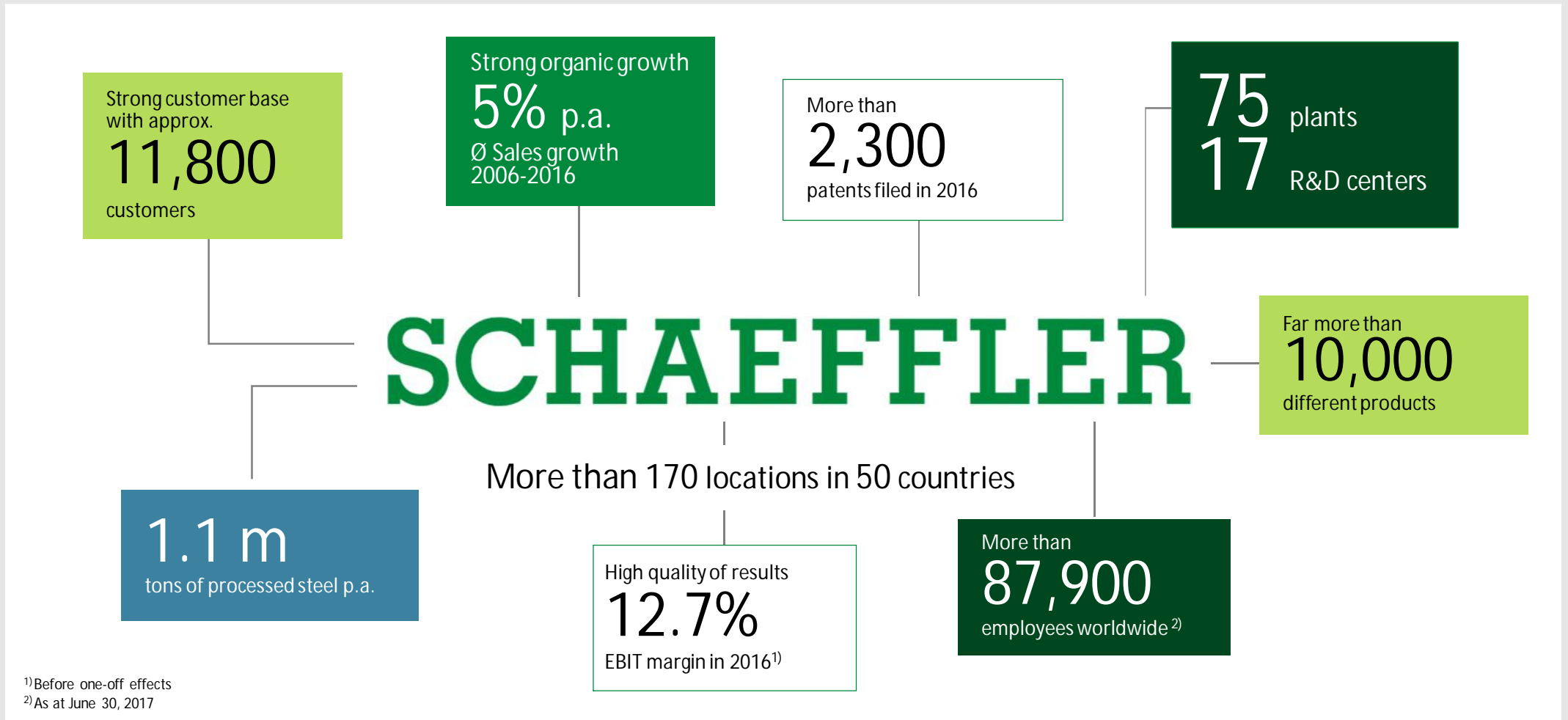




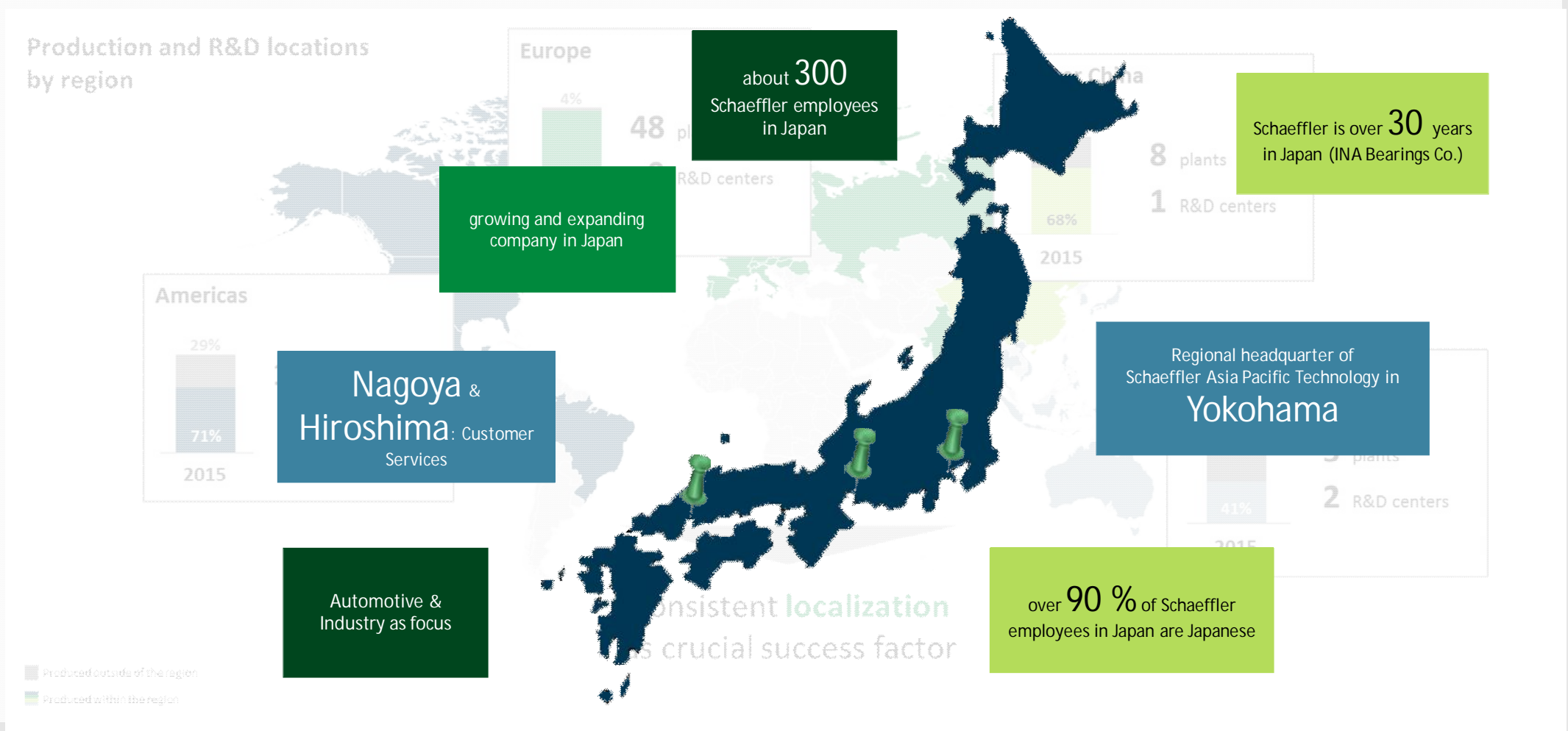
Digital Transformation at Schaeffler - Opportunities and Challenges

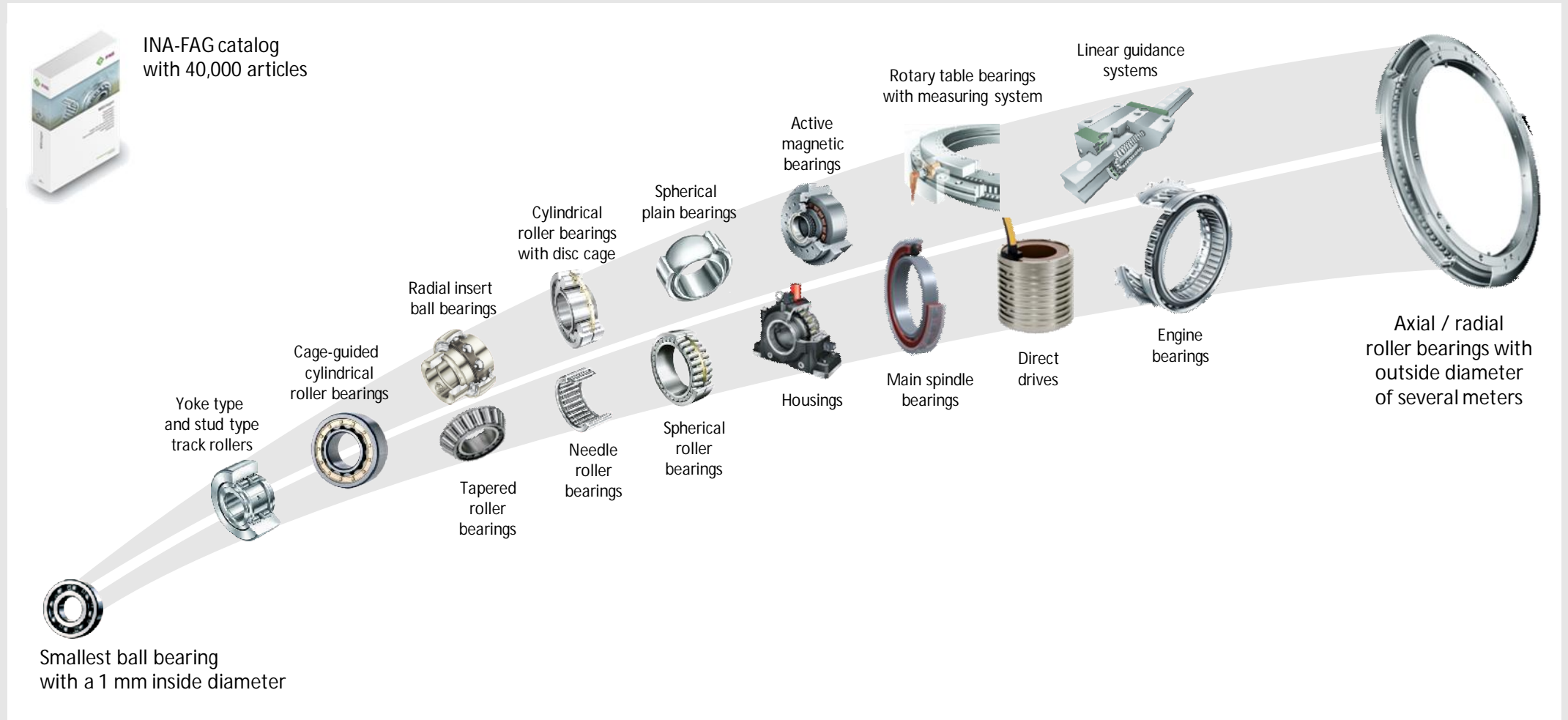
Dr. Tomas Smetana, CTO Asia Pacific and Japan

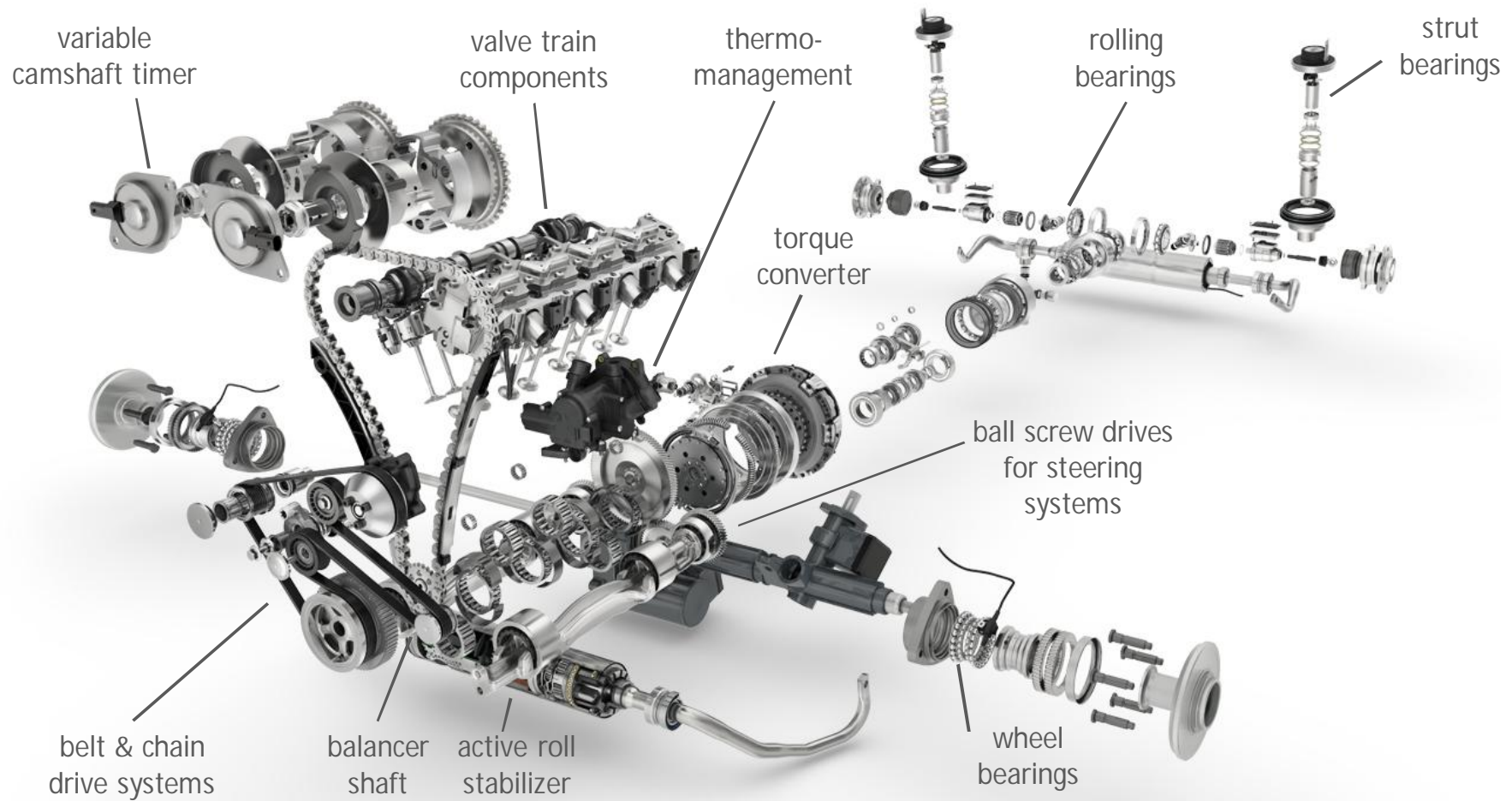
November 28st 2017




We are a global player with local presence – Focus on Japan









**“We are a precision mechanic with
best-in-class manufacturing and
system expertise.”**

Starting point for developing our strategic direction – Four megatrends

SCHAEFFLER

Environment

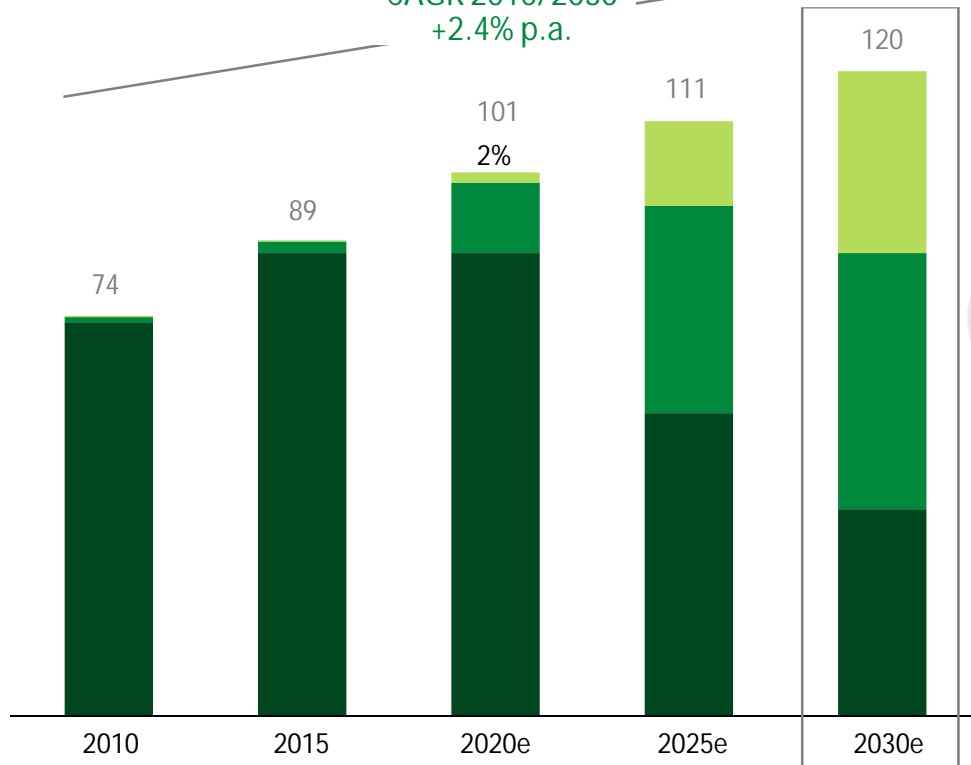
Urbanization

Globalization

Digitalization

Accelerated Scenario

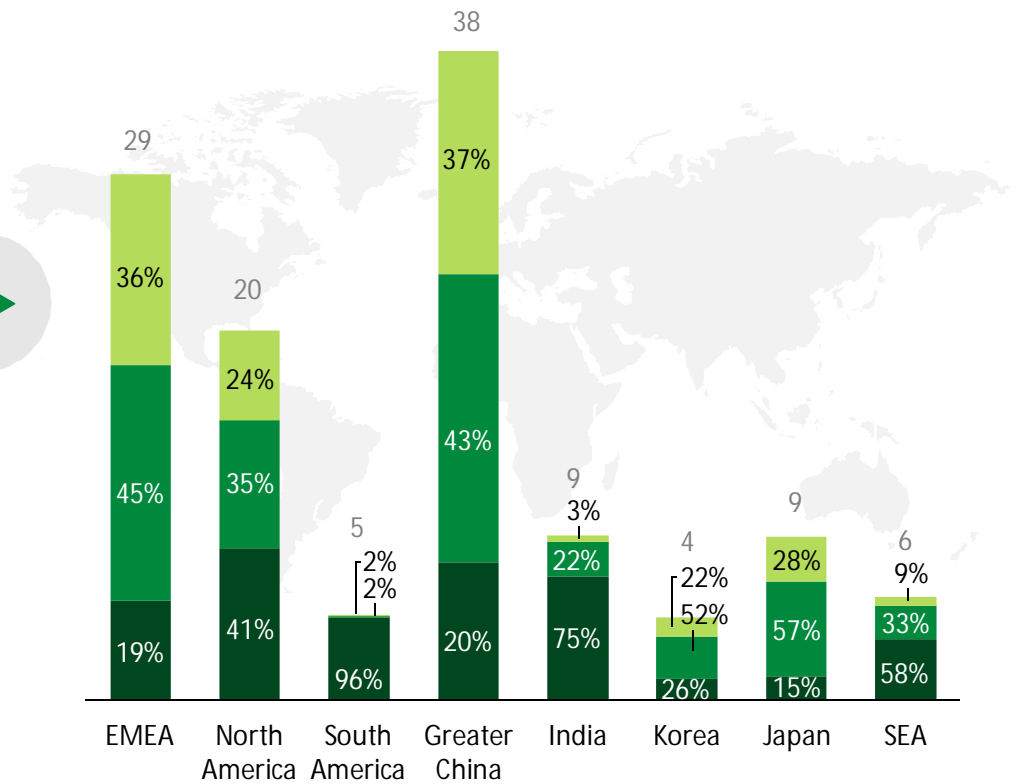
Global vehicle production [in mn units]

CAGR 2010/2030
+2.4% p.a.

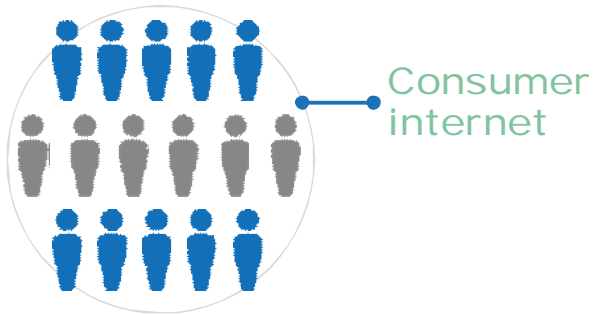
Source: IHS and Schaeffler Assumptions / Values based on Light Vehicles < 6 tons only, ICE = Internal Combustion Engine; HEV = Hybrid Electric Vehicles ranging from 48V Mild Hybrid to PHEV, BEV = Battery Electric Vehicles (incl. Fuel Cell Electric Vehicles)

Regionalized Accelerated Scenario 2030

Global vehicle production [in mn units]



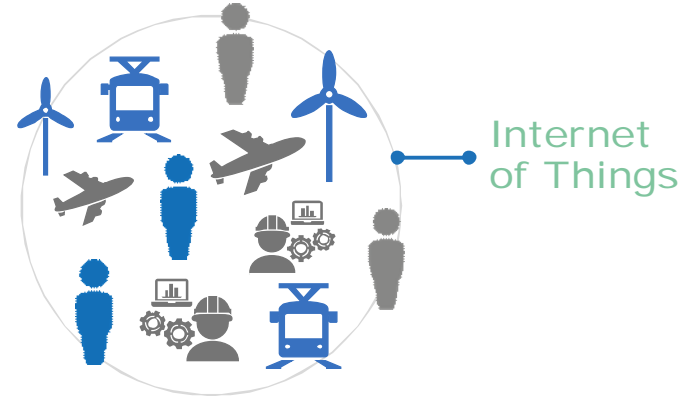
What happened
when **2Bn**
PEOPLE
became connected?



\$1.7 Tr in 2010



What happens
when **50Bn**
MACHINES
become connected?



\$4-11 Tr by 2025

SOURCE: McKinsey

Strategy "Mobility for tomorrow"

Four focus areas – Where we want to play

SCHAEFFLER

Eco-friendly drives

- ▶ Optimized combustion engine
- ▶ Electric vehicles
- ▶ Industrial drives



Urban mobility

- ▶ Two-wheelers
- ▶ Inner-city railways
- ▶ Micro mobiles



Interurban mobility

- ▶ Rail vehicles
- ▶ Aircraft
- ▶ Off-highway



Mobility for tomorrow

Energy chain

- ▶ Wind power
- ▶ Solar power
- ▶ Conventional power generation



1 E-Mobility



- ▶ Separate Business Division "E-Mobility" as of January 1st, 2018
- ▶ Strengthen footprint in Greater China as lead market for E-Mobility
- ▶ E-Motor and electronic competence as key drivers



15% of total Sales Automotive OEM from HEV/BEV in 2020

2 Industry 4.0



- ▶ Separate Organizational Unit "Industry 4.0" as of January 1st, 2018
- ▶ Combining Mechatronic business with digital driven services (i.e. Condition Monitoring)
- ▶ Schaeffler Eco System



10% of Sales from Industry 4.0-related products and solutions in 2022

3 Digitalization



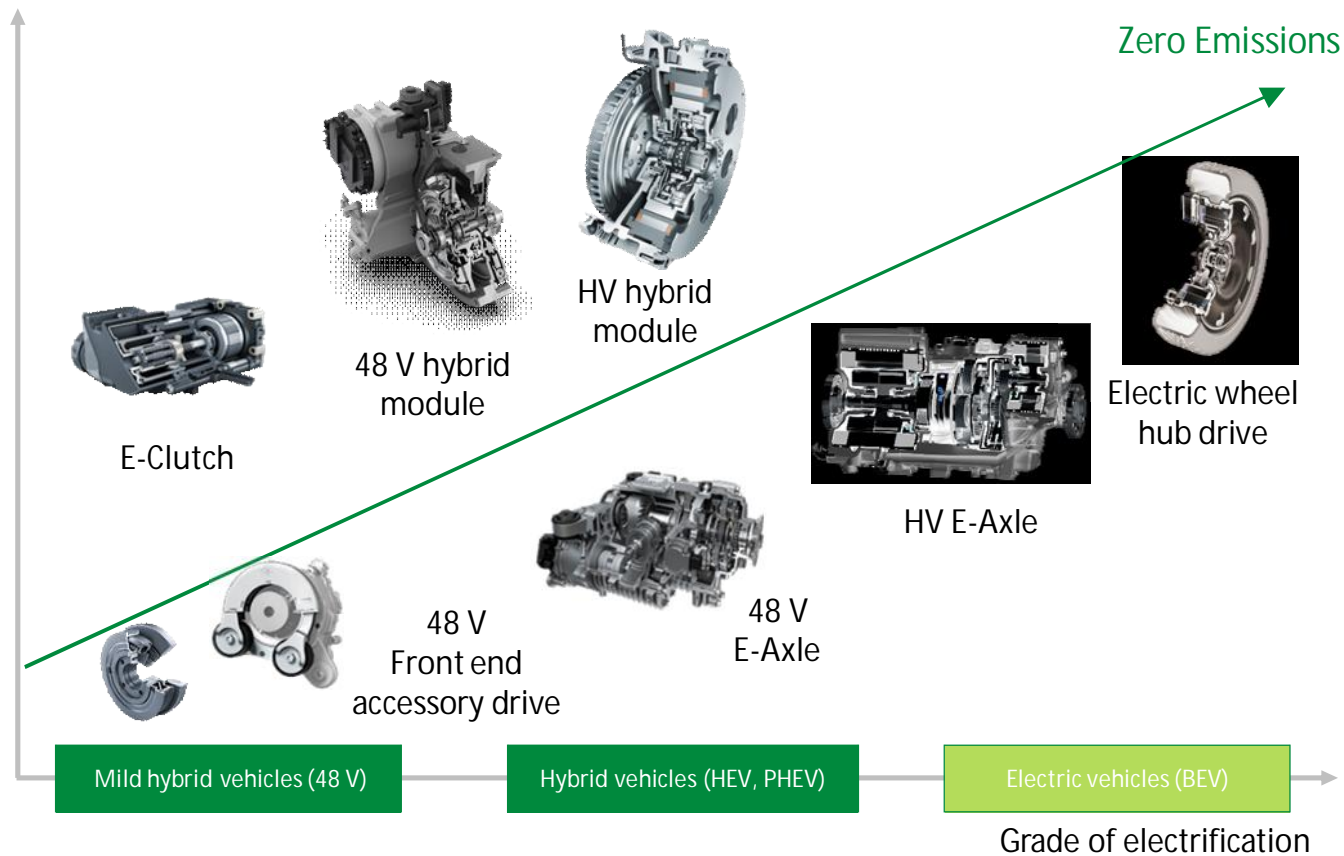
- ▶ Group wide Digital Agenda with 4 key areas coordinated by Digital Chief Officer
- ▶ Today 100 employees work on 30 digital projects
- ▶ Strategic partnership with IBM



10% of added value from digitally enhanced products and services in 2020¹⁾

¹⁾Annual General Meeting 2017

Product portfolio



Key aspects

1999

1st Schaeffler E-Mobility symposium

2002

1st E-Mobility concept car

2005

1st serial production of components for hybrid modules

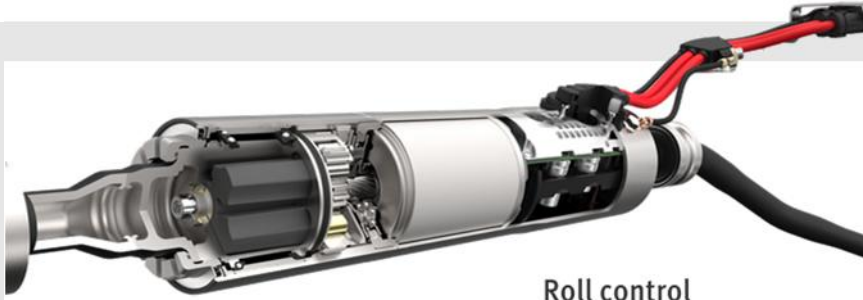
2016

- ▶ 500 Million Euro investment to date¹⁾, 1,200 employees globally
- ▶ More than 20 customer projects
- ▶ 6 series contracts for hybrid modules and e-axes

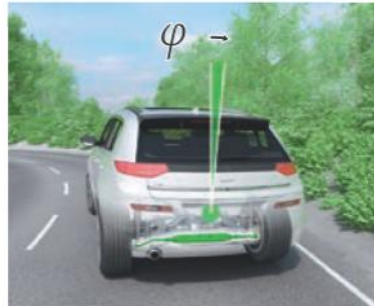
Until 2020

- ▶ Further 500 Million Euro investment¹⁾
- ▶ Doubling of employees in R&D and manufacturing

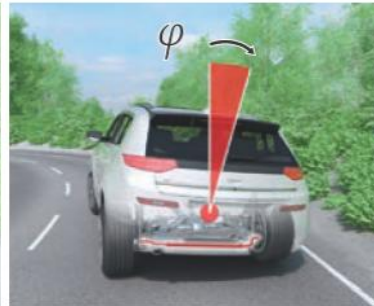
¹⁾ Including R&D



Roll control



Active mechatronic roll control



Passive roll stabilization

Comfort



Decoupling: actuator torque front axle $T_{FA} \approx 0$

Agility and sportiness



Understeer $T_{FA} > T_{RA}$



Neutral drivability $T_{FA} \approx T_{RA}$



Oversteer $T_{FA} < T_{RA}$

Safety



Active mechatronic roll control



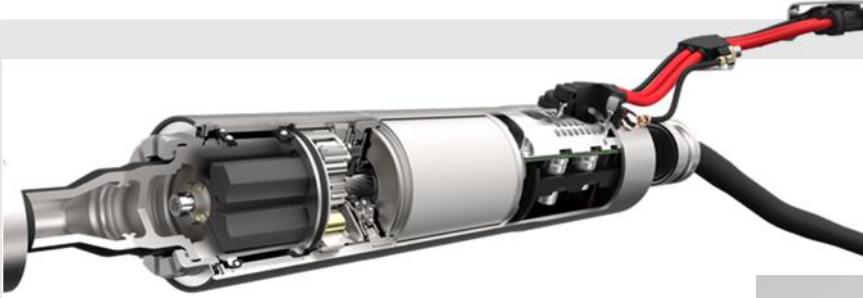
Passive roll stabilization



Eco-Friendly drives

Smart Chassis and Potentials of Connectivity

SCHAEFFLER



Wind Power 4.0

Digitalized condition monitoring of wind turbines

- ▶ Automated rolling bearing diagnosis
- ▶ Calculating the remaining useful life of rolling bearings
- ▶ Remote monitoring



Machine Tool 4.0

Concept for digitalizing production

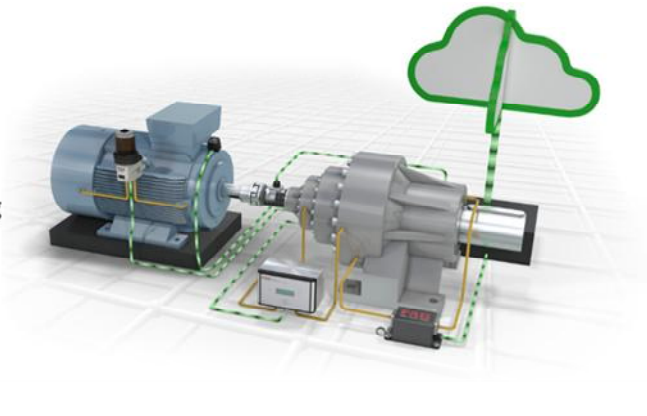
- ▶ Monitoring machine processes (vibrations, forces, temperatures)



Drive Train 4.0

Demonstration of the online monitoring of drive systems

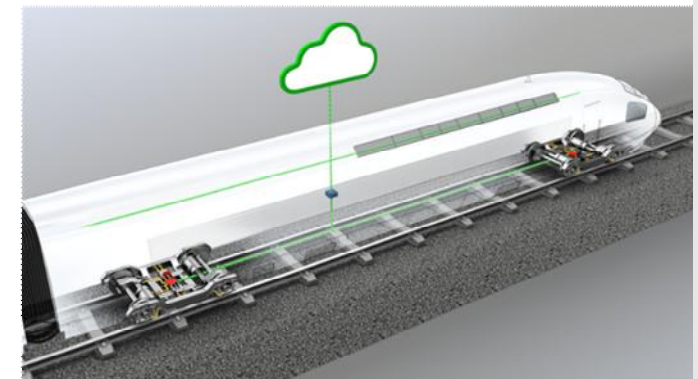
- ▶ Automated rolling bearing diagnosis
- ▶ Calculating the remaining useful life of rolling bearings

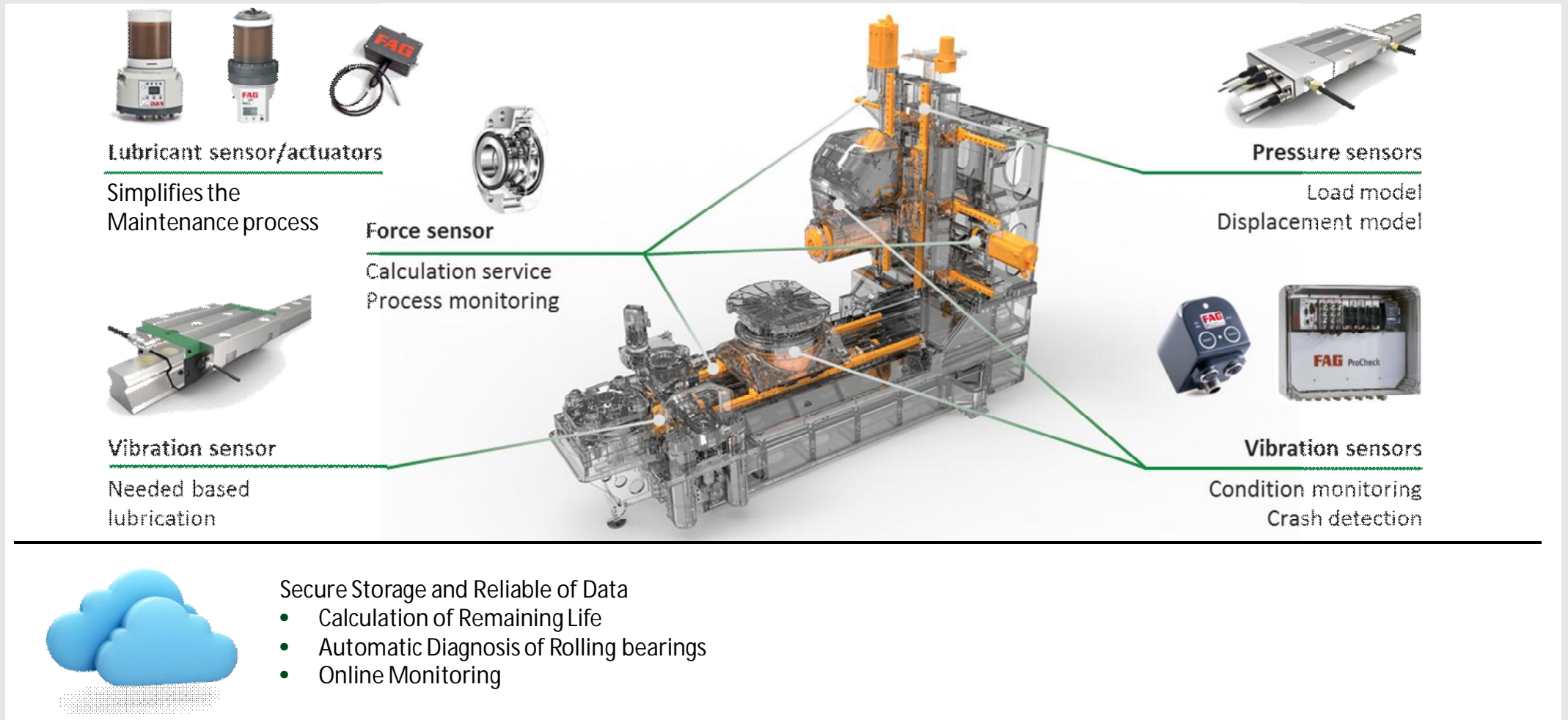


Railway 4.0

Digitalized condition monitoring of axlebox bearings, traction motors, and gearboxes

- ▶ Predictive maintenance
- ▶ Automated rolling bearing diagnosis
- ▶ Calculating the remaining useful life of grease





Collaboration Work with DMG Mori
Partner Award 2017 for Schaeffler as Overall Winner

SCHAEFFLER





Products and Services



- ▶ The rolling bearing of the future works as a sensor
- ▶ Additional added value by connecting to the Schaeffler cloud



Machines and Processes



- ▶ Further development of production thanks to networked machines
- ▶ Considerable reduction in setup times by means of digital order management



Analyses and Simulation



- ▶ Value-adding information by connecting product and process data
- ▶ Design for human-machine interaction

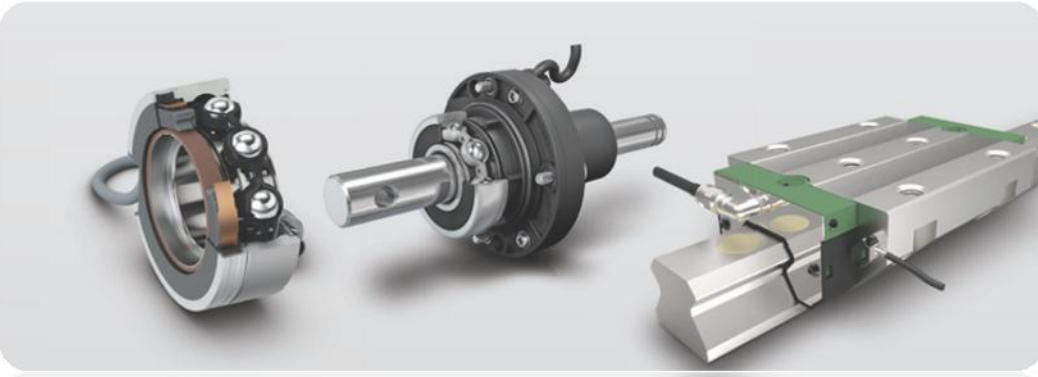
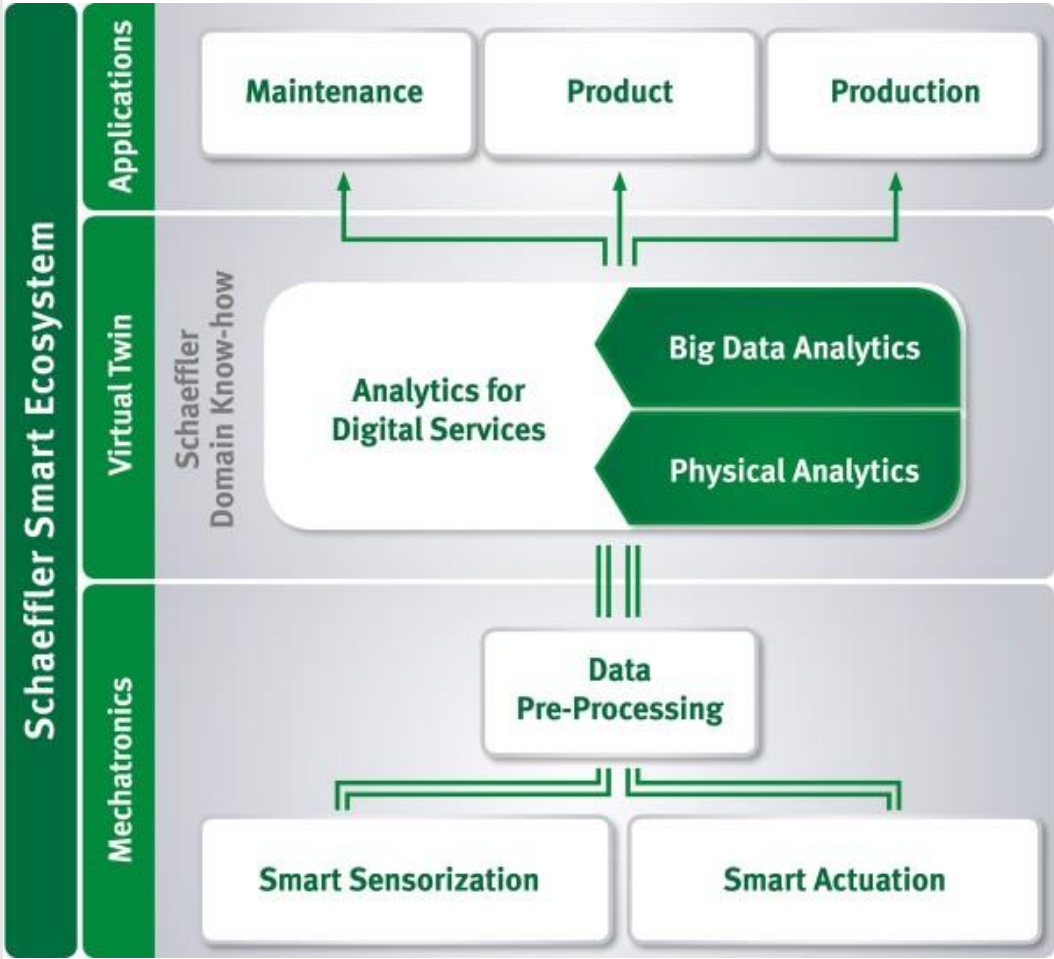


User Experience and Customer Value



- ▶ Data recording and evaluation in real time to increase productivity
- ▶ Online condition monitoring as a new business model will be expanded significantly in the future

Digital Agenda



*Thank you for
your attention*

