Accelerating FTTH rollouts

Agenda

- Welcome and Introductions
  - Lindsay Welch, TRS-RenTelco Marketing Manager
- TRS Overview
  - Micah Hurd, TRS-RenTelco Product Manager
- EXFO: Accelerating FTTH Rollouts
  - Guillaume Lavallée, Manager – Optical Solutions
- EXFO/TRS-RenTelco Partnership: Equipment & Special Promotions
- Q&A – Joint TRS and EXFO

We provide comprehensive Test & Measurement solutions delivering equipment-as-a-service.

Plan, acquire, and efficiently utilize instruments to maximize return on investment.

- End-to-end fulfillment from our Dallas, TX headquarters
- 5,000+ configurable models available, valued at over $500MM
- In-House Financing and flexible procurement programs to Rent, Lease, or Buy
- State-of-the-Art 20,000 sq ft Calibration Lab on site
- Same-Day-Shipping with Next Day Delivery Available

A proud member of the
McGrath Family of Businesses

Why Do Customers Choose TRS-RenTelco?

Customer Service Excellence

Talk with a **Live Person** when you call

24/7/365 Technical Support

Late-Order processing

Comprehensive Solutions

Customized **In-house Financing**

Deep and wide **Inventory**

Equipment ships **Ready To Use**

Fulfillment Accuracy & Speed

Same-day Shipping

80% of Calibrations Performed In-house

99.72% Customer-Scored Equipment Quality Ranking

Reliable Expertise

Strategic singular focus on the rental market

Top-tier rental partner to all major manufacturers

Financially Secure publicly traded company

ACCELERATING FTTH ROLLOUTS

Scalable, Automated Solutions to Overcome Challenges

GUILLAUME LAVALLÉE
TEAM MANAGER, OPTICAL INSTRUMENTS, EXFO

TRS RenTelco℠

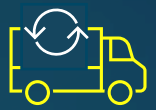
EXFO

AGENDA

- CLOUD HOSTED AUTOMATION
- BUILD PHASE
- SERVICE ACTIVATION PHASE
- MAINTENANCE PHASE

A SOLUTION TO TACKLE CHALLENGES FACED WITH LEGACY TESTING STRATEGY

LIMITED TESTING AND AUTOMATION CAN CAUSE:



HIGH ACTIVATION FAILURE RATES

Up to 30%, forcing costly truck rolls and customer churn.

MANUAL, ERROR-PRONE PROCESSES

Manual data entry and siloed testing procedures, leading to inconsistencies and inefficiencies.

LACK OF REAL-TIME VISIBILITY

Missing tracking network progress, validating MoP compliance and ensuring alignment with contractors.

WORKFORCE TURNOVER AND TRAINING GAPS

Costly onboarding and inconsistent testing quality.

Increasing pressure to outsource.

NETWORK DEGRADATION BETWEEN BUILD & ACTIVATION

Outages and performance issues emerge, impacting reliability and customer satisfaction.

LONG TIME-TO-REPAIR (TTR)

Inaccurate cable & fiber documentation is frequently raised as the leading root cause of inefficiency in operation and maintenance.

FTTH NETWORK LIFECYCLE PHASES

Build

The foundation of a network's reliability is laid during construction. Precise fiber testing ensures that quality standards are met before activation.

Activation

Turning up services should be seamless, but activation failures can lead to costly rework, delays, and frustrated customers

Operations & Maintenance

Without proactive monitoring, service disruptions and degradations become difficult to pinpoint, leading to excessive truck rolls and reactive troubleshooting.

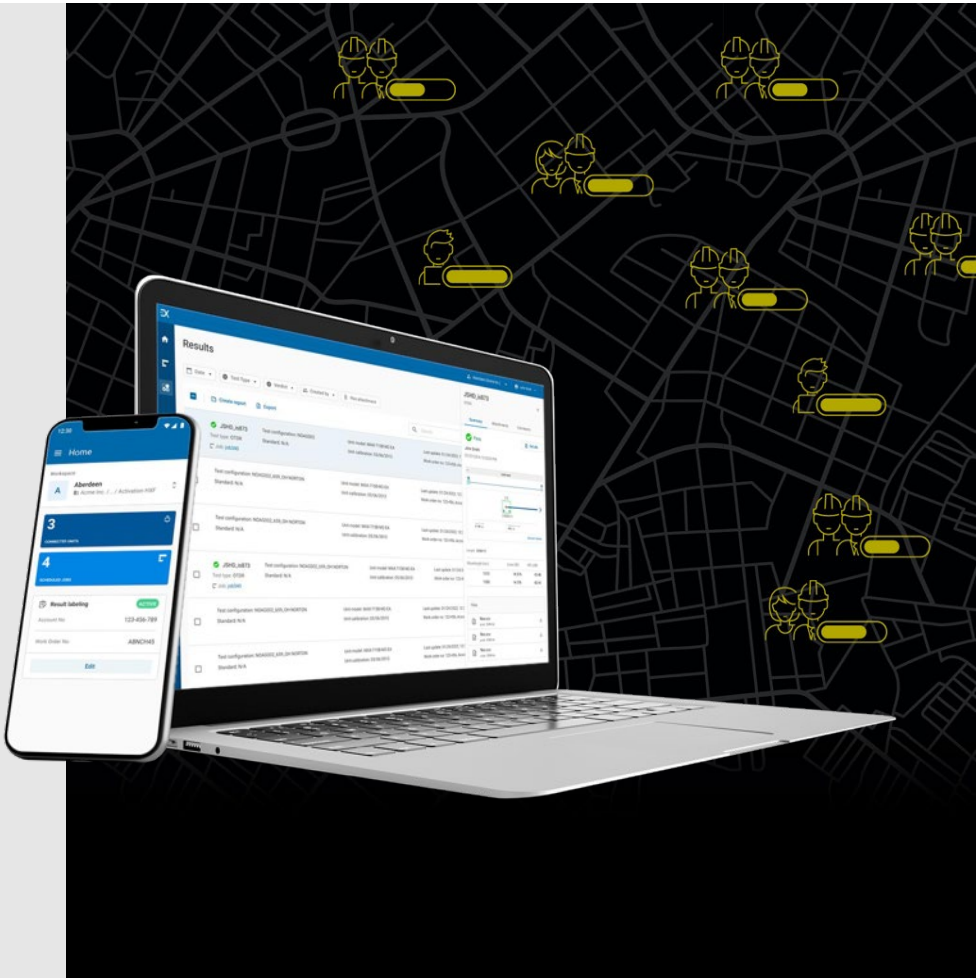
Upgrade

As networks grow, integrating new technology with legacy systems requires a seamless approach to testing and validation to avoid performance issues.

EXFO Exchange

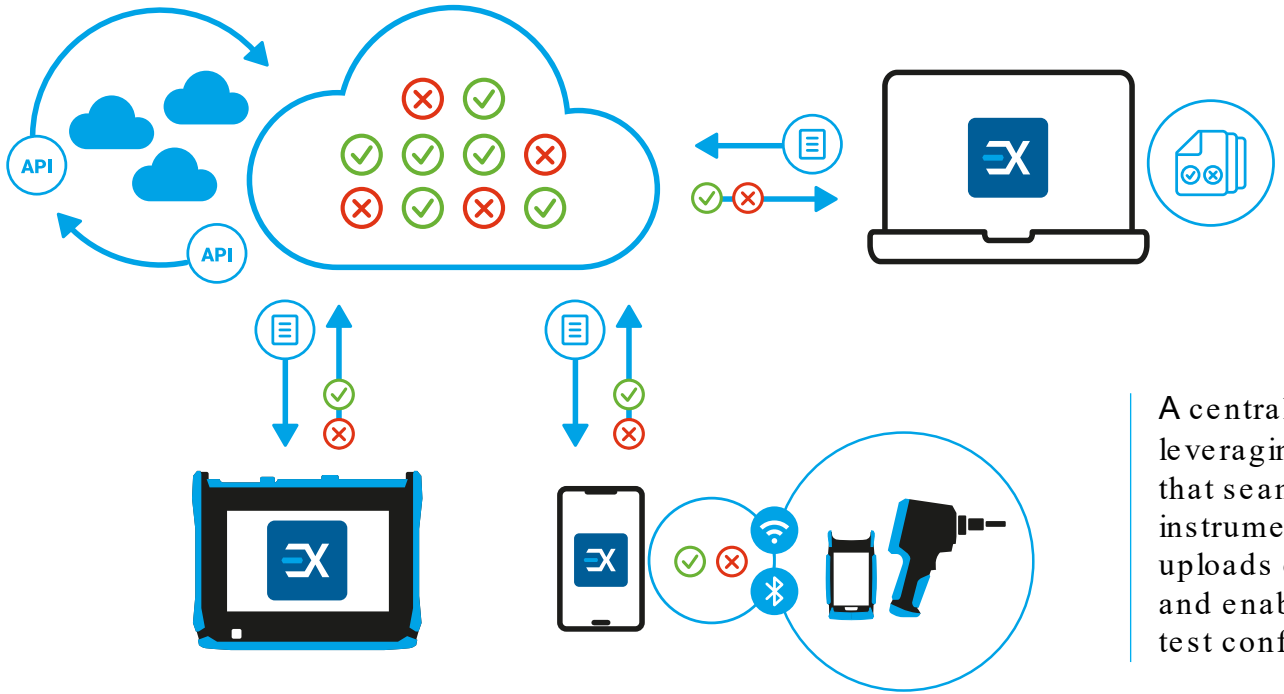
Cloud-hosted solution for sharing test results and ensuring compliance.

Paired with EXFO's leading test instruments, EXFO Exchange drives an entire ecosystem, while integrating seamlessly with existing operation processes.



Share test results | Boost compliance | Unlock insights

EXFO EXCHANGE ECOSYSTEM



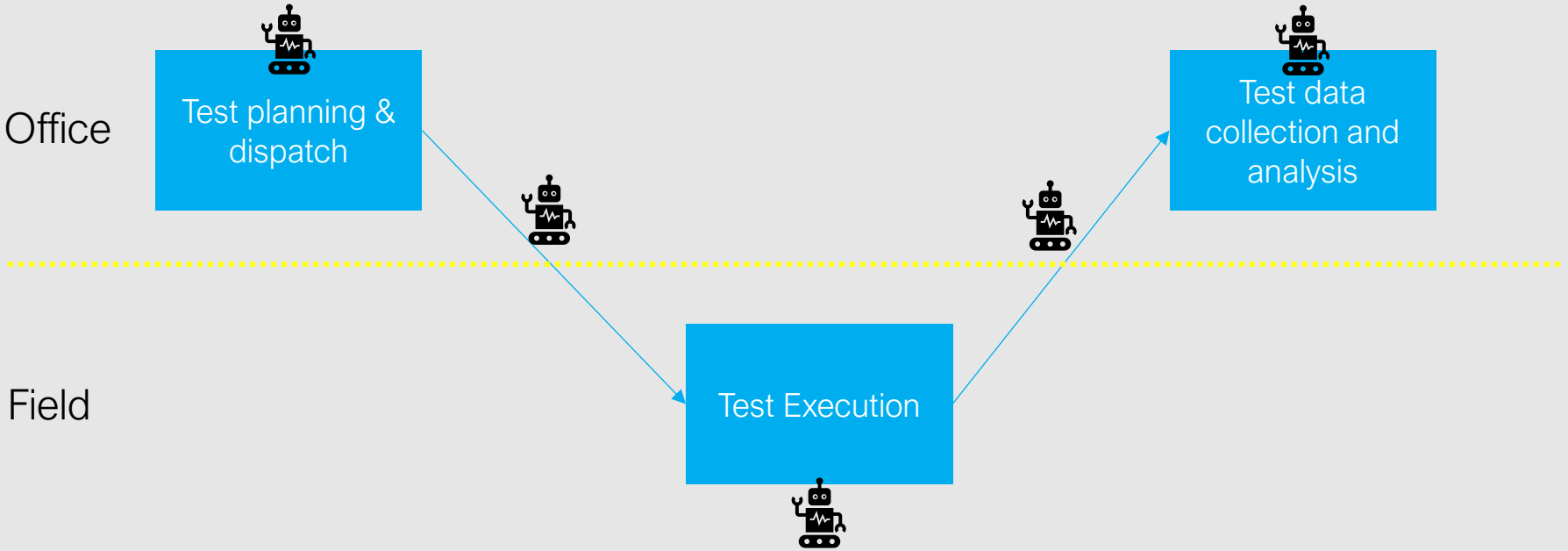
A centralized test ecosystem—leveraging cloud connectivity—that seamlessly connects the test instruments, automates result uploads or close-out packages, and enables the provisioning of test configuration.

TEST PROCESS AUTOMATION

AUTOMATION STEPS OF TEST PROCESS

Task automation

Transition automation



MAKING AN IMPACT ON OPEX AND BRAND

REAL-WORLD RESULTS FROM TEST PROCESS AUTOMATION DRIVING EFFICIENCY

US FTTH Wholesale Operator

97%

less manager time for job & COP creation

From 8h + 30min to 30min + 2 min

CityFibre (UK FTTH Wholesale)

From **2-4 weeks** to **2-4 days**

test process time

per neighborhood

US FTTH Wholesale Operator

-75%

Activation failure

From 40% to <10% thanks to build quality improvement

Major US Cable Operator

66%

less truck rolls from failed activations

From 30% to <10% thanks to enforced compliance with activation process

ACCELERATE THE BUILD WHILE MAINTAINING QUALITY

TYPICAL TOOLS FOR FTTH BUILD

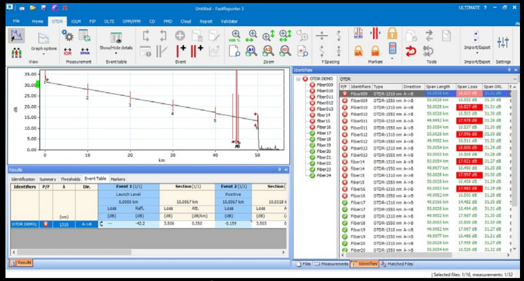
OTDR – Link length, link loss, link ORL, event loss, reflectance & location

OLTS - Continuity check, link length, link loss, link ORL,

CONNECTOR INSPECTION – Connector end-face conditions

REPORTING – Post-processing results and Close-out package preparation

VFL, LFD,…



OLTS VS OTDR

OLTS

Main advantage: testing time

MAX/FTBx-945 FasTest: certifies 2 fibers at 2 wavelengths in 2.6 seconds

OTDR

Main advantage:

- Can identify and locate problems (ex bad splices during build phase)
- Can be reused in the maintenance phase for troubleshooting

Some customers use both OLTS and OTDR to follow standards

Some customer use OLTS to certify and when it fails, they use OTDR to find cause of problem

Navigate, Update, Collaborate with ease

Connectivity for better visibility

FTB-LITE OTDR SERIES
with always-on connectivity

Streamlined compliance and automated validation: Automated job tracking and real-time reporting.

Enhanced collaboration and efficiency: Real-time data sharing, automated uploads, and cloud-based reporting.

Valuable insights: Automated access to comprehensive live data to perform analytics.

Free 36-month data plan	Seamless integration with EXFO Exchange	3-year warranty
Optical link mapper (OLM)	Large touchscreen	All-day battery autonomy

AXS MINI-OTDR SERIES

THE ACCURACY, RELIABILITY AND DURABILITY OF EXFO'S OTDRS IN A COMPACT DESIGN FOR THE FIELD.

Optical link mapper (OLM): Automatic analysis of multiple wavelengths with a consolidated icon-based link view.

Optimized display: Key results, settings, OTDR trace, linear view and the OLM—on a single screen.

Connectivity: Store and share test results, streamlines workflows, and ensures compliance via EXFO Exchange.

Swap-Out connectors: Avoid repair downtime with these field replaceable connectors.

Integrated testing essentials: In-line light source and power checker on the same port as well as a VFL.

MODELS:

AXS-120
Access/last-mile
34/32 dB

AXS-130
FTTH/PON
39/38/39 dB
Live and/or dark fiber

MAXTESTER 945

Optical loss test set (OLTS)

First tablet-inspired, multifunction optical loss test set (OLTS) delivering insertion loss, optical return loss and fiber length measurements at two wavelengths in five seconds via fully automated bidirectional FasTesT™ analysis.

- 100% automated bidirectional test at two wavelengths under 5 seconds
- On-board assistant and diagnosis to eliminate reference errors
- Best-in-class singlemode distance range of 200 km
- Optical return loss (ORL) measurement

No. 1 cause of network failures is contaminated connectors

- NTT-Advanced Technology Research

80% of network owners report having connector issues

FIP-500
Fiber Inspection Scope

Fastest and first inspection in the industry for single-fiber, multi-fiber and duplex connectors, with the most reliable results. Self-contained, fully automated tool for zero-button testing all day—without the need to recharge batteries or offload results.

Spot on every time.

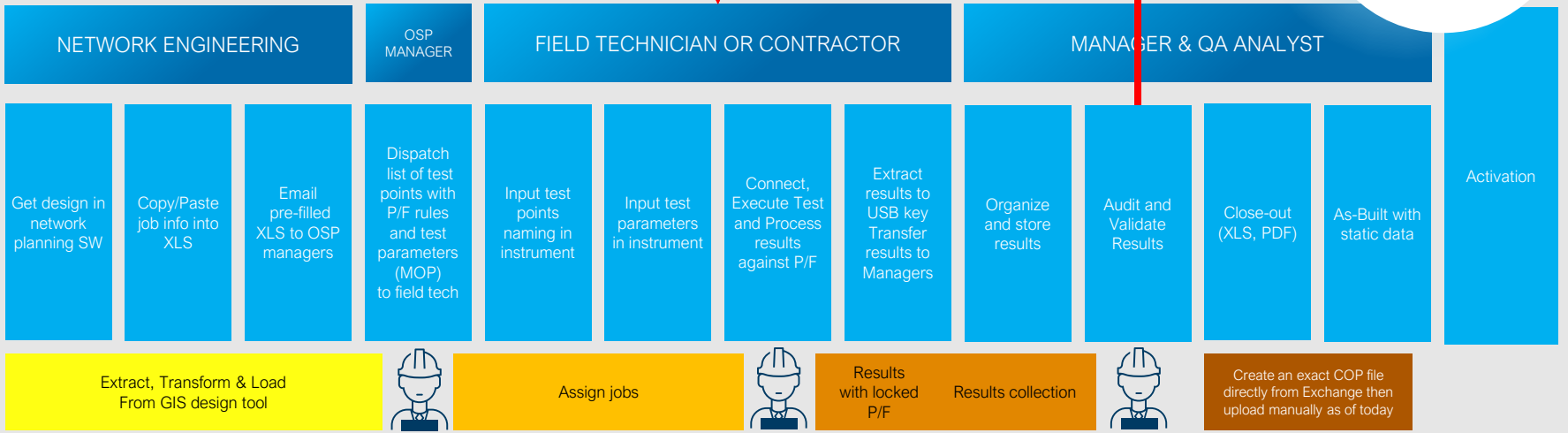
Equip technicians against the no.1 cause of outages.

- Supports single-fiber, duplex and multi-fiber
- 100% automated: zero-button operation
- Automated thresholds adjustment with SmarTips
- Lightning-fast operation

US FTTH WHOLESALE OPERATOR BUI

PROCESS – QA & DOCUMENTATION

AND WE ARE JUST STARTING!



JOB CREATION
FROM 8H TO 15MIN

TEST WITH RIGHT PARAMETERS / NAMING CONVENTION FIRST TIME =
LESS TRUCK ROLLS FOR RE-TEST

COP CREATION
FROM 30 MIN TO 2 MIN

REDUCED TRUCK ROLLS ON FAILED ACTIVATION
FROM 40% TO UNDER 10%

CITYFIBRE (UK) BUILD WORKFLOW EVOLUTION

A REAL-WORLD OUTCOME OF TEST PROCESS AUTOMATION

CityFibre

2011-2018
OTDR Testing without a test management platform

Average Test Process Time:
2-4 Weeks
(per neighborhood)

2019-2024
Initial workflow automation implementation

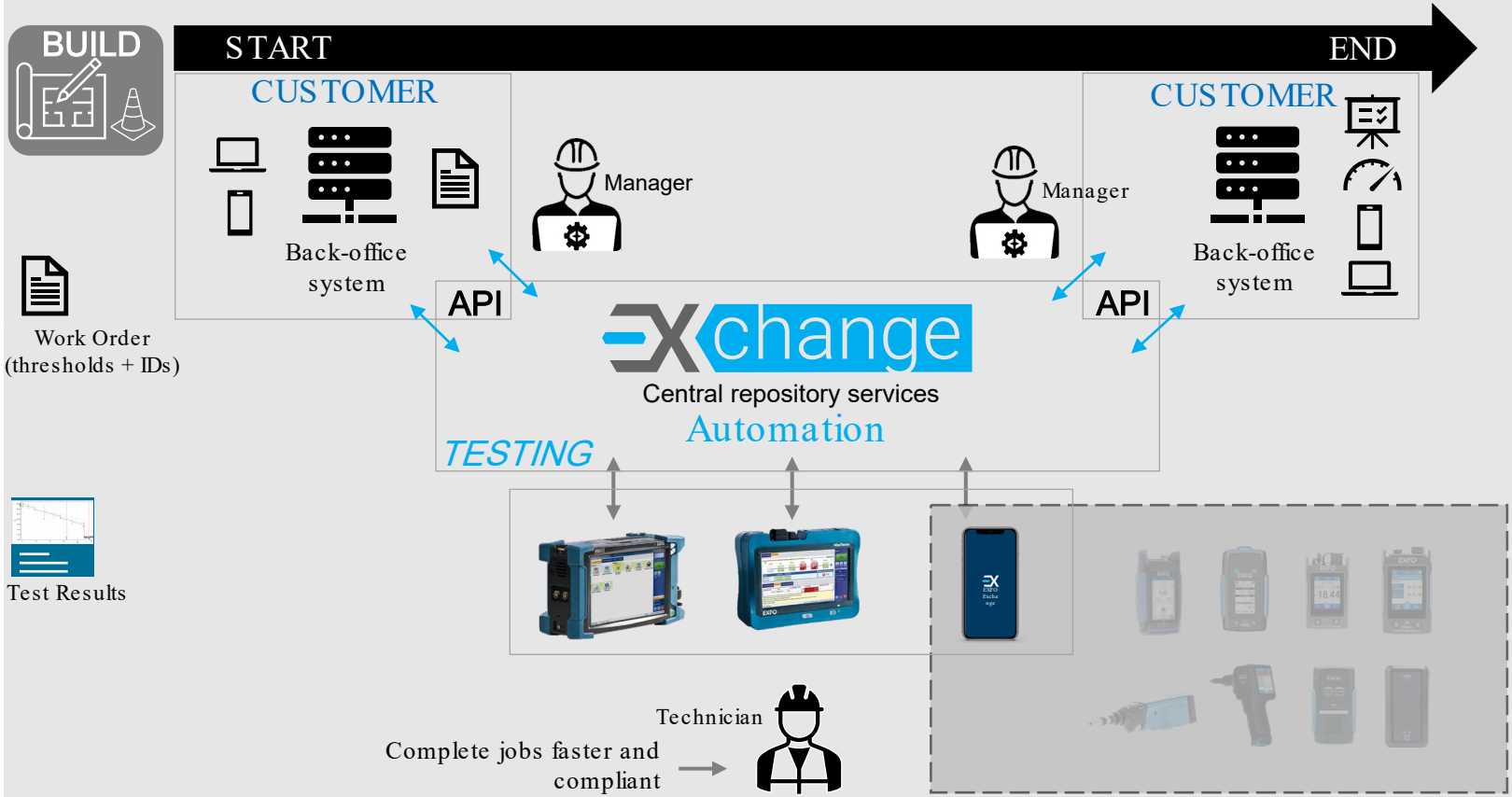
Average Test Process Time:
1-2 Weeks
(per neighborhood)

2024-2025
Enhanced workflow automation and APIs in & out Exchange

Average Test Process Time:
2-4 Days (4x Faster)
(per neighborhood)

Test Process = from test planning to test result acceptance

AUTOMATION: A STEPWISE APPROACH



FROM TEST PROCESS EFFICIENCY TO INSIGHTS GENERATION,

THE POWER OF DATA

"We have deployed 'EXFO Exchange' throughout our network because it remotely provides a fast, accurate picture of what's happening at any given location through cloud-based insight"

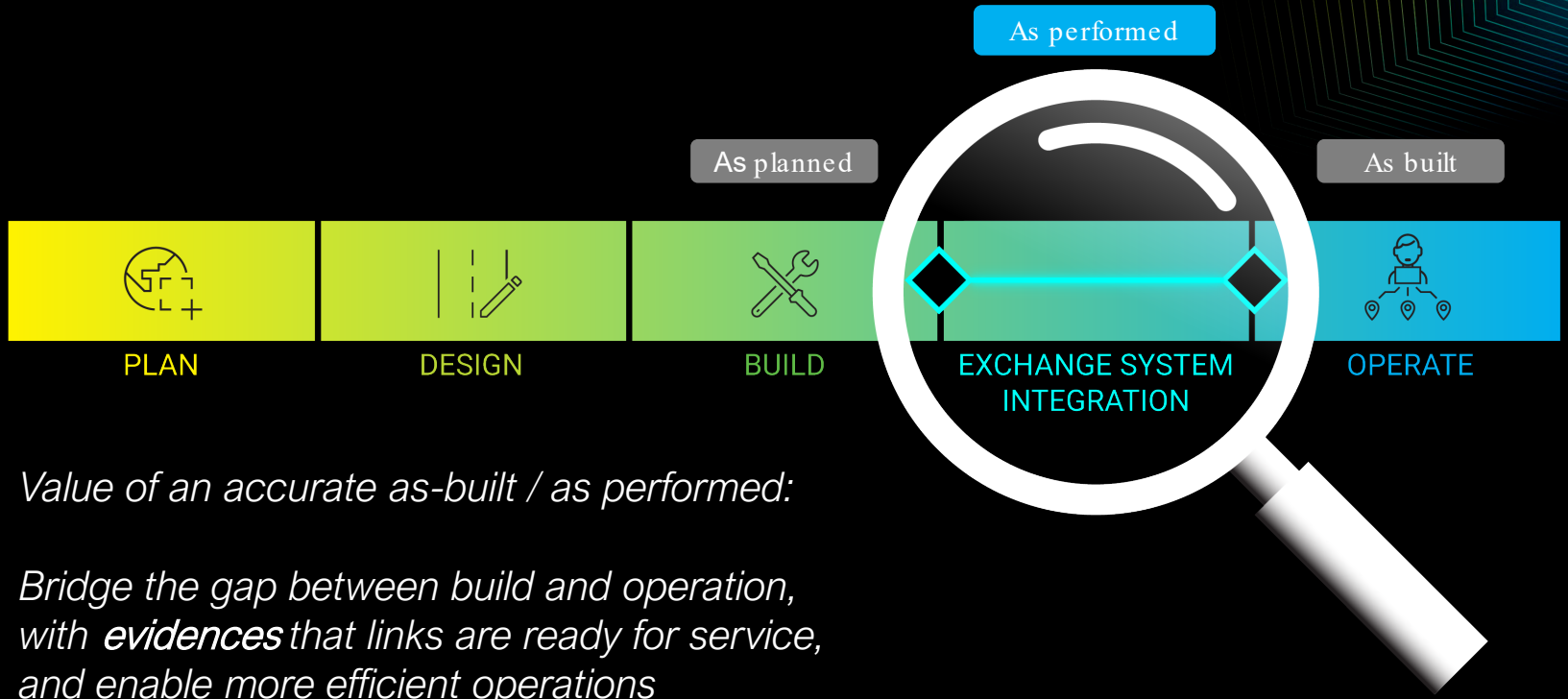
Tim Clark
Head of Passive Architecture and Engineering

CityFibre

- Enhanced Decision-Making
- Cost Savings and Maximised ROI
- Enhanced Customer Experience
- Improved Quality Assurance
- Competitive Advantage

CONNECT THE NETWORK LIFE CYCLES

WITH THE EXFO ‘AS PERFORMED’ DATASET



Value of an accurate as-built / as performed:

*Bridge the gap between build and operation, with **evidences** that links are ready for service, and enable more efficient operations*

ENFORCE COMPLIANCE IN ACTIVATION

TYPICAL TOOLS FOR FTTH ACTIVATION

PON POWER METER / POWER METER – Power levels

VFL – Red light

CONNECTOR INSPECTION – Connector end-face condition

OPTICAL FIBER MULTIMETER – Last mile link length/loss/ORL, Event loss / reflectance / distance, Power levels

SERVICE TESTER – Validate bandwidth speed, Wi-Fi, GPON/XGS-PON

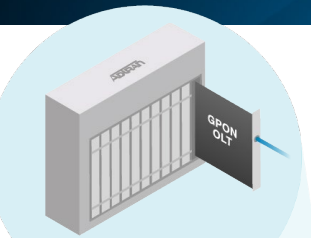
Power meters
Broadband and PON

With PON-aware™ to automatically detect and test next-gen and legacy PON technologies.

EXFO offers a series of power meters that can test both upstream and downstream signal or multiple services including GPON, EPON, XGS-PON and 10G-EPON technologies, as well as broadband.

PX1 | PPM1 | PPM-350D

Use case: GPON Only : Broadband power meter



OLT

ODF

FDC

1x4 splitter

FDP

1x8 splitter

Business office/
flat

House

PX1

PX1: Broadband power meter

- Robust and rugged IP54 pocket -sized design
- Auto -wavelength recognition and switching
- Tone detection
- 45 calibrated wavelengths

Measures

- Downstream power level →
- **NOT** Filtered per PON technology

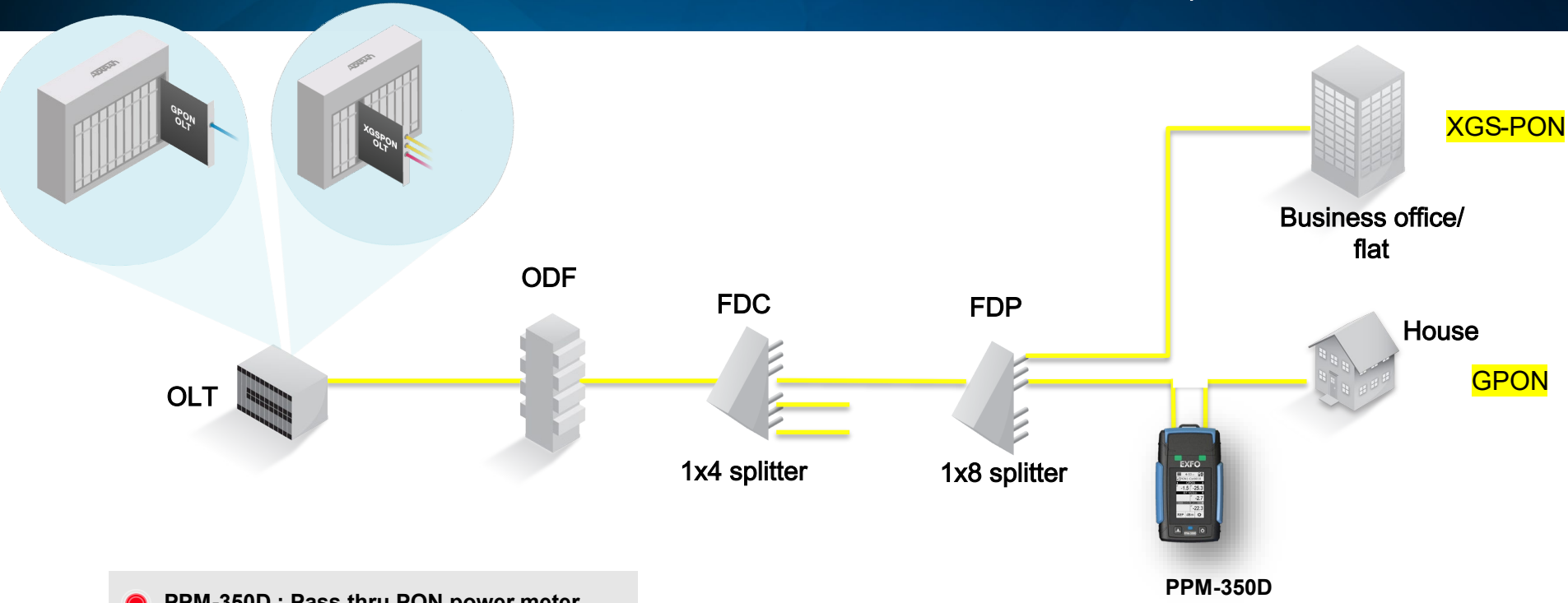
Pass-Thru PON power meter

For Multi-Layer service activation

1. Filtered detectors, permitting individual measurement of each wavelength
2. Pass-through connection allows the ONT and OLT to communicate with each other, so all signals are present. Measures upstream burst signal

EXFO : PPM-350D

Use case: GPON/XGS-PON Combo: Pass-Thru PON power meter

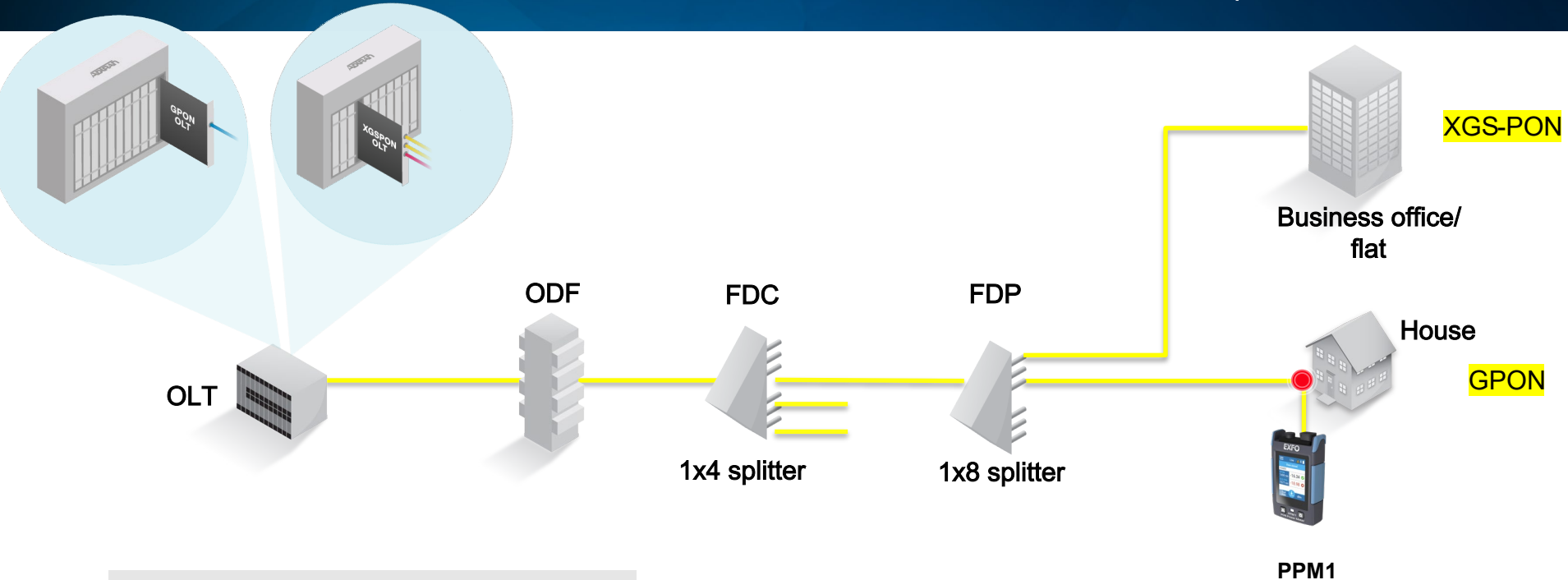


PPM-350D : Pass thru PON power meter

Simultaneously measures

- Upstream power level
- Downstream power level
- Filtered per PON technology

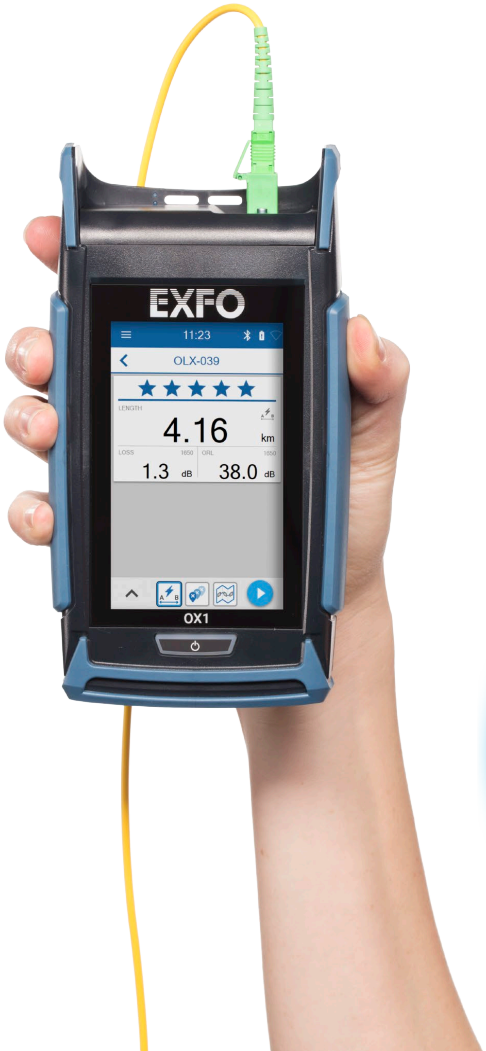
Use case: GPON/XGS-PON Combo: Downstream PON power meter



PPM1 : Downstream PON power meter

- PON-aware™ dual-layer tester
- Broadband power meter mode
- IP54 pocket-sized design
- Auto-wavelength recognition
- Tone detection
- 5 calibrated wavelengths

- Downstream power level →
- Filtered per PON technology



OX1:OPTICAL EXPLORER

Optical fiber multimeter

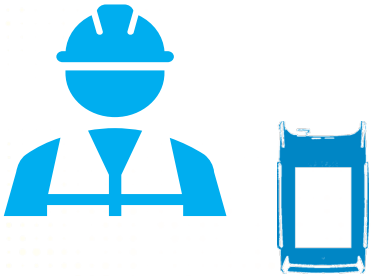
Fiber optic tester that performs link verification and automated fault tracking in seconds. Empowering frontline technicians to explore further and do more.

No settings required make it an essential for any frontline technician's toolkit.

Evaluate the quality of fiber links in seconds.

- Click-Out optical connectors
- Displays fiber length, loss and optical return loss (ORL) in under 3 seconds
- On-the-spot detection and location of common causes of failures
- Built-in power checker and light source

What is an Optical fiber multimeter ?

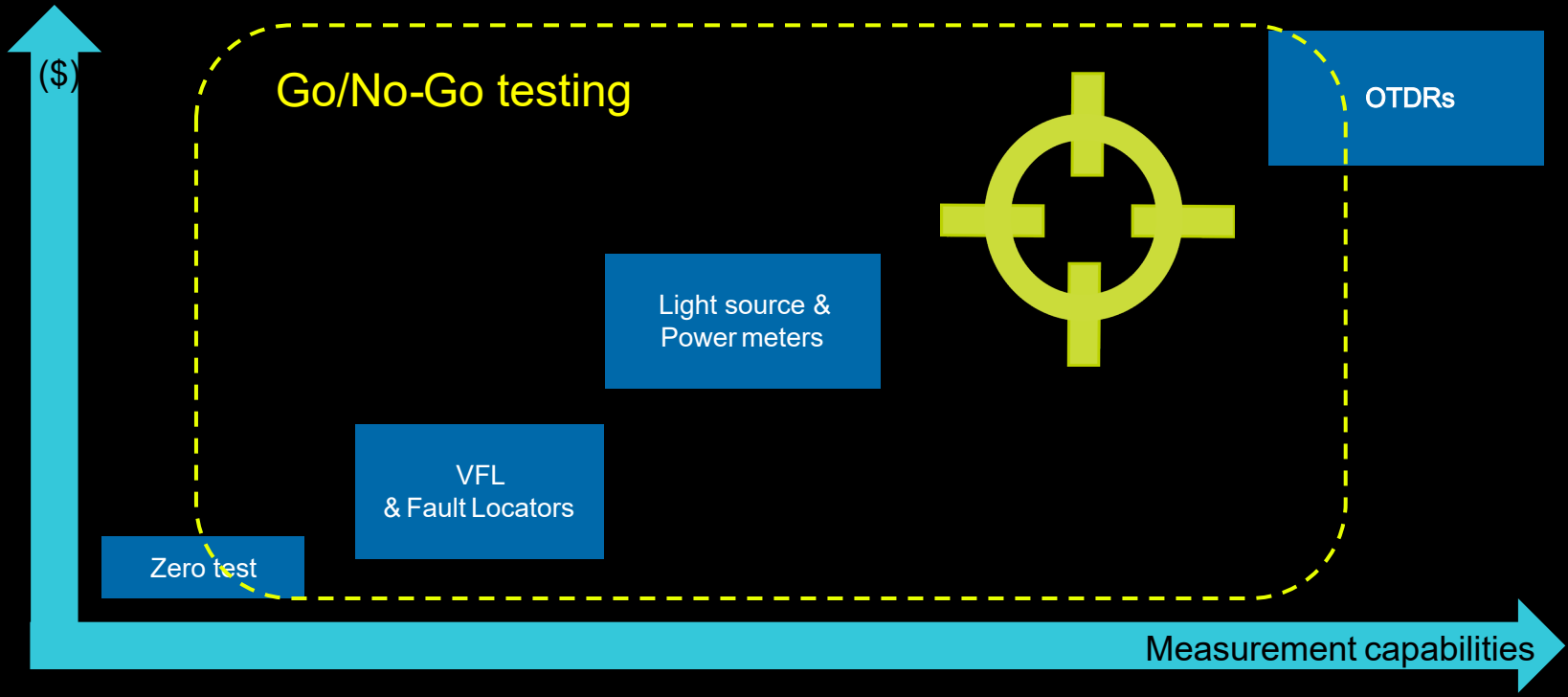


A complete tool set in a single unit:

- Power checker, to measure the OLT downstream signal
- A light source with tone to trace fiber
- Flash advisor, Link loss, ORL and fiber length in a few seconds
- Fault finding capabilities up to the splitter
- Link mapping of the good and bad events

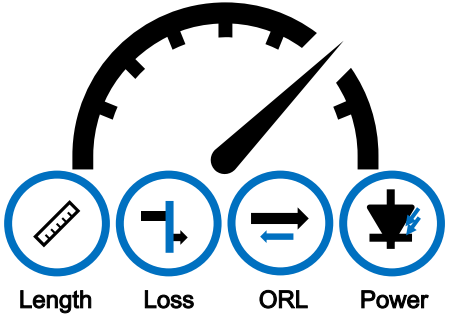
Simply press **“Play”**, no setup of configuration required

Targeted Field of Play



Key Benefits

Empowers the frontline fiber optic technicians

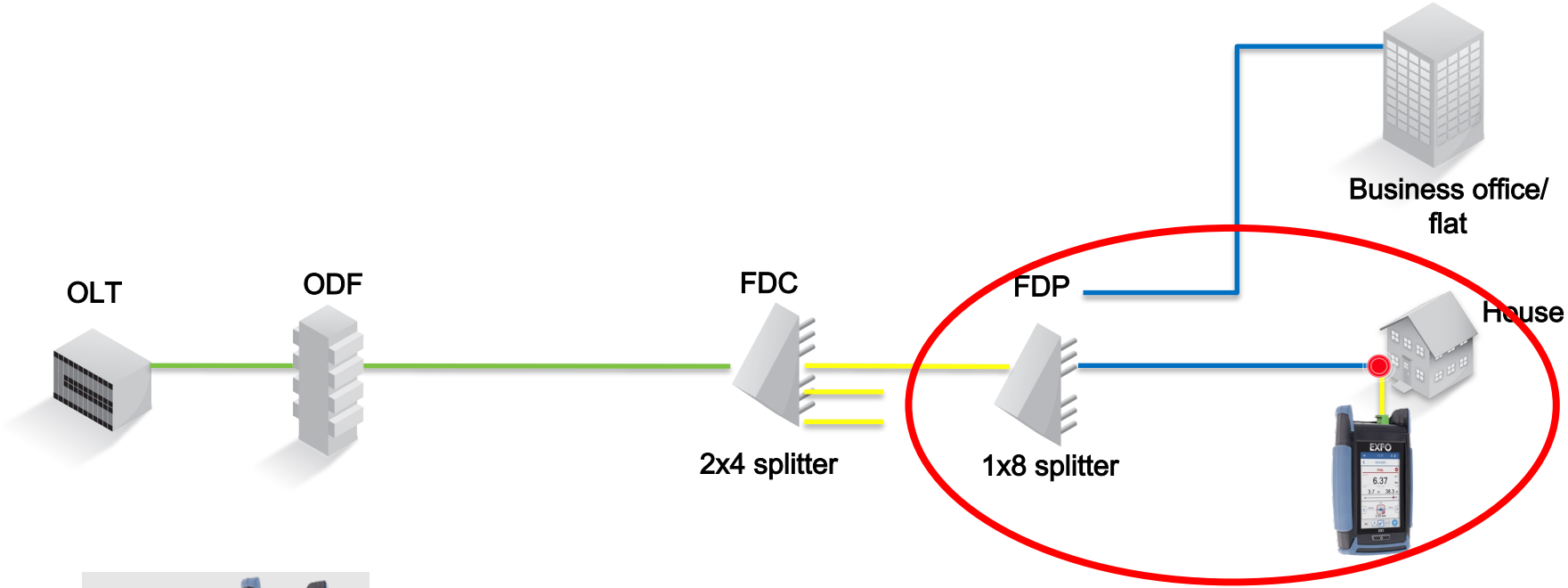


Quickly measures key optical parameters

Assesses fiber link health

Facilitates troubleshooting

Use case: OX1



(OX1)

Optical Fiber Multimeter

EX Series

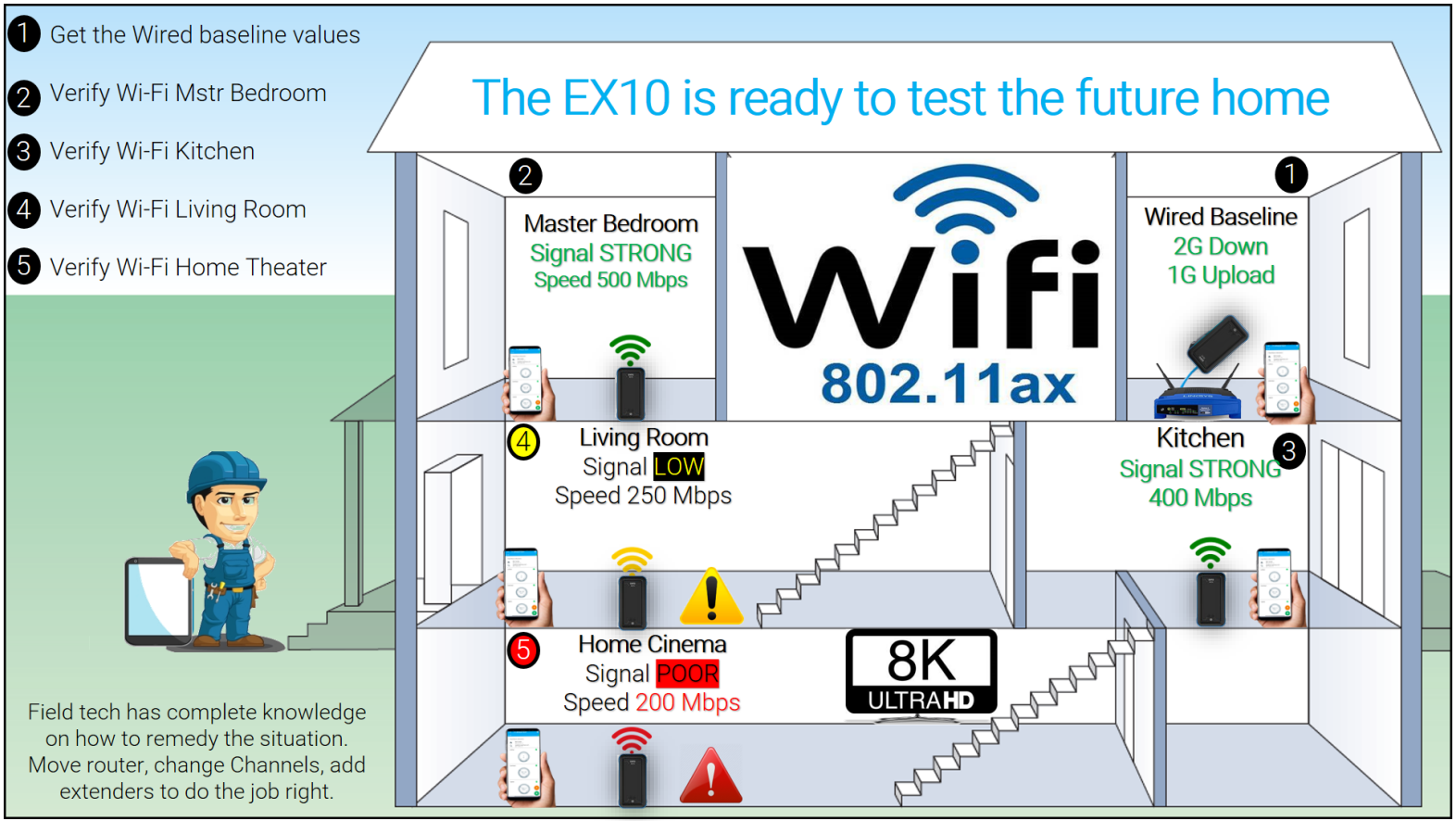
Residential and business services testers

Multigigabit, GPON, XGS-PON, Wi-Fi testing solution

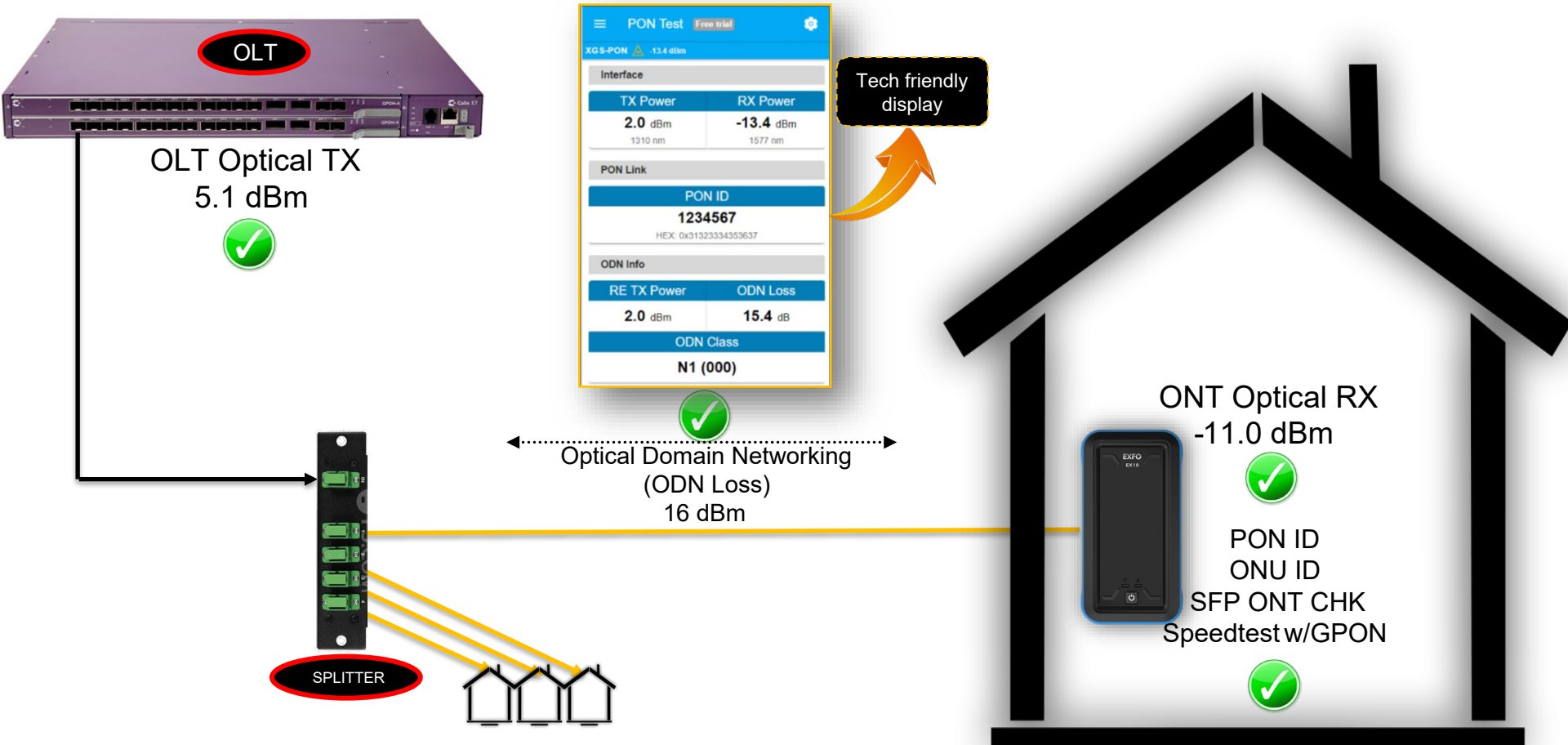
Validates bandwidth speed up to 10 gigabit ethernet, emulates GPON ONT, fully tests residential Wi-Fi 6E and monitors both residential and business quality of experience.

Simple | Open | Carrier-grade | Multipurpose

Residential use case (above 1G, 4K, 8K & WiFi 6E)

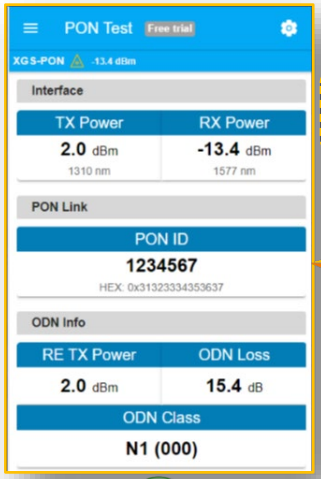


GPON & XGS PON ONT Emulation



GPON & XGS PON ONT Emulation

OLT Optical TX
5.1 dBm



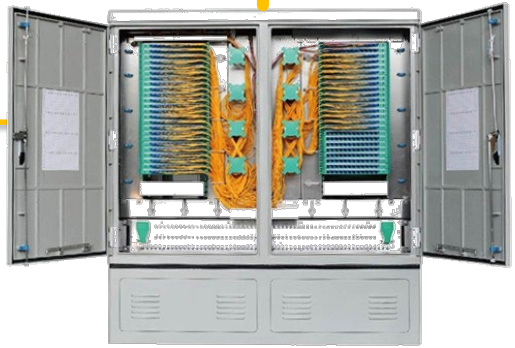
Tech friendly display

Optical Domain Networking
(ODN Loss)
16 dBm

ONT Optical RX
-11.0 dBm

PON ID
ONU ID
SFP ONT CHK
Speedtest w/xPON

SPLITTER



TESTING BEYOND NO/LOW LIGHT MANUAL CHECK

TEST PROCESS AUTOMATION IN SERVICE ACTIVATION TO

1. Enforce compliance in the field
2. Collect data for continuous improvement
3. Collect data for accurate as-built

ENFORCING COMPLIANCE IN THE FIELD

REAL-LIFE EXAMPLE FROM RESIDENTIAL ACTIVATION

CONNECTED PON METER WITH JOB MODE FEATURING EACH STEP OF THE MOP

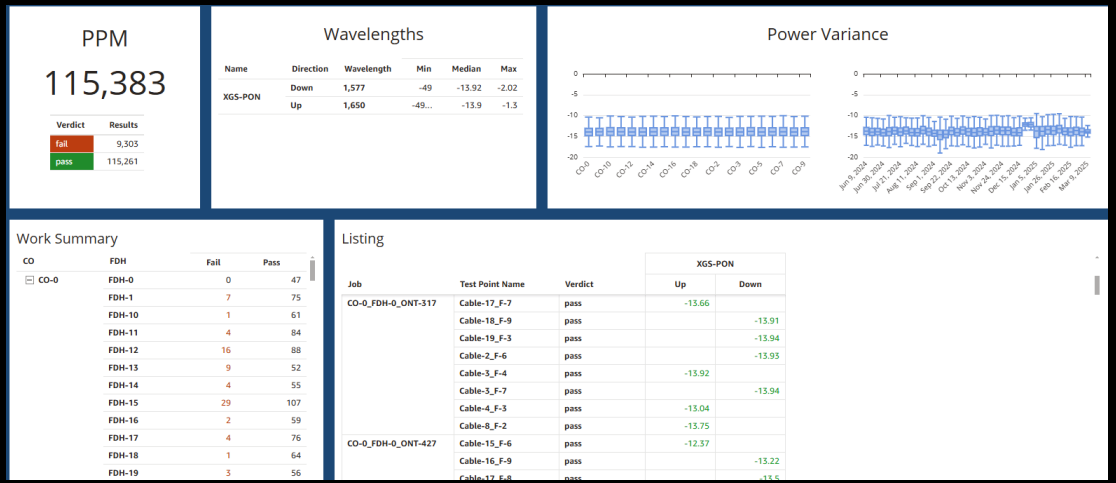
Technician receive digital job with predefined naming
-> no manual typing and related errors

Technician must confirm each step to close the job,
-> ensures compliance and improves installation quality

Contextualized test data automatically uploaded
-> data captured effortlessly and without delay

COLLECT DATA FOR CONTINUOUS IMPROVEMENT

ACTIONABLE ANALYTICS



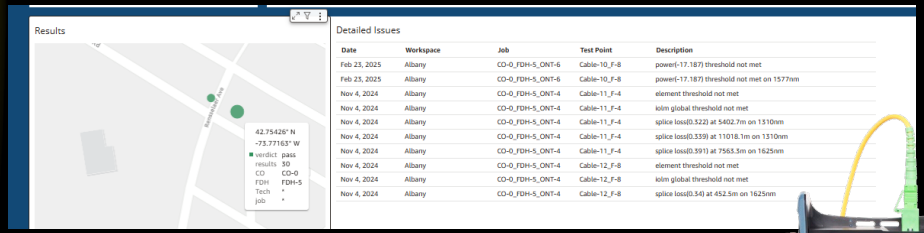
EXAMPLE OF DATA-DRIVEN CONTINUOUS IMPROVEMENT:

- Identify best-performers (individuals or regions) for best practice sharing
- Better resource optimization
- Identify patterns from low-performers (bad components or equipments? training requirement?…) to address most impacting weaknesses
- …

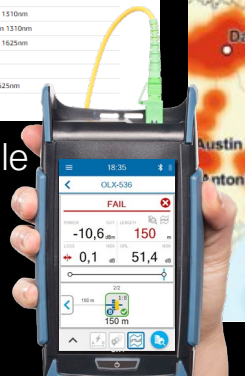
COLLECT DATA FOR ACCURATE AS-BUILT

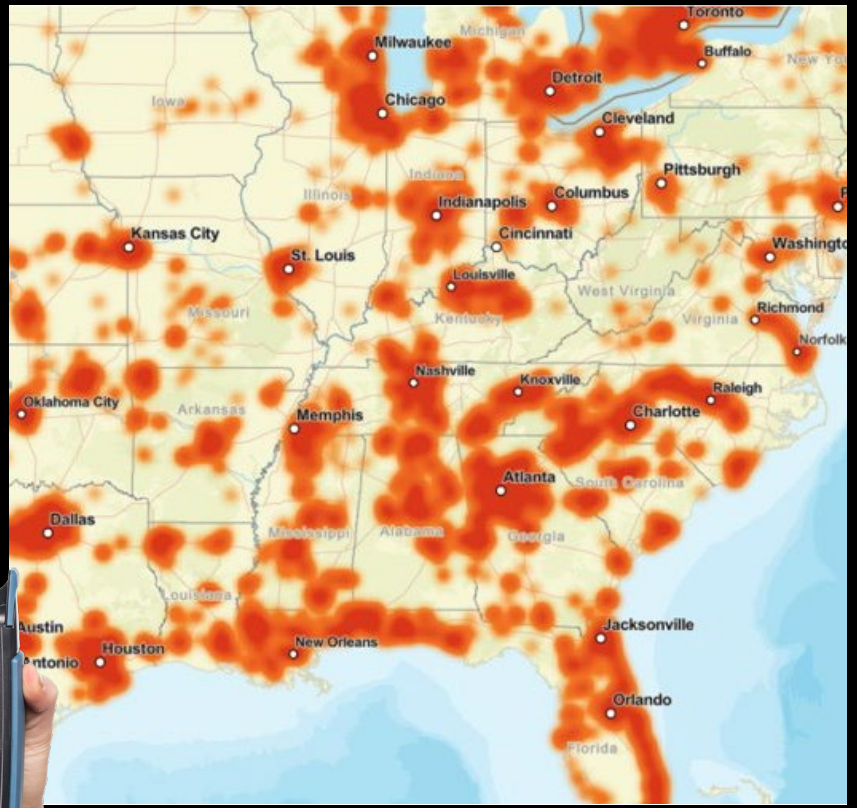
EXAMPLE OF GEO-REFERENCED TEST LOCATIONS

- Improve exact location of drop terminal & home based on GPS added to the test result
- Add picture to the test job to attach to your network documentation



- Exact optical spec of last mile / drop cable (length, loss, etc…) with Optical Fiber Multimeter, in addition to power levels





AUTOMATION IN OPERATION & MAINTENANCE

TYPICAL TOOLS FOR FTTH OPERATIONS & MAINTENANCE

LIVE OTDR – Link length, link loss, link ORL, event loss/reflectance/ location

OPTICAL FIBER MULTIMETER – Last mile link length/loss/ORL, Event loss/reflectance/distance, Power levels

PPM / PM – Power levels

INSPECTION – Connector end-face condition

VFL – Red light

REMOTE OTDR – CO-based OTDR with optical switch (RFTS)

CHALLENGES CALLING FOR AUTOMATION IN OPERATION AND MAINTENANCE

TTR

Time-To-Repair takes time : fault isolation, demarking & fault localization in case it is fiber related.
But also test after repair !

As-Built/ Documentation

Inaccurate cable & fiber documentation is frequently raised as #1 problem in operation and maintenance

Intermittent issues

Cable attenuations, splices and connections losses subject to environment & mechanical stresses, they come & go

NETWORK UPGRADES TEST REQUIREMENTS

- Higher rates PON can support higher split ratio, this impacting the loss budget. Loss/Power validation becomes important
- Higher bandwidth will be more sensitive to connector cleanliness, connector inspection becomes event more important
- Customer paying more for higher bandwidth will want proof that they get the service they pay for: EX speed testing
- First targets for higher rates are business who might have SLA requiring testing proofs.

KEY TAKE-AWAYS

NETWORK AUTONOMY
as the guiding principle for cost efficiency and scalability.

TEST STRATEGIES PLAY CRUCIAL ROLE
throughout the network lifecycle by enhancing quality and generating the data needed to achieve autonomy.

AUTOMATING TEST PROCESSES
is key to reducing testing costs.

THANK YOU!

Guillaume Lavallee
M +1-418-997-5458
Guillaume.lavallee@EXFO.com
EXFO.com

TRS RenTelco℠ EXFO

The TRS & EXFO Partnership

sales@trs-rentelco.com
800.874.7123

- *EXFO Rental Partner* with an expansive inventory and a full range of acquisition options:
  - Short and Long-Term, Full-Service Rentals (overnight exchanges available)
    - Minimize user downtime
  - Operating Leases
  - Sales of NEW equipment through distribution sales
  - 0% Financing for New and Certified Pre-Owned Equipment

Call us today for a free consultation to see how we can help!

800.874.7123

Questions?

EXFO

TRS RenTelco℠