DESIGN WITH 2D AND 3D DETAILING (MBD)

Michael Fridman
MBD & Detailing Product Manager – PTC

forum europe

AGENDA

- MBD Opportunities & Challenges
- Creo 4.0 MBD Improvements Overview
- Creo 5.0 Core MBD Improvements
- Creo 5.0 GD&T Advisor
- Creo 5.0 2D Drawing Enhancements
- Creo 6.0 Outlook
- Questions

MBD OPPORTUNITIES & CHALLENGES

MBD VS. MBE

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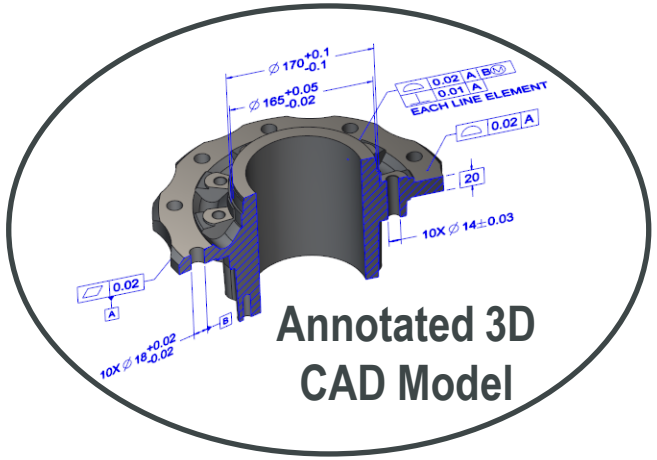

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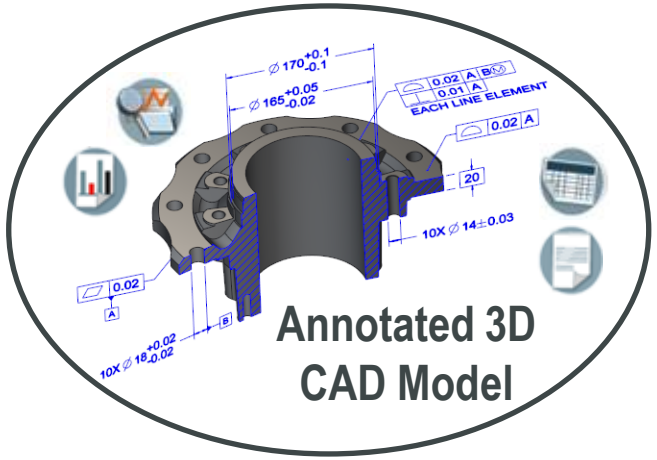

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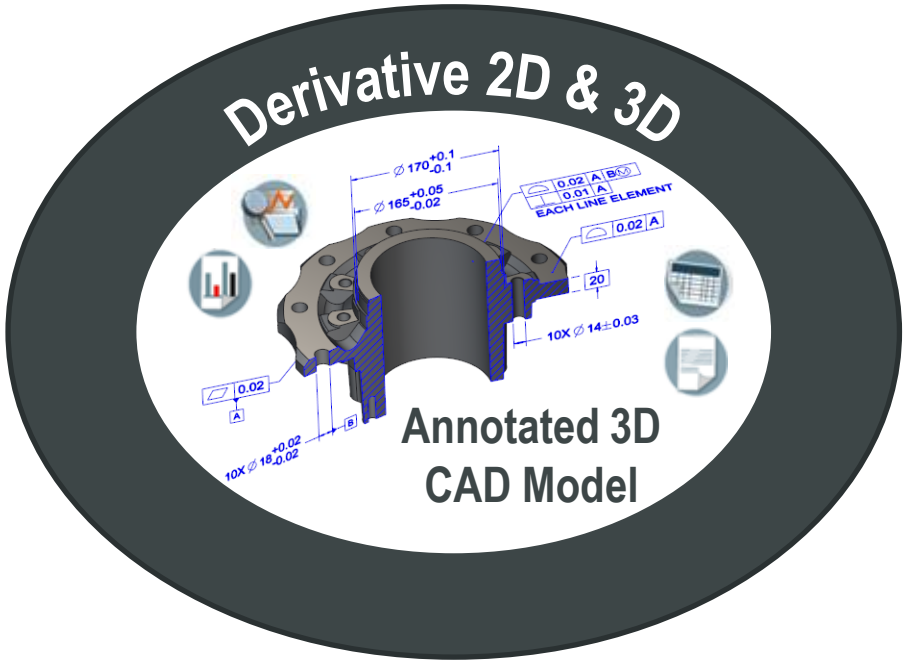

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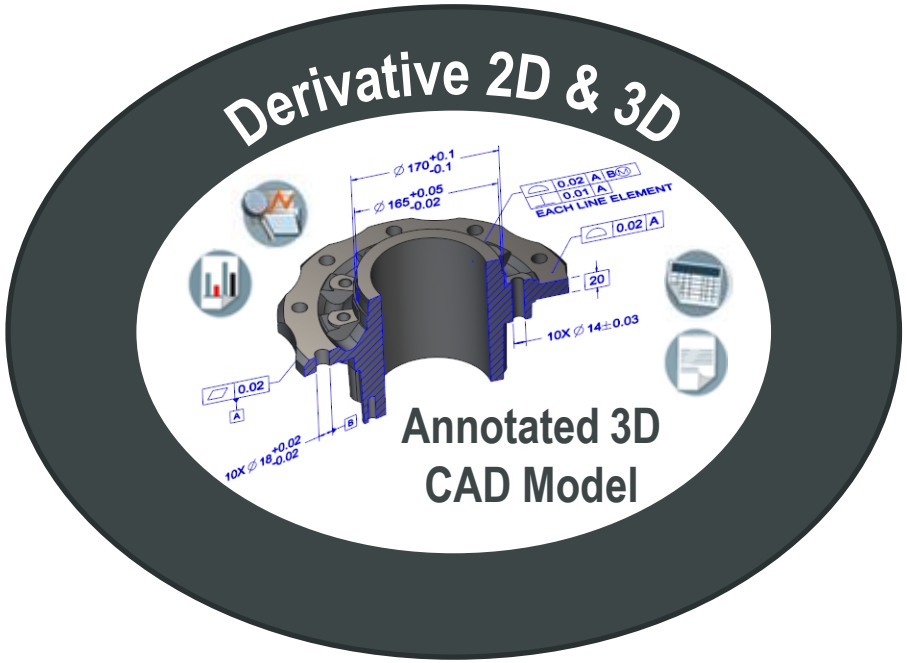

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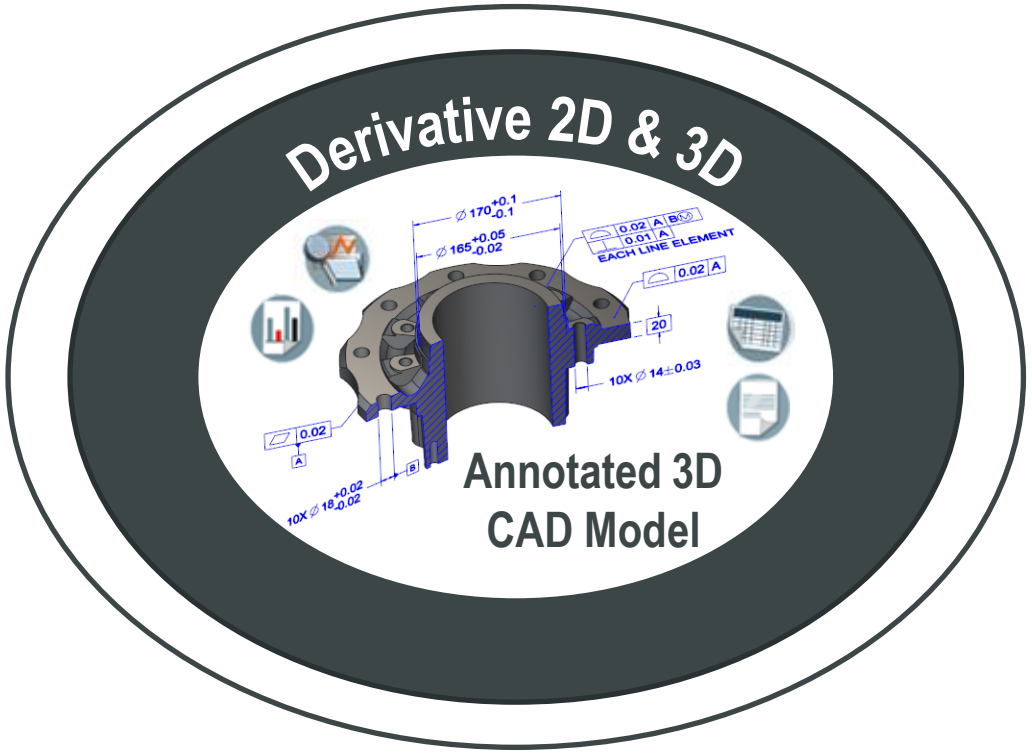

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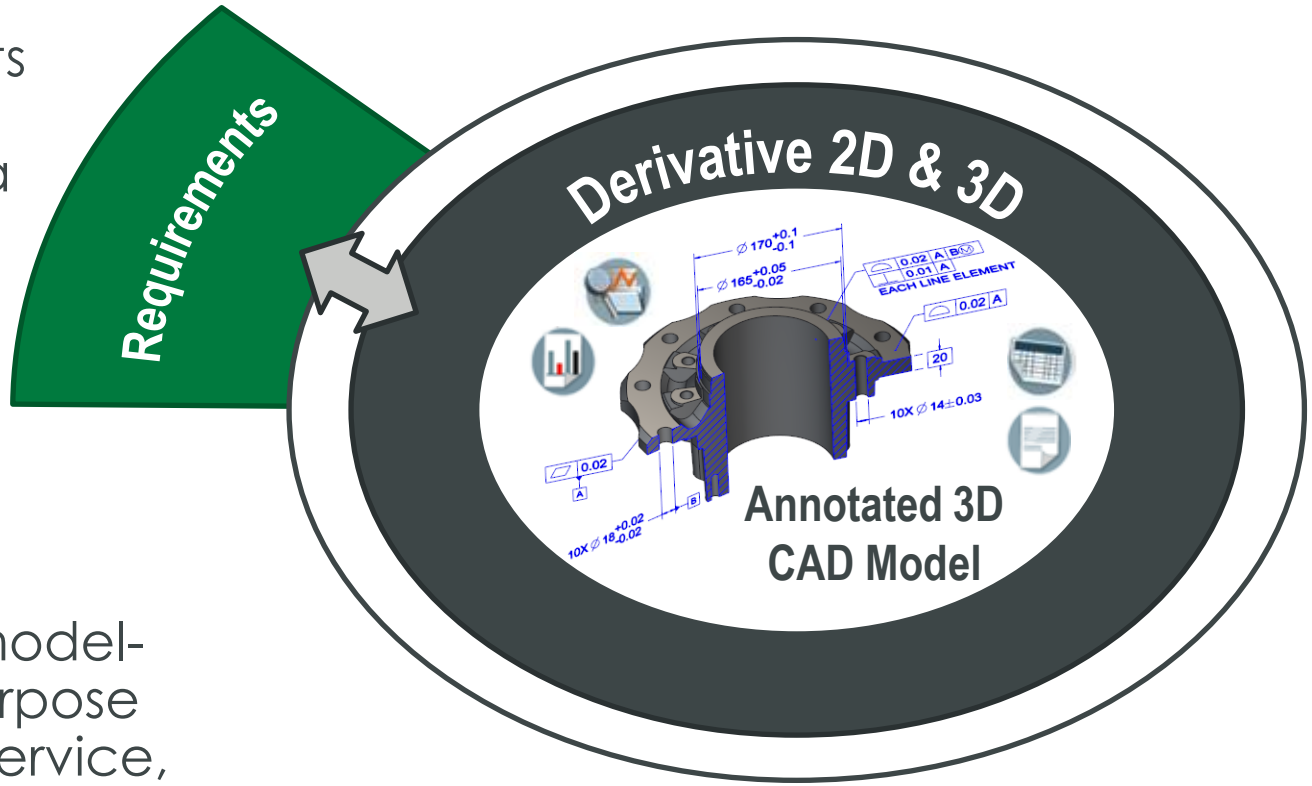

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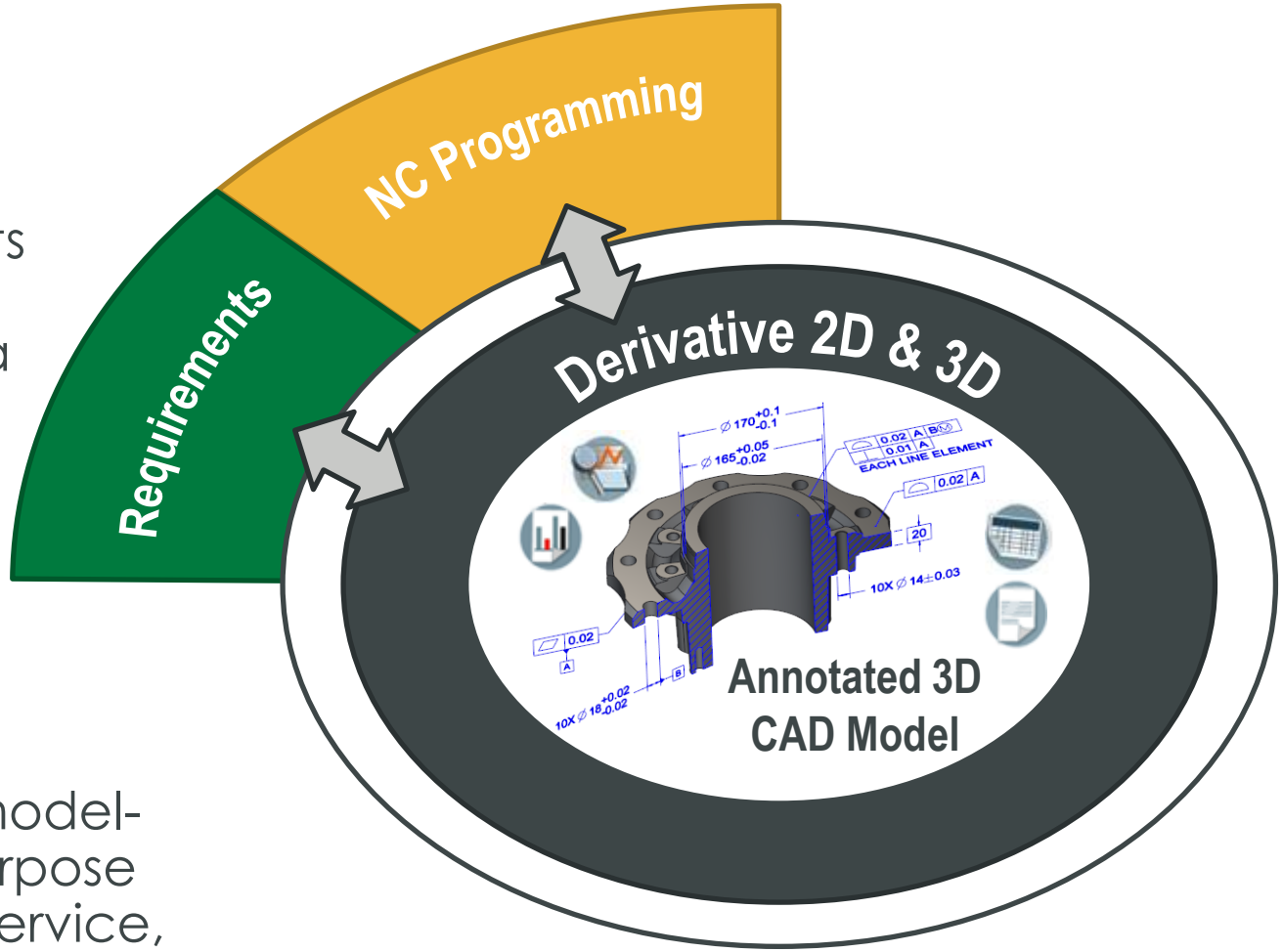

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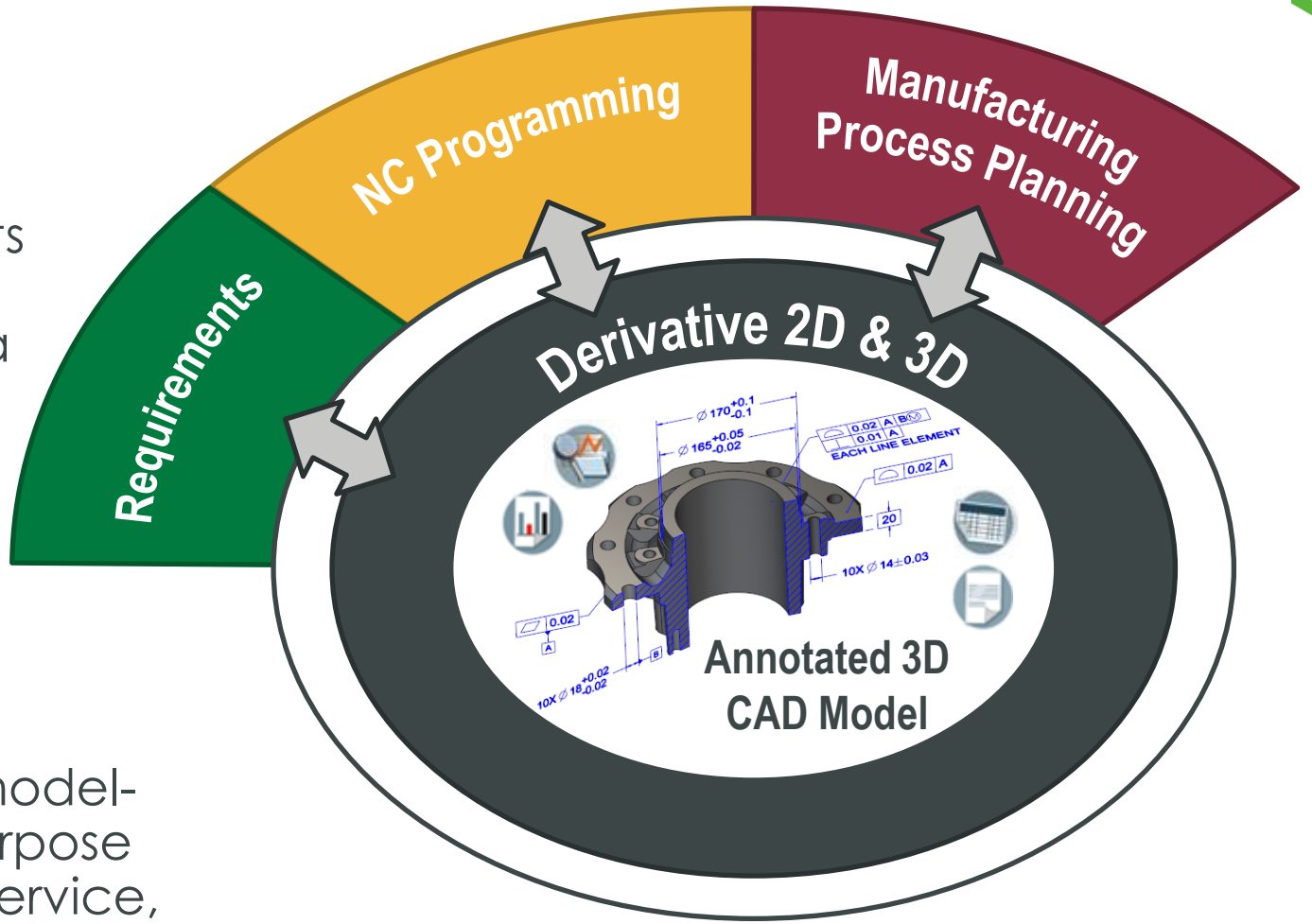

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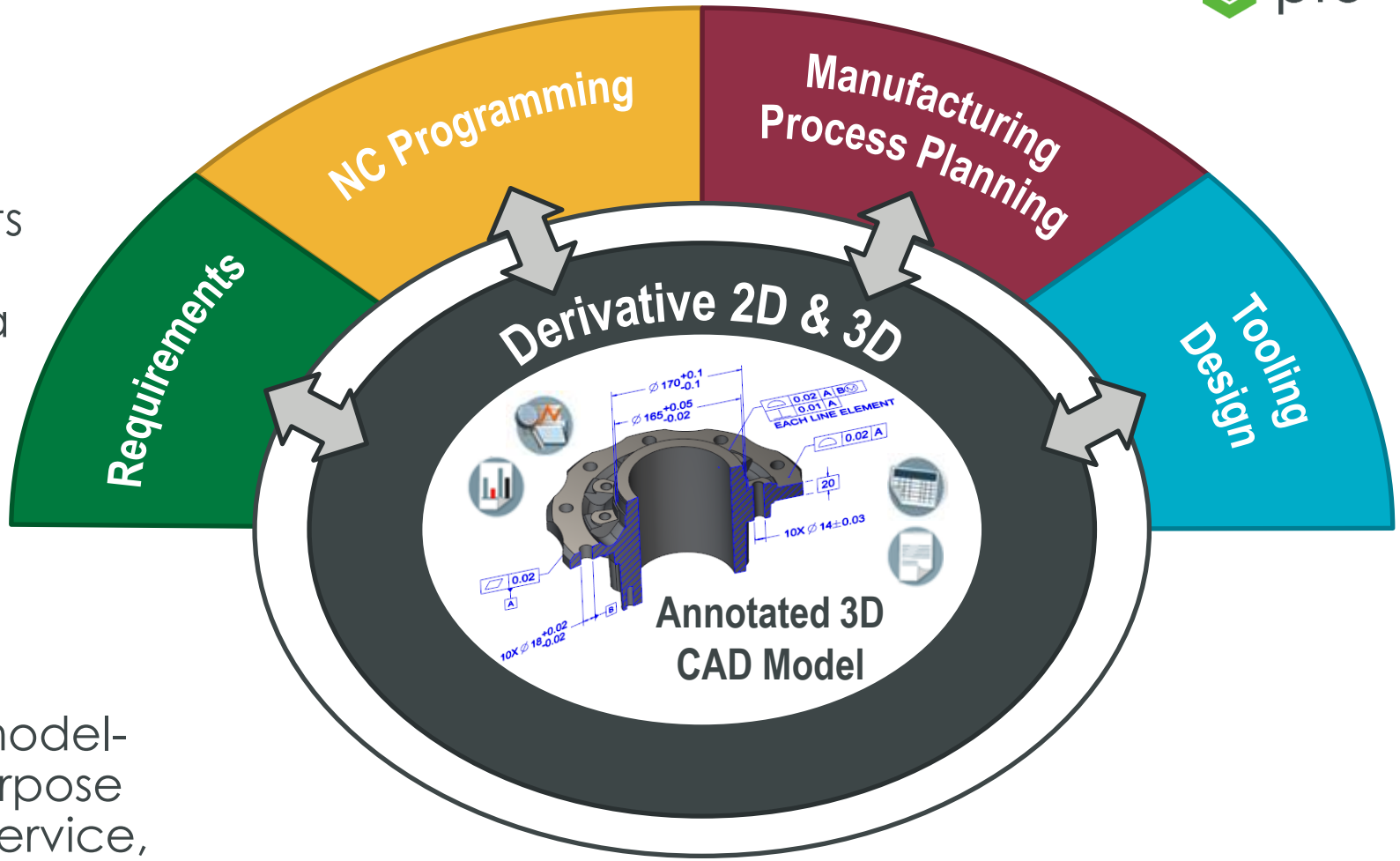

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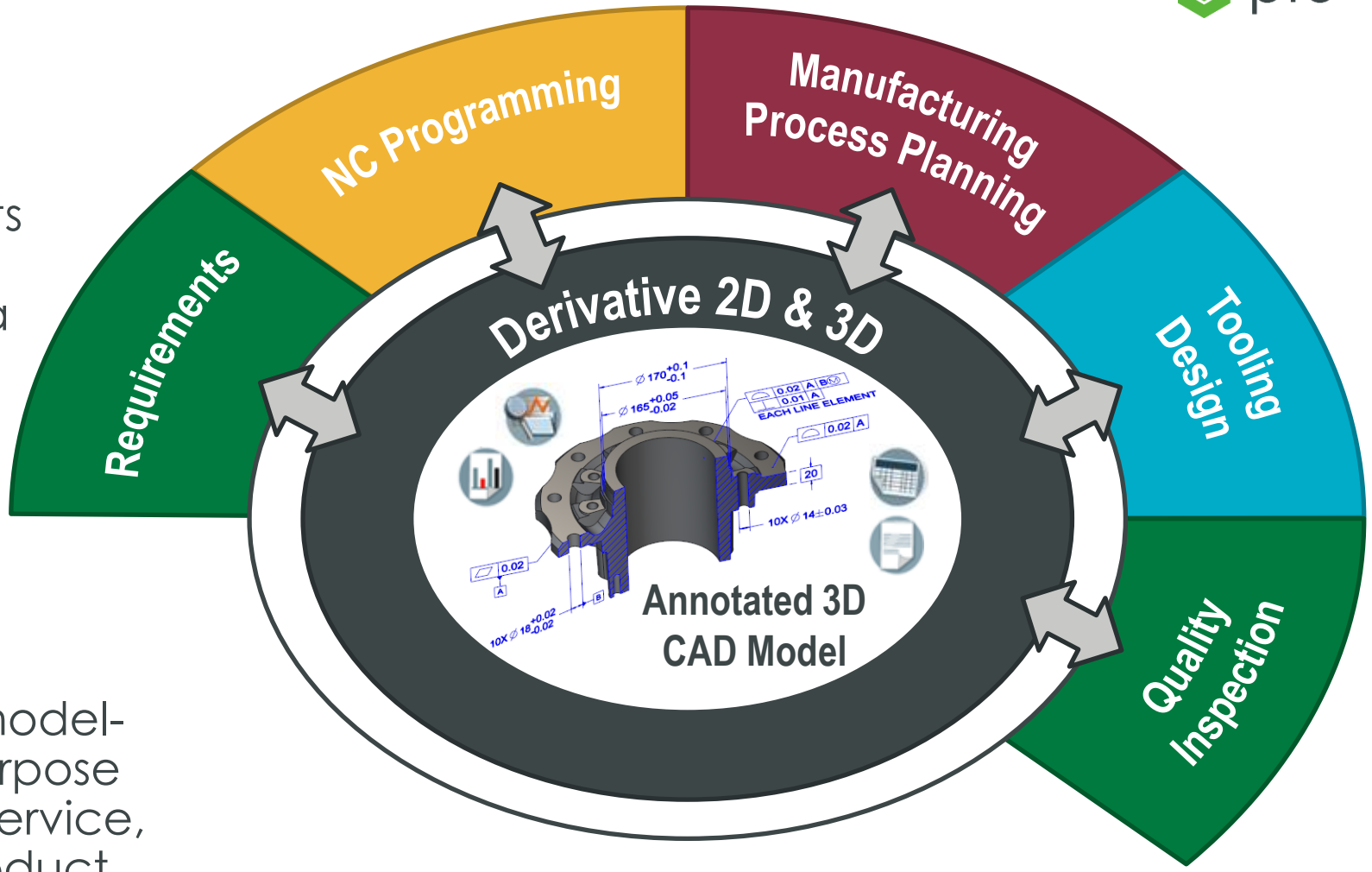

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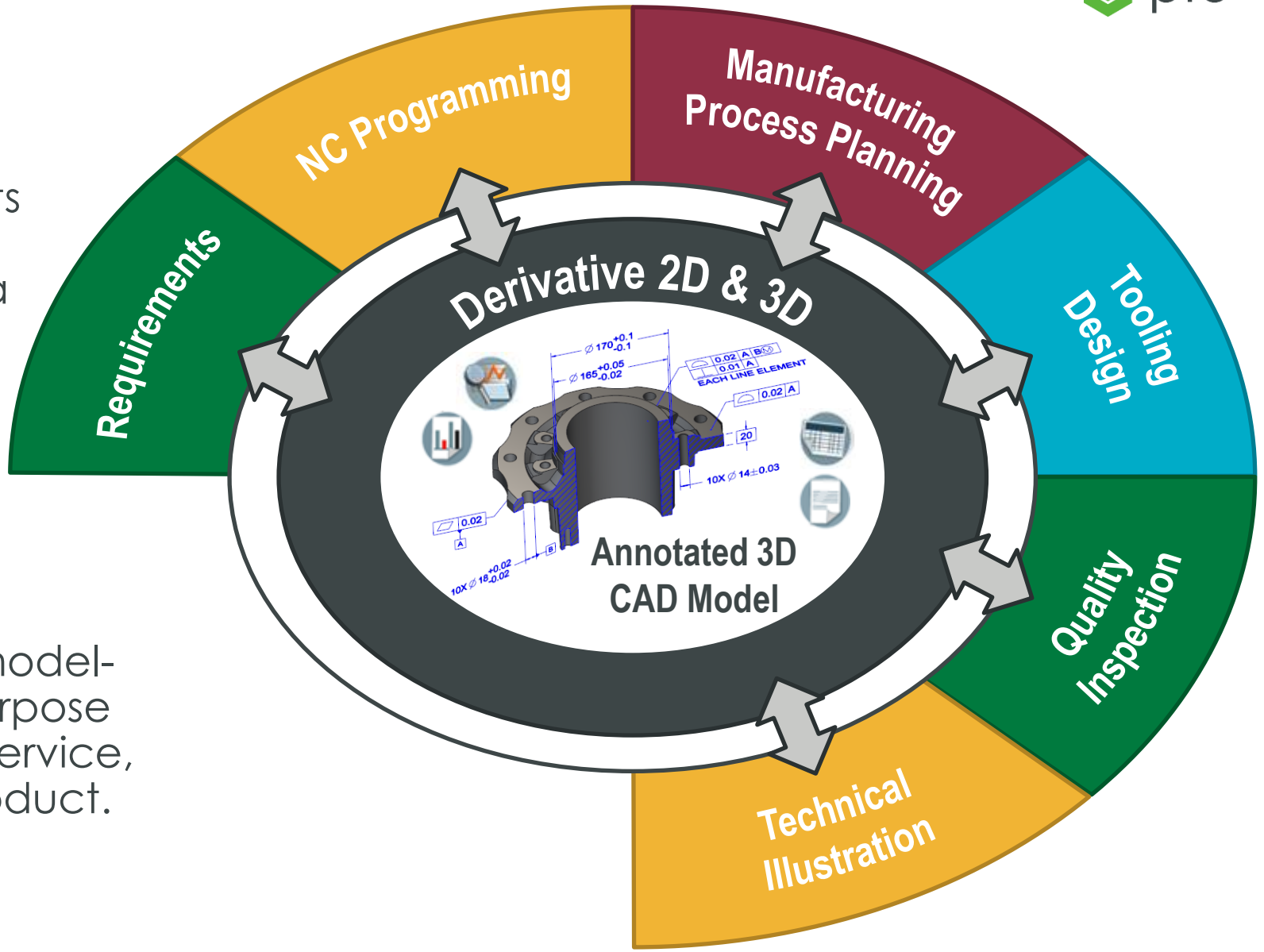

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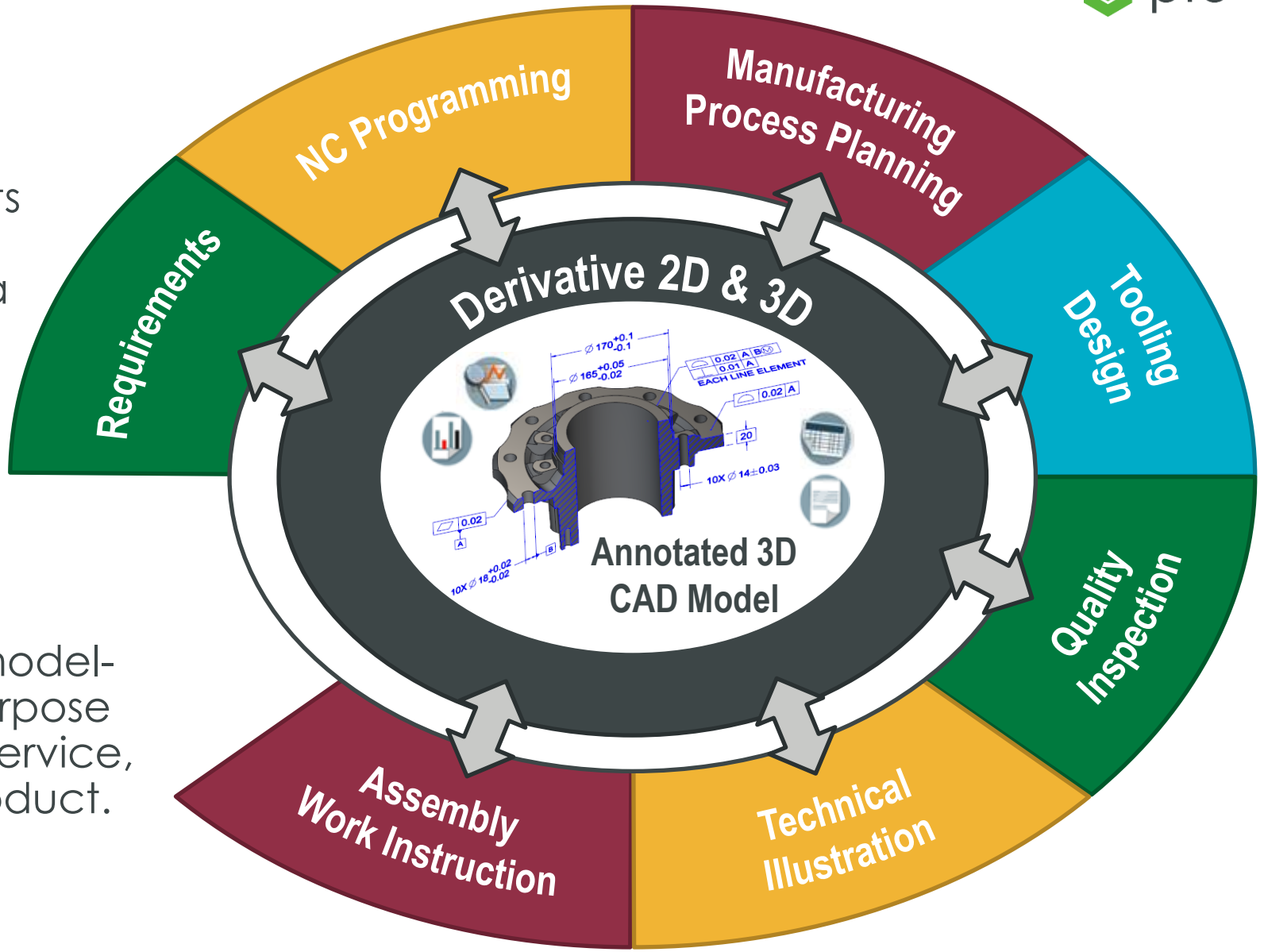

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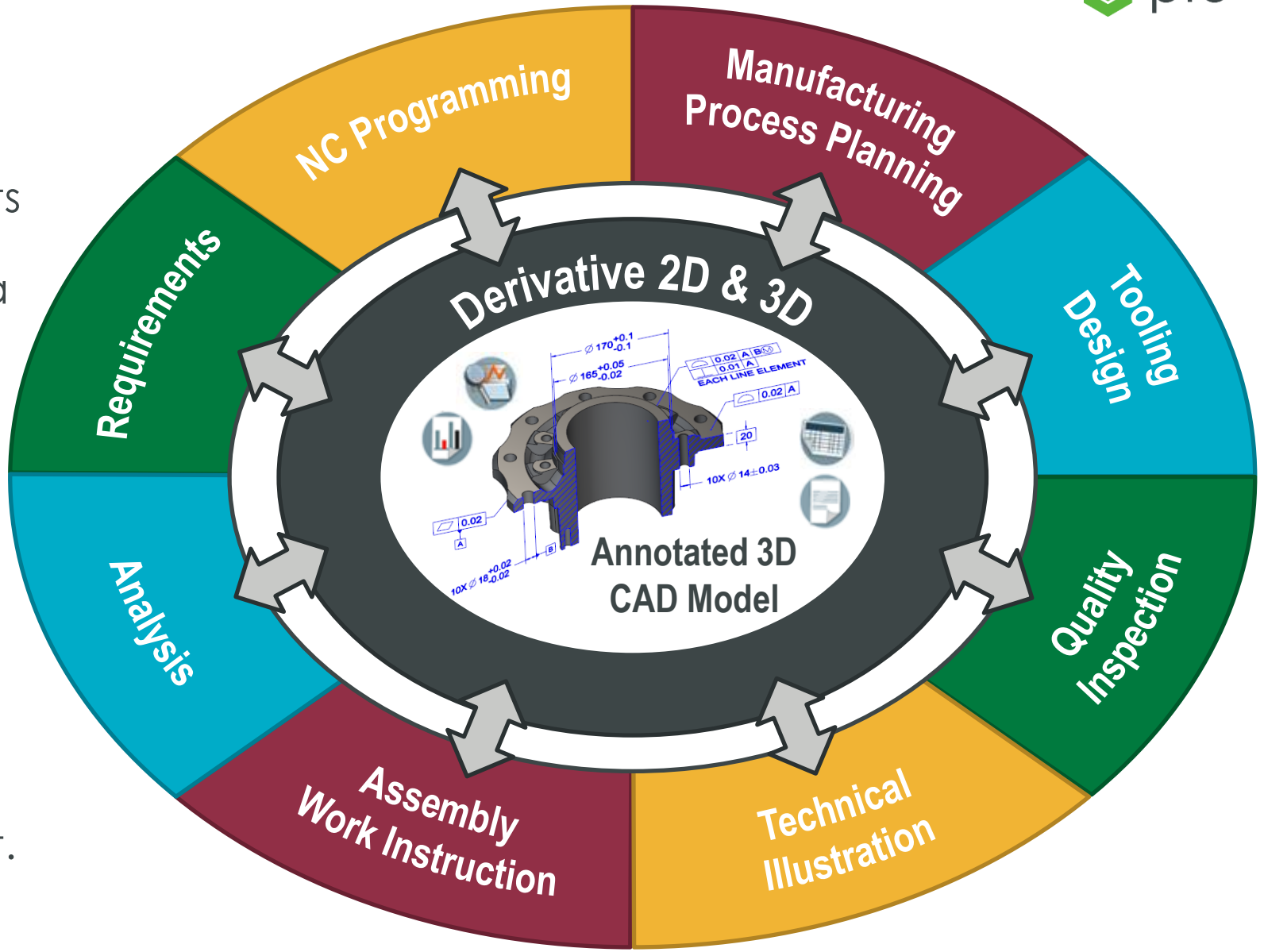

MBD VALUE OPPORTUNITIES

MBD offers the potential for significant time and cost savings

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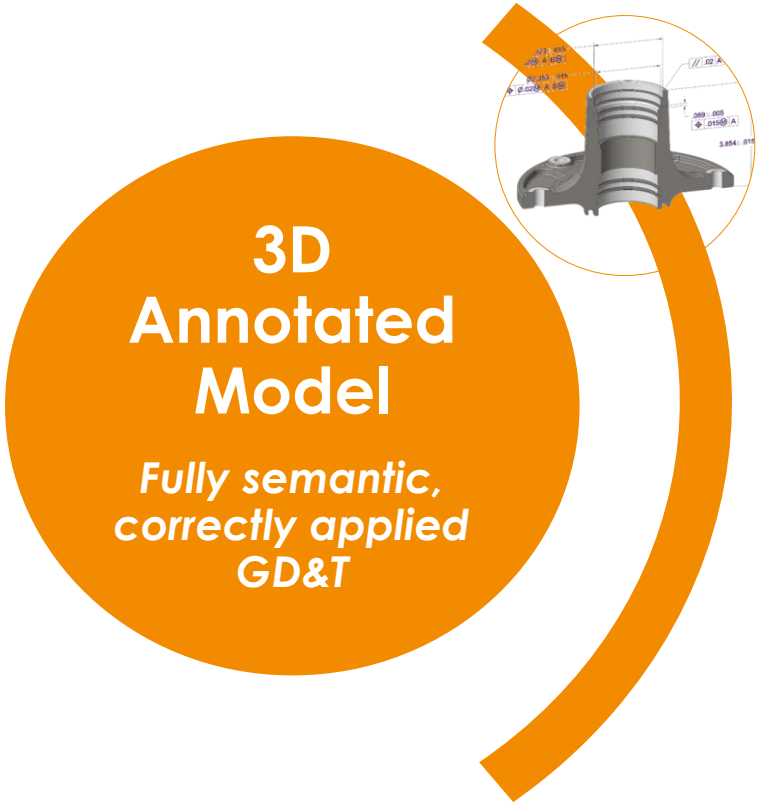
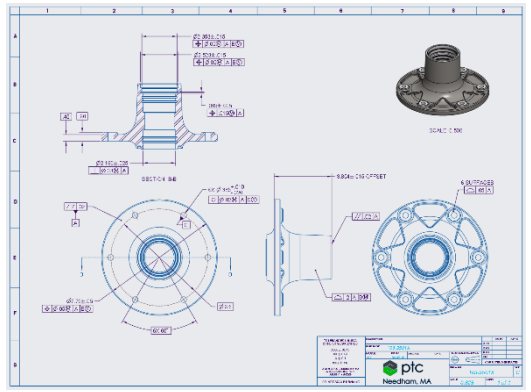
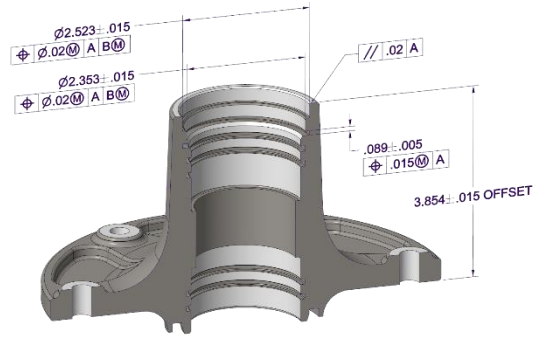


Faster Product Development



Fully annotated drawing



Minimally annotated model

Streamlining configuration & change management

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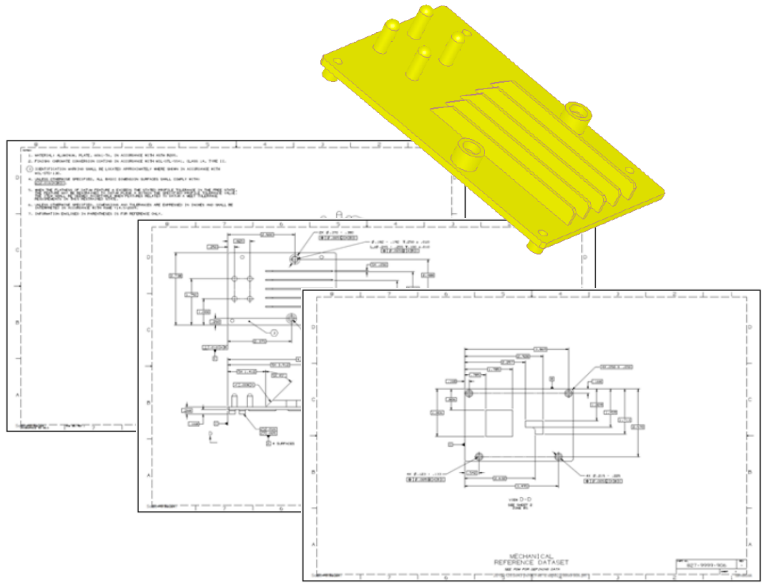
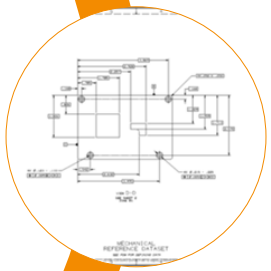


3D Annotated Model

Fully semantic, correctly applied GD&T



Faster Manufacturing & Inspection

Streamlined CMM programming

- MBD = **1.7 hours**
- 2D Drawing = **7.4 hours**
- As tested on a specific dataset

Data from: *Investigating the Impact of Standards-Based Interoperability for Design to Manufacturing and Quality in the Supply Chain*

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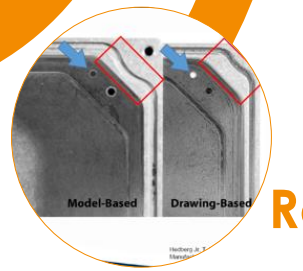

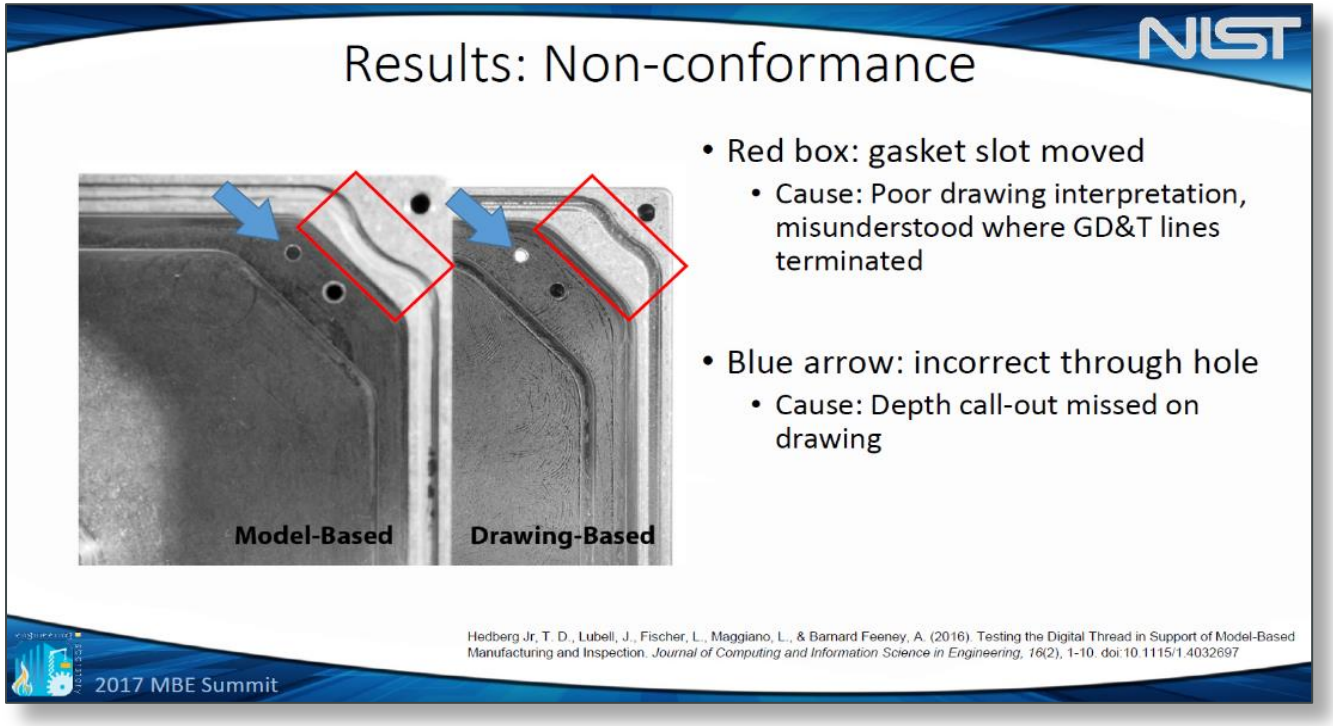

Example from: *Testing the Digital Thread in Support of Model-Based Manufacturing and Inspection*

Reduced Errors and Non-conformances

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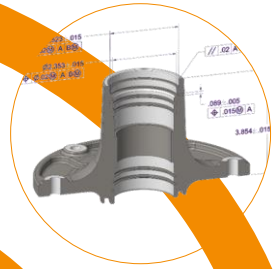
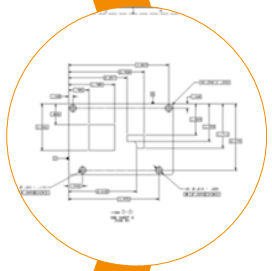


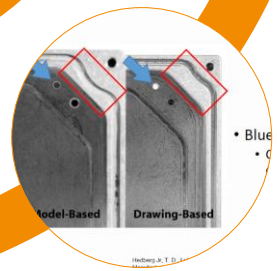
Faster Product Development

Simplify complexity



Faster Manufacturing and Inspection

Save time ,especially downstream



Reduced Errors and Non-conformances

Eliminate ambiguity & reduce errors

COMMON MBD CHALLENGES

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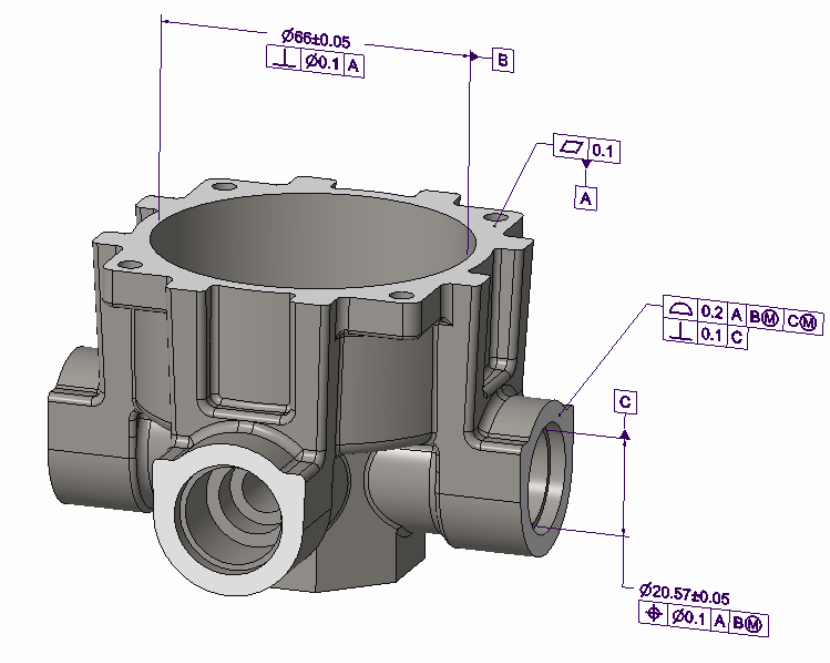
- Resistance to process change (org culture)

COMMON MBD CHALLENGES

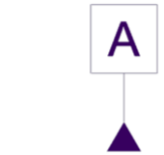
- 3D annotation tools are cumbersome and not as efficient as 2D drawing
  - ***Streamlined annotation workflows***
- CAD tools don't support standards well
  - ***Improved ASME and ISO standard support***
- Native CAD and neutral formats don't support full semantic definition
  - ***Full semantic definition in native Creo***
  - ***Semantic PMI support with STEP AP242***
- GD&T knowledge is lacking
  - ***GD&T Advisor to guide and educate user***
- Resistance to process change (org culture)
  - ***Familiar 2D printed output to supplement the model***

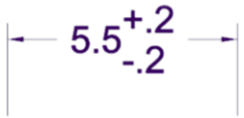
CREO 4.0 MBD IMPROVEMENTS OVERVIEW

CREO 4.0 AND BEYOND– NEW MBD CAPABILITIES



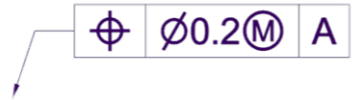
Modernized Annotations





Modernized Key Annotation Types for GD&T

Automatic naming for datums
Syntax checking
Manage reference to geometry
Built-in standard target areas
ASME & ISO text symbols



User Experience Enhancements

Consistent placement and editing workflow
Dynamic preview
Placement options
Contextual properties ribbon

Combination State Enhancements

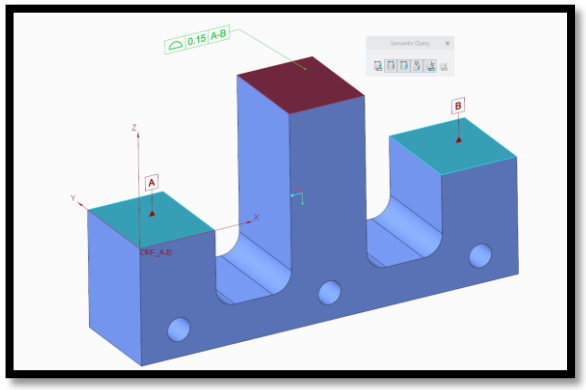
Appearance States
Supplemental Geometry handling
Combination State publishing
Combination State printing

Improved annotation workflows

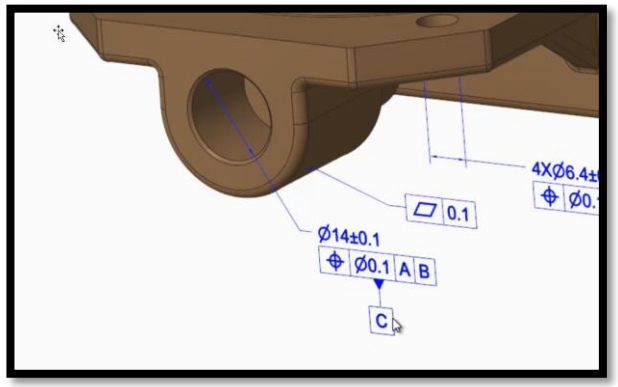
Standards and productivity enhancements

CREO 4.0 MOR ENHANCEMENTS FOR MBD

- Semantic Query – M020



- Semantic PMI support for STEP AP242 – M020
- New Datum Feature Symbol attachment option – M030



- Leveraging existing annotations in GD&T Advisor – M040

Future looking information subject to change without notice

CREO 5.0
CORE MBD IMPROVEMENTS

MINI TOOLBAR

MBD

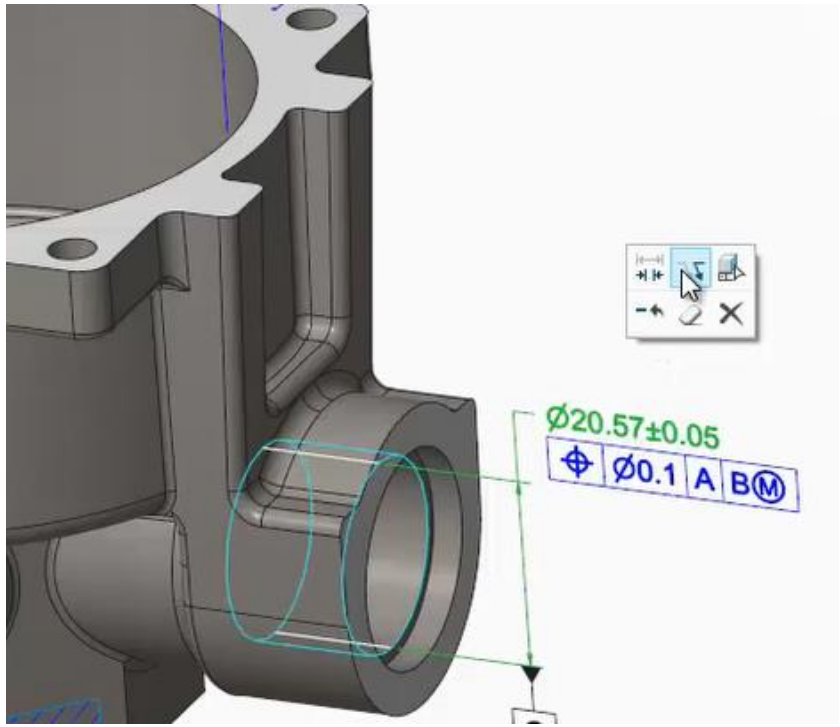
- Dimension
- Annotation

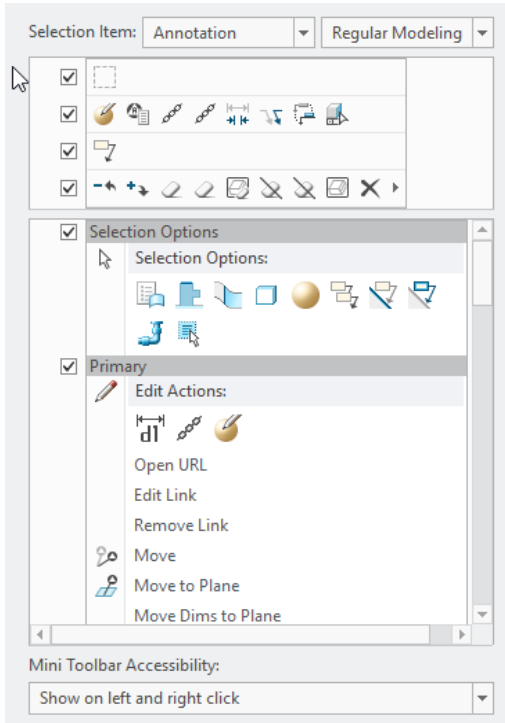
Benefits

- Faster interaction with the design
- Increased selection and command access efficiency
- Less mouse travel
- Focus stays on design, not UI

Mini Toolbar for Annotations

- Intuitive context-sensitive command access for Annotations
- In Model-Based Definition and Detailed Drawings
- WYSIWYG customization





MBD_MINITOOLBAR_3D_ANNO_S (Active) - Creo Parametric 5.0

File | Model | Analysis | Annotate | Tools | View | Flexible Modeling | Applications

New | Update | Combination States

FLAT TO SCREEN | FRONT | TOP | RIGHT | BACK | BOTTOM | LEFT | Active Annotation Plane | Annotation Planes

Show Annotations | Add to State | Remove from State | Erase | Manage Annotations

Dimension | Geometric Tolerance | Datum Feature Symbol | Datum Target | Ordinate Driven Dimension | Note | Surface Finish | Symbol | Annotations

Annotation Feature | Datum Target Annotation Feature | Annotation Features

Semantic Query | Query

Plane | Axis | Sketch | Datums

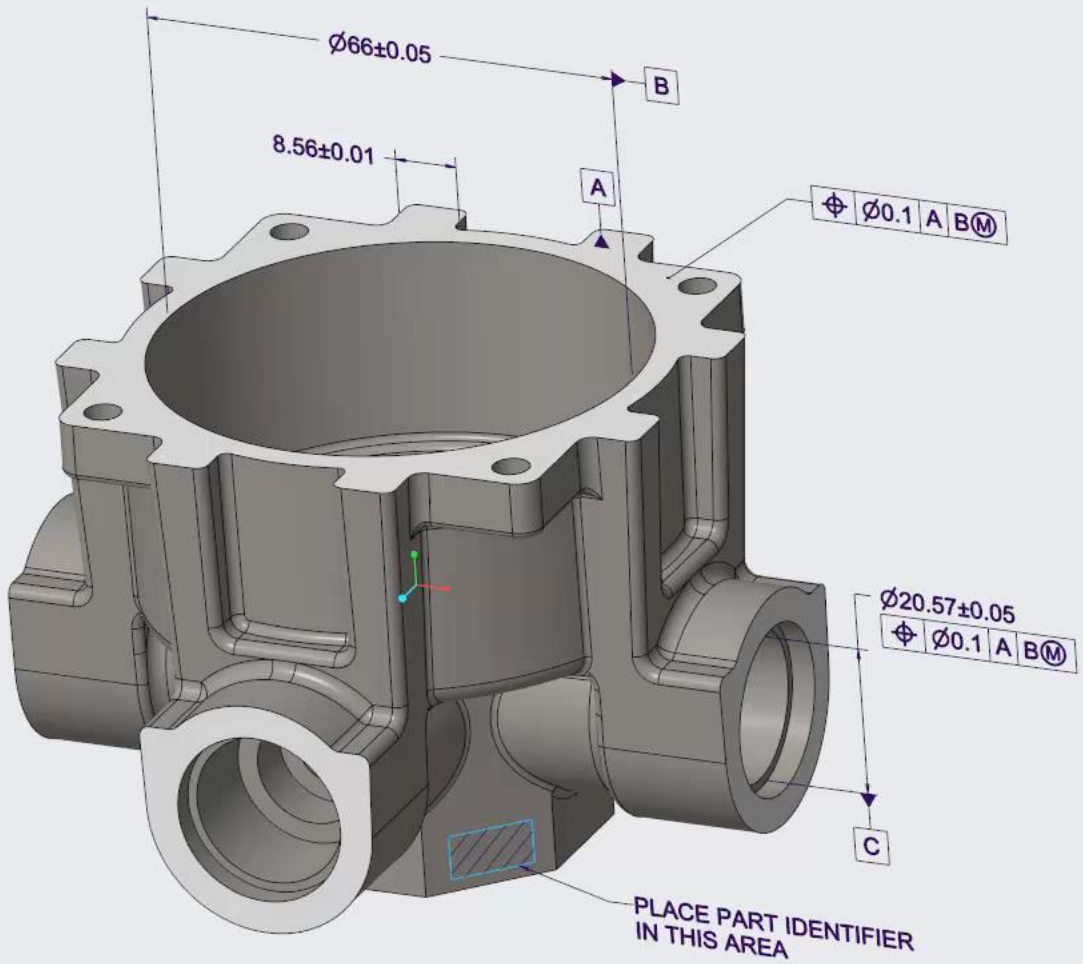
Model Tree | Folder Browser | Favorites

Detail Tree

- MBD_1
- DRV_DIM_D9
- DRV_DIM_D61
- ad392
- gp10
- gp13
- Note_27
- Line
- Line
- Line
- Line
- Datum_Tag_B
- Datum_Tag_C
- Datum_Tag_A

Model Tree

- MBD_MINITOOLBAR_3D_ANNO_S.PRT
- Materials
- Annotations
  - Note_27
  - gp10
  - gp13
  - gp14
  - ad392
  - Datum_Tag_B
  - Datum_Tag_C
  - Datum_Tag_A
- RIGHT
- TOP
- FRONT
- PRT_CSYS_DEF
- Y_AXIS
- Revolve 1
- Extrude 1
- Pattern 1 of LOCAL_GROUP
- Group LOCAL_GROUP_8



X.X +-0.1
X.XX +-0.01
X.XXX +-0.001
ANG +-0.5

Mbd_1 | Mbd_2 | Mbd_3 | Default All *

• Checked feature types will be displayed in the model tree.

Geometry

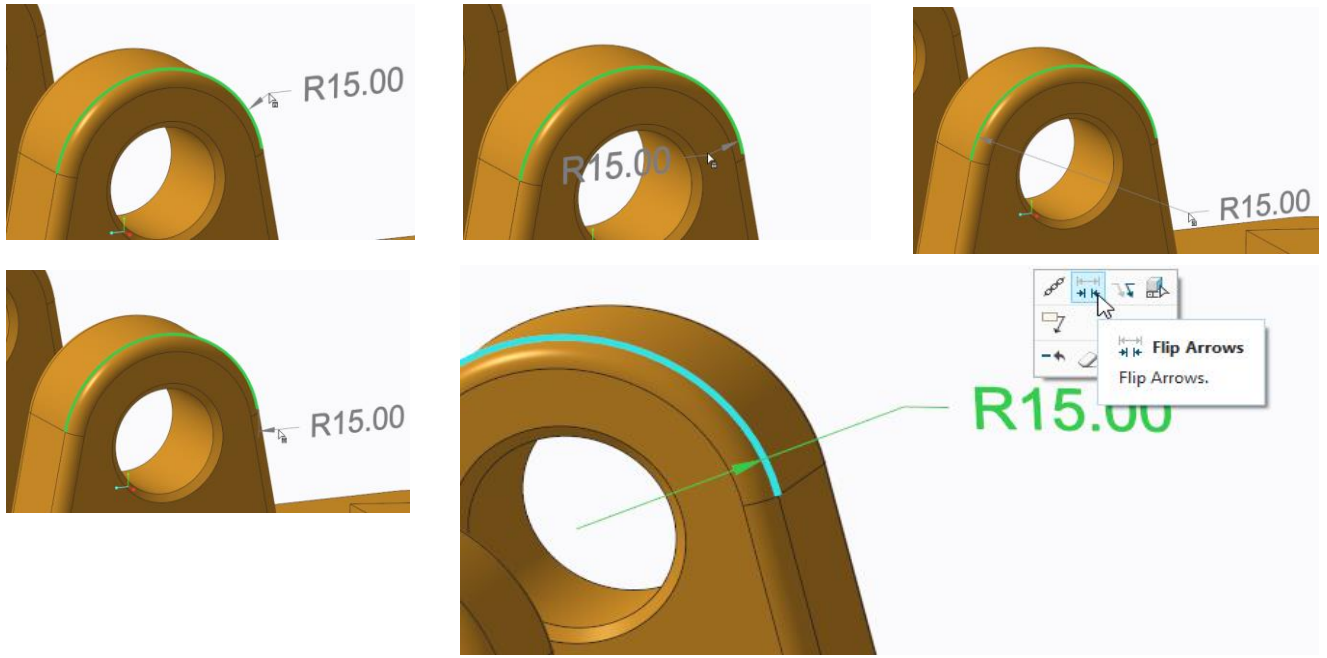
RADIAL DIMENSION: USER EXPERIENCE

Benefits

- Faster, easier and more intuitive definition of the look of radial dimension during their creation

Radial Dimensions Placement Enhancement

- Better default arrow states for radial dimensions
  - Evaluated depending on cursor position
  - More visual and predictive arrow states during creation of radial dimensions
  - Flexible flip control workflows for arrow states



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ANNOT_PLANE1

Annotation Planes

Active Annotation Plane

Show Annotations | Add to State | Remove from State | Erase

Manage Annotations

Dimension | Geometric Tolerance | Datum Feature Symbol | Datum Target | Ordinate Driven Dimension | Note | Surface Finish | Symbol

Annotations

Annotation Feature | Datum Target Annotation Feature

Annotation Features

Semantic Query

Query

Plane | Axis | Sketch

Datums

Model Tree | Folder Browser | Favorites

Detail Tree

MBD1

Model Tree

MBD_RADIAL_DIMS.PRT

Annotations

ad151

ad154

ad155

RIGHT

TOP

FRONT

PRT_CSYS_DEF

Extrude 1

Round 1

Group LOCAL_GROUP

Mirror 1

Sketch 1

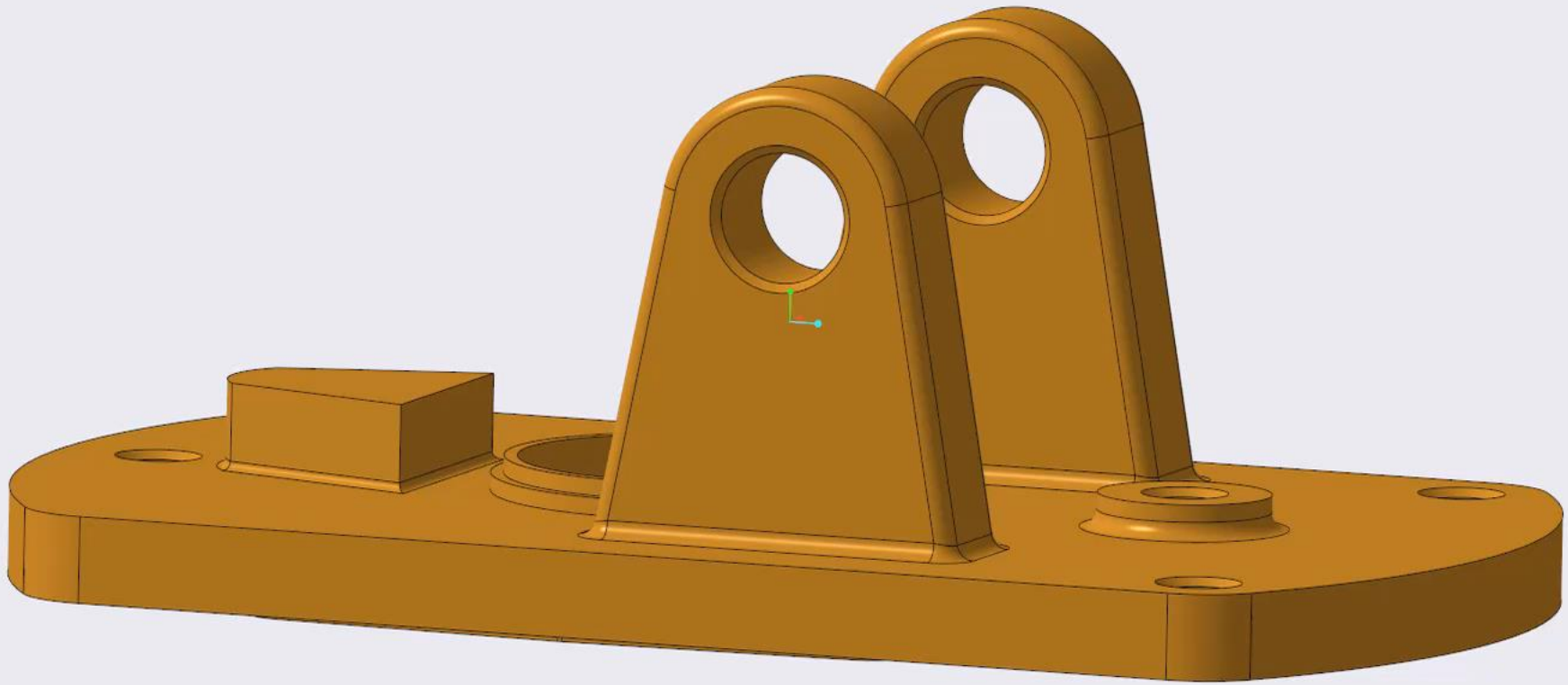
Extrude 4

Round 4

Round 5

Extrude 3

Extrude 5



X.X +-0.1
X.XX +-0.01
X.XXX +-0.001
ANG +-0.5

Cont_0001 | Mbd1 | Mbd2 | Mbd_3 | Default All *

Geometry

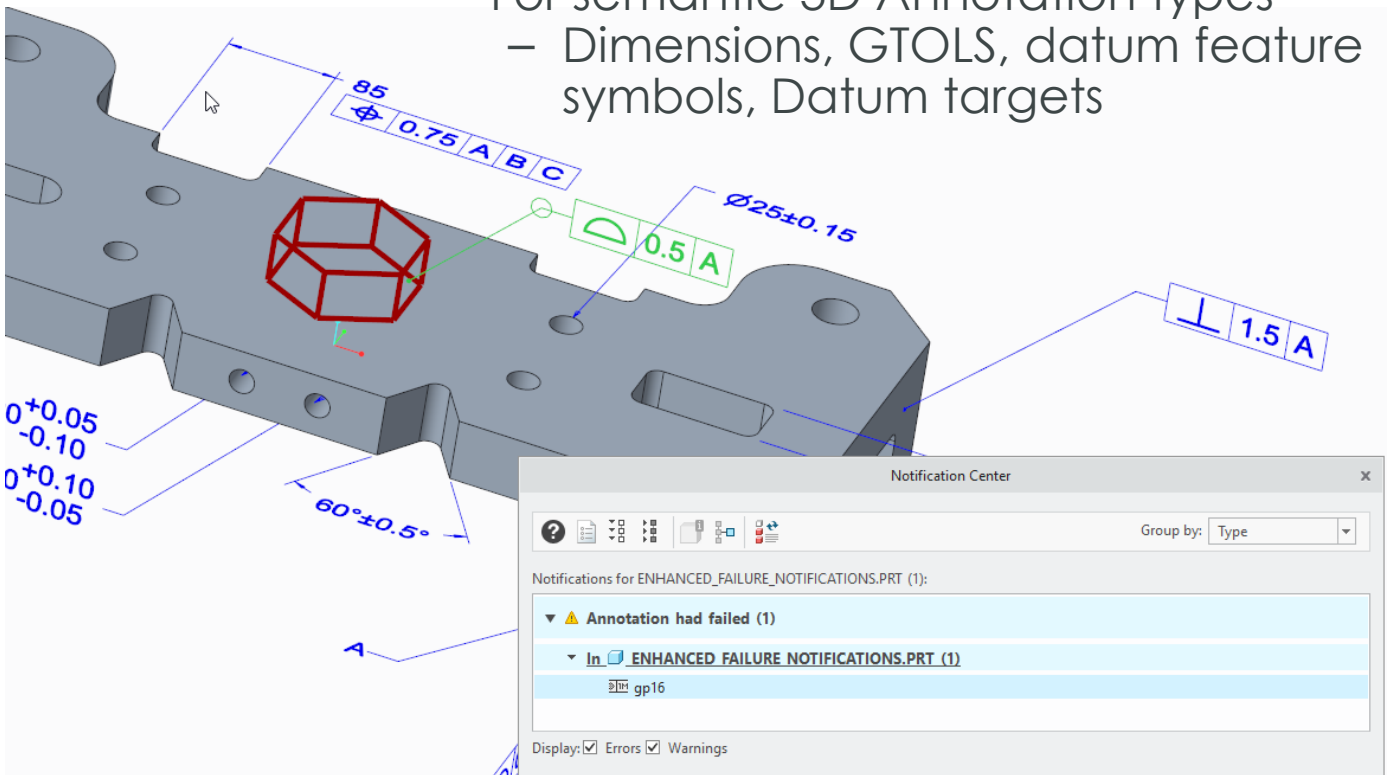
FAILURE NOTIFICATIONS FOR 3D ANNOTATIONS

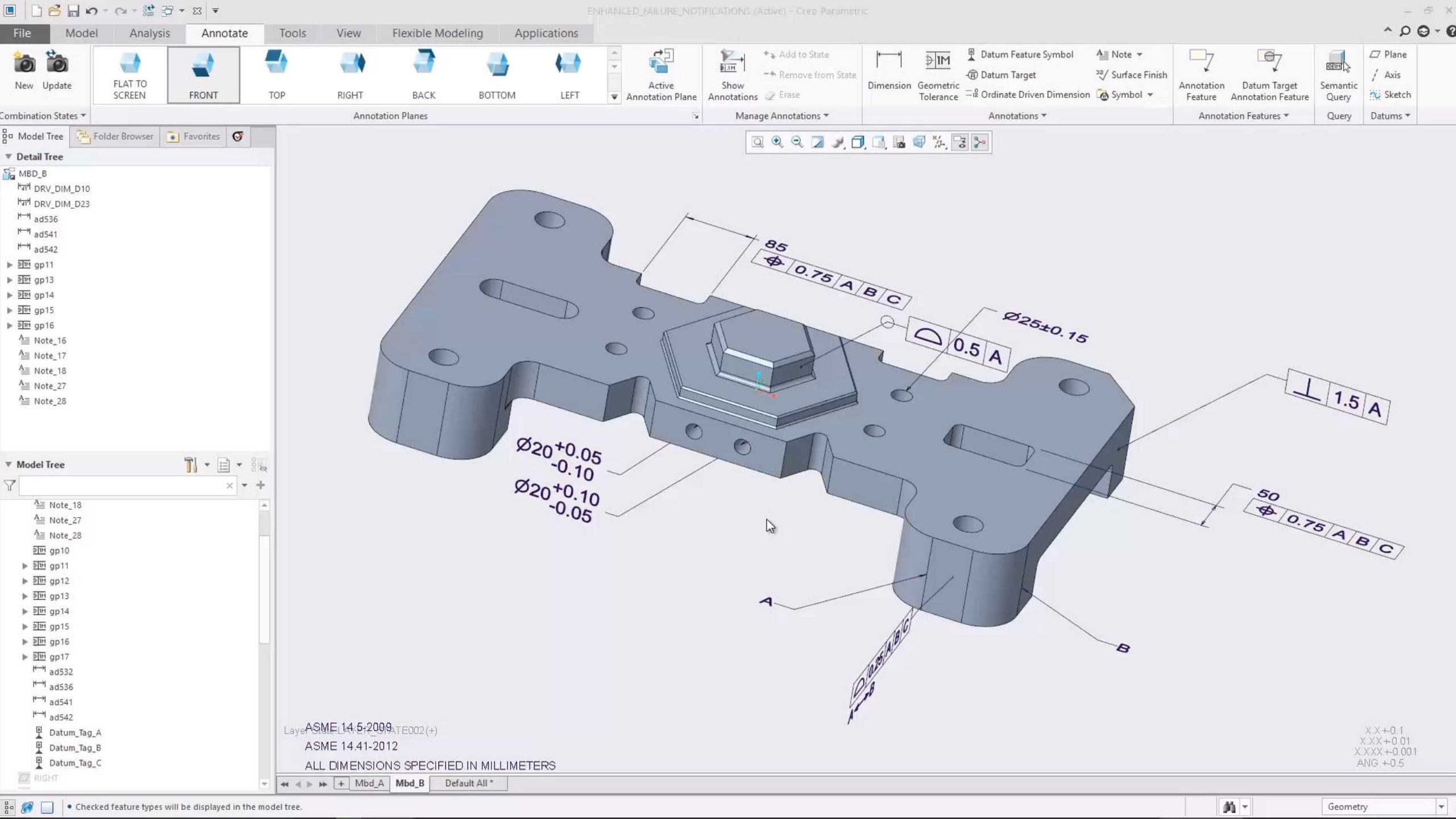
Benefits

- Identify and diagnose failing 3D Annotations and missing references faster through
  - Improved graphical display/highlighting
  - Enhanced references setup & reporting options

Improved Failure Notifications Display

- Improved failing annotation display in graphics screen, Notification Center, Model tree, Detail tree
- Failing annotation reference highlighting
  - According to severity
  - Strong vs weak references
    - For semantic 3D Annotation types
      - Dimensions, GTOLS, datum feature symbols, Datum targets




ENHANCED_FAILURE_NOTIFICATIONS (Active) - Creo Parametric
File
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New
Update
Combination States
FLAT TO SCREEN
FRONT
TOP
RIGHT
BACK
BOTTOM
LEFT
Active Annotation Plane
Annotation Planes
Show Annotations
Add to State
Remove from State
Erase
Manage Annotations
Dimension
Geometric Tolerance
Datum Feature Symbol
Datum Target
Ordinate Driven Dimension
Note
Surface Finish
Symbol
Annotations
Annotation Feature
Datum Target Annotation Feature
Annotation Features
Semantic Query
Query
Plane
Axis
Sketch
Datums
Model Tree
Folder Browser
Favorites
Detail Tree
MBD_B
DRV_DIM_D10
DRV_DIM_D23
ad536
ad541
ad542
gp11
gp13
gp14
gp15
gp16
Note_16
Note_17
Note_18
Note_27
Note_28
Model Tree
Note_18
Note_27
Note_28
gp10
gp11
gp12
gp13
gp14
gp15
gp16
gp17
ad532
ad536
ad541
ad542
Datum_Tag_A
Datum_Tag_B
Datum_Tag_C
RIGHT
85
0.75 A B C
Ø25±0.15
0.5 A
1.5 A
50
0.75 A B C
Ø20 +0.05 -0.10
Ø20 +0.10 -0.05
A
B
ASME 14.5-2009
ASME 14.41-2012
ALL DIMENSIONS SPECIFIED IN MILLIMETERS
X.X +-0.1
X.XX +-0.01
X.XXX +-0.001
ANG +-0.5
Mbd_A
Mbd_B
Default All *
Checked feature types will be displayed in the model tree.
Geometry

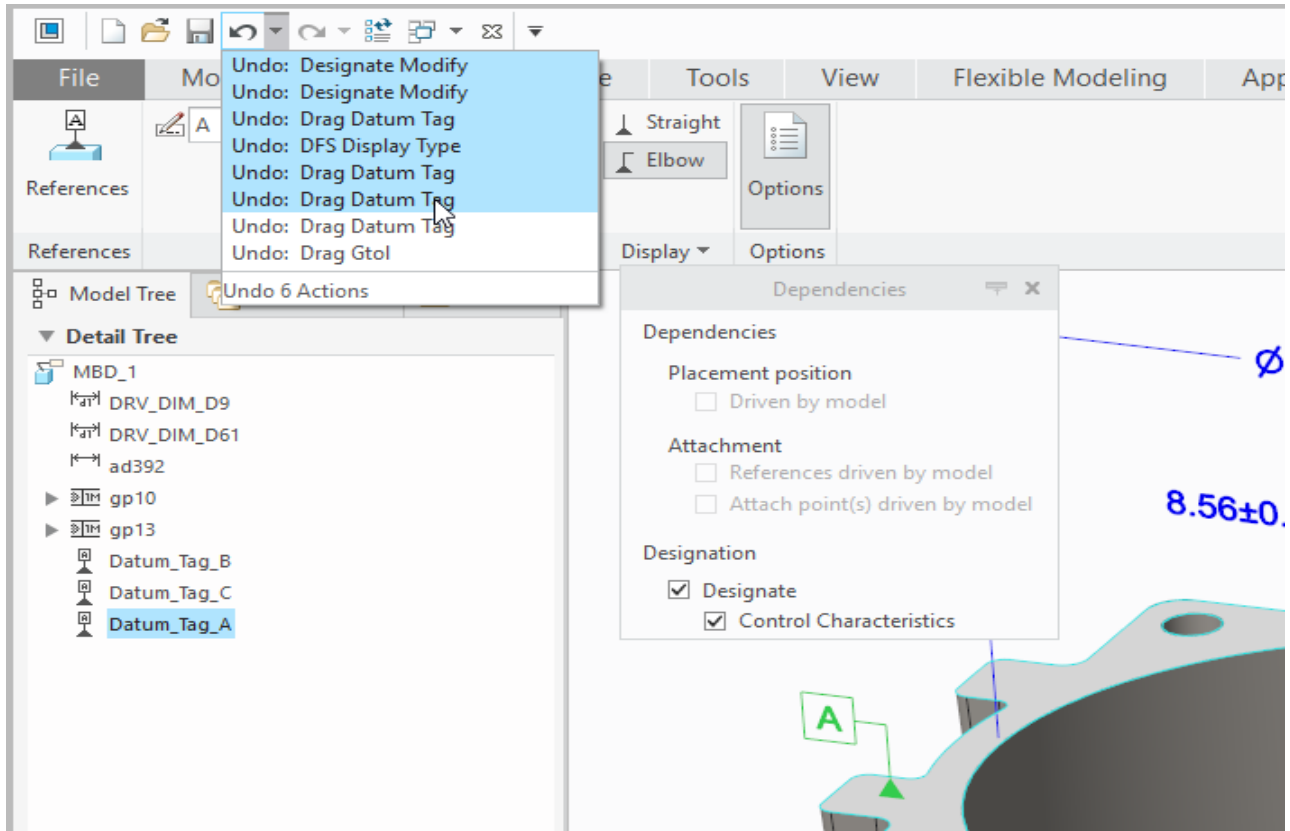
UNDO/REDO

Benefits

- More efficient and reliable workflow to revert to previous work states

Improved Undo/Redo Support

- For Annotation creation and modification
- In **Model-Based-Definition** and Detailed Drawing workflows
- For modernized annotations (dims, gtol, dfs, dt) of all types: **3D**, 2D, 3D shown in 2D, 3D shown in 2D with broken associativity)



MBD_UNDO_REDO (Active) - Creo Parametric 5.0

File | Model | Analysis | Annotate | Tools | View | Flexible Modeling | Applications

New | Update | Combination States

FLAT TO SCREEN | FRONT | TOP | RIGHT | BACK | BOTTOM | LEFT | Active Annotation Plane | Annotation Planes

Show Annotations | Add to State | Remove from State | Erase | Manage Annotations

Dimension | Geometric Tolerance | Datum Feature Symbol | Datum Target | Ordinate Driven Dimension | Note | Surface Finish | Symbol | Annotations

Annotation Feature | Datum Target Annotation Feature | Annotation Features

Semantic Query | Query

Plane | Axis | Sketch | Datums

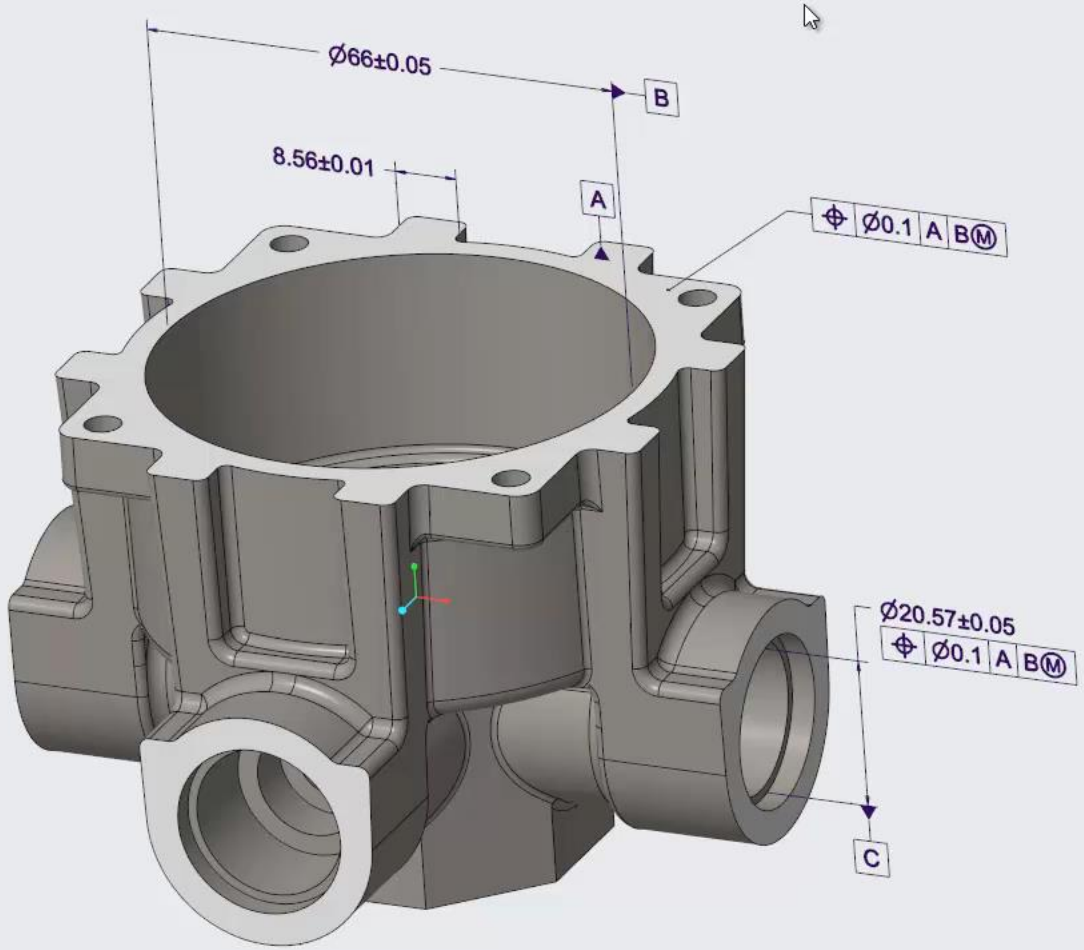
Model Tree | Folder Browser | Favorites

Detail Tree

- MBD_1
- DRV_DIM_D9
- DRV_DIM_D61
- ad392
- gp10
- gp13
- Datum_Tag_B
- Datum_Tag_C
- Datum_Tag_A

Model Tree

- Materials
- Annotations
  - gp10
  - gp13
  - gp14
  - ad392
  - Datum_Tag_B
  - Datum_Tag_C
  - Datum_Tag_A
- RIGHT
- TOP
- FRONT
- PRT_CSYS_DEF
- Y_AXIS
- Revolve 1
- Extrude 1
- Pattern 1 of LOCAL GROUP



X.X +-0.1
X.XX +-0.01
X.XXX +-0.001
ANG +-0.5

Mbd_1 | Mbd_2 | Mbd_3 | Default All *

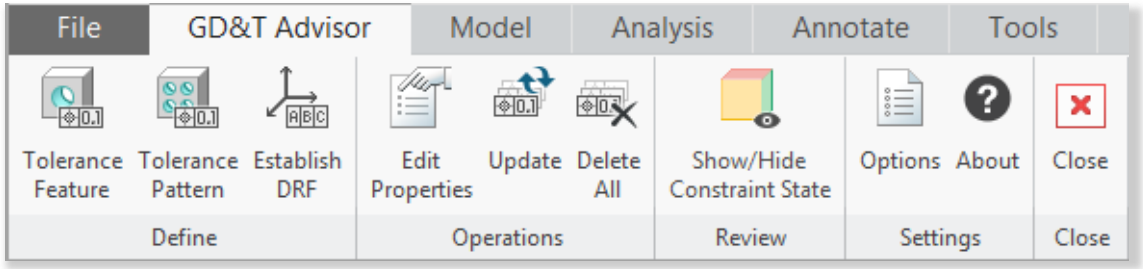
Geometry

CREO 5.0 GD&T ADVISOR

GD&T ADVISOR OVERVIEW

Fast, Easy, Accurate GD&T Creation

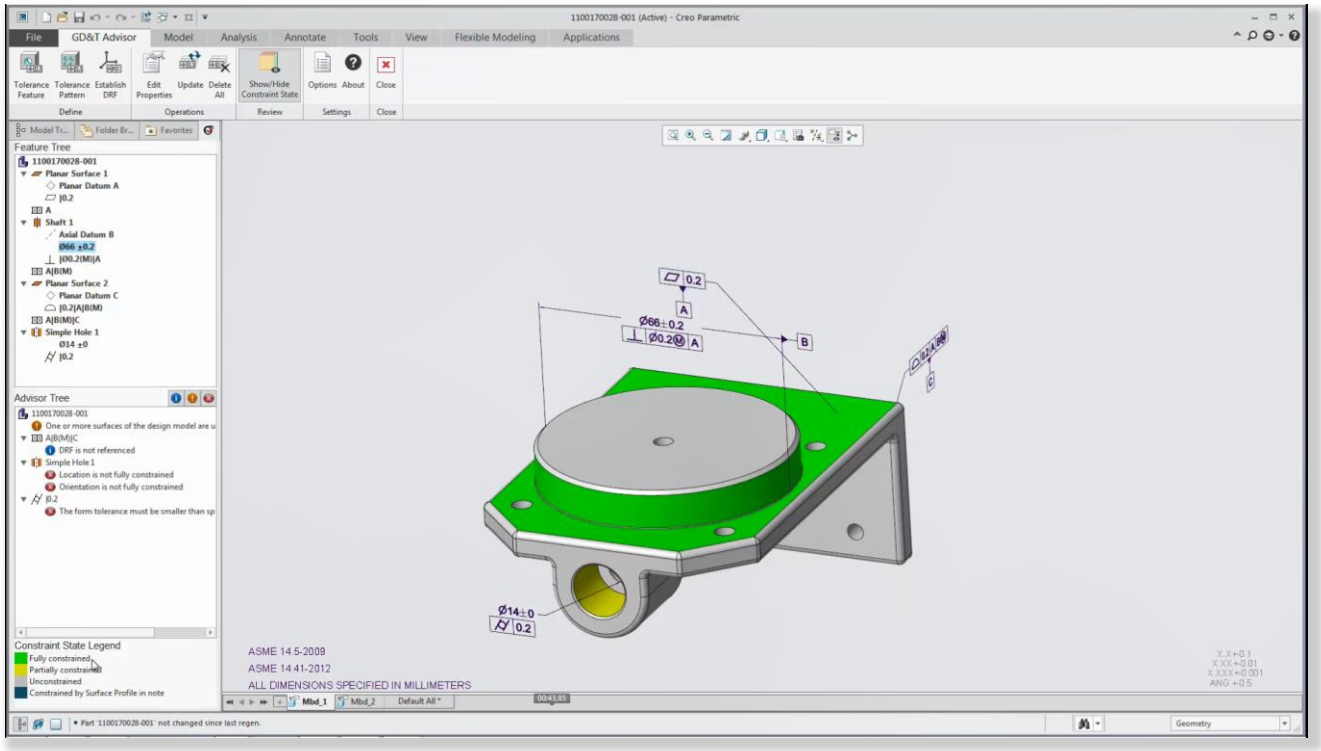
- Creation
  - Feature-centric workflow guides the user
  - Fast creation of syntactically correct annotations
- Validation
  - Complies with ASME and ISO standards
  - Fully constrains the model geometry
- Education
  - Extensive help content
  - Advisor messages provide feedback on status of the GD&T applied to the model

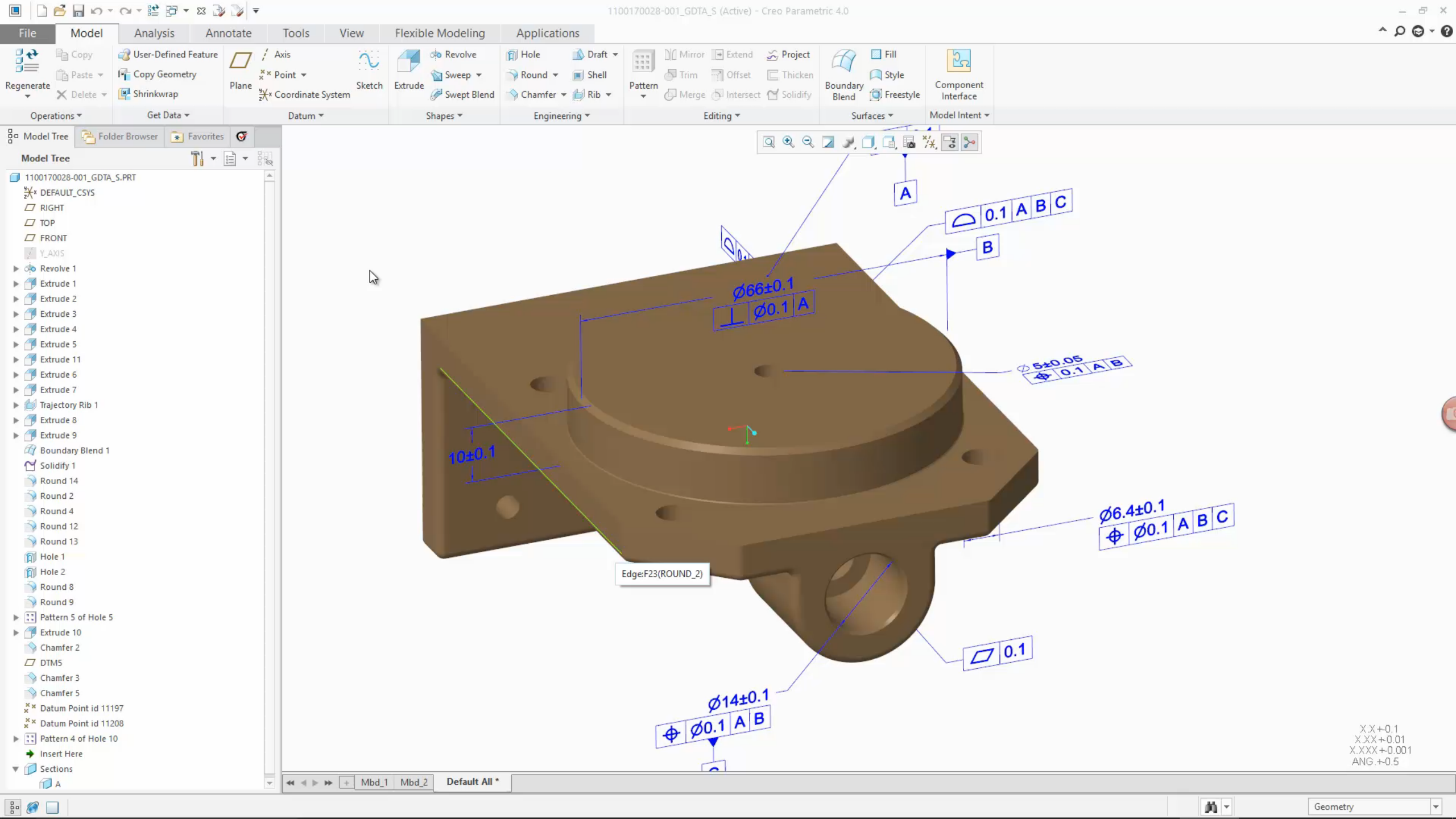


ENHANCED GD&T ADVISOR INTEGRATION

Leveraging Existing Annotations

- Analysis and reuse of existing annotations created in Creo
  - Supported with Creo 5.0 and Creo 4.0 M040
  - Licensed with new Enterprise license
  - New SMB license for GD&T Advisor (excludes reuse of existing annotations)




1100170028-001_GDTA_S (Active) - Creo Parametric 4.0
File
Model
Analysis
Annotate
Tools
View
Flexible Modeling
Applications
Regenerate
Copy
Paste
Delete
User-Defined Feature
Copy Geometry
Shrinkwrap
Plane
Axis
Point
Coordinate System
Sketch
Extrude
Revolve
Sweep
Swept Blend
Hole
Round
Chamfer
Draft
Shell
Rib
Pattern
Mirror
Extend
Project
Trim
Offset
Thicken
Merge
Intersect
Solidify
Boundary Blend
Fill
Style
Freestyle
Component Interface
Operations
Get Data
Datum
Shapes
Engineering
Editing
Surfaces
Model Intent
Model Tree
Folder Browser
Favorites
Model Tree
1100170028-001_GDTA_S.PRT
DEFAULT_CSYS
RIGHT
TOP
FRONT
Y_AXIS
Revolve 1
Extrude 1
Extrude 2
Extrude 3
Extrude 4
Extrude 5
Extrude 11
Extrude 6
Extrude 7
Trajectory Rib 1
Extrude 8
Extrude 9
Boundary Blend 1
Solidify 1
Round 14
Round 2
Round 4
Round 12
Round 13
Hole 1
Hole 2
Round 8
Round 9
Pattern 5 of Hole 5
Extrude 10
Chamfer 2
DTM5
Chamfer 3
Chamfer 5
Datum Point id 11197
Datum Point id 11208
Pattern 4 of Hole 10
Insert Here
Sections
A
A
0.1 A B C
B
Ø66±0.1
Ø0.1 A
Ø5±0.05
0.1 A B
10±0.1
Edge:F23(ROUND_2)
Ø6.4±0.1
Ø0.1 A B C
0.1
Ø14±0.1
Ø0.1 A B
Mbd_1
Mbd_2
Default All *
X.X +-0.1
X.XX +-0.01
X.XXX +-0.001
ANG. +-0.5
Geometry

CREO 5.0 2D DETAILING ENHANCEMENTS

MINI TOOLBAR

Drawing

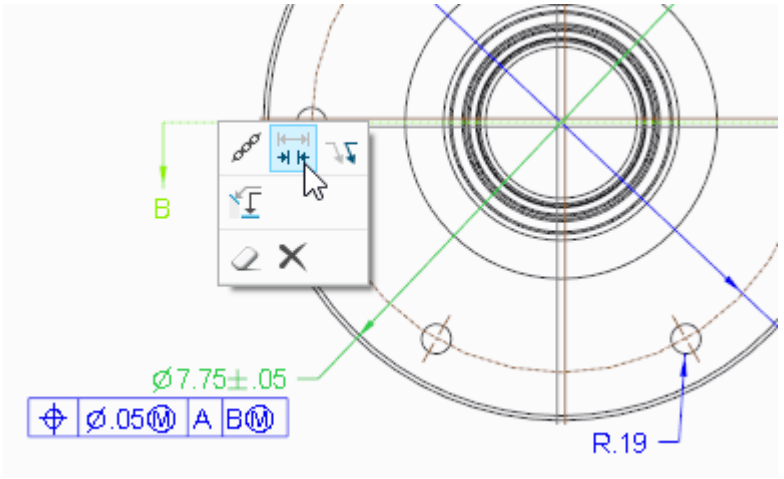
- Dimension
- Annotation
- Drawing View
- Drawing
- Drafting

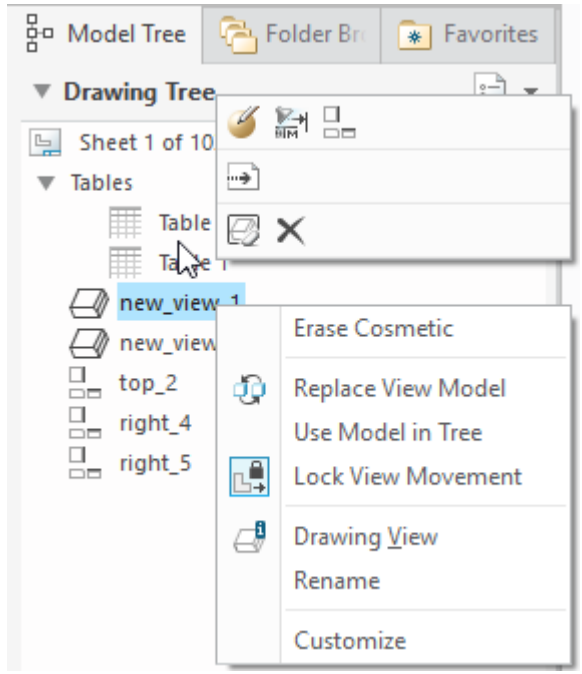
Benefits

- Faster interaction with the design
- Increased selection and command access efficiency
- Less mouse travel
- Focus stays on design, not UI

Mini Toolbar in Detailed Drawings

- Intuitive context-sensitive command access for 2D Annotations and Drawing objects
- WYSIWYG customization





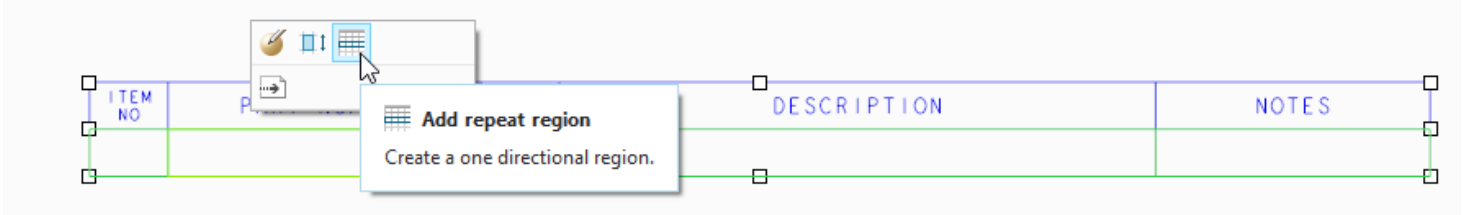


Table | Table from File | Hole Table | Select Table | Save Table | Move to Sheet | Properties | Add Column | Add Row | Height and Width | Line Display | Merge Cells | Unmerge Cells | Repeat Region | Update Tables | Delete Contents | Switch Symbols | Create Balloons | Cleanup Balloons | Create Ref Balloons | Merge Balloons | Split Balloons | Detach Balloons | Redistribute Quantity | Text Style | Line Style | Arrow Style | Repeat Last Format | Hyperlink

Table | Rows & Columns | Data | Balloons | Format

Model Tree | Folder Browser | Favorites

Drawing Tree

- Sheet 1 of 103-9501X.DRW
- Tables
  - Table 1
  - Table 2
  - Table 3
  - Table 4
  - Table 1
- new_view_1
- new_view_3
- top_2
- right_4
- right_5

Model Tree

- 103-9501X.PRT
- Materials
- SIDE
- TOP
- FRONT
- CS0
- Protrusion id 214
- DTM1
- Extrude 9
- DTM2
- Extrude 10
- DTM3
- Extrude 11
- DTM4

Ø2.168±.025
Ø.03Ⓜ A

SECTION B-B

6X Ø.385 +.010 -.020
Ø.02Ⓜ A BⓂ

.02 A

C

B B

Ø7.75±.05
Ø.05Ⓜ A BⓂ

Ø6.500

3.854±.015 OFFSET

// .02 A

6 SURFACES
.05 A

.2 A BⓂ

ITEM NO	PART NUMBER	QTY	DESCRIPTION	NOTES

TOLERANCES UNLESS OTHERWISE SPECIFIED
.XXX ± 0.015
.XX ± 0.03
.X ± 0.1
ANG ± 1.0
GEOMETRIC DIMENSIONING & TOLERANCING PER: ASME Y14.5-2009
DO NOT SCALE DRAWING

DESCRIPTION:
PART NAME: 103-9501X
DRAWN: JDC DATE: Nov-07-16 CHECKED: DATE:

ptc Needham, MA

SCALE: 0.625 TYPE: PART NAME: 103-9501X SIZE: C

Sheet 1

General

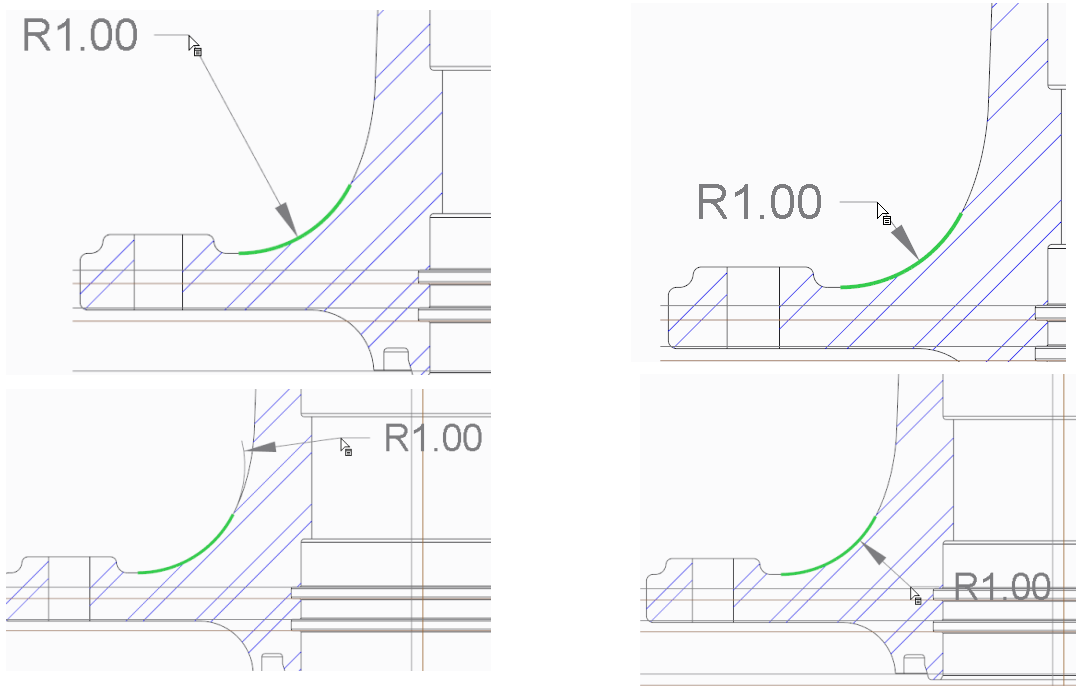
RADIAL DIMENSION CREATION: USER EXPERIENCE

Benefits

- Faster, easier and more intuitive definition of the look of radial dimension during their creation
- Reduced number of clicks / need to „flip“

Radial Dimensions Placement Enhancement

- Better default arrow states for radial dimensions
  - Evaluated depending on cursor position
  - More visual and predictive arrow states during creation of radial dimensions
  - Flexible flip control workflows for arrow states



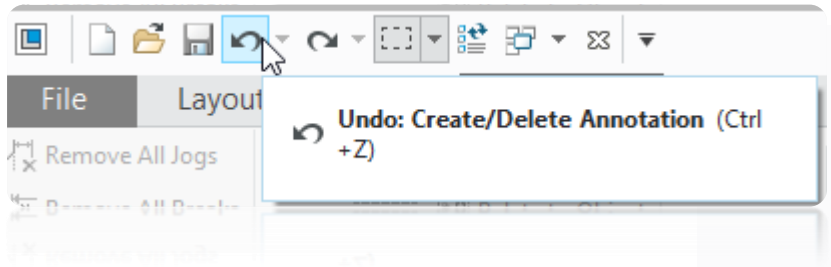
UNDO/REDO

Benefits

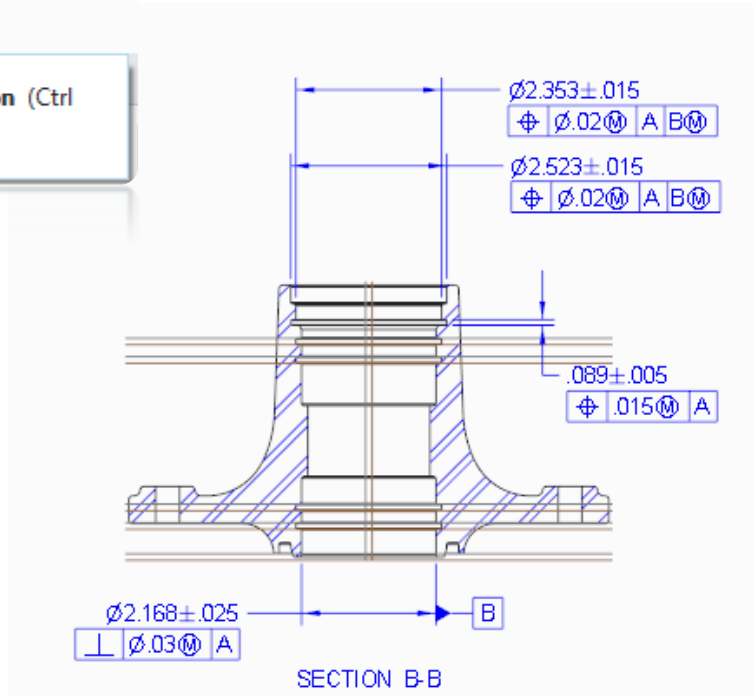
- More efficient and reliable workflow to revert to previous work states

Improved Undo/Redo Support

- For Annotation creation and modification
- In Model-Based-Definition and **Detailed Drawing workflows**
- For modernized annotations (dims, gtol, dfs, dt) of all types: 3D, **2D, 3D shown in 2D, 3D shown in 2D with broken associativity**)



Ctrl-Z



DETAILED DRAWINGS: PERFORMANCE

Benefits

- Increased productivity and efficiency when working with drawings of large assemblies

Improved Large Assembly Performance in Detailed Drawings

- Further enhanced multi-threading algorithms for operations involving hidden line removal (HLR) in Detailed Drawings
  - Load, Update View, Update Sheet, etc

- Focus on large assemblies
  - Much faster drawing retrieval
- The HLR multithreading is governed by a **detail option** '*hlr_multithreading*'

DETAILED DRAWINGS: LEADER NOTES

Benefits

- Increased ISO Standard Compliance

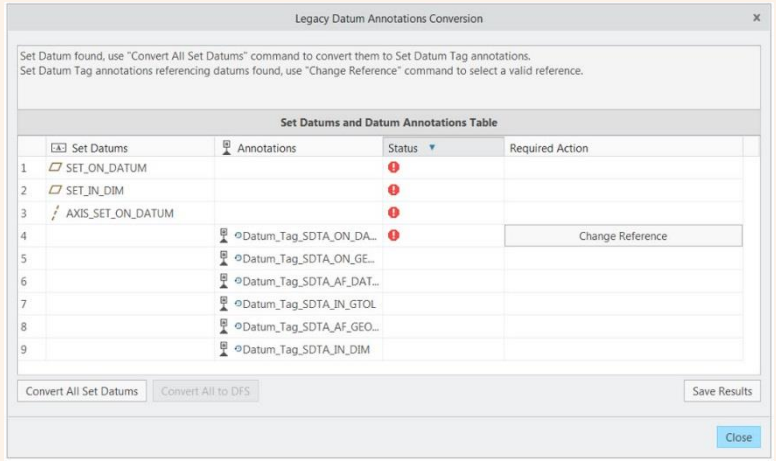
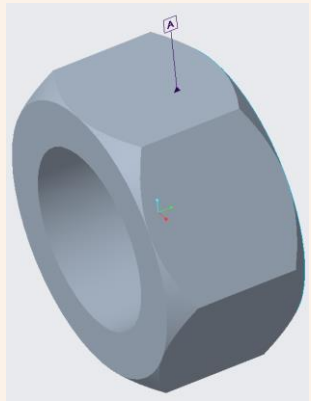
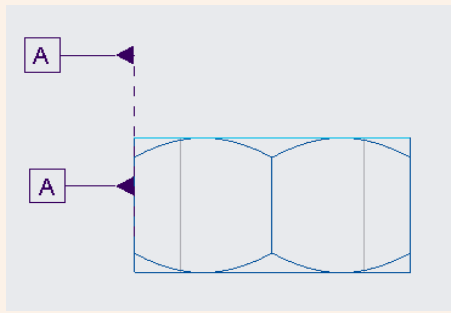
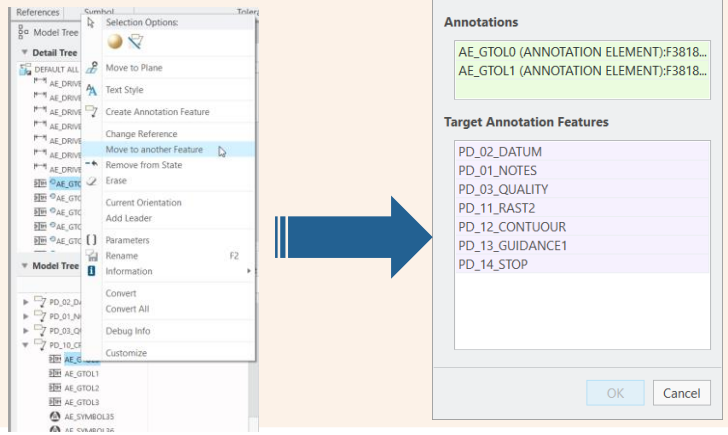
Iso-Compliant Representation of Leader Notes

- New Detail option ***default_note_leader_type*** for ISO-compliant representation of leader notes
- Values:
  - ***std_asme*** — Note annotations appear centered on the leader's elbow
  - ***std_iso*** — Note annotations appear above an extended elbow
  - Default: ***std_asme***

CREO 6.0 OUTLOOK

OUTLOOK

- Continued MBD enhancements exposed in Creo 4.0/5.0 maintenance versions and Creo 6.0

Legacy datum annotation conversion tool		Additional placement flexibility on drawings		Additional flexibility when working with annotation features	
Creo 4.0 M060 Creo 5.0.2.0	Creo 6.0.0.0	Creo 4.0 M060 Creo 5.0.2.0	Creo 6.0.0.0	Creo 4.0 M080 Creo 5.0 MOR	Creo 6.0.0.0
				Move annotations between different annotation features 	

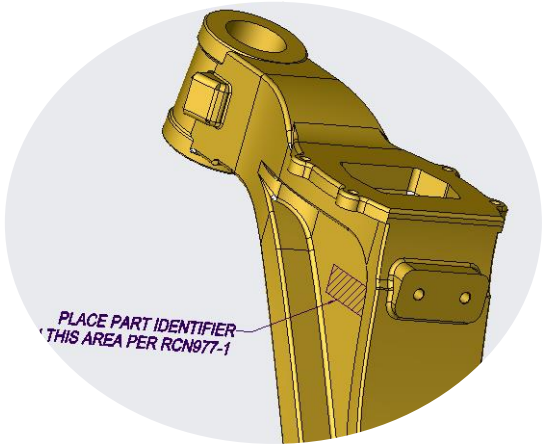
Future looking information subject to change without notice

OUTLOOK

Future looking information subject to change without notice

OUTLOOK

- Cont'd Annotation modernization
  - Notes, etc.

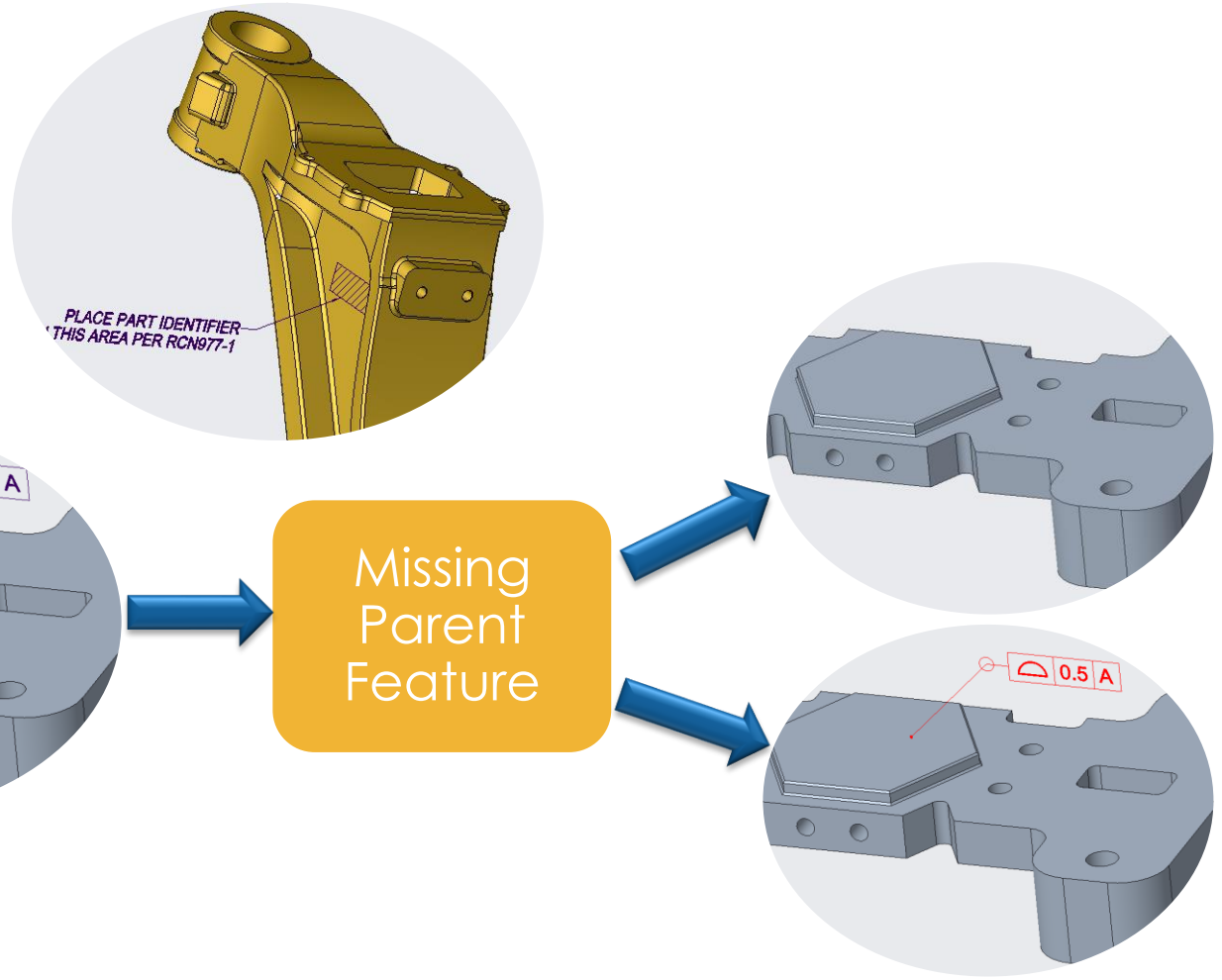


Future looking information subject to change without notice

OUTLOOK

- Cont'd Annotation modernization
  - Notes, etc.

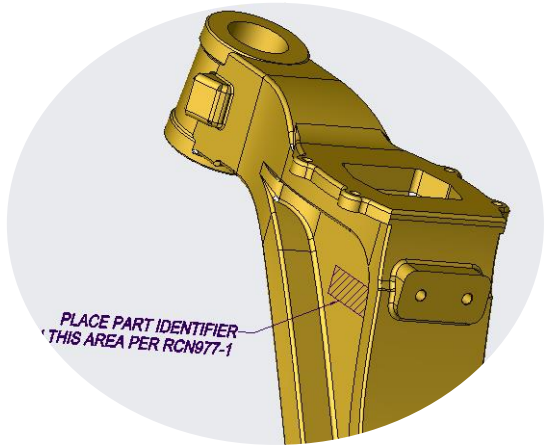
- Improved MBD/Annotation UX
  - Children handling
    - Configurable behavior
  - Reference handling
  - Propagation
  - Etc.

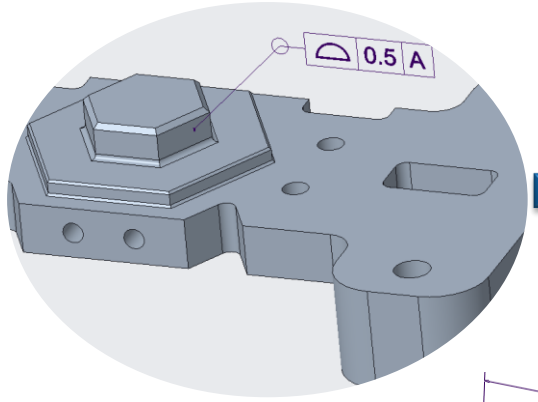


Future looking information subject to change without notice

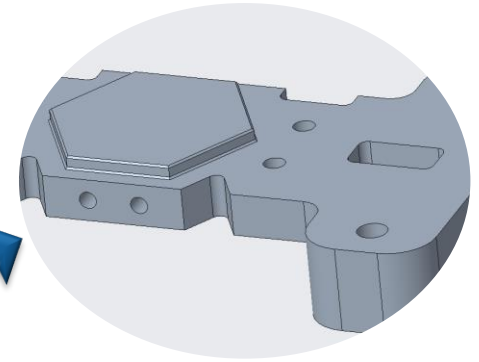
OUTLOOK

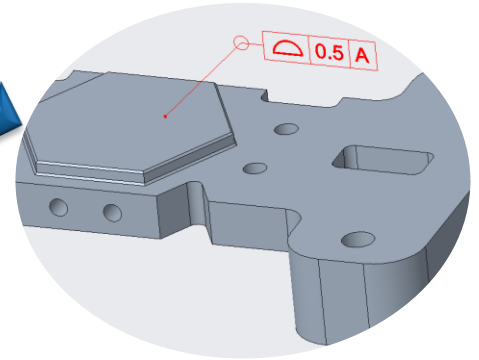
- Cont'd Annotation modernization
  - Notes, etc.
- Improved MBD/Annotation UX
  - Children handling
    - Configurable behavior
  - Reference handling
  - Propagation
  - Etc.
- MBE Related enhancements
  - Creo View: better WYSIWYG
  - Model check
  - STEP robustness

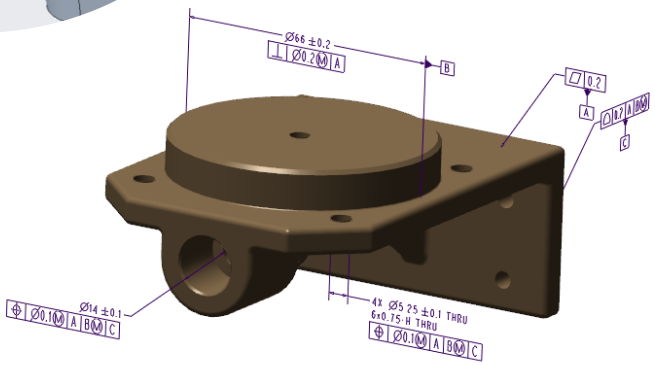




Missing Parent Feature







Future looking information subject to change without notice

QUESTIONS?


ptc