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Industrial IoT in manufacturing

2019 EandM Pacific Northwest Automation Roadshow

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Use cases of the Digital Twin of Performance

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Predictive maintenance

Process optimization

Resource optimization

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We want to avoid unplanned downtimes in PCB milling separators

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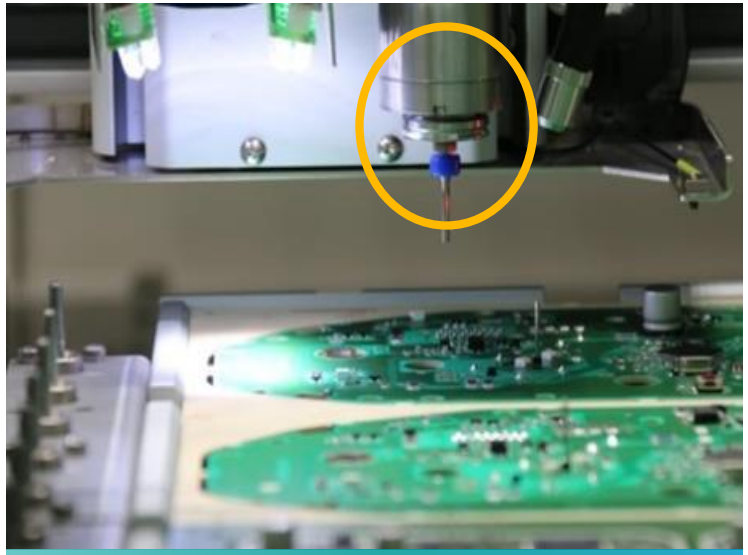
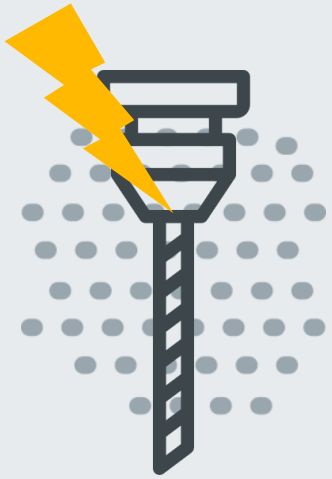


Objective: Milling spindle in a PCB[1] separator



Problem: Milling dust causes machine downtimes

Motor current

and speed analysis

Target: Detect and analyze operating parameters to predict downtime

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Analytics @ Spindle

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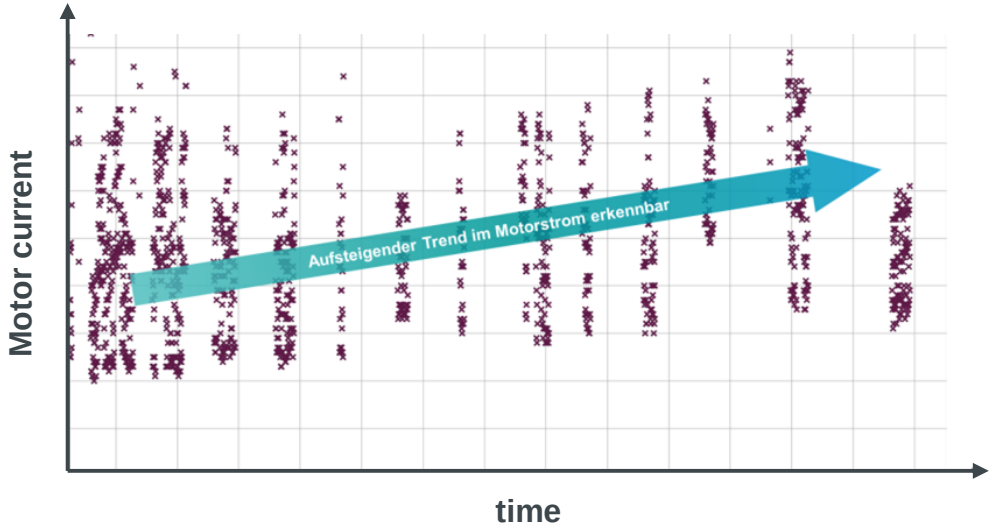
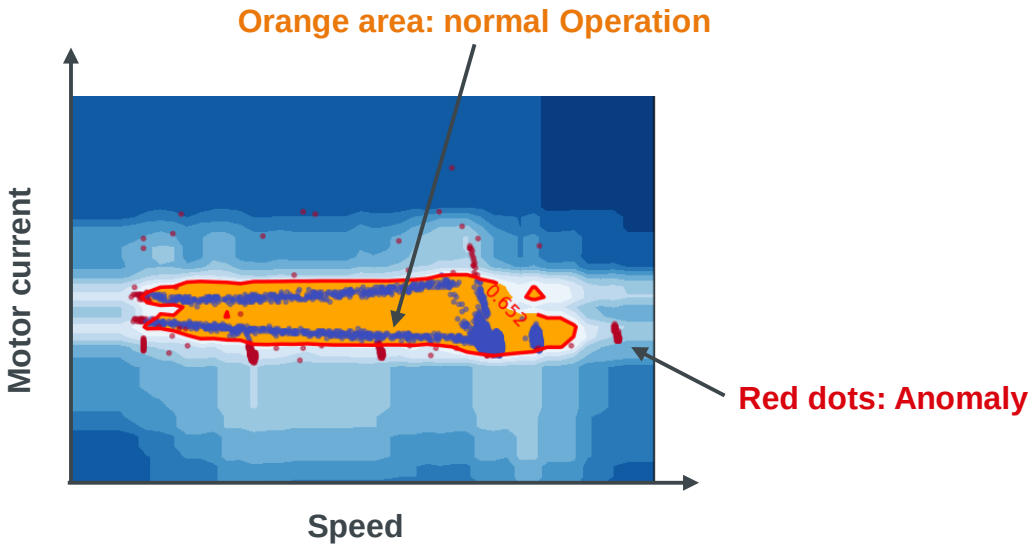
Trend analysis

Target: Locate downtime period



Anomaly detection

Target: Set trigger for service routine



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Our downtime prediction for milling spindles already works!

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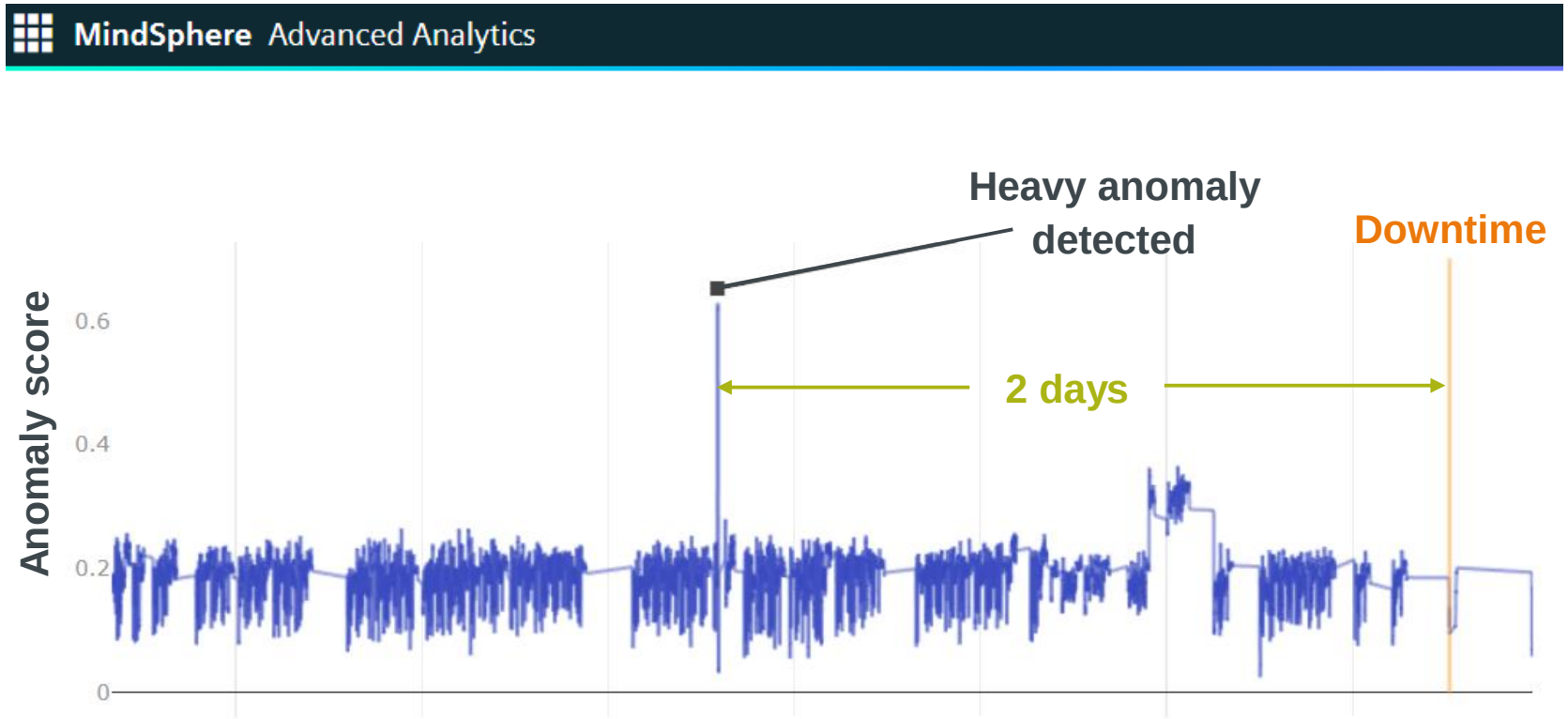

The algorithm detects downtimes up to 2 days in advance!

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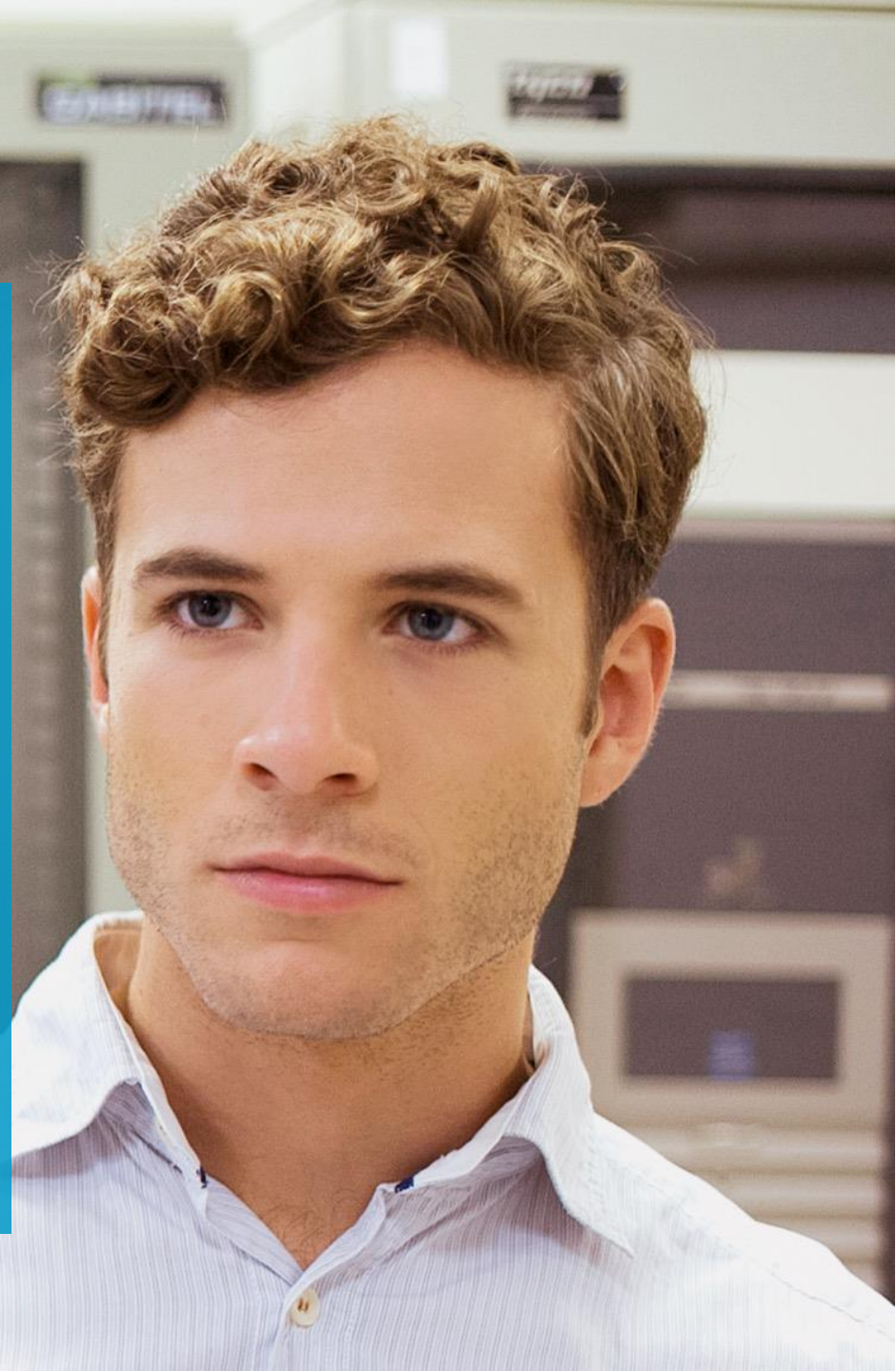
Operation Challenges

- Lack of information/transparency
- Lack of comprehensive diagnostic
- Large number of legacy systems
- Retiring of experienced workforce[1]
- Schedule-based maintenance process
- Unrealized process improvements



[1] Jesse Sumrak, Retiring Baby Boomers Cause Manufacturing Labor Shortages', *Lendio*, 2011, p. 1, https://www.lendio.com/news/small-business-outlook/manufacturing-shortages/, (accessed 18 September 2018).

Key Drivers of the Internet of Things

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The cost per unit of key technologies is falling

	2007	2018
DRONES	$100,000	$145
3D PRINTING	$40,000	$165
INDUSTRIAL ROBOTS	$550,000	$20,000
SENSORS	$30,000	$10
SMART PHONES	$449	$130

- Temperature
- Humidity
- Vibration
- 3-axis motion
- Location

$50

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What makes Industrial IoT Different …

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Drive/Inverter

700

Motor/Gear Box

2,000

How many data points are there in a

Drive Train Application?

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Technologies that enable step change

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Cloud Computing and analytics

Edge Computing and analytics

Machine Learning & Deep Learning

APIs & Low-Code Rapid App Development

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MindSphere
The Open, Cloud-based, IoT Operating System

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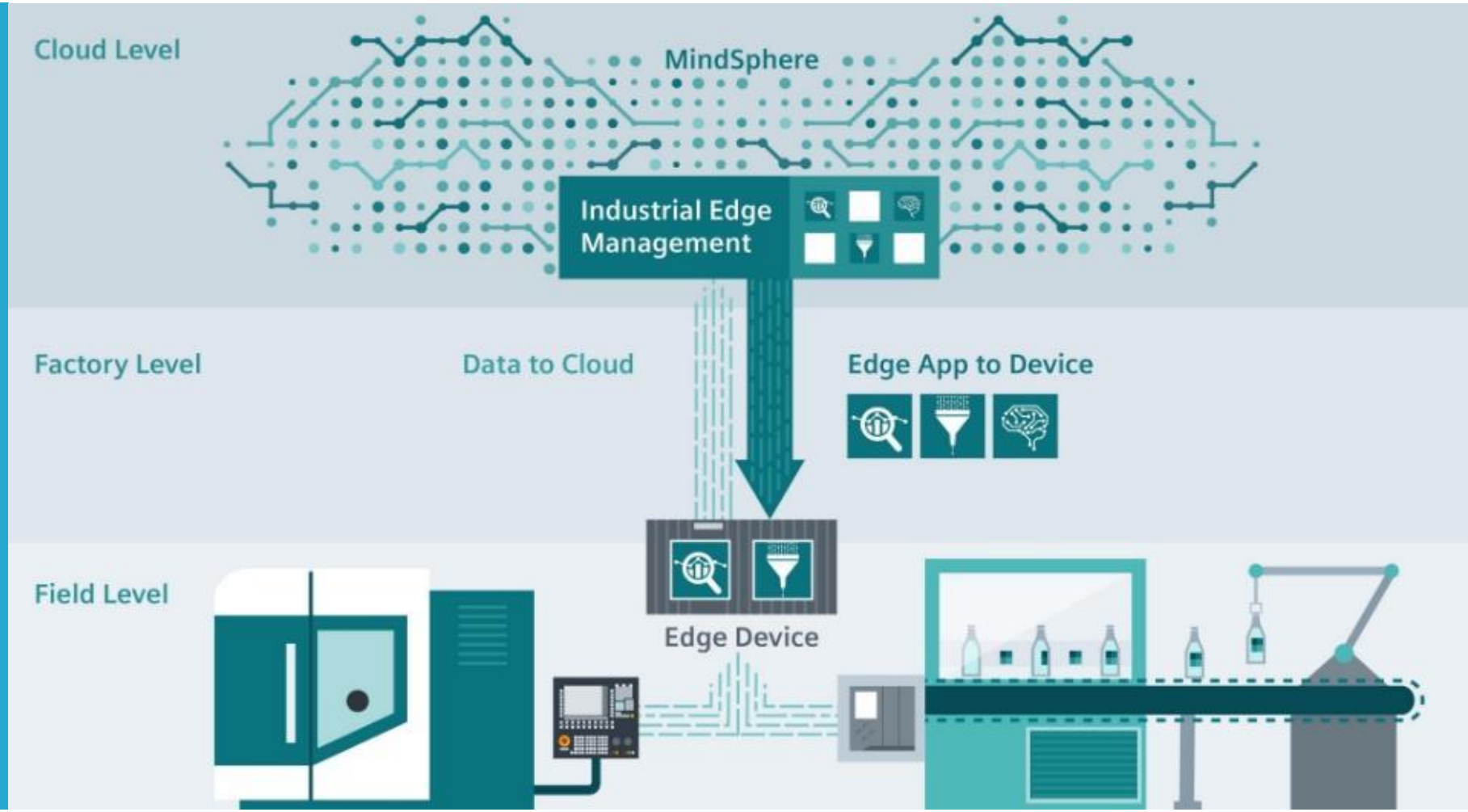
MindApps
Asset transparency and analytical insights into machines, plants, fleets and systems

MindSphere
Open Platform as a Service (PaaS) for scalable, global IoT connectivity and application development with native cloud accessibility

MindConnect
Connecting assets with secure plug and play connection of Siemens and third-party products and equipment



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MindSphere enables a quick, easy and secure start into data-driven services

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STEP 1
Connect

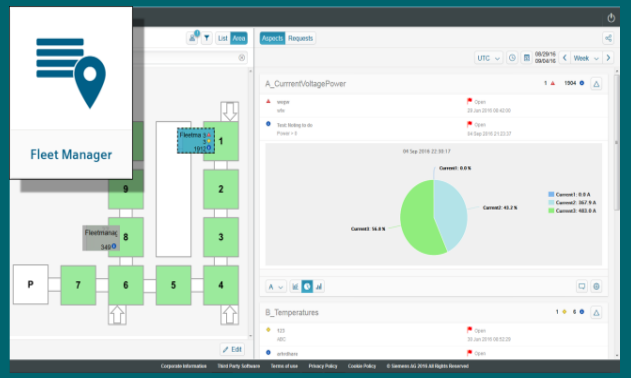
Get MindSphere user-account, receive and integrate your MindConnect element into your machine/equipment

STEP 2
Configure

Configure data acquisition, connectivity and Visual Analyzer via MindSphere

STEP 3
Run the Service

Monitor e.g. health status of all assets and drill into details using MindApp Fleet Manager



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MindConnect
Bridge to the Cloud

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MindConnect API/LIB

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Industrial IoT Digital Maturity

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Value Creation
Solution Maturity

Connect & Monitor

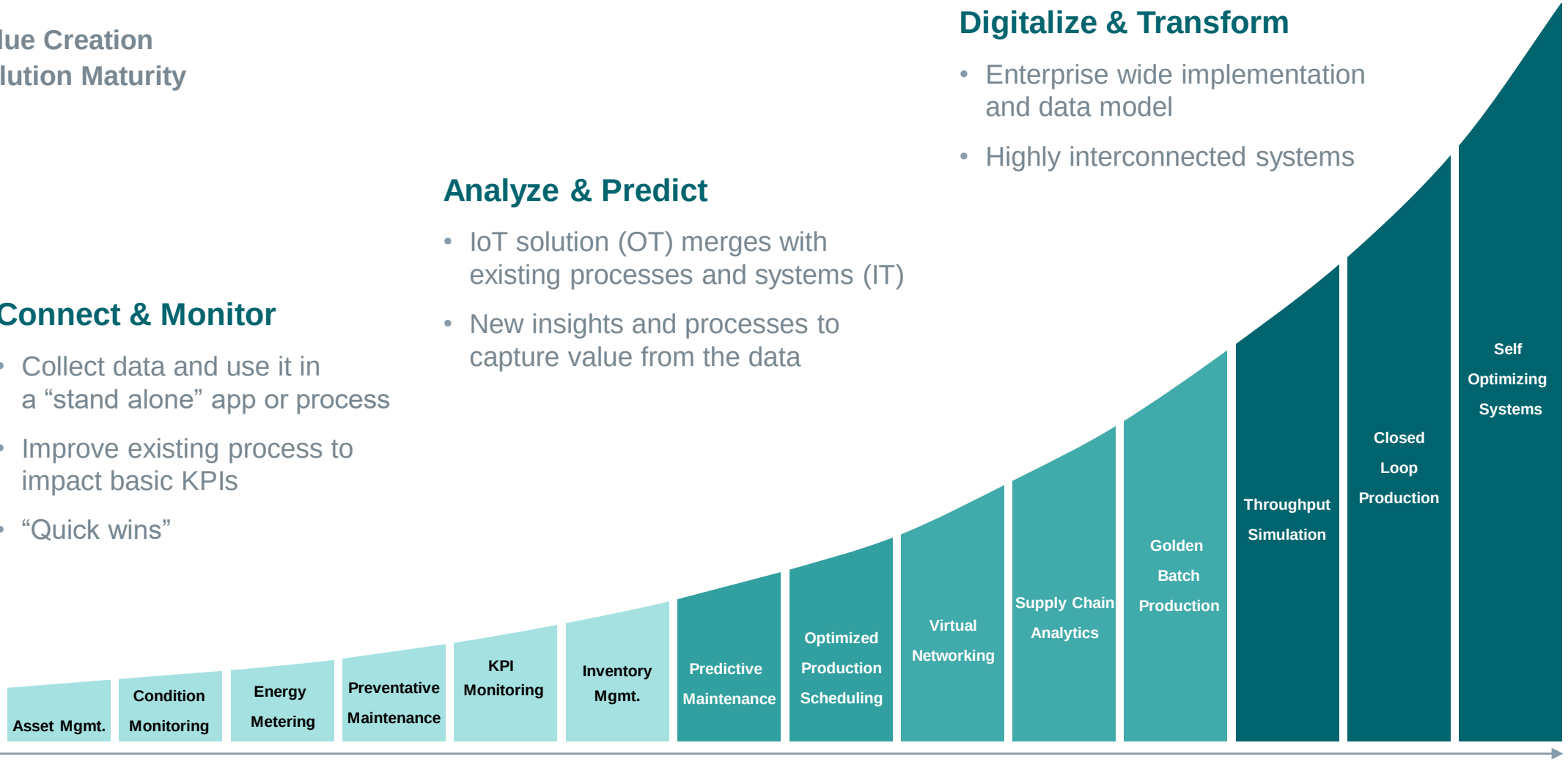
- Collect data and use it in a “stand alone” app or process
- Improve existing process to impact basic KPIs
- “Quick wins”

Analyze & Predict

- IoT solution (OT) merges with existing processes and systems (IT)
- New insights and processes to capture value from the data

Digitalize & Transform

- Enterprise wide implementation and data model
- Highly interconnected systems



IT/OT Convergence

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Digital Twin of the Performance - Gebr. Heller Maschinenfabrik

MindSphere - Condition Monitoring

Foto: Gebr. Heller Maschinenfabrik GmbH

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Gebr. Heller Maschinenfabrik GmbH

- Leading supplier of CNC machining centers and flexible production systems

Solutions

- Siemens complete automation and drive technology
- Siemens MindSphere cloud-based open IoT operating system
- "HELLER4Services" allows machine data and their graphic representation to be evaluated in the "HELLER Services Interface" based on MindSphere

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

The Goal of a Digital Transformation

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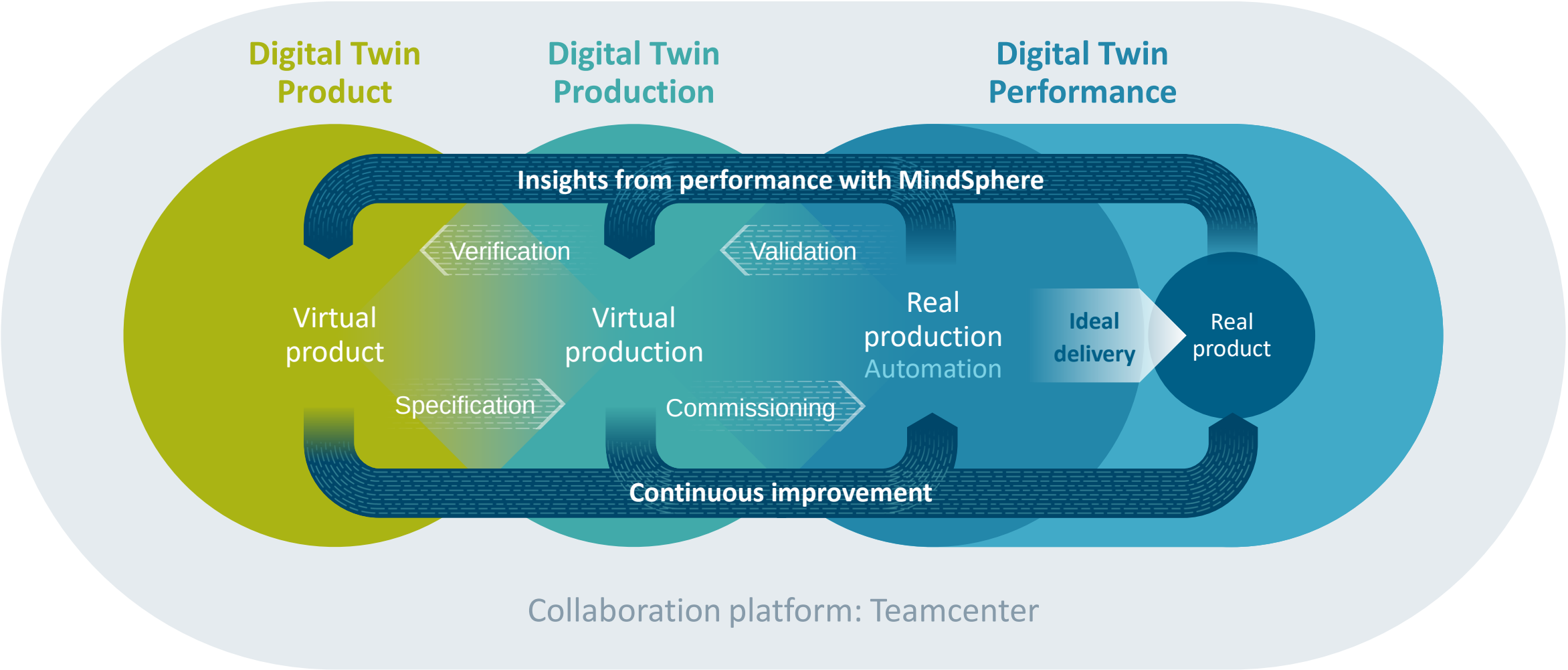

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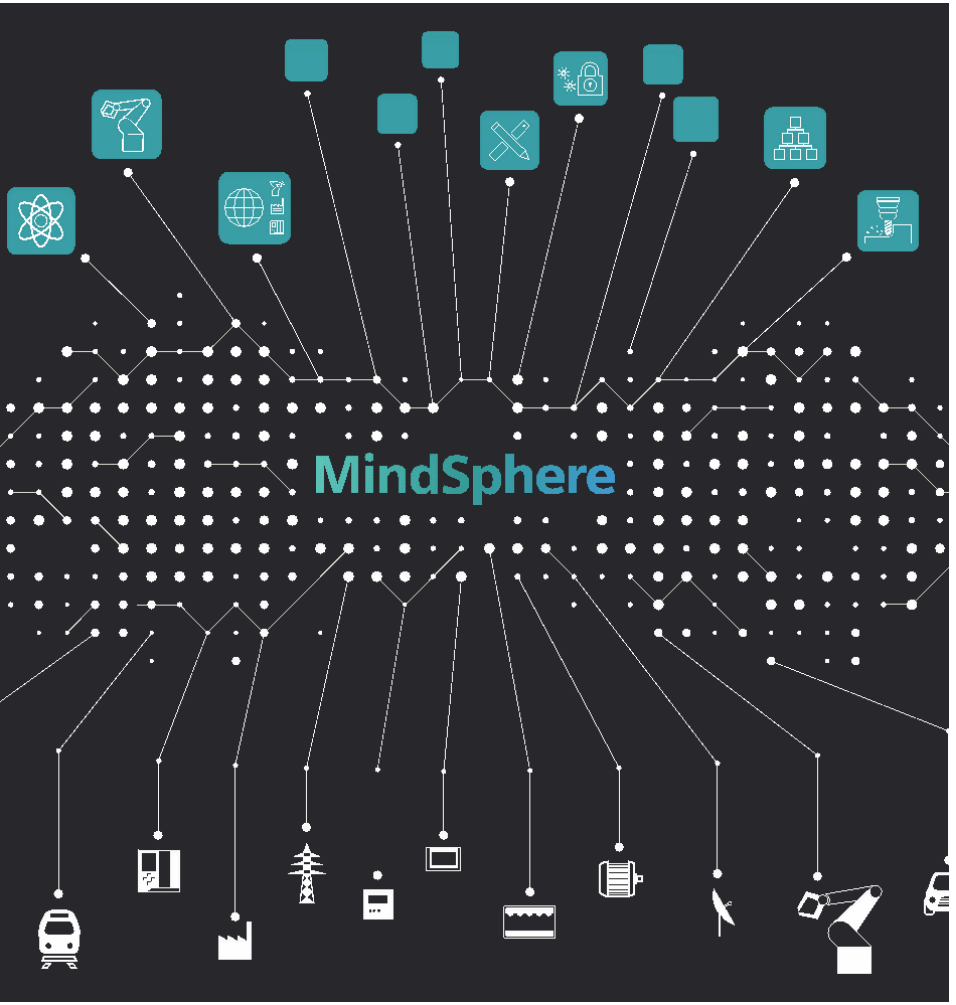
Thank You!



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