

PTC CREO NEUIGKEITEN PRODUKTAUSBlick PRÄSENTATION



DIGITAL TRANSFORMS PHYSICAL

Christoph von Andrian-Werburg

Director CAD Sales

PTC Parametric Technology GmbH
candrian@ptc.com

+49 151 19548852



Klaus Raab

Anwendungsberater

INNEO Solutions GmbH
kraab@inneo.com

+49 7961 890 146



INNEO®

That's IT.

AGENDA

- Market Trends & Creo Roadmap
- Creo 10 – What's New
- Model Based Definition
- Creo+





MARKET TRENDS & CREO ROADMAP

CREO FOR INTEGRAL DESIGN, MANUFACTURING & SIMULATION CAPABILITIES

CAD



- 2D & 3D Concept Design Tools
- Parts & Assembly Modeling
- Automatic 2D Drawing Creation & Update
- Fully Semantic Model Based Definition
- Multi-CAD Collaboration & Data Exchange
- Assembly Management & Performance Tools
- Parametric & Freeform Surface Design
- Sheet Metal Part Design Tools
- Mechanism Design
- Molded/Cast Part Design Tools
- Structural Framework & Weldment Design
- Photorealistic Rendering & Animation
- Direct Modeling with Creo Flexible Modeling
- Design Reuse & Automation
- Volume Production & Mold Machining Capabilities
- Associative Mold & Die Design
- Broad Array of Simulation Technology for Engineers



MARKET TRENDS CREATE OPPORTUNITIES & CHALLENGES

EVOLVING WORKFORCE



AUTOMATION



SUSTAINABILITY INITIATIVES



SAAS



The USA will be short by **11 million** engineers by 2030, Germany by **185 thousand**.

BCG



NEW TECHNOLOGIES CAN HELP

AI



DATA AGILITY



COMPUTING
ADVANCES



DIGITAL/PHYSICAL
CONVERGENCE



Manufacturers are investing
\$524 billion in digital
transformation initiatives



NEW TECHNOLOGIES CAN HELP

AI



AI Materials



Generative Design



AI Security



AI Software Engineering



AI Analytics

DATA AGILITY



Data Sharing



Influencer Engineering



Metaverse



Blockchain

COMPUTING ADVANCES



Simulation



Quantum Computing



IT Automation



Cloud



Self Integrating Apps

DIGITAL/PHYSICAL CONVERGENCE



Additive Manufacturing



Tech Stack Goes Physical



Design for Manufacturing

NEW TECHNOLOGIES CAN HELP – IN ENGINEERING

AI



AI Materials



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DIGITAL/PHYSICAL CONVERGENCE



Additive Manufacturing



Tech Stack Goes Physical

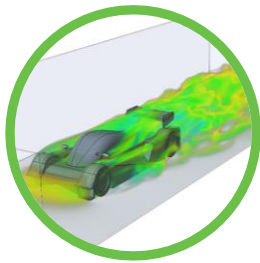


Design for Manufacturing

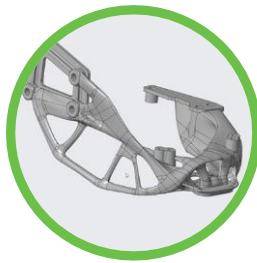
EMERGING TECHNOLOGIES ARE CHANGING DESIGN AND MANUFACTURING

Only Creo delivers these technologies deeply integrating into the design environment...

...while delivering integral design, manufacturing & simulation capabilities supporting the entire digital and physical product lifecycle.



Real-Time Simulation



AI-Driven Generative Design



IoT-Driven Design



AR Collaboration



Design for Additive Manufacturing



FUTURE CAD INVESTMENT AREAS

CAD



User
Productivity



Design with
Composites



Model Based
Definition



Control Center*

Core Functionality

Emerging Technologies



Generative
Design



Simulation
Driven Design



Design for
Additive



Real Time
Collaboration*



CREO 10 – WHAT'S NEW

INTRODUCING CREO 10

Design for Composites

Design for Electrification

Design for Ergonomics

Productivity and Usability

Simulation & Generative Design

Manufacturing



INTRODUCING CREO 10

Design for Composites

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DESIGN FOR COMPOSITES

New Composite Design

■ Design

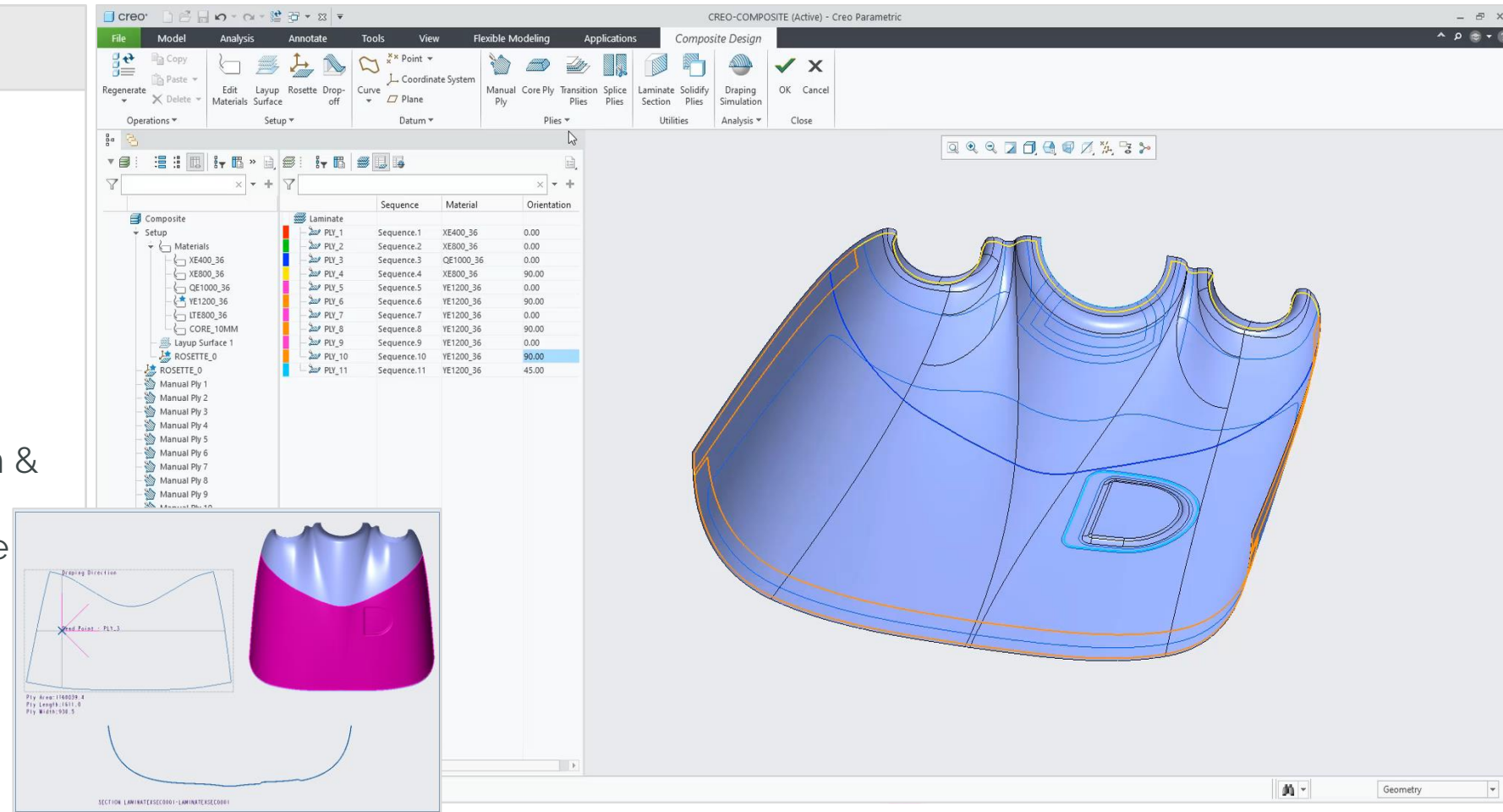
- ❑ Ply & Core creation
- ❑ Ply Transitions
- ❑ Create Solid & IML quilt
- ❑ Sectioning of Plies

■ Simulation

- ❑ Advanced draping simulation & flat ply export
- ❑ Integrates with Creo Simulate
- ❑ Export to 3rd party analysis

■ Manufacturing

- ❑ Draping & Flat pattern (DXF)
- ❑ Splicing & Darting
- ❑ Template based automated Ply books



Benefits:

- Accurately define & capture full composite structure
- Validate and identify manufacturability issues
- Derive digital work instructions

INTRODUCING CREO 10

Design for Composites

Design for Electrification

Design for Ergonomics

Productivity and Usability

Simulation & Generative Design

Manufacturing

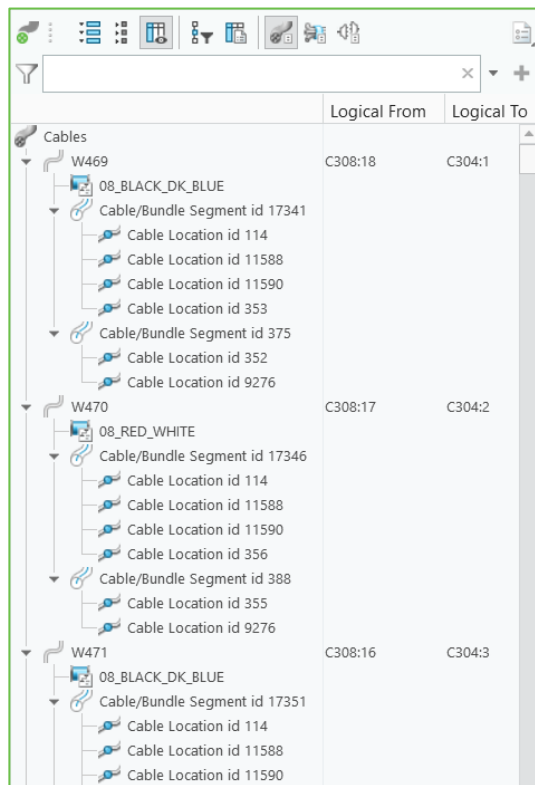


DESIGN FOR ELECTRIFICATION

Cabling tree

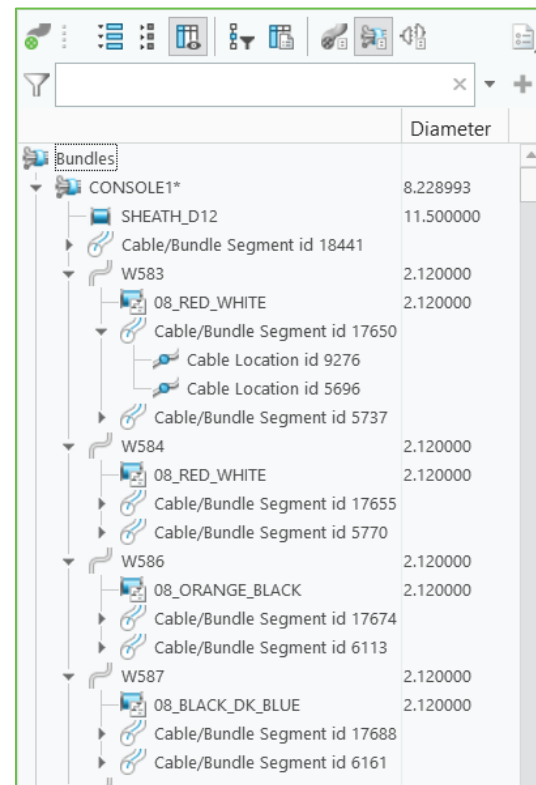
- New Cabling Tree
 - Cables View,
 - Bundles View
 - Connectivity View
- Simple search and dedicated cabling queries.
- Dedicated filters and columns for each view

Cable view



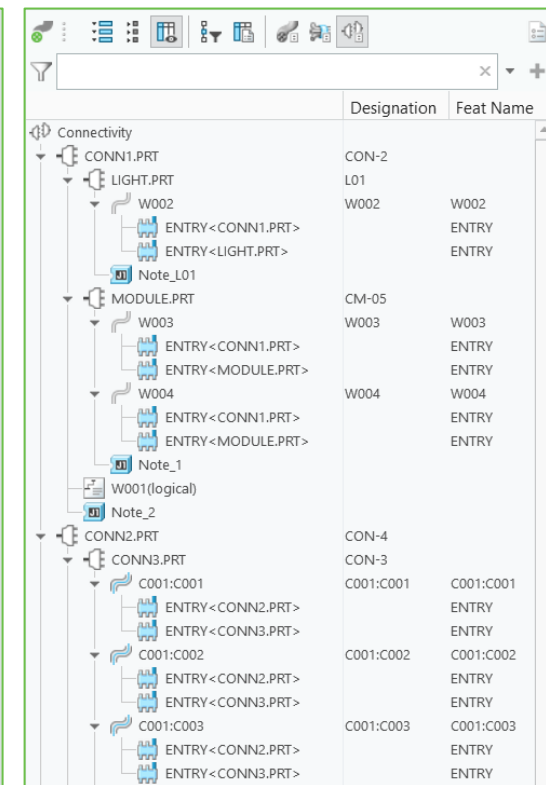
	Logical From	Logical To
Cables		
W469	C308:18	C304:1
08_BLACK_DK_BLUE		
Cable/Bundle Segment id 17341		
Cable Location id 114		
Cable Location id 11588		
Cable Location id 11590		
Cable Location id 353		
Cable/Bundle Segment id 375		
Cable Location id 352		
Cable Location id 9276		
W470	C308:17	C304:2
08_RED_WHITE		
Cable/Bundle Segment id 17346		
Cable Location id 114		
Cable Location id 11588		
Cable Location id 11590		
Cable Location id 356		
Cable/Bundle Segment id 388		
Cable Location id 355		
Cable Location id 9276		
W471	C308:16	C304:3
08_BLACK_DK_BLUE		
Cable/Bundle Segment id 17351		
Cable Location id 114		
Cable Location id 11588		
Cable Location id 11590		

Bundle view



	Diameter
Bundles	
CONSOLE1*	8.228993
SHEATH_D12	11.500000
Cable/Bundle Segment id 18441	
W583	2.120000
08_RED_WHITE	2.120000
Cable/Bundle Segment id 17650	
Cable Location id 9276	
Cable Location id 5696	
Cable/Bundle Segment id 5737	
W584	2.120000
08_RED_WHITE	2.120000
Cable/Bundle Segment id 17655	
Cable/Bundle Segment id 5770	
W586	2.120000
08_ORANGE_BLACK	2.120000
Cable/Bundle Segment id 17674	
Cable/Bundle Segment id 6113	
W587	2.120000
08_BLACK_DK_BLUE	2.120000
Cable/Bundle Segment id 17688	
Cable/Bundle Segment id 6161	

Connectivity view



	Designation	Feat Name
Connectivity		
CONN1.PRT	CON-2	
LIGHT.PRT	L01	
W002	W002	W002
ENTRY <CONN1.PRT>		ENTRY
ENTRY <LIGHT.PRT>		ENTRY
Note_L01		
MODULE.PRT	CM-05	
W003	W003	W003
ENTRY <CONN1.PRT>		ENTRY
ENTRY <MODULE.PRT>		ENTRY
W004	W004	W004
ENTRY <CONN1.PRT>		ENTRY
ENTRY <MODULE.PRT>		ENTRY
Note_1		
W001(logical)		
Note_2		
CONN2.PRT	CON-4	
CONN3.PRT	CON-3	
C001:C001	C001:C001	C001:C001
ENTRY <CONN2.PRT>		ENTRY
ENTRY <CONN3.PRT>		ENTRY
C001:C002	C001:C002	C001:C002
ENTRY <CONN2.PRT>		ENTRY
ENTRY <CONN3.PRT>		ENTRY
C001:C003	C001:C003	C001:C003
ENTRY <CONN2.PRT>		ENTRY
ENTRY <CONN3.PRT>		ENTRY

Benefits:

- Better visibility into harness structure
- Easier discoverability of harness elements
- Easier investigation and validation of the harness

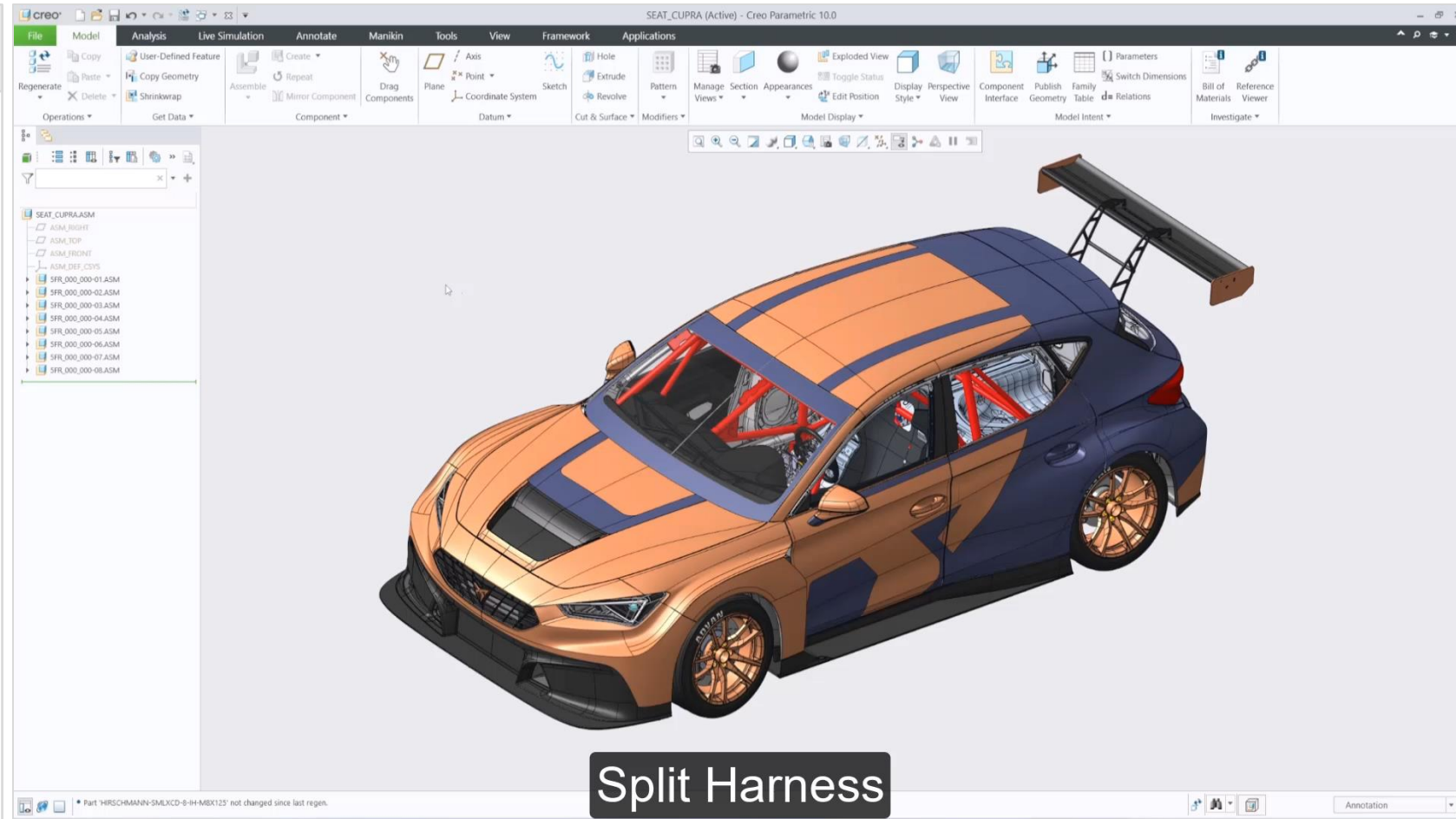
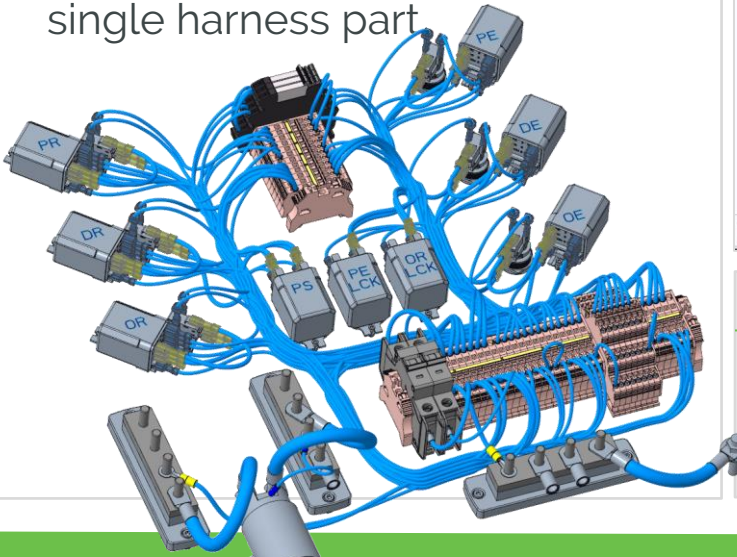
Split/Merge Harness

■ Split Harness

- Split an existing harness into two separate parts
- Dependent or Independent options
- Automatic restructuring of referenced components, cabling data and skeletons.

■ Merge harness

- merge two harnesses into a single harness part



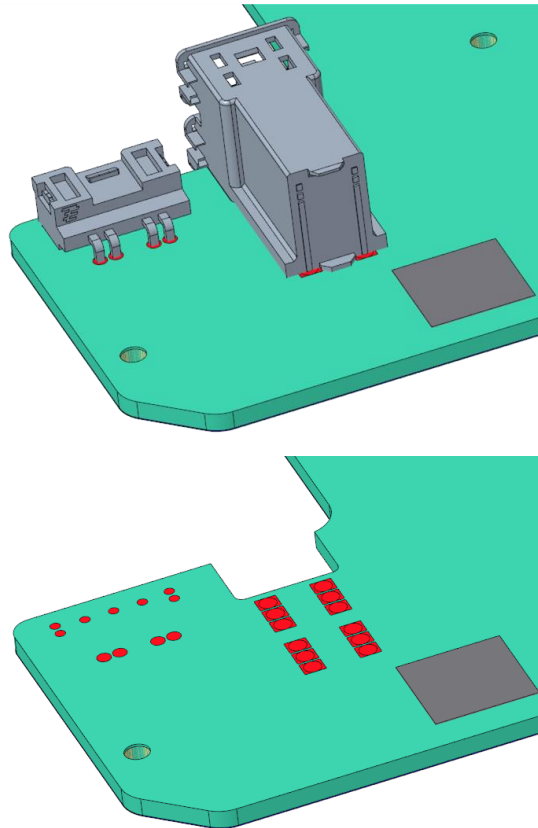
Benefits:

- Enables collaborative harness design workflows.
- Allows reuse of harness sub-systems
- Merge back split harnesses into a single piece for flattening.

ECAD Paste masks

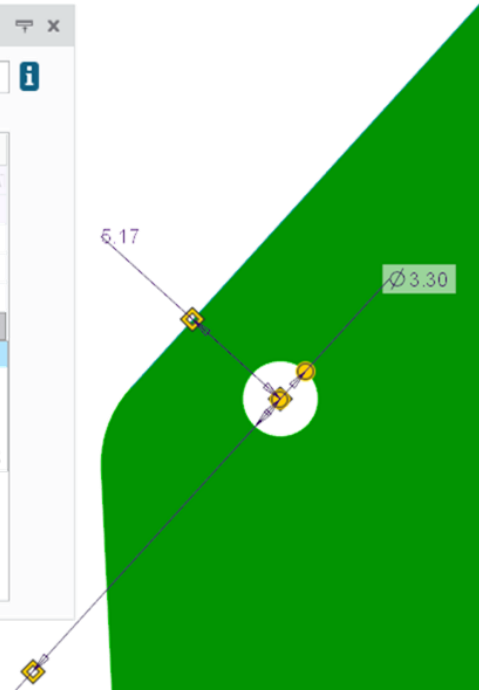
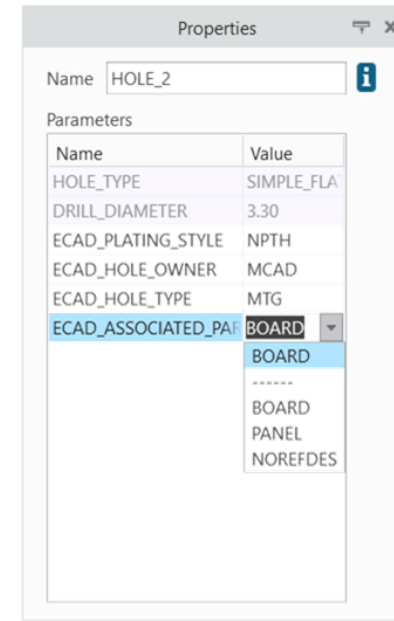
- Import Paste Mask (Stencil) top/bottom layers as ECAD Context Data.

Type	Top Layer	Bottom Layer	Include
Pin Pads			
Via Pads			
Routes			
Planes			
Conductive Figures			
Silkscreen			
Solder Mask	133	126	<input type="checkbox"/>
Paste Mask	113		<input checked="" type="checkbox"/>



ECAD Hole parameters

- Set ECAD parameters when creating holes in ECAD environment
- Parameters and defaults are now customizable using ECAD dedicated chart ecad.hol file.



INTRODUCING CREO 10

Design for Composites

Design for Electrification

Design for Ergonomics

Productivity and Usability

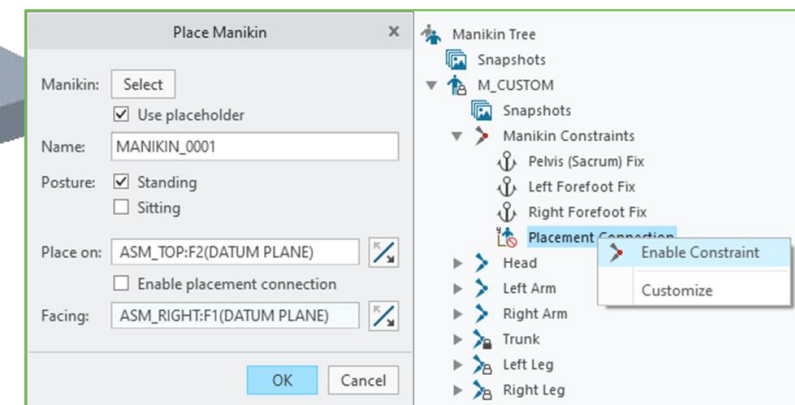
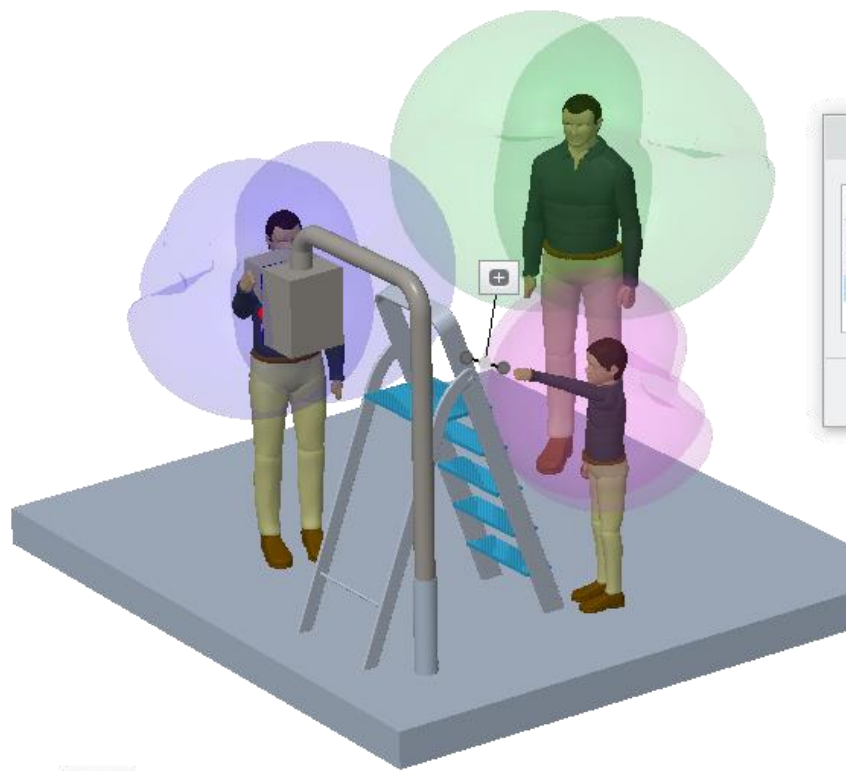
Simulation & Generative Design

Manufacturing



Manikin

- Usability enhancements
 - Placement connections in tree
 - Manage multiple snapshots
 - Dimension control when manipulating manikin
- Easily measure angle between 2 joint segments
- Support multiple reach envelopes per hand
- Control orientation during reach operation
- Updated Manikin Library as inseparable assemblies

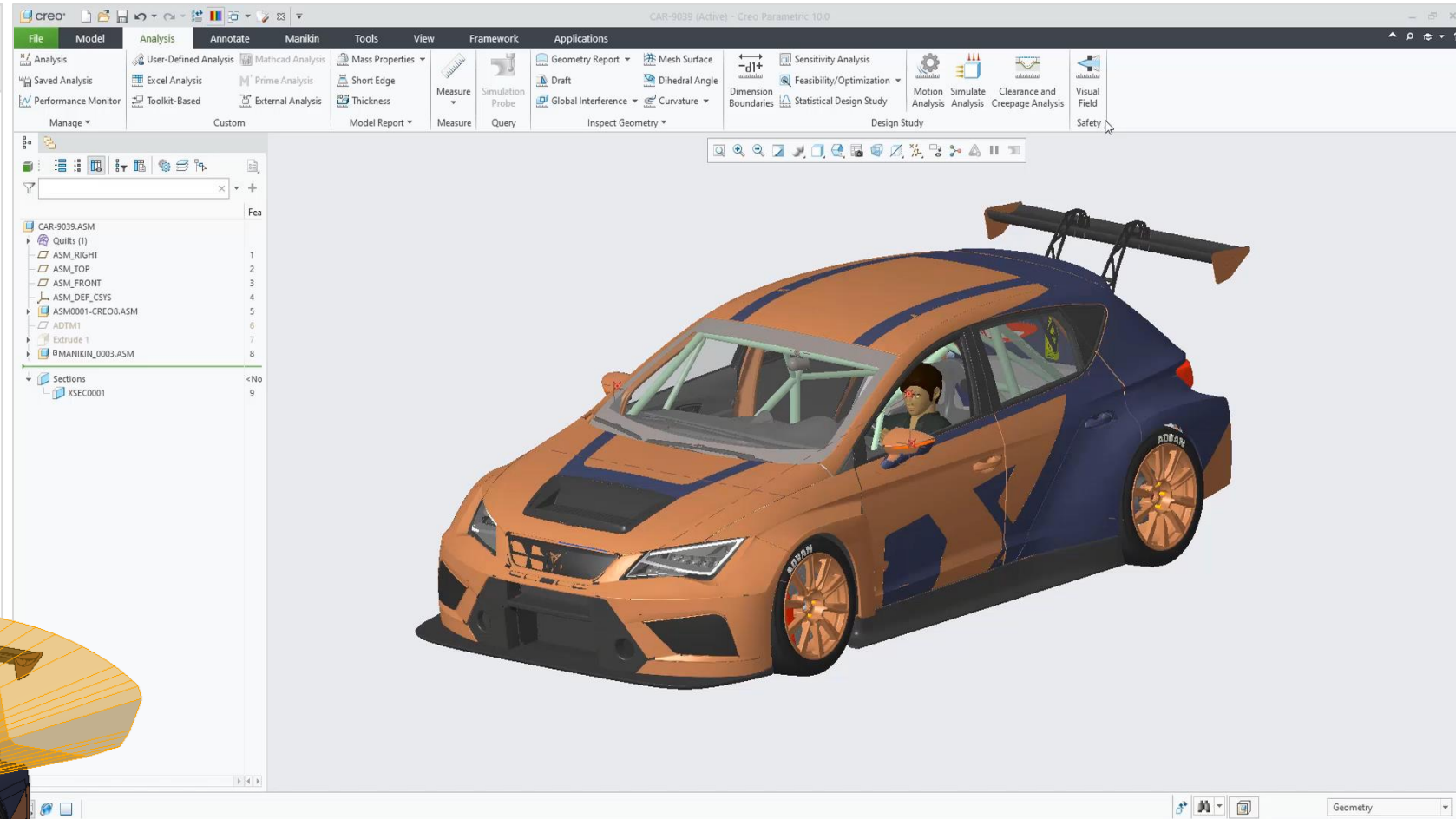
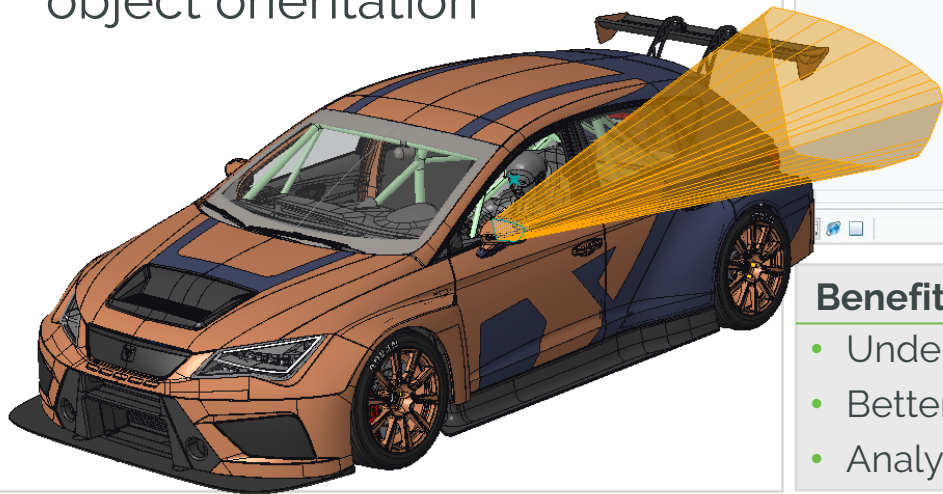


Benefits:

- Understand angles between joints
- Easier data management of manikin library
- Accurately control manikin position

Visual Field feature

- Perform a reflection analysis by looking at a reflective object.
- Resulting surface cone represents the visual field reflecting of the selected object (like a mirror).
- Control over reflective object orientation



Benefits:

- Understand the visual field cone by looking at a reflective object.
- Better insight into resulting field of view
- Analyze model to conform to visibility standards

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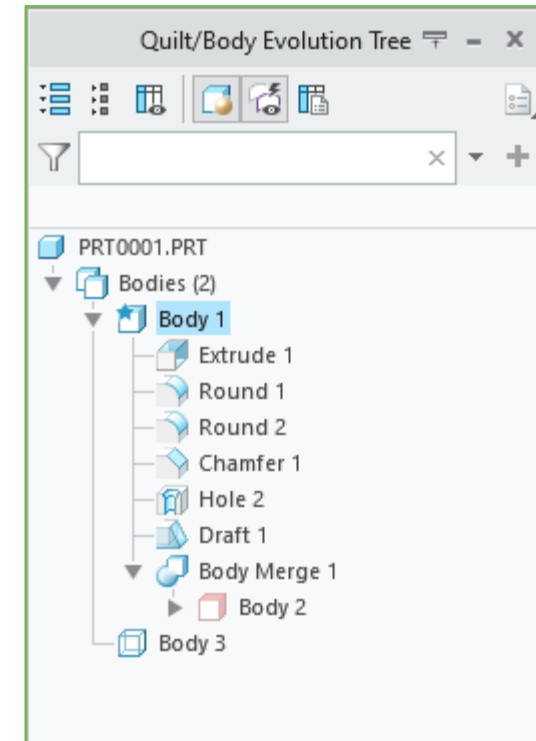
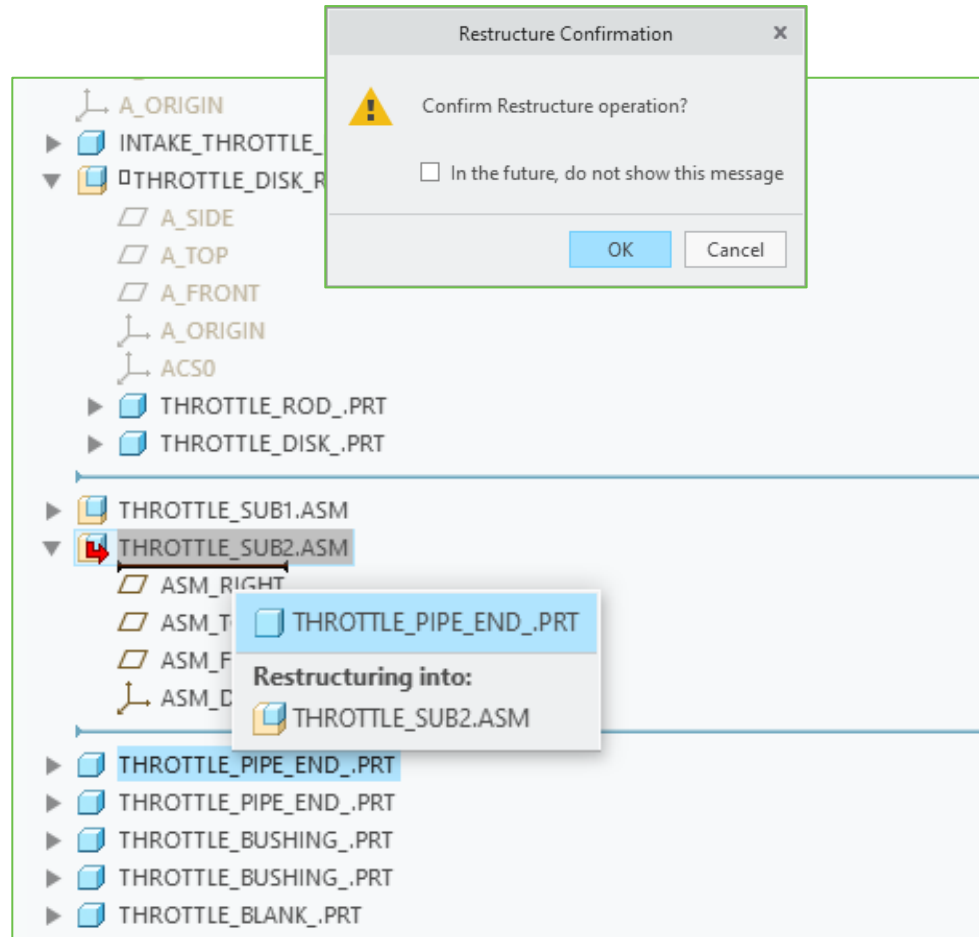
Manufacturing



PRODUCTIVITY & USABILITY

Model tree

- Improved reorder and restructure workflows
- Quilt/body Evolution tree
 - Drag & drop
 - Support for columns and search
 - Tree settings stored in .ui
- Improved tree display



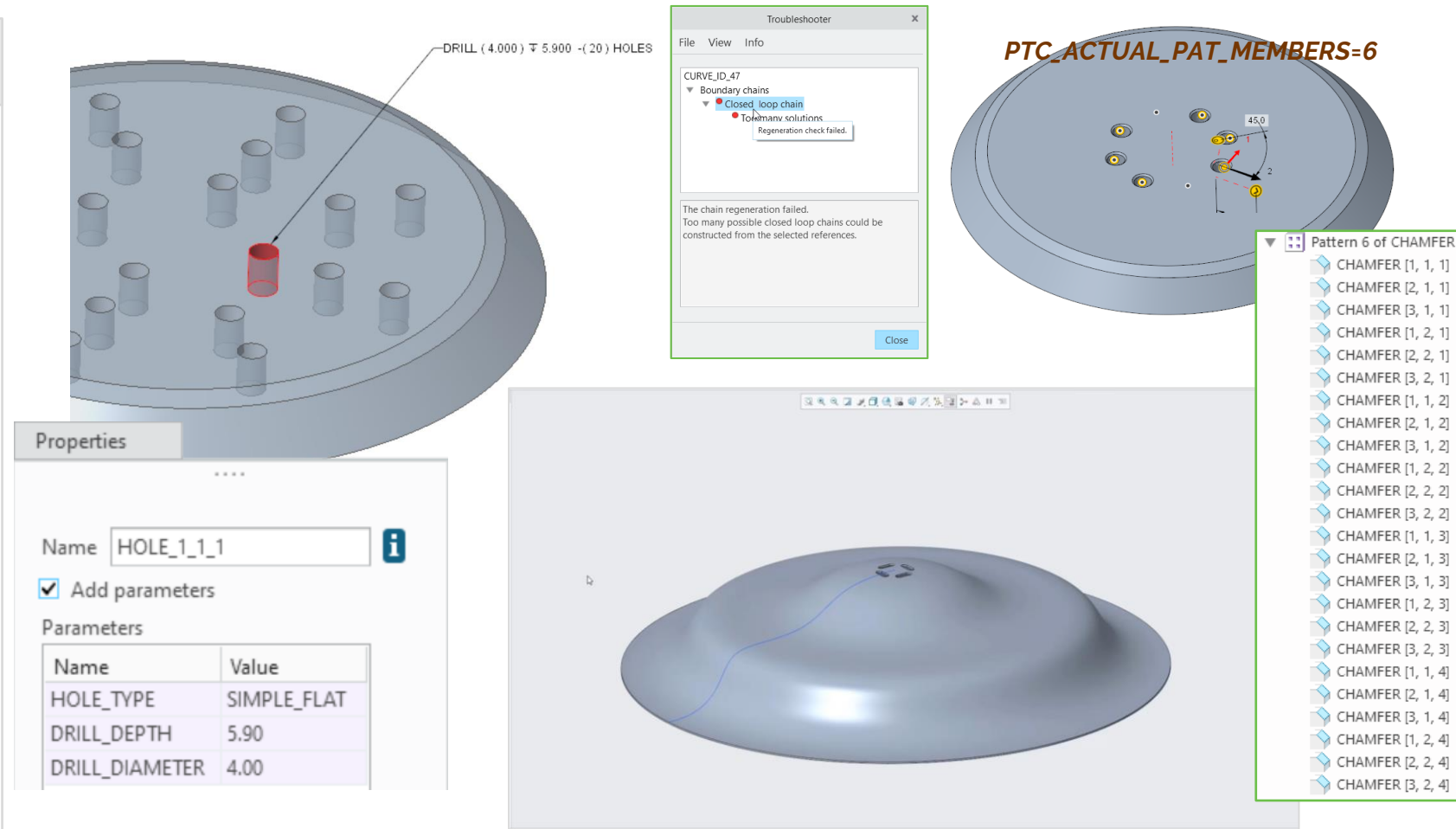
Benefits:

- Remove confusion between restructure and reorder
- More productive usage of the Quilt/Body Evolution Tree
- Increased design productivity and unified workflow

PRODUCTIVITY & USABILITY

Modeling

- Sketcher Project/Offset
 - Project/offset as construction geometry
 - Improved trouble-shooting
 - All-curves-in-feature" option
 - Trajectory-based features
- Standard parameters and hole note for simple holes
- Pattern
 - More Flexible Dimension Pattern for Pattern-of-Pattern
 - Reference pattern index
 - Pattern member parameter



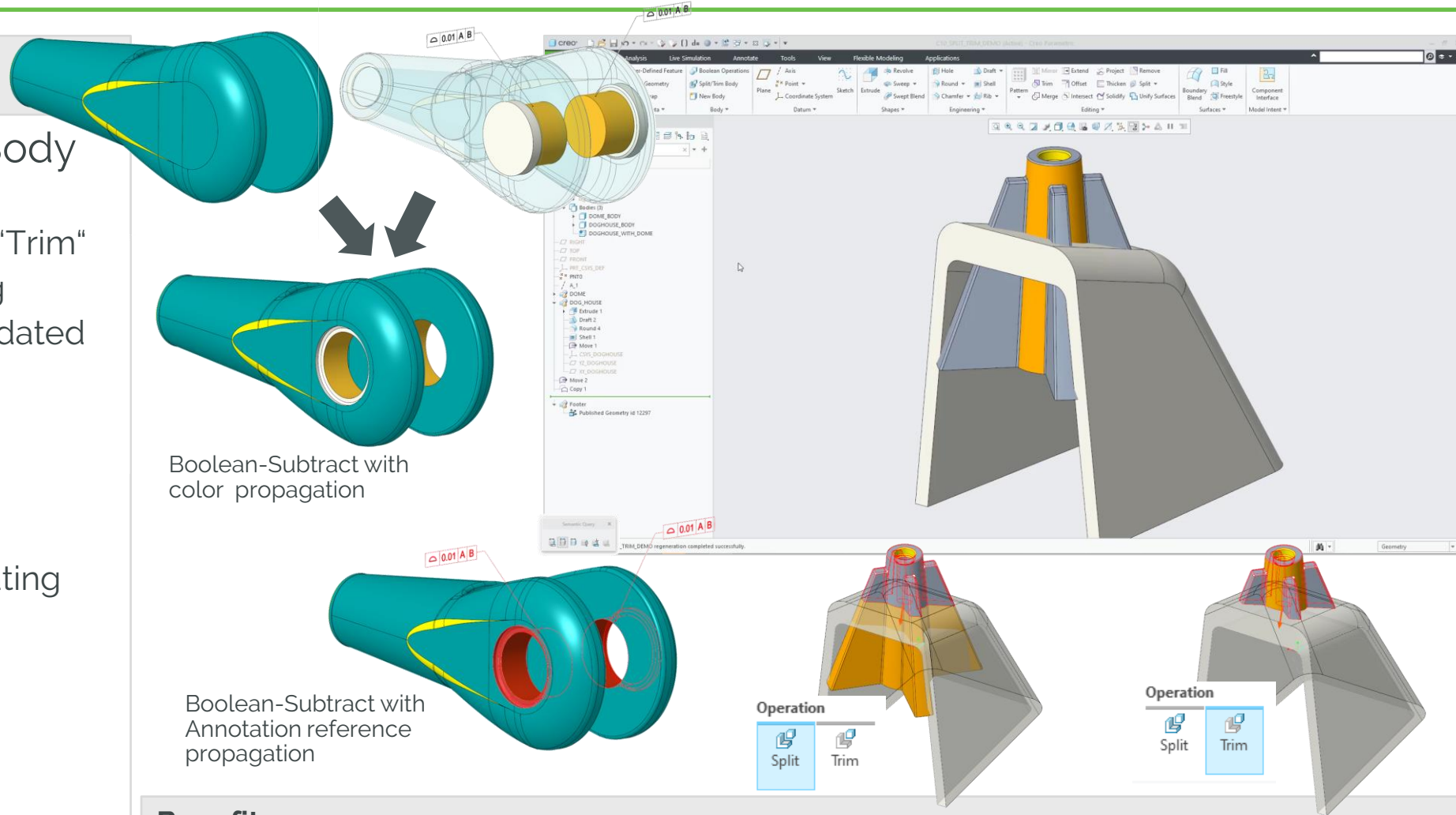
Benefits:

- Aligned documentation process for standard and simple hole types
- Increased usability & productivity in sketching
- Allows parameter callout of active pattern instance count

PRODUCTIVITY & USABILITY

Multibody

- Combined Split/Trim Body Feature
 - Toggle between “Split” & “Trim”
 - Dedicated feature naming
 - Legacy feature will be updated upon Edit-Definition
- Boolean propagation
 - Control of appearance propagation
 - Control of reference updating

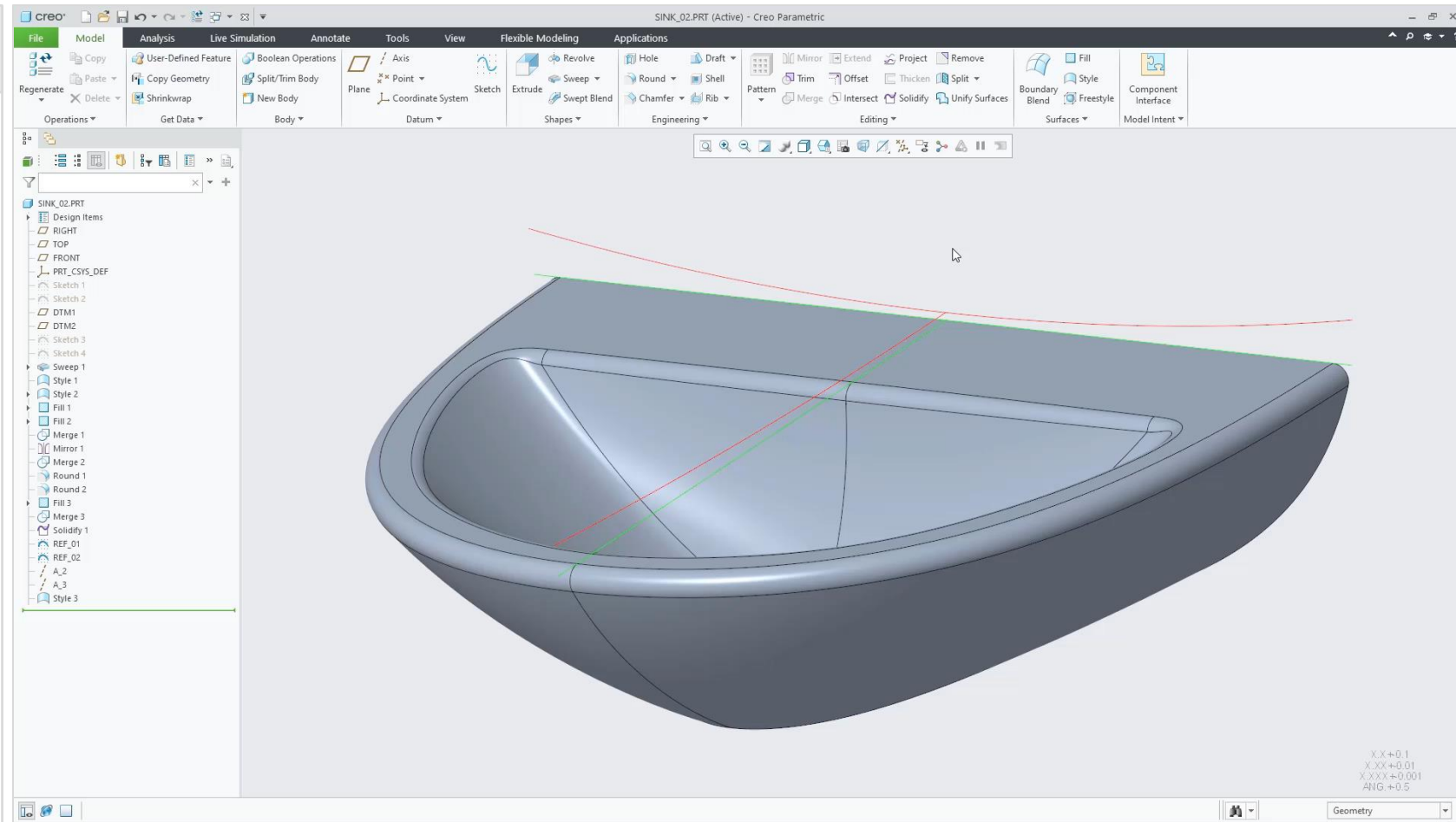
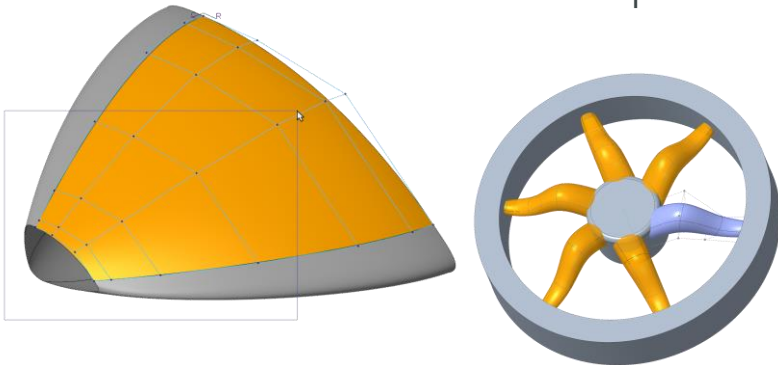


Benefits:

- Easy access to a single tool to split and trim bodies
- Unified workflows to Trim a body by object or by volumes
- Transparent feature naming in model tree

Surfacing

- Warp enhancement
 - Stretch model geometry to defined references
 - Specify a target curve for the spine tool
- Freestyle
 - Rotational Symmetry
 - Lock mesh elements
- Style
 - Smooth normal connection
 - Box selection for control points



Benefits:

- Control model deformation through an independent curve
- Easier selection of points to manipulate the surface
- Prevent unintended editing of control mesh

INTRODUCING CREO 10

Design for Composites

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SIMULATION DRIVEN DESIGN

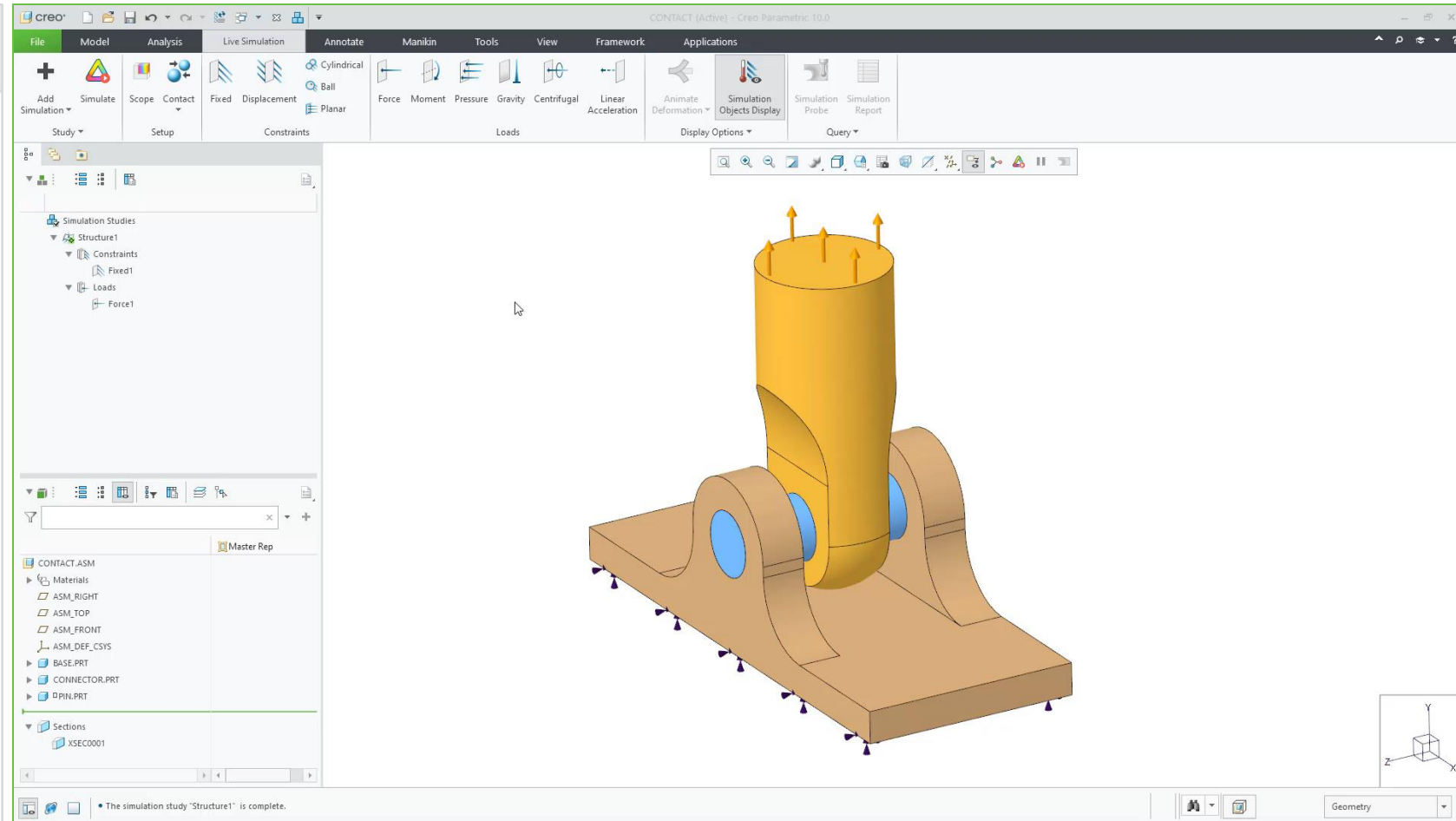
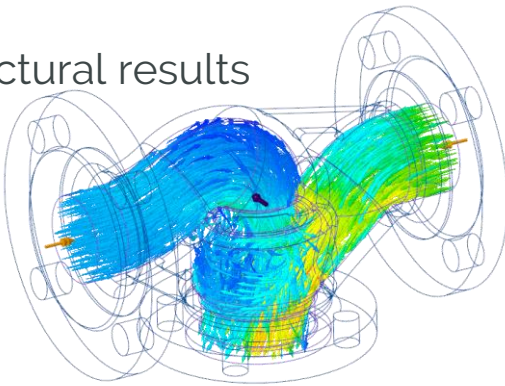
Creo Simulation Live

■ Contact Simulation

- Bonded, free and no separation are possible options
- By default, all objects are bonded.
- Improved contact detection (also available in Creo Ansys Simulation)

■ Expanded Result options

- Complete Vector Results for fluid
- Structural results

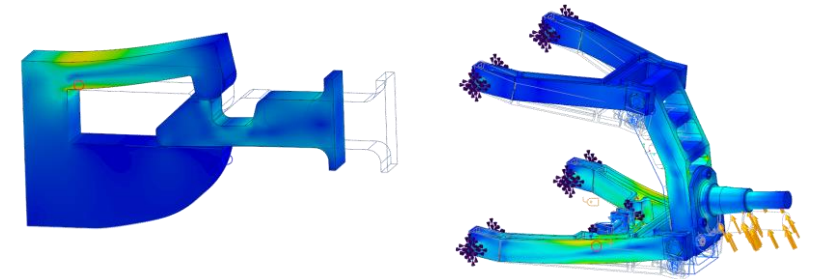
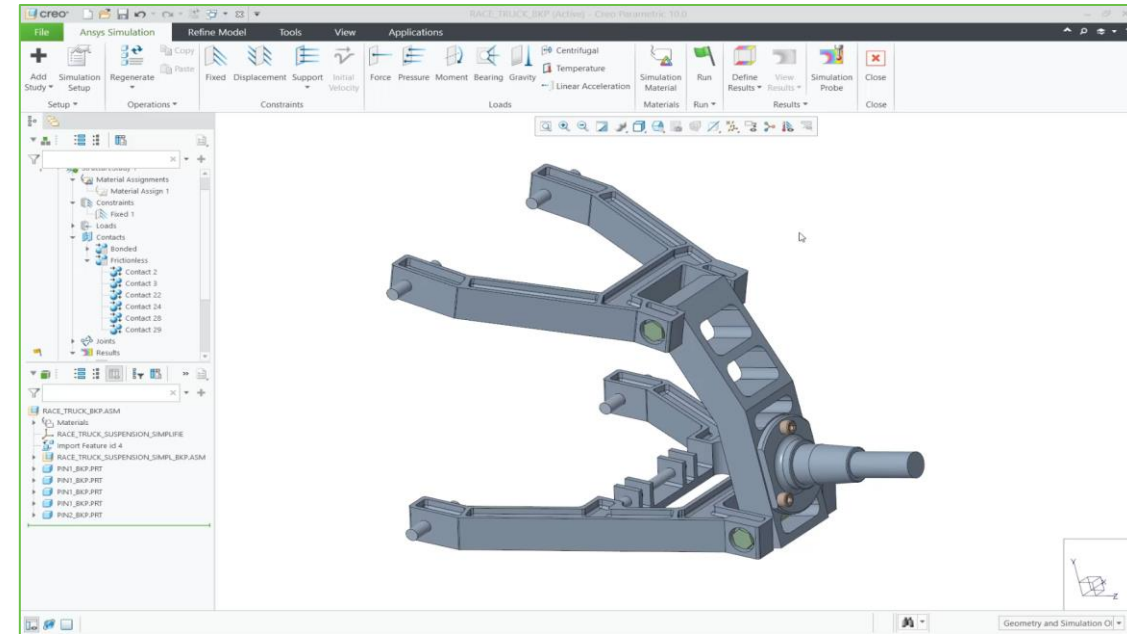
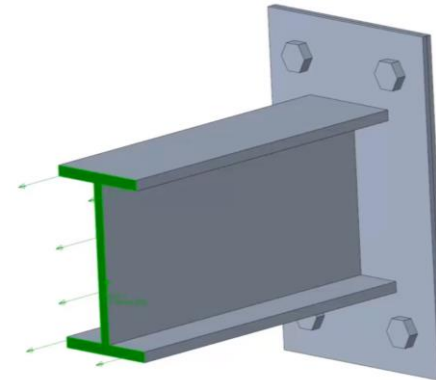
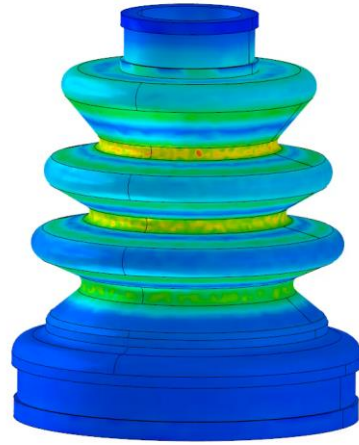


Benefits:

- More accurate solutions when contact is important
- Can now define with touching surfaces are free
- Contact stresses can now be reported

Ansys Simulation Advanced

- Non-Linear Contact
 - New contact types - Frictional, frictionless and rough
 - Preview Simulation for all contact options
- Non-linear Materials
 - Bi-linear plasticity
 - Neo-Hookean hyperelasticity
 - Linear orthotropic elasticity
- Combined physics of Thermal and Structural
 - Thermal expansion use case



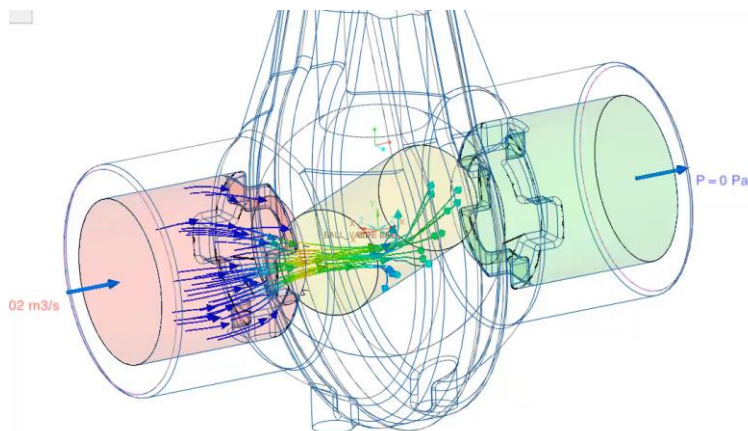
Benefits:

- Powerful and robust contact options
- Expands amount of use cases
- More realistic and accurate results

SIMULATION DRIVEN DESIGN

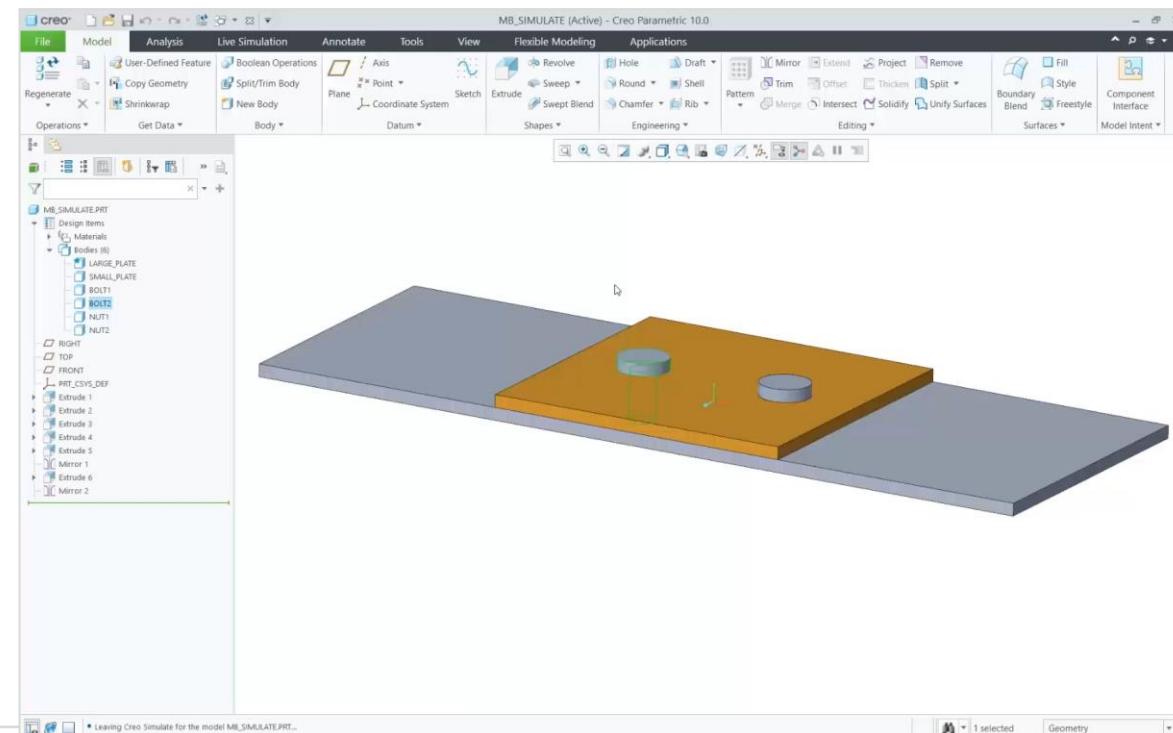
Creo Flow Analysis

- Improved indicator for streamline display
 - Arrow
 - Sphere
 - Control parameters for each
- Improved animation effect
 - Single streamline animation
- Post processor settings saved with project
 - Simulation scene



Creo Simulate

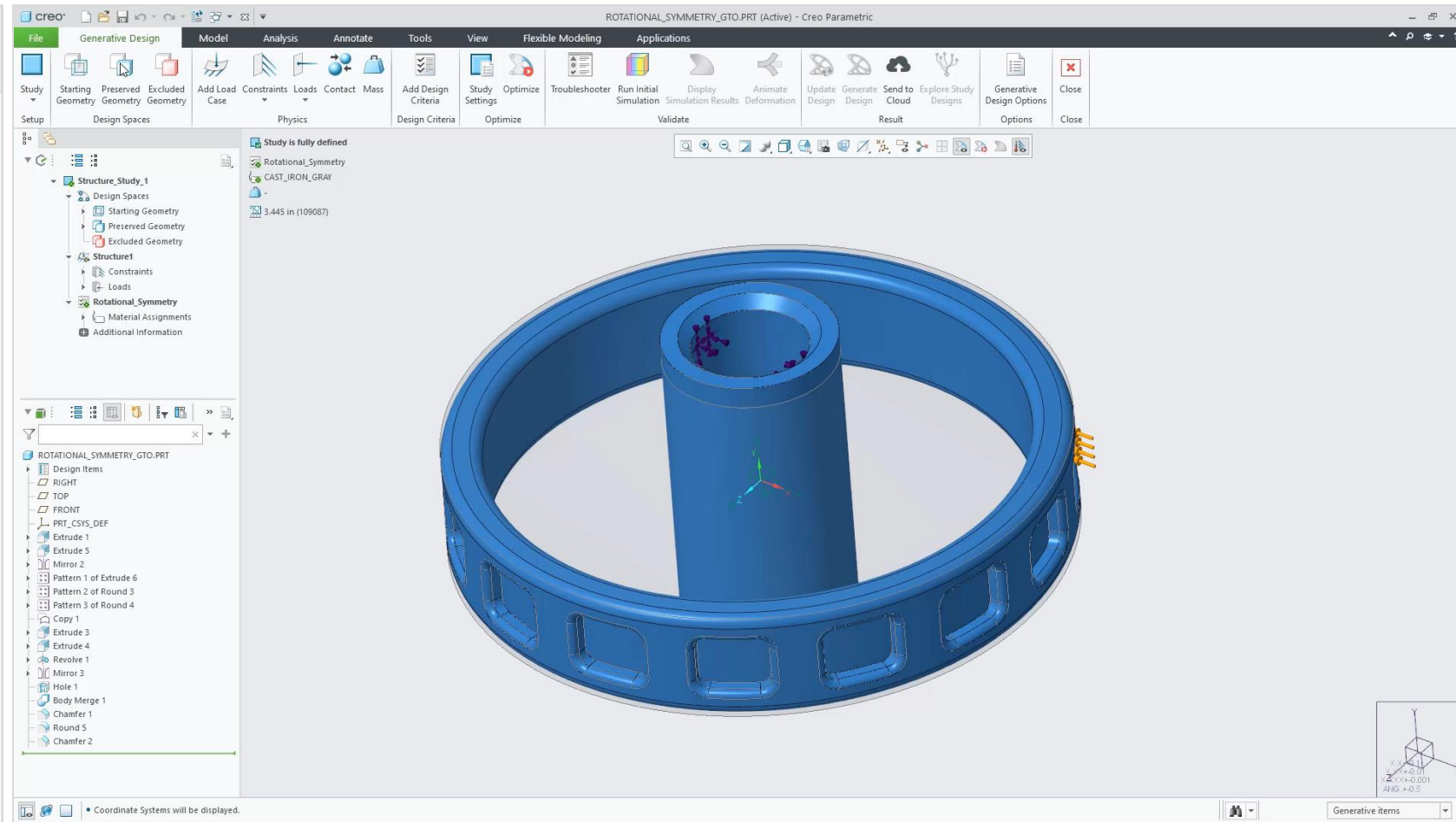
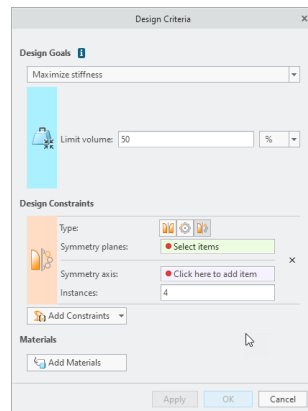
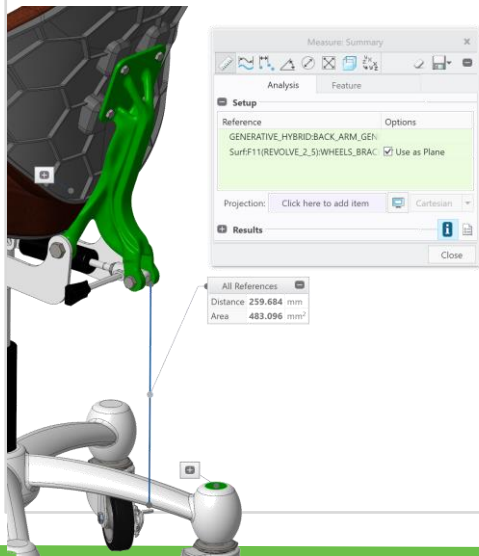
- Support for multibody
 - Interfaces between bodies
 - Different materials per bodies
 - Bodies as reference for heat loads
 - Part-type mesh controls for separate bodies
 - Measures reference bodies



GENERATIVE DESIGN

Expansion

- Rotational Symmetry
 - Apply constraints for rotational symmetry
 - Specify axis and number of instances
- Point mass & remote loads
- Measure between regular geometry and hybrid body



Benefits:

- Ensure optimized geometry is radially balanced
- Increased control of geometry that is output from generative design optimizations
- Improve usability to help users perform calculations for fit and function use cases

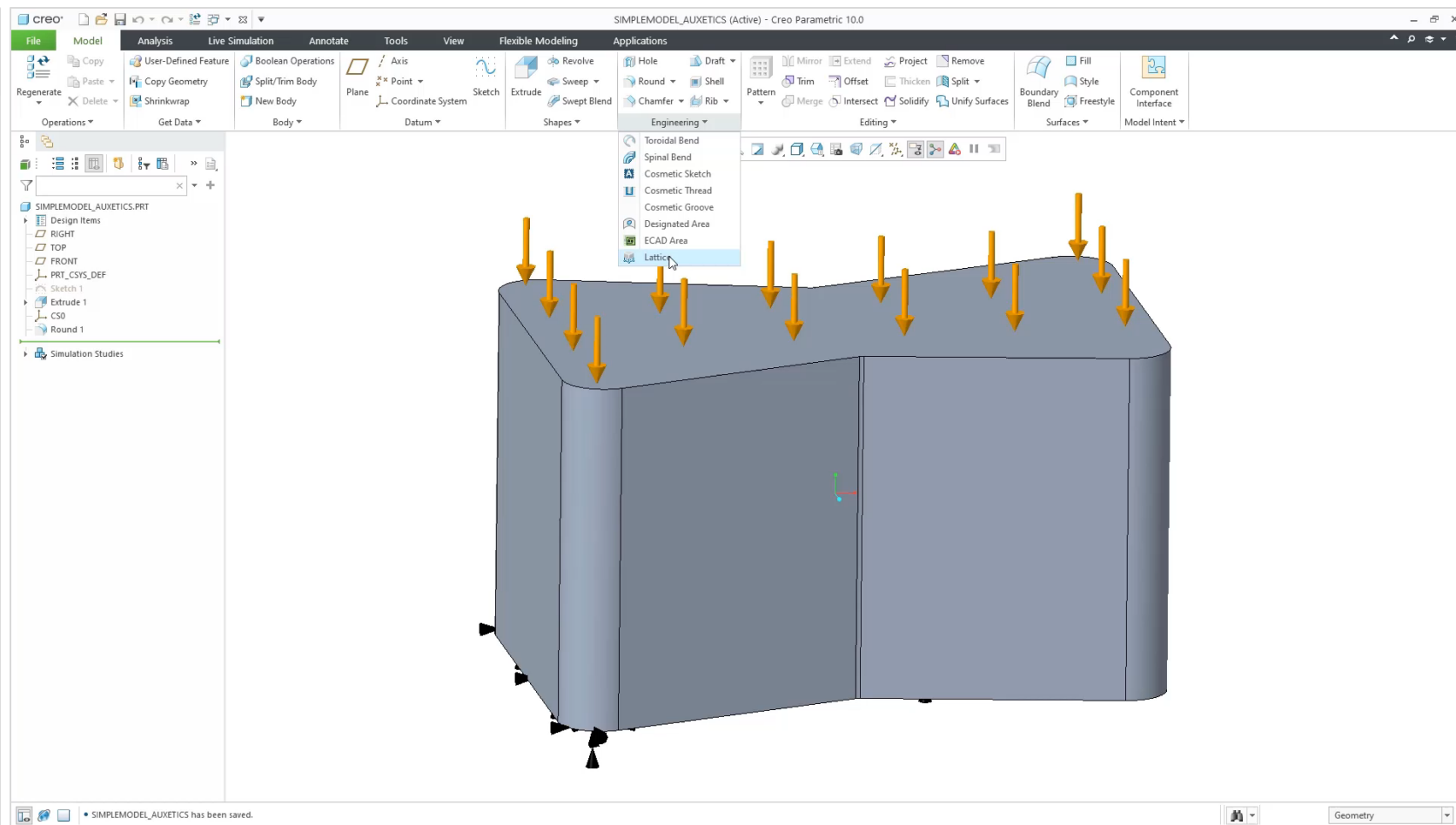
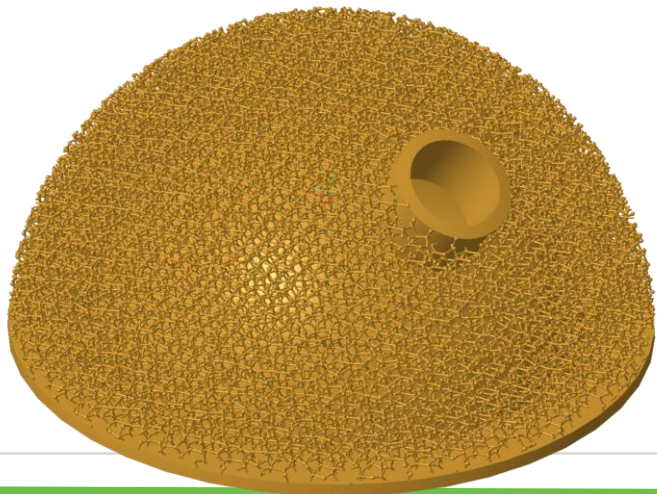
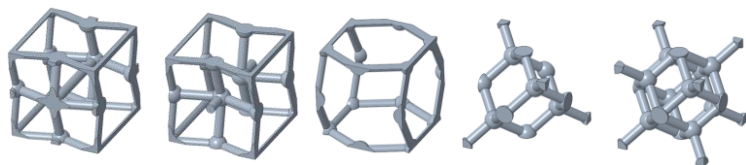
INTRODUCING CREO 10

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Beam lattices

- Three new cells
 - Rhombic dodecahedron
 - Rhombic with diamond
 - elongated dodecahedron
- Support for Auxetic cells
 - lattices with negative Poisson ratios

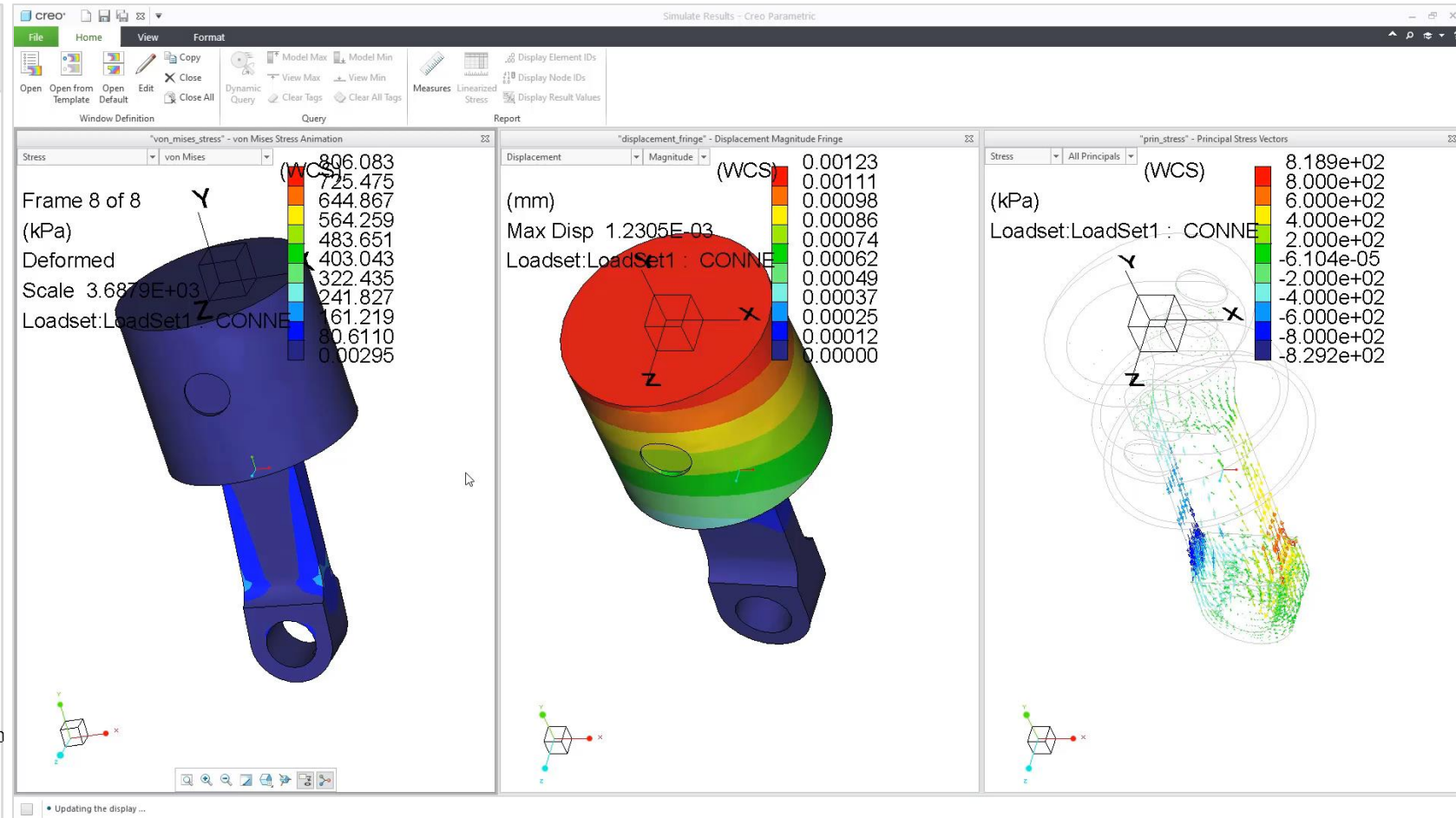
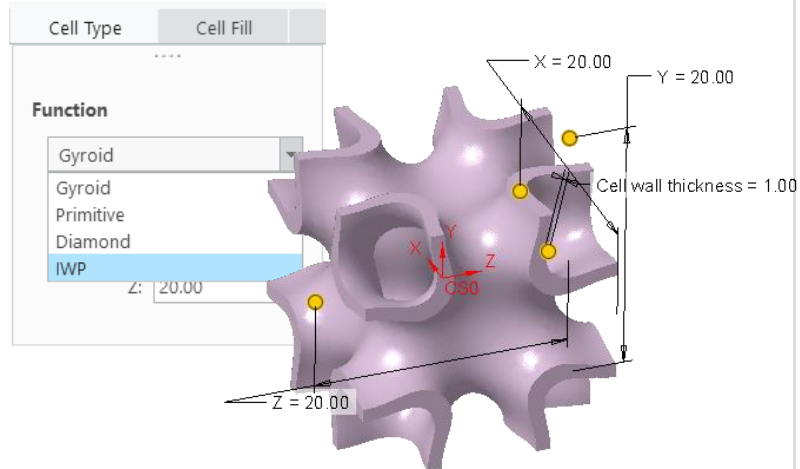


Benefits:

- Creation of medical devices approved cell types within the Creo environment
- Easily create high energy absorption and fracture resistance metamaterials
- Eliminate need to switch to specialist software to support such lattice types

Formula driven lattices

- Support of simulation-driven variability on FDL lattices
 - Allow the thickness of FDL lattice to be controlled by result of simulation.
- IWP cell (I-graph and wrapped package)
 - Creation of lattices with highest structural efficiency



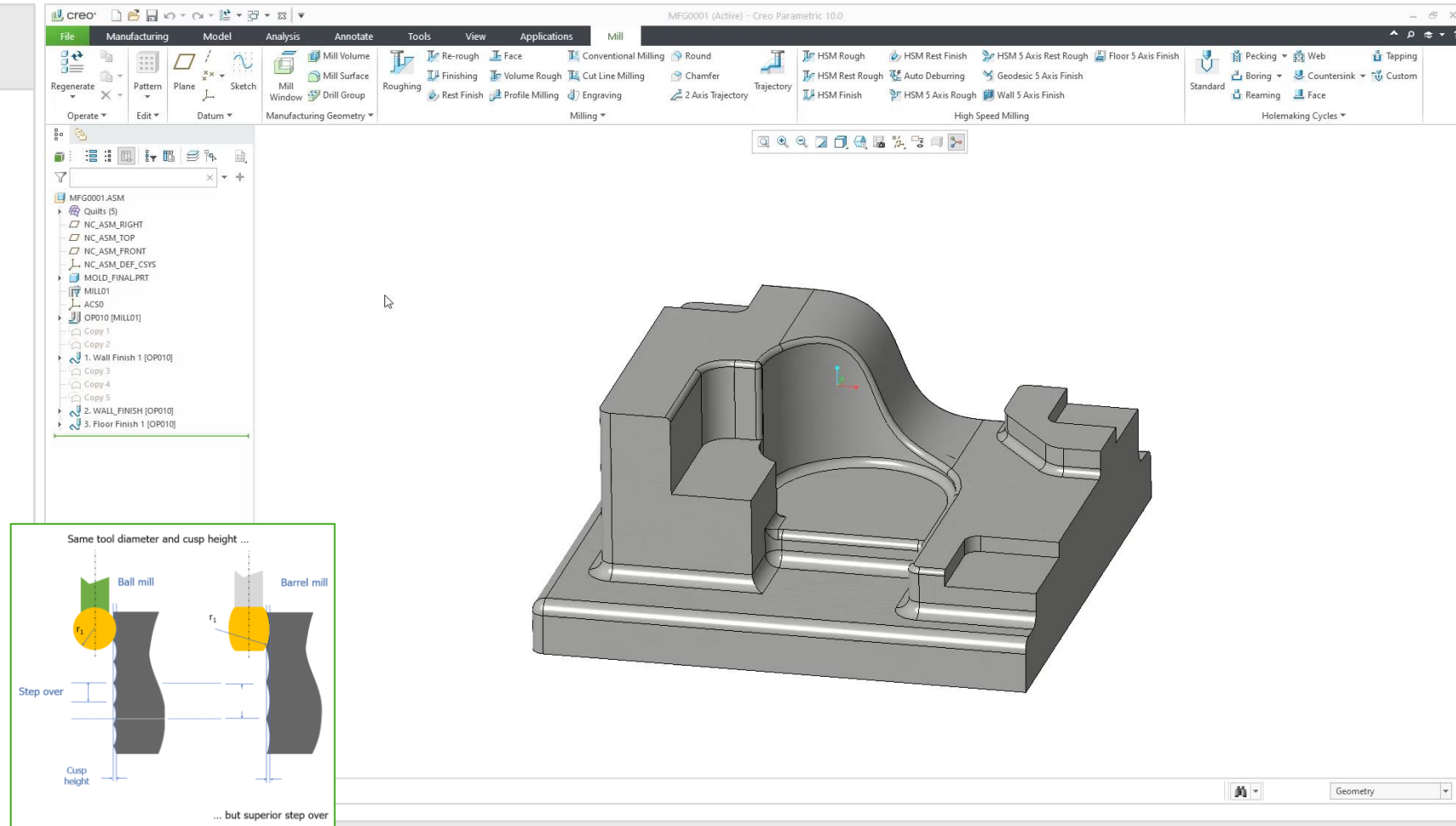
Benefits:

- Creation of variable wall thickness lattices based on simulation results
- Extended coverage of Simulation driven lattices functionality
- Creation of heat exchangers also optimized to withstand structural loads

SUBTRACTIVE MANUFACTURING

Subtractive MFG

- Support for barrel tools in HSM
 - Two new commands: Wall and Floor Finishing
- Use Mill Volume in HSM
 - Supported for Rough and Rest-Roughing NC sequences
- New CL player for synchronized NC steps
 - Display of CL data of all heads
 - Step-by-step toolpath display
 - Collision and gouge check
- Area Turning
 - CUTCOM for each slice
 - Clear distance parameter



Benefits:

- Higher productivity due to higher step over parameters
- Higher surface quality due to low cusp and smooth transitions between cuts
- Lower dynamic disturbances due to shorter tools



MODEL BASED DEFINITION

THE MBD / MBE WAVE IS HERE



BOSCH



FESTO



ABB

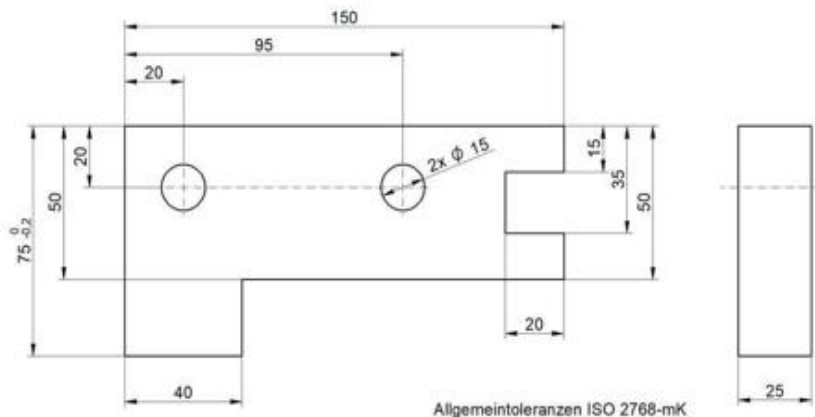
SCHAEFFLER



THE SITUATION: NEW GEOMETRICAL PRODUCT SPECIFICATION (GPS)

Geometrical Product Specifications(GPS) is the international symbol language used to express tolerances in technical drawings.

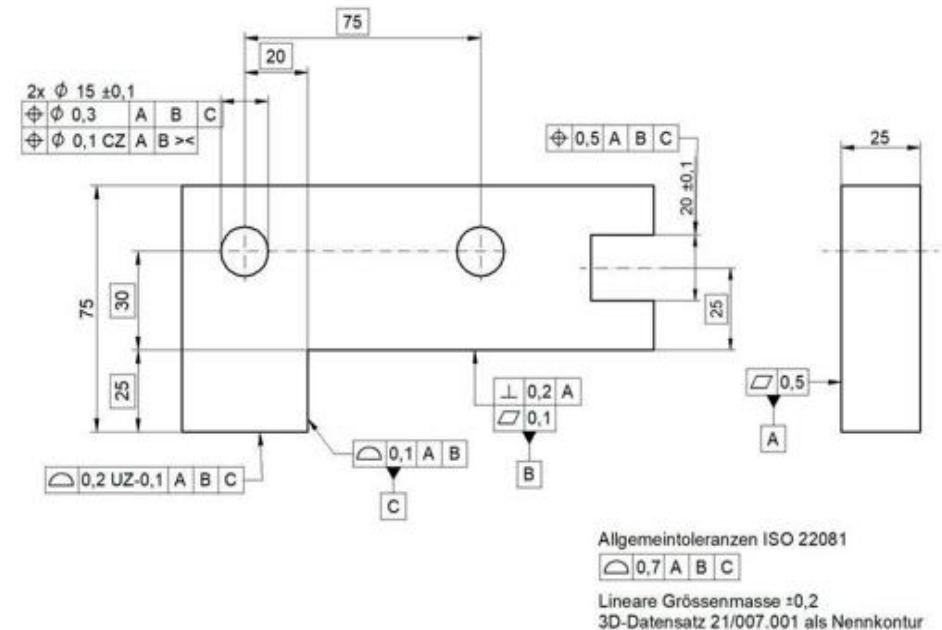
OLD



ISO GPS is a g specification

- Used to capture designs
- based on **max** 14638, ISO 110
- Enables the use of companies and

NEW



DIGITAL TRANSFORMATION: MODEL BASED DEFINITION

human readable

Traditional Process: The 2D drawing is the legal asset that describes/defines the product

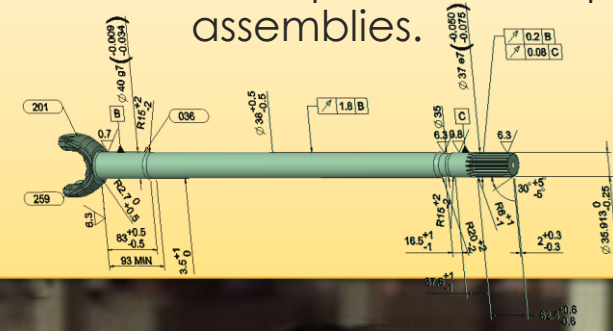
- Before 3D CAD, 2D was the standard format and primary engineering deliverable
- Many processes in existence today are based on the use of a 2D drawing (i.e., inspection)

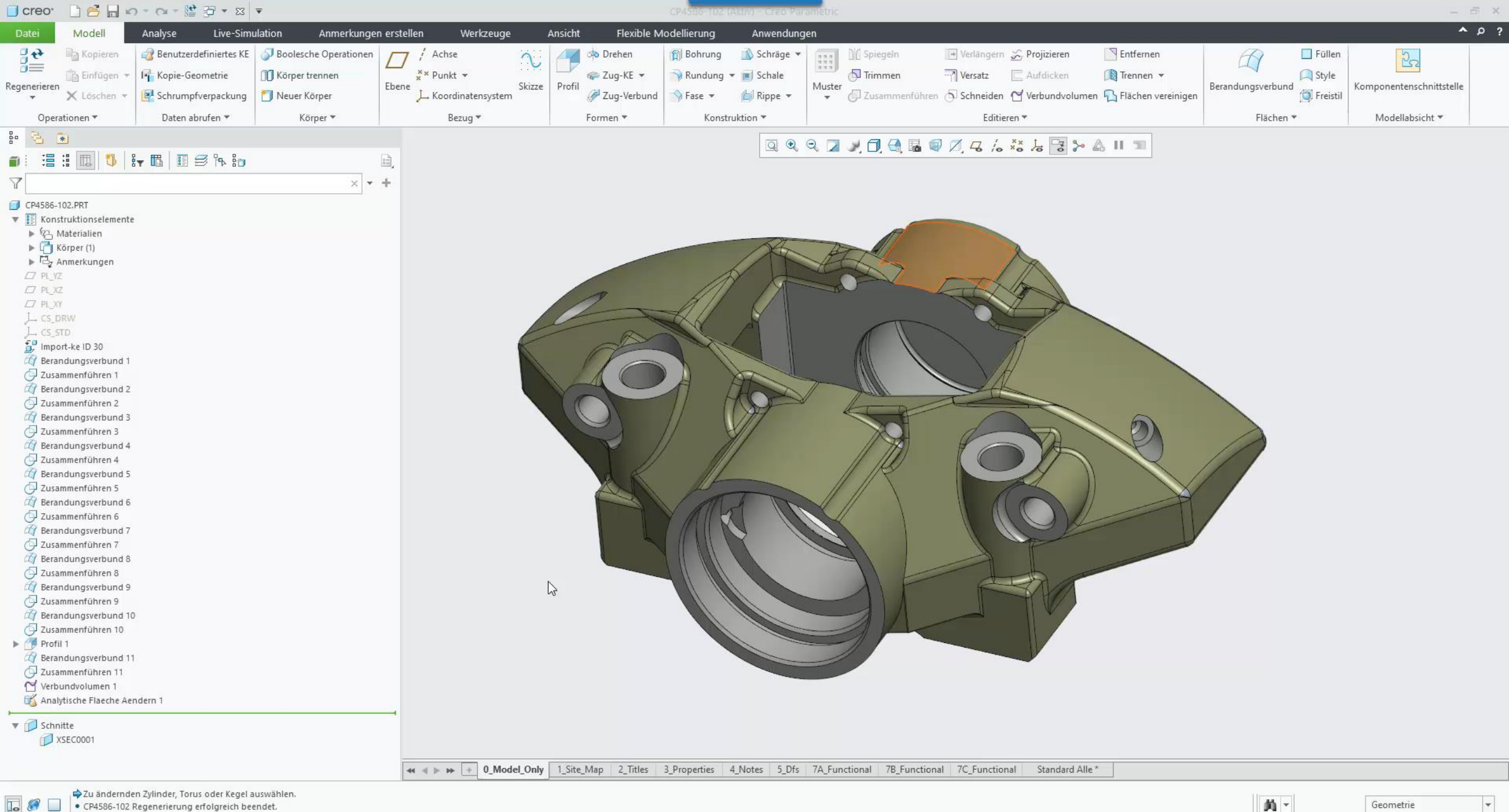
Digital Transformation: MBD creates a single source of truth, the 3D model

- The 3D model includes all dimensions, tolerances, GD&T, notes and other information
- Why are we still creating and managing a separate asset (2D drawing) to document what's in the model?

human **and** machine readable

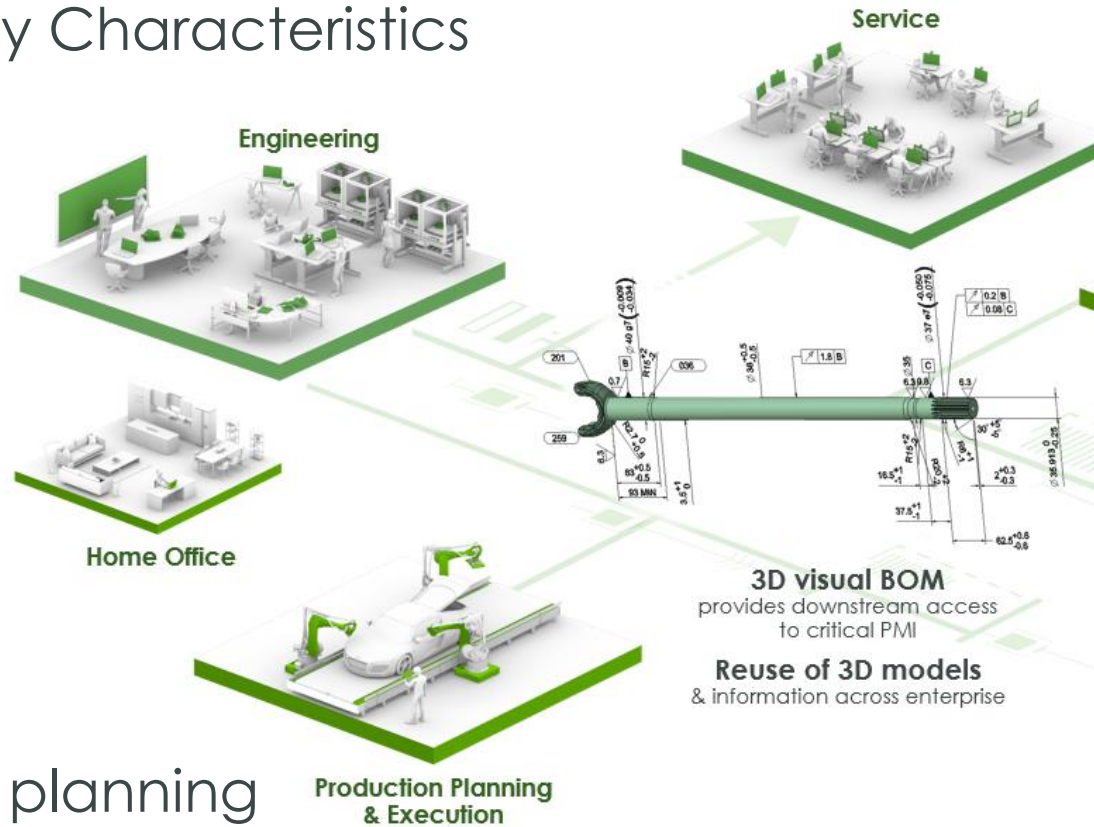
Model-based definition (MBD), is the practice of using 3D models within a 3D CAD software to define individual components and product assemblies.





TOP FOUR USE CASES

C Key Characteristics



A Inspection planning



B Production planning

D NC Programming

Top 3 Use Cases for MBD

Inspection Planning

-95%

2D drawing based

MBD based

10.5 days

4.5 hours

Engineering

Service

Quality

NC Programming

-66%

2D drawing based

MBD based

6 days

2 days

3D visual BOM

provides downstream access
to critical PMI

Reuse of 3D m

Production Planning

-50%

2D drawing based

MBD based

5.5 days

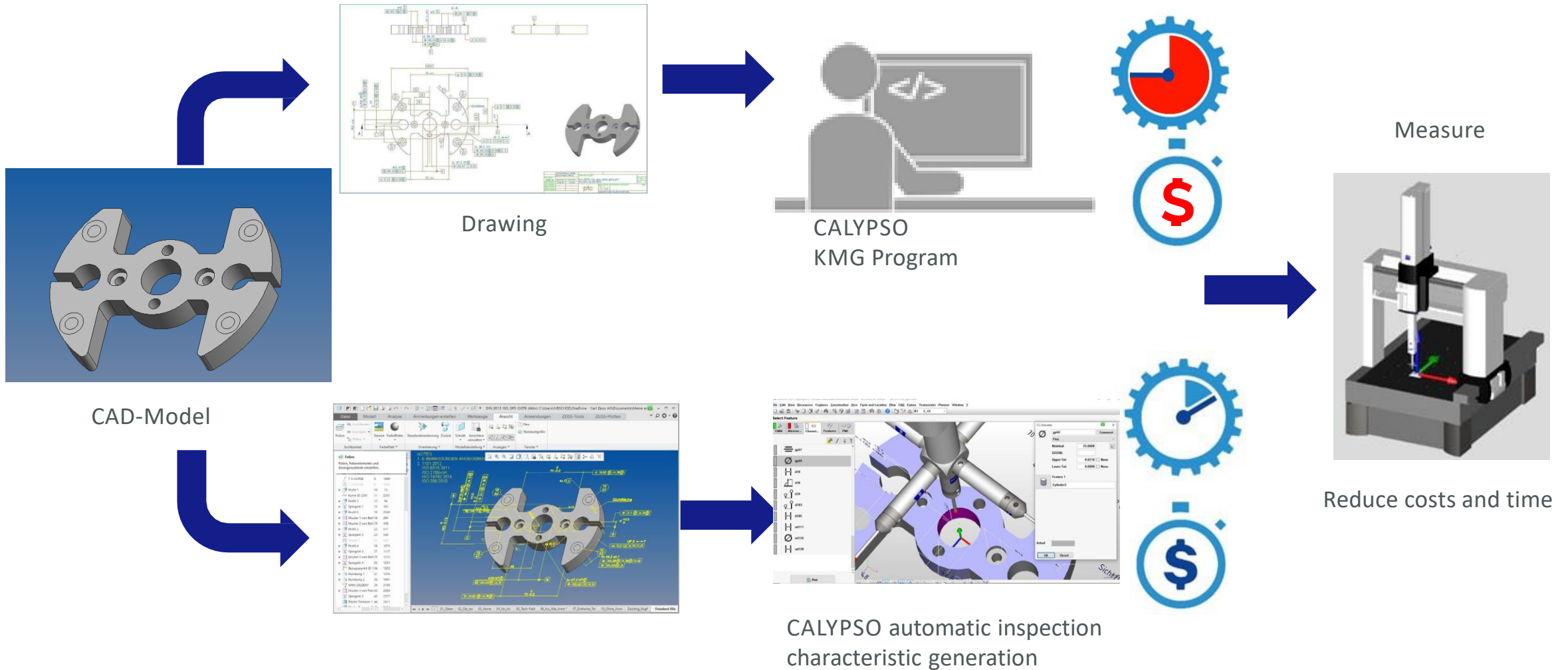
2.75 days

Production Planning & Execution

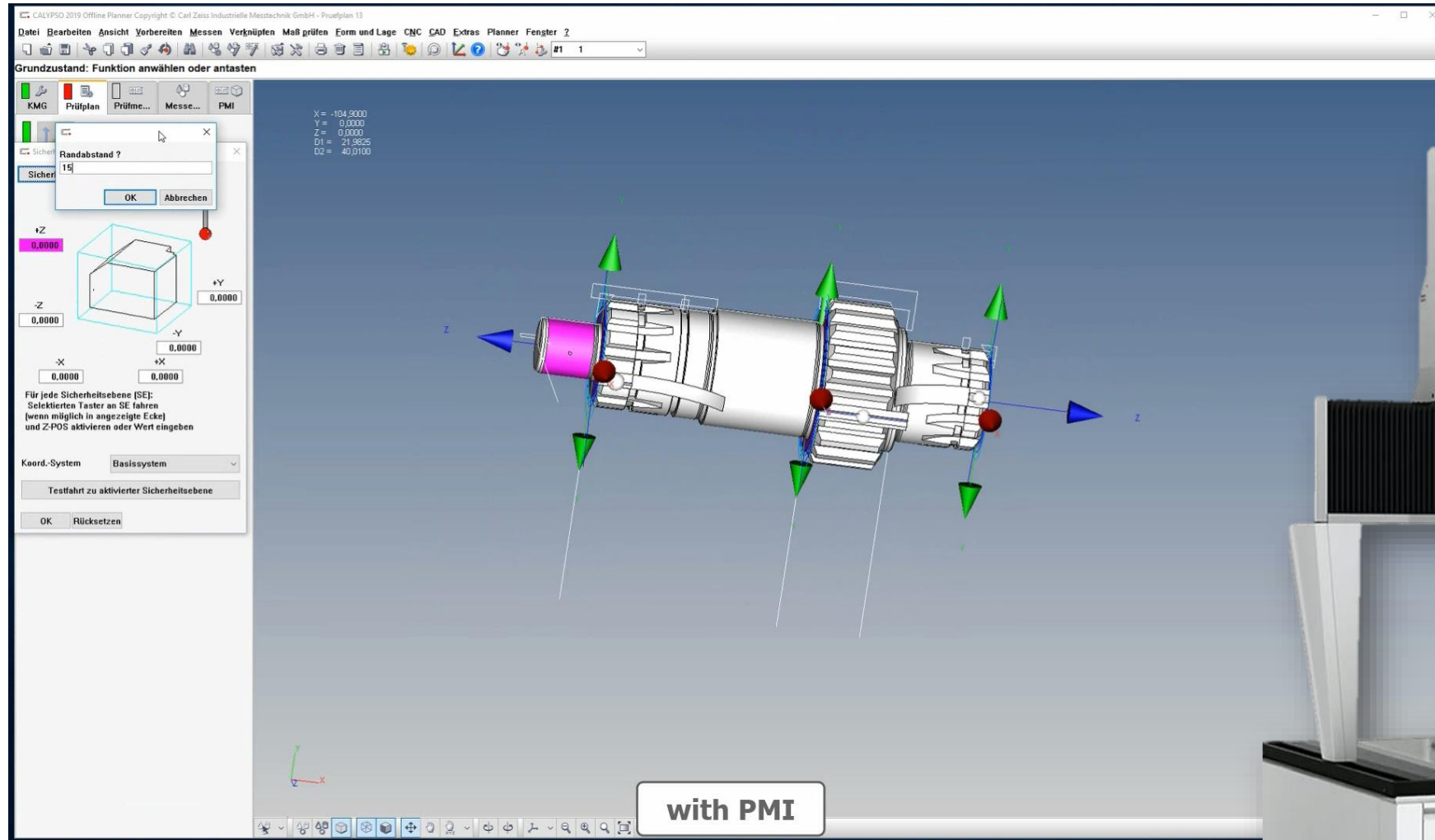
Supply Chain

ZEISS QUALITY EXCELLENCE CENTER

AUTOMATIC MEASUREMENT PROGRAM GENERATION



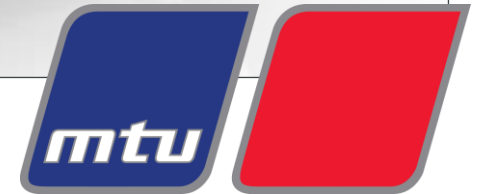
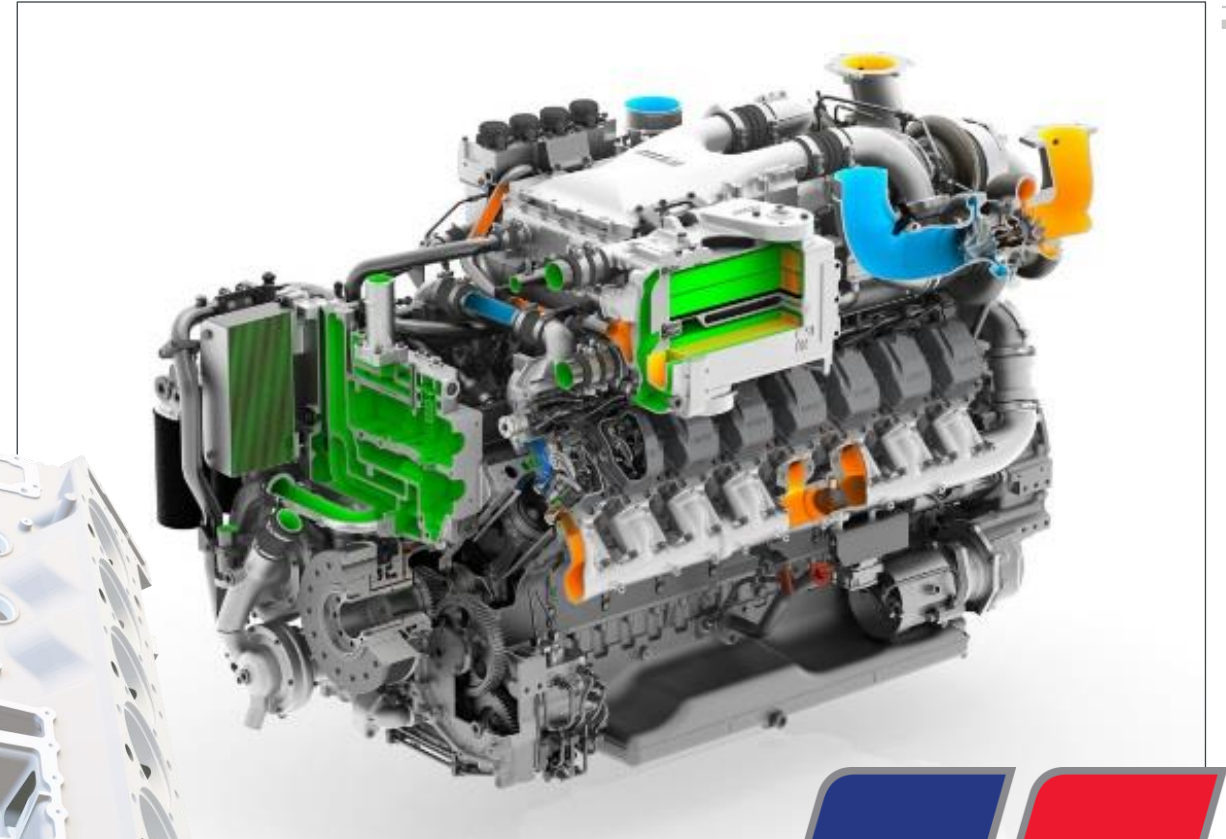
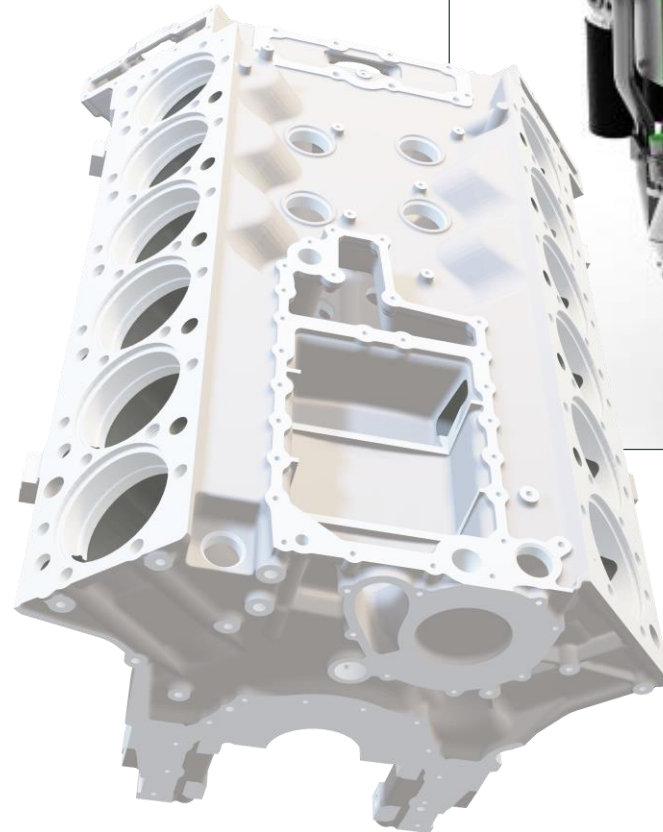
USE CASE – INSPECTION PLANNING WITH ZEISS



CONTROL CHARACTERISTICS

MTU: Diesel Engine

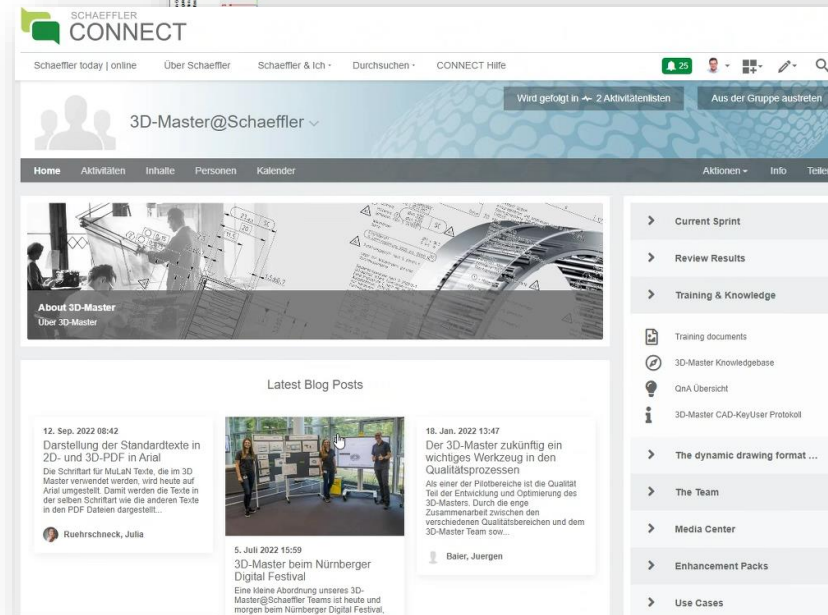
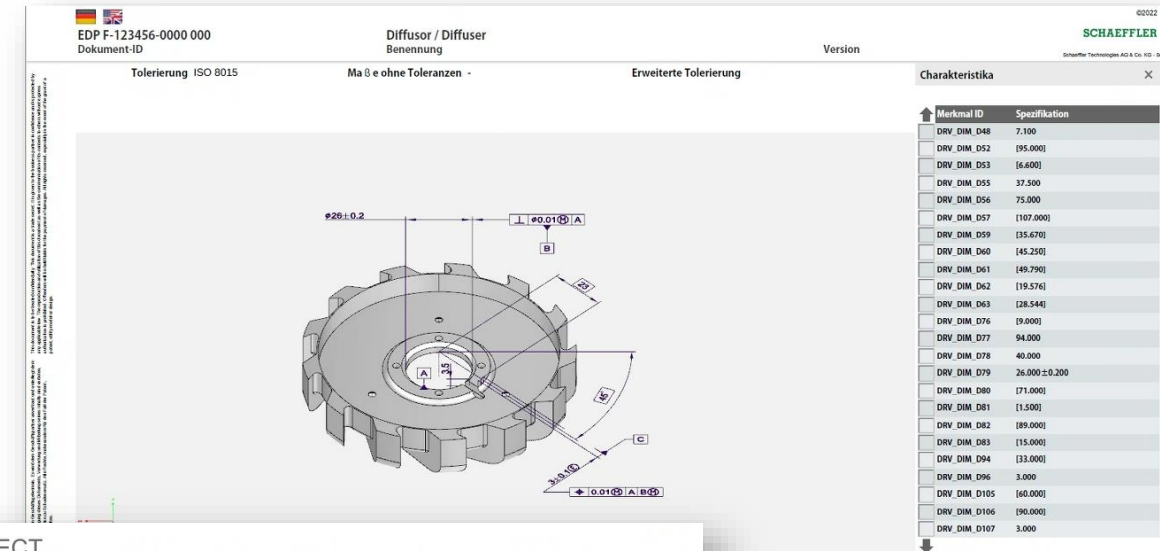
- 160 Key characteristics to describe emission requirements
- Business critical
- Highly IP protection



PRODUCTION PLANNING AND NC PROGRAMMING

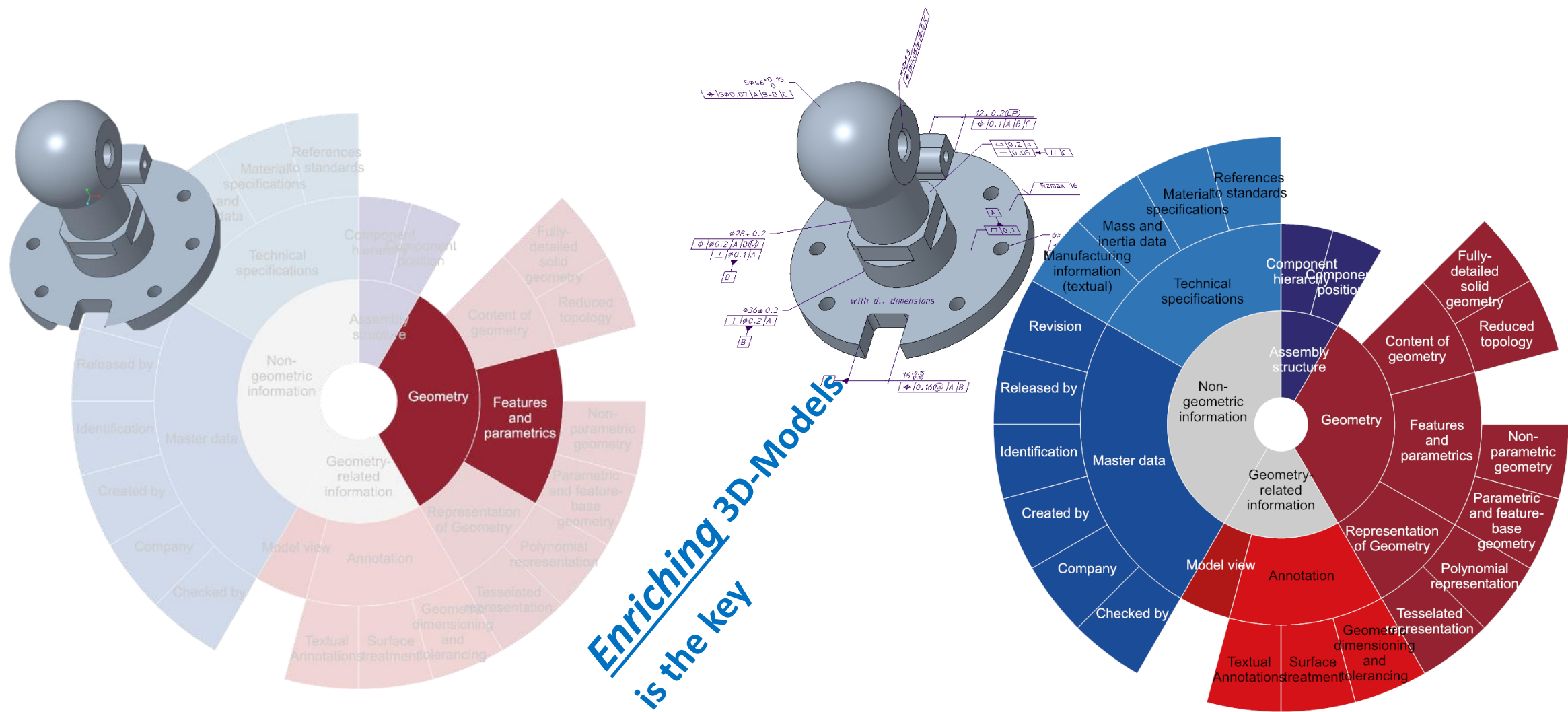
- Project:
“Machine Readable Implementation”
- Use of PMI data for:
 - Production Planning and NC Programming
 - Inspection with Hexagon / Zeiss using Step AP 242
- Training Connect
“3D Master@SCHAEFFLER”
 - Blogs
 - User Trainings

SCHAEFFLER



Use of 3D mCAD models instead of 2D drawings for releases

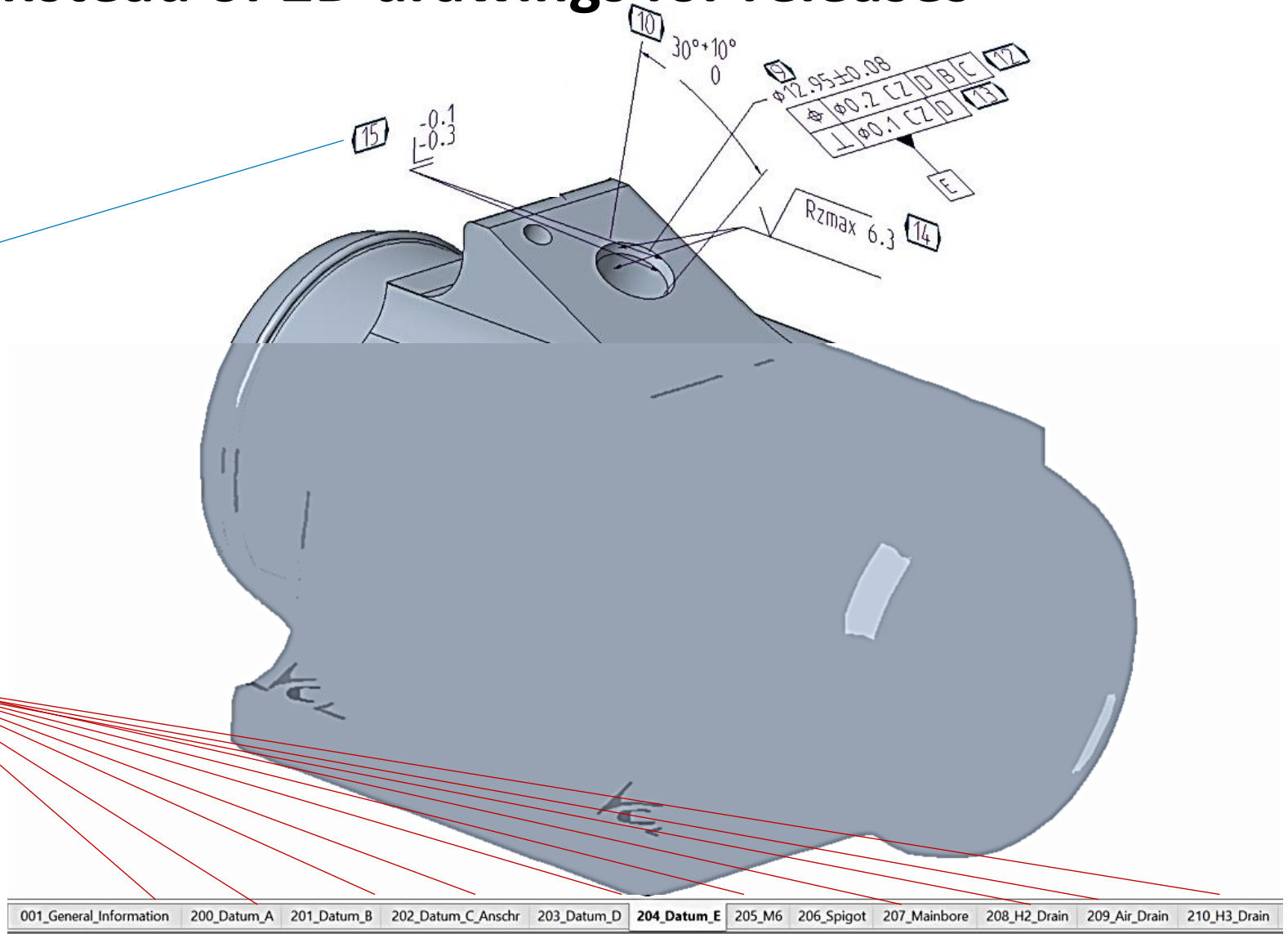
(But:) Key for Mechanics



Modeling Concept 1/2

- ▶ Function based tolerancing
- ▶ using ISO GPS symbols
- ▶ Characteristics get an ID from the very beginning, means already in CAD model

Specific CAD-Views contain **functional elements** with all characteristics relevant for a **function**



BOSCH SUCCESS MOVIE

Pioneering the 3D  Master @Bosch Power Tool



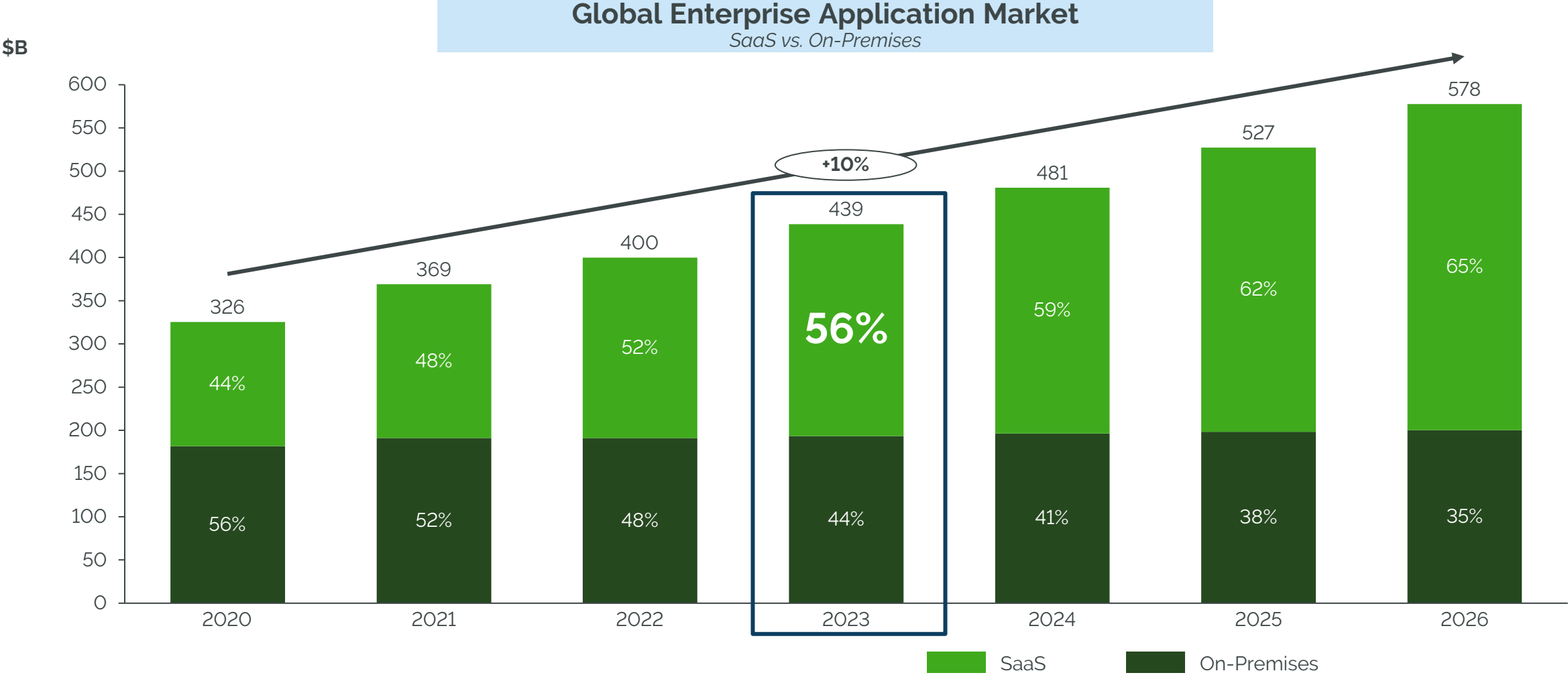
<https://www.youtube.com/watch?v=YHEBg-uUpVE>





WHY CAD SaaS? CRITICAL-BUSINESS BENEFITS

ENTERPRISE APPLICATION MARKET SHIFTS TO SAAS



Source: IDC, "Worldwide Software as a Service and Cloud Software Forecast, 2022-2026," July 2022

WHY CREO+?

- Proven Performance of Creo
- Cloud-Based CAD Administration
- Real-Time Design Collaboration

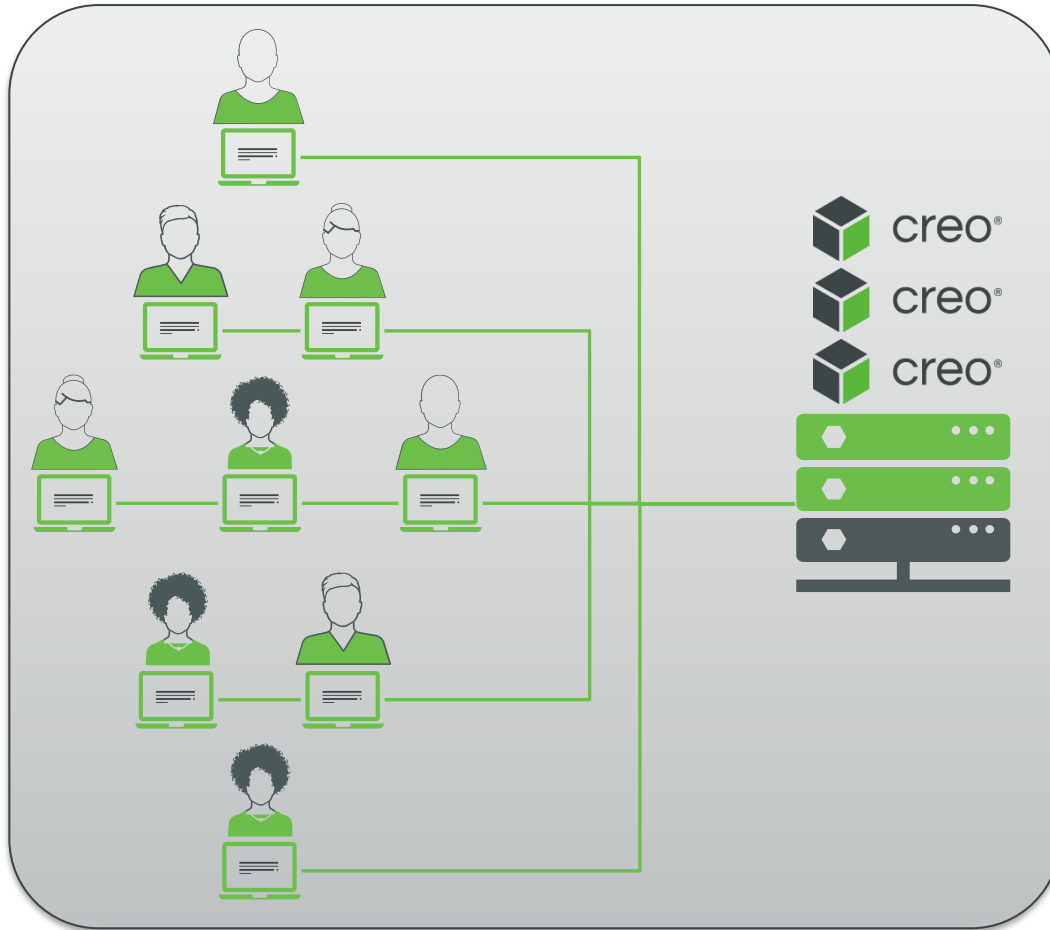


CREO+ POWER & PROVEN PERFORMANCE



- Award-Winning Creo Capabilities
 - Generative, simulation, MBD, additive manufacturing, etc.
- Same Creo software, now available as SaaS
 - No data translation required
- Fully upward compatible with on-premises Creo
 - Easier collaboration with colleagues and supply chain
- Benefit of latest technologies and usability
 - **Plus**, additional SaaS-only capabilities!

CURRENT PROCESS FOR ON-PREM CREO



Customer IT

Floating Licenses w/ Concurrent Users

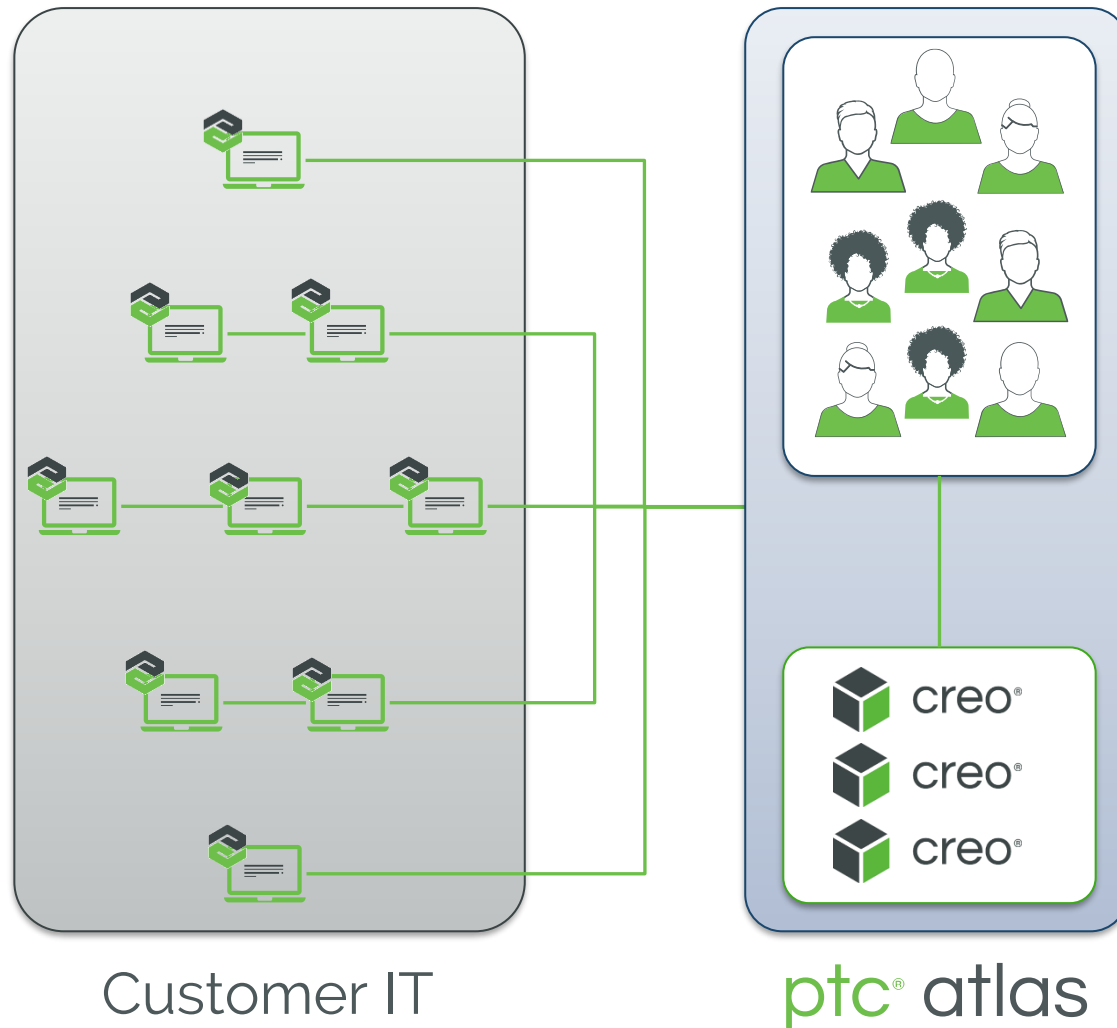
- Companies generate and manage their Creo licenses on a local server
- Admin's install, configure Creo which will be deployed to their users
 - Perform exhaustive testing to validate the version
- Leverage 3rd party tools to push the validated version to their users

Note: Each update requires steps to be repeated

Challenge:

- **45% of Technical Support** calls related to licensing and installation

TRANSITION TO CREO+ POWERED BY ATLAS



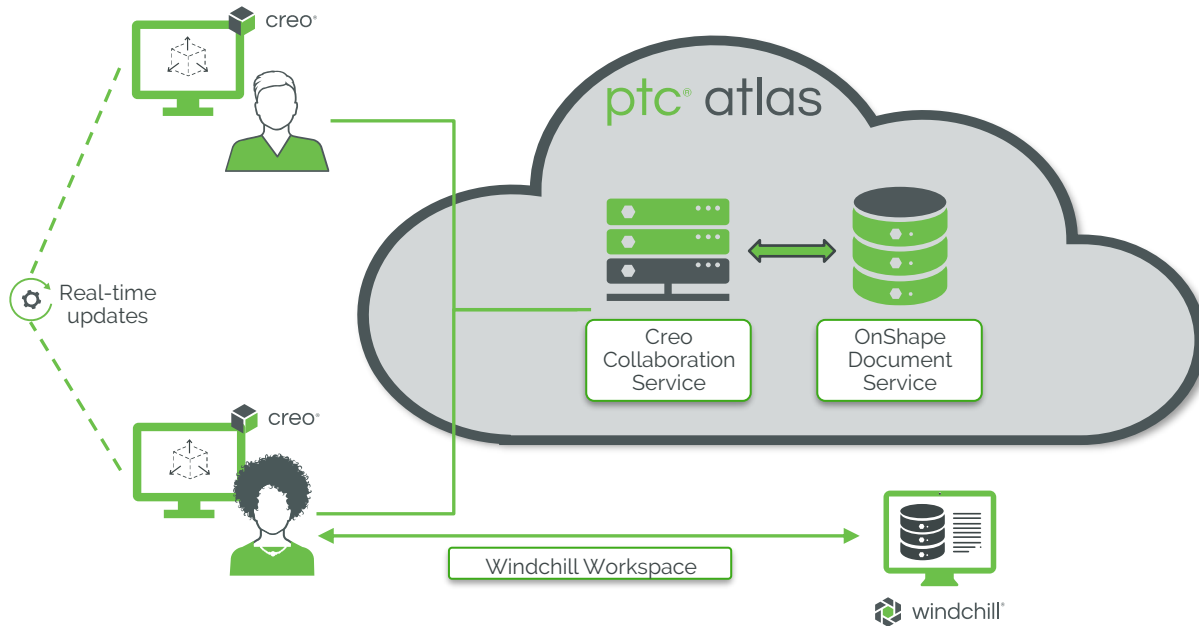
Named User Entitlement with access to Extensions

- Users are invited into the organization and granted access to run Creo+
- Users are assigned Named User License Entitlements based on their given role and responsibility
- Groups are created with a defined setup options, dedicated extensions licenses and assigned users
- Creo+ would be automatically be installed on user machines, based on group specifications
- Updates are automatically pushed and installed to all users

Solution:

- Through central administration and deployment, calls to Technical Support will be drastically reduced

COLLABORATION WITH CREO+

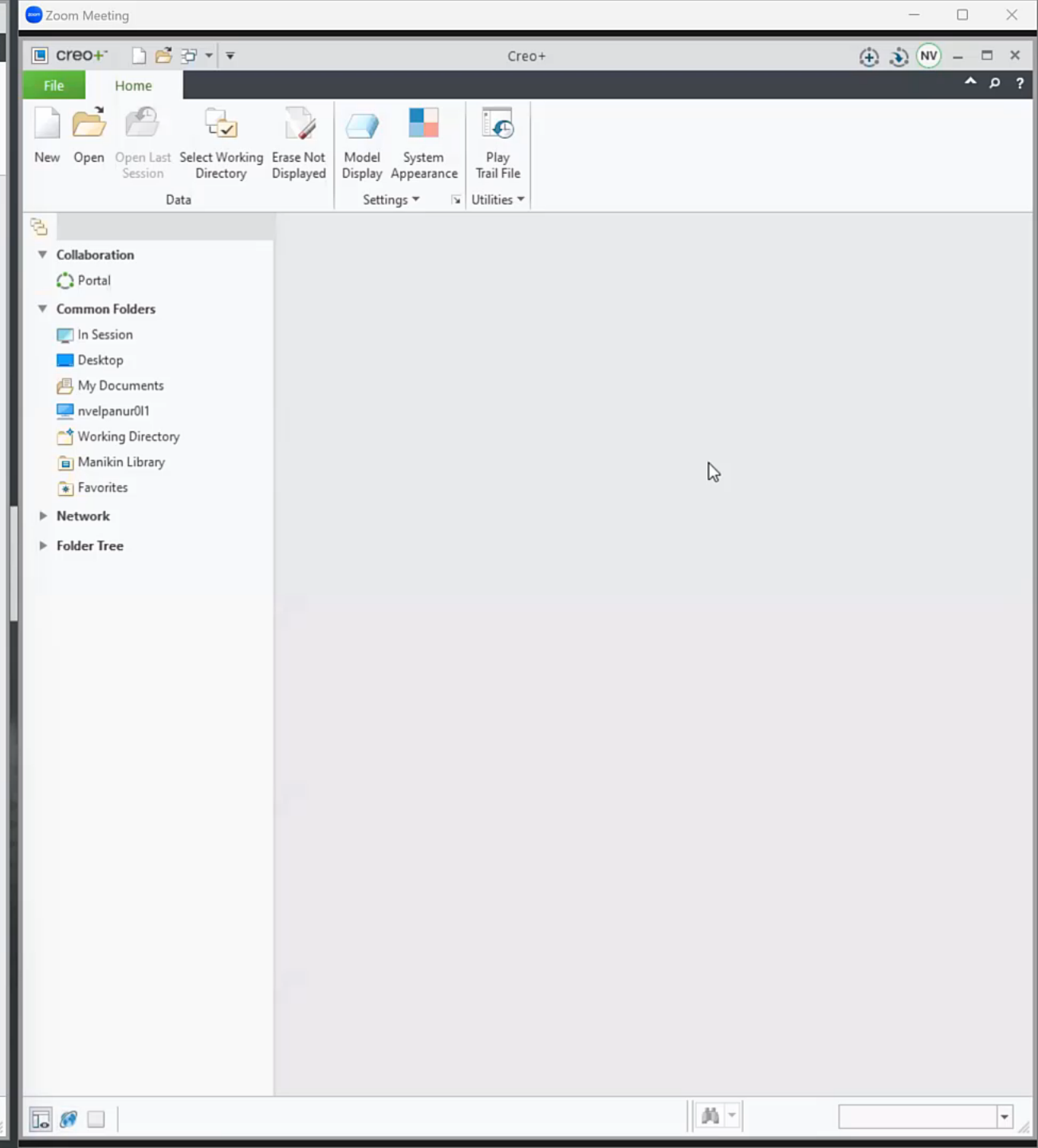
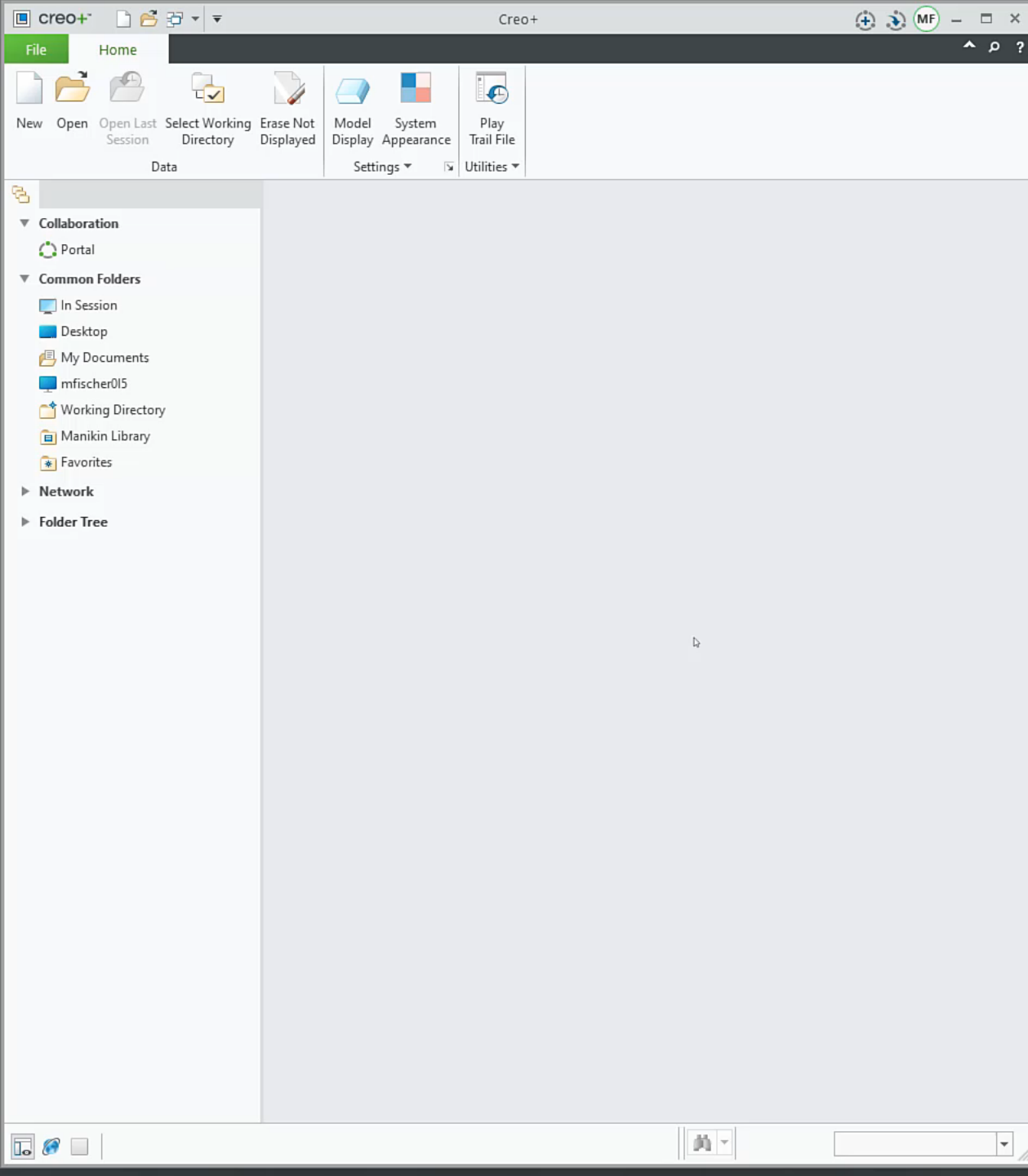


Multi-user Collaboration in Creo

- Users start up a Creo Collaboration session and bring in the required project data
- Multiple other users can be invited to join the Collaboration session and work on specific portions of the design
- Since the Collaboration service runs on Atlas, each change is synchronized in real-time across all users
- Multiple design variations can be explored and feedback can be captured within the project

Solution:

- Creo Collaboration brings together multiple designers to collaborate in real-time – faster and more efficiently in a secure connected environment



PLM COMPATIBILITY



windchill®



creo+

- Windchill
 - Compatible with Windchill 12.02 through Windchill 13
 - Creo+ is tightly integrated with SaaS-delivered Windchill+
- Compatible with Local PLM/PDM
 - Customer responsibility to test, manage, and validate that the third-party system works as expected.
- For existing Windchill users, Creo+ customers should expect to move to Windchill+.
 - Creo+ and Windchill+ are simply better together

FUTURE OF CREO+



Creo+ Product Launch

Centralized administration, automated deployment, and real-time collaboration



Configuration Management

Manage companies' configurations for Creo+



Creo+ Streaming

Stream Creo+ on any machine through a supported browser.



Customization Management

Manage customized applications



Lightweight PDM

Atlas-based product data management designed for Creo+

2023

2024

2025+



Expanded Innovation

Deliver quarterly updates of Creo+ enhancements



Enhanced Telemetry

Aggregated view of diagnostic data, performance and license usage.



Government Certification

Certification for controlled cloud environments.

Future features will be continuously improved based on current usage/ customer feedback

Future looking information. Subject to change without notice.

FUTURE CAD INVESTMENT AREAS

CAD



creo® +



User
Productivity



Design with
Composites



Model Based
Definition



Control Center*

Core Functionality

Emerging Technologies



Generative
Design



Simulation
Driven Design



Design for
Additive



Real Time
Collaboration*



DIGITAL TRANSFORMS PHYSICAL

THANK YOU

www.ptc.com/creo

ptc.com

