

Transforming Industry through the Industrial Metaverse: a Catalyst for Sustainability

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Industry accounts for...

**Global greenhouse gas
emission**

30%

**Energy
consumption**

37%

Source: World Economic Forum, 2023



Climate



Covid



Conflict



Competition

Industry's challenges are multiplying

Industrial companies must become resilient



ENERGY
EFFICIENCY



RESOURCE EFFICIENCY

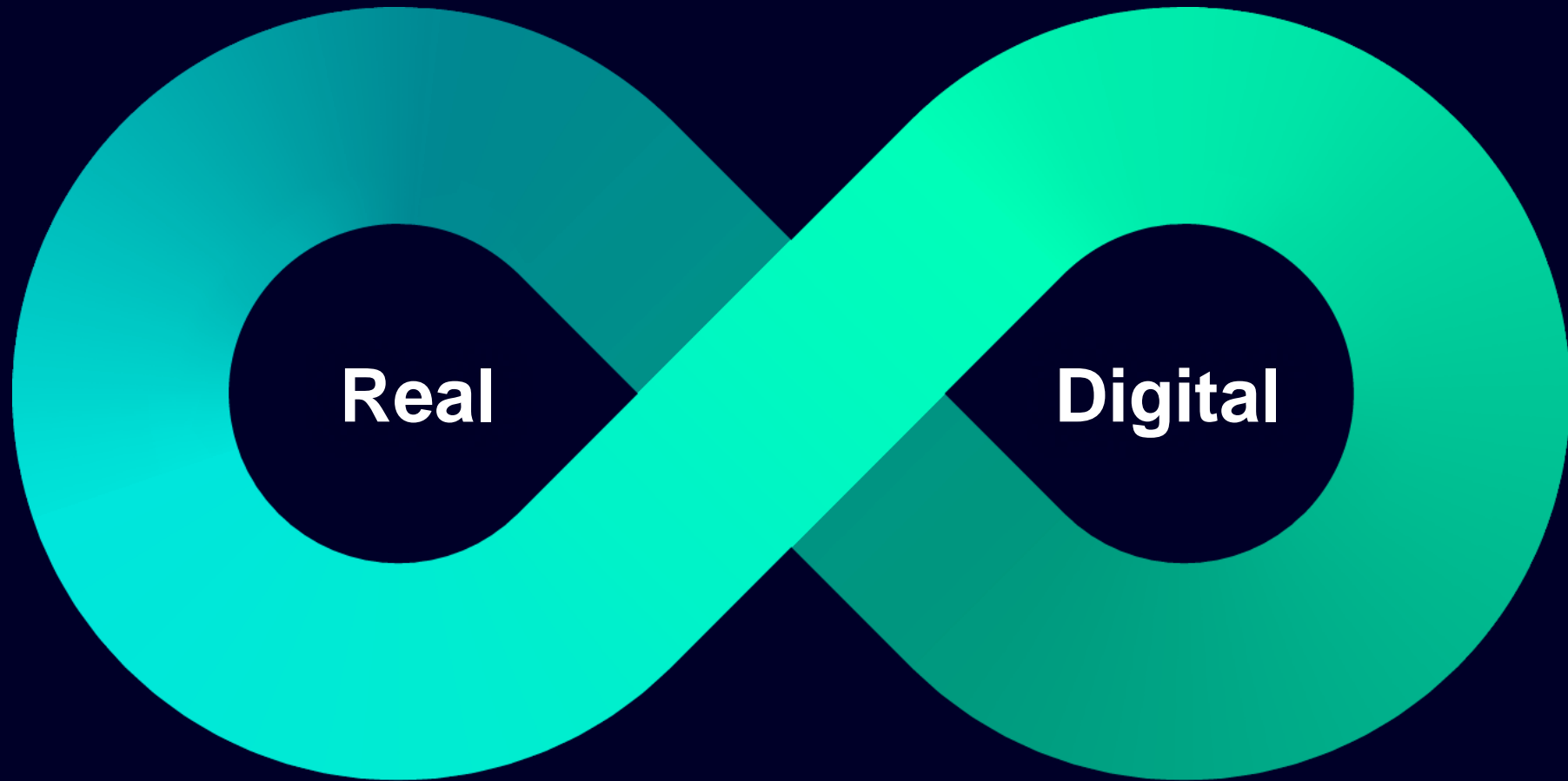


FLEXIBILITY



NEW WORK

The Industrial Metaverse will drive resilience
by combining the real and the digital worlds



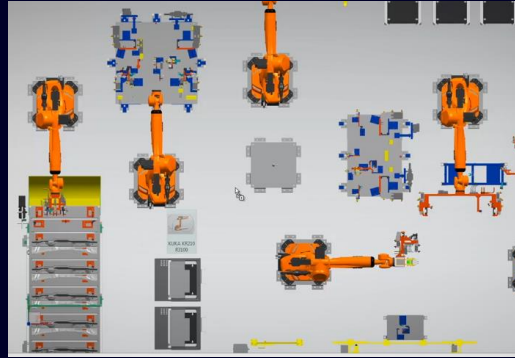
The Industrial Metaverse

Accelerate digitalization for a sustainable future

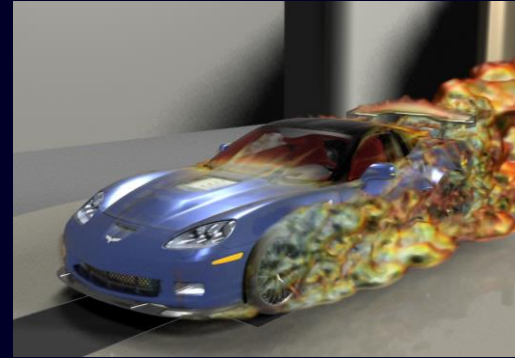
A place to experience the Digital Twin of industrial assets ¹⁾, by...



Visualizing a real system **photo-realistically** and gaining insights in an **immersive** environment



Meeting in **real-time**, to review **collaboratively** and make changes immediately



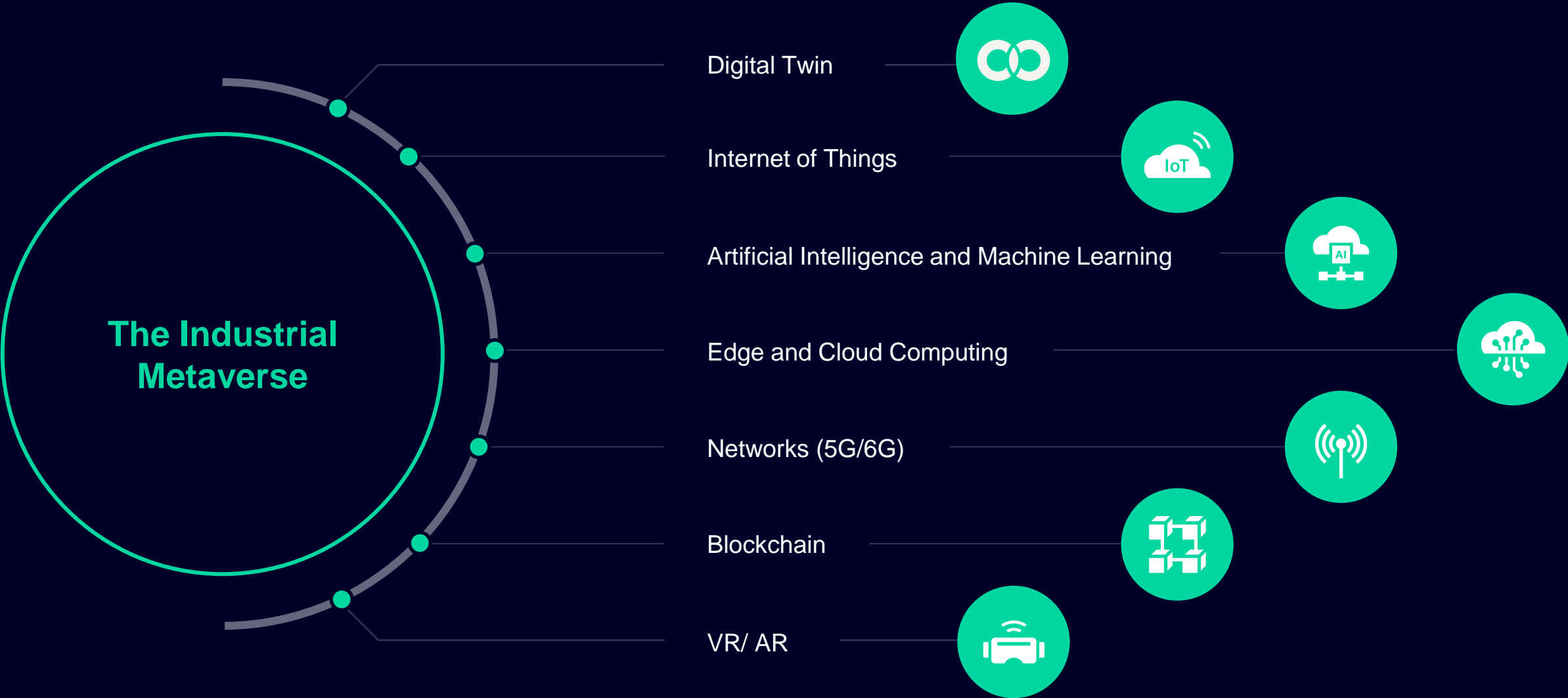
Continuously and **physic-based** evaluating, **simulating** and **predicting** the behavior of a system



Monitor, analyze and manage real assets **interactively in closed loop**

¹⁾ Products, Machines, Systems, Plants, Infrastructures, ...

Evolution and convergence of key technologies will enable the Industrial Metaverse



Industrial Metaverse

Use cases along product lifecycle



Design & Engineering

- Perform **interactive simulations**
- Evaluate **collaboratively**

Virtual Testing & Validation

- **Photorealistic environments**

Production

- **Virtual commissioning Assessment** for the impact of new devices or software

Operations

- **Visualize** workflows and data
- **Remote or augmented control** of assets
- **Remote servicing**

Training

- For **unusual or costly scenarios**
- By **remote experts**



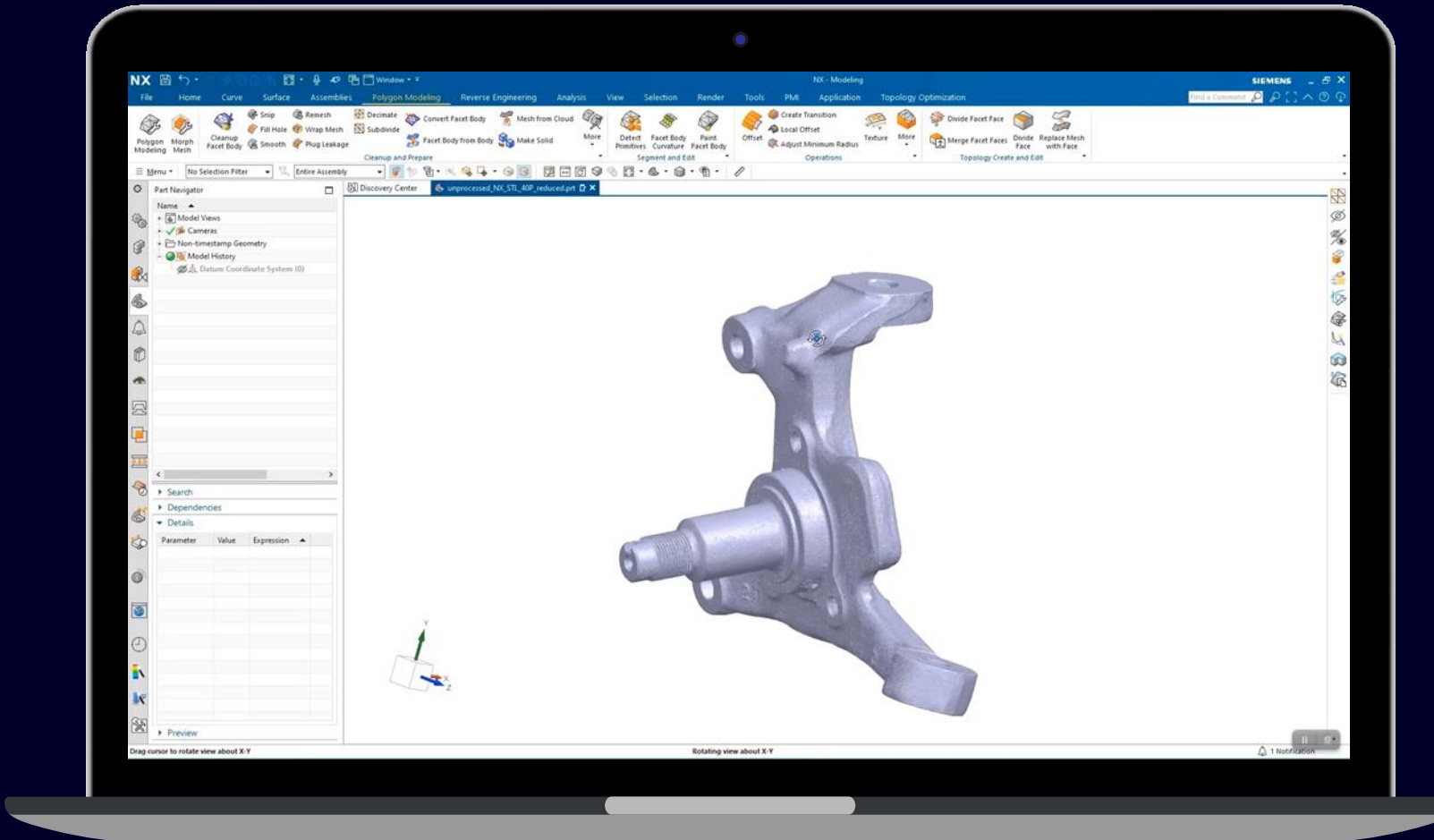


Siemens' use cases already demonstrate the potential of
the Industrial Metaverse

**to achieve CO2 and
Sustainability targets**

Design & Engineering

Create revolutionary lightweight designs



- New designs to reduce mass to achieve CO₂ and Sustainability targets can be quickly generated using state-of-the-art AI automation achieving optimized mass and performance targets.

Value

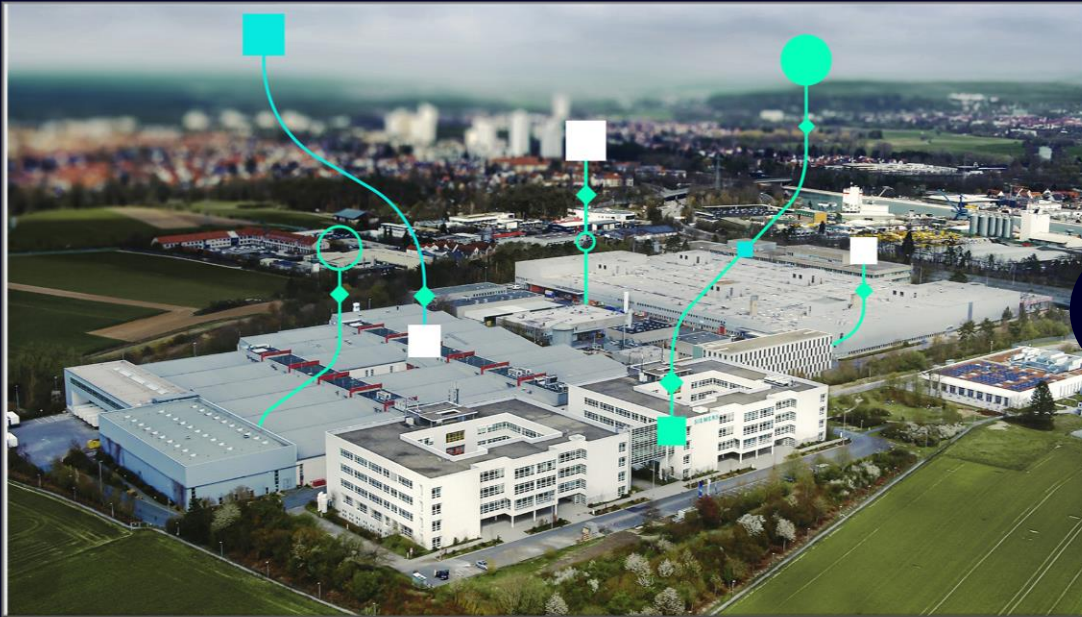
- Intelligent exploration of design space
- Minimizing material usage while still meeting all requirements
- Upfront and continuous validation to meet new design paradigms
- Enable scale-up from prototype to mass production in a single system



Customer Zero for the Industrial Metaverse

Gerätewerk Erlangen

Brownfield digitalization of our own plant



- 40% faster time to market
- ~7% productivity increase per year
- -57% reduction of energy consumption
- 99,99% perfect quality – every day

Nanjing

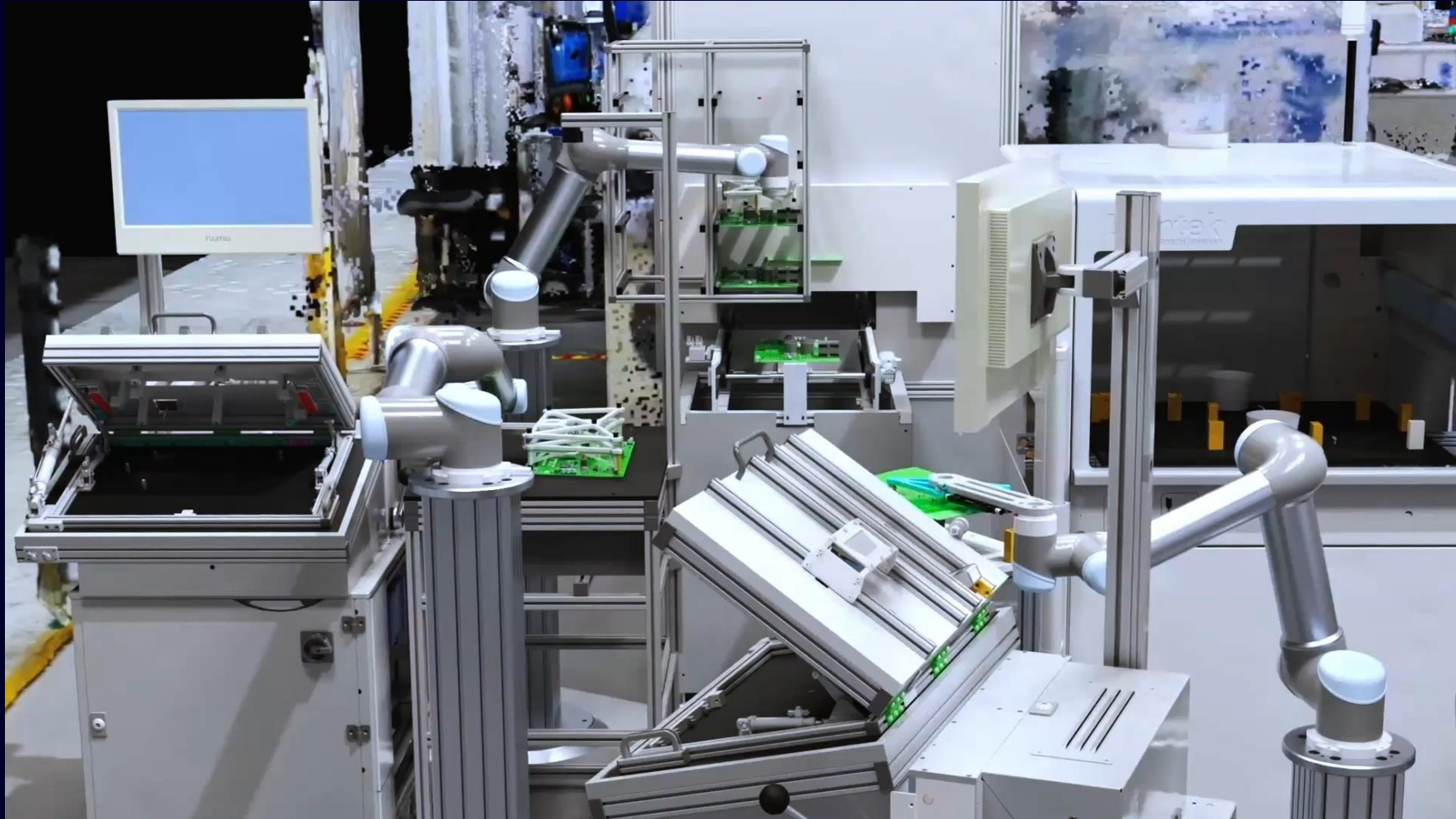
First digital native factory born from own digitalization concept



- 40% higher flexibility
- 20% higher productivity
- 5,000t CO2 reductions

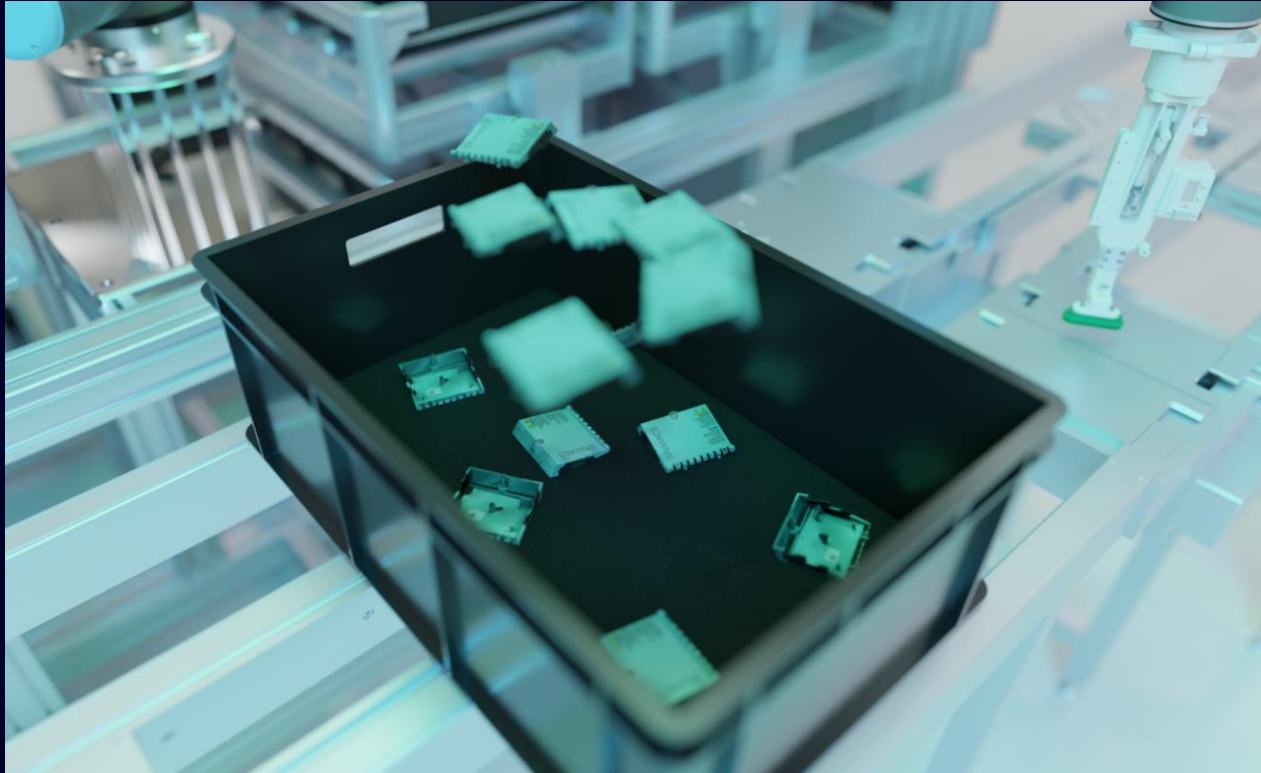
Virtual Testing & Validation

Synthetic data for AI training to accelerate automation ramp-up



Virtual Testing & Validation

Synthetic data for AI training to accelerate automation ramp-up



- Automated Bin Picking Solutions identify parts and estimate the 6D-positioning of parts need to be trained with hundreds of images to achieve high picking precision
- 100% Computer-generated images are used for AI training

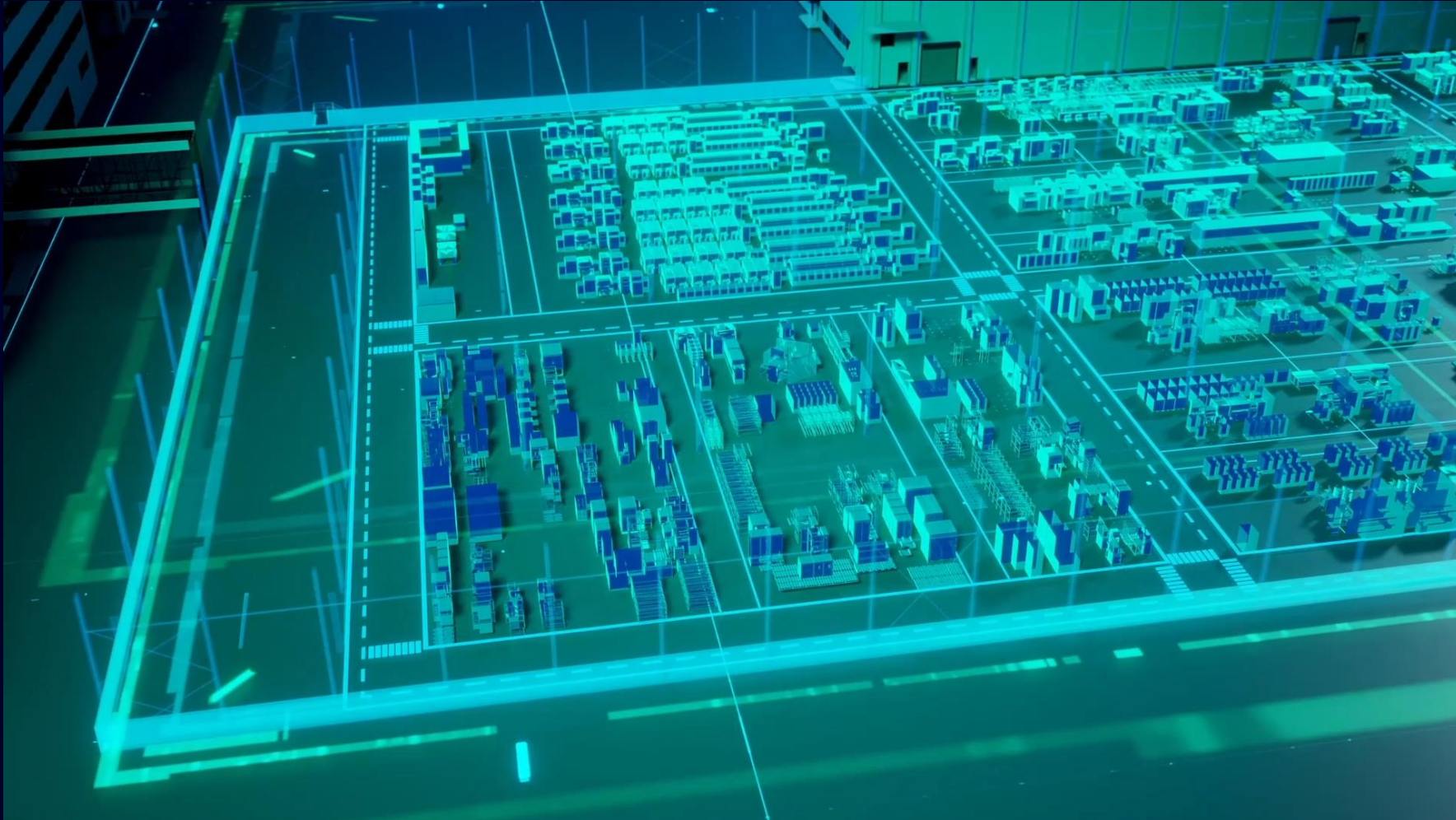
Value

- Using Siemens' SynthAI combined with advanced simulation capabilities (for, e.g., reflections, defects, errors) saves time and efforts for image capturing and labeling



Production

Immersive 3D layout for facilitated planning, modelling, and simulation



Production

Immersive 3D layout for facilitated planning, modelling, and simulation



- Legacy brownfield plants show significant deviations from actual layout to planning status in infrastructure and asset layout

Value

- 3D representation of shopfloor assets and actual layout as planning basis
- First-Time-Right approach minimizes manual effort and cost during implementation
- Improve quality & speed of relocation, new machine/new product introduction projects
- Enabler for holistic digital twin of production



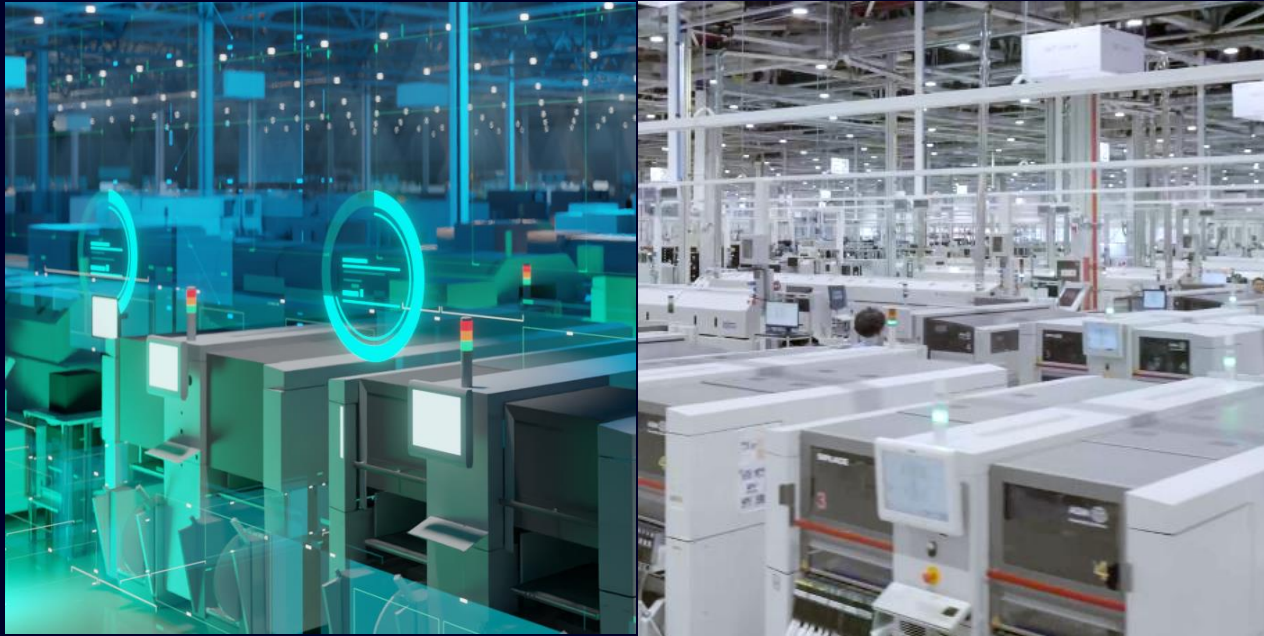
Operations

Collaboration for deep-dives of deviation analysis across factory networks



Operations

Collaboration for deep-dives of deviation analysis across factory networks



- Expertise for complex production processes and machinery may be geographically distributed
- Problem-solving on shopfloor gets more and more complex due to increasing number of singular expert systems and (partly siloed) data lakes

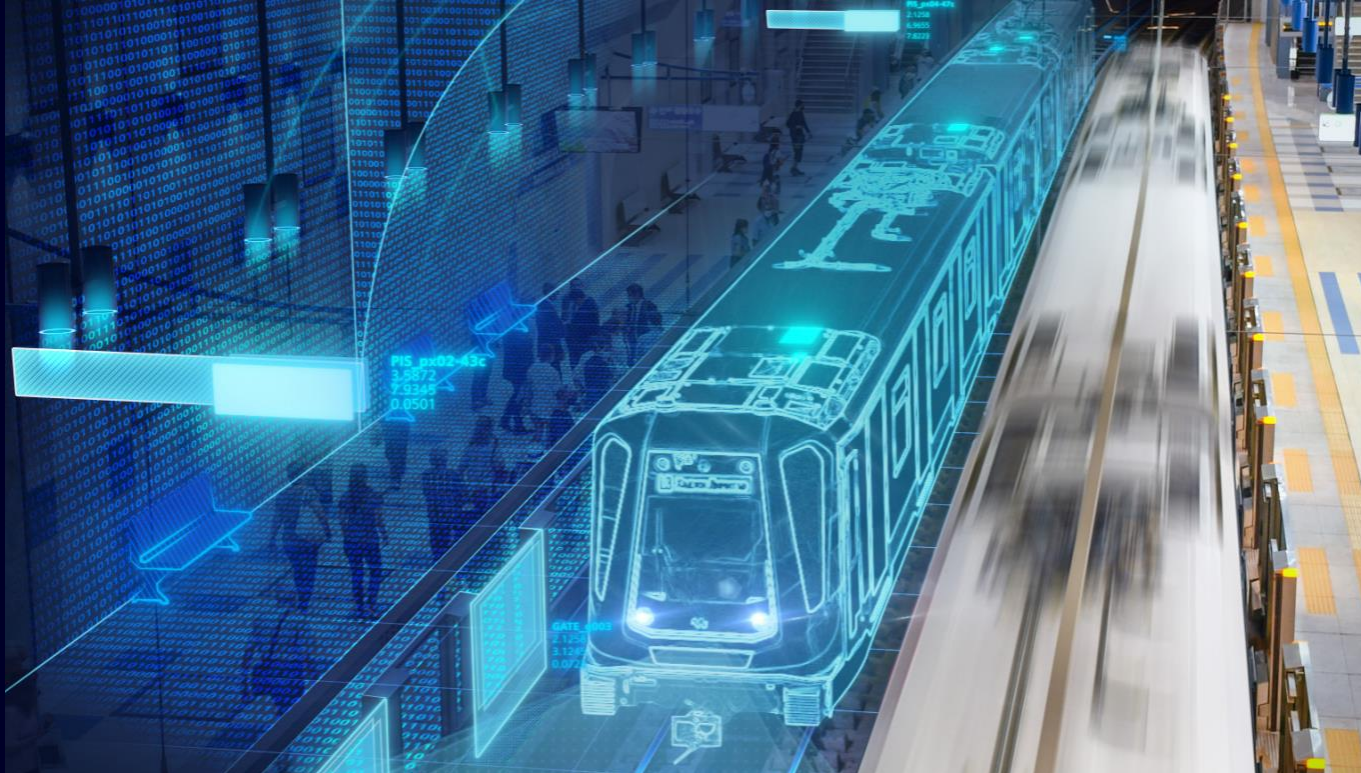
Value

- Allow own staff and external partners to easily collaborate and dive into data
- Combine different digital twins, simulations and expert systems in one collaborative platform
- Reduction of problem-solving time & travel expenses in a factory network
- Ensure feasibility of changes upfront and reduce interference on shopfloor using new state simulation



Training

Early virtual training in customer-specific environment



- Early driver training on virtual tracks, with realistic behavior of the train control system

Value

- Reduced training costs
- Look-and-feel of track infrastructure can be explored already during planning
- Early-stage design review, along with the gathering of local knowledge about the specifics of the track
- Maximum use of the digital twin increases operational efficiency and reduces errors



Industrial Metaverse

Sustainable use cases along product lifecycle



Design & Engineering

- Design for **disassembly** and **efficiency**

Virtual Testing & Validation

- Minimize **resource** utilization

Production

- Optimize **energy** efficiency

Operations

- Increase lifetime e.g. **predictive maintenance**

Training

- Empower **people** and reduce **travels**



Industrial Metaverse drives Sustainability

It only takes us to open up for collaboration

Contact

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