Schneider Electric, Intel, and Red Hat explore modern DCSs

According to a report by McKinsey, "Smart manufacturing has the potential to create up to $3.7 trillion in value by 2025, driving growth, innovation, and competitiveness across sectors."[1]

Embracing flexibility and resilience for future digital manufacturing

In today's fast-paced digital world, manufacturing leaders must adopt flexible production and sharpened resilience while maintaining operational efficiency. However, recent surveys reveal that 10% of manufacturers have successfully completed or are nearing the end of their digitalization journey.[2] This is due to obstacles, including outdated mindsets, siloed structures, and resistance to change.

To tackle these challenges, a fresh approach is essential—one that promotes open, interoperable systems.

Limitations of traditional control systems

While highly productive and reliable, operational technology (OT) has historically sacrificed flexibility for the sake of productivity. Facing the risk of being left behind in their market, leaders need to embrace collaboration with new functionality and proactively strengthen and speed up operations, with the flexibility and intelligence to scale based on demand.

▸ **Manual operations:** Excessive reliance on manual procedures with heterogeneous, outdated systems leads to inefficient plant operations, intensified by the lack of specialized IT expertise.

▸ **Difficulty scaling:** Proprietary technologies and vendor-dependent stacks limit the ability to grow and adapt.

▸ **Limited data access:** Isolated structures hinder visibility and real-time decision- making.

▸ **Obstacles to innovation:** Rigidity stifles innovation, preventing experimentations with new ideas and solutions that could stimulate growth. The skills gap and knowledge loss due to staff turnover further exacerbates the challenge.

Unlocking the potential of edge-powered process automation

In manufacturing automation, physical processes form the focal point of process control systems engineered to tackle production operation and monitoring. Manufacturers use various data inputs to transform them into a product.

Consider fluid control—an essential component of continuous manufacturing process systems in industries, such as chemicals, life sciences, and oil and gas production. For example, in chemical production, maintaining the correct ratio of raw materials to additives during the polymerization process is crucial for achieving the desired properties of the final product, such as density, strength, and flexibility.

Achieving these objectives helps minimize waste, reduce energy consumption, ensure consistent product characteristics, maintain physical safety, and increase overall production throughput.

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1 McKinsey Insights. *"What are Industry 4.0, the Fourth Industrial Revolution, and 4IR?"* 17 Aug. 2022.

2 PwC. *"PwC digital factory transformation survey 2022,"* 2022.

Key components of a control loop

Sensors: Responsible for measuring and monitoring in real time the process variables, such as flow rate, liquid level, temperature, and pressure

Actuators: Physical action or movement in response to signals from controllers, such as motors, drives, pumps, and valves

Controllers: Advanced devices, such as programmable logic controllers (PLCs) and distributed control systems (DCSs), that analyze inputs from sensors and determine appropriate control action for the actuators

Operator interface and monitor: Provide users with visualization and interaction capabilities, allowing effective monitoring and control of the process, such as human-machine interfaces (HMIs) and computerized workstations

Real-time networking: Facilitates exchange of data and input and output (I/O) across various components, ensuring deterministic and coordinated control actions, such as time-sensitive network (TSN)
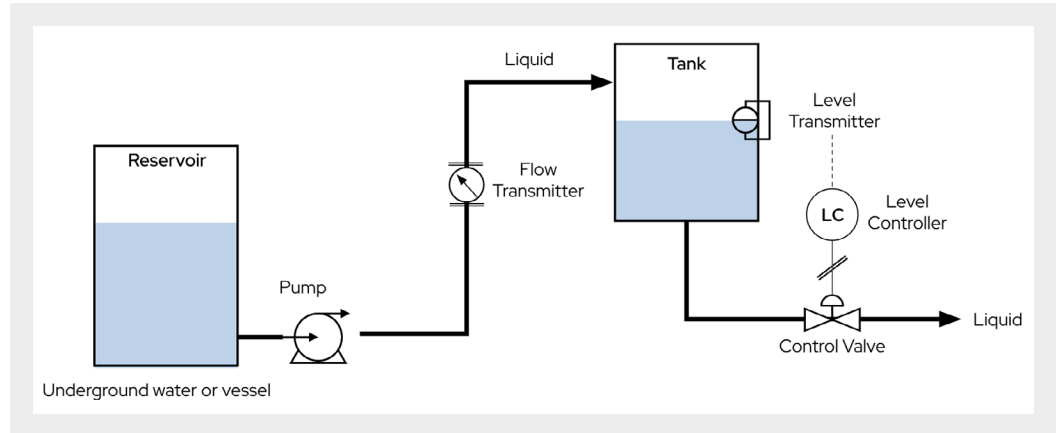
As illustrated above, a typical process control loop features a level transmitter, a flow transmitter, a level controller, a control valve, and a pump—all working together to regulate the fluid level in a process tank. This automation of the process is very well understood by the OT community.

Building modern distributed control systems

Integrated with an edge computing platform, process control systems can operate with even greater precision and efficiency, bringing unparalleled flexibility to fasten the innovation feedback loop in continuous manufacturing processes. Now that the process is well automated, the need to automate the control system platforms, taking advantage of well-established IT technologies, arises.

Here's why a newer approach to DCSs are essential for modern process manufacturing:

▸ **Compliance and standards:** A more modern approach to DCSs ensures adherence to regulatory requirements and industry standards.

▸ **Scalability and flexibility:** A software-defined platform approach facilitates uninterrupted, portable, scalable process control and maximizes adaptability.

▸ **Enhanced automation:** Orchestrated automation simplifies management and increases availability in manufacturing control systems, allowing the end users to focus on the task at hand: producing.

▸ **Robustness:** Uninterrupted operations supported by high-availability and redundancy attributes are built-in with the platform and engineered at every layer of the infrastructure. The new environment requires a new level of high and scalable availability.

▸ **AI-powered efficiency:** AI uses predictive maintenance to optimize processes by adjusting controls and identifying potential issues before impacting production.

▸ **Security:** An up-to-date approach to DCSs supports increased connectivity and integration requirements and eliminates reliance on obscurity in control systems for a security-hardened environment.

Edge-powered process control use cases and applications

- Quality control

- Prescriptive and predictive maintenance

- Sustainability and environmental impact

- Energy management

- Remote monitoring and control

Red Hat, Intel, and Schneider Electric: A market-leading collaboration

To overcome these challenges and limitations of traditional distributed control systems, Intel, Schneider Electric, and Red Hat collaborated to provide a modern, more innovative approach to building and operating DCSs.

The expansion of edge computing should clear the way for open, interoperable platforms and technologies, manufacturing standards and top-tier cloud-native capabilities in conjunction with advanced hardware and control software to equip organizations to adapt to evolving market dynamics.
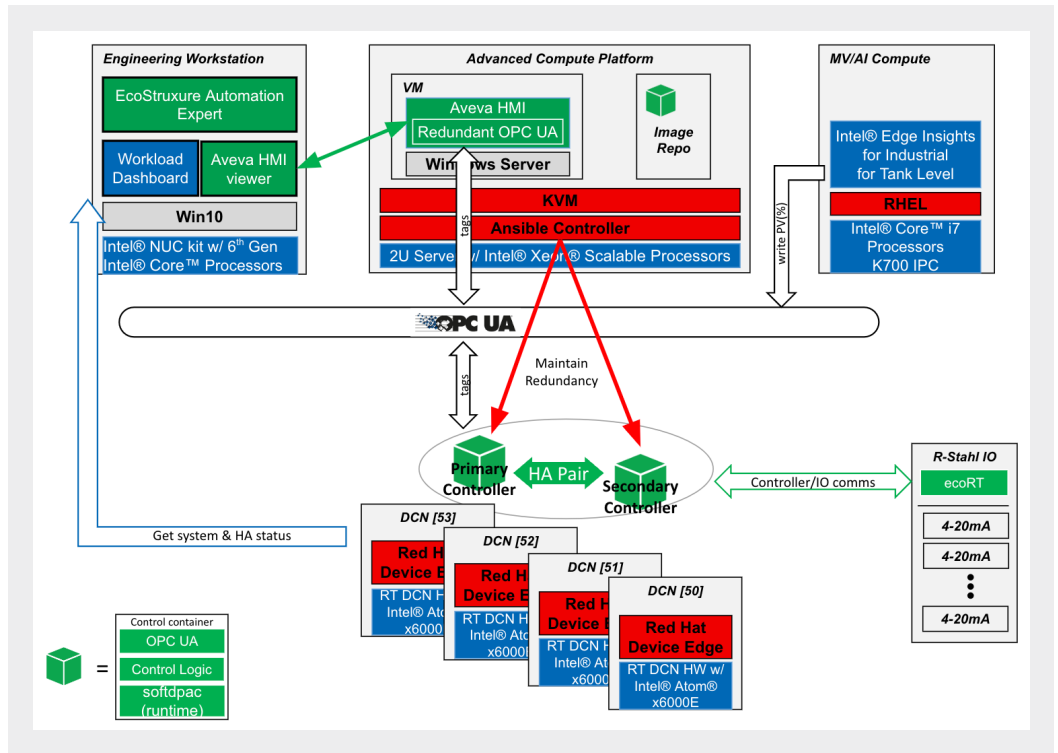
About FDO

Linux Foundation–backed Fast IDentity Online (FIDO) Device Onboard specification aims to address configuring edge and Internet of Things (IoT) servers.

Key capabilities and features

▸ **Control switchover:** Transition between controller nodes without interruption, reducing downtime and enhancing reliability. Push beyond traditional boundaries of redundancy and fault tolerance in control systems.

▸ **Predictable performance:** Operate within process system limits at any load, in any condition, constantly meeting a consistent behavior of the control loop. This is an essential step toward a more autonomous platform.

▸ **Zero touch provisioning and management:** Streamline device addition and replacement with autonomous edge life cycle management and more security-focused configuration using FIDO Device Onboard (FDO).

Highlights:

- Deterministic assured execution runtime

- Enterprise-grade Linux OS

- Automated provisioning, management, and scaling

- IaC life cycle management of the control systems stack

- Support execution runtimes compliant with Open Platform Communications Unified Architecture (OPC UA), providing real-time connectivity

▸ **Nonimpactful updates:** Continuous cycles to maintain operating systems and clustered edge applications receiving most recent updates and security patches, without impacting the availability of system state.

▸ **AI-based sensing and control:** Implement predictive maintenance and condition-based monitoring to detect anomalies and adjust operations.

▸ **Infrastructure as code (IaC):** Employ best practices from enterprise IT for critical OT systems. Achieve enhanced management and deployment, ensuring agility and responsiveness in control systems.

▸ **Real-time analytics:** Take advantage of artificial intelligence and machine learning (AI/ML) integration for data-driven process optimization, enhanced product quality, and to identify opportunities for improvements.

Proven solution components

In this innovative solution approach, several key products from Red Hat, Intel, and Schneider Electric collaborate to address the requirements discussed.

These proven components create a powerful, integrated strategy that helps organizations overcome contemporary manufacturing challenges and attain unparalleled levels of efficiency, flexibility, and innovation.

▸ **Red Hat® Device Edge** provides the flexibility to deploy and manage workloads on small, resource-constrained devices at scale. It combines Red Hat Enterprise Linux® with MicroShift—a lightweight Kubernetes distribution from Red Hat OpenShift®—so users can deploy anything from traditional Linux workloads to complex containerized services.

▸ **Red Hat Ansible® Automation Platform** is an open source automation tool for the orchestration of both enterprise IT and OT environments, helping to automate tasks like configuration management, provisioning, application deployment, and life cycle management, improving overall workflow.

This approach combines Schneider Electric's EcoStruxture™ Automation Expert (Soft dPAC) and Intel's Edge Controls for Industrial to form an integrated solution, from silicon to software. Harness 2U Intel® Xeon® Scalable processors server references, Source Lake distributed control node, machine vision and AI infrastructure, and a workload dashboard for an efficient platform.

Embrace the future of openness

Don't let outdated systems hinder progress. Embrace a modern solution to transform control systems, optimize operations, and reduce costs with an edge computing strategy.

Visit redhat.com/edge to learn more and book a discovery session to discuss Red Hat Edge portfolio products with an expert.

About Red Hat

Red Hat helps customers standardize across environments, develop cloud-native applications, and integrate, automate, secure, and manage complex environments with award-winning support, training, and consulting services.

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