Track Monitor Solution Overview

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Video

https://www.youtube.com/watch?v=QmqGQI0S9NA

Track maintenance is a major challenge for rail and metro operators

Measuring the condition of the tracks is a manual process performed periodically on closed tracks

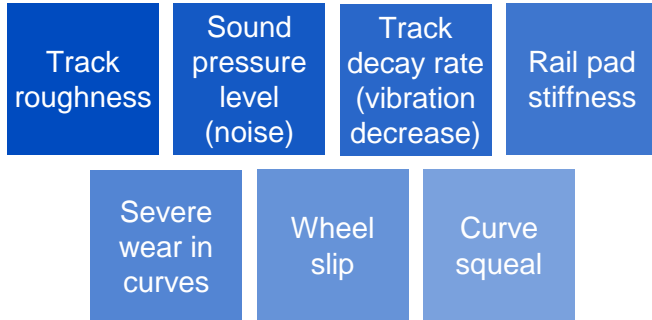Dependent on engine drivers to report track damage that require urgent repair

Lack of good data leads to difficulties in planning maintenance, handling problems, and addressing noise complaints from the general public
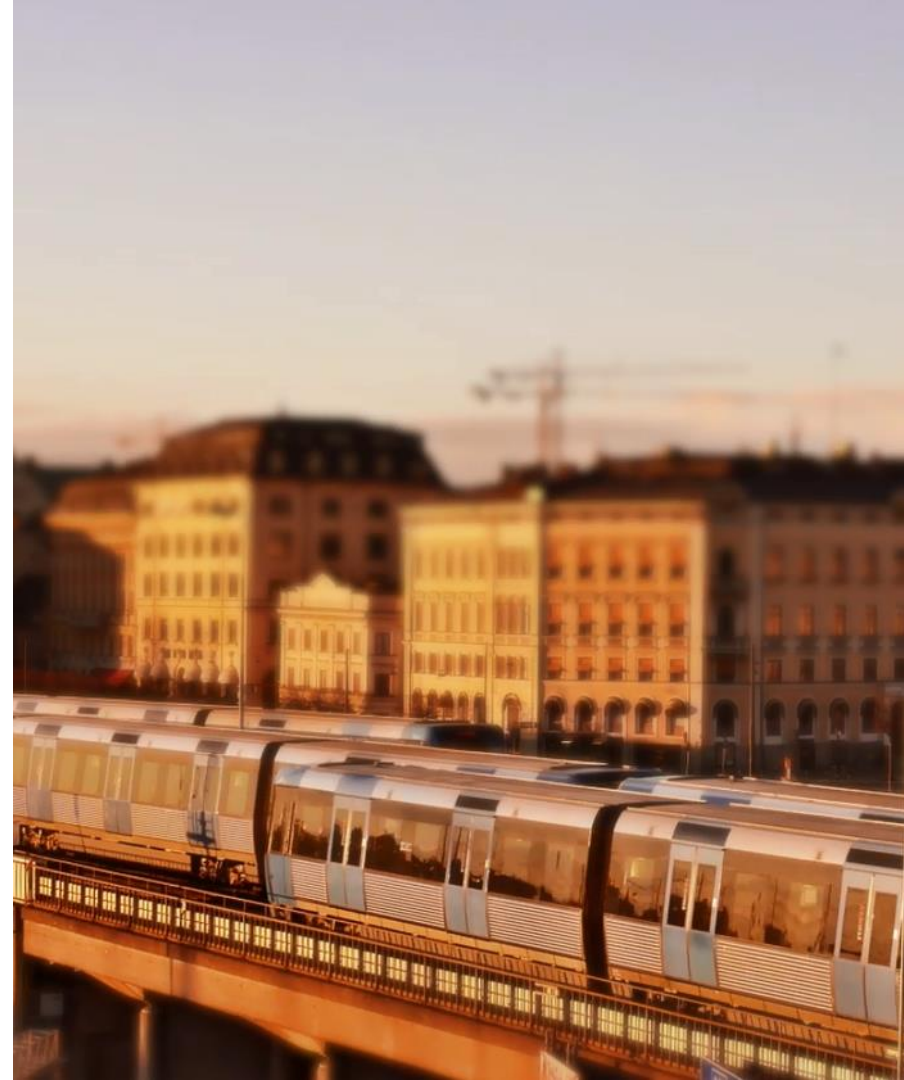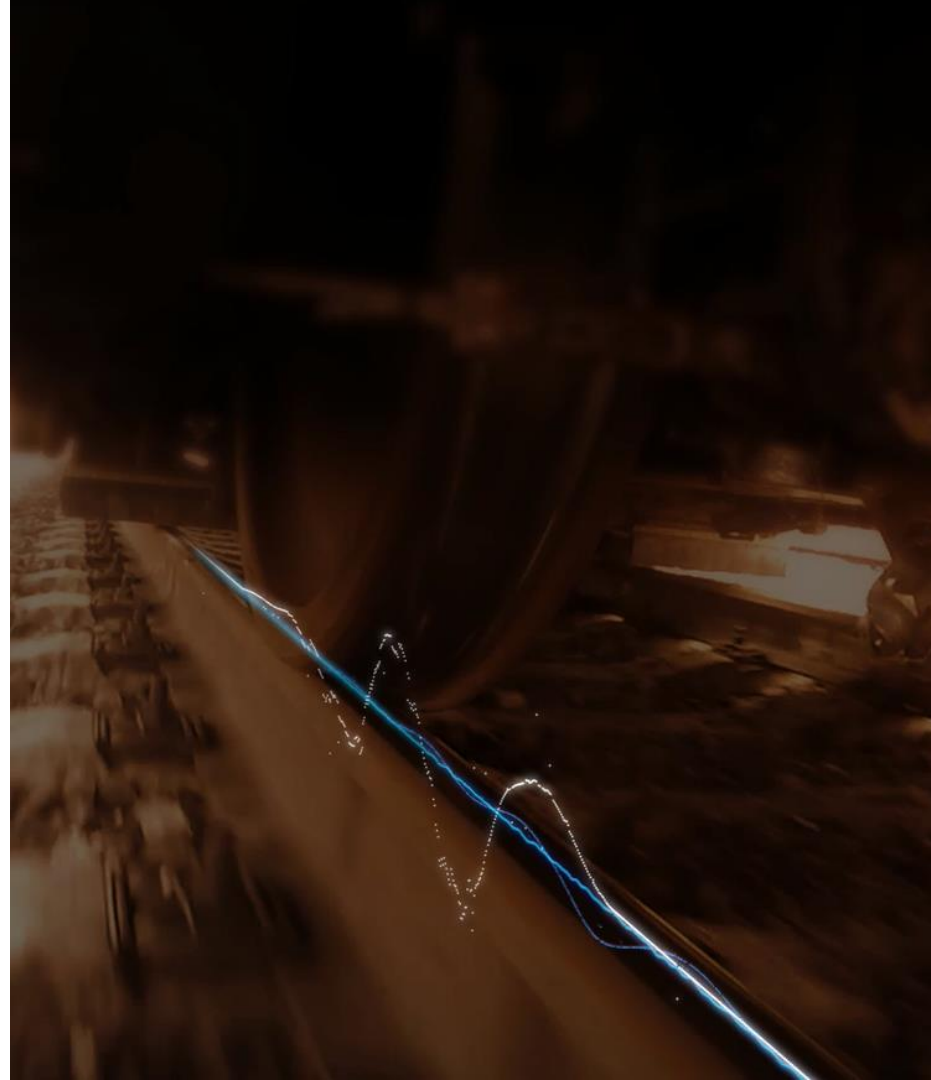
Acoustic rail track monitoring

Continuously monitors the condition of railway tracks using microphones and other sensors

Calculates and presents a number of parameters for each section of the track

Track roughness	Sound pressure level (noise)	Track decay rate (vibration decrease)	Rail pad stiffness
	Severe wear in curves	Wheel slip	Curve squeal

Used to identify need for track maintenance and generate automatic alerts for urgent problems

The track data collected supports several use cases

Data type	Usage for track maintenance
Track roughness	Track roughness relative to EU Technical Specifications for Interoperability (TSI) reference curve. Indicates that grinding might be necessary.
Sound pressure level	Sound pressure level measured under the train. Impulsive or unexpected noise can be an indication of a problem with the rail.
Track decay rate	How quickly vibration in the rail decreases. A low track decay rate can be an indication of for instance a loose rail or a track floating above the ballast.
Rail pad stiffness	Indicates that rail pads have become stiff resulting in more vibration.
Severe wear	Indicates severe wear in the contact between the outer wheel flange and the rail in a curve. Lubrication may be needed to stop the wear.
Wheel slip	Indicates slippery tracks, due to weather or too much lubrication. A change in driving behaviour might be needed to limit damages (wheel flats).
Curve squeal	Indicates disturbing high-frequency noise, mainly in curves.

The solution consists of two main components

Onboard system

TYRÉNS
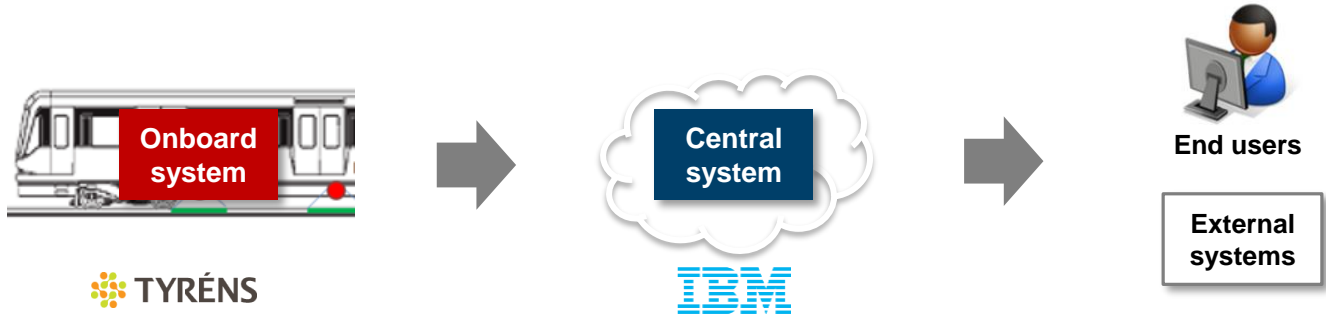
The **onboard system** is mounted on the trains and consists or microphones and other equipment to detect the condition of the track.

Central system

IBM

The **central system** is running in IBM Cloud and contains components to store and present track data, and generate alerts

End users

External systems

End users at railway operators or maintenance companies use the solution to monitor the condition of the tracks. **External systems** receive alerts or use APIs to access track data

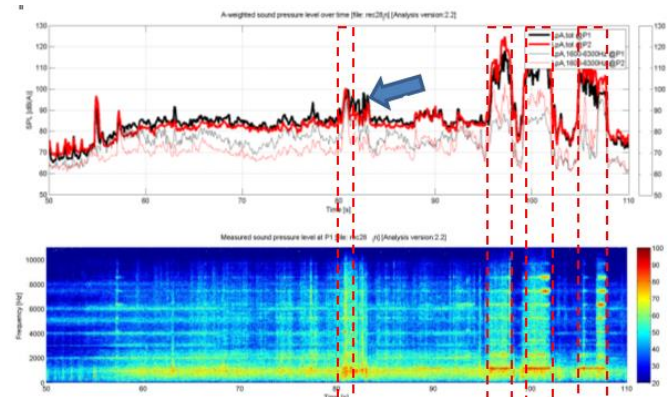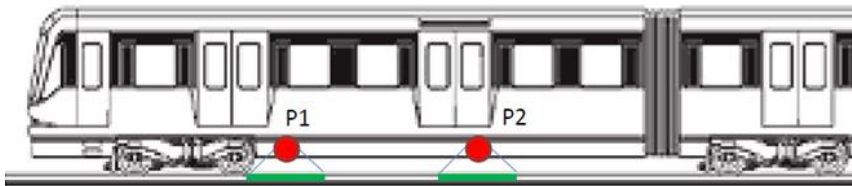# The onboard system records and analyzes sound

Onboard equipment

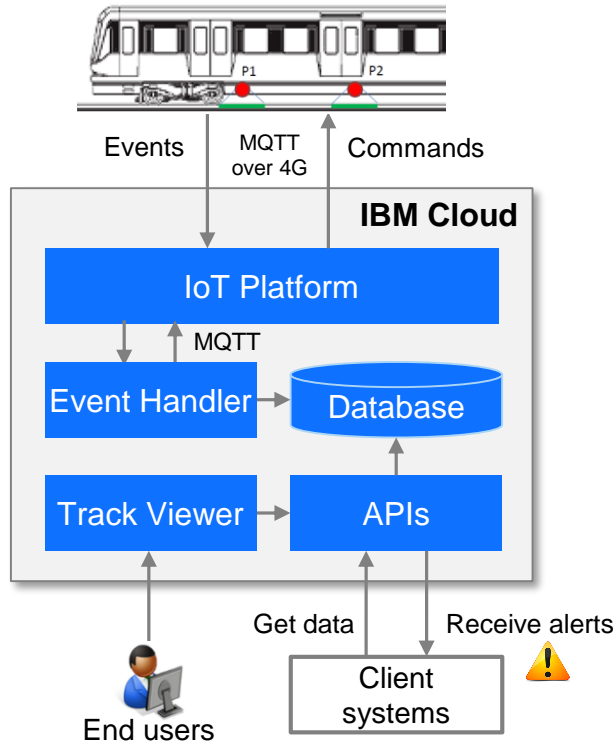4 microphones mounted under the train

2 accelerometers

Tachometer and GPS for position and speed

Software for real-time analysis of acoustic data and communication with central system (via 4G network)

The central system is provided as SaaS in IBM Cloud

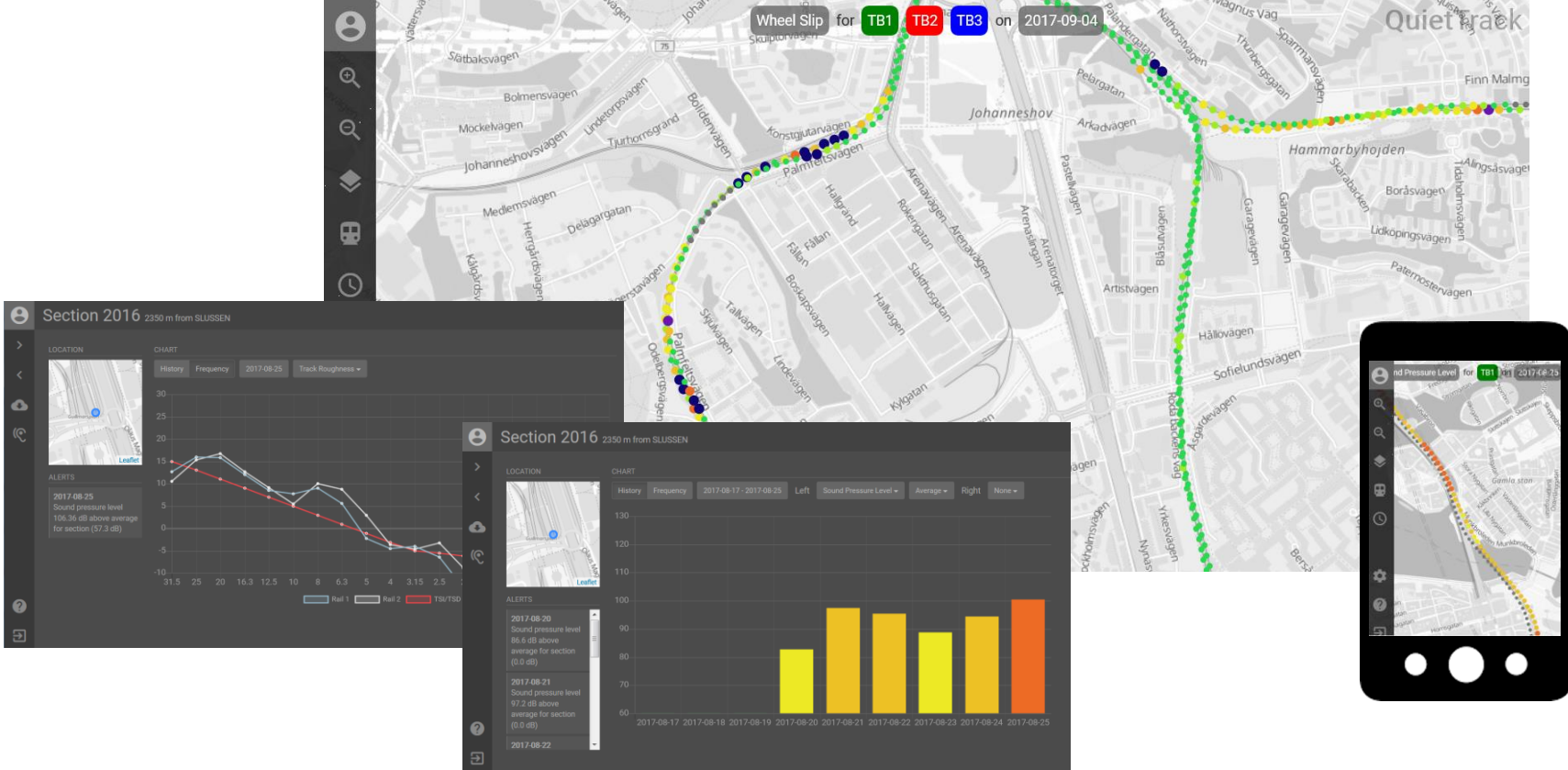Internet of Things platform for communication with onboard systems

Event handler aggregates data and generates alerts when anomalies are detected

Track Viewer for end users to analyze track data

APIs to client systems for receiving real-time alerts and reading data

Track Viewer gives end users a real-time view of track status

Substantial business benefits for operations and maintenance

Real-time insight into track condition

Reduced cost for track maintenance through automatic analytics and targeted investments

Reduced risk for damage on track and wheels due to severe wear in curves or wheel slip

Extended lifetime of tracks

Reduced cost for noise reduction activities and better handling of complaints from general public

Reduced risk for delays and better flow in traffic

The solution has been installed in the Stockholm metro

SL is responsible for public transport in Stockholm

A large number of metro, local train, and bus lines

Transportation and maintenance services outsourced to several private companies

Onboard system installed on seven metro trains

Track data and alerts available to SL and subcontractors

Thank you

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Technical questions
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