



IO-Link und Condition Monitoring

The value of data transparency in digital ecosystems

All About Automation - Chemnitz, 30 Sep – 1 Okt 2025 |

Werner Flögel



Speaker Info

Welcome



Werner Flögel

HS-Heilbronn: Lecturer in

- Electric Design
- Software Engineering

DKE: SCI 4.0-ERKI Member Expert Board AI

IO-Link: Associate in the IO-Link Community

GEMÜ: from 1990 – August 2025

Consultant / Officer Strategic Innovation

GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG



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Disclaimer:

*Sources of content derived from
public available docs presented by speaker.
GEMÜ and IO-Link are brands
owned by the company and or association*

Smart Factory requires Realtime-Information

Reasons for Data-Transparency:

Increase in efficiency (OEE)

Sustainability, Energy efficiency

Avoid unexpected stop

Realtime Information Sources:

operational data recording
(manually or automatic)

Device data acquisition

Dashboarding

Production monitoring, Supply Chain

Prioritising, staff information

Data imports / OT-IT-Migration:

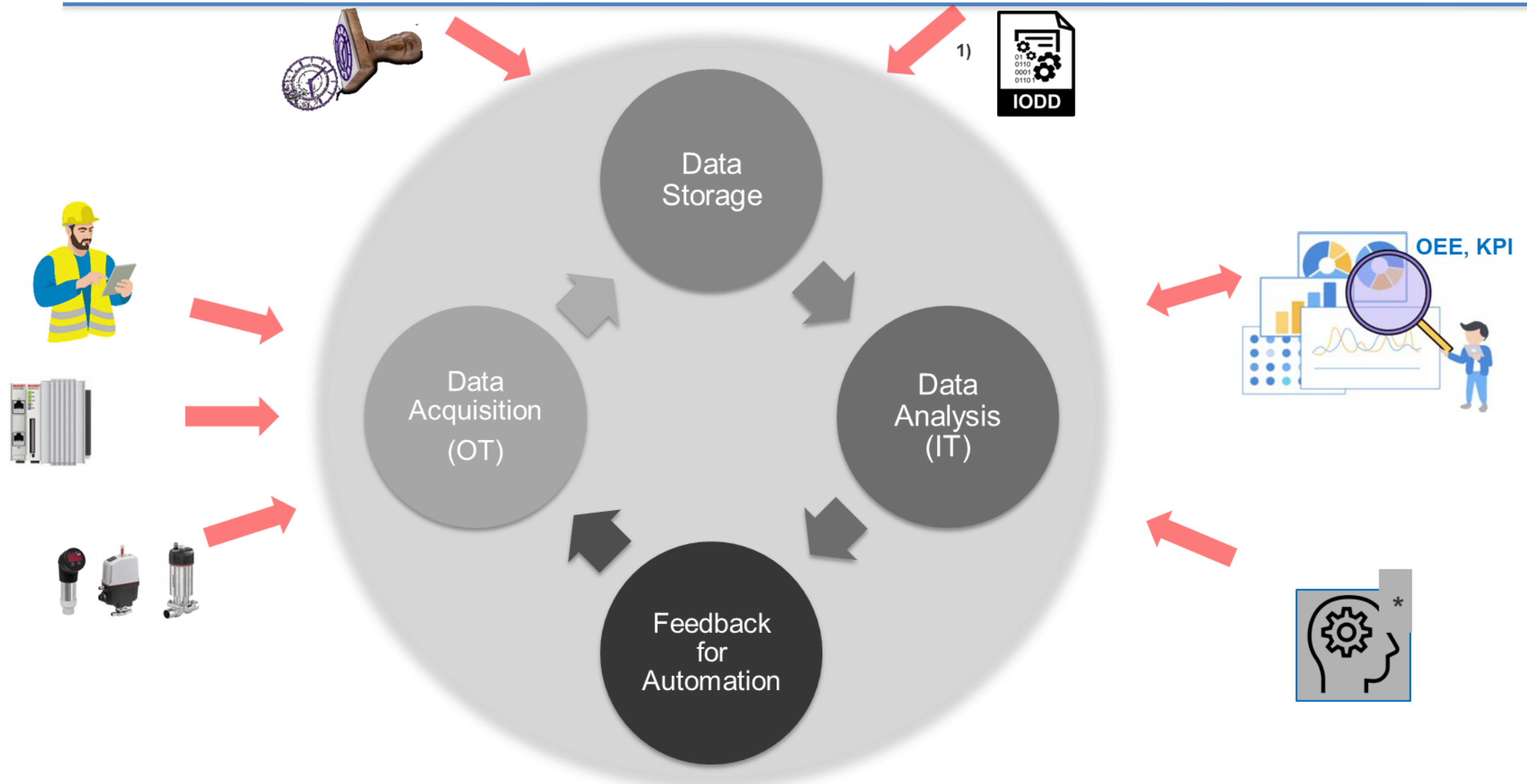
MES-Software

ERP-Software (SAP, PSI, ...)

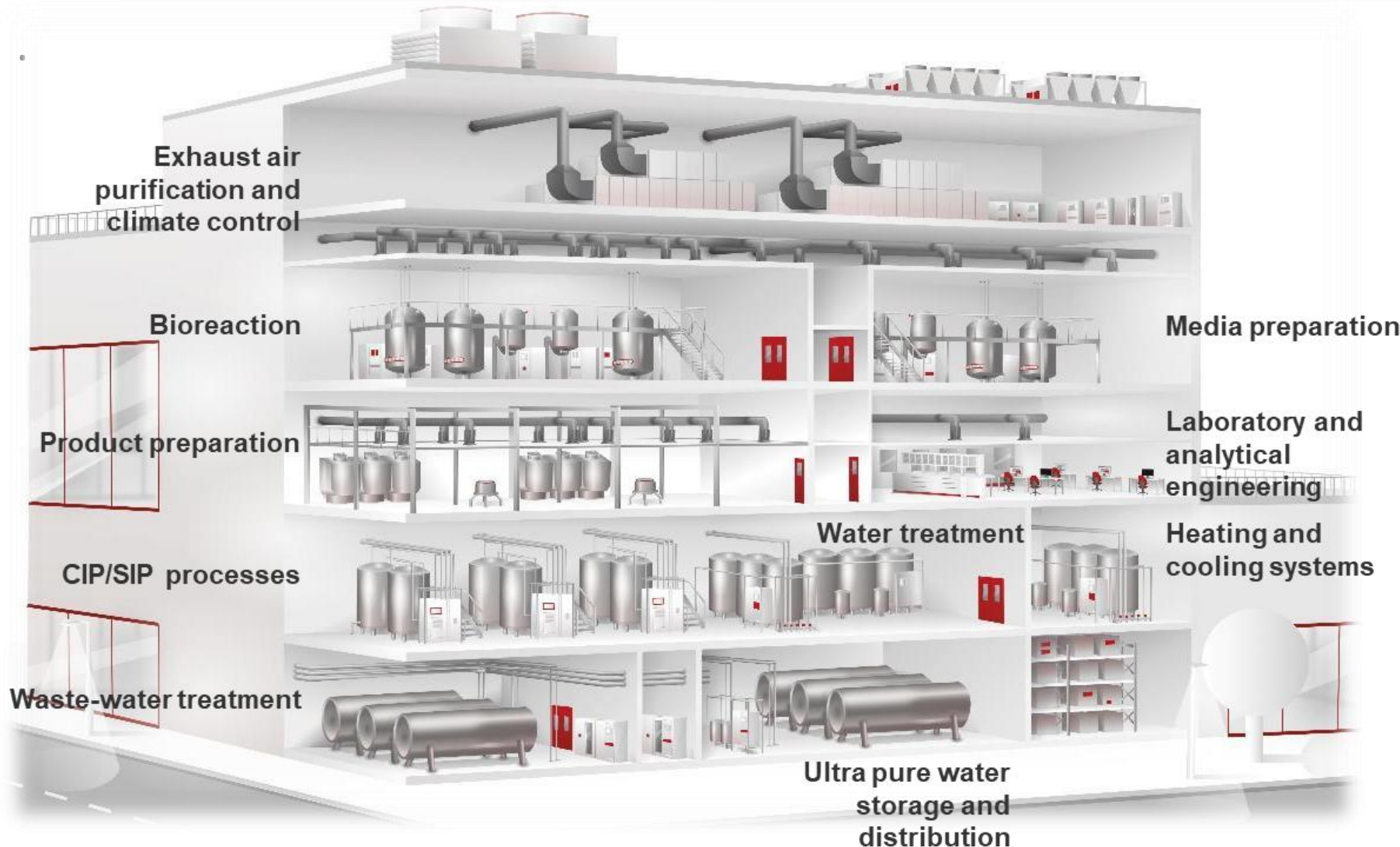
AI-Algorithmen (Power BI)



The “Control-loop” of Data Processing in a Smart Factory



Areas of use for **GEMÜ** valves, measurement and control systems



Perspective using
example Pharma

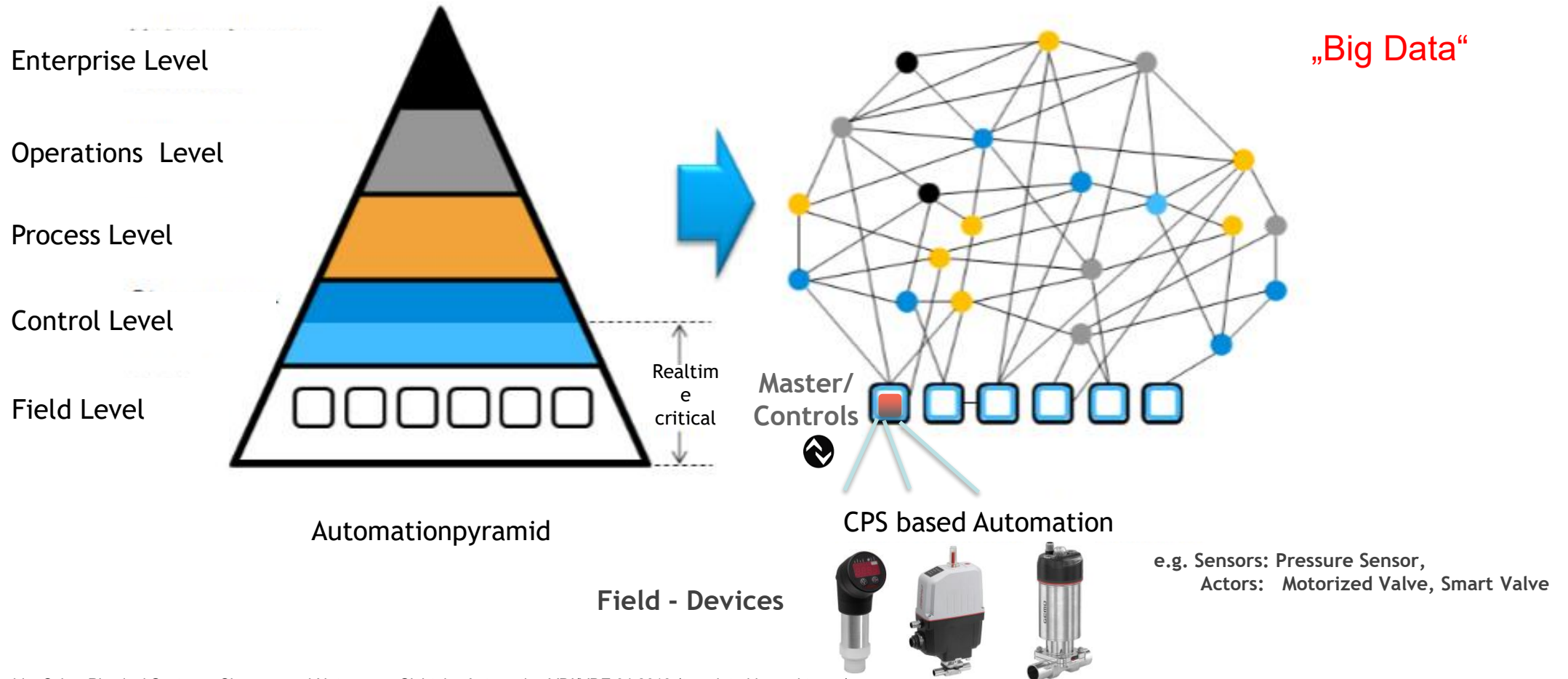
- Systemes/Subsystems
- Modules
- Skids
- Different OEM's, Manufacturer
- Vertical Structures



Graphic Source:
Schematic from **GEMÜ**

Automation Hierarchy

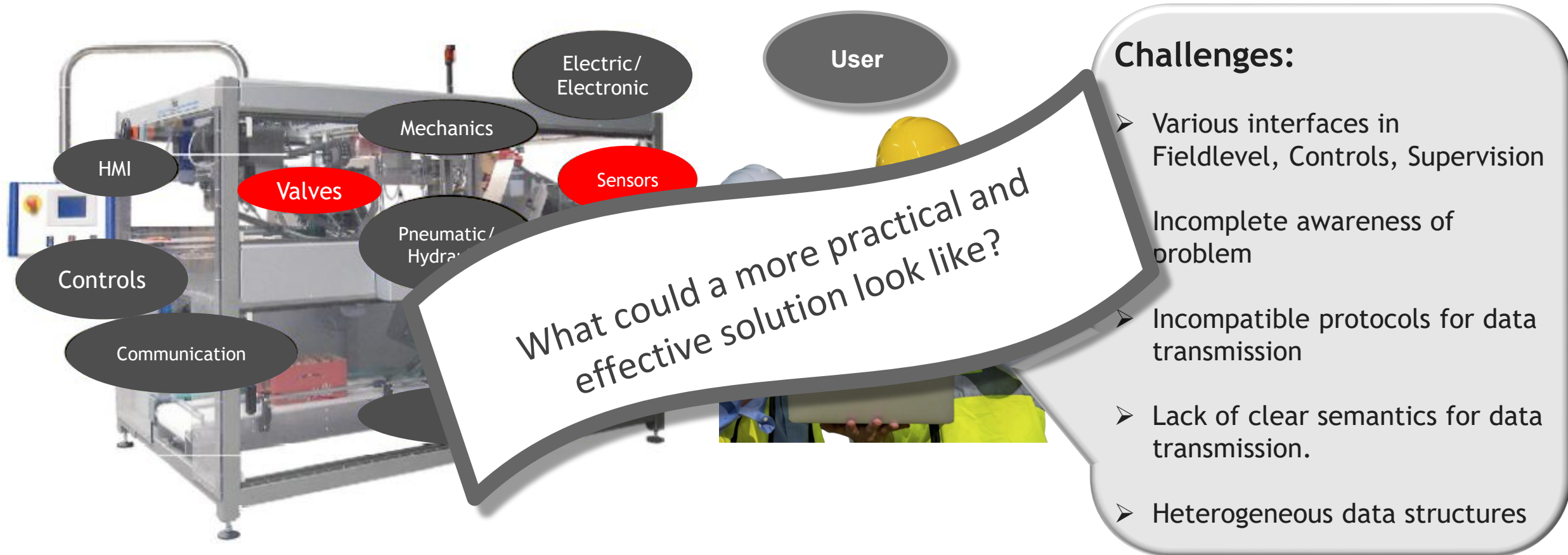
- Perspectives over time



Source/Graphic: Cyber-Physical Systems: Chancen und Nutzen aus Sicht der Automation VDI/VDE 04.2013 (translated in engl terms)

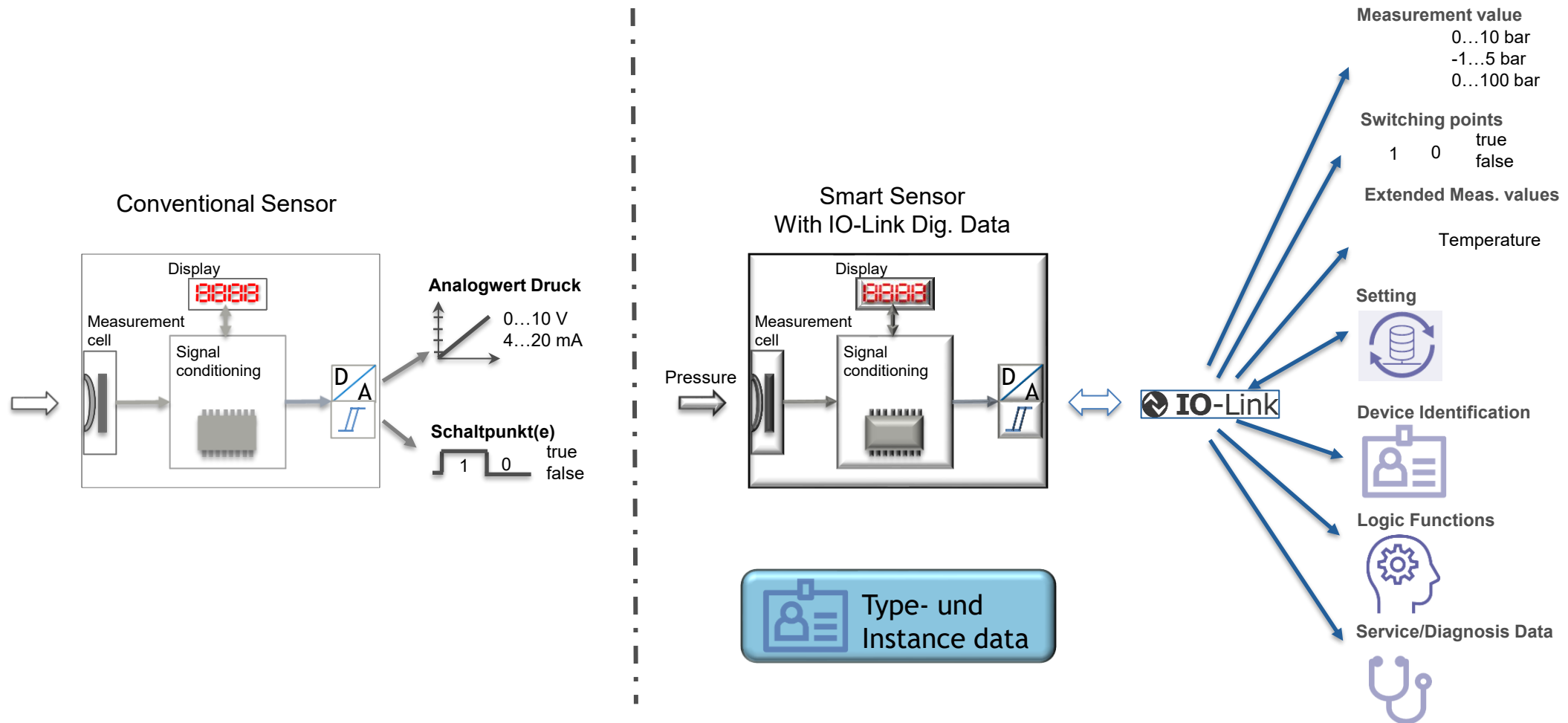
Challenges in Deployment and Integration

- Exemplary extract from a packaging machine

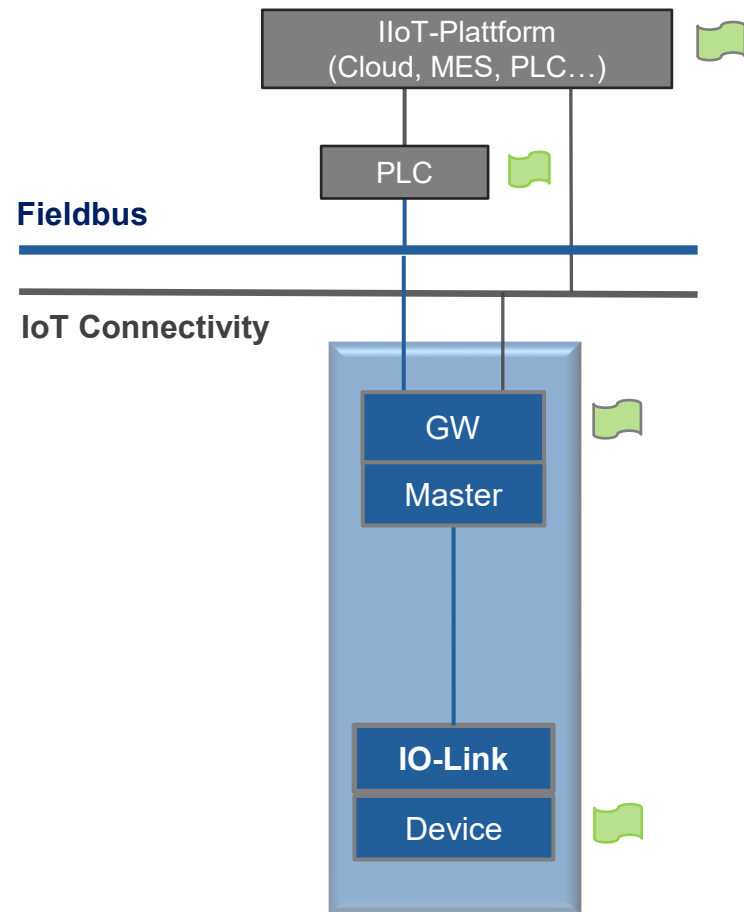


Source, Image: P. Schneider/J. Haufe, FhG-IIS, Technics for the design of automationsystems

Conventional versa Smart Devices – typ. setup



Dataflow from smart Devices – applicants perspective



Data should be Technology-independent

	Brand 1	Brand 2	Brand 3
Act. Pressure [bar]	Transferred value	Transferred value	Transferred value
0	1000	1280	0
5	5000	8767	500
10	9000	15103	1000

Applicant needs to convert raw data format

Example.: Pressure



Analog values in process data in case of left justification for different resolutions.

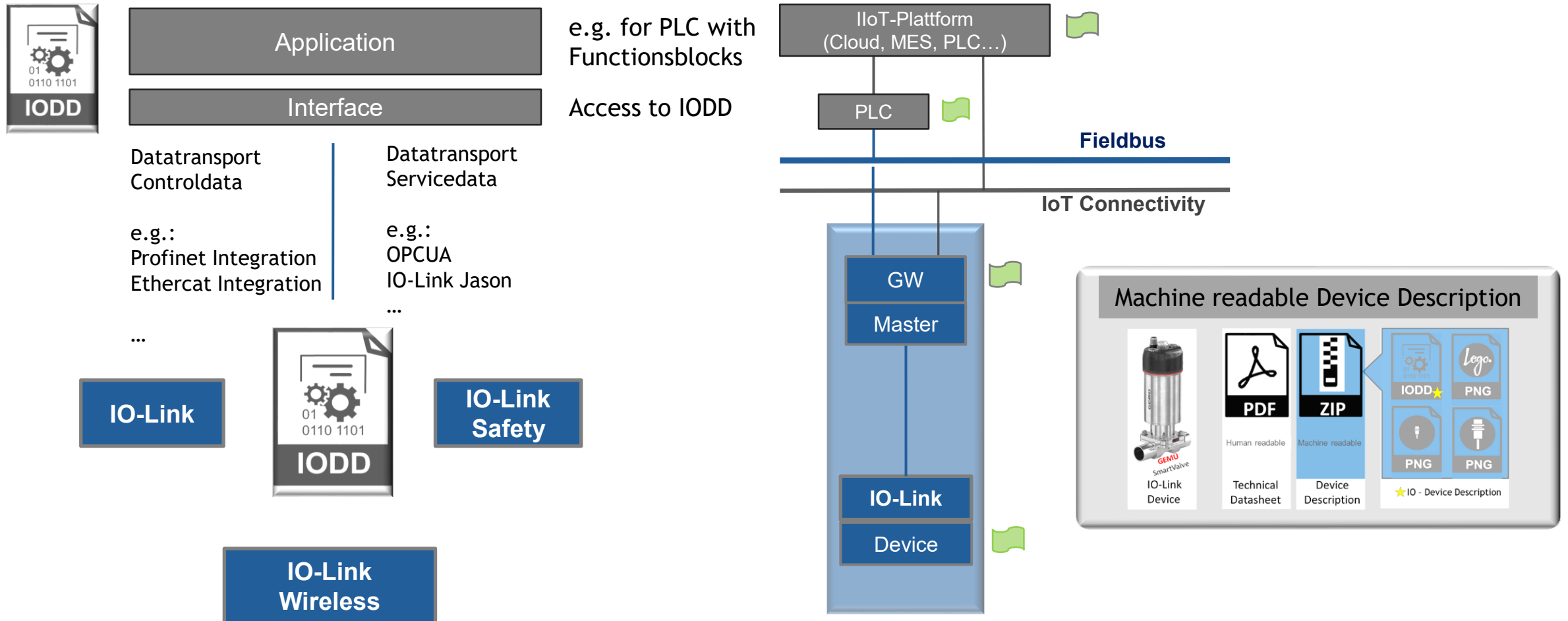
Byte	n								n+1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
MSB	10 bit analog value								LSB							
MSB	12 bit analog value										LSB					
MSB	14 bit analog value												LSB			
MSB	16 bit analog value														LSB	

Analog values in process data in case of right justification for different resolutions.

Byte	n								n+1								
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
								MSB	10 bit analog value							LSB	
							MSB	12 bit analog value									LSB
						MSB	14 bit analog value									LSB	
MSB	16 bit analog value														LSB		

Left / right bound dataframes

IO-Link General Communication Architecture



IO-Link Master as gateway to OT and IT

- Master/Gateways with 2 separate Ports (Y-Weg)
- Its task, intelligent distribution of data
- „**Controls - Channel**“: handling of control/PLC relevant information/data
- „**IoT - Channel**“: handling of Industry4.0 relevant information/data (Quality, production data, Cloud Storage and solutions, ERP connectivity, Human-machine-interaction, AI, Analytics)
- „Firewall“ between OT and IT
- Support of relevant fieldbus communication & open IoT-Interfaces!

BE A WINNER WITH IO-Link

