

Discover the value of the Digital Enterprise

Hannover Messe, April 24, 2017 | Klaus Helmrich,
Member of the Management Board of Siemens AG

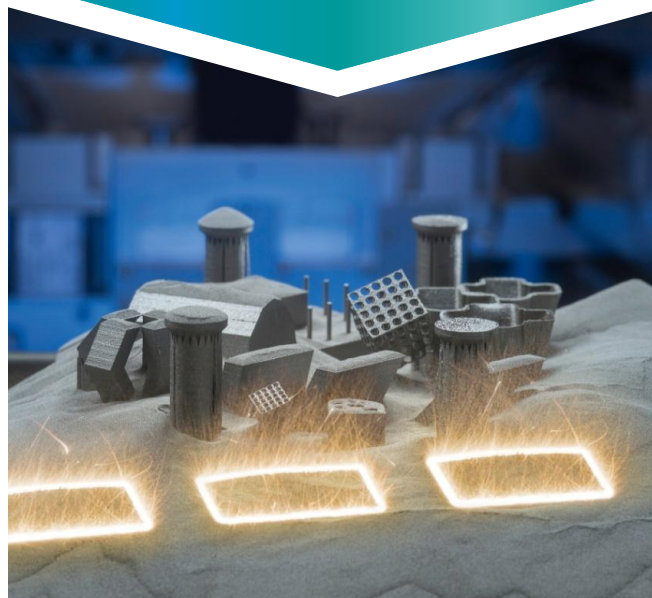
The digital transformation in industry is creating new opportunities – New business models and ecosystems are emerging

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From mechanical components ...
to smart, integrated systems



From traditional materials/
production ... to new materials
and production processes
(3D printing)



From permanently defined
variants ... to personalized
products

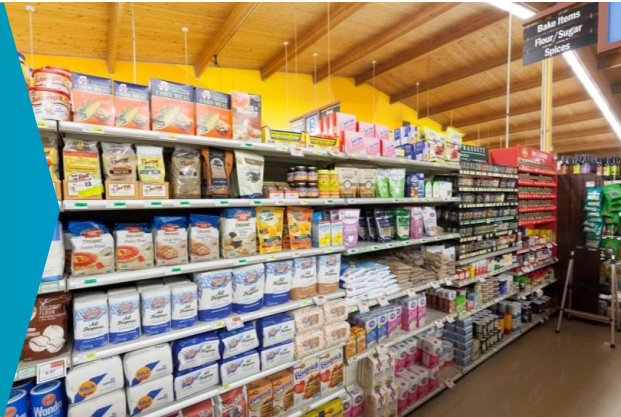


Customer demand for individual products in smaller batch sizes and greater variety leads to digitalization ...

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... in the
food/beverage
and consumer
goods
industries

– individual
packaging –



... in the auto
industry

– freely selectable
options –



... in
medicine

– drug formulas tailored
to the patient –



... even the
complete home

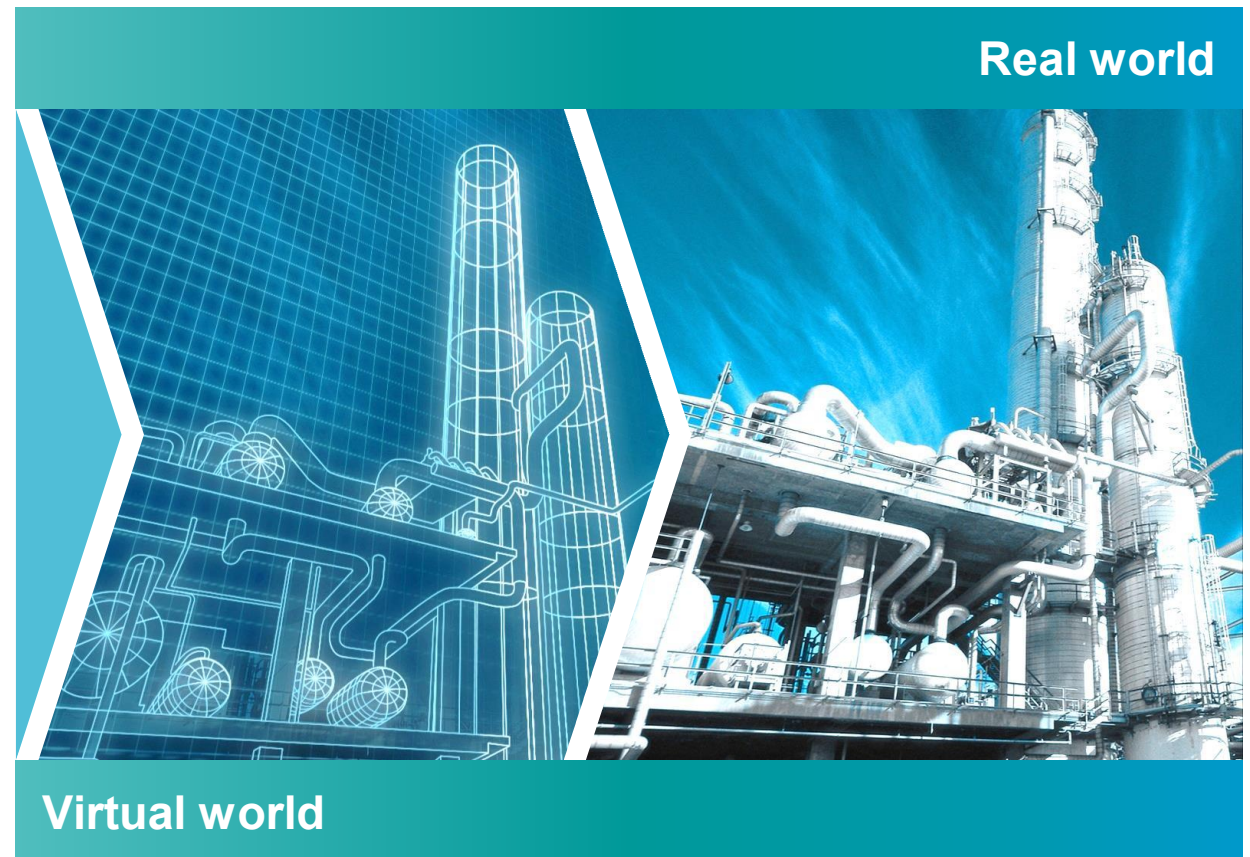
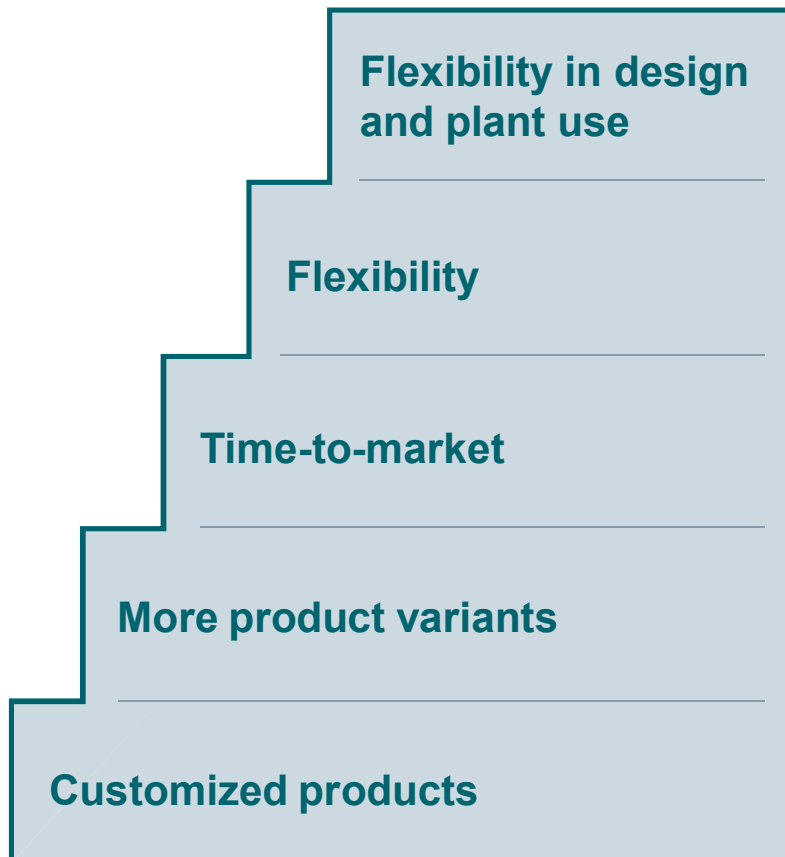
– planned and built
to customer
specifications –



Source: Keller HCW

The end-to-end consistency of the virtual and real worlds enables customized products

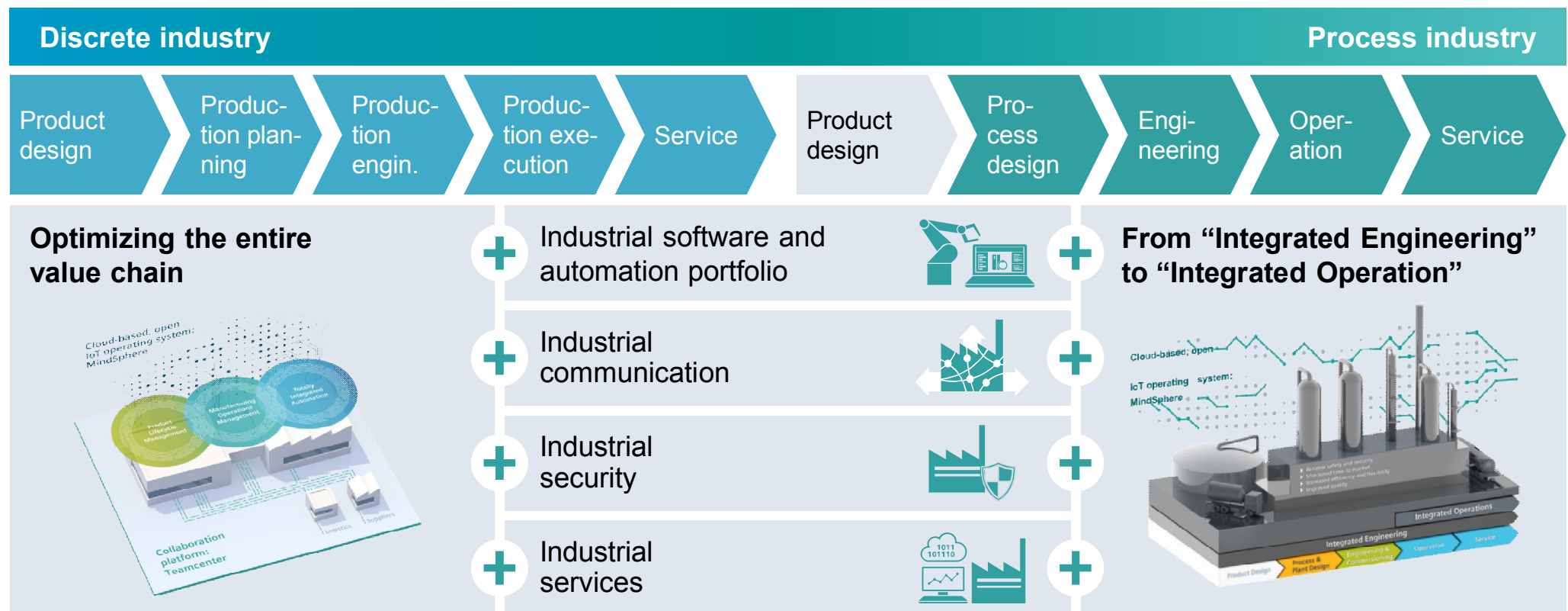
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The Digital Enterprise for the discrete and process industries brings the virtual and real worlds together



Digital Enterprise



Our digital solutions are already winning over customers and analysts



“What (...) helps us is the parallelism between building the machine physically and digitalization, so that we can coordinate the digital representations of the machine with the customer at a very early stage and begin programming.”



Dr. Hagen Gehringer, CEO, Bausch + Ströbel
Maschinenfabrik Ilshofen GmbH & Co. KG

“(...) in terms of having a unique, broad-based portfolio across the Electrification, Automation and Digitalization chain – as well as a consistent message on the practical application of digital technology – Siemens stands out.”

Morgan Stanley

“With the simulation, I know everything works. With the design alone, I think that it will work.”

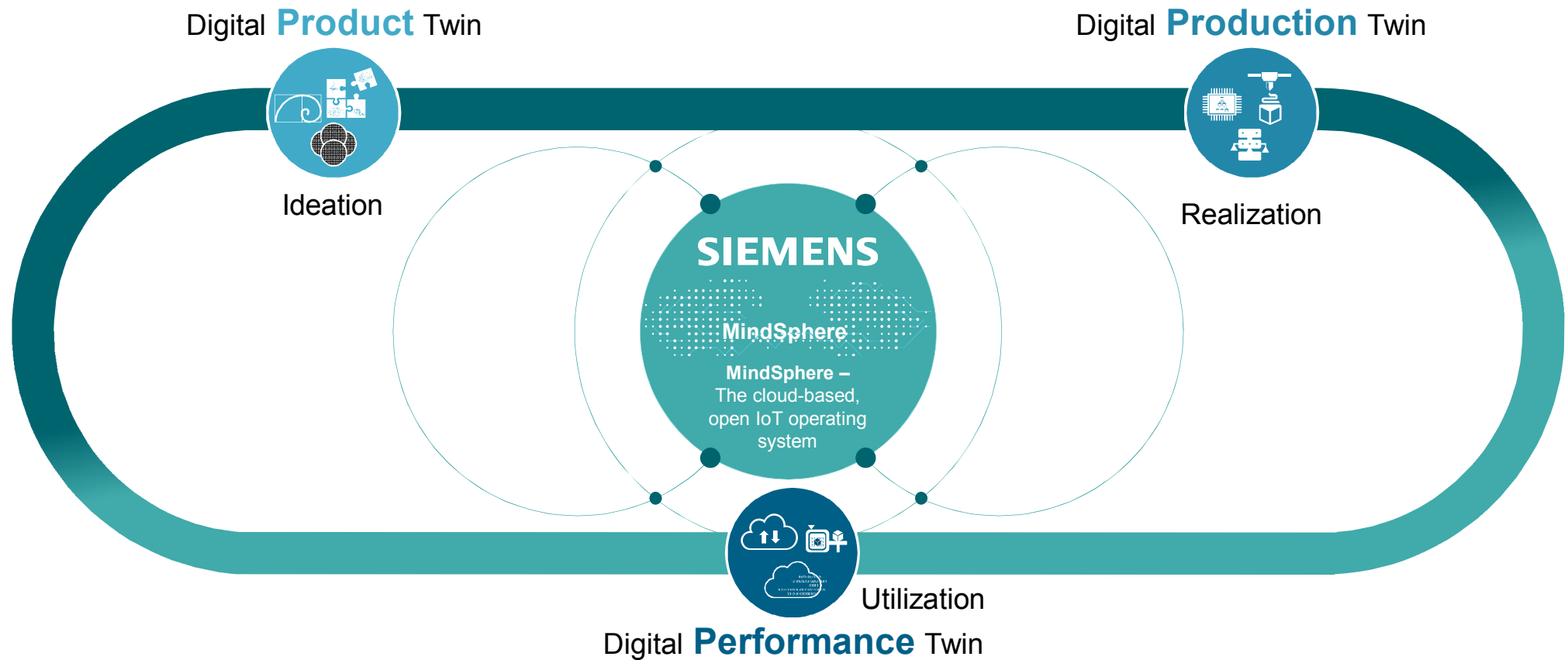
OPTIMA

Rainer Feuchter, CEO,
OPTIMA consumer GmbH

The “Digital Twin” – Design and simulation of the entire value chain

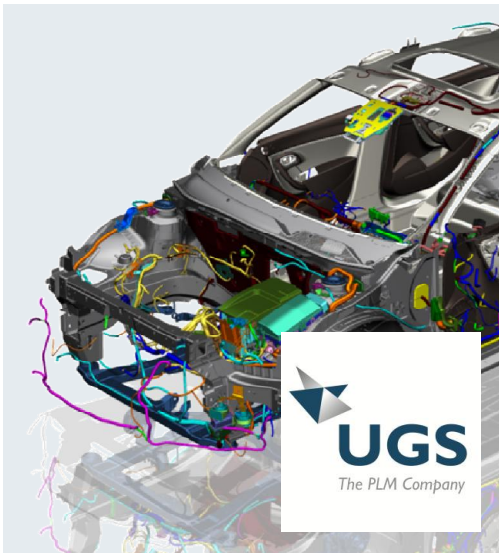
Simulation solutions are required for flexibility in design, production and process optimization

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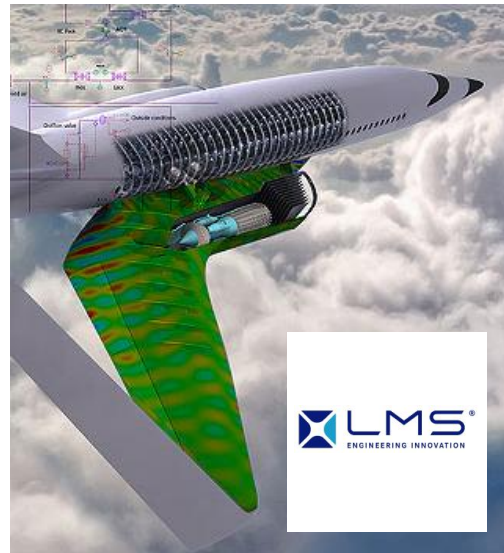


Simulation – Systematic expansion of our portfolio for design, simulation and testing

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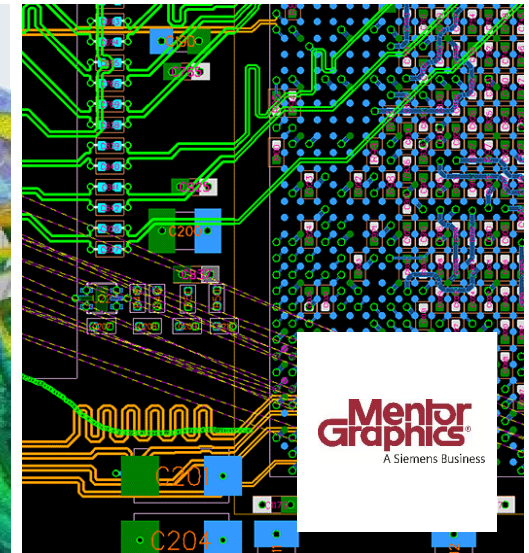
Simulated product development in 3D environments



Simulating the behavior of mechanical and mechatronic systems



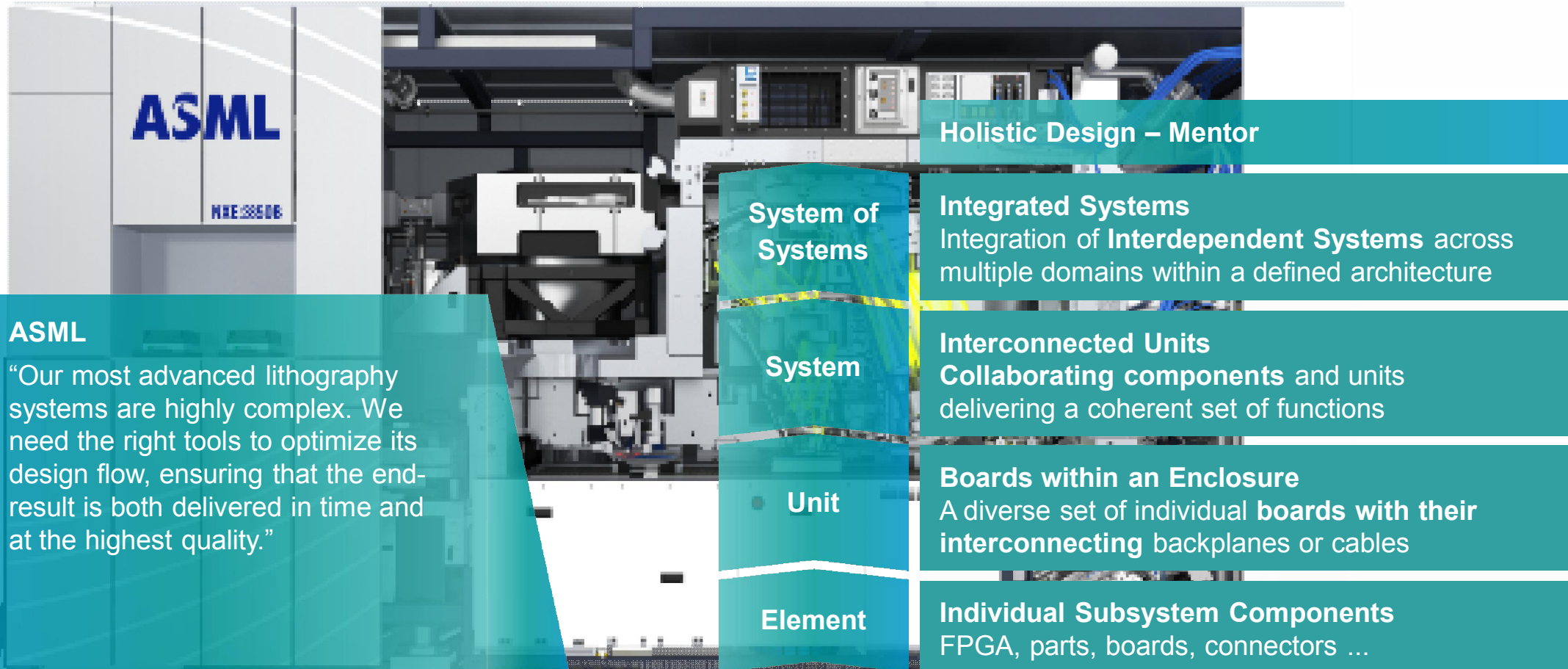
Simulation and analysis of air flows, heat transfer, fluids and gases



Simulation of electric and electronic systems

“System of Systems” Challenge – Multi-Domain Integration Demands – ASML Example

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Innovation and digitalization in machine building – Bausch + Ströbel – packaging machines for the pharmaceutical industry



Digital twin of the machine

based on Teamcenter with NX, Mechatronics Concept Designer (MCD) and TIA Portal

- Permits simulation and testing, from the concept to the real machine

Customer benefits:
At least 30% engineering efficiency saves time and money and increases flexibility

Innovative hardware components

SIMATIC S7-1500 T-CPU with Safety Integrated

- Motion control functionality, including absolute camming and failure tolerance on one CPU



**Virtual commissioning reduces time-to-market,
increases flexibility and saves money**

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Benefits

- Simulation of the complete plant in the virtual world even before it is used in the real world
- Shorter commissioning
- Early error identification
- Time savings
- Lower costs
- No unscheduled events on the construction site
- Personnel training

Virtual world

(Source: Consorzio Macchine Utensili (Comau))

Real world

Comprehensive simulation portfolio for the process industry

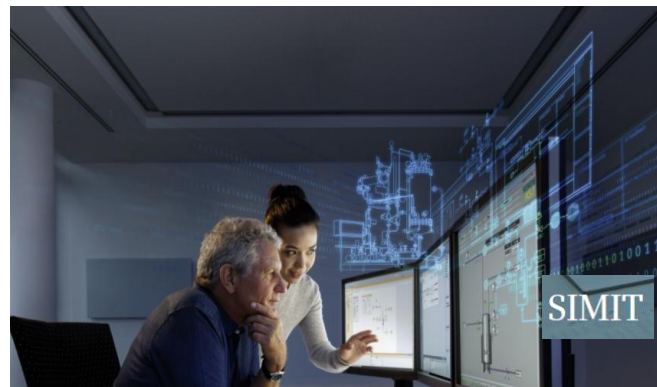


COMOS and COMOS Walkinside Plant construction software



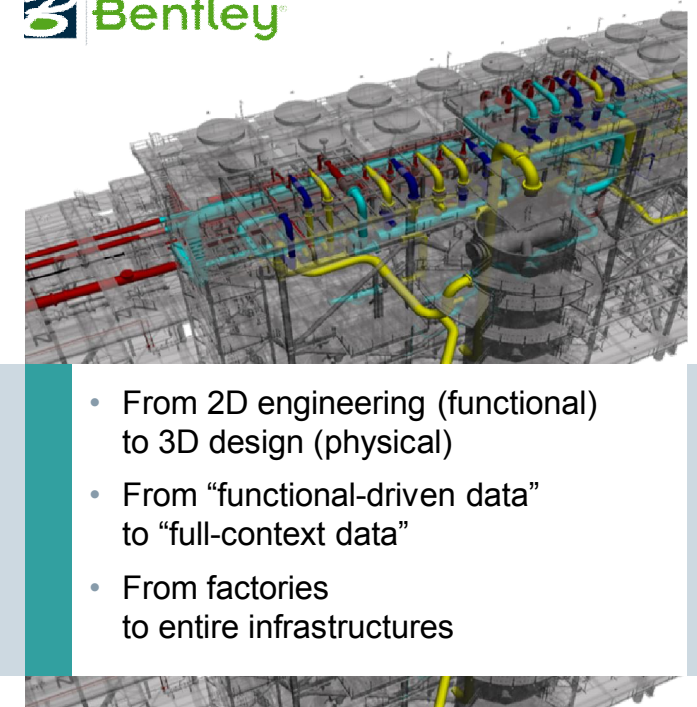
- Integrated plant construction
- Shared data platform
- End-to-end plant asset management throughout the entire lifecycle of an industrial plant

SIMIT – simulation and training software



- Virtual commissioning of plants and process workflows
- Emulation based on an integrated virtual controller
- Realistic environment simulation for training purposes

3D design software (from 2D to 3D)



- From 2D engineering (functional) to 3D design (physical)
- From “functional-driven data” to “full-context data”
- From factories to entire infrastructures

The digital twin is the “heart” of the smart factory – Plant simulation adds value – Volvo as an example

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Benefits

- Virtual model
- Personnel deployment planning
- Definition of multidisciplinary work packages
- Visualization of construction status
- Planning of mechanical finishing
- Definition of work packages for finishing/commissioning
- Library of industry-specific checklists

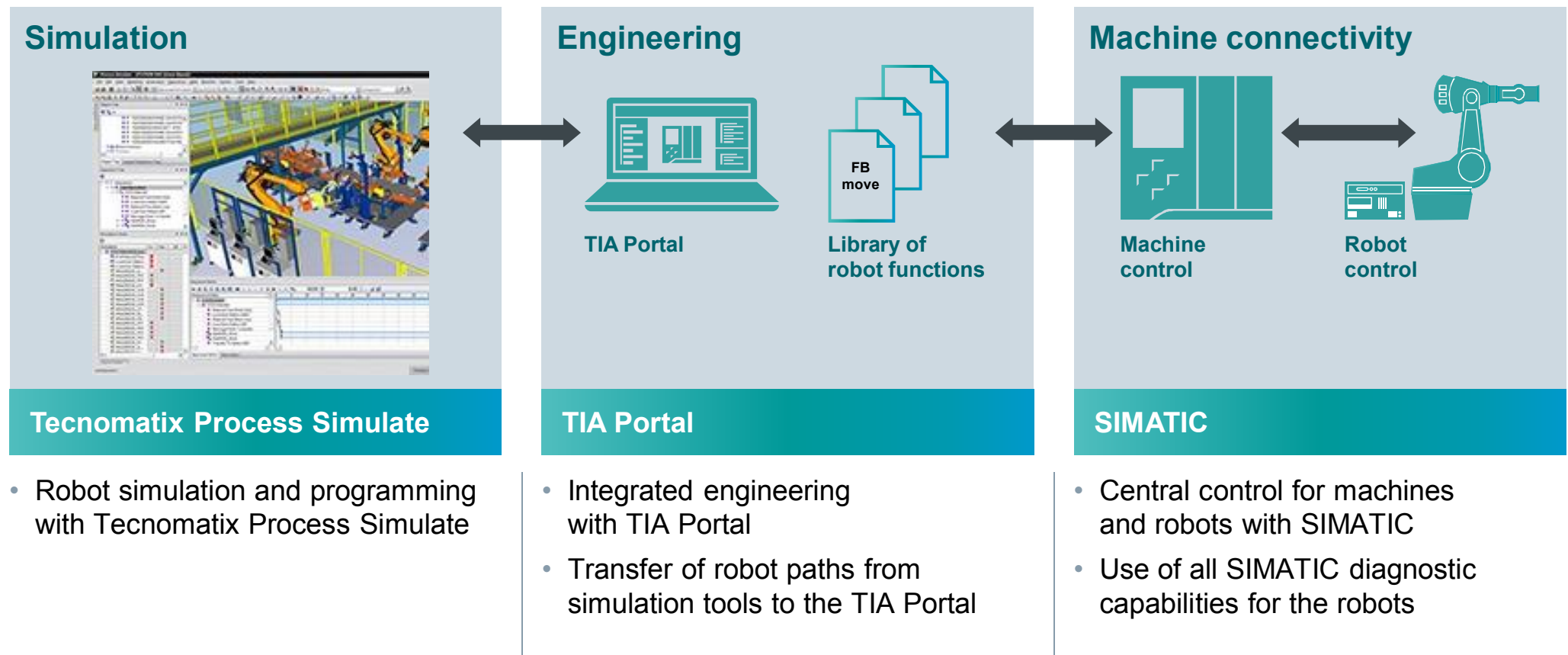


Movie: Volvo Cars Group



New production forms and processes

New possibilities for handling systems and robot integration through simulation, engineering and machine connectivity



Customer benefits – Saves time and makes robots easy to use – Gämmerler GmbH (OEM postpress operation)

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Customer benefits

- **Saves engineering time** through a shared engineering platform for robotics and PLC
- **Simplified operation of the entire plant**, thanks to central control and one HMI for machines and robots

Siemens solutions used

- TIA Portal
- SIMATIC S7-1500 F-CPU
- Comfort panels



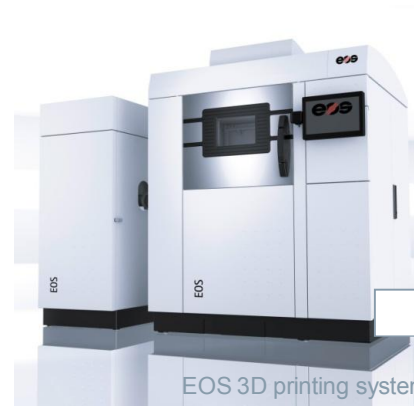
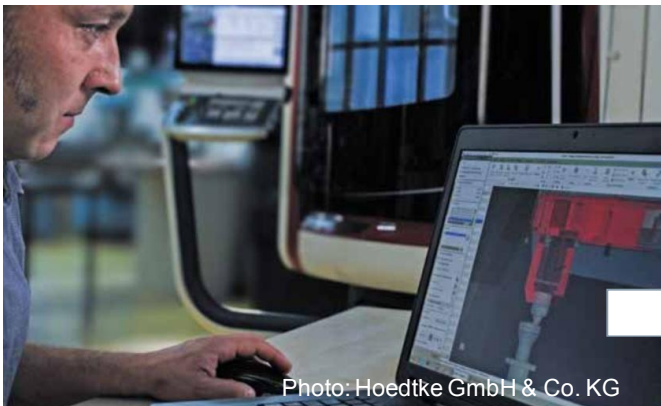
Additive manufacturing benefits customers through fast manufacturing of customized products

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Consistent, end-to-end portfolio from design to machine automation

Cooperation with leading manufacturers of 3D printing systems

Finished product
Advances through **customization**



Showcase
at Hannover
Messe

Siemens

- Siemens NX and Teamcenter
- Automation technology, incl. SINUMERIK, SIMATIC

Partners

DMG MORI

stratasys

eos
e-Manufacturing Solutions

TRUMPF

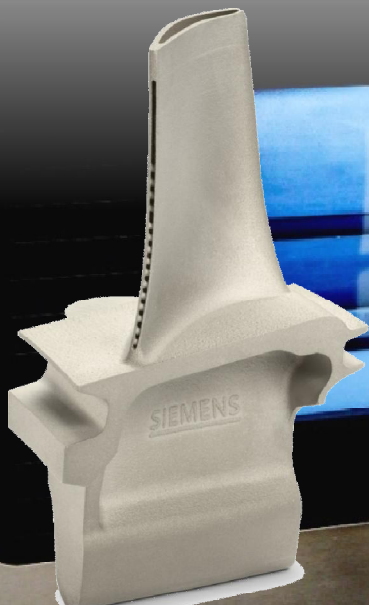
hp

Benefits

- Fast availability of individual products, e.g. a patient-specific surgical aid in this case

Breakthrough in 3D printing – Siemens tests gas turbine blades produced entirely by additive manufacturing at full power

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For example at Siemens in Finspång, Sweden, and Berlin, Germany, in cooperation with Materials Solutions in Worcester, UK

Customer benefits

- Prototype development is up to 90% faster
- Unique designs are possible
- Improved component properties
- Spare parts available “on-demand”

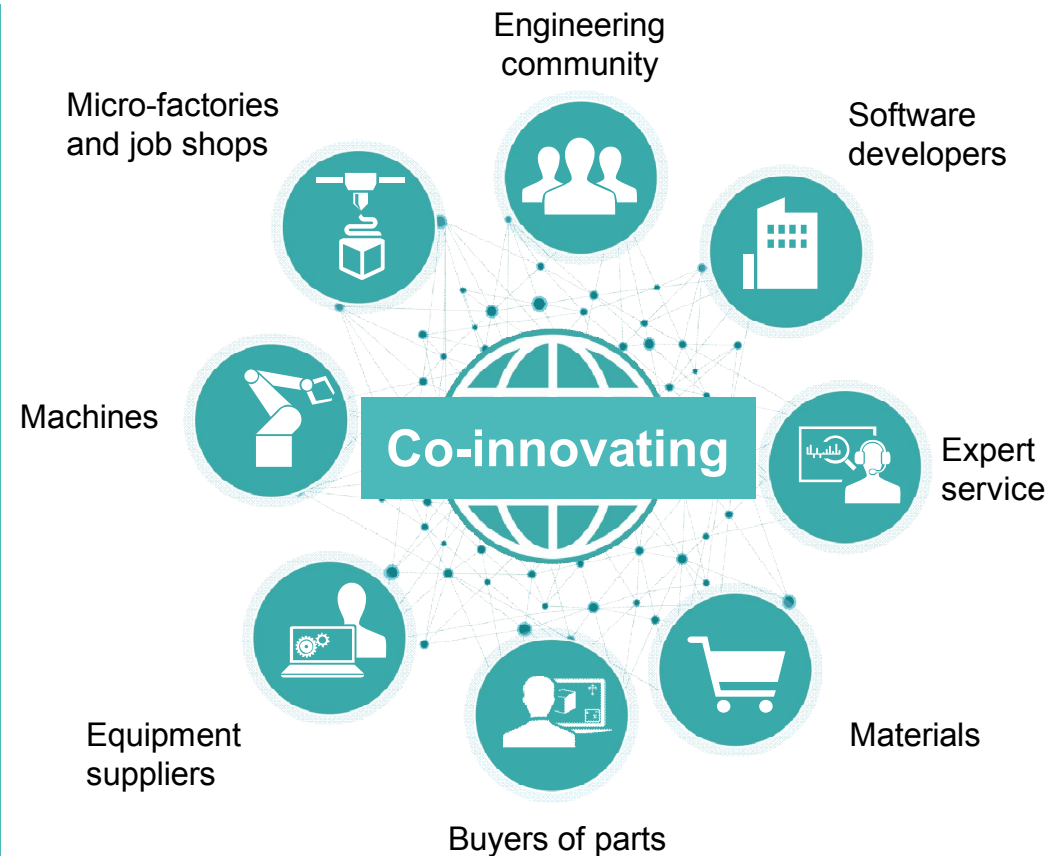


Siemens Part Manufacturing Platform¹ – A global gateway to on-demand design and manufacturing



- A global, digital partner collaboration platform for decentralized industrial additive manufacturing (AM)
- An “ecosystem” for product developers, experts, producers, 3D printer OEMs and suppliers of AM materials and software
- The Siemens offering: Design and simulation software, control and automation solutions and MindSphere

¹ Project in preparation



Customized production – adidas and Siemens cooperate on SPEEDFACTORIES



Innovation partnership: adidas – Siemens

adidas

- Will in the future offer its customers sporting goods tailored to specific customer requirements
- Flexible production of highly functional and individual products – faster than ever before!

Siemens

- Simulates the entire value chain – before the first seam is made
- Automates production

Customized production at the customer's request: Shorter time to market/greater flexibility/better quality/higher efficiency



Photo: adidas

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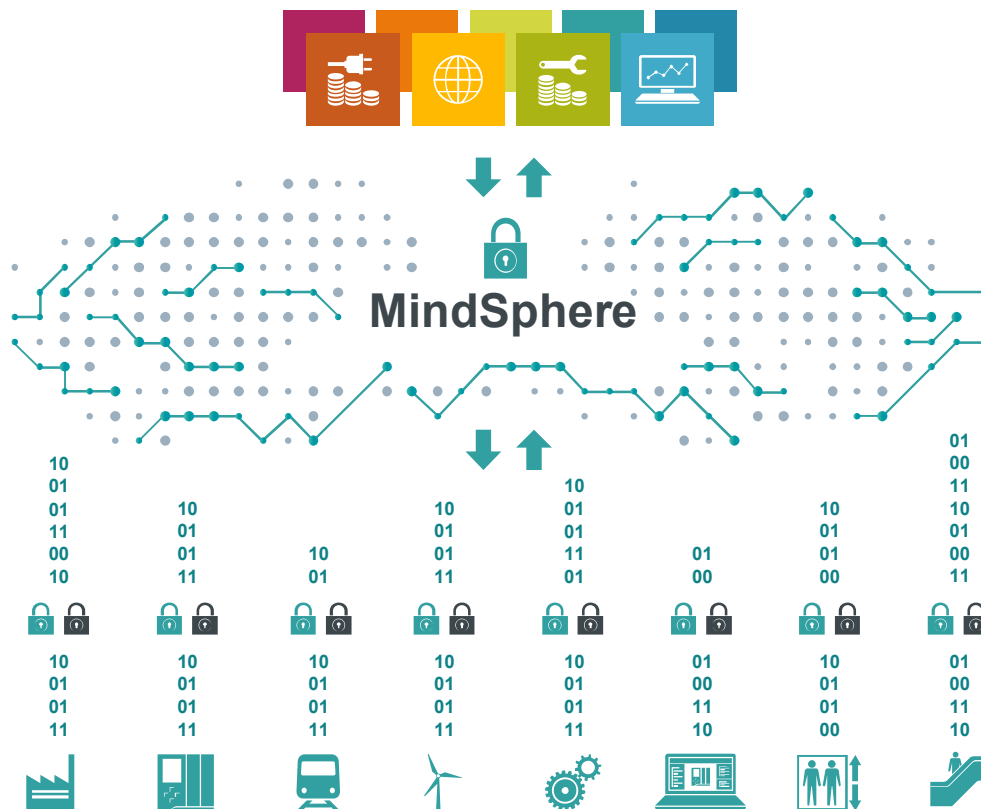


MindSphere

Data-based services – Cloud connectivity and new business models

MindSphere – The cloud-based, open operating system for the Internet of Things – from Siemens

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MindApps

- Apps from OEMs, from end customers, from partners and from Siemens
- Transparency in plants and analytical insight (e.g. fleet management)

MindSphere

- Open interface for developing customer-specific apps
- **Different cloud infrastructures: SAP, AtoS, Microsoft Azure** as public or private clouds or on the premises (planned)

MindConnect

- **Open standards** for connectivity, e.g. **OPC UA**
- **Plug & play connection** of Siemens and third-party **products**
- **Secure and encrypted** data communication

MindSphere applications – A comprehensive ecosystem with strong partners

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Our partners



- Consulting/strategic partners
- Connectivity partners
- Application developers
- Technology providers
- System integrators
- IaaS providers

Condition monitoring of machine tools with MindSphere – Gebr. Heller Maschinenfabrik GmbH

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Gebr. Heller Maschinenfabrik GmbH

- Leading supplier of CNC machining centers and flexible production systems

Siemens Solutions

- Complete automation and drive technology
- MindSphere platform

Benefits

- Global access to data (connectivity over the cloud)
- Increased productivity, quality and availability for the end customer
- New business model for collaboration with the end customer

Heller offers its own condition monitoring app: “Heller Services Interface”



Photo: Gebr. Heller Maschinenfabrik GmbH

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Cloud connectivity at the customer's request – Calvatis GmbH uses new business models with MindSphere

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Photos: Calvatis GmbH

Calvatis GmbH

- Manufacturer of industrial cleaning machines and cleaning agents for the F&B industry

Siemens Solutions MindSphere

- Connects the cleaning machines to the cloud via MindConnect Nano
- Visualizes the data
- Facilitates performance management and predictive maintenance

Benefits

- Meets explicit end customer demand
- Permits new digital services and business models
- Vision: Pay-per-use business models

Secure water supply at optimized costs – Fernwasserversorgung Franken (MindSphere ready)

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Fernwasserversorgung Franken (FWF) supplies large parts of Central and Lower Franconia with drinking water

- Operates 52 wells, 5 waterworks, more than 35 pumping stations
- Water for approx. 325,000 people

The Siemens SMART WATER solution

- Helps ensure the supply of drinking water
- Optimizes pumping schedules, i.e. pumps use electricity at times when prices are low and supply is high
- Assists the water industry in participating actively in the energy market

Customer benefits:
Saves energy and costs by
optimizing pump operation
(15% optimization potential)



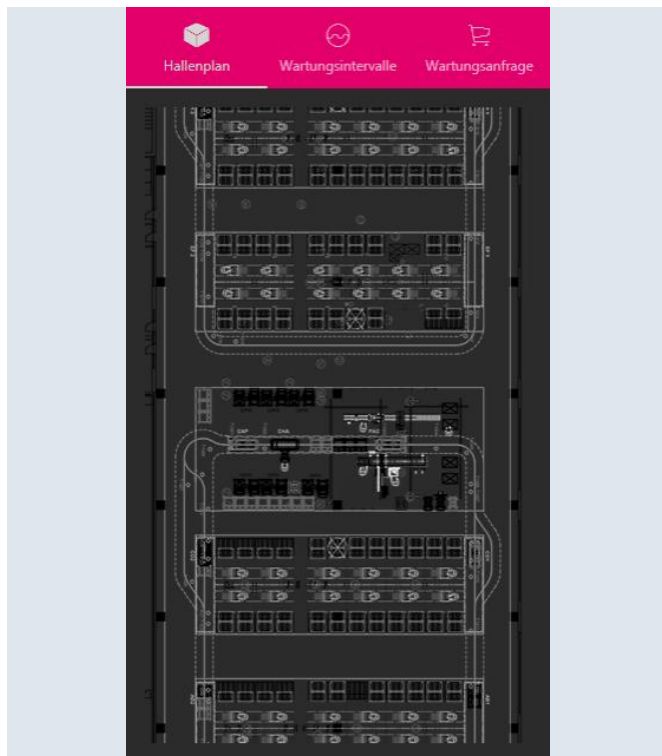
Photo: Fernwasserversorgung Franken

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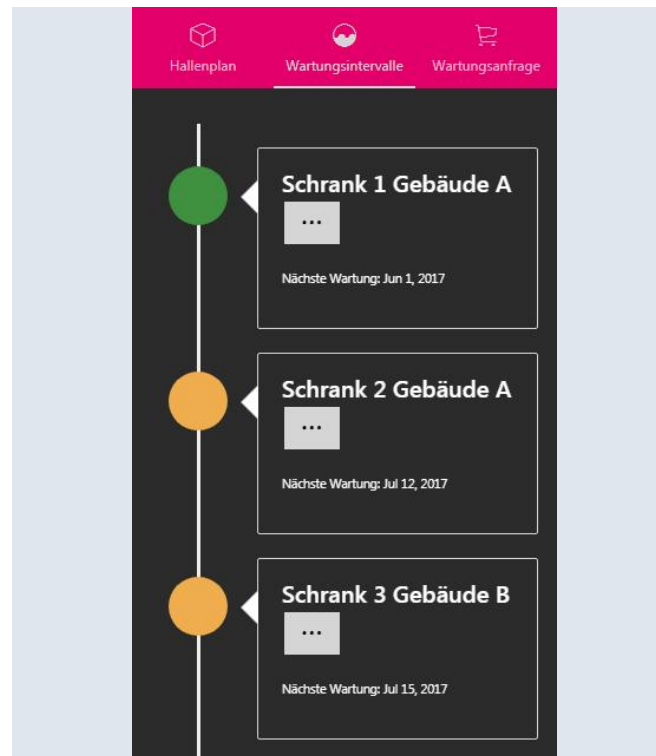
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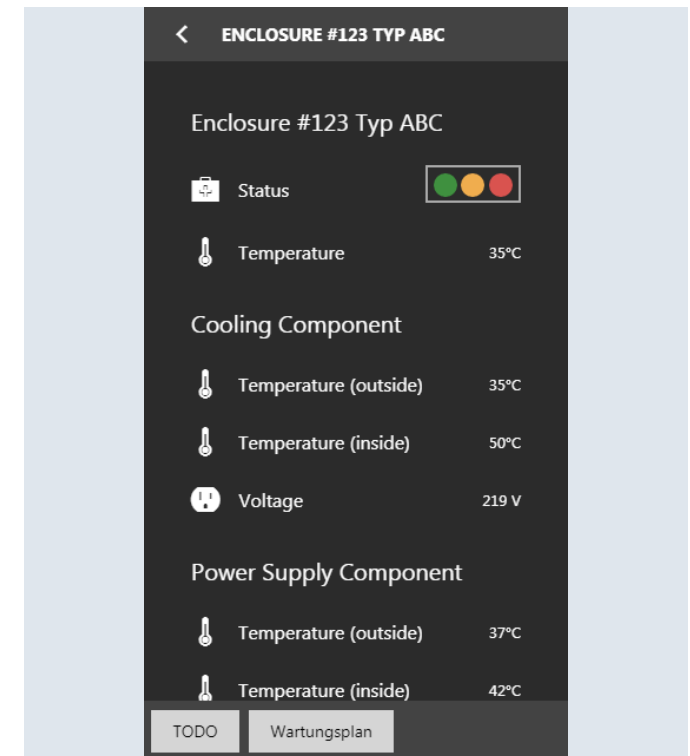
Data from the cooling unit to MindSphere – Siemens and Rittal enable future predictive maintenance of control panels



Virtual hall plan



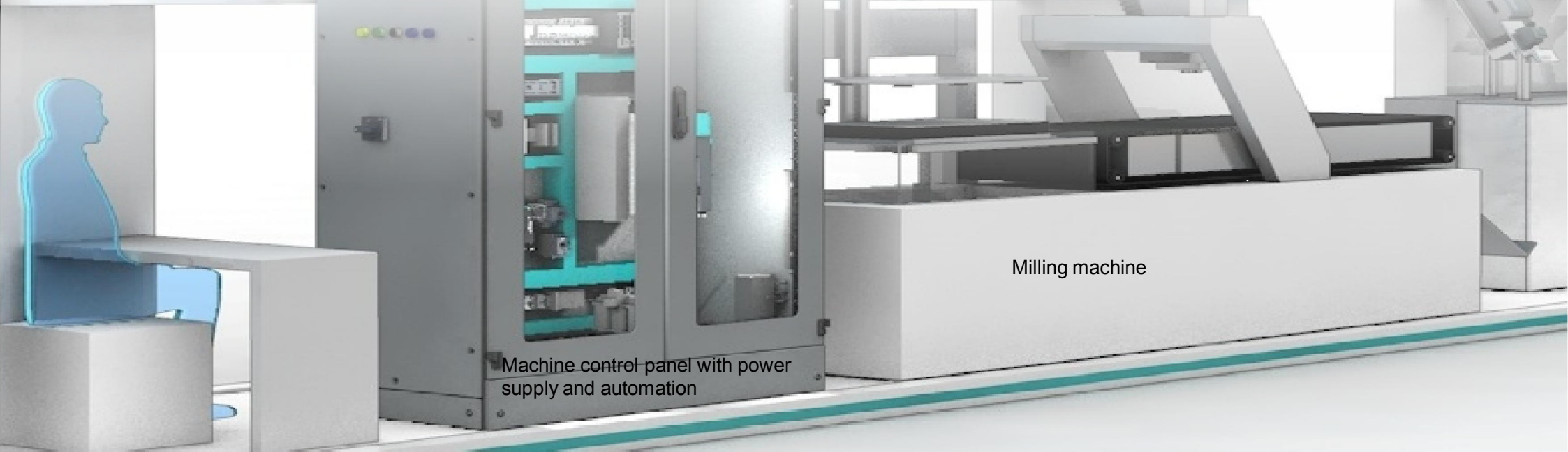
Equipment overview



Equipment status

Complete view of the data – EnergyIP will run on MindSphere in the future

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Automated engineering,
e.g., with databases of low-voltage switchgear

Integration in industrial automation systems,
e.g., with the TIA Portal

Energy data collection,
e.g., via the 3VA molded-case circuit-breaker or the 7KM PAC meter

Connection to MindSphere
and data evaluation,
e.g. via apps

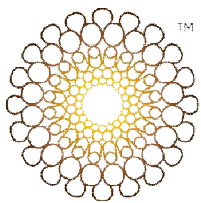


Siemens-Expo 2020 Premier Partnership for Intelligent Infrastructure and Operations enabled by MindSphere

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As Expo 2020 Premier Partner, Siemens will be providing a wide range of innovative solutions, technologies and products

- E. g. our **open, cloud-based IoT operating system, MindSphere**, for optimization of energy management and building management on Expo-site
- At the Expo 2020, we will show how MindSphere can also create major customer benefits for infrastructure



**EXPO
2020
DUBAI
UAE**

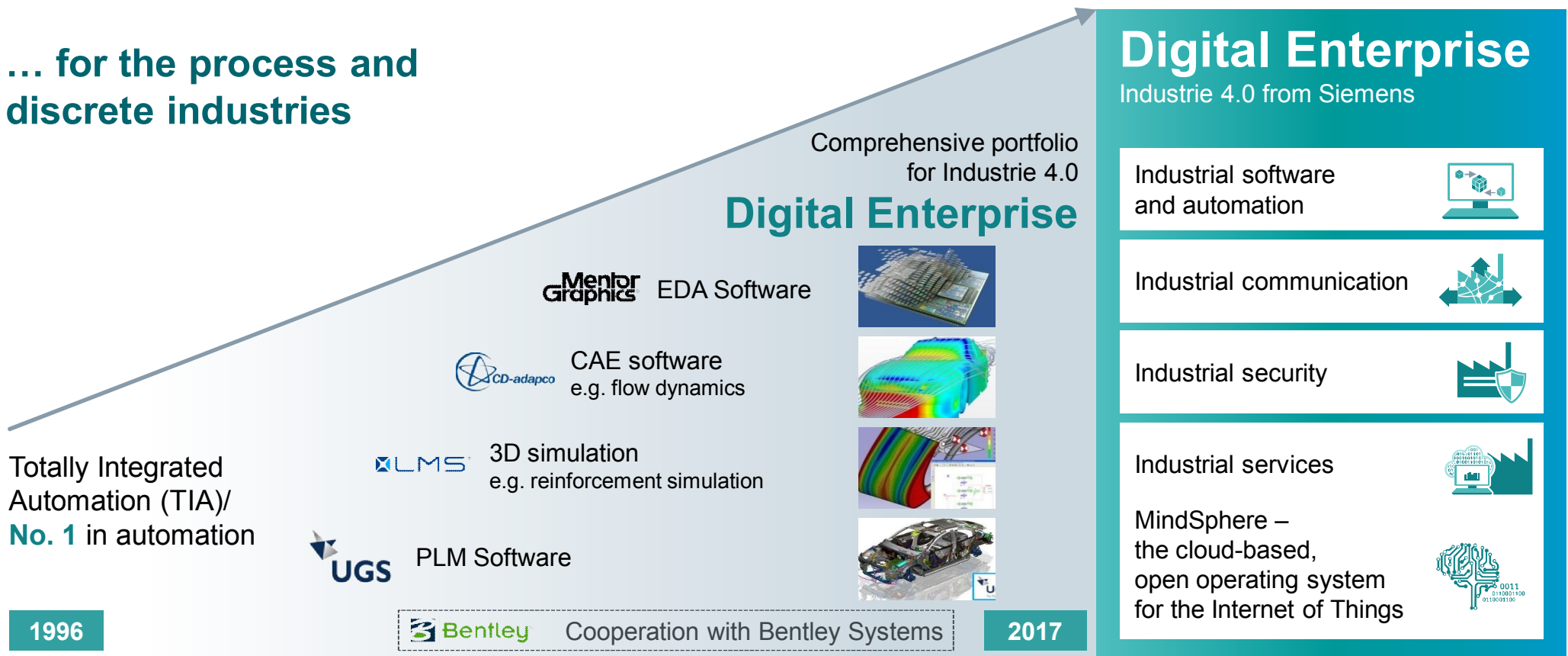
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OFFICIAL PREMIER PARTNER

From our leading position in automation, we're driving digitalization of our business and the entire industry

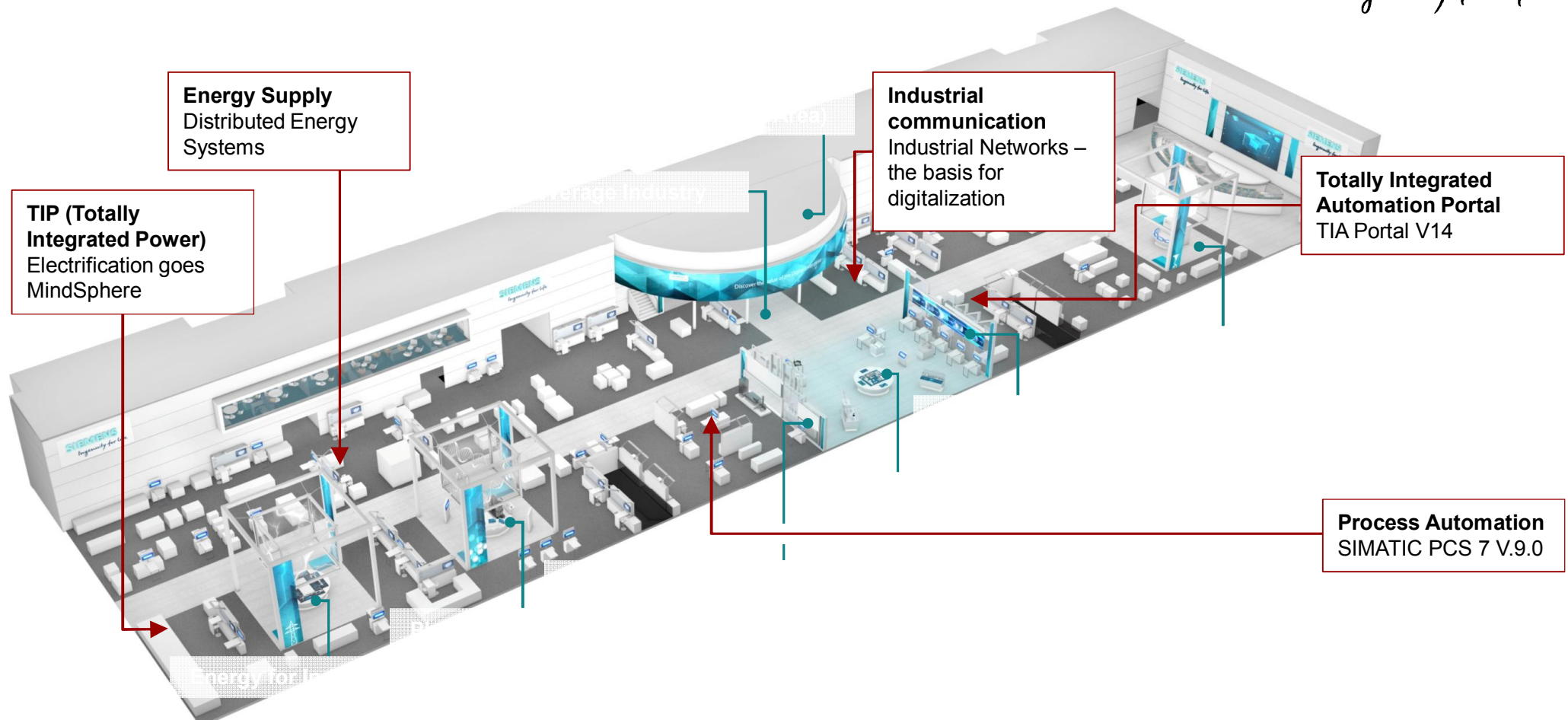


... for the process and discrete industries



Visit us in Hall 9 at Hannover Messe 2017

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Your questions

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Back-up!

Connection between discrete and process industries – Customized production based on the example of the dairy industry

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Individual
customer
requirements



Customized
product

1 Product and process design

- Teamcenter and NX (packaging)
- R&D Suite (recipe/formulation)

2 Production or process planning

- COMOS as a planning tool for using SIMATIC PCS 7
- Plant simulation as the basis for using TIA Portal

3 Engineering

- **Control:** COMOS + SIMATIC PCS7 and SCADA/PLC/TIA solution
- **Bottling and packaging:** Solutions engineered with TIA Portal

4 Production or operation

- SIMATIC IT
- COMOS + SIMATIC PCS7 and SCADA/PLC/TIA solution
- KHS direct print machine

5 Service

- MindApps customized for F&B
- Process monitoring
- Line monitoring
- Lifecycle services
- Energy analytics

Hannover Messe 2017 – A selection of our new products and solutions

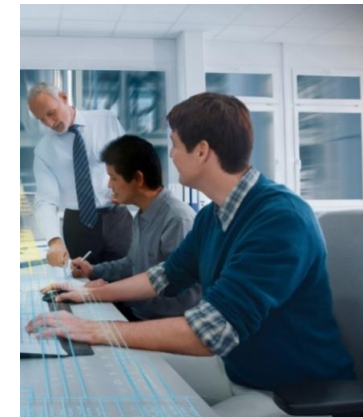
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**New servo
drive system
SINAMICS S210**



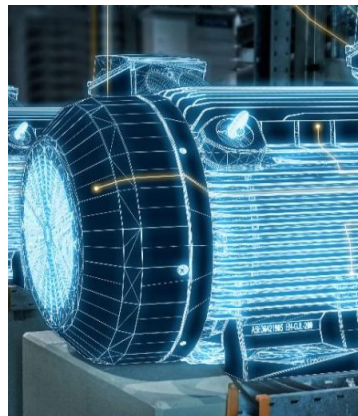
**Integrated
control panels**
The easy way
to an optimum
control panel



**SIMATIC PCS 7
V.9.0**
Higher pro-
ductivity for
equipment
operators and
maintenance
personnel



TIA Portal V14
Greater
consistency:
open, virtual
and networked



SIMOTICS SD
The next gen-
eration of low-
voltage motors

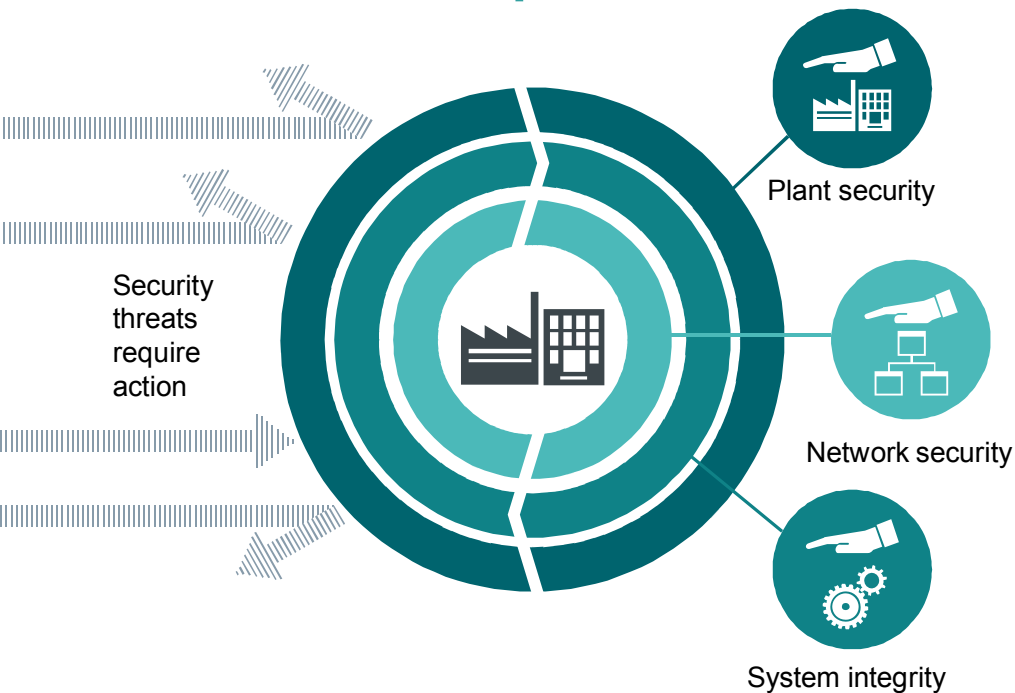


**Industrial
networks –
the basis for
digitalization!**
Concepts for and
implementation
of industrial
networks
of the future

Digitalization requires maximum industrial security – Our cyber security portfolio



Siemens security concept – “Defense in Depth”



Siemens products and systems offer integrated security



Knowledge and
copy protection
User management



Firewalls and VPN

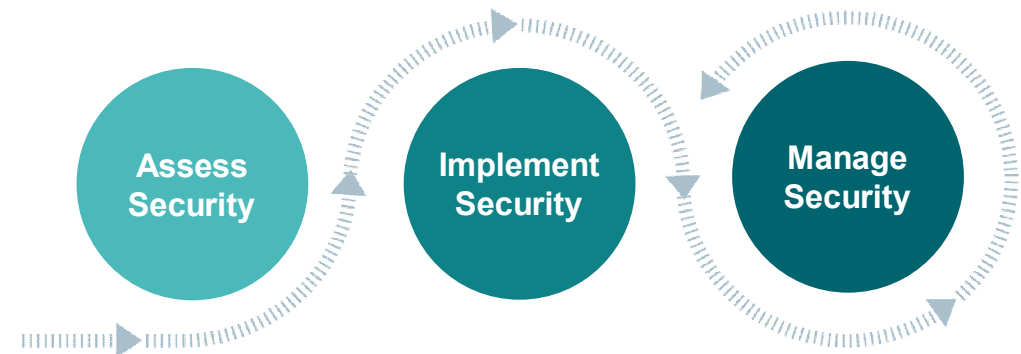


Physical protection
Processes and
guidelines



System improve-
ments, Continuous
monitoring

Siemens Plant Security Services



Industrial Security – Siemens meets the highest security standards for products and production



- Protection against denial-of-service attacks
- Defined behavior in the event of an attack
- Improved availability



- “Secure Product Development Lifecycle” for the DF and PD Divisions based on IEC 62443-4-1
- “Industrial Control Systems and Components,” SIMATIC PCS 7, based on IEC62443-4-1 and IEC62443-3-3 (ed. 1)



- The first certification for security levels (CSPN – Certification de Sécurité de Premier Niveau)

- TIA Ethernet-based devices
- E.g. S7-1500, 1505S, S7-300, CP343-1 SCALANCE S

- PLM process of DF and PD
- PCS 7 process control system

- S7-1500 controller
- XM408-8C

Since 10/2012
More than 100 devices certified

Since 8/2016

Since 4/2016

Hannover Messe 2017 – Siemens motto – Discover the value of the Digital Enterprise



From our leading position in automation, we're driving the digitalization of our business and the entire industry

- We connect the virtual and real worlds with our Digital Enterprise portfolio
- **Design and simulation**
We are the only supplier to offer the digital twin throughout the entire value chain –
for products (NX), production (Tecnomatix) and the process industry (Bentley/Comos)
- **Driving new production forms and processes**
We simplify the integration of new production methods –
with new solutions for handling systems and robot integration
We support additive manufacturing for all branches of industry –
with our software portfolio, our automation solutions and by establishing an open, global “digital marketplace”, created with leading partners (in preparation)
- **Data-based services**
We make connectivity to the cloud easy and enable new business models with MindSphere –
the cloud-based, open operating system for the Internet of Things
Numerous partners present their MindApps for the entire industry (e.g. Atos, Microsoft, Accenture, SAP)