

GEANT Field Experience with Infinera ICE6 800G Transmission over LEAF

Guy Roberts, GÉANT

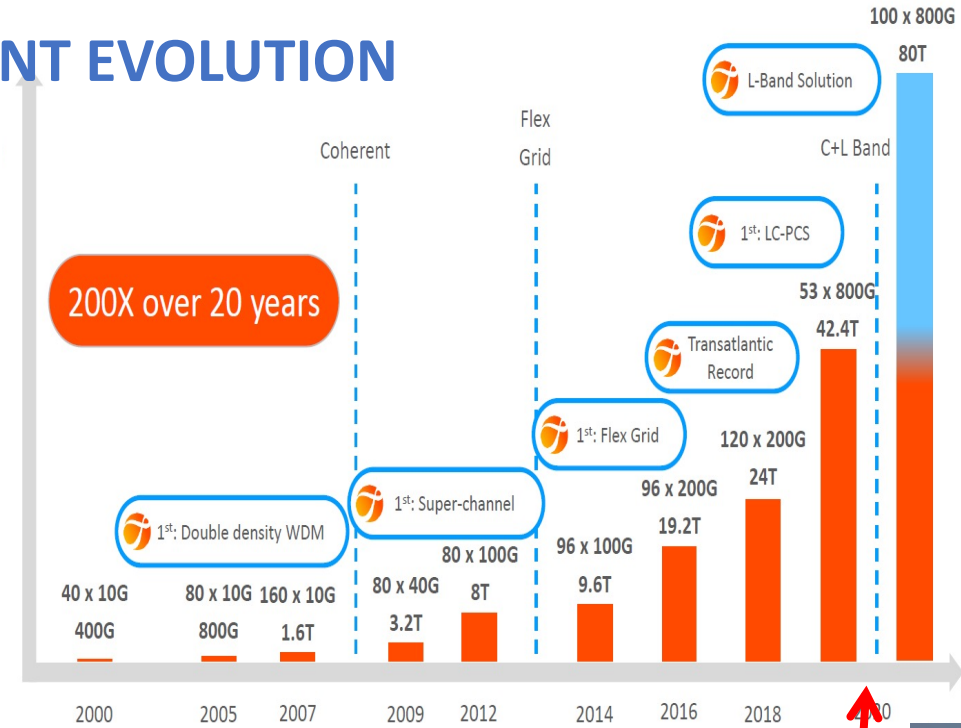
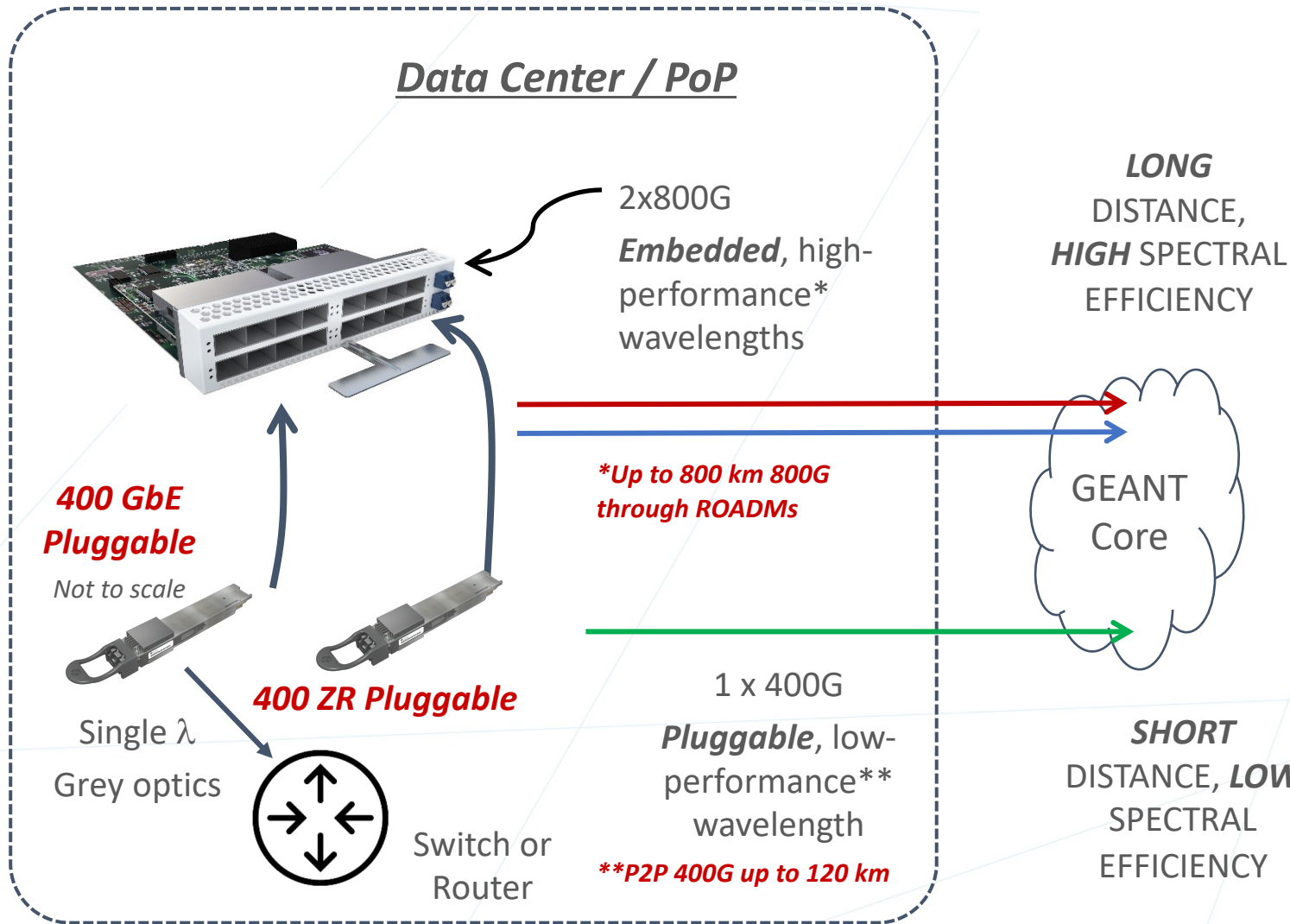
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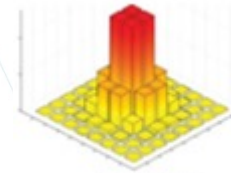
CLIENT VS LINE : EMBEDDED VS PLUGGABLE : COHERENT EVOLUTION



Field Trial 2021:
800G Direct Detect
800G per λ , 42T per fiber

GEANT TRIAL OF INFINERA ICE6: OPTICAL ENGINE CHARACTERISTICS

- PCS-64QAM modulation
- Advanced Features:
 - Nyquist Subcarriers, Long Codeword PCS, DBA, SD-FEC Gain Sharing, Hybrid Modulation
- 2x800G wavelengths = 1.6Tb/s
- High Baud Rates: 32-96 Gbaud



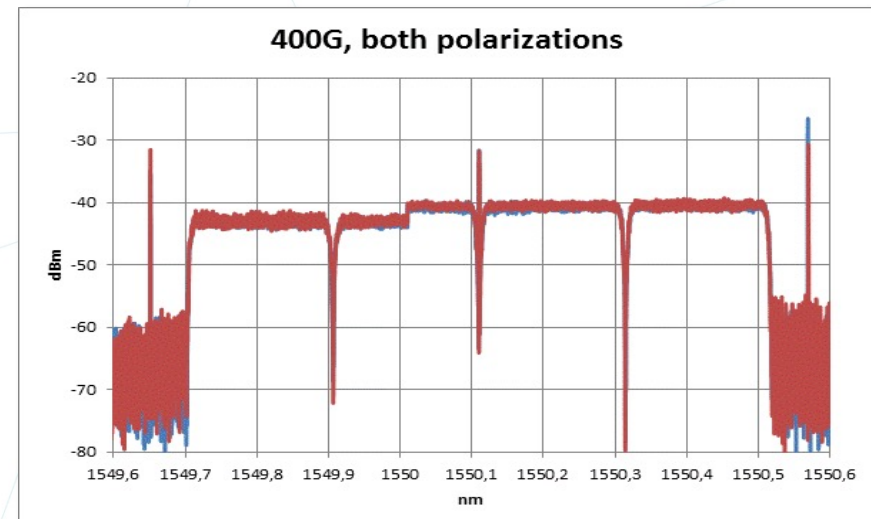
LC-PCS



SD-FEC Gain Sharing



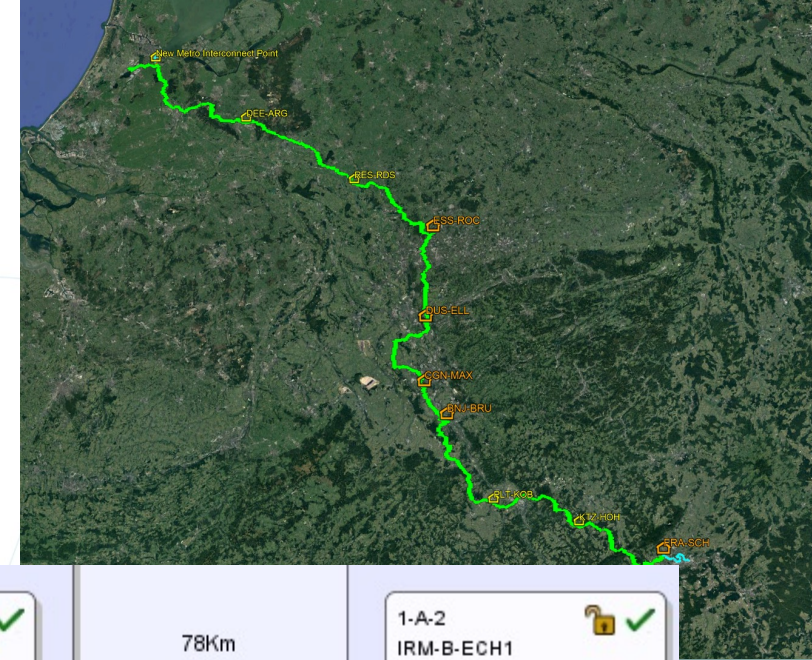
Ultra High Baud Rate
(32-96 Gbaud)



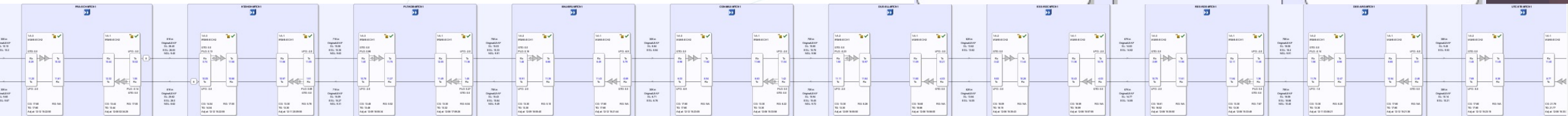
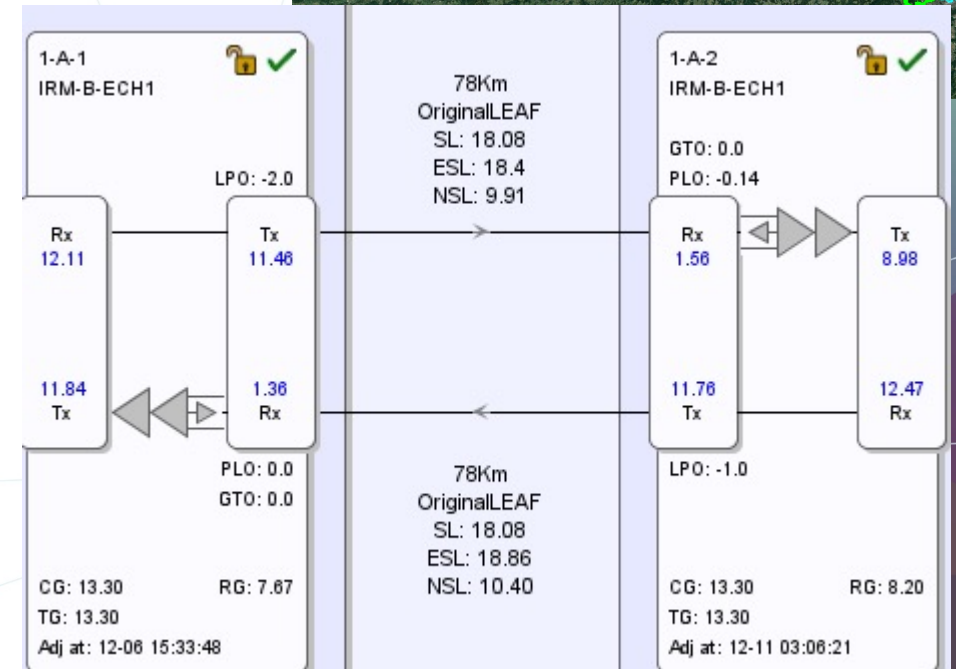
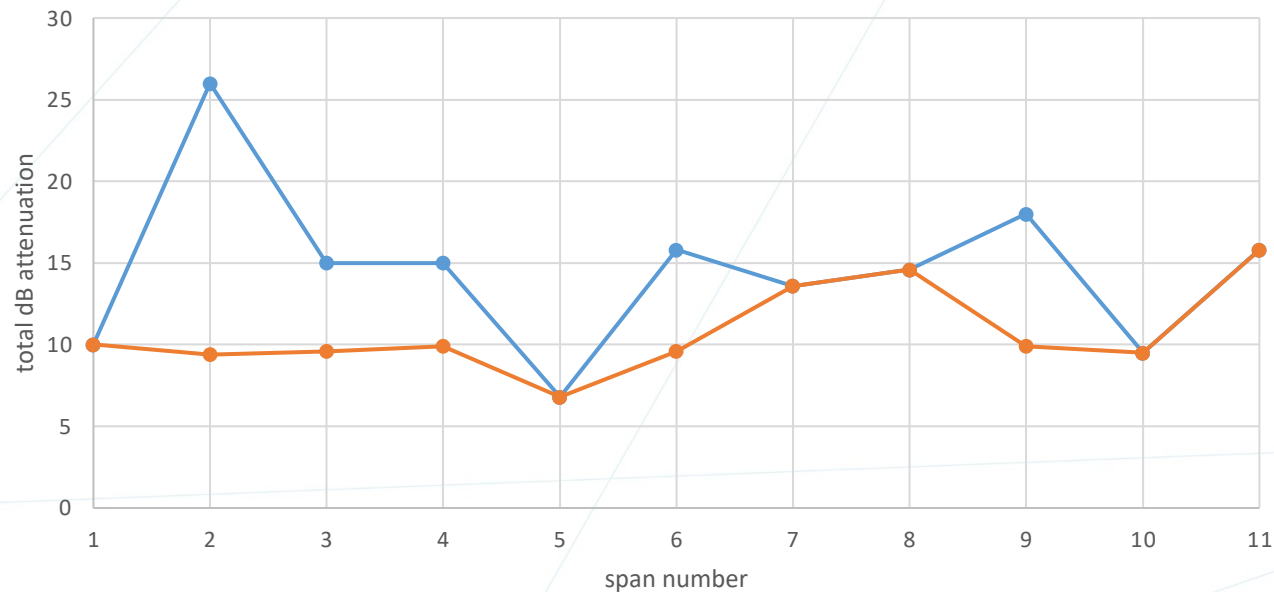
Fine control allows user to maximize performance on all fiber types

AMSTERDAM TO FRANKFURT TRIAL RESULTS

- 800 Gb/s over 672 km on G.655 LEAF
- Test is performed in red band, where LEAF dispersion is a bit higher
- RAMAN reduces net loss to typically 10dB



RAMAN - net span loss



FIBER CHARACTERISTICS FOR OPTIMUM COHERENT PERFORMANCE

Coherent performance is typically limited by *nonlinear impairments*
Self Phase Modulation ***Cross Phase Modulation*** ***Four Wave Mixing***

1

High dispersion

(Coherent systems are tolerant to dispersion)

G.652D

CD: **18** ps/nm/km @ 1550nm

G.655 LEAF

CD: **4** ps/nm/km @ 1550nm

2

Large Effective Area

(small A_{eff} bad for coherent)

G.652D

A_{eff} : **85** μm^2 @ 1550nm

G.655 LEAF

A_{eff} : **72** μm^2 @ 1550nm

RAMAN reduces net span loss - lower optical launch power and lower non-linear impairments

SUMMARY AND TIPS TO ENHANCE LEAF PERFORMANCE

- 800 Gb/s with good margins over 672 km
- New modulation and DSP techniques are improving OSNR tolerance
- Key to good performance line system should high OSNR in the coherent receiver
- Keep spans short to minimize noise
- Use Raman wherever possible for low noise amplification – ideal for coherent transmission