



Digitalization Initiatives in Rail Business

Dr. Stefan Spindler
Member of the Executive Board, CEO Industrial
Schaeffler AG

Key Megatrends

Society Trends

- ▶ Urbanization
- ▶ Population growth

Technology Trends

- ▶ Growing complexity
- ▶ Digitalization

Environmental Trends

- ▶ Renewable energy
- ▶ Availability of resources

Economic Trends

- ▶ Globalization
- ▶ Affordable mobility

Four strategic focus areas

1 Eco-friendly drives



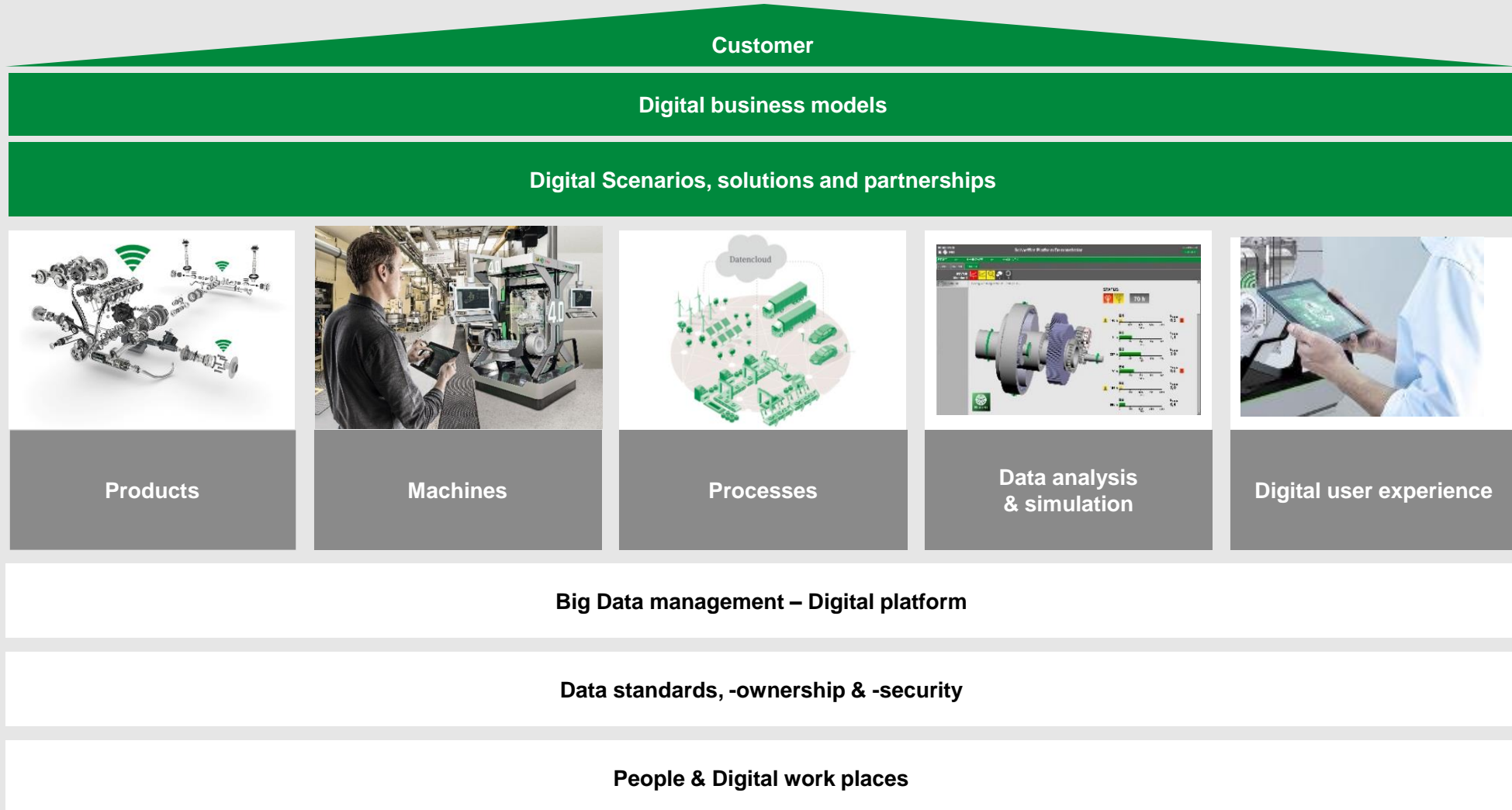
Urban Mobility 2



3 Interurban Mobility



Energy Chain 4



Mobility for tomorrow

Urban Mobility

Interurban Mobility



Hall 21, booth 402

Schaeffler – Your Partner in Rail:

From mechanical drive components to digital maintenance concepts

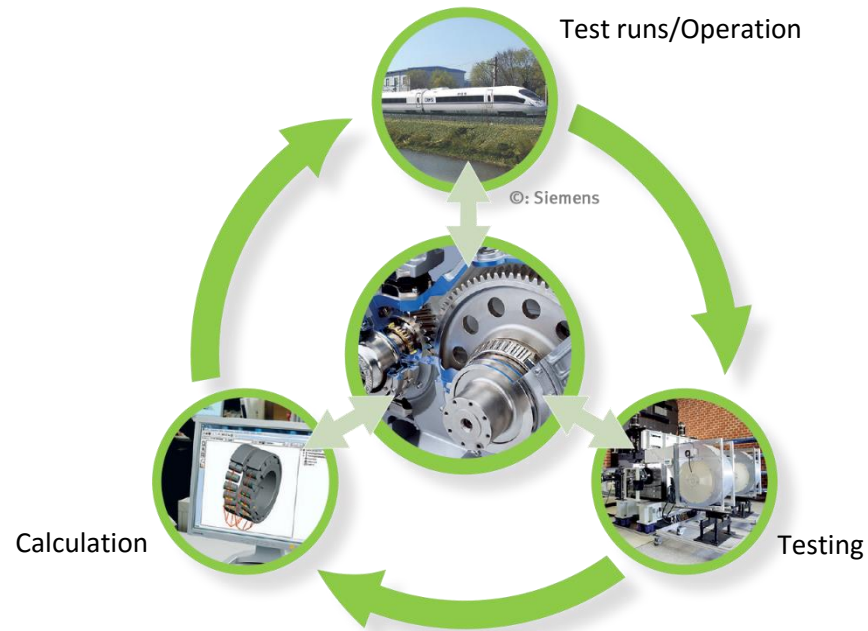
Target group OEM: System know how

- ▶ Customized solutions for drive train in highspeed, metro- and freight trains
- ▶ Innovations for mechanical components and modules

Target group MRO: Digitalisation

- ▶ New solutions for condition monitoring of the future
- ▶ Predictive Maintenance for rail – Concept for the digital maintenance of wheelset bearings

System know how



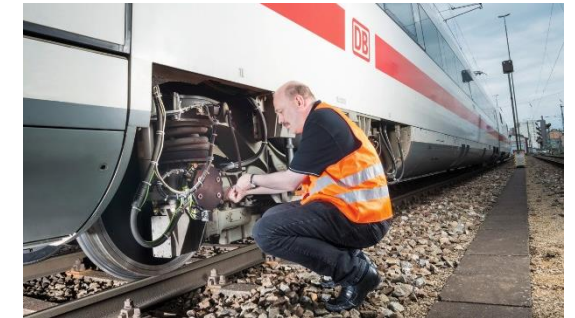
- ▶ Substantiated **application know how** by validation of testing- and calculation methods by test runs in operation
- ▶ Development of **components and services** for railway vehicles based on comprehensive experience and knowledge

Market

OEM



MRO



Bearings



Sensors



Reconditioning

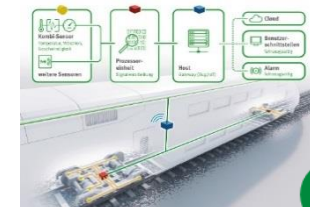


Spare parts



Mechatronic Modules

1



Services/Condition Monitoring

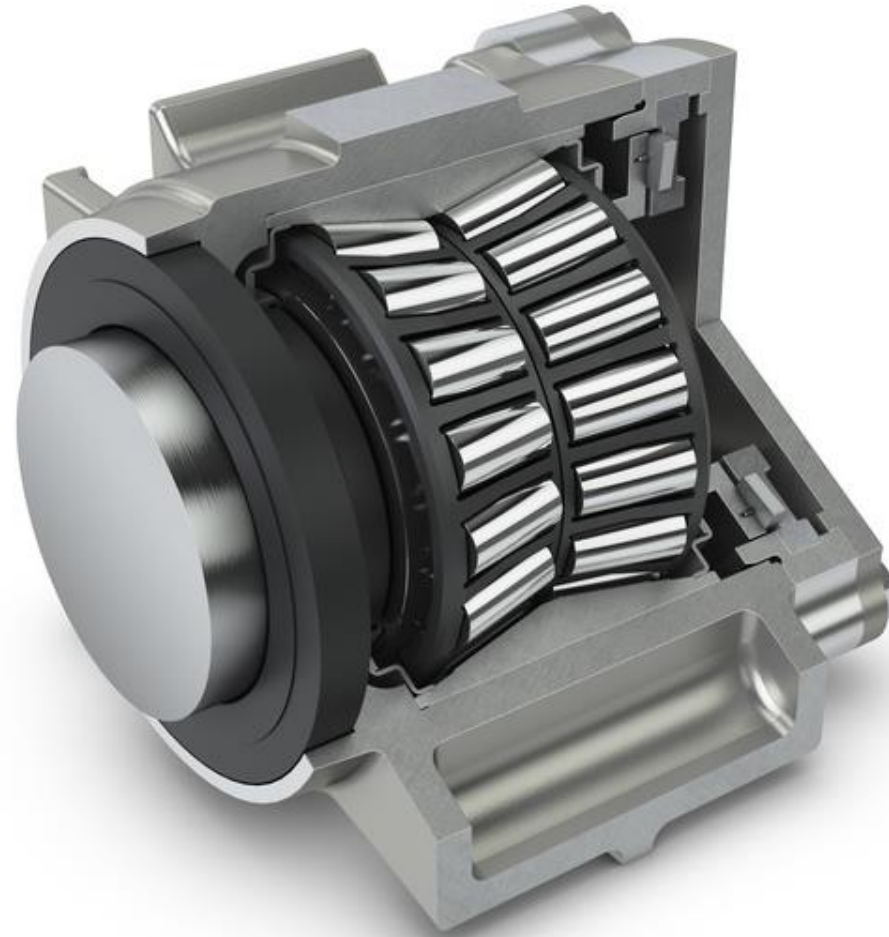
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1 OEM: Example for components

Wheelset generator for power supply on freight wagons

Basis for all kinds of digital applications

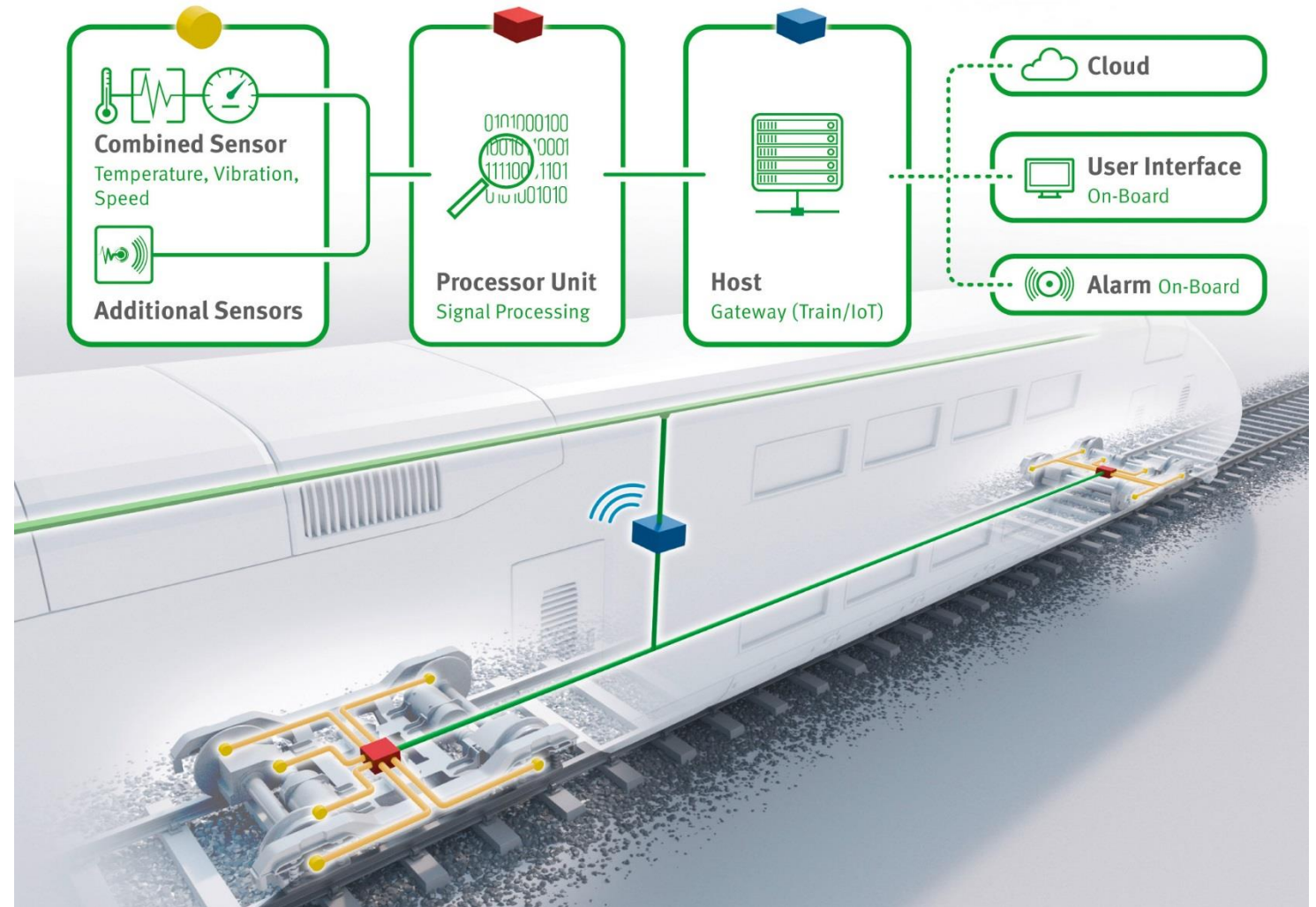
- ▶ Supplies electric power for train speeds from 35 up to 180 km/h
- ▶ Power supply for all kinds of rail applications, e.g. GPS, Condition Monitoring, Lighting, Break assistant and Hopper wagon
- ▶ Retrofit
- ▶ Rechargeable battery for power supply in non moving wagons
- ▶ Prototype is presented at InnoTrans. First project starting 2016 with customer in China.



Concept for digitalized condition monitoring of wheelset bearings

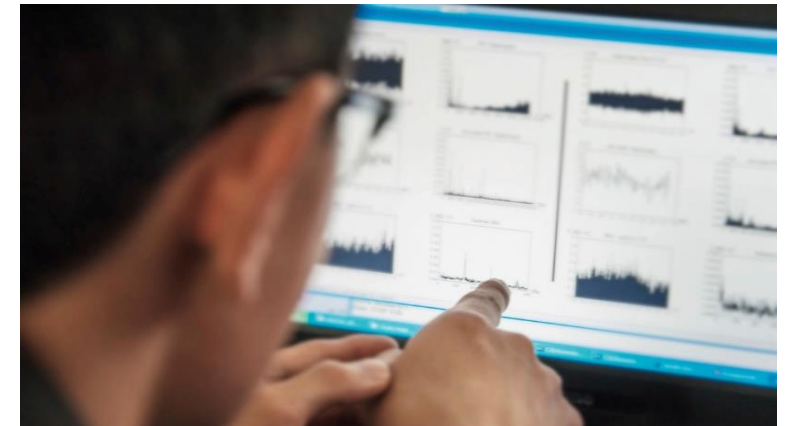
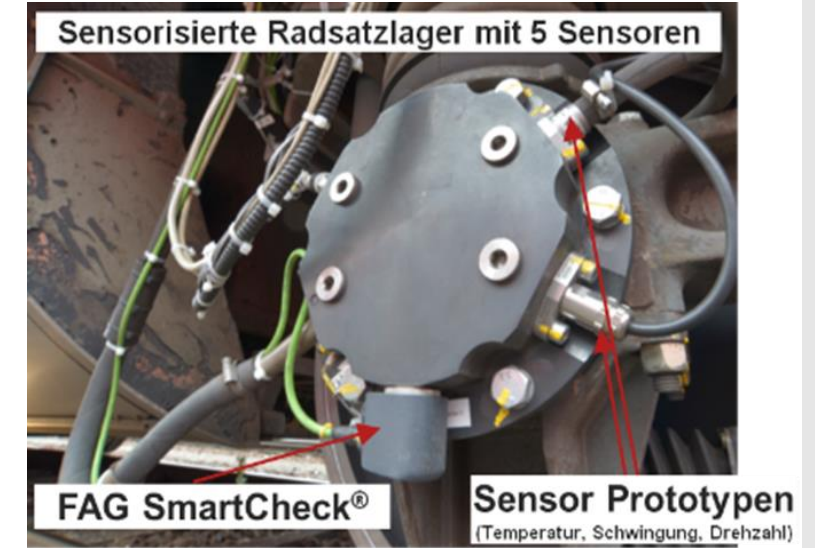
Schaeffler supports its customers throughout all levels of digital value creation from the sensor to the cloud.

- ▶ New, railway specific condition monitoring system for predictive maintenance
 - ▷ Automatic bearing diagnostics (Remaining useful life – RUL)
 - ▷ Calculation of remaining grease lifetime based on operation conditions (Grease-RUL)
 - ▷ Security standard SIL for temperature measuring
 - ▷ Ready for cloud-based and on-board applications



Test run ICE / DB

- ▶ Test run of Schaeffler Condition Monitoring System
 - ▷ Duration: 3 weeks
 - ▷ Distance: approx. 10,000 km (Germany)
 - ▷ Multi-functional sensors for
 - ▷ Temperature
 - ▷ Rotational speed
 - ▷ Vibrations
- ▶ Schaeffler is able to identify the lifetime status of bearings
- ▶ This will be the basis to predict remaining lifetime
- ▶ Interpretation of external influences is also possible (e.g. flat spots on wheels)



Key messages

1 "Rail" is a key element of Schaeffler's strategic concept "**Mobility for tomorrow**" in the areas of Urban and Interurban Mobility

2 Schaeffler is **component supplier** with a broad product portfolio for motor, gearbox and wheelset

3 With our enlarged **system know how** we are able to supply the most reliable and economic **products and services** in the market

4 **Digitalisation** will offer us the opportunity of new, integrated maintenance concepts for operators

**Mobility for
tomorrow**

Your Partner in Rail