MSC Apex™

# MSC Apex™ – CAE-система нового поколения

Гуменюк Александр

старший технический эксперт
MSC Software RUS

*8 Октября 2014*

MSC Software

# Agenda

- MSC Apex Market Significance
- MSC Apex Platform – User Experience
- MSC Apex Platform – Solver Technology
- MSC Apex Products – MSC Apex Modeler
- MSC Apex Products – MSC Apex Structures

# MSC Apex Market Significance

# MSC Simulation Trends Survey – March 2014

- **800+ Participants**
- **Industry Representation**
  - 23% Aerospace
  - 26% Automotive
  - 11% Machinery
  - 40% Other

- **Focus of Study**
  - Learnability & Usability
  - Process Challenges
  - Physics & Fidelity
  - Simulation Early in Design
  - Supply Chain Collaboration

# Simulation Trends

## Learnability and Usability

**~50%**

Need more than a month+ to learn new CAE software

**60%**

Lack resources and skills to interpret results

**85%**

See value in engineers (non-analysts) using CAE tools

## Process Challenges

**55%**

Spend more than 30% of time on geometry clean-up and meshing

**67%**

Need 2-4 solver runs to obtain a converged solution

**~80%**

Say obtaining simulation results is a bottleneck

Note: All figures based on a March 2014 online survey of MSC Software customers with 746 participants.

# Simulation Trends

## Physics & Fidelity

**~50%**

Spend days to weeks transferring linear FEA models to nonlinear FEA

**58%**

Nonlinear flexible parts important to validity of multi-body simulations

**83%**

Would benefit from a unified simulation environment

## Simulation Earlier in Design Cycle

**70%**

Don’t receive simulation results in a timely manner

**90%**

Desire to bring simulation earlier in design cycle

**~93%**

Find value in analysts performing conceptual studies during initial design

Note: All figures based on a March 2014 online survey of MSC Software customers with 746 participants.

# Simulation Trends

## Supply Chain Collaboration

**4%**

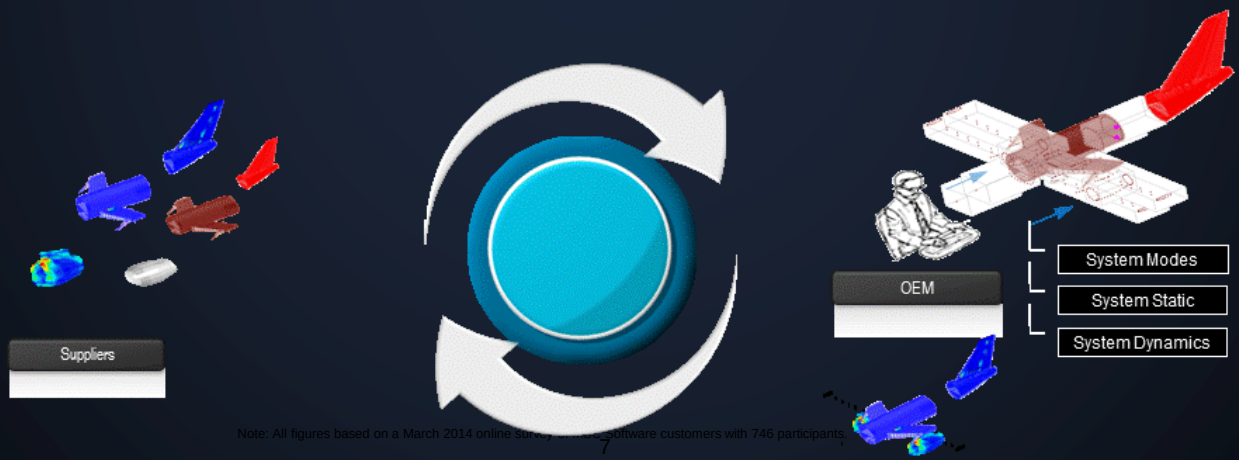
**Satisfied with quality of simulation models received from suppliers**

**75%**

**Rebuild supplier models**

**80%**

**See value in simulation models from suppliers**




Note: All figures based on a March 2014 online survey of MSC Software customers with 746 participants.

# What is MSC Apex?


**MSC Apex is MSC's new CAE platform**

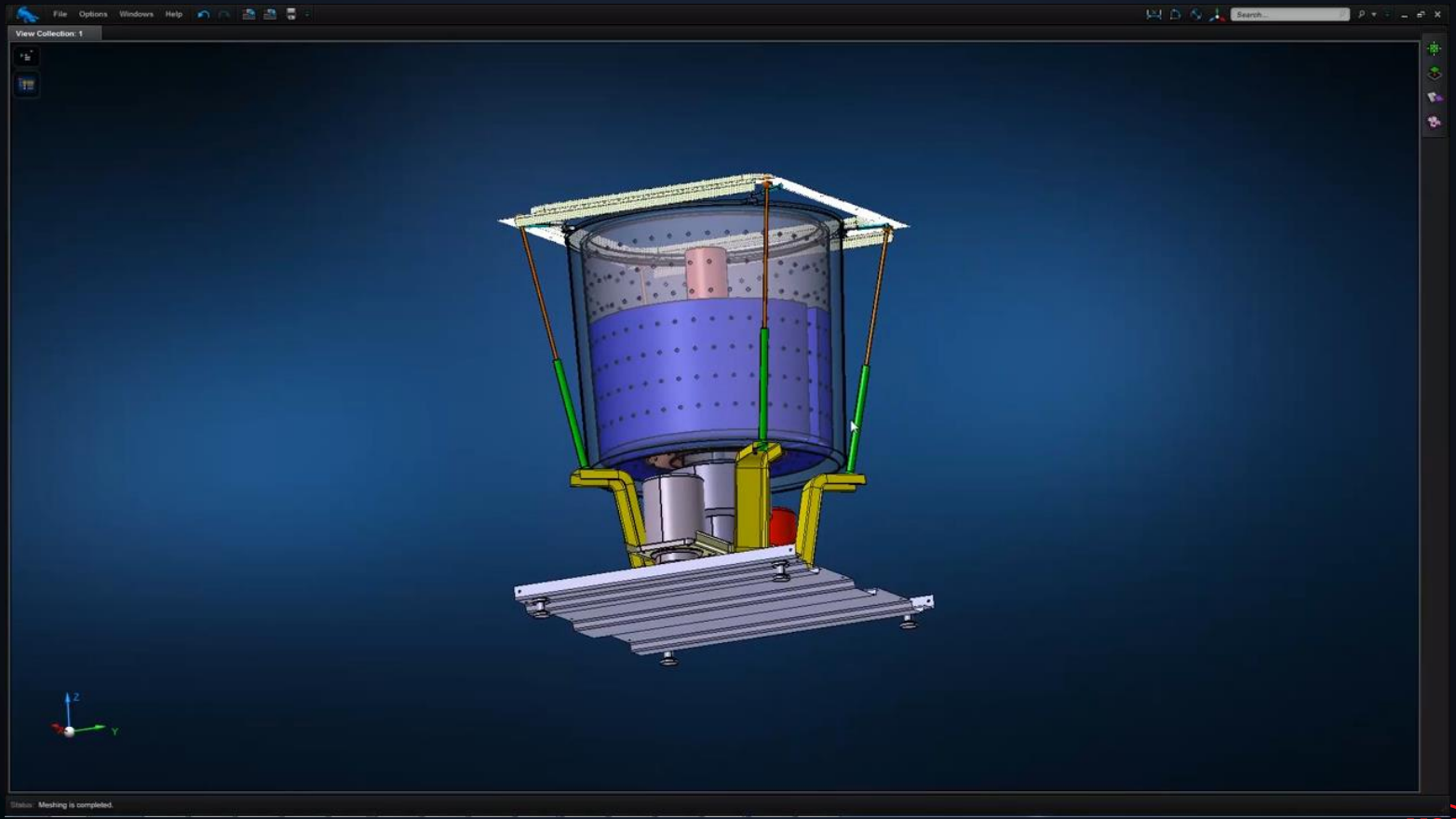
- **A unique game changing user experience, easy-to-learn, easy-to-use**
- **With CAE specific Direct Modeling and Meshing**
- **With Integrated, Incremental Solver Methods for Solver Validated Modeling**
- **Based on Computational Parts & Assemblies Technologies**

**To be delivered in stages…**

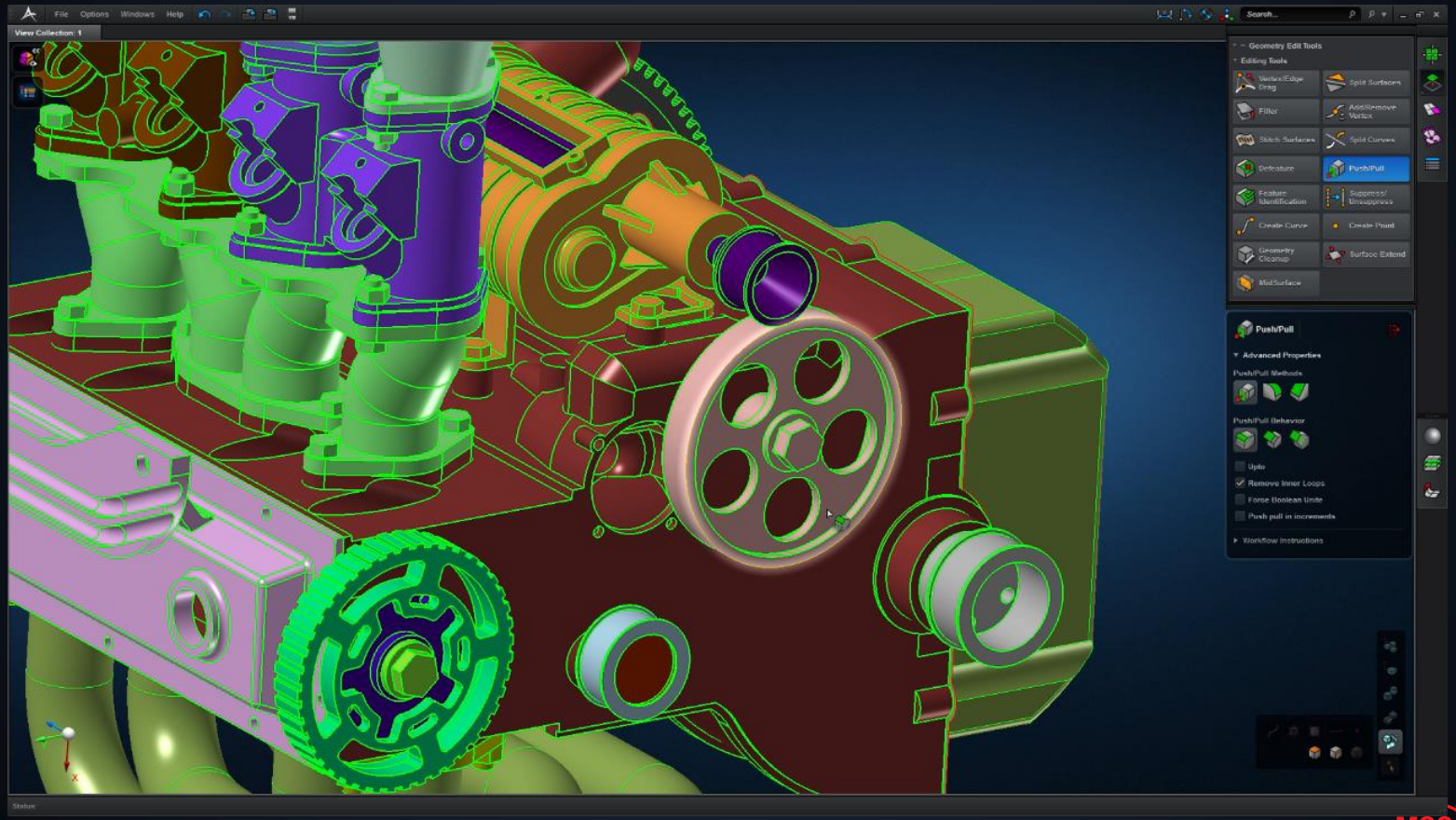
# MSC Apex Platform
# User Experience

# Easy to Learn, Easy to Use

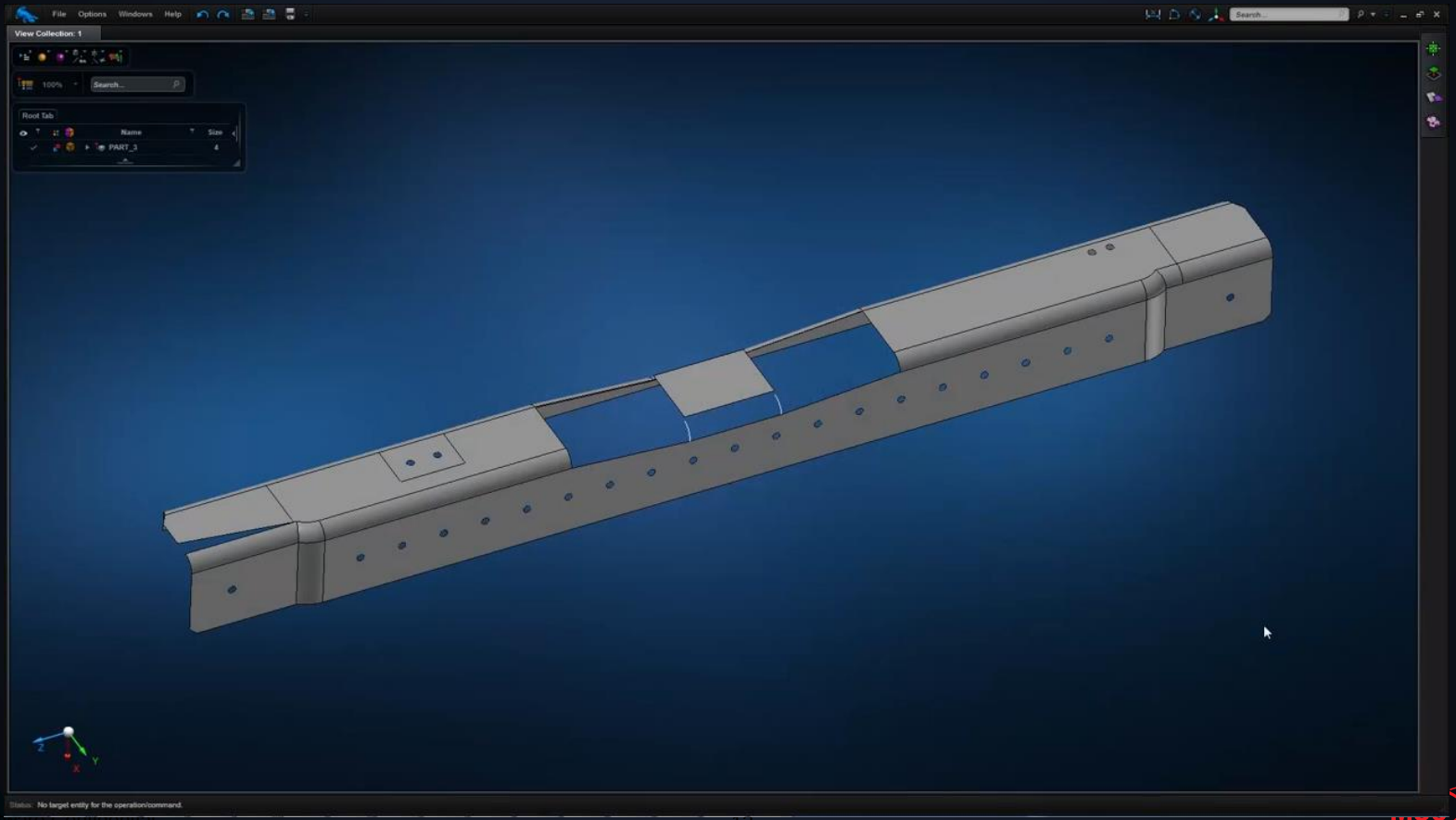
# Easy to Learn, Easy to Use



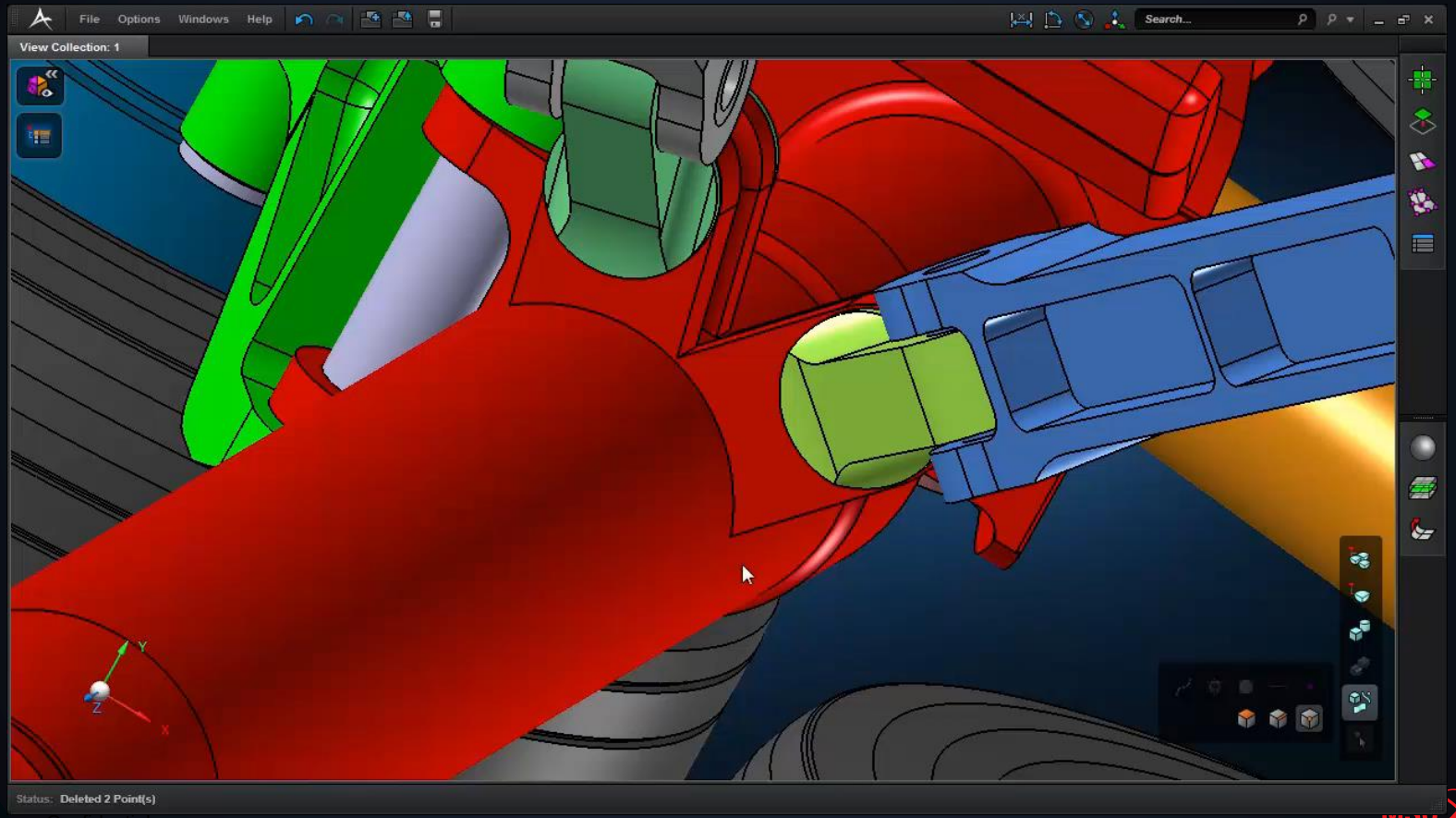
# Easy to Learn, Easy to Use



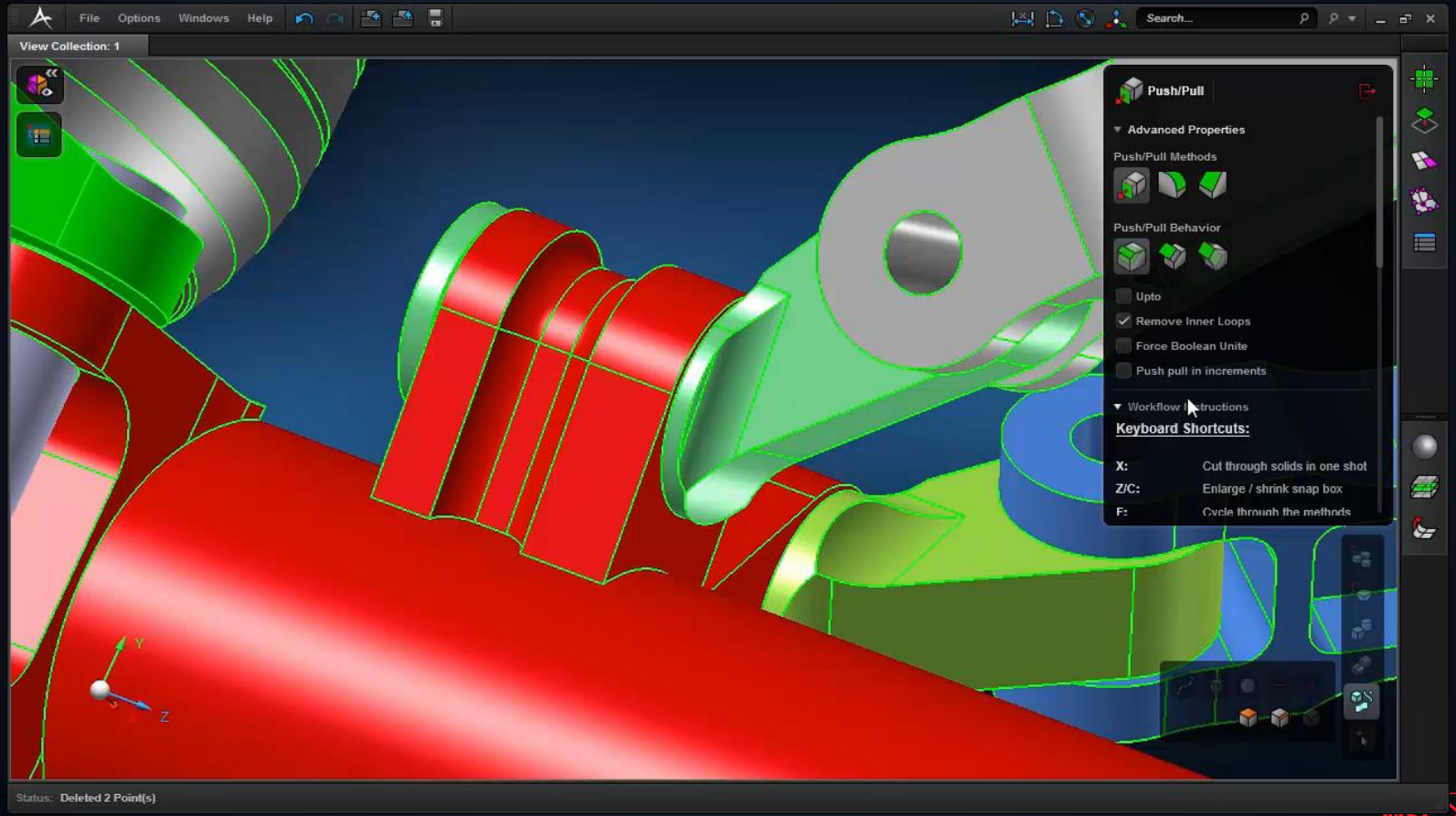
# Easy to Learn, Easy to Use



# Easy to Learn, Easy to Use



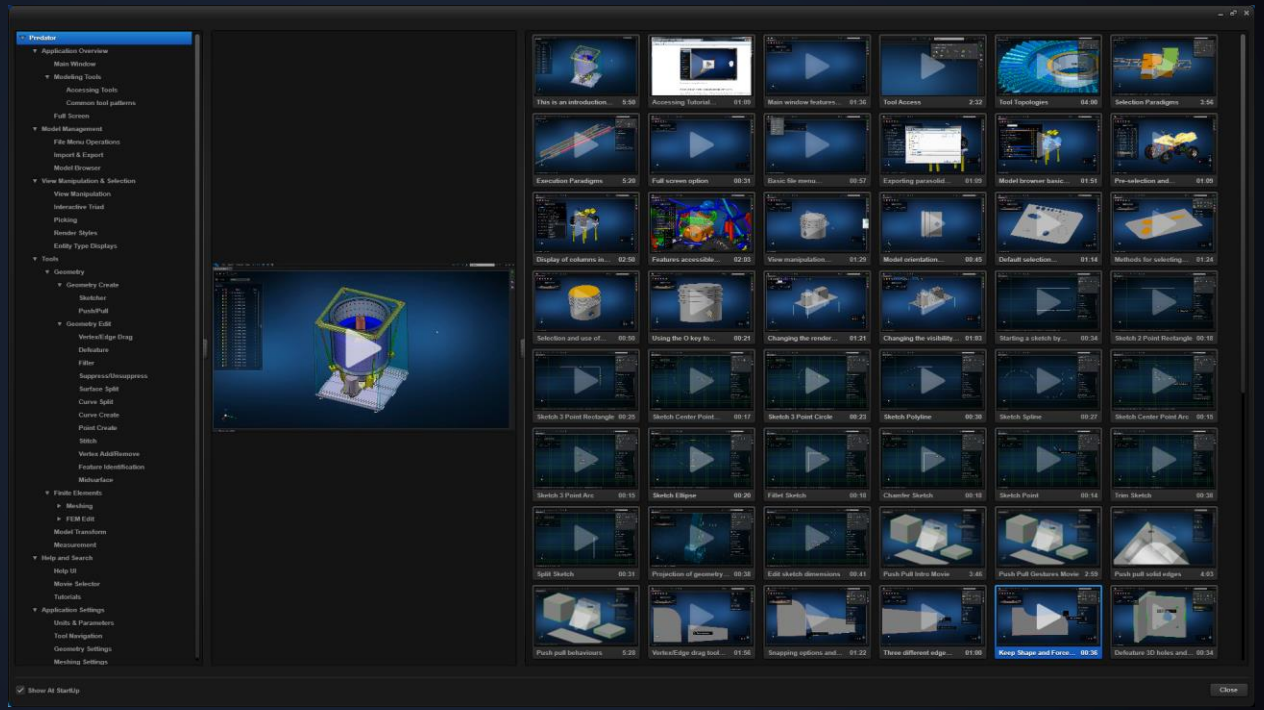
# Easy to Learn, Easy to Use



# Easy to Learn, Easy to Use

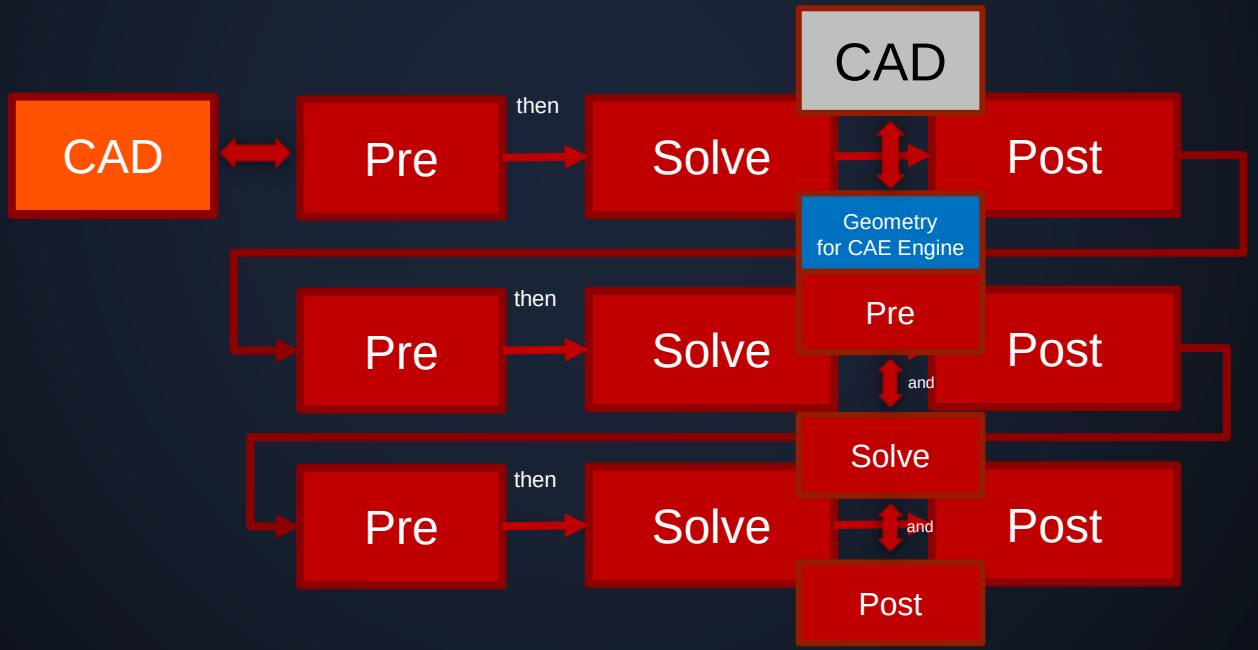
**Apex is available in 3 Languages!**

- English
- Chinese
- Japanese



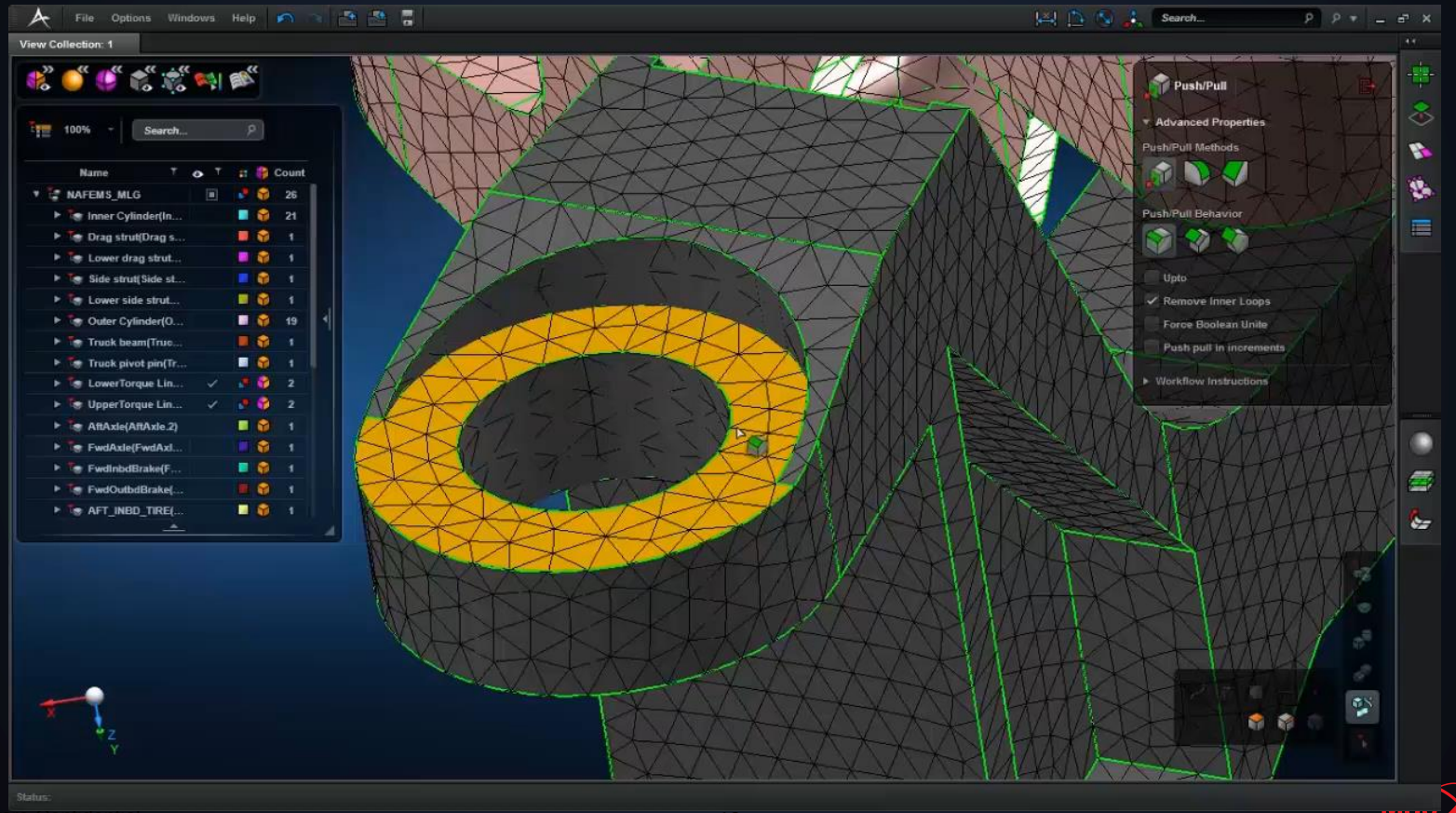
# MSC Apex Paradigm Shift

- **Architectural change**
  - Rearrangement in the way components are relate to each other

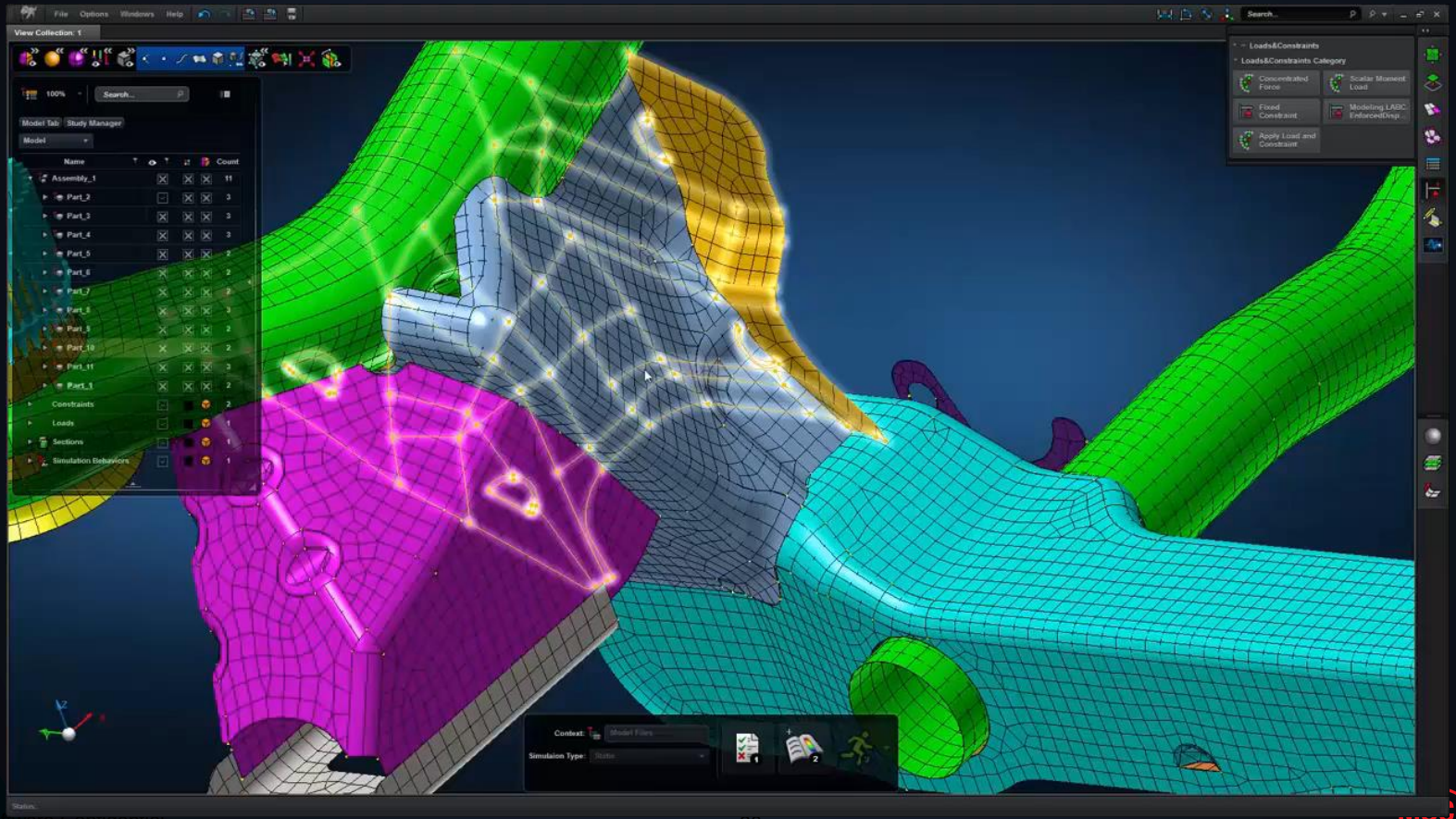


# Direct Modeling

# CAE Specific Direct Modeling and Meshing



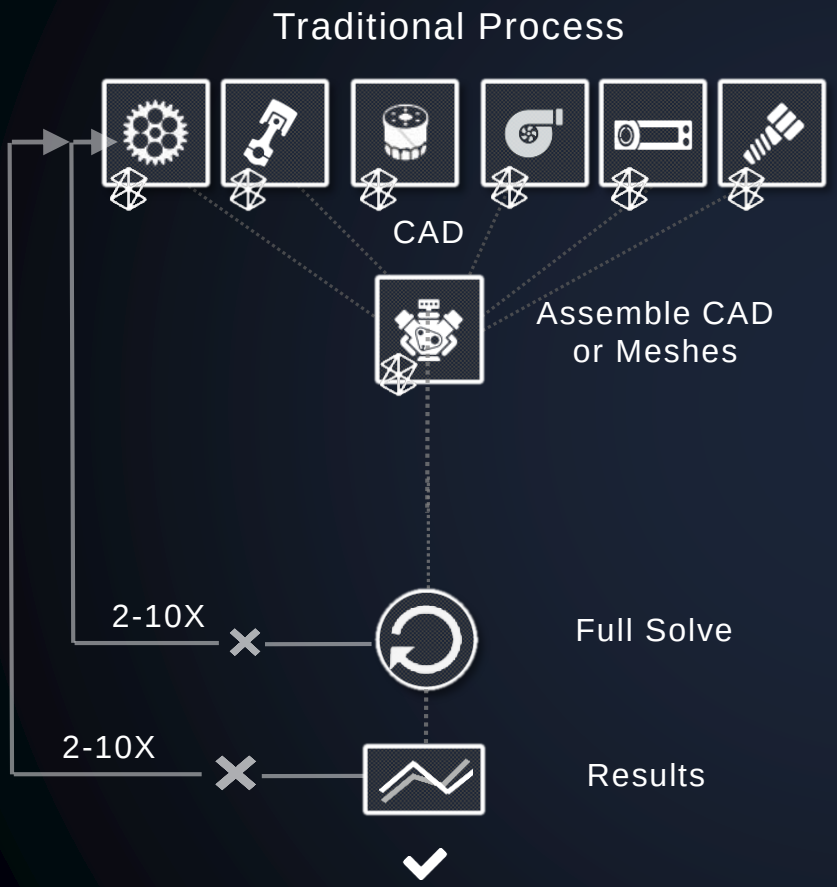
# Integrated and Generative



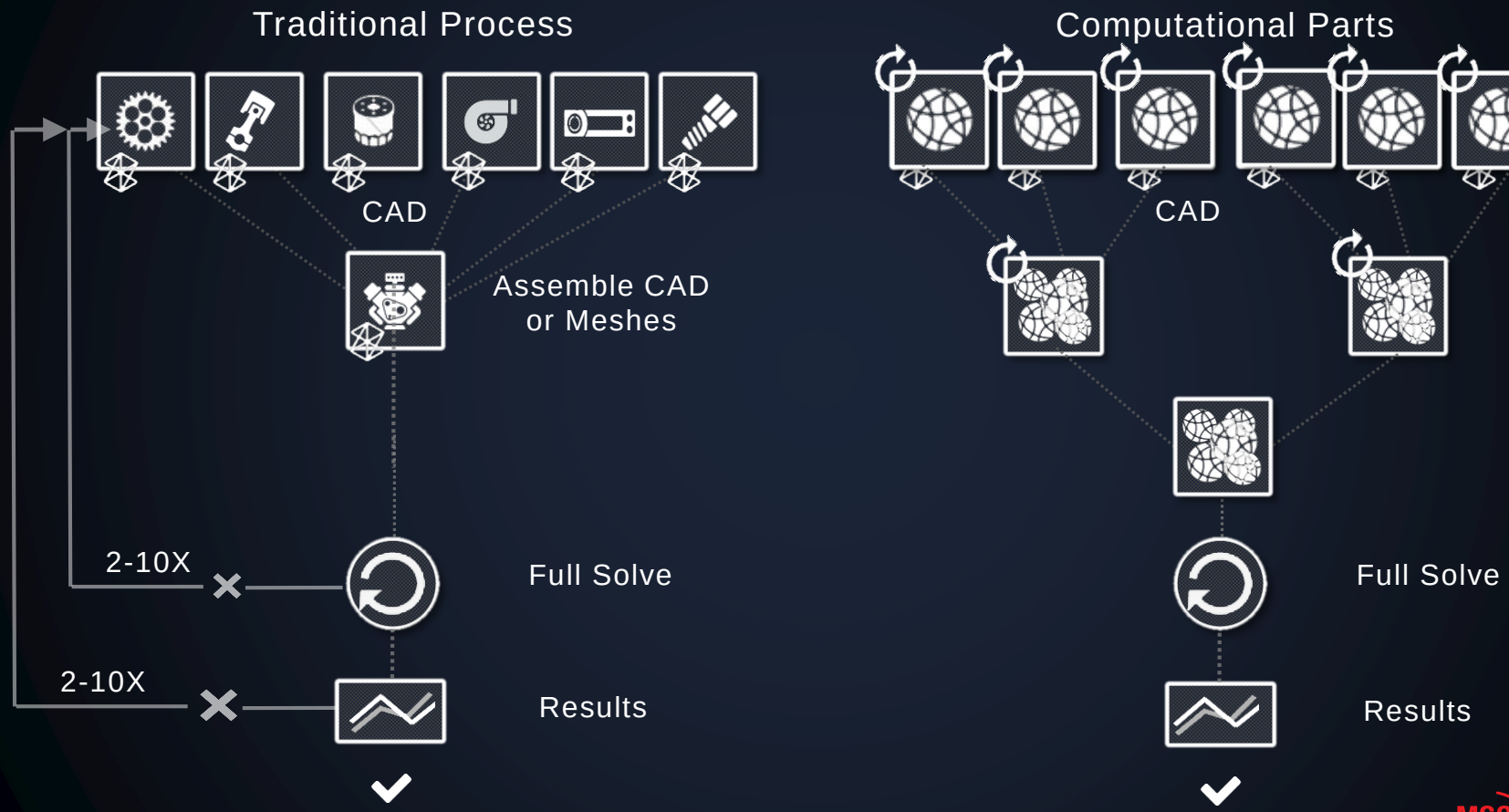
# Integrated and Generative

# MSC Apex Platform
# Solver Technology

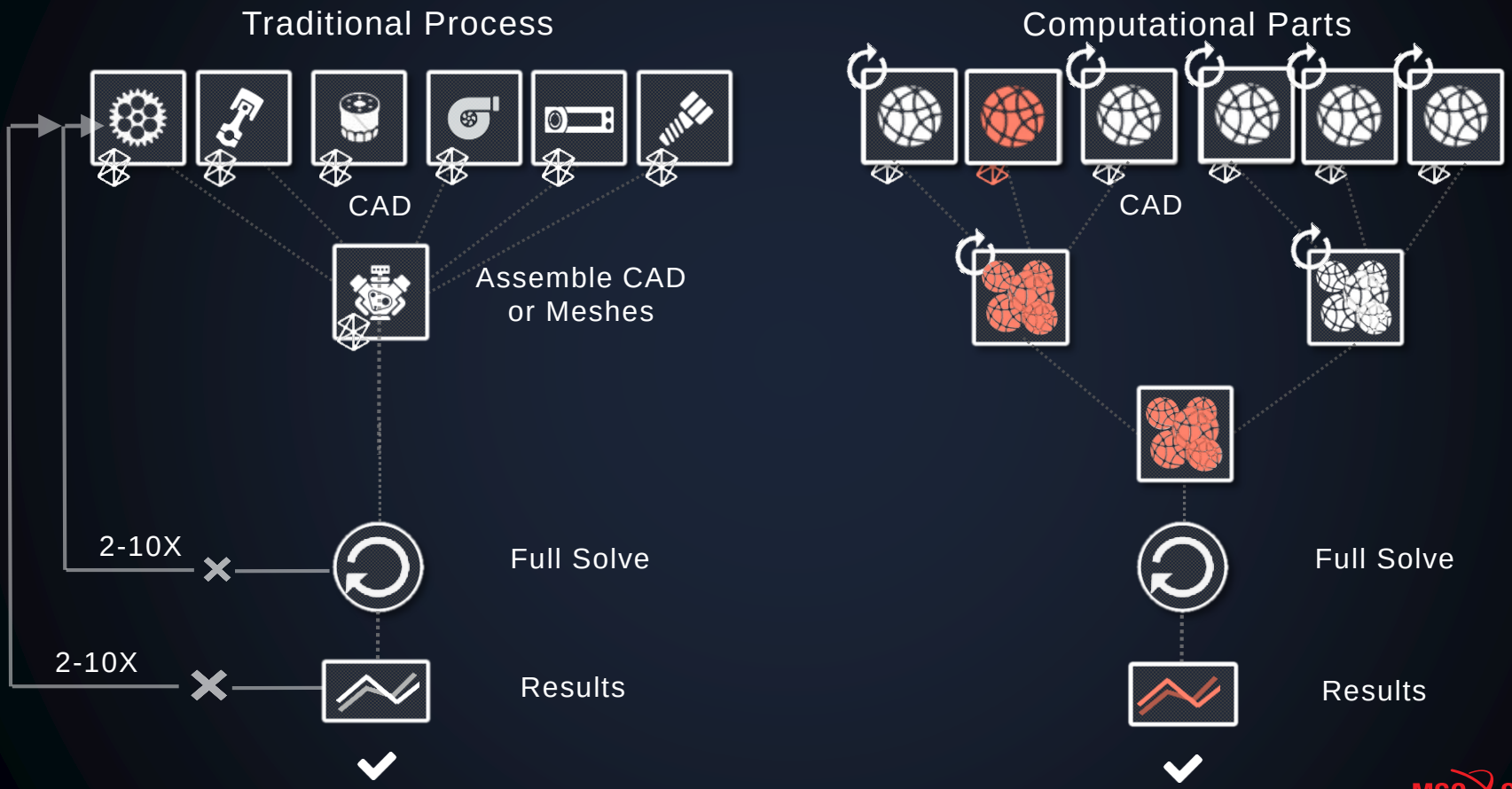
# Computational Parts – Incremental Validation



# Computational Parts – Incremental Validation

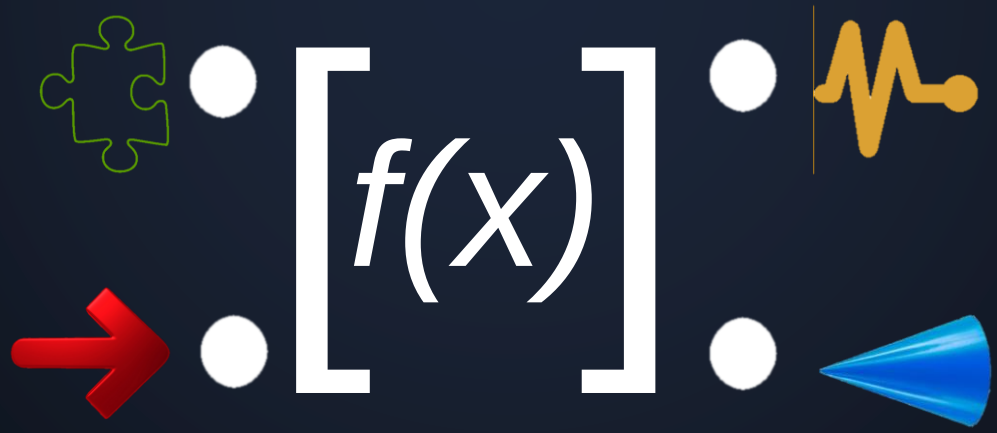


# Computational Parts – Incremental Solve (Trade Studies)



# What is a Computational Part?

- *A computational part (CP) is mathematical model that represent the behavior of a part independently from other parts in an assembly.*
- *A CP has a “boundary” where the part can be connected to other parts, LBCs applied, and “sensors” where you can define key metrics to be recovered*
- *CPs can be reduced (Static, dynamic reduction) or not reduced (full fidelity)*
- *In all cases CPs are not physical representations (geometry or material properties) of parts, and can be shared while protecting your IP*



# Computational Parts – Multi-User, IP Protected

Suppliers

OEM

# Computational Parts – Multi-User, IP Protected

Suppliers

OEM

# Computational Parts – Multi-User, IP Protected

Suppliers

OEM

# Computational Parts – Multi-User, IP Protected

# Computational Parts – Multi-User, IP Protected

# Computational Parts – Incremental Solve

# Computational Parts

# MSC Apex Products

# Products we are Announcing

## Beta Release Coming Soon!


MSC Apex Structures

MSC Apex Modeler

## Available Today!


MSC Apex Modeler


MSC Apex Modeler

"Cheetah"

"Black Marlin"

"Arctic Wolf"

# MSC Apex Modeler

## Available Now!

# Challenges of Today

- *"CAD Geometry is not analysis suitable" and "Geometry repair and meshing operations are tedious, error prone, and takes too long"*
- *"Iterations with the Design Team on design improvements take too much time"*
- *"Existing products are too hard to use and take too long to learn. Implementation and support costs are too high"*

**~50%**
Need more than a month to learn new CAE software

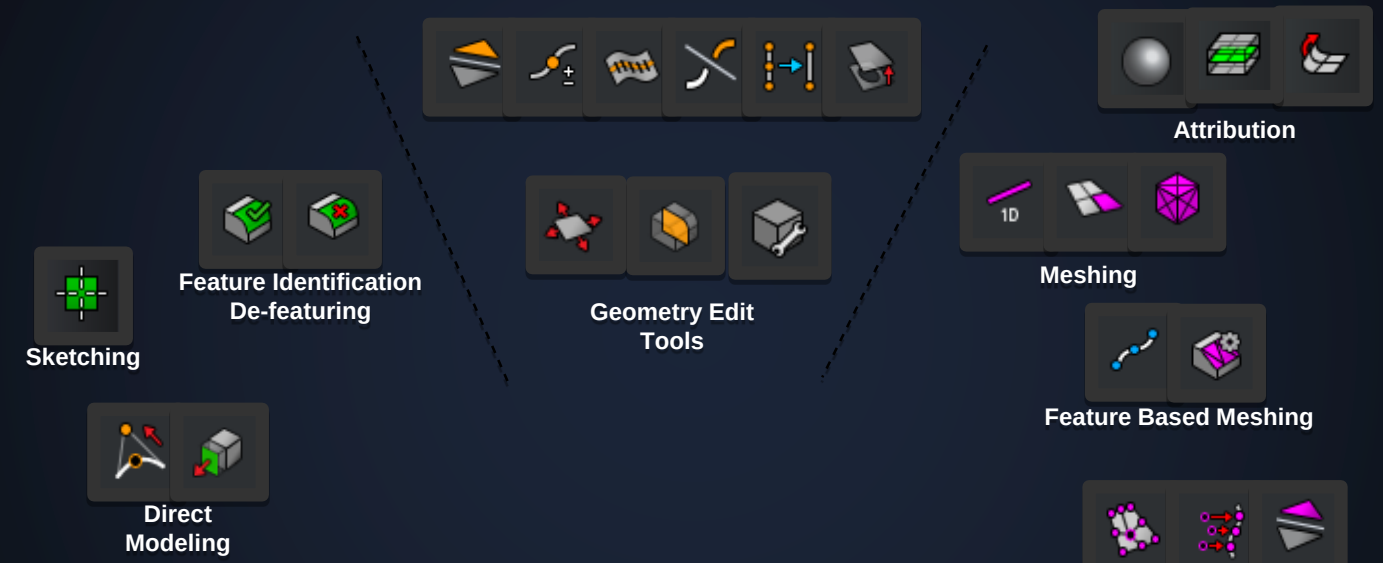
**55%**
Spend more than 30% of time on geometry clean-up and meshing

**85%**
See value in engineers (non-analysts) using CAE tools

# What is MSC Apex Modeler?

- CAD to Mesh Solution
- Easy to Learn, Easy to Use
- CAE Specific Direct Modeling
- Complementary to Patran

# MSC Apex Geometry and Meshing

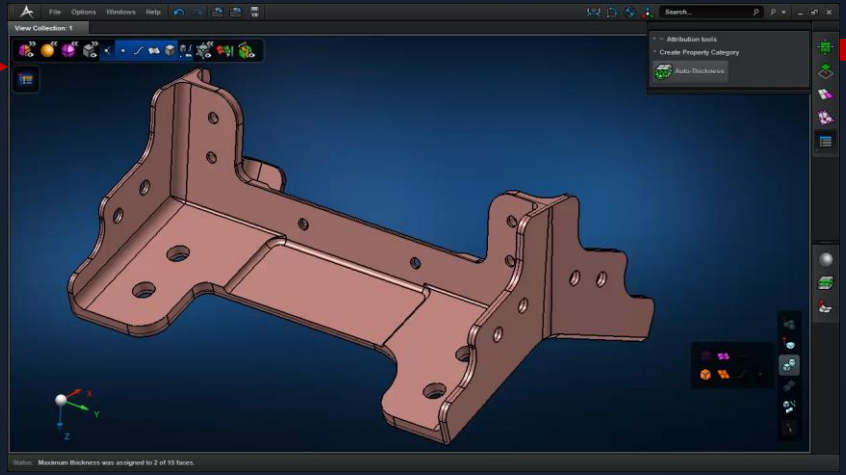


# Supports Popular CAD & Geometry Formats

## Complementary to Engineering Workflow

### CAD Formats

ACIS
CATIA V4
CATIA V5
IGES
Parasolid
PTC Creo
SolidWorks
STEP
NX
Inventor



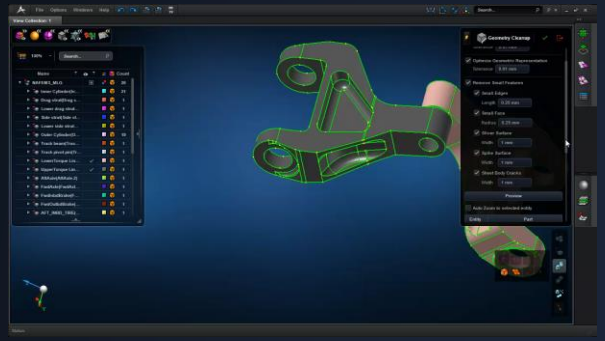
MSC Apex Modeler

### BDF

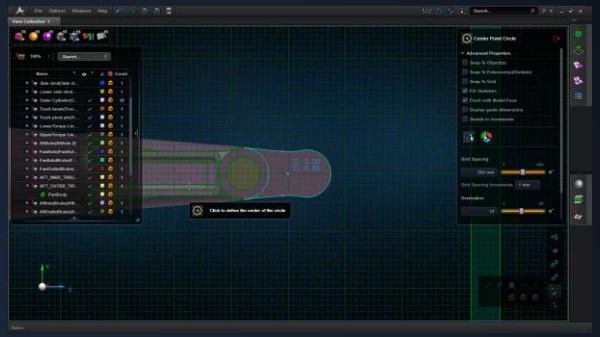
Nodes, elements, materials, section properties
User defined units
Include files for parts

### Parasolid

# Geometry Edit and Meshing Examples

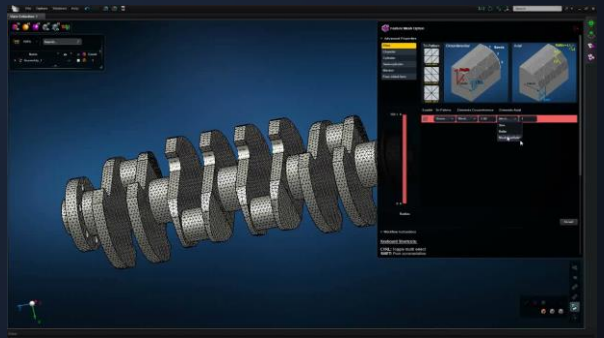


Geometry Repair



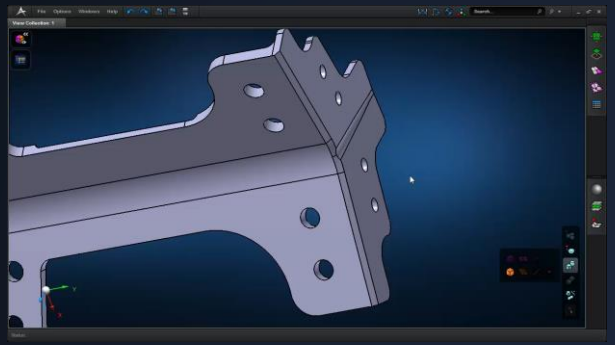
Sketching

De-featuring

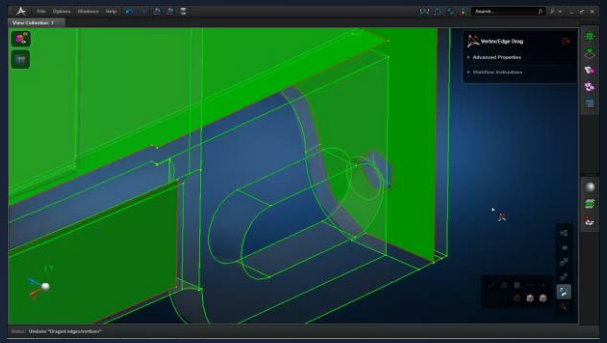


Feature Base Meshing

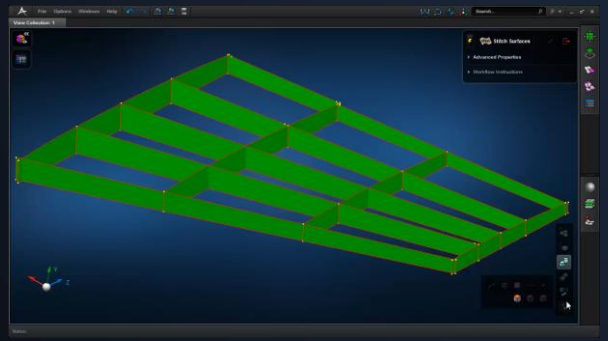
# 2D Geometry & Mid-Surface Repair Examples



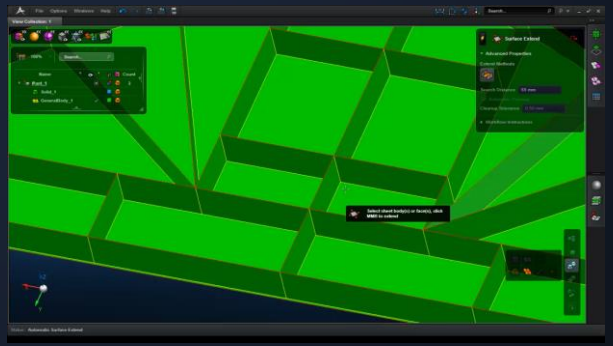
Mid-surface Extraction



Vertex/Edge Drag

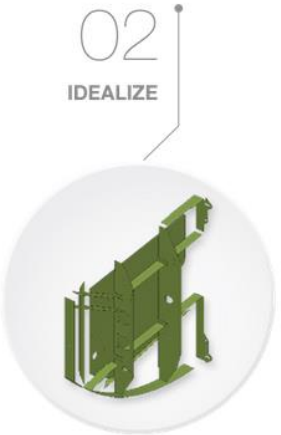


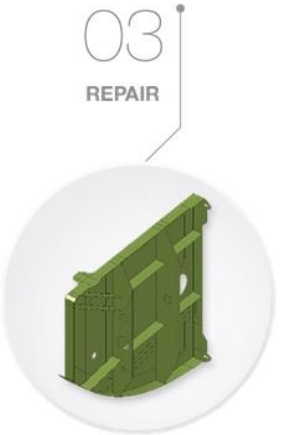
Stitching



Auto Extend

# Mid-surfacing of a Bulkhead

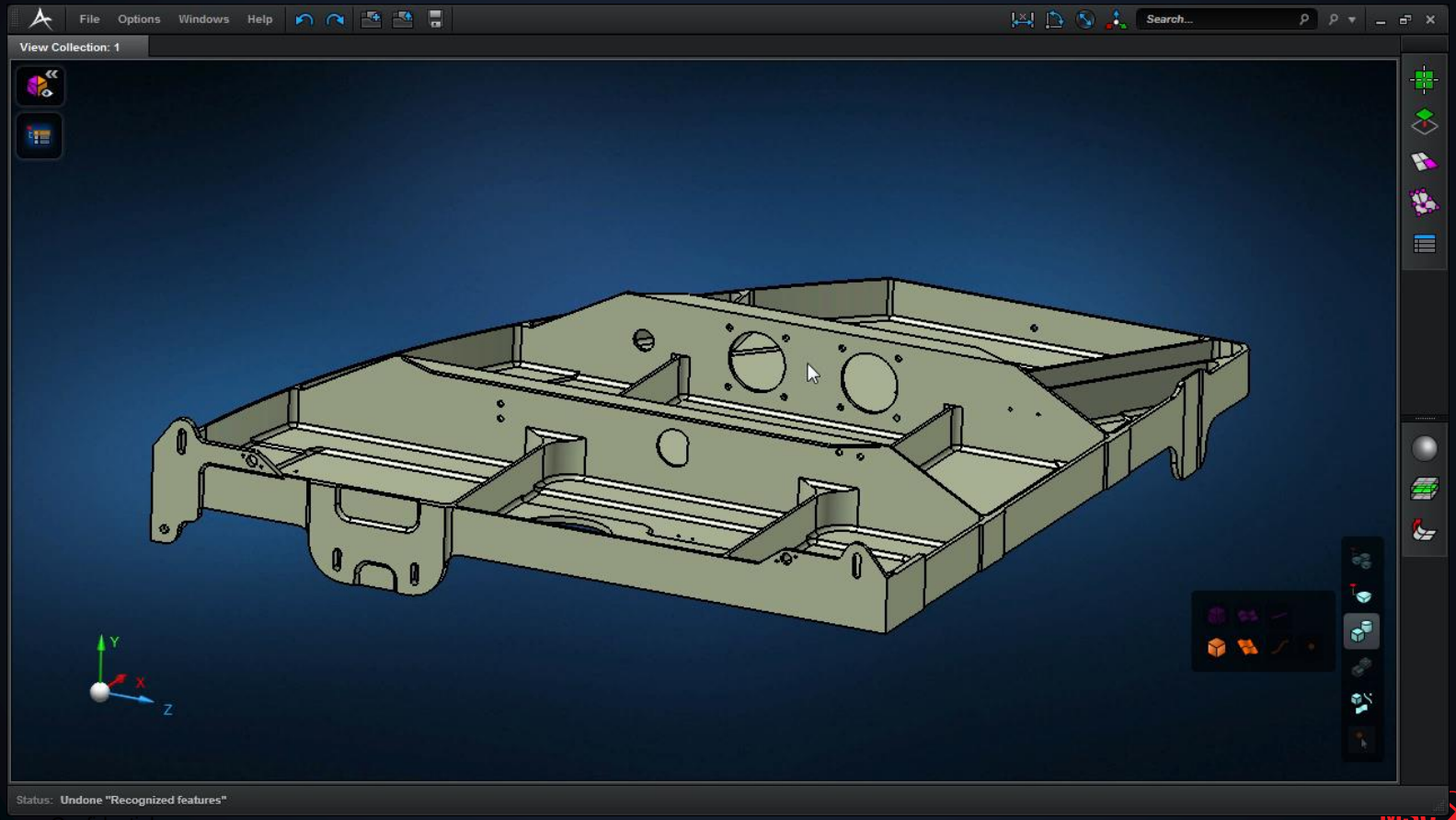


## Productivity Gains

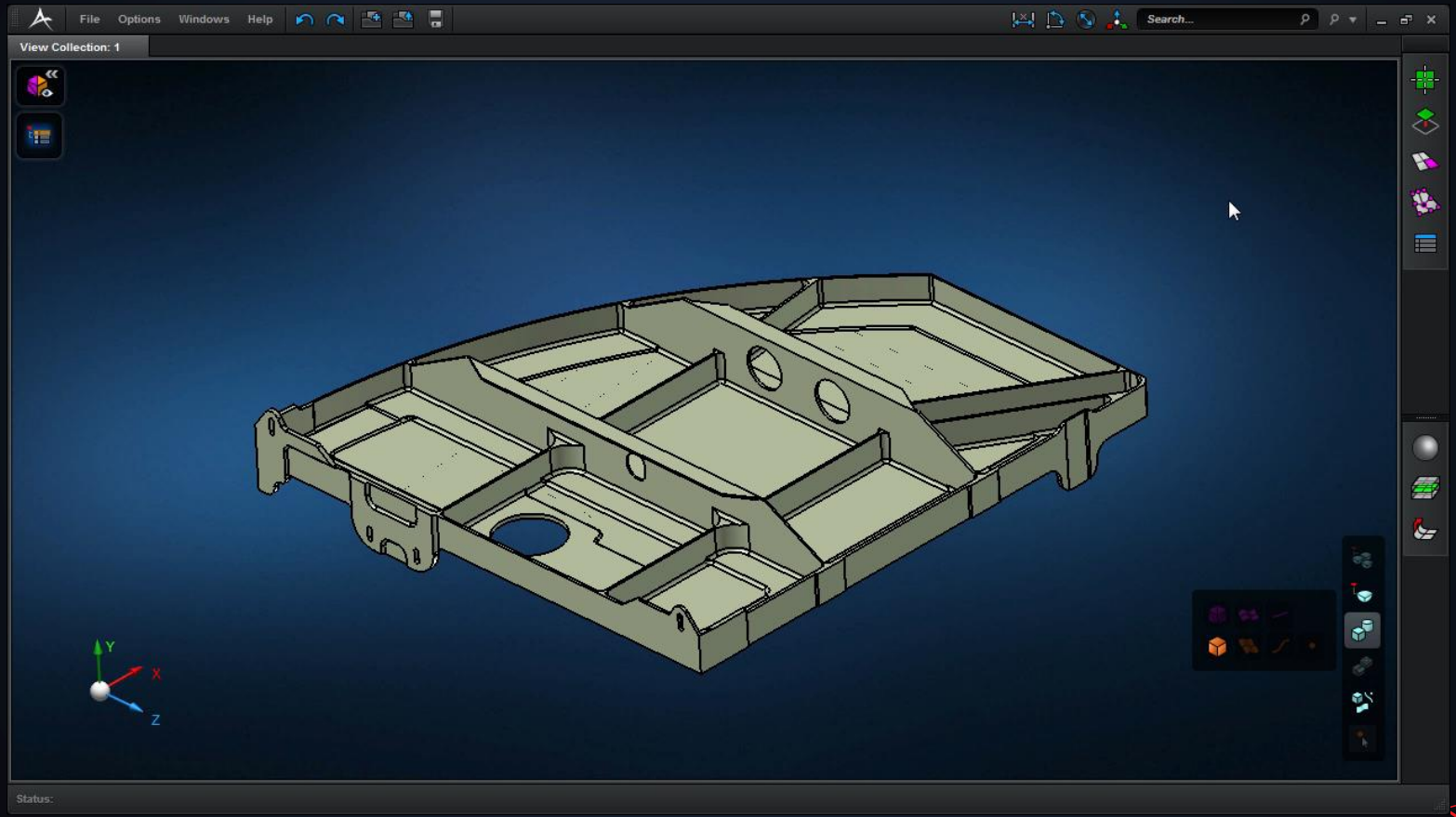
For this Aerospace Bulkhead and with conventional CAE tools, 50 hours were required to create meshed geometry. In MSC Apex Modeler, the process only took 5.5 hours and required little effort to extract mid-surfaces, connect separate surfaces, mesh, and assign thicknesses and offsets.

| | TODAY'S WORKFLOW | MSC APEX WORKFLOW |
|---|---|---|
| Expertise Required | High | Low |
| Analysis Geometry Creation | 35 h | 3 h |
| Mesh Creation | 3 h | 2 h |
| Property Assignments | 12 h | 0.5 h |
| Complete Entire Scenario | **50 h** | **5.5 h** |

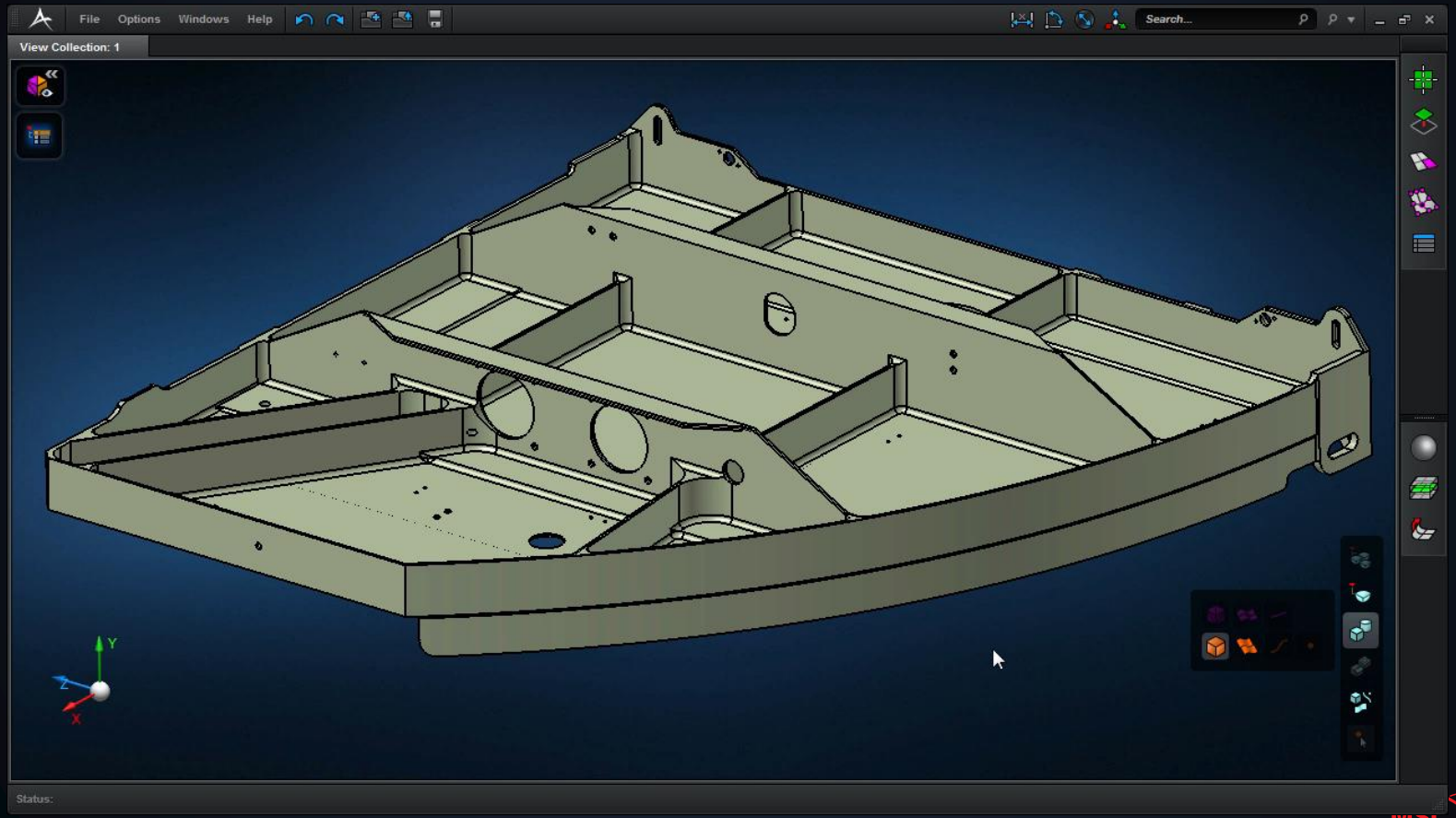
# Mid-surfacing of a Bulkhead



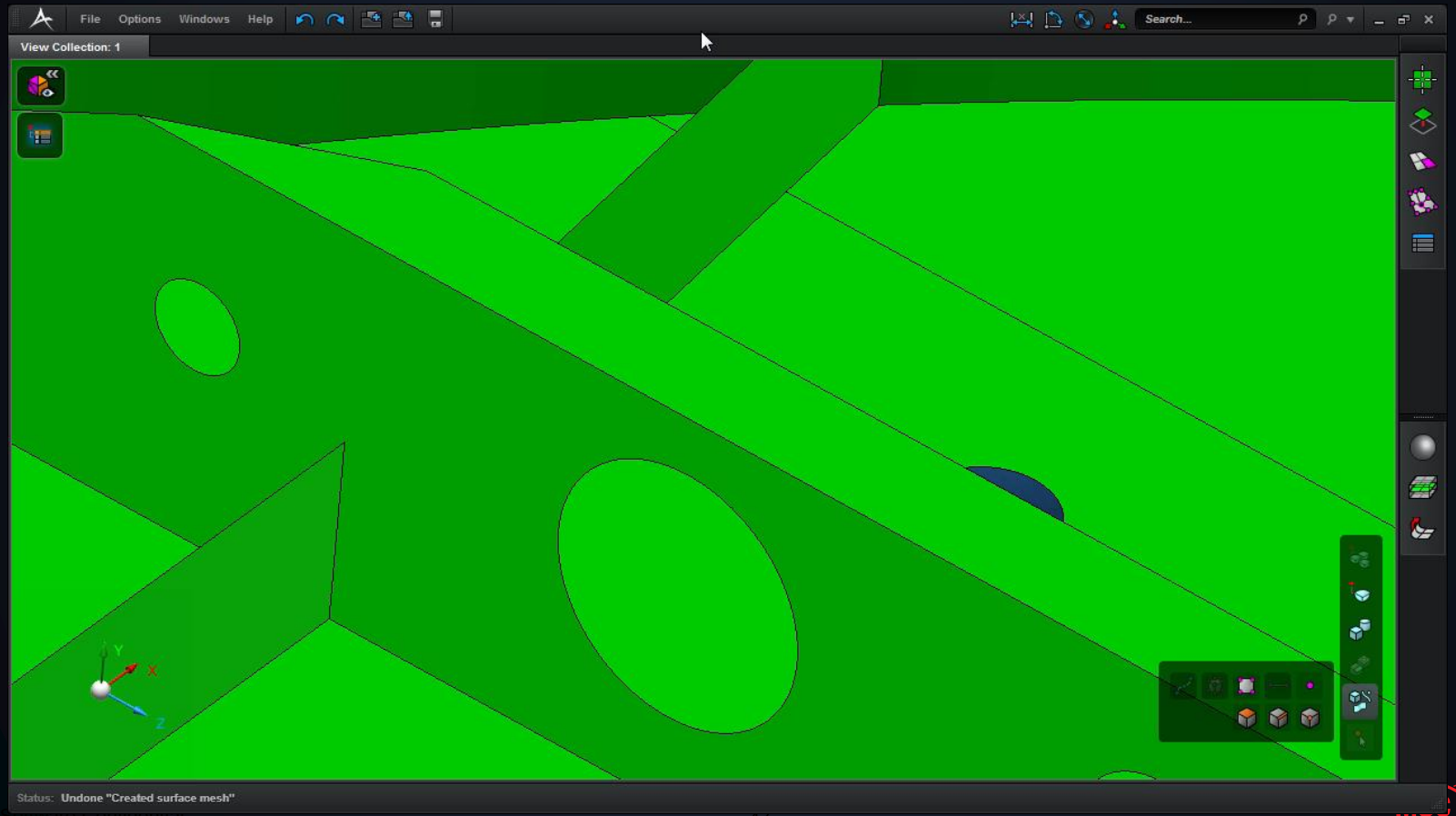
# Mid-surfacing of a Bulkhead



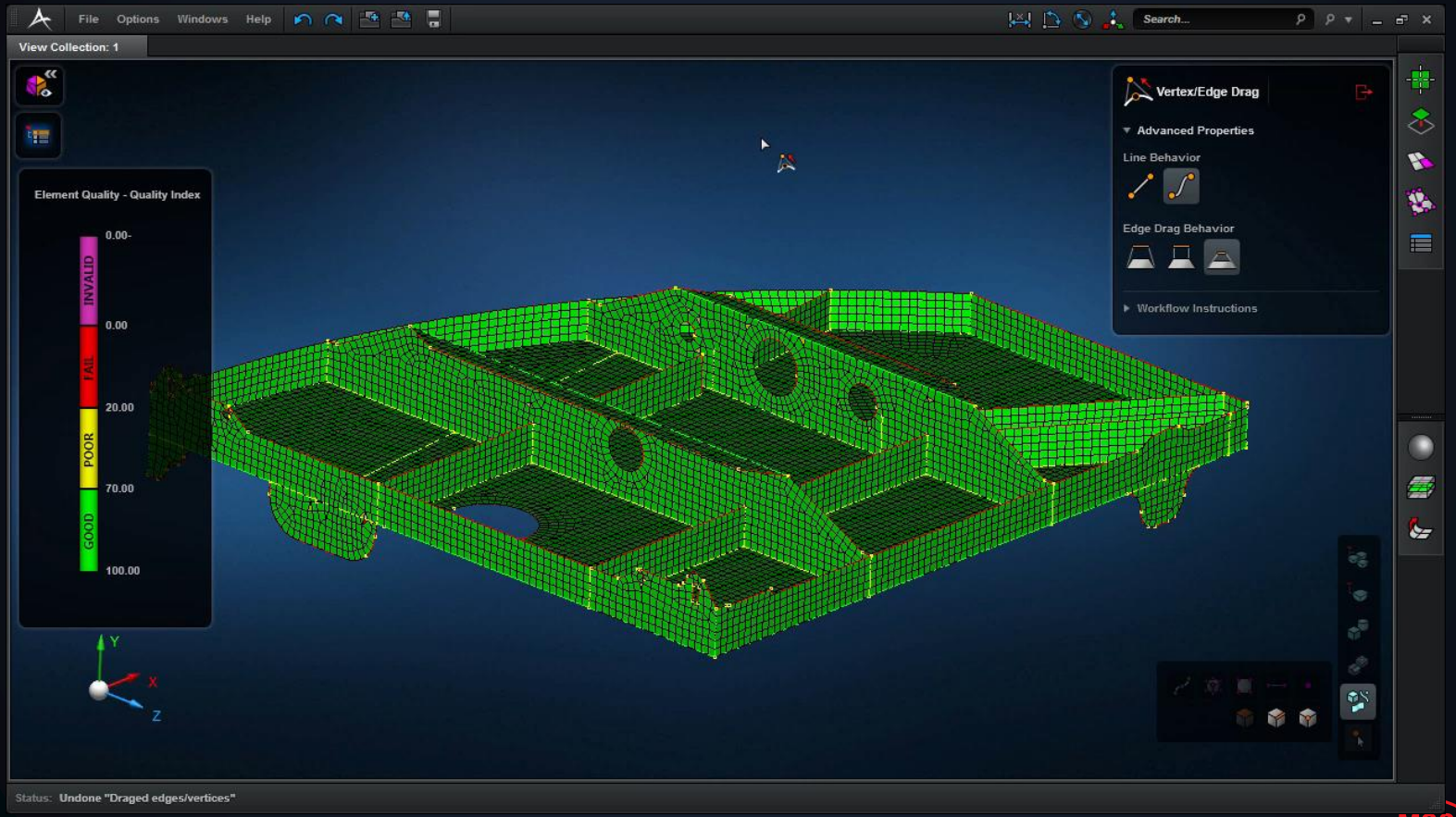
# Mid-surfacing of a Bulkhead



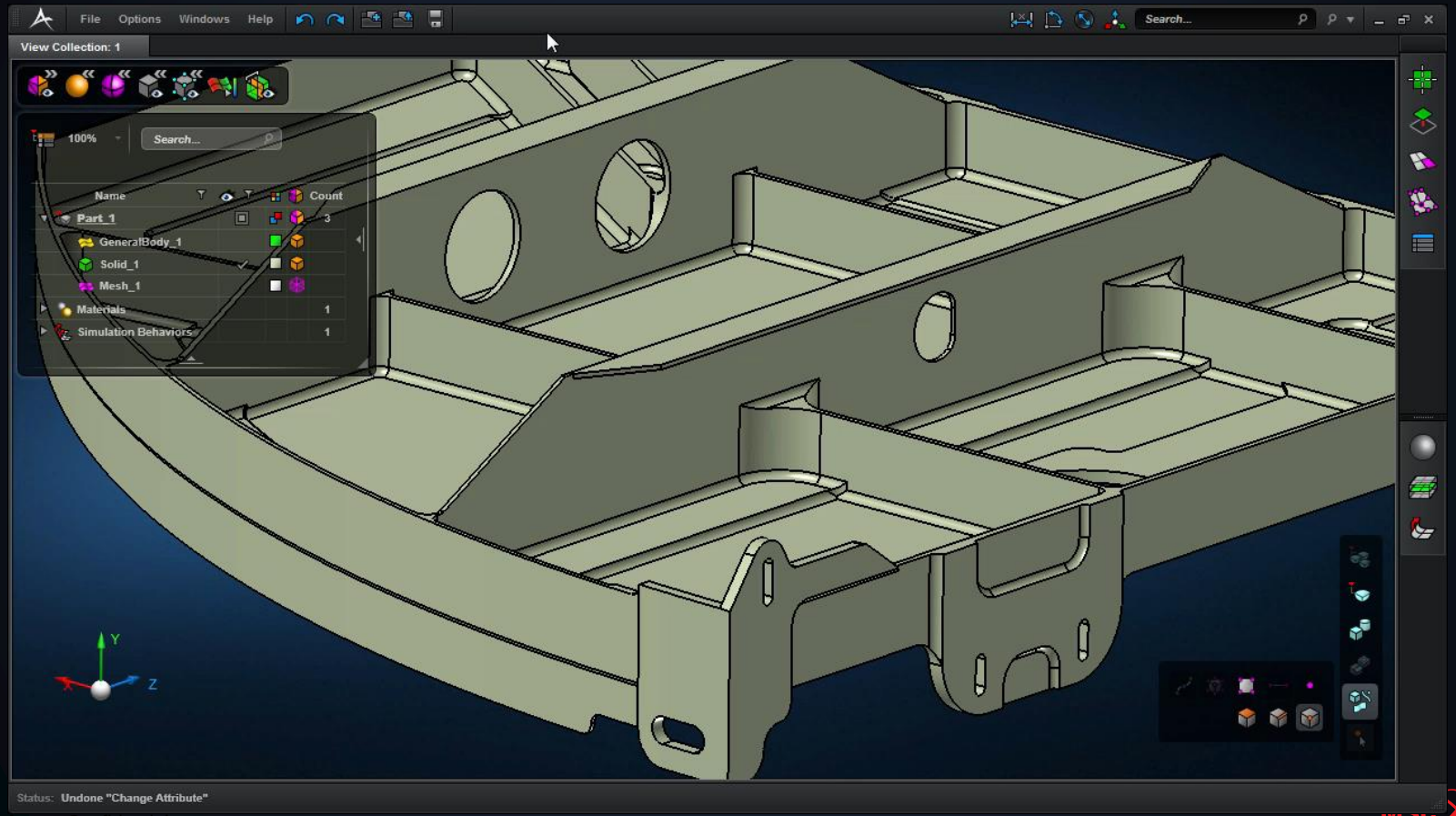
# Mid-surfacing of a Bulkhead



# Mid-surfacing of a Bulkhead



# Mid-surfacing of a Bulkhead



# What are MSC Apex Customers are Saying?

KABAN

"It is so easy to use and yet so enjoyable. I complete the same work in a half day rather than 3-4 days."

*~ Kaban Makina*

RSG
株式会社 菱友システム技術

"The time required to prepare the model and mesh was reduced from 8 hours to 1 hour. There is no need to go back into CAD to change the model."

*- RSG Takasago*

VIESSMANN

"The mid-surface capability has sped up our meshing process by a factor of 3"

*~ Viessman Werke*



MSC Software

# MSC Apex Structures

## Beta Release Coming Soon!

# Challenges of Today

- *“Nastran analysis input deck creation is tedious, error prone and takes too long”*
- *“Incremental changes require complete rerun of system and is not suitable for multi-user system engineering”*
- *“Simulation results are often coming too late in the design cycle”*

**~67%**

Need 2-4 solver runs to obtain a converged solution

**80%**

Say obtaining simulation results is a bottleneck

**~93%**

Find value in analysts performing conceptual studies during initial design

# What is MSC Apex Structures?

- **Linear Structural Analysis Solution**
- **Integrated and Generative**
- **Computational Parts and Assemblies**
  - Incremental Validation
  - Incremental Solve
- **Complementary to your existing workflow**

# MSC Apex Structures (Add-on to MSC Apex Modeler)

Geometry Edit Tools

Attribution

Analysis Readiness

Simulation Execution

Feature Based Meshing

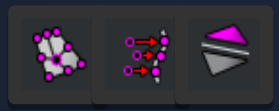
Computational Parts

- Incremental validation
- Incremental solve

Post Processing

Sketching

Feature Identification De-featuring



Mesh Edit

Direct Modeling

# CAD to Results

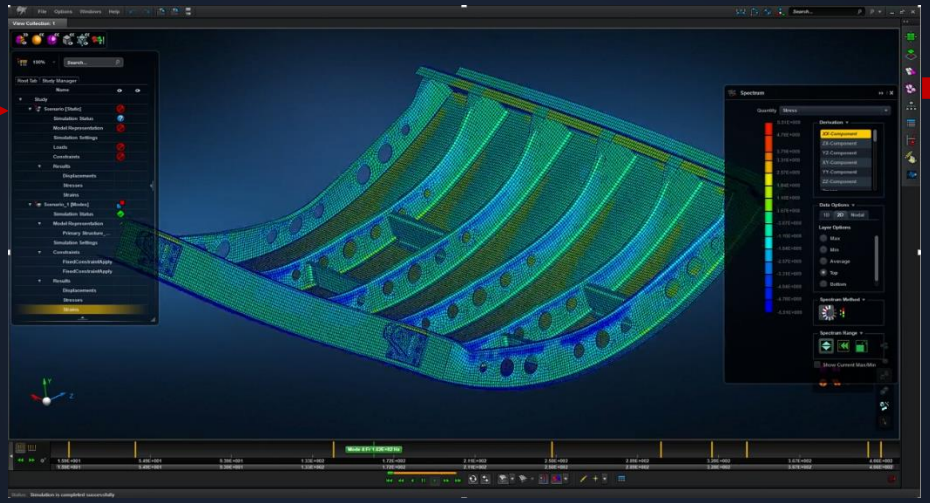
# Complementary to existing Workflow

## CAD Formats

ACIS, CATIA V4, CATIA V5, IGES, Parasolid, PTC Creo, SolidWorks, STEP, NX, Inventor

## BDF

Nodes, elements, material, section, connections, loads, BCs



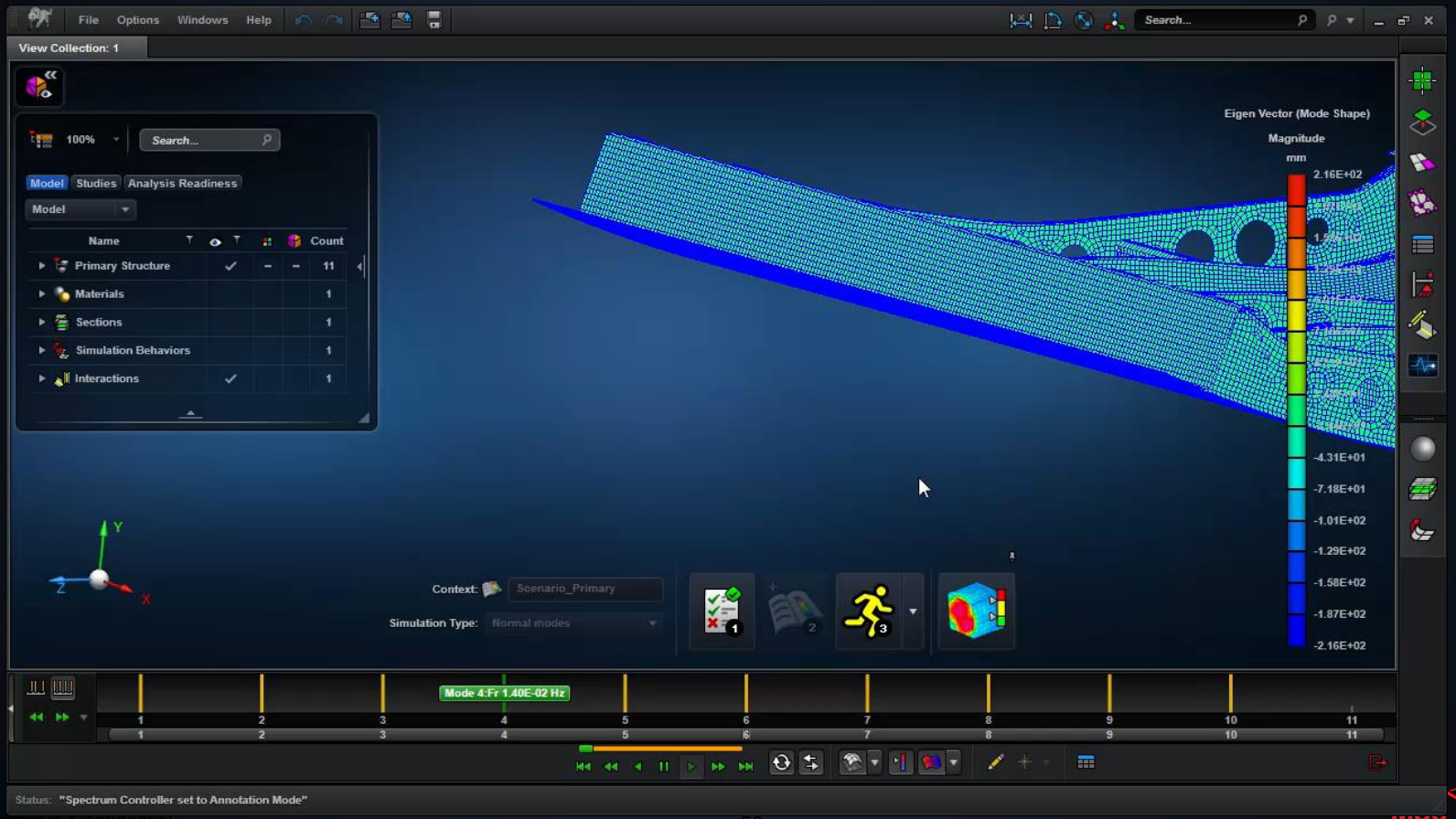
MSC Apex Structures

## Parasolid

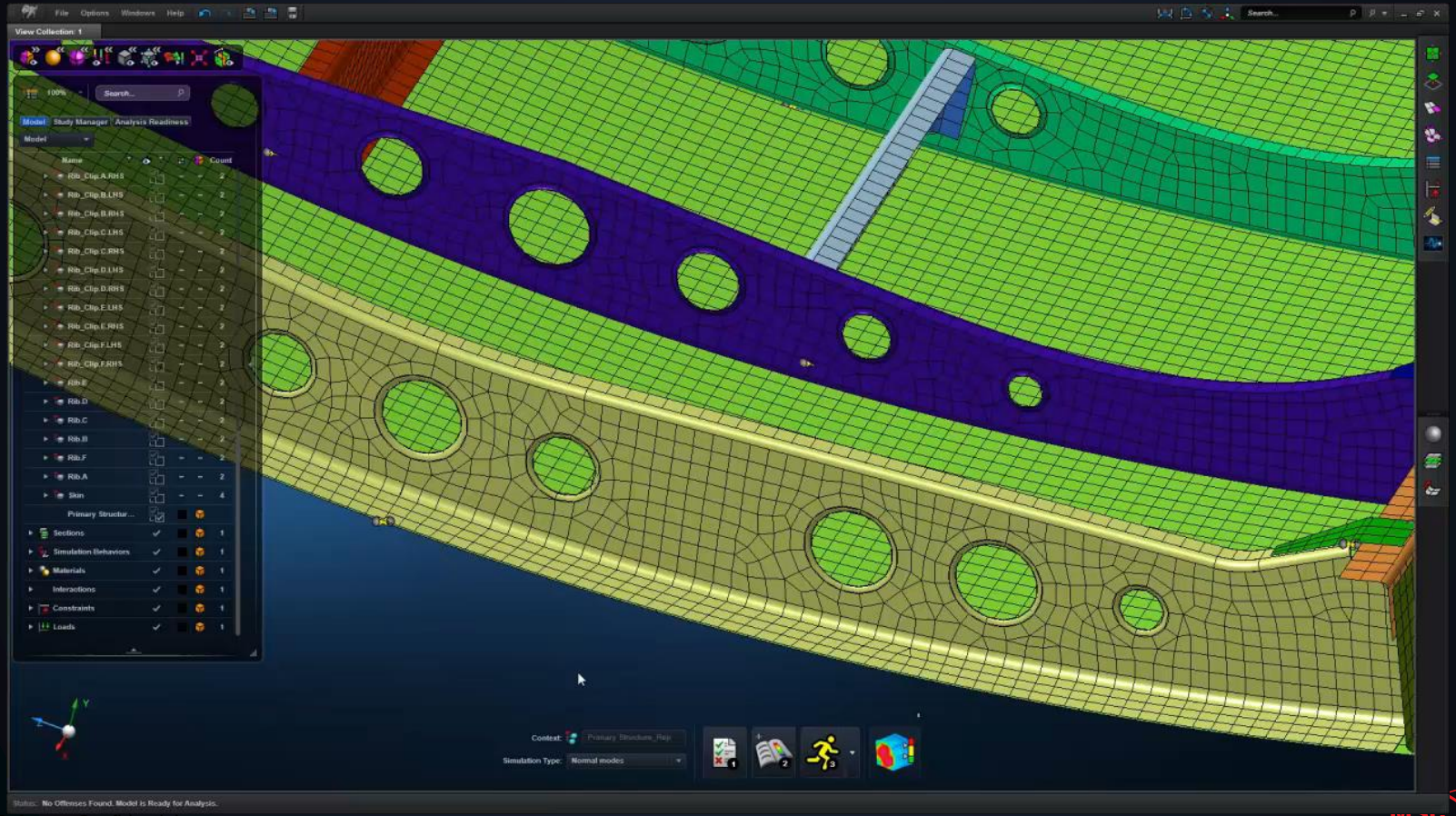
## BDF

Nodes, elements, material, section, connections, loads, BCs

# MSC Apex Structures Preview – Incremental Validation



# MSC Apex Structures Preview



# MSC Apex Summary

# What is MSC Apex?


**MSC Apex is MSC's new CAE platform**

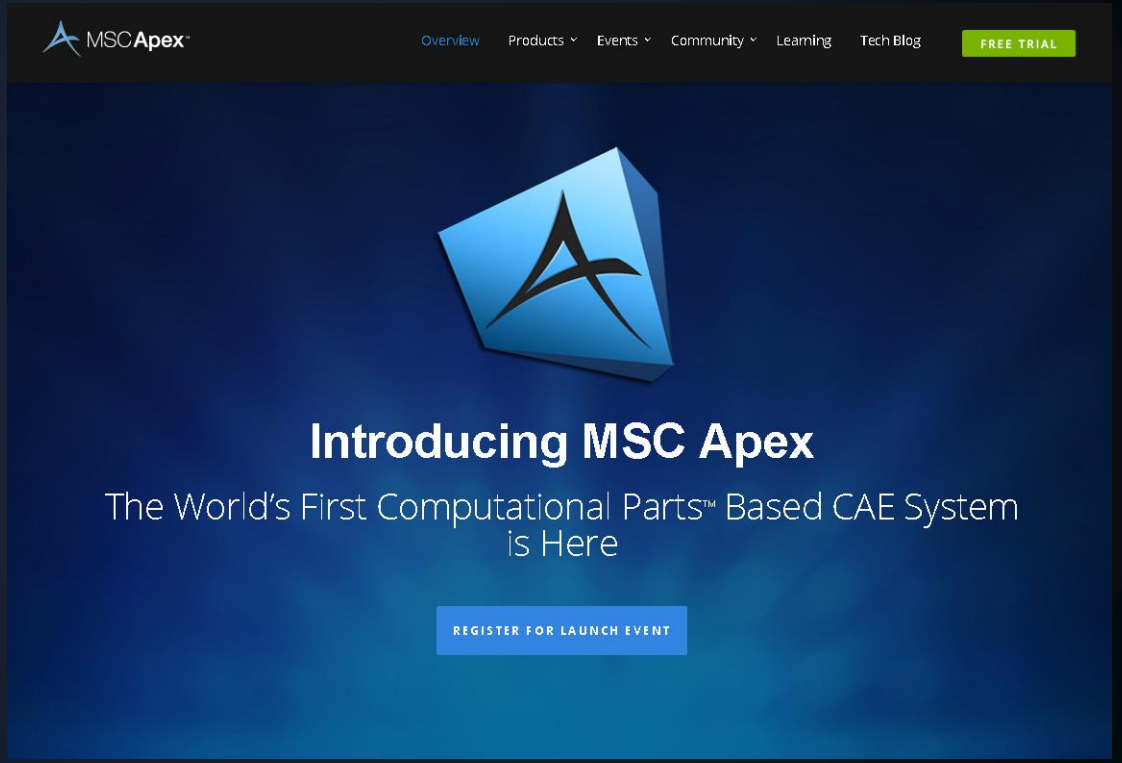
- **A unique game changing user experience, easy-to-learn, easy-to-use**
- **With CAE specific Direct Modeling and Meshing**
- **With Integrated, Incremental Solver Methods for Solver Validated Modeling**
- **Based on Computational Parts & Assemblies Technologies**

**To be delivered in stages…**

# For more information visit www.mscapex.com

**Request a free trial**

**Request a demo**



# MSC Apex™

MSC Software