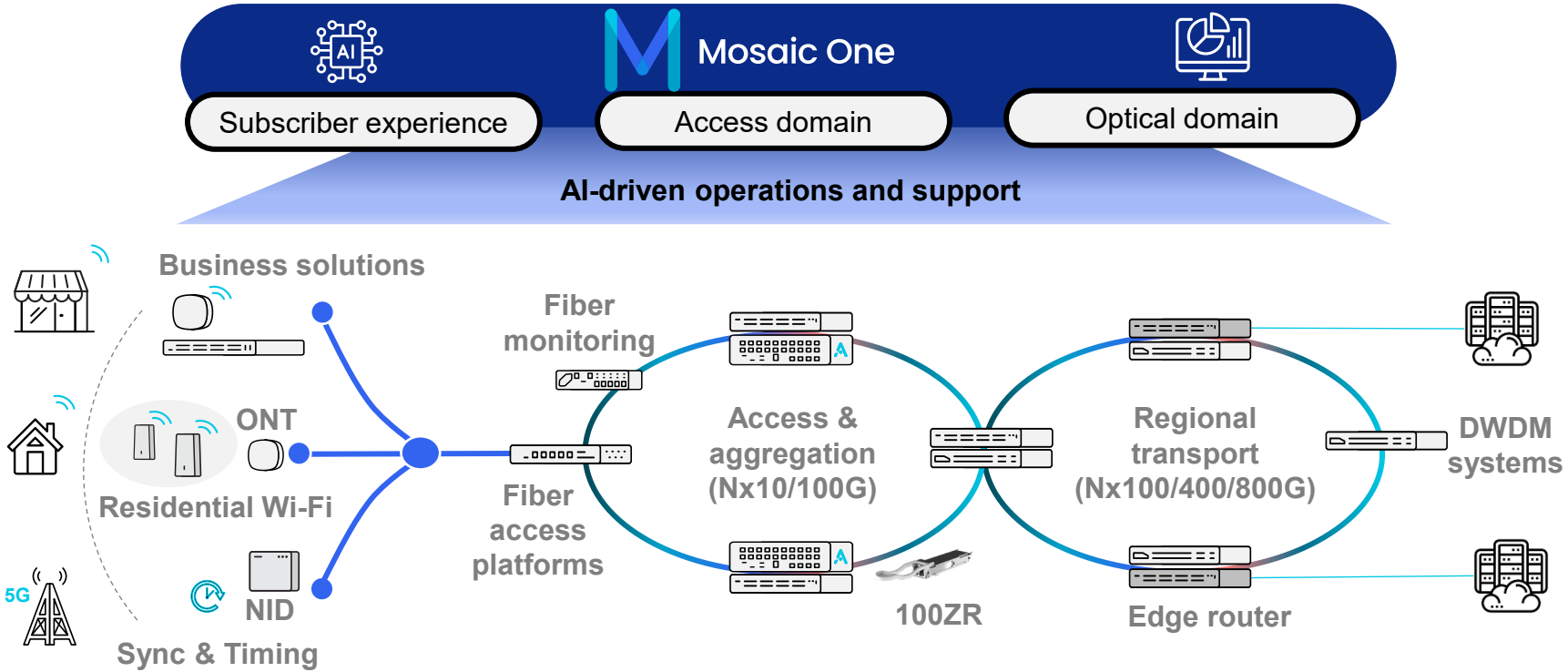
Adtran

# Protecting your network with 24/7 in-service fiber monitoring

## Improve network availability and reduce costs

August 2024

# Your trusted partner for fiber networking, operations and support



# Why Adtran infrastructure monitoring?

# Do you know your fiber?

What‘s the current ***real*** quality of your fiber?

In case of a fiber break, ***how long*** would it take you to find out where it happened exactly?

Can you **track** fiber link performance over time?

Can you accurately track fiber splicing quality from a **central location** after repairs?

Would you be **notified** of potential physical infrastructure malicious attacks or eavesdropping?

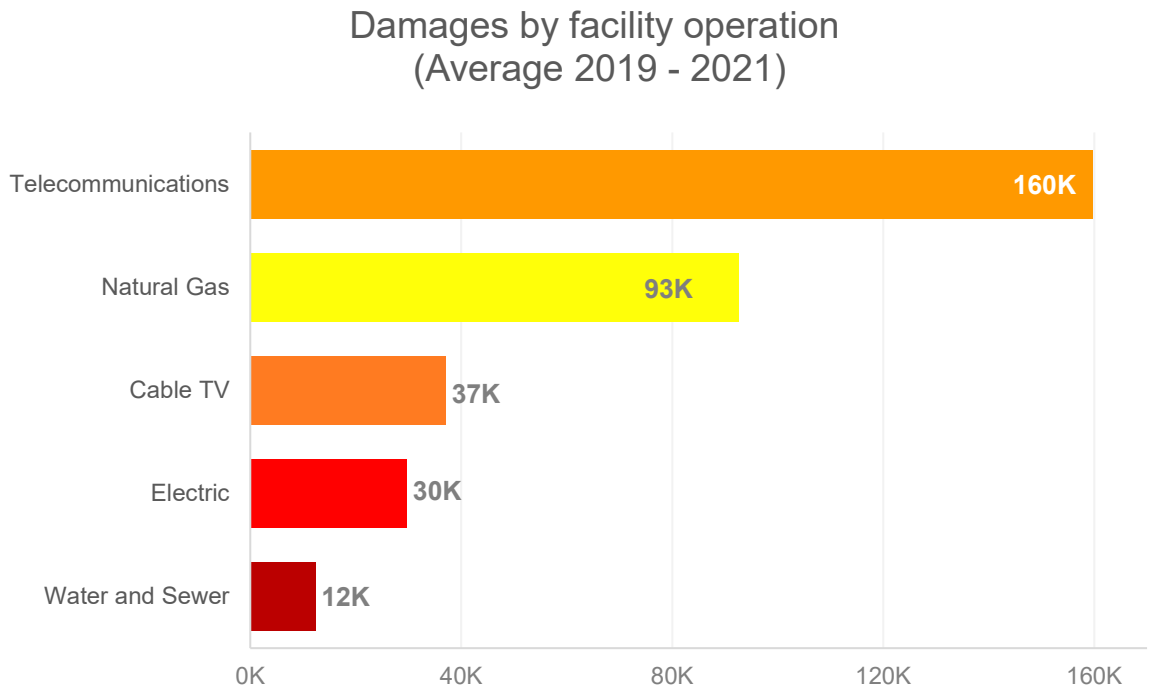
Fiber eavesdropping

Fiber or splice degradation

Fiber break

ACCORDING TO CGA, DAMAGES TO BURIED FACILITIES IS A $30B ISSUE!

# 430+ telecom infrastructure damages daily in NA



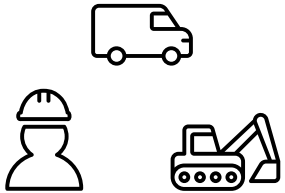

Source: https://commongroundalliance.com/Publications-Media/DIRT-Report (2019-21 Reports)

REAL AND COSTLY PROBLEM WITH RAPID GROWTH

# False and unplanned truck rolls

## 25%

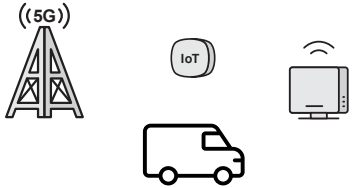
### Faults in fresh installs



- Poor installation quality
- Incorrect documentation
- Substandard components
- Improper network design

## 70%

### No fiber fault found




- Electronic failures
- Upper layer network protocols
- Improper access rights/configuration
- Intermittent failures (flapping)

COST-EFFICIENT, SCALABLE AND RELIABLE IN-SERVICE MONITORING

# Adtran's infrastructure monitoring (AIM) solution

- 24/7 in-service fiber link monitoring
- Independent of any transport speed, protocol, or system vendor equipment
- Based on well-established OTDR technology
- Automated real-time fiber fault detection localization and notification
- Identifies fiber faults vs. electronics as source of network outages
- Provides monitoring of facility access, physical assets, and environmental condition

Ensemble Fiber Director

ALM

Passive sensors

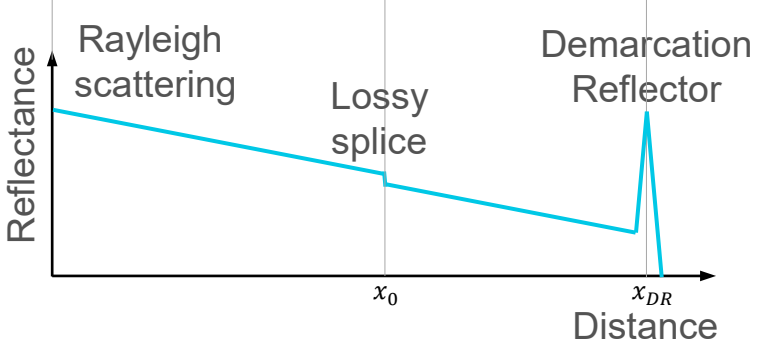
REAL-TIME GEOGRAPHICAL INFORMATION WITH MULTIPLE NOTIFICATION OPTIONS

# Exact real-world fault location within seconds

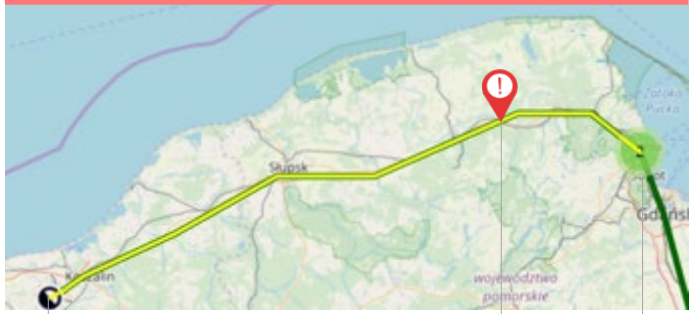
Ensemble Fiber Director

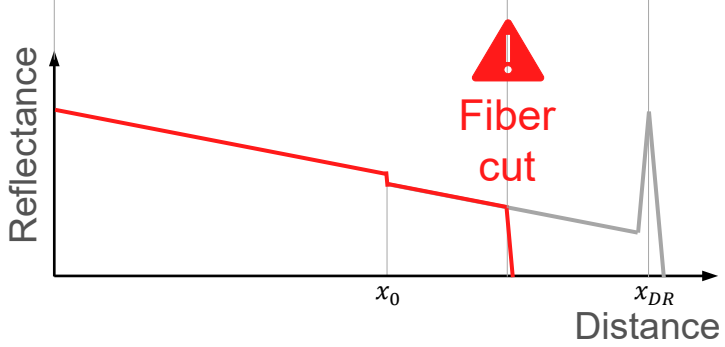
ALM monitor unit

## Normal operation


## Fiber-cut detection

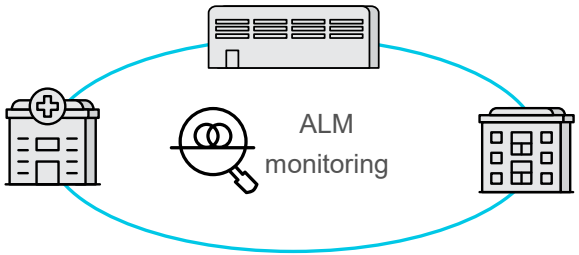


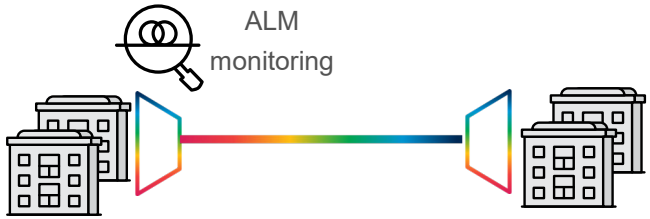
VENDOR, SPEED AND TECHNOLOGY AGNOSTIC

# For carriers, service providers, enterprises, utilities

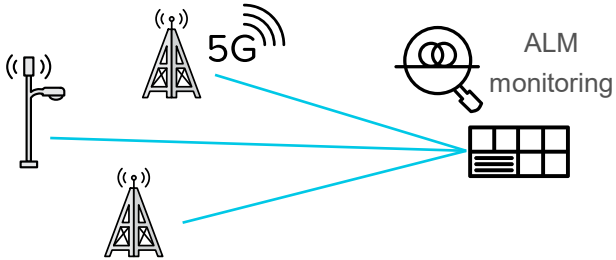
## Dark fiber



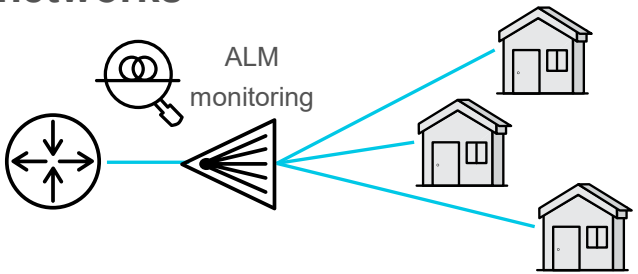

## DWDM systems



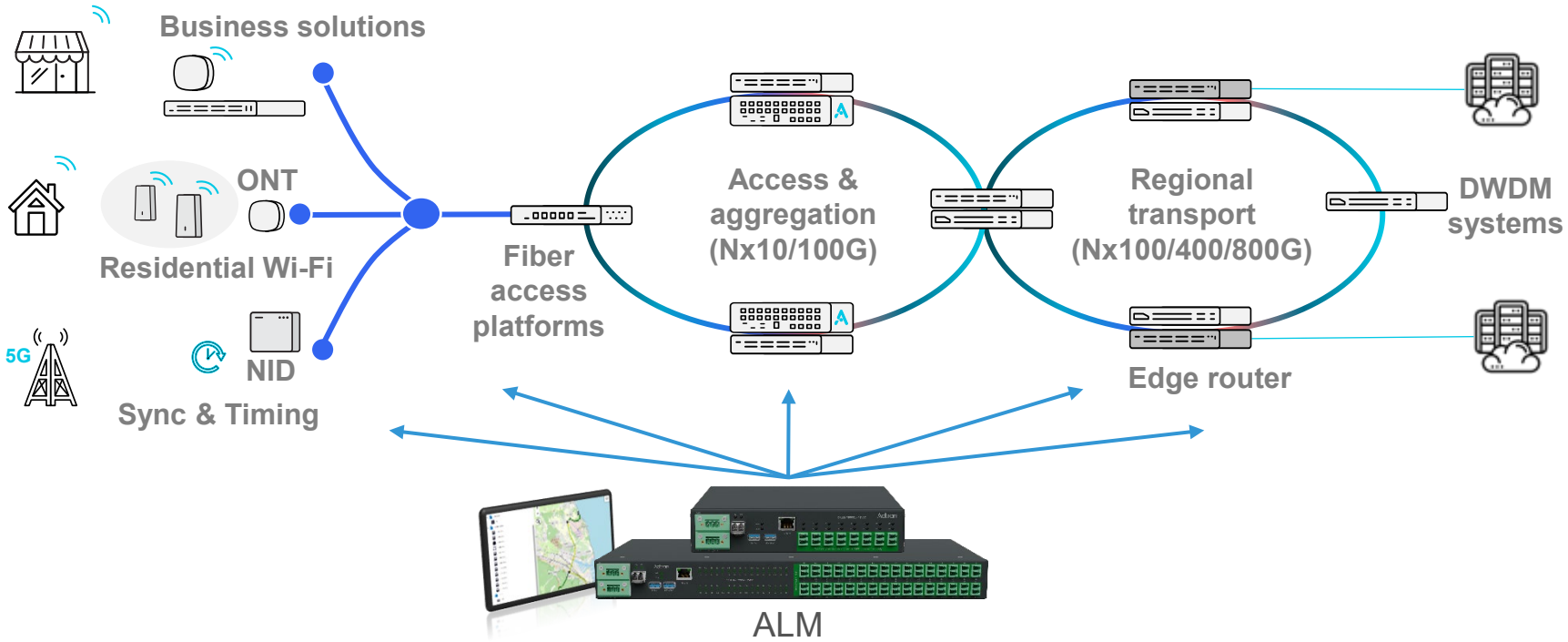

## Mobile fronthaul and backhaul




## PON networks



# Cross domain infrastructure monitoring



# Your benefits with Adtran infrastructure monitoring

# Your benefits with Adtran infrastructure monitoring

## Proactive assurance

- 24/7 fiber monitoring (dark or lit fiber)
- Monitor the impact of harsh environments
- Isolate root cause: fiber or end equipment?

## Business benefits

- Optimize fiber utilization
- Upsell differentiated services
- Improve installation and turnup


## Intrusion protection

- Protect against hackers
- Safeguard against vandalism and accidents
- Secure your enclosures against trespassing and environmental conditions

## MTTR & opex reduction

- Reduce downtime through accurate use of truck rolls
- Drive installation, documentation and troubleshooting efficiencies in outside plants
- Guarantee SLAs



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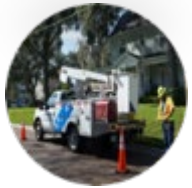
# ALM simplifies operations and reduces opex

**Minimize MTTR**

- Real time fiber fault detection, localization and notification
- OSP team dispatched to exact location



**Eliminate false truck rolls**

- Identifies fiber vs equipment as a source of an outage
- Helps ensure that the right team equipped with the right equipment is dispatched

**Identify guilty party**

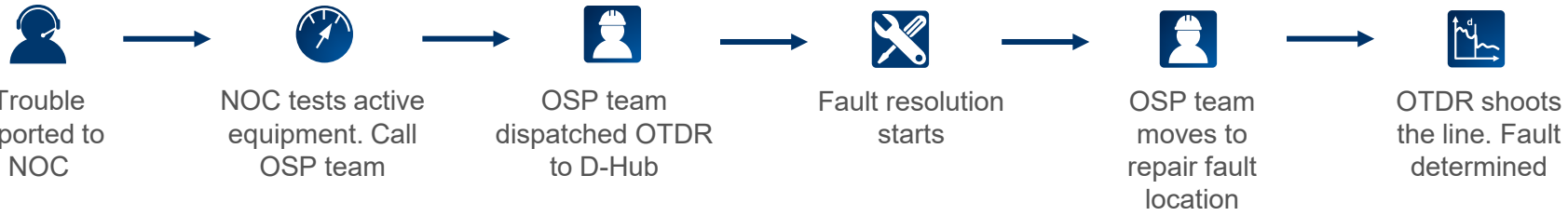
- Rapid fault identification and localization help catch culprits on-site
- Enables possible restitution from the guilty party




OSP = outside plant

# ALM significantly reduces mean time to respond (MTTR)

## Without ALM



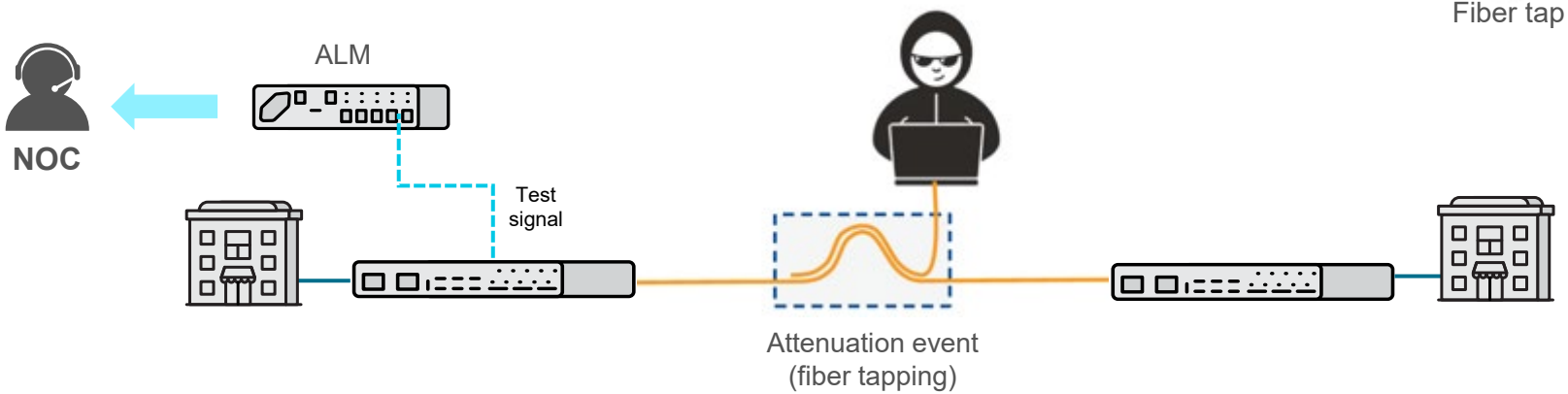

## With ALM

OPTICAL FIBERS TRAVERSE UNPROTECTED LOCATIONS

# ALM detects fiber tapping

- Fiber tapping can be carried out with the use of a clip-on coupler
- This attack vector can be efficiently monitored by the ALM as an attenuation event
- Fault location is available as well to rapidly deploy field services

Fiber tap



# How does ALM work?
# Solution components

MONITOR UNIT

# ALM

## Compact and low-power solution

Monitoring of up to 64 fibers per 1RU ALM device
AC and DC power options

## Real-time information

Fiber integrity measurement takes 2 to 5 seconds
GUI, CLI, SNMP, NETCONF, GIS, & email mgt support

**16-port ALM**


**64-port ALM**

## Precise fault location

Integrated in many geographic information systems (GIS) and Adtran Ensemble Fiber Director

## Low-maintenance solution

No calibration required; fanless design helps decrease operational costs



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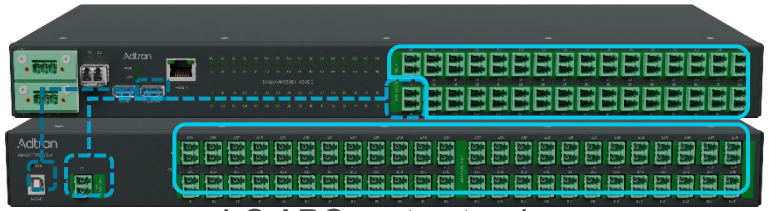
CONFIGURATION EXAMPLES*

# Port extenders for high density solutions

## Up to 158 monitoring ports in 2RU

- LC-based port expansion
- ALM64 + LC APC port extender
- 158 (62+96) fiber monitoring ports

64ALM



LC APC port extender

## Up to 392 monitoring ports in 1RU

- MPO-based port expansion
- ALM16 + MPO port extender
- 392 (8+384) fiber monitoring ports

16ALM MPO port extender

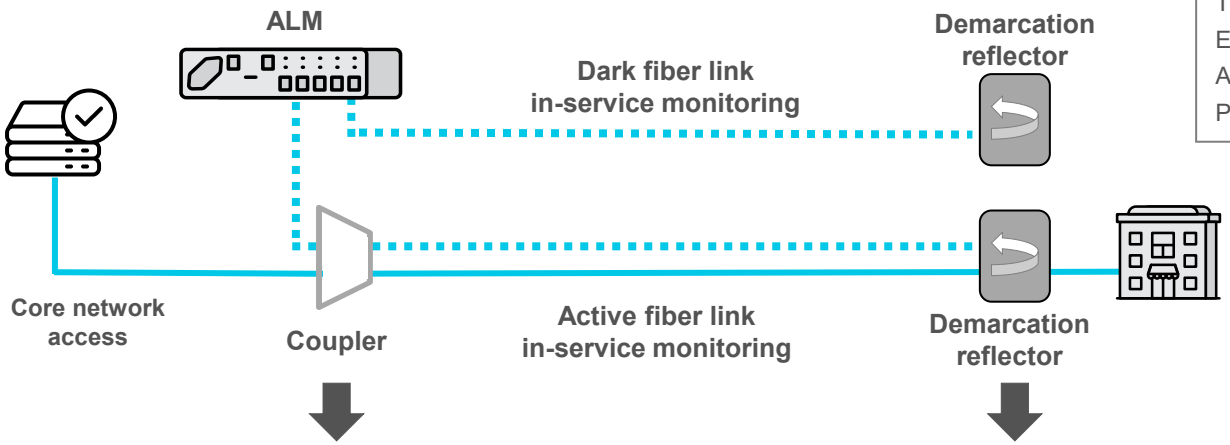
*Port extender units can be used with either ALM16 or ALM64

ALM EASILY INTEGRATES INTO YOUR NETWORK

# Point-to-point network monitoring

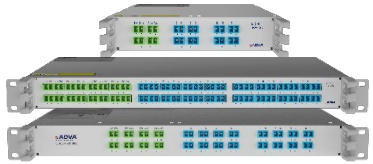
## PTP ALM specifications

| | |
|---|---|
| Test signal: | 1650 nm |
| Distance range: | up to 160km |
| Dynamic range: | 41dB |
| Power consumption: | up to 13W |
| Temperature range: | -5 to 55°C |
| Event dead zone: | 0.8m |
| Attn. dead zone: | 4m |
| Passives: | ~0.5 dB per |




## WDM coupler

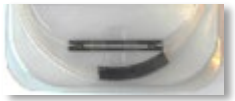
Y cable



Rack mount
variants

## Demarcation reflector

Plug-In
LC, SC, APC, UPC

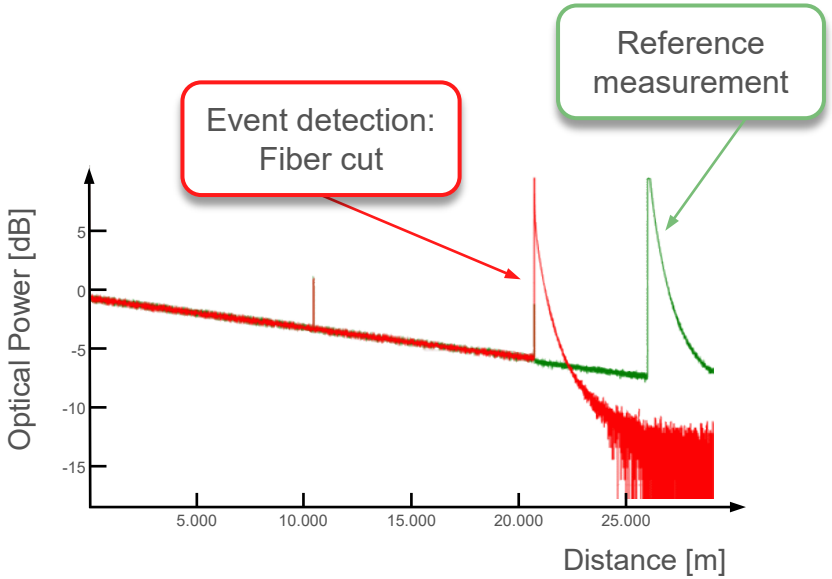


Splice in

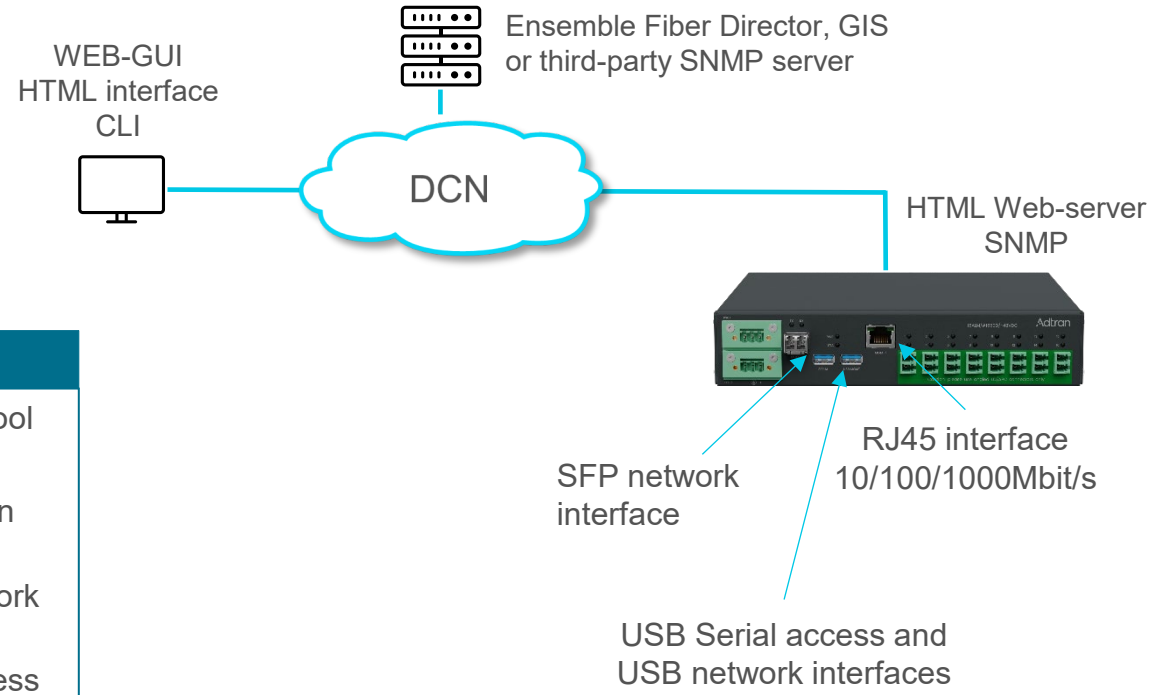
# How does ALM work?

Automatic alarm generation based on events

- The reference measurement is used for comparison (fingerprint)
- A list of reflective optical events with associated distance per fiber link is created
- Measure compared to baseline and cuts and/or alarm thresholds crossed creates event and notification



# ALM management




## Configuration and monitoring support

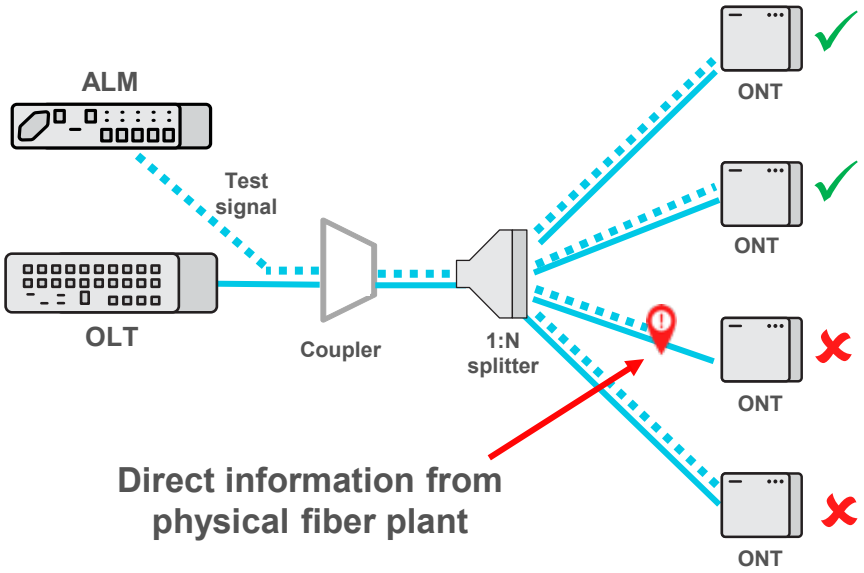
- Embedded Web browser management tool
- Multi-user support
- Syslog, RADIUS, TACACS authentication
- Secure HTML web-interface for direct control over the ALM and review of network status
- Robust SNMP v3 support, SSH CLI Access
- Event notifications via SNMP and email
- NETCONF (Yang models)

# ALM deep PON assurance

Innovative solution for 24/7 monitoring of PON networks without reflectors

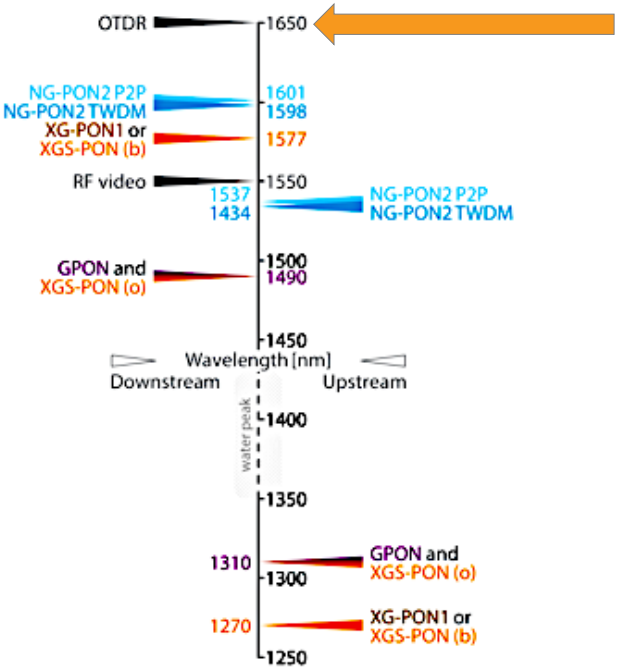
# ALM deep PON assurance (DPA)

- 24/7 in-service, non-intrusive PON monitoring even beyond splitters
- Industry-first and only **reflector-less solution**
- Supports all PON generations
- Provides direct fiber plant status vs. upper layer management protocols supported by OLT and ONT
- Greatly reduces the cost per ONT monitored
- Eases installation tasks and stocking
- Eliminates optical loss of reflectors



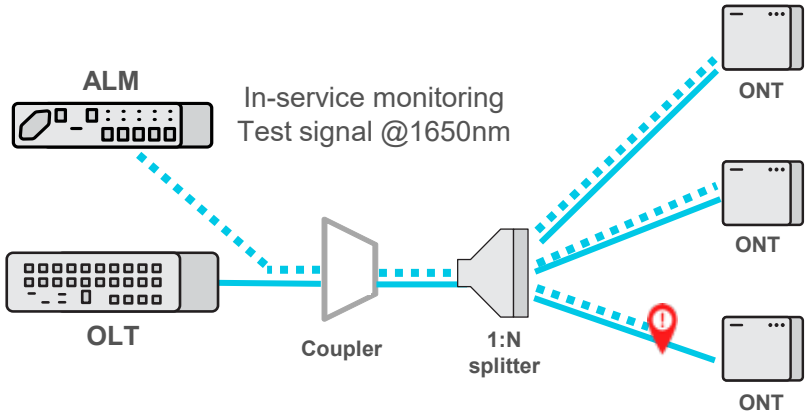
SUPPORTS LEGACY AND FUTURE PON IMPLEMENTATIONS

# 24/7 in-service and non-disruptive PON monitoring



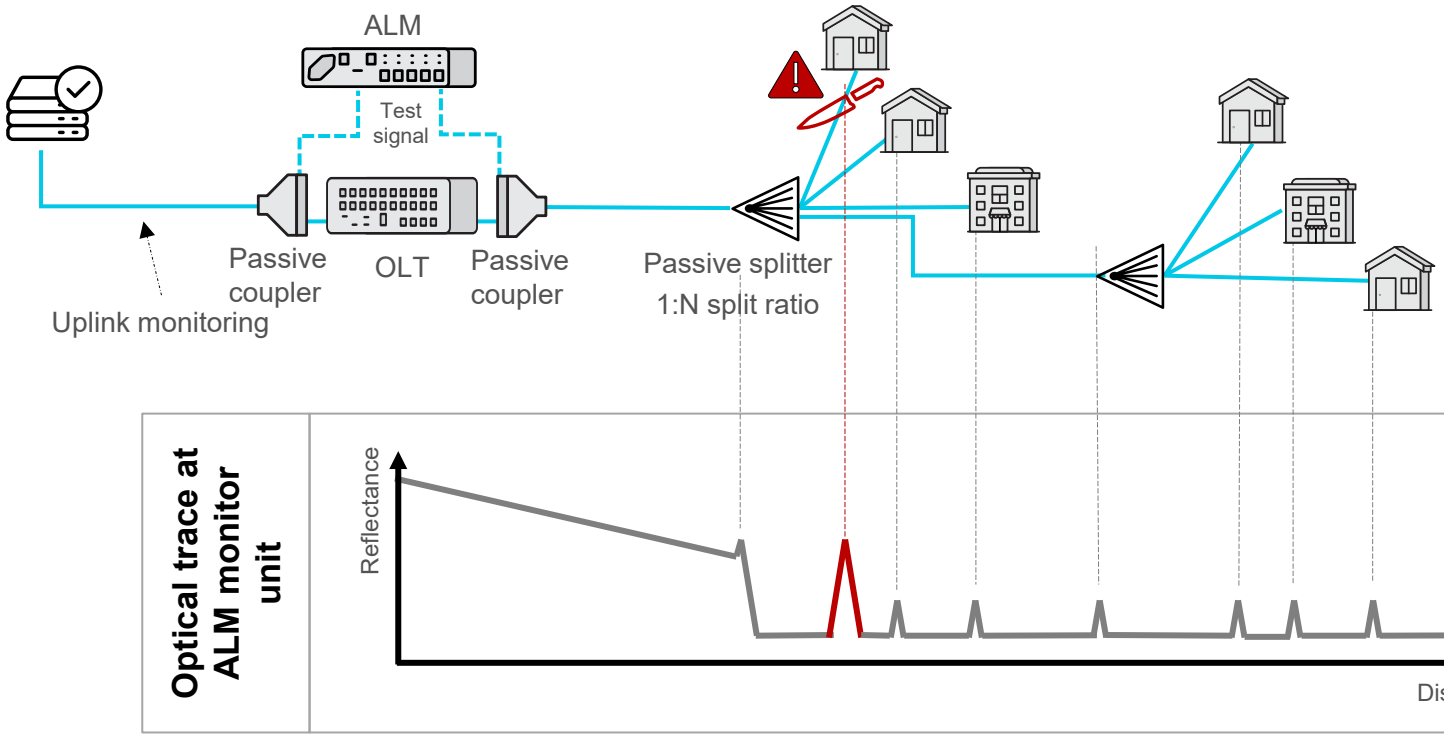

Assignment of wavelengths to GPON, XG-PON1, XGS-PON, NG-PON2, RF video overlay and OTDR

- 1650nm operates outside PON wavelengths
- Fiber monitoring can be performed while network is operational
- No need to take network offline or schedule maintenance windows



ALM IS ABLE TO “SEE” BEYOND THE SPLITTER

# ALM with deep PON assurance (DPA)



MINIMIZE OPERATIONAL COSTS

# ALM supports all phases of the network lifecycle

## Build

- Step-wise measurements
- Verify build-to-plan
- Detect damage after build

## Provision

- Birth Certificate per ONU
- ONU detection/localization
- Simplified troubleshooting

## Operate

- Performance monitoring
- Fiber fault localization
- On-site fault analysis

# ALM management

WIDE RANGE OF OPTIONS TO FIT ORGANIZATIONS

# ALM management and integration

## Embedded mgt. Tool

**Embedded** management tool
**Node** level management
**CLI, SNMP, NETCONF/YANG**

- Configuration and monitoring
- Integration with NOC applications

**GUI interface**

- Full configuration and monitoring
- Logs, statistics, **OTDR traces**, fault analysis
- **Basic GIS** location-based event information

## Ensemble Fiber Director

Network Management System
ALM port configuration
GIS data input and editing
**Customer management**

- Route assignments
- Configurable layouts
- User groups

**Advanced alarming**

- Alarm filtering
- Route correlation
- Email notifications

## 3rd party GIS integration

**Leverages existing** fiber asset management
**Northbound interface**: REST, SNMP
Compatible GIS **solutions**:

- OSPInsight
- Cocon
- NetGeo
- CableScout
- ConnectMaster
- Investigation: 3GIS, GE SmallWorld, Vetro



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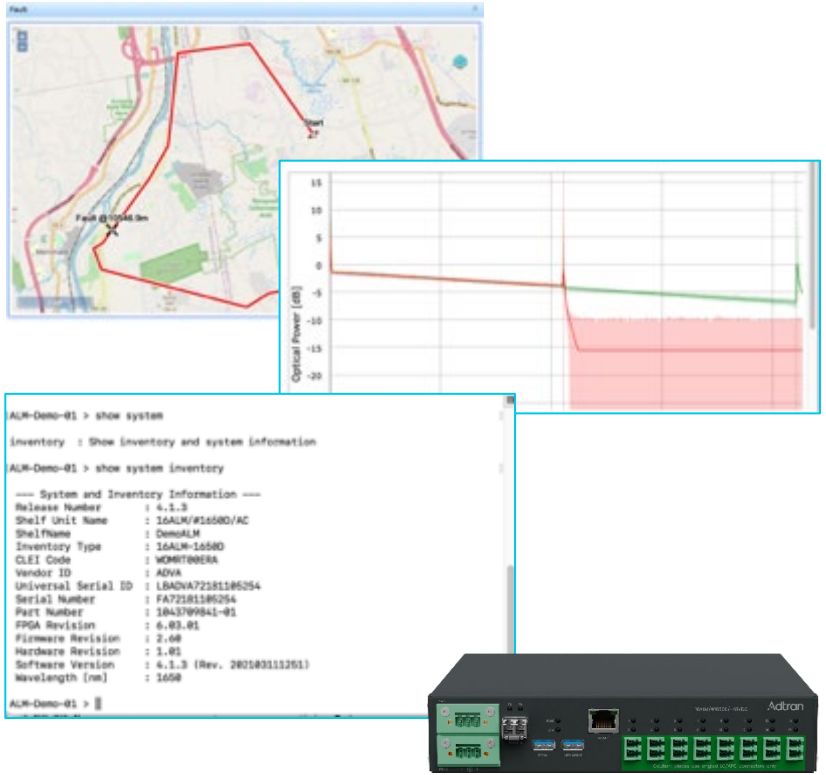
# ALM embedded management tools

## CLI, SNMP, NETCONF

- Provides common interfaces for configuration and monitoring
- Enables automation and integration into common NOC applications

## GUI Interface

- Full configuration and monitoring access
- Logs, statistics, OTDR traces, fault analysis
- Entry level GIS-like support with location-based event information



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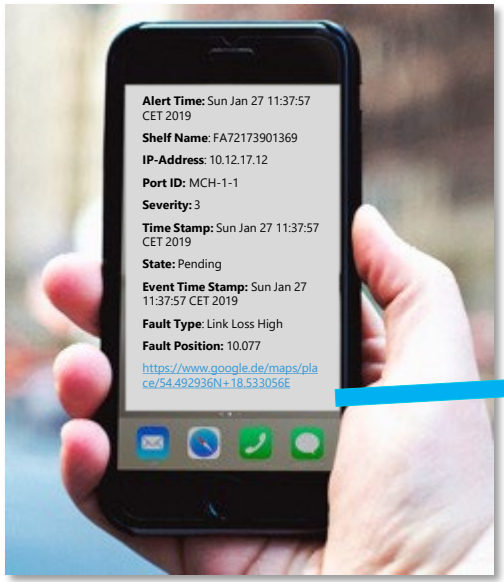
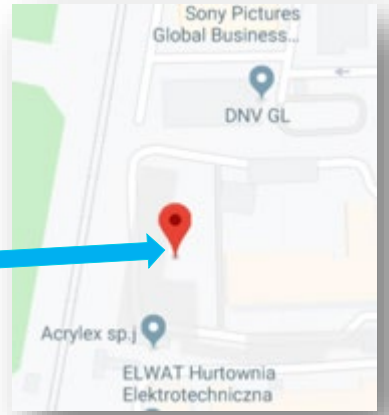
# Alarm notifications

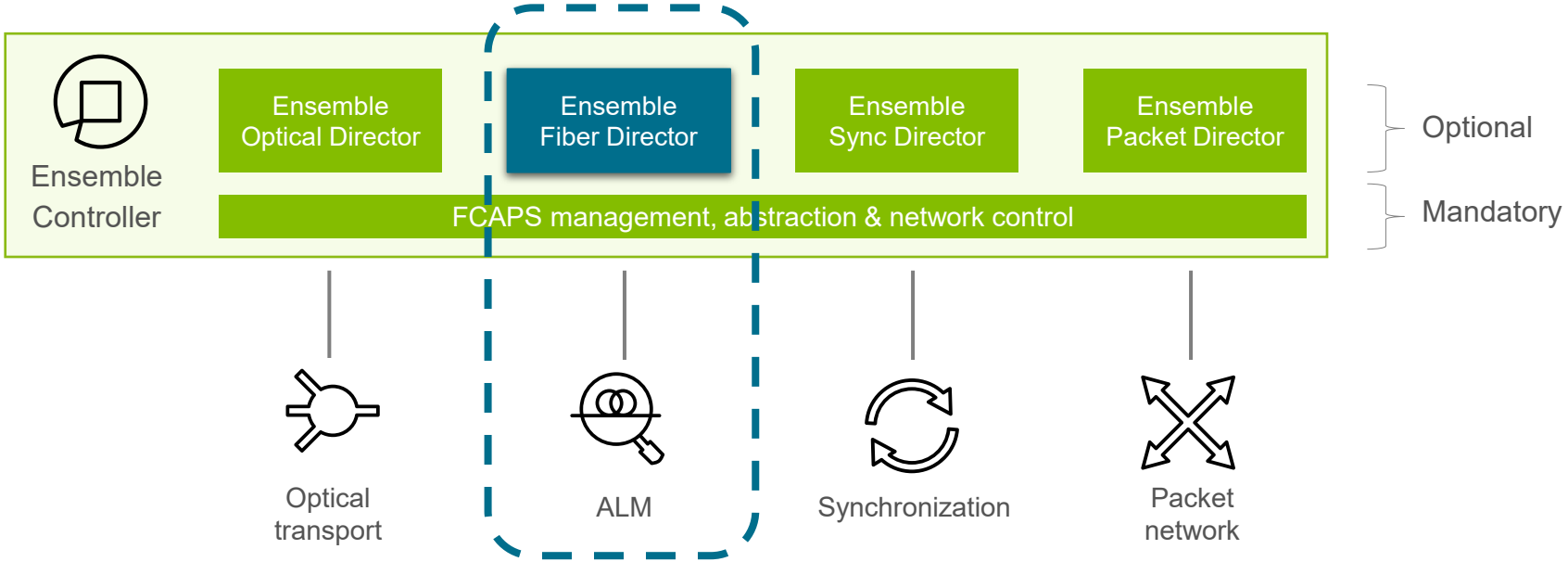
## Notification options

- SNMP Traps
- NETCONF
- Email messages
  - Integration with Google Maps, OpenStreet Maps
  - Multi user support



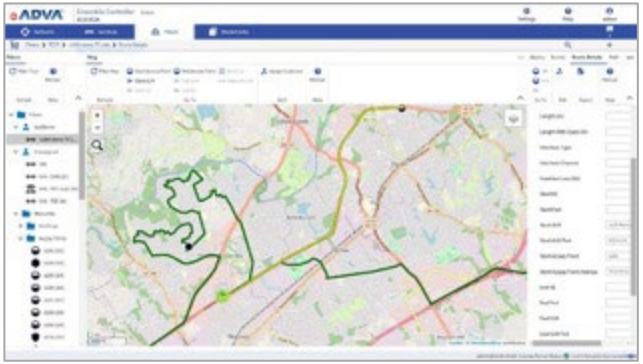
# Ensemble Fiber Director is part of Ensemble Controller

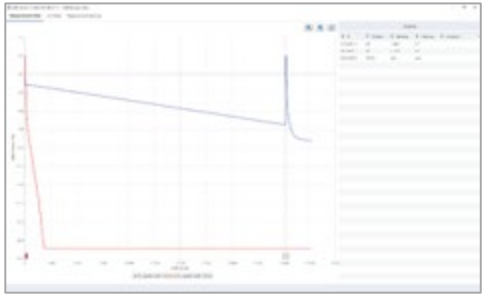


GIS-LIKE SUPPORT ACROSS ENTIRE NETWORK FIBER INFRASTRUCTURE

# Ensemble Fiber Director

Network overview including active alarms

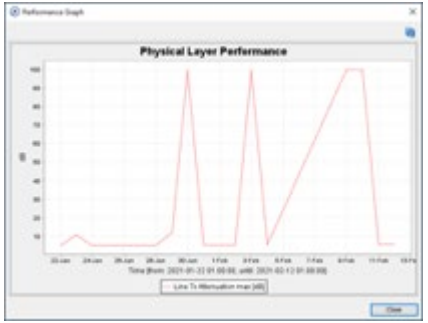




ALM OTDR trace reader

Geographic information

Detailed fiber information




Performance monitoring

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# Passive sensors

# Passive sensor monitoring

## Passive solution

- All sensors are completely passive
- No power required

## Utilizes a dedicated dark fiber link

- Multiple locations can be monitored on a single fiber
- Long reach (100km+)

## Immune to jamming and EMI

- Photons are used for detection instead of electrons

## Complete system surveillance

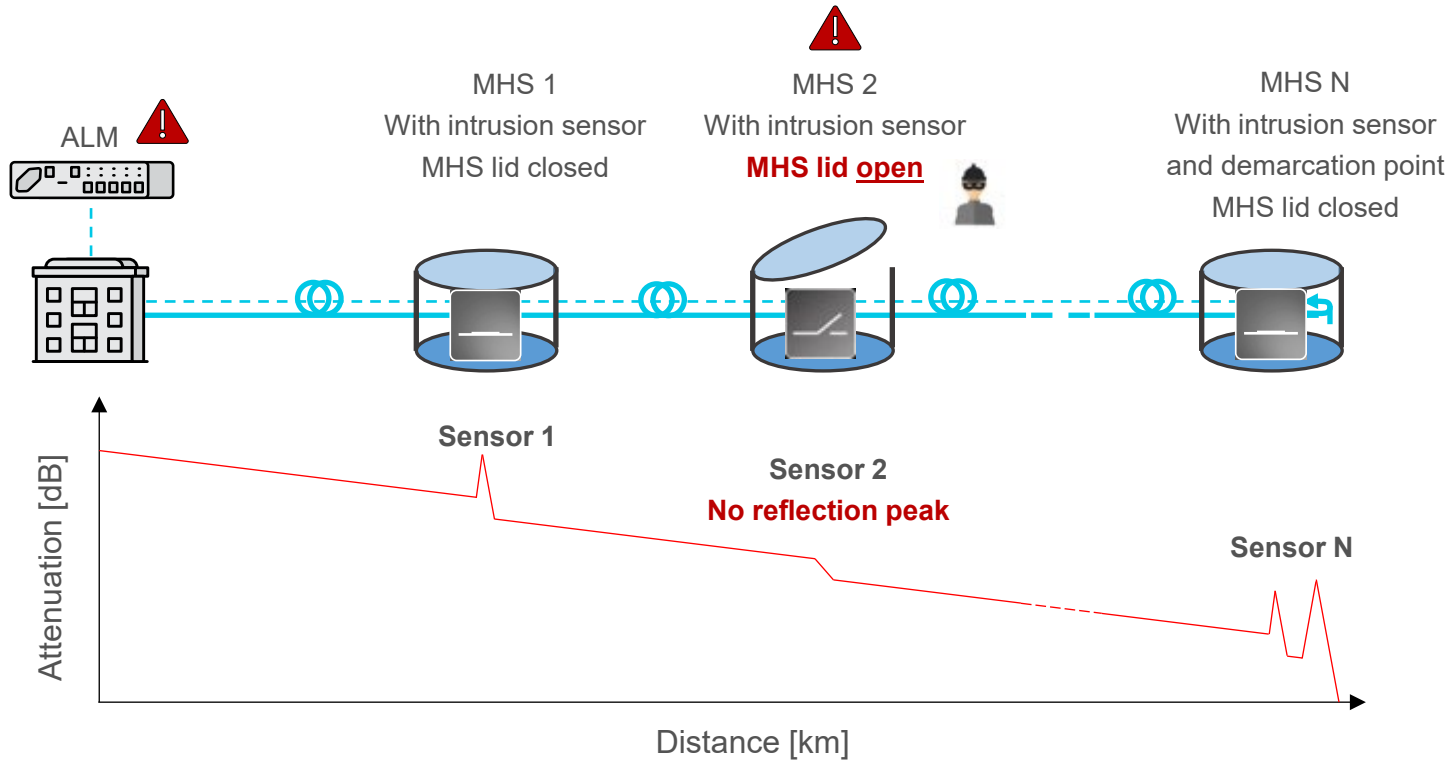
- Accurate spatial detection with fault localization

Moisture

Cabinet door

Maintenance hole

# How does it work?



# Summary

SUMMARY

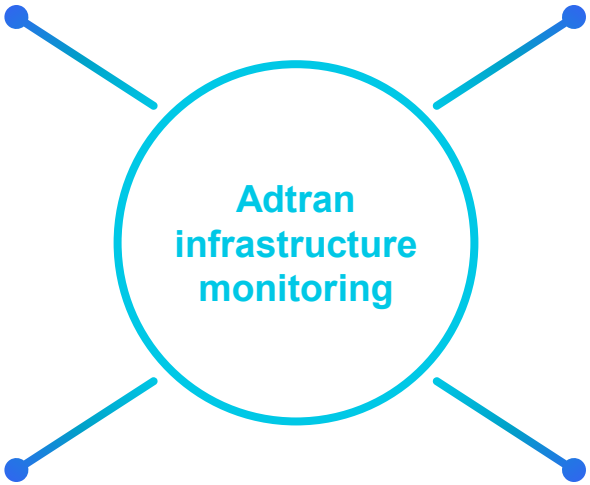
# Cost-efficient, scalable and reliable fiber monitoring

## 24/7 in-service fiber monitoring

- Automated real-time fiber fault detection, localization and notification
- Also helps monitor facilities and detect fiber tapping

## For any network

- Independent of transport speed, protocol, or system vendor equipment
- For lit or dark fiber, active, or passive networks




## Deep PON assurance

- Market's first and only PON monitoring solution without reflectors
- Identifies fiber faults vs. electronics as source of network outages

## Ease of use

- Precise fault location with map view, GIS
- Numerous alarm notification options
- Ensemble Fiber Director
- 3rd-party GIS integration



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# MULTI SENSING SOLUTION

Standard OTDR (1625nm)

Attenuation curve

Brillouin OTDR

Strain and temperature

**What is Distrasense?  Coming Soon 2025!**

Phase OTDR

Acoustics

Four functions in one solution

1) Attenuation
2) Strain
3) Temperature
4) Acoustics

# Thank you