## GE VERNOVA

# CREATE YOUR DIGITAL PLANT

Digital transformation is a critical priority for industrial organizations

How do you start the digital transformation process? This is particularly difficult for industrial organizations due to legacy automation devices, disparate software applications, and the constant need to keep up with ever changing customer demands. Fortunately, proven solutions and processes provide the foundation for creating digital, optimized plants.
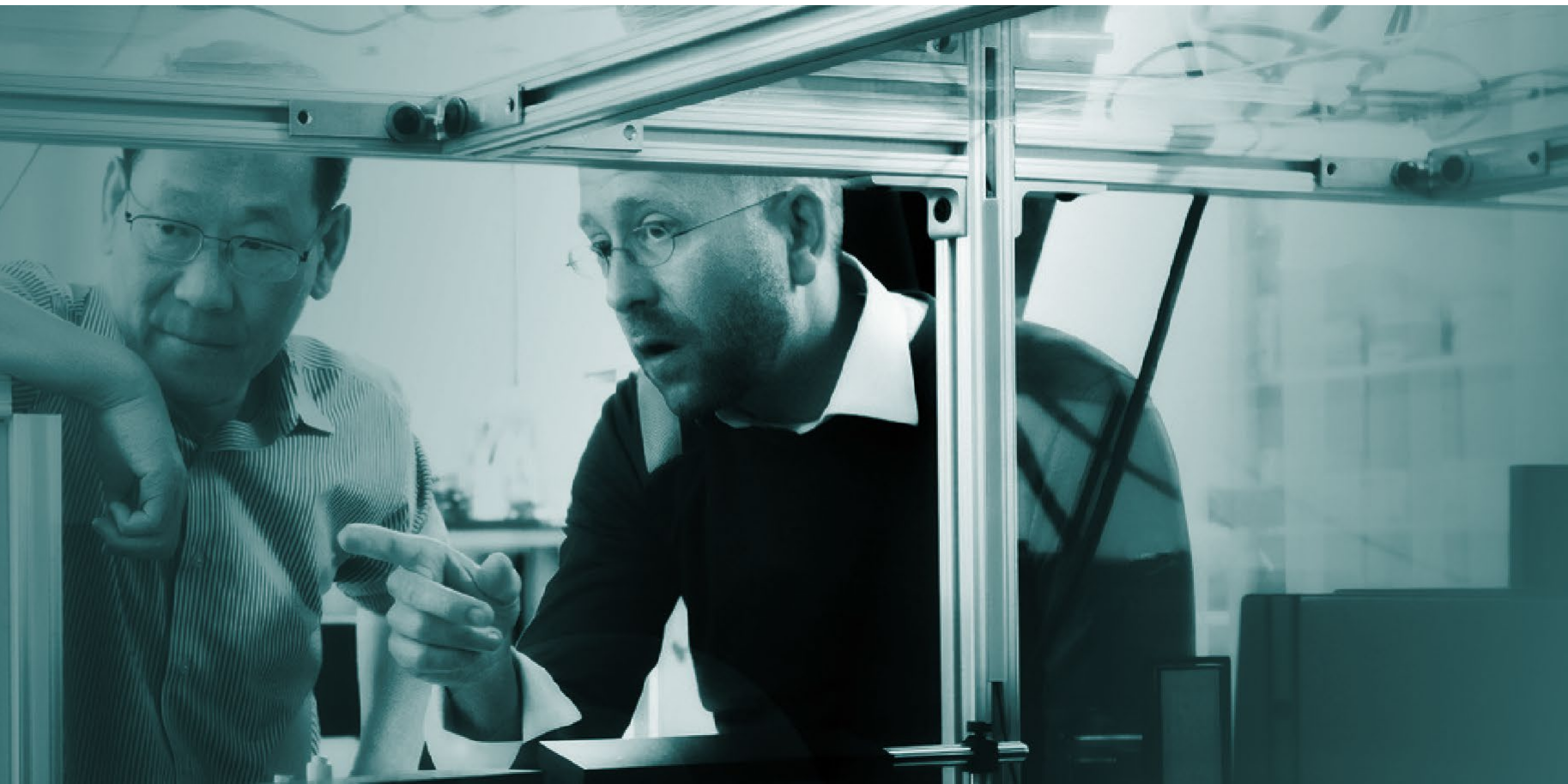
# INTRODUCTION

In today's rapidly changing industrial landscape, manufacturers and utilities must embrace digital transformation to keep up with the pace of change, meet growing operations challenges, and remain competitive. The foundation of digital transformation starts with capturing industrial data, combining it with other meaningful data sources for context and managing a historic record. It is data, turned into information, that provides the basis for meaningful outcomes.

Data historian and centralized visualization technologies empower users to unlock the value of their data. The outcome is a high-productivity development and visualization environment that enables optimized plant operations, supported by faster development, a democratization of tools and capabilities throughout a plant, improved operational performance, lower costs, a changed mindset among employees, and a culture of continuous improvement. Examples of market leaders from multiple sectors illustrate the outcomes companies are achieving.

# THE INDUSTRIAL LANDSCAPE IS RAPIDLY CHANGING

Technological innovations are reshaping the industrial landscape. These innovations include cheap sensors, a high-speed telecom infrastructure that can move huge amounts of data, unprecedented computation power, mobile and touch interfaces, and a standards-based open ecosystem for interoperability. This ecosystem includes web-based technologies, APIs for connectivity, machine learning, and AI.

As these technologies evolve and take hold, organizations desire outcomes that include increased revenue and productivity, lower costs, and more consistent quality. Industrial organizations are also dealing with high rates of retirement of aging workers who have deep knowledge and expertise. These individuals are being replaced by younger workers who lack the same knowledge but are digital natives with skills and experience with mobile devices and web-based technologies.
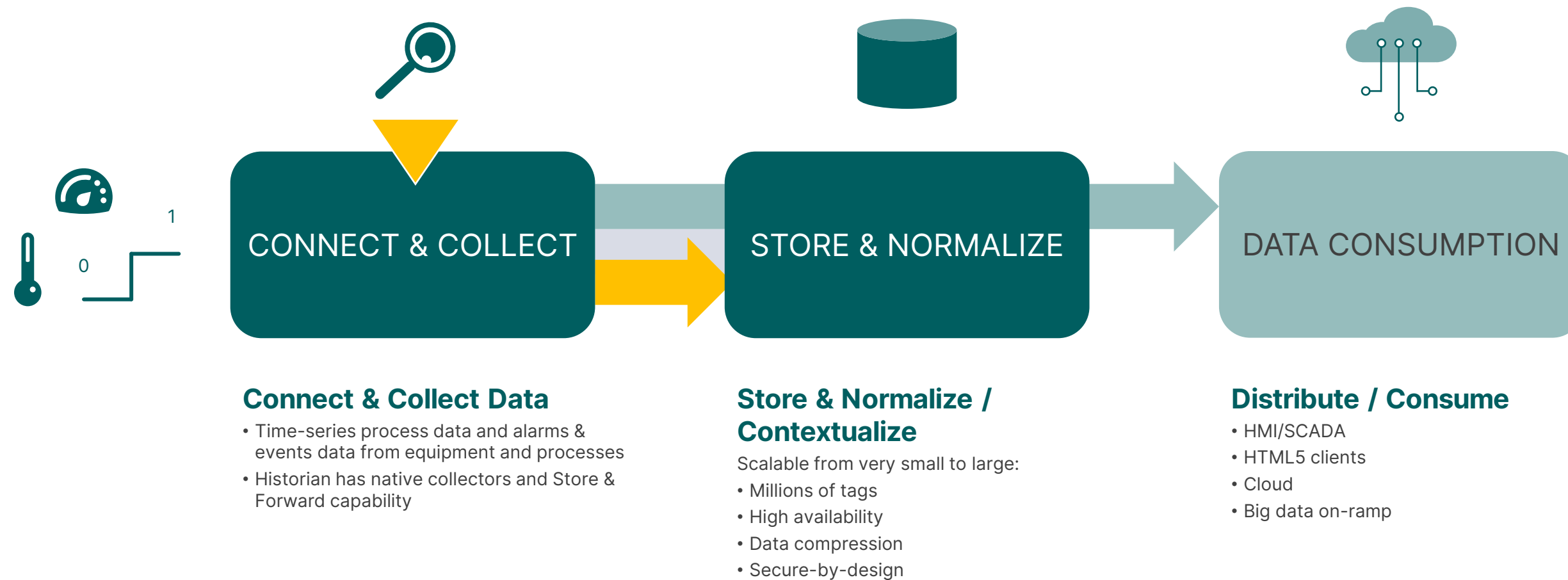
Technology suppliers in the automation ecosystem have the challenge and opportunity to help industrial companies cope with these changes while achieving their desired outcomes.
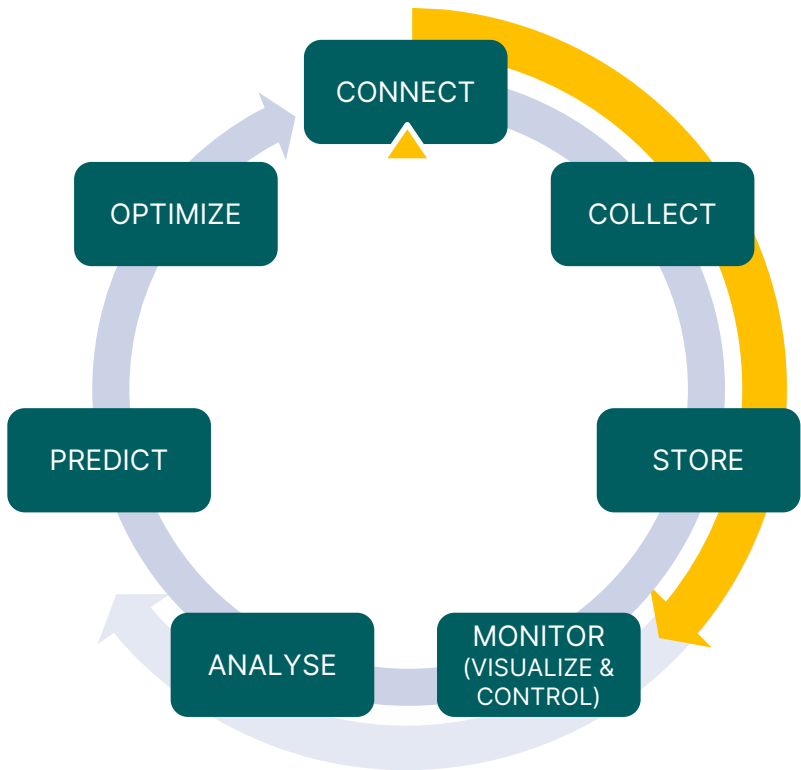
# DIGITAL TRANSFORMATION STARTS WITH DATA MANAGEMENT

Many of the most important advances in the Industrial Internet of Things (IIOT) ecosystem rely on collecting massive volumes of data from multiple sources, then: storing, normalizing, visualizing, and sharing this data, and being able to analyze it to generate actionable insights to predict and optimize operations.

# DATA HISTORIANS DELIVER THE FOUNDATION



**CONNECT & COLLECT**

**STORE & NORMALIZE**

**DATA CONSUMPTION**

### Connect & Collect Data
- Time-series process data and alarms & events data from equipment and processes
- Historian has native collectors and Store & Forward capability

### Store & Normalize / Contextualize
Scalable from very small to large:
- Millions of tags
- High availability
- Data compression
- Secure-by-design

### Distribute / Consume
- HMI/SCADA
- HTML5 clients
- Cloud
- Big data on-ramp

Organizations need the ability to aggregate near real-time data from sensors along with historical data from ERP systems, quality systems, HMI/SCADA, and other data sources. In addition, users need to know the data is clean, valid, and high quality.

At the core of data management is a plant- or enterprise- wide data historian, that facilitates data collection, storage
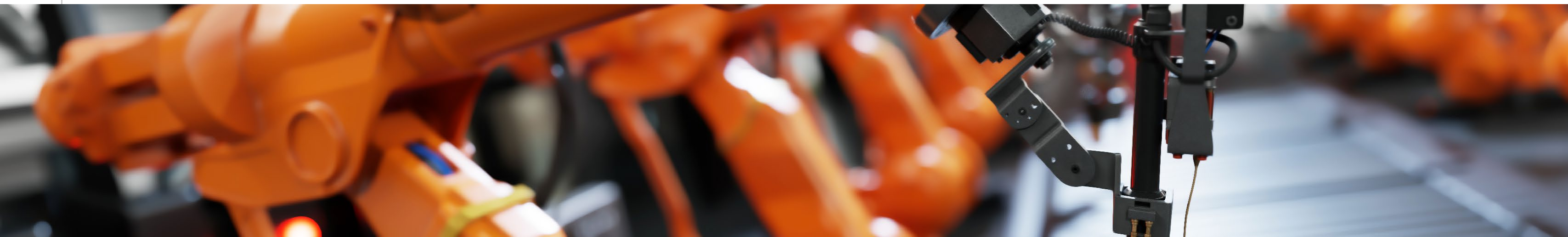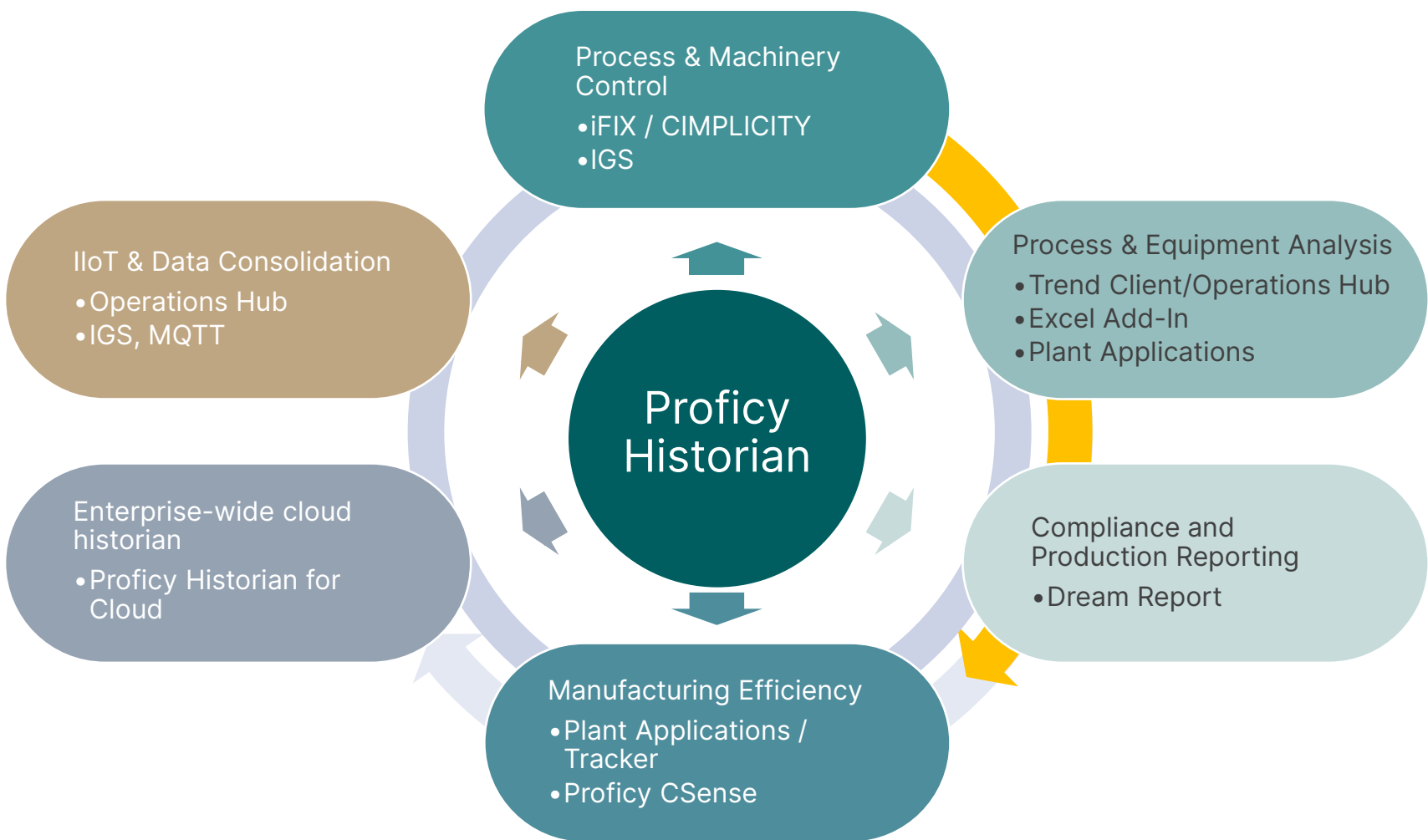
and normalization, and distribution. It stores time-series process data and alarm and event (A&E) data from industrial equipment and processes. Data can be collected from hundreds of different types of control systems and should be scalable from a small set of data tags to millions. Data should be distributed from a data historian by an integration with HMI/SCADA clients, through HTML5 clients, or via APIs.

*"The nice thing about Proficy Historian is it lets organizations start very small and have a roadmap to long-term and very robust and intense data analytics."*

Data is the foundation for delivering outcomes, data historians provide the common thread. This supports organizations to drive IoT initiatives, process and equipment analysis, compliance reporting, and more.

In addition to a data historian, another key component to turning data into information is via an asset model, to provide context that personnel of all levels can understand — from the plant floor to the operations center.

*"For us, the first step in creating information is putting the data that has been collected in a context everyone in the organization can understand."*

Process & Machinery Control
•iFIX / CIMPLICITY
•IGS

IIoT & Data Consolidation
•Operations Hub
•IGS, MQTT

Proficy Historian

Process & Equipment Analysis
•Trend Client/Operations Hub
•Excel Add-In
•Plant Applications

Enterprise-wide cloud historian
•Proficy Historian for Cloud

Compliance and Production Reporting
•Dream Report

Manufacturing Efficiency
•Plant Applications / Tracker
•Proficy CSense

# VISUALIZE AND SHARE DATA TO DERIVE VALUE

To provide customers with a data management solution that has both asset model context and visualization, GE Vernova developed Proficy Operations Hub, which integrates with historian technology such as Proficy Historian. This combination enables manufacturers and utilities to unlock the value in their data through shared information and collaboration as well as rapid application development (RAD) tools.

## What's the value of data if it can't be shared and visualized across a plant and enterprise?

Proficy Operations Hub is an industrial application platform for aggregating data from multiple sources. Proficy Operations Hub's code-free environment allows industrial applications to be rapidly built and deployed. It enables improved plant operations through comprehensive information that is easier to analyze and act upon. Key aspects include:

- Connecting to all systems in a multipurpose, multi-use plant and enterprise
- Democratizing tools so they are accessible throughout the organization and easy to use by all
- Visualizing data across all levels of a network
- Scalability in being useful for both small initiatives and massive undertakings

Connectivity is critical, and some methods include OPC UA, MQTT (Message Queue Telemetry Transport), and REST APIs.
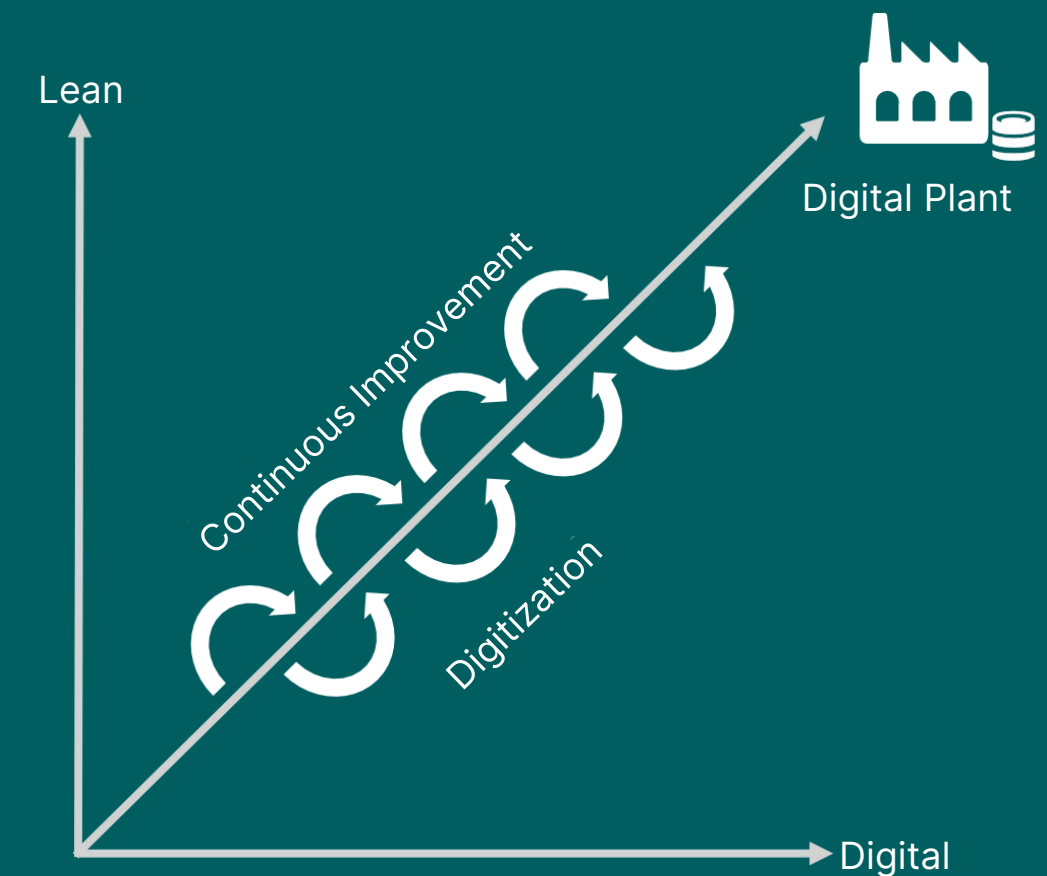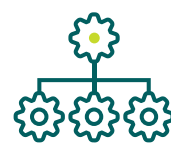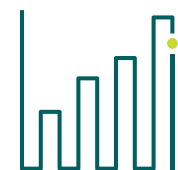
*"A key part of our belief is that tools have to be democratized . . . we want the tools to be accessible and usable by everyone."*

# ENABLE DIGITAL KAIZEN FOR CONTINUOUS IMPROVEMENT

Kaizen is an idea and practice that has existed for years. Kaizen is "change for better" through continuous improvements. With Kaizen, everyone is empowered to make small improvements, monitor the results, and constantly iterate. Over time these small continual changes lead to significant improvements.

As the industrial world embraces digitization, GE Vernova enables "Digital Kaizen." This involves:

- Applying the Kaizen concepts of continuous improvement
- Digitizing processes
- Democratizing digital tools

With Digital Kaizen, organizations don't transform through multi-year, complicated, and complex initiatives. Plants and enterprises get to their goal through a disciplined process of incremental improvement. This includes using Lean methodology to get ideas from plant users and operators about improvements. This is followed by digitization, testing, and repetition of the process. Digital Kaizen is not about a technology or tool. It is a mindset and a mentality.
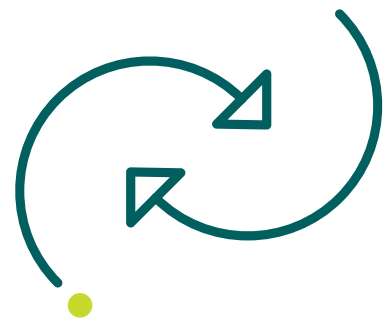
*"We have seen a great unlocking of opportunity for improvements in operations by having a shared value mindset about driving improvement and success."*

## The Digital Kaizen journey has three essential steps:

### 1

Aggregate contextual and situational information and digitize processes to provide greater visibility and transparency into what is happening today.

### 2

Democratize digital tools to enable greater accessibility, ad hoc analysis, and collaboration. This step is about analysis and collaboration to figure out how to make things better.
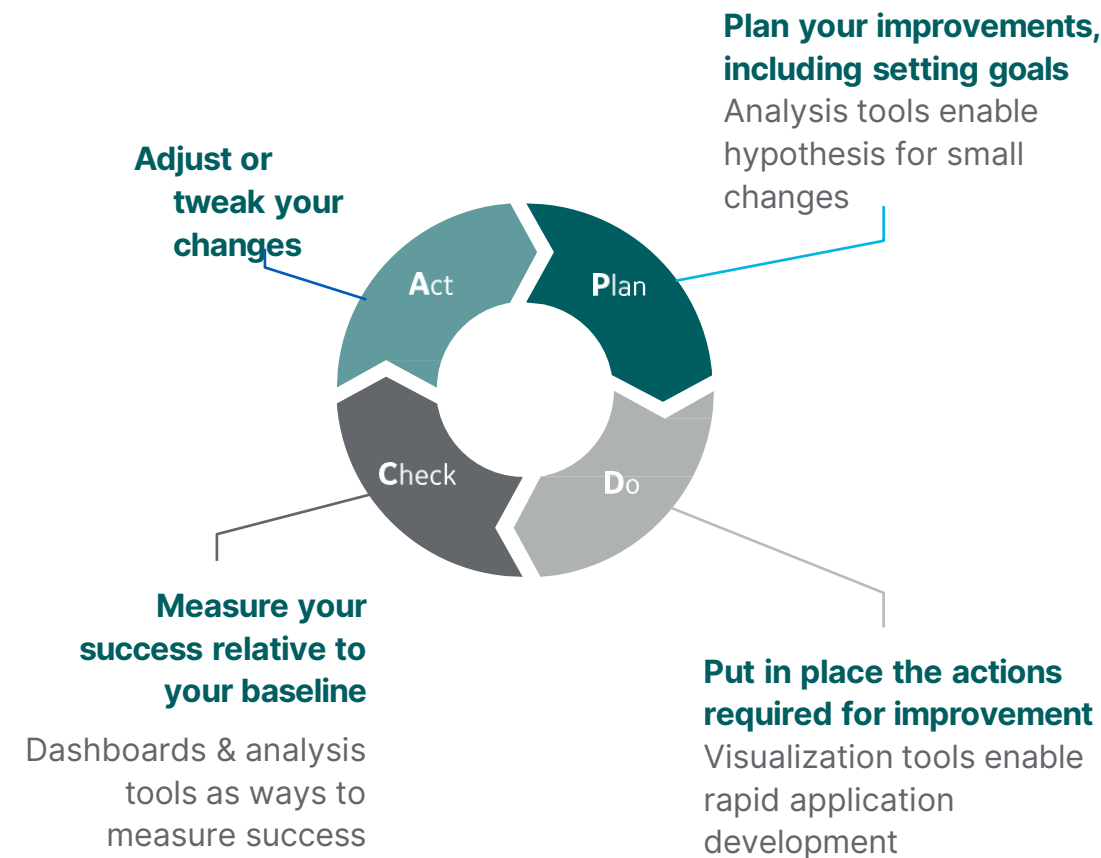
### 3

Leverage analytics to provide automated operator assistance, advanced warnings, and intelligent decision making.

# PLAN, DO, CHECK, ACT (PDCA)

The Digital Kaizen construct uses PDCA as a lifecycle. The steps in the lifecycle are:

- Plan your improvements
- Do the actions required for improvement
- Check by measuring success
- Act by adjusting or tweaking

**Plan your improvements, including setting goals**
Analysis tools enable hypothesis for small changes

**Adjust or tweak your changes**

**A**ct

**P**lan

**C**heck

**D**o

**Measure your success relative to your baseline**
Dashboards & analysis tools as ways to measure success

**Put in place the actions required for improvement**
Visualization tools enable rapid application development

# DIGITAL PROCEDURES

Many customers still have processes and procedures that involve paper or whiteboards or rely on the knowledge of a few experts. Organizations often begin their digital transformation by digitizing processes and procedures. Digitization is aided by consistent, standard operating procedures.

# DRIVE COLLABORATION

Collaboration is essential for teams to be more successful and for organizations to achieve their desired outcomes. An example of collaboration — using PDCA — is a healthcare manufacturer. This company has a weekly meeting with operators in its plant. The operators come together ("Plan") to discuss how digital apps can improve the operators' processes, minimize unnecessary work, and increase efficiency.
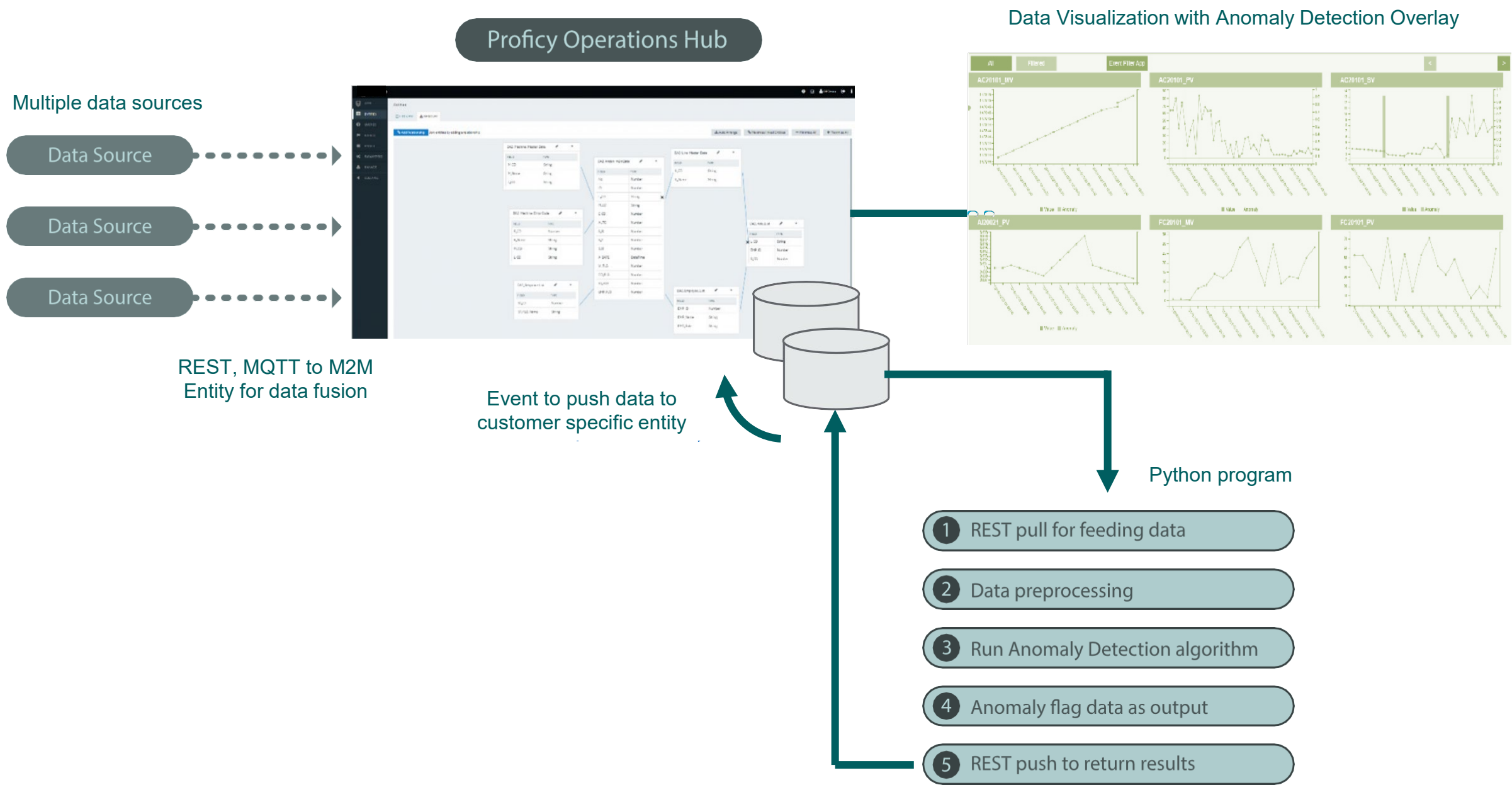
Based on operators' feedback, a digital team quickly develops prototypes in Proficy Operations Hub by creating and modifying apps ("Do"). Operators use the apps and share their feedback ("Check"). The digital team adjusts and tweaks the apps ("Act") based on the operators' feedback.

# PREDICT AND OPTIMIZE

As another example, a chemical company has a digital team focused on analytics. This team works with operators, line supervisors, and plant managers to understand challenges they are facing. Analysts create analytics that are visualized in Proficy Operations Hub. They use GE Vernova's provided SDK to pull and push data. Operators and line supervisors are notified of anomalies, which they verify and act upon.
The digital team continues to add more data sources based on feedback and analysts tweak analytics based on feedback.

This company brought data from multiple sources into Proficy Operations Hub. They then used the tool to create context and meaning, going from raw data to information and visualization. This provided a better understanding of what was happening in the plant, enabled anomaly detection, and allowed the company to optimize through analytics.



Data Visualization with Anomaly Detection Overlay

Proficy Operations Hub

Multiple data sources

Data Source

Data Source

Data Source

REST, MQTT to M2M
Entity for data fusion

Event to push data to
customer specific entity

Python program

1 REST pull for feeding data

2 Data preprocessing

3 Run Anomaly Detection algorithm

4 Anomaly flag data as output

5 REST push to return results

# THE ULTIMATE OUTCOME: OPTIMIZED PLANT OPERATIONS

The combination of effective data management, tools such as Proficy Historian and Proficy Operations Hub, and practices such as Digital Kaizen creates a high-productivity environment as well as the foundation for IoT. With this path toward a foundation for digital transformation, industrial organizations are enabled for continuous improvement and optimized plant operations. In turn, optimized plant operations allow each function within the plant to achieve their desired outcomes, including increased speed, reduced errors, lower costs, and a culture of continuous improvement.

*"The end goal from a plant management perspective is running a more optimized, truly digital plant that provides greater intelligence, greater collaboration, and greater throughput and output of your product, with greater quality."*

## Desired Outcomes for Each Function

| System Integrators/Developers, Enterprise Software Managers | Plant Personnel/Operators | Plant Management |
| --- | --- | --- |
| • Faster development, deployment, configuration & updates/ maintenance through a high-productivity development environment / RAD tools, code-free design, centralized web apps<br><br>• Easily create targeted apps across aggregated disparate data sources | • Improved operational performance and reduced human errors through democratized tools and accessibility<br><br>• Employees are part of the entire change process | • Reduced Total Cost of Ownership (TCO)<br><br>• Shared values and mindset of plant employees toward improvements<br><br>• Unlock continuous improvements |

# ABOUT GE VERNOVA'S PROFICY® SOFTWARE & SERVICES

GE Vernova's Proficy® Software & Services empowers teams, illuminating the path to a greener, more profitable future. Our proven industrial software accelerates innovation, enables connected workers, and operationalizes sustainability. We're driving measurable progress for over 20,000 diverse customers around the world.
The Proficy portfolio includes cloud-based and on-prem HMI/SCADA, MES, industrial data management, and analytics. Our software solves  the toughest industrial challenges and is used in applications such as discrete, hybrid, and continuous manufacturing; utilities automation; metro transit; and much more. Proficy offers architecture flexibility including single machines, remote substations,  and complex, distributed networks that span multiple factories and geographies.

Explore Proficy Software & Services