FactoryTalk DataMosaix
Knowledge Transfer for Partners

PARTNER TECHNICAL ENABLEMENT

Rockwell Automation

expanding **human possibility**®

PUBLIC

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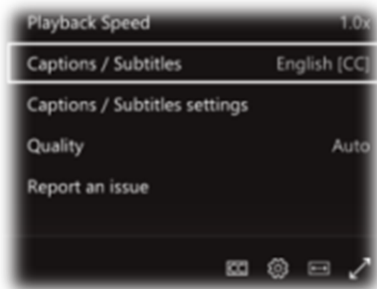kolikara@rockwellautomation.com

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Housekeeping

- Post questions thru Q&A icon

- In case you have any questions post the session, please, write us at ptec@rockwellautomation.com

- To turn on live captions and subtitles, select **Captions/Subtitles On**

- Recordings/Collaterals in our KTP page

- Scan the QR code for direct access to the KTP page

- If you don´t have access, please, write to us at ptec@rockwellautomation.com

- We are always looking for feedback to improve the KTP initiative – your voice matters

- Please, by the end of each session, help us to improve by investing 1 minute to fill the survey

Agenda

1 THE INDUSTRY CHALLENGES

2 OUR INTEGRATED APPROACH

3 THE DATAOPS SOLUTION & DEMO

4 DRIVING OPERATIONAL VALUE

5 PRÉ-REQS TO WORK WITH FTDM

6 LICENSING

7 WRAP-UP

RA Rockwell Automation

The industry challenges

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You need data to solve challenging problems

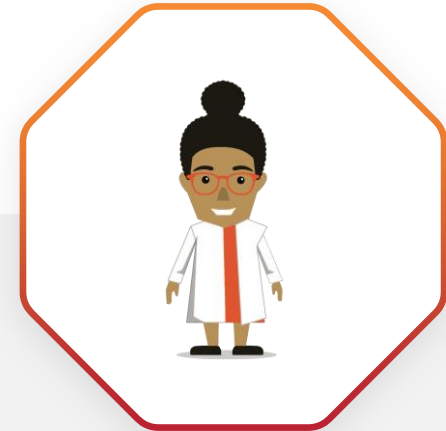### Reliability Engineers

Process / Manufacturing Engineers

Data Scientists

"What were the root causes of an equipment fault that led to unplanned downtime and how can I predict it?"

"What process variables or environmental factors contributed to lower-than-expected yields?"

"What are the critical factors to include in a predictive model to anticipate and avoid an out-of-specification finished product?"

What tough problems are YOU trying to solve with data?

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The data you need exists in many different types and structures

Unstructured

- Process Diagrams
- Application code
- Test records
- Digital Twins
- Work instructions
- Video / Imagery

Relational

- Batch records
- MES data
- ERP data
- Devices information
- OEE

Time Series

- Real time values
- Sensor data
- Performance

Events

- Activity logs
- Maintenance records
- Alarms
- Work orders

Operate

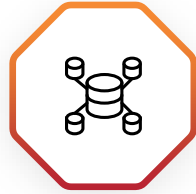*Design*

Maintain

Rockwell Automation

Barriers to maximizing the value of your data

Lack of open, contextualized, governed, scalable data strategy

Point Solutions

Point solutions are useful for solving individual pain points but don't make it easier to solve the next problem

Data in Silos

IT, OT and ET (engineering) data live in silos and are difficult to use in combination

Data Lacks Context

Data lacks context making it difficult to understand and use except by experts
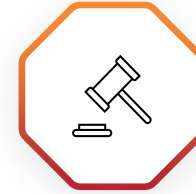
Data isn't Trusted

Data is poor quality, untimely, with no owner and governance process, yielding untrusted insights

Difficulty Scaling

Scaling application deployments and repeatability of solutions across units, lines and sites is onerous and time consuming

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DATA: **UNLOCKING A COMPETITIVE OPPORTUNITY**

This survey shows that a third of data goes unused. Many manufacturers see that increased technology adoption creates vast amounts of data, which can be harnessed and analyzed to improve performance and increase profits.

Respondents stated a need for better data and analytics usage to drive positive business outcomes over the next five years, citing this as a competitive shortfall;

40% more manufacturers say they lack the ability to use data to make decisions to outpace the competition in 2023 compared to last year.

Driving Improvements Over the Next 5 Years

Better use of data analytics	40%
Increased automation	40%
Adopting smart manufacturing software	36%
Adopting cloud technology	36%
ESG/sustainability program/policies	35%
Automated process enforcement	33%
Increased training and employee programs	32%
Increased use of Artificial Intelligence/Machine Learning	32%
Adopting supply chain planning software	31%
Leveraging new/emerging market opportunities	31%

Q. How do you plan to drive positive business outcomes over the next five years? Select top 5   Base: 1353

Rockwell Automation   8th Annual State of Smart Manufacturing Report

Why is it so hard?

When exploring solutions | Typically...only a few simple questions are asked

Visible

| What am I trying to do? | What "data" is needed? | How do I use it to solve the problem? |

| How is the data collected? | How is the data stored and accessed? | How is the data secured and governed? |
| What context does the data need to be understood? | How do various applications use the data? | Many more... |
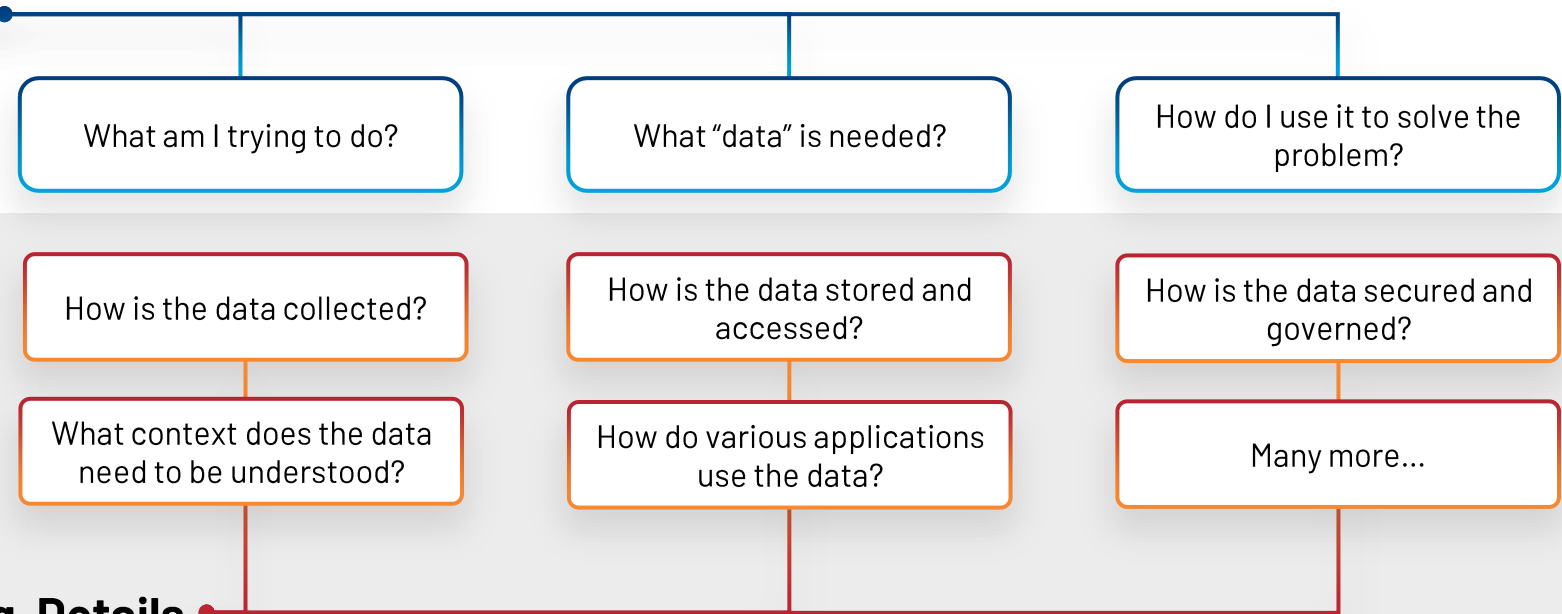
Underlying Details

When implementing the solutions | The tough challenges must be solved to succeed

What makes DataOps *industrial* ?

Industrial DataOps

An industrial DataOps solution simplifies and accelerates the journey to scalable and sustainable digital transformation

Standard OT Connectivity

Industrial data is trapped in many disconnected systems.

Industrial DataOps simplifies access to industrial data sources with standard connectivity.

Scalability for Industrial Data

Industrial systems have massive amounts of time series data.

Industrial DataOps simplifies scaling to the quantity and variety of data that's needed.

Links Digital to Physical

Industrial organizations live in the physical world.

Industrial DataOps simplifies contextualizing data with diagrams, images and 3D models that represent the real-world environment.

OT / Production Self Service

Transformation happens when people change the way they work.

Industrial DataOps simplifies adoption with data contextualization, discovery and modeling tools geared for industrial users.

Engineering Analysis

Domain experts need to conduct complex engineering analysis.

Industrial DataOps simplifies both ad-hoc and repeatable data analysis using engineering functions and simulation data.

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Industrial DataOps unlocks transformation value for industrial enterprises

20 – 30% reduction in maintenance costs

50 – 60% improvement in worker productivity

5 – 8% reduction in asset downtime

*Results based on previous deployments
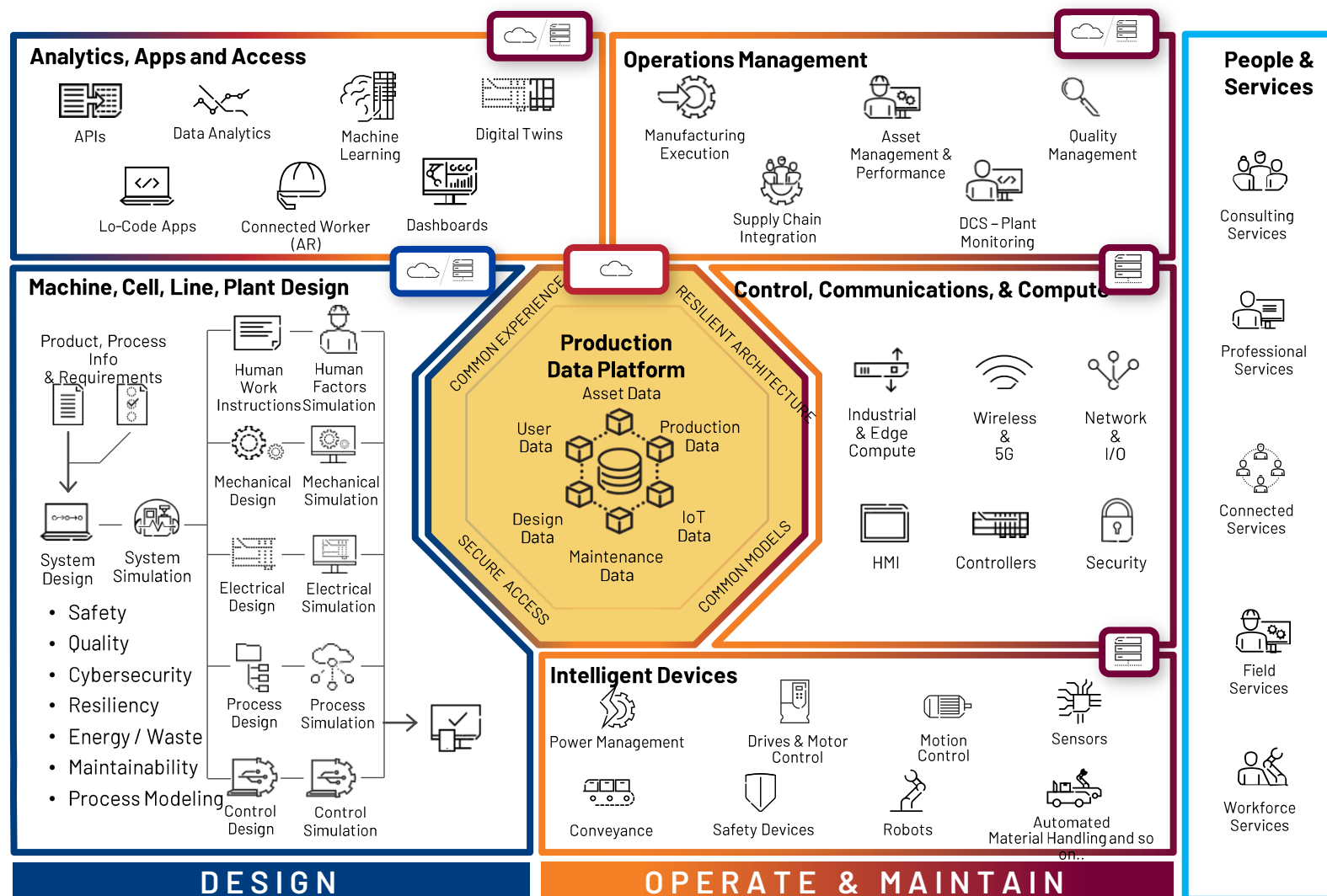
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Integrated Approach

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The Connected Enterprise® Production System

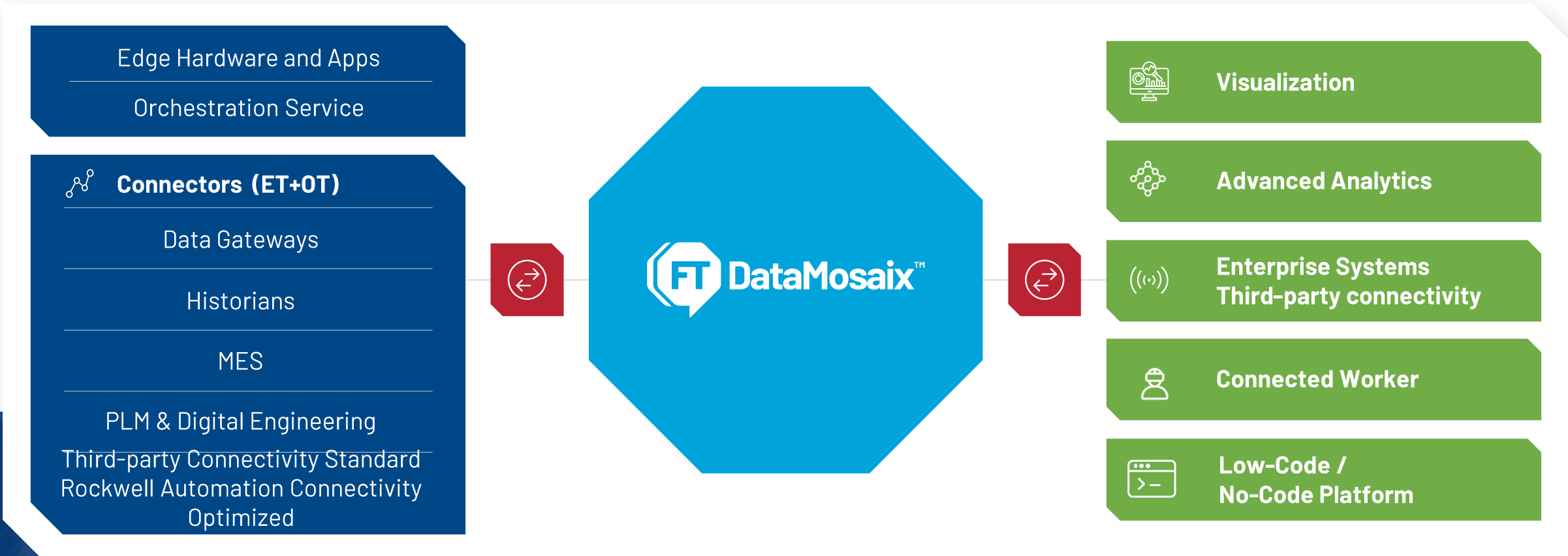Transforming manufacturing throughout the lifecycle

Using data and automation to connect people, processes and tools so they can operate at maximum capacity

Engineered for agility, scalability and security with data at its core

Analytics, Apps and Access
- APIs
- Data Analytics
- Machine Learning
- Digital Twins
- Lo-Code Apps
- Connected Worker (AR)
- Dashboards

Operations Management
- Manufacturing Execution
- Asset Management & Performance
- Quality Management
- Supply Chain Integration
- DCS – Plant Monitoring

Machine, Cell, Line, Plant Design
- Product, Process Info & Requirements
- Human Work Instructions
- Human Factors Simulation
- Mechanical Design
- Mechanical Simulation
- System Design
- System Simulation
- Electrical Design
- Electrical Simulation
- Safety
- Quality
- Cybersecurity
- Resiliency
- Energy / Waste
- Maintainability
- Process Modeling
- Process Design
- Process Simulation
- Control Design
- Control Simulation

Production Data Platform
- Asset Data
- User Data
- Production Data
- Design Data
- IoT Data
- Maintenance Data

COMMON EXPERIENCE · RESILIENT ARCHITECTURE · SECURE ACCESS · COMMON MODELS

Control, Communications, & Compute
- Industrial & Edge Compute
- Wireless & 5G
- Network & I/O
- HMI
- Controllers
- Security

Intelligent Devices
- Power Management
- Drives & Motor Control
- Motion Control
- Sensors
- Conveyance
- Safety Devices
- Robots
- Automated Material Handling and so on..

People & Services
- Consulting Services
- Professional Services
- Connected Services
- Field Services
- Workforce Services

DESIGN

OPERATE & MAINTAIN

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Introducing FactoryTalk® DataMosaix™

Transform your data into value with a SaaS Industrial Data Hub

Edge Hardware and Apps

Orchestration Service

Connectors (ET+OT)

Data Gateways

Historians

MES

PLM & Digital Engineering

Third-party Connectivity Standard
Rockwell Automation Connectivity
Optimized

DataMosaix™

Visualization

Advanced Analytics

**Enterprise Systems
Third-party connectivity**

Connected Worker

**Low-Code /
No-Code Platform**

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Bringing industrial DataOps to FactoryTalk® Operation Hub™

FactoryTalk® DataMosaix™ is part of a comprehensive and rapidly growing SaaS portfolio
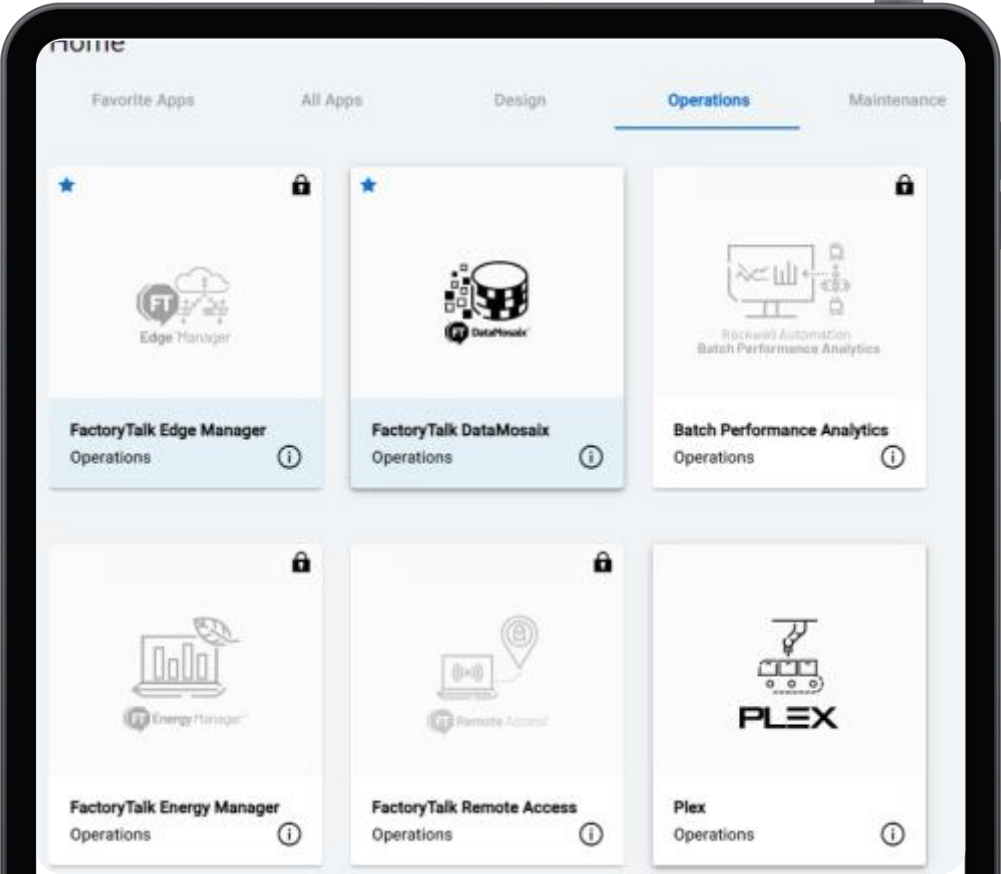
Benefits of SaaS

Lower total cost of ownership

No need for a large team to manage custom digital infrastructure

Greater agility

Scale as needed and adopt new capabilities faster

Faster time to value

Leverage the skill sets your workforce already have

Optimized system performance

Purpose built for large quantities of time-series data

More predictable costs

No unplanned capacity expansions or cost overruns

Maintain ownership of your data

Let's explore more...

Rockwell
Automation

You have data: Now what?

Having access to your data is the beginning. Putting it to work for you is the next step.

Available

Standard connectivity to IT/OT/ET data from industrial data sources at scale.

Improve organizational productivity with all relevant data already in one place.

Meaningful

AI-supported **and scalable contextualization** of data across data sources, allowing for data to be interpreted and understood in the relevant business context.

Useful

Easy to search single source of information with full traceability for **unparalleled self-service data discovery, orchestration and solution development**.

Valuable

Real-time visualization and advanced analytics applications deployed at scale that drive **optimal decision-making and autonomous closed-loop actions**.
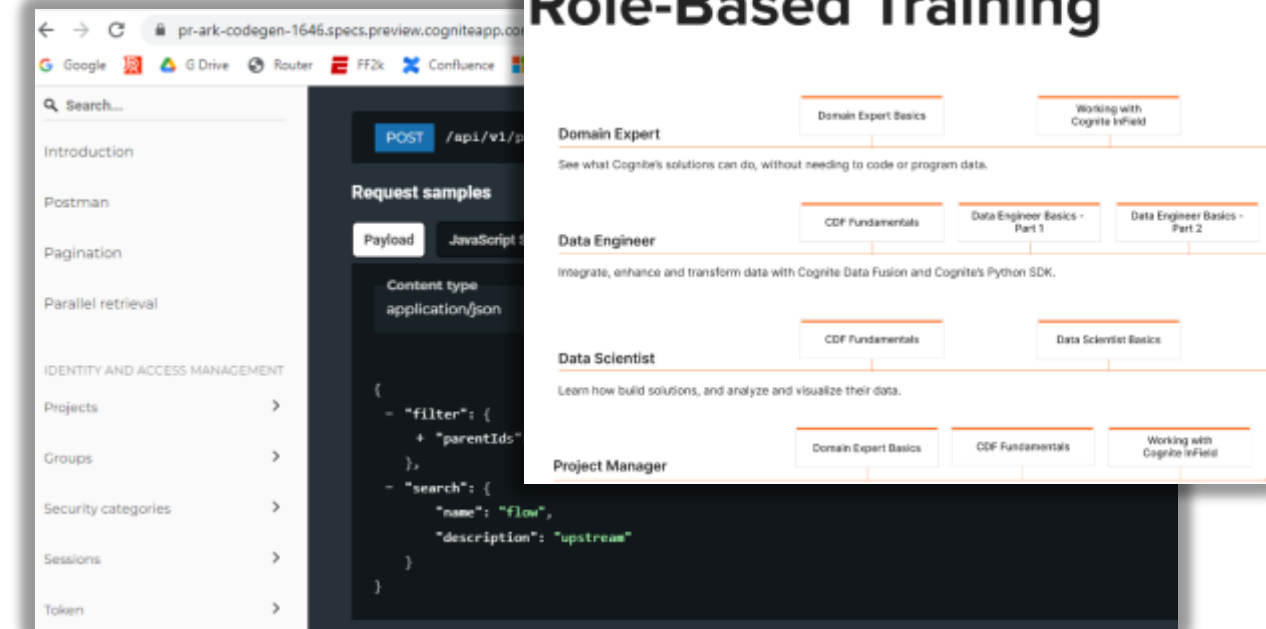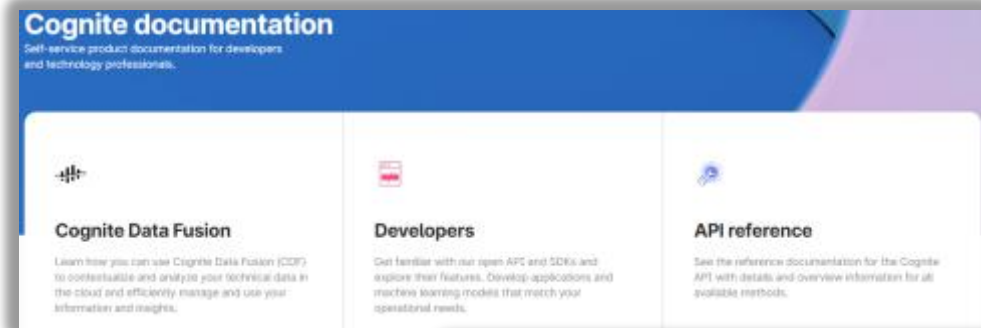
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FactoryTalk® DataMosaix™ Overview

Expose industrial data in an Industrial Knowledge Graph to realize value through apps and analytics

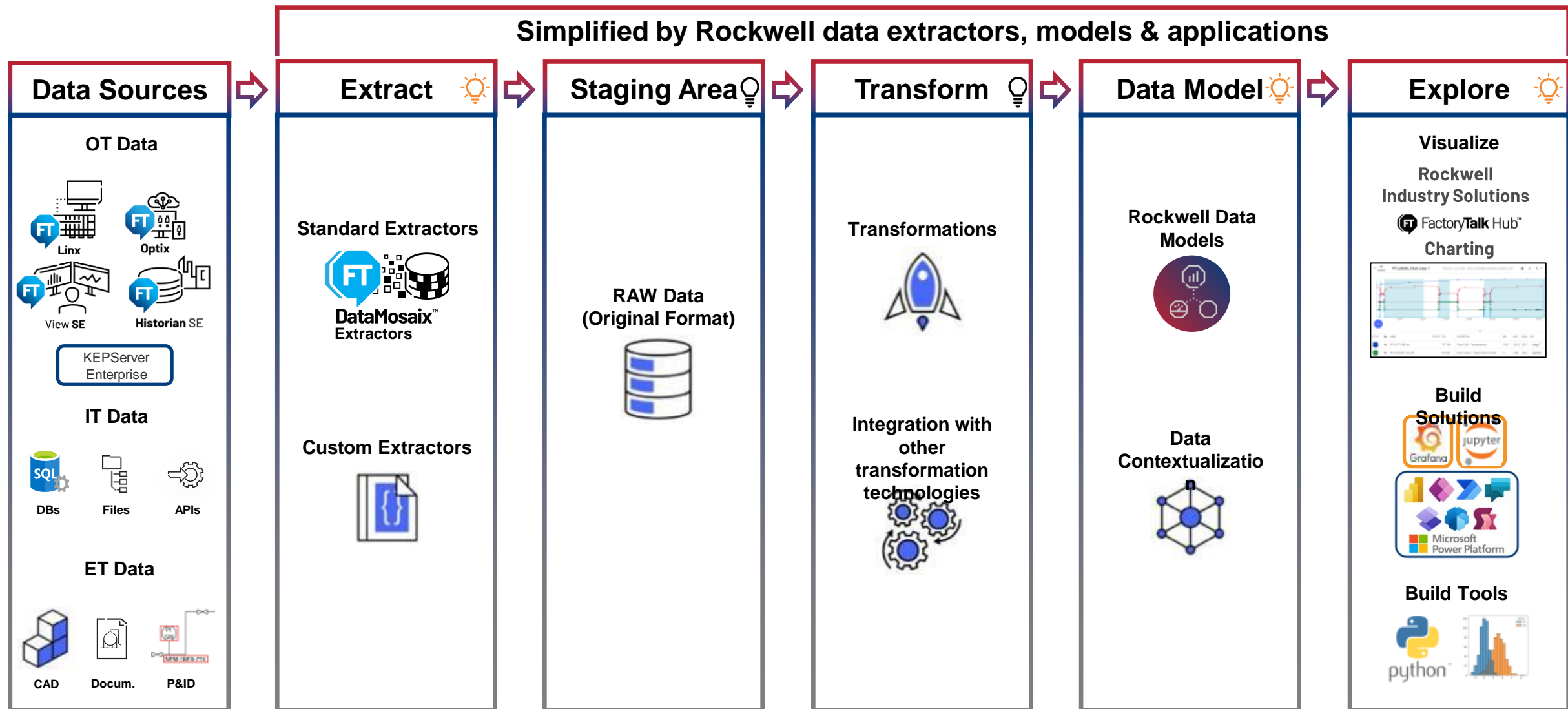| Make data **available**	Make data **meaningful**	Make data **useful**	Make data **valuable**

DATA SOURCES

Time Series –
Historian, HMI, PLC, Sensor

Structured –
Alarms, OEE, MES, CMMS, QMS, ERP

Engineering–
Diagrams, 3D Models, Simulation

INTEGRATION & TRANSFORMATION

CONNECTORS

CONTEXTUALIZATION SERVICES

Manual SME

Rule-based

Custom ML-based

Pre-built ML-based

Document parsing

Entity matching

Engineering diagram parsing

INDUSTRIAL KNOWLEDGE GRAPH

EQUIPMENT A

FILE C

EQUIPMENT D

SELF-SERVICE & APP DEVELOPER TOOLS

Data Exploration

Flexible Data Modeling

Data Quality Monitoring

Templates & Functions

Schema Services

3D model rendering

Event-based monitoring

+++

GUI — API — SDKs

APPLICATIONS & DATA SCIENCE

Charting

Industry Solution Applications

Analytics & Data Science

DATA GOVERNANCE AND QUALITY →

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Application developer services

- **Public git hub repository**

- **SDK for Javascript, Java, Python**

- **REST API**

- **GraphQL API for complex data models**

- **Extractor toolkit/sample code**

- **Extensive community and training material**

- **Connectors for Grafana, PowerBI and**

  Jupyter Notebook available

Simplified Architecture

Simplified by Rockwell data extractors, models & applications

Data Sources

OT Data

Linx · Optix · View SE · Historian SE

KEPServer Enterprise

IT Data

DBs · Files · APIs

ET Data

CAD · Docum. · P&ID

Extract 💡

Standard Extractors

DataMosaix™ Extractors

Custom Extractors

Staging Area 💡

RAW Data (Original Format)

Transform 💡

Transformations

Integration with other transformation technologies

Data Model 💡

Rockwell Data Models

Data Contextualization

Explore 💡

Visualize

Rockwell Industry Solutions

FactoryTalk Hub™

Charting

Build Solutions

Grafana · jupyter

Microsoft Power Platform

Build Tools

python

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Data Extraction

Prebuilt Extractors to common industrial data sources and systems

30+ prebuilt extractors including:

- OPC DA, HDA and UA
- FactoryTalk® Optix
- FactoryTalk® Historian SE
- OSI PI / PI AF
- DB (ODBC)

- File
- Documentum and D2
- SAP
- Hosted Extractors (Event Hub / MQTT / Kafka)

More extractors for FactoryTalk® products coming soon!

Custom Extractor Templates

Pre-built functionality to quickly develop extractors to highly customized solutions.

3D Models

Integrate CAD models or point clouds and version control models

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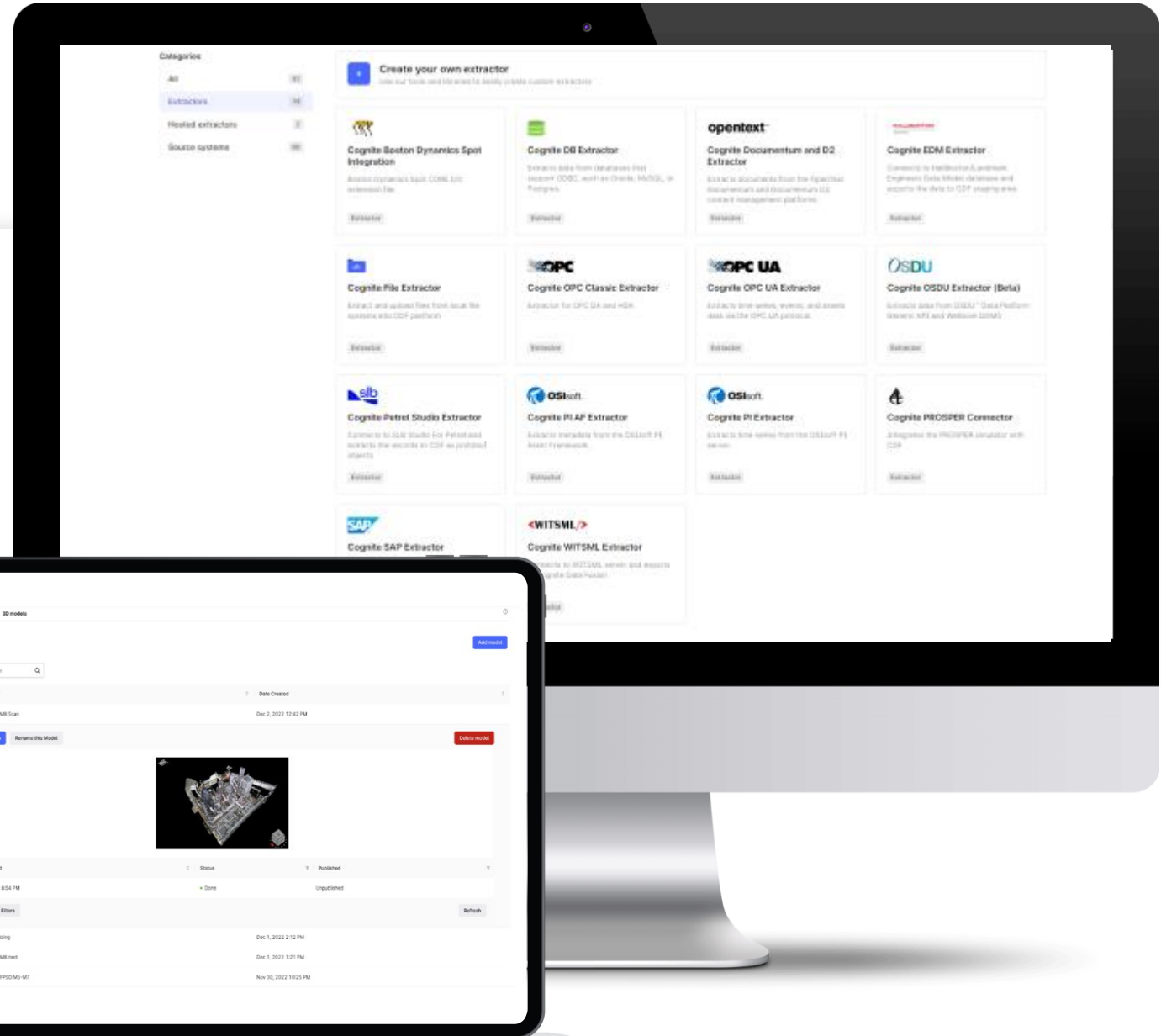
Data Contextualization

Contextualization is the process of establishing meaningful relationships between data sources and types to traverse and find data through a digital representation of the relationships that exists in the physical world.

Sensor data

Work Order → Maintenance Report

3D Model → Hardware specification

Sensor data
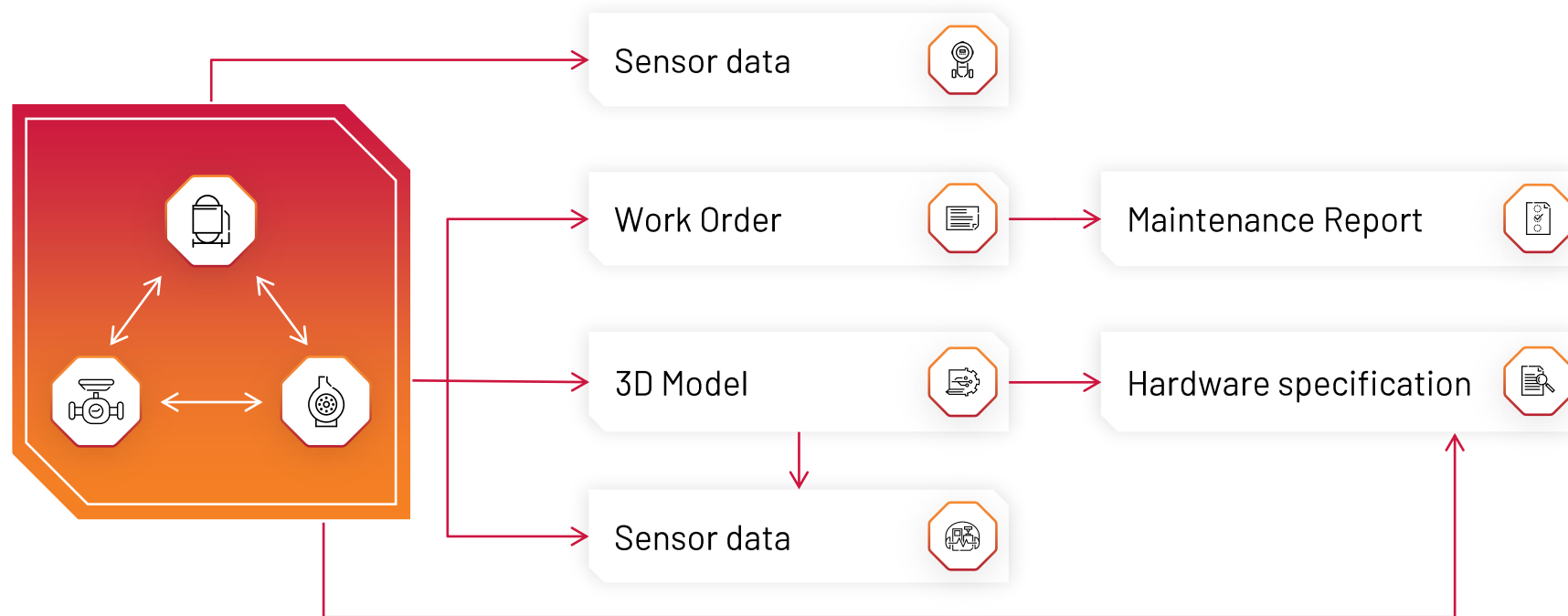
Data contextualization simplifies the complex nature of industrial data with meaningful relationships.

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Data Contextualization

Time Series

Events

Files

Assets

- Link Time Series to Assets
- Link Events to Assets
- Link Files to Assets
- Ad-hoc or Scheduled
- Fuzzy search, multiple fields

Contextualization Engine

Assets

Files

Events

Time Series
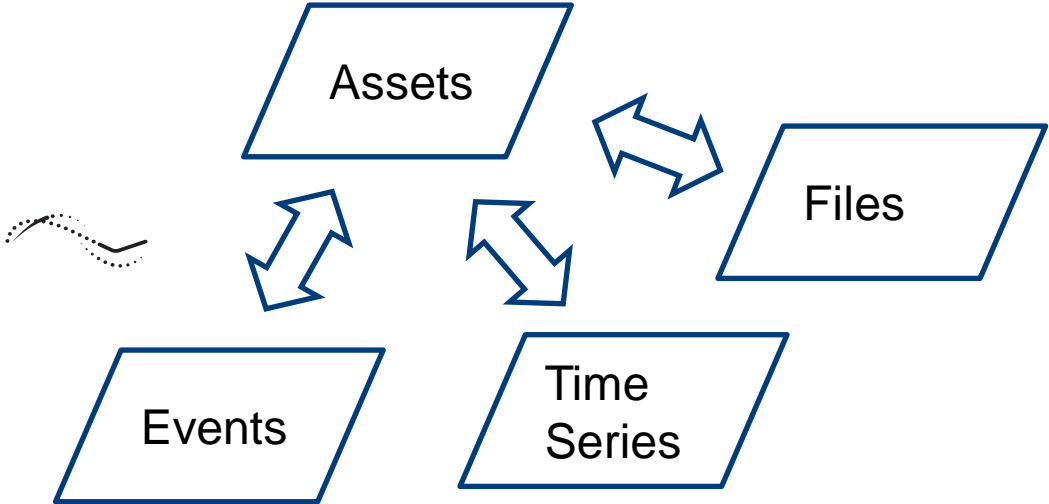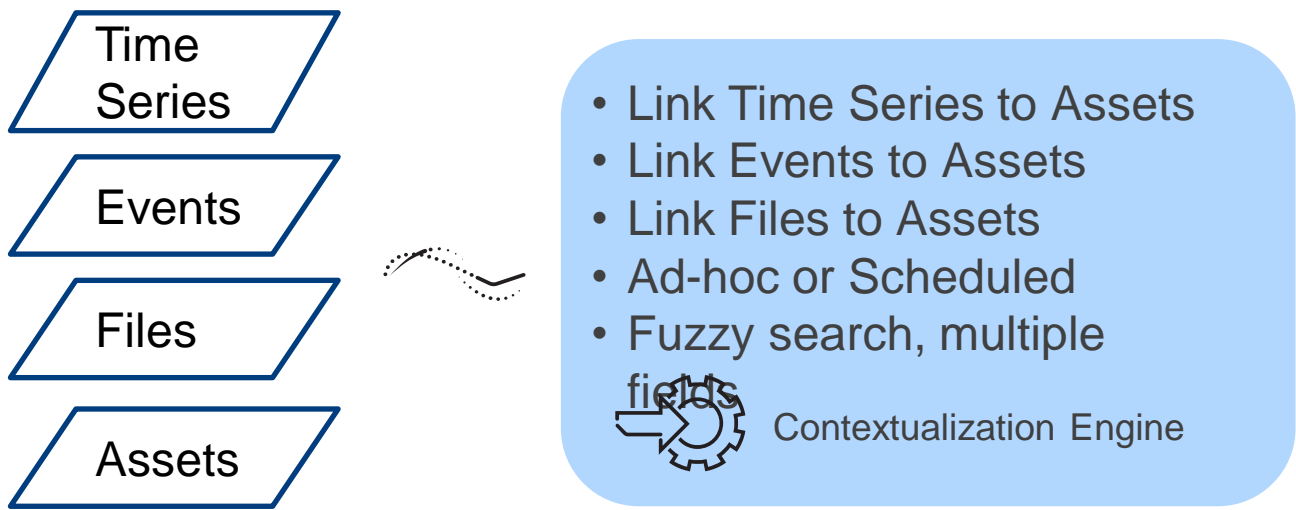
Example

ID	Asset Name
001	Palletizer1
002	Packer2

Description	Start Time
Alarm Line1 Starved Palletizer	2023-02-05 16:16
Packing Product X Line2/Packer	2023-02-05 16:23

Match Events to Assets
Description =
AssetName

Does This Asset	Match this Event?	Confidence
Palletizer 1	Alarm Line1 Starved Palletizer	70%
Packer2	Packing Product X Line2/Packer	80%

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P&ID contextualization
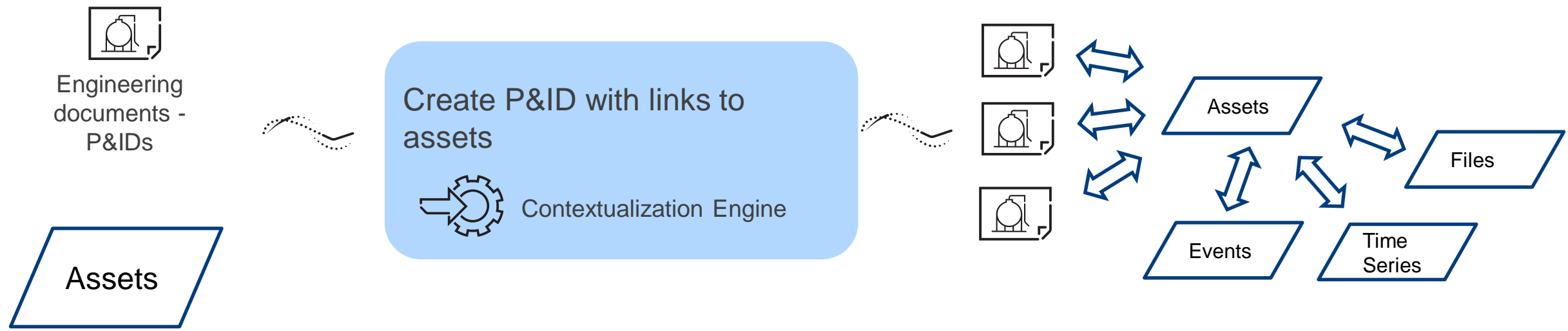
Example

Asset Name
V-101
P-201
PT-212
TI-123

Contextualization Engine

Asset: V101
Capacity: X L
Area: 51
Time series: T degF
Time series: pH
Event: Level Alarm
Event: Valve Open
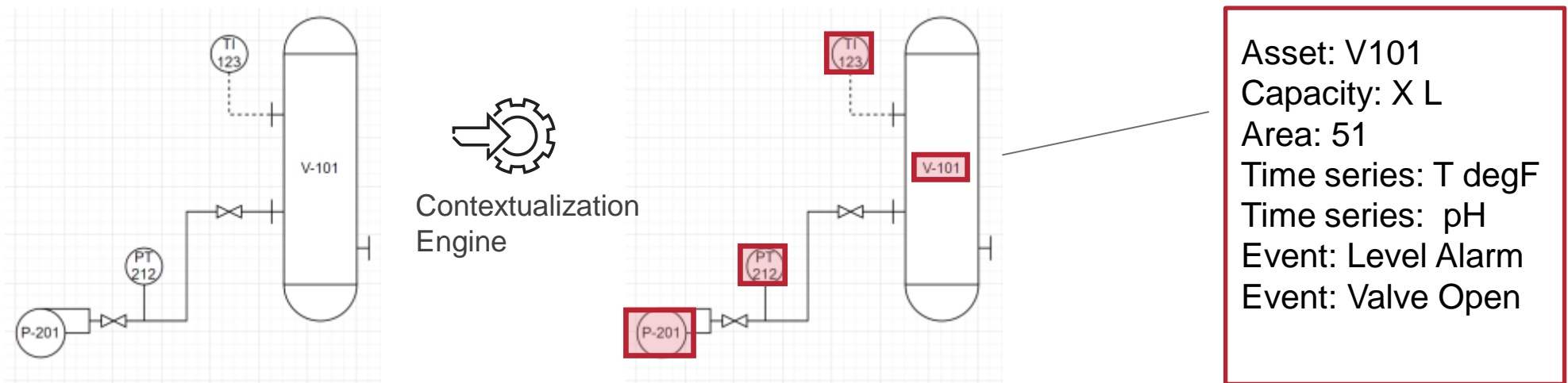
Data Exploration
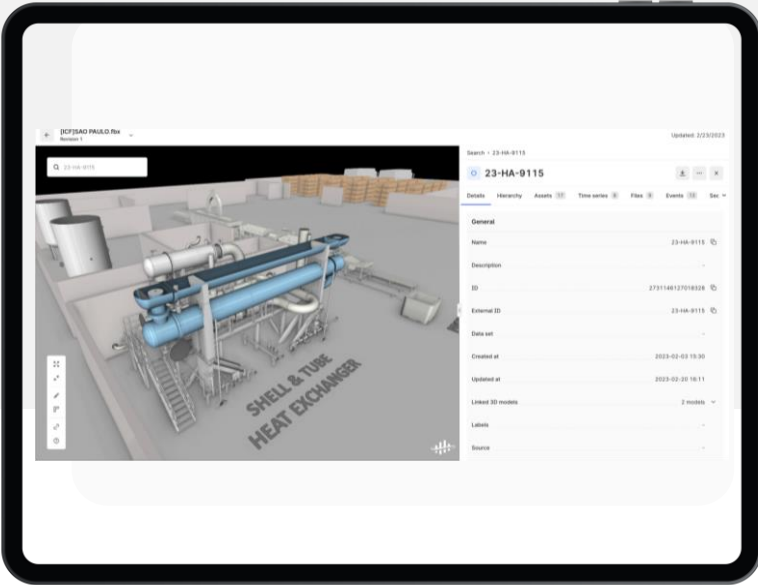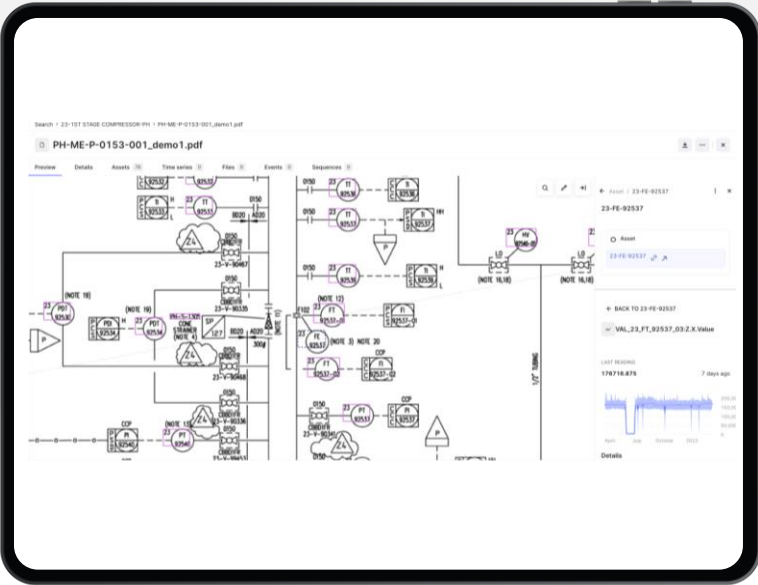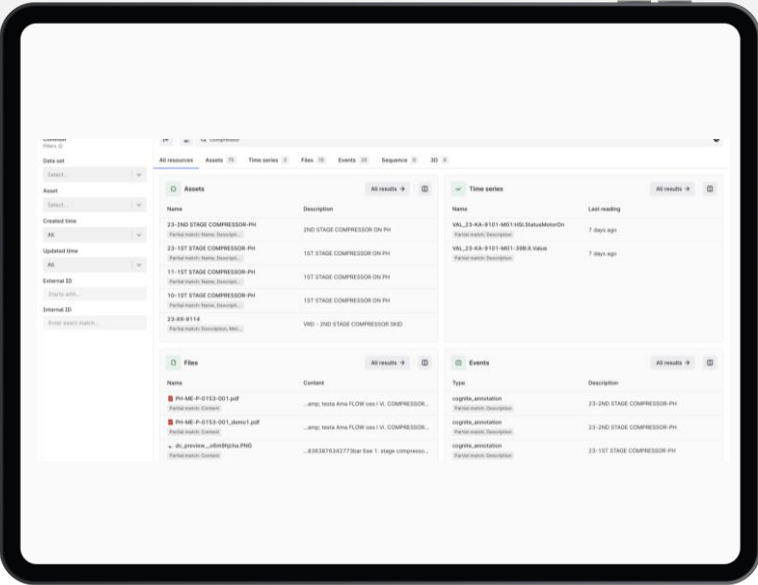
Find data in seconds, not hours

Explore all data through a **traditional asset hierarchy** and **add additional search context** for enhanced filtering

Navigate process diagrams and other engineering drawings for a **process-oriented view**

Use **contextualized 3D models** to access time series, drawings, events, files and more through a unified UI

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Data Exploration

Native Charting Tools
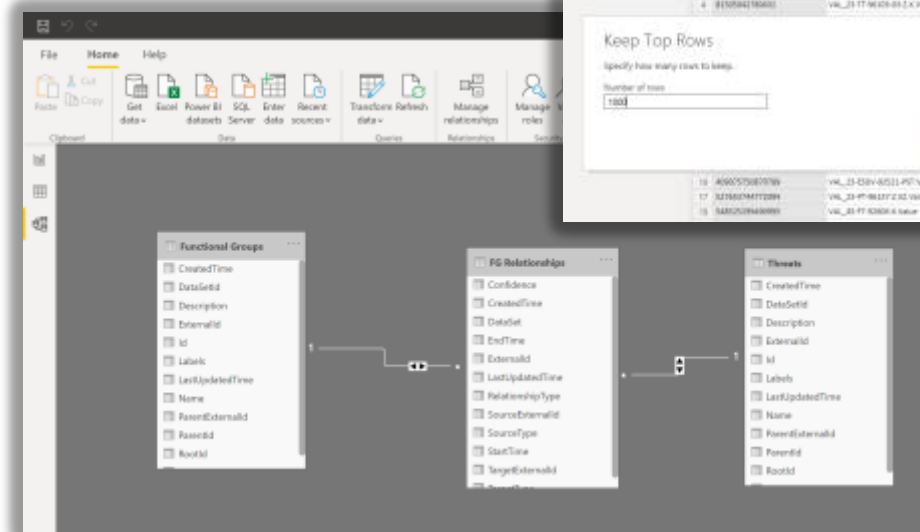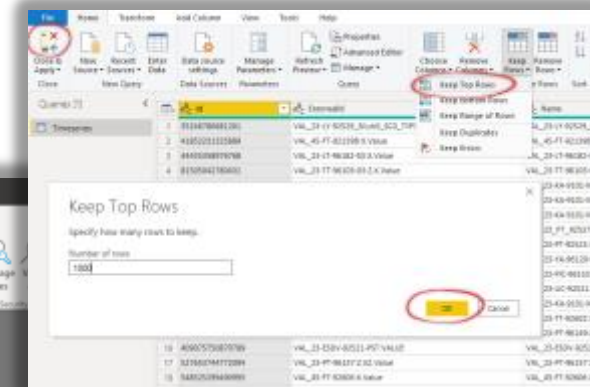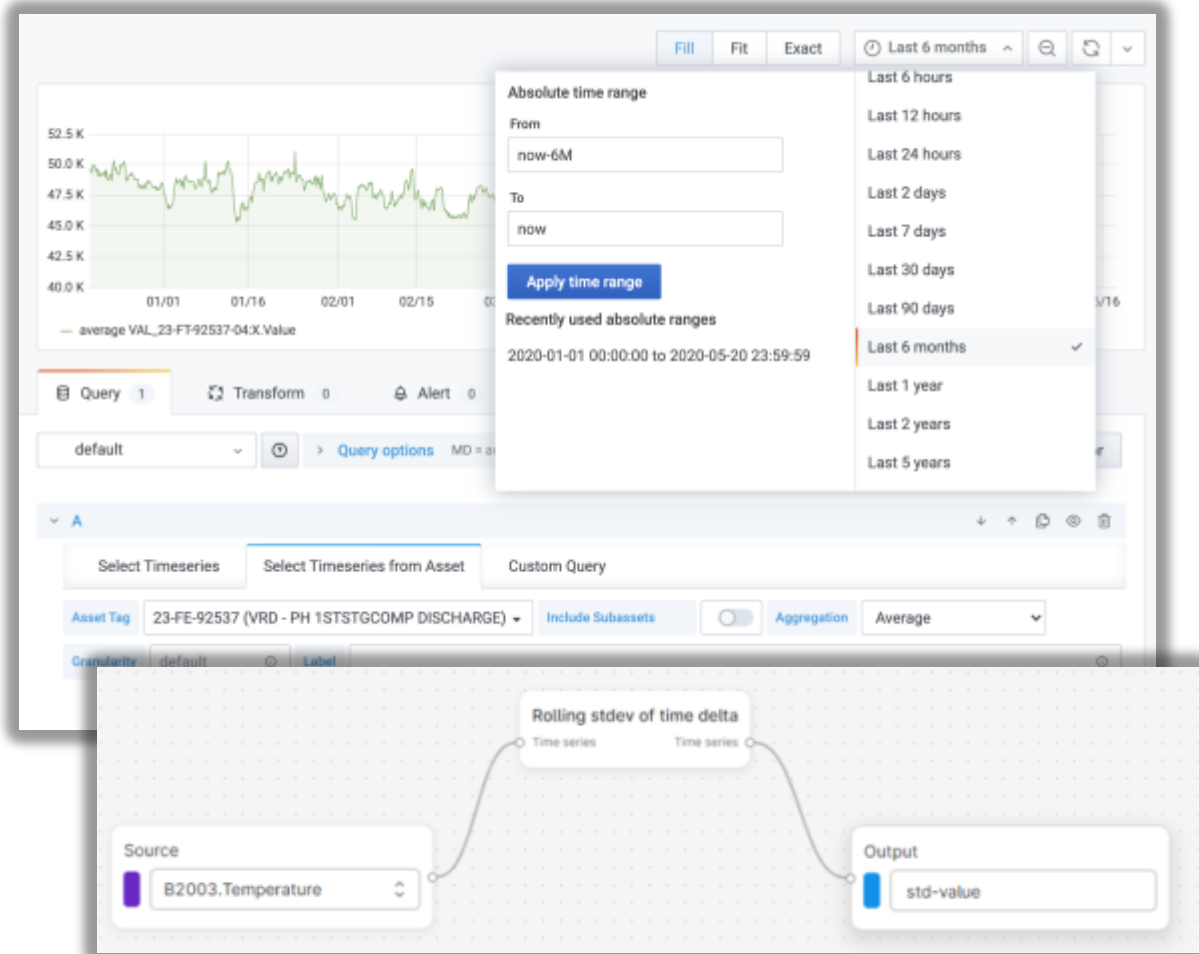
Make data valuable

Generate the insights that **drive action**

DataMosaix™

Conduct ad-hoc domain expert analysis

- No-code analysis of time series and events data with an industrial data analytics library
- Domain experts can share insights and collaborate
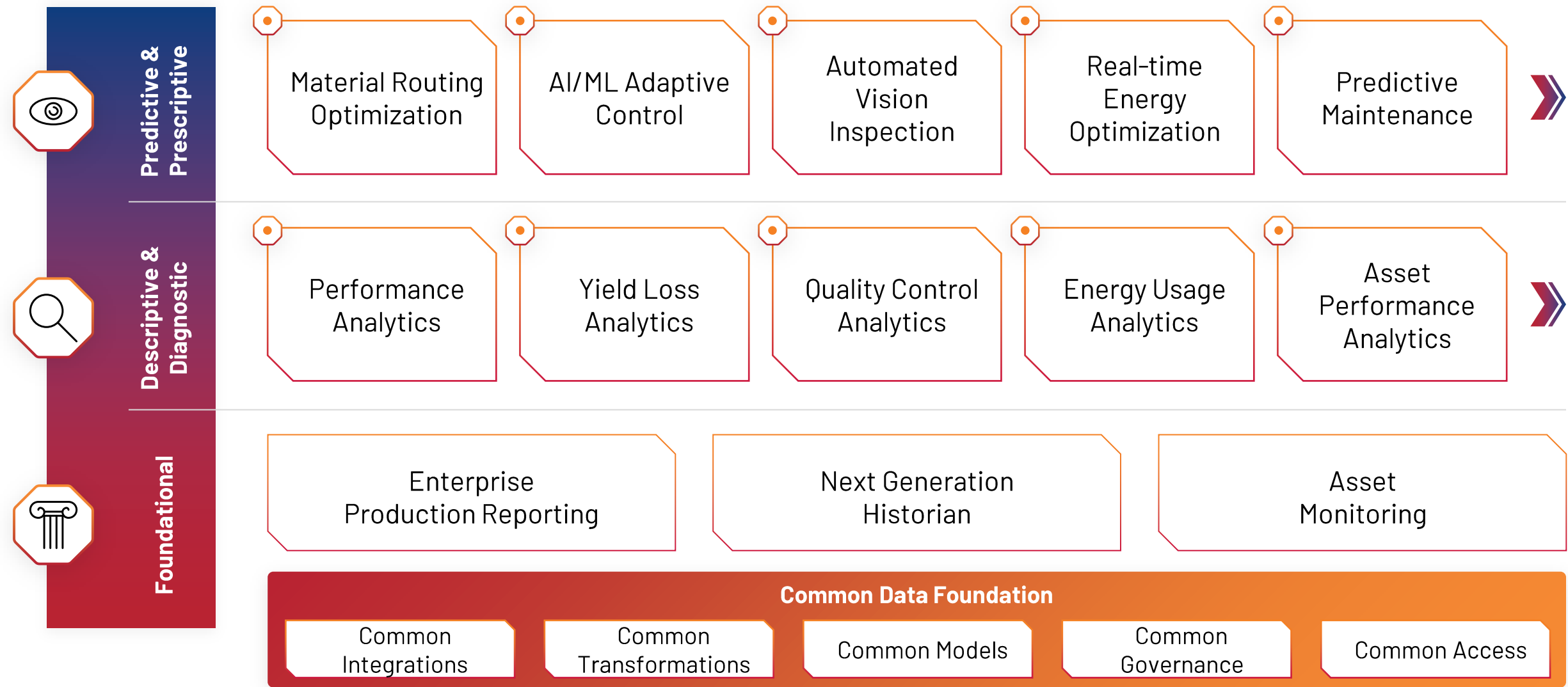
Deploy scalable applications

- Pre-built connectors for industry standard visualization tools
- Open APIs and SDKs for application developers
- Rockwell Automation Industry Solutions

Develop advanced analytics

- Standard connectivity to leading data analytics and simulation tools for data scientists
- Develop, run and share code in Jupyter notebooks

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Scaling high value applications

Foundational use cases generate rapid value while also providing a scalable data foundation to rapidly develop and deploy visualization and data science applications.
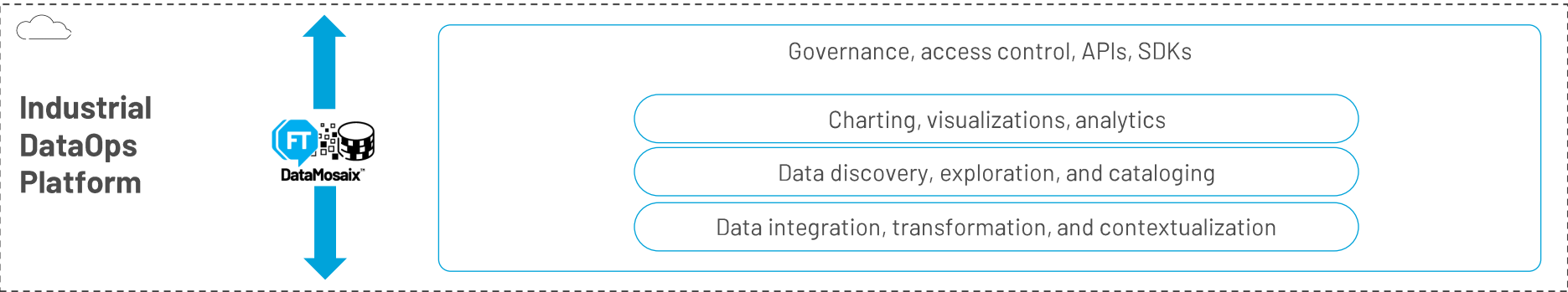
Predictive & Prescriptive

| Material Routing Optimization | AI/ML Adaptive Control | Automated Vision Inspection | Real-time Energy Optimization | Predictive Maintenance |

Descriptive & Diagnostic

| Performance Analytics | Yield Loss Analytics | Quality Control Analytics | Energy Usage Analytics | Asset Performance Analytics |

Foundational

| Enterprise Production Reporting | Next Generation Historian | Asset Monitoring |

Common Data Foundation

| Common Integrations | Common Transformations | Common Models | Common Governance | Common Access |

FactoryTalk® DataMosaix™ at center of the solutions strategy

FactoryTalk Hub™

Industry Solutions

Energy Management | Batch Performance | Asset Intelligence | ...custom apps

Maximize long-term value and scalability with a common manufacturing data hub.

Industry-focused, out-of-the-box applications **reduce time to value.**

Industrial DataOps Platform

DataMosaix™

Governance, access control, APIs, SDKs

Charting, visualizations, analytics

Data discovery, exploration, and cataloging

Data integration, transformation, and contextualization

**Accelerate advanced data science capabilities** with a single source of trusted and contextualized data.
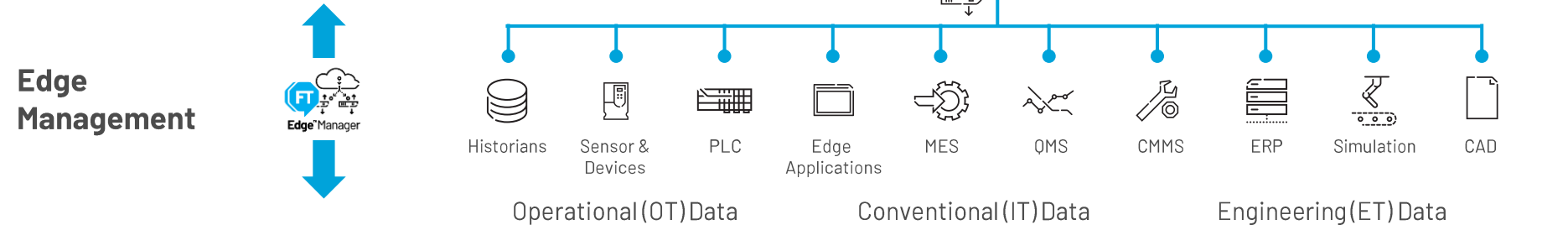
The Industrial DataOps Platform simplifies a converged manufacturing data architecture at a **lower TCO.**

Edge Management

Edge™ Manager

Historians | Sensor & Devices | PLC | Edge Applications | MES | QMS | CMMS | ERP | Simulation | CAD

Operational (OT) Data | Conventional (IT) Data | Engineering (ET) Data

Standard and flexible data extractors connect to existing automation and software systems.

Rockwell Automation

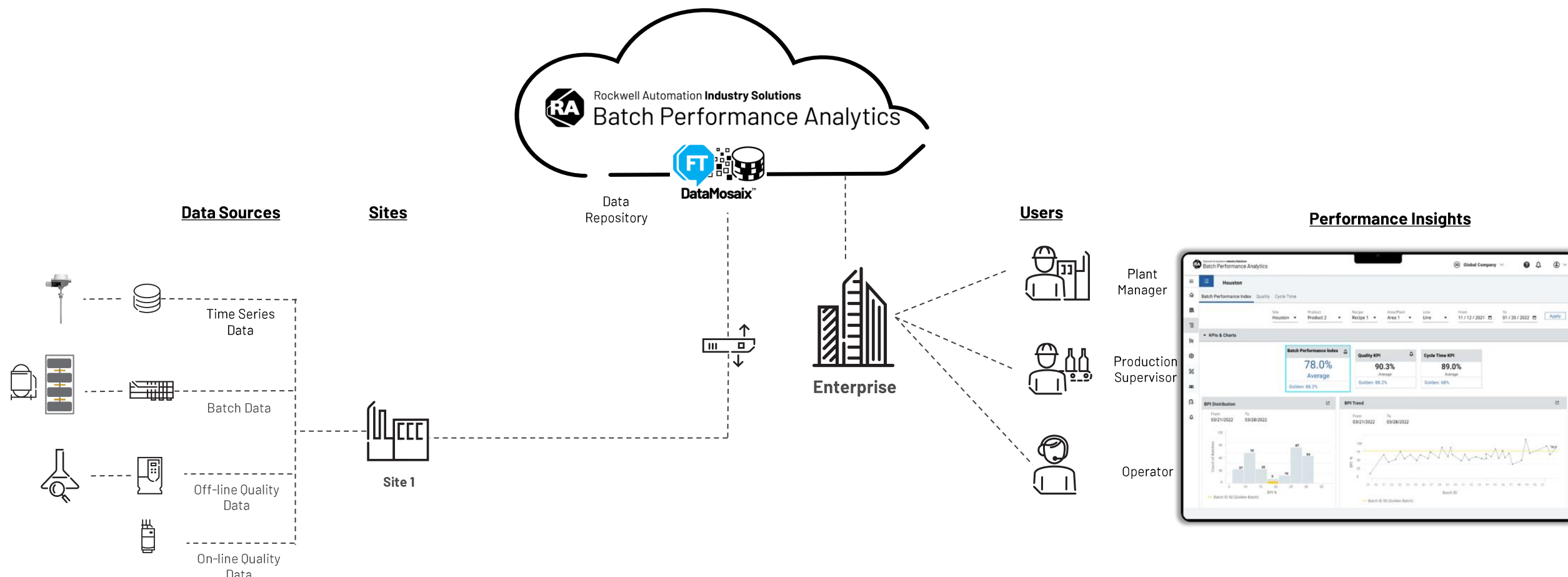# FACTORYTALK® ENERGY MANAGER
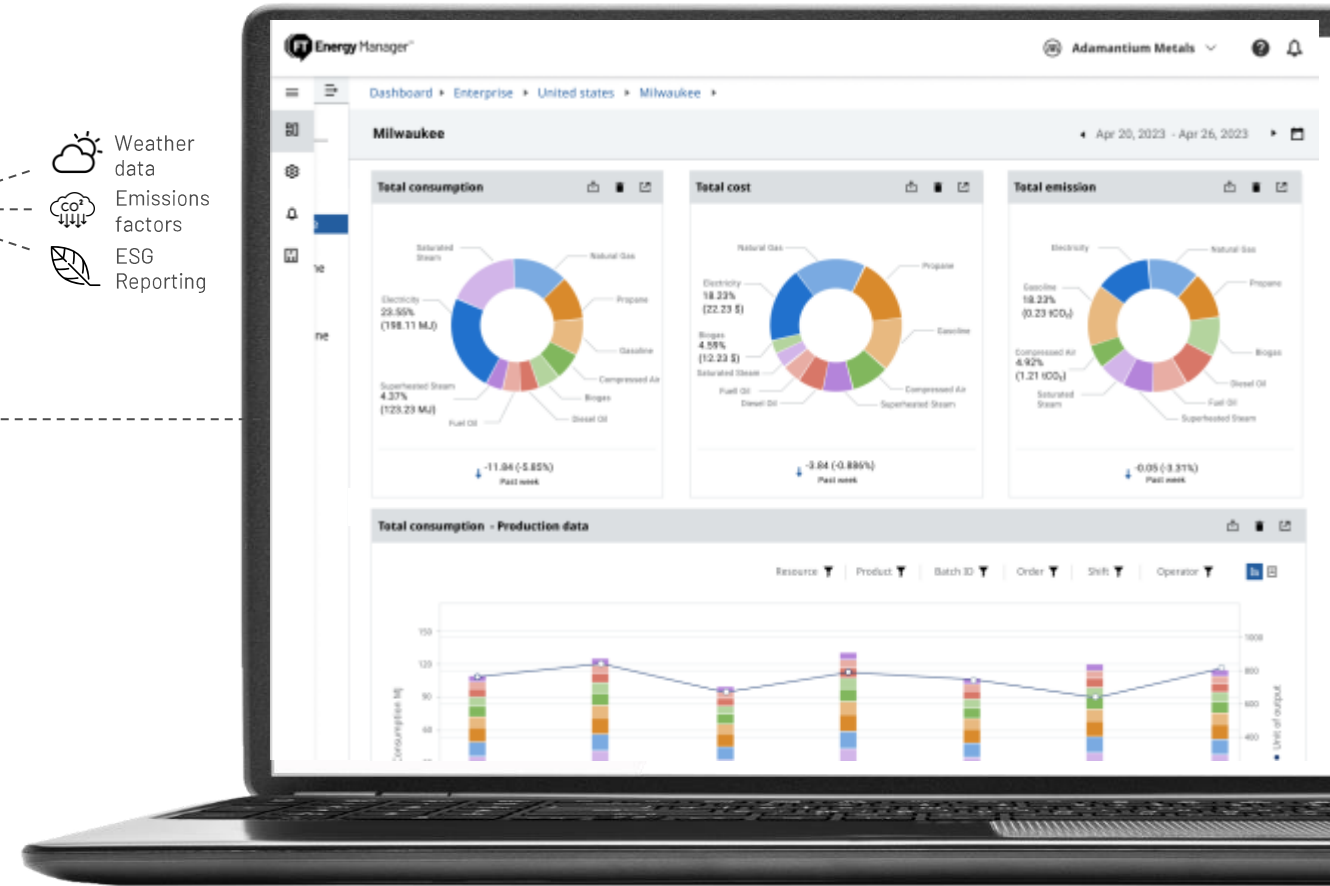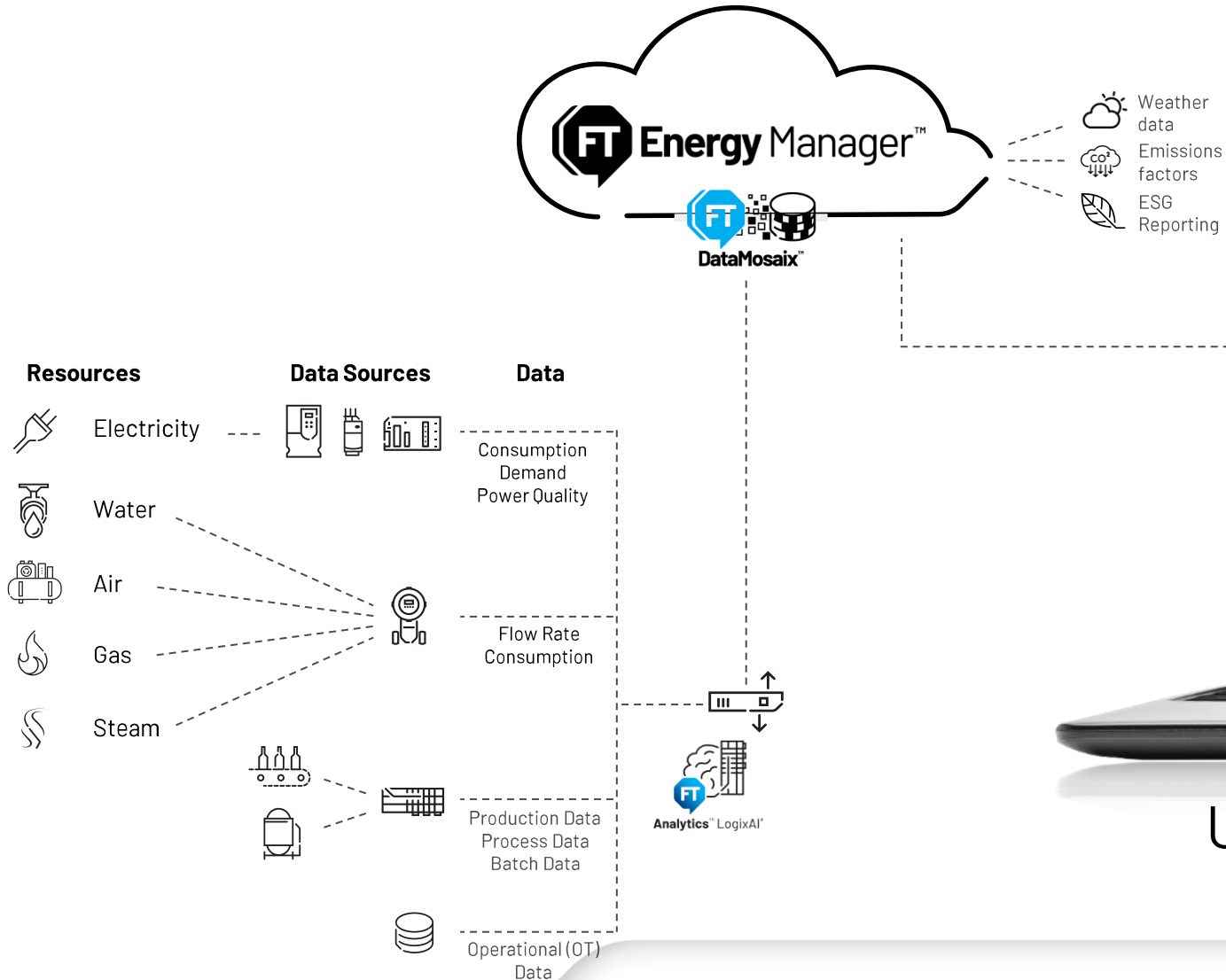
Understand & **optimize energy usage** with contextualized analytics

BATCH PERFORMANCE ANALYTICS

Data Sources

Time Series Data

Batch Data

Off-line Quality Data

On-line Quality Data

Sites

Site 1

Rockwell Automation **Industry Solutions**
Batch Performance Analytics
DataMosaix™

Data Repository

Enterprise

Users

Plant Manager

Production Supervisor

Operator

Performance Insights

unlock the **golden batch** to improve **quality** & **yield**

Rockwell Automation

Licensing

Rockwell Automation

FactoryTalk DataMosaix SaaS Subscription Pricing

	Standard	Enterprise
Purchasable Unit	1000 tags	1000 tags
Discounting	5% per break	10% per break
Volume Breaks	5, 10, 25, 40, 70, 100	Standard + Higher Volume
Rockwell Automation Applications	Unlimited	Unlimited
Non-Rockwell Automation Applications	Up to 2 applications	Unlimited
Customer Defined Data Models	Not Included	Unlimited
Assets and Sites	Unlimited	Unlimited
Events*	Unlimited	Unlimited
Files*	Asset-linking only	Fully contextualized
Financial & Structured Data*	Included with Rockwell Automation applications	Unlimited
Extractor and Pipeline Count	Unlimited	Unlimited
API Calls / Day*	Unlimited	Unlimited
Users	Unlimited	Unlimited
Charts (Ad-Hoc data visualization)	Included	Included
Functions	Not Included	Metered (TBD)
2D CAD Files	Not Included	1000 files per 1k tags
3D CAD Files	Not Included	1 TB per 1k tags
Point Clouds	Not Included	Add-On Fee
Images & Vision	Not Included	Add-On Fee

*Monitored for reasonable and customary usage

A tag is defined as time series data. Alarms, events and relational data (e.g., SQL database) do not add to the tag count.

Quantity Discounting

Quantity (1k tags = 1 unit)	Standard	Enterprise
2	2.5%	5.0%
5	5%	10%
10	10%	20%
25	15%	30%
40	20%	40%
70	25%	50%
100	30%	60%

- Pricing is not dependent on the number of sites.
- Work with the Rockwell Automation on enterprise pricing agreements when the tag count is greater than 100,000.

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For current pricing, always check the Software Portal

FactoryTalk DataMosaix SaaS Subscription Tier Comparison

	SaaS Standard	SaaS Enterprise
Purchasable Unit	1000 tags	1000 tags
Discounting	5% per volume break	10% per volume break
Volume Breaks	5, 10, 25, 40, 70, 100	Standard + Higher Volume
Rockwell Automation Applications	Unlimited	Unlimited
Non-Rockwell Automation Applications	Up to 2 applications	Unlimited
Customer Defined Data Models	Not Included	Unlimited
Assets and Sites	Unlimited	Unlimited
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Point Clouds	Not Included	Add-On Fee
Images & Vision	Not Included	Add-On Fee

*Monitored for reasonable and customary usage

3rd party applications that use data from DataMosaix
Examples:
- *PowerBI typically counts as 1 application*
- *Grafana typically counts at 1 application*
- *Each PowerApp typically counts at 1 application*

Data models used by any Rockwell Automation application are included in all tiers. SaaS Enterprise is required to build customer-defined data models that leverage the flexible data modeling capability.

SaaS Standard allows for document storage, with the files linked to the corresponding asset in the Knowledge Graph. SaaS Enterprise provides AI-enabled detection of assets in engineering documents to contextualize data directly on the diagram.

Any data required for Rockwell Automation applications is included in the Standard option. Integrating ERP and enterprise system data that use custom data models requires the Enterprise option.

Functions (i.e., streaming analytics), CAD file contextualization, and vision integration are targeted for customers further along the adoption path and looking to expand value realization.

For current pricing, always check the <u>*Software Portal*</u>

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Data Collection Frequency and Storage

How fast can time series data be collected?

How long can that data stored in the cloud?

Up to 50 million time-stamped data points can be stored for a single tag.

This provide *flexibility* for different types of manufacturers and their applications.

Time series data refers to a combination of a value and a time stamp, or something that can be trended. The value can be direct from the source or calculated.

Collecting data faster means the data won't be stored for as long.

Examples

Data Collection Frequency	Duration of Storage
1 value / 100 ms	~60 days
1 value / 1 sec	~18 months
1 value / 10 sec	~16 years

Keep it simple!

When determining pricing, assume 1 value per second. Adjust as necessary if the customer requires a higher frequency or longer storage.

Update tag counts as needed

Higher tag counts can be used to accommodate requirements where more than 50 million time-stamped data points are needed for a single tag.

Example:
- **Requirement:** Collect data at a frequency of 1 value / 0.5 sec, but data retention must remain at 18 months
- **Solution:** Double the tag count for pricing

Note: The 50 million time-stamped data points cannot be divided across multiple tags.

Rockwell Automation

FactoryTalk Energy Manager SaaS Licensing

Customer Enterprise

Industry Solutions

DataMosaix™

Scaling Factor

Customer Site

Site A Site B Site X

#SITES

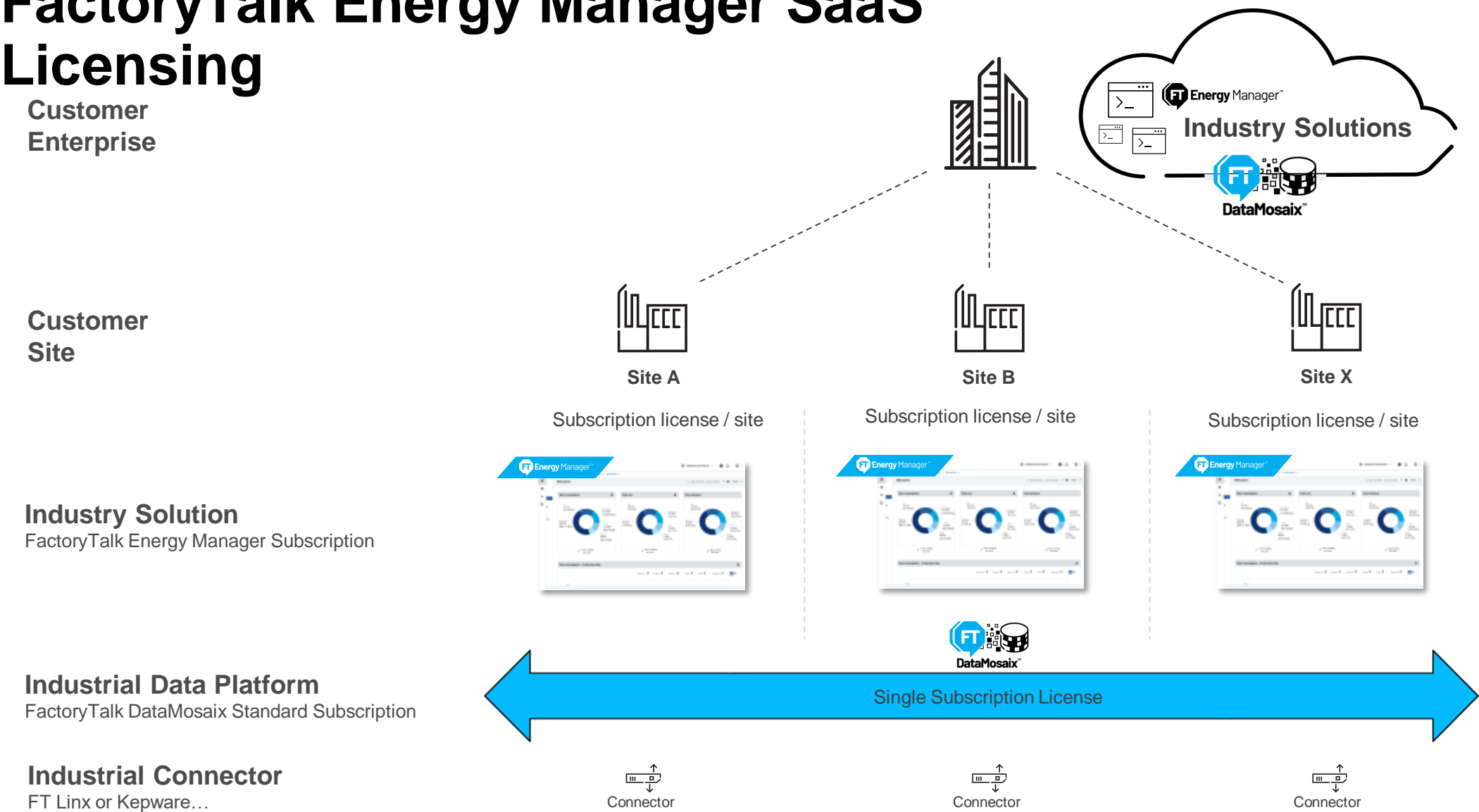Subscription license / site Subscription license / site Subscription license / site

Industry Solution
FactoryTalk Energy Manager Subscription

DataMosaix™

Industrial Data Platform
FactoryTalk DataMosaix Standard Subscription

Single Subscription License

#TAGS

Industrial Connector
FT Linx or Kepware…

Connector Connector Connector

#CONNECTORS

* For current pricing, always check the Software Portal

Rockwell Automation

WRAP-UP

Rockwell Automation

FactoryTalk® DataMosaix™ – The Industrial DataOps

Add content for deep dive into the following steps:

- More details about the deployment phases
    - FTDM Main UI / Home Page
    - Connect (Ways to connect – Default Extractors / API and SDKs)
        https://developer.cognite.com/
        https://developer.cognite.com/dev/
        https://developer.cognite.com/sdks/
        https://api-docs.cognite.com/20230101/
    - Staging Area (Raw Data)
    - Transform (Cleaned Data)
    - Contextualize (Data Mapping)
    - Visualize (Default Charts + Data Access for Other Apps)
- Referenced Architecture Diagrams

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Learn More, Get in Touch! (Rockwell PTEC content)

- ➤ Learn More
  - • Visit the Knowledge Transfer page
  - • Visit the Partner Toolbox page
    - • Recordings, Collaterals, Presentations available

- ➤ Need access to the above content? Have a Technical Question?
  - • Email us at ptec@rockwellautomation.com

- ➤ Land or Expand on your Customers
  - • Got a lead?
  - • Contact your Rockwell Partner Representative
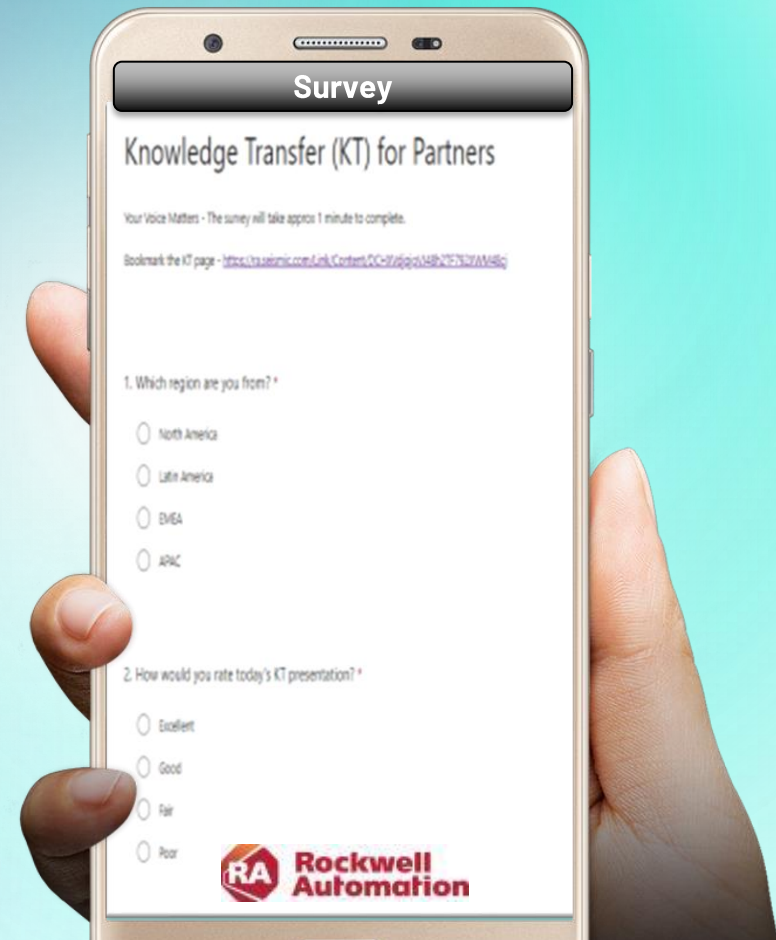
- ➤ Share your experiences with us!

Information Software - Knowledge Transfer

KTP Tube

Check out our video tutorials available on our
Knowledge Transfer Page

WE WANT YOUR FEEDBACK

Rockwell Automation

share your
feedback

Please complete the **session survey** to allow us to improve the initiative for you

Scan this QR Code or go to the website in the chat window

Thank You

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