LightReading LIVE! WEBINAR

The Outlook for Open and Disaggregated Packet and Optical Networks

January 26, 2021

Sponsored by

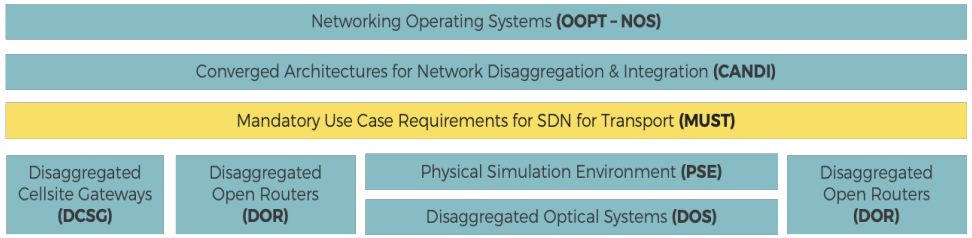
Infinera ipinfusion TELECOM INFRA PROJECT VOLTA Networks

Today's Agenda

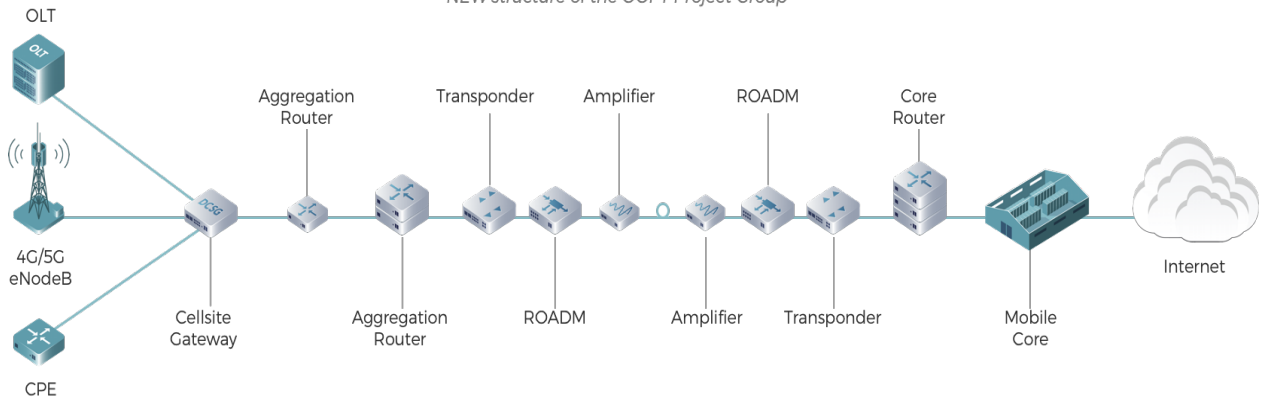
10 Min	Introduction and Project Highlights • **Sterling Perrin**, Senior Principal Analyst, Heavy Reading
10 Min	Operator Keynote: Transport Strategy: Transport and IP Disaggregation • **Rafael Canto Palancar**, Transport & IP Network Manager, Telefonica
10 Min	Operator Keynote: Towards Open and Disaggregated Transport Networks • **Lloyd Mphahlele**, General Manager, Group Technology MTN
45 Min	Moderated Panel Discussion • **Tim Doiron**, Senior Director, Solution Marketing, Infinera • **Hugh Kelly**, Vice President, Marketing, Volta • **Diego Mari Moretón**, Connectivity Technologies & Ecosystems Manager, Facebook • **Shaji Nathan**, Chief Product Officer, IP Infusion
15 Min	Audience Q&A

About the Market Leader Project

Open Optical and Packet Transport Group Structure



NEW structure of the OOPT Project Group



Source: TIP

- Focus: open and disaggregated transport networks roughly mapping to TIP OOPT scope of work
- Global operator survey conducted December 2020
  - 82 respondents
- 90-minute symposium webinar
- Survey results white paper: to be published soon
- Two analyst blogs

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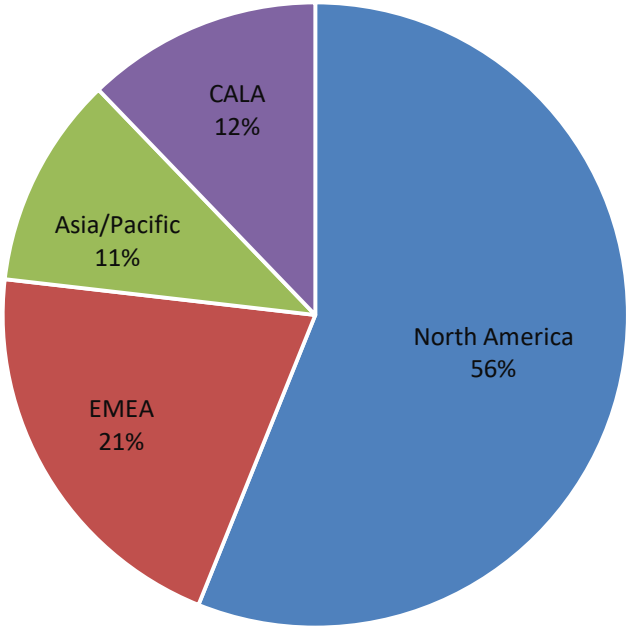
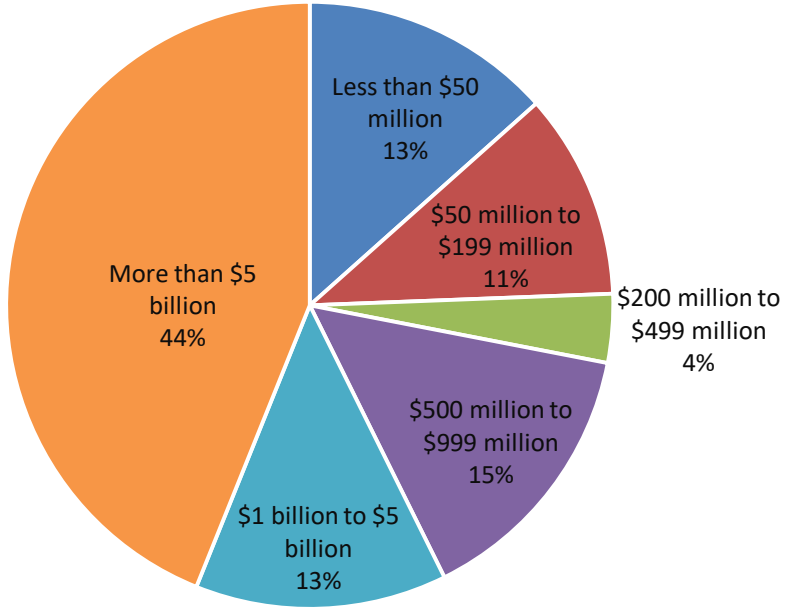
Survey Demographics

By Region



By Revenue



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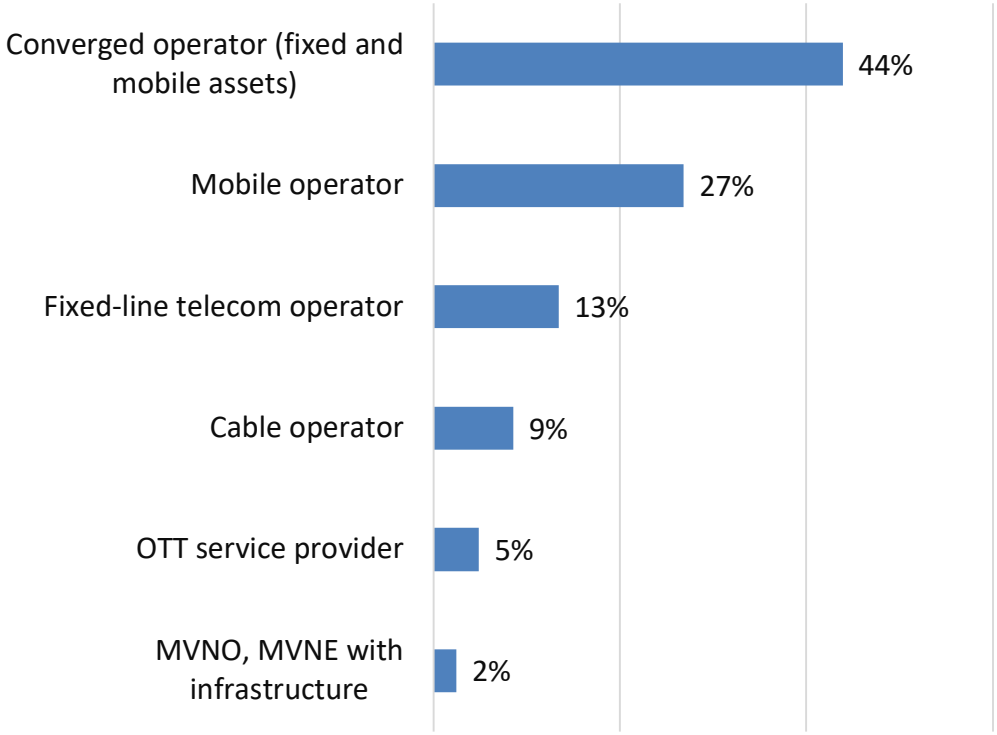
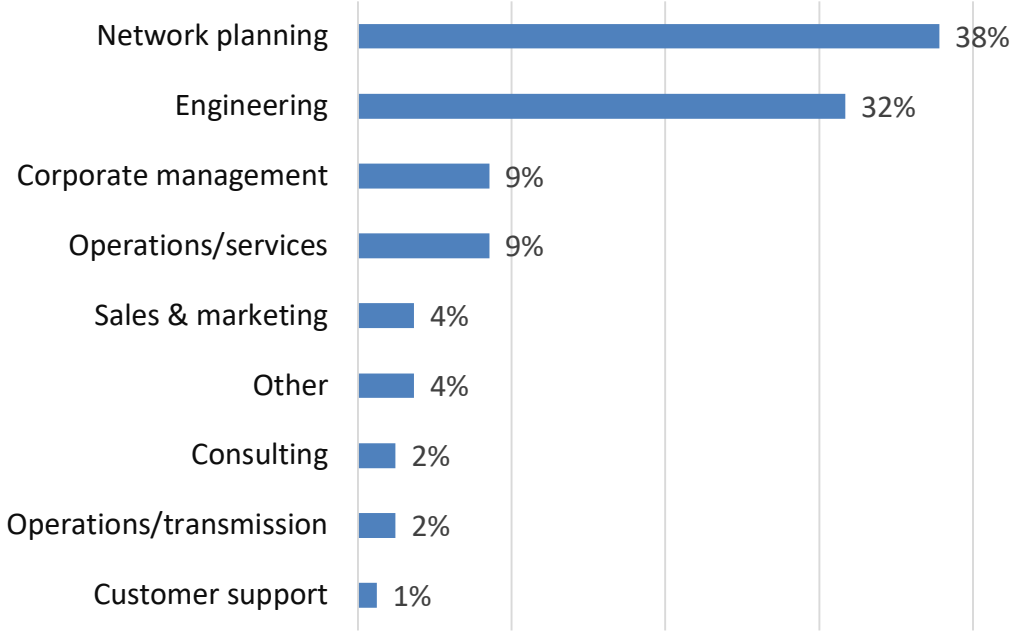
Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

Survey Demographics (continued)

By Operator Type



By Job Function



100% involved in network planning and/or purchasing

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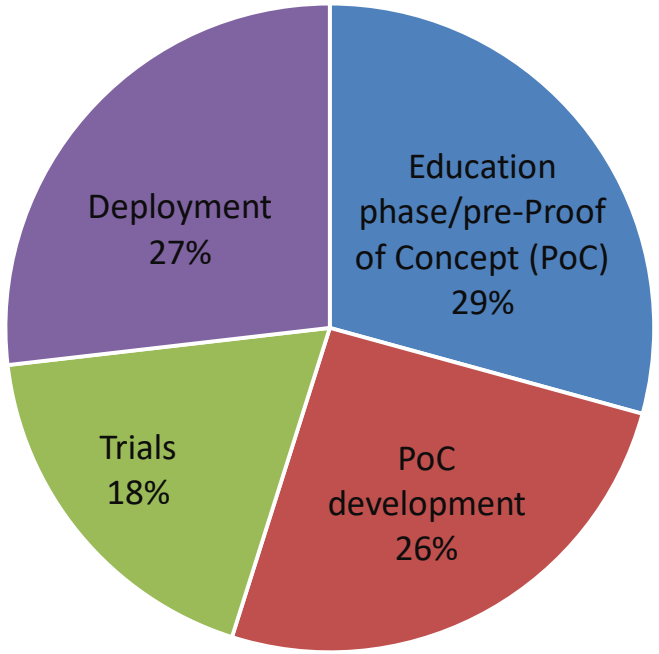
Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

Disaggregated Networks Deployments Phase

Q3. Which statement best describes your organization's current phase of deploying disaggregated networking solutions?



- Not surprisingly, operators are fairly early in the process:
  - 55% currently in early stages of pre-PoC and PoC
  - 45% in more advanced stages of trial and deployment
- North American phases far more advanced vs. ROW
- Survey self-selection suggests respondents skew more aggressive than greater population of operators

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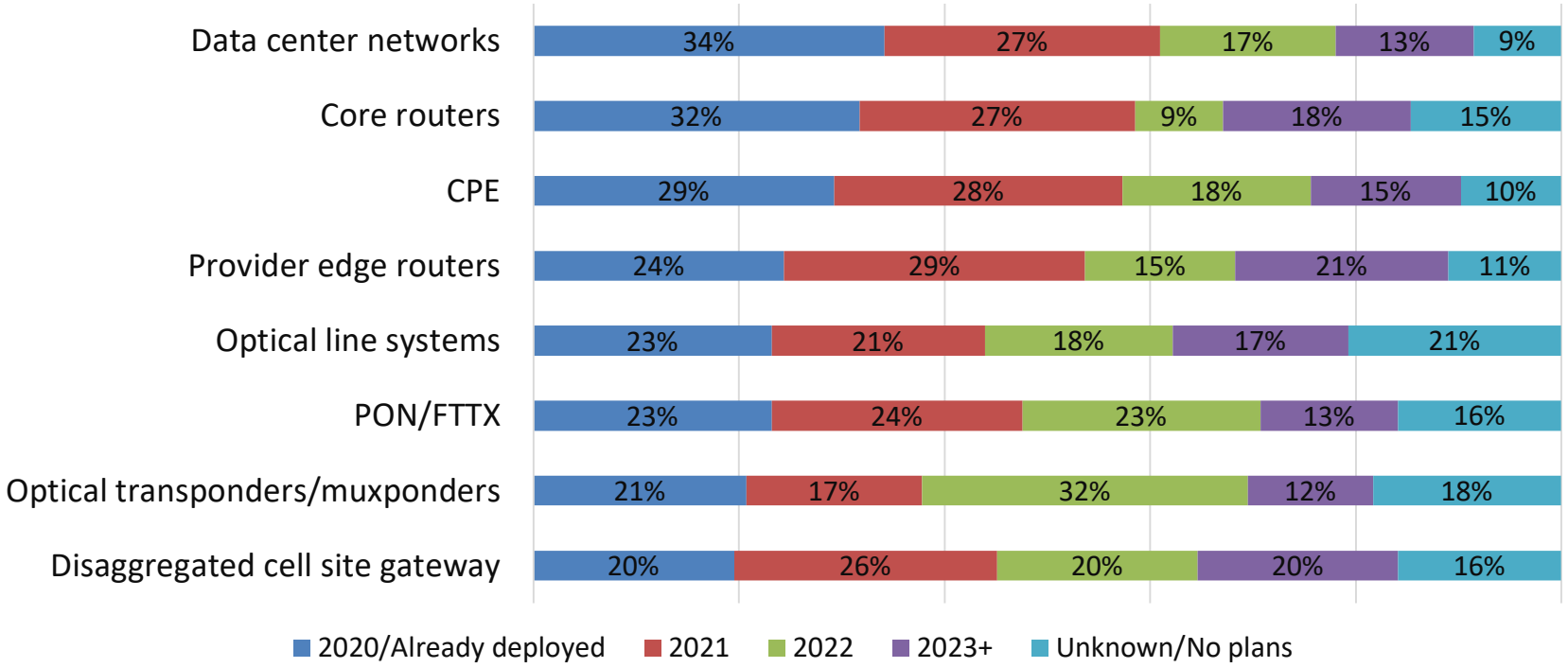
Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

Operator Deployment Timelines

What is your organization's expected timeline for deployment disaggregation in the following segments?



- Plans most aggressive for data center networks, core routers, CPE
- North American timelines far more advanced vs. ROW countries
- Interest in DCSG is high, but deployment timeline lags other segments

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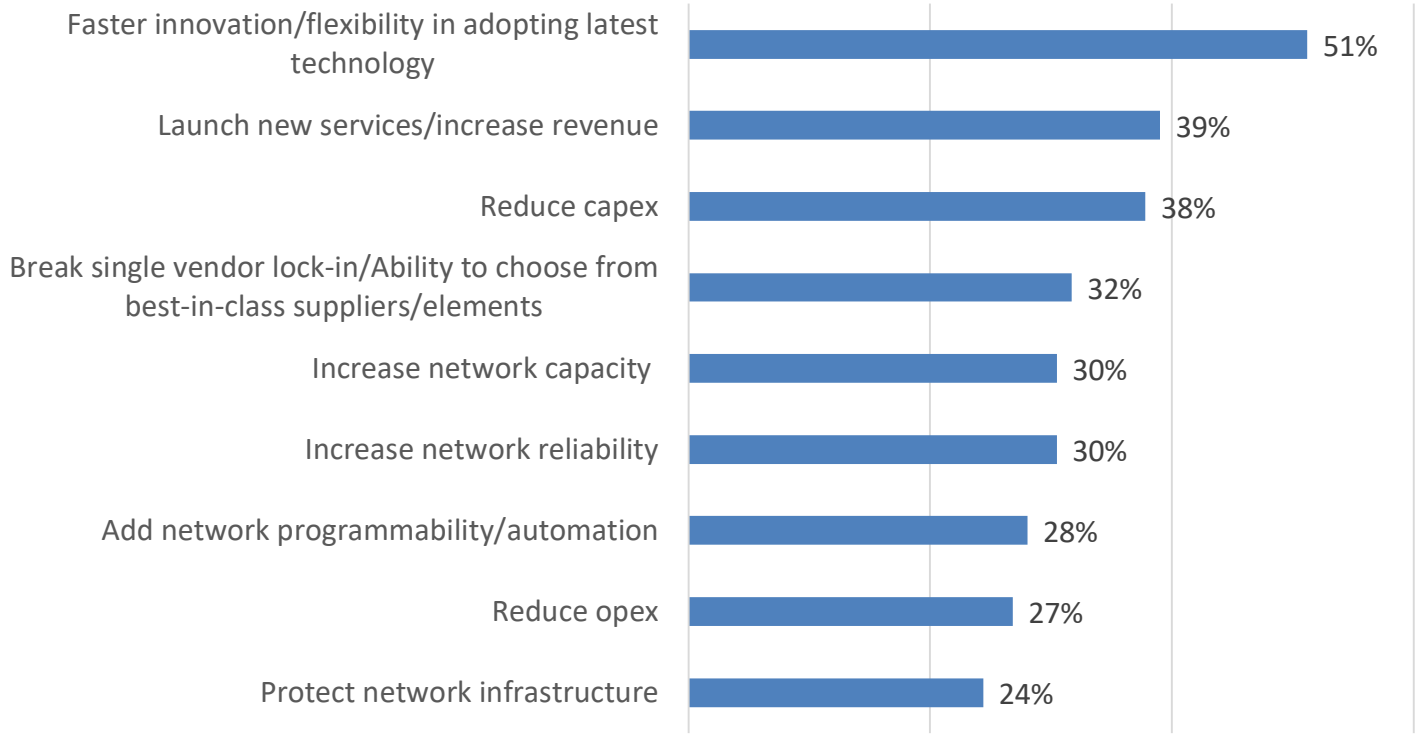
Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

What Is Driving Disaggregation?

What are the top factors motivating your organization to adopt disaggregated networking solutions?



- Innovation and flexibility top driving factors
- New services/revenue and lowering capex form second tier of important drivers

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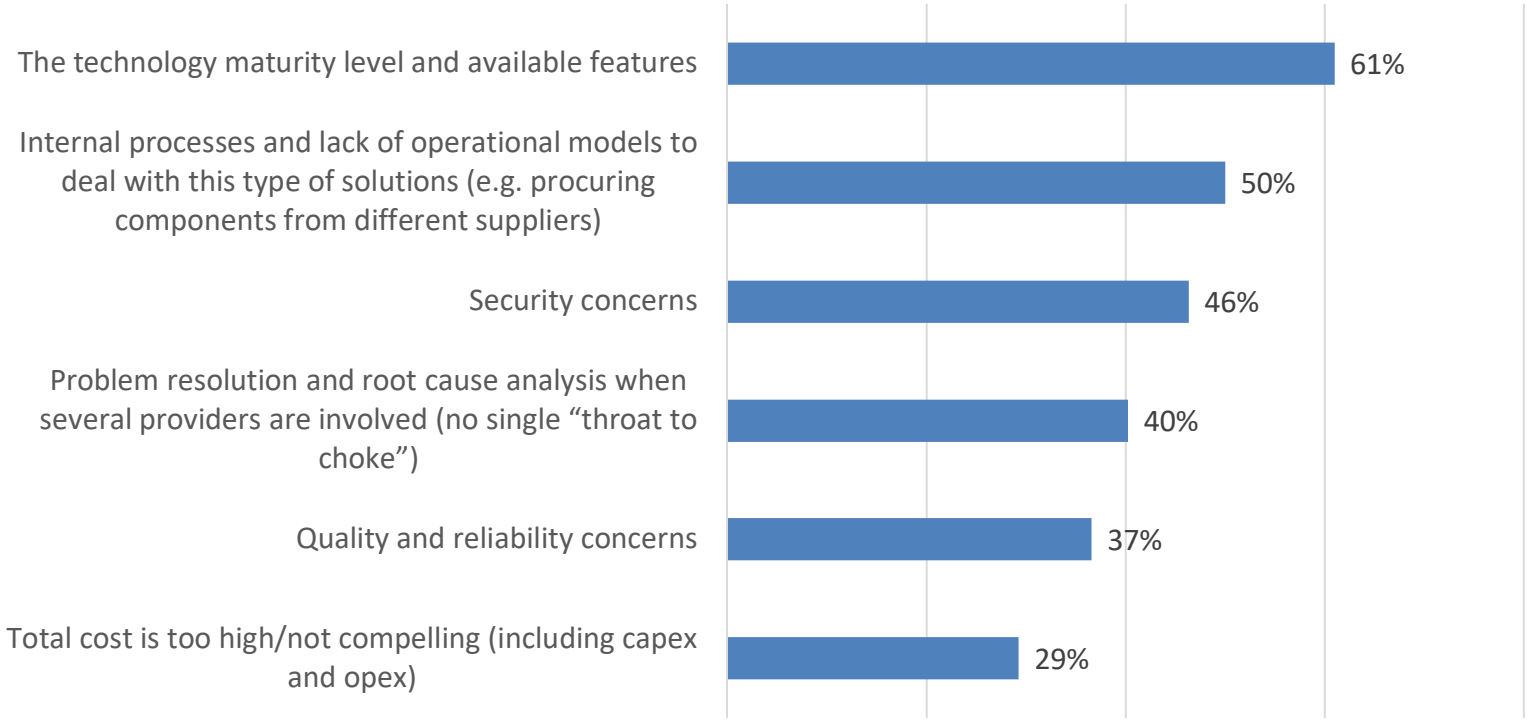
Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

What Challenges Stand in the Way?

What are the biggest challenges to adopting/deploying open disaggregated networking technologies in your organization?



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Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

- Dual challenges consistently rise to the top:
  - Technology maturity and feature parity with traditional elements
  - Operational challenges of dealing with disaggregated networks
- Encouragingly, costs are not standing in the way

Transport Strategy

IP & Optical Disaggregation

Rafael Cantó Palancar
Telefonica CTIO Office

The Outlook for Open and Disaggregated Packet and Optical Networks
26.01.2021

Telefónica Transport Network Strategy

SDN Control Plane

Disaggregation

2019: **Transformation of IP and optical networks** completed with a multiservice multilayer flattened network approach, providing support for 5G & FTTH

TECHNOLOGY EVOLUTION

SDN brings intelligence to IP and Optical network. Traffic Engineering is simplified. Basic for automation, disaggregation and slicing

First trials and deployments of both IP and optical disaggregation

Open Transport

Open Transport

Software Defined Networking

Disaggregation

Why are we deploying SDN?

	Simplify OSS Integration
	Network Intelligence
	OPEN Transport
5G	Network Slicing

- Consolidate OSS integration with a **single northbound interface per technology**.
- **Decouple** technology **evolution** in OSS and Network.

- Enable **traffic engineering** and **automatic service provisioning**.
- Facilitate **migrations** and **operational** processes.

- SDN enables adopting **new suppliers** as the device have the same interface.
- Generation of **free demand** in RFQs.

- Control mechanisms to allocate the required **network resources per slice** and assure performance and quality.

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How can we achieve SDN deployment?

Functional Architecture
Standard agreed NBI and SBI

Reference Model

Network Operators

Suppliers

Collaboration Fora

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MUST

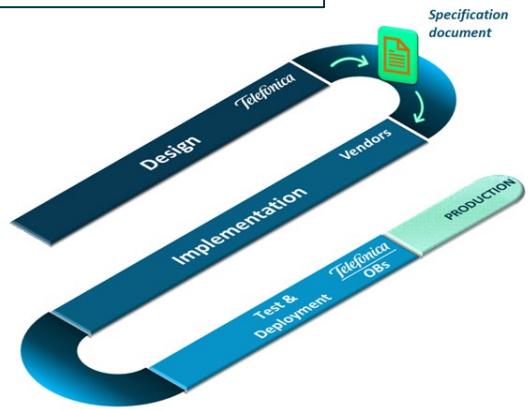
ONF

IETF

OPENCONFIG

Step by step
Provide value

Use Case Oriented



Standards Based

Industrial alliances
Follow mature standards

Network Abstraction Model

E2E network view
Minimize entrance barriers

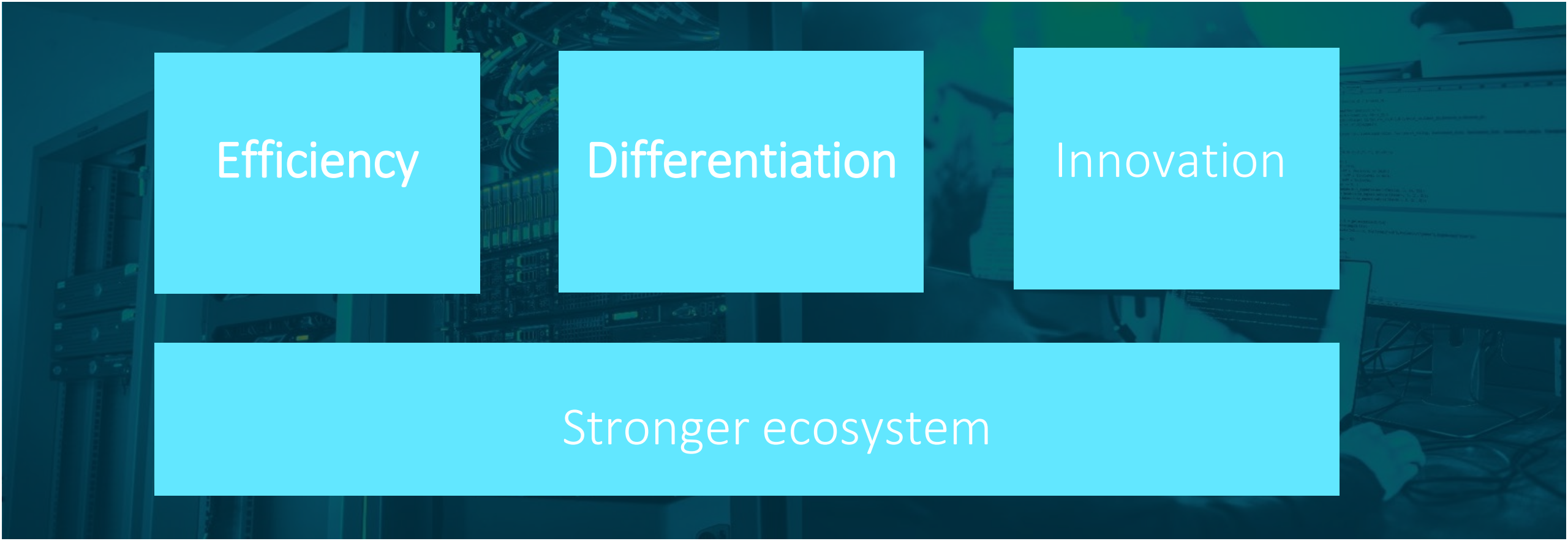
Telefónica

Open Transport

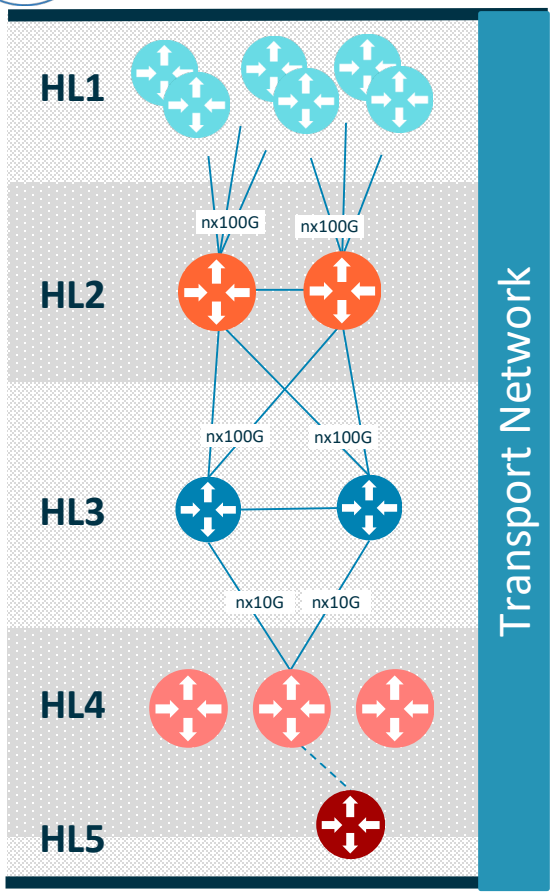
Software Defined Networking

Disaggregation

Why moving to disaggregated solutions?



Open Fusion: Disaggregating transport networks



IP NETWORK

Merchant-silicon vs ASICS.
Ex. Cisco over Broadcom

- **Core backbone** (Intenational Network)
- **Cache aggregation** (Latam)
- Service platforms…

Open White-box

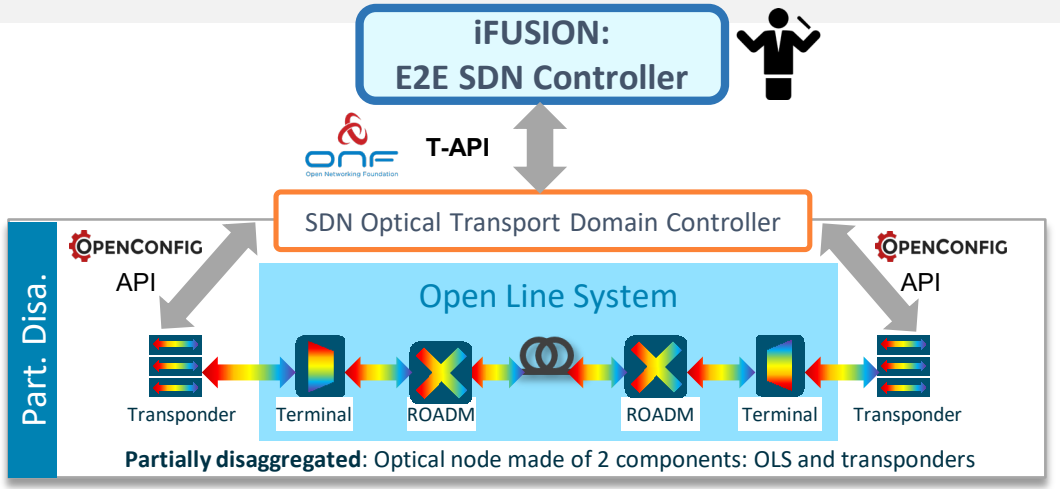
Network OS

Bare-Metal

Mature industrial solutions may cover **Cell Site Router** (HL5) demand. First commercial deployments. High volume

PARTIAL OPTICAL DISAGGREGATION

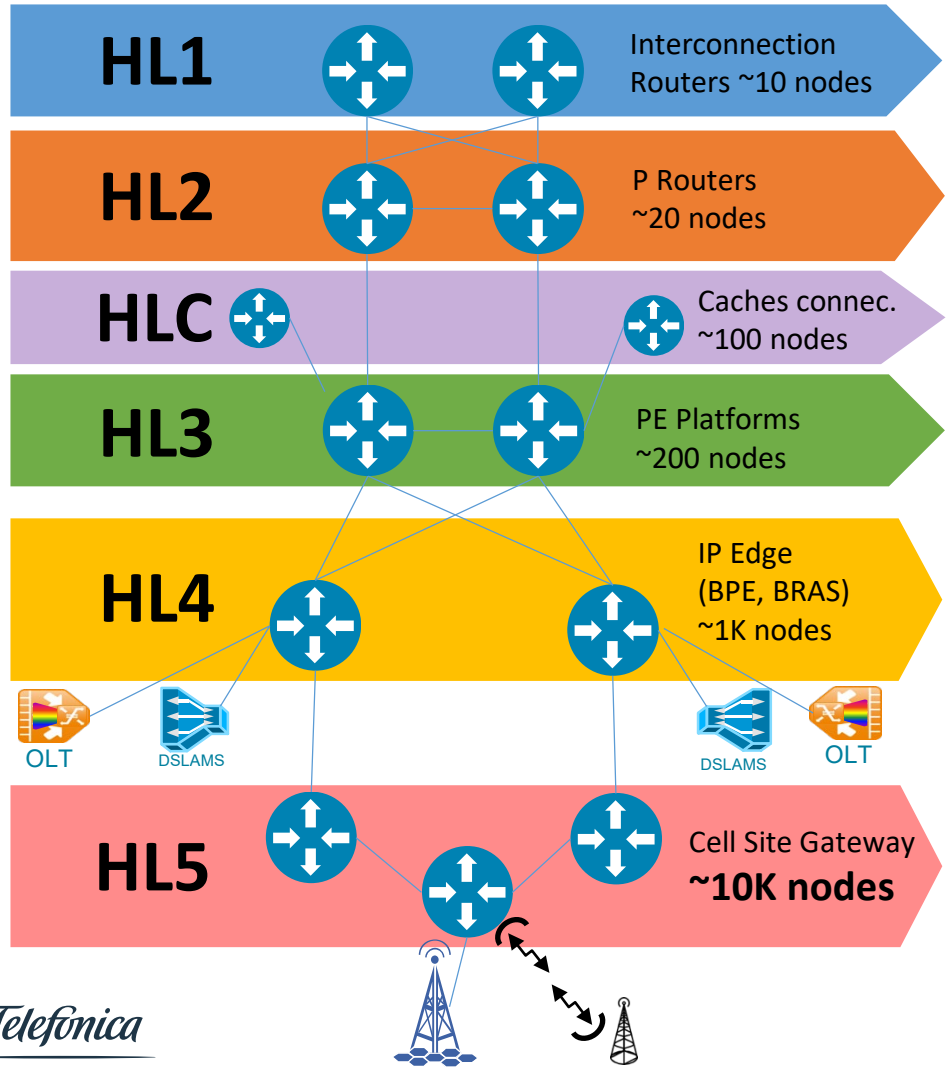
Within **TIP** and **ONF**, Telefonica is collaborating in operator-led initiatives to create **open disaggregated optical equipment**, open and common standards, and open-source software

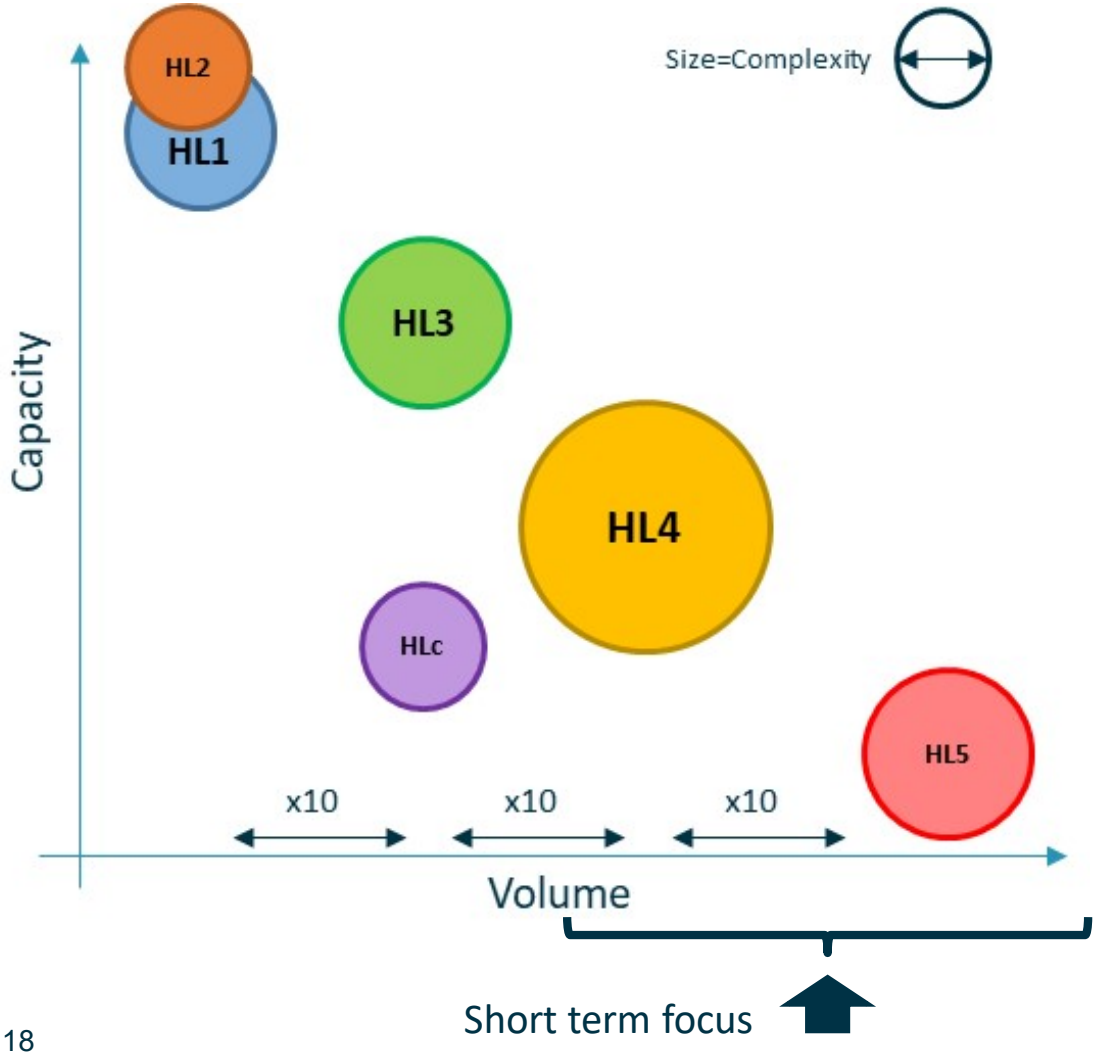


Focus on Partial optical disaggregation (**transponder-OLS**), **currently** applied in our procurement processes, and covers certain share of the demand. This option leverages on SDN capabilities for scale

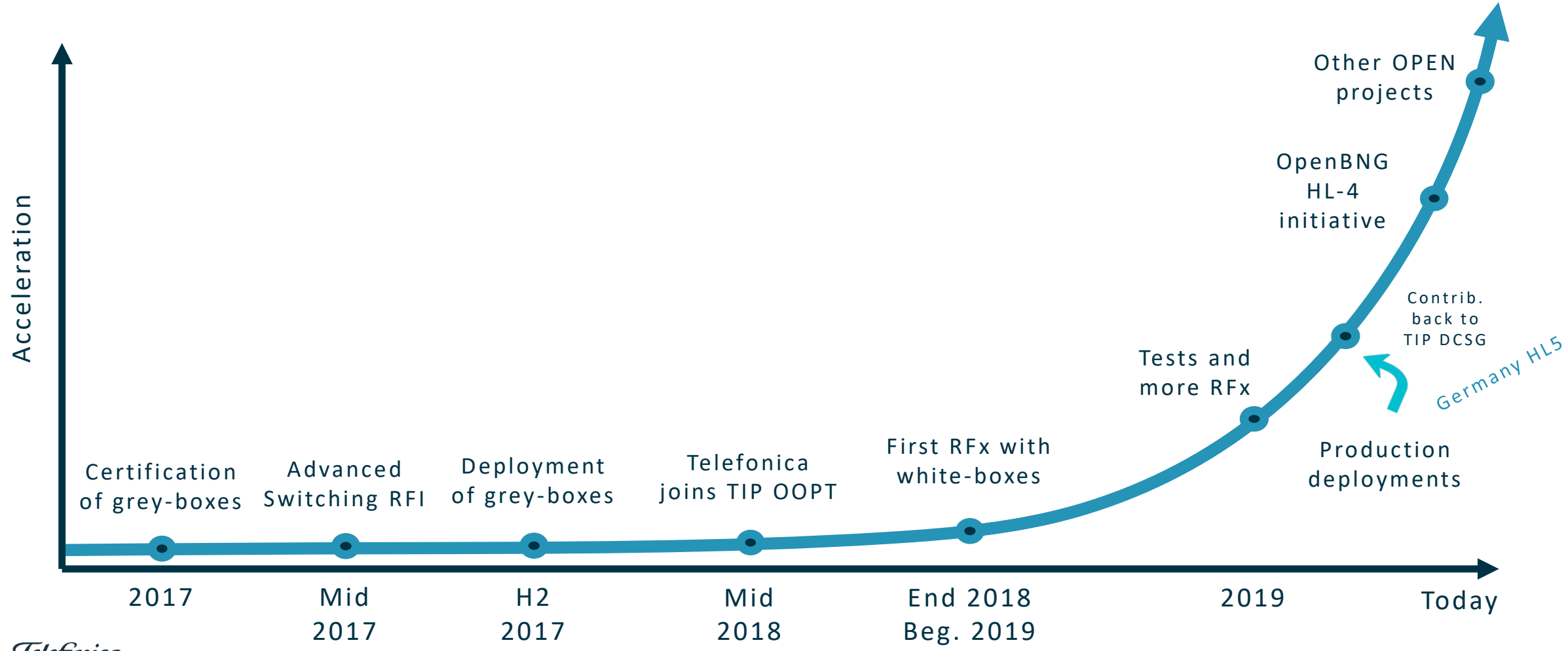
Open FUSION is transforming Telefonica's IP networks

Complexity and Volume considerations





Our journey to disaggregation



Telefónica collaboration in disaggregated initiatives

Leveraging when possible shared work with other Operators to build momentum

Disaggregated Cell Site Router

- **Launch Oct 2018.** Telefonica, Vodafone and TIM Brasil led the spec definition.
- **Production.** Telefonica deployed DCSG in 2020 in Ecuador, Peru and Germany.

Open BNG

- Coordinated Open Community started by BT, DT, Telefonica, and Vodafone
- High Level **Specs released Oct 2020** in TIP

Cassini

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- **Launch 2017.** Project launched within TIP.
- **Field trial.** Telefonica tested Cassini in 2019 in Peru.

Phoenix

TELECOM INFRA
PROJECT

- **Launch March 2020.** Telefonica, Telia, NTT, MTN, DT and Vodafone led the spec definition.
- **Testing.** Products are ready validation will start in Q1 2021.

IP

Optical

Wrap Up

Wrap Up

- Telefónica already using disaggregation both in optical and IP
  - IP Disaggregation initial focus in low hierarchy routers (HL 5 - DCSG) to be extended to HL4 – OpenBNG in 2022
  - Optical (partial) Disaggregation through the use third party transponders (e.g. Phoenix). More complex disaggregation models under evaluation
- SDN as key enabler of transport automation and disaggregation
  - Use case progressive approach is demonstrating to be the right approach. MUST initiative in TIP extends this methodology to the Industry
- Collaborative, agreed, common requirements will be key to build attractive and healthy ecosystems around open disaggregated networks in the long term


Telefónica

Towards Open and Disaggregated Transport Networks

Lloyd Mphahlele,
General Manager, Group Technology, MTN

MTN

TELECOM INFRA PROJECT

Open Disaggregated Technology At MTN

LEARNINGS

- Multivendor RAN interoperability
- 5G RAN ready
- Remove Vender lock-in
- Interoperability with other leading IP Core Providers
- Roadmap to Network Automation

BENEFITS

- Increased technology options to meet MTN network of the future needs
- Meets MTN network agility needs as a connectivity provider in the region
- Align to MTN strategic objectives

CHALLENGES

- Operator management systems readiness for open API's

"First African operator to **demonstrate 5G RAN vendor interoperability** on open, disaggregated technology (DCSG)"

The Transport CASSI Framework to Drive Value

ENABLING GROWTH

TCO EFFICIENCY

CONVERGED & CONGESTION Free to enable growth

ALWAYS On to protect revenues

SCALABLE to drive TCO Efficiency

SIMPLIFIED to drive TCO Efficiency

INTELLIGENT to enable automation

C A S S I

The Transport CASSI Framework To Drive Value

THE CASSI FRAMEWORK

C	**Converged & Congestion Free**
A	**Always On**
S	**Scalable**
S	**Simplified**
I	**Intelligent**

VALUE ALIGNMENT

- Open IP-Optical convergence to increase MTN network capacity
- Open API's seamlessly stitch and converge transport network domains
- Convergence of web scale technology to meet increase in service needs
- High-capacity capability enabling network agility

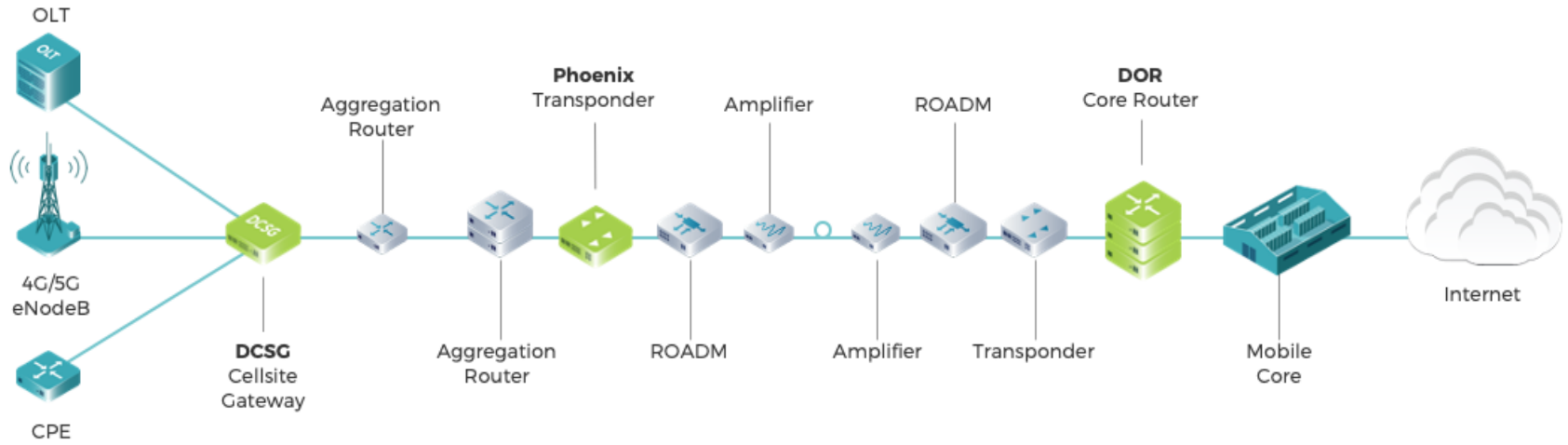
- Always on provides strong resilience and high network availability
- Innovation to realize true open network automation
- Evolving legacy transport domains into software define and controlled architectures

- Realizing scale through best of breed technology vendor ecosystem, increased competition, driving lower cost
- Operator led design of purpose fit transport network solutions

- Open and disaggregated network architectures to ease integration and lower network OpEx cost
- Future proof network investments

- Software defined automation, reducing services lead times
- Visualization & forecast with SDN

MTN Collaboration in Disaggregated Initiatives



Disaggregated Cell Site Gateways (DCSG)

Open and disaggregated vendor neutral cell site gateway with high capacity chipsets to future proof capital investment and standard based API to ease network integration and optimize operational expenditure

Phoenix

An open neutral L0/L1 transponder that MTN can deploy on top/together with their existing line systems to increase the capacity of their optical networks. It is based on disaggregated components (HW and SW) with 200/400G line interfaces

Disaggregated Open Routers (DOR)

To build open and disaggregated core routers that MTN can deploy in their current IP/MPLS networks to future proof 5G investments

Wireless Backhaul

A wireless backhaul transport solution, adopting the principles of an open and disaggregated architecture to optimize network efficiencies, speed up service deployment and ease integration

TODAY	**Lab Trial Complete**	**Operator Specification Released**	**Requirements published**	**Prototyping**
NEXT	**Scale Field trial (Q1 2021)**	**Prototyping (Q1 2021)**	**RFI/Prototyping (Q1 2021)**	**Lab trial (Q2 2021)**

What's Next

- Open and disaggregation Cell site gateway deployment at scale
- 5G acceleration with open and disaggregation technologies
- Finalize MUST use cases for adoption
- Expand and incubate ecosystem for DOR and Phoenix
- Roadmap to Network Automation


MTN
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PROJECT
We are good together
Together We Build

Panelists

Tim Doiron
Senior Director, Solution Marketing, Infinera

Hugh Kelly
Vice President, Marketing, Volta

Diego Mari Moretón
Connectivity Technologies & Ecosystems Manager, Facebook

Shaji Nathan
Chief Product Officer, IP Infusion

Motivations

- How specifically will open and disaggregated networks:
  - Drive faster innovation?
  - Deliver new revenue streams for operators?
- Examples?

Inhibitors

- Survey shows dual challenges stand in the way of progress on disaggregation:
  - Technology maturity and feature parity with traditional elements
  - Operator ability to operationalize disparate vendors and technologies
- How does the industry address these two challenges?
- Examples?

Disaggregated Networking: Customer Deployments

CSR Customer in Taiwan	**Disaggregated Solution**	IN PRODUCTION
▪ Nation-wide operator with close to 2M subscribers for 3G/4G and 5G ▪ Close to 3000 network devices in upgrade/expansion plan	▪ OcNOS software, Ufispace S9500-30XS (QAX), support services for access and aggregation ▪ MPLS, L2,L3VPN, 1588v2, SyncE	
CSR Customer in Brazil	**Disaggregated Solution**	IN PRODUCTION
▪ Subsidiary of Direct TV ▪ Connecting 11x different sites with more than 40 nodes in deployment	▪ OcNOS software, Dell Qumran 4248-FBL ▪ Metro ring for fixed and mobile wireless ▪ MPLS FRR, VPWS, CFM, Y.1731	
Packet Optical Customer in Chile	**Disaggregated Solution**	IN PRODUCTION
▪ Multi-city ISP (internet, voice, IPTV) ▪ Close to 50 Cassini systems, plus another 50 AS5912-54x (Qumran MX)	▪ OcNOS software, Cassini OOPT Edgecore ▪ Cassini for spine and inter-connect ▪ VXLAN, Multicast	

Industry Collaboration and Ecosystems

- What is the role of TIP in building open and disaggregated networks?
- What other groups are most significant for packet and optical networks?

Value of TIP: A Service Provider Perspective

Q: What do you see as the most important help/benefits that TIP can bring to service providers interested in open and disaggregated networks?

"accelerate the development and deployment of open, disaggregated, solutions"

"Interoperability and flexibility in the context of a multivendor, open ecosystem"

"A new approach to building and deploying telecom network infrastructure"

"Scalability and improved delivery timelines"

"Shared Knowledge"

Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

Disaggregated Cell Site Gateway

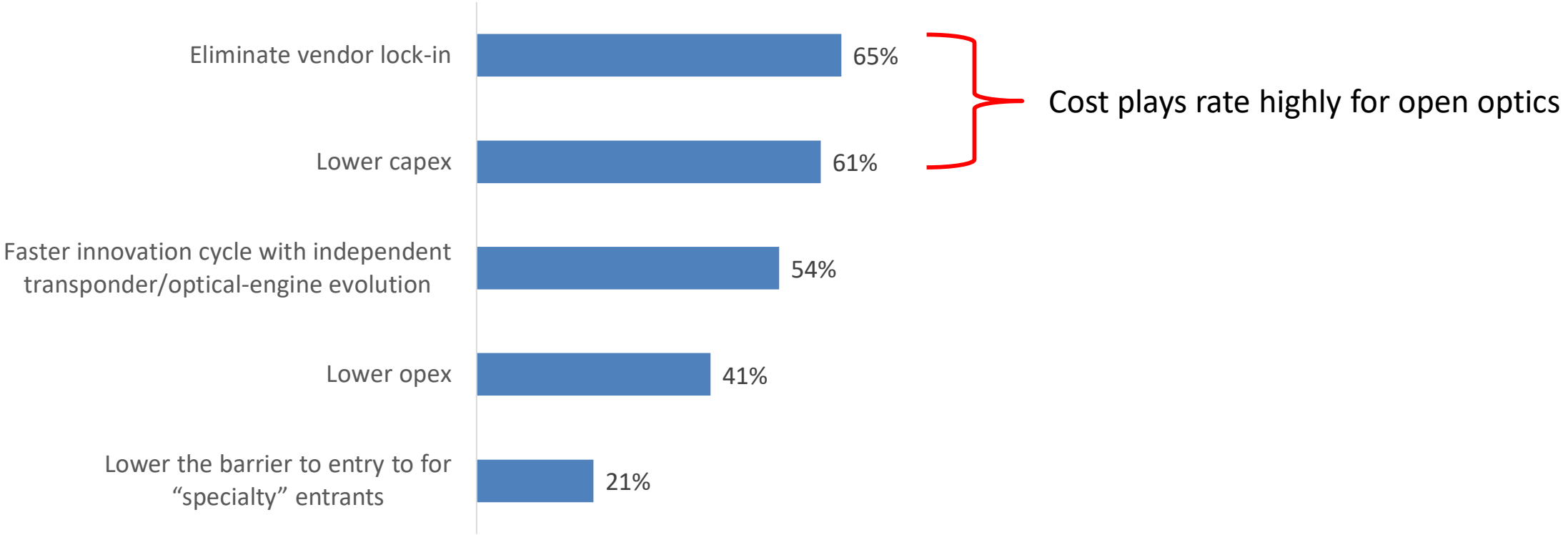
- Disaggregated cell site gateway is gaining traction with operators:
  - What is the value proposition of disaggregating this element?
- What are the critical features for DCSG?

Open Optical Networks

- What is the winning disaggregated architecture for optical networks?
  - Horizontal disaggregation?
  - Vertical disaggregation?
- Are pluggable modules set to supplant embedded optics at 400G?

Benefits of Open Optical Networks

What are the biggest benefits of deploying of a multi-vendor open optical networking solution?



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Source: Heavy Reading Open and Disaggregated Networks Survey, 2020

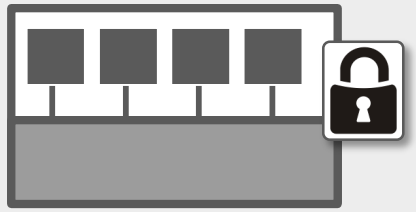
Key Attributes for Open Optical Networking Solutions

TRADITIONAL CLOSED SOLUTIONS

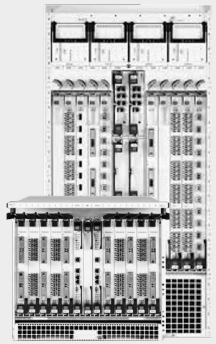
SINGLE-VENDOR NETWORKING SOLUTIONS

XPONDERS

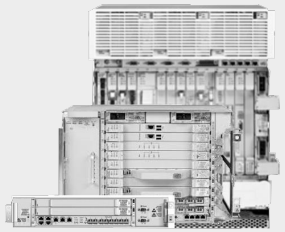
OPTICAL LAYER
(ROADMs, Amplifiers, Filters)



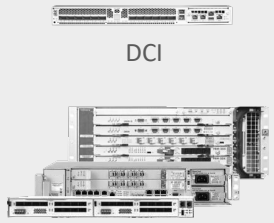
PROPRIETARY PLATFORMS & INTERFACES



OTN



PACKET OPTICAL



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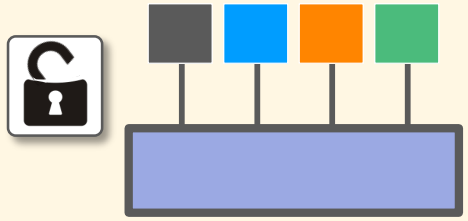
FUNCTIONALLY ENABLE MULTI-VENDOR NETWORKS

OPERATIONALLY ENABLE MULTI-VENDOR NETWORKS

OPEN OPTICAL SOLUTIONS

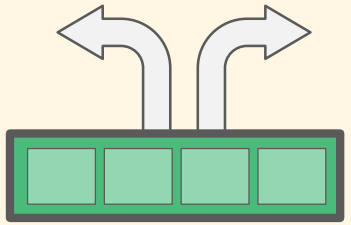
1 SEPARATION OF TRANSPONDER & OPTICAL LAYER



XPONDERS

OPTICAL LAYER
(ROADMs, Amplifiers, Filters)

2 STANDARD OPEN APIs & STANDARD DATA MODELS



NETCONF, RESTCONF,
Streaming Telemetry

YANG BASED
(OpenConfig, Open ROADM)

Questions and Answers