Fighting Fiber with More Fiber

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Thursday, May 20, 2021

11:00 am –12:00 pm ET (8:00 am -9:00 am PT)

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Today's Speakers

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Agenda

- **Light Reading—**Fiber Study Highlights
- **Vecima—**The Cable Conundrum – Capacity and Coverage
- **Corning—**WDM – The Move to 10G and Beyond
- **VIAVI –**Overcoming DWDM Challenges
- **SCTE**—Training, Standards & Certifications
- **Audience Q&A**

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LR/SCTE Fiber Outlook Study Overview

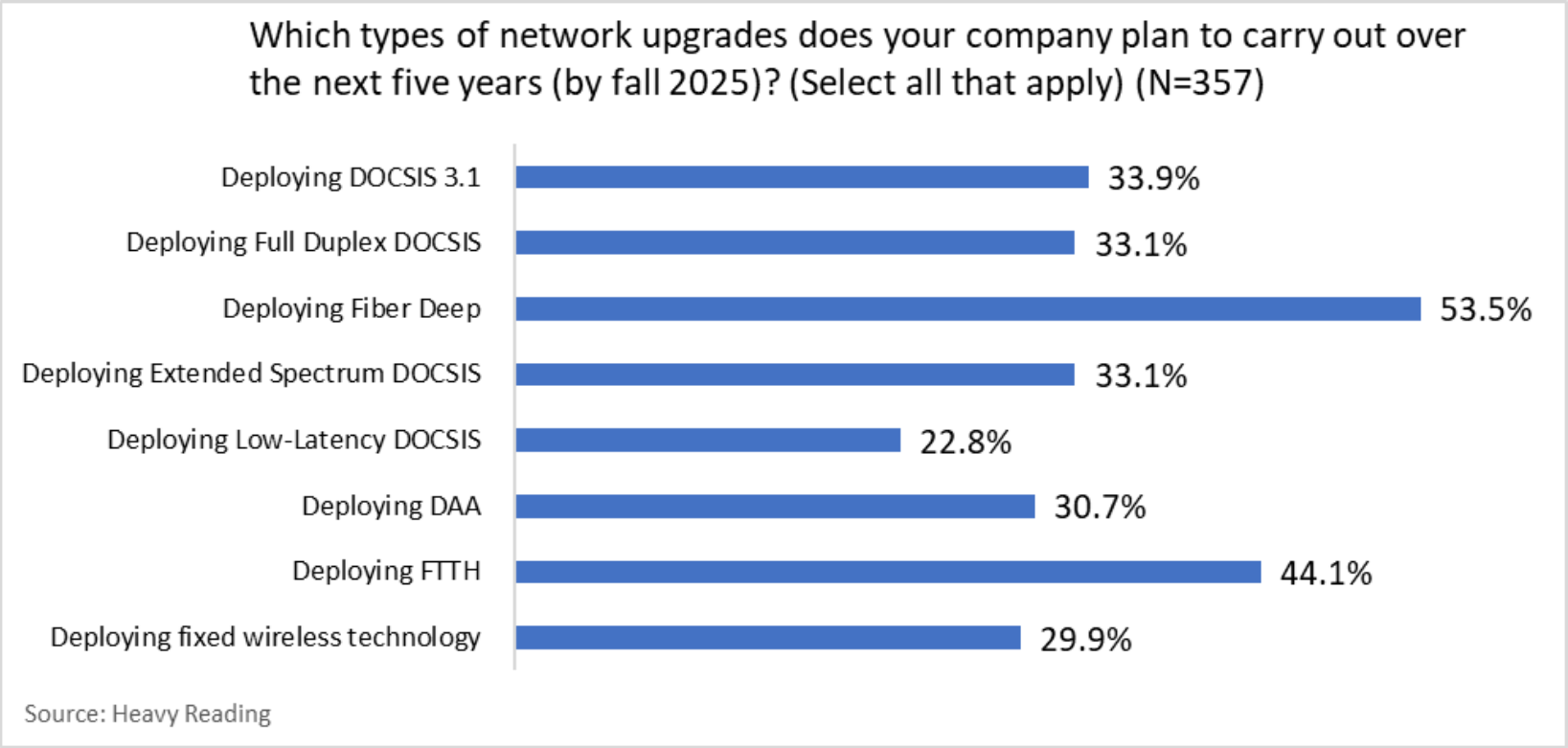
Overall Highlights

LightReading

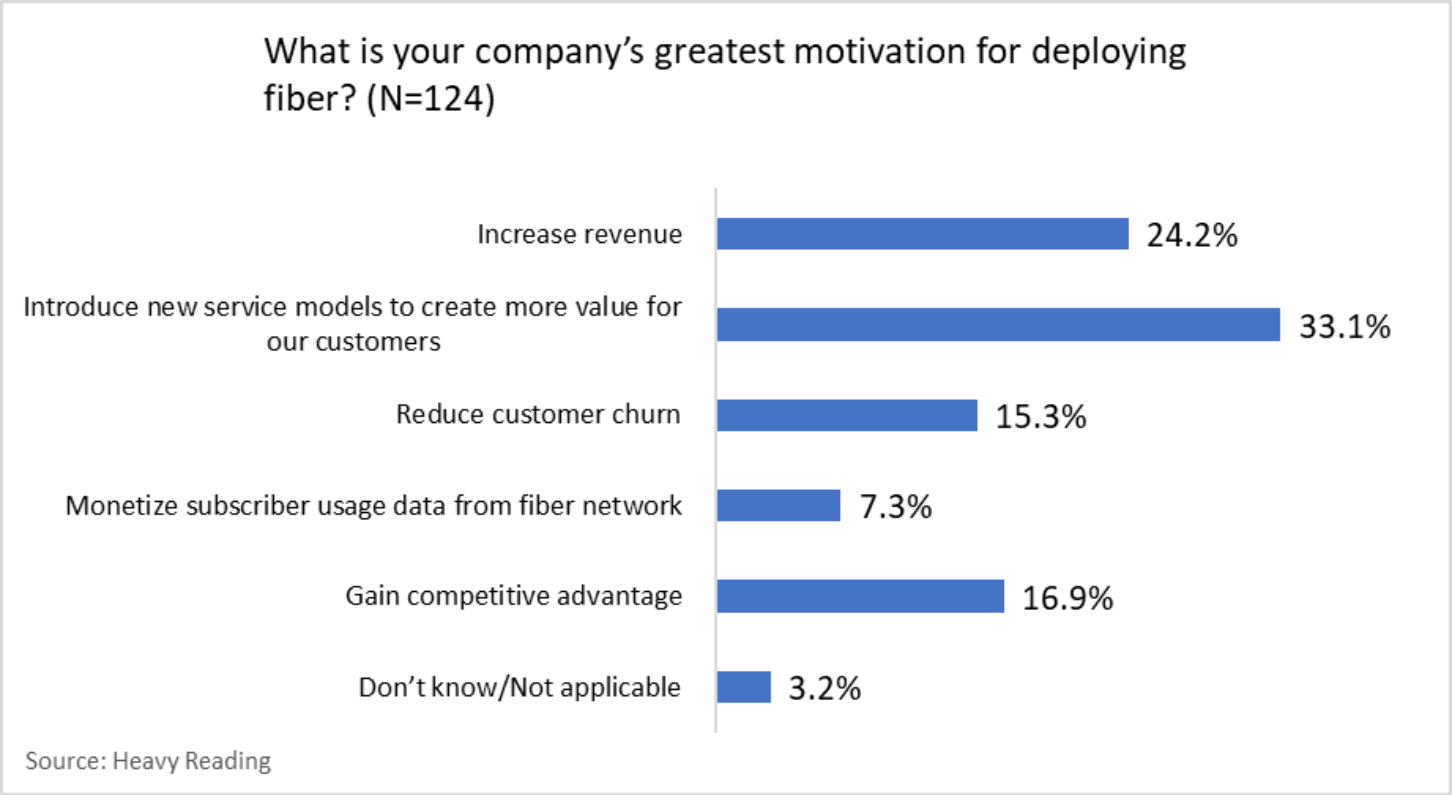
SCTE Cable Fiber Outlook Survey Highlights

- More than one-half of survey respondents (nearly 54%) said their company plans to deploy fiber deep networks over the next five years, eliminating all, or nearly all, of the signal amplifiers in their HFC plant
- At the same time, over two-fifths of survey participants (44%) said their company intends to build FTTH networks over the next five years
- Close to one-half (45%) of respondents rated a lack of “capacity for higher upstream demand” as the biggest network upgrade challenge that operators face because of COVID-19
- Nearly two-fifths of respondents (38%) identified a “lack of available fiber” and almost as many (36%) named an “inability to install new fiber lines as fast” as they would like

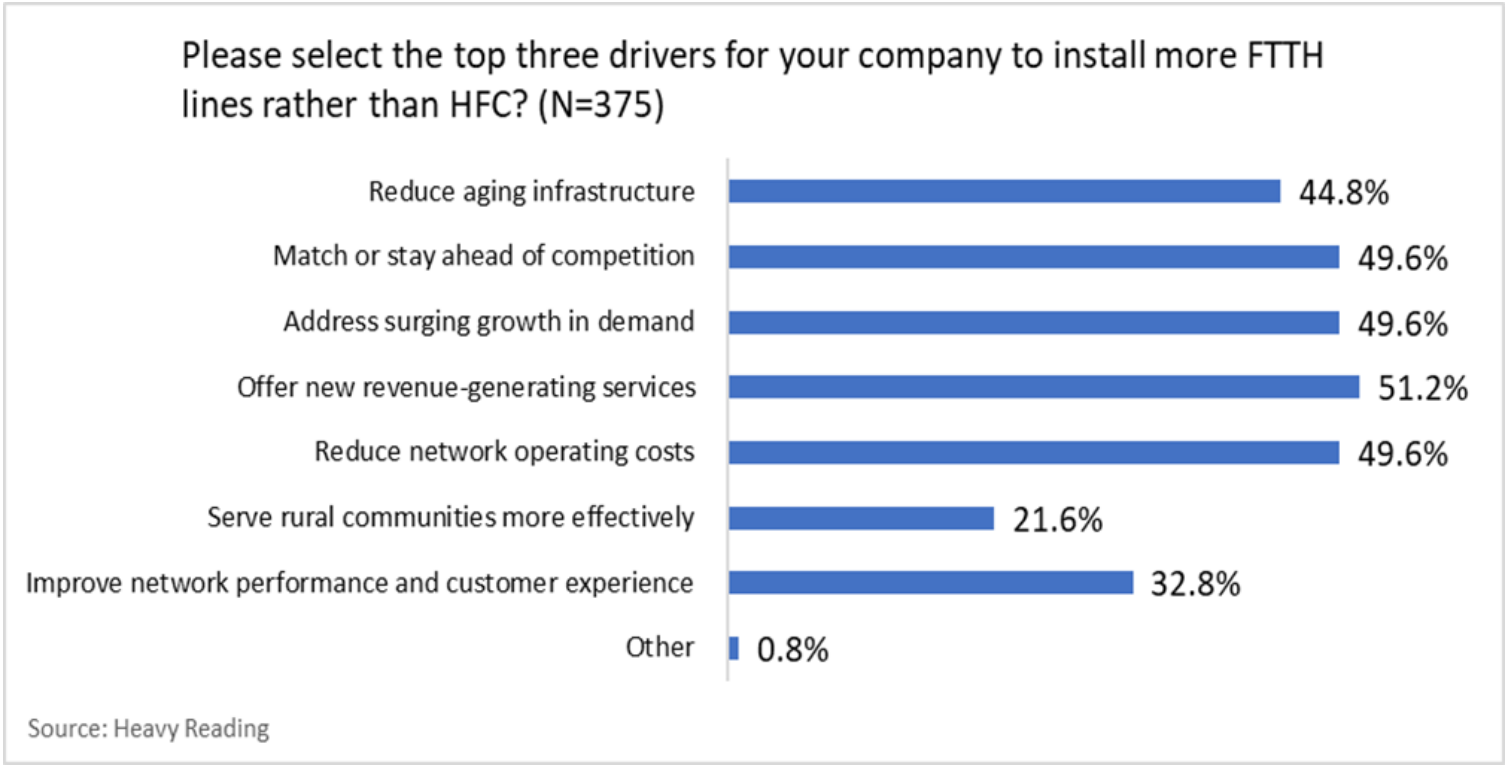
Types of HFC Network Upgrades Planned



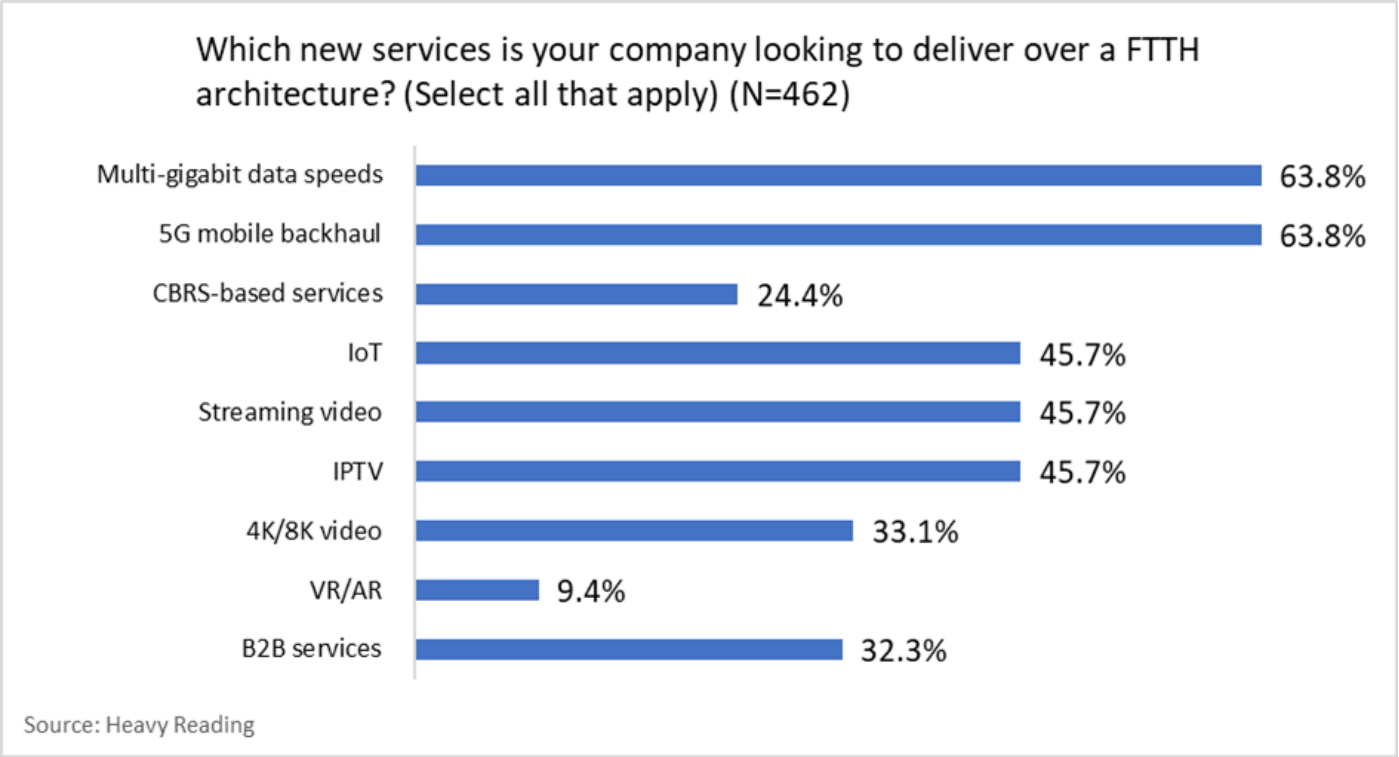
Greatest Motivation for Deploying Fiber



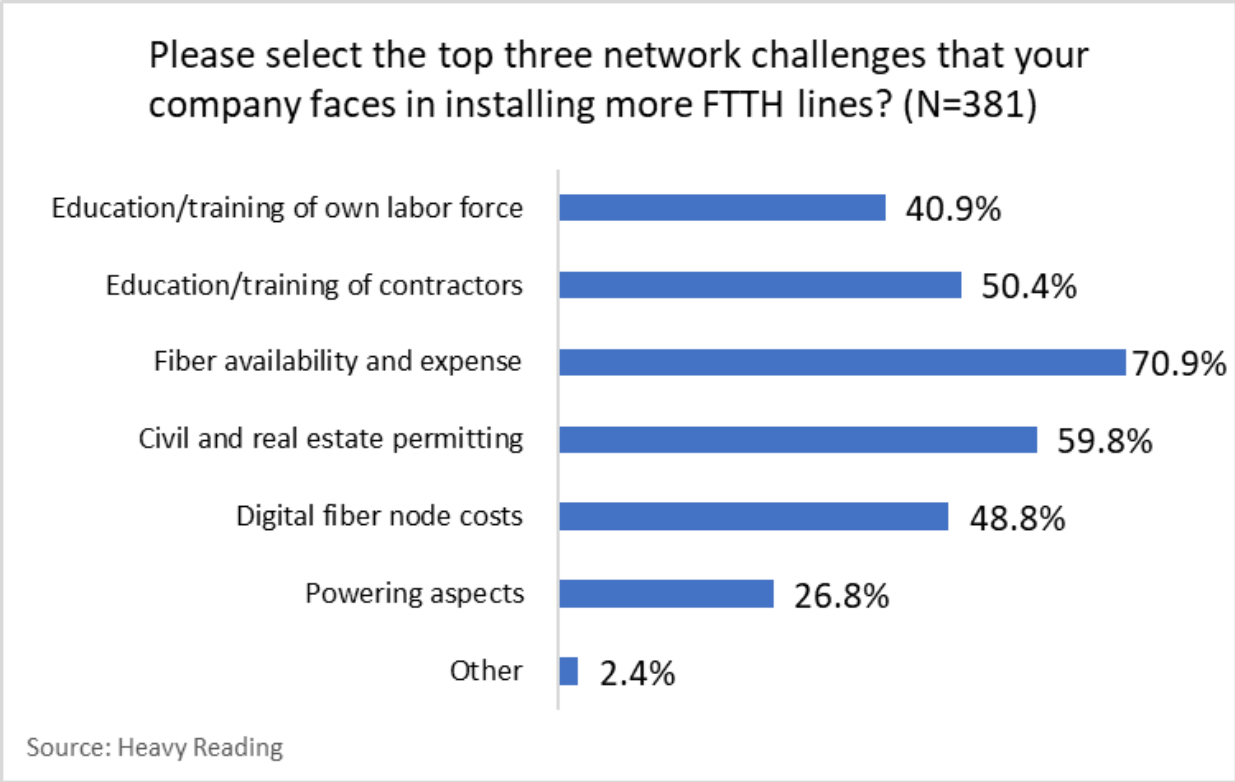
Biggest Fiber Drivers



Biggest New Fiber-Enabled Services



Top Three Network Challenges Faced with Fiber



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Cable MSO Wish List

01 | Explosive Subscriber Capacity Needs

02 | Increased Service Velocity

03 | Higher Fidelity HFC with Fiber Deep

04 | Faster QAM To IP Video Transition

05 | Greater Head End Density

06 | Integrated Operations Systems

07 | Reduced Cost To Deploy New Svcs

Fighting & WINNING with Fiber vs. Fiber!

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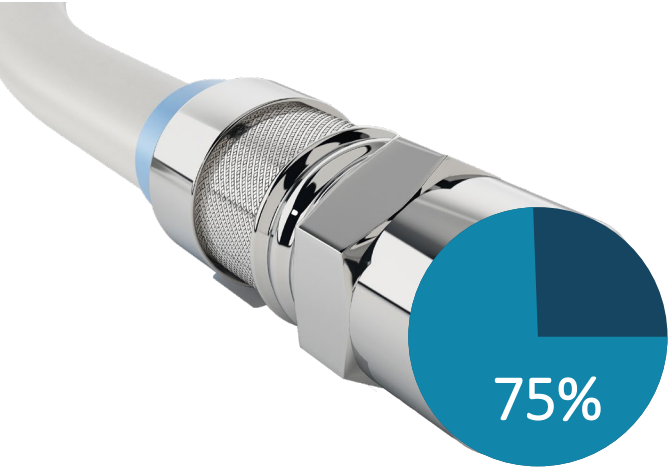
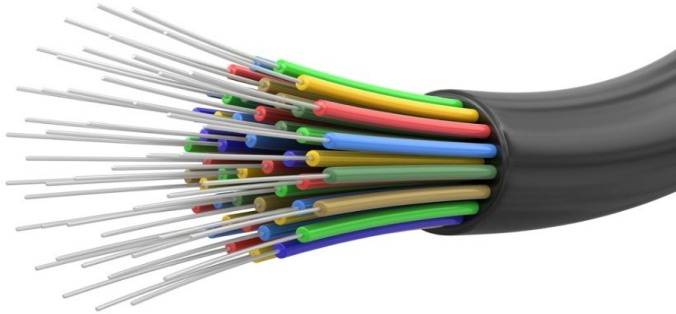
The Cable Conundrum – Capacity and Coverage

Coax has vast coverage, but has capacity limits



Fiber brings capacity, but lacks coverage and is expensive

25%



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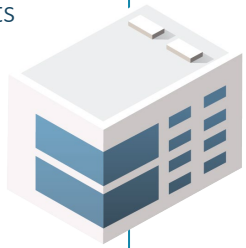
What options do MSOs have for their access network?

Coax has vast coverage, but some capacity limits

Fiber brings capacity, but lacks ubiquitous coverage and can be expensive



"Status Quo"

- Business as usual HFC capacity expansion with node splits, DOCSIS 3.1, spectrum reallocation
- Space, power, and distance limitations plus operational cost and complexity are blockers

Distributed Access Architecture

- Simplify the network by pushing certain cable functions to the node and virtualizing the headend
- Network expansion (fiber deep, node splits, DOCSIS 3.1/4.0) without cost, space, power, & distance bottlenecks
- Stepping stone to FTTP

FTTP

- Fiber to the home or business: EPON, GPON, or P2P
- The ideal solution: unlimited capacity and future-proof – but slowed by required investment

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FTTP Competitive Advantage

Faster

Better

- Cost of Deploying New Subscribers
- Training
- Back Office Integration

- Gigabit Speeds
- CableLabs DPoE/EPON
- Leverage IP Video
- Massive Upstream Capacity
- Reduced OPEX
- Better E2E Interoperability

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Rural Digital Opportunity Fund

Rural Digital Opportunity Fund

$20.4B USD to:

- Buildout rural fiber over 10 years
- Many Vecima customers have received funding
- Vecima Tier 1 operator initiating huge fiber build
- Incremental to existing FTTP opportunity

American Jobs Plan

The White House
@WhiteHouse
United States government organization

Right now, more than 35% of rural Americans lack access to broadband at minimally acceptable speeds. President Biden's American Jobs Plan will change that and bring affordable, reliable high-speed internet to every American.

12:14 PM · 4/25/21 · The White House

$100B USD to:

- Build high-speed broadband infrastructure to reach 100% coverage
- Promote transparency and competition
- Reduce the cost of broadband internet service and promote more widespread adoption

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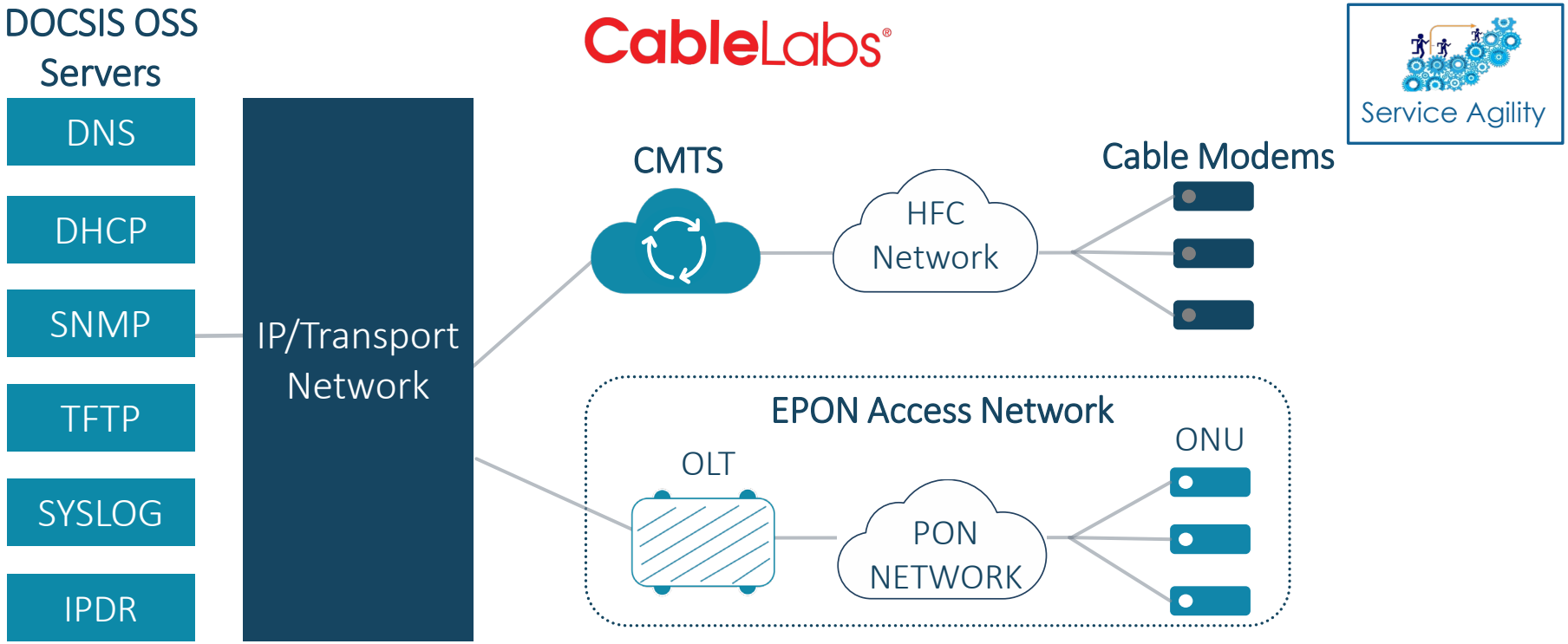
DOCSIS Provisioning of EPON - DPoE



PON system look like DOCSIS with ONU as “virtual cable modems”

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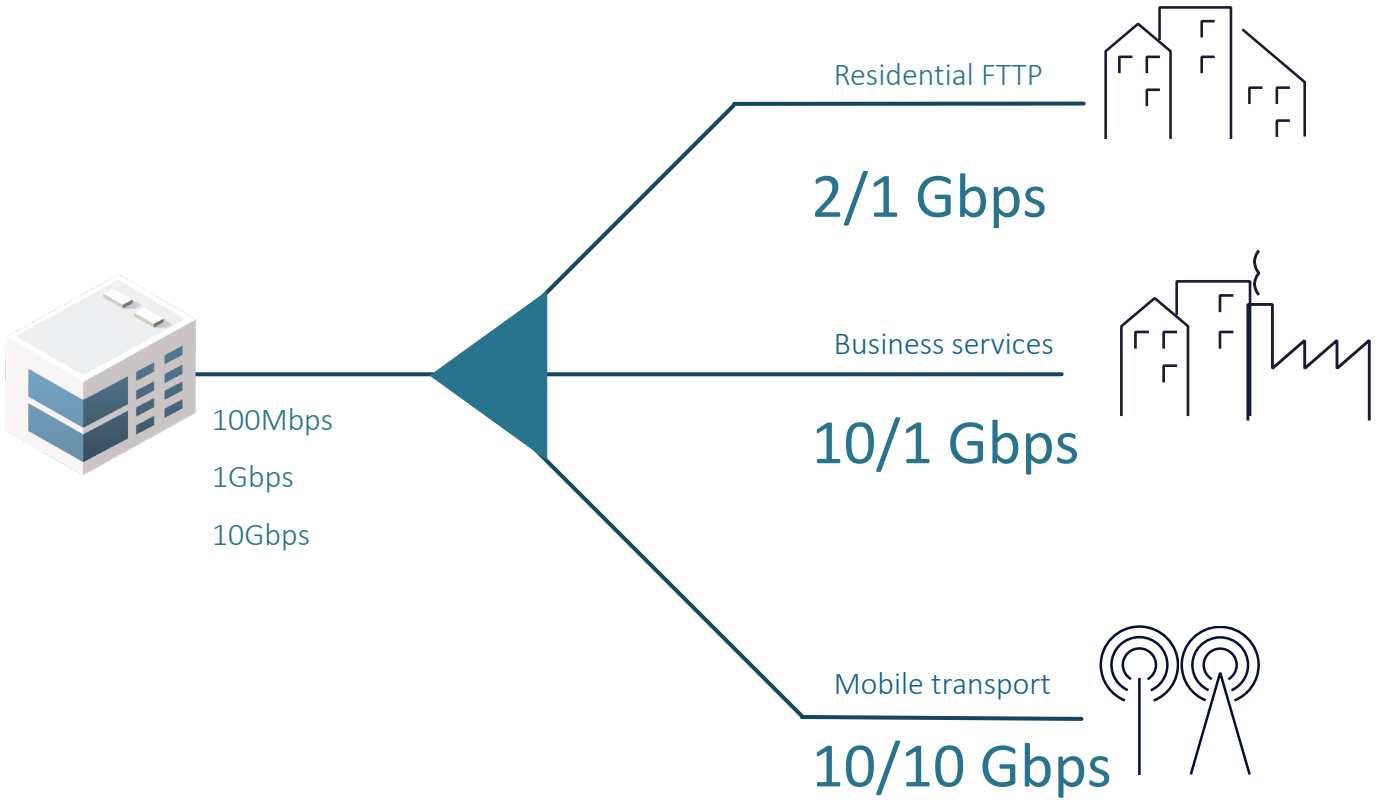
10G EPON Connect Everyone and Everything FASTER



Service Agility

EASY

Operational Simplicity

Savings

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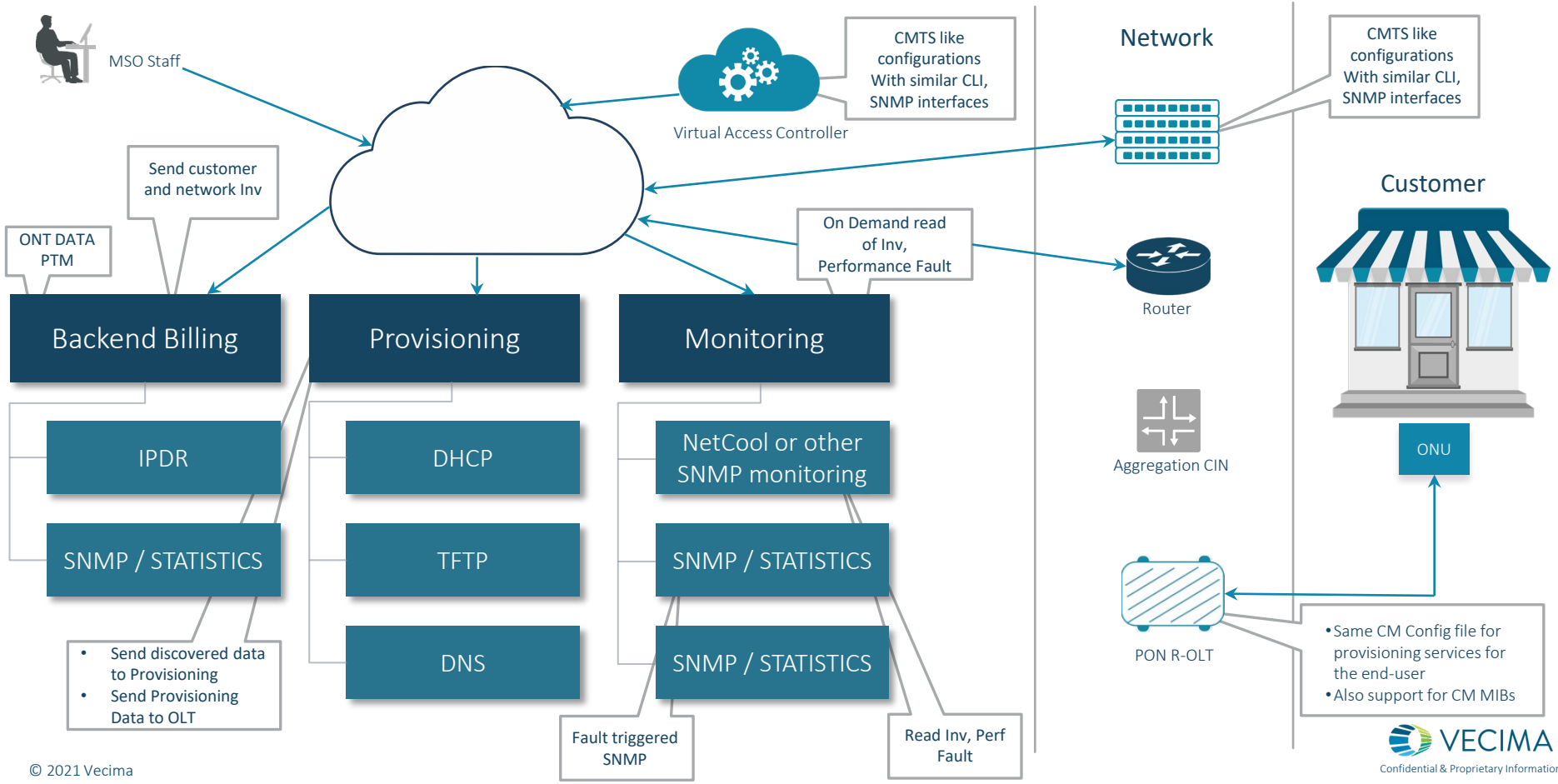
DPoE Management & Provisioning with Virtualization



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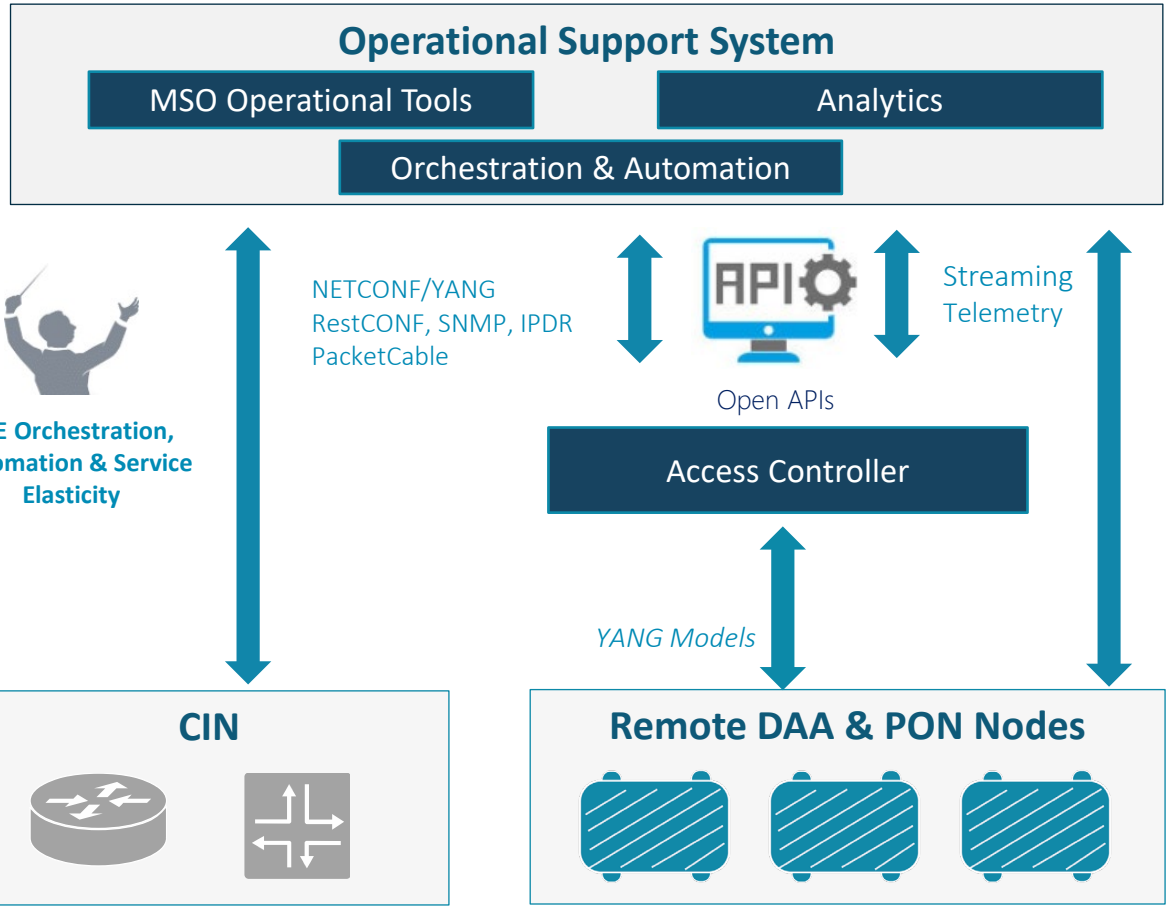
DAA + PON Management Plane Future Automation Options



Service Agility

Reduced OPEX

Optimized Resource Footprint

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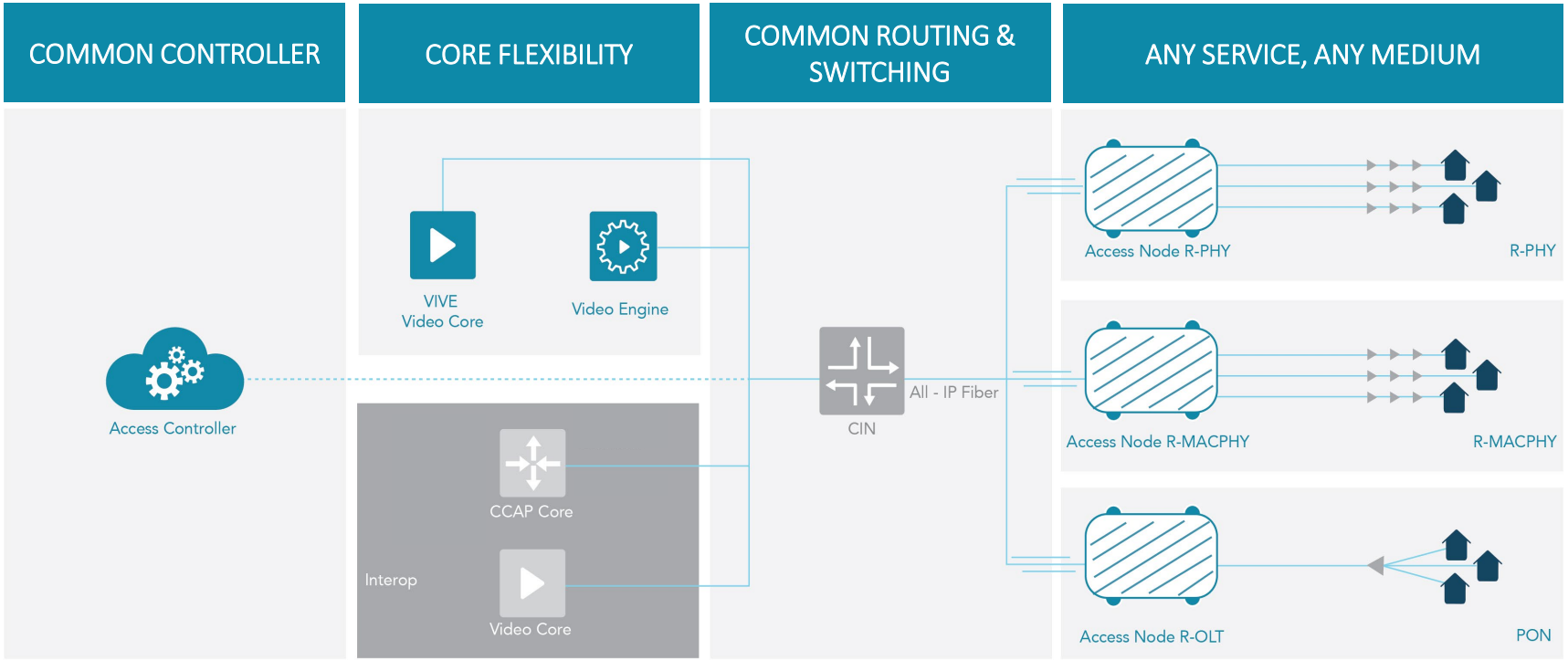
Unified Cable Access: R-PHY, R-MACPHY and PON together



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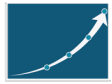
SUMMARY

Keys to Fighting & Winning with Fiber vs Fiber

- Introduce FTTP faster and easier with L2 PON solution leveraging CableLabs DPoE
- Migration to All IP Video Services
- Unified Access – DAA with Fiber Deep plus PON Solution for Competitive Advantage

Competitive Advantage



Faster time to revenue

Innovative, future-proof technology

Leadership with network coverage

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Jason Morris

Marketing Manager
Corning Optical Communication

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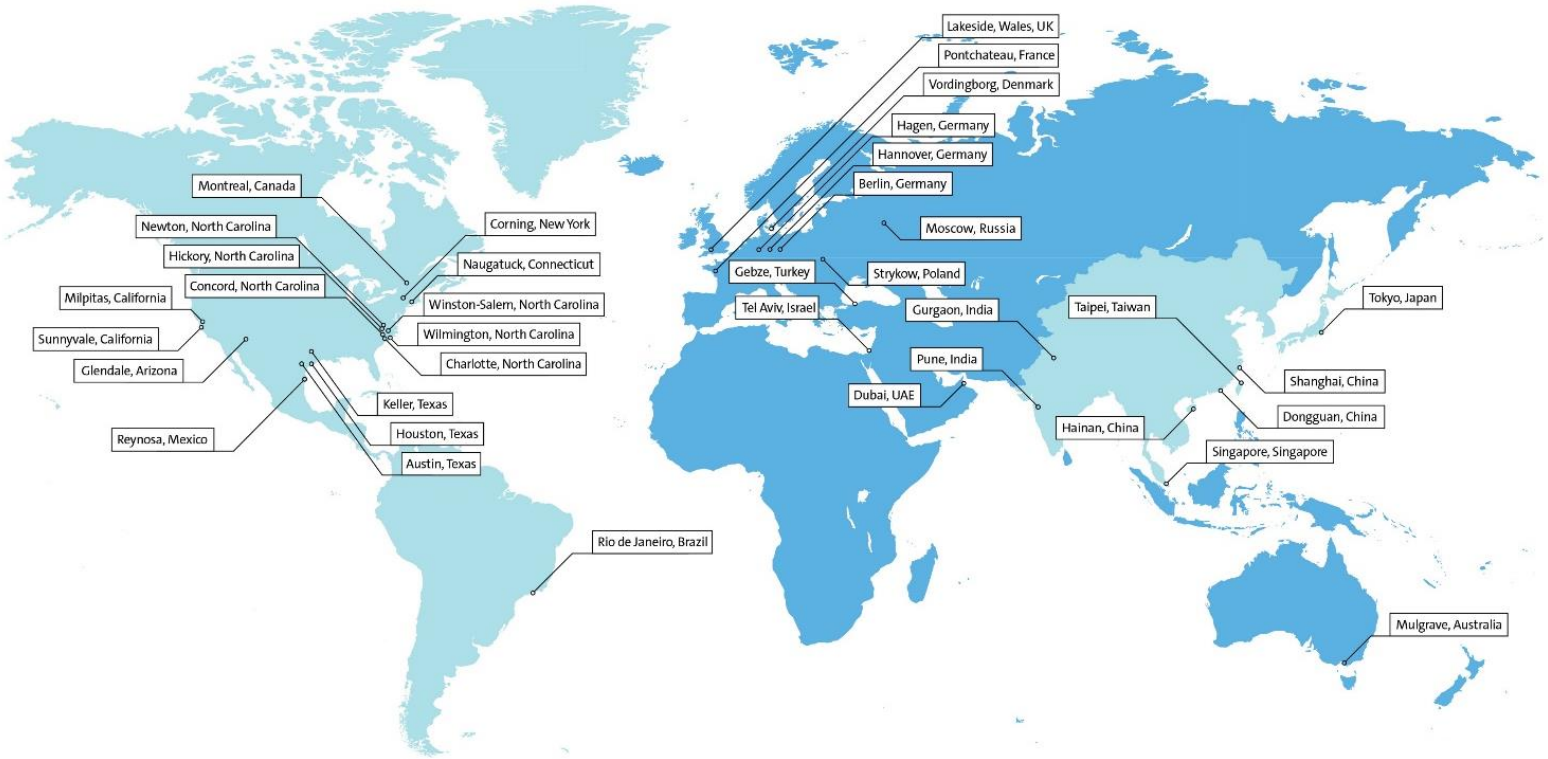
Fighting Fiber with More Fiber

Jason Morris

May 20, 2021

Productivity & Innovation

Fighting Fiber with More Fiber – Increased Productivity



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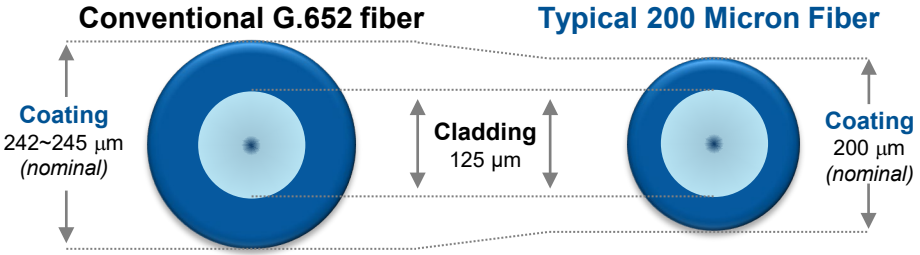
Fighting Fiber with More Fiber – Fiber Innovation

OPTICAL FIBER



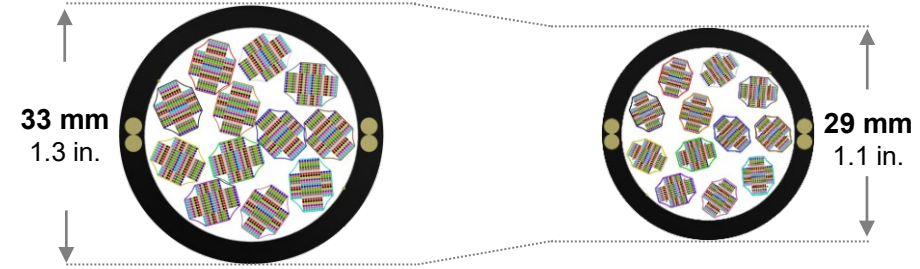
- 125 µm glass cladding diameter maintained for splicing purposes
- 200 µm coating diameter for further cable miniaturization
- 30% reduction in cross-sectional area

1,728 FIBERS

SMF-28 Ultra 200 fiber enables:

- 15% reduction in cable outer diameter
- 40% increase in fiber density

3,456 FIBERS



SMF-28 Ultra 200 fiber enables:

- 12% reduction in cable outer diameter
- 29% increase in fiber density

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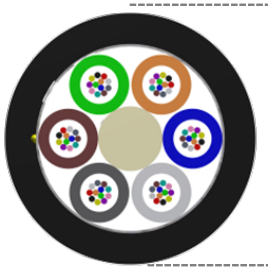
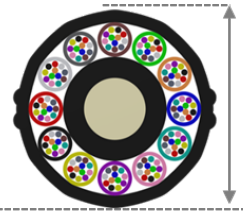
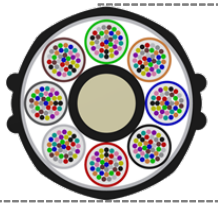
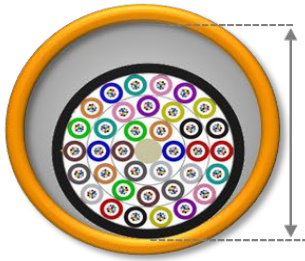
Fighting Fiber with More Fiber – Cable Innovation

Attribute	Loose Tube (LT) Cable 72F	MiniXtend® Cable 144F	MiniXtend® HD Cable 288F
Per-Cable Fiber Density	 10.3 mm 72 FIBRES	 8.1 mm 2x MORE FIBRES	 8.1 mm 4x MORE FIBRES
Per-Duct Fiber Density	 33 mm (ID) 432 FIBRES (maximum LT fibre count)	7 x 144 = 1,008 F ~40 mm 2.3x MORE FIBRES	7 x 288 = 2,016 F ~40 mm 4.6x MORE FIBRES

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Fighting Fiber with More Fiber – Smaller, Denser, Faster, Easier

Smaller

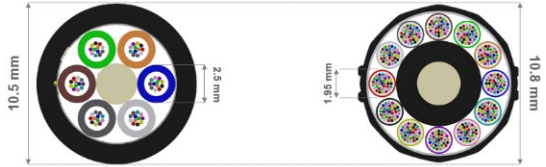
Lighter cables reduce load on poles

Up to 50% lower weight

Denser

Reduced OD enables more fiber per duct

2-4x density improvement



Faster

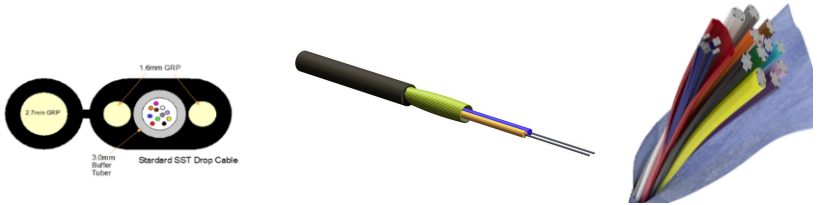
FastAccess Technology speeds up cable access

Up to 70% faster

Easier

Gel-Free, Routable, I/O Drop and Self-Support cables

Better handling and installation



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Wave Division Multiplexing

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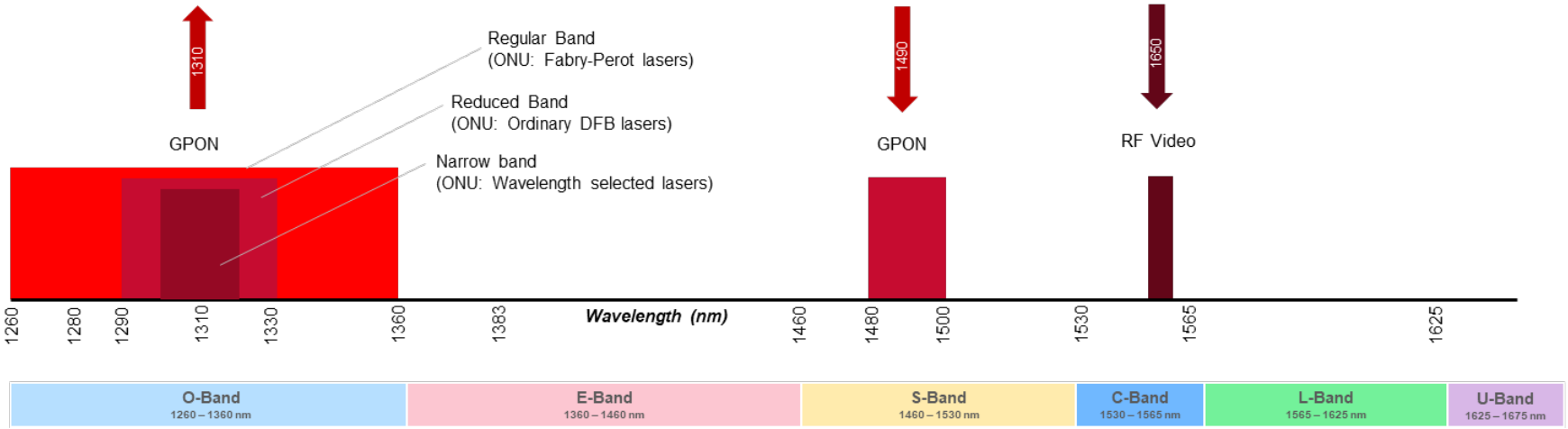
WDM – The Move to 10G and Beyond



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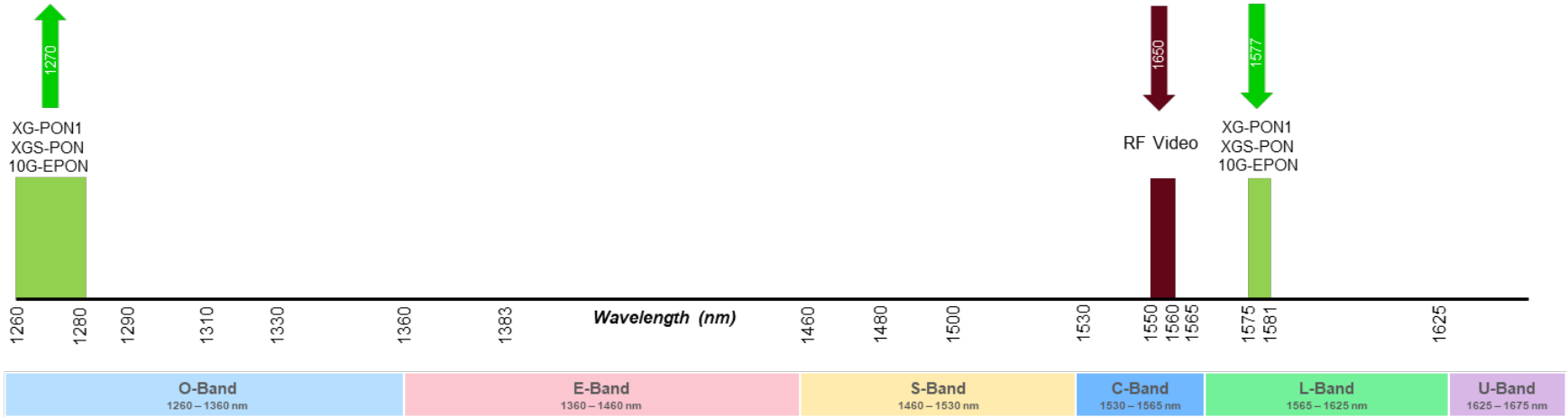

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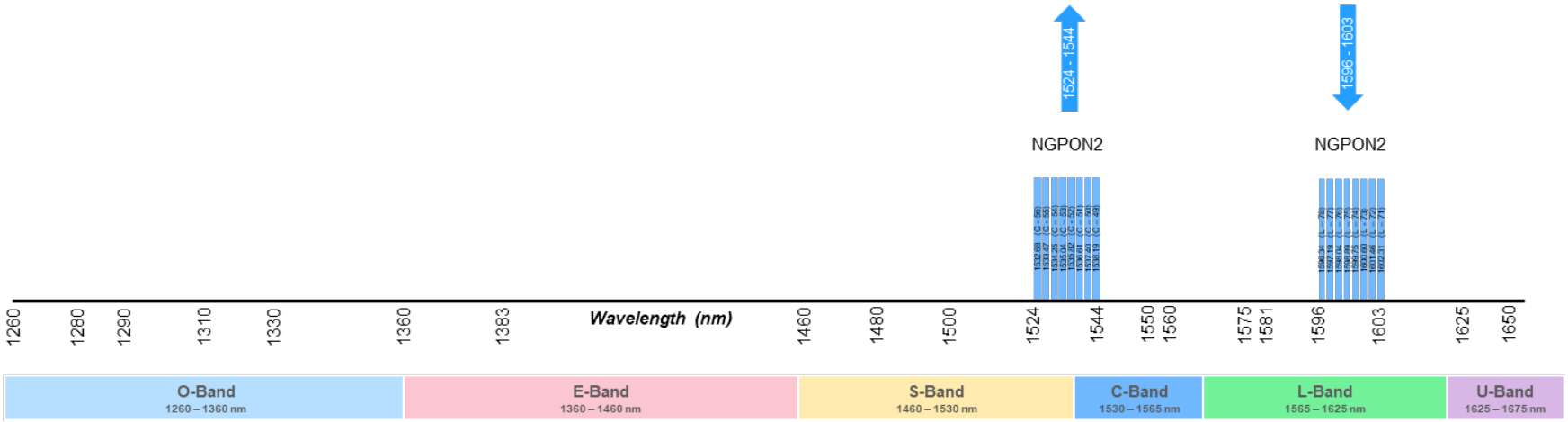
WDM – The Move to 10G and Beyond



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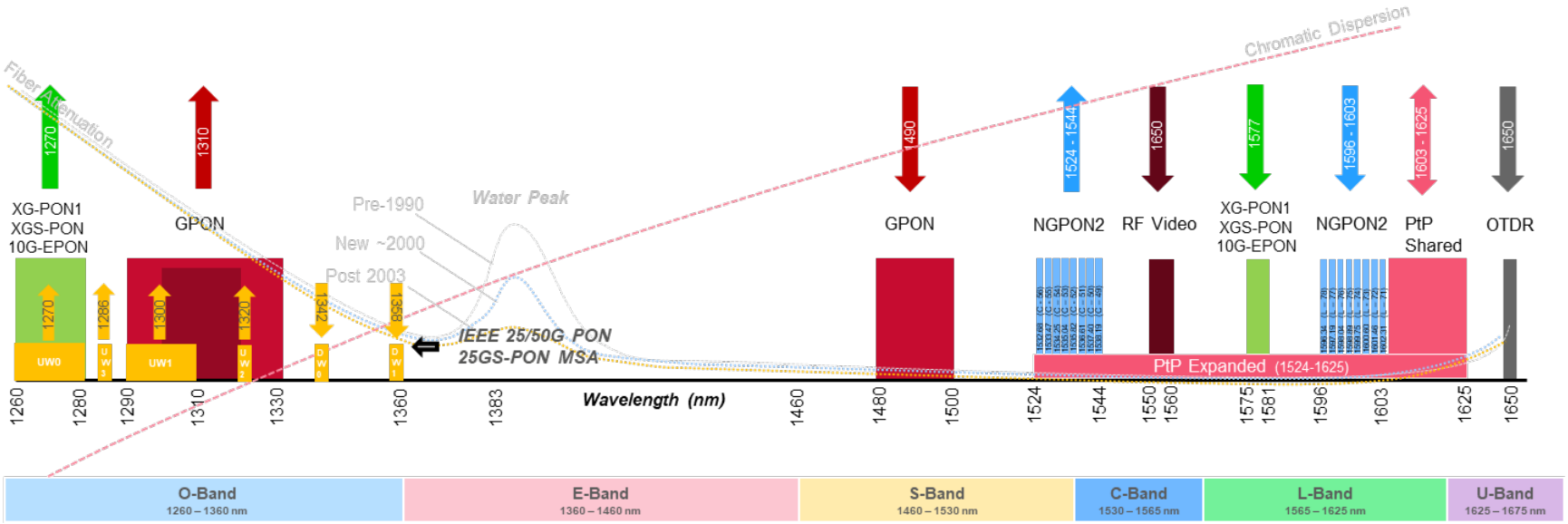
WDM – The Move to 10G and Beyond



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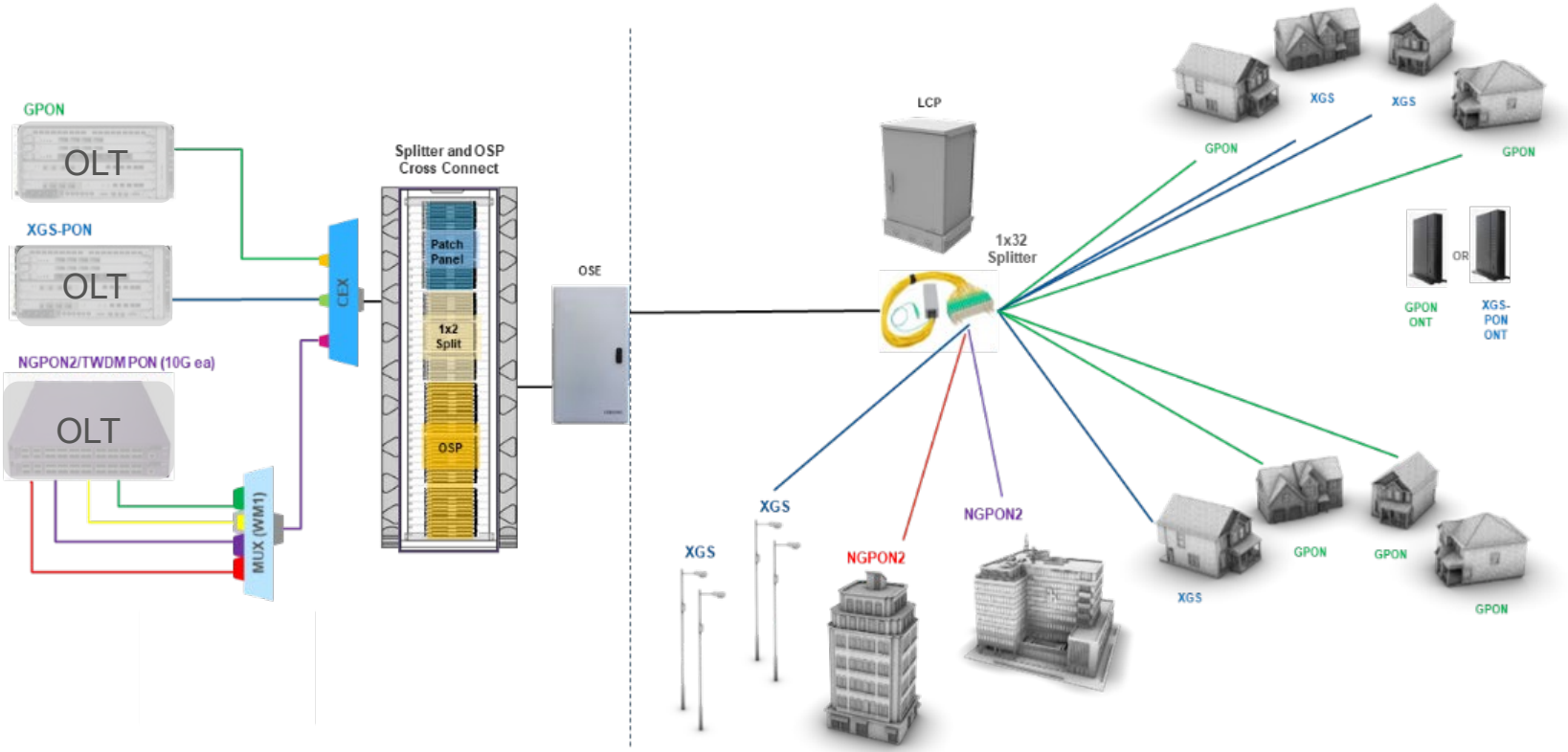
WDM – The Move to 10G and Beyond



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Fighting Fiber with Fiber

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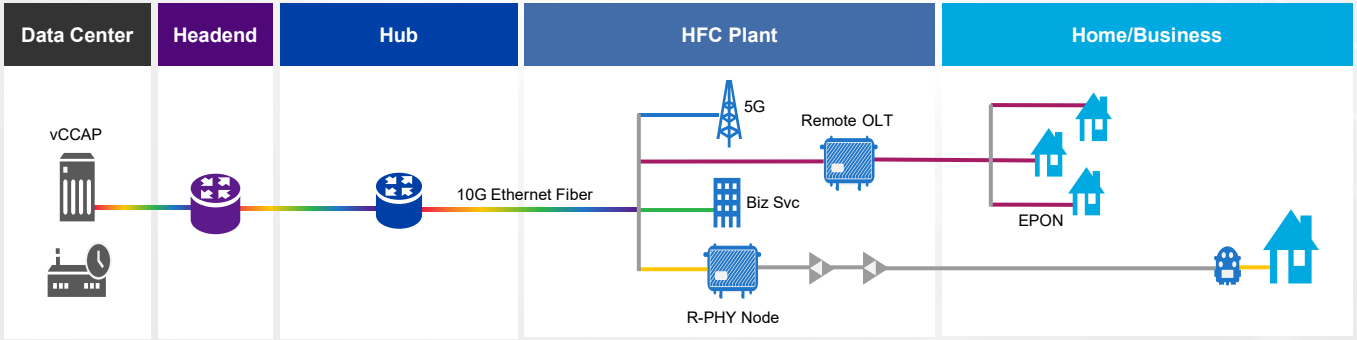
May 2021

Why Fiber/DWDM?

- More bandwidth needed per end user
- Fiber being deployed deeper to support this
- New technologies
  - Fiber Deep, Distributed Access Architectures (DAA)/RemotePHY and 5G Backhaul
- Use passive xWDM to increase capacity and reduce OPEX
- Adding more Is (virtual lanes) increases the capacity - **without laying more fiber!**
- Capacity can be further expanded by upgrading the components at each end
- Provides wavelength routing for **passive** distribution



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Key DWDM Challenges

MULTIPLE WAVELENGTHS
Multiple wavelengths in play

DIFFERENT TECHNOLOGIES
Different technologies in play (CWDM, DWDM, O-band/CORWave, etc.)

HIGH SPEED TRANSPORT
High speed transport (10-100G+)

SYSTEM IS LIVE
Entire system is live once first wavelength/customer is turned up

CLOSE CHANNEL SPACING
Extremely close channel spacing in DWDM

SPECIFIC COMPONENTS
Wavelength specific components in system (mux/demux, add/drop)

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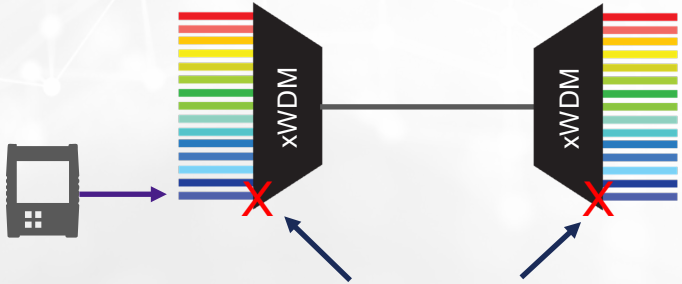
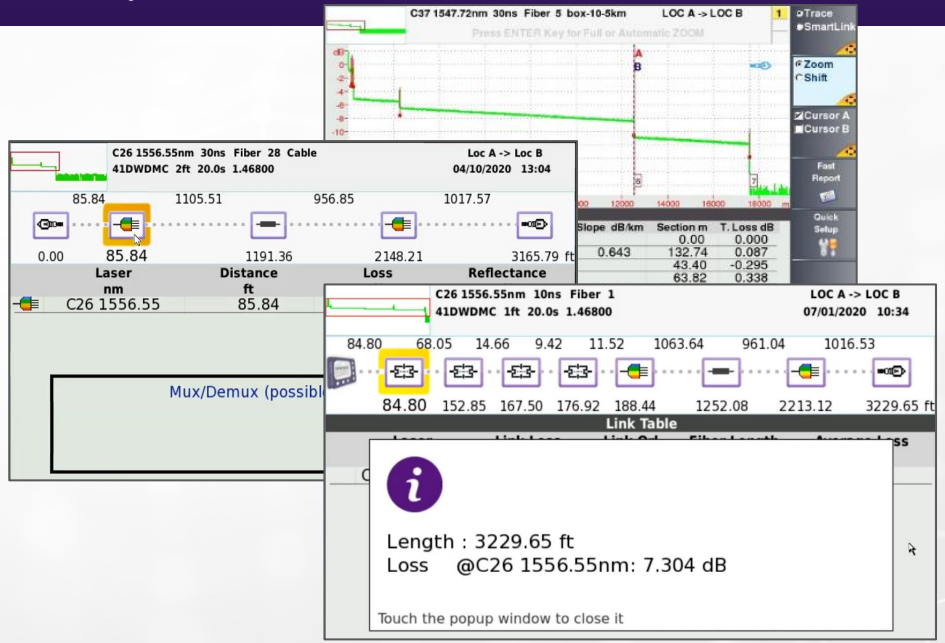
How to Test? Wavelength Routing and Continuity

- WDM Mux and Demux are wavelength specific components
- Requires specific wavelength OTDR in order to pass





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Specific Issues: DWDM Port Not Passing Light

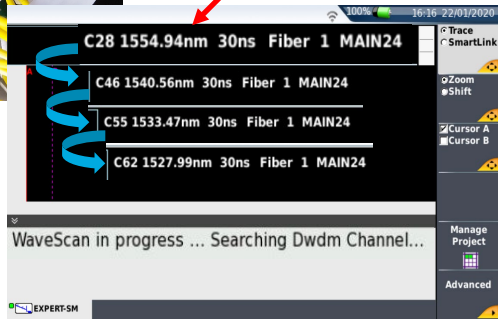
PROBLEM

DWDM port not passing expected wavelength of light
→ bad mux, crossed fibers, mislabeled port, no channel ID on port,…?

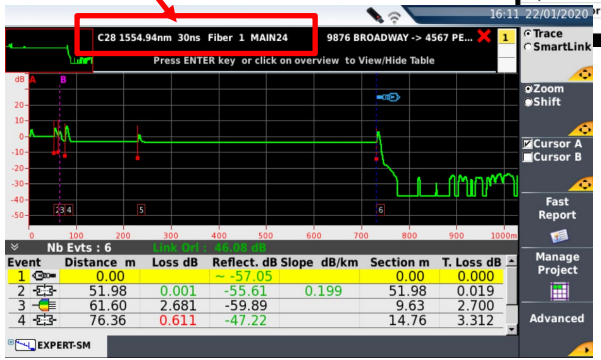
TEST

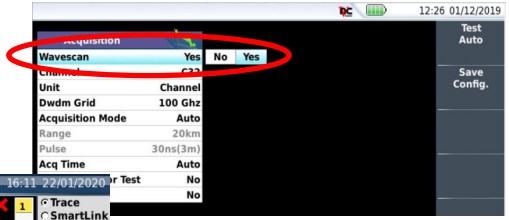
Used DWDM OTDR including Wavescan
→ OTDR tunable laser scans through all channels in under 10 seconds to identify channel(s) that passes through that WDM port

Automatically scans through all channels in <10 seconds



DWDM channel identified and OTDR test results shown in Trace or SLM views





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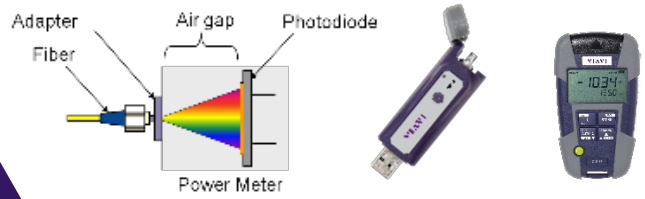
How to Test?

Selecting the Right Power Meter

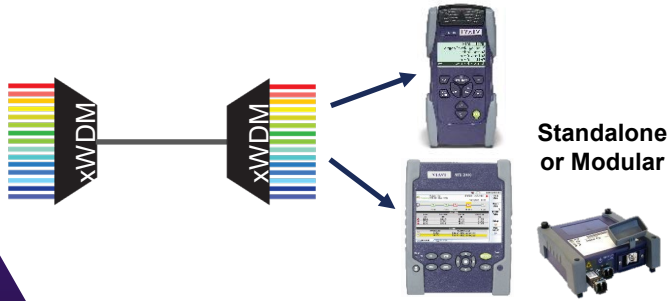
BROADBAND POWER METER

- Measures average peak power of **ALL** wavelengths present
- Will only provide accurate power measurement if only **one** wavelength is present
- *Does* **NOT** *confirm which wavelength/ channel is present or being measured!*



WDM POWER METER (AKA "CHANNEL CHECKER")

- Has ability to isolate and measure each individual wavelength
- Verifies power level and channel presence
- Verify mux/demux operation
- Verify correct channel and power reaching destination



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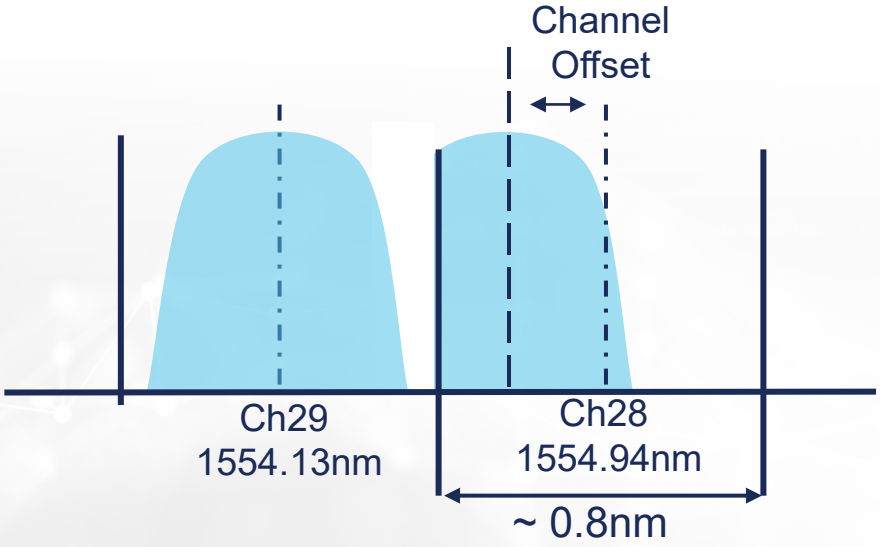
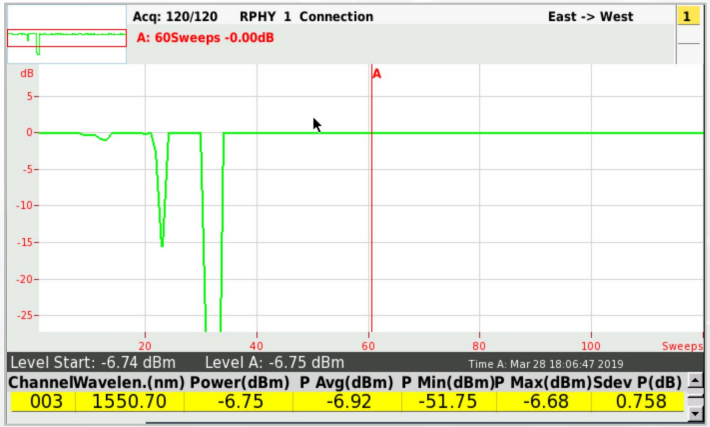
Channel Verification vs Channel Checking



How well is the wavelength centred with the channel?

Is the power level stable?



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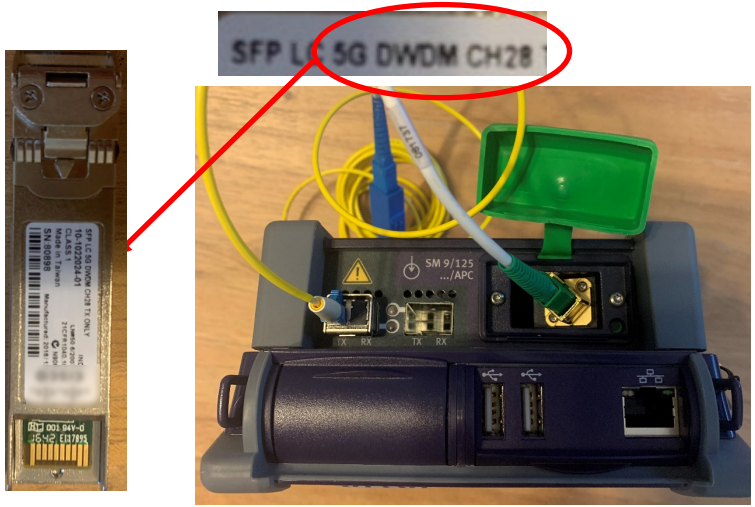
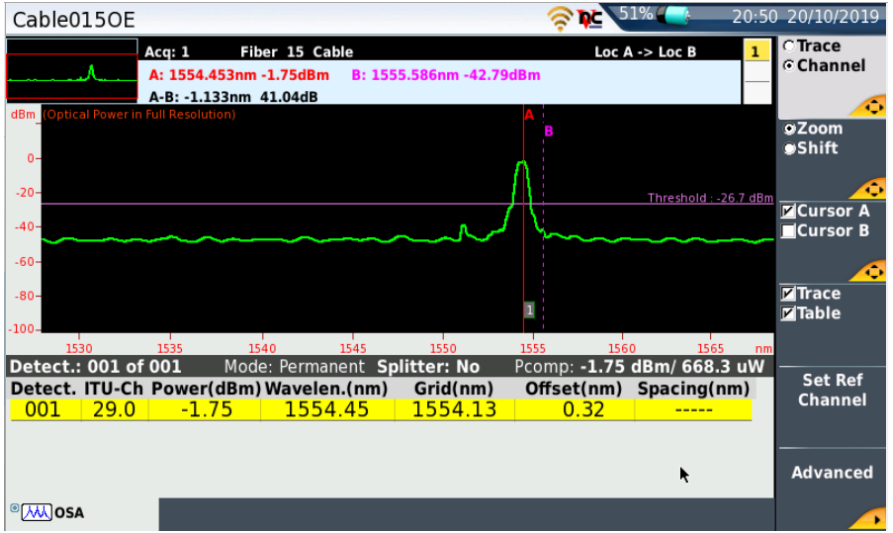
Specific Issues: Bad / Mislabeled SFP+

PROBLEM Unable to Rx **CH 28** - what's the problem (bad mux, bad fiber, bad SFP+,…) ?

TEST Used Optical Channel Checker/Verifier (OCV) to test SFP+
→ OCV detects **CH 29** w/ 0.32nm offset! (replace SFP+)





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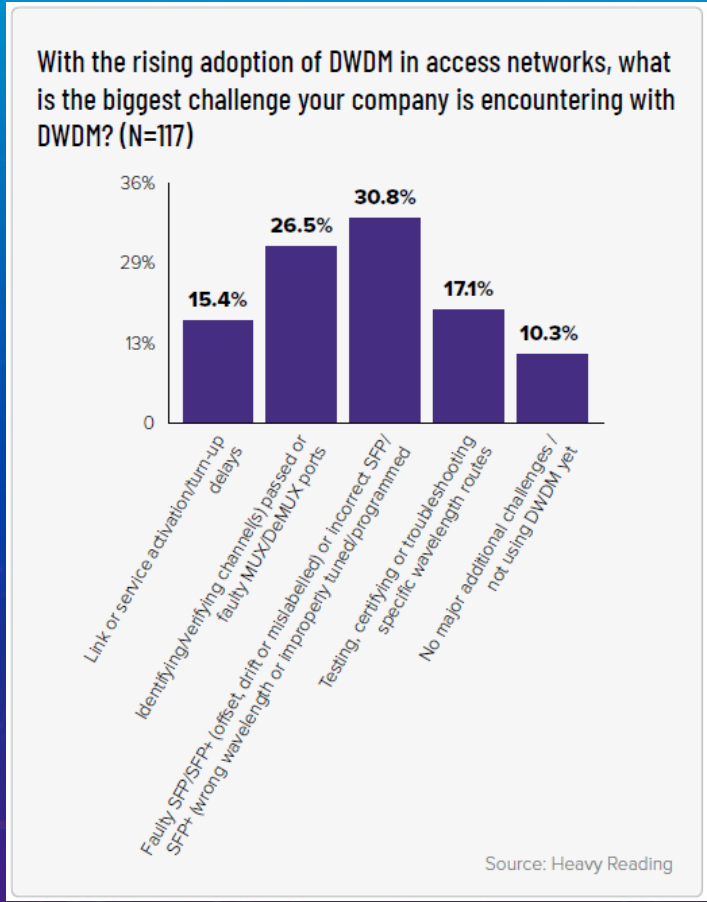
The Industry View



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Audience Poll I

Which network upgrade options is your company considering? (Feel free to select more than 1 choice).

- Going Fiber Deep
- Deploying FTTP
- Implementing DAA
- Deploying DOCSIS 4.0
- Implementing network virtualization
- Other

Steve Harris

Executive Director

Technical Sales, Learning & Development

SCTE

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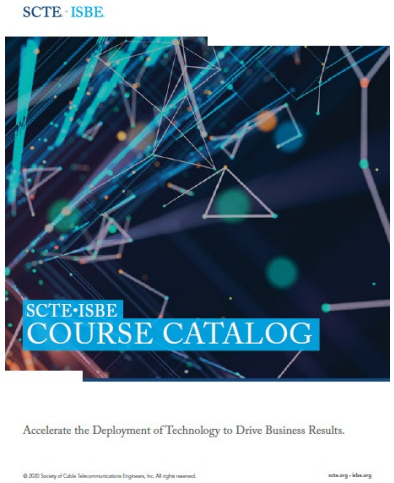

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Member ***SCTE MicroLessons*** *on Fiber Cleaning & Fiber Deep too!*

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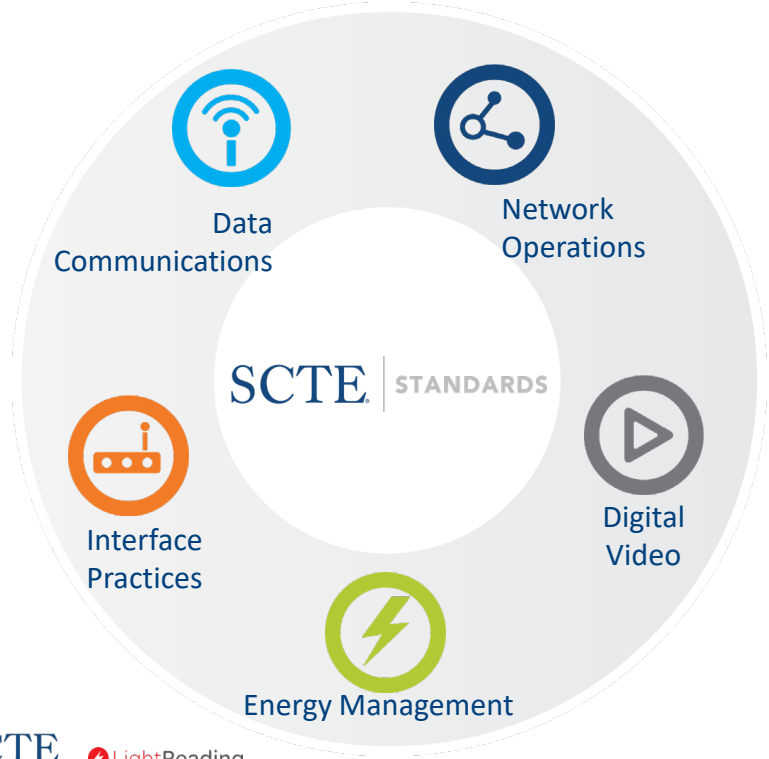

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Audience Poll II

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- Yes
- No
- My company is already a member but I would like to join a committee

Audience Q & A

Alan Breznick
Cable/Video Practice Leader
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Steve Harris
Executive Director
Technical Sales, Learning & Development
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Vijay Raman
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