Welcome

Plataforma Industria 4.0

Antonio Gordillo IMA 19 Agosto 2021

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Webinar Software y Tecnologías

Agenda

- Qué es la Plataforma Industria 4.0
  - Tecnología PROFINET
  - Tecnología OPC UA
  - Tecnología PLCnext Technology
  - Tecnología PROFICLOUD
- Tecnología Plataforma Industria 4.0
- Ejemplo en Building Automation System
- Conclusiones

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¿Qué es la Industria 4.0?

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Technology

PROFINET

PROFINET®

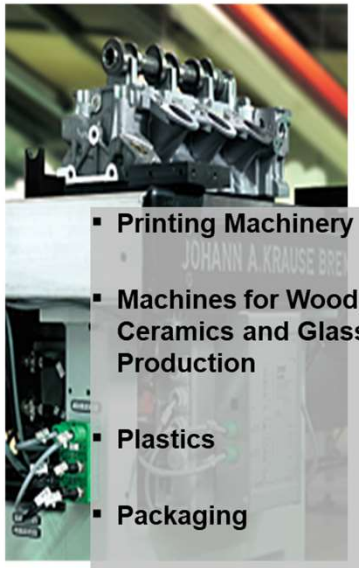
Process Automation

- Oil & Gas & Energy Industries
- Chemical and Medial Industries
- Mines und Metal Industry
- Food & Beverage
- ....

Factory Automation

- Wind Turbines
- Assembly Machine and Textile Industry
- Automotive
- Automotive-Conveying
- Water / Wastewater and Recycling
- Shipbuilding
- Traffic and Railway
- Buildings
- Logistics, Transportation
- ....

Motion Control



- Printing Machinery
- Machines for Wood, Ceramics and Glass Production
- Plastics
- Packaging
- ....

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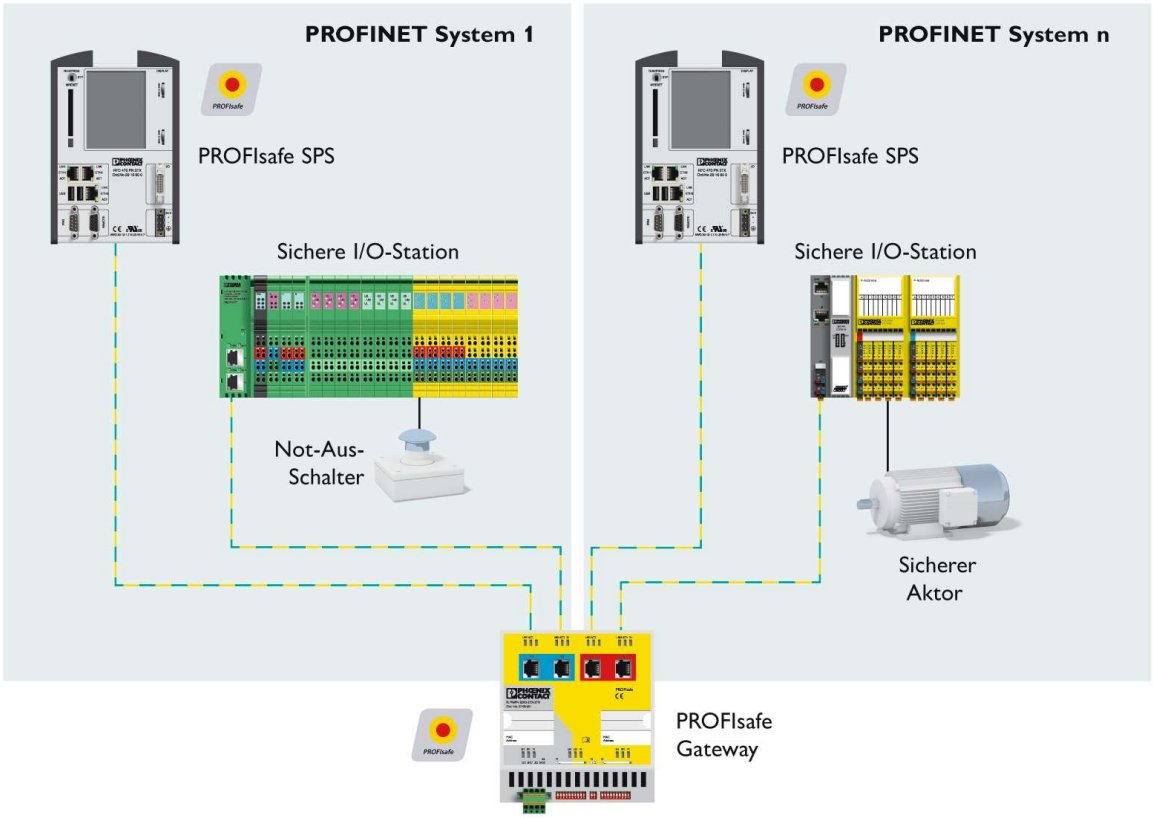
PROFISAFE



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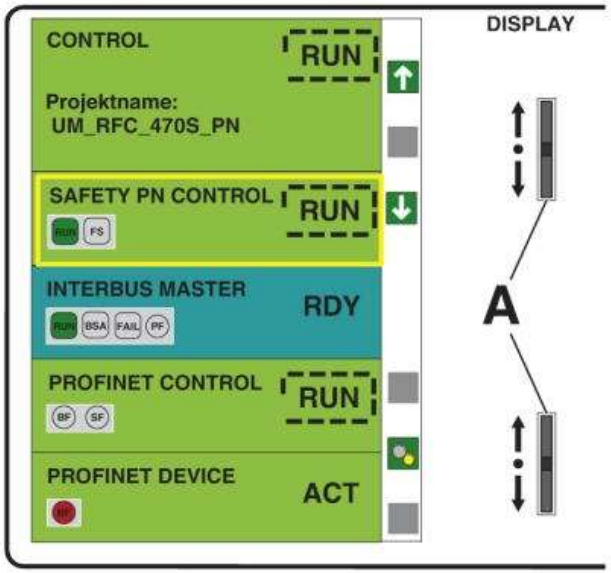

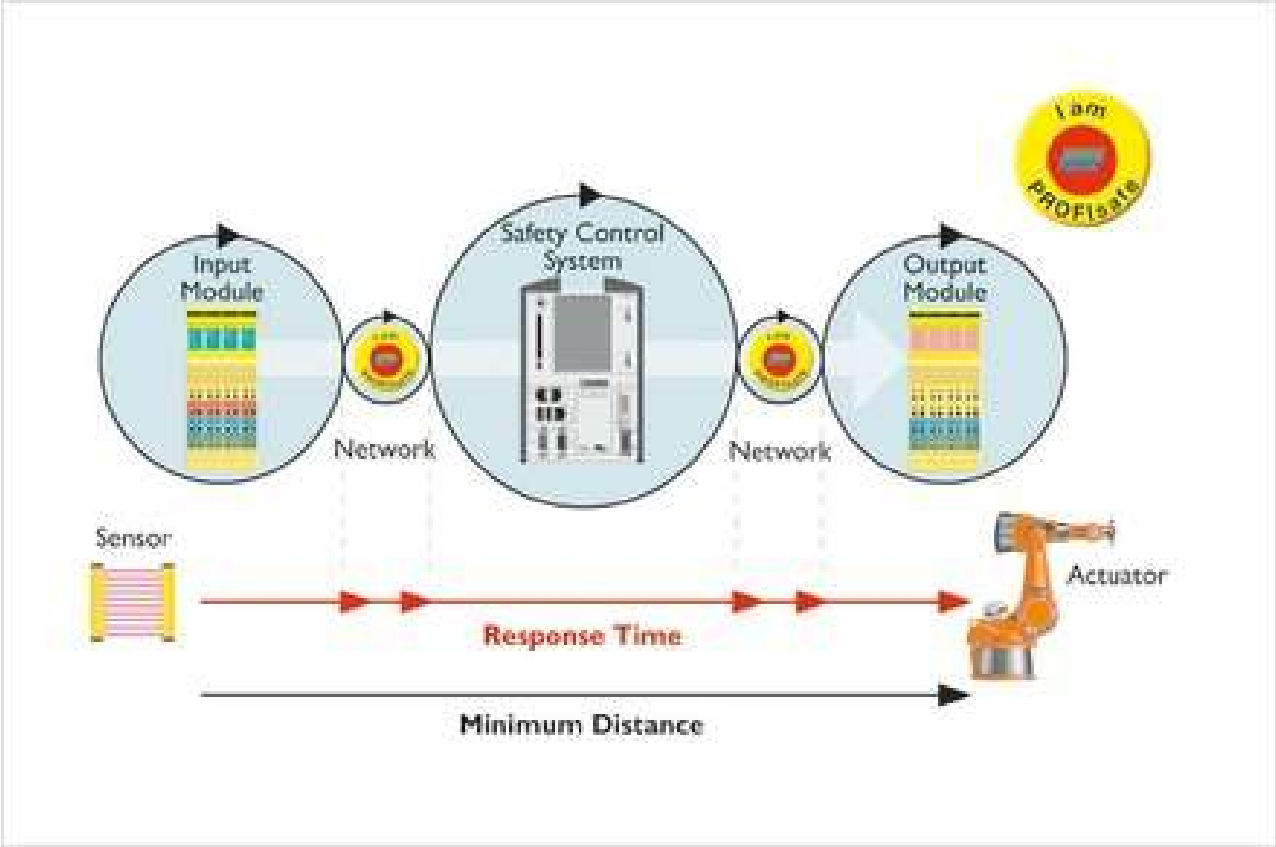

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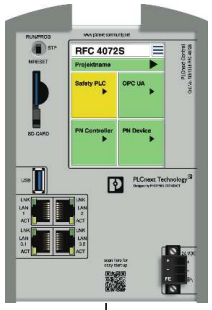
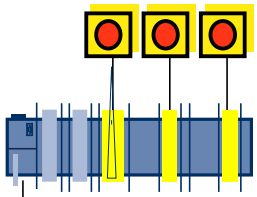
RFC 4072S
(F-Host)



Emergency Stop



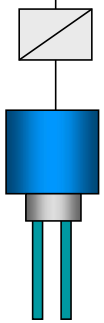
Safety I/Os

Standard I/Os

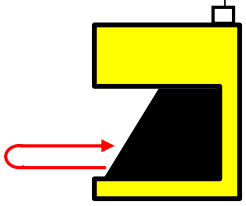
PROFIsafe

Standard and safety devices in common ethernet network

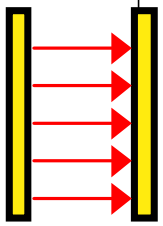
DP/PA



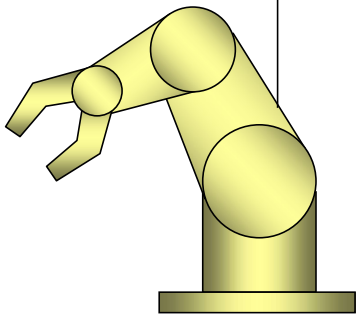
Limit switch



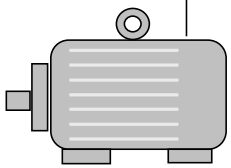
Safety
Scanner



Light curtain



Robot



E Motors

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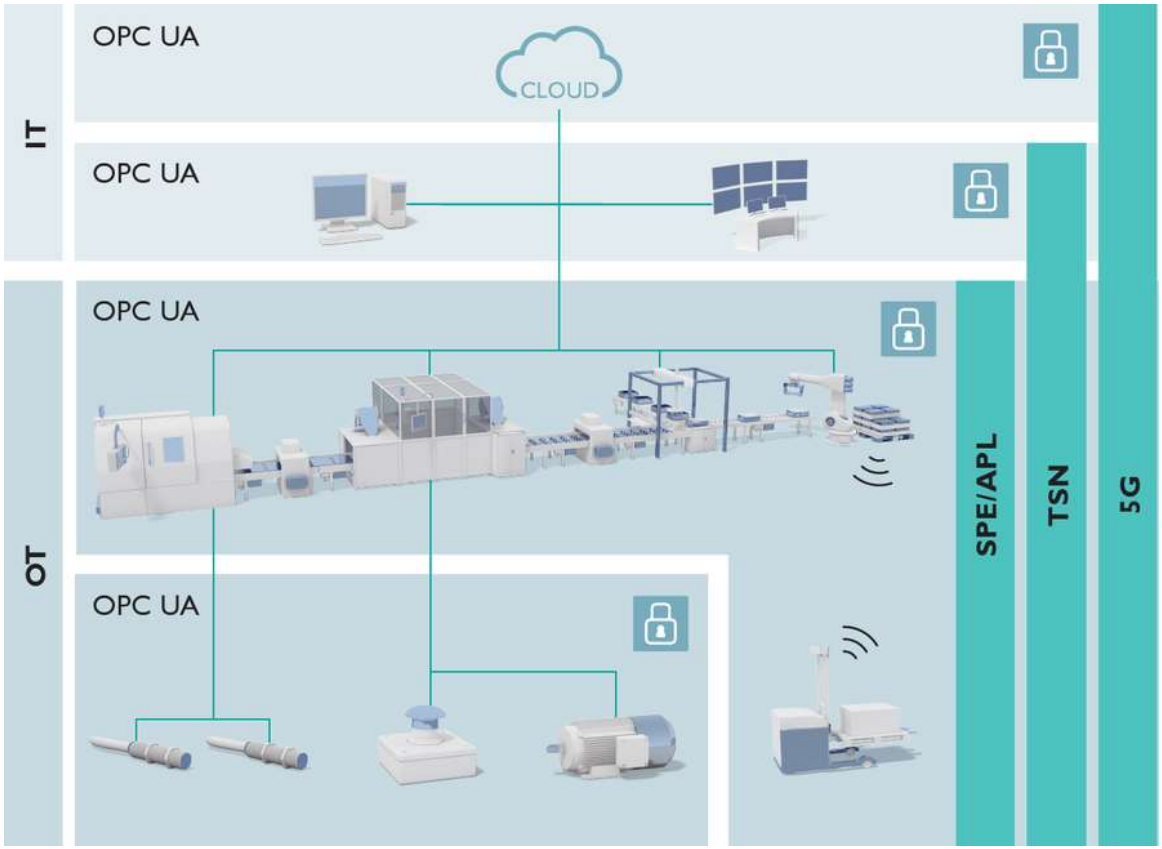
Software and Technology innitiative

OPC UA

The basic framework for the future of industrial communication technology is currently being developed across a large number of committees and standardization projects. New communication standards such as OPC UA, TSN, SPE, and 5G will be far superior to previous systems in terms of costs, data throughput, latency and determinism.



The new technologies TSN, SPE/APL, 5G, and OPC UA, are not to be considered as being independent of each other – rather, together they will form the communication of the future

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OPC UA

OPC UA is already used as the superordinate communication standard in systems. OPC UA is now being expanded through the addition of standardized application profiles in the field, for example for I/O, safety, and motion.

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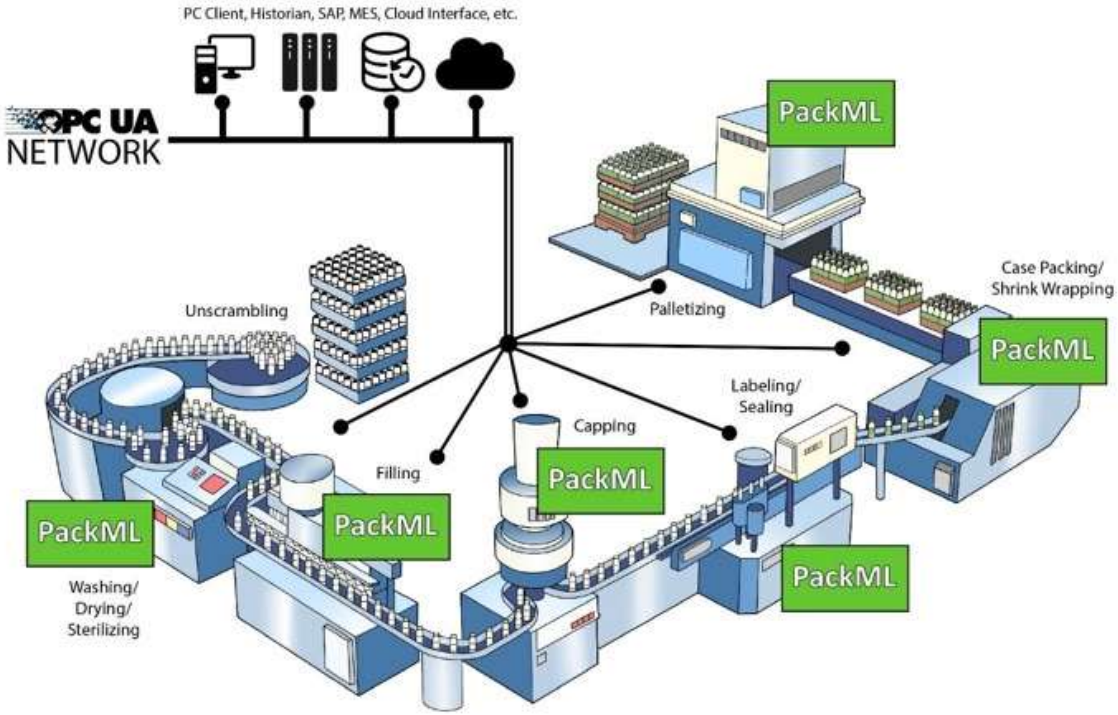
OPC UA Arquitecture



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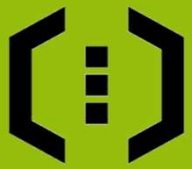
PLCnext Technology
Designed by PHOENIX CONTACT

Ecosystem & PLCnext Store

The Open Ecosystem for Limitless Automation

PLCnext Technology
enhance your automation thinking

PLCnext Control	PLCnext Engineer	PLCnext Store	PLCnext Community
			
Open Control Platform PLCs in various performance classes including PLCnext Runtime System and accessories for PLCnext Technology	**Engineering Software** Engineering tool for commissioning, configuring, and programming PLCnext Controls	**Software Store for Automation** Apps for functional extension of PLCnext Control and PLCnext Engineer	**User Collaboration & Resources** Information, support, and helpful resources about PLCnext Technology including FAQs, forums, tutorials and a GitHub presence

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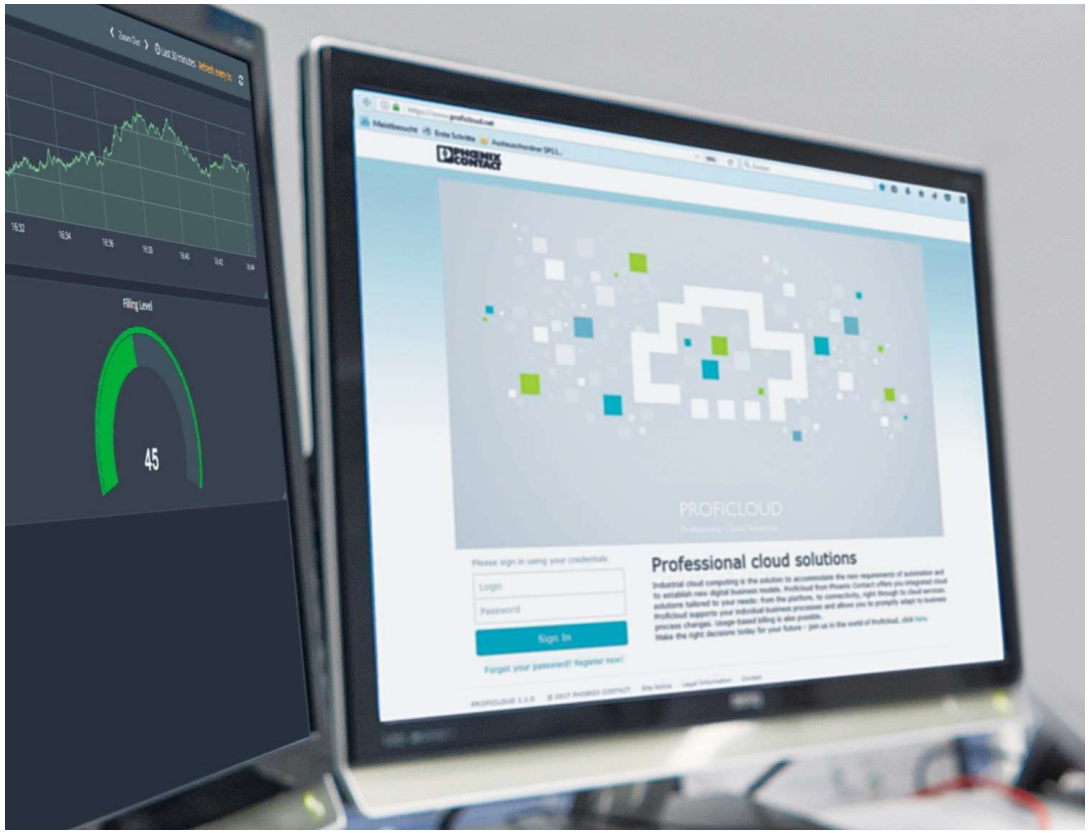
Technología

PROFICLOUD

PROFICLOUD



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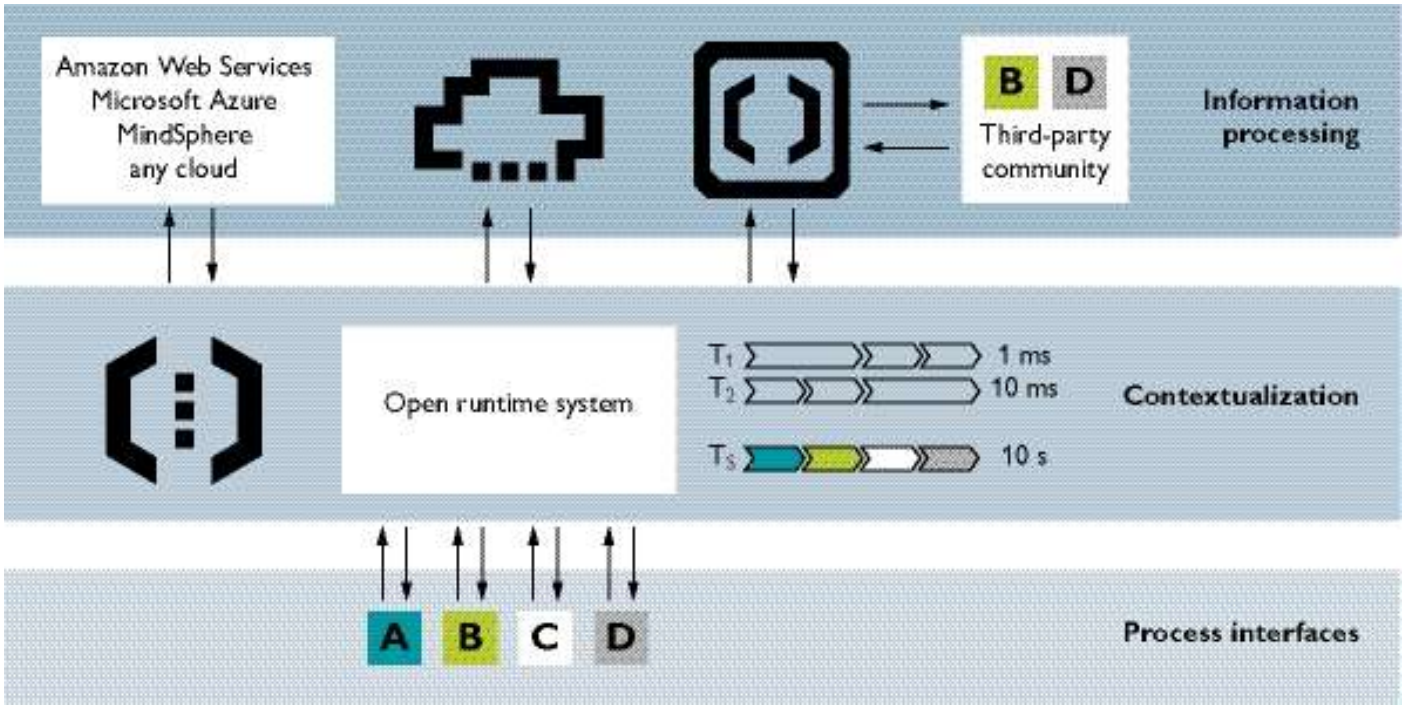
Technology

PROFICLOUD



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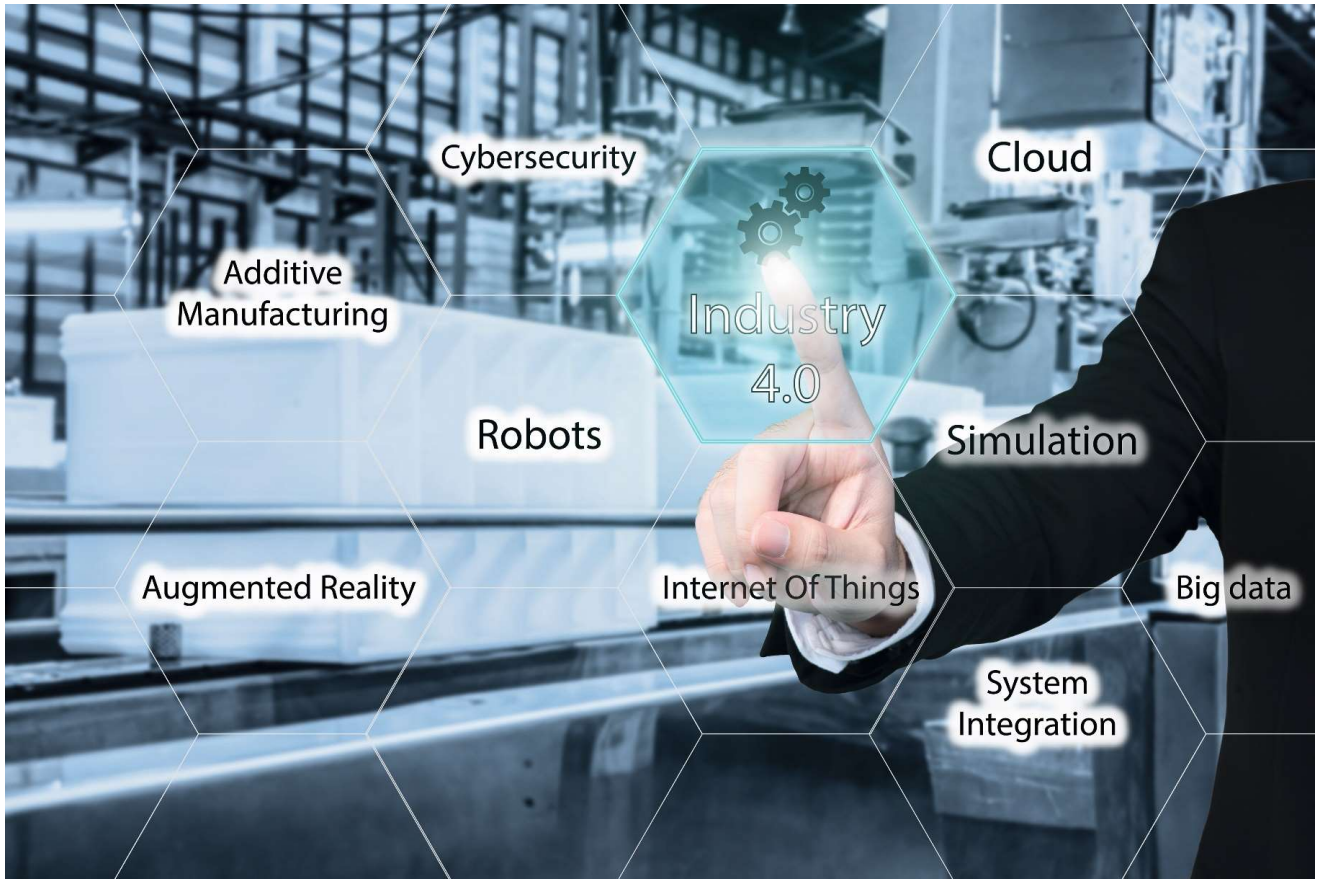
Industrie 4.0



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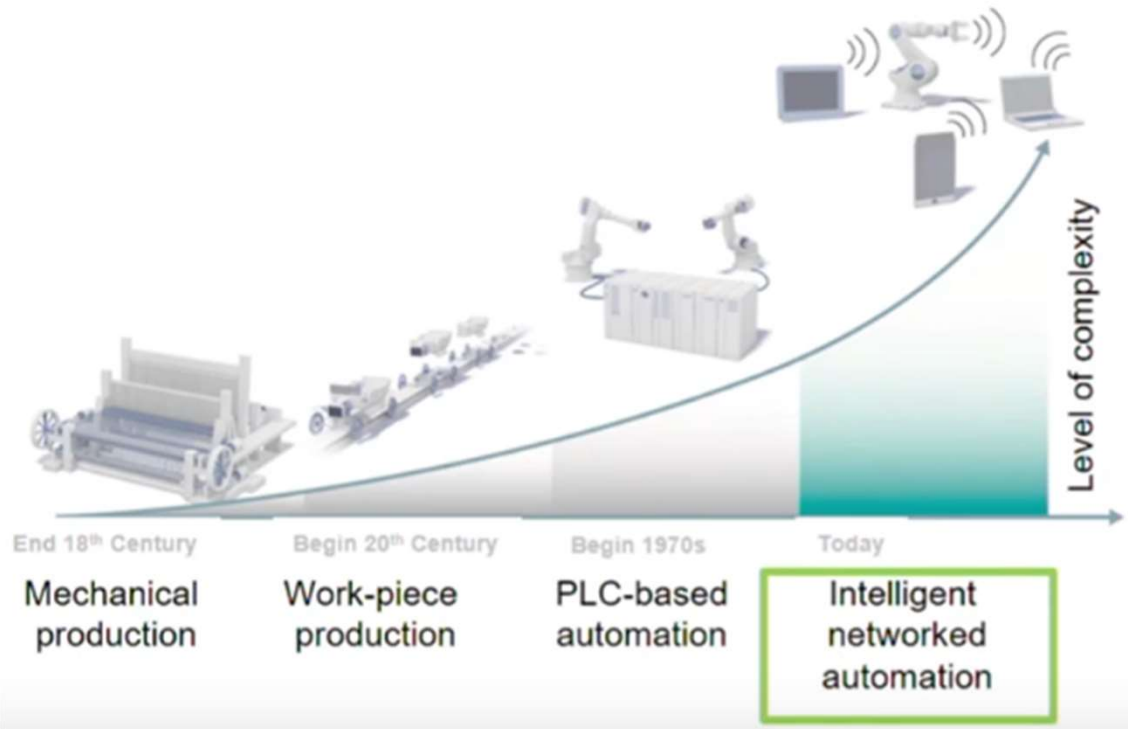
Digitalization – Challenges today

Evolution of Technology



The world is becoming more digital, intelligent and flexible. Initiatives such as Industrie 4.0 in Germany, the Industrial Internet Consortium in the USA or China Manufacturing 2025 are providing the first responses to the question of how digitalization will affect our surroundings.

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Industria 4.0:
la cuarta revolución industrial de Alemania

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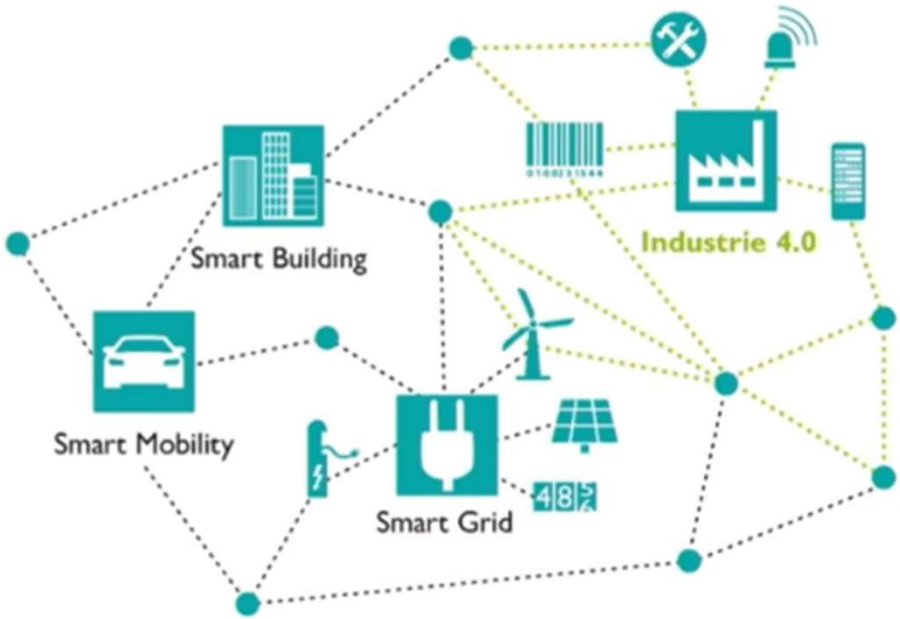
Digitalization – Challenges today

Industrie 4.0

- … stands for the digitization of production and product life cycle
- …stands for the technical integration of cyber-physical systems and the Internet of Things and Services in production and logistics



source: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0, Forschungsunion, acatech

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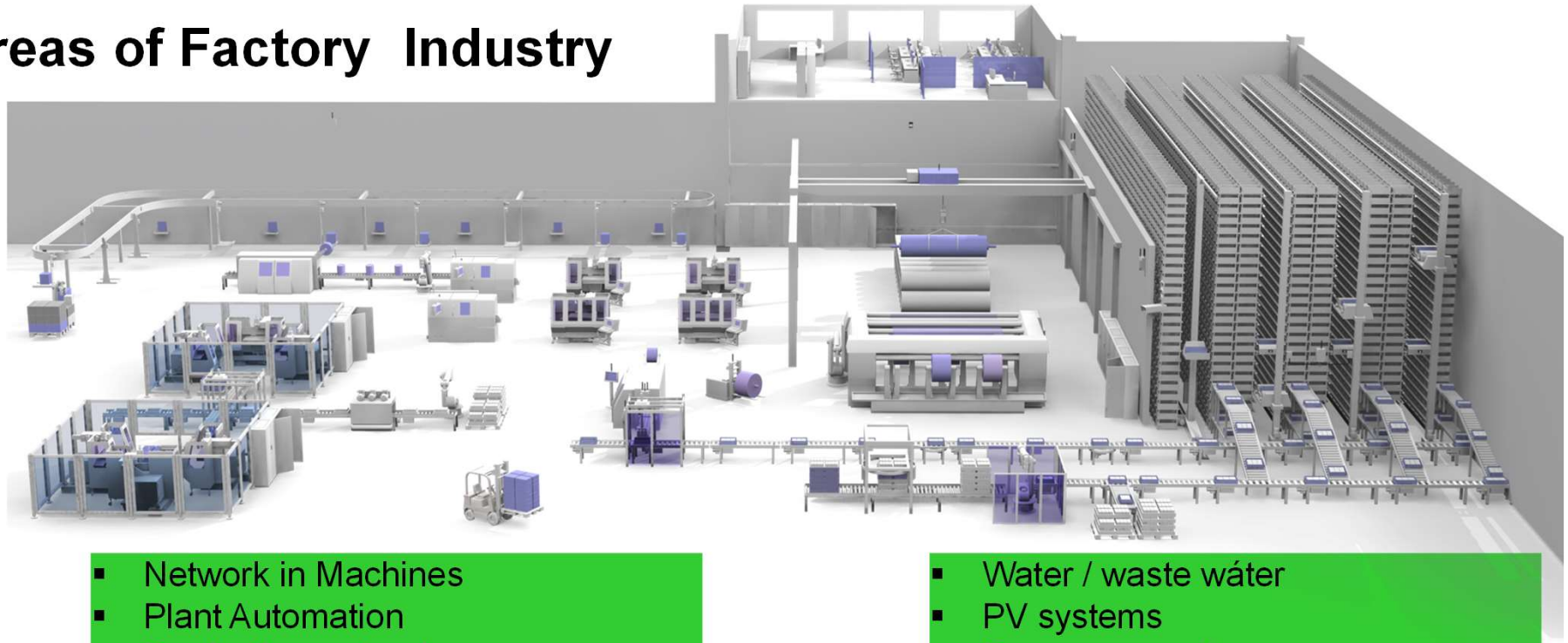
Digitalization

Areas of Factory Industry



- Network in Machines
- Plant Automation
- Production networks
- Infraestructure networks
- Wind power systems

- Water / waste wáter
- PV systems
- Power generation
- Energy systems

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Worldwide organization: Basis for a consistent and reliable framework

International Initiatives

Cooperation between Plattform Industrie 4.0 and the Industrial Internet Consortium

Interplay of the two architectural models

Plattform Industrie 4.0 and the Industrial Internet Consortium have
to analyse how their architecture models, namely RAMI (Reference Ar
Industrie 4.0) and IIRA (Industrial Internet Reference Architecture) ca
ensuring that the two systems will be interoperable in the future.

More information about the cooperation with the IIC can be found u
links:

Germany and China – De

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Joint action plan adopted by Plattform Industrie 4.0 and Japan's Robot Revolution Initiative

Henning Banthien (left), Head of office Plattform Industrie 4.0, Tomoaki Kubo, Head of RRI office

© Plattform Industrie 4.0

Germany and Japan are key partners when it comes to the digitalisation of indust
meeting was held in Japan in February 2016, Plattform Industrie 4.0 and its Japan
the Robot Revolution Initiative – have taken action and have signed a **joint agreem**
future cooperation. The Japanese initiative has also collected use cases, which can
↦ here.

More information about the cooperation with Japan can be found under the follo

Hannover Declaration (PDF, 220KB)

Joint publication: Facilitating International Cooperation for Secure Industrial Inte
Things/Industrie 4.0

Joint publication: The common strategy on international standardization in field
of Things/Industrie 4.0

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Worldwide organization: Basis for a consistent and reliable framework

IIC and Plattform Industrie 4.0

Industrial Internet Consortium (IIC): Global not-for-profit partnership of industy, government and academia started in March 2014.

- World's leading organization transforming business and society by accelerating the Industrial Internet of Things (IIoT)
- Cross-domain oriented approach: deliver a trustworthy IIoT in which the world's systems and devices are securely connected and controlled to deliver transformational outcomes.
- https://www.iiconsortium.org/

Plattform Industrie 4.0: Started in April 2013 and is Germany`s central network of politics, science and industry for driving forward digitalization in manufacturing.

- Its goal is to understand trends, connect people and offer support.
- Coordinating the shaping of the digital structural shift of German industry.
- https://www.plattform-i40.de/PI40/Navigation/EN/Home/home.html

Worldwide organization: Basis for a consistent and reliable framework

Models for communication

Industrial Internet Reference Architecture (IIRA)

- Standards-based architectural template and methodology enables Industrial Internet of Things (IIoT) system architects to design their own systems based on a common framework and concepts.
- Common architecture framework to develop interoperable IIoT systems for diverse applications.

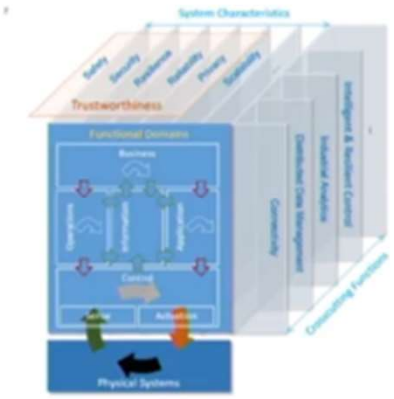
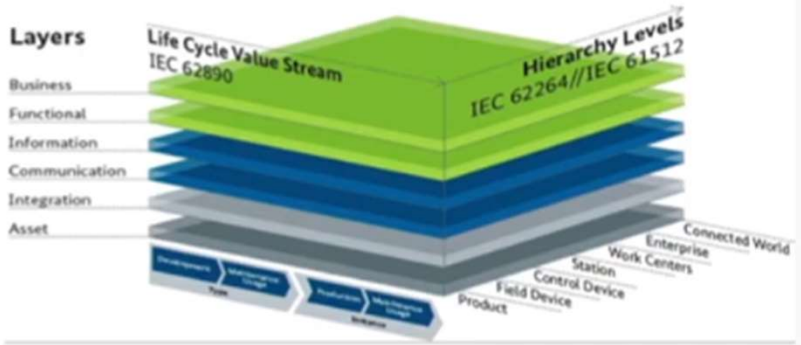


Figure 6-5: Functional Domains, Crosscutting Functions and System Characteristics

Reference Architectural Model Industrie 4.0 (RAMI4.0)

- Guidance for Industrie 4.0
- Three-dimensional map showing the most important aspects of Industrie 4.0.
- Ensures that all participants involved share a common perspective and develop a common understanding.



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Worldwide organization: Basis for a consistent and reliable framework

Collaborative work

2015:

- Explore the potential alignment of their two architecture efforts
- Understand the technical issues from both perspectives
- Reduce market confusion

2019: Ongoing approach for interoperability

- to identify mappings, differences and enhancements on both sides
- to formulate requirements for standardization bodies together
- to create a joint testbed for testing architectural elements
- to work together to increase the adoption of the Industrial Internet

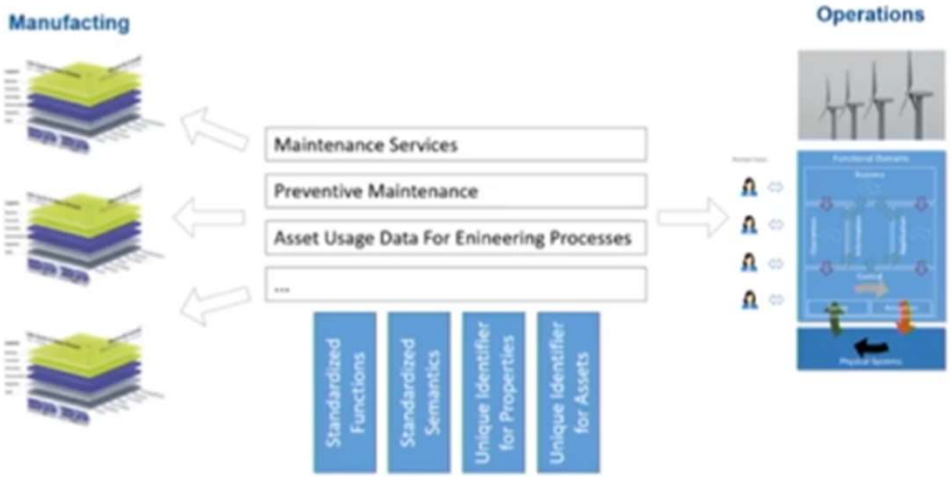

Figure 8 Interoperability between RAMI 4.0 and IIRA systems.

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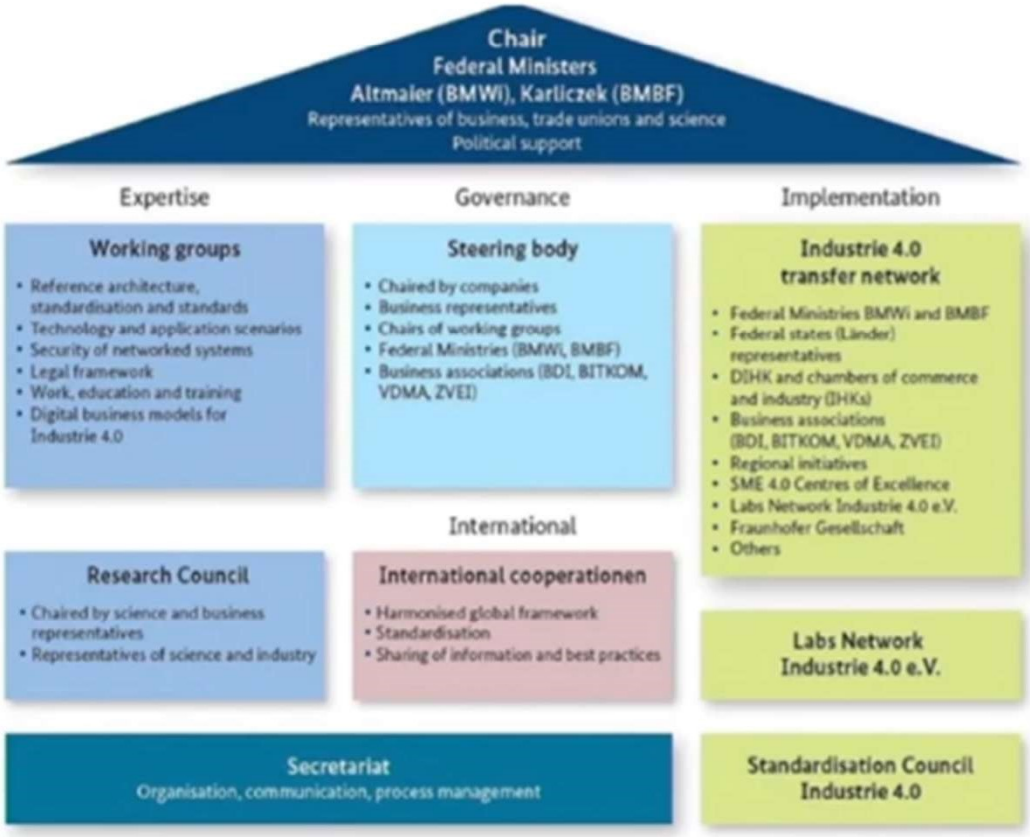
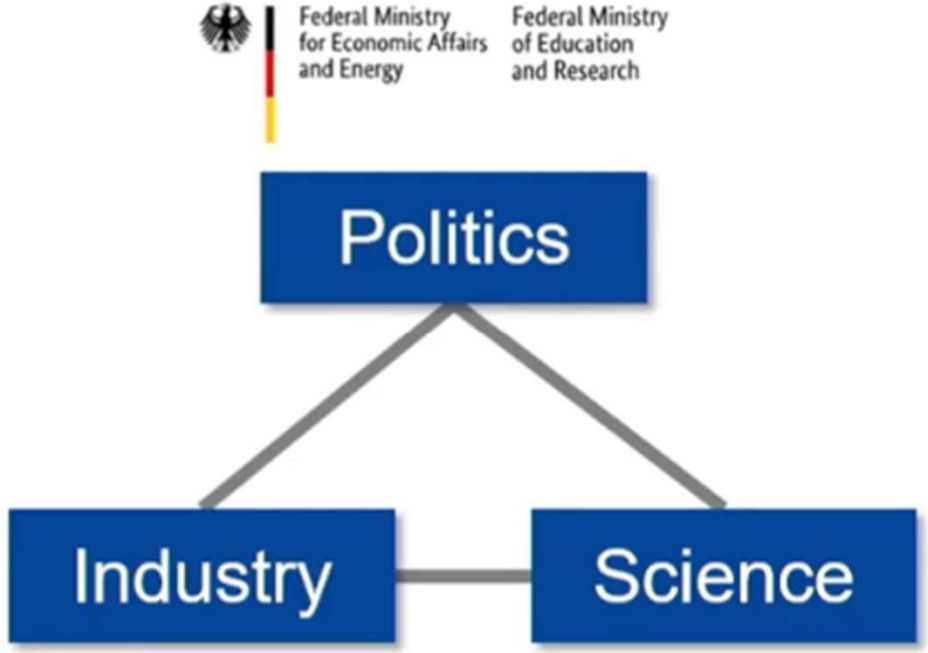
Worldwide organization: Basis for a consistent and reliable framework

The german Plattform „Industrie 4.0“



Source: BMWi, July 2018



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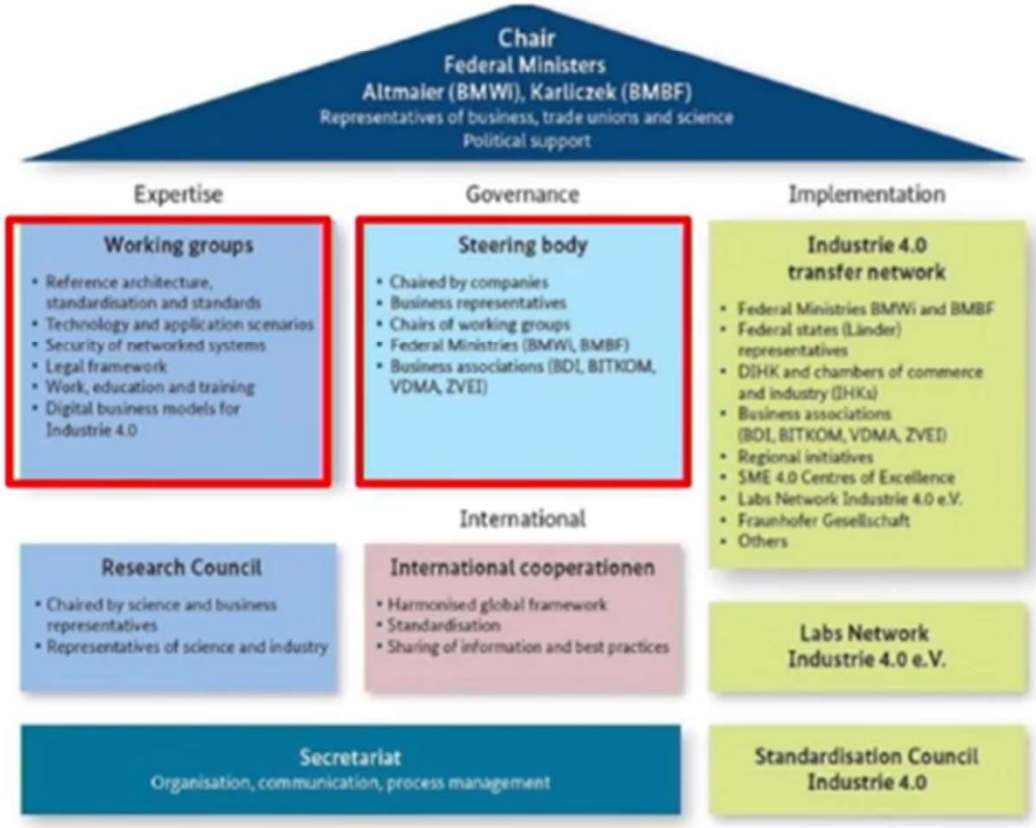
Worldwide organization: Basis for a consistent and reliable framework

The german Plattform „Industrie 4.0“



Source: BMWi, July 2018

Objective Steering committee
Strategy development

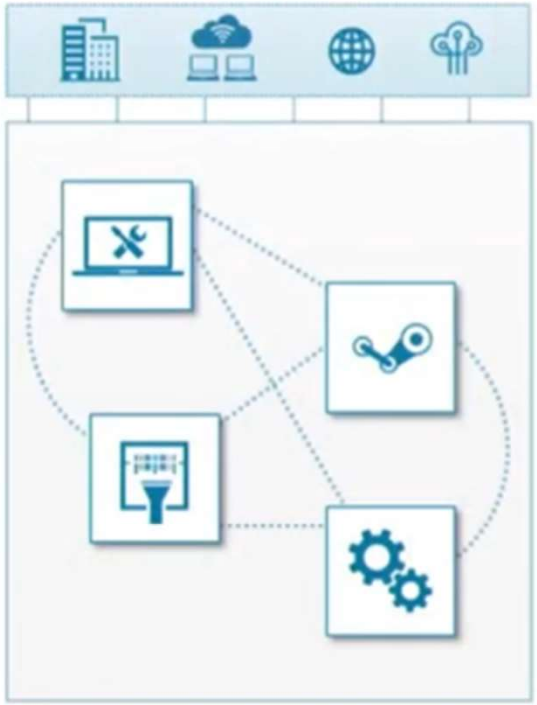
Member: Roland Bent, CTO Phoenix Contact

Working Groups

WG 1: Reference Architecture & Standards
WG 2: Research & Innovation
WG 3: Security of linked systems
WG 4: Regulatory framework
WG 5: Labour, training, education

Technical basics – How does Industrie 4.0 work?

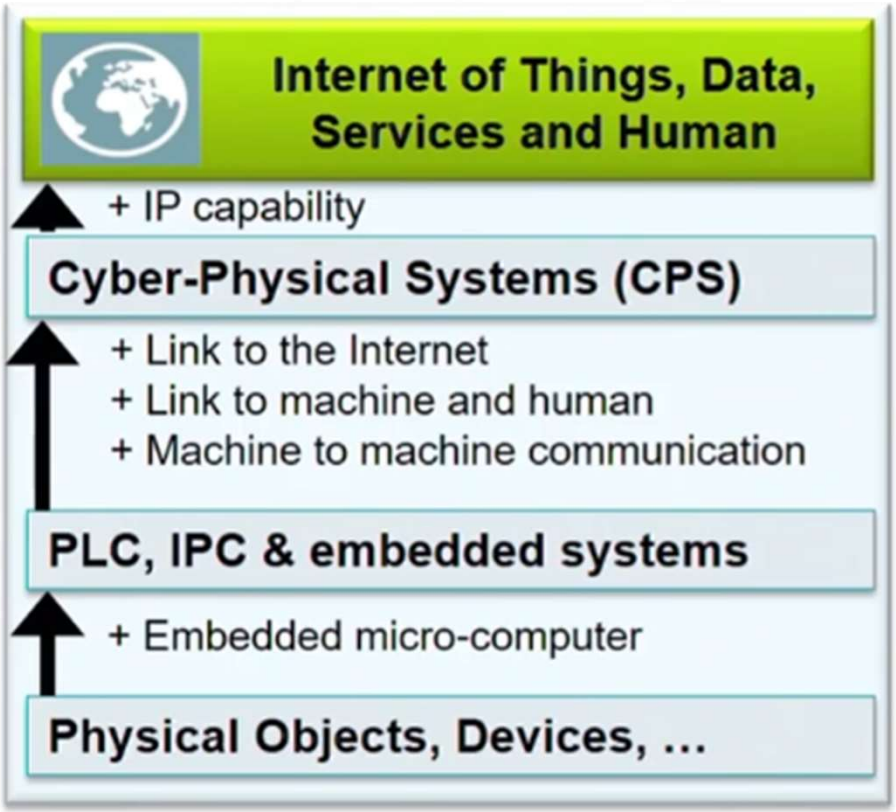
What do communication participants need?



- Globally standardized communication
- Standardized language for the exchange of information
- Easy installation and operation (“Plug and Play”)

Technical basics – How does Industrie 4.0 work?

Cyber Physical Systems (CPS)



… worldwide use of data and services

… communicate via interfaces

… interact via multi modal Human-Machine-Interfaces (HMI)

… control

… acting via actuators

… sensing data via sensors

Source: Forschungsunion Wirtschaft – Wissenschaft

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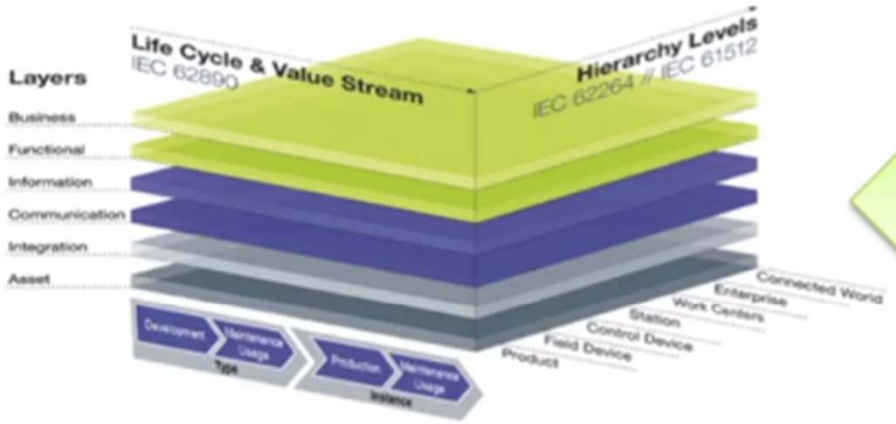
Technical basics – How does Industrie 4.0 work?

Cyber Physical System (CPS)

Reference architecture model Industrie 4.0 (RAMI4.0)



Locating

Industrie 4.0 component

source: VDI/VDE ZVEI Statusreport Referenzarchitekturmodell Industrie 4.0 4/2015

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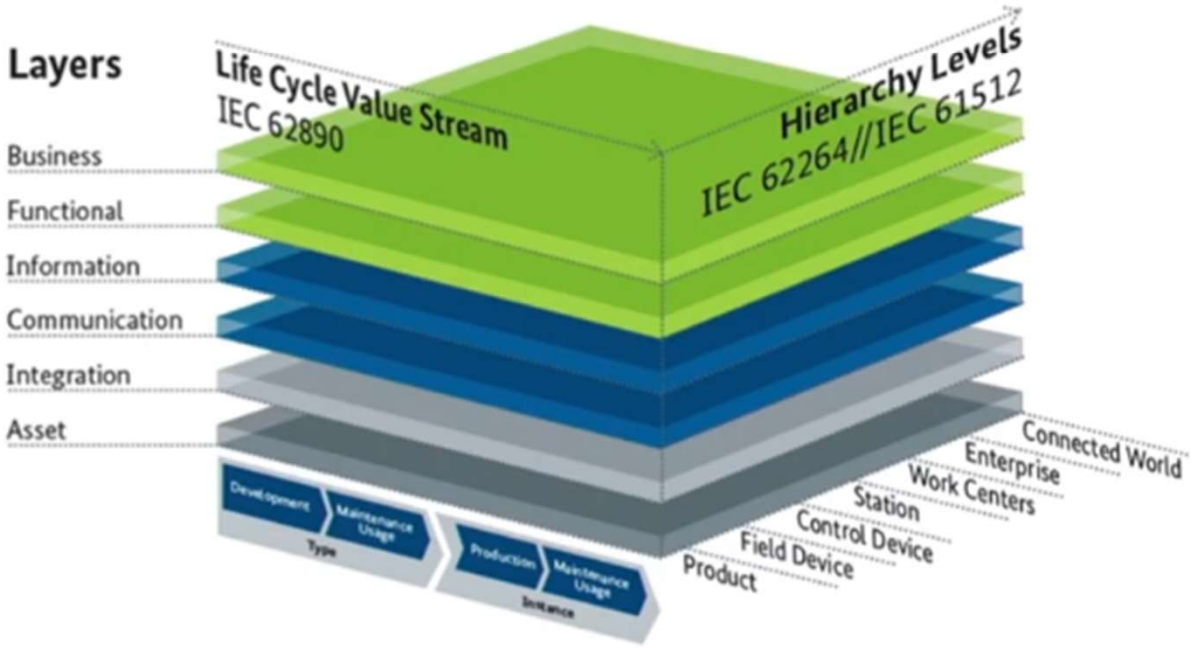
Technical basics – How does Industrie 4.0 work?

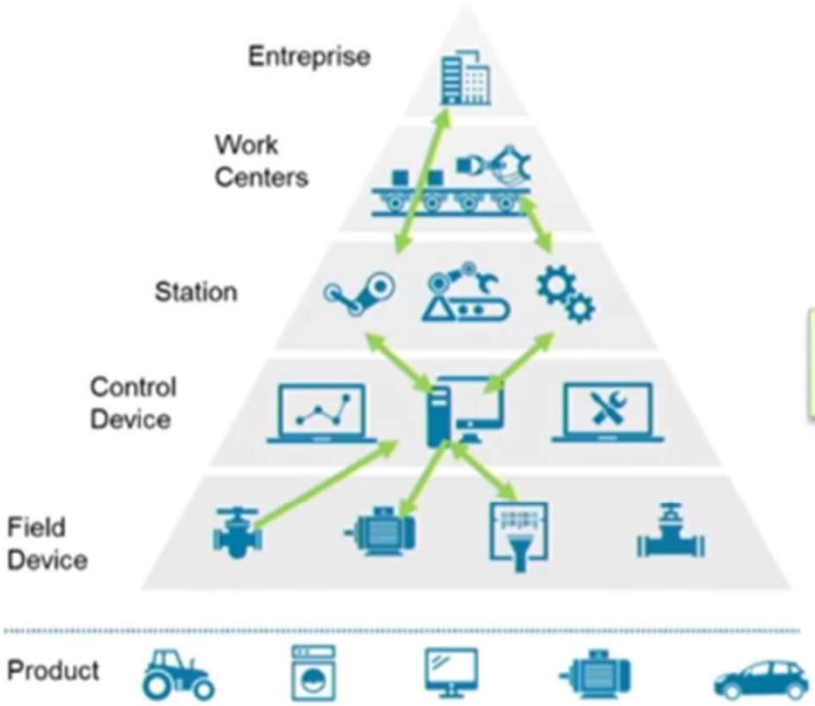
Reference Architectural Model for Industrie 4.0

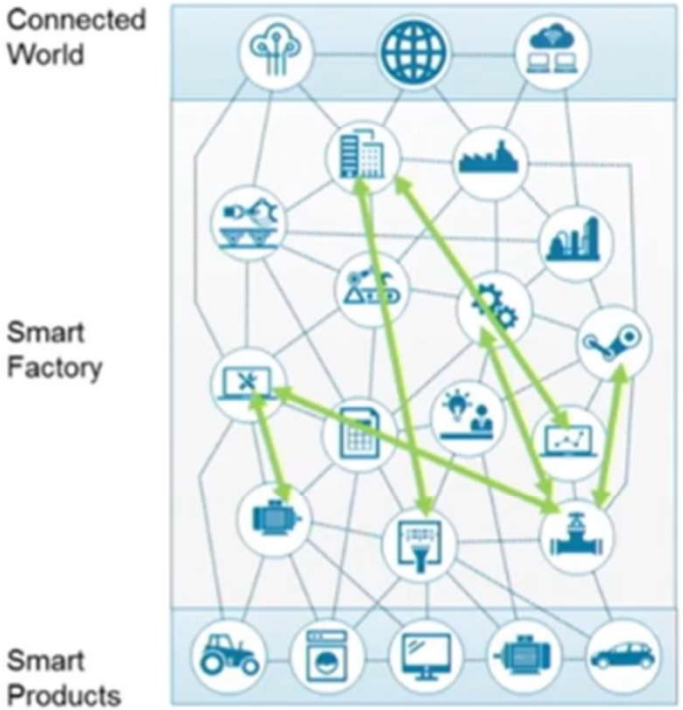
- RAMI 4.0 is a three-dimensional map showing how to approach the issue of Industrie 4.0 in a structured manner.
- RAMI 4.0 ensures that all parties involved in Industrie 4.0 communication understand each other.



Technical basics – How does Industrie 4.0 work?

From the hierarchy to the Industrial Internet





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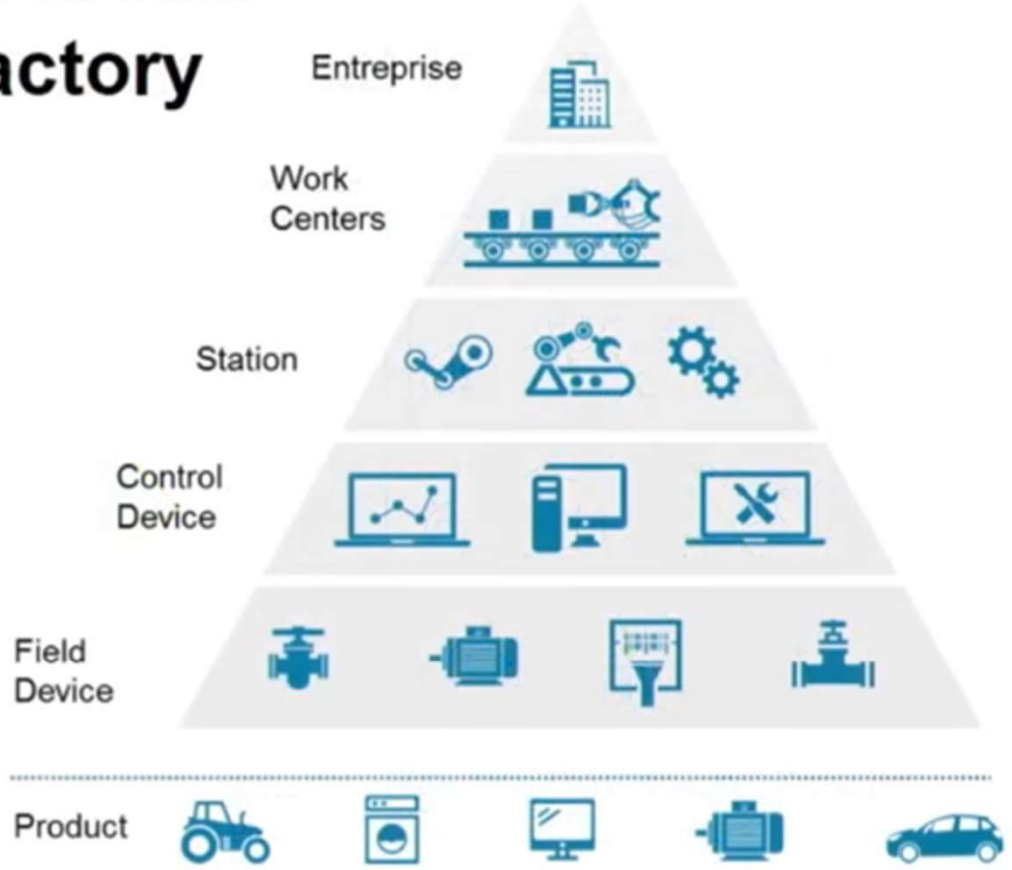
Technical basics – How does Industrie 4.0 work?

Axis 1 – hierarchy: the factory

Industrie 3.0:

- Hardware-based structure
- Functions are bound to hardware
- Hierarchy-based communication
- Product is isolated



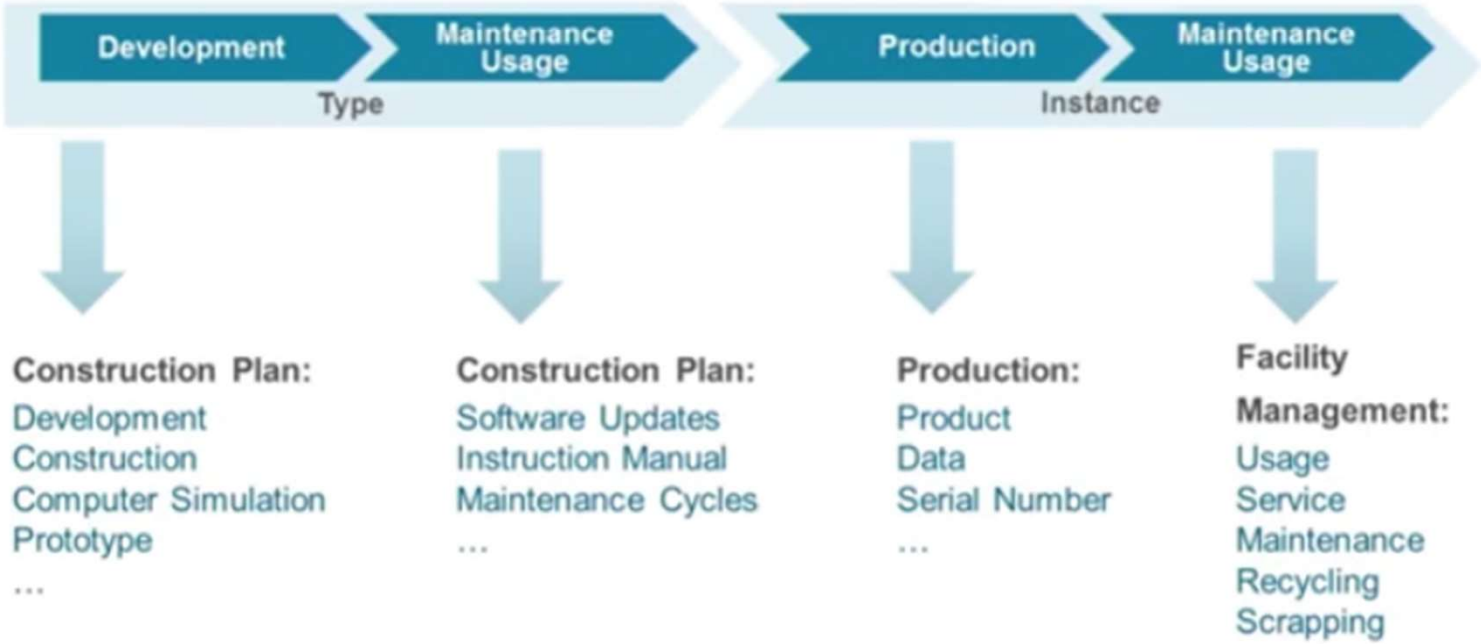
Technical basics – How does Industrie 4.0 work?

Axis 2 – IT-architecture

Technical basics – How does Industrie 4.0 work?

Axis 3 – product life cycle

The Product: From the First Idea to the Scrapyard



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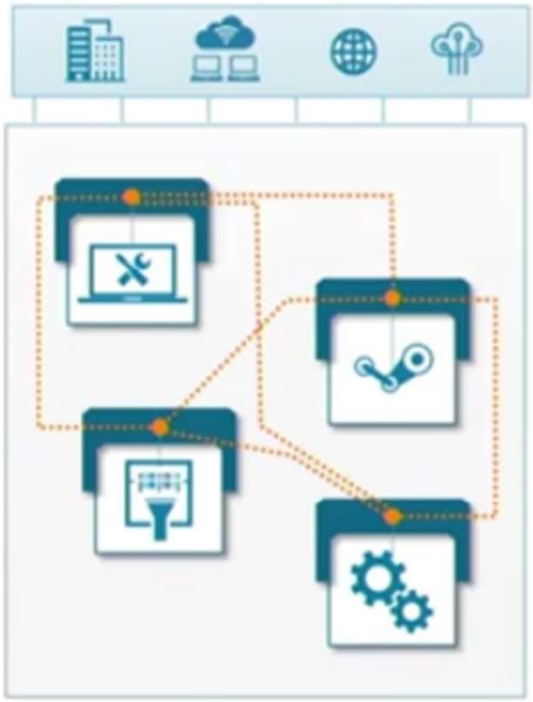
Technical basics – How does Industrie 4.0 work?

Who is responsible for interpreting?



The administration shell

- ... is the interface connecting I4.0 to the physical object
- ... stores all data and information on the asset
- ... serves as the network's standardized communication interface

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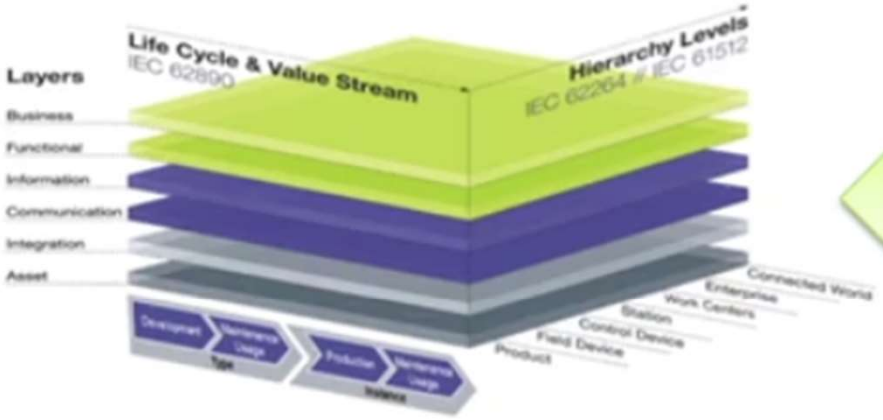
Technical basics – How does Industrie 4.0 work?

Cyber Physical System (CPS)

Reference architecture model Industrie 4.0 (RAMI4.0)



Locating

Industrie 4.0 component

source: VDI/VDE ZVEI Statusreport Referenzarchitekturmodell Industrie 4.0 4/2015

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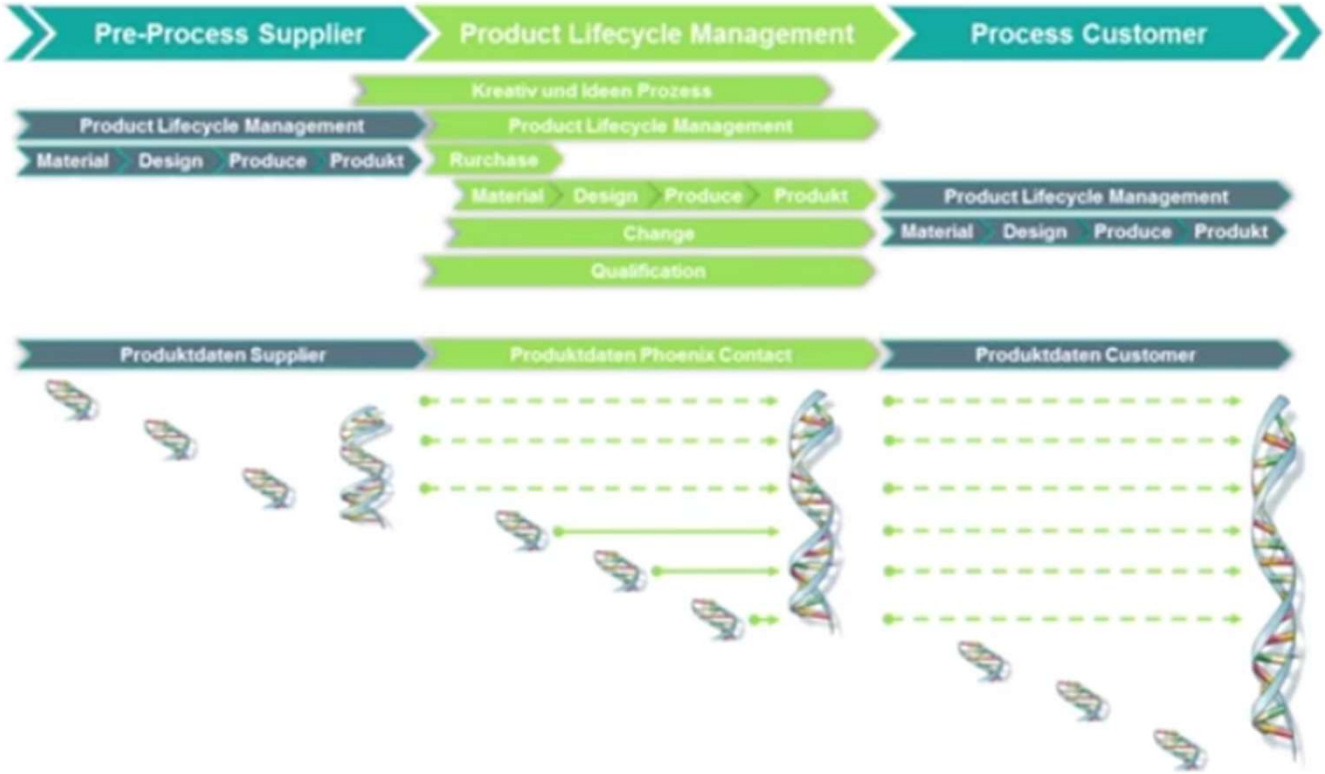
Technical Basics – How does Industry 4.0 do ?

Data of the producto life cycle



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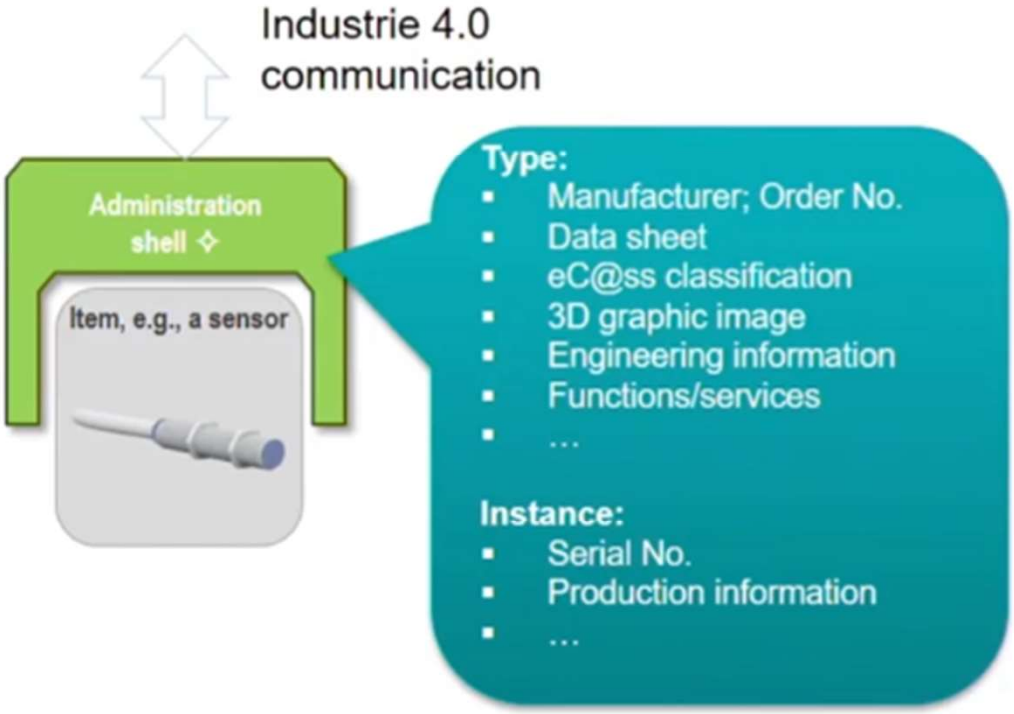
Technical basics – How does Industrie 4.0 work?

Data of the product lifecycle



- An Industrie 4.0 system consists of Industrie 4.0 components
- These consist of the actual item and an **administration shell**, together forming a **cyber physical system** (CPS)

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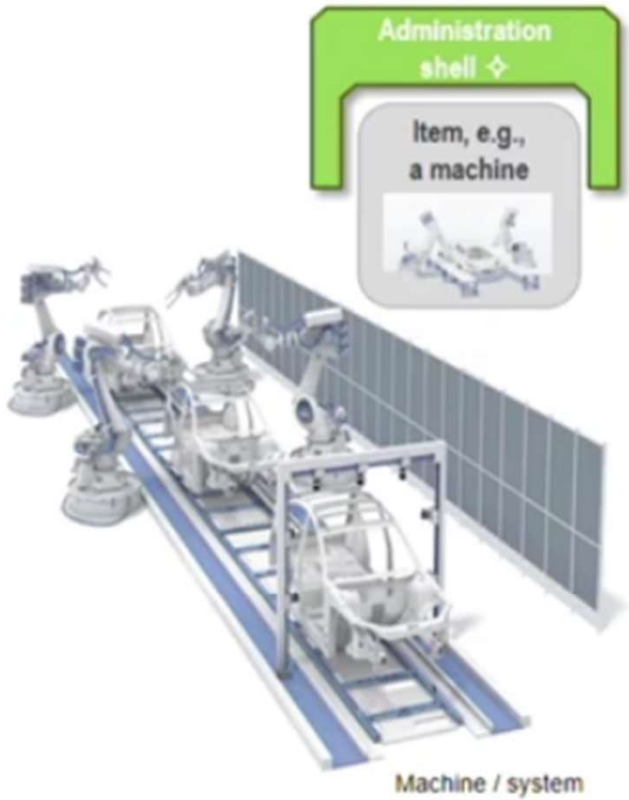
Technical basics – How does Industrie 4.0 work?

Industrie 4.0 system

Added value is created by data collected in the administration shel

For example, runtime data can provide the data basis for optimizing maintenance intervals or predictive maintenance



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Example – Advantages in building automation

Start to use your data today

Phoenix Contact, Bad Pyrmont, Germany

Example – Advantages in building automation

Facility as a cyber-physical system

Building types
Production, development and office building

Maintenance management
Predictive operation via learning algorithms

Plant monitoring
Heating, ventilation, air conditioning, space

Domestic production
CHPs, heat pumps, photovoltaics

Energy optimization
Load and storage management heat-cooling ring

E-Mobility
Charging infrastructure incl. interface to billing systems

Safety
Security
access controls
video surveillance

One building management system for all applications

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Example – Advantages in building automation

New building with „building IoT“

- office building
- 18,000 m² usable space
- 5 floors & atrium
- approx. 600 employees
- 160 kW photovoltaic plant
- E-Mobility charging stations

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Example – Advantages in building automation

Description

- One building management system is used for all applications such as maintenance management, system monitoring, security, energy generation, optimization of consumption and e-mobility
- Web-based building energy management system connected to all devices such as pumps, elevators, solar panels, lights, batteries, etc.
- Overview of current energy flow, trends and deviations to identify improvement potentials
- App allows users to adjust lighting and temperature
- System automatically improves energy efficiency

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PLATTFORM Industrie 4.0

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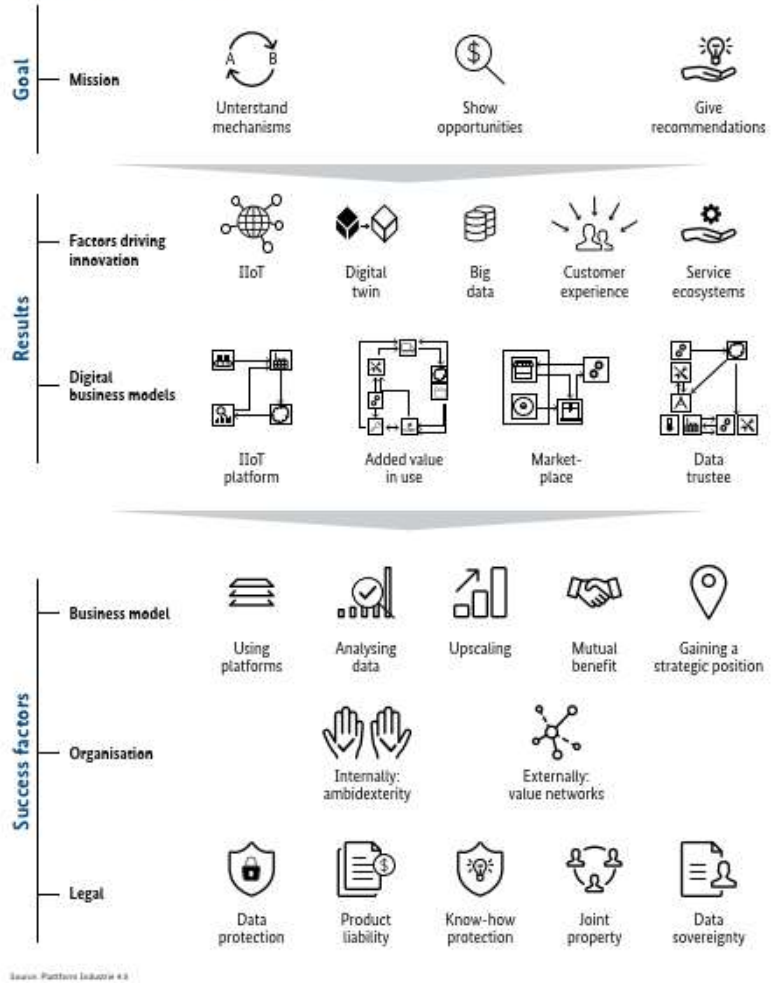
Plattform Industrie 4.0

Through Industrie 4.0, Germany has created a globally recognized brand. Numerous countries have built their strategies for the transformation of production on German standards. For example, Industrie 4.0 has inspired China to seek an "initiative to completely enhance Chinese industry" with its 'Made in China 2025' plan. In addition, 20,000 publications about Industrie 4.0 have been published in German-speaking countries alone since 2014, with well over 100,000 published internationally.[1] Authors include ministries, scientific and research institutions, academies, associations, companies, consulting firms, trade unions and foundations. A remarkable achievement!

Figure 1: Digital business models for Industrie 4.0



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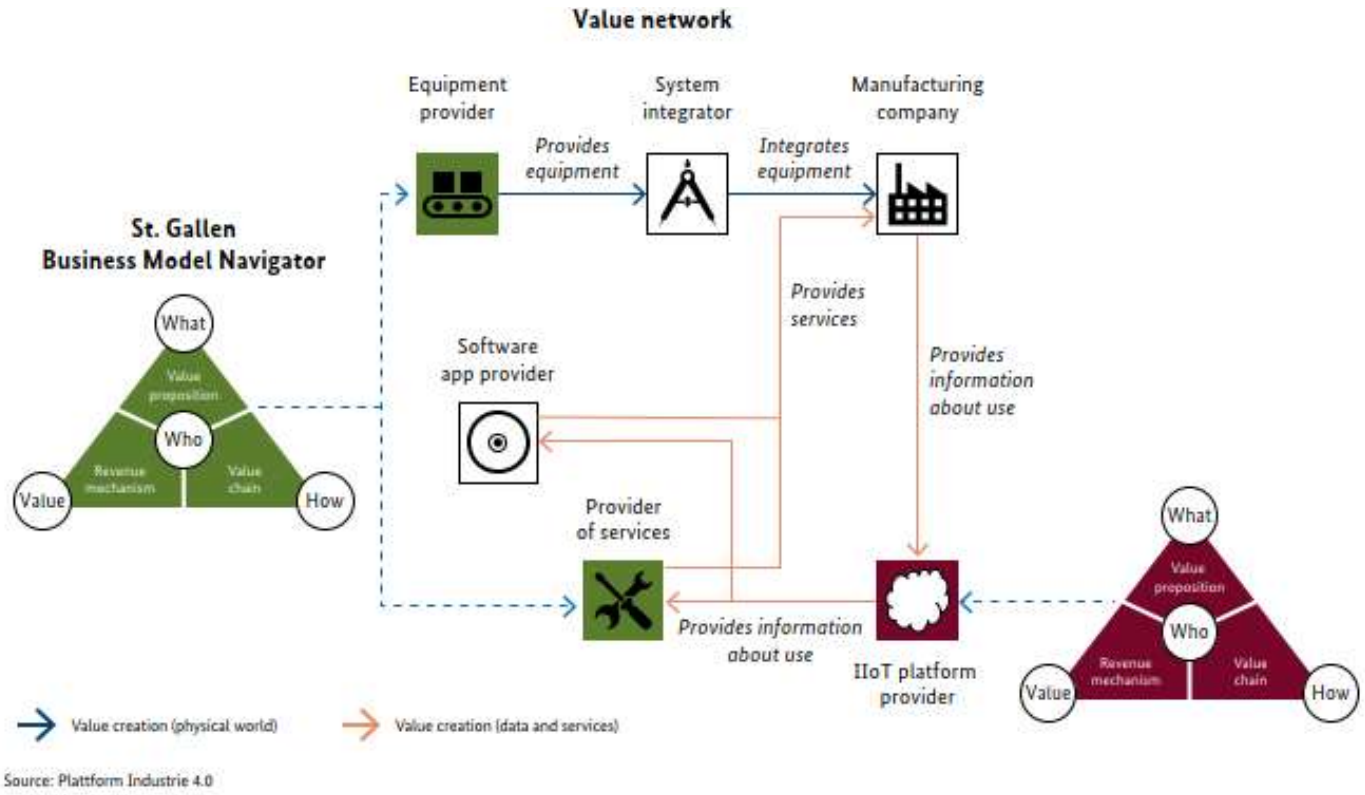
Technology

Plattform Industrie 4.0



Source: Plattform Industrie 4.0

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Industrie 4.0 and it’s impact on smart buildings and infrastructure

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Technology

IIoT

INDUSTRIAL
INTERNET
OF THINGS

Figure 1: The first step in creating an IIoT application is to make sure that your devices – both legacy and new – can communicate with each other, so that you are getting the most out of all of your data.

Speaking a common language: Getting your devices ready for IIoT

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