Webinar: New Data Center Test Requirements

Thank you for joining us. We will begin shortly

NOTE: This presentation includes Q&A. We will be taking questions during the presentation with answers at the end using the questions section of your control panel.

VIAVI Solutions

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Agenda

- Welcome and Introductions
  - Lindsay Welch, TRS-RenTelco Marketing Manger
- TRS-RenTelco: Test & Measurement Solutions
  - Micah Hurd, Product Manager
- VIAVI: New Data Center Test Requirements
  - Neven Jambresic, Regional PLM - Fiber Optic Test
- Q&A – Joint TRS and VIAVI

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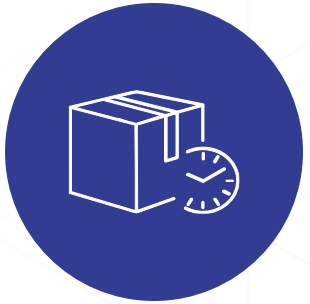

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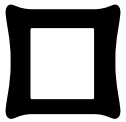
Agenda

New Architecture, Network Segments, New Connectivity

Inspection and Cleaning

Tier 1 Fiber Certification



Tier 2 Fiber Certification and OTDR

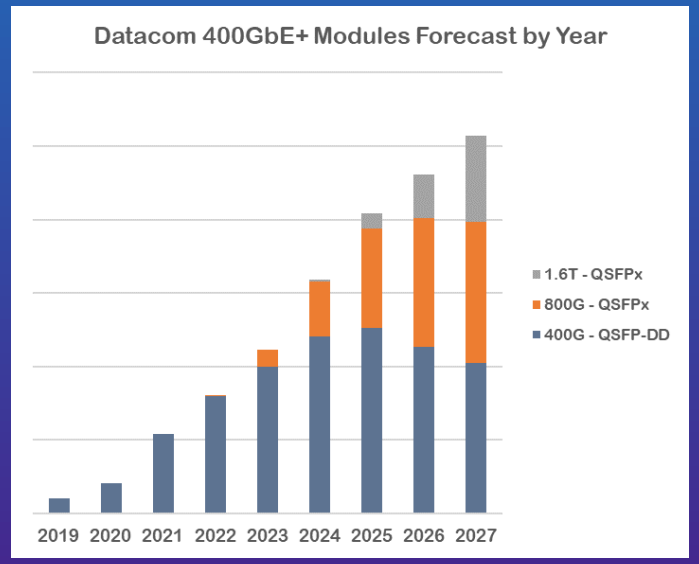
Test Automation

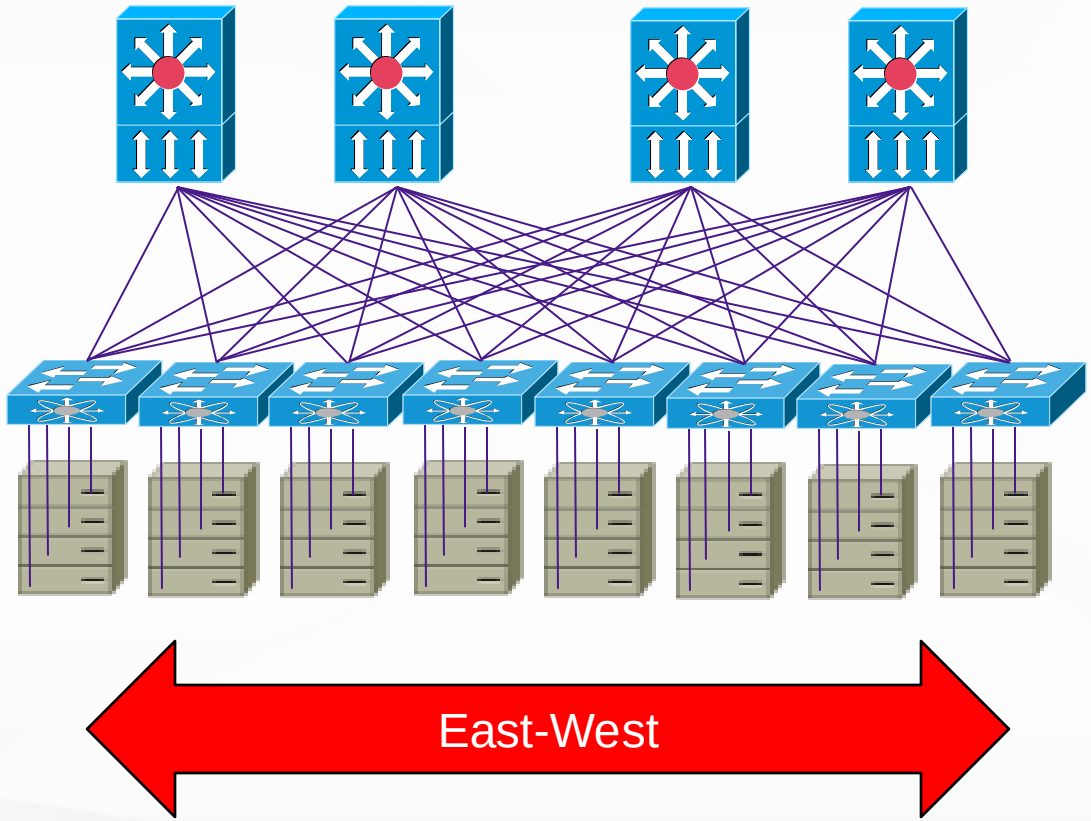
Summary

Supercomputer Architecture and Connectivity

Driven by AI / ML Requirements

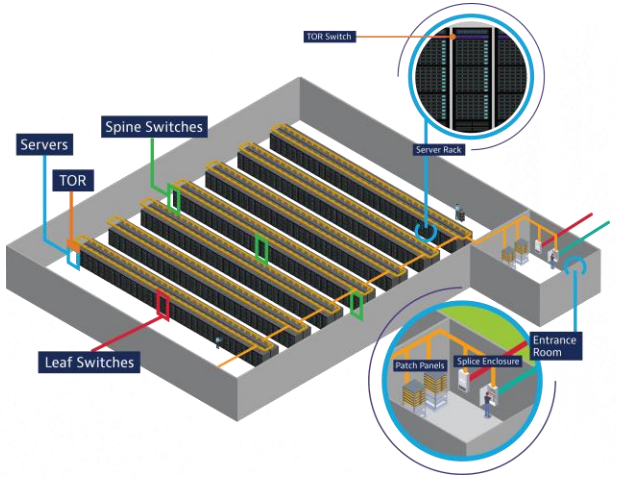
- Leaf / Spine Fabrics
- East-West Traffic
- Shuffle Architecture
- Multi-Fiber Connectivity
- New Connector Types
- High Density Panels
- Hybrid Links



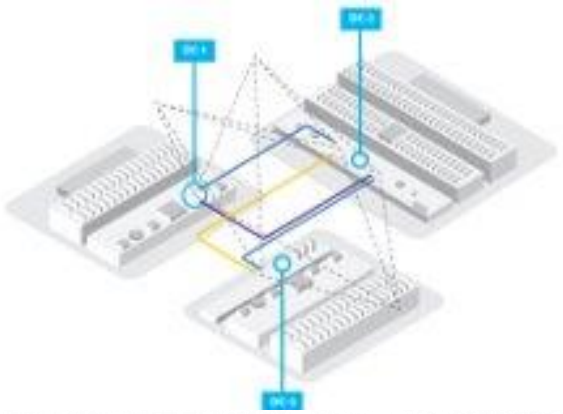


Network Segments

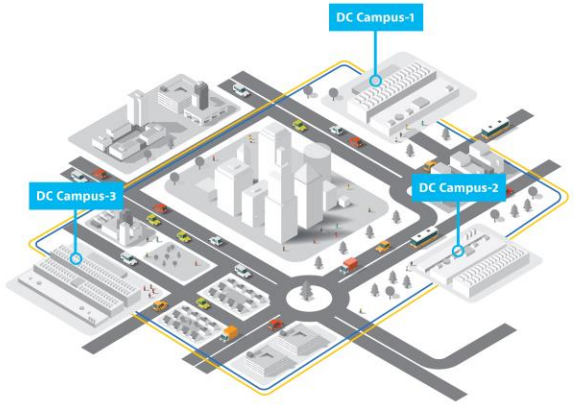
Data Center Fiber Network Segments



Inside Plant
Inside Data Centre



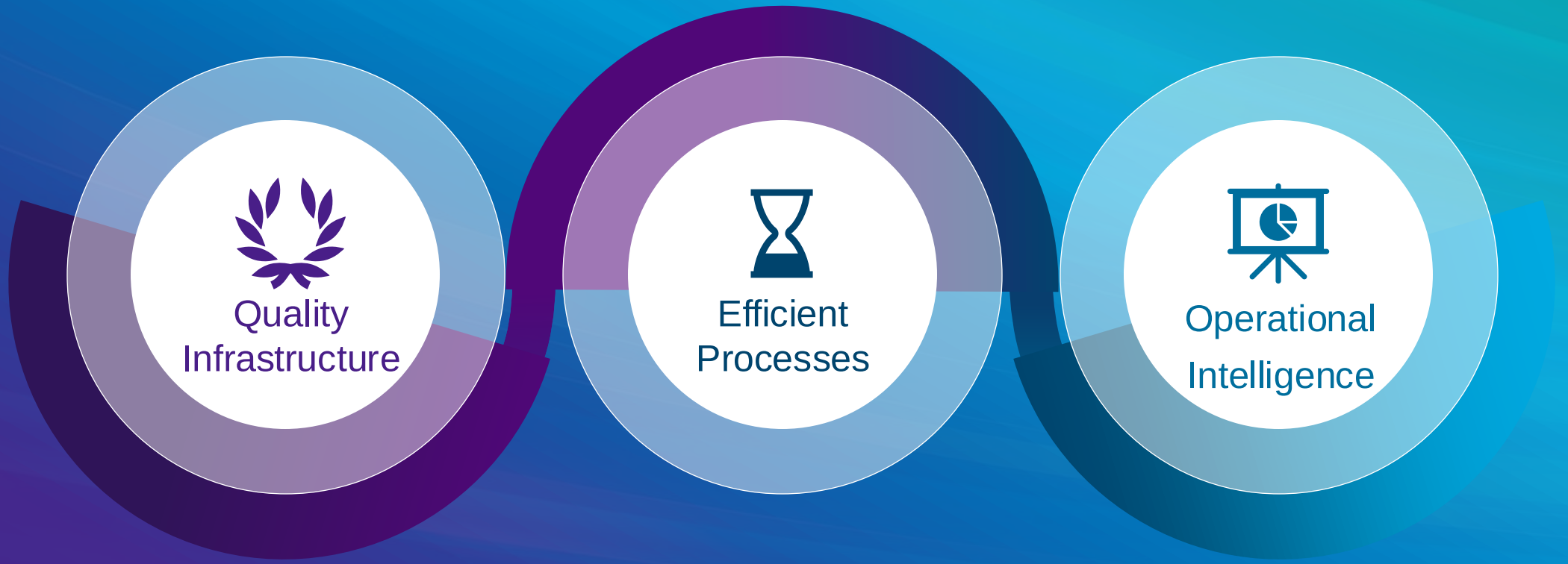
Outside Plant Campus
Data Center Interconnect



Outside Plant Metro/Long-Haul
Data Center Interconnect

Tier 1 (Loss, length, polarity)	☑	☑	
ORL (Bi-Directional)		☑	☑
Tier 2 OTDR (Bi-Directional)		☑	☑
Dispersion Testing (CD/PMD)			☑
Connector End Face Inspection	☑	☑	☑

Challenges
Build Faster and More



- No compromise of quality over deployment speed
- Guarantee it is built per the specs
- Limit « human factors »

- Continously optimize workflow and streamline processes
- Develop best practices
- Guarantee the MOP and specs are consistently followed

- Control jobs status from start to completion
- Project administration (costs, assets, teams, vendors…)
- Gather, analyse and validate high volume of data

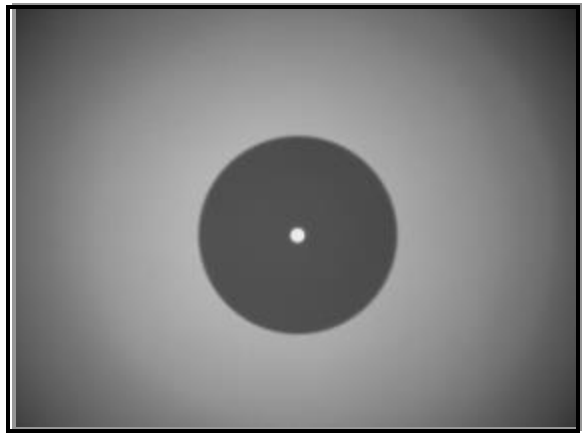
Inspection & Cleaning

Single Fiber vs. Multi-Fiber Connectors

SINGLE FIBER CONNECTORS

Simplex

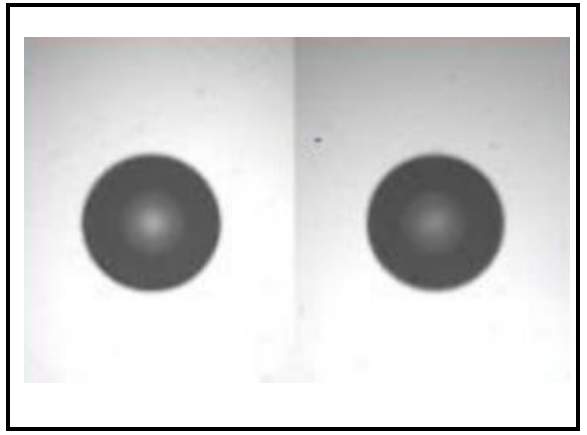
LC UPC



- Common types: LC and SC

Duplex

Duplex LC, SN and MDC PC

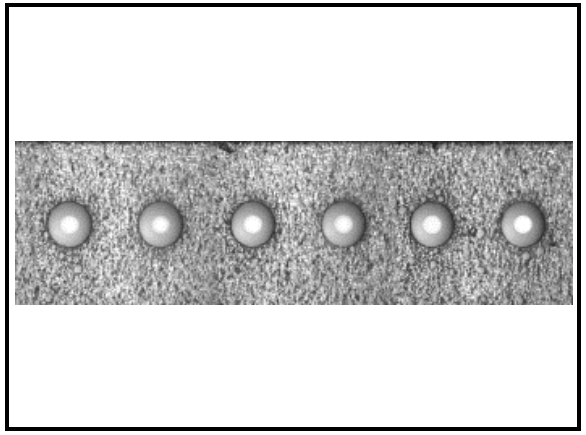


- Common types: Duplex LC, SN and MDC
- Trending: Very Small Form Factor (VSFF) connectors – SN and MDC

- ▶ White ceramic ferrule
- ▶ One fiber per connector

MULTI-FIBER CONNECTORS

Multi-Terminus (MT/TMT) Ferrule



- Common types include MPO, MTP®, and MMC/SN-MT

- ▶ Polymer ferrule
- ▶ Multiple fibers in linear array

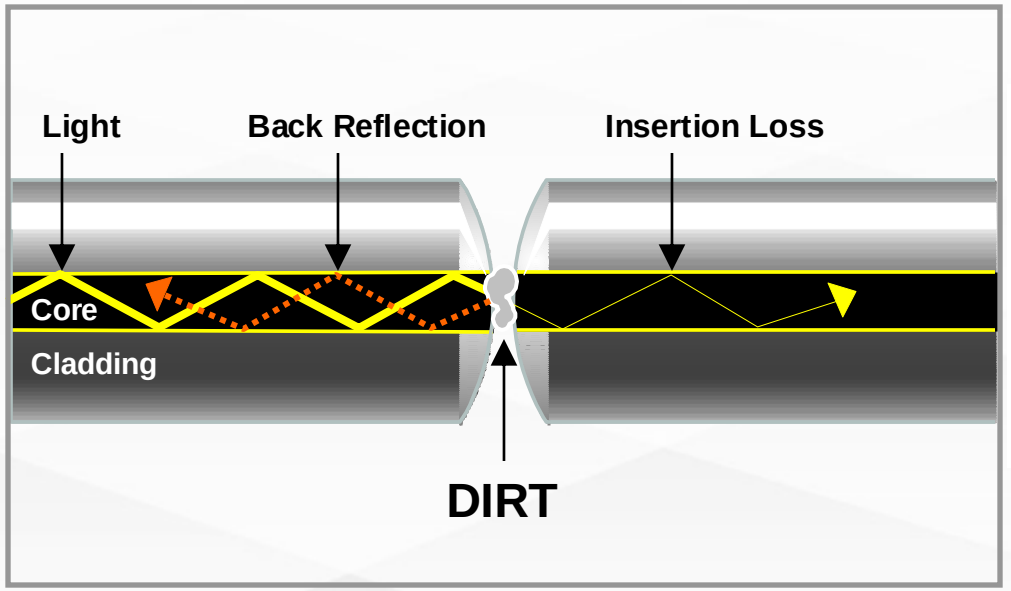
What Makes a BAD Fiber Connection?

Today's connector design and production techniques have eliminated most of the challenges to achieving **Core Alignment** and **Physical Contact.**

REMAINING CHALLENGE

MAINTAINING A **PRISTINE END-FACE**

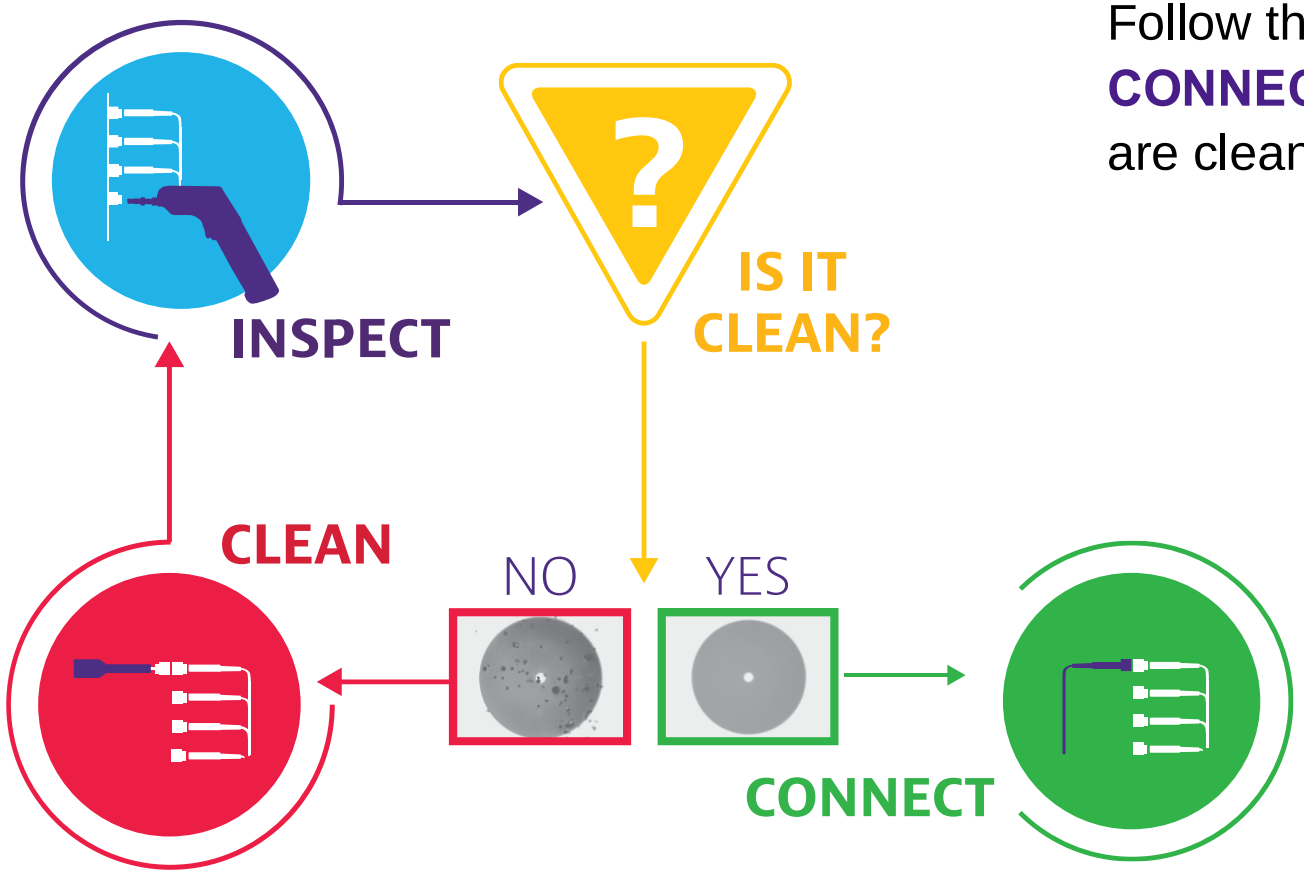
As a result, **CONTAMINATION is the #1 source of troubleshooting in optical networks.**



A single particle mated into the core of a fiber can cause significant **back reflection**, **insertion loss** and even **equipment damage.**

Inspect *Before* You Connect℠

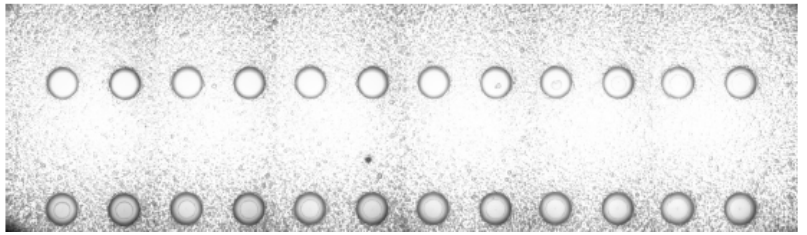
Extremely Important!



Follow this simple **"INSPECT *BEFORE* YOU CONNECT"** process to ensure fiber end faces are clean prior to mating connectors

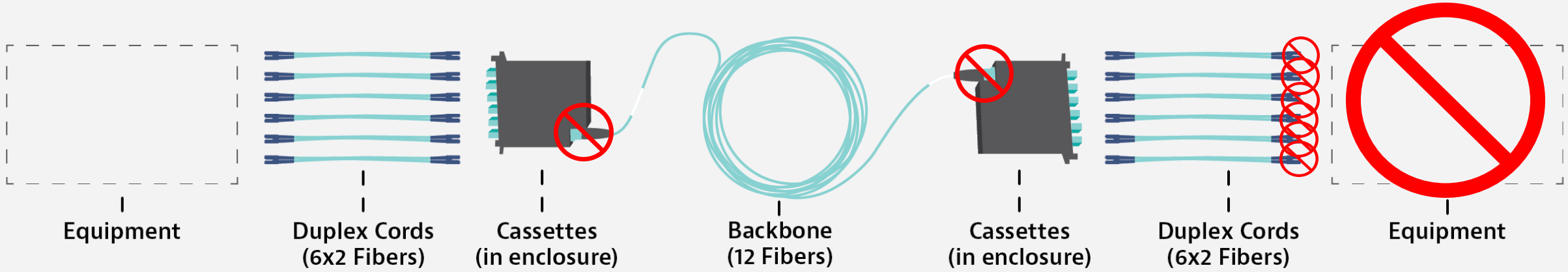
Test Info			
Fiber Type	Ribbon		FAIL ⊗
Profile Name	Ribbon, SM APC (IEC-61300-3-35 Ed. 2.0)		
Connector Type	MPO 12x2		
Optical Setting	FCPT-MMCA-C		
Analysis Profile Criteria			
Find scratches	True		
Cladding Diameter (µm)	125	Core Diameter (µm)	9
Zone	**Defects**		**Scratches**
Zone A (0 - 25)	Fail if more than 0 defects		Fail if more than 4 scratches Fail if any width is more than 3 µm
Zone B (25 - 115)	Fail if any diameter is more than 5 µm Fail if more than 5 defects Exclude if diameter is less than 2µm		

1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	X	X	X	X	X
13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
X	X	X	X	X	X	X	X	X	X	X	X



The Exponential Impact of Contamination (Data Centers)

If **CONTAMINATION** is present on a multifiber connector, the impact can be exponential and much more problematic.



Inspect Both Connectors in Pair

Inspecting BOTH sides of the connection is the **ONLY WAY** to ensure that it will be free of contamination and defects

Patch Cord (“Male”) Inspection

Bulkhead / Port (“Female”) Inspection

- Patch cords are easy to access, and view compared to the fiber inside the bulkhead (which is frequently overlooked)
- The bulkhead side may only be half of the connection, but it is far more likely to be dirty and problematic

Cleaning Best Practices

- Many tools exist to clean fiber
- Many companies have their own “best practices”
- Dry clean first. If that does not clean, then try wet cleaning
- **Always finish with dry cleaning**






Tier 1 or « Basic » Fiber Certification

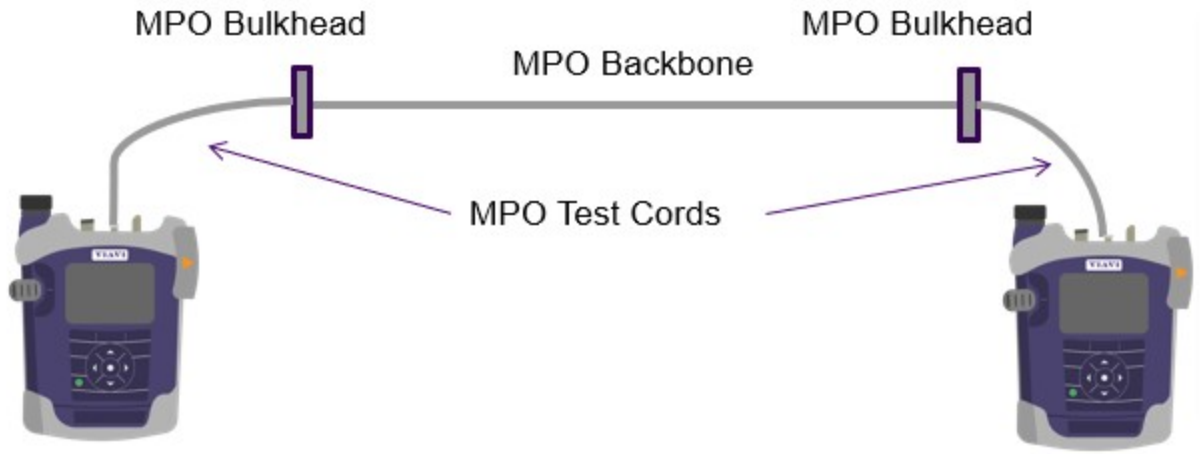
What is Tier 1 Testing

- Testing installed optical fiber cabling for attenuation with an Optical Loss Test Set (OLTS) > insertion loss
- Verify cable length, polarity and continuity
- Tier-2 or « Advanced » testing include Tier 1 tests plus the addition of the characterization by an Optical Time Domain Reflectometer (OTDR): uniformity of cable attenuation, splices and connector insertion loss, connector reflectance

Optical Loss Measurement

As light traverses a fiber, it decreases in power level. The decrease in power level, also called optical loss, is expressed in Decibels (dB).

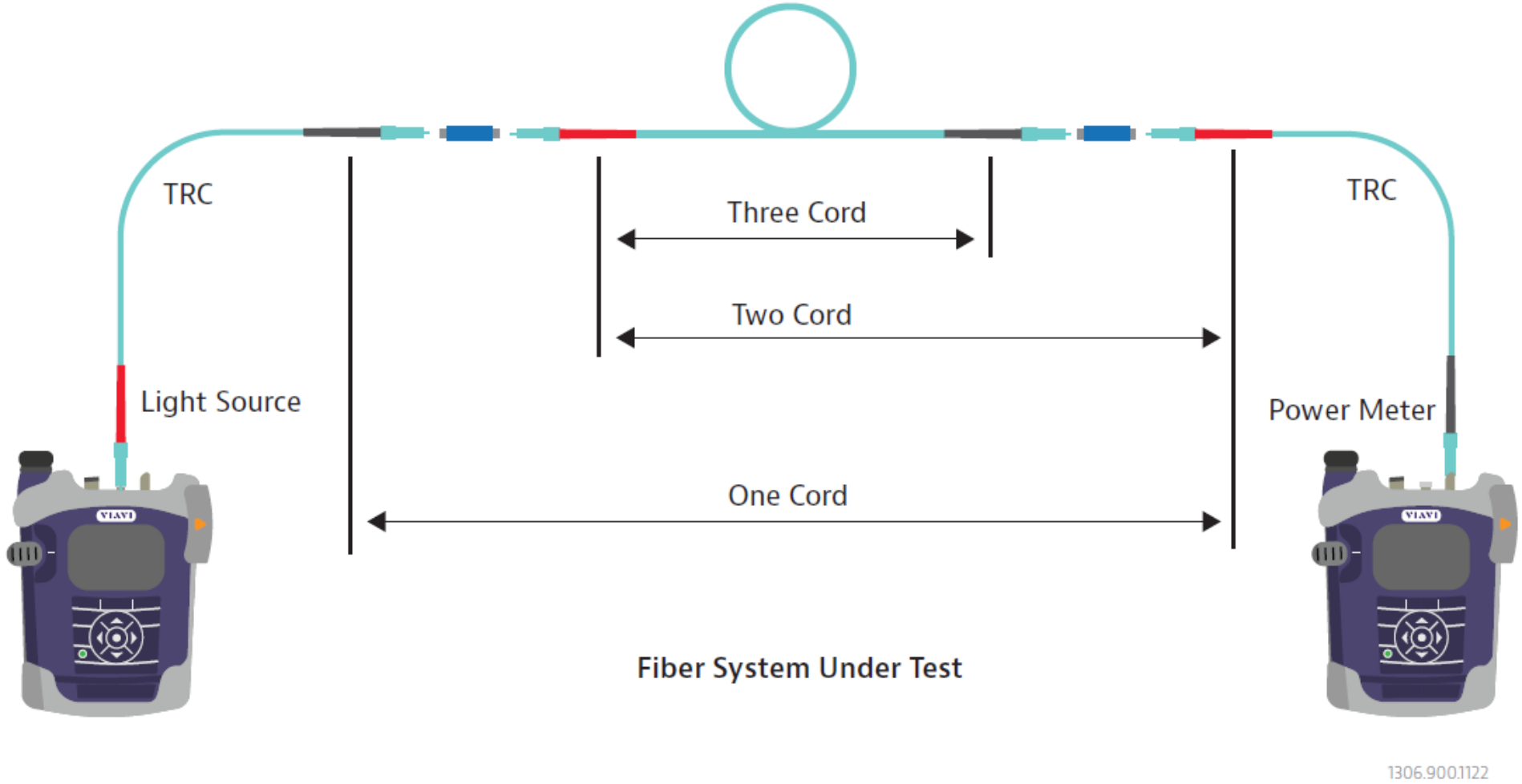
The most accurate way for fiber testers to measure the overall optical loss in a fiber is to inject a known level of light in one end and measure the level of light at the other end, using an optical loss test set (OLTS). The difference between source and receive power levels is the loss. Since the optical light source and power meter are connected to opposite ends of the link, access to both ends of the fiber is required for this method



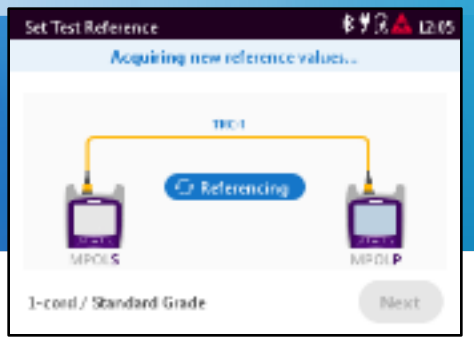
Reference Methods

Ensuring we measure what we need to

See special cases > adapter cord method

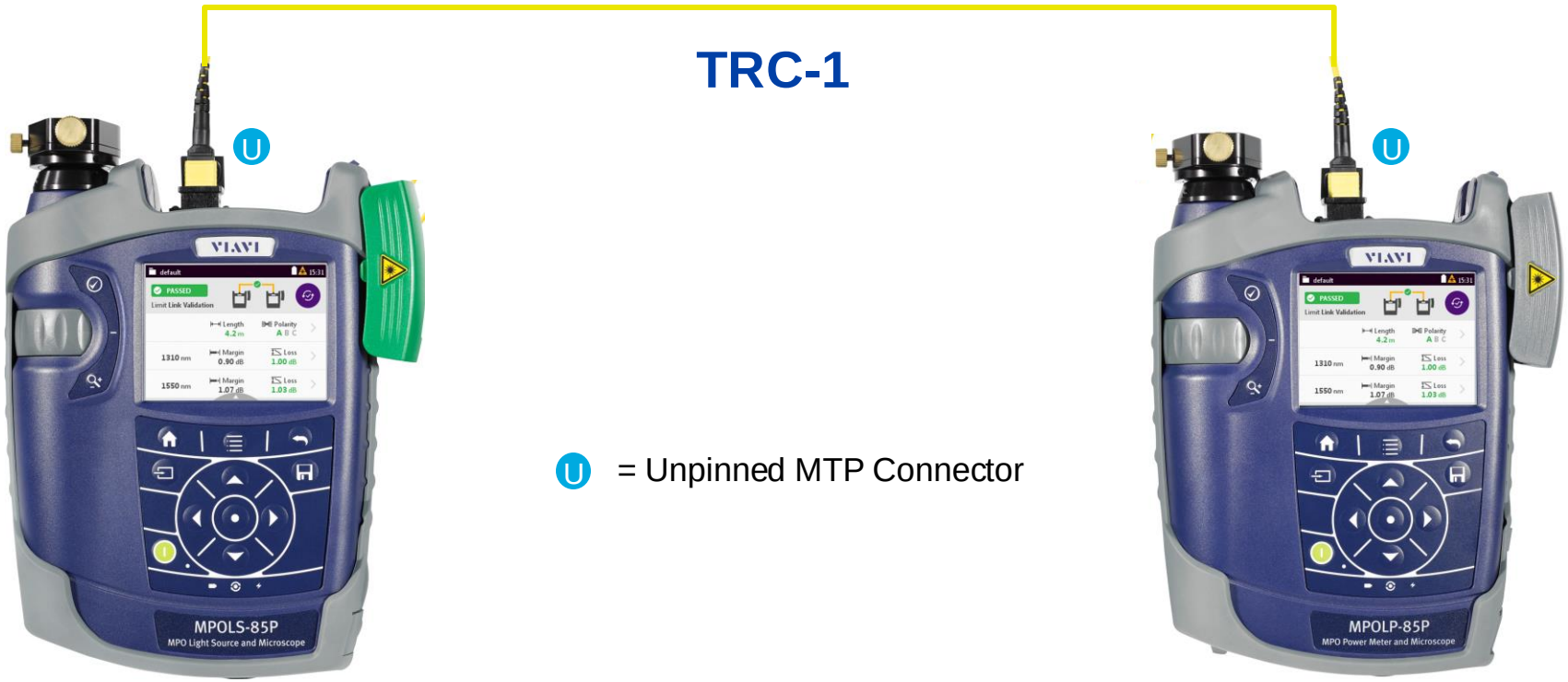


1-Cord Reference (Reference Test Method)



IMPORTANT: *Inspect and, if necessary, clean all TRCs*

Connect the MPOLP to the MPOLS using an UNPINNED-to-UNPINNED MTP Pro connectorized test reference cord (TRC-1) as shown below



MPOLS Source

MPOLP Meter

You are now ready to begin testing!

Connect to fiber to be tested

TRC-1

TRC-2

P = Pinned MTP connector

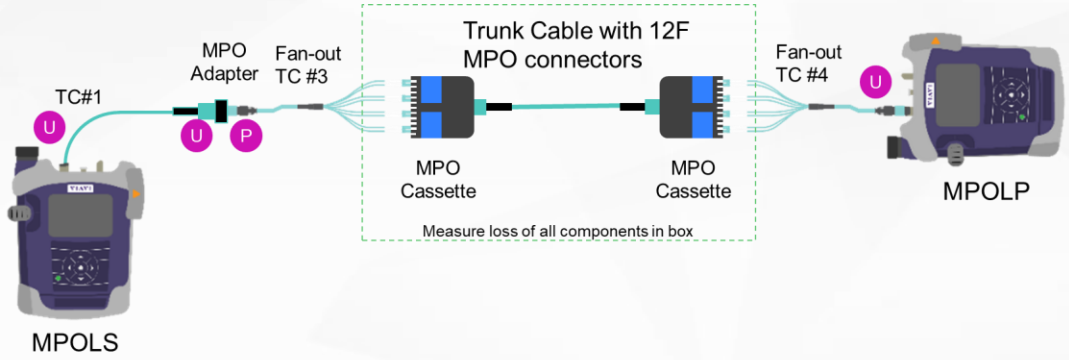
U = Unpinned MTP connector

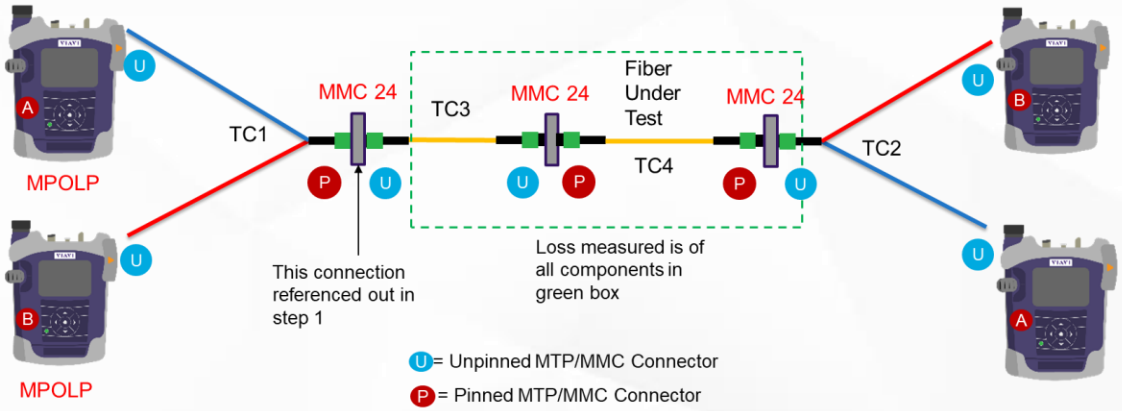
Special Cases
Adapter-Cord Method

1. Different connectors at either end
   - e.g. LC to SC

2. Connectors that don't match receive port of tester
   - e.g. new very small form factor (VSFF) connectivity with different fiber count

3. MPO
   - Pinned vs. un-pinned > use of gender neutral cords or adapter cords





Tier 2 Fiber Testing & Advanced OTDR

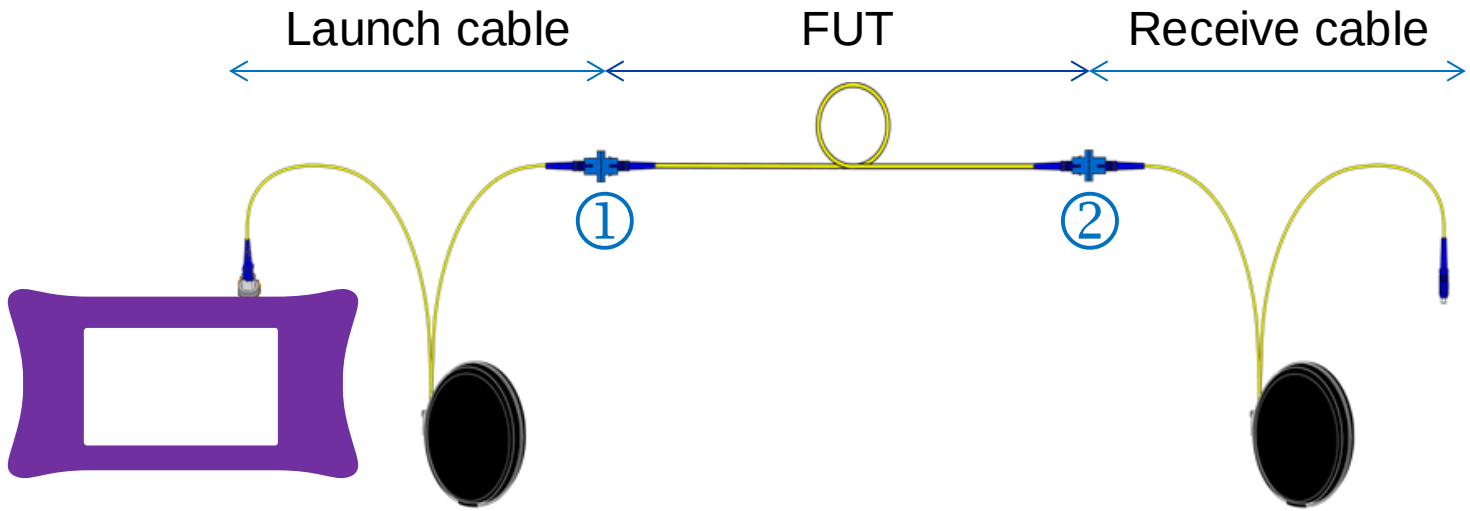
Introduction to the OTDR

- Tier-1 (Basic) Certification cannot ensure individual event (splices and connection) losses are within spec OR the cable attenuation is uniform
- Tier-2 (Advanced) Certification adds the characterization of these events to the Tier-1 certification test, using an OTDR
- An OTDR is also the ideal fiber troubleshooting tool to quickly find the cause AND location of excess loss (incl. breaks) and reflectance

OTDR DCI Requirements

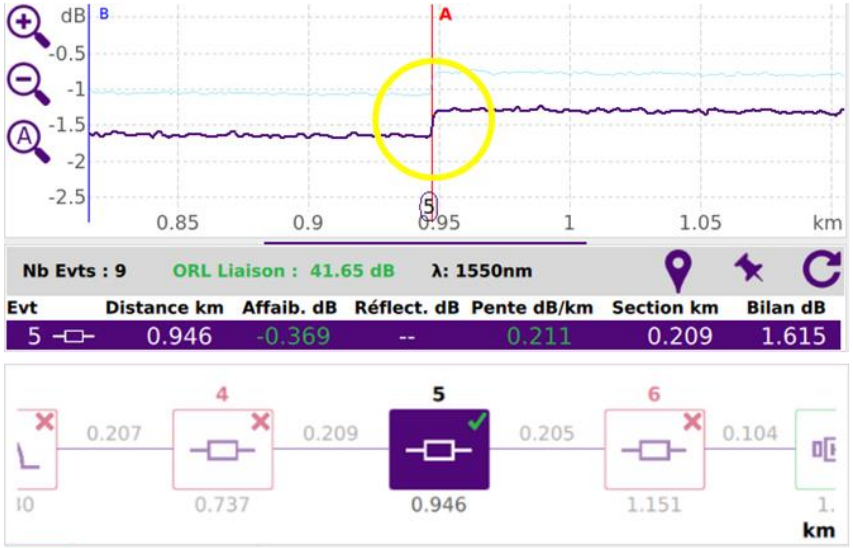
What is New?

- Hyperscalers provide a Division 27 document that outlines the guidelines for fiber testing in communication systems. This document is crucial for all technicians who test fiber in data centers during construction, as it contains the latest standards and procedures that must be followed. Cables that run between buildings, contain splices, or are over 1km, as well as cables that have no terminations (raw fiber) shall be tested with an OTDR.



OTDR Bi-Directional Testing

A→B direction:
Apparent gain (False Positive)



B→A direction:
Excessive loss (False Negative)

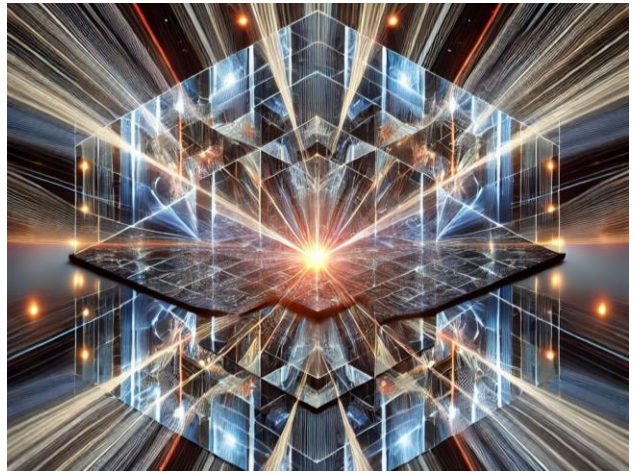
The “TRUE” splice loss is the average:

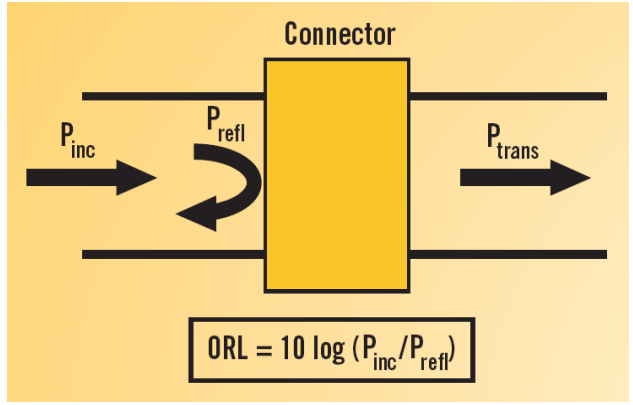
$$\frac{(Event\ loss\ A \rightarrow B + Event\ loss\ B \rightarrow A)}{2}$$

In this example @1550 nm, the TRUE loss of event #5 is **0,049 dB** (which is a PASS ☑)

The importance of ORL and Reflectance

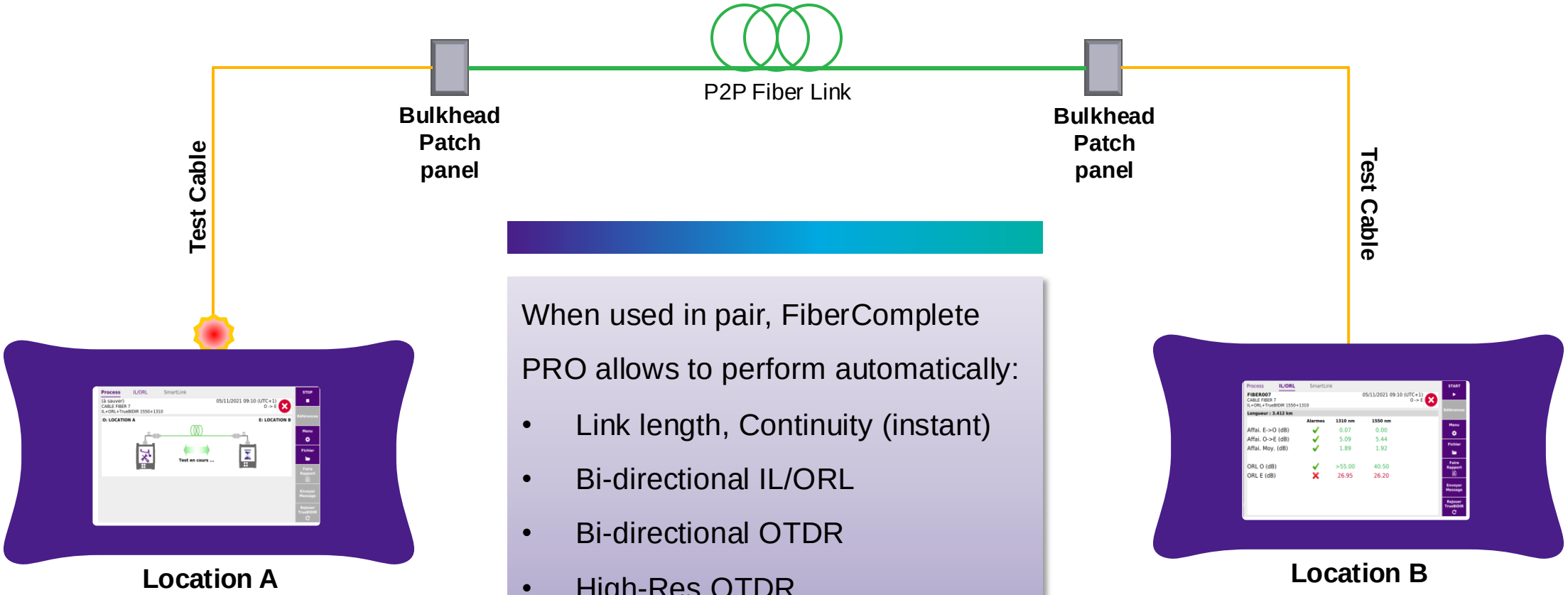
- ORL vs Reflectance
  - ORL: total amount of transmitted light reflected back to the source. ORL is measured in dB and is a positive value
  - Reflectance: amount of reflected light at a discrete location/event, ex connector. Reflectance is measured in dB and is a negative value
- Impact of ORL and Reflectance
  - Increase transmitter noise > increase BER
  - Increase light source interferences > changes central wavelength and output power
  - High incidence of transmitter damage
  - Increase in multipath interference (MPI)





FiberComplete PRO Automated Bi-Directional Measurement

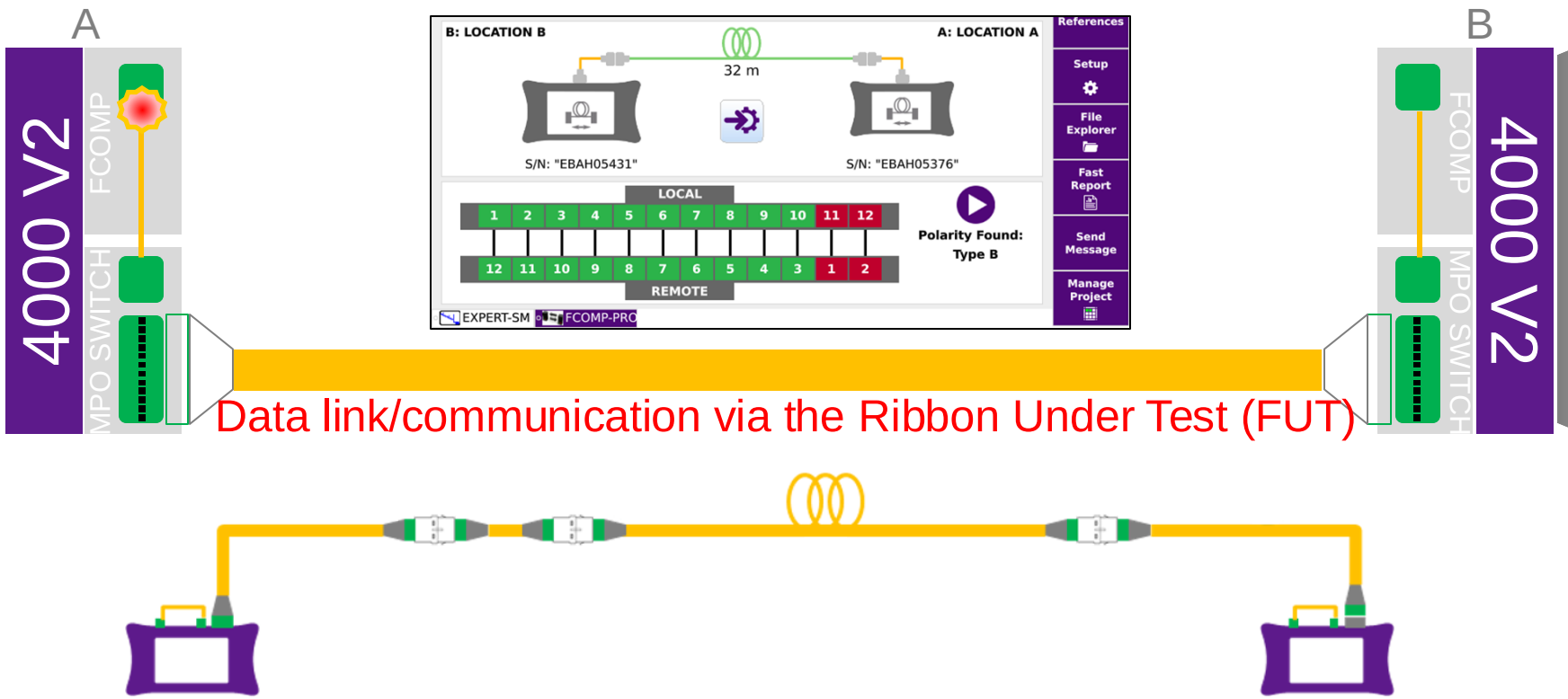
Job done right in ONE connection, ONE button press



When used in pair, FiberComplete PRO allows to perform automatically:

- Link length, Continuity (instant)
- Bi-directional IL/ORL
- Bi-directional OTDR
- High-Res OTDR
- Real time Bidirectional Analysis
- Reporting (.json/.pdf/.sor)

Native MPO Network Testing – IL/ORL/OTDR



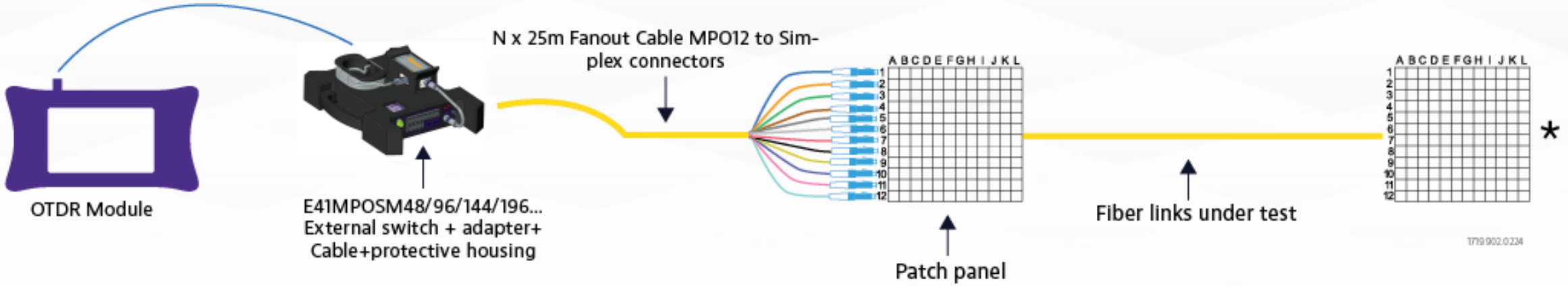
- A single MPO test port / single connection for OTDR
- Polarity check and continuity validation
- Sequence through all the tests and all the fibers (up to 12) automatically
- Clear track and record of the test status, results and files

High fiber count cable certification- Data center

Streamlining the test workflow in Construction with automatic bulk sequence

Conducting automatic tests sequence on high fiber count cables

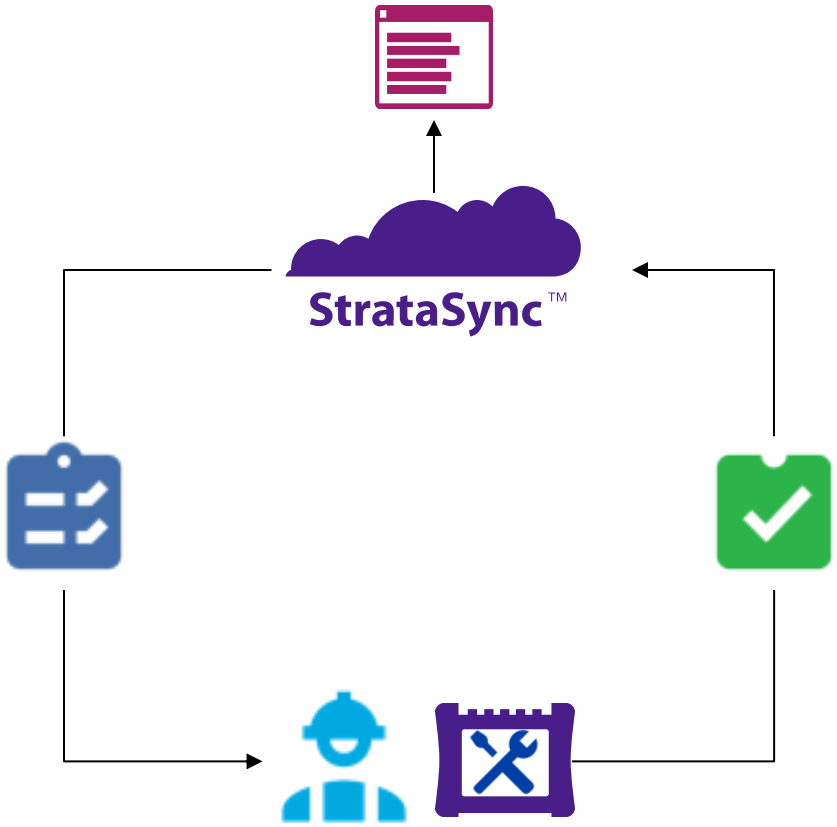
- Unidirectional OTDR, Bidirectional. OTDR (with TrueBIDIR)* ; Bidirectional. IL/ORL**+OTDR



On-board MPO12 switch & now External high capacity switches accelerates the workflow, transform time in money: automatic switch sequence

Test Automation

Maximize Workforce and Workflow Efficiency



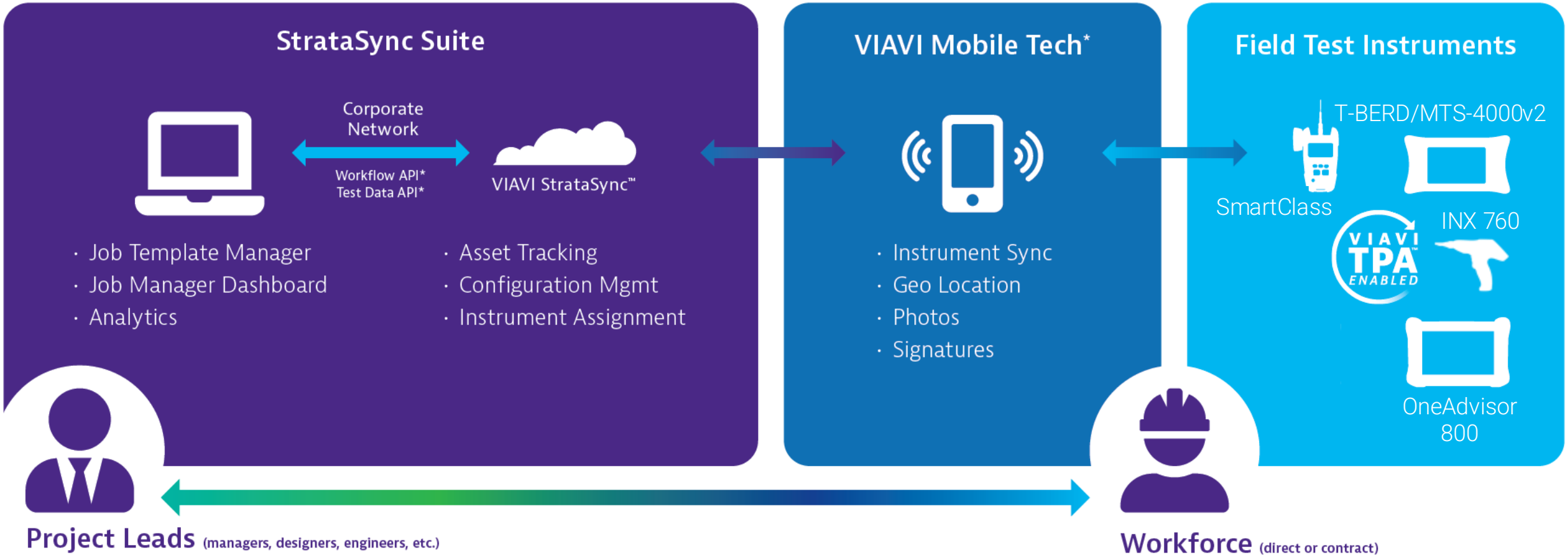
Ensure MOPs, consistency and error-free setup – Push a universal plan by job type to tech instrument

Detect failure before commissioning/handover – get real-time visibility on the measurement progress and results

Be in control and reduce management costs – keep a track of instrument status and job tickets and, oversee assignments

Test Process Automation

VIAVI TPA™



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Summary

- Different network segments mean different measurement requirements
- Although testing standards exist, requirements can vary from one data center operator to another
- Best practices
  1. IBYC
  2. Tier-1: Ensure proper referencing process is followed per connector type being tested
  3. Advanced Tier-2/OTDR:
     - Use of launch/receive cables
     - All-in-one loss, ORL and OTDR to gain efficiency, remove operational errors, reduce cost of consumables
     - Scale for ultra high fiber count cables and multi-fiber connector-based links with MPO switch
- Embrace TPA to:
  - Streamline fiber acceptance jobs management
  - Speed up and automate the E2E testing process
  - Simplify administrative work and test data management

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Questions?


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