

# Leadership for the Next Industrial Revolution

Driving the Digital Enterprise in Product  
Development and Manufacturing

Ralf Leinen : Vice President, Siemens Digital Factory  
6<sup>th</sup> CSIR Conference, October 6<sup>th</sup>, 2017



# Digitalization changes everything

The next trillion dollars will be earned with data – for our customers and for our industries.

*Michael Dell, founder of Dell Inc.*

Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.

*Pierre Nanterme, CEO Accenture*

# New business models in the internet age are disrupting complete markets

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*Ingenuity for life*

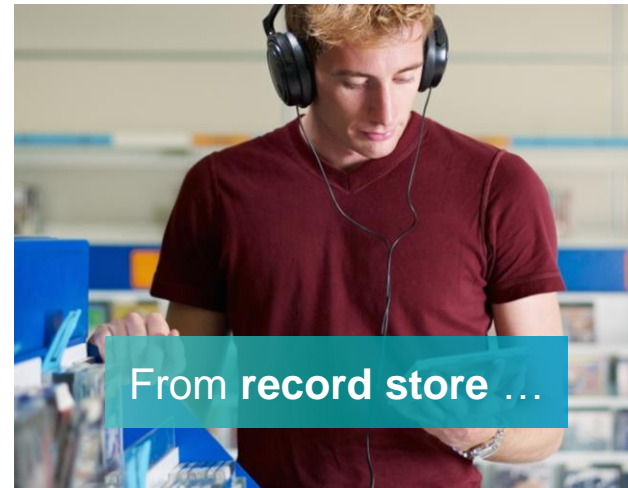


From bookstore ...

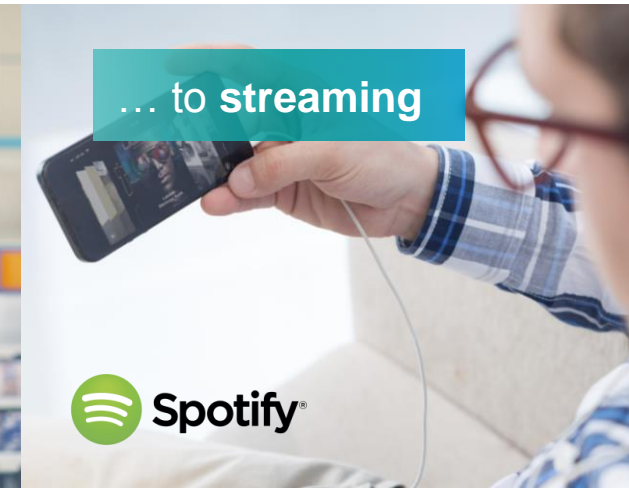


... to e-book

amazon



From record store ...



... to streaming

Spotify®



From Yellow Pages ...

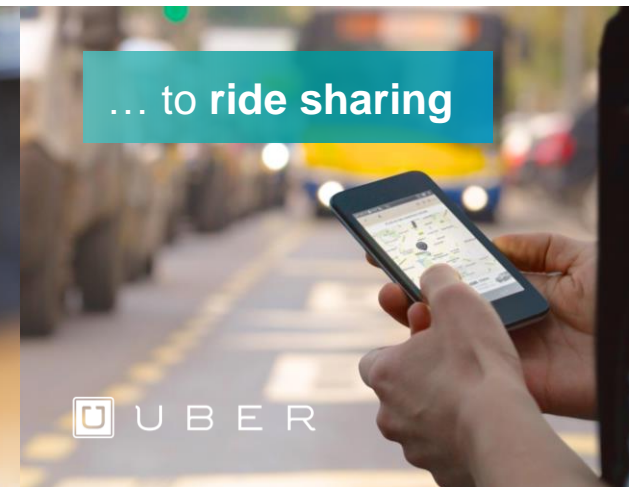


... to marketplace

MyHammer



From taxi ...



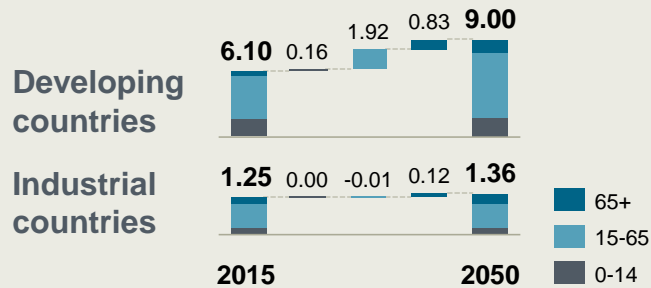
... to ride sharing

UBER

# Five Megatrends shaping our world

## Demographic change

World population<sup>1</sup>, in bn

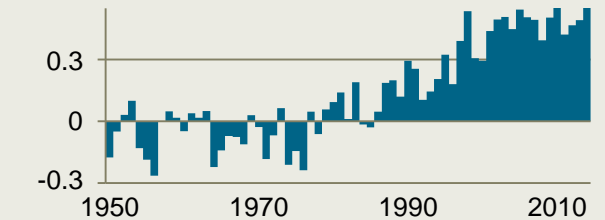


## Growing and aging population

## Global warming and weather extremes

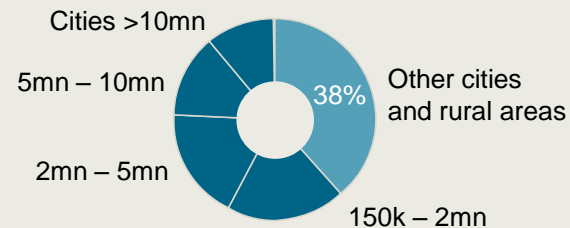
## Climate change

Annual mean temperature variations 1950-2014<sup>2</sup> (in °C)



## Urbanization

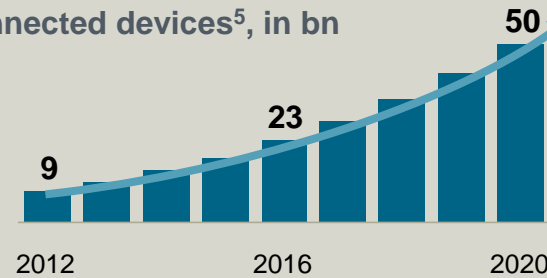
Contribution to global GDP growth, 2007-2025<sup>3</sup>, in %



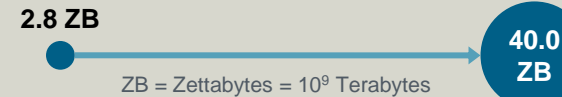
## Digital transformation

Connected devices<sup>5</sup>, in bn

Exponential growth of connected devices ...



... and digital data<sup>6</sup>

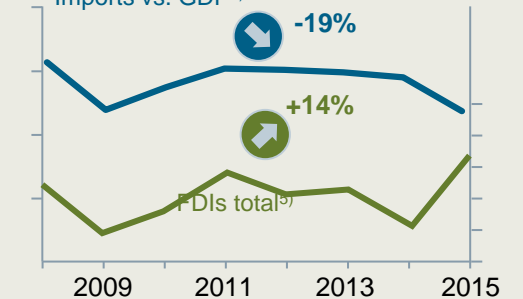


Cities as main driver of GDP growth

Trend to bring investment back

## Nationalization

Imports vs. GDP<sup>4</sup>

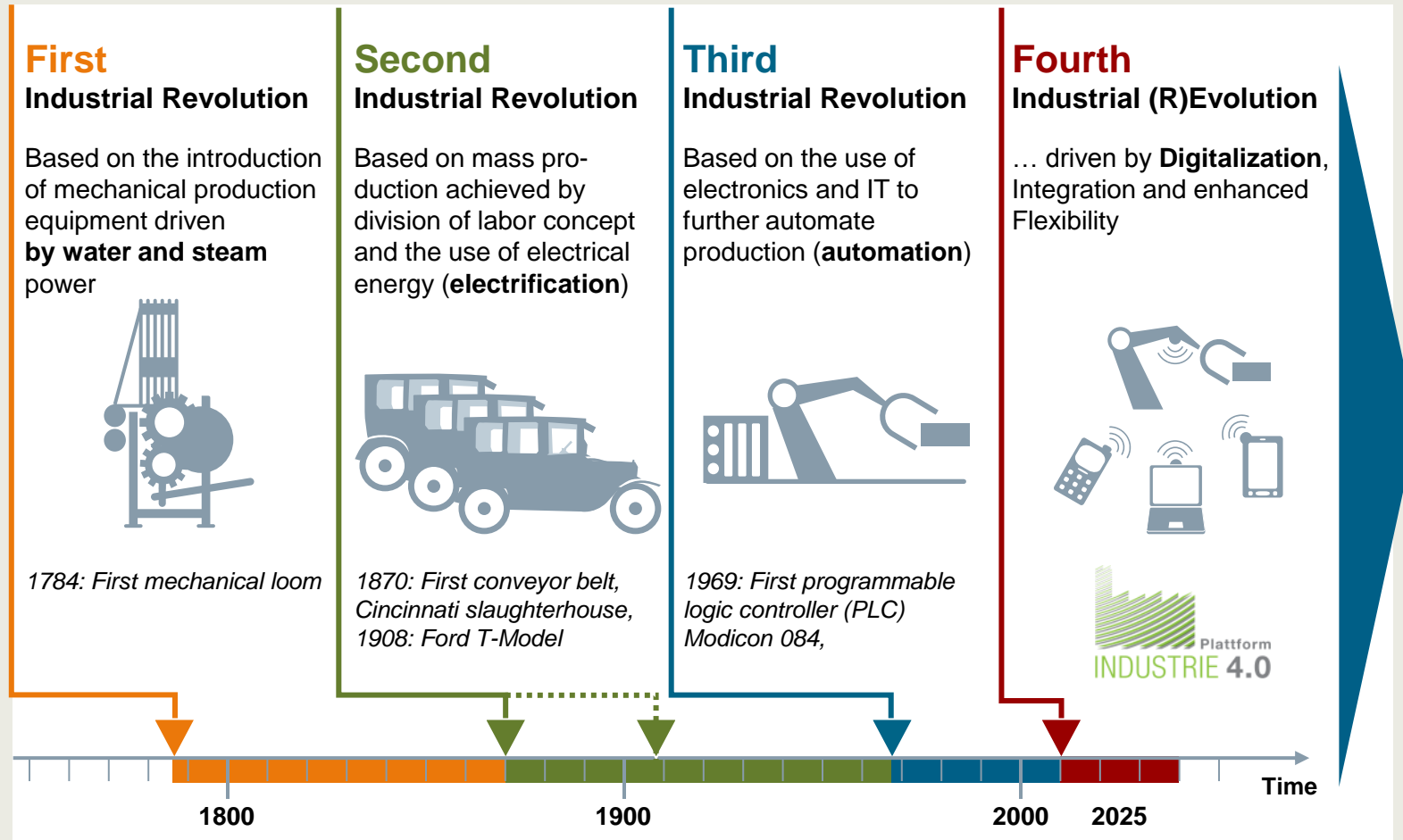


1) UN World Population Prospects (2012) | 2) Met Office Hadley Centre observations (2014) | 3) McKinsey Global Institute Cityscope (2011) | 4) UNCTAD: Import Flow merchandise: Total trade and share / GDP

| 5) 2008-2014: UN Conference on Trade and Development: FDI inward flow ; 2015: UNCTAD Global Investment Trends Monitor No.22

| 6) Cisco: The Internet of Everything (2013) | 7) IDC: The Digital Universe (2012)

# From Industry 1.0 to Industry 4.0, an initiative of the German industry sponsored by the German Government



## Characteristics

- Humans, devices and systems are connected along the entire value chain
- All relevant information is available in real-time – across suppliers, manufacturers and customers
- Parts of the value chain can constantly be optimized with respect to different criteria, e.g., cost, resources, customer needs

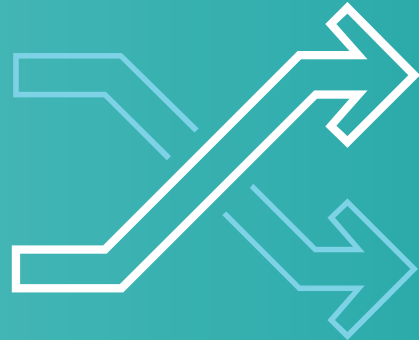
Our customers have essential requirements –  
throughout the manufacturing industry

**SIEMENS**  
*Ingenuity for life*

Speed



Flexibility



Quality



Efficiency



**Security**



# Technological forces transforming industry



## Changing the way products come to life

## Changing the way products are realized

## Changing the way products evolve

Generative design

Intelligent models

Intelligent automation

Additive manufacturing

Cloud ecosystems

Knowledge automation

System of systems

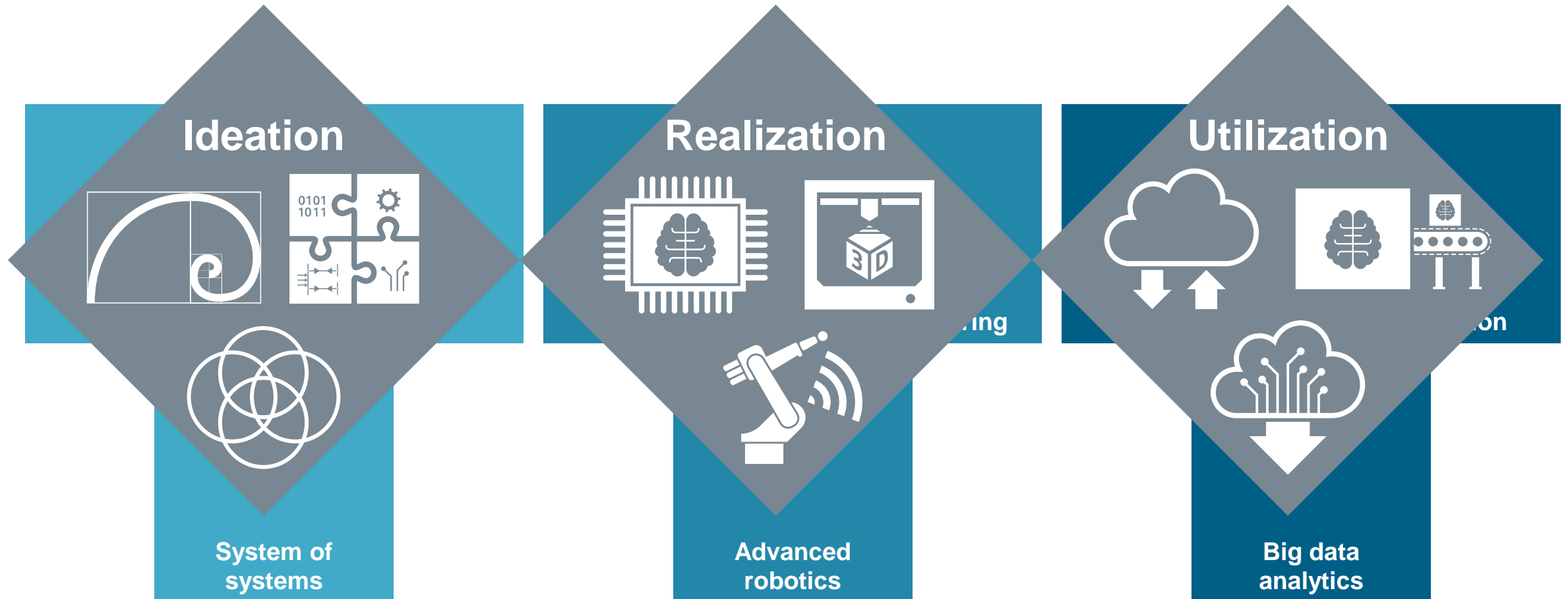
Advanced robotics

Big data analytics



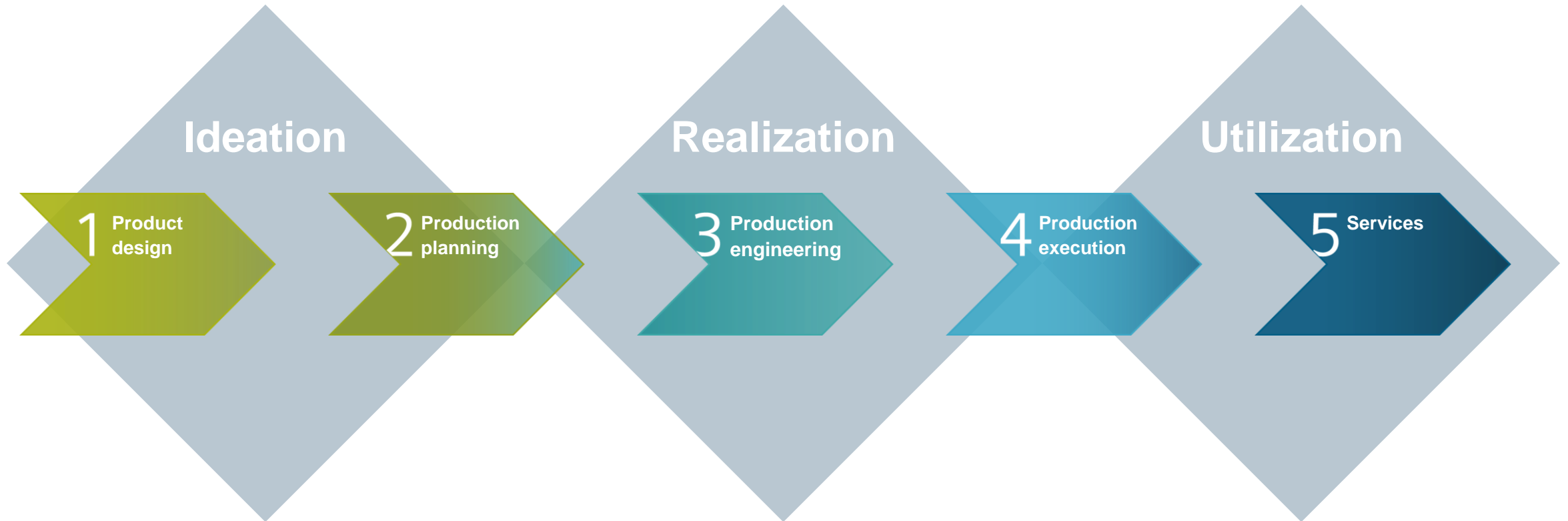
# Manufacturers must embrace the technologies and transform their business into a digital enterprise

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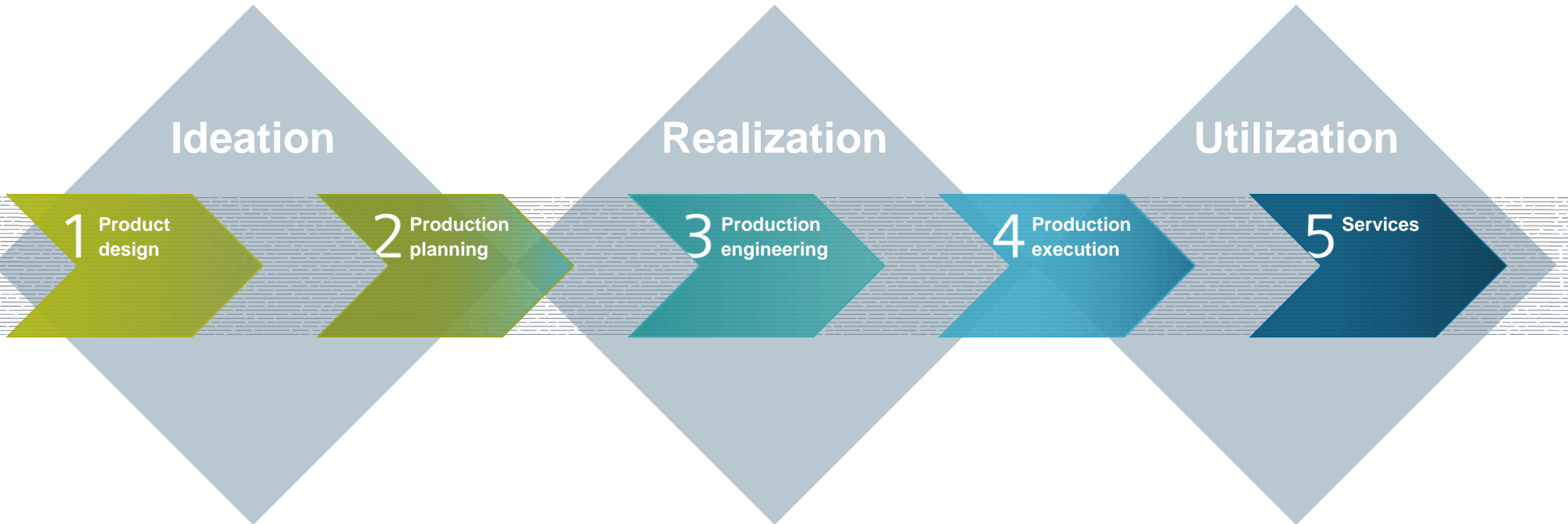
# Applied across the entire value chain

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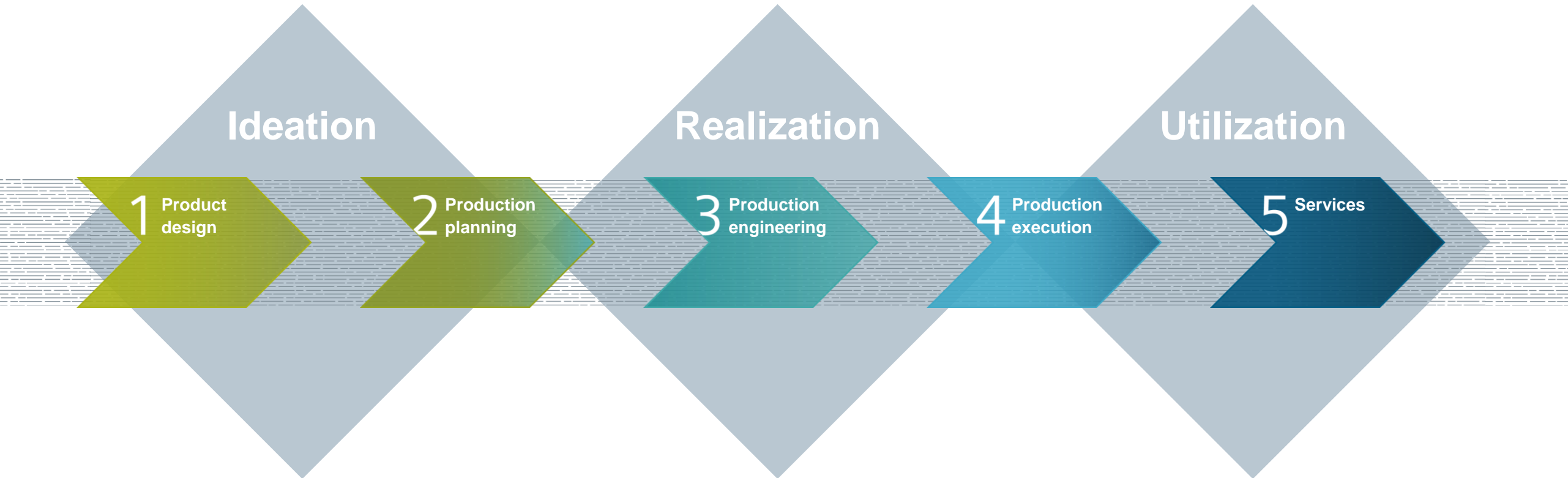
# A common digital thread enables continuous business transformation

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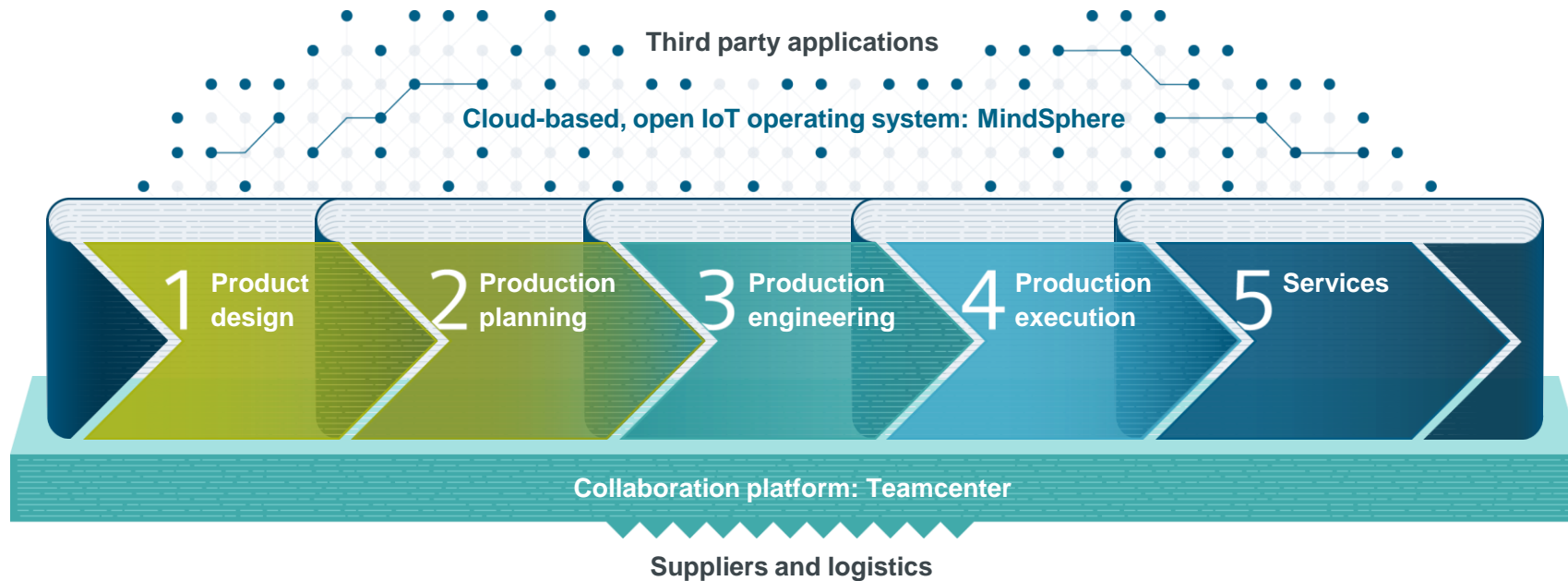
# By compressing the innovation lifecycle

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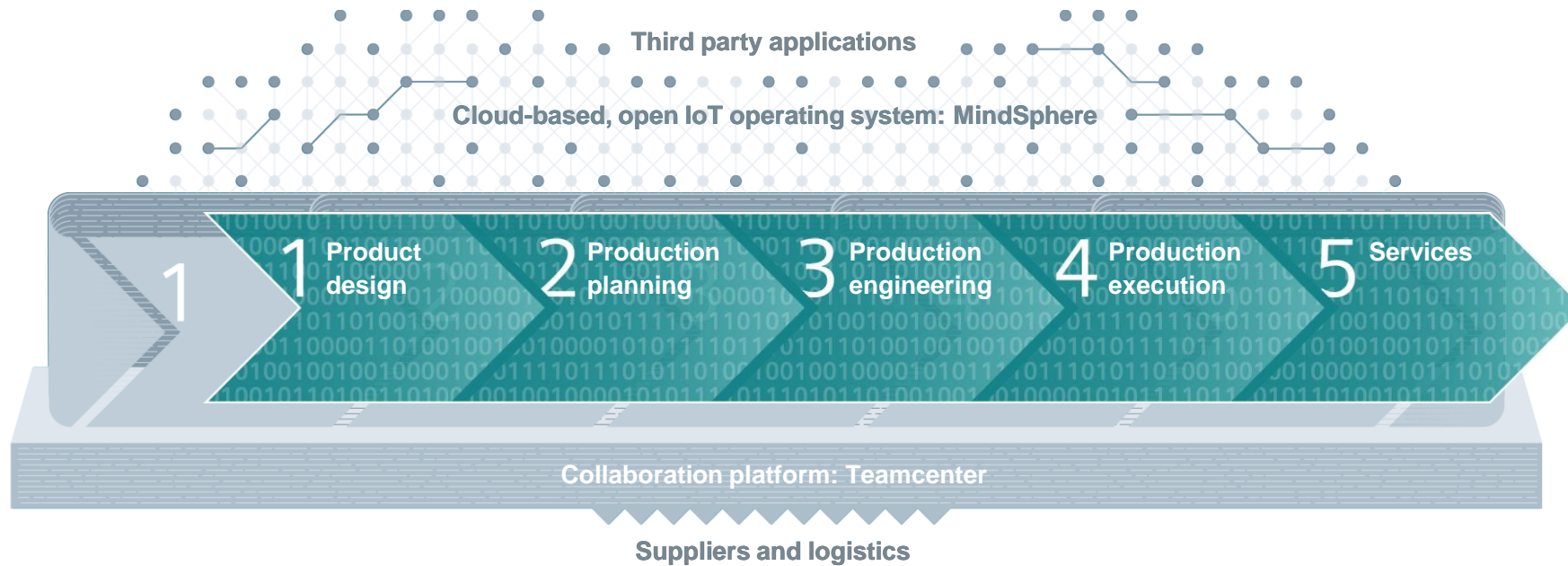
# Analyze assets as they perform with MindSphere and feed back insights to continuously optimize the value chain

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# Create a powerful Digital Twin of the entire value chain

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SIEMENS

SIMATIC FIELD PG

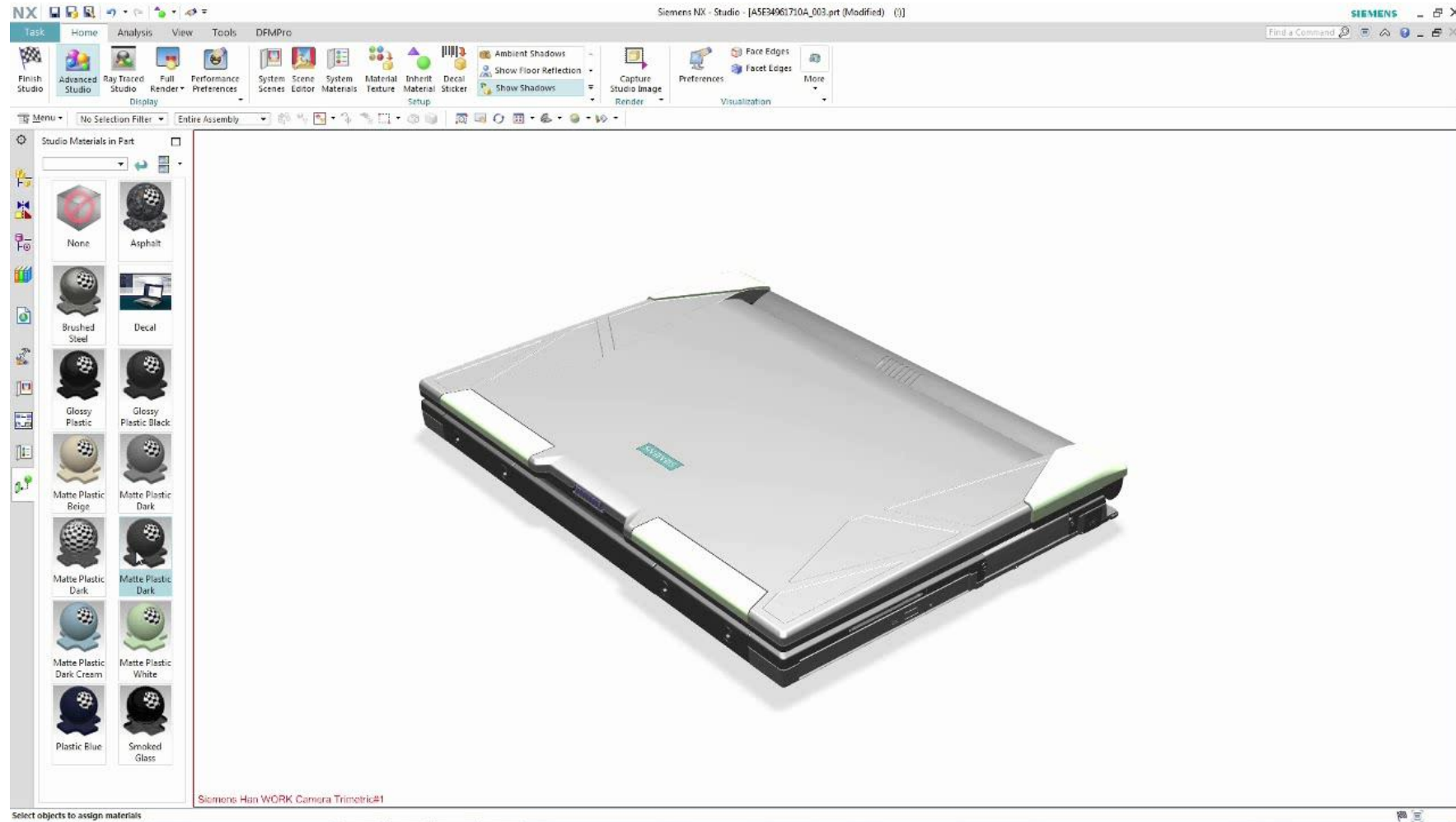


# Product design

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Design and  
simulate  
the product

NX CAD/CAE/CAM



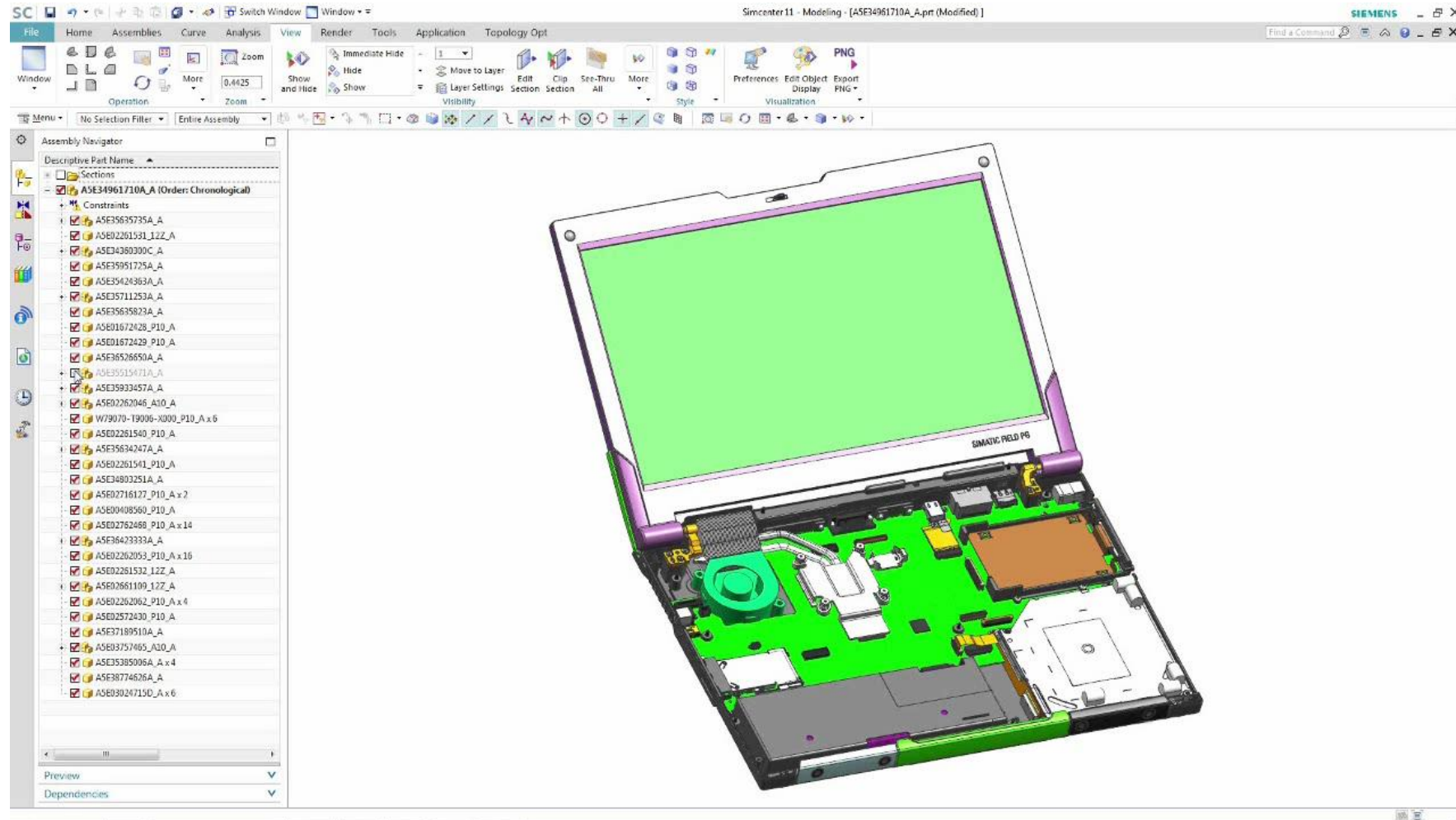


# Product design



Simulate  
the physical  
behavior

Simcenter

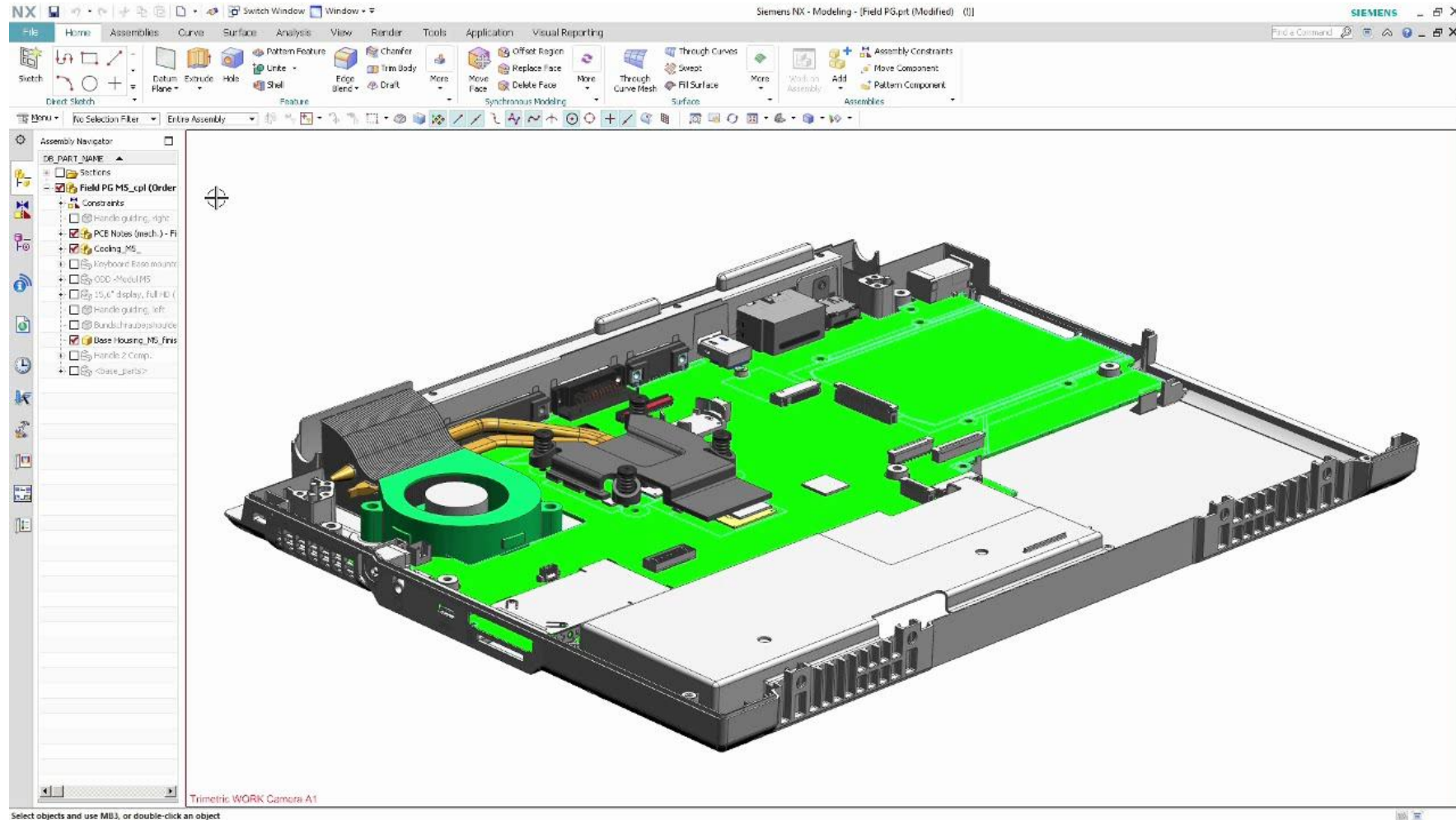


# Product design

**SIEMENS**  
*Ingenuity for life*

Perfect your  
product in the  
virtual world

NX CAD/CAE/CAM



## Product design

Design and  
simulate  
electronic  
systems

Mentor Graphics



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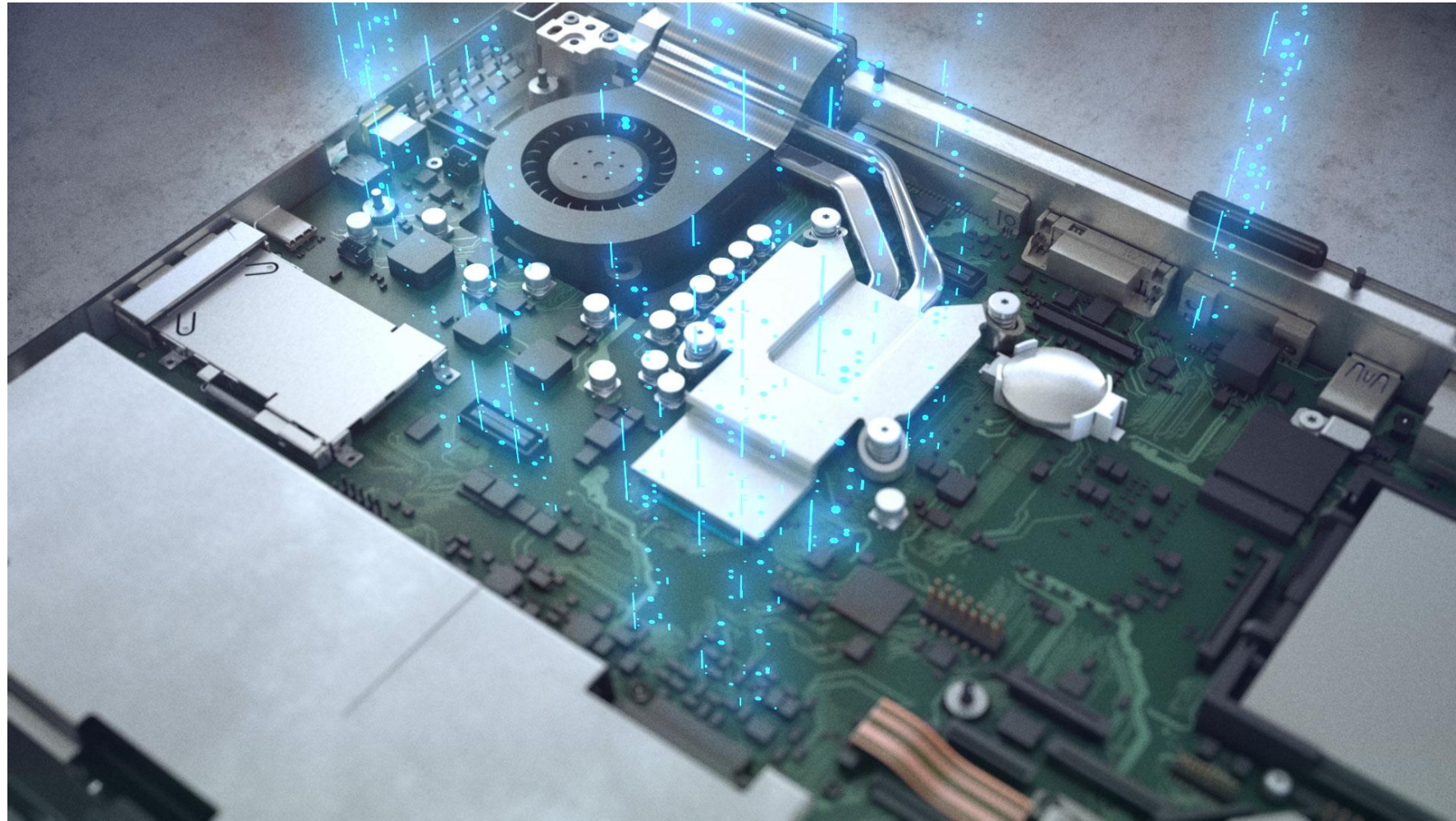
**Mentor  
Graphics**  
A Siemens Business

## Product design

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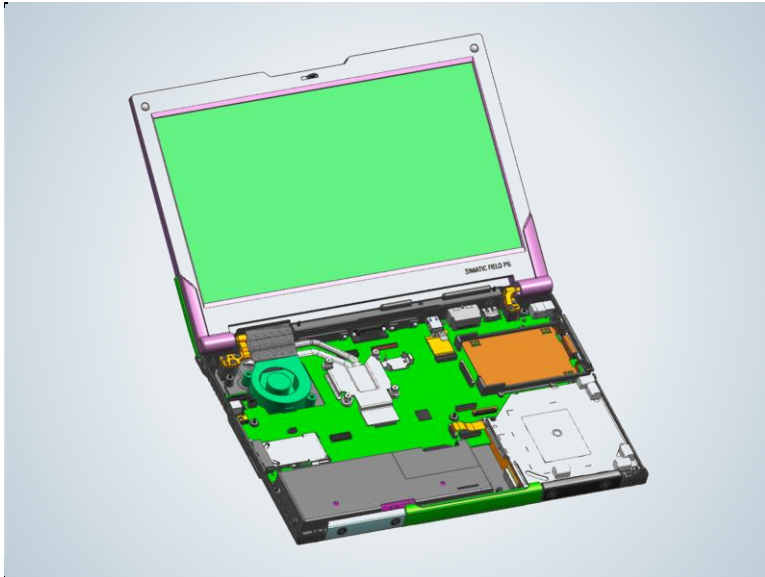
Develop,  
simulate,  
validate,  
and manage  
embedded  
software

Polarion ALM

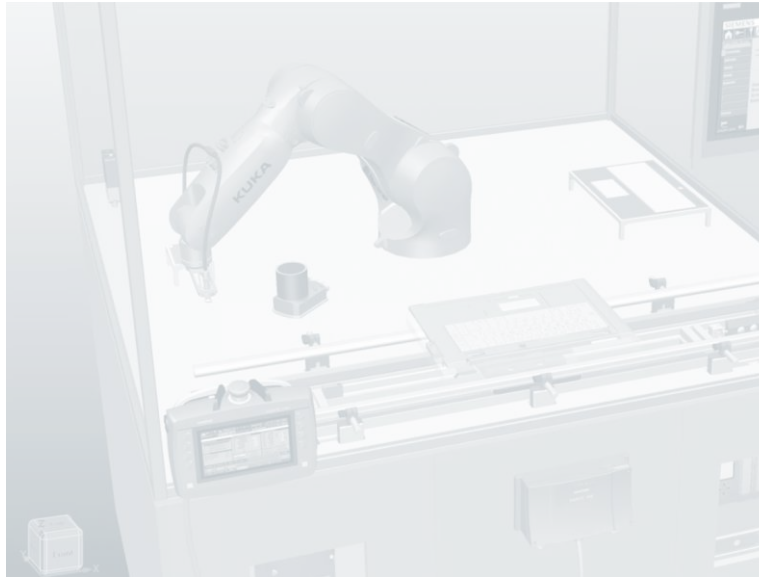


# Digital Twin

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Digital Twin of  
the product



Digital Twin of  
the production



Digital Twin of  
the performance

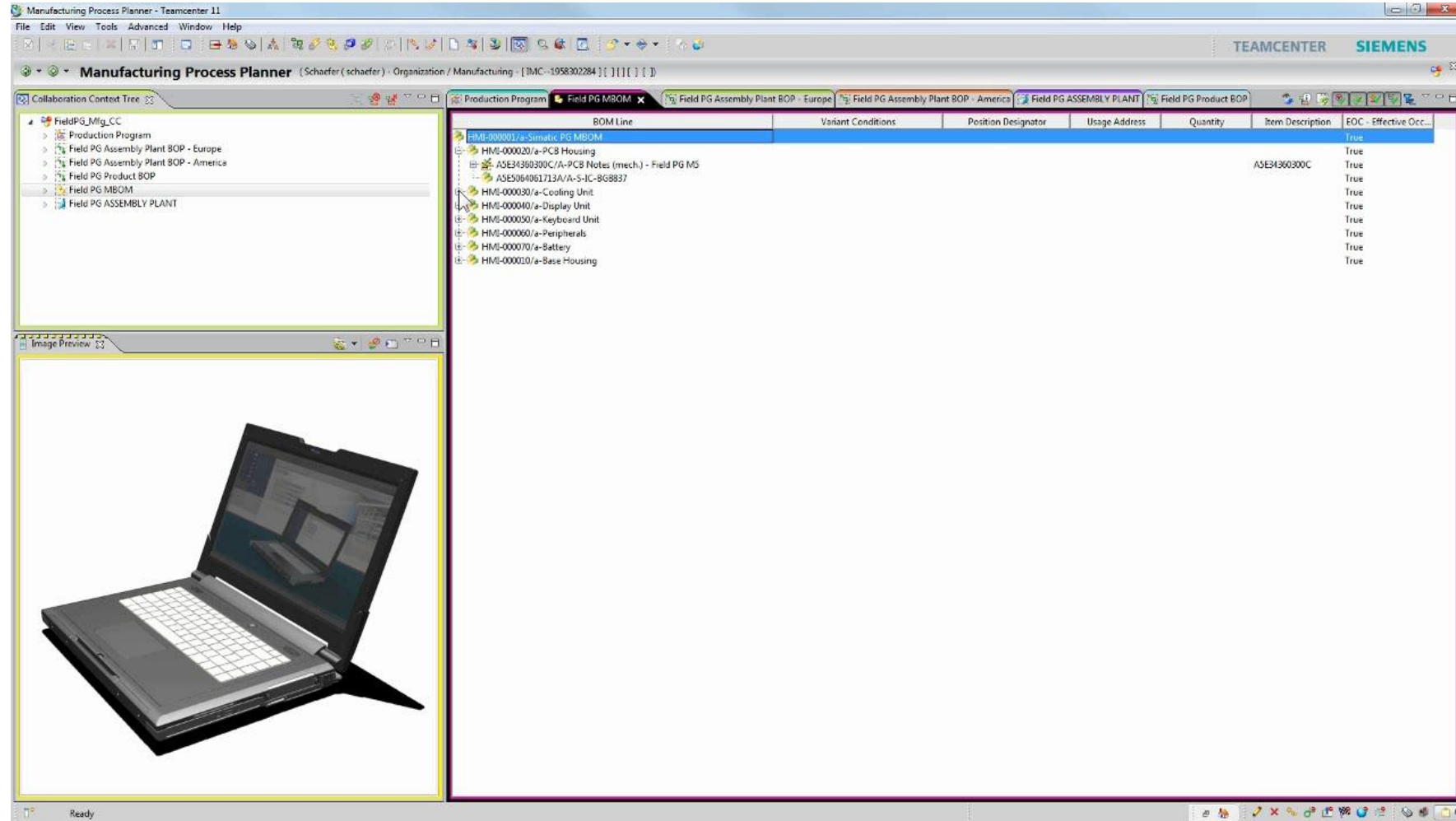


# Production planning



Plan and  
validate your  
production  
process

Teamcenter  
Manufacturing

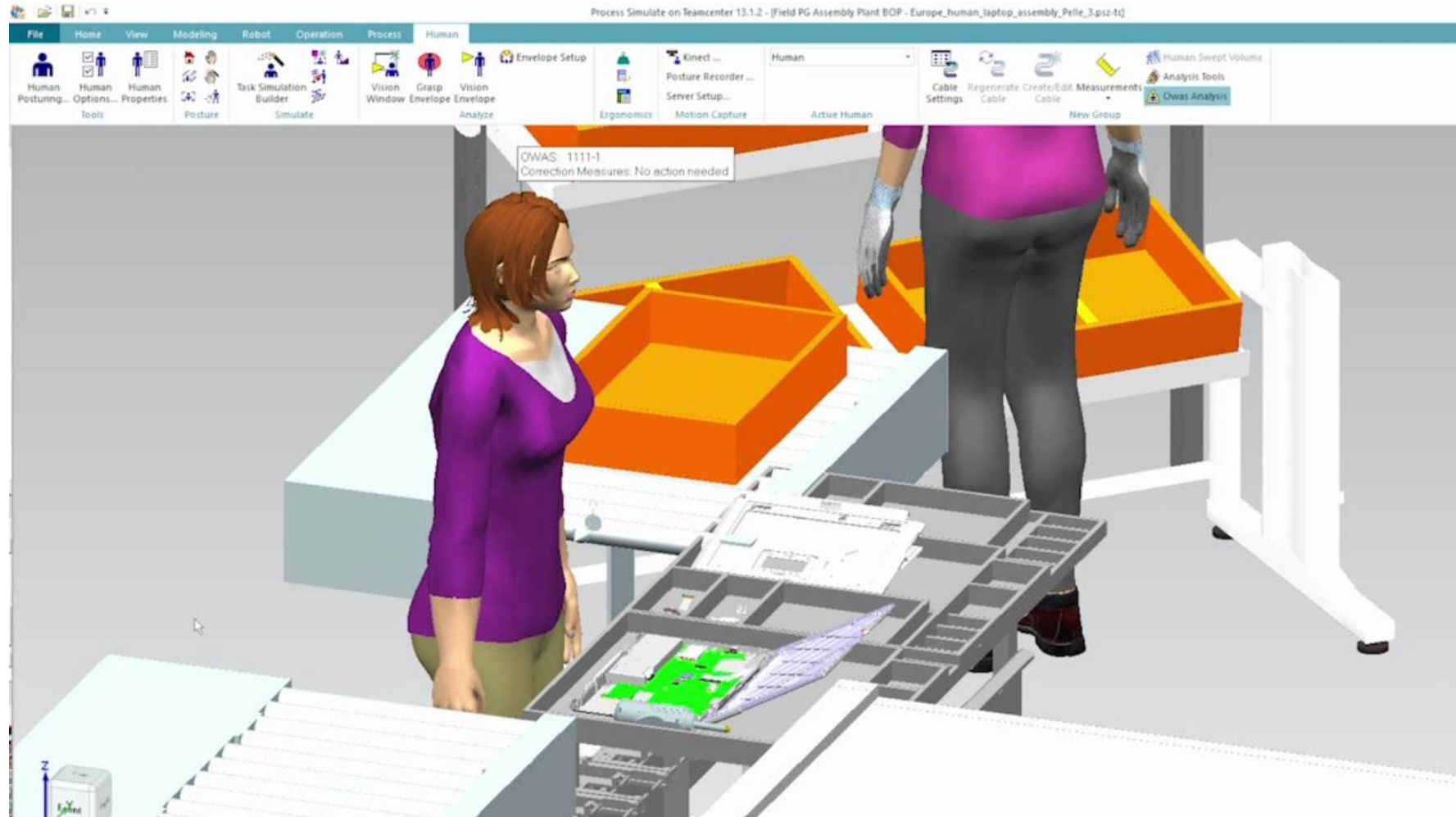


# Production planning

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Simulate  
working  
conditions  
for humans

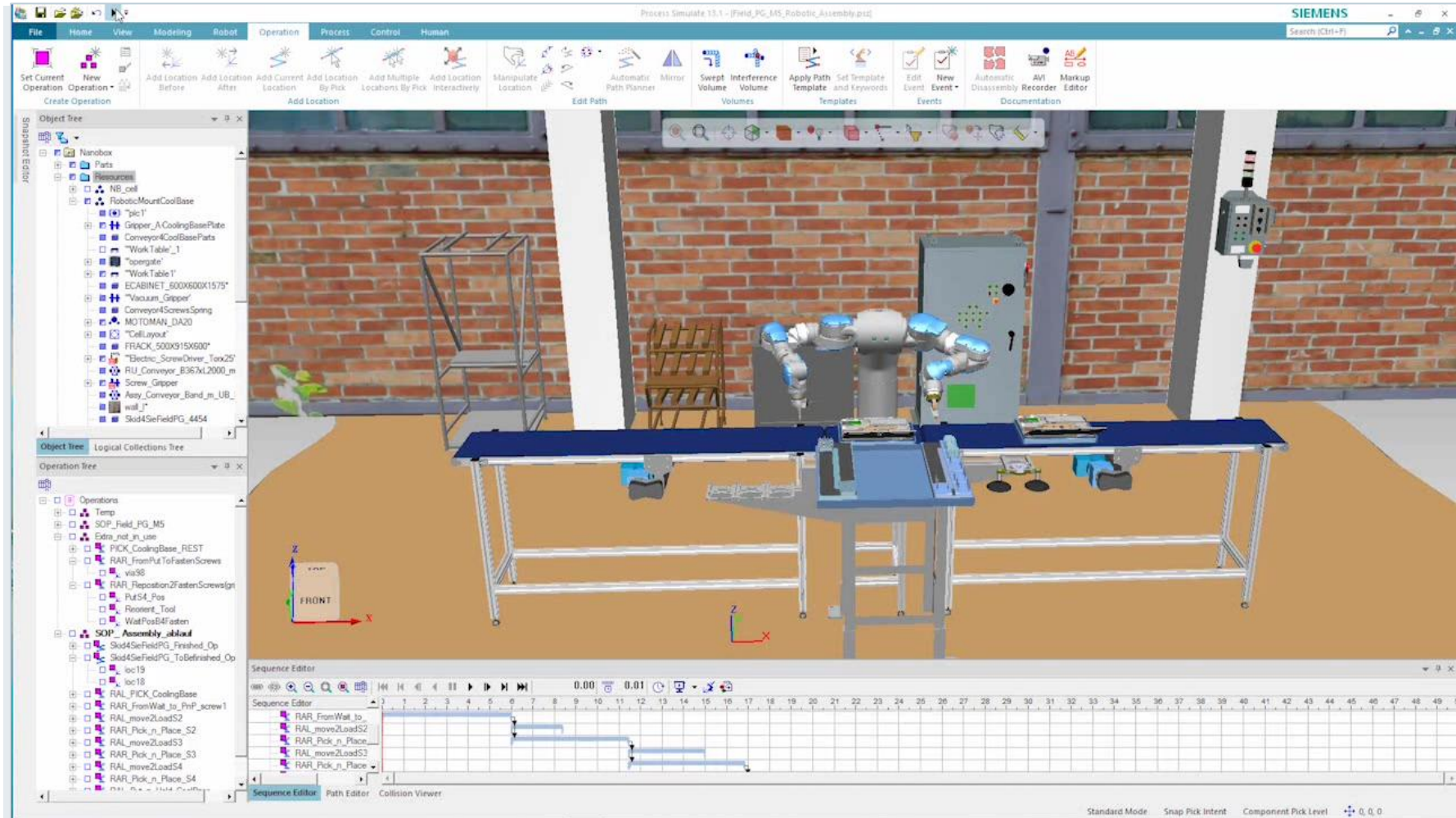
Tecnomatix  
Process Simulate



# Production planning

Simulate work processes for robots

Tecnomatix  
Process Simulate

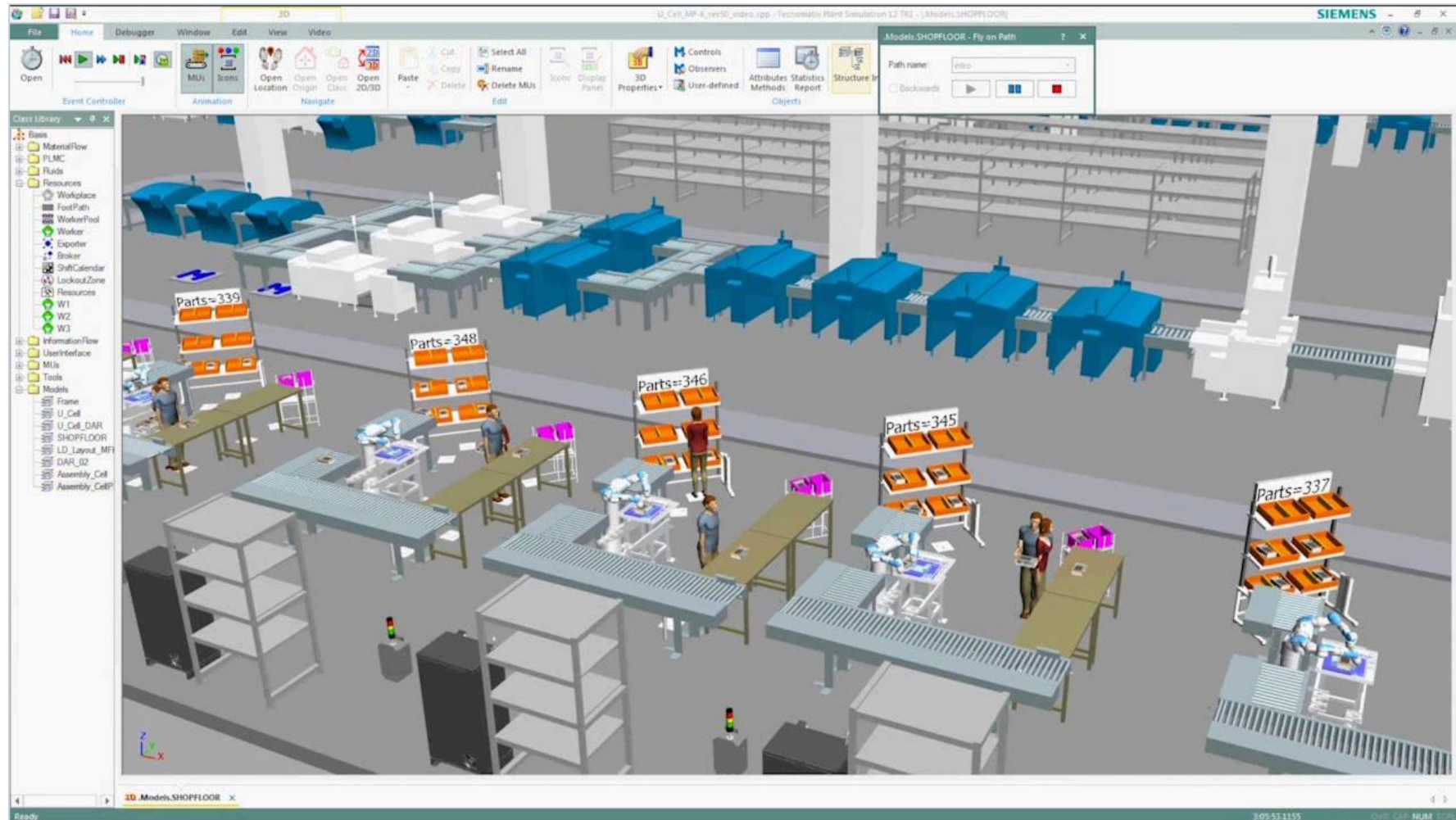




# Production planning

Simulate and optimize your production processes

Tecnomatix  
Plant Simulation

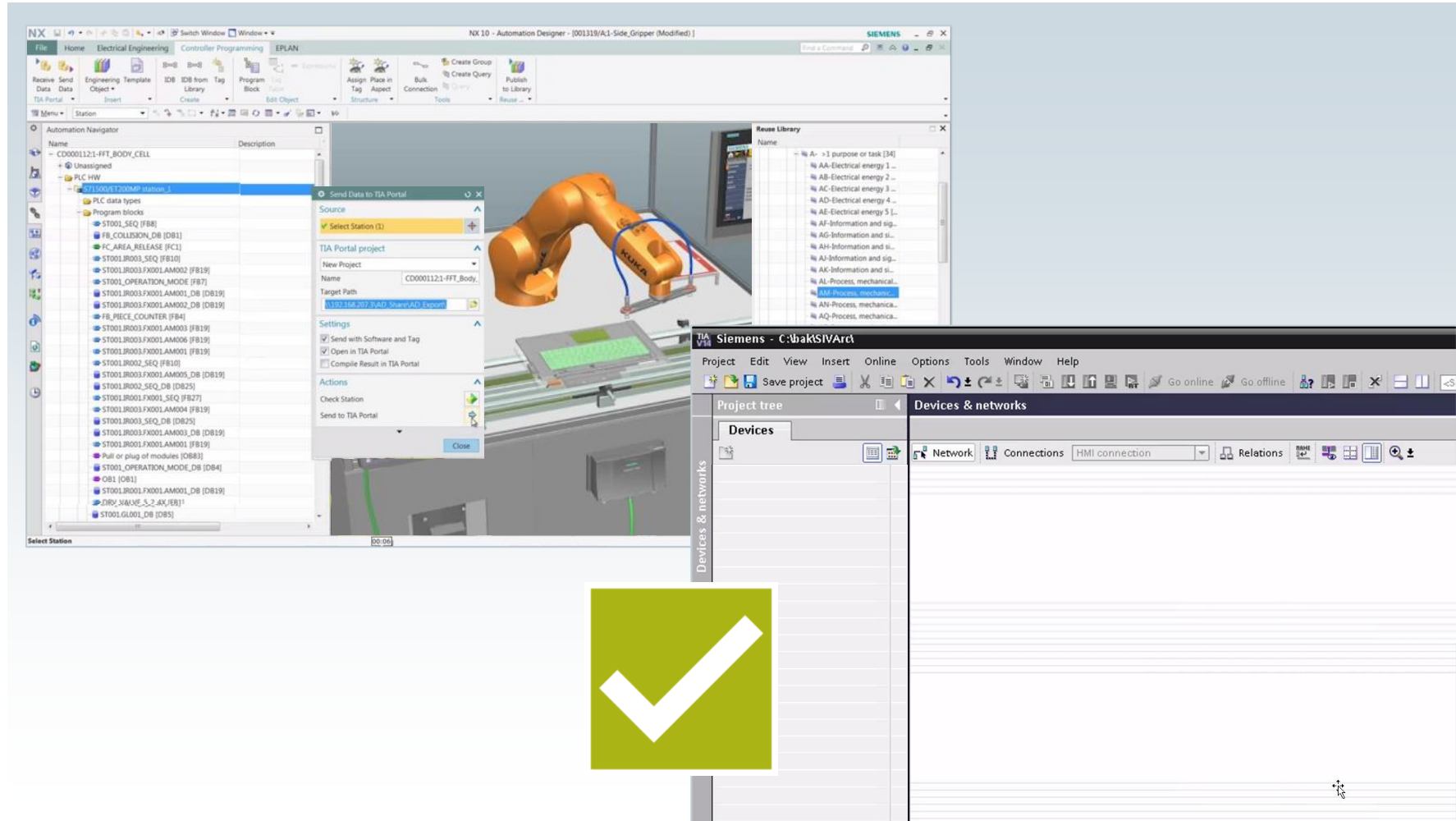


# Production engineering



Automatically  
generate the  
PLC code for  
TIA Portal

Automation Designer

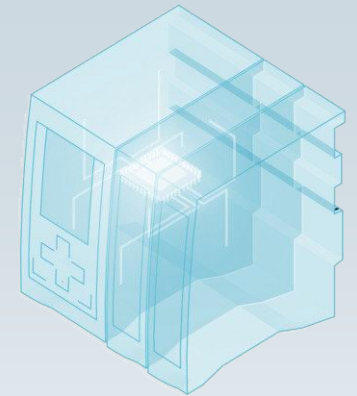
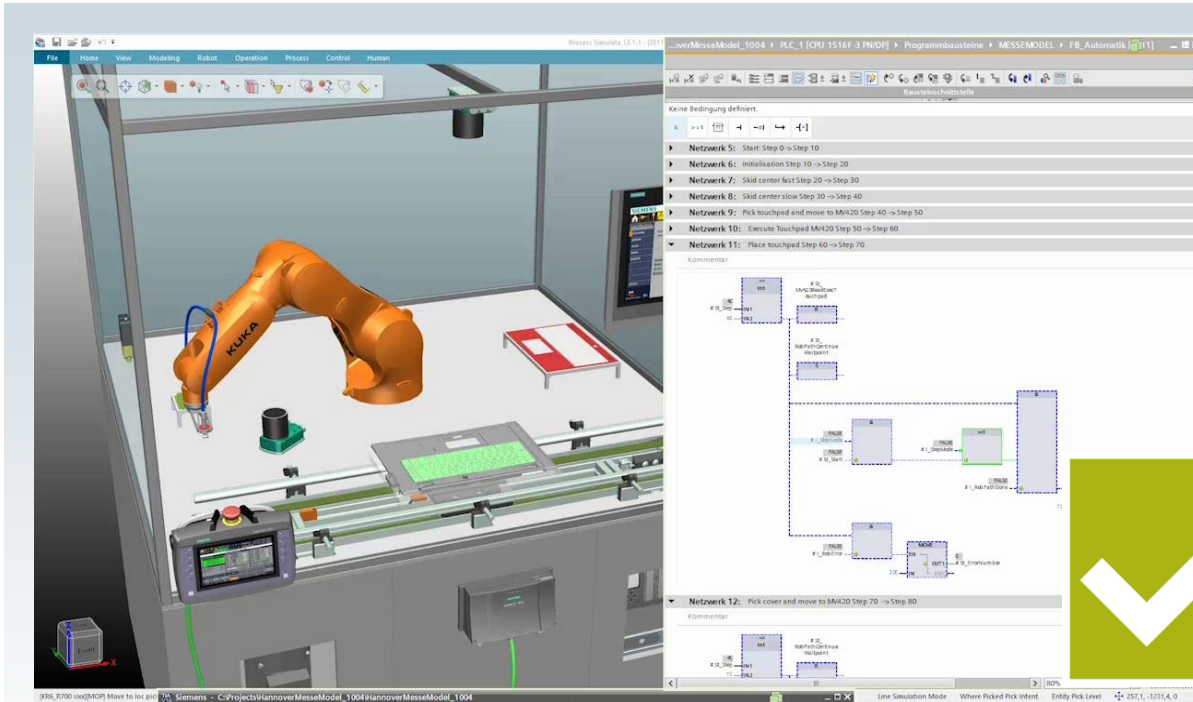


# Production engineering

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Validate the  
PLC code  
in the virtual  
world

Tecnomatix  
Process Simulate,  
PLCSIM Advanced,  
TIA Portal



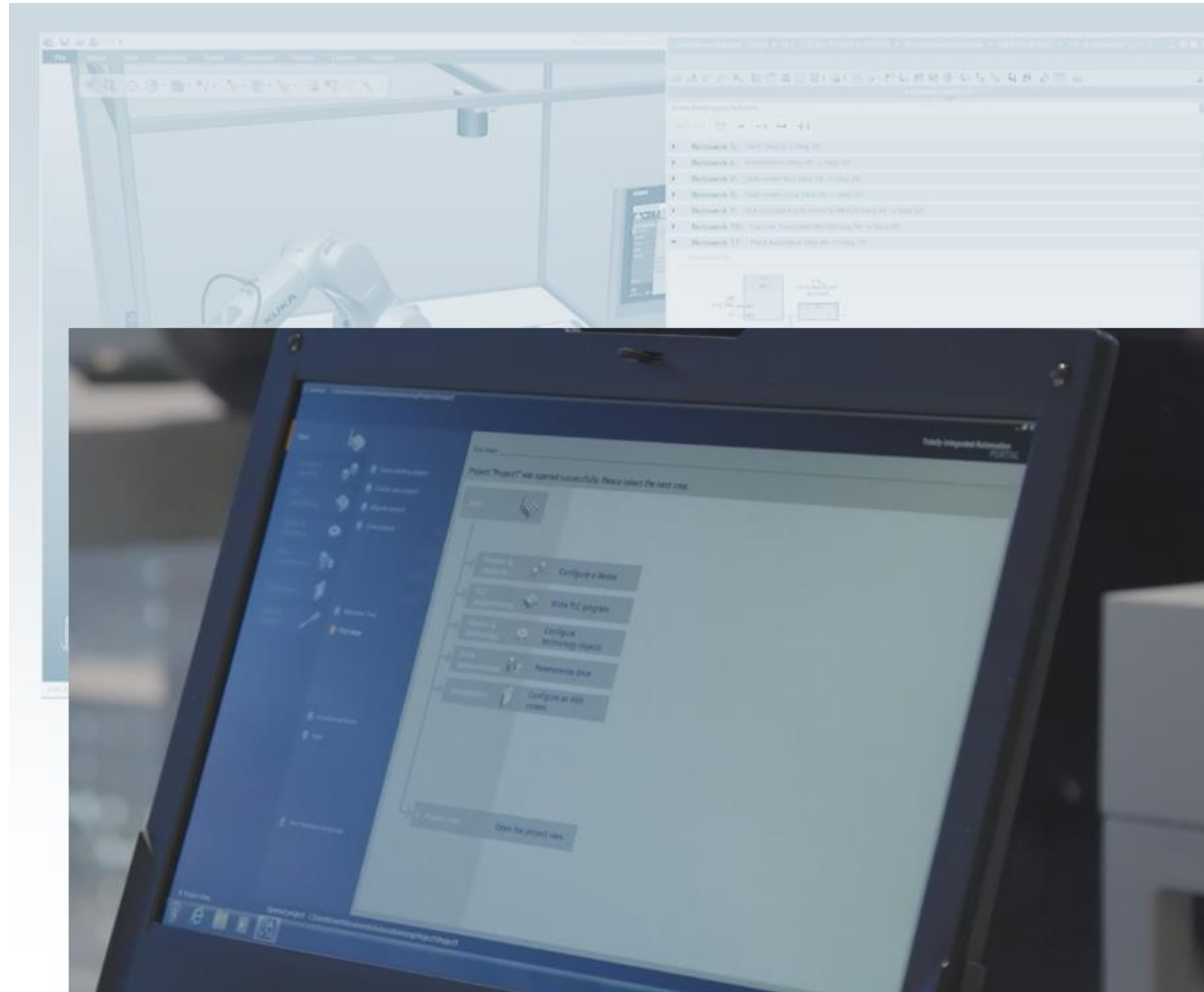
Digital Twin  
of SIMATIC  
S7-1500

# Production engineering

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Fast and  
efficient  
engineering  
and  
commissioning

Totally Integrated  
Automation Portal

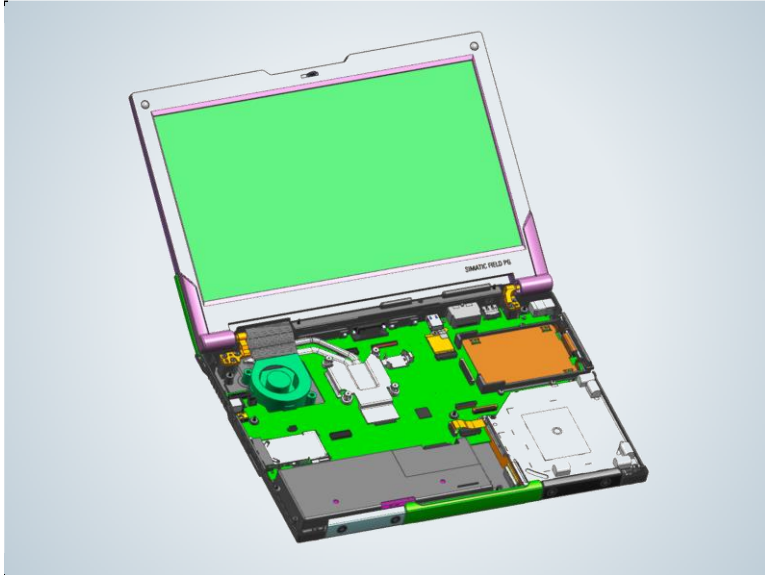


**SIMATIC**  
**S7-1500**

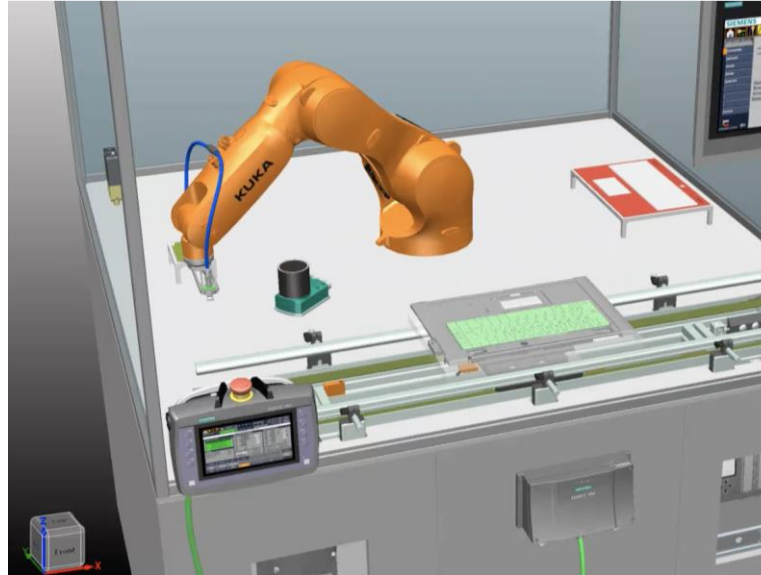


# Digital Twin

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Digital Twin of  
the product



Digital Twin of  
the production



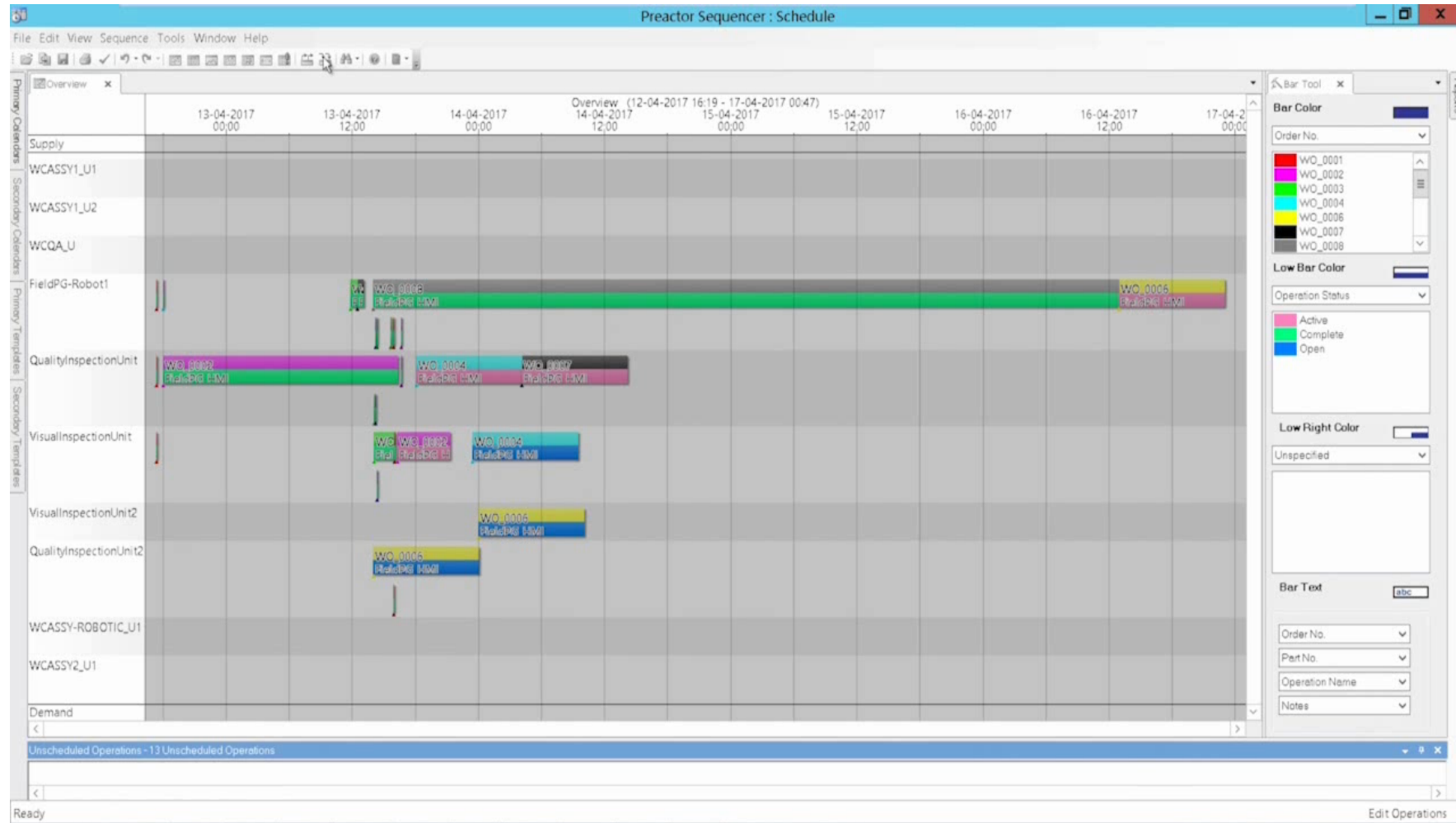
Digital Twin of  
the performance

# Production execution



Schedule  
your work  
operations

SIMATIC IT Preactor

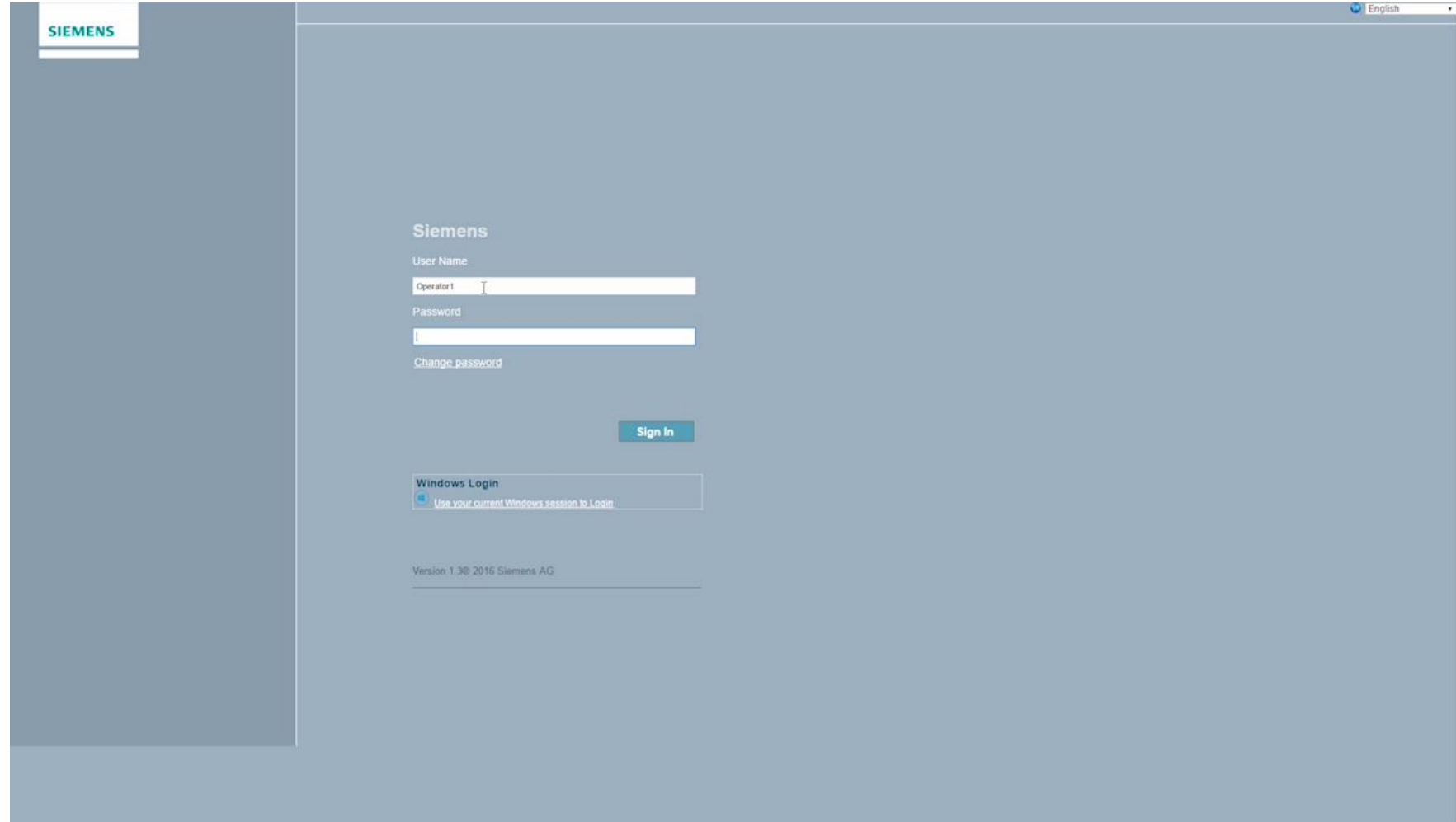


# Production execution



Easily process  
work  
operations

SIMATIC IT  
Unified Architecture



# Production execution

Run quality  
inspection  
operations

**SIMATIC IT**  
Unified Architecture



**SIMATIC IT Unified Architecture Discrete Manufacturing 1.0**

Home Main ▾

Work Order	Notifications	Work Orders pre-kit	Supervisor Non-Conformance	Product Coordinator Dashboard
Work Order Update	Change Management	Verify Work Orders	Hold	Future Hold
Product Coordinator Time Update	Operator Landing Page	Work Order Work in Progress	Genealogy	Tool
Inventory	Factory	Process flow	Storage	Wrench



# Production execution

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Efficient  
and secure  
production  
with TIA

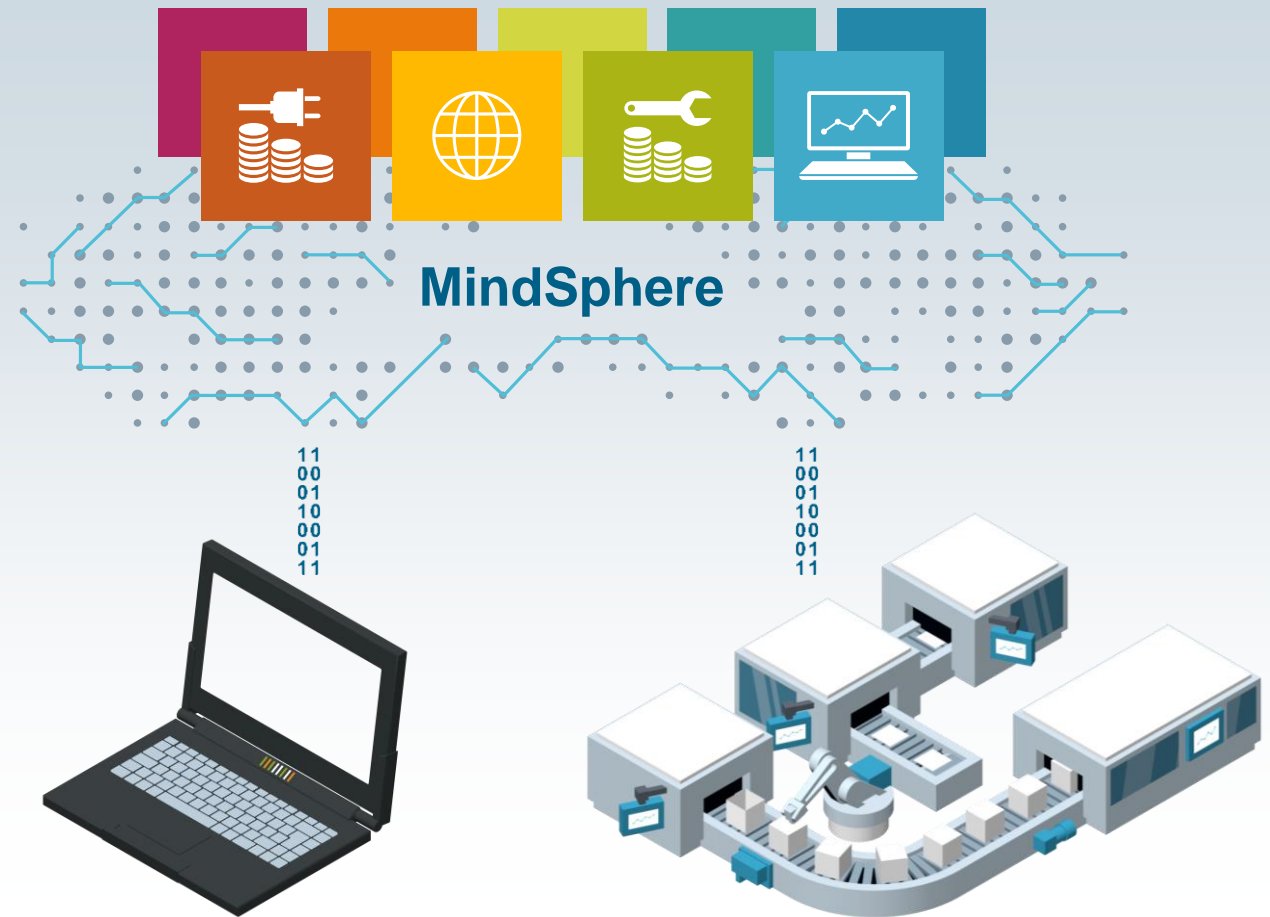
SIMATIC, SINUMERIK,  
SIMOTION, SIMOTICS,  
SINAMICS and SIRIUS



# Services

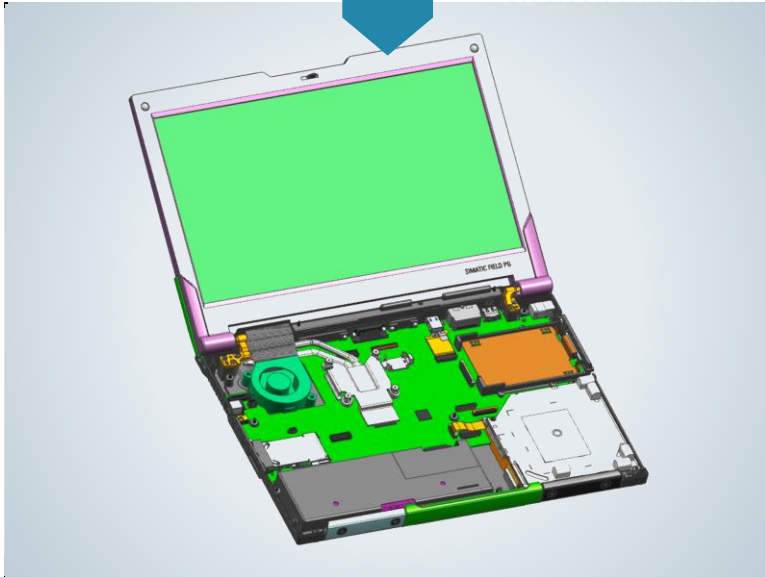
Let your  
products and  
your production  
speak to you

MindSphere –  
the cloud-based, open  
IoT operating system

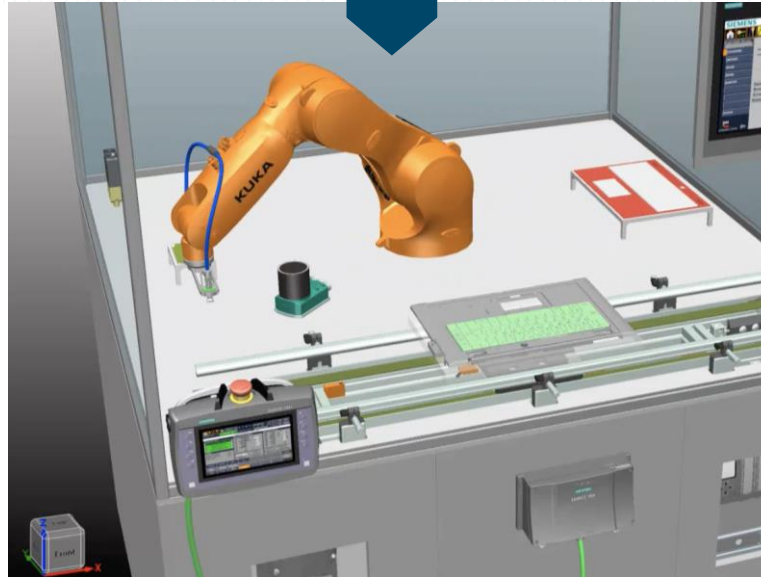




feed back insights to continuously optimize product and production



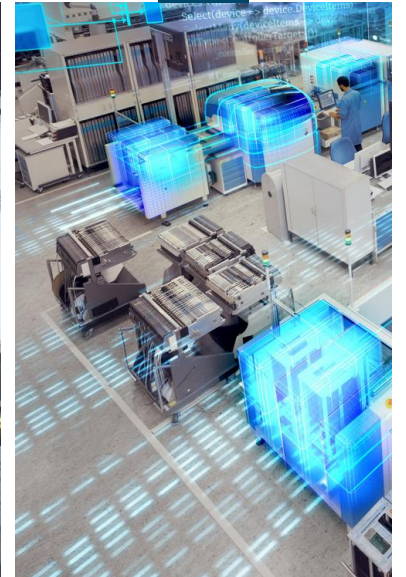
Digital Twin of the product



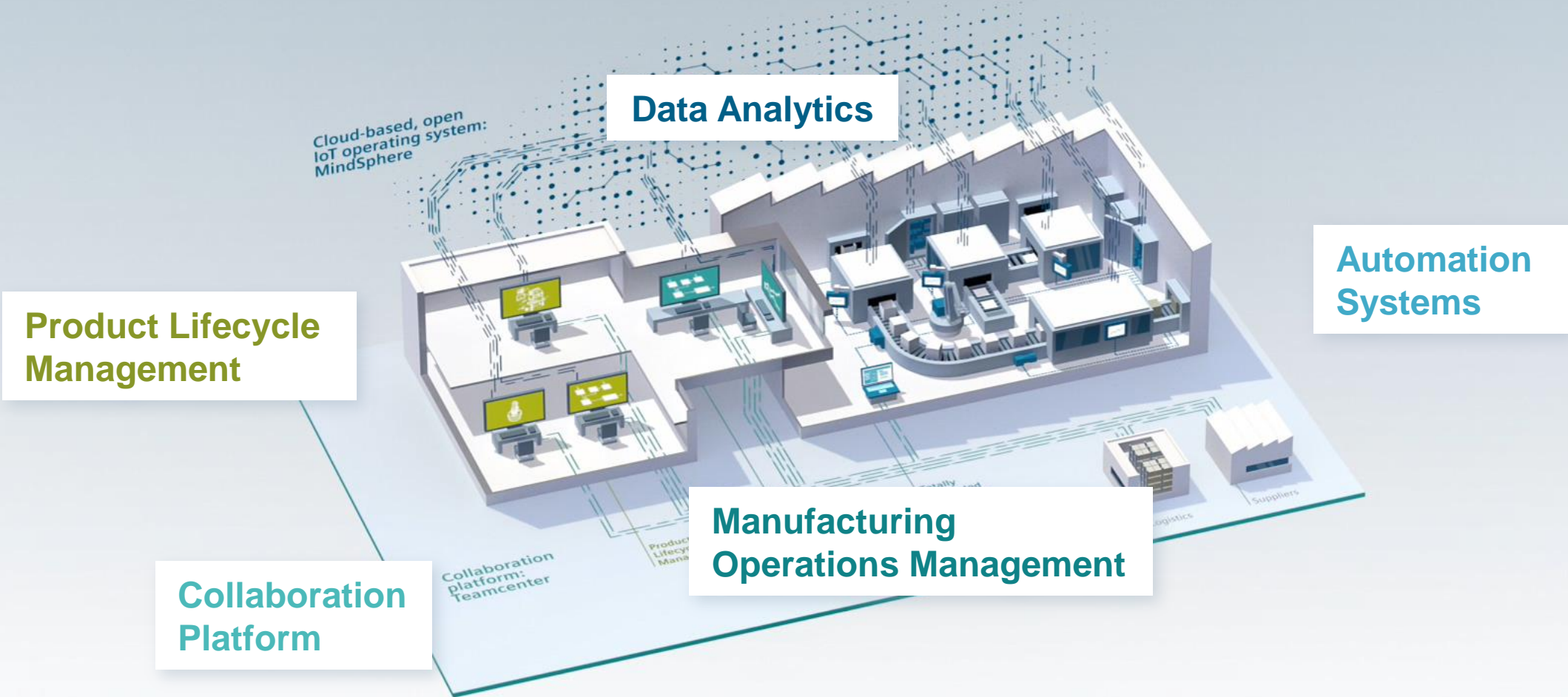
Digital Twin of the production



Digital Twin of the performance



# Digital Enterprise Suite



# Rolls Royce

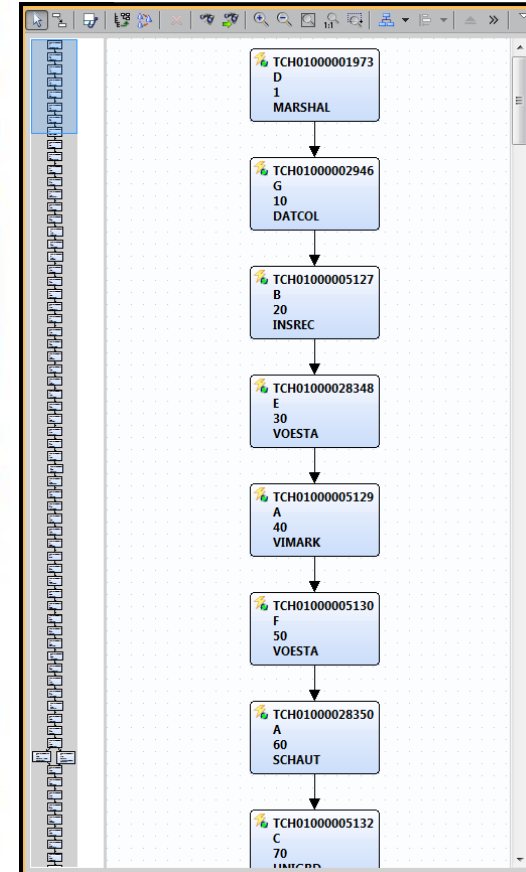
50 Global Plants : Machining & Assembly

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PLM / MOM in  
Closed-Loop  
reduces engine  
assembly time  
by 60 hours



## Bill of Process



**Maserati : FIAT Chrysler**

**SIEMENS**  
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**70,000 different  
product  
combinations  
are produced  
3x faster with  
30% decrease  
in Time to  
Market**



# We embrace digitalization in our own operations

**SIEMENS**  
*Ingenuity for Life*



**Speed**



**1 per second**

We produce more than 1 million products per month – one per second.

**Flexibility**



A growing portfolio of **1300** products

digitally designed for 60,000 different customers.

**Quality**



Quality level of

**99.99895%**

or 10.5 defects per million.

**1** Product design

**2** Production planning

**3** Production engineering

**4** Production execution

**5** Services

**SIEMENS**  
*Ingenuity for life*





A night view of a city with a large stadium illuminated, overlaid with a blue digital circuit pattern. The scene is captured from an elevated position, showing the city lights and the stadium's bright lights. The digital overlay consists of glowing blue lines and dots, resembling a circuit board or data network, set against a dark blue background with a starry sky effect.

**Thank you**