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Pharma Event Introduction to MindSphere

24th September 2019

Henrik Ruff, Siemens

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Siemens Digitalisation Strategy

MindSphere – the Cloud-based, open IoT Operating System from Siemens

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Applications

Powerful industry solutions with advanced analytics

Apps developed by Siemens, end-customers, OEMs, partners …

Open PaaS Application Framework

Develop robust industrial IoT solutions faster with global scalability

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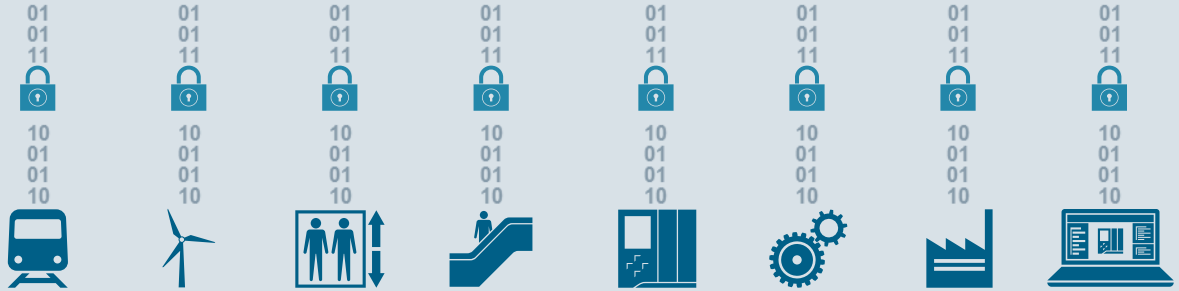
Connectivity

Connect products, plants, systems, machines and enterprise applications



Bringing our Vision to Life
Key Components of Digitalization

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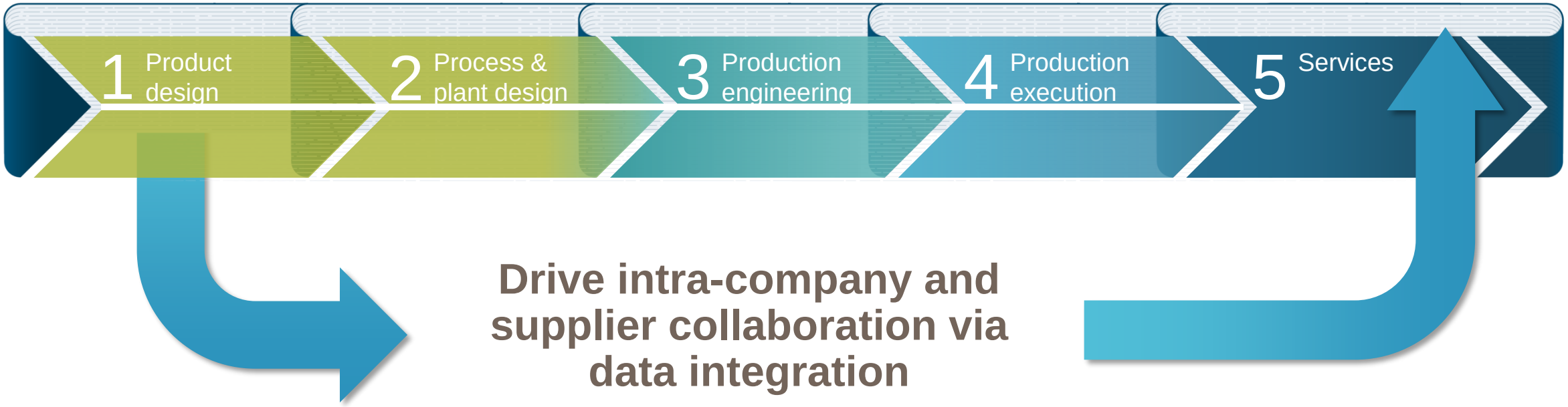
Use Simulation to achieve foresight in the Virtual World

Use Big Data Analytics to gain insight and drive continuous improvement



Drive intra-company and supplier collaboration via data integration

Helping innovators realize the power of digital

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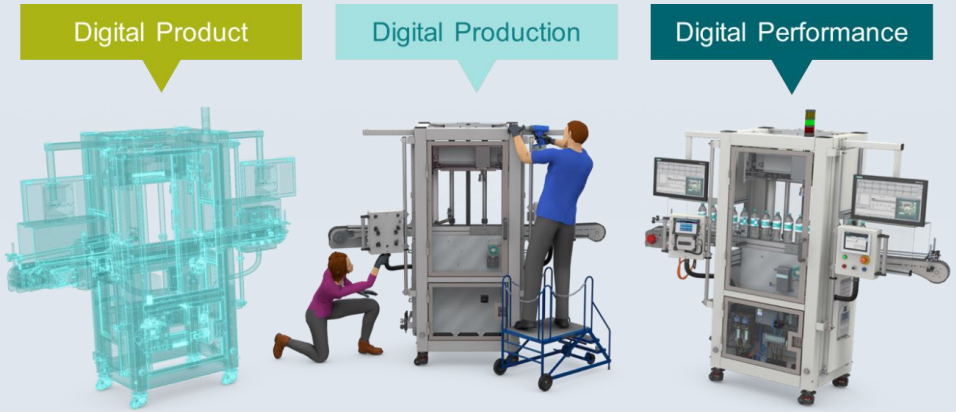
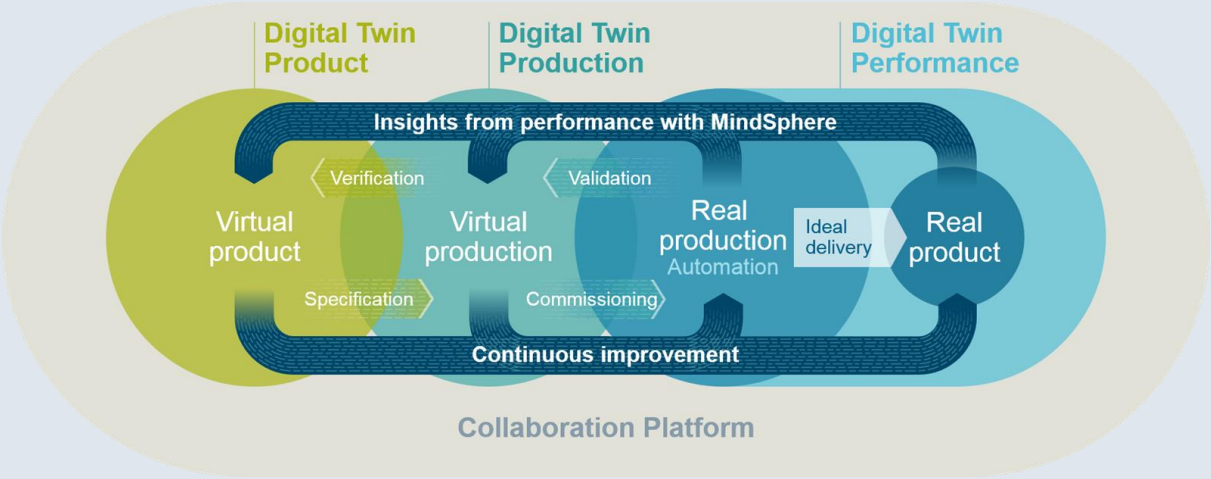
Digital Twins for Every Phase of the Innovation Process



Closed-loop Innovation with the Complete Digital Twin



Digital Twins for:

- Automotive
- Aerospace & Defense
- Manufacturing
- Industrial

The Digital Industrial Transformation landscape

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Outcomes

World class supply chain
- Reliable supply by reducing variations in quality and processes
- Simulation and what-if analysis to anticipate and mitigate disruptions
- Increase efficiency and effectiveness of supply chain planning and decision making

Productivity
- Increase throughput by process control through minimized variances
- Enable collaboration and innovation moving from feelings to facts
- Predictive and prescriptive Operations

Inventory and distribution
- Reduce inventory
- Assurance of product identity and supplier sourcing
- Minimized inventory based on precise forecasting, better planning and optimized maintenance strategies

Sustainability and society
- Decrease energy consumption and environmental footprint
- Decrease waste, water and energy consumption
- Expand access to healthcare in developing areas

Better patient outcomes
- Personal medicine and interaction provides better patient experience and outcomes
- AI extracts insights from trials, HCPs and other sources
- Smart contracting

Digital Enterprise
- Create environment promoting collaboration, continues learning and innovation
- Move from feelings to facts
- Scale expertise globally and enable COEs supporting globally

Digital Transformation

Cyber Security

R&D	Vendor	Planner	Operator	Employee	HCP	Dispensaries	Patient	Manager
Direct access to patient data	Vendor management	Planning simulation	Work instructions	Knowledge management	Medicine impact analysis	Delivery tracking	Outcome based pricing	Unambiguous information
Big data analytics	Quality integration	Supply chain transparency	Proactive prescriptive analytics	Constant learning	Personal medicine	Predictive planning	Personal medicine	Immediate decision feedback
Test simulations	Forecast and planning	Dynamic accurate forecast	Manufacturing Social Network	Innovative culture	Smart contracts	Smart contracts	Smart contracts	Risk Transparency

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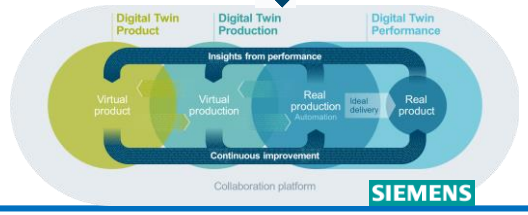
Common components



Edge Analytics

MindSphere partner ecosystem overview

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Consulting/strategy partners

- Provide digital transformation services based on MindSphere
- Develop vertical apps

Technology partners

- Enhance capabilities as well as adoption of MindSphere platform utilizing analytics, AI and Big Data

Application developer/ISV

- Develop vertical apps
- Sell apps based on MindSphere

Hybrid OT partners

- Leverage partners from an automation and instrumentation background to develop IoT applications and provide services

System integrator

- Connect other enterprise systems on the cloud (ERP, CMMS, etc.)
- Provide connectivity and implementation services

Connectivity partners

- Develop connectivity into products
- Sell connectivity products

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MindApps

Accelerating Value Delivery through new data driven applications

MindSphere – open by Design at industrial scale

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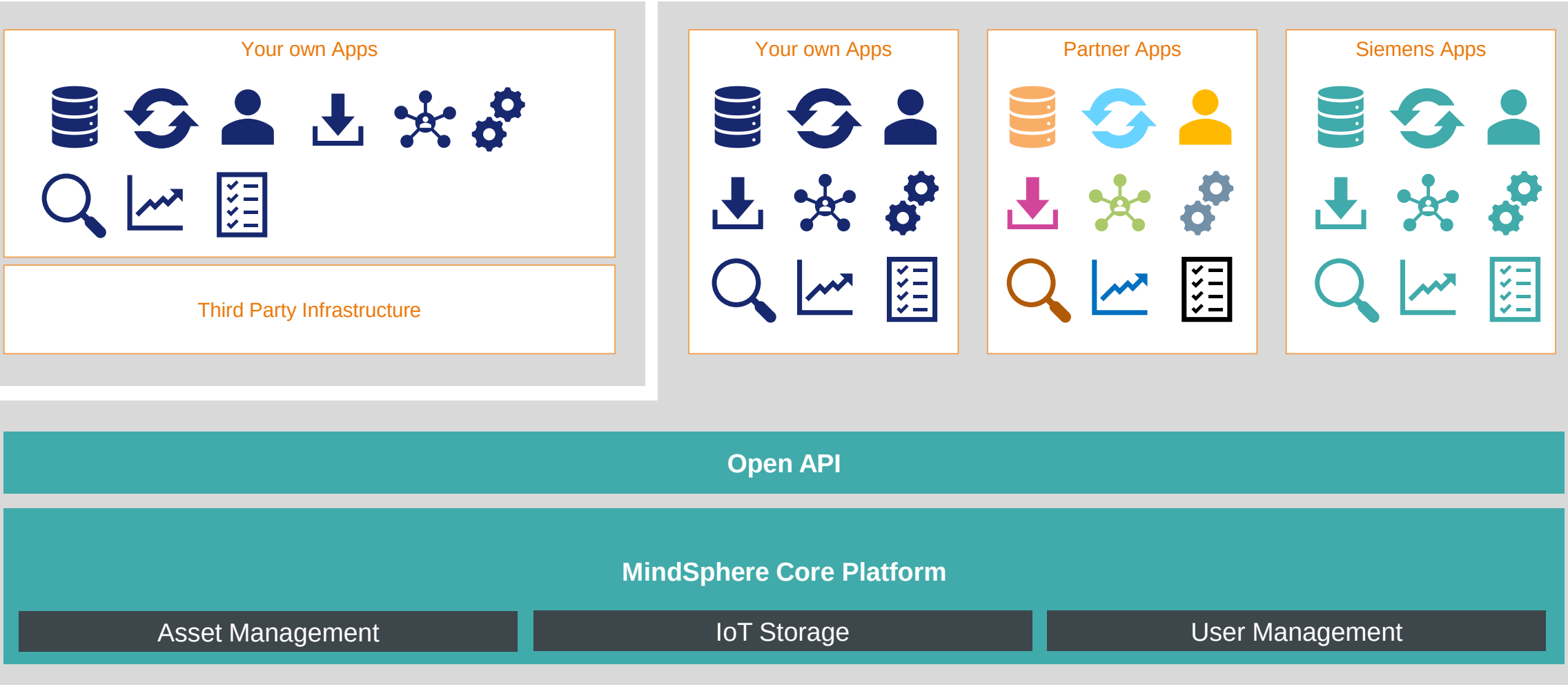

MindSphere Application Centers
Co-creating Value with Customers

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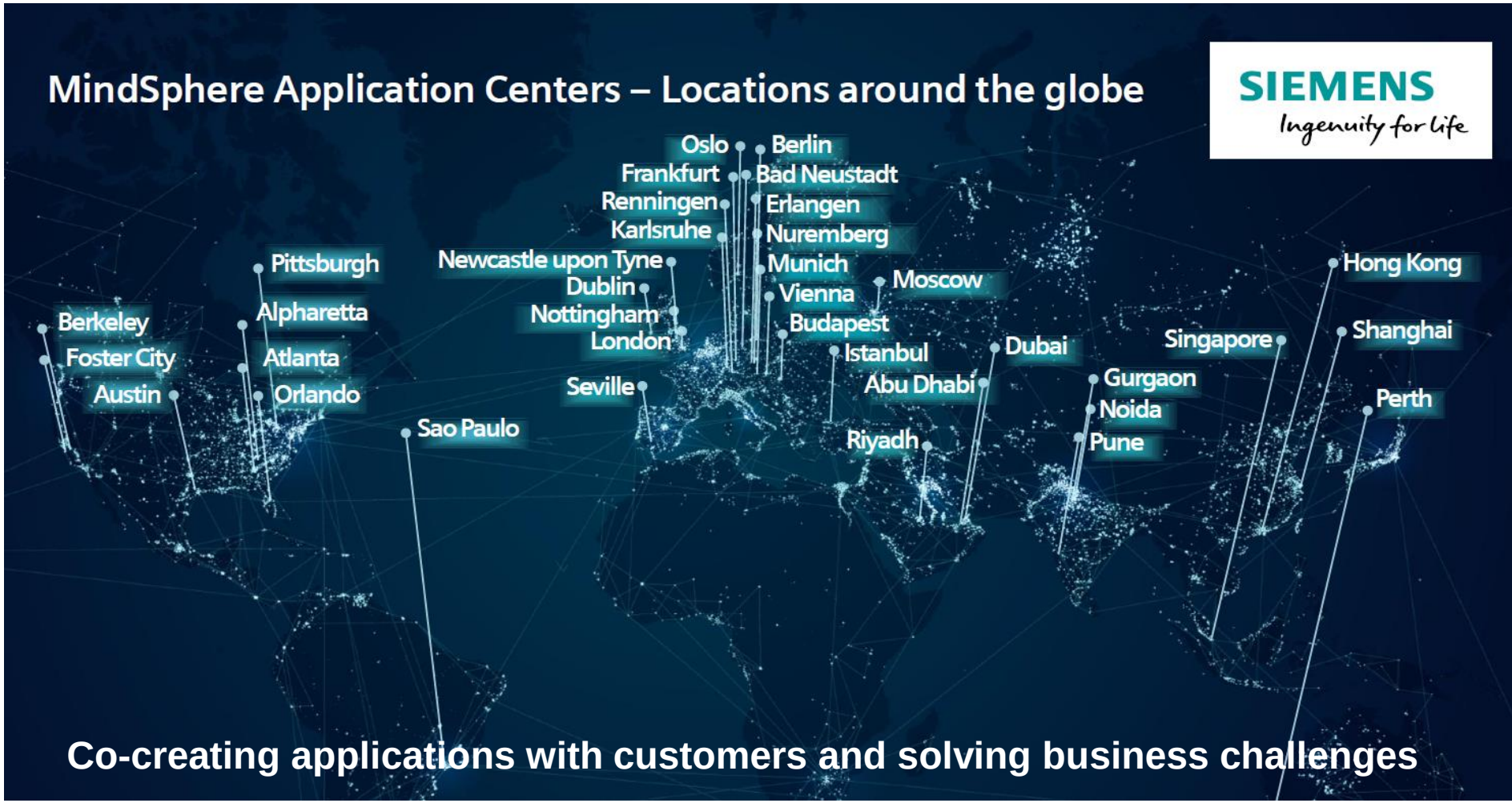
20 MindSphere Application Centers

50 Locations in **17** countries across the globe

~900 Software developers, data specialists and engineers



Apps available to demo – de.apps.siemens.cloud

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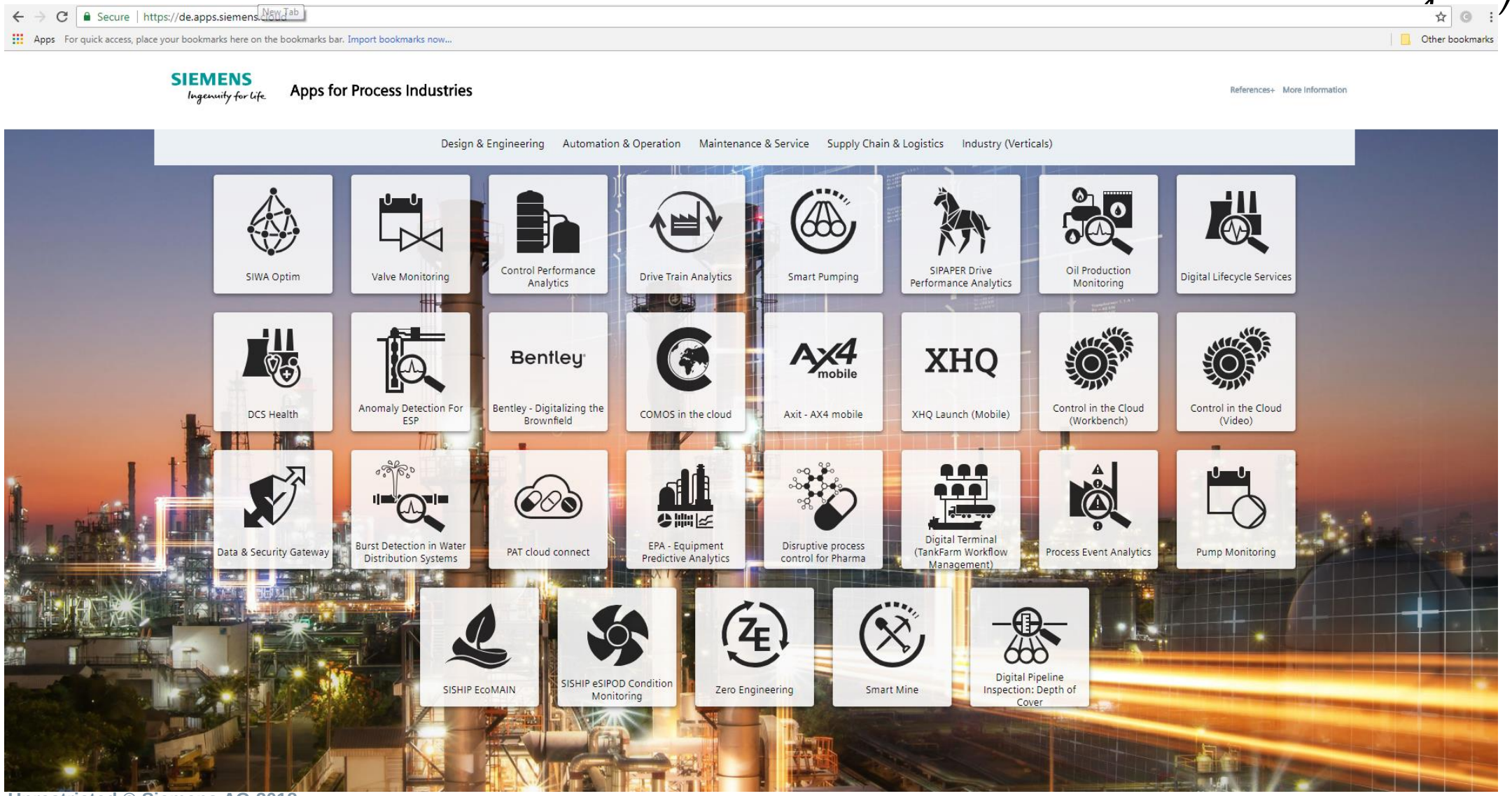

Why MindSphere for predictive maintenance?

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MindSphere enables you to connect your critical factory assets to gain operational transparency for predictive maintenance across products, plants, systems and machines:

- Leverage end-to-end predictive maintenance capabilities out of the box to eliminate the effort, time and expense of building and maintaining custom applications
- Use **machine learning and deep learning** to identify the point-in-time in which maintenance is the most cost-effective
- Provision and de-provision cloud-based IT infrastructure on demand to support your evolving needs

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MindSphere Application Development

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650+ Customers
in 29 countries

60,000+
Developers

80 Universities

430 Employees

135 Partners

Global strategic partnerships

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Since October 2018 a Siemens company

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Mendix is a leading low-code platform to create, integrate, deploy, manage and iterate modern business applications at scale.

Gartner MQ for High-Productivity Platforms
April 2018

Reference customers:

KLM engineering & maintenance

KUEHNE+NAGEL

ZURICH

PHILIPS

Ministry of Defence

The Leading Low Code Platform for the Enterprise

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Build better apps faster and collaboratively while relieving pressure on existing IT resources

Agile model-driven development

Visual modeling is 6 -10x more productive*

Business & IT work together

Built for Domain, Process and Engineering experts as well professional developers.

Multi-experience

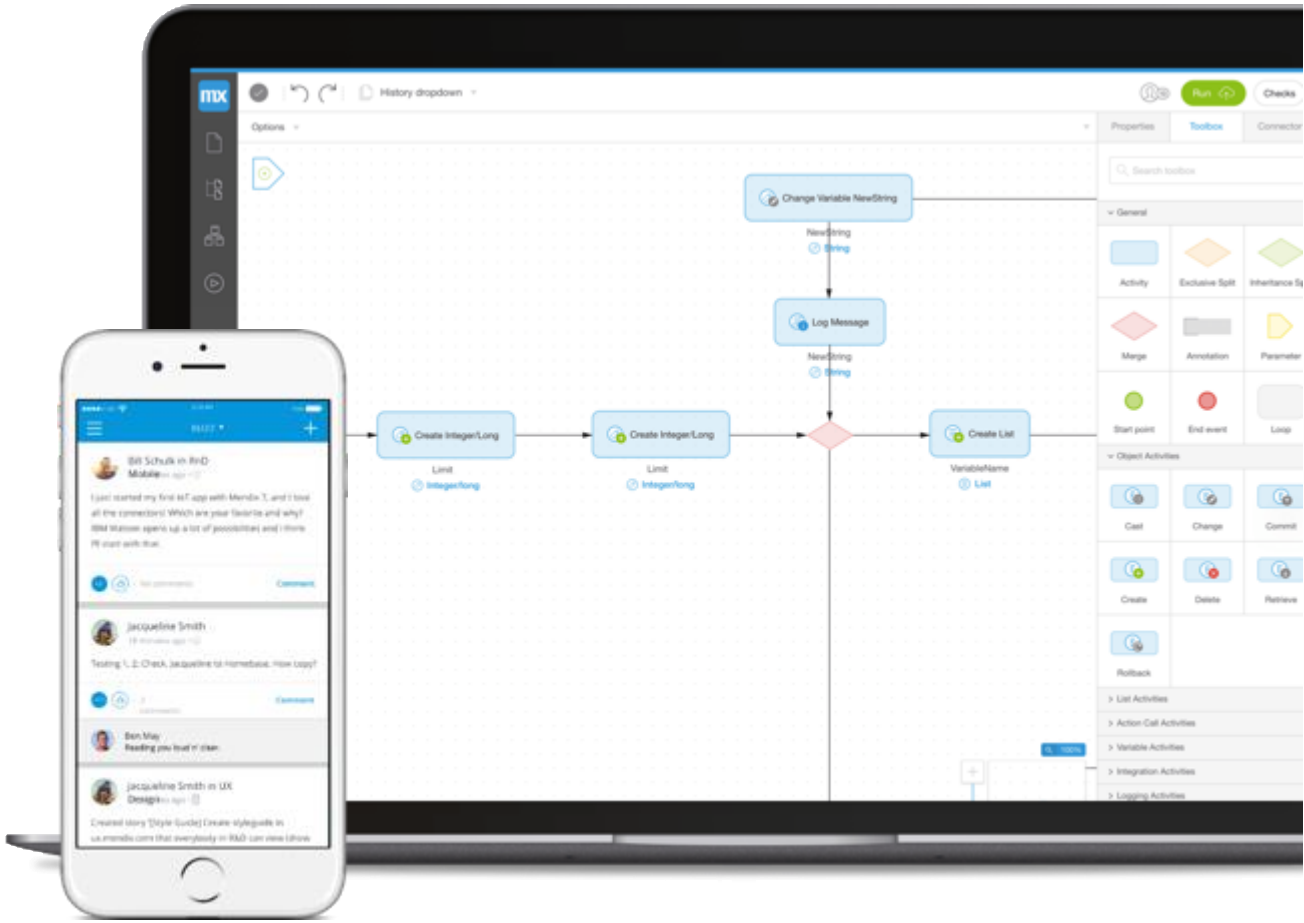
Applications for any device, online and offline, smart and connected via APIs

Deploy to *any* cloud with a single click

No time waiting for environments to be provisioned in public Cloud, private cloud or even on-premises

Maximize re-use

Out of the box connectors available for Teamcenter, SAP and Mindsphere



*Source: QSM report link & Forrester article link

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MindSphere for Pharma

siemens.com/pharma

On Premise IOT and Data Analytics platform

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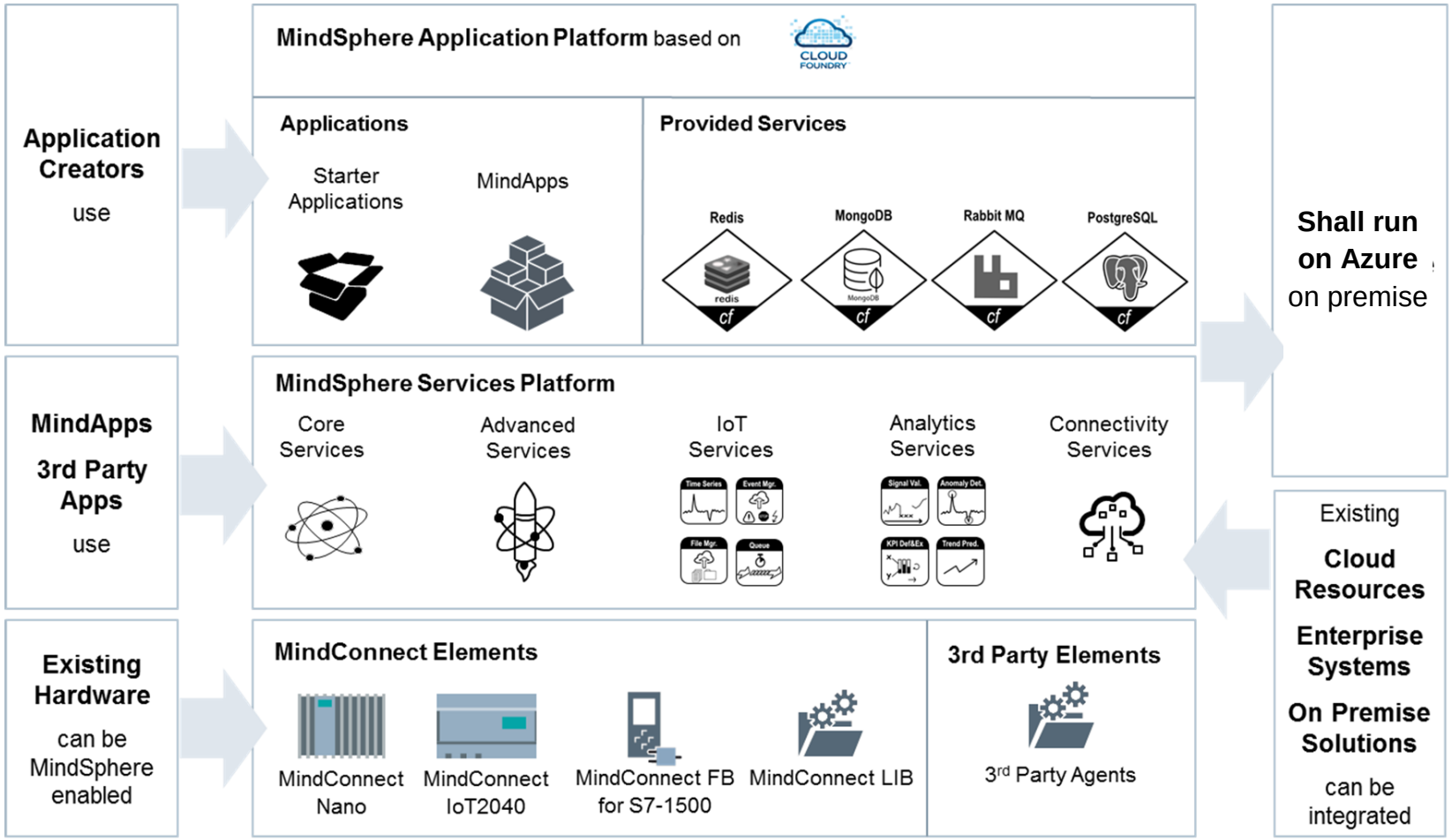
Atos & Siemens
Global Strategic Alliance



Siemens' Digital Offerings for Pharma

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Engineering … create your Digital Twin

Plant Design & Sim.

- FEED
- P&ID
- Piping
- eDMS PQM

Product Design

- Bio R&D Suite

Process Design

- Static Simulation
- Dynamic Simulation

Unit Design & Sim.

- Reactors
- Heat Exchanger
- Virtual Commissioning

Greenfield

Brownfield

(additional to the above mentioned)

- Digital Twin Generation
- DCS Migration

Increasing Maturity of Digital Twin

Operation … link real and virtual World

Reach for Operational Excellence

Manage Operations

- Batch Record in Cloud
- Electronic Batch Recording
- Sched-uling
- OEE
- Lab Mgmt
- GMP Dashbd

Improve Processes

- Control Loop Opt.
- PAT in the cloud
- Process Event Analytics
- Sensor Information Visualizer
- Disruptive Process Control*
- Operator Training Simulator
- Shift-book
- Logistics
- Data 2 Patient

Ensure Asset Uptime

- Valves
- Pumps
- Drives
- DCS Health
- Sensor Visualization
- GMP Maint.

Establish a secure connectivity

- Network Mon.
- Ind. Connectivity Services

*Disruptive Process Control is a project in Biopharma Mindsphere Application Center, Dublin (Bio MAC)

Current development focus

Ideas under development

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Edge

Positioning of Edge Technology in the system architecture for automation

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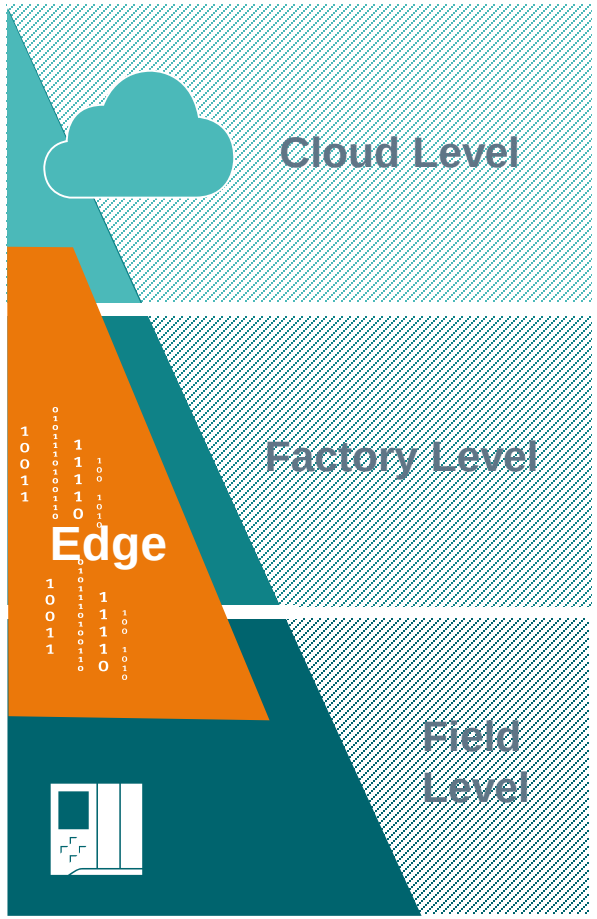
Technology



Characteristics

Cloud
- Platform (as a Service) for **global visualization and processing** of data on a high-level language basis
- **Integration of IT functionalities** such as long-term data archiving, scalable computing power & software deployment

Management / Controlling Layer (ERP, MES, SCADA)

Edge Computing
- **Open Ecosystem of hardware and software** for flexible execution of encapsulated, high-level language-based apps
- **Enable IT functionalities** for automated collection, processing and exchange of **data**

Automation - Mission Critical
- Production control
- Process control

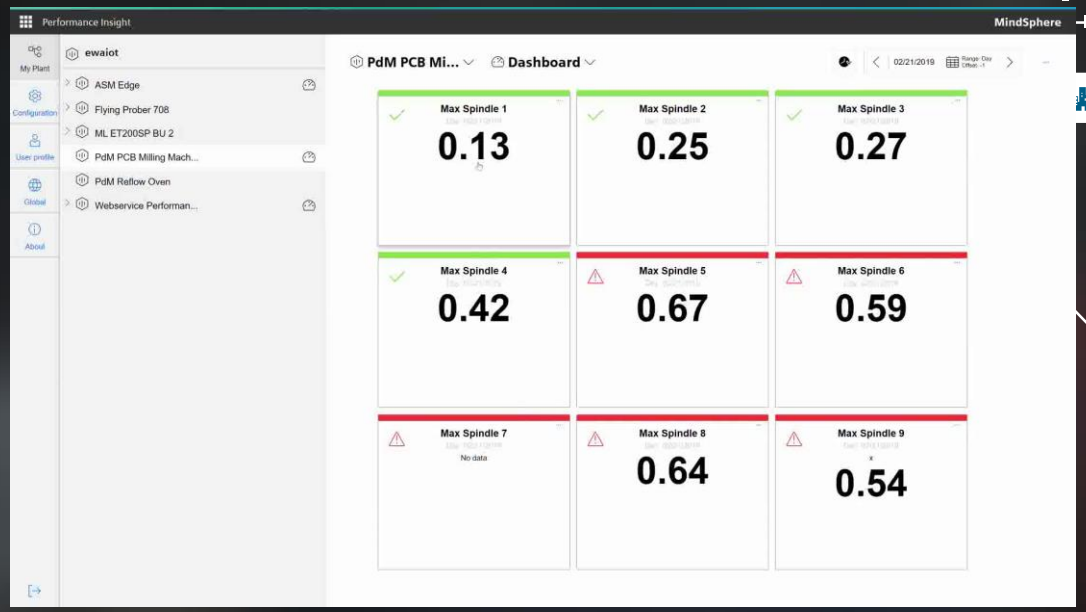
PCB cutting machine

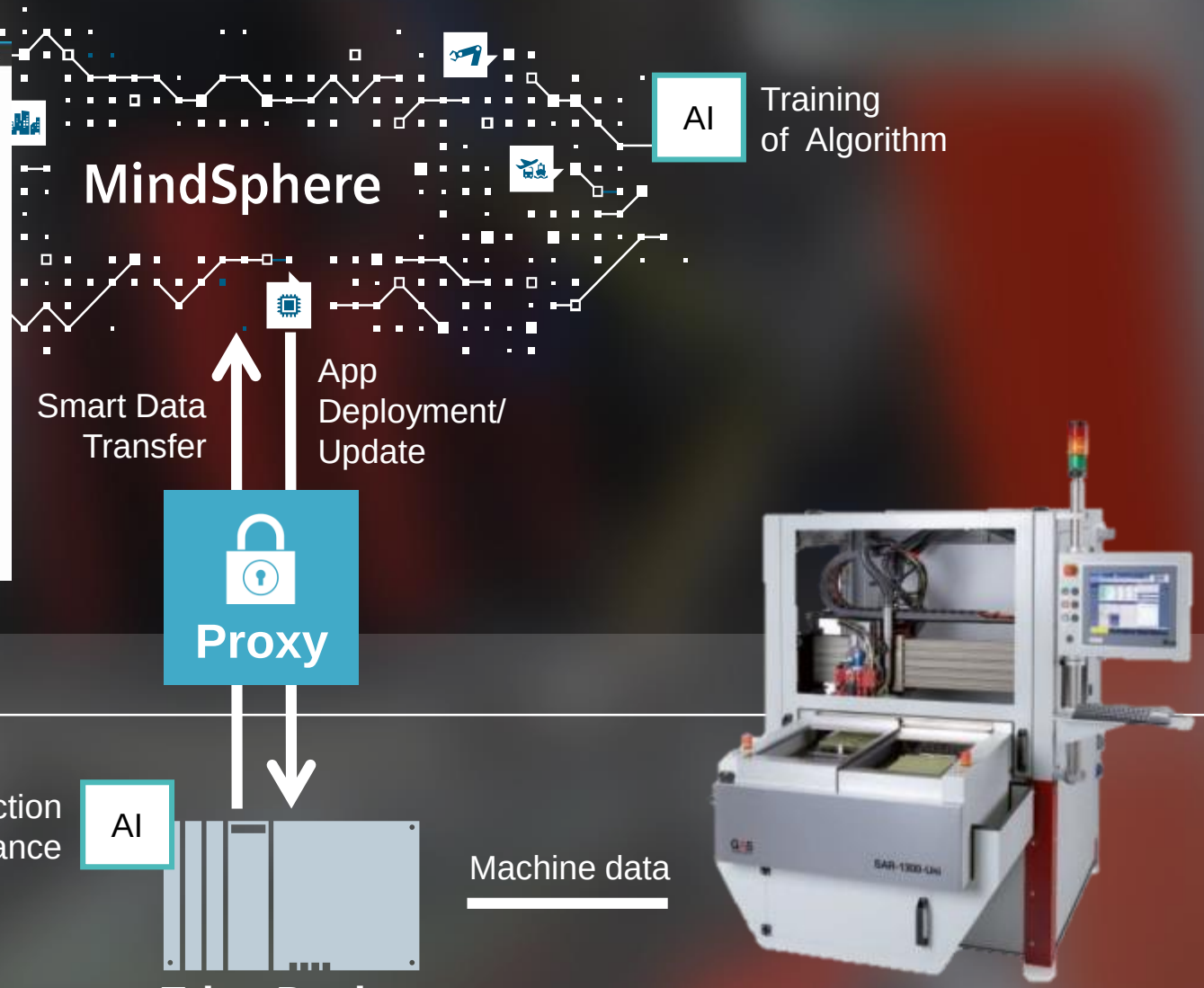
Siemens Electronics Factory
Amberg, Germany

The challenge

Aggressive milling dust causes drive bearing to get stuck

Non production critical level





Production critical level

AI predicts spindle maintenance for PCB cutting machine up to

2 days
in advance

Reducing preliminary spindle failures of this type by

100%

Total savings for 18 machines

200k€
p.a.

You and Siemens
- Digital industrial transformation partnership maturity curve

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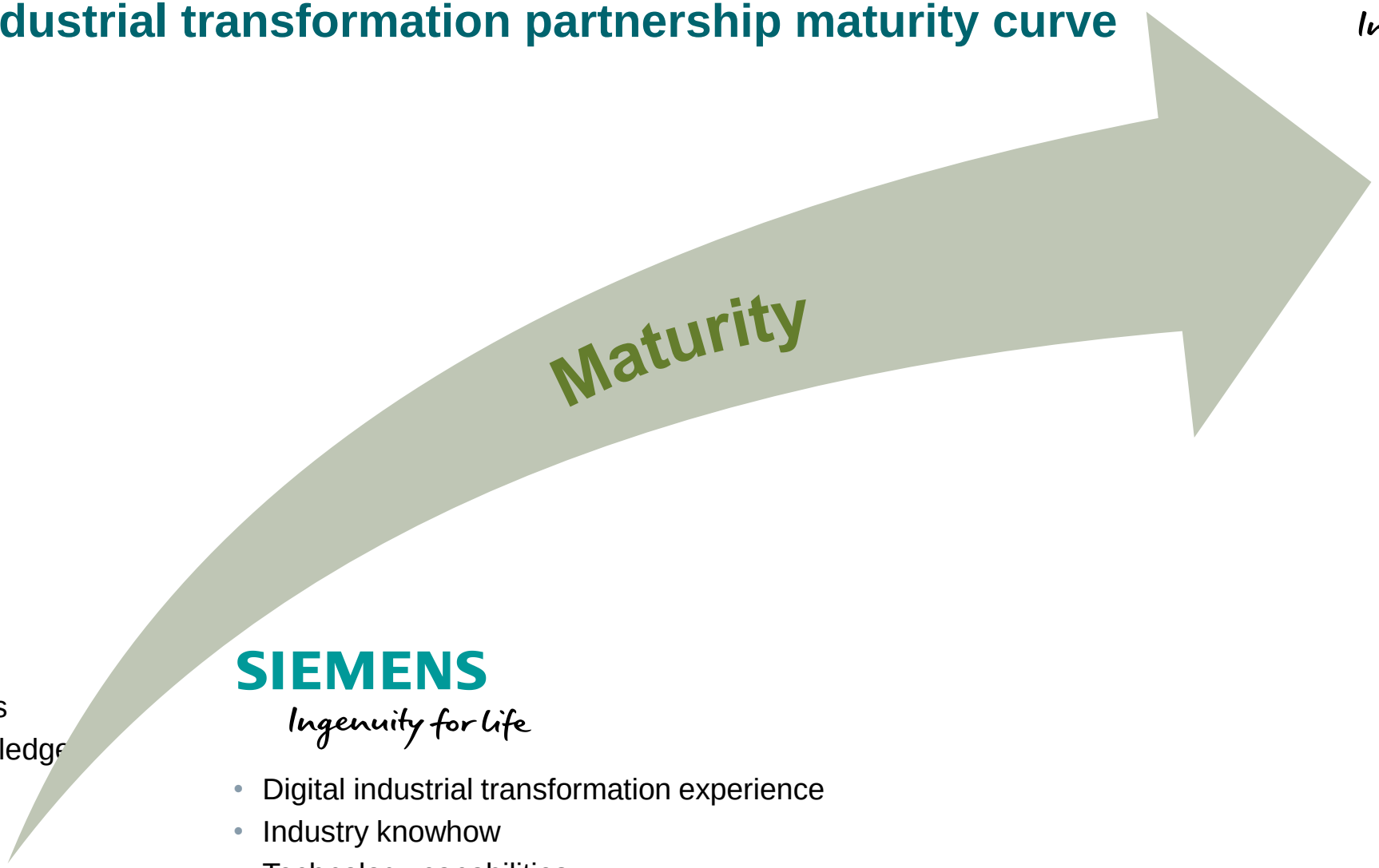

- **YOU**
- Domain knowledge
- Business objectives
- Infrastructure knowledge
- …

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- Digital industrial transformation experience
- Industry knowhow
- Technology capabilities
- ….

Digital Industrial Transformation approach

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DIT outcomes

Reduce customer order lead time by 20%
Contribution: 1%
Owner: COO

Minimize production lead time
Owner: VP Operations

Optimize satellite warehouse locations and stock levels
Owner: Logistics

Optimize demand forecasting
Owner: CSO

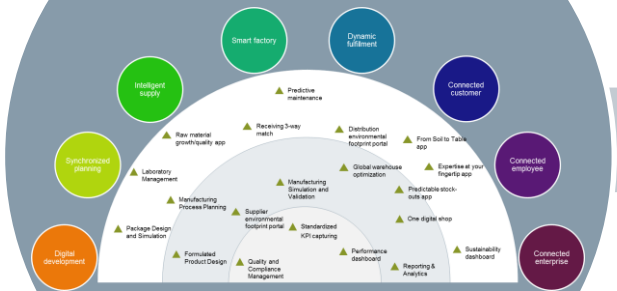
Early supply quality and quantity visibility
Owner: SVP Procurement

Optimize demand forecasting
Owner: CSO

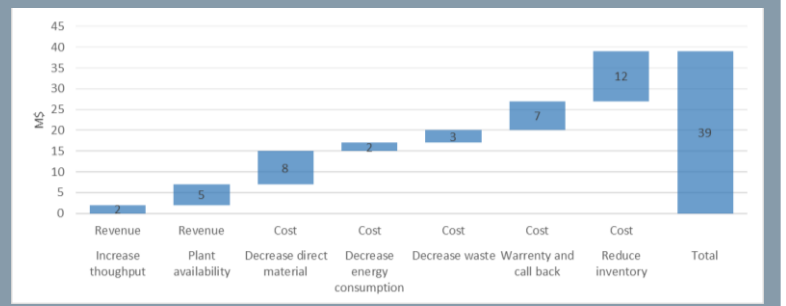
DIT elements

DIT Scope

Potential projects



Business Value Release



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Pharma Event

½ day Free Work Shop

VALUE HACKER.

Creates business value.

Next steps…….

Come and say hello at the mini stand outside

Or contact me:

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