LIVE! LightReading WEBINAR

Trends in Optical Disaggregation

Presented by : infinera

LUMENTUM

Today's Presenters

Moderator

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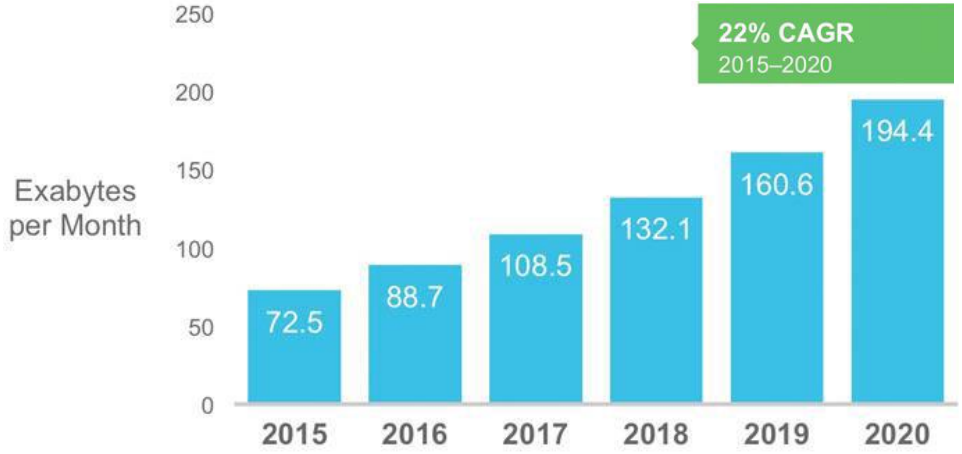
Agenda

- Industry Drivers, Enablers & Activities
- Optical Systems Disaggregation Opportunities
- Industry Goals & Priorities
- Open Line System Vision, Progress & Next Steps
- Q&A

Drivers & Enablers for Optical Disaggregation

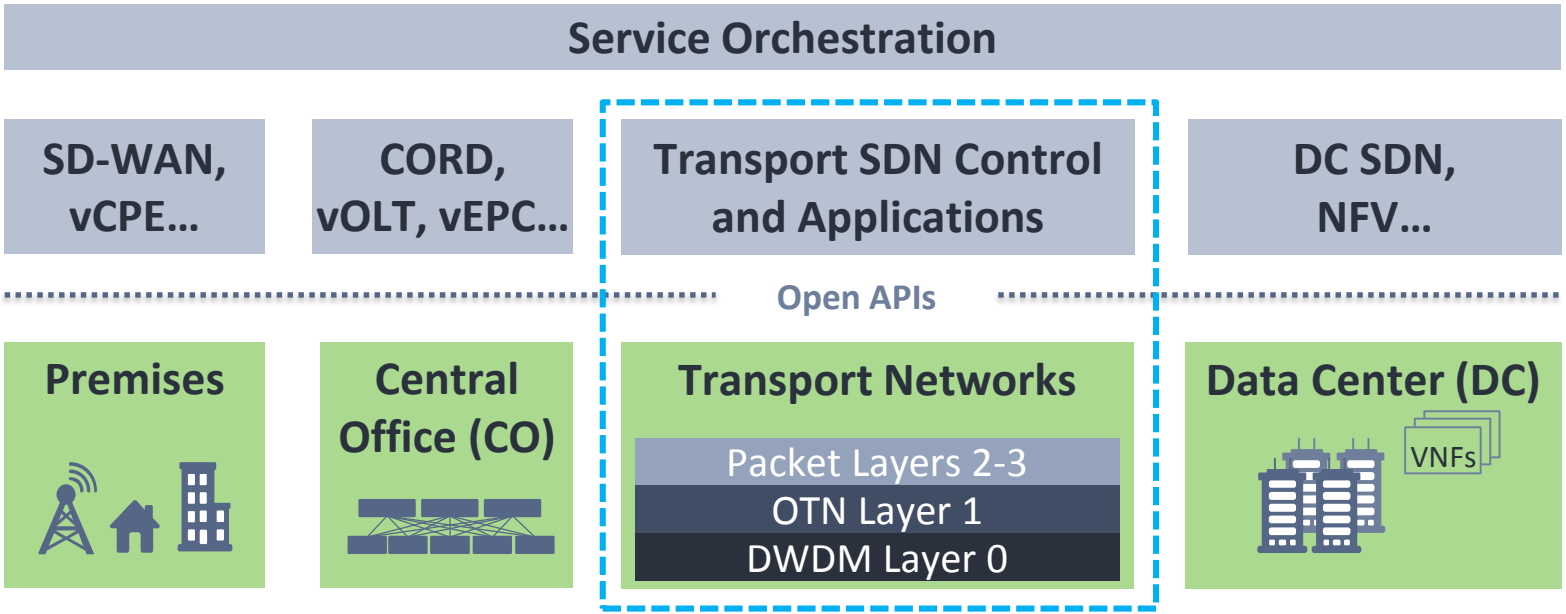
- Demand growth & shifts:
  - Rapidly growing user traffic
  - Migration to the cloud
  - Result: Increased demand for network flexibility, agility and optimized cost



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

- Technology enablers:
  - Increasing use of open source and whitebox approaches (especially in data centers)
  - Multi-layer transport SDN automation & optimization

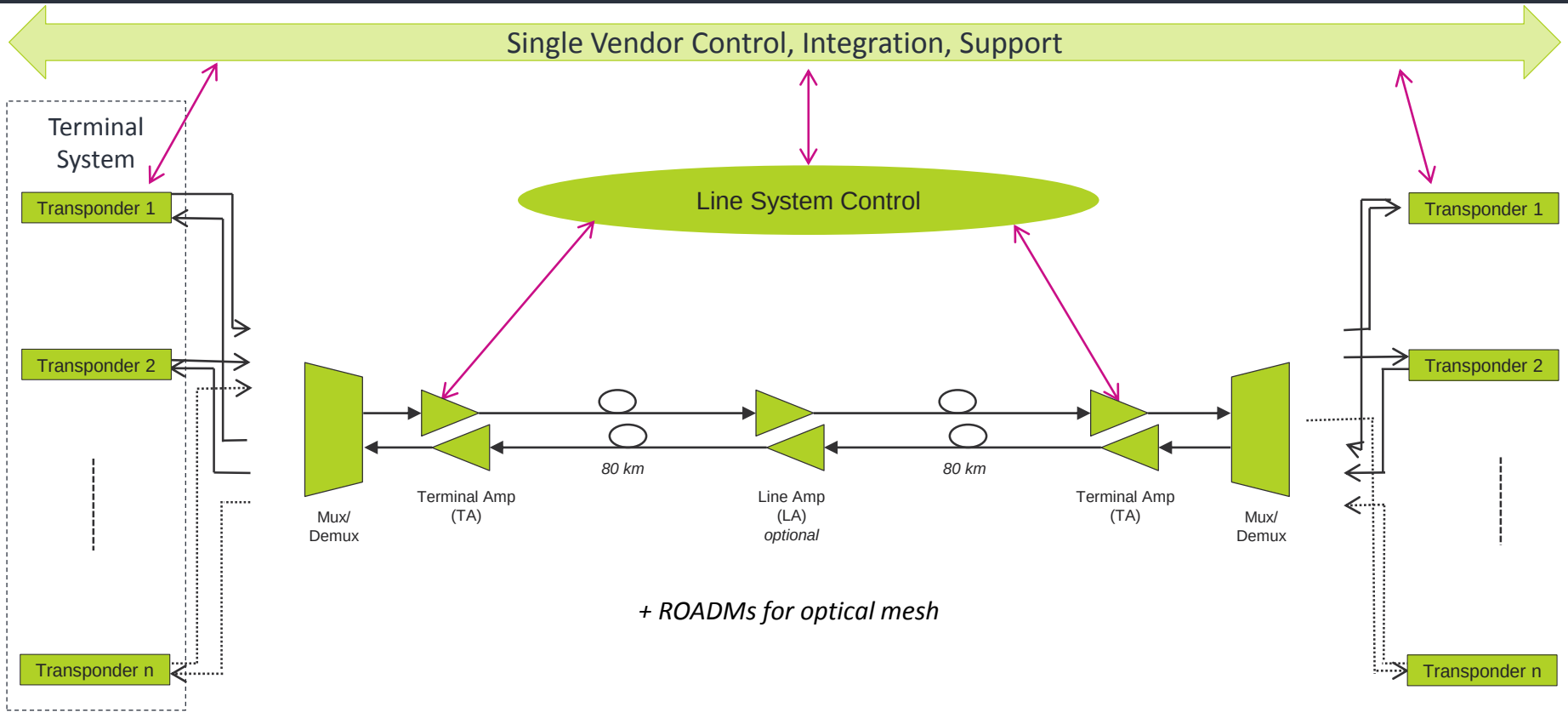
Enabling Technology: Multi-layer Transport SDN



Open/Disaggregated Optical Systems Activities

- Fixed-grid Open Line Systems
  - Separate vendor (“alien”) wavelengths over fixed-grid 50 GHz line systems
  - Evolving for 10 years with limited impact
- Flexible Grid Open Line Systems
  - No industry consensus definition yet, some early requirements and RFPs
  - Growing interest and support, limited deployment
- Open ROADM MSA
  - Targeting metro/edge applications
  - Participation from many influential industry members
- Telecom Infra Project (TIP) Initiatives
  - Voyager white box packet-optical system
  - MSA Proposal for point-to-point open line system
  - Strong industry participation

Typical Current Deployment: Integrated Optical System



Industry Goals

- Enable operators to multi-source critical high value components
- Automate and optimize L0-L3 operations thru software
- Innovate faster by decoupling development cycles for line systems and terminal equipment

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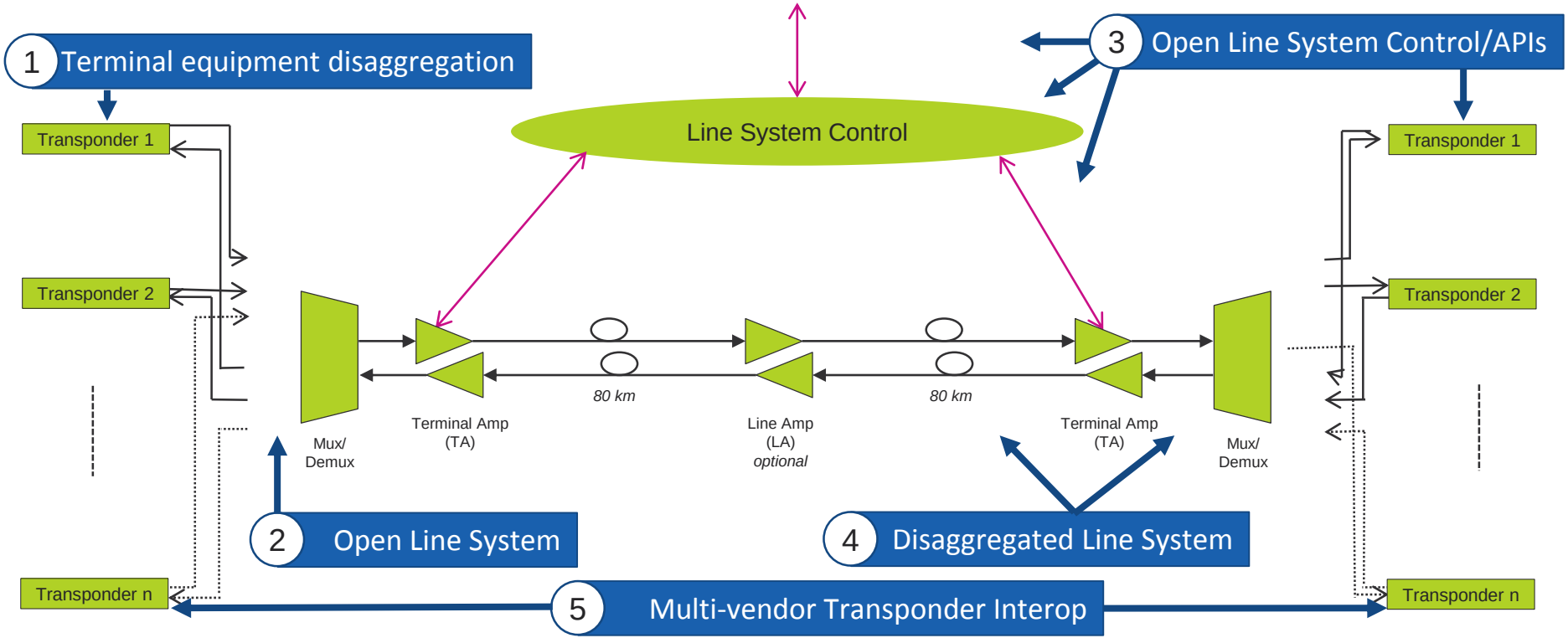
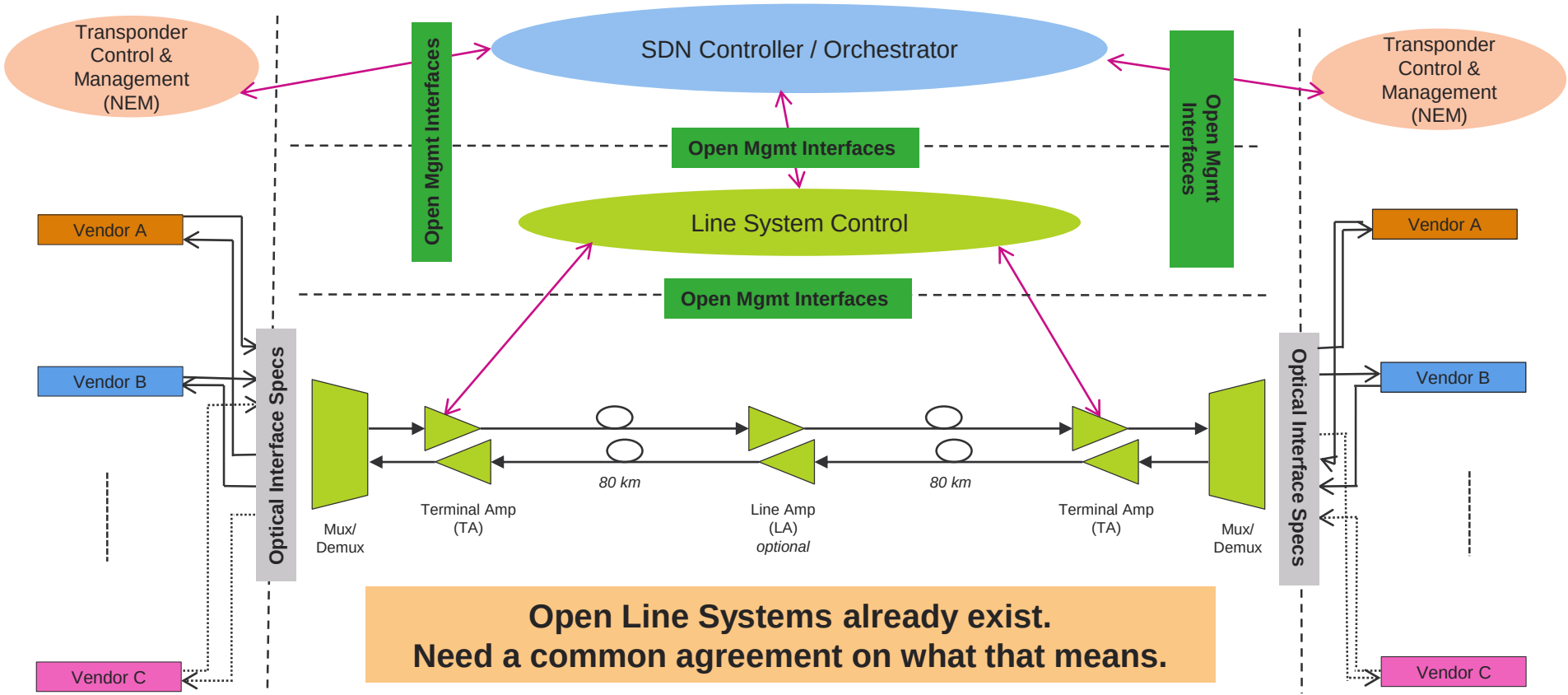
Opportunities for Optical Disaggregation

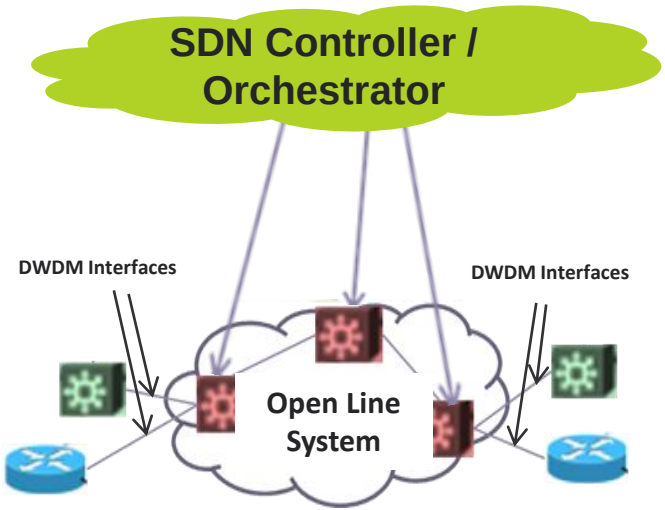


Open Line Systems



Open Line Systems already exist.
Need a common agreement on what that means.

Telecom Infra Project (TIP)

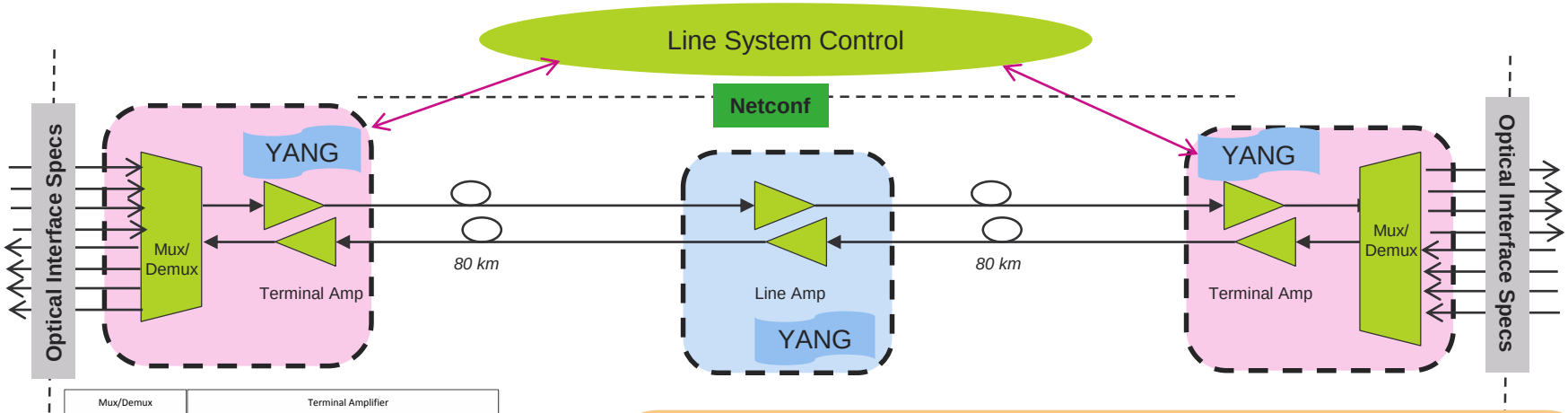


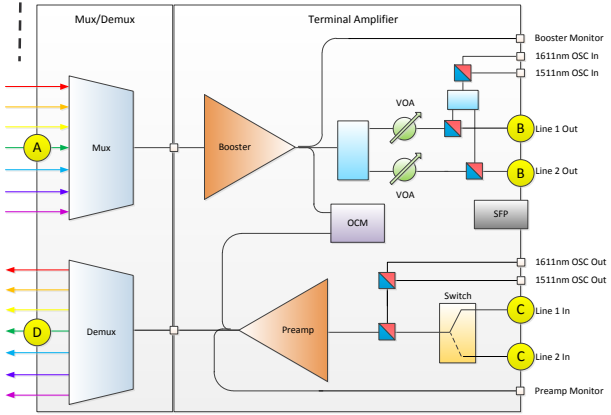
Open Packet Optical Transport Working Group

http://www.telecominfraproject.com/

"The Telecom Infra Project (TIP) is an engineering-focused initiative driven by operators, infrastructure providers, system integrators, and other technology companies that aim to reimagine the traditional approach to building and deploying telecom network infrastructure"

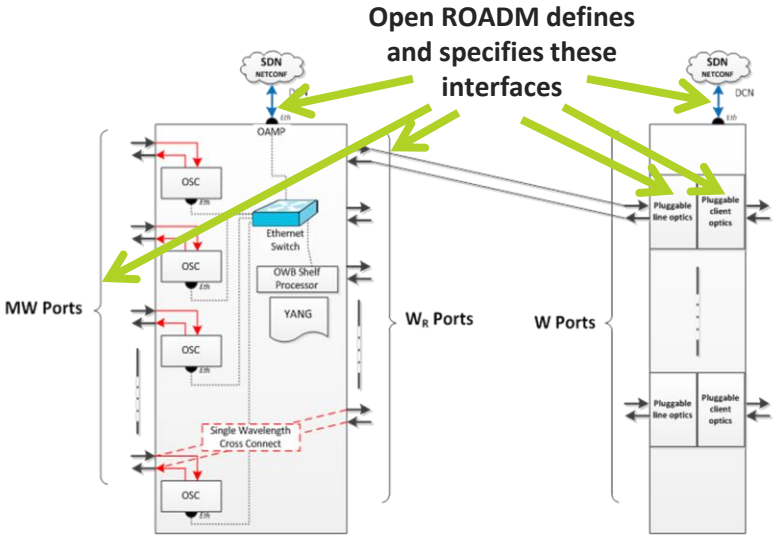
TIP Proposal for Point-to-Point Open Line System





- Node-level optical spec (similar to Open ROADM approach) but tailored for point to point OLS configuration.
- Specifications proposed for key optical (filter BW, incremental OSNR contribution, channel powers, gain masks, OSC, monitoring points, line protection, etc.) and control parameters.
- Yang data models proposed for two nodes (Terminal & ILA)

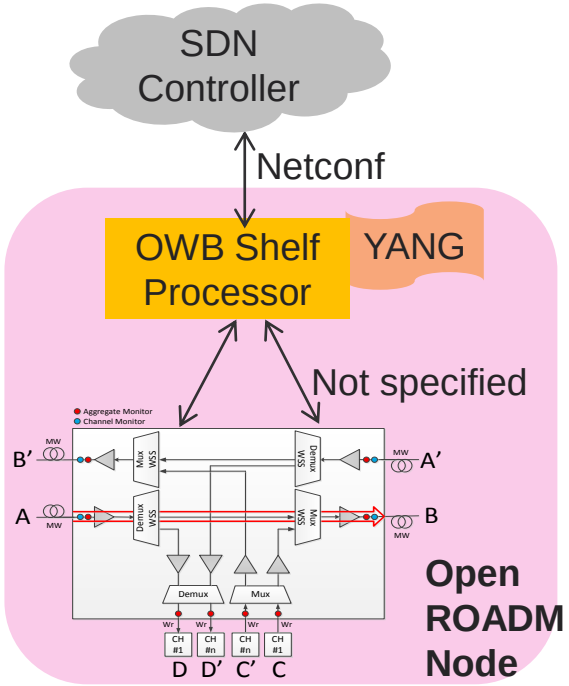
Open ROADM MSA

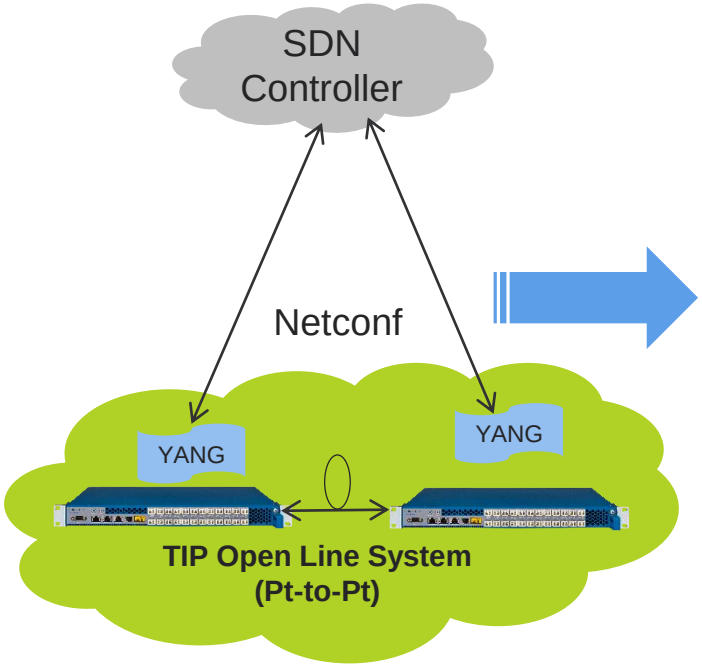


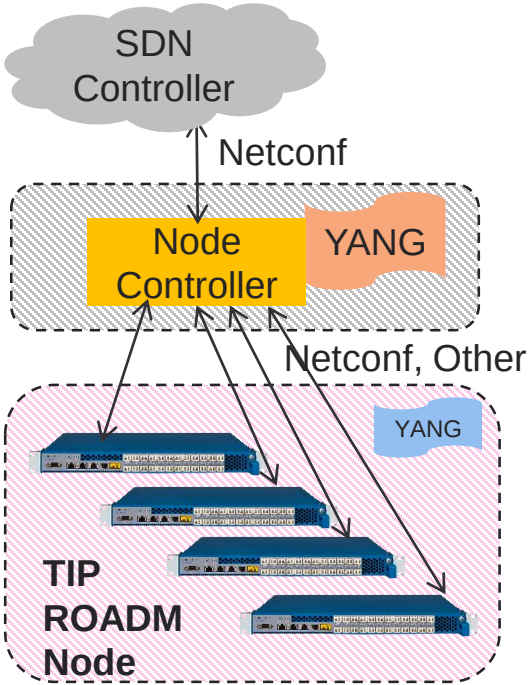
- Targeted at metro/edge applications (100G QPSK, <500km, highly meshed connectivity).
- Photonic layer (WSS, EDFA) hardware disaggregated from Tx/Rx hardware (lineside and client)
- SDN Controller replaces vendor-specific control plane and Element Management System
- SDN Controller agnostic to vendor hardware.

"Open ROADM project has at its core the drive towards faster pace innovation and competition, as well as increased volumes through mass adoption, coupled with optical layer flexibility and software control to overcome all the disadvantages of today's ROADM systems".

Synergies between Proposed TIP-OLS & Open ROADM MSA







- **OSC definition (1511nm, 100Mb -> 1 GE) is aligned**
- **ALS shutdown logic is aligned**

Open Line System Interop Activity (1/2)

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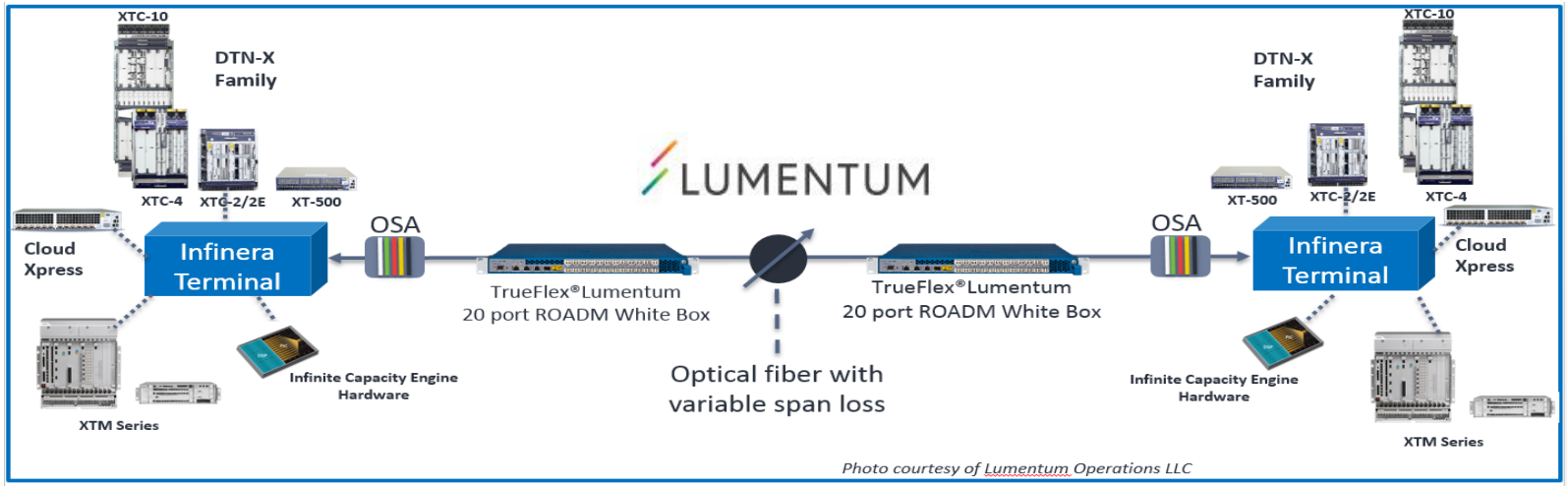
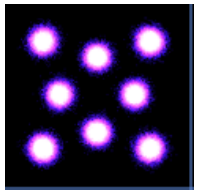
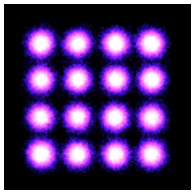


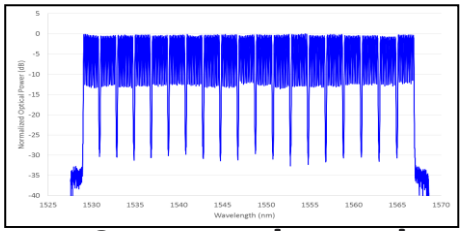


8QAM



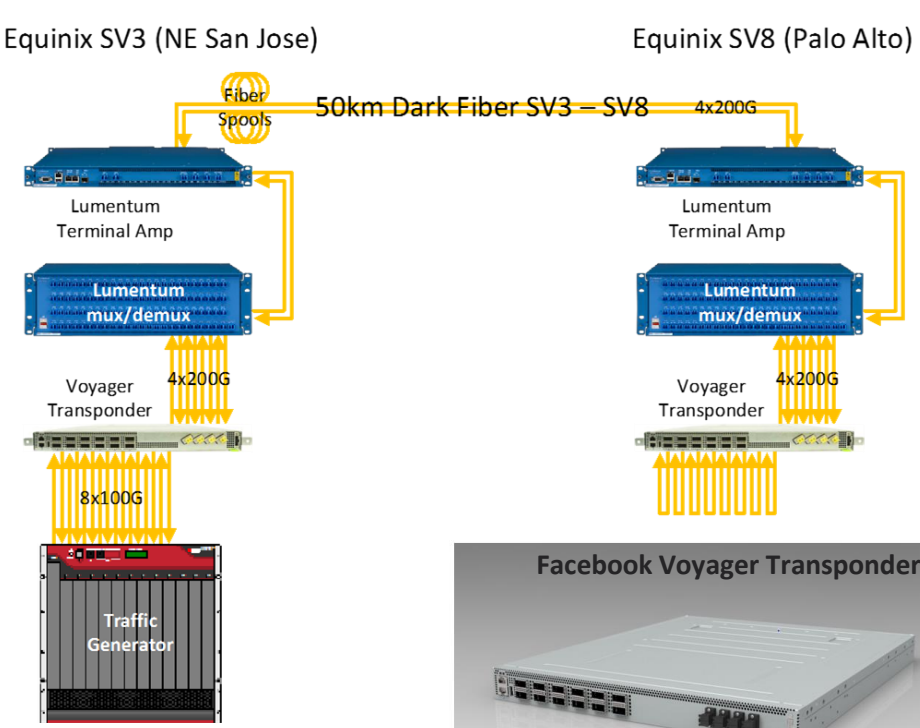
16QAM

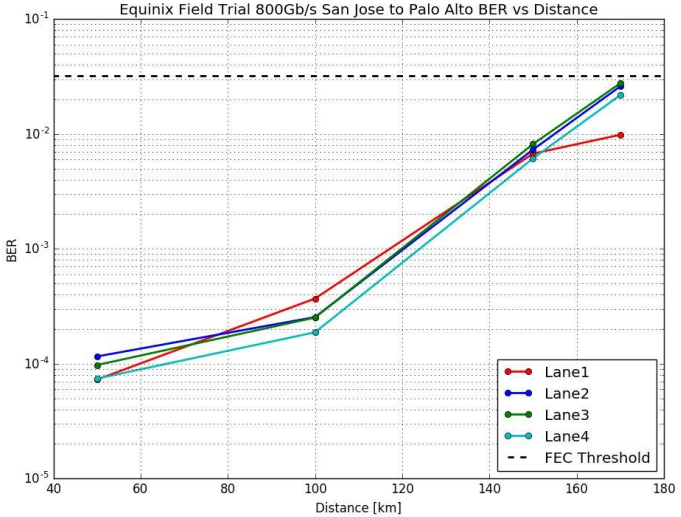
Validated OSNR, end-to-end connectivity, reach and successful error-free data transmission for seamless performance over metro distances.

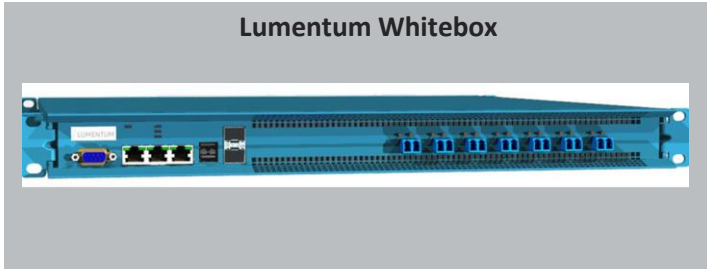


19 super-channels

Open Line System Interop Activity (2/2)







Moving Toward Flexible Grid Open Line Systems: Lessons Learned

- Flexible grid open line systems have been an evolving concept with limited adoption
- Early solutions tended to suffer challenges when using alien terminal line cards
  - Not all 'Native' functions worked properly
  - Challenges around ownership of network performance commitment
- Many solutions still miss key technical elements for true future proofing
  - Has resulted in OLS primarily using transponders from same vendor

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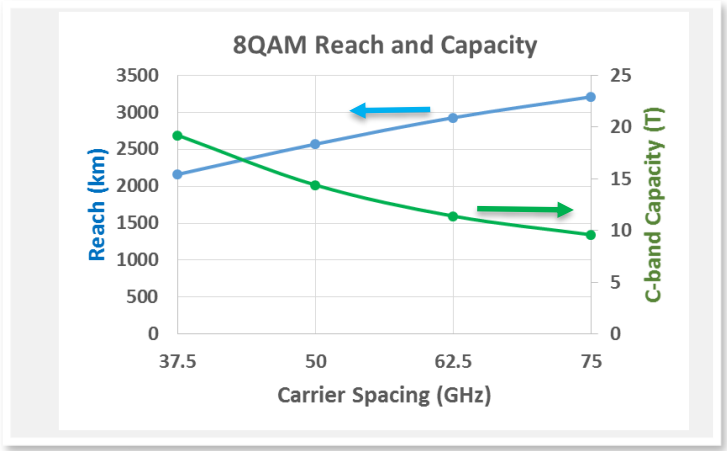
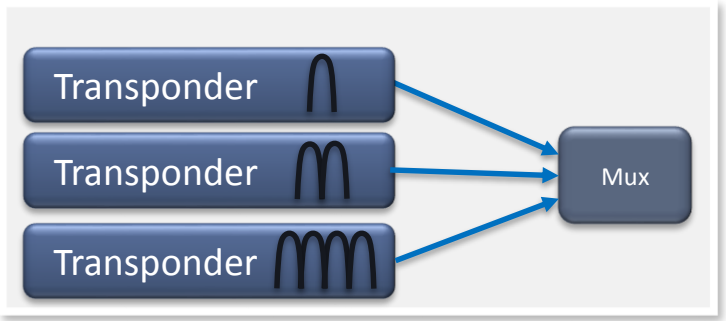
Flexible Grid Open Line System Vision: Controls (part 1)

- Automated amplifier, ROADM WSS & OPM control for native and alien channels
  - Alien channel recognition and power balancing
- Support for variable channel spacing (Flex)
  - 37.5GHz, 50GHz, 62.5Ghz, 35GHz, etc…
  - Allows maximum fiber capacity
  - Allows full flexibility in capacity/reach optimization
- Support for externally muxed sources
  - Industry currently providing single, dual, and multi-carrier solutions. All need to be supported.

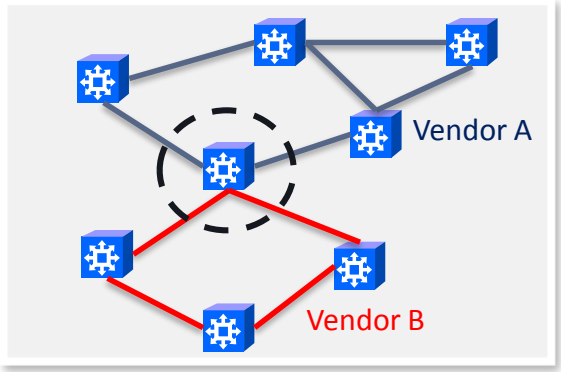


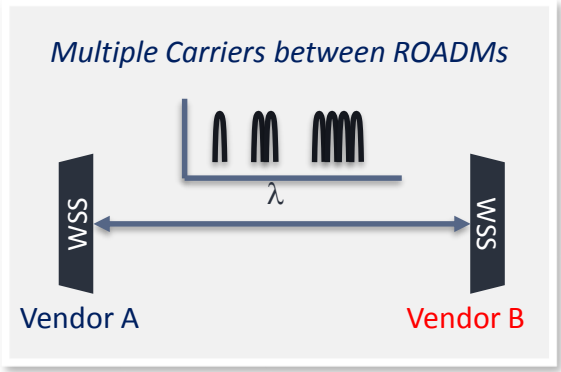


Flexible Grid Open Line System Vision : Controls (part 2)

- Support for Network to Network ROADM optical interop
  - Support multiple carriers transmitting between elements
  - Extreme case is full ‘OpenROADM’ concept

- Eliminate customized line module features that exclude operation over alien OLS
  - e.g. special carrier tagging





Challenges and Next Steps

Challenge	Next Steps
Gaining industry alignment on vision and definition for open line systems	• Converge on OLS component requirements • Converge on common control architectures, APIs, YANG data models
Preserving room for differentiation	Define approaches that maximize benefits of commonality yet allow for customization and innovation of features
Understanding where to pursue disaggregation with common controls versus integration for optimized performance	Define & clarify trade-offs across markets • DCI • Metro • Long haul
Network-level integration, service and support for disaggregated elements	• Multi-vendor testing & integration • Commercial service offerings

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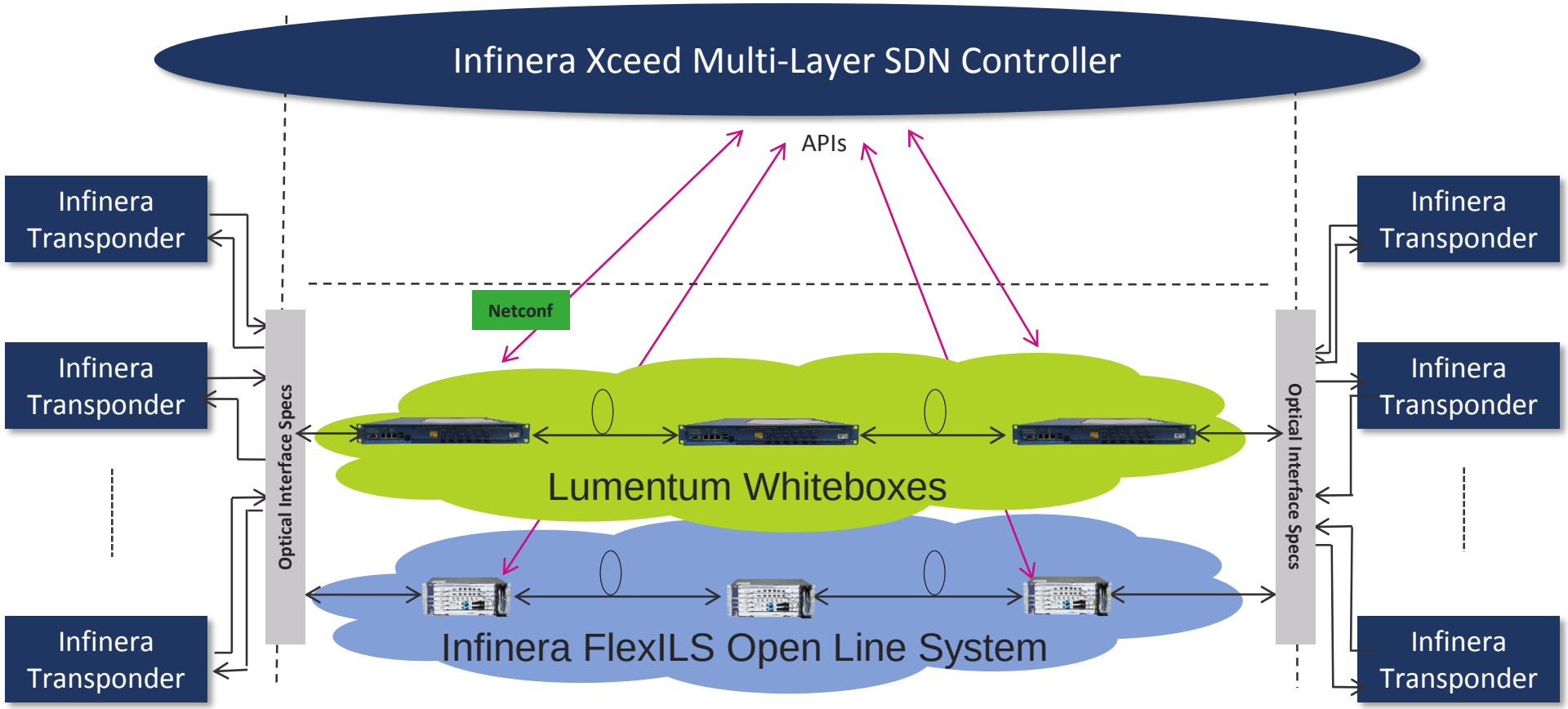
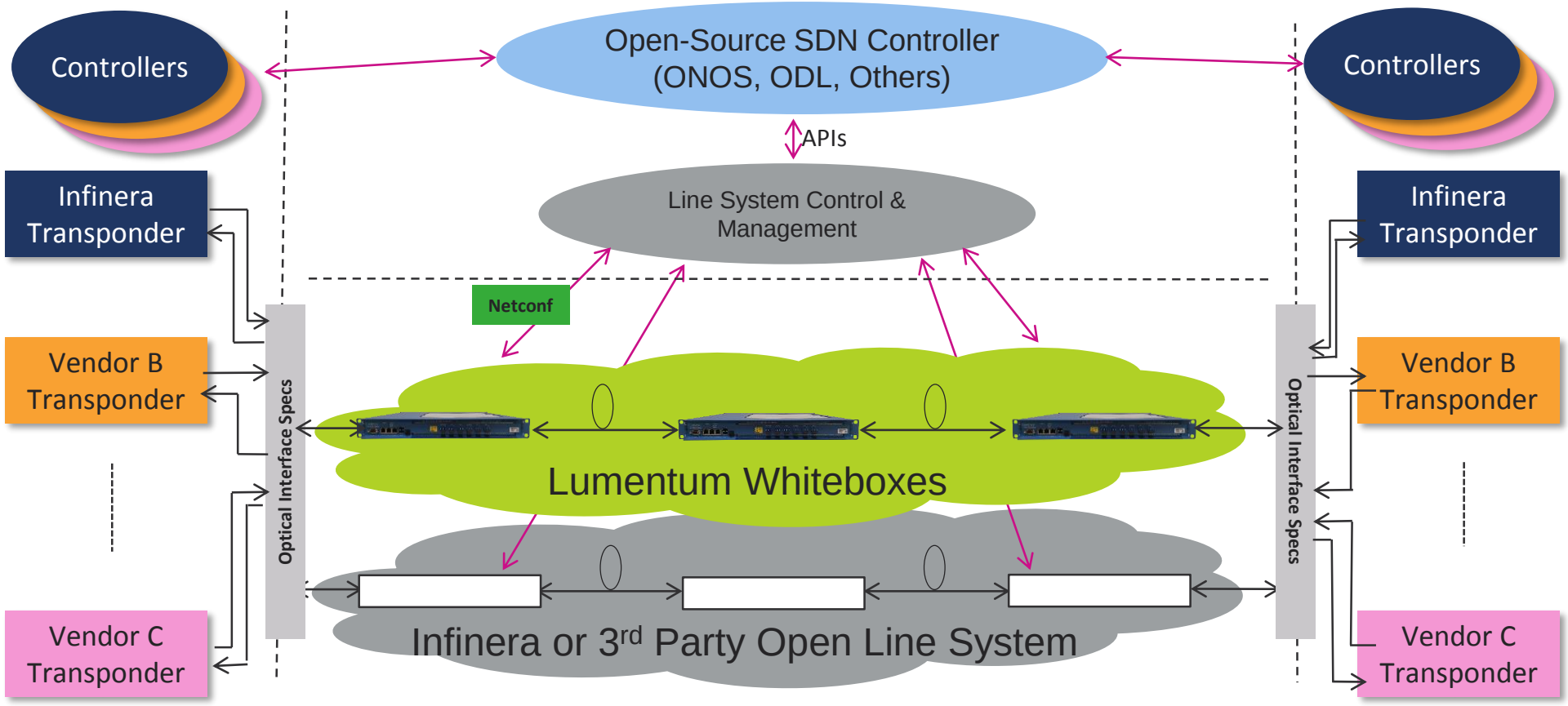
Establishing a Blueprint for Open Line Systems



Enabling an Open Ecosystem



Questions and Answers?

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