

Webinar Logistics

- Audio
- Questions' Panel
- Recording and Slides



Webinar 1: Leveraging Real-Time GPU Solvers for Simulation Driven Designs

Daniel Moses, Sr. Applications Engineer at DRD Technology

June 18, 2024

Agenda

- **Introduction to DRD**
- **What is Simulation Driven Design**
- **Barriers to Simulation Driven Design**
- **Examples of Simulation Driven Design**
 - **Real Time Simulation**
 - **Parametric Solves**
 - **Topology Optimization**



Webinar 1: Leveraging Real-Time GPU Solvers for Simulation Driven Designs	6/18/24
Webinar 2: Empowering Design Engineers with Faster and More Accurate GPU Physics Solvers	6/27/24

*Email support@drd.com to register

Mission Statement



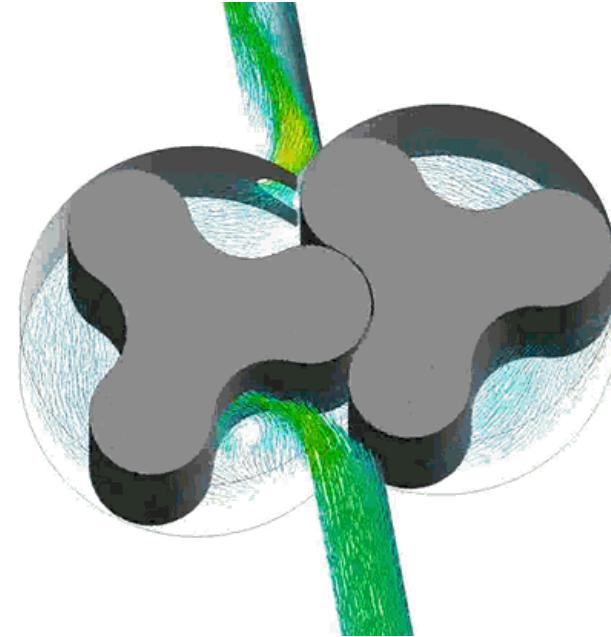
CERTIFIED ELITE CHANNEL PARTNER

DRD helps its customer make effective utilization of Ansys through products sales and a range of services including technical support, training, consulting, mentoring, and technology transfer.

DRD History

Since 1980, DRD Technology has been focused on engineering simulation.

In 1984, DRD became an Ansys Channel Partner.



“I’ve been working with DRD for 29 years. Working with your team has been one of the more enjoyable parts of my career. You have always been ready to help in any way.”

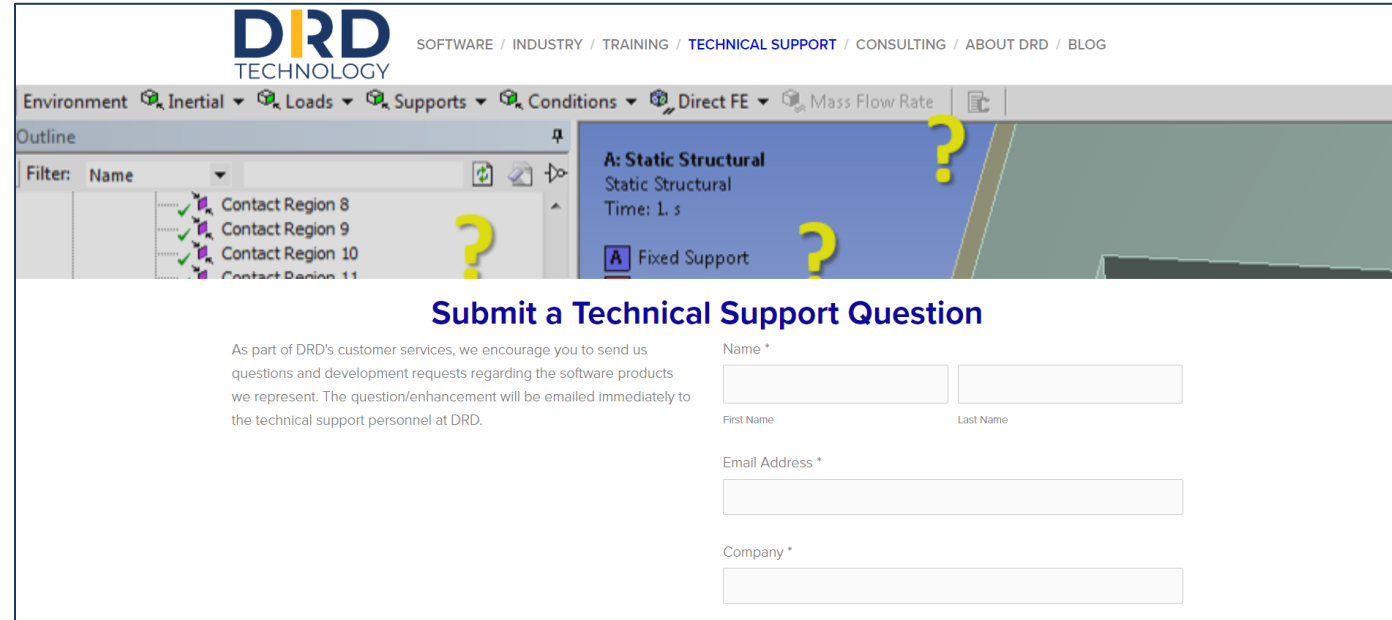
- Rick Kunc  **SOLVAY**
asking more from chemistry®

Technical Support Contact Coordinates

Phone: 918 743-3013 ext 1

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Web: www.drd.com



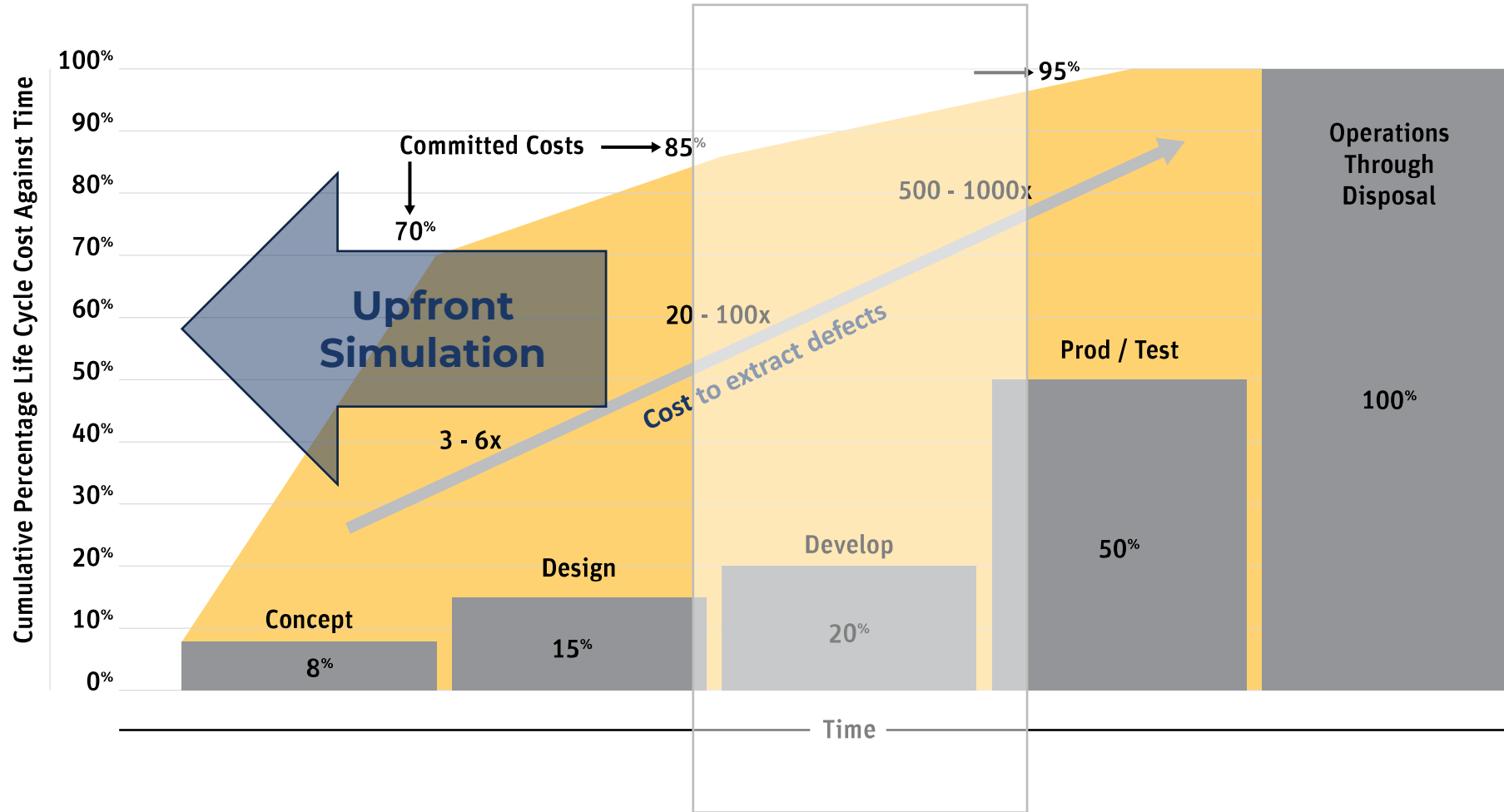
The screenshot shows the DRD Technology software interface. At the top, the DRD logo is displayed with the text "SOFTWARE / INDUSTRY / TRAINING / TECHNICAL SUPPORT / CONSULTING / ABOUT DRD / BLOG". Below the logo, there are several tabs: "Environment", "Inertial", "Loads", "Supports", "Conditions", "Direct FE", and "Mass Flow Rate". The "Supports" tab is active, showing a tree view of "Contact Region 8", "Contact Region 9", "Contact Region 10", and "Contact Region 11". A yellow question mark is placed over the "Contact Region 9" item. To the right, a panel titled "A: Static Structural" shows "Static Structural" and "Time: 1. s". Below this, a "Fixed Support" is indicated with a yellow question mark. The main content area is titled "Submit a Technical Support Question" and contains the following text: "As part of DRD's customer services, we encourage you to send us questions and development requests regarding the software products we represent. The question/enhancement will be emailed immediately to the technical support personnel at DRD." Below the text are four input fields: "Name *" (split into "First Name" and "Last Name"), "Email Address *", and "Company *".

“The best aspect of the (software) decision was the outstanding support that we get from DRD as they partner with us to make the tool work most efficiently and accurately for us.”

Dick Rawlings

What is Simulation Driven Design?

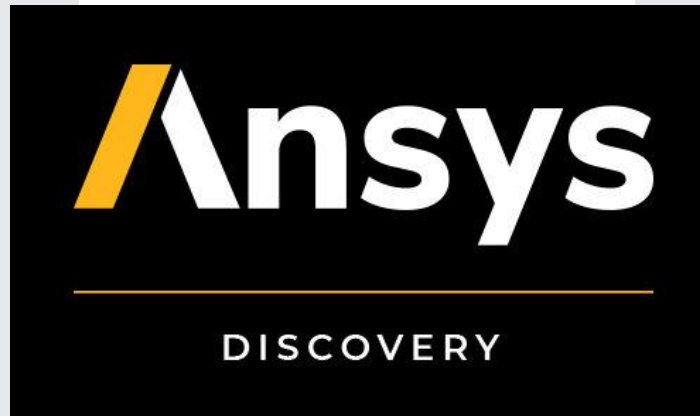
Leveraging virtual simulations to optimize and validate designs early in the design cycle, reducing costs, enhancing performance, and accelerating development



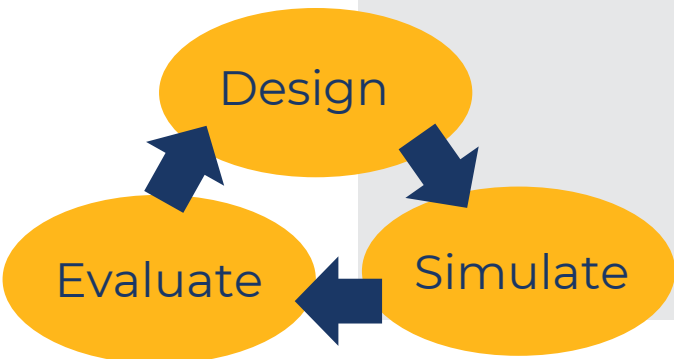
Barriers to Simulation Driven Design



Traditional Design Approach

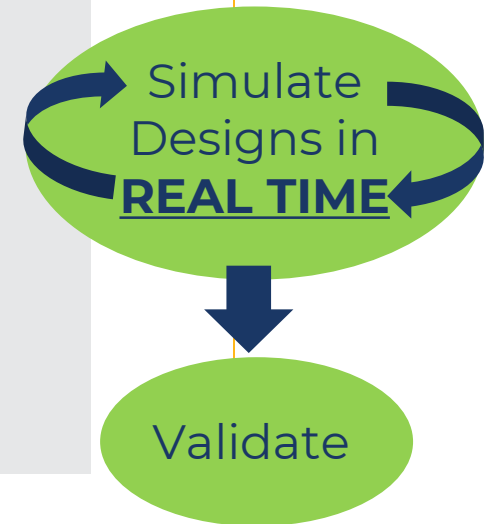


Simulation Driven Design



- Too many tools
- Difficult to learn
- Too long to set up
- Too long to solve

- Single UI
- Intuitive, Simple
- Just works Mentality
- Fast Solvers



Enabling Real Time Simulation: Single UI

- Too many tools
- Difficult to learn
- Too long to set up
- Too long to solve



Geometry Preparation

SpaceClaim 2.0

MODEL

Live GPU Solver

**Structures, Fluids, TO, Modal,
Electromagnetics**

EXPLORE

Higher Fidelity

Access to Flagship Solvers

REFINE

Enabling Real Time Simulation: Integrated Training

- Too many tools
- **Difficult to learn**
- Too long to set up
- Too long to solve

Interactive Tours

Investigate and Simplify the Model
Investigate different views of the model to help make fixing problems easier.

Model Tree
Expand the model tree to see the various components.

Interactive Tours use the *Overlay Help* system which can be used for Tool & UI help while modeling

Video & Steps

Instructions

1. Investigate the model by turning it around.
4. Click to display the plan view.

Continue to the next step to identify and fix problems in the model.

interference between bodies, gaps between edges, and other irregularities.

Interactive Tours use the *Overlay Help* system which can be used for Tool & UI help while modeling

These Interactive Tours supplement any other training content and will accelerate Discovery learning

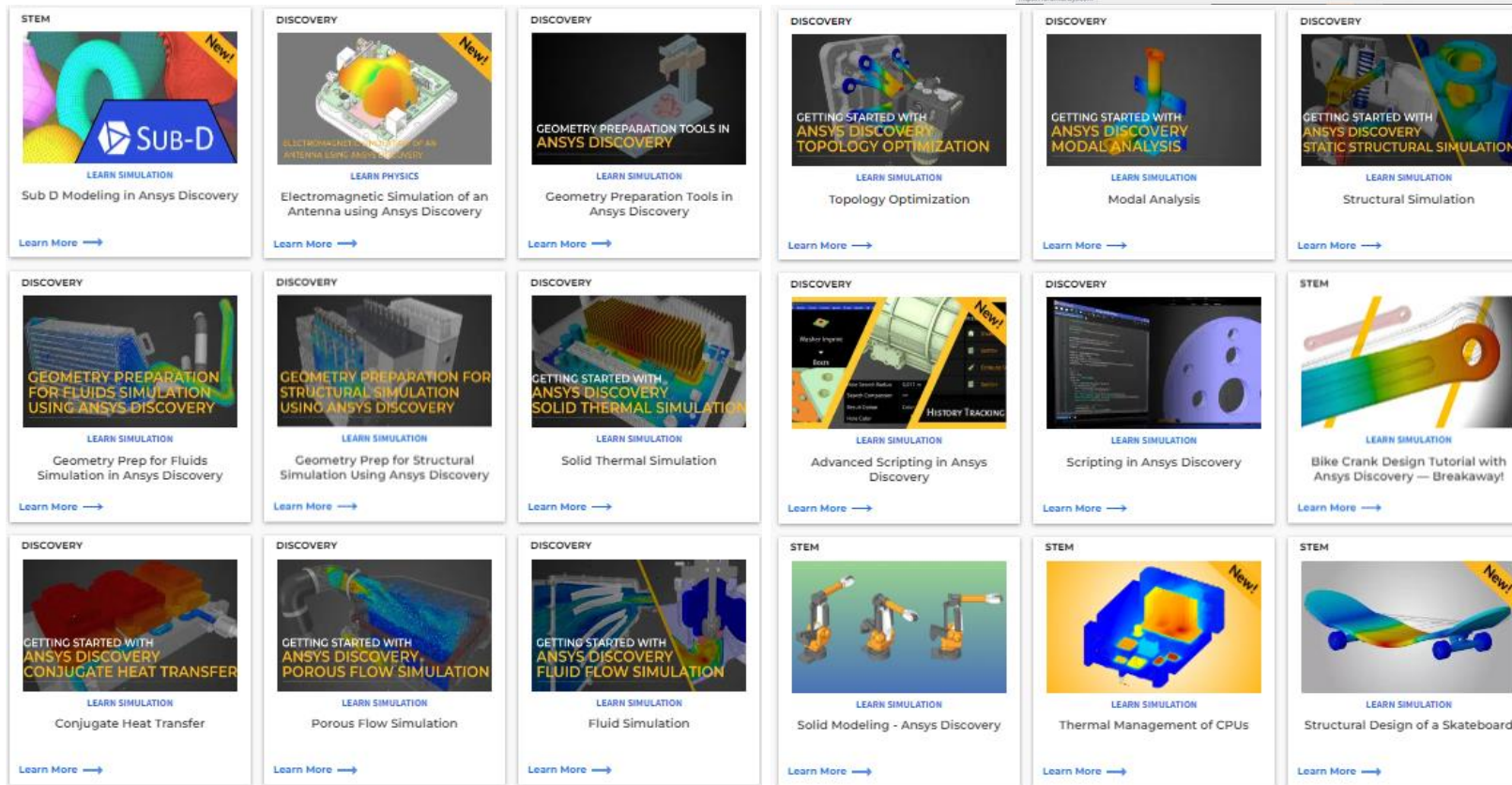
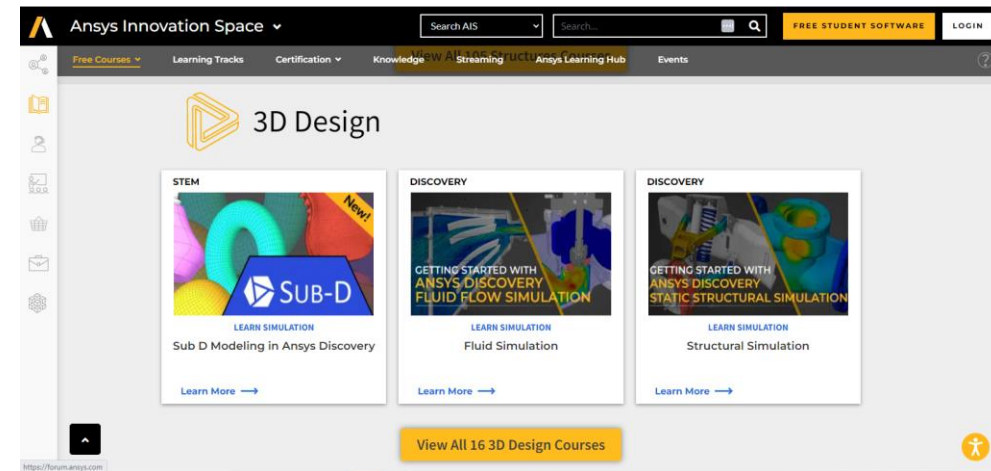
Ansys Innovation Space

Choose Your Learning Path:

- Choose from several structured course lessons designed to get you up to speed with Discovery.

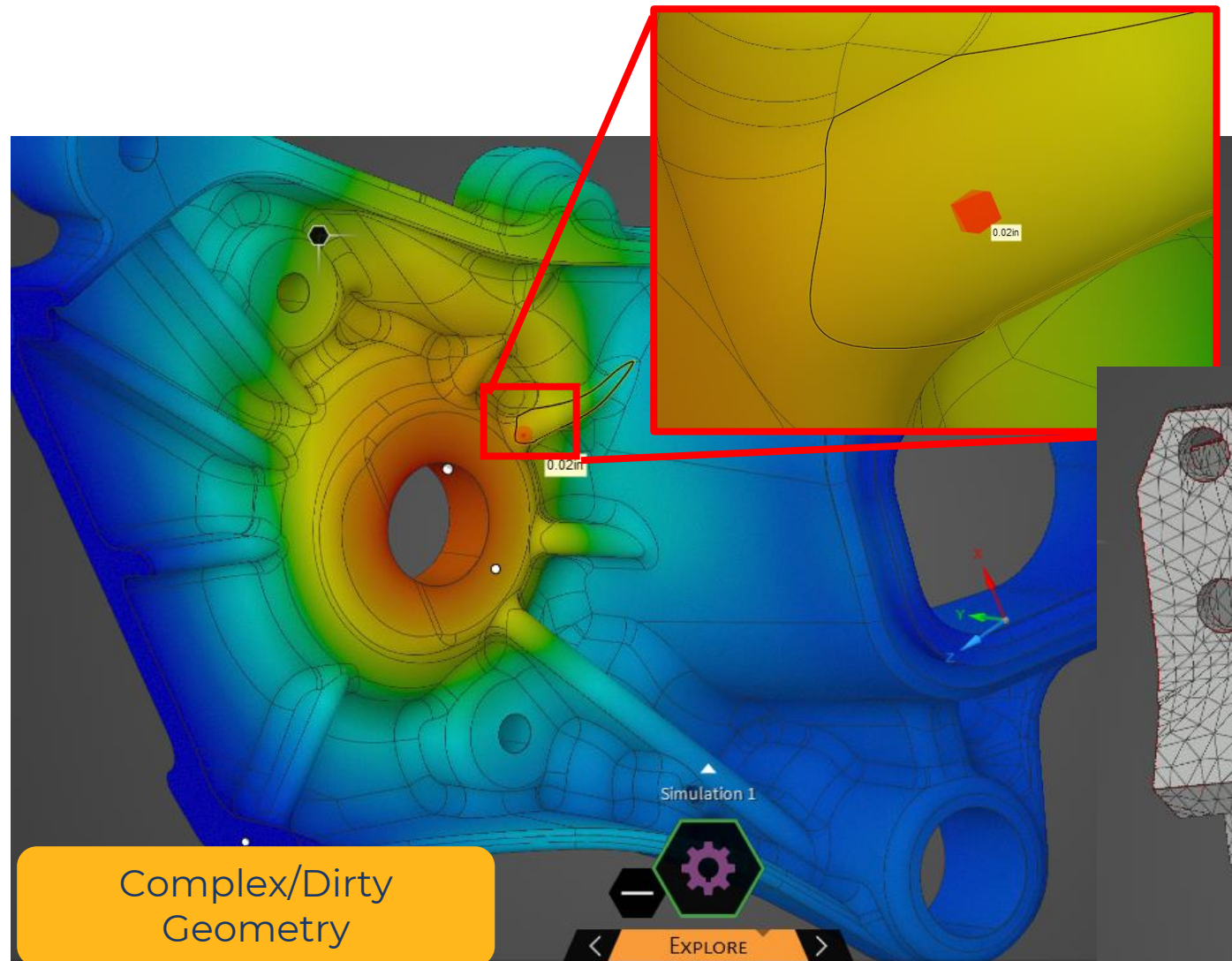
How to Access:

- [Courses.ansys.com](https://courses.ansys.com)

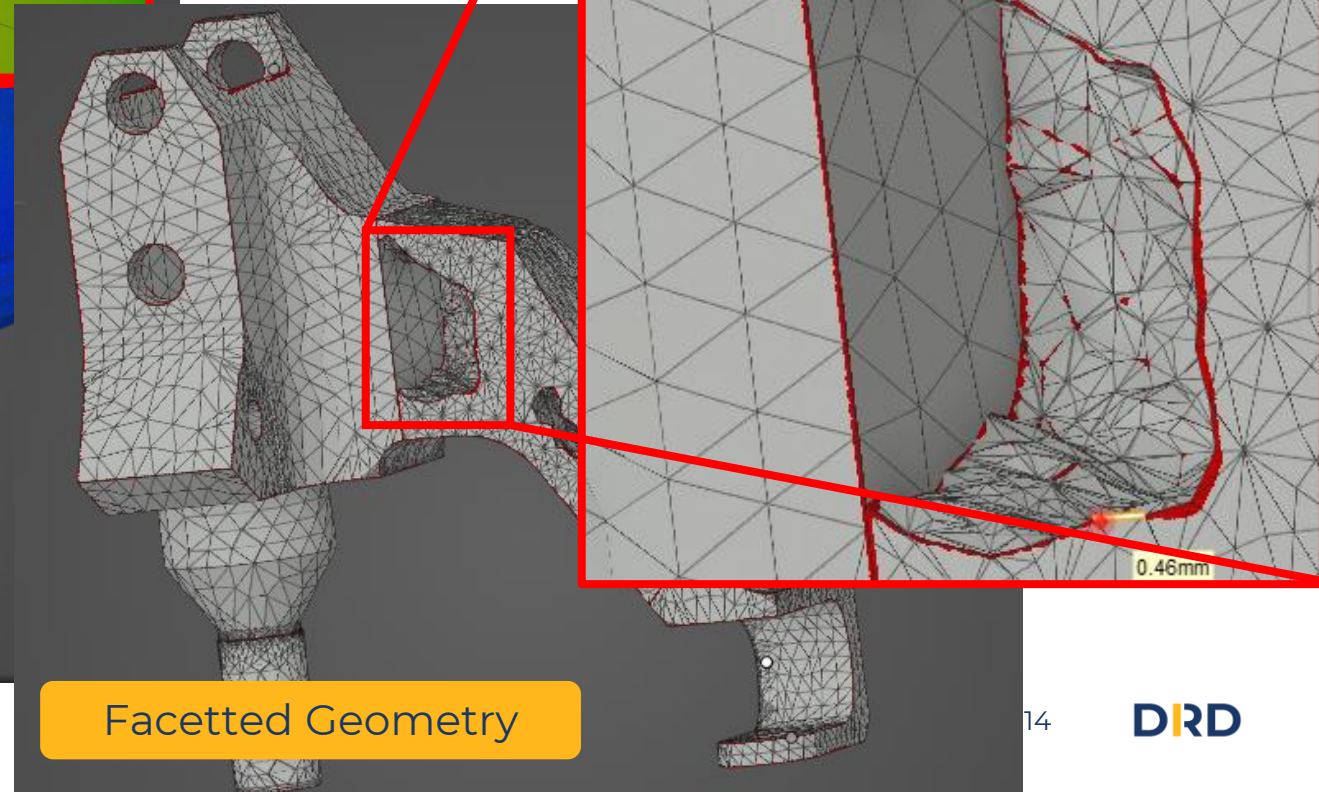


Enabling Real Time Simulation: Just Works Meshing

- Too many tools
- Difficult to learn
- Too long to set up
- Too long to solve



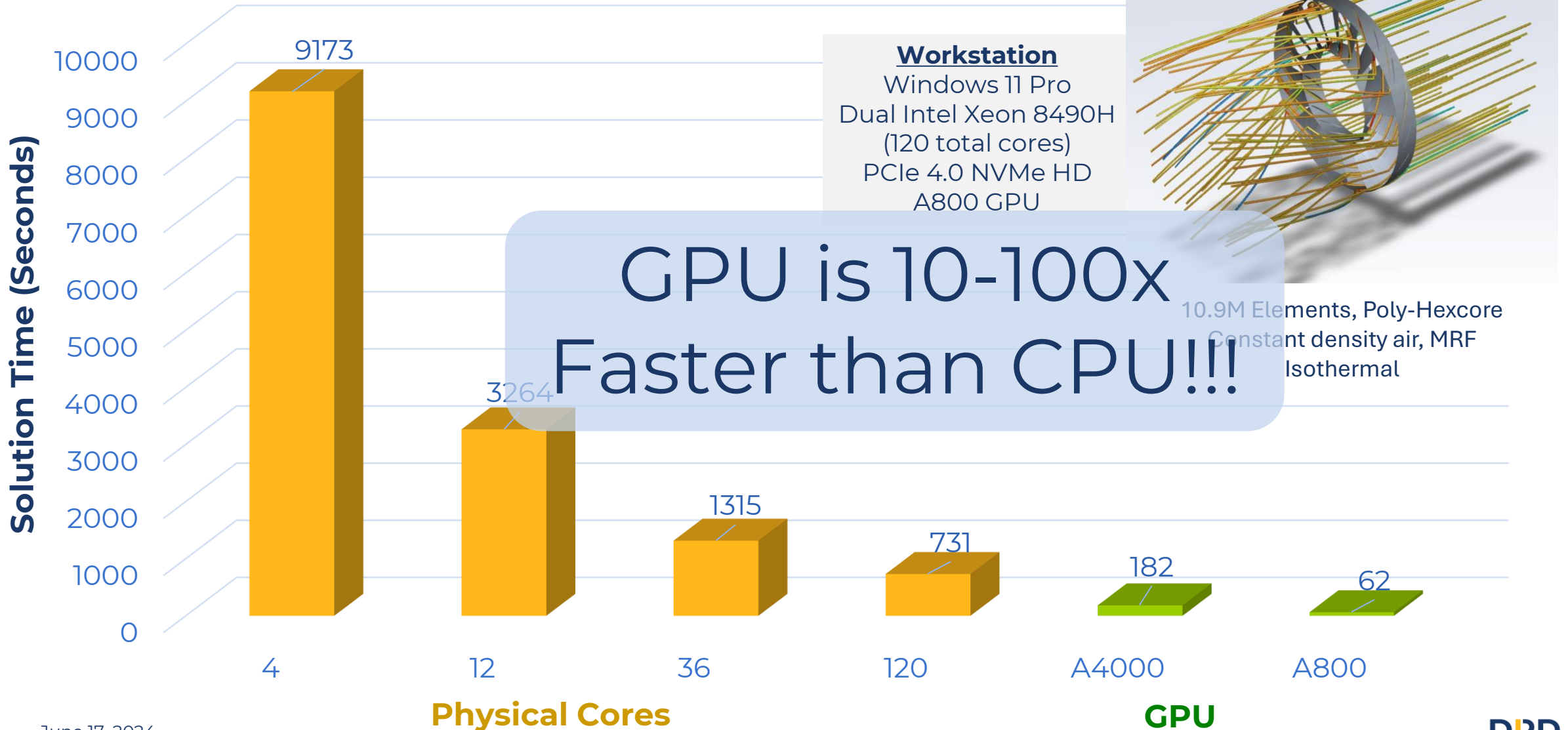
Complex/Dirty Geometry



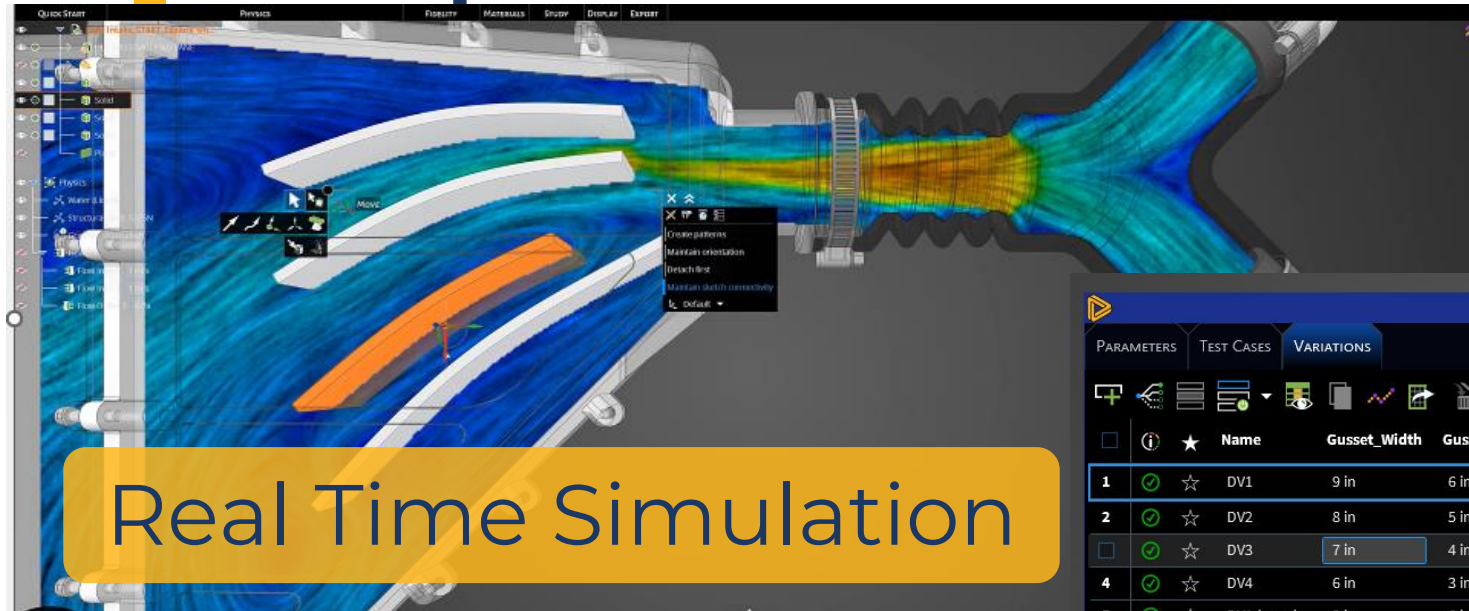
Facetted Geometry

Enabling Real Time Simulation: GPU Solvers

- Too many tools
- Difficult to learn
- Too long to set up
- Too long to solve



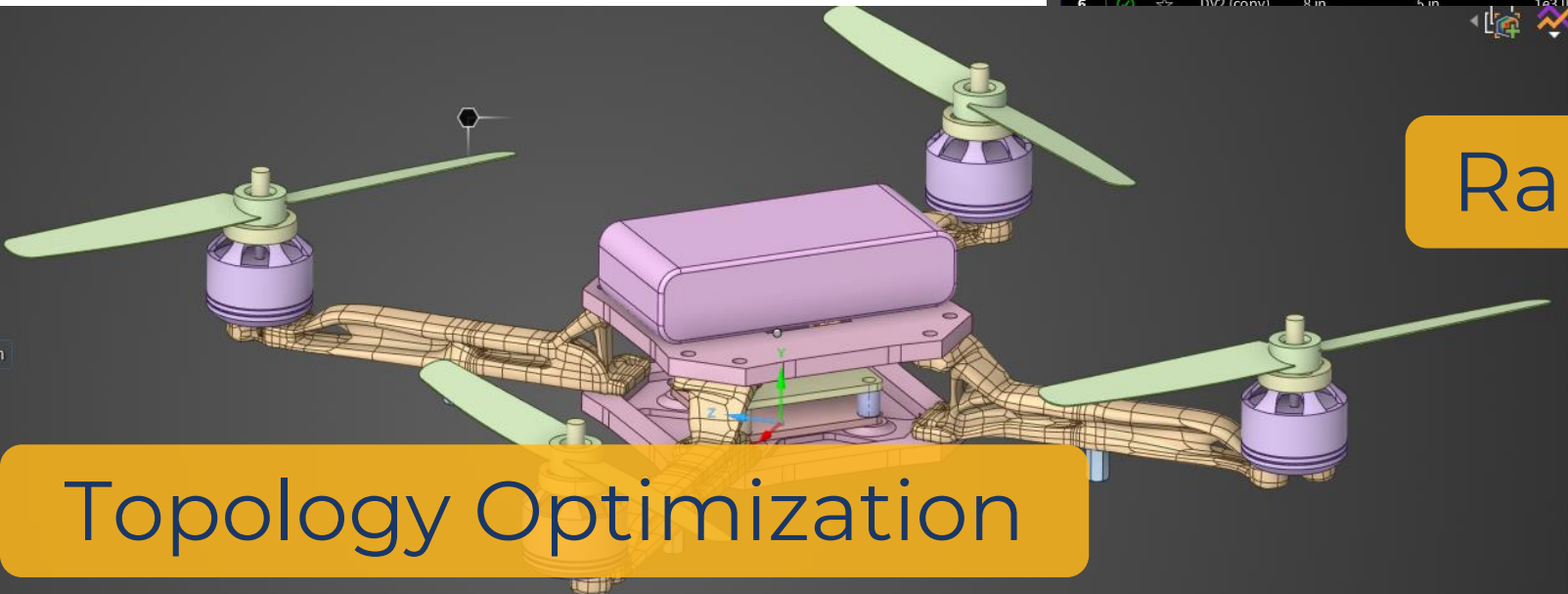
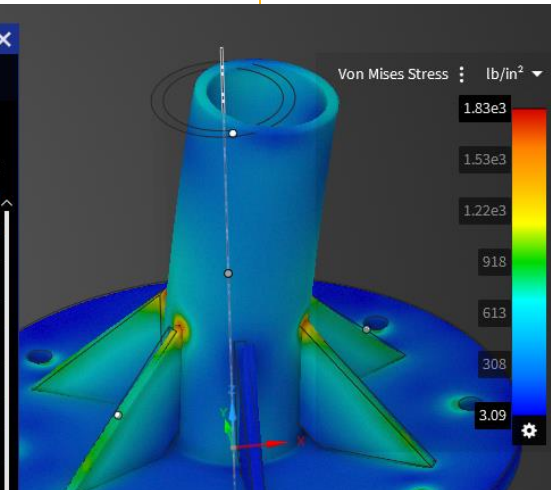
Examples



Parameter Study

PARAMETERS TEST CASES VARIATIONS

	Name	Gusset_Width	Gusset_Height	Distributed...	Distributed...	Distributed...	Gusset_C
1	DV1	9 in	6 in	1e3 lbf	0 lbf	0 lbf	6
2	DV2	8 in	5 in	1e3 lbf	0 lbf	0 lbf	6
3	DV3	7 in	4 in	1e3 lbf	0 lbf	0 lbf	6
4	DV4	6 in	3 in	1e3 lbf	0 lbf	0 lbf	6
5	DV1 (copy)	9 in	6 in	1e3 lbf	0 lbf	0 lbf	4
6	DV2 (copy)	8 in	5 in	1e3 lbf	0 lbf	0 lbf	4



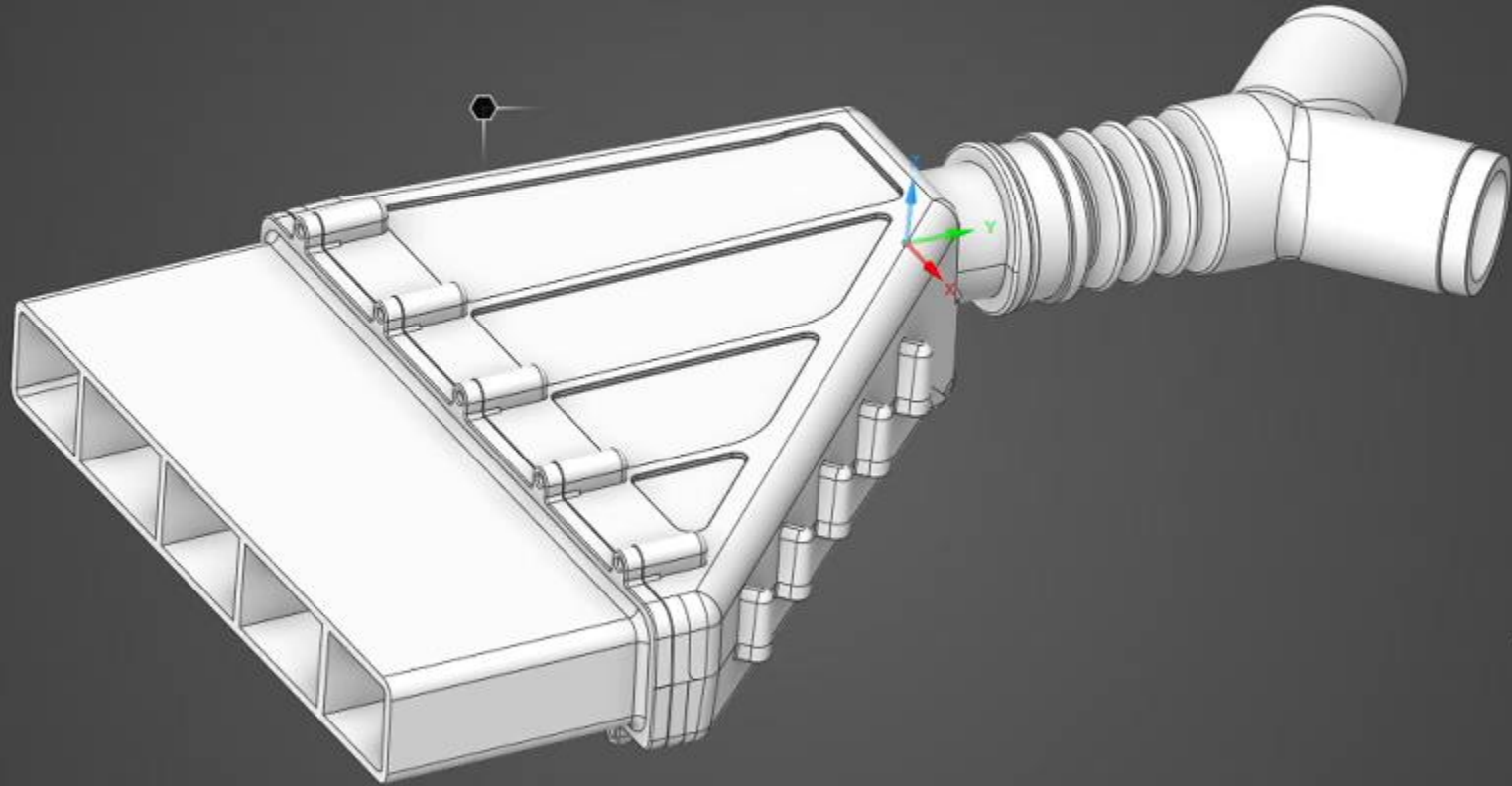
DESIGN SUBD DISPLAY MEASURE FACETS REPAIR PREPARE SIMULATION

Assign Orient Display Extend Midsurface Assign Display Assign Display Assign Volume Extract Enclosure Generate Split by Plane Imprint Wrap Interference Rounds Faces Short Edges Detect Pre-check Share Unshare Review Update Parameters Workb

BEAMS AND SHELLS BOLTS WELDS MATERIAL REMOVE IDENTIFY SHARE TOPOLOGY GEC

Duct Assembly Outlet Vanes_I...

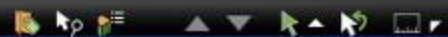
- Inlet
- Air Box
- Outlet
- Physics
 - Structural steel, S275N



EXPLORE

May 10, 2023

Add or remove objects from the selection



DESIGN FACETS DISPLAY MEASURE PREPARE SIMULATION

Internal Flow External Flow Structural Fluid Flow Solid Thermal

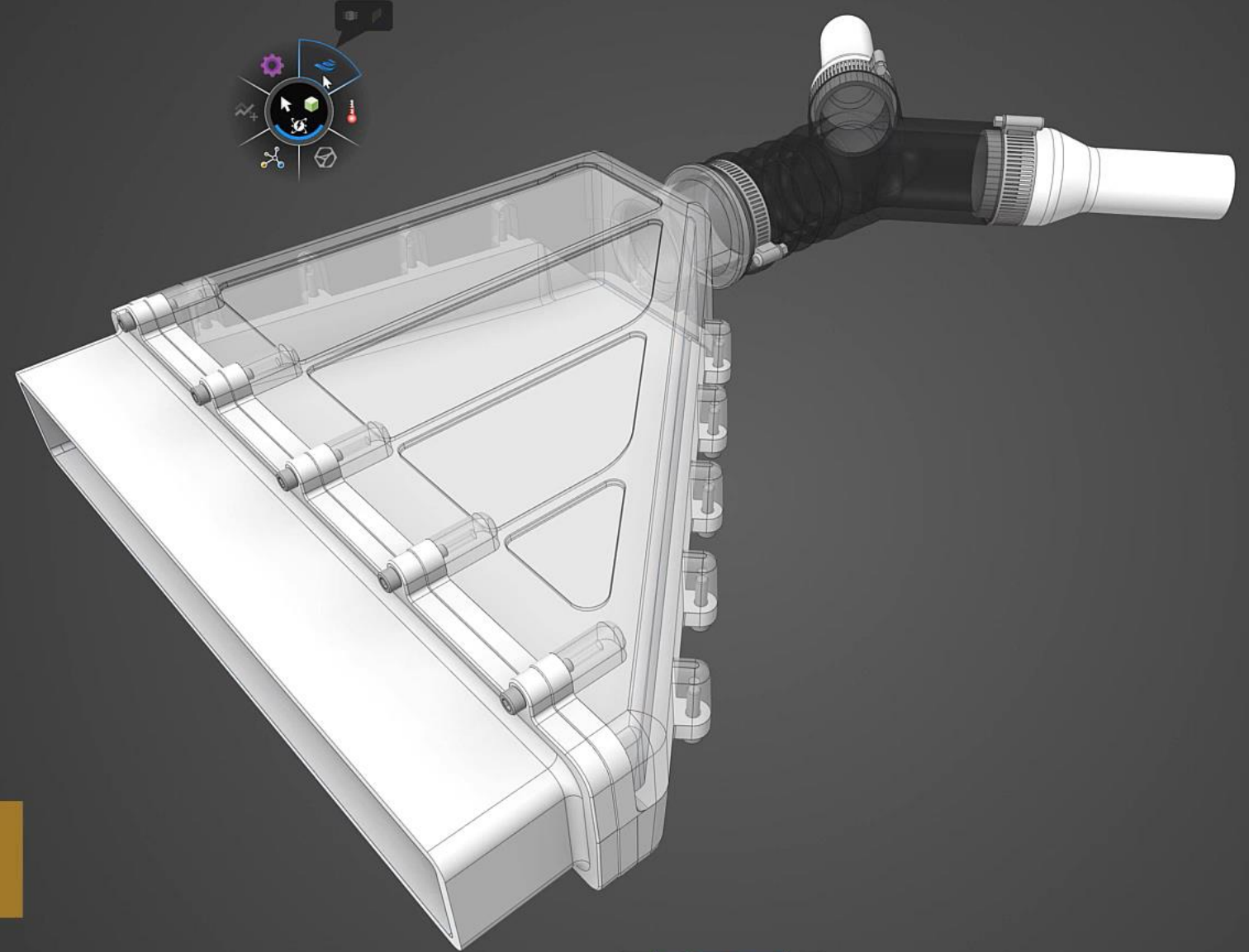
Simulation Options Natural Frequency Topology Optimization

Global Local Materials Simulation Show Transfer

FIDELITY MATERIALS STUDY DISPLAY EXPORT

QUICK START

- Duct Intake_START
 - DUCT ASSEMBLY NO VANE
 - Volume
 - Plane
- Physics
 - Structural steel, S275N



May 10, 2023

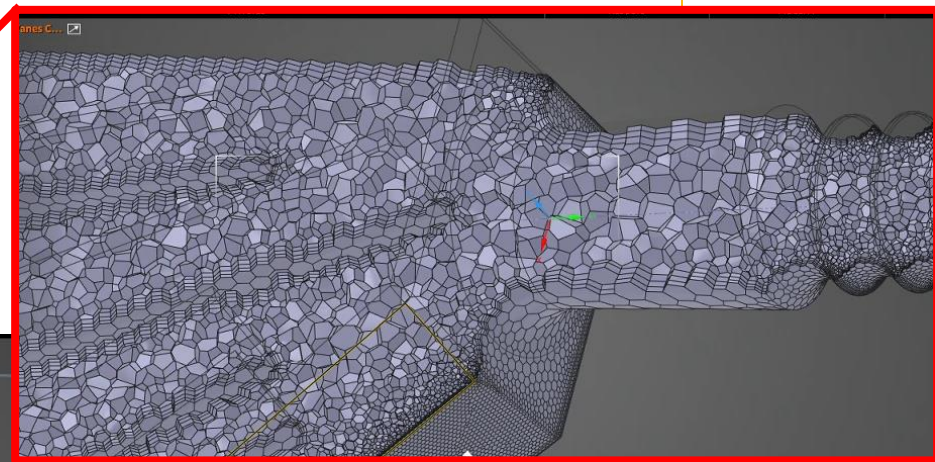
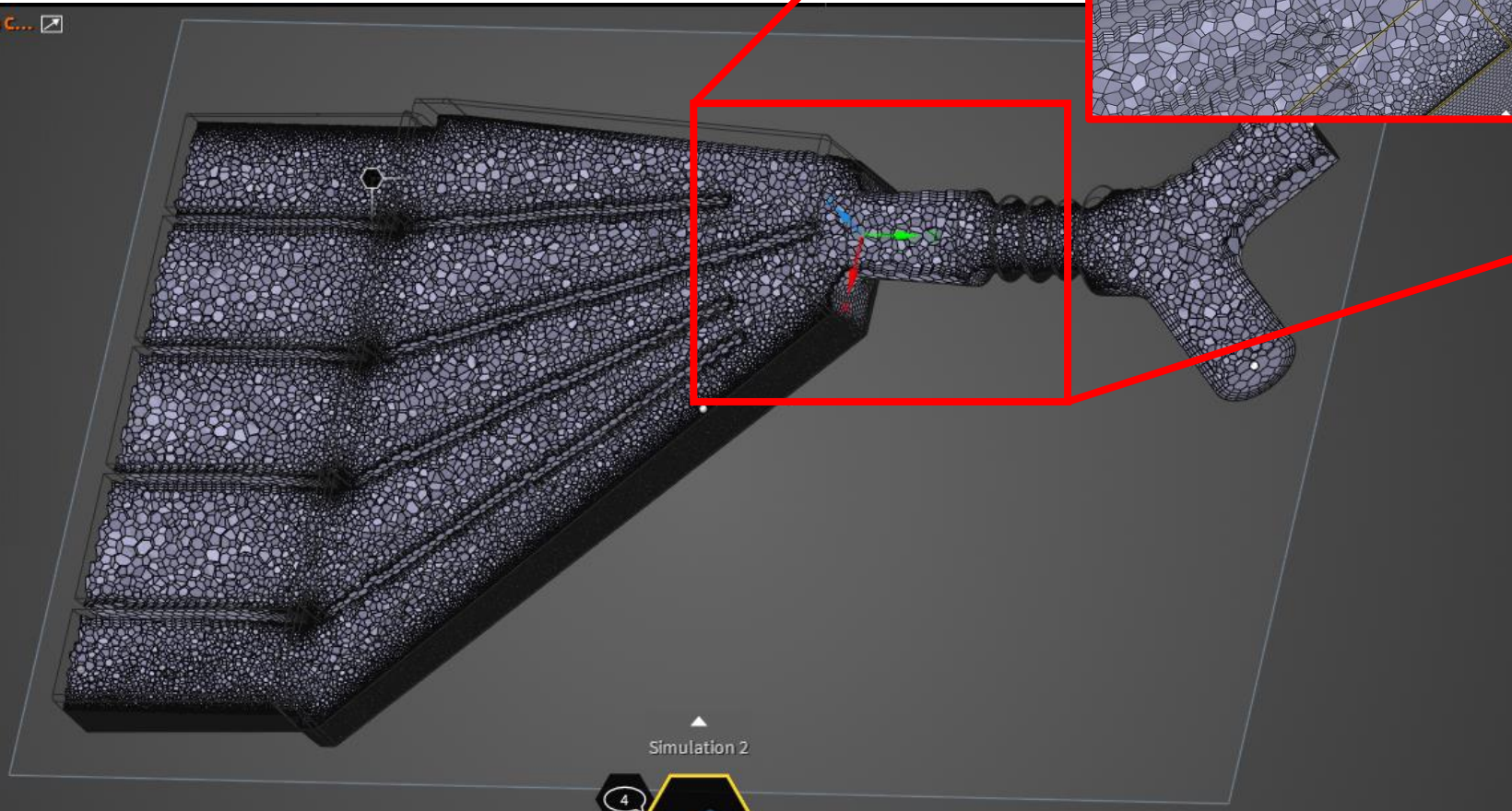
EXPLORE



Refined Solutions

- Duct Assembly Outlet Vanes C...
- Inlet
- Air Box
- Outlet
- Volume
- Plane

- Physics
 - Structural steel, S275N
 - Water (Liquid)
 - Gravity
 - Non-Slip Wall (default)
- Flows
 - Flow Inlet 1 10 m/s
 - Flow Inlet 20 10 m/s
 - Flow Outlet 21 0 Pa



Simulation 2

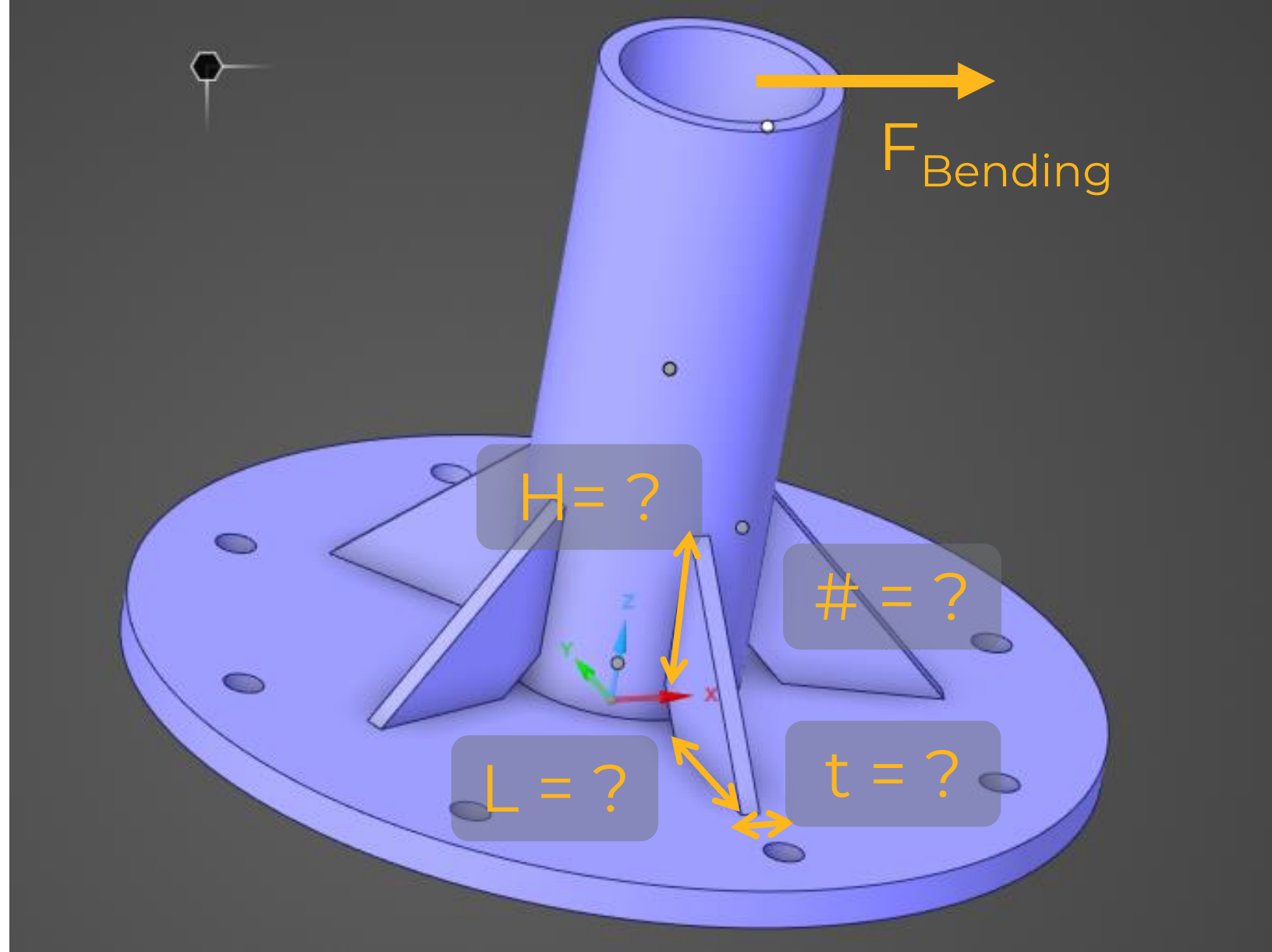
4

REFINE

Click an object. Double-click to select an edge loop. Triple-click to select a solid.

Example 2:

- Even small number of inputs can result in dozens or hundreds of design points.
- “Design of experiments” may be quite tedious
- Interpretation of results may be time consuming
- May result in sub-optimal design decisions
- Validation based approach instead of Simulation Driven

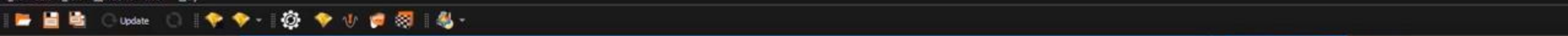


Easily Set up and Run Hundreds of Parameter Variations

The screenshot displays a CAD software interface with a 'Parameter Study' window open. The window is divided into 'PARAMETERS', 'TEST CASES', and 'VARIATIONS' tabs. The 'VARIATIONS' tab is active, showing a table of 11 variations. The table columns are: Name, Gusset_Width, Gusset_Height, Distributed... (three columns), and Gusset_C. The variations are numbered 1 through 11, with 5 through 11 being copies of the first four variations. The 'Distributed...' column for variation 7 has a value of '0 lbf' highlighted.

	Name	Gusset_Width	Gusset_Height	Distributed...	Distributed...	Distributed...	Gusset_C
1	DV1	9 in	6 in	1e3 lbf	0 lbf	0 lbf	6
2	DV2	8 in	5 in	1e3 lbf	0 lbf	0 lbf	6
3	DV3	7 in	4 in	1e3 lbf	0 lbf	0 lbf	6
4	DV4	6 in	3 in	1e3 lbf	0 lbf	0 lbf	6
5	DV1 (copy)	9 in	6 in	1e3 lbf	0 lbf	0 lbf	4
6	DV2 (copy)	8 in	5 in	1e3 lbf	0 lbf	0 lbf	4
7	DV3 (copy)	7 in	4 in	1e3 lbf	0 lbf	0 lbf	4
8	DV4 (copy)	6 in	3 in	1e3 lbf	0 lbf	0 lbf	4
9	DV1 (copy 1)	9 in	6 in	1e3 lbf	0 lbf	0 lbf	8
10	DV2 (copy 1)	8 in	5 in	1e3 lbf	0 lbf	0 lbf	8
11	DV3 (copy 1)	7 in	4 in	1e3 lbf	0 lbf	0 lbf	8

To the right of the table is a 3D model of a gusset plate assembly. The model is color-coded by Von Mises Stress, with a legend on the right showing values from 1.92 to 2.9e3 lb/in². The legend values are: 2.9e3, 2.41e3, 1.93e3, 1.45e3, 967, 484, and 1.92. The model shows a vertical shaft passing through a circular base plate with a gusset plate attached. The stress is highest at the junction of the shaft and the gusset plate.



Common settings

Hide dimension selection

1st:

2nd:

3rd:

Hide plot settings

Show settings for:

2D Anthill plot

Dimension for color:

Dimension for size:

Regression analysis:

Hide design selection

Select best design(s)

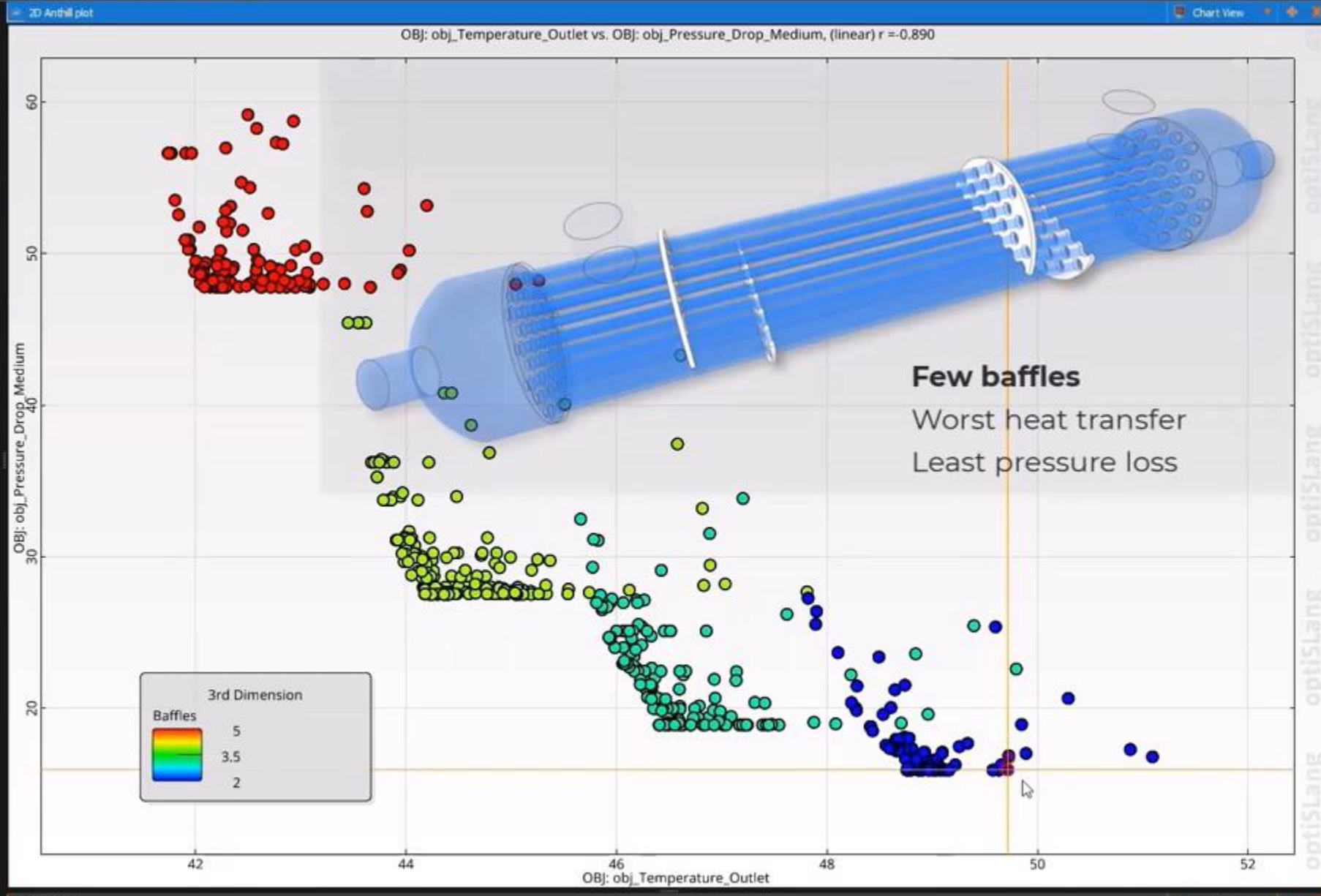
Select all Invert selection

Design selection: 13;

Show details

Show design activation

Show parameter values



Preferences

Show properties for:

Property	Value
Application	
Select layout...	Frame layout (Prev...
Show visual...	False
Render mode	Force desktop Ope...
Preserve par...	False
Minimum d...	10
Ask before ...	False
Choose par...	True
Select best ...	False
Global corre...	Linear correlation
Automatica...	True
Show para...	False
UI style	Dark
Show para...	True
Show respo...	True
Show criteria	True
Global criter...	Actual value
Show plot t...	All designs

Subwindows

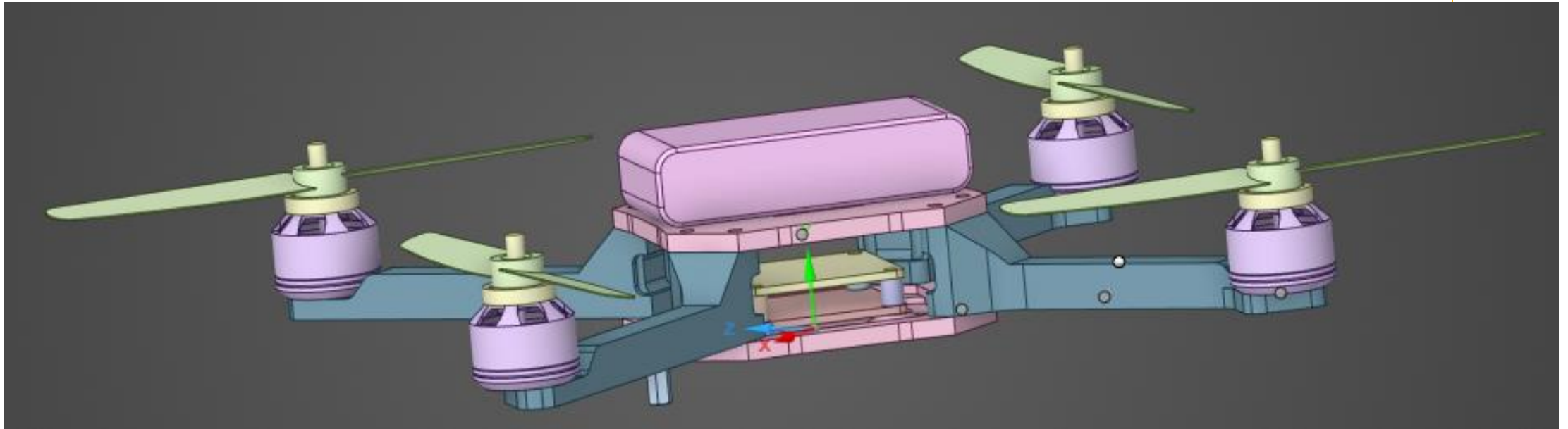
- 2D Anthill plot
 - Window appearance

Visuals

Search for:

- Approximation
 - Approximation designtable (Beta)
 - Approximation model informati...
 - Approximation history
 - Residual plot
 - Coefficient of Prognosis
 - CoP matrix
 - Response surface 2D plot
 - Response surface 3D plot
 - Response surface topview plot
- Data mining
 - Designtable
 - 2D Anthill plot
 - 3D Cloud plot
 - Parallel coordinates plot
 - Signal plot
 - Spider plot
 - Parametrization
- Miscellaneous
 - Custom plot
 - Path Visual
- Optimization
 - Design comparison plot

Demo 3: Simulation Driven Design Through Topology Optimization



DESIGN SUBD DISPLAY MEASURE FACETS REPAIR PREPARE SIMULATION

QuickScope Materials Structural Fluid Flow Solid Thermal Electromagnetics Review

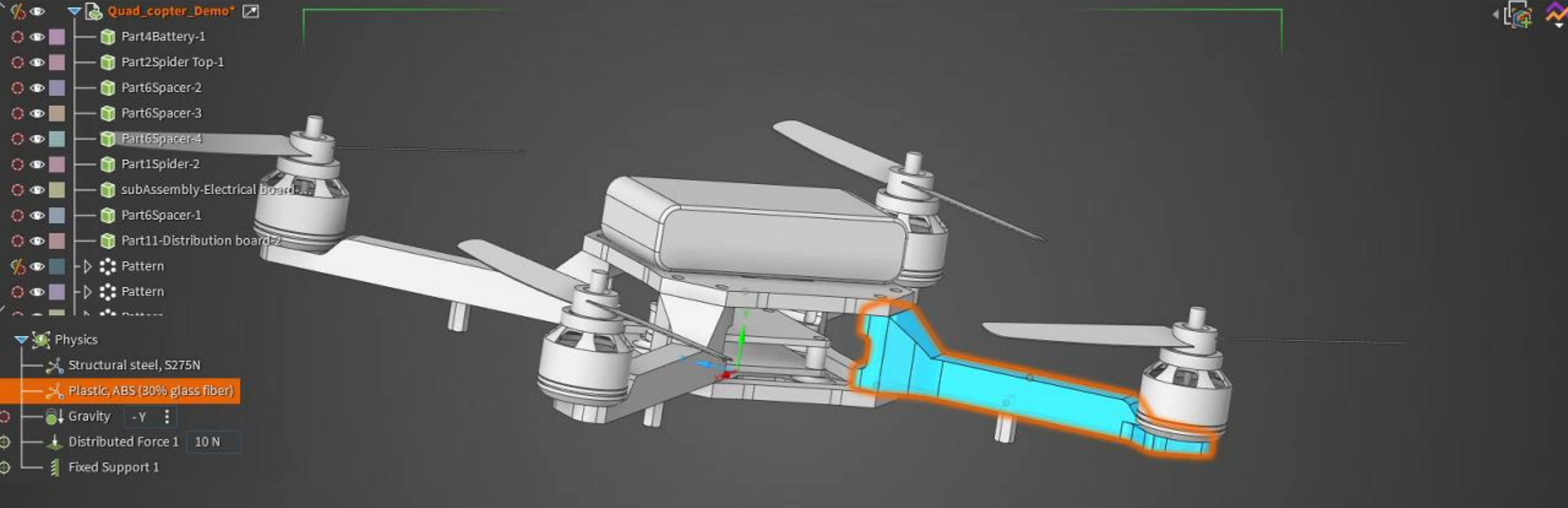
Symmetry Simulation Options Natural Frequency Topology Optimization

Scene Monitors Connection Assessment

Size Preview Global Local Resolution

Simulation Parameters Variations Show

STUDY DISPLAY



- Quad_copter_Demo*
- Part4Battery-1
- Part2Splder Top-1
- Part6Spacer-2
- Part6Spacer-3
- Part6Spacer-4
- Part1Spider-2
- subAssembly-Electrical Board
- Part6Spacer-1
- Part11-Distribution board-2
- Pattern
- Pattern

- Physics
- Structural steel, S275N
- Plastic, ABS (30% glass fiber)
- Gravity -Y
- Distributed Force 1 10 N
- Fixed Support 1



Simulation 1

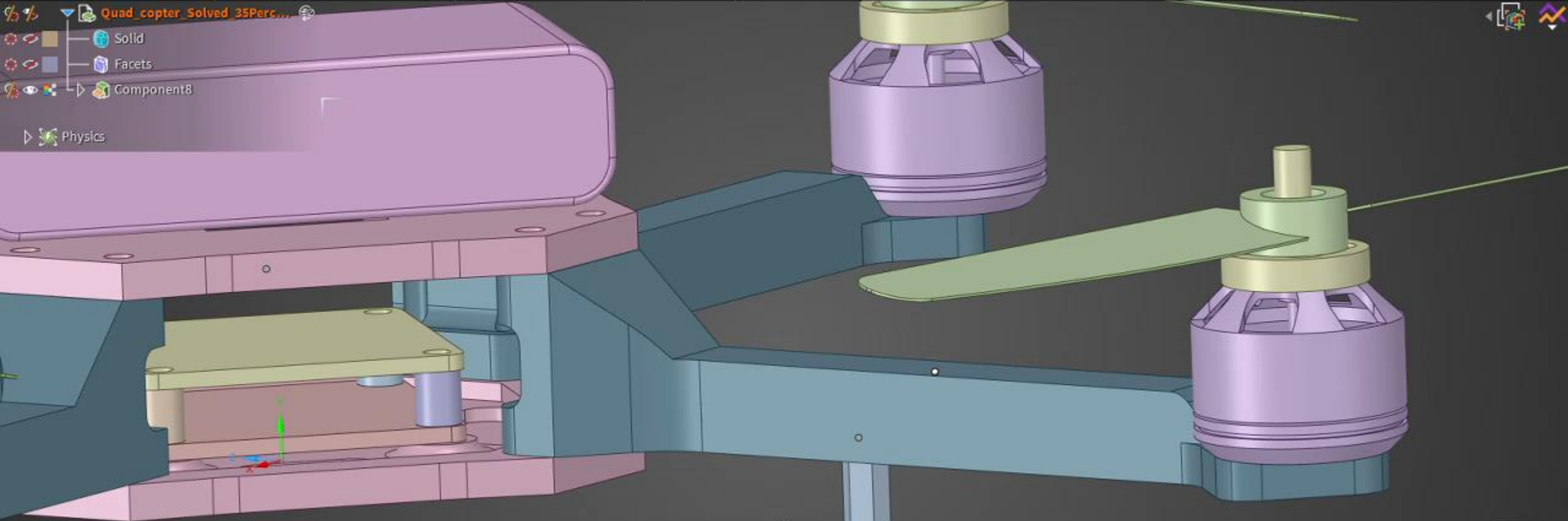
EXPLORE



DESIGN
SUB-D
DISPLAY
MEASURE
FACETS
REPAIR
PREPARE
SIMULATION

PASTE PRIMITIVE CONVERT SELECT PULL MOVE FILL SUBDIVIDE BRIDGE SPLIT CREATE SNAP SMOOTH SHOW

CLIPBOARD CREATE EDIT MODIFY VIEW



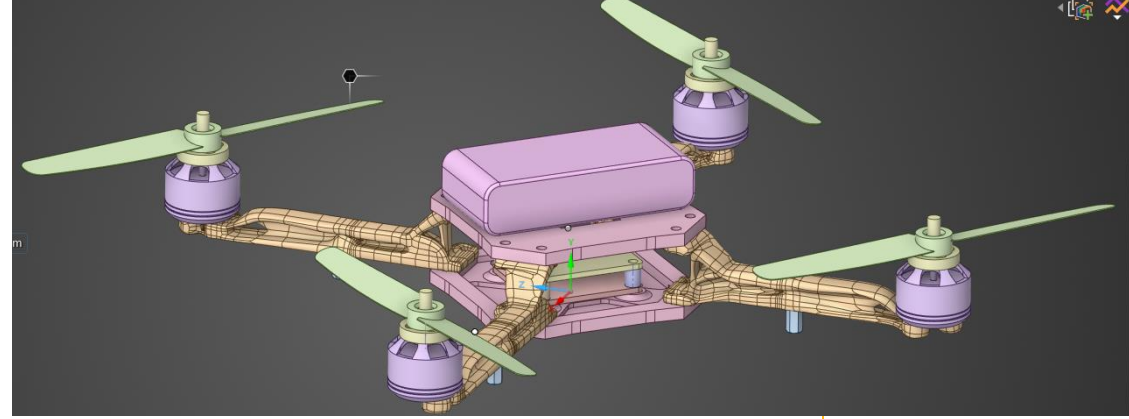
Simulation 1

EXPLORE

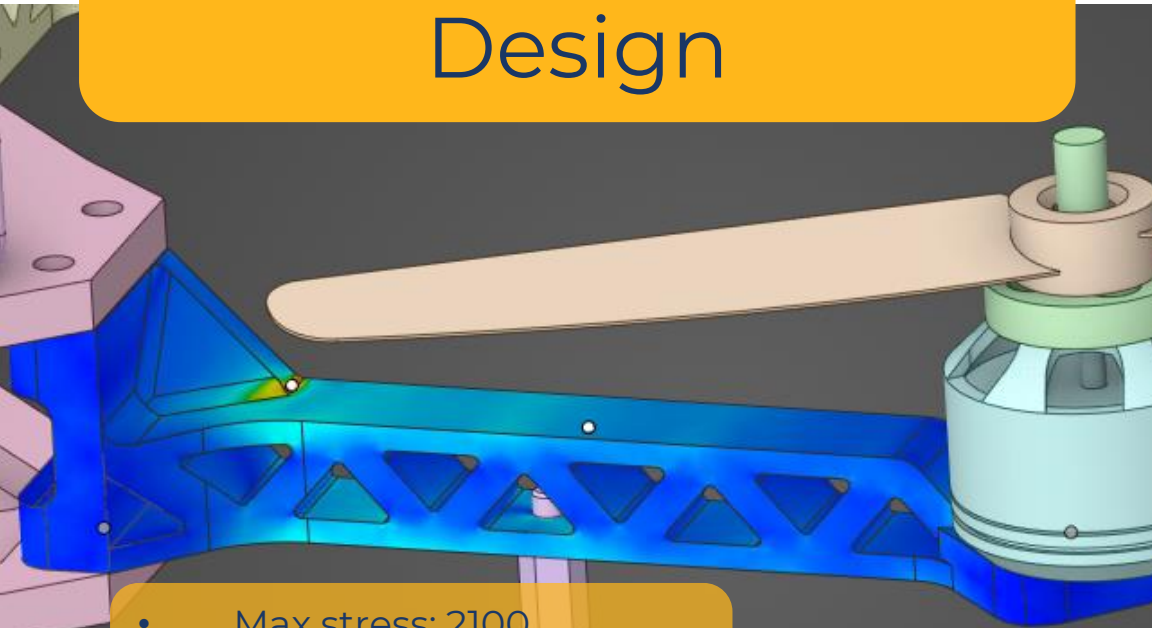
Add or remove objects from the selection

June 17, 2024

Optimization

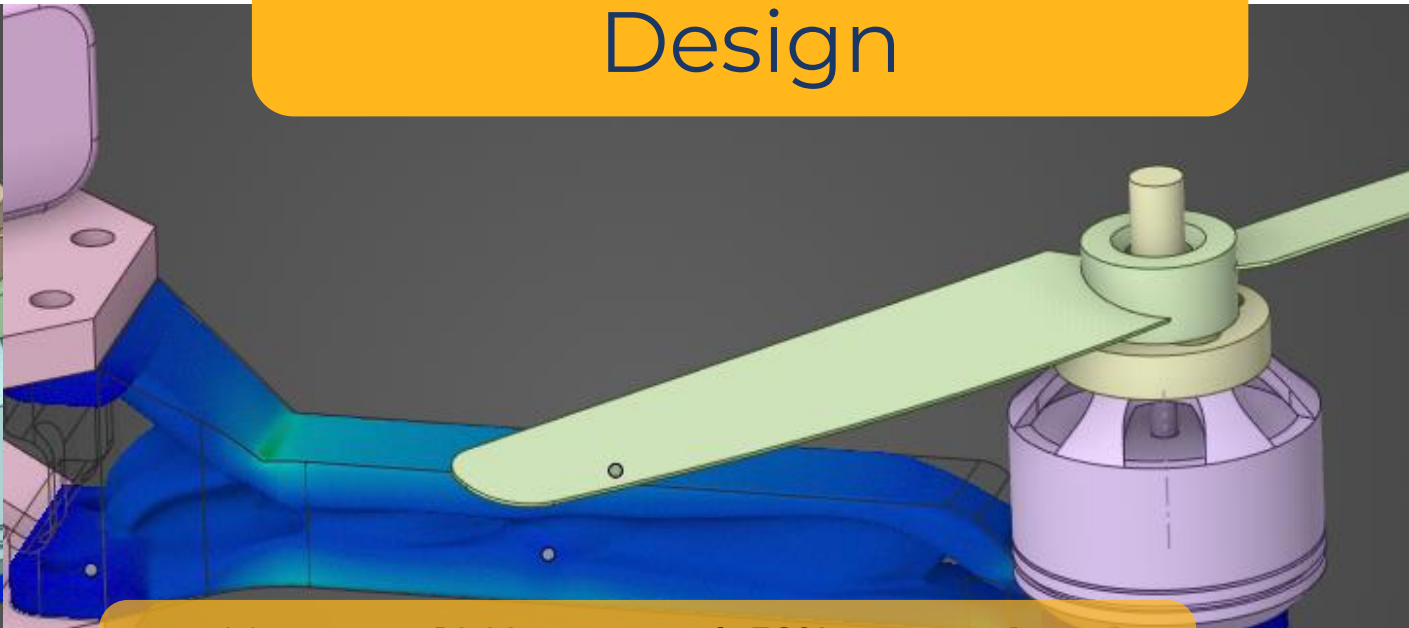


Simulation Validated Design



- Max stress: 2100
- Final Mass: 10 g
- Deflection: 0.37mm

Simulation Driven Design




- Max stress: 1040 → **50% stronger!**
- Final Mass: 8.5 g → **15% lighter!**
- Deflection: 0.32mm → **13% stiffer!**

Conclusions



Simulation Driven Design Enables...

- **Cost and Time Efficiency:** By identifying and resolving potential issues early in the design process, it reduces the need for physical prototypes, saving both time and money.
- **Innovation and Flexibility:** Enables exploration of a wider range of design alternatives and innovative solutions, fostering creativity and flexibility in the design process.
- **Enhanced Product Performance:** Simulation driven design allows for extensive virtual testing and optimization, leading to improved performance and reliability of the final product.



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Webinar 2: Empowering Design Engineers with Faster and More Accurate GPU Physics Solvers	6/27/24

*Email support@drd.com to register for Webinar 2

Is Discovery's real time GPU solver a fit for your simulation driven design needs?

Phone: 918 743-3013 ext 1

Email: support@drd.com

Web: www.drd.com

The screenshot shows the DRD Technology website's technical support form. The header includes the DRD TECHNOLOGY logo and navigation links: SIMULATION PRODUCTS, CONSULTING, TRAINING COURSES, SUPPORT, RESOURCES, ABOUT, and CONTACT US. The main heading is 'Submit a Technical Support Question'. Below this, a paragraph states: 'As part of DRD's customer services, we encourage you to send us questions and development requests regarding the software products we represent. The question/enhancement will be emailed immediately to the technical support personnel at DRD.' The form fields are: First name*, Last name*, Email*, Phone number, Company name*, and Which Product? (a dropdown menu with 'Please Select' as the current selection).

Questions?

- Please post questions in the Q&A panel chat now