Industrial grade AI

How does Siemens enable AI on the shopfloor?

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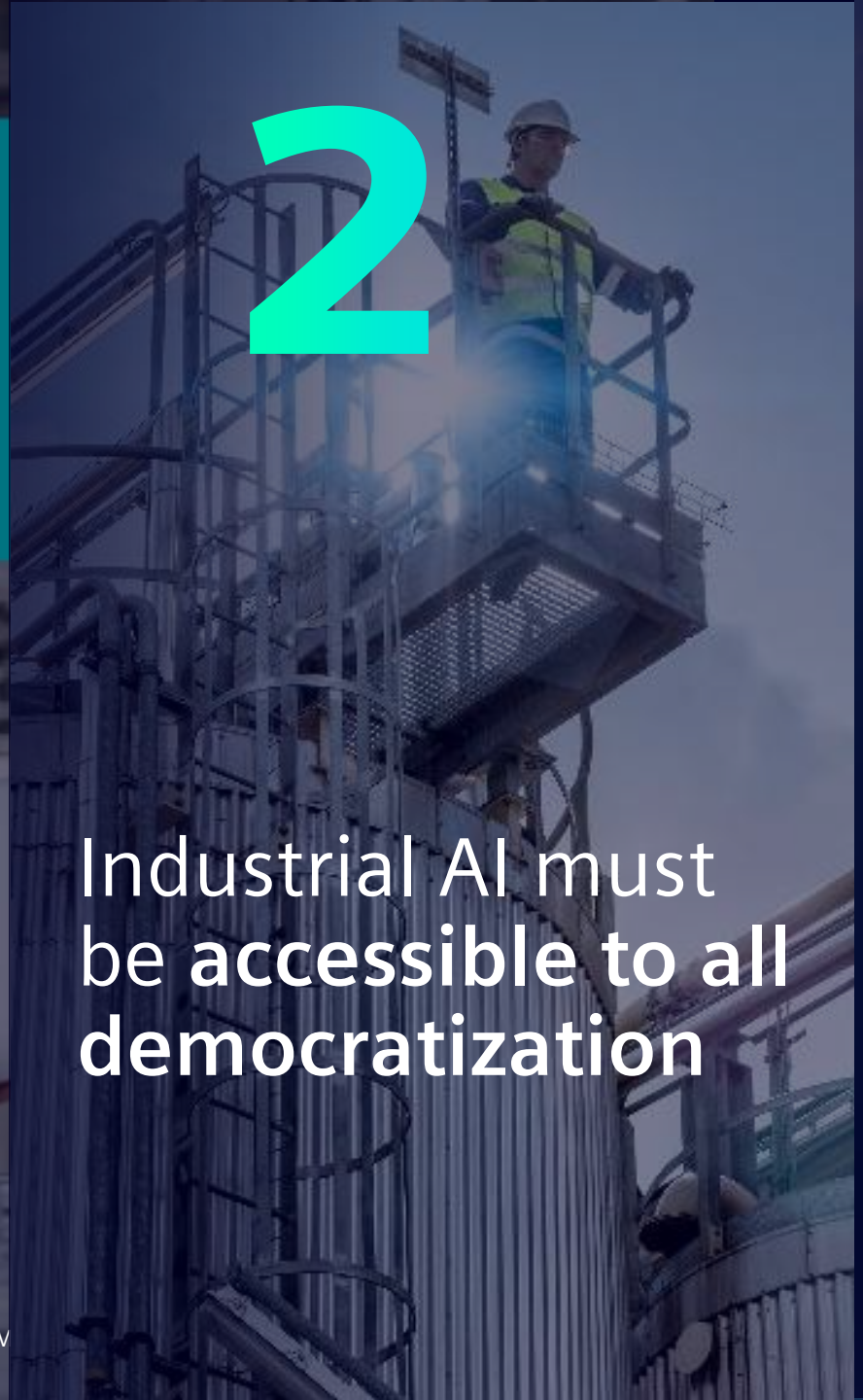
At Siemens, we are investing heavily in artificial intelligence because we are convinced that it is the key to the next stage of industrialization.

Roland Busch, CEO of Siemens AG

1

AI must be
industrial grade



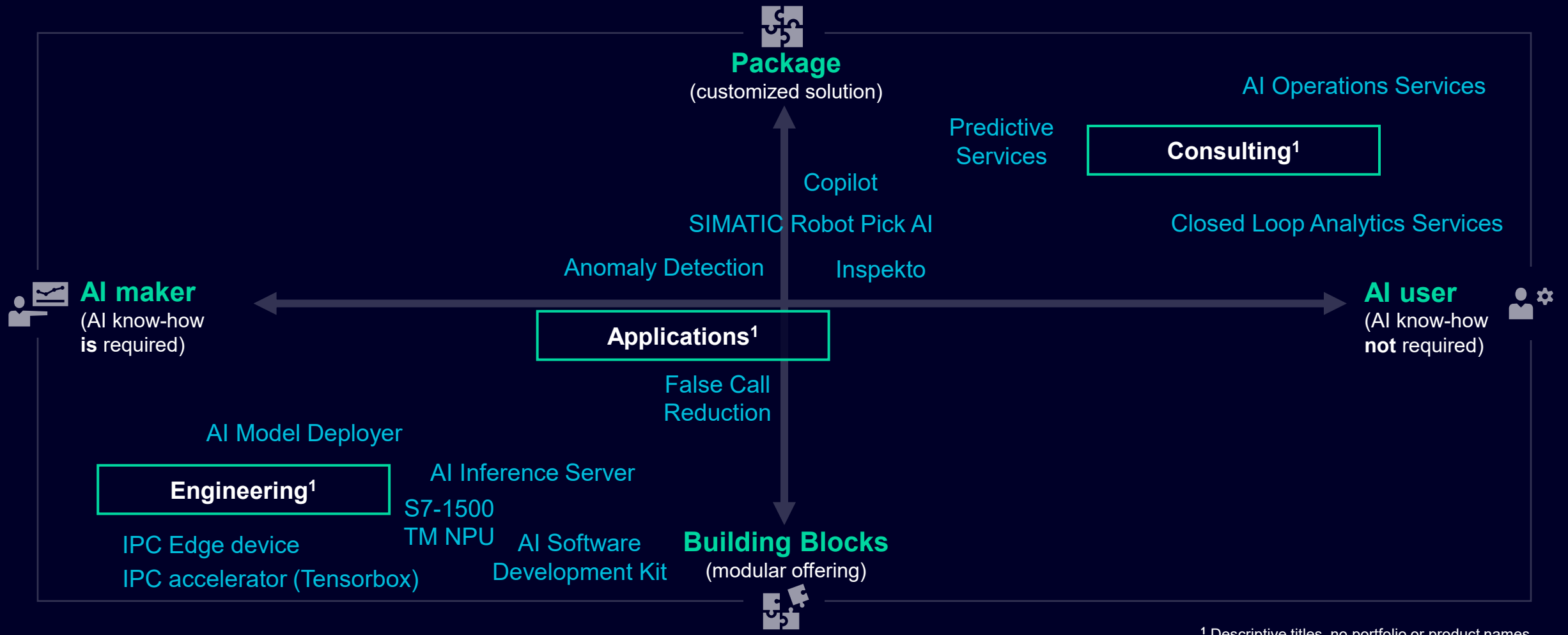
2

Industrial AI must
be **accessible to all**
democratization

3

Industrial AI
needs **strong**
ecosystems

We pick you up no matter where you are!
Dedicated offering for specific target personas



[1] Descriptive titles, no portfolio or product names

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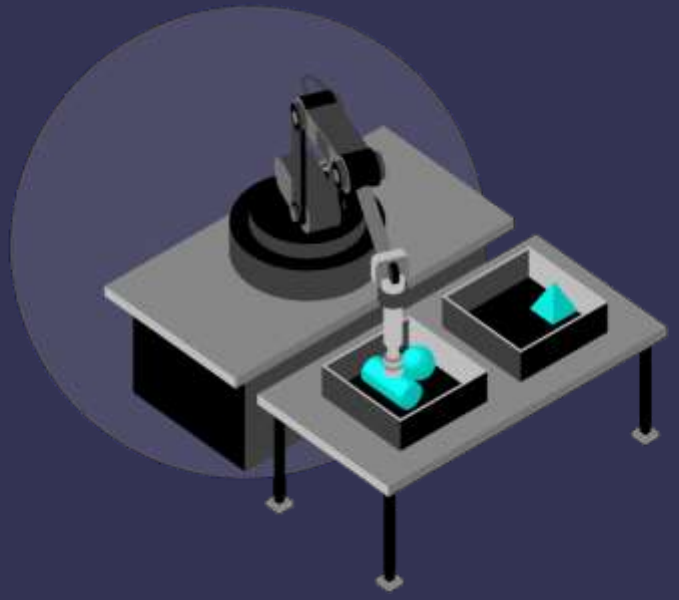
Off-the-shelve AI-based robot picking 💪
Trained by the Digital Twin

1st skills: **SIMATIC Robot Pick AI**
Picking of unknown items

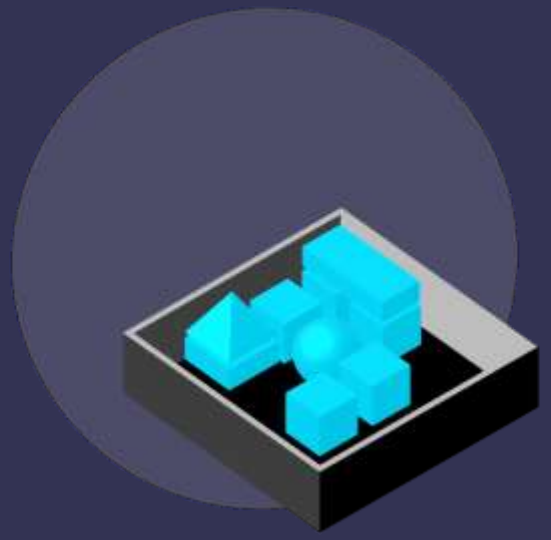
Bin-to-Bin Each Picking



Bin-to-Bin Each Picking
Conveyor Induction / Depalletize

2nd skill: **SIMATIC Robot Pack AI**
Placement of unknown items

Logistics Packing



In preparation

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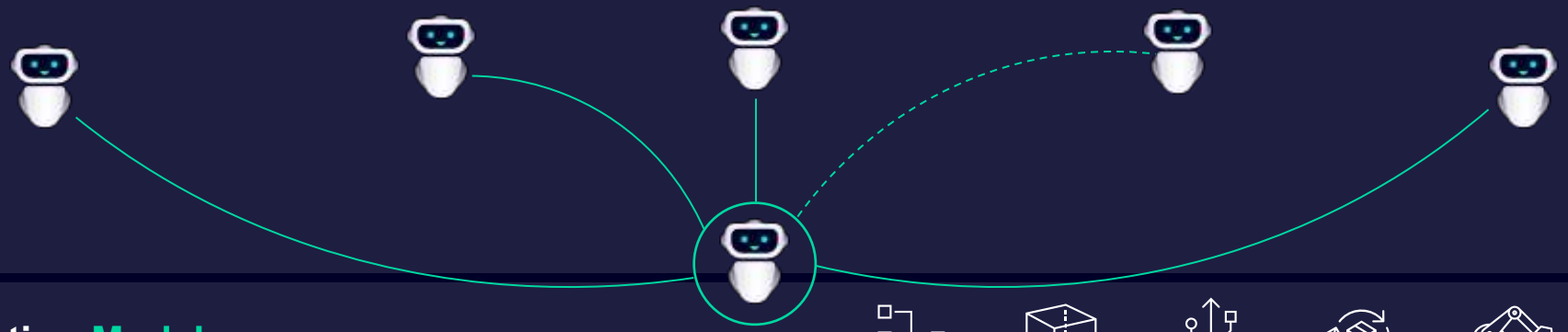
Our approach to Siemens Industrial AI

Industrial Copilots leverage Agentic AI to orchestrate Customer-centric Workflows

Industrial Copilots along the Value Chain

Design	Planning	Engineering	Operations	Service

Agentic workflows



Industrial Foundation Model

Design plants & Products	Simulate processes	Automate machines	Operate processes	Maintain Asset infrastructure
COMOS, NX	Simcenter, gPROMS, Heeds, …	TIA Portal, Engineering Copilot, …	Operations Copilot, eaSie, Insights Hub, …	Senseye, Insights Hub, Teamcenter, …

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Scaling AI on the shopfloor MLOps

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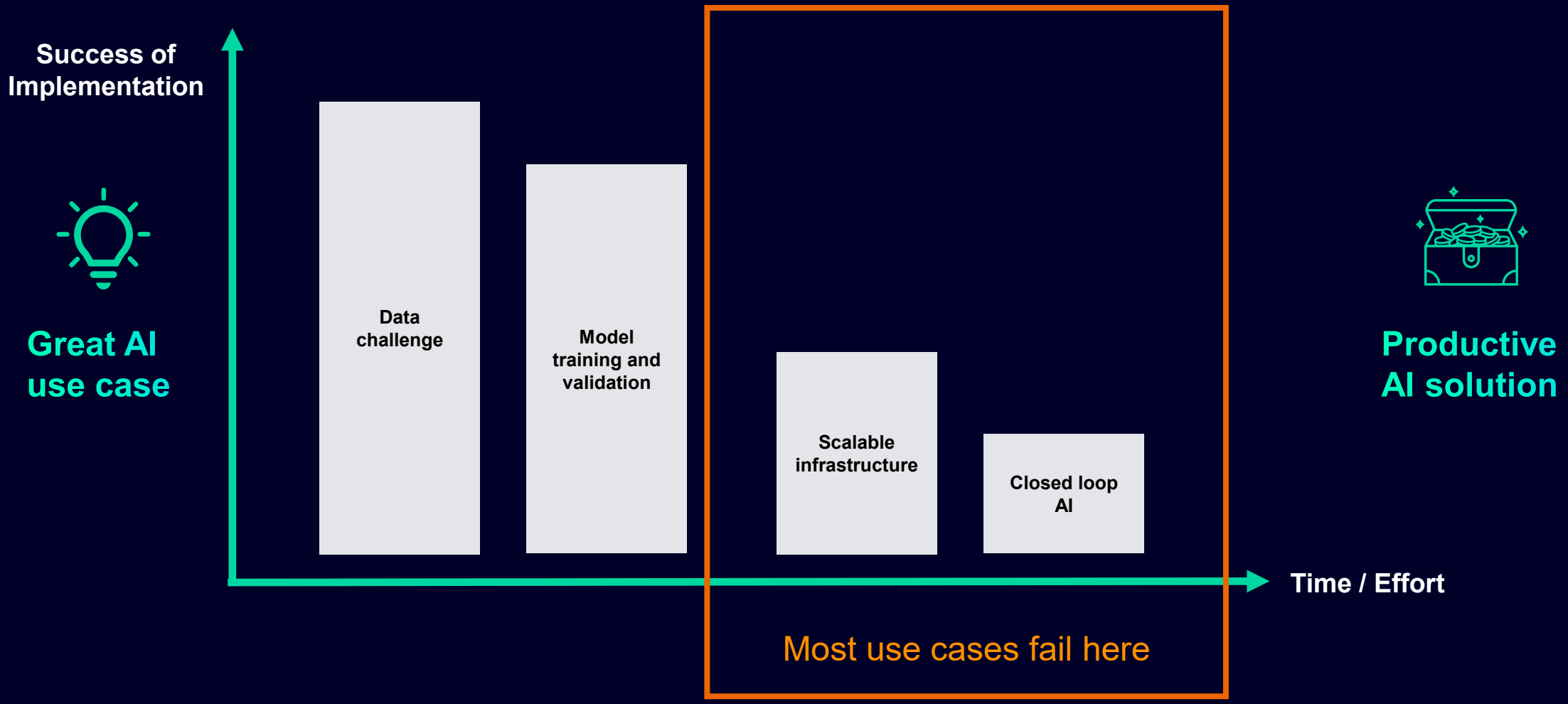
What is their challenge?
And why are they failing?



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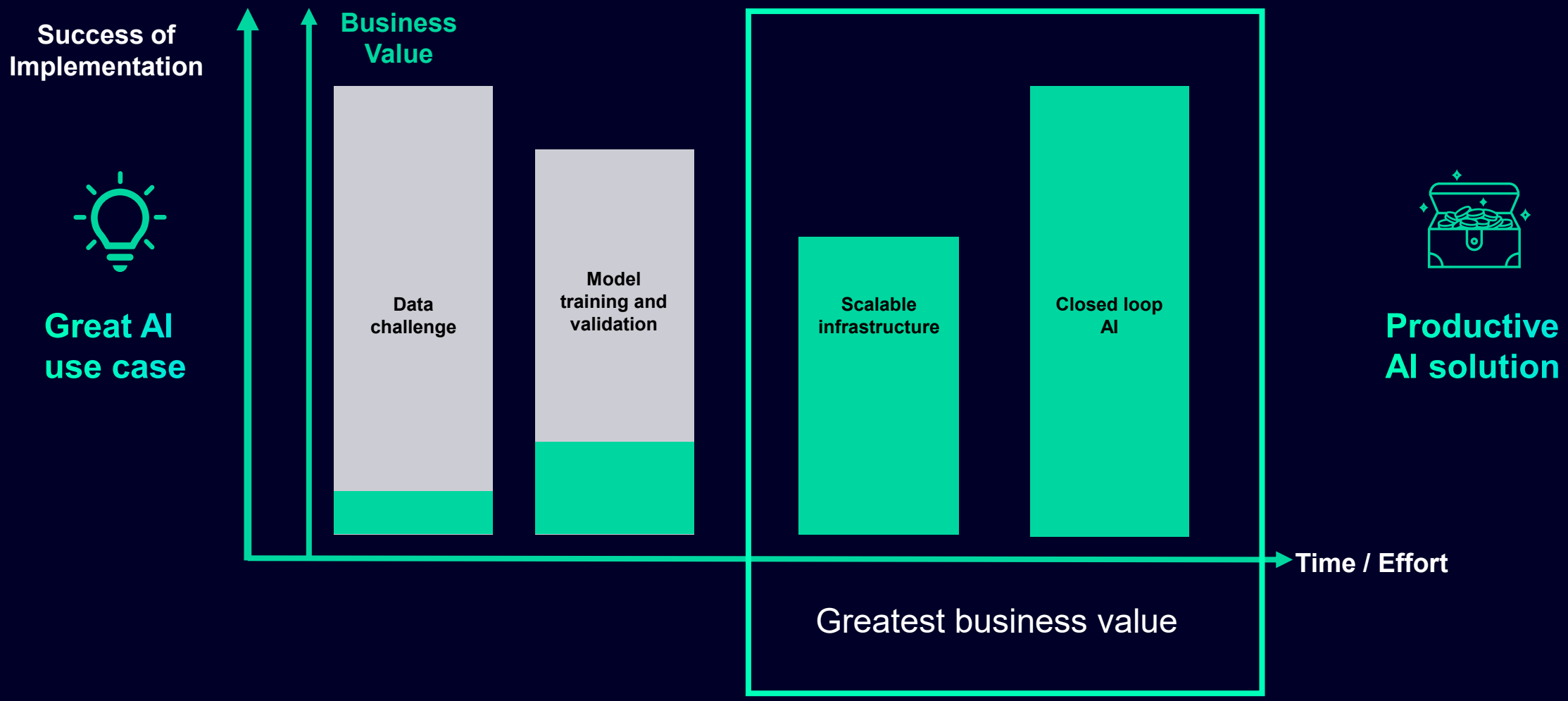
What are they looking for?



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How does Siemens enable AI on the shopfloor?

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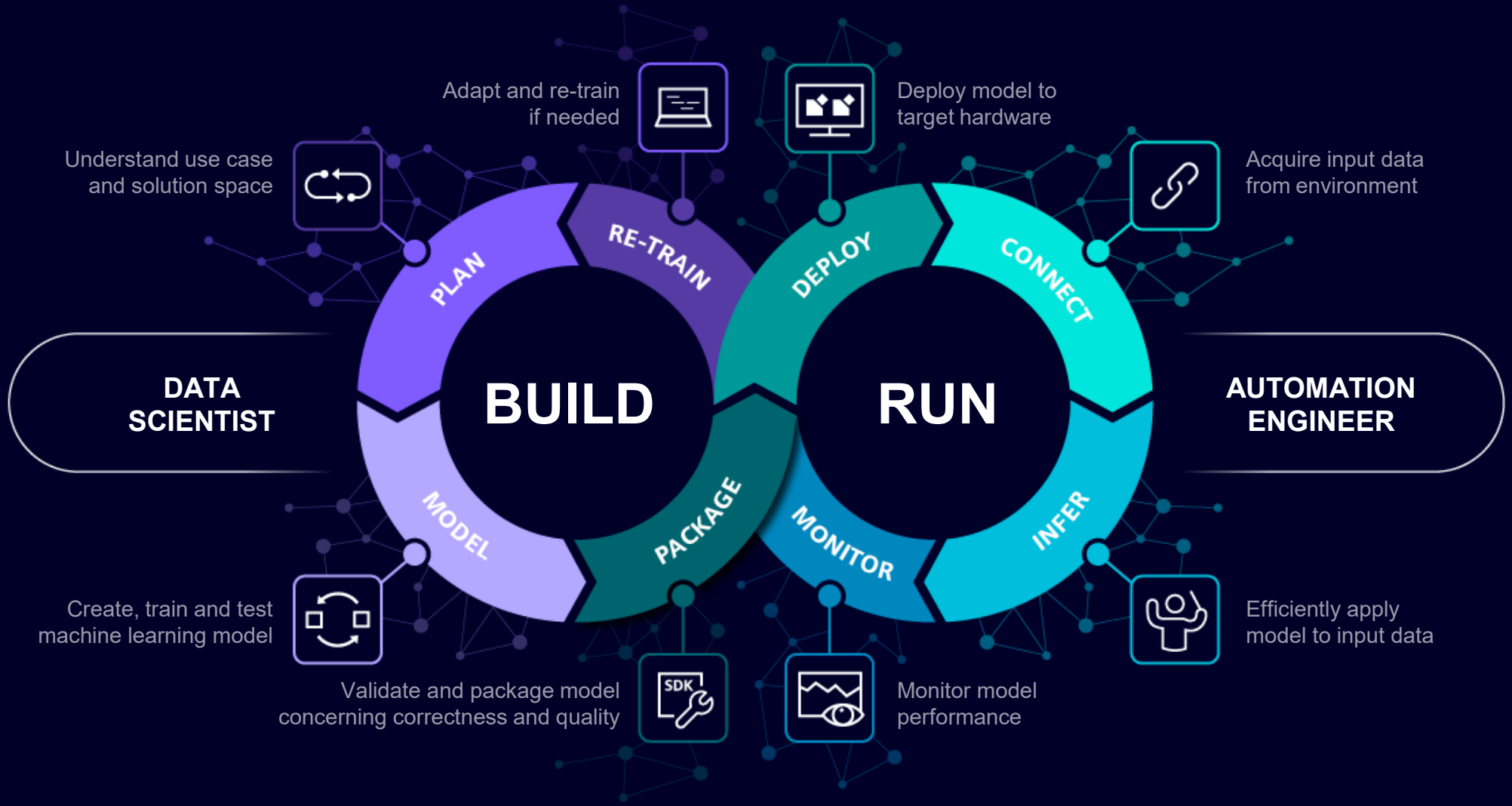
Industrial AI lifecycle: building and operating AI models on scale - MLOps

Easy-to-use tooling applicable for automation engineers and data scientists



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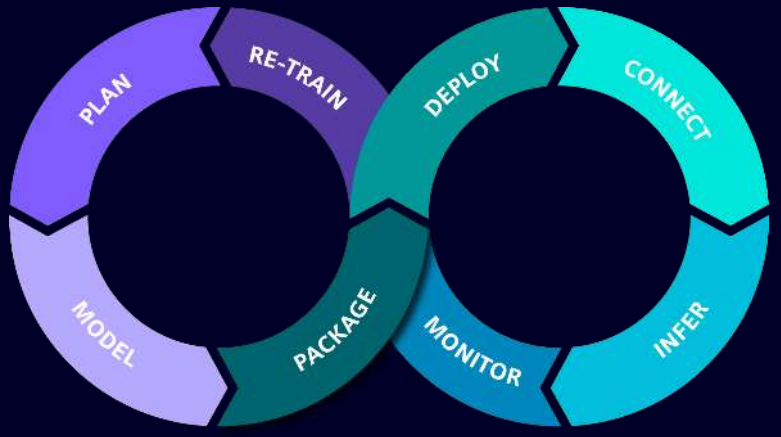
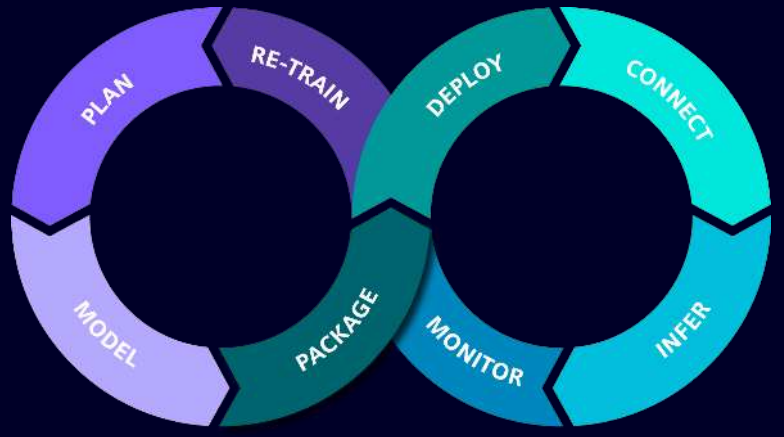
The Machine Learning Operations (ML Ops) cycle
Differences consumer vs. manufacturing industries

In the consumer industry



AI is trained and runs in the cloud

In the manufacturing industry



AI is trained in the cloud

AI runs in the shopfloor

(there are exceptions)

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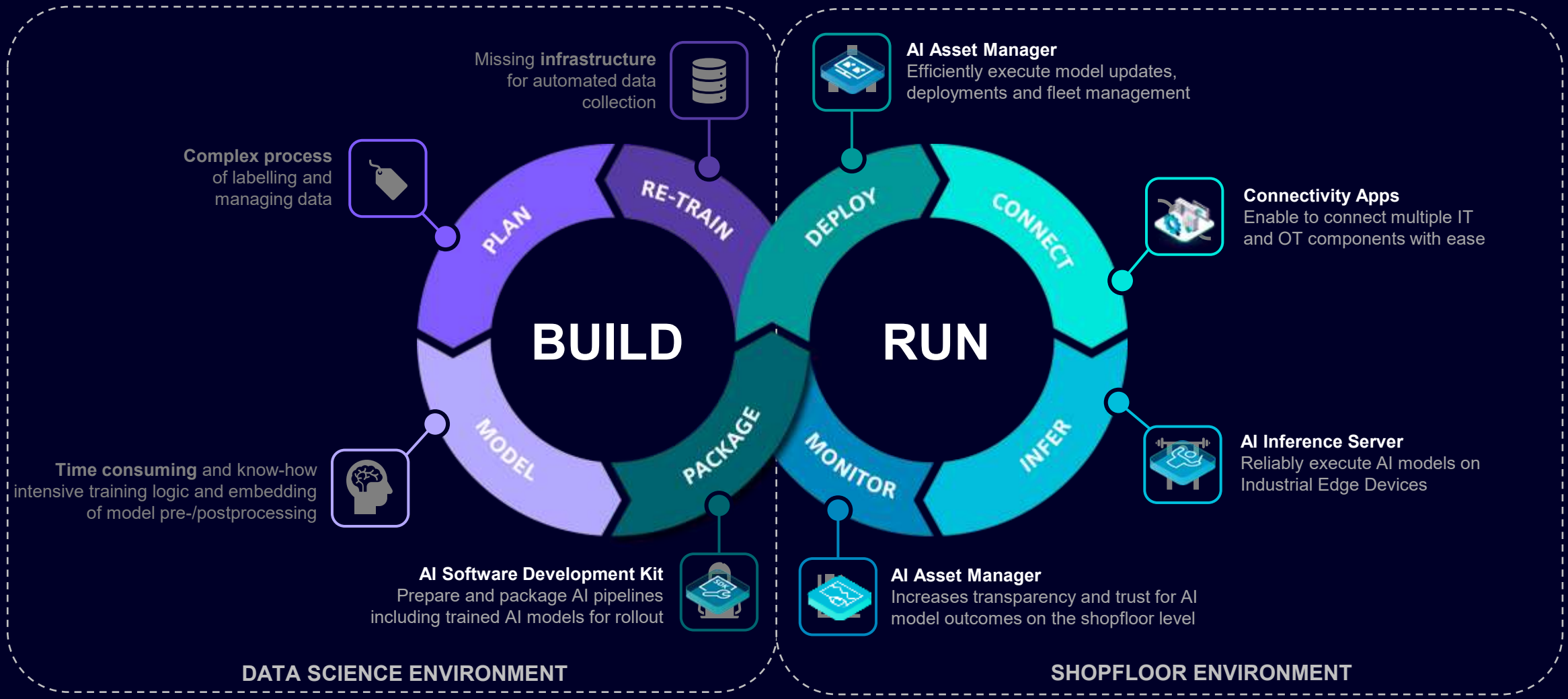
Our Industrial AI portfolio supports customers to productively operate and scale their AI use cases beyond a PoC



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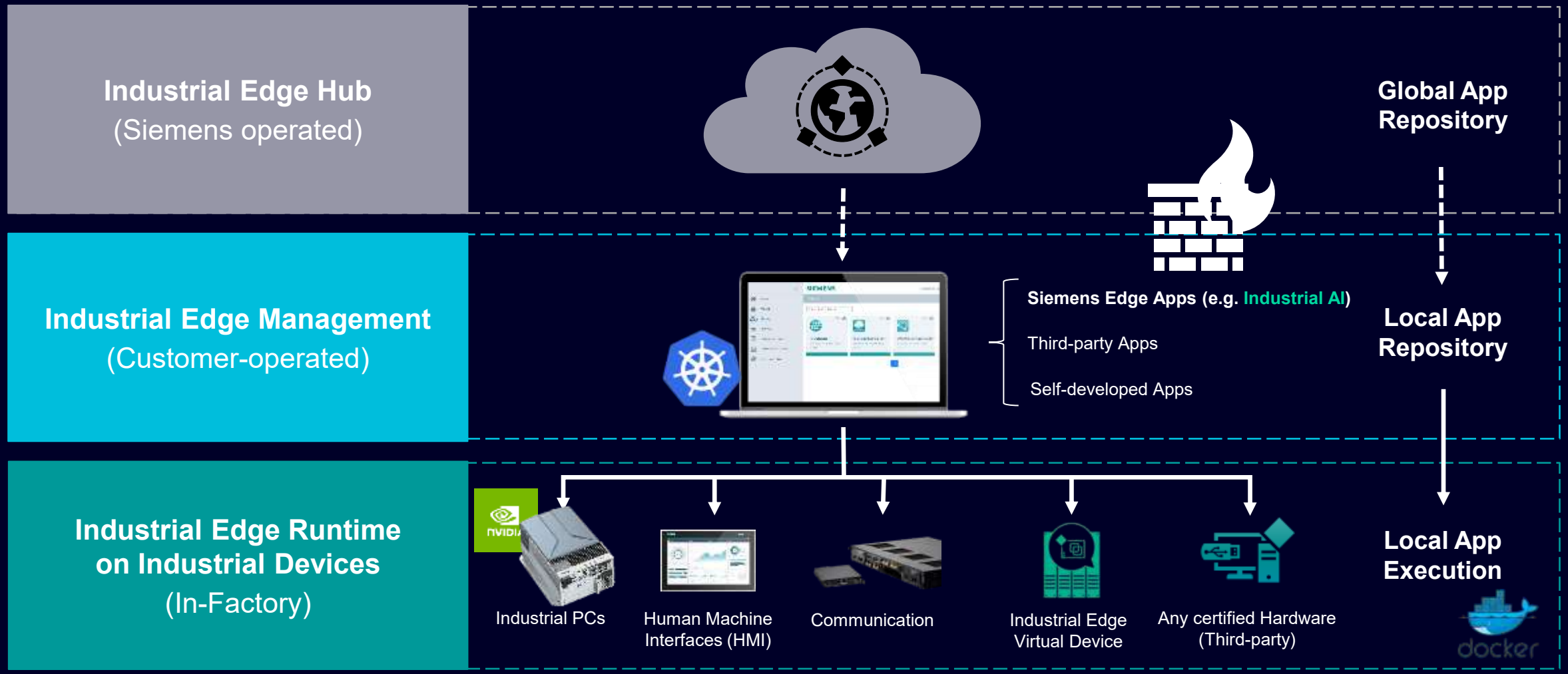
Industrial Edge architecture as base layer for Industrial AI
Container orchestration – device & software management



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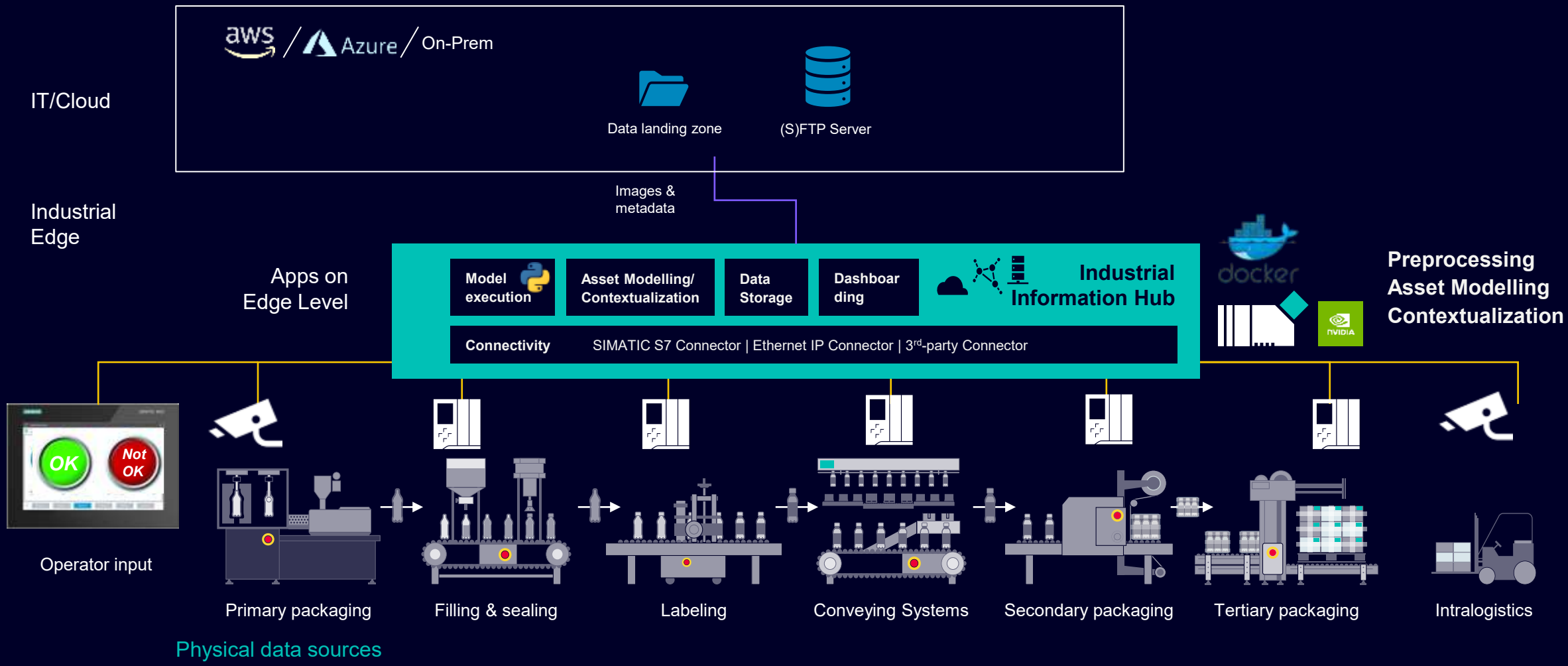
Set the data foundation, connect, structure and scale with Siemens Industrial Edge



IT System Connectivity OT Data Sources

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AI Solution architecture with AI Suite on Industrial Edge MLOps workflow

Cloud level

Factory level

Field level

aws / Azure / On-Prem

AI Software Development Kit

PyTorch
TensorFlow
ONNX
Keras

Data landing zone

Model development & validation pipeline

Packaged models

AI model pull

(S)FTP Server

Images & metadata

AI Asset Manager

One Stop Shop – AI solution management, distribution, and operations

Model deployment

Metrics

Industrial Edge (virtual) Device

Vision Data Collector

Vision Connector

Other connectors

Databus

AI Inference Server

Visu
My App
App
IIH E

docker

AI model development & packaging

Data Scientist

AI model management & performance monitoring

Automation Engineer

AI model runtime & data acquisition interfaces

Automation Engineer

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Repeatable deployments: Industrial AI blueprint architecture for AWS

Industrial AI AWS to Edge workflow:

Web App for convenient model configuration

Efficient model training via SageMaker

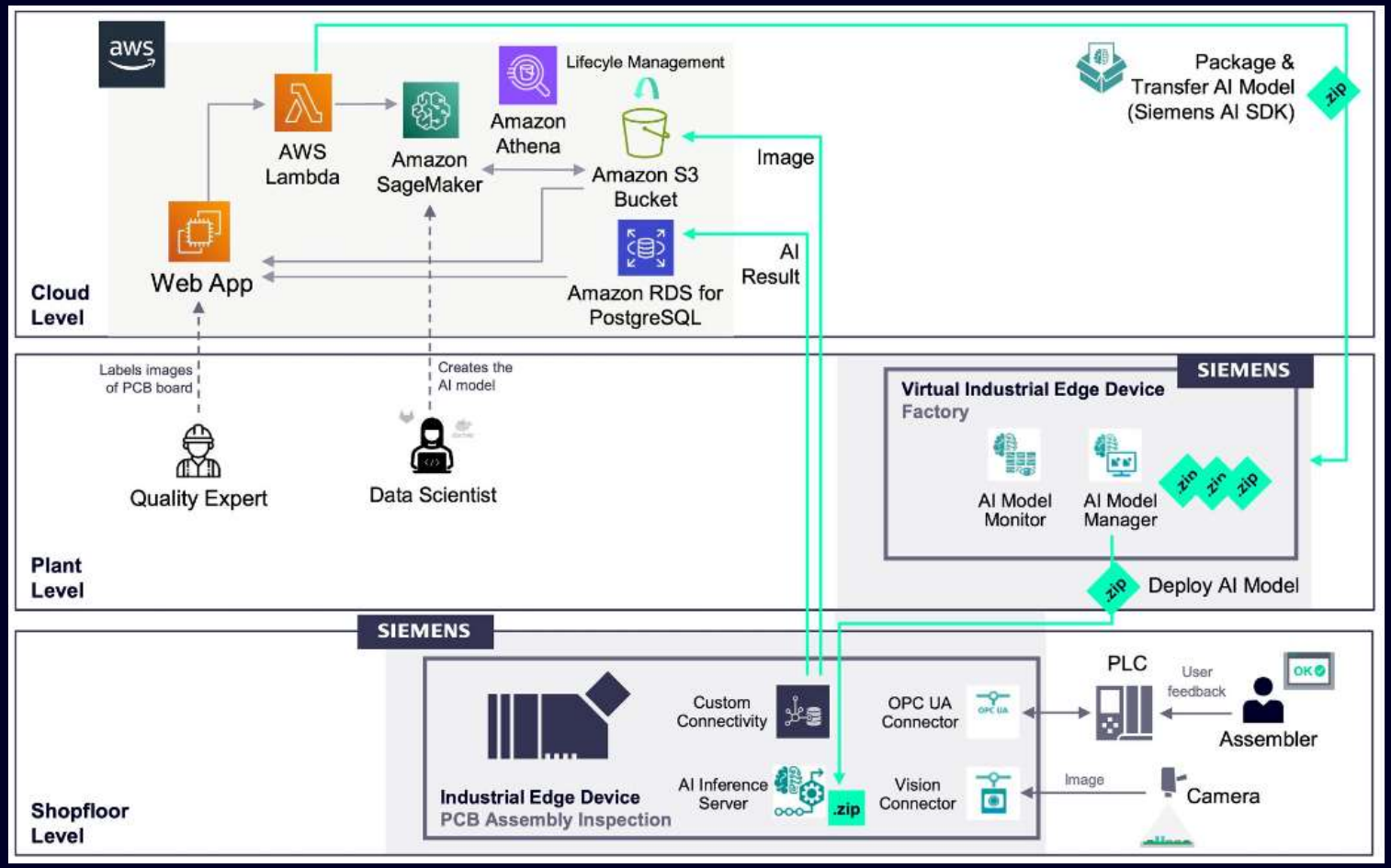
AWS Lambda functions for the easy orchestration, integration of AI SDK and transfer jobs to AI Model Manager

S3 & RDS as model input and output storage

Cost efficient data lifecycle management to ensure long term traceability

AWS specific edge-to-cloud deployment process shown here:

https://aws.amazon.com/blogs/apn/automated-cloud-to-edge-deployment-of-industrial-ai-models-with-siemens-industrial-edge/



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Repeatable deployments: Industrial AI blueprint architecture for Azure

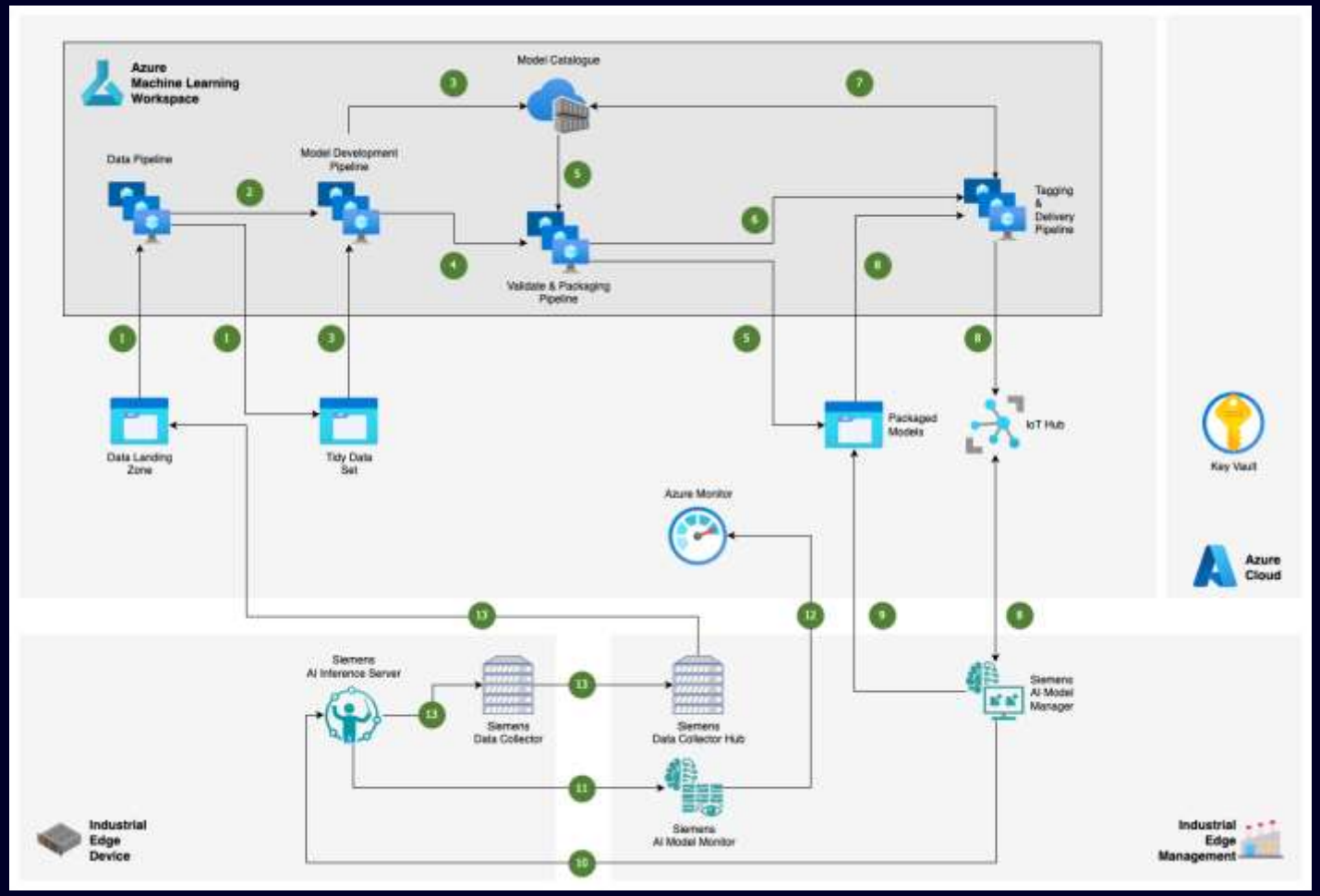
Microsoft

Industrial AI Azure to Edge workflow:

Data landing zone - preparation of the data
Training workflow
Package your model
Delivery to factory
Inference of the trained model
Observe model metrics

Azure reference architecture:

https://techcommunity.microsoft.com/t5/azure-architecture-blog/a-reference-architecture-for-siemens-and-microsoft-customers-in/ba-p/4077589



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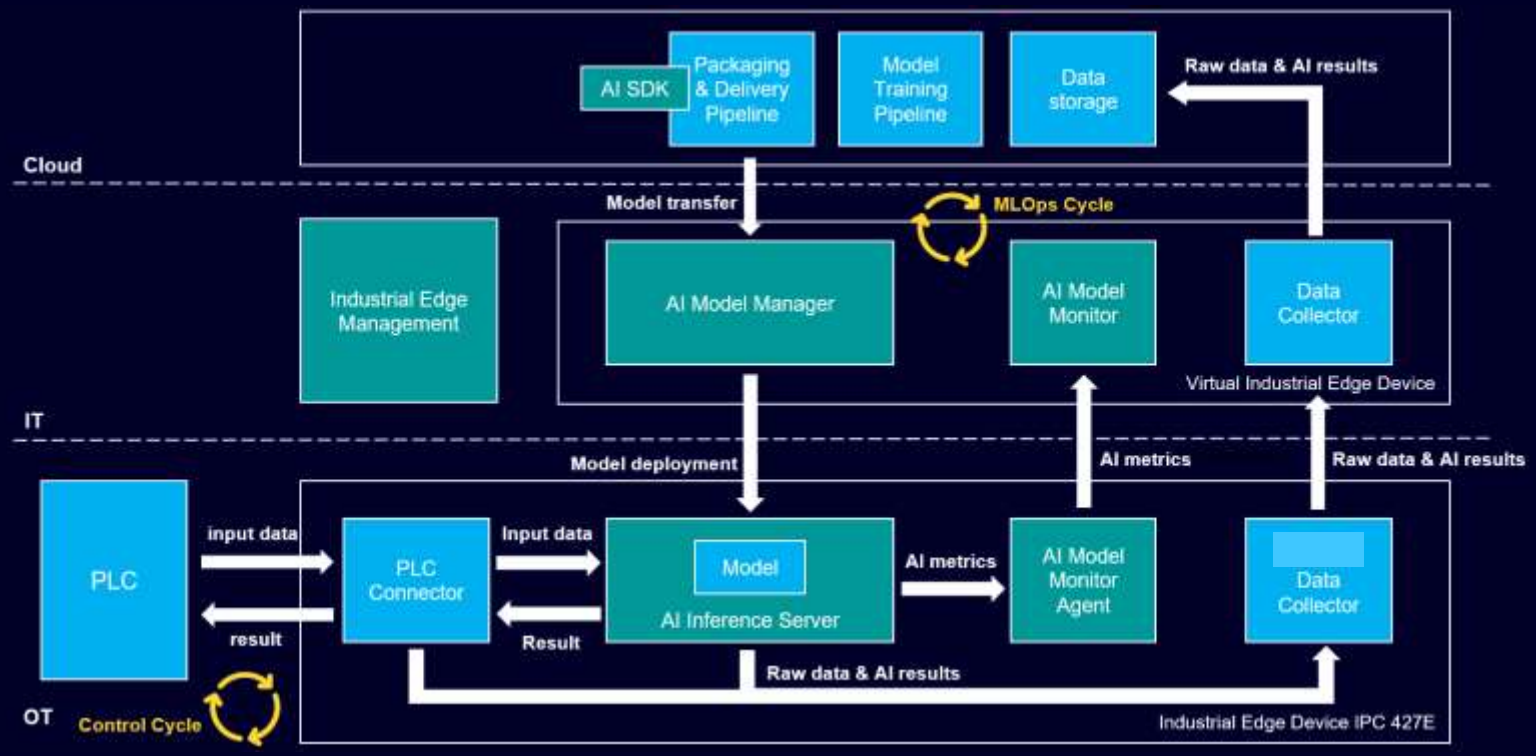
AI based soft-sensor to supervise process parameters



Siemens portfolio Partner offering

Solution

Siemens Industrial AI portfolio based on Industrial Edge architecture automatically predict the process parameter value of the liquid continuously and adjust the respective flow rates.

- Predicting process parameter continuously measuring input flow rate with physical sensor and additional AI based soft-sensor
- Industrial Edge platform scales efficiently across lines and sites with standardized hardware and software components
- Two Closed Loops could be realized:
  1. Control Cycle: Read PLC data, feed into AI Model, transfer back to the controller
  2. MLOps (Machine Learning Operations) Cycle: Train AI model, deploy from cloud to shop floor, inference, re-training if necessary
- Reduction of human supervision and increasing product quality

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Our customers went beyond experimentation and use Industrial AI productively

Quality prediction: Spot welding

Challenge

Spot welding defects **discovered late** cause **high costs**

Solution

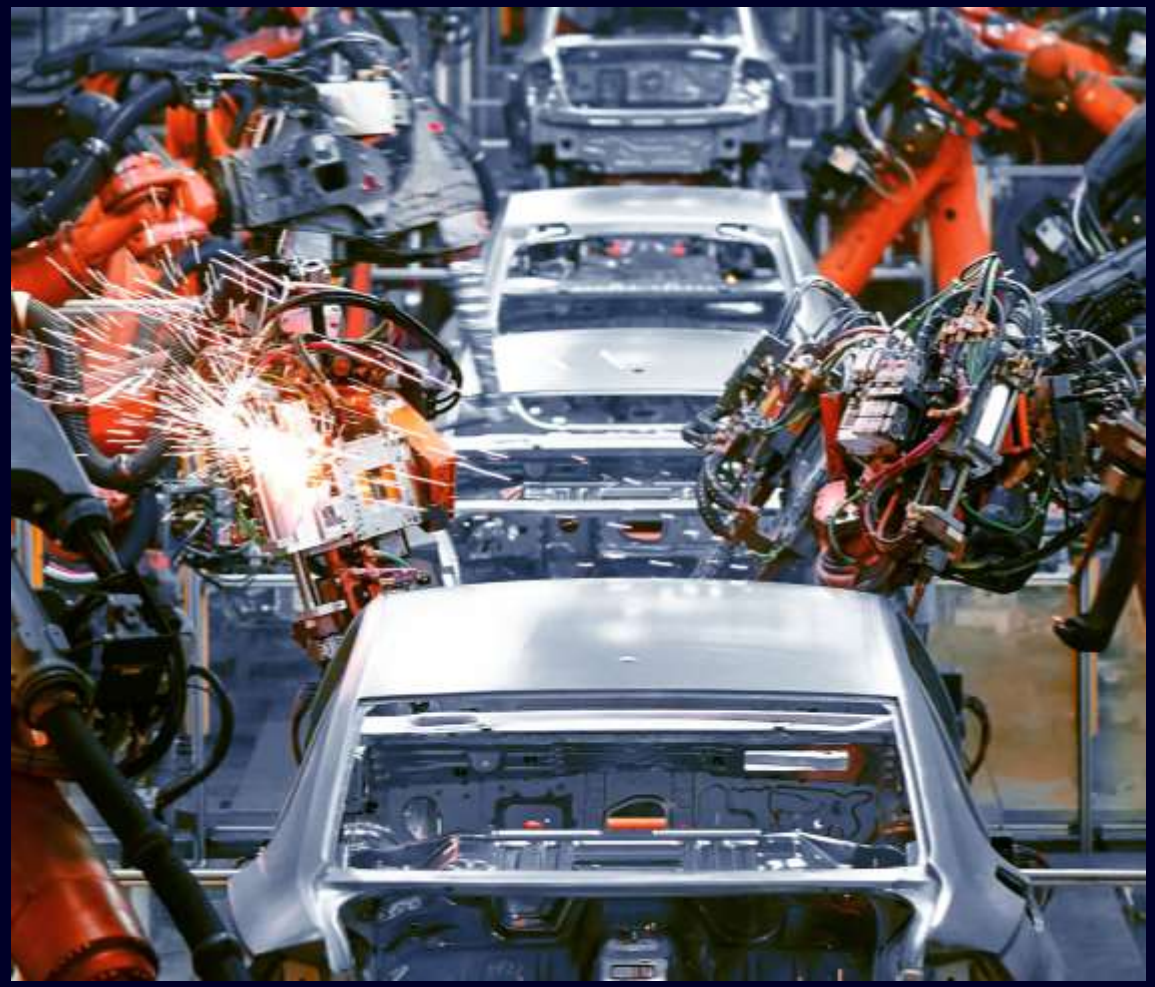
Machine learning **identifies key parameters** and evaluates each weld **in real time**.

Error detection rate up to

17 %

increased

Full test coverage



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Industrial Edge – Framework and infrastructure for software-defined solutions

Industrial Operations X

IIoT Services / Cloud

Insights Hub

IIoT Services / Cloud

Senseye

Manufacturing execution

Opcenter

IT-like Engineering

SIMATIC AX

Intelligence

Industrial AI & Copilot

Infrastructure

Industrial Edge

Virtual PLC

SIMATIC CPU 1517V

Supervisory Control/HMI

SIMATIC WinCC Unified

Operation Data Twin

Industrial Information Hub

Operations Apps

Industrial Analytic Apps

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