Fiber Assurance Solutions: Advanced Link Monitoring

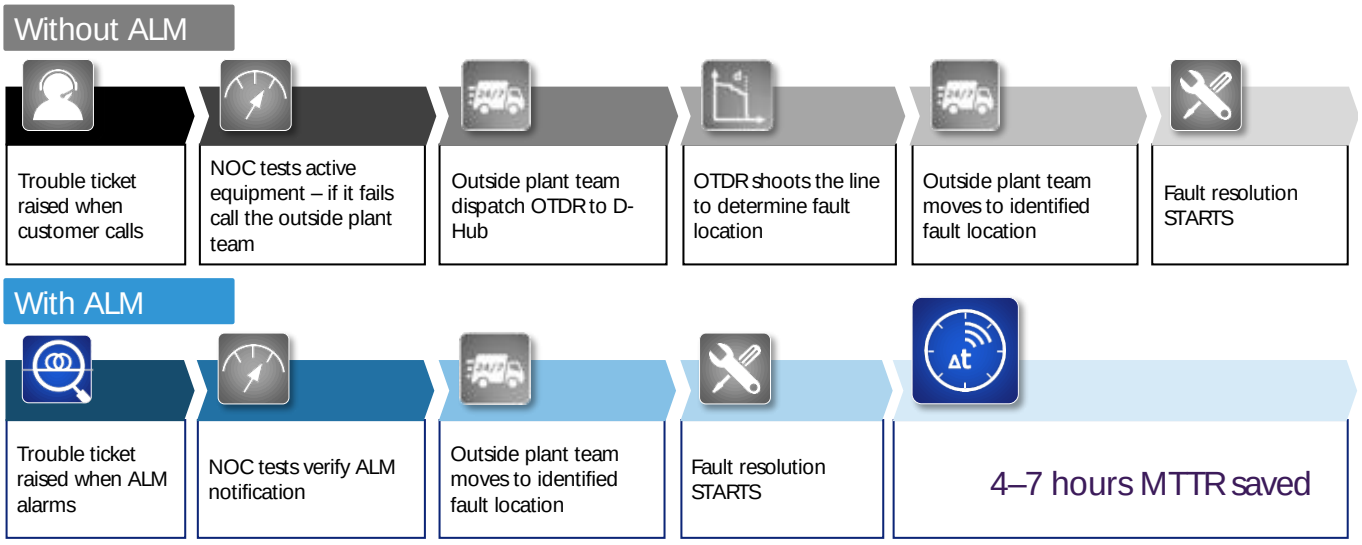
Opex and Capex Benefits

Determining the return on investment for ADVA's Advanced Link Monitoring (ALM) Fiber Assurance solution involves the considerations including operational and capital expense along with considerations for customer satisfaction and SLA financial considerations. It is very difficult to provide a general answer as each application has different set of challenges and cost factors so there is no "one size fits all" answer. This document provides a number of examples points and considerations highlighting the various areas the ALM provides an exceptional return on investment.

CAPEX/OPEX Savings: Reduction of mean time to repair (MTTR)

Gathering feedback from various Tier 1 operators we see that the MTTR is reduced by about 7 hours on average when fiber monitoring is deployed. Reducing the MTTR is influenced by many factors including determining the location of the fault to the proper owner of the fiber in question, the location, the type of failure whether it be a cut or high attenuation loss, coordinating trouble tickets, and many other notification and coordination issues across organizations.

The ALM solution is very effective in the reduction of unnecessary truck rolls and associated activities. Many times when a report of a fiber cut comes in and the team is dispatched it turns out that the outage was not caused by a fiber cut but by the by other equipment in the network. This causes unnecessary truck rolls or truck rolls with the wrong personnel not equipped to address the actual fault in the network. Many times field engineers drive to the site to discover that the problem is not within the fiber infrastructure but perhaps the end user equipment. Event notifications that lack detailed information about the nature of the failure does not only delays the root cause analysis procedure of the fault, but also introduces unnecessary cost by dispatching inefficient resources.



The exact cost savings that can be obtained with fiber monitoring for MTTR reduction and eliminating unnecessary truck rolls will depend highly on whether companies use their own field engineers to manage their own fiber infrastructure or whether they are using an external party to manage their fibers. Organizations that use external third party for fiber management then the cost per hour and per dispatch is usually well known. The cost for external party maintenance is typically rather high compared to internal resources and provides an even more compelling ROI for the ALM solution. of unnecessary truck rolls.

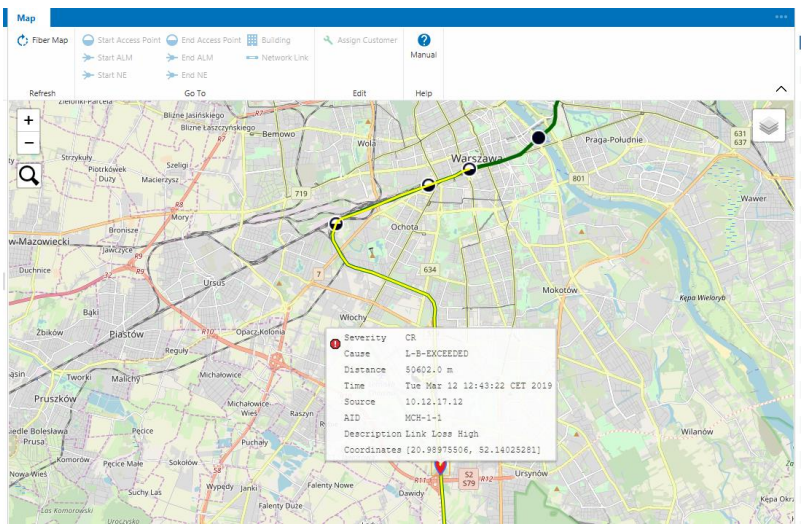
- Direct Costs per incident
    - Labor Costs (per hour) to identify and repair faults
    - Number of events per week, month, year
    - Direct vs. Indirect Labor Costs
    - Truck Rolls (fuel, mileage, maintenance)
    - Test Gear (OTDR)
    - Access to facility coordination across organizations
    - SLA performance and penalties

Positioning the ALM in a network that is managed by internal resources can be more difficult and requires additional considerations and approach to determining cost factors. Typically, organizations that utilize its own field engineering team there are different approaches including whether the team is sent out to fix something in the field and\or whether they are on stand-by.

Here is an example using a conservative estimate of $100 per person per hour (including cost for transport, gear etc.) and assuming an event takes 7 hours to definitively determine the failure and failure location which enables the repair and a return to service. The engagement of two field engineers results in $1400 per event. To determine an ROI the number of occurrences per year needs to be considered. The number of occurrences can vary strongly from country to country and region to region and installation to installation. For example, In India multiple fiber cuts happen on a daily basis, whereas in Germany and the United States fiber cuts are more seldom. Assuming a conservative number: three fiber cut per week then this results to $218k USD savings per year.

CAPEX/OPEX Savings: compensation / restitution for damage incurred

Fiber cuts are often caused by external parties and not always properly reported. A Tier 1 carrier in Germany described how quite often a guilty party will try to cover up or conceal the excavation as soon as they see that a fiber was cut. In those instances, they will first cover up the excavation, load the power shovel on a truck and clear the site. When these situations occur, it is not possible for the Carrier to get restitution for the damage incurred. After installing a fiber monitoring system, the carrier managed to catch the guilty party in most of the incidents due to the rapid identification of the fault and the detailed location information and was able to identify the offending part and receive restitution. The specific details on the exact amount of compensation that was received were not made available however the statement of the carrier was that it "easily paid for the installation cost of the monitoring equipment".



Detailed Network Fault Notification

Improved Network Quality

Savings that can be obtained through improving the network quality are indirect and more difficult to quantify however clearly exist. The continuous monitoring of the fiber infrastructure provides real-time control of the quality of field engineers and their repairs further ensuring that the network not only is available but operating and maximum performance. If there is a fiber cut and the field engineer performs a poor splice or bends the fiber too much, the ALM monitoring will identify this immediately.

The installation of new fiber links experiences improved quality as well as the ALM can identify a "lossy" patch panel that can be resolved even before network turn-up. This detailed link quality visibility is very beneficial when existing network links are upgraded for example from 100G to 200G. In that case the optical signal to noise ratio (OSNR) of the link will determine whether a link can be upgraded or not. Fiber loss is the main impairment that reduces the OSNR. By keeping the access insertion losses low, EDFA powers can be reduced, use of Raman amplifiers be avoided and the link capacity can be maximized for performance. Ensuring the fiber network is of the highest quality reduces complexing as well as realized cost savings of eliminating additional which would have been compensating for poor quality fiber connections.

Increased SLA: Dark fiber provider

Fiber monitoring benefits dark fiber providers not only from an SLA and MTTR standpoint but also in the ability to more quickly turn up service and therefore shorten the time to revenue for their fiber assets. Without monitoring a dark fiber provider does not have any knowledge of the health of the network on an on-going basis, only information from the time which it was installed. Should a fiber cut occur between the time of the initial installation and the current day, the provider would have no knowledge of that change without constant fiber monitoring. With fiber monitoring the provider would know about a change in status, send a repair team to ensure that when the fiber asset was to be "turned up" and leased to an end user, the fiber is fully functional and ready to use.

This "fiber readiness" results in quick time to review and ensures that customer capture and retention as the service will be ready immediately. Fiber monitoring also allows the dark fiber provider to be able to react their customers' inquiries about fiber availability. With monitored fiber the provider can be sure that their fiber asset is not the source of the network problem and point to end user equipment removing themselves as a possible source of the fault while also speeding the time of their end customer to get a faster resolution to the outage. This increased SLA offers a dark fiber provider an effective means to increase the rent per month and the cost of the ALM monitoring equipment could pay for itself with the win of one customer or increase SLA within one event or over a period of 1-2 two years. Each environment is different but the ROI potential is easily visible.

Increased SLA: Ethernet service

Several Tier 1 network providers are leveraging the ALM to enable them to offer a premium Ethernet service. In essence, they add the ALM to monitor the access line of an Ethernet service and offer increased SLA (faster repair-time / improved MTTR). Organizations such as banks and governmental institutions often require these types of service agreements and fiber monitoring ensures that the service provider can meet these stringent demands in a cost effective manner.

The ability to offered tiered service offerings with "down time" guarantees allows the provides to differentiate themselves from other providers as well as maximizes revenue opportunity will providing high levels of customer satisfaction.

Security

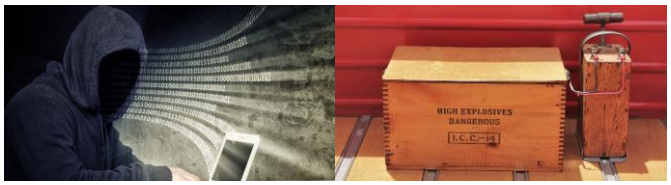
The network infrastructure can be an overlooked target for security threats. Most security concerns with wide media exposure revolve around user identify and unauthorized access to data. The fiber infrastructure can be a target that will enable data theft but also the fiber network can be a target to disrupt communications to cause chaos and confusion and push organizations to backup systems which can be far less secure, available or reliable.

The ALM is capable to detect fiber intrusion and this feature is a very common request by banks and governmental institutions to monitor the fiber across their network. Even though often times encryption is used on the transponders between data centers, banks and governmental institutions typically don't want to take any chances and want to prevent third parties from getting access to the fiber infrastructure. The ALM not only identifies any high loss locations that might point to taps in the system, it will also monitor changes of insertion loss indicating locations where someone might try to tap the fiber. The business model for the carrier in this application is that the ALM enables an SLA in which changes to the fiber infrastructure are monitored. This capability not only provides differentiation for the carrier for their service to offer to third parties, it also is an incremental revenue generator.

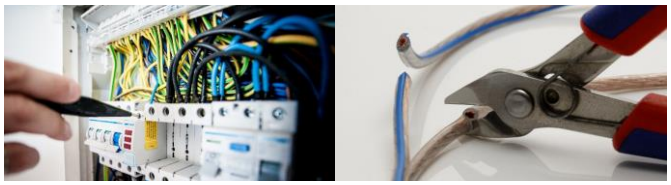
Vandalism

Natural disasters

Cyber Terrorism



Theft-Sabotage



Summary

The performance of the fiber infrastructure is a critical aspect for any carrier, service provider or Enterprise. Ensuring the network is operational is critical to ensure the proper operation of communications and is threatened by many items including human error, environmental condition, vandalism, terrorism and information theft. The ability to respond to these threats as quickly as possible is paramount. The ability to control the costs of maintenance are extremely important to the financial stability and bottom line of any organization by reducing costs as well as maximizing revenue opportunities. Adva's Fiber Assurance Solutions enabled by the Advance Link Monitoring (ALM) solution provides the foundation and technology to optimize fiber resources.