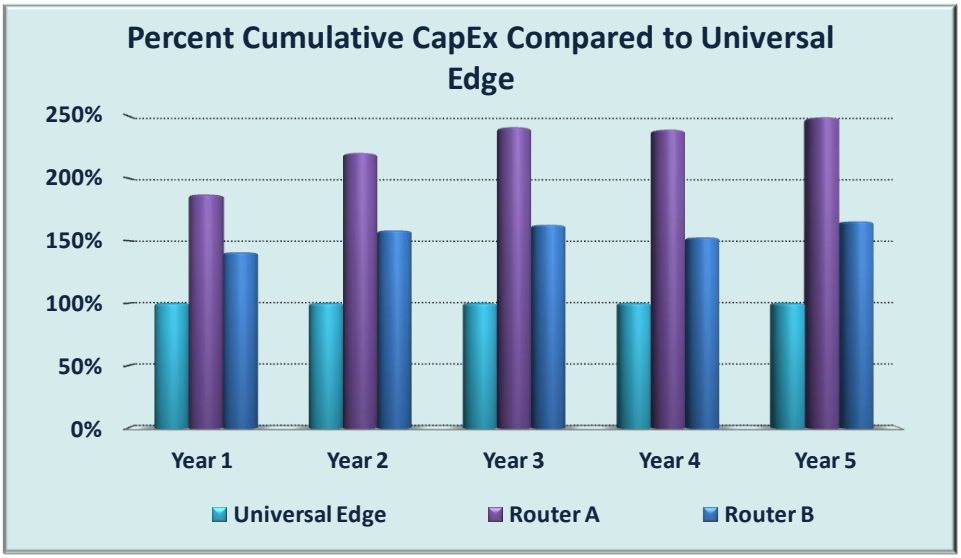


Figure 5. Percentage Cumulative CapEx Compared to Universal Edge

The Universal Edge has a CapEx advantage in every study year. With greater system capacity plus higher port and slot densities, the Universal Edge scales better than competing systems. The 10GE port density of the Universal Edge is 2 to 3.2 times greater than that of the competing routers.

Figure 6 compares the percentage cumulative OpEx of the competing routers to the Universal Edge.

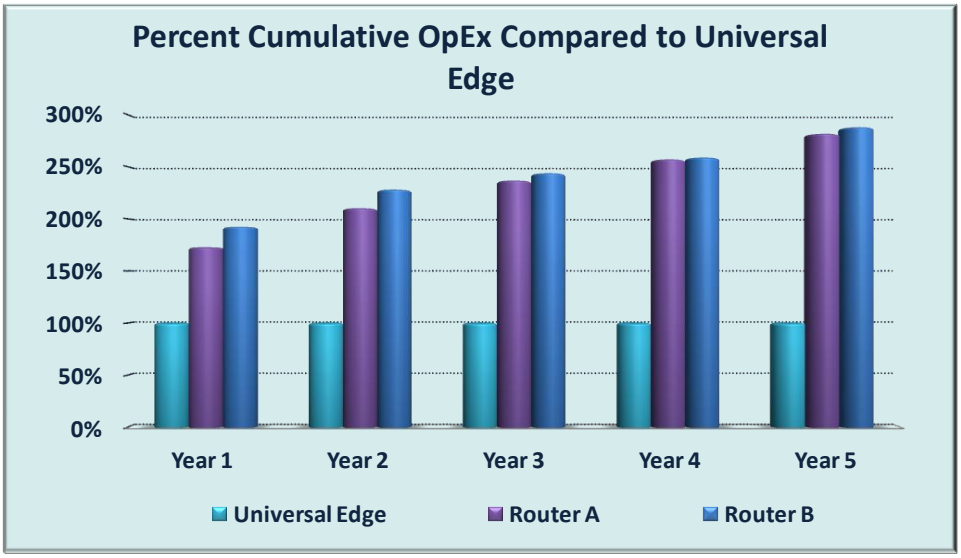


Figure 6. Percentage Cumulative OpEx Compared to Universal Edge

The Universal Edge has a substantial OpEx advantage over its competitors in each study year. The primary savings sources are:

- Higher system capacity and superior port and slot density, which reduces CapEx and the number of chassis deployed in the edge network. This in turn reduces support expense, which is directly linked to CapEx. In addition, capacity management, network upgrade and patches and network care expenses are reduced because the Universal Edge has fewer chassis and cards under management than the competing edge routers.

- Lower power consumption (45% to 80% lower KWH): The Universal Edge router has approximately the same power budget per slot as competing routers. However, it has more ports per slot and more slots per chassis. Hence power costs are much lower.

- Junos and VPN Tool Kit: Junos service delivery optimization integrates service delivery touch points, which reduce operating complexity and minimize training costs. Juniper has opened up Junos with an SDK, which allows third-party and customer-developed applications to run directly on Juniper hardware. The VPN Toolkit provides numerous connectivity options for Layers 2 and 3, including multicast and IPv6. These software features further reduce engineer furnish and install, capacity management, network upgrades and patches and network care expenses. This is accomplished by streamlining network operations, which reduces the time required to perform network operations tasks and accelerates network deployment and service delivery.

Conclusion

Convergence, scalability, efficiency, standardization and manageability are all factors that have a direct impact on service providers' profitability and their ability to offer new services and products. The Juniper Universal Edge router delivers an integrated and converged solution that addresses these requirements. The MX Series 3D Universal Edge router allows for cost-efficient scaling of converged services and delivers advanced features that enable service providers to manage exploding traffic growth,

strategically transform their infrastructures to deliver new services and applications, maintain differentiation and sustain profitability.

Juniper Networks MX Series 3D Universal Edge routing platform is optimized with a single, open operating system for the convergence of business, residential, and mobile service delivery. With this study, we find the Universal Edge lowers TCO 45% to 60% over five years as compared to two competing edge routers. Capital expenditures are 39% to 60% lower, operating expenditures 64% to 65% lower and power consumption 45% to 80% lower. These savings originate primarily from higher system capacity plus superior port and slot density.

Service providers, in response to untamed bandwidth growth, are exploring converging platforms for different customer domains. Juniper Networks recently published a case study highlighting the experience of one European carrier that has converged onto the Universal Edge, and the obvious trend is for other carriers to go down a similar path. This study establishes the optimized economics of this path and shows that Juniper delivers very compelling economic benefits.