EquipWise Overview

EquipWise empowers enterprises to seamlessly collect, consolidate, and analyze equipment data, unlocking the full potential of AI-driven engineering calculations and advanced analytics. By harnessing the power of data, manufacturers can optimize equipment performance, enhance sustainability, and ensure operational safety—leading to smarter, more efficient, and future-ready manufacturing.

Features (Functional & Technical)

01 Data Ingestion
Data Orchestration
Of Structured, unstructured, timeseries and Master data,

02 Contextualization
Timeseries data standardization , Correlation to business operations

03 AI Analytics
Engineering calculations & computations, Statistics & traditional AI
Multi Agentic AI

04 Process eelligence
Smart Predictions
Simulations
Optimizations

Target Customers

Original Equipment Manufacturer (OEM)

Equipment Users

Equipment Leasing Services

Outcomes / Benefits

Enhanced & Efficient equipment availability, and performance
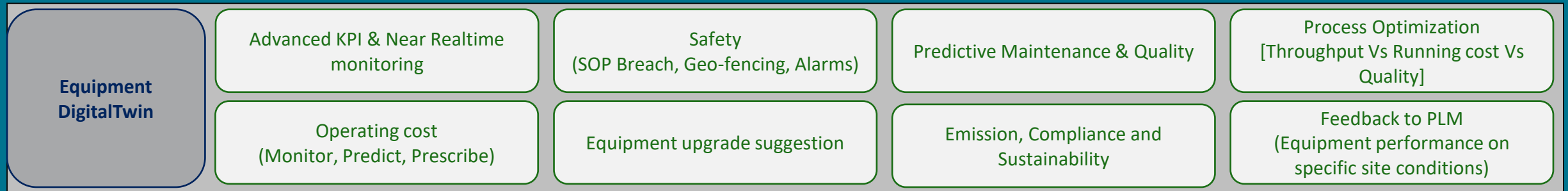
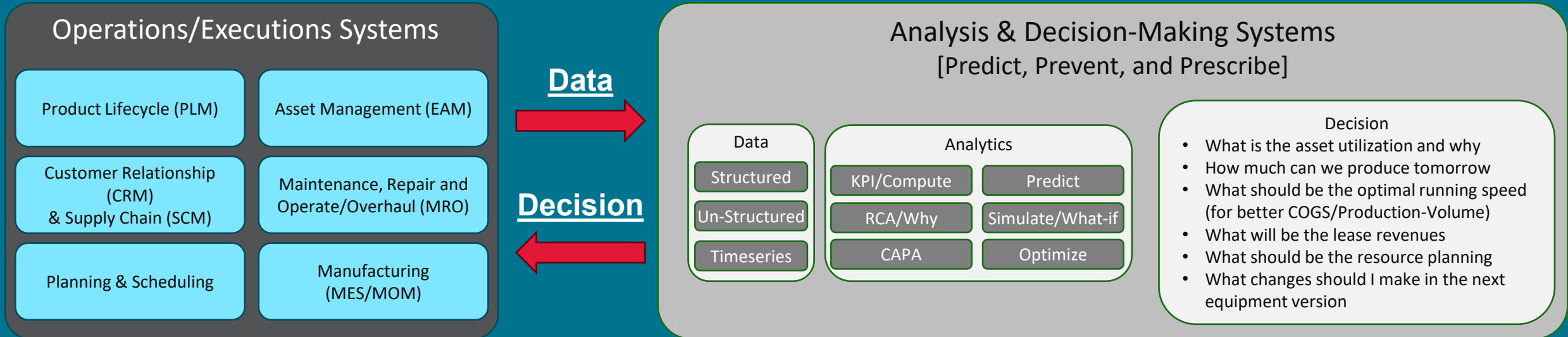Extended equipment life span

Proactive production scheduling
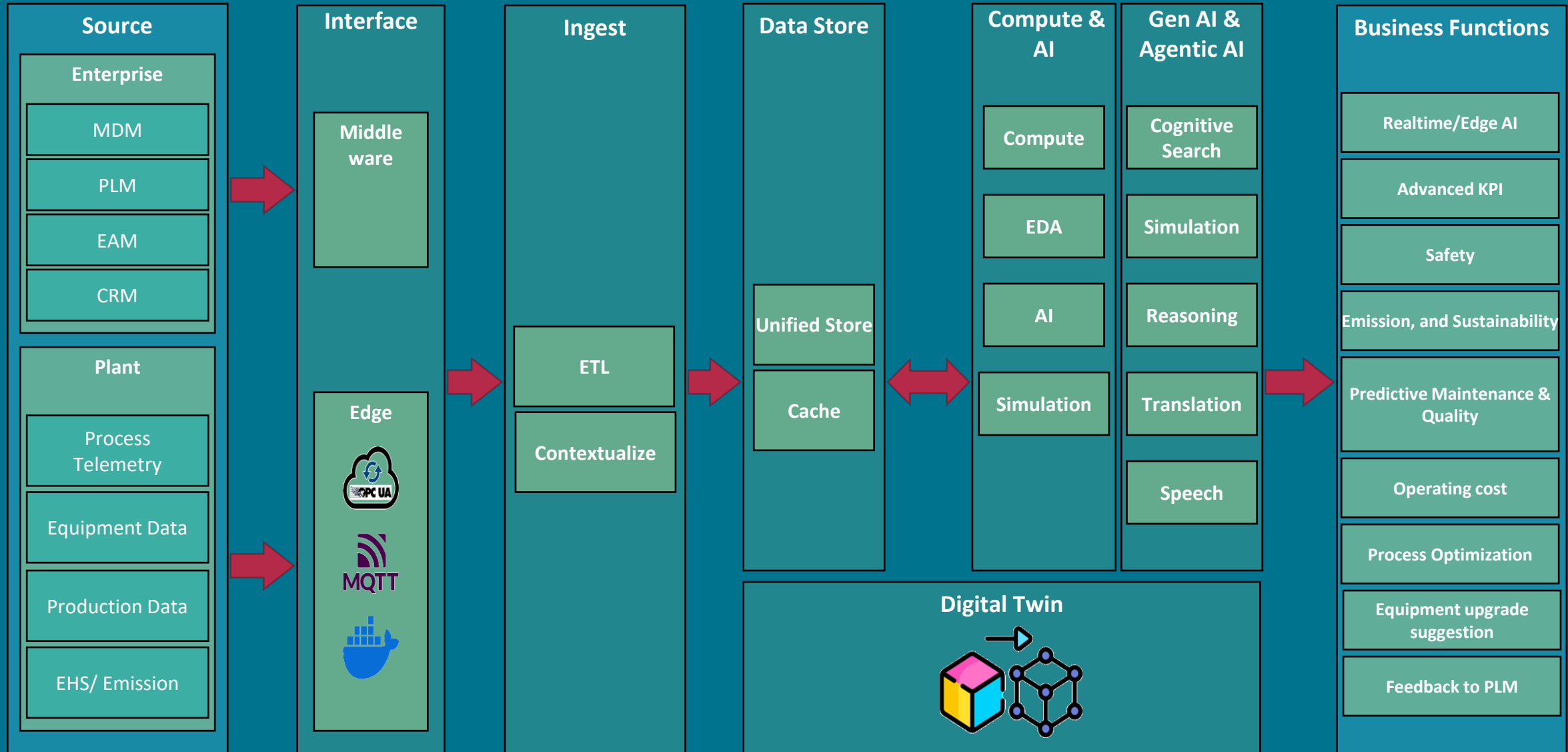
Enhanced safety on the MFG Shop floor

Minimized TCO

Real-time Analytics and Conversational UI

EquipWise Model
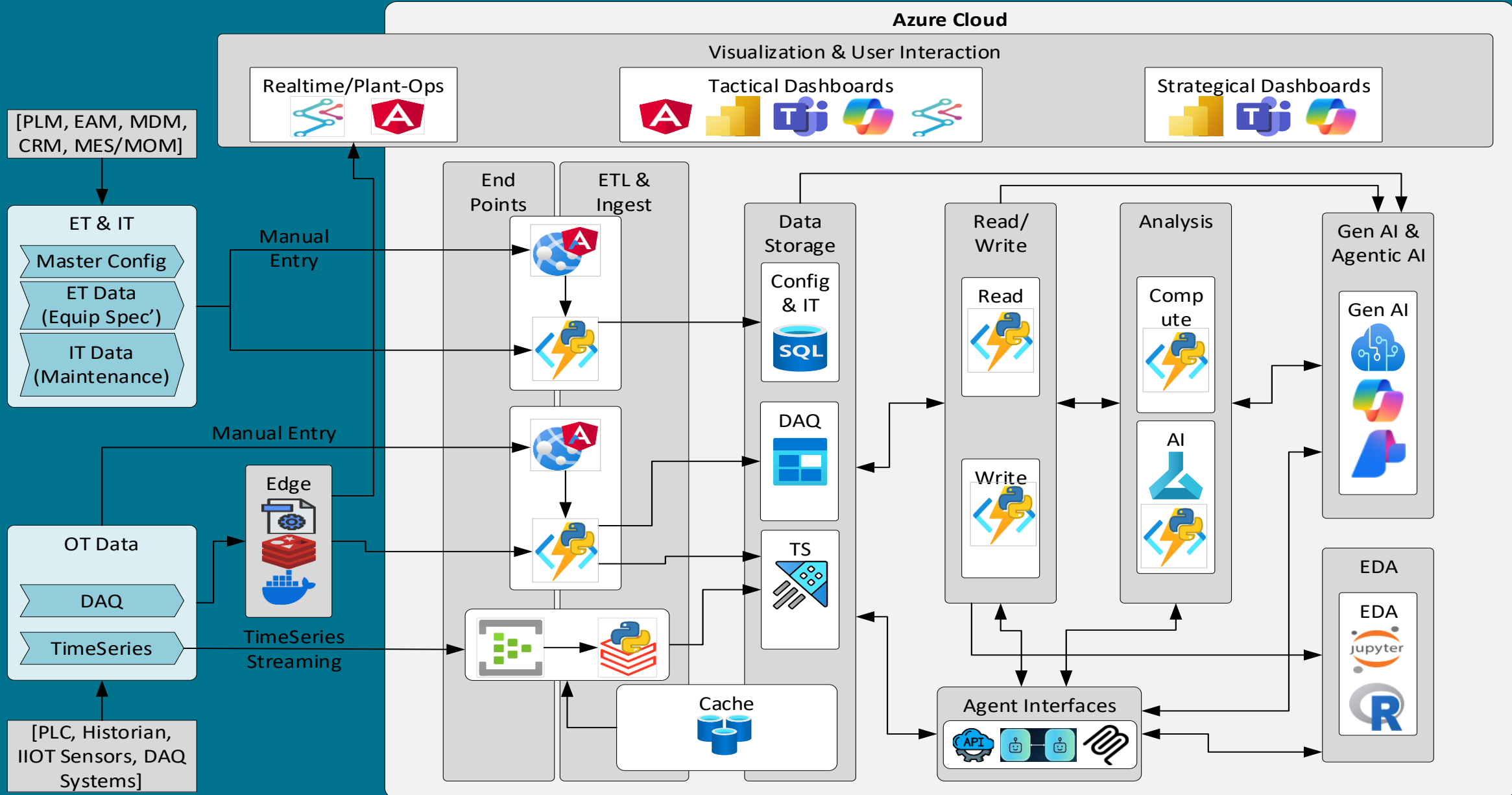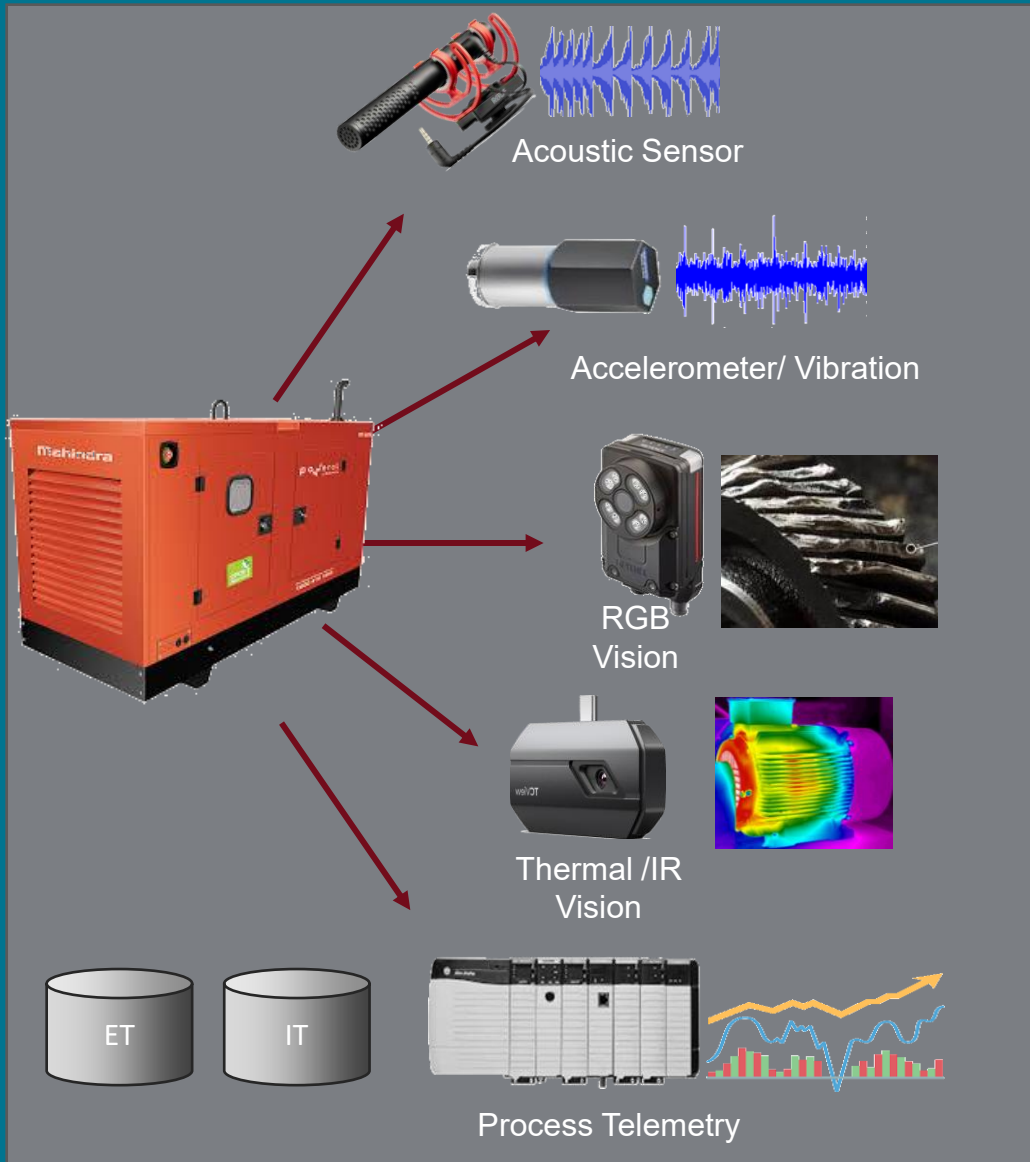
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Operations/Executions Systems

Product Lifecycle (PLM)	Asset Management (EAM)
Customer Relationship (CRM) & Supply Chain (SCM)	Maintenance, Repair and Operate/Overhaul (MRO)
Planning & Scheduling	Manufacturing (MES/MOM)

Data →

Decision ←

Analysis & Decision-Making Systems
[Predict, Prevent, and Prescribe]

Data
- Structured
- Un-Structured
- Timeseries

Analytics

KPI/Compute	Predict
RCA/Why	Simulate/What-if
CAPA	Optimize

Decision
- What is the asset utilization and why
- How much can we produce tomorrow
- What should be the optimal running speed (for better COGS/Production-Volume)
- What will be the lease revenues
- What should be the resource planning
- What changes should I make in the next equipment version

Equipment DigitalTwin

Advanced KPI & Near Realtime monitoring	Safety (SOP Breach, Geo-fencing, Alarms)
Operating cost (Monitor, Predict, Prescribe)	Equipment upgrade suggestion

Predictive Maintenance & Quality	Process Optimization [Throughput Vs Running cost Vs Quality]
Emission, Compliance and Sustainability	Feedback to PLM (Equipment performance on specific site conditions)

EquipWise Architecture (Based On Azure)

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Source

Enterprise
- MDM
- PLM
- EAM
- CRM

Plant
- Process Telemetry
- Equipment Data
- Production Data
- EHS/ Emission

Interface

Middle ware

Edge
OPC UA
MQTT

Ingest

ETL

Contextualize

Data Store

Unified Store

Cache

Compute & AI

- Compute
- EDA
- AI
- Simulation

Gen AI & Agentic AI

- Cognitive Search
- Simulation
- Reasoning
- Translation
- Speech

Digital Twin

Business Functions

- Realtime/Edge AI
- Advanced KPI
- Safety
- Emission, and Sustainability
- Predictive Maintenance & Quality
- Operating cost
- Process Optimization
- Equipment upgrade suggestion
- Feedback to PLM

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EquipWise Reference Architecture (Based On Azure)

Data Interface

Acoustic Sensor

Accelerometer/ Vibration

RGB Vision

Thermal /IR Vision

ET   IT

Process Telemetry

- Predictive Maintenance
- EHS/Safety
- Equipment level Process Simulation
- Equipment Optimization

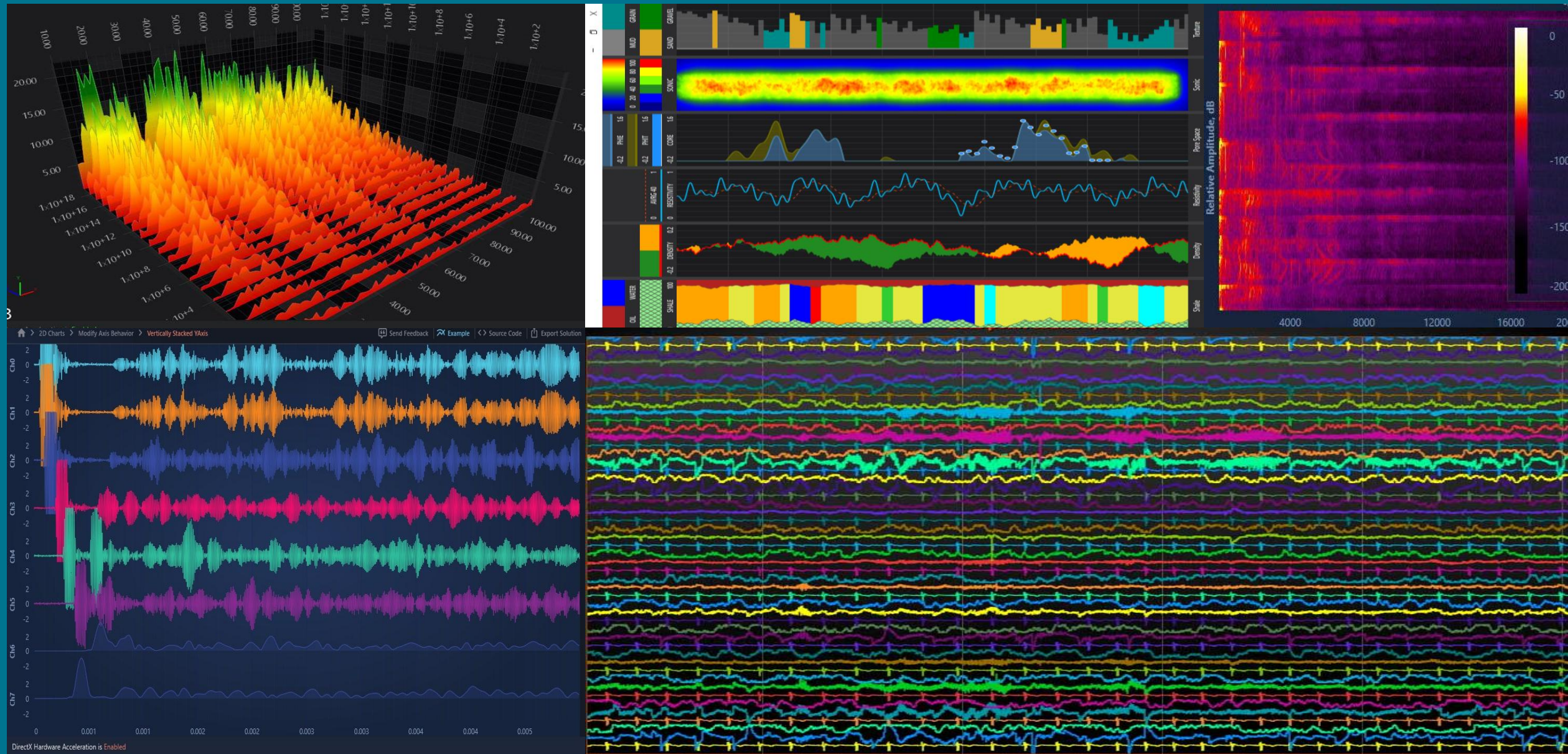| #	Machine Components	Acoustics	Vibration	RGB Vision	IR Vision	Process Telemetry
1	Rotating (Pump, bearing, motor, gearbox, …)	High	High	Low	Medium	Medium
2	Repeating & Reciprocating (CNC, Robotics, Recip pump, auto IC engine)	High	Medium	Medium	Medium	Medium
3	Thermal (boilers, motor, bearing, heat exchanger, heaters, electrical contacts)	Low	Low	Low	High	Medium
4	Metal to metal contact (Bearing, pully, chain, clutch, ball, screws)	Medium	Medium	Medium	High	Medium
5	Material cutting (CNC, cutting tools/edges, power press)	High	Medium	Low	Low	Medium
6	Fluid movement (Pipeline, valves, hydraulics/pneumatics)	Low	Low	Medium	Low	Medium
7	Integrated equipment (CNC, Engine, hydraulic press)	Low	Low	Low	Low	High

Edge Compute and Operational AI
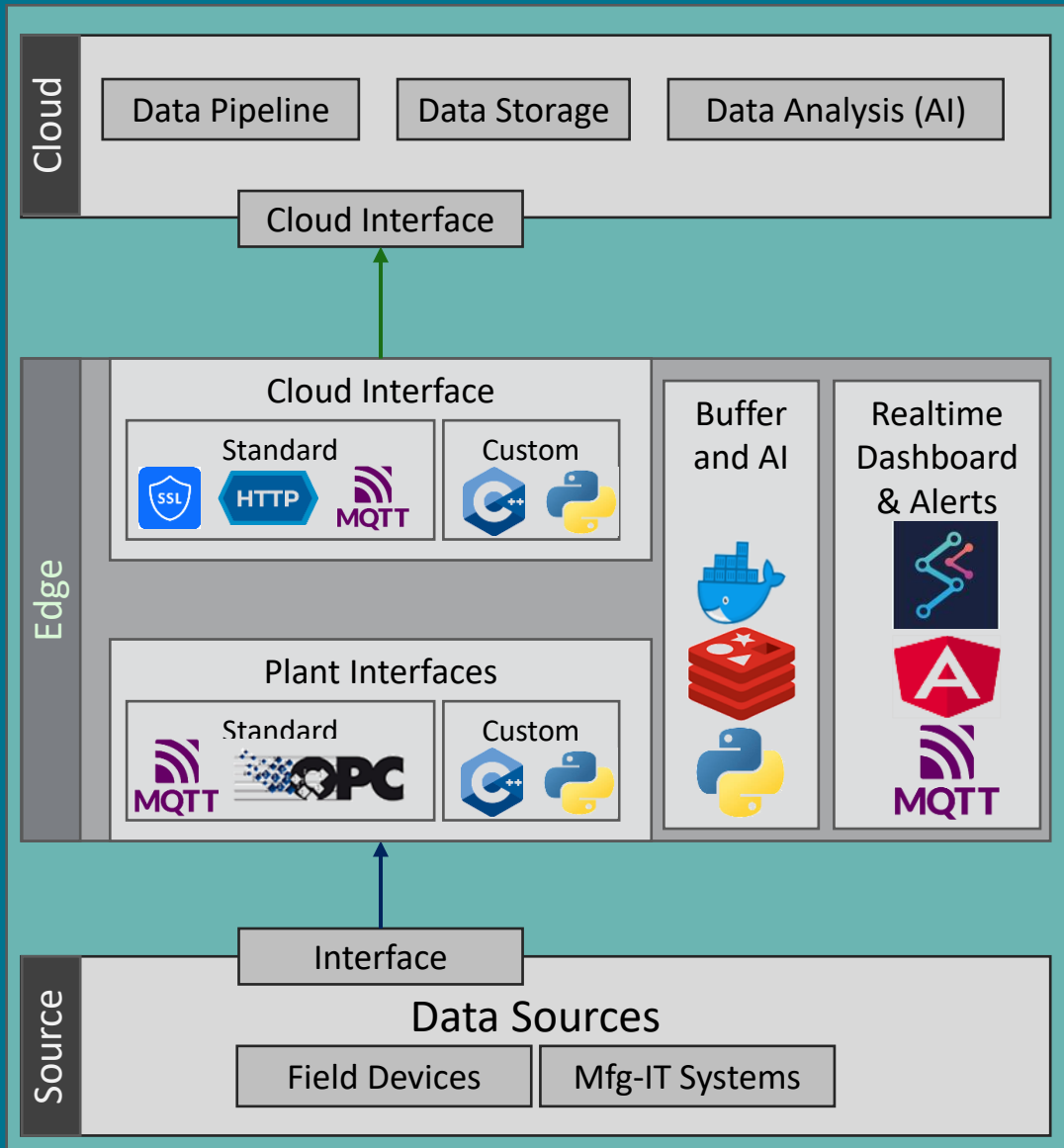
- **Plant Interface**
  - Standard interfaces like MQTT, OPC
  - Equipment specific custom developed interfaces using
  - Mfg-IT (like MES/MOM, QMS, LIMS,...) Interface needed for edge compute

- **Data Buffer**
  - Data for edge compute & AI
  - Data for real-time dashboards
  - Optimal network usage and handling spotty network
  - Downsizing data

- **Edge AI**
  - Realtime highspeed analysis such as FFT, Acoustics, image processing, timeseries
  - Realtime AI driven predictive maintenance, SOP breach, quality deviation
  - Realtime guidance for operations optimization (set-value (SV) suggestion)

- **Realtime Alerts and Dashboards**
  - High density and high-speed dashboards for engineers and technicians
  - Realtime alerts annunciation channelled to required recipients

- **Cloud Interface**
  - Pushing data to cloud
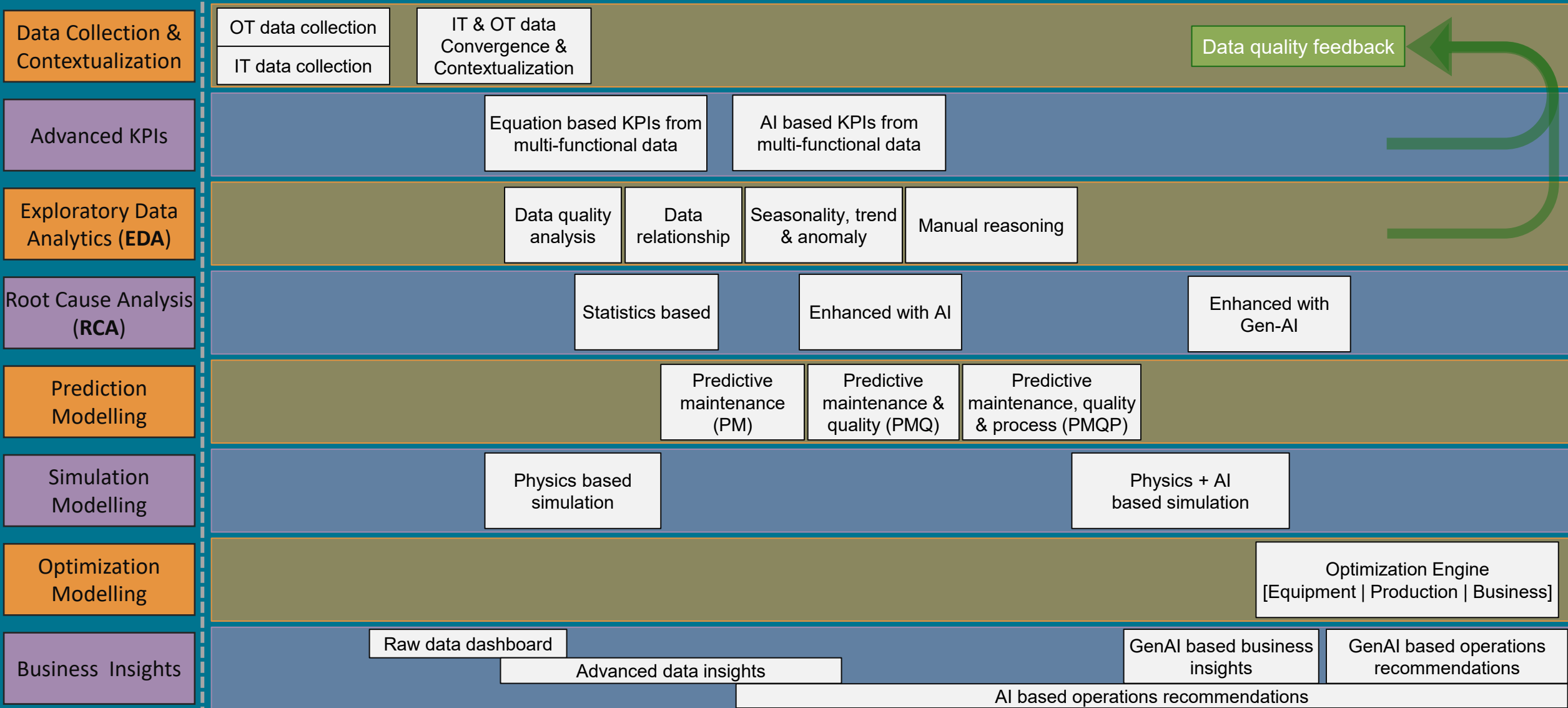 - Configuration synchronization

Data Interface | Edge & Ops' AI | Data Storage | Tactical AI | Strategical AI

Data Storage

Method :	PLM	Installation & SAT	Production Operations	Maintenance	Quality	Decommission & Scrap

| Men |
| Machine |
| Material |

(Based on ISA-95/88 standard, upgraded to current database technologies using RAMI4.0)

XRef

CRUD Functions

Computation

Math Model

Stat Model

AI Model

Workflow/ Orchestration / Business Functions

Exploratory Data Analysis (EDA)

Simulation

Prediction

Dashboards

Cache	Master	Transaction	Un Structured	Timeseries

- Get Equipment Telemetry (PV,SV,AE)
- Get workers on an equipment / Production
- Get Maintenance WO details
- Get weather
- Get RM, WIP, FG quality record

- Physics calc (Pump Efficiency, heat transfer, …)
- Timeseries analysis (Trend, Cyclicity, cluster, shift/drift, …)
- Data transformation(FFT, wavelet,…)
- Statistics, Hypothesis testing, Co-Relation, …
- Deep-Learning AI models
- LLM AI models

Industrial AI - Roadmap

Data Collection & Contextualization		
OT data collection	IT & OT data Convergence & Contextualization	Data quality feedback
IT data collection		

Advanced KPIs
- Equation based KPIs from multi-functional data
- AI based KPIs from multi-functional data

Exploratory Data Analytics (EDA)
- Data quality analysis
- Data relationship
- Seasonality, trend & anomaly
- Manual reasoning

Root Cause Analysis (RCA)
- Statistics based
- Enhanced with AI
- Enhanced with Gen-AI

Prediction Modelling
- Predictive maintenance (PM)
- Predictive maintenance & quality (PMQ)
- Predictive maintenance, quality & process (PMQP)

Simulation Modelling
- Physics based simulation
- Physics + AI based simulation

Optimization Modelling
- Optimization Engine [Equipment | Production | Business]

Business Insights
- Raw data dashboard
- Advanced data insights
- GenAI based business insights
- GenAI based operations recommendations
- AI based operations recommendations

Data Driven Decision - Maturity Model

Level 5

- Generative Ai systems are available for
- data exploration
- Prediction
- Simulation
- Process optimization

Level 4

- Predictive maintenance, quality, & Process
- Simulate equipment and process for various floor conditions
- Find optimal running condition (optimized between throughput and COGS)

Level 3

- Exploratory Data Analytics (EDA) is available
- Able to perform statistics like trend, co-relation and other DoE activities

Level 2

- Data is Curated.
- KPI, Cross-Functional BI is available

Level 1

- Unified data platform is available.
- Data is not curated

Level 0

- Data is scattered across systems. Some of them are not digitized/not accessible

Agentic AI Model

Multi Language

Multi Persona

Multi Function

UI Chat Screen
- Classic chat
- Graphs
- Engg' drawing

Rule Engine

Math Compute

Classic AI

Text AI

AI

Cache

API

DB

salesforce

SAP PLANT MAINTENANCE

Maximo as a Service

Existing Interfaces

AI Security

Master Agent

Cloud Components

Custom Orchestration
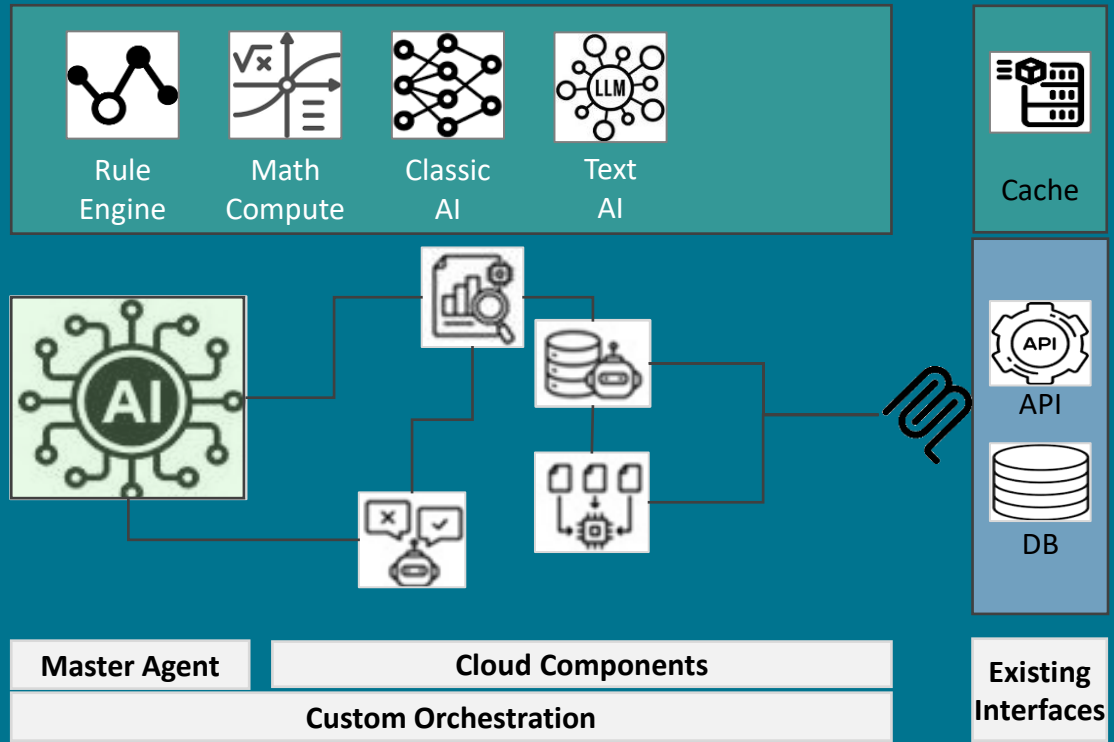
Features					
Multi Language, Persona, & Function Support	**A**ccurate and fast model using fusion of Math-Compute, Traditional-AI, and modern Gen-AI	**Cost effective and accurate** AI model using custom orchestration and Chat	**Fast and accurate** AI model using Data Cache	**Easy navigation** using simple chat UI	**Highly scalable** using custom orchestration

Data Interface   Edge & Ops' AI   Data Storage   Tactical AI   Strategical AI

High Density Scientific Charts – **2D**
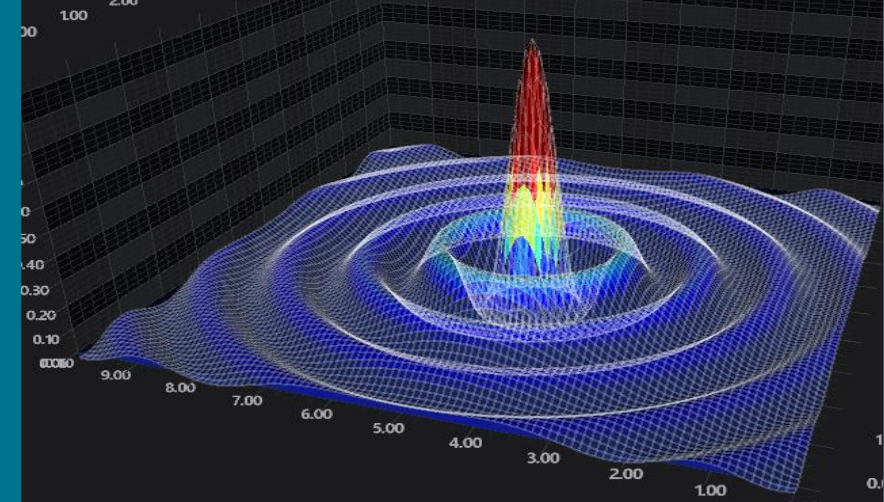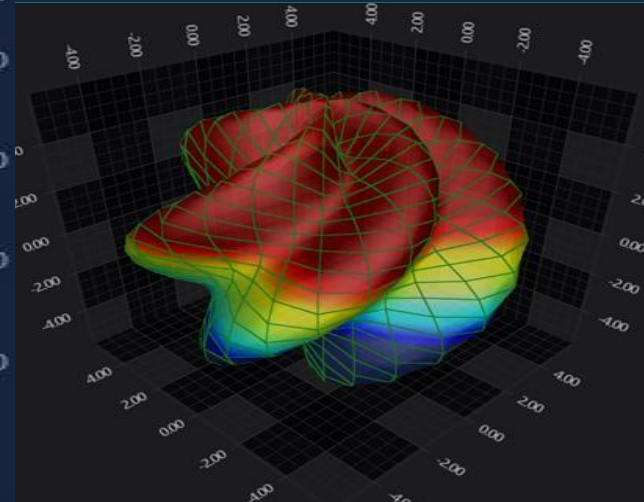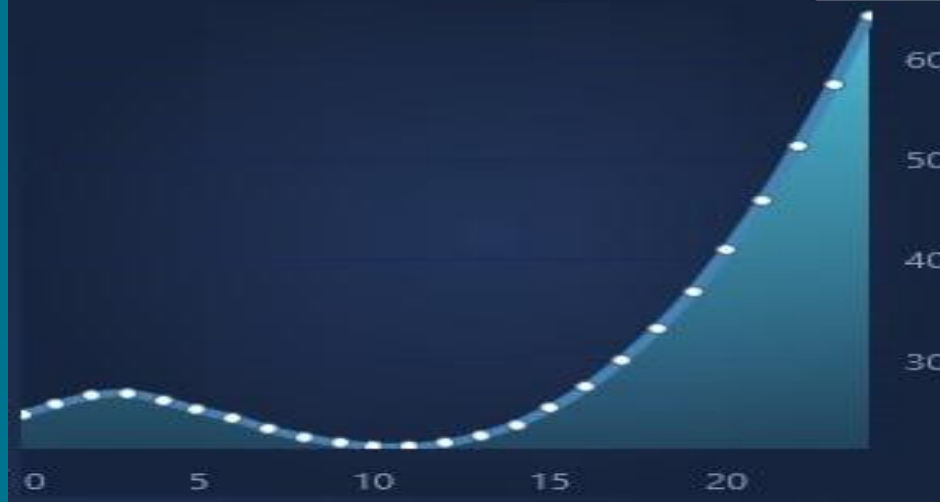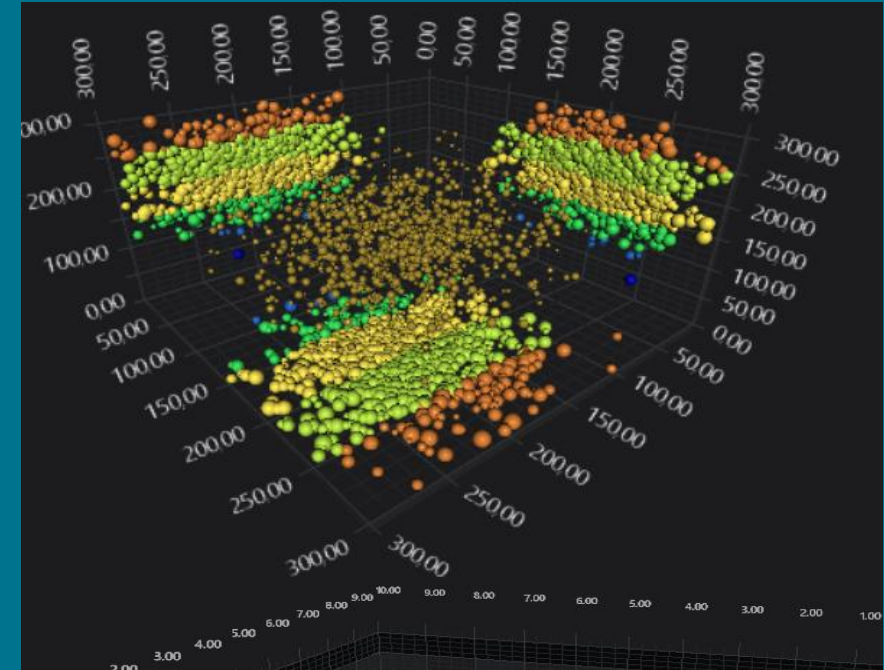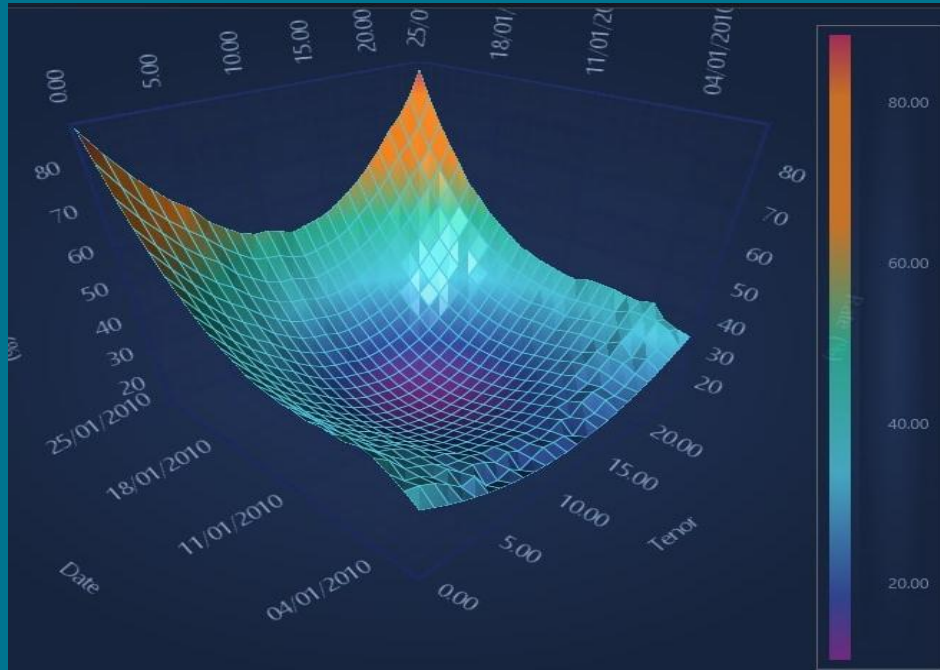
Advanced KPI & Realtime Monitoring

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Challenges

- KPIs are based on calculations. They don't predict/forecast. Not forward looking
- Confined within one business operations system (EAM, SCM, CRM, …)
- Not available across the Enterprise

Solution

- Collect & contextualize from all relevant data sources (IIOT, PLC, SCADA/HMI, Historians, PLM, EAM, SCM, and CRM)
- Advanced & scalable KPI calculation engine is built to derive KPIs and insights using the contextualized data
- Advanced prediction/forecasting feature is added using AI/ML
- Advanced live dashboards are added for easy visualization and interactive/exploratory analytics (EDA)
- Alarms/Incidents/Transaction data are overlayed for easy RCA

Business Outcomes

- Accurate & Enterprise-wide visibility
- Prediction on plant/equipment behavior in the feature
- Accurate and quick Root Cause Analysis (RCA)
- Better Corrective And Preventive Action (CAPA)
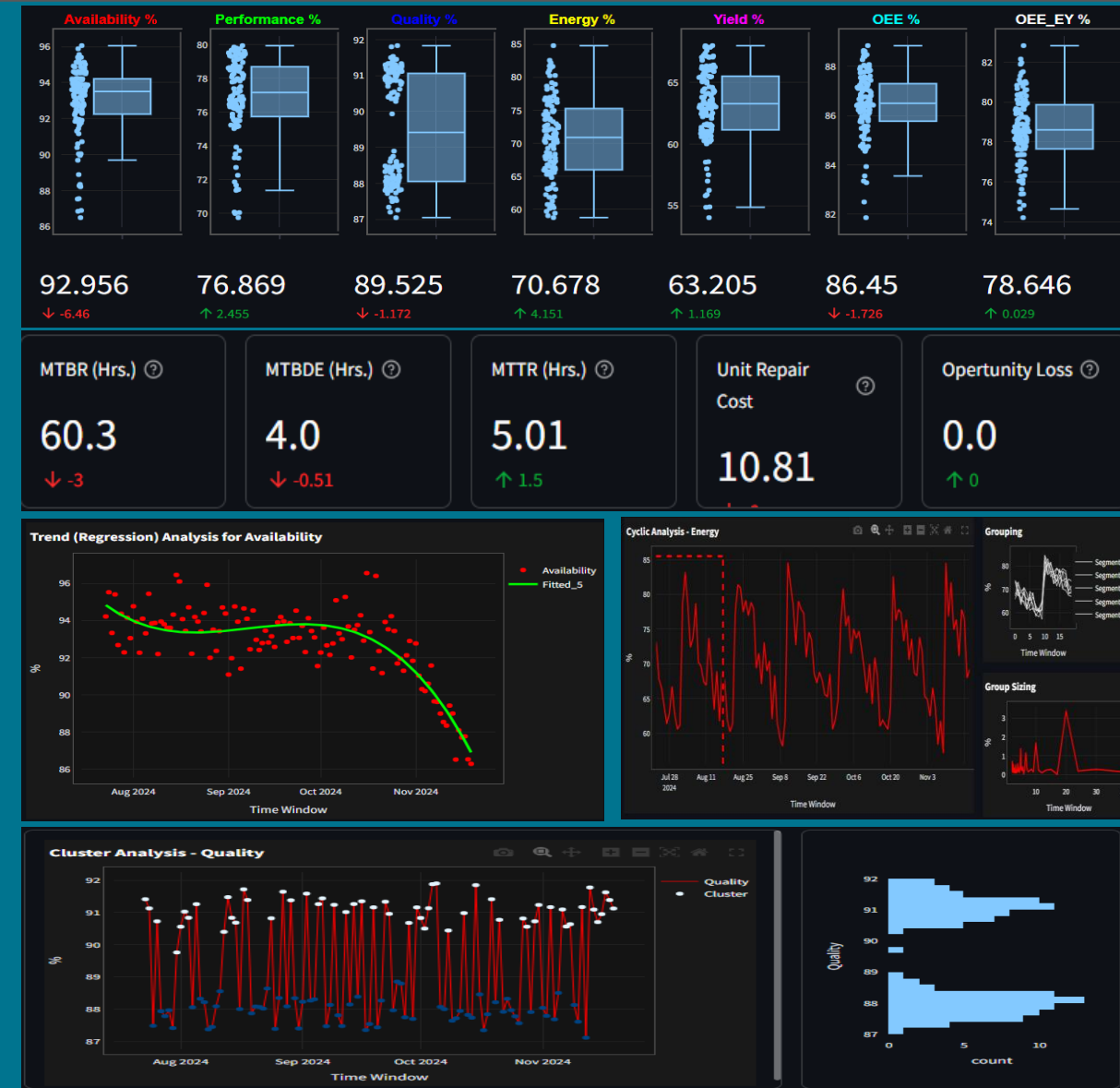
Predictive Maintenance

Challenges

- Equipment fails suddenly, leads to costly breakdown maintenance and production loss
- Unable to perform accurate production planning/scheduling

Solution

- Combine equipment/process telemetry, RM quality (if available), environment/ambience data
- Build reliability analysis like FFT/SW-FFT on vibration data
- Build physical computation model for standard components like motors, gears, pumps …
- Build multi dimensional AI/ML models to predict anomalies and potential equipment failure

Business Outcomes

- Increases equipment lifespan & reliability (higher MTBF)
- Reduced COGS
- Reduced emission and improved sustainability
- Accurate planning & scheduling
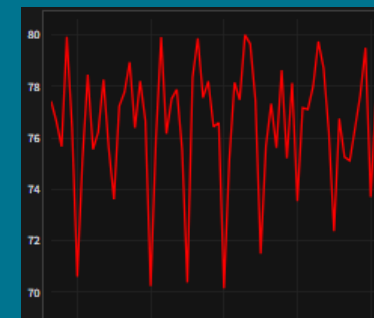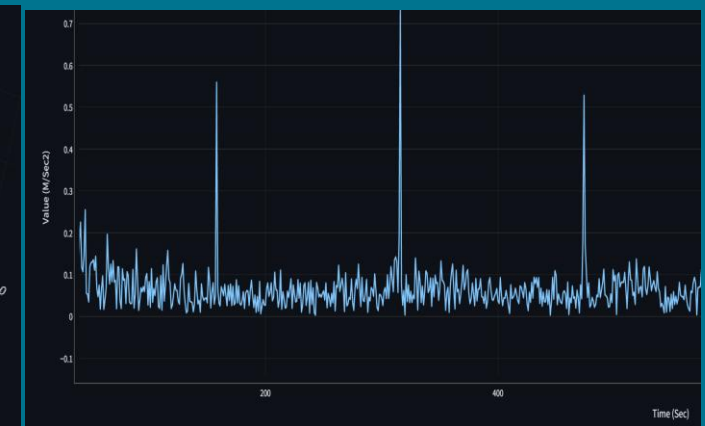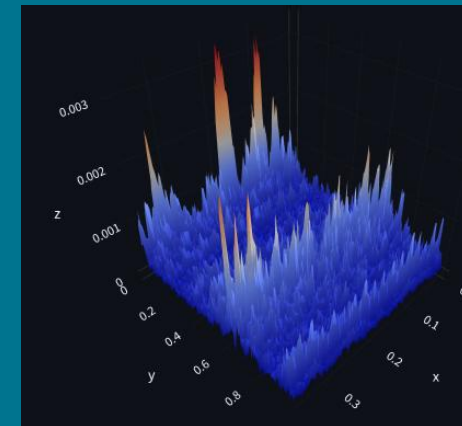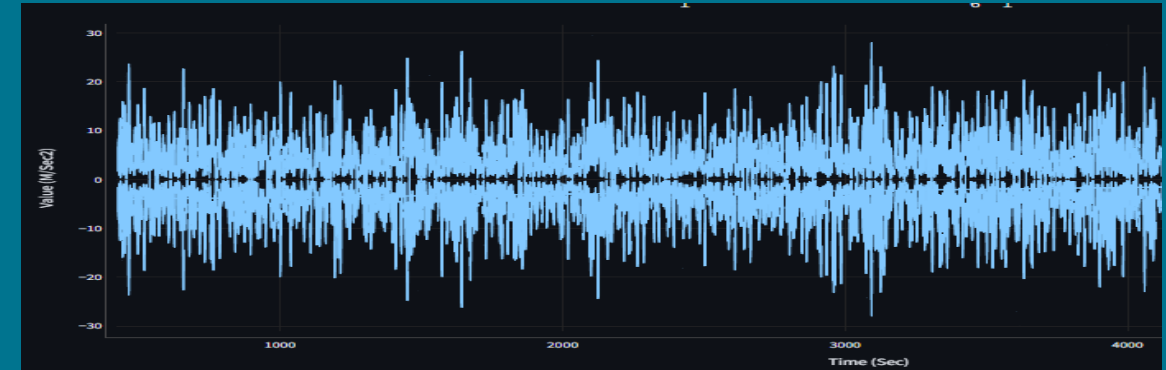
Accurate Billing / Invoicing

Challenges

- Equipment usage invoicing/billing is based on basic measurements like production quantity and running Hrs.
- This do not consider actual events and equipment status

Solution

- Build a billing calculation engine considering the following
  - Actual running Hrs at various conditions
  - Actual production quantity
  - Any SOP breaches
  - Any production loss due to the leased equipment

Business Outcomes

- Accurate equipment usage/lease billing
- Reasoning for each cost element
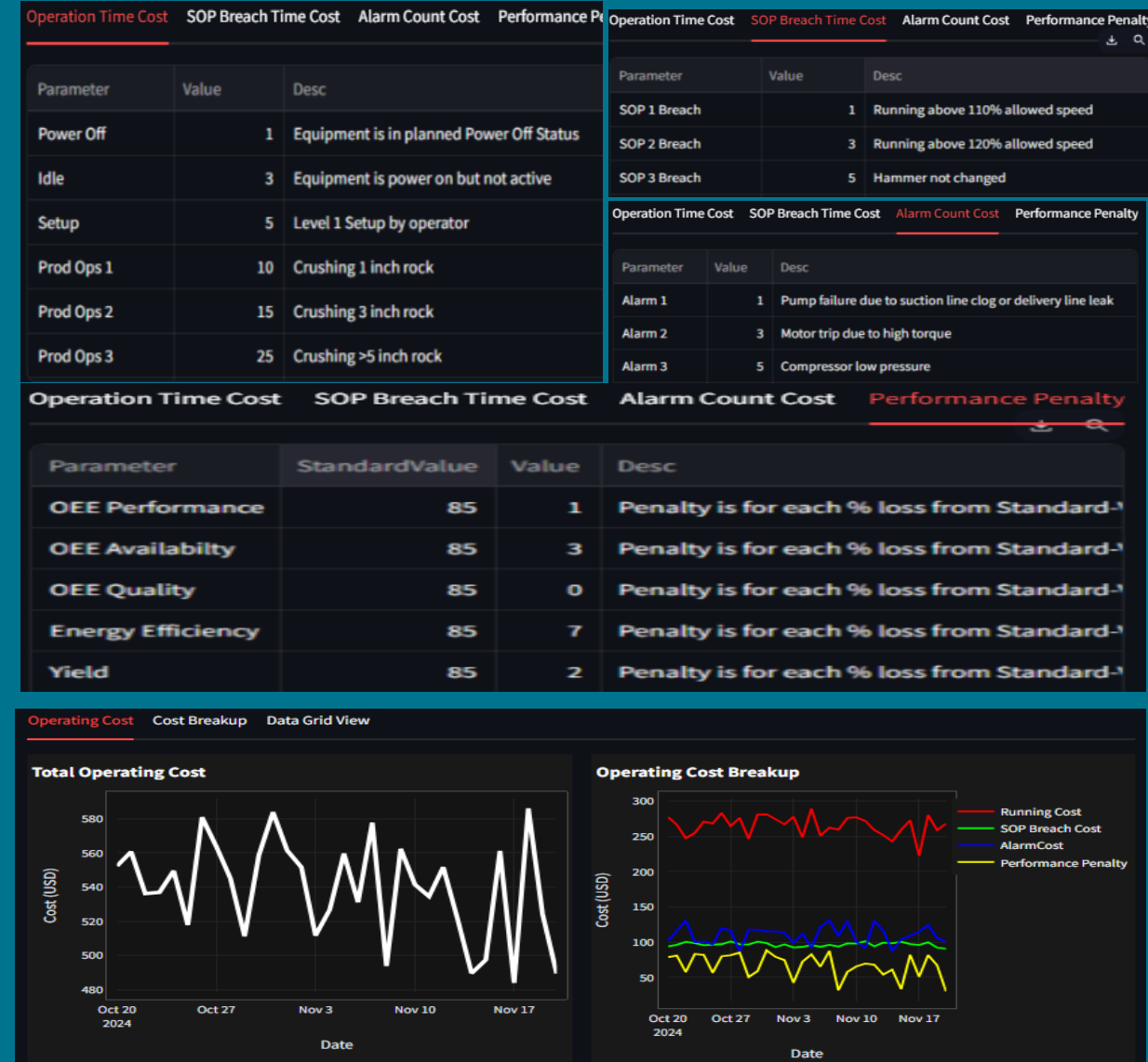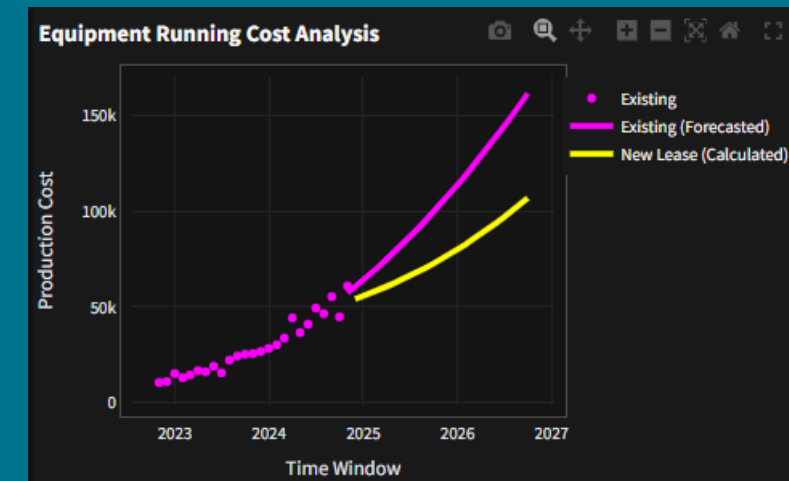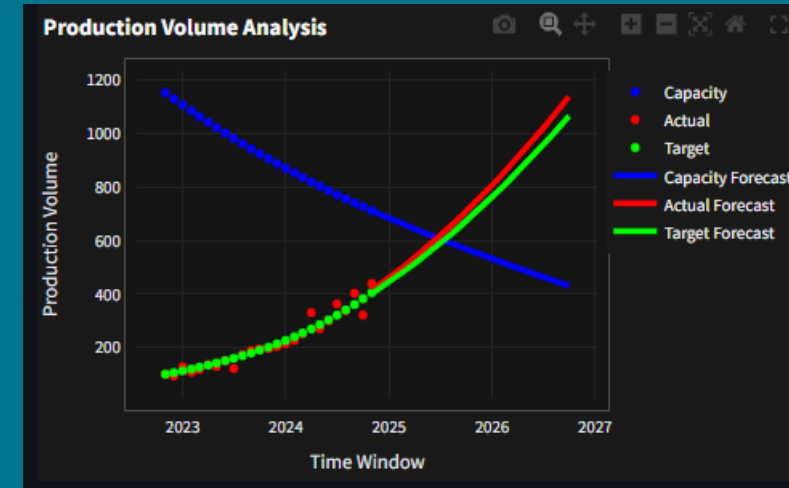
Upgrade / Replace Suggestion

Challenges

- Equipment wear out over a period, resulting into higher maintenance cost, emission and breakdowns. Industry is unable to perform the precise calculation to decide the optimal time to replace the equipment.

Solution

- Build an upgrade suggestion calculation engine considering the following
  - Trend in maintenance cost
  - Equipment downtime and hence loss in production
  - Any impact on product quality
  - Emission & Energy consumption
  - Production growth requirements
  - New equipment costs

Business Outcomes

- Reduced COGS
- Reduced emission and improved sustainability
- Reliable plant operations & produciton

Production Volume Analysis

Legend: Capacity, Actual, Target, Capacity Forecast, Actual Forecast, Target Forecast

Equipment Running Cost Analysis

Legend: Existing, Existing (Forecasted), New Lease (Calculated)

Availability_Initial	0.8
Availability_CAGR	-0.01
Performance_Initial	0.9
Performance_CAGR	-0.01
Quality_Initial	0.98
Quality_CAGR	-0.06
Energy_Initial	0.8
Energy_CAGR	-0.06
Recovery_Initial	0.9
Recovery_CAGR	-0.06
ProducitonTarget_Initial	100
ProducitonTarget_CAGR	0.06
ScheduledHrs	16