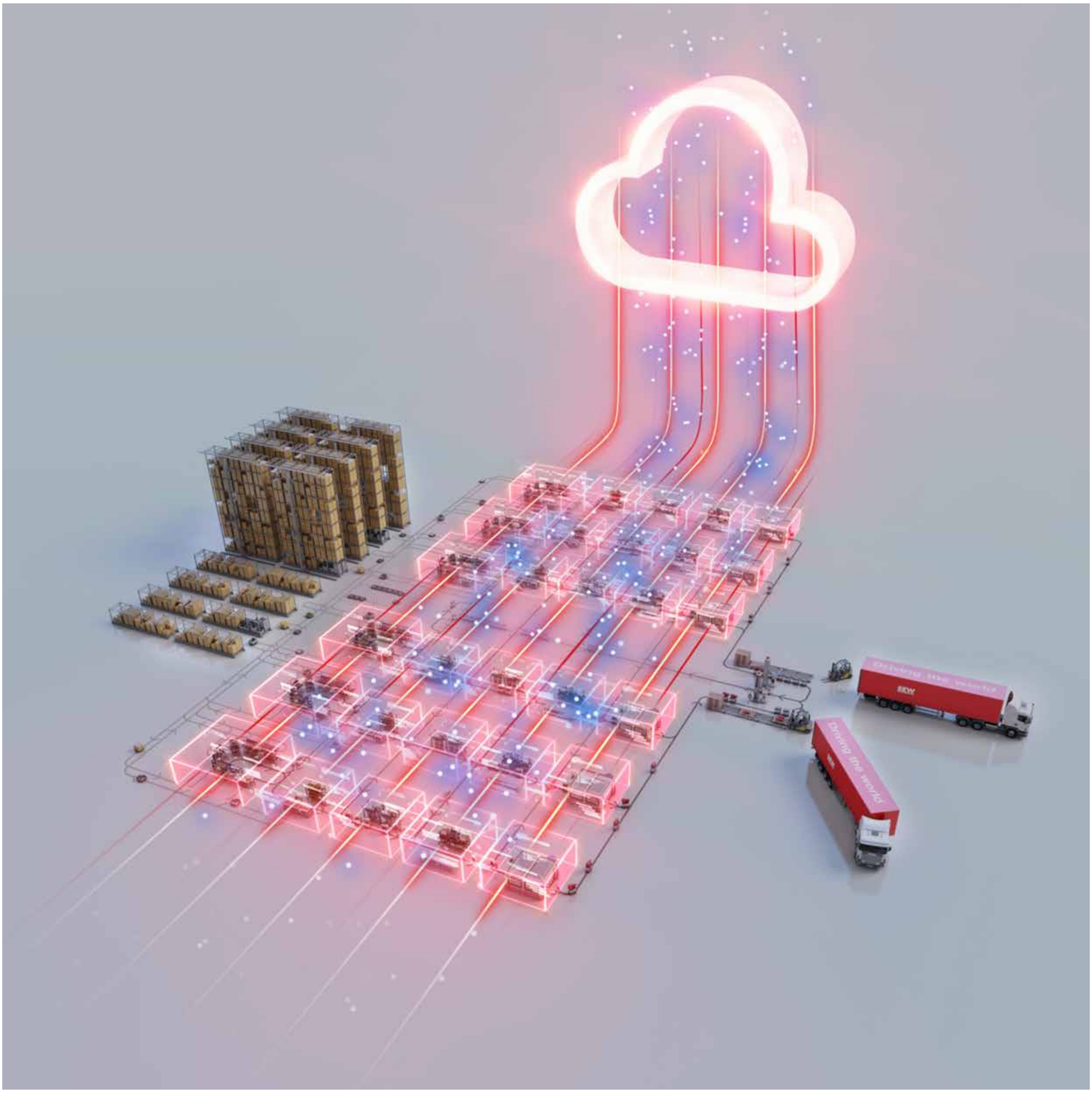
Driving the world

# Becoming the best in digital integration

Increasing productivity and resilience with software-defined factory



# Table of contents

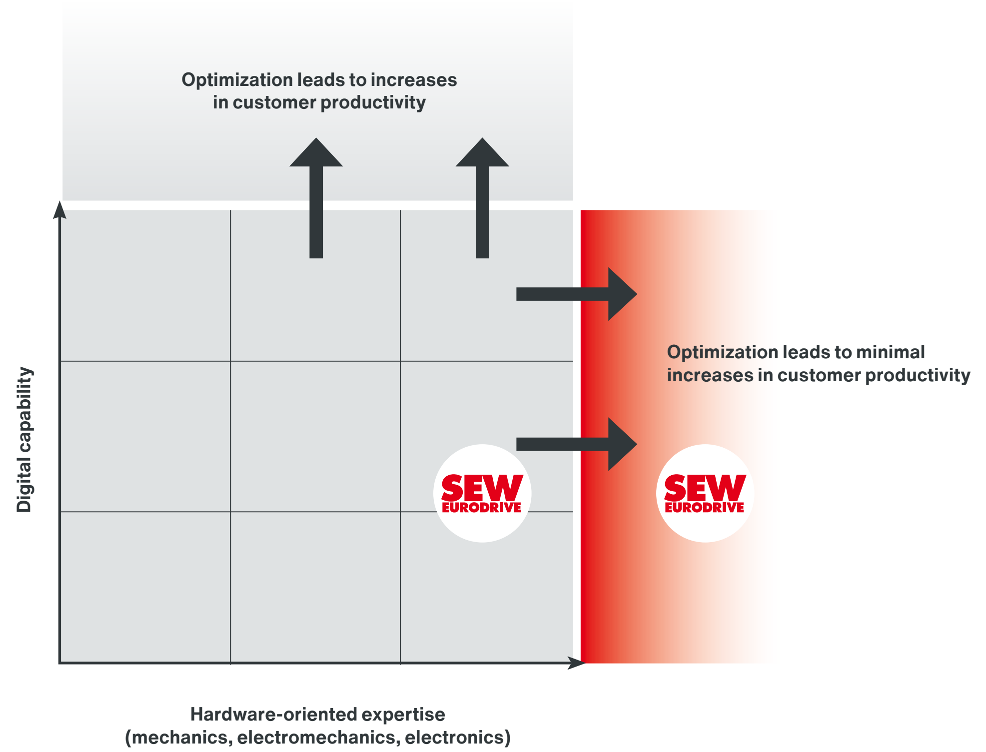




# 1 Introduction

In today's manufacturing landscape, companies face mounting pressure to become more flexible, efficient, and resilient. Traditional, hardware-defined automation systems often struggle to keep up with global supply chain disruptions, rapidly changing customer demands, and the growing push toward sustainability. While mechanical, electromechanical, and electronic innovations have long been the backbone of industrial progress, their ability to deliver significant productivity gains is diminishing.

The illustration below highlights this pivotal challenge. On the right-hand side, a continued emphasis on hardware-oriented competencies yields only marginal improvements in customer value. Many manufacturers find themselves in this zone – where further optimization of physical systems delivers limited returns. In contrast, the left-hand side points toward a more promising direction: the rise of digital competencies as the next growth engine. By embracing software-defined control, data-driven services, and end-to-end connectivity, companies can access a new productivity frontier.



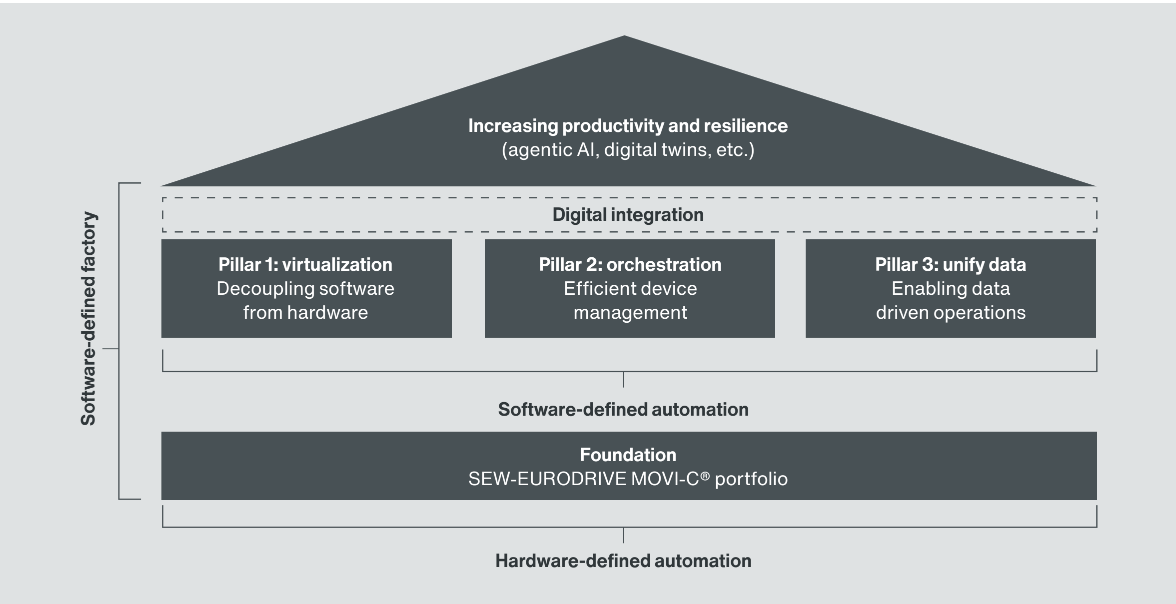

Just as smartphones have replaced countless standalone consumer devices, digitalization in manufacturing drives value, ease of use, and productivity across the entire lifecycle. The image illustrates how competitiveness is no longer defined by hardware alone, but by the digital experience built around it.

Manufacturers can no longer rely solely on hardware-defined systems. To remain competitive, they must increase productivity – not only by reducing capital expenditures (CAPEX), but by focusing on total cost of ownership (TCO) and optimizing operations during usage.

Digital integration delivers these gains: enabling easier operation, faster adaptation, and higher output through software-driven capabilities. That's where the greatest leverage lies today.

At SEW-EURODRIVE, we have experienced these challenges firsthand in our own factories. We realized that to remain competitive and prepared for the future, we need a new kind of factory that could adapt quickly, scale up, and improve continuously without major hardware changes.

This is why we embrace the concept of the software-defined factory. It's a modern approach where powerful software tools manage and control production systems, allowing greater flexibility, real-time insights, and faster improvements.




In this white paper, we share our journey and insights as we work on integrating the key software-defined automation pillars into our own operations. While the transformation is ongoing, we outline the foundational ideas – such as decoupling software from hardware, improving device management, and using data to drive smarter decisions – and explain how these concepts can help other manufacturers increase productivity and build long-term resilience.

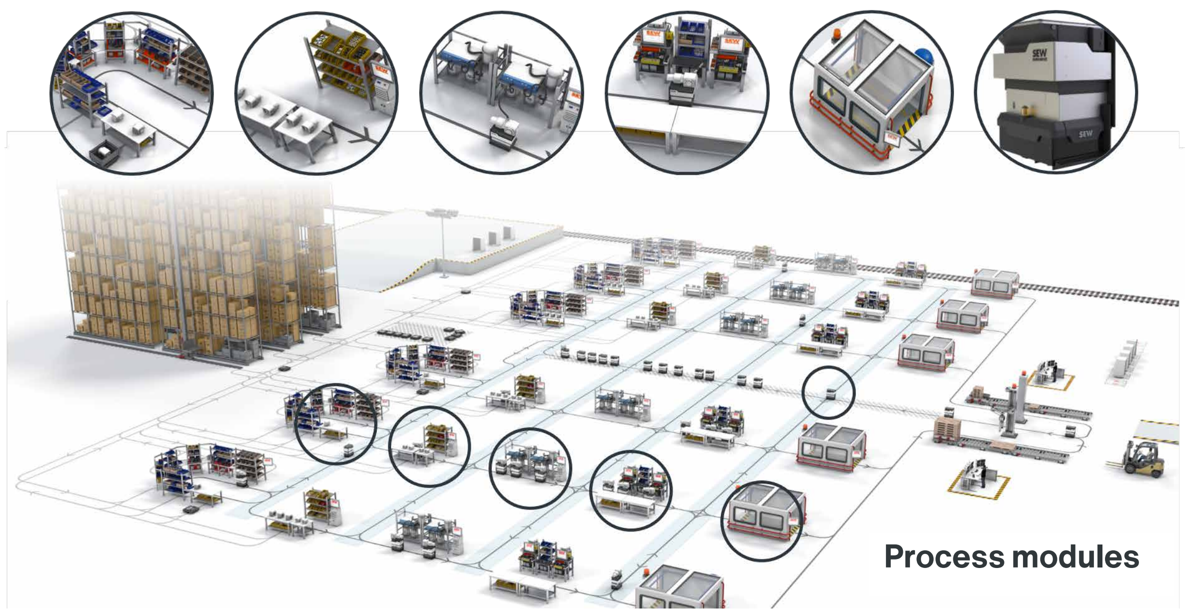


# 2 The drivers behind a more productive and resilient factory

## 2.1 Modular and flexible, but still not fully digital

At SEW-EURODRIVE, we've already made significant progress toward Industry 4.0. Our factory setup is modular and flexible, built around process modules that allow us to assemble, test, and package products in decentralized units. These modules can be rearranged, scaled, or reused based on production needs.

To connect these modules efficiently, we use e.g. automated guided vehicles (AGVs) that transport materials between stations, helping us create a dynamic, reconfigurable shop floor. This flexible hardware structure allows us to respond quickly to changes in production volume, product variants, or customer demand.



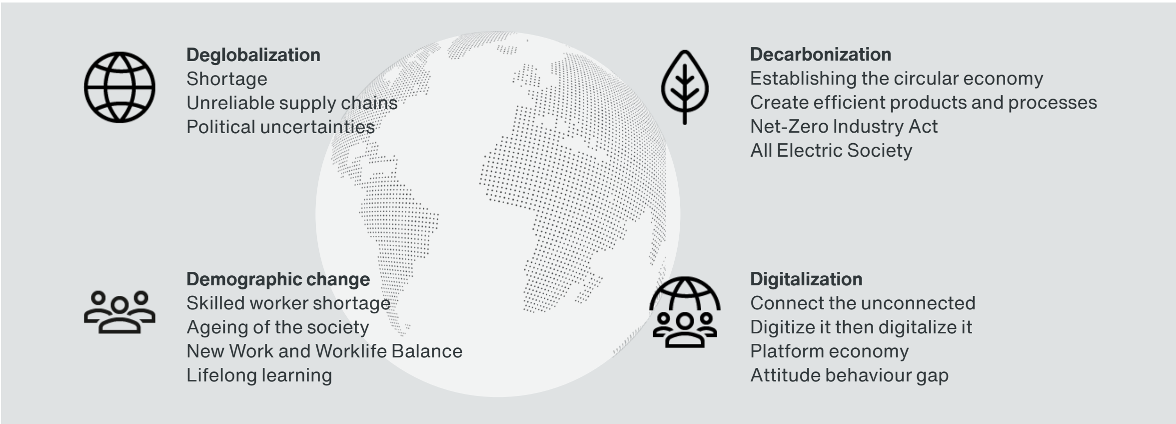

However, while this modular production system is a big step forward, it's still not enough.

There is still a lot of manual effort required for coordination between modules. Data is often trapped in silos, which limits our ability to make real-time decisions. Although our setup is highly flexible in terms of physical layout, it still lacks the digital intelligence necessary to operate as one seamless, adaptive system.

This experience made one thing clear: hardware flexibility alone isn't enough. To unlock true agility, productivity, and resilience, we must embed software-defined intelligence into our factory, creating a system that is not only modular but also self-optimizing, data-driven, and digitally connected from end to end.

## 2.2 The 4D megatrends reshaping manufacturing

While modular, flexible factory setups mark significant progress, they are not enough to prepare manufacturers for the scale of disruption reshaping the industry. The need for transformation is not just a reaction to immediate operational challenges – it is being driven by powerful global forces that are fundamentally altering how and where value is created. These global forces, known as the 4D megatrends, are pushing companies to rethink how they work, how they compete, and how they stay resilient.




**Deglobalization**
Unstable supply chains, shifting political alliances, and increasing geopolitical uncertainty are driving companies to rethink global sourcing strategies. Regional supply networks and localized production are becoming essential to reduce risk and improve reliability. This trend is also relevant in the field of high-tech solutions. For topics like AI, cloud and cybersecurity, we expect different regional approaches to emerge – driven by regulatory environments, trust requirements, and data sovereignty concerns. In the context of digitalization, there is no one-size-fits-all model; companies must adopt differentiated strategies that align with local conditions and technology sensitivities.

**Demographic Change**
The manufacturing workforce is in transition: experienced professionals are retiring, while digital-native talent is entering the job market. Combined with a global shortage of skilled labor, this shift is putting pressure on companies to rethink how work is organized. To stay productive, manufacturers must leverage digital tools and automation – not only to compensate for labor gaps, but to optimize workforce deployment across the entire process chain. At the same time, modern, tech-enabled environments are becoming essential to attract and retain new talent by offering more flexible, engaging, and future-ready workplaces. In this context, artificial intelligence (AI) could become a key enabler. AI could help manufacturers stay productive with fewer staff by preserving expert knowledge before retirement, supporting workers with real-time guidance, improving planning and decision-making, and creating modern workplaces that attract new talent.

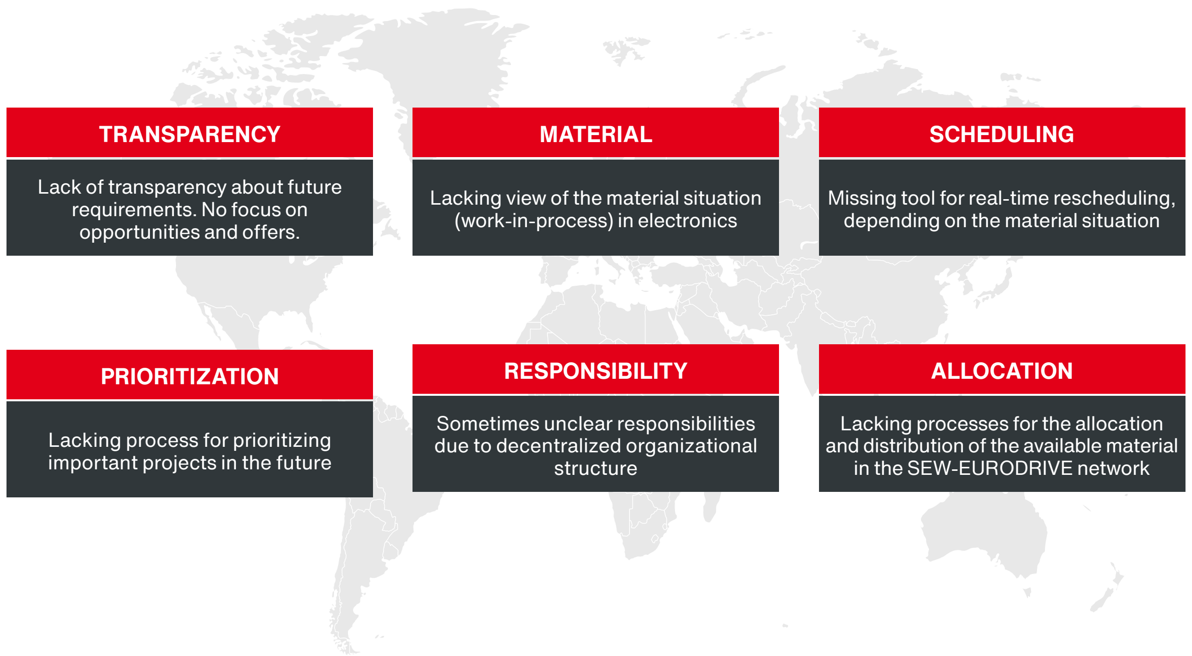
**Decarbonization**
Sustainability is no longer optional. Governments, customers, and investors are all demanding cleaner, more efficient processes. This includes circular economy practices, electrification, and the use of smart energy solutions. Manufacturers must rethink not just what they produce, but how they produce it. If doing right it can become a major differentiator for our economy.
Reference: white paper Sustainability

**Digitalization**
Digitalization enables everything else-from connecting machines and systems to automating workflows and improving decision-making. The goal is not just to add digital tools, but to fully integrate them across the process chain. Companies that fail to embrace digitalization risk falling behind, while those that succeed can unlock speed, scalability, and service-based business models.



## 2.3 Lessons from crisis: why resilience matters

Recent global crises-such as the COVID-19 pandemic, supply chain disruptions, political conflicts, and workforce shortages-have exposed critical weaknesses in manufacturing systems worldwide. At SEW-EURODRIVE, we felt these impacts directly and saw where even advanced modular production systems fell short. These events didn't just challenge how we operate – they revealed the gaps we need to close to become truly resilient.




These combined challenges made it clear: To be ready for the future, we need more than flexible hardware. We need smarter systems that offer real-time visibility, automated coordination, and resilience by design.

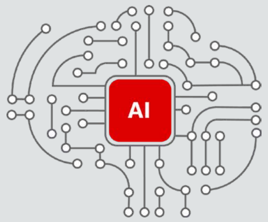
## 2.4 Digital trends we can't ignore

Digitalization is not just a trend – it's the engine behind the transformation of modern manufacturing. It enables smarter processes, faster decision-making, and entirely new ways of working and delivering value. For companies aiming to increase resilience and productivity, embracing digitalization is essential. Several key trends are shaping this transformation:

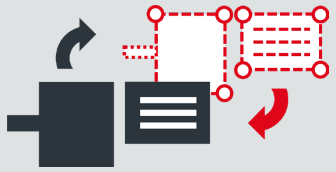
**Openness and Collaboration**
In order to innovate quickly and on a large scale, manufacturers and suppliers must transition from isolated solutions to open, collaborative ecosystems. Partnering with technology leaders – and even competitors, allows for faster access to new markets, tools, and reach. Open platforms eliminate silos and facilitate scaling digital solutions across operations and locations.

**User-centric design**
Creating intuitive and efficient digital solutions relies on prioritizing user experience (UX). Successful digital services go beyond functionality to deliver seamless, enjoyable interactions that encourage user adoption and satisfaction.

**Cloud only**
Cloud technology enables scalable, adaptable services that are essential for fluctuating demand, rapid feature deployment, and global reach. This shift goes beyond adopting new technologies – it's about rethinking infrastructure to ensure that services are robust, scalable, and agile, and aligned with evolving customer needs and technological advances.




**Artificial intelligence**
Generative AI processes inputs like text, images, and video to create new content. Tools such as ChatGPT introduced AI into personal lives, and its evolution continues with specialized AI agents designed for specific tasks. These agents are transforming work by automating processes and generating value, with future advancements as reasoning likely turning them into collaborative partners rather than support tools. In industrial automation, AI could autonomously manage and adapt processes, effectively automating the automation to enhance efficiency and scalability.



**Digital twins**
Physical products are no longer standalone. They come with a digital counterpart that evolves alongside them. Digital twins represent the complete lifecycle of a physical asset. From the digital nameplate to configuration, usage data, and service history, they provide a continuous, evolving model of machines, systems, or entire factories. This enables real-time optimization, simulation, predictive maintenance, and seamless integration across the process chain – before, during, and after deployment.

These challenges and trends highlight a clear need for manufacturing systems to evolve into more connected, adaptable, and intelligent solutions. Enter the software-defined factory, an approach that transforms digital principles into practical solutions on the factory floor.



# 3 Software-defined factory

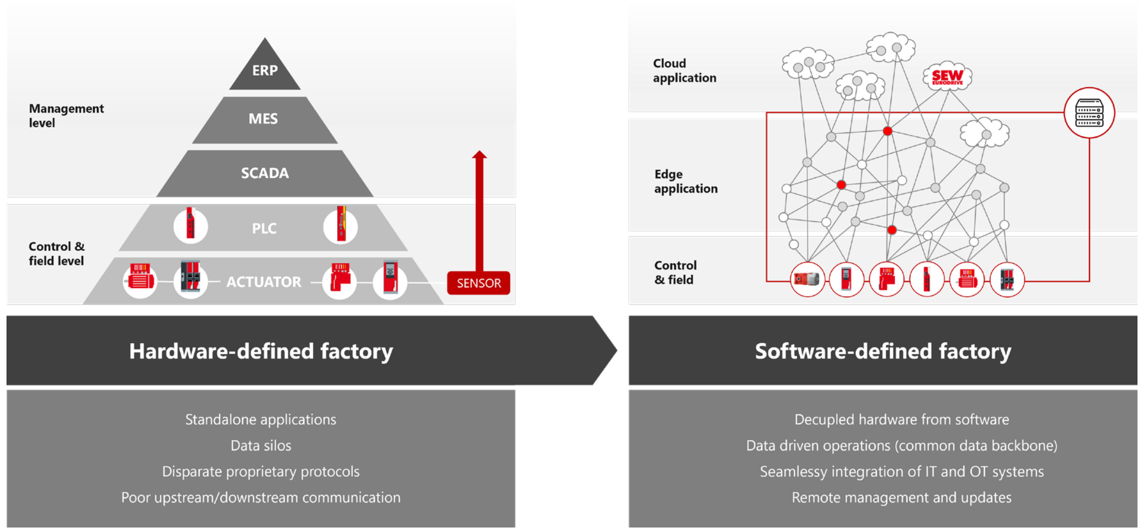
As manufacturing faces increasing pressure to become more flexible, efficient, and resilient, traditional hardware-defined automation systems are reaching their limits. Even highly modular setups, while a step forward, still struggle to respond quickly to change and integrate across the digital value chain. To meet the demands of a dynamic and digitalized world, manufacturers need a fundamentally new approach: the software-defined factory.

## 3.1 What is the software-defined factory?

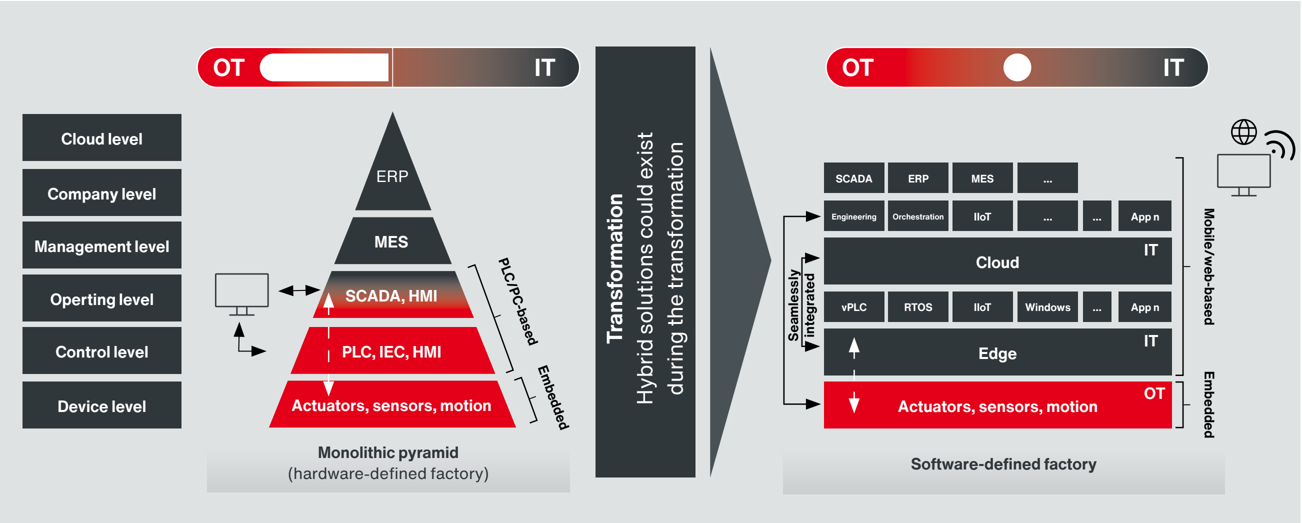
The software-defined factory represents a complete production environment where software takes over many of the roles previously tied to physical hardware. Instead of manually or locally configuring machines and systems, functions such as control, monitoring, planning, and optimization are managed through software-based platforms. In the future, AI agents could take over some of these tasks and execute them autonomously. This shift enables production environments to become more adaptable, scalable, and intelligent.

**Software-defined factory (SDF):**
- Refers to a complete factory environment that is controlled by software.
- The goal is to make production facilities more flexible, scalable, adaptable and more productive and efficient.
- It encompasses all aspects of manufacturing, including machine control, production planning, quality assurance, supply chain management, and IT infrastructure.

At SEW-EURODRIVE, we view this transition as a major evolution – one that reallocates responsibilities between IT (edge and cloud) and OT (actuators, sensors and motion), allowing both domains to operate in harmony while leveraging their unique strengths. The software-defined factory marks a decisive step toward realizing the full extension of Industry 4.0. It's no longer just about precision and speed on the shop floor; it's about building systems that are seamlessly integrated into the broader digital ecosystem. This level of integration was difficult to achieve in the past. Incompatibilities between proprietary protocols, siloed architectures, and the lack of standardized interfaces meant that IT and OT systems often couldn't communicate effectively. They weren't plug-and-play compatible.




This transformation emerges from the combination of software-defined automation with digitalization and the horizontal interconnection of all processes along the customer journey. The traditional hardware-centric approach, despite its reliability, lacks the flexibility and integration needed in today's environment. A software-defined factory replaces rigid, hardware-specific control with software-driven configuration and orchestration, making it easier to adapt, monitor, and improve operations in real time.




The result is a factory that is not only efficient and scalable, but also capable of learning, adapting, and improving continuously. The ultimate goal is to create a system that operates autonomously and optimizes itself without constant manual intervention – a factory that is prepared for whatever the future demands.

## 3.2 Industrial ecosystems within the software-defined factory

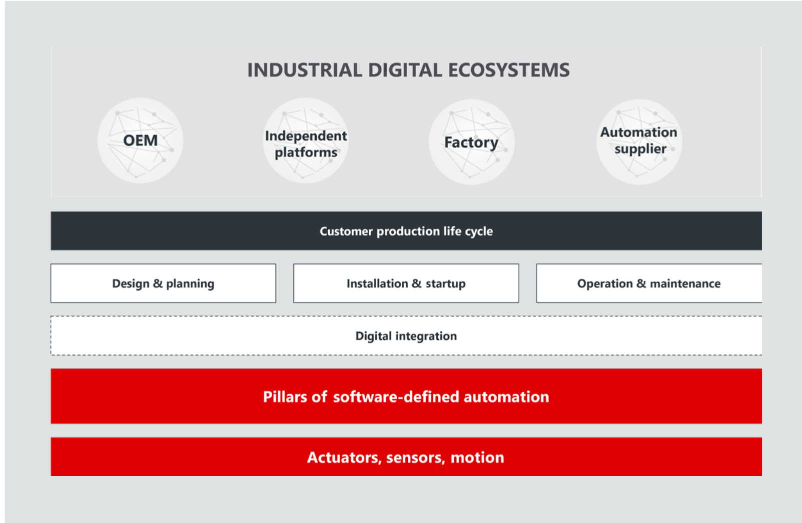
In the digital age, no system operates in isolation – and the same holds true for the software-defined factory. A modern factory is no longer a closed production island; it is part of a digital ecosystem of platforms, services, and connected value chains.

We can draw a useful analogy from the consumer technology world. Consider the ecosystems built by companies like Apple, Google, or Huawei. These ecosystems are not just collections of devices – they are tightly integrated environments where software, services, and hardware all work seamlessly together. Once a user joins such an ecosystem, everything from the smartphone to the cloud services to third-party apps is designed to interconnect, update automatically, and provide a unified experience. This doesn't mean that others cannot participate in the ecosystem – interoperability is key – but the best performance is achieved when all components are fully integrated.

This same principle should now apply to industrial automation. In the context of the software-defined factory, digital ecosystems are networks of partners, platforms, and services that work together to deliver not just products, but smart, integrated solutions. The value of a product now depends on how well it connects to this broader system – how easily it shares data, receives updates, and integrates into a coordinated, software-defined workflow. These industrial ecosystems can take different forms. Some are driven by end customers, where manufacturers develop their own digital backbone and require that all equipment and systems seamlessly integrate into it. Others are defined by machine builders, who deliver complete solutions that include the machine itself, the control system, a digital twin, and integrated service interfaces. A third approach relies on independent platforms that act as neutral hubs for integration, orchestration, and collaboration among various suppliers, service providers, and users.

A fourth form of ecosystem is increasingly emerging: one led by automation suppliers themselves. These suppliers are evolving beyond their traditional hardware roles to become full-fledged software and integration partners. These companies now go beyond hardware, offering containerized software, edge orchestration, and cloud-ready services. They position themselves as digital enablers that bridge the shop floor and the cloud, and play a strategic role in production IT.






Regardless of how they are created, all successful digital ecosystems should share the same foundational qualities: openness, interoperability, and strong cybersecurity. In a software-defined environment, proprietary silos are unsustainable. Instead, these ecosystems thrive when systems communicate via standardized interfaces, APIs, and plug-and-play connections between hardware and software.

Within the software-defined factory, digital ecosystems fulfill multiple roles. They serve as collaborative spaces where innovation can happen continuously. They enable seamless data exchange across companies and partners, allowing for more coordinated operations. And they provide the foundation for lifecycle services such as predictive maintenance, over-the-air software updates, and real-time performance optimization.

Just like in consumer technology, the user experience is also a critical factor. Whether it's an operator on the shop floor, a technician servicing equipment, or an engineer optimizing a system, intuitive interfaces, helpful recommendations, and seamless interactions across factory and cloud environments significantly increase the value and usability of the entire system.

## 3.3 Integration into ecosystems: enabling digital interoperability

For a factory to fully realize the benefits of the software-defined factory, it must be able to connect to and participate in relevant digital ecosystems. Integration is no longer optional – it is a strategic necessity. But integration doesn't mean simply plugging into a cloud. It requires a clear architectural vision, standardized interfaces, and secure data exchange protocols.

Some factories build their own ecosystems from the ground up. Others integrate into well-established industry platforms. Both approaches must follow core principles: flexibility, security, and scalability. There is no single approach that fits all scenarios – true digital integration requires the ability to connect with multiple systems, environments, and partners simultaneously.

This ability to integrate broadly, rather than being limited to a single ecosystem, has become a key differentiator. Manufacturers who can flexibly participate in several digital networks are better positioned to scale, innovate, and serve diverse customer needs. The goal is not just to connect, but to connect better, deeper, and more openly than others.

The real enablers of integration are the software-defined automation pillars, which we'll explore next. These pillars act as interfaces to the ecosystem – allowing hardware to become software-configurable, devices to be centrally orchestrated, and operational data to be turned into valuable insights. Without them, integration remains fragmented or fragile.

In the next chapter, we'll explain how these pillars create the foundation for interoperability, agility, and intelligence within the software-defined factory.

# 4 Software-defined automation

The software-defined factory is only possible with a new approach to automation. One that moves beyond rigid hardware systems and embraces flexibility, intelligence, and real-time adaptability. This approach is known as software-defined automation, and it forms the operational backbone of a future proof production environment.

Software-defined automation provides the essential capabilities needed for modern factories to become dynamic, responsive, and seamlessly connected. It simplifies system architecture, boosts productivity, and enables faster, more informed decision-making across production processes.
At SEW-EURODRIVE, we view this not as a disruption, but as a natural evolution-building on existing strengths while preparing for the future.

**Software-defined automation (SDA):**

- Focuses specifically on the automation level within the factory.
- The goal is to decoulpe control systems (e.g., PLC, DCS) from proprietary hardware and provide them as software solutions.
- It allows flexible adjustments of control logic and processes without the need for physical changes to the hardware.
- Makes people more efficient because it reduces the complexity dramatically.

This transformation is based on three central pillars that enable flexibility, scalability, and intelligence in digital manufacturing. The first pillar, virtualization, separates software from hardware to increase flexibility and simplify updates.
The second, orchestration, streamlines device management through centralized configuration and control. The third, unified data, connects machines and systems to generate actionable insights and enable data-driven decisions.

Digital integration

| Pillar 1: virtualization | Pillar 2: orchestration | Pillar 3: unify data |
|---|---|---|
| Decoupling software from hardware | Efficient device management | Enabling data driven operations |

Software-defined automation

Together, these pillars reduce complexity, lower integration costs, and enable seamless digital interaction – not only within the factory but across the wider manufacturing network. They prepare the environment to become self-configuring, self-monitoring, and self-optimizing – core traits of a fully software-defined factory.

Crucially, all three pillars must be built on a foundation of security by design. In an increasingly connected industrial world, cybersecurity is not optional – it is a core design principle. As manufacturing systems become more distributed, cloudenabled, and data-driven, they also face greater exposure to cyber threats that can impact safety, uptime, and intellectual property.

Security by design means integrating protection into every layer of the system, from edge devices and control software to orchestration platforms and cloud interfaces. This includes secure boot mechanisms, encrypted communication, strong authentication, role-based access control, and update processes that preserve system integrity over time.
In the context of software-defined automation – where systems are remotely managed, software is updated over the air, and data flows across multiple environments – a robust security architecture is essential to ensure trust, compliance, and operational continuity. Future-proofing industrial environments requires resilience against evolving threats, with built-in detection and response capabilities aligned with standards like IEC 62443 and ISO/IEC 27001.

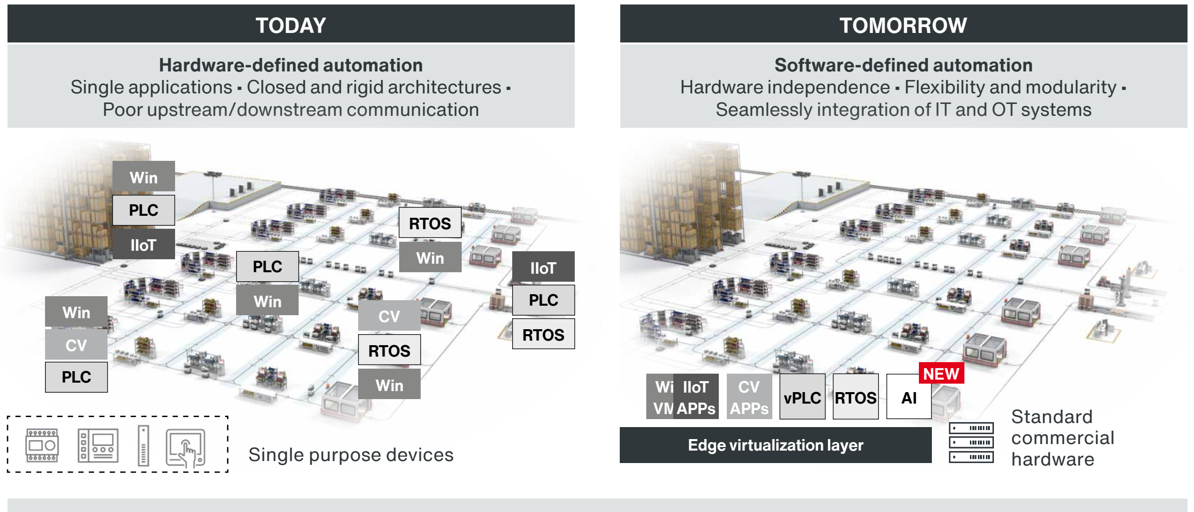
Ultimately, digital transformation and cybersecurity must go hand in hand. Without a secure foundation, the core benefits of software-defined architectures – agility, scalability, and openness – cannot be fully realized.

In the following sections, we explore each of these pillars in more detail – beginning with virtualization and the shift toward software-defined control in a de-globalized world, where local responsiveness and adaptability are critical.



## 4.1 Pillar 1: virtualization – decoupling software from hardware

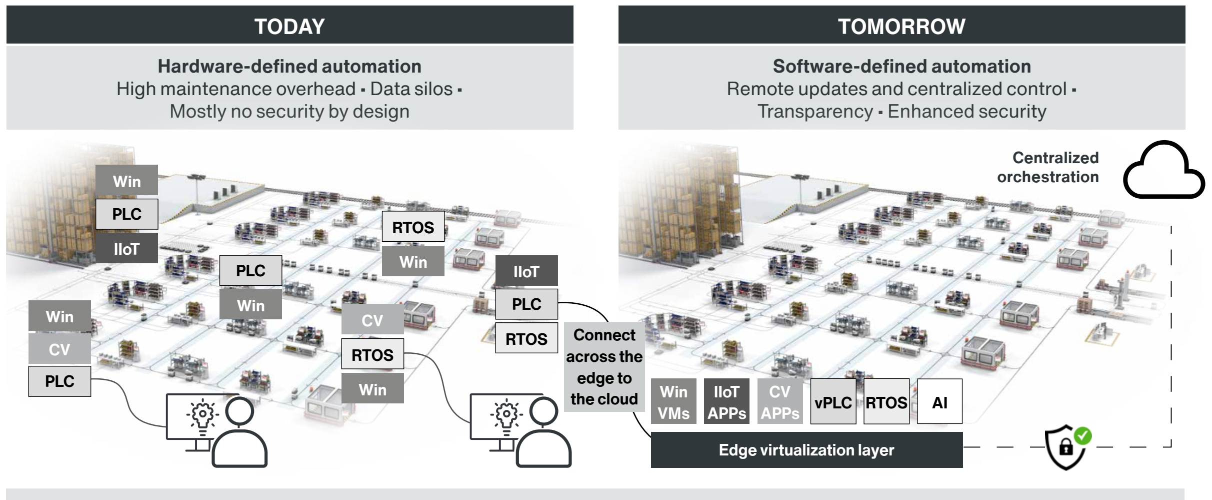
Virtualization (e.g. solved by containerization) of operational technology (OT) software allows applications and their dependencies to run in isolated, portable environments. This approach removes the need for dedicated, proprietary hardware by enabling software to run on a broad variety of standard commercial devices, similar to those used in IT data centres. As a result, factories gain the ability to scale: They can introduce new functions or meet new demands without changing the physical device. This software-defined flexibility makes integration into different ecosystems easier, quicker updates, better security, lower energy use, and seamless integration of IT and OT systems – all while keeping the same hardware infrastructure in place.




## 4.2 Pillar 2: orchestration – efficient device management

Efficient device management is essential for any modern, software-defined factory environment. In traditional automation systems, deploying and maintaining devices requires significant manual effort, custom configurations, and frequent on-site updates. This creates complexity, increases costs, and slows down responsiveness. In contrast, the software-defined factory introduces a new model of centralized orchestration, where device provisioning, configuration, and lifecycle management are handled through a unified platform.

At the heart of this approach is automation. Devices are delivered with default settings and, once securely connected to a central orchestration portal, can automatically retrieve customer-specific parameters, update themselves, and integrate seamlessly into the system-without manual intervention. This results in greater consistency, faster deployment, and much easier scalability across multiple sites.



The same principles apply not only to individual components but also to entire factory infrastructure, from edge computing platforms to distributed applications. By using concepts like infrastructur as a code – borrowed from IT manufacturers can manage automation assets like modern software systems. This includes automatically rolling out updates, pushing configuration changes, and ensuring system-wide security compliance from a central interface.

Ultimately, efficient device management improves system reliability, reduces downtime, and strengthens cybersecurity. More importantly, it enables manufacturers to shift from static, manually maintained operations to a dynamic, resilient automation ecosystem that can grow and adapt alongside changing business and production needs.

## 4.3 Pillar 3: unified data – enabling data-driven operations

In software-defined automation, data is no longer a by-product – it is a strategic asset that fuels productivity, resilience, and innovation. The third pillar, unified data, marks the transition point where automation becomes truly intelligent and connected – laying the foundation for the software-defined factory.

By harnessing the full potential of operational data, manufacturers can shift from isolated systems to fully integrated, data-driven environments that enable performance, agility, and new business models across the entire lifecycle.

Traditionally, much of the data generated by machines, sensors, and systems remained siloed or underutilized. By contrast, data-driven operations aim to break down these barriers through seamless connectivity and standardized data structures. This starts with establishing vertical integration, where data from field devices, legacy systems, and modern automation components is collected in a unified, scalable architecture.

A key enabler of this is the Asset Administration Shell (AAS) – a standardized digital representation of physical and virtual assets. The AAS helps structure and contextualize raw data, turning it into machine-readable information that can be accessed, analyzed, and shared across the ecosystem. This creates a single source of truth for each asset, allowing systems and services to interact more intelligently and efficiently.

Once this foundation is in place, data can be used to fuel advanced digital services such as predictive maintenance, AI-powered optimization, energy monitoring, and even recycling strategies. This enables manufacturers to gain deeper visibility into their processes, respond faster to deviations, and continuously improve based on real-time insights.

By integrating data-driven capabilities into the very fabric of automation, factories move from reactive to proactive operations. They become capable of anticipating problems, optimizing processes, and supporting entirely new business models – such as outcome-based services or pay-per-use production.

Ultimately, this pillar ensures that data is not just collected, but converted into value-driving smarter decisions, better services, and more resilient operations.

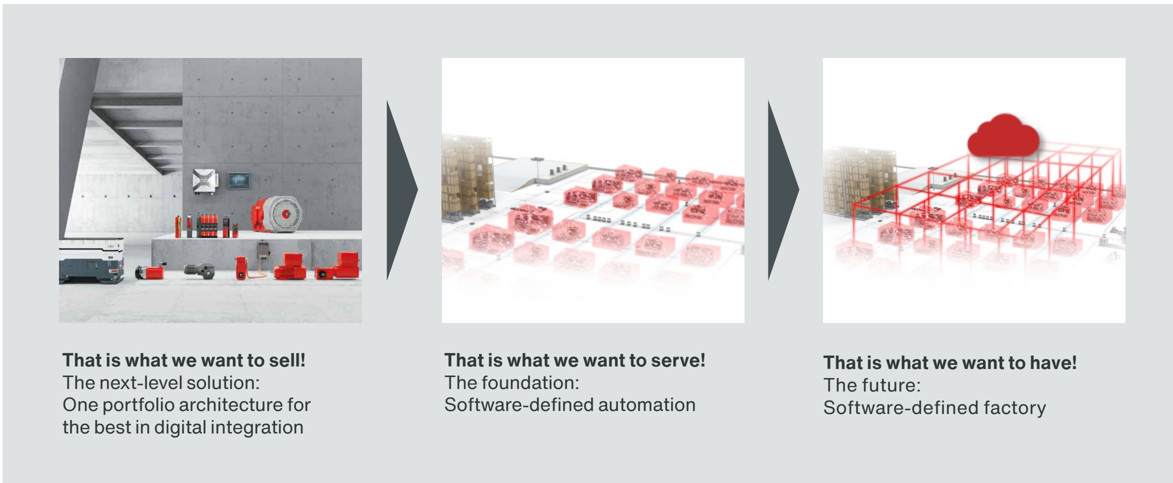


# 5 Positioned for the transition ahead

## 5.1 Foundation for the software-defined factory

SEW-EURODRIVE has always stood for reliable motion and drive solutions, built on a strong foundation of engineering expertise, modular technology, and long – term customer partnerships. From gear units and motors to complete mechatronic systems like our MOVI-C® modular automation system, we have continuously evolved to meet the needs of modern industry. This portfolio has already enabled modularity, flexibility, and high-performance automation in hardware-defined environments.


However, as the future of manufacturing shifts toward software-defined systems, we are ready to move with it. Our existing portfolio is not only compatible with this shift – it actively supports it. With container-ready software, orchestratable devices, and built-in support for data connectivity, our automation solutions aims to enable virtualization, centralized orchestration, and seamless integration into digital ecosystems.




We see this not as a reset, but as a continuation of our innovation journey – a natural step that connects our mechanical and motion expertise with the full potential of software-defined automation approach.

## 5.2 With digitalization to servitization

While the technical foundation is in place, a broader transformation is unfolding – one that goes beyond engineering. As automation systems become more connected and intelligent, new business models are starting to emerge.

Manufacturers are exploring ways to move from selling hardware once to delivering ongoing value as a service. This may take the form of subscription-based solutions, performance-based contracts, or pay-per-use production models. Customers are increasingly expecting outcomes – not just machines.

This shift, known as servitization, brings major opportunities – but also new challenges. It demands deeper integration between machines and cloud platforms, flexible commercial models, and continuous customer engagement. It also means collaborating more openly with partners, customers, and even competitors to co-create value.

# 6 Conclusion

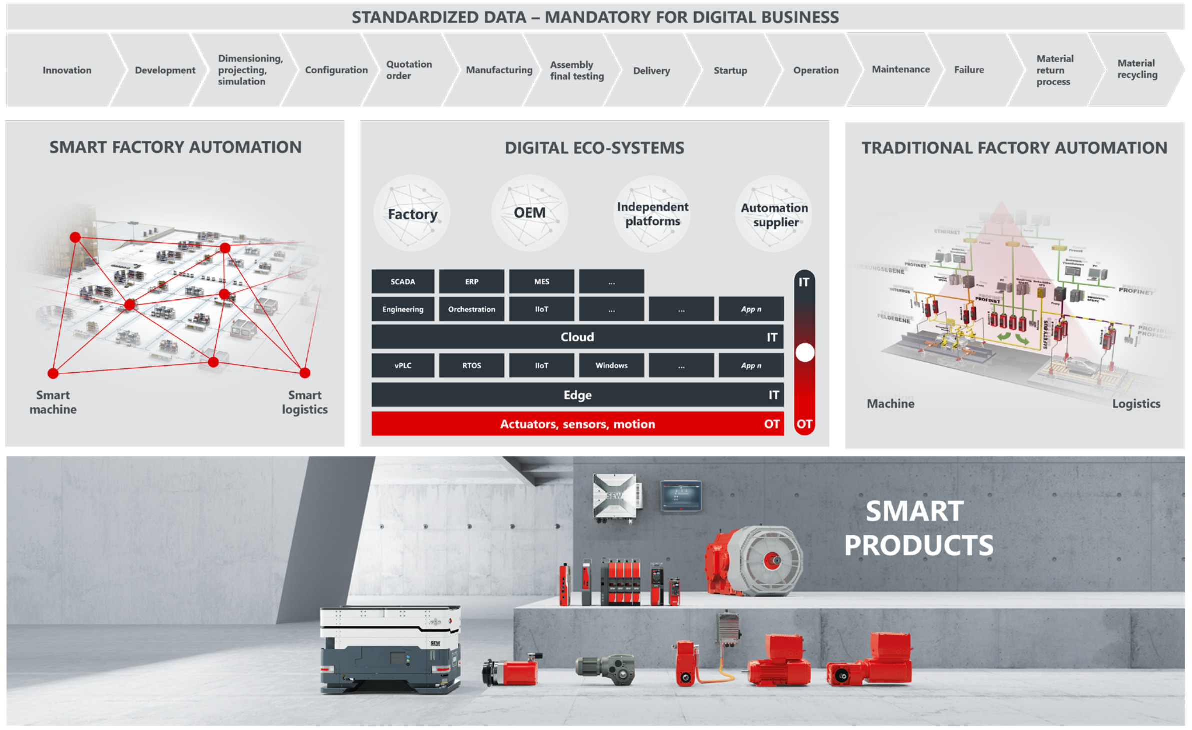
At SEW-EURODRIVE, motion and drive technology remain our core – and automation is our mission. In a rapidly evolving industrial landscape, we are committed to making these strengths not only more resilient, but also future-ready. As the world transitions into a software-defined era, we will continue to focus on what we do best: delivering robust, reliable technology while embracing new digital capabilities that make our systems easier to deploy, operate, and scale.

**DRIVE TECHNOLOGY REMAINS THE CORE OF OUR BUSINESS, WE ONLY HAVE TO REINTERPRET IT DIGITALLY.**

**DEFINE ONE ARCHITECTURE AND MAKE YOUR PRODUCT PORTFOLIO BEST DIGITAL INTEGRABLE.**



As digital architectures evolve, we are preparing to support both extremes: software-defined factory, cloud-connected environments and traditional automation pyramids within hardware-defined factory. Our unified portfolio enables customers to move freely between these worlds with full flexibility and interoperability. We know that our customers already face enough complexity – our role is to simplify. That means building systems that integrate seamlessly, operate reliably, and deliver maximum value with minimal setup.




We are not seeking to build our own digital ecosystem. Instead, we are committed to integrating seamlessly into existing ones by providing standardized digital interfaces and interoperable solutions that are ready for use by customers and partners, and that address the full spectrum of customer needs. This interface should span the entire product lifecycle should also serve different customer profiles and needs. Whether embedded in a machine builder's solution, connected to an end-customer's platform, or managed via an independent orchestration layer, our portfolio is designed to fit. We meet our customers where they are – today and tomorrow.

The future of industrial automation will be increasingly software-defined. But it still depends reliable hardware core, on trust, engineering excellence, and deep understanding of the customer's reality. We bring all of this together with a growing capability to deliver and support automation that configures itself, adapts to change, and continuously improves.

We are ready for what comes next, and we invite our partners and customers to move forward with us.

# 7 Glossary

| Term | Definition |
|---|---|
| **Agile development** | A software development approach that emphasizes iterative progress, collaboration, and the flexibility to adapt to change. |
| **Artificial intelligence (AI)** | The simulation of human intelligence in machines, enabling them to learn, reason, and make autonomous decisions. |
| **Application Programming Interface (API)** | A defined set of rules and functions that allow software applications to communicate and exchange data or services. |
| **Asset Administration Shell (AAS)** | A digital representation of a physical or virtual asset that standardizes data exchange, enabling interoperability and supporting the concept of digital twins. |
| **Automation pyramid** | A traditional model used in industrial automation that represents hierarchical layers of control systems, from field devices at the bottom to enterprise-level systems at the top. Each layer manages specific functions and communicates with adjacent layers. |
| **Cloud computing** | The delivery of computing resources (such as storage, applications, and processing power) over the internet, replacing on-site infrastructure. |
| **Cloud-native** | An approach to software design that leverages cloud computing infrastructure and capabilities from the outset to ensure scalability, flexibility, and resilience. |
| **CI/CD (Continuous integration / continuous deployment)** | A software development method that automates testing, integration, and deployment processes to enable rapid and reliable updates. |
| **Cybersecurity** | Measures and practices designed to protect digital systems, data, and users from unauthorized access, attacks, or damage. |
| **Containerization** | A lightweight form of virtualization that packages applications and their dependencies into isolated units (containers), making them portable and consistent across environments. |
| **Data-driven services** | Digital services that use real-time or historical data analytics to optimize operations, improve efficiency, and support intelligent decision-making. |
| **DevSecOps** | A methodology that integrates security practices into all stages of the software development and operations lifecycle. |
| **Digital ecosystem** | A network of interconnected digital systems, platforms, partners, and services that work together to enable value creation and innovation. |
| **Digital integration** | The process of connecting hardware, software, and data systems to improve collaboration, automation, and overall operational performance. |
| **Digital interface** | A defined point of interaction between digital systems that enables data exchange and control across different software or hardware components. |
| **Digital lifecycle** | The continuous process through which industrial assets are designed, deployed, operated, maintained, and optimized using digital technologies, from initial planning to end-of-life. |
| **Digital twin** | A digital model that mirrors a real-world object or system, continuously updated with real-time data wieviel sind to enable simulation, monitoring, and optimization. |



| Term | Definition |
|---|---|
| **Edge computing** | A decentralized computing model in which data is processed closer to the source (e.g. a machine or device) rather than relying solely on centralized cloud systems. |
| **Edge device** | A hardware component located at the edge of the network that collects, processes, and transmits data. These devices are often used in Industrial IoT applications. |
| **Hybrid cloud** | A computing architecture that combines public and private cloud systems, allowing data and applications to move seamlessly between them. |
| **Industrial Internet of Things (IIoT)** | A network of connected industrial devices that communicate and share data with each other and with central systems to optimize manufacturing and logistics processes. |
| **Infrastructure as code (IaC)** | The practice of managing and provisioning infrastructure using machine-readable definition files, enabling automation and scalability in system deployment. |
| **Machine learning (ML)** | A subset of AI where algorithms learn from data to make predictions or decisions without being explicitly programmed for every scenario. |
| **Motion control** | The use of devices such as drives, motors, and controllers to manage the movement of machinery in industrial automation systems. |
| **Orchestration** | The automated coordination and management of systems, devices, and software components to streamline operations and increase efficiency. |
| **Orchestratable devices** | Hardware components designed to be centrally managed and configured through orchestration platforms, enabling automation at scale. |
| **Predictive maintenance** | The use of analytics and machine learning to forecast equipment failures, allowing for timely interventions that reduce downtime and maintenance costs. |
| **Reference architecture** | A standardized, reusable blueprint that defines best practices and system components for implementing digital solutions |
| **Self-optimizing system** | A system capable of automatically adjusting its parameters and operations based on data and feedback to improve performance without manual intervention. |
| **Security by design** | An approach to system and software development that incorporates security from the earliest design stages, ensuring robustness and compliance. |
| **Servitization** | The transformation from selling products to offering value-added services, often through digital platforms and recurring revenue models. |
| **Software-defined automation** | The concept of using software to control, manage, and adapt industrial automation systems, decoupling functionality from specific hardware. |
| **Software-defined factory** | A factory environment where software, rather than hardware, defines and manages production processes – enabling greater agility, scalability, and intelligence. |
| **User Experience (UX)** | The overall experience a person has when interacting with a system, application, or product, including usability, accessibility, and satisfaction. |
| **Virtualization platform** | A software layer that allows multiple virtual systems or applications to run independently on shared physical infrastructure, enabling flexibility and resource efficiency. |

**SEW-EURODRIVE GmbH & Co KG**
Ernst-Blickle-Str. 42
76646 Bruchsal/Germany
T +49 7251 75-0
F +49 7251 75-1970
sew@sew-eurodrive.com
www.sew-eurodrive.com