



Deutsche Bahn Cable Theft Monitoring Berlin, Germany

Project Overview

Cable theft costs millions of dollars every year for rail network operators across the globe. Not only does it cause material damage, but the costs of cable theft also include network delays, failures and repairs. In some situations cable theft also poses a safety risk due to circuit failures and electrical hazards.

Deutsche Bahn, the German rail operator, loses an estimated 14 million euros per year in cable theft (Mobilitätsmagazin, 2015). As an established rail operator, the benefits of partnering with AP Sensing were twofold: first, to reduce the costs of cable theft, and secondly to utilize a smart, innovative solution as an investment into the advancement of its railway infrastructure.

Solution

In 2018, AP Sensing began cable theft trials with the Deutsche Bahn in Berlin. Distributed Acoustic Sensing (DAS) technology uses a fiber optic cable as a continuous sensor that detects acoustic energy. With DAS, AP Sensing can detect, locate and classify multiple acoustic events in real time. During this specific trial, one N52-Series DAS unit was set up in a single-ended installation. The unit was used to monitor a 36 km track from the south of Berlin to Brauth.

Benefits

One of the advantages of using fiber optic sensing for railway monitoring is that pre-existing trackside infrastructure and cables can be used. This means that the installation and maintenance of the system is low-effort and does not require trackside closures.



Background

- Cable theft costs rail operators millions of dollars every year
- Established rail operator looking for a modern, smart solution and to deploy updated technology to railway infrastructure



Solution & Benefits

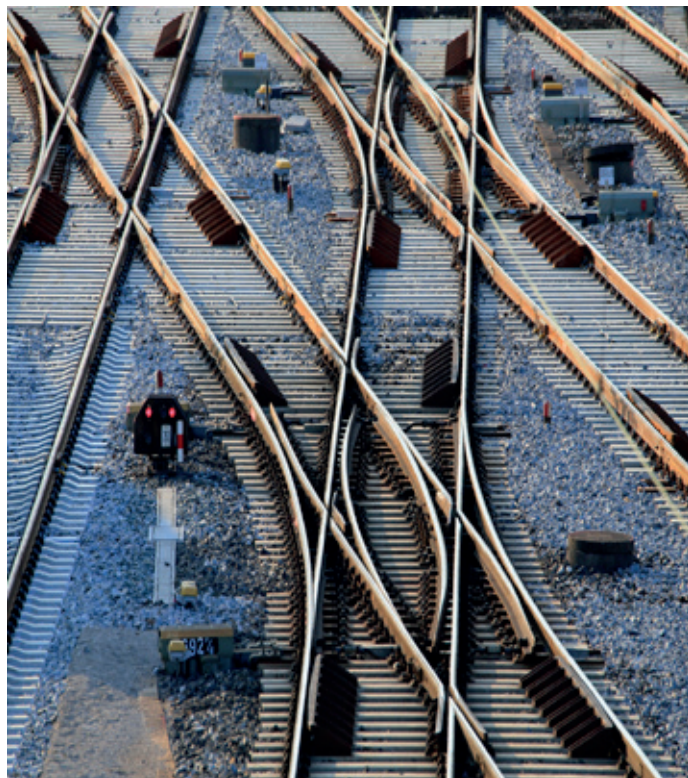
- One Distributed Acoustic Sensing (DAS) unit with a 70 km range deployed to monitor cable theft
- System uses pre-existing track side infrastructure
- DAS technology has flexibility to detect various types of rail events
- 24/7 real-time monitoring data



In comparison to other technologies that are traditionally used to monitor cable theft such as infrared cameras, DAS offers continuous sensing capabilities at every point along a track. Additionally, it is a smart solution and high performing technology. In combination with artificial intelligence (AI), DAS technology can be used for smart, predictive maintenance.

The use of a digital twin - a digital representation of a train, railway track, or both - is used to optimize rail network and provide better planning capabilities.

Therefore, DAS technology can be used for many facets of rail monitoring track condition, train condition, train location and integrity, defects and natural hazards. AP Sensing was originally selected by the Deutsche Bahn for the capabilities of our DAS system and its potential in R&D for future innovations.



Trials

After the initial installation in Berlin, a trial was conducted at two different locations along the track. Following data collection and analysis, the system then entered a phase of performance enhancement. At the end of this phase, the system was left for a three month period of observation.

The Berlin cable theft trials with Deutsche Bahn were completed successfully in 2019. Since this date, AP Sensing and the Deutsche Bahn have continued to work together on further railway monitoring projects within the scope of Digital Rail for Germany focused on developing reliable algorithms using AI. The focus of these projects include train tracking (integrity and localization), improved train operation via moving blocks, and a platform announcement project focused on providing more detailed information for train users.

The photos used in the case study are copyright Deutsch Bahn AG /Volker Emerslebe and Deutsche Bahn AF/ Uwe Mieth.