stl.tech

# Sensron

## Fibre-Optic Sensing Solution for Oil & Gas industry

# Oil and Gas Industry

## Overview

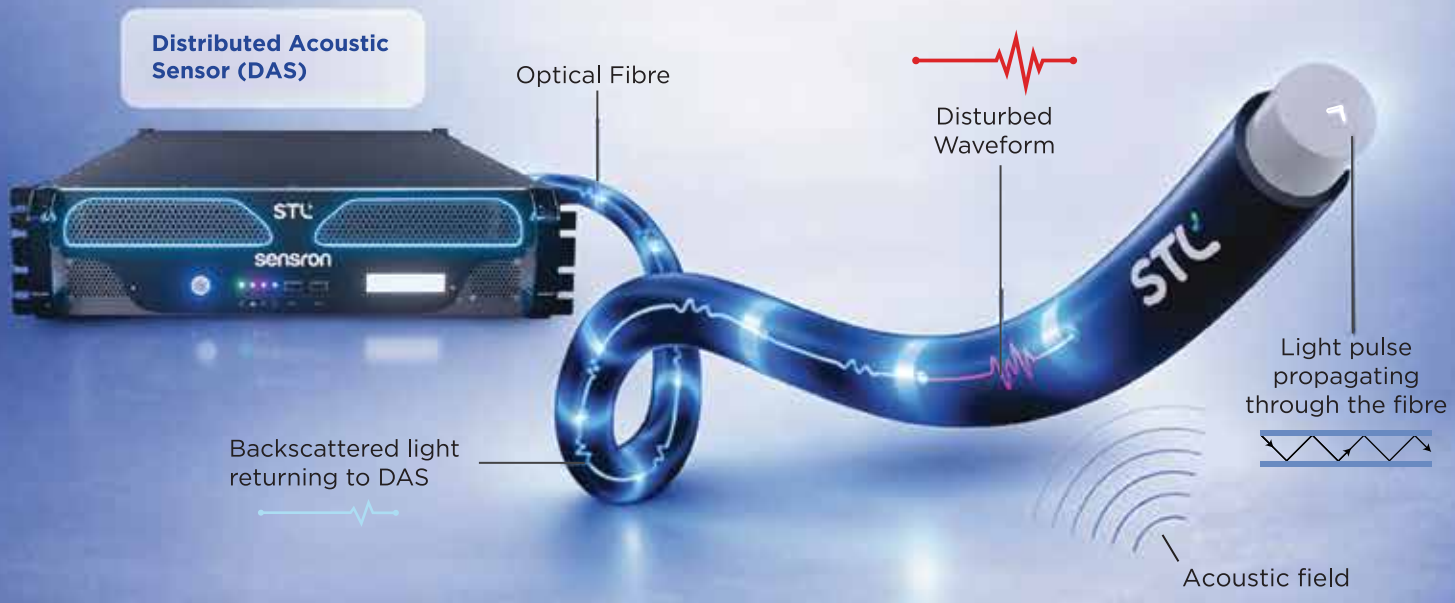
In recent years, Oil and natural gas infrastructure has undergone substantial expansion, largely fueled by growing investments aimed at facilitating the nation's transition away from coal and bolstering energy security.

Distributed Acoustic Sensing (DAS) represents a state-of-the-art solution for enhancing the protection and integrity of oil and gas pipelines. This technology utilizes standard, installed optical fiber—acting as a continuous, high-sensitivity sensor—to monitor the pipeline corridor across vast distances in real-time. By sending pulsed laser light down the fiber and precisely analyzing the backscattered signal, DAS systems can instantaneously detect and locate various forms of acoustic energy (vibrations) along the entire length of the asset. This unparalleled capability makes DAS highly effective for both pipeline leak detection (identifying the distinct acoustic signature of pressurized fluid escaping the pipe) and for security and third-party intrusion (TPI) monitoring (recognizing vibrations caused by digging, machinery, walking, or vehicle movement near the pipeline). The immediate, highly localized detection provided by DAS dramatically educes response times for operational disturbances, minimizing potential environmental and safety hazards, and safeguarding crucial infrastructure against damage or theft.

# STL's Fibre Optic Sensing (FOS) Solution

STL delivers a fully integrated and networked sensing solution based on Distributed Acoustic Sensor (DAS) coupled with an AI-enabled smart alarm system that helps to detect, inform, and defend with actionable insights A DAS interrogator converts standard communications single mode fibre into thousands of extremely sensitive acoustic and vibration sensors. It senses the vibrations from various events around it, which could be several meters away.

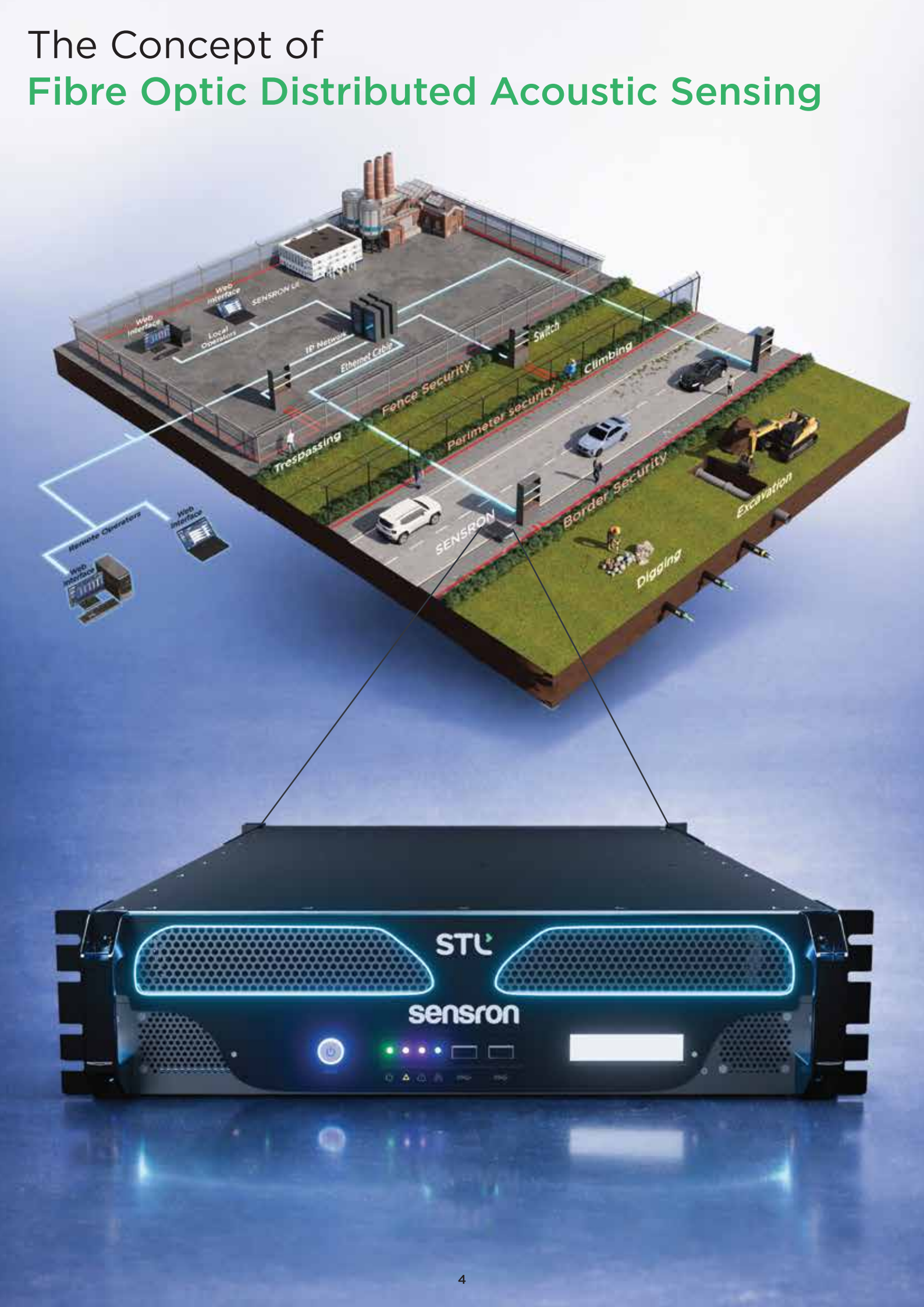
As the data is processed in real-time, advanced signal processing and AI algorithms in our sensing solution recognize the unique pattern of each type of event. The events are detected, classified, and reported to the users through a GUI with actionable insights. The system can then show the users the precise locations and durations of the events and enable the user to make a timely and appropriate response.



# Building Blocks of STL's

| | |
|---|---|
| **DAS Interrogator** | Sends thousands of short pulses of light along the fibre every second and observes the backscattered light disturbed by the vibrations surrounding the optical fibre |
| **Event Detection and Classification** | Deep Learning algorithm that detect and classify events based on the unique signature |
| **Pre-Processing Module** | Converts huge data received from the DAS interrogator into meaningful data for easy visualization and processing |
| **Data Storage** | Stores event-related information |
| **Graphical User Interface** | Web-based user interface to monitor events – type, location and time, configure zones, control user access, configure various parameters & settings, etc |
| **API** | Enables integrations with other applications |

# The Concept of
# Fibre Optic Distributed Acoustic Sensing



# Specification & Features of FOS Solution

Advanced AI/ML-algorithm-based solution

Detects and locates multiple intrusion simultaneously

Dual channel DAS (range*-80+ km)

Single channel capacity (range*-40+ km)

Event location accuracy: ±10m

Response Time: < 10 sec

Probability of detection: > 95%

Full integrated central monitoring system with alarms and tracking mechanism

API integration

**Interrogator Specifications**
Wavelength: 1550 nm, Input voltage : 100-240 V AC, 50/60 HZ
19” rack-mountable, Output connector : SC/APC

**Interface:**
TCP/IP via software API,

Events Detection range (Depends on soil conditions & event types)

a. Manual Digging
b. Mechanized Digging(Excavator)
c. Auguring
d. Drilling
e. Vehicle Movement

*based on the link attenuation

# Software **Features**

- Web based graphical user interface
- Role Based Access Control(RBAC)
- System configuration and calibrations
- Centralized Monitoring solution
- Historical logs of events and status
- Zone configuration
- Alarm Acknowledgment
- User Comment
- Geo Mapping and Custom Marker
- Zone Creation
- Live and Historic Waterfall
- Live and Historic Alerts
- Auto-Startup & Remote Diagnostic
- Realtime Dual channel Monitoring
- Event Audio and Spectrogram
- API Integration
- Remote Updates & Configuration back-up
- User Specific Access
- Online Maps with customized resolution
- Fine tuning and ML Configuration
- Alarm Report Generation (CSV, PDF, Excel)

# STL Sensron DAS: Detection Capability

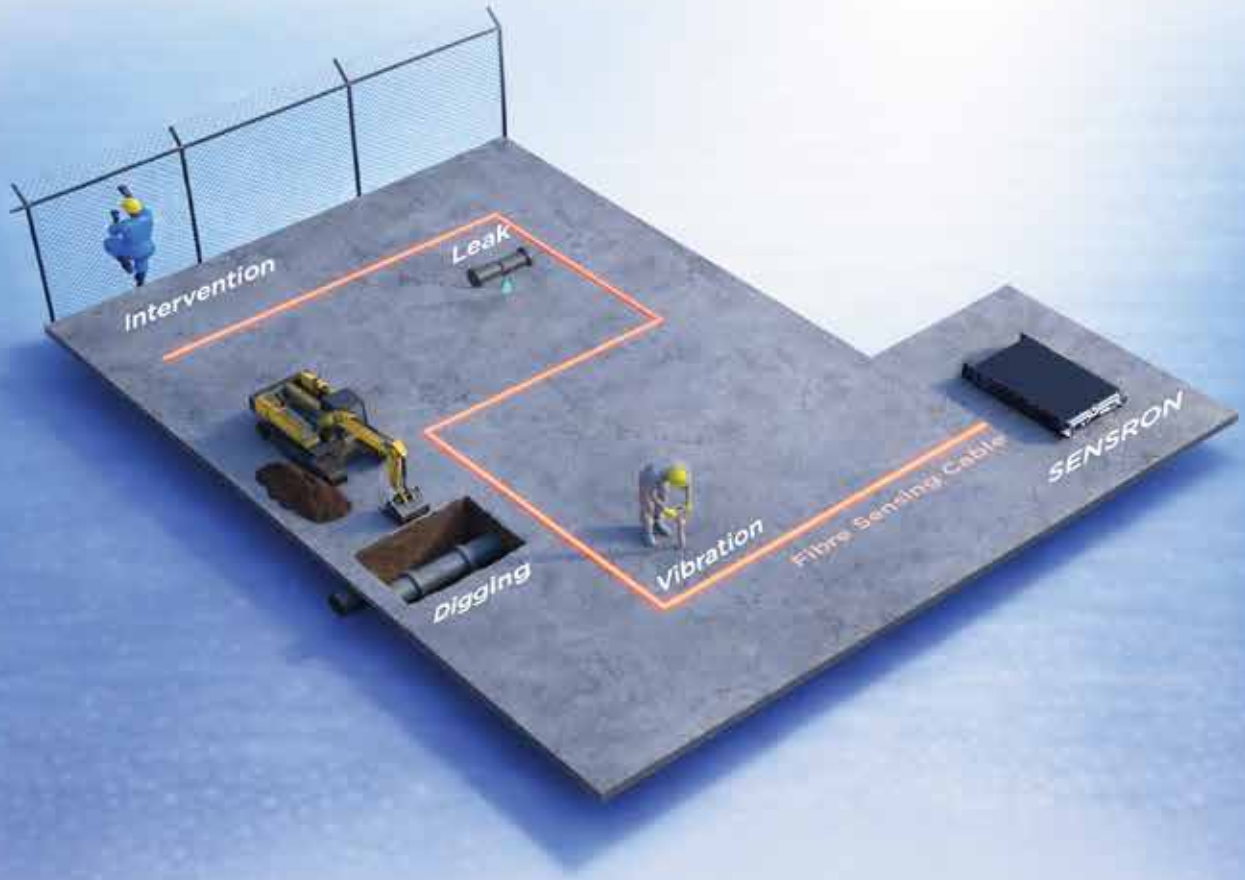
Distributed Acoustic Sensing (DAS) provides continuous, real-time surveillance along the entire length of a pipeline. It effectively turns the installed fiber optic cable into a highly sensitive array of thousands of virtual microphones, allowing operators to "listen" for disturbances and anomalies. Sensron Solution with its advanced AI/ML algorithms classify the disturbances/vibrations into relevant type of events.

## Third Party Intrusion (TPI)

- Vehicle movement (cars, trucks)
- Mechanical digging (excavators, bulldozers)
- Manual digging (shovels, pickaxe/spade)
- Drilling or tapping the pipeline

## Monitoring

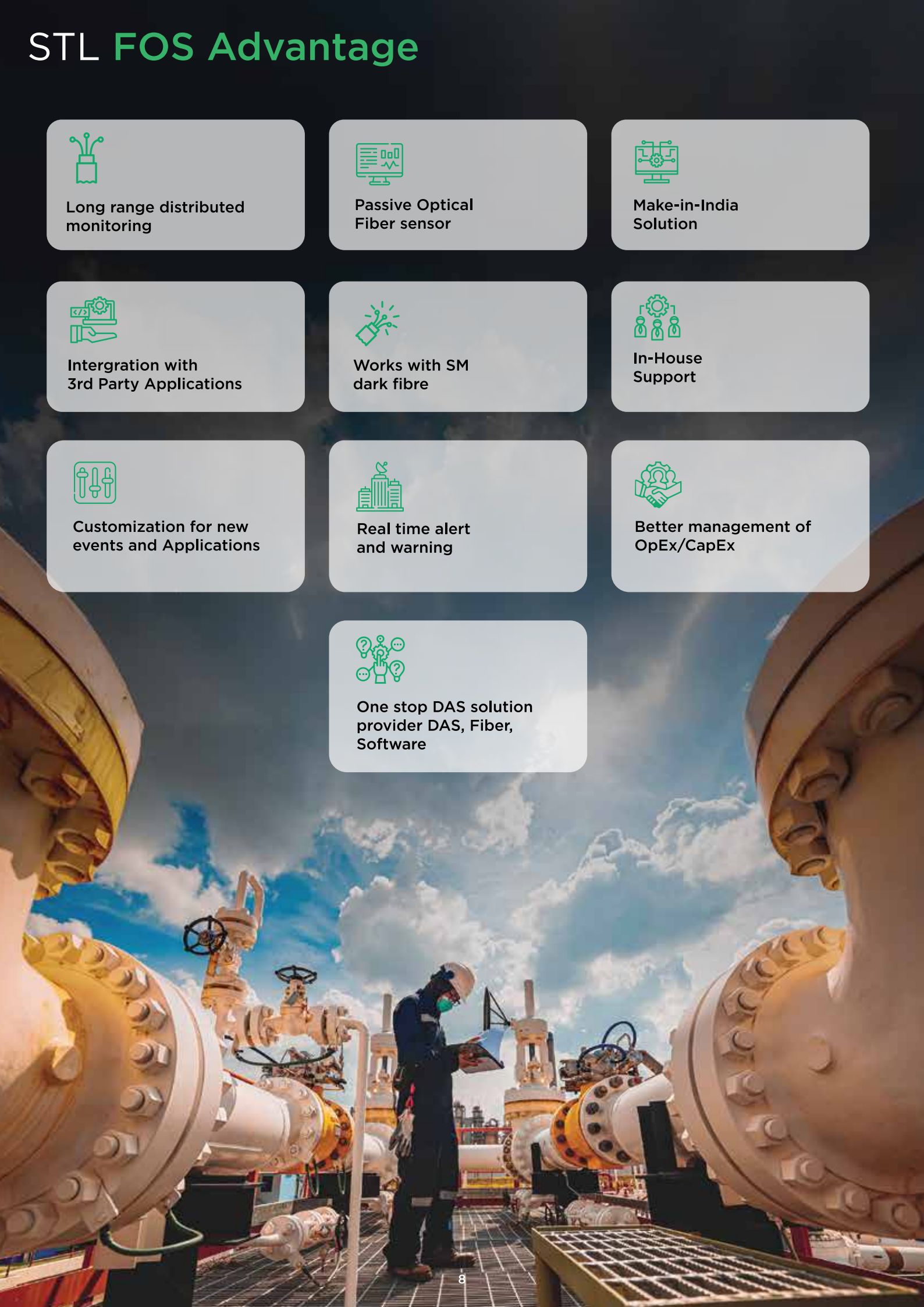
- PIG Tracking
- Leak Detection
- Geo Hazard Monitoring




The Concept of Fibre Optic Distributed Acoustic Sensing

# STL FOS Advantage

- Long range distributed monitoring
- Passive Optical Fiber sensor
- Make-in-India Solution
- Intergration with 3rd Party Applications
- Works with SM dark fibre
- In-House Support
- Customization for new events and Applications
- Real time alert and warning
- Better management of OpEx/CapEx
- One stop DAS solution provider DAS, Fiber, Software



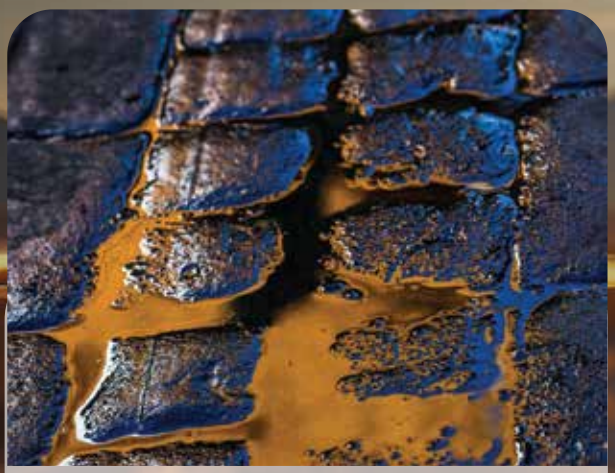
# Application Areas and Event Cases

## Third Party Intrusion (TPI) Activities

DAS can detect third-party activities like unauthorized access or tampering along the pipeline. Physical intrusion events such as digging, auguring or drilling near the pipeline, which might damage the infrastructure can be detected.

## PIG Tracking

When pipeline inspection gauge (PIG) moves inside the pipeline as part of maintenance activity, it creates vibration along the pipeline. DAS can detect these vibrations and can be used to locate the PIG.



## Early Leak Detection

DAS can detect leaks early by identifying subtle changes in temperature, pressure, and acoustic signals.

**Acoustic signals:** Leaks produce distinct acoustic signatures, which DAS can detect even at a distance, helping to pinpoint the location of the leak.

# Key Features

## Long-Range Monitoring

Fibre-optic cables can cover vast distances, which is particularly useful for monitoring long pipeline networks

## Continous Monitoring

24x7 monitoring providing round the clock surveillance of the pipelines

## Real-time Monitoring

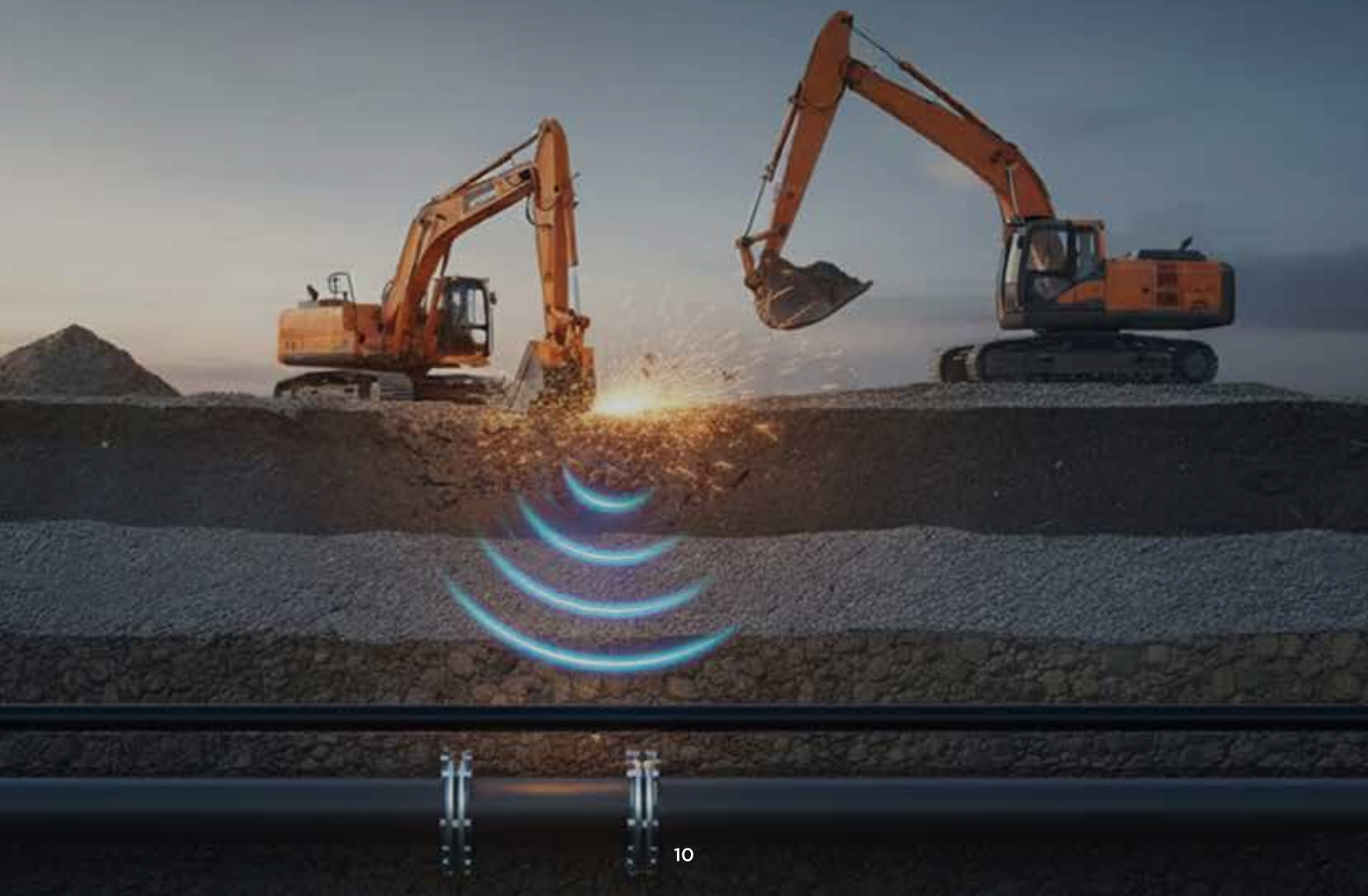
DAS real time alert generation to avoid any severe events

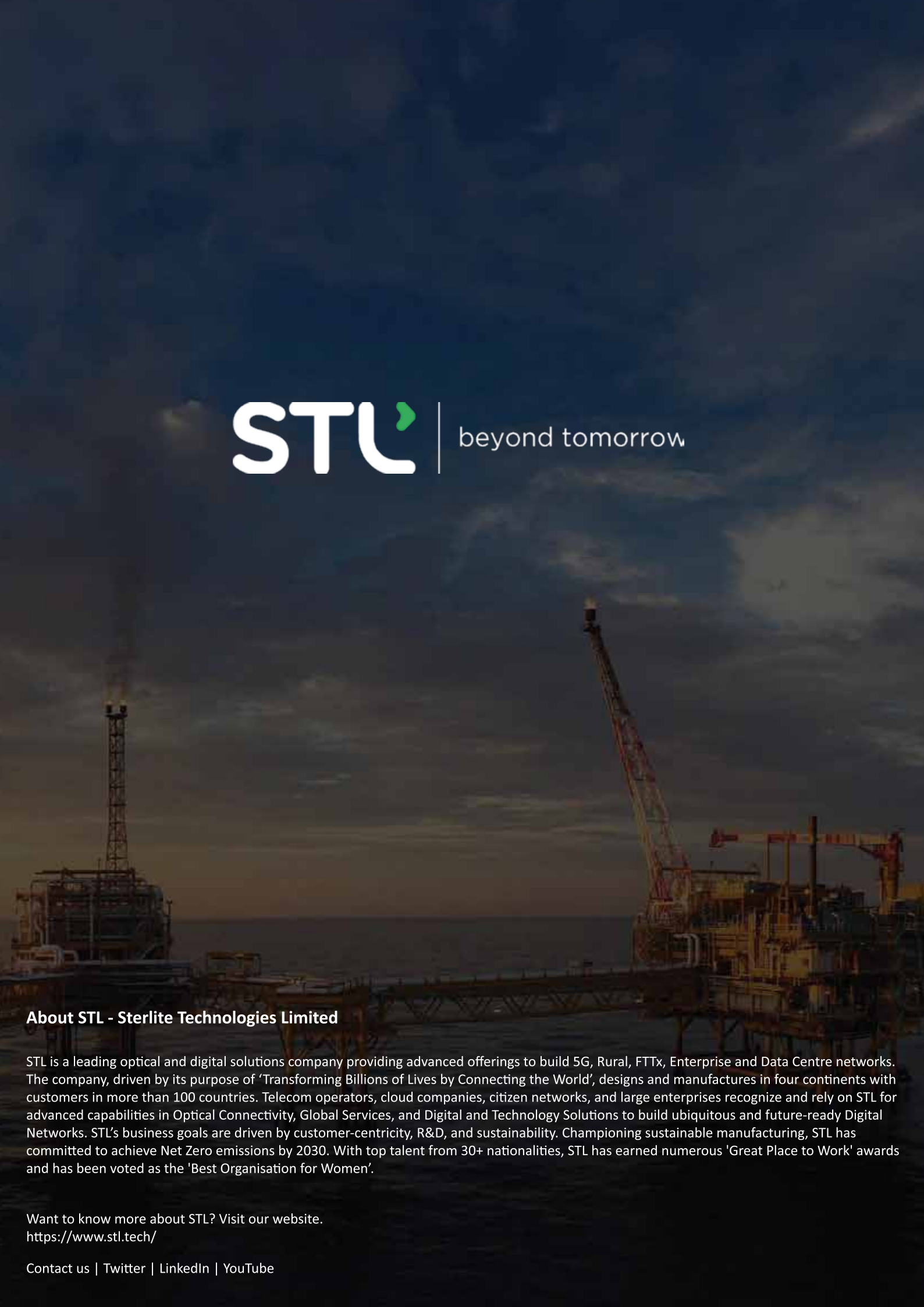
## High Sensitivity

Capability to detect small variations at early stages enabling early warning about potential issues.

## AI Driven Event Classification

AI classification to identify genuine and Non genuine vents.






## About STL - Sterlite Technologies Limited

STL is a leading optical and digital solutions company providing advanced offerings to build 5G, Rural, FTTx, Enterprise and Data Centre networks. The company, driven by its purpose of 'Transforming Billions of Lives by Connecting the World', designs and manufactures in four continents with customers in more than 100 countries. Telecom operators, cloud companies, citizen networks, and large enterprises recognize and rely on STL for advanced capabilities in Optical Connectivity, Global Services, and Digital and Technology Solutions to build ubiquitous and future-ready Digital Networks. STL's business goals are driven by customer-centricity, R&D, and sustainability. Championing sustainable manufacturing, STL has committed to achieve Net Zero emissions by 2030. With top talent from 30+ nationalities, STL has earned numerous 'Great Place to Work' awards and has been voted as the 'Best Organisation for Women'.

Want to know more about STL? Visit our website.
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