Universal Automation

A call for change



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Life Is On Schneider Electric

Executive Summary

Since its humble beginnings in the mid-20th century, computer-based automation technology has helped propel industry forward. Now we have reached a critical crossroads.

Should we continue investing in technology created decades ago, or should we embrace a new era of software-defined automation that fully harnesses the potential of the digital world?

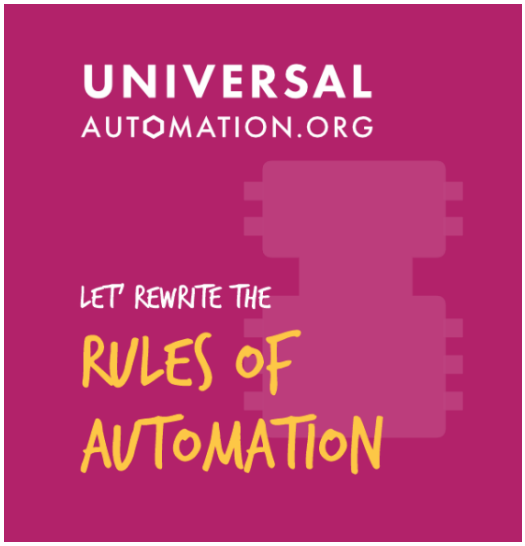
Will we continue to accept the limitations we have learned to live with: big engineering efforts, lack of modularization, and barriers that inhibit adaptability and hinder innovation? Or is it time to break free from our current paradigm of proprietary, closed automation—and write a new playbook for the future?

In Digital Transformation: Survive and Thrive in an Era of Mass Extinction, Thomas Siebel proposes that organizations,

> “Recognize when an existing model has run its course and evolve. They must create new, innovative processes that take advantage of the most abundant and available resources. They must prepare for future upheavals by developing systems with interchangeable parts; produce faster, scale faster, work faster.”

Shared source is an approach where a software or hardware source code is made available to a broader community.

Unlike traditional proprietary software, where the source code is kept private and controlled by a single entity, the shared source approach allows a more inclusive and collaborative development process.



We believe it is time to invigorate industry with a **shared source** model, like the ones used in the computing, smartphone, and ecommerce worlds (among others). By sharing technology, we can build a plug and produce ecosystem of automation applications that solve specific challenges in a proven way. Think of all the apps in your smartphone app store.

Software-defined automation will fuel innovation and support long-lasting growth in a sustainable way.

It’s time for
universal automation.

The future of industry is wide open.

Question:

What do these companies have in common?



Engineers in a major water treatment plant streamline a water recycling project, **cutting engineering time by 20%** to tackle water scarcity.



A systems integrator delivers a **future-ready operations** update, featuring **simplified IT integration** including predictive maintenance, for an international consumer packaged goods company to better meet changing market demands.



A global manufacturer **reduces CapEx by 35% and cuts downtime by 25%** in its smart warehousing operation to improve customer service.



A pioneer in permanent carbon capture **increases yield and scalability while reducing engineering costs** to combat climate change.



Efficiency reigns as an intelligent refrigeration equipment company **cuts commissioning time by 30%** with “wrap and reuse” of automation assets and digital twin technology to **speed time to market and increase ROI**.

Answer:

universal automation

See more examples here

What is universal automation

Universal automation is the combination of two things:

1. It is a **shared-source implementation** of an automation standard* for portability, reusability, and distribution of applications across platforms.

2. It is an independent, **not-for-profit association** of users, vendors, and academics managing that shared-source implementation. It is called UniversalAutomation.org, and is open to anyone willing to change the game of automation.

*The **IEC 61499 standard** defines a high-level system design language for distributed information and control systems.

IEC 64199 addresses the challenge of ensuring portability, configurability, and interoperability of application software across different vendors. Additionally, it promotes software and hardware independence.

The IEC 61499 standard extends and enhances the IEC 61131-3 standard.

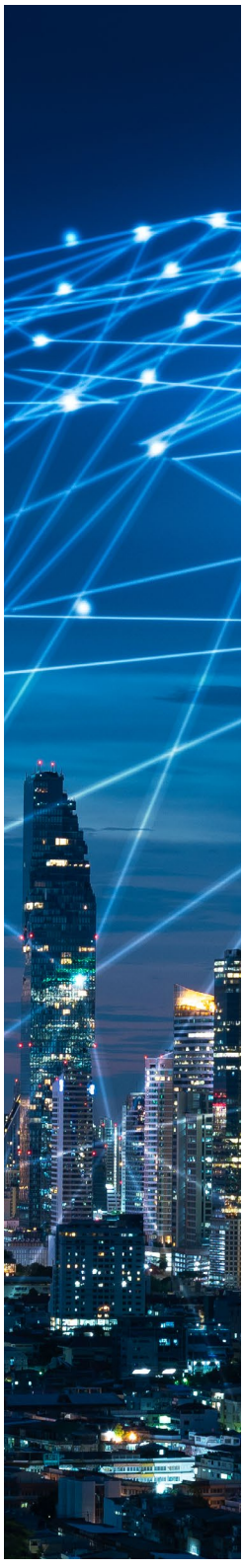
Learn more about IEC 61499





Digitalization: Industry's Quantum Leap

Manufacturing and process industries are undergoing a digital upgrade that is forever transforming the way we process and manufacture goods and services.



In this fourth industrial revolution, automation is integrating with advanced technologies such as artificial intelligence and machine learning to improve real-time control of critical business, operating, and sustainability variables with unprecedented precision.

Information technology (IT) and operational technology (OT) are converging into smart, interconnected systems that can swiftly adapt to any changing condition, while continuing to enhance efficiency, productivity, sustainability, and financial performance.

> "The level of digital information within the organization combined with that available in the virtual world can enhance the organization's understanding, preparation, monitoring, response, and recovery related to crises. Given this, we see digitalization as 'the great enabler' of end-to-end organizational resilience."
>
> Deloitte

Sometimes referred to as the Industrial Internet of Things (IIoT), the IT/OT connection is used to make data-driven decisions that sustainably improve financial performance.

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." By bridging the gap between IT and OT, manufacturing and process companies realize faster and more efficient productivity, while infusing their operations with the flexibility and intelligence to scale as needed.

Industrial Internet of Things (IIoT)	
IT	OT
Data management and analytics	Data acquisition
Connectivity and networking	Real-time control
Visualization, digital twin	Process monitoring



Unlocking Industry 4.0

Unfortunately, Industry 4.0's potential is constrained by outdated, proprietary automation platforms. Most industrial automation architecture in use today was defined decades ago. These hardware-based systems were never built to take advantage of the advanced technologies and enormous computing power that we have today.

Unchanging design principles make integration cumbersome, upgrades costly, and tether systems to specific machines. These proprietary systems stifle innovation, increase ownership costs, and hinder IT-driven progress.

Automation solutions that cannot **seamlessly work across multivendor installations** hinder problem-solving and make it difficult for companies to adapt to the fast-paced digital landscape.

This leads to excessive engineering expenses, delayed innovation, and reduced agility - resulting in missed opportunities. When automation apps designed for one vendor do not easily work on others:

- Innovation is stalled and the pace of change is slow
- Isolated control islands require complex engineering to unify plant systems
- Extra interfaces lead to lower reliability, increased downtime, and higher costs

But change is possible.

> “Innovations in digitalization and connectivity as well as advances in processing power and design regularly disrupt markets. In the smartphone market, the iPhone and the iTunes ecosystem redefined what consumers wanted and how they would get it. The idea of software-defined cars that could be updated over the air—sometimes called ‘smartphones on wheels’—first became reality in the automotive market in 2012.”
>
> McKinsey & Company

Software-defined automation

Next-generation manufacturing and process **operations do not have to be centered around an automation system architecture at all**. Instead, the automation system can be an open platform tool that is used to implement new manufacturing and production models. The convergence of digital technology advancements, ubiquitous data, and widespread connectivity now make it possible.

Software-defined automation separates the hardware from the software. This opens opportunities for cost-effective, simple interoperability with enterprise IT systems across the full lifecycle—from design to operations to supply chain and beyond.

According to the IDC report Software-Defined Industrial Automation, "the datacenter and IT worlds have already driven significant cost savings and optimization of IT environments by utilizing a mix of hardware solutions being orchestrated and executed by a unified virtualized software stack. These same technology trends are now on the cusp of revolutionizing the way industrial automation systems are built. … A confluence of significant market trends are making the shift to software-defined automation inevitable."



Software-defined automation can "control multiple hardware assets from a variety of containerized software running on shared hardware resources. These hardware resources could be next-generation PLCs, or they could be more IT-like hardware such as ruggedized or advanced networking equipment."

IDC

Portability: ability of a software application or program to run on different computer systems or platforms without major modifications. It ensures that the software can be easily moved or "ported" from one environment to another without significant code changes. This enhances flexibility and compatibility across various devices and systems.

Shared-source technology allows developers to adapt and customize the software for different platforms, enhancing its portability. It also fosters collaboration and independence from a single vendor, further supporting portability efforts.

Portable automation applications

To succeed in a software-driven world, **portability** is essential. We've seen the IT, energy, and telecommunications spaces thrive with this model. These sectors prove that using shared source technology not only saves time and cost but also fosters continuous improvement and easy adaptation to evolving conditions.

Industry-wide adoption of **a common universal automation layer** across vendors will guarantee application interoperability and portability for next-generation automation software. This will allow manufacturers and process industries to retrofit or build their automation systems with ease, avoiding extensive engineering efforts and preventing non-cohesive system designs that incur technical debt.

Technical debt: the cost and complexity that accumulates when design compromises or shortcuts are made, resulting in suboptimal quality that is hard to maintain and evolve. It represents the extra effort required to address deficiencies and refactor or improve the design in the future.

Plug and Produce

Universal automation allows OEMs, system integrators, and end users to build automation solutions by **plugging together best-of-breed applications** using low-code graphical tools.

The IT and telecommunications markets love their plug-and-play applications because they work as soon as they are activated, they are easy to use (and update), and they are reliable. Much in the same way that consumers can easily deploy apps to their devices to simplify their lives, based on their own unique needs, universal automation enables plant managers, operators, and engineers to deploy the apps and solutions they need to overcome their unique business and operating challenges. All industrial stakeholders can benefit from much simpler, less labor intensive behind-the-scenes integration.



What is Open Automation?

Open has many different meanings in the operational technology world today. Progress has been made, but there is more work to be done before industry widely accepts and implements true "open automation."

In the information technology world, open software provides transparent access to its inner workings, enabling customization and development by third-party entities.

Interoperable industrial systems or devices can connect and exchange information (communicate) with each other by leveraging networking protocols. However, today's automation networking protocols aren't always open, or standards based, and some are proprietary. And interoperable doesn't necessarily mean portable.

Portable industrial applications can be easily moved between or used on different platforms or devices without code changes, modification, or redevelopment - ensuring compatibility and smooth operation across different environments.

Universal applications can be written once and **reused** to run on all automation devices (e.g., PLCs, controllers, industrial PCs, dockers, servers, and others) with the UniversalAutomation.org runtime execution engine implemented.

Open automation

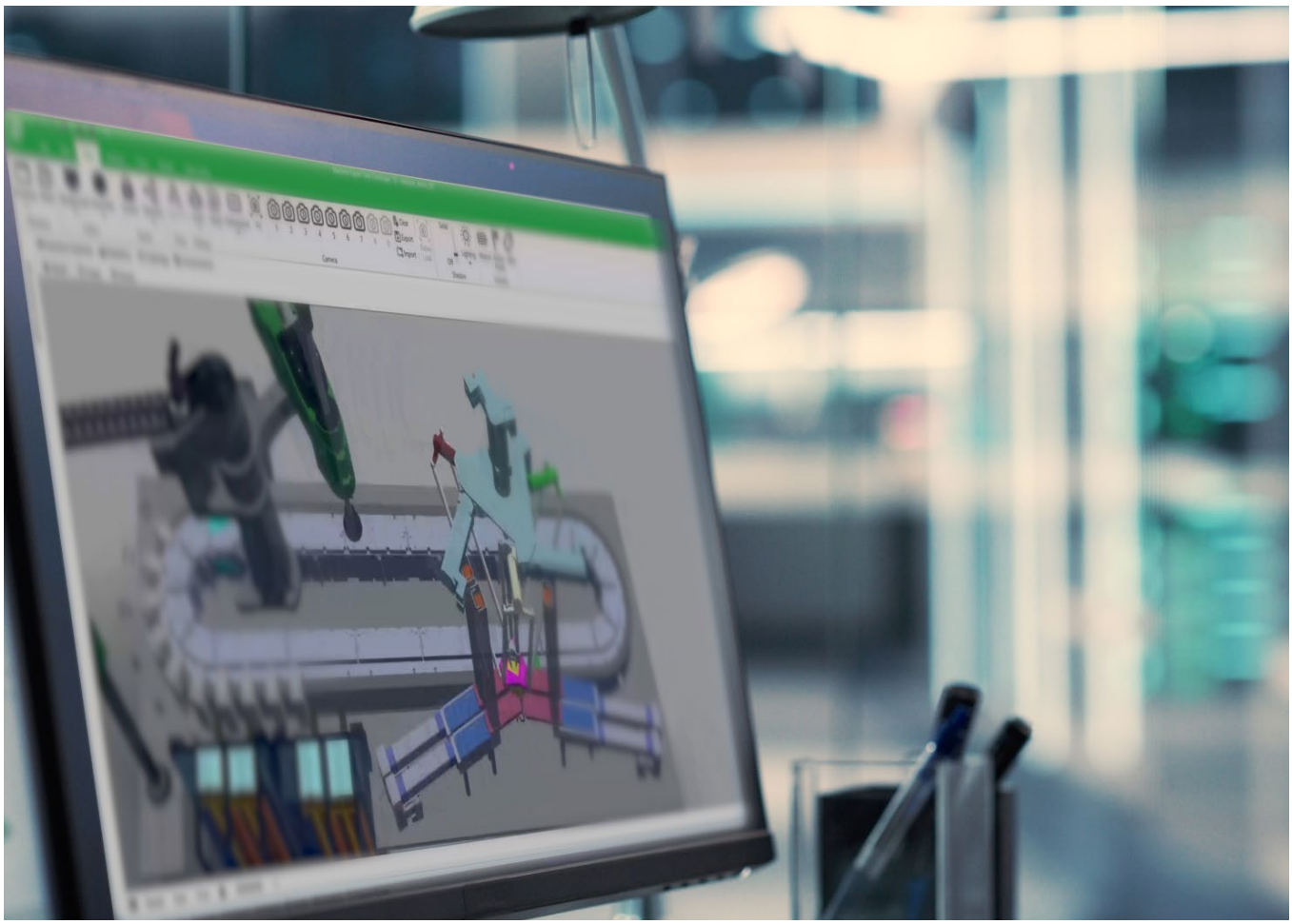
The pressure to adopt “open automation” has been mounting for stakeholders across all corners of industry for a while. Many organizations recognize that next-generation industrial automation must break free from the proprietary locked-in model we have now. UniversalAutomation.Org and other initiatives are highly complementary. A few examples are:

- Open Process Automation Forum (OPAF)
- NAMUR
- Open Platform Communications Foundation (OPC)

OPAF has adopted the IEC 61499 standard as part of its O-PAS standard-of-standards. UniversalAutomation.org provides a vendor-independent platform on which the OPAF model can be built in the form of IEC 61499 software components.

The OPC Foundation has developed a unified architecture platform (OPC UA) for “the secure and reliable exchange of data in the industrial automation space and in other industries.” And in fact, the technology shared by UniversalAutomation.org has an OPC UA stack implemented.

Some automation suppliers market their offers as “open.” However, not all have embraced vendor-agnostic portability, where **automation applications from one vendor can run on hardware from another.**



Constraints Are More Historical than Technical

The incentive to take the leap into the industries of the future is compelling. So, what is stopping us from unleashing this new level of industrial excellence? Surprisingly, the constraints are more historical and psychological than technical.

It is natural for traditional industrial automation vendors to resist change. The concept of interoperable and portable applications conflicts with their longstanding business models. However, manufacturing and processing companies are beginning to see proprietary automation systems as a barrier to growth and a cost, rather than an enabler and source of profit.

What is the difference between UniversalAutomation.Org and other standardization bodies?

UniversalAutomation.org is managing a **shared-source implementation** of the IEC 61499 standard and acts as an accelerator for other open initiatives.

A proven in use standardized library of software components enables universal automation devices to quickly implement other open standards. This mirrors the functionality of modern IT software systems.

Held hostage by misguided risk-aversion

Vendors benefiting from a proprietary model may argue that building systems based on best-of-breed components from multiple vendors increases risk, but the reality is just the opposite:

1. **Risk is reduced** when an end user can leverage the domain expertise of multiple authorities with broad and deep competence in each field, as well as the fresh perspectives from up-and-coming innovators that challenge the status quo.

2. Proven-in-use software applications running on a standard-based system are **more reliable** and more **easily expanded and adapted** for future use. By contrast, custom-programmed proprietary systems are expensive to maintain and difficult to upgrade.

3. In the IT-world, the approach of sharing technology **eliminates the risk** associated with interpreting written standards and accelerates broad support. For example, Linux® has been used for years in mission-critical applications and is supported by an extensive ecosystem.



Universal automation benefits everyone

The reality is that system integrators and EPCs are already building solutions with components from different vendors. It is just a lot more difficult than it needs to be.

Moving from a proprietary world to universal automation not only benefits end users, but it also gives those willing to innovate a head start in the race for **new value built on software innovation**. Universal automation creates market demand for proven-in-use software apps that bring unique values to users and new revenues for vendors.

Traditional automation suppliers can strengthen their competitive positions in the digital world by reassessing their unique value-add and strategically updating their business models.

As automation systems become more flexible and prove increased end user value, a virtuous cycle will be created where investment in automation systems will increase. New business models will be enabled, new customers reached, and new markets served.

BlackBerry stands as a classic example of the impact of a shared-source model on business success.

As a smartphone pioneer, BlackBerry initially saw substantial growth due to its secure messaging and email features. However, the advent of competitors like Apple's iPhone and Google's Android system led to a significant decline in BlackBerry's market share. One crucial factor behind this decline was BlackBerry's proprietary software platform. While competitors enabled app development ecosystems, BlackBerry devices were limited to applications built specifically for its platform. This meant that developers had to create separate apps for BlackBerry, which resulted in a smaller selection and slower development compared to the robust app stores of iOS and Android.

"Innovations in digitalization and connectivity as well as advances in processing power and design regularly disrupt markets. In the smartphone market, the iPhone and the iTunes ecosystem redefined what consumers wanted and how they would get it. The idea of software-defined cars that could be updated over the air - sometimes called "smartphones on wheels" - first became reality in the automotive market in 2012."

McKinsey & Company

Closing the Loop of Automation Process

"Closed-loop process control is the bedrock of automation, and it always has been. However, as the systems for measuring and predicting operational outcomes based on more complex and integrated data models evolve, the methods of closing that loop must evolve as well.

To achieve upper ends of maturity in either domain will require a merging of the two. Companies are seeking to capitalize on their data more effectively in operations, and the logical progression of this requires them to use AI-driven data models to close the loop of automation processes."

IDC

This Changes Everything

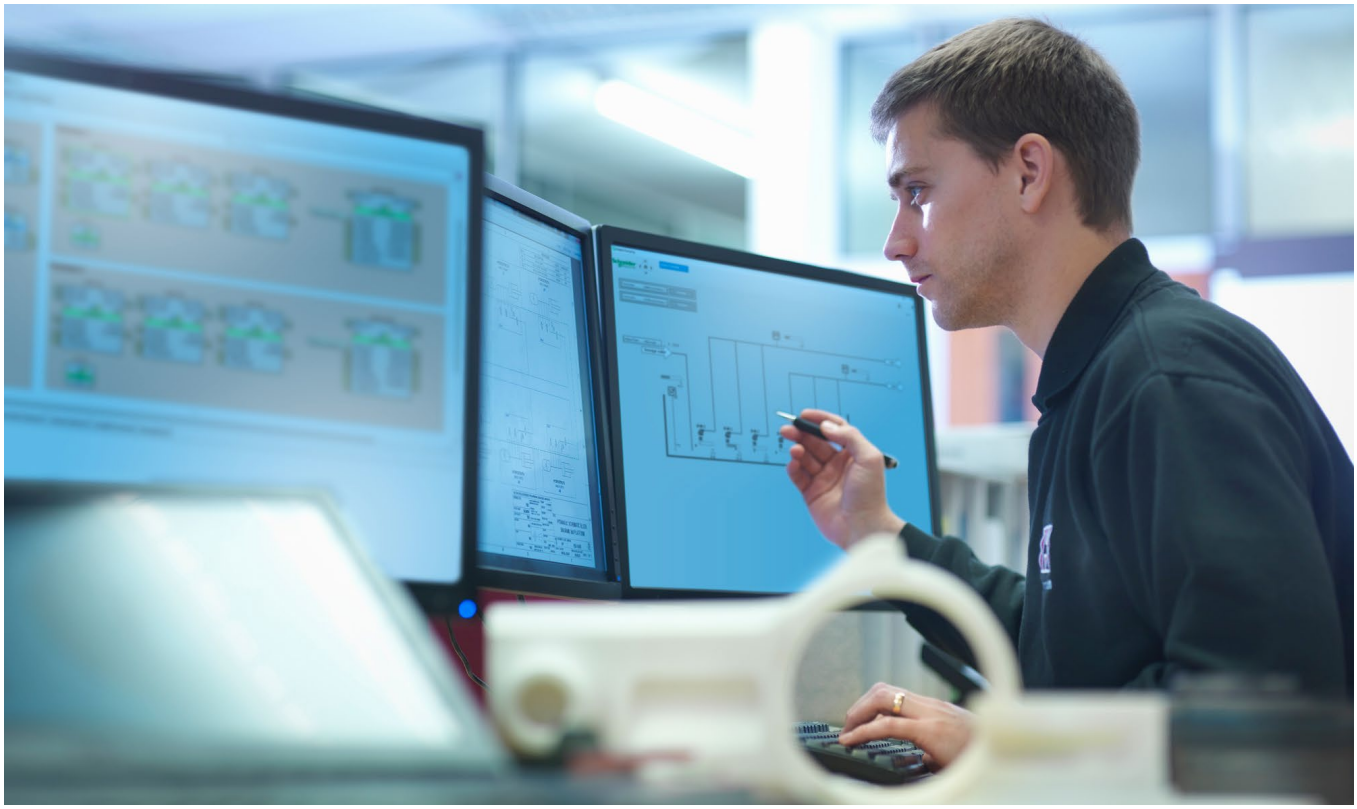
Because we believe in the merits of universal automation so strongly, Schneider Electric launched the first universal automation offer. EcoStruxure Automation Expert is a software-centric industrial automation platform. It uses a **hardware-independent approach to design and control** for more efficient interoperability, portability, and re-usability of applications across vendors. It also can define architectures based on a user's specific automation needs.

By decoupling the software layer from the hardware and taking a decentralized approach to automation engineering, it allows portability and enables **IT/OT convergence** across the complete lifecycle of an industrial operation.

In its report, The Road to Universal Automation, ARC stated, "Today's demands for greater manufacturing flexibility and higher productivity require that control system software development must become much more like IT software development. Far better management of this software as a resource becomes a critical need in the era of Industry 4.0. EcoStruxure Automation Expert is designed to close this gap."

"EcoStruxure Automation Expert is a game changer in the world of industrial automation. Its software-centric plug-and-produce architecture empowers users to easily integrate the most appropriate solutions for their unique requirements, regardless of vendor."

Frost & Sullivan

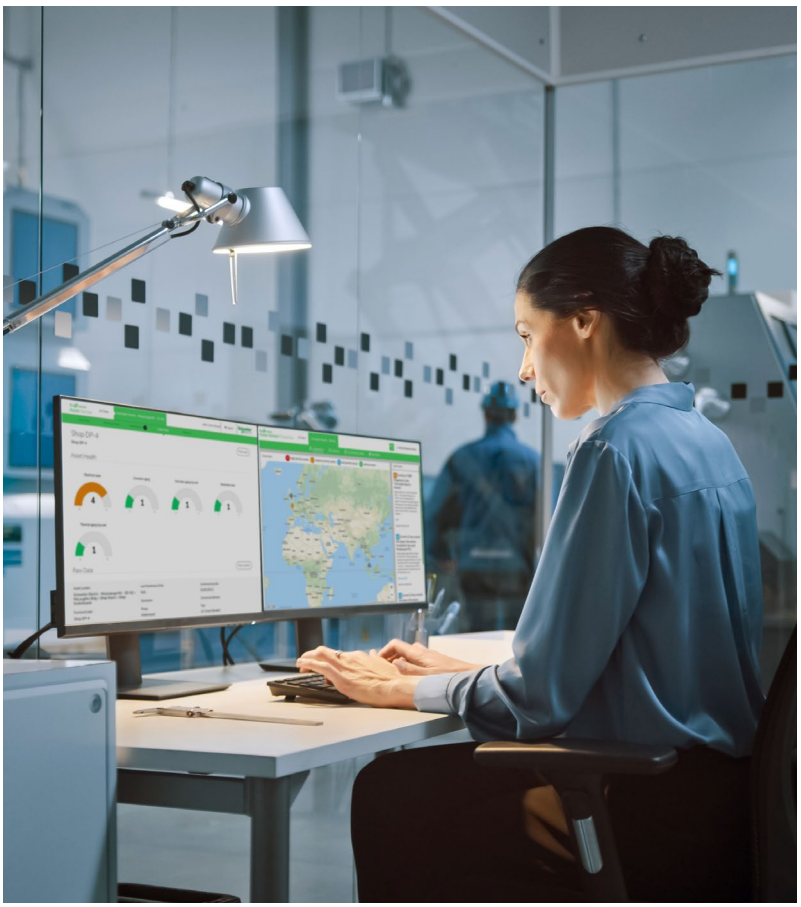


Not your parent's automation

After 50 years, it is software (not hardware) that is driving automation to the next level. We can create **step-change operational improvements** with a portable plug-and-produce application ecosystem that gives users the freedom to select and integrate best-in-class technologies — without regard to vendor.

We believe universal automation will unleash a wave of unbound innovation and usher in a new era of **à la carte automation**. Portable, interoperable, **plug and produce** applications that can run on any universal automation-compatible hardware will create an entirely vendor-agnostic environment for optimizing both cost and performance.

Industrial enterprises that embrace universal automation will realize step-change improvements in productivity, efficiency, and sustainability that we could only dream of a decade ago.



"According to our analysis, many of today's most advanced trends in manufacturing technologies—such as digital twins, robots capable of teaching themselves, and devices that can do their own programming—will become commonplace in the future. These trends will enable a "software-defined" paradigm for industrial automation."

McKinsey & Company

"A standardized automation system layer would be immensely valuable in economic terms. ARC research estimates the worldwide supplier DCS services market at $7 billion to $8 billion per year and that end users spend approximately $20 to $30 billion per year to service the installed base. A substantial part of that spending could be avoided through a standardized automation layer. Far beyond the cost savings, standardization would enable highly skilled process engineers and technicians to focus more on production improvements rather than merely rewriting legacy code."

ARC Advisory Group

Together We Can Transform Industries

We can overcome the limitations of closed, proprietary automation that have been holding us back. However, no single company can achieve everything promised by Industry 4.0 alone. To thrive in this new era, we need an extended ecosystem of collaborators working in synergy. Today, we must unite, be innovative, and bring about sustainable and lasting positive change for industrial operations.

Will you be part of the universal automation future?

About UniversalAutomation.org

UniversalAutomation.Org was formed by a diverse group of industrial leaders and pioneers who joined together to advance the world of automation. For the first time, IT and OT software vendors, end users, systems integrators, OEMs, start-ups, and higher education institutions are **sharing a common automation software** layer across their products and solutions.

UniversalAutomation.Org members are developing interoperable and portable automation software that can run with almost any hardware, creating an entirely vendor-agnostic ecosystem for automation software development.

By merging both the information technology and operational technology worlds with a shared-source implementation, the organization seeks to unleash the full potential of Industry 4.0 and beyond.

To learn more or to join the team changing the game, visit UniversalAutomation.org

Additional Resources

EcoStruxure Automation Expert online demonstration

Introduction to UniversalAutomation.org

Is industrial automation headed for a tipping point? (McKinsey & Company)

New Paths for Automation, a Documentary

Schneider Electric Applauded by Frost & Sullivan for Enabling Interoperability and Improving Efficiency with Its Universal Automation System (Frost & Sullivan)

Software-Defined Industrial Automation (IDC)

The Road to Universal Automation (ARC Advisory Group)

What are Industry 4.0, the Fourth Industrial Revolution, and 4IR? (McKinsey & Company)

What is IEC 61499

Universal Automation: A New Era in the Automation Industry (IIoT World)

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