Facilitating Digitalization in Extra-Small Cargill Facilities using Edge Data Store

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About Cargill
At a glance

160,000 employees  Working in 70 countries  More than 158 years of experience

A trusted partner for food, agriculture, financial and industrial customers in more than 125 countries.

Fiscal 2023 revenue: $177B
Our Business

We provide insights to our partners

We transform raw materials into finished goods

We move products around the world

For farmers
We supply feeds, other inputs and expertise to farmers, and buy crops and livestock from them

For customers
We deliver finished goods to customers in the foodservice, retail, consumer packaged goods and industrial sectors

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Problem Statement – Cargill uses conventional PI solution at ~220 plants globally but did not have historian solution for ~400 extra-small facilities (e.g. grain elevators, protein processing plants, feed mills, shipping ports/terminals, ships, etc.)

**COST**

- These Cargill manufacturing facilities with extra-small footprint cannot justify the high investment in conventional PI server systems.
- Cargill was not able to digitalize data acquisition at these small plants without significant investment. This prevented driving value from data at these sites.

**INFRASTRUCTURE**

- Such small sites lack the infrastructure or automation/IT resources to sustain local PI servers.
- The business has a wide variety of automation infrastructure, PLC vendors and technology. There is a need to use a common solution across plants with different process control systems (PCS) for easy centralized maintenance and support.

**DIFFERENT SOURCES**

- There is a business need to connect to a variety of data sources such as PLC (control systems) data, structured files, SQL data, etc.
AVEVA Edge Data Store Use Case (Solution):

**Plant A**
- Protected Network
  - Plant-wide Process Control System
  - Standalone PLCs not on plant-wide control systems

**Grain Elevator A**
- Protected Network
  - On-site VM or Physical Machine

**Central PI Environment**
- Central Collection Network
- Admin Network
  - PI Historian+ Asset Framework (AF)
    - Data Archive (primary, secondary)
    - Asset Twin
    - Event Frames
  - Visualization
    - PI Vision
    - Web API
  - PI Integrator for BA
    - Export to CDP
    - Visualize in BI apps
  - MS SQL Server
  - Cloud Data Platform
    - BI Analytics (Ex. PowerBI)
  - RtDuet
  - Admin Network

**Ship A**
- Protected Network
  - Ship Control System
  - AVEVA Adapter for Modbus

**Plants, Ship, B, C, D...**
- AVEVA Edge Data Store Use Case (Solution):
  - Ship Control System
  - AVEVA Adapter for Modbus
  - Edge Data Store (EDS)
Cargill discussed with AVEVA on most cost-effective approach

Alignment of Cargill roadmap with EDS roadmap

Identification and Deployment

Worked with Cargill business to deploy EDS solution at global level

Deployed AVEVA Edge Data Store (EDS) interface to read data from a variety of data sources using OPC UA adaptor.

Single central PI infrastructure for the whole enterprise at data center

This enables solutions partners like RtDuet (RtTech) and Seeq.

Scaling

Scaling at the current enterprise

Exploring opportunity to deploy and scale at other enterprises

Utilizing adaptors to integrate other sources of data, e.g. RDBMS, structure file format

Working on use cases to achieve visualization of data stored at EDS
Cargill Facilities Benefiting from EDS

Feed Mills

Grain Elevators

Transport Ships/Port Terminals

Small Meat Processors
SUCCESS STORIES/DASHBOARDS

Ensure Productivity is on Target

- PI EDS at a packaging line monitored KPIs such as production vs. target, bags/min, downtime etc. vs. target in real-time.
- Alarm information provides root-cause analysis into main causes for low productivity.
- PI helped identify some downstream bottlenecks which can be addressed using some control programming changes.
Monitor Quality and Avoid Excess Giveaway

**Quality Measurement**

- A plant implemented an automated sampling and quality measurement instrument
- EDS ingested JSON files from the instrument using AVEVA Structured Data File adapter and created PI tags
- Plant operators were able to monitor lab quality in real-time along with process data and make necessary adjustments
- PI also enabled remote experts to view data and suggest improvements
RtDuet

• PI enabled automatic downtime tracking and reason-coding to track downtime and slowdowns for daily continuous improvement
Solution Meets Business Needs

**COST EFFECTIVE**
- Implemented PI data acquisition at very small facilities cost effectively.
- The traditional PI implementation at Cargill did not financially suit the extra-small sites.

**MINIMAL ARCHITECTURE**
- Standardized the architecture to avoid siloed implementation.
- Sustainable design with minimal footprint which is easy to run and maintain.
- Centralized environment allows easy data comparison across multiple sites.

**EASE OF INTEGRATION**
- Data can be contextualized at single AF and consumed by visualization and analytical applications.
- Could build a standard system architecture and data model that could be easily leveraged to multiple facilities.
Learnings from EDS Implementation

Comparison of EDS vs. PI Interfaces + Data Historian

• Edge Data Store is **complementary to PI System** for select use cases to bring edge data to the cloud

• **Different configuration requirements** for PI interfaces vs Edge Data Store and other AVEVA Adapters

• Edge Data Store is a **newer product** with regular enhancements

• **Additional learning resources** needed for Edge Data Store and AVEVA Adapters
Cargill Digitalizes its Extra-Small Manufacturing Facilities

**Challenge**
- Extra small facilities such as feed mills, grain elevators, meat processing plants, ships, port terminals etc. are not digitally mature
- Such sites cannot justify the cost of conventional PI server systems at sites as they only have a few hundred tags.
- Small sites do not have the automation or IT resources on site to sustain the local PI servers

**Solution**
- Deployed AVEVA™ Edge Data Store™ at small facilities to send data to a central PI environment.
- A variety of data sources such as OPC UA, structured files, etc., can be read using AVEVA PI Adapters.

**Results**
- PI data acquisition was deployed at extra-small facilities very cost effectively.
- Data architecture could be standardized allowing rapid scaling to more facilities.
- PI EDS has flexibility to connect to a variety of data sources such as OPC UA and MODBUS
- In combination with PI adapters, other type of data was integrated
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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.

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