Rockwell Automation

Introduction to FactoryTalk® DataMosaix™

expanding **human possibility**®

PUBLIC

AT A GLANCE

Rockwell Automation

Our strategy is to bring The Connected Enterprise to life.

We integrate control and information across the enterprise to help industrial companies and their people be more productive and sustainable.

$7.8B
FISCAL 2022 SALES

25,000
EMPLOYEES

100+
COUNTRIES

ABOVE-MARKET GROWTH | PRODUCTIVITY | INTELLECTUAL CAPITAL >>> VALUE CREATION

Rockwell Automation

expanding **human possibility**®

We're taking

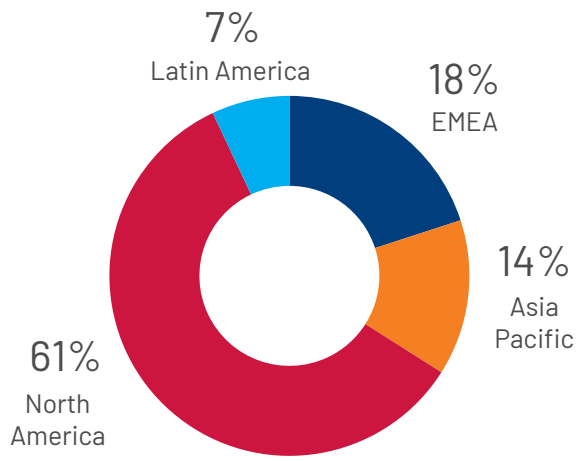
manufacturing to a whole new level

by making our customers more resilient, agile, and sustainable.

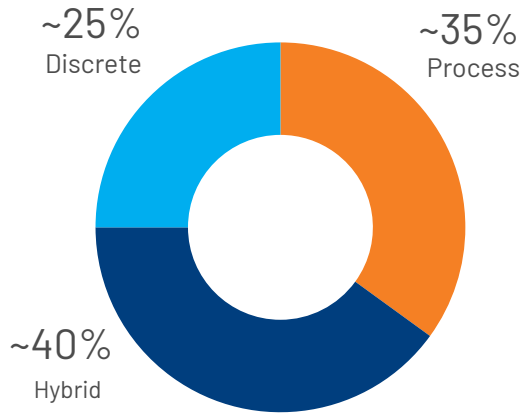
SERVING CUSTOMERS FOR 119 YEARS

AT A GLANCE

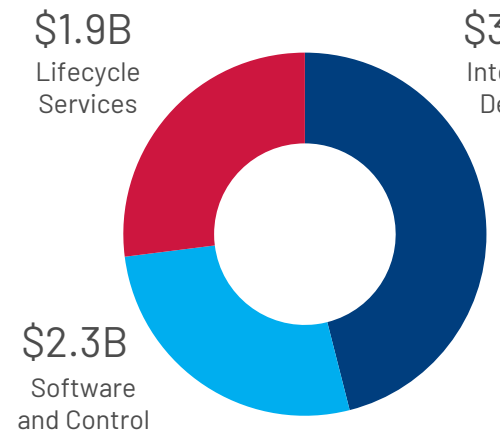
$7.8B 2022 sales



BY **REGION**



BY **INDUSTRY**



BY **SEGMENT**

GLOBAL

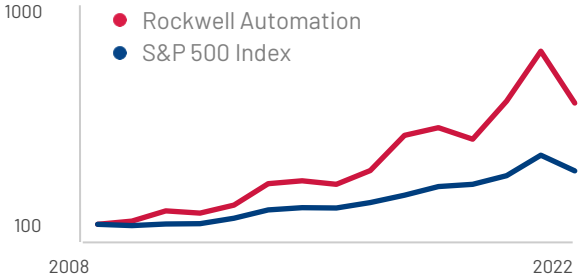
100+ Number of countries

25k Employees: more than half outside the U.S.

2022 WORLD'S MOST ETHICAL COMPANIES® WWW.ETHISPHERE.COM 14-TIME HONOREE — World's Most Ethical Companies

FAST COMPANY — The 50 best places to work for innovators

Total shareowner return



You need data to solve challenging problems

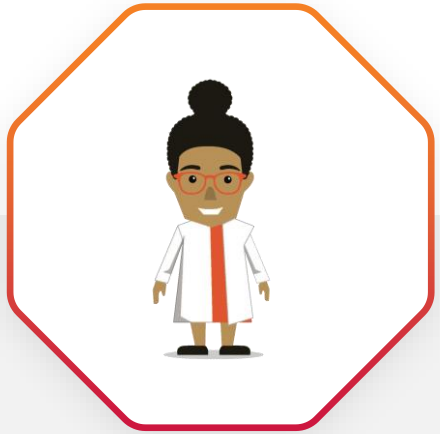
Reliability Engineers

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

Process / Manufacturing Engineers

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

Data Scientists



"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

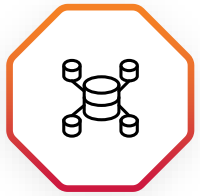
Maintain

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

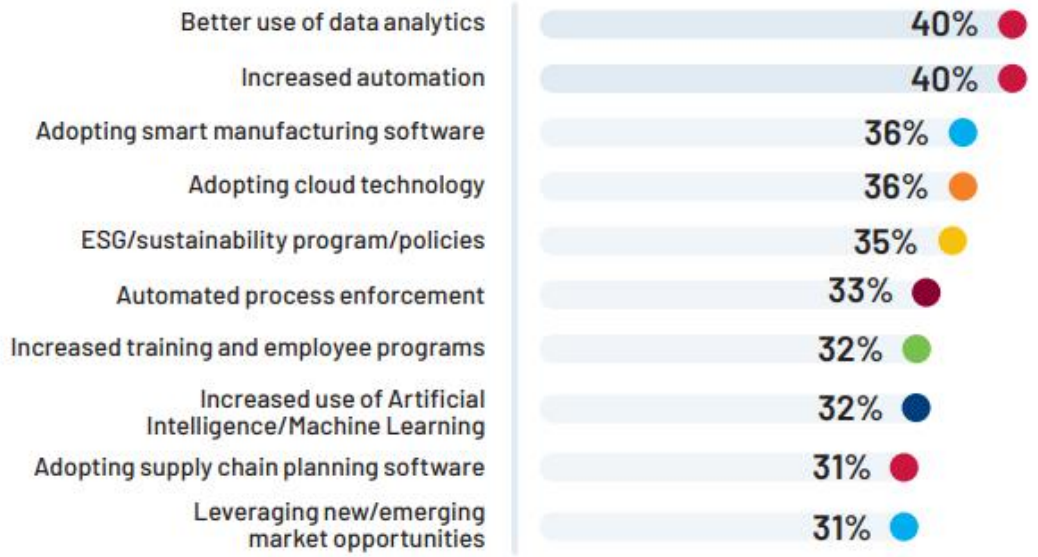
DATA: **UNLOCKING A COMPETITIVE OPPORTUNITY**

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



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

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?

Underlying Details

- 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…

When implementing the solutions

The tough challenges must be solved to succeed

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Why do you need an industrial data hub?

Delivering industrial DataOps and enabling agility and ownership

Industrial DataOps

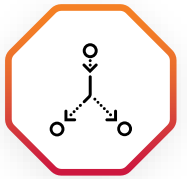
Connects to a variety of OT, ET and IT data sources. Provides scalable capabilities for data transformation, contextualization and modeling.

Industrial Data Product

Enables building industrial data products with essential capabilities for accessing, manipulating and deriving insights from industrial data.

Domain Ownership

Decentralizes the ownership of industrial data to the domain closest to the data.



Federated, Decentralized Data Governance

Promotes the accountability of OT functions with more independence and less overhead.

What makes DataOps *industrial ?*

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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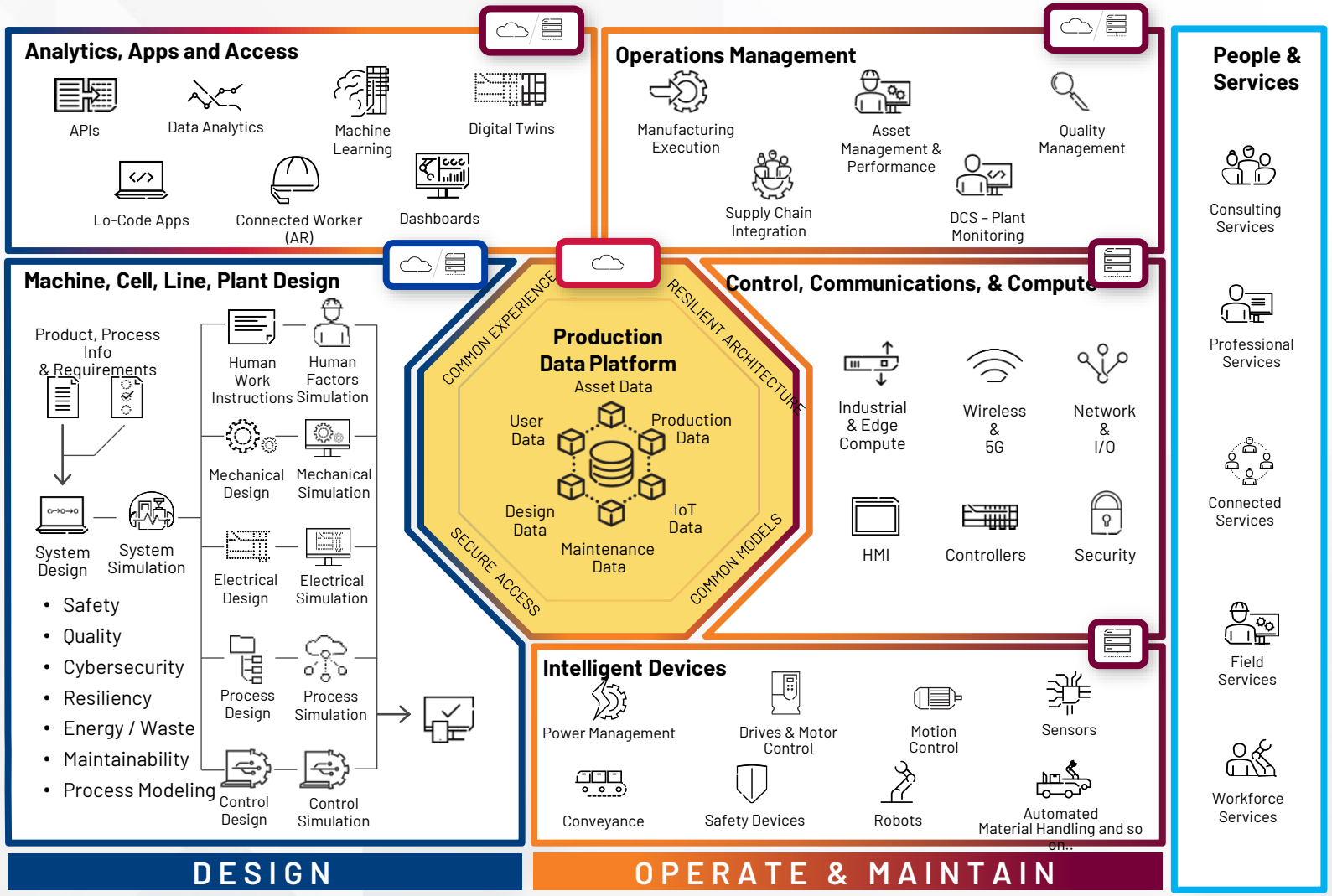
The Connected Enterprise® Production System

Transforming manufacturing throughout the lifecycle

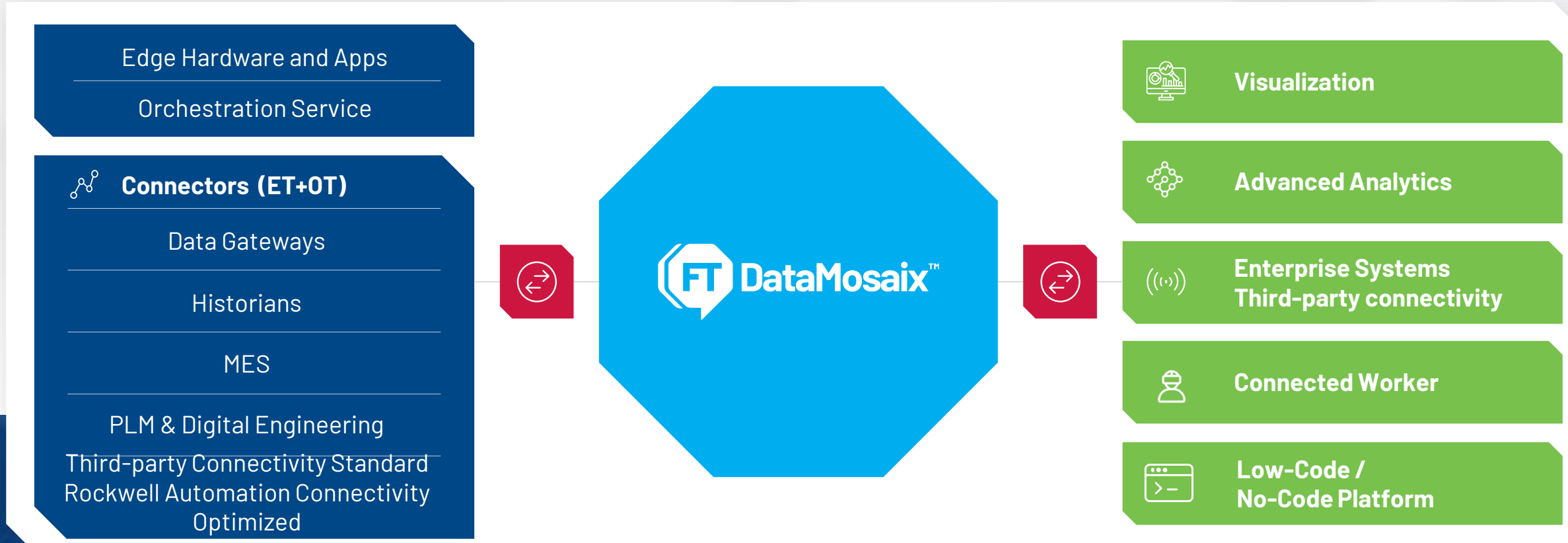
Using data and automation to connect people, processes and tools so they can operate at maximum capacity

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



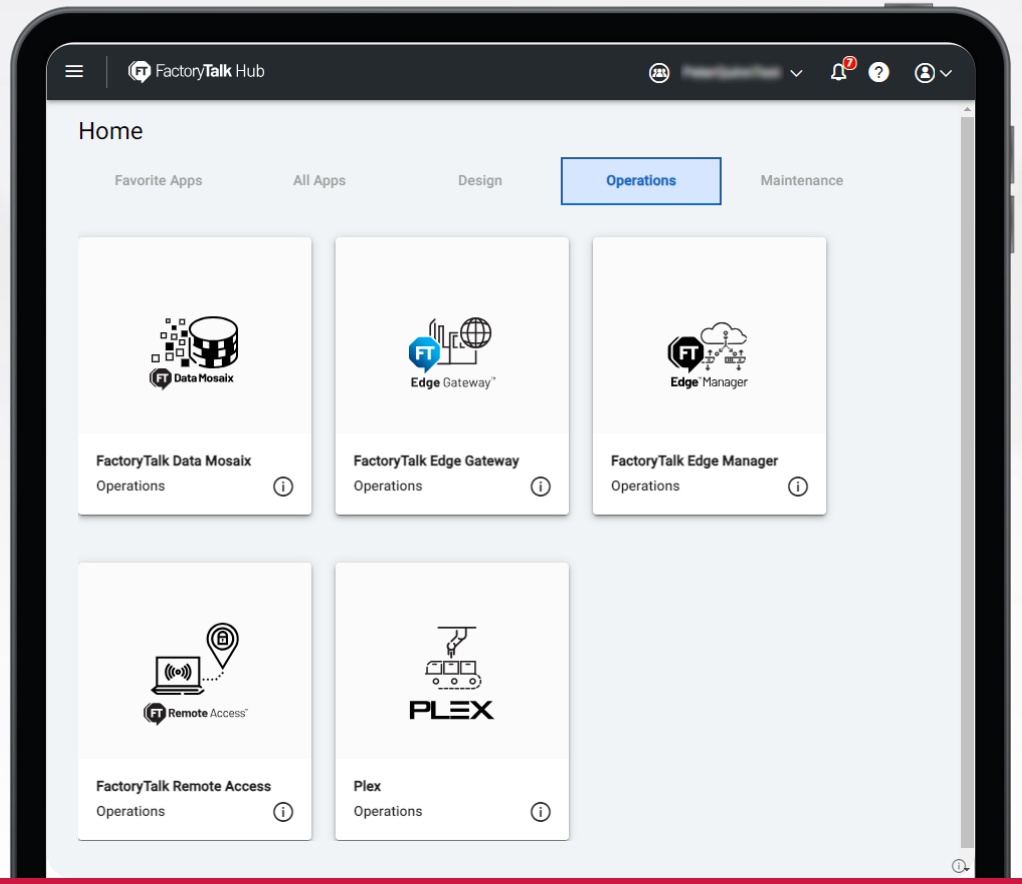
Introducing FactoryTalk® DataMosaix™

Transform your data into value with a SaaS Industrial Data Hub



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

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

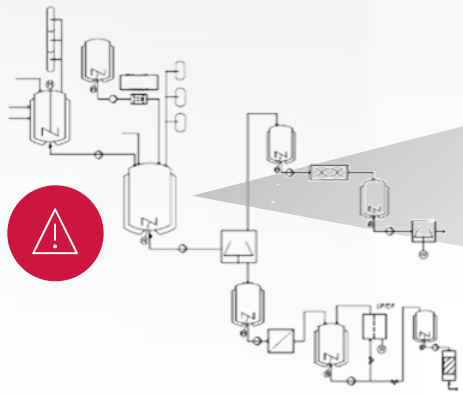
Real-time visualization and advanced analytics applications deployed at scale that drive **optimal decision-making and autonomous closed-loop actions**.

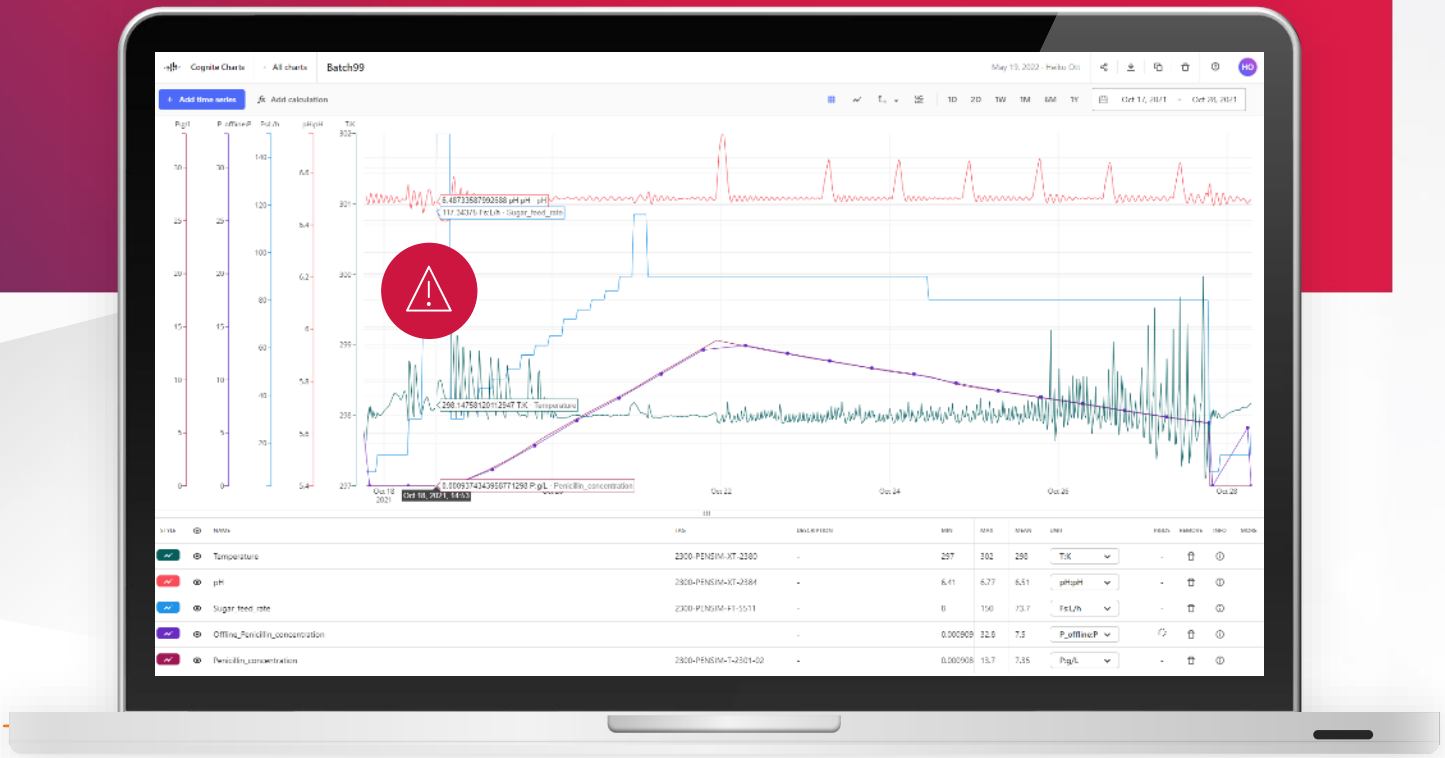
Foundational Use Case: Next generation Historian

Easy, centralized and contextualized data across multiple plants for faster root cause analysis by off-site SMEs

Ability to store and analyze time series and events data from a production asset or process.

Enrich time series with context from enterprise and third-party data systems to enable problem solving

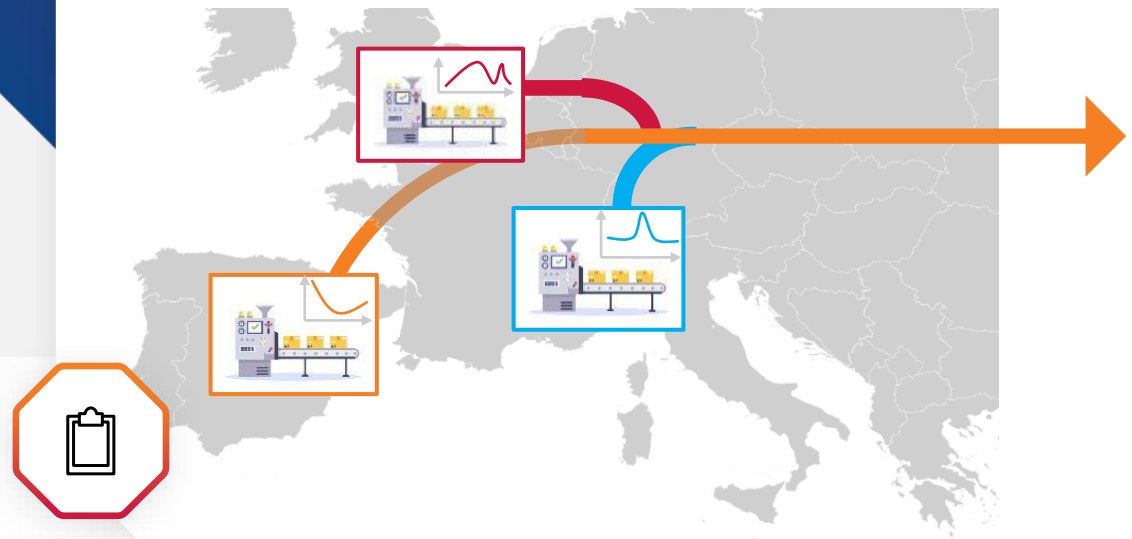




Foundational Use Case: Enterprise production reporting

Real-time and trusted enterprise visibility to plant performance to optimize production planning

- Compare OEE by plant, line, equipment or shift and conduct ad-hoc queries to understand plant performance
- Off the shelf OEE calculations that don't require an extensive IT project
- Leverage the existing investment in on-premise OEE reporting tools by reusing the existing context
- Make informed production planning decisions



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Foundational Use Case: Asset monitoring

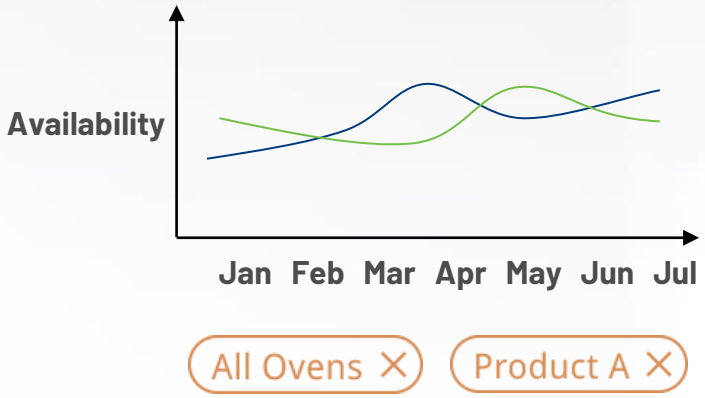
Analysis of real time asset data to detect issues and determine what corrective actions are needed

Compare reliability of similar equipment across multiple plants

Improve meaning of sensor data trends with the related IT/OT/ET context (e.g., maintenance work orders)

Quickly find root causes of downtime events with ad-hoc engineering analysis

Enterprise Asset Dashboard

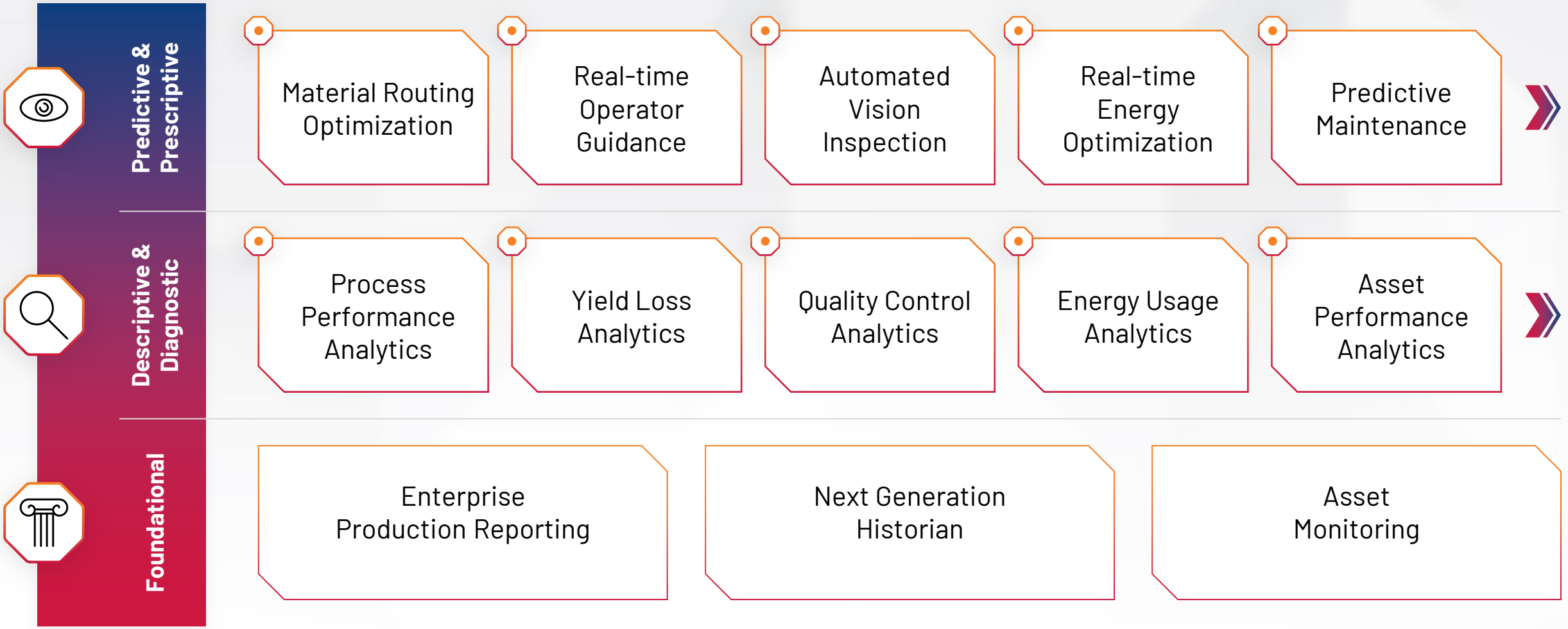


Top Alarms by Equipment

Plant B Oven	254		296		-42	
Plant A Oven	246		181		65	
Plant B Mixer	101		191		-90	
Plant B Extru	303		76		227	
Plant C Oven	200		217		-17	
Plant C Mixer	118		273		-155	
	201		148		53	

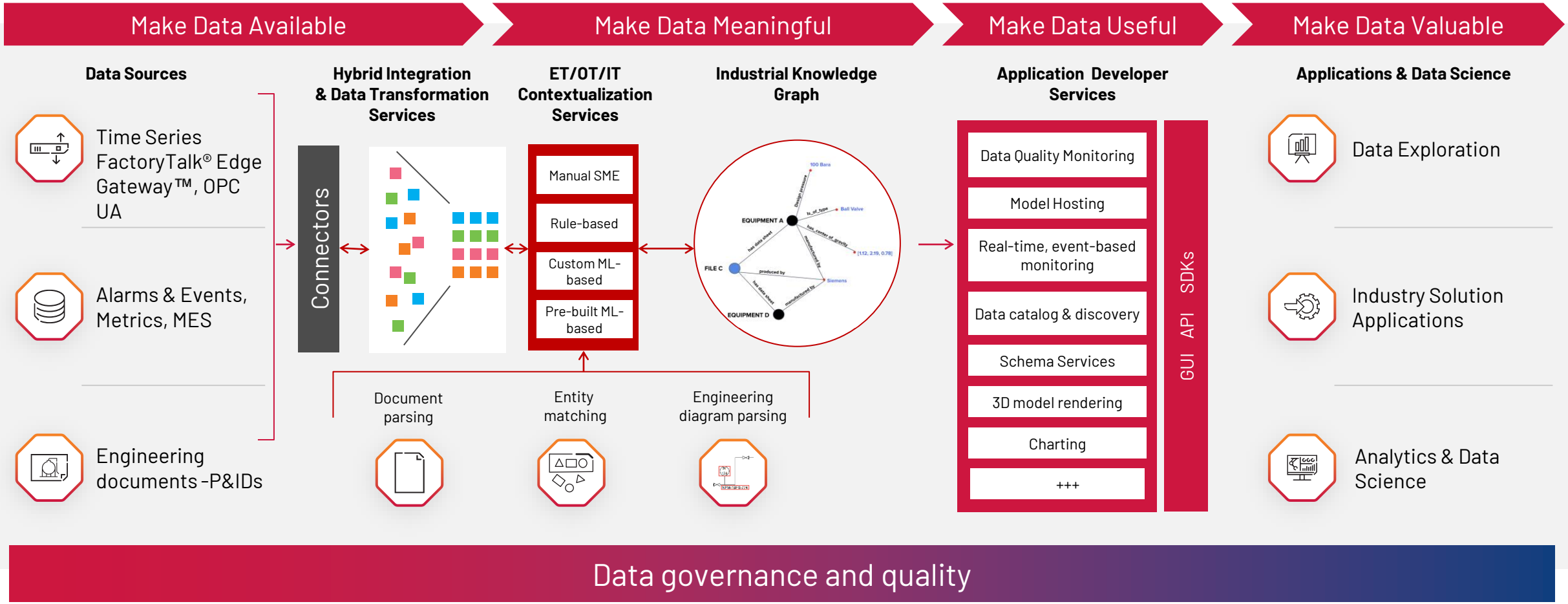
Scaling high value applications

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



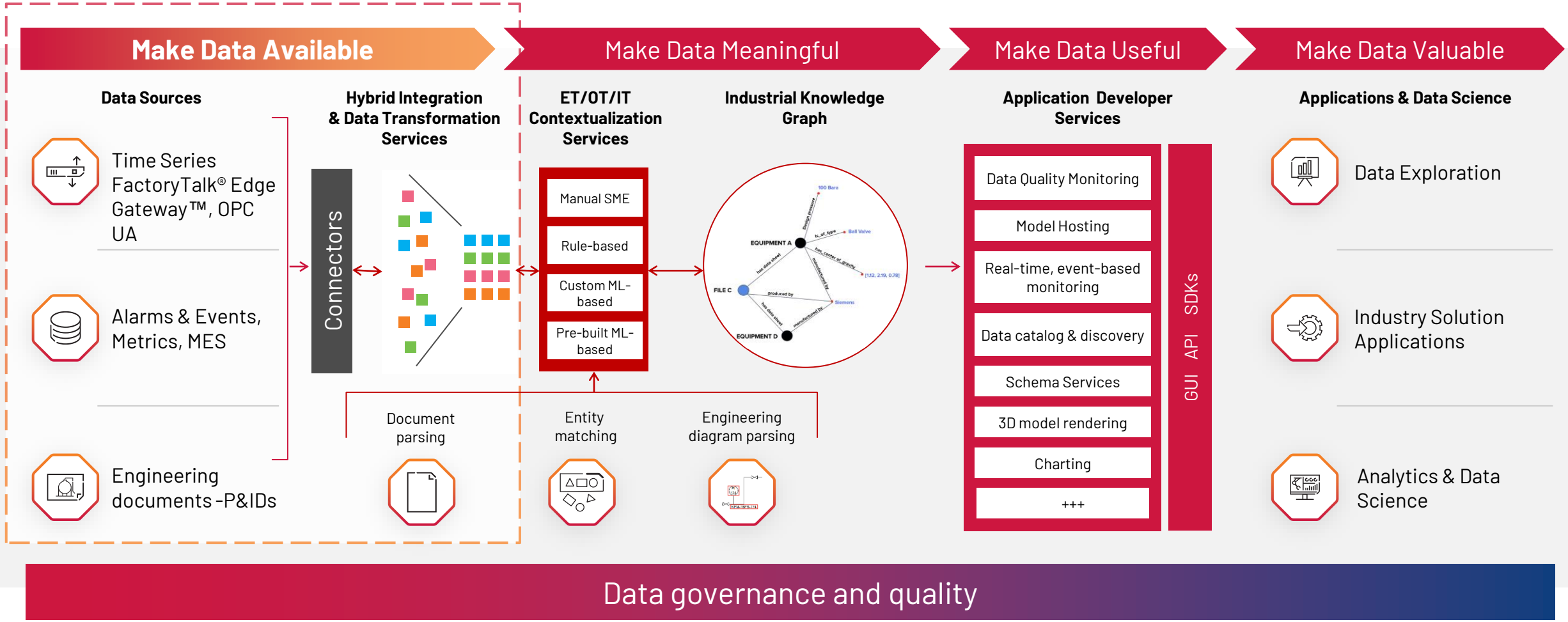
FactoryTalk® DataMosaix™ overview

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



Make data available

Liberate industrial data from silos



Data extraction

Prebuilt Extractors to common industrial data sources and systems

30+ prebuilt extractors including:

- FactoryTalk® Edge Gateway™
- FactoryTalk® Historian SE
- OSI PI
- OPC UA
- KEPServer
- PostgreSQL
- Documentum
- MQTT

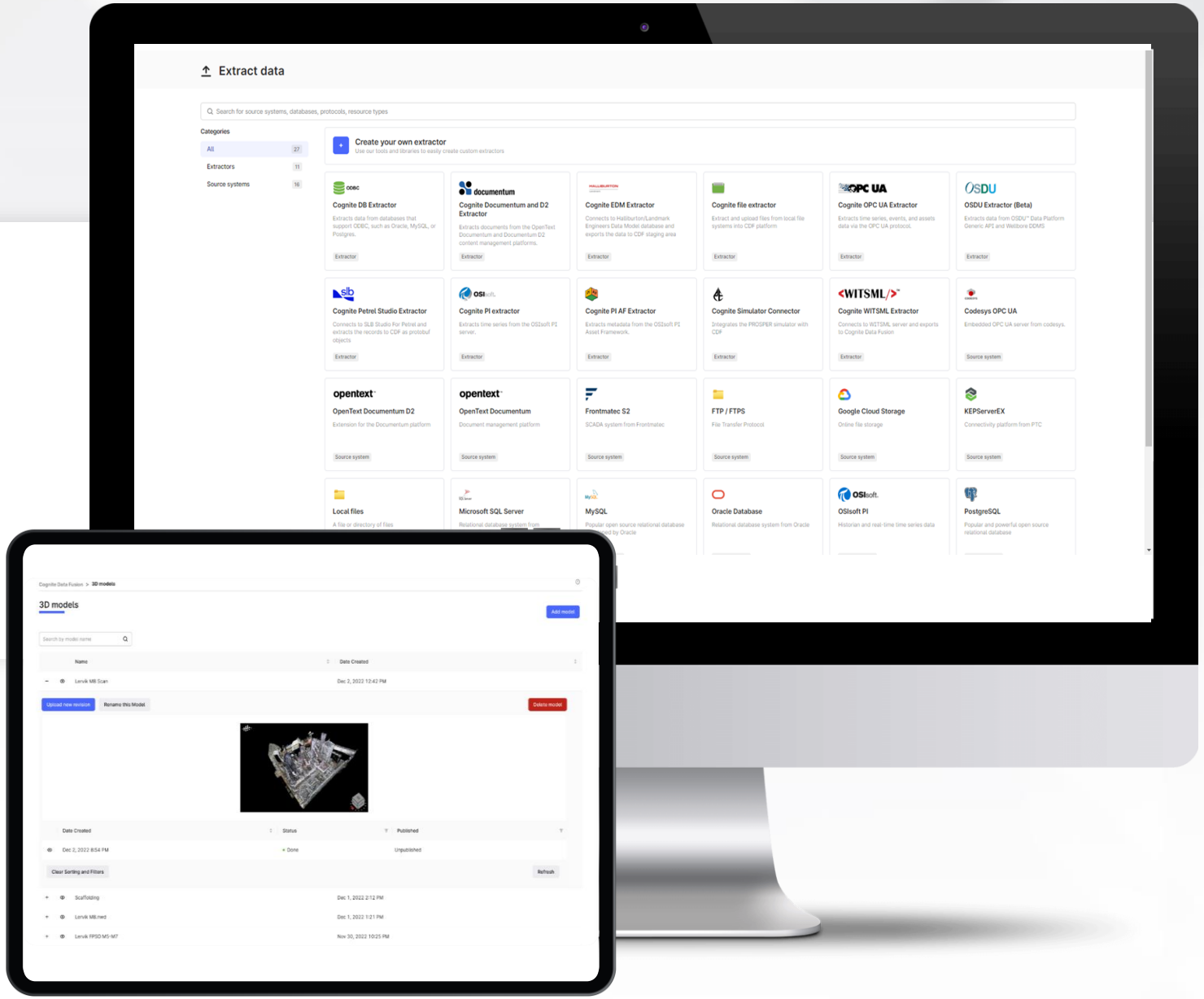
More extractors for FactoryTalk® products coming soon!

Custom Extractor Templates

Pre-built functionality to quickly develop extractors to highly customized solutions like SAP

3D Models

Integrate CAD models or point clouds and version control models



Scalable connectivity with FactoryTalk® Edge™ Manager and FactoryTalk® Edge Gateway™

FT Edge™ Manager

Public and Private Edge Connector Marketplace

Industrial Edge Application and Device Fleet Management

Centralized FactoryTalk® Edge Gateway™ Management

FT DataMosaix™

- Assets
- Time Series
- Events
- Files

Connect disparate OT data sources

EDGE COMPUTE DEVICE

Edge Gateway™ | FactoryTalk® Historian SE Extractor | SQL Extractor

Historian SE

EDGE COMPUTE DEVICE

Edge Gateway™ | Historian Extractor | OPC UA Extractor

EDGE COMPUTE DEVICE

Edge Gateway™ | KEPServer Extractor | MQTT Extractor

Edge Orchestration

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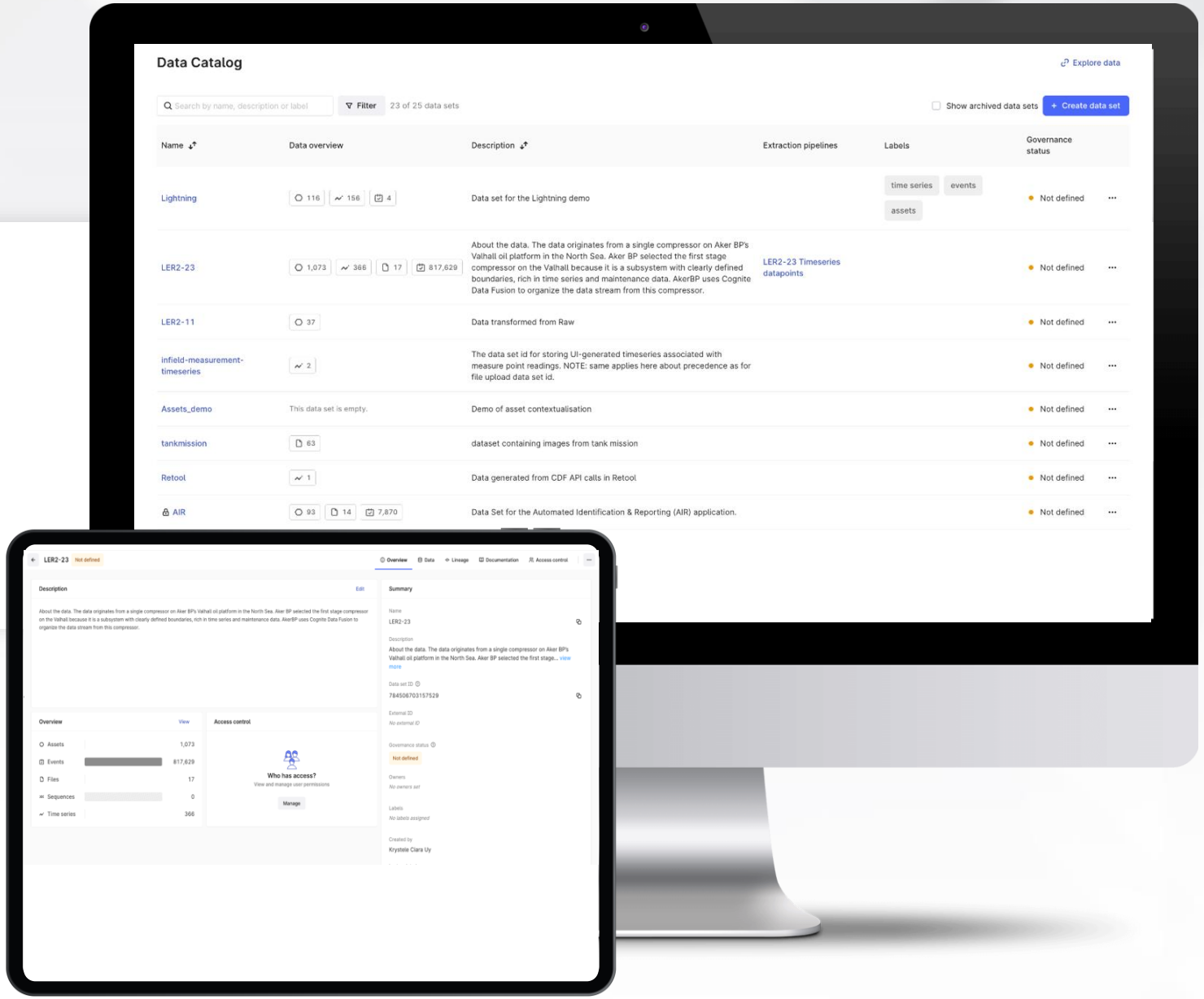
Data catalog and user management

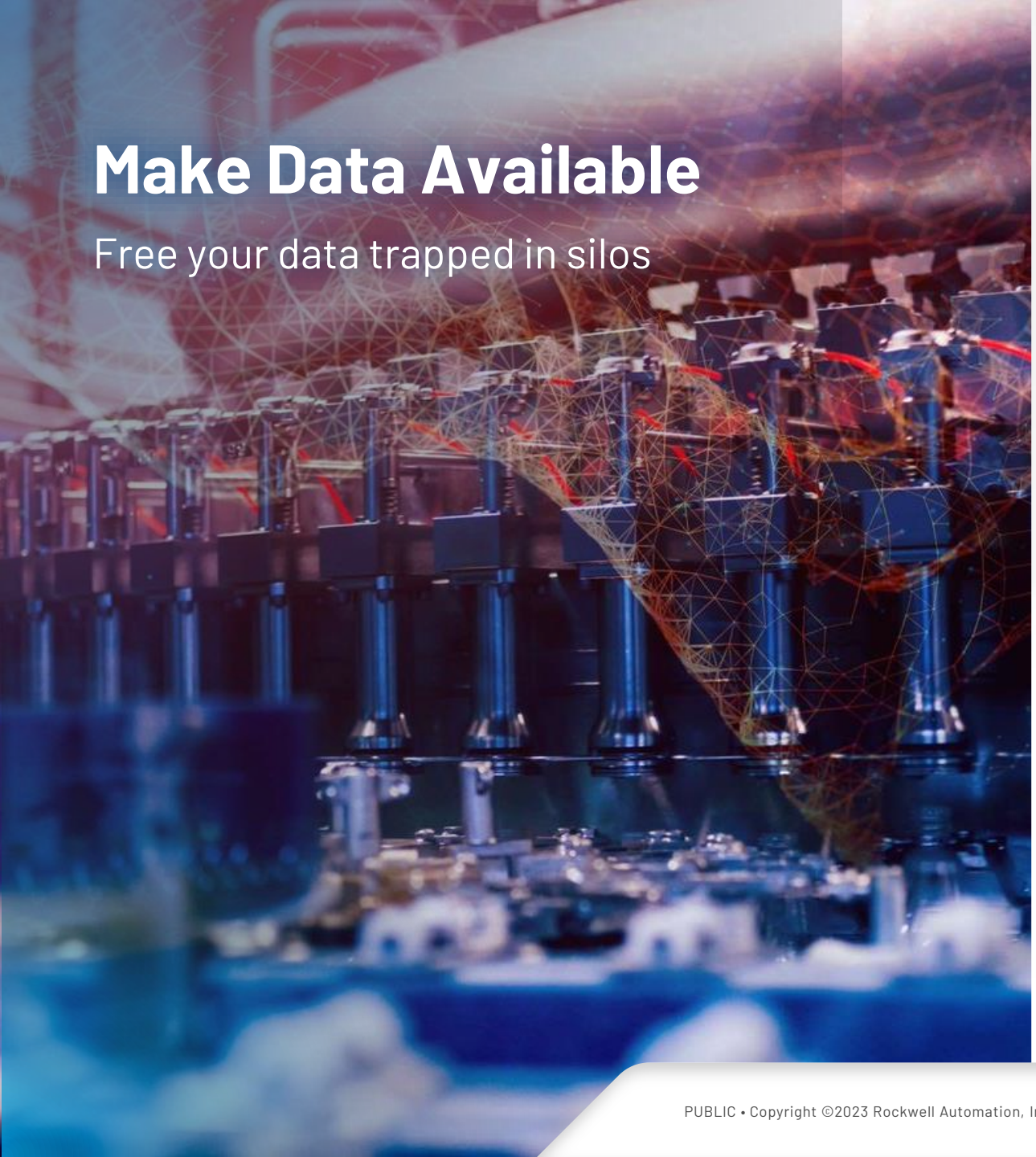
Right information to the right person

- Govern data sets, set access controls and create streamlined view for all roles
- Enable scale by limiting sites to only see data set relevant to them
- Access data lineage, documentation and access control from a single location

Managing user access

- Create groups to give certain user access to the correct functionality and capabilities based on role
- Set access policies to control access to site specific data or to enable partners access to data specific to their area of concern





Make Data Available

Free your data trapped in silos

FT DataMosaix™

Simplify data connectivity

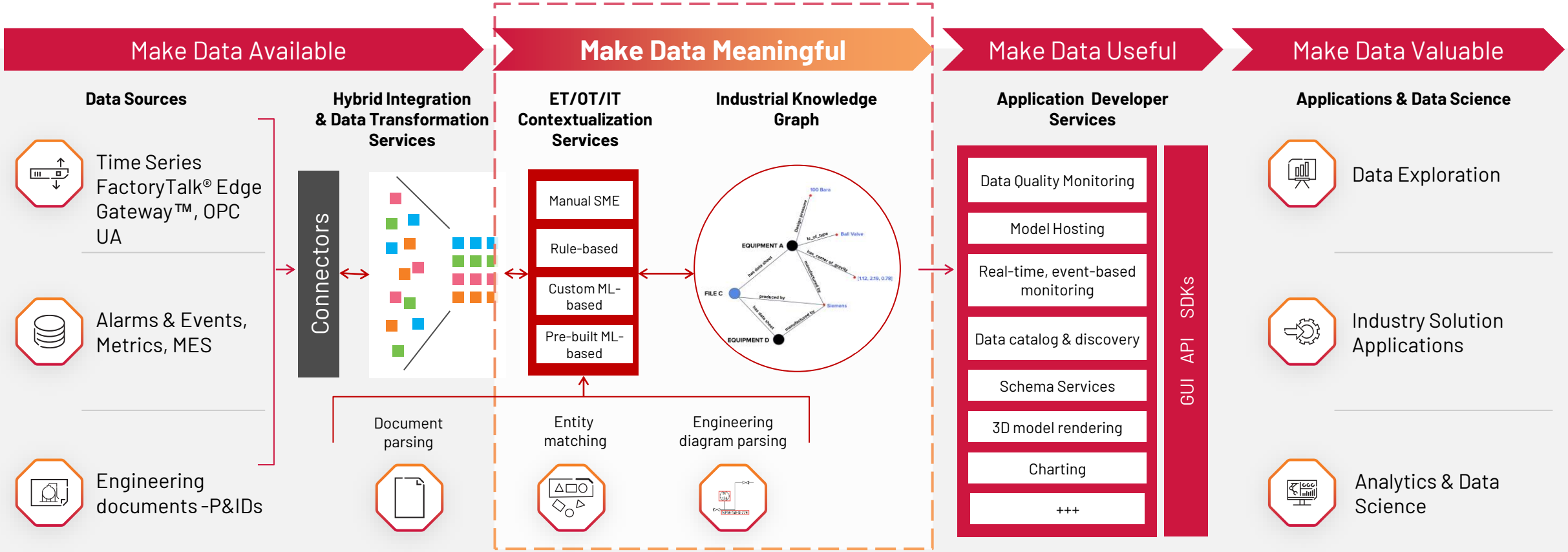
- Reduced manual effort to collect data across many sources
- Pre-built OT and IT data extractors for common industrial data sources
- Standard integration with FactoryTalk® Edge Gateway™ for real-time data
- Well-documented APIs and SDKs for custom extraction
- Standard import of engineering data

Capture data at scale

- Rapidly scale across machines, lines and facilities with re-usable data pipelines
- Real-time monitoring and lifecycle management of data pipelines
- Full traceability of data ingestion and transformation
- Configure and manage users and role-based access to data

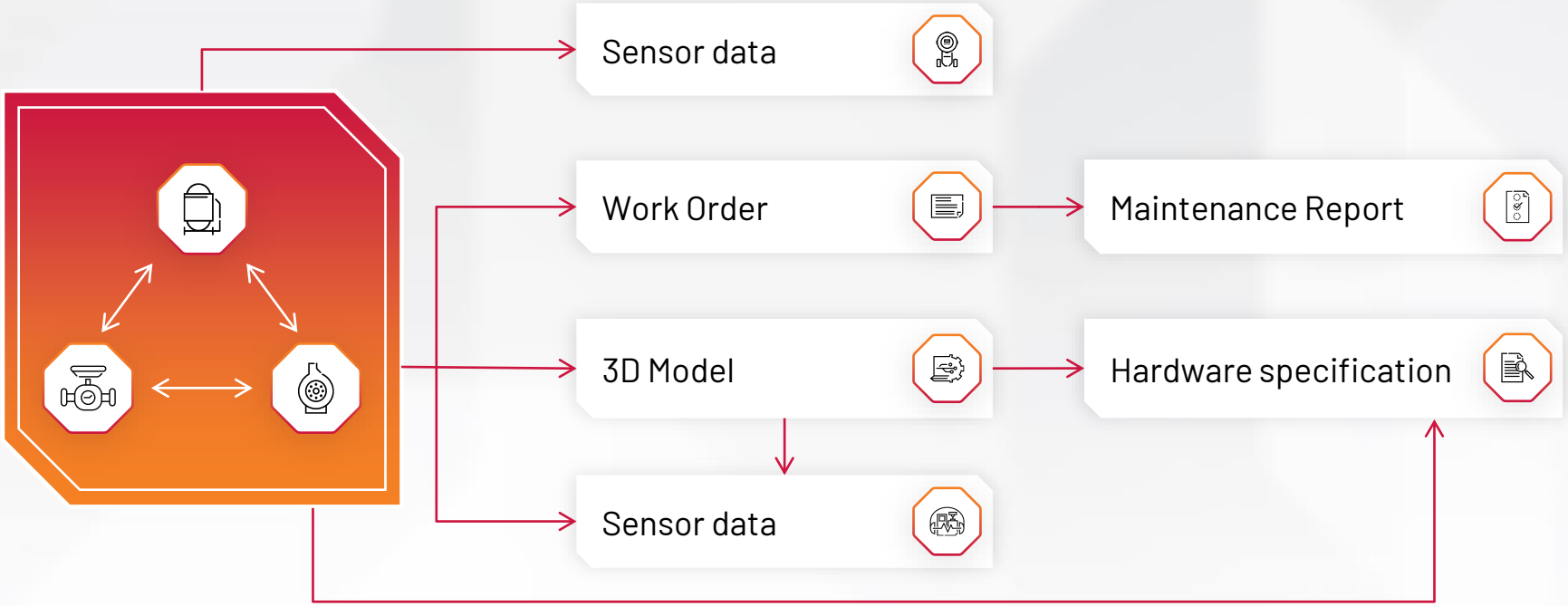
Make data meaningful

Create an Industrial Knowledge Graph to make your data “speak human”



What is 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.



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

Entity matching

No-code to contextualize data

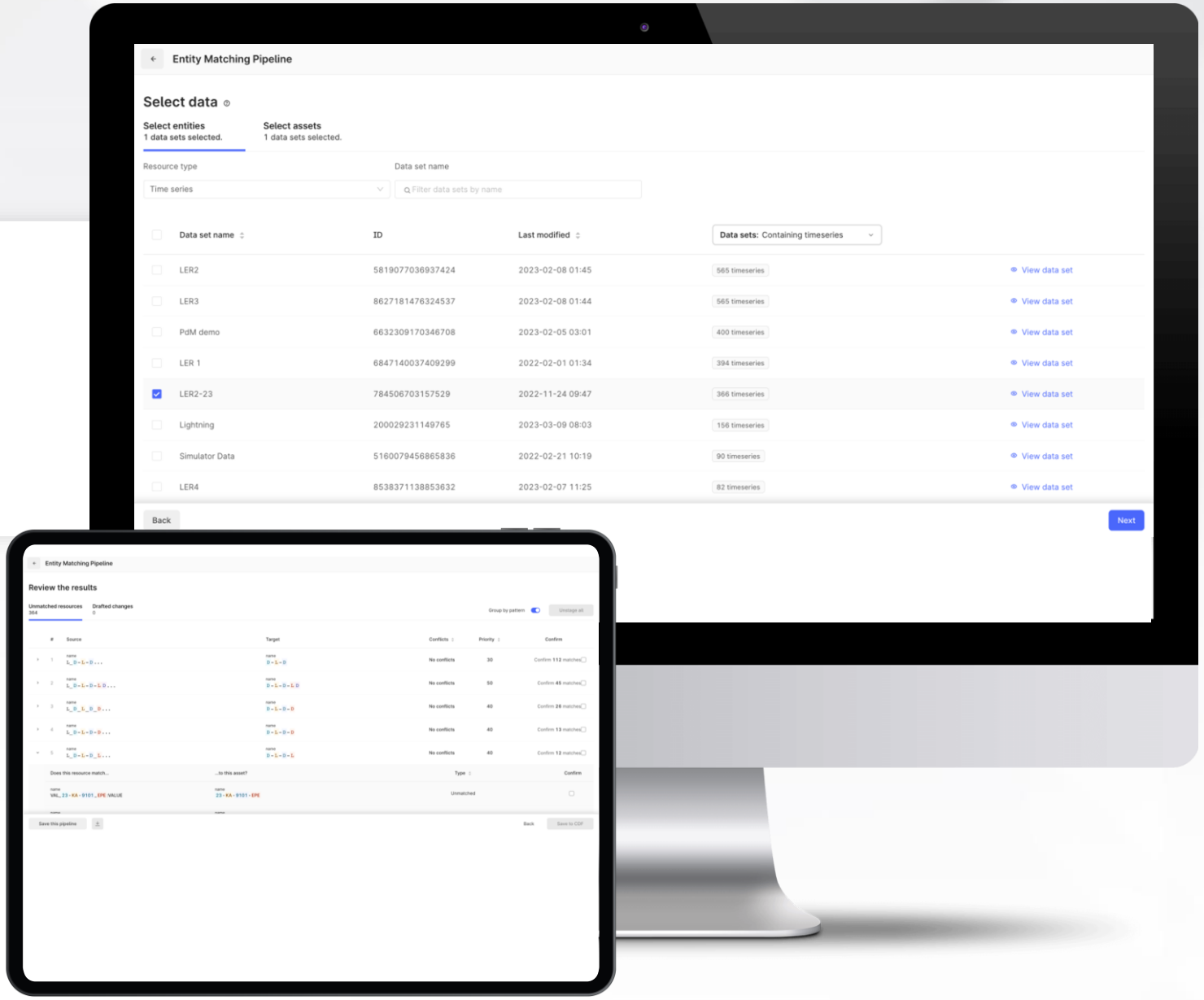
Choose data sets and select an **AI-powered algorithm** to determine relationships based on name, description or any other meta-data.

Review automated rules

No need to create context manually in CSV files. **FactoryTalk® DataMosaix™ automatically recommends relationships between data**.

Example: A maintenance event description correlates to a specific asset type.

The resulting pipeline will automatically be maintained when data is modified at the source or new data is added.



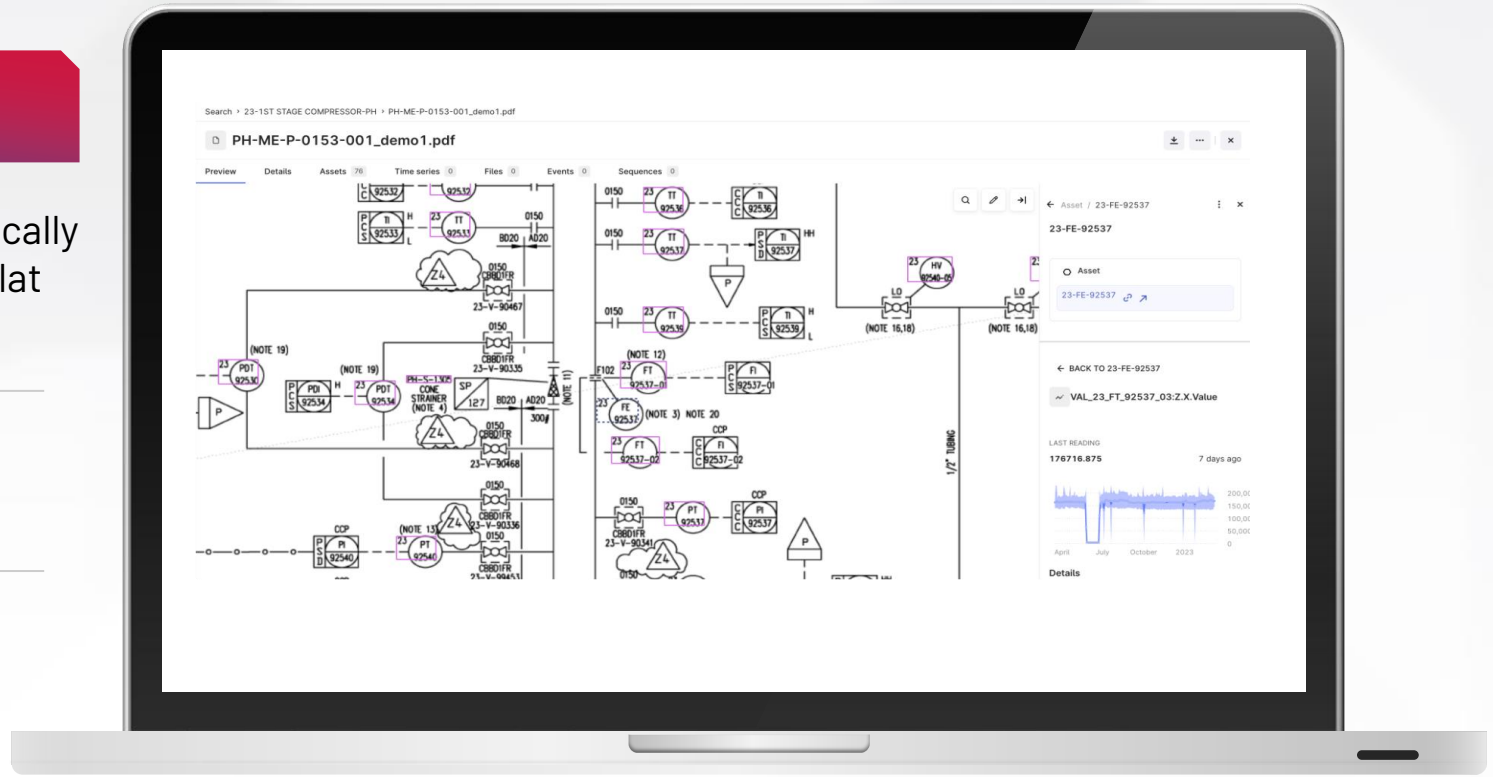
Create interactive engineering diagrams

Contextualizing Drawings

Computer vision detects tags and automatically maps assets and time series to previously flat PDFs.

Manually add additional context from data available in FactoryTalk® DataMosaix™

Real-time process data is available on all process drawings and diagrams.



Make data meaningful

Easily contextualize complex data

DataMosaix™

Accelerate data contextualization

- Give context to time series, events, documents, images, 3D models and more
- Create logical relationships between all data types, even with different naming conventions
- AI-enabled automated contextualization services
- Image and video contextualization and management

Link digital to physical

- Bring static documents to life
- Create interactive engineering diagrams to easily understand the physical context of time series data, alarms, work orders and so on

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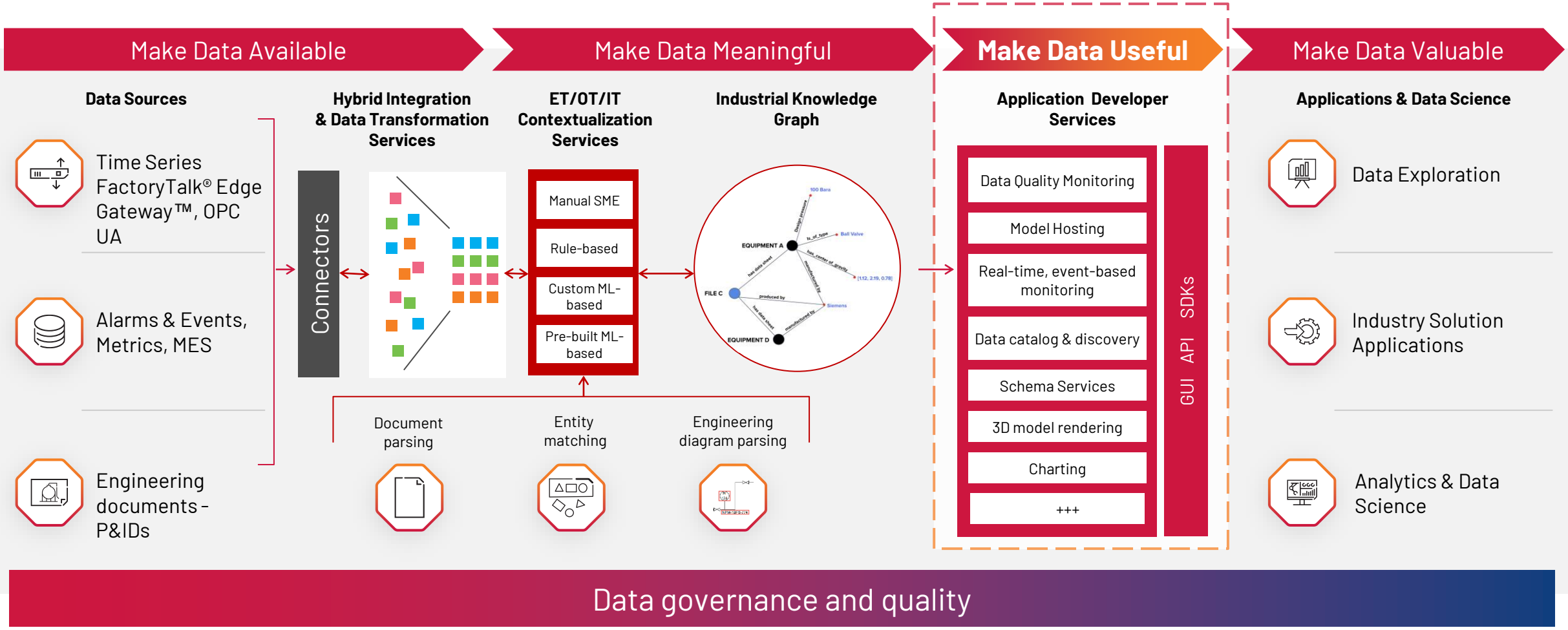
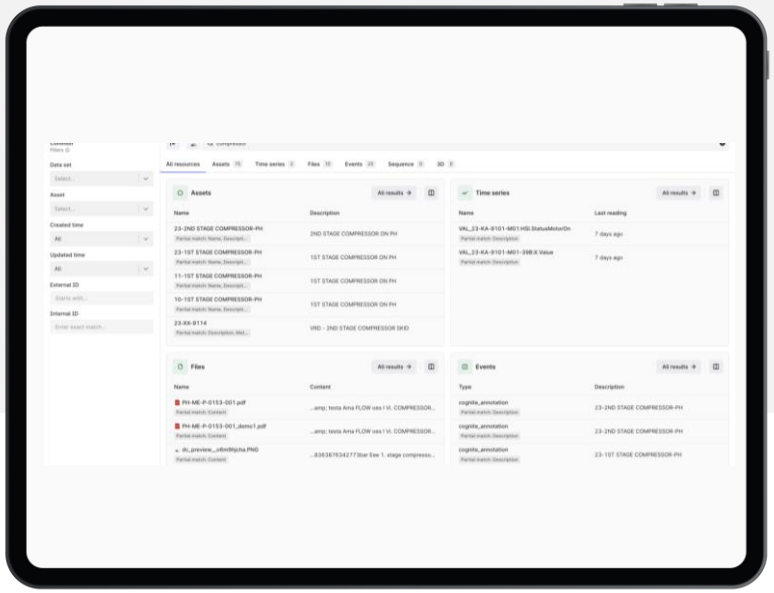
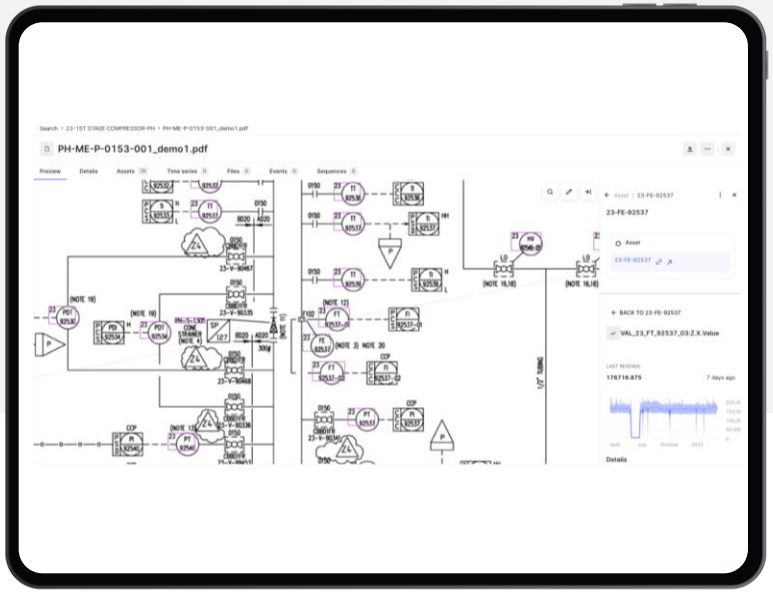
Make data useful

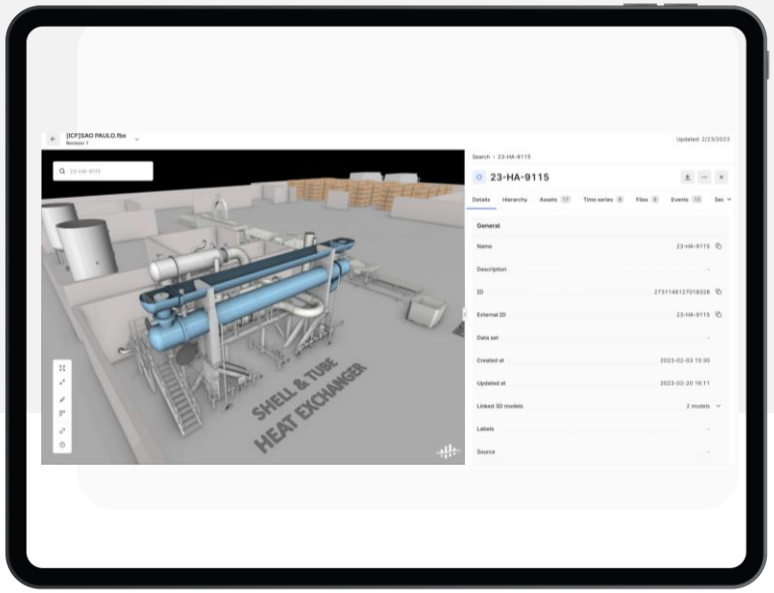
Turn your data into reusable “data products”



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

Data models to capture different perspectives

Source data model

Raw data into FactoryTalk® DataMosaix™

- Work orders from ERP / MES
- Time series from FactoryTalk® Edge Gateway™
- Alarms from HMI

Domain data model

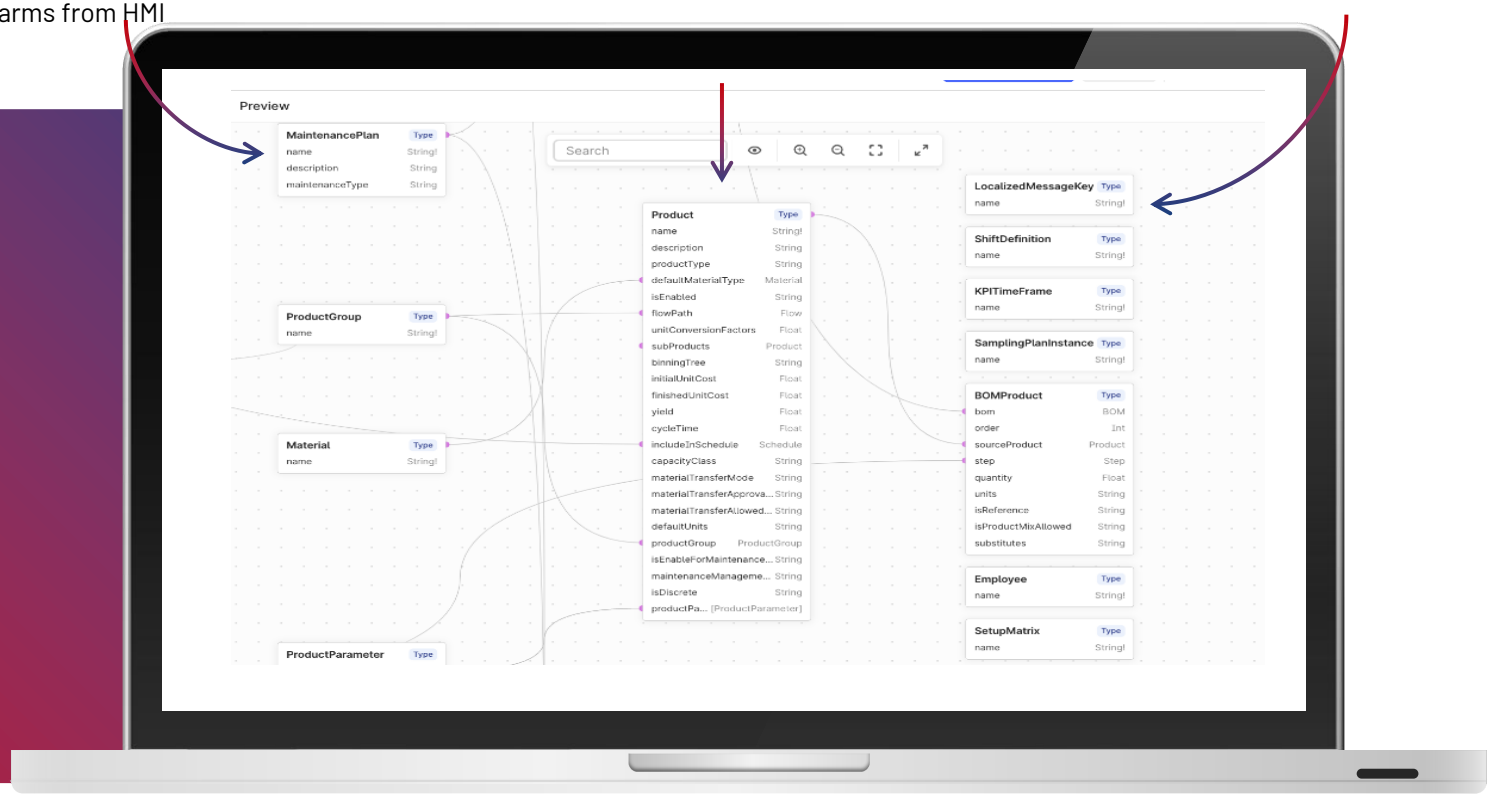
Populate pre-built models

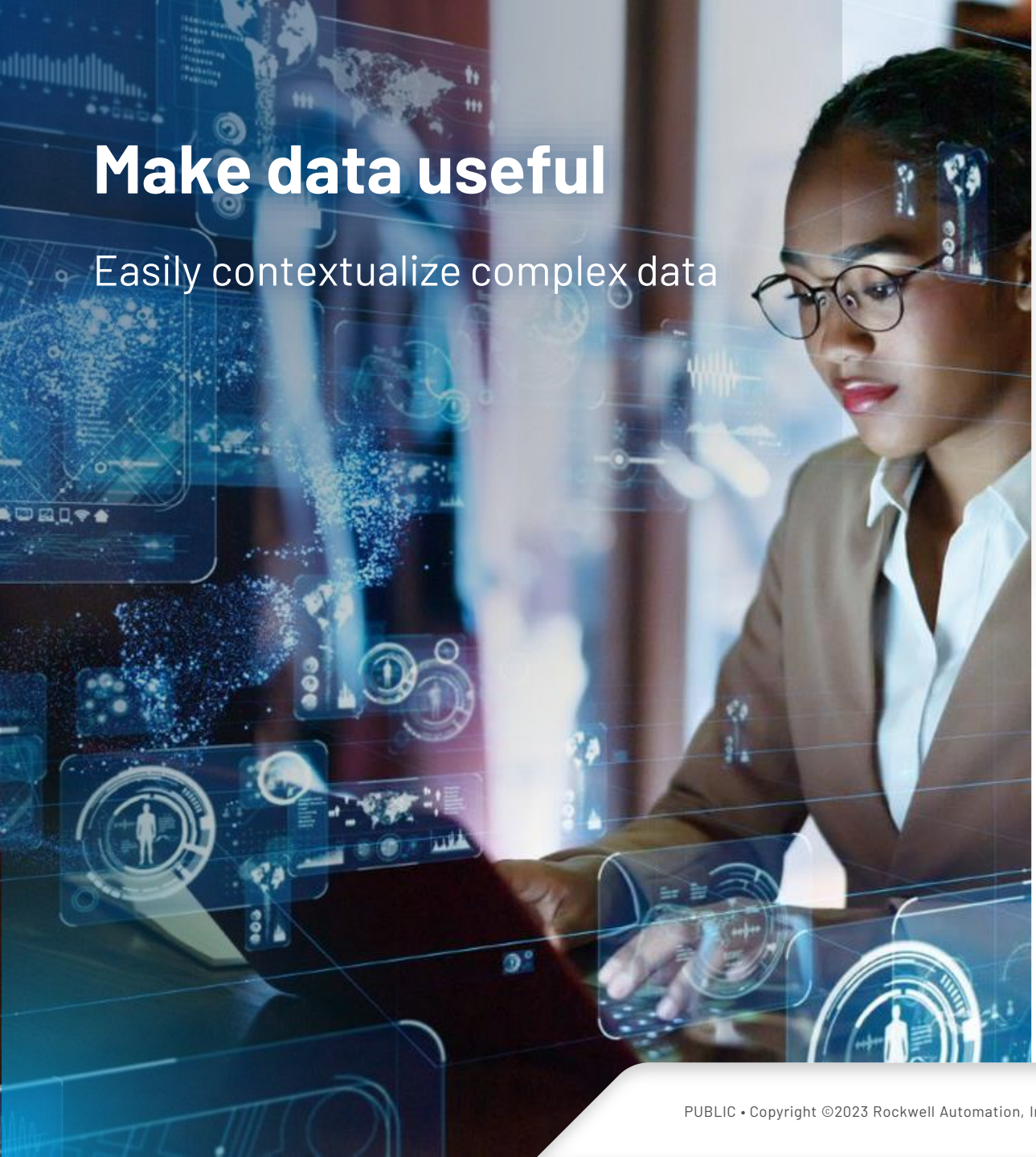
- Asset centric
- Follow standards (e.g., ISA-95, ISA-88)
- Custom semantic types

Solution data model

Model data for specific use cases

- Create data models using subset of domain models
- Auto-populate models for scaling





Make data useful

Easily contextualize complex data

FT DataMosaix™

Easily explore the available data

- Intuitive search across contextualized data
- Contextualized view of assets, time series, documents, models and so on

Create flexible and reusable data models

- No-code data modeling to create data "building blocks" for assets, processes or other structures based on application needs
- Flexible data models to support a variety of use cases
- Auto-populated data models for scaling
- Functions to generate insights to use across applications
- Pre-built templates to accelerate application development

Expose data to develop applications

- APIs and SDKs to integrate data models and templates with the visualization and analytics applications of choice

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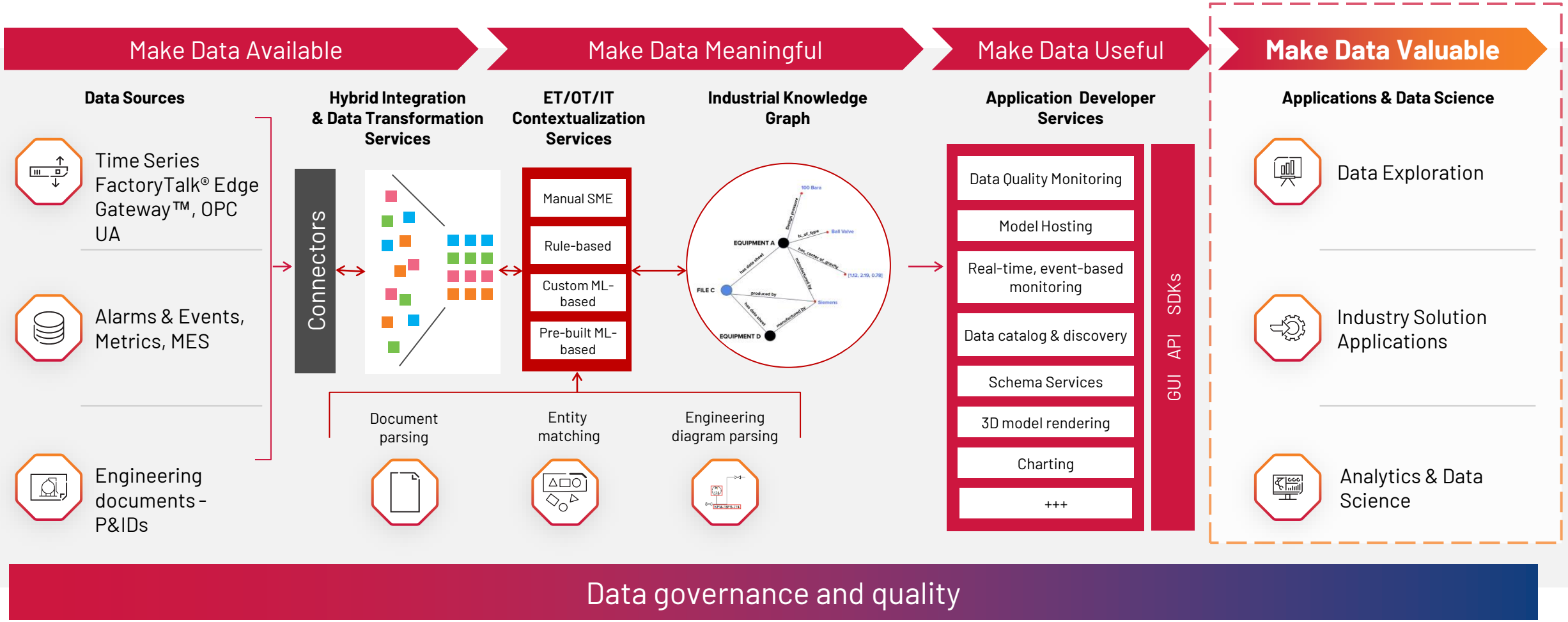
Make data valuable

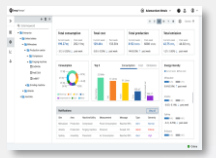
Realize value from your data through scalable apps and analytics



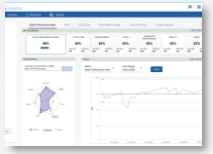
FactoryTalk® DataMosaix™ at the center of a scalable app strategy

Industry Solutions

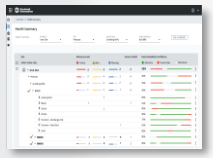
FactoryTalk Hub™



FactoryTalk® Energy Manager



Rockwell Automation Industry Solution - Batch Performance Analytics



Rockwell Automation Industry Solution - Asset Intelligence for Mining

...more

Low-Code / No-Code

KPI Tracking

AI / ML Models

...more

Apps from Any Source
(Vendor Agnostic)

Data Platform

DataMosaix™

FactoryTalk Hub™

Governance, access control, APIs, SDKs

Charting, visualizations, analytics

Data discovery, exploration and cataloging

Data integration, transformation and contextualization

Integrate data from OT, IT and ET sources
Extend value by connecting and contextualizing data

Apply governance to diverse data sets
Trusted data gets used more for less cost

Deploy more solutions faster
Data in one place with interoperability for a modern architecture

Automate data and asset modeling
Scale across sites more efficiently

Edge Management + Connectivity

Edge™ Manager

Edge Gateway™

FactoryTalk Hub™

DATA EXTRACTOR

Historians | PLCs / IoT | MES | QMS | CMMS | ERP | Simulation | Files

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

Rockwell Automation

Charting and no-code analytics

On-the-fly trending and analysis

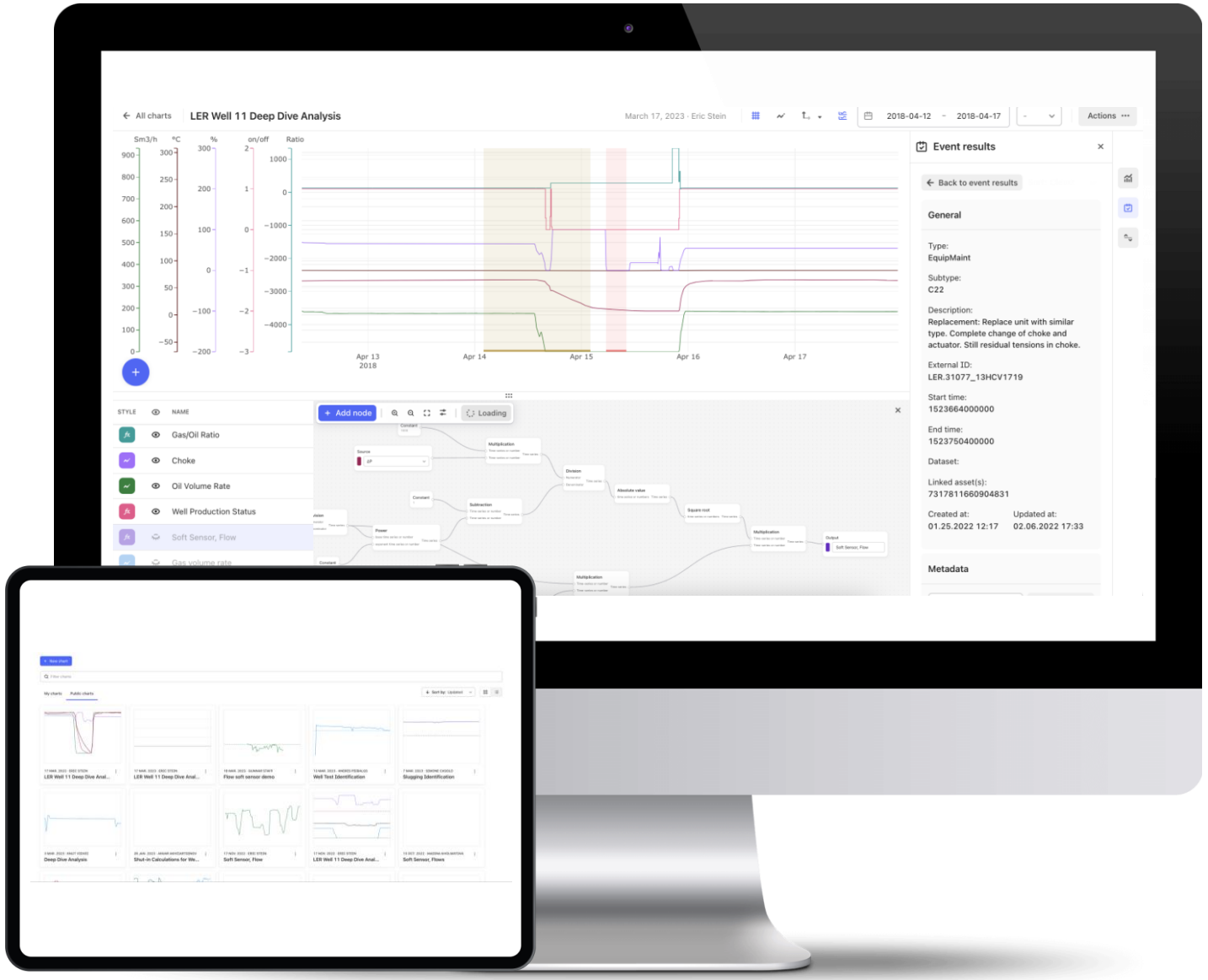
Access contextualized data with powerful, no-code experience to perform **industrial data analytics, troubleshooting and root cause analysis.**

Industrial data science library with pre-built calculations

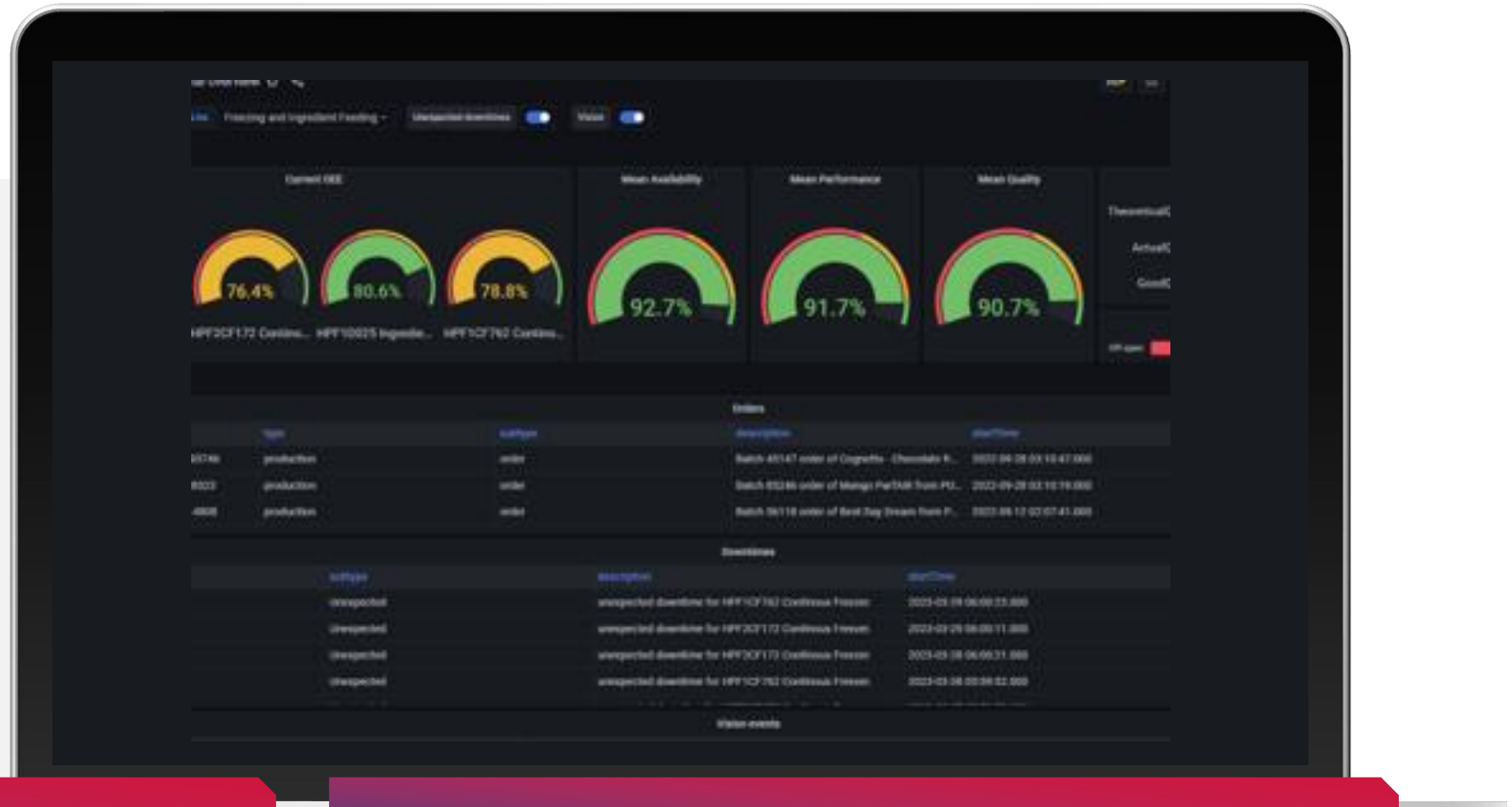
Overlay events and alerts from CMMS, HMI or historian and send notifications to complete workflows

Collaborate and share insights

Create public charts that **subject matter experts** can share with operations and front-line workers.



Open ecosystem visualization



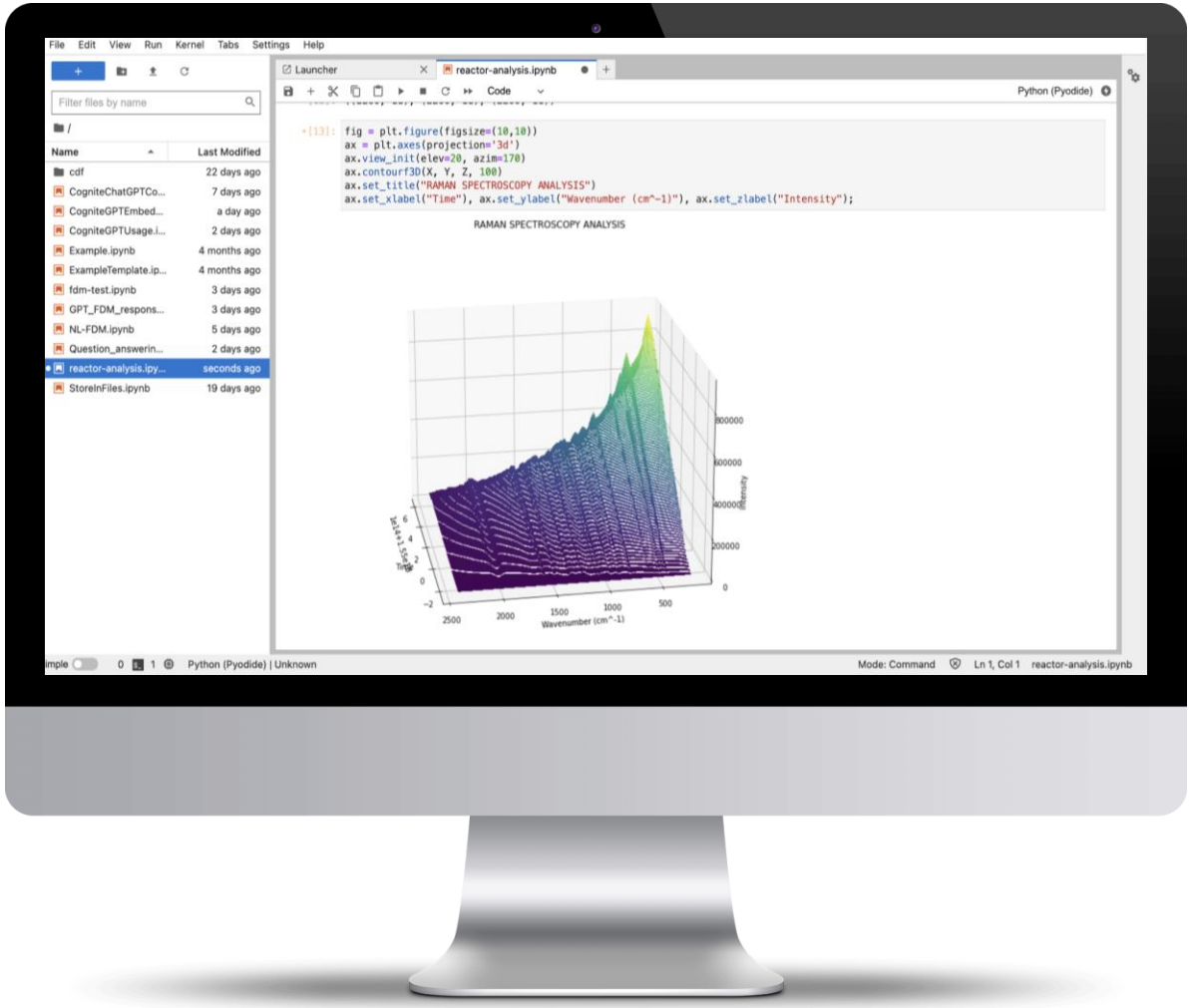
Pre-built connectors in industry standard visualization

Standard connectors to applications like **Grafana** and **PowerBI.**

Search data in context

Unified access to time series, events, calculations, etc. Create queries that **automatically update and maintain dashboards.**

Open ecosystem analytics



Pre-built connectors and open APIs

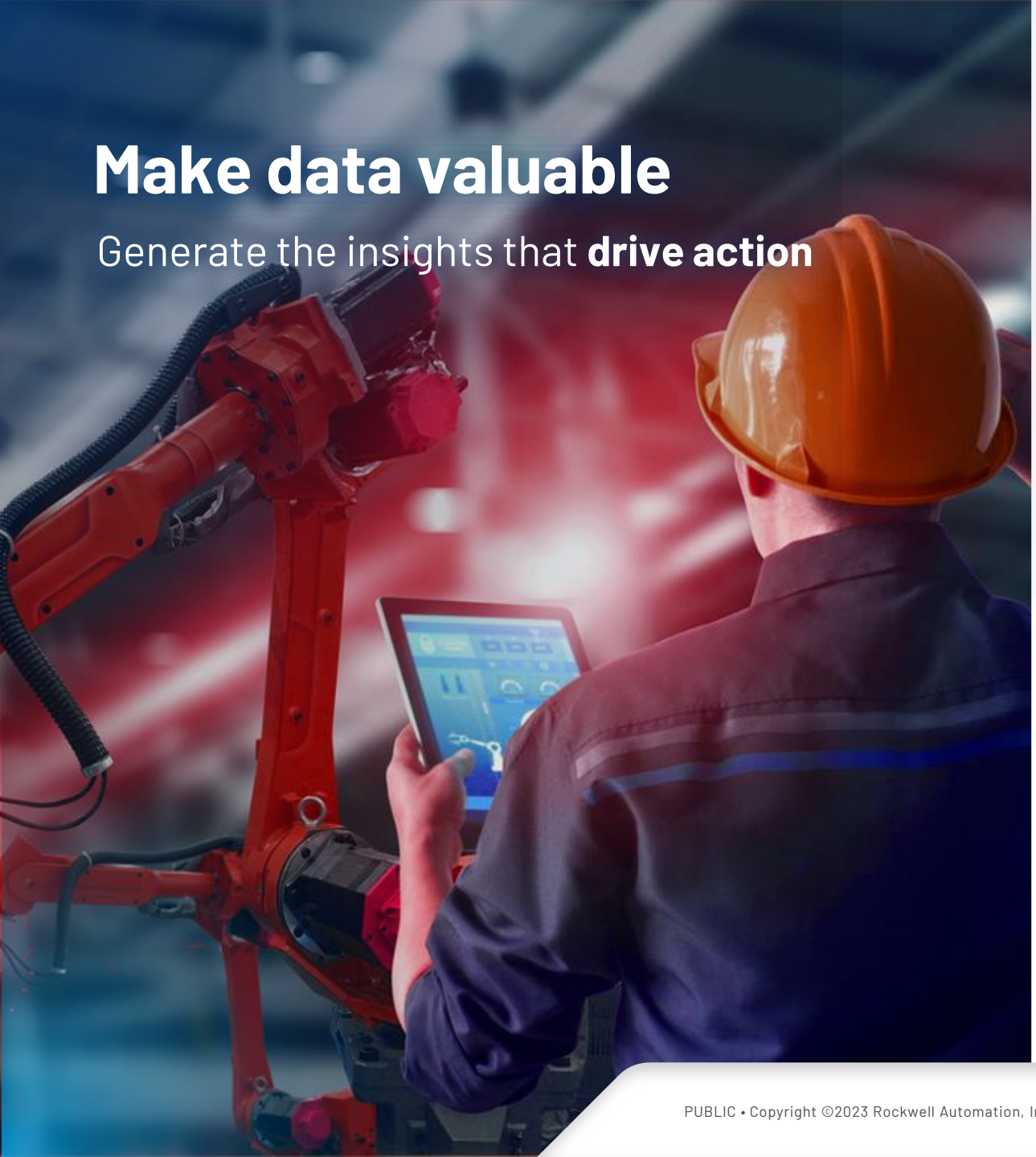
Connect to industry leading applications for access contextualized data in analytics services like **Azure Synapse Analytics**

Run and deploy Python models

Run **Jupyter Notebooks** and quickly deploy and operationalize functions on live data

Well-documented, open APIs

Contextualized data and data models are accessible to support the use case deployed in other analytics applications



Make data valuable

Generate the insights that **drive action**

FT 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

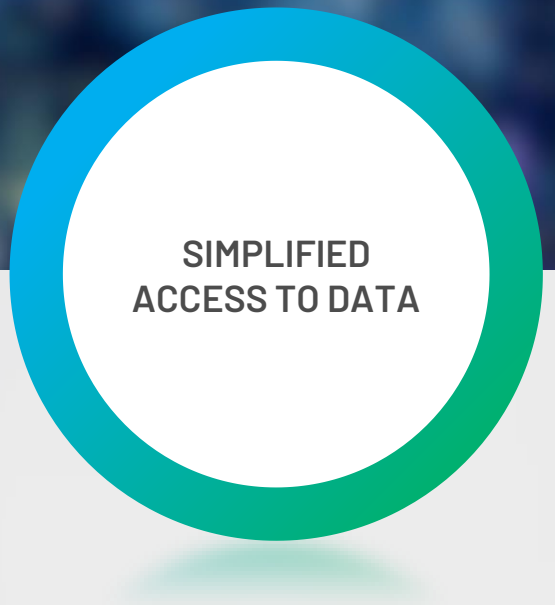
Rockwell Automation

The Rockwell Automation® difference

The right partner can mobilize your enterprise for healthy growth and ongoing innovation

Scale DX initiatives faster with an IT/OT convergence leader

Leverage standard connectivity to OT data sources



Enable scalable growth in current and future applications

Accelerate key use cases with trusted solution providers

Thank you

Rockwell Automation

expanding human possibility®

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