

# Juniper Networks Packet Optical Solutions for Access and Aggregation

Open, automated, and simple

## Challenge

Metro operators are looking to new services like mobile backhaul, Carrier Ethernet, and smart utility and transportation networks to improve business results. Legacy metro optical networks are too costly and inflexible for today's dynamic service offerings.

## Solution

Juniper helps service providers accelerate the introduction of next-generation services by implementing open, programmable, and simple networks. Combining end-to-end packet optical networking platforms with unified management and control software, the solutions streamline operations, reduce TCO, and accelerate service agility.

## Benefits

- **Open:** A standard methodology to deploying packet optical networks maximizes interoperability within the provider network.
- **Programmable:** An open optical layer with abstract APIs unleashes automation and streamlines service orchestration.
- **Simple:** Converged network architecture reduces CapEx and OpEx and simplifies operations. Juniper's flexible product family supports a range of markets and services, with industry-leading 10 Gbps, 100 Gbps and 200 Gbps wavelengths in a small capacity footprint.

Skyrocketing video, cloud, and IoT traffic are pushing metro networks to the brink. Service providers must expand network capacity to support ever-increasing traffic volumes, but run the risk of deriving only nominal returns on their infrastructure investments. Going forward, metro network operators must identify innovative ways to monetize assets, improve service agility, and contain costs.

Juniper packet optical solutions for access and aggregation help carriers accelerate time-to-revenue and reduce TCO by consolidating infrastructure and implementing simpler, more intelligent and dynamic networks. These solutions eliminate inefficiencies by converging distinct packet and optical layers, and they improve automation, enabling better monetization of network infrastructure. They provide a seamless upgrade path from 10 Gbps to 100 Gbps and beyond and are ideal for a variety of applications including Carrier Ethernet, mobile backhaul, smart utility and transportation networks, and residential and business broadband service delivery.

## The Challenge

Metro operators must expand their solution portfolios to avoid commoditization and maintain an edge in today's increasingly competitive marketplace. Many are exploring opportunities like Ethernet business services, mobile backhaul, and smart transportation and utility networks to rejuvenate margin and revenue growth. But legacy networks that were designed to support traditional data transport services can't meet the increased price-performance, scalability, and agility demands of today's cloud-centric, mobile-oriented applications.

Many service providers are constrained by legacy metro optical networks that are inherently costly and complex to administer and scale. Most legacy equipment vendors provide low-level management interfaces and limited APIs that inhibit automation and innovation. Introducing new services, provisioning new customers, or troubleshooting problems can be manually intensive, time-consuming processes involving a number of different network elements and management systems. Worse still, most legacy networks are statically configured to support peak traffic demands—an inefficient approach that squanders bandwidth and capital. Expanding network capacity means adding wavelengths and network elements, and increasing operational expense and complexity (more devices and touchpoints).

## Juniper Networks Packet Optical Access and Aggregation Solutions

Juniper's packet optical access and aggregation solutions let service providers incrementally construct a high-capacity packet-optical infrastructure that meets the stringent price-performance and agility demands of next-generation metro applications and services. Flexible pay-as-you-grow platforms minimize upfront capital expenditures and limit business risks. And non-disruptive migration strategies protect and extend previous investments. This fully integrated, end-to-end solution portfolio includes the

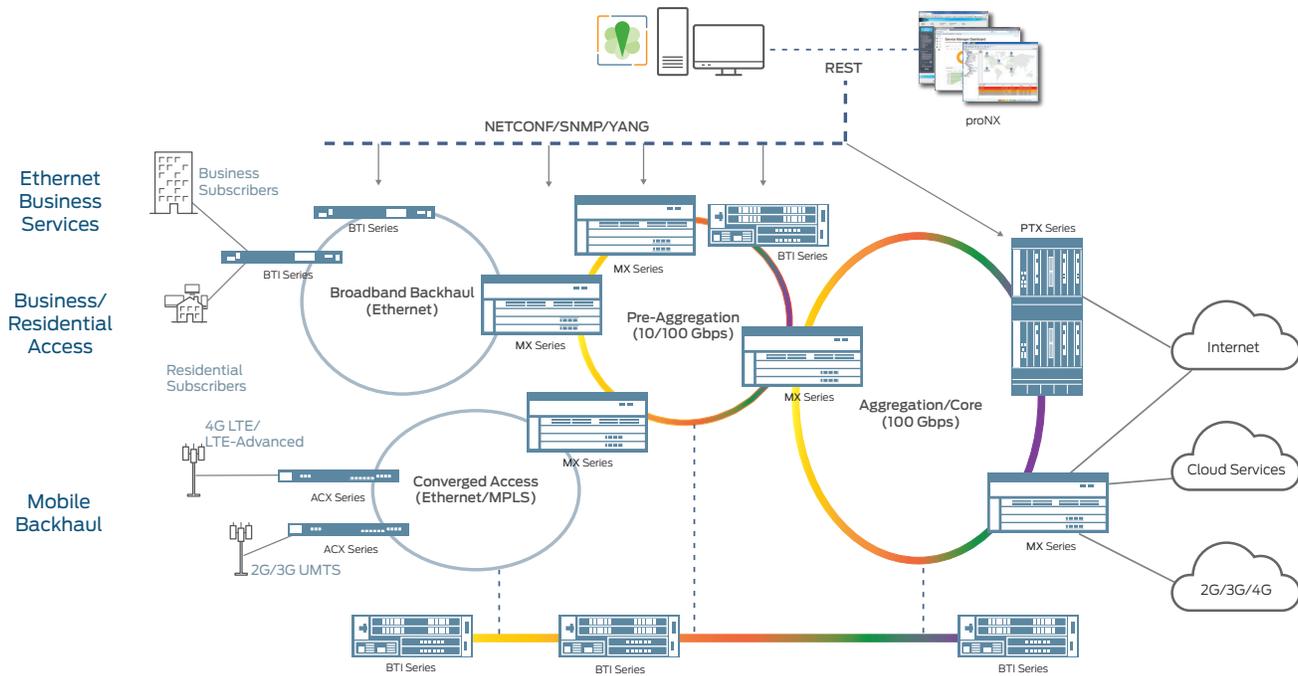


Figure 1: Juniper Networks end-to-end packet optical access and aggregation solution portfolio

Juniper Networks® BTI7000 and BTI7800 lines of packet optical transport platforms, MX Series 5G Universal Routing Platforms, ACX Series Universal Access Routers, BTI800 Ethernet access platforms, NorthStar Controller, and proNX Service Manager for management and control.

## Features and Benefits

### Open

Juniper’s open platforms help meet customer demands for extensive interoperability. Juniper’s solutions embrace the open Yang data models from industry leading groups such as OpenConfig and IETF. This leads to faster innovation and seamless user experience across a converged packet optical network.

### Programmable

Juniper’s packet optical solutions accelerate time-to-market, increase service agility, and unleash services innovation by streamlining automation. An optical layer and RESTful APIs make it easy for external applications and operations/business support system (OSS/BSS) platforms to commission resources and orchestrate services across geographies and network elements.

### Simple

Juniper solutions reduce TCO and avoid stranded capacity by eliminating network layers, devices, and touchpoints. Juniper’s converged packet optical platforms support Carrier Ethernet, wavelength-division multiplexing (WDM), and Reconfigurable Optical Add Drop Mux (ROADM) functionality, along with

multiprotocol client interfaces with unified management and control. A flexible, pay-as-you-grow architecture enables incremental scalability with low start-up cost.

## Solution Components

### BTI7000 Packet Optical Transport Platforms

The BTI7000 line of packet optical transport platforms delivers highly scalable, carrier-grade networking for metro networks. The systems unify packet and optical service delivery at the metro edge, integrating Carrier Ethernet switching, a WDM optical layer, ROADMs, and photonic-layer elements. The BTI7000 line delivers high densities and capacity in a compact, modular platform, helping service providers consolidate equipment, conserve rack space, and streamline operations.

### BTI7800 Packet Optical Transport Platforms

The BTI7800 line of packet optical transport platforms supports large-scale 10 Gbps, 100 Gbps, and 200 Gbps wavelength capacities in a programmable platform. Featuring a rich set of optical capabilities, including coherent modules with integrated ROADMs, the BTI7800 line helps service providers increase network capacity, reduce space, power and cooling costs, improve network utilization, and simplify the deployment of next-generation services.

### MX Series 5G Universal Routing Platforms

The MX Series 5G Universal Routing Platforms are true carrier-grade edge routing platforms that ensure network and service availability with a broad set of multilayered physical, logical, and

protocol-level resiliency features. For example, they can be used to connect to local or regional peering and points of presence (POP) sites, and provide stateful firewall services for network protection and managed security. The highly extensible MX Series can also be used as an aggregation platform from the hardened MX104 on the low end, to the MX960 for high capacity needs, to the MX2020 that provides a full feature, high-performance, high-density edge device.

## ACX Series Universal Access Routers

The ACX Series brings operational intelligence to the access and aggregation layers, providing the option to deploy Ethernet or IP/MPLS infrastructure. ACX Series routers are optimized for converging mobile, business, and residential access services on a single platform. The ACX Series supports a wide variety of deployment options with a range of port densities and interface types. Environmental or temperature-hardened designs, on most models, and low power consumption enable deployment in extreme temperature situations such as in outside cabinets and remote POPs.

## BT1800 Ethernet Access Platforms

The BT1800 line of Ethernet access platforms delivers high-performance connectivity and aggregation for Carrier Ethernet business services, mobile backhaul, and IoT applications. The standards-based, carrier-grade product family includes compact service access devices and high-capacity service aggregation platforms that provide a cost-effective and seamless path to high-performance Ethernet services.

## proNX Service Manager

Juniper's proNX Service Manager is a management and control software suite that streamlines the deployment and operation of next-generation metro networks. The proNX Service Manager software includes provisioning templates, configuration wizards, and one-click service activation features that eliminate manually intensive and error-prone tasks, accelerate bandwidth turn-up and capacity expansion, and simplify operations. RESTful APIs streamline integration with external management applications including SDN controllers such as Juniper Networks NorthStar Controller, service orchestration solutions, and operations and business support systems (OSS/BSS).

## NorthStar Controller

NorthStar Controller is a flexible traffic engineering solution that delivers granular visibility and control over IP/MPLS and optical layer flows. It streamlines capacity planning, enables proactive monitoring, and lets service providers dynamically route traffic and balance loads based on administratively defined policies.

## Use Cases

### Ethernet Business Services

Use Juniper's Metro Ethernet Forum (MEF)-certified solutions to offer Ethernet-based services that deliver the high performance, scalability, and fine service granularity enterprises demand. These

solutions support a complete set of standards-based Carrier Ethernet services, including Ethernet private line, Ethernet virtual private line, and Ethernet LAN services. Comprehensive security features, prioritization capabilities, and protection schemes allow various traffic types—as well as traffic from multiple customers—to efficiently and reliably transit the same packet connection.

### Mobile Backhaul

Juniper packet optical access and aggregation solutions are ideal for 4G/LTE/LTE-advanced backhaul applications. Service providers can mirror the scalability, security, and service prioritization of a private line within a QoS-enabled, shared packet network. Resilient fiber ring protection and ITU G.8031 and G.8032v2 support ensure high service availability. And comprehensive service monitoring and Operation, Administration, and Maintenance (OAM) capabilities enable strict service-level agreement (SLA) compliance.

### Residential/Business Broadband Services Delivery

Use Juniper solutions to incrementally construct a high-capacity packet-optical infrastructure that meets the stringent price-performance and agility demands of next-generation residential and business broadband services. Avoid stranded capacity and lopsided business models with long paybacks. An invest-as-you-grow architecture tightly aligns expenses with business requirements.

### Utility and Transportation Networks

Leverage Juniper packet optical access and aggregation solutions to deliver next-generation metro network services for energy providers and transportation system operators. Smart transportation and energy management systems demand reliable, high-performance connectivity. Tap into the massive Internet of Things market by offering a wide range of standards-based networking services.

## Summary—Eliminate Metro Network Cost and Complexity with Juniper

Exploding traffic volumes, ongoing pricing pressure, and an evolving competitive landscape are forcing service providers to rethink the ways they build out infrastructure and market services. Legacy networking solutions designed to support conventional data transport services are too costly and inflexible for contemporary applications and services.

Juniper packet optical access and aggregation solutions help service providers accelerate the introduction of new high-margin, high-growth services with industry-leading scale, density, and performance. The end-to-end product portfolio enables a collapsed network architecture that eliminates inefficiencies, increases automation, and enables better monetization of network assets. These solutions help service providers improve business results and exploit massive IoT, cloud, and mobility market opportunities.

## Next Steps

To learn more about how Juniper packet optical access and aggregation solutions can help your company gain a competitive edge, contact your Juniper sales representative or visit [www.juniper.net](http://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.

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