



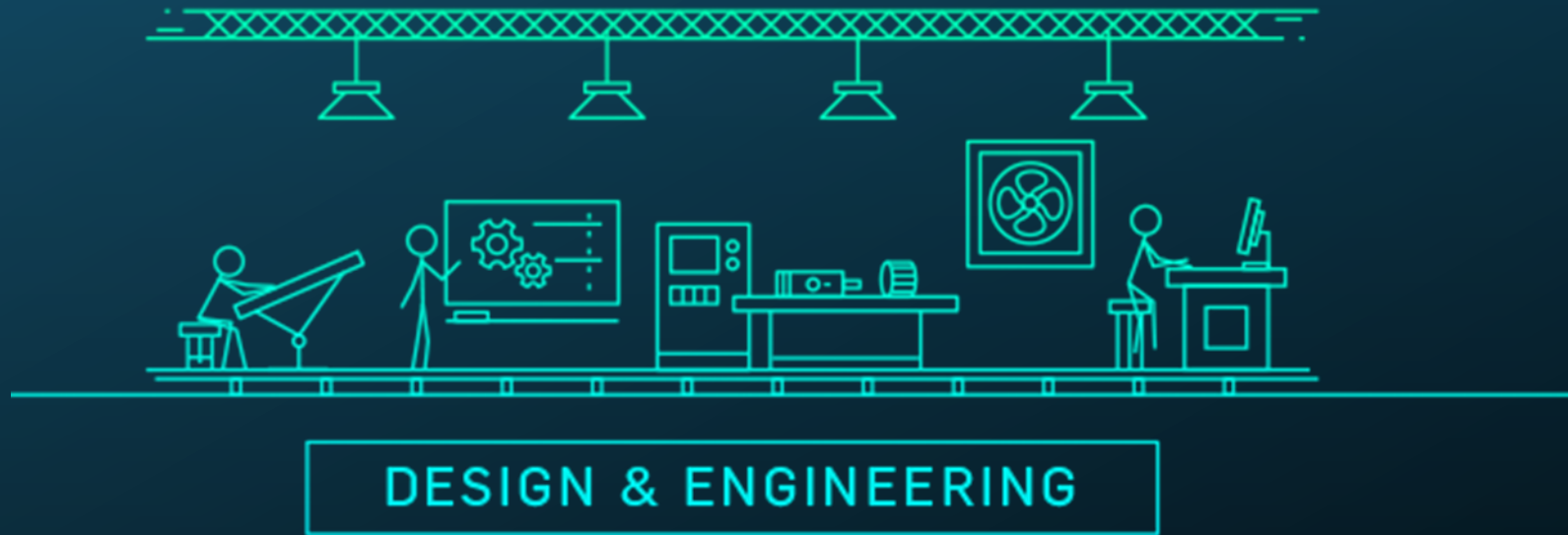
Making manufacturing smarter

Norbert Hanke
President, Manufacturing
Intelligence division

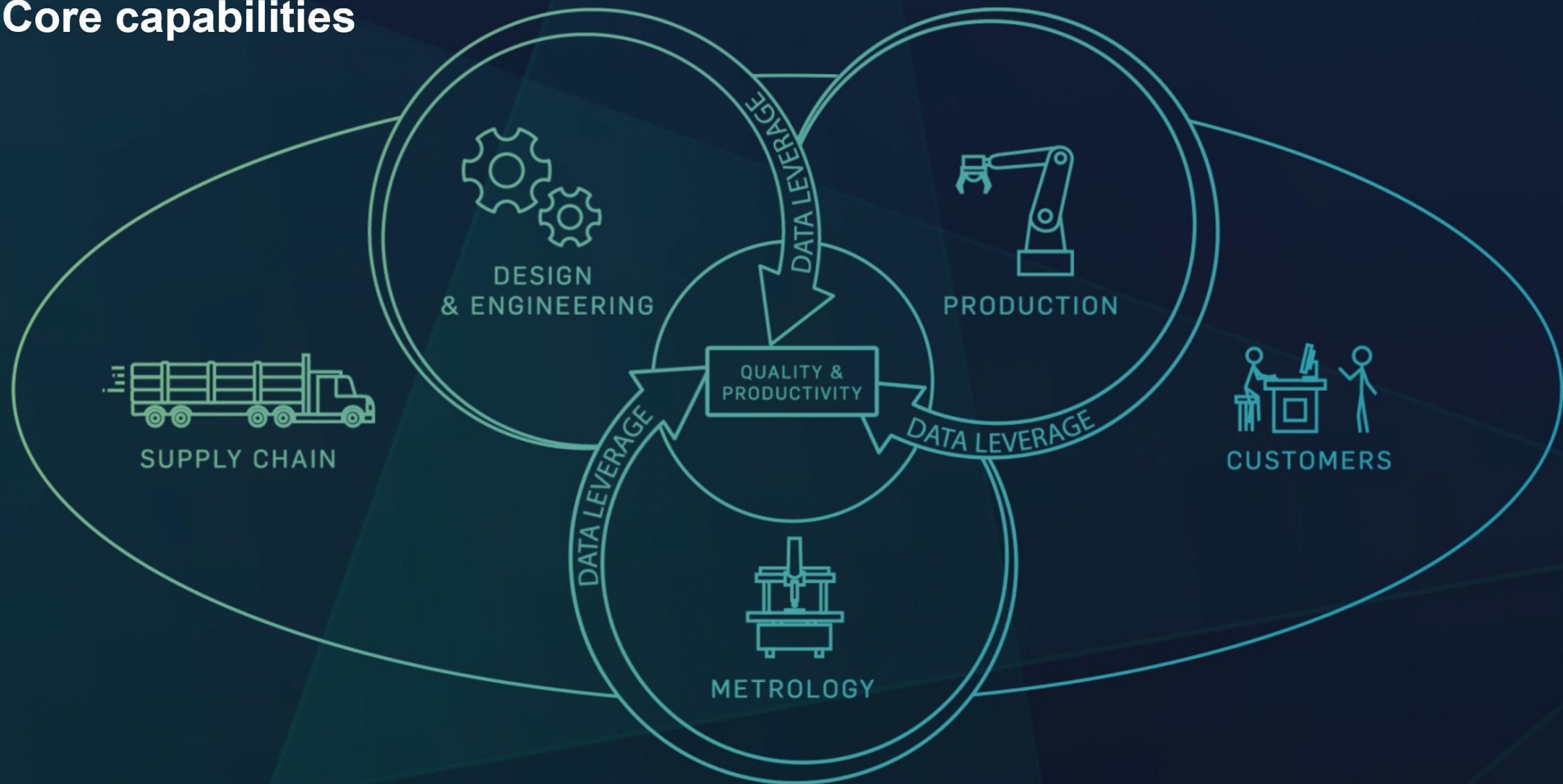
Business introduction

Core capabilities

Generating and using data from the real and virtual worlds to improve quality & productivity



Core capabilities

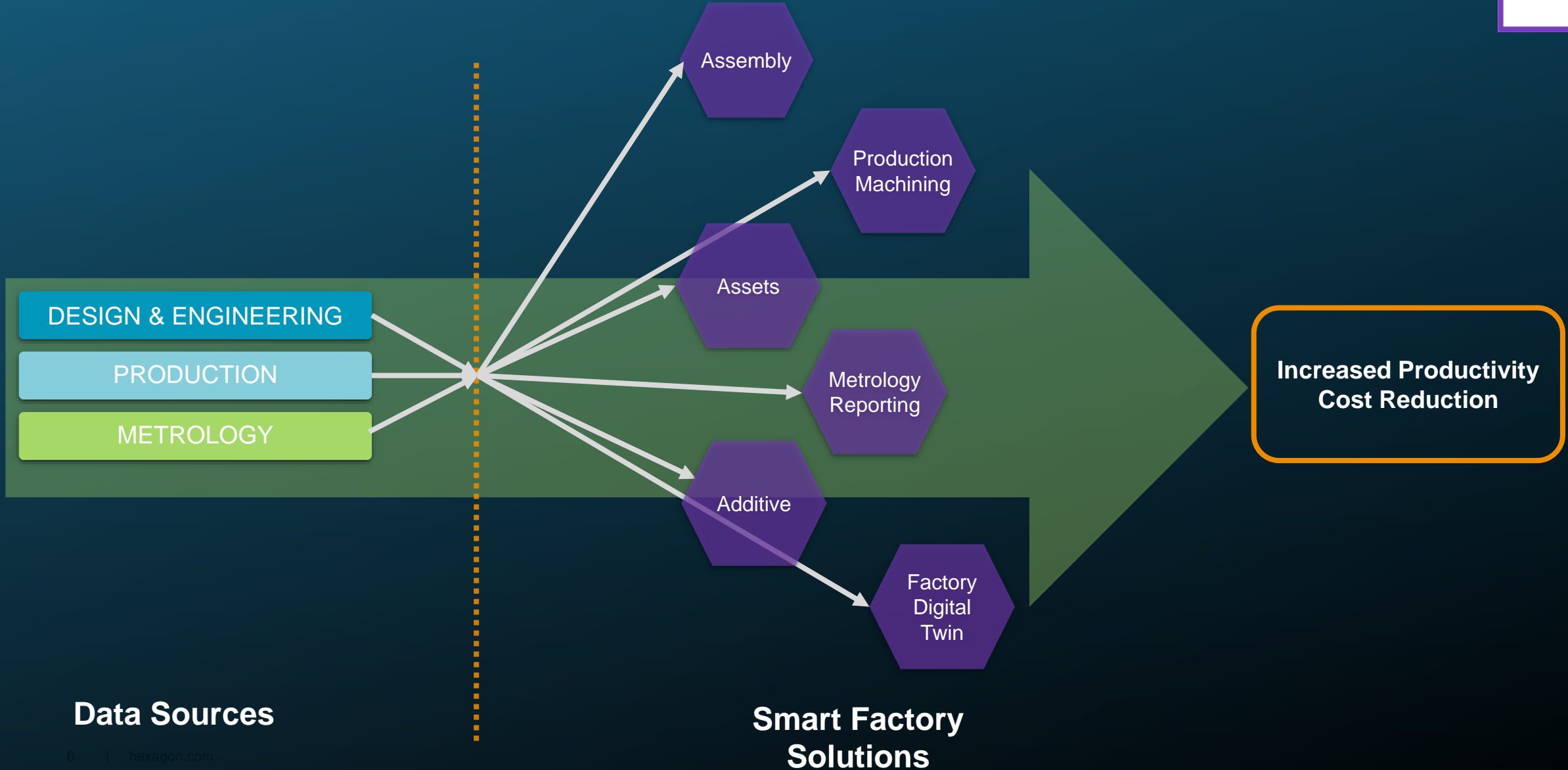


Automation is good, autonomous is better!



Combining Data from the Real and Virtual Worlds

SF_x



Hexagon Manufacturing Intelligence at a glance

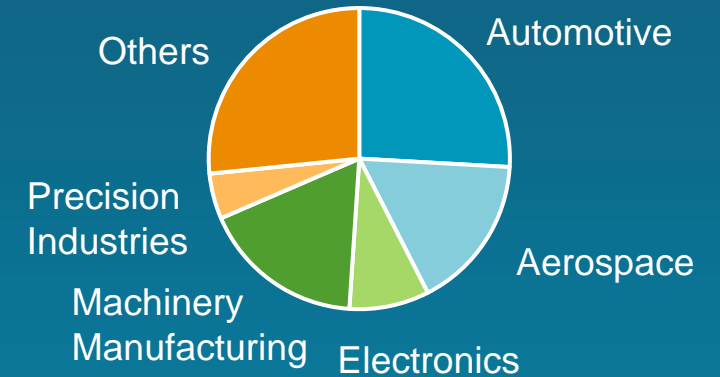
DIGITAL MANUFACTURING LEADER

- Solutions leverage data from design and engineering, production and metrology to improve manufacturing quality, efficiency and productivity
- 60 percent software and services
- Revenue ~1.5bn. EUR

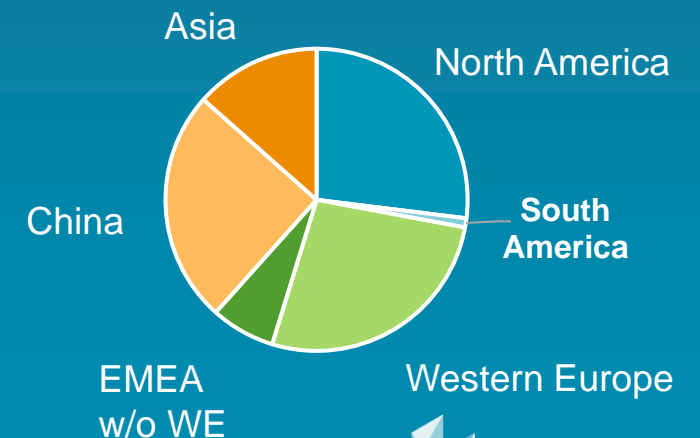
GLOBAL THINKING & LOCAL ACTING

- Active business in more than >100 countries
- 8 000+ employees
- 75 percent direct sales

Sales by segment



Sales by region





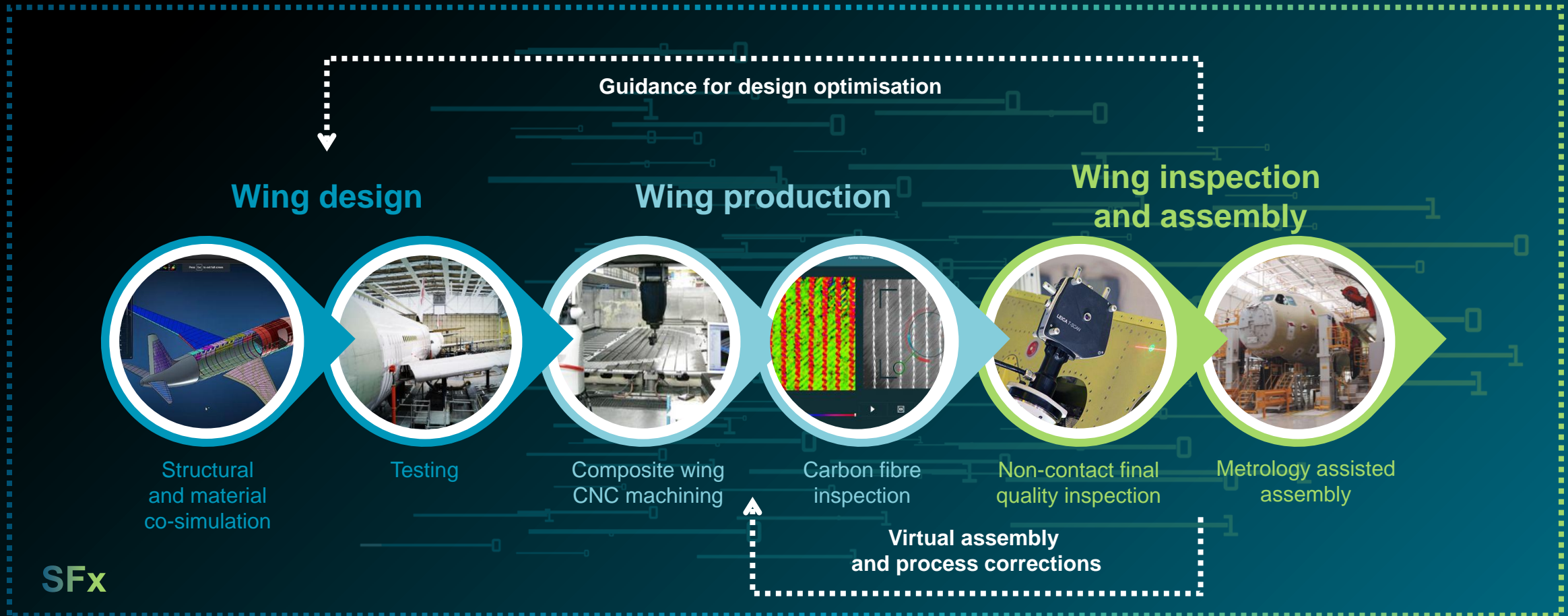
Aerospace

Customer Challenges

- Time to Market
- Productivity

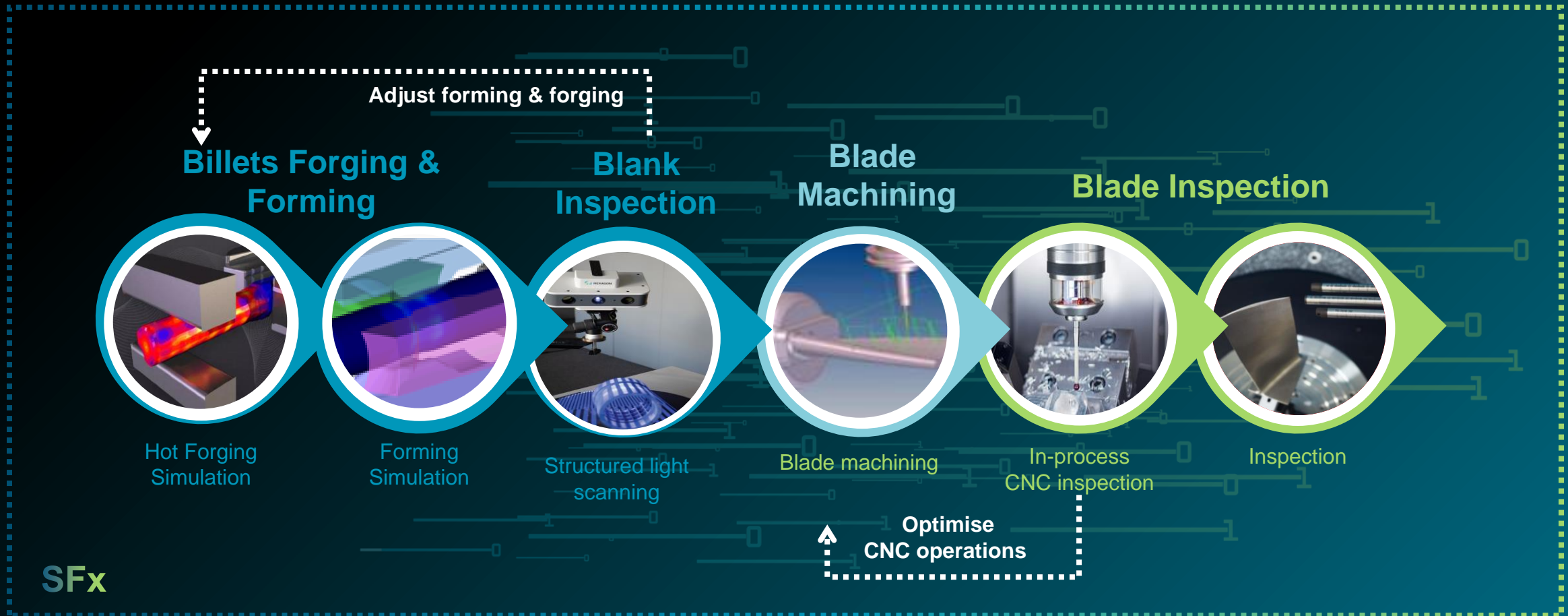
Aerospace customer challenge: Time to market

Enhanced wing to fuselage assembly process



Aerospace customer challenge: Productivity

End-to-end aero-engine blade manufacturing





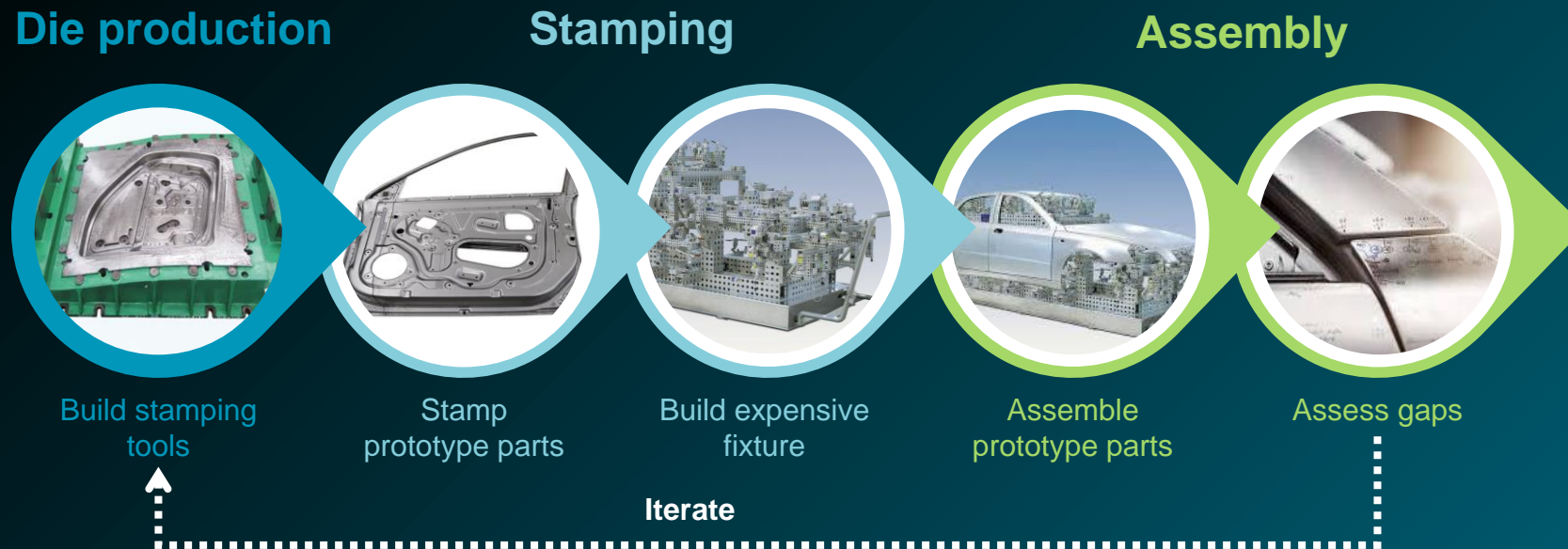
Automotive

Customer Challenges

- Time to Market
- Productivity
- Move to Electric

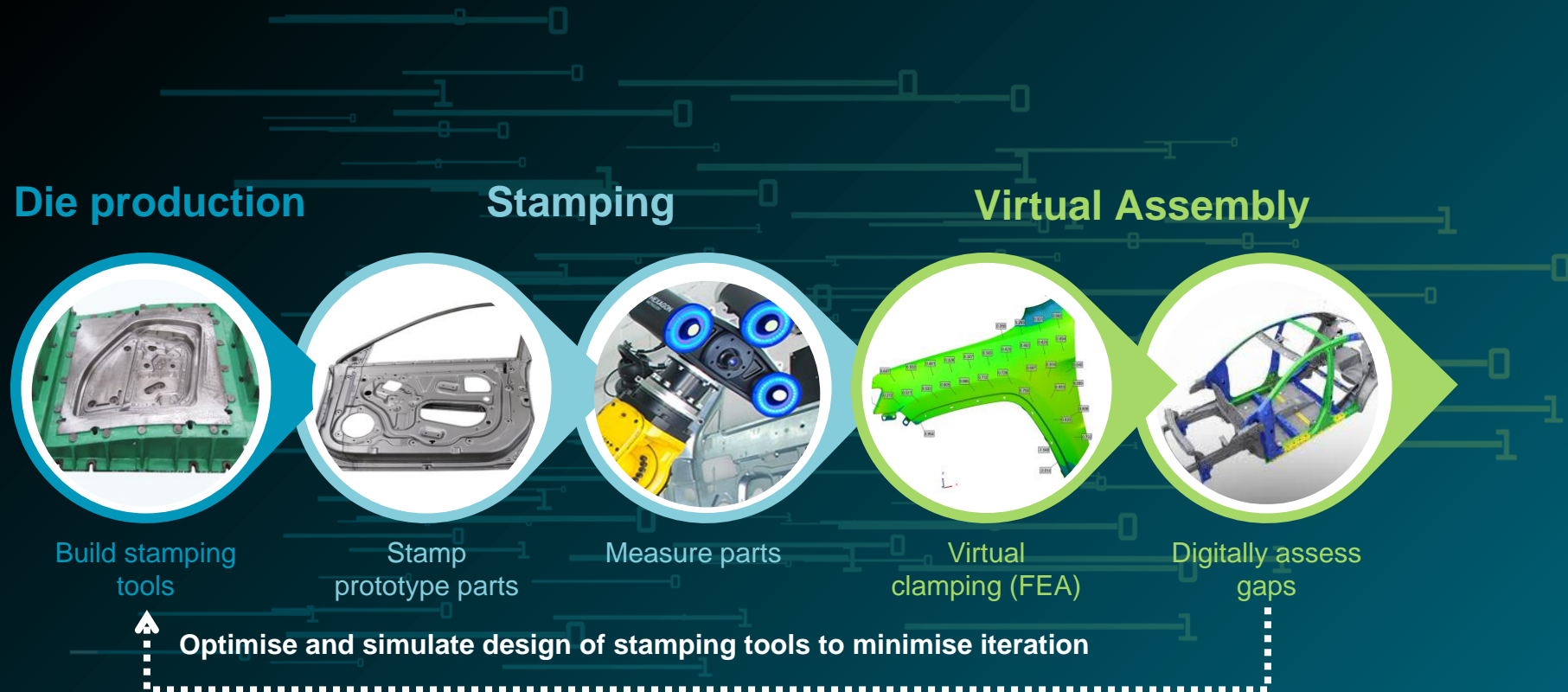
Automotive customer challenge: Time to market

Digital twin assembly



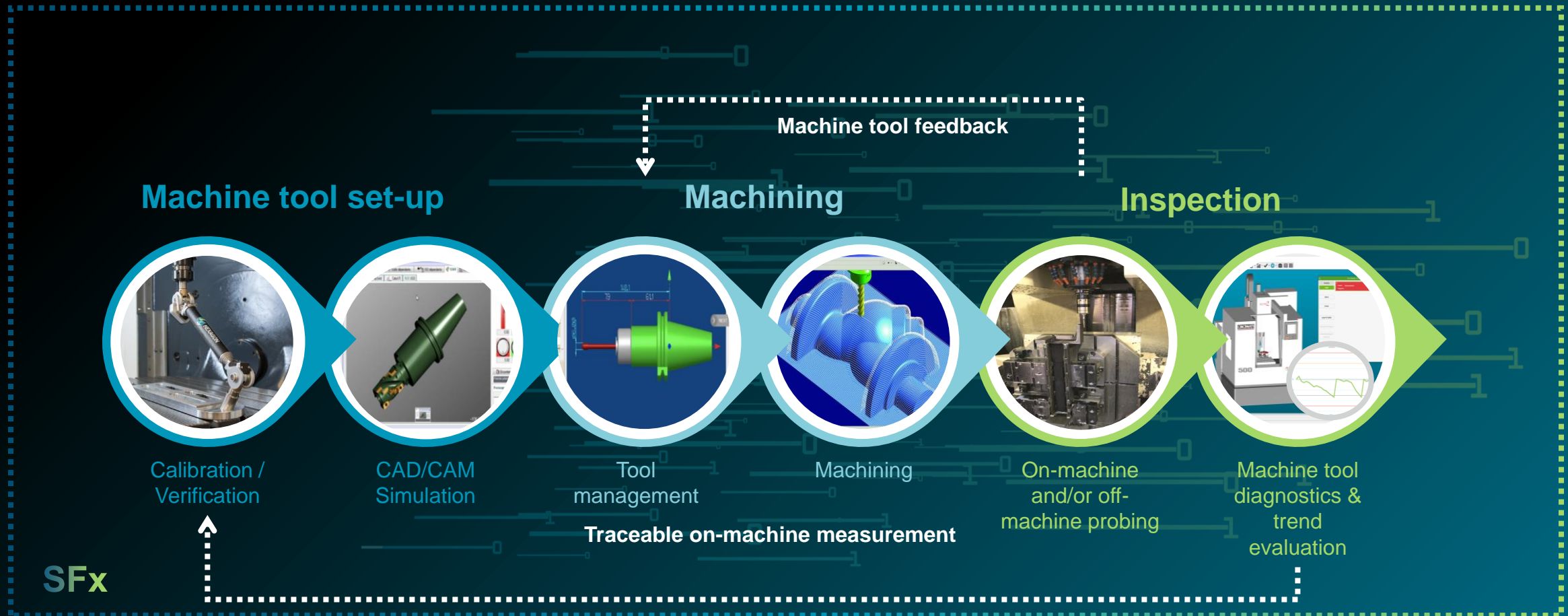
Automotive customer challenge: Time to market

Digital twin assembly



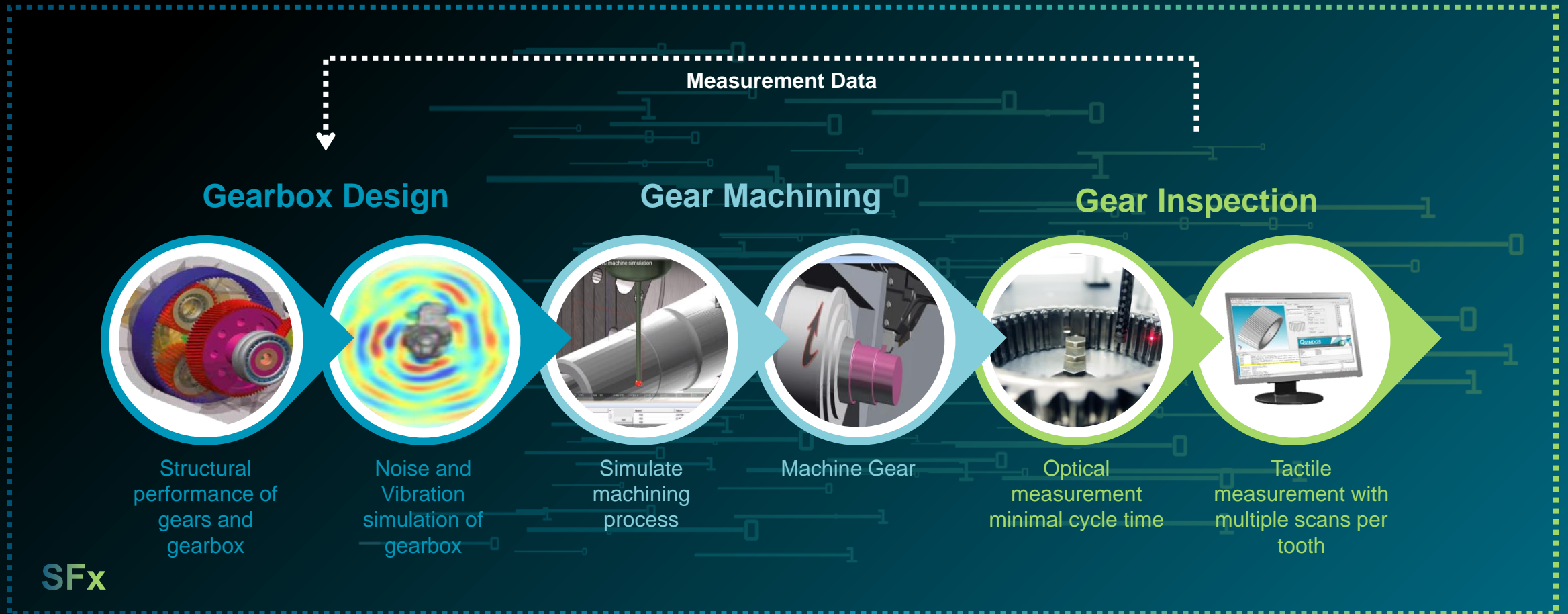
SF_x

Automotive customer challenge: Productivity Towards Self-optimising machine tools



Automotive customer challenge: Electric cars

New transmissions; high speeds and associated torques



VinFast - Vietnam First Homemade Car Manufacturer

Time to Market



R&D and Design

- Research & Development
- Design & Dynamics Simulation
- Product Development Activities



Production, Assembly & Quality Assurance

- **Q-DAS** - Quality management systems
- **eMMA** – Assembly management
- **Toro Advantage** - SUV & Sedan body frame
- **Portable Arm & Tracker** - Body part
- **White Light** – Press parts
- **Global S CMM** – Engine parts





Simulation gets real

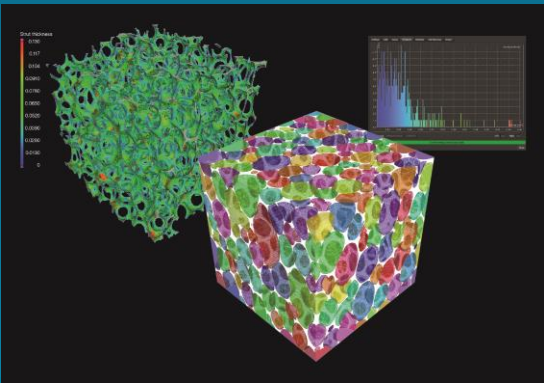
Paolo Guglielmini

President,
Design and Engineering Software

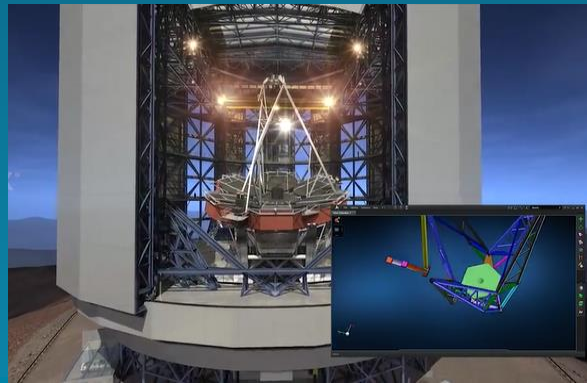
Why enter the CAE software space?

The rationale for our acquisition of MSC Software back in early 2017

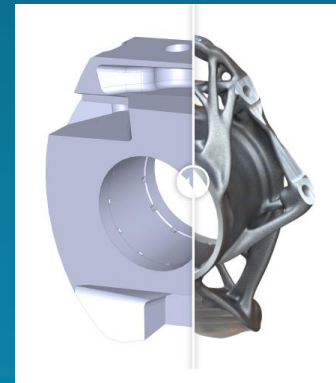
Predict part and process performance crucial to Smart Factory



Gain access to our OEMs' design departments



CAE underlying growth, in user base and disciplines



MSC Software footprint in automotive and aerospace



(*) Computer-aided engineering (CAE) software is broadly utilised to perform engineering analysis, finite element analysis (FEA), computational fluid dynamics (CFD), multibody dynamics (MBD), durability and optimization amongst others.



Solutions Development – Strategies

Lead in fast-growth adjacencies

- ✓ Virtual Manufacturing
- ✓ Materials
- ✓ Co-Sim, embed Acoustics and Complex Fluid Dynamics (CFD)

Smart Factory ready

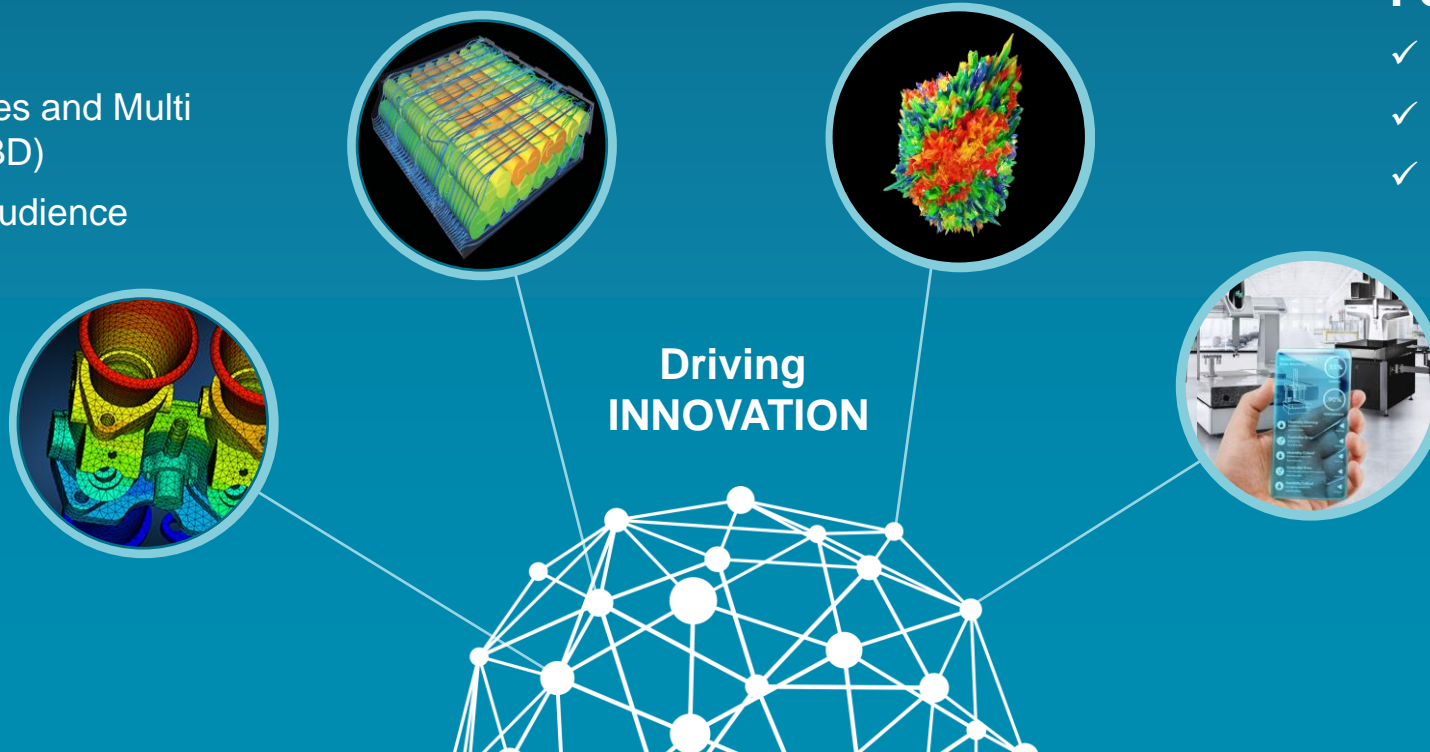
- ✓ From CAD... to any data set
- ✓ Costing, Manufacturability, Sustainability
- ✓ Image based simulation

APEX platform

- ✓ Strengthen Structures and Multi Body Dynamics (MBD)
- ✓ UX to target wider audience
- ✓ Workflow focus

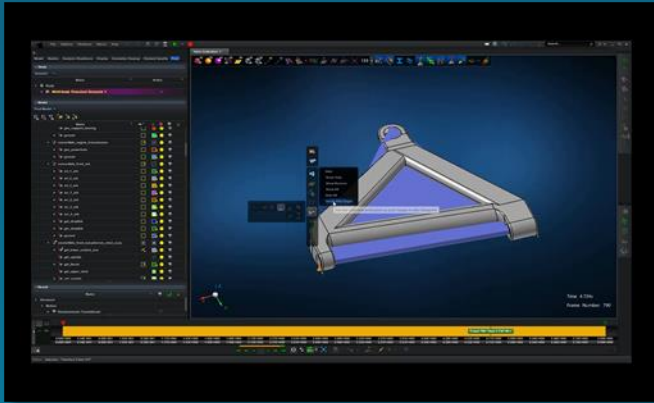
Force Multipliers

- ✓ Machine Learning applied
- ✓ Drive Automation and Scalability
- ✓ Cloud delivery



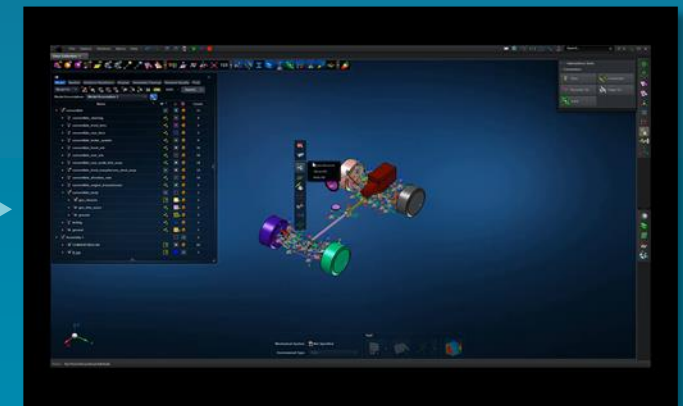
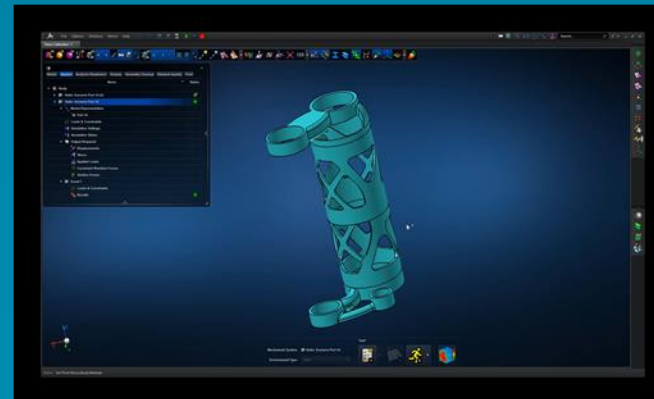
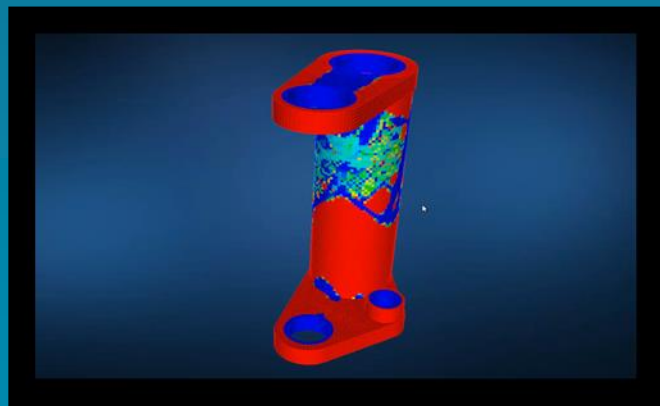
Apex platform, consolidate the structural domain

Explore design space



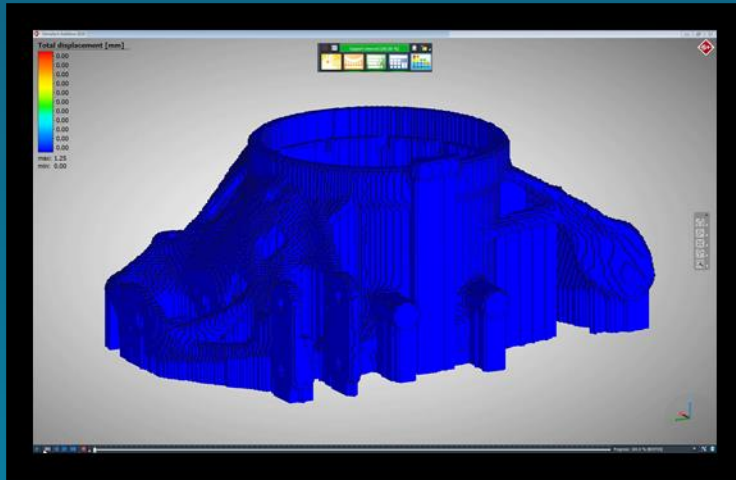
Productive: Unparalleled productivity, automation
Accessible: 300k analysts vs 3m engineers
Pervasive: Entry point for multi-physics adoption
Fundamental: Building block for SFX solutions

Validate for manufacturing

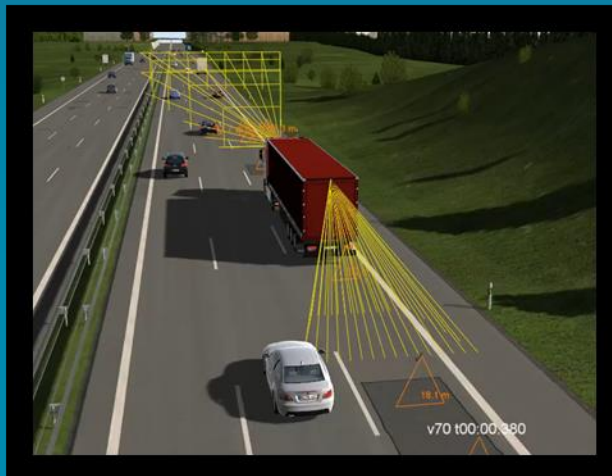


Fast growth adjacent markets

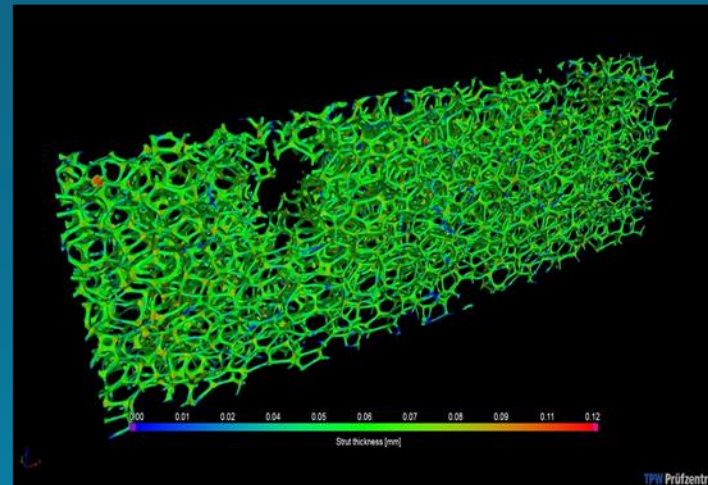
Virtual manufacturing



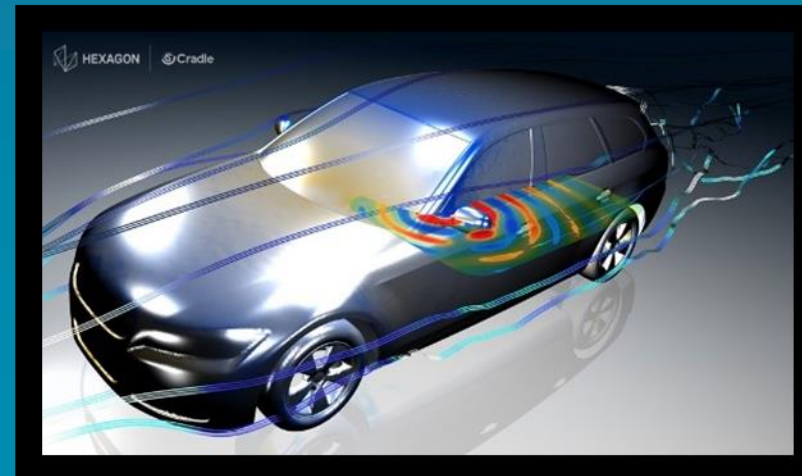
AV / ADAS



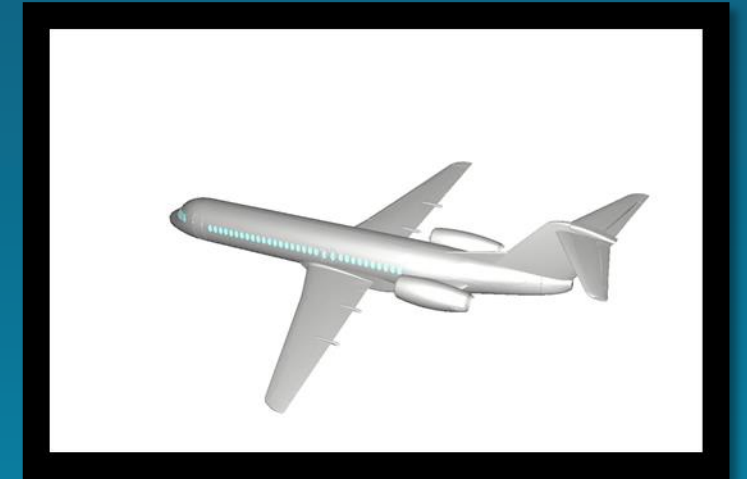
Materials



Acoustics and CFD

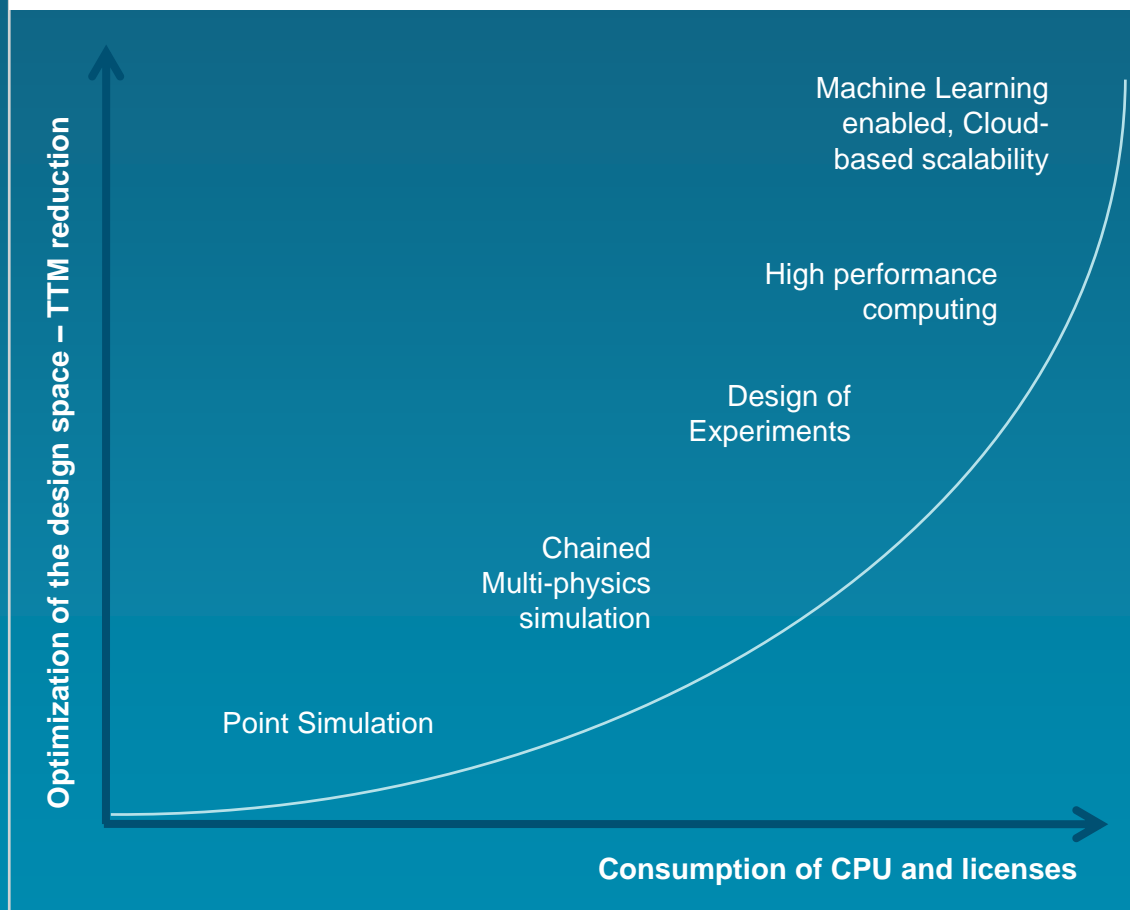


Co-simulation

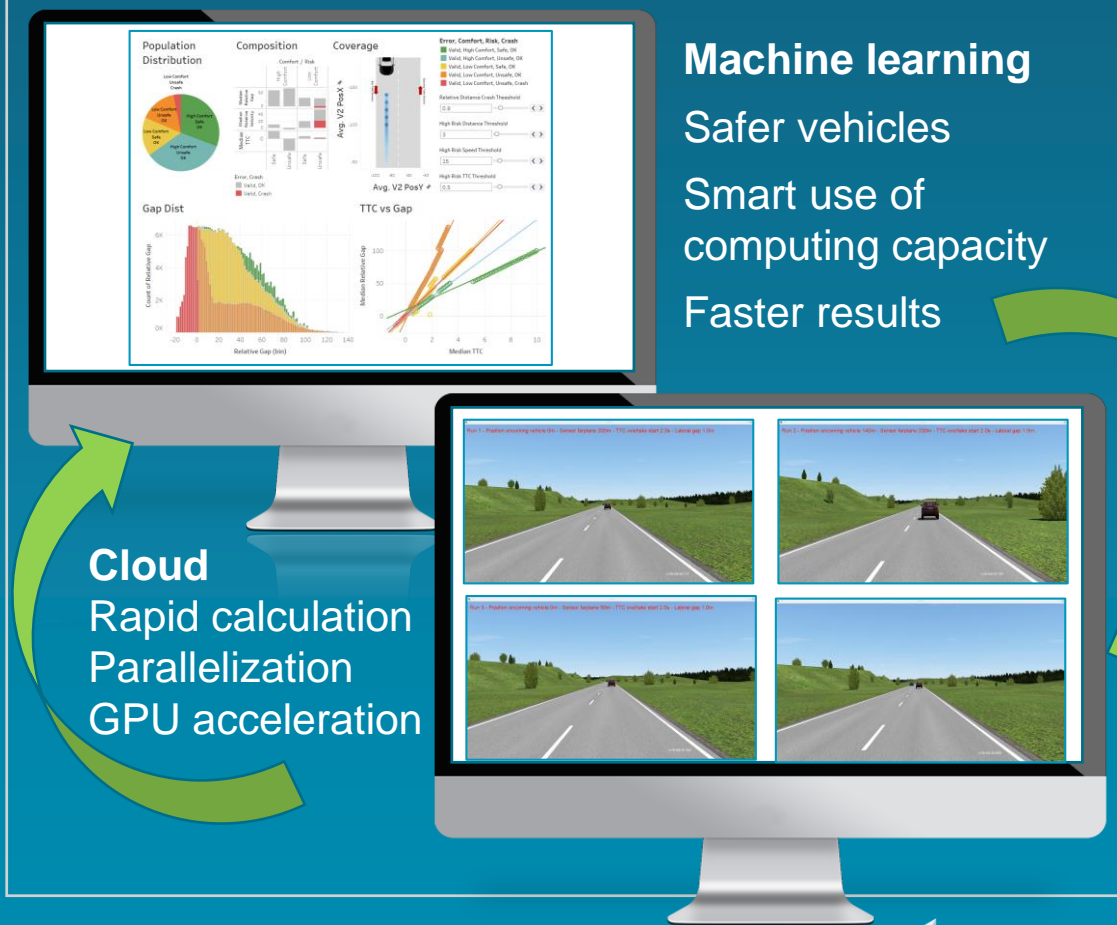


Force multipliers, drive innovation and consumption

The need for scalability

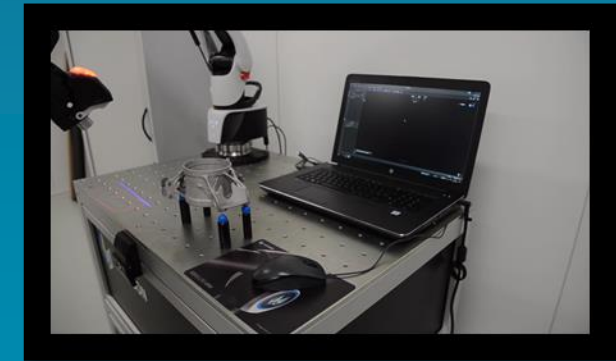
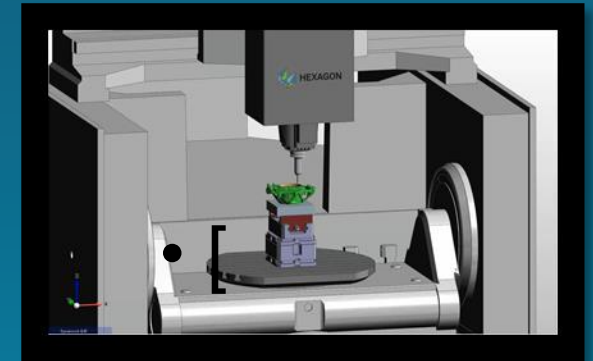
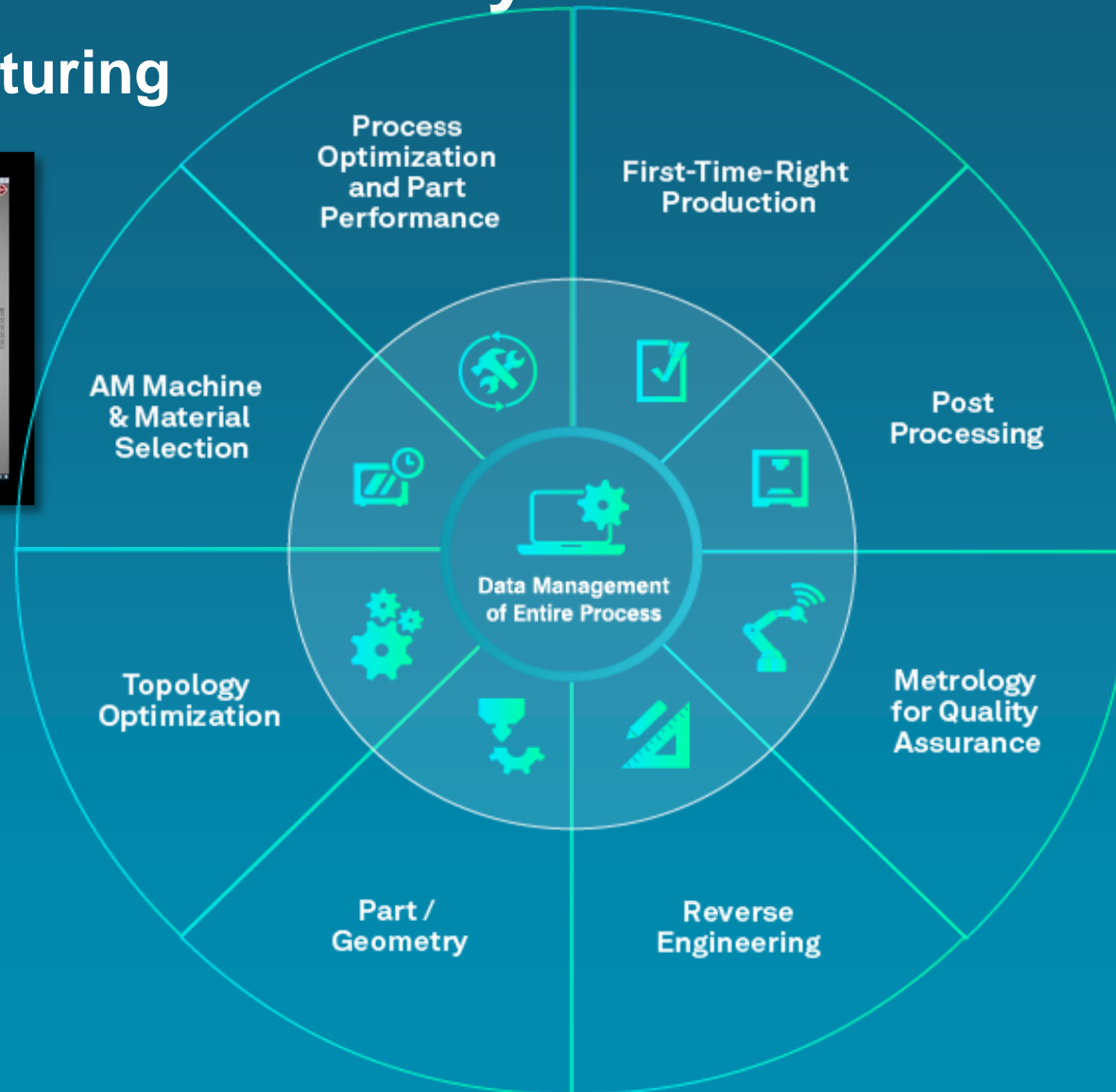
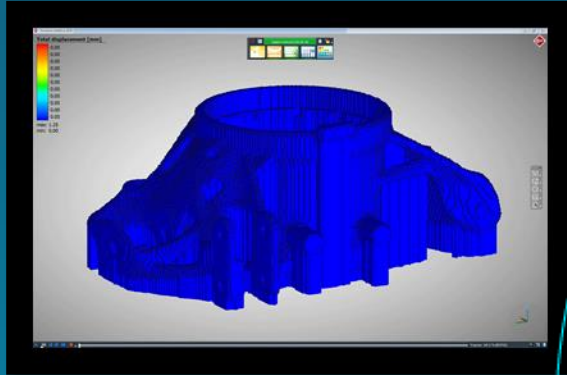


Future ready



CAE powers Smart Factory

Additive manufacturing



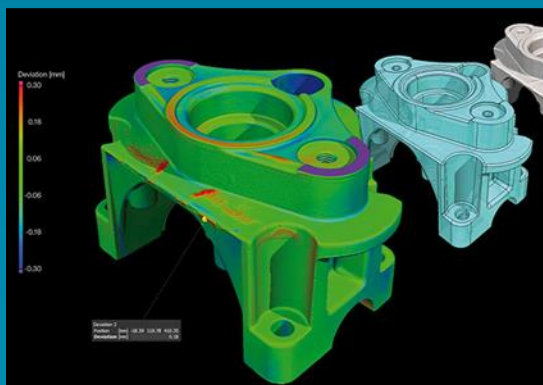
Volume Graphics to leverage need for X-ray inspection



Complex Parts

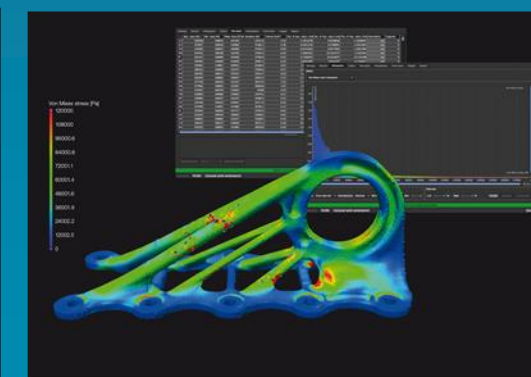
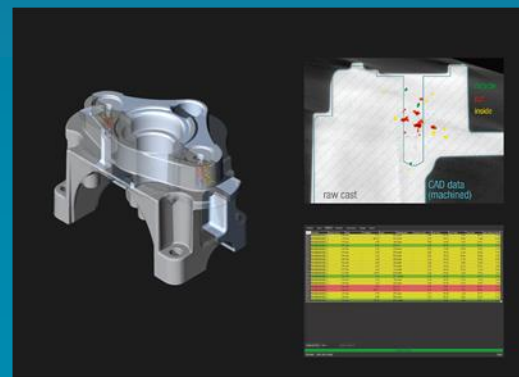
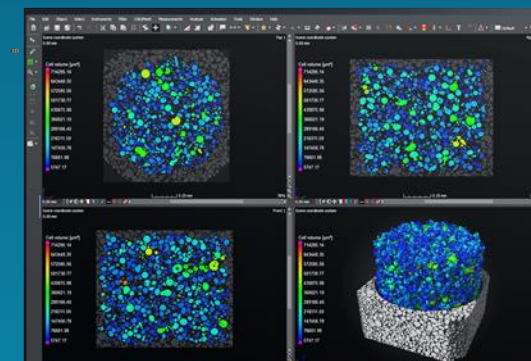
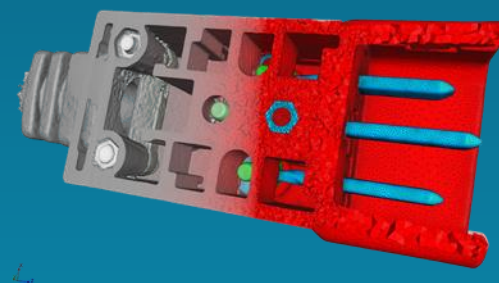


Production Ready

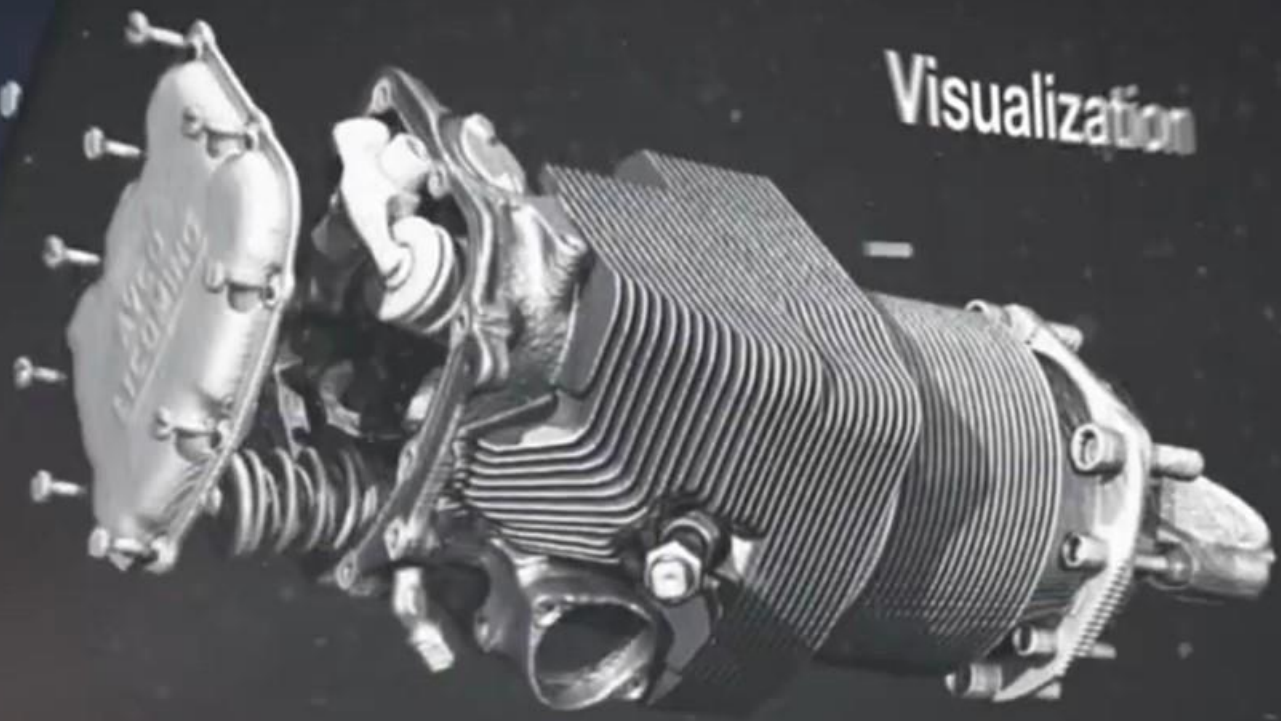


Advanced Materials

A key building block for Smart Factory



Visualization



fine segme

**Make it
smarter**

