Industry 4.0

Technologies for the factory of the future

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German Research Center for Artificial Intelligence (DFKI)

780 employees
18 Professors
>40 Mio € Turnover

Location Kaiserslautern — since 07/1988

- Augmented Reality
- Embedded Intelligence
- Knowledge Management
- Innovative Factory Systems

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Location Saarbruck — since 07/1988

780

Location Bremen — since 11/2005

Location Berlin — since 05/2012

Lab Osnabrück

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- the basics
- the changes
- the smartfactory
- conclusion

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Our smart world

All applications

Worldwide network

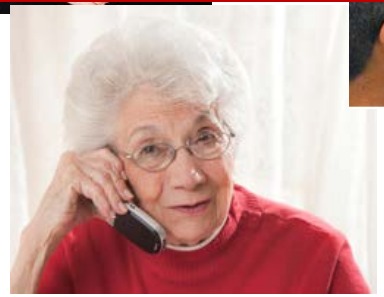
Information will be available

anywhere, anytime, with any content, for any user using any device and any access

All locations

always „ON"

All ages



Have fun

Apps all over

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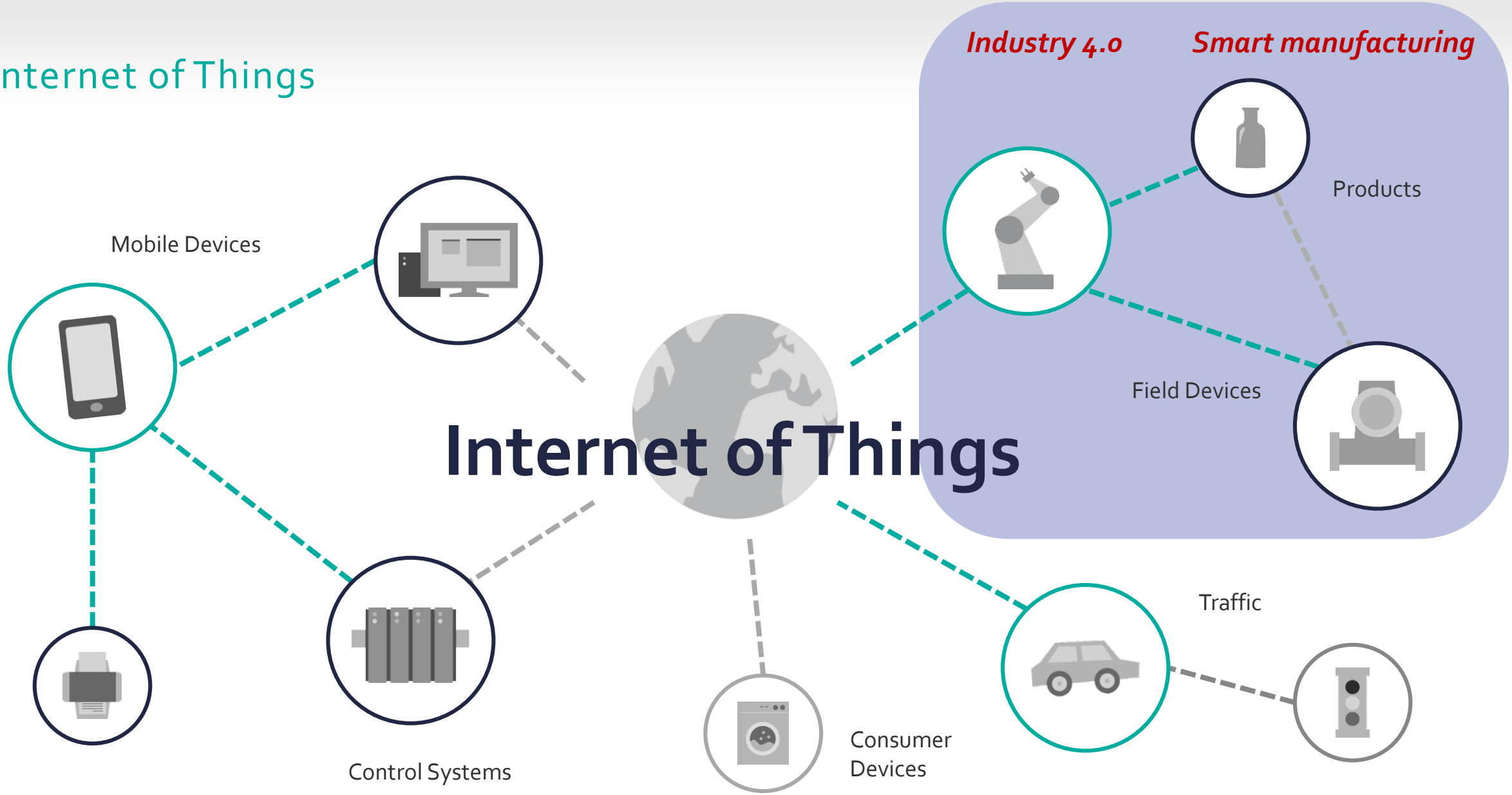
Internet of Things



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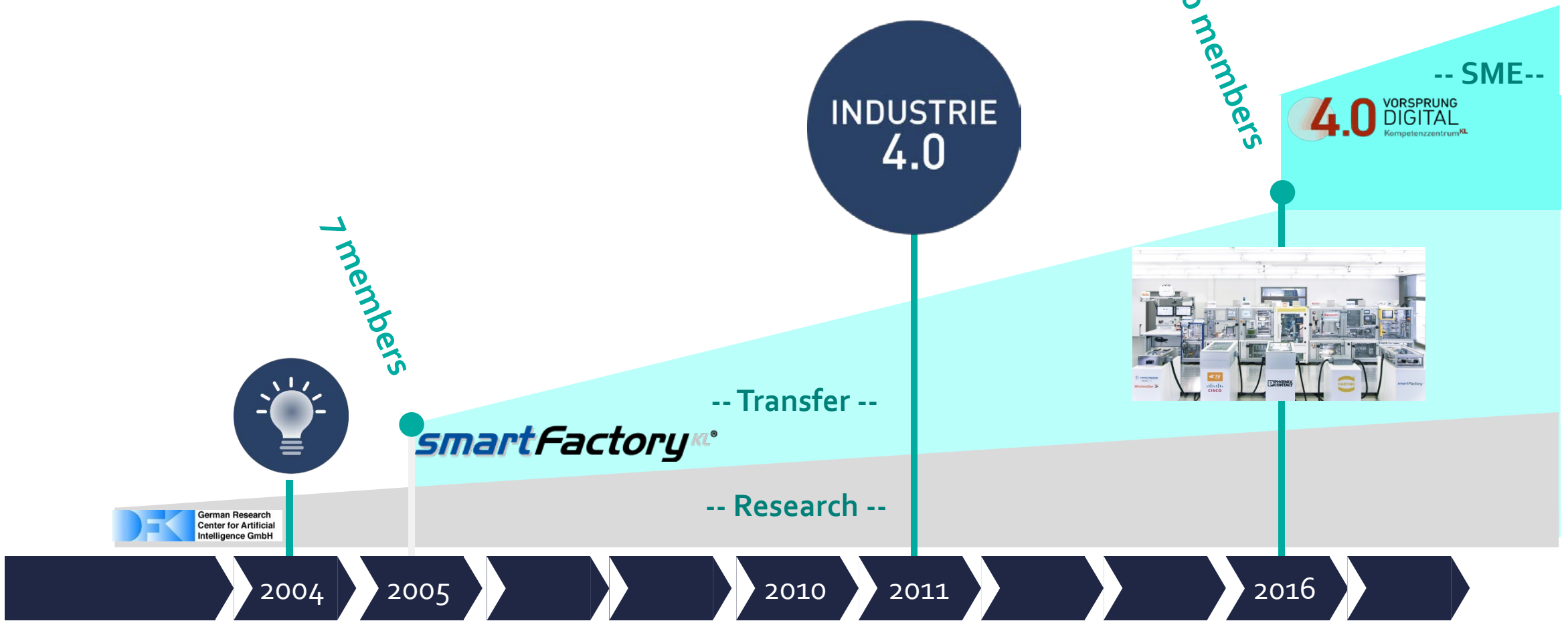
The Industry 4.0 / SmartFactory^{KL} History



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What is Industry 4.0?

Digitization and networking of all processes, products and resources

Pervasive Engineering

Internet of Things

It´s not a standard

INDUSTRIE 4.0

It´s not clearly defined

Big Data

Smart products

Virtual <-> real world

Human and work

Standardized Interfaces

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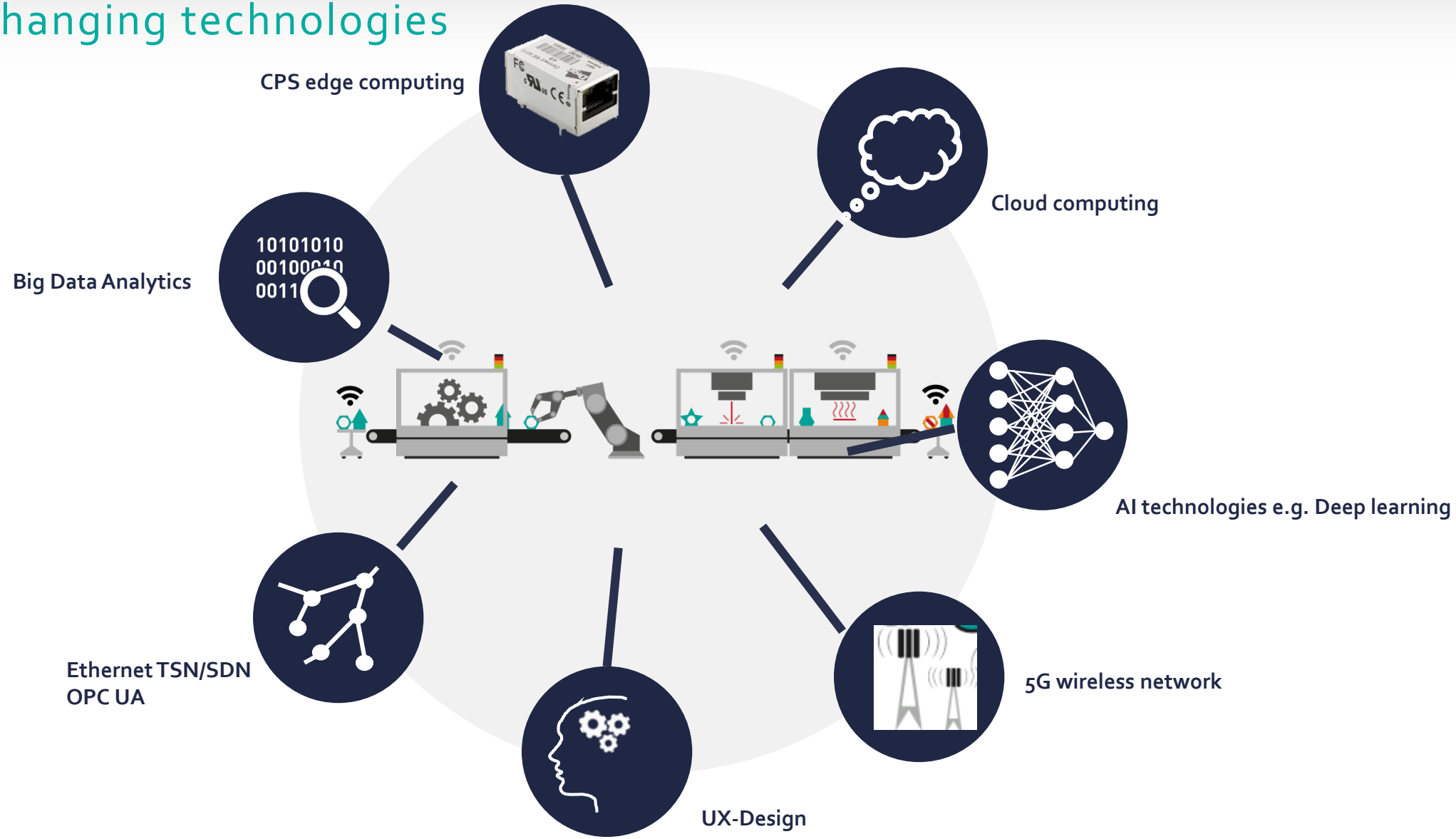
Game changing technologies



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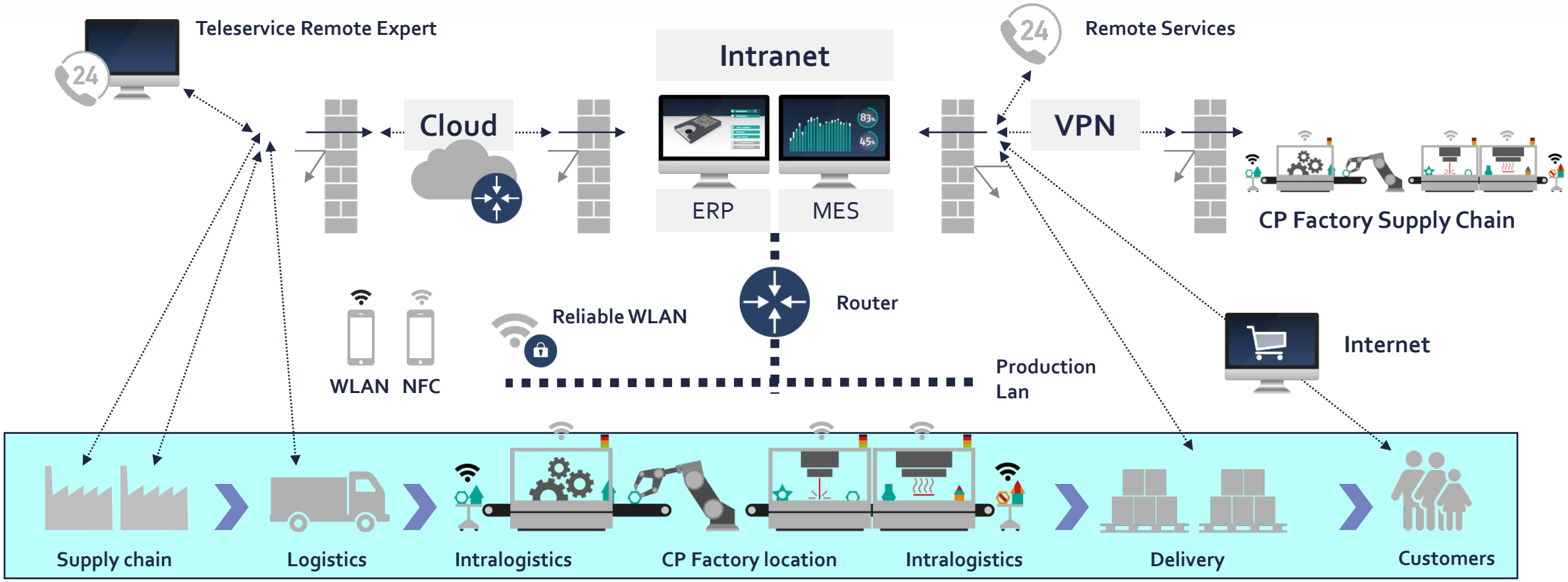
Digital Transformation of the Industry



Logistics | IT systems | IT security | Networking | CP Factory cloud

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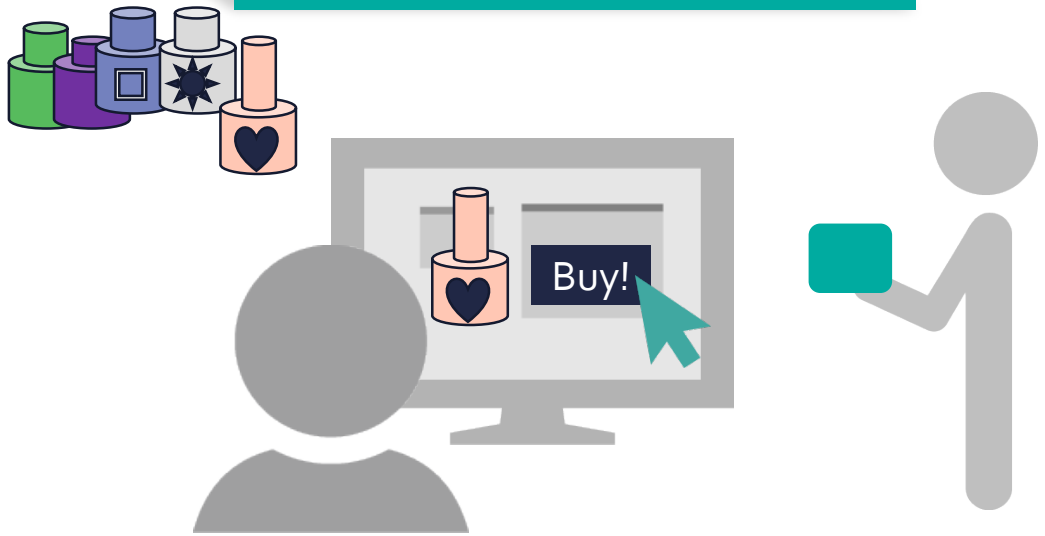
Customer's changing paradigms

Paradigm of the past

Cheap, cheaper, cheapest!

Paradigm of the future



Order by a mouse click
get YOUR product tomorrow!

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Personalized products are coming

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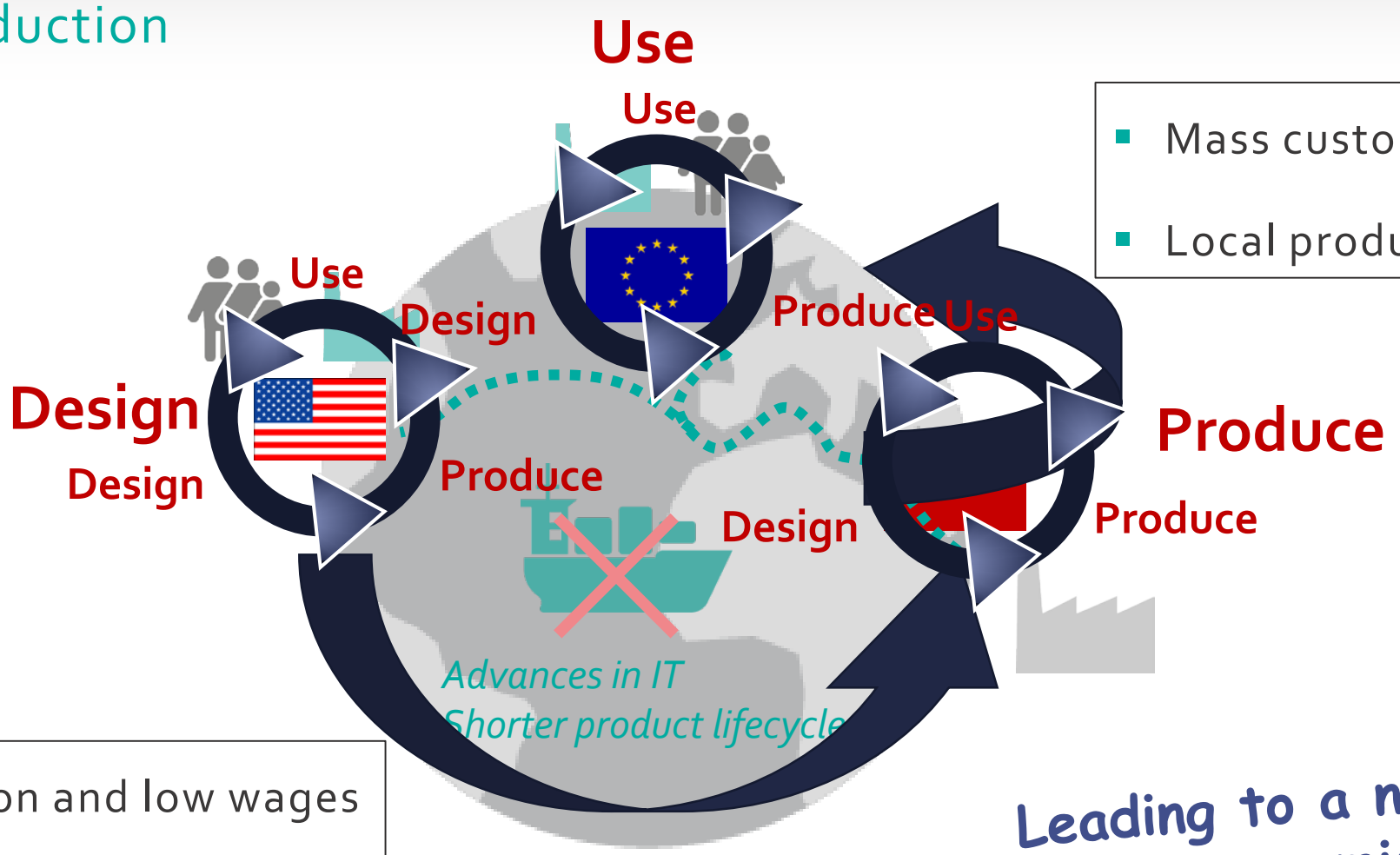
Reshoring production



- Mass customization
- Local production

- Mass production and low wages
- Long delivery times

Leading to a new world economic structure?

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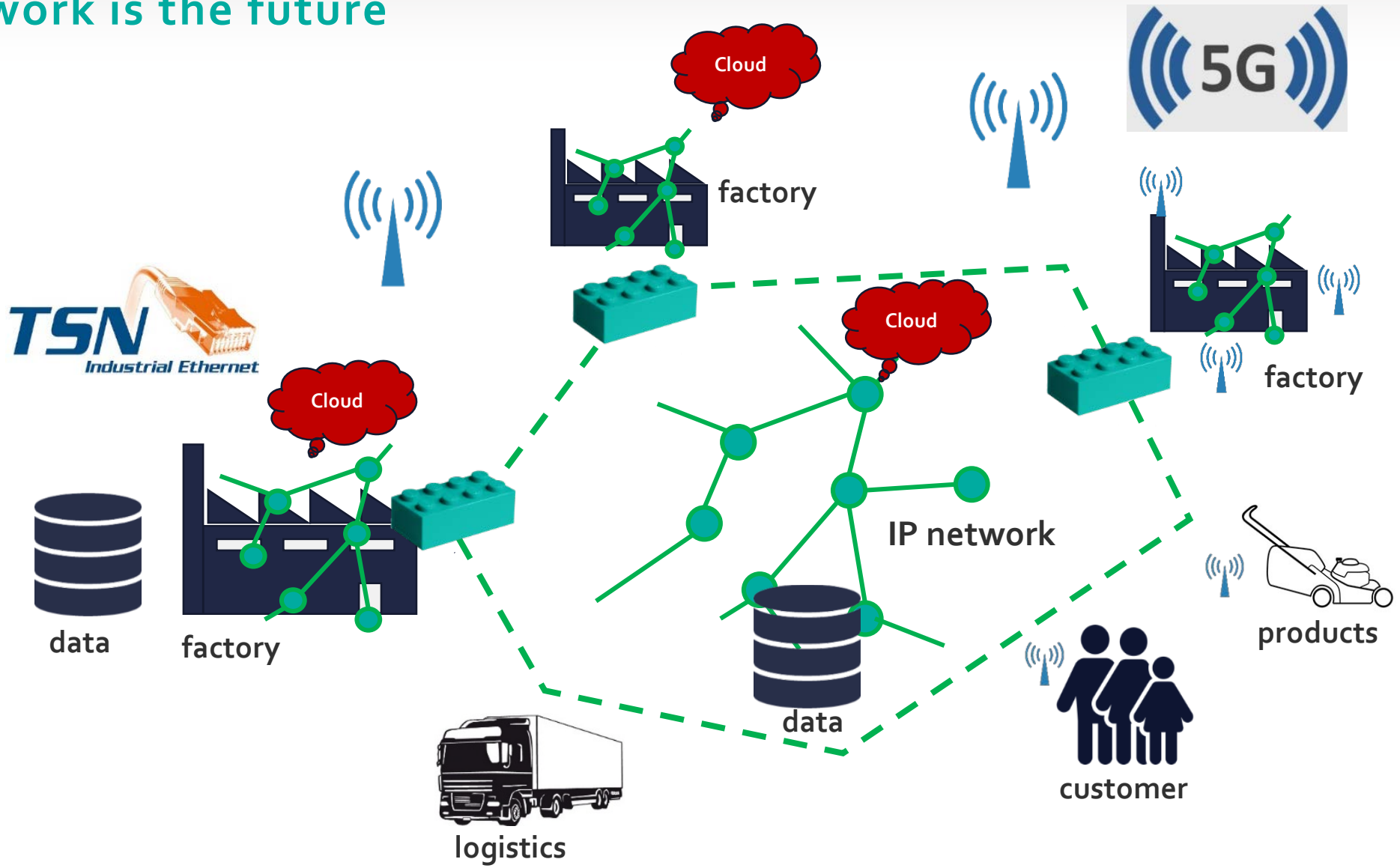
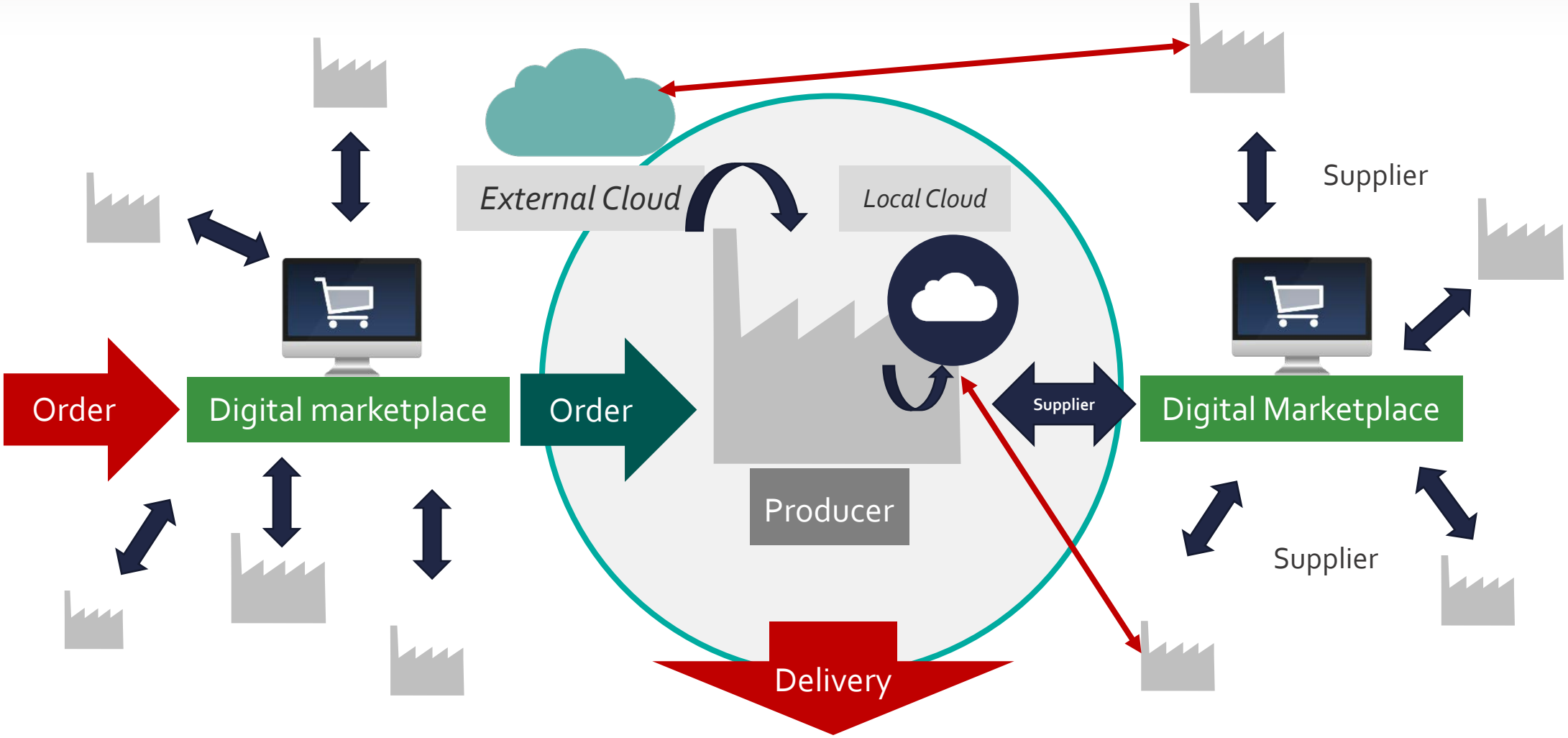
The network is the future



Production in networks



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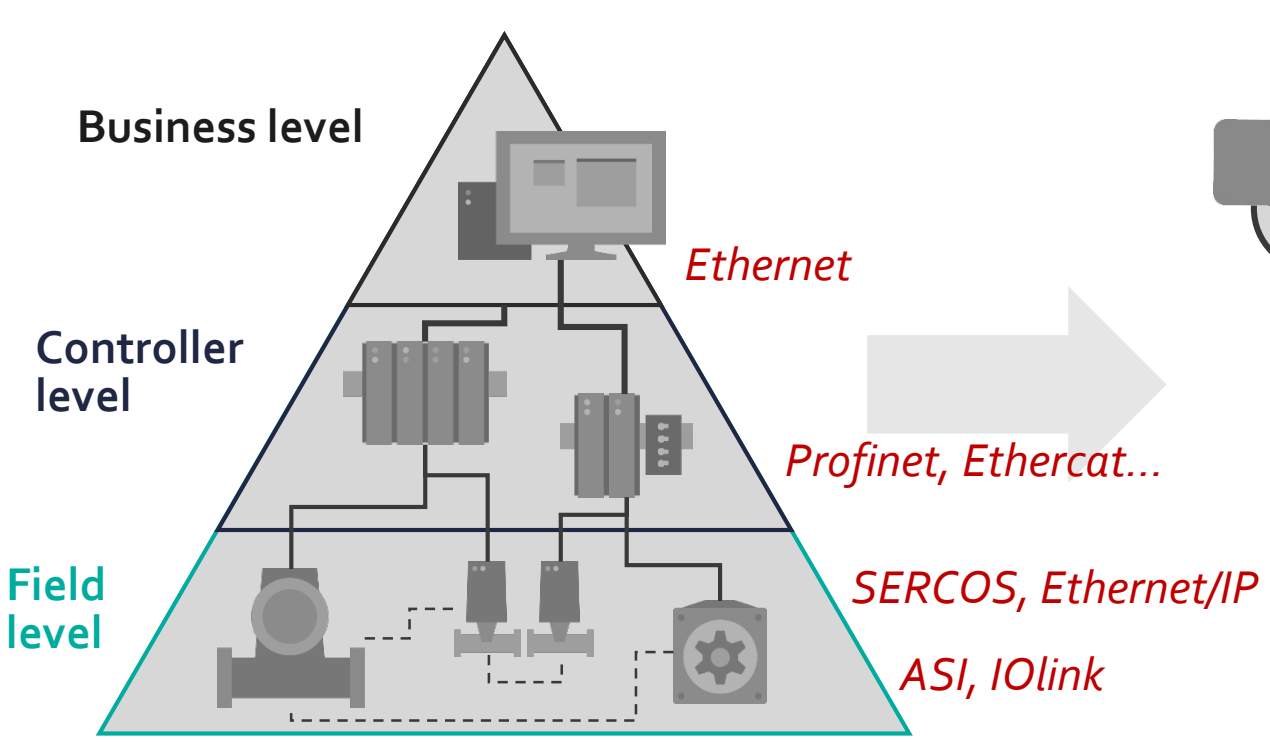
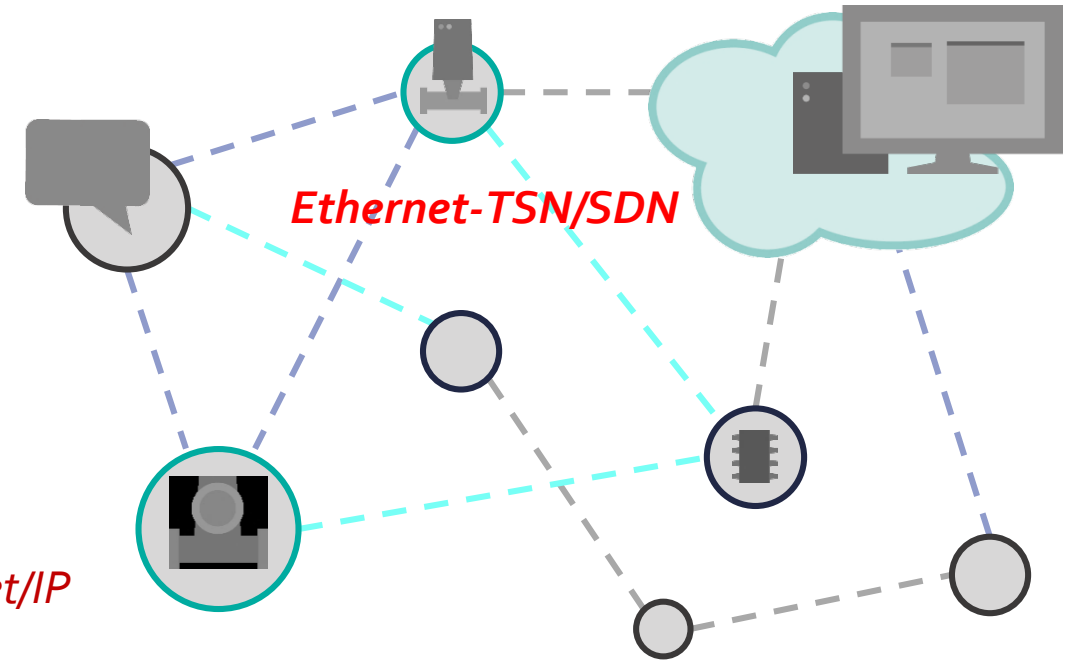
Digitization | from Pyramid to Network Structures based on worldwide standards





Rigid structures today

Dynamic *structures tomorrow*

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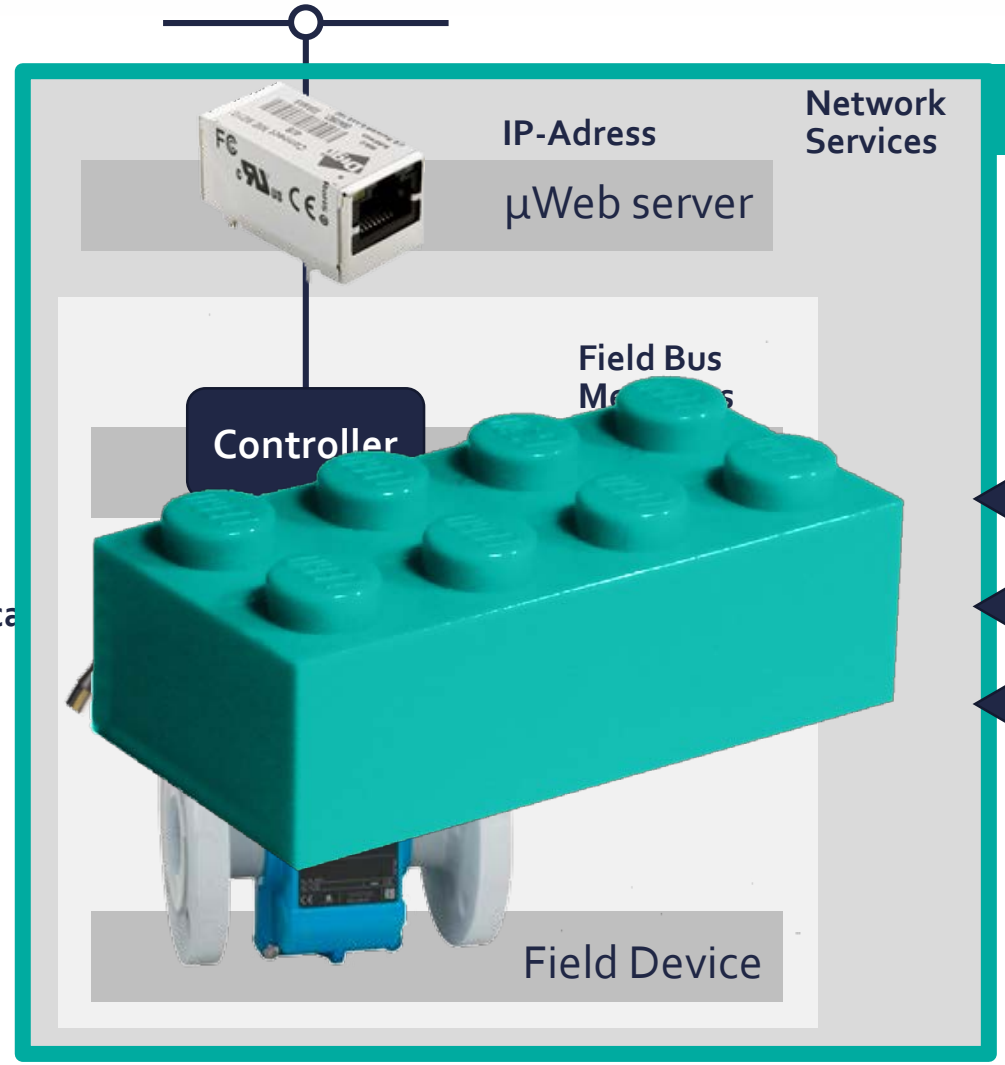
Towards smart modules



Cyber-Physical System

Fundamental Principles

Self Identification
(who am I?)

Services Exploration
(what do I offer?)

Autonomous Networking
(who are my partners?)

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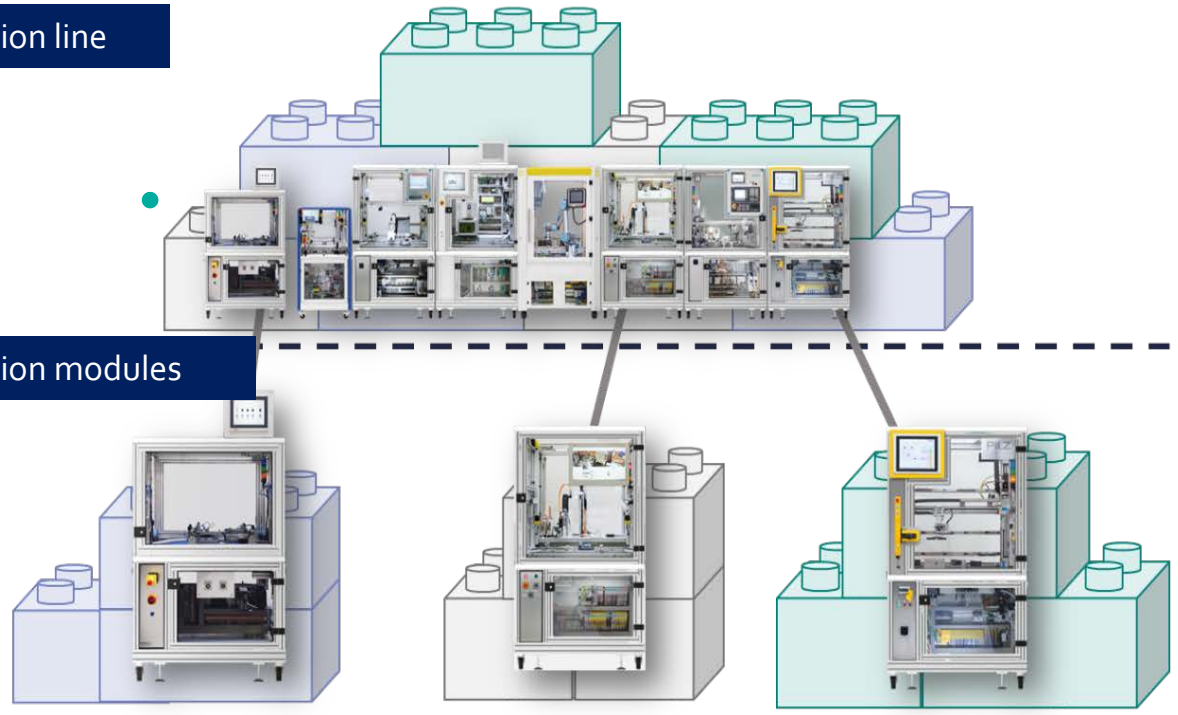
The modular agile factory kit

Production line

Production modules



...needs a stack of standards

Interoperability Standards

SEMANTIC SERVICE DESCRIPTION

OWL	OWL-S	SAWSDL	...
WSDL	EDDL	Device Class Profiles	...

Communication Standards

ISO-OSI

7	? SoA-Services
6	OPC-UA
5	
4	TCP/IP
3	
2	Ethernet, WiFi, 5G
1	

Electromechanical Standards

Han-Modular®

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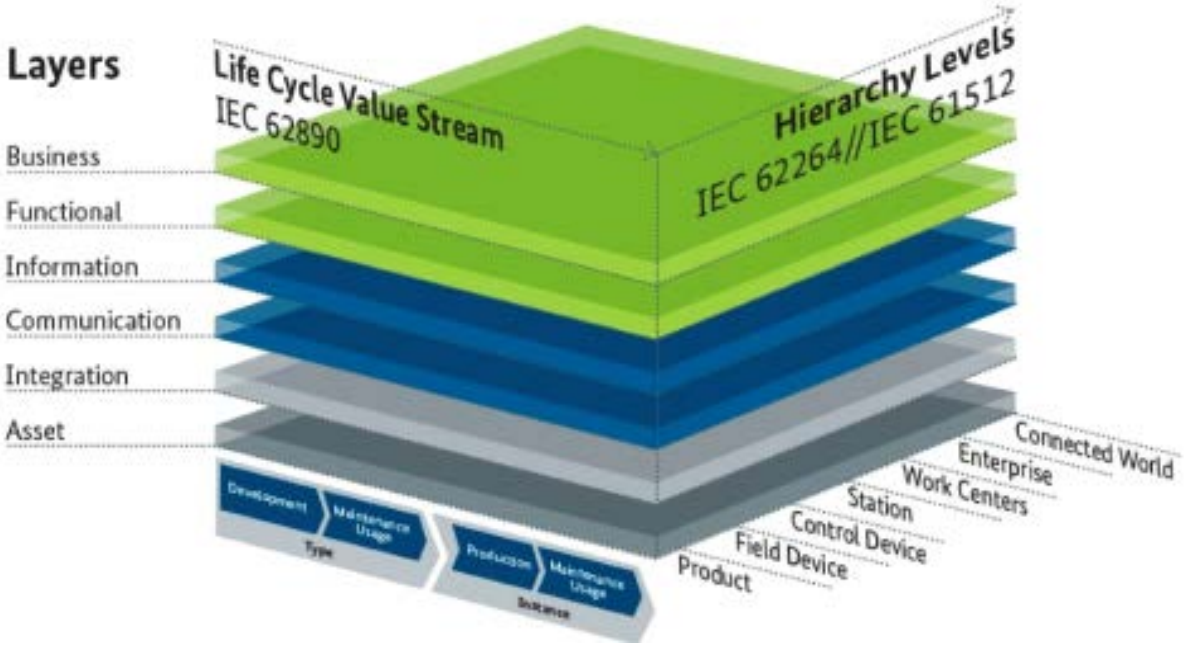
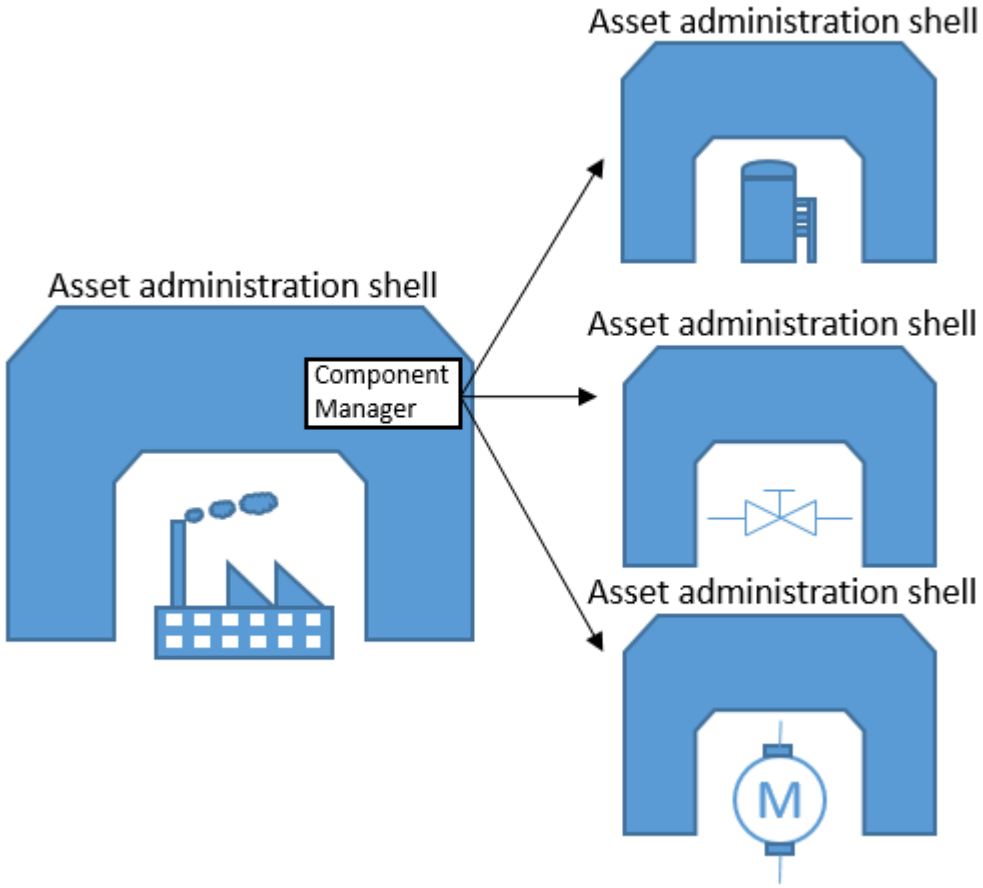
Standardization in progress

Reference architecture model RAMI 4.0



Asset Adminstration Shell



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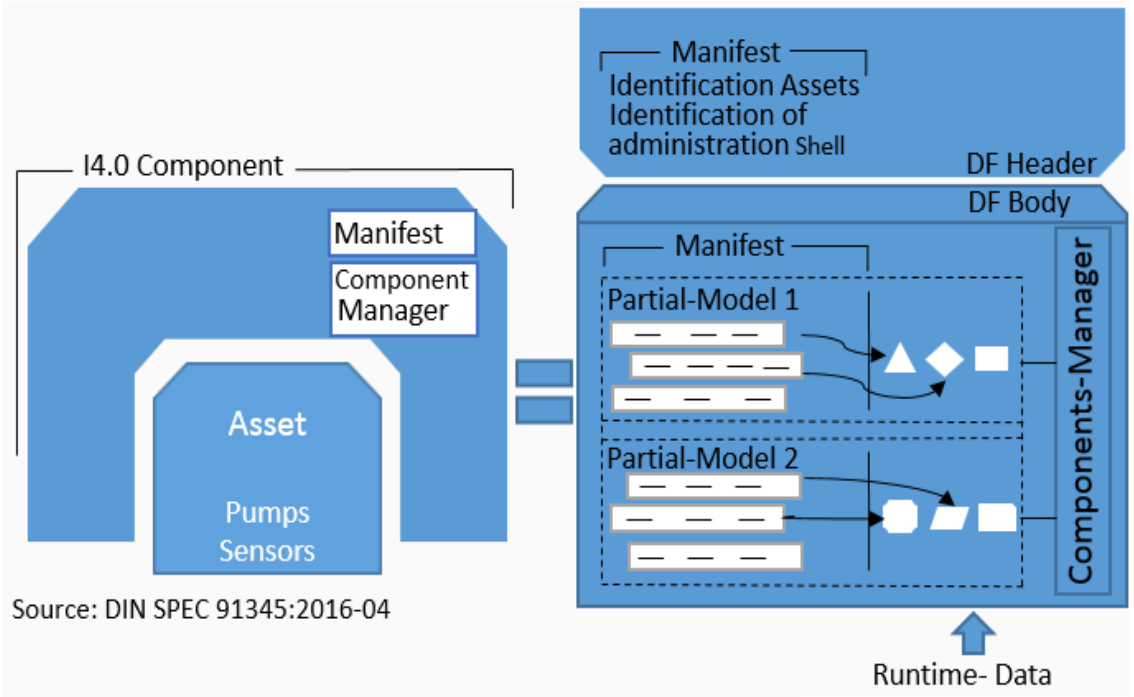
The open AAS model

Asset administration shell



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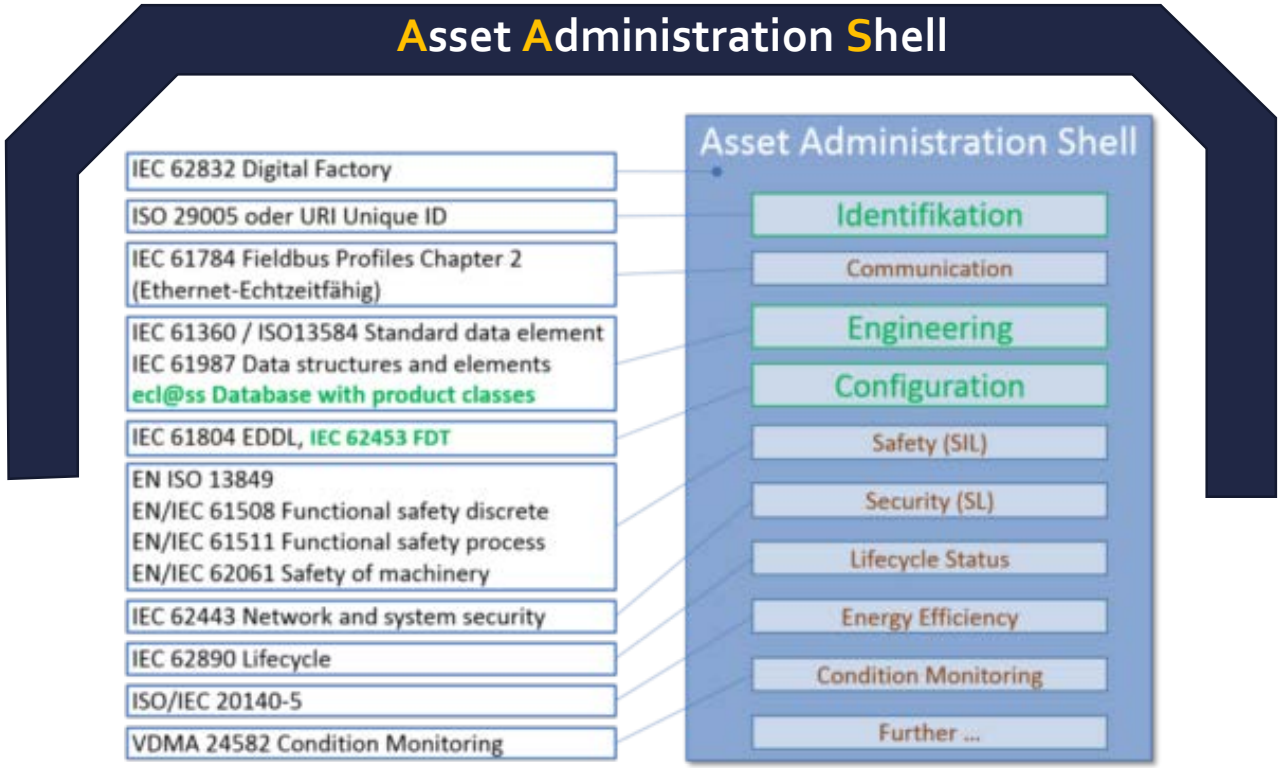

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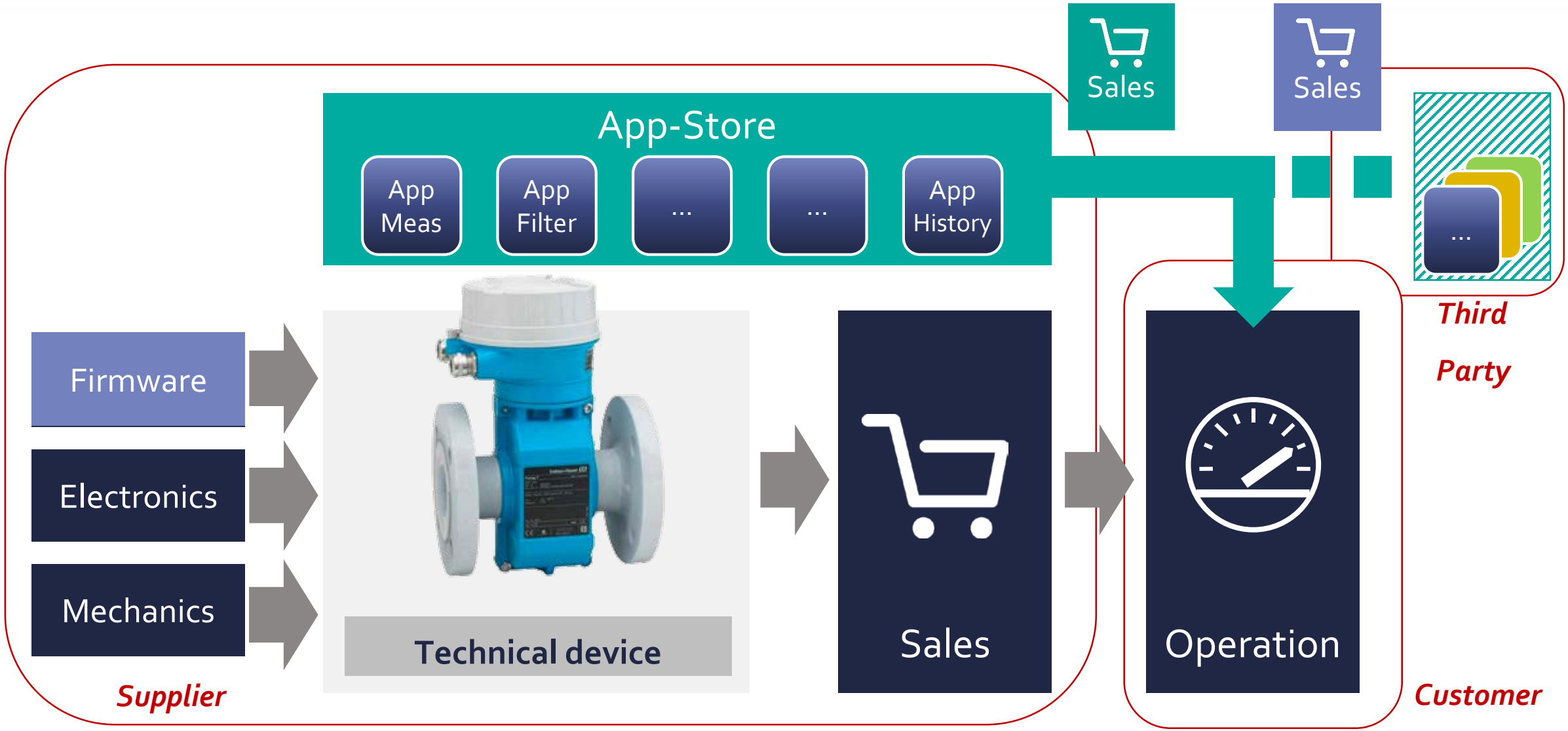
Separation of Hard- & Software



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The human in the Industry 4.0 age…

will be
supported by smart
technologies

will have
more information
available

will have
higher mobility

must have more
interdisciplinary knowledge

needs additional
education and training

will have more responsibility
and freedom

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From vision to reality – the *SmartFactory*^{KL}

Launch:	June 2005
Legal form:	registered non-profit association
Members:	50 (institutions only)
Governance:	general assembly, executive board
Financing:	fees, donations, projects
Employees:	currently 32
Turnover:	2.5 Mio €

The ***SmartFactory***^{KL} is the **worldwide biggest and most popular manufacturer independent research and demonstration center** for **INDUSTRIE 4.0** technologies.

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SmartFactory^{KL} Lab

Industrie 4.0 vision → in multivendor cooperation → Industrie 4.0 products

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SmartFactory^KL members

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Industry 4.0 vision

we **Learn Work Build Present** *together*

Industry 4.0 products

- Component manufacturers
- Certification organizations
- Software providers
- Security providers
- Network providers
- Users
- Research organizations
- Marketing organizations

organized as a registered non-profit association

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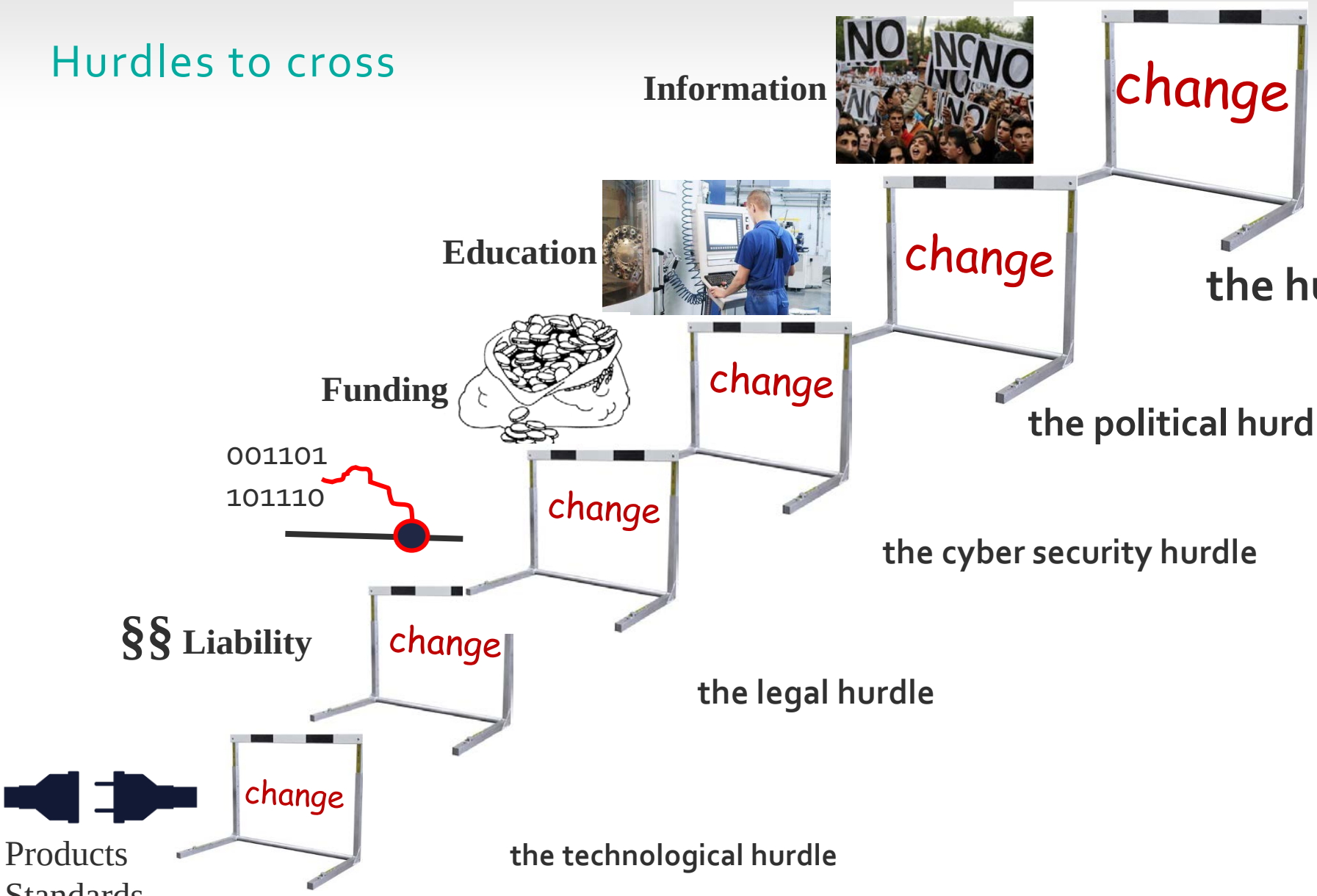
Hurdles to cross



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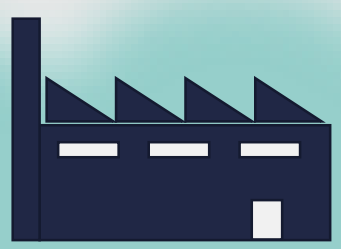
Path to Industry 4.0



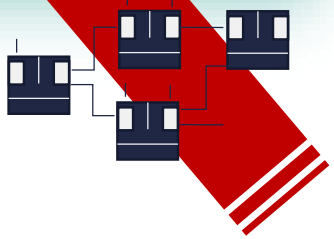
INDUSTRIE 4.0

Level 3

Smart machines

Smart products

Smart processes



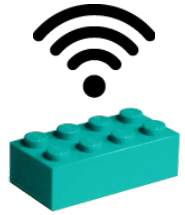
Level 2

Use smart devices

Care about data

Train staff

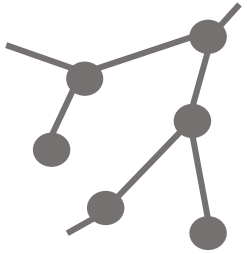
Track assets



Use standards

Level 1

Participate in networks



Keep informed

1st -> Analyze your situation

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Industrie 4.0 worldwide competition

EU – DIH Program

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Thanks for listening

and remember

Everything should be made as simple as possible, but no simpler !

Albert Einstein

Detlef Zuehlke

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