

Monitoring + Assurance

March 2020

2 ALM System Hardware

1 ALM Monitor Unit

Two variants:

- AC and DC
- 16 or 64 ports



2 WDM Coupler

Y-cable



8ch



16ch



32ch



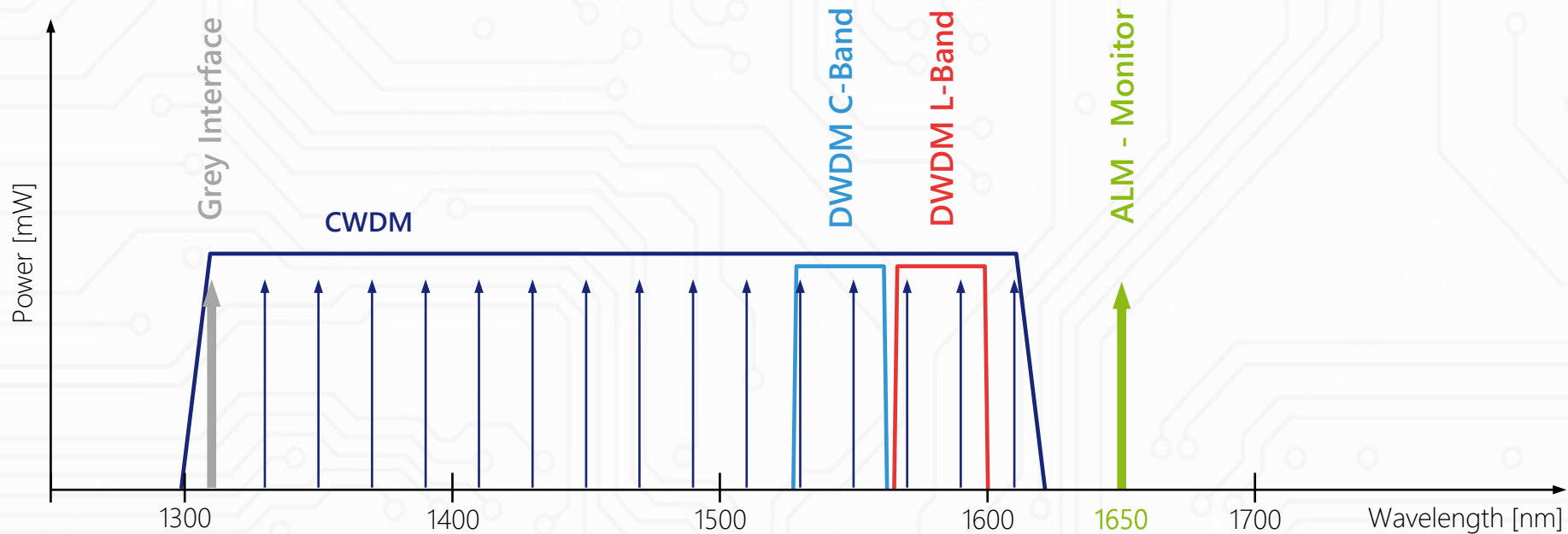
3 Demarcation Reflector



Multiple variants available:

- LC and SC pluggables (PC or APC)
- Patchcord with integrated reflector (PC or APC)

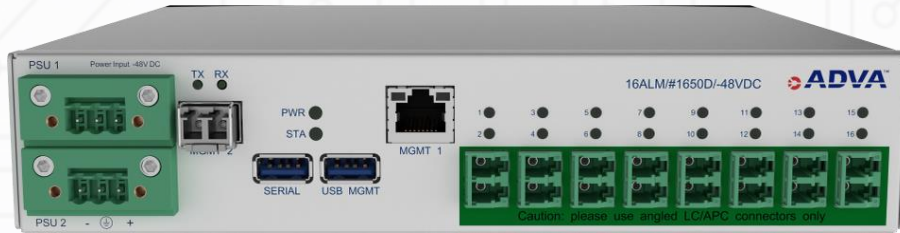
ALM Wavelength Overview



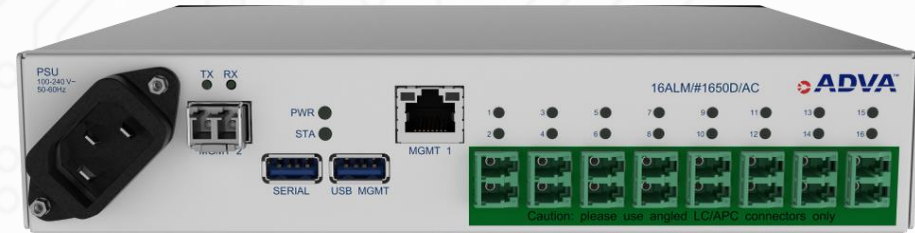
Permanent ALM Monitoring does not interfere with any other transport wavelengths

16-port ALM (ALM16)

16ALM/#1650D/-48VDC



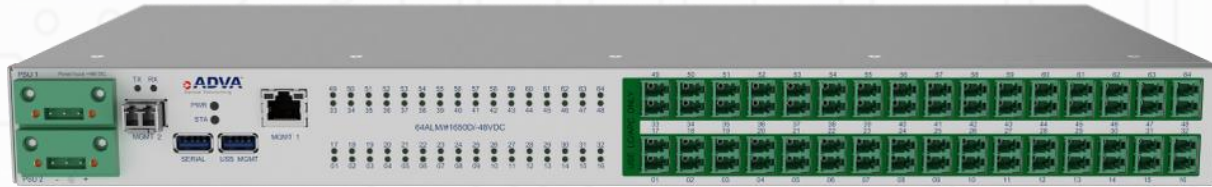
16ALM/#1650D/AC



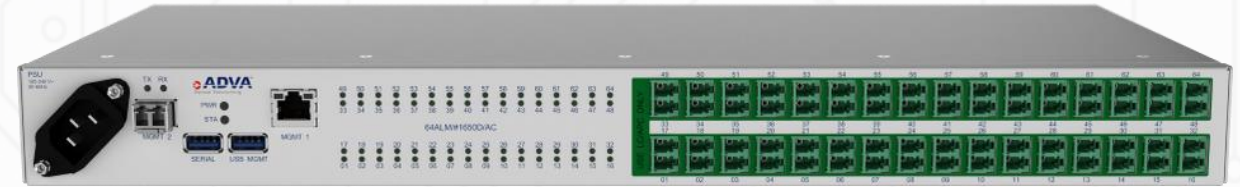
Parameter	Value
Shelf size	1HU, half size
Connector type	LC/APC to ALM filter 16/1CSM+#1650
Measuring wavelength	1650 nm
Fault detection accuracy	+/- 10 m
Power	AC and -48VDC variants
Management connection	1x RJ45 or SFP (1x RS232 for debug)
Management system	<ul style="list-style-type: none"> • Stand alone, HTML web interface • SNMP/NETCONF for alarm notification • REST API • RADIUS/TACACS+ for remote authentication • Syslog

64-port ALM (ALM64)

64ALM/#1650D/-48VDC



64ALM/#1650D/AC



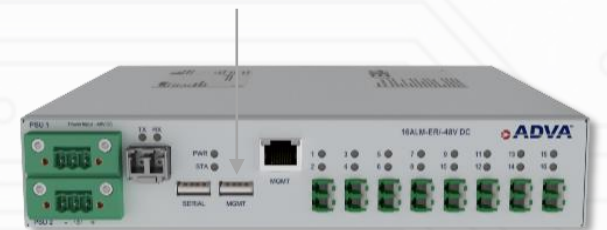
Parameter	Value
Shelf size	1HU
Connector type	LC/APC to ALM filter 16/1CSM+#1650
Measuring wavelength	1650 nm
Fault detection accuracy	+/- 10 m
Power	AC and -48VDC variants
Management connection	1x RJ45 or SFP (1x RS232 for debug)
Management system	<ul style="list-style-type: none"> • Stand alone, HTML web interface • SNMP/NETCONF for alarm notification • REST API • RADIUS/TACACS+ for remote authentication • Syslog

3G/4G USB dongle for remote DNC access

- On some sites a DCN might not be available. Remote access can be realized to an ALM in that case by using a 3G/4G Dongle
- The following dongles are currently SUPPORTED:
 - ZTE MF823
 - D-Link DWP-157
 - Huawei E3372 4G LTE
- Note: it is uncertain yet which of these dongles are going to be included in the release
- ADVA does not resell the dongles. Customers are to purchase the dongles directly



USB Dongle is connected to
MGMT port



Coupler Shelf

- 1HU shelf with 16 integrated WDM Couplers
- Only one 16/1CSM/1HU+#1650 module required per ALM Monitor Unit.
- 16 LC/APC cables are required to connect the ALM Monitoring Unit to the shelf



16/1CSM/1HU+#1650

Y-Cable

- Ruggedized Y-cable with an integrated WDM Coupler
- Per ALM port a Y-cable needs to be used (up to 16 cables per ALM monitor unit)



J-Y/SM/1CS+#1650/LC/0310

32x WDM Coupler (32/1CSM/1HU+#1650)



A 32x WDM Coupler shelf will be developed in 1RU with LC/PC connectors. In essence this is the same as the 16x WDM Coupler shelf, but then at double the density.

9 8x WDM Coupler



- 8-channel WDM Coupler to be mounted next to ALM16
- Standard ALM16 mounting brackets can be used
- Mountable in 19", 21" and 23" racks
- Ideal for use with non-ADVA DWDM Transmission systems where the required port count is typically not very high

Patchcord Reflector

- Single demarcation reflector packaged in a stub enclosure with 310 cm fibers and LC connectors
- A demarcation reflector needs to be used per ALM (up to 16 cables per ALM monitor unit)
- Industrial Temperature Component (-40°C ... +85°C)



J/SM/DR/PTP/LC/03109

Pluggable Reflector

- Pluggable SC enclosure (the same enclosure commonly used for attenuators)
- A demarcation reflector needs to be used per ALM (up to 16 cables per ALM monitor unit)
- Industrial Temperature Component (-40°C ... +85°C)

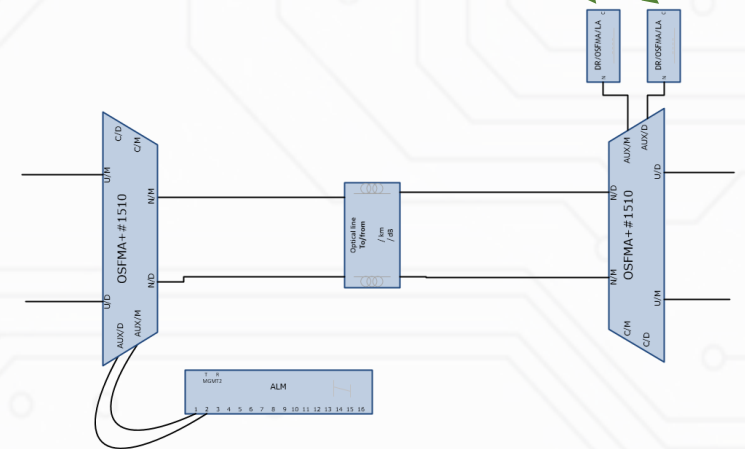
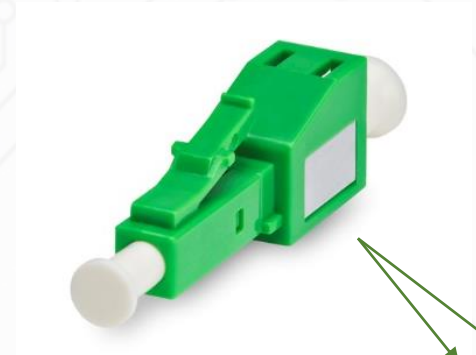


DR/PTP/SC

New Reflector for OSFMA

DR/OSFMA/LA

- **What is it?**
New reflector in an LC/APC plug form factor
- **Reason for introduction:**
Pluggable reflector that can directly be connected to the AUX port of the OSFMA and newer amplifiers with internal ALM couplers.
- **Supported wavelengths:**
Reflects full c-band so can only be used in combination with coupler or for cable monitoring, **can not be used as reflector with data passing through it.**



Note: Has a simplex fiber connector so you need two if you want to reflect both fibers of the duplex AUX port

ALM Management

Control Options for Monitor Unit

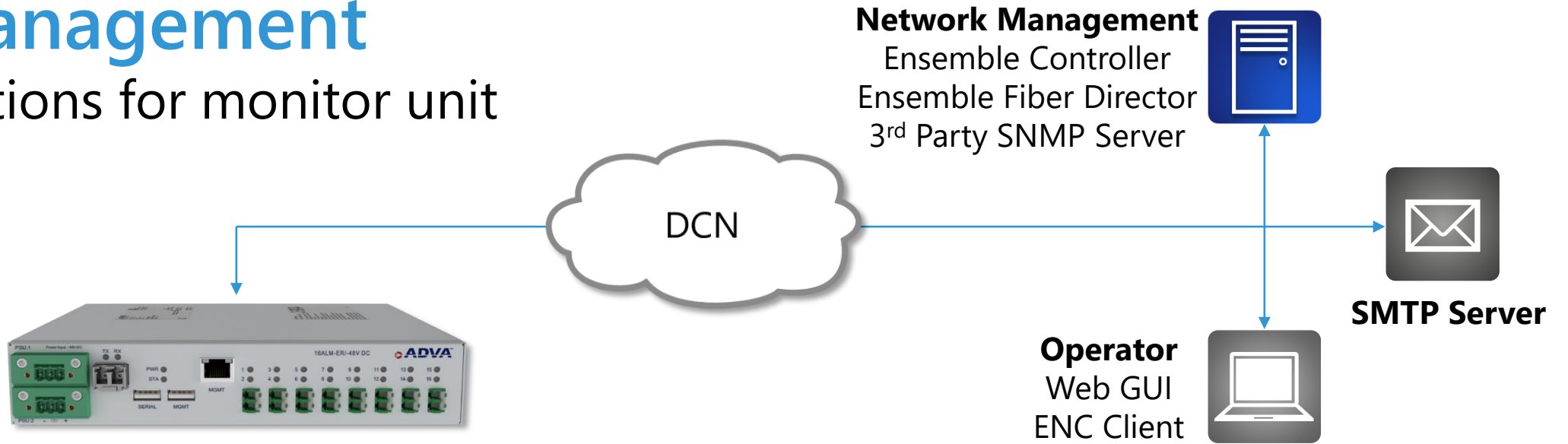


Management Communication

- RS232 interface (for CLI)
- RJ45 interface 10/100MB
- Shipped with default IP address
- Web browser management tool
- Login/password required
- HTML web-interface for direct control over the ALM and review of network status
- Communication using SNMP commands (including SNMP Traps)

ALM Management

Control options for monitor unit



Serial port

- RS-232 interface

Combo MGMT port

- RJ45 10/100/1000 Base-T
- SFP for OSC

Management protocols

- SNMP (v1, v2c, v3)
- NETCONF
- REST
- HTTP/HTTPS
- SSH

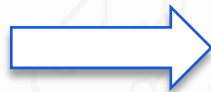
Notification protocols

- E-mail/SMS
- Syslog
- SNMP/NETCONF

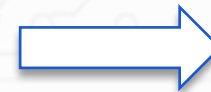
USB port

- RNDIS IP interface
- Serial port
- Mobile dongle
- LAN adapter

- Human readable email format
 - Initial email implementation of the ALM was XML-format only
 - Some customers want to receive human readable emails
 - Email type to be sent can be configured in the ALM GUI
- SMS capability
 - In addition some customers request SMS notification
 - In order to send an SMS an “email-to-SMS” gateway is needed
 - Many gateways exist (some for free, some for a low fee)
 - <https://martinfitzpatrick.name/list-of-email-to-sms-gateways/>
 - <https://www.textmagic.com/email-to-sms/>



SMS Gateway



18 ALM Operation Modes



Scan every 1 min

Automated Testing

On-Demand Testing



IP-based web interface

Automated/Polled fiber link loss test

On-demand fiber link OTDR analysis test

Automatic fiber link OTDR analysis test

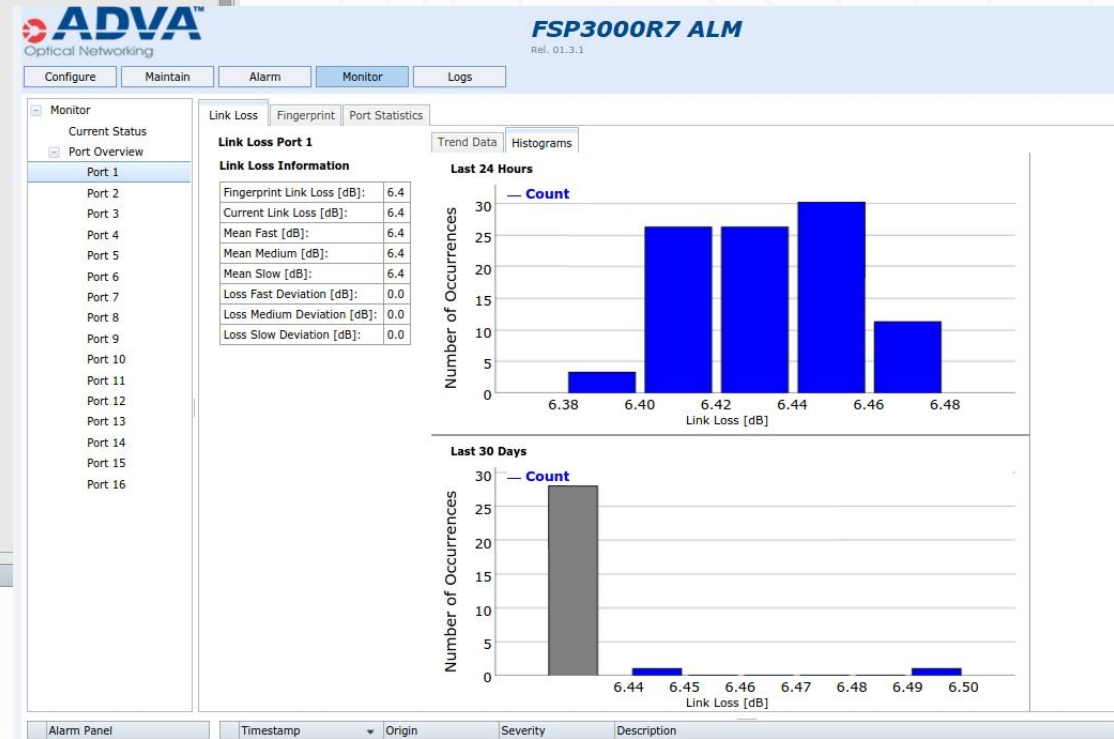
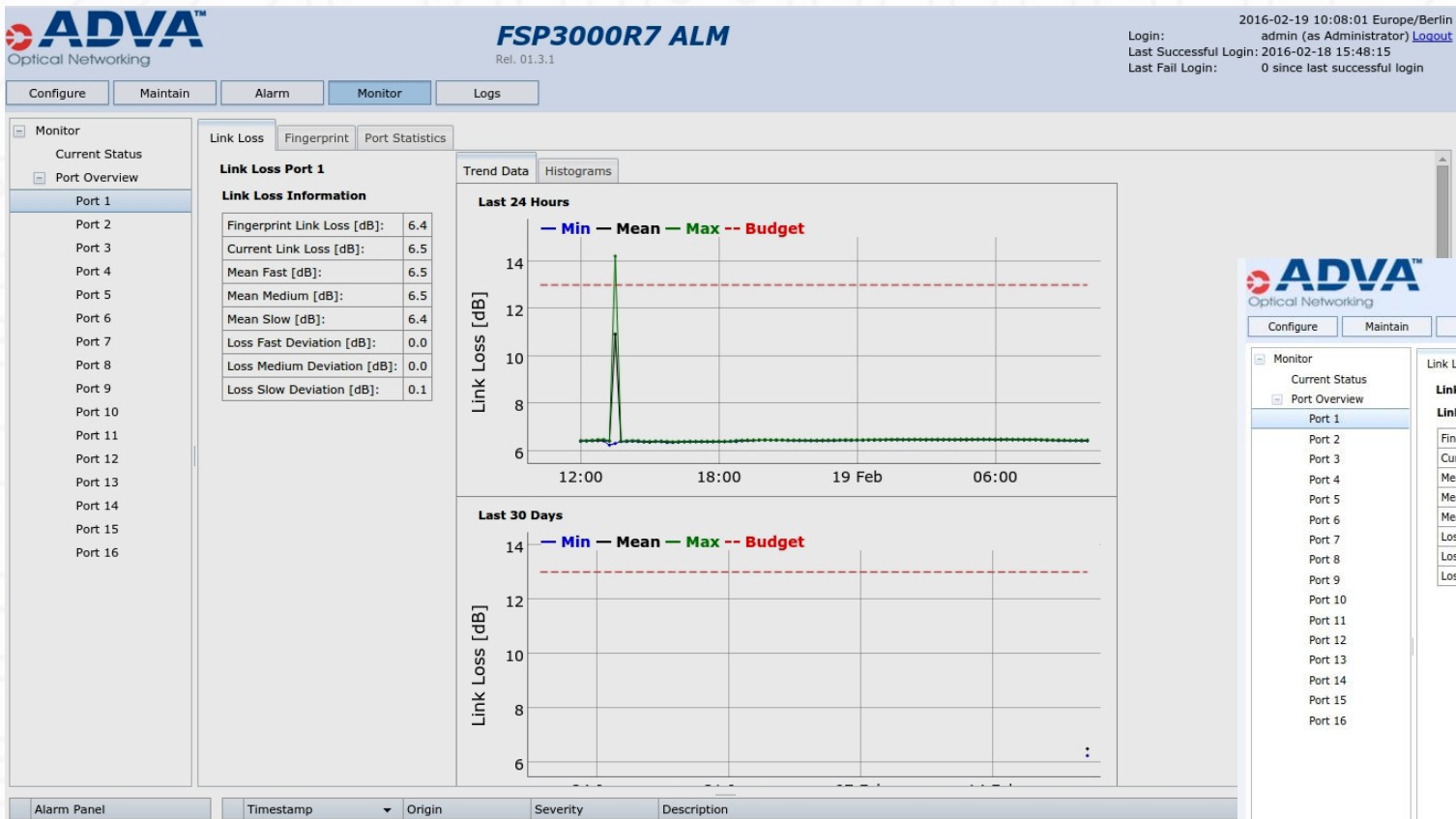
Total insertion-loss to BASELINE comparison

OTDR curve to BASELINE comparison

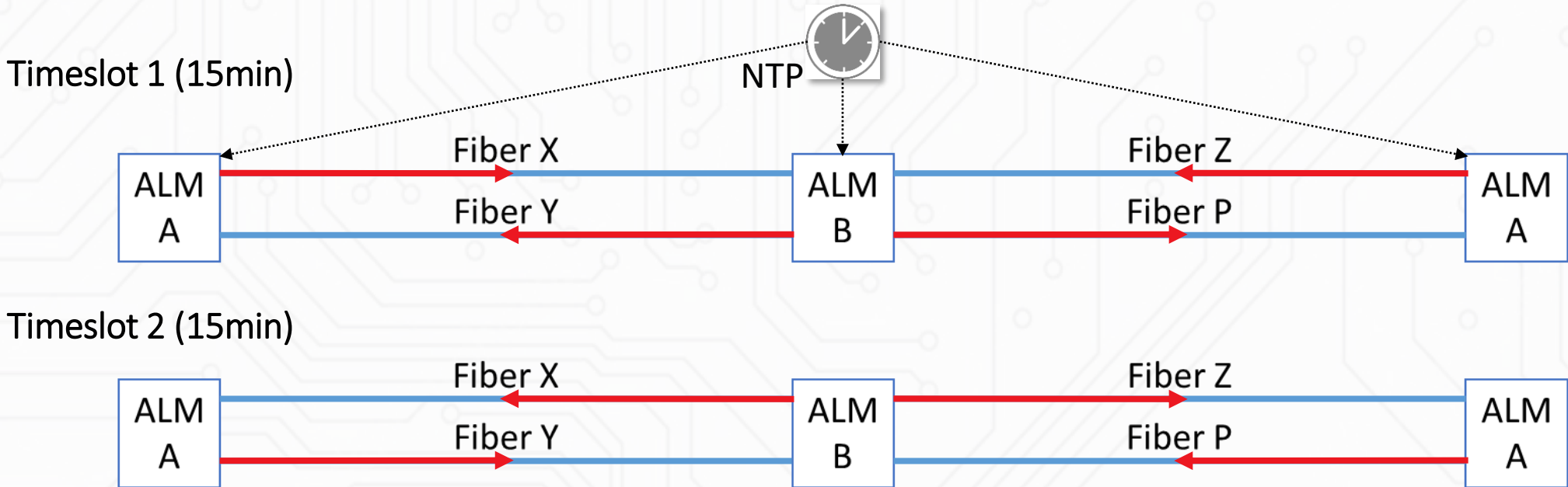
BASELINE fiber measurements

Alarm Generation:
Comparison exceeds error thresholds

19 Management ALM (Examples)



20 Bi-directional Operation - Active

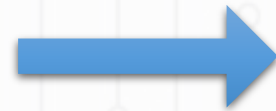
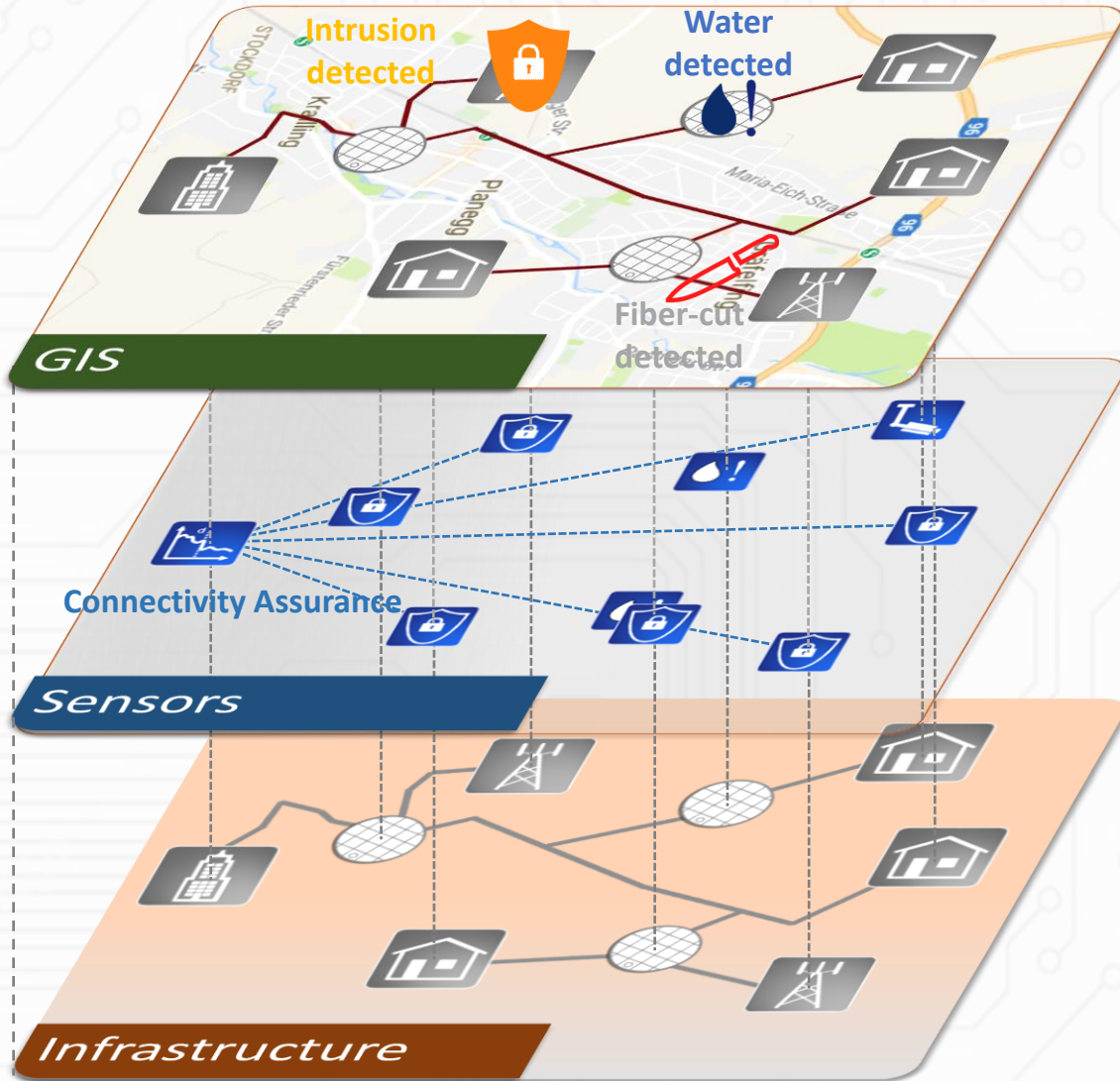


- In R2.3 fiber faults are detected automatically in bi-directional operation using a central NTP clock for synchronization
- The ALMs take turns measuring co/counter propagating fibers



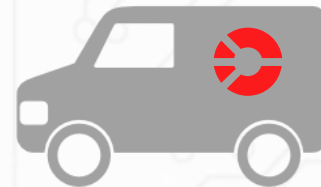
- A cable cut will cut both transmission fibers and thus will regardless of the timeslot be detected

GIS-based Assurance Service Offering



ADVA
SmartNOC

- Fiber-cut detected
- Water detected
- Intrusion detected



Dispatch
Repair Service

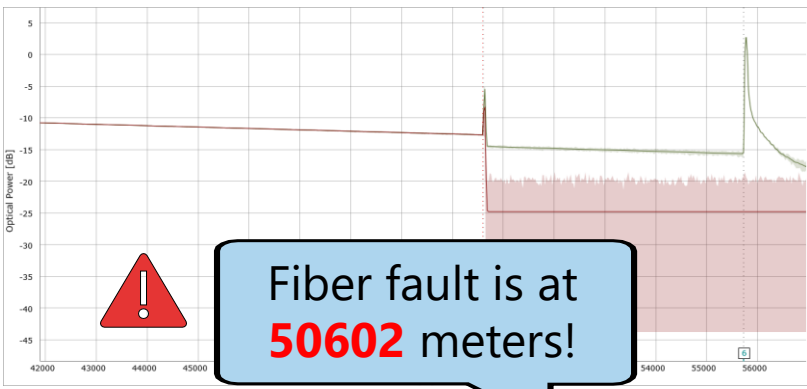


Customer
Notification

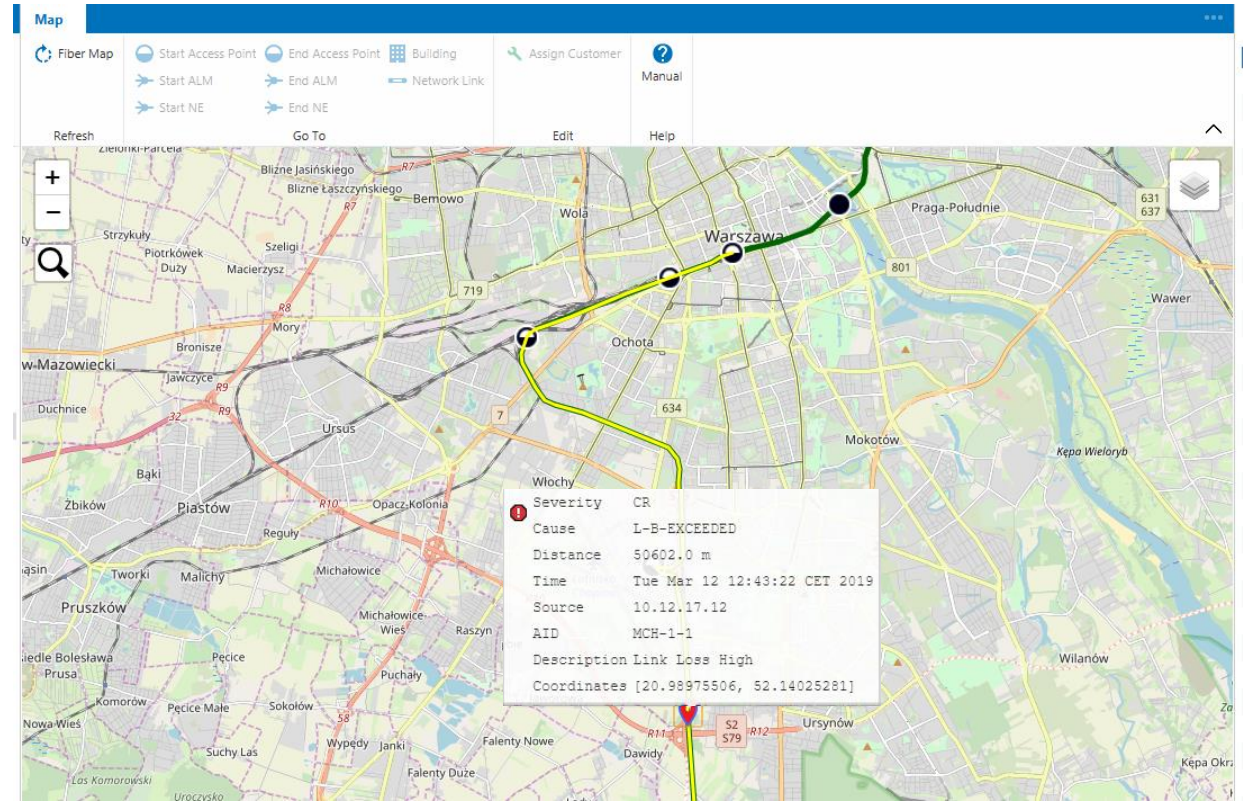
Ensemble Fiber Director Benefits

Extender fiber assurance possibilities

Optical distance reported by the ALM unit



Converted into geographic coordinates



Exact real-world fault location within seconds

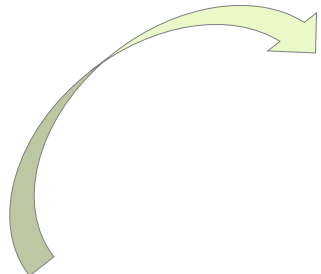
External data import

Supported data formats

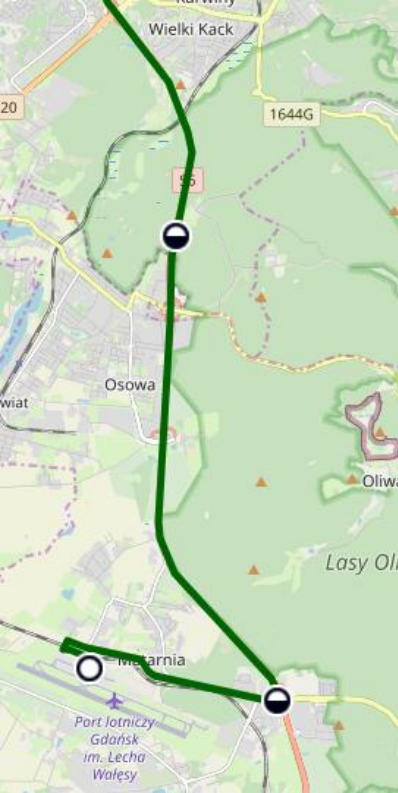
- Shape (SHP) Format
- ArcGIS data
- KML/KMZ Files
- WGS-84
- ... many more



Fiber Data File

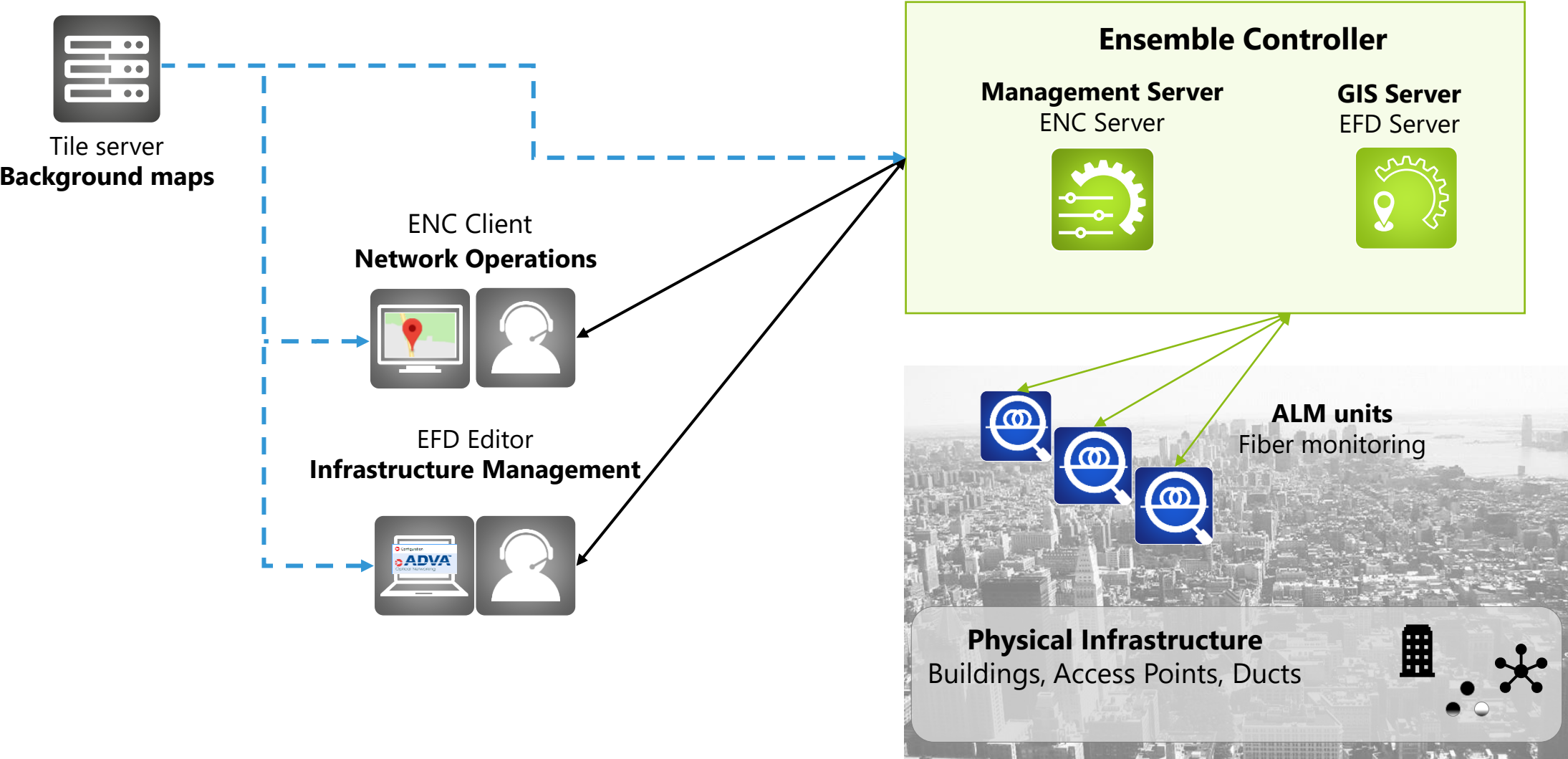


Fiber Director Server

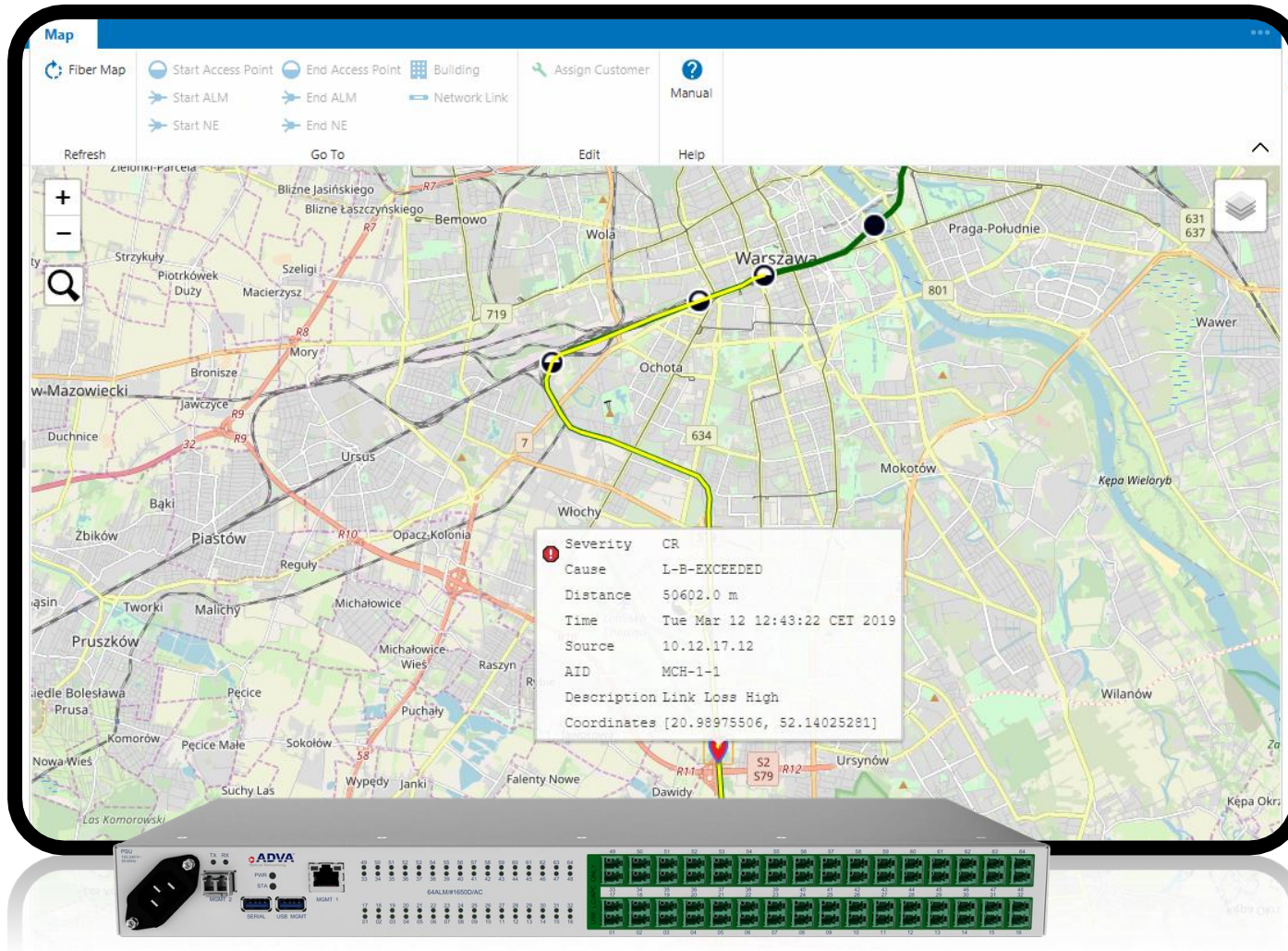


Ensemble Fiber Director

Components



Third party integrations



Compatible GIS solutions:

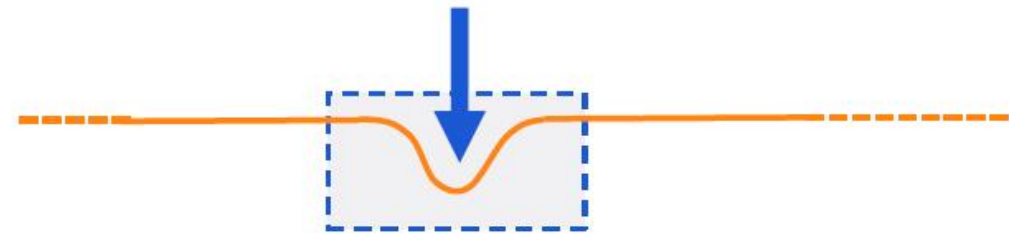
- Ensemble Fiber Director
- OSPInsight
- Cocon
- NetGeo
- CableScout
- ConnectMaster

Fibernet-of-Things



NEW

Manhole cover opens



Fiber sensor

Passive, remotely monitored fiber sensors for measuring pressure, humidity and temperature

Investment protection via passive fiber sensors

Passive sensors introduction

Use cases and solutions



Opening/intrusion detection



Anti-theft protection



Perimeter security

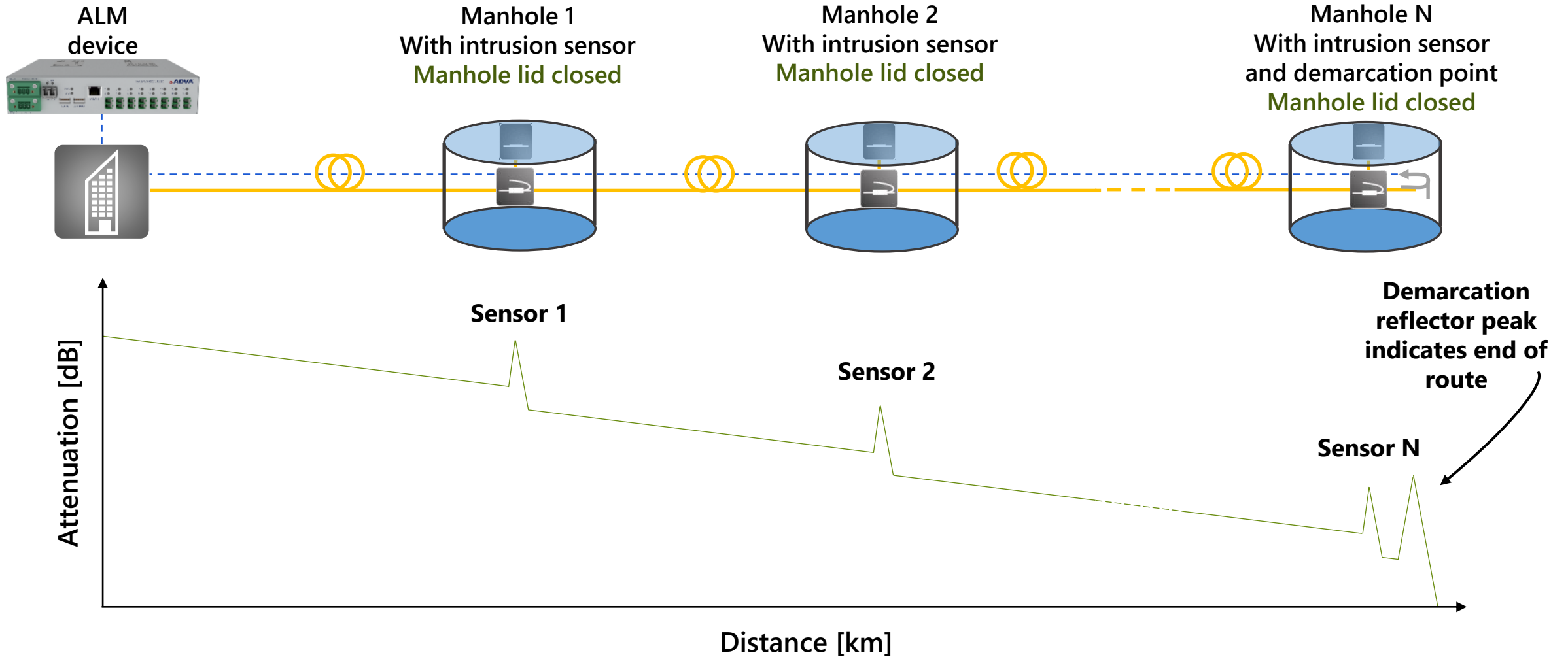


Flooding detection



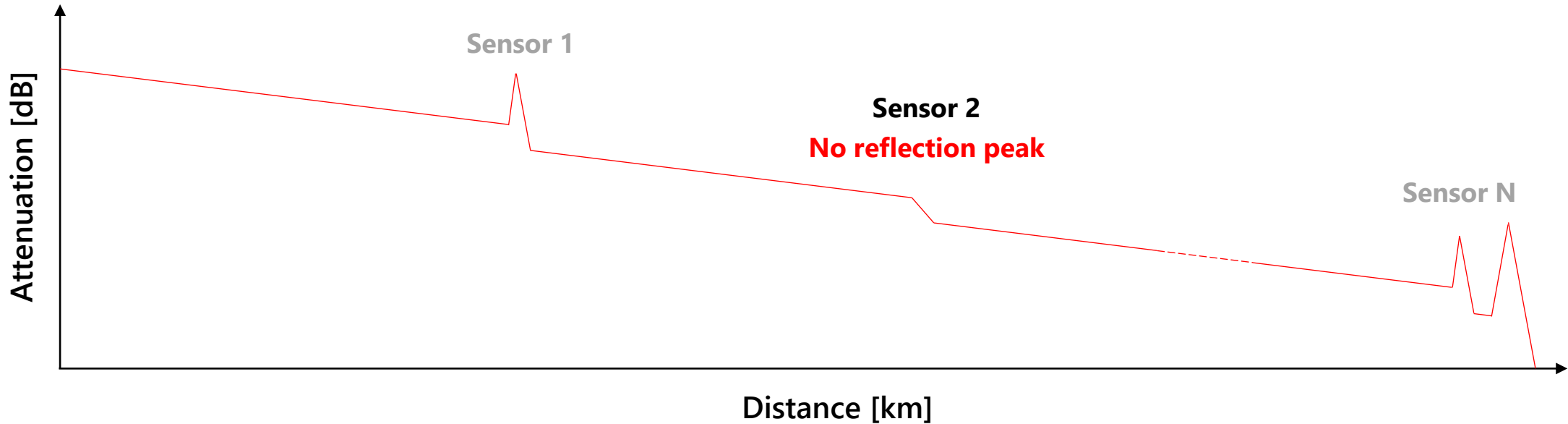
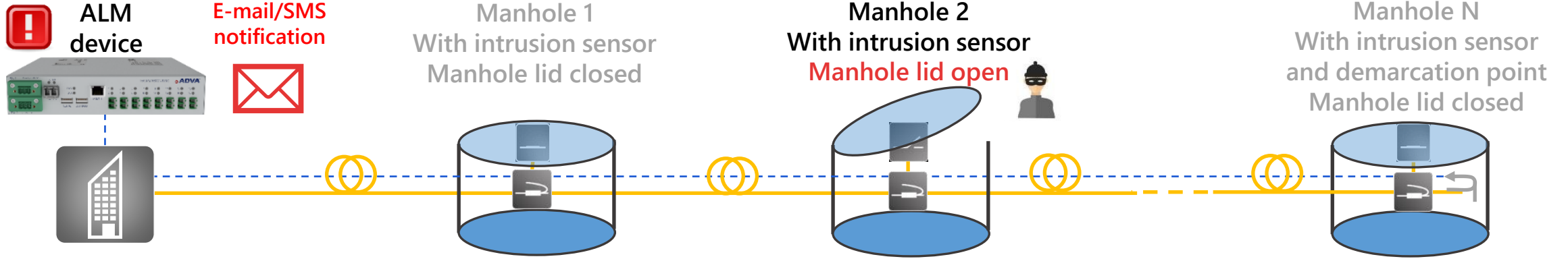
Intrusion sensor - concept

Initial state – no intrusion



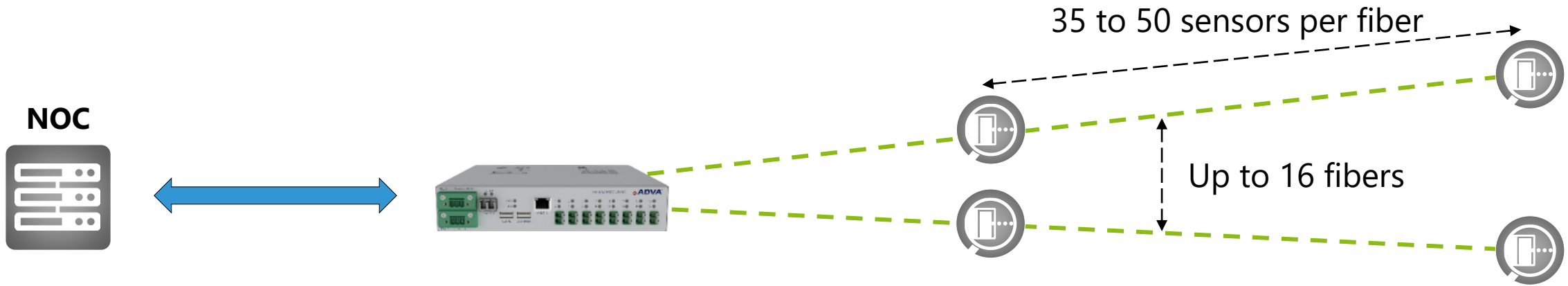
Intrusion sensor - concept

Intrusion event



Intrusion sensor scalability

How does the solution scale?



One ALM16 unit monitors up to 800 sensors

Each sensor is individually identified in the OTDR trace

Simultaneous intrusions can be identified

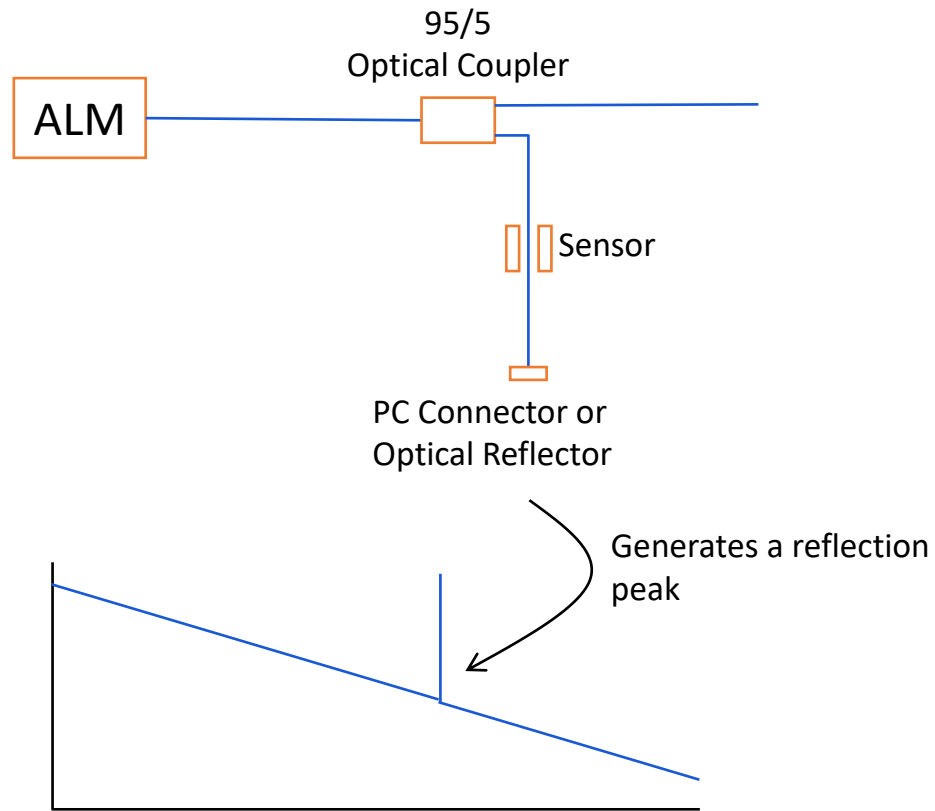
Each direction requires one dark fiber for monitoring



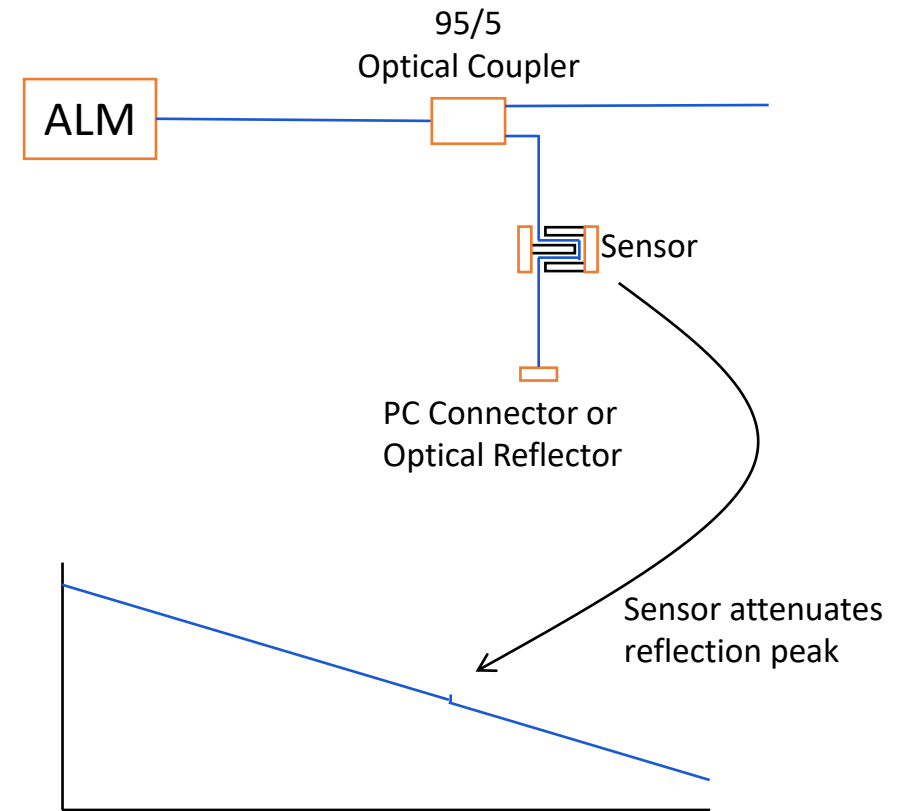
Robust and scalable solution

30 Passive Reflection Concept

Sensor in normal / off condition

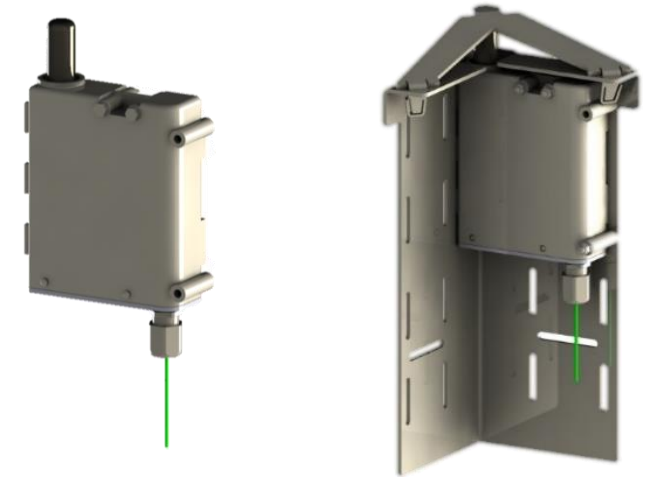


Sensor in activated / on condition

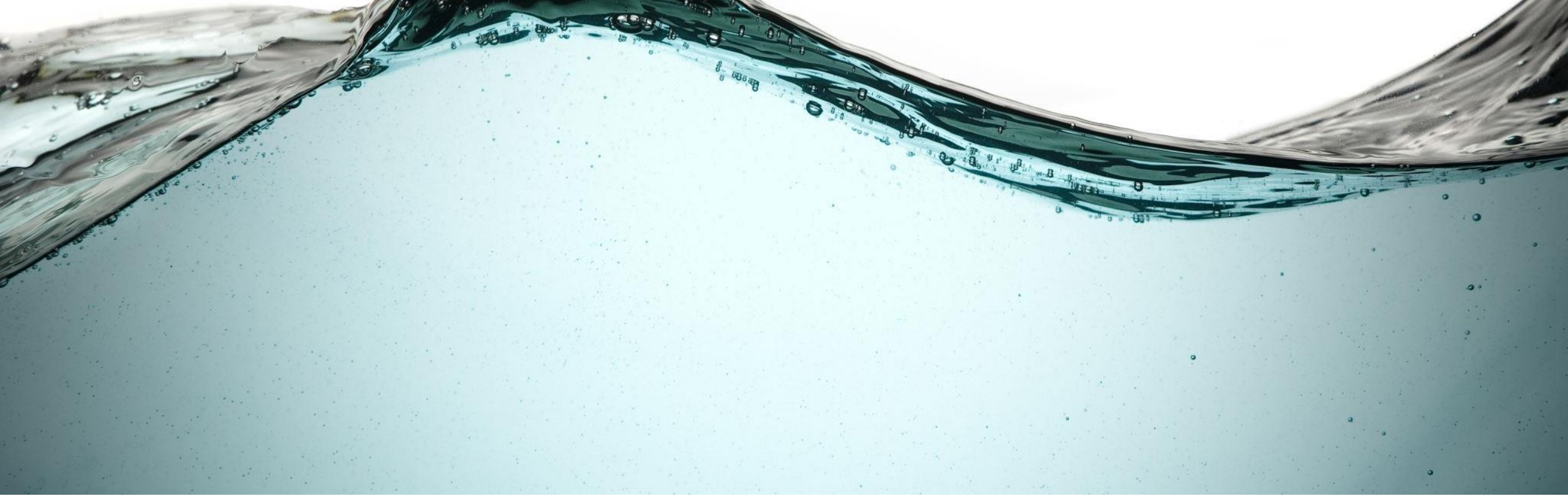


Intrusion sensor - overview

- Completely passive - no power source required
- Immune to EMI and jamming
- Integrated into the ADVA Fiber Assurance Solution
 - Seamlessly integrated into ALM
 - GIS support available
- Wait-to-restore timer guarantees intrusion detection
- Protection class IP54, IK 09
- Mounting kits can be customized upon request



Passive and ruggedized intrusion sensor

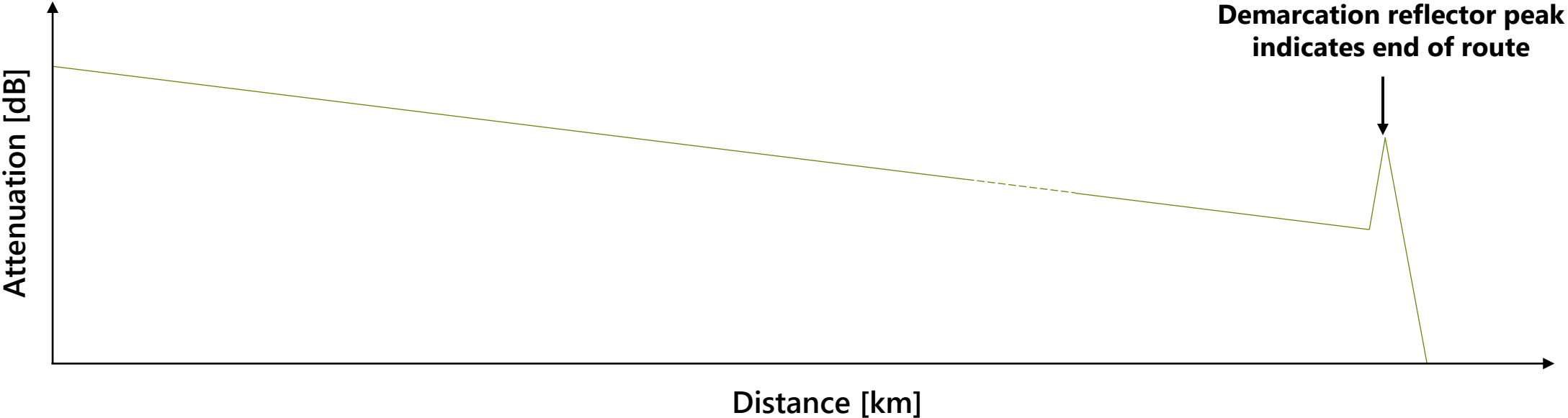
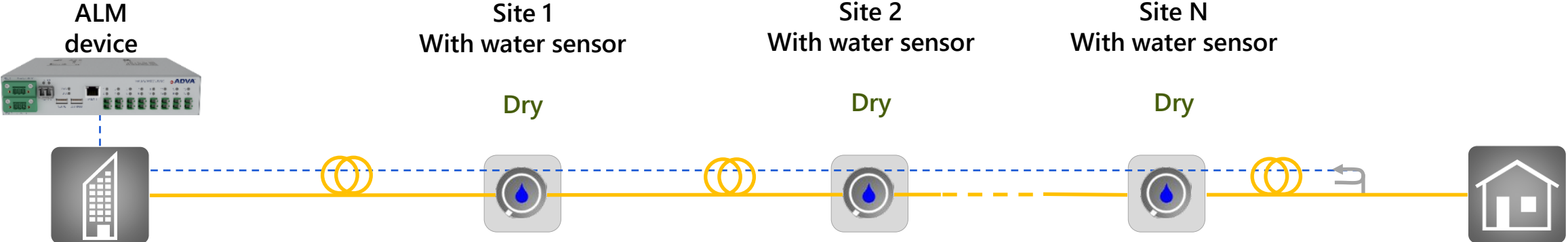


Water sensor

Detailed specification

Water sensor - concept

Initial state – no flooding

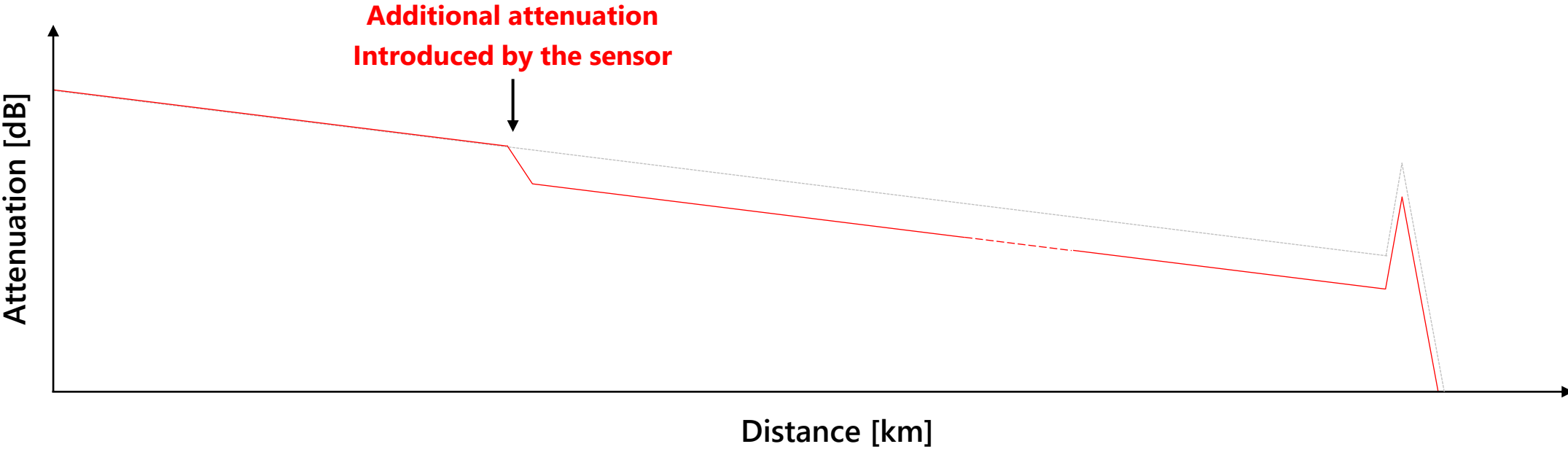
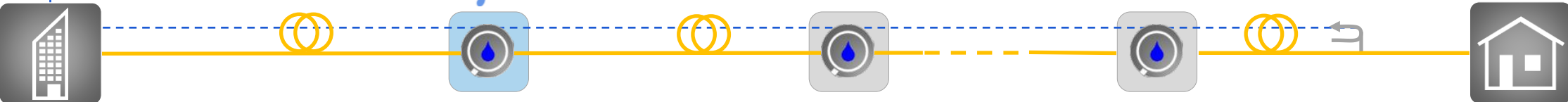
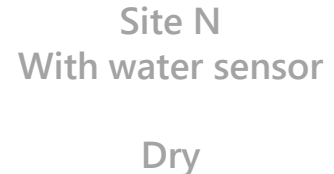
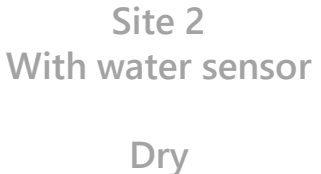


Water sensor - concept

Flooding detected

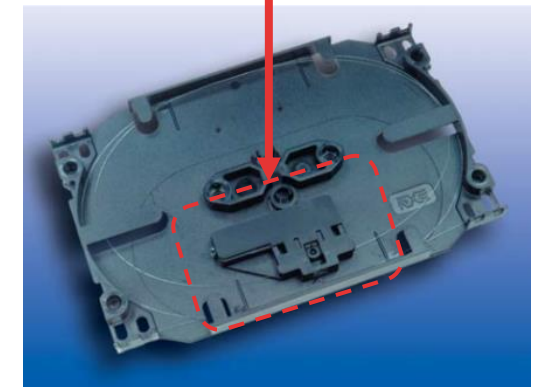


E-mail/SMS notification



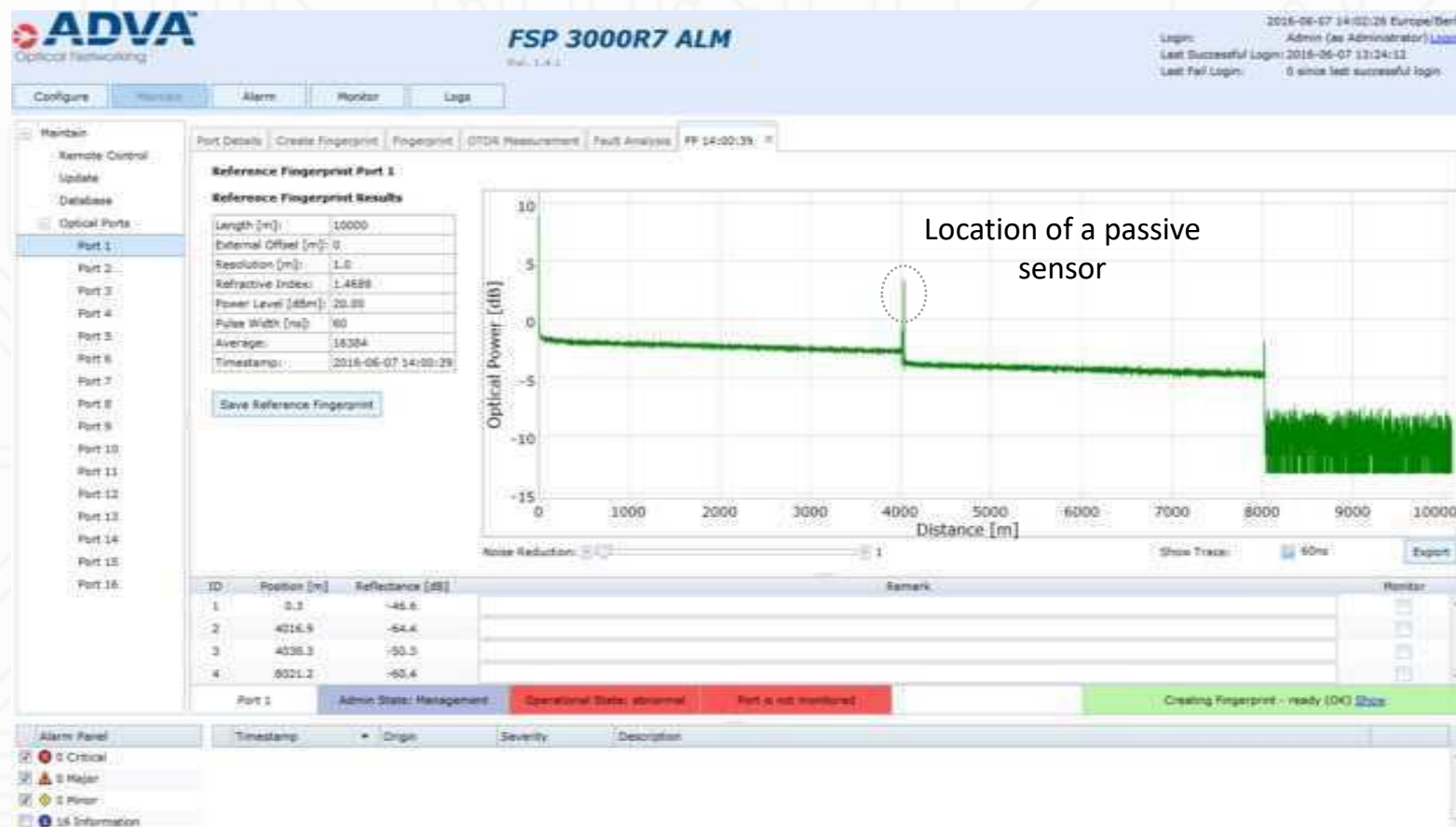
Water sensor - overview

- Completely passive - no power source required
- Immune to EMI and jamming
- Integrated into the ADVA Fiber Assurance Solution
 - Seamlessly integrated into ALM
 - GIS support available
- Water does not damage the sensor (re-usable)
- Fast response time: ≤ 5 minutes



Cost-effective, universal fiber sensor

31 Configuration of Passive Monitors



Step 1: run finger print. The passive sensors can be easily detected by looking at the reflection peaks

32 Configuration of Passive Monitors



Select reflection peaks from sensors to be monitored

Step 2: select the reflection peaks from the sensors that are to be monitored



In case an enclosure is opened, the reflection peak disappears and an alarm is raised

Спасибо

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