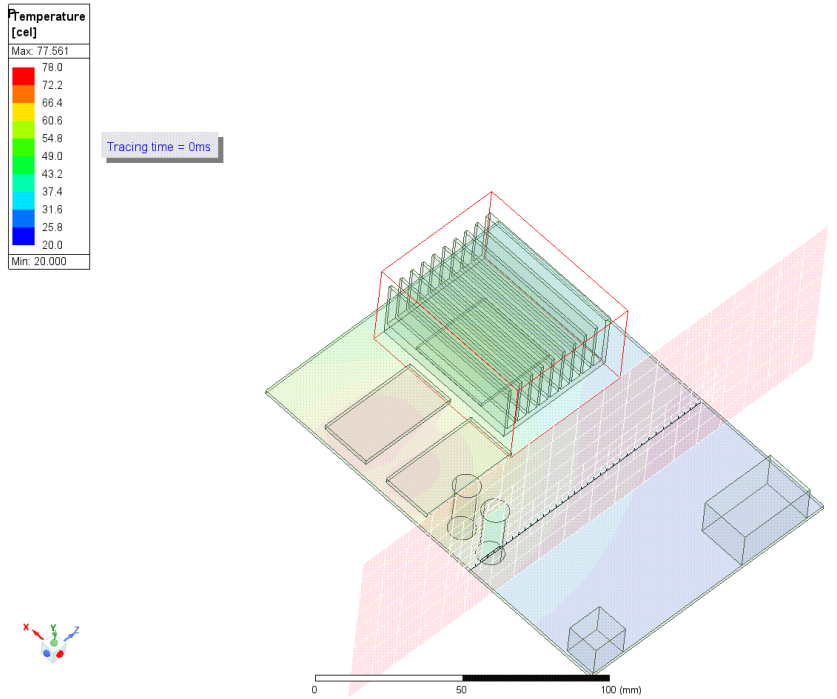
Release 2023 R1 Highlights
Thermal Integrity in AEDT

AEDT Icepak
2023R1 Update

Icepak 2023R1 Highlights

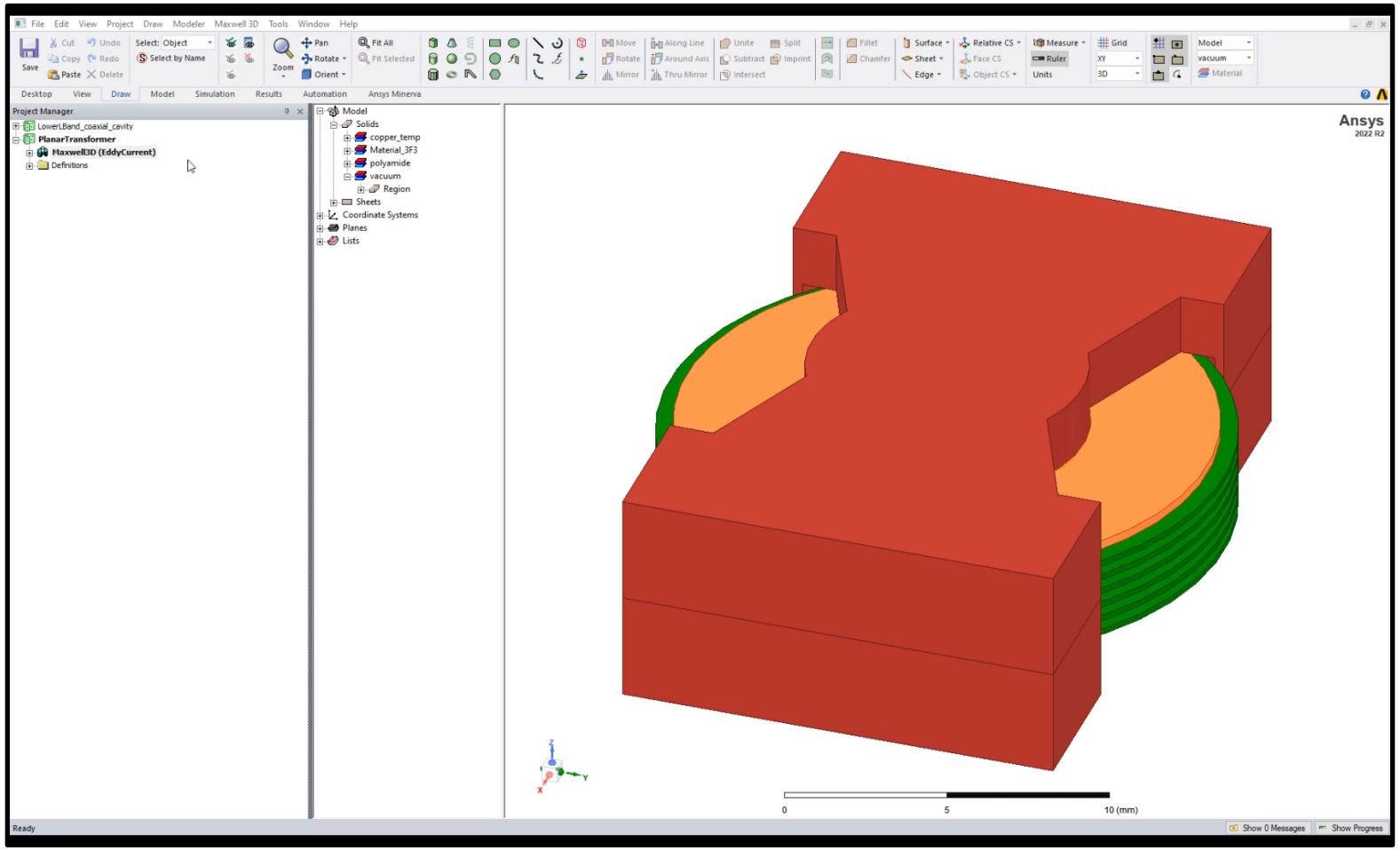
- **Automatic Export of Icepak or Mechanical Thermal Project from HFSS/Maxwell/Q3D**
  - **Commercial**
- **Icepak-Sherlock data transfer support for multiple PCBs**
- **CTM V2 support**
  - 2-way co-simulation with Redhawk SC-ET
- **Meshing Enhancements**
  - Stair-Step Meshing for 2D MLM
  - Automatic 2D MLM in Slider Meshing
- **ECXML export**
  - BC's, Native components, Mesh regions and monitor points supported
- **Post Processing**
  - Hybrid mesh support for post processing (Beta)
  - Streamline creation from a plane
- **ROM**
  - Delphi network support for BGA (Beta)
- **Migration**
  - Imports PCB with via information



Credit: Babu/Narendra

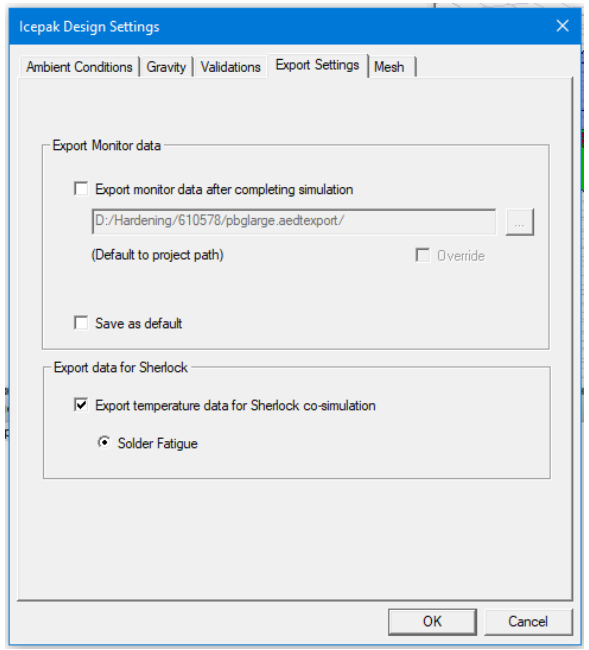
Workflow Enhancements: Thermal Design Creation

- Automated creation of linked thermal design from a source EM design
  - Icepak/Mechanical target designs created
  - Source Designs can be HFSS/Maxwell/Q3D
- Boundary conditions and excitations created automatically
  - Forced convection & Natural convection domains (Icepak)
  - Conduction setup (Mechanical)
  - Solution setup created in ready-to-run design

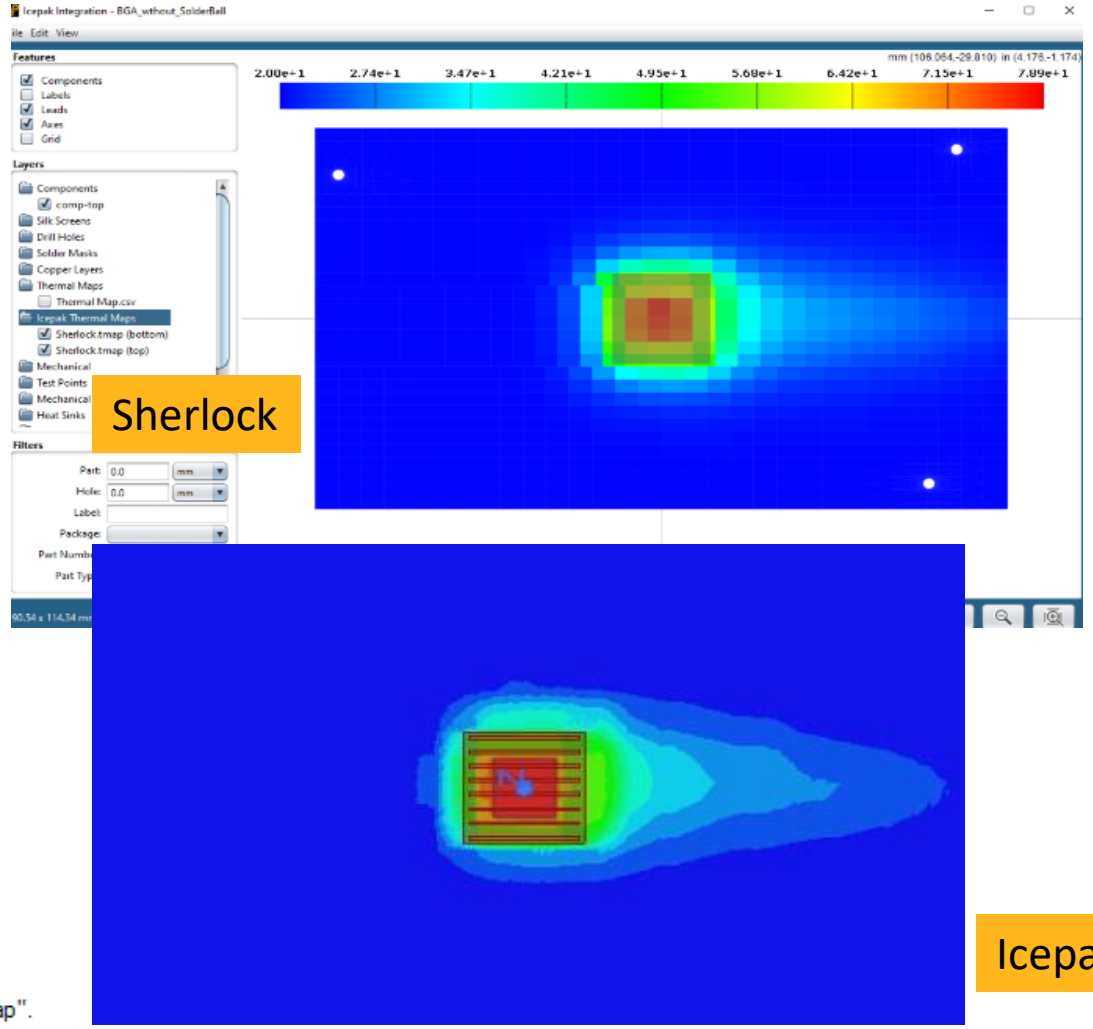


Icepak-Sherlock Data Transfer

- Enable 1-way data transfer between Icepak and Sherlock for co-simulation
- Solder Fatigue Analysis for *multiple* PCB supported
- PCB transformations supported
  - Temp data is written at the location of PCB in EDB file



Wrote Sherlock co-simulation data at "E:/Projects/Development/Sherlock/BGA_wthout_SolderBall_UpdatedModel.aedtexport/IcepakDesign1/Setup1/Sherlock.tmap". (7:52:16 AM Mar 23, 2022)



HTC Back-annotation to RHSC-ET

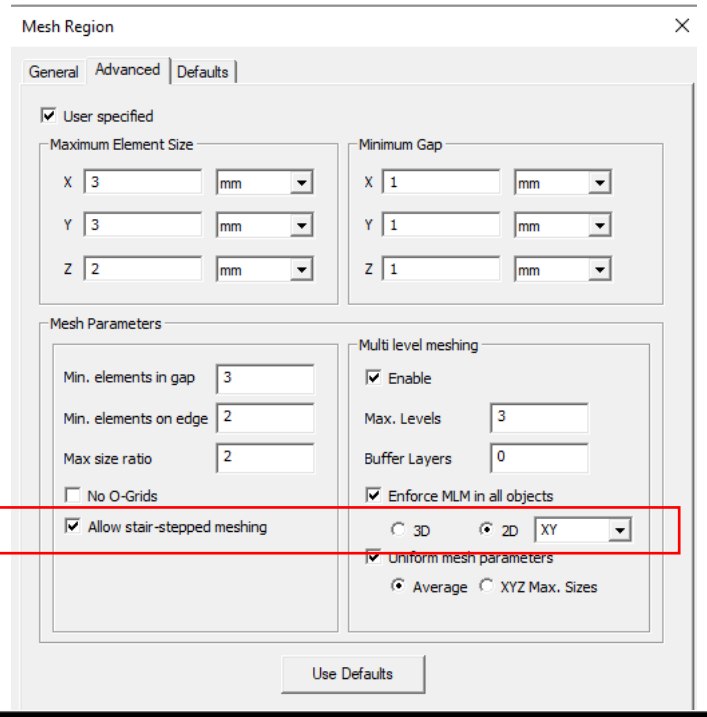
- Icepak:
  - Thermal modeling of a physical die using CTMv2 (encrypted component)
  - Export this die's top & bottom surface HTC to a binary file
- RHSC-ET:
  - Back-annotate this HTC as boundary condition of physical die
  - Executes detailed CTM modeling and displays chip thermal profile results
- Support Face-up or Face-down die configurations
- One-to-One mapping to the CTM coordinate system

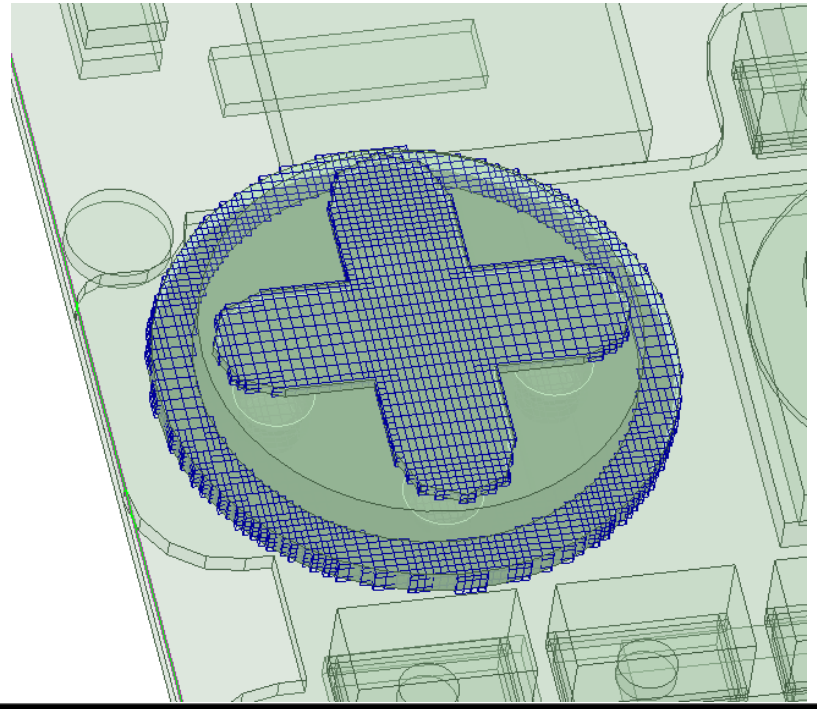
```
1  # Version 3.1
2  # DIE 0.000000 0.000000 8985.000000 8965.000000
3  # TILE 1797 1793
4  # LAYER 2 Top Btm
5  # AVG 11395.561565 -1483.420257
6  # SCALE_FACTOR  1.000000
7  # RESOLUTION  5.000000
8  # TileID X1(um) Y1(um) X2(um) Y2(um) HTC_Top HTC_Btm
9  1 0.000000 455.000000 5.000000 460.000000 10149.933332 -8705.393249
10 2 0.000000 460.000000 5.000000 465.000000 10172.118904 -8669.055529
11 3 0.000000 465.000000 5.000000 470.000000 10172.118904 -8669.055529
12 4 0.000000 470.000000 5.000000 475.000000 10172.118904 -8669.055529
13 5 0.000000 475.000000 5.000000 480.000000 10172.118904 -8669.055529
14 6 0.000000 480.000000 5.000000 485.000000 10172.118904 -8669.055529
```

HDM: Stair-Step Meshing for 2D MLM

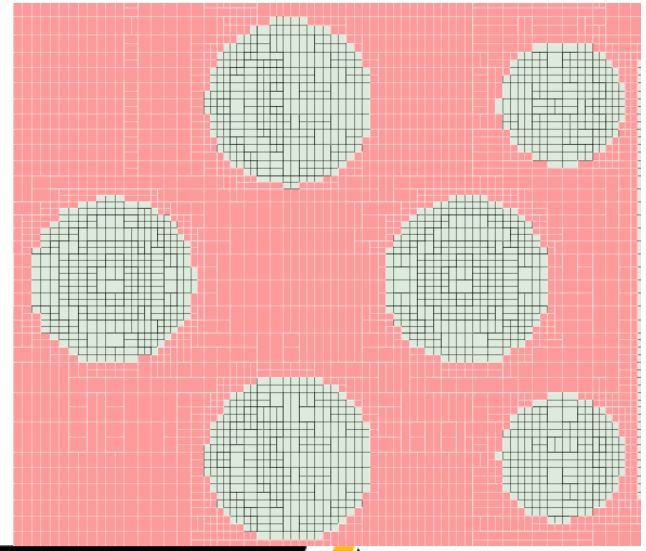
Enabling stair-step meshing method for 2DMLM

- Stair-step meshing is frequently used as a fail-proof option if meshing for complex models are prone to failure.
- Select both “Allow stair-stepped meshing” and “2D MLM” to use.
- Improve meshing efficiency.





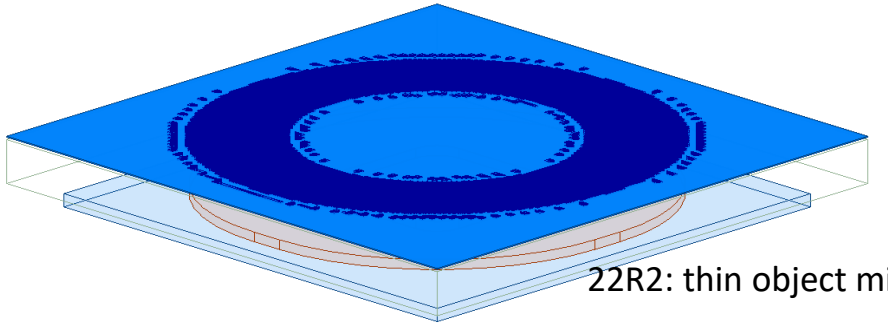
Stair-step: 1035966 cells ~ 92 s
Regular: 2386436 cells ~ 152 s



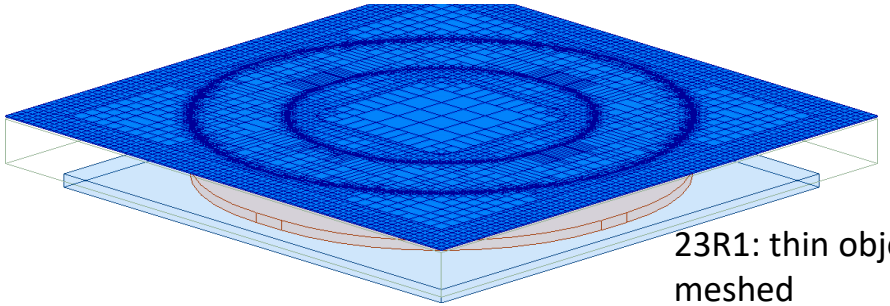
HDM: Automatic 2DMLM in Slider Meshing

Detect 2.5D geometries in model automatically and apply 2D MLM in proper directions

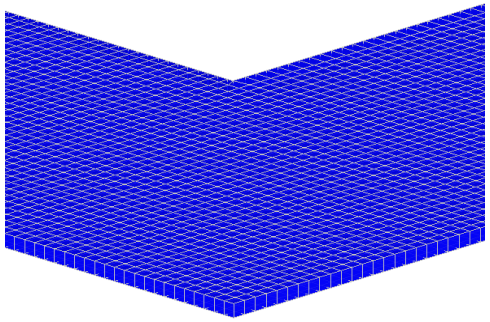
- Slider-bar meshing medium or higher levels used 3D MLM, which did not necessarily work well for 2.5D layered thin geometries.
- In 2023R1, slider-bar meshing will automatically detect 2.5D geometries and calculate a suitable direction to apply 2D MLM, if applicable.
- Helpful for meshing thin objects in model.



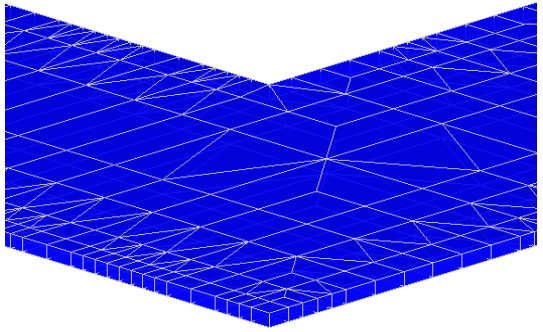
22R2: thin object missing mesh



23R1: thin object correctly meshed



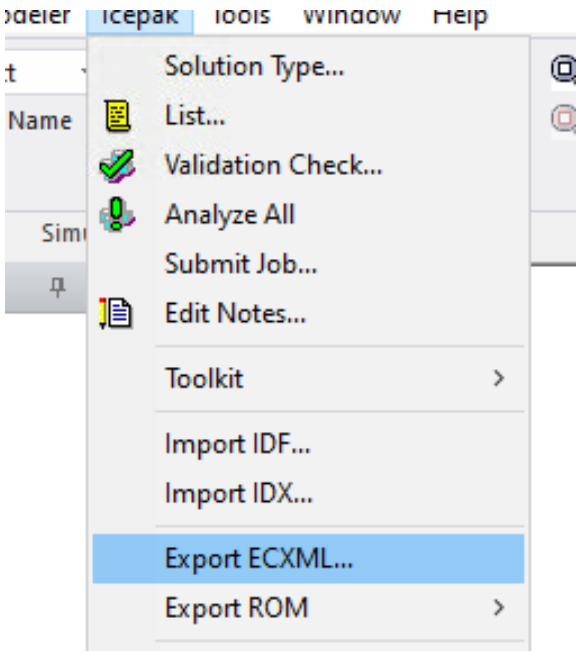
22R2 Uniform 3D MLM:
very dense mesh



23R1 2D MLM:
anisotropic mesh reduces mesh count

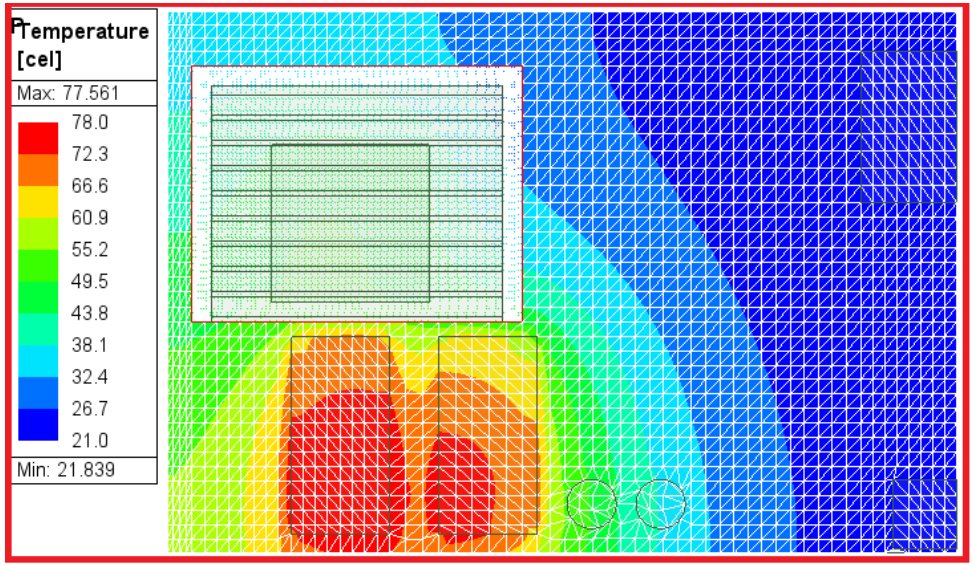
ECXML Export

- Support common-format ECXML export of Icepak Designs
- Supported BCs
  - Solution Domain
  - Block (solid 3d block, solid 2d block, cylinder block)
  - Source (2d source, 3d source)
  - Plate
  - Wall
  - Grille (2d grille, opening b.c. without velocity)
  - 2-resistor model networks
  - Flow resistance (3d flow resistance)
- Native Components
  - Fan (rectangle 2d fan and axial 3d fan)
  - Heatsink
  - PCB (no solder ball, no via)
- Others
  - Mesh Regions
  - Point monitor

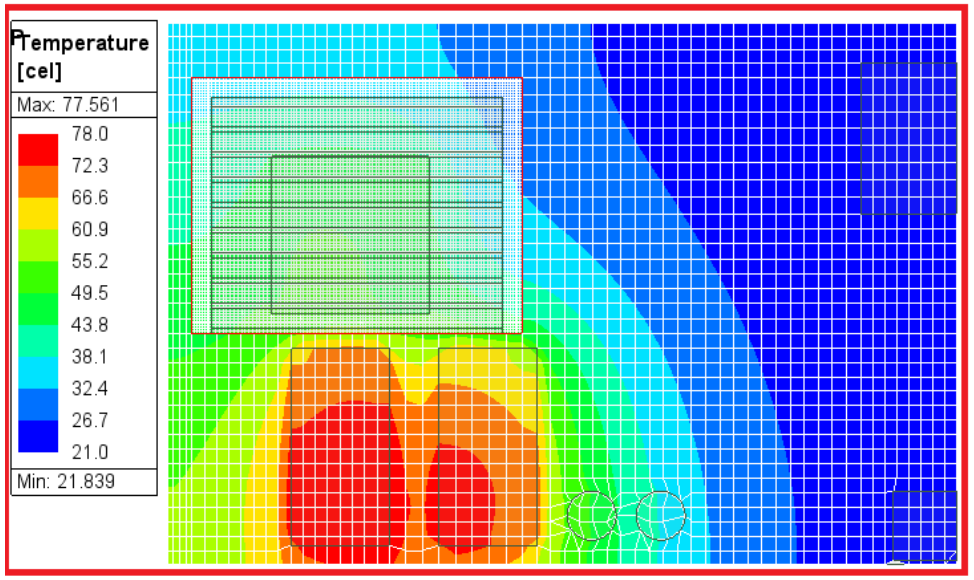


Hybrid Mesh Post Processing (Beta)

- Support for Quad and Hex elements
- No splitting into tets!
- Greatly reduces number of elements for postprocessing
- Increased speed of plotting, summary reports and field calculator operations
- New post processing paradigm for AEDT and especially created for Icepak as it uses a hex-dominant mesh
- ~2x-3x speed up for some models

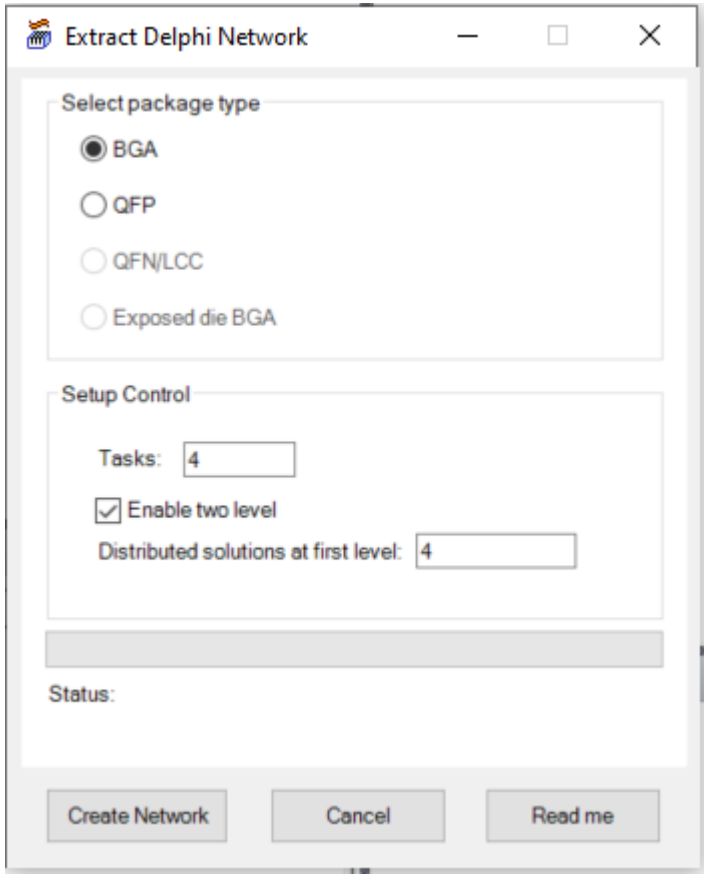


22.2

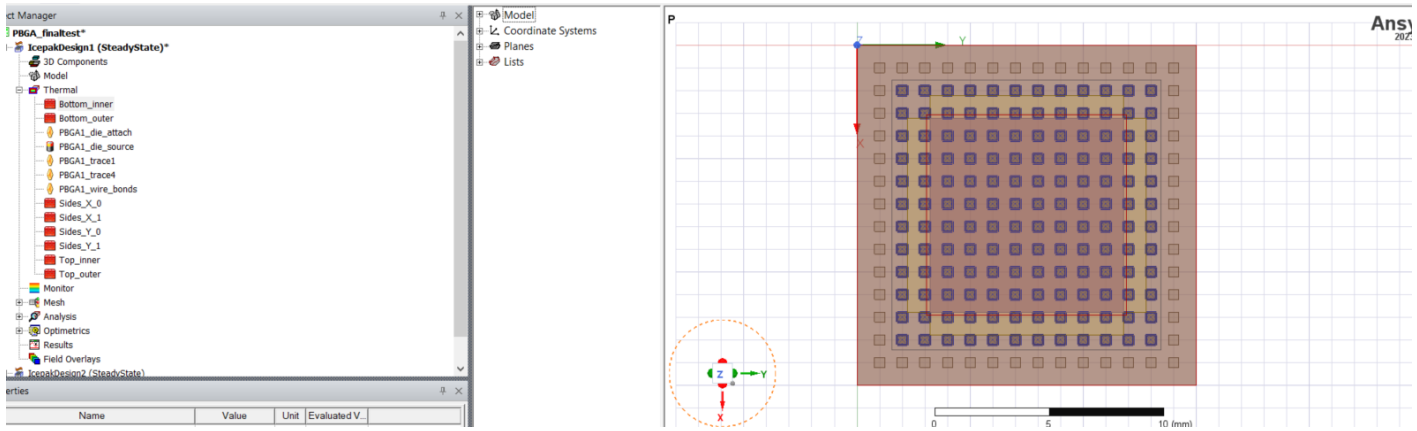


23.1

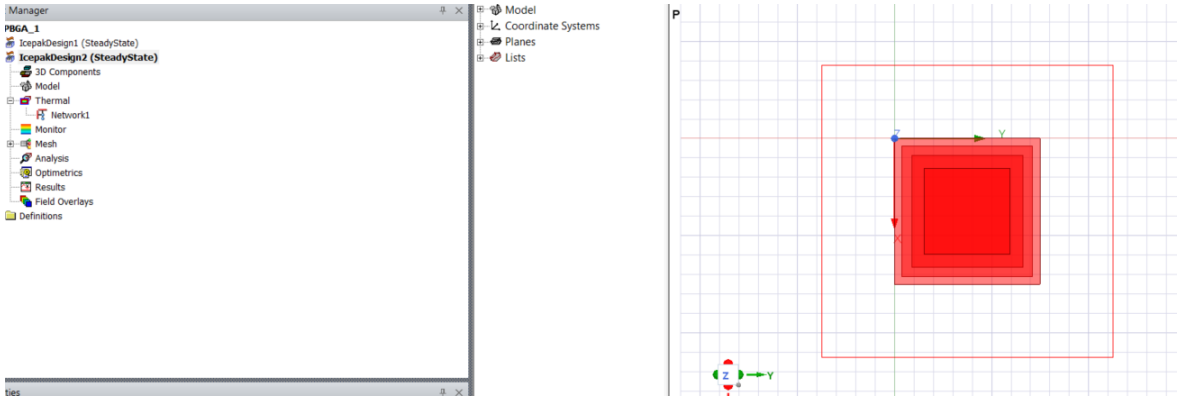
ROM: Delphi Network Creation for BGAs (Beta)



- Create BC's, parametric setup.



- Run Parametric setup
- Extract data from Parametric solve and Run

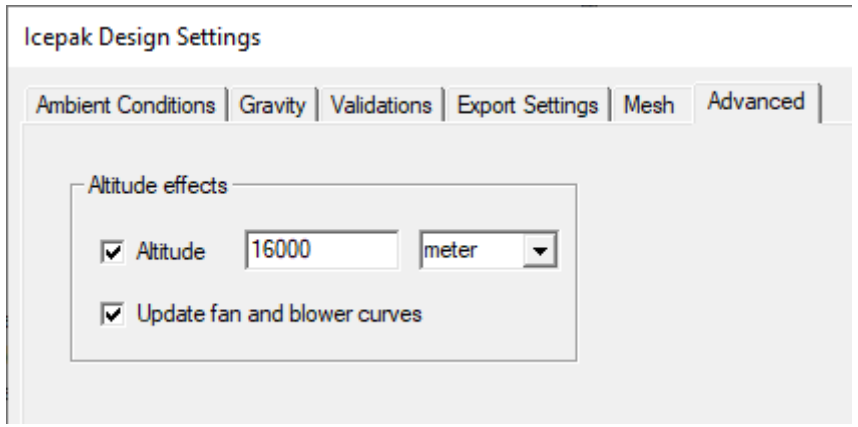


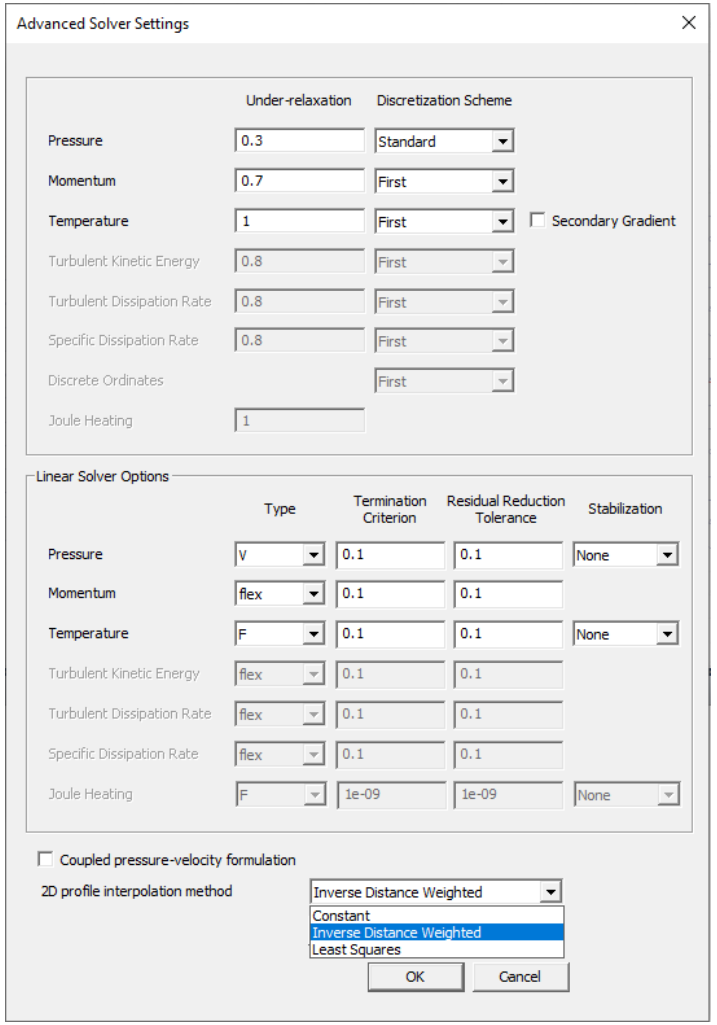
- Final network created after optimization.

Enhancements

- Introduced 2D profile interpolation method
  - Constant
  - Inverse Weighted
  - Least Squares

- Introduced Altitude Effects



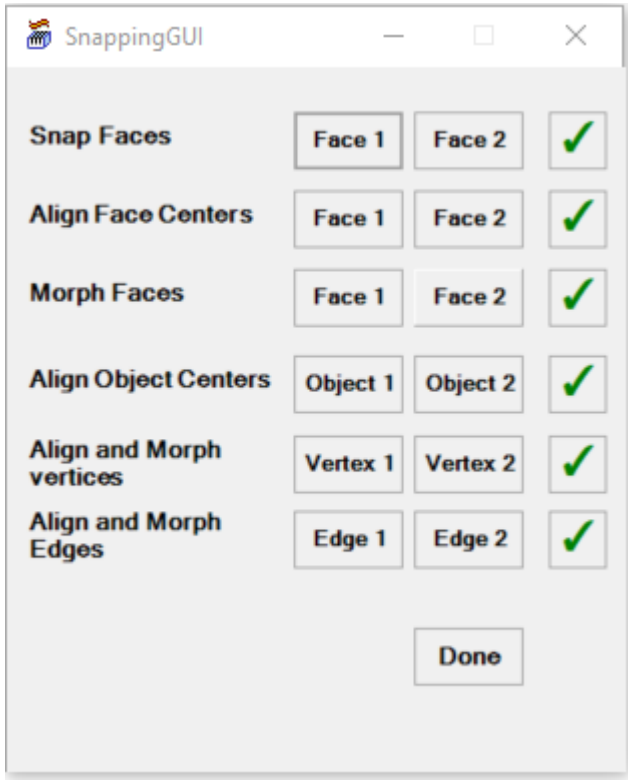


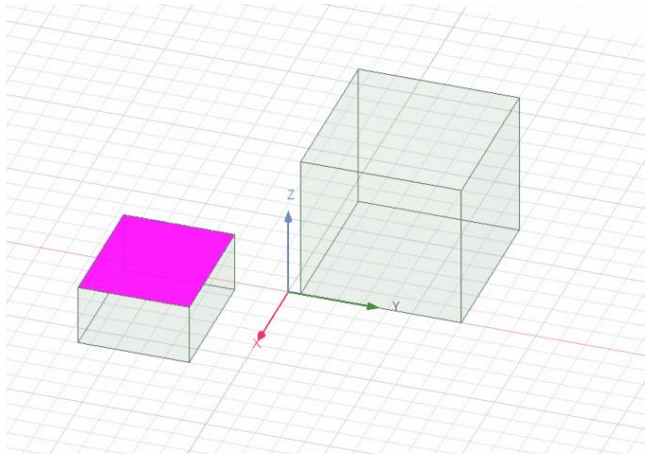
Classic Icepak Migration: TZR Import Enhancements

- Import Face Centered Based Contour Plots.
- Imports PCB with via information.
- Imports particle streamline attributes from Classic Icepak Post Object.

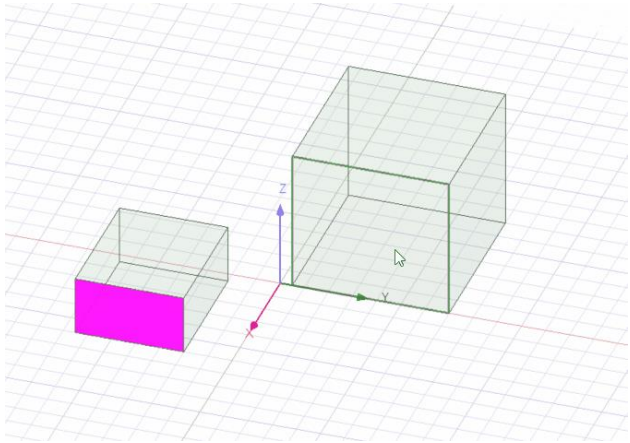
Toolkit Development

Snapping Toolkit:

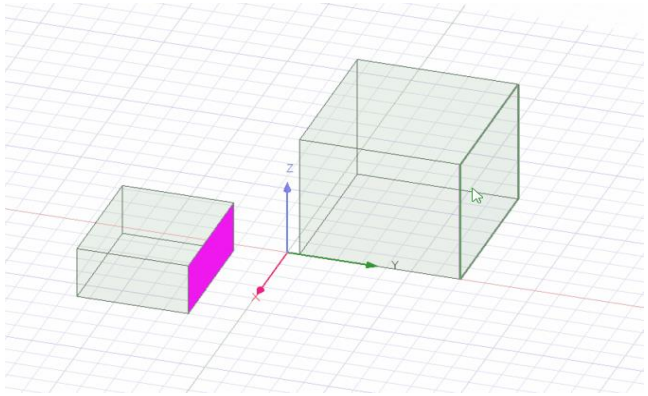




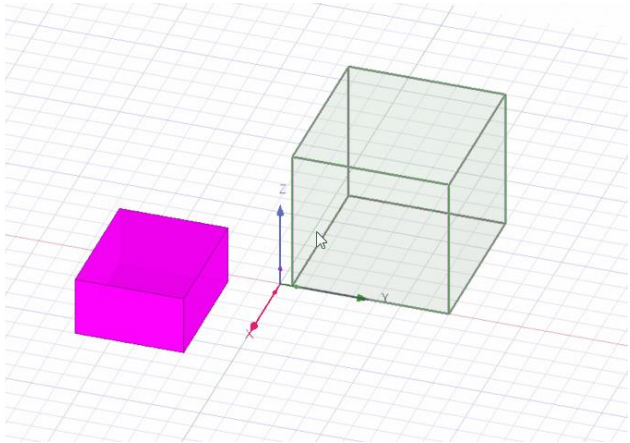
Snap Faces



Align face centers

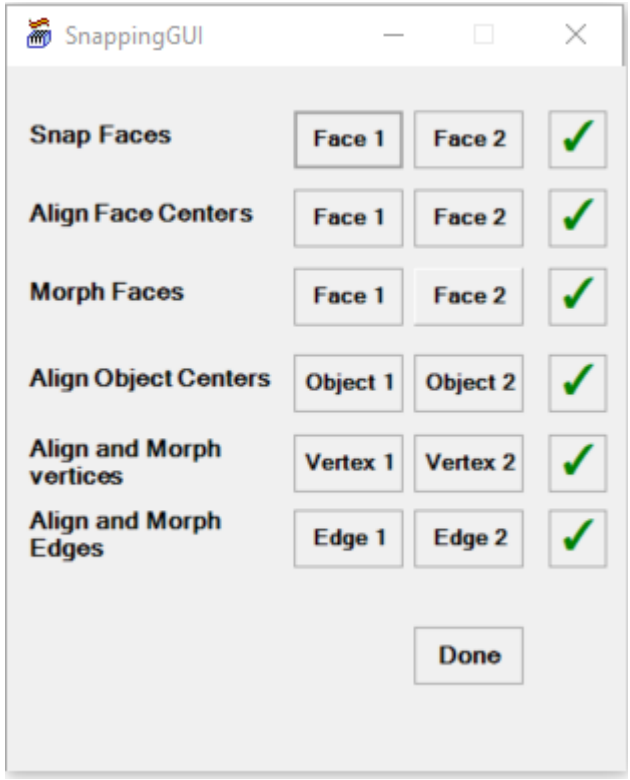


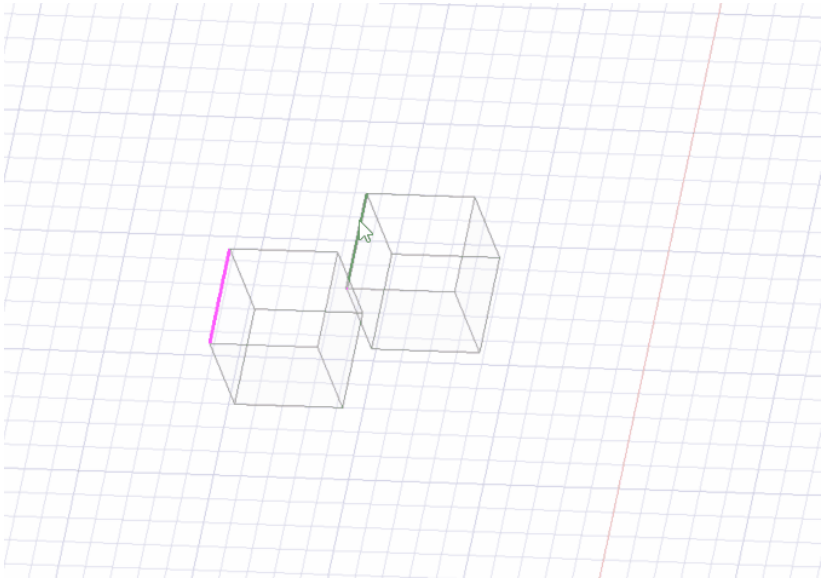
Morph Faces



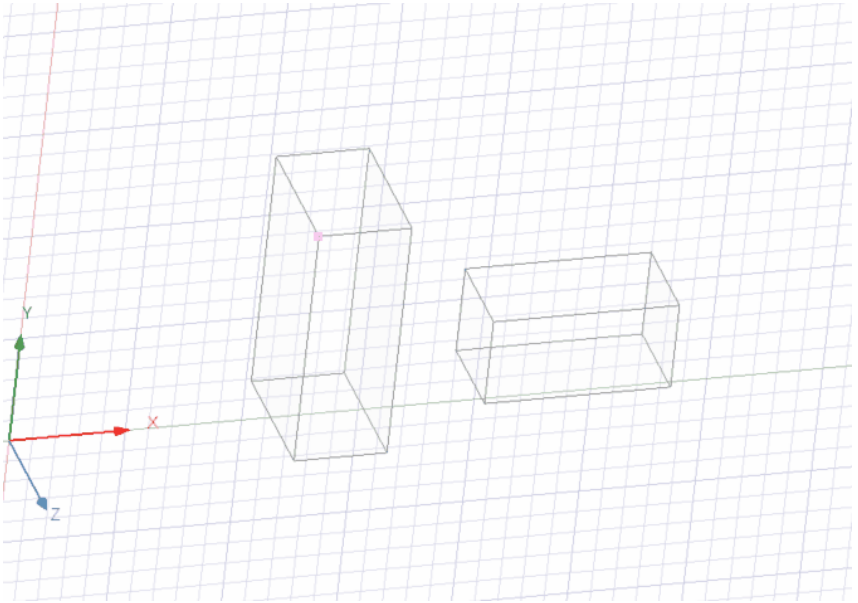
Align object centers

Toolkits: Snapping Toolkit (2)





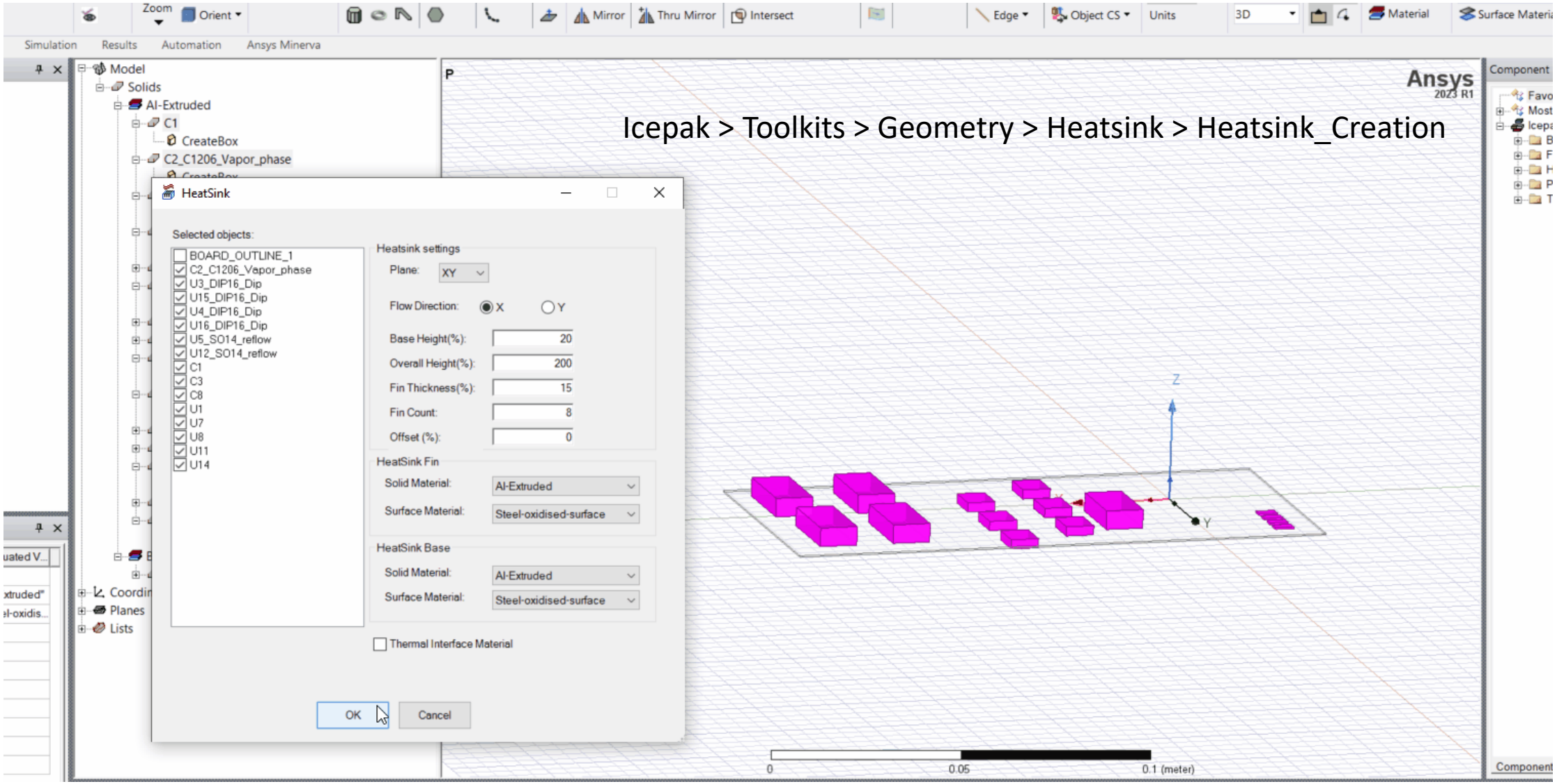
Align and morph edges



Align and morph vertices

Icepak > Toolkits > Productivity > Snapping

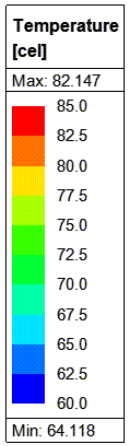
Toolkits: Heatsink Automation Toolkit (3)

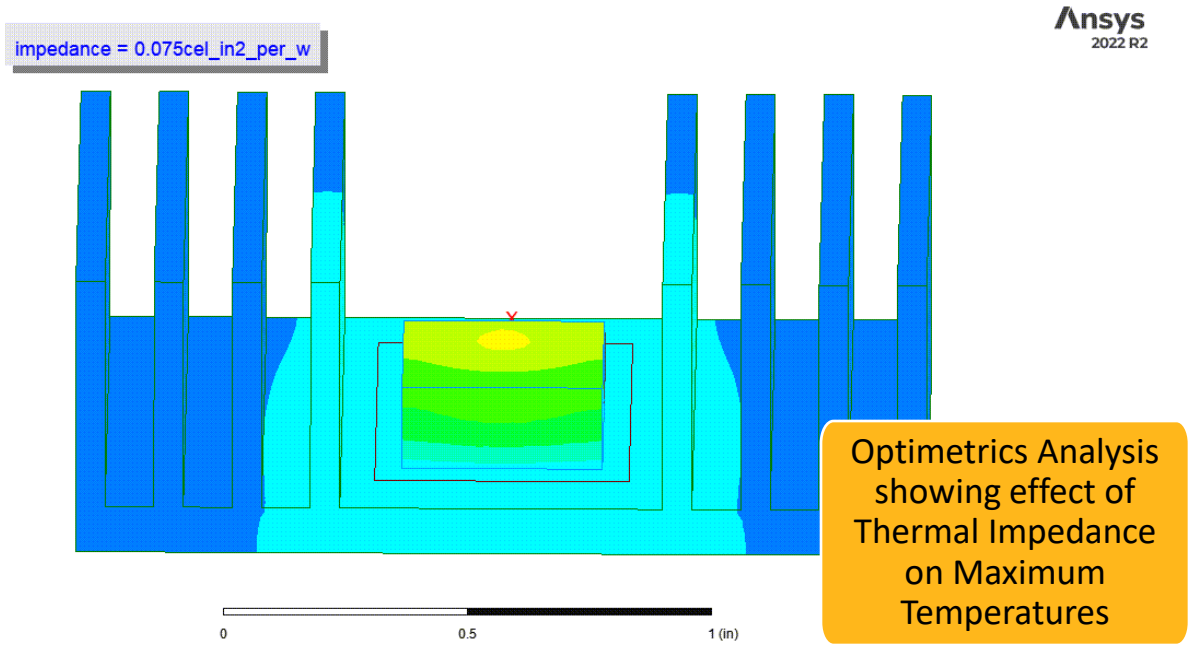


AEDT Mechanical
2023R1 Update

Mechanical 2023R1 Highlights

- Thermal
  - **Automatic Export of Icepak or Mechanical Thermal Project from HFSS/Maxwell/Q3D**
  - Contacts – *Commercial*
  - *Smart Slider Mesh Enhancements*
  - Transient Thermal Solution Type – *Alpha*
- Structural - *Beta*
  - Object Reference Temperature
  - Edges supported for Fixed Support BC





Optimetrics Analysis showing effect of Thermal Impedance on Maximum Temperatures

Workflow Enhancements: Thermal Design Creation

- Automated creation of linked thermal design from a source EM design
  - Icepak/Mechanical target designs created
  - Source Designs can be HFSS/Maxwell/Q3D
- Boundary conditions and excitations created automatically
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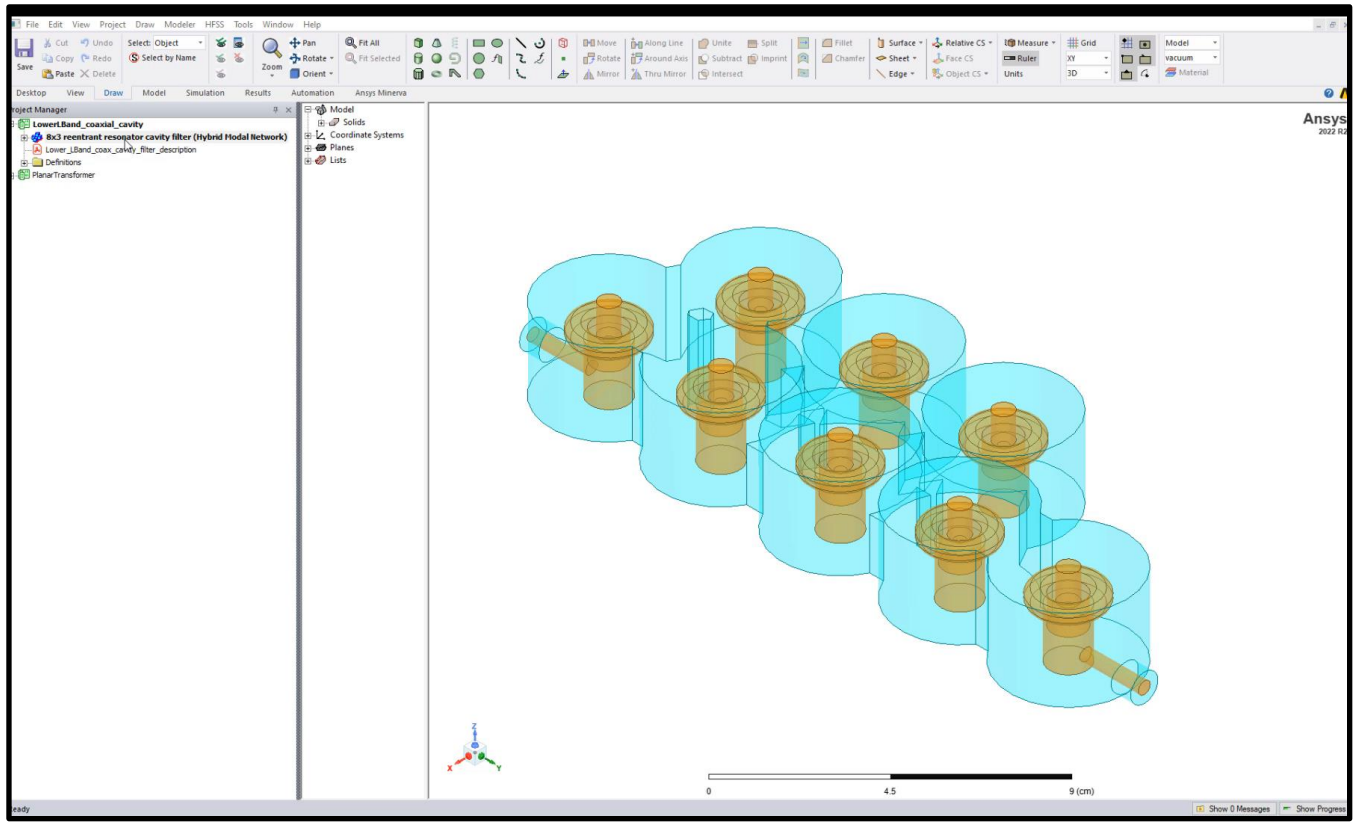
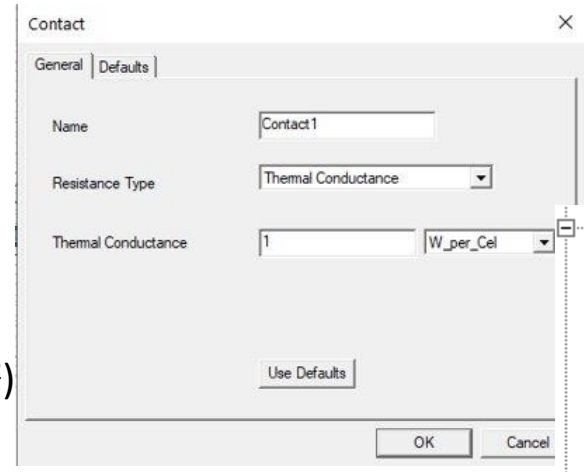
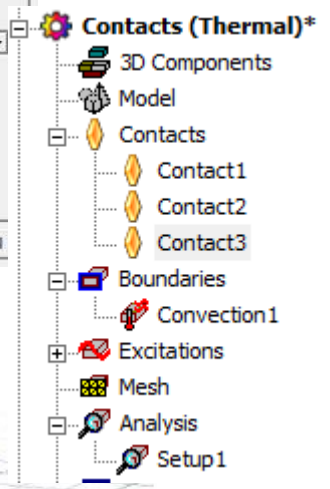
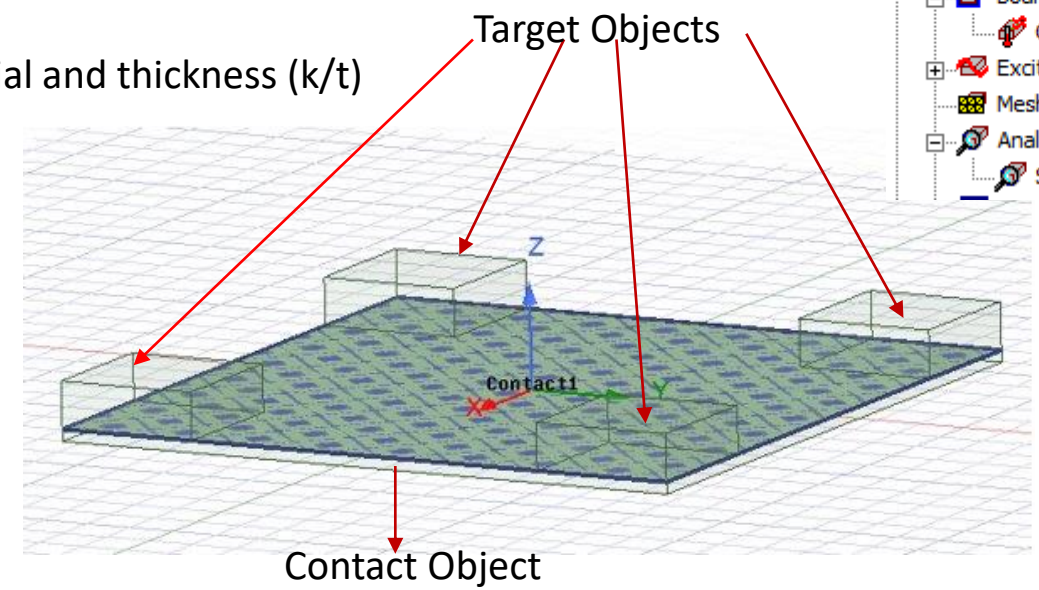


Thermal Contacts

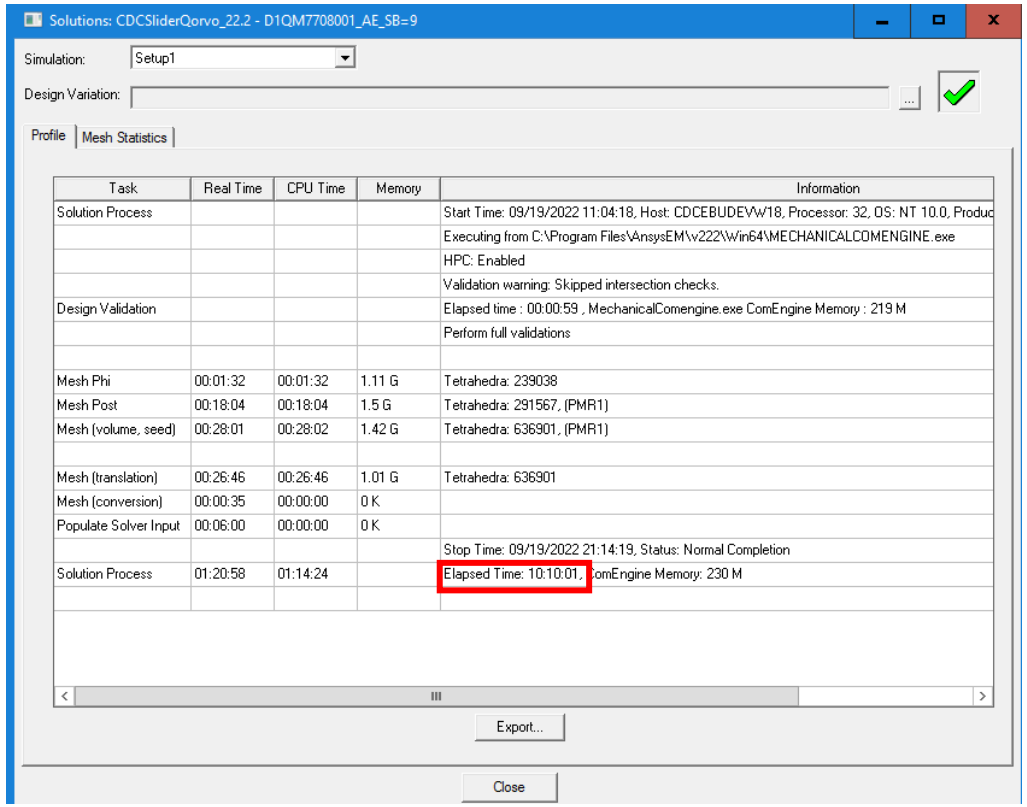
- Support for Thermal Contacts [*Commercial*]
  - Assignment on Faces or Shells in contact with other objects/shells
    - Select faces/shells for contacts, target faces automatically determined
  - Resistance types:
    - Thermal Conductance – Total conductance for contact surface area (W/C)
    - Thermal Conductance per unit area – Distributed conductance per unit area (W/C-m^2)
    - Thermal Resistance – Total resistance for the contact surface area (C/W)
    - Thermal Impedance – Total resistance times area (C-m^2/W)
    - Thickness and Material – Conductance calculated based on material and thickness (k/t)
  - Multi-Region mesh created when contacts created
    - Non-conformal mesh created only at contact surfaces
      - No zero contact resistances defined at other surfaces
    - Improved and faster mesh handling!





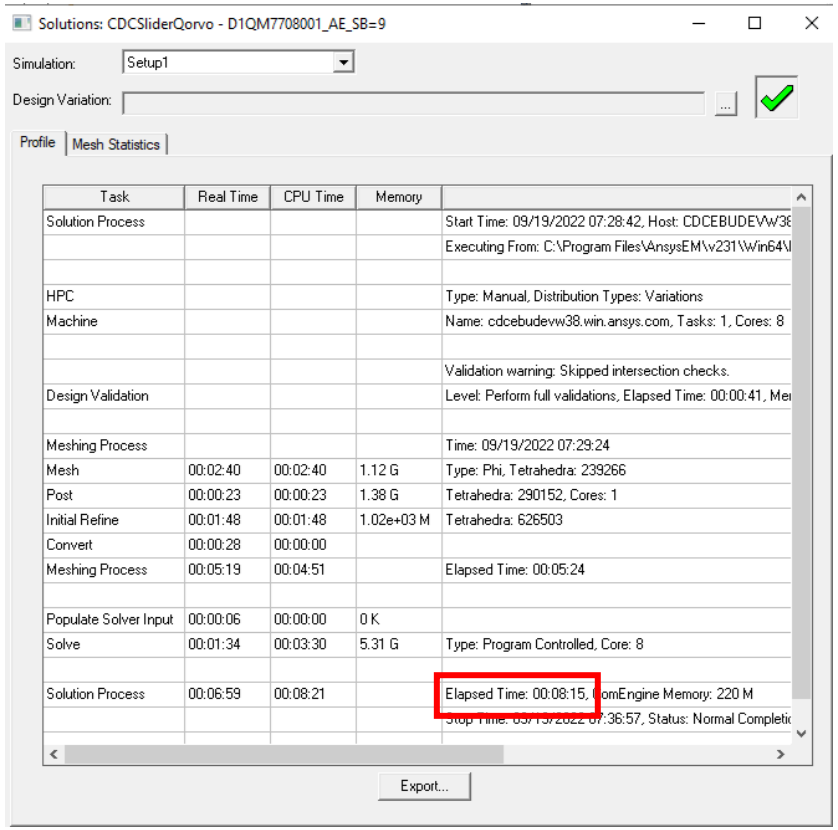


Thermal Contacts : Improved Mesh Handling



2022R2

Solution Time:
10 hr 10 min

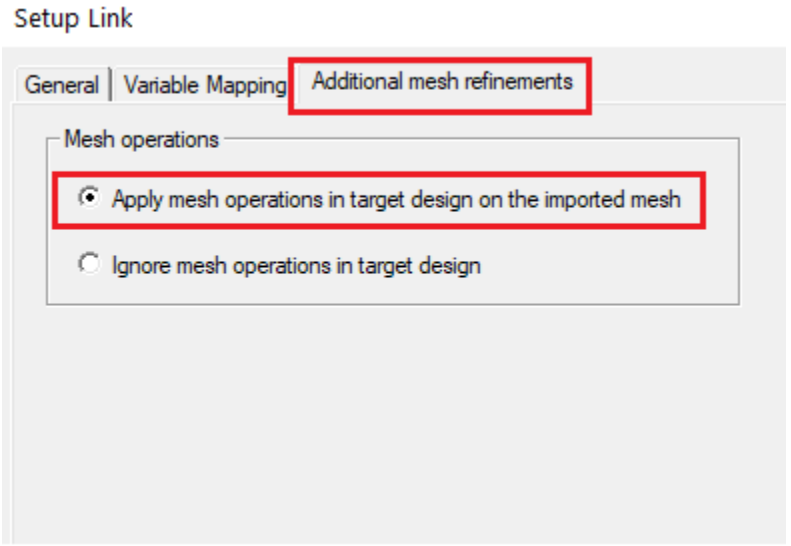


2023R1

Solution Time:
8 min 15 sec

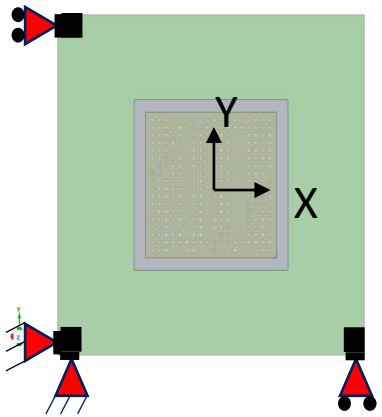
Thermal Contacts - Limitations

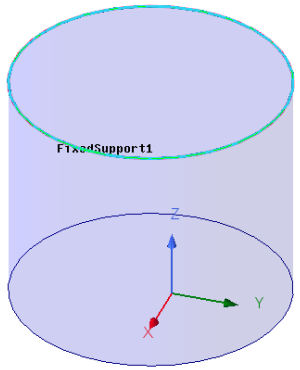
- Thermal cannot be used as source design for mesh links
  - Thermal-Thermal mesh links supported
  - ‘Apply mesh operations in target design’ not supported for the mesh link
- Convection boundary cannot be defined on a contact surface



Structural Solution Enhancements

- Structural Solution type [Beta]
  - Reference Temperature Specification for Objects
    - Stress-free temperature for individual objects
    - Environment temperature default
  - Edge Support
    - Enable edges to be defined as Fixed Support boundaries





Properties

Name	Value	Unit	Evaluated Value
Name	Rod		
Material	"steel_1008"		"steel_1008"
Solve Inside	☑		
Reference Temperature	EnvTemp		20cel
Orientation	Global		
Model	☑		
Group	Model		
Display Wireframe	☐		
Material Appearance	☑		
Color			
Transparent	0		

Attribute

Properties: Mechanical_MaterialOverridesTest - MechanicalDesign2 - Modeler

Attribute

Name	Value	Unit	Evaluated Value	Description	Read-only
Name	Substrate				☐
Material	"FR4_epoxy"		"FR4_epoxy"		☐
Solve Inside	☑				☐
Reference Temperature	EnvTemp		20cel		☐
Orientation	Global				☐
Model	☑				☐
Group	Model				☐
Display Wireframe	☐				☐
Material Appearance	☑				☐
Color					☑
Transparent	0				☑

☐ Show Hidden

OK Cancel Apply


Ansys