

# Simplify Data Center Interconnect and Data Center Edge Operations

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A simple, sustainable data center solution

## Juniper PTX Series use cases

Discover how AI advancements **challenge existing** network architectures

## AI and cloud innovations transform networking requirements

An explosion of artificial intelligence (AI) and cloud innovations are transforming the way organizations conduct business. However, for the cloud and service providers tasked with delivering them, these applications bring demanding new networking requirements that push the limits of current data center architectures. That's especially true for the high-capacity routers that enable data center interconnect (DCI) and data center edge networks.

## The capabilities you need

**Specialized** traffic engineering capabilities **optimize** traffic flows

## Simplify network design and management

Both DCI and data center edge networks require high-throughput routing with always-on reliability. But historically, data center operators have used different types of routers to address the distinct requirements of each role.

● DCI networks connect multiple data centers for functions like data replication, load-balancing, disaster recovery, and resource pooling, where extreme throughput and efficiency are the top priority.

- These routers should support traffic engineering via MPLS, Segment Routing, and Ethernet virtual private networks (EVPNs) to optimize traffic flows and assure efficient data transfer among sites.
- DCI routers must also provide low latency, resiliency, and scalability to keep pace with evolving data center traffic, including the ability to scale on the fly.

● Data center edge networks connect the data center to external networks like wide-area networks (WAN), campus and branch networks, and the internet.

- To meet the varied connectivity requirements of diverse external networks, these routers should provide high port density and flexibility to mix and match interfaces, plus support for a wide range of protocols and traffic types.
- Data center edge routers must also support quality of service (QoS) to optimize application traffic, carrier-grade reliability, and strong security to protect against external threats.

**The answer: Juniper PTX**

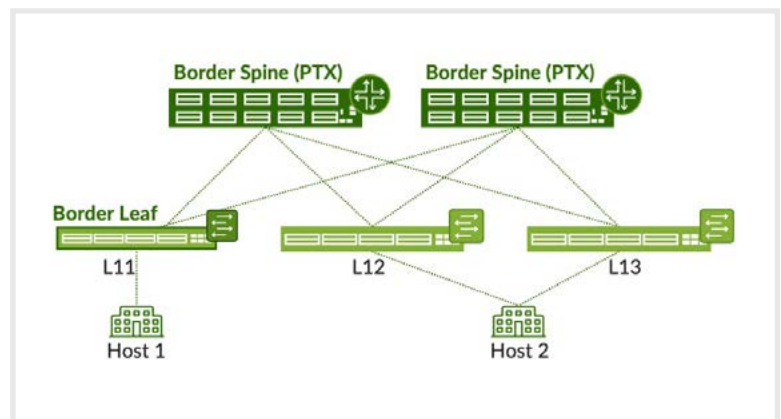
## A single solution for DCI and data center edge

Despite these differences, a growing number of cloud providers, telecom service providers, and other data center operators are seeking a single solution to fill both roles. Juniper PTX has long answered that call by offering core, peering, and aggregation functions in the world's largest WAN and data center architectures. Now, with its versatile feature set, modular design, and exceptional performance and density, it's become an ideal choice for DCI and data center edge use cases.

### Data center interconnect

Historically, DCI networks primarily handled high-volume, long-haul traffic between data centers for data replication and disaster recovery. These functions are still critical for large-scale data center operators. Increasingly, though, DCI networks also play a key role in enabling AI-Native Networking fabrics, connecting thousands of graphical processing units (GPUs) within the data center for AI model training and inferencing, as well as linking external data sources. In fact, the most capable DCI routers, like Juniper PTX, can support both functions in the same deployment: interconnectivity across leaves within a single AI cluster, plus external connectivity to other data centers.

Figure 1 illustrates a typical DCI deployment using Juniper PTX as spines in a spine-leaf architecture, employing Border Gateway Protocol (eBGP) underlay plus overlay. Designs like these are becoming common in AI-Native data centers, where Juniper PTX routers function as border spines connecting border leaf switches, like the [Juniper QFX Series](#), each of which connects multiple host GPUs.



**FIGURE 1**  
DCI network design  
with Juniper PTX

Note that, in these architectures, the border spine can also function as a “super spine.” Here, Juniper PTX not only interconnects all leaves and GPU hosts in an AI-Native network, but simultaneously provides DCI functionality to external data centers to exchange training data and ensure resiliency for AI training and inferencing applications.

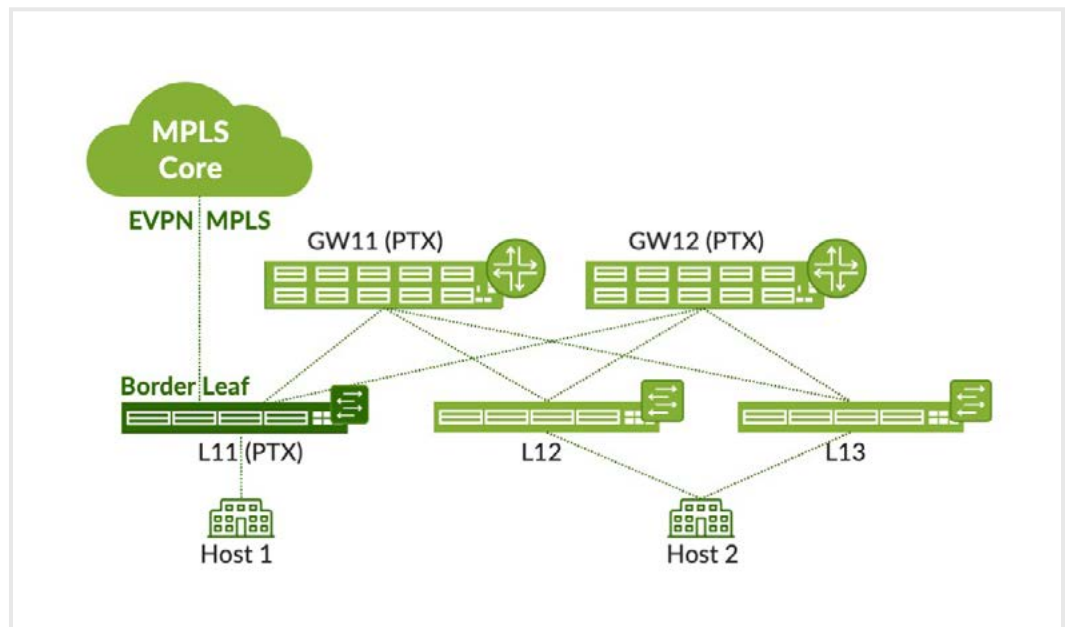
These types of network designs are proliferating rapidly in large-scale data centers. In fact, multiple leading cloud providers now use Juniper PTX to support AI-Native networks, and any large-scale DCI deployment that uses 100GE, 400GE, or even 800GE optical links.

To meet the extreme bandwidth and throughput requirements of DCI and AI-Native networks, Juniper PTX uses deep packet buffers to enable the fast, efficient transfer of huge volumes of traffic. Its low latency meets the unique requirements of AI workloads, such as synchronizing operations across thousands of GPU nodes for model-training or real-time inferencing, without creating bottlenecks. It provides specialized traffic engineering capabilities to optimize traffic flows, and the security features to encrypt sensitive data in transit. And it delivers the resiliency to support mission-critical data center applications with the scalability to keep up with traffic growth.

### Data center edge

Data center edge networks primarily handle ingress and egress traffic between the data center and external networks and service providers. As a result, data center edge routers often must support a wide range of interfaces and protocols to accommodate diverse connectivity needs as the environment evolves. To meet these requirements, data center edge routers must also deliver high density, advanced security, QoS capabilities, and carrier-grade reliability.

Figure 2 illustrates a data center edge using a close spine-leaf architecture with two leaves, once again using eBGP underlay plus overlay, with Juniper PTX providing edge connectivity.



**FIGURE 2**

**Data center edge network design with Juniper PTX**

Juniper PTX provides an ideal combination of density, security, and adaptability for evolving data center edge deployments. Its industry-leading port density enables operators to connect with diverse external networks and service providers in myriad ways, with the flexibility to support changing traffic patterns and scale with evolving needs. The router's advanced QoS intelligence prioritizes critical traffic to assure optimal application performance. And it provides carrier-grade reliability to ensure nonstop connectivity, with advanced security features to protect against external threats.

**Core capabilities**

## The Juniper PTX advantage

By addressing the needs of both DCI and data center edge networks (as well as traditional core, peering, and aggregation roles) in the same platform, Juniper PTX dramatically simplifies network design and management. At the same time, its high density, flexibility, and sustainability reduce operational overhead and maximize resource utilization.

Across DCI, data center edge, and other network use cases, Juniper PTX provides:

“Fastweb is delighted to see how scaling **DCI networks can be innovated to high-density** 400GE, 800GE and beyond.”

**Domenico Cimini**  
Network Operations and Engineering Manager,  
Fastweb

Industry-leading port density and radix

PTX routers deliver up to 28.8 terabits of throughput per line card or fixed chassis, with deep packet buffers and very low latency to support AI-Native fabric architectures and other demanding use cases.

Scalability to 800GE and beyond

New PTX routers with Juniper’s groundbreaking Express 5 silicon unleash 800GE (or double density 400GE) scalability. With their modular architecture and port flexibility, operators can continually scale network bandwidth to meet changing needs.

Flexibility

PTX routers support diverse network protocols and technologies, including EVPN, Segment Routing, and MPLS. Operators can apply PTX to a wide range of data center network architectures and continually reuse the platforms in new ways.

Carrier-grade reliability

PTX routers use features like redundant power supplies, hot-swappable components, and graceful restart to ensure that the network stays operational, even in the event of component failures.

Sustainability

Explosive growth in energy consumption is among the biggest challenges facing data center operators—especially for AI-Native networks connecting thousands of power-hungry GPUs. With their innovative system design, advanced power management features, and Express 5 silicon, PTX routers set the standard for environmentally conscious networking. The PTX10002-36QDD, for example, delivers double the capacity of previous-generation routers in the same footprint, with a 75% improvement in Watts/Gbps.

Expanded visibility

PTX routers come equipped with advanced features like hierarchical QoS(HQoS), traffic engineering, and streaming telemetry that provide valuable insights to optimize network performance.

Automation

When operators use Juniper PTX in multiple roles, they can apply the same consistent automation across all of them—whether using Paragon Automation, homegrown tools, or open management protocols and APIs. Using a variety of standards-based data models, operators can automate operations from Day 0 planning through Day 2 operations and beyond.

Packet-optical convergence

Juniper PTX supports transformative [IP over Dense Wavelength Division Multiplexing \(IPoDWDM\)](#), opening new possibilities for more efficient network designs. PTX routers support a wide range of coherent and non-coherent optical transceivers from Juniper and others. Operators can connect data centers over longer distances without the need for external transponders—enabling up to 54% power savings and 55% lower carbon emissions.

“Juniper Networks **enables us to achieve an experience-first focus** to meeting our key business objectives.”

**Steven Schecter**  
Senior Director,  
Network Architecture,  
Akamai

[www.juniper.net](http://www.juniper.net)

## How we deliver



**Akamai** completely reimagined its global network with Juniper 400G routing and integrated coherent optics.



**Fastweb** uses Juniper Apstra software to design, automate, and continuously validate network fabric operations.

## Our advantage

### Innovation in action

Juniper PTX has long been the first choice for core, peering, and high-speed aggregation deployments. In fact, more than 3,000 leading cloud and service providers use Juniper PTX. Now a growing number are also using PTX to deploy more capable DCI and data center edge networks as well.

#### Fastweb: Unleashing scalable data center interconnect

“Fastweb is excited to deploy a new DCI network that will further extend connection to the Fastweb backbone to provide access to the internet and other services with increased performance for our customers. The DCI network is composed of core Juniper PTX10001-36MR and edge MX304 devices. With the launch of Juniper’s new 800GE PTX products, Fastweb is delighted to see how scaling DCI networks can be innovated to high-density 400GE, 800GE and beyond.”

– Domenico Cimini, *Network Operations and Engineering Manager, Fastweb*

#### Akamai: Future-proofing the data center edge

“Akamai’s Connected Cloud, our massively distributed edge and cloud platform, offers our customers the highest scale, capacity, reach, and visibility to keep applications and experiences closer to users. Juniper Networks enables us to achieve an experience-first focus to meeting our key business objectives through our 400GE Juniper PTX network. We are eager to be one of the first to trial Juniper’s 800GE PTX Express 5-based silicon solution so that we can continue to evolve our global infrastructure and peering networks to industry-leading network reach, capacity, and density.”

– Steven Schecter, *Senior Director, Network Architecture, Akamai*



## Why Juniper

## Reimagine data center networks with Juniper PTX

AI is just the latest application to upend data center networking requirements. Others will inevitably follow, driving ever-greater requirements for higher capacity and density, and more advanced capabilities for use cases like DCI and data center edge. With Juniper PTX, cloud and service providers can support the most demanding new networking use cases, as well as traditional ones.

To learn more, please visit our [PTX Series Routers product page](#).

### About Juniper Networks

At Juniper Networks, we are dedicated to dramatically simplifying network operations and driving superior experiences for end users. Our solutions deliver industry-leading insight, automation, security, and AI to drive real business results. We believe that powering connections will bring us closer together while empowering us all to solve the world's greatest challenges of well-being, sustainability, and equality.

## More information

## Discover how Juniper PTX routers simplify data center operations

To learn more about Data center, visit our website at <https://www.juniper.net/us/en/solutions/data-center.html>

For technical data sheets, guides and documentation, visit <https://www.juniper.net/us/en/how-to-buy/guided/dt/data-center.html>

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