Extended Capacity for Next Generation Long-Haul Networks

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Motivation

- **L-band deployments with minimal up-front cost**
- **Add L-band capacity only when it is actually needed due to C-band exhaustion**
- Avoid operational complexity and impact to existing services
- Maximizing the performance and agility of the overall C+L system
Revisiting sites
More cards to manage and spare
Scalability limitations
Performance impacts: SRS tilt

Fig. Historical C + L band upgrade solution

Ciena

- With the 6500 Reconfigurable Line System (RLS), network operators deploy, day 1, C&L-band optimized equipment that uses integrated channelized Amplified Spontaneous Emission (ASE) loading to ensure maximum fiber capacity, optimal system performance and guaranteed in-service upgrade.

Fig. Ciena’s integrated C + L band upgrade solution

Ciena

- **Simplified operations:** Operators initially deploy integrated C&L-band amplifiers, then when L-band is needed, only the ROADM sites need to be upgraded.

- **Optimal performance and capacity:** regardless of channel loading conditions – whether the L-band is carrying live traffic or not, the system behaves as if it is fully loaded from day one.

- **In-service upgrade**

- **Same number of cards**

“With Ciena’s 6500 RLS, network operators can efficiently scale their networks to meet the most demanding photonic layer requirements with a fully in-service upgradable, optimized C&L-band solution that is optimized to provide maximum performance and capacity, minimize footprint, and improve density.”
Infinera

• Glenn Laxdal, Infinera Senior Vice President and General Manager, Product Management says, "By deploying the Infinera C+L Solution now, Windstream is leading the industry, providing a powerful example of how to prepare for future growth and business success."

• In addition to the L-band-expandable line system, Infinera has developed advanced, innovative control software that tackles the challenges of dynamic power balancing and allows the addition of L-band capacity without complex planning restrictions and without service impact.

Infinera

**Doubles capacity without a hit:** Infinera C+L Solution allows Windstream to use entire C-band before starting L-band deployments, while still protecting existing traffic from any service-impacting outages. This enables operators to minimize up-front capital investment, increase return on investment, and reduce operational complexity and cost.

**Extends ICE’s advantages to the L-band:** INFINITE CAPACITY ENGINE (ICE) delivers cloud scale capacity for Infinera Intelligent Transport Networks. ICE also supports Infinera Instant Bandwidth for flexible software defined capacity on demand. The new ICE L-band optical engines will bring all these benefits of vertical integration, leading optical performance and software defined capacity to the L-band.

Infinera

• The Infinera C+L Solution incorporates C-band and L-band variants of Infinera’s transponders enabled via the company’s Infinite Capacity Engine (ICE) coherent DSP as well as FlexILS line system elements.

• It also includes end-to-end controls to enable combined C+L operation on a single fiber pair.
Infinera and Corning demonstrate 55 Tb/s capable transmission equipment operating in C+L bands across 600 km of G.654.E compliant ultra-low-loss, large effective area fiber.
Corning® TXFTM Optical Fiber

• Combined benefits of ultra-low-loss and large effective area
• Typically 0.168 dB/km and 125 μm² at 1550 nm
• Fully compliant with ITU-T Recommendation G.654.E, a category of advanced fibers for long-haul terrestrial networks
• Exceptional terrestrial reach capability for high channel speed transmission
Infinera XT-3300 Meshponders

• The trial validates ICE4’s transmission of 8QAM (quadrature amplitude modulation) 600 gigabits per second (600G) super-channel in 140 gigahertz of spectrum, delivering the highest spectral efficiency of 4.3 bits per second per hertz with commercial-ready performance margin.

Infinera FlexILS

• The Infinera FlexILS flexible grid line system is the industry’s most widely deployed flexible grid open optical line system delivering future-proof scalability, flexibility and programmability

• Operators can deploy FlexILS for extended C-band capacity today and expand to the L-band with a simple, non-service-impacting upgrade when more capacity is needed