Cut Fiber Test and Certification Times in Half

VIAVI Solutions

Douglas Clague

Solutions Marketing Manager

May 8th, 2019

Welcome - Transition to a Fiber-Rich Network Webinar Series

Mission : Increase fiber technology knowledge and skill set around network vulnerabilities and test procedures to quickly eliminate problems.

Series runs April 23-June 18

Speakers Today Wednesday, May 8, 2019

Cut Fiber Test and Certification Times in Half

- **Sue Selby, NA Regional and Channel Marketing Manager**
- **Douglas Clague, Solutions Marketing Manager**

Transition to Fiber Rich Webinar Series #2 2019	Date	Topic	Link to Register/Recording	Speakers:
Webinar 1	*April 23, 2019*	*Automating Test Workflow to Accelerate Jobs*	*Automating Test Workflow to Accelerate Jobs Recording Link*	*Stephanie Burris, Senior Product Line Manager* *Jim Ritter , Senior Product Line Manager*
Webinar 2	**May 8, 2019**	**Cutting Fiber Test and Certification Times in Half**	**Cut Fiber Test and Certification Times in Half**	**Douglas Clague, Solutions Marketing - CITV - Fiber, VIAVI Solutions**
Webinar 3	May 14, 2019	Fiber Monitoring Repeat for APJ	Fiber Monitoring Repeat (APJ/West NA)	Stephanie Burris, Product Line Manager, Fiber Products and StrataSync, VIAVI Solutions
Webinar 4	May 21, 2019	How to Effectively Operationalize DAA	How to Effectively Operationalize DAA	Jim Walsh, Solutions Marketing, VIAVI Solutions
Webinar 5	June 18, 2019	Distributed Fiber Optic Sensing and Monitoring	Distributed Fiber Optic Sensing and Monitoring	Stephanie Burris, Product Line Manager, Fiber Monitoring, VIAVI Solutions Dr. Vincent Lecoeuche, Fiber Optics Engineer, VIAVI Solutions

Agenda

Webinar Summary:

- Reasons for going beyond basic fiber test by including ODTR testing
  - Benefits of doing this bi-directionally
  - Types of issues it can find
  - How the implementation of bi-directional test in the equipment itself, coupled with automation levels and workflow, can dramatically reduce test and report generation times
- Market Trends and Drivers
- Real world examples
- Summary
- Questions and Answers

Market Trends and Drivers

- 5G - IoT - Smart Home - Self drive cars – eHealth – 8K video - Gigabit to the Home…

100G reaching mainstream deployment phase

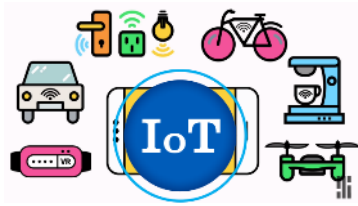
Next Gen PON around the corner

Next Gen access DOCSIS & Gfast

C-RAN deployment (DAS to C-RAN migration) & 5G

100G/400G in Data Center and Enterprise

High density fiber cables & MPO



Objectives and Challenges

Ensure long-term network reliability

- Accurate and reliable fiber characterization
- Certify that fiber links meet network equipment requirements
- Quickly troubleshoot in case of faults

Technicians’ efficiency

- Do the job fast and right the first time
- Limited training time
- Storing test results & report generation

Basic optical fiber link commissioning/acceptance

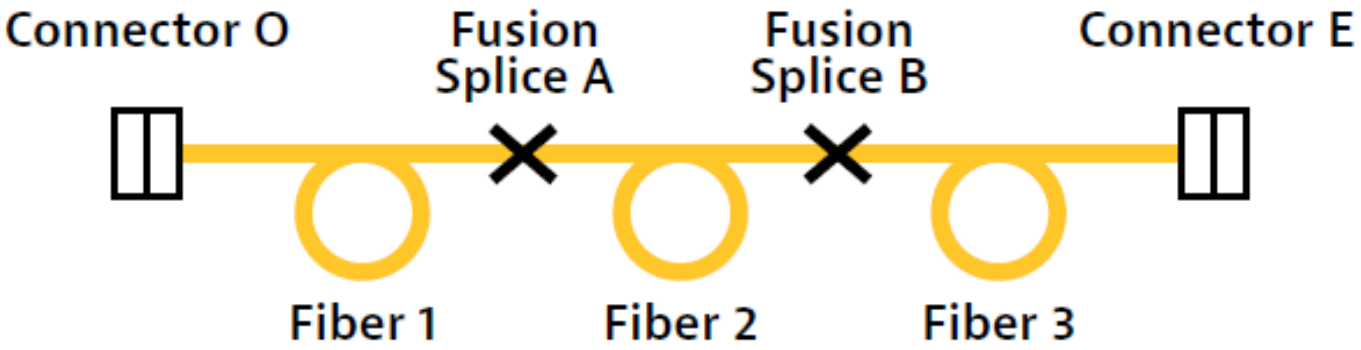
- Network equipment vendors provide the specifications so their optical systems perform correctly:
  - Typically this is optical loss budget and ORL limits
- Tight loss budget (such as in FTTH/PON) and higher transmission bandwidth networks require precise insertion loss (IL) and ORL measurements.
- Bad insertion loss and ORL values will result in signal degradation which causes unreliable transmission
- Unidirectional vs Bidirectional:
  - The IL value is the same in both direction. However a bidirectional measurement will give a better accuracy
  - The ORL may be different in both direction. A bidirectional measurement is mandatory.

Traditional measurement methods for IL/ORL

Type	Method	Advantages	Drawbacks
Insertion Loss (IL)	Light source + power meter	Simple to use Cost effective	Manual referencing Limited report
	OTDR	Access to one end of the fiber Detect faults Comprehensive report	No continuity check Average accuracy Rely on auto-detection
ORL	ORL meter (OCWR)	Simple to use Cost effective	Manual referencing Limited report
	OTDR	Access to one end of the fiber Detect faults Comprehensive report	Average accuracy Rely on auto-detection

Beyond IL and ORL Testing

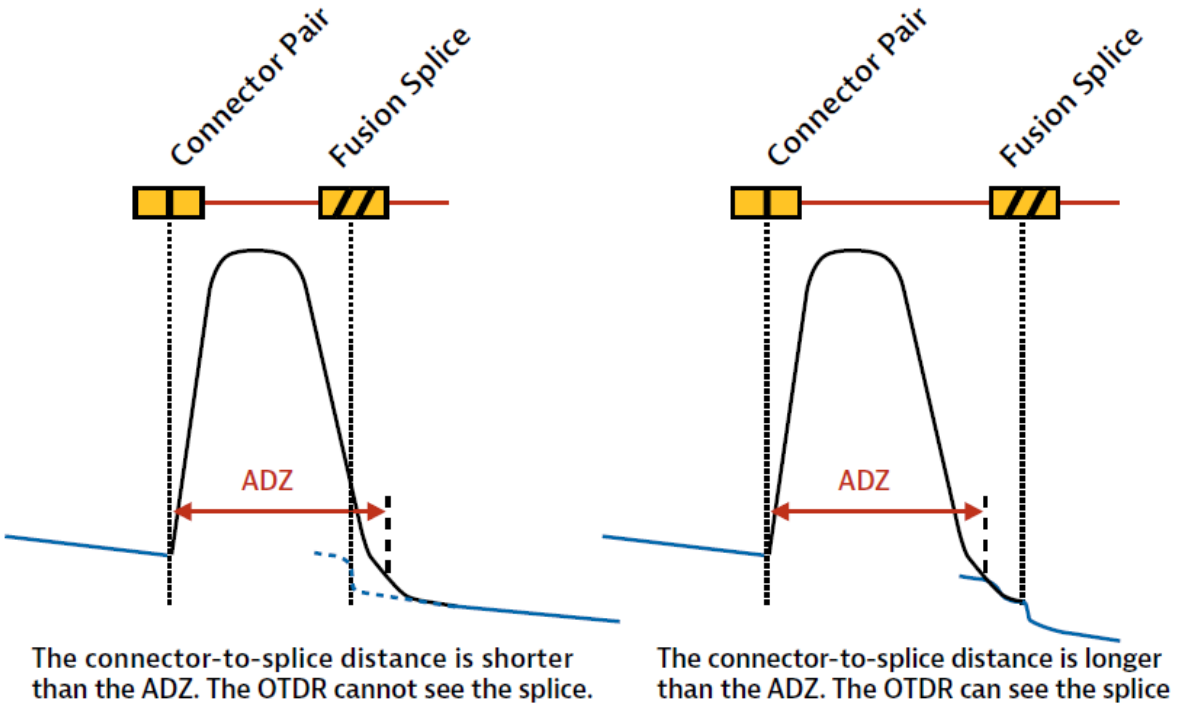
- IL/ORL only tells you part of the story
- If there is a problem you still need an OTDR to locate it
- OTDR trace can reveal issues IL/ORL miss
  - Bends, bad splice, bad or poorly mated connectors
  - Mismatched fiber sections



Beyond Uni-directional OTDR test

Bi-directional OTDR test

- Gives better event detection & characterization along the entire fiber link
- Can reveal events hidden by OTDR deadzone performance when tested from only one direction



It’s not just VIAVI recommending Bi-Directional OTDR test

- IEC 62316
- IEC 61280-4-1 Ed2.0
- IEC 61280-4-2
- IEC 60793-1-40:2001
- IEC 6128-4-2:2014
- IEC 147363-3
- TIA-455-8 (TOTP-8)
- **G.650.3-201708**
  - Page 4 (Link attenuation): it is well known that bidirectional OTDR measurement is more accurate than unidirectional measurement, but unidirectional measurements are often done as an initial check. When the results of such a check are marginal, follow-up with bidirectional measurement is recommended.
  - Page 5: Normally, for commissioning a new cable link, OTDR testing is carried out in both directions on every fiber using at least two wavelengths. In practical engineering, unidirectional OTDR test results can be used to roughly judge the splice quality, but accurate splice loss measurement must be based on the bidirectional OTDR test.

Bi-directional verses Uni-directional OTDR test

Is more accurate and gives true splice/event loss that averages out measurement errors and manufacturing tolerances (backscatter differences)

Can identify mismatch fiber sections (due to fiber type or variations in manufacturing or variations between manufacturers)

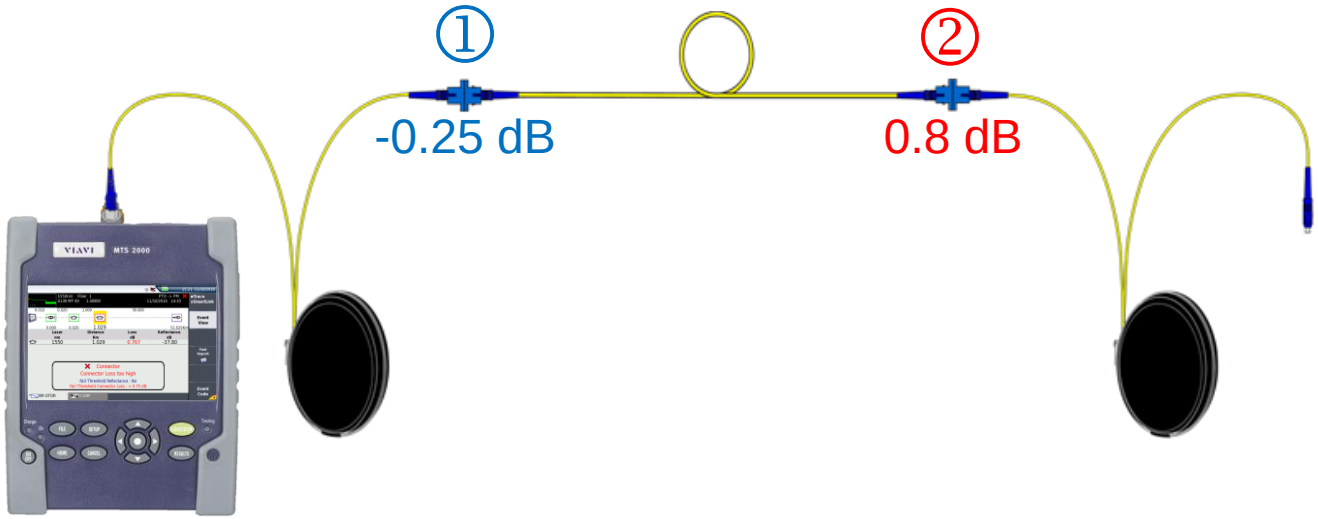
Proves if a gainer event on a trace is a ‘real’ problem potentially preventing unnecessary fiber/connector/splice replacement

Poll Question

- When deploying new fiber or activating dark fiber what is the main test you perform?
  - Insertion Loss (IL)
  - Optical Return Loss (ORL)
  - OTDR
  - Bi-direction OTDR
  - No test

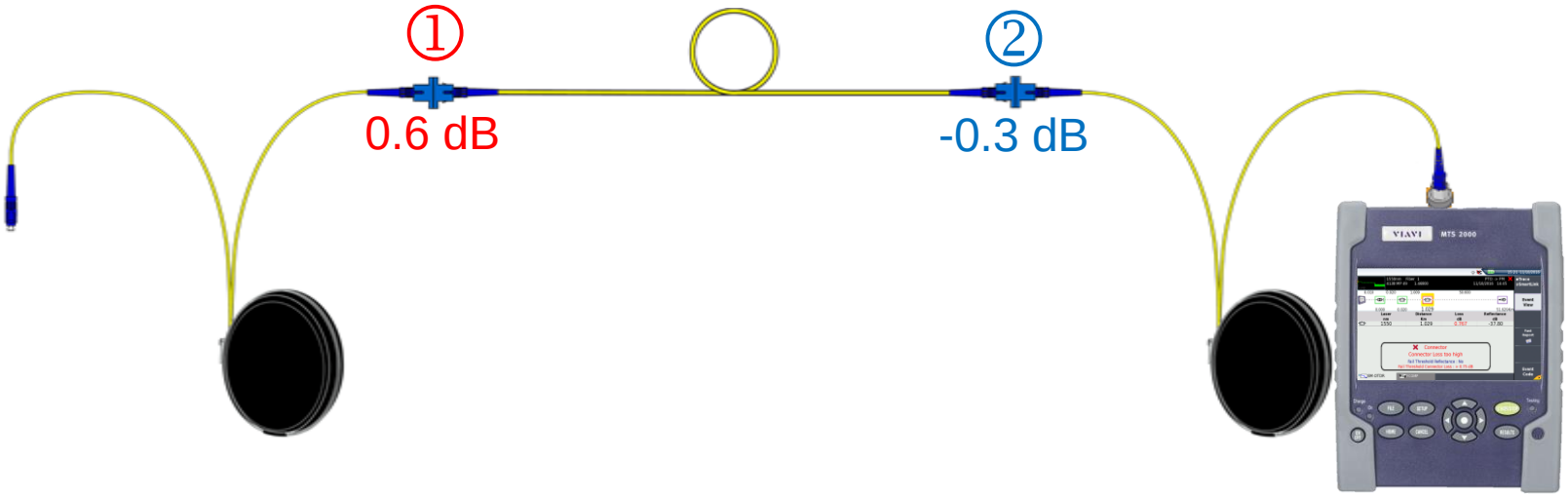
Accurate fiber characterization: Uni vs Bi-directional OTDR

- Is that really a fail at connection ②?
  - Event limit set to 0.5 dB
- A negative value indicates gainer, due to mismatch of fiber types
- Only bidirectional analysis gives a “true” loss value



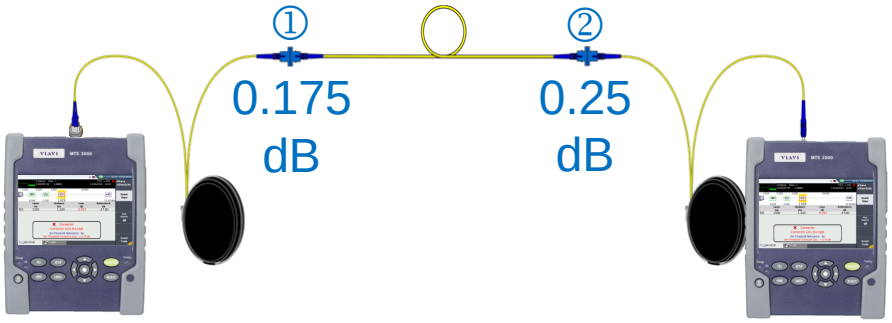
Accurate fiber characterization: Uni vs Bi-directional OTDR

- Tested in the other direction, it now fails at connection ① !
  - Event limit set to 0.5 dB

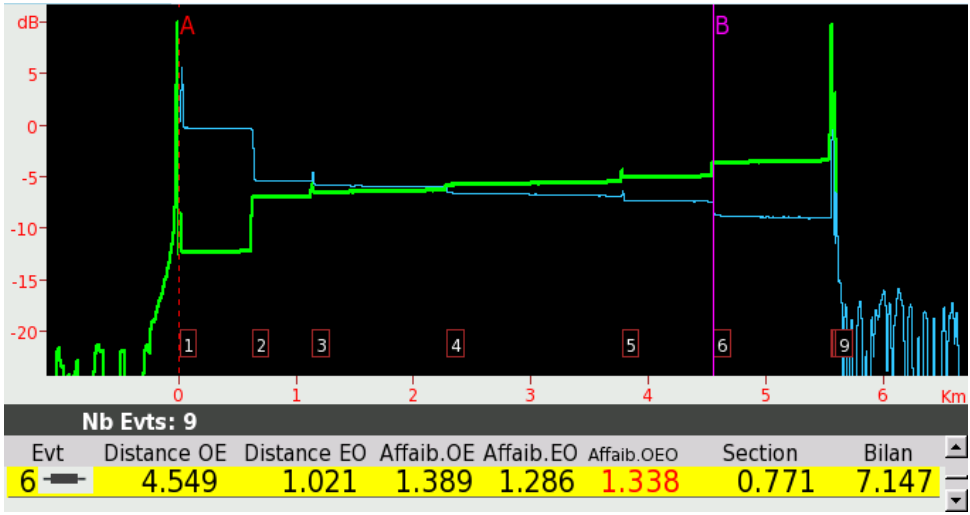


Bi-directional averaging

- When bi-directional averaging is implemented
  - Mismatches in backscatter coefficient between the launch/tail fibers and the fiber under test are taken out, mathematically speaking

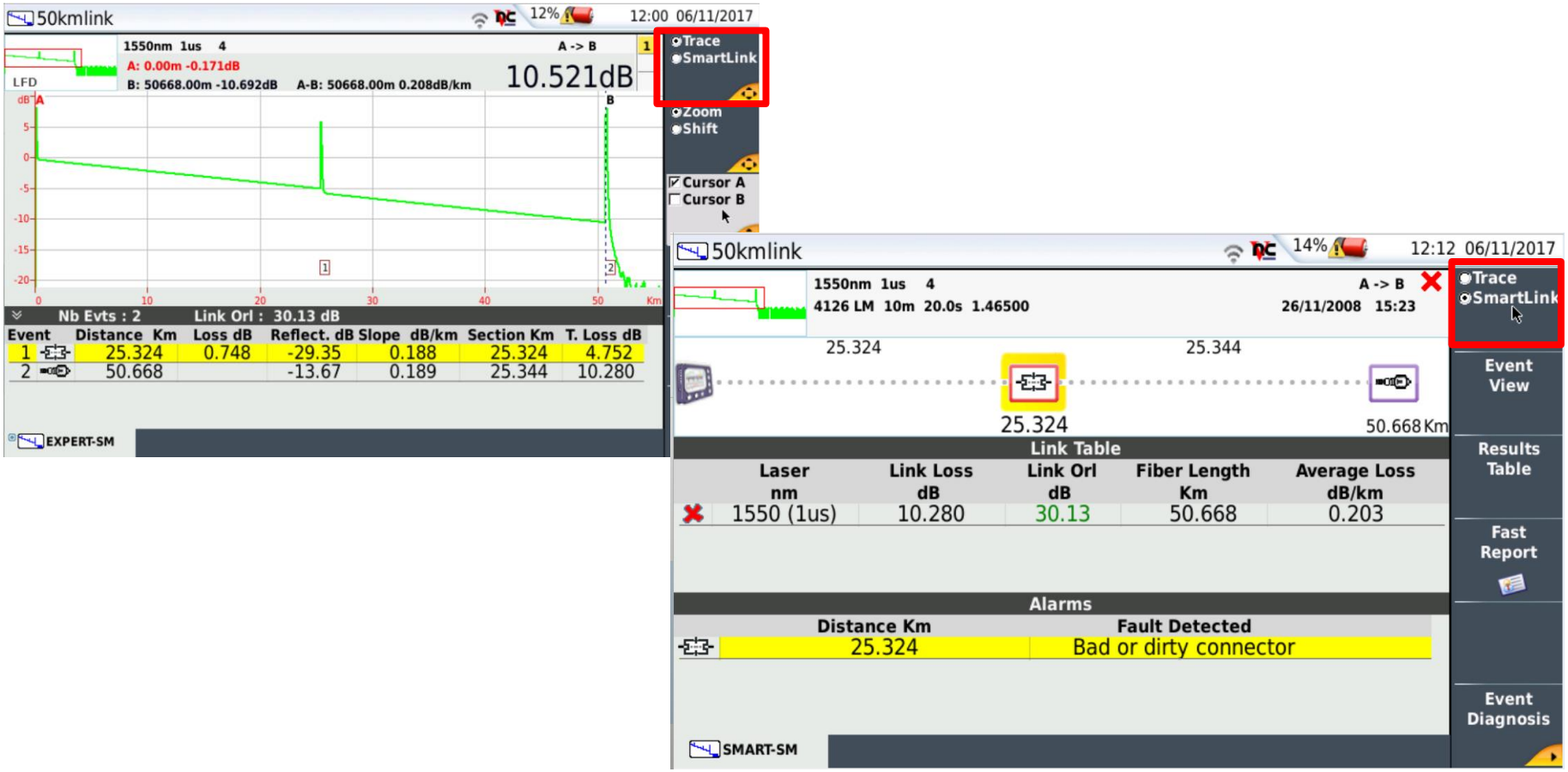


Example of bidirectional OTDR result traces



	A -> B	B -> A	Sum	Average
Connector 1	-0.25	0.6	0.35	0.175
Connector 2	0.8	-0.3	0.5	0.25

You have to make reading OTDR traces easy



Standard SmartLink Mapper displays OTDR results in a simple, icon-based map view (SmartLink), with a clear diagnostic of detected issues

Poll Question

- When deploying or handing over fiber links, which activity consumes the most time?
  - Testing
  - Generating reports
  - Submitting reports
  - Re-test
  - Additional truck rolls for re-test

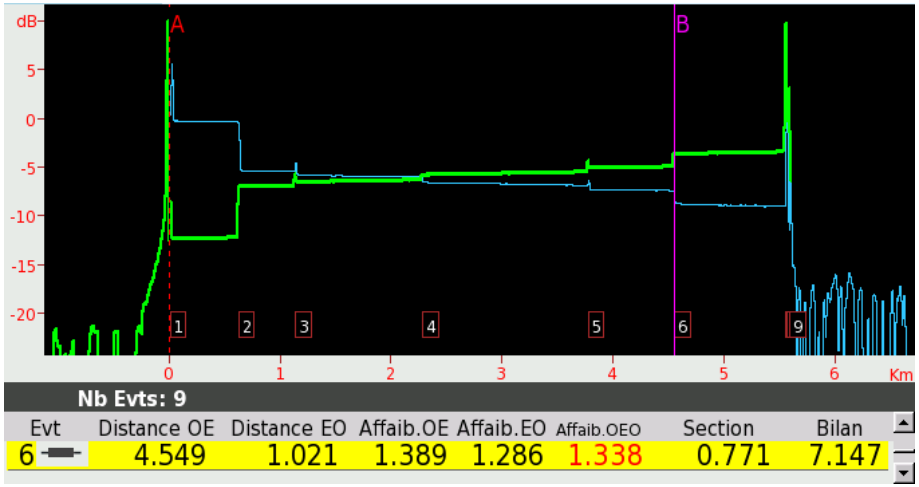
How test equipment is designed has an impact

Measurement time	• Plays a part in total test time
Most solutions that include IL, ORL and OTDR testing use more that one piece of equipment or more than one test port	• One unit or test port for IL/ORL and another for OTDR
This introduces risks	• Of connector contamination (or damage)
And has an impact on work flow / test flow	• Moving between instruments or test leads takes time • You have to manually restart testing • It should involve more inspection cycles

Bi-directional OTDR Test Challenges

Bi-directional testing means

- Running tests manually from each end of a fiber
- Risk of test config/settings mismatch (risking different event detection/identification & conflicting results)
- Extreme care needed over result file naming (so they can be matched later)
- Complicated report generation (typically a post processing activity)



Print date : 11/12/2018 18:08 File : CABLE-FIBER.blts.pdf

Cable Id : CABLE
Location B : LOCATION B
Technician Id :
Location A : LOCATION A
Job Id :

MTS 2000V2 (S/N EBAK00036) 4126 MA3FCO (S/N 00466) Date : 11/12/2018 18:06

Setup FCOMP 1550+1310 5.600 km IL+ORL+Length
Reference

Wavelength	Side/Side	Loopback	ORL Power Lev. (dBm)	ORL Zero (dB)
1310 nm	-7.35	---	-6.66	36.76
1490 nm	-6.50	---	-6.50	58.50
1550 nm	-7.04	---	-6.66	40.11
1625 nm	-6.50	---	-6.50	58.50

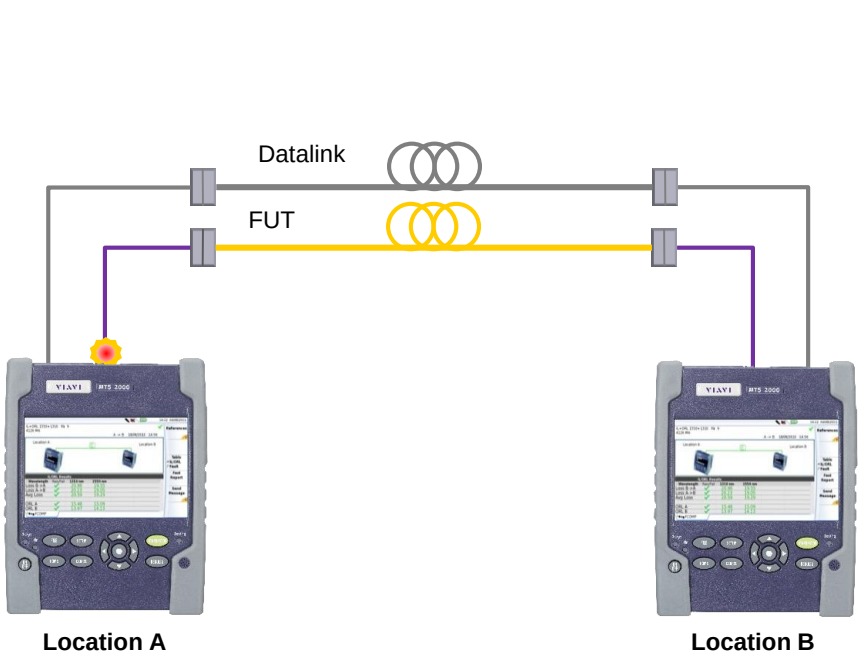
Fib #	Length	Wavelength	Loss A->B	Loss B->A	Avg Loss	ORL A	ORL B
1	5.600 km	1310	9.99	10.17	10.08	36.89	37.62
		1550	11.96	12.41	12.18	39.30	39.04
2	5.600 km	1310	10.35	10.53	10.44	36.78	38.80
		1550	12.49	12.72	12.60	39.10	39.69
3	5.600 km	1310	10.33	10.62	10.47	36.94	38.11
		1550	12.53	12.74	12.63	39.07	39.74
4	5.600 km	1310	5.42	5.34	5.38	34.76	35.63
		1550	8.33	8.46	8.39	37.21	43.40
5	5.600 km	1310	5.33	5.39	5.36	43.63	33.20
		1550	8.24	8.28	8.26	>55.00	35.82
6	5.600 km	1310	5.37	5.40	5.38	40.85	33.22
		1550	8.26	8.36	8.31	>55.00	35.82

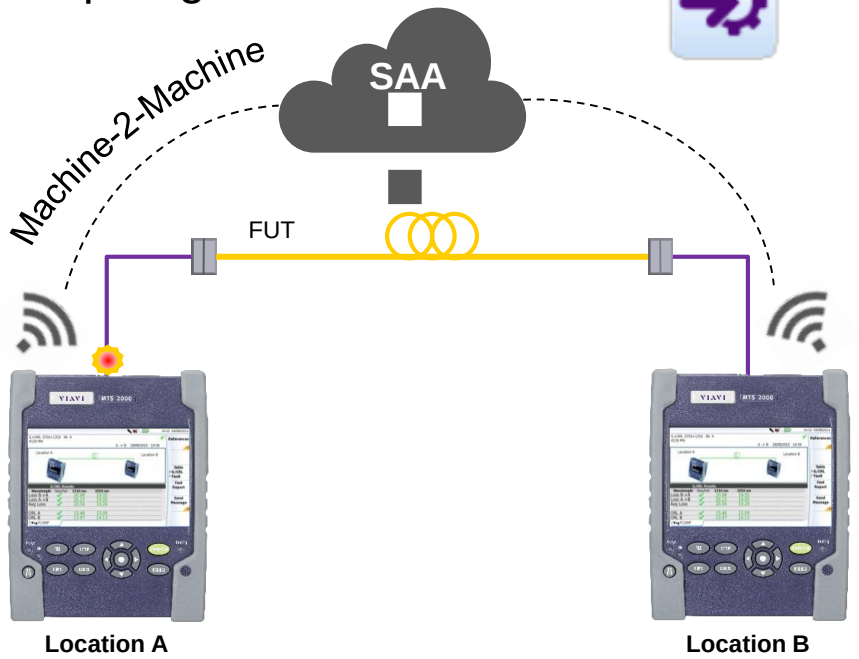
Example of bidirectional OTDR result traces and report pdf

Solution: End to End Setup and Communications

- Full config/setup exchange between instruments (for IL, ORL **& OTDR**)
  - Using the fiber datalink (via mainframe talkset port)
  - M2M using SmartAccess Anywhere (SAA) (via internet/cloud, local LAN, mobile hotspot)
- One connection (one test port) for IL,ORL & OTDR
- One-touch automated measurements
- Results available on both units for immediate report generation

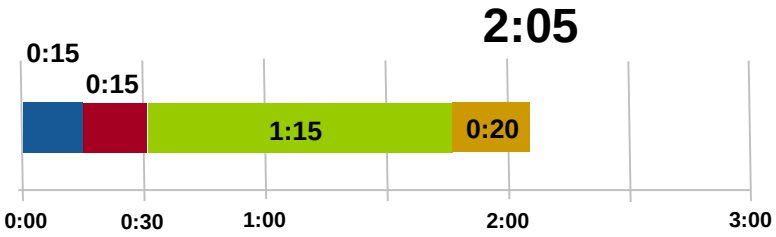
Simple setup exchange button



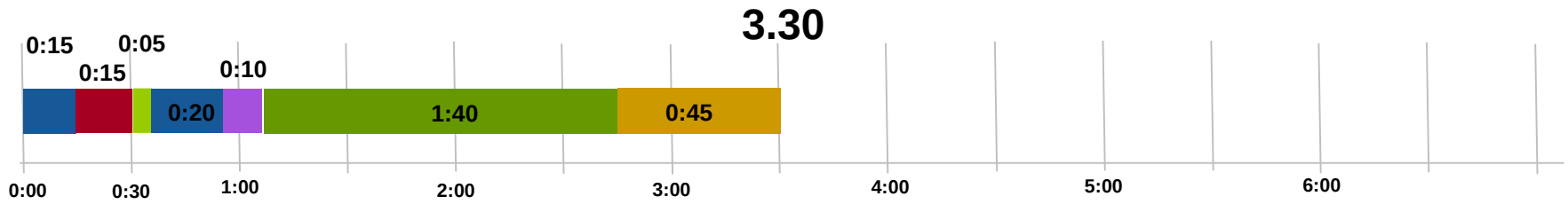


Test and Certification times – single vs dual port solutions
Bi-dir IL & ORL plus Uni-dir OTDR

VIAVI total test time inc report:
~ 2min 5sec – uni-dir OTDR
Nearest equivalent:
~ 3mins 30sec



1. Inspect, clean FUT port and re-inspect
2. Inspect, clean test lead and re-inspect
3. Run automatic Bi-dir IL, ORL & Uni-dir OTDR @ 1310/1550nm
4. Auto report generation

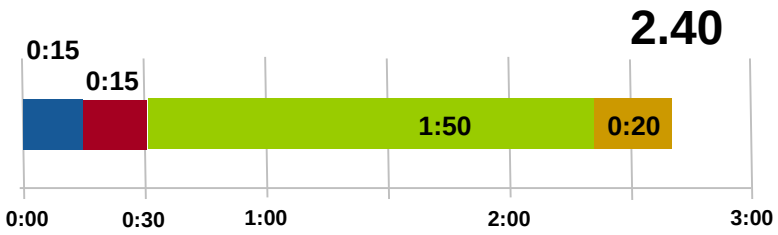


1. Inspect, clean FUT /port and re-inspect
2. Inspect, clean test lead and re-inspect
3. Run automatic Bi-dir IL, ORL only @ 1310/1550nm and auto save results
4. Move FUT/port from IL/ORL test lead to OTDR test lead, clean and re-inspect
5. Call far end tech to disconnect IL/ORL test lead
6. Manually start OTDR test @ 1310/1550nm and auto save results
7. Manual Report consolidation of IL/ORL & OTDR results

Test and Certification times – single vs dual port solutions Bi-dir IL & ORL plus Bi-dir OTDR

VIAVI FiberComplete with T-BERD/MTS-2000 & P5000i
- Approx 50% time saving
- Full acceptance test of 91 fibers in just over 4 hours

VIAVI total test time inc report:
~ 2min 40sec – bi-dir OTDR
Nearest equivalent:
~ 5mins 40sec



1. Inspect, clean FUT port and re-inspect
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3. Run automatic Bi-dir IL, ORL & OTDR @ 1310/1550nm
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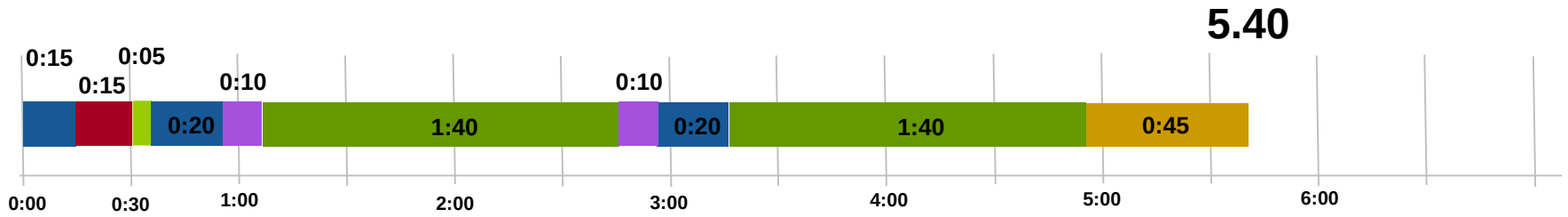
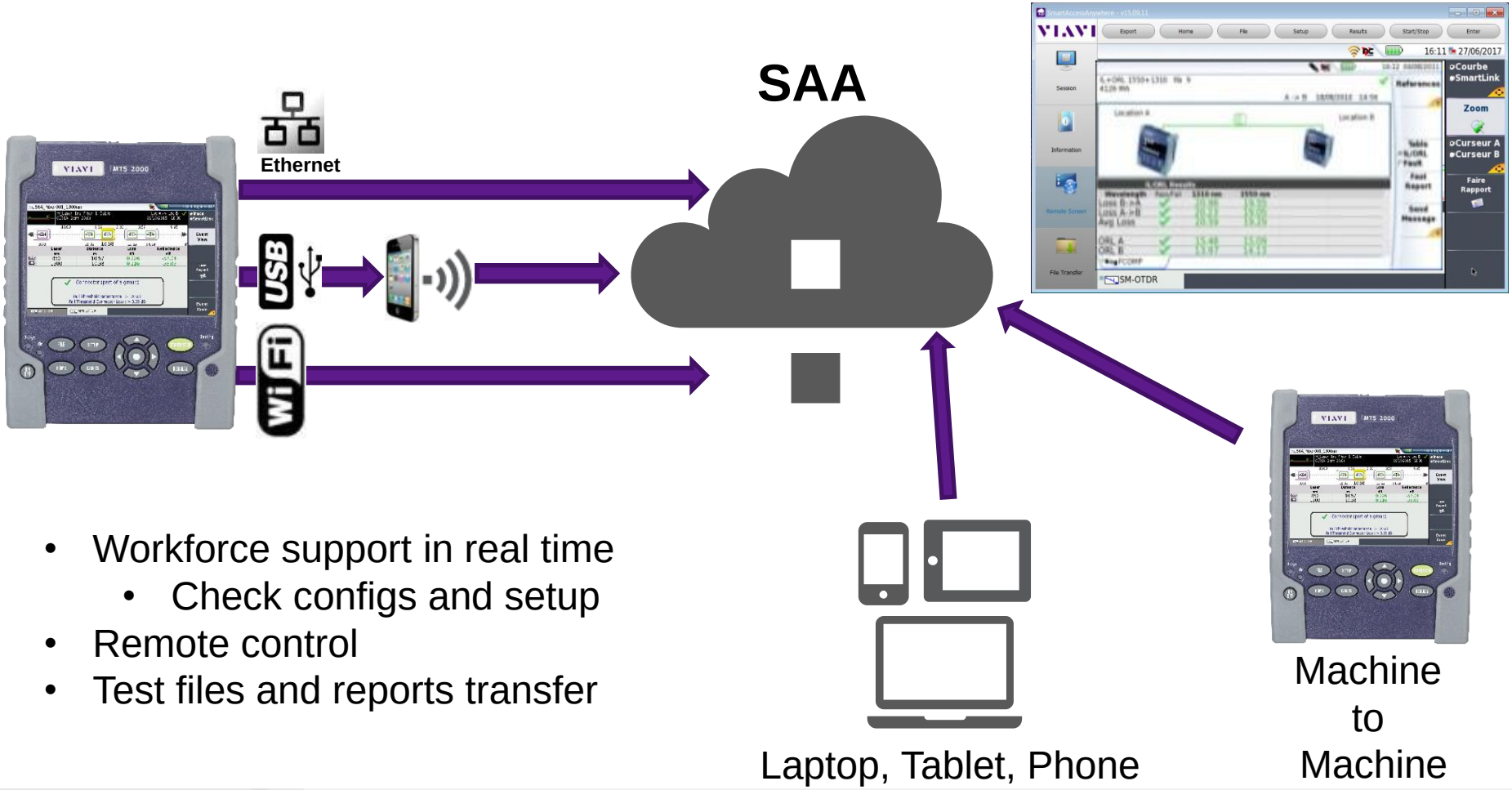


1. Inspect, clean FUT/port and re-inspect (near end)
2. Inspect, clean test lead and re-inspect (near end)
3. Run automatic Bi-dir IL, ORL only @ 1310/1550nm and auto save
4. Move FUT/port from IL/ORL test lead to OTDR test lead, clean, re-inspect
5. Call far end tech to disconnect IL/ORL test lead
6. Manually start OTDR test @ 1310/1550nm and auto save
7. Call near end tech to disconnect OTDR test lead
8. Move FUT/port from IL/ORL test lead to OTDR test lead, clean and re-inspect (far end)
9. Manually start OTDR test @ 1310/1550nm (far end)
10. Manual Report consolidation of IL/ORL & OTDR results

Remote Coaching - Supporting the experience gap

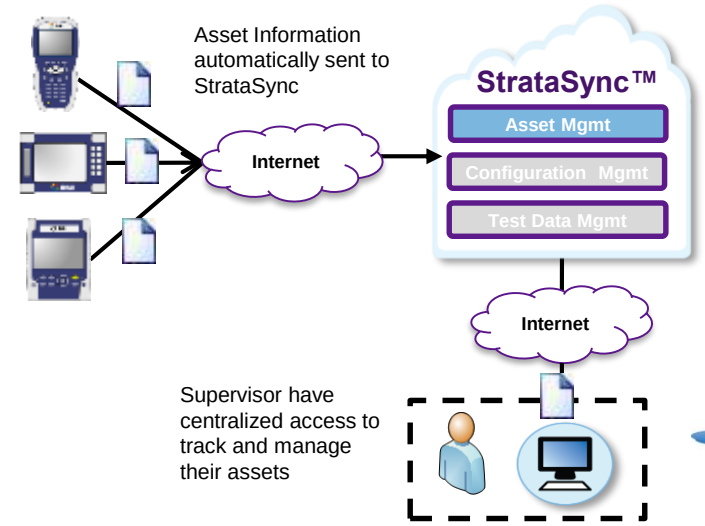
- Remote coaching with Smart Access Anywhere (SAA)



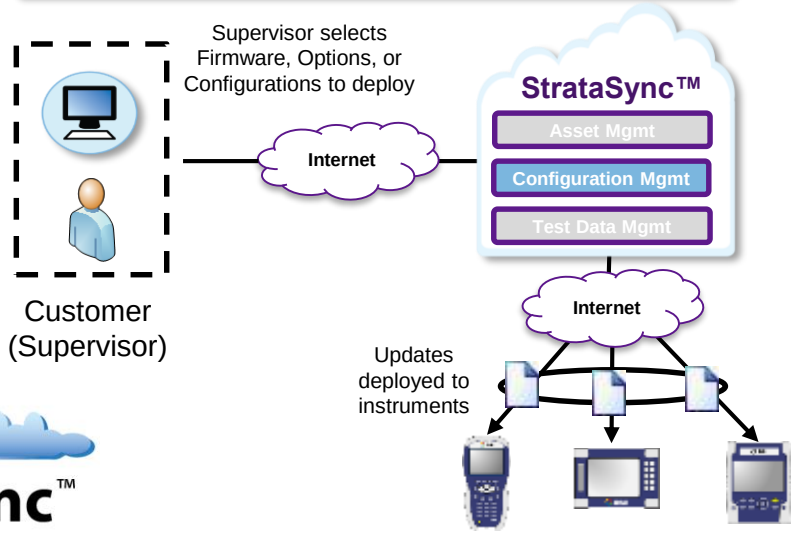
- Workforce support in real time
  - Check configs and setup
- Remote control
- Test files and reports transfer

Easy Results & Report Submission - Cloud Support

Asset Visibility & Tracking



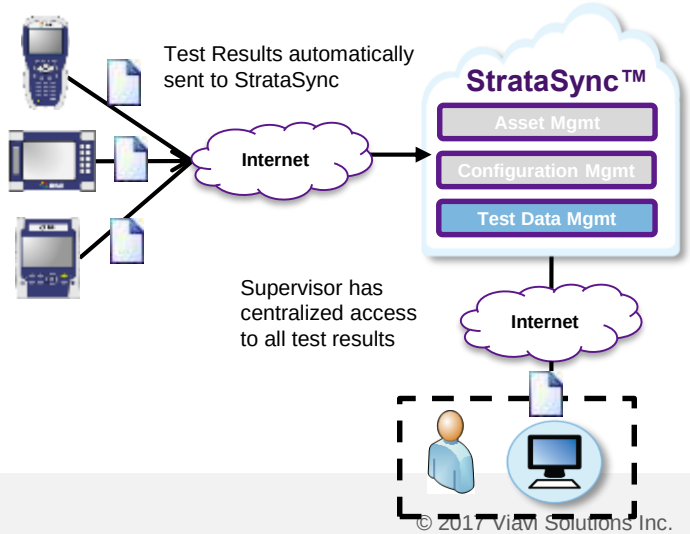
Configuration Updates



StrataSync™

- Multiple use cases across **multiple instruments** from the functionality provided by StrataSync™
- StrataSync will enable customers to **increase operational efficiency** by significantly **reducing time** to track and configure devices, get access to test data, and train their work force

Centralized Test Results



Poll Question

- What are the main issues you face/find on-site
  - Dirty connectors
  - Fiber bends
  - Continuity – finding the right fiber ends to test
  - Mis-matched fiber sections

Takeaways

- Improved productivity through …
  - Significant reduction in total test and cert time: Continuity check, bi-directional IL/ORL & distance & OTDR, and the report generation – 50% faster than other solutions
  - Test config automatically sync'd on both instruments (minimal setup time and chance of errors)
  - Tests performed automatically from both ends, results naming convention & storage is managed and results stored – better workflow automation
  - Simple & quick reporting, generated on-board instrument and upload via StrataSync – minimal post processing work
  - Avoid certification mistakes - Minimize chance of test errors and repeat site visits to retest
  - Contractors – complete jobs faster, easier report generation and submission, get paid sooner

THANK YOU FOR JOINING!

Webinar Recordings will be available

Questions?

Upcoming Webinars: Transition to a Fiber-Rich Network

- REPEAT for APJ: Optical Fiber Monitoring, Tues, May 14
- How to Effectively Operationalize DAA, Tues May 21
- Distributed Fiber Optic Sensing and Monitoring, Tues, June 18

Awards: 2018 BTR and Lightwave Innovation Awards For ONMSi, OTU5000, PON Construction

Upcoming major VIAVI events:

- EMEA:
  - EMEA Demo Van – book a visit
  - ANGA COM, June 4-6 Cologne, Germany
- North America:
  - SCTE Regional Conferences
  - CommTech West – May 28-30 Calgary AB
  - Fiber Connect – June 3-5, Orlando, FL
  - ISE – SEPT. 24 – 26, Ft.Worth, TX
  - SCTE Cable Tec Expo 2019 – Sept 30- Oct 3, New Orleans, LA

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