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Ingenuity for life

Industry trends
TIA Portal in Digital Factory

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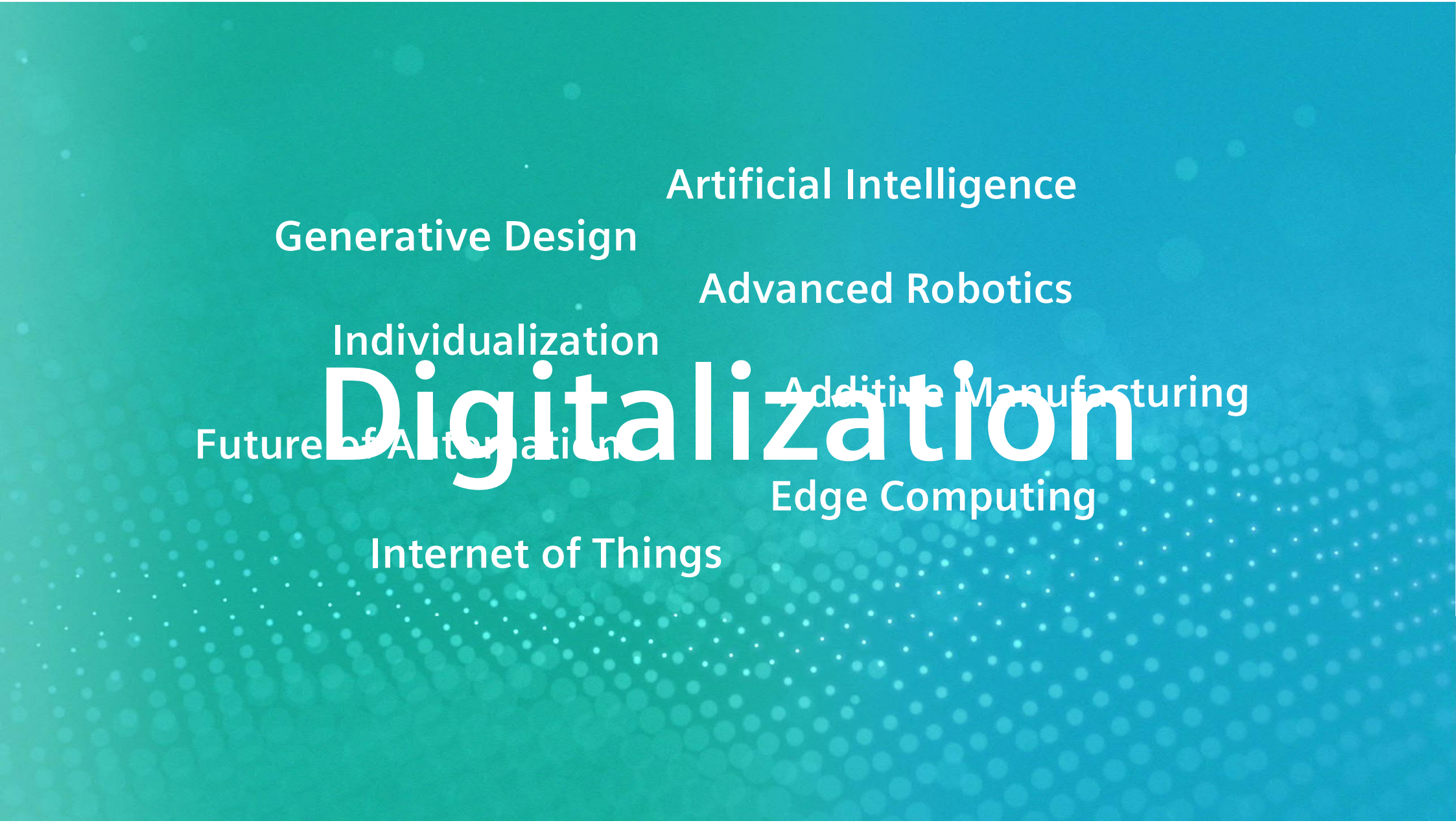
Lucian George Dragnea


Artificial Intelligence
Generative Design
Advanced Robotics
Individualization
Digitalization
Additive Manufacturing
Future of Automation
Edge Computing
Internet of Things

Essential market and customer requirements

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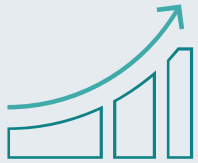
Speed

Flexibility

Quality



Efficiency

New business models

Security

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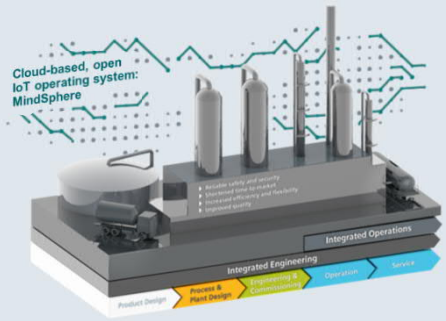
Digital Enterprise

Process Industries

Product design | Process and plant design | Engineering | Operation | Services

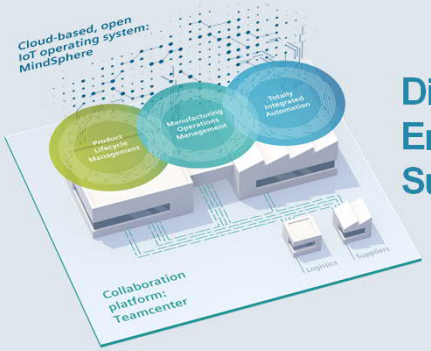
Industrial Software and Automation for process industries



Discrete Industries

Product design | Production planning | Production engineering | Production execution | Services

Industrial Software and Automation for discrete industries



Digital Enterprise Suite

Industrial Communication

Industrial Security

Industrial Services

Technological forces transforming industry

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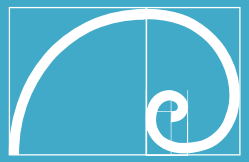
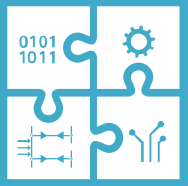
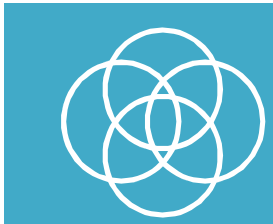
Changing the way products come to life



Generative design

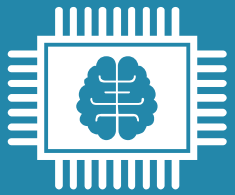


Intelligent models



System of systems

Changing the way products are realized



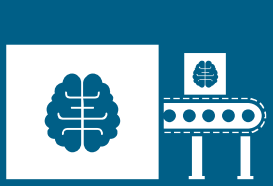
Intelligent automation

Additive manufacturing

Advanced robotics

Changing the way products evolve

Cloud ecosystems



Knowledge automation

Big data analytics

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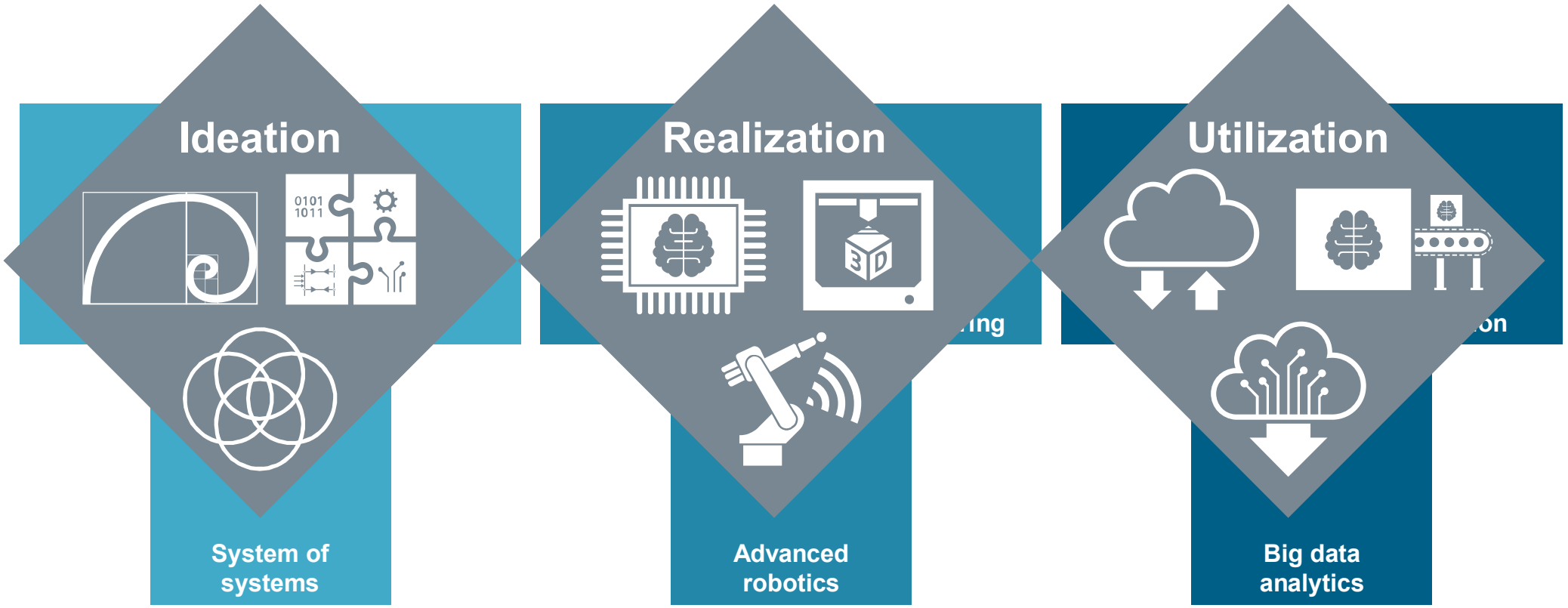

The most holistic Digital Twin

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Design, simulate and verify products digitally, including mechanics and multi-physics, electronics and management of software

Digital Twin Product

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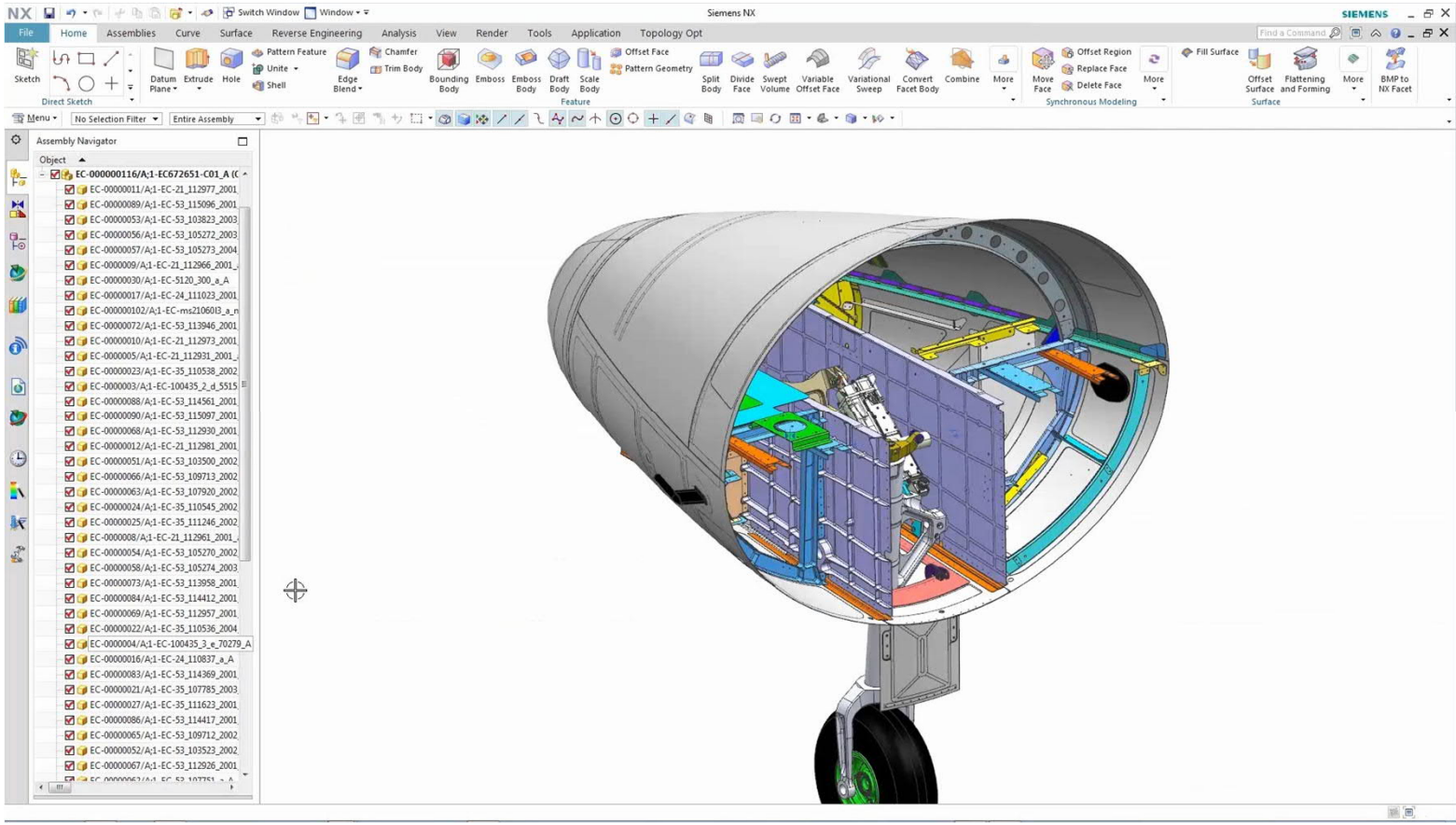
Design and simulate the product

NX CAD and Simcenter



Digital Twin Product

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Simulate the physical behavior

Simcenter

Digital Twin Product

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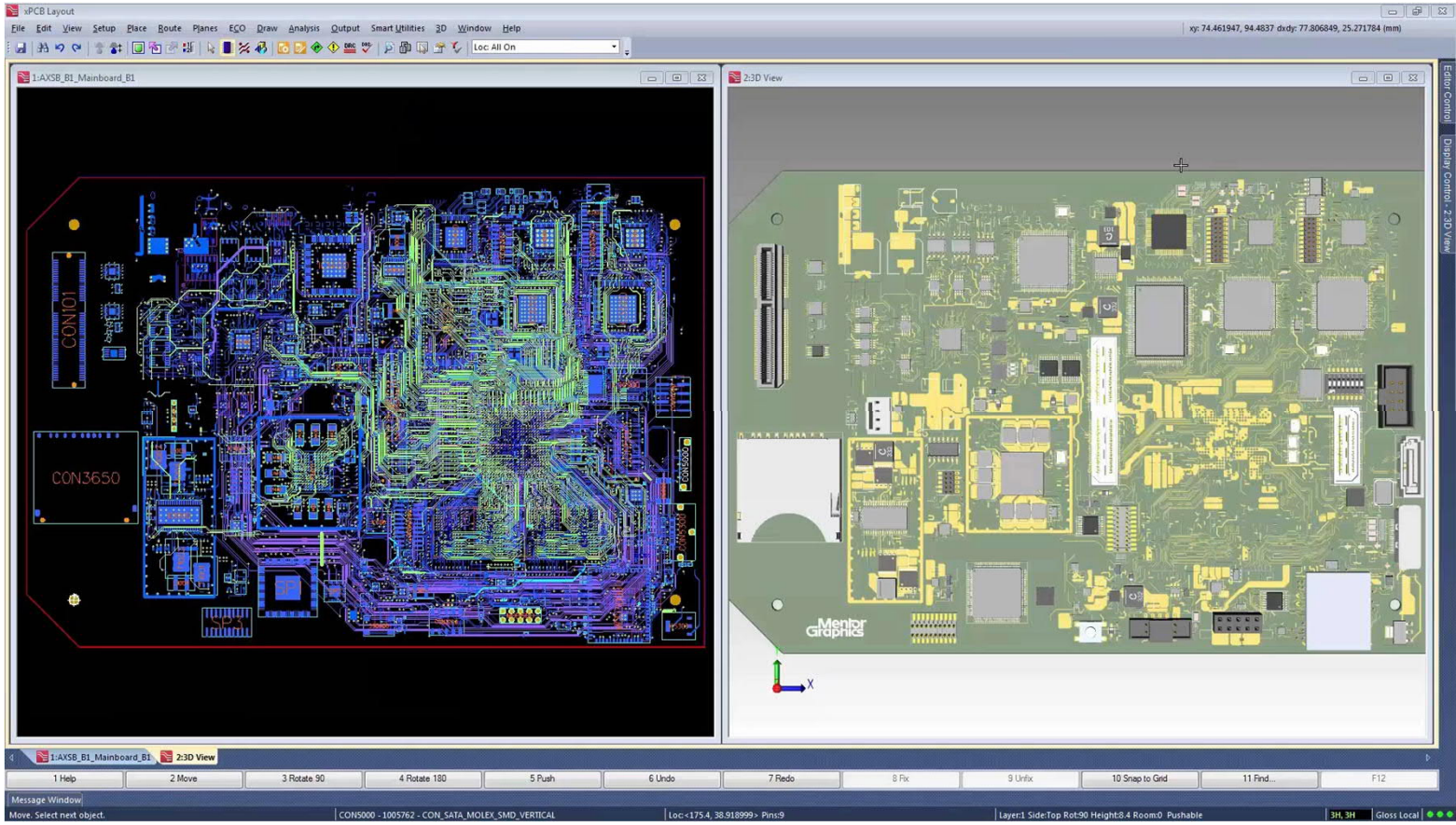
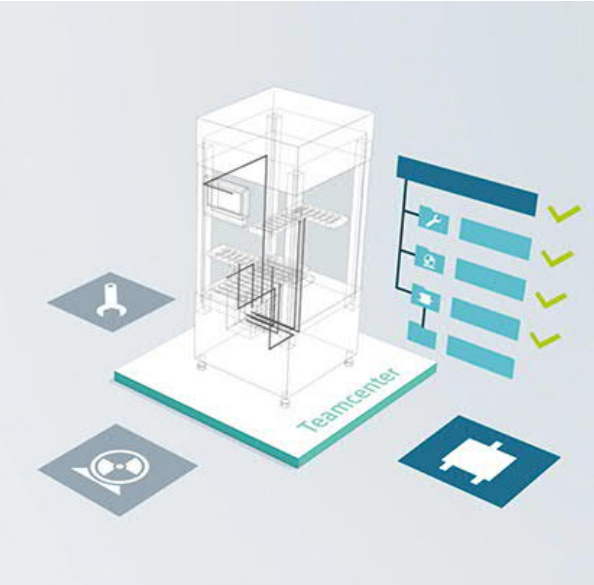
Develop integrated electrical and electronic systems

Capital, Xpedition



PLM integration of automation engineering



Teamcenter and PLM integration

Benefits

+ No time-consuming search processes
+ Errors avoided thanks to consistent engineering data

Our offering

- TIA Portal
- Teamcenter

The most holistic Digital Twin

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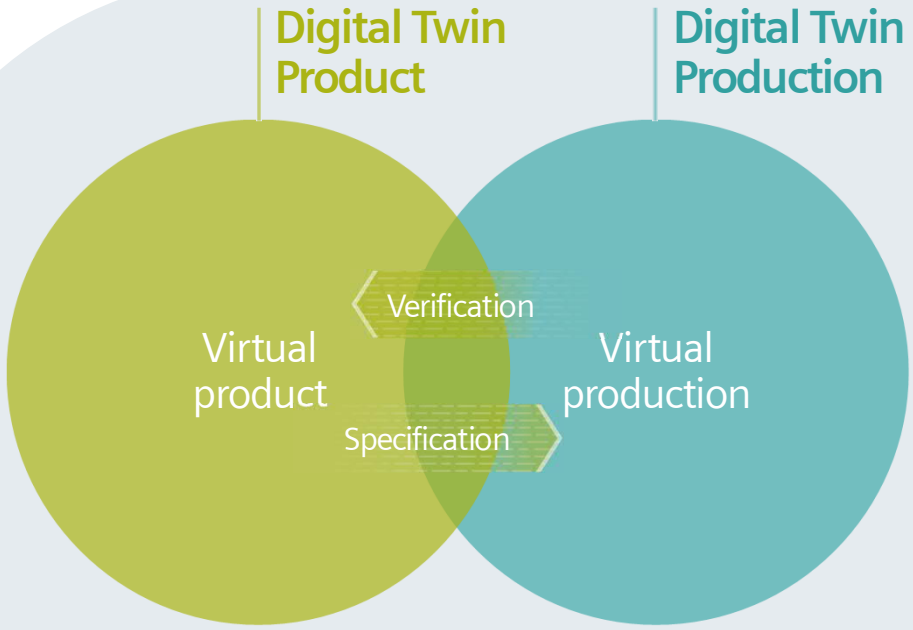

Plan, simulate, predict and optimize production digitally with PLC code generation and virtual commissioning.

Digital Twin Production

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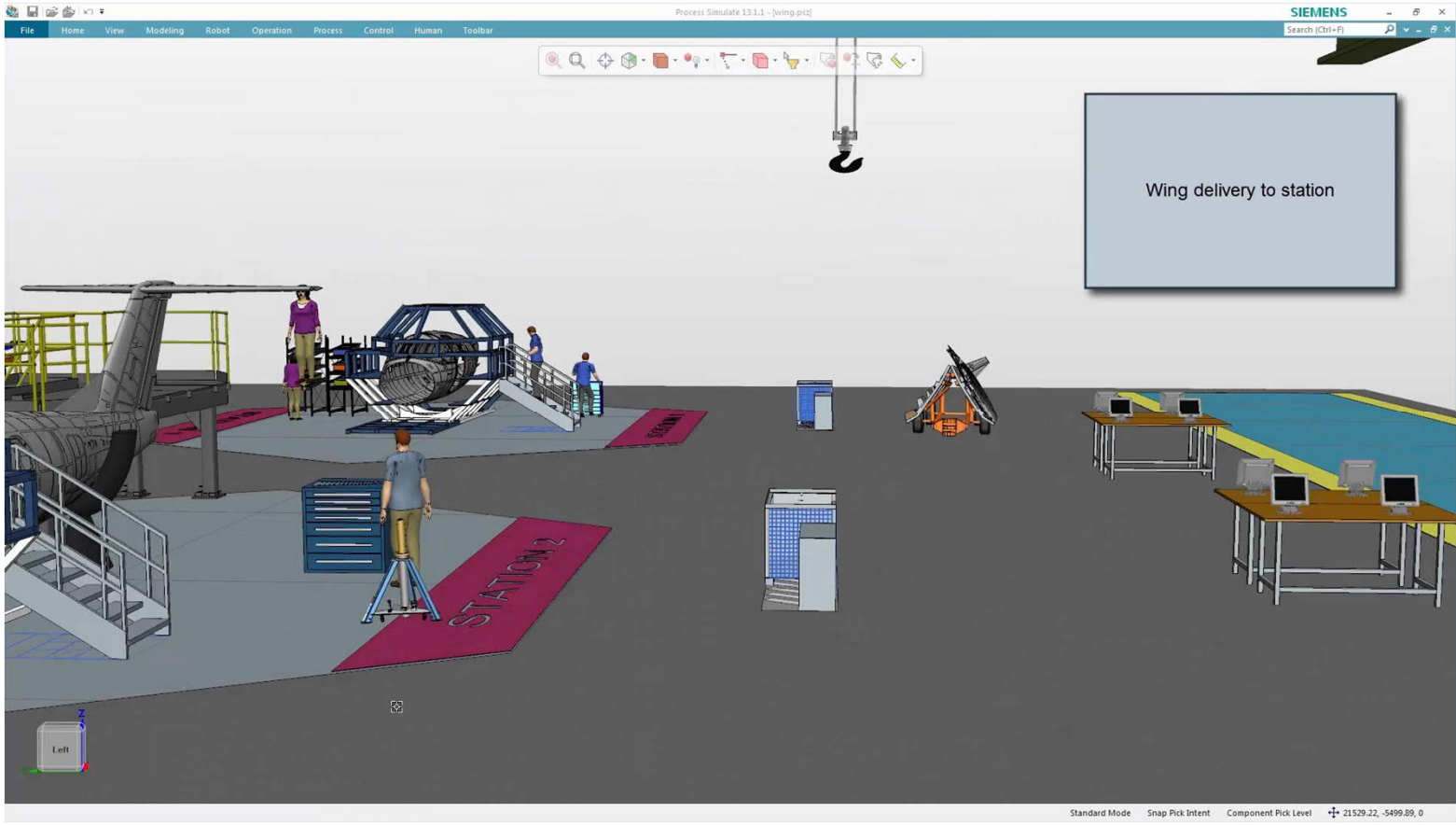
Simulate and optimize manufacturing assembly processes

Tecnomatix Process Simulate,

Plant Simulation Teamcenter



Digital Twin Production

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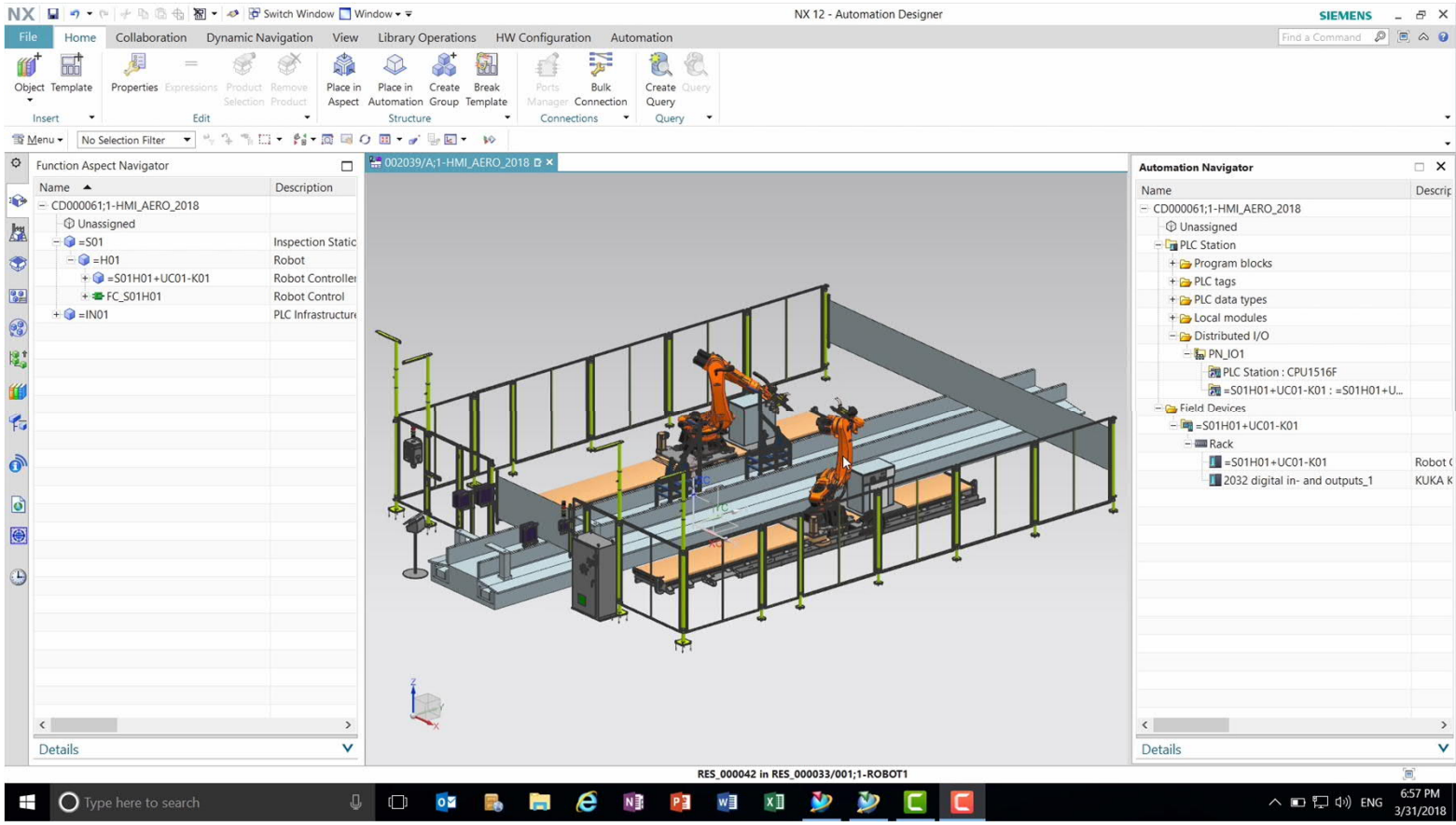
Generate the PLC code in collaborative automation design

Automation Designer



Digital Twin Production

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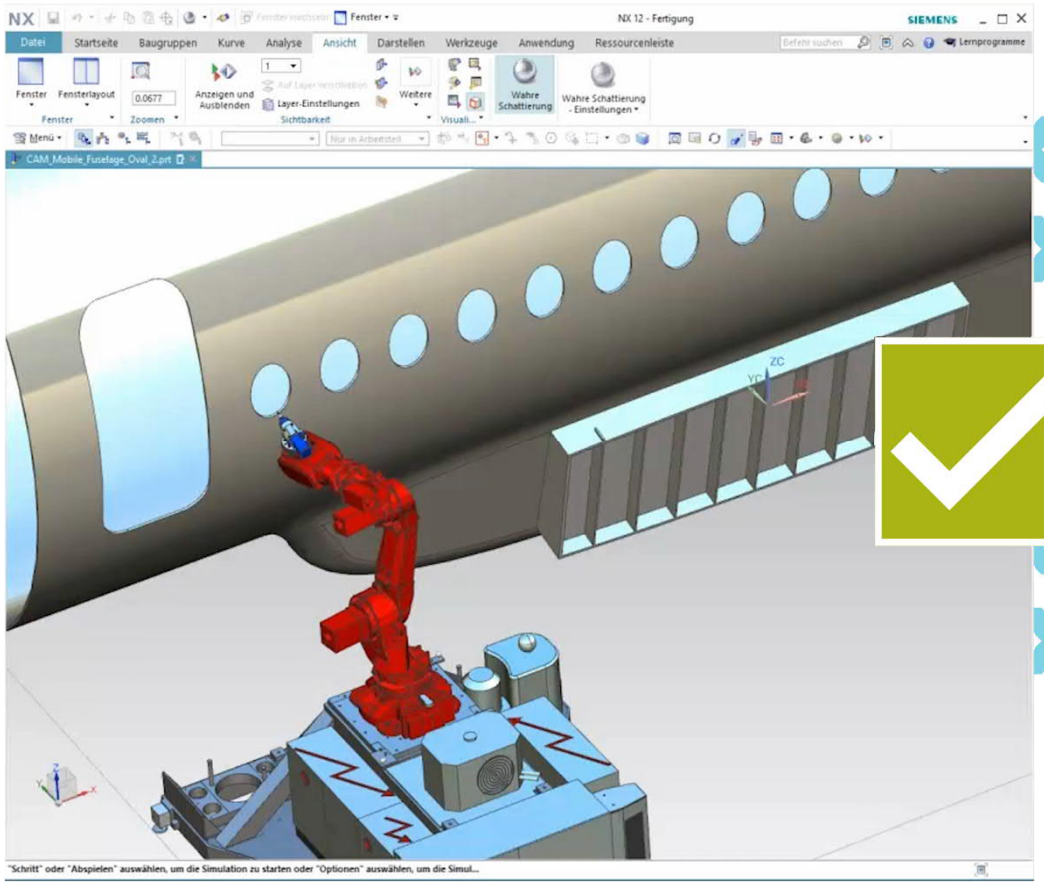
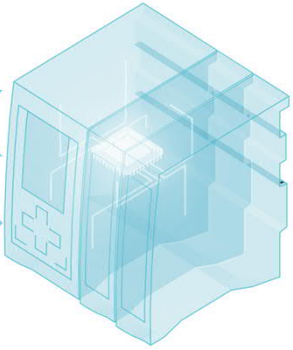
Validate the automation code in the virtual world

Mechatronics Concept Designer, SIMIT, PLCSIM Advanced, TIA Portal



SINUMERIK 840D sl



Digital Twin of SIMATIC S7-1500

The most holistic Digital Twin

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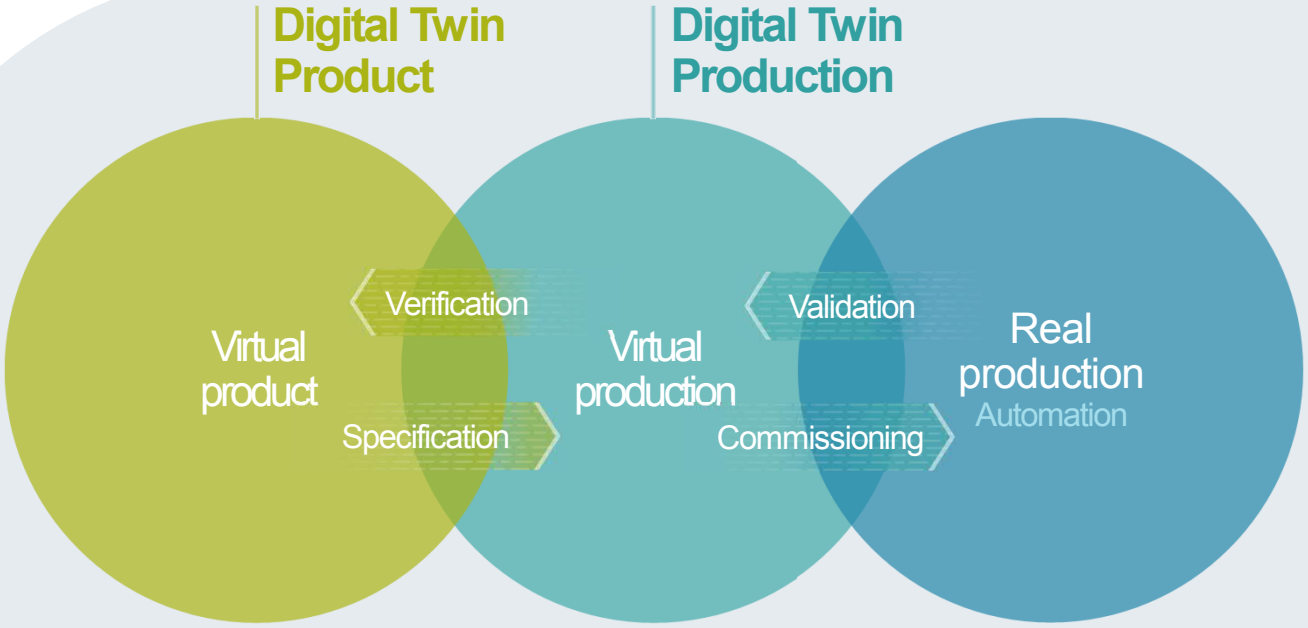

Run production efficiently and securely with Totally Integrated Automation.

Real production

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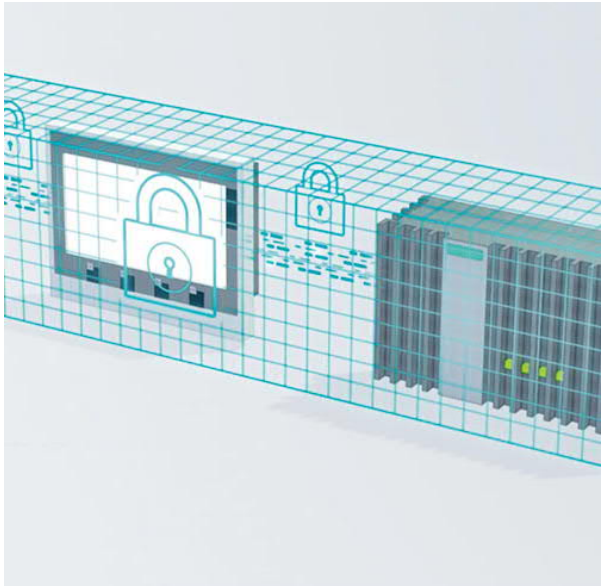
Efficient and secure production with TIA

SIMATIC, SINUMERIK, SIMOTION, SIMOTICS, SINAMICS, and SIRIUS

Industrial Security for plants and machines



IEC 62443, the leading Industrial Security standard.

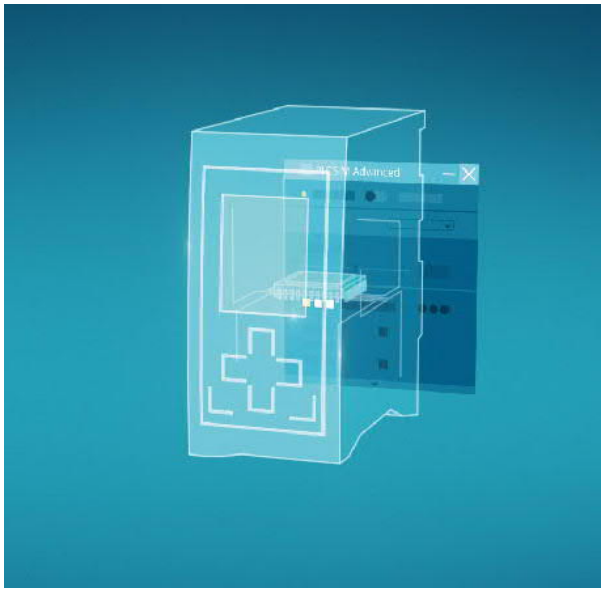
Benefits

+ Protection of productivity
+ Consistent, end-to-end security engineering
+ Comprehensive security concept

Our offering

- TIA Portal
- Industrial Security

Digital Twin Production



More time in the office, fewer on-site errors

Benefits

+ 30% shorter development time thanks to parallel mechanical and automation engineering
+ Reduced error costs thanks to early detection
+ Easier to calculate costs for real commissioning

Our offering

- Virtual commissioning
- SIMATIC S7-PLCSIM Advanced
- Technomatix NX MCD
- TIA Portal

Integrated energy management

Making energy flows and energy consumption transparent

Benefits

+ In-depth energy analysis
+ Calculable energy consumption
+ Optimized production costs

Our offering

- SIMATIC Energy Suite
- SIMATIC Energy Manager PRO
- SIMATIC WinCC

Product and production improvement in the real world

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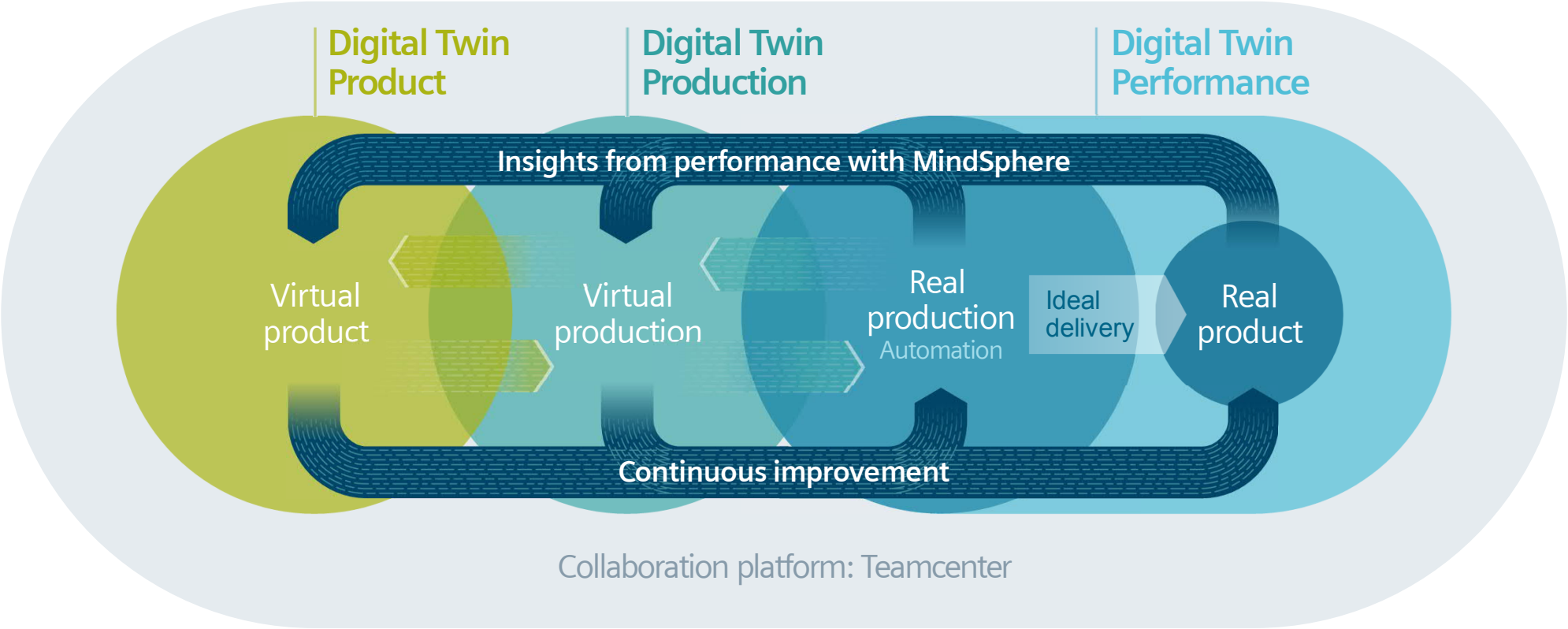

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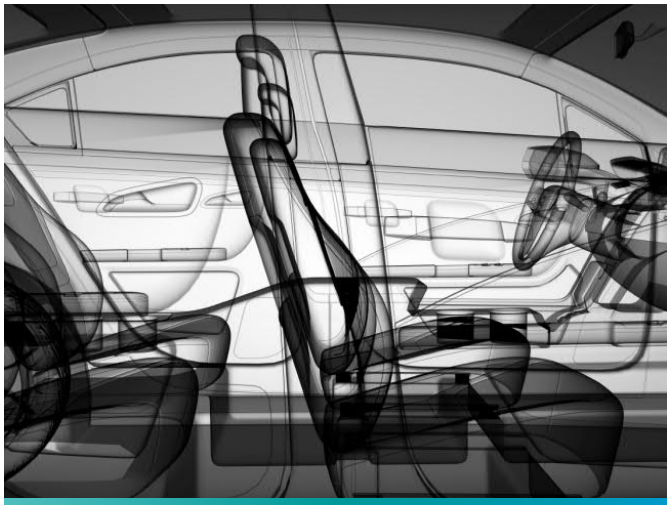
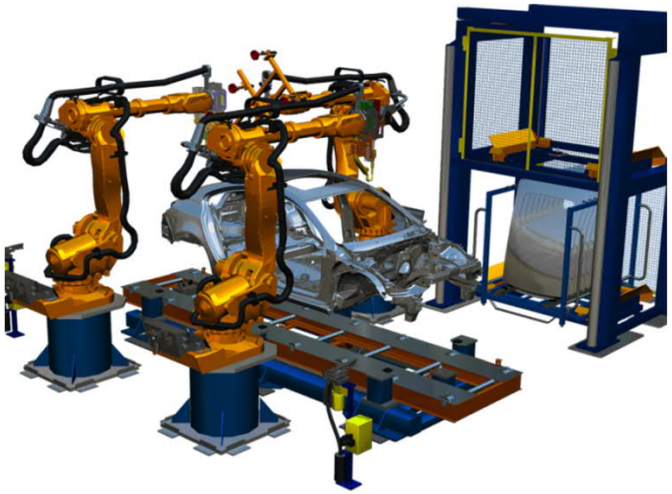
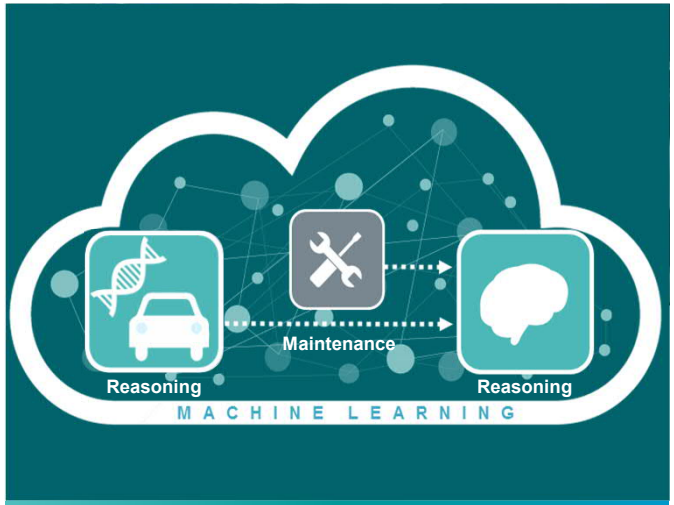
Development → Production → Services



Digital
Product
Twin

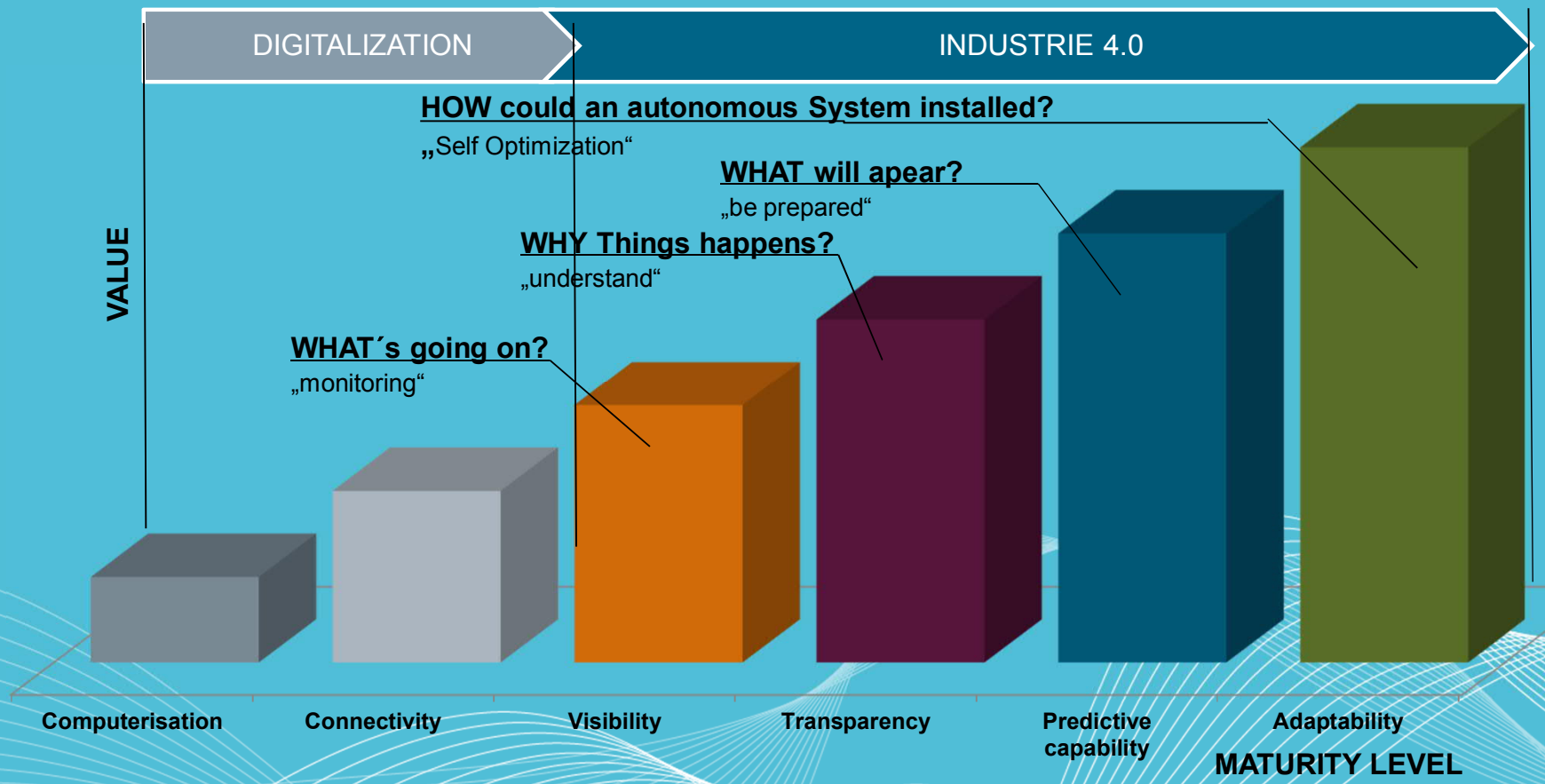


Digital
Production
Twin

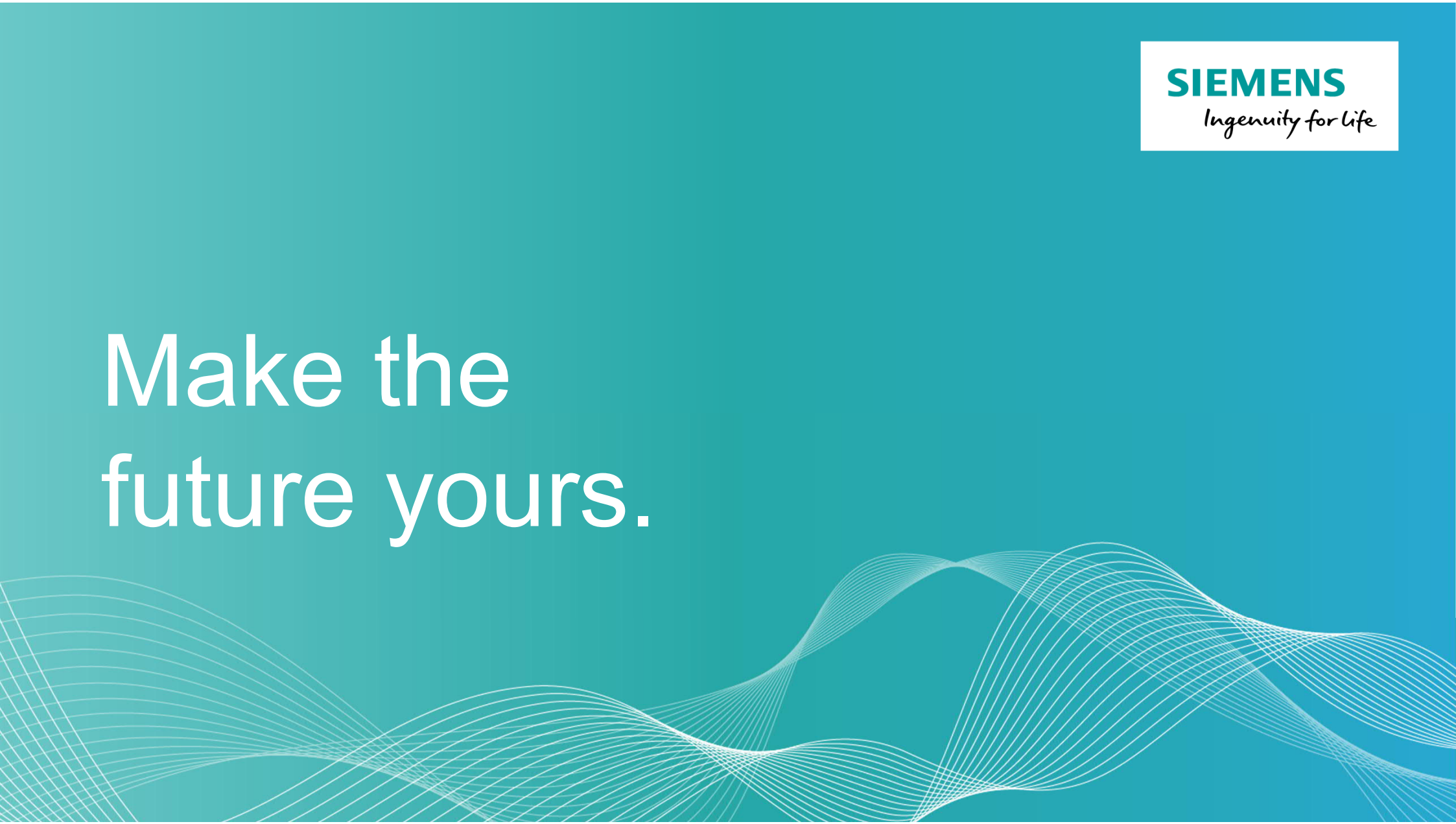


Digital
Performance
Twin

Benefit-based development



Stages in Industrie 4.0 development path (source FIR e.V. at RWTH Aachen University)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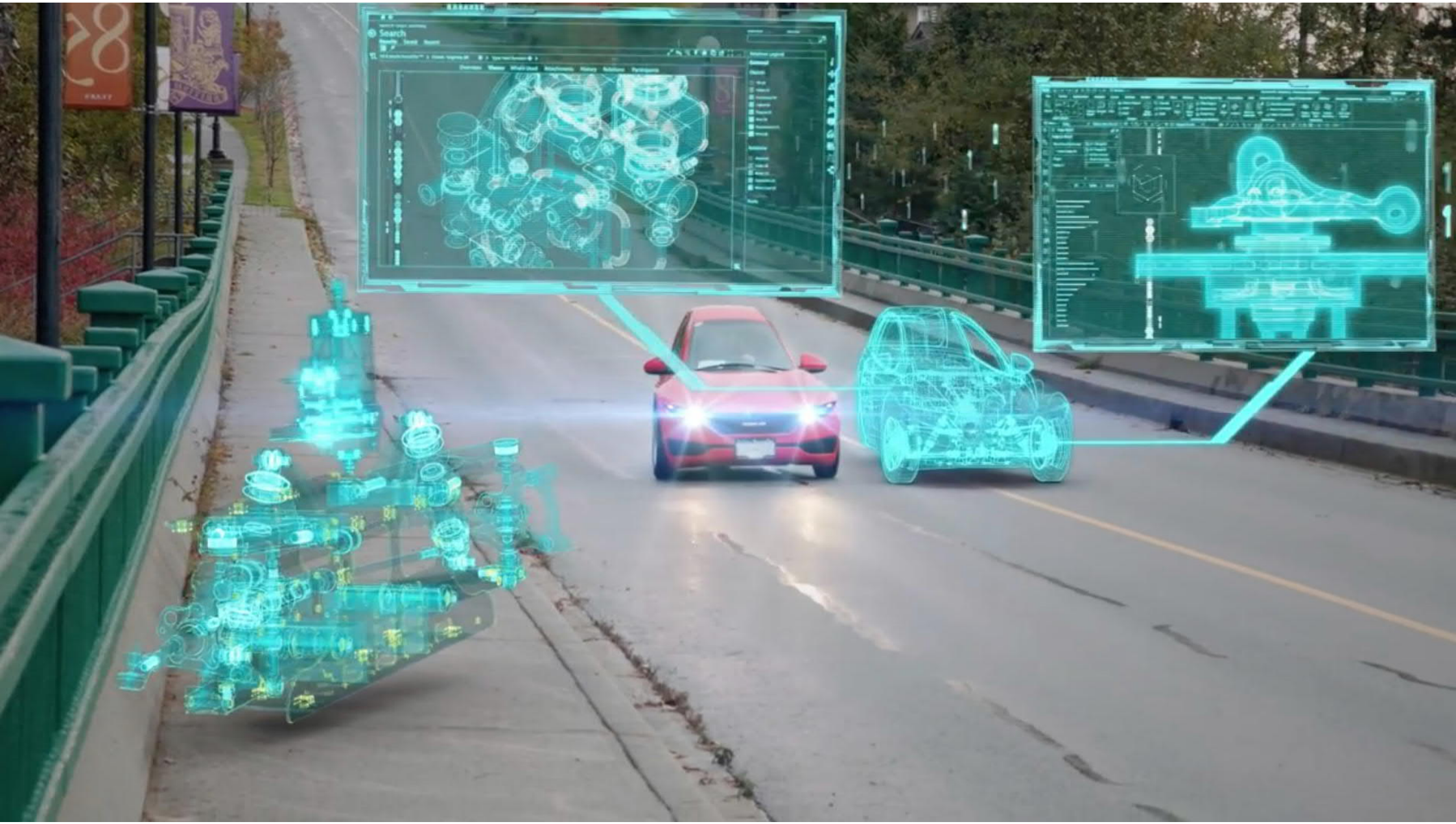
Make the
future yours.



SIMATIC ET 200SP Open Controller 2

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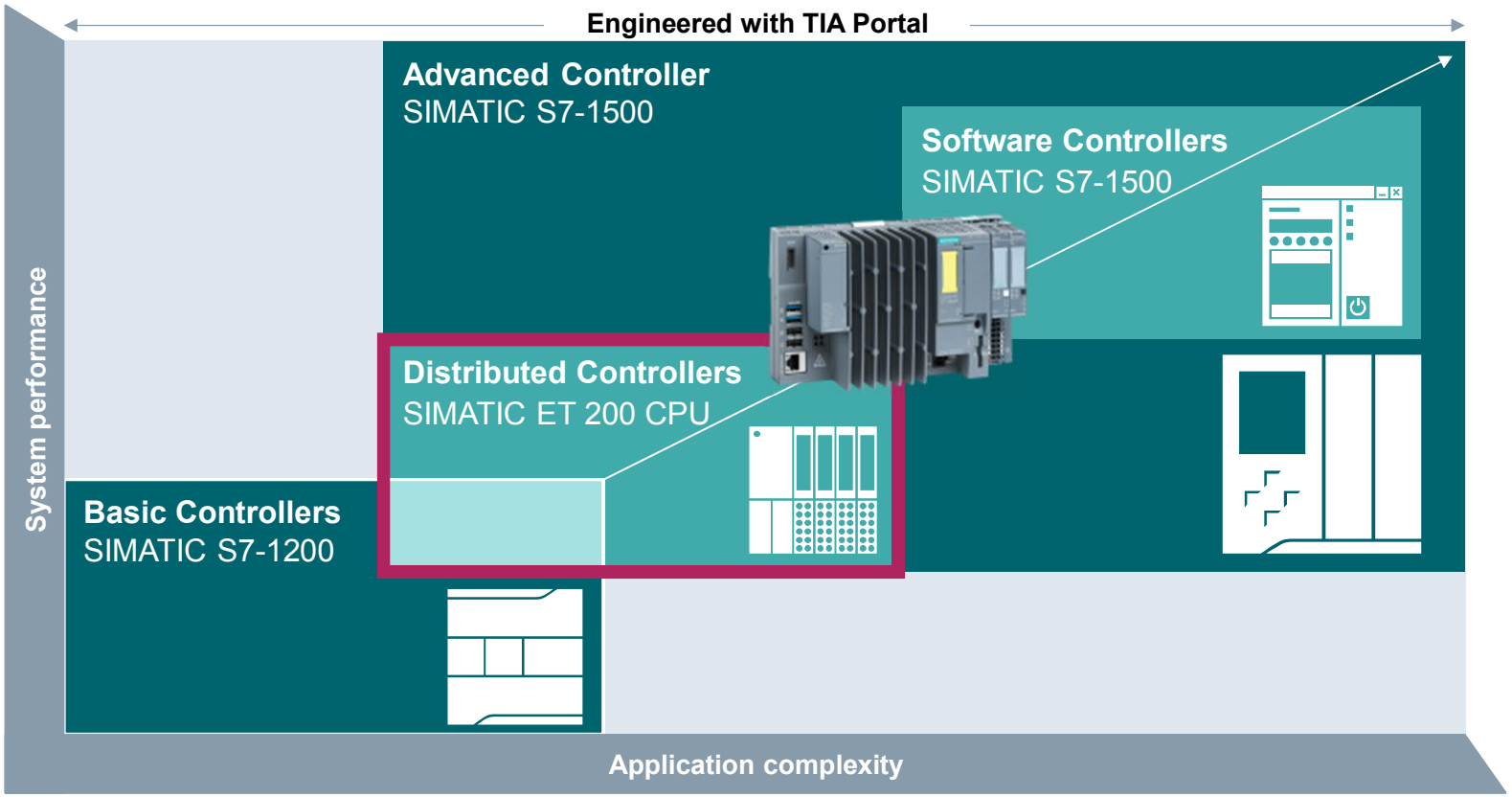

- Efficient engineering
- Innovative design
- Reliable diagnostics
- Safety Integrated
- Security Integrated
- Technology Integrated

SIMATIC ET 200SP Open Controller 2

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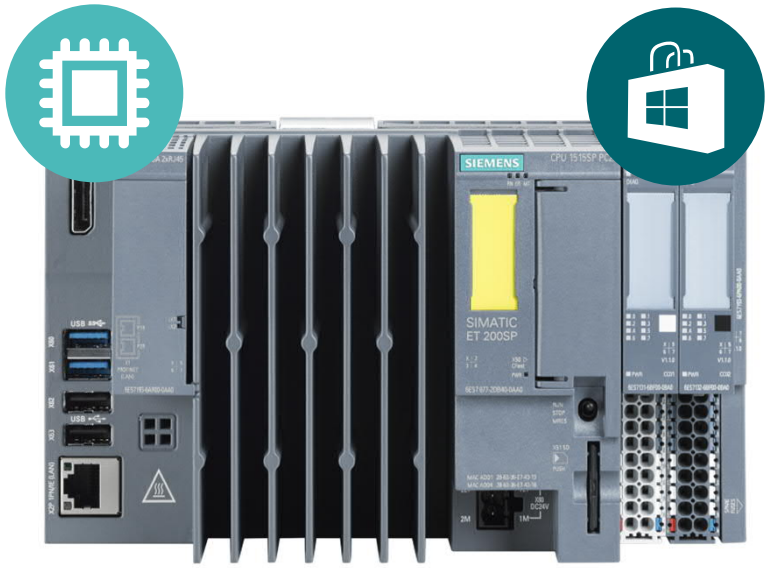
Hardware

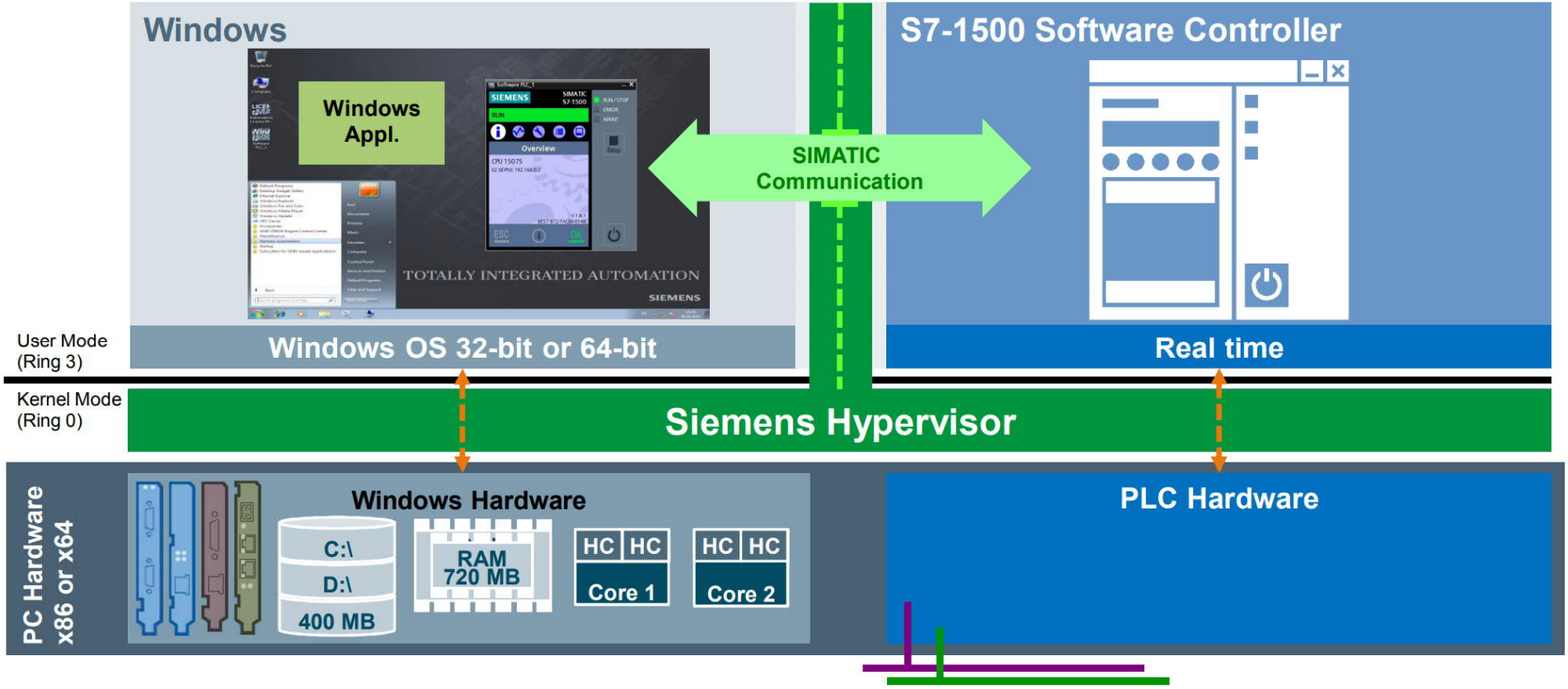
- Fanless design
- High temperature range (-20°C to 60°C)
- 8 GB RAM
- All PC interfaces onboard (DPP, USB, Gbit Ethernet)
- Exchangeable bus adapter for PROFINET IRT
- Integrated Run-Stop switch for the controller



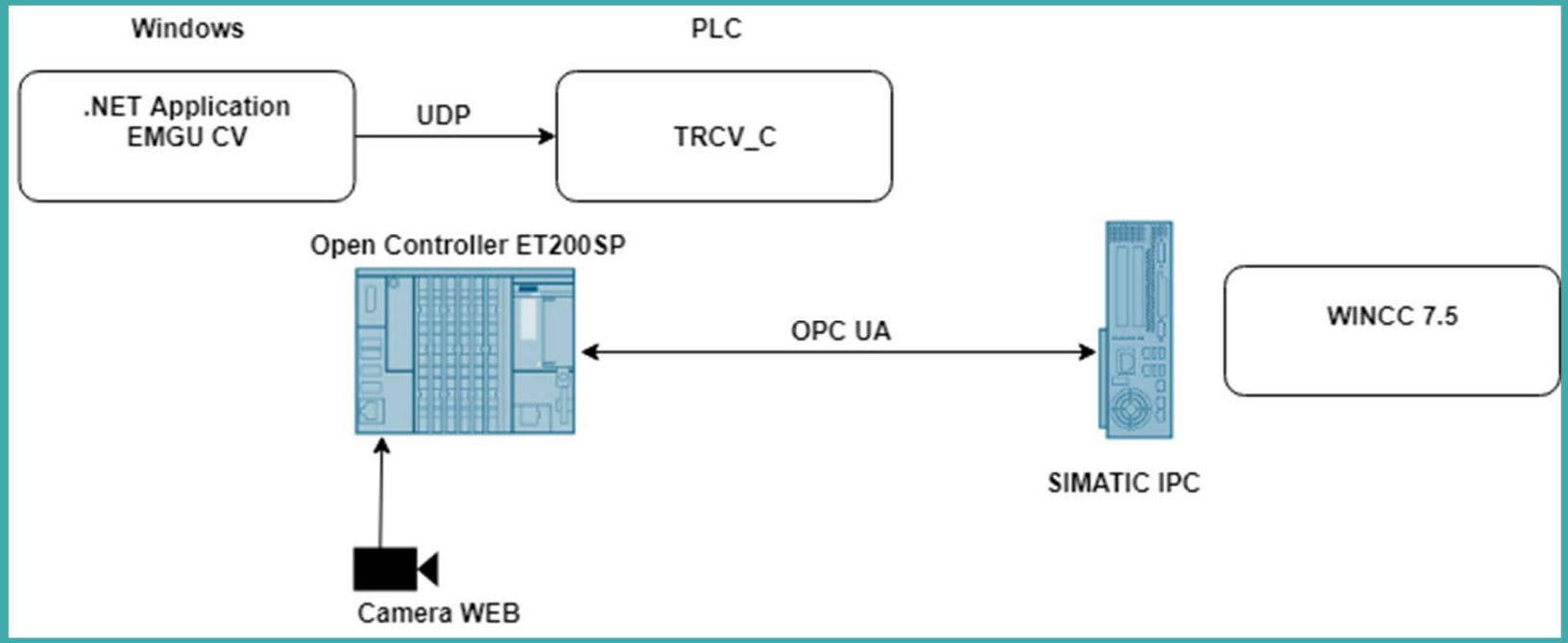
Software

- S7-1500 Software Controller already installed
- Optionally with installed WinCC RT Advanced visualization software
- Visualization also possible with multitouch functionality
- Windows 10 Enterprise 2016 LTSB 64 bit
- Restore via USB stick

SIMATIC ET 200SP Open Controller 2



SIMATIC ET 200SP Open Controller 2 – Application



WinCC / IndustrialDataBridge

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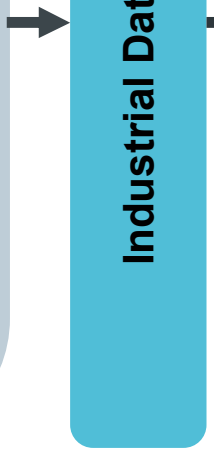
Provider (data source)

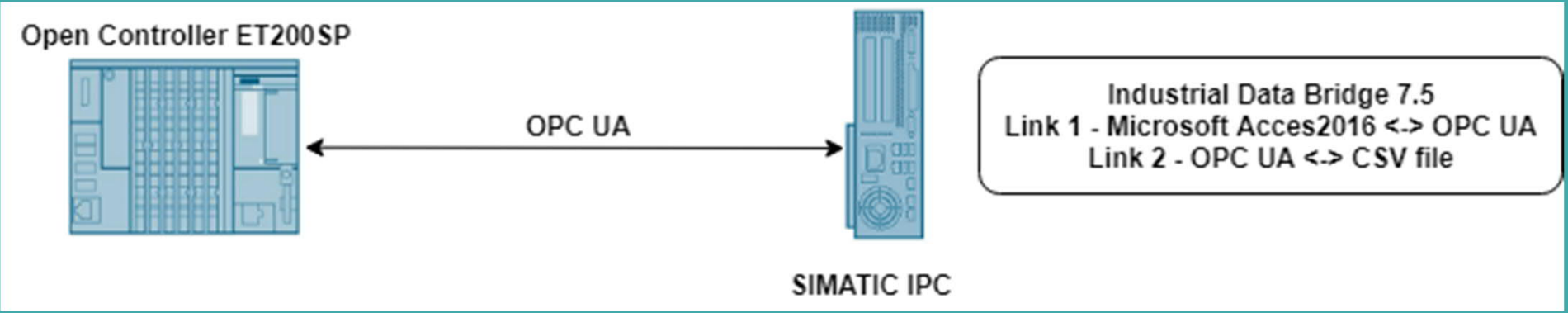
- ✓ MS Access 2003, 2007, 2010, 2013, 2016
- ✓ MS SQL Server 2005, 2008, 2008R2, 2012, 2014, 2016
- ✓ MySQL 3.5, 5.1.5.5, 5.6, 5.7
- ✓ Oracle 8i, 10g, 11g, 12c
- ✓ OPC Data Access 3.0
- ✓ OPC XML 1.01
- ✓ Send / Receive
- ✓ WinCC OLE DB 7.2, 7.3, 7.4, 7.4 SP1, 7.5
- ✓ WinCC UserArchive 7.2, 7.3, 7.4, 7.4 SP1, 7.5
- ✓ WinCC RT Prof.V13 SP1, V13 SP2, V14 SP1, V15
- ✓ OPC UA DA (1.0.3) Client



Consumer (data target)

- ✓ CSV, TXT
- ✓ MS Access 2003, 2007, 2010, 2013, 2016
- ✓ MS SQL Server 2005, 2008, 2008R2, 2012, 2014, 2016
- ✓ MySQL 3.5, 5.1.5.5, 5.6.5.7
- ✓ Oracle 8i, 10g, 11g, 12c
- ✓ MS Excel 2003, 2007, 2010, 2013, 2016
- ✓ OPC Data Access 3.0
- ✓ OPC XML 1.01
- ✓ IDB OPC Server 7.5
- ✓ Send / Receive
- ✓ WinCC UserArchive 7.2, 7.3, 7.4, 7.4 SP1, 7.5
- ✓ Configurable TXT / HTML / XML
- ✓ WinCC RT Prof. V13 SP1, V13 SP2, V14 SP1 , V15
- ✓ OPC UA DA (1.0.3) Server (including status messages)

WinCC / Industrial Data Bridge



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Engineered with TIA Portal

SIMATIC S7-1500 Redundant Systems

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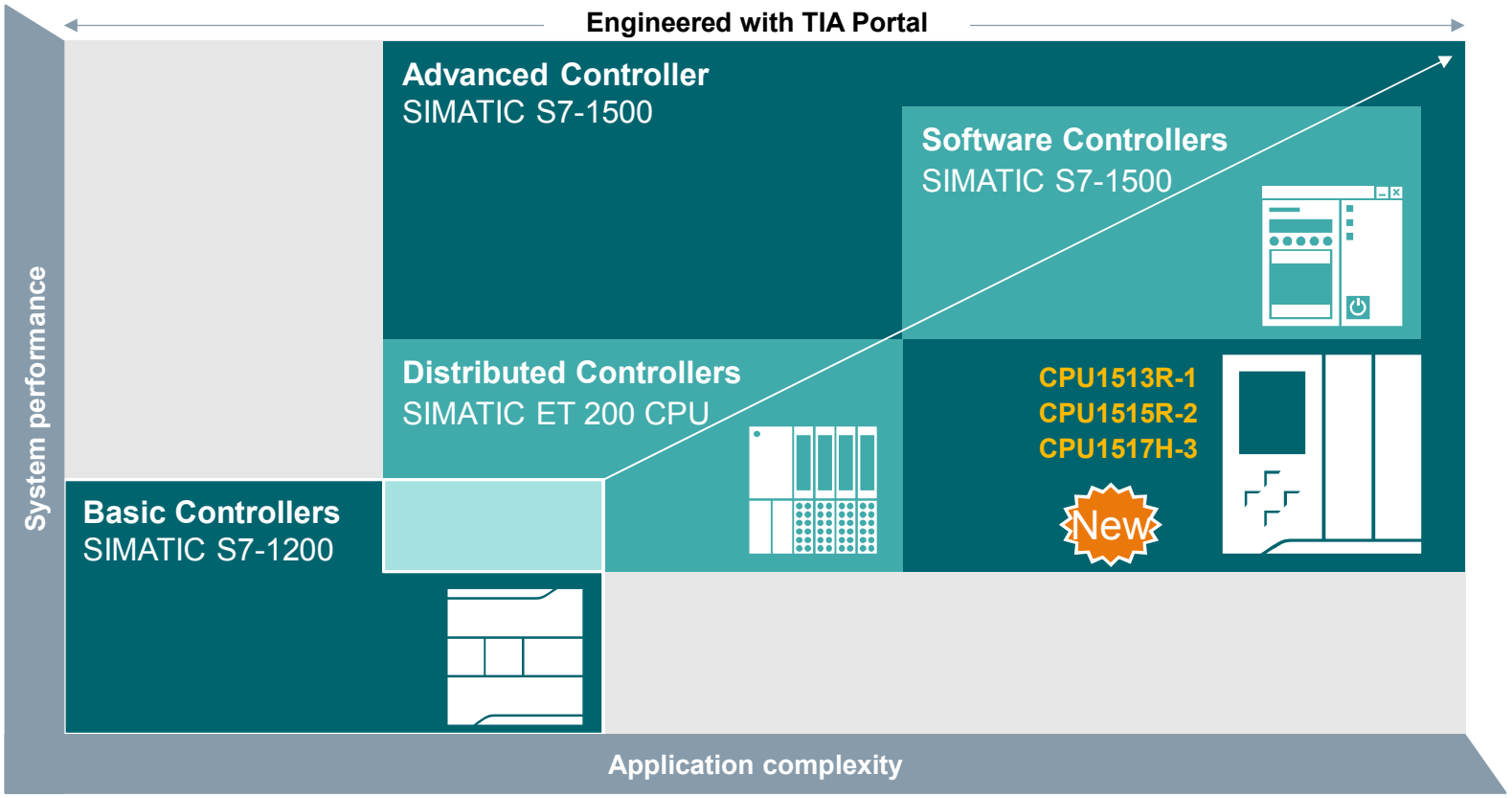

- Efficient Engineering
- Innovative Design
- Reliable Diagnosis
- Safety Integrated
- Security Integrated
- Technology Integrated

SIMATIC S7-1500 Redundant systems

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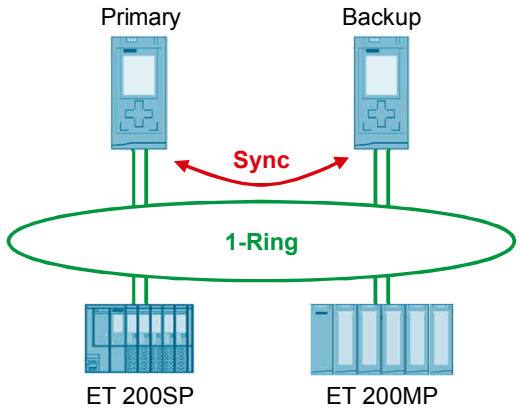
Consistent concept – **Identical** synchronization process

Scaling of the switching performance over the **available bandwidth** of the sync connection

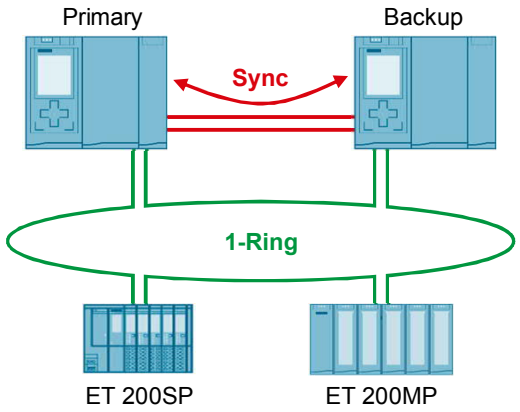
CPU type
Synchronization
Switchover time
I/O systems
Type of connection

Redundant – S7-1500R



CPU 1513R/CPU 1515R
via **PROFINET Ring (MRP)**
200 – 500ms
ET 200SP and ET 200MP
Single connection (PN redundancy S2)

High available – S7-1500H



CPU 1517H
via **Sync-Module**
<100ms
ET 200SP and ET 200MP
Single connection (PN redundancy S2)

SIMATIC S7-1500R/H - PROFINET Network configuration

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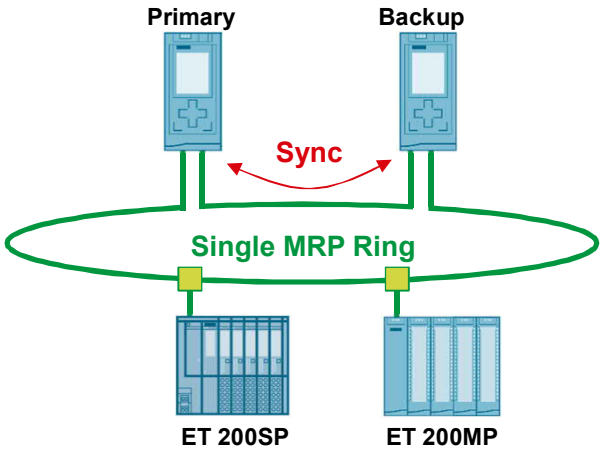
Requirements for the PROFINET network configuration

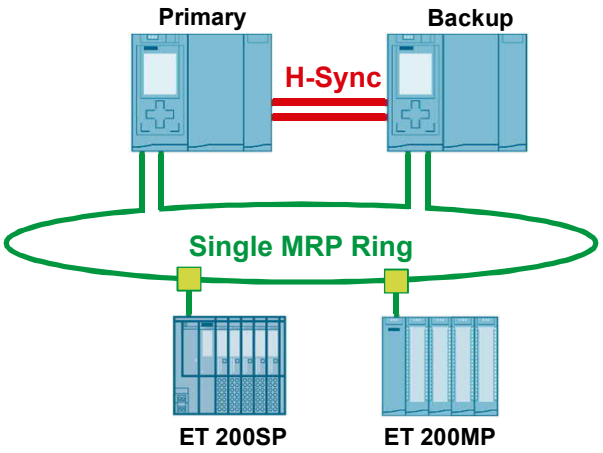
- MRP Ring (default setting in the configuration)
- PLC's need to be part of the ring

Redundant 1500R



Max. 16 devices in ring*)

High Available 1500H



Max. 50 devices in ring*)

*) Recommendation

Communication
System IP-Address – Switching Primary

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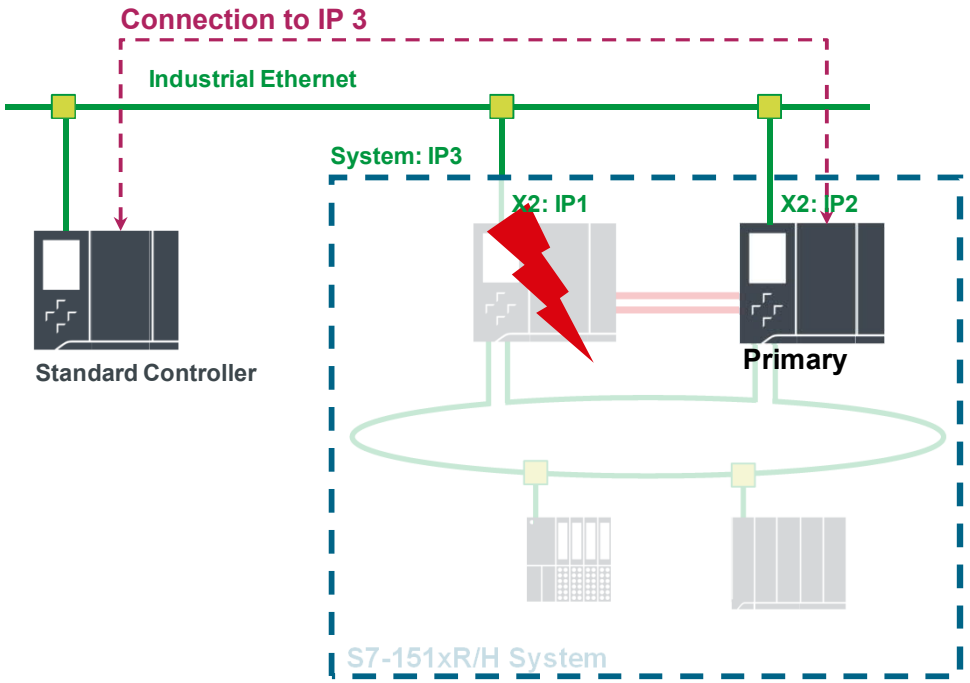
Using System IP instead of PLC interface IP

- Transparent communication between standard PLC and R/H-System
- The standard communication partner is automatically connected to the primary PLC



Communication
System IP-Address in the PN-MRP-Ring

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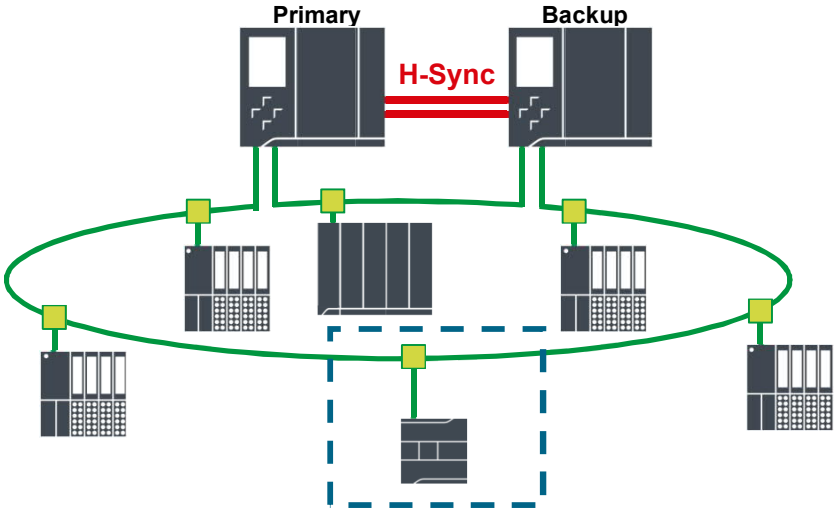
Include Standard Controllers in the MRP Ring

- The S7-1500R/H does not support Single PN Devices (S1) or iDevices.
- Nevertheless, it is possible to physically include a S7-1500/1200 per Switch or directly into the MRP Ring, to communicate to the H-System via OUC.



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Digitalization
creates
opportunities and risks

Digitalization creates …

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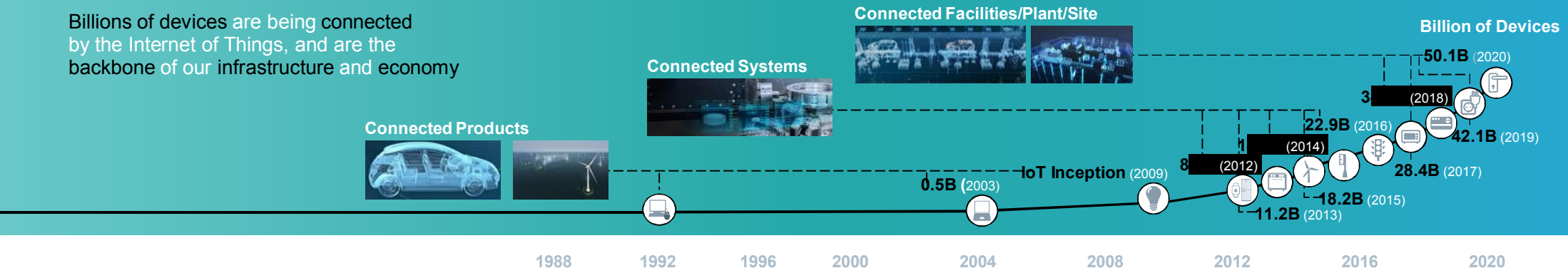
Opportunities

Billions of devices are being connected by the Internet of Things, and are the backbone of our infrastructure and economy



… and risks

Exposure to malicious cyber attacks is also growing dramatically, putting our lives and the stability of our society at risk

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MindSphere
The cloud-based, open IoT operating system
www.siemens.com/mindsphere

Why now?

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85%

of potential assets remain unconnected.

Technology and Innovation for the Future of Production: Accelerating Value Creation
World Economic Forum, Mar 2017

64%

of respondents are either engaged in or planning an IIoT project in the next year.

Technology and Innovation for the Future of Production: Accelerating Value Creation
World Economic Forum, Mar 2017

It is the beginning of the era of digitalization

- Few organizations are currently realizing the full value of the IIoT, but it's only a matter of time

Early adopters receive the biggest gains

- Opportunity to proactively build major competitive advantages

More than half the market is investing in the IIoT

- Become industry leader with optimized processes

Industrial Security

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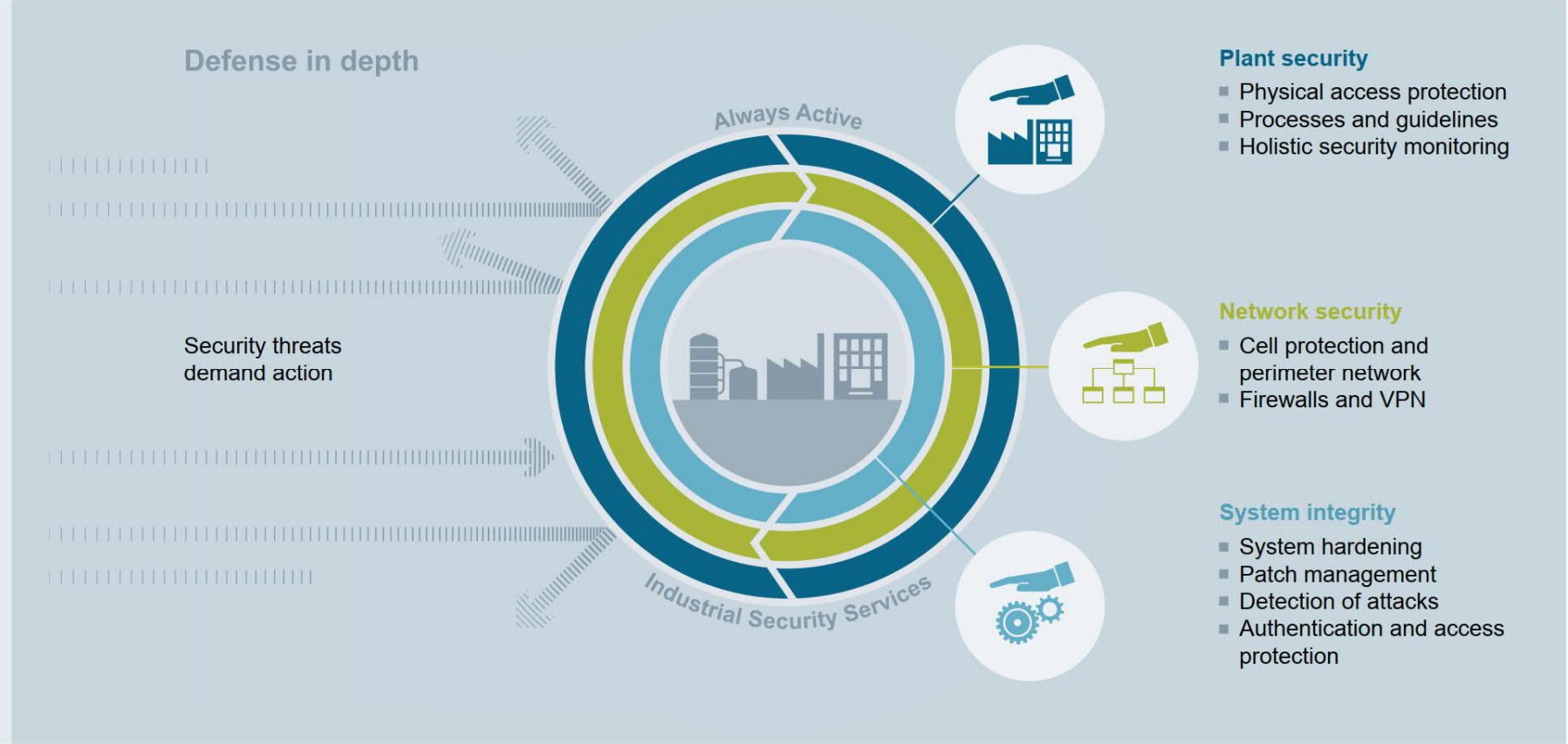

Industrial Security

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SCALANCE SC63x-2C

This high-performance industrial firewall appliance offers the following benefits:

- Cell protection via firewall – also configurable on a user-specific basis – with 600 Mbit/s and up to 1,000 firewall rules
- Bridge firewall for the protection of flat networks
- NAT/NAPT for communicating with serial machines with identical IP addresses
- Secured remote access via SINEMA Remote Connect
- Fiber optics for long distances (up to 200 km)
- Digital input for local activation of secured remote access
- Digital signal output via signal contact
- Console port for direct access via programming device
- Redundant 24 V DC power supply
- Versatile installation options for fast and reliable mounting
- Compact design with metal rear panel
- Simple device replacement using C-PLUG replacement medium for automatically saving configuration and engineering data
- Integration in redundant network structures by means of VRRPv3 and, with SCALANCE SC636-2C, additionally by means of MRP

SIMATIC IOT2040

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SIMATIC quality – 24/7 operation

Expandability and connectivity

mPCIe, various standard interfaces and available protocol drivers

Performance and Deterministic

Intel Quark® CPU and 1 GB RAM

Openness

Free programmable in high-level languages

AutomatIon.ConnecTed

Easy connection to automation level with PROFINET

SIMATIC IOT2040

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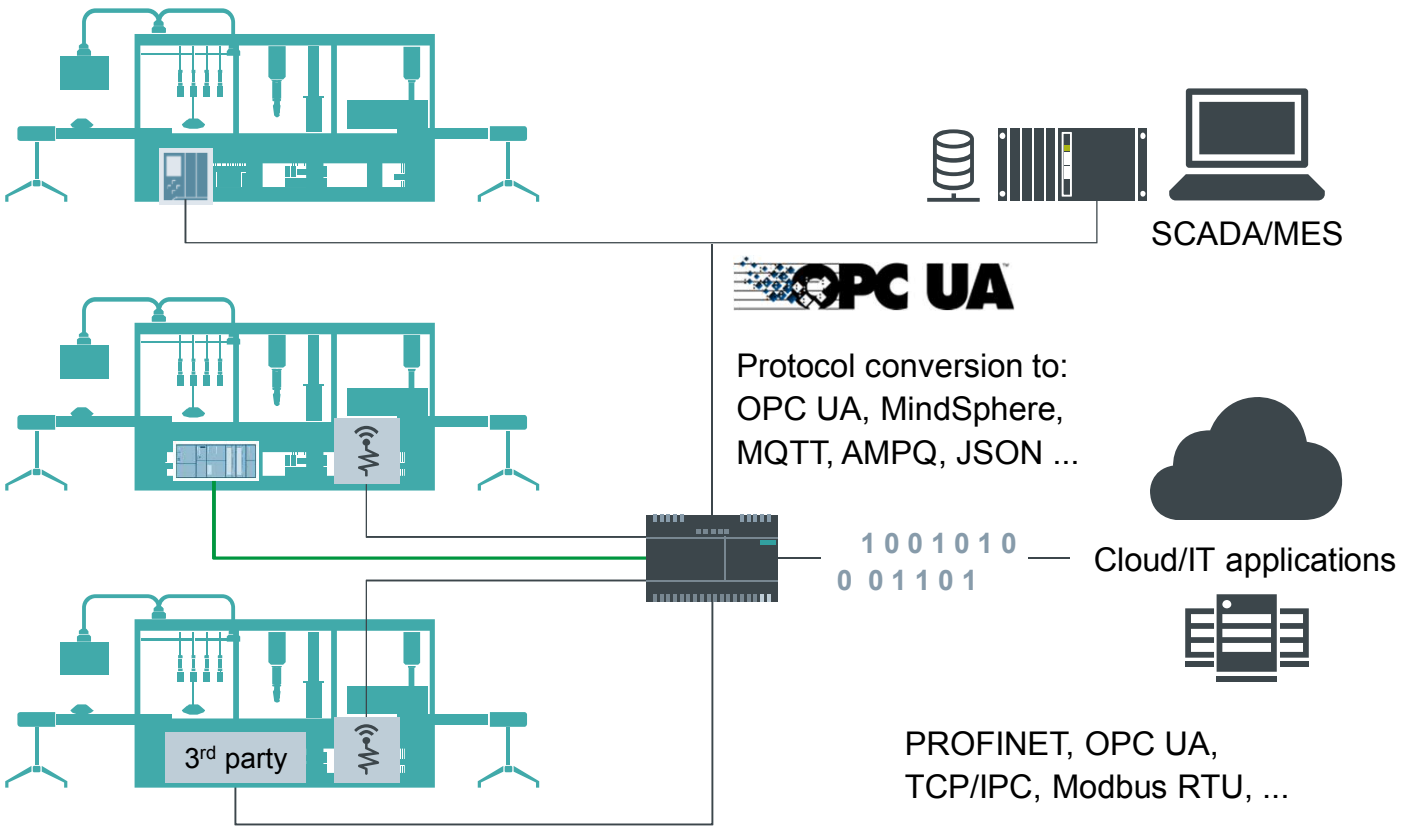
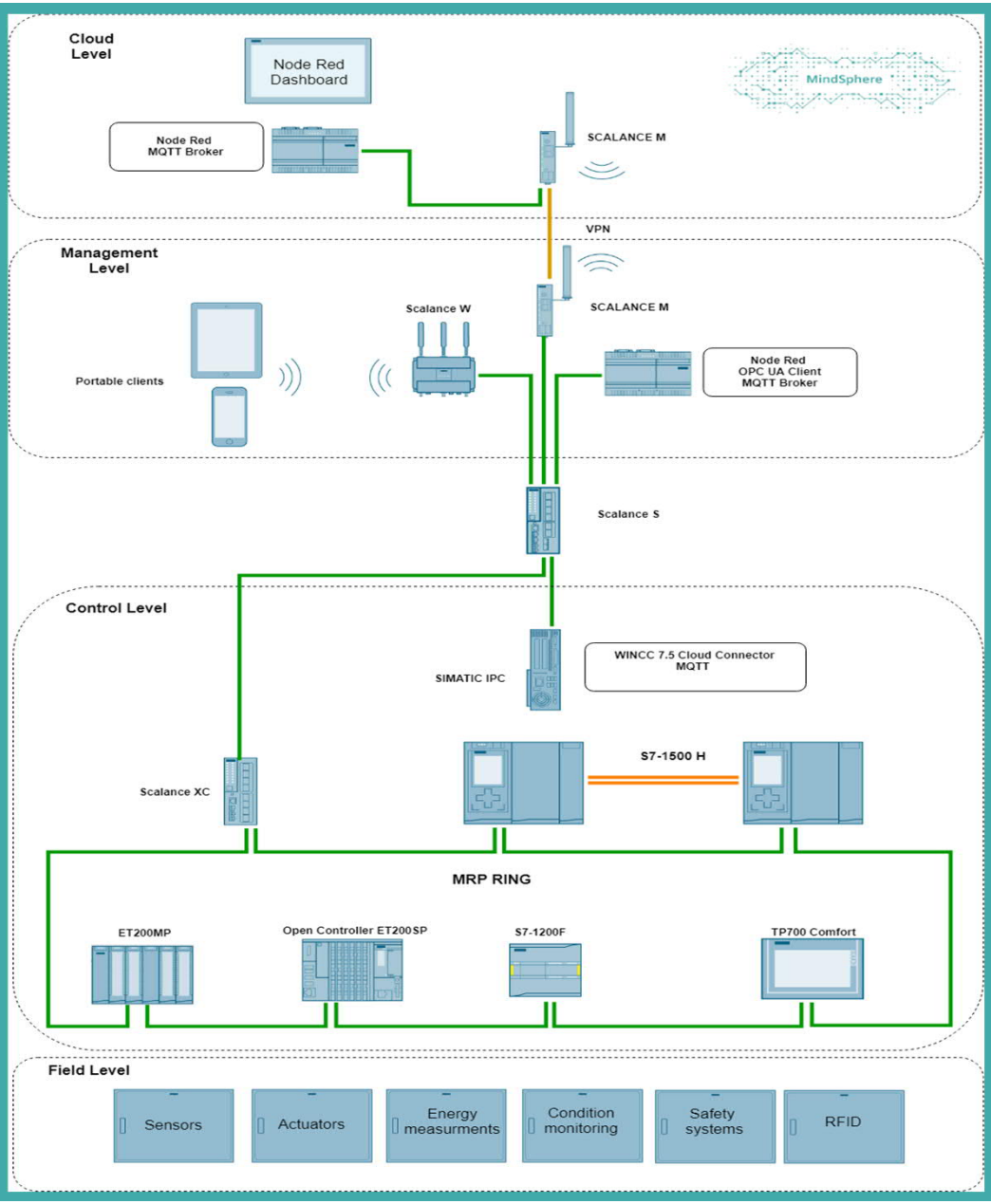


- Inter-connecting various sources
- Pre-processing/data acquisition with SIMATIC IOT2040
- Data transfer to company network or direct to cloud applications
- Use existing automation solution

SIMATIC IOT2040 complements automation portfolio

SIMATIC IOT2040 as cost-efficient and open data gateway for retro-fitting existing concepts and make them “IoT ready”

Cloud Application



Future of Automation

Thought leadership