cognizant | **aws**

From vision to precision – quality without compromise

Next-gen quality management for smart manufacturing by Cognizant and AWS

In the modern manufacturing landscape, quality is more than a checkpoint—it's a continuous, intelligent process.

Cognizant's Quality Management solution, built on AWS, empowers manufacturers with real-time insights into product quality and process deviations. Leveraging advanced tools like computer vision and time series monitoring, this solution ensures that quality is maintained at scale, without adding overhead or delays.

By integrating quality assurance directly into production flows, manufacturers can drive greater consistency, detect and reduce defects early, and deliver excellence at speed.

Solving Today's Manufacturing Challenges

1 Quality control

Ensure consistent, high-quality output by continuously monitoring and analyzing key quality indicators
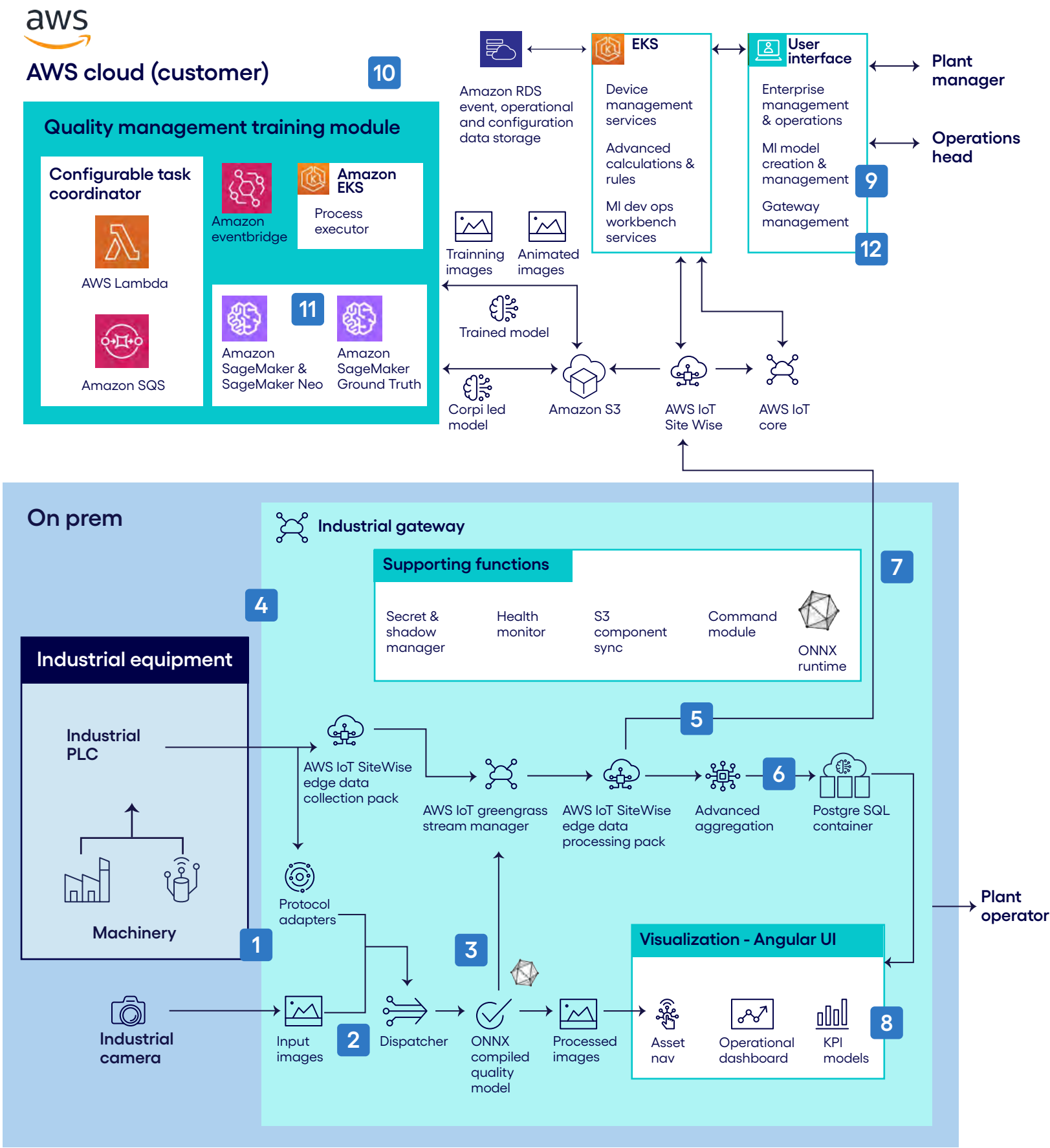
2 Process variation

Identify and address process variations (drift/shift) to maintain optimal performance and process control

3 Defect detection

Apply computer vision to detect and correct anomalies and defects in real-time—reducing inspection lag and human error.

Key highlights

- **AI-powered computer vision**
  Automated visual inspections enhance accuracy, consistency, and speed of defect detection

- **Time series monitoring**
  Real-time analysis of process parameters for early warning on deviations

- **Cloud-native architecture**
  Scalable and secure deployment on AWS, enabling global reach and system integration

- **Customizable thresholds**
  Fine-tuned alerting and KPI tracking tailored to production environments

- **Waste minimization**
  Early intervention prevents costly rework and scrap

- **Built-in agility**
  Rapid deployment and integration with existing production lines

Solution framework

aws

AWS cloud (customer) [10]

Quality management training module

Configurable task coordinator

Amazon eventbridge

Amazon EKS
Process executor

AWS Lambda

Amazon SQS

[11]
Amazon SageMaker & SageMaker Neo

Amazon SageMaker Ground Truth

Trainning images

Animated images

Trained model

Corpi led model

Amazon S3

AWS IoT Site Wise

AWS IoT core

Amazon RDS event, operational and configuration data storage

EKS
Device management services

Advanced calculations & rules

MI dev ops workbench services

User interface
Enterprise management & operations

MI model creation & management

Gateway management

Plant manager

Operations head

[9]

[12]

On prem

Industrial gateway

[7]

Supporting functions

Secret & shadow manager

Health monitor

S3 component sync

Command module

ONNX runtime

[4]

Industrial equipment

Industrial PLC

Machinery

AWS IoT SiteWise edge data collection pack

Protocol adapters

AWS IoT greengrass stream manager

AWS IoT SiteWise edge data processing pack

Advanced aggregation [6]

Postgre SQL container

[5]

[1]

Industrial camera

Input images

[2] Dispatcher

[3]

ONNX compiled quality model

Processed images

Visualization - Angular UI

Asset nav

Operational dashboard

KPI models

[8]

Plant operator

CV at the edge

[1] A camera is used to capture product images and stored on the edge device

[2] The capture images are routed to the appropriate compiled quality model for inference.

[3] The result of the inference is stored in Site wise edge and combined with other real-time data and calculations to generate OEE, other operational metrics, and identify quality issues

Operation at the edge

[4] Realtime data is collected from the industrial equipment from built-in or custom connectors and stored on the gateway.

[5] Operational metrics, as configured in the cloud interface, are calculated based on real-time data, inference results, and results from the Advanced Aggregation function.

[6] Additional advanced aggregations are calculated based on OT system configurations, shift schedules, etc. and stored on the edge device

[7] Data and aggregations, as configured, are transferred from the edge device to the cloud for enterprise level views and additional data analysis.

[8] Users can view the operational data, quality results, and custom dashboard on the edge even if cloud connectivity is lost.

[9] User interface to train ML models, manage gateway deployments, and manage Enterprise operational performance.

[10] Process or quality engineers train new models by requesting images from the edge device, identifying good/bad parts, and annotating defects via an intuitive interface.

[11] Computer vision model is automatically trained and compiled for an edge device. The model version is controlled and available for deployment to the gateway.

[12] An easy-to-use interface allows quality or process engineers to select the model to deploy to an edge device. The model is updated on the gateway.

Moving ahead from reactive inspection to **real-time prevention**

By embedding intelligence at the point of production, it elevates both efficiency and product excellence - setting the foundation for future-ready manufacturing

Use cases in action

Foundation for Computer Vision

Automatically detect defects and anomalies in products during the manufacturing process

Monitoring time series data for process variation

Identify and address process variations, ensuring consistent quality and performance

Business impact

- **Improved product quality** through real-time defect detection and process monitoring

- **Reduced waste** by early defect detection and elimination minimizes material loss and scrap

- **Optimized processes and improved operational efficiency** by maintaining consistent process performance and reducing variations

Real-world impact

Case study
A leading farm equipment manufacturer

Challenge

A leading agricultural farm equipment manufacturer welds multiple components to a frame before the final assembly of the machine.

The welding process of such large frames is a manual task, which leads to missing parts. **The objective was to identify if a part of the frame was missing via image analytics.**

Solution

Cognizant implemented an **AI/ML model and used computer vision on AWS cloud** to inspect frames for missing parts.

Outcome

- **Improved the operational efficiency** by replacing manual inspections

- **Implemented a scalable solution** that can be leveraged for other use cases in other manufacturing plants

- **Automatic and increased detection accuracy**

- **~15% reduction** in non-value add activities

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Learn more about Cognizant and AWS partnership:
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