aws
SUMMIT
MILANO
21-22 GIUGNO 2022

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Accelerare progetti per l’industria 4.0 con AWS for Industrial

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Amazon Web Services

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TPS MFG Process & Tool Leader
Baker Hughes

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AWS CoE S&C Europe
Capgemini

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Rethinking industrial technology

Industrial customers in asset-intensive industries such as **manufacturing, energy, mining, automotive, and agriculture** are leveraging **new digital technologies** to drive faster and better decisions

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Common challenges across industries

1. Connectivity and Security
2. Edge/offline processing
3. Real time visibility (OEE)
4. Quality inspection
5. Predictive maintenance
6. Data contextualisation

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Industrial Architecture

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Industrial Architecture : Connectivity

Factory

ML Inference →

Cameras

OPC-UA/Modbus →

Industrial Equipment/Machines

Custom Protocol →

PLC/DCS

AWS Cloud

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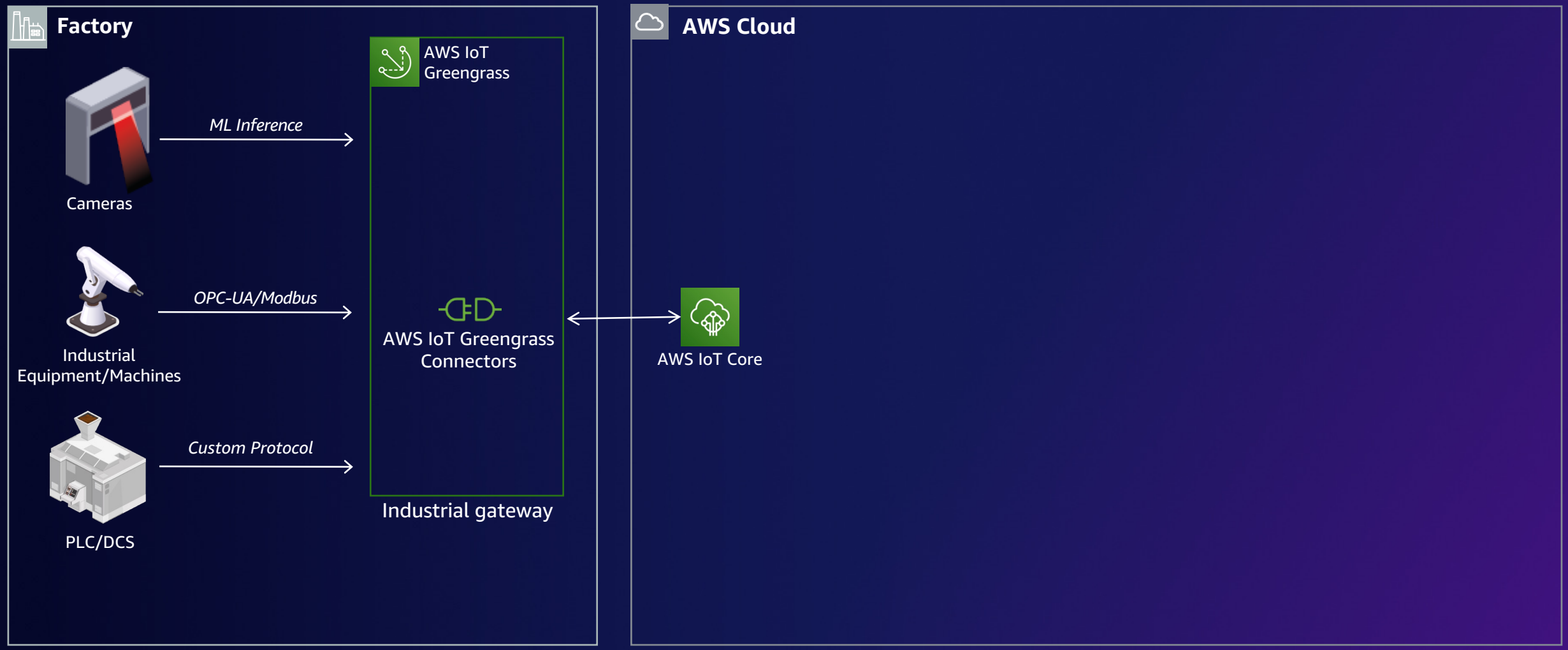
Industrial Architecture : Connectivity



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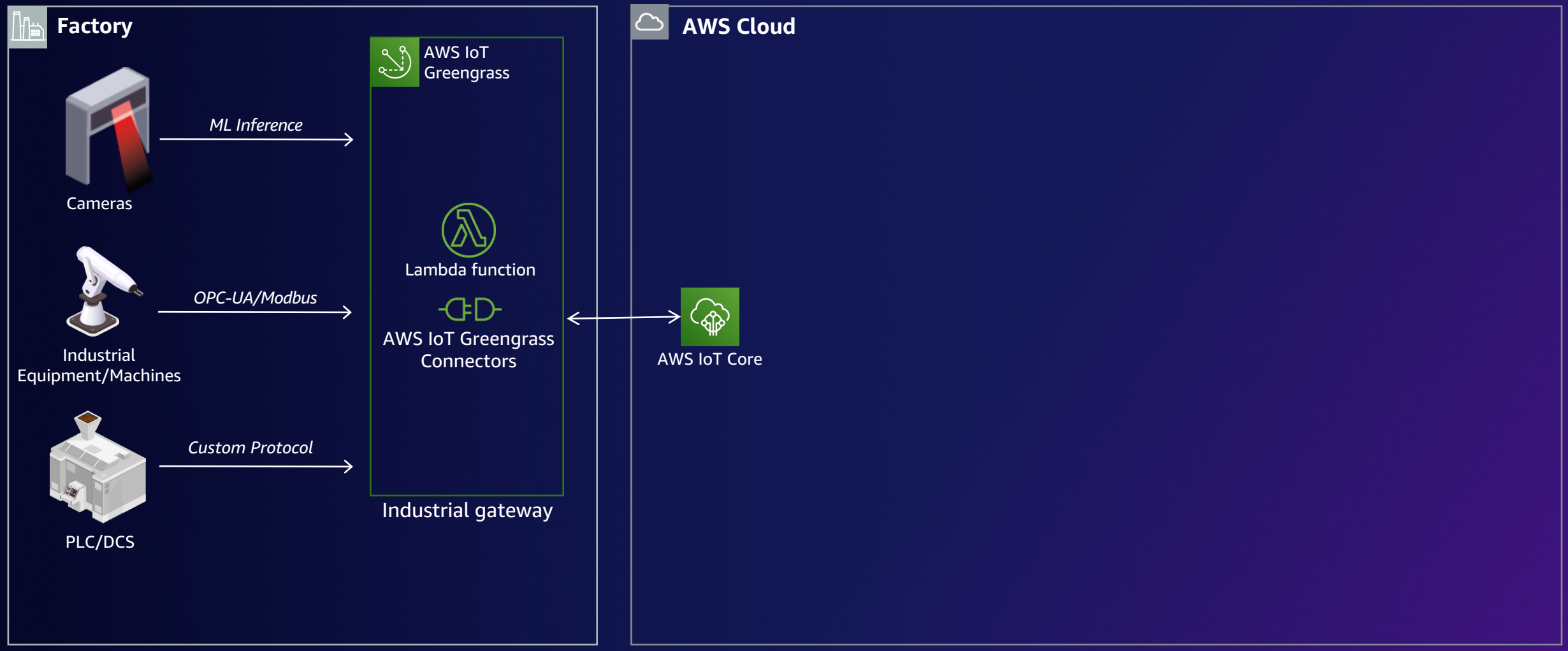
Industrial Architecture : Edge/offline processing



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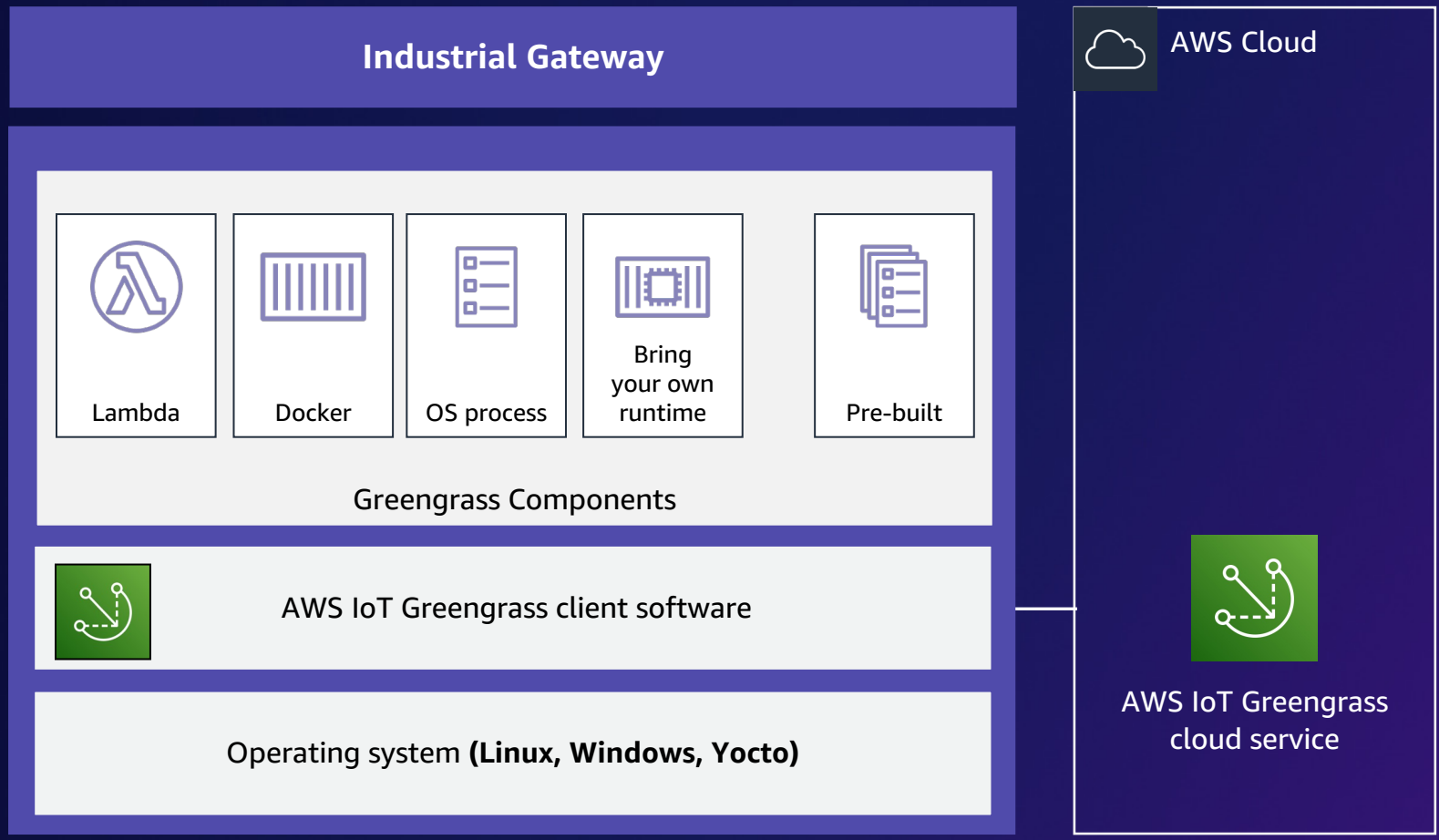
AWS IoT Greengrass



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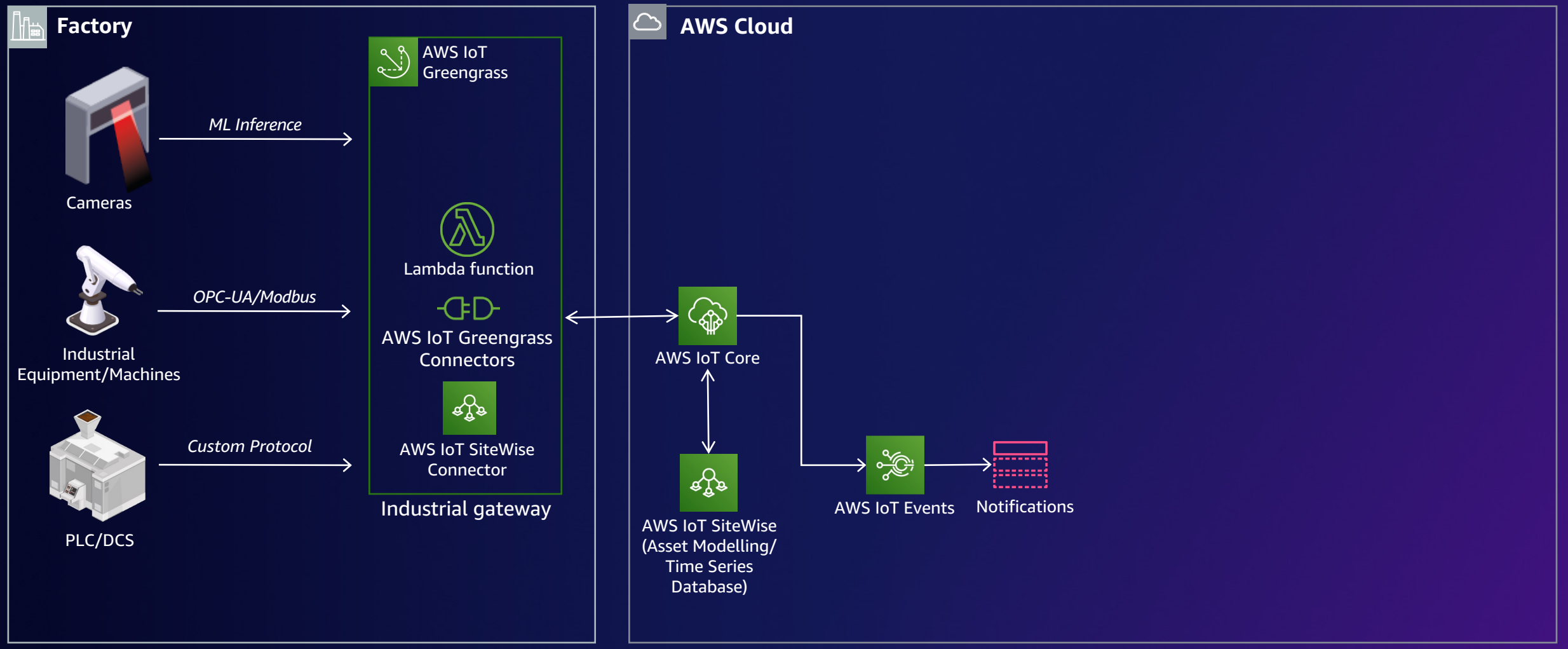
Industrial Architecture : Data transparency



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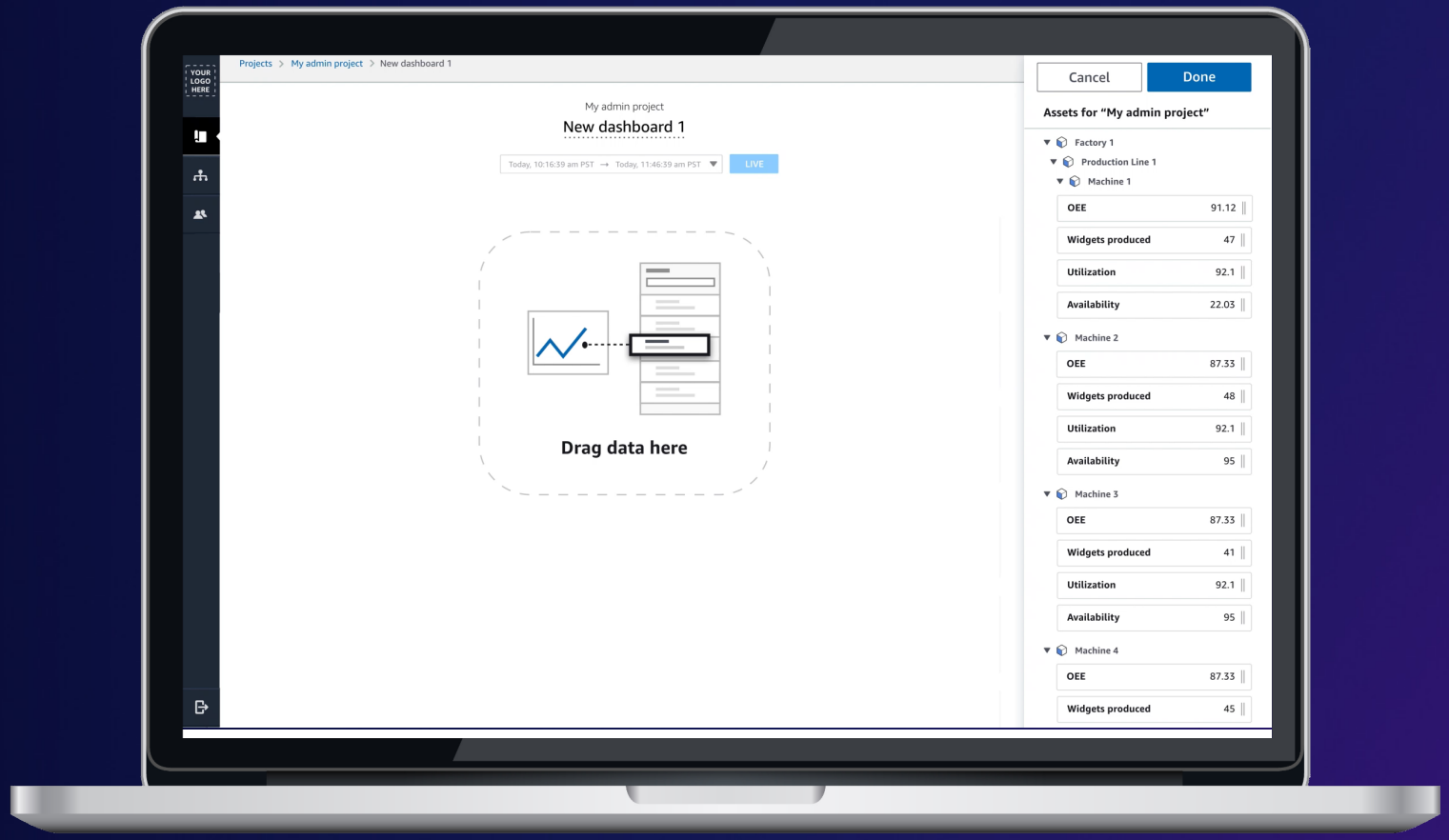
AWS IoT SiteWise

Create a fully managed web application for visualizing and interacting with operational data from devices and equipment connected to AWS IoT



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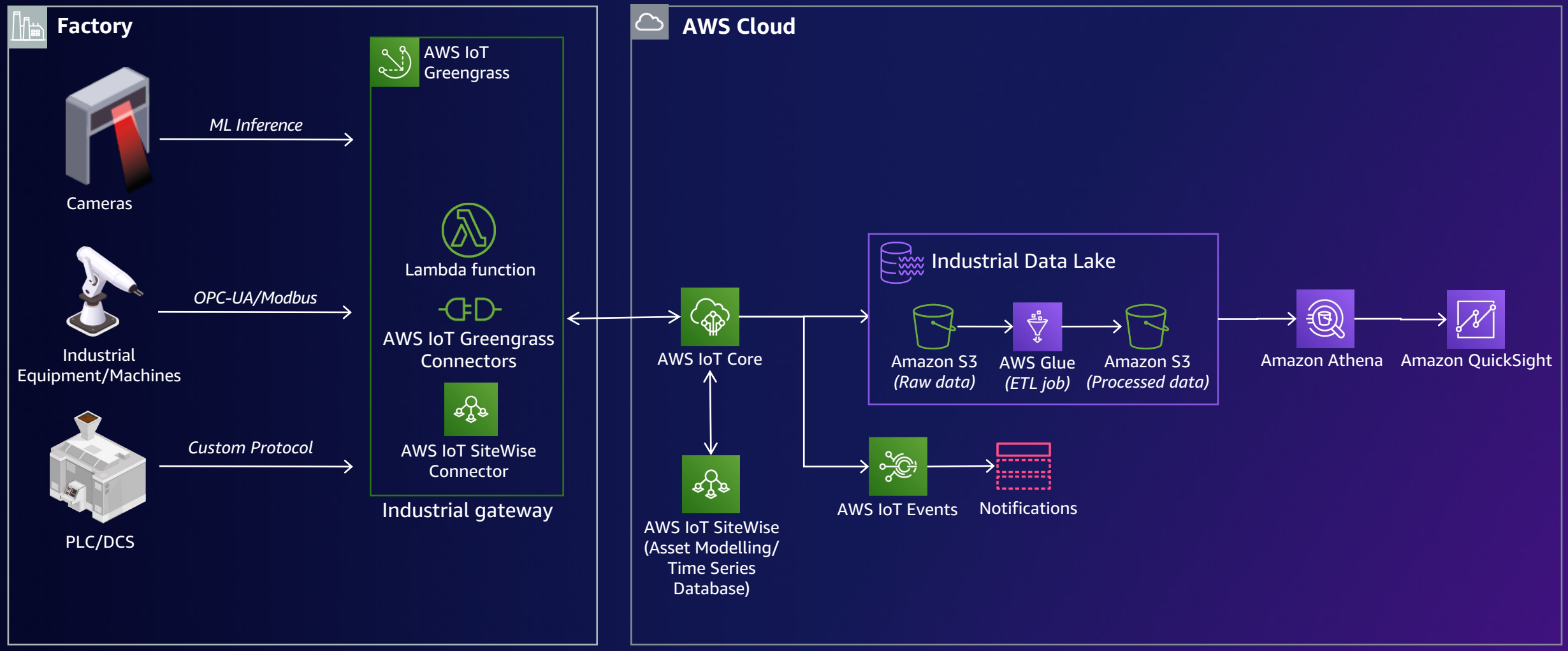
Industrial Architecture : Data transparency



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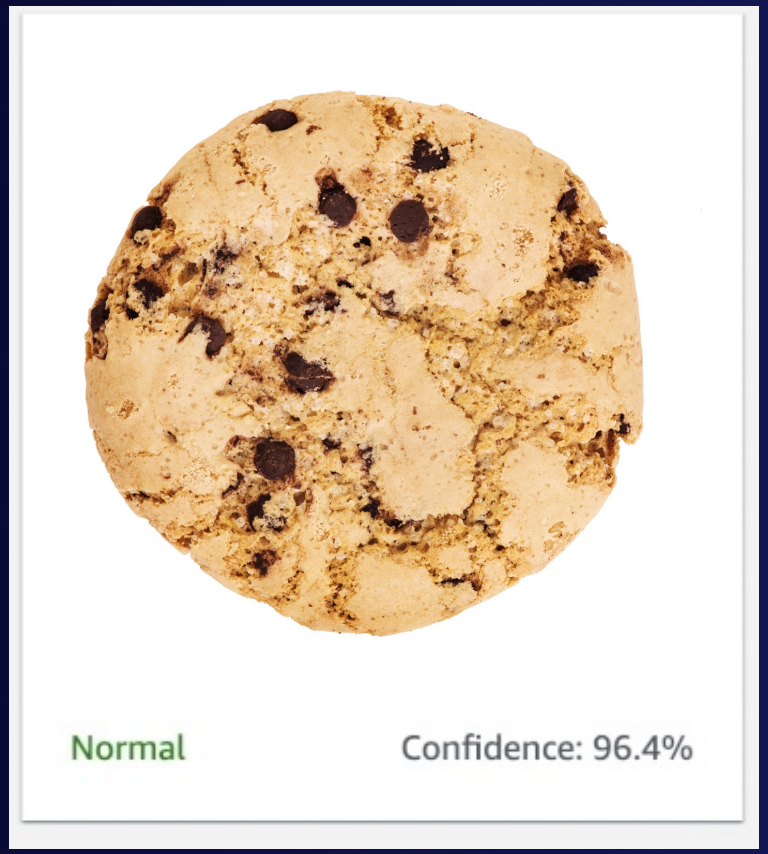
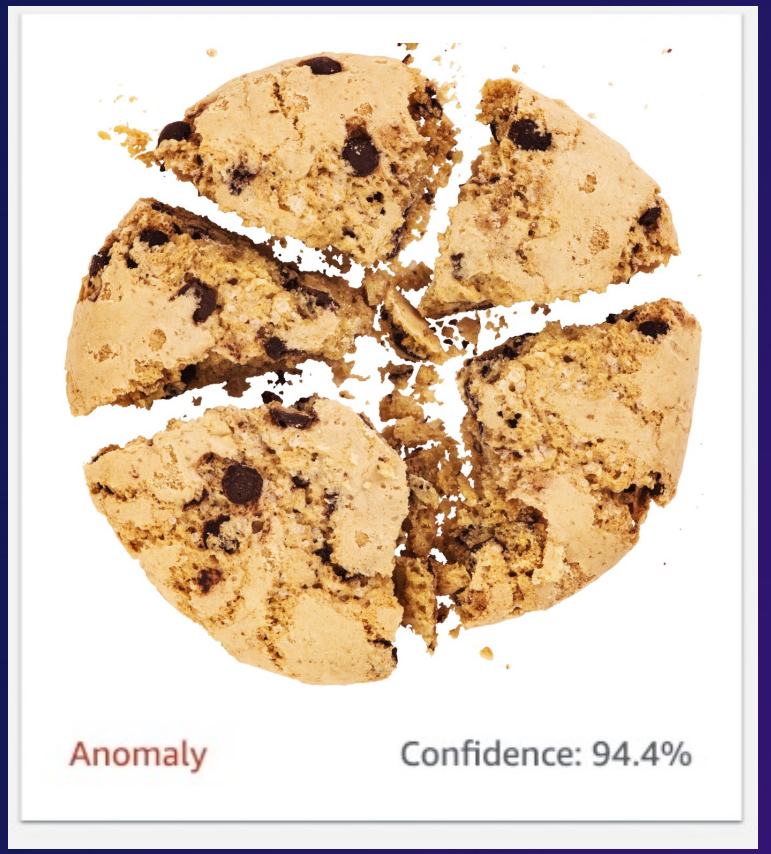
Industrial Architecture : Quality inspection





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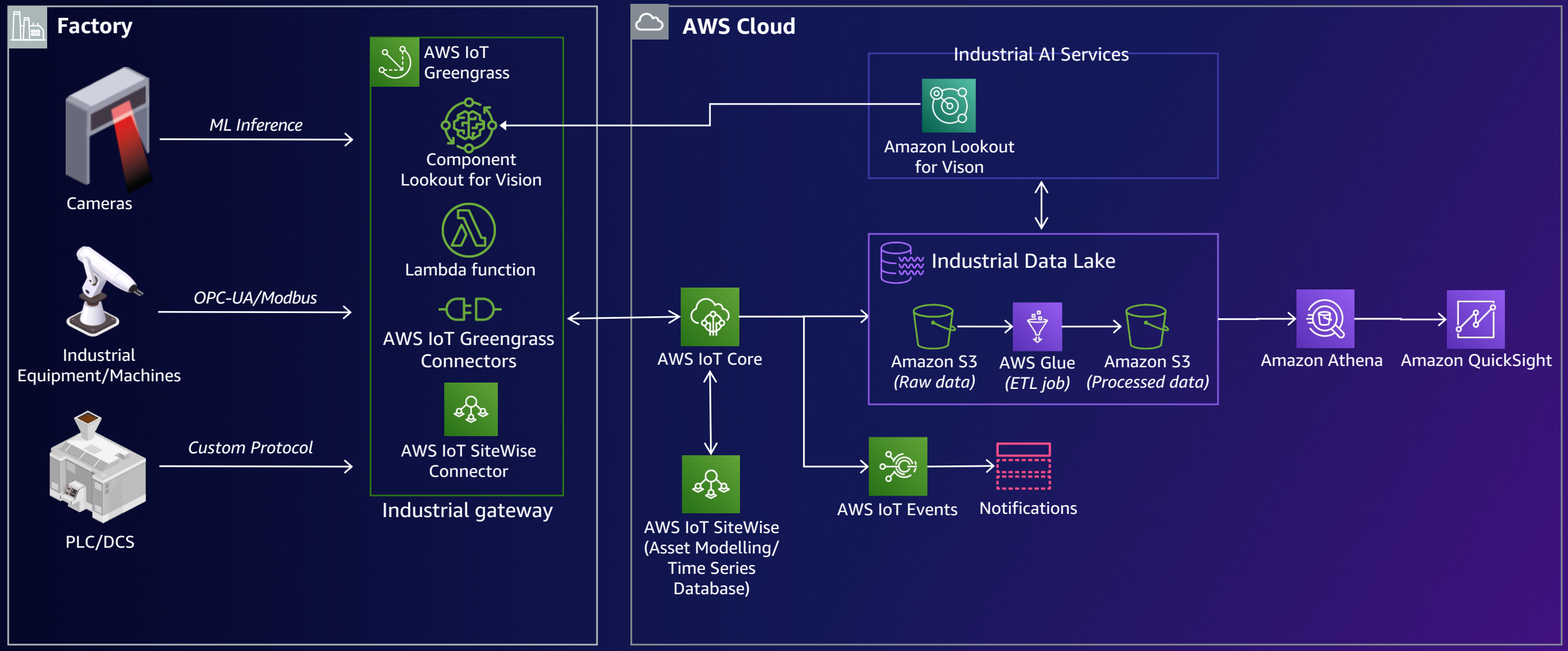
Industrial Architecture : Quality inspection



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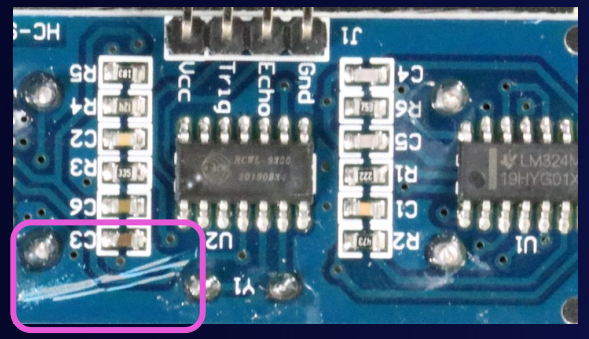
Amazon Lookout for Vision

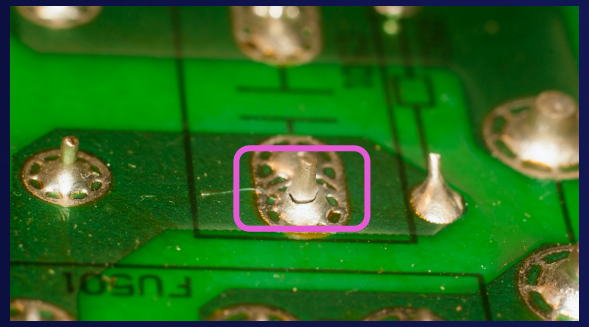


Anomaly

Scratch (surface defect)

Example

Printed circuit board



Anomaly

Improper solder (shape defect)

Example

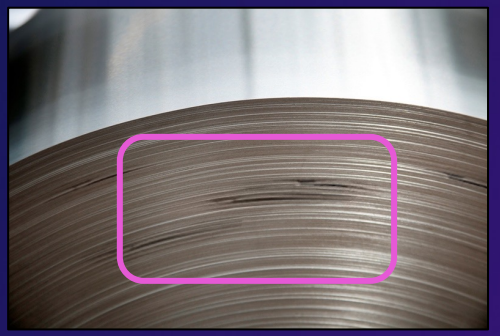
Printed circuit board

Anomaly

Absence/Presence; Misalignment/Placement

Example

Blister Pack



Anomaly

Defect Count, Change, Consistency

Example

Steel coil

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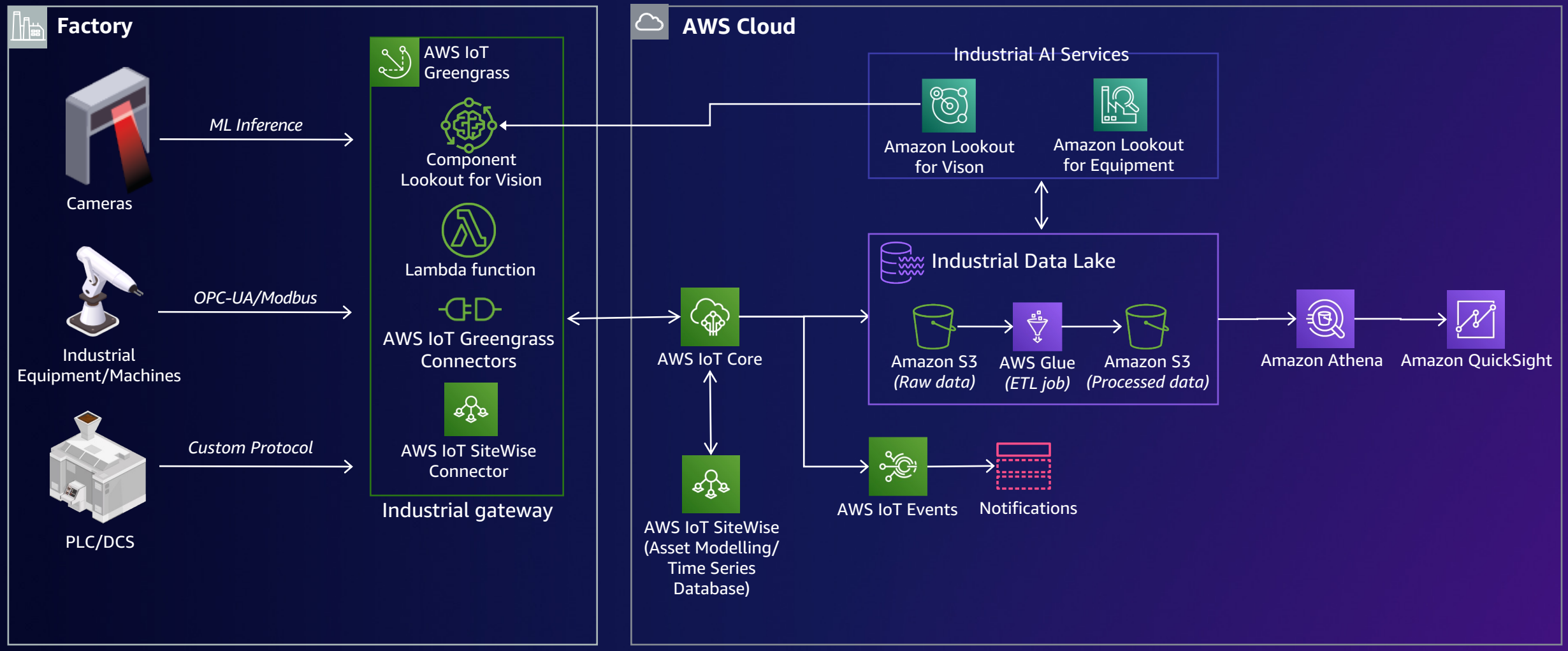
Industrial Architecture : Predictive maintenance



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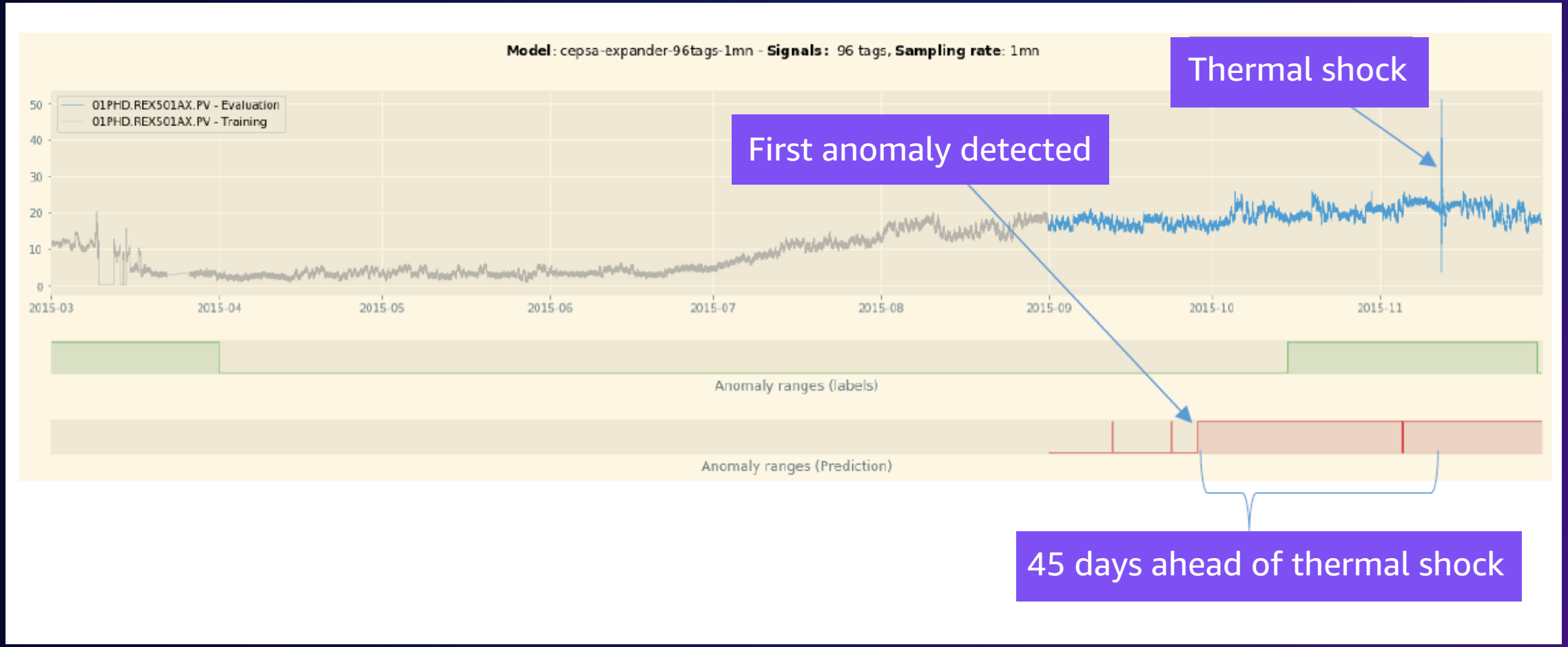
Amazon Lookout for Equipment



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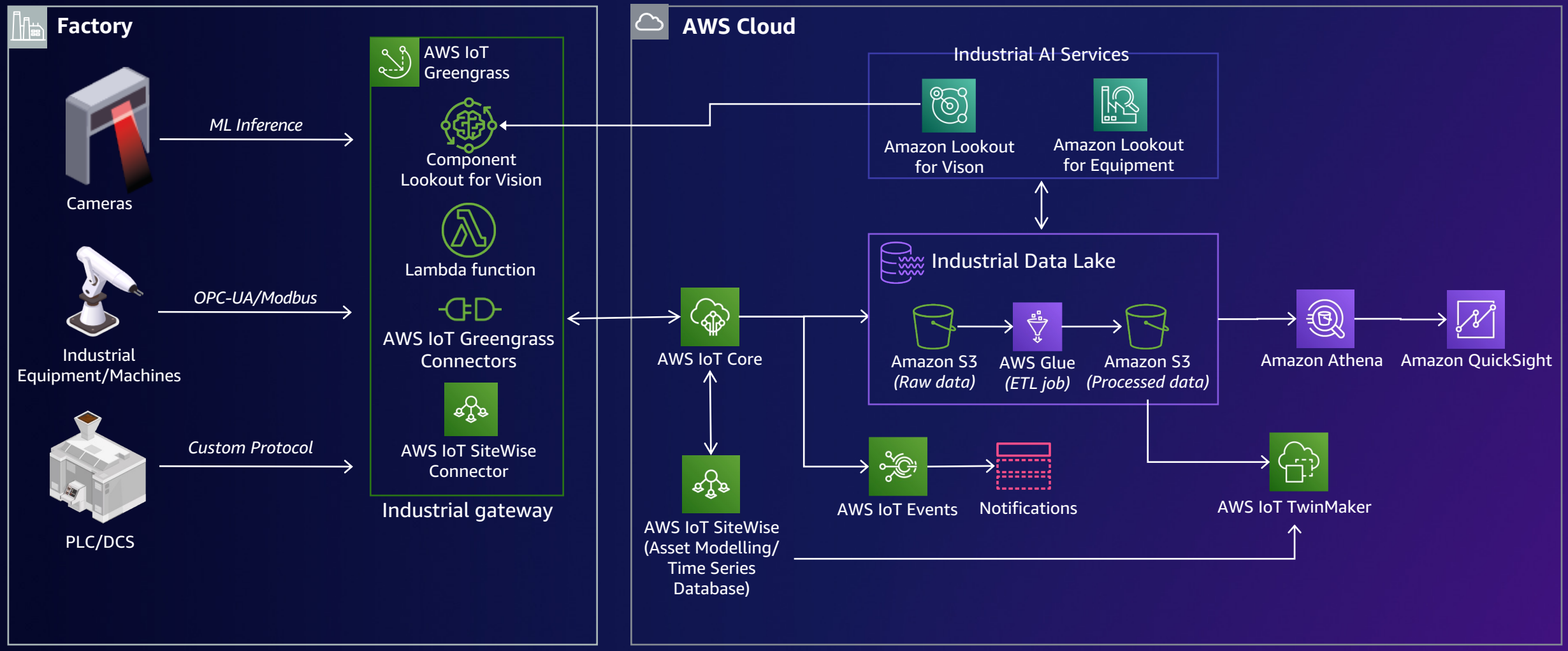
Industrial Architecture : Data contextualisation



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We take energy forward—making it safer, cleaner, and more efficient for people and the planet

120
Countries

54,000
Employees

$20.5B
Revenue

204
Perfect HSE days in 2020

$492M
In R&D development

>2,500
Patents awarded

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Baker Hughes

Our product companies

Oilfield Services

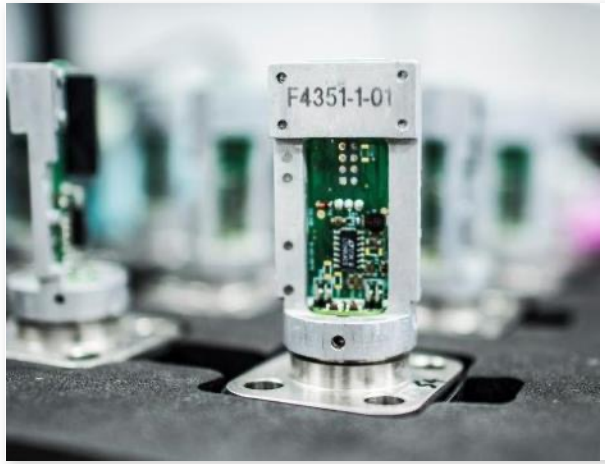
Lower cost per barrel over the life of field

Oilfield Equipment

Ultra-reliable technologies for the harshest environments

Turbomachinery & Process Solutions

Industry-leading availability and reliability



Digital Solutions

Peace of mind for the world's infrastructure

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Baker Hughes

How we innovate

Industrial innovation | Digital innovation | New technology and ventures

- $492M in research investment
- 17 global innovation centers
- 8 additive manufacturing centers
- >2,500 patents awarded in 2021
- ~$250M in new energy orders

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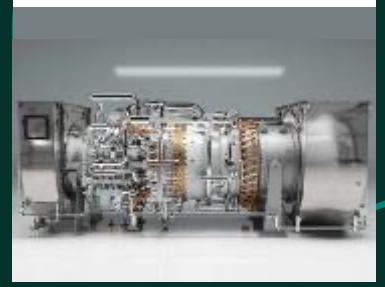
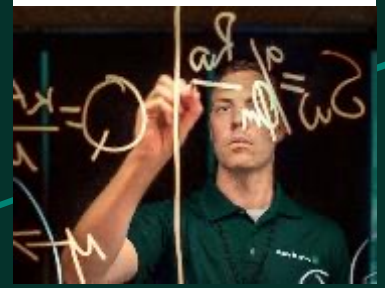
Baker Hughes

Leading the energy transition

We have committed to achieve net-zero carbon eq. emissions from operations by 2050 and are investing in new technologies to help customers reduce their emissions.

Low carbon energy solutions

Measurement and mitigation	Low to zero emissions solutions	Quantification and verification	Alternative energy services
			

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Baker Hughes

Capgemini

ACCELERARE PROGETTI PER L'INDUSTRIA 4.0 CON AWS FOR INDUSTRIAL

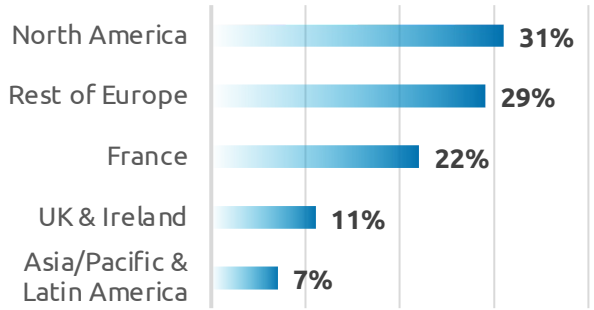
La storia dell'evoluzione del progetto Industria 4.0 di Baker Hughes costruito con Capgemini, partito da un singolo stabilimento fino ad arrivare ad un'infrastruttura distribuita con più di 1000 dispositivi connessi. Scopri come i servizi AWS vengono utilizzati per garantire la sicurezza dei dati, accelerare il rilascio di nuove funzionalità e mantenere alta l'efficenza degli impianti.

CAPGEMINI GROUP AT A GLANCE

Capgemini Group is One of the World's Largest Management and IT Consulting Companies

GROUP REVENUE

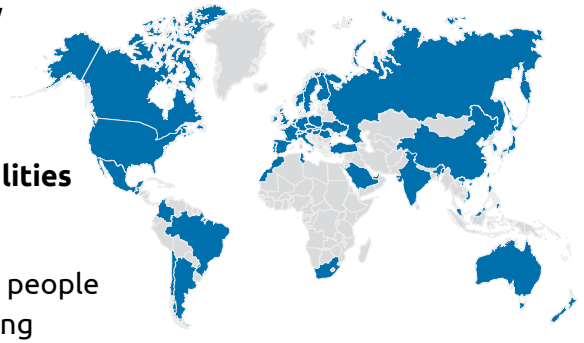
Group Revenue for 2021:
€18 billion



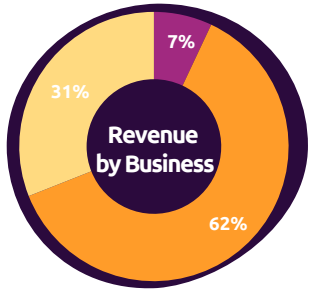
ONE TEAM

Present in nearly
50 countries
and
120+ nationalities

325,000+ people worldwide working together as **one team**

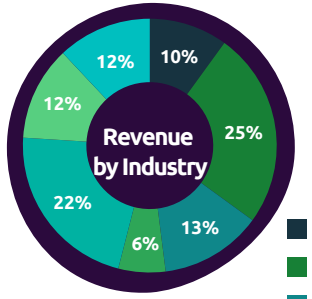


OUR SERVICES



- Strategy & Transformation
- Operations & Engineering
- Applications & Technology

SECTOR FOCUS



- Energy, Utilities & Chemicals
- Manufacturing, Automotive & Life Sciences
- Financial Services
- Public Sector
- Services
- Telecommunication, Media &Technology
- Consumer Goods & Retail

BUSINESS SUB-BRANDS

Capgemini invent

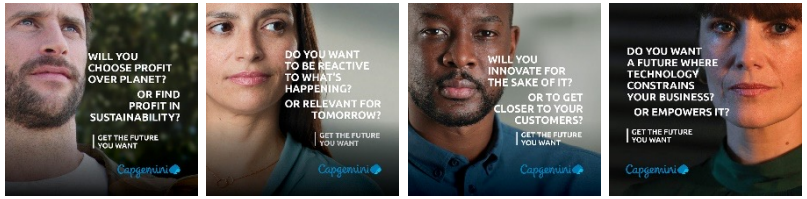
Capgemini engineering

sogeti
Part of Capgemini

See other sub-brands

OUR BRAND PROMISE

GET THE FUTURE YOU WANT



THOUGHT LEADERSHIP AND INNOVATION

Capgemini Research Institute

Ranked #1 consecutively for the 5th time for the quality of its research

Global network designed to enable enterprises to establish how they realize their innovation opportunities.

Capgemini
APPLIED INNOVATION EXCHANGE

We are Architects of Positive Futures
Diversity & Inclusion | Digital Inclusion | Environmental Sustainability

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CAPGEMINI CUSTOMERS ON AWS

FINANCIAL SERVICE

BANKING & CAPITAL MARKET

Bank of Ireland
TransUnion
HSBC
Fairstone
Loans that suit you
BARCLAYS
Allianz

INSURANCE

Liberty Mutual INSURANCE
RADIAN
KEMPER
NSW GOVERNMENT SICorp NSW Self Insurance Corporation
TIAA
Direct Line Group
Michael Page
Follett
metromile
Principal Global Investors
FARMERS INSURANCE
veda ADVANTAGE
Fidelity INVESTMENTS

MANUFACTURING

Baker Hughes
LP BUILDING SOLUTIONS
SAGEM
AIRBUS
GE Aviation
Weyerhaeuser

AUTOMOTIVE

BMW
FREE2MOVE SERVICES
crown lift trucks
KAR AUCTION SERVICES
Volkswagen
PENSKE Truck Rental

LIFE SCIENCE

Dräger
CORTEVA agriscience
MammaCare
Seqirus A CSL Company
BAYER
SANOFI
CANTEL MEDICAL
GE Healthcare

CPRD

BURBERRY LONDON
McDonald's
MICHAEL KORS
Coke One CONA SERVICES LLC
HAVI Global Solutions
Chick-fil-A
SUBWAY
FrieslandCampina

TMT

MOTOROLA
BROADGREEN PICTURES
SNCF
CAPRI HOLDINGS LIMITED
STX ENTERTAINMENT
telenor connexion
UNIVERSAL MUSIC GROUP
GOLFNOW

PUBLIC SECTOR

Home Office

OTHERS

EB
Jollibee
LIONSGATE
MODEC

EUC

EQUIFAX
GE
Entergy
gasNatural fenosa
excelerate energy
BAYER
AXIP ENERGY SERVICES
FREEPORT LNG
centrica
Chesapeake ENERGY
Cameron LNG
Fleur de Lis Energy, L.L.C.
Petrofac
eprimo der energiediscounter
GE Renewable Energy
INVISTA
innospec specialty chemicals
JC Fodale

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ASSET OPTIMIZATION WITH BAKER HUGHES

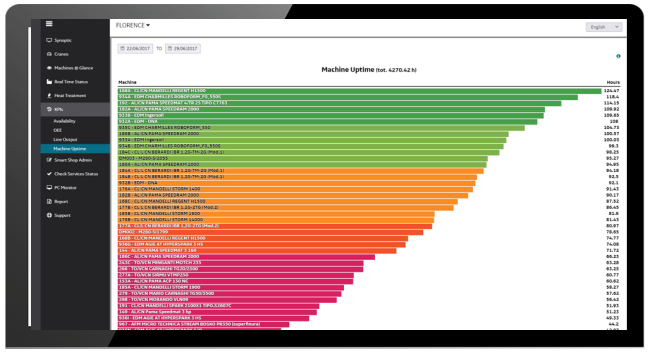
Baker Hughes

Solution

An industrial internet solution that gathers data from all manufacturing devices to provide a new level of insight

Connectivity

Capgemini and Baker Hughes implemented an Industrial Internet of Things solution that transformed shop floor processes.



14 plants – 916 machines connected

Benefits

- Enhanced visibility and insight
- Real time management of manufacturing processes provides real-time status updates, analysis of historical data, and visual metrics dashboards
- Prevention of 26,000 hours of downtime in 2017 (saving of up to 6.0 Mio USD)
- 12% increase in machine utilization five months after the deployment of the solution

Up to :

- **↓15% lead time**
- **+5% machine utilization**
- **+1 inventory turns**

Indirect saving
From Intuitions to Insights

Direct saving
Increase OEE

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FACTORY

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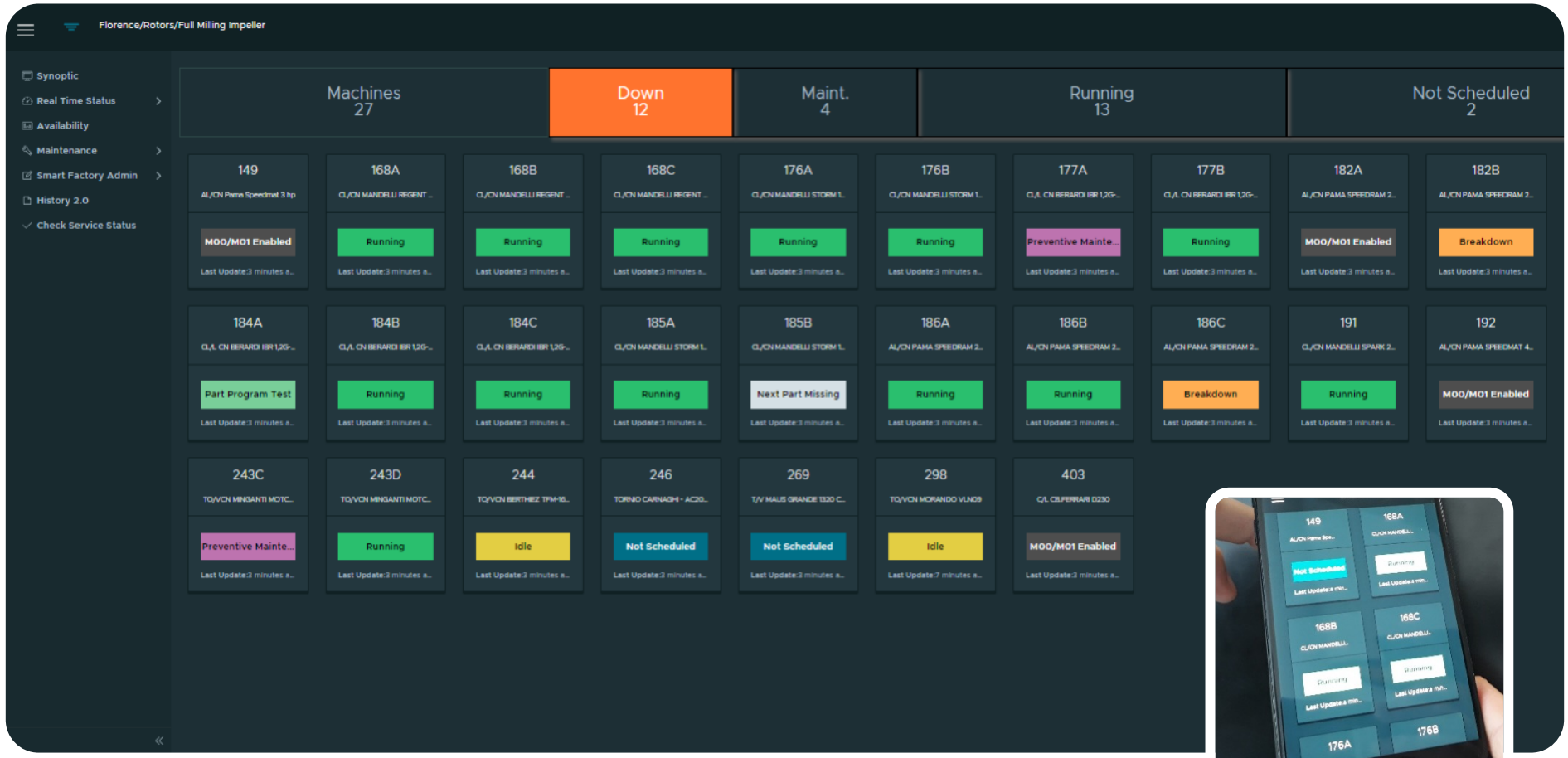
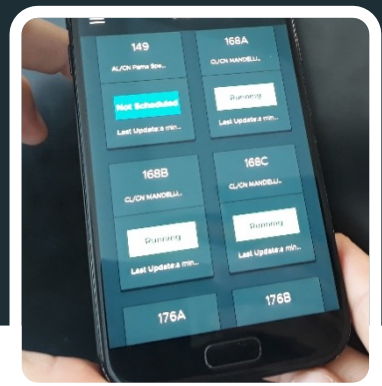
SYNOPTIC VIEW – MACHINE@GLANCE





- Monitor the status of the machines
- Real time data
- Aggregated summary in the top updated in real time
- The user can interact selecting a specific machine

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REAL TIME STATUS VIEWS

Overview / Tool Monitor

- Details of the machines in the plant
- Operational time remaining and information about the new operation and necessary tools from ERP / SAP
- View to show machines with critical problems with red border

Maintenance View

- Machines with active problems (Breakdown and Preventive Maintenance)
- MTBF, MTTR and DT
- Last Work Order with the list of the last 10 alarms

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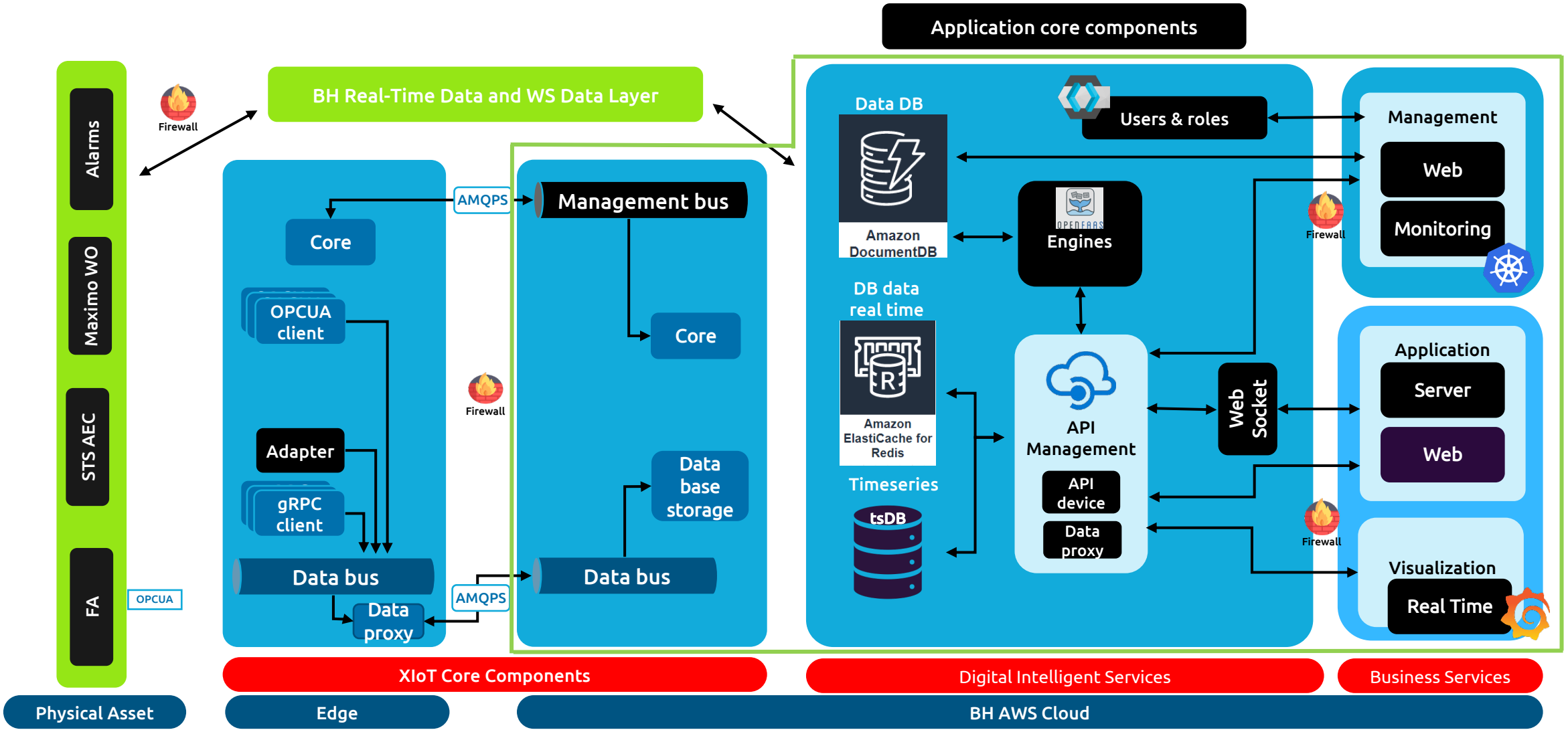
HIGH LEVEL ARCHITECTURE



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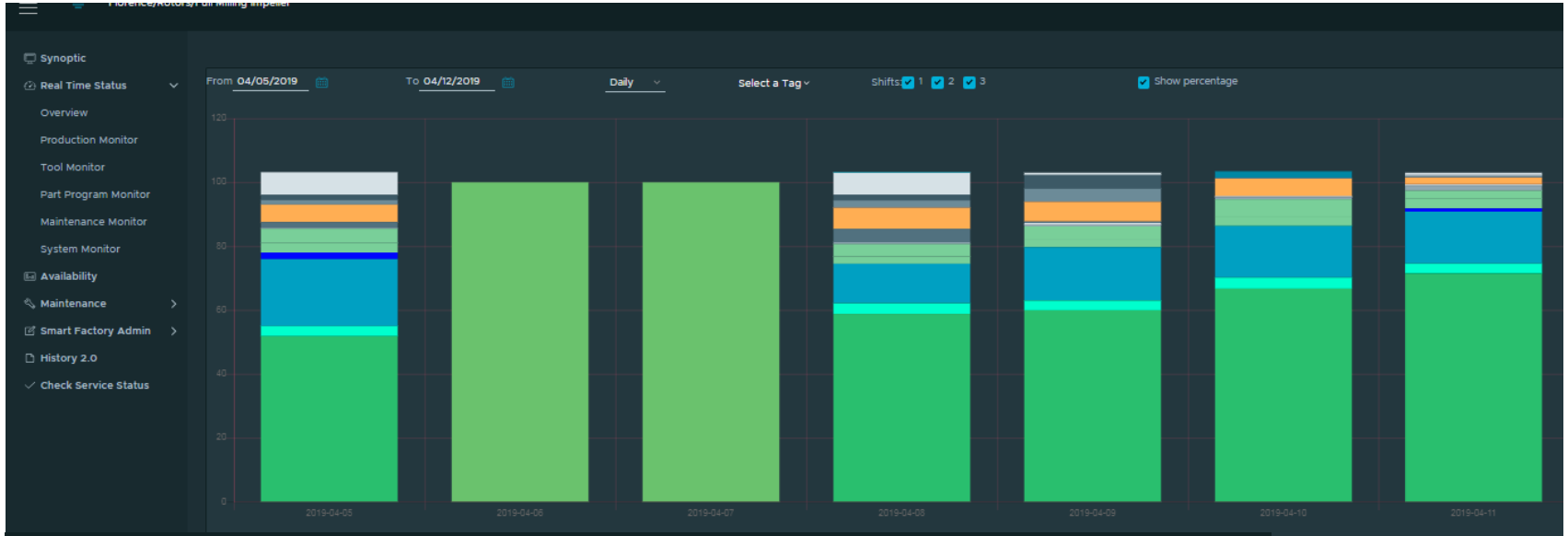
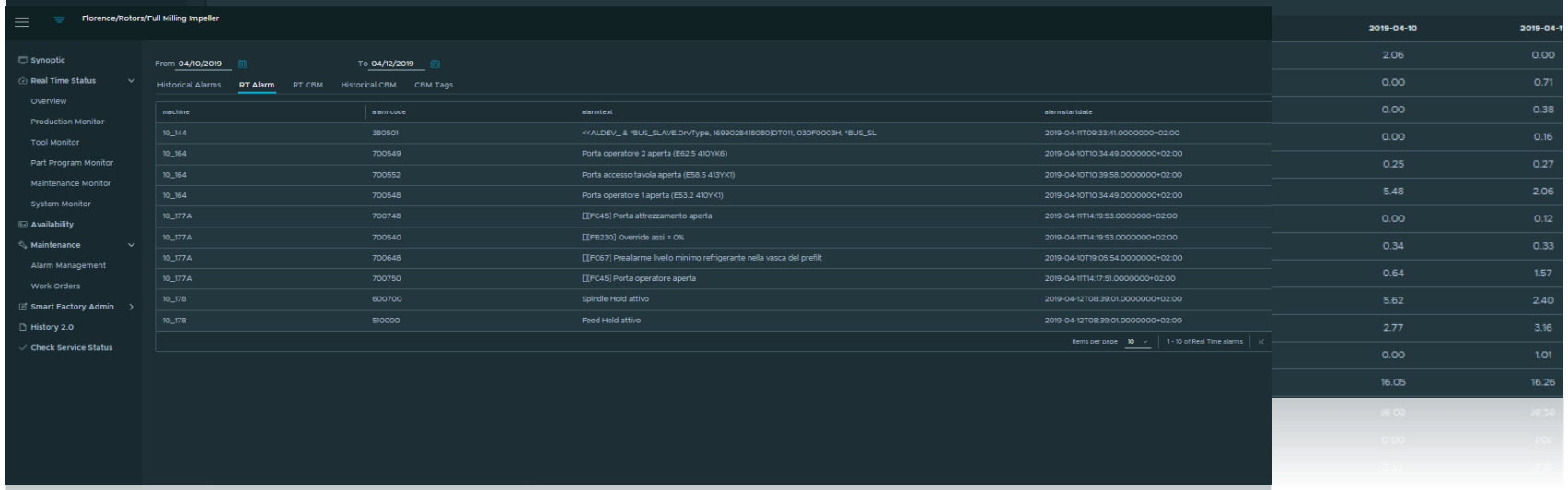
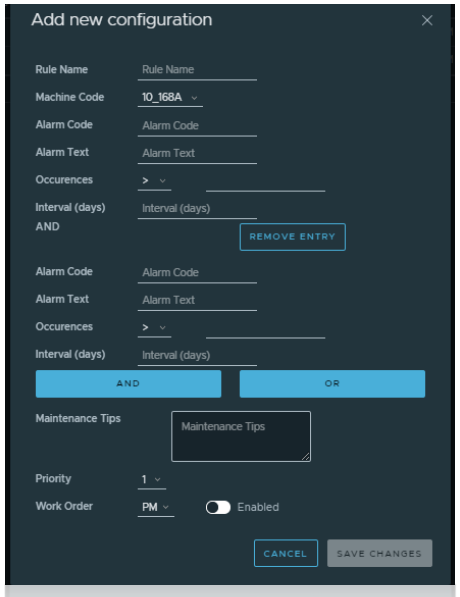
KPI – AVAILABILITY VIEW/CBM





- Time spent by the machines respect the various machine states (reason code). Different aggregations and filters are available.
- CBM (Condition Based Maintenance) allow to build complex rules both on alarms and machine tags and automatically open Work Order integrated with external tools



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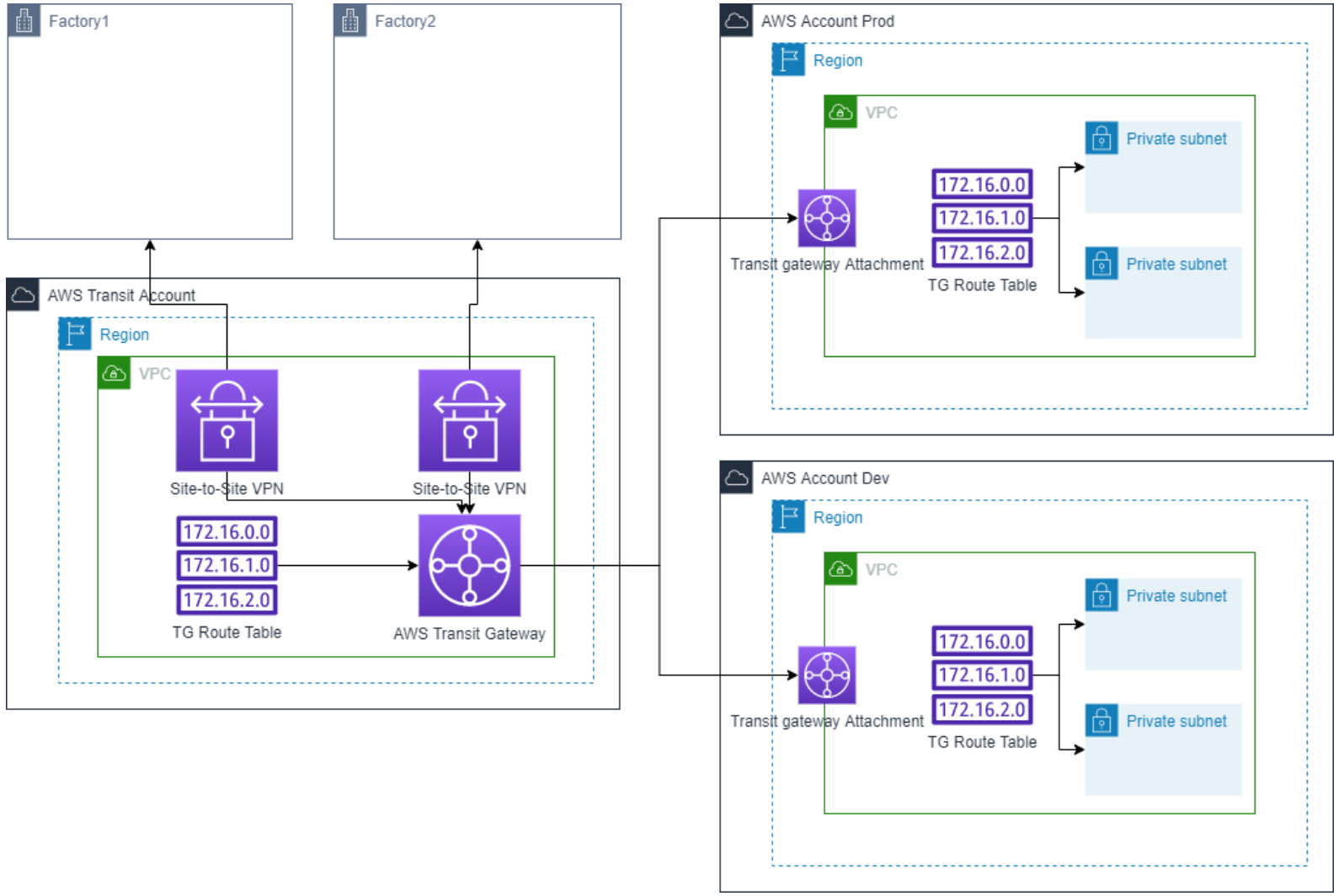
ROAD TO SCALABILITY

CONNECTIVITY USING TRANSIT GATEWAY AND VPN P2P



- VPNs site to site used to connect each plant
- Transit gateway used to distribute connectivity between different environments
- RouteTables to correctly route traffic
- Complex to manage, mantaine and scale

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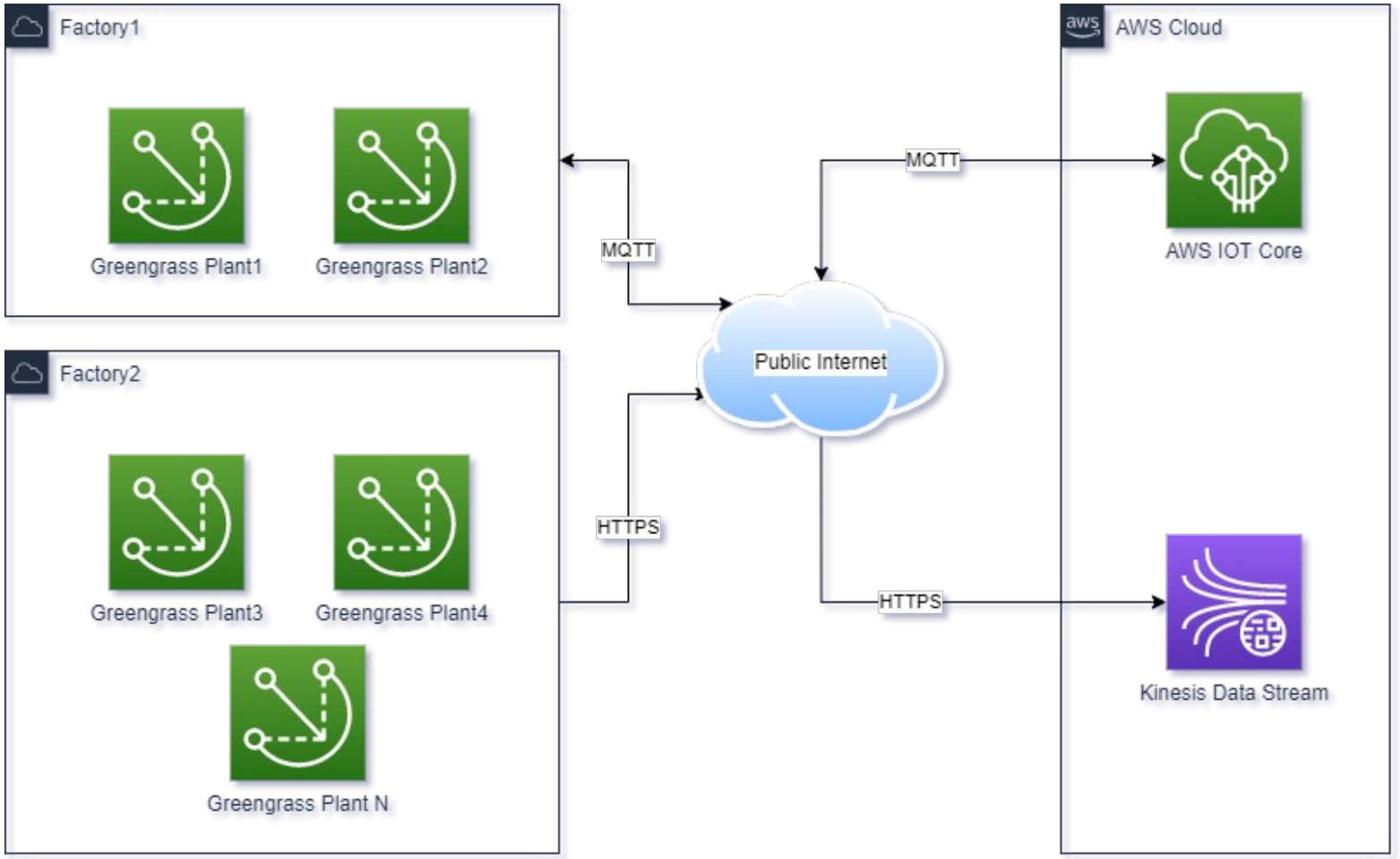
CONNECTIVITY USING PUBLIC INTERNET



- All traffic to and from AWS IoT is sent securely over Transport Layer Security (TLS)
- Authentication using X.509 Certificates
- Authorization using IoT Core policies
- Whitelist on-premise iot endpoint «account-specific-prefix.iot.aws-region.amazonaws.com»
- AWS IoT Device Defender
- Easier to scale

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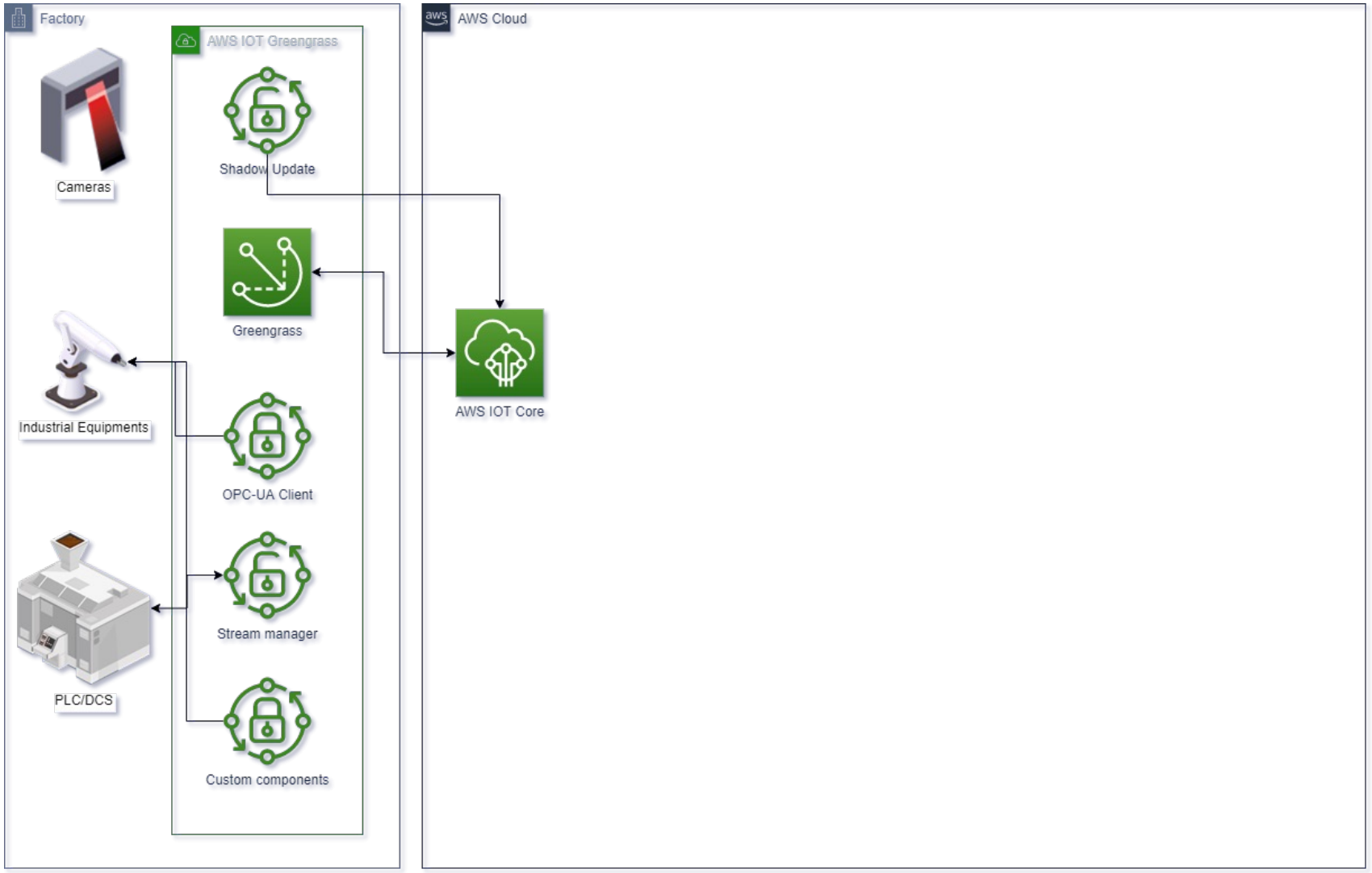
GREENGRASS V2 COMPONENTS



Private components

- OPC-UA Client
- Reuse existing code in custom components

AWS-Provided Components

- Shadow Update
- Stream manager

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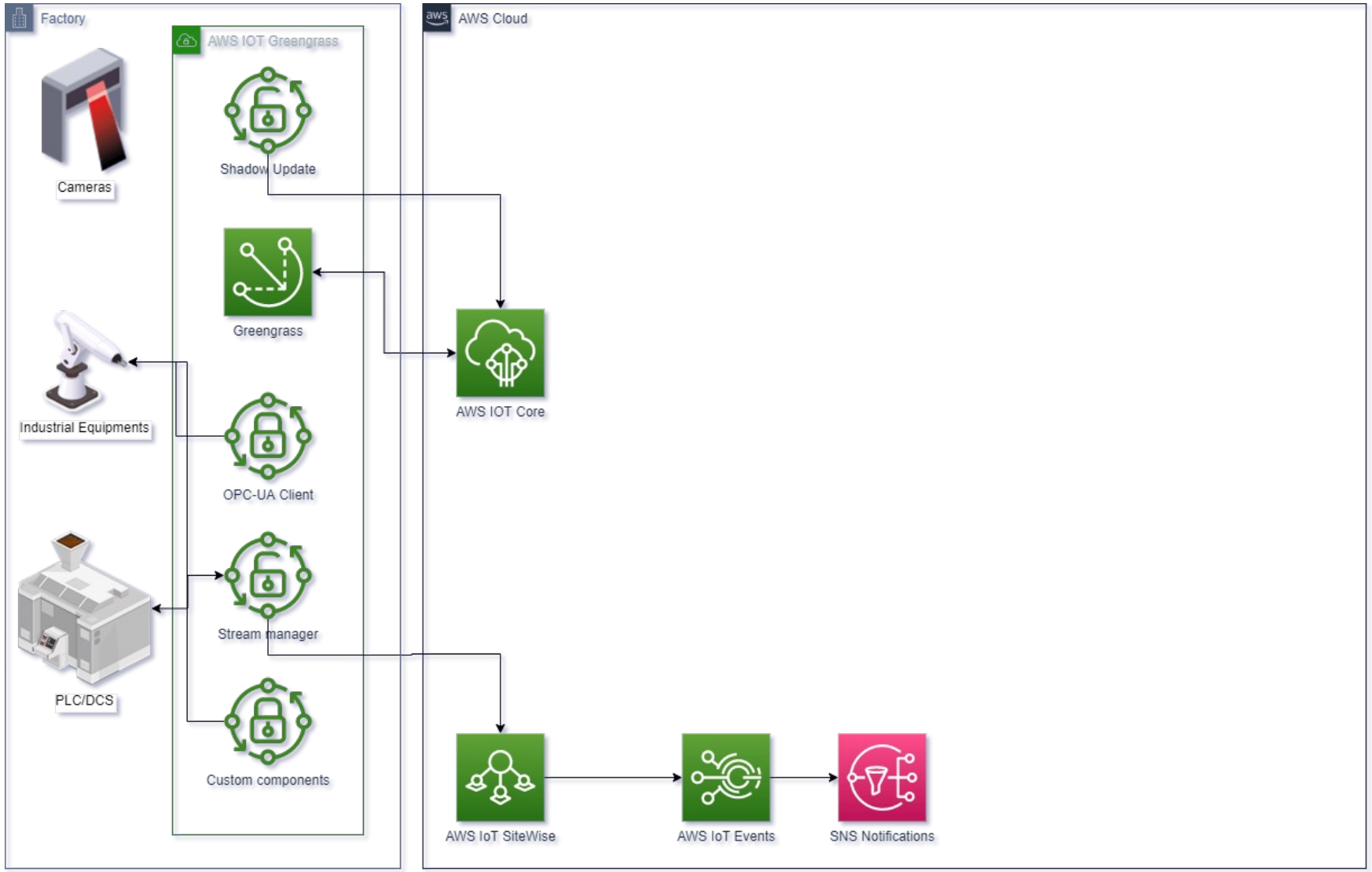
AWS IOT CORE + IOT SITEWISE



- AWS IoT Sitewise for fast prototyping
- AWS IoT Alarms
- External Alarms supported
- Dashboard accessible using AWS SSO
- Pay attention to cost for real time sampled data

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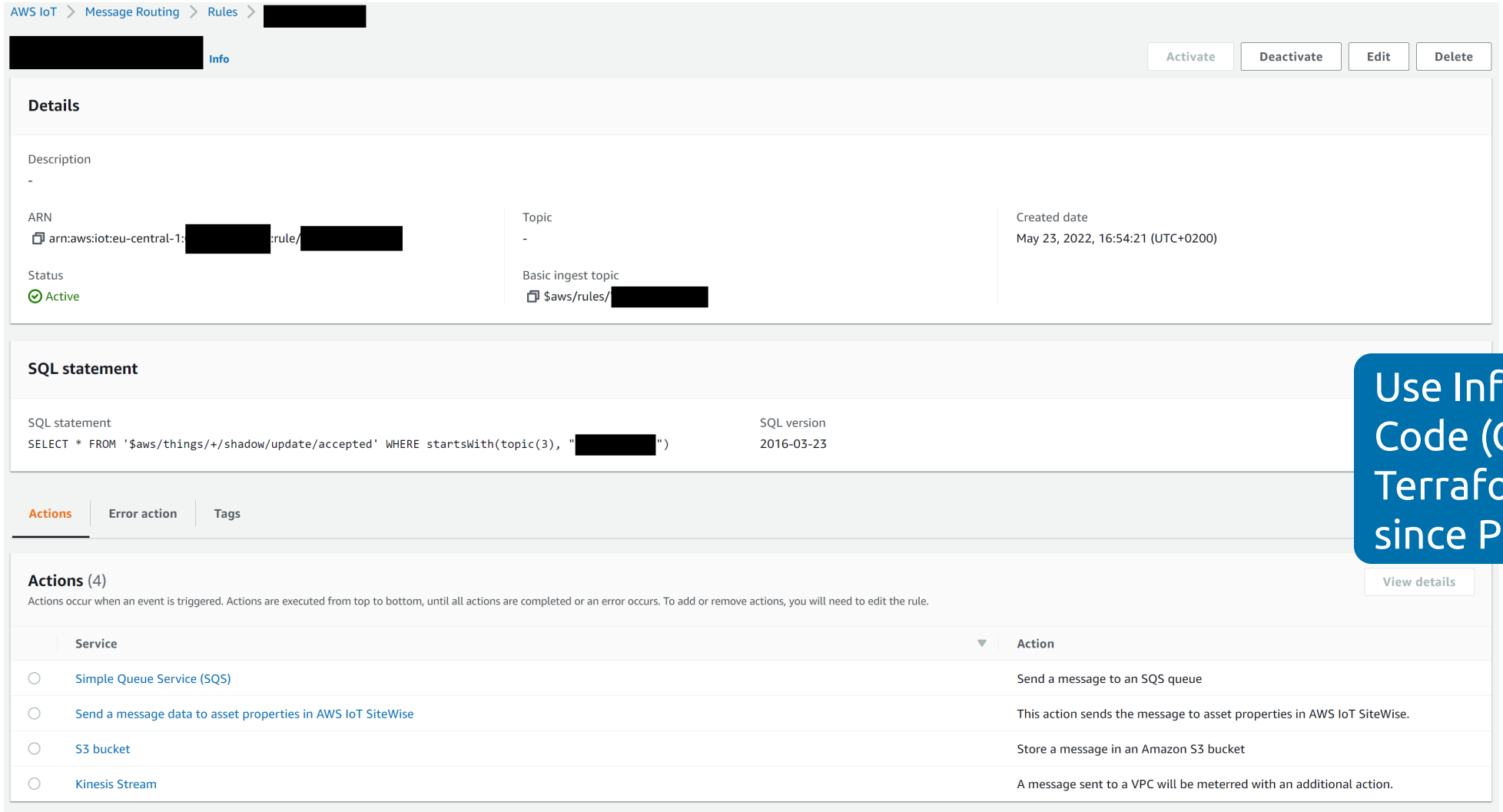
FAST PROTOTYPING USING AWS IOT PLATFORM



Use Infrastructure as Code (Cloudformation, Terraform, CDK, etc.) since POC

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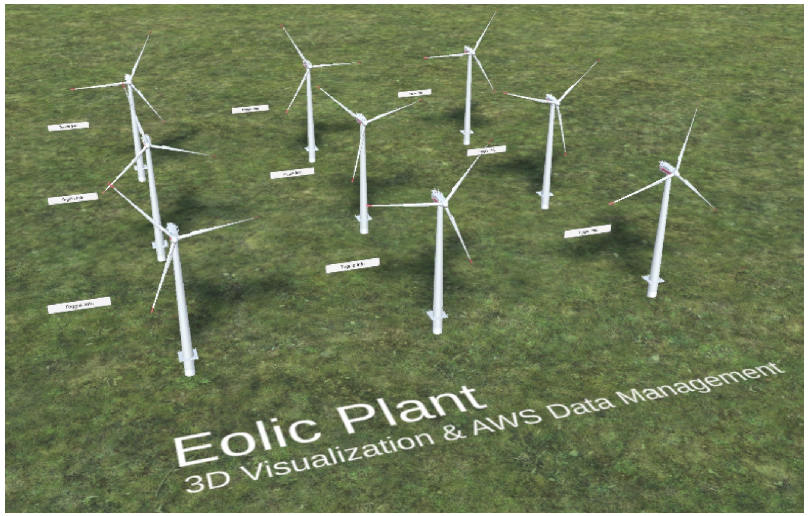
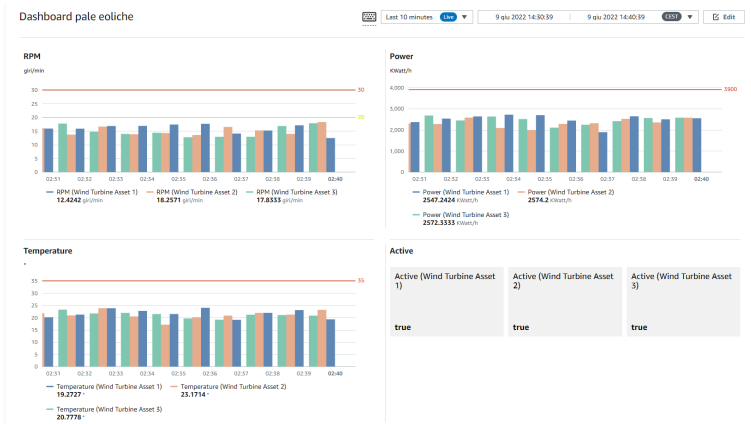
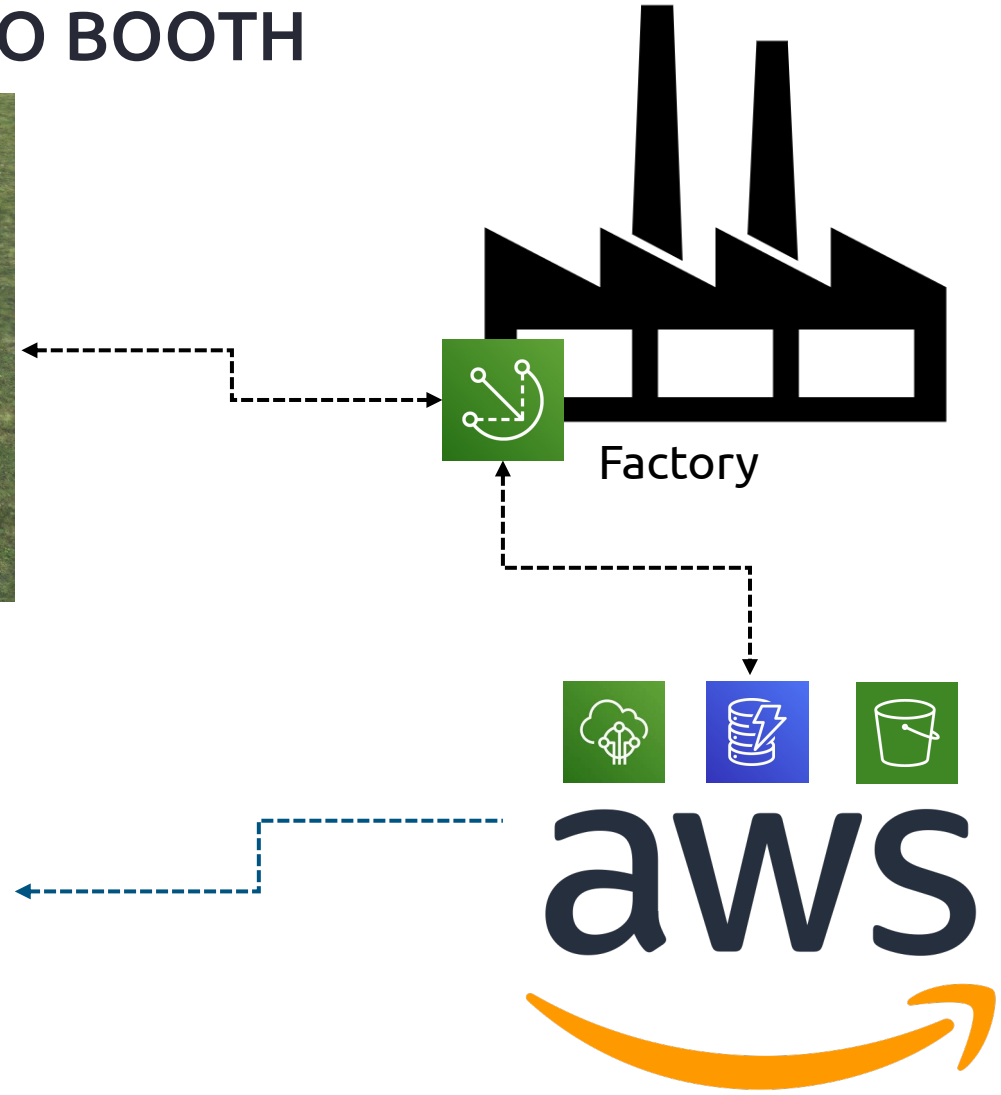
DEMO DIGITAL TWIN AL NOSTRO BOOTH



Digital Eolic Plant



Dashboard



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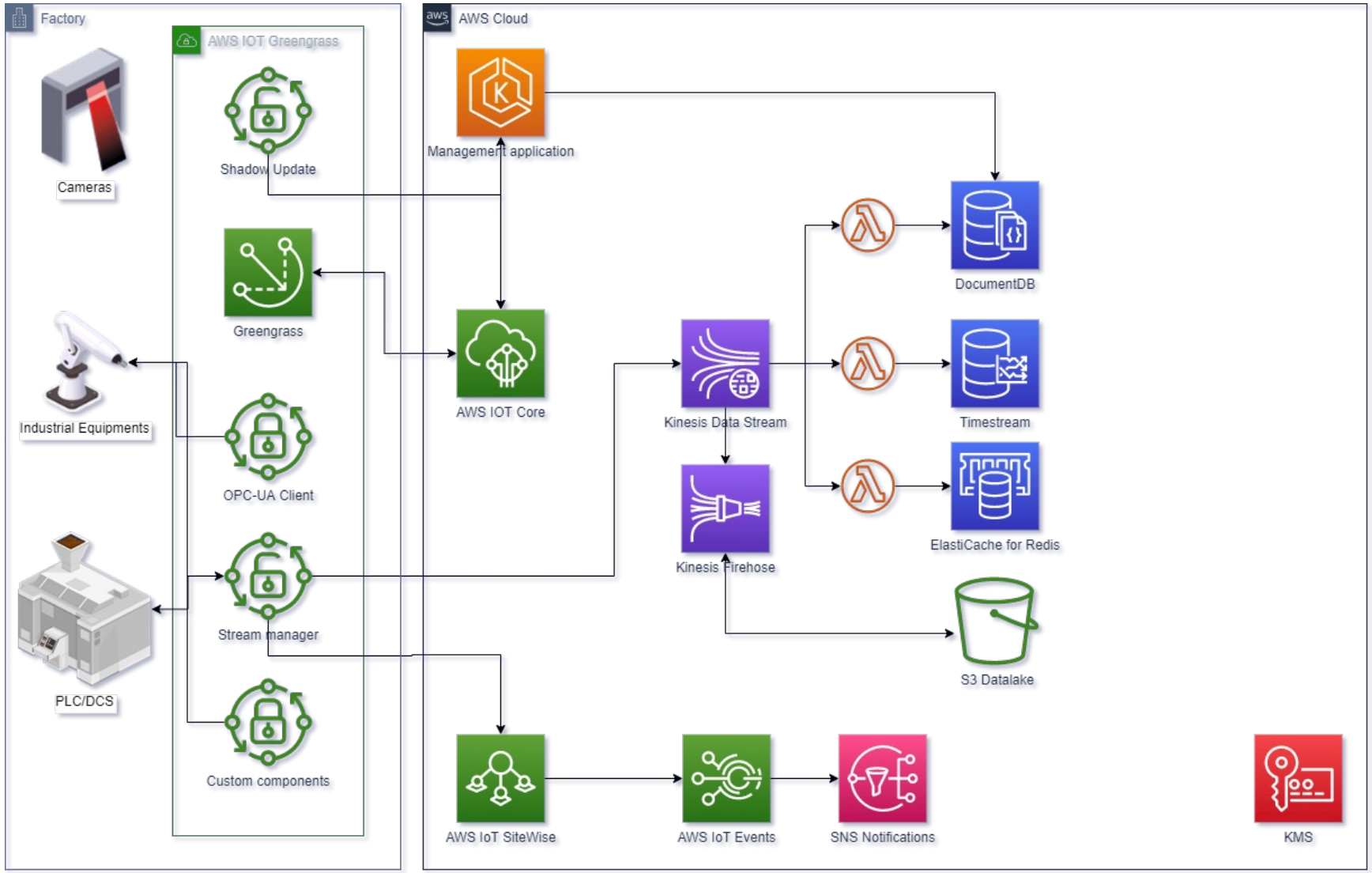
INDUSTRIAL DATA LAKE



- Amazon Kinesis Data Stream On-demand
- An agile datalake using Amazon Kinesis and IaC
- Data automatically distribuited between 4 different storages
- Data encrypted by default at-rest and in-transit

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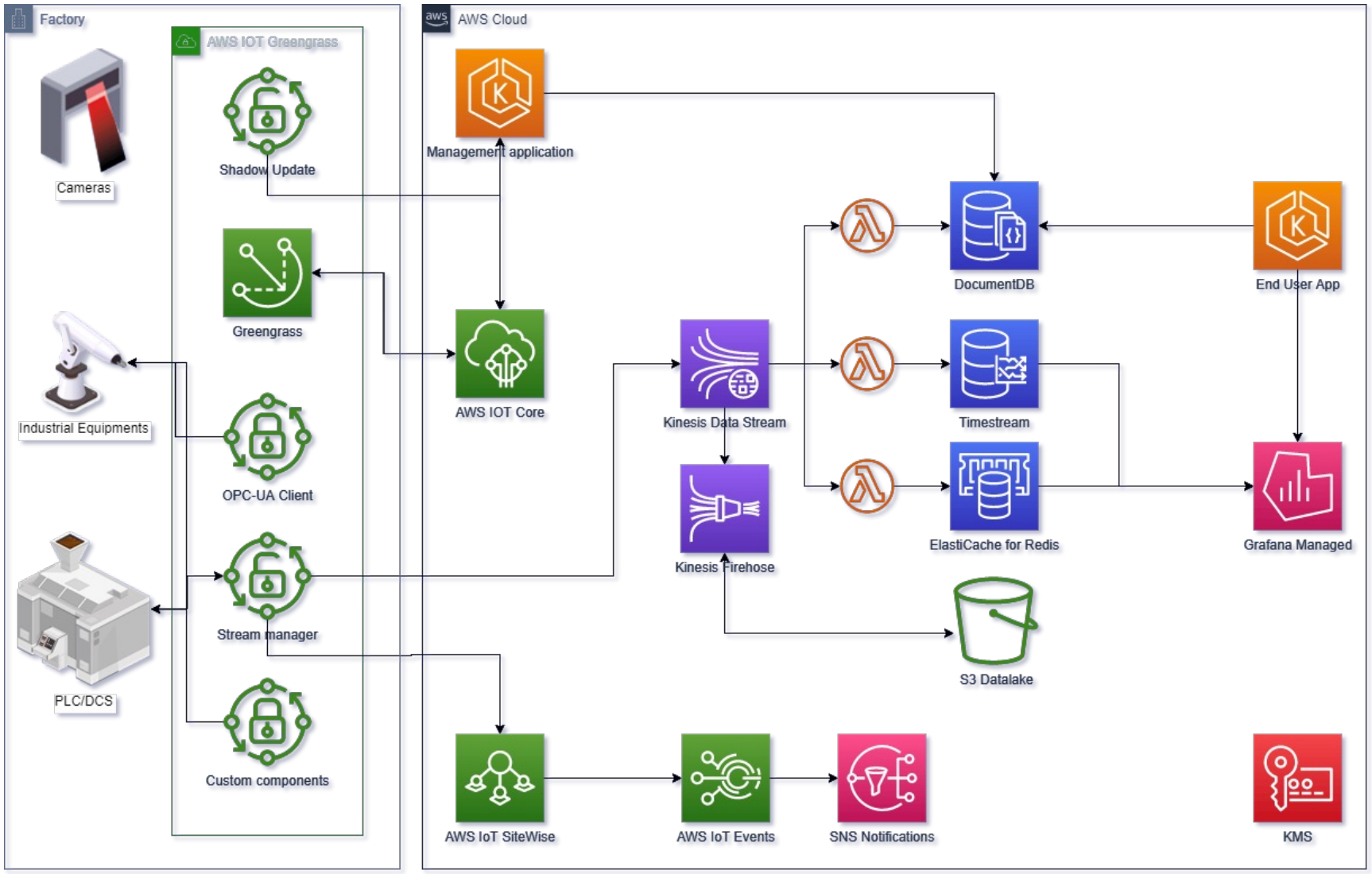
VISUALIZATION USING AMAZON MANAGED GRAFANA



- Re-use existing dashboards
- Integrated with End User App using SAML
- Integrated with AWS SSO

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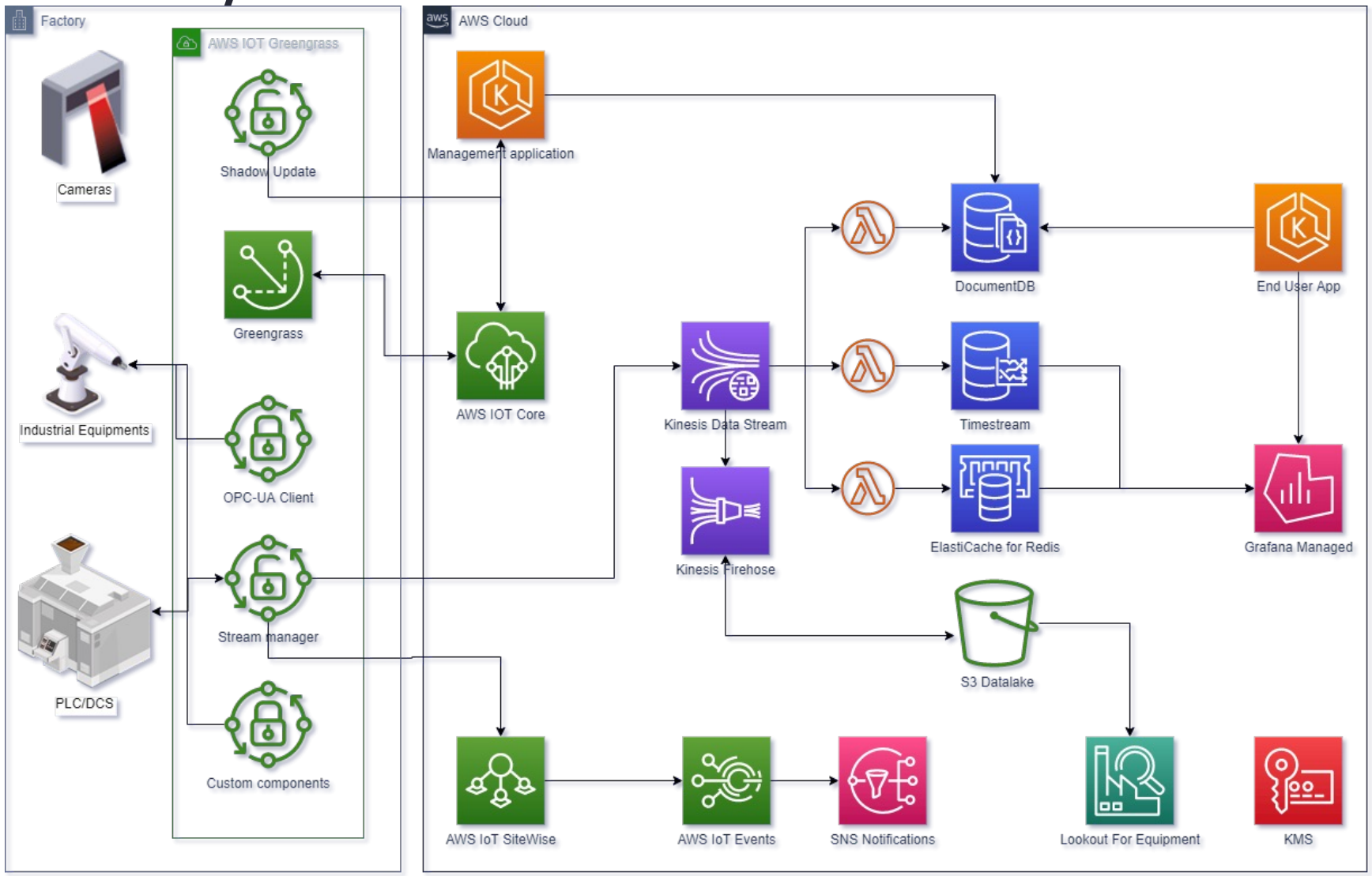
TO BE AI/ML



- Lookout for Equipment
- Predictive maintenance
- Sagemaker Edge Manager Agent

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Thank you!

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