



**HACIA UN TODO INTELIGENTE Y CONECTADO**  
**ALTAIR CAMBIA LAS REGLAS DEL JUEGO DE LA INDUSTRIA 4.0**

Paloma Reinoso / Senior Product Specialist SmartWorks IoT

## About me

### Paloma Reinoso Otero

- Senior Product Specialist en Altair España (mayo 2022 – Actualidad)
- Product Specialist en Altair España ( julio 2021 – mayo 2022)
- Becario de IoT en Altair España (septiembre 2020 – julio 2021)
- Máster en Ingeniería Industrial por la Universidad Pontificia Comillas Madrid, España.
- Ingeniero Industrial por la Universidad Pontificia Comillas Madrid, España.



**Paloma Reinoso Otero**

Senior Product Specialist SmartWorks IoT – Altair

# DISCOVERING ALTAIR SMARTWORKS IOT TECHNOLOGY

To transform enterprise decision-making by leveraging the *convergence* of simulation, high-performance computing, and artificial intelligence.



**1985**

Founded & Headquartered  
in Troy, MI U.S.

**\$532M**

FY21  
Revenue

**3,000+**

Engineers, Scientists,  
and Creative Thinkers

**15,000+**

Customers  
Globally

**86**

Offices in  
25 Countries

**150+**

Altair and Partner  
Software Products



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 **ALTAIR**

# 15,000+ Customers Worldwide

|  |                          |                                 |   |                                  |                                  |
|--|--------------------------|---------------------------------|---|----------------------------------|----------------------------------|
| <p><b>Automotive</b></p>               | <p><b>Aerospace</b></p>  | <p><b>Civil Engineering</b></p> | <p><b>Education</b></p>                 | <p><b>Energy</b></p>             | <p><b>Financial Services</b></p> |
| <p><b>Government &amp; Defense</b></p> | <p><b>Heavy Rail</b></p> | <p><b>Industrial Goods</b></p>  | <p><b>Life &amp; Earth Sciences</b></p> | <p><b>Material Suppliers</b></p> | <p><b>Technology</b></p>         |

# Altair Accelerates the Entire Enterprise

## Industrial Designers

- MBSE
- Simulation Driven Design
- Manufacturing Simulation
- No Mesh CAE
- Design Studies

## Mechanical + Electrical Engineers

- Structures
- CFD
- Thermodynamics
- Motion
- Electromagnetics
- PCB Analysis

## Software Developers

- Functions as a Service
- Specialized Databases
- Backend as a Service

## Operations + Manufacturing

- IoT Connectivity
- Device Management
- Stream Processing
- Data Visualization

## Data Analysts, Scientists & Engineers

- Data Prep
- Data Exploration
- Model Development
- Polyglot Model Runtime
- MLOps

## Finance, Business + Marketing

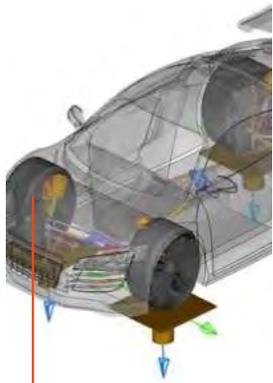
- Report Mining
- Dashboard Creation
- Self-service data transformation

## IT + DevOps

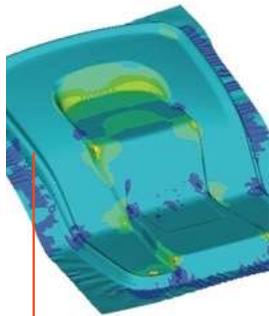
- Edge Computing
- High Performance Computing
- Cloud Bursting
- Monitoring and Analysis



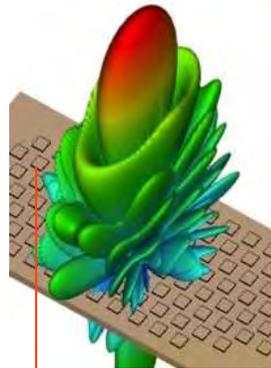
# Deep modeling, visualization, and solver portfolio



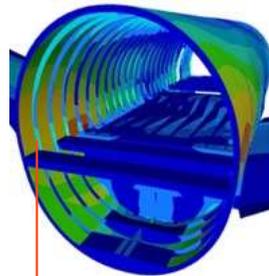
**Systems Simulation**



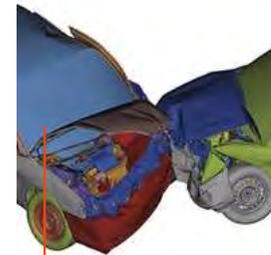
**Manufacturing Simulation**



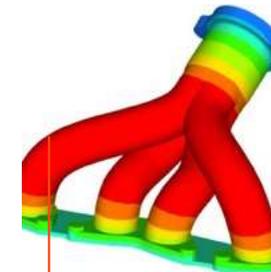
**Electromagnetics**



**Structural Analysis**



**Crash, Safety, Impact & Blast**



**Thermal Analysis**



**Fluid Dynamics**

Broadest Portfolio of Optimization-enabled Solvers

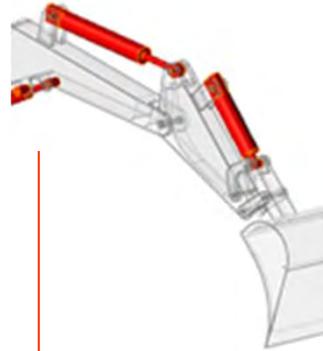
## Powerful concept, design, and optimization tools



**Studio**



**Structures**



**Motion**

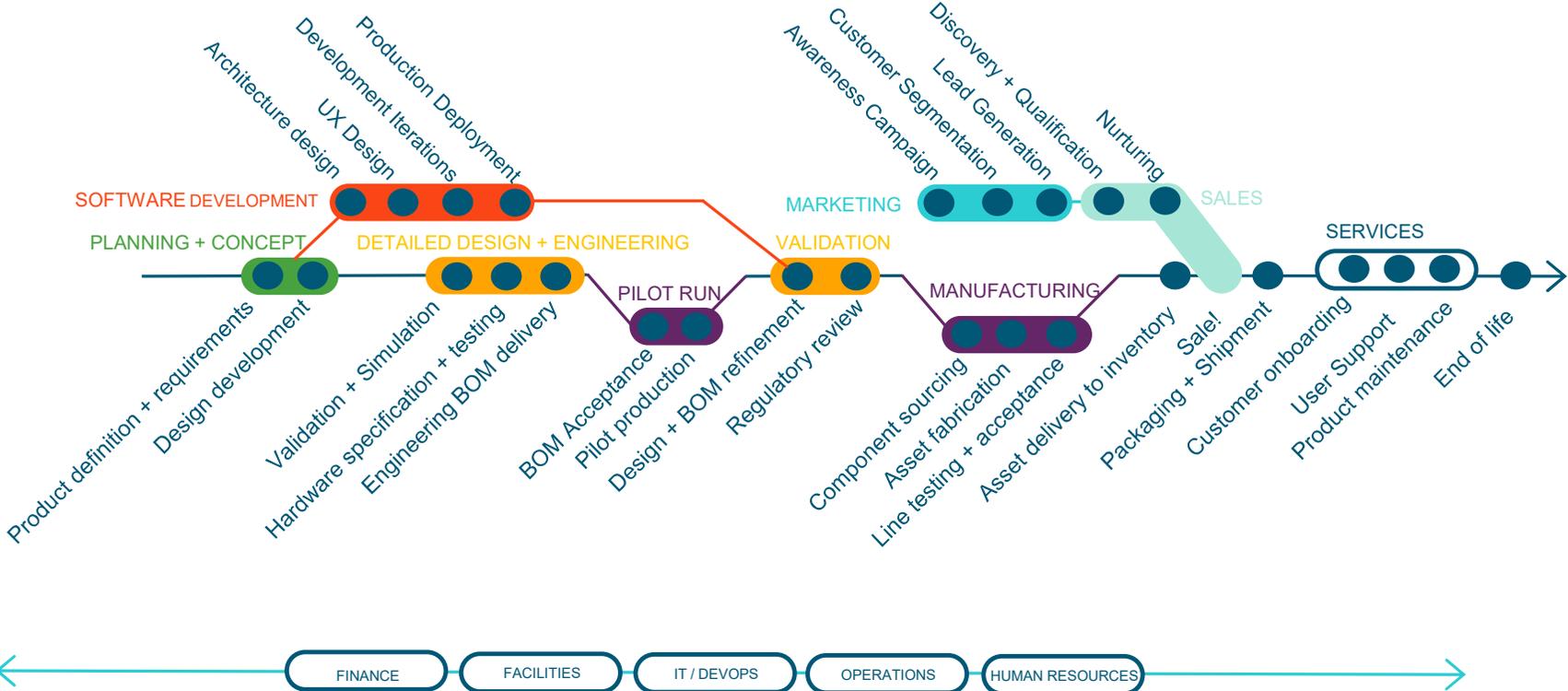


**Manufacturing Processes**

The industry's most powerful and intuitive solution for design engineers to create high performing and manufacturing products.

# Accelerating the Digital Thread Enterprise

Build industry-shaking smart products



# Why Industry 4.0?

## Supply & demand

- Shifting demand to emerging countries
- Increased importance of additional services
- Variability in core production costs

## Business models

- Evolution from traditional to connected products
- Shift from selling assets to selling the use of assets

## Technology

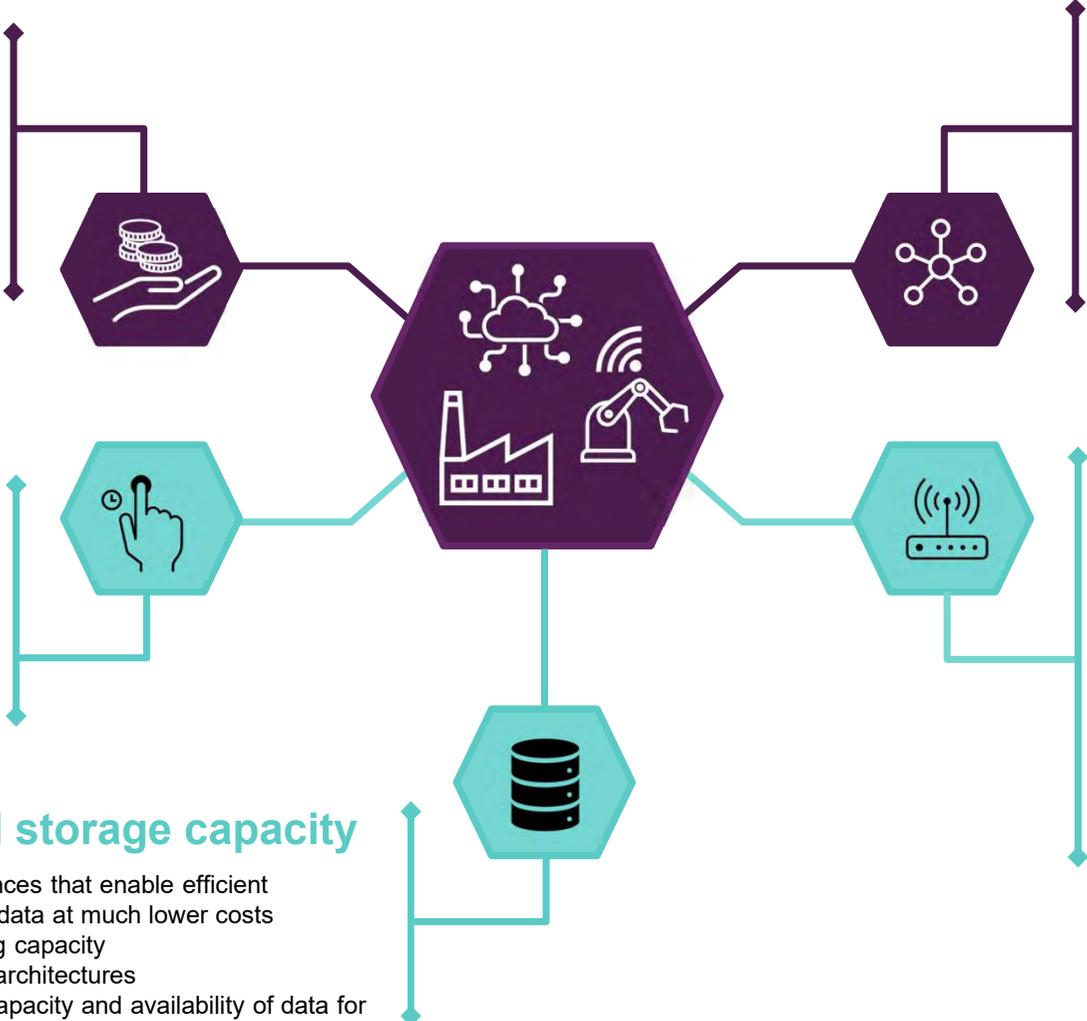
- Lower technology costs
- Increased processing and storage capacity
- Maturity and applicability to business cases

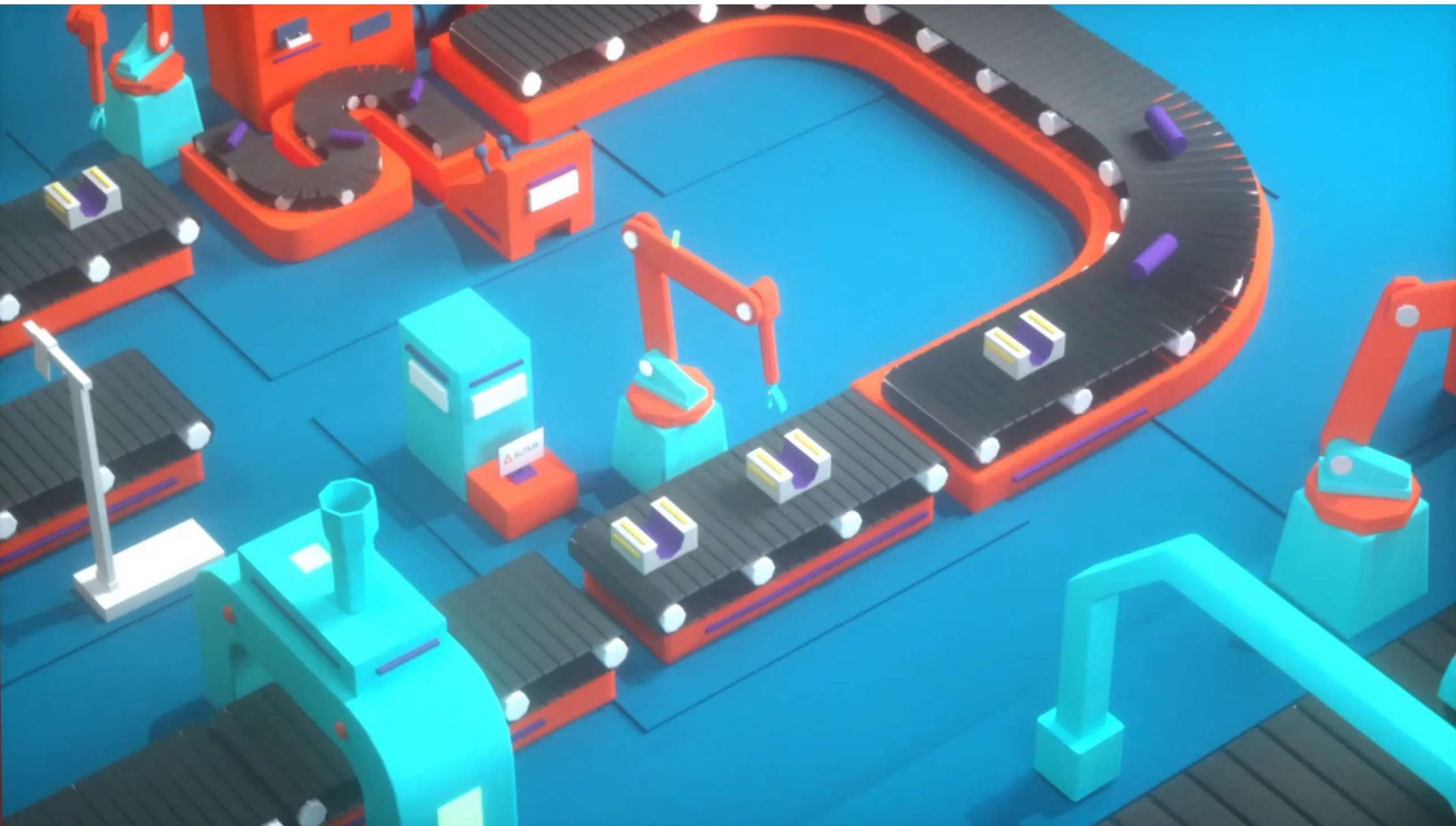
## Connectivity & data generation

- Massive sensorization: any element (thing), process and relationship is (potentially) connected.
- Exponential increase of data generation, in every process or interaction (physical or technological).
- Need to transform data into valuable information for decision making.

## Processing and storage capacity

- Technological advances that enable efficient management of big data at much lower costs
- Increased computing capacity
- Big Data and cloud architectures
- Increased storage capacity and availability of data for exploration.





An aerial view of a city at dusk, with a digital network overlay of white lines connecting various points across the cityscape. The sky is a mix of orange and blue, and the city lights are visible. The text is overlaid on this background.

“By 2023, the smart manufacturing market will grow to approximately 480 billion U.S. dollars”

How can we...

- make products cheaper, but maintain **quality** ?
- **lower spend** on waste/returns/warranties ?
- **identify problems** before they appear ?
- use the data collected to make **better choices and decisions faster** ?

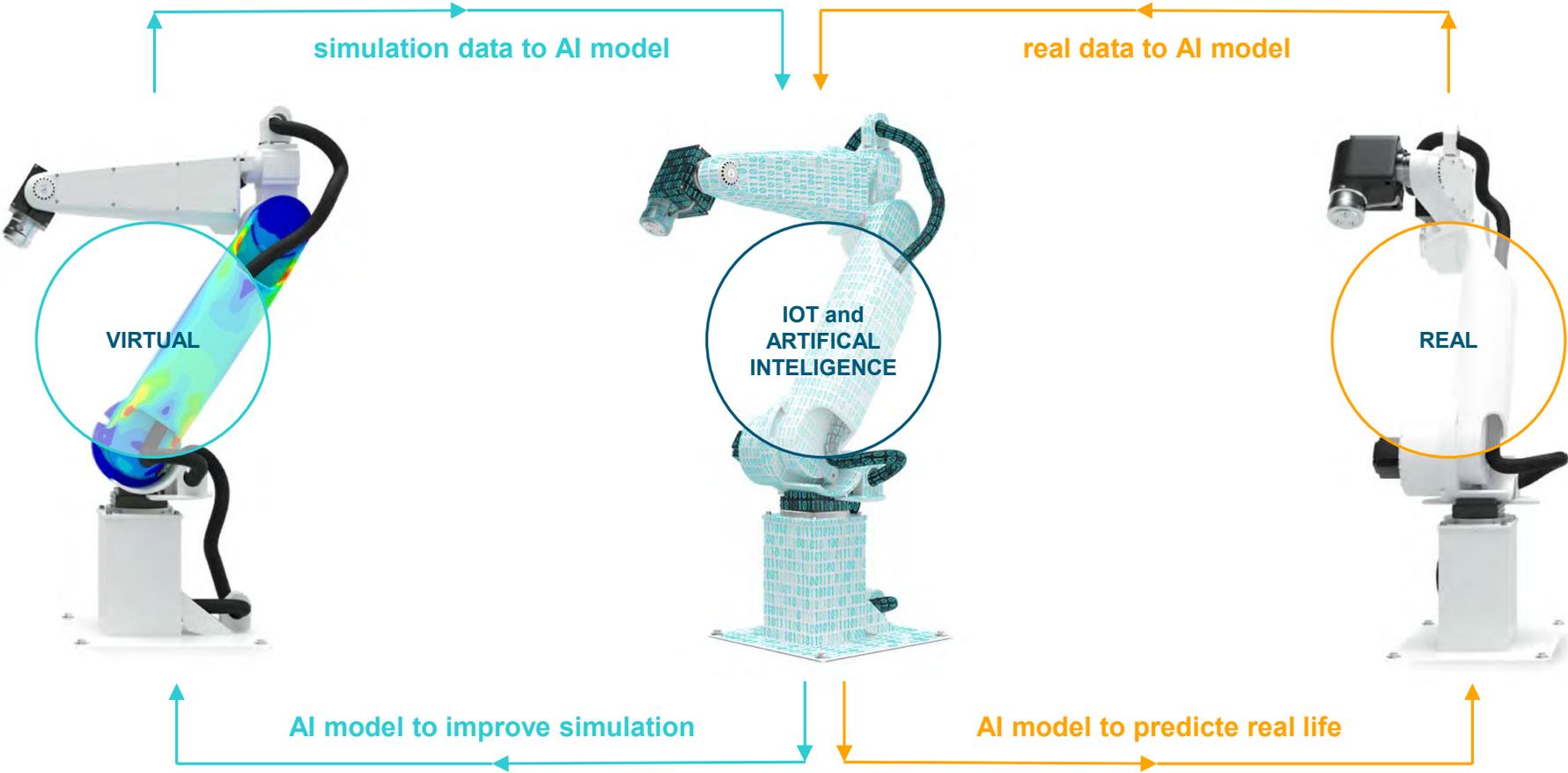
# The value of Digitalization



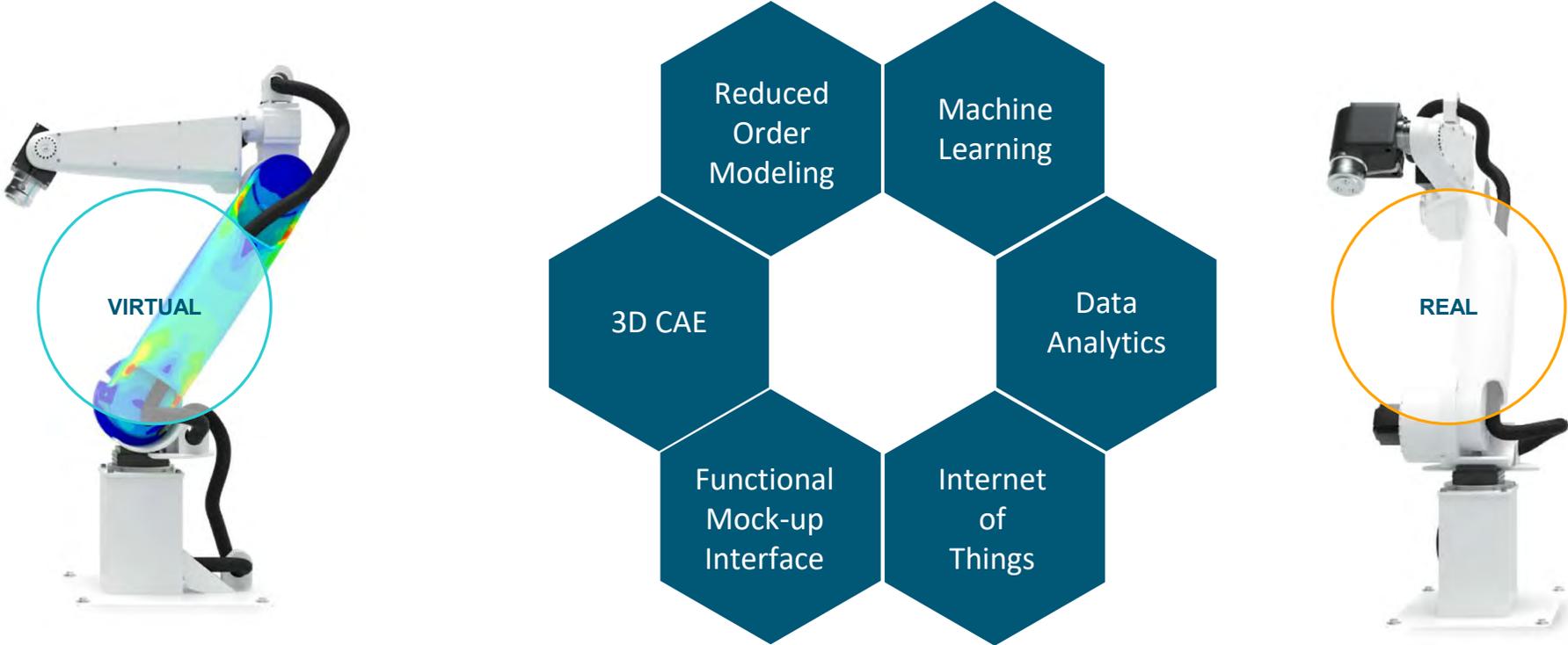
## Benefits

- Collaboration
- Historical data to leverage
- Enhanced decision making
- Better designs created faster at improved cost
- Higher ROI over product lifecycle

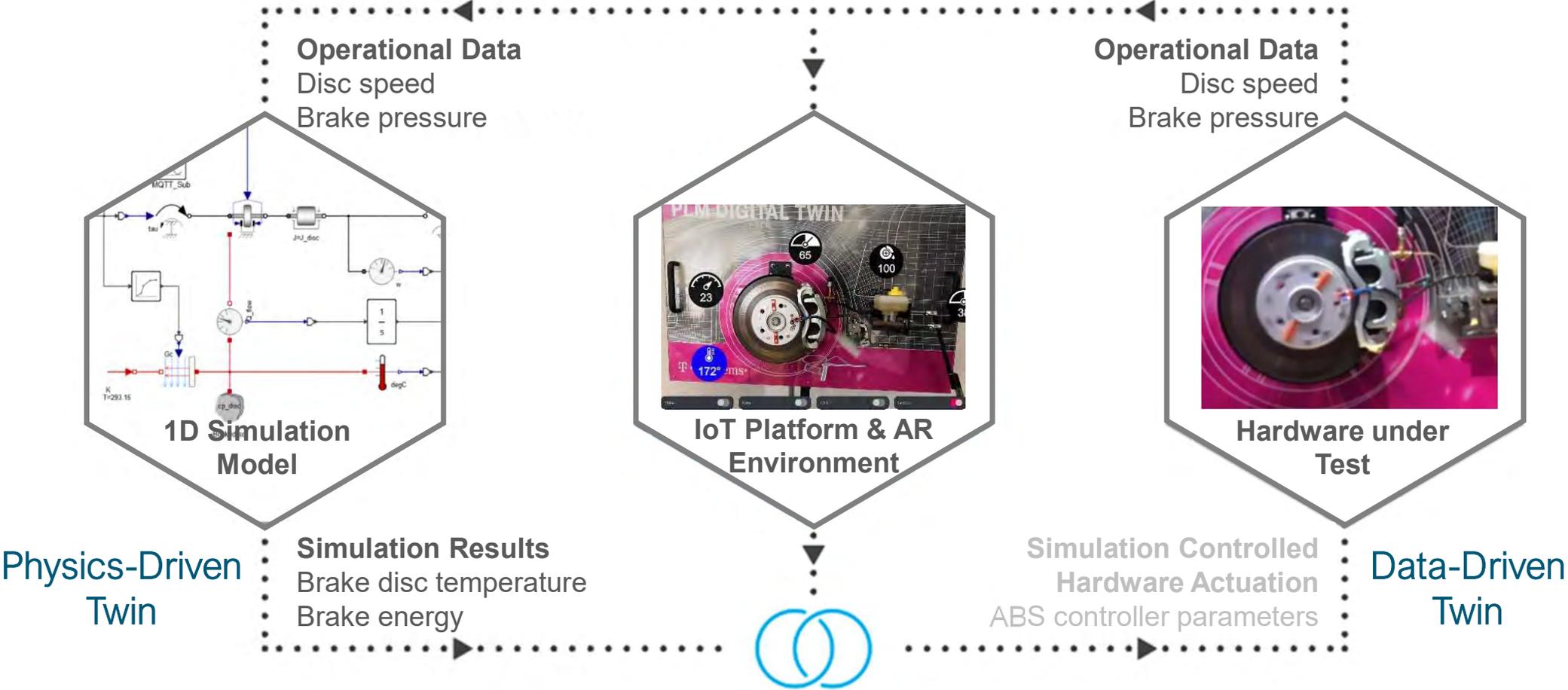
# Altair Digital Twin Platform: Building Blocks



# Altair Digital Twin Platform: Building Blocks



# Augmenting reality with virtual sensors





# HOW TO SUCCESSFULLY DIGITALIZE OPERATIONS

## Implementing a smart manufacturing process



### Connect

Connecting machines, peripherals, and other data sources to a common network is the basis to use data to automate value creation



### Collection

After achieving connectivity comes the collection and storage of production data, which is the foundation for the next steps in the process



### Visualize

While a smart factory relies on data, generating value from it is essential to make insightful, fully-informed decisions



### Analyze

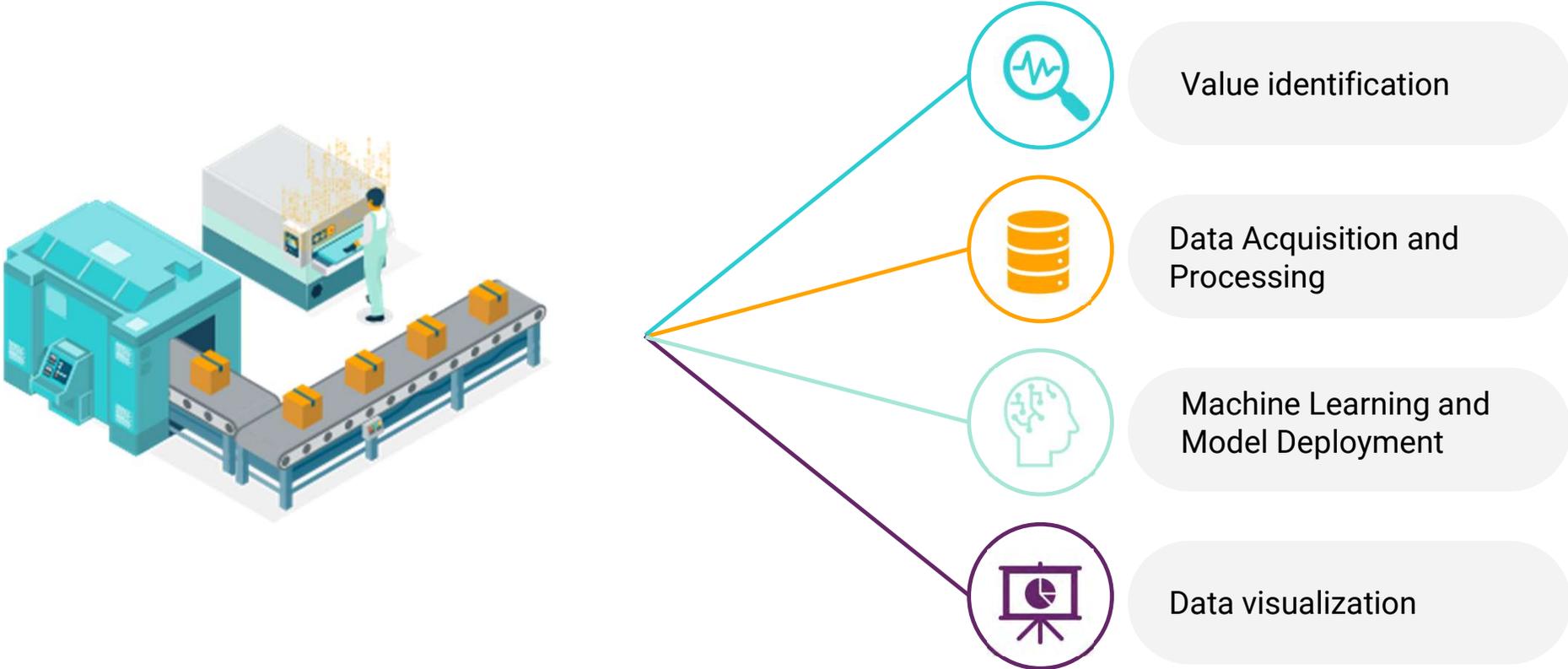
Using specialist software gives the user the possibility to emulate how an expert would use data to generate insights



### Automate

Enable the system to perform autonomous decisions and actions to support the entire organization's decision making

# Manufacturing Data Analytics Workflow



# Altair SmartWorks



## SMARTWORKS ANALYTICS

LOW-CODE DATA ANALYTICS AND DATA SCIENCE

- MANUFACTURING
- MARKETING
- SALES
- FINANCE



## SMARTWORKS IOT

LOW-CODE IIOT AND APPLICATION DEVELOPMENT PLATFORM

- MANUFACTURING
- SOFTWARE DEVELOPMENT
- SYSTEM VALIDATION

# Modern. Scalable. Secure.



## Intuitive interfaces

*REST, MQTT, SDK's*

## Cloud-native Architecture

*Kubernetes, Docker, Containers, Microservices, Terraform, Helm*

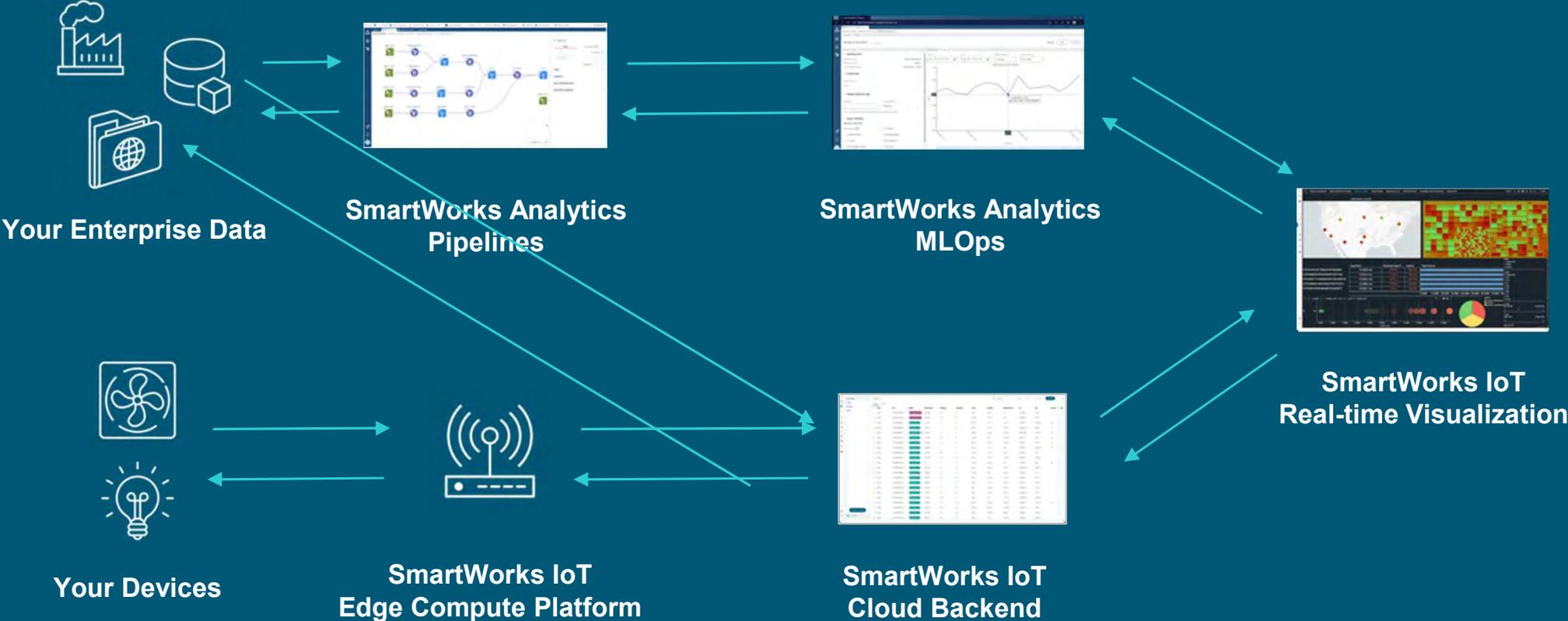
## Modern Languages

*Go, Python, Typescript*

## Modern, Open Toolset

*Kafka, TiDB, KrakenD, ORY, VernMQ, React, Web Components*

# Tools for the Full Lifecycle of enabling Operational ML

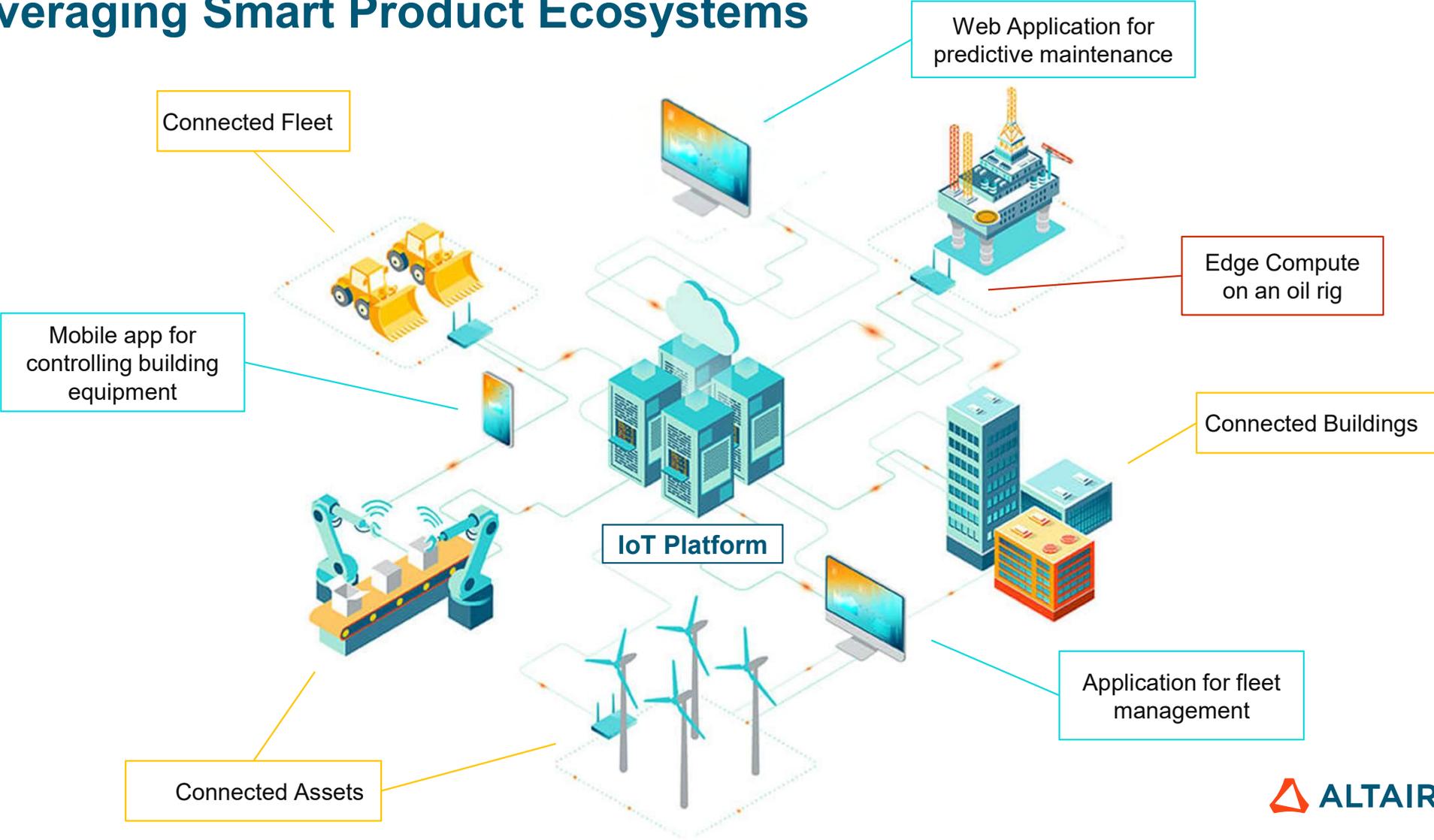


# SmartWorks IoT

Low-code IoT application  
development platform



# Leveraging Smart Product Ecosystems



# Understanding IoT Ecosystem

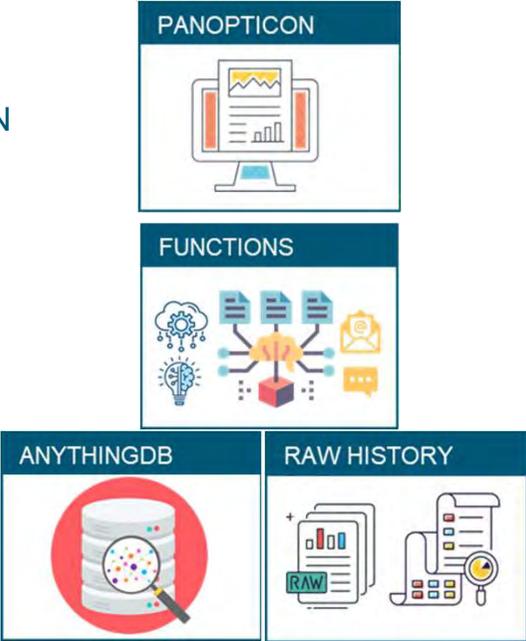


REAL TIME VISUALIZATION AND ANALYSIS

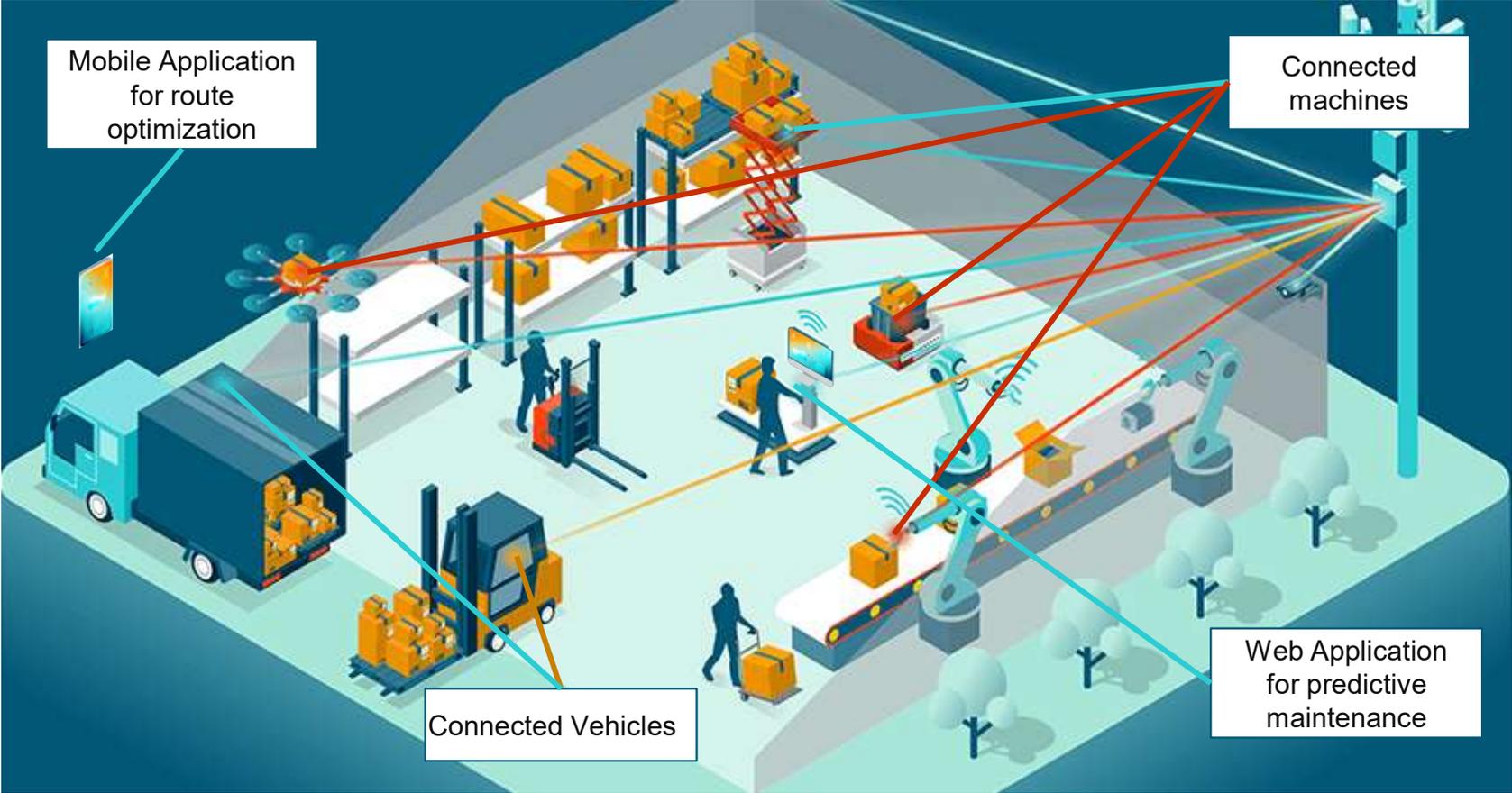
BUILD AI, AUTOMATION, USE ML MODELS

DATABASE

CONNECTED THINGS



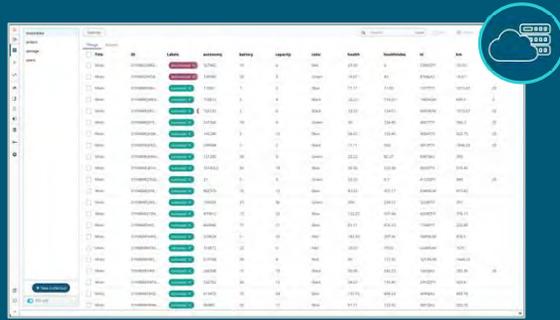
# Leveraging smart connected ecosystems



# Develop an IoT App



Devices



SmartWorks IoT



User App



- Communication between devices and the application
- Store data from the device
- Transform and filter the data
- Set alerts/notifications
- Integrate with ML models
- Develop custom algorithms

# Dashboard Creator for RT Asset Monitoring

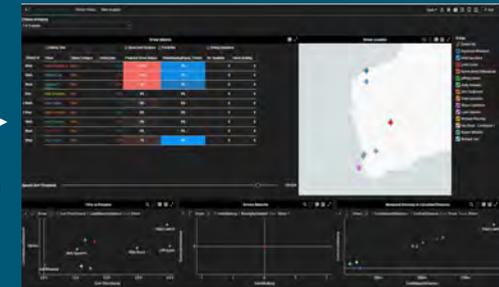


Devices



| ID   | Name     | Location | Status  | Temp | Humidity | Pressure | Altitude | Speed | Direction | ... |
|------|----------|----------|---------|------|----------|----------|----------|-------|-----------|-----|
| 1001 | Device A | Site 1   | Online  | 25.5 | 65%      | 1013     | 100m     | 10    | North     | ... |
| 1002 | Device B | Site 2   | Offline | 15.0 | 40%      | 1015     | 120m     | 5     | South     | ... |
| 1003 | Device C | Site 3   | Online  | 30.0 | 80%      | 1010     | 80m      | 15    | East      | ... |
| 1004 | Device D | Site 4   | Warning | 40.0 | 90%      | 1008     | 60m      | 20    | West      | ... |
| 1005 | Device E | Site 5   | Online  | 20.0 | 50%      | 1012     | 90m      | 8     | North     | ... |

SmartWorks IoT

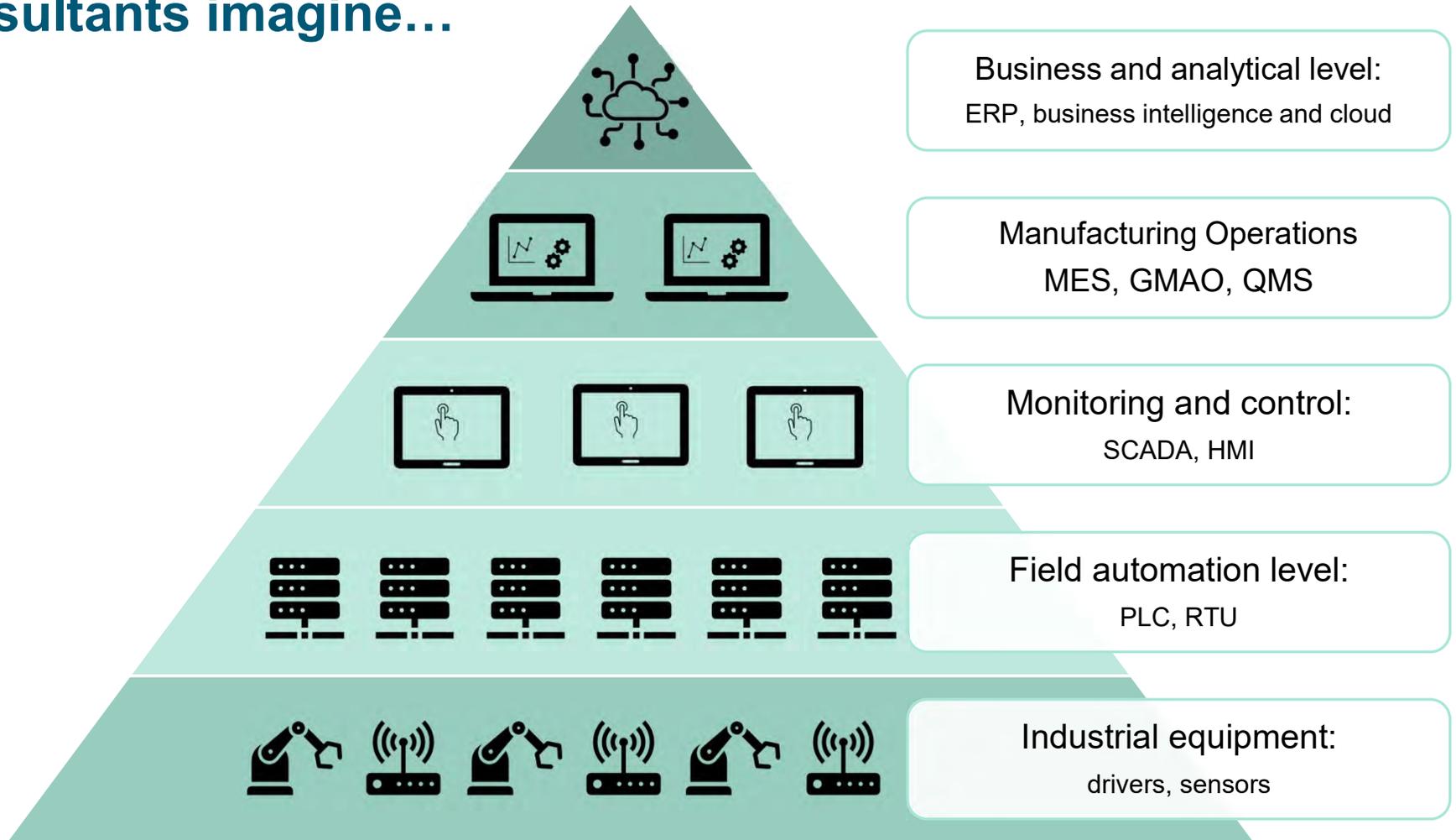


SmartWorks IoT  
Real-time Visualization

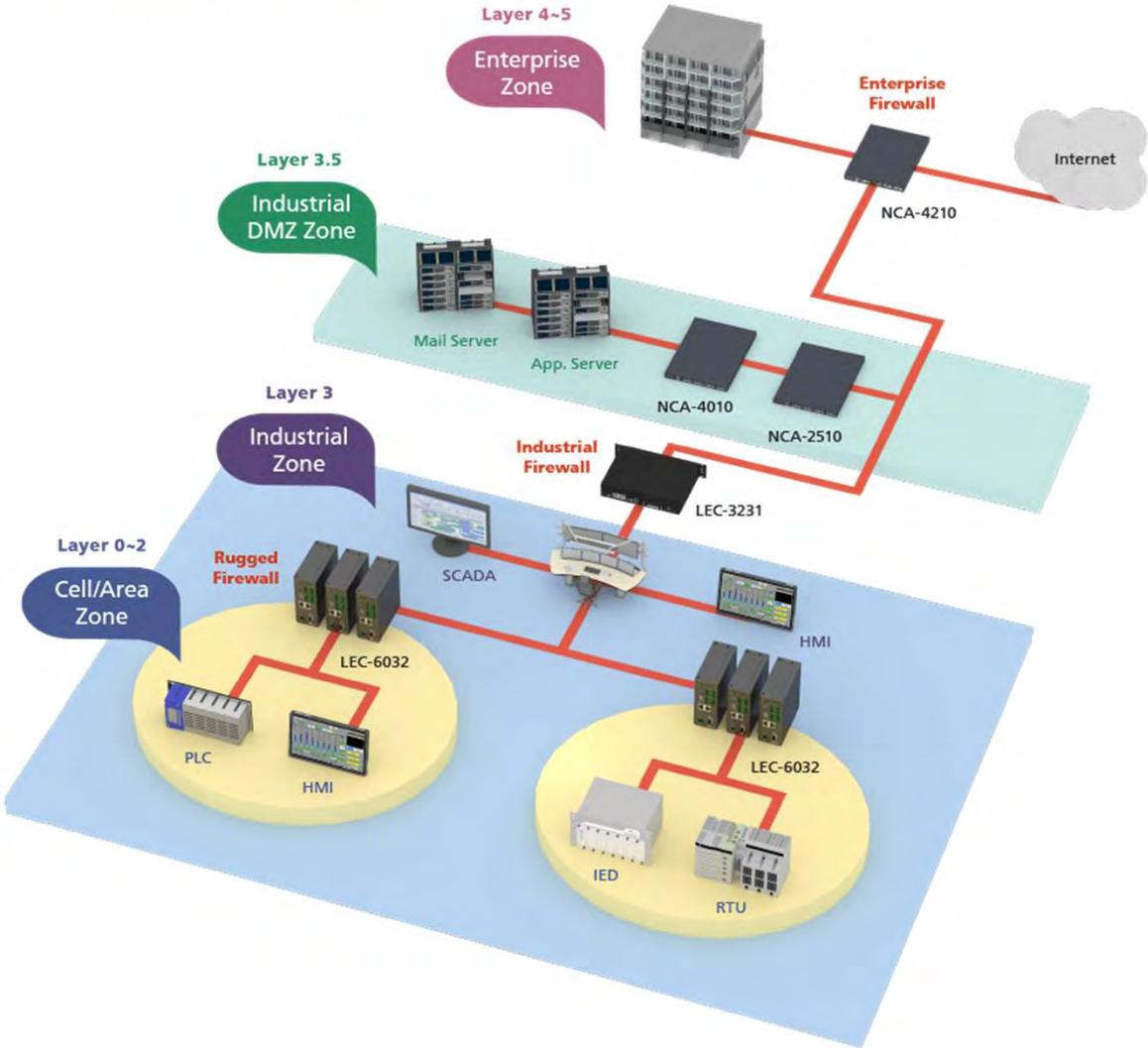
- Real-time Charts, and Graphs
- Dozens of Data Connectors
- Device Control



# What consultants imagine...

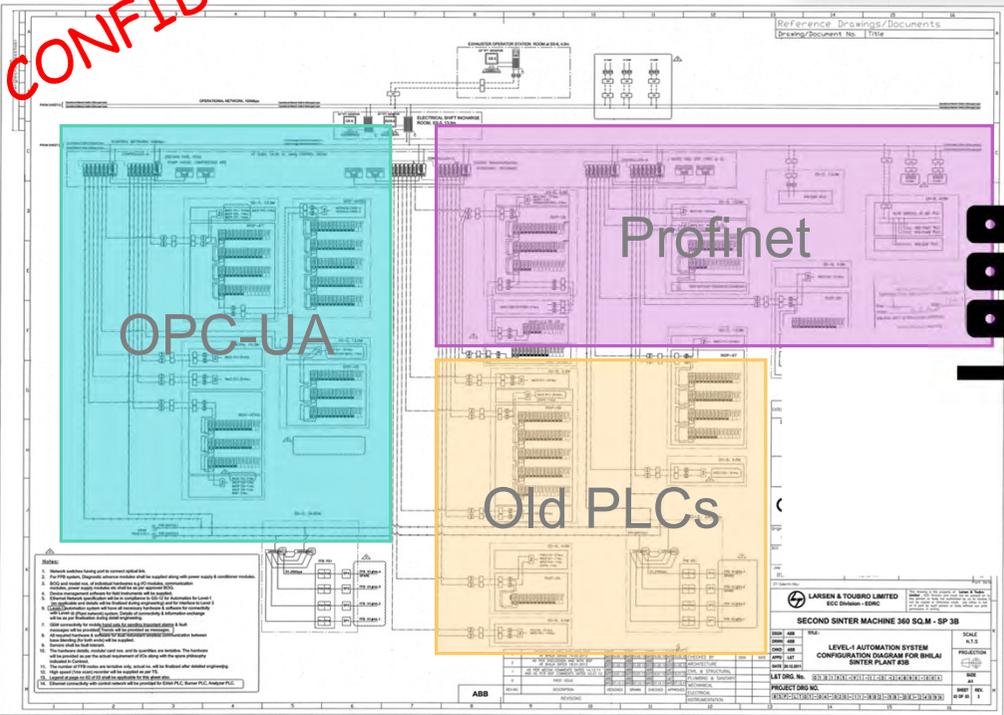


# What your CTO thinks you have...

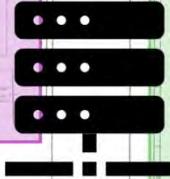
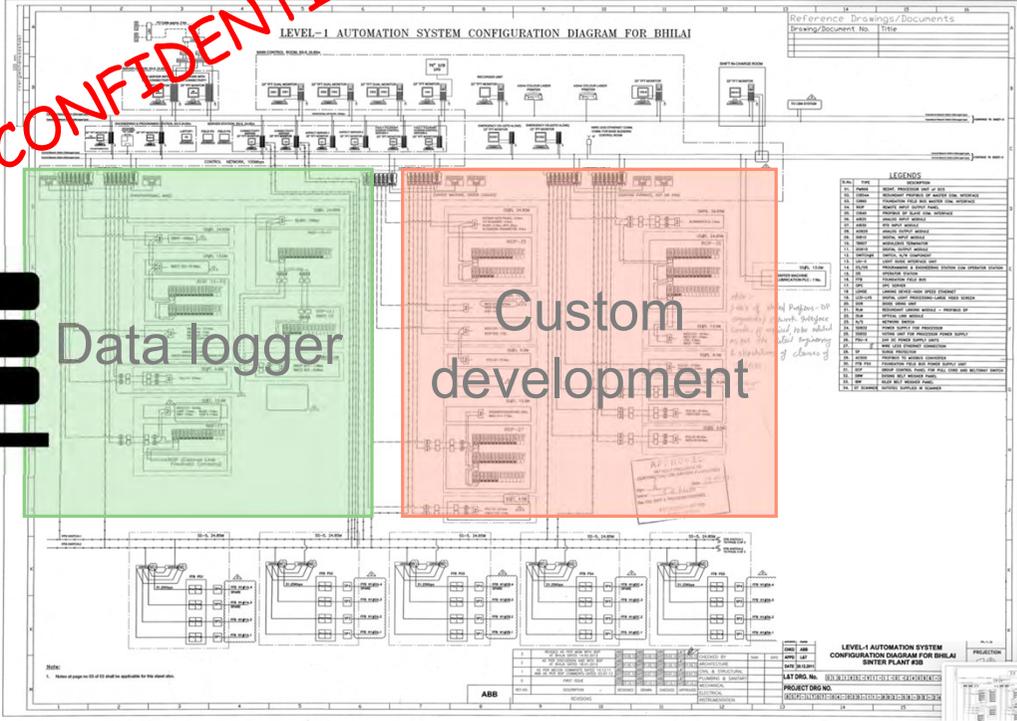


# What the reality is...

CONFIDENTIAL



CONFIDENTIAL



# Orchestration platform for Edge AI and Automation



**Devices**



**SmartWorks IoT Edge Compute Platform**

- Protocol Normalization
- Data transformation
- Hardware monitoring
- Remote access
- Cloud Connectivity
- OS updates



**SmartWorks IoT Cloud Backend**



**SmartWorks IoT Real-time Visualization**

no-gloves



# REAL USE CASES



## Implementing a traceability system

### Challenge

Carbon fiber is used in many composite manufacturing processes that range from the aerospace to bike helmets. Its storage and usage under very cold conditions is key. Out of cooler time control and optimal usage are key quality parameters

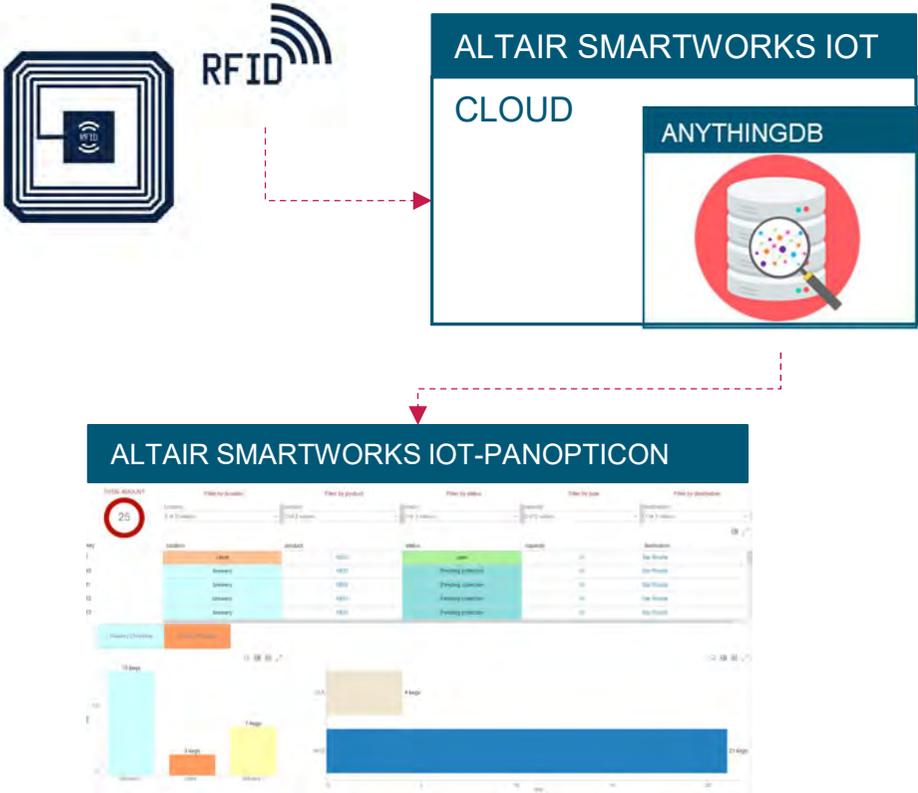
### Solution

Global Solutions Group took a commercial hardware to build a traceability solution with minimum process intrusion and integration with existing ERP. A combination of field work to deploy and calibrate RFID antenna and cloud services to minimize costs

### Outcomes

- Reduced losses from raw material misplacing
- Enhanced management process
- No investment in engineering or development while integrated with internal processes
- Proven hardware, ease to replace and extend

# Solution architecture



## Quality improvement – Industry 4.0 in Pharmaceutical

### Challenge

Only Fine powder is used in the production of the tablets. The coarse powder is either thrown away or collected for a second round of crushing and separation. Acceptable level of fine/coarse particle size is 90%. Batches with less than 90% fine/coarse output need to be flagged in advance for extending the crushing cycle

### Solution

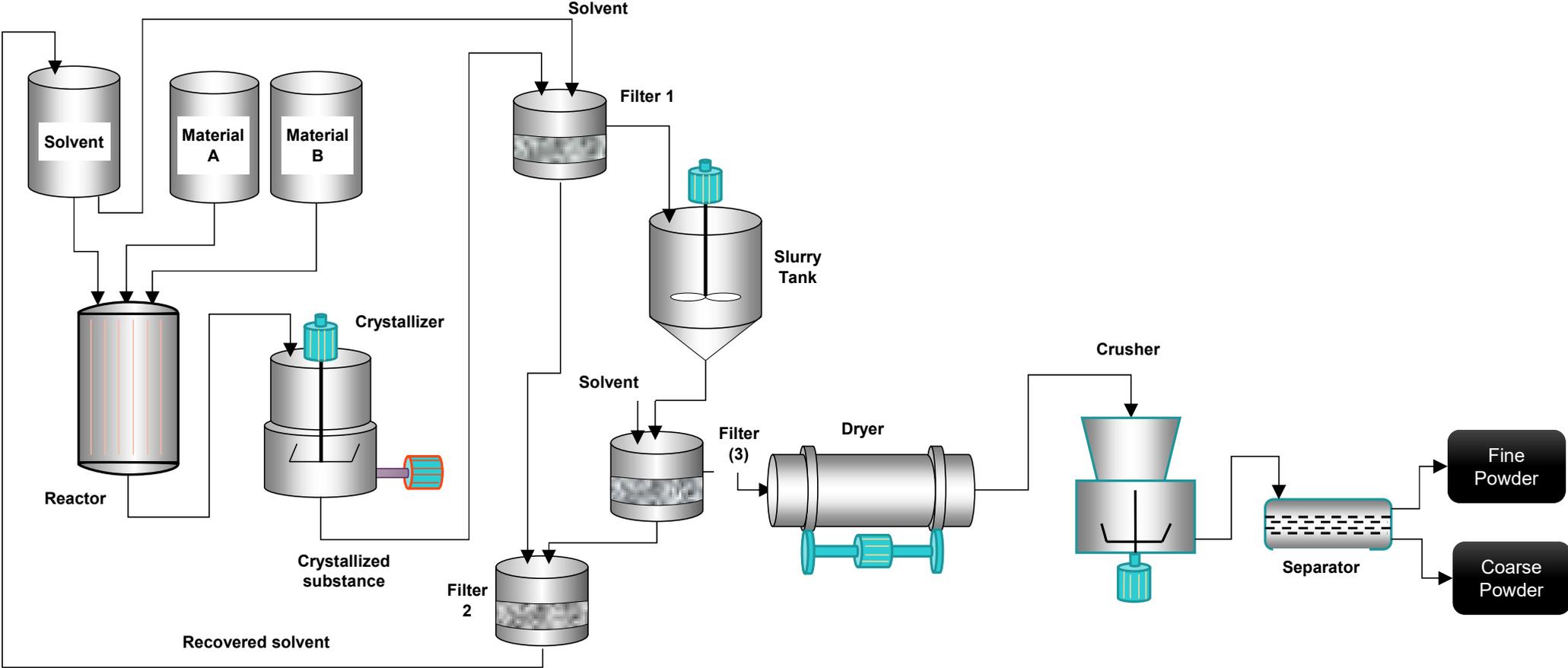
Develop a ML model to predict the likelihood that the current batch will need extended crushing time to yield a ratio of 90% or more fine/coarse particles. Create an alert for a longer crushing cycle if high probability of having <90% fine particles.

### Outcomes

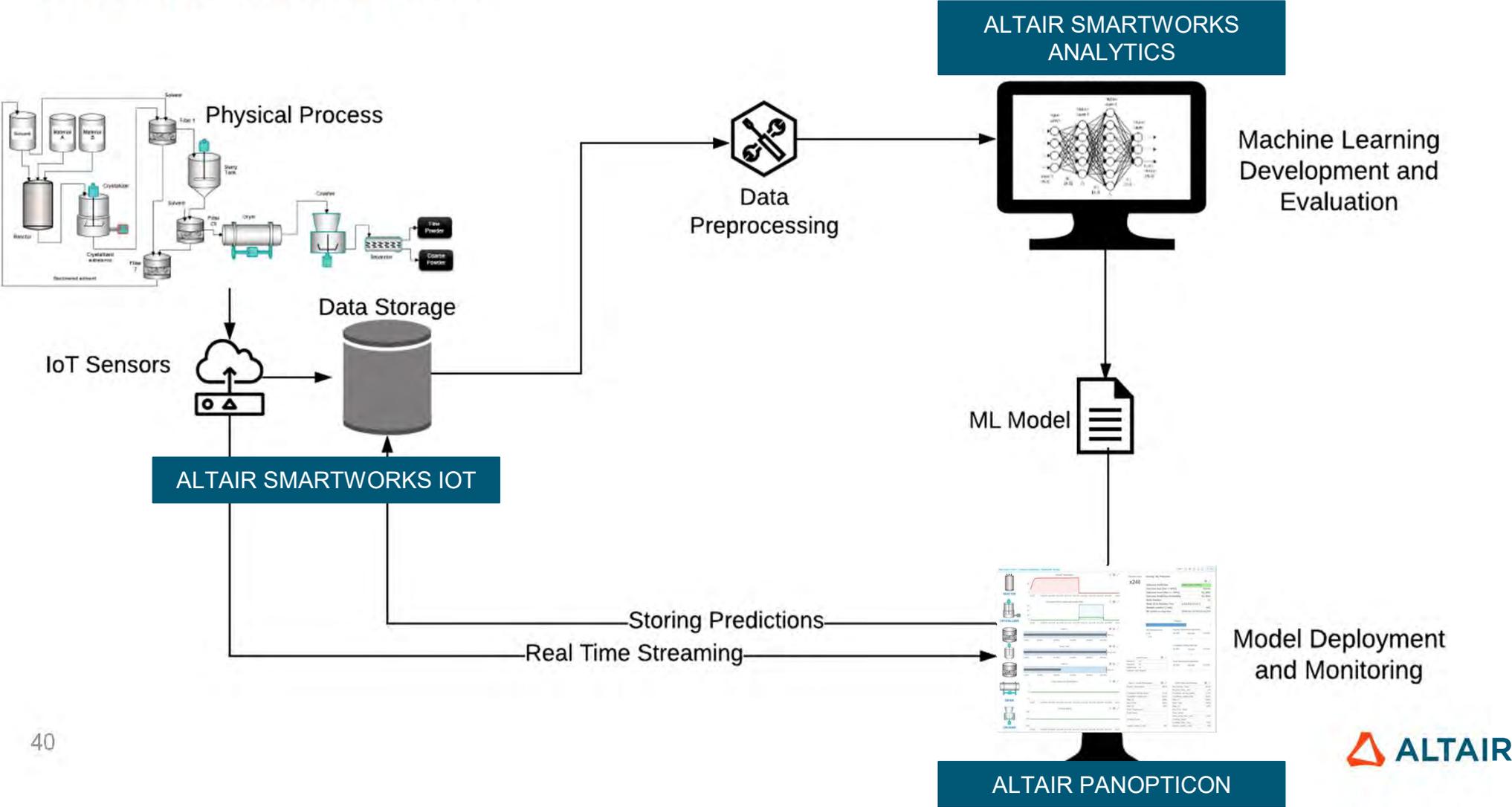
- Process Monitoring and timeseries analysis
- Continuous ML Scoring
- What-if and back Test
- Process Details display

# Case Study

- Organic Synthesis Process



# Solution architecture





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## Predictive maintenance

### Challenge

Makino, one of the largest machine tool manufacturers in the world, wanted to implement an efficient predictive maintenance solution and increase revenue by improving asset utilization and reducing downtime

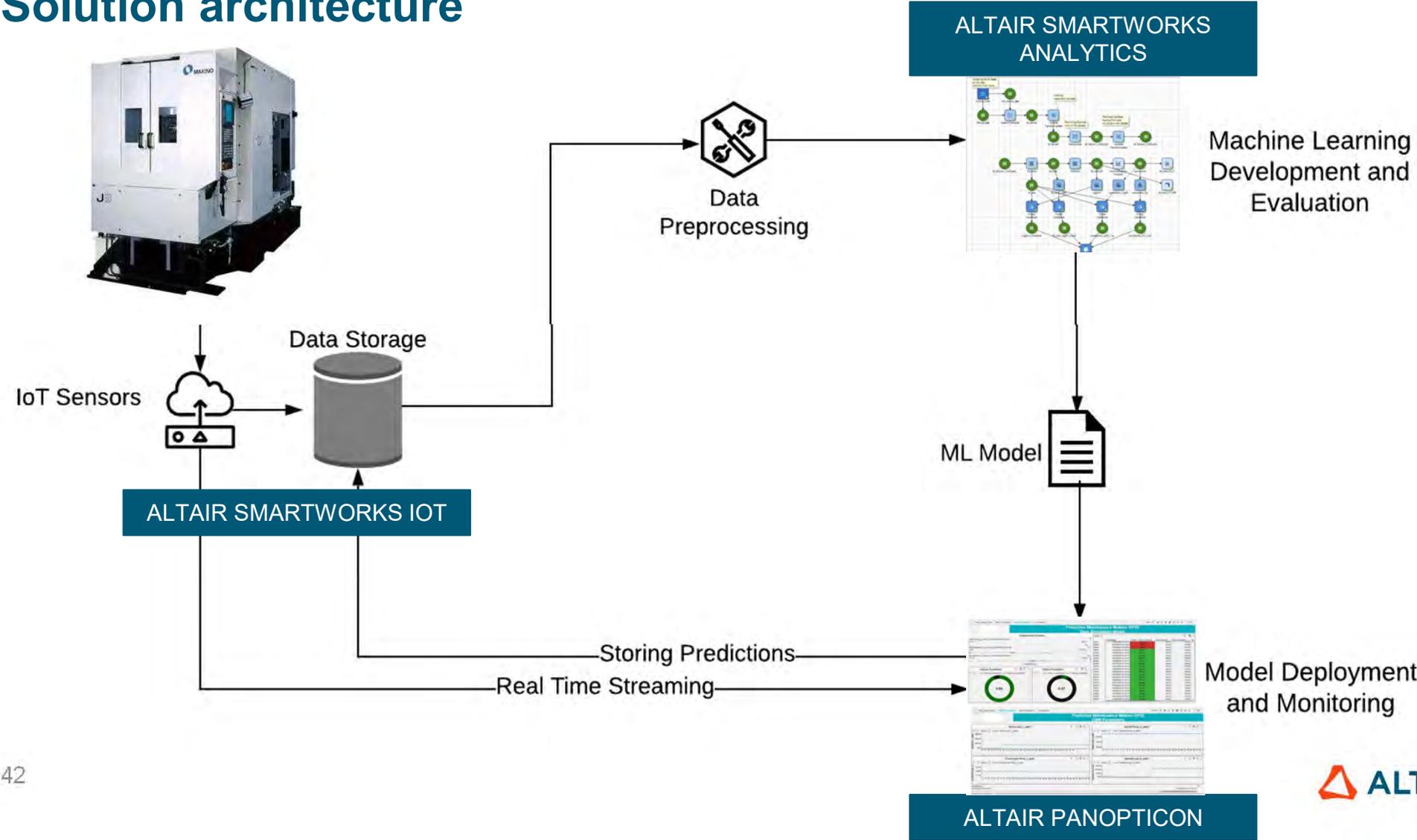
### Solution

Develop a ML model to predict insights for probability failure index for different machine failure predictions. Send alerts based on machine parameters and implement real time machine operation monitoring

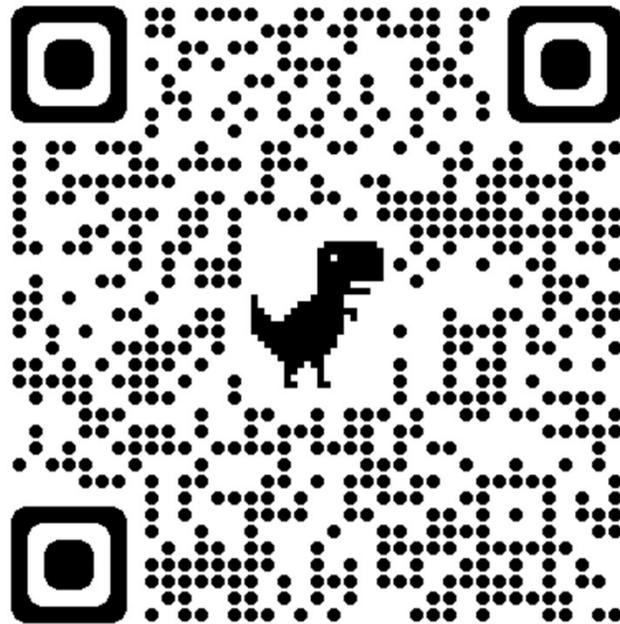
### Outcomes

- Shift in Maintenance practices from time based to usage and condition-based maintenance through data driven decision process.
- Reduce Fixed Asset Service and Maintenance Costs.
- Reduce Asset Service and Maintenance Parts Inventory.

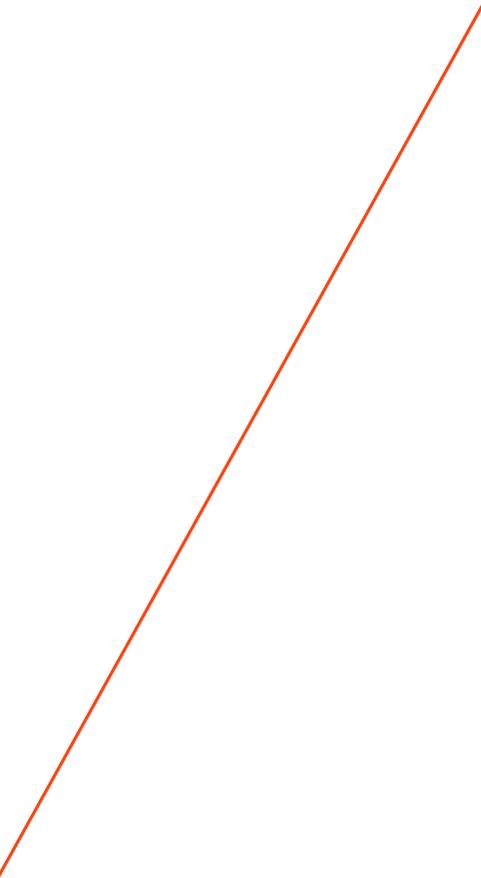
# Solution architecture



# Q & A



**Sign up for free today!**



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**THANK YOU**

altair.com



#ONLYFORWARD

