"Digital services in Railway-Signaling, by Siemens"

Smart Maintenance Conference, September 05, 2017 | Winterthur

Siemens Mobility Services
we design mobility since 1881

Berlin 1881: Operation and Maintenance of the first electrical tram

Winterthur 2017: Data support operation/maintenance within the railway

History

Today and tomorrow

Our service offerings serve the whole Mobility portfolio
With a set of portfolio elements and service contracts for your requirements
Whatever your rail business is …

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Mainline Transport (CS MLT)

High Speed trains

Commuter trains

Locomotives

Mobility Management (CS MM)

Rail Automation

Urban Transport (CS UT)

Metros + APM

Light Rail

Passenger Coaches

Turnkey Projects & Electrification (CS TPE)

Rail Electrification

… our offerings serve your needs!

Maintenance Services

Spare Part Services

Digital Services

Upgrade Services

Qualification Services

Operation Services

SIMOS™ Service Portfolio

Digital Services

Smart Monitoring

Smart Data Analysis

Smart Prediction

Smart Security

Smart Guidance

Digital Services as one element of the entire Mobility Software and Digitalization portfolio

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Digitalization

Mobility Software

Timetabling & Capacity Planning

'NextGen' Train Control SW

Extended Rail Operations Control

Road Traffic Software (TM aaS)

(SDV) Fleet Management SW

SiMobility Connect Platform

(Intermodal) Journey Planning

Electronic / Mobile Ticketing

Passenger info/assistance SW

Train IT / Always Connected

Mobility Digital Services

Topic of today!

Smart Monitoring

Smart Data Analysis

Smart Prediction

Smart Security

Smart Guidance

Based on Railigent® Platform

MindSphere – the IoT operating system

Automation

Electrification

Digitally enhanced fleets and field equipment

Highly & fully automated driving rail

Highly automated yards / freight

Distributed wayside architecture / Interlocking in the cloud
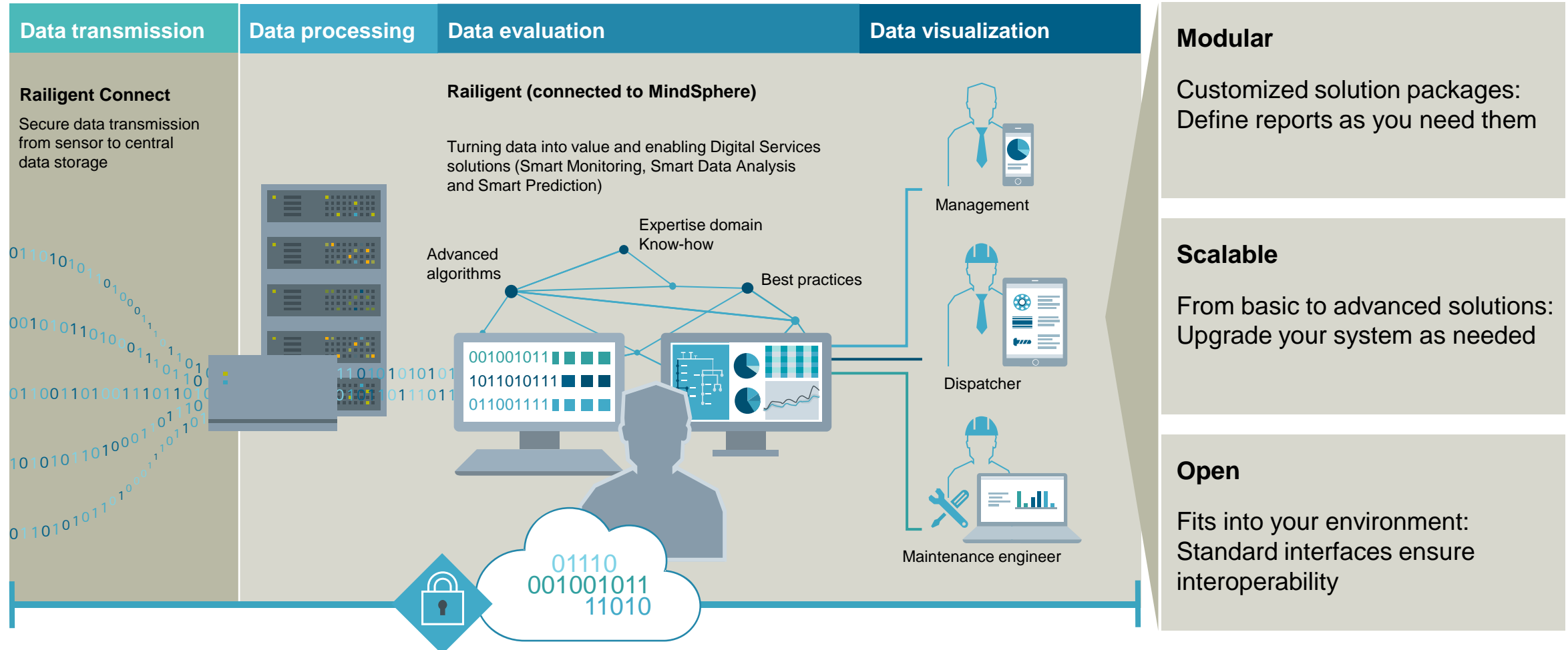
Holistic IT Security Concept

Railigent connected to MindSphere as dedicated rail asset management platform with applications to increase availability and performance

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Benefits

Through-put optimization   Delay minute reduction   Energy consumption reduction

Applications* & Platform
*extract

| Condition monitoring | Remote diagnosis | Failure prediction | Spare parts optimization | Trouble shooting support | Etc. |

Railigent for railway infrastructure and rolling stock

Operating system

MindSphere

Connectivity

Railigent® – The platform to manage rail assets smarter, covering the entire chain from data transmission to action recommendations

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Data transmission	Data processing	Data evaluation	Data visualization

Railigent Connect

Secure data transmission from sensor to central data storage

Railigent (connected to MindSphere)

Turning data into value and enabling Digital Services solutions (Smart Monitoring, Smart Data Analysis and Smart Prediction)

Expertise domain Know-how

Advanced algorithms

Best practices

Management

Dispatcher

Maintenance engineer

01110
001001011
11010

Modular

Customized solution packages: Define reports as you need them

Scalable

From basic to advanced solutions: Upgrade your system as needed

Open

Fits into your environment: Standard interfaces ensure interoperability

Smart Monitoring – Data Visualization – User Interface example – Dashboard for Rollingstock

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The Dispatcher receives all **relevant information** via a dashboard to initiate **corrective maintenance** at an **early stage** where required
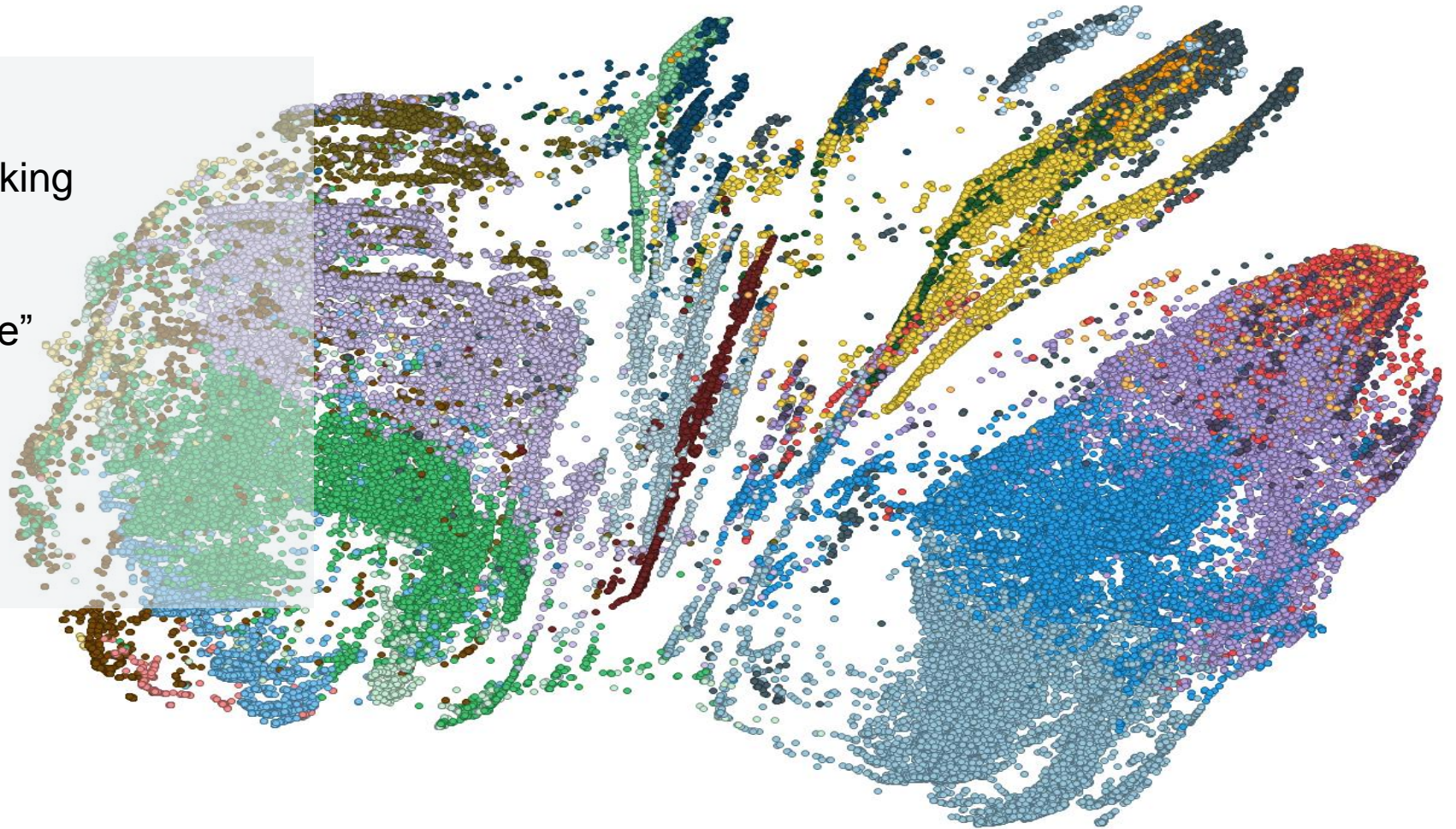
SIEMENS
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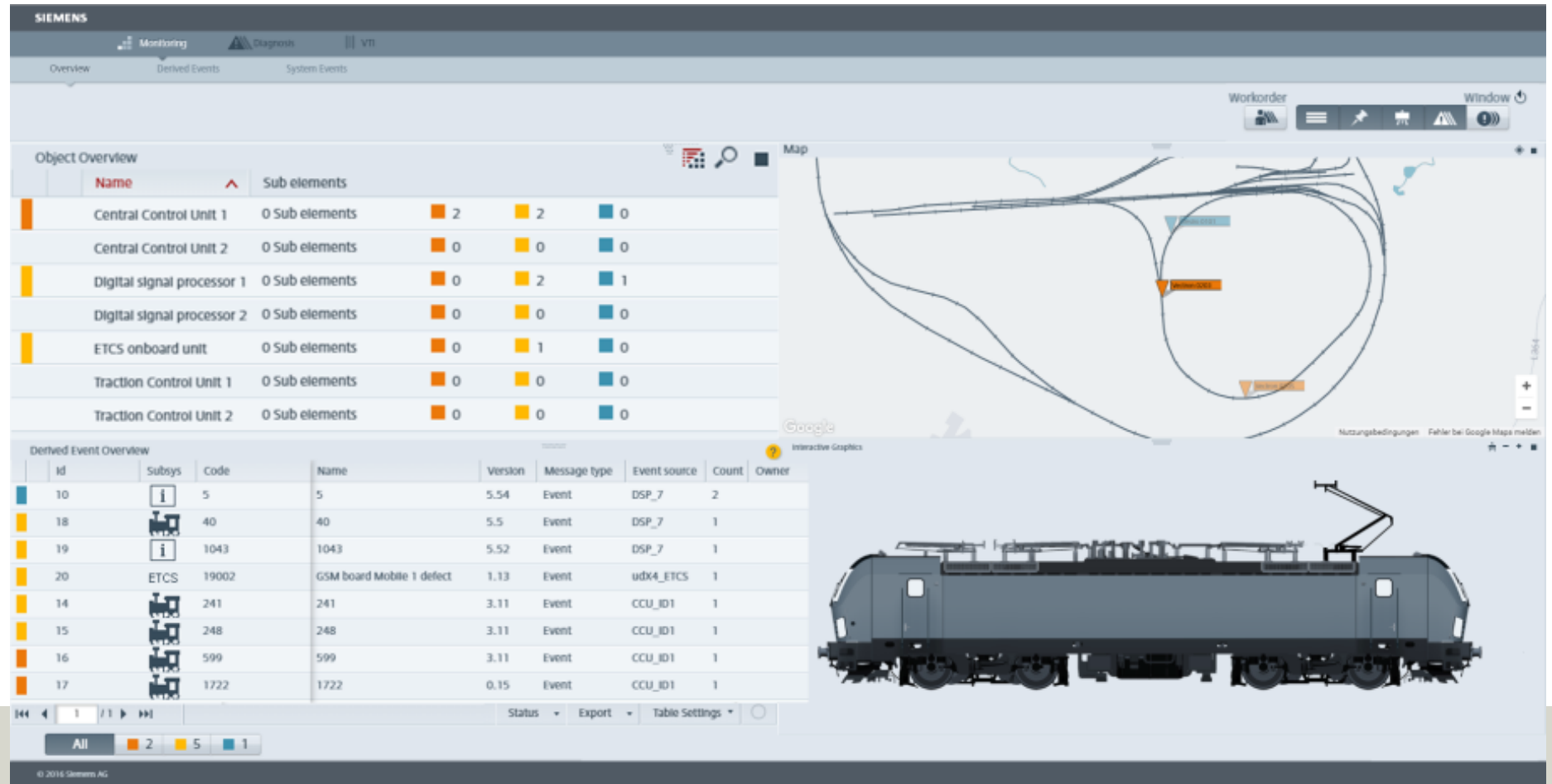
Siemens Mobility
Data Services @ Signaling…

Siemens AG 2017

siemens.com/mobility

Diagnostic, Smart Monitoring, Smart Data Analysis und Smart Prediction in Signaling

Topics

- Status electronic interlocking

- Info: relay interlocking

- Info: ETCS "Infrastructure"

- Info: ETCS "OBU"

- Q & A

Example Use Case – Visualization of multi-dimensional sensor data, 91 dimensional sensor data in 2 dimensional space
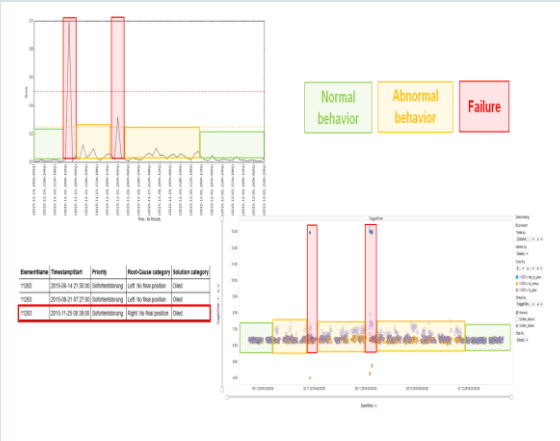
Smart Monitoring, Smart Data Anaylsis, Smart Prediction
Interlocking (IL*) Bremen, first use cases (start)

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Analysis of abnormal pattern within the internal IL-bus system

Short-term forecast of switch problems
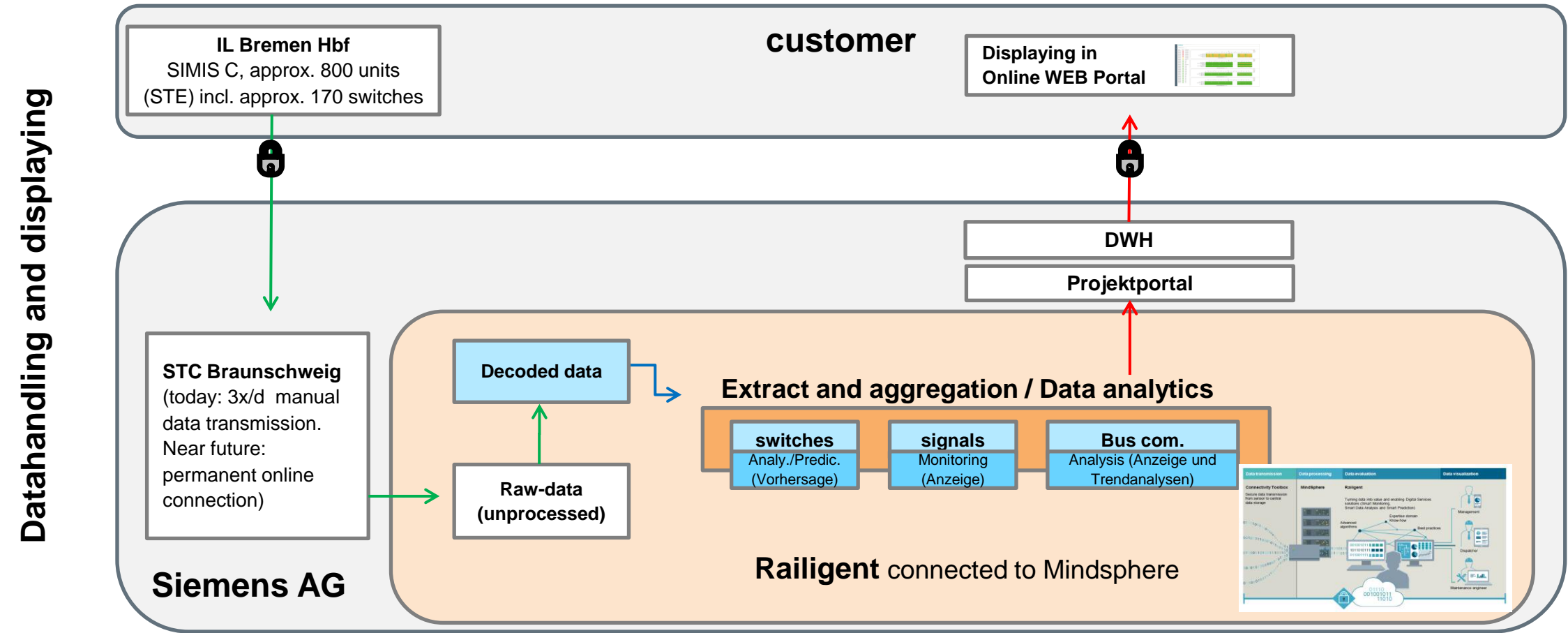
Monitoring of lamp signal data

Normal behavior   Abnormal behavior   Failure

*= IL = Electronic Interlocking, here type Simis C

Status IL Bremen
since April 2017 „Live-Test" (test object)

Datahandling and displaying

customer

IL Bremen Hbf
SIMIS C, approx. 800 units
(STE) incl. approx. 170 switches

Displaying in
Online WEB Portal

DWH

Projektportal

STC Braunschweig
(today: 3x/d manual
data transmission.
Near future:
permanent online
connection)

Siemens AG

Decoded data

Raw-data
(unprocessed)

Extract and aggregation / Data analytics

switches	**signals**	**Bus com.**
Analy./Predic. (Vorhersage)	Monitoring (Anzeige)	Analysis (Anzeige und Trendanalysen)

Railigent connected to Mindsphere

Only use of IL internal data telegrams/information. No additional sensors and/or special switch diagnostic!
„Use the existing equipment as a sensor!"

Status IL Bremen
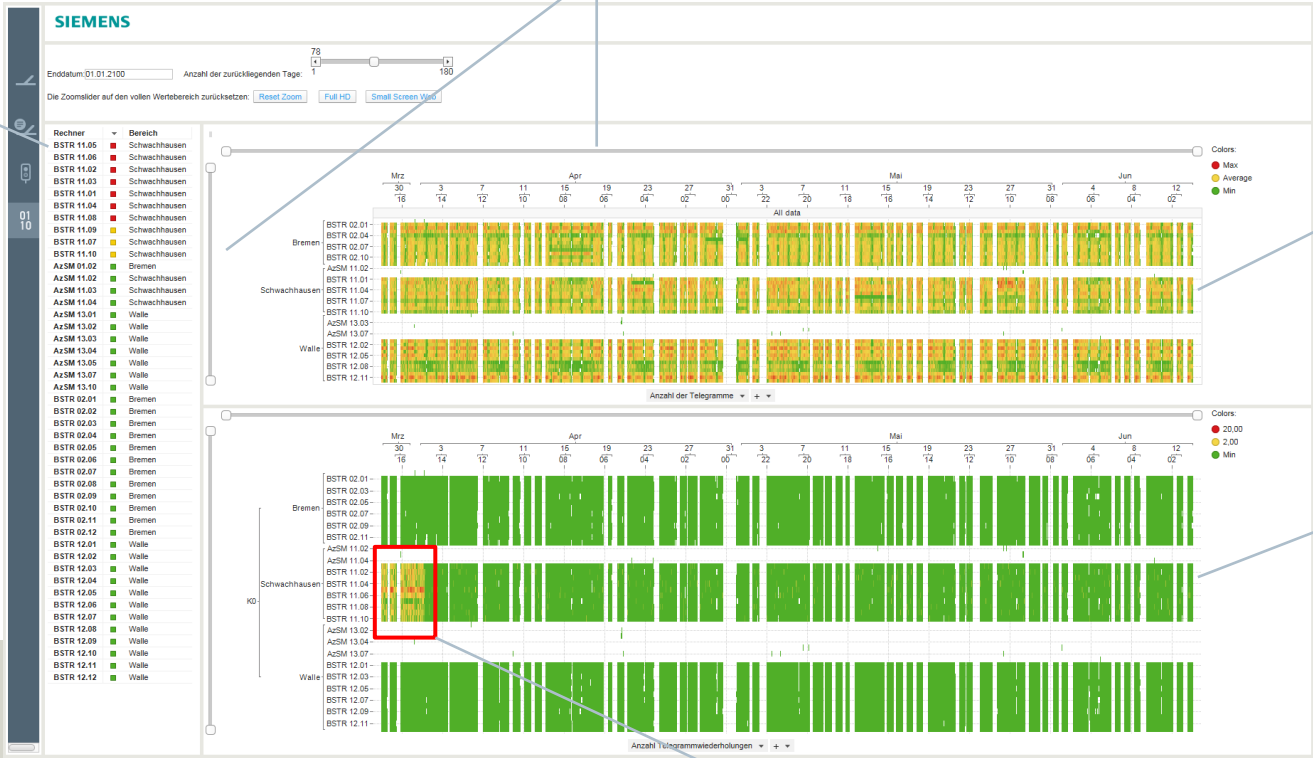# Example Bus communication – Monitoring/Analysis

Exemplary visualization

zoomslider

Traffic lights display and heatmaps

Traffic of transferred telegrammes

Telegramme repeat

Example: Defect of optocoupling unit

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Exemplary visualization

Traffic lights

Abnormal picture → switch problem, „Pattern analytics" for forecast of future problems
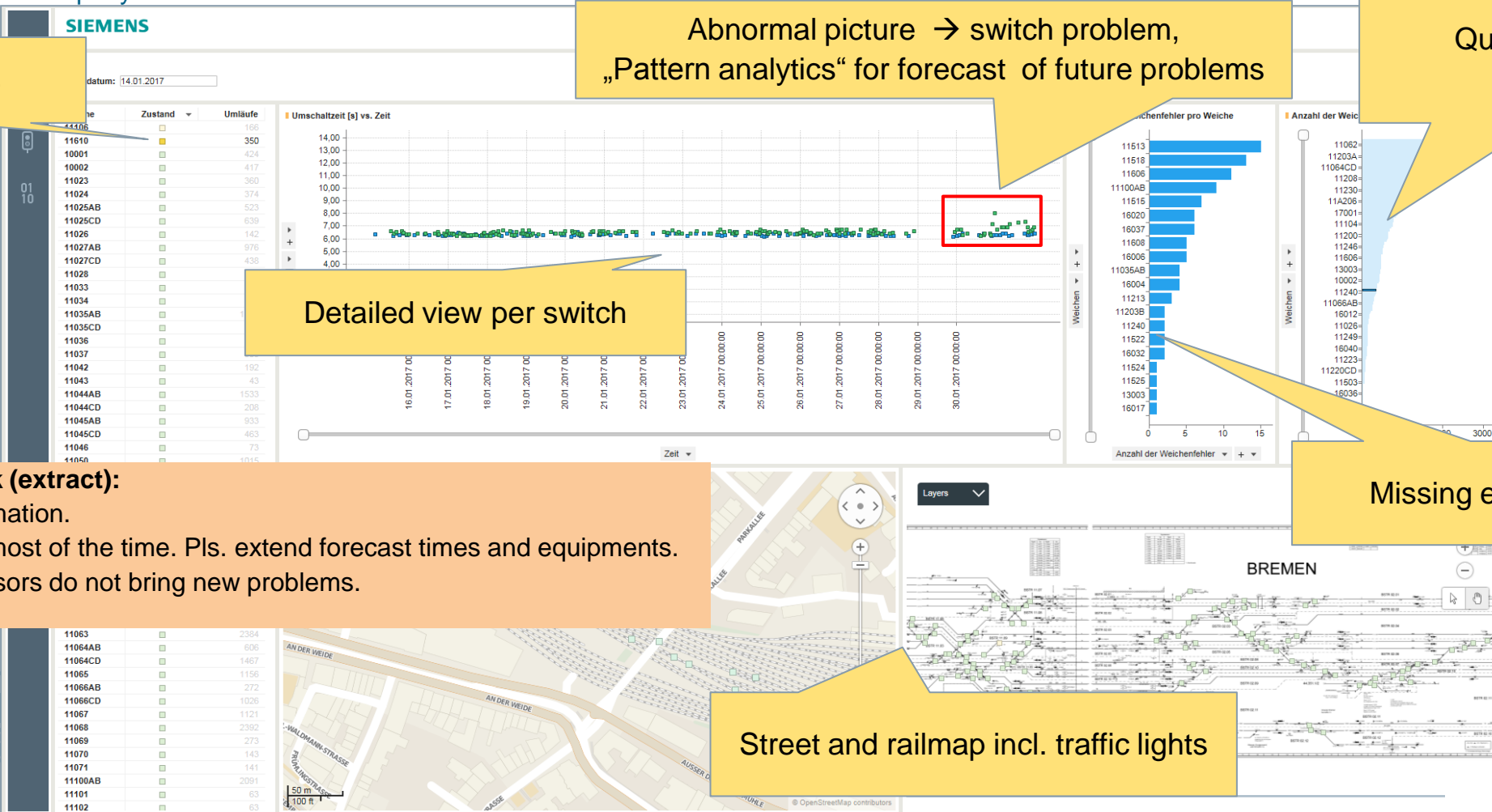
Quantity of switch movements

Detailed view per switch

Missing end position

Customer feedback (extract):
- A lot of new information.
- The forecast fits most of the time. Pls. extend forecast times and equipments.
- No additional sensors do not bring new problems.
- Etc.

Street and railmap incl. traffic lights

Diagnostic, Smart Monitoring, Data Analysis, Prediction „Relayinterlockings are in the world of smart data"

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Customer requirements:

- Reduce delay minutes by diagnostics and prediction

- Optimize product lifetime, due to controlled preventive measures

Siemens technical concept, already succesfull tested (Lab-interlocking). First data analysed.

Next step:

Decision by customer.

Possible pilot- Bremen-Sebaldsbrück. Approx. 130 units.

confidential

DSL | VPN | Internet-Provider

BREMEN-SEBALDSBRÜCK
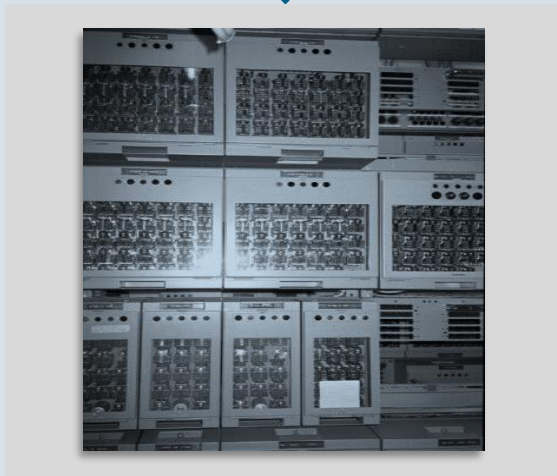
Relay interlocking type SpDrs60

Smart Monitoring, Smart Data Analysis, Smart Prediction
ETCS L2 infrastrucuture, first use cases

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Analysis of data transmission (maintenance)

Analysis of mode exchange (maintenance)

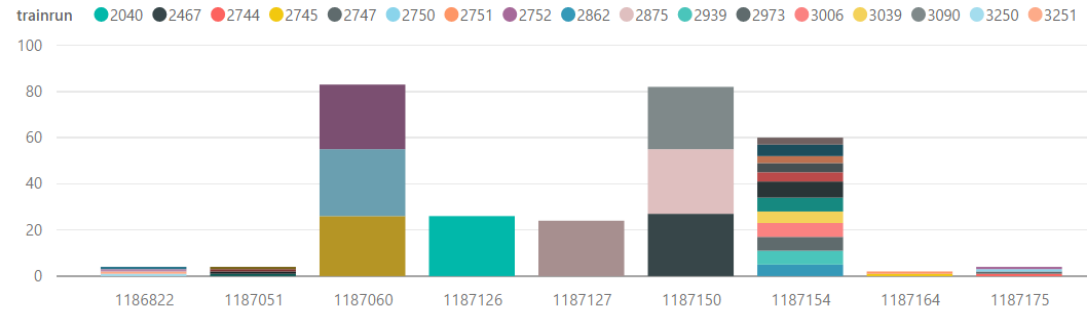**Sidis DA Train movement data-statistics (operation/maintenance)**

Smart Monitoring, Smart Data Analysis, Smart Prediction Monitoring from data transmisson errors (ETCS infrastructure)
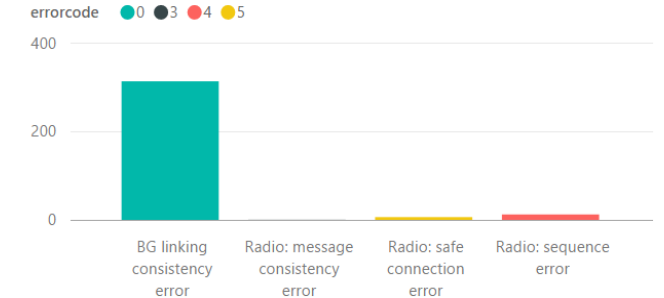
Data transmisson problems (ETCS radio)

- Displaying of train information
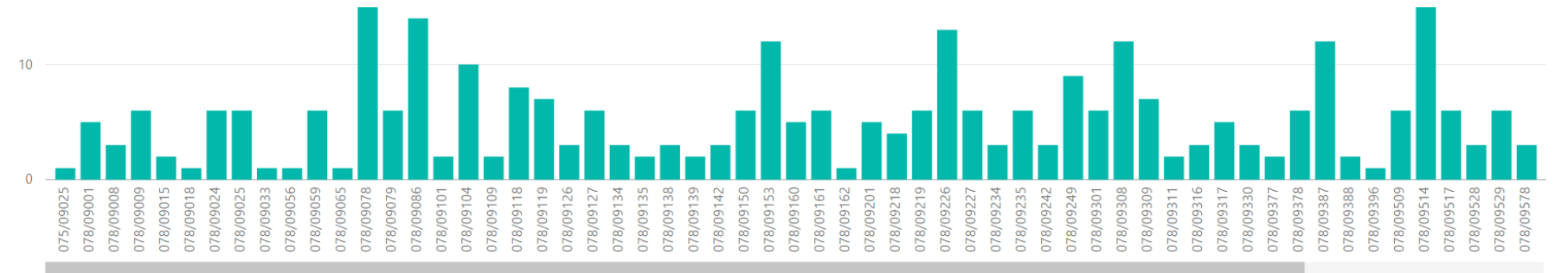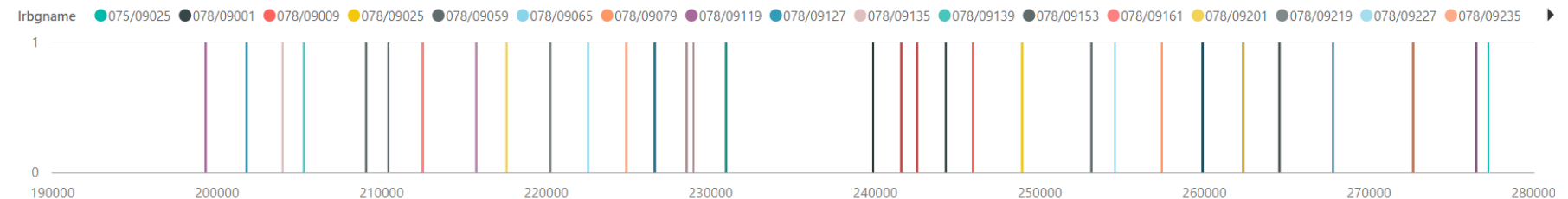- Displaying of problems based on km (comparison between „km and train")

Smart Monitoring, Smart Data Analysis, Smart Prediction
Analysis of transmission errors (ETCS OBU)

Radar error:

Abnormal switch frequency between modes
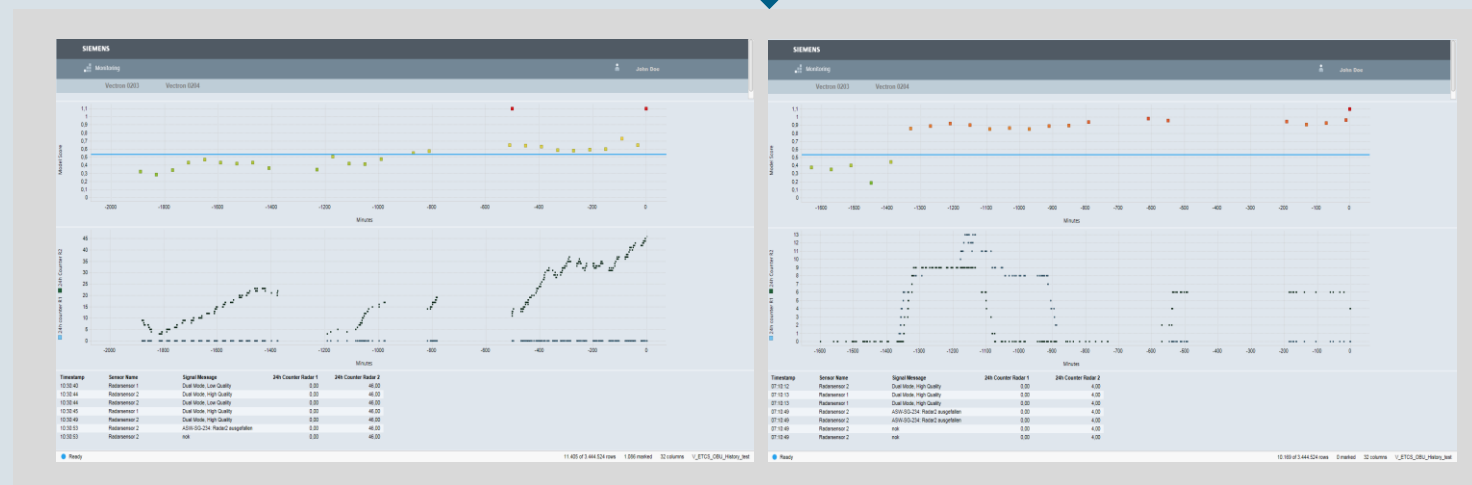
OBU = Onboard-unit, train equipment

Questions & Answers

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If you have no question,

perhaps I did something wrong?

Please feel free to ask!!

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