Experience. Outcomes.

APPLICATION NOTE

Simplifying Optical Networking through Adaptive, Ultra-dense Photonic Solutions

6500 Reconfigurable Line System

Today's networking challenges

Bandwidth demands are exploding in a variety of applications, and network operators are struggling to scale network capacity to provide the speeds that end-users expect. Furthermore, space constraints in these applications are driving the need to maintain existing footprint as capacity scales. As a result, Global Content Network (GCN), cable, and wireless providers are looking to compact, high-density photonic layer solutions that easily scale to enable more capacity for their lead applications.

GCNs are experiencing exponential traffic growth, by a factor of two year-over-year, which is driving the need for massive scalability to keep up with growth in compute, store, and interconnect requirements. As they interconnect more data center locations, GCNs require solutions that help maintain their speed of innovation. They need solutions that allow for increased automation, provide more capacity with reduced footprint and power, and are future-proof to enable frequent technology updates.

Cable or Multiple System Operators (MSOs) are modernizing their metro/access networks by evolving analog Hybrid Fiber-Coax (HFC) networks into modern, optical infrastructures that can provide higher-capacity connectivity. While the transport groups within these MSOs are familiar with photonic layer technology in long-haul and metro sections of their networks, it has not typically been deployed near the network edge. MSOs are turning to simple-to-deploy, highly scalable photonic solutions as part of their network modernization efforts.

Wireless operators are deploying higher capacity devices and additional cell sites for higher performance mobile services to reduce customer churn. To facilitate massive mobile infrastructure upgrades and deployments, they need photonic line system equipment that is compact, rapid to deploy, and simple to manage.

Each application shares the need for a greater level of scale from the photonic line system—the ability to add/drop hundreds of wavelengths and interconnect a large number of fibers within a single node. But that scalability must be paired with density, so the line system can fit into space constrained environments. In addition to scalability in a small footprint, operators need a platform that offers flexibility, programmability, and ease of use to evolve their networks quickly and efficiently. They are turning to compact, simple to deploy photonic layer solutions that can improve scalability, reduce footprint requirements, and offer more flexibility and programmability to enable the Adaptive Network.

The Adaptive Network
Get ready to adapt

Introducing the 6500 Reconfigurable Line System

Ciena pioneered openness for photonic line systems, with deployments starting in 2005. Subsequently, in 2013, Ciena added programmability and flexibility to the photonic line with Colorless, Directionless capability. The new 6500 Reconfigurable Line System (RLS) extends this openness

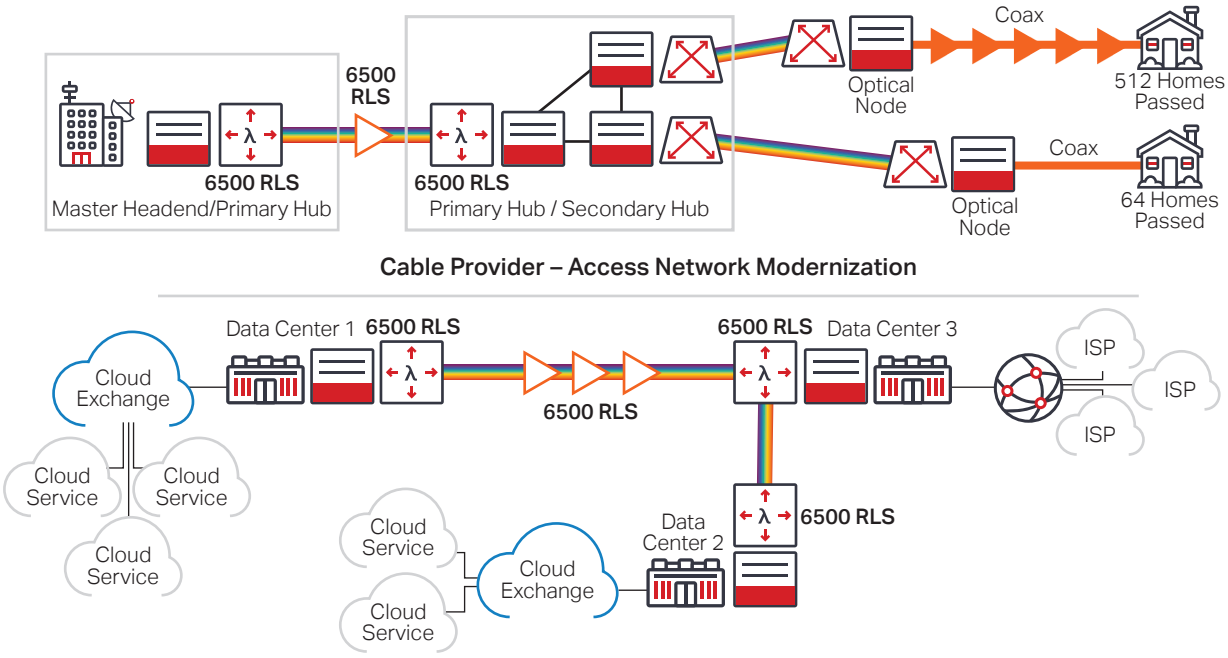

Figure 1. 6500 Reconfigurable Line System applications

and programmability into a compact, modular solution to reduce footprint. Operators can quickly react to unpredictable traffic requirements and easily scale wavelength capacity within a small footprint for bandwidth intensive applications such as data center interconnect, MSO access network modernization, and 4G/5G wireless infrastructure upgrades.

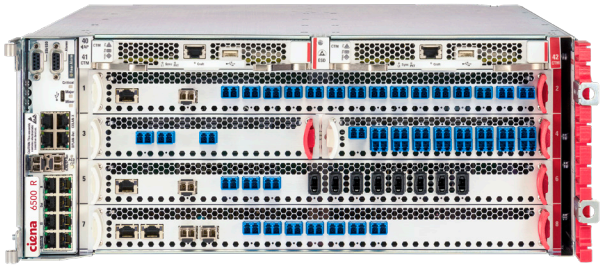

Figure 2. 6500 Reconfigurable Line System

Despite its compact size, the 6500 RLS provides highly dense ROADM and amplifier configurations, giving it the ability to seamlessly scale to support the highest bandwidth requirements using the latest technologies. It can be deployed at large junction sites to provide ROADM flexibility across many different directions with fully-flexible Colorless, Directionless, Contentionless (CDC) configurations, or alternatively, it can be deployed for efficient, point-to-point applications.

Design optimized for scale to efficiently address the highest capacity network requirements

The 6500 RLS is ultra-scalable to meet the most demanding photonic layer requirements. It is modular, supporting various photonic layer cards across its 1RU, 2RU, and 4RU chassis options, and it offers pay-as-you-grow flexibility as nodal capacity requirements increase. For applications that require high connectivity, such as dense metro networks, the 6500 RLS provides an industry-leading 32-port ROADM configuration offering scale in terms of nodal degrees and add/drop. It also supports up to 384 channels of add/drop per node (and scales up to 1,536 channels) in CDC configurations for locations requiring massive add/drop capacity.

For fiber constrained networks—or for operators wanting to squeeze the most capacity out of a single fiber pair—the 6500 RLS can double fiber capacity with its integrated C+L-band architecture. When deployed with C+L terminal equipment, such as Waveserver® Ai, it provides the photonic layer infrastructure for over 60 Tb/s of capacity on a single fiber pair, giving operators an option to carry more revenue generating services without lighting additional fibers.

Modular and compact form factor reduces footprint

The 6500 RLS is modular, giving operators the choice to select the hardware and software they need for a wide range of applications using highly integrated building blocks. This

offers advantages over competing small form factor, fixed-configuration devices that lack flexibility to adapt to different network requirements. The 6500 RLS has a compact footprint to reduce space in high capacity applications by as much as 70 percent when compared to larger, more traditional chassis-based solutions.

The 6500 Reconfigurable Line System
Learn more

Simple to deploy and operate

In addition to its massive scale in a tiny footprint, the 6500 RLS is designed for deployment simplicity to improve service velocity. It simplifies management at large sites with multiple shelves by concatenating them into a single managed node. The 6500 RLS also offers tools to improve fiber connection management as nodes scale to higher degrees of connectivity and greater quantities of optical add/drop channels.

The 6500 RLS also increases photonic layer intelligence with a rich set of instrumentation features that speed up deployment and troubleshooting. Photonic connection validation ensures users can easily identify manual fibering errors or dirty fiber connections. When fiber cuts occur, its integrated bi-directional OTDR (Optical Time Domain Reflectometer) pinpoints fiber fault locations to speed-up technician deployment for fiber repairs and reduce network downtime. Another advanced feature includes integrated channelized ASE (Amplified Spontaneous Emission) which maintains constant optimal system performance throughout the life of the network and allows for faster turn-up of wavelengths and faster wavelength restoration times during fault conditions.

The 6500 RLS interoperates with the Layer 0 control plane to improve network resiliency and is designed to be used with automated wavelength turn-up and re-routing procedures as networks become more programmable and adaptive.

Open and highly programmable

The 6500 RLS is optimized for photonic layer functionality, and its open architecture facilitates its deployment as part of a multi-vendor network. Its flexible, modular architecture can be configured for simple functions such as line amplification, or more robust configurations, such as full CDC ROADM, giving it the flexibility to fit into a variety of disaggregated line system applications. The 6500 RLS also utilizes a future-proof, flexible-grid architecture with a variety of connectivity options to match application requirements, and it allows operation of any vendor's transponders without penalty.

A full suite of common open APIs has been incorporated to support modern requirements for programmability, automated provisioning, and streaming telemetry. The 6500 RLS supports operational processes and automation through North and South-bound open APIs, and it easily integrates into existing operational tools and back-office systems. For operators who prefer a more turnkey approach to network management, the 6500 RLS is managed by Blue Planet® Manage, Control and Plan (MCP), Ciena's domain controller for complete network and service lifecycle operations.

With its open and programmable software architecture, it can be configured to operate as a fully integrated system running Ciena software components, and it is also architected to support third-party stand-alone software components—bringing a new level of openness and programmability to the photonic layer that has not been seen in the industry until now.

Providing the foundation for the Adaptive Network

The 6500 RLS significantly improves operational efficiencies, providing the scale and programmability required for the Adaptive Network. It is ready for the future, with an amplifier and flexible grid architecture optimized for C+L-band, as well as future coherent modem technologies with very high baud rates. It provides the scalability needed for high capacity applications such as DCI, cable network modernization, and the transition to 5G wireless.

With its open and programmable architecture and its simple to deploy operational model, the 6500 RLS lays the foundation for the Adaptive Network that utilizes intelligent automation and provides improved visibility into the photonic layer network.

Get answers to your questions
Visit the Ciena Community