Beyond Boundaries: AVEVA's Convergence of Edge and Cloud for Reshaping Wastewater Management

Presented By: Eric Conder
Who is Inframark?

180+ Employees
33+ Years of Service Excellence
1,500+ Clients Served
1,200 Treatment Projects Completed

9 Office Locations
CISSP Certified Cybersecurity Services
1 MILLION Data Points Managed on Cloud Hosted SCADA

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Who is Inframark?

- 3,000 dedicated employees across North America in 25 states
- 400+ business and municipal clients
- Manages 287 water and 279 wastewater facilities
- Manages more than 2,000 lift stations
- Combined capability of treating more than 1 billion gallons daily
- 99.9% regulatory compliance
- 99+% partnership renewal rate company-wide
Challenge
• Use machine learning to discover and explore new insights from existing data.
• Leverage disparate data sources across the enterprise to gain insights into operational efficiencies.
• Find a software stack that will enable any team in the enterprise to access and view the data.

Solution
• Utilize AVEVA Edge, Edge Management, and Data Hub to aggregate the data into an accessible repository. Then, use AVEVA Data Hub, Connect Visualization Services, and Advanced Analytics to discover the operational efficiencies and gain valuable insights.

Results
• Developed a unified namespace to use when aggregating plant data into Data Hub
• Combined lab data, SCADA historian data, and real-time data into AVEVA Data Hub
• Created assets, visualizations, and AVEVA Advanced Analytics models that can easily be accessed by clients, enterprise users, and anyone else we need to share the information with.
• Built a few Advanced Analytics models that we’ll continue to refine and operationalize.
Getting Started
Lighthouse Architecture

- Bridgeport Wastewater Treatment Plant
- Cloud Service or Cloud Hosted
- WEATHER API
- INTEGRATION
- INFRAMARK PLANT OPERATOR
- INFRAMARK SME
- INFRAMARK OPERATIONS
- AVEVA ADVANCED ANALYTICS
- AVEVA DATA HUB
- AVEVA EDGE MANAGEMENT
- AVEVA Connect
- Desktop Browser

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Collecting the Data
Lighthouse Architecture

On-Premise

- Historical Data Files
- Script (Data Hub API)
- Samples
- IIOT Sensors/Gateway
- Pumps
- Bowers
- Basins, Channels
- AVEVA Edge
- Cloud Service or Cloud Hosted
- Weather API
- Integration
- Lab System
- Integration
- MQTT Broker
- AVEVA Adapter MQTT
- AVEVA Connect Visualization Services
- AVEVA Data Hub
- AVEVA Advanced Analytics
- AVEVA Edge Management
- Desktop Browser
- Inframark Plant Operator
- Inframark SME
- Inframark Operations

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Edge Data Collection

AVEVA Edge On-Premise

- Communicates with plant PLCs
- Transmits data to cloud-based MQTT broker
- Can easily be setup for enterprise-wide deployment
Edge Data Collection

Unified Namespace

- Efficiently organize data for multiple customers, facilities, process areas, etc.
- Aids in searching for data
- Allows for easy, secure data sharing later
Edge Data Collection

Connecting AVEVA DataHub

- AVEVA Adapter for MQTT
- Connect to cloud-based MQTT broker
- Connect to AVEVA DataHub
- Map MQTT broker tags to AVEVA DataHub streams

```json
"DataSource": {
    "hostNameOrIpAddress": 
    "port": 8883,
    "PrimaryHostID": "Bridgeport-DataHub",
    "protocol": "Tcp",
    "TLS": "Tls12",
    "userName": 
    "password": 
    "clientId": 
    "MQTTVersion": "3.1.1",
    "validateServerCertificate": false,
    "streamIdPrefix": null,
    "defaultStreamIdPattern": "{MetricName}"
}
```
Edge Data Collection

Connecting AVEVA DataHub

- AVEVA Adapter for MQTT
- Connect to cloud-based MQTT broker
- Connect to AVEVA DataHub
- Map MQTT broker tags to AVEVA DataHub streams
Edge Data Collection

Connecting AVEVA DataHub

- Deploy AVEVA DataHub device configuration
- Requirement to support variety of protocols
  - AVEVA Edge and AVEVA Adapter
- How to deal with software installation, updates and status
Edge Data Collection

Software Management

• Requirement to support variety of protocols
  • AVEVA Edge and AVEVA Adapter
• How to deal with software installation, configuration updates and status monitoring
Aggregating the Data
Lighthouse Architecture

AVEVA Connect

WEATHER API

INTEGRATION

LAB SYSTEM

INTEGRATION

MQTT BROKER

AVEVA ADAPTER MQTT

Cloud Service

or Cloud Hosted

AVEVA CONNECT

VISUALIZATION

SERVICES

AVEVA DATA HUB

AVEVA ADVANCED

ANALYTICS

AVEVA EDGE

MANAGEMENT

AVEVA Connect

Desktop Browser

INFRAMARK PLANT OPERATOR

INFRAMARK SME

INFRAMARK OPERATIONS

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Edge Data Collection

Data Flow Management

- Keep the data flowing
- Data Hub historizes metrics
- Monitor health

![Graph showing data flow metrics]

- Health: Good
- IO Rate: 7.15 event/s
- Error Rate: 0 event/s
- Type Count: 3
- Stream Count: 1,649
Creating assets from Data Hub
Visualizing the Data
Understand the Dataset

Viewing Stream Data
Visualization Content

- Create standalone visualization content
- Link content to Assets and Asset Types
- Create dashboards containing embedded and linked visualization content
Predicting the Data
## Ideal Model Conditions

### Overview

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKN</td>
<td>Predict quality parameter based on process data</td>
</tr>
</tbody>
</table>

### What data does this model use?

- BridgetportCT.EastSide.Influent.NH3... (Property Input, Active)
- Actual Quality (Property Input, Active)
- Product Event (Event, Inactive)

**Active?:** ✔️  **Last Training:** Oct 7th, 2023 at 16:37  **Data collected every:** 24:00  **Executes every:** N/A  **Retraining every:** N/A

### Steps

1. **What data should the Model consider?**
   - Add Data
   - Complete

2. **When should data be collected?**
   - Set Timing
   - Complete

3. **Validate the Model's configuration.**
   - Evaluate Model
   - Completed

4. **Start training a Model with your Twin's data.**
   - Start Training
   - Complete

5. **See what your Model found in your data.**
   - Review Results
   - Ready

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Ideal Model Conditions

Disabled properties below have already been used in this model.

1. Property to Predict
   - Primary Effluent.TKN.Value

2. Property Inputs

3. Set Controllables

4. Segmentation

5. Filtering

6. Targets and Limits

7. Model Outputs

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Separation Analysis
Ideal Model Conditions

BridgetportCT.EastSide.Effluent Bypass.TSS.Value

Normal Distribution  Event Distribution
Predict Biological Oxygen Demand

- Required for Dissolved Oxygen prediction
- 5+ day advantage over lab results
Predict Dissolved Oxygen

Dissolved Oxygen Predictions

• Exploring dataset for modeling opportunities
• Predictions could help reduce energy use
Predict Total Kjeldahl Nitrogen (TKN)

• Required to make other biological process predictions
• Add additional instrumentation
• Utilize AVEVA Advanced Analytics’ controllable inputs and limits
• Generate process control suggestions from AVEVA Advanced Analytics models
• Finalize AVEVA Connect Visualization content showing inputs, predictions, and suggestions
• Incorporate AVEVA Advanced Analytics data into on-premise or cloud SCADA platforms
Looking to the Future

Unified Operations Center
Eric Conder

HMI Department Manager

- Inframark A&I Division
- eric.conder@inframark.com
Questions?

Please wait for the microphone.
State your name and company.

Please remember to...

Navigate to this session in the mobile app to complete the survey.

Thank you!
Recommended Sessions

Secure data sharing at scale with the AVEVA Data Hub Community
Tuesday, October 24 @ 2:50pm
Room 2004

Unlocking the power of AIOps for IIoT with AVEVA Data Hub and AVEVA Advanced Analytics
Accenture
Tuesday, October 24 @ 3:50pm
Room 2004

Introduction to AVEVA’s Developer Program
Tuesday, October 24 @ 4:30pm
Room 2004

Enabling end-to-end continuous biomanufacturing by leveraging real-time data in the cloud
Biosana
Wednesday, October 25 @ 8:40am
Room 2004

Uniting AVEVA Data Hub and Advanced Analytics with IOTA View, for Proactive Well Maintenance
Devon Energy
Wednesday, October 25 @ 10:20am
Room 2004

Sharing data across Quebec Iron Ore’s IT and OT ecosystem with AVEVA’s cloud technologies
Quebec Iron Ore
Wednesday, October 25 @ 1:30pm
Room 2004
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ABOUT AVEVA

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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.

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.

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