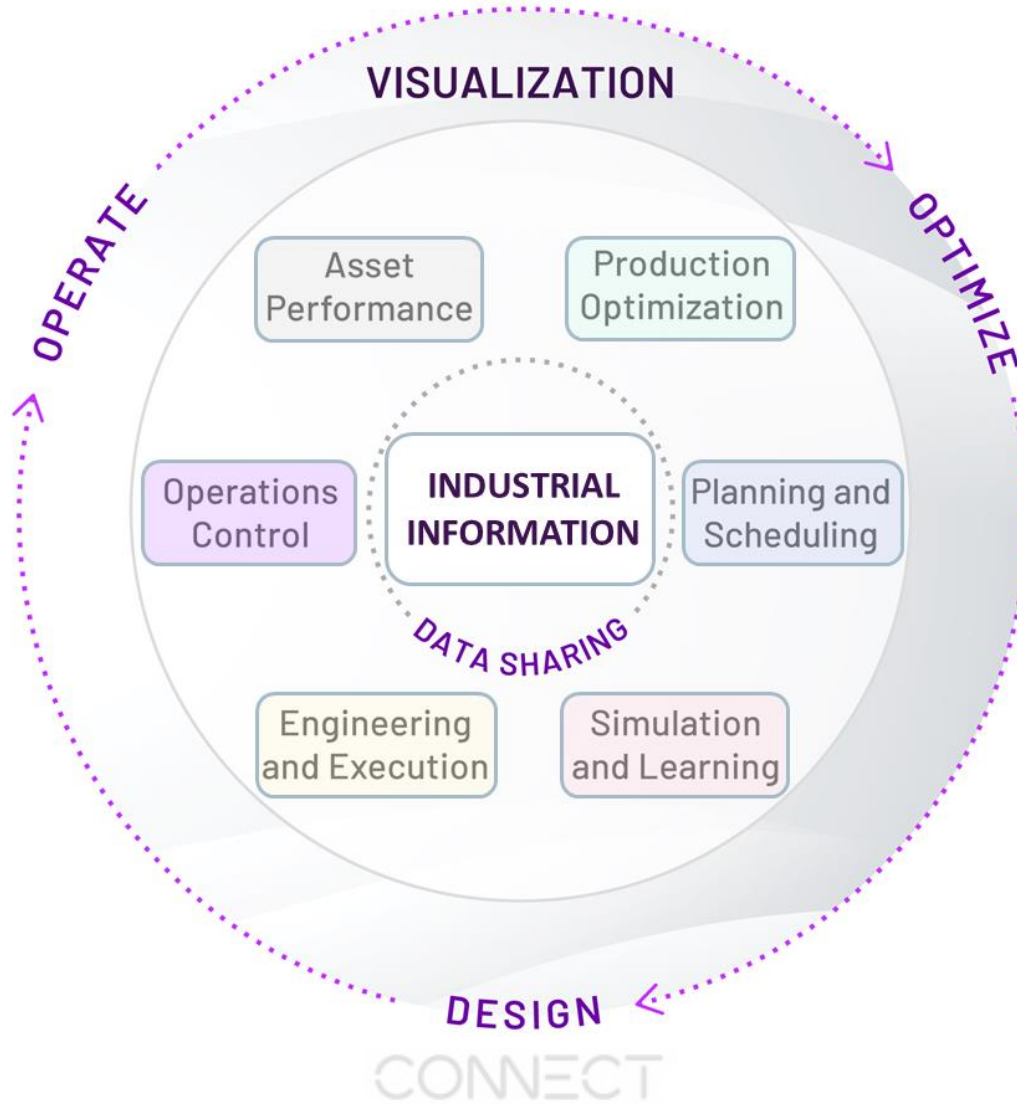# AI use cases for HMI/SCADA

Generate Impact to Achieve Greater Goals

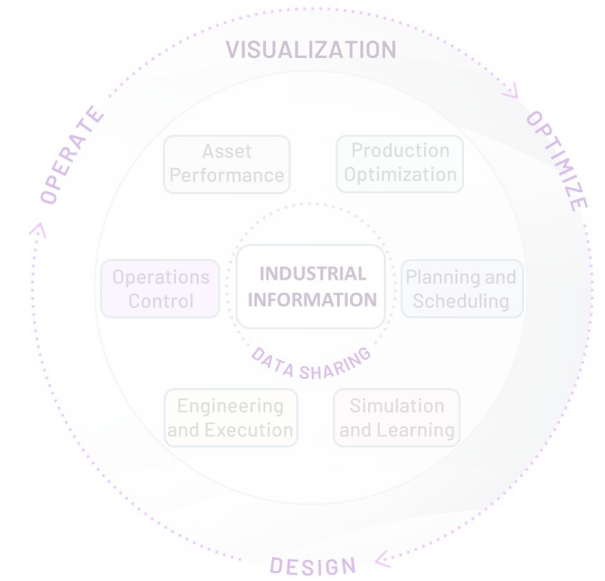Brian Leonard, Product Manager at AVEVA

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AVEVA AI Today

18 commercial AI soluti...

- E3D Whitespace Optimizer
- E3D Generative Design
- Point Cloud Manager (Intelligent Point Clo...

- Grey-box Modeling (carbon capture, etc...
- AI-infused Dynamic Simulation

VISUALIZATION

OPERATE

OPTIMIZE

Asset Performance

Production Optimization

Operations Control

INDUSTRIAL INFORMATION

Planning and Scheduling

Engineering and Execution

Simulation and Learning

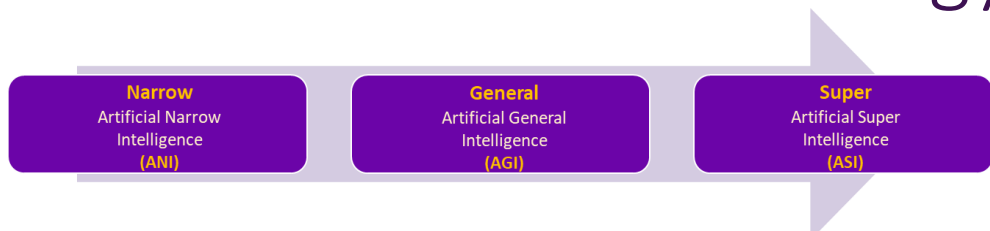**DATA SHARING**

DESIGN

CONNECT

- Automated Analytics
- Guided Analytics
- Predictive Analytics/Maintenance
- Asset Prescriptive Analytics

- Process Optimization
- Predictive Quality/Throughput (batch)
- Remaining Useful Life Estimation (RULE)
- Predictive Asset Optimization (risk-based)

- Schedule AI Assistant
- Realtime Crude Assistant

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AVEVA Industrial AI Strategy

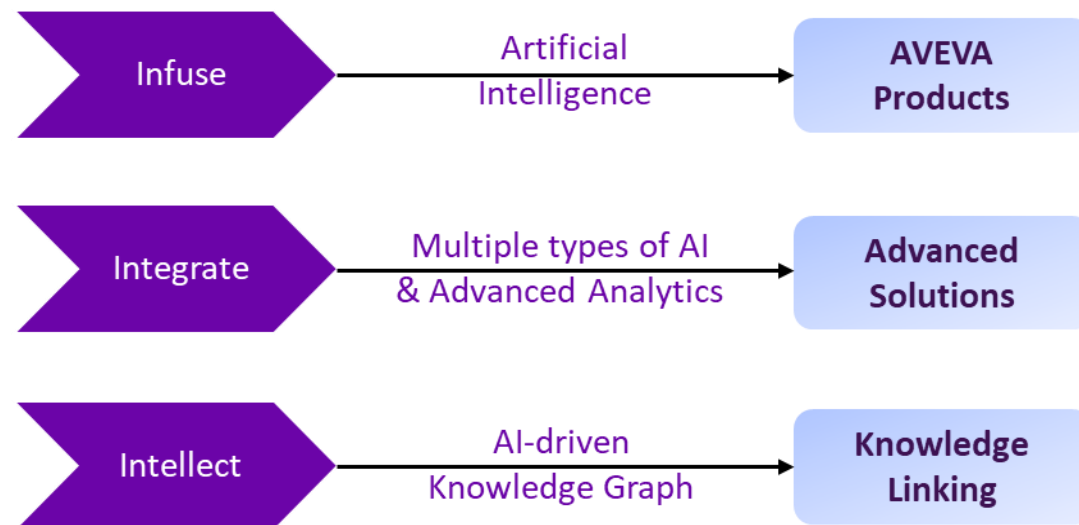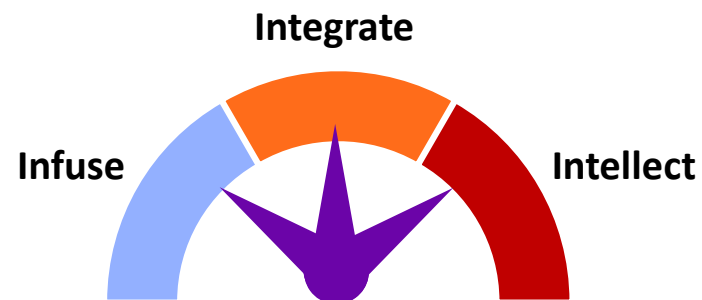| Narrow	General	Super
Artificial Narrow Intelligence (ANI)	Artificial General Intelligence (AGI)	Artificial Super Intelligence (ASI)

Vision

- Help industrial customers provide a **Sustainable Future**
- Drive the **Autonomous Plant**
- Create comprehensive **Digital Intellect**

Strategy

Infuse → Integrate → Intellect

Integrate

Infuse

Intellect

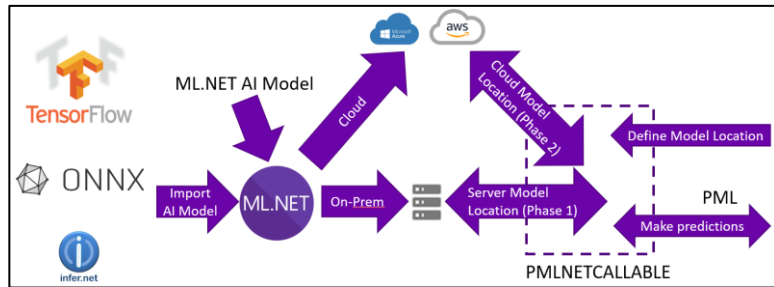| Infuse	Artificial Intelligence	AVEVA Products
Integrate	Multiple types of AI & Advanced Analytics	Advanced Solutions
Intellect	AI-driven Knowledge Graph	Knowledge Linking

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DESIGN /
BUILD

AI

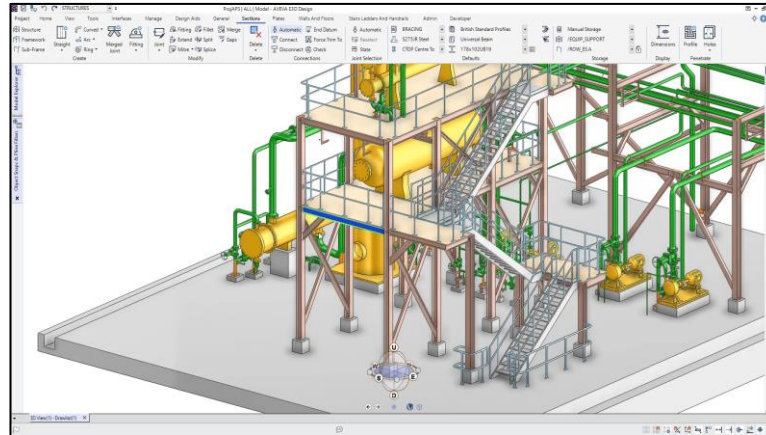**AVEVA**

What can you do today?

AI in AVEVA™ Unified Engineering (E3D Design)
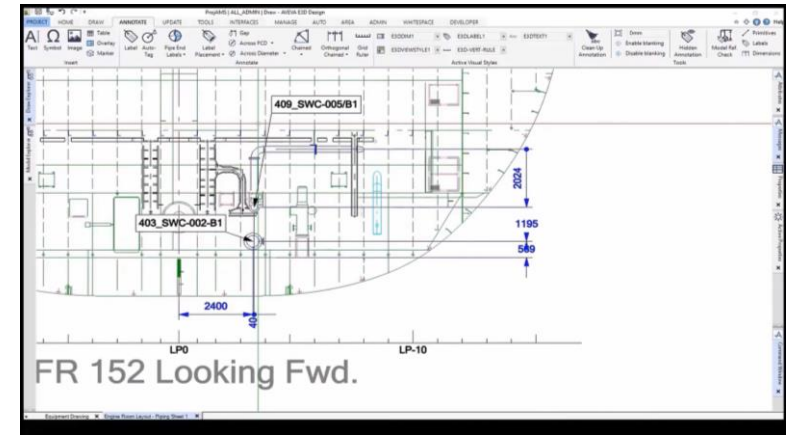
Utilizing ML.NET models

- Ability to import trained ML models with Microsoft ML.NET models
- Direct import and consumption via a PMLNETCALLABLE object
- Easy to execute from model module interface, via the Machine Learning button in the Developer tab

Rules Manager

- Speed up 3D design process by configuring logical rules
- Out-of-the-box compliance for created elements
- Automatic execution as design elements are created
- Create rules for design properties of
  - structural joints
  - fittings and design templates
- Compatible with automatic joint features

Whitespace Optimizer

- Automatic location and efficient utilization of drawing whitespace
  - Easy to use user interface
  - Batch mode possible
  - Multiple files from across databases can be bundled
- Replaces manual effort required to 'finish' drawing deliverables
- An add-on product for AVEVA™ E3D Design that uses AI engine via our secure Cloud platform AVEVA Connect
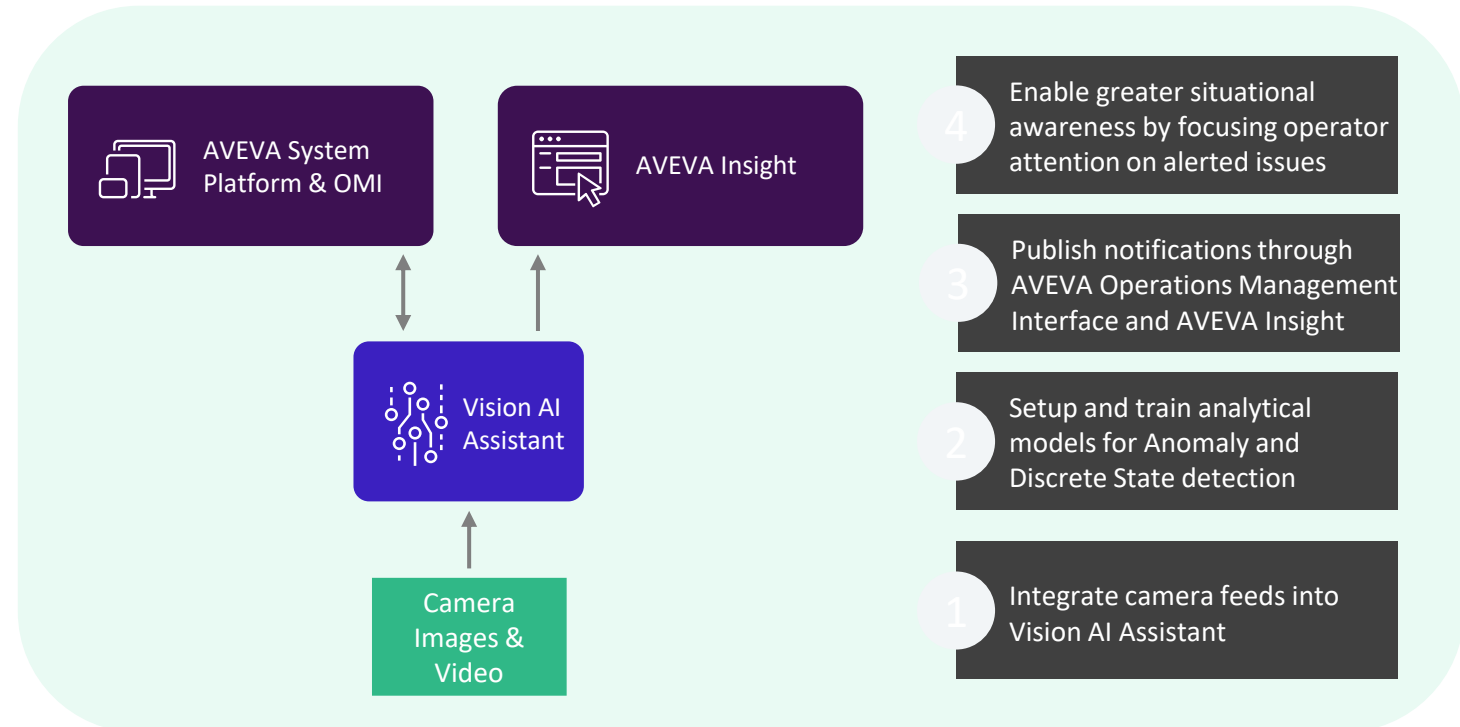
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OPERATE / OPTIMIZE

AI

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Vision AI Assistant

Visual Anomaly Detection in HMI/SCADA

Vision AI Assistant applies image processing models to real-time camera feeds automatically identifying and reporting anomalies or inconsistencies from learned image states.

- Monitor real-time image streams

- Employs deep learning to train and deploy machine learning models

- Provides alerts and notifications to operators

- Easy-to-use web-based interface

- Designed to work in low latency industrial environments

- Helps operators maintain attention on their tasks without having to continuously monitor live camera feeds, enhancing their situational awareness

- Integrated with AVEVA System Platform & OMI and AVEVA Insight

AVEVA System Platform & OMI

AVEVA Insight

Vision AI Assistant

Camera Images & Video

4 Enable greater situational awareness by focusing operator attention on alerted issues

3 Publish notifications through AVEVA Operations Management Interface and AVEVA Insight

2 Setup and train analytical models for Anomaly and Discrete State detection

1 Integrate camera feeds into Vision AI Assistant
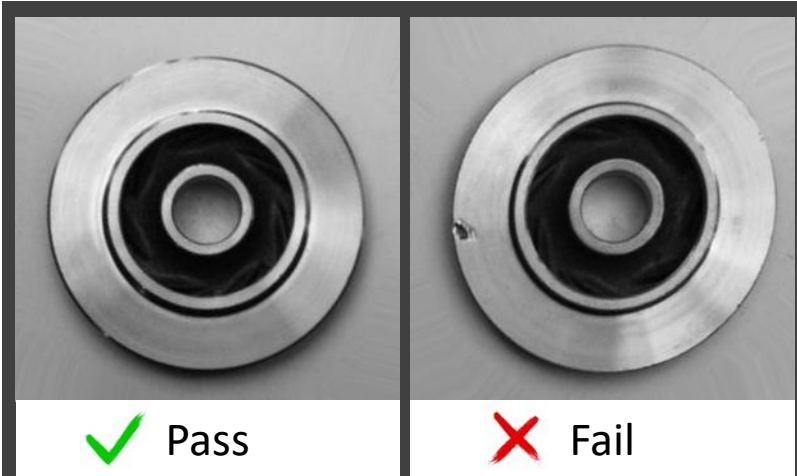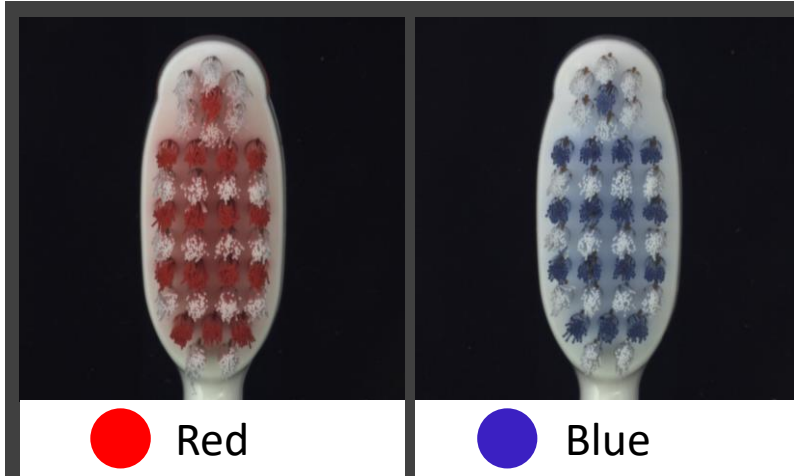
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Analytic modes – Vision AI Assistant skill types

Use images from existing general-purpose cameras and convert them into image classification-based analytics
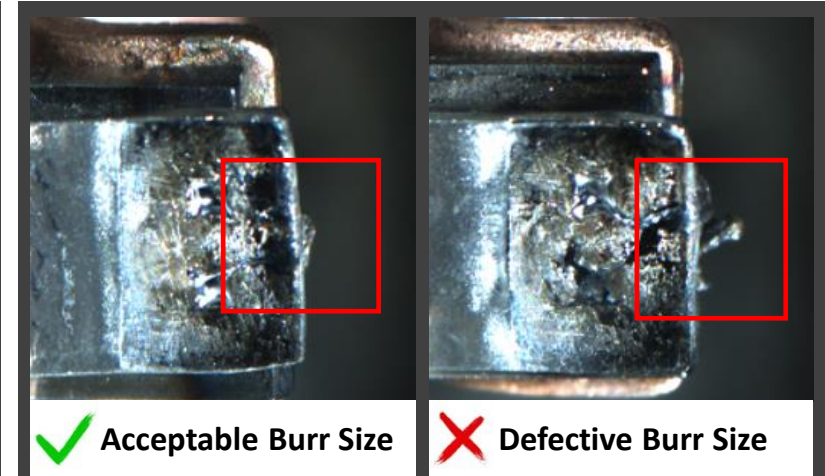
✓ Pass	✗ Fail

Anomaly Detection Model

Use when there are plenty of images available to represent the 'normal' state, and a vast array of negative states for which images are not readily available.

🔴 Red	🔵 Blue

Discrete State Detection Model

Use when two states are known and identifiable to train the learning algorithm.

✓ Acceptable Burr Size	✗ Defective Burr Size

User Defined Pipeline

Self-specify a series of automated steps in a chain for pre-processing and transformation of desired images. Powerful for a range of use cases: measuring dimensions, determining color, finding defects, and more.

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Deploying Vision AI Assistant within AVEVA™ System Platform

AVEVA System Platform - Vision AI Assistant OMI App
(On Premises)

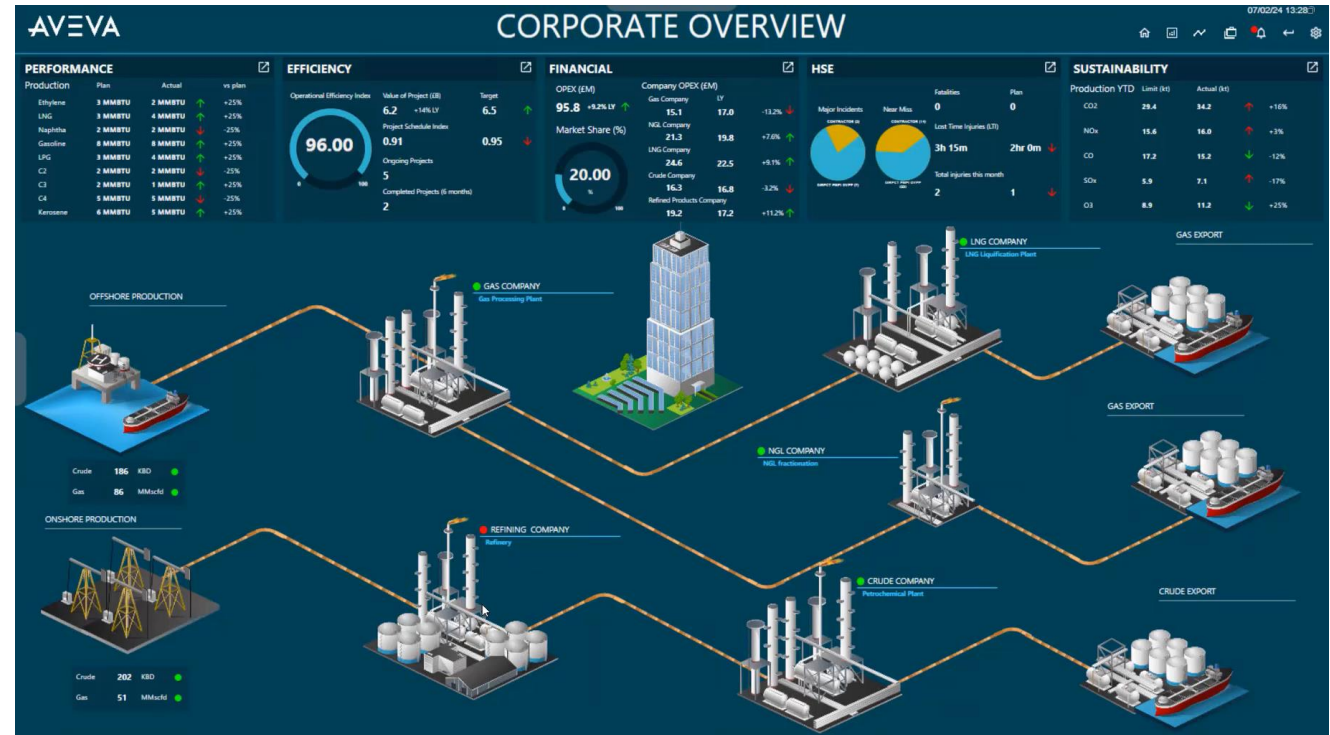- Operational view of anomalies/classifications
- Review image classification results

AVEVA Insight – Vision AI Assistant OMI App
(Cloud)

Operational view with data and visual anomaly results shown in a consolidated list to investigate root cause

Vision AI Assistant Web Client
(On Premises)

- Configure, train, preview, deploy models
- Review image classification results
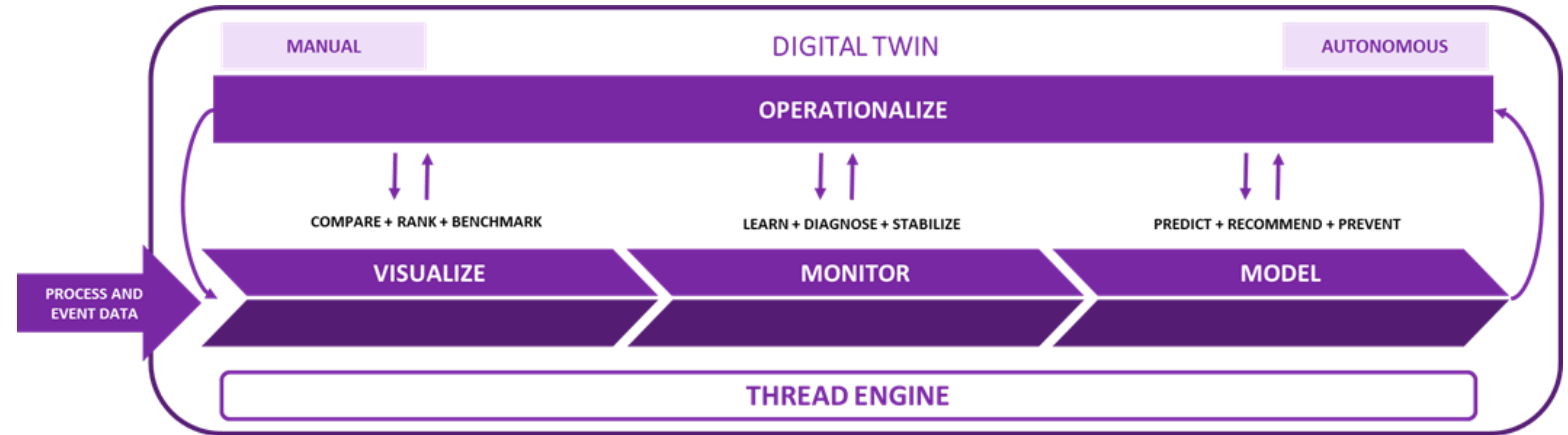- Retrain and compare model results

AVEVA™ Advanced Analytics

- **Improve** quality*, throughput, energy efficiency, uptime, asset life

- **Reduce unplanned downtime**

- Complete framework for Analytics
  - Adapters for several source types in addition to CONNECT data services(native)
  - Calculation engine with flexible equations, statistics, data flows, scripting, etc. (aka Threads)
  - Flexible AI applications, from easy wizard configuration, to data science scripting
  - **Analysis of historical and current data in various tables and charts with operational recommendations**
  - Alert and incident management
  - Automated ML model refresh
  - Scale across thousands of assets or processes

Process and event data flow: VISUALIZE → MONITOR → MODEL, with OPERATIONALIZE and THREAD ENGINE. COMPARE + RANK + BENCHMARK, LEARN + DIAGNOSE + STABILIZE, PREDICT + RECOMMEND + PREVENT. MANUAL / DIGITAL TWIN / AUTONOMOUS.

AVEVA Advanced Analytics surrounded by:

Predictive Quality
- Run CpK
- First Pass Quality %

Predictive Uptime
- Uptime %
- Remaining Time to Downtime
- Probability of Downtime

Predictive Throughput
- Production Rate
- Run Length
- Cycle Time
- Material Cost/Unit Production

Predictive Asset Reliability
- Mean Time Between Failure
- Remaining Time To Failure
- Probability of Failure

Predictive Energy Efficiency
- Energy Cost
- Unit Production

Predictive Asset Life
- Remaining useful life
- Total life

AVEVA™ Predictive Analytics

Optimize your asset reliability, maintenance and performance

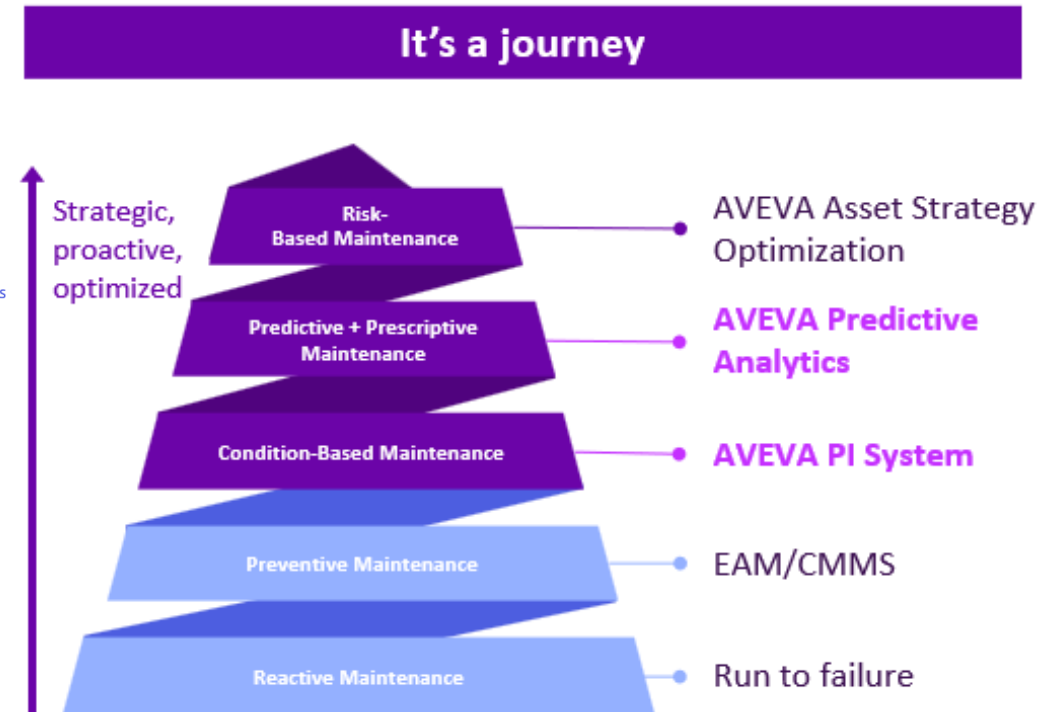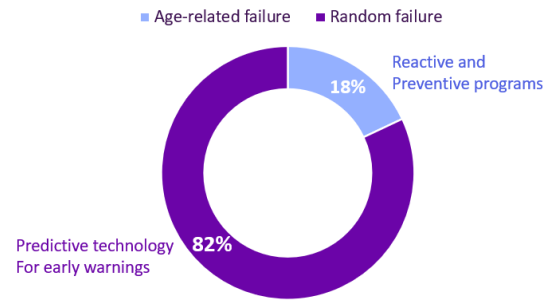Achieve fast time to value through out-of-the-box
- predictive monitoring of industrial equipment assets
- Compressors, Pumps, Gearbox's, Motors, Turbines, Generators, etc.

Improve asset reliability and performance
- optimize maintenance planning
- reduce maintenance costs
- reduce energy consumption and lost power

Prevent equipment & process failures
- early warning detection and diagnosis of equipment problems
- detection of industrial process issues

■ Age-related failure   ■ Random failure

18% — Reactive and Preventive programs

82% — Predictive technology For early warnings

It's a journey

Strategic, proactive, optimized

- Risk-Based Maintenance — AVEVA Asset Strategy Optimization
- Predictive + Prescriptive Maintenance — **AVEVA Predictive Analytics**
- Condition-Based Maintenance — **AVEVA PI System**
- Preventive Maintenance — EAM/CMMS
- Reactive Maintenance — Run to failure
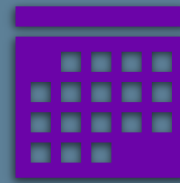
AVΞVA

AVEVA™ Predictive Asset Optimization

Customer challenge: Determining the best action when an anomaly is detected
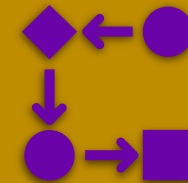
Stop and fix it now?

- Fix immediately to eliminate risk of failure
- Return to standard operations quicker

Wait until planned shutdown?

- Risk of equipment failure during operations
- If no failure, then less cost

Can I operate differently?

- A change in configuration could reduce the risk of failure while extending the life of the equipment at risk

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Integrated AI

Predictive + Prescriptive + Prognostic

✓ **Historical**

What Happened

Historical Domain

✓ **Real-Time**

What's Happening

Real-Time Domain

✚ **Predictive**

What If

Machine Learning Domain

✚ **Prescriptive**

What to do

Maintenance Action Domain

✚ **Prognostics**

How bad will it get

Artificial Intelligence Domain
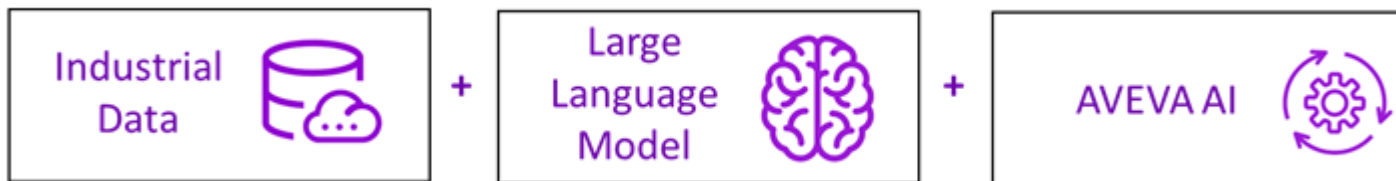
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Industrial AI Assistant on CONNECT

…partnered with ▦ Microsoft | AVEVA AI infused | Patent-pending

Knowledge-Linking

- AI-driven data inferencing
- Automatic relationships across structured and unstructured data
- No data hierarchy or model needed
- Fast on-boarding

Objective-Driven

- Ask complicated questions ("why is my compressor operating worse now than it did last week?")
- Breaks down the question into sub-queries behind the scenes, using focused guardrails
- Consolidates the response back to the user
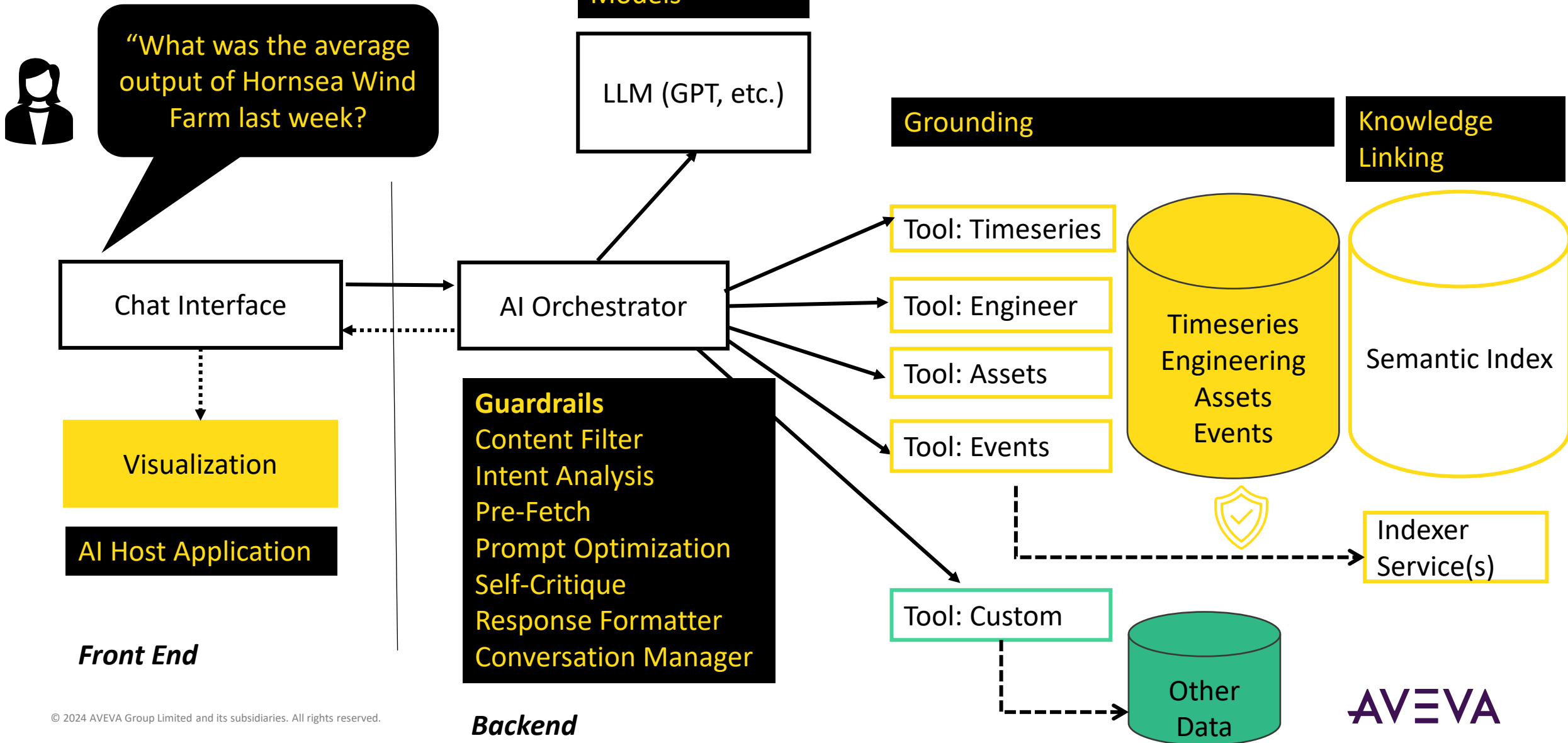- Transparent & traceable through Citations

Industrial Data + Large Language Model + AVEVA AI

Industrial AI Assistant (Preview) ✕

Assistant | 12:59:03 pm
Hi David Smith. How can I help you?

David Smith | 1:01:20 pm
I received some alerts for a pump called J-9002A - can you tell me what the problem is?

Assistant | 1:01:35 pm
The pump J-9002A has had a total of 28 events recently. Out of these, 12 events were due to high vibration, causing the pump to stop for a total duration of 2 hours. The remaining 16 events were normal, with the pump running for a total duration of 2 hours and 40 minutes. The high vibration could be the problem that triggered the alerts. It is recommended to check the pump for any mechanical issues that might be causing the high vibration.

Show Event Details

Asset Utilization

Enter your message...

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Architecture

"What was the average output of Hornsea Wind Farm last week?"

Front End

- Chat Interface
- Visualization
- AI Host Application

Backend

AI Foundation Models
- LLM (GPT, etc.)

AI Orchestrator

Guardrails
Content Filter
Intent Analysis
Pre-Fetch
Prompt Optimization
Self-Critique
Response Formatter
Conversation Manager

Grounding
- Tool: Timeseries
- Tool: Engineer
- Tool: Assets
- Tool: Events
- Tool: Custom

Timeseries Engineering Assets Events

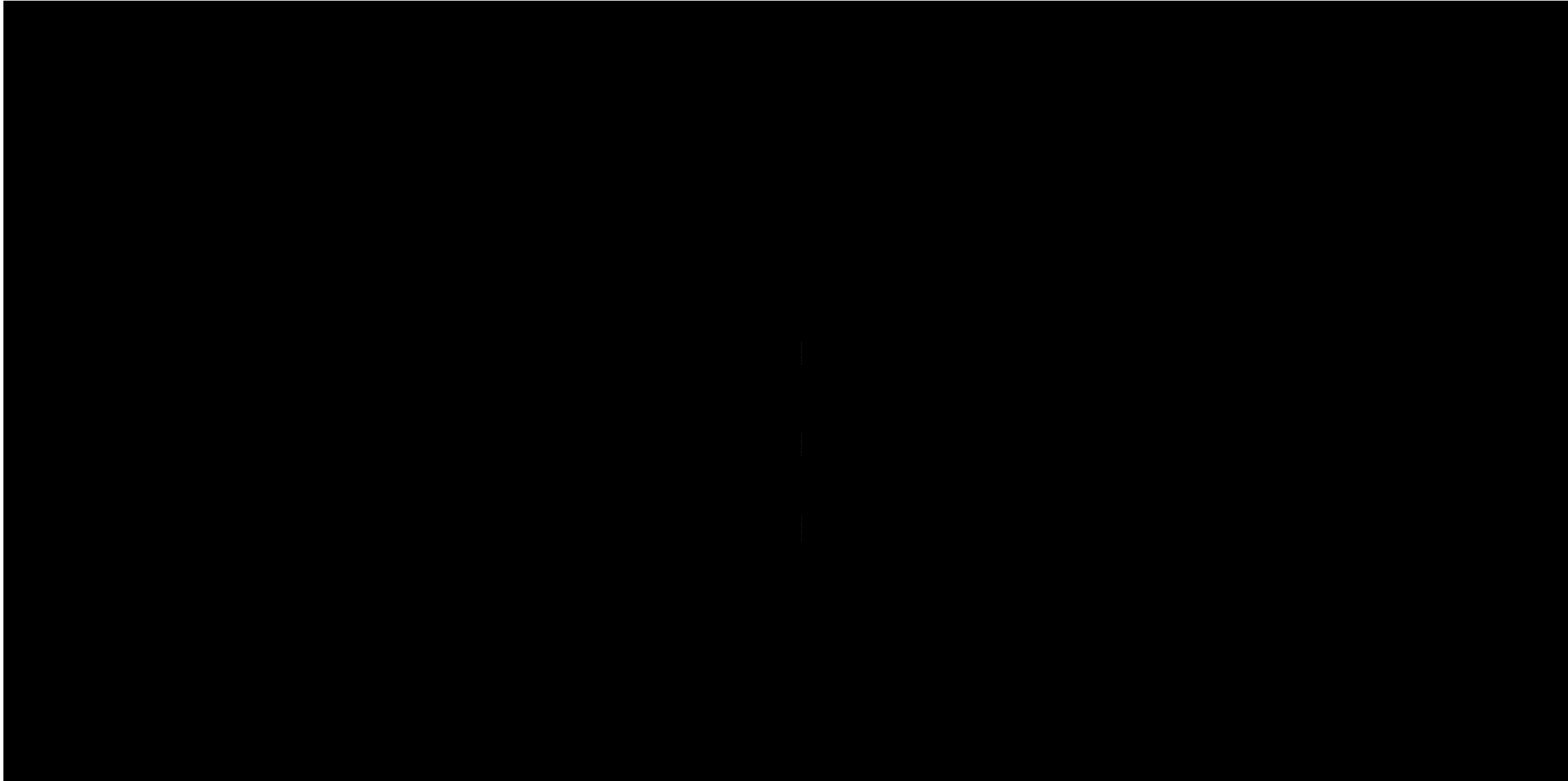Knowledge Linking
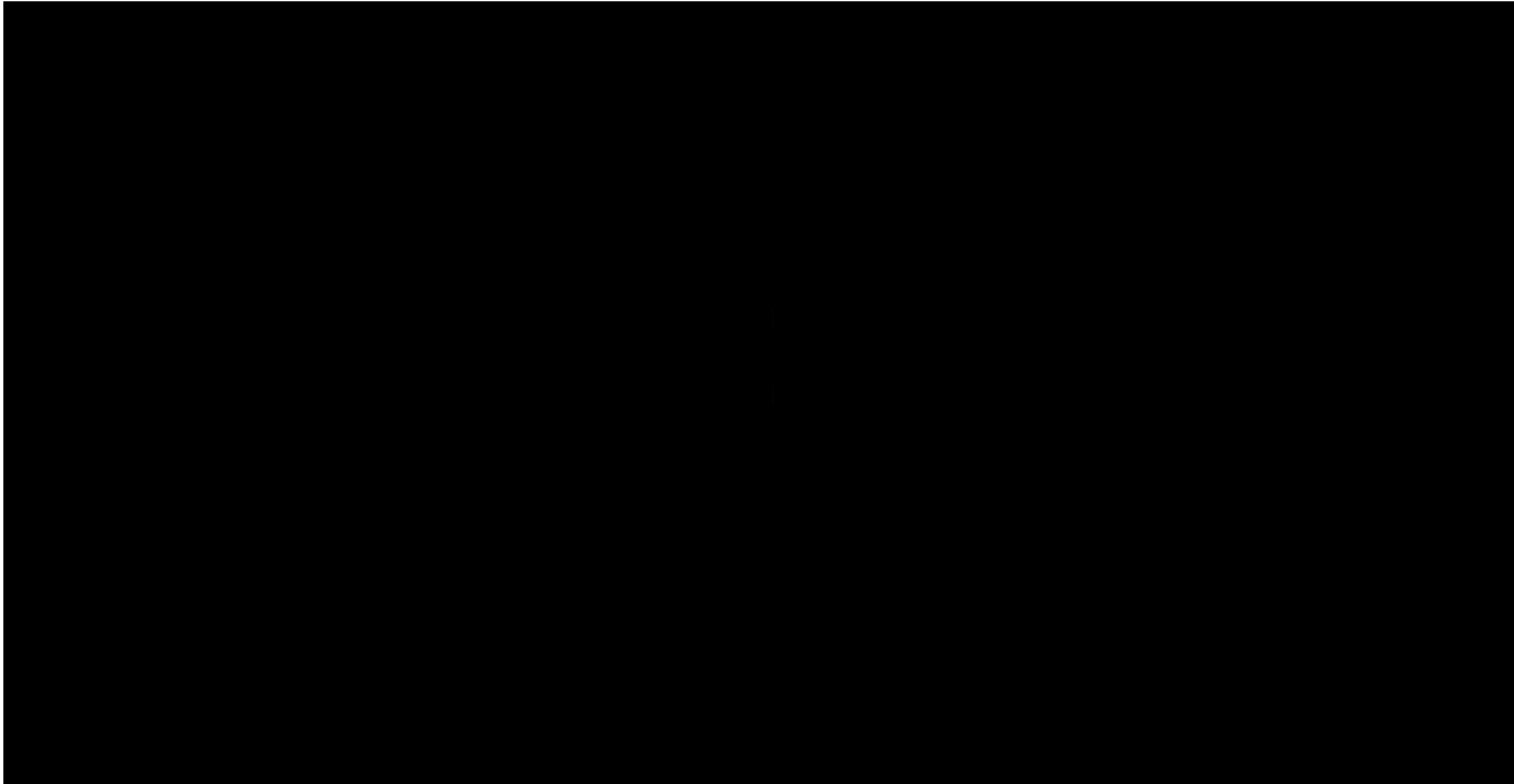- Semantic Index

Indexer Service(s)
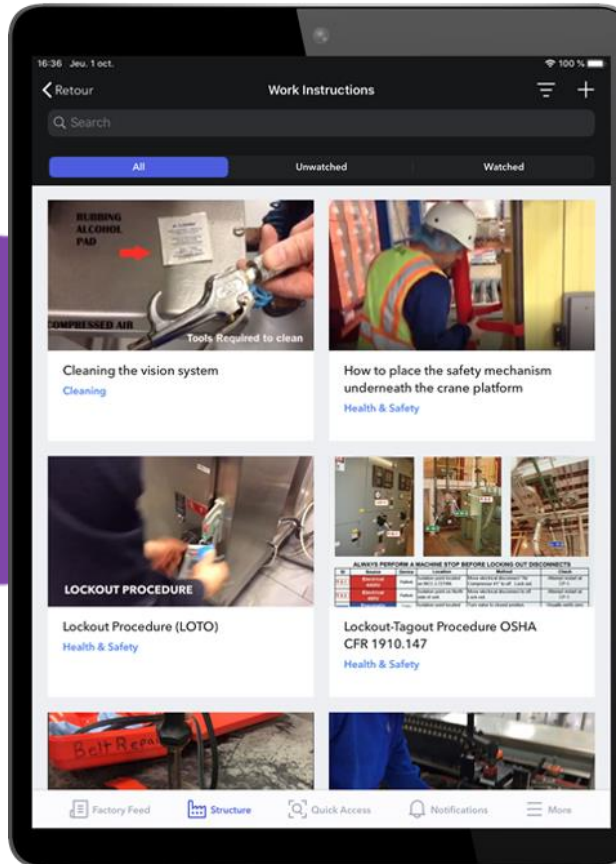
Other Data

AVEVA

Industrial AI Assistant

Sneak Peek – Generating Dashboards using AI

Bringing Knowledge & Digital Entities Together

Experienced

Best Practices

Tribal Knowledge

Tech Savvy

Collaborative

Untapped Potential

AVEVA

Continuous Improvement of Skills Knowledge

Identify Issues
Factory Feed,
Dashboards & Forms

Solve Problems
Issues
Management

Apply & Improve
Checklists & Tasks

Capture & Share
Digital Work Instructions
& Troubleshoots

Train & Learn
Skills Development
& Management

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AVEVA Development Studio

From the Labs

devstudio.dev-devstudio.capdev-connect.aveva.com/inference

AVEVA™ Development Studio

- Home
- Assets
- Inference
- Applications
- Entitlements
- Publish
- Internal

Inference: DesalPlantDemo

Tags processed for Source DesalPlantDemo **XX%** (xxxxx of xxxxx)

Next: Configure naming standards

1 Review tag naming formats — **2** Configure naming standards

Next

Major tag formats
Select to view

Format 1
(52%) 480 of 923

Format 2
(38%) 348 of 923

Format 3
(3%) 25 of 923

Format 4
(3%) 24 of 923

Format 5
(2%) 23 of 923

Format 6
(2%) 17 of 923

Format 7
(1%) 6 of 923

1. Click on each Format 1 and confirm its meaning. View tags for this format Ignore this format
You may also use the buttons to split or merge parts to create more or less meaning.

You must have no duplicates for the format below to continue to the next format

Cluster	1	.	A I T	7121312	_	aCOMMS
Attribute	?	Separator	Asset Type	?	Separator	Attribute

Definition for selected part (type or select)   View values found for this part

Attribute ✕ ▾

2. Review minor tag formats similar to Format 1
These representative tags have similar formats and will share the definitions set above. Hover and click the arrow if a format needs to be defined separately.

Count (click to view)	Tag Name	Comment	Define separately	Ignore
XX% (128)	Cluster1.AIT7121312_aM1		☐	☐

3. Save and view new format

Confirm

COLLAPSE ‹

Type here to search

Questions?

AVΞVΛ

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@avevagroup

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com

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