

PTC® Live Global

PTC 218 – PTC Creo Parametric 3.0 Flexible Modeling Update

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PTC Creo Product Manager

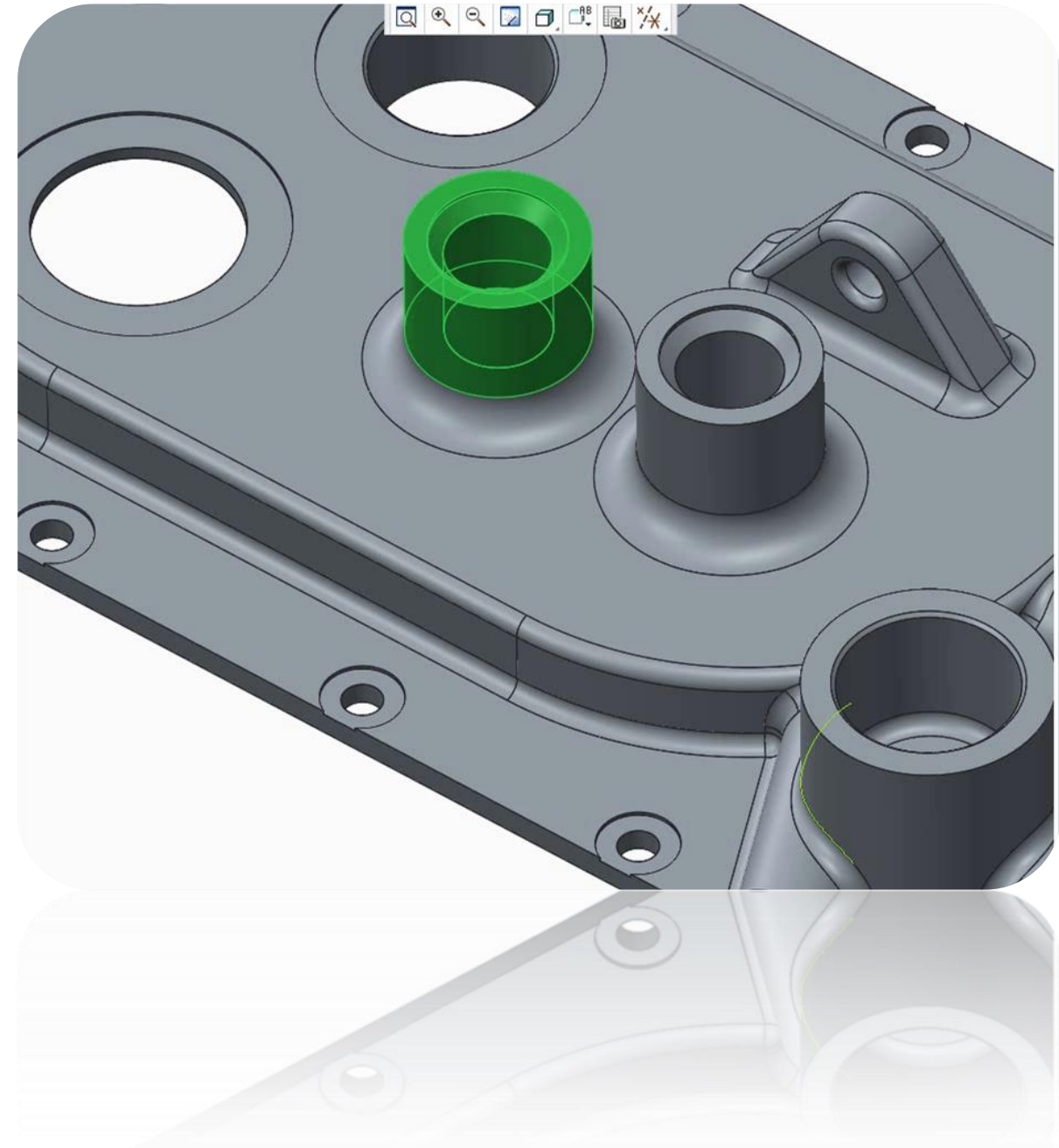
June 2015



- **What is the PTC Creo Flexible Modeling Extension**
 - Comparison of PTC 3D Direct Modeling technologies
 - PTC Creo Flexible Modeling Extension
- **Flexible Modeling Basics**
 - How it works
 - Selection Methods
 - Tools
- **Flexible Modeling Enhancements**
 - Shapes Gallery
 - Multi-Color Preview
 - Flex Feature Enhancements
 - Move Tool Enhancements
 - Bounding Edges
 - Rounds and Chamfers
 - Patterns
 - Dimension Forwarding

PTC Creo Flexible Modeling Extension

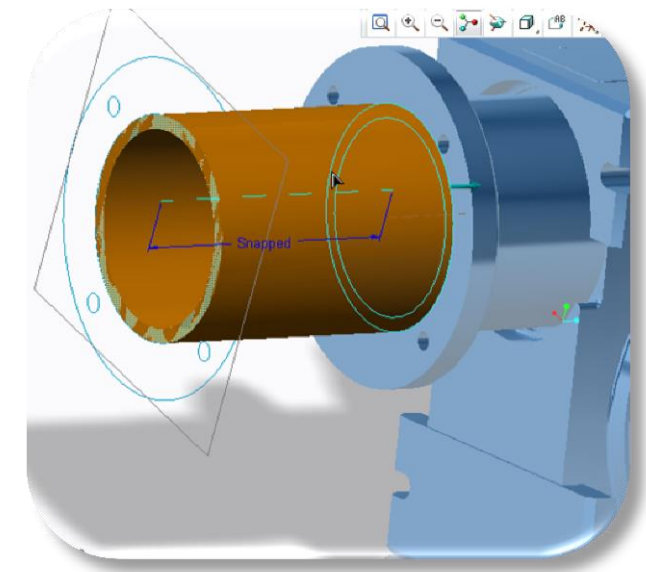
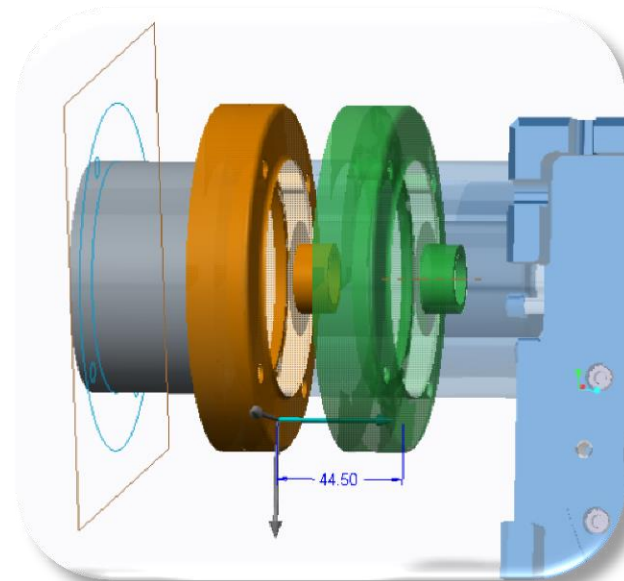
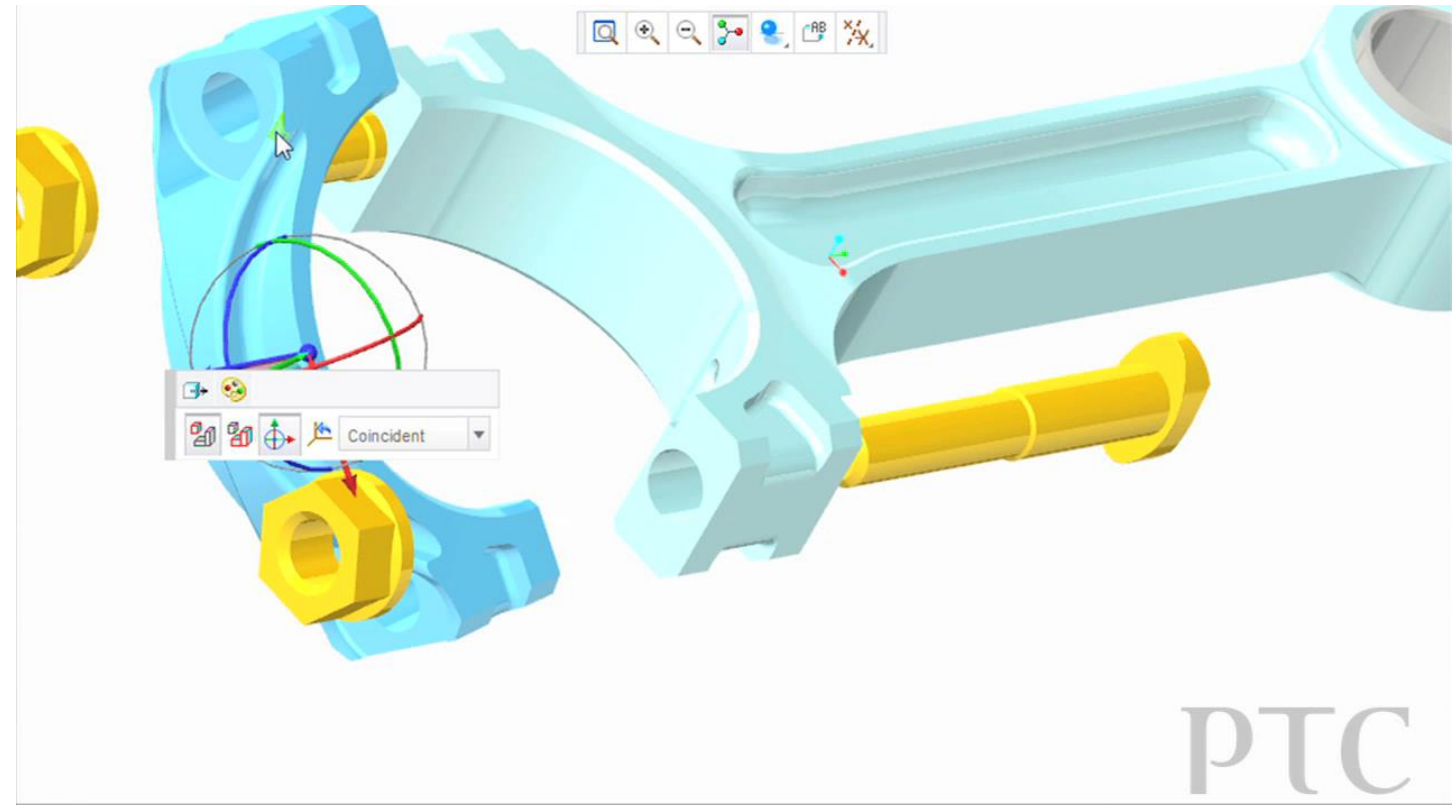
- Extension to PTC Creo Parametric
- Primary users are 3D parametric CAD users
- Geometry modification — not creation
 - Editing models with no or obsolete design intent
 - Accommodate late changes



PTC Creo Flexible

PTC Creo Direct

- New
 - Parametric
 - Product
 - Geometric
- PTC's standalone Direct Modeling Solution
 - Broad range of users especially casual CAD users
 - Supports geometry creation and modification
 - Full interoperability with PTC Creo Parametric
 - Example uses
 - CAE Simplification
 - Early part concepting
 - Design reviews

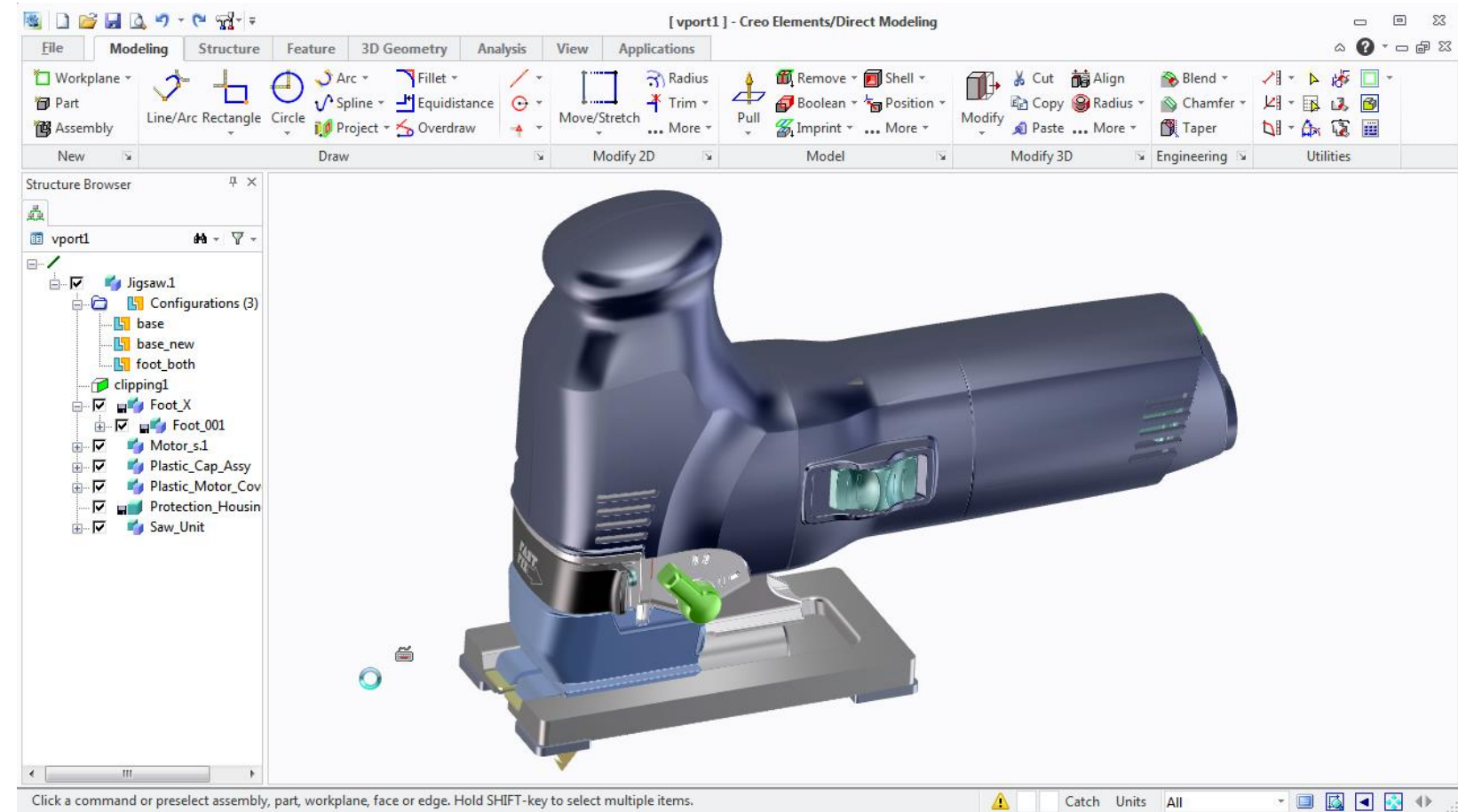


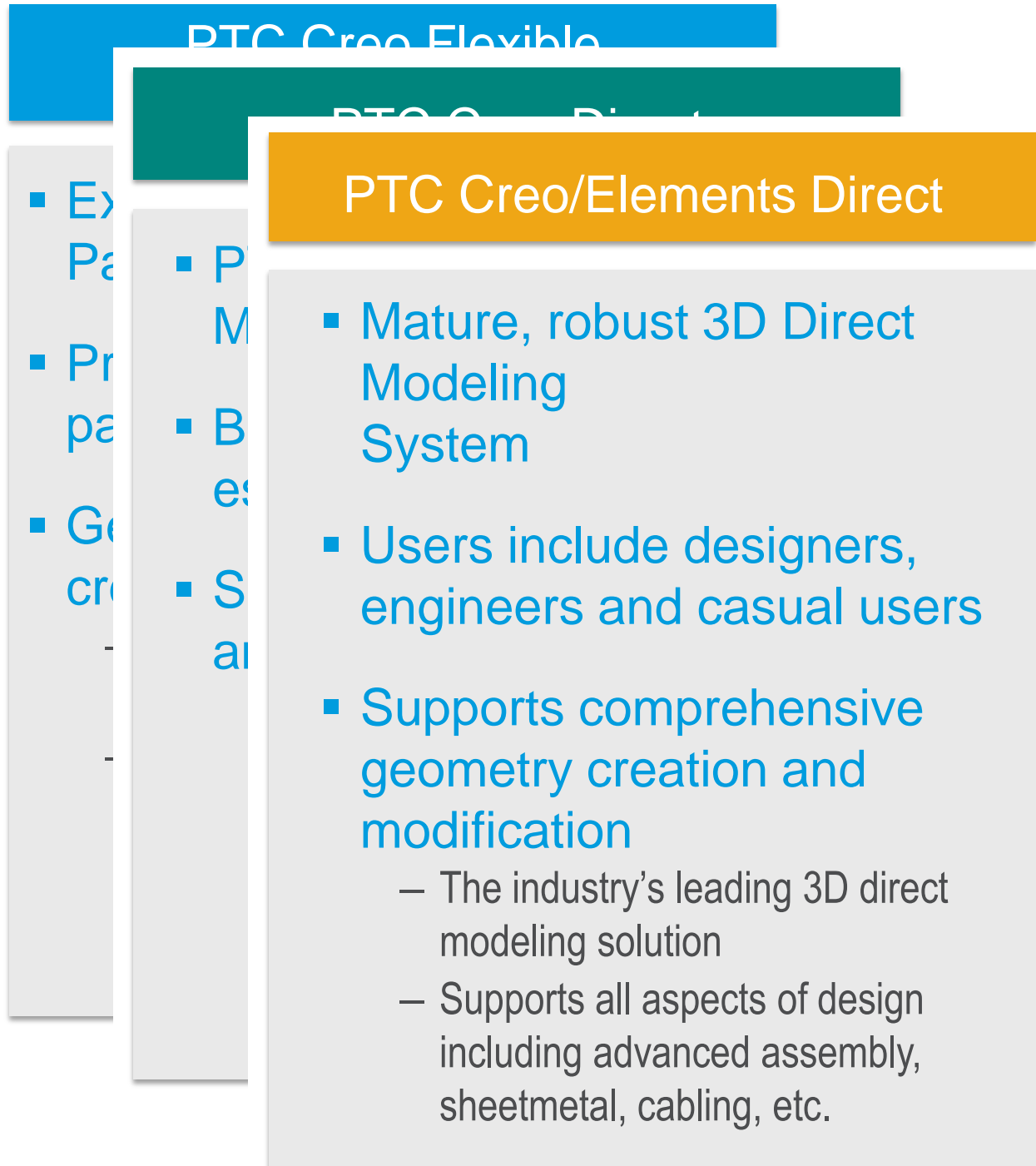
PTC Creo Flexible

PTC Creo Direct

PTC Creo/Elements Direct

- New
- Pa
- Pr
- Ge
- T
- M
- B
- S
- Mature, robust 3D Direct Modeling System
- Users include designers, engineers and casual users
- Supports comprehensive geometry creation and modification
 - The industry's leading 3D direct modeling solution
 - Supports all aspects of design including advanced assembly, sheetmetal, cabling, etc.





PTC Creo Flexible Modeling Extension

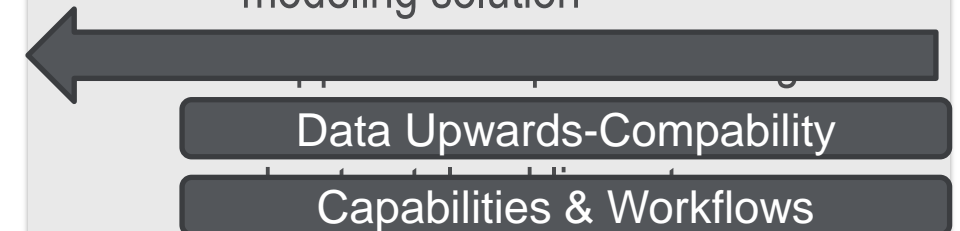
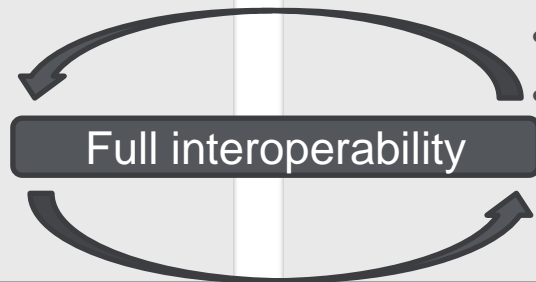
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PTC Creo Direct

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PTC Creo/Elements Direct

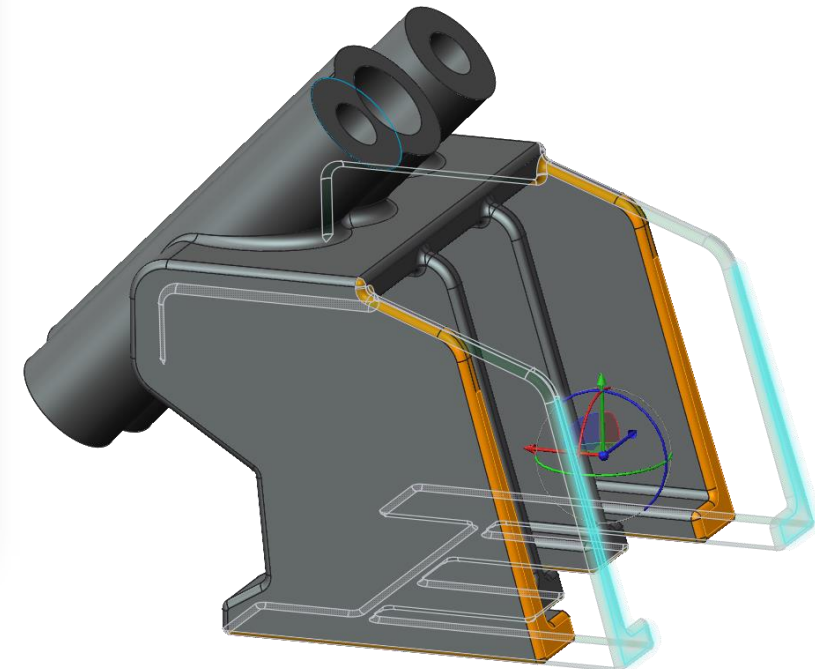
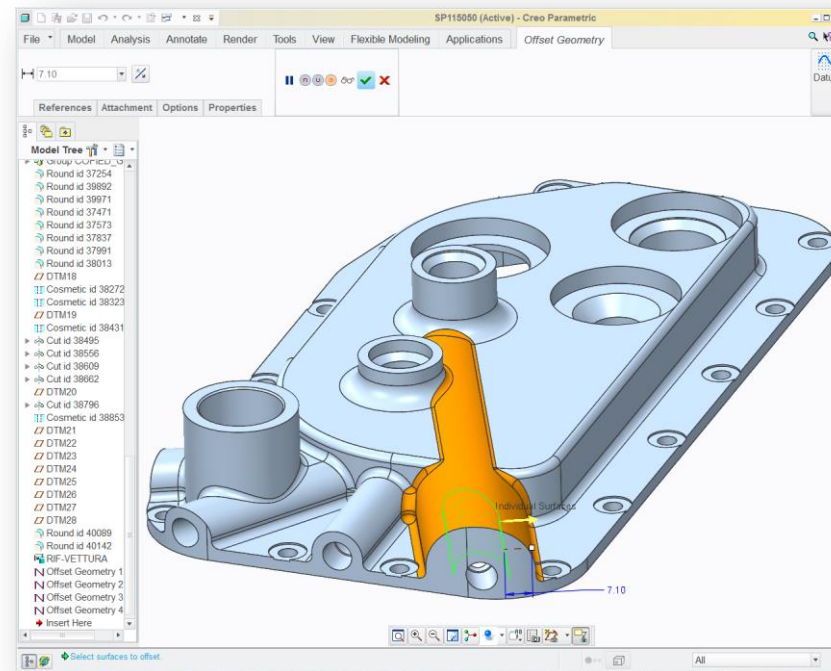
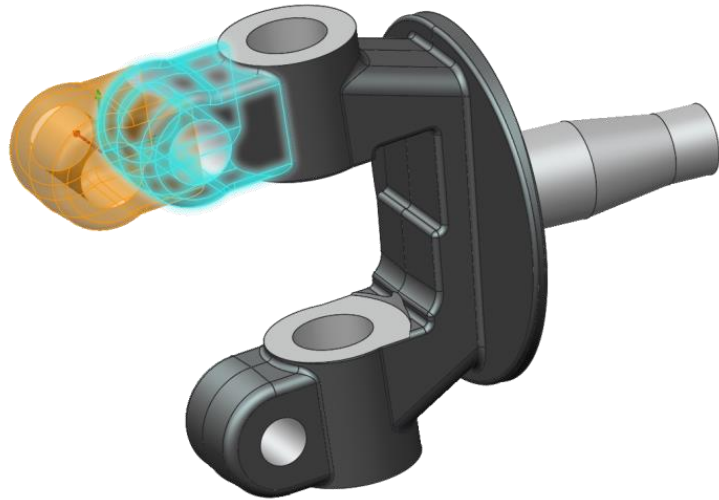
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- Supports comprehensive geometry creation and modification
 - The industry's leading 3D direct modeling solution



PTC Creo Platform & Common Data Model

What is the PTC Creo Flexible Modeling Extension?

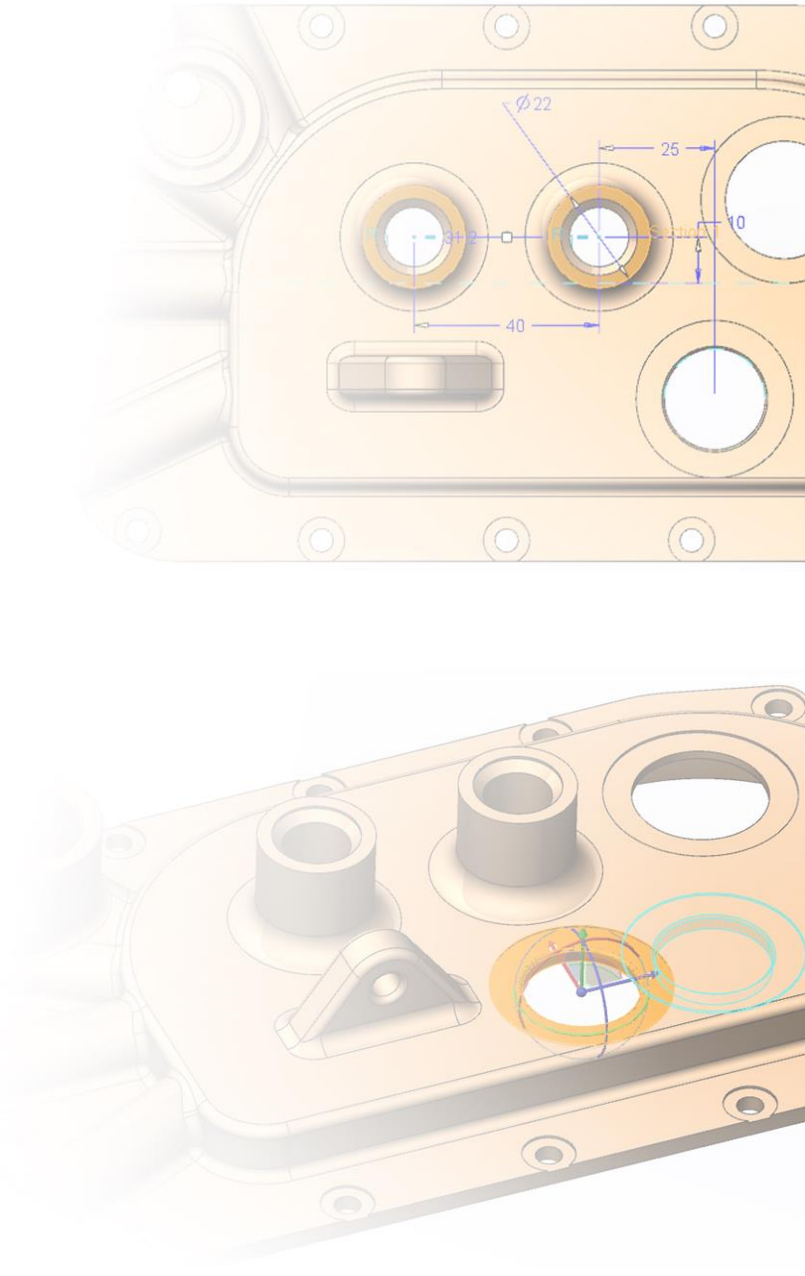
- PTC Creo Flexible Modeling Extension is an add-on extension developed to provide Direct Editing capabilities within PTC Creo Parametric
 - PTC Creo Flexible Modeling provides the editing capabilities of PTC Creo Direct
 - PTC Creo Flexible Modeling does not allow the user to create “new” geometry



Enables Multi-CAD Design/Rapid Change

Make fast, flexible edits to parametric and imported geometry

- **Make fast changes to “rigidly defined” parametric models**
 - Eliminate the need to investigate and rework design intent
 - Use direct editing to “override” parametric constraints and design intent
 - Simplify models for CAE with no concerns about feature definitions & dependencies
- **Add new design intent**
 - Capture direct edits as editable features in the model tree
 - Define new model intelligence to replace out-of-date or conflicting design intent
 - All underlying design intent is still available and even usable
- **Easily make changes to imported data from any CAD source**
 - Make fast changes using geometry-based selection and editing tools
 - Define model intelligence that is missing in imported data
 - Recognize design intent (patterns, symmetry) and parameterize “dumb” geometry

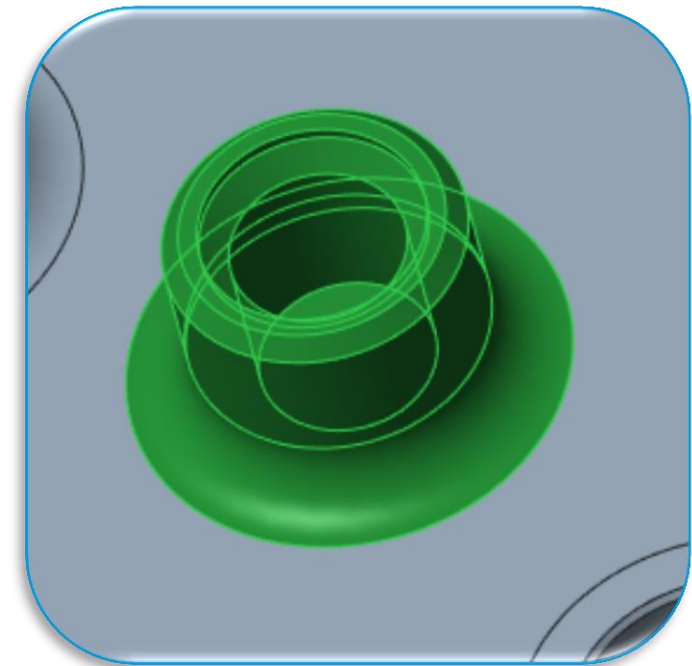
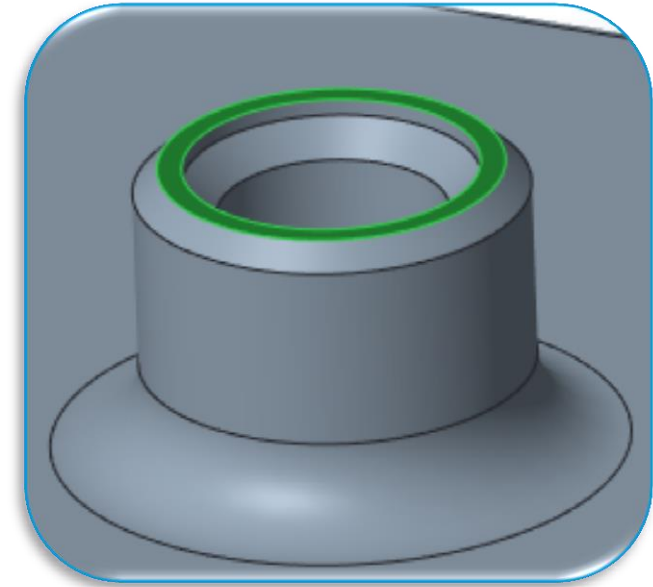
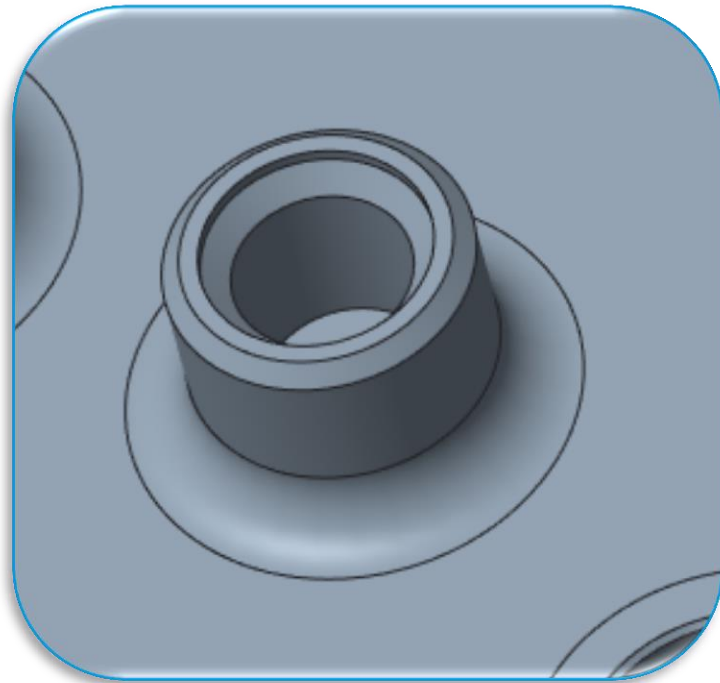


Use Cases

- **Late Stage Changes**
 - Make changes quickly without losing the underlying design intent!
- **Design Innovation and Concepting**
 - Explore alternative designs even if they are not supported by the underlying design intent
- **Multi-CAD data environment**
 - Directly edit non-native CAD data
 - Recognize design intent in imported geometry
 - Add design intent
- **Geometry Simplification for Analysis**
 - Remove and simplify geometry to improve CAE cycle times

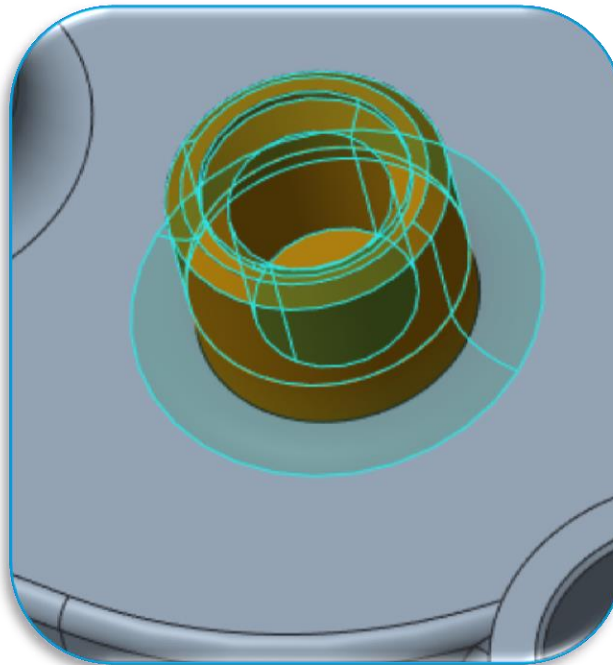
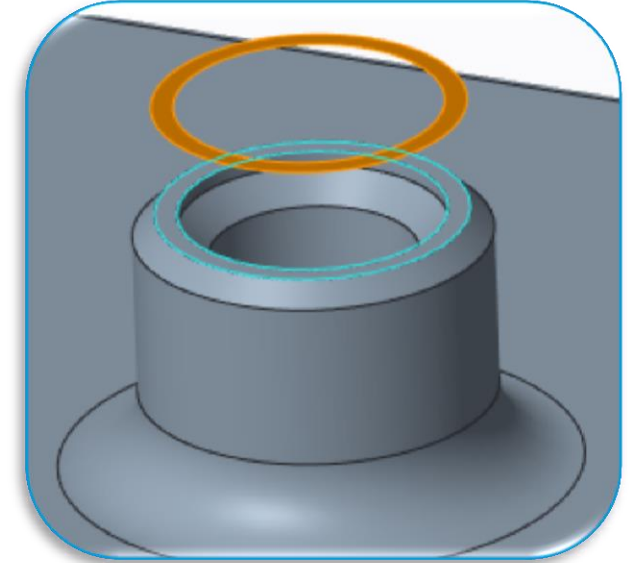
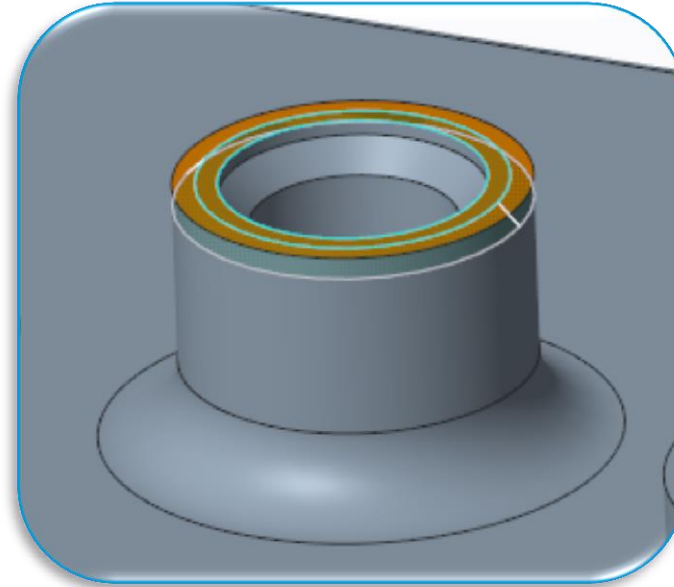
How does it work?

- Direct editing of geometry, not features
 - Select surfaces
 - Modify them with FMX tools



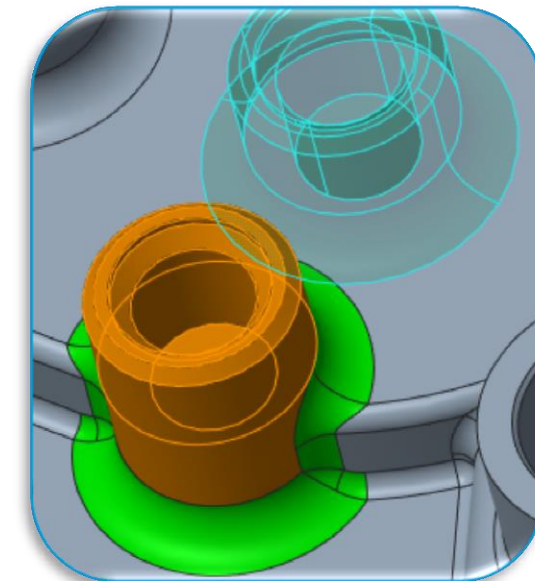
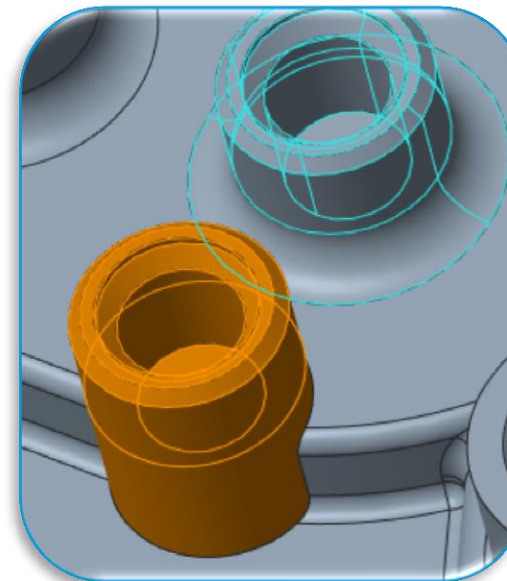
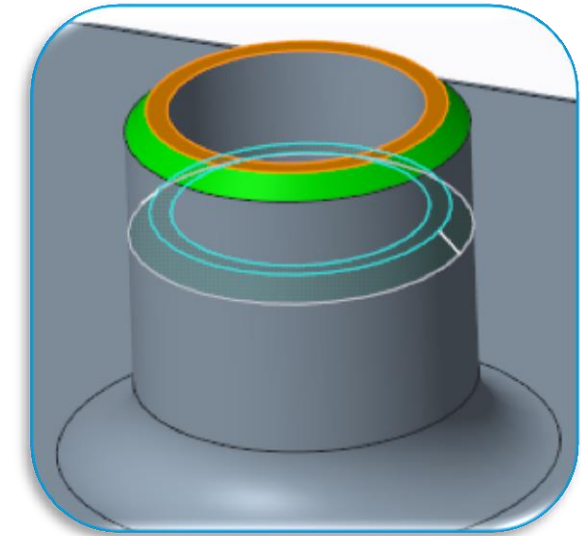
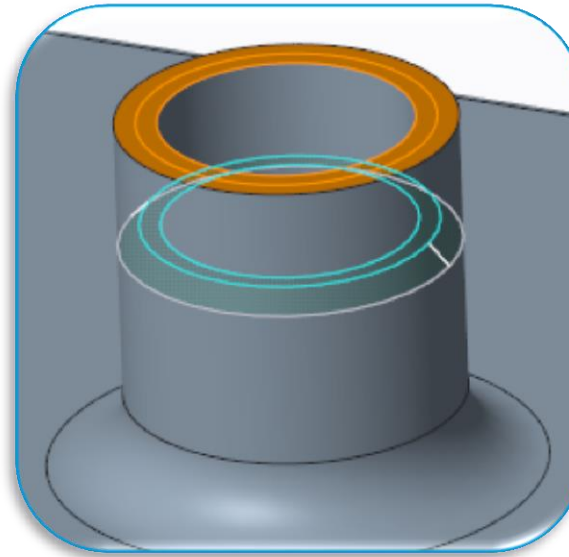
How does it work?

- **Attachment Geometry is Removed**
 - Round and chamfer attachment geometry is identified and removed
- **Surfaces are modified**
 - Surfaces are modified according to the selected tool and inputs



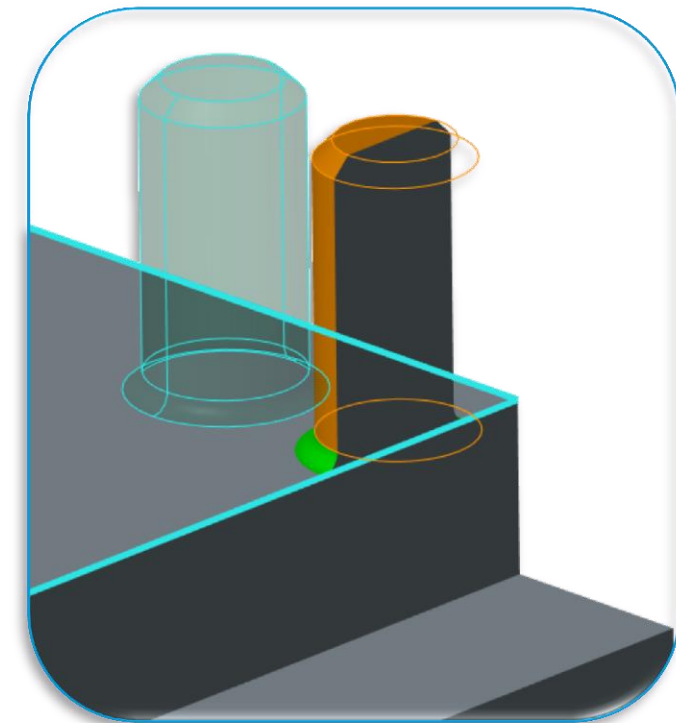
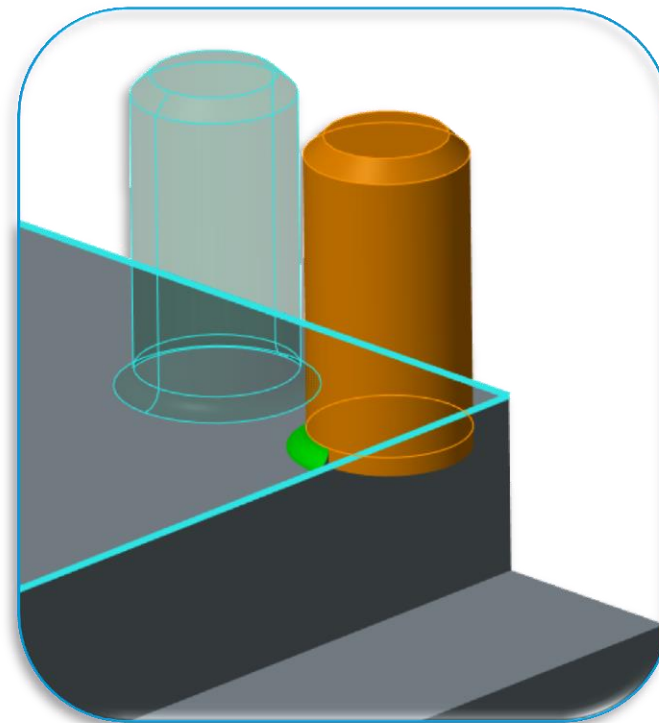
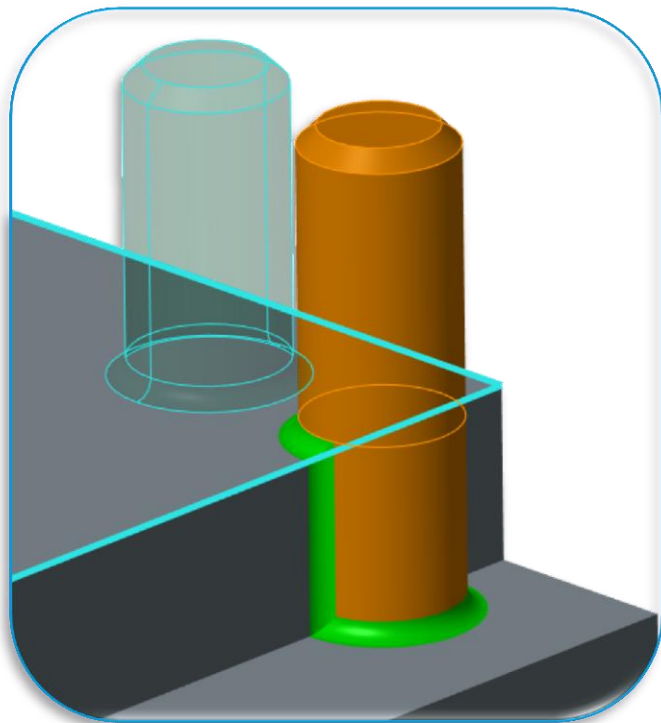
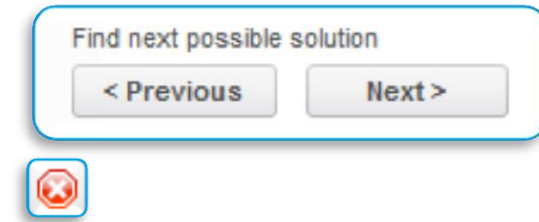
How does it work?

- **Surfaces are Extended and Attached to Heal Gaps**
 - Resulting one sided surfaces are extended and intersected with solid geometry
 - Controlled by the “Attach moved geometry” checkbox
- **Attachment Geometry is Recreated**
 - Round and chamfer attachment geometry is recreated
 - Controlled by the “Create round/chamfer geometry” checkbox
 - Available when the “Attach moved geometry” checkbox is checked



Multiple solutions

- **Multiple solutions exist for many Flexible Modeling operations**
 - Various surfaces can be extended and intersected to heal gaps in the solid model
 - Bounding Edges help to define which surfaces will be used
 - Previous and Next buttons are used to see other solutions
 - The Stop button can be used to interrupt calculation of solutions



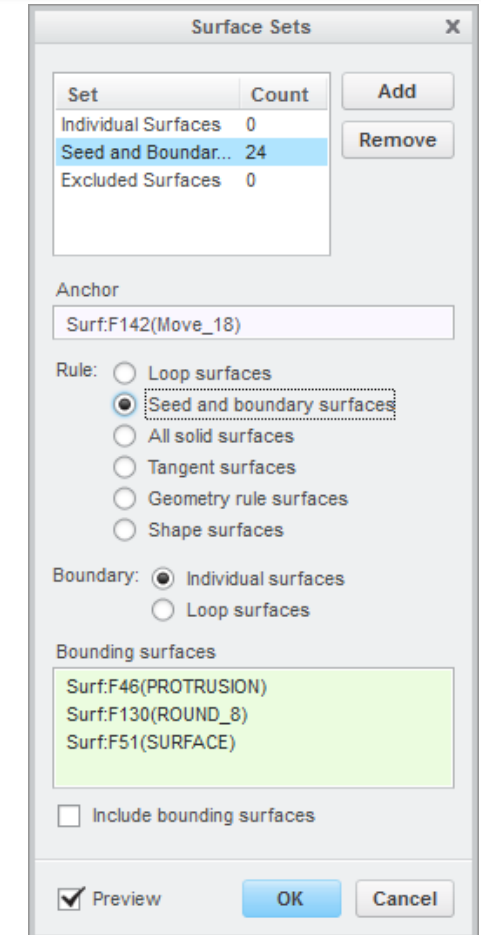
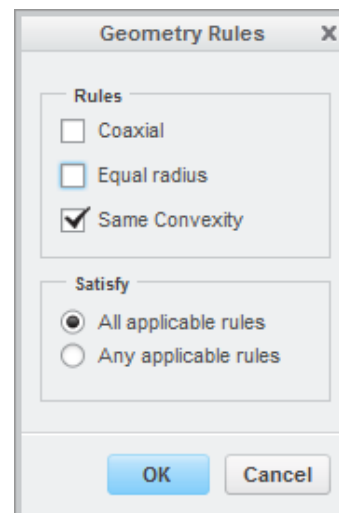
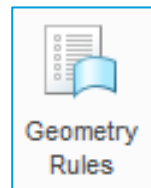
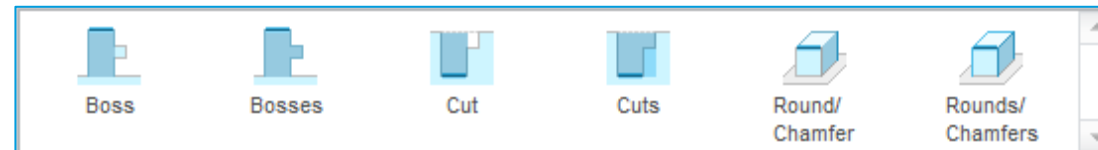
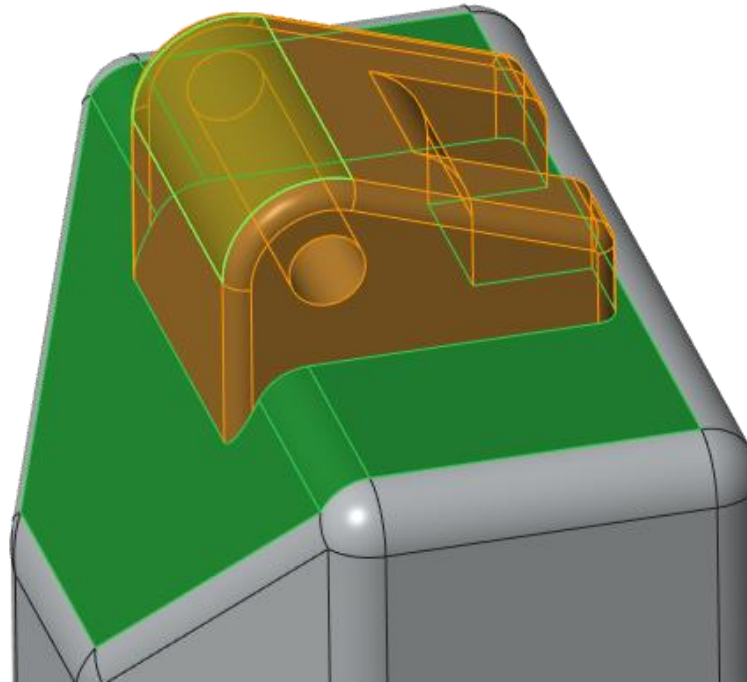
Selection Methods

- **Traditional**
 - Simple Selection
 - Rule-based surface sets

- **Tangent Surfaces**

- **Shape Surface Gallery**
 - Boss(es)
 - Cut(s)
 - Round(s)/Chamfer(s)

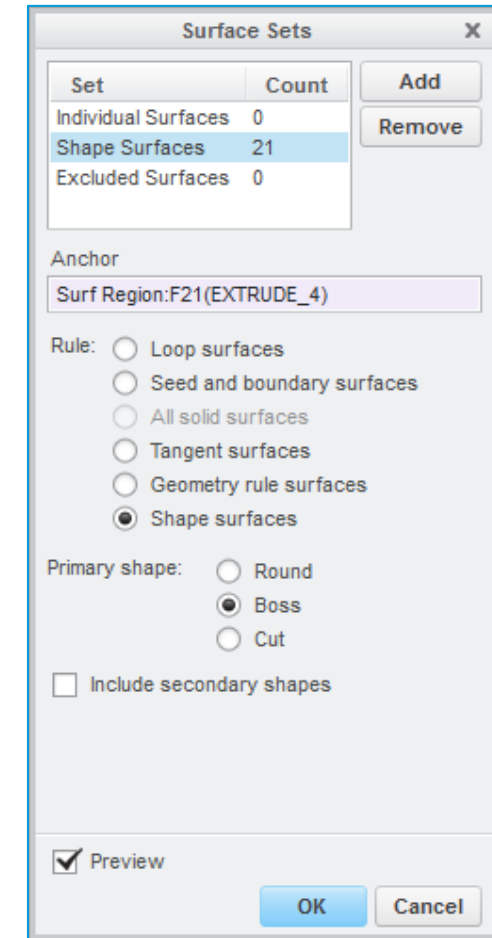
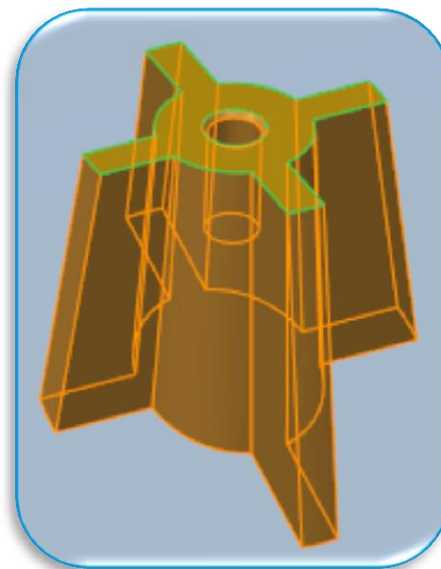
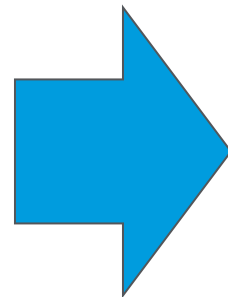
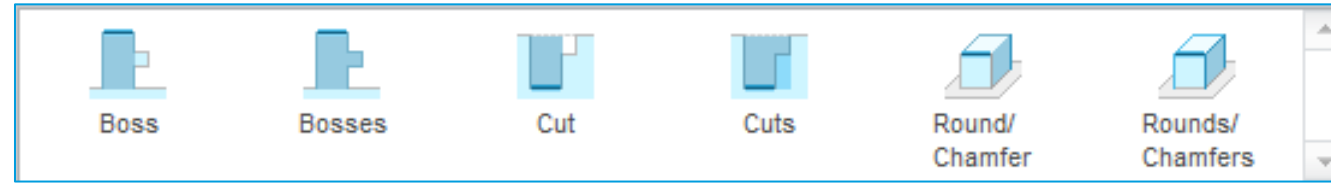
- **Geometry Rules**
 - Coplanar
 - Parallel
 - Coaxial
 - Equal radius
 - Same convexity



Selection Methods

- **Shape Selection Rules**

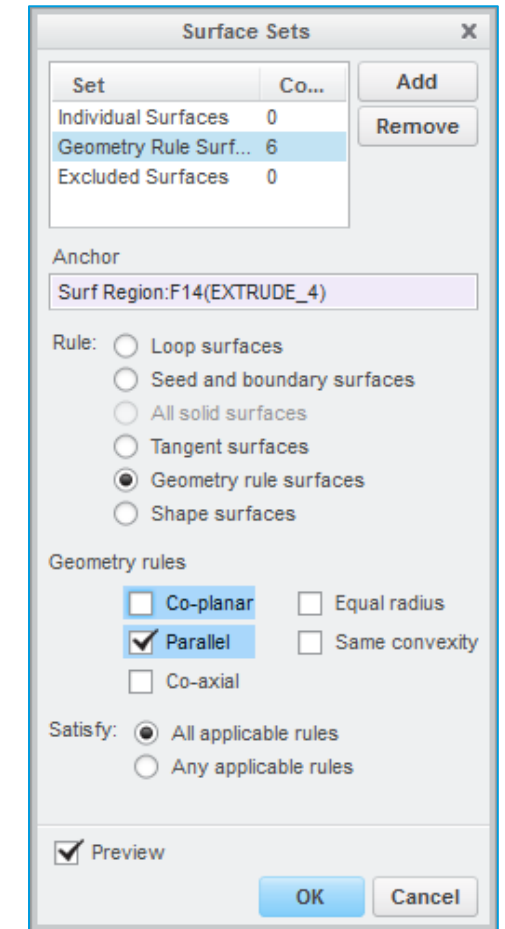
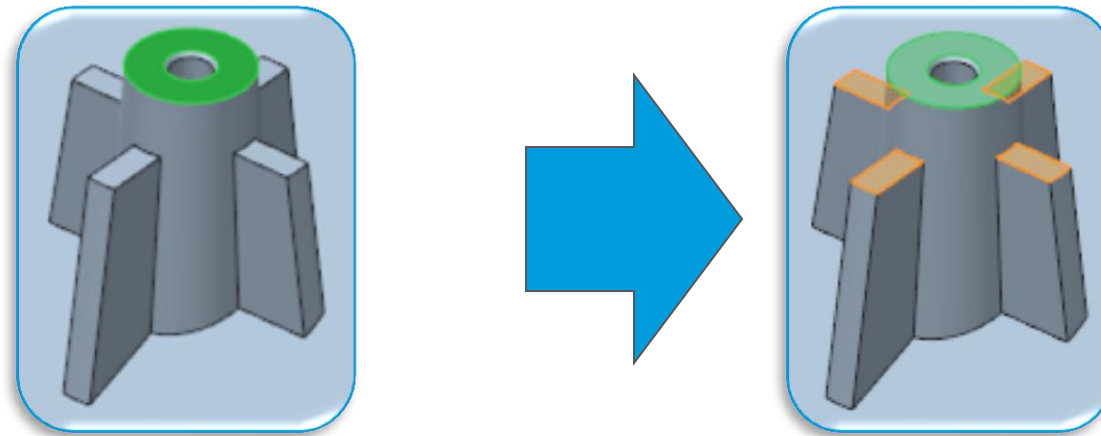
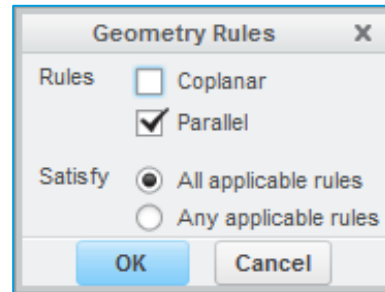
1. Select the Anchor surface
2. Select the shape to recognize
 - Boss(es)
 - Cut(s)
 - Round(s)/Chamfer(s)



Selection Methods

- **Geometry Rules**

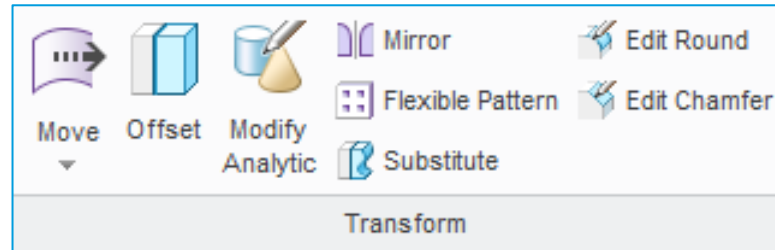
1. Select an Anchor surface on analytic geometry
 - cylinders, planes, cones, spheres, tori
2. Select Geometry Rules
3. Apply any or all rules
 - Coplanar
 - Parallel
 - Coaxial
 - Equal radius
 - Same convexity



Tools

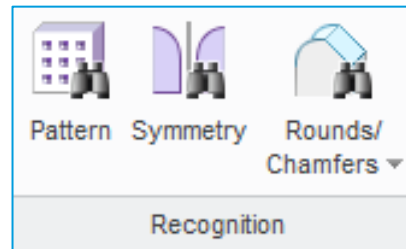
- Transform Group

- Move
- Offset
- Modify Analytic
- Mirror
- **NEW** Flexible Pattern
- Substitute
- **NEW** Edit Round/Chamfer



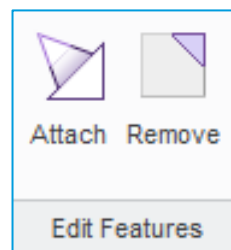
- Recognition Group

- Pattern
- Symmetry
- **NEW** Rounds/Chamfers



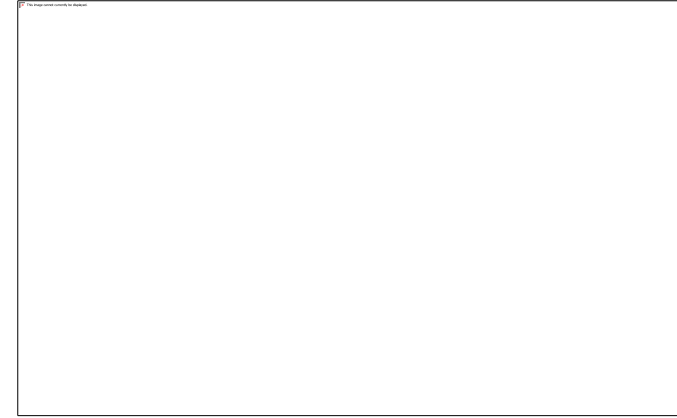
- Edit Group

- Attach
- Remove



Drawing Associativity

- **Shown Dimensions**
 - Owned by a specific feature
 - Unaffected by FMX features
- **Created Dimensions**
 - Measure geometry with references to geometric entities
 - Automatically updated with most FMX features
- **GTOL's, notes, surface finishes, and symbols in both 2D and 3D**
 - Automatically updated with most FMX features
- **Limitations**
 - Annotations affected by the following are highlighted, not updated
 - Offset
 - Substitute
 - Pattern Recognition with Allow Edit
 - **Highlight by Attributes** with **Show out of date** checkbox will display any out of date annotations in purple



Highlight by Attributes

Item Type

- Dimension
- Note
- Geom tol
- 2D datum/axis
- 2D sketched entity
- Reference dim
- Surface finish
- 2D symbol

Owner Model

- The drawing
- A 3D model

On Layer

- Any or none
- At least one
- Selected

Select Layers

Dimension Type

- Owned by a model
- Created and associative
- Created but non-associative
- Not-to-scale

Out of Date References

- Show out of date

Update References

Highlight Flex Features

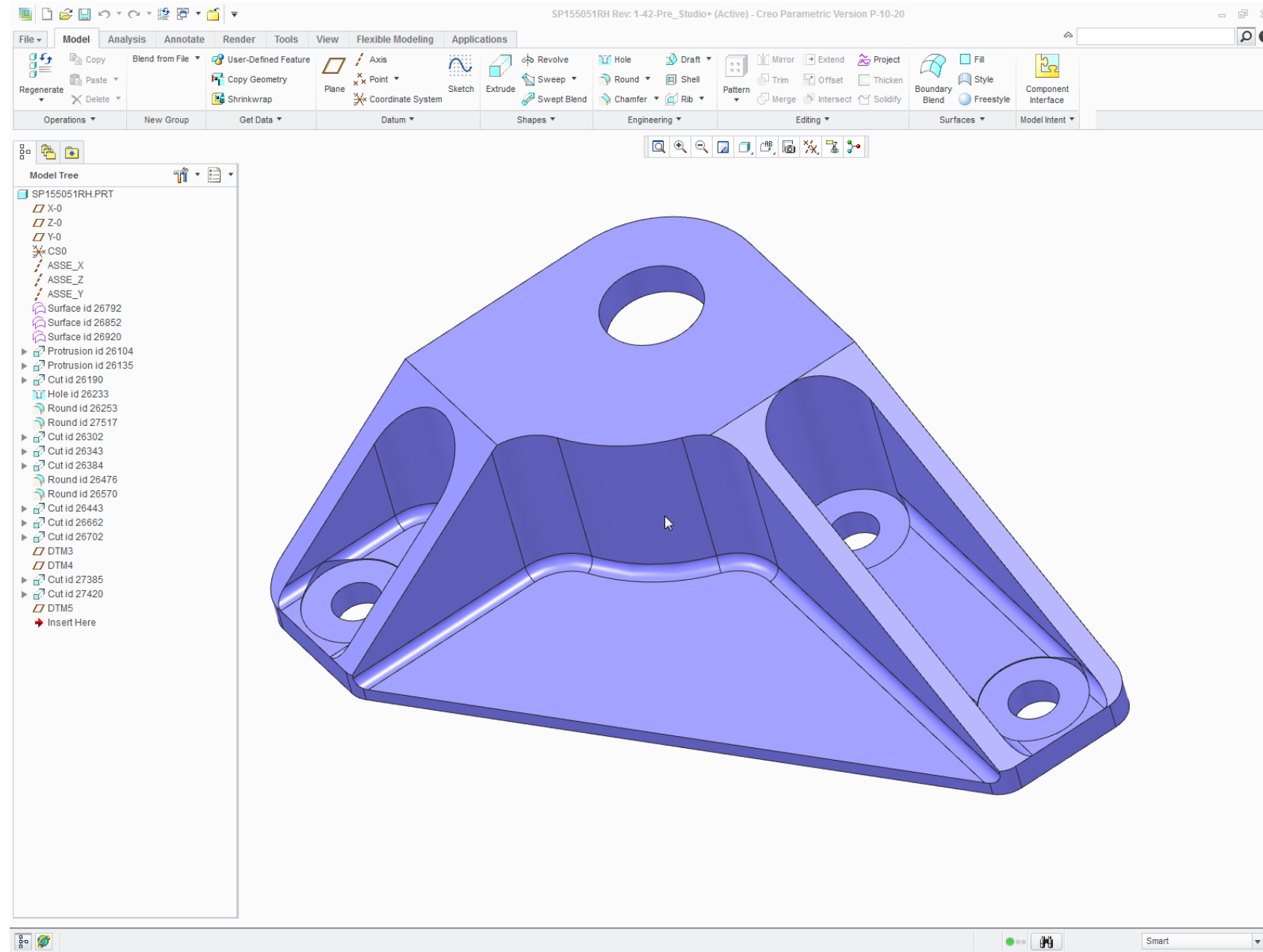
Displayed in View

- Any
- Selected

Select View

Highlight Close

Video of the Drawing Update Demo



Enhancements to FMX in PTC Creo Parametric 3.0

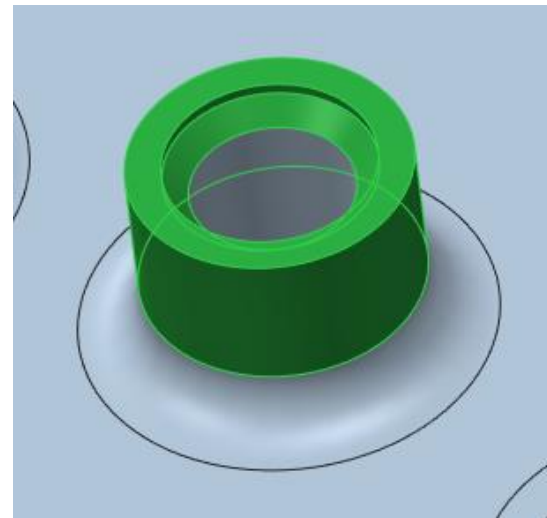
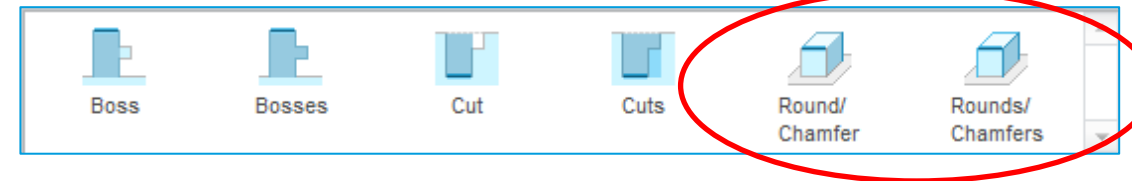
Overview

- **Shapes Gallery**
 - Multi-threading Shape Analysis
 - Support for Chamfers
 - Improved Shape Analysis
- **Multi-Color Preview**
- **Flex Feature Enhancements**
 - Tangency propagation option
- **Move Tool Enhancements**
 - Pull option
 - Support for inferred axis
- **Bounding Edges**
 - Display of Bounding Edges
 - Improvements to default solutions
- **Rounds and Chamfers**
 - Support for non-circular rounds
 - Chamfer handling and editing
 - Round/chamfer recognition feature
- **Patterns**
 - New Flex Pattern tool
 - Pattern propagation from any member
 - Propagation of User Defined bounding edges

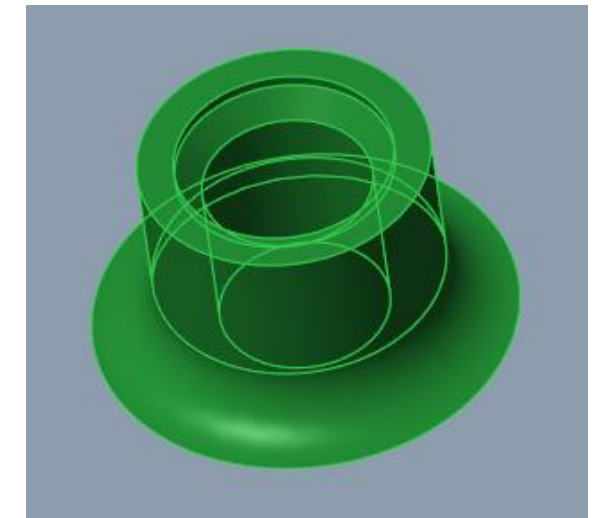
Shapes Gallery

Capabilities

- Multi-threading Shape Analysis
 - All applicable shapes calculated simultaneously
- Added Support for Chamfers
- Improved Shape Analysis
 - Improved algorithm
 - Inclusion of round/chamfer geometry
 - Easier Remove operation



Boss with Secondary
PTC Creo 2.0

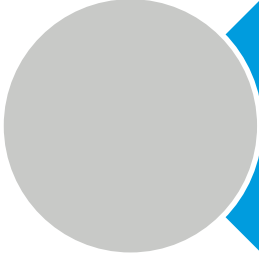
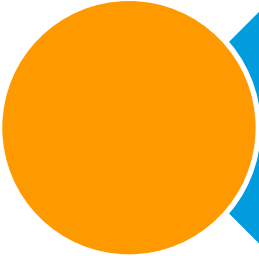
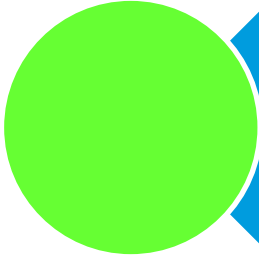
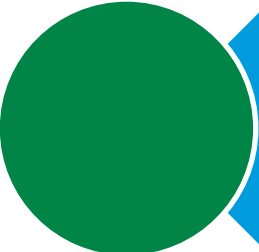


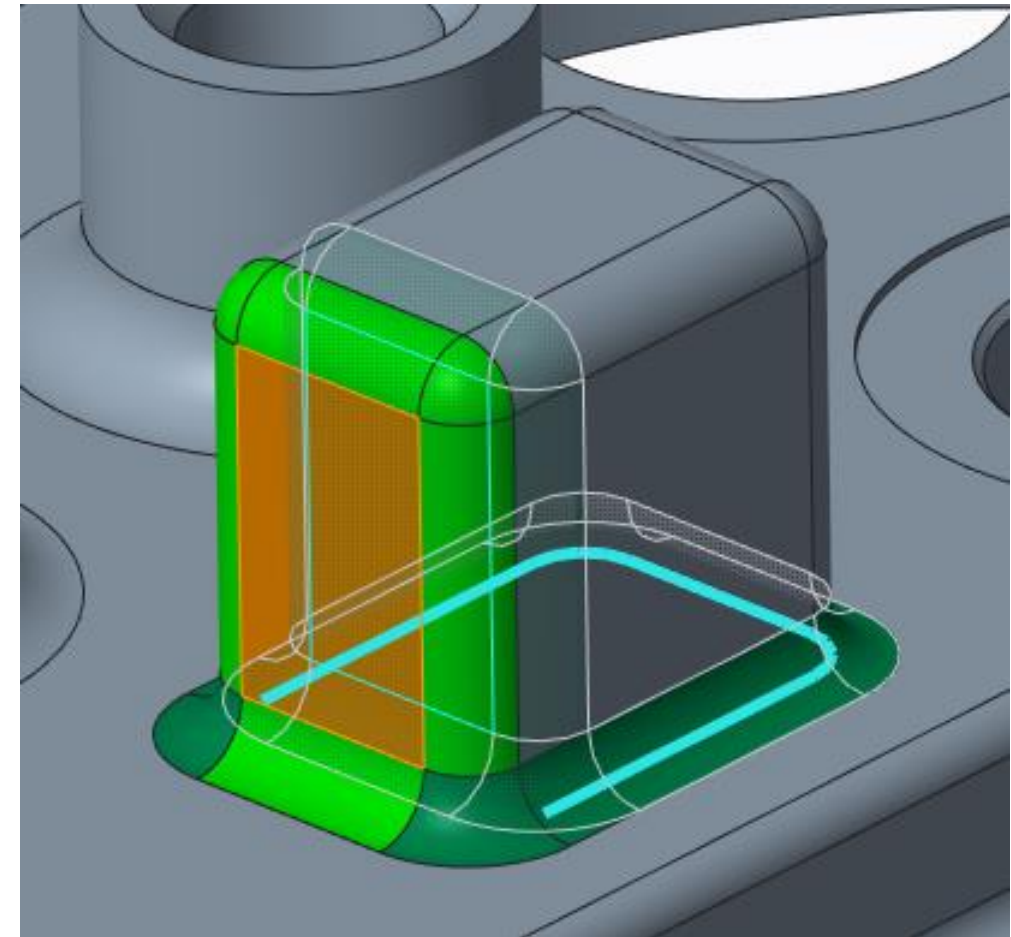
Bosses
PTC Creo 3.0

Benefits

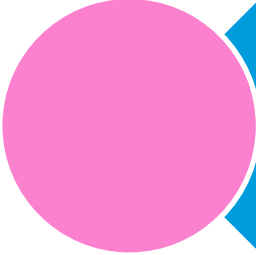
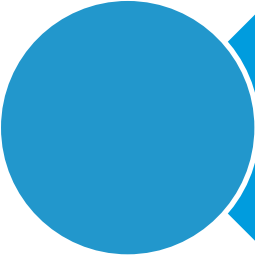
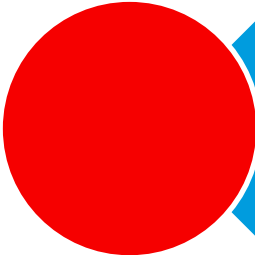
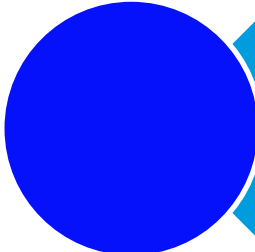
- Faster display of various shapes
- Better handling of more types of attachment geometry
- Better display of geometry to be modified

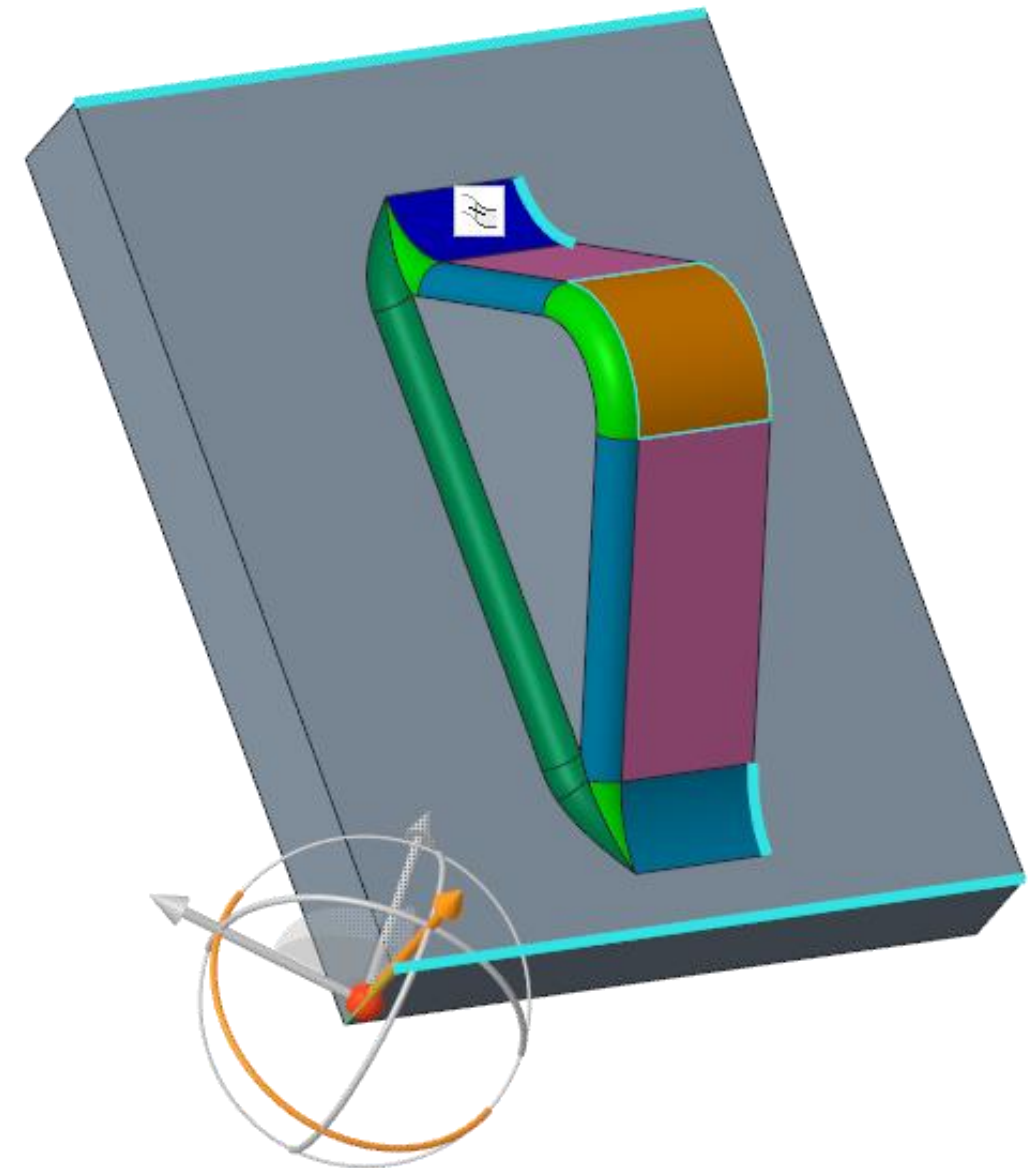
Multi-Color Preview (w/o Tangency Propagation)

-  Background Geometry
-  Transformed Geometry
-  Rounds that can't be propagated through
-  Interfering Rounds



Multi-Color Preview (w/ Tangency Propagation option)

-  Dragged Geometry
-  Rounds that can be propagated through
-  Rounds that can't be recreated
-  Fixed Geometry



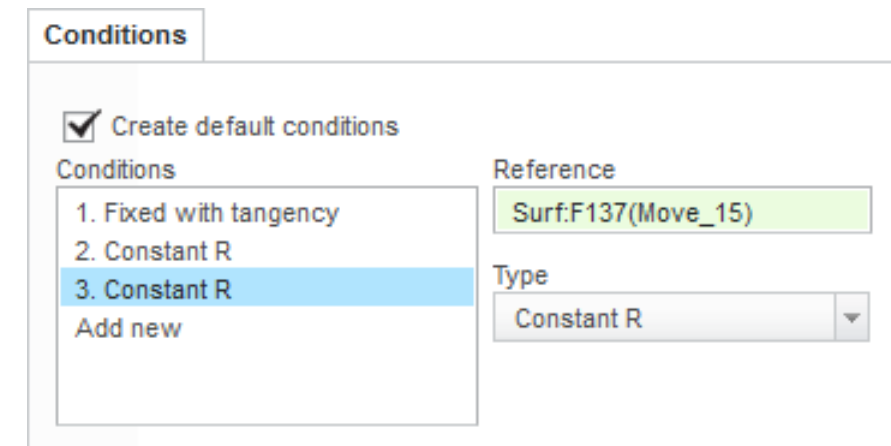
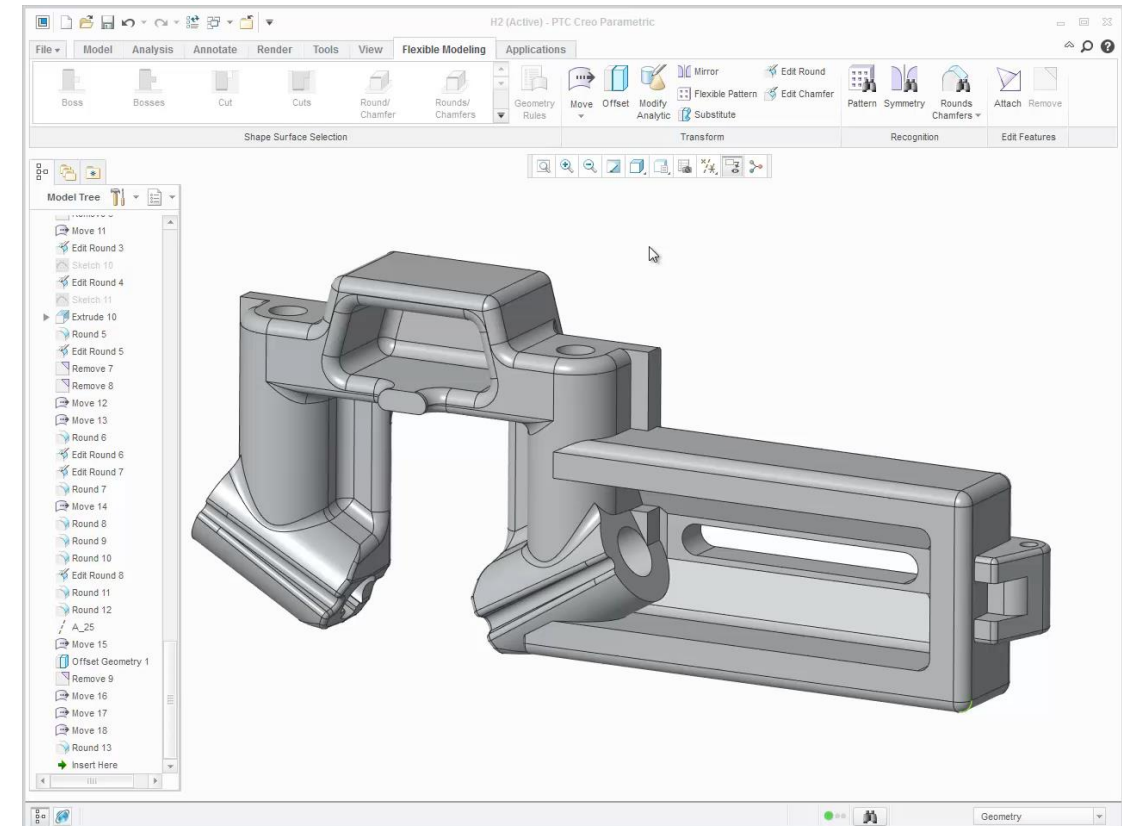
Flexible Feature Enhancements

Capabilities

- Tangency propagation option
 - Maintain tangent connections from modified geometry to adjacent geometry in:
 - Move
 - Offset
 - Modify Analytic
 - System default conditions are created to limit scope
 - Controlled by Create default conditions checkbox
 - Apply conditions to the tangent attached geometry to control how it is adjusted
 - Fixed, Fixed Axis, Fixed Center, Fix Underlying Edge, Fix with Tangency, Fix normal
 - Propagate Through

Benefits

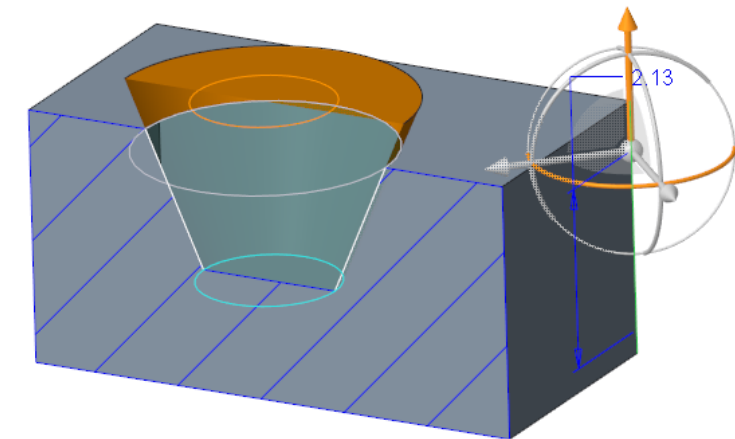
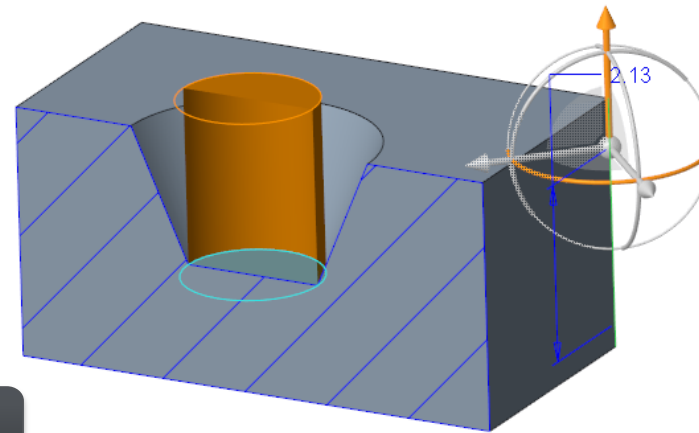
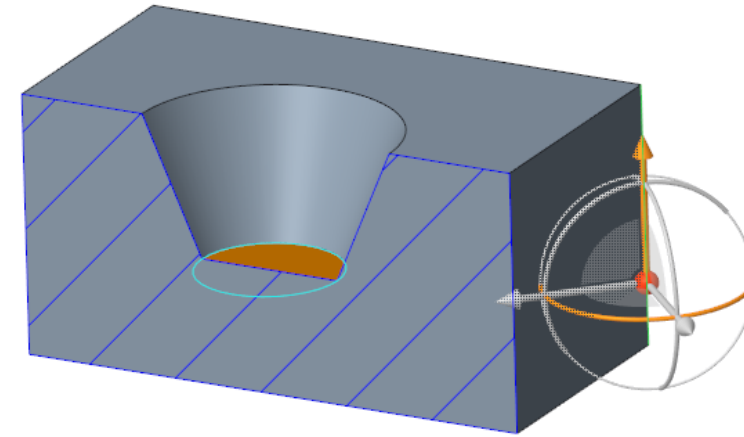
- Ability to modify more complex geometry
- More predictable results



Move Tool Enhancements

Capabilities

- Pull option in Move Tool
 - Attach moved geometry by:
 - Creating side surfaces along the boundary of the moved geometry
 - Extending the neighboring surfaces adjacent to the moved geometry
- Inferred refs for Move by Dimension
 - Ability to infer an axis when a cylinder is chosen



Benefits

- More predictable results
- Improved workflows

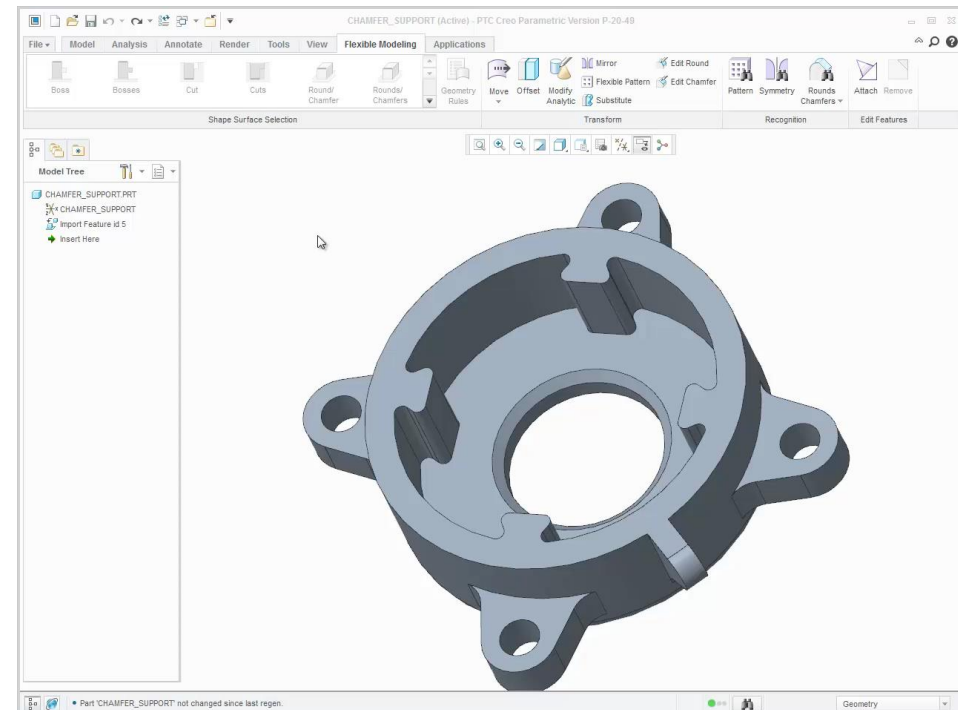
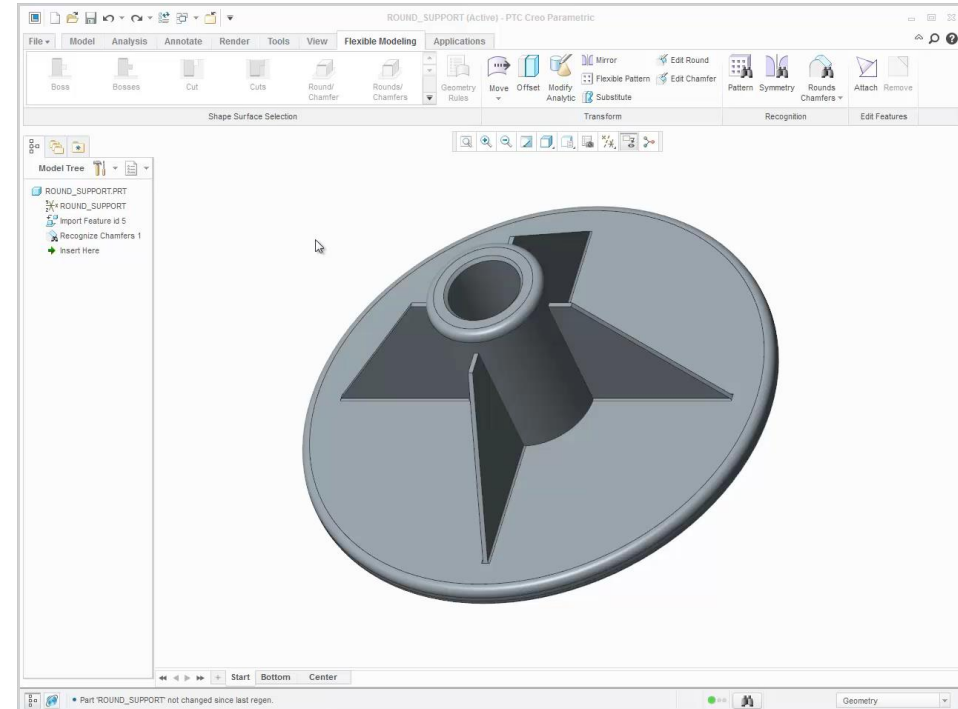
Rounds and Chamfers

Capabilities

- Support for non-circular rounds
 - Symmetric and asymmetric conic and C2 rounds
 - Removed and recreated in Flexible Modeling tools
 - Edit Round - Circular, Conic, C2, D1 x D2 Conic, or D1 x D2 C2
- Chamfer handling and editing
 - Removed and recreated in Flexible Modeling tools
 - Edit Chamfer – DxD, D1xD2, Angle x D, 45 x D, 0x0, 01x02
- Round/chamfer recognition feature
 - Control how the system treats individual round-like and chamfer-like geometry

Benefits

- Preserve engineering intent of non-circular rounds and chamfers
- More flexible and predictable geometry handling



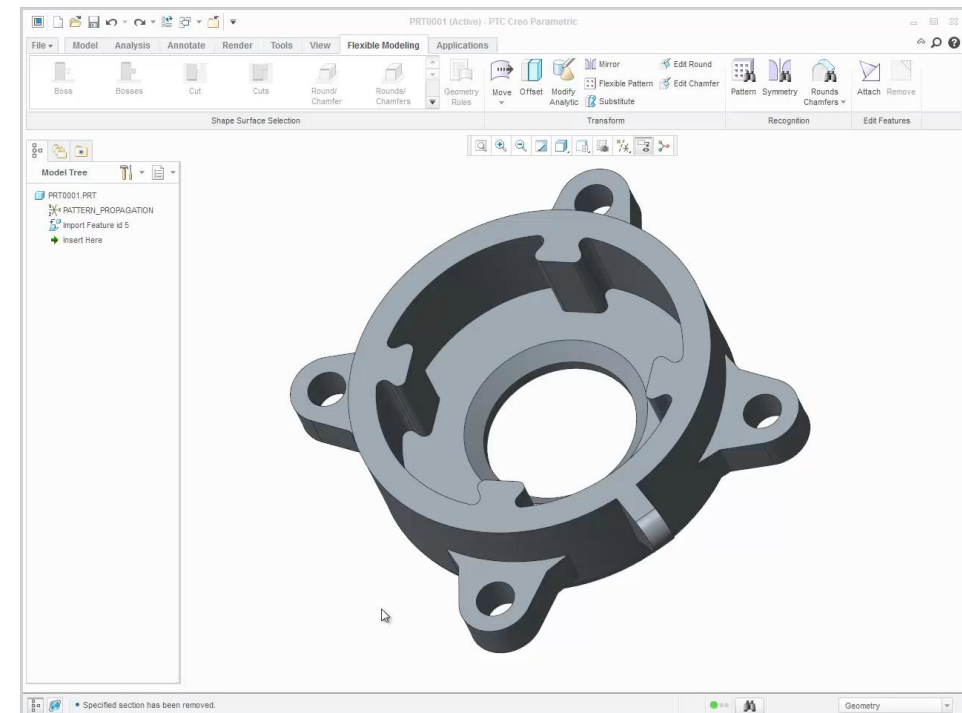
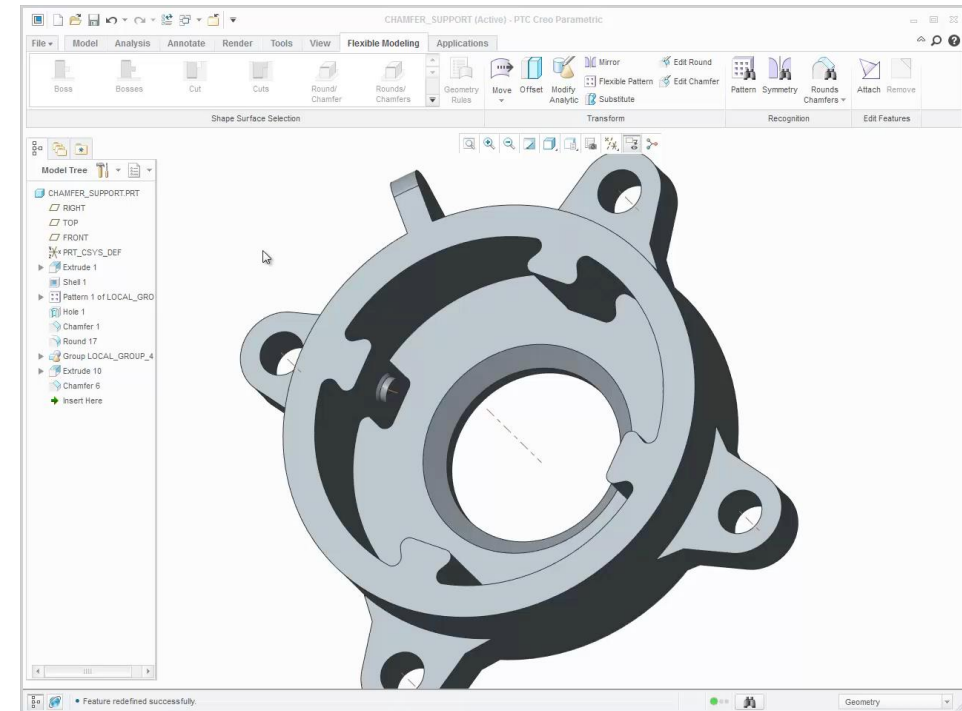
Patterns

Capabilities

- **New Flex Pattern tool**
 - Ability to pattern geometry with flex support
 - Rounds/chamfers are removed and recreated
 - Pattern instances are attached and merged to the solid
- **Pattern propagation from any member**
 - Make Flex changes to any pattern member
 - Propagate changes to all other pattern members
- **Propagation of user defined bounding edges**
 - Can propagate Flex changes with user defined bounding edges to the pattern

Benefits

- Pattern geometry regardless of topology change or presence of rounds or chamfers
- More flexible modeling workflows



- Your feedback is valuable
- Don't miss out on the chance to provide your feedback
- Gain a chance to win an instant prize!
- Complete your session evaluation now

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