

Fraunhofer-Institute for Optronics, System Technology and Image Exploitation IOSB

Industry 4.0 – a new paradigm in German manufacturing



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Mladà Boleslav, September 14, 2012



Karlsruhe



Ettlingen



Ilmenau



Lemgo

Fraunhofer IOSB-overview

CEOs:

Prof. Dr.-Ing. Jürgen Beyerer
Prof. Dr. Maurus Tacke



Core competencies:

Optronics
System technology
Vision technology



Business units:

Automation
Energy, water, environment
Automated Visual Inspection
Defence
Security



Key figures:

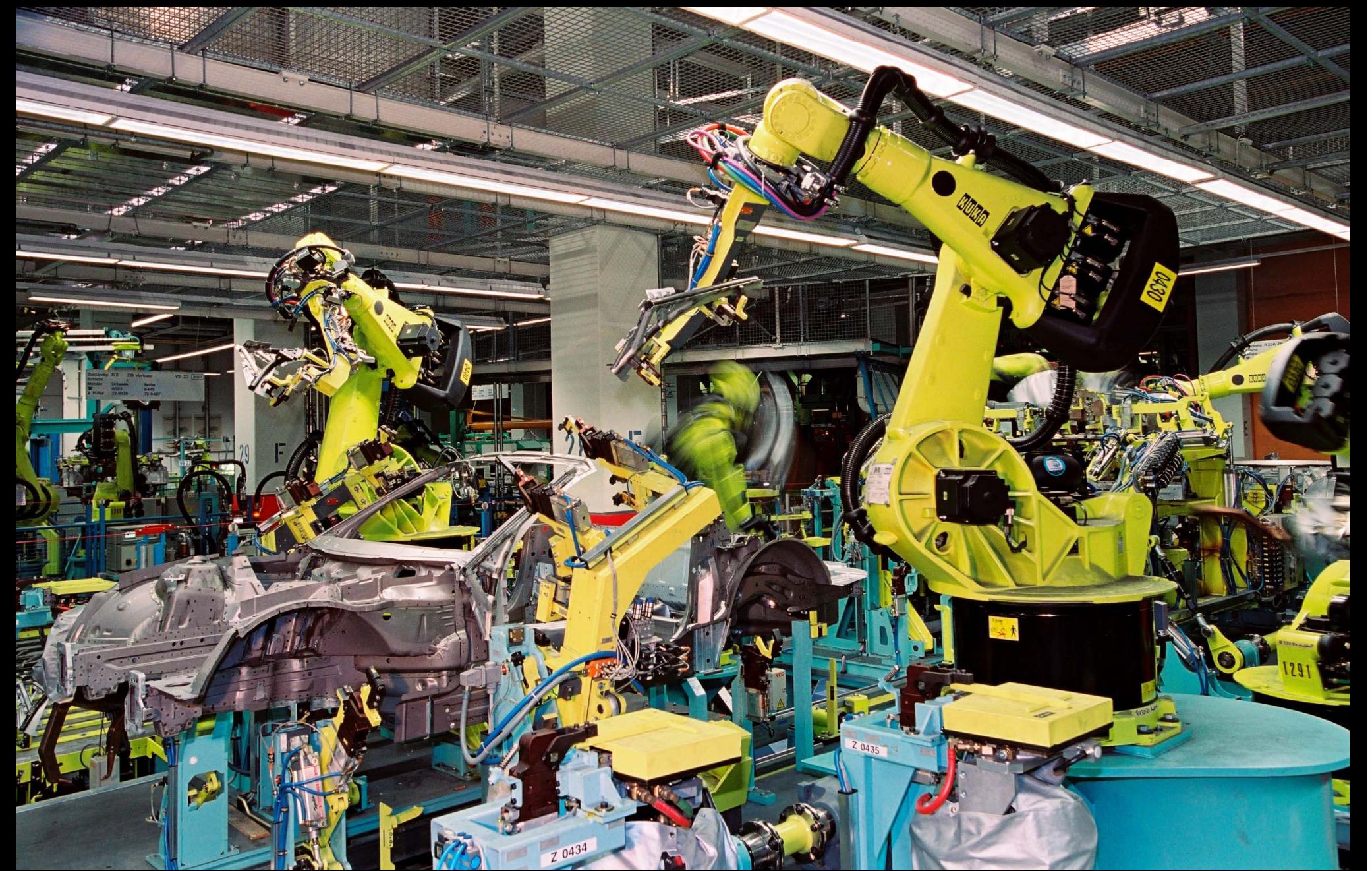
| | |
|--------------------------|-----------|
| Budget 2012 | 41 Mio. € |
| Total staff | 405 |
| Scientists and engineers | 267 |
| Students | 130 |

Cooperation with:

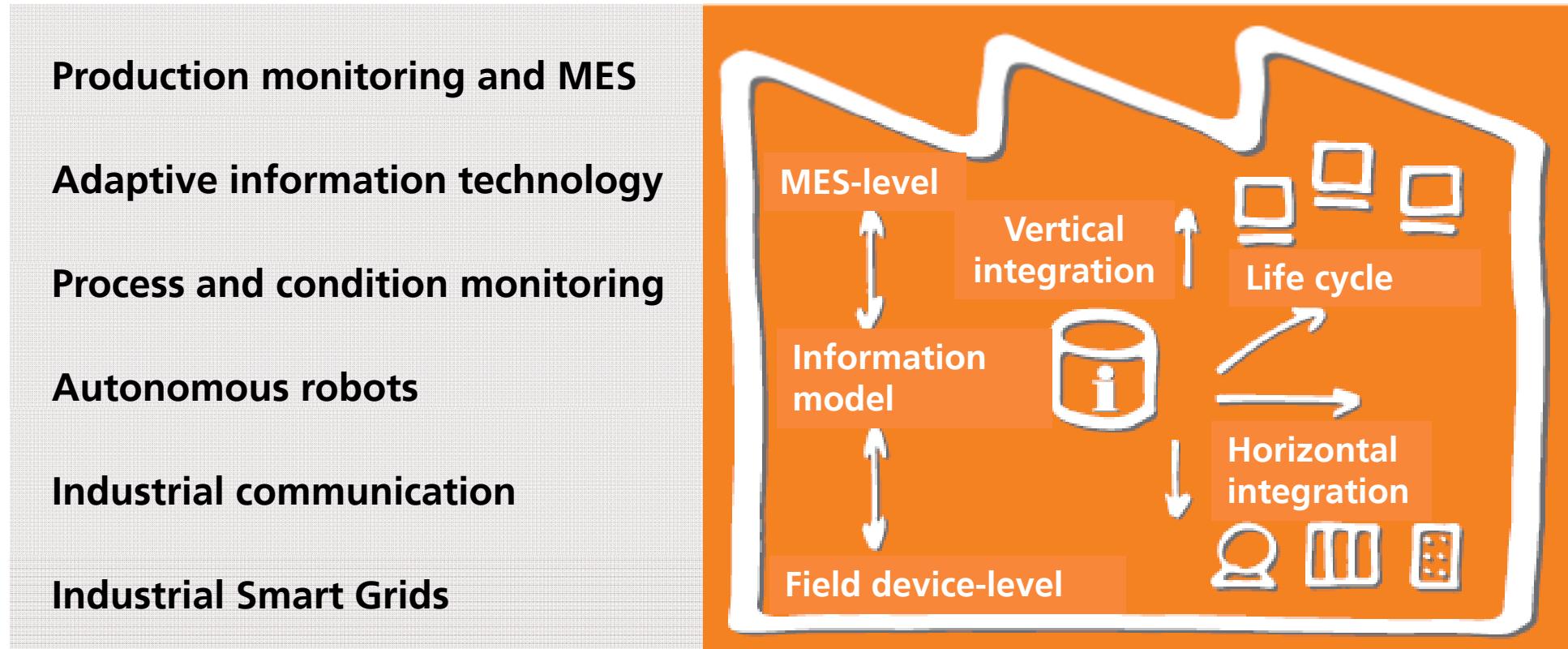


Faculty for computer science, Institute for anthropomatics,
Chair for interactive realtime systems

Realtime IT for complex manufacturing processes



Service offering of the Business Unit "Automation"



Qualification and training for experts and executives

1. Starting point for our work in information technology: monitoring & control system for Daimler in press, body, paint, trim shop

The integrated monitoring & reporting system for Daimler consists of

- ProVis.Agent® for monitoring & control,
- ProVis.Visu® for real-time visualization,
- ProVis.Paula® for web based reporting.

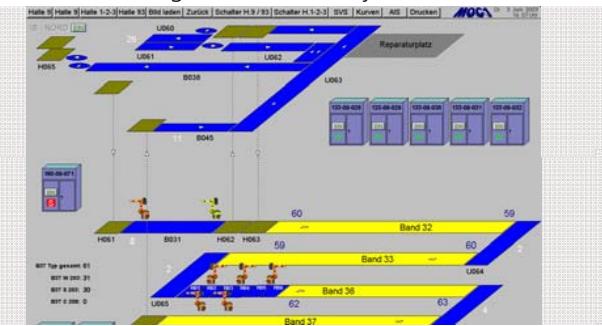
Central control room in the Bremen plant



In the Bremen plant ProVis.Agent monitors app. 450 PLCs of app. 2.000 machines/facilities in body, paint and trim shop

In the Woeth plant (commercial vehicles) we have delivered ProVis.Agent incl. online body tracking, central shift calendar, integration of EMOS (Durr-monitoring system, paint shop)

Process image of an assembly line



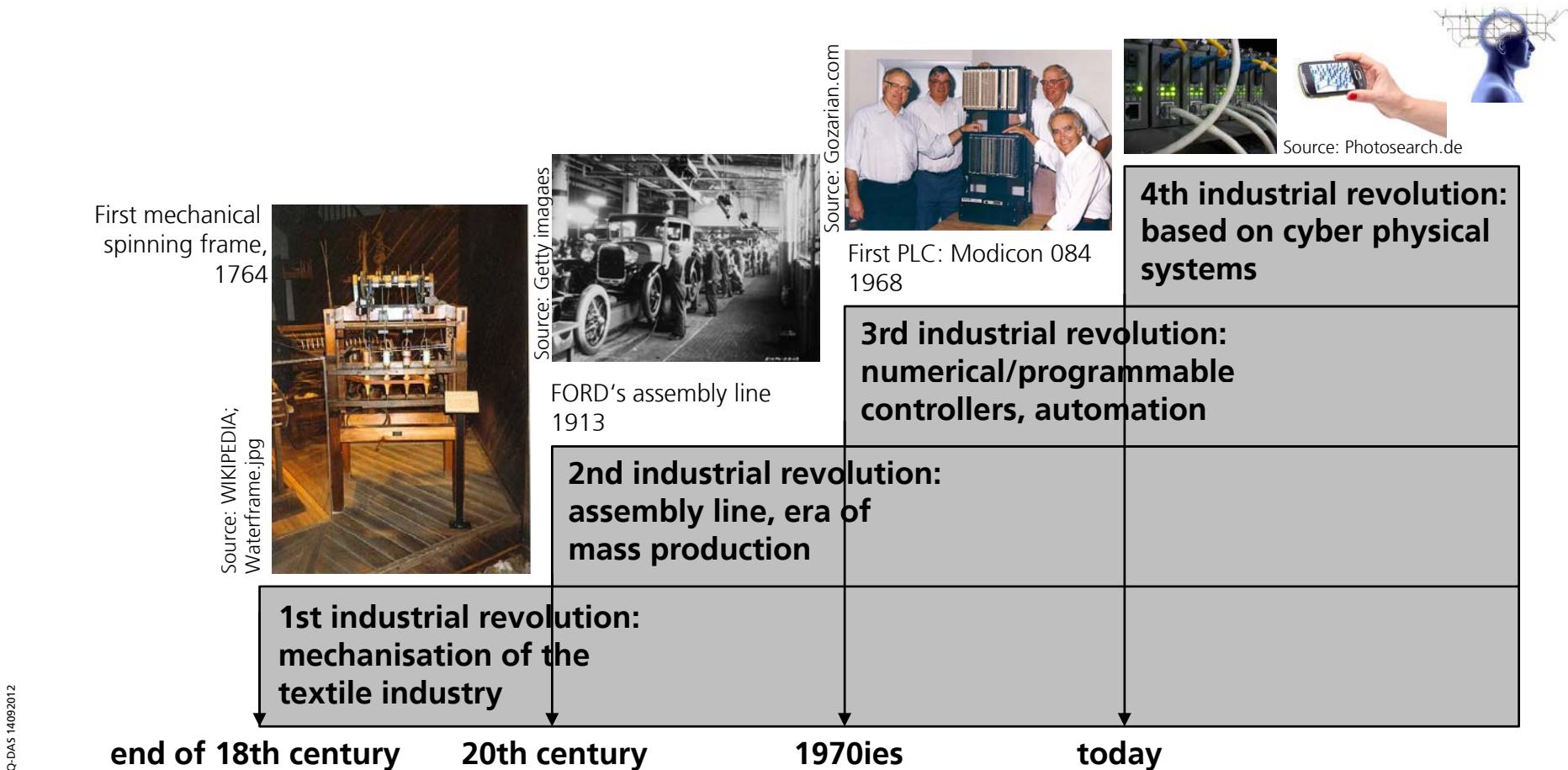
Example for ProVis.PAULA-GUI



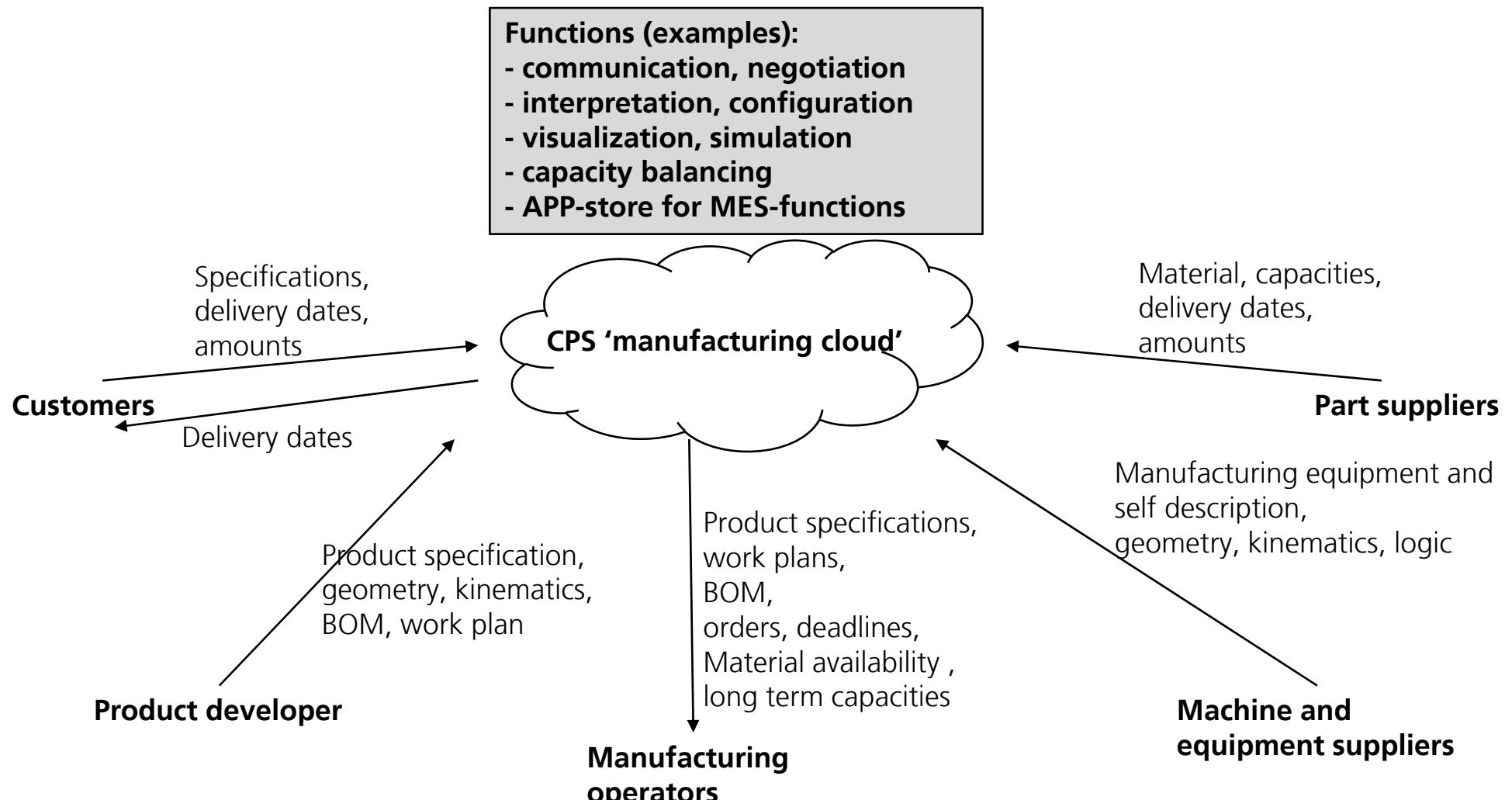
The web based reporting system for manufacturing and machine data based on content management system WebGenesis®, data amount Daimler Bremen:

1 TByte raw data/35d, 2.000 facilities, app. 1.600 users

2. What does “Industry 4.0” mean?



2. Industry 4.0 and the future factory

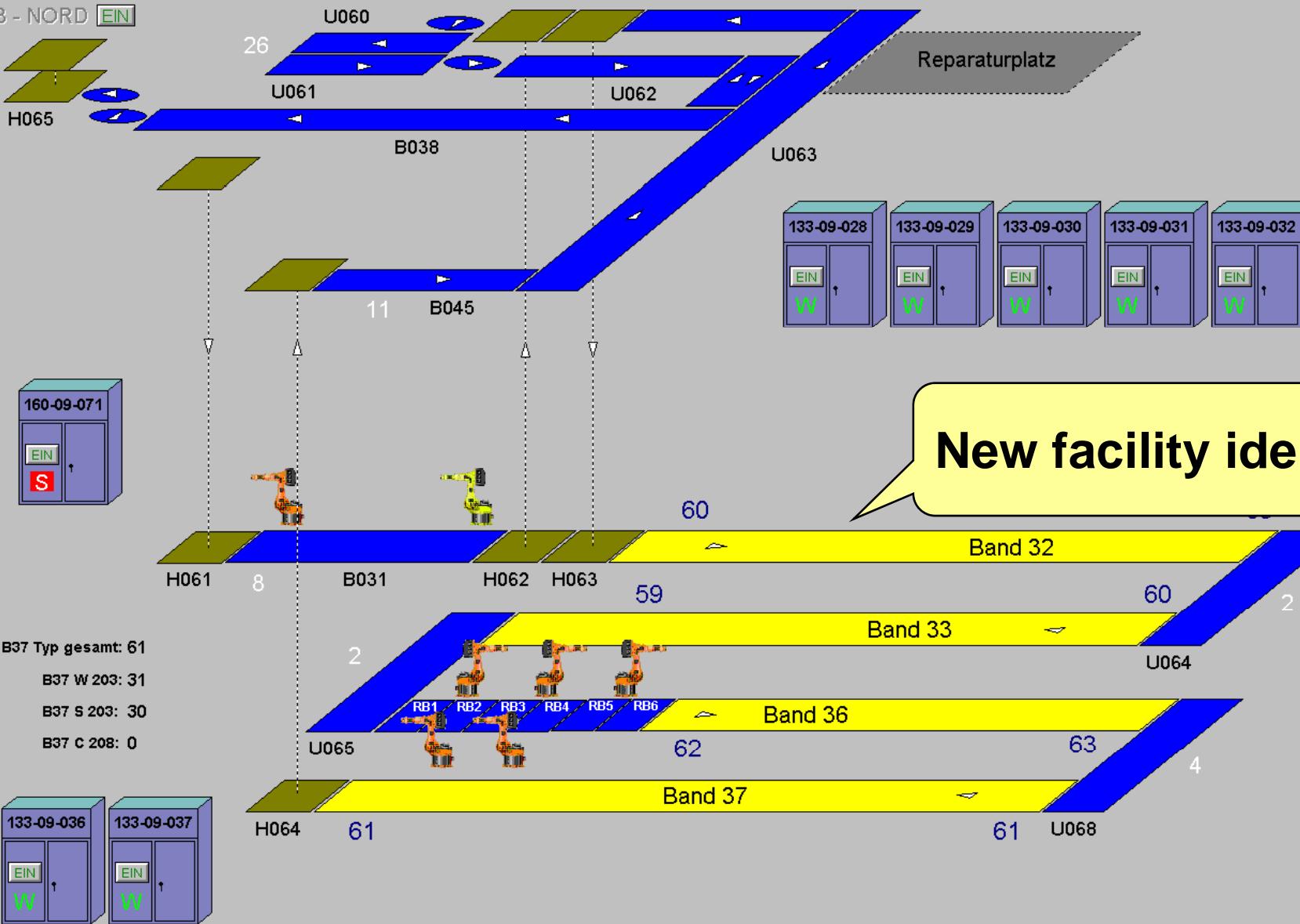


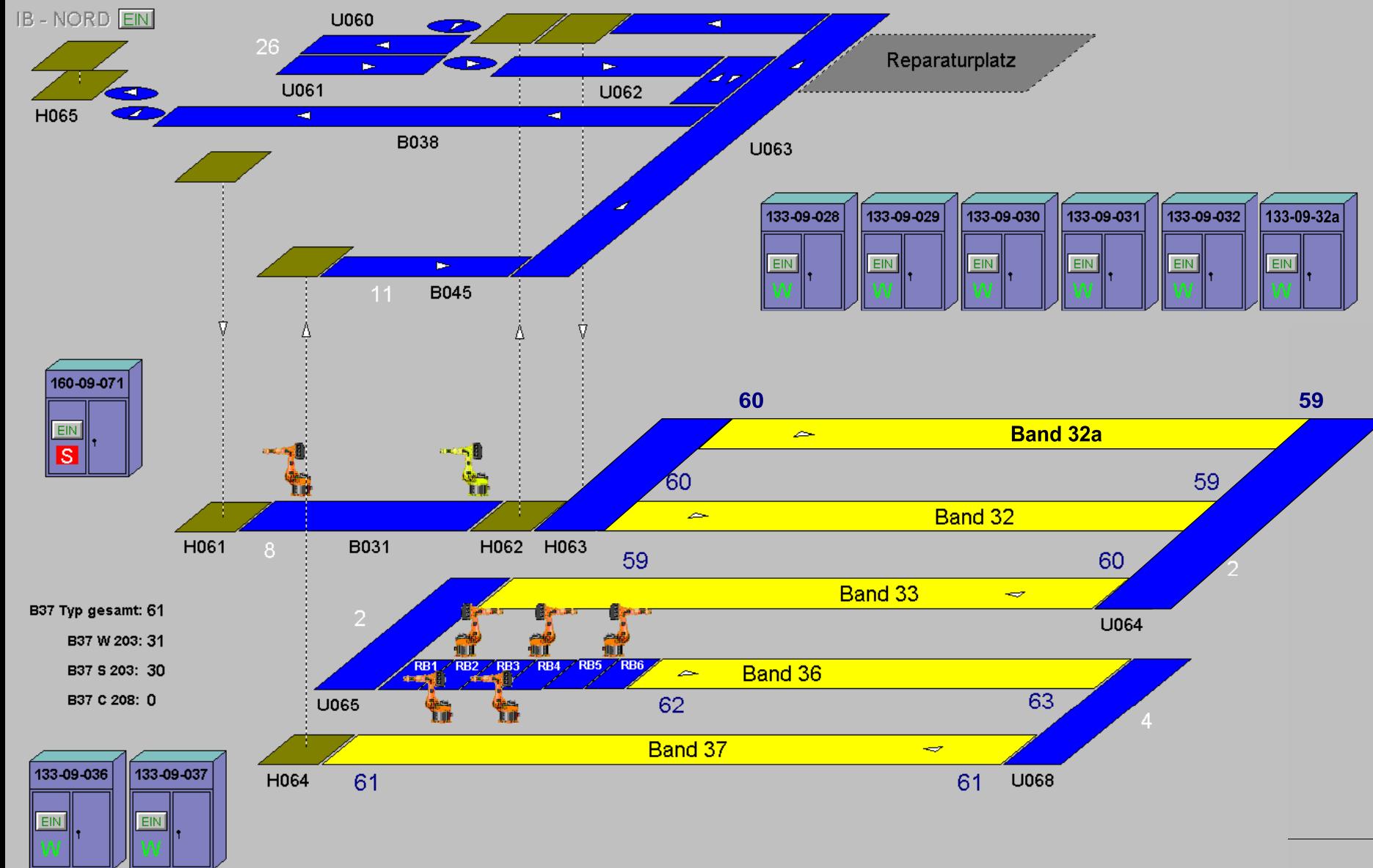
3.1 Aspects of Industry 4.0: Interoperability in information technology for manufacturing

- ▶ software embedded in field devices, which are connected by the field bus, e.g. in sensors, actuators, drives, valves, etc.;
- ▶ the control software of machinery and equipment, e. g. programmable logic controllers (PLCs);
- ▶ the software managing the equipment, e. g. SCADA, manufacturing execution systems – MES, etc.

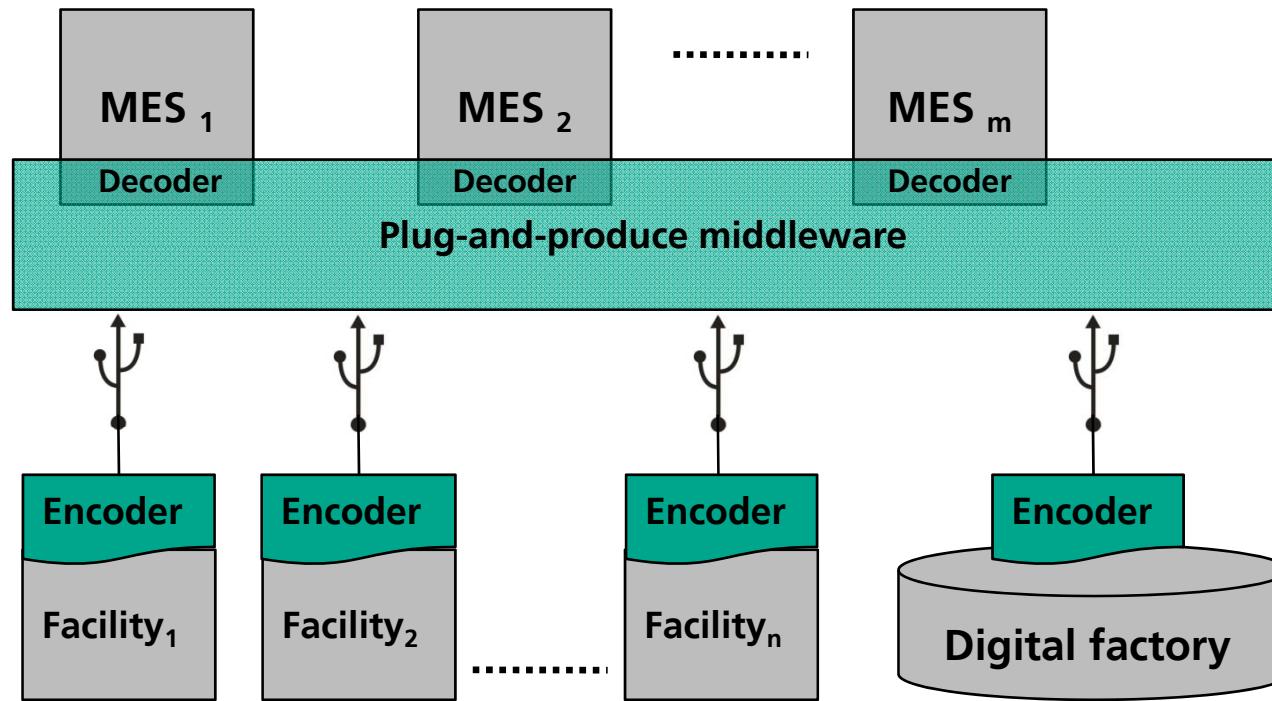
GOAL: standard interface (USB-mechanisms) for the factory

IB - NORD [EIN]

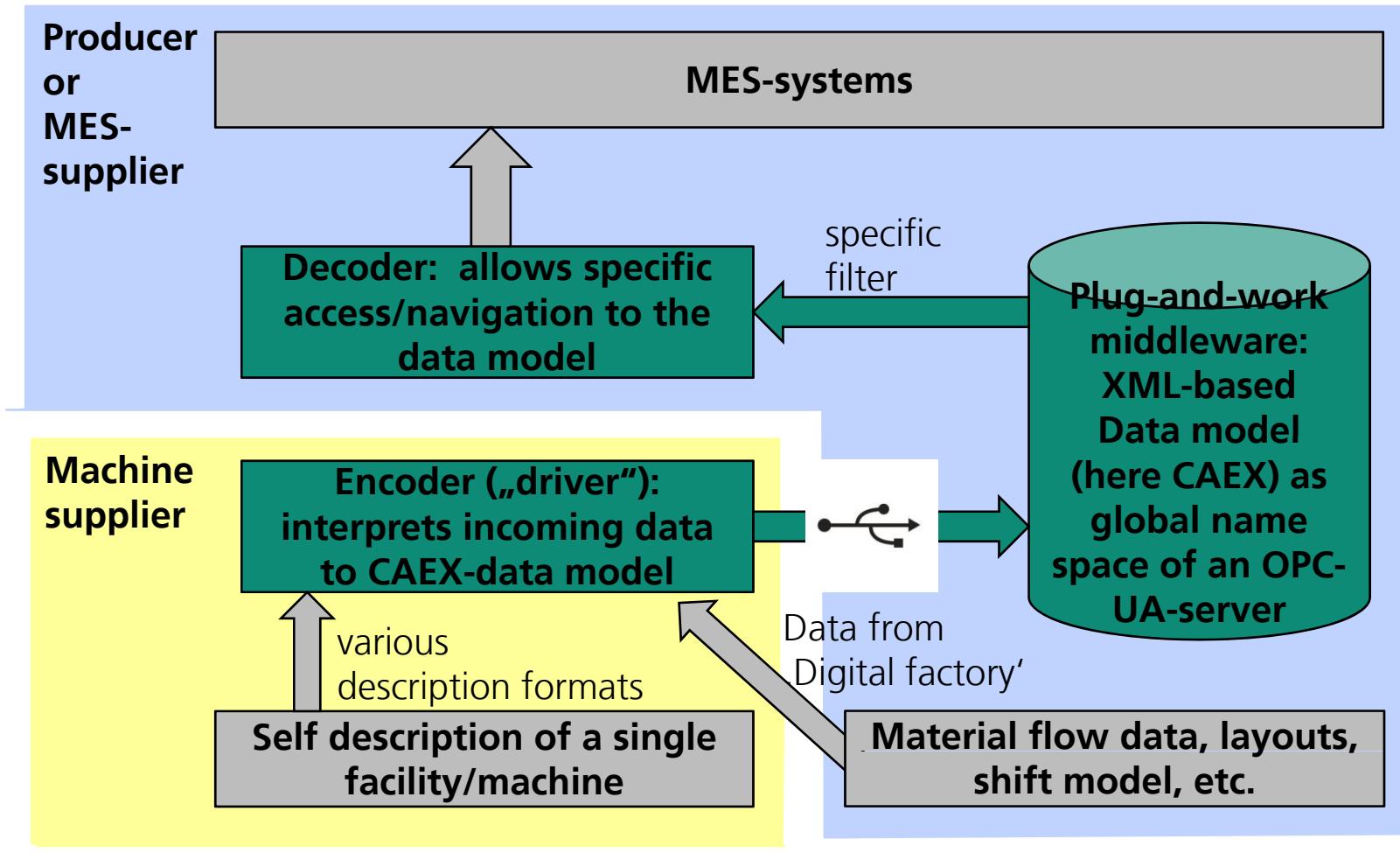




3.1 Required components for plug-and-work methodology

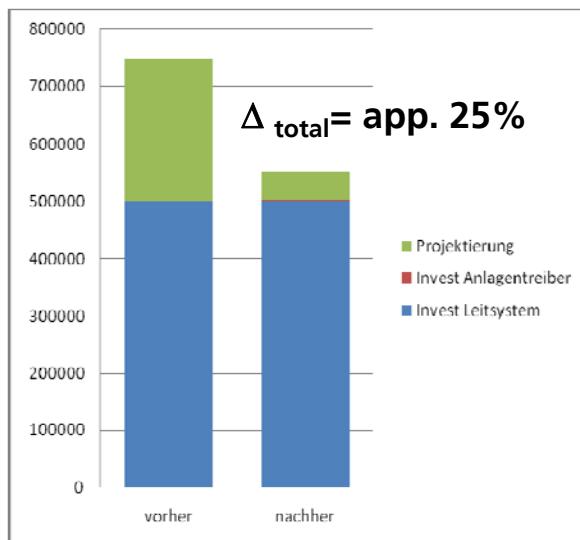


3.1 Developed and patented methodology



3.1 Example for plug-and-work benefits

Potential for cost savings
by „plug-and-work“
(Values based on
experience of IOSB)



Potential for savings at MES-/Monotoring-systems or HMI; example ProVis.Agent®

Assumptions:

| | |
|---|------------------|
| Invest monitoring system: | 500.000 € |
| Monitored PLCs per system: | 250 |
| Efforts per PLC for Image-, IO- and facility engineering | 2-5 days |
| => Total engineering efforts | app. 500 days |
| Cost per day engineering: | 500 € |
| total cost engineering: | 250.000 € |
| Potential for savings by plug-and-work: app. 80% | 200.000 € |

3.1 Example for plug-and-work effects

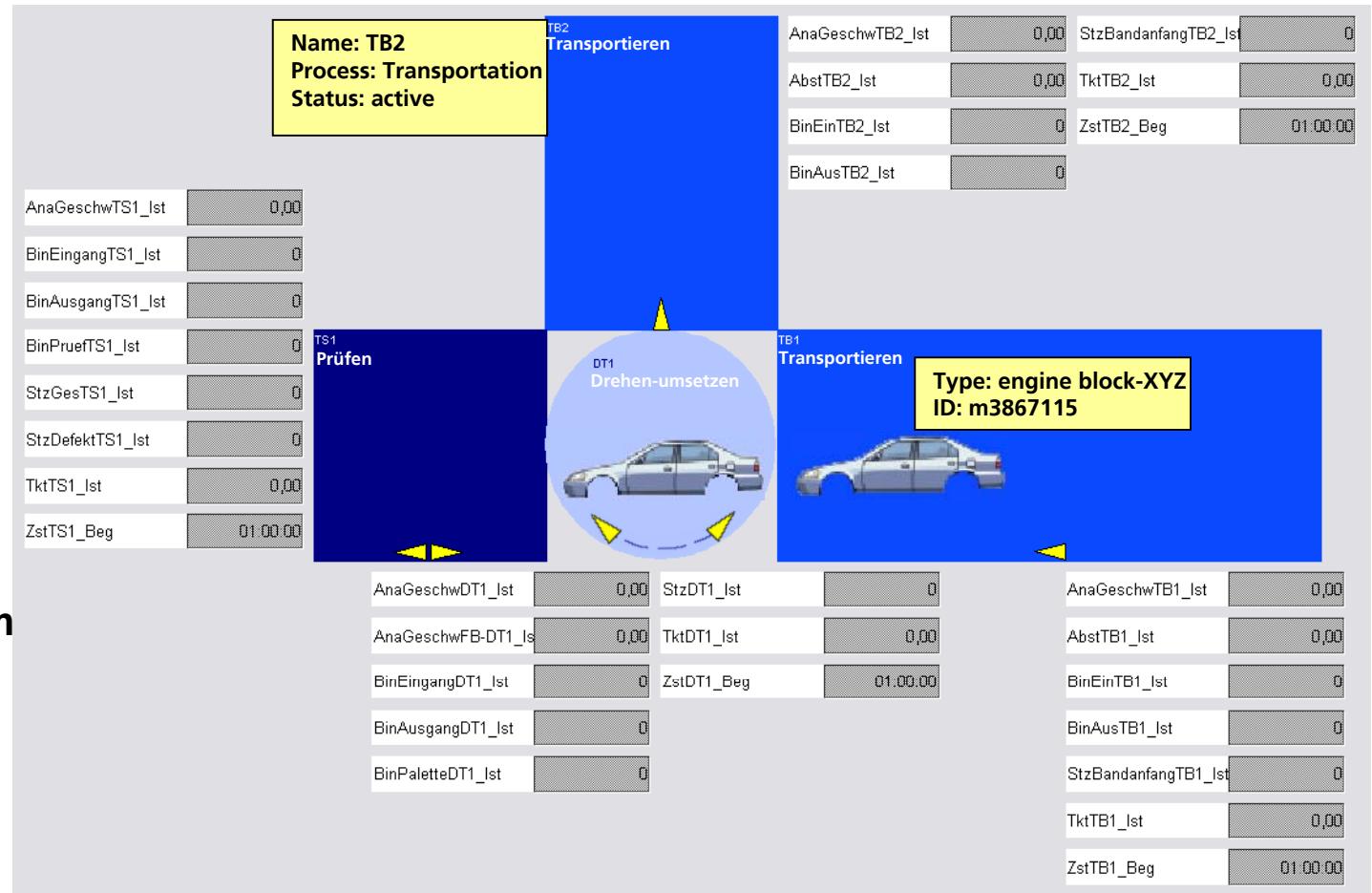
Example of a demonstrator:

- TS1: test station
- DT1: turn table
- TB1: transport belt 1
- TB2: transport belt 2
- + various variables and values

completely! generated from self description of facilities including topology information from layout planning

Next step:

- test with real facility at Daimler Woerth



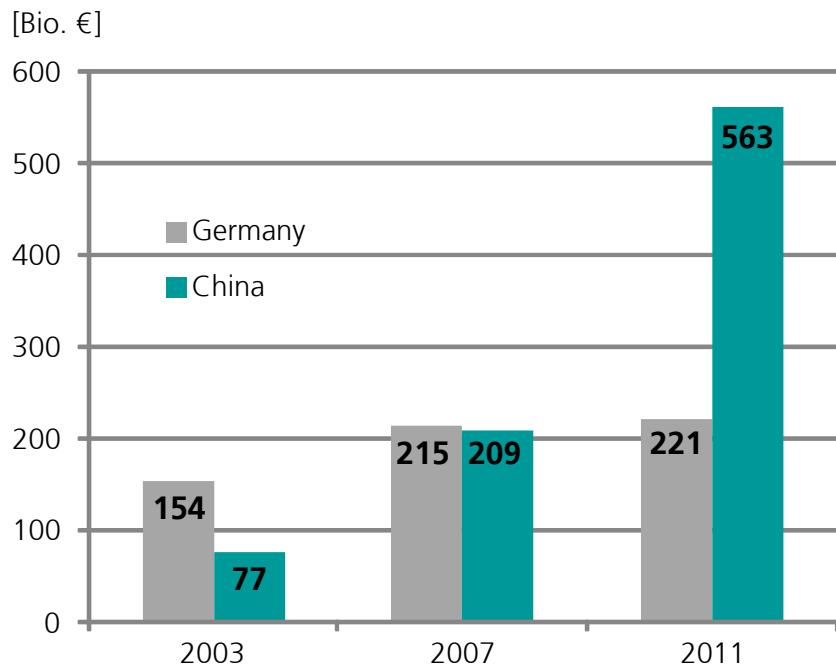
3.2 Aspects of Industry 4.0: Gesture interaction



- ▶ **Technology: gesture recognition and man-machine-interaction instead of keyboard, mouse, touch-screen**
- ▶ **Multi-user/multi display interaction**
- ▶ **Benefits: time saving, for gestures can be recognized directly on the object, e.g. quality inspection**

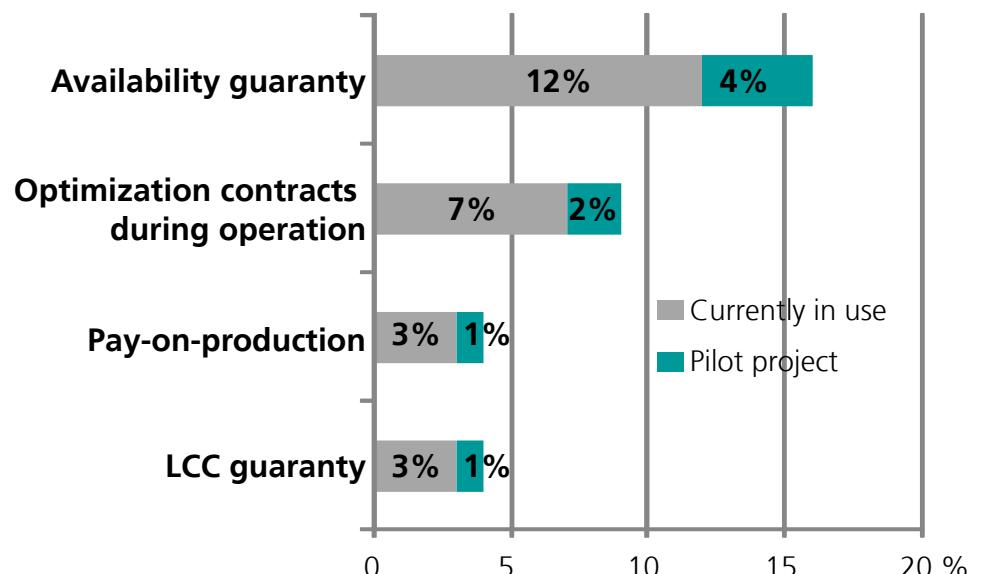
3.3 Aspects of Industry 4.0: machine builders of the future

Development of machine sales in Germany and China (Source: VDMA: Maschinenbau in Zahl und Bild 2012)



Presentation Q-DAS 14092012

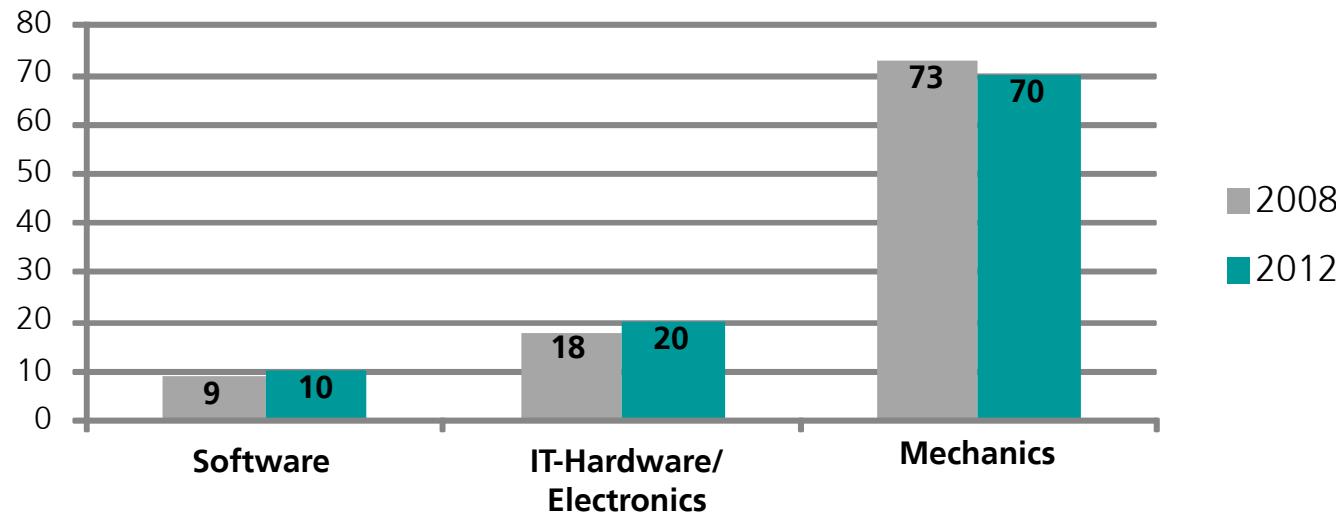
Examples for product services for today's customers (Source: Fraunhofer ISI, Modernisierung der Produktion: Nutzen statt Produkte kaufen)



3.3 Aspects of Industry 4.0: machine builders of the future

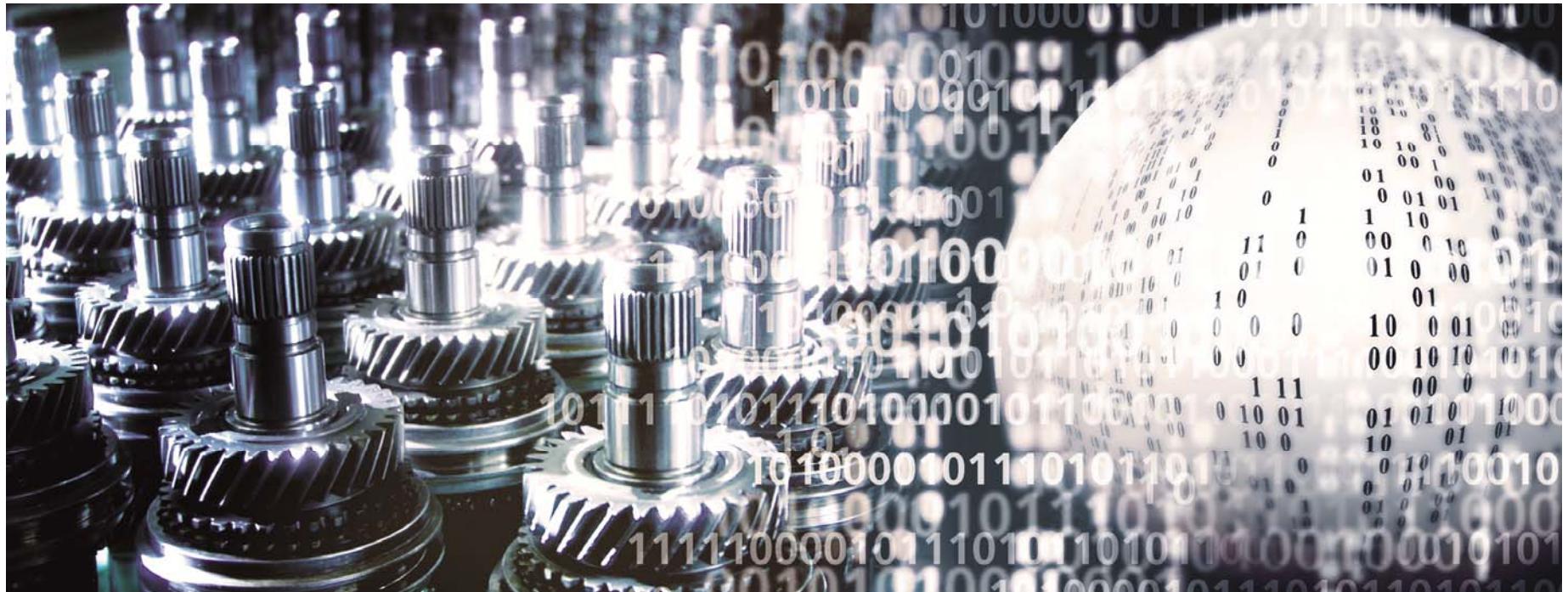
Average share of components/competencies in today's machines

(Source: VDMA – Forum IT@Automation)



13% of machine builders: „Products consist less than 50% of hardware“

3.4 Aspects of Industry 4.0: machine builders of the future



- ▶ IT-based services lead to new business models
- ▶ For machine builders also software will become a product

4 Conclusions

- ▶ Internet and mobile devices from the office are also used on the shop floor
 - ➔ iPads, smart phones, Ethernet factory wide;
Security and availability are required
- ▶ Degree of software in conventional mechanical products increase
 - ➔ organizational structure and process organization will change towards software development, tests, etc.; *opportunities* for new business models
- ▶ The separate disciplines industrial engineering, automation and IT merge
 - ➔ increasing demands concerning interdisciplinary cooperation; new degree programs, lifelong qualification, new ways of cooperation
- ▶ Supplier structure / different software vendors do not support integrated use of IT
 - ➔ interoperability and standards are overdue
- ▶ Risk of data-, information- and functional ‘overkill’
 - ➔ assistant functions, role based access, new GUIs, semantic search, etc., required
- ▶ ‘automation of automation’
 - ➔ configuration and parameterization instead of programming

Testing platform – Industrial IT Lab

- R&D-platform „IT-based automation“
- All IT-processes from the sensor up to the control room
- Multi-vendor equipment

Supported by:



JUNGMANN
Systemtechnik



For further information please join us:



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