IMAGINE THE POSSIBILITIES...
OPERATIONAL TRANSFORMATION

Addressing Unrelenting Growth In Backbone Fiber Systems Using Next Generation Photonics And Automation

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Introduction

Bandwidth Continues to Grow

Internet traffic has grown 3+ fold over the last 5 years

Drivers include video (OTT), gaming, mobile devices, social media, IOT

Will this growth trend continue?
Introduction

11 Year Full Spectrum System Growth @ 25% CAGR
Network Design

Fixed Grid to Flexible Grid Migration

Fixed Grid WSS

Flexible Grid WSS

Fixed A/D

Fixed A/D

Fixed A/D

Flex A/D

Flex A/D

Flex A/D Fixed A/D

Flex A/D Fixed A/D
Express Overlay Networks

Original Network:
- Site A to Site B
- Site A to Site C
- Site A to Site D
- Site A to Site E

Bottleneck at Site E:
- C-Core
- R-Region

Express Overlay Addition:
- Brand new capacity added
- Reduced total capacity

Diagram shows the increase in network capacity after the addition.
Capacity vs Reach Performance by Baud

Nominal OTN reaches shown
Flexible Grid Photonic Use Cases

The current fixed grid 50GHz ITU grid is just a subset of what the gridless model allows.

Channels can be spectrally squeezed to allocate more space for new channels.

Channel bandwidth can be more or less than 50GHz.
New Hardware

First-Generation L-band Impact from Stimulated Raman Scattering (SRS) and Power Transfer during L-band Upgrade

Balanced with C-band only

Consequence of L-band population

Power

C-band  L-band

Power Transfer

C-band  L-band
New Hardware

Next Generation Integrated Amplified Spontaneous Emission (ASE) – Optimized C&L -band

Balanced with C-band traffic

Balanced with C&L-band traffic
Software and Automation

Software – Planning to Deployment

Telecom operators have always struggled with software

Different Software exists for every aspect of network management

Planning was never really a part of operational software

Next generation Network Management Systems (NMS) take a more holistic approach

Network planning is now a part of operational software
Software and Automation

Zero Touch Provisioning

1) Planning builds necessary commissioning files and places them on an FTP server

2) Customer configures their DHCP server to point the Photonic Hardware to its boot file

3) After installation, the Photonic Hardware gets an IP address and its Boot File location via DHCP

4) The Photonic Hardware retrieves its boot file and commissioning files from the server to complete its commissioning
Optimizing capacity for SNR requires programmable optics AND real-time analytics.

- **Programmable coherent modems**
- **Real-time access to network data**

Finer granularity of line rate speeds leads to better utilization of the available margin in the network.

Network programmability and automation requires instrumented hardware and Open APIs.
Thank You!

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