



Decarbonization

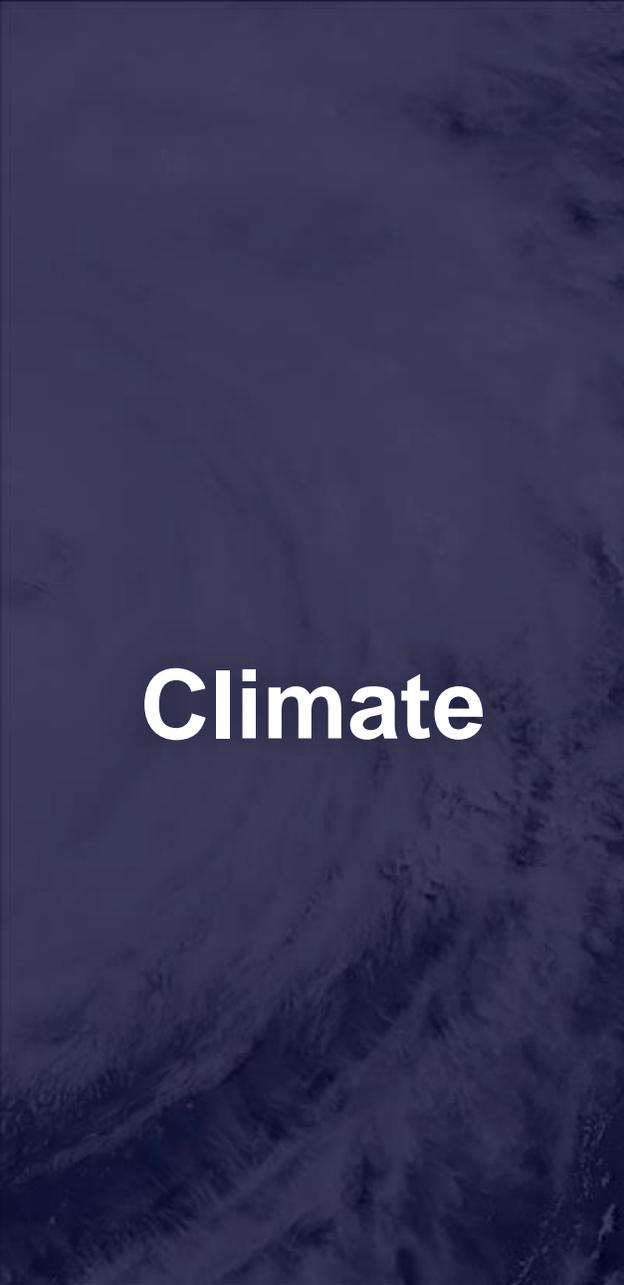
20%

Energy efficiency

37%

Resource efficiency

Only 13%



**Climate**



**Covid**



**Conflict**

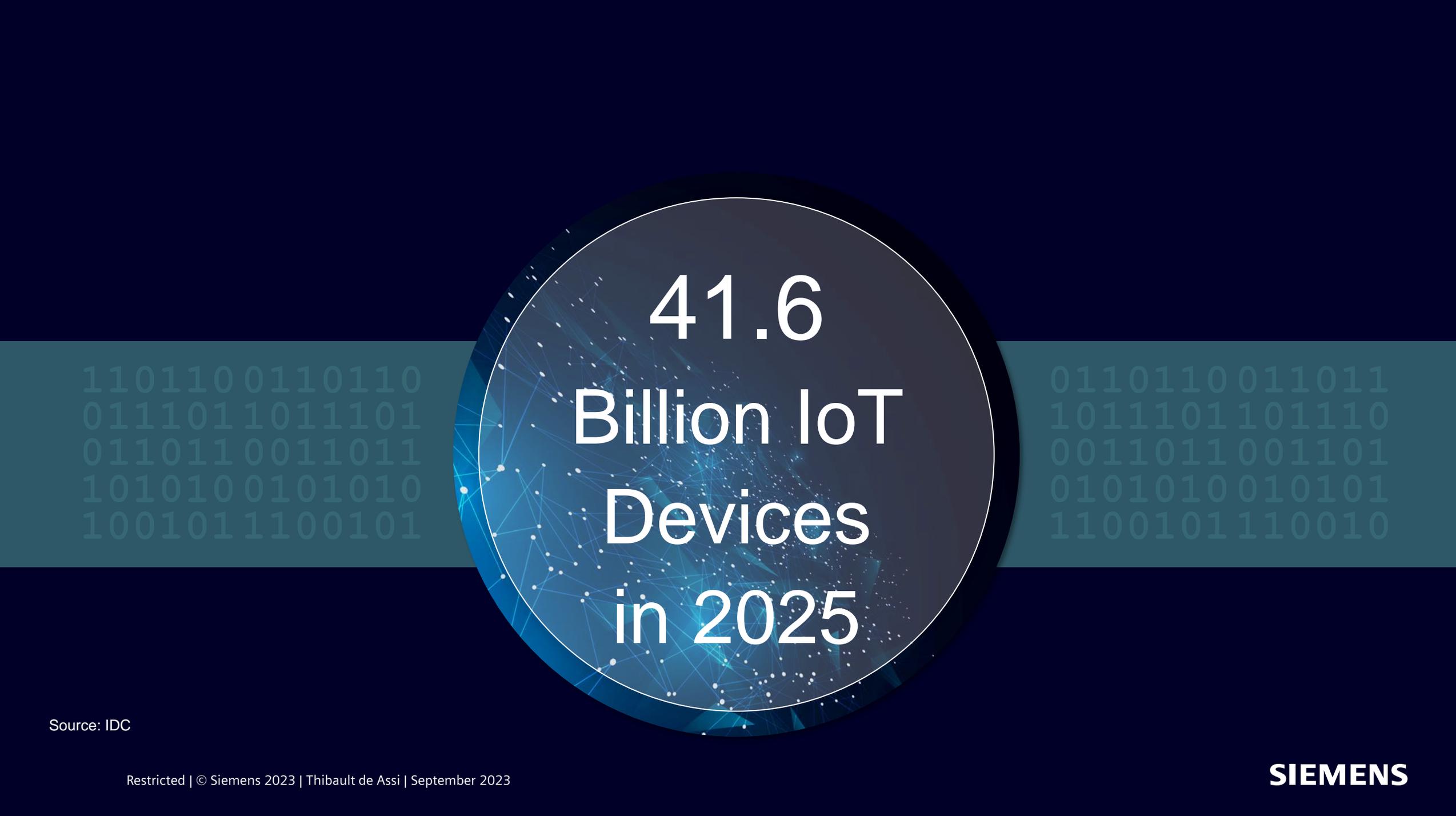


**Competition**

# Opportunities to improve operational effectiveness through smart data driven



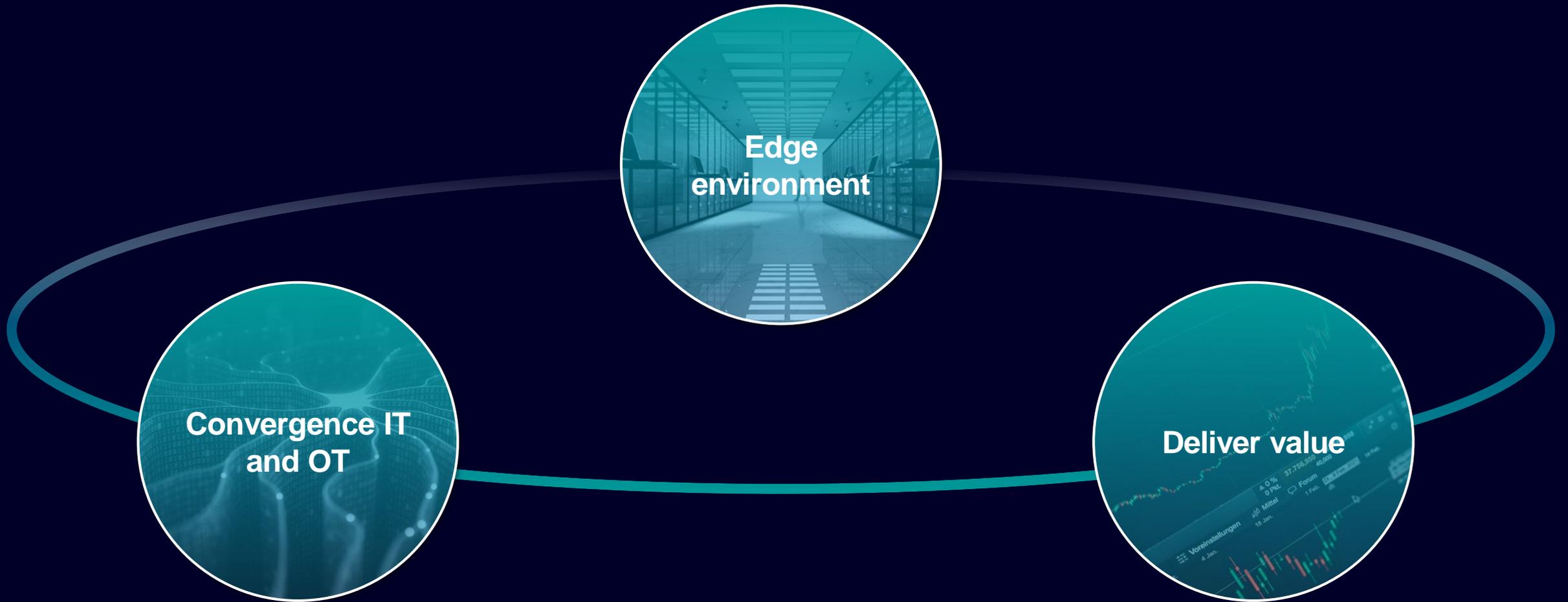
1) What Edge Computing Means for Infrastructure and Operations Leaders - Gartner, 2018  
2) Artificial Intelligence of Things by Technology & Solutions 2020-2025 - Research & Markets



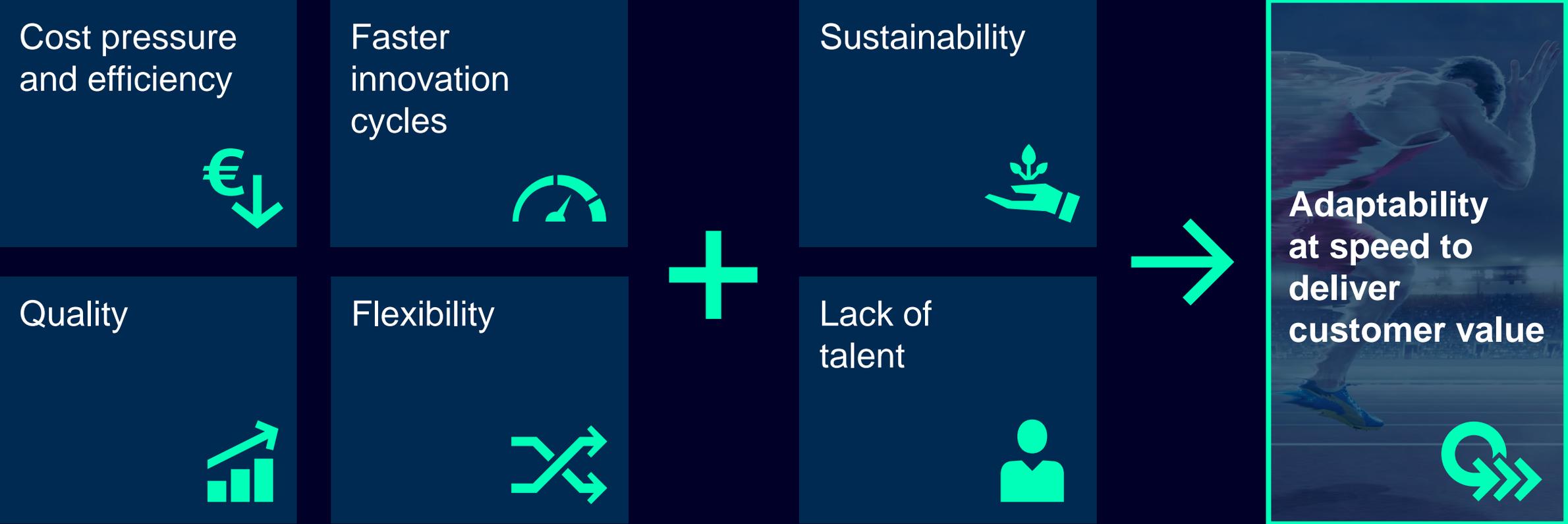
41.6  
Billion IoT  
Devices  
in 2025

Source: IDC

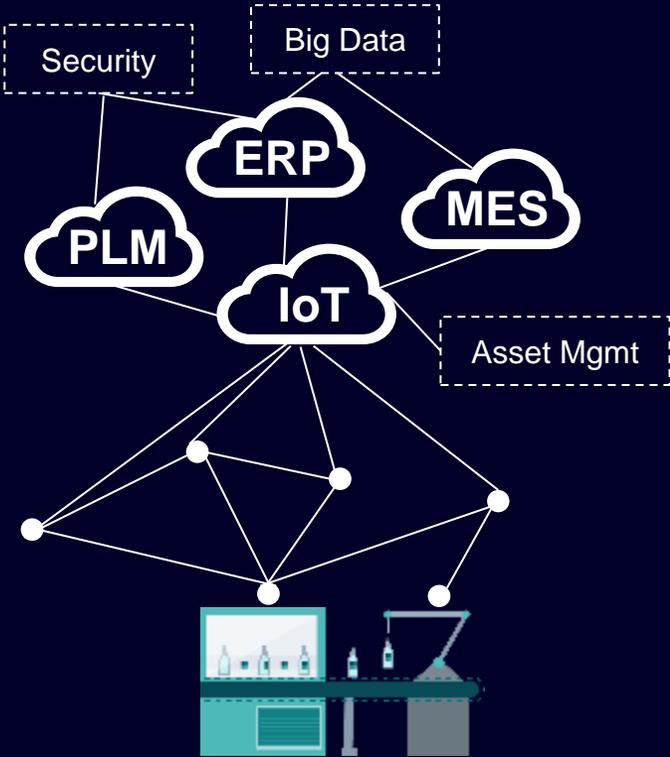
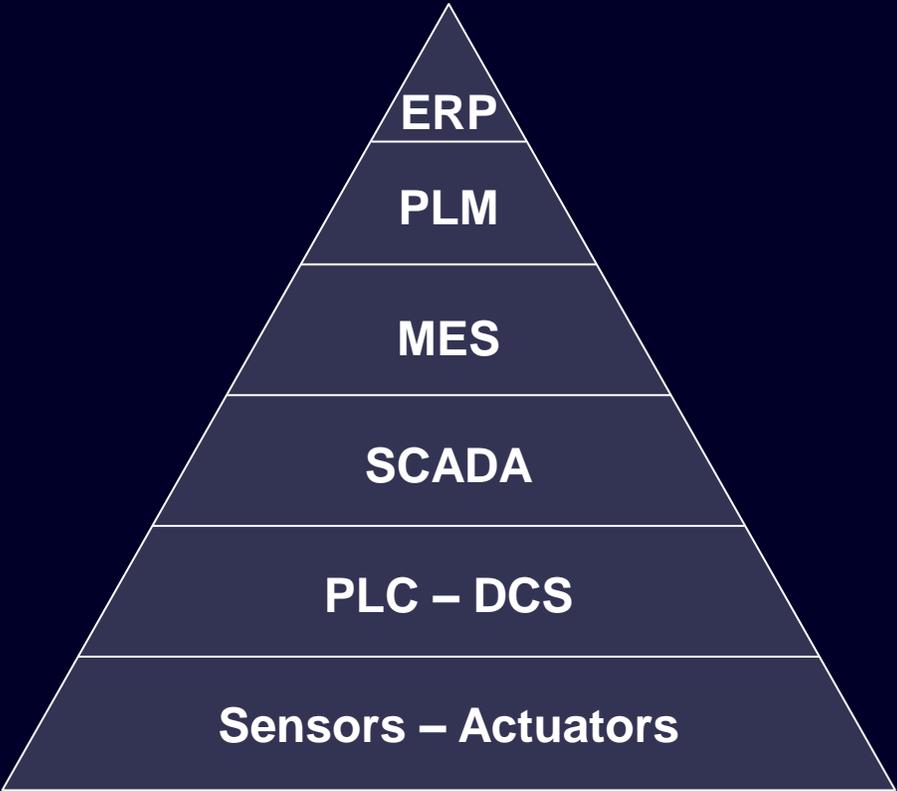
# Addressing key industry challenges



**Industry's challenges are multiplying –  
with new ones being added all the time**



# The automation pyramid becomes a network



Intelligence

Application

Cloud

Edge & Control

Field

# How?

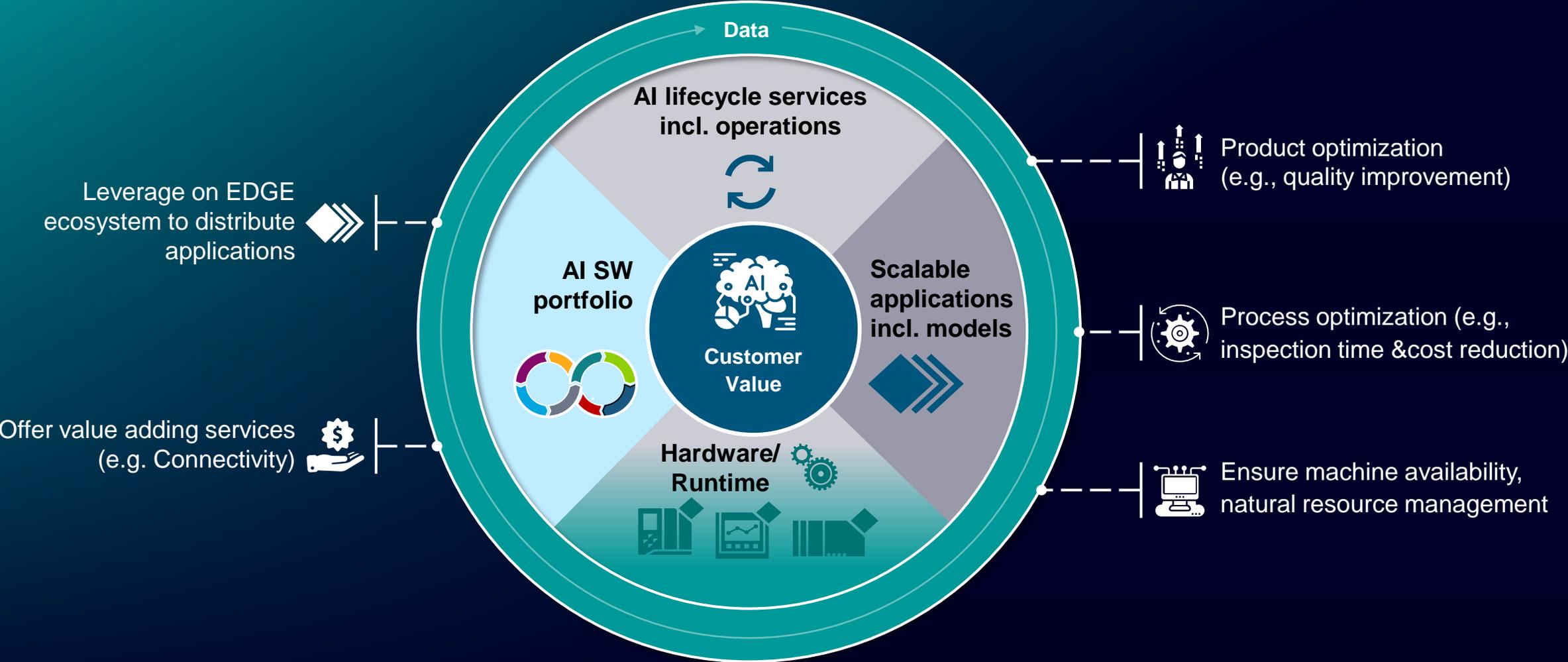


# Let's transform the industry together

Thibault de Assi , General Manager, Siemens Digital Industries

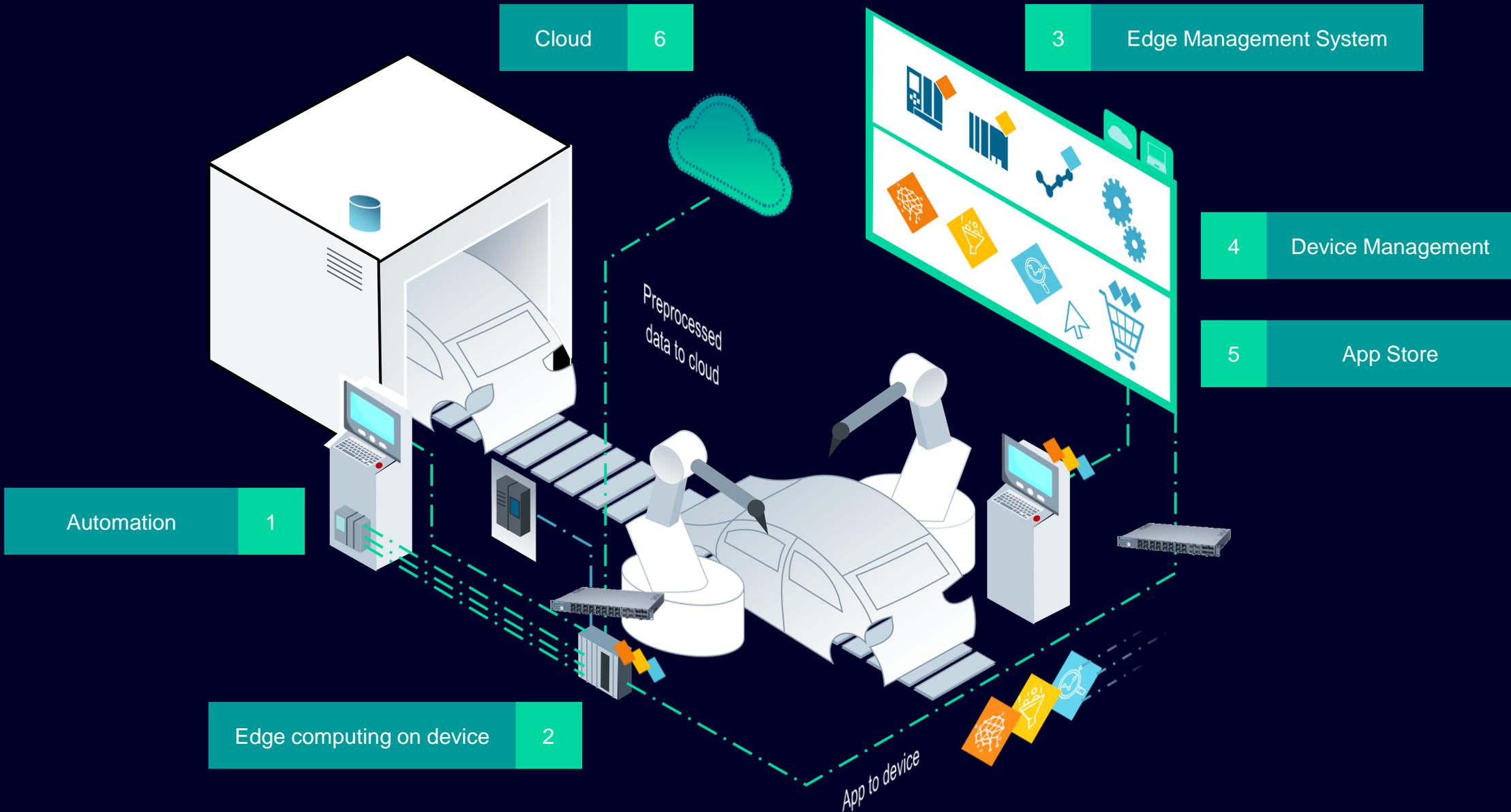
With a holistic  
approach and  
domain expertise

# Siemens delivers customer value with end-to-end AI offerings: Integrated hardware, software, models & services



# Industrial Edge in the context of Siemens Xcelerator – everything for resilient industrial operations





# Industrial Edge

Live-Demonstration



# Artificial Intelligence – Achieving smarter and efficient production cross various application fields



Anomaly Detection



Smart Assistant



Quality Inspection



Predictive Maintenance



Defect detection



Quality Prediction



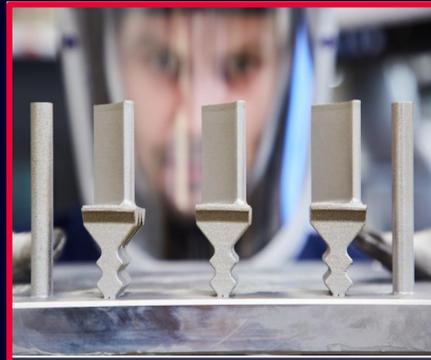
Process Optimization



Audio Diagnostics



Process Optimization



Visual Inspection

# Defect Prediction – Die Casting Process



Press Shop



## Anomaly detection for die casting process to reduce costs

Anomaly detection of the process enables early prediction of product quality thereby reducing process costs associated with the defects



### CUSTOMER PAIN(S)

- Metal casting process usually presents high defect rate (2-4%)
- Due to unknown process parameters and conditions anomaly cannot be easily identified or predicted
- Further processing of defected parts are extremely costly (70+% processing costs)

### OUR APPROACH

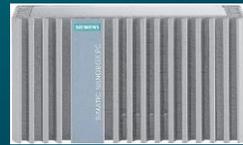
- Identify key process parameters affecting the throughput of die casting machine
- Reduce process costs by detecting and thus ejecting defective parts out of the production process
- Build and deploy machine learning model on Edge to make real-time anomaly detection and defects prediction, feedback the result to PLC to prevent further production of defected parts

### CUSTOMER VALUE

- Early state quality prediction to avoid further process costs of defected products by **30+%**
- Optimize process and decrease defect rate by **40+%**
- Gain better visibility over process parameters and process anomalies



# Example architecture to bring AI to the shopfloor with IPC/Edge



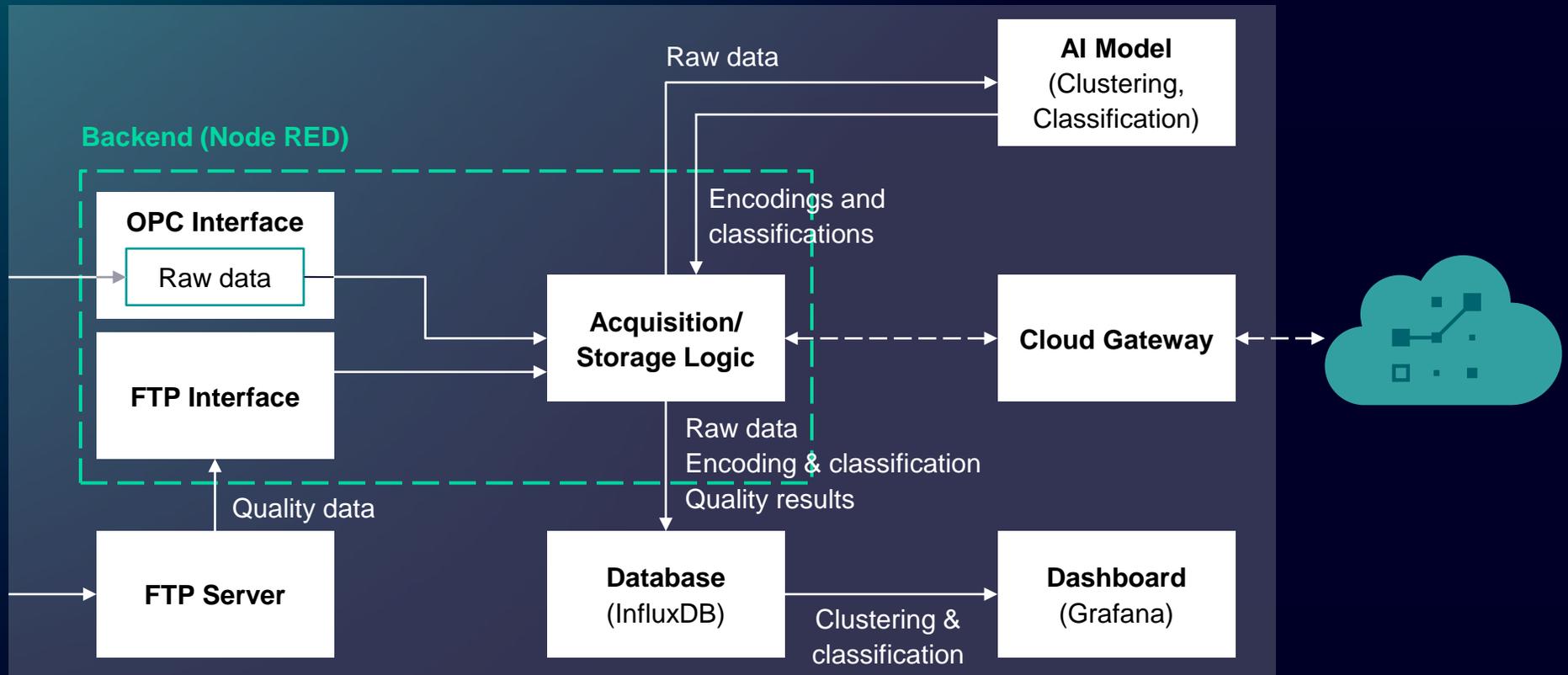
**SIMATIC EDGE Box**

## S7-1518 PLC



**Data from PLC**  
Subset of raw data as required by dashboards

**Quality Results**  
(offline files)



# Process Optimization – Improving Beer Quality



## Business Issue

- Provide holistic optimization of process parameters based on thorough analysis of influencing factors at each step in a brewery.



## CUSTOMER PAIN(S)

- Inconsistency in the beer quality is mainly influenced due to change in process parameters
- Currently no clear indication or a recipe is available that guarantees best graded beer(grade 6.8) consistently.

## OUR APPROACH

- Identify key process parameters influencing the beer quality.
- AI based solution is developed to predict parameters for achieving an optimized process.
- Observe the trend leading to 6.8 grade beer and correlate all the processes together to achieve this.
- Training and deployment is done on the edge system.

## CUSTOMER VALUE

- Consistent quality in the beer increases the overall productivity.
- Reliable system to identify optimized parameter values for every process.
- Improved data source after combining process data with lab results for trend analysis .

# Data driven approach for process optimization

## Target

Few data are available

Water consumption optimization

Refine energy consumption in wort cooling and maintain optimum temperature

Predict accidental conditions using the logistic data and generate a warning to avoid such incidents

identify influencing factors to achieve 6.8 grade of beer consistently

Malt batch per silo  
Mill Gap

Quantity/Temperatures  
Hop additives  
Average brew pH values  
Alarms  
CaCl<sub>2</sub> quantity  
Water flow/Temperature ...

Yeast Type  
Yeast Generation  
Dosing Data  
Number of brews  
Silica gel quantity ...

Packaging units  
Machine performance  
Quality  
Energy ...

**Q-Score**  
Clinical lab test report  
Quantitative taste report.

Raw material



Brewing



Fermentation



Packaging



Quality Check



Few data being tracked

Water (influences beer quality), no clear mapping in place

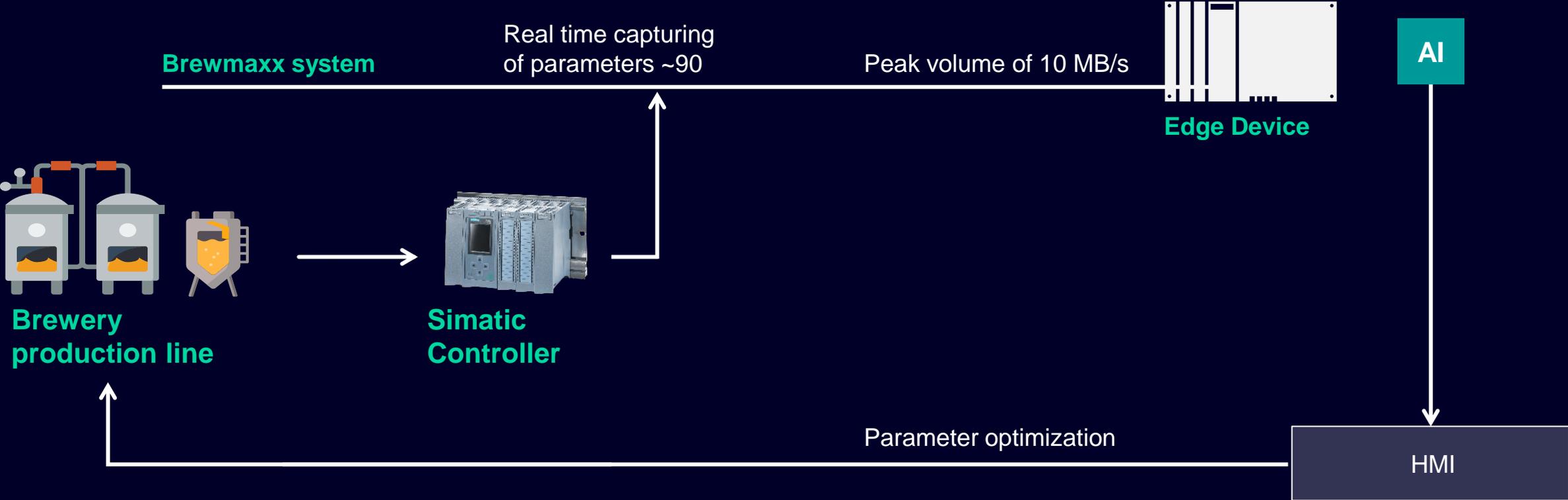
Energy efficiency

Transportation (bottles fall from the pallets); Machine performance and folding quality

Recipe does not guaranty 6.8 quality grade

## Challenges

# Production Critical Level



# Visual Inspection of Printed Layers in Jet Binder Additive Manufacturing



3D printing



## Business Issue

- Detection of defects post printing is costly in terms of time and labor
- Late detection leads to waste of time and material used for 3D printing.
- Corrective actions need to be taken during print job.

## TECHNICAL CHALLENGES

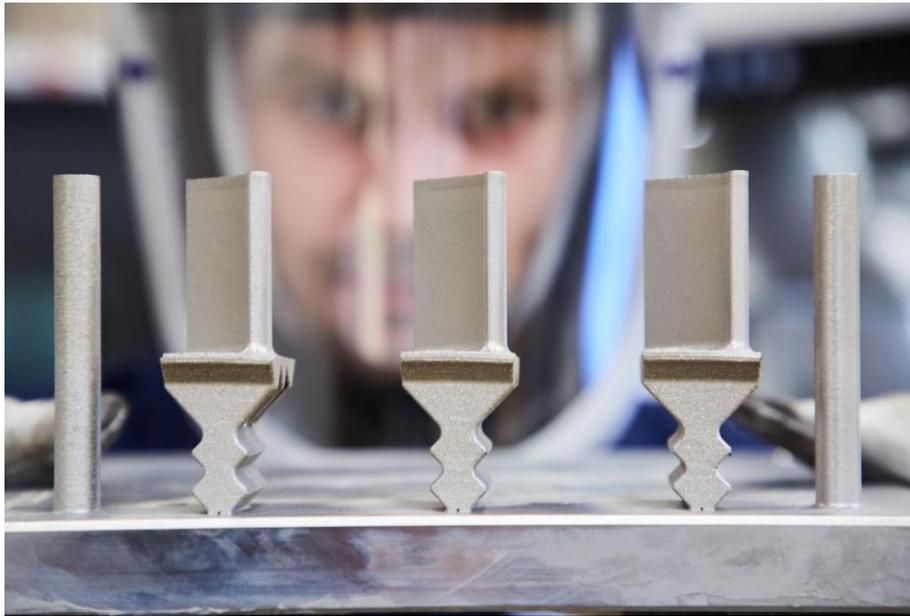
- The defects are very small and could lead to complete design failure.
- There is specific description to the defects and linked to their occurrences, only 3D printing expert can identify and localize the defects.
- No external camera is available, the line scan camera attached with the scanner is only option.

## DEPLOYMENT SOLUTION

- Classical machine learning algorithms approach to identify the anomaly is deployed.
- We are able to classify and model the different kind of defects combining the ML approach with Image Processing solutions on IPC427E type.

## BUSINESS VALUE

- Reduced downtime and scrap rate
- Early defect detection saved the cost, material and effort in 3D printing.
- Saved the time of experts in localizing small defects.



**2,500**

Average number  
of layers per job

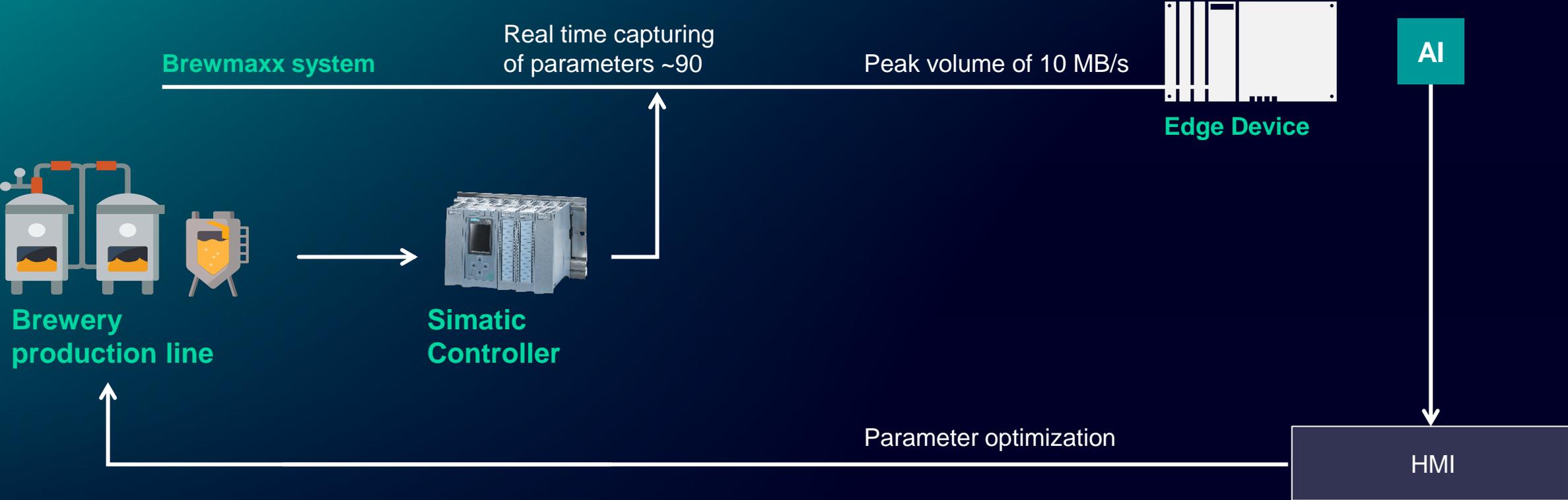
**30 hours**

Average Printing  
Time for all layers

**2.5 hours/day**

Reduced time and rework.

# Production Critical Level



# Thank you

