



# **Twin Cities ANSYS® User Meeting**

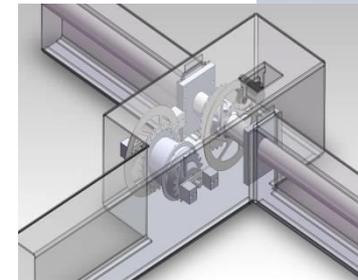
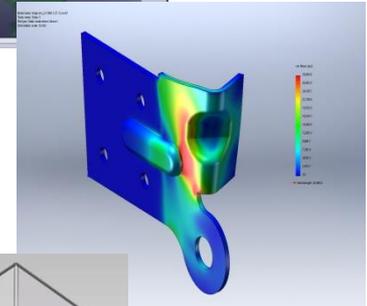
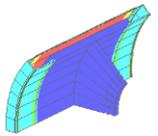
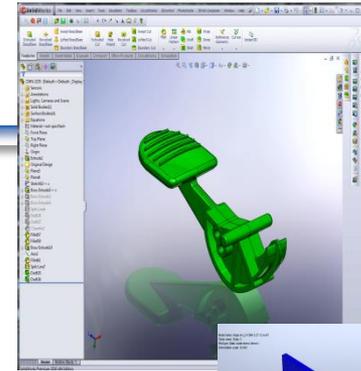
**November 2015**

## **Spaceclaim vs. Design Modeler**



## Contract Design and Engineering Services

- 13 years of mechanical design experience (Biomedical, Automotive, Consumer)
- MS Mech Eng, St Thomas      BS Aero Eng, Iowa State
- Certified SolidWorks Expert
  - Advanced Part and Assembly Modeling
  - Sheet Metal
  - Surfacing
  - PDM
  - User Training
- FEA - SolidWorks Simulation, ANSYS via Epsilon FEA
- Contracts starting at 2 hours (\$190)



# Agenda

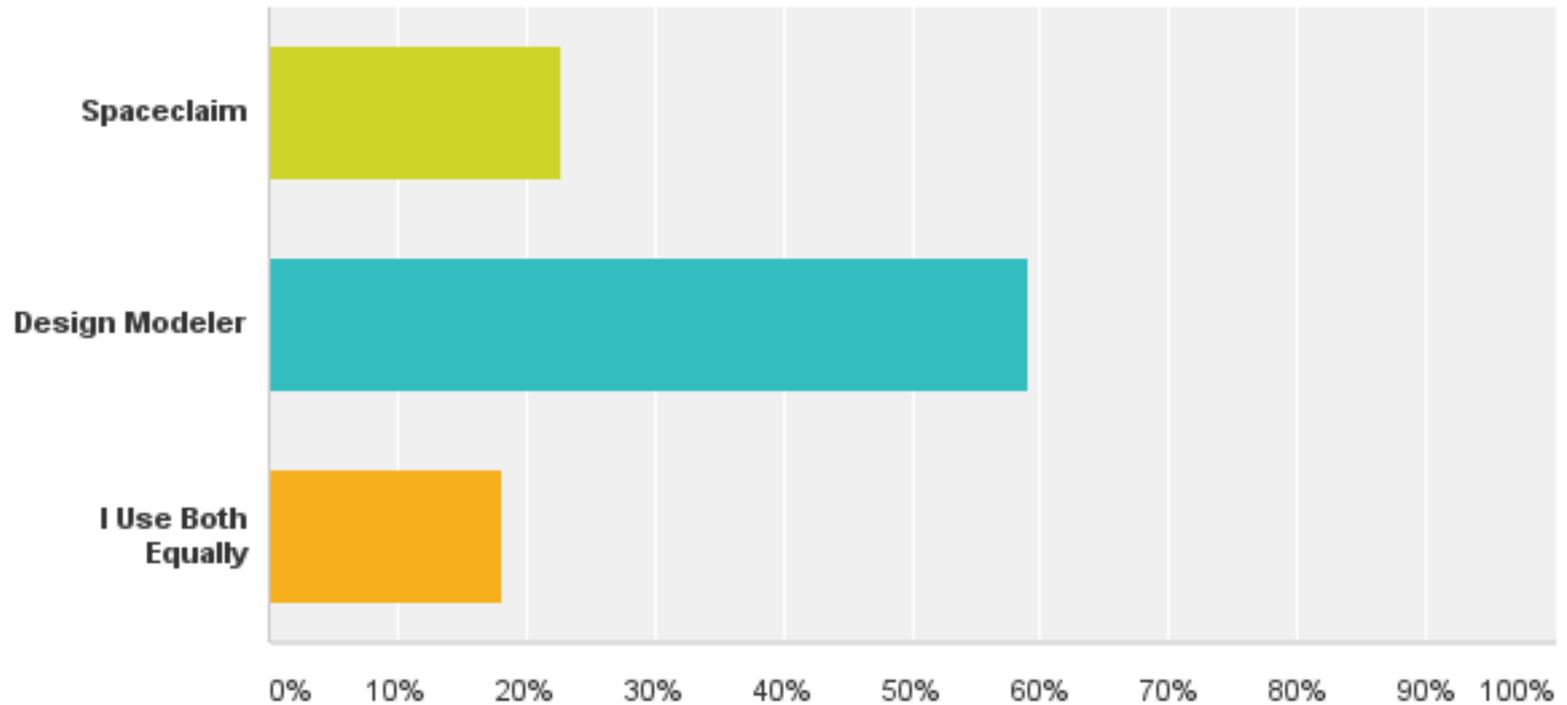
1. Survey Results
2. Background on Spaceclaim
3. Pros/ Cons of Design Modeler
4. Pros/ Cons of Spaceclaim
5. Head-to-Head Showdown!



# Survey Results

## Q2 Which tool do you currently use more?

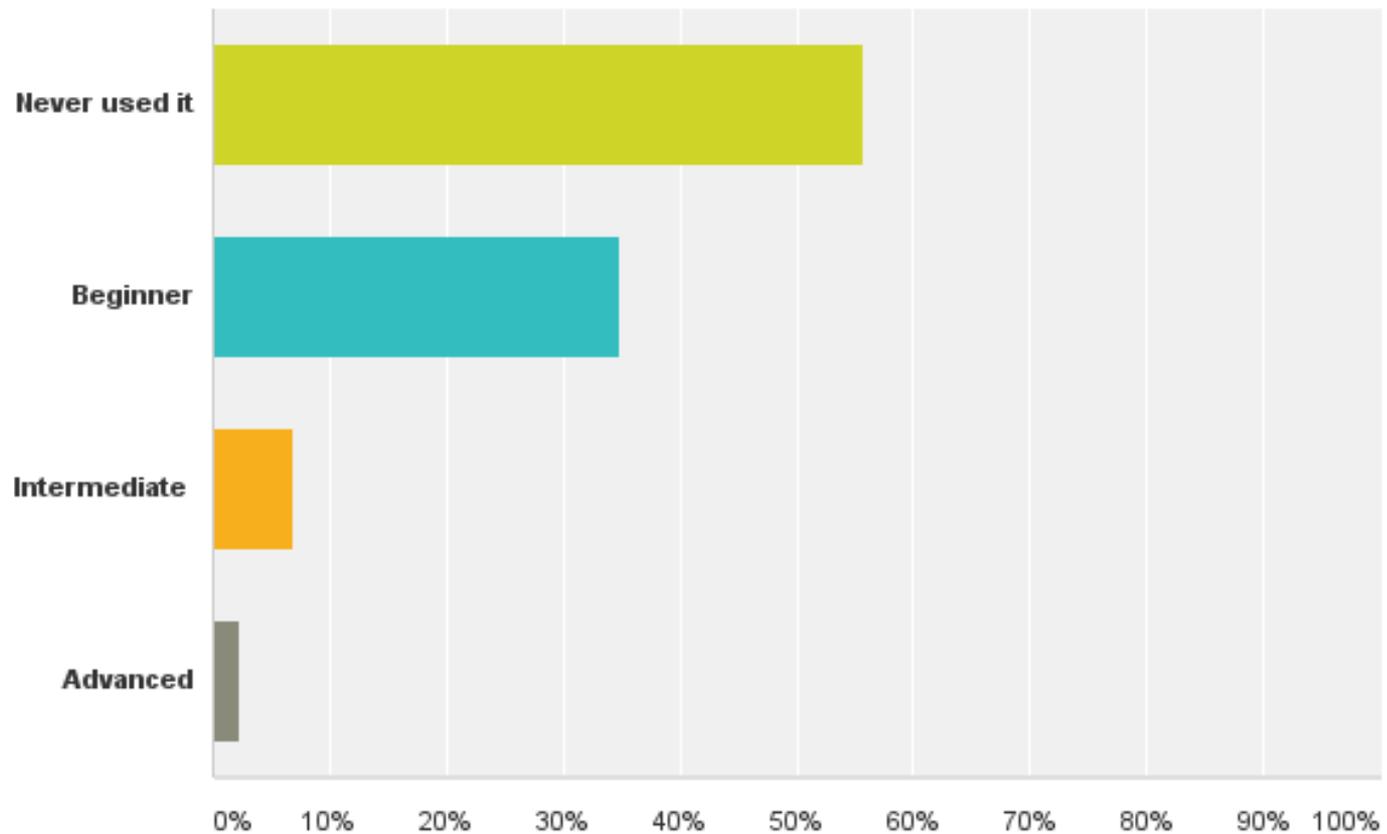
Answered: 44 Skipped: 1



# Survey Results

## Q3 What level of experience do you have using Spaceclaim?

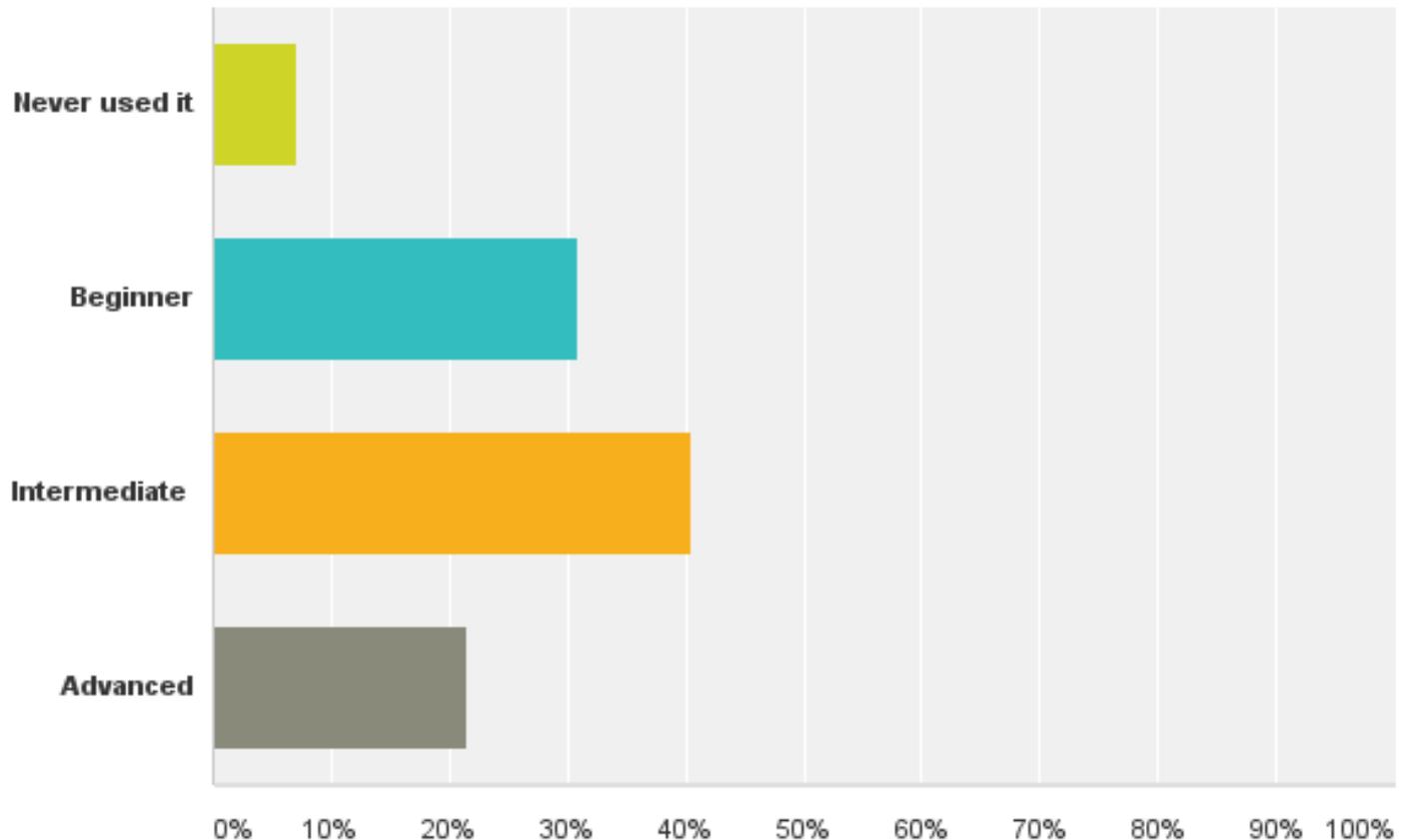
Answered: 43 Skipped: 2



# Survey Results

## Q4 What level of experience do you have using Design Modeler?

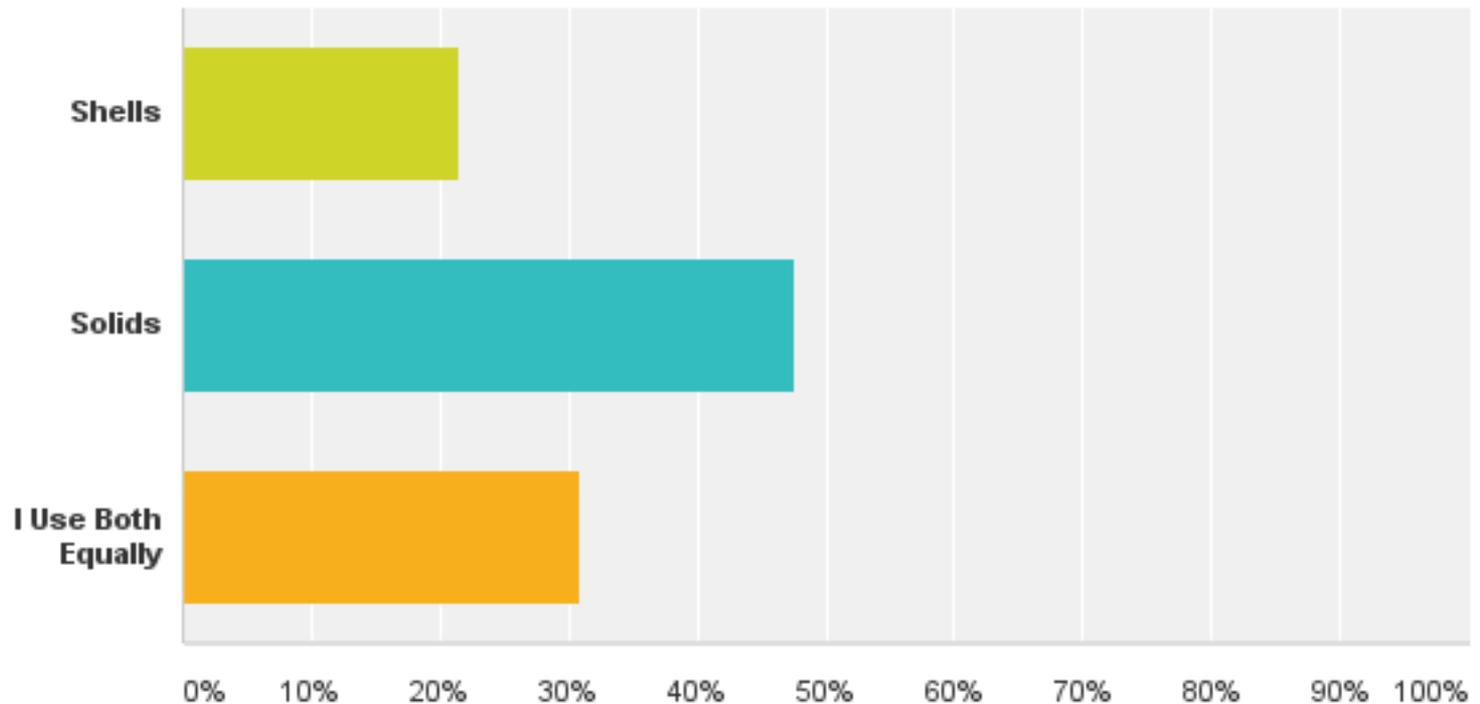
Answered: 42 Skipped: 3



# Survey Results

## Q5 When importing to a model, do you primarily use shells or solids?

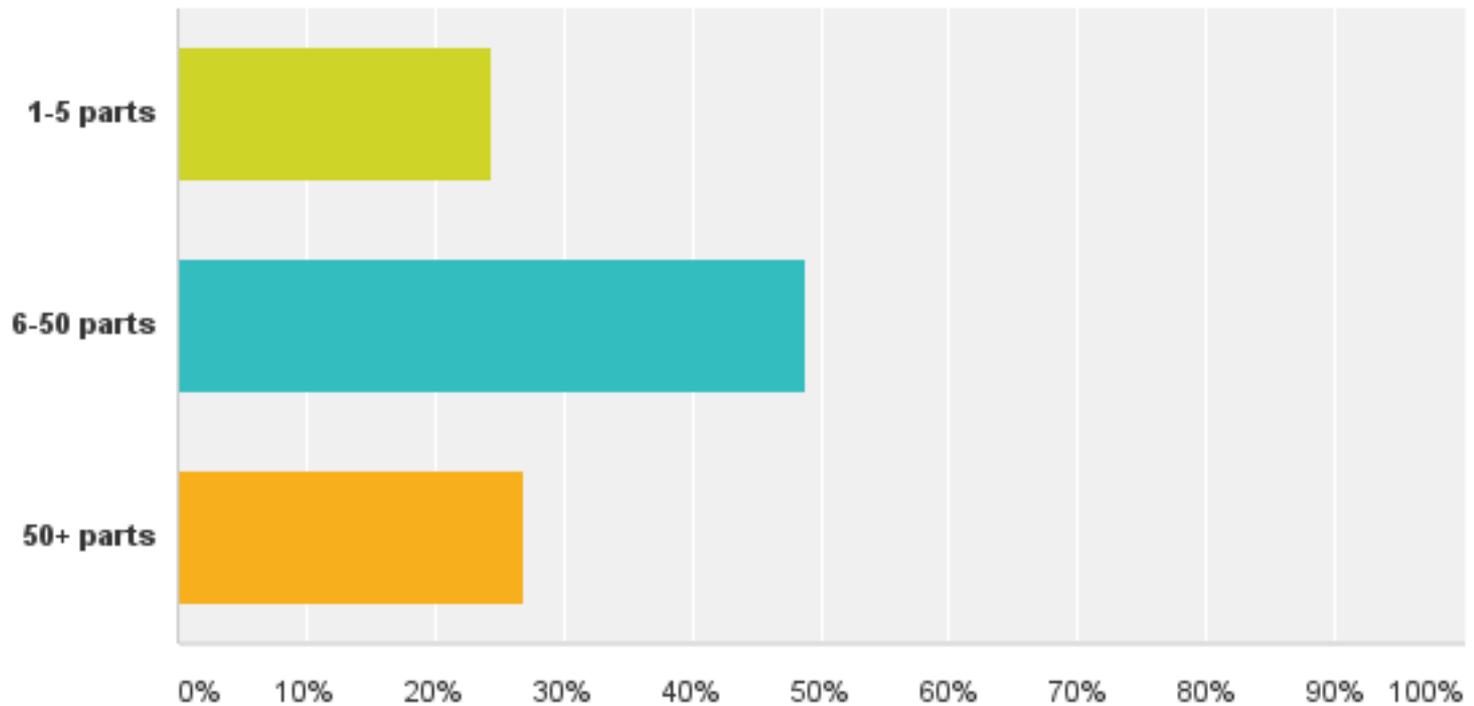
Answered: 42 Skipped: 3



# Survey Results

## Q6 When importing to a model, how many parts does your model typical have?

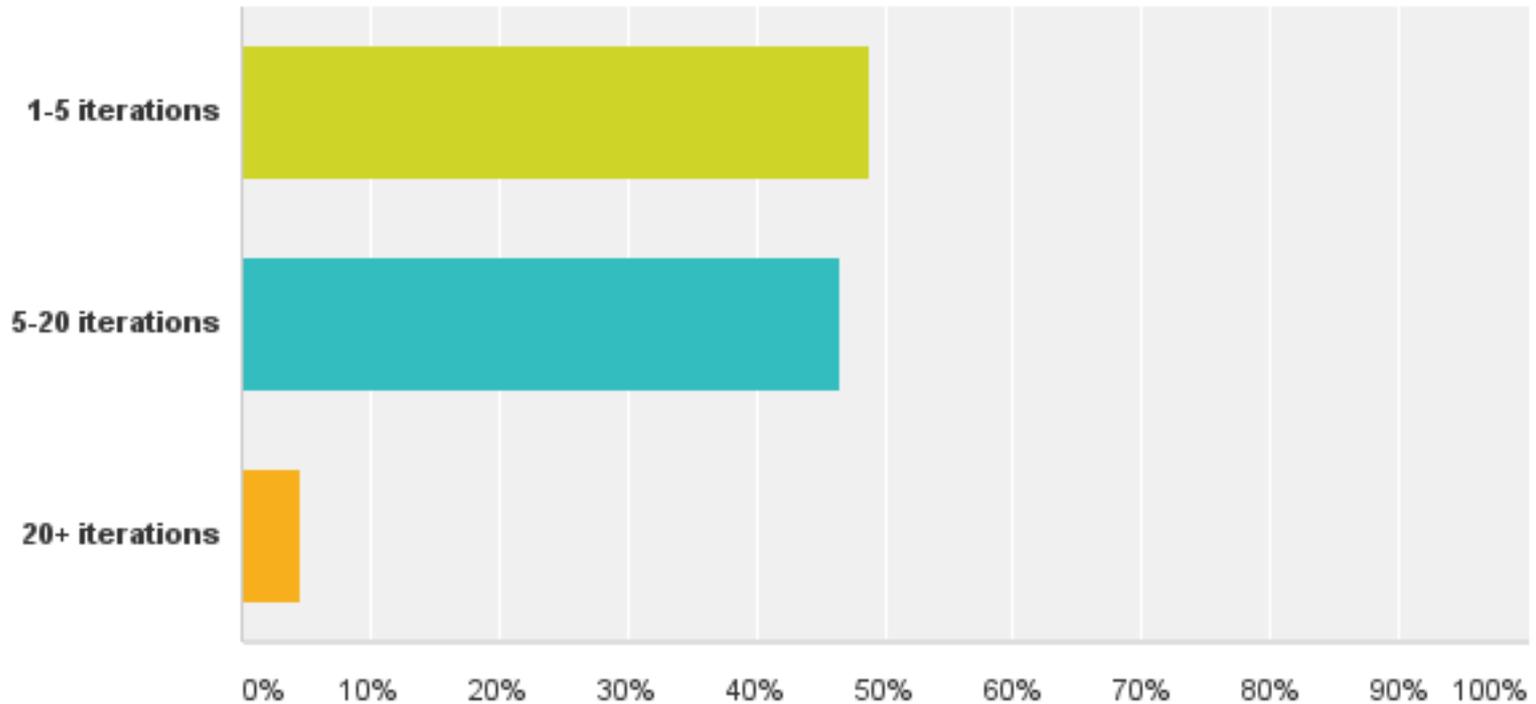
Answered: 41 Skipped: 4



# Survey Results

## Q7 How many geometry iterations do you typically go through for a project?

Answered: 43 Skipped: 2



# Survey Discussion

- Are these results surprising?
  - ~75% of the community is using DM in some capacity
  - 2% of respondents feel they are “advanced” at Spaceclaim; 22% feel “advanced” in DM
  - Normal distribution of people using shells/solids
  - 5% of users do 20+ iterations on a typical project



# Background on Spaceclaim

- Founded in 2005 by an engineering group including Mike Payne (founder of Solidworks)
- First version of Spaceclaim released in 2007
- Used for ANSYS direct modeling since 2009
- Bought for 85 million dollars in 2014 by ANSYS
- Renamed “ANSYS SpaceClaim Direct Modeler” for ANSYS modeling applications
- Sold to other OEM packages, as well as direct to end user



# Why Use Spaceclaim?

- Embedded within ANSYS
  - Can form multi-body parts
- Not intended to replace active CAD software (Inventor, Solidworks, PRO/E) for pure drafting
- Alternative to DesignModeler for modifying geometry coming from other CAD packages



# Pros/ Cons of Design Modeler

## Pros

- Tree structure can make going back and making simple model changes easy
- Can form multi-body parts to connect bodies together without using contact
- Allows multiple connection types (joints, automatic) between surfaces

## Cons

- Hard to learn GUI
  - Legacy causes strange organization
- “Clunky” and slow interface with having to generate after each operation
- Tree structure can become invalidated
- Future “development” is at risk



# Pros/Cons of Spaceclaim

## Pros

## Cons

- Direct editor—don't have to worry about invalidating design tree
- Easy to learn GUI—only need 3 basic commands to make 90% of geometries
- Undo, Cut & Paste, intelligent interface design for great user experience

- Connectivity / Show contact tool is buggy
- Low tolerance ( $1e-8$  like CAD) – can create problems with slivers/connectivity
- Can't set dimensions for part relationships – non-parametric tool.
- Still in “development”, creating/solving bugs

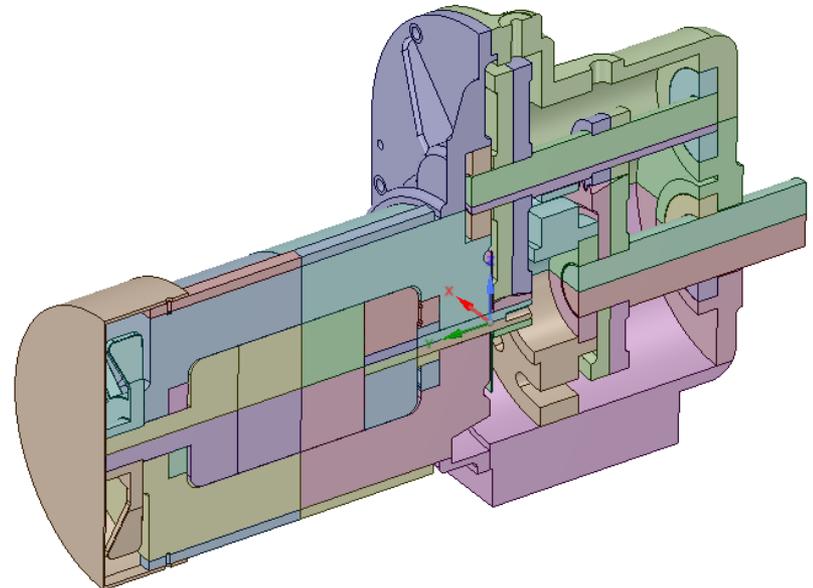
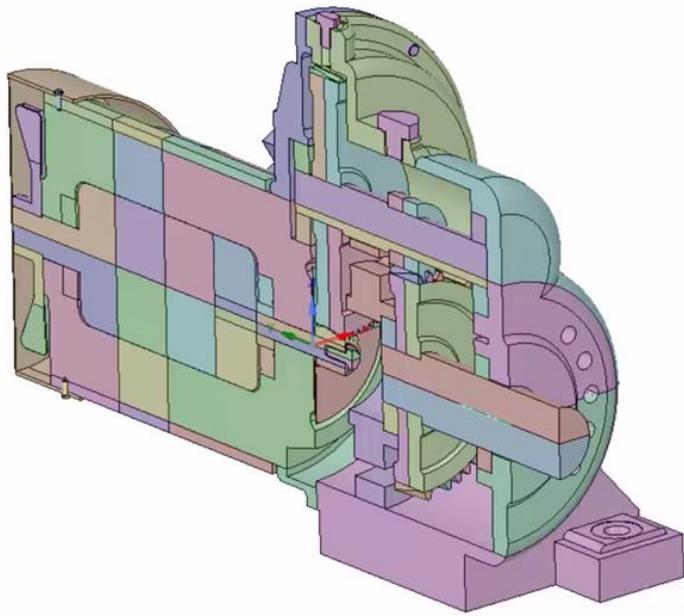


# Head-to-Head Showdown

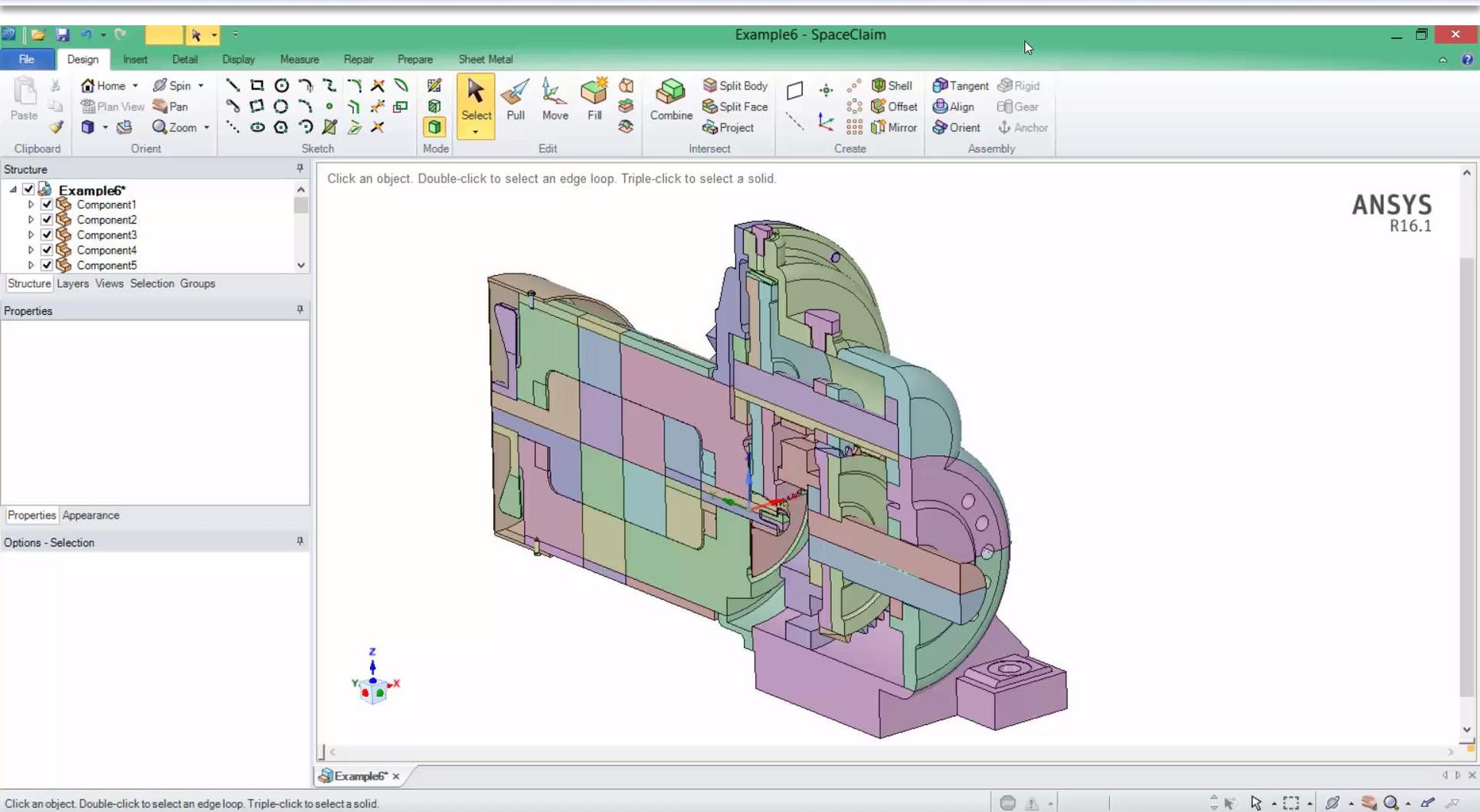
1. Changing the number of holes on a geometry from 5 to 4
2. Projecting 8 washers onto geometry
3. Mid-surface 5 parts in an assembly
4. Connect 5 parts together via weld surfaces
5. Adding a second .step file to the existing geometry
6. Fixing a partially corrupted model

# Showdown #1

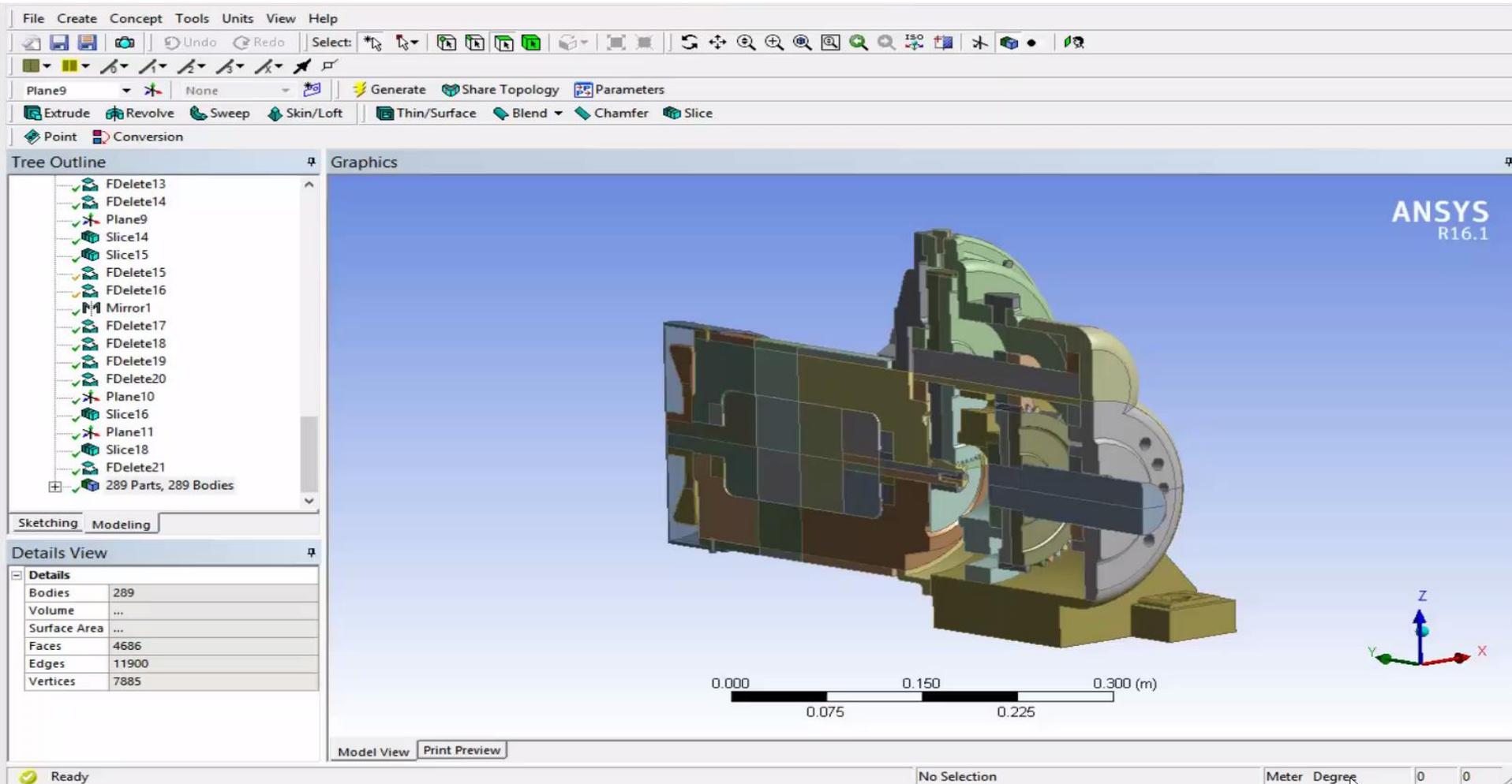
- **The Problem:** A multi-part engine system has been imported and prepped for Mechanical; however, the design has now changed. Which program can change the number of holes in the front face from 5 to 4 in 10 seconds?



# Showdown #1 (Spaceclaim)



# Showdown #1 (Design Modeler)



The screenshot displays the ANSYS Design Modeler software interface. The main window shows a 3D model of a complex mechanical assembly, likely a turbine or engine component, rendered in a cutaway view to reveal internal features. The model is composed of numerous parts, color-coded in shades of green, blue, and brown. A coordinate system (X, Y, Z) is visible in the bottom right corner of the graphics area. A scale bar at the bottom of the graphics area indicates dimensions in meters, ranging from 0.000 to 0.300, with intermediate markers at 0.075, 0.150, and 0.225.

The interface includes a menu bar at the top with options: File, Create, Concept, Tools, Units, View, Help. Below the menu bar is a toolbar with various icons for selection, manipulation, and modeling. The main toolbar contains buttons for Plane9, None, Generate, Share Topology, Parameters, Extrude, Revolve, Sweep, Skin/Loft, Thin/Surface, Blend, Chamfer, and Slice. Below the main toolbar are buttons for Point and Conversion.

The left sidebar contains the Tree Outline and Details View panels. The Tree Outline panel lists the following items:

- FDelete13
- FDelete14
- Plane9
- Slice14
- Slice15
- FDelete15
- FDelete16
- Mirror1
- FDelete17
- FDelete18
- FDelete19
- FDelete20
- Plane10
- Slice16
- Plane11
- Slice18
- FDelete21
- 289 Parts, 289 Bodies

The Details View panel shows the following statistics:

Details	
Bodies	289
Volume	...
Surface Area	...
Faces	4686
Edges	11900
Vertices	7885

The bottom status bar shows "Ready", "No Selection", "Meter Degree", and "0 0".

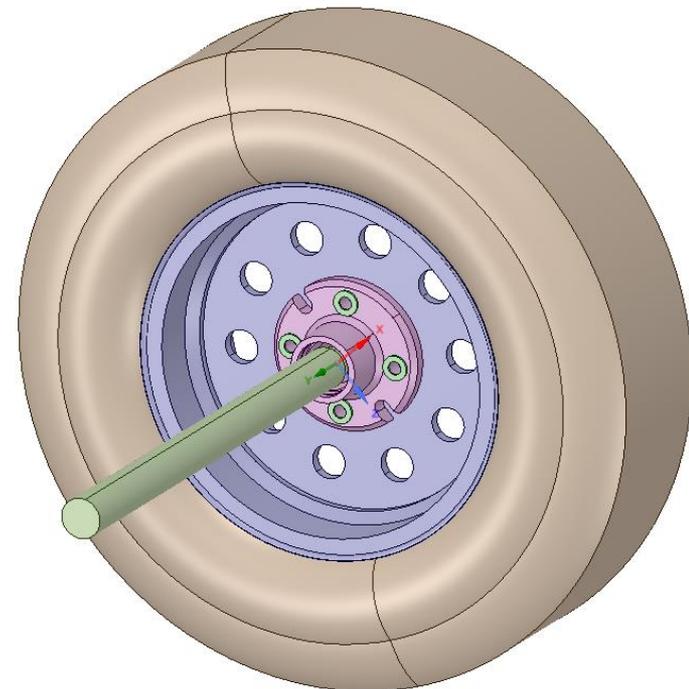
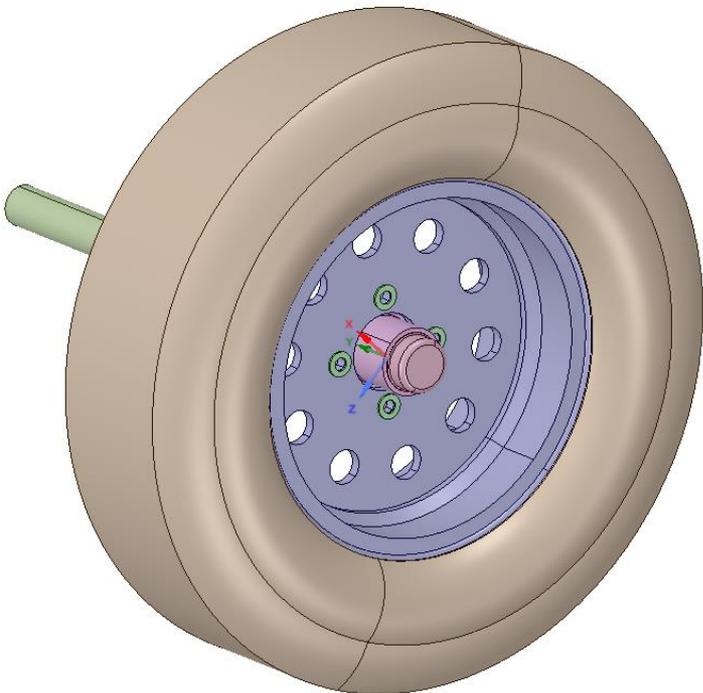


# And the Winner is....

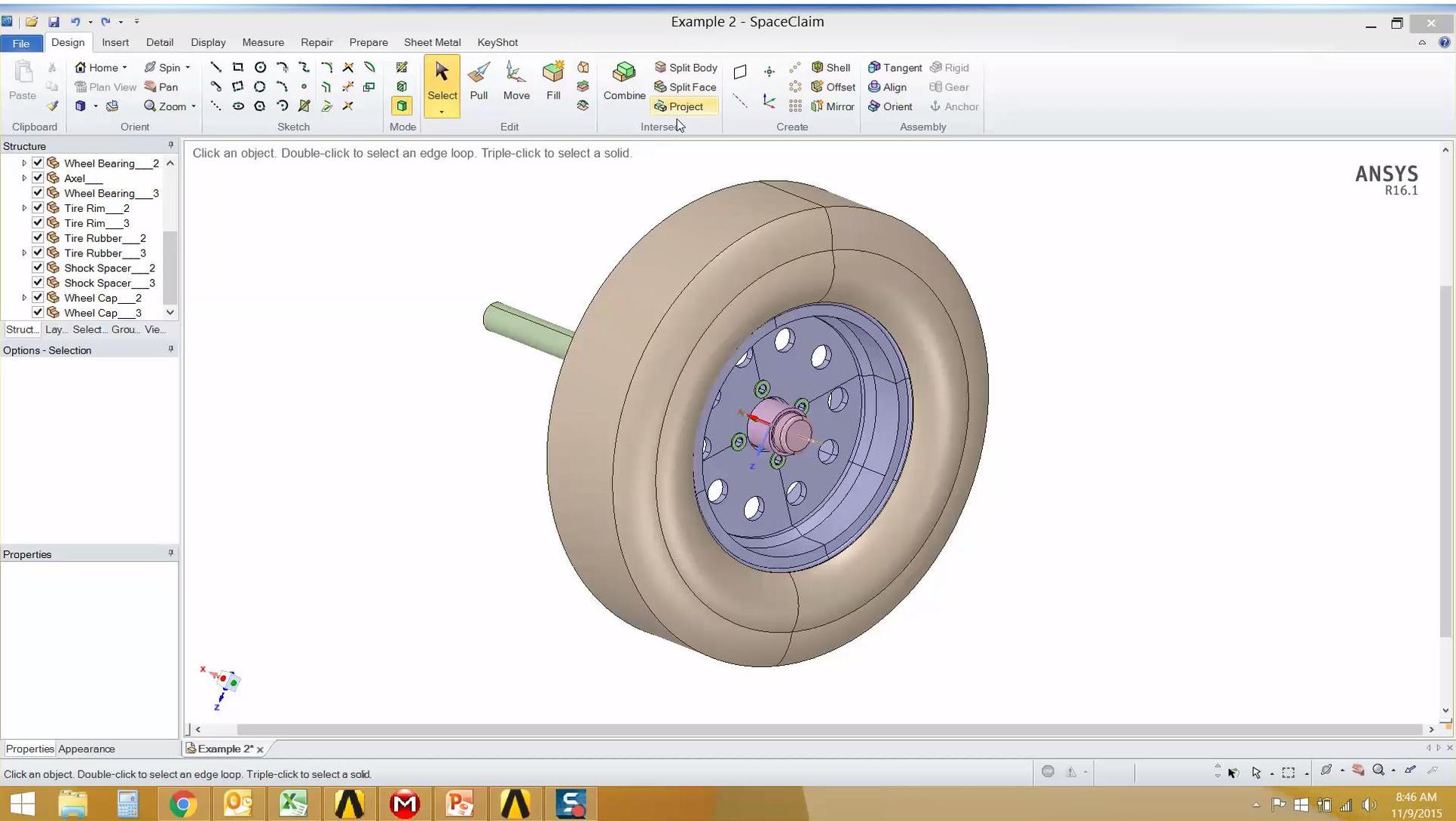
- Spaceclaim!
- Why: Making direct modeling changes to a geometry is Spaceclaim's bread-and-butter! Going back and making changes to models in Design Modeler either adds more functions onto the tree, or can invalidate the model.

## Showdown #2

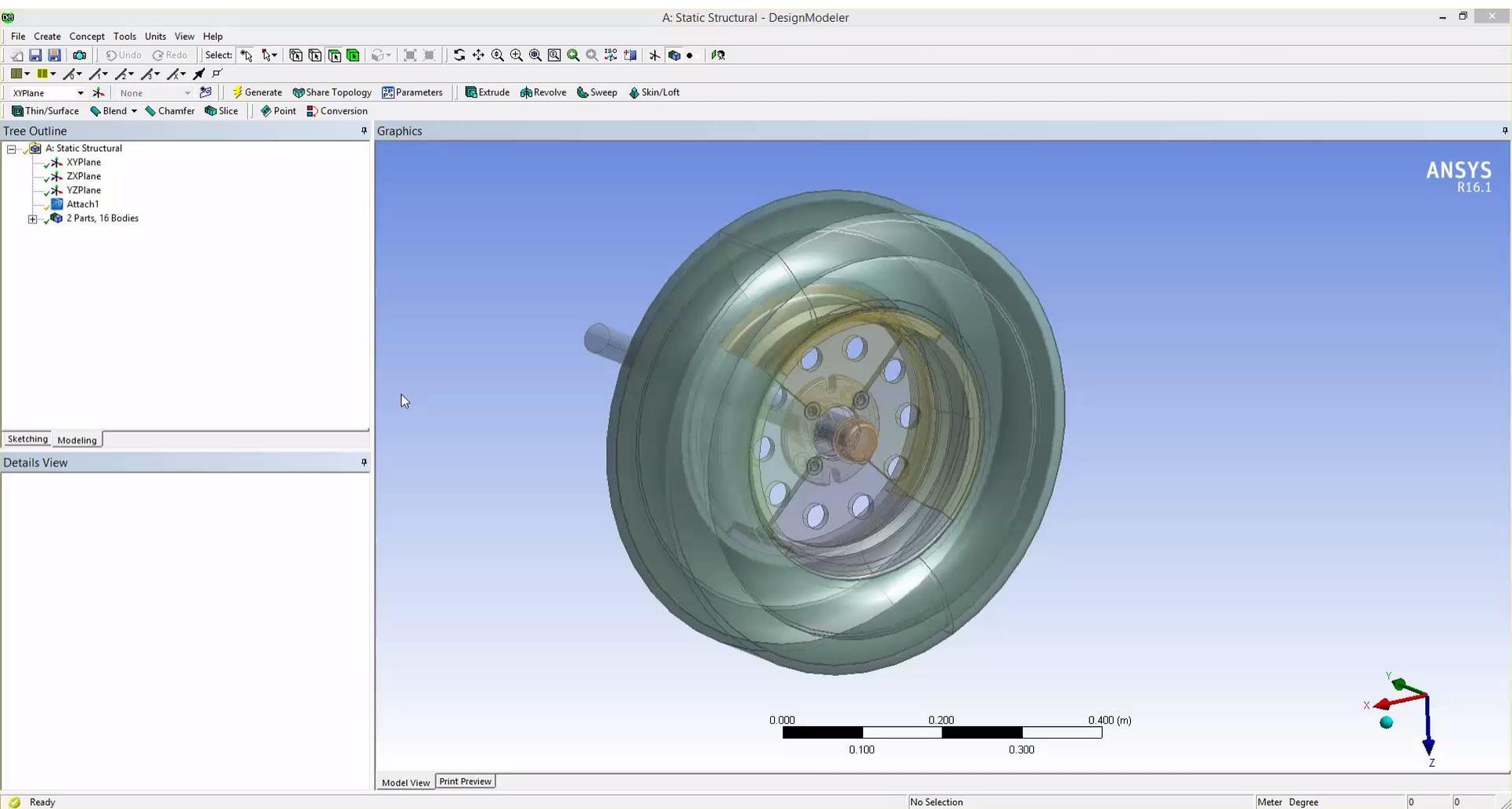
- **The Problem:** A wheel hub has four washers on each side to connect it to the axle. Which program can project the faces of the washers onto the wheel hub body in 30 seconds?



# Showdown #2 (Spaceclaim)



# Showdown #2 (Design Modeler)



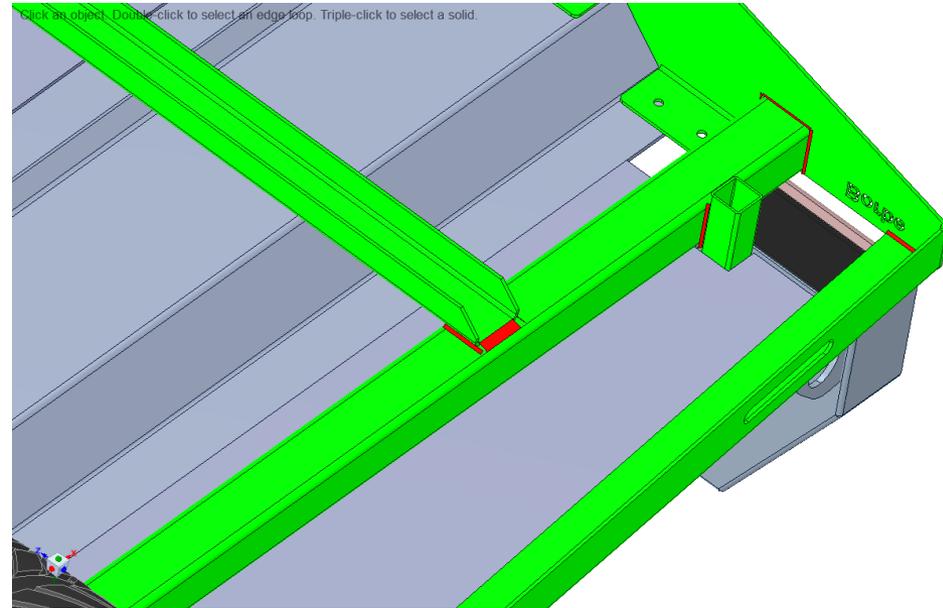
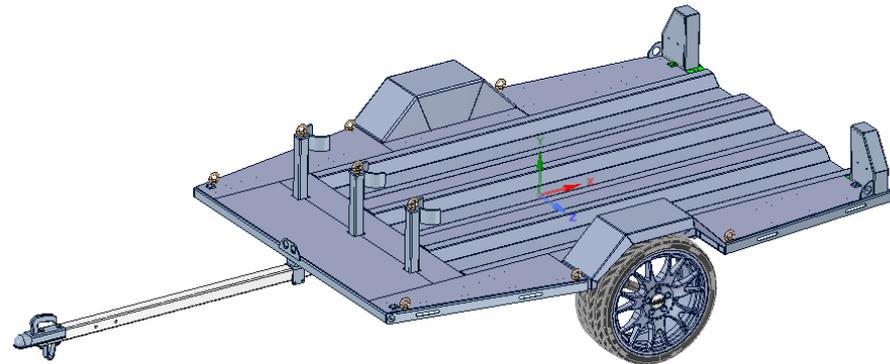


# And the Winner is....

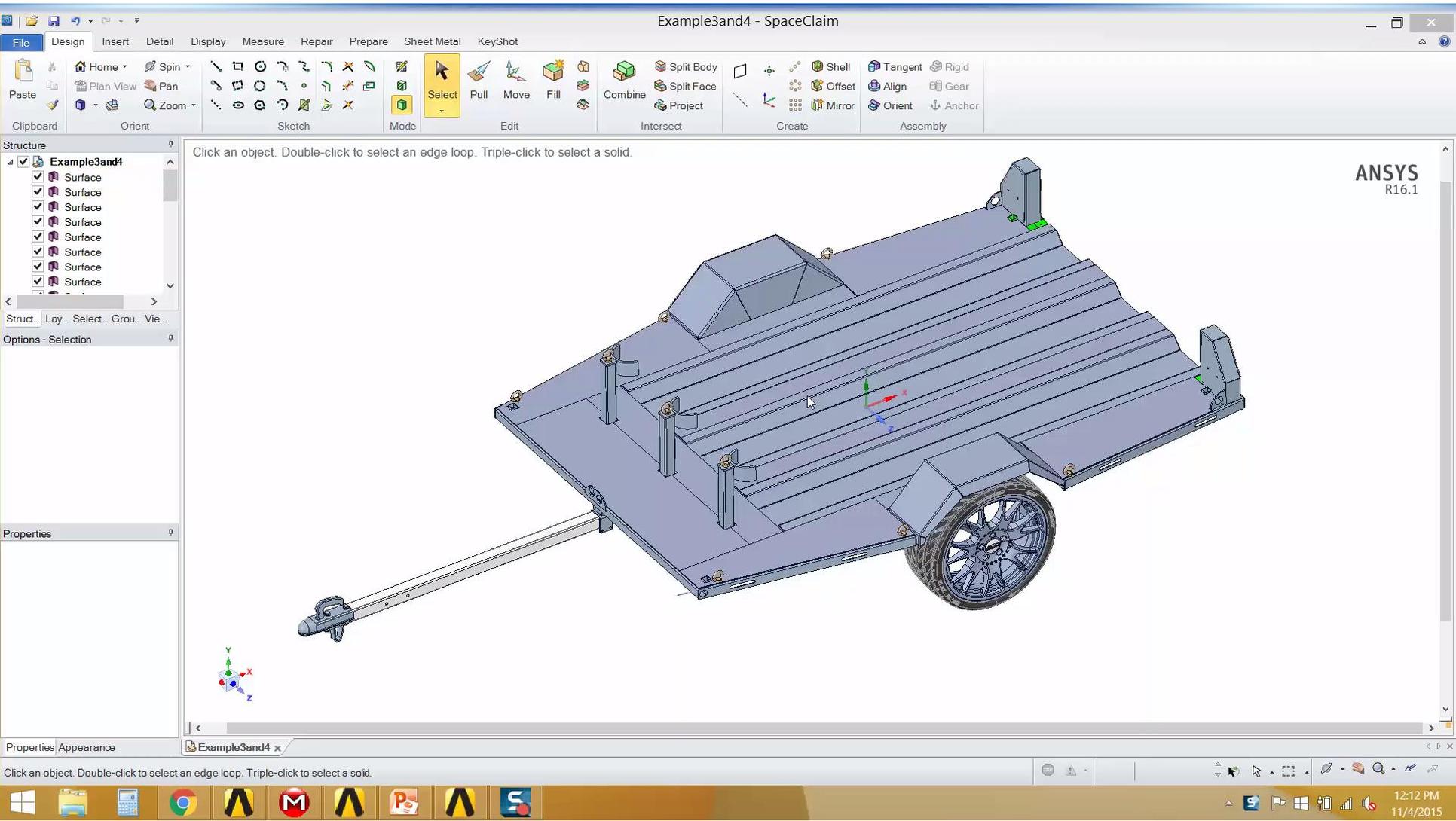
- **Spaceclaim!**
- **Why:** Spaceclaim allows you to select multiple surfaces (not edges) to project, as well as multiple surfaces to project to.

# Showdown #3

- **The Problem:** A trailer model is made up of solid bodies and surfaces representing welds. Which program can mid-surface five of the solid body (green) parts in 31 seconds?



# Showdown #3 (Spaceclaim)



# Showdown #3 (Design Modeler)

C: Static Structural - DesignModeler

File Create Concept Tools Units View Help

XYPlane None Generate Share Topology Parameters Extrude Revolve Sweep Skin/Loft

Thin/Surface Blend Chamfer Slice Point Conversion

Tree Outline Graphics

C: Static Structural

- XYPlane
- ZXPlane
- YZPlane
- Attach1
- 97 Parts, 216 Bodies

Sketching Modeling

Details View

Details of Attach1

Import	Attach1
Source	E:\Epsilon\User Meeting\E...
Target Geometry Type	Workbench
Base Plane	XYPlane
Operation	Add Frozen
Refresh	No
<b>Basic Geometry Options</b>	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Yes

Section Planes

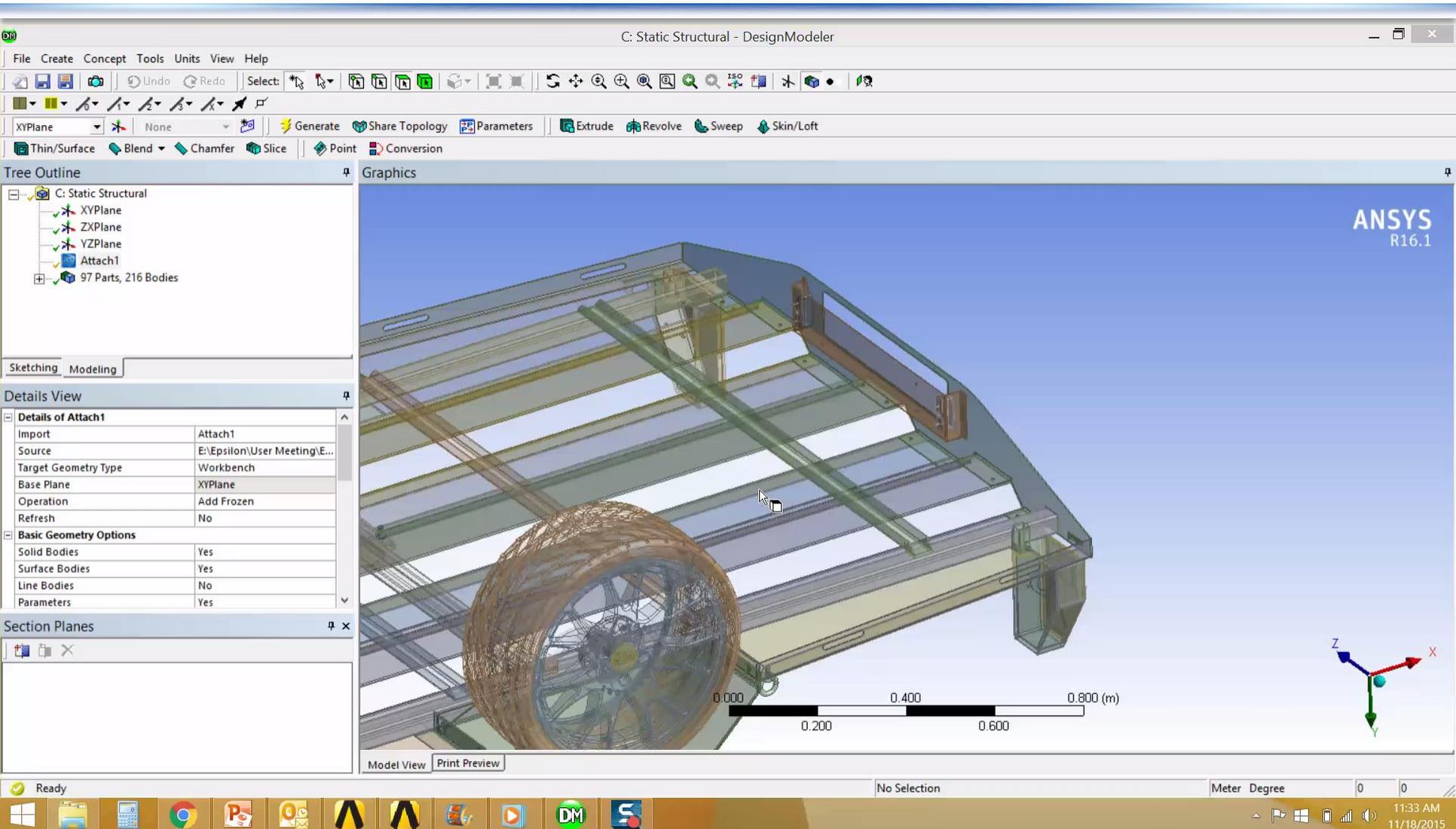
Model View Print Preview

ANSYS R16.1

0.000 0.200 0.400 0.600 0.800 (m)

Ready No Selection Meter Degree 0 0

11:33 AM 11/18/2015



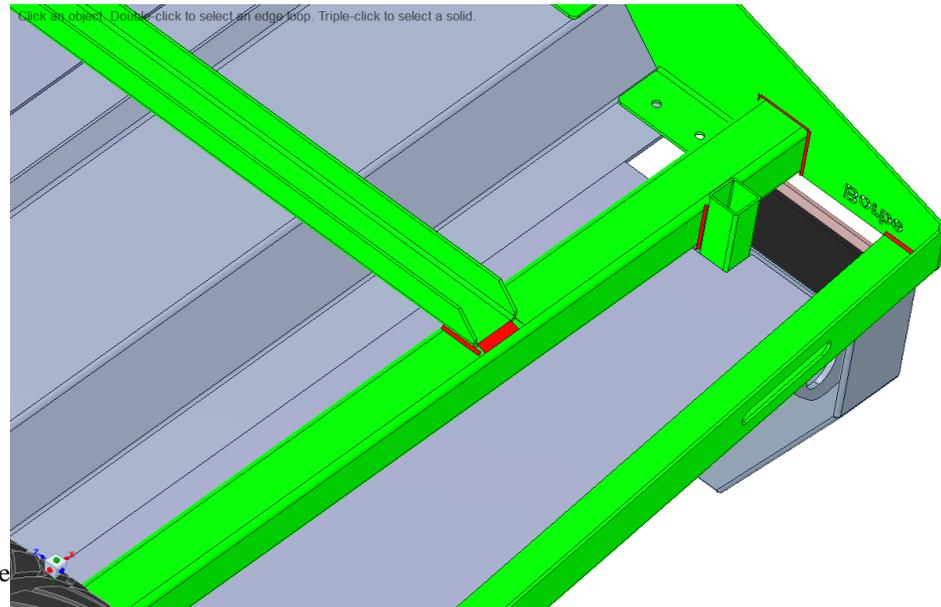
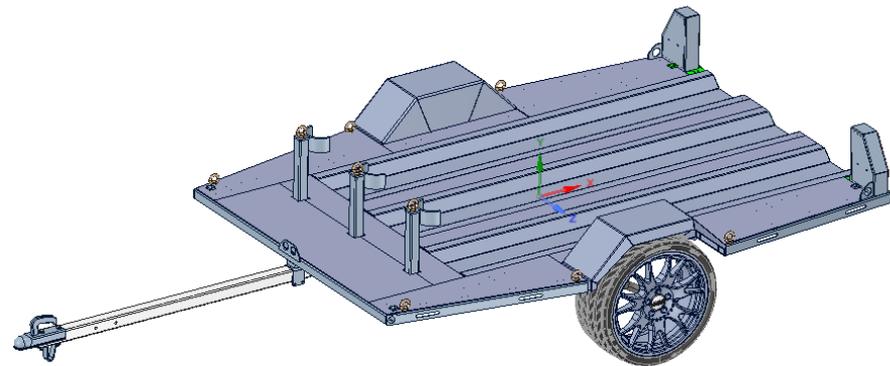


# And the Winner is....

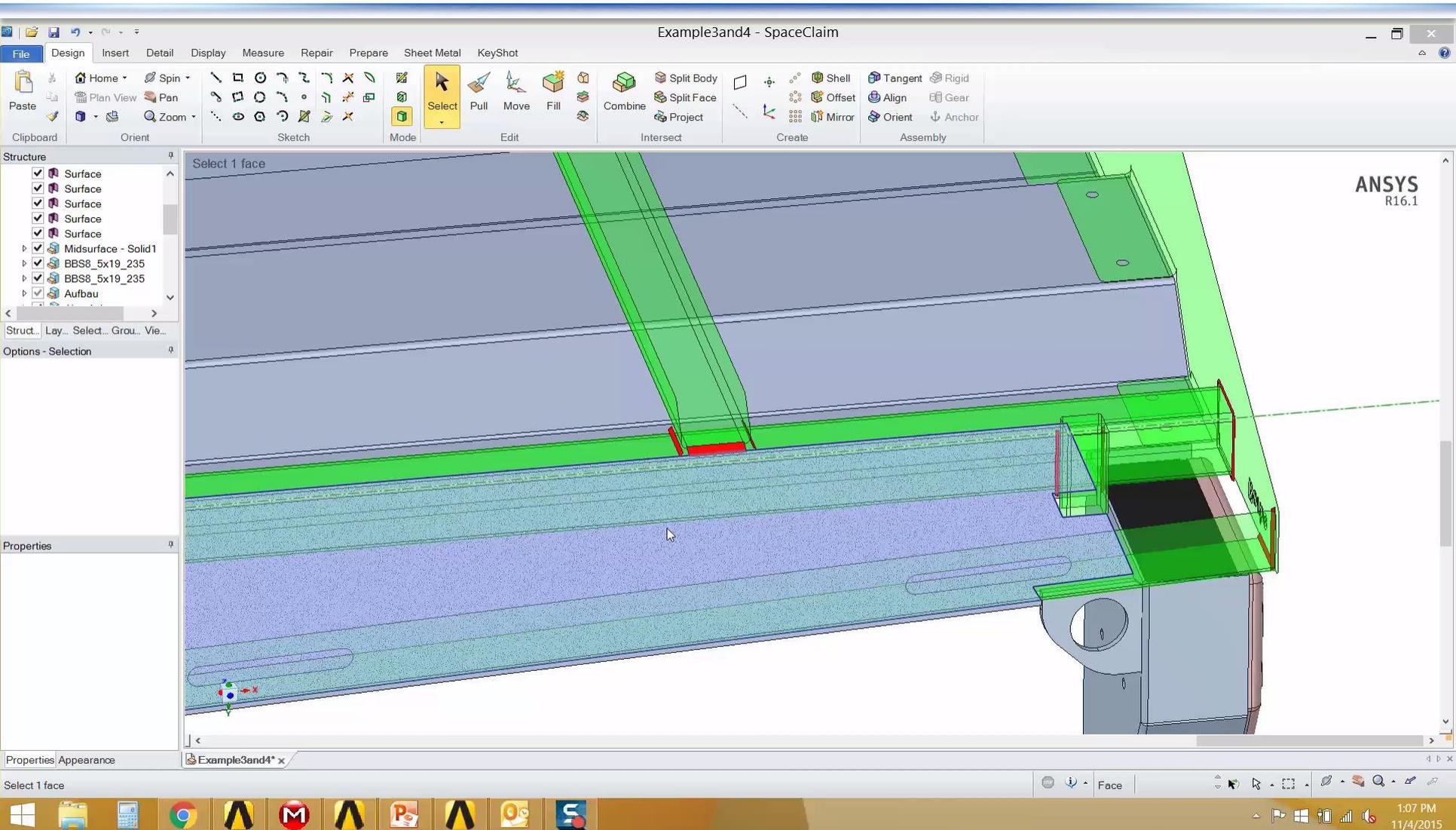
- **Spaceclaim!**
- **Why:** Spaceclaim needs less clicks in order to select/midplane the necessary geometry

# Showdown #4

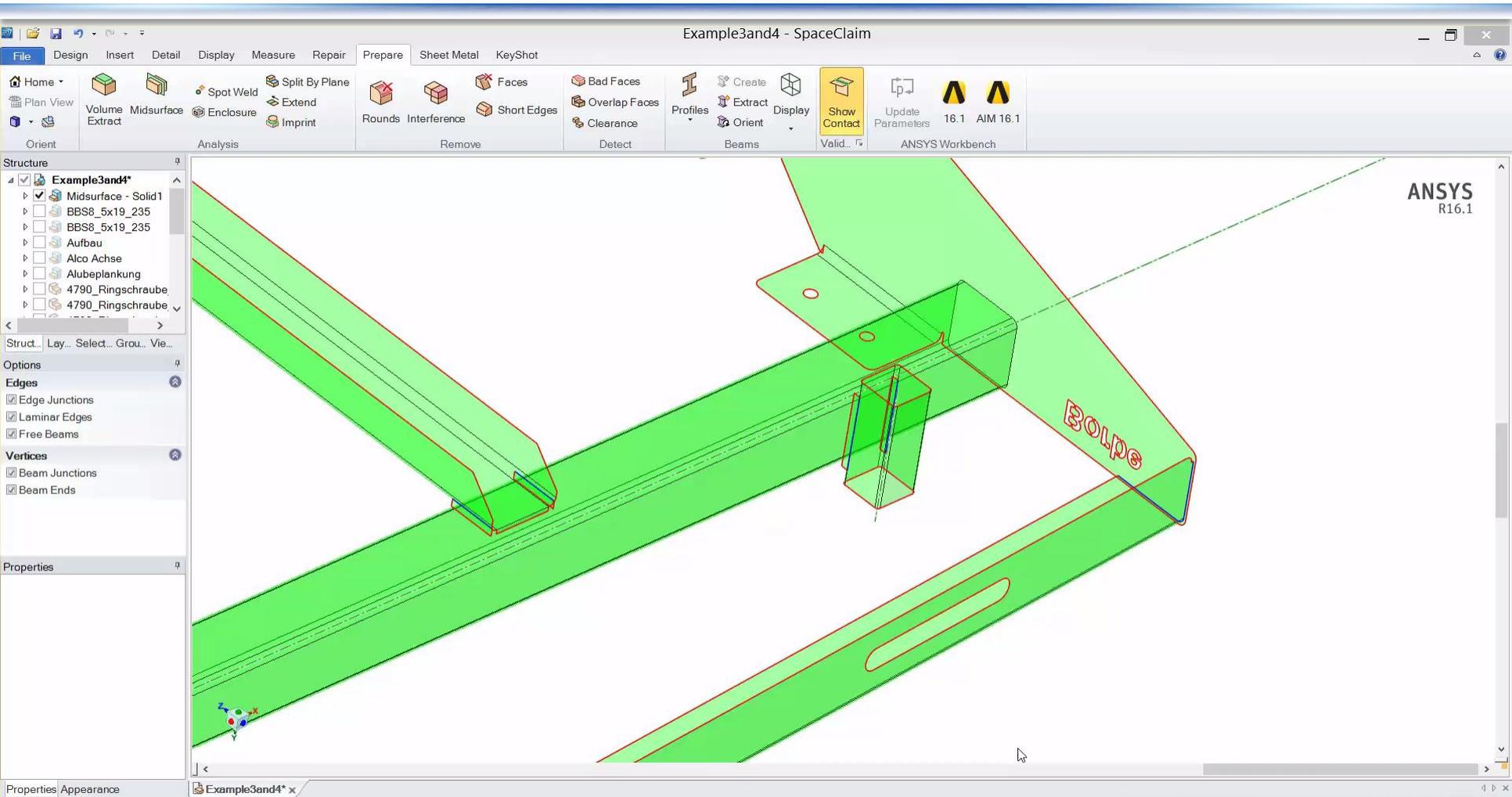
- **The Problem:** A trailer model is made up of mid-surfaced bodies and surfaces representing welds. Which program can connect the mid-surfaces together at the welded (red) locations in under 4 minutes?



# Showdown #4 (Spaceclaim)

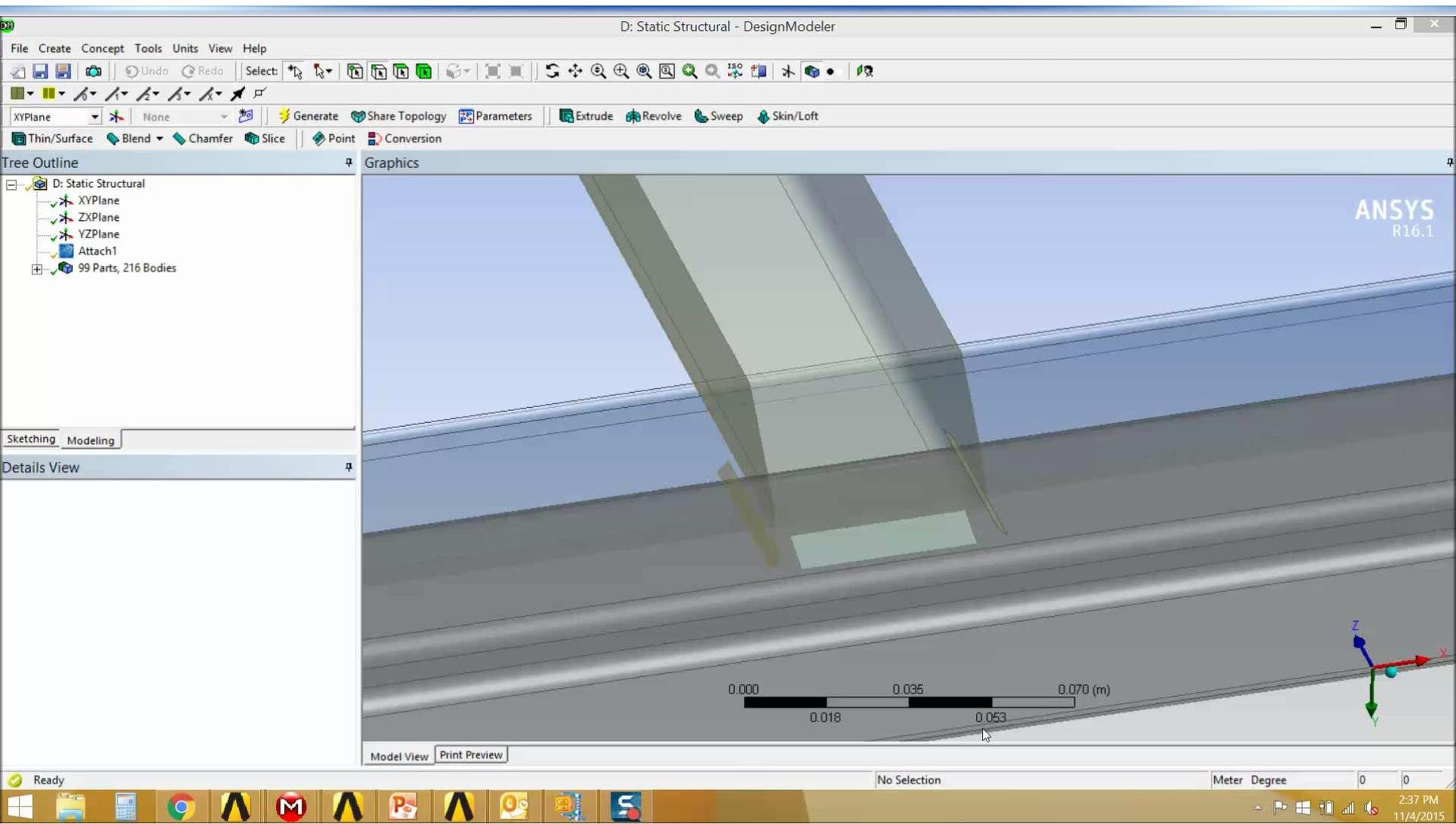


# Showdown #4 (Spaceclaim--Continued)



**Hours? Days? Weeks?**

# Showdown #4 (Design Modeler)

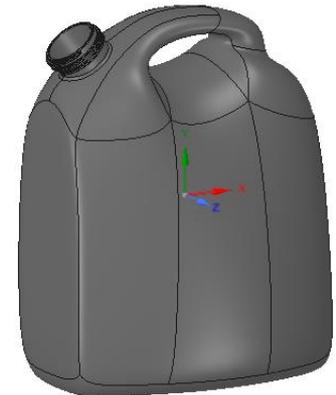
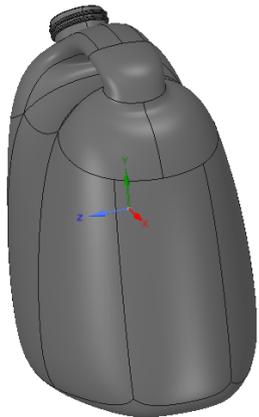


# And the Winner is....

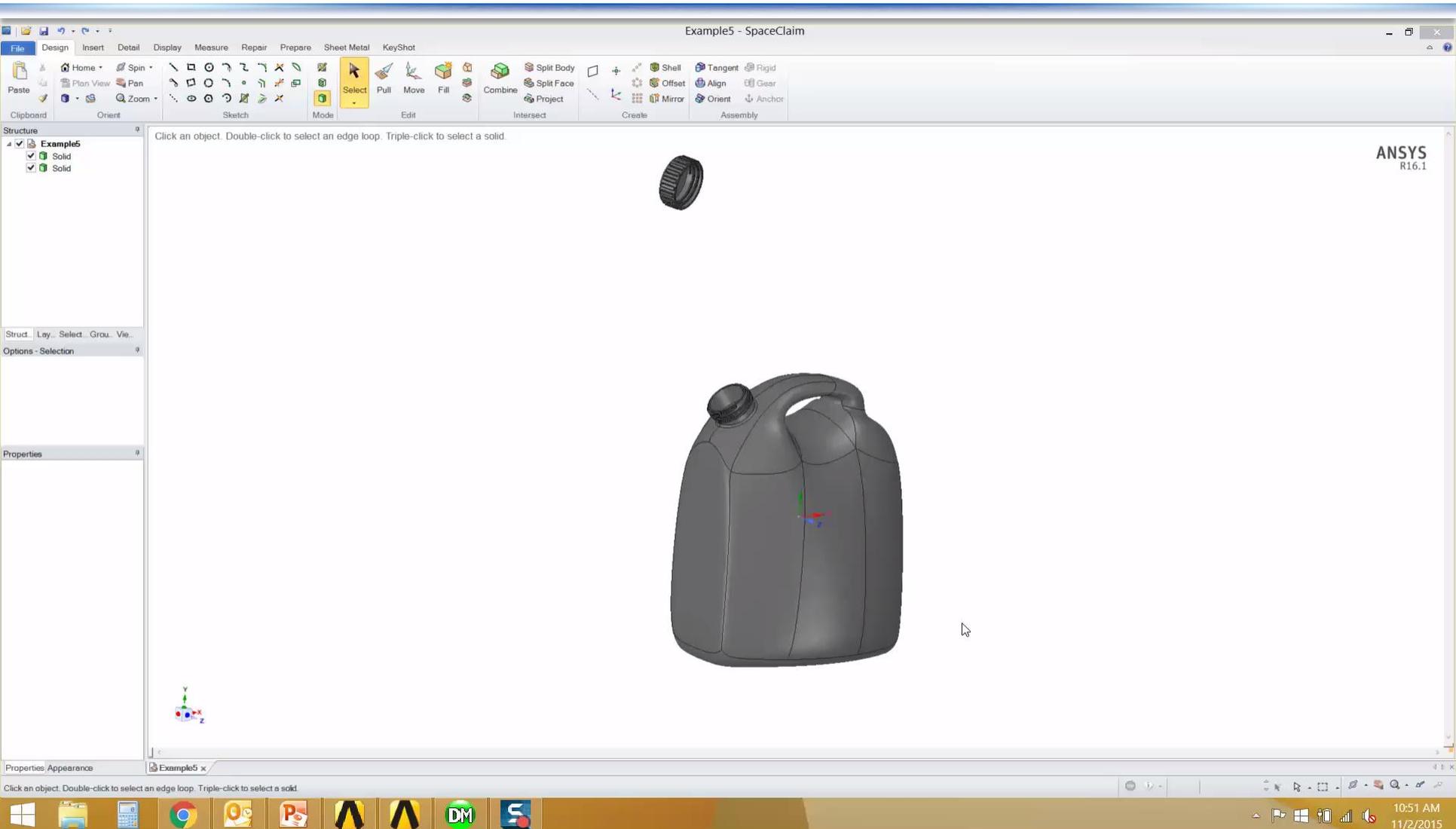
- Design Modeler!
- Why:
  - If everything works correctly within Spaceclaim, the welding/connection process in Spaceclaim is significantly faster than in Design Modeler.
  - The “Show Contact” tool is buggy, and can cause an extreme amount of excess work to determine where the problem is coming from.

# Showdown #5

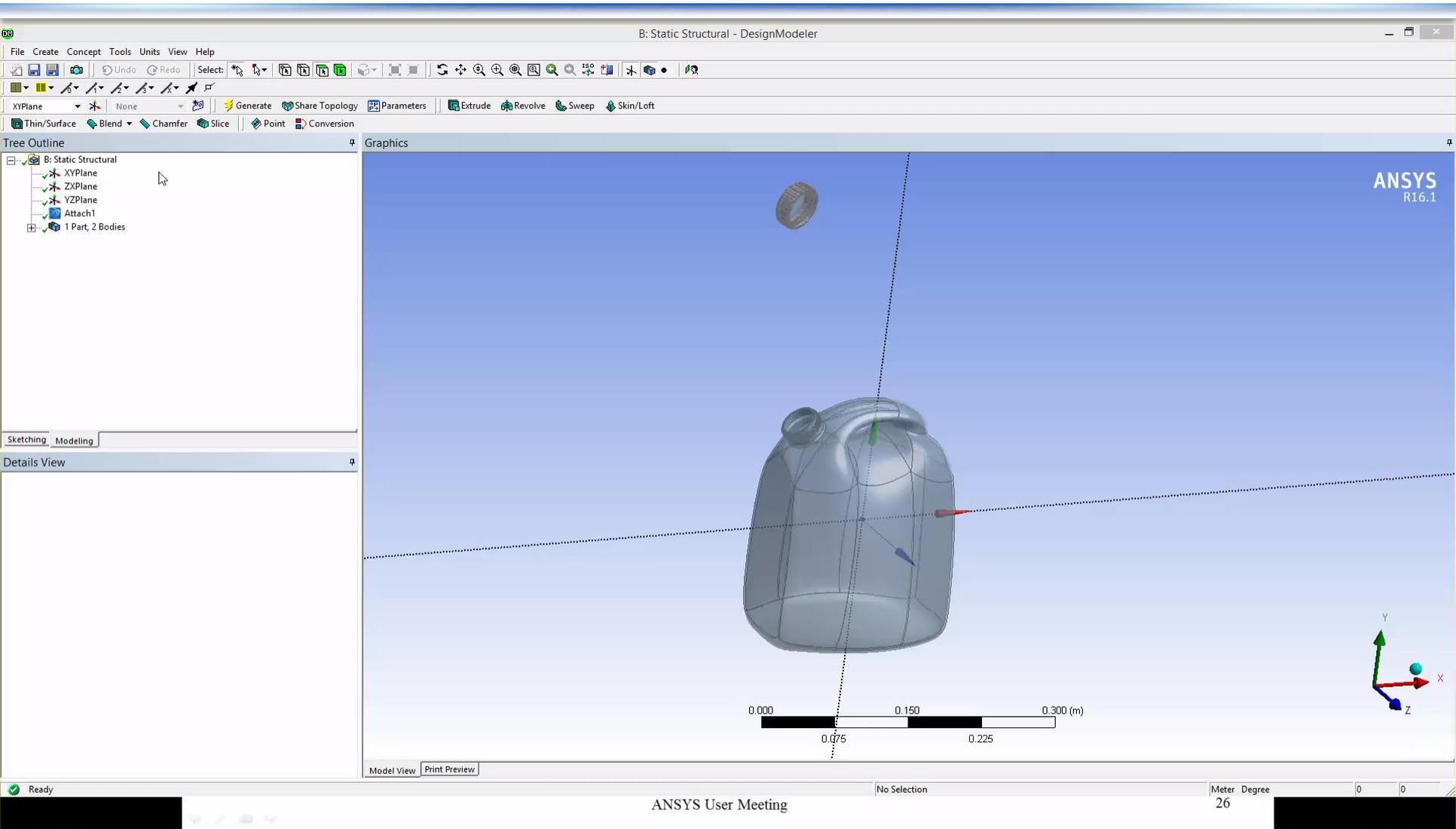
- **The Problem:** An assembly consists of a container and a cap, which should be fixed together per normal use conditions. Which program can move the two bodies together in 47 seconds?



# Showdown #5 (Spaceclaim)



# Showdown #5 (Design Modeler)



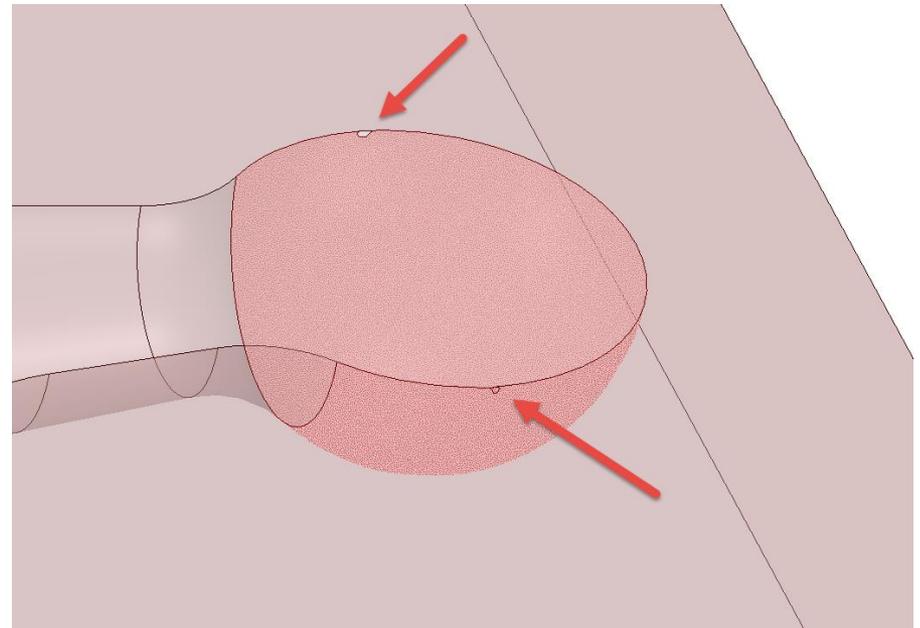
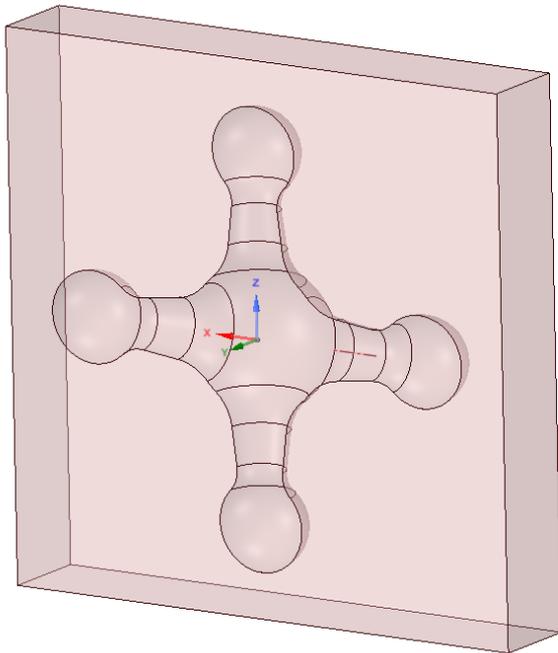


# And the Winner is....

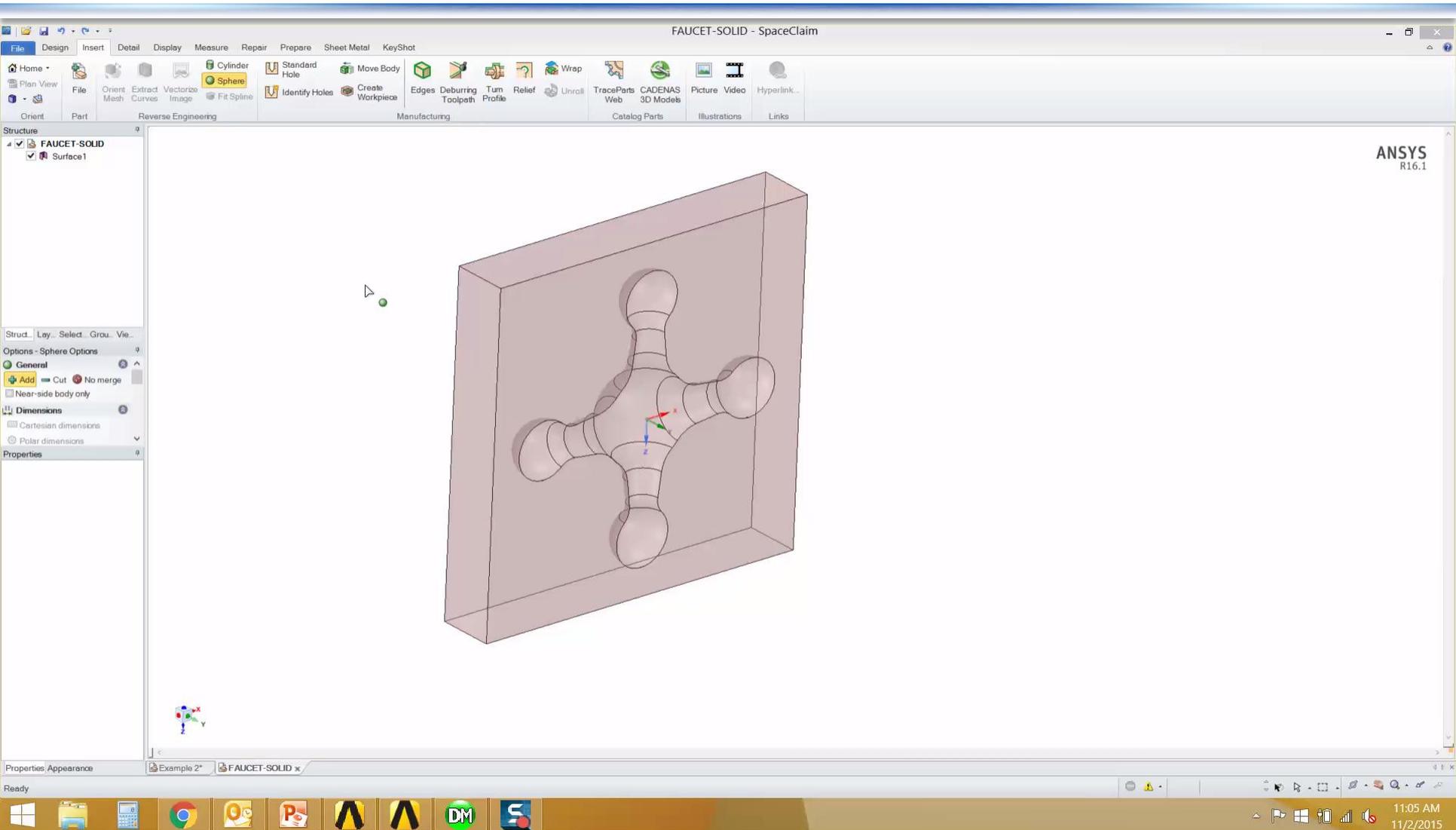
- **Design Modeler!**
- **Why:** Spaceclaim only allows you to move/rotate about 1 axis at a time; whereas Design Modeler lets you setup axis for each object, and then match those axis together in a single move operation.

# Showdown #6

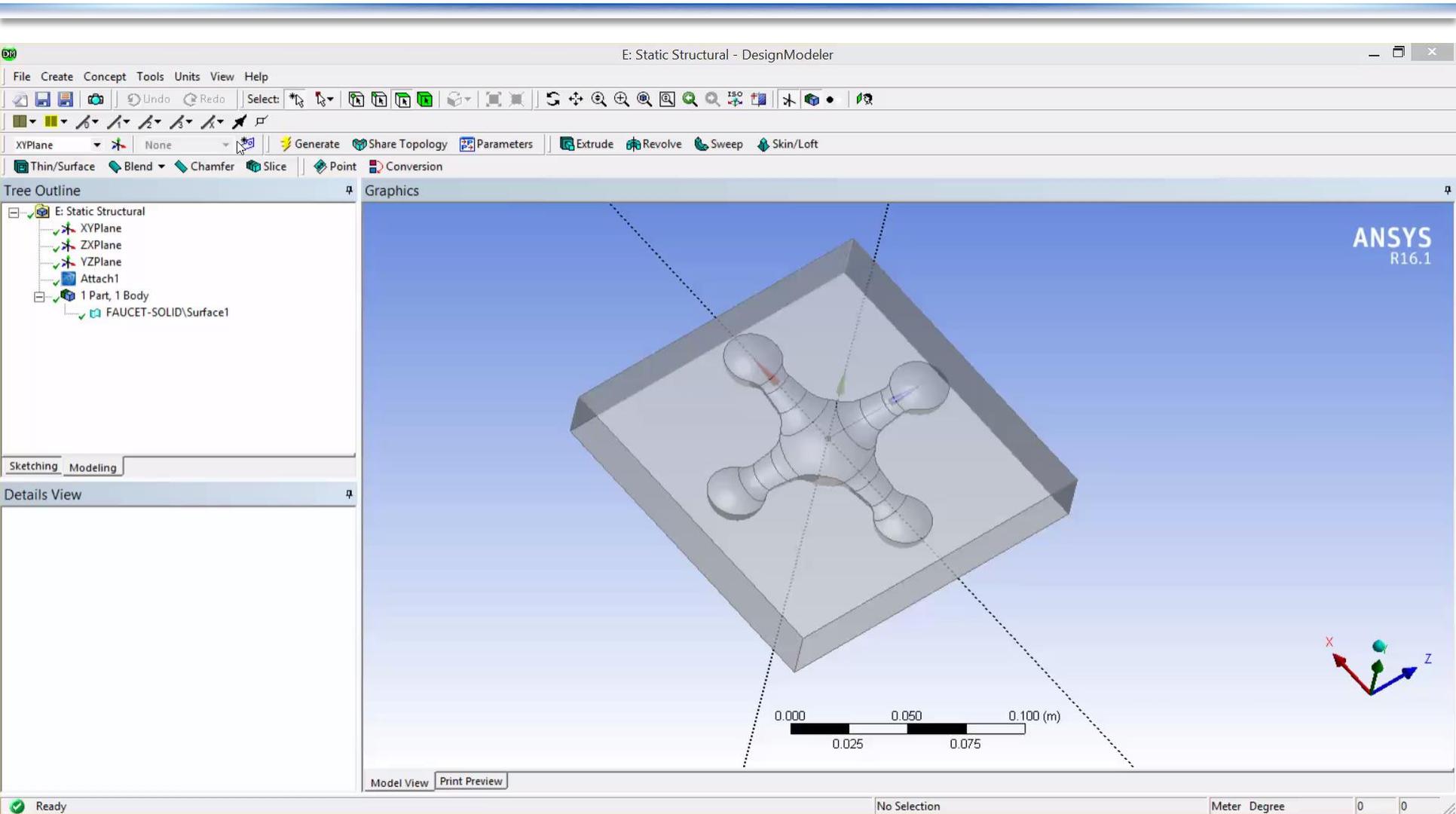
- **The Problem:** An IGES solid body geometry is imported, but has corruption errors (slivers, missing faces, duplicate faces) in the geometry. Which program can fix these errors and convert the part back to a solid body in 42 seconds?



# Showdown #6 (Spaceclaim)



# Showdown #6 (Design Modeler)





# And the Winner is....

- **Design Modeler...in this case!**
- **Why:** For corrupted geometry, it really depends on the tool. Sometimes Design Modeler has faster repair options...other times Spaceclaim is faster.



# Showdown Discussion

- Does your experience match?
  - Are there lessons learned to share with the group?
- What would you have done differently?
  - Can you think of any faster/easier way to modify the geometry?
- What situations would you still continue to use DM? When would you use Spaceclaim?

# Closing Comments

- Which tool is better?
  - Depends on the problem
  - Spaceclaim and DM are different tools for your toolbox
- Using a tool requires invested learning
  - Hard to prioritize learning Spaceclaim over getting a project completed on time
  - **Learning a tool also means figuring out what its not good at, which can be time consuming**



# Let Epsilon FEA Help!

- Flatten the learning curve with Epsilon's Help
  - We will work 1-on-1 with you
  - Use on actual job / your next geometry prep.
  - Invest 20 hours into support, and save 60 hours fighting the tool!
  - Avoid project delays & risk of the unknown

