

Digital Enterprise – Thinking industry further!

Hannover Messe 2019 | April 1, 2019

Klaus Helmrich, Member of the Managing Board of
Siemens AG and CEO of Digital Industries

Key messages for Hannover Messe 2019

Digital Enterprise – Thinking industry further!



Digital Industries will lead industry to the next level of digital transformation:
Thinking industry further!

Digital Industries will extend its Digital Enterprise portfolio with future technologies

- At the Hannover Messe 2018, our message was “Digital Enterprise – Implement now!”
- Now innovation leader Siemens is thinking further: to the next level of digital transformation
- The deeper use of data pools and linking of hardware, software and Cloud platforms will create a new level of data consistency and knowledge acquisition from data – for more flexible and productive processes

Numerous innovations will be presented for deeper and broader data usage and increased productivity

- Integrated future technologies in the Digital Enterprise portfolio create new potential for optimization: Edge computing, artificial intelligence, autonomous handling systems, Industrial 5G, Blockchain, Additive Manufacturing
- New process control system Simatic PCS neo

The carefully developed Digital Enterprise portfolio offers end-to-end solutions for the specific requirements of each sector in the manufacturing and process industries

- This supports increased flexibility, productivity and new business models for companies of any sector or size: as can be seen in the concrete examples from our customers and our Siemens factories

The implementation of this digital transformation requires a strategy – Digital Industries is the ideal partner

- Siemens provides support for the evaluation, implementation, integration and continuation of Industrie 4.0 measures

Paving the way for the future: convergence of Information Technology (IT) and Operational Technology (OT)

- Technologies such as Edge computing bring mechanisms from the IT world to the level of OT.
- In future, this will enable the integration of data across all levels: from the shop floor to IT systems such as Supply Chain Management, Enterprise Resource Planning, etc.

Making industrial processes more flexible – greater customization with increased demands on productivity

Flexible production

Customized products,
variable batch sizes down to batch size 1

Performance

Plant availability, changeover times,
maintenance, cyber security

Lifecycle optimization

Transparency over the entire lifecycle,
productivity, time-to-market, asset and cost
optimization

Global collaboration

Networked, secure operation, cooperation
between many users in real time

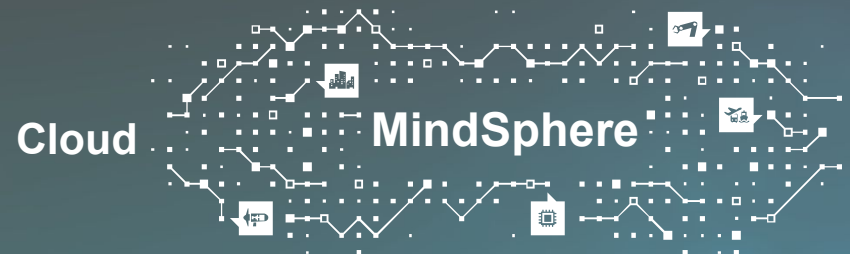
New business models

Digital Enterprise at the Hannover Messe 2018 Implement now!



Digital Enterprise

Digital end-to-end solutions for discrete and process industries



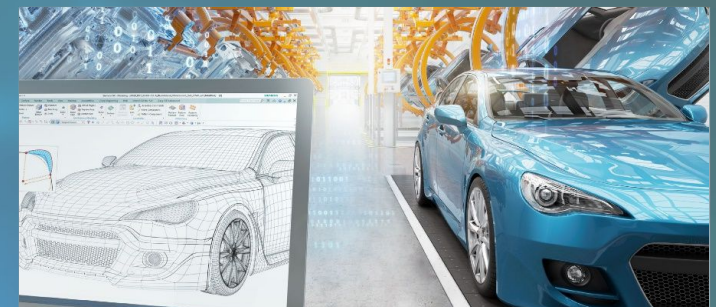
Automation and industrial software for process and discrete industries



Industrial communication

Industrial security

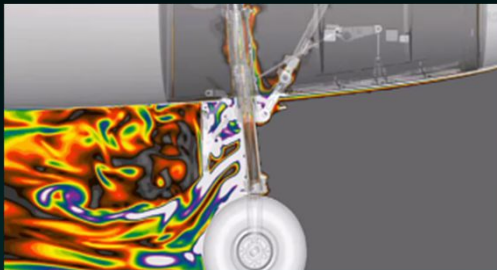
Industrial services



Hannover Messe 2018 – Implement now!



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Faster product development

>15%



**Shorter commissioning:
robots programmed offline**

>98%



Greater customization

**100l instead of
>5000l**



**Higher availability
up to**

10%

Study by VDMA industry association – proves increased productivity through digitalization

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Time-to-market¹

Twice as many variants in 10 years with same number of employees
(Automated process chain)

Lead time²

Shorter development cycles
(Digital Enterprise platform for data and process management)

Development costs³

>50% fewer engineering hours
(NX environment)

Flexibility⁴

Up to 70% shorter commissioning phase
(offline robot programming)

Accenture study: Digitalization requires expertise, collaboration and entrepreneurial decisions



Few successful pilot projects –
Comprehensive digitalization strategy required

Many small individual programs – **Introduce consistent, end-to-end solutions and new business models**

Division of tasks is slowing digitalization –
Strengthen interdisciplinary collaboration with partners

Digital expertise and courage are missing – **Push ahead with training and continuing education and supplement it with external expertise**

<https://www.accenture.de/weckruf-zur-digitalisierung>

Determining the digital readiness of companies – with Siemens and the Singapore Economic Development Board



Smart Industry Readiness Index from Singapore Economic Development Board, Siemens, SAP, McKinsey and TÜV Süd

Prioritization matrix for Industrie 4.0 measures

Launch in Hanover, April 1, 2019, with Dr. Koh Poh Koon, Senior Minister of State (Trade and Industry), Singapore

Digital Enterprise 2019

Thinking industry further!

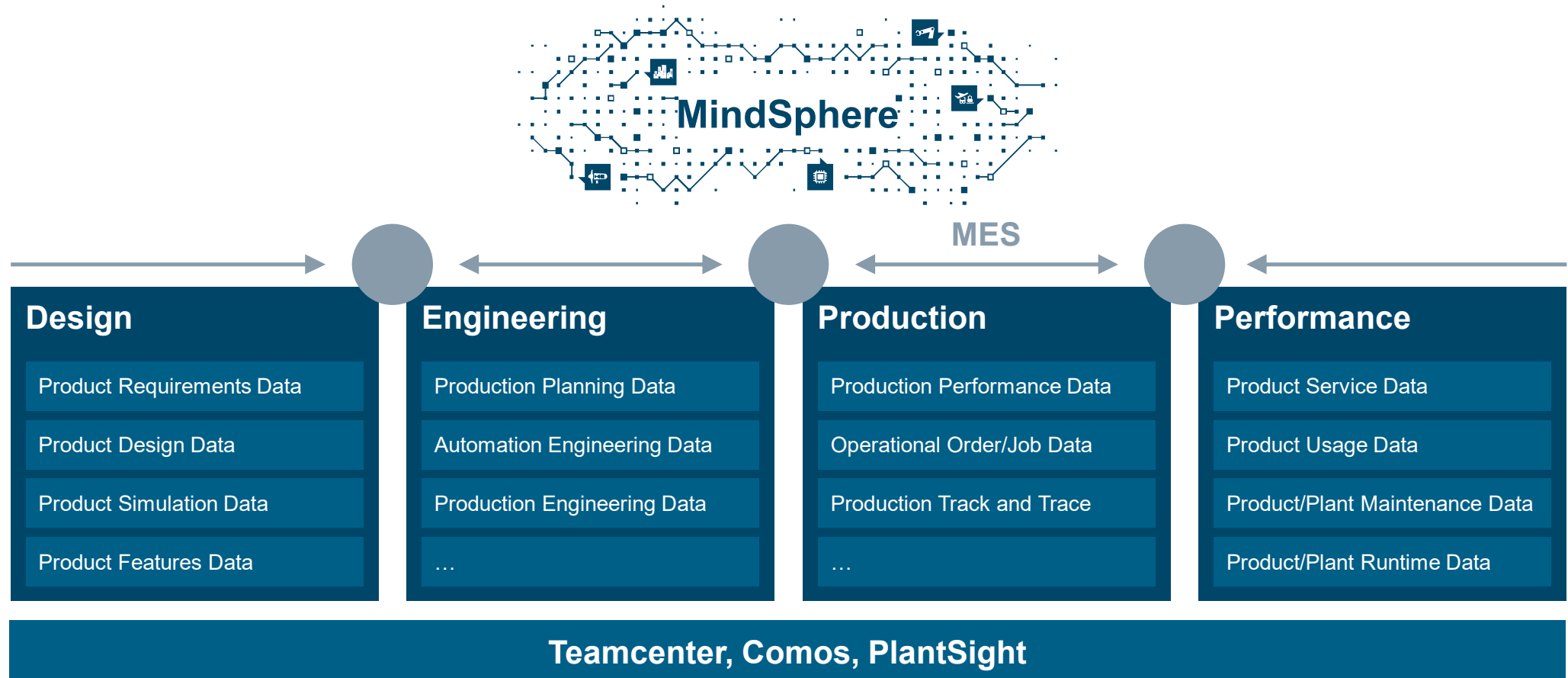
Data
usage

Plat-
forms

Cutting-edge
technologies

Digital Enterprise – Thinking industry further!

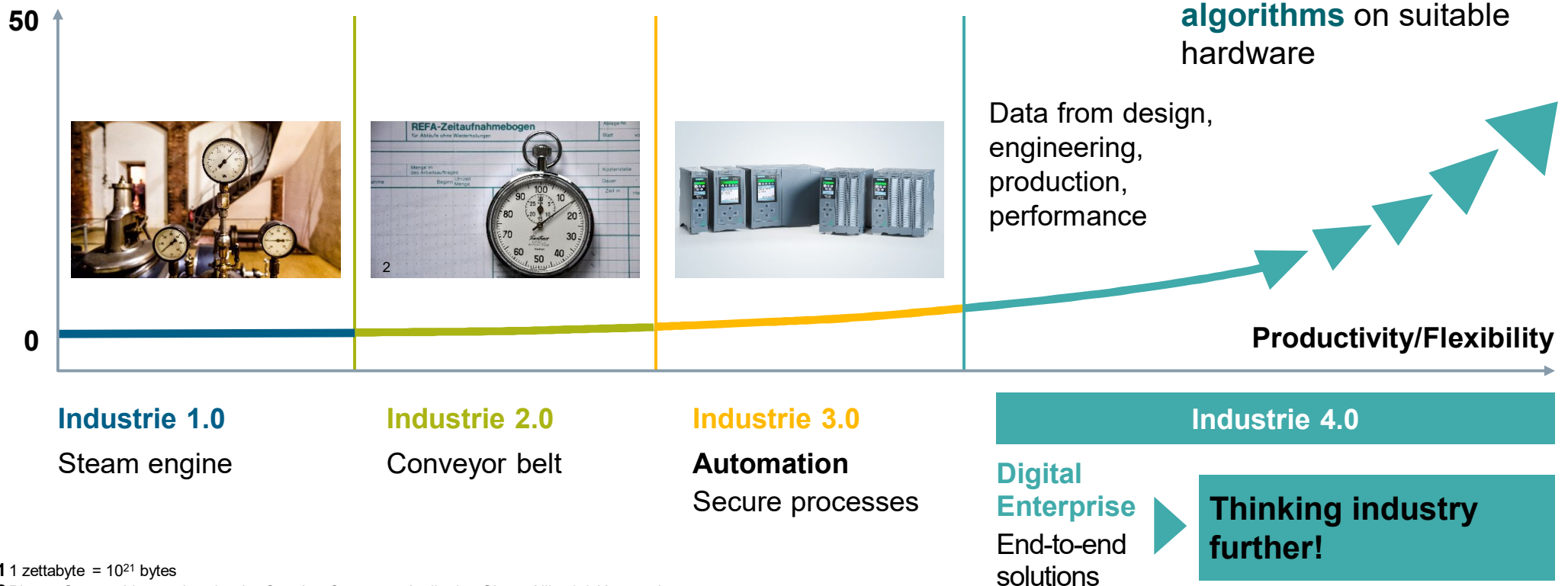
Data as the new resource for discrete and process industries



Growing volumes of data in the digital transformation are opening up new productivity potential and greater flexibility

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Data volume (in zettabytes¹)



¹ 1 zettabyte = 10^{21} bytes

² Picture Source: Licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.

Thinking industry further!

Industrial Edge

MindSphere

Artificial intelligence

Blockchain

Autonomous production systems

Additive manufacturing

Industrial 5G

New process control system

Digital Enterprise automation platforms

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SIMATIC

Scalable industrial automation systems



SINUMERIK

Intelligent solutions for machine tools



SIMATIC PCS 7

Powerful, compact hardware for process industries



SIMOTION

High-end motion control system



SINAMICS

Frequency converter for every drive application



SIMOTICS

Highly efficient electric motors



SIRIUS

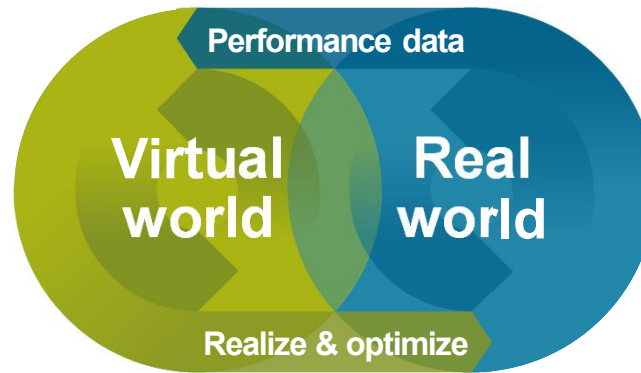
Modular industrial controls



SCALANCE

Reliable industrial communication

Digital Enterprise software platforms – comprehensive, constantly expanding software portfolio



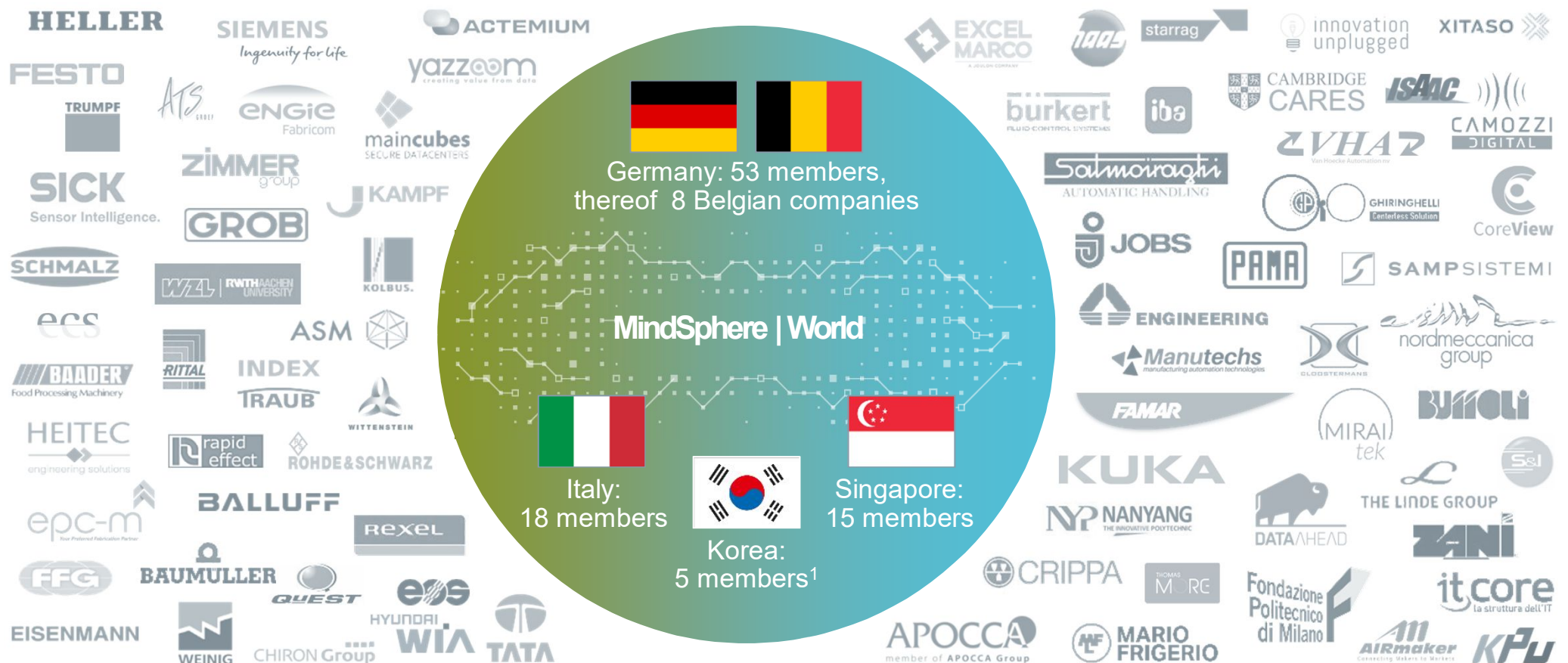
MindSphere

NX CAD	Teamcenter	NX Line Designer/MCD/	Simatic IT	MindSphere Apps
Polarion	Manufacturing	Automation Designer	Camstar	Digital Lifecycle Service
Simcenter	NX CAM / Additive	Simit	WinCC/SCADA	Asset Performance Suite
Mentor Xpedition	Tecnomatix	TIA Portal	CNC Shop floor Mgt SW	
Mentor Capital	Mentor Valor	Simatic PCS7	Edge Apps	

Teamcenter, Comos, PlantSight

MindSphere | World – currently about 90 member companies in Europe and Asia

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¹ In the process of foundation

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Collaboration: Volkswagen also to cooperate with Siemens for Industrial Cloud

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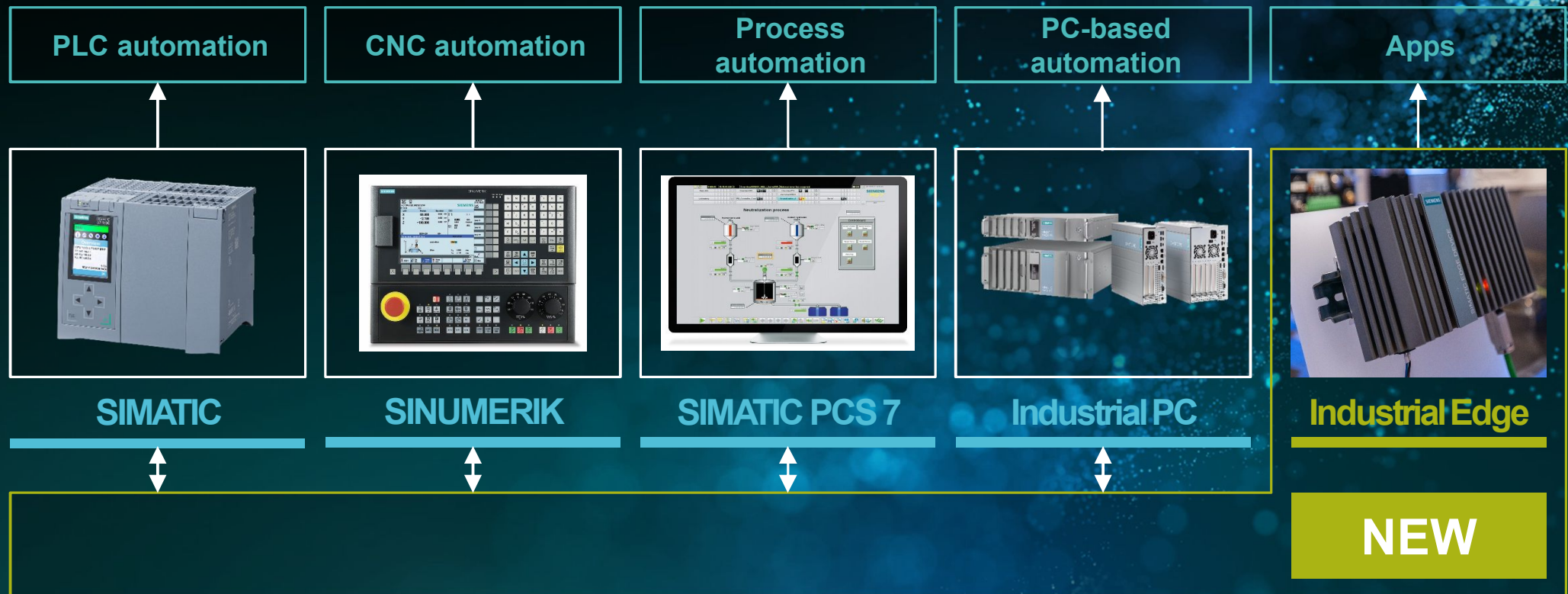
Siemens as integration partner ensures efficient networking of production systems, machinery and equipment at 122 Volkswagen plants

Data transparency and analysis to lay foundations for further productivity improvements

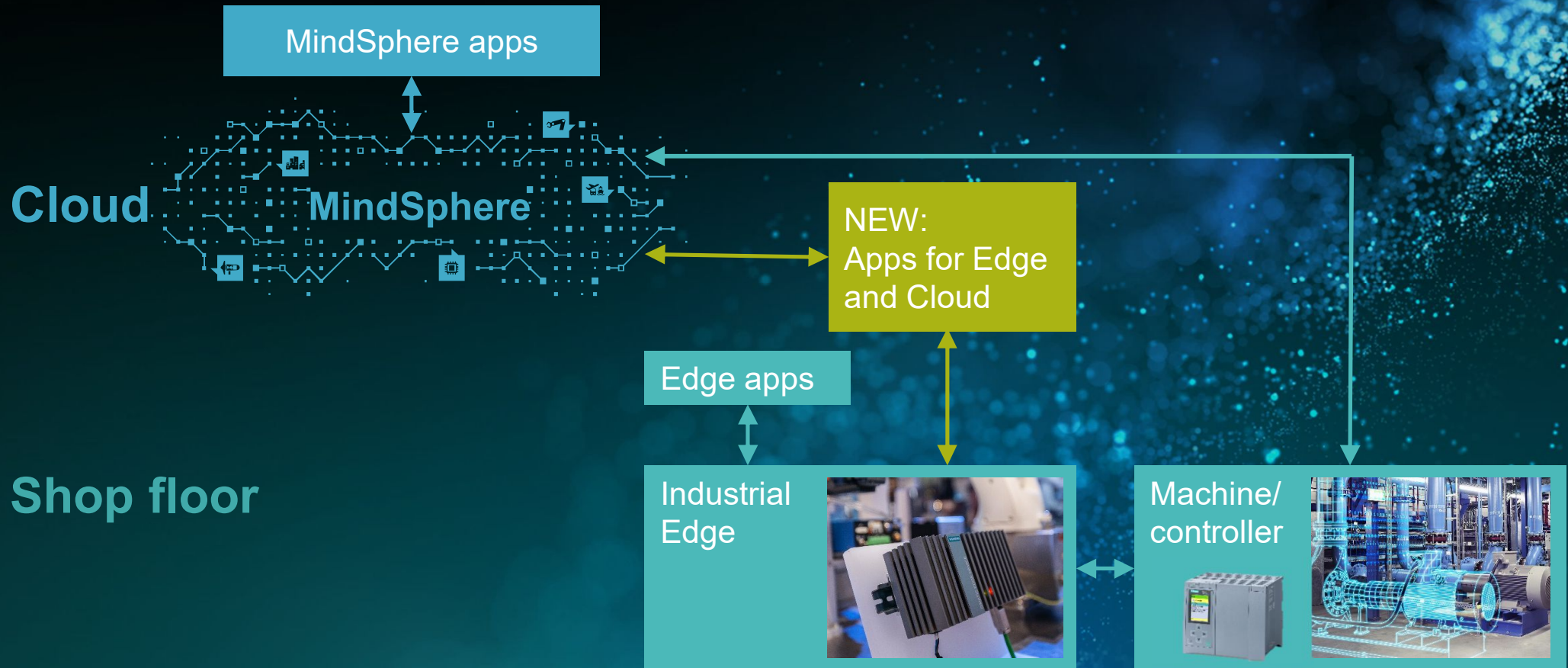
Volkswagen, Siemens and machinery and equipment suppliers develop new functions and applications together



Digital Enterprise automation platforms – enhanced by Edge functionality



Renaissance on the shop floor – a scalable concept up to the MindSphere Cloud system



A large industrial machine, possibly a CNC lathe or mill, is shown in a factory environment. The machine is white and blue, with a control panel on the left. A glowing blue digital overlay is superimposed on the machine, showing a 3D model of a part and various data points. The background is dark with blue light effects and faint grid lines.

Siemens Industrial Edge

Data analysis platform brings benefits of the Cloud to the shop floor

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NEW

Analyze MyWorkpiece/Capture application: for optimized production process

Realtime analysis of process data from machine control system

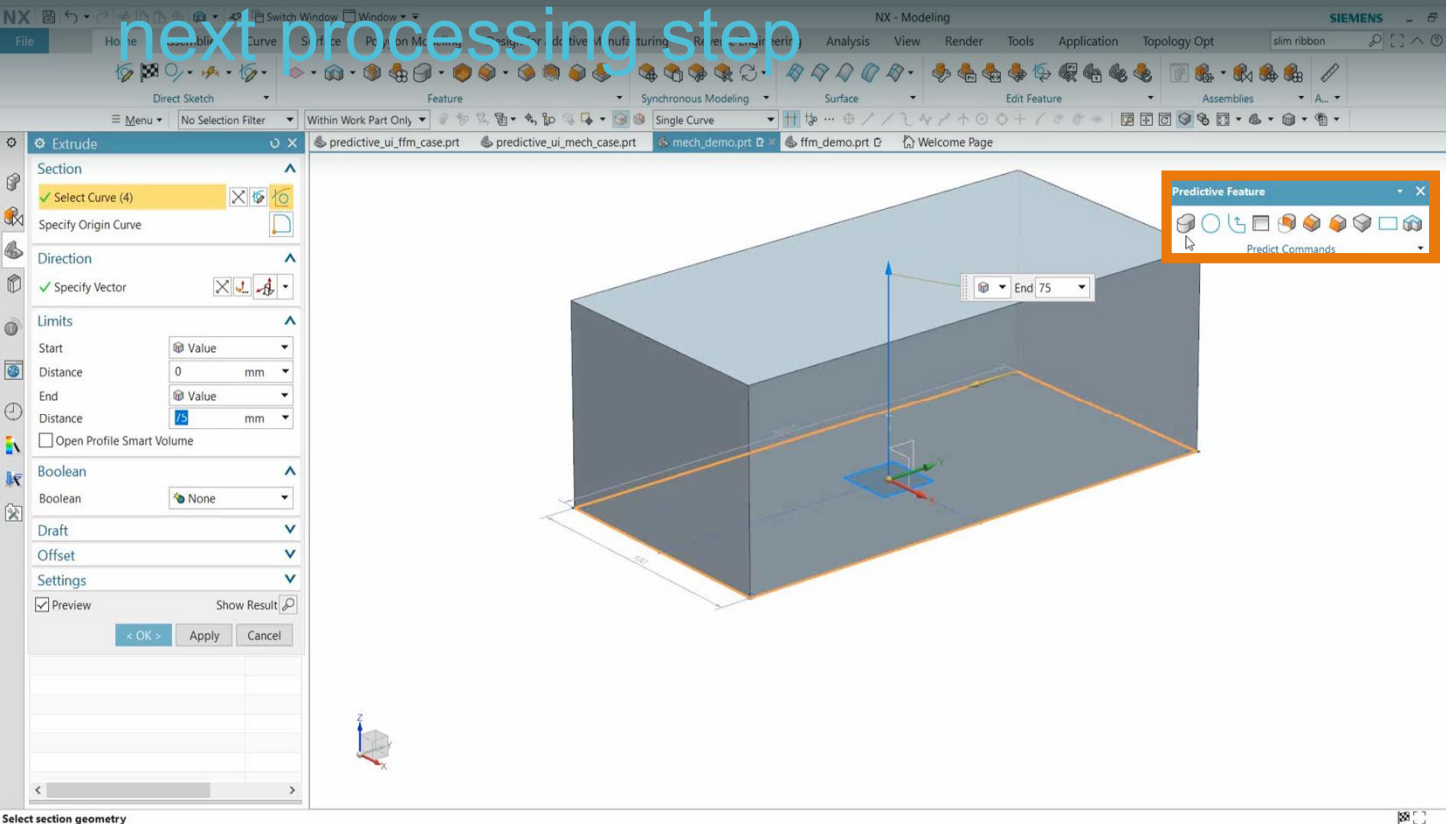
Target/actual value comparison using digital twin product/digital twin performance

Analyze MyMachine/Condition application: Periodic checking of machine properties

High machine availability through improved diagnostics

Artificial Intelligence

NX software with AI: detection of the next processing step



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NEU

First CAX software extended to include AI and machine learning

Functions provided dynamically depending on user behavior

Very high level of detail for digital twin

Up to 20% more efficient process sequences in construction

Autonomous handling systems

Artificial Intelligence module for Simatic S7-1500 – robots perform handling tasks independently

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NEW

Reliable detection and processing of unknown workpieces

Easy learning process without time-consuming training

Direct processing of data using neural networks

Intelligence at field level



Autonomous manufacturing structures

Automated Guided Vehicle for more flexibility and scalability

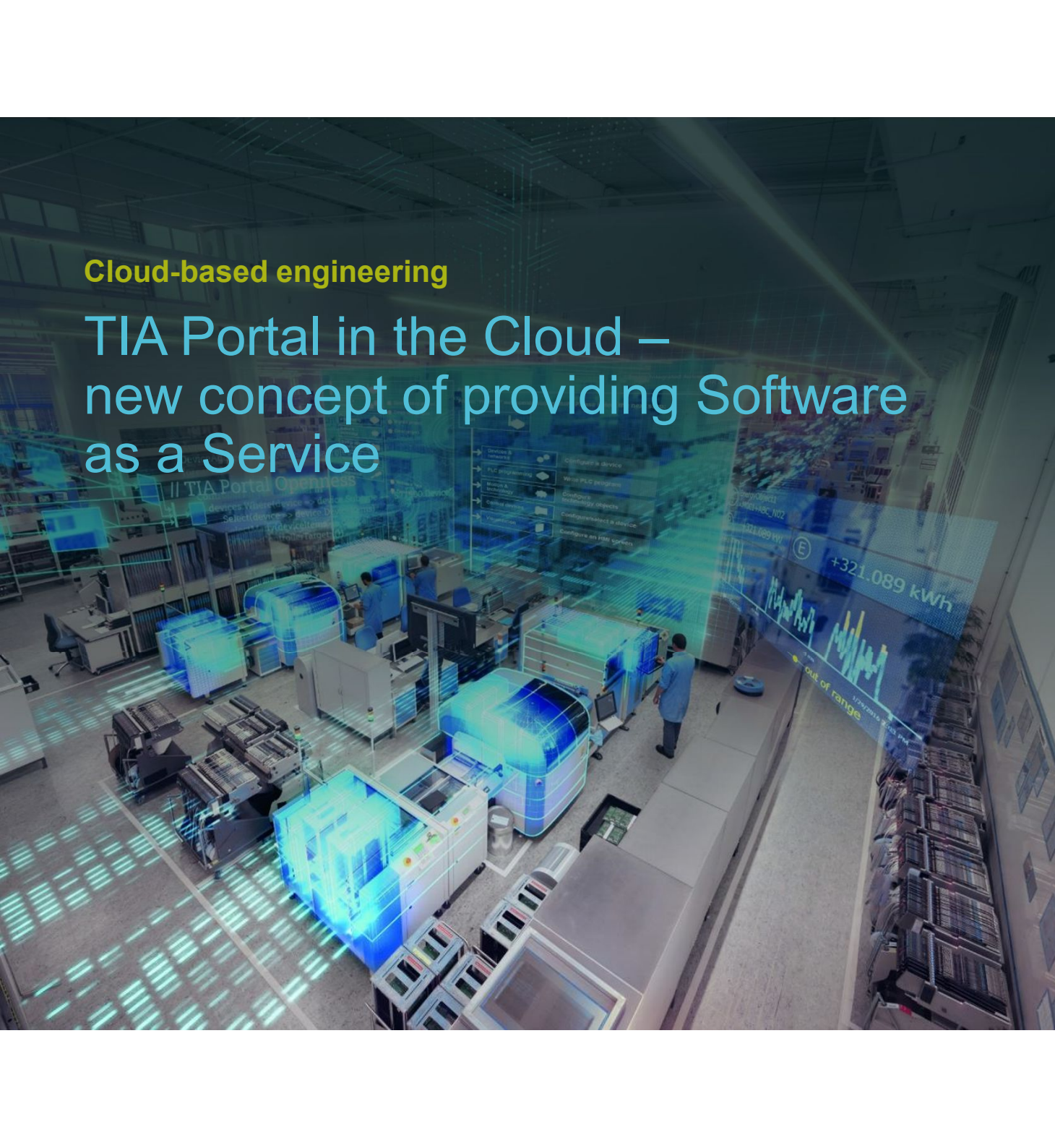
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NEW

Transport of a battery pack for electric cars from manufacturing to assembly

Flexibility in manufacturing for different vehicle and battery types – up to 30% shorter changeover times

Fitted with Siemens technology (controller, HMI, drives, RFID, automation software, etc.)



Cloud-based engineering

TIA Portal in the Cloud – new concept of providing Software as a Service

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NEW

No installation effort

Fast availability of new versions

Use of various hardware
(PC, tablet, etc.)

Trial version from October 2019

Industrial communication

Industrial 5G: reliable and high-performance communication for Industrie 4.0

Digital Connectivity for Industry



Platforms

Data storage and compaction, virtual runtime environment, business process engines, hosting



Connectivity

Gateways, switches, routers, access points, network services



Smart objects/ "things"

PLCs, field devices, sensors, motors, Edge devices, workpieces, tools, etc.

Industrial 5G



NEW

- Industrial 5G is a clear part of Siemens strategy
- Own research projects for Industrial 5G
- 5G Interoperability Test Center under real OT conditions
- Evaluation and testing of industry standards (TSN, OPC UA)
- In future at Digital Industries: Infrastructure for Industrial 5G (base stations and clients)

Blockchain

Traceability of products and data security

Secure gateway at every step of the supply chain, connected to IoT, PLC or MES as required



Blockchain



Secure gateway – Siemens MindConnect Nano



IoT sensor



PLC



MES – Simatic IT UA

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NEW

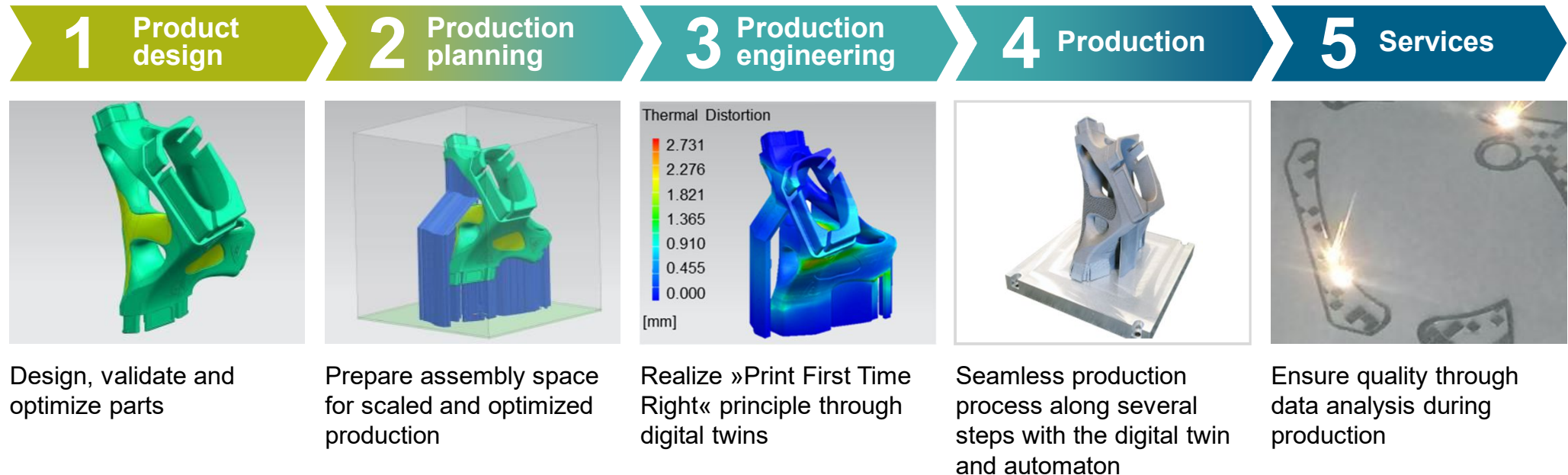
Transparency of global supply chain through to end customer

Data security through global secure gateways

Product security and transparency along the entire value chain

Consistent portfolio for industrial Additive Manufacturing – example of frame concept for e-car batteries¹

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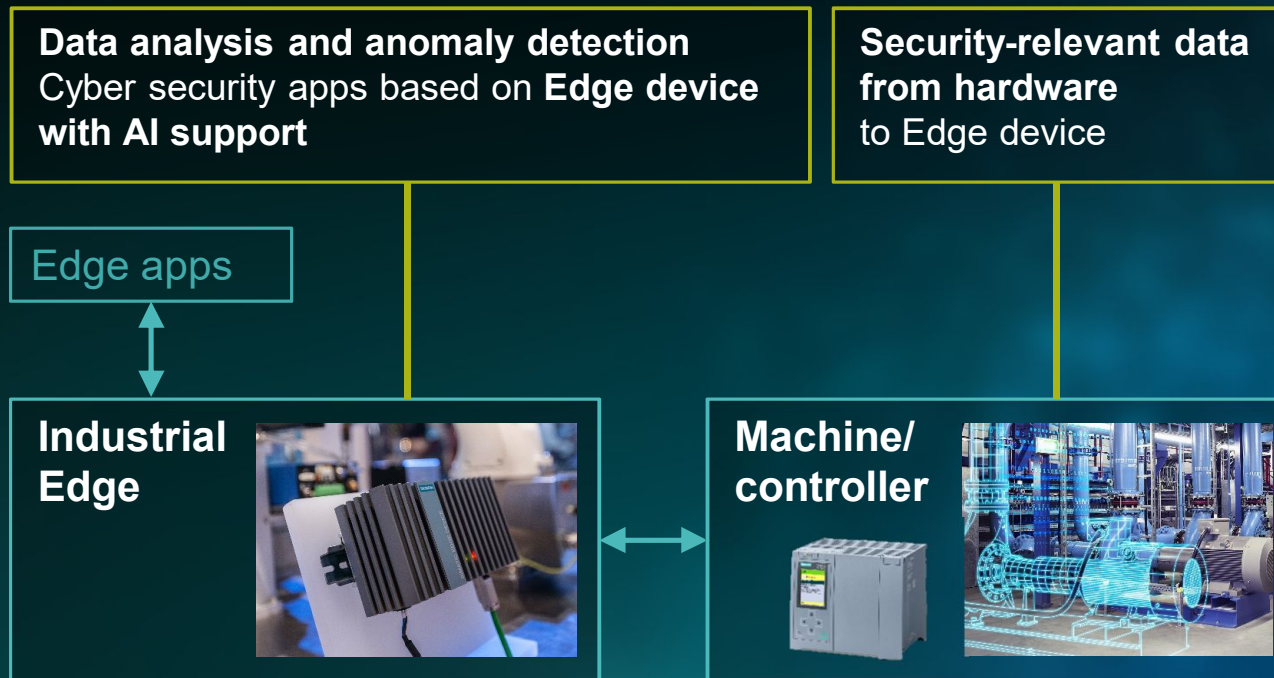
Data and process management

¹ Projektpartner: EDAG, BLM Group, Concept Laser, Constellium, IAPT

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Faster with Edge and KI

Basis for automation and digitalization – cyber security



Up to 60% faster
anomaly detection

Detection of cyber attacks in real
time

Use of local data reduces risks

Intelligent response to unexpected
events through machine learning



PlantSight Cloud services

Secure, web-based
access to all plant data

Bentley
Advancing Infrastructure

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NEW

Cloud-based portal for digital twin of the plant

Consolidation of all relevant
1D/2D/3D data

Visualization of current
plant data at any time

Data consistency even on
plant expansion

All tasks visible thanks to
intuitive web portal

New process control system – web-based



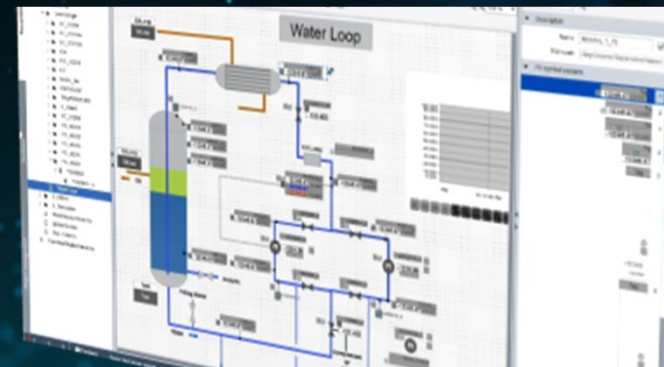
SIMATIC PCS 7 for ...



- Comprehensive range of applications for all process industries
- Continuous processes as well as batch and regulated industries
- New and existing plants



New process control system for



- Petrochemicals, water and plant infrastructure
- Continuous processes, from process modules to world-scale plants
- New plants

Common hardware platform and application architecture for Simatic PCS 7 and new process control system

-
- Web-based **multi-user engineering**
 - An **intuitive user interface** for every application
 - **Object-oriented** data management
 - Open and flexible architecture for **modular automation** and **maximum scalability**
-

SIMATIC

PCS neo

Higher productivity
with greater
customization
and complexity

Example Siemens factories

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Annual productivity

**Amberg factory and
Karlsruhe factory**

Thanks to cutting-
edge technologies

- Flexible automation
- Digitalization
- IoT/artificial intelligence

Conventional
productivity
measures

2017 2018 2019 2020 2021

Concrete examples from Siemens factories

Automation and digitalization for greater flexibility and productivity

More flexible automation (Amberg)

**Lightweight robots –
more efficient handling**



Artificial intelligence (Amberg)

**Quality control via algorithm –
higher output**



Artificial intelligence (Karlsruhe)

**Intelligent planning – asset
optimization & greater delivery
reliability**



20% higher productivity

30% reduction in costly x-ray
inspection for printed circuit
boards

>50% better demand
forecasting

Data usage – Platforms – Cutting-edge technologies – Heller4Industry example



HELLER

Business models

Flexibility

Productivity

Automation

Sinumerik

Heller Maschinenbau
Control of machines

Sinumerik Edge

Heller4Performance
Optimization of machines
Heller4Operation –
Integration in value chain

**Analyze MyMachine/
Analyze MyCondition**

Heller4Services
Predictive maintenance

MindSphere

Heller4Use
Flexibility and transparency
in machine use

Digital Enterprise tailored to specific industries – success factor: collaboration of OEM – user – Siemens



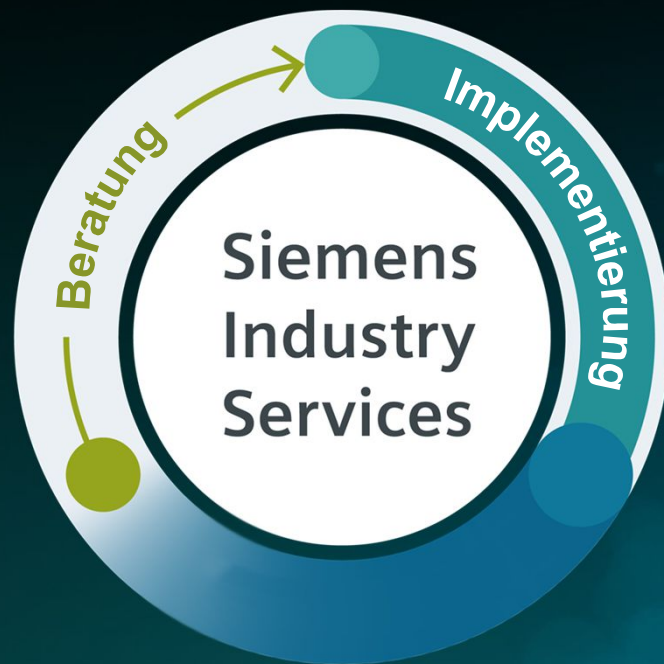
Process industries

Discrete industries



¹ Will be addressed in cooperation with other OpCos/POC

Siemens supports digital transformation from concept development to implementation



**Concept development,
implementation and optimization**

**Determining readiness
for digital transformation**

Roadmap for Digital Enterprise

Thinking industry further!

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Outlook: increasing convergence
of IT and OT

Industrie 4.0

**Working with
data**

**Optimizing with
data**

Connecting with data from IT



Digital Enterprise – Thinking industry further!

An overview of our booth

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