“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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… our offerings serve your needs!

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

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
- Smart Monitoring
- Smart Data Analysis
- Smart Prediction
- Smart Security
- Smart Guidance

MindSphere – the IoT operating system

Digitally enhanced fleets and field equipment
- Highly & fully automated driving rail
- Highly automated yards / freight
- Distributed wayside architecture / Interlocking in the cloud

Automatisation

Electrification

Holistic IT Security Concept

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

Benefits

Applications* & Platform

*extract

Operating system

Connectivity

Through-put optimization
Delay minute reduction
Energy consumption reduction

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

Railigent for railway infrastructure and rolling stock

MindSphere

Benefits:
- Through-put optimization
- Delay minute reduction
- Energy consumption reduction

Applications:
- Condition monitoring
- Remote diagnosis
- Failure prediction
- Spare parts optimization
- Trouble shooting support
- Etc.

Benefits:
- Through optimization
- Delay minute reduction
- Energy consumption reduction

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

**Data transmission**
- Railigent Connect
  - Secure data transmission from sensor to central data storage

**Data processing**
- Advanced algorithms

**Data evaluation**
- Expertise domain Know-how
- Best practices

**Data visualization**
- Railigent (connected to MindSphere)
  - Turning data into value and enabling Digital Services solutions (Smart Monitoring, Smart Data Analysis and Smart Prediction)

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**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

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The Dispatcher receives all relevant information via a dashboard to initiate corrective maintenance at an early stage where required.
Diagnosis, 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 Analysis, Smart Prediction
Interlocking (IL*) Bremen, first use cases (start)

Analysis of abnormal pattern within the internal IL-bus system

Short-term forecast of switch problems

Monitoring of lamp signal data

* = IL = Electronic Interlocking, here type Simis C
Status IL Bremen since April 2017 „Live-Test“ (test object)

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

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

Siemens AG

STC Braunschweig

Decoded data
Raw-data (unprocessed)

Extract and aggregation / Data analytics

switches
Analy./Predic. (Vorhersage)

signals
Monitoring (Anzeige)

Bus com.
Analysis (Anzeige und Trendanalysen)

Railigent connected to Mindsphere

"Use the existing equipment as a sensor!"

Displaying in Online WEB Portal

DWH
Projektportal

Customer

Raw-data

Only use of IL internal data telegrams/information. No additional sensors and/or special switch diagnostic!
Status IL Bremen
Example Bus communication – Monitoring/Analysis

Exemplary visualization

Traffic lights display and heatmaps

zoomslider

Traffic of transferred telegrammes

Telegramme repeat

Example: Defect of optocoupling unit
Status IL Bremen
Example Switch-Analysis/Prediction

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

Street and railmap incl. traffic lights

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.
Diagnostic, Smart Monitoring, Data Analysis, Prediction
„Relay interlockings are in the world of smart data“

Customer requirements:
- Reduce delay minutes by diagnostics and prediction
- Optimize product lifetime, due to controlled preventive measures

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

Next step:
Decision by customer.
Possible pilot - Bremen-Sebaldsbrück. Approx. 130 units.

Relay interlocking type SpDrs60
Smart Monitoring, Smart Data Analysis, Smart Prediction
ETCS L2 infrastructure, first use cases

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 transmission errors (ETCS infrastructure)

Data transmission 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

If you have no question, perhaps I did something wrong?

Please feel free to ask!!

Haertel, Reiner
Siemens AG, MO CS CRM BM (Bwg)
Ackerstr. 22
38126 Braunschweig, Germany
Phone: +49 (531) 226-3096, Mobile: +49 (162) 2307487
E-mail: reiner.haertel@siemens.com