Data Collection and Remote Monitoring from Edge to Cloud

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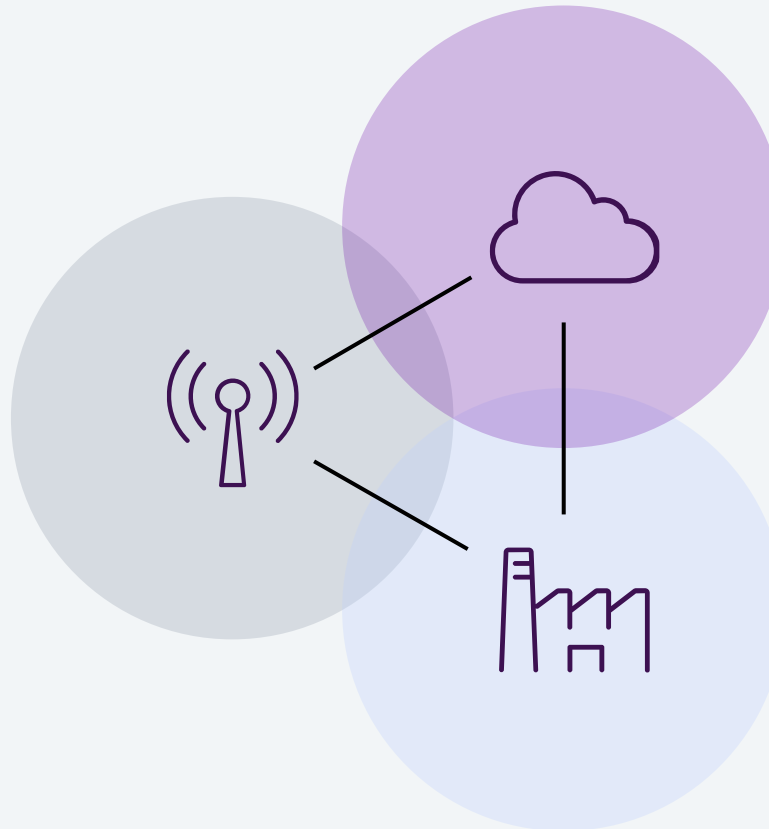
AVEVA

An ecosystem that spans from edge to plant to cloud

AVEVA's offerings that support OT, IT, and IIoT use cases

PI Data Infrastructure

At the edge
Pervasive, real-time data collection from sensors, IIoT devices and remote assets

In the cloud
Scalable data services available for a wider array of users, tools and applications

On-premises
Enriched industrial data available 24/7 for critical operations

AVΞVA

Collect data from every valuable data source

The scenario determines your data collection needs

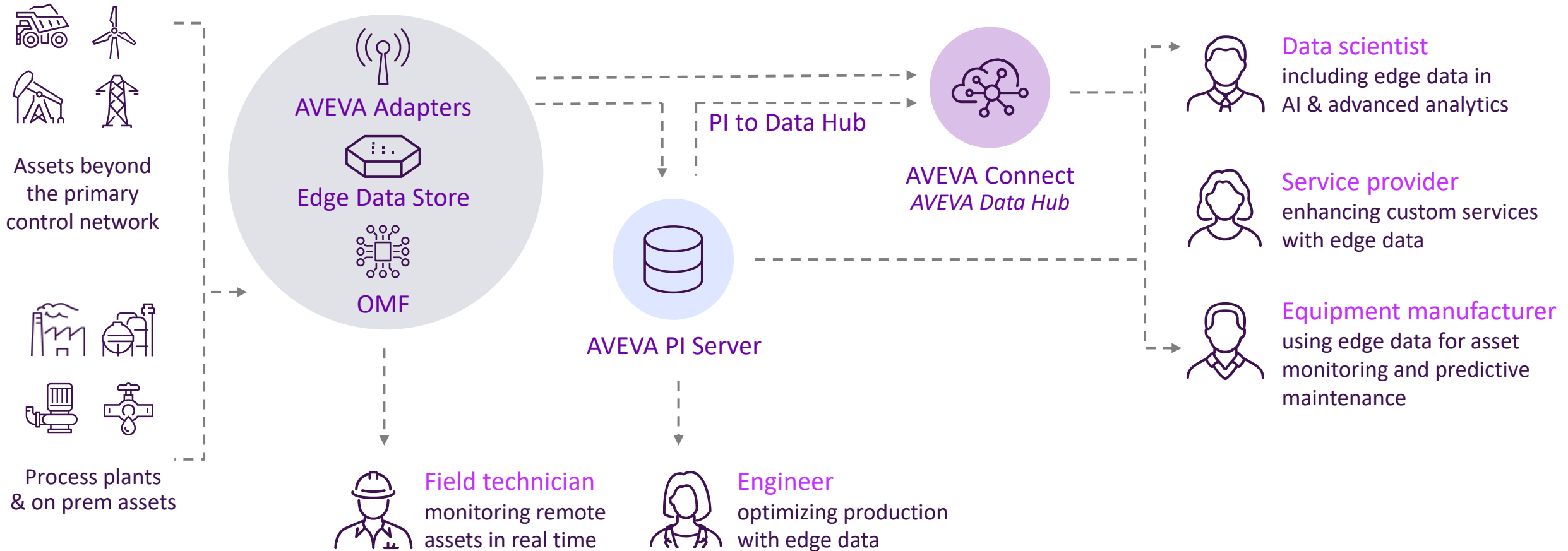**Industrial Edge**   **24/7 on-premises operations**   **Cloud services**

AVEVA Adapters | Edge Data Store | PI to Data Hub | Custom connectivity … and More!

AVEVA

Data Collection from Edge to Cloud

Assets beyond the primary control network

Process plants & on prem assets

AVEVA Adapters

Edge Data Store

OMF

PI to Data Hub

AVEVA Connect
AVEVA Data Hub

AVEVA PI Server

Data scientist
including edge data in AI & advanced analytics

Service provider
enhancing custom services with edge data

Equipment manufacturer
using edge data for asset monitoring and predictive maintenance

Field technician
monitoring remote assets in real time

Engineer
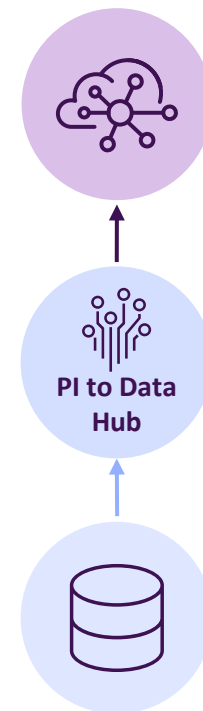optimizing production with edge data

AVEVA

Data Collection from Edge to Plant to Cloud

AVEVA

Enabling on-premises data transfer to the cloud

PI to Data Hub | Simple installation, centralized configuration

- Send **current, historical, or AF elements and attributes** from existing AVEVA PI Server data to AVEVA Data Hub

- **Simple installation process** to quickly get started with data transfers

- **Access configuration and health information** of the agent and data transfers from a **central location**

PI to Data Hub

Agent [Id = 79ca82d6-221d-44b8-b476-128015d6f...

Manage Agent	Transfer Metrics

Agent Overview

Agent Description	Agent [Id = 79ca82d6-221d-44b8-...
Agent Namespace	AVEVA-Events
Agent Status	✅ Registered
Agent Version	✅ 2.2.1163.0
AF Server Index Status	✅ Succeeded ↻
PI Points Index Status	✅ Succeeded ↻
Communication Time	Sep 19, 2023, 3:11:49 PM

Transfer Overview

Transfer Name	Transfer
Transfer Description	
Transfer Status	✅ Started
Current Activity	Sending Streaming Data
Last Modified	Aug 14, 2023, 6:23:14 AM

📋 **View/Edit Transfer**   ✖ **Remove Transfer**

⏹ **Stop Transfer**

AVEVA™ Data Hub ▸ PI to Data Hub Agents

Filter Agents...

👤🔒 Manage Permissions   ✖ Remove Agent   ⧉ Logs   ⬇ Download Agent   ❓ Help

Description ↑		Status		Version		Data Archive		AF Server		Region		Namespace		Host Name	
Agent [Id = 79ca82d6-221d-44b8-b...		✅ Good		✅ 2.2.1163.0		PIServer		AWCPIAgent		westus		AVEVA-Events			
CURT2016 to ADH		✅ Good		✅ 2.2.1163.0		curt2016		CURT2016		westus		Development			
DEMOVM - Alomari		❌ Bad		✅ 2.2.1163.0		PIDEMOVM		pidemovm		westus		AVEVA-Events			

AVEVA

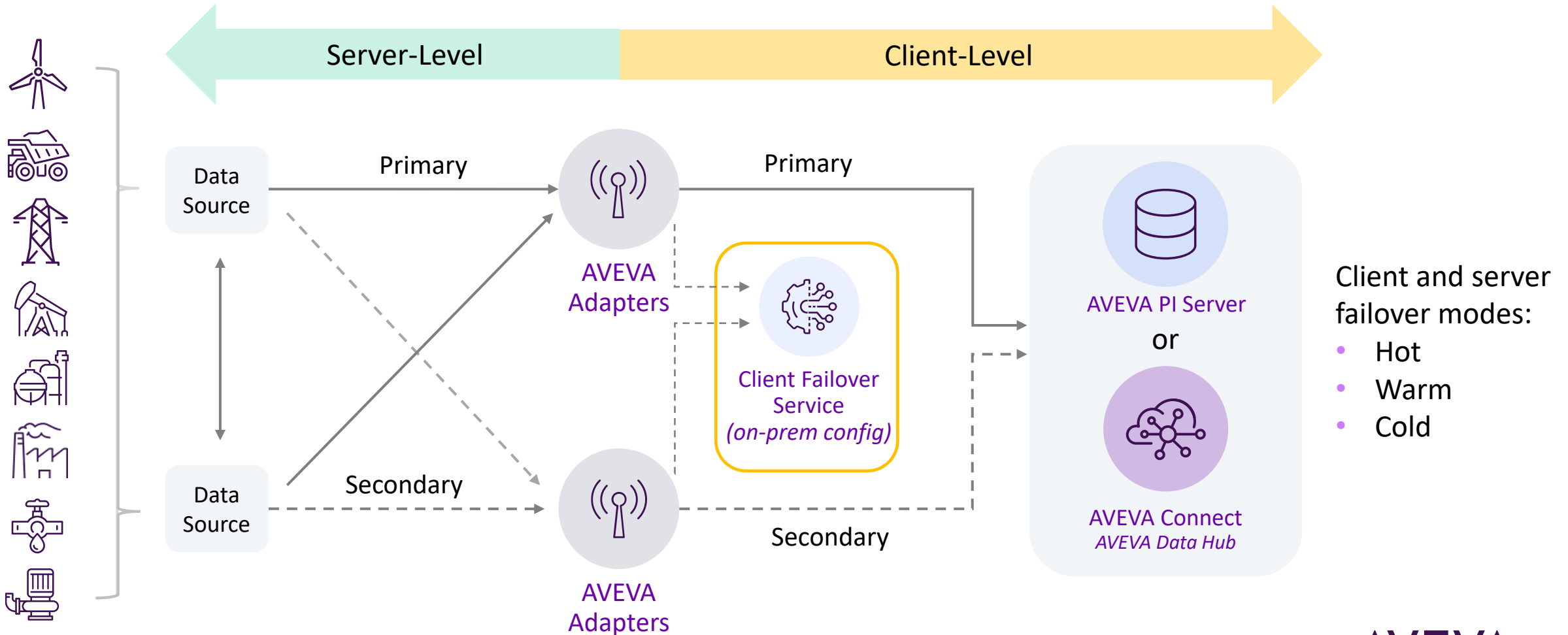# Extending real-time data connectivity to remote assets

AVEVA Adapters | Ready off-the-shelf, lightweight footprint, flexible end-points

- **Lightweight, robust, real-time data collection,** buffering technology protects data during network outages or unavailability of destination endpoint

- **Out-of-the-box connectivity** to **common industrial protocols:** Azure Event Hubs, BACnet, DNP3, Modbus TCP, MQTT, OPC UA, RDBMS, Structured Data Files

- **Maximize uptime** with **client-side failover; server-side failover** available as provided by the data source

- **Cross-platform compatible,** installation options for Windows and Linux devices or use Docker containers

- **Simplified management,** cloud-hosted remote installation, configuration management, and health monitoring

- **Multiple data destinations**, transfer data to PI Servers, AVEVA Data Hub, and/or Edge Data Store and use filtering to reduce network bandwidth

Ingress

AVEVA Adapters
Out-of-the-box connectivity to industrial protocols

Administration
Simplified, scalable management

Egress

Buffer
RAM & disk

Filters
Dead band

Health
Status

Failover
Status

Edge Data Store

AVEVA PI Server

AVEVA Connect
AVEVA Data Hub

Client Failover Service
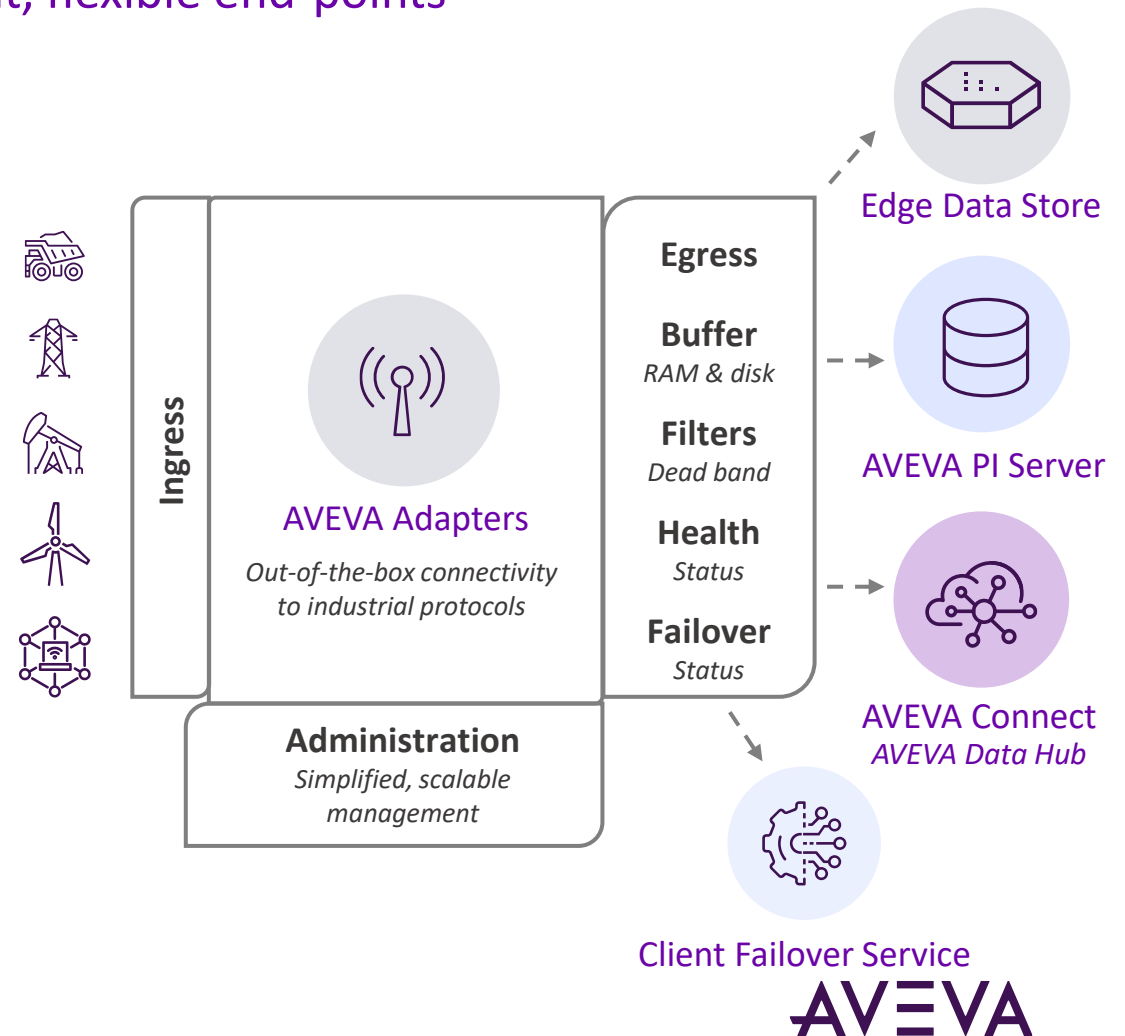
High availability for mitigating data loss

Client-side and server-side failover for AVEVA PI Server and AVEVA Data Hub

Server-Level ← | → Client-Level
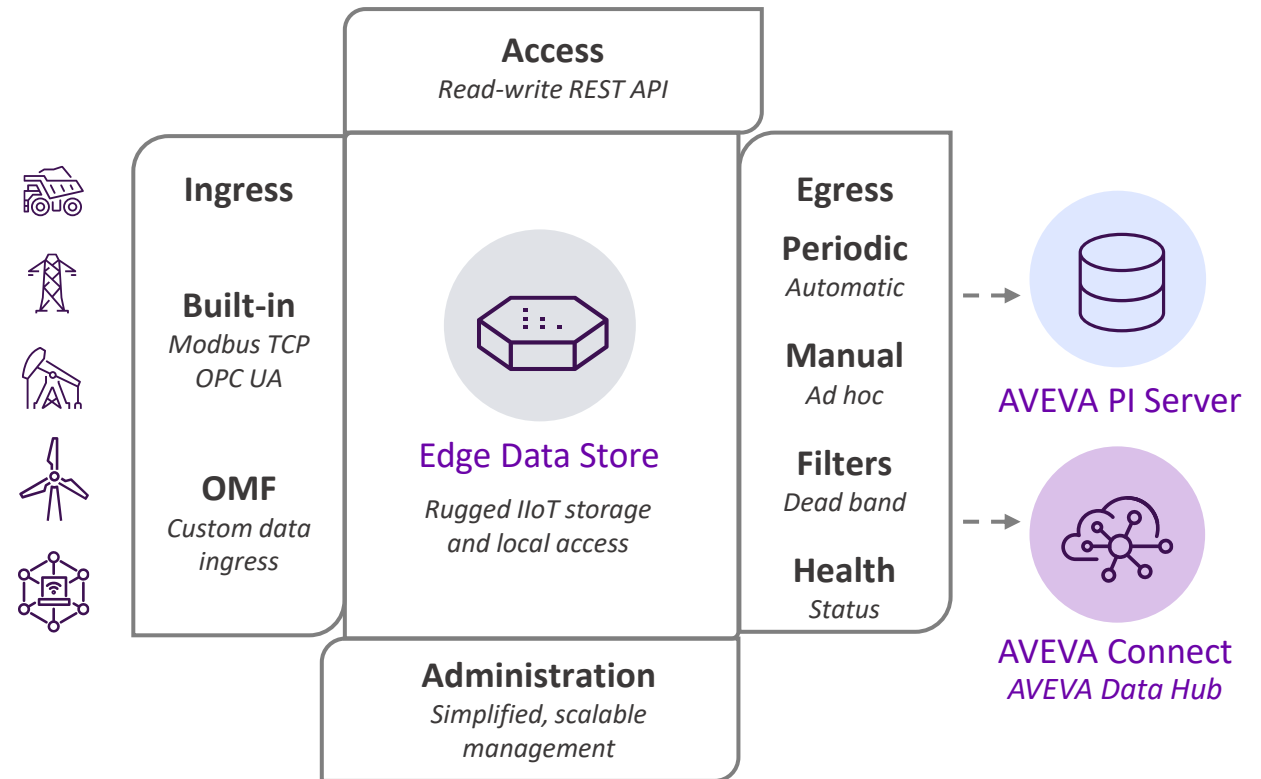
Data Source —— Primary —— AVEVA Adapters —— Primary ——

AVEVA Adapters

Client Failover Service *(on-prem config)*

Data Source —— Secondary —— AVEVA Adapters —— Secondary ——

AVEVA PI Server

or

AVEVA Connect
AVEVA Data Hub

Client and server failover modes:
- Hot
- Warm
- Cold

AVΞVA

Lightweight data storage and integration at the industrial edge

Edge Data Store | Local storage, self-healing, application platform

- **Lightweight, resilient data storage, purpose-built** for **harsh and/or uncrewed environments** – self-healing to survive power loss to the device, network outages, and unavailability of destination endpoints

- **Out-of-the-box connectivity** to **Modbus TCP** and **OPC UA servers**, custom application connectivity available through an **OMF endpoint**

- **Feature rich, programmatic API** for custom application development such as **local analytics or visualization**

- **Cross-platform compatible,** installation options for Windows and Linux devices or use Docker containers

- **Simplified management,** cloud-hosted remote installation, configuration management, and health monitoring

- **Multiple data destinations,** directly integrate with AVEVA PI Servers and AVEVA Data Hub and use filtering to reduce network bandwidth

Access
Read-write REST API

Ingress

Built-in
Modbus TCP
OPC UA

OMF
Custom data ingress

Edge Data Store
Rugged IIoT storage and local access

Egress

Periodic
Automatic

Manual
Ad hoc

Filters
Dead band

Health
Status

Administration
Simplified, scalable management

AVEVA PI Server

AVEVA Connect
AVEVA Data Hub

Homogenous connectivity to AVEVA systems

Open Message Format (OMF) | Scalable application development for edge, on premises, and cloud

- **Maximum developer flexibility**, any hardware platform, any operating system, any development tools

- Internet friendly, secure **REST API endpoints,** no VPNs required!

- Inbound connectivity to **Edge Data Store, AVEVA PI Servers, AVEVA Data Hub**

- **Outbound connectivity by Edge Data Store, AVEVA Adapters, and AVEVA Historian** provides interoperability with AVEVA PI Servers and AVEVA Data Hub

- Specification is **public and available to all**

OMF Applications

Custom connectivity for industrial assets

Edge Data Store

AVEVA PI Server

AVEVA Data Hub
AVEVA Connect

AVEVA

Remote Monitoring from Edge To Cloud

AVEVA
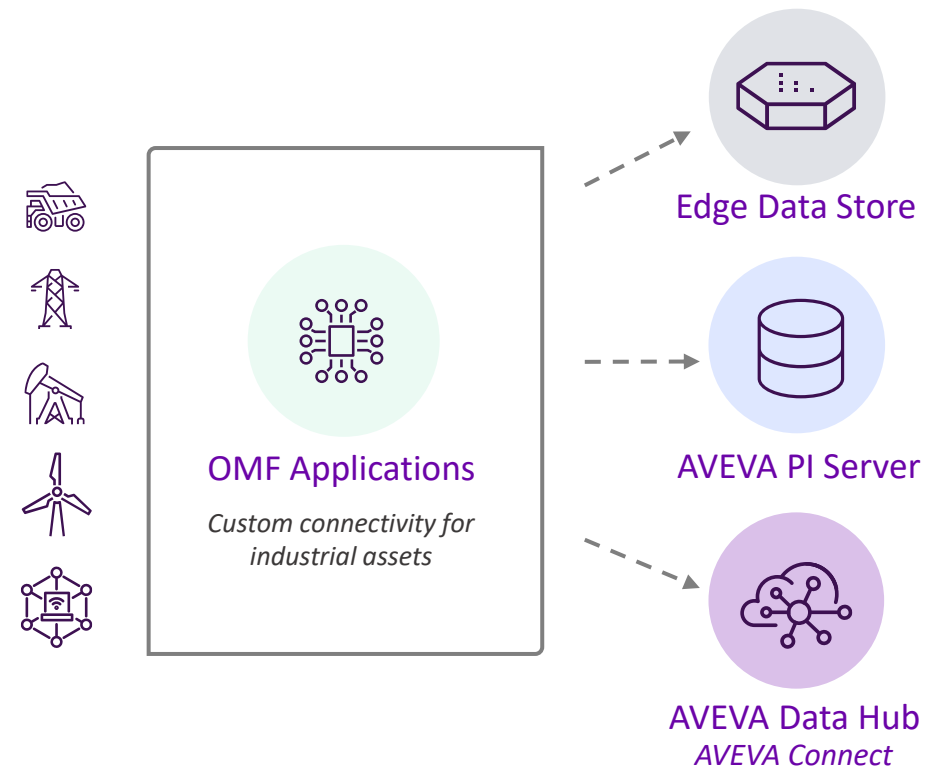
3x

Number of IoT devices exist in 2030 compared to number in 2020. Data from these devices will grow even faster.

Source: Gartner. Predicts 2022: The distributed enterprise drives computing to the edge.

AVEVA

The power of AVEVA Connect, our industrial platform

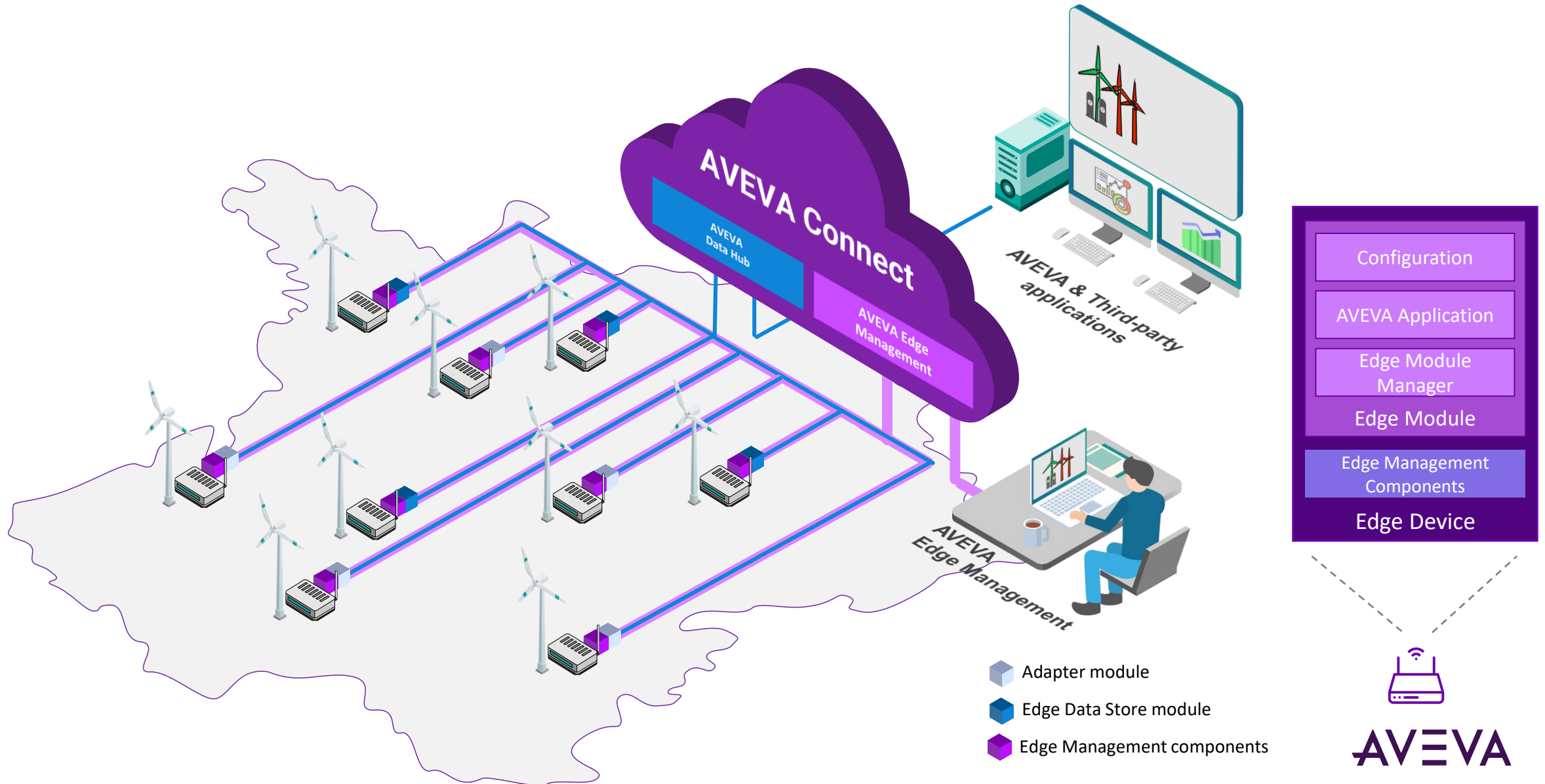Open and neutral platform providing rich data insights for your unified industrial ecosystem

Remote operations monitoring

Data science & advanced analysis

Applications

Data sharing with trusted ecosystem partners

AVEVA Connect

Service & usage management: monitor budget, consumption, and permissions

Data services: aggregation, sharing, and contextualization

Visualization services: rich persona-based experiences

Modeling & analytics: robust calculations using AI and ML

Application development services: solutions to enhance customer use cases

Remote assets

AVEVA data sources

3rd party data sources

AVEVA

The power of AVEVA Connect, our industrial platform

Enabling a hybrid data architecture from edge to cloud

Remote operations monitoring

Data science & advanced analysis

Applications

Data sharing with trusted ecosystem partners

AVEVA Connect

Edge Management
device twin, deployment, and monitoring

Data Hub
aggregation, sharing, and contextualization

Remote assets

AVEVA data sources

3rd party data sources

AVEVA
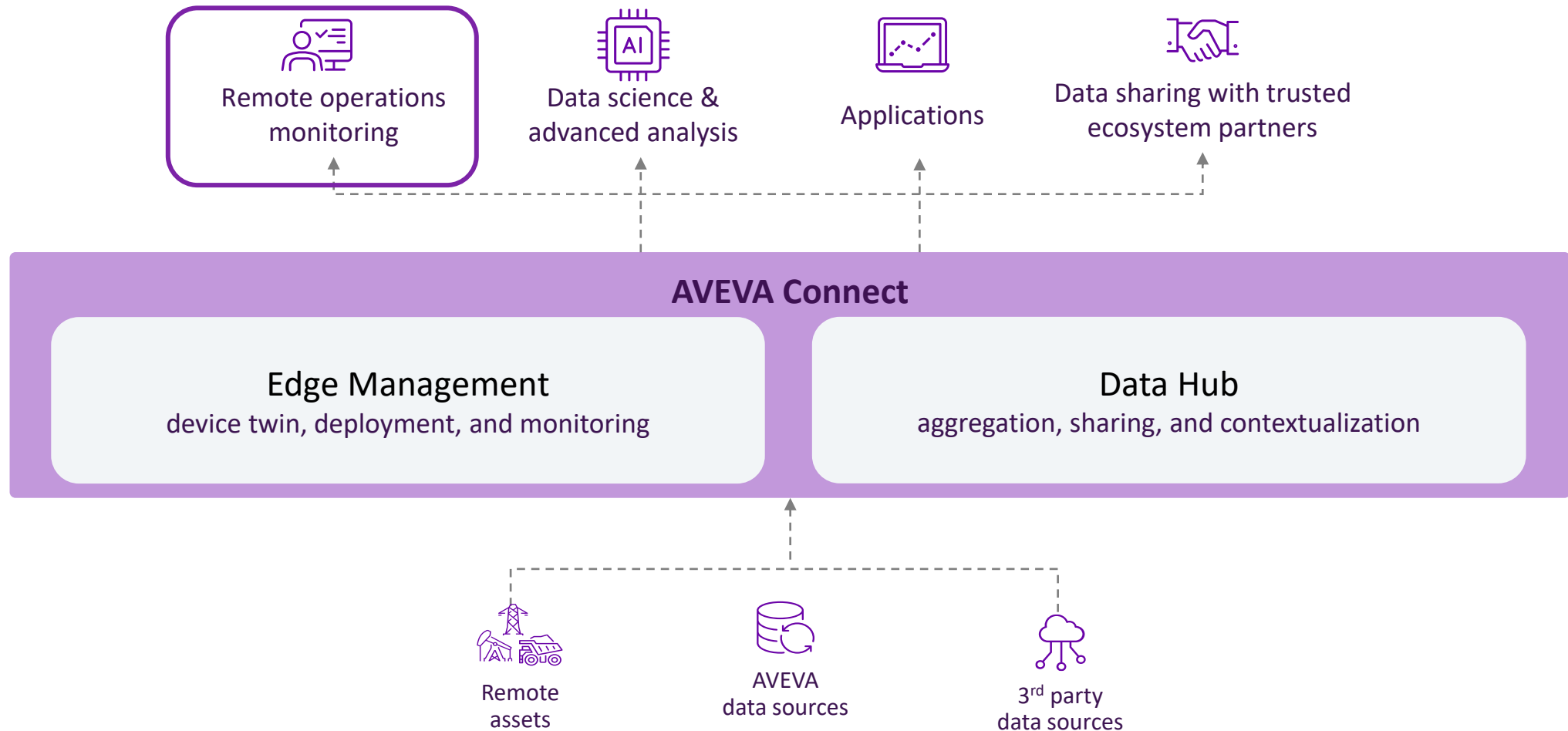
Manage software deployments at scale with Edge Management

AVEVA Connect
AVEVA Data Hub
AVEVA Edge Management

AVEVA & Third-party applications

AVEVA Edge Management

Configuration
AVEVA Application
Edge Module Manager
Edge Module
Edge Management Components
Edge Device

Adapter module
Edge Data Store module
Edge Management components

AVEVA

Edge Management – Push-button Deployment Experience

| 1. Create and configure device twin | 2. Pair and bootstrap device | 3. Deploy software | 4. Manage device and software |

Device List

Device List

Status	Connection	License	Name
NEW			temp 06162023
NEW			OPCUASystemTest2
PUBLISHED			DHARDASeUFF
NEW			Vishwa SS R1
DEPLOYED		✓	AVEVA World Demo Device
NEW			Ryan Test
NEW			Vishwa EDS MQTT
PUBLISHED			MQTTSystemTestGA1
NEW		⚠	JSLinux
NEW			TestTestTest
DEPLOYED		✓	edstest
DEPLOYED		✓	OPCUAARMSTT4
DEPLOYED		✓	EDSARM64SystemTestGA1

Items per page: 16   97 – 112 of 123 |< < > >|

AVEVA World Demo Device

| Summary | Details | Modules | Deployment |

Status   Connection Status   CPU

Connection Status   CPU

📶 Connected   ▦ 2.4 %

Deployment Status   Used Memory

DEPLOYED   ▥ 1.82 GB of 10.15 GB

License   Used Storage

✓   ▤ 5.20 MB of 104.35 MB

366 Days Remaining

☐ Disable Device Monitoring

[Log]

Modules

Name	AVEVA Adapter for MQTT
Description	Edge System Version: 1.4.0.75	Edge Module Manager Version: 1.1.0.15
File Size	

| Modules | Deployment |

ense or leave at zero to use current

	New		
dits/Month	Months	Total	Auto-renew
5	12	60	☑

tal this deployment   60

...sh

[Cancel] [Publish]

AVEVA

Data Hub – Edge System Configuration

AVEVA Connect
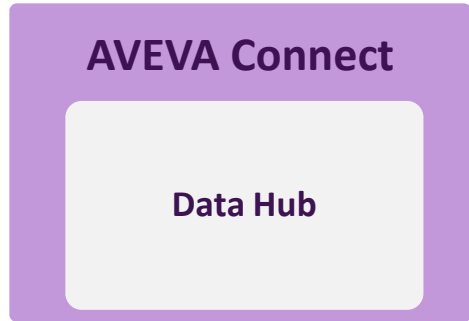
Data Hub

Quick start with default config

Validate edge system config

Templatize/Export edge system config

AVEVA™ Data Hub ▸ Edge Data Store & Adapters

🏠 Home

🗄 Data Management

⮕ Data Collection

📈 Visualization

Σ Analytics

🛡 Security

🔧 Developer Tools

ℹ Support

mqtt_configuration
Type: AVEVA Adapter for MQTT   Version:

JSON Configuration ▾   ✅ No Problem

```
 1  {
 2      "System": {
 3          "Logging": {
 4              "logLevel": "Information",
 5              "logFileSizeLimitBytes": 3
 6              "logFileCountLimit": 31
 7          },
 8          "HealthEndpoints": [
 9              {
10                  "id": "DataHub",
11                  "endpoint": "https://usw
12                  "clientId": "",
13                  "clientSecret": null
14              }
15          ],
16          "Components": [
17              {
18                  "componentId": "OmfEgres
19                  "componentType": "OmfEgr
20              },
21              {
22                  "componentId": "MQTTSpar
23                  "componentType": "MQTTSp
24              },
25              {
26                  "componentId": "MQTT1",
27                  "componentType": "MQTT"
28              }
29          ],
```

mqtt_configuration
AVEVA Adapter for MQTT 1.2.0

Details

✏ ⋮ ✕

⬇ Export Configuration

🗑 Remove

JSON Configuration ▾

Export

```
{
    "System": {
        "Logging": {
            "logLevel": "Information",
            "logFileSizeLimitBytes": 34636833,
            "logFileCountLimit": 31
        },
        "HealthEndpoints": [
            {
                "id": "DataHub",
                "endpoint": "https://uswe.int-datahub.capdev-connect.aveva.com/api/v1
                "clientId": "",
                "clientSecret": null
            }
        ],
        "Components": [
            {
                "componentId": "OmfEgress",
                "componentType": "OmfEgress"
            },
            {
                "componentId": "MQTTSparkplugB1",
                "componentType": "MQTTSparkplugB"
            },
            {
                "componentId": "MQTT1",
                "componentType": "MQTT"
            }
        ],
```

AVEVA

Data Hub – Edge System Health Monitoring

AVEVA Connect
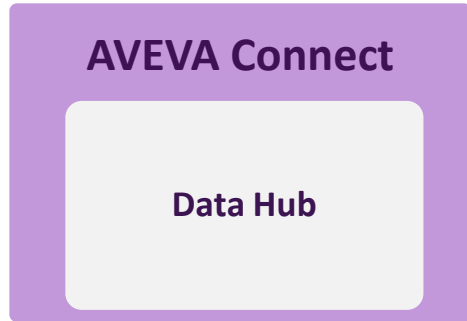
Data Hub

Overview of system health across fleet

Filter by Status, Type, and more

Easy access to edge system configuration

AVEVA™ Data Hub ▶ **Edge Data Store & Adapters**

⚙ Victoria Program ▼   🔔   ❓   👤

Systems ▼   Search for Systems   🔍   ⋮

🔻 Good ⊗ | Starting ⊗ | Lost Communication ⊗ | Device In Error ⊗   ⊞ ☰

Status 📊   ⌃

☑ ✅ Good

☑ ✅ Starting

☐ ⚠ Attempting Failover

☐ ⚠ Connected / No Data

☐ ⚠ Not Configured

☐ ⚠ Server Error

☑ ⚠ Lost Communication

☑ ❌ Device In Error

☐ ⊘ Removed

☐ ⏻ Shutdown

Clear All

Type   ⌃

☐ AVEVA Adapter for Azure Event Hubs

☐ AVEVA Adapter for BACnet

☐ AVEVA Adapter for DNP3

☐ AVEVA Adapter for Modbus TCP

Device Name	Status ↑
AVEVAWorldDemoDevice	❌ Device In Error
zrPI4TestDevice	❌ Device In Error
RMCERLEAN19	✅ Good
rPI4zr	✅ Good
AuroraMeredith	✅ Good
daedalus	✅ Good
zrVictoriaGATestLinuxX64	✅ Good
OPCUASystemTestARM4	✅ Good
OPCUAx64STT1	✅ Good
EDSx64SystemTestGA1	⚠ Lost Communication
USOAKLH3TR5Y2	⚠ Lost Communication
CZFRYL5CNS273	⚠ Lost Communication
derrickvm	⚠ Lost Communication
zrVictoriaGATestLinuxX64	⚠ Lost Communication
zrEflowTest	⚠ Lost Communication

1 – 50 of 85 |< < > >|

Items per page: 50 ▼

❌ **AVEVAWorldDemoDevice**   ✏ ⋮ ✕
AVEVA Adapter for MQTT 1.2.0.59

Details   **Configuration** ⚠

Id	d3ead683-ee50-4fe0-3c1d-08dbc5a94746 📋
Status	**Device In Error**
Memory	**110.1 MB**
Storage Used	**8.2 GB / 12.3 GB** ▬▬▬ 67%
Last Contacted	**a few seconds ago**
Last Modified	
Tags	✏

Components

❌ MQTTSparkplugB1   〰

Health	**Device In Error**
IO Rate	**0 event/s**
Type Count	**Loading Failed**
Stream Count	**Loading Failed**
Error Rate	**0 event/s**

❌ MQTT1   〰

Health	**Device In Error**

AVEVA

Accelerate Time to Value with AVEVA Connect

AVEVA Connect

Edge Management	Data Hub

Push-button deployment of edge software modules	Remote monitoring of software health and status

Standardized applications in disparate remote locations	Configuration authoring and editing experience

Improve visibility to device, software, and connection health

Reduce TCO with centralized device, software, and configuration management

AVEVA

What's Next

AVEVA

What's Next for Edge Data Store and AVEVA Adapters?

Roadmap

Available Now

- **Remote Device Management:** Install & monitor edge modules using Edge Management

- **Edge Data Store and AVEVA Adapter Edge Modules:** Docker images that support remote device management; includes OPC UA & MQTT adapters

- **AVEVA Adapter Failover:** Available with OPC UA & MQTT adapters

In Development

- **Remote Software Management:** Configure & monitor Edge Data Store and AVEVA Adapters from AVEVA Data Hub (*late CY 2023*)

- **Edge Modules for all AVEVA Adapters** (*early CY 2023*)

- **Failover for all AVEVA Adapters** (*early CY 2024*)

Future Consideration

- **Additional AVEVA Adapters:** Connectivity to more sources

- **Asset Handling:** Collect and transfer asset data

- **Event Handling:** Collect and transfer event data

- **Digital Twin:** Collect and transfer 1D data

- **OMF Endpoint Updates:** Assets, events, 1D data, and relationships

AVEVA

Sneak Peek at Data Hub to PI

Rich visualization with AVEVA Connect

Lighthouse Program Success Stories and Highlights

Transportation

Ship — Edge Data Store → PI Server

Automotive Manufacturing

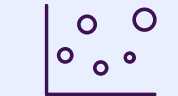Equipment — Edge Data Store → AVEVA Data Hub — → Analytics

Power

Pipelines / Meter — AVEVA Adapter for MQTT → PI Server

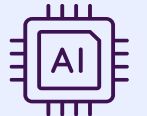**Materials Manufacturing**

PI Server — PI to Data Hub → AVEVA Data Hub — Community Sharing → AVEVA Data Hub ⋮ Predictive Analytics

Interested in Lighthouse Program? Email **lighthouse@aveva.com**

AVΞVA

Recommended Sessions

Enabling end-to-end continuous biomanufacturing by leveraging real-time data in the cloud
Biosana

Wednesday, October 25 @ 8:40am
Room 2004

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

Wednesday, October 25 @ 9:20am
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

AVEVA PI System Portfolio data connectivity update

Wednesday, October 25 @ 11am
Rooms 2001-2003

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

Wednesday, October 25 @ 2:50pm
Room 2004

Extending your PI System infrastructure to edge and cloud
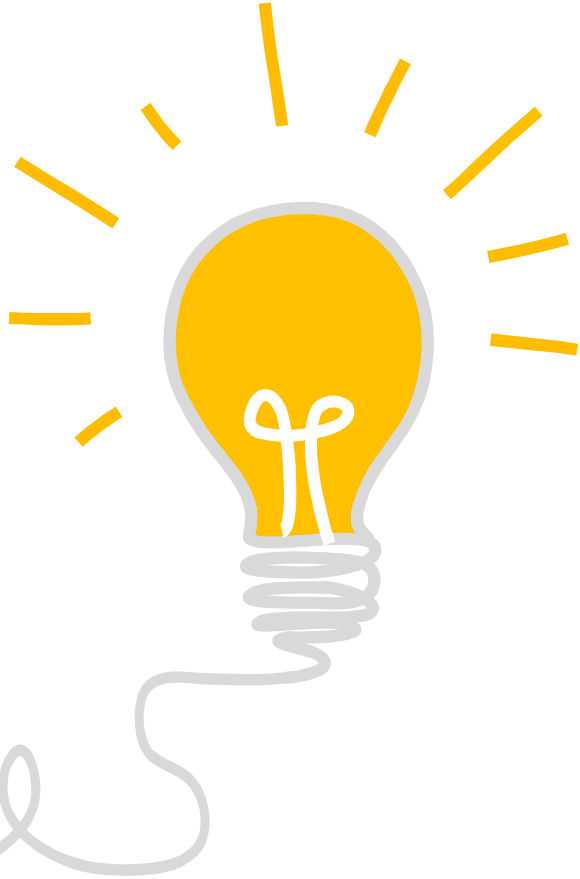
Thursday, October 26 @ 1:30pm
Rooms: 2001-2003

Bringing industrial operations data into your analytics platform with AVEVA Data Hub Data Views

Thursday, October 26 @ 10:45am
Room 2004

Visit us at the AVEVA Data Hub, AVEVA Connect, and Edge and IIoT booths in the Expo Hall!

AVEVA

How can you influence the AVEVA product roadmap?

https://feedback.aveva.com

Let us know your product feedback!

AVΞVA

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AV≡VA

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AVEVA

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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

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