

CASE STUDY

Schaeffler Stress-Tests Its Automation **Before Deployment**

How simulation-first development became the blueprint for software-defined manufacturing at scale.

Customer:

Schaeffler Technologies AG
& Co. KG

Partners:

MHP (integration and methodology),
NVIDIA Omniverse (simulation
environment)
Wandelbots NOVA (hardware-agnostic
automation platform)

Focus:

Software-defined manufacturing enabled
by simulation-first automation

Management Summary



At several thousand robotic systems across a global production network, Schaeffler's **sequential automation model had become a constraint on speed and innovation**: physical prototypes required for feasibility checks, automation logic locked to specific hardware, and commissioning delays of weeks to months structurally embedded in certain projects. **Schaeffler redesigned the development sequence**. Working with MHP, Wandelbots, and NVIDIA Omniverse, process feasibility, collision risk, quality inspection and process stability are now **validated in a shared**

development environment before any physical deployment decision is made. The initial use case delivered approximately

two weeks' reduction in development cycle time,

eliminated late-stage rework, and produced reusable,

hardware-independent automation logic

applicable across plants and robot vendors. The objective was not a single optimised cell. It was a **repeatable development standard for software-defined manufacturing at global scale**.



About Schaeffler

The **Schaeffler Group** has been driving forward groundbreaking inventions and developments in the field of **motion technology** for 80 years. With innovative technologies, products, and services for electric mobility, CO₂-efficient drives, chassis solutions, and renewable energies, the company is a **reliable partner for making motion more efficient, intelligent, and sustainable** – over the entire life cycle. Schaeffler describes its comprehensive range of products and services by means of eight product families: from bearing solutions and all types of linear guidance systems through to repair and monitoring services. With around 110,000 employees and more than 250 locations in 55 countries, **Schaeffler is one of the world's largest family-owned companies and ranks among Germany's most innovative companies.**



In April 2026, Schaeffler received the German Innovation Award in the Large Companies category for its Industrial Metaverse: a digital ecosystem bridging the physical shop floor with a virtual simulation environment.



Schaeffler has set out the vision to have 50 percent
of their plants in the industrial metaverse by 2030.

Every Design Was a Bet

Schaeffler operates several thousand robotic systems in production. As product complexity increases, identifying and implementing new automation becomes more technically demanding and time-intensive. Under a sequential development model – hardware specified first, software written around it, validation at the end – that compounding complexity translated directly into a constraint on execution speed. There was a fundamental gap between the adaptability the business required and the speed at which automation could actually be delivered.

The limitations of the model were structural. Sequential hardware and software development meant issues only became visible at commissioning. Physical prototypes were required before feasibility could be confirmed – expensive and inefficient at scale. Automation logic, tightly coupled to specific hardware, could not transfer to

the next cell or application. Additional efforts during commissioning caused delays of weeks.

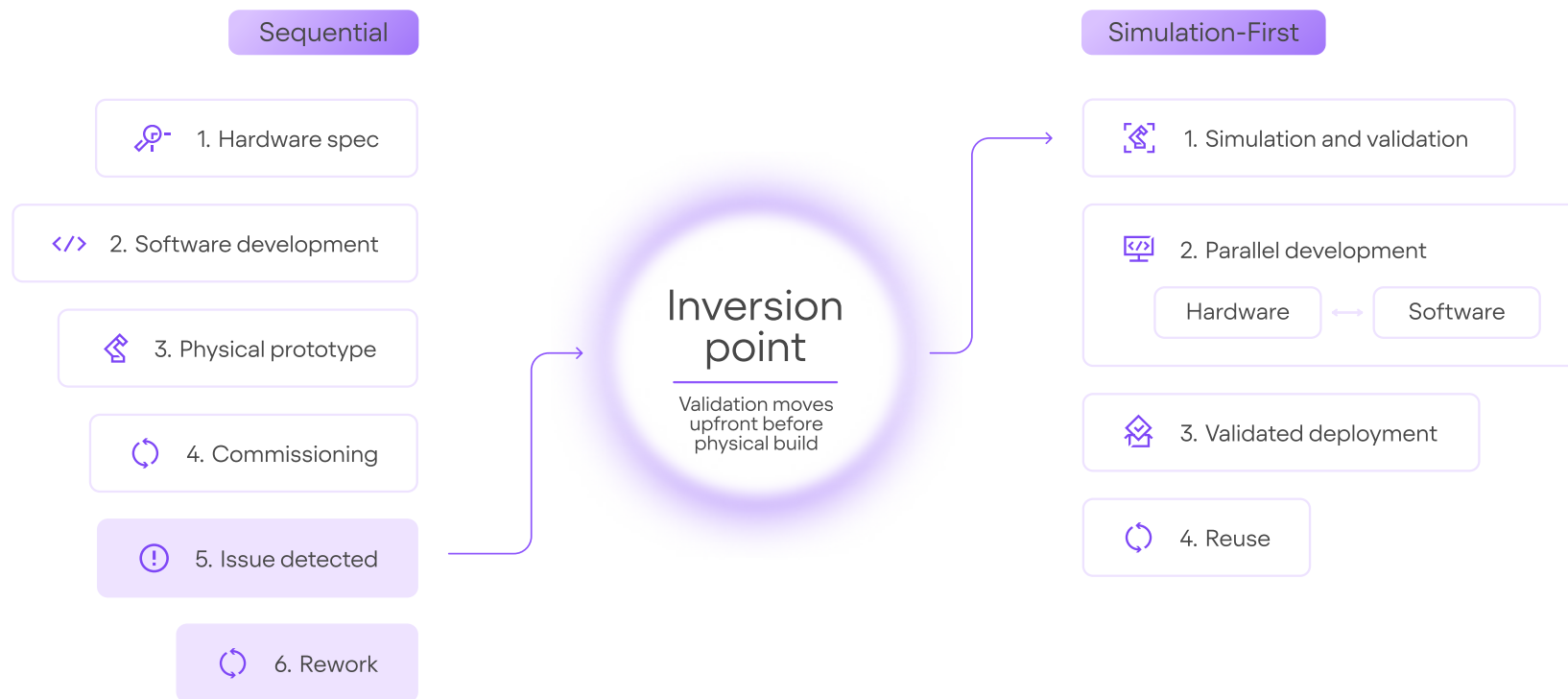
The problem sharpened in complex applications. In inverter production, where component geometries are highly intricate, process behavior could not be predicted without extensive physical testing. There was no shortcut inside the existing model.

Schaeffler's assessment was clear. The existing development model had become the bottleneck, preventing automation from keeping pace with growing complexity.

Rather than refining individual projects, the company
set out to establish a development approach designed
for speed and scalability.



Traditional vs. Simulation-First Process



Inverting the Sequence

Schaeffler's objective was to **establish a simulation-first automation development model**: one that reduces development time and risk, minimises dependency on physical prototypes, enables earlier validation of process feasibility, increases process stability, and **accelerates time to target OEE**. The objective was not a single optimised cell, but a **repeatable development approach scalable across the global production network**.

The initiative brought together three partners with clear, distinct roles. Schaeffler acted as use-case

owner and industrial driver. MHP – with prior experience in both simulation environments and the Wandelbots platform – served as integration partner and methodological lead, combining industrial process understanding, simulation methodology, and implementation expertise. Wandelbots was the core enabler for hardware-independent automation, providing unified interfaces between simulation and real-world execution. NVIDIA Omniverse was selected as the simulation environment for its performance, openness, and flexibility in modelling and validating complex processes. Partner selection was based on prior

evaluations and existing collaborations, with strong alignment to Schaeffler's strategic direction.

Together, this created a shared development environment where robot behavior, process logic, and system interactions could be developed, tested, and adapted before any physical deployment.

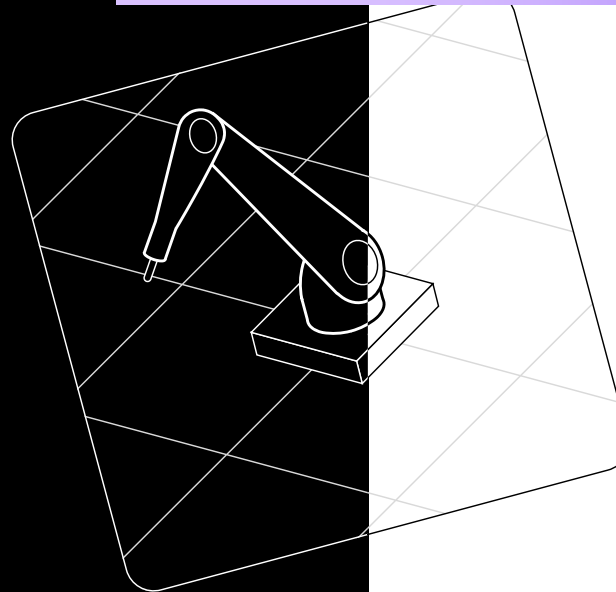


The first application was a **digital twin** of a robotic packaging cell. Robot movements, layout configurations, reachability and feasibility as well as cycle times were validated before any physical component was installed. Complex process behavior – including coolant drainage dynamics – was modelled in the digital environment. Camera placement and lighting conditions for quality inspection were configured and tested virtually.

Mechanical and packaging constraints were identified early. Packaging tolerances that would have caused collisions and contamination during commissioning were identified and resolved in simulation – eliminating a rework cycle that would previously have cost weeks. When layout parameters changed, the automation logic adapted automatically, without manual reprogramming.



This was not the digital twin of a decade ago...



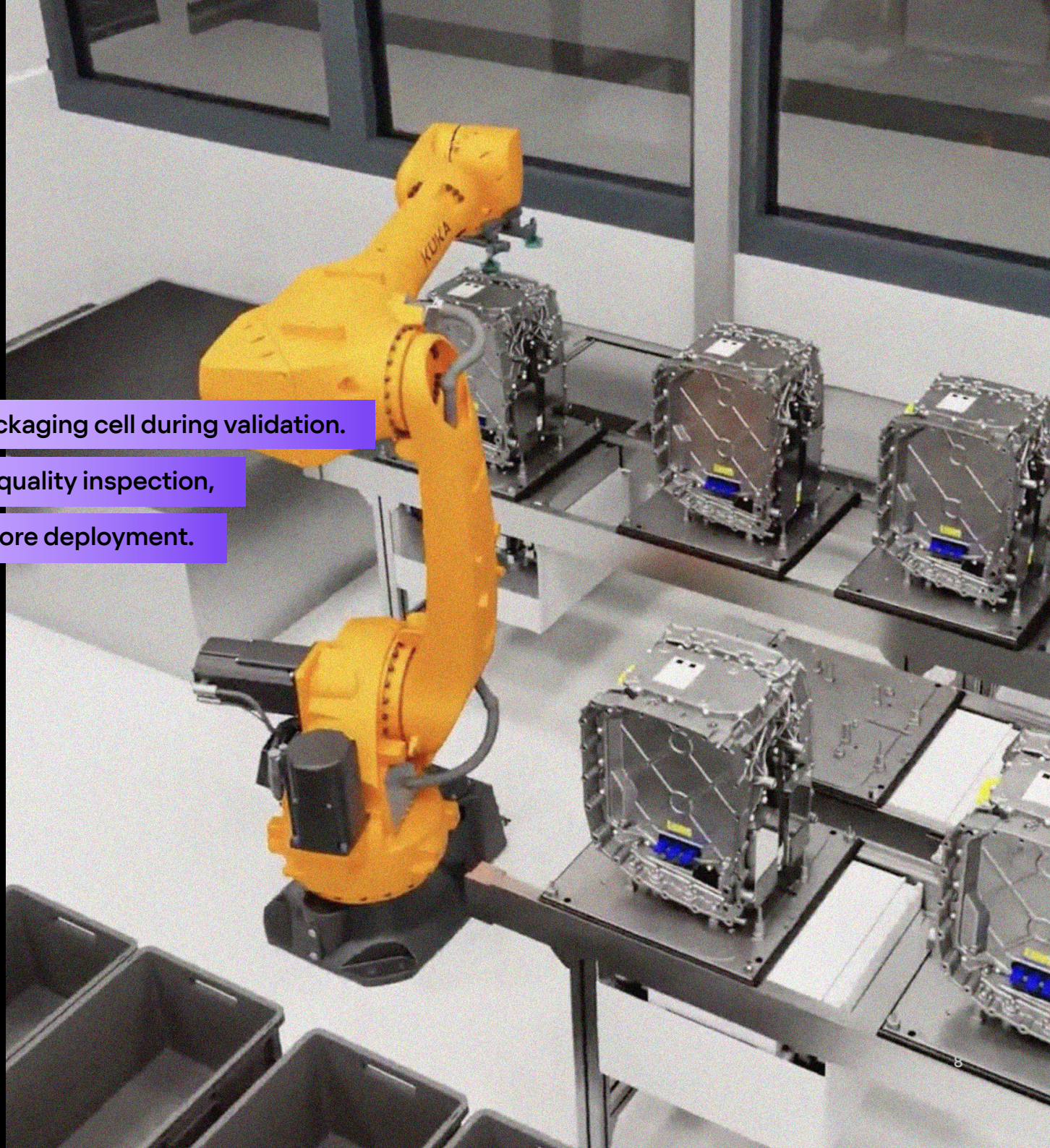
...a static 3D layout used for visualisation and offline checks. Built in NVIDIA Omniverse, the environment reproduced the cell's physics: contact, material behavior, sensor perspective, timing. More importantly, NOVA drove the virtual cell through the same control layer that would later drive the physical one. The robot was not modelled in software and then re-programmed for the floor; the logic validated in simulation was the logic deployed. That equivalence is what turns "tested in simulation" from an approximation into a prediction – and what collapses the sim-to-real gap that normally forces weeks of on-site tuning.

Digital twin of Schaeffler's automated packaging cell during validation.

See how robot layouts process behavior, quality inspection,
and packaging constraints are tested before deployment.

Watch the [full video here](#).

Credit: Schaeffler Technologies AG & Co. KG



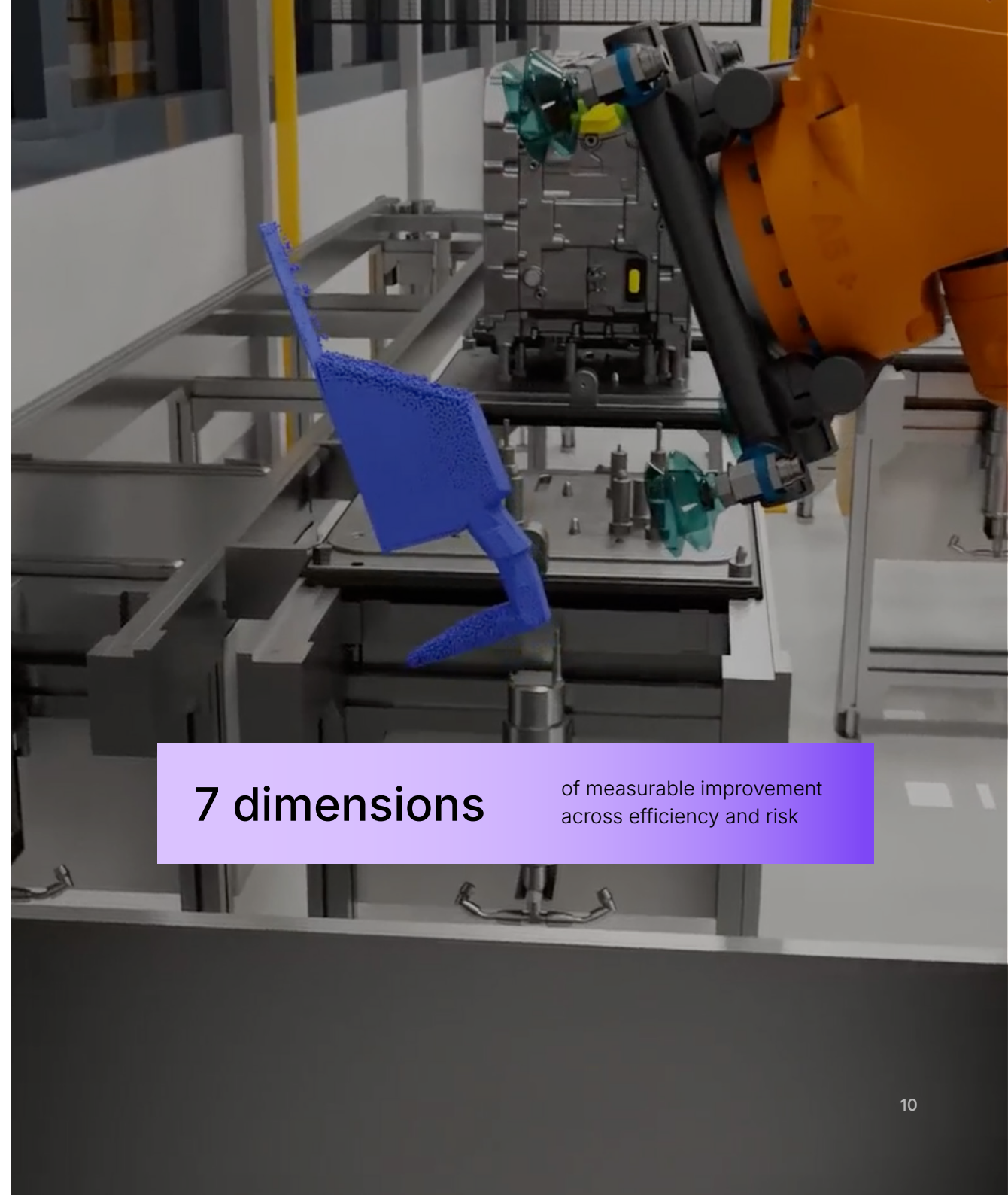
What Changes When Validation Moves Upstream

Speed is one outcome of the shift, but not its defining characteristic. The bigger change is that engineering risk moves earlier in the development cycle, where it can be identified and addressed before deployment.

Before	After
Sequential hardware and software development; issues surface at commissioning	Hardware and software development run in parallel from the start
Physical prototypes required to validate feasibility	Process feasibility grounded in physical constraints validated in simulation before physical deployment
Late issue detection; correction most expensive at this stage	Early risk identification; problems resolved where they cost least
Manual reprogramming required when layouts change	Automatic adaptation to layout changes
Use-case-specific engineering; automation logic does not transfer	Reusable automation logic across cells, plants, and robot vendors

Measured across the initial use cases:

- **~2 weeks** reduction in development cycle time per application
- **Rework cycles eliminated**, removing delays that previously ran from several weeks to months
- **Earlier identification of bottlenecks**, shifting risk detection from commissioning to the development phase
- **Reduced dependency on physical prototypes**, with corresponding reductions in testing effort and cost
- **Increased reuse of automation logic**, reducing the need for use-case-specific engineering
- **Parallelisation of hardware and software development**, accelerating overall project timelines
- **Reduced dependency on specialised roles**, enabling a more integrated engineering workflow



7 dimensions

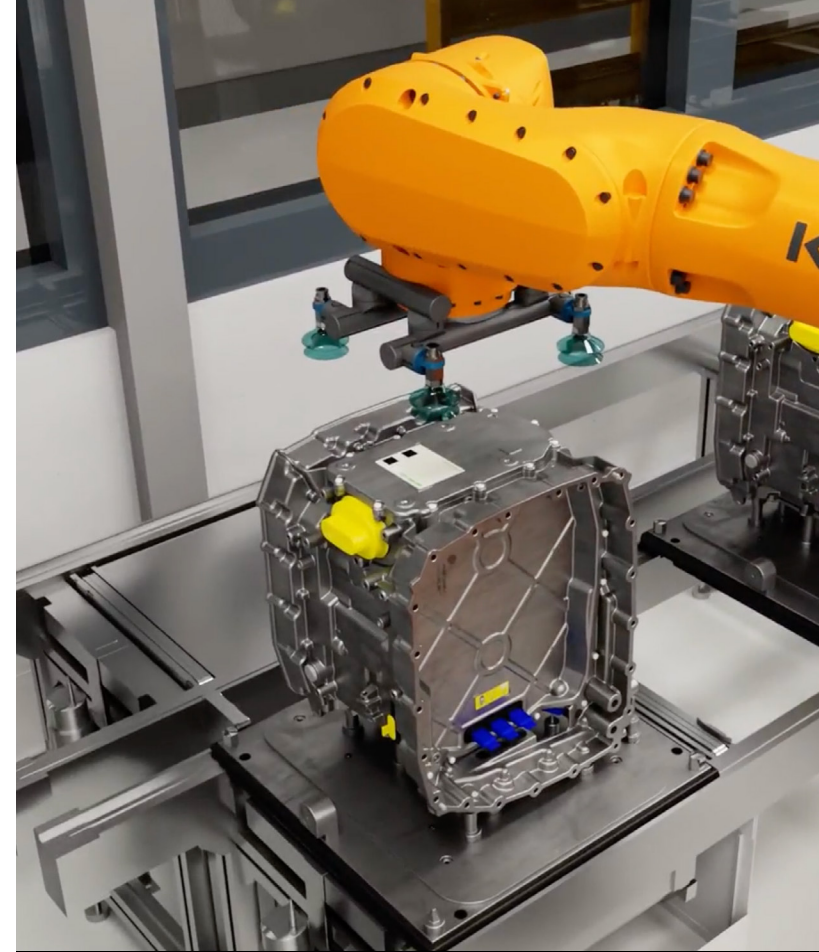
of measurable improvement
across efficiency and risk

A Blueprint, Not a Better Cell

This initiative delivered more than a more efficient packaging cell. It established a development blueprint: a replicable, simulation-first model that can be applied across Schaeffler's global production network, laying the foundation for software-defined manufacturing.

Scalability is enabled by four structural properties of the approach:

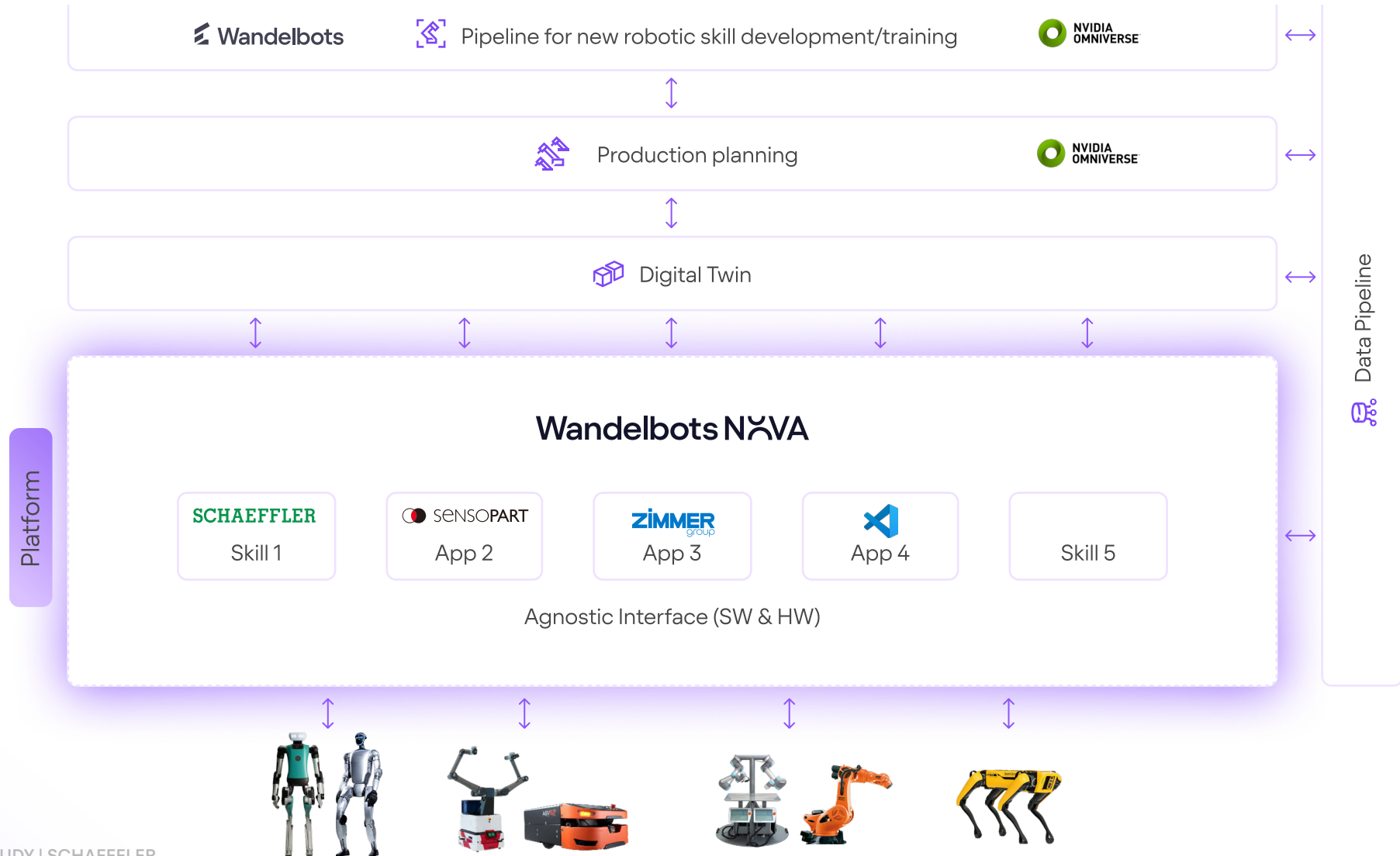
- Automation logic is hardware-independent, meaning it is not bound to a specific robot or vendor
- Software components are reusable and modular, so each new application builds on what was validated before
- Interfaces between simulation and real-world execution are standardised, so the development methodology transfers to new cells without renegotiating integration from scratch
- The development environment is unified across teams and partners, enabling consistent deployment across sites.



By shifting validation earlier, enabling reuse, and decoupling software from hardware, Schaeffler established a scalable foundation for **Physical AI-driven manufacturing**. These changes reshape how industrial automation is designed, deployed, and scaled across the enterprise.



Advanced Automation Robotics Platform



About Wandelbots

Wandelbots is a deep-tech company focused on enabling software-defined automation and Physical AI in industrial environments. Its NOVA platform acts as the execution and control layer of Physical AI systems, connecting robots, AI models, and digital twins into a unified operational environment.

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