

INFOBRIEF

Unlocking IP/Optical convergence success with coherent routing

To simplify network architectures, achieve sustainability benchmarks, and keep up with user and application thirst for bandwidth, many network operators are looking to converge the IP and optical layers of their networks. According to a study conducted by Heavy Reading, 87% of providers view IP/Optical convergence as important for their next-generation networks.¹

But historical industry thinking around IP/Optical convergence has narrowly focused on collapsing the IP and optical layers of the network—by simply putting a coherent plug in a router. IP/Optical convergence requires more than that. To succeed, operators need to take a holistic approach focused on delivering the greatest performance and return on investment. This includes not just the traditional view of IP/Optical convergence but is also inclusive of automation from multi-layer operations and scale from an intelligent programmable optical layer.

Understanding the challenges

For decades, operators have built separate networks to support different applications, service types, and service-level agreements (SLAs). This has resulted in complex, cost-intensive, and rigid network environments. These networks are based on old assumptions and network designs that must be

reevaluated to keep pace with new demands in an era of 5G and multi-cloud IP and must be lean and automated—not bloated. Optical technologies must be truly scalable. Software control must go further to provide coordinated multi-layer visibility and automation so operators can plan, dynamically adjust traffic flows, and troubleshoot across network layers to achieve optimal network performance. These new networks must all deliver real sustainability and cost-efficiency benefits. IP/Optical convergence provides the opportunity to reshape aging networks and embrace new assumptions.

Ciena's coherent routing

Based on a deep understanding of the challenges operators face in trying to converge the IP and optical layers of their networks, Ciena's coherent routing brings together the latest in IP and optical technology innovation with advanced multi-layer operations.

It is based on Ciena's proven coherent routers—including the [5132](#), [5134](#), [5164](#), [5166](#), [5169](#), [5171](#), [5184](#), [5186](#), [8110](#), [8112](#), [8114](#), [8140](#), [8180](#), [8190](#), and [WaveRouter®-2](#), [WaveRouter-7](#), and [WaveRouter-13](#)—and driven by a next-gen IP network operating system (NOS). Ciena's coherent routers are integrated with industry-leading [WaveLogic™ 5 Nano](#) (WL5n) and [WaveLogic 6 Nano](#) (WL6n) coherent pluggables and [WaveLogic 6 Extreme](#) (WL6e). They're supported by Ciena's fully instrumented, use case–optimized photonic line systems, such as [Coherent ELS](#), a coherent edge line system, and [6500 Reconfigurable Line System](#) (RLS).

¹ Heavy Reading, IP Optical Convergence Global Survey, May 2021, n=220

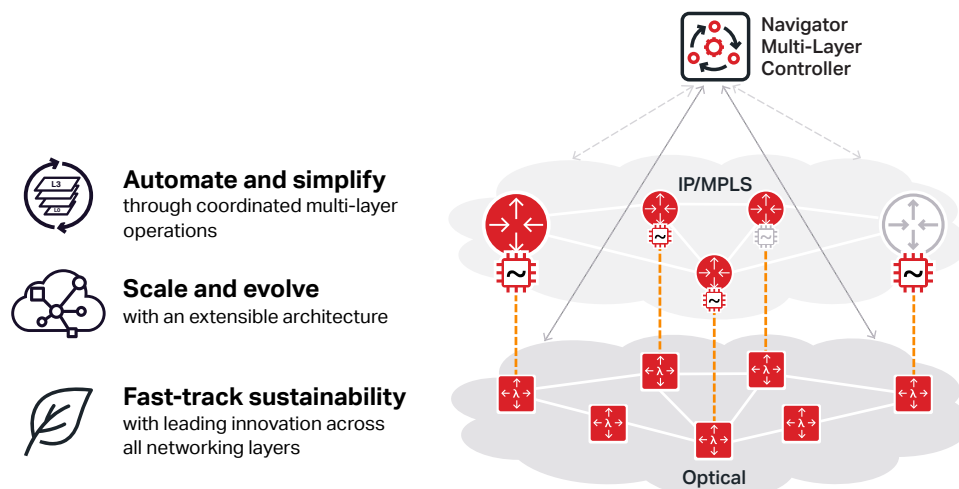


Figure 1. Ciena's coherent routing

On the cutting edge of multi-layer operations, coherent routing takes IP/Optical convergence to the next level. Ciena's [Navigator Network Control Suite™](#) (Navigator NCS) provides integrated planning and powerful analytics that span network layers. In a single pane of glass, Ciena's coherent routing allows operators to easily manage converged networks and optimize performance across a multi-vendor infrastructure. The result is a simplified, highly scalable, and sustainable network driven by coordinated multi-layer operations.

Benefits of Ciena's coherent routing

Automate and simplify across network layers:

With Ciena's coherent routing, operators can automate and simplify network operations across layers—which is the key to unlocking the power of network convergence. With coordinated, multi-layer operations, Navigator NCS allows operators to quickly plan their converged network, guaranteeing the best path, design, and performance with the right equipment and protocols.

Additional cost efficiencies are gained through Navigator NCS open APIs that enable automation of converged IP and optical operational workflows throughout the entire network lifecycle. To adapt capacity to demand and maximize infrastructure ROI, Navigator NCS multi-layer analytics find potential capacity bottlenecks and, through software-defined control, fine-tune network performance by assigning network resources when and where they are needed to deliver the best possible customer experience. In addition to network performance optimization, unique features, such as multi-layer alarm correlation to affected customer services, significantly reduce troubleshooting

time. And all this is possible through a single pane of glass. Working from a unified view of converged architecture, operators can easily and intelligently drive better network performance and deliver any-to-any connectivity to new places in the network.

[Coherent routing: A rapid evolution to IP/Optical convergence](#)

[Read blog](#)

Scale and evolve the network with ease: Ciena's coherent routing enables dynamic scalability and easy network expansion. It starts with Ciena's purpose-built coherent routers, which are based on an Adaptive IP™ approach and designed to be open, automated, and lean. These are integrated with industry-leading WL5n and WL6n coherent pluggables, which are available in both interoperable and high-performance variants and WL6e 1.6 Tb/s performance-optimized coherent optics. This allows operators to deploy the capacity and performance needed for their networks, with pay-as-you-grow modularity.

To ensure the converged network can easily extend to new locations and evolve to support future generations of coherent technology, this solution also uses Ciena's flexible, self-configurable photonic underlay. With embedded instrumentation and programmability, Ciena's intelligent photonics support application-responsive networking to unleash ultimate scalability and flexibility when managing IP traffic flows. When combined with Navigator NCS software-defined control and analytics, Ciena's coherent routing provides a converged, highly scalable network that can adjust capacity based on demand.

Fast-track sustainability efforts: With Ciena's coherent routing, operators gain the reliability and operational benefits of fewer routers and coherent optics to deploy and manage, fewer error-prone manual provisioning processes, and fewer site visits. Ciena continues to invest in the sustainability of critical network elements—from routers, interoperable, and high-performance coherent pluggables to use case-optimized photonics and off-board software—helping operators advance their sustainability goals.

Sustainability models show Ciena has helped customers avoid more than 550,000 metric tons of CO₂e over an eight-year period (2014–2021) with routing and switching products. This helped customers' production networks achieve 23% in power savings, equaling 96,000,000 kWh saved, which resulted in \$12 million per year OPEX savings.²

Through WaveLogic coherent optic investments, Ciena introduced the industry's first 400G transceiver in 2017. The pluggable version was delivered five years later at one-fifth the power, one-tenth the space, and with improved—and industry-leading—systems performance. Ciena offers use case-optimized, fully instrumented, and programmable open line systems (Coherent ELS and 6500 RLS) so operators can deploy a space- and cost-optimal configuration for needed flexibility and scalability. Based on numerous network studies, as capacity in the network increases, a flexible photonic underlay using ROADMs provides 30%–50% in power savings compared to a hop-by-hop architecture.

Combining Ciena's IP and optical innovations, Ciena's coherent routing offers significant improvements in footprint and power savings to enable more efficient and sustainable networks for customers—and the planet at large. As an example, evolving the network from a 100G-optimized configuration to a 400G-optimized coherent routing architecture results in a 75% reduction in footprint and a 70% reduction in power.³ This is just one example. Upgrading from earlier technology generations can result in even greater OPEX savings.

Open and disaggregated by design: While using Ciena's technology all together drives significant business value, coherent routing is also open and disaggregated by design. All solution components work within existing

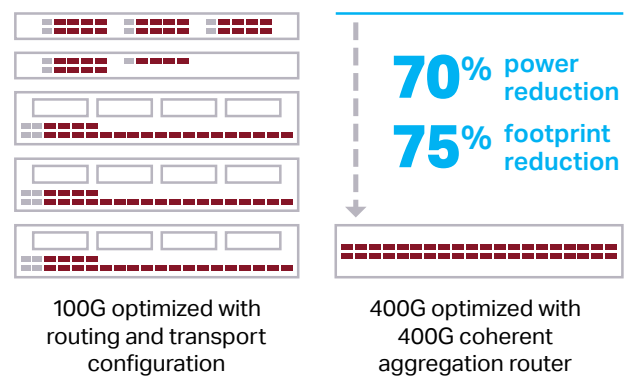


Figure 2. Significant improvements with Ciena's coherent optical investments and coherent routing

legacy environments and with third-party technologies, giving operators maximum flexibility and choice to achieve their ideal converged end state. Furthermore, Navigator NCS supports industry-recognized open APIs and data models to provide visualization and monitoring of third-party optical line systems and transponders (for example, visualization, monitoring of alarms, and metrics). This allows coordinated multi-layer operations even in multi-vendor environments.

For more than 30 years, Ciena has earned the trust of network operators across the globe, helping them build some of the most adaptive, customer-centric networks in the world. To guide operators in their convergence journey, [Ciena Services](#) experts can collaborate with operators to develop an evolution strategy that meets their business goals. Using Ciena's [Network Transformation Suite](#) is an industry best practice that deploys leading network experts, data analytics, and automation tools to reduce risk and provide the best path forward to ensure that operators get the most out of their network investment.

The key to successful network convergence

Operators can realize IP/Optical convergence success with Ciena's coherent routing. Ciena brings together purpose-built routers, leading coherent optics, and intelligent flexible photonics—all driven by cutting-edge multi-layer operations. Guided by experts, Ciena helps operators achieve simplified multi-layer operations, dynamic scalability, and improved network sustainability to take convergence to the next level.

² The Ciena Routing and Switching Portfolio Sustainability Model to Quantify Equivalent CO₂ Emissions Avoided: 2014–2021

³ Omdia, "Pluggable PON and Ciena – promoting sustainable access," Julie Kunstler and Jaimie Lenderman, April 2024

Ciena may make changes at any time to the products or specifications contained herein without notice. Ciena and the Ciena Logo are trademarks or registered trademarks of Ciena Corporation in the U.S. and other countries. A complete list of Ciena's trademarks is available at www.ciena.com. Third-party trademarks are the property of their respective owners and do not imply a partnership between Ciena and any other company. Copyright © 2024 Ciena® Corporation. All rights reserved IB128 11.2024