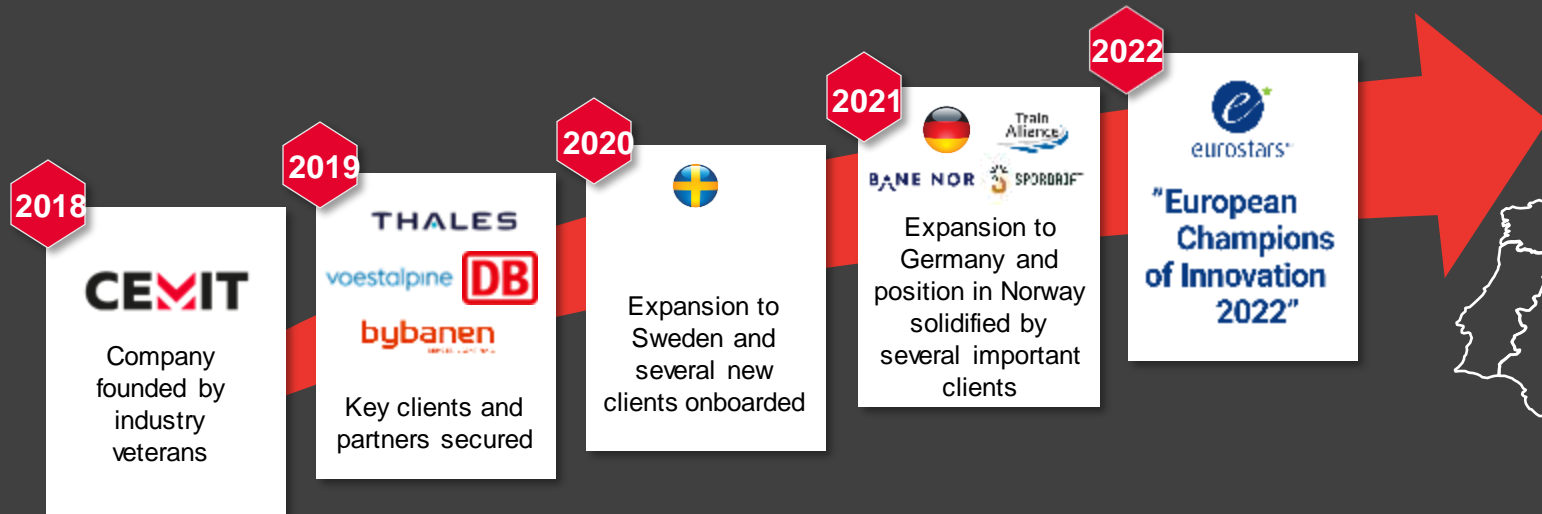




Trains with Brains

CEMIT at a glance

- Founded in 2018
- Mission to redefine sustainable transport by making railways more intelligent
- A unique team of experienced rail experts, data analysts and computer scientists, currently 50, 50, +300 by 2025
- Eurostars No1 (Horizon 2020/EU) 2022



CEMIT business areas - products and services

SaaS

Intelligent Railway System



- ✓ Big Data railway software platform
- ✓ Smart sensors, big data, machine learning, data visualisation, decision support
- ✓ The CEMIT platform supports custom development, connecting any data source

Rail Applications



- ✓ **Rail Visualizer:**
Predictive maintenance through smart sensors, data sources, visualised dashboards
- ✓ **Rail Depot Management:**
AI driven train recognition software to manage rail depots
- ✓ **Custom Rail Applications:**
Developed with CEMIT Intelligent Railway System

Projects and Services

Railway Expert Services



- ✓ Engineering, design and project management for technical rail infrastructure
- ✓ Hands on engineering, signalling and installation experts leading entire projects
- ✓ Senior rail management services supporting operators and infrastructure owners

Railway Technology



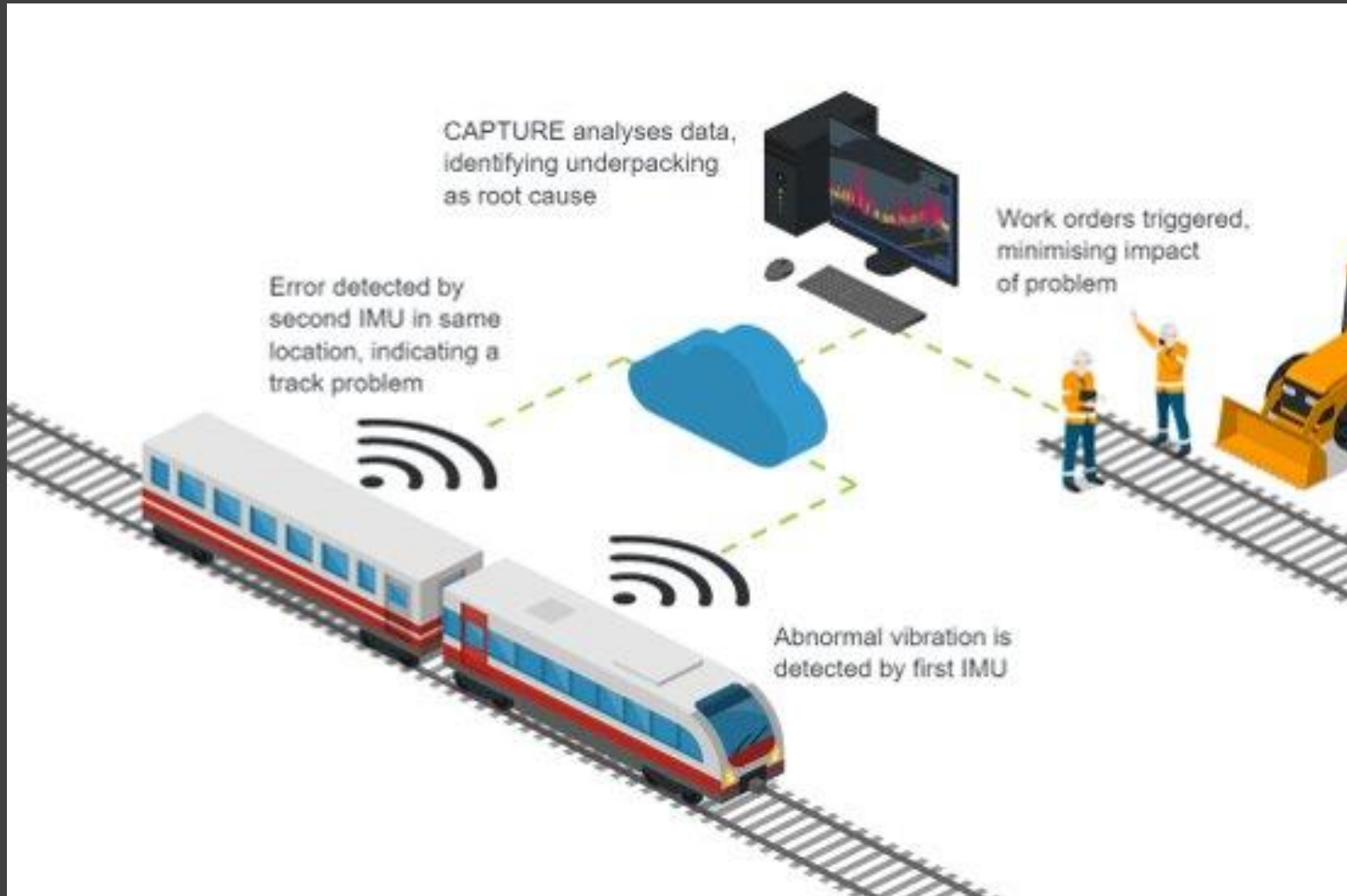
- ✓ Technology partnerships with leading rail industry players on signal and rail technology
- ✓ Knowhow of projecting, integrating and installing technical rail solutions
- ✓ Partnerships with Unstad, Thales, Deutsche Bahn, BBR etc.
- ✓ voestalpine agent and service partner in Scandinavia



Use the «train as a drone»



CEMIT intelligent railway technology



CEMIT intelligent railway system

Intelligent railway system

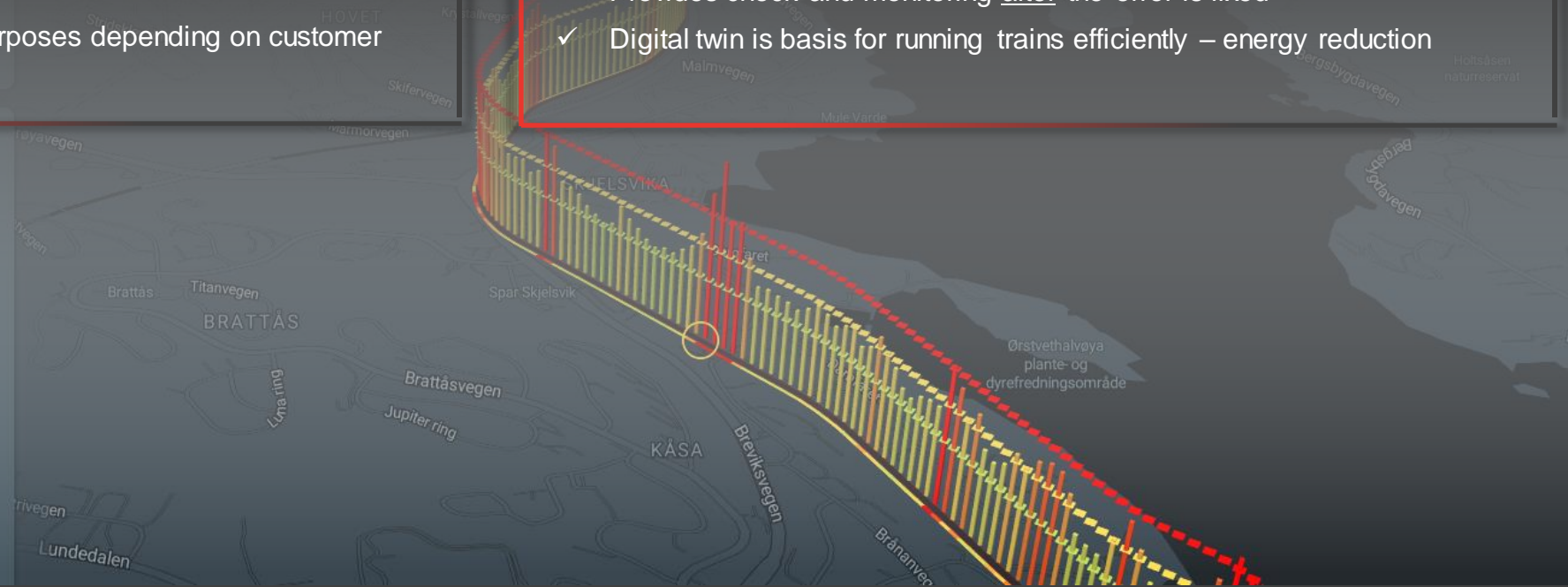
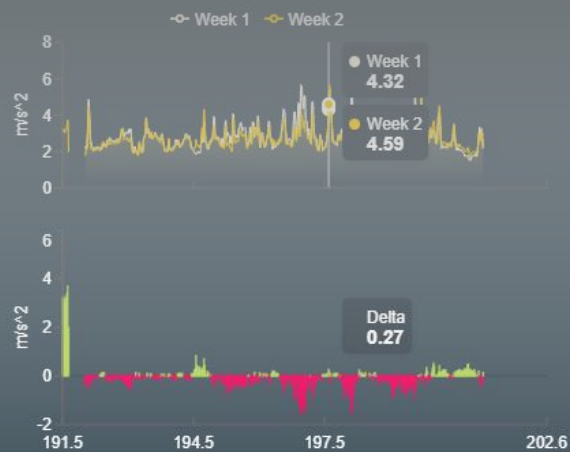
CEMIT solutions is constantly monitoring railway infrastructure and trains by using train in regular traffic as a “drone” and data collector

- ✓ No installation cost & disruptive monitoring methods
- ✓ Of the shelf- & inexpensive technology (engineered by CEMIT)
- ✓ Superior position accuracy – even without GPS signals
- ✓ Protected and complex data analysis modules enabling to predict how errors will develop – digital twin
- ✓ The same data is used for multiple purposes depending on customer needs

Customer benefits

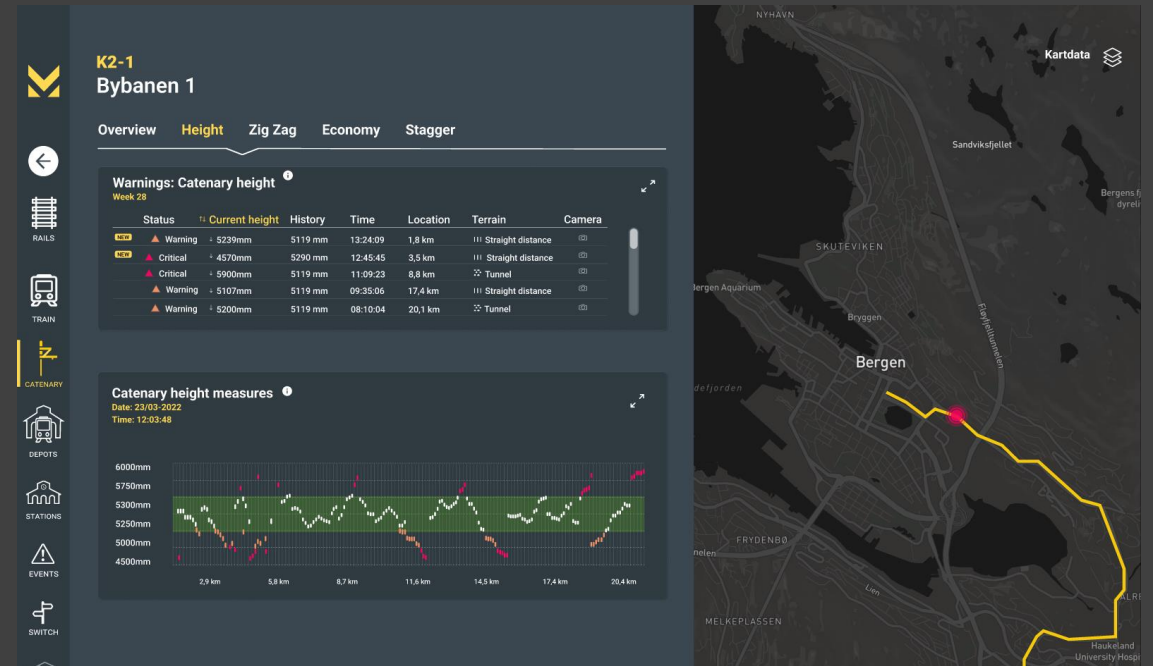
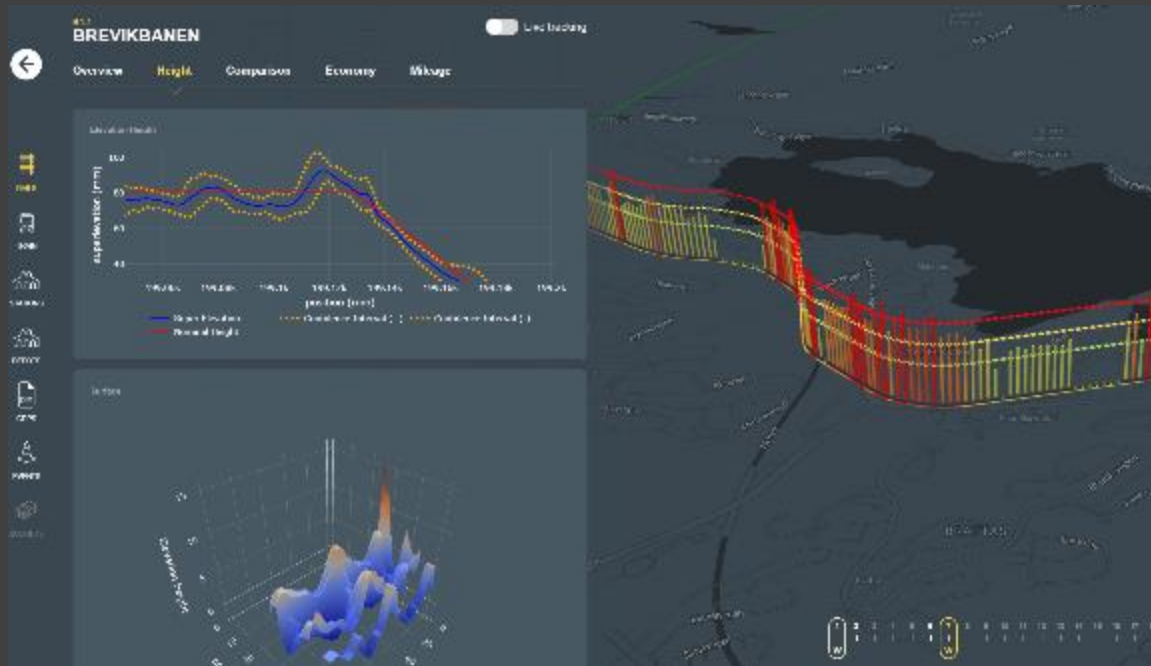
- ✓ Prediction enables the customers to find errors at an early stage and fix them before unwanted events occur
- ✓ Provides information for finding the best (cheapest) time to fix the error
- ✓ Will limit search time for finding errors tremendously – special advantage for subways and tunnels
- ✓ Allows customers to focus on cost effective - “right maintenance”
- ✓ Provides check and monitoring after the error is fixed
- ✓ Digital twin is basis for running trains efficiently – energy reduction

Mean acceleration of XYZ summarized



Artificial Intelligence and Machine Learning

Process large amounts of data for infrastructure and rolling stock
Identify patterns, deviations and anomalies



CEMIT Visualizer applications and features

Existing applications

Infrastructure

- ✓ **CEMIT Visualizer**
 - ✓ **Feature – Track monitoring**

Pending features

Infrastructure features Q2

- ✓ **CEMIT Visualizer**
 - ✓ **Catenary monitoring**
 - ✓ **Free room space monitoring**
 - ✓ **Track monitoring extension (track gauge)**
 - ✓ **Track monitoring point machine**

Rolling stock / others

- ✓ **CEMIT Visualizer**
 - ✓ **Feature – Train monitoring**
 - ✓ **Feature – Wheel temperature**
 - Week 1 → Week 7
- ✓ **CEMIT RDMS – Depot Management System**
- ✓ **CEMIT GRPS – Graphical Route Planning System**

Rolling stock / others features Q2

-
- ✓ **CEMIT Visualizer**
- ✓ **Train monitoring (Car body)**
 - ✓ **Transverse accelerations**
 - ✓ **Wheel wear condition monitoring and prediction**
 - ✓ **Context between transverse acc. and wheel wear**

CEMIT Visualizer – benefits and cost savings

Benefits

- **Continuous surveillance of train and infrastructure (train as a drone)**
- **Continuous Condition Monitoring, train and infrastructure**
- **Traceability and documentation of non-conformances**
- **Develop and build predictive maintenance**
- **(Rail and infrastructure) production optimalization tool**
- **Alarm setting on infrastructure**
- **Measure and documentation of safety and passenger comfort**

Cost savings

- Reduce cost of stand-by and maintenance contractors
- Reduce cost of inspection, NDT inspection, etc.
- Reduce cost and increase efficiency in use of inspection trains
- Reduce cost of train out of service
- Reduce cost of alternative services (bus, etc.)
- Reduce cost of displeased customers



Making one of the greenest ways to travel even greener

- There is a global megatrend towards greener, more sustainable transport
- CEMIT provides significant improvements to railway sustainability by improving fault reduction and by increasing accuracy, efficiency and predictability of railways, trams and city trains
- These improvements lower the overall costs and improves the user experience for the customer. This strengthens competitiveness in relation to fossil-fueled transport and road transport

Direct contribution to 5 of the UN's Sustainability Goals



Reduced downtime

- ✓ Predictable and smarter operations and maintenance through big data analysis and AI reduce downtime with over 20%



Energy efficiency

- ✓ Through reduction of unnecessary processes and improved overall performance energy consumption can be reduced by more than 5%



Reducing costs

- ✓ Predictable maintenance through big data and AI significantly reduces resource with costs reductions of more than 30%



Improved safety

- ✓ Improved knowledge of overall condition of the infrastructure enables prediction of maintenance needs and proactive maintenance of critical parts improving safety



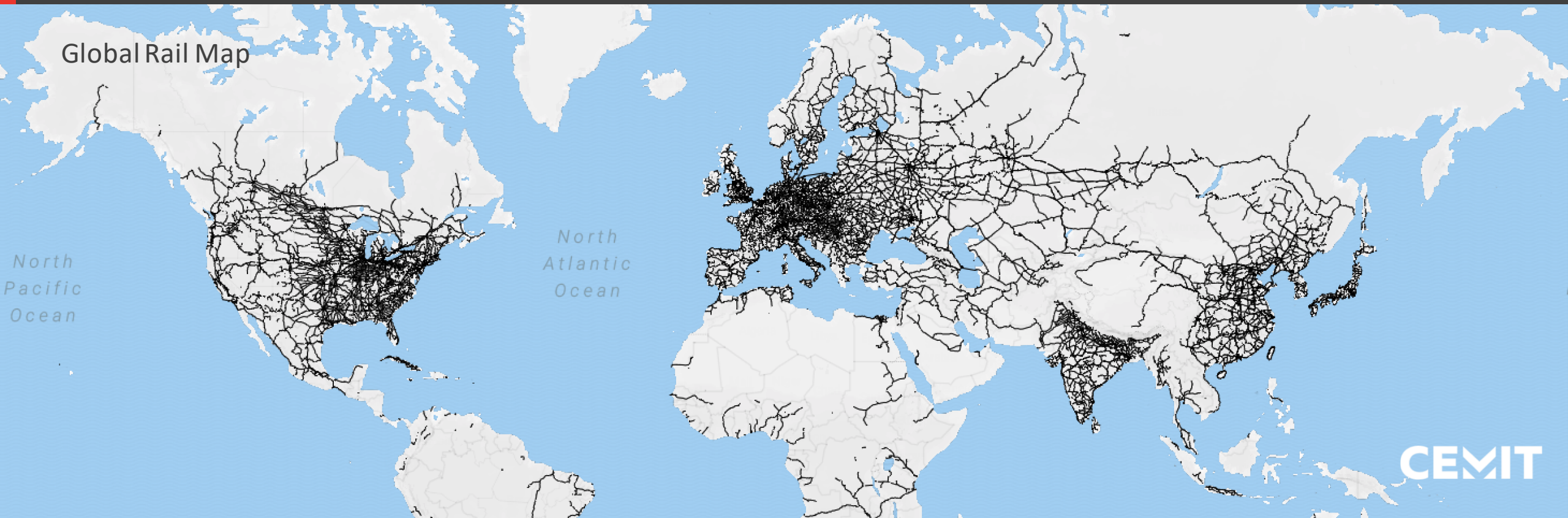
Digitalisation

- ✓ Replace manual and paper based solutions and processes. Removing the need for large printers, paper archives and increases productivity and team cooperation

The market opportunity of redefining a >100 Billion € industry

- ✓ The market for maintenance alone only in Europe is a 25 Billion € yearly market
- ✓ Railway maintenance machinery is worth €6.8 billion, growing at 10% CAGR during the next 5 years
- ✓ Railway System Market €18.87 billion in 2018 globally, and is projected to reach €28.52 billion by 2026

Of this growth, 43% is expected to come from European markets. Technavio claims that IoT-based remote monitoring of train and tracks is anticipated to drive the railway maintenance machinery market growth.



bybanen
BERGEN LIGHT RAIL

 **FLYTOGET**

 **CargoNet**

BANE NOR

 **SPORDRIFT**

 **Jernhusen**

**Train
Alliance**


 | **NORD**



CEMIT



MAKING RAILWAYS MORE INTELLIGENT

CEMIT are your partner for the digitalisation of rail transport operation and maintenance, making technology more accessible and affordable

Digitalisation is leading to increased accuracy, efficiency and predictability, increasing sustainability and competitiveness of rail transport



Visualizer, CDC & Vision

Visualizer

Grafana

Trackwidth

Catenary





CEMIT

Making Railways More Intelligent