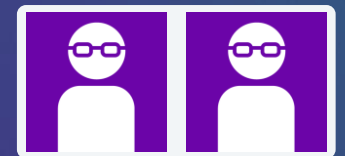OCTOBER 26, 2023

Using AVEVA™ PI System™ for aggregated analysis of HMI/SCADA data

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AVEVA

Agenda

- AVEVA™ Historian in the control network

- Demo: Replicate AVEVA™ Historian data to AVEVA™ PI System™

- Why aggregate HMI/SCADA data to AVEVA™ PI System™?

AVEVA

AVEVA™ Historian in the control network

Consolidate Multiple Systems

AVEVA
Historian

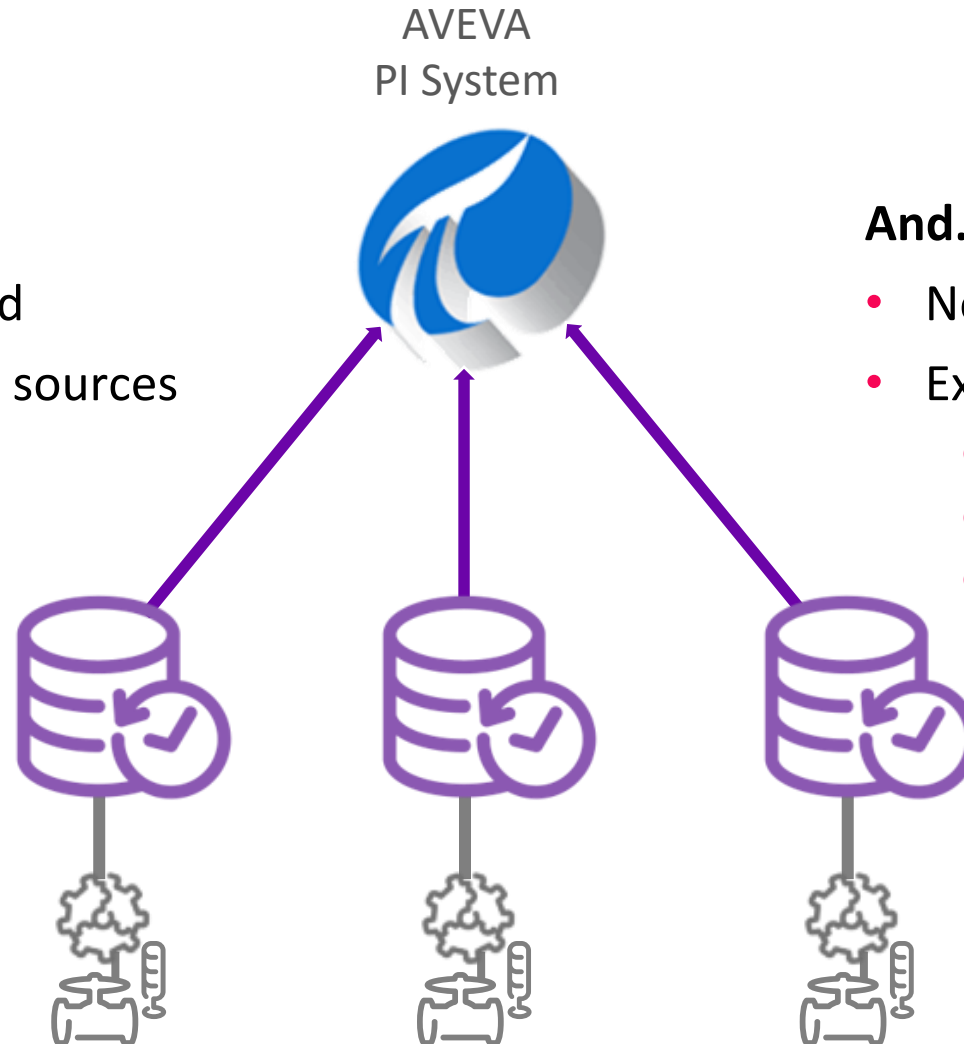- Centralized information

- Long-term system of record

- Works well for very similar sources

AVΞVA

Consolidate Multiple Systems

AVEVA
PI System
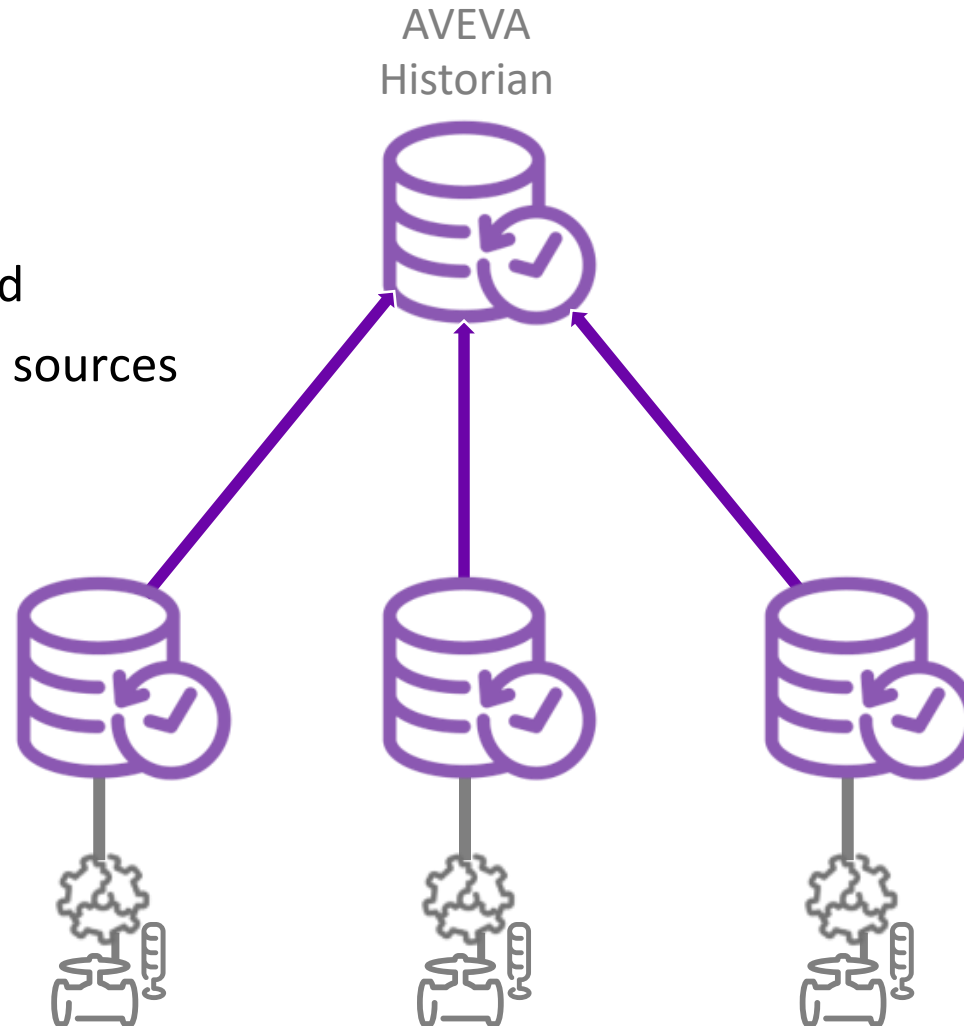
- Centralized information

- Long-term system of record

- Works well for very similar sources

And…

- Normalize dissimilar sources

- Extend raw time-series data
  - Richer information model
  - Add analytics/calculations
  - Event context

File   Action   View   Help

Name

Local Replication

MyDataHub

- ArchestrA System Management Console (SVR19)
  - Historian
    - Historian Group
      - SVR19
        - Management Console
          - Status
          - Data Acquisition
          - Replication
          - Clients
          - History Blocks
        - Configuration Editor
          - System Configuration
            - Parameters
            - Data Acquisition
            - Storage
            - Tag Configuration
              - Messages
              - Engineering Units
              - Engineering Units Catalog
              - Analog Tags
              - Analog Summary Tags
              - Discrete Tags
              - String Tags
              - State Summary Tags
              - Event Tags
              - Summaries
            - Replication
              - Replication Schedules
              - Replication Servers
                - Local Replication
                - MyDataHub
            - Public Groups
            - Private Groups
  - Galaxy Database Manager
  - Operations Integration Server Manager
  - Log Viewer
  - Platform Manager

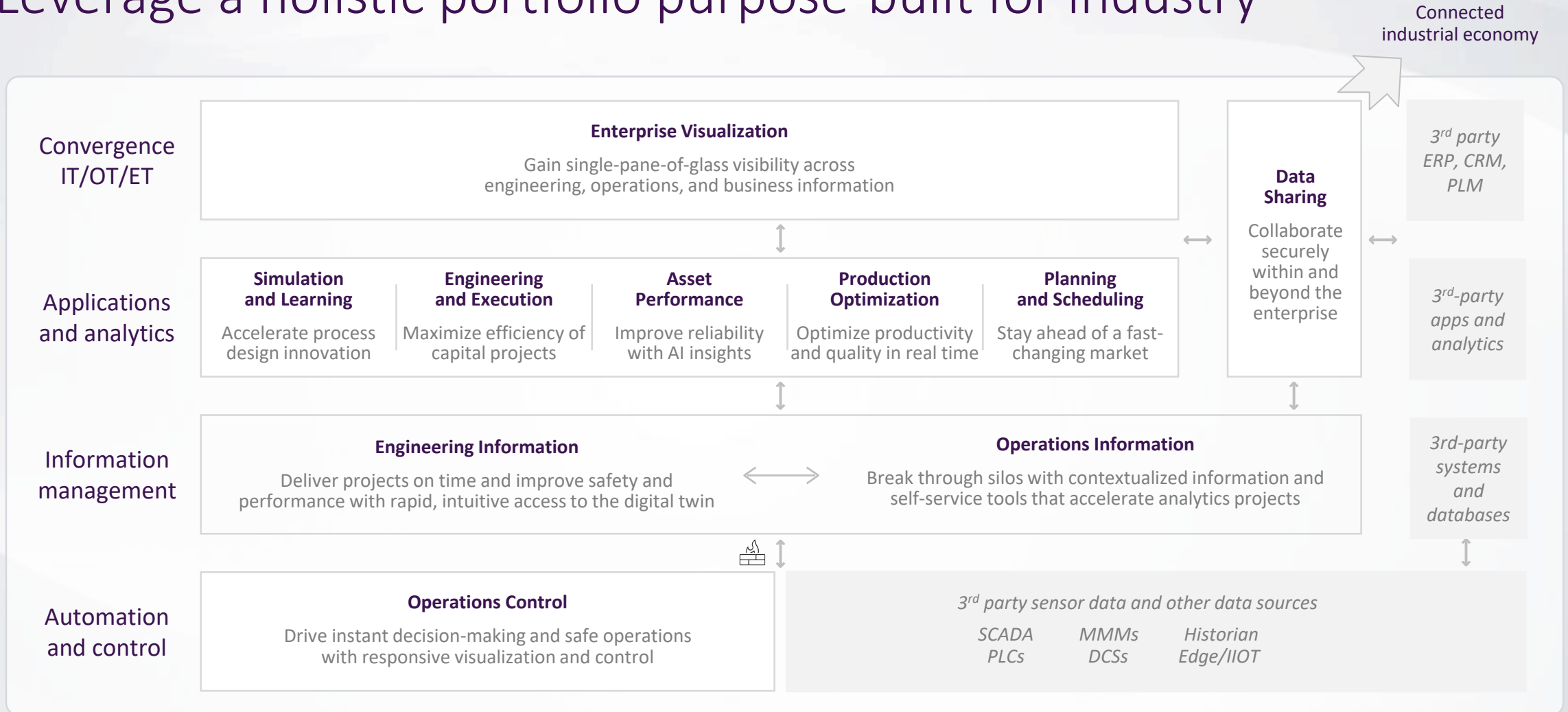# Integrating with AVEVA™ PI System™

- Includes:
  - "Simple" replications (every value)
  - Tag meta data
  - Asset Framework model from "Model View"
  - "Original" data

- Does <u>Not</u> Support:
  - "Summary" replication
  - Alarm history
  - "Versioned" data (CSV/SQL/SDK updates)

- Based on OMF/Adapter Framework
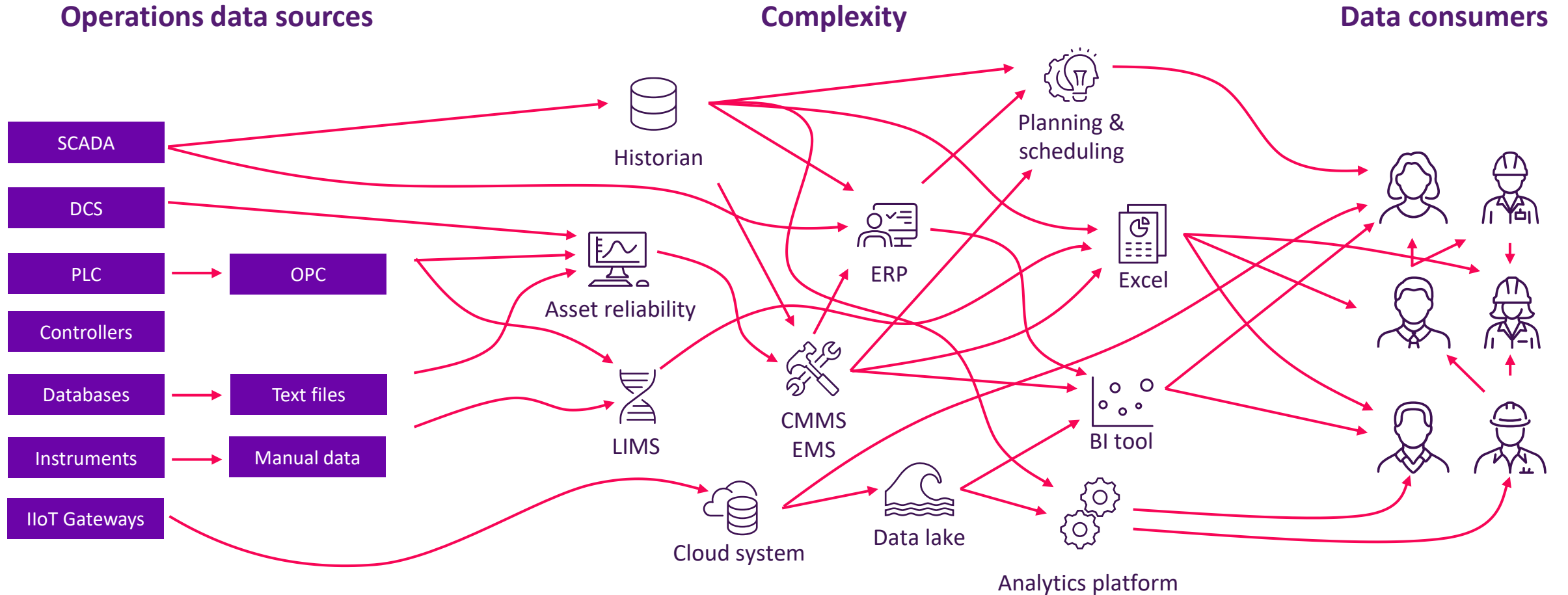
- Also works with AVEVA™ Data Hub

Historian 2023

AV∃VA

Why aggregate HMI/SCADA data to AVEVA™ PI System™?

AVEVA

Leverage a holistic portfolio purpose-built for industry

Connected industrial economy

Convergence IT/OT/ET

Enterprise Visualization

Gain single-pane-of-glass visibility across engineering, operations, and business information

3rd party ERP, CRM, PLM

Data Sharing

Collaborate securely within and beyond the enterprise

Applications and analytics

Simulation and Learning	**Engineering and Execution**	**Asset Performance**	**Production Optimization**	**Planning and Scheduling**
Accelerate process design innovation	Maximize efficiency of capital projects	Improve reliability with AI insights	Optimize productivity and quality in real time	Stay ahead of a fast-changing market

3rd-party apps and analytics

Information management

Engineering Information

Deliver projects on time and improve safety and performance with rapid, intuitive access to the digital twin

Operations Information

Break through silos with contextualized information and self-service tools that accelerate analytics projects

3rd-party systems and databases

Automation and control

Operations Control

Drive instant decision-making and safe operations with responsive visualization and control

3rd party sensor data and other data sources

SCADA   MMMs   Historian
PLCs   DCSs   Edge/IIOT

AVEVA

Managing operations data is complex

Operations data sources

Complexity

Data consumers

SCADA

DCS

PLC → OPC

Controllers

Databases → Text files

Instruments → Manual data

IIoT Gateways

Historian

Asset reliability

LIMS

ERP

CMMS EMS

Cloud system

Planning & scheduling

Excel

BI tool

Data lake

Analytics platform

AVEVA

AVEVA™ PI System™ connects people to data with an infrastructure approach

Operations data sources

- SCADA
- DCS
- PLC → OPC
- Controllers
- Databases → Text files
- Instruments → Manual data
- IIoT Gateways
- Cloud systems

AVEVA PI System

Collect

Store & Enrich

Visualize & Deliver

Visualize	Report
Analyze	Notify
Share	Integrate

Data consumers

AVEVA
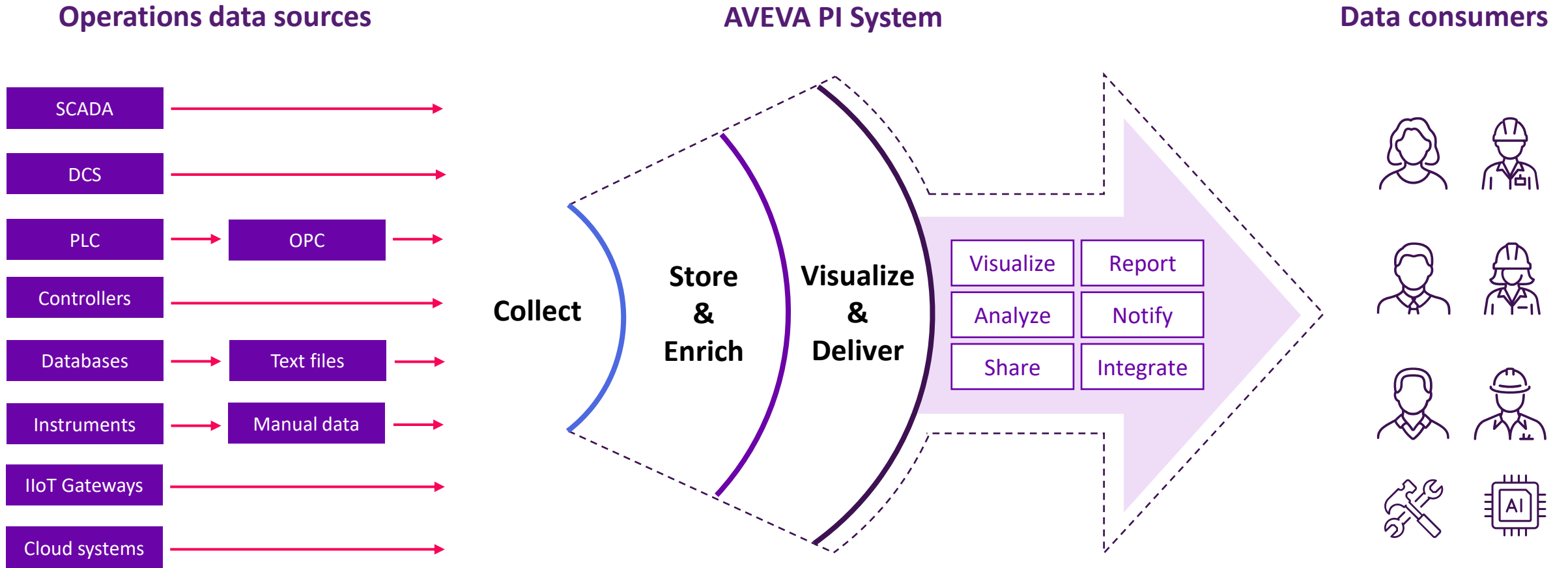
Gather past, present, & forecasted data from hundreds of sources

PLC
DCS
SCADA

OPC

Manual

IoT sensors

SQL & other databases

Collect

Store & Enrich

Visualize & Deliver
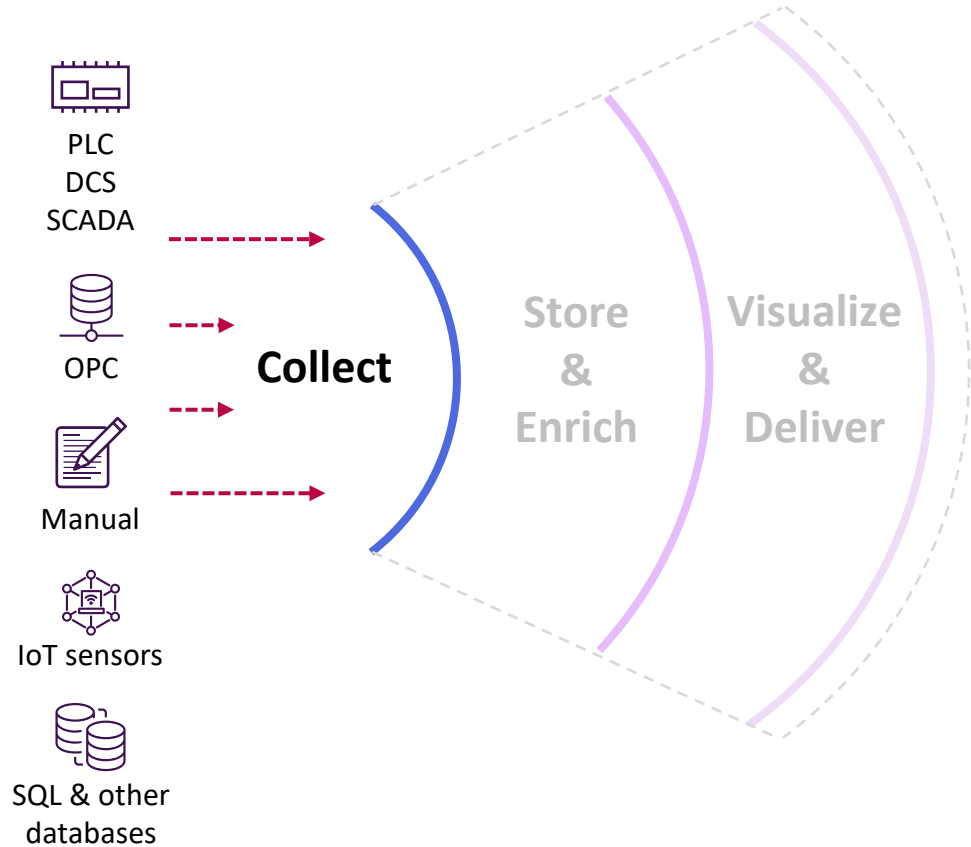
- Connect to any asset regardless of vendor, location or environment

- Supports 225+ industrial protocols

- Developed and maintained by us

- Configuration only. No programming required

AVΞVΛ

Turn raw data into actionable information

Collect

Store & Enrich

Visualize & Deliver
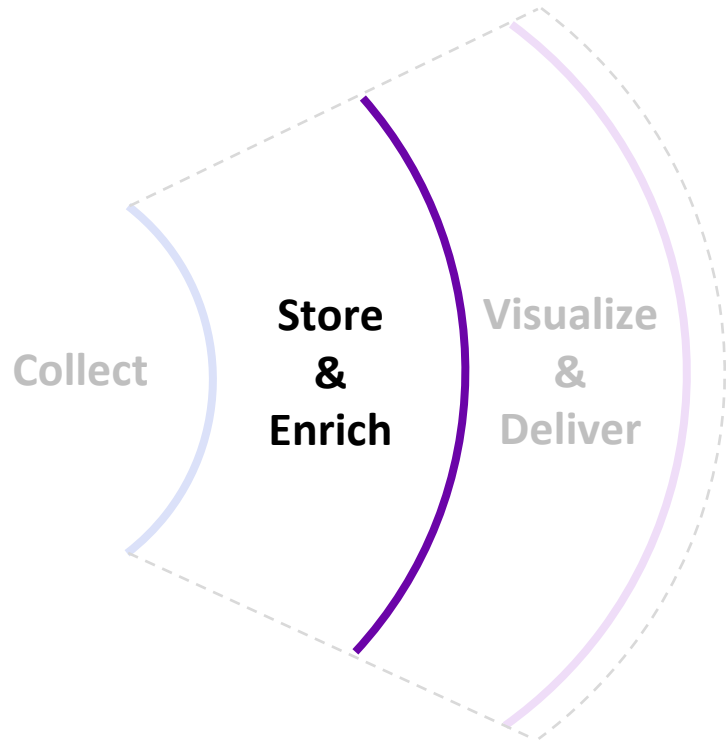
- Store high-frequency and large volumes of data

- Provide context to your data

- Run real-time analytics on your raw data

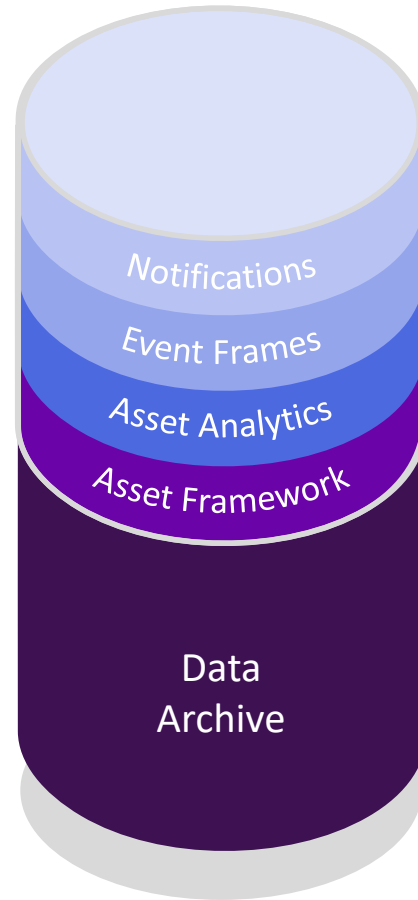- Bookmark & notify on key events and batches in your data

AVΞVA

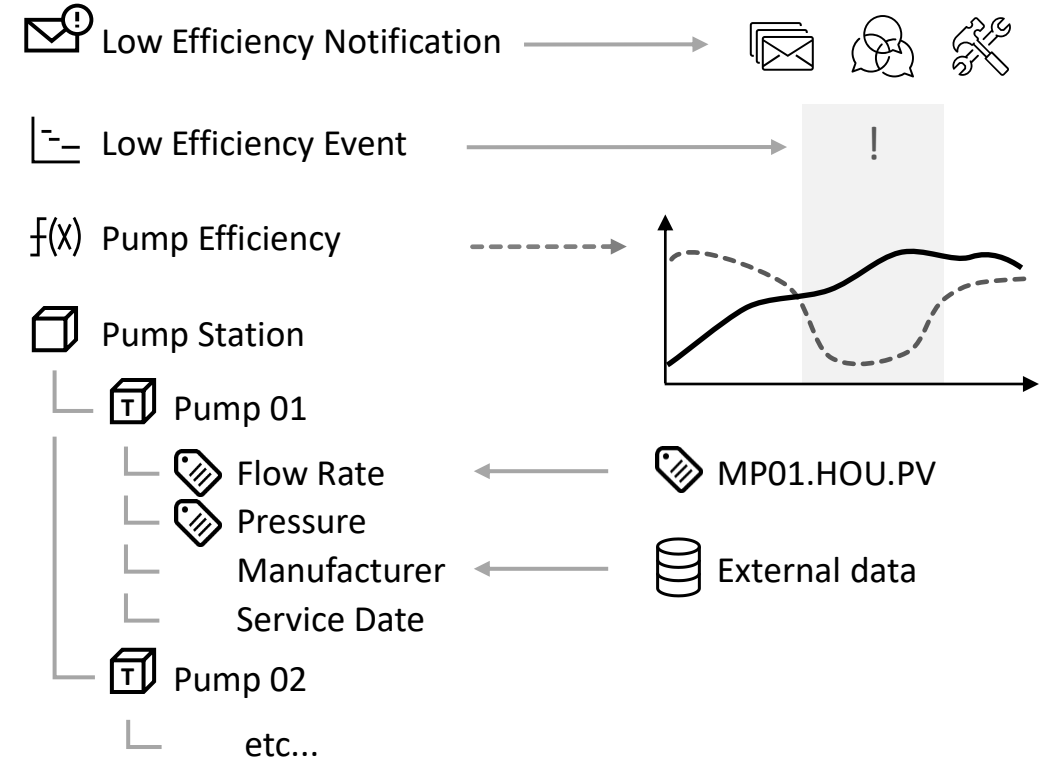# Enrichment features turn data into decision-ready information

Add structure and meaningful context to your operations data

Automatically **pinpoint important events** in your operations

Asset 97: Springfield

Average uptime

Total energy usage

Asset 42: Springfield

Underperforming asset

| Data Archive | Asset Framework | Asset Analytics | Event Frames | Notifications |

Optimized storage & access to massive volumes of operational data

Transform raw data into actionable KPIs using streaming calculations

Send automatic alerts to the right people with the right information

AVΞVA

AVEVA™ PI Server

AVEVA PI Server layers data enrichment services on top of an industry-leading, real-time operations data store.
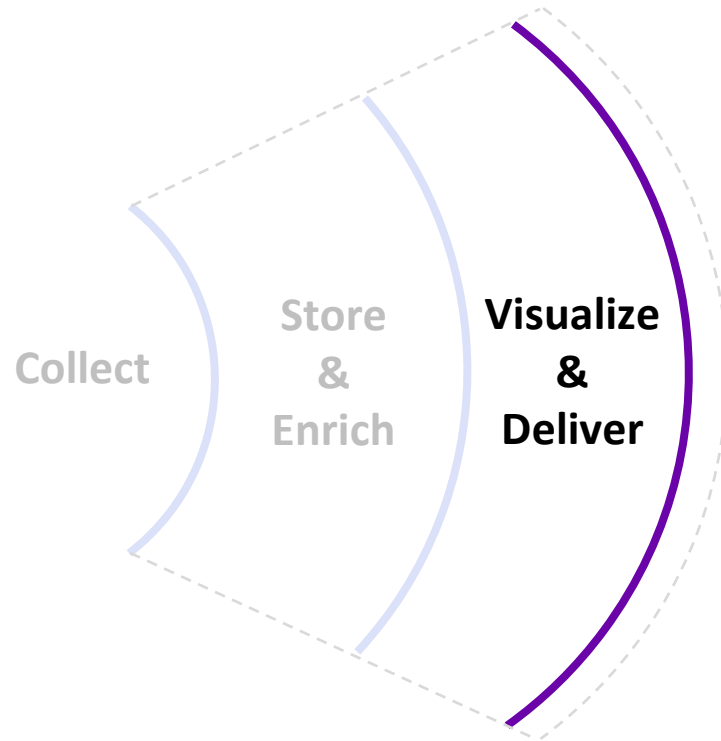
- Data Archive:
  real-time data storage

- Asset Framework:
  adds context to raw data streams

- Asset Analytics:
  user-defined calculations

- Event Frames:
  bookmark important events

- Notifications:
  send email or alerts when action is needed

AVEVA PI Server

Notifications

Event Frames

Asset Analytics

Asset Framework

Data Archive

Low Efficiency Notification

Low Efficiency Event

$f(X)$ Pump Efficiency

Pump Station
- Pump 01
  - Flow Rate
  - Pressure
  - Manufacturer
  - Service Date
- Pump 02
  - etc…

MP01.HOU.PV

External data

!

Deliver operations insights in real-time to anyone, anywhere

Collect

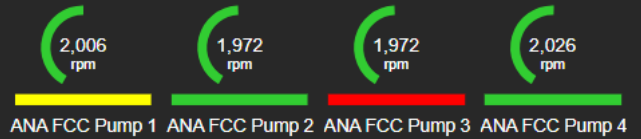Store & Enrich

Visualize & Deliver

- Dynamic, real-time displays that update in seconds, not minutes

- View KPI's in Microsoft Excel or on any web-browser enabled device

- Build self-service dashboards or reports without requiring assistance from IT

- Publish large-scale real-time exports and streams of data and metadata to third-party geospatial, big data, or business analysis platforms

- Rich programmatic access to build anything on AVEVA PI System

AVΞVΛ

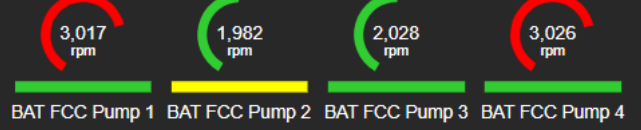# AVEVA™ PI Vision: Real-time data visualization for decision makers

- An **easy to use, self-service, scalable** visualization solution

- Dynamic displays

- Access real-time OT data from **any device** – phone, tablet, laptop, desktop

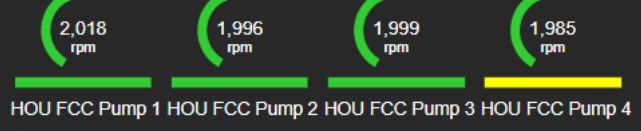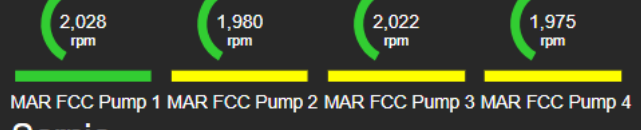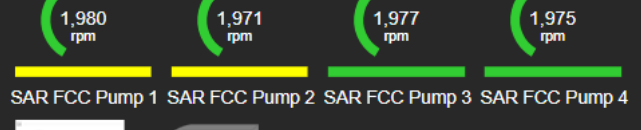- **Share** real-time displays across your organization

AVEVA

OSIsoft
PI Vision

New Display | OSI\dlopez

MB Pumps (read-only) (explorer-mode) Asset: ANA FCC Pump 1+ ▼   Export

ANA FCC Pump 1

Anacortes
- 2,006 rpm — ANA FCC Pump 1
- 1,972 rpm — ANA FCC Pump 2
- 1,972 rpm — ANA FCC Pump 3
- 2,026 rpm — ANA FCC Pump 4

Baton Rouge
- 3,017 rpm — BAT FCC Pump 1
- 1,982 rpm — BAT FCC Pump 2
- 2,028 rpm — BAT FCC Pump 3
- 3,026 rpm — BAT FCC Pump 4

Houston
- 2,018 rpm — HOU FCC Pump 1
- 1,996 rpm — HOU FCC Pump 2
- 1,999 rpm — HOU FCC Pump 3
- 1,985 rpm — HOU FCC Pump 4

Martinez
- 2,028 rpm — MAR FCC Pump 1
- 1,980 rpm — MAR FCC Pump 2
- 2,022 rpm — MAR FCC Pump 3
- 1,975 rpm — MAR FCC Pump 4

Sarnia
- 1,980 rpm — SAR FCC Pump 1
- 1,971 rpm — SAR FCC Pump 2
- 1,977 rpm — SAR FCC Pump 3
- 1,975 rpm — SAR FCC Pump 4

Data Entry   Home

Name	Value
ANA FCC Pump 1|Manufacturer	Federation Pumps
ANA FCC Pump 1|Serial Number	NCC1701A
ANA FCC Pump 1|Asset	ANA FCC Pump 1
ANA FCC Pump 1|FCC	ANA FCC 1
ANA FCC Pump 1|Refinery	Anacortes Refinery
ANA FCC Pump 1|Date - Installed	1/1/2017 12:00:00 AM
ANA FCC Pump 1|Date - Last Service	12/26/2019 8:30:00 AM

Temp 140.3 °F   Temp 84.9 °F

X 0.1992 mils
2.1854 mils
Y 0.1988 mils
Y 2.1993 mils

Motor Vibration

Vibration X - Inboard Bearing 0.1992 mils
Vibration X - Outboard Bearing 2.1854 mils
Vibration Y - Inboard Bearing 0.1988 mils
Vibration Y - Outboard Bearing 2.1993 mils
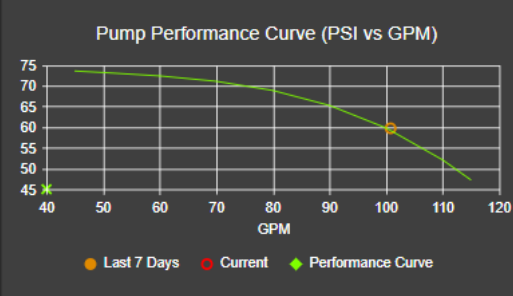
12/7/2019 2:51:18 PM   31d   1/7/2020 2:51:18 PM
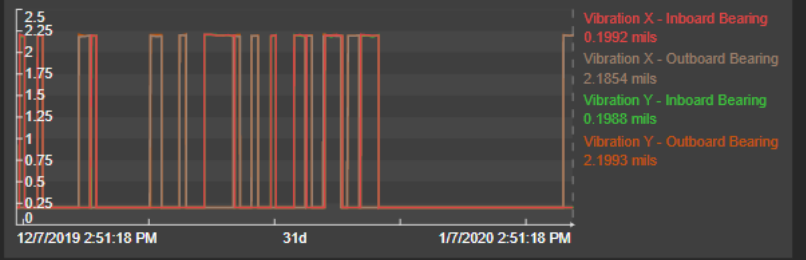
Run Hours
Since Installed 26,438 h | Since Last Service 293.5 h

Pump Operations
748.4 °F 75.4 psi
100 A
2,006 rpm
Troubleshooting Checklist
100.8 US gal/min

Pump Performance Curve (PSI vs GPM)
- Last 7 Days
- Current
- Performance Curve

High Vibration Events

Event Name	Start Time	End Time	Reason	Acknowledged By
ANA FCC Pump 1 Pump Upset 2020-01-07 00:17:07	1/7/2020 2:17:07 AM	In Progress		
ANA FCC Pump 1 Pump Upset 2019-12-26 21:07:07	12/26/2019 11:07:07 PM	12/27/2019 7:00:07 PM		
ANA FCC Pump 1 Pump Upset 2019-12-08 17:17:07	12/8/2019 7:17:07 PM	12/9/2019 2:00:07 AM		

Bearing Temperature Events

Event Name	Start Time	End Time	Reason	Acknowledged By
ANA FCC Pump 1 Pump Upset 2020-01-07 01:49:07	1/7/2020 3:49:07 AM	In Progress		
ANA FCC Pump 1 Pump Upset 2019-12-26 21:07:07	12/26/2019 11:07:07 PM	1/6/2020 2:09:46 PM		

Cavitation Events

Event Name	Start Time	End Time	Reason	Acknowledged By
ANA FCC Pump 1 Pump Upset 2019-12-09 11:43:07	12/9/2019 1:43:07 PM	1/6/2020 2:09:46 PM		
ANA FCC Pump 1 Pump Upset 2019-11-18 11:46:07	11/18/2019 1:46:07 PM	1/6/2020 2:09:46 PM		

12/7/2019 2:51:18 PM   ◄ 31d ►   Now   1/7/2020 2:51:18 PM

OSIsoft
PI Vision

New Display | OSI\dlopez

(read-only) (explorer-mode)   Export

Events

☐ Automatically refresh the list

📌 **Pinned**

▽ Tableting Cycle 2020-01-07 09:50:45.000
   1/7/2020 11:50:45 AM - 1/7/2020 12:08:45 PM

Search Results

◆ Tableting Cycle 2020-01-07 12:22:45.000
■ Tableting Cycle 2020-01-07 12:03:45.000
▲ Tableting Cycle 2020-01-07 11:44:45.000
▼ Tableting Cycle 2020-01-07 11:25:45.000
○ Tableting Cycle 2020-01-07 11:06:45.000
◆ Tableting Cycle 2020-01-07 10:47:45.000
◻ Tableting Cycle 2020-01-07 10:28:45.000

🔍 Edit Search Criteria

Attributes

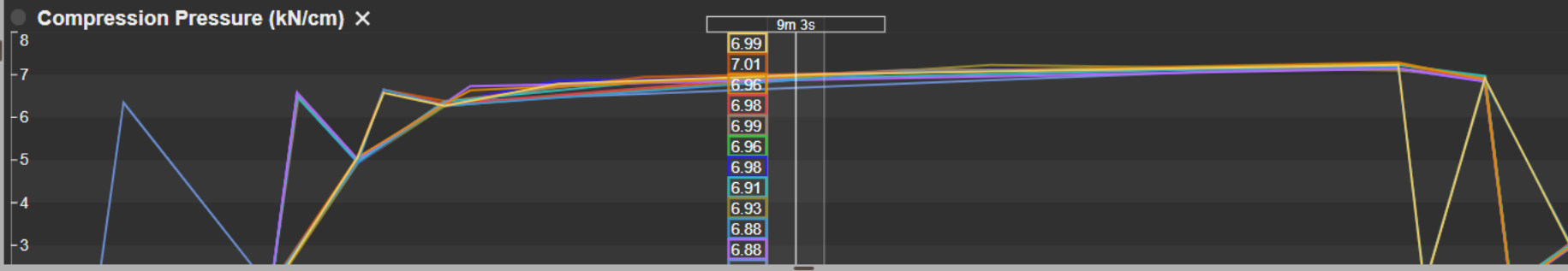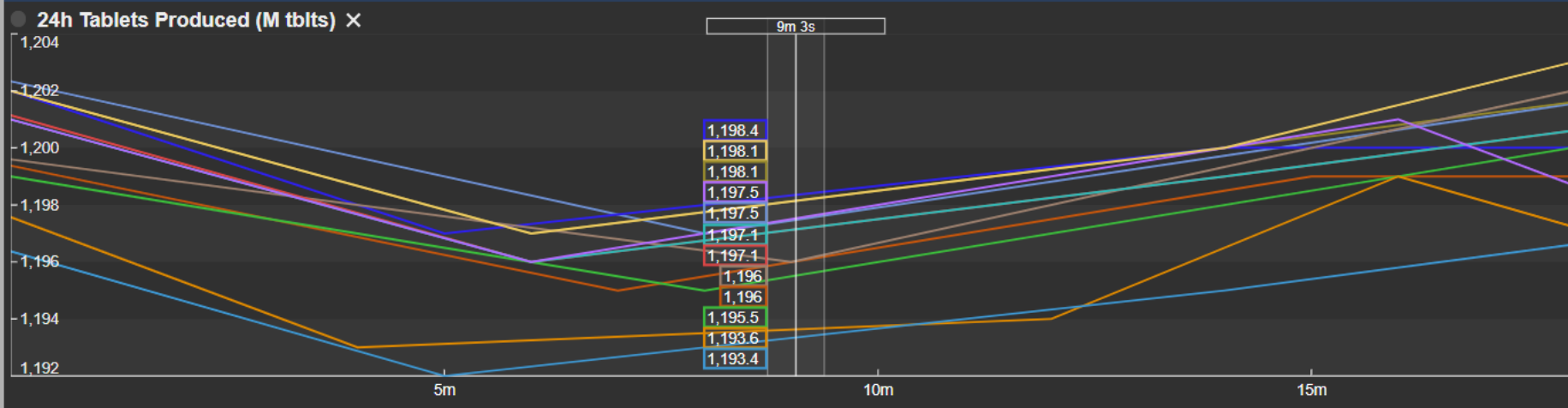☰ Plant: Plant1
☰ Site: Charlotte, NC

KPIs

☰ 24h Tablets Produced: 1,196.6 M tblts
☰ Compression pressure - 7-Day Average: 5.46 kN/cm
☰ Hourly Tablets Produced: 50,230 tblts
☰ Production Rate - Hourly Avg: 12.83 tblts/s
☰ Tablets Produced Today: 645.15 M tblts

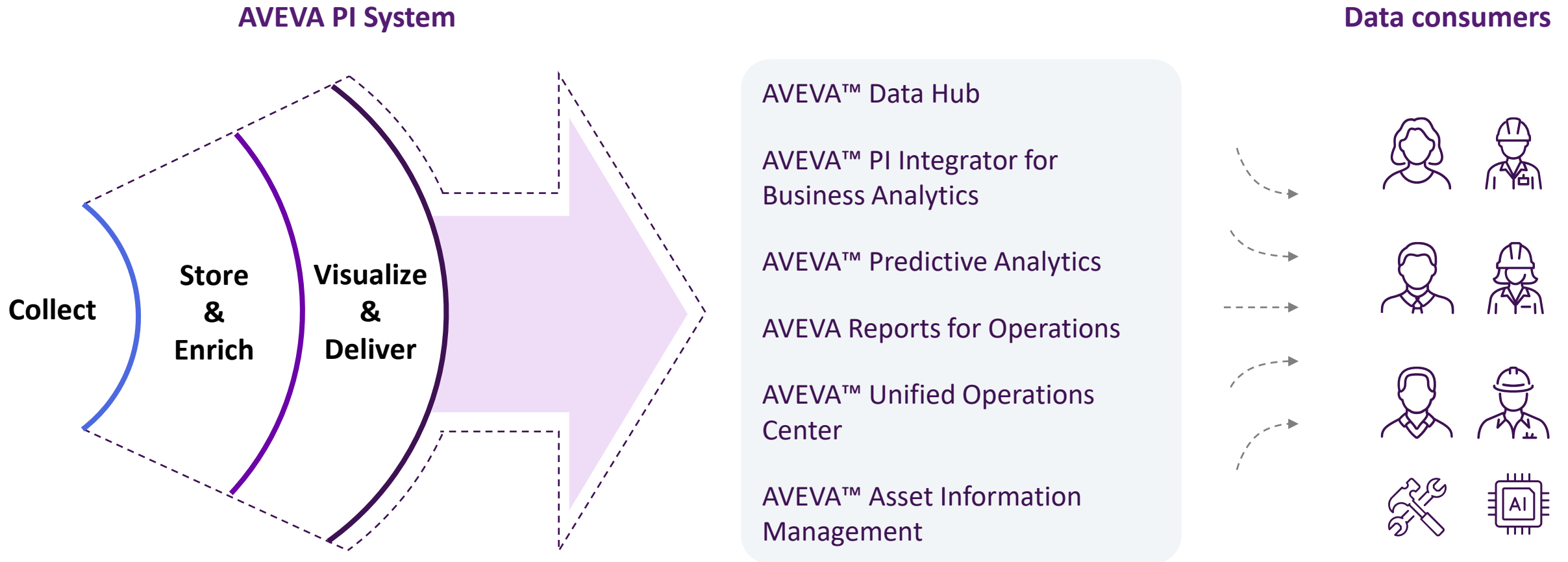## Parameters

☰ Compression Pressure: 2.98 kN/cm

● 24h Tablets Produced (M tblts) ✕

9m 3s

1,204
1,202
1,200
1,198
1,196
1,194
1,192

1,198.4
1,198.1
1,198.1
1,197.5
1,197.5
1,197.1
1,197.1
1,196
1,196
1,195.5
1,193.6
1,193.4

5m   10m   15m

● Compression Pressure (kN/cm) ✕

9m 3s

8
7
6
5
4
3

6.99
7.01
6.96
6.98
6.99
6.96
6.98
6.91
6.93
6.88
6.88

▽ Tableting Cycle 2020-01-07 09:50:45.000
● Tableting Cycle 2020-01-07 12:41:45.000
◆ Tableting Cycle 2020-01-07 12:22:45.000
■ Tableting Cycle 2020-01-07 12:03:45.000
▲ Tableting Cycle 2020-01-07 11:44:45.000
▼ Tableting Cycle 2020-01-07 11:25:45.000
○ Tableting Cycle 2020-01-07 11:06:45.000

Native Data Egress from AVEVA™ PI System™ Infrastructure within AVEVA Portfolio

AVEVA PI System

Data consumers

Collect

Store & Enrich

Visualize & Deliver

AVEVA™ Data Hub

AVEVA™ PI Integrator for Business Analytics

AVEVA™ Predictive Analytics

AVEVA Reports for Operations

AVEVA™ Unified Operations Center

AVEVA™ Asset Information Management

AVΞVΛ

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!

AVEVA

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The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

AVEVA

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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

AVEVA