AVEVA™ Data Hub™ is storing something new, and it’s a must-see Event

Todd Brown & Alicia Coppock
AVEVA Connect: Our industrial cloud platform

Our industrial cloud platform is your digital transformation hub

- Transform faster
- Enable new ways of work
- Connect and collaborate
- One single source of truth
- Move from CapEx to OpEx
- Lower dependency on IT
- Always the latest and greatest features
- Easily scale up and down
- Built with security, resiliency, high-availability
AVEVA Data Hub

A cloud-native industrial platform designed for aggregating, storing, enriching, accessing, analyzing, and securely sharing real-time operations data from historians, edge devices, and more

- Managed, secure, multi-tenant platform
- Operated & maintained by AVEVA
- High speed, scalable, elastic, & resilient
- Modern, secure REST APIs
- Built & deployed on Microsoft Azure

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AVEVA Data Hub in 2023

A cloud-native industrial platform designed for aggregating, storing, enriching, accessing, analyzing, and securely sharing real-time operations data from historians, edge devices, and more

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Supported Regions
West US (California)
North Europe (Ireland)
Australia East (New South Wales)

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Events capture meaningful industrial context & observations

Event Start

- Temp
- Pressure
- Level
- Machine State

Values at Start

What happened leading up to the event?

What was my process doing during the event?

What other events happened during this time?

Summary Stats: Min, Max, Avg, etc. of Temp & Pressure over the duration of the event

Event Duration

Event End

Values at End

What happened after the event?

Which events are occurring most frequently on this asset (by count or cumulative duration)?

Find all the times when ______ happened over the past month on my wind turbines.

Overlay the temperature for my last 30 batches for my product ‘Super Drug’.
Events scaled for your industrial enterprise

**Multisite / Enterprise Use Cases**
- Production Performance
- Product Quality
- Sustainability
- Reporting & Dashboards
- Visualization
- and more …

**Cloud Platform Advantages**
- Data science & AI/ML platforms
- 3rd party analytic tools
- Custom & partner applications
- Data sharing with business partners
- Scalability

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Delivering more value with AVEVA Connected MES

Enterprise Data Management Services

AVEVA Advanced Analytics
Production Optimization (AI/ML) Services

AVEVA Connect visualization services
[AVEVA MES Reporting]

Analysis & Dashboarding Services

Multisite / Enterprise Use Cases

- Production Performance
- Product Quality
- Sustainability
- Reporting & Dashboards
- Visualization
- and more ...

AVEVA Manufacturing Execution System (MES)
AVEVA Manufacturing Execution System (MES)
AVEVA Manufacturing Execution System (MES)
Events in AVEVA Data Hub

Alicia Coppock
Event & Production Data Context in AVEVA Data Hub

Enterprise Connected AVEVA MES

- **Egress & API**
  - *AVEVA Connect visualization services*: Visualization & Reporting for AVEVA MES
  - Rich GraphQL API for accessing events & related events, reference data, and assets.
  - GraphQL Explorer UI for building complex queries easily
- **Enrichment**
  - *AVEVA Advanced Analytics*: creation of events from process data, inclusion of events in analytics & machine learning, visualization of events
- **Storage**
  - Flexible schema for modeling & storing industrial events & reference data
  - Capture complex relationships between events, reference data, and assets
  - Events leveraging scale of the cloud
- **Ingress**
  - Rich API for ingressing event data from other applications & event sources
  - Out of the box connectivity for AVEVA MES
Flexible schema for modeling Events & Reference Data

AVEVA Data Hub Events & Reference Data

**Event Types** – definitions for domain specific events

- **Alarm**
  - id
  - eventName
  - eventStartTime
  - eventEndTime
  - eventDuration
  - eventState
  - ackType
  - Asset → Asset
  - severity
  - severityCat → AlarmSeverityCat

- **ProductionEvent**
  - id
  - eventName
  - eventStartTime
  - eventEndTime
  - eventDuration
  - eventState
  - dispositionReason
  - dispositionType
  - quantity
  - lot → MaterialLot
  - Operation → WOOperationEvent
  - Shift → ShiftEvent

**Reference Data Types** – definitions for additional context

- **ItemDefinition**
  - id
  - name
  - item_id
  - item_dec
  - item_class_id
  - uom_id
  - template
  - lifetime
  - unit_cost

- **AlarmSeverityCat**
  - id
  - name
  - severity
  - color
  - Alarms → alarm events
Capturing industrial relationships between events, ref data, & assets

AVEVA Data Hub Events & Reference Data

• Flexible Relationships
  • Any Event property can reference another event or reference data or asset or [future entity] in the graph
  • More flexibility: Model the unique relationships in your data

```json
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

"data": {
  "events": {
    "queryProductionEvent": {
      "eventStartTime": "2022-02-21T04:45:00Z",
      "id": "pe_0001",
      "eventEndTime": null,
      "eventDuration": "574.09:18:49.5455849",
      "eventState": "ACTIVE",
      "dispositionReason": "Very Good Product",
      "dispositionType": "GOOD",
      "lot": {
        "id": "lot_0001"
      },
      "operation": {
        "eventStartTime": "2022-02-15T04:30:00Z",
        "id": "oper_0001",
        "eventEndTime": null
      },
      "quantity": 3
    }
  }
}
```

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Richer query language to interact with the connected industrial data

AVEVA Data Hub Events & Reference Data

- **GraphQL – Richer Query Language to interact with the data**
- Rich GraphQL API Console
- Retrieve specific properties from related data in one query by navigating the relationships between entities
Ingressing Events

Multiple ways to ingest events into AVEVA Data Hub (more to come in future)

- **AVEVA Advanced Analytics**
  - No code analytics product that can READ DATA from data streams, assets, and events and then WRITE BACK streams and events into Data Hub!

- **AVEVA Events to Data Hub**
  - Built initially for integration with AVEVA MES
  - Requires an events data source REST endpoint that supports the message format for events

- **REST API & GraphQL API**
  - Write directly to events store leveraging our APIs
AVEVA Events to Data Hub

Built initially for AVEVA MES & supports sources with REST endpoint

- Requires a data source REST endpoint that supports the message format for events
- Polls a data source for event types & data on schedules
- Creates Assets/Types, Event/Types, Reference Data/Types, Enumerations in AVEVA Data Hub
- Buffers data on disconnection
- Supports history recovery
- Health & diagnostics info

Event Message Format JSON component 1

Event Message Format JSON component 2

Other Curated Events Source

REST API Endpoint 1

REST API Endpoint 2

AVEVA Events to Data Hub

Data Ingress

Health & Diagnostics

Data Egress

Graph Store

OME Health Endpoint

Asset/Asset Type API

Type Store API

Graph REST API

JSON

"QueryId": "WO_JobsEvents1",
"QueryString": "/eventData?action=UPSERT&type=WO_Jobs&eventCreatedUtc>?LST?"
}

JSON

"eventType": "WO_Jobs",
"eventName": "Palletizer Operation",
"eventStartTime": "10/27/2022 12:26:46 PM",
"eventEndTime": "10/27/2022 03:15:20 PM",
"entity": "Palletizer 2",
"item_id": "FP300",
"qty_prod": "860",
"wo_id": "WO_09172022_19"
AVEVA Advanced Analytics

Combine your existing data with ML-enabled applications for faster and smarter decisions

Data Hub is system of record for Advanced Analytics – direct read/write data in/out of Data Hub

Predictive Quality
- Run CpK
- First Pass Quality %

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

Predictive Energy Efficiency
- Energy Cost
- Unit Production
MES enterprise production performance reporting with AVEVA “connected MES”

**MES Production Performance Analysis**

**Single Asset Scenarios:**
- OEE KPIs (*)
- OEE KPIs by Product/by Shift (*)
- OEE KPIs Trend (*)
- OEE KPI Details (*)
- Production Summary
- Production Trend
- Utilization Status
- Utilization Summary
- Utilization Trend
- Utilization Timeline/Gantt
- Utilization Time Summary
- Utilization Time Summary by Product/by Shift
- Utilization Details

**Multi-Asset Comparison Scenarios:**
- OEE KPI (*)
- Downtime Summary
- MTTR/MTBF Summary

(*) OEE KPIs includes OEE, Availability, Performance & Quality
Events in Partner Applications
Demo

Events in AVEVA Data Hub
Latest Service Updates

AVEVA™ Data Hub has a new look!

Sep 30, 2021, 12:43 PM

On September 30th, 2021, users will find an improved look and feel when they log in to the AVEVA™ Data Hub customer portal. To be more specific, some notable changes include:

- Colors are used a little more intentionally to draw users to the primary actions within the portal.
- The left navigation menu is more visually streamlined, showing only the categories of Data Hub’s capabilities (e.g., visualization and analytics) and having the ability to collapse this menu to just icons.
- There is now a universal location for where users pick the

Quick Links

- View API documentation
- Explore working code samples provided in multiple programming languages
- View service blog
- Manage Users And User Access For Your Organization
- Manage clients and secrets for securely accessing your data
- Experiment with the REST API console

Yesterday’s Resource Usage

- Oct 10, 2023
- Streams Stored: 46,710
- Streams Accessed: 2,721
- Shared Streams: 0

System Health

- Ok

PI to Data Hub Agents

- All agents in good health
### Top Utilization Reasons

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running</td>
<td>5651</td>
</tr>
<tr>
<td>Clean Up</td>
<td>2329</td>
</tr>
<tr>
<td>Run Degraded Speed</td>
<td>2124</td>
</tr>
<tr>
<td>Idle</td>
<td>406</td>
</tr>
<tr>
<td>Starved</td>
<td>167</td>
</tr>
</tbody>
</table>

### Equipment Utilization States

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Utilization State</th>
<th>Event Start Time</th>
<th>Event End Time</th>
<th>Utilization Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line1Filler</td>
<td>Running</td>
<td>10/2/2023 12:00:02 AM</td>
<td>10/2/2023 12:01:23 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Packr</td>
<td>Running</td>
<td>10/2/2023 12:00:22 AM</td>
<td>10/2/2023 12:02:23 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Labbler</td>
<td>Running</td>
<td>10/2/2023 12:00:22 AM</td>
<td>10/2/2023 12:02:23 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Palletizer</td>
<td>Maintenance</td>
<td>10/2/2023 12:00:23 AM</td>
<td>10/2/2023 12:01:23 AM</td>
<td>Clean Up</td>
</tr>
<tr>
<td>Reactor1</td>
<td>Stopped</td>
<td>10/2/2023 12:01:23 AM</td>
<td>10/2/2023 12:02:23 AM</td>
<td>Run Degraded Speed</td>
</tr>
<tr>
<td>Blender1</td>
<td>Running</td>
<td>10/2/2023 12:02:23 AM</td>
<td>10/2/2023 12:03:01 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Packr</td>
<td>Running</td>
<td>10/2/2023 12:03:01 AM</td>
<td>10/2/2023 12:03:23 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Filler</td>
<td>Running</td>
<td>10/2/2023 12:03:01 AM</td>
<td>10/2/2023 12:03:23 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Labbler</td>
<td>Running</td>
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<td>10/2/2023 12:03:23 AM</td>
<td>Running</td>
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<tr>
<td>Line1Palletizer</td>
<td>Maintenance</td>
<td>10/2/2023 12:03:01 AM</td>
<td>10/2/2023 12:04:01 AM</td>
<td>Clean Up</td>
</tr>
<tr>
<td>Reactor1</td>
<td>Stopped</td>
<td>10/2/2023 12:04:01 AM</td>
<td>10/2/2023 12:05:23 AM</td>
<td>Run Degraded Speed</td>
</tr>
<tr>
<td>Blender1</td>
<td>Running</td>
<td>10/2/2023 12:05:23 AM</td>
<td>10/2/2023 12:06:01 AM</td>
<td>Running</td>
</tr>
<tr>
<td>Line1Packr</td>
<td>Running</td>
<td>10/2/2023 12:06:01 AM</td>
<td>10/2/2023 12:07:23 AM</td>
<td>Running</td>
</tr>
</tbody>
</table>
Sample Dashboard 1

Line 1 equipments

Utilization Chart

Most frequent Events

OEE Trend
Wrap Up

Events in AVEVA Data Hub
Solid foundation to expanding the industrial data footprint

**Engineering & Operations Data: 1D, 2D, 3D**

**Process Data: Streams**
- Timestamp
- Depth
- Pressure
- Speed
- Latitude
- Longitude
- Quality information

**Events & Production Context: Events & Reference Data**

**Asset Context: Assets**

Lighthouse Preview (Event Apps): Now
Lighthouse Preview (AVEVA MES): Dec 2023
General Availability: 1Q2024

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AVEVA Lighthouse Program

Join us in a Lighthouse Project to prove & shape the value of new technology for your business scenarios!

- **AVEVA provides:**
  - AVEVA pre-released software
  - Installation & configuration support
  - Technical R&D support
  - Program management

- **Participating customer provides:**
  - Viable scenario
  - Resources to use AVEVA pre-released software for your scenario
  - Product feedback on use of software for scenario
  - Willingness to document a success story and participate in a future AVEVA public presentation

Email us at lighthouse@aveva.com to engage with our team!
Where to find more information on AVEVA Data Hub

Overview & Resources

Documentation

Security & Trust Center

Service Description
- https://www.aveva.com/content/dam/aveva/documents/datasheets/AVEVA_Data_Hub_on_AVEVA_Connect_v1_1.pdf
Recommended Sessions

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

Get more out of your data with AVEVA Advanced Analytics
Wednesday, October 25 @ 2:10pm
Room 2004

Facilitating Digitalization in Extra-Small Cargill Facilities using Edge Data Store
*Cargill*
Wednesday, October 25 @ 2:50pm
Room 2004

Bringing industrial operations data into your analytics platform with AVEVA Data Hub Data Views
Thursday, October 26 @ 10:45am
Room 2004

Improving Kaiser Permanente’s sustainability footprint with enhanced energy efficiency, visibility, and optimization
*Kaiser Permanente/DERNetSoft*
Thursday, October 26 @ 11:25am
Room 2004

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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