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On-board and Wayside Train Measurement

TSI-SPOT® - SINGLE POINT OF TRUTH

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Railway Webinar Series

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Weekly Sessions in July 2021 | 4:00 PM (CET) | 10:00 AM (EST) | English

- Measurement in and for Railway - the HBK Ecosystem
- On-board and Wayside Train Measurement: Enabler of Efficient Operations
- Rail Vehicle Moving Source Beamforming
- Durability and Reliability Post-processing From Rail Operational Data

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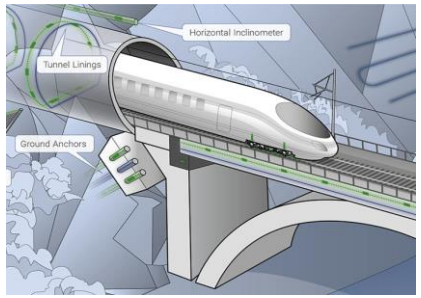

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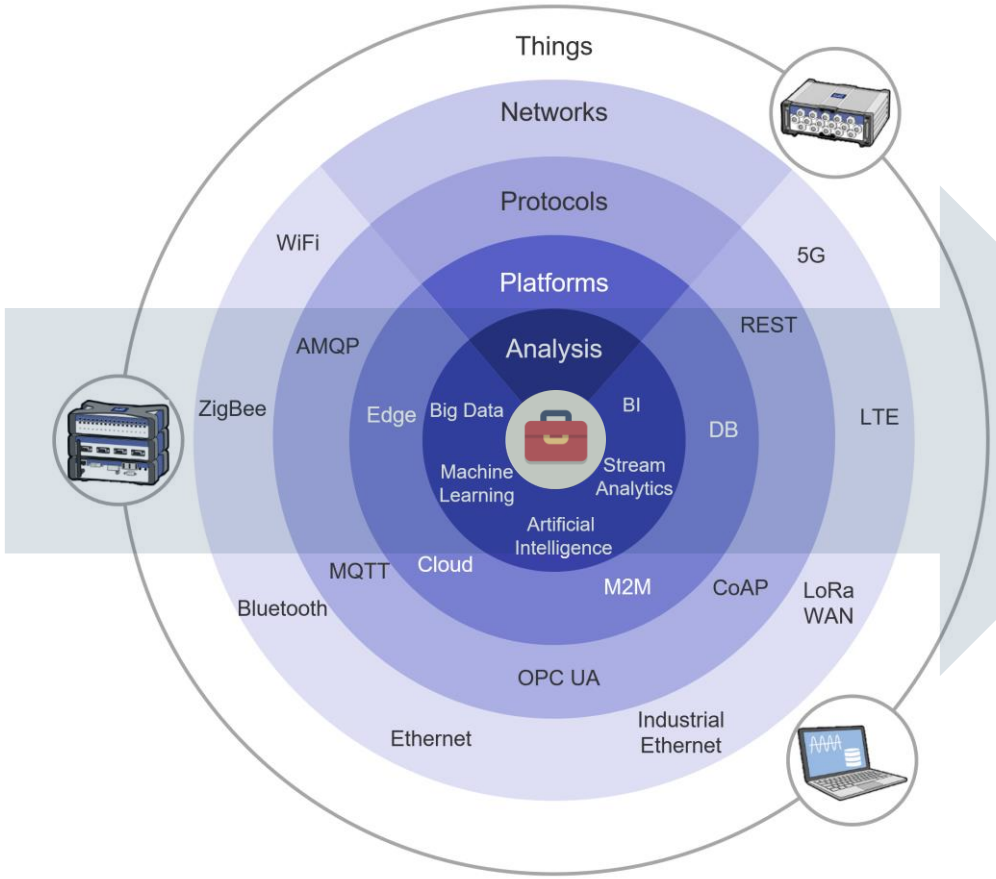
Ongoing maintenance revolution

Convential strategy

- Reactive / corrective maintenance
- Scheduled, time period-based maintenance

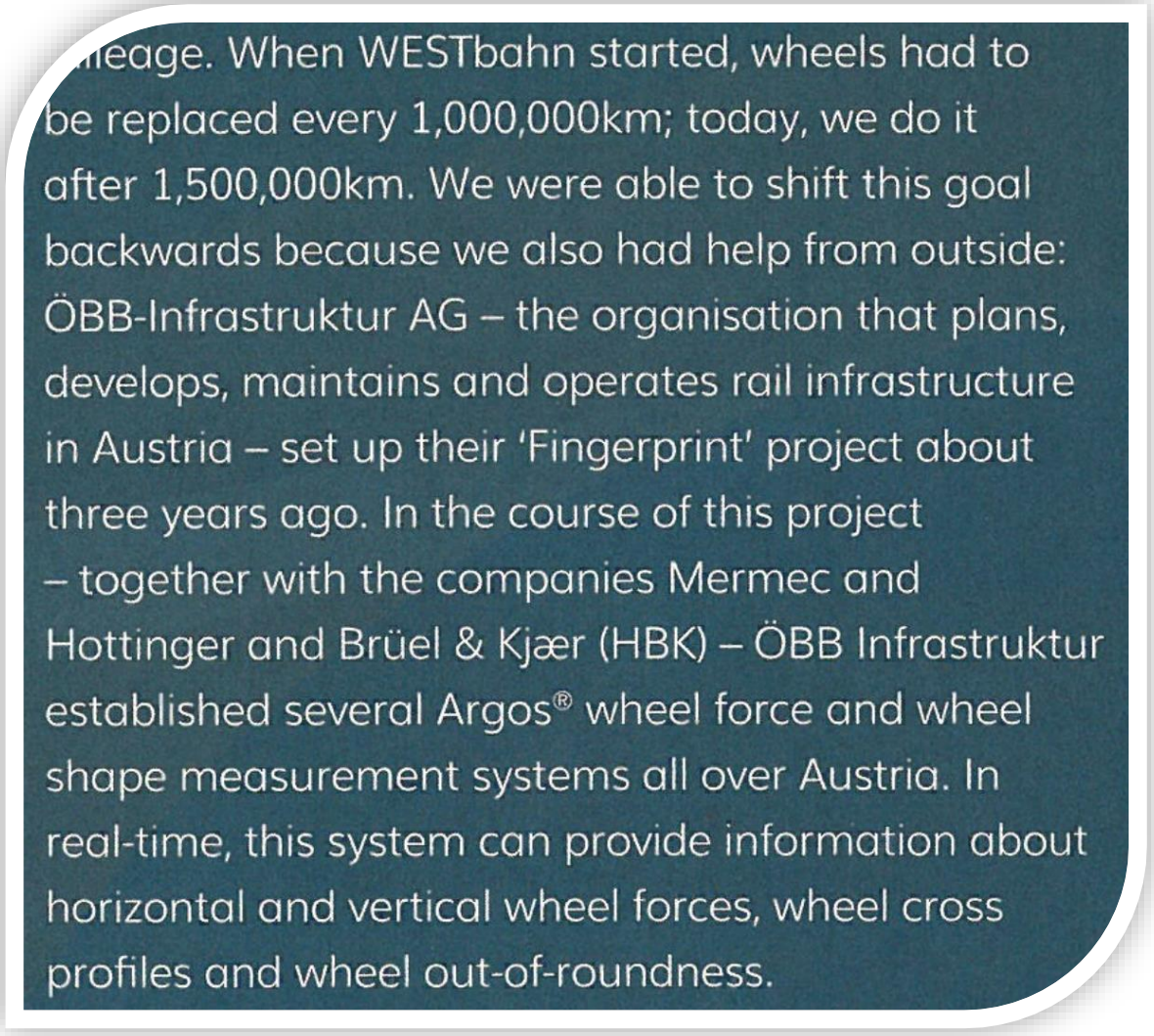
Toolbox



New strategies

- Usage/Load based maintenance
- Condition based maintenance
- Predictive maintenance
- Prescriptive maintenance

WTMS increased wheel lifetime: from 1 Mio. km to 1.5 Mio.



- Global Railway Review
  Volume 27, Issue 03

ERA – The target railway system

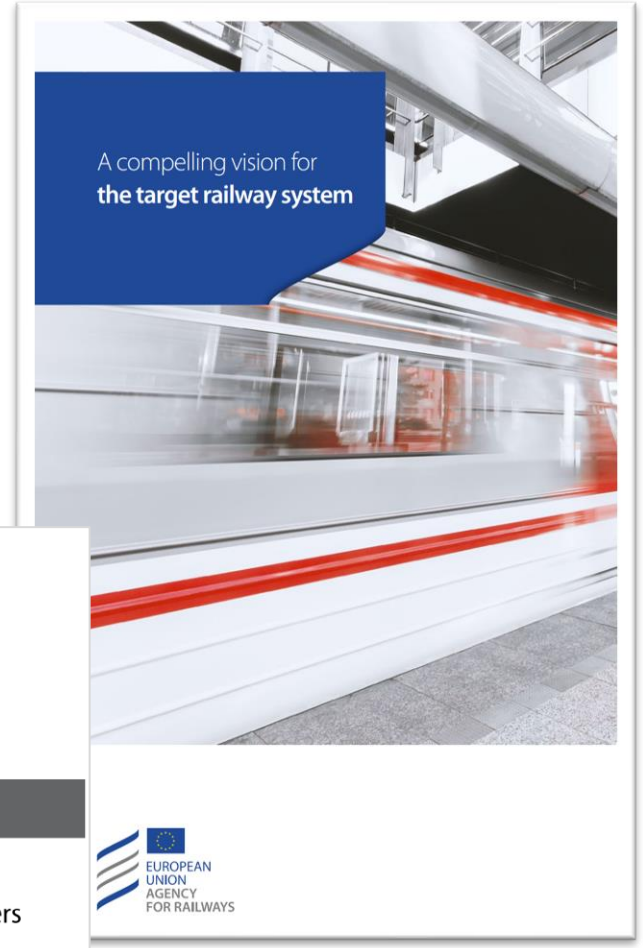
6. Vehicles

6.1. Overview

On-board intelligence

All vehicles

- Intelligent maintenance (vehicle condition monitoring, predictive maintenance based on real time data)
- Infrastructure condition monitoring from vehicles



5.3. Target system components and their link to the enablers

The table below is a first attempt to specify the link between the identified target system components and their enablers.

TARGET	ENABLER	ACTOR
Optimisation of infrastructure management	› Big data › Multimodal approach › Use of platforms	› Policy makers › Infrastructure managers › Research bodies › Industrial actors
Replace obsolescent core concepts and eliminate the diversity of engineering rules and technical specifications	› Robust migration strategy	› Policy makers › Infrastructure managers

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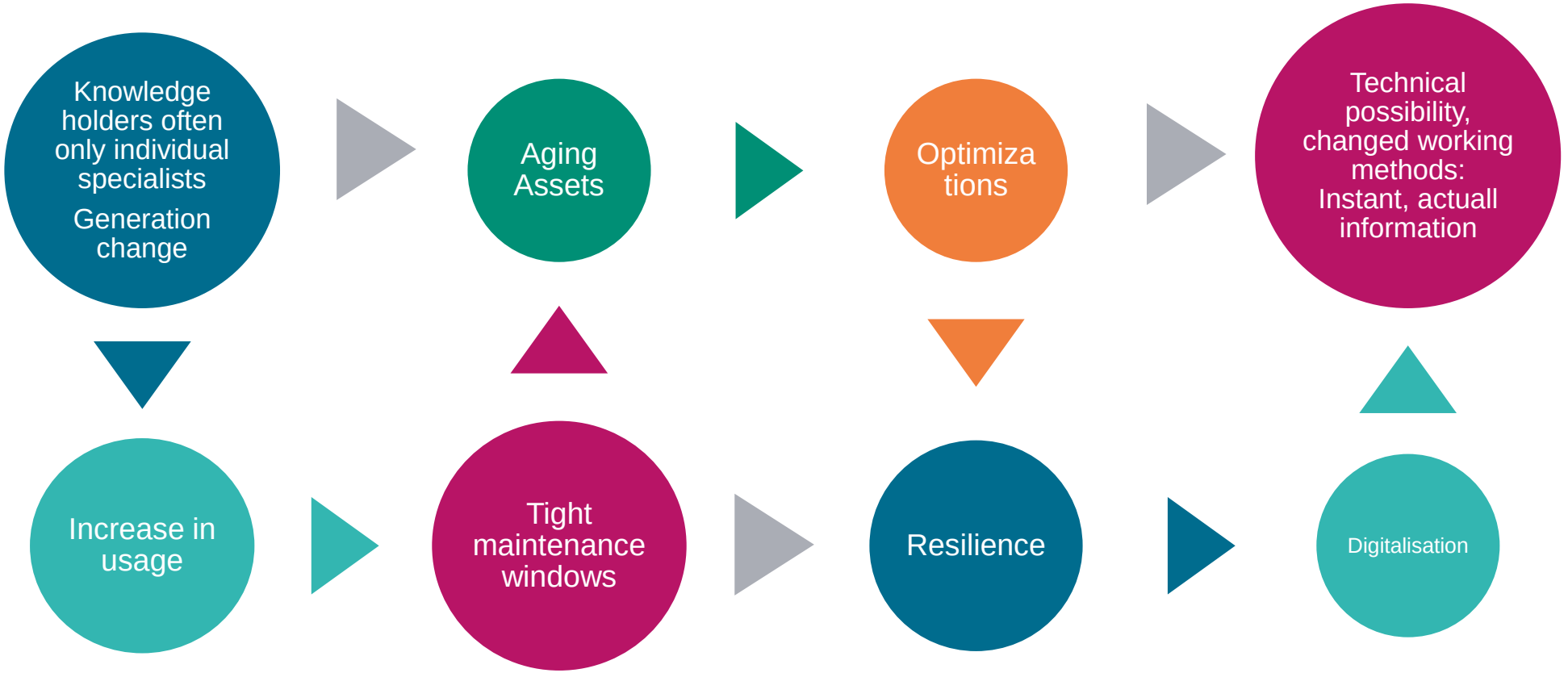
Why new maintenance strategies?



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How are maintenance costs reduced?

- **More effectiveness**
  - Detect anomalies early
  - Increase maintenance intervals through short interval metrological checks
  - Maintenance effectiveness - Verification by measuring after maintenance has been carried out
  - Better knowledge of current and predicted state of the assets

- **Greater efficiency**
  - Better preparation / coordination of maintenance through measurement data
  - Automatic assessment of assets

- **Low-wear products**
  - measurement data based holistic view enables (wear) optimization of assets
  - Systematic finding of weak points / cost drivers
  - Better understanding, leads to new solutions

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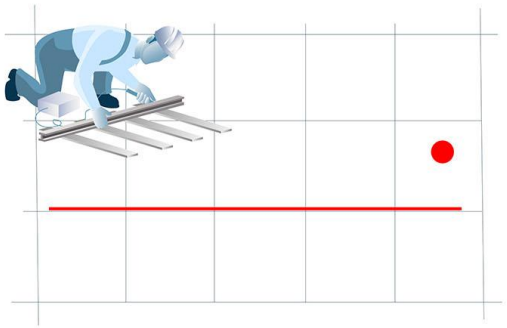
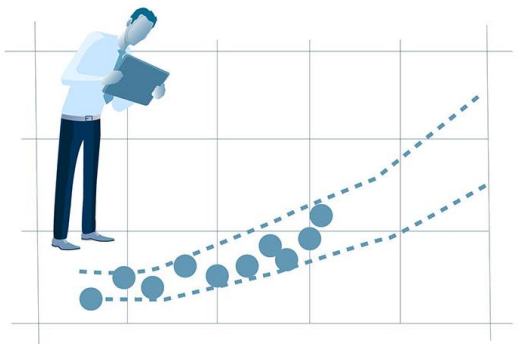
„Measurement“: for reliable, automated decisions

Reactive

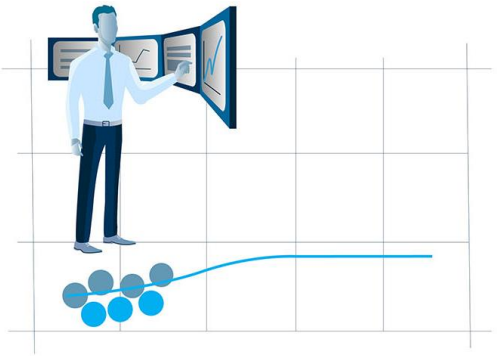


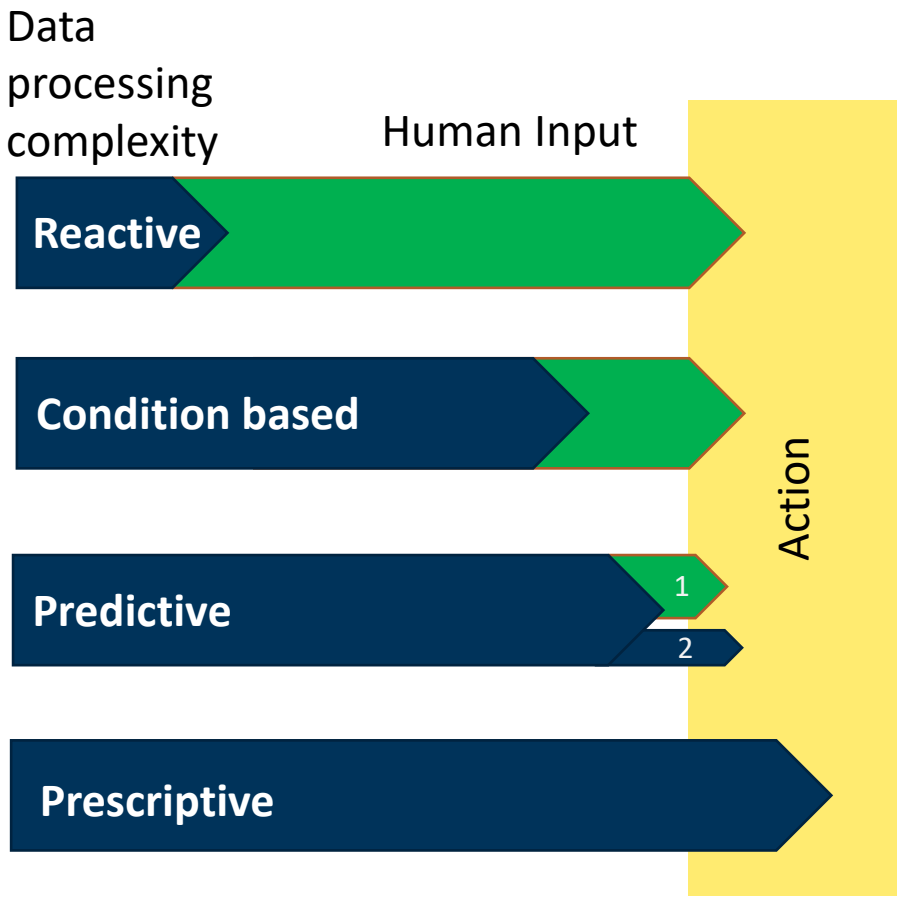
Condition based

Predictive



Prescriptive





1…decision prepared
2…automated

The HBK TSI-SPOT® concept for digital transformation

- **Ecosystem**
  - Sensors, data acquisition system for wayside and onboard measurement

Generate and Acquire Data

Sensors / Instruments

Camera
(track parts)

GPS/GNSS/IMU

Cloud

Data processing (prediction)
Data storage & management
Collaboration

Analog sensors

Edge Recorder

data pre-qualification
classification

optical or
electrical
link

Connectivity

Ethernet
Vehicle internet link

Wi Fi
On track
On train station /
check point

3G 4G 5G
Mobile network
provider

Direct access

Fiber optic
sensors

Noise & Vibration

Vehicle bus

CAN, MVB, SIBAS, TCN

Control units (ECU)
Overall, brakes,
air pressure system, ...

Classic
data center

Data processing (prediction)
Data storage & management
Collaboration

Generate and Acquire Data

Sensors / Instruments

Camera (track parts)

Weather station

Cloud

Data processing (prediction)
Data storage & management
Collaboration

Analog sensors

Switch Cabinet

Connectivity

Ethernet

On track
On train station / check point

Wi Fi

3G 4G 5G

Mobile network provider

Direct access

Fiber-optic sensors

Noise & Vibration

Many more sensors

Deflection, Inclination, tilt, displacement, Joint and crack, Identification (RFID) ...

Classic data center

Collaboration
Evaluation
Data mining

Wayside Train Measurement with ARGOS® from HBK – precise and reliable

Generate and Acquire Data

Sensors / Instruments

WIM
Weigh in Motion

RBM STRAIGHT
Hunting

RBM CURVE
Running Behaviour

OOR STAND-ALONE
Wheel Out of Roundness

DYN
Dynamic Force

OOR
Wheel out of Roundness

LONG
Traction Forces

PROFIL
Wheel Cross Profile

The HBK TSI-SPOT® concept for digital transformation

- **Ecosystem**
  - Sensors, data acquisition system for wayside and onboard measurement
  - Software for data evaluation and simulation (HBK Prencia®)
  - Link with commercial data (HBK Reliasoft®)

Generate and Acquire Data

Collect and Manage Data

Analyze

Make Decisions and Act

Visualize

Sensors / Instruments

3rd Party Systems

OSIsoft.

IBM maximo

SAP

Data cleansing, validation, storage and archiving

Connectors

Maintenance Data

XFRACAS

Usage data (time series)

PES VePRO Framework

Extract value from the data [Engineering & ML]

nCode

Engineering & Data Science

ReliaSoft

Reliability Strategy and Analysis

Configurable tools

Facilitate decisions and take the right actions

Generate Work Orders

Create Notifications

Workflow Engine

Bring data into the hands of the right people

Dashboards

KPIs and trends

Automated Reports

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- **Open interfaces, high flexibility (modular)**
  - → Customer-specific (sub) systems
  - → Complete solutions

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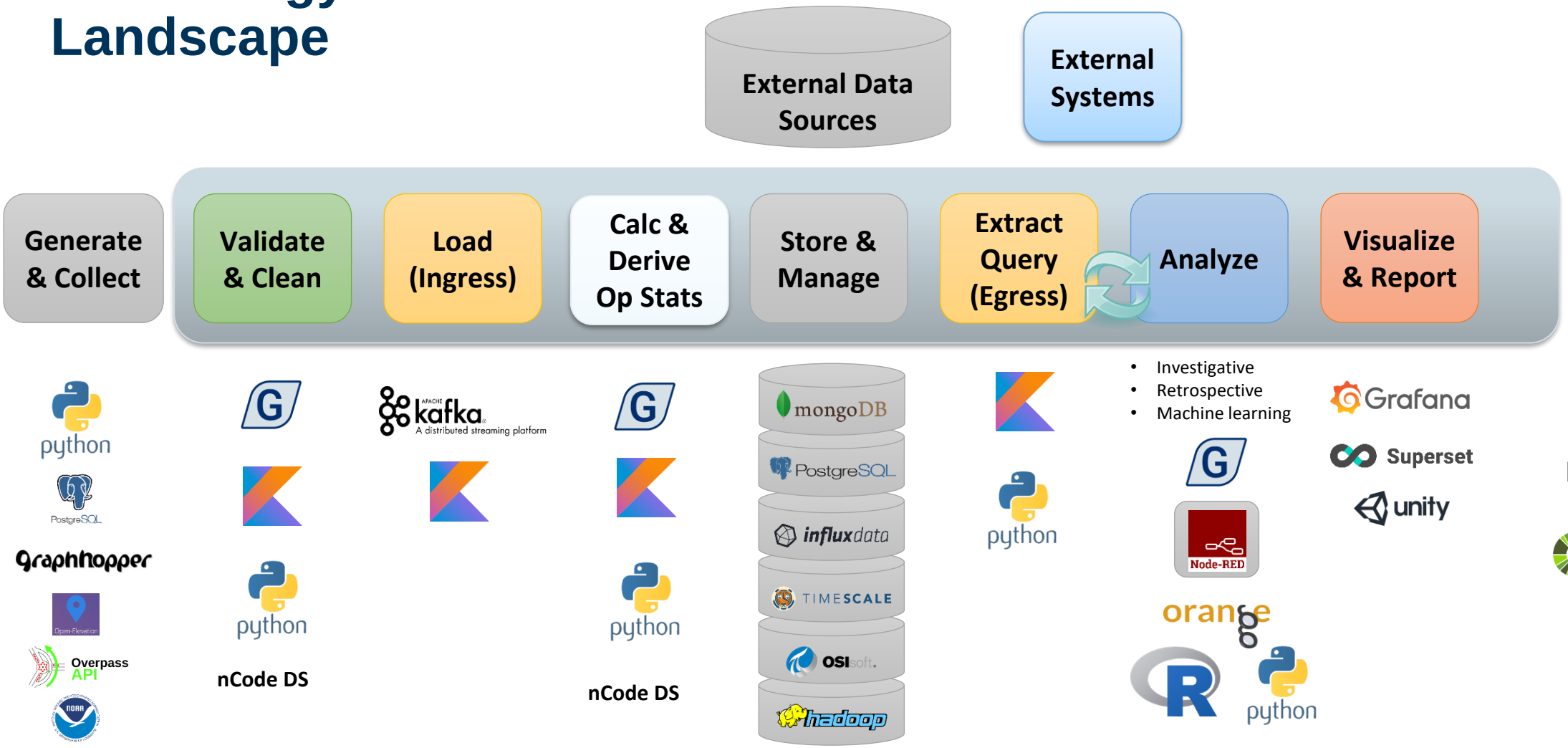
Technology Landscape



STRATEGY
1) Implement best in class open source solutions
2) Integrate leading commercial products where appropriate

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The HBK TSI-SPOT® concept for digital transformation

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- **Open interfaces, high flexibility (modular)**
  - → Customer-specific (sub) systems
  - → Complete solutions

- **Single Point of Truth**
  - Describes a database that claims to be correct (high data accuracy and integrity) and that can be relied on (technical interpretation). Redundancies are wanted.
  - Business/technical requirements significantly greater than IT requirements
  - ➔ **Reliable overall view for safe and quick technical / economic decision**

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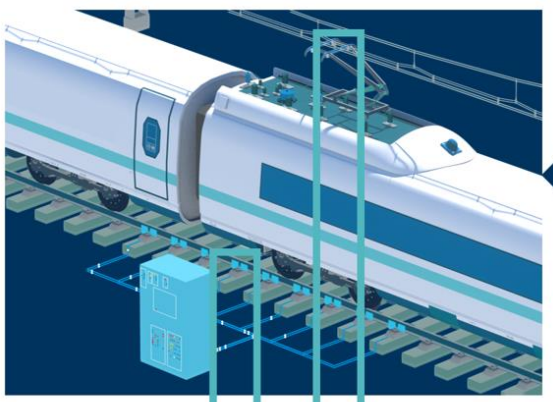
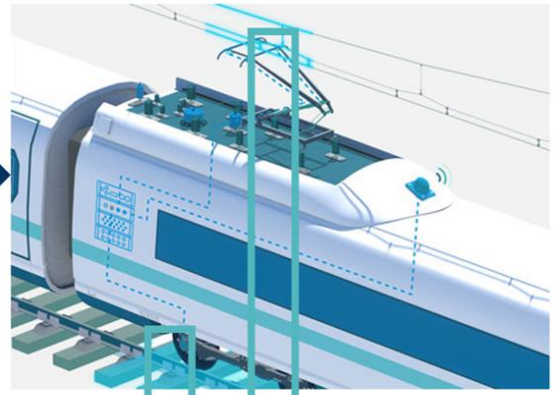
Wayside Measurement
Wheel und Pantograph

On-Board Measurement
Superstructure and Overhead line



Single **P**oint **O**f **T**ruth

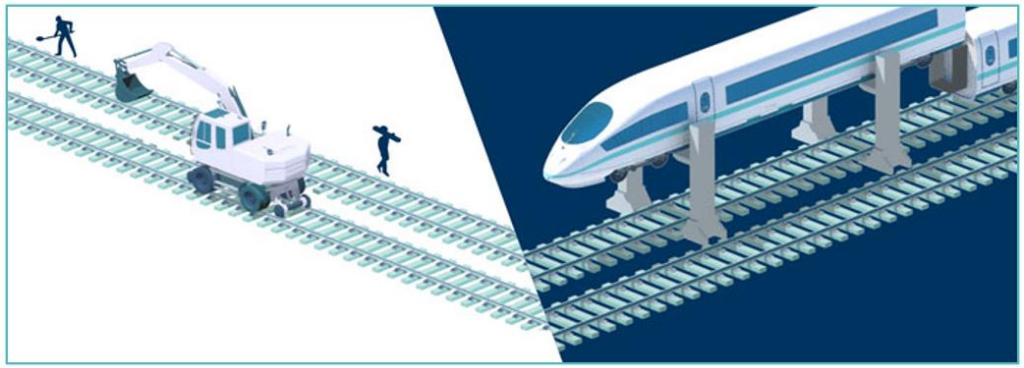
adjustement and data exchange



professional validation and objectification of measurement data

Commercial data

Set action (timely)



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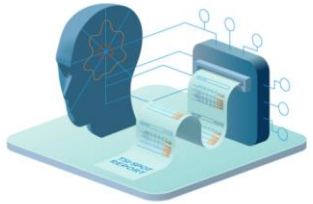
TSI-SPOT® concept key facts

- Holistic, reliable view of the vehicle and infrastructure in real time
- Unnecessary wear and tear can be reduced where it has the least effect on performance and costs
- High data quality, fully automated forecasts to affect maintenance interventions directly

smart

future-proof

cost-effective



holistic

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Ressources

- http://www.hbkworld.com/rail
- https://www.argos-systems.at/
- Pioneering solutions for the modern and efficient infrastructure and vehicles maintenance – YouTube https://www.youtube.com/watch?v=8ibyDzz1aR8
- HBK - ARGOS® Wayside Train Measurement explained with real Installations – YouTube https://www.youtube.com/watch?v=S5G5Kt-01Hk

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Thank You

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