

Juniper Cloud Metro

*Reimagine metro networks for better user experiences,
improved efficiency, and sustainable business growth*



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Executive summary

Metro networks are changing, and the economics underpinning yesterday's "retro metro" look increasingly unsustainable. Fortunately, a new approach puts service provider networks and operations on a stronger footing for the future: Cloud Metro. By applying cloud principles, state-of-the-art systems, and end-to-end automation, service providers can reimagine metro networks for a cloud-connected, experience-first world. You can start transforming your network today, and build a more profitable, sustainable foundation for the future.

The Growing Metro Challenge

Metro networks aren't what they used to be. Previously, service providers used longer-distance regional networks mostly for aggregation. Today's metro has become the new "edge," where connectivity, distributed cloud computing, and next-generation service experiences converge.

These changes push the critical control point for network services—where throughput, security, and quality of experience (QoE) get defined—out closer to subscribers. And they introduce many new challenges for service providers, including:

- **Explosive traffic growth:** Metro traffic bandwidth is estimated to grow more than 500 percent from 2021 to 2027. According to a 2023 Heavy Reading survey of network operators, half expect 10-24 percent metro growth annually. Another 37 percent expect 25 percent or higher growth.
- **Rising customer expectations:** As subscribers consume more video content, real-time communications, and performance-sensitive cloud services, operators face nonstop pressure to increase throughput and provide better QoE.
- **Mounting cybersecurity threats:** Service providers need simple, flexible ways to protect distributed infrastructure and data—including cell sites and other remote locations with little or no onsite staff.
- **Skills shortage:** Even as operators need more advanced networking and software skills, the people who can provide them keep getting harder to acquire. Eighty-six percent of telecom executives named skills shortages as the biggest impediment to network modernization.
- **Sustainability commitments:** Service providers also face mounting pressure to reduce carbon footprint and promote greener operations. The International Telecommunication Union's Net Zero standard, for example, requires operators to reduce greenhouse emissions by 45 percent by 2030.

Add up the impact of these changes, and the economics of traditional metro networks start to collapse. There is simply no way to keep pace with nonstop demand for extreme throughput, agility, and next-generation user experiences with a legacy, device-based approach to scaling metro networks. The cost per bit quickly becomes unsustainable.

These problems don't apply only to conventional metro networks connecting urban markets in Europe, Asia, and the Americas. Operators deploying large regional and national networks in emerging markets face the same set of issues. With new 5G and cloud applications emerging that require even higher throughput and specialized handling at the edge—distributed artificial intelligence (AI), industrial automation, augmented reality and virtual reality (AR/VR), and others—the challenge will only grow.

Fortunately, service providers don't have to keep doing things the same way, only hoping for different results. There's a better approach to tackle these challenges and unlock sustainable growth—for your business, your people, and your zero-carbon goals. It's Cloud Metro, and it applies modern cloud principles to enable more efficient, sustainable metro infrastructures. Now, Juniper Networks can help you reimagine metro networking and position your business for superior subscriber experiences, simplified operations, and more profitable long-term growth.

Unleash Cloud Metro Transformation

Cloud Metro is a new category of solutions optimized for service provider network transformation and sustainable business growth. It applies cloud principles to architecting, building, and operating metro networks, to help operators meet new requirements that traditional approaches can't address.

Cloud Metro puts the end user front and center, employing experience-first networking principles to deliver the highest-quality subscriber experiences. It uses automation and AI to reimagine network operations. It delivers the performance and capacity required to meet insatiable customer demand, with industry-energy efficiency and system longevity. And, unlike yesterday's retro metro, it combines groundbreaking efficiencies and networking innovations to enable sustainable business growth. Using the latest silicon and systems, automated security and assurance, and next-generation IP and optical convergence, a Cloud Metro can deliver up to 71% lower TCO.

	Retro Metro	Cloud Metro	Profit	People	Planet
Operations	Focus on devices	Focus on service experiences	✓	✓	
	Manual, “DIY” operations	Experience-first network automation	✓	✓	
	Individual expertise	Experience augmented with virtual network assist	✓	✓	
Systems	Traffic aggregation only	“Smart” rich features and scale plus aggregation	✓		✓
	Monolithic power design	Energy-efficient adaptive power design	✓		✓
	Rip and replace 3-5 years	PAYG, 7-12 years	✓		✓
Architecture	Scale up	Scale out and scale up	✓		✓
	Network silos: mobile vs. business vs. consumer	Network convergence with network slicing	✓		✓
	Passive assurance	Embedded active assurance	✓	✓	✓
	“Bolt-on” security	Built-in zero trust security	✓	✓	

Figure 1: Cloud Metro delivers advantages to help operators that a retro metro can't address

Cloud Metro combines:

- Sustainable systems:** Cloud Metro systems, based on the groundbreaking Juniper Networks ACX7000 line of Cloud Metro routers, provide the throughput and scale to meet insatiable customer demand for cloud-, 5G, and AI-enabled digital experiences. These systems provide up to 54 ports of concurrent 400GbE capacity—up to 21.6 Tbps—with support for the latest XR/ZR/ZR+ coherent optics to efficiently deliver 400GbE and beyond. At the same time, Cloud Metro solutions use advanced chassis designs and adaptive power innovations to achieve breakthrough performance with up to 77% lower power consumption, in up to 64% less space, with an expected service life 4 to 7 years longer than other solutions.
- Sustainable architecture:** A Cloud Metro supports all residential, business, and mobile services on a single, converged IP services fabric. It can support both scale-up and scale-out architectures, enabling “pay-as-you-grow” network expansion that continually aligns investment with customer demand. It embeds Zero Trust security and active assurance directly into the network fabric. It also provides a converged framework to collapse previously siloed optical and IP network layers—eliminating dedicated optical equipment and freeing up huge amounts of reserve bandwidth.
- Sustainable operations:** Cloud Metro draws on a range of AI-enabled, experience-first automation capabilities to reinvent metro network operations—simplifying day-to-day workflows, accelerating provisioning, and minimizing network outages and service issues. Juniper routers use intent-based automation to ensure that services are deployed right the first time and every time, measuring user experience directly on the service plane to automatically verify that the network is delivering the right level of performance. Meanwhile,

embedded AI-for-operations (AIOps) intelligence helps diagnose and fix problems more quickly, driving down manual effort and timelines for Day-2 network operations. Together, these capabilities can help you overcome industrywide skills shortages, accelerate time-to-revenue, and dramatically improve efficiency across network operations.

These are just a few of the many benefits you can expect from a Cloud Metro. By working with Juniper, you can also tap into unique capabilities like:

- **Built-in Zero Trust security:** Cloud Metro embeds Zero Trust security principles throughout the IP services fabric to protect your network and customers. For example, select ACX7000 platforms provide line-rate MACsec along with native file encryption. Every Cloud Metro platform also includes a unique, cryptographically signed device ID that complies with the IEEE 802.1AR standard for secure device identity, stored in Trusted Platform Module (TPM) 2.0 silicon. The moment a Cloud Metro platform boots, it automatically verifies device authenticity and integrity, verifying that neither hardware nor software has been tampered with.
- **Embedded active assurance:** Traditional metro networks require complex standalone solutions to validate that devices are configured correctly and provide the service quality that users expect. Cloud Metro takes a different approach, embedding active assurance test agents directly into the Junos® OS Evolved software in every ACX7000 platform. The network itself becomes a distributed sensor that proactively tests and validates end-user experience—without requiring specialized tooling or expertise. You can proactively enable end-to-end services, such as proactively verifying that a new cell site is ready to serve customers or that an edge cloud meets performance requirements for a new network slice. And, if there's a problem, this distributed sensor capability can cut incident resolution times in half.
- **Use case flexibility:** Metro networks encompass a range of locations and facilities, operating under different environmental conditions with different requirements for capacity, scale, and port configuration. With Juniper's broad portfolio of ACX7000 platforms, you extend the right performance and service scale to the right location—while maintaining the same consistent feature set and operational experience everywhere. Choose from hardened solutions built for cell sites and industrial environments, modular chassis with extreme scale for edge access and aggregation, and fixed platforms for scale-out architectures.

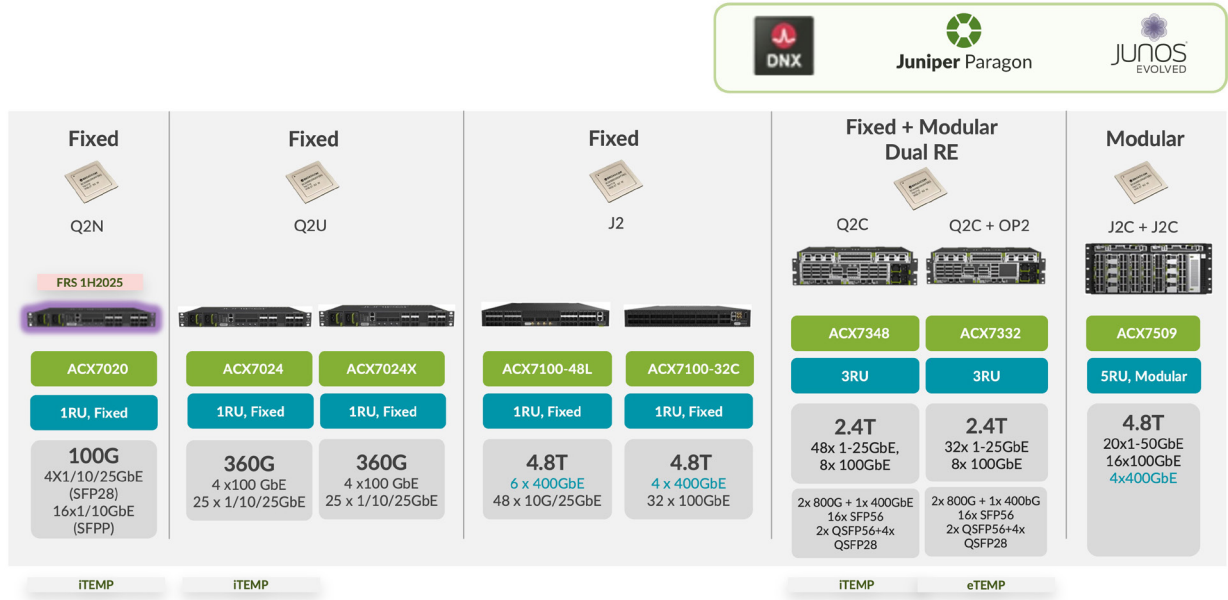


Figure 2: ACX7000 portfolio

- IP-Optical convergence:** One of the most high-impact changes service providers can make is to converge siloed network layers with IP over Dense Wavelength Division Multiplexing (IPoDWDM). With the ability to plug next-generation coherent optics directly into Cloud Metro routers, you bring **400GbE** capacity and beyond to every corner of your network. Using Juniper's Converged Optical Routing Architecture (CORA) to consolidate everything onto an IP mesh architecture, you also liberate vast reserves of idle lambdas traditionally set aside for optical network protection, freeing up as much as 50% more bandwidth. At the same time, you eliminate the need for external DWDM transponders for many applications—slashing power and space requirements, driving down capital expenses, and reducing TCO by more than 45%.

Together, these capabilities help you create a more scalable, assured, and secure IP services fabric that's optimized for the explosion of new devices and applications at the metro edge. You gain a versatile foundation to deliver new 5G-, cloud-, and AI-enabled services, with more sustainable profitability.

Cloud Metro in Action

Since announcing Juniper's Cloud Metro vision less than three years ago, this new approach to metro networking has generated significant industry interest. In a recent survey conducted by *Heavy Reading*, operators named Juniper one of the top innovators shaping the future of metro networking. *Light Reading* also named Juniper's Cloud Metro portfolio the Editor's Choice for "Most Innovative Routing and Switching Solution" in its 2022 Leading Lights Awards.

Just as important, service providers around the globe are already benefiting from Cloud Metro innovations. Examples include:

- **Tele Columbus:** One of Germany's leading service providers implemented a converged Cloud Metro solution that consolidated all consumer and business services onto a single, open infrastructure. By extending optical reach out closer to subscribers, Tele Columbus can continually scale up capacity and capabilities to meet new demands. At the same time, the automated, highly efficient metro network simplifies operations, while helping Tele Columbus reduce CO2 emissions.
- **MetroFibre:** As one of South Africa's largest service providers, MetroFibre faced skyrocketing demand for fast, reliable Internet service from hundreds of thousands business and residential customers. With Juniper Cloud Metro solutions, they were able to dramatically increase scale and efficiency in record time—doubling network speeds at no additional cost to subscribers. Today, the metro network provides a converged edge platform for business, residential, and ISP services. MetroFibre maintains unprecedented density and capacity, even in locations with limited space and power. Additionally, operations teams have seen up to 80% fewer network incidents per month.
- Even beyond traditional metro markets, service providers are tapping into the value of Juniper Cloud Metro solutions. Algeria Telecom, for instance, is deploying a modern nationwide IP network using Juniper Cloud Metro technology, which will accommodate surging traffic demands today and in the future.

Start Your Network Transformation

Service providers in every market face the same growing challenges:

- Extreme customer demand for higher throughput and better QoE
- High costs and operational complexity to maintain metro networks and safeguard subscriber data
- Network economics that look increasingly unsustainable—especially as customers adopt more distributed 5G, cloud, and AI applications

These problems can't be solved by simply deploying new equipment into the same old architectures. They demand a radically different approach to building and operating metro networks.

Juniper Networks can help you reimagine the retro metro and implement a highly scalable, secure, and efficient converged IP architecture. With groundbreaking Juniper Cloud Metro solutions, you can ramp up capacity and scale everywhere, while driving down costs and CO2 emissions. You can tap into game-changing innovations like embedded security and assurance, end-to-end automation, and IP-optical convergence. Experience-first automation continually, automatically delivers outstanding subscriber experiences.

The convergence of next-generation 5G, cloud, and AI experiences at the edge brings massive change to service provider networks. It is an incredible opportunity. Let Juniper Networks help you put your business in the best position to capitalize.

To learn more about Juniper Cloud Metro network solutions, visit www.juniper.net/us/en/solutions/ip-transport-solution/metro.html.

About Juniper Networks

Juniper Networks believes that connectivity is not the same as experiencing a great connection. Juniper's AI-Native Networking Platform is built from the ground up to leverage AI to deliver the best and most secure user experiences from the edge to the data center and cloud. Additional information can be found at [Juniper Networks](https://www.juniper.net) or connect with Juniper on X (Twitter), LinkedIn, and Facebook.



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