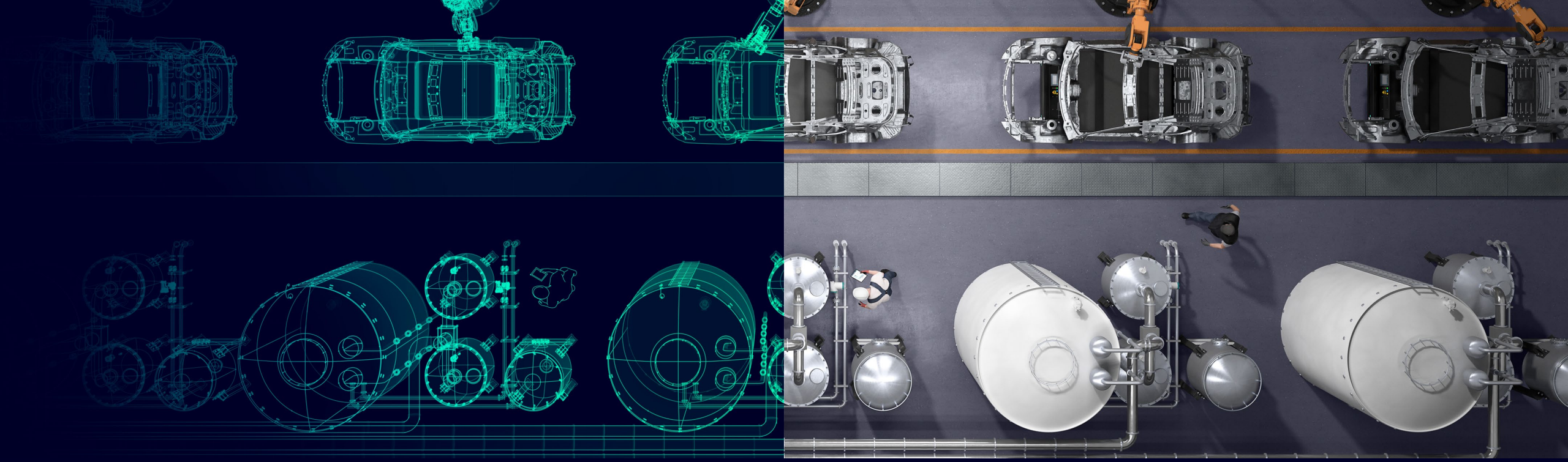

Simulation in Discrete Industries

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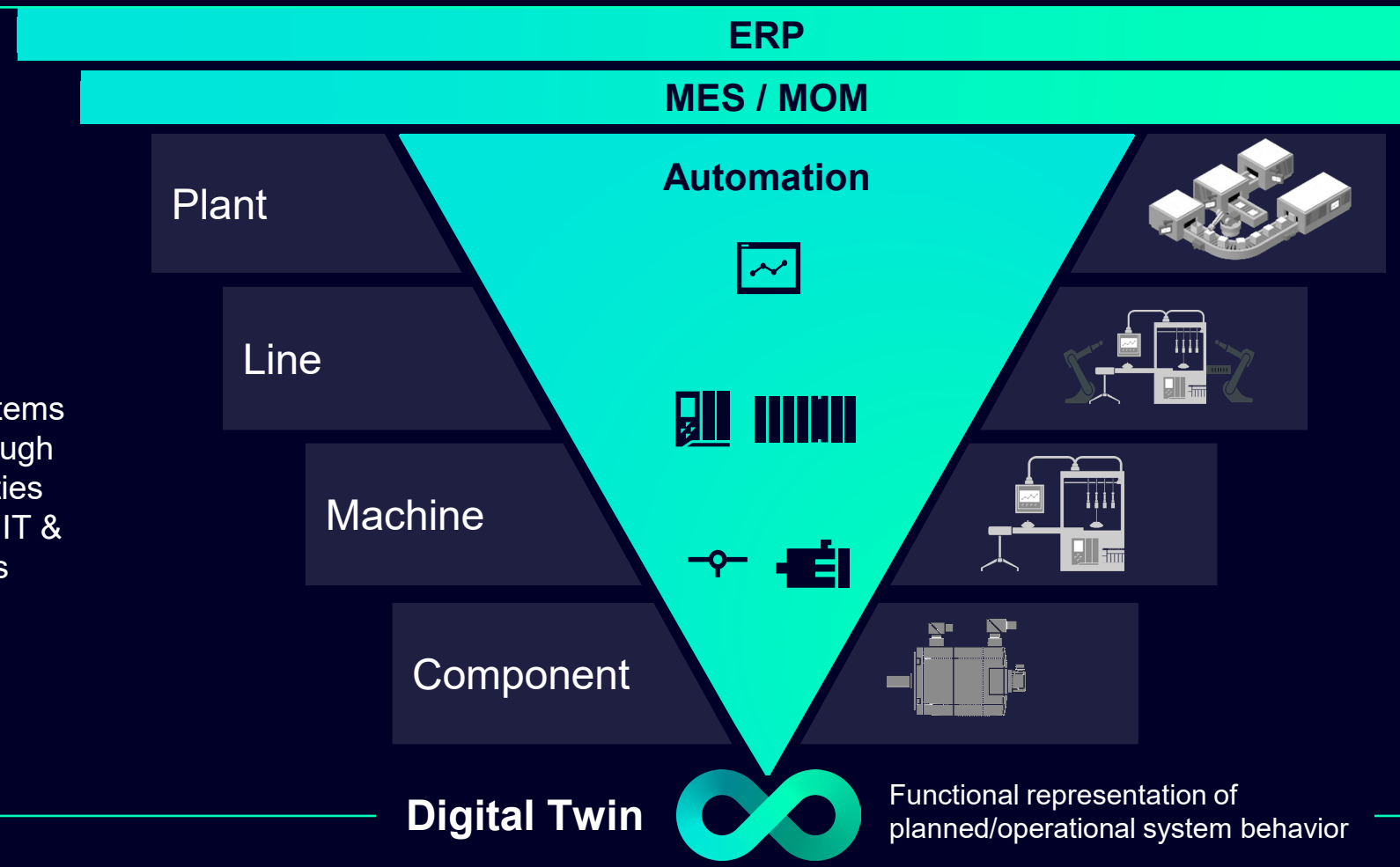
Combining Real and Digital

To generate insights, reduce risks and optimize systems



Real

Behavior of systems determined through physical properties and interplay of IT & OT technologies

Digital

Simulation:
Modelling of **relevant** system behavior

e.g., physics, kinematics, mathematical, event-based, black box (FMU, ROM…)

Digital Twin

Functional representation of planned/operational system behavior

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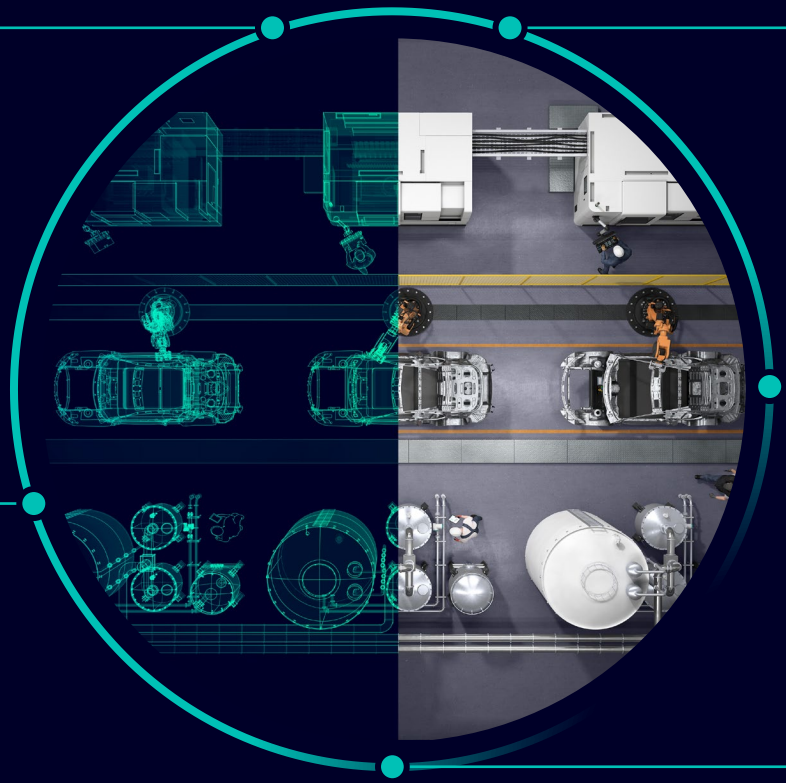
Accelerate innovation, improve efficiency and ensure quality with the Digital Twin for Production

MARKETING & STAKEHOLDER ENGAGEMENT

CONCEPT DESIGN & ENGINEERING



OPERATIONS INSIGHTS & OPTIMIZATION

OPERATIONS TRAINING

VIRTUAL COMMISSIONING & ACCEPTANCE TESTING

Model extension and continuous re-use

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Simulation Use Cases Across the Production Lifecycle

From concept design and virtual commissioning to operator training and continuous optimization

Marketing & Stakeholder Engagement

- Attract customers using (3D) models
- Align stakeholder requirements early
- Facilitate more frequent customer reviews
- Increase overall customer satisfaction

Level:
- Plant
- Line
- Machine
- Component

Tools:
- Designcenter Immersive Designer
- Tecnomatix Process Simulate VR / Collaborate
- Tecnomatix Plant Simulation
- Digital Twin Composer

Concept Design & Engineering

- Enable virtual prototyping for suppliers
- Detect design errors early in the process
- Validate systems before physical testing
- Reduce design costs and shorten production timelines

Level:
- Plant
- Line
- Machine
- Component

Tools:
- S7-PLCSIM Advanced
- SIMIT SP, RT
- Simcenter Amesim
- Designcenter MCD
- Tecnomatix Process Simulate
- Tecnomatix Plant Simulation
- DriveSim Engineer
- Simatic Robot Simulator

Virtual Commissioning & Acceptance Testing

- Identify and resolve issues prior to on-site implementation
- Ensure smoother and faster system deployments

Level:
- Plant
- Line
- Machine
- Component

Tools:
- S7-PLCSIM Advanced
- SIMIT SP, RT
- Simcenter Amesim
- Designcenter MCD
- Tecnomatix Process Simulate
- Tecnomatix Plant Simulation

Operations Training

- Use digital twins to provide safe and efficient training
- Train staff before physical equipment arrives
- Support readiness ahead of on-site commissioning

Level:
- Plant
- Line
- Machine
- Component

Tools:
- S7-PLCSIM Advanced
- SIMIT TrP
- Simcenter Amesim
- Designcenter MCD
- Tecnomatix Process Simulate
- Tecnomatix Plant Simulation

Operations Insights & Optimization

- Run digital twins in parallel to real operations
- Troubleshoot problems more effectively
- Analyze performance in real-time
- Optimize operational parameters through actionable suggestions

Level:
- Plant
- Line
- Machine
- Component

Tools:
- Optimize My Plant
- Tecnomatix Plant Simulation
- LiveTwin / xDT
- Simulation setups from virtual commissioning for trouble shooting and testing

Simulation models created during engineering become Digital Twins that support commissioning, training and operational optimization.

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Simulation for Suppliers
of Discrete Industrial Systems

Use Cases

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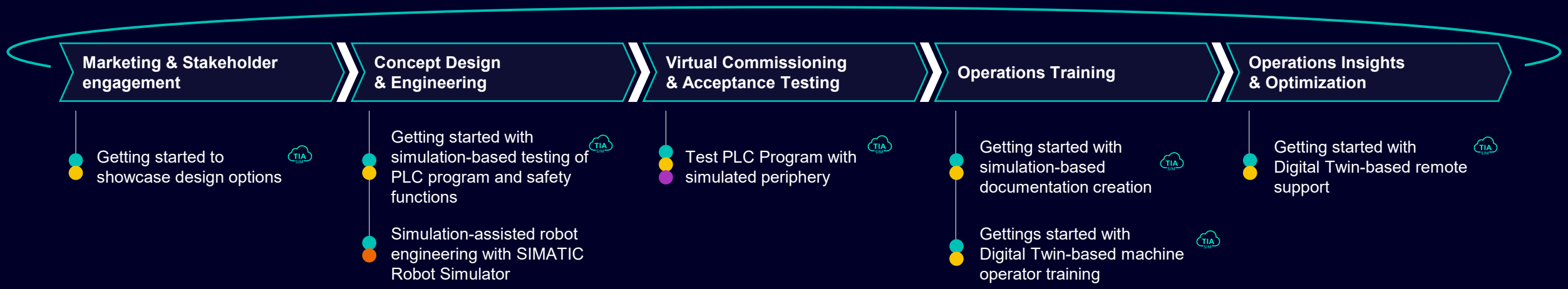
Getting started with simulation for optimization of machine engineering and commissioning processes - for Small and Medium Enterprises



TIA Simulation Cloud

Cloud-based engineering and simulation suite for industrial systems. Using state-of-the-art streaming technology, high-performance simulation is possible on almost any end device with a web browser.

SIMATIC S7-PLCSIM Advanced

PLCSIM Advanced simulates a SIMATIC S7-1500 controller, which enables comprehensive simulations of all functions, including communication, safety, and web servers. The data can be used with other software, thanks to open interfaces.

SIMIT Simulation Platform

SIMIT enables simulations of active components and peripherals like drives, sensors, and actuators with the help of behavioral modeling.

SIMIT Rapid Tester

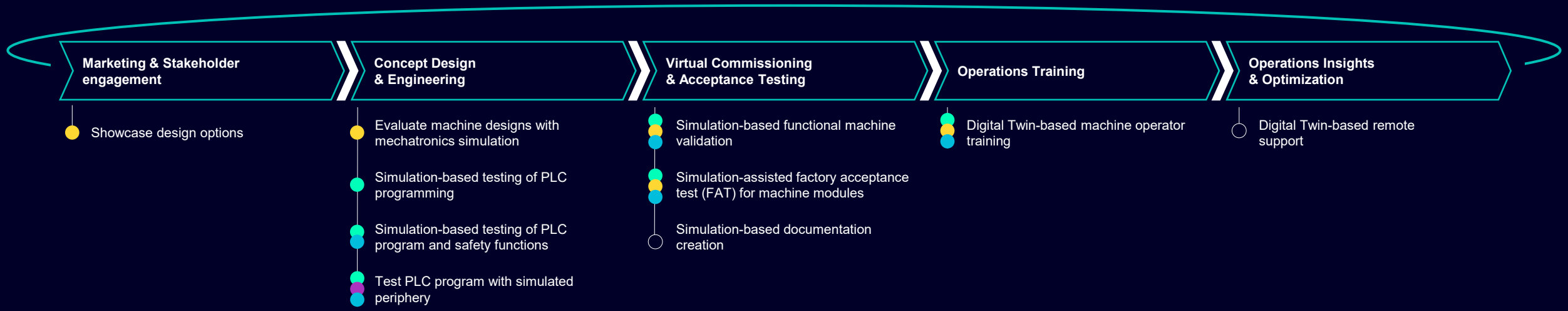
SIMIT Rapid Tester is a solution that allows you to automatically test and validate project specific engineering and libraries as well as process and operation functions in a repeatable and well documented manner

SIMATIC Robot Simulator

Kinematics simulation and visualization for SIMATIC Robot Integrator & Library

SIEMENS

Benefit from mechatronic simulation across the machine value cycle



Designcenter MCD

Designcenter MCD is used to create a kinematic simulation model of a machine based on CAD data coming from engineering. This model makes it possible to simulate typical aspects such as motion sequences and collisions.

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SIMIT Simulation Platform

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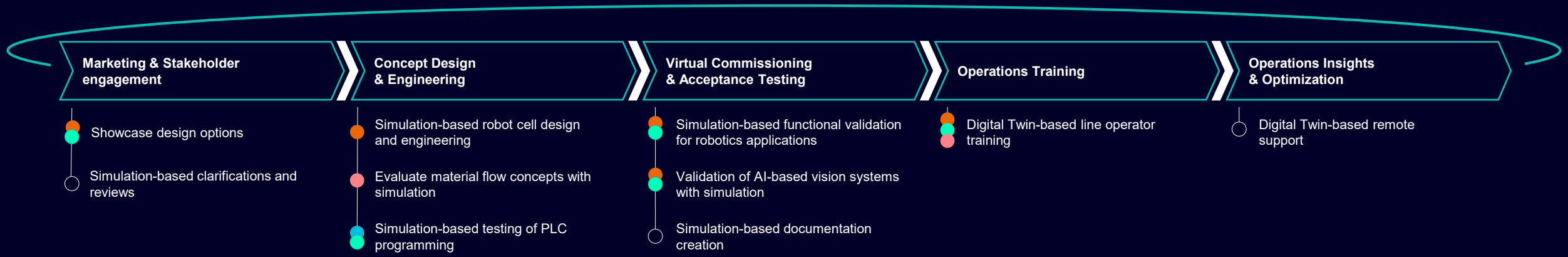
SIMIT Rapid Tester

SIMIT Rapid Tester is a solution that allows you to automatically test and validate project specific engineering and libraries as well as process and operation functions in a repeatable and well documented manner

○ Application independent

SIEMENS

Benefit from robotic and material flow simulation across the lifecycle of lines



● *(Tecnomatix) Process Simulate*

Plan, simulate and validate human tasks, robotics processes and automation during the entire product development lifecycle from concept, engineering and commissioning to production and continuous improvement.

● *SIMATIC S7-PLCSIM Advanced*

PLCSIM Advanced simulates a SIMATIC S7-1500 controller, which enables comprehensive simulations of all functions, including communication, safety, and web servers. The data can be used with other software, thanks to open interfaces.

● *Plant Simulation*

Model, simulate, visualize and analyze production systems and logistics processes to optimize material flow and resource utilization for all levels of your plant planning, from global facilities and local plants to specific production lines.

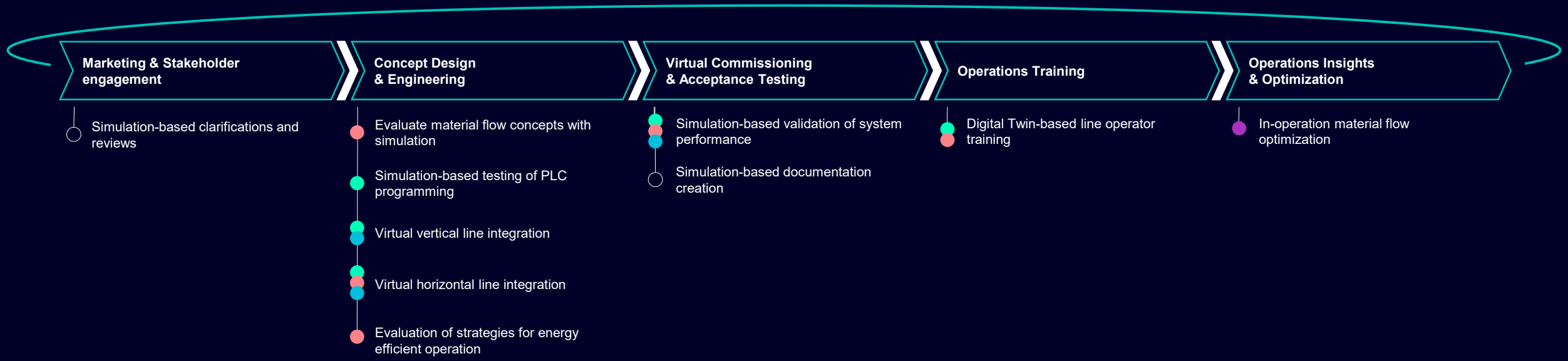
● *SIMIT Simulation Platform*

SIMIT enables simulations of active components and peripherals like drives, sensors, and actuators with the help of behavioral modeling. With SIMIT, you can test the controller program while taking into account the electrical system behavior and making it the link between automation and mechanics.

○ Application independent

SIEMENS

Benefit from material flow simulation across the integration value chain



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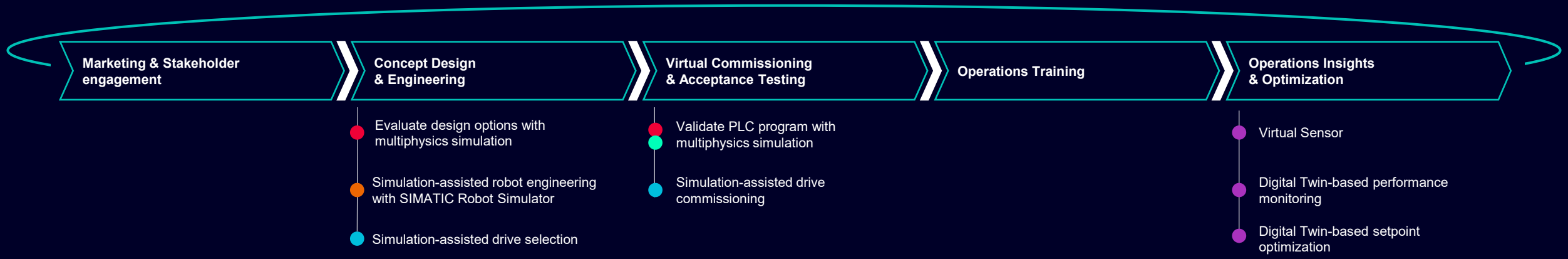
Optimize My Plant

Connect the digital twin of production to enterprise and shopfloor systems to create an always-on predictive engine using Mendix and Plant Simulation as a service.

○ Application independent

SIEMENS

Simulation beyond kinematics brings benefits across the complete lifecycle



- *Amesim*

Simcenter Amesim is an integrated and scalable mechatronic systems simulation platform that allows design engineers to virtually assess and optimize the systems' performance.

- *SIMATIC S7-PLCSIM Advanced*

PLCSIM Advanced simulates a SIMATIC S7-1500 controller, which enables comprehensive simulations of all functions, including communication, safety, and web servers. The data can be used with other software, thanks to open interfaces.

- *Executable digital twin / LiveTwin (xDT)*

Deliver smarter products and processes by connecting the real and virtual worlds to unlock new insights. The executable digital twin lets you leverage digital twin models across the entire product lifecycle.

- *DriveSim Designer & DriveSim Engineer*

Simulation for SINAMICS drives with functional mockup units (.fmu) or firmware-in-the-loop

- *SIMATIC Robot Simulator*

Kinematics simulation and visualization for SIMATIC Robot Integrator & Library

○ Application independent

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Simulation for Operators
of Discrete Industrial Systems

Use Cases

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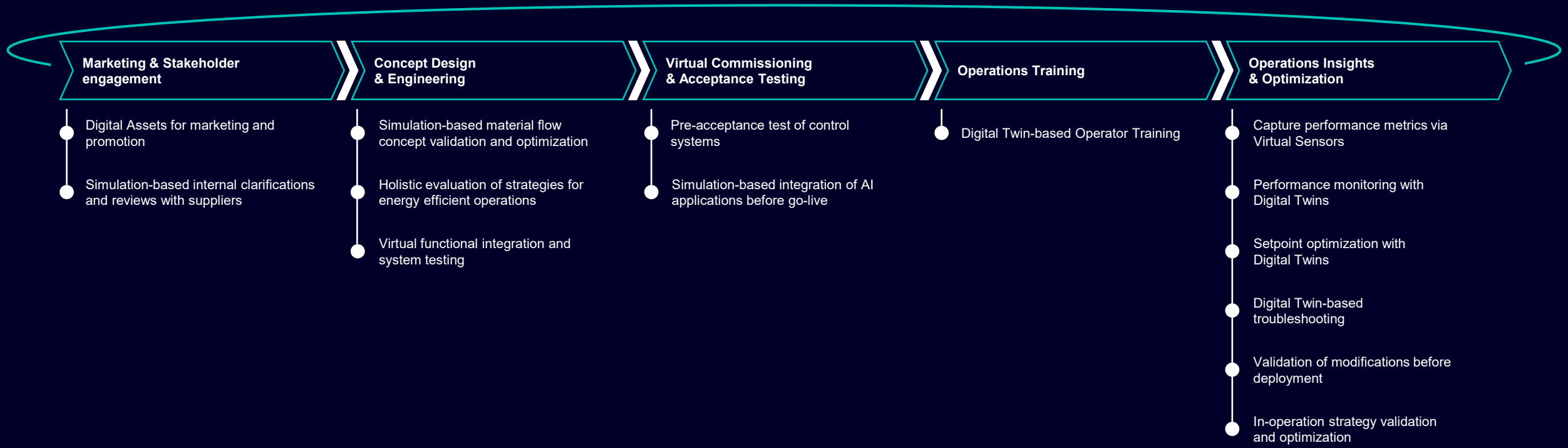
Simulation and Digital Twins support the value creation along the entire lifecycle



Integration of simulation models and Digital Twins from suppliers

SIEMENS

Leverage engineering data as part of the comprehensive Digital Twin delivered alongside the physical equipment

Phases

Concept design & Engineering

Suppliers use simulation-driven concept design to evaluate different system concepts and identify the optimal solution with respect to specific Key Performance Indicators (KPIs), such as throughput, energy consumption, and others. Simulation is also helpful in engineering and testing a chosen design. However, simulation is ideally used during an iterative and integrated concept design and engineering process.

Virtual Commissioning & Acceptance Testing

Suppliers employ virtual testing to ensure the proper functioning of the automation design, and they use virtual commissioning to confirm that the entire industrial system operates in accordance with the agreed-upon specifications. End-Customers might also agree to virtual Digital-Twin based acceptance tests instead of legacy site acceptance testing.

Use Cases

- Evaluate design options with multiphysics simulation
- Validate PLC program with multiphysics simulation

- Evaluate machine designs with mechatronics simulation
- Simulation-based functional machine validation

- Simulation-based robot cell design and engineering
- Simulation-based functional validation for robotics applications

- Simulation-based testing of PLC program & safety functions
- Virtual horizontal line integration

Software

Amesim
SIMIT PLCSIM Adv.

Designcenter MCD
SIMIT
PLCSIM Adv.

Process Simulate
PLCSIM Adv.

SIMIT
PLCSIM Adv.
Plant Simulation

Leverage engineering data as part of the comprehensive Digital Twin delivered alongside the physical equipment

Use Cases

Evaluate design options with multiphysics simulation

Validate PLC program with multiphysics simulation

Evaluate machine designs with mechatronics simulation

Simulation-based functional machine validation

Simulation-based robot cell design and engineering

Simulation-based functional validation for robotics applications

Simulation-based testing of PLC program & safety functions

Virtual horizontal line integration

Operations Training, Insights and Optimization

Increase operator confidence and reduce risks by leveraging virtual training environments

Reduce ramp-up and change-over times through virtual integration & validation

Optimize operations and improve quality by connecting Digital Twins with operations

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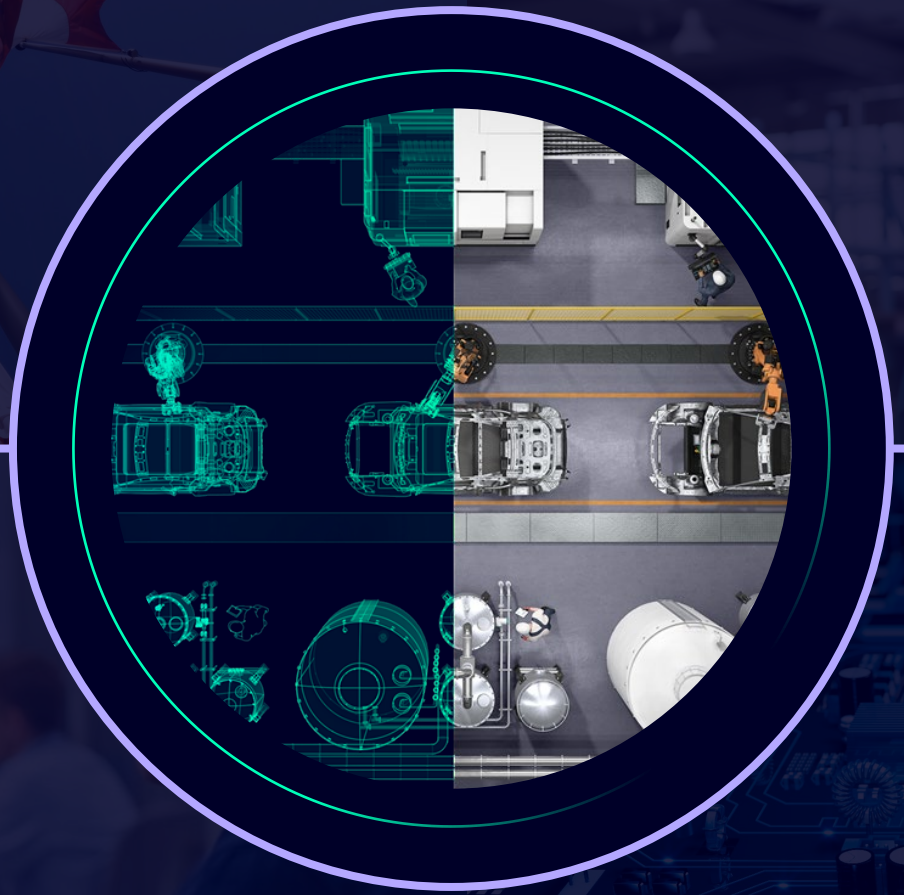
Simulation for Industrial Systems supports value creation throughout the entire organization

Strengthen competitiveness

- increased collaboration between domains and realization of holistic optimization potentials
- improved quality and troubleshooting
- higher flexibility and resilience



Counter the talent shortage

- digital working environments, available anytime and anywhere
- reduced onboarding times to get new hires productive
- improved knowledge retention

Fuel your Digital Transformation

- informed decision making
- digital engineering workflows
- efficient integration of new technologies

Become more sustainable

- reduced scrap during ramp-up
- improved resource utilization
- reduced energy consumption

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Simulation for Industrial Systems
Portfolio Overview

Automation Simulation
S7-PLCSIM Advanced

Drive Simulation
DriveSim Engineer

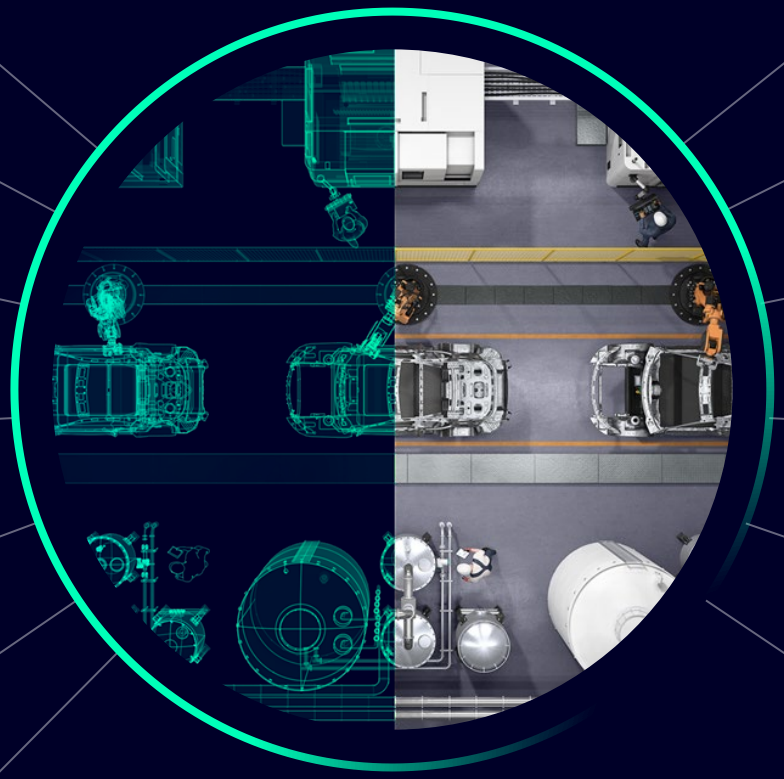
Field Device & Behavior Simulation
SIMIT

Multiphysics Simulation
Simcenter Amesim

Kinematic & Mechanic Simulation
Designcenter MCD

Robotic & Mechanic Simulation
Tecnomatix Process Simulate

Material Flow Simulation
Plant Simulation



Operator Training
SIMIT Training Platform

Functional Test Automation
SIMIT Rapid Tester

Process & Chemical Simulation
gPROMS

Machine Tool Simulation
SINUMERIK ONE: Create/Run My Virtual Mach.

Executable Digital Twin
Live Twin

Operational Strategy Evaluation
Optimize My Plant

Model extension and
continuous re-use

SIEMENS

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