

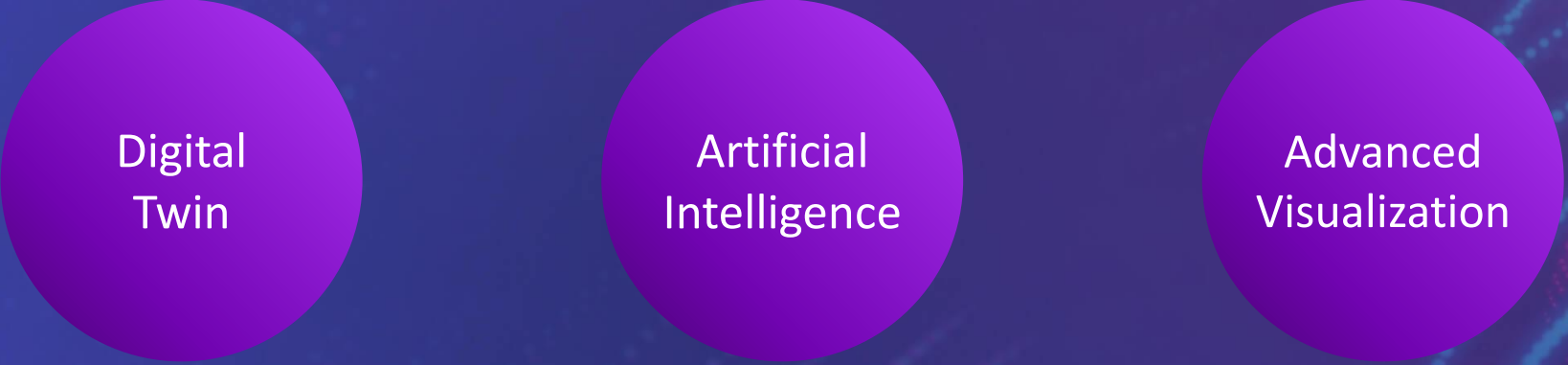
AVEVA PI WORLD

Digital Insights for Industrial Innovation

Andrew McCloskey, CTO & EVP R&D

Colm McCarthy, SVP Portfolio Management

AVEVA



Digital
Twin

Artificial
Intelligence

Advanced
Visualization

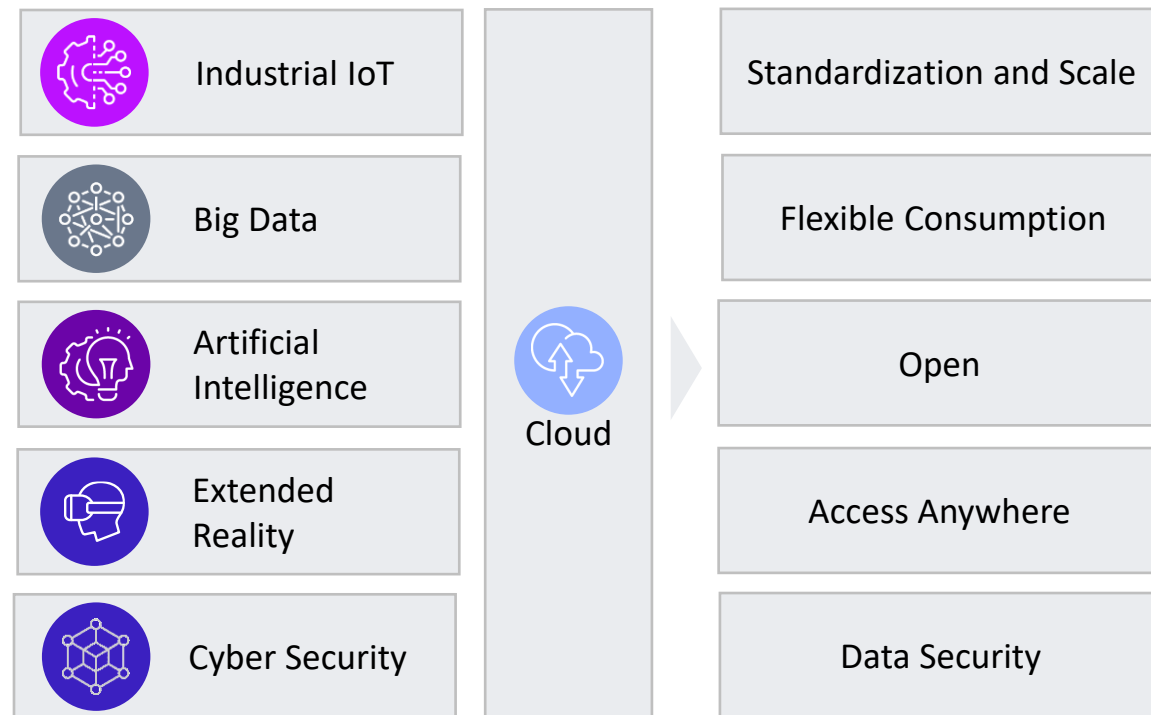
AVEVA

Our portfolio strategy is shaped by the market environment

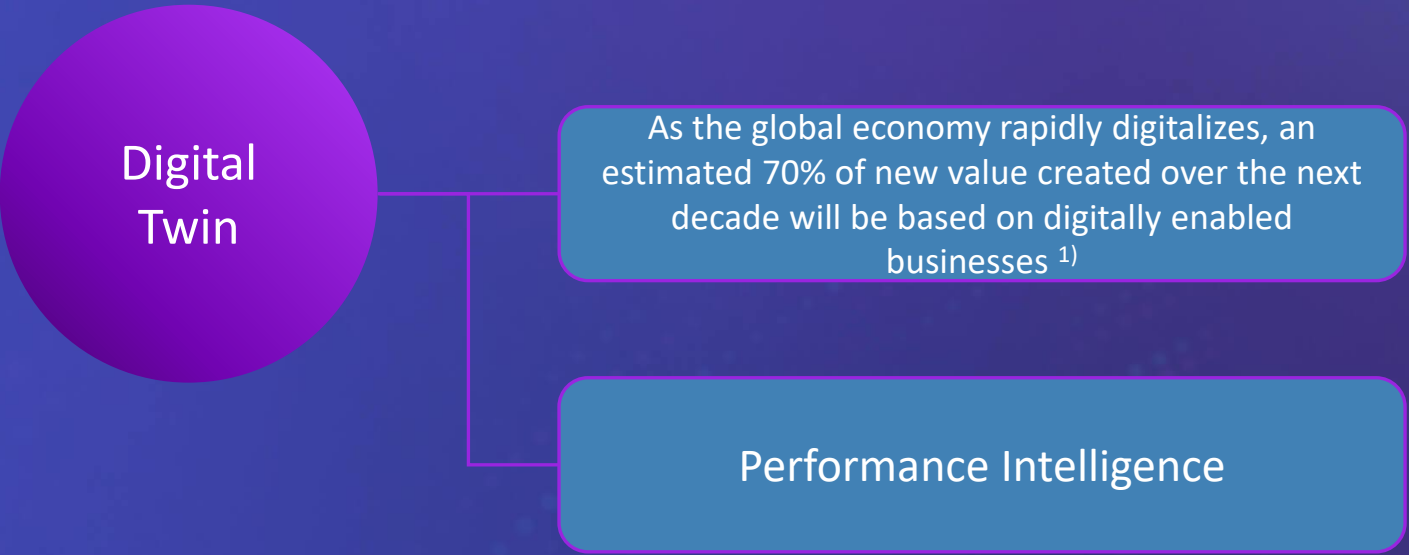
Industry Imperatives



Technology Enablers



Digital Twin



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graph LR; DT((Digital Twin)) --- B1[As the global economy rapidly digitalizes, an estimated 70% of new value created over the next decade will be based on digitally enabled businesses 1)]; DT --- B2[Performance Intelligence];
```

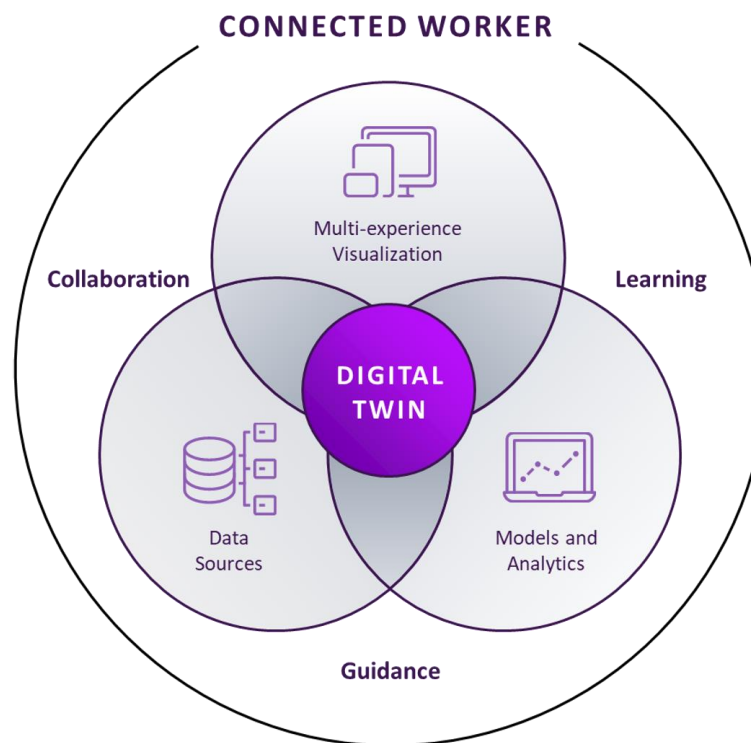
As the global economy rapidly digitalizes, an estimated 70% of new value created over the next decade will be based on digitally enabled businesses ¹⁾

Performance Intelligence

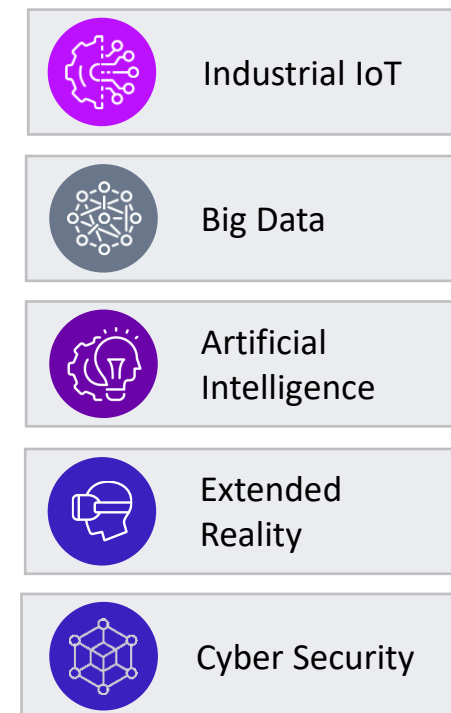
AVEVA

Complete digital thread to empower the connected worker

Industry Imperatives



Technology Enablers

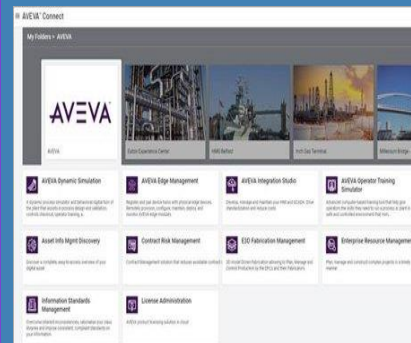


Digital Twin

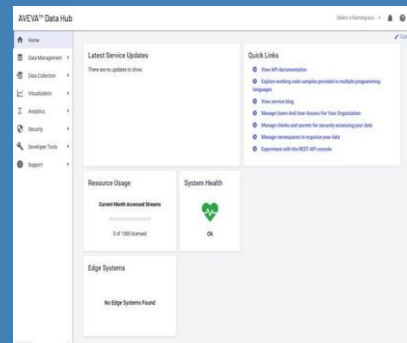
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Performance Intelligence

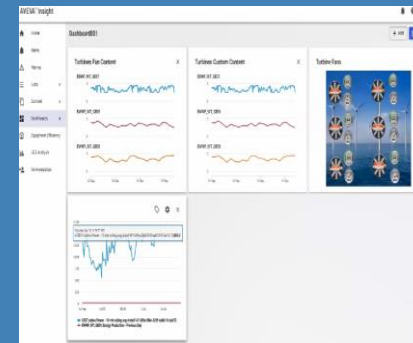
AVEVA Connect



AVEVA Data Hub



AVEVA Insight

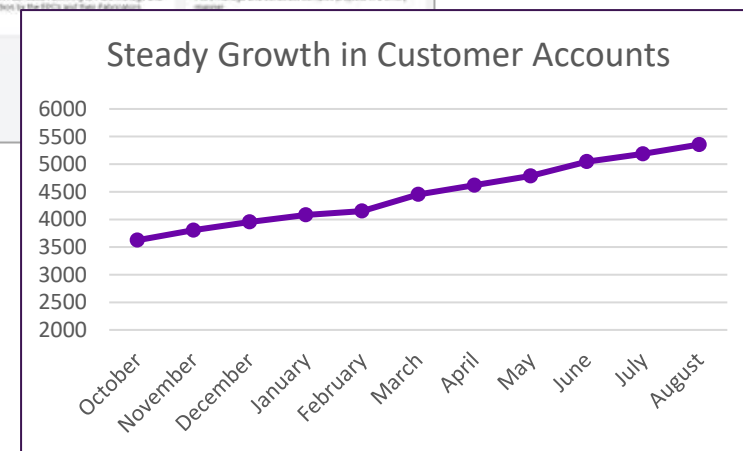
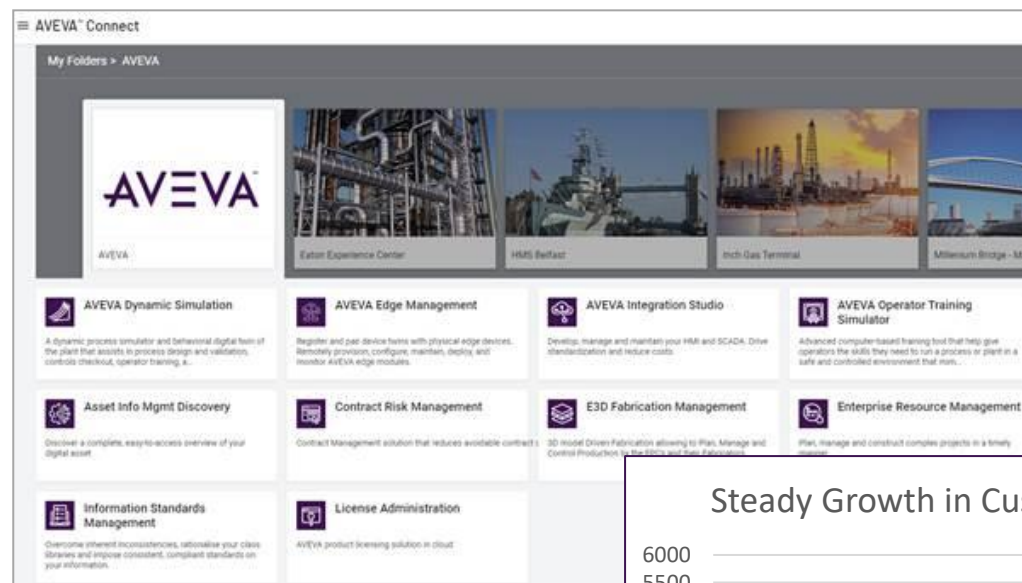


AVEVA

Optimizing your digital twin value via AVEVA Connect

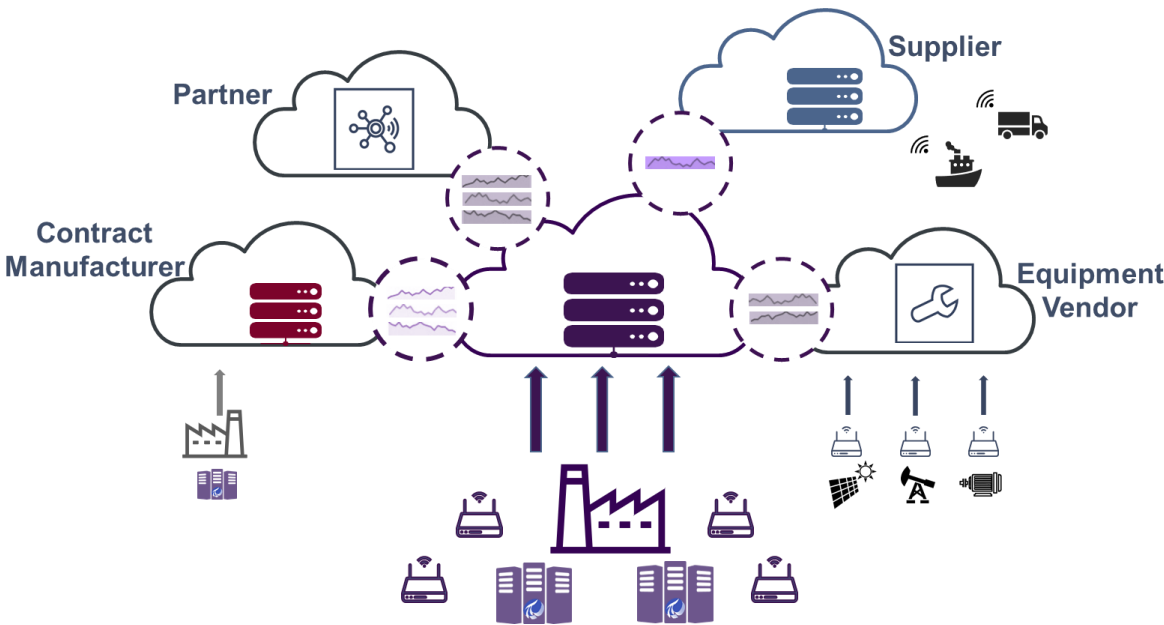
Premier Industrial Cloud Platform

- AVEVA Connect launched in 2018
- Account management, user & role management, product cataloguing and access, and more
- Unique commercial Flex Credit system to easily access AVEVA portfolio
- Federated security model
- Multiple sites managed centrally
- Over **5,000** companies using now & growing
- **100,000+** logins every week
- **25+** AVEVA cloud offers available



AVEVA Connect an Open System

Communities - connecting customers, vendors and partners



AVEVA Developer Network

Home **APIs** Products Scenarios Reports Profile Sign out

APIs

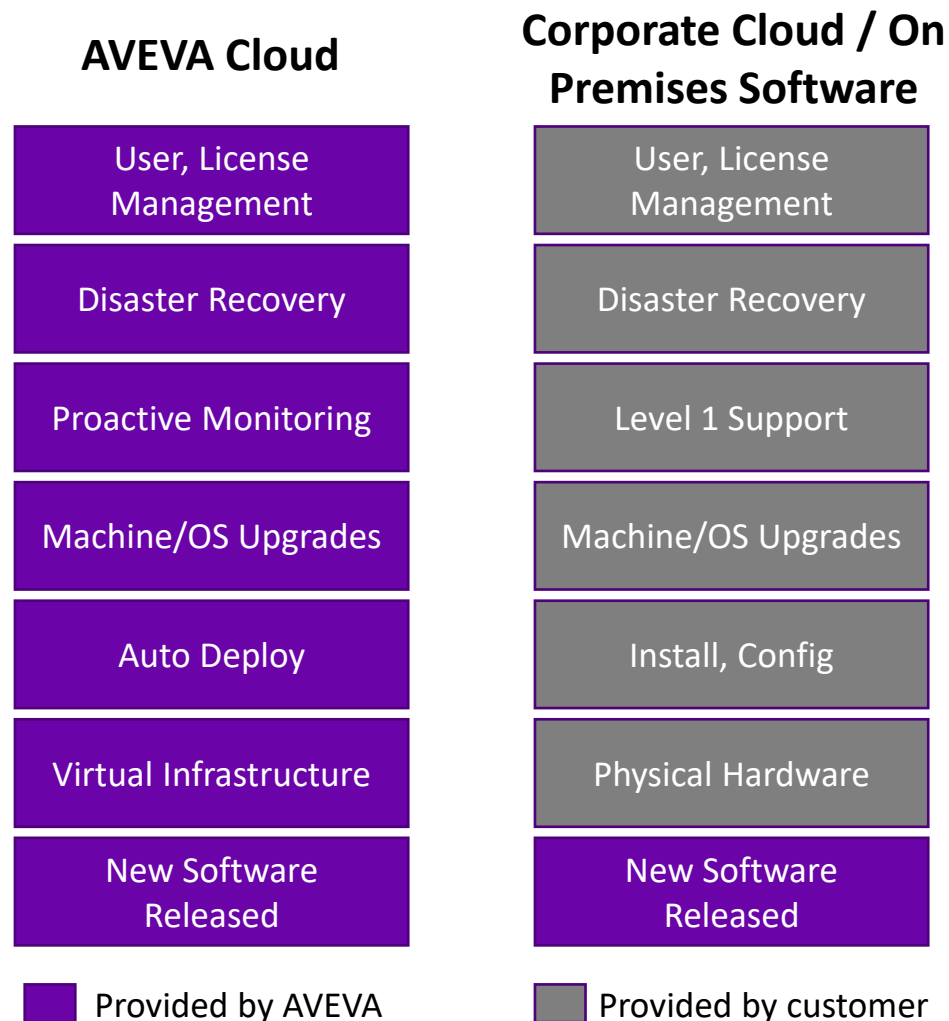
Search APIs Group by tag

Name	Description
Account Management	
Account Management - v1	Manages AVEVA Connect Accounts
Storage Blob Service	Blob Service for Storage
Storage Management - v1	Manages Storage
Storage SignalR - v1	Manages Storage SignalR
Subscription Management	CCP Subscription Management Service
Usage Management	CCP Core Usage Management API
User and Access Management - v1	Manages User Membership and Authorization
User and Access Management - v2	Manages User Membership and Authorization

Formal Connect SDK in development now for release in 2022

AVEVA's 24x7 cloud monitoring to ensure high availability

- World class AVEVA Cloud DevOps team - located across three continents in high coordination
- Every new software release productized and automatically deployed
- Proactive monitoring
- Incidence response with transparency and quick resolution
- **99.95% average uptime** achieved across all AVEVA cloud offers over the past 12 months!



AVEVA Connect and all products follow robust Security program

AVEVA is dedicated to serving our customers in their mission to operate safe and reliable systems in the face of ever-evolving challenges

Security Development Lifecycle

- Products with built-in security
- Use best available security tools
- Integrate agile DevOps methods

Operational Assurance

- Use leading security services
- Monitor continuously
- Integrate assurance activities

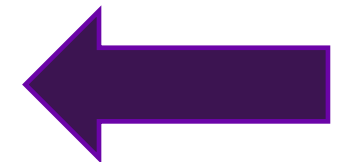
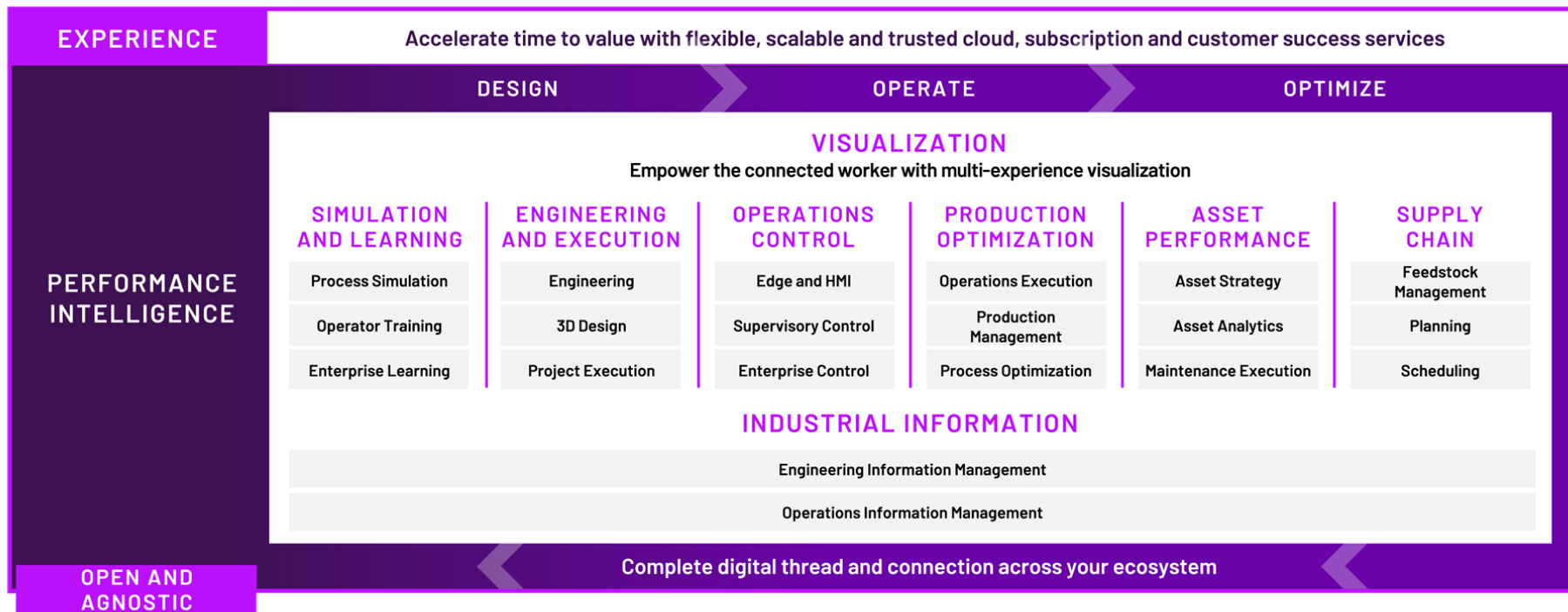
Constructive Engagement

- Partner with our customers
- Learn from security experts
- Collaborate with stakeholders



Digital twin core is at the information layer

We are investing heavily to ensure your investment in the PI System continues to provide high returns



Add value to your existing PI System investment via the Cloud

Why the cloud



Available

Your data is available everywhere you go, whenever you need it.



Empower

Elastic scale beyond traditional systems. Interconnectivity with advanced analytics.



Managed

Rely on management by the experts, reducing your support burden.



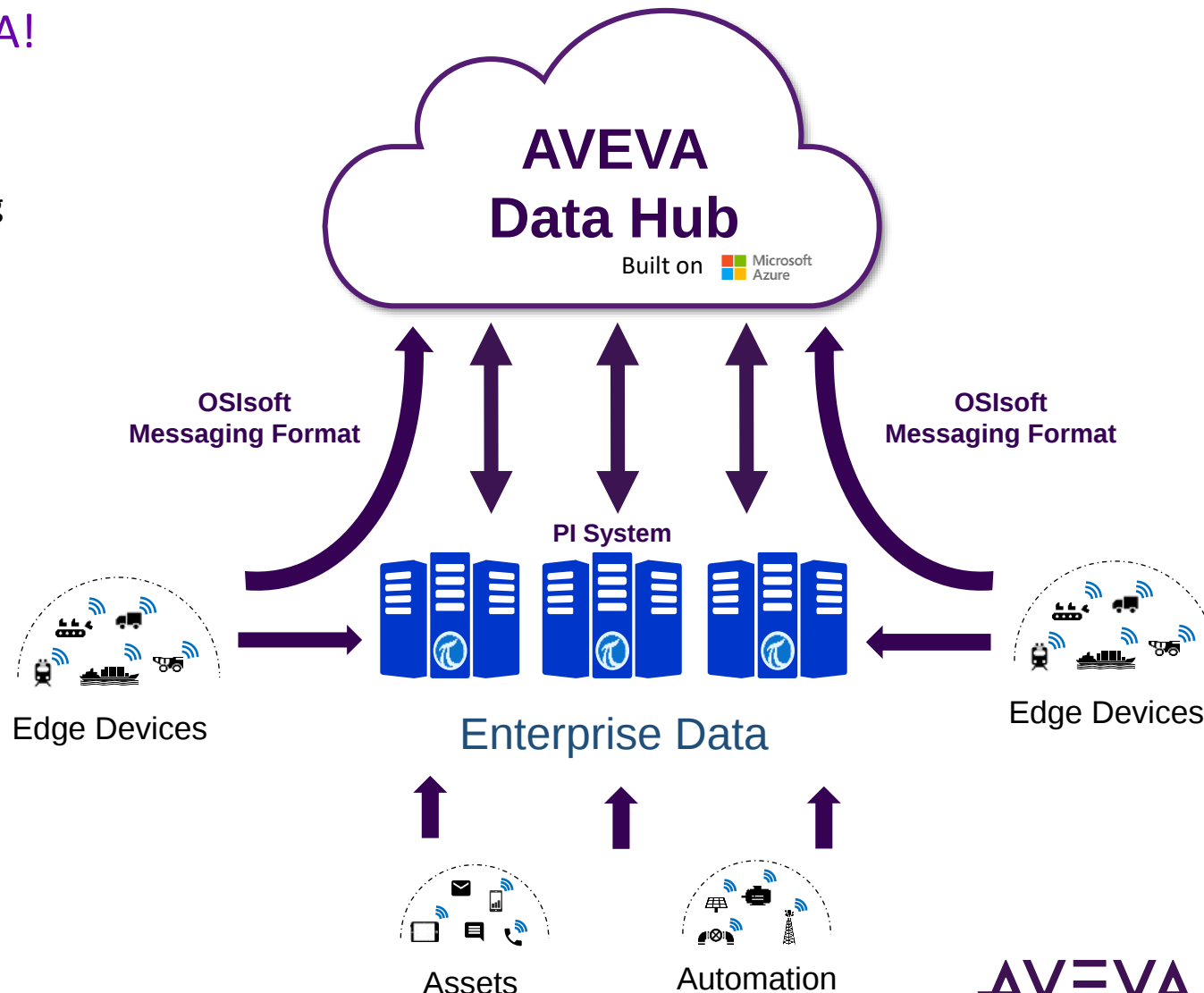
Connect

Share data with your community of vendors, service providers and business partners through simplified central security.

Add value to your existing PI System investment via the Cloud

No one knows your data better than AVEVA!

- AVEVA Data Hub purpose built for the cloud
 - Microservice design for low TCO and ease of expanding
 - Secure
 - Isolated
 - Years in development (formerly called OCS)
 - Built on top of Microsoft Azure
- Functionality we've wanted to add for years
 - Advanced data shapes
 - Complex indexing
 - Auto-generation of metadata and assets
 - Scale
- Tight coupling with the PI System
 - Bi-directional transfer optimized at both ends
 - Maintains granular authorization
 - Accurate data representation

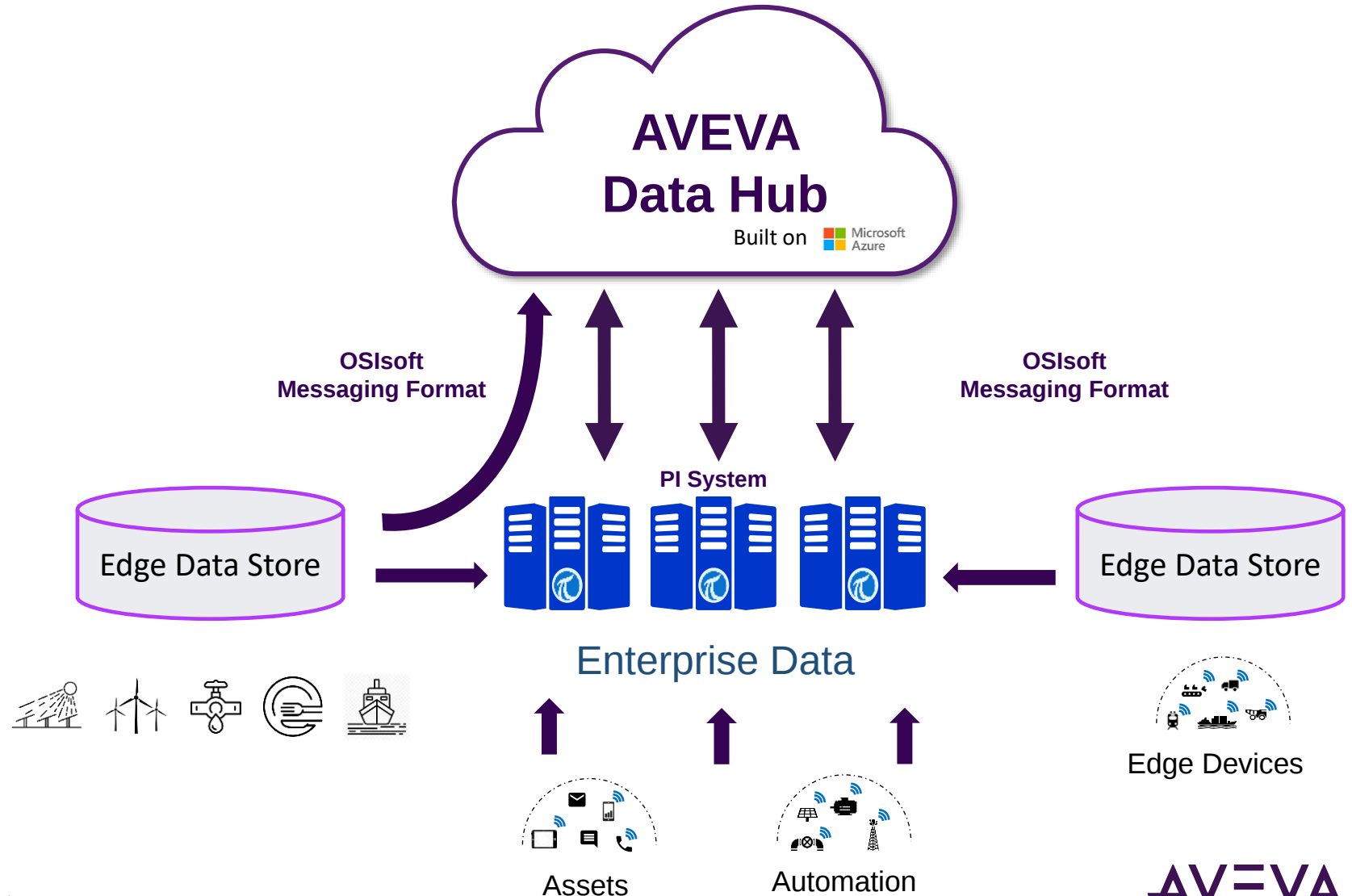


AVEVA

Add value to your existing PI System investment via the Cloud

And to the Edge

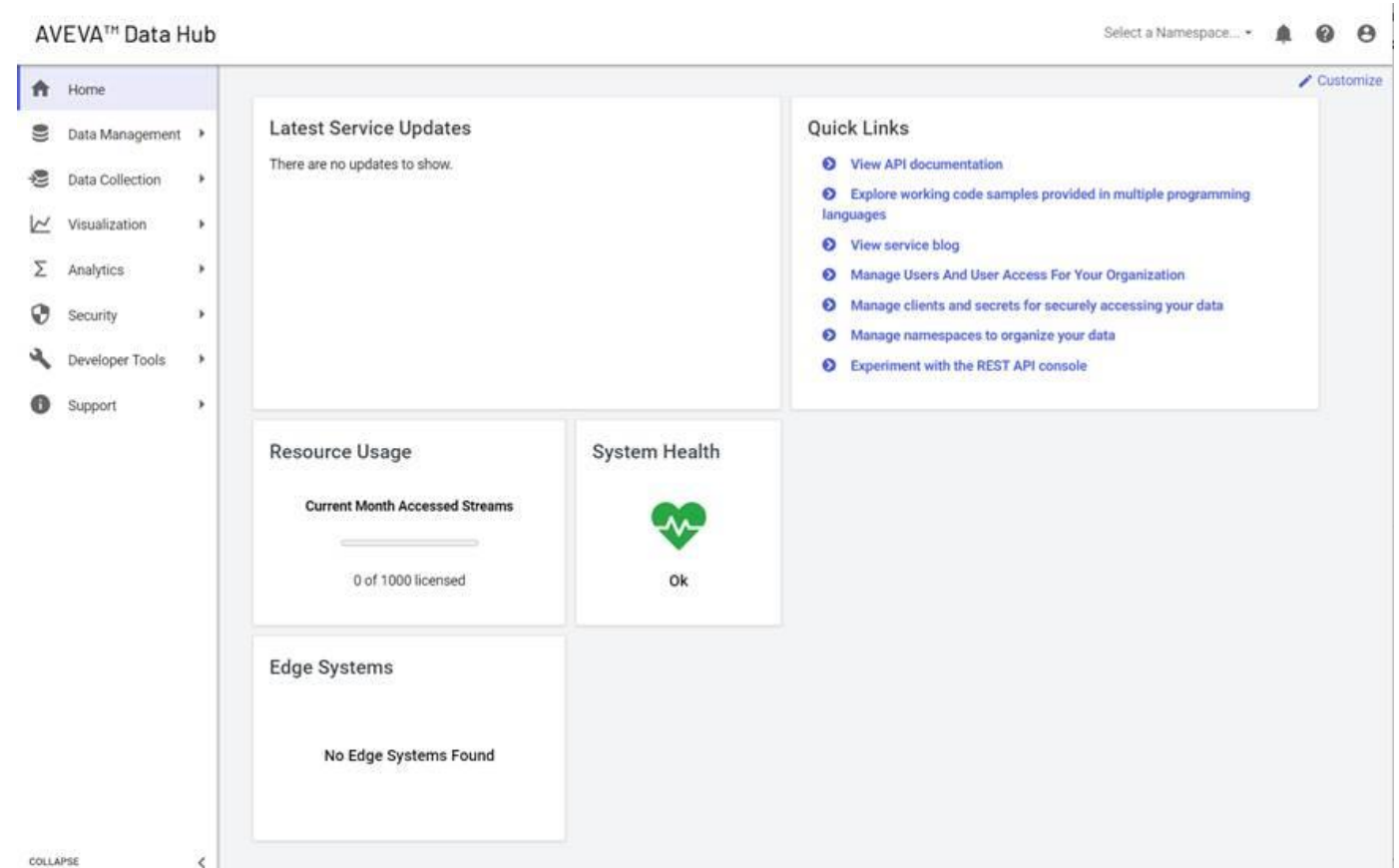
- Path to the cloud leads to the edge as well
- Edge Data Store
 - Cloud archive on devices
 - Useful at remote locations
 - Supports Adapters
 - Supports third parties
- Tight coupling with the PI System and Data Hub
 - Interconnects with Operational Information Data Stores
 - Low-effort integration



AVEVA Data Hub Integrated with AVEVA Connect

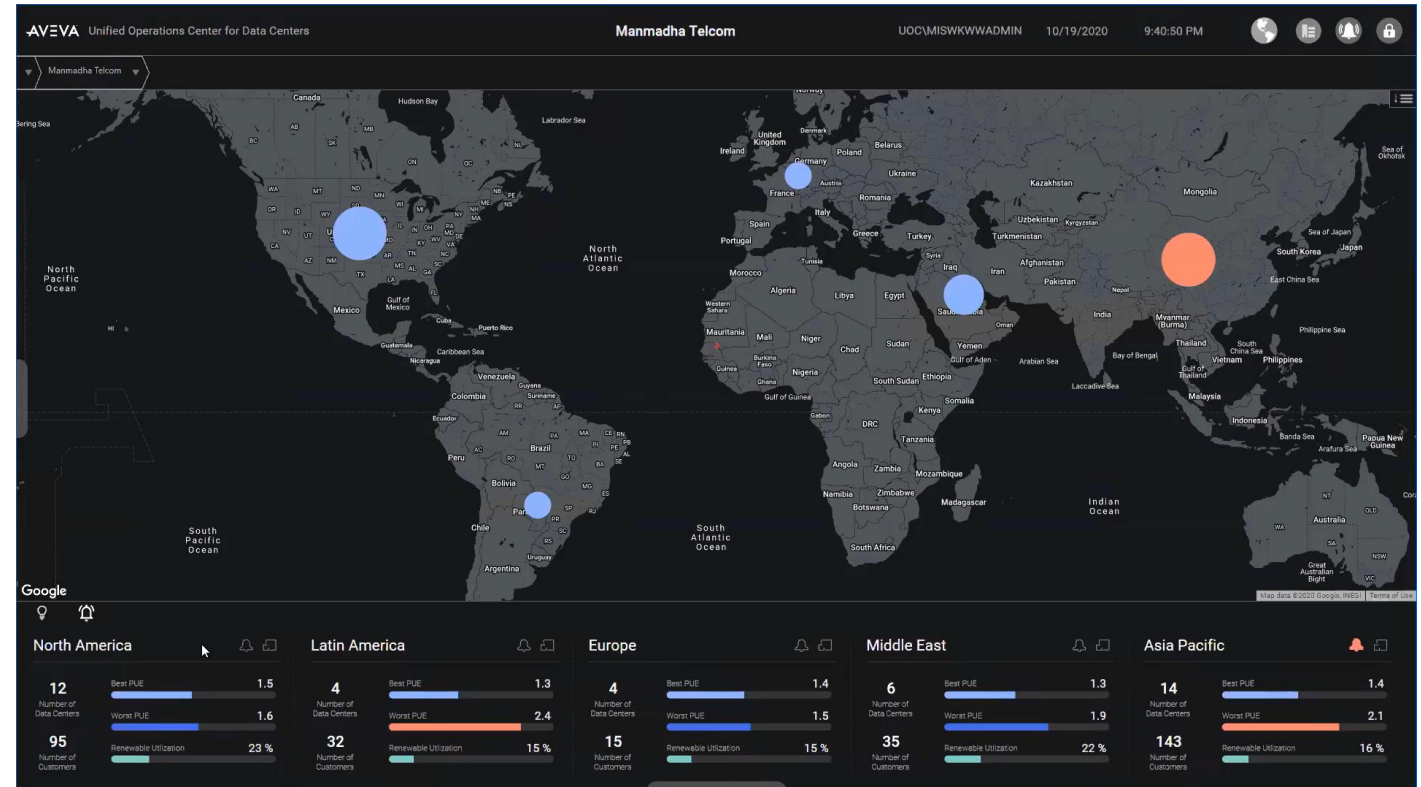
Enables common user experience and access to broader portfolio

- AVEVA Connect integration includes:
 - Single sign-on with federated IdP
 - Support for flex credits
 - Provisioning via Connect folders
 - AVEVA Cloud DevOps monitoring
 - Adoption of AVEVA UX guidelines
- Customer value:
 - Ease of use
 - Ease of administering AVEVA software
 - Flexibility of commercial license
 - Access to entire AVEVA Cloud Portfolio
 - Highly secure



AVEVA Data Hub advanced visualization - UoC

- AVEVA Unified Operations Center (UoC)
 - Enterprise offer in our market leading HMI portfolio
 - Now works seamlessly with on-prem PI System and soon with AVEVA Data Hub (for multi-site aggregation and analysis)
 - Provides visual contextualization for
 - Operational data
 - AVEVA applications (and associated data)
 - 3rd party applications
 - 3rd party data sources
 - Custom applications
 - More...
- **Operational excellence is primary outcome!**



AVEVA Data Hub advanced visualization - Insight

- AVEVA Insight
 - Cloud-based visualization service
 - Self-service and fast (dashboards up in minutes)
 - Binds the power of the cloud and AI
 - Brings data to everyone to unlock new use cases / new ways of finding value in your data
 - Browser or mobile app
 - Can be consumed by UoC for full operational value
- **Powerful yet extremely easy to use**

The screenshot displays the AVEVA Data Hub interface for the 'Namespaces' section. The left sidebar contains navigation links: Home, Data Management (selected), Data Collection, Visualization, Analytics, Security, Developer Tools, and Support. The main content area shows a table of namespaces with columns: Region, Id, Description, and State. The table lists five namespaces, all in an 'Active' state. Below the table, a large text overlay reads: 'Take full control of your data using AVEVA Data Hub'. On the right, the 'Details' panel shows the 'Information' tab with an overview of the selected namespace, including Tenant Id, Namespace Id, Description, Region, State, Type Count, and Stream Count.

Region	Id	Description	State
West US	Production_SaaS	Production environme...	Active
West US	Production_CSA	Production environme...	Active
West US	Production	Production environment	Active
West US	Development	Development environ...	Active
West Europe	OSIsoftEMEA	OSIsoft EMEA OCS Na...	Active

Take full control of your data using
AVEVA Data Hub

Overview

Tenant Id	fd328631-61dc-4b31-86cb-42501786abc5
Namespace Id	Production_SaaS
Description	Production environment
Region	West US
State	Active
Type Count	29
Stream Count	9737

Artificial Intelligence

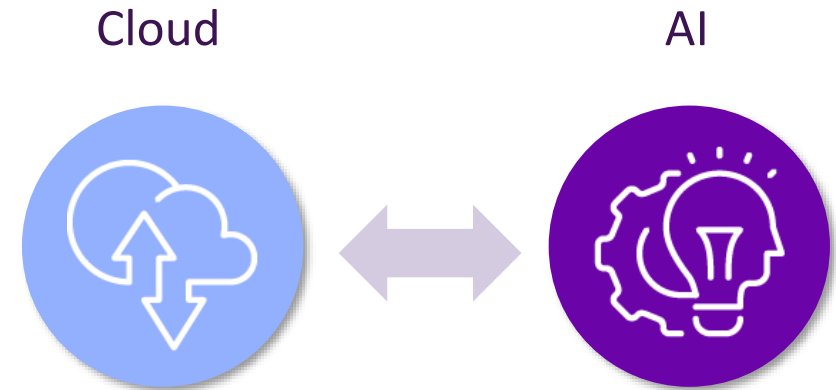
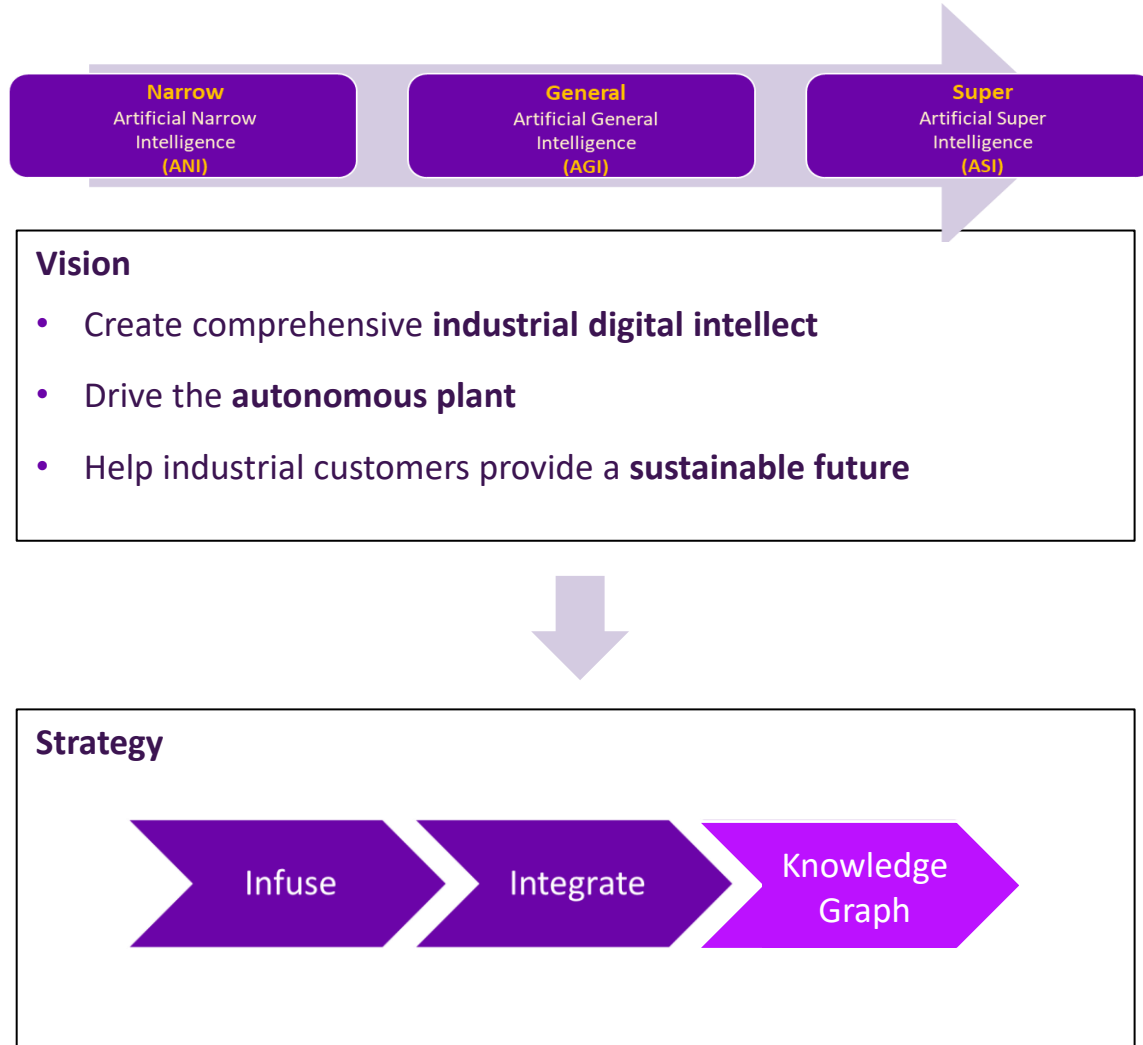
Global data usage will increase from 33 zettabytes in 2018 to 175 zettabytes by 2025 – increase of 430% ¹⁾

Integrated

Integrated

Knowledge
Graph

AVEVA AI



Cloud enables the reach
AI establishes the intellect



AVEVA Industrial knowledge Graph

OFFERS

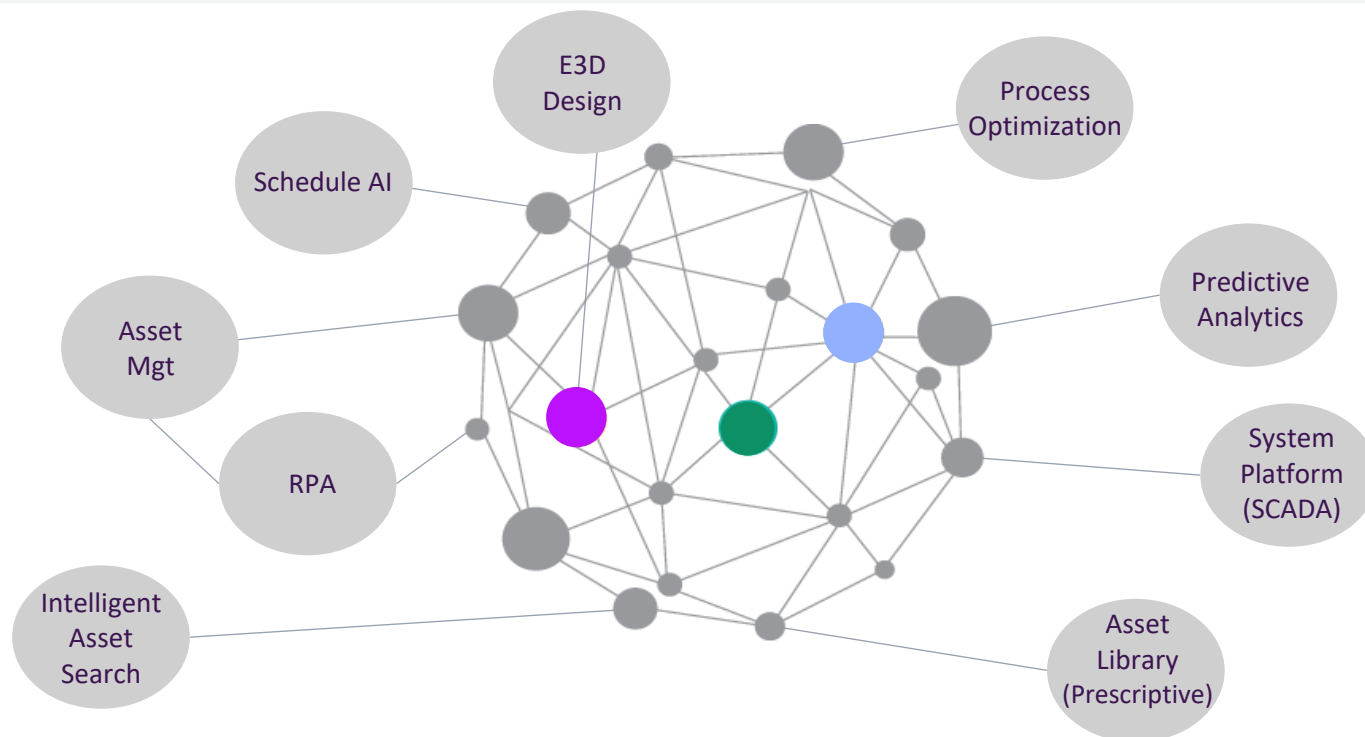
AVEVA
Insight

AVEVA Unified
Operations Center

AVEVA Unified
Supply Chain

AVEVA Unified
Engineering

INTELLECT



DATA

Operational

Maintenance

PI System

Data Lakes

Other Data Historians

Engineering

Performance

Asset

Cloud

Third-party sources

Drive Operational Resilience
and Agility

Engage and Empower the
Connected Worker

Enable Autonomous Operations

Enhance Sustainability

AVEVA

Artificial Intelligence

Global data usage will increase from 33 zettabytes in 2018 to 175 zettabytes by 2025 – increase of 430% ¹⁾

Integrated

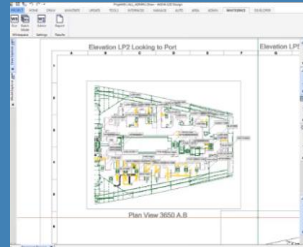
Integrated

Knowledge Graph

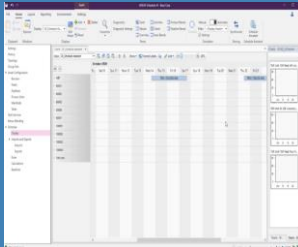
Digitizing Brownfields



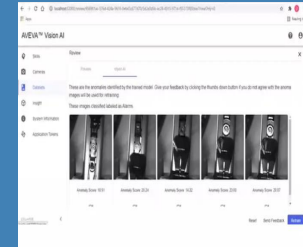
Whitespace Optimizer



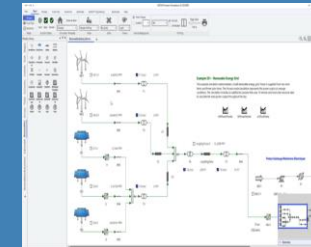
Schedule AI Assistant



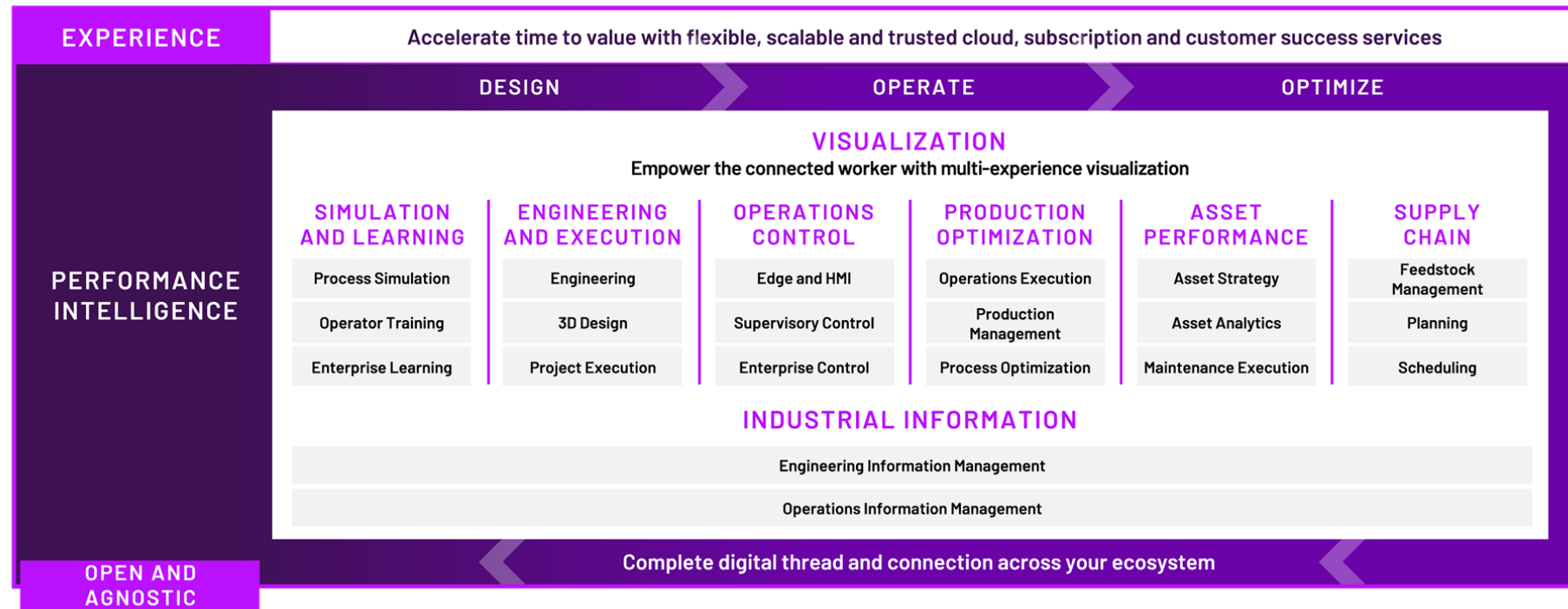
Vision AI



Process Simulation



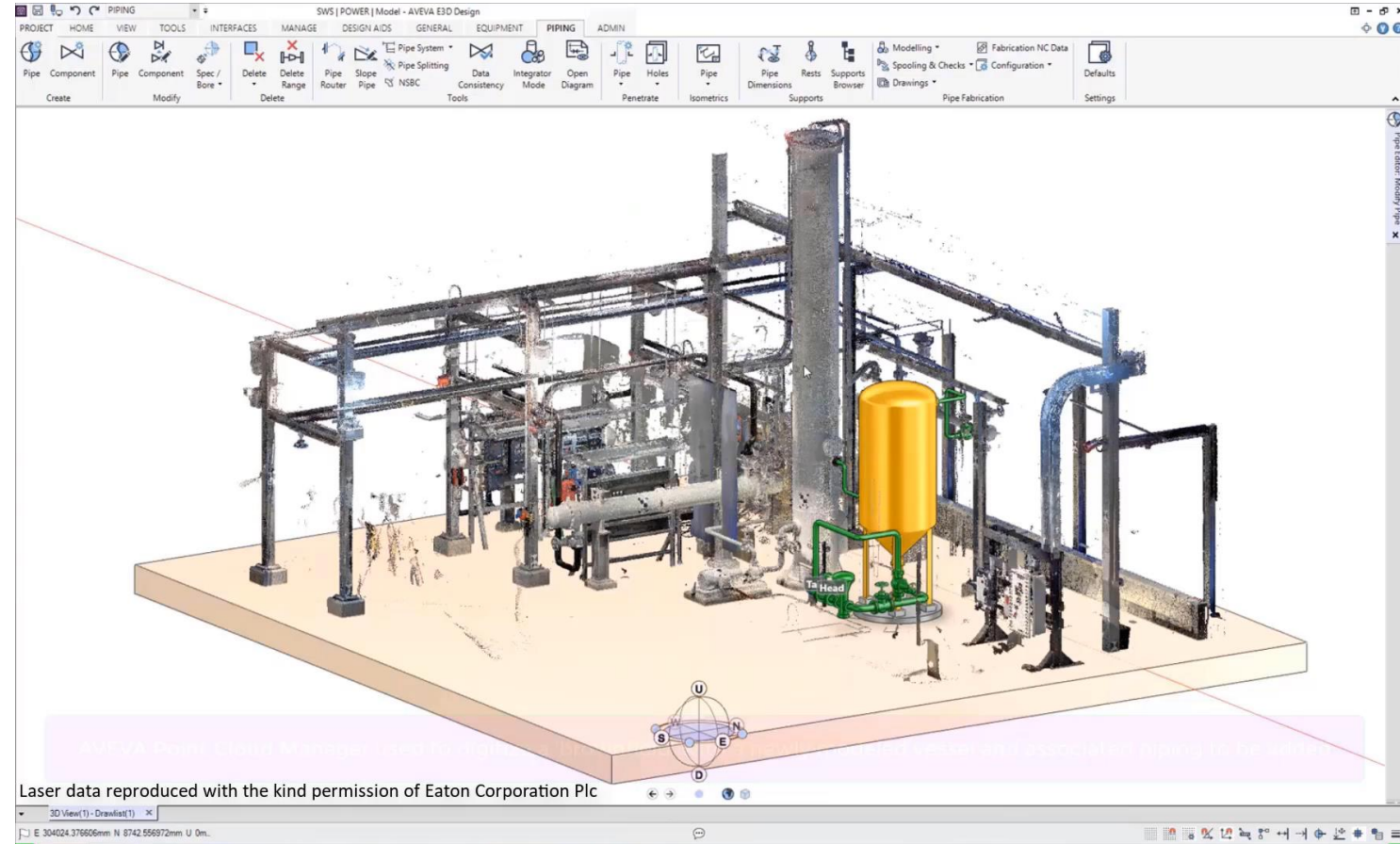
AI and advanced analytics expanding throughout our portfolio



Enabling AI via digitally transforming brownfield sites

Incremental approach toward digitizing existing assets and realizing benefit

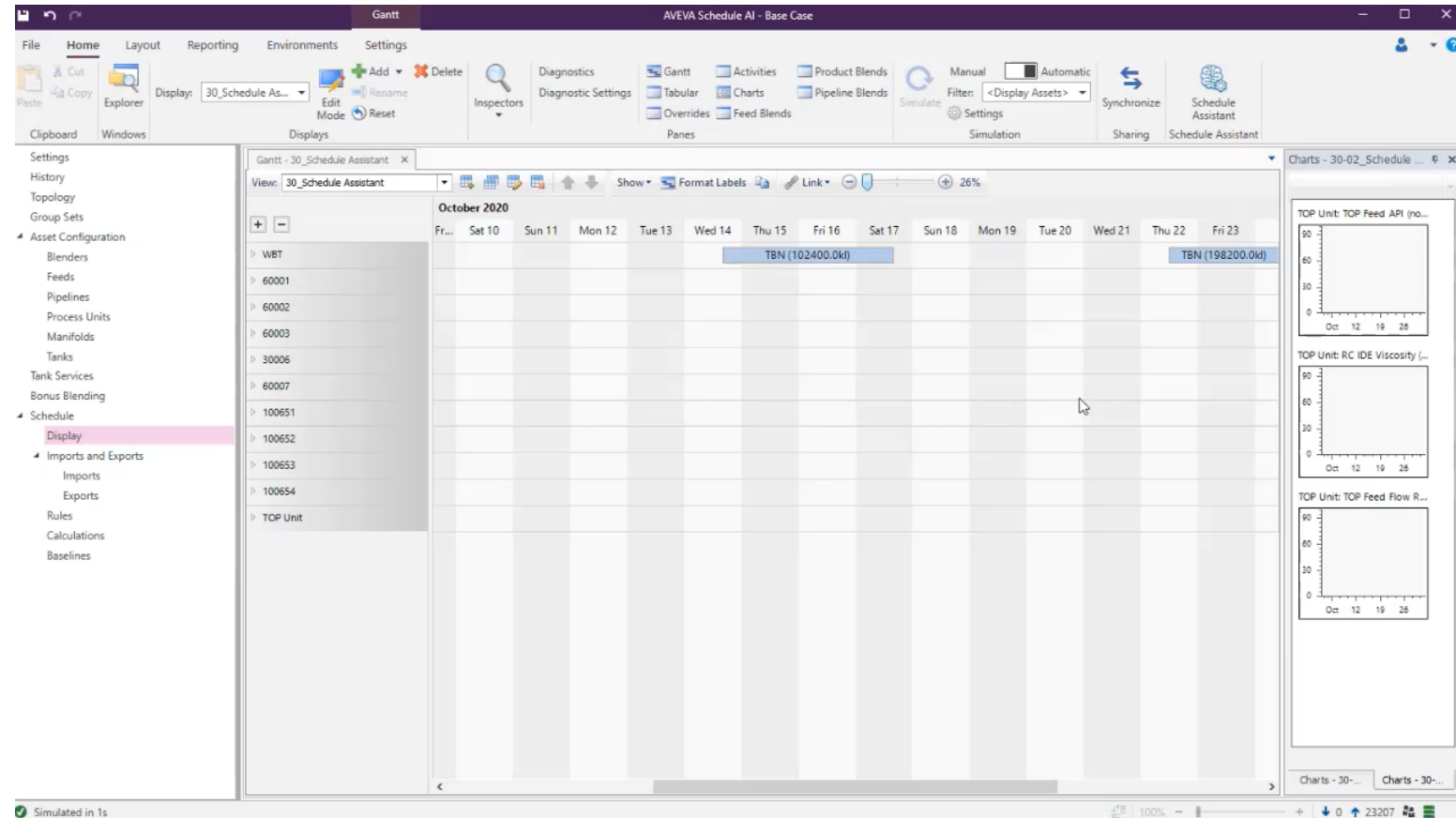
- AVEVA Point Cloud:
 - Is first step towards leveraging power of AI and First Principles
 - Fully integrated with AVEVA Connect
 - Laser scan to E3D (our design software) and Process Simulation in lower possible time
 - Provides digital representation of your assets
 - Enables all of the benefits of going digital – including tapping into the power of AI



Schedule AI Assistant recommends best possible schedule

Decision support in seconds

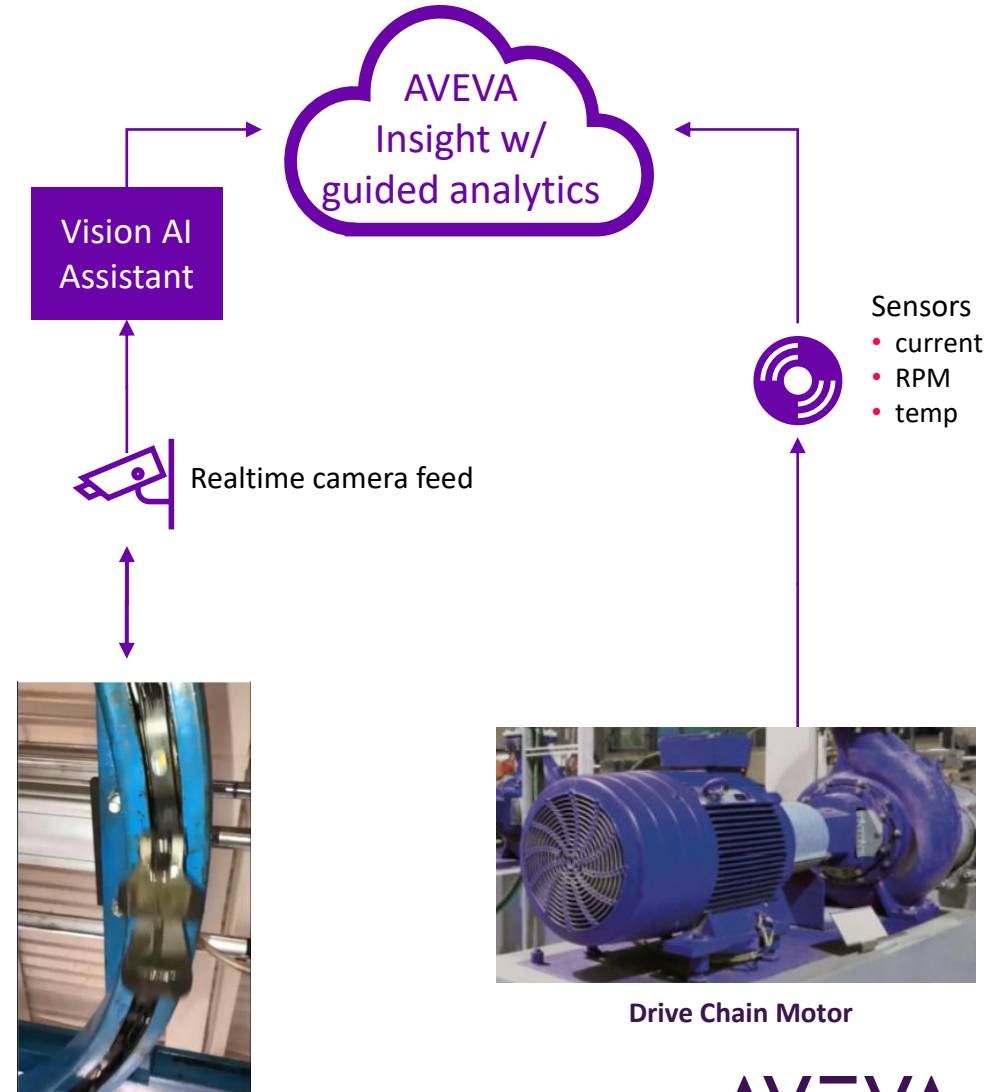
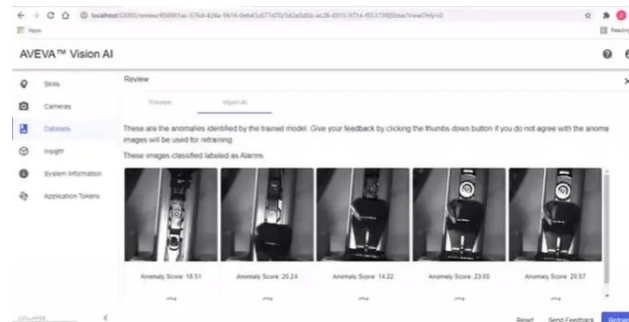
- Schedule AI Assistant
 - Applies AI algorithms and complex math to run through thousands of schedule options
 - Selects best option based on defined priority (CO2 emission, product specifics, profitability, etc.)
 - Leverages AVEVA Calculation Hub to automatically spin up required CPU's to perform all calculations quickly



AVEVA Vision AI Assistant has multiple high value uses

State-of-the-Art Manufacturing

- Vision AI Assistant
 - Provides real-time AI analysis of camera feeds on the factory floor
 - Proactively finds issues that are extremely difficult to detect with naked eye
 - Works with any camera
 - Shown here applied to overhead factory chain where unexpected failures cost over \$150K per year at the site installed
 - Fully integrated with AVEVA Insight to visualize results and act proactively

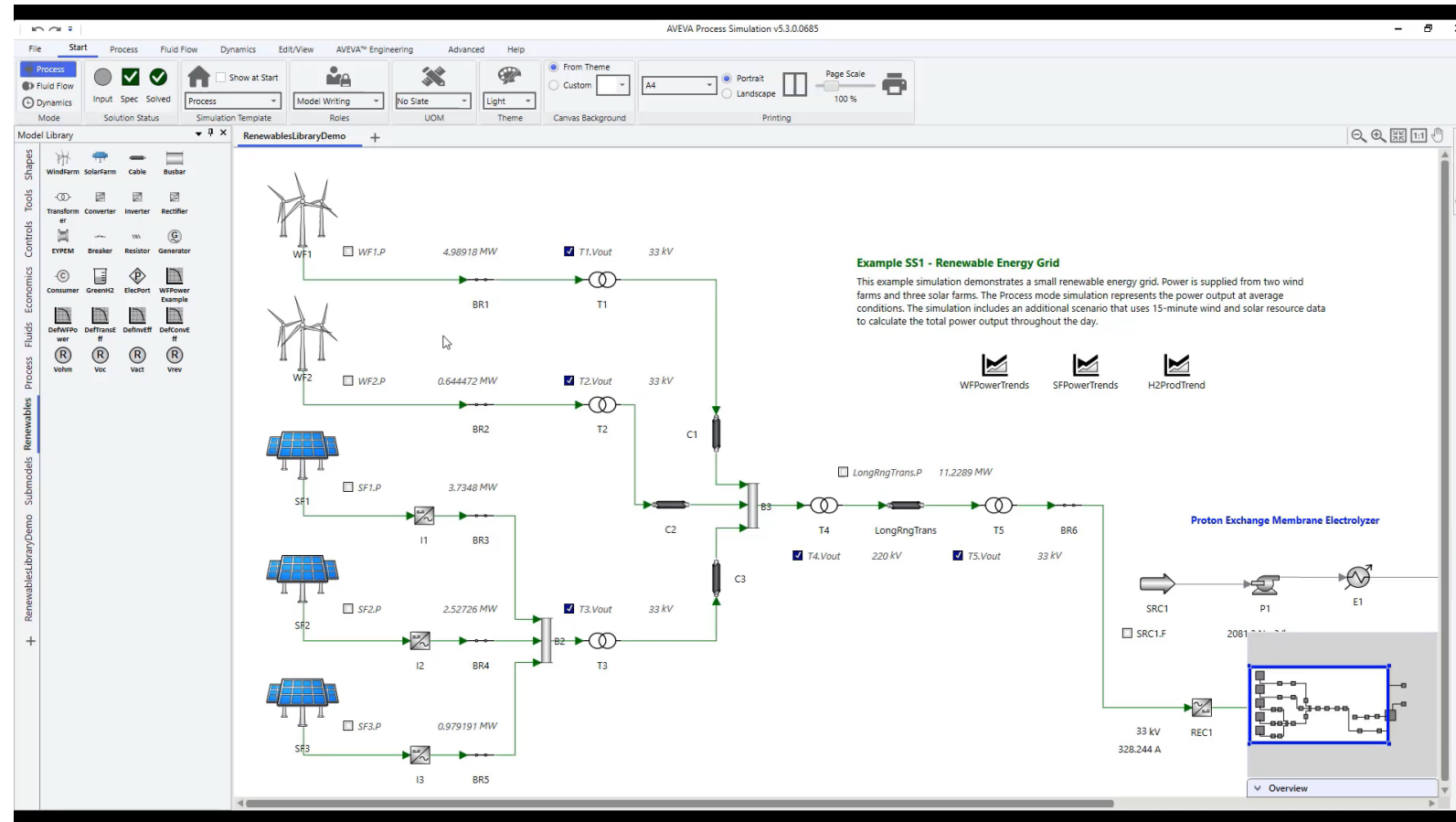


Overhead Factory Drive Chain

Advanced analytics provided in AVEVA Process Simulation

First principles modeling offer absolute predictive insights into complex manufacturing processes

- AVEVA Process Simulation
 - Uses applied first principles to solve very difficult customer challenges
 - Provides seamless switching between steady state, rating, and dynamic modes of processes to optimize systems
 - Enables process engineers to customize and easily add new equipment models to solve new problems
 - Our latest version comes with built-in renewable energy models, hydrogen models, and CO2 optimizing (reducing) hydrocarbon & chemicals models

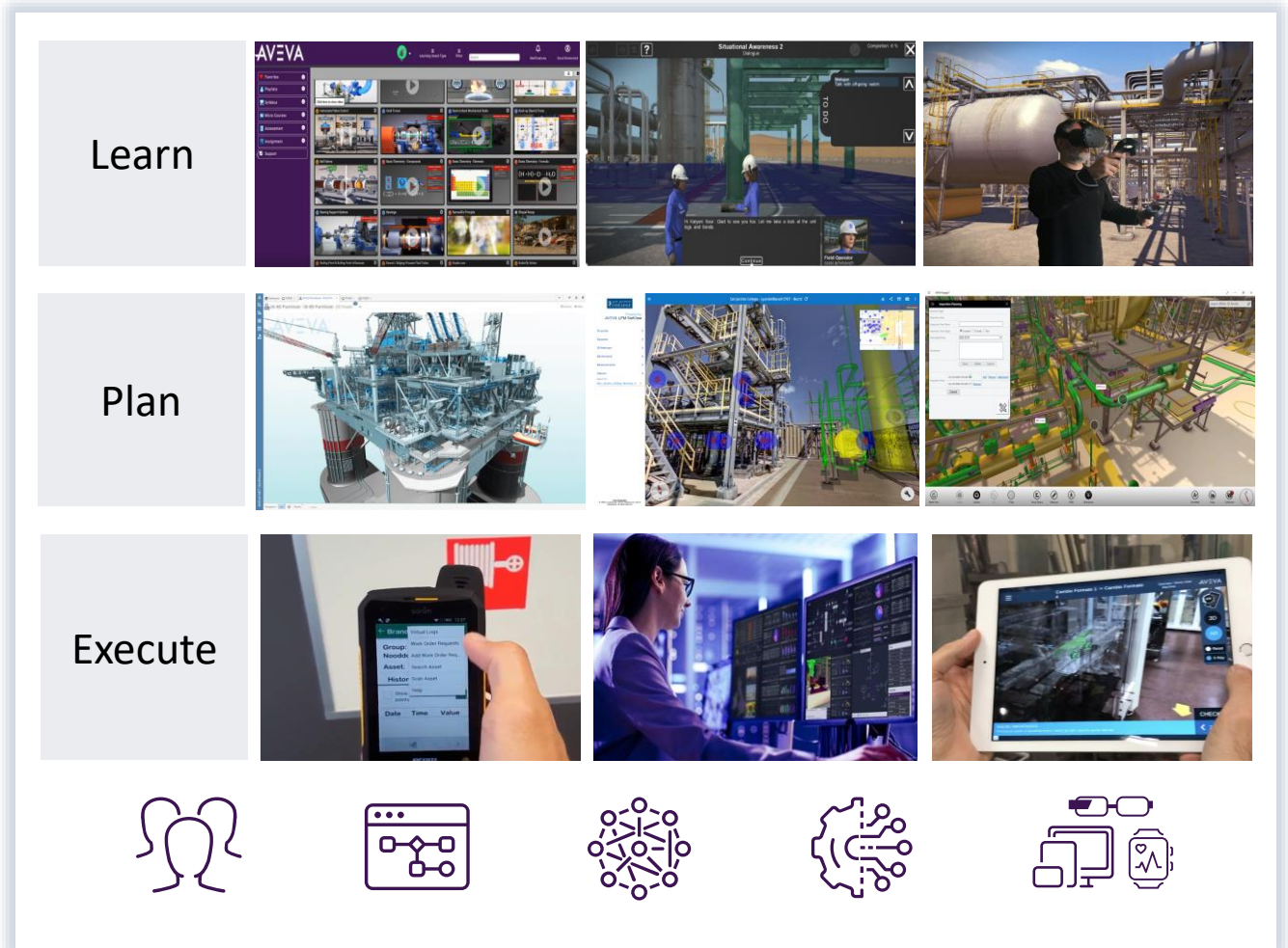


Advanced Visualization

73% of industrial organizations have
started Connected Worker initiatives ¹⁾

Empower the Connected Worker

Empowering the Connected Worker

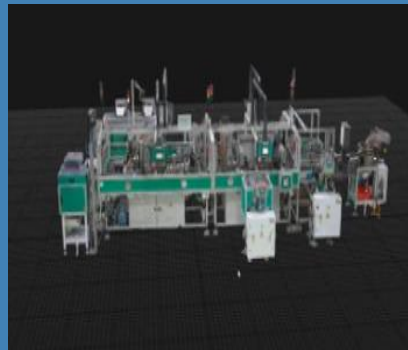


Advanced Visualization

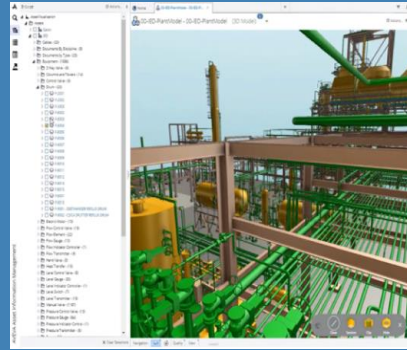
73% of industrial organizations have started Connected Worker initiatives ¹⁾

Empower the Connected Worker

Equipment



Facility

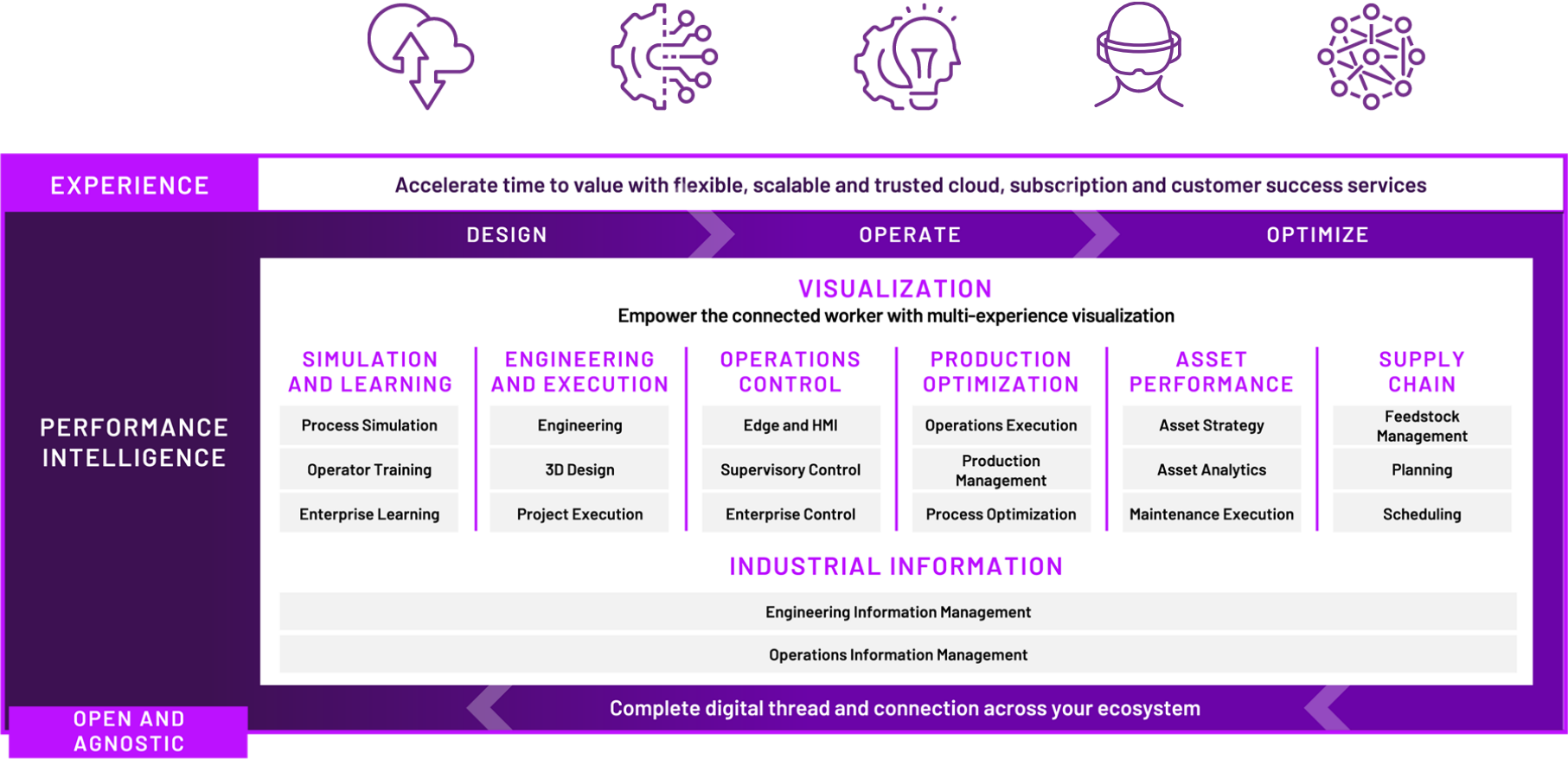


Immersive



AVEVA

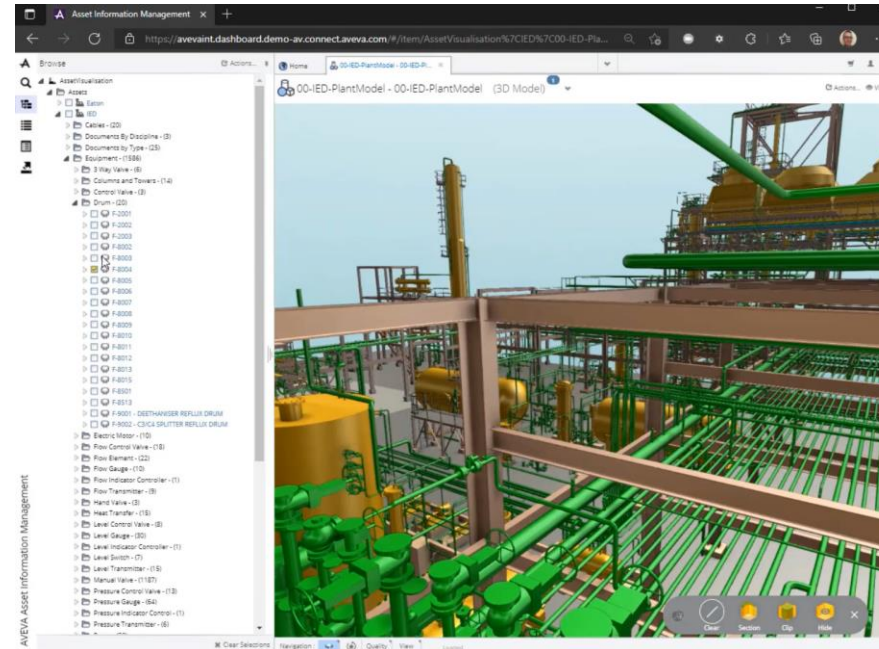
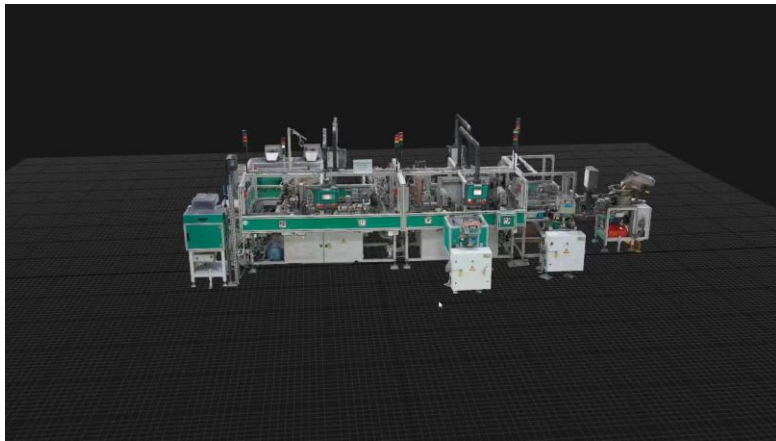
Rich visualization enables information to be actioned



AVEVA advanced visualization goes beyond trend charts

Our 3D rendering engine is used across use cases to provide customers built-for-purpose experience

- Photo-realistic for detailed maintenance with reduced training cost and error
- Asset Information Management provides engineering and operational data overlay in browser for ease of access
- VR, AR and HoloLens 2 site walkthrough provide multiple options to safely view critical information

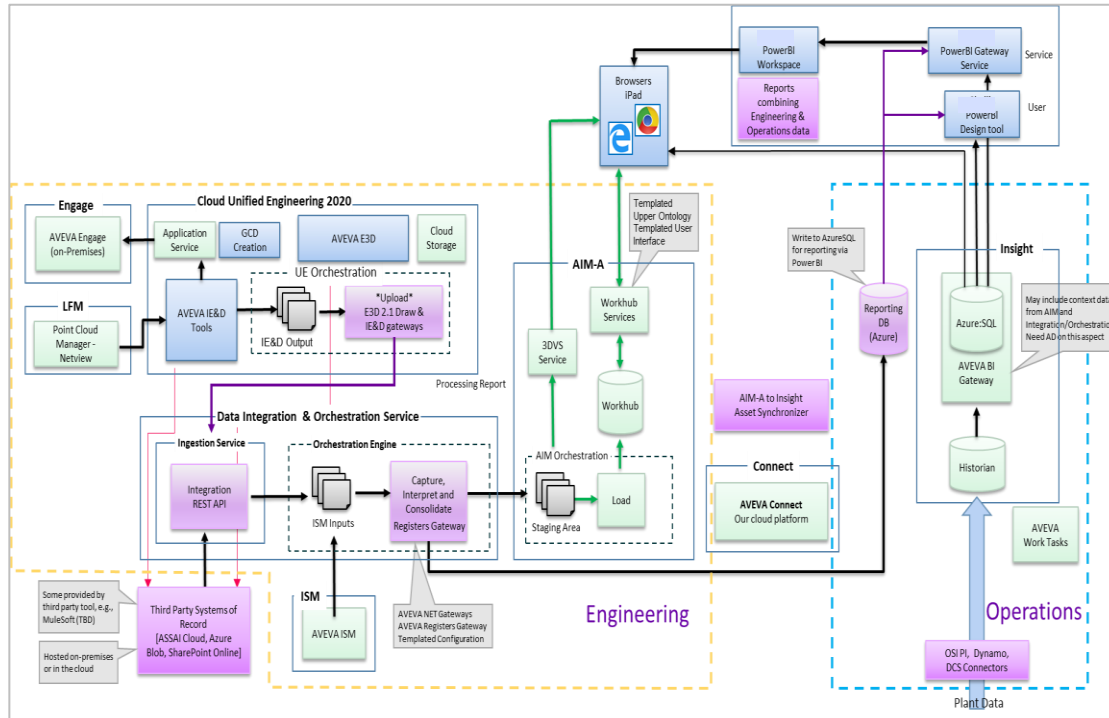


Wrap up

AVEVA digital twin, AI and advanced visualization all come together in the cloud

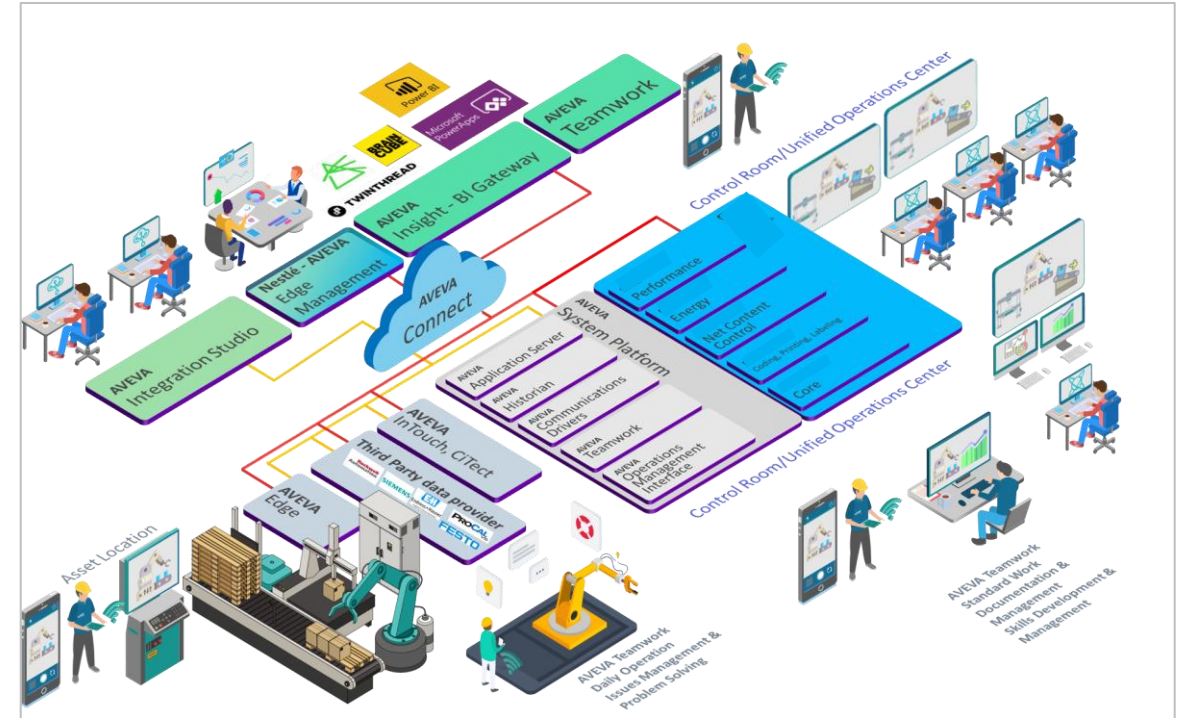
Real customers are deploying AVEVA's capabilities combined with 3rd party cloud applications for substantial business value

Real-world deployment example 1: Digital Twin for operational excellence



- Engineering Data Warehouse: ingestion, orchestration
- Integrate 3rd party authoring, visualization, document management
- Integrate PI operational data
- Common engineering and operations visualization
- Common user management, administration, security
- Target deployment to **~60 assets (sites)**.

Real-world deployment example 2: Digital twin & enabling connected worker



- Installed base on-prem: HMI/SCADA, MES across all businesses
- Scope for Connected Worker strategy: contextual information, analysis, guidance
- Solution will leverage AVEVA installed base and 3rd party partner capability
- Native cloud deployment (low TCO, standardization), multi-platform capability
- Common user management, administration, security
- Target deployment to **~350 factories**.

AVEVA R&D is global and scaled to best serve our customers

2,100+

R&D capacity (200+ scrum teams)

10

Global R&D hub centers

>£170m

Annual R&D Investment

1,000+

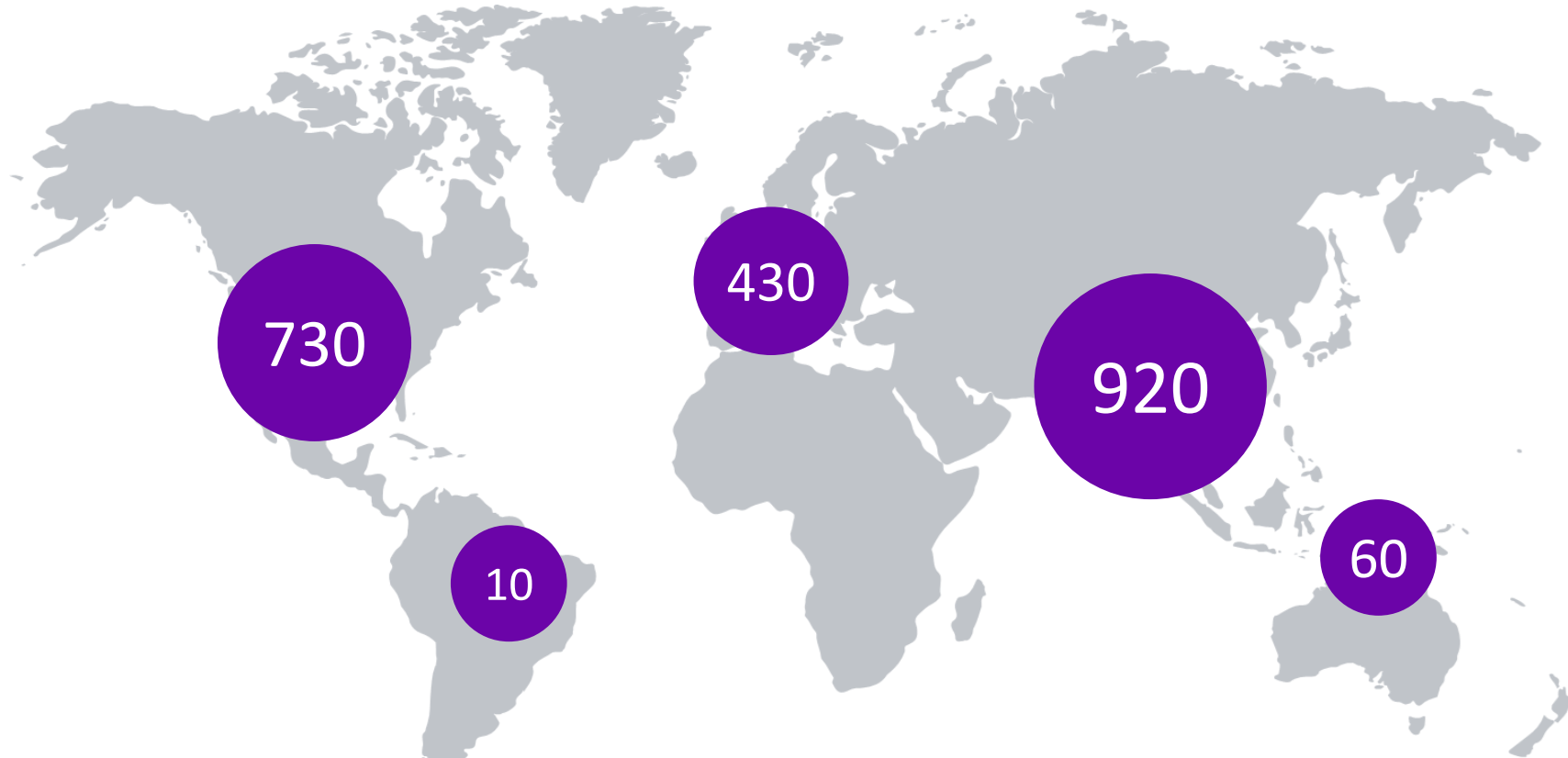
Cloud deployments per year

140+

Patents awarded (100 more in review)

23.5%

Women in hands-on engineering role



- Agile-lean practices across all teams to ensure high ROI, quality, security & predictability
- Continual learning organization with formal advanced cloud and AI training required by all
- High innovation through diversity of thought provided by diversity of our people

AVEVA



Thank you for your time!

- We are highly interested to hear and learn from you. Send us a note at:

Andrew.McCloskey@AVEVA.com

Colm.McCarthy@AVEVA.com

End of Presentation



AVEVA