

# PACKET OPTICAL DATA CENTER INTERCONNECT SOLUTION

## Challenge

Data center operators must scale network capacity between sites and to POPs and peering points to support escalating traffic growth.

## Solution

Juniper Networks DCI solution combines end-to-end packet optical networking platforms with unified management and control software and open APIs, helping providers simplify operations, reduce TCO, and accelerate capacity expansion.

## Benefits

- **Simple:** Provides a compact form factor that fits efficiently into precious rack space
- **Open:** Delivers an open packet optical network architecture that ensures interoperability
- **Smart:** Offers intelligent automation tools and intuitive multilayer end-to-end visibility throughout the entire DCI underlay, ensuring that infrastructure capital is optimized for peak efficiency

*Content providers, collocation providers, and hosted service providers across the globe are building out new data centers and expanding network capacity to keep pace with growing business demands. Skyrocketing video, social media, and distributed application traffic pose significant capacity planning and network engineering challenges for data center operators. These operators must upgrade network infrastructure and expand bandwidth between data centers, as well as to points of presence (POPs) and peering points, to support this rapid traffic growth and enable workload mobility, business continuity, and disaster recovery.*

*Juniper Networks packet optical Data Center Interconnect (DCI) solution lets operators turn up and extend inter-data center capacity quickly and cost effectively. It's a simple, open, and smart solution that delivers Web scale, agility, and economics while dramatically simplifying operations.*

## The Challenge

Businesses and consumers are flocking to the cloud for a wide range of services. The cloud, however, fundamentally transforms the way applications are built and delivered, creating complex capacity planning and design challenges for network operators. Today's mobile-first, cloud-first application traffic increasingly flows into and out of the data center to peering points, partners, and other data centers.

Legacy networks designed to support traditional traffic flows and data transport services are too costly, complex, and inflexible for today's dynamic cloud environments.

Conventional networks are typically built on separate layers of switching, routing, and optical networking elements with distinct administrative interfaces and limited APIs. Most are statically configured to support peak traffic demands—an inefficient and expensive approach that squanders bandwidth. Expanding capacity means adding more switches and routers, which increases operational expense and complexity.

## Juniper Networks Packet Optical Data Center Interconnect Solution

Juniper's packet optical DCI solution delivers flexible, high-capacity, low-latency connectivity between data centers as well as to POPs and peering points. A collapsed architecture eliminates excessive equipment expense and complexity, while end-to-end provisioning, monitoring, and control capabilities and open APIs improve operations and accelerate service agility.

The fully integrated portfolio includes Juniper Networks® MX Series 5G Universal Routing Platforms, QFX Series Switches, TCX1000 Programmable ROADMs, the ACX6360 Universal Metro Router, the NorthStar Controller, and proNX Optical Director software for management and control.

## Features and Benefits

### Simple

Juniper's packet optical DCI solution delivers flexible, high-density 10 Gbps/100 Gbps/200 Gbps wavelengths in a tiny footprint, creating a simple, pay-as-you-grow architecture that enables incremental scalability with low first-in costs. High density in a compact footprint conserves precious rack space, which reduces the number of cables and transponders required as well as the number of network elements to manage. This simplifies wiring, eliminates configuration errors, and improves operational efficiencies.

### Open

Juniper's packet optical DCI solution is an open optical line system that allows best-of-breed network element choices. The traditionally deployed fixed, single-vendor optical layer provides scalability but requires operationally intensive procedures—and significant preplanning—for the network to scale and operate effectively.

Juniper's converged packet optical platforms support both overlay tunnel technology such as Ethernet VPN (EVPN) and MPLS, optical underlay technology such as 100 Gbps/200 Gbps/400 Gbps coherent dense wavelength-division multiplexing (DWDM) interfaces, and reconfigurable optical add/drop multiplexer (ROADM) functionality, as well as a unified management and control plane. Depending on the desired configuration, Juniper packet optical systems can be used either as an integrated optical line system or as disaggregated transponders to a network element with DWDM interfaces. This is a highly flexible approach that allows the speedy delivery of new service offerings and increases competitiveness by providing plug-and-play interoperability with other standards-based third-party solutions.

### Smart

Juniper's packet optical DCI solution lets users create a programmable pool of high-performance network resources, while a dynamic optical layer and RESTful APIs make it easy for external applications and operations/business support systems (OSS/BSS) to interactively provision resources and orchestrate services across data centers and network elements. The intelligence provided in the optical layer accelerates time to market and enhances service agility by streamlining automation, ensuring that infrastructure capital is optimized for peak efficiency.

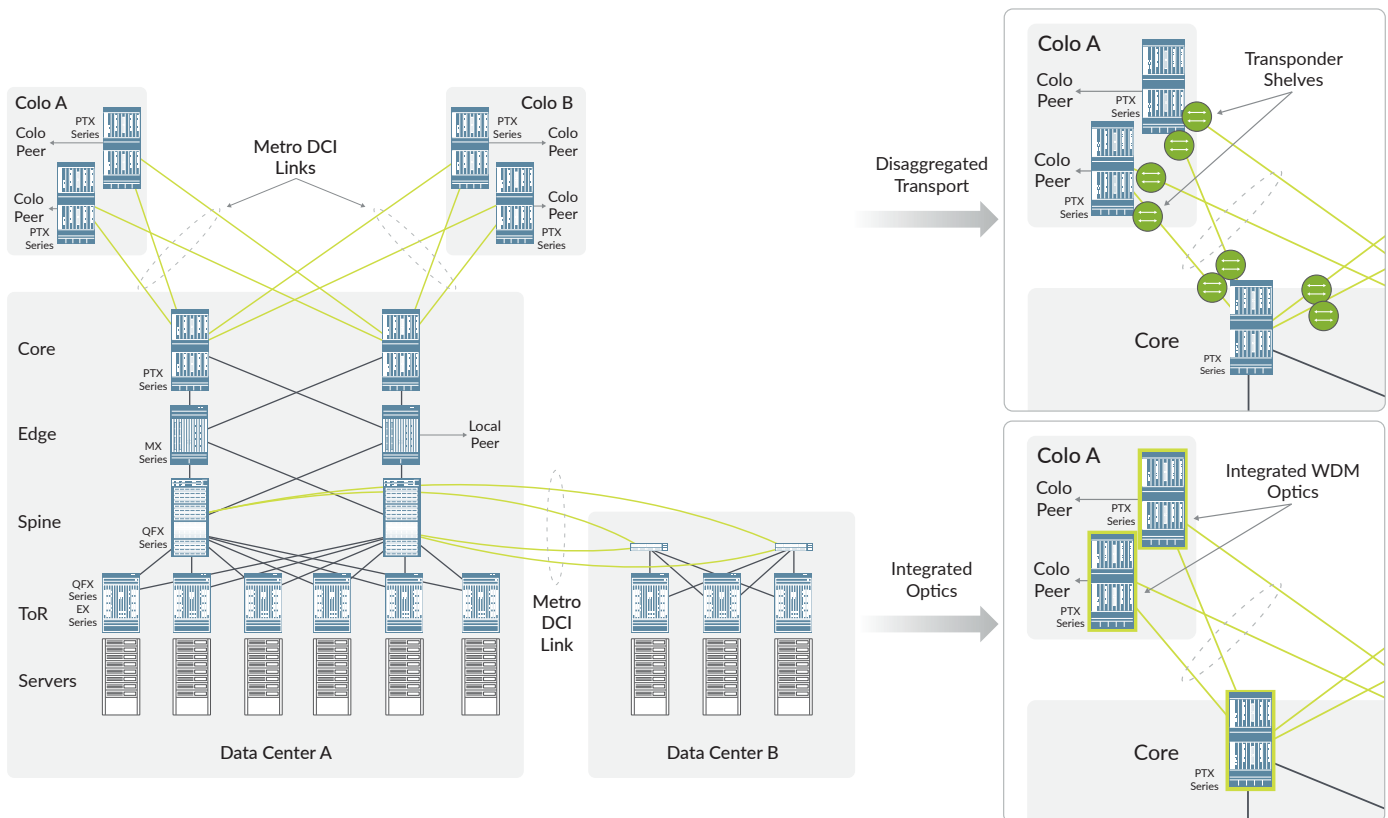


Figure 1: Juniper's packet optical DCI solution delivers flexible, high-capacity, low-latency connectivity between data centers as well as to POPs and peering points.

## Integrated Value

- Reduces implementation costs via less cabling, lower power requirements, and smaller footprint
- Leverages existing Juniper resources
- Minimizes impact to existing power and space requirements
- Optimizes router/switch port density
- Integrates DWDM card optics
- Simplifies architecture
- Reduces failure points
- Simplifies operations
- Unifies management
- Integrates fast reroute (FRR) to ensure better network uptime

## Solution Components

### MX Series 5G Universal Routing Platforms

The MX Series 5G Universal Routing Platforms are true carrier-grade edge routers that ensure high network and service availability with a broad set of multilayered physical, logical, and protocol-level resiliency features. Used to connect data centers, peering points, and POP sites, the software-controlled platforms provide a comprehensive set of switching, routing, and security capabilities.

### QFX Series Switches

QFX Series switches deliver industry-leading performance and density. Offering throughput up to 6 Tbps per slot, QFX Series switches provide sustained wire-speed switching with low latency and can be deployed as 10GbE, 40GbE, or 100GbE access, spine, core, or aggregation devices. Integrated optics for 100 Gbps and 200 Gbps DWDM are also available on the larger QFX10008 and QFX10016 models.

### ACX6360 Universal Metro Router

The ACX6360 Universal Metro Router is a 1.6 Terabit lineside 1 U router that can also be deployed in a simple transponder mode, which passes the client QSPF28 ports directly to CFP2 200G DCO ports sequentially. This allows the ACX6360 to be used for both traditional transport as well as to extend the spine-leaf environment of the data center.

### TCX1000 Programmable ROADMs Optical Line System

A flex-grid-capable 1 U per degree ROADM with integrated universal ports, the TCX1000 Programmable ROADM is a perfect starting point for DCI deployments. The universal ports can be utilized for direct wavelength additions of up to 19 channels, and eight-channel CD filters can be inserted at any channel to multiply the node's drop-add capabilities. The TCX1000 also offers advanced features such as optical protection switching via 8ch CD filters.

### proNX Optical Director Software

Juniper Networks proNX Management Applications and optical control software streamline end-to-end administration of packet optical networks. The proNX software suite includes provisioning templates, configuration wizards, and one-click service activation features that eliminate manually

intensive and error-prone tasks, accelerating bandwidth turn-up and capacity expansion. RESTful APIs simplify integration with external management applications, including controllers such as NorthStar, service orchestration solutions, and OSS/BSS platforms.

### NorthStar Controller

Juniper Networks 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

### Data Center to Data Center

The Juniper DCI solution establishes resilient, high-capacity, low-latency packet optical connectivity between two or more data centers, enabling workload mobility, business continuity, disaster recovery, and tenant-to-tenant connectivity across sites. Point-to-point connections between data centers or mesh networks interconnecting several data centers can also be implemented.

### Peering/Collocation

With the Juniper packet optical DCI solution, users can establish 100 Gbps or 200 Gbps connections to POPs and peering points, giving tenants high-capacity cross-connects to content providers, business partners, and service providers to move up the value chain.

### Cloud/Metro Connect

The Juniper packet optical DCI solution offers enterprise customers high-bandwidth, low-latency cloud connections that bypass the public Internet for superior throughput, reliability, and security. Direct connectivity to multiple cloud providers over a private IP service enhances revenues and margins with value-added connectivity services backed by SLAs.

## Summary—Simple, Open, and Smart Data Center Interconnect Solution

Juniper Networks packet optical DCI solution delivers Web scalability, agility, and economics for the cloud era. It efficiently expands capacity between data centers, POPs, and peering points to accommodate skyrocketing traffic growth and to enable value-added services. Juniper's packet optical DCI solution eliminates excessive equipment costs and operational complexity with a collapsed network architecture of high-density, high-performance switching and routing platforms. This integrated DCI solution ensures continuous availability with reliable platforms and a resilient networking infrastructure, while accelerating service agility and streamlining operations with automation, end-to-end provisioning, and management—significantly improving bottom-line business results.

### Next Steps

To learn more about how Juniper packet optical Data Center Interconnect solution 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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