Streamline product development to deliver greater innovation

NX Topology Optimization

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Topology Optimization Driven by Functional Requirements

Integrated into NX with easy-to-use UI

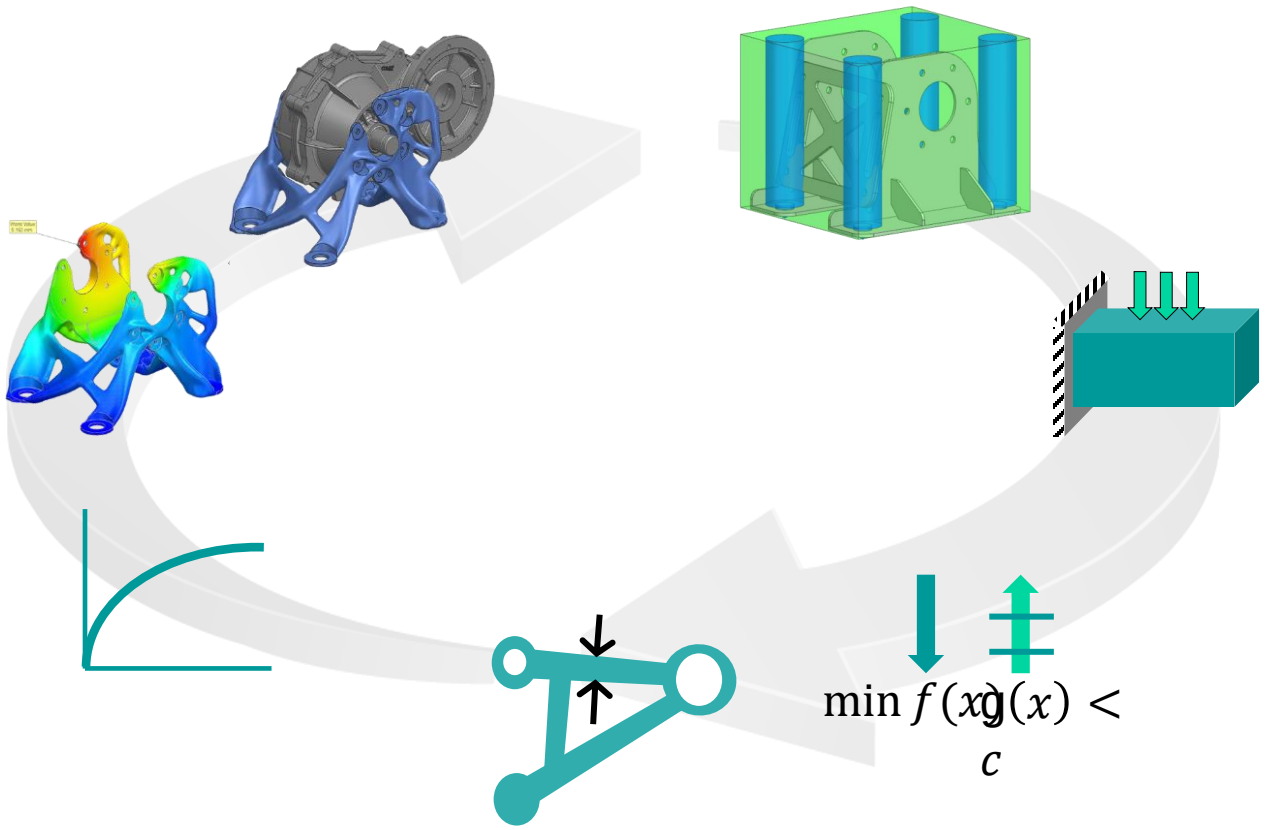
Inputs driven by functional requirements

“What if” studies

Mixed Convergent Body result easy to modify and reuse

Part of the PLM workflows

- Management
- Simulation
- Manufacturing



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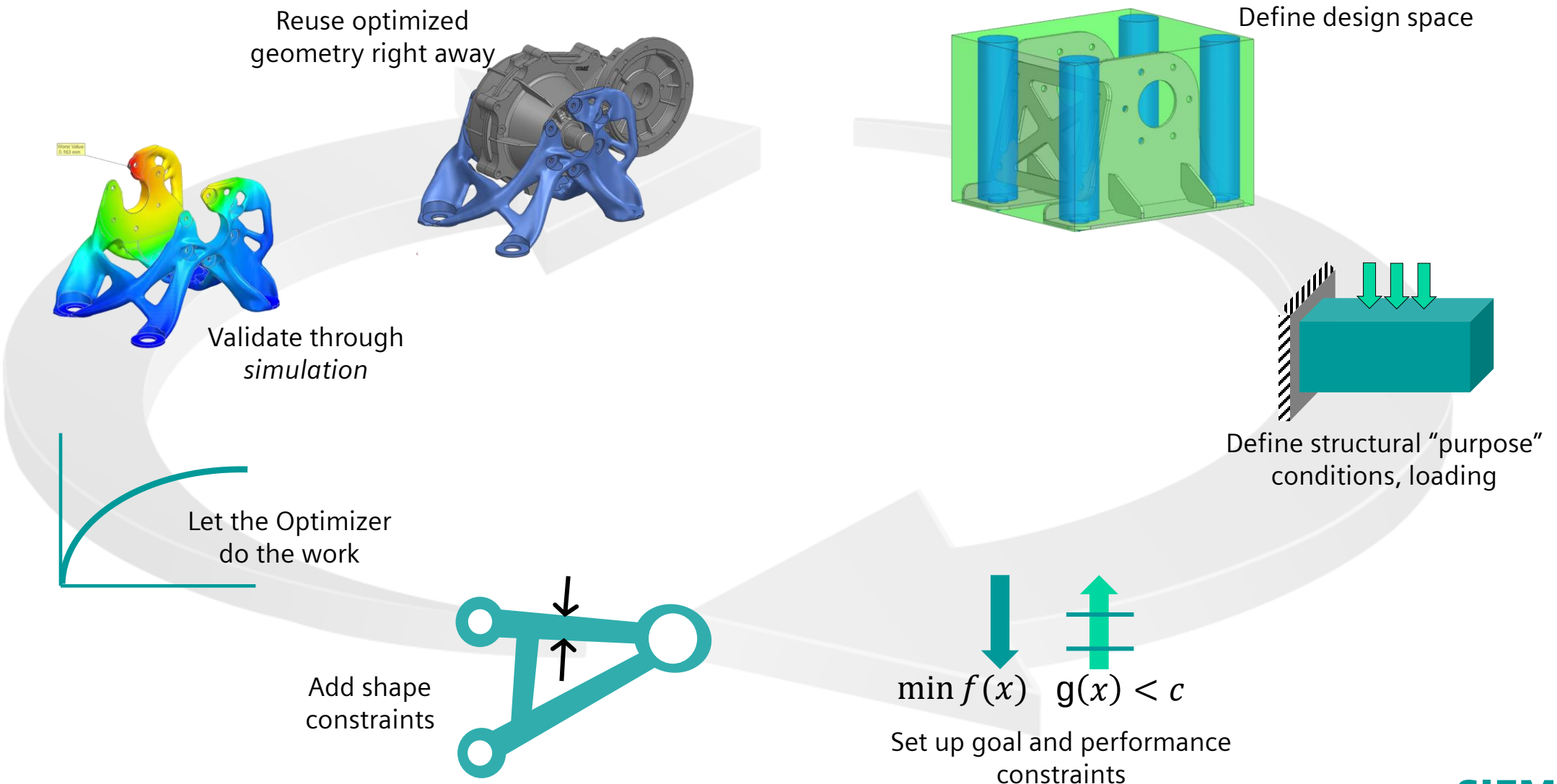
Topology Optimization Driven by Functional Requirements



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NX Topology Optimizer UI

Integrated in NX

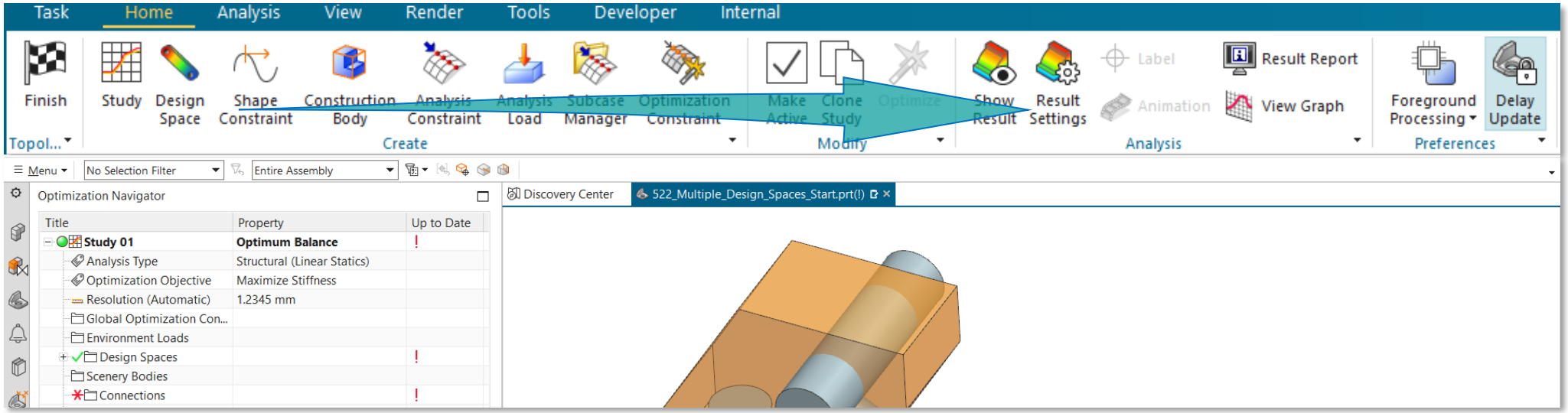
- Shares the common User Experience

Intuitive to use

- Ribbon bar guides you from start to finish, “left to right”

Consistent in the assembly context

- Keeps track of and updates reference geometry



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NX Integration – NX User Experience

Consistency

- Within all NX workflows

Comprehensive documentation

Command Finder

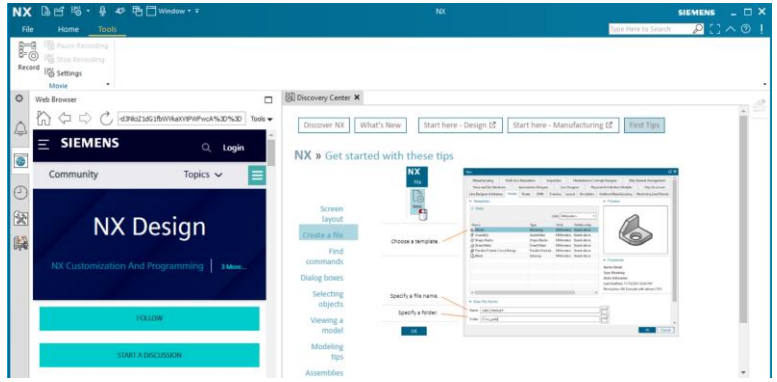
Command prediction

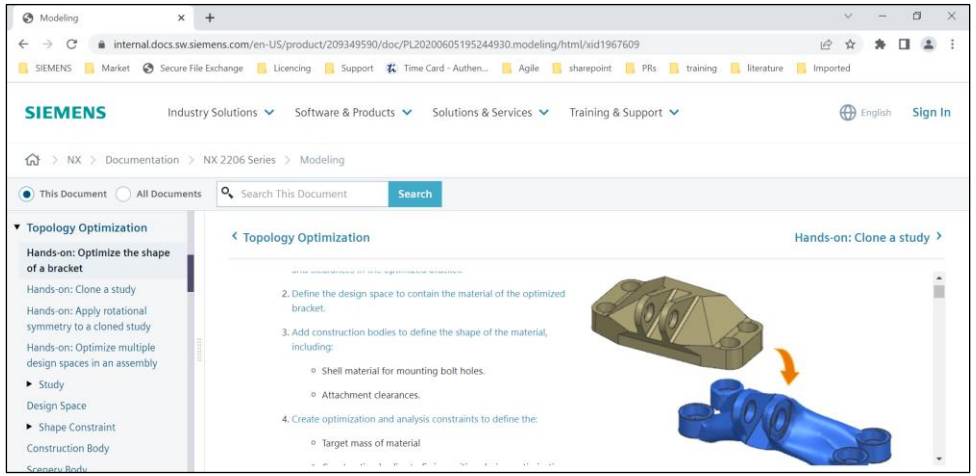
Comprehensive user aids

- Built-in guard-rails for the less experienced user
- Checks for conflicts to ensure user creates a valid model

Easy

- Reduced learning curve through visual learning tools





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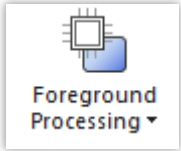
Computation of the optimization

The optimization will run on the fastest local hardware available, ie the GPU or CPU. The GPU will be used initially but it will depend on the dedicated GPU memory available and size of optimization model

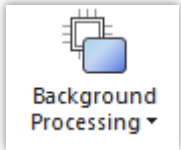
Optimization execution:

Foreground



- Optimization is run with the monitor to show the progress
- NX session is locked

Background



- Multiple optimizations can be run in parallel
- Study is locked, but NX session is unlocked enabling user to continue working
- User can exit and re-start NX at a later time to retrieve results

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NX Integration – Topology Optimization Feature

Task based feature in the NX modelling environment

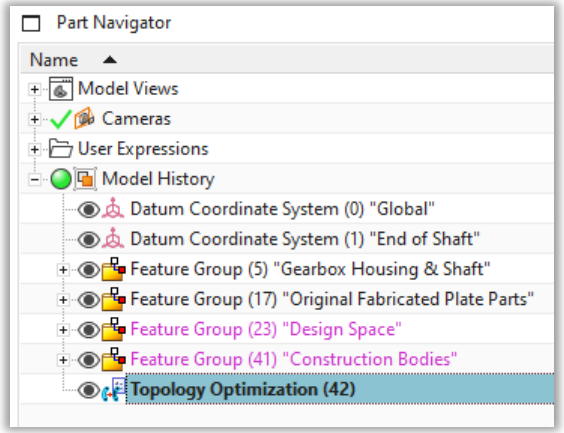
- Works as an NX user expects it to work

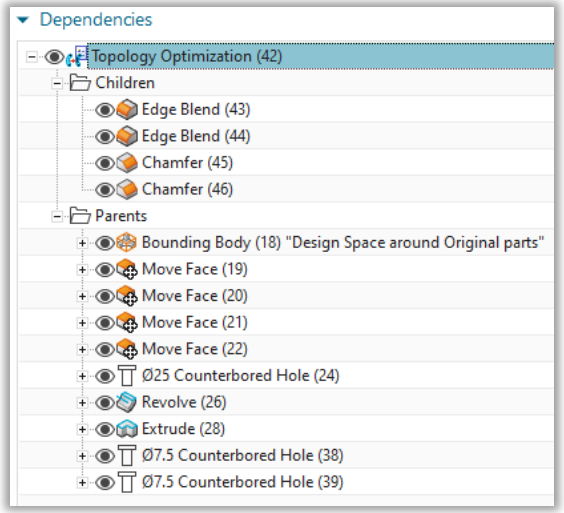
Up-stream Associativity

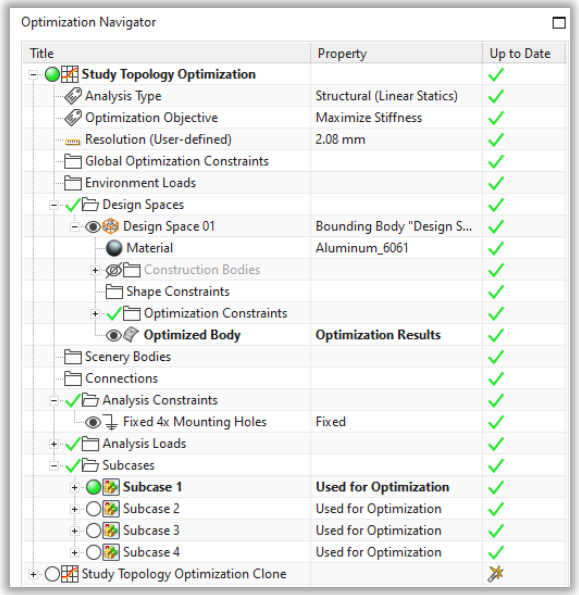
- Keeps track of referenced geometry

Down-stream Associativity

- Features update when Topology Optimization feature updates
- Results can be used directly in all downstream processes







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Validate and reuse your optimal design

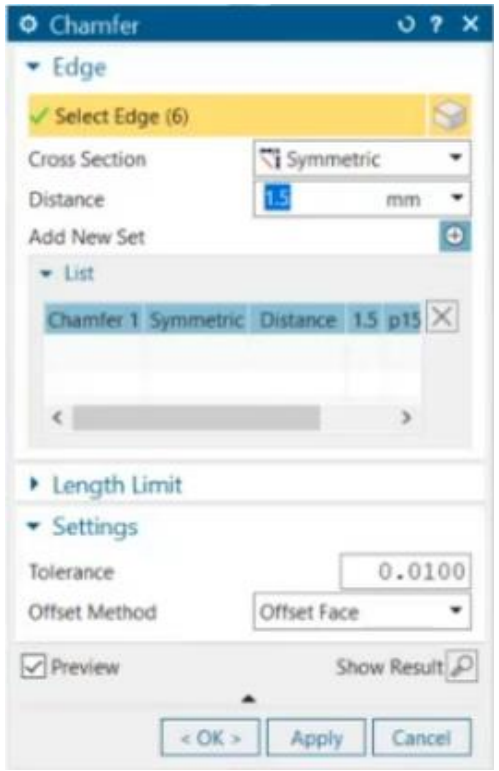
Mixed convergent optimized geometry

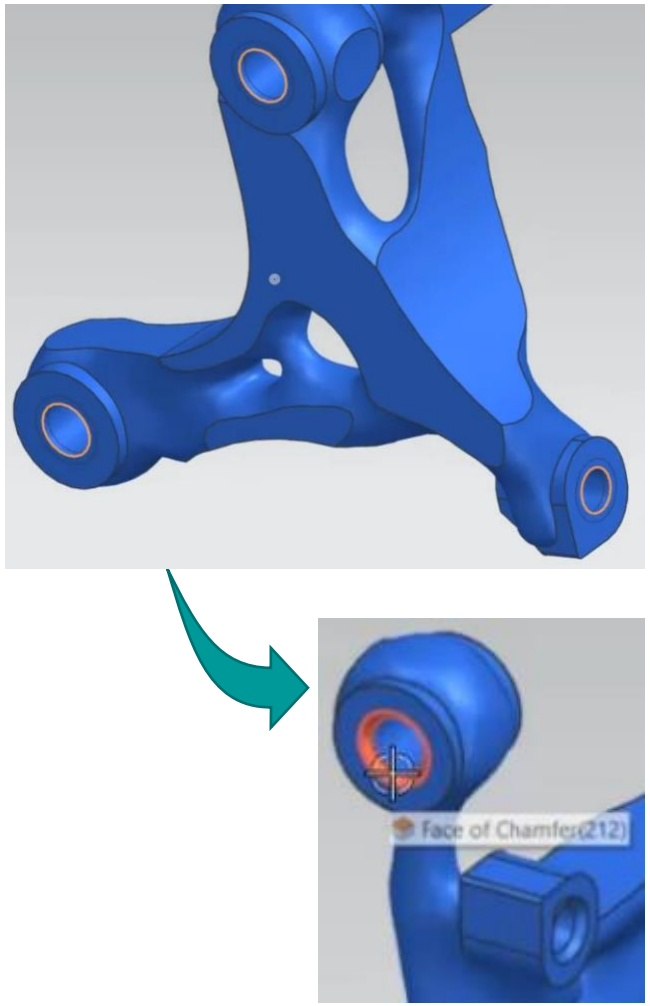
- Mesh Faces trimmed with traditional face types

The finished design is parametric with mixed modeling so additional input can be placed on the model and feed all downstream applications of the digital tread.

Can directly be modified and reused in NX and/or Simcenter3D to verify results are comparable to a reference using preferred solver

In-built post-processing enables validation of results with contour plots, tables and graphs





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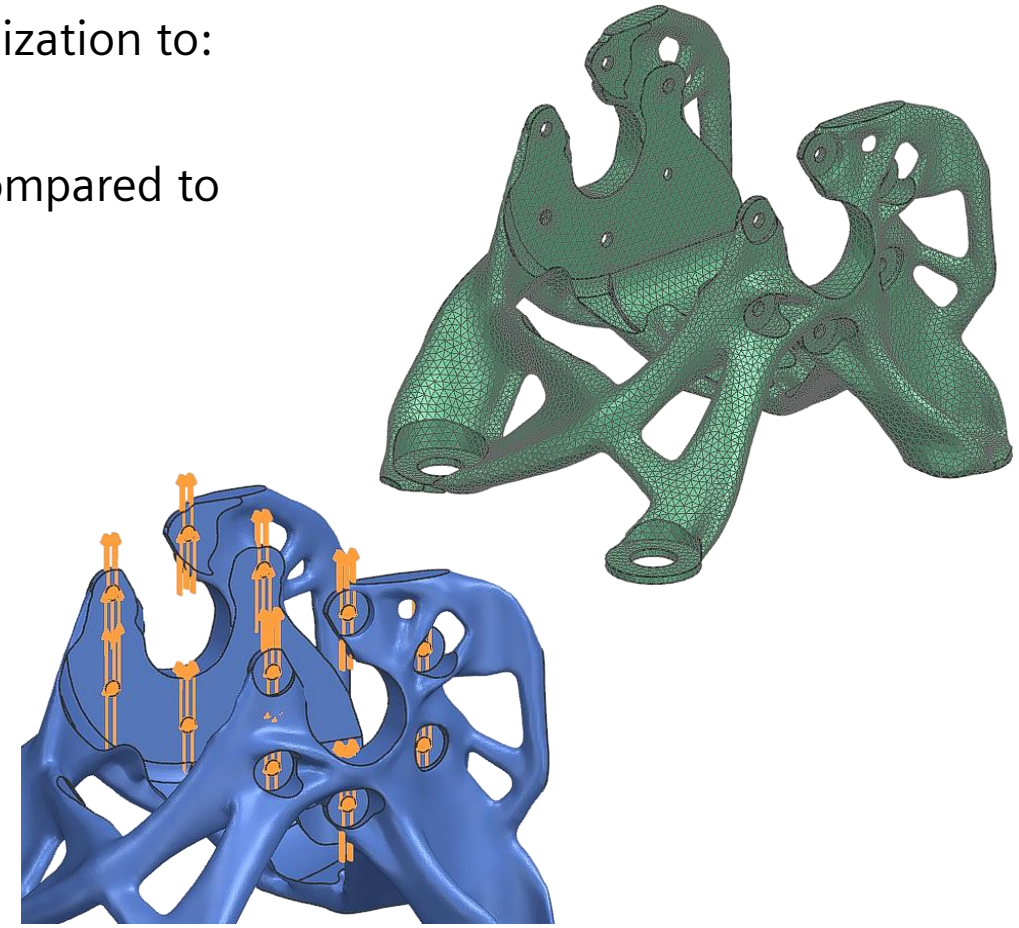
Verification Using Simcenter 3D & Preferred Reference Solver

Use Simcenter 3D with the same setup as the Topology Optimization to:

- Validate the model (does it pass acceptance criteria)
- Verify the optimized results meet the requirements when compared to a known reference solver

Validate & Verify using your preferred reference solver

- Simcenter Nastran
- Simcenter Samcef
- Abaqus
- ANSYS
- MSC.Nastran



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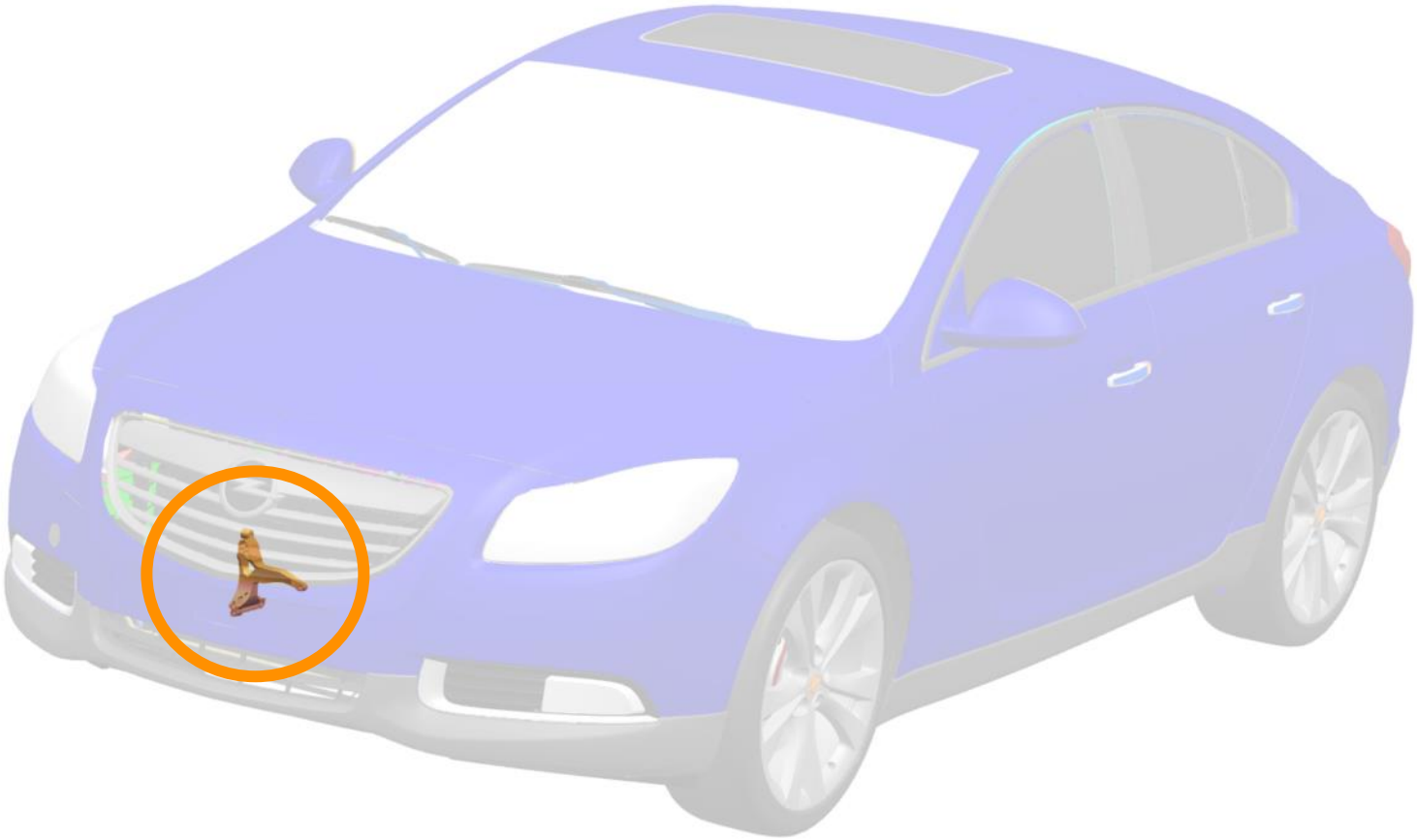
NX Topology Optimization Demonstration

Bracket to hold AC Pump, designed in context of the vehicle assembly



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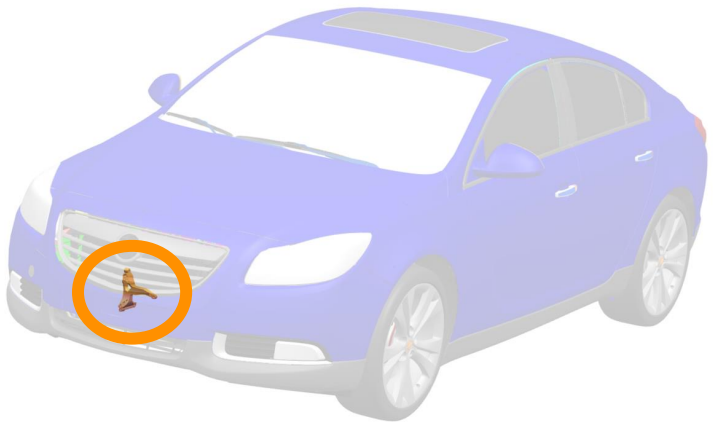
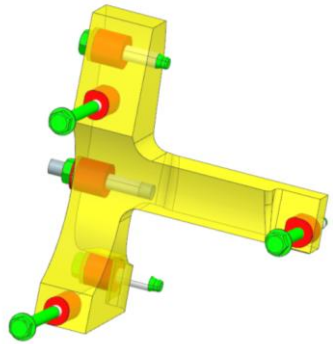
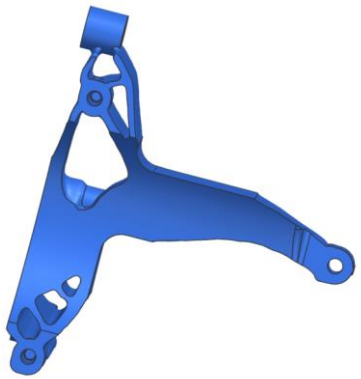
NX Topology Optimization Demonstration

Optimization is like a cooking recipe. You put in the ingredients and out comes the optimized design







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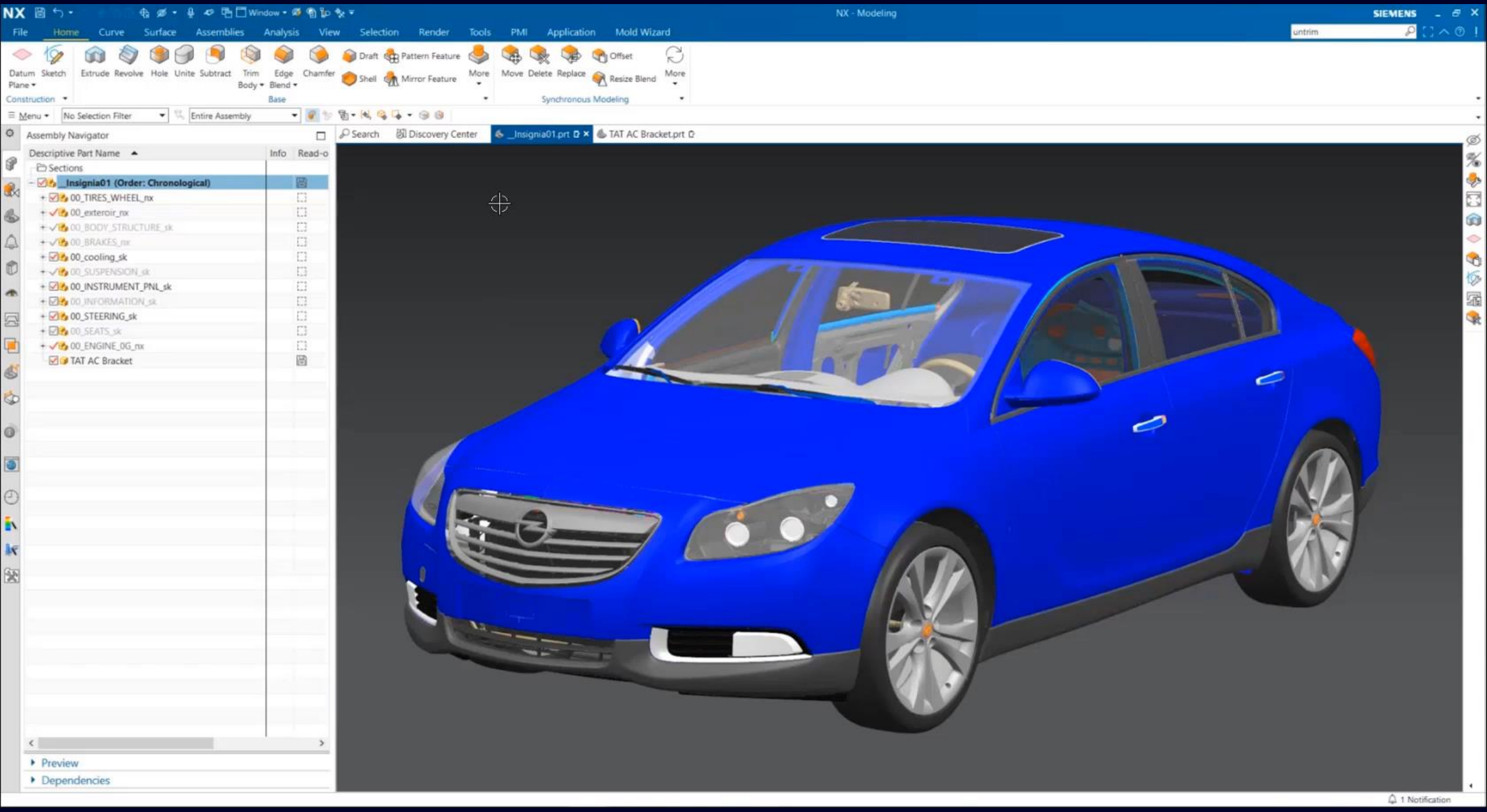
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Selection
Render
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Application
Mold Wizard
untrim
Datum Plane
Sketch
Construction
Extrude
Revolve
Hole
Unite
Subtract
Trim Body
Edge Blend
Chamfer
Draft
Pattern Feature
Shell
Mirror Feature
More
Base
Move
Delete
Replace
Offset
Resize Blend
More
Synchronous Modeling
Menu
No Selection Filter
Entire Assembly
Assembly Navigator
Descriptive Part Name
Info
Read-o
Sections
_Insignia01 (Order: Chronological)
00_TIRES_WHEEL_nx
00_exteroir_nx
00_BODY_STRUCTURE_sk
00_BRAKES_nx
00_cooling_sk
00_SUSPENSION_sk
00_INSTRUMENT_PNL_sk
00_INFORMATION_sk
00_STEERING_sk
00_SEATS_sk
00_ENGINE_0G_nx
TAT AC Bracket
Preview
Dependencies
Search
Discovery Center
_Insignia01.prt
TAT AC Bracket.prt
1 Notification

PLM Workflow made easy

Managed in Teamcenter

- Integrated synchronized management of all product data

Manufacturing workflows

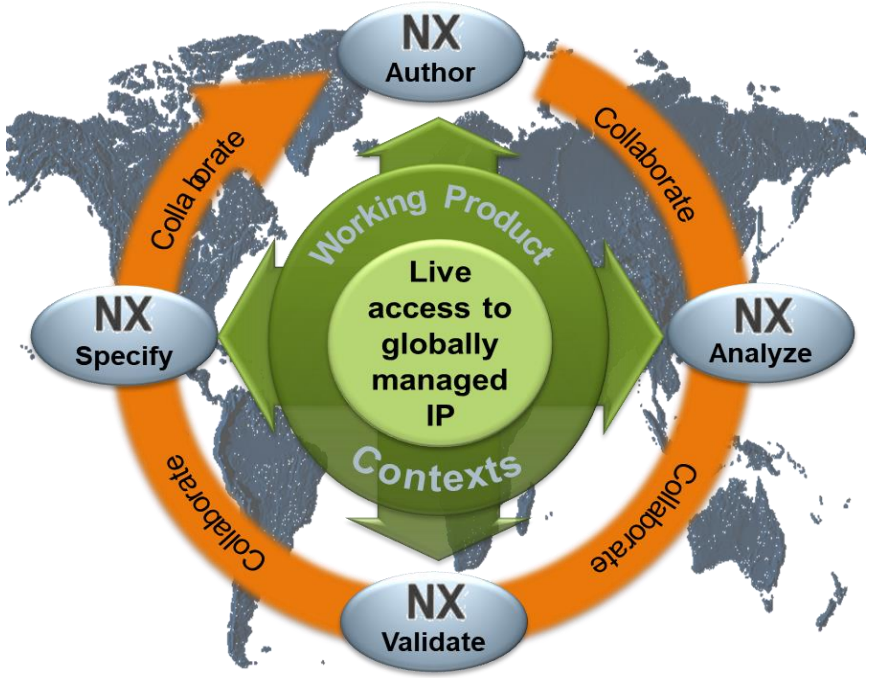
- Subtractive & Additive workflow preparation

Simcenter 3D Simulation workflow

- Advanced physics simulation

Simcenter HEEDS/ Simcenter 3D Design Space Exploration

- Multi-Disciplinary Optimization and Design Space Exploration



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HEEDS – MDO & DoE

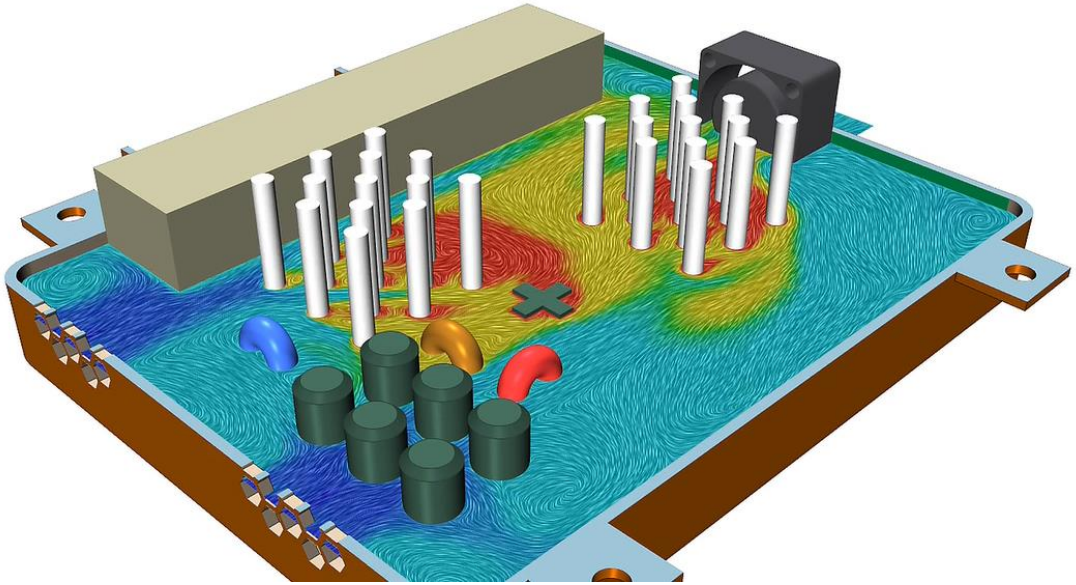
Intelligent design exploration

Automate design simulation processes to allow for time-efficiency and uncovers new design concepts that improve product performance

Connection to NX is through Expressions

Uses four enabling technologies:

- Process automation
- Distributed execution
- Efficient search
- Insight & discovery



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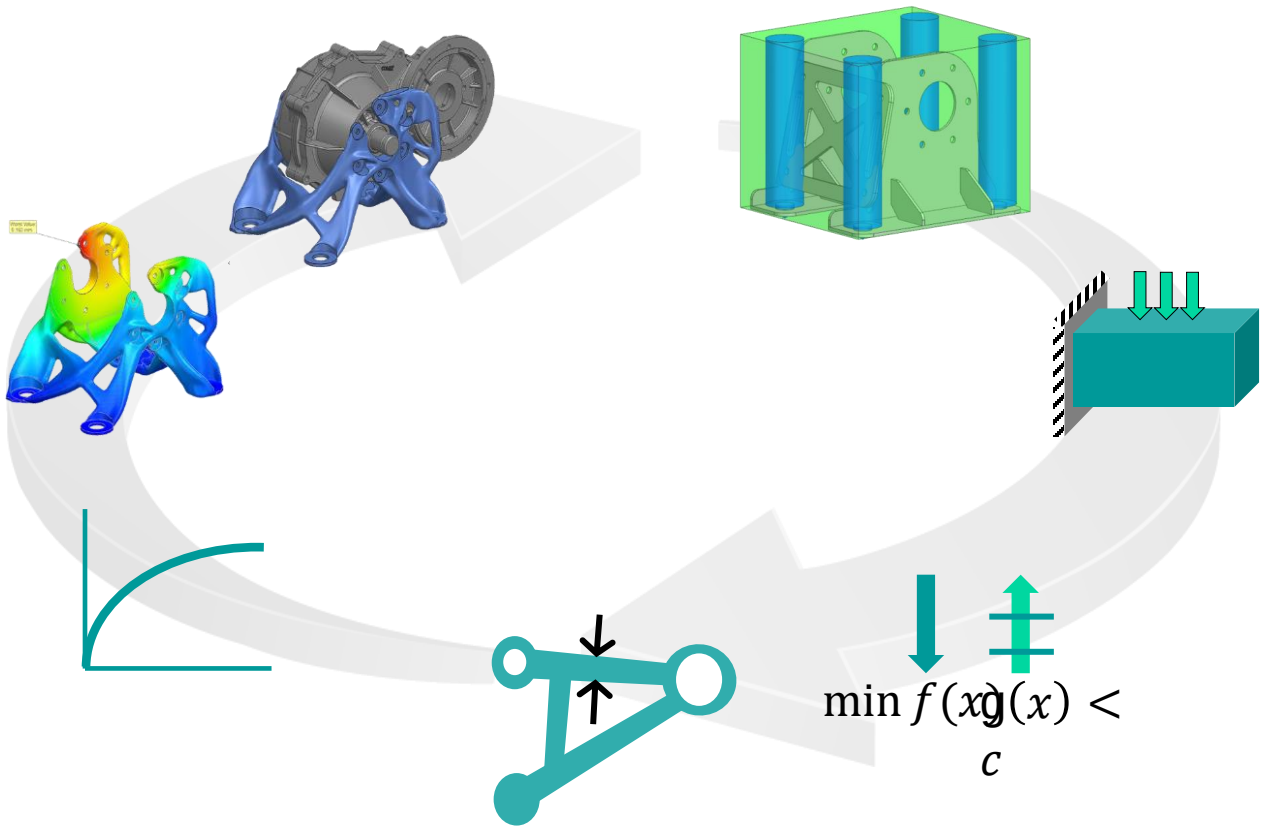

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Thank you for your attention

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