Release 2022 R1 Highlights Thermal Integrity

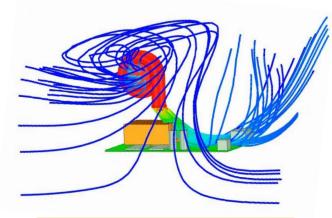


2022 R1 Icepak Updates

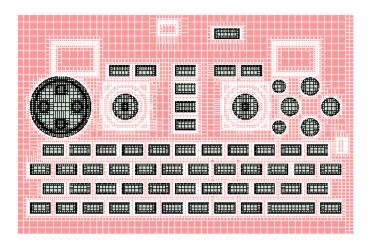


Icepak 2022 R1 Highlights

- Reduced Order Modeling (ROM)
 - Redhawk CTM 2-Way & New Delphi Network Creation
- Blower Modeling
- ECAD Import Wirebond & IDX
- Maxwell 2D Icepak EM Loss Coupling



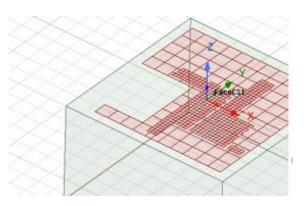
Streamlines into and out of a Centrifugal CAD Blower cooling a PCB assembly

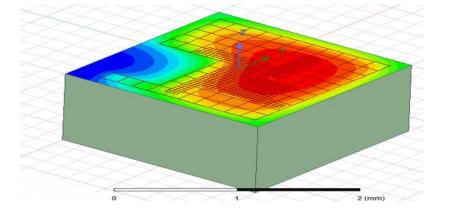


- Mesher Enhancements 2.5D Improvements
- User Experience
 - Streamlines & Validation Enhancements
 - Improved Error messaging & troubleshooting
- Migration
 - Improve speed of TZR conversion
 - Network Schematic enhancements
 - Toolkit enhancements
 - PCB, Package parameterization

RedHawk CTM Two-Way Workflow

- Chip Thermal Model (CTM) two-way co-simulation
 - Chip-aware system design (2021R2)
 - System-aware chip design (2022R1)
 - Auto-export temperatures to RedHawk after simulation
 - Defaults to export folder specified under Design Settings
 - Binary format
 - CTM import using a 3rd party text file
 - CTM native component created
 - No temperature data export



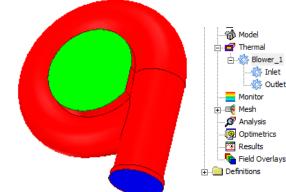


	31 (A		
lame	Стмі		
CTM File	D:\ANSYSDev\TestPr	ijs\CTM\CTMimport.bt	
Import settings:			
Rotation	0deg		
Density number	500		
Resolution	4		
Tr	Import Data		
Radiation	Steel-oxidised-st	tece	
CTM profiles		CTM summary	
Sources		Tem Total power (W) SH po	
	СТІ	limport.txt 🔀	
	1	#DistanceUnit: r	nm ·
	0	#TemperatureUnit	
	2		
	3	#Power/HeatFlux	
	3	#Power/HeatFluxU #CellLocations	
	3 4 5	<pre>#Power/HeatFlux0 #CellLocations 0.0 0.0 1.0 1.0</pre>	Jnit: W
	3 4 5 6	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0.</pre>	Jnit: W
	3 4 5	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0. 0.0 1.0 1.0 1.5</pre>	Jnit: W
	3 4 5 6 7	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0. 0.0 1.0 1.0 1.5 #Temperatures</pre>	Jnit: W
	3 4 5 6 7 8 9	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0. 0.0 1.0 1.0 1.5 #Temperatures</pre>	Jnit: W .5
	3 4 5 6 7 8 9 10 11	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0.0 0.0 1.0 1.0 1.5 #Temperatures 10 20 30 40 50 6 #PowerMapOfCells 0.1 0.15 0.2 0.2</pre>	Jnit: W .5 50 25-0.3-0.35
	3 4 5 6 7 8 9 10 11 12	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0. 0.0 1.0 1.0 1.5 #Temperatures 10 20 30 40 50 0 #PowerMapOfCells 0.1 0.15 0.2 0.2 0.1 0.13 0.16 0.</pre>	Jnit: W .5 50 25 0.3 0.35 .19 0.22 0.2
	3 4 5 6 7 8 9 10 11 12	<pre>#Power/HeatFluxt #CellLocations 0.0 0.0 1.0 1.0 0.0 0.0 -1.0 -0.0 0.0 1.0 1.0 1.5 #Temperatures 10 20 30 40 50 6 #PowerMapOfCells 0.1 0.15 0.2 0.2</pre>	Jnit: W .5 50 25 0.3 0.35 .19 0.22 0.2



Blower Modeling

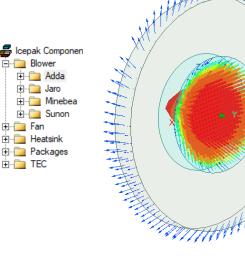
- Generalized Blower boundary
 - Impellers (type 1)
 - Centrifugal blowers (type 2)
 - Single and dual inlets for all geometries
- Blower toolkit •
 - Geometry and BC for rectangular and cylindrical geometries
- Vendor Component Library
 - Adda, Jaro, Minebea, Sunon
- Blower Assignment
 - Polygonal approximation allowed for type 1
 - Multiple co-planar inlet faces allowed for type 2
 - Ability to toggle inlet/outlet faces
- **Blower Specifications** ullet
 - Blower flow curve
 - Fan blade/exit angle
 - RPM (type 1)
 - **Blower Power**



🌼 Inlet

🆾 Outlet

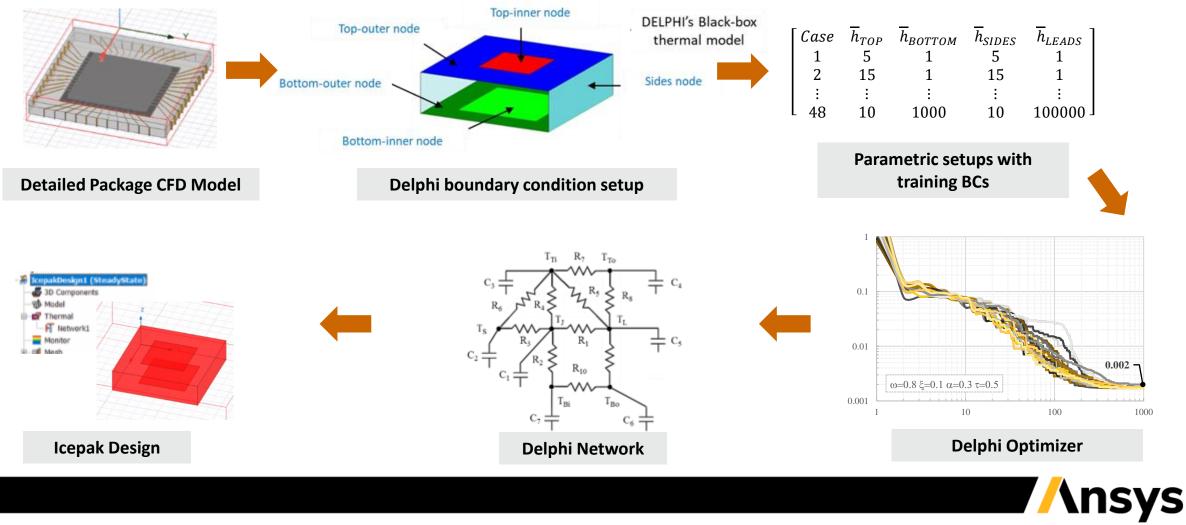
Blower Thermal Model	× 444
General Defaults	
	Edit Dataset
Blower Type: C Type 1 © Type 2	
Blower Specification	-
Blower Row: Row Curve	Coordinates-Click on header to change unit
Blower Power: 0.5	VolumeFlow [cfm] Pressure [in_water] 🔺
	0 0.5
Exhaust Exit Angle: 17 rad	20 0.48
	50 0.425
	80 0.35
	90 0.25
	100 0



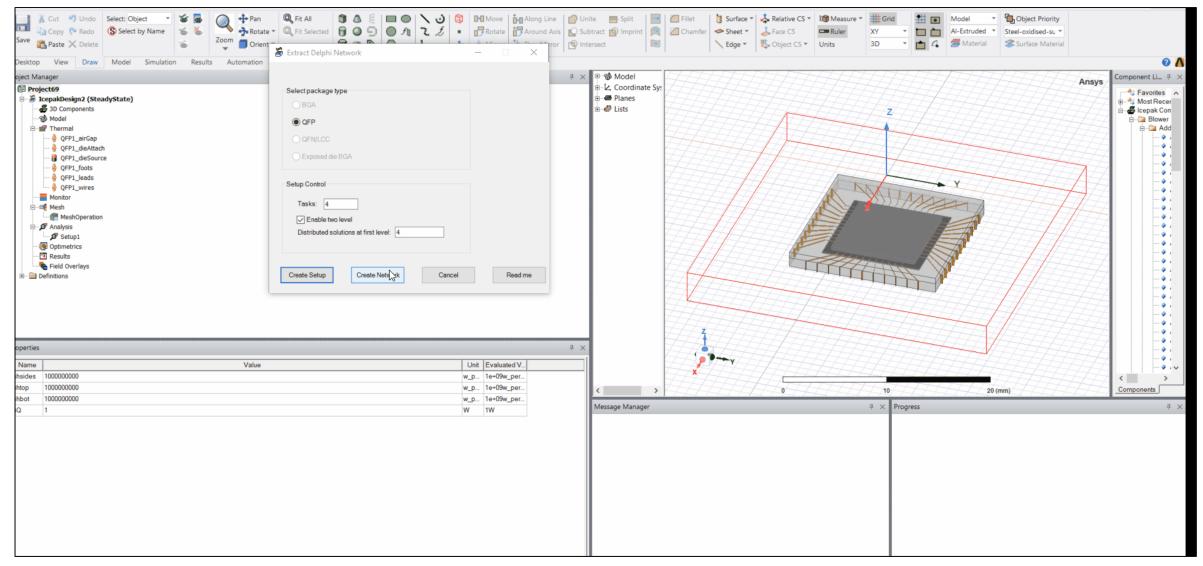


Reduced Order Modeling - Delphi Network Creation*

• Steady-state Delphi network creation for QFP packages



Automated Delphi Network Creation Workflow in AEDT





ECAD - Bondwire Import

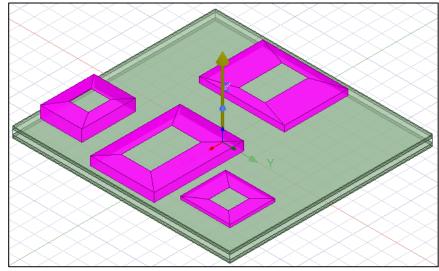
- Bondwire Import with PCB Component
 - Bondwires attached to components with die properties
 - Material and wire diameter input options
 - Modeled as sheets with shell conduction plate BC

		_	Components
Componer	nt Model X	Û	Regular Expr:
Component Info	0		F v Resistor
Part Name:	GA780J		
Part Type:	IC		E Capacitor
Ref Des:	, U2		⊡ √ IC ⊡
No. Pins:	33		
Model Interface	9		
Interface:	Manual 💌		🗄 🛷 U3 (16 pi
Die Properties-			'⊡… <i>IC</i> PE42693 ⊞…√ U1 (26 pi
Туре:	Wire bond 🔹		i⊡
Orientation:	Chip up 💌	1900 000 000 18//////	Unler
Height:	0.0003		
Solder Ball Prop	perties		
Shape:	None 💌		
Diameter:	0		
Mid Diameter:	0		
Height:	0	U	

Include Parts: O None	C Device Parts	Package Parts
Above Stackup		
Model Connectors As	:	
C Solderbumps 📀 B	Bondwires	
Bondwire Material:	Au-Typical	
Wire Diameter:	0.05	mm 💌



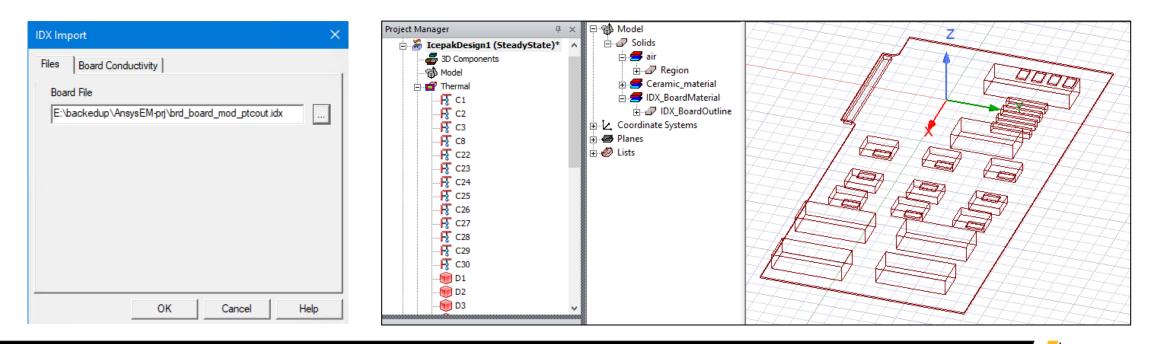
Cross-section View

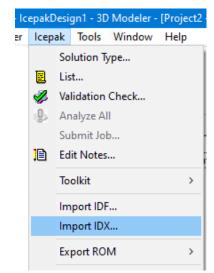




ECAD - IDX Import

- IDX Import XML based format consisting of ECAD and MCAD data
 - Support geometry and boundary condition import (MCAD)
 - Like IDF import in Icepak AEDT
 - Limitations
 - ECAD data import not supported
 - Filters, Modeling options, Cutouts not supported

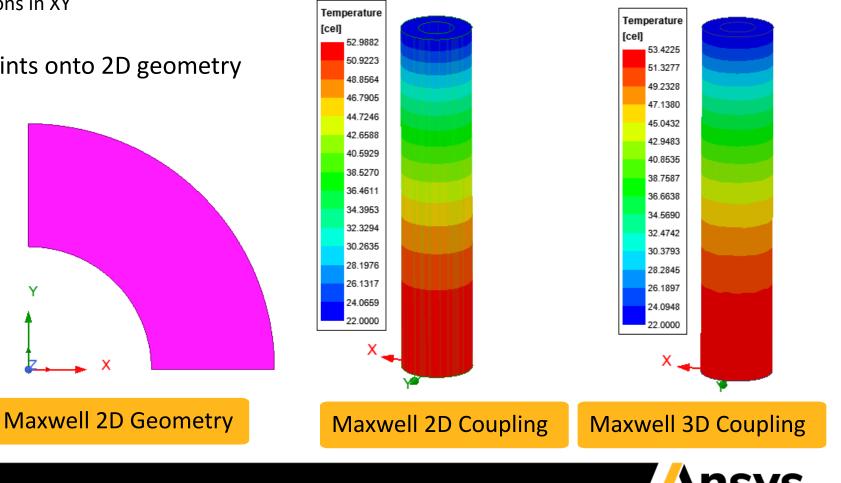




Ansys

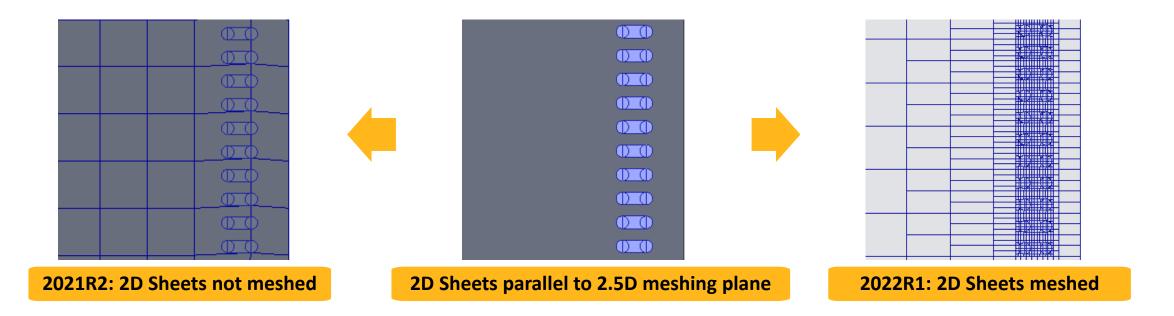
Maxwell 2D – Icepak EM Loss Coupling

- Support EM Loss Import from Maxwell 2D
 - Extruded geometries of 2D representations
 - Support both +ve and -ve extrusions in XY
 - Can be partial geometries
 - Coupling projects 3D mesh points onto 2D geometry
 - Limitations
 - Extrusions need to be along Z axis
 - Losses not conservative



Meshing Enhancements - 2.5D Meshing

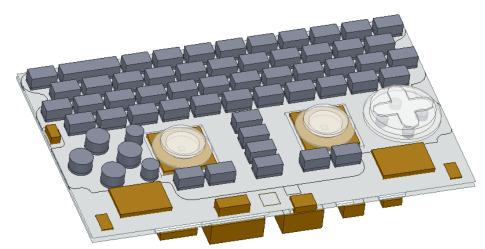
- Capturing Thin Objects in 2.5D Meshing
 - Refinement around 2D sheets parallel to the 2.5D meshing plane
 - Create additional refinement and multi-level around 2D sheets
 - Further mesh optimization using 2.5D mesh sub-blocking in following slide



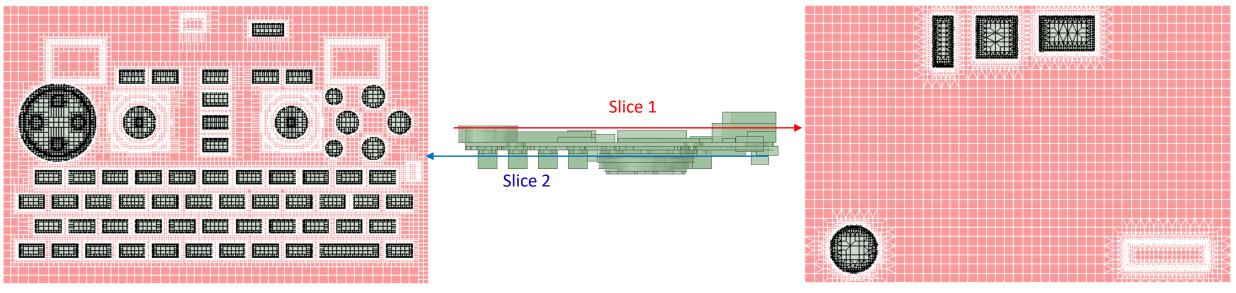


Meshing Enhancements - 2.5D Meshing*

- Domain Sub-blocking for 2.5D Meshing
 - Prevent refinement from being imprinted throughout extrusion
 - Domain split according to in-plane geometry features
 - Uses non-conformal interface to couple different meshing blocks
 - Reduced mesh counts and improved performance (~50%)



Keyboard model mesh count: 2021R2: 2.35M 2022R1: 1.38M





Fluid Flow Streamlines*

- Steady-state and transient particle traces
 - Forward and reverse direction
 - Uniform and mesh node seeding with skip option
 - Color by variable
 - Standard AEDT line and marker options

- Animations a	re not supported y	et	Forward streamlines
Create Field Plot Specify Name Speed2 Specify Folder Design: IcepakDesign3 Context Solution: Setup1: SteadyState Field Type: Fields Intrinsic Variables	Fields Calculator Surface Smoothing Category: Standard Quantity In Volume Pressure SurfPressure SurfTemperature Velocity Vectors Ux Uy Uz SurfVelocity Vectors SurfVelocity Vectors	Particle Trace Definition × Trace options Start time(s): 0 End time(s): 1752.93328985 Max steps: 1000 Reverse direction	Speed Impersec; 0.6801 0.6801 0.6801 0.6801 0.6801 0.6801 0.6801 0.6801 0.6801 0.6802 0.572 0.5108 0.4644 0.4179 0.3250 0.2322 0.1867 0.1877 0.1878 0.1879 0.1870 0.1871 0.1872 0.1872 0.1873 0.1874 0.1929 0.194
Save As Default	Speed Box1 ViscocityRatio Box2 WalfYPlus Plot on surface only TKE Plot on surface only Epsilon Adjourned state Kx V Ky ViscocityRatio	Seeds options C Uniform Count: 6 C Nodes Skip: 5 OK Cancel	Reverse streamlines with markers

Speed [m_per_sec] 2.3059 2.1521 1.9984 1.8447 1.6910

> 1.5372 1.3835 1.2298

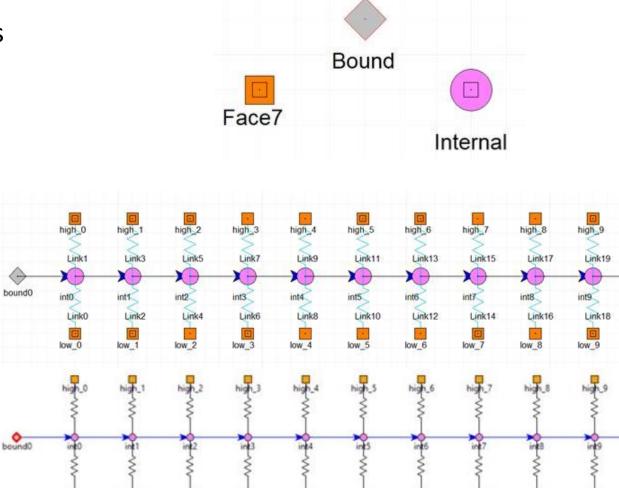
1.0761 0.9223 0.7686

0.6149 0.4612 0.3074

0.1537

Network Schematic Enhancements

- Network circuit schematic enhancements
 - Simplified node representations
 - Similar 'look-and-feel' to Icepak Classic
 - Symbols
 - Color scheme
 - Links connect to nodes directly at centers
 - Icepak Classic network import
 - Networks with non-angled links imported
 - Angled links still imported using page ports



low_5

low 4



low 9

low 8

low 7

low 6

 \mathbf{x}

bound1

bound1

Miscellaneous Enhancements

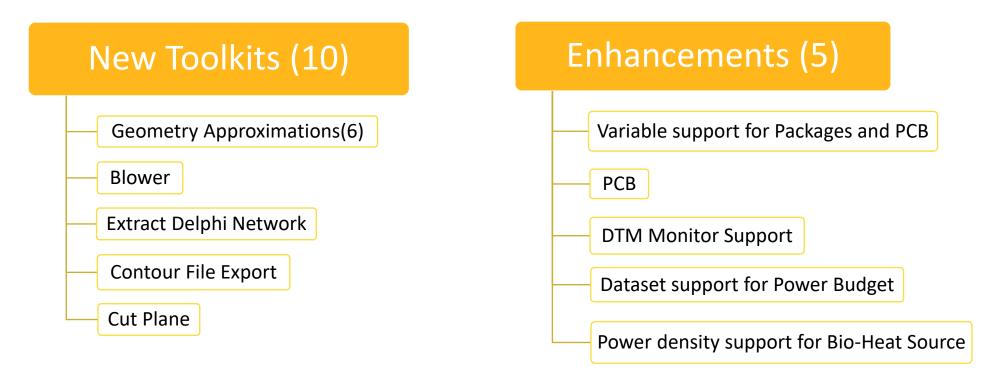
- Solver File Export / Import
 - Write Solver Files option
 - Import Solver Files option*
- Fields Summary
 - Combined side option for surface quantities
 - Algebraic sum of Default and Adjacent side values
 - Single option to report:
 - Non-zero values at all 1-sided surfaces
 - Ensure heat balance at 2-sided surfaces
- TZR File Import Speed Improvement
 - Synchronization & Validation*
 - Speed-ups up to 70x observed

Analysis Analysis Analysis Optimetri Results Field Ove ×	Copy Rename Delete	
EcepakDesign So Compt Model Formal	Properties Disable Setup	Import Settings 3
Mesh Mesh	Add 2-Way Coupling Generate Mesh Analyze Write Solver Files Import Solver Files Submit Job Revert to Initial Condition	Import Solver Files Solver Files Directory C:/D/mnagulap/22.1/blower/Graphics_Card_mr.aedtexport (Default to project path) Override
	NEVEL OF HILE CONDUCT	Analyse Cancel

Calculations:							
Entity Type	Geometry Type	Entity	Quantity	Side	Normal	Area/Volume	Total
Boundary	Surface	Opening1 VolumeFlowRate[m^3/s]		Default		2.4 m^2	
Boundary	Surface	Opening1	VolumeFlowRate[m^3/s]	Adjacent		2.4 m^2	-0.00430313
Boundary	Surface	Opening1	VolumeFlowRate[m^3/s]	Combined		2.4 m^2	-0.00430313
Setup Calculation Entity Type: Boundary Geometry Type: Surface V Side C Default Adjacent C Entity: Blower_2 SurfElectricPot SurfCurrentDer Surf)		Cancel

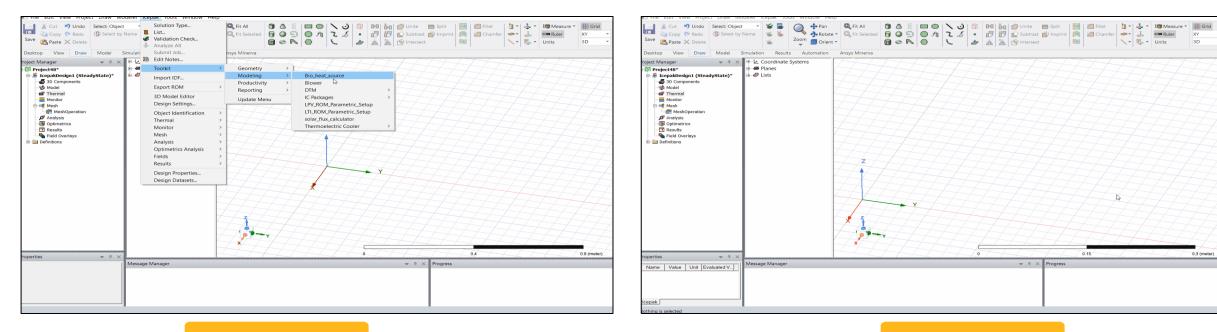


Toolkits Development





Blower Modeling - Toolkits



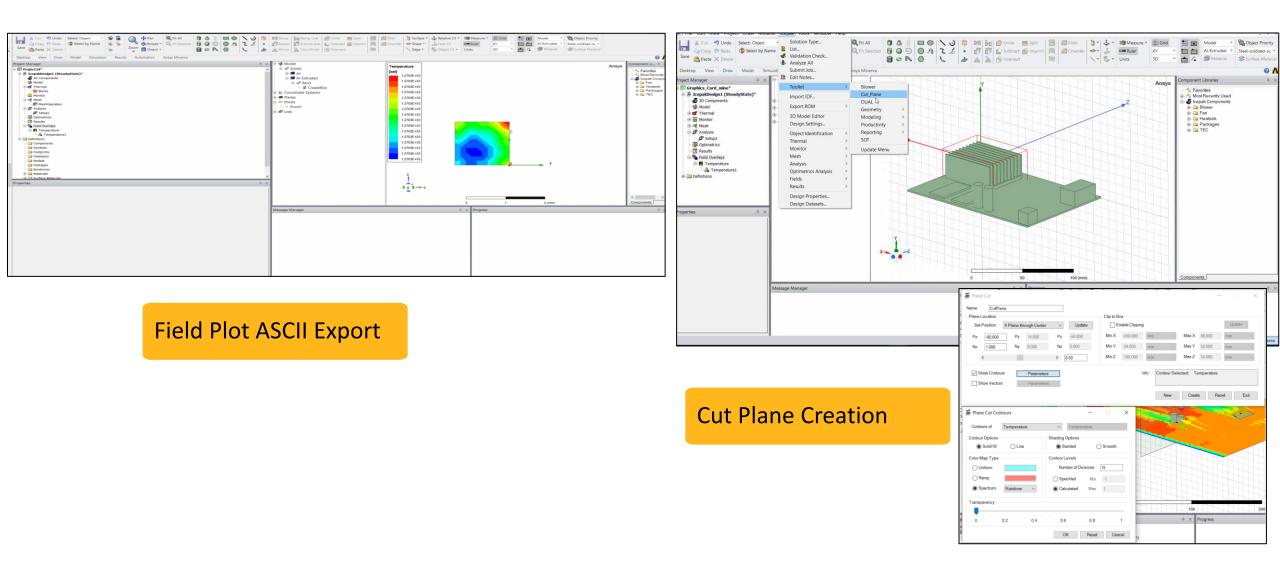
Type 1 Blowers

Type 2 Blowers



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Post Processing Toolkits





Other Toolkit Enhancements

Thermostat for Source Control				- 🗆 ×	🗃 Printed Circuit Board	-
facro Specification	Monitor Point:	Trigger Temperature: ON OFF	Power Factor: ON OFF		Geometry Properties	
Select Object(s): source_1.source_1_1 Select Object(s): source_1_1_source_1_2			cel v 1 0 cel v 1 0	Edit 😧 New	Pob type Compact Rack specification Number in rack Rack spacing 0.0 meter Themal specification Total power 0 WW Substrate Thickness 0.016 meter Configure Via	35
Setup Name: Setup1 Test Name: DTM D:/DTM/ D/DTM/ D/DTM/	OK Reset	Cancel upport			Trace layer Type Simple Detailed Trace layer parameters # Layer thickness % coverage Layer Material 1 0.1 mm 55 Cu-Pure 2 0.1 mm 80 Cu-Pure 3 0.1 mm 60 Cu-Pure	Add Iay
					Effective conductivity (plane) = 66.909 W/m-K Effective conductivity (normal) = 0.466 W/m-K Allowable trace layer thickness = 0.0012 meter Recalculate)
					Create PCB Use Default Cancel	

PCB



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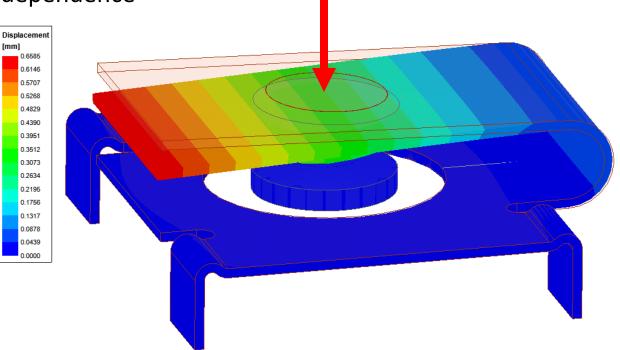
2022 R1 Mechanical in AEDT

Update



Mechanical 2022R1 Highlights

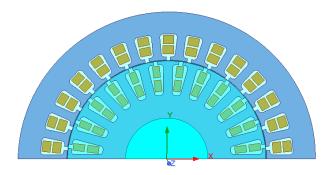
- Coupling
 - Maxwell 2D Thermal EM Loss Coupling
- Materials
 - General expression support for temperature-dependence
- Structural Beta
 - Boundaries
 - Displacement
 - Pressure/Force
 - Coupling
 - Mechanical Thermal-Structural Link
 - EM Force Structural Coupling
- Meshing Beta
 - Thermal Slider bar Meshing
- Reporting
 - Fields Summary



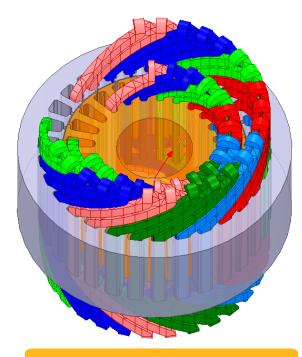


Maxwell 2D – Thermal EM Loss Coupling

- Support EM Loss Import from Maxwell 2D
 - Extruded geometries of 2D representations
 - Support both +ve and -ve extrusions in XY
 - Can be partial geometries
 - Coupling projects 3D mesh points onto 2D geometry
 - Limitations
 - Extrusions need to be along Z axis
 - Losses not conservative
 - 2-way coupling not supported



Maxwell 2D Geometry



Thermal 3D Geometry



Temperature-Dependent Materials

Edit Thermal M Expression Basic Coefficie Temper TL and

- Temperature Dependent Materials
 - General expression support
 - Quadratic expressions
 - Advanced coefficient support •
 - Converted to datasets for solver
 - Thermal & Structural

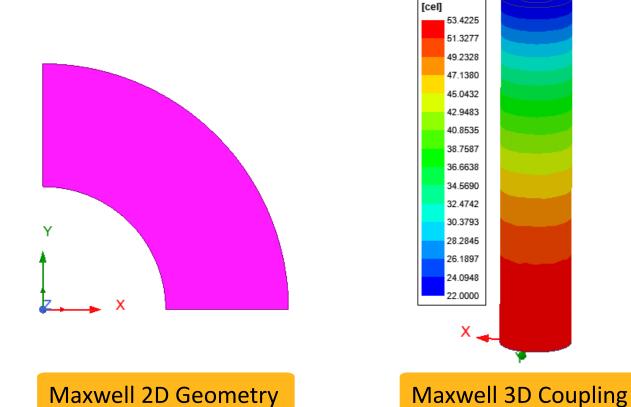
			Edit Thermal Modifier $ imes$
	Edit Thermal Modifier	×	
	C Expression		Expression
als	Basic Coefficient Set Advanced C Temperature-Dependent The P(Temp) = Pref [1 + C1(Ter Reference Thermal Conducti Pref = 205 Parameters TempRef: 22 C1: 0.0012 C2: 2.39e-06	mal Conductivity: np - TempRef) + C2(Temp - TempRef) ^ 2]	Temperature-Dependent Themal Conductivity: P(Temp) = Pref [Modifier] Reference Themal Conductivity: Pref = 205 Parameters Modifier: ff(Temp > 2200cel, 14.95100476, ff(Temp < 0cel, 0.97475676, 1 + 0.0012 * (Temp - (22cel)) + 2.39e-06 * pow ((Temp - (22cel)) . 2))) Use temperature dependent dataset
	<u> </u>	OK Cancel	OK Cancel
ermal Modifier ession ⓒ Quadratic Coefficient Set Advanced Coeffi	flicient Set		MPTEMP, 1, 0
Temperature Limits	oper temperature limits where the		MPTEMP,2,20 MPTEMP,3,40 MPTEMP,4,60 MPTEMP,6,80 MPTEMP,6,100 MPTEMP,7,120 MPTEMP,7,120
TU: 2200	cel		MPTEMP,9,160 MPTEMP,10,180 MPTEMP,11,200 MPTEMP,12,300 MPTEMP,13,400
	t themal modifier values outside the		MPTEMP,14,500 MPTEMP,15,600 MPTEMP,16,700 MPTEMP,17,800 MPTEMP,18,900 MPTEMP,19,1000 MPTEMP,19,1000
TMU: 14.95100476			MPDATA,KXX,1, ,233.8134799,240.8500638,248.2786078,256.0991118,264.3115758,311.2532958, MPDATA,KXX,1, ,367.9940158,434.5337358,510.8724558,597.0101758,692.9468958,798.6826158, MPDATA,KXX,1, ,914.2173358, ! W m^-1 C^-1 MPTEMP,



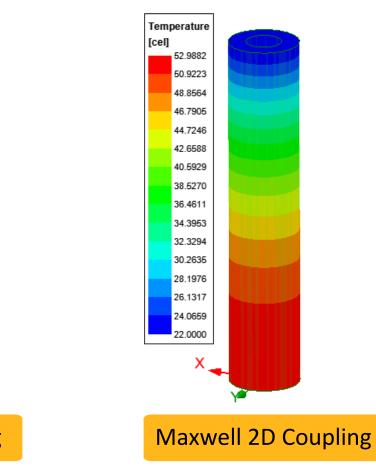
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Maxwell 2D – Thermal EM Loss Coupling

Temperature







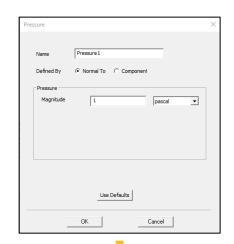


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Mechanical Structural - Pressure/Force Excitations

- Force Excitation
 - Face and Object assignment
 - Uniform and Non-uniform Force options
 - Uniform (face): X, Y, Z components
 - Non-uniform via Setup Link to HFSS/Maxwell
- Pressure Excitation
 - Face assignment
 - Normal To or Component options
 - Normal To: Magnitude
 - Component: X, Y, Z components
 - Support curved faces

Name Force1		_		1
Name Force1				
Force				
• Uniform				
Coordinate system	Global 👻			
X Component	0	newton	•	
Y component	0	newton	-	
Z Component	-1	newton	-	
C Non-Uniform	Setup Link			
	Use Defaults			



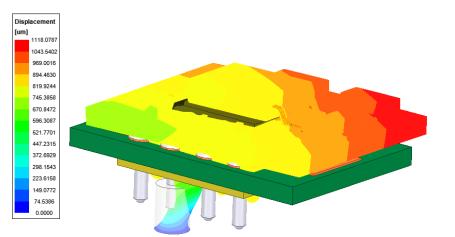
[mm] 0.6585 0.6146 0.5707 0.5268 199.5400 185.287 171 034 156.781-0.4829 0.4390 142.5286 0.3951 0.3512 0.3073 0.2634 0.2195 128.2757 114.0229 99.7700 85.5171 71.2643 57.0114 0.1756 42.7586 28.5057 14.2529 0.0000 0.1317 0.0878 0.0439 0.0000

Assembly under 1N vertical force



Structural - Displacement Excitation

- Displacement Excitation
 - Assignment: Faces and Edges
 - Normal To (faces)
 - Magnitude
 - Components (faces and edges)
 - X, Y, Z components
 - Each component can be fixed magnitude or free



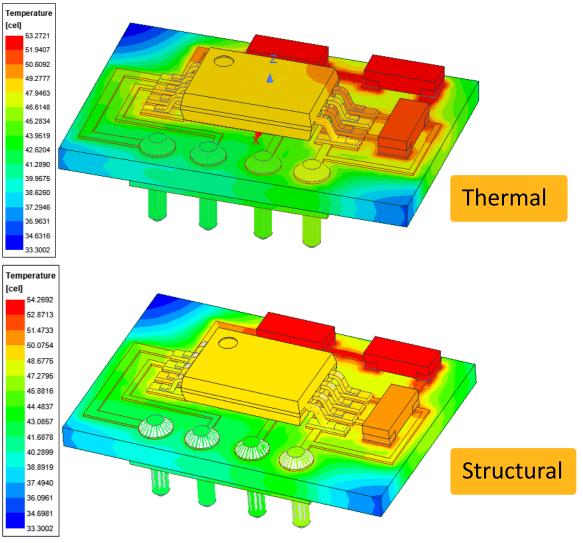
placement		\times	Displa	cement				
Name Defined By	Displacement2 Normal To Components		1	lame	Displace	ment1		
⊢Displacement – Magnitude	0.5			Displacement — Coordinate sys X Component Y component Z Component	Free Free	1	mm mm mm	× ×
	Use Defaults OK Cancel				OK	Use Defaults	Cancel	

PCB Assembly with Y, Z displacements along edge



Thermal Stress Analysis - Link to Mechanical Thermal

- Coupled Thermal Stress Analysis
 - Linked to Thermal design
 - Thermal condition excitation
 - Temperatures imported for objects
 - System Coupling mapper
 - Temperature field plots





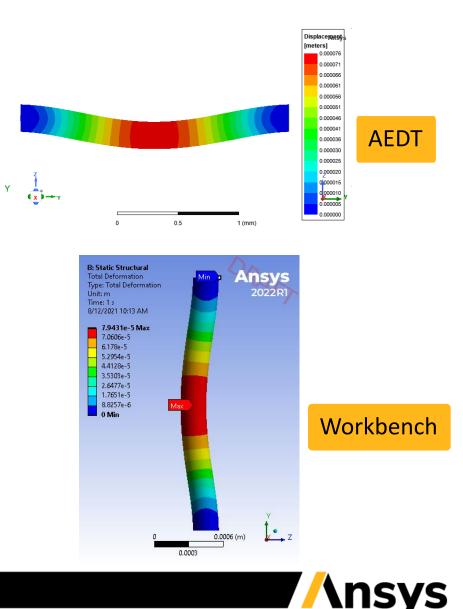
EM Force – Structural Coupling

• Coupled EM Force - Structural Analysis

- Linked to Maxwell 3D
 - Surface and Volume assignment
- Linked to HFSS
 - Surface assignment
- Assignment: Faces and Objects
- 1-way coupling support

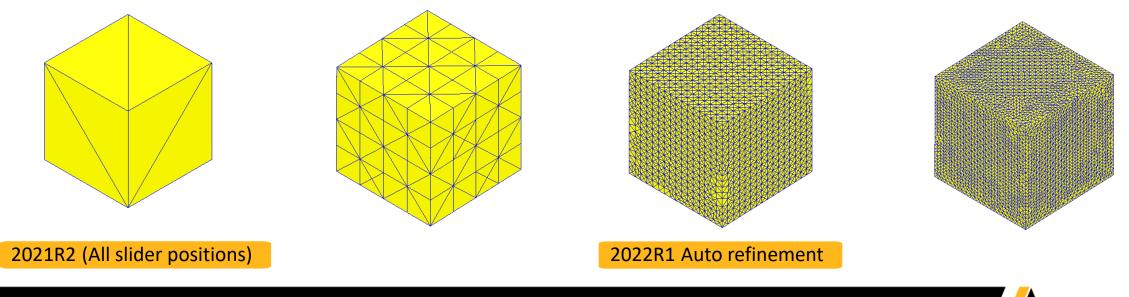
etup Link				2
General Variab	e Mapping			
Product:	ElectronicsDesktop 💌			
Source Project:	✓ Use This Project			
	Save source path relative to:			
	C The project directory of selected prod	uct		
	C This project			
	This Project* - busbars2			
Source Design:	Maxwell3DDesign1		•	
Source Solution	: Setup1 : LastAdaptive		-	
	-		-	
Simulate so	urce design as needed			
Preserve so	urce design solution			
	ractor mode, source project will be saved up	oon exit.		
				_

Force			\times
Name Force 1			
,			
Force			
C Uniform			
Coordinate system	Global	•	
X Component	1	newton 💌	
Y component	1	newton 💌	
Z Component	1	newton 💌	
Non-Uniform	Setup Link		
	Use Defaults		
OK		Cancel	

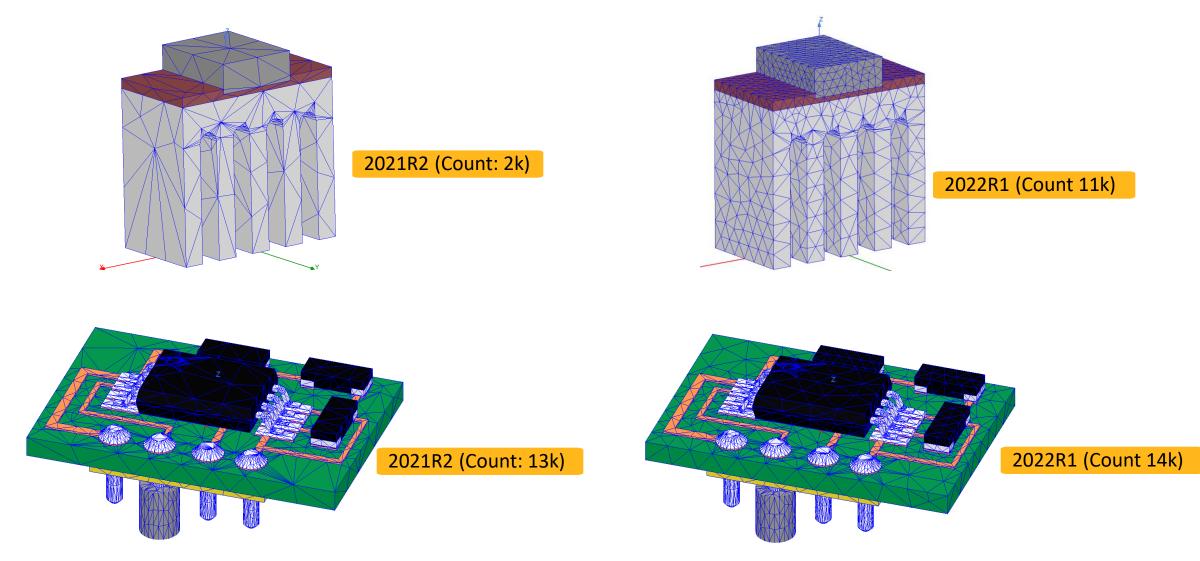


Automated Slider-bar Meshing – Mechanical Thermal [Beta]

- Automated refinement based on slider position
 - Length-based refinement inside and on surfaces of all objects
 - Refinement tailored to curvilinear and rectilinear geometries
- Restrict the need for user-defined mesh operations
- Improved solution accuracy



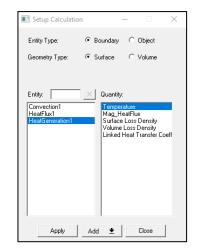
Automated Slider-bar Meshing – Mechanical Thermal [Beta]





Fields Summary

- User-friendly report calculation capability
 - Supports all Fields Calculator variables
 - Boundary and Object selection
 - Surface and Volume calculations
 - Min, Max, Mean, Standard Deviation, Total**
 - Multi-select and multiple calculations
 - Export to CSV format



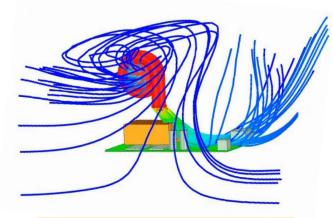
	olution:	Setup1 : Solu	ition						-]		
C)esign Variatio	n: Nominal							•			
al	culations:											
	Entity Type	Geometry Type	Entity	Quantity	Side	Normal	Min	Max	Mean	Stdev	Area	Setup
	Boundary	Surface	Convection1	Temperature[C]	Default		87.2397	91.2407	88.6246	0.974567	0.0117:	
	Object	Surface	Box1	Temperature[C]	Default		87.2397	91.2664	88.8164	1.12229	0.0128!	Delete
	Object	Volume	Box1,Box2,Box3	Temperature[C]	Default		87.2397	92.0858	89.4631	1.38128	3.4966	Clear All
	Object	Surface	Box1	Mag_HeatFlux[W/m^2]	Default		2065.29	48196	18972	9898.65	0.0128!	

^{**} Total and Heat Flow Rate available for Objects, but not boundaries

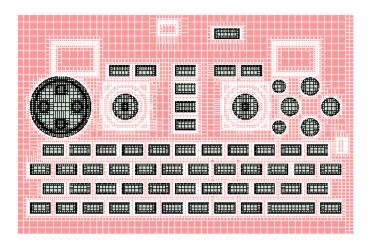


Icepak 2022 R1 Highlights

- Reduced Order Modeling (ROM)
 - Redhawk CTM 2-Way & New Delphi Network Creation
- Blower Modeling
- ECAD Import Wirebond & IDX
- Maxwell 2D Icepak EM Loss Coupling



Streamlines into and out of a Centrifugal CAD Blower cooling a PCB assembly

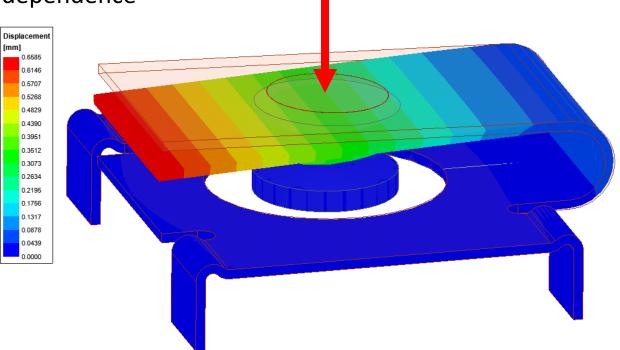


- Mesher Enhancements 2.5D Improvements
- User Experience
 - Streamlines & Validation Enhancements
 - Improved Error messaging & troubleshooting
- Migration
 - Improve speed of TZR conversion
 - Network Schematic enhancements
 - Toolkit enhancements
 - PCB, Package parameterization



Mechanical 2022R1 Highlights

- Coupling
 - Maxwell 2D Thermal EM Loss Coupling
- Materials
 - General expression support for temperature-dependence
- Structural Beta
 - Boundaries
 - Displacement
 - Pressure/Force
 - Coupling
 - Mechanical Thermal-Structural Link
 - EM Force Structural Coupling
- Meshing Beta
 - Thermal Slider bar Meshing
- Reporting
 - Fields Summary









APPENDIX



Validation - Error Messages and Handling

• HDM Error Message Handling

- Detailed error messages printed in message window and HDM aborted
- Cause of errors and suggested solutions documented
- Boundary Condition Validation
 - Improved error handling
 - Cause of errors and suggested solutions documented

Error Message	Cause of Error	Possible Solution
Unknown planes:	A 2D sheet primitive object has a plane other than xy,xz, or yz	Contact Ansys support for assistance
Incorrect polygon vert count	A polygon object has less than 3 vertices, or the specified number of vertices does not match the actual number	Check polygon shape definition for repeated vertices. If no repeated vertices are defined, submit a defect tolcepak Dev
Domain is not present, error in input file	The air region is not correctly identified by the geometry engine.	Contact Ansys support for assistance
Failed to triangulate objectObject_Name. Polygon vertices may be collapsed due to min gap settings	The polygon shape "Object_Name" cannot be converted into a triangulatedsurface for meshing.	Check the vertices of the polygon to see if any two ofthem are too close to each other, If so, considermerging them to one point.
External mesh "file name" cannot be reused. Please check if it is a valid mesh file.	The reuse mesh file named "file name" cannot be located or opened.	Check if the correct mesh file has been selected in the reuse mesh operation.
Polyhedron is not supported in Icepak. Reuse mesh cell type must be hex, prism, pyramid or tet.	The reuse mesh contains polyhedral cells, which are not supported by Icepak.	When meshing in fluent, avoid using polyhedral cells.
External mesh's bounding box must match the object's box. The local coordinate system of the object might be wrong	The reuse mesh's bounding box does not match that of the geometry	Check if the correct mesh file has been selected in the reuse mesh operation. Check if the reuse meshconforms well with the geometry.
Element count (total_count, nx, ny ,nz) is higher than the max_elements specified	For cartesianmesher, the mesh count of the initial background mesh is larger than the maximum element count specified in the UI.	Use larger max elementsize, orincrease the "Maxelements" located in the "Options" tab of mesh controlpanel.
CART3D/CART2D HANGING NODE FAILED for assembly (meshregion) name.	3D/2D multi-level meshing is not successful in the mesh region.	Use non-isotropic transition of 3D MLM.



Troubleshooting Documentation

You are here: Icepak Help > Icepak Troubleshooting > Icepak Troubleshooting Meshing



Icepak Help

Icepak Troubleshooting - Boundary Conditions

Error Message	Cause	Guidance
Interior Opening "OpeningName" cannot have a Velocity specification.	Velocity is specified on an internal opening.	Switch the opening inlet type to Pressure.
for Stationary wall "WallName" will be	A stationary wall with heat transfer coefficient specified is on the interior of the computational domain.	Switch the external condition to Heat Flux.
does not have any wall or flow		Create an external wall boundary or appropriate flow boundaries.

You are here: Icepak Help > Icepak Troubleshooting > Icepak Troubleshooting Meshing



Icepak Help

Icepak Troubleshooting - Meshing

Error Message	Cause	Guidance
Unknown planes	A 2D sheet primitive object has a plane other than xy, xz, or yz.	Contact Ansys support for assistance.
Incorrect polygon vert count	A polygon object has less than 3 vertices, or the specified number of vertices does not match the actual number.	Check the polygon shape definition for repeated vertices. If no repeated vertices are defined, contact Ansys support for assistance.
Domain is not present, error in input file	The air region is not correctly identified by the geometry engine.	Contact Ansys support for assistance.
External mesh "file name" cannot be reused. Please check if it is a valid mesh file.		Check if the correct mesh file has been selected in the reuse mesh operation.
Polyhedron is not supported in Icepak. Reuse mesh cell type must be hex, prism, pyramid or tet.	The reuse mesh contains polyhedral cells, which are not supported by Icepak.	When meshing in Fluent, avoid using polyhedral cells.
xternal mesh's bounding box must latch the object's box. The local pordinate system of the object might e wrong.		Check if the correct mesh file has been selected in the reuse mesh operation. Also, check if the reuse mesh conforms well with the geometry.
Failed to triangulate object "object The polygon shape "object name" cannot be converted into a triangulated surface for meshing.		Check the vertices of the polygon to see overlapped vertices or self- intersection. If so, correct the geometry.
CART3D/CART2D HangingNode FAILED for assembly (mesh region) "assembly name".	3D/2D multilevel meshing is not successful for the mesh region "assembly name".	Use non-isotropic transition of 3D MLM.



Classic Icepak 2022 R1

Update



Classic Icepak 2022R1 Summary

- Scheduler enhancements
 - Slurm support
 - Switch to FLUENT scheduler syntax
- Modeling
 - Transient junction temperature
 - DO solar irradiation model on flow boundary
- Meshing
 - Size function for 2d objects in 2.5D
 - Auto 2D Layer-by-Layer Mesh Separately (BETA)
 - Handle 2D object on mesh separately/mesh reuse objects (BETA)
- Miscellaneous
 - Network node names in Temperature Limits dialog
 - Option to merge ECXML file
 - Use CAD z-axis as flow direction for CAD fan

Scheduler Enhancements

- Slurm scheduler support
 - Remote Linux from windows
 - Native on Linux
- FLUENT command line syntax switched to "– scheduler_{param}=<options>" format
 - fluent 3ddp -t4 ... -node0=<Remote Linux Login Host> scheduler=<lsf, sge, pbs, slurm> scheduler_headnode=<Submission host>

Parallel settings	_ ×
Configuration	
C Serial	C Parallel
O Network parallel	Job Scheduler
GPU computing	GPUs 1
Parallei options	
# processors	2
Network parallel option	
Compute node file	G Browse
Job Scheduler options	z
# processors	4
Remote Icepak ROOT	/nfs/ausjlimrh5/home/jlim/ansys_inc/v21
Remote solver path	/nfs/ausjlimrh5/home/jlim/ansys_inc/v21
OUse LSF OUse	SGE C Use PBSPro 📀 Use Slurm
Slurm submission host	cdcslurmhost.ansys.com
Slurm partition	partname
Slurm options	
Specify monitor point	output frequency 10
🖉 Accept 🛛 🕞 Sa	ve 🕒 Load 💥 Cancel



Scheduler Enhancements (Cont'd)

- Distinction between "Remote Linux login host" vs "Submission host"
 - Remote Linux login host Remote Linux desktop/server for login using user's credentials
 - Submission host Cluster head node where scheduler is started
 - If "Submission host" is empty or "localhost", cluster head node assumed to be login host

-Job Scheduler options			
# processors		4	
Remote solver path		/home/jxia/ansys_inc/v211/fluent	
Remote working direc	tory	/home/jxia/tmp/lsf	
Remote Linux login ho	st	cdcs12llsfcn01.ansys.com	П
Remote spawn comm Copy to remote comm		plink -l jxia -i c:/temp/ssh-priv.ppk cmd "pscp -scp -i c:/temp/ssh-priv.p	Π
		C Use PBSPro C Use Slurm	
LSF submission host	cdc	s12llsfcn01.ansys.com	
LSF queue	norr	nal	Π
LSF options	-x		
🔽 Enable tight couplin	ng wi	th MPI library	

# processors	2
Remote Icepak ROOT	/ansys_inc/v212/icepak
Remote solver path	/ansys_inc/v212/fluent
• Use LSF • Use	SGE 🧿 Use PBSPro 🧿 Use Slurm
LSF submission host	cdcs12llsffcn01.ansys.com

Submission host on native Linux from current workingmachine

LSF submission ho	ost cdcs12llsfcn01.ansys.com			
LSF queue	normal			
LSF options	-x			
Enable tight co.	upling with MPI library			
- Lincolo agin co				

PBS submission host

Submission host for respective schedulers when using Remote Linux from Windows

GE qmaster	cdcrsms12v01.ansys.com	
GE queue	all.q	
ЭЕ ре	pe_mpi 4	

Slurm options

//nsys

Modeling

- Transient junction power
 - Two resistor, Star network and Full shunt
 - Save, Load, View updated in *Transient Viewer*

Transients					
1-					time Component network
- 0.8					
0.6 —					
-					
0.2 -					
	20	1 40	60		
	Time	(\$)			
🔀 Close 🔤	🖉 Update 📃 💷 Show	All 🖉 Load All	📑 Save All	Zoom	

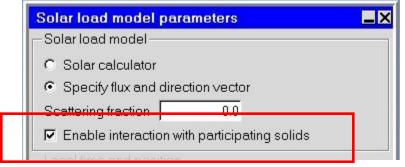
Junction power viewer

_ X Blocks [component network] Info Geometry Properties Notes Block type: C Solid C Hollow C Fluid @ Network -Network type-Network parameters Two resistor Min Z Board side -20 C/W -C Star network Ric C Full shunt Rjb 22 C/W -C General Junction power 0.5 W 🕶 ✓ Transient Edit 0.0001 Ibm 🔻 Mass 2 W-min/lb-C -Specific heat Interface resistance _ × Transient power Time interval Start time 0 s 🕶 60 s 🔻 End time Thermal specification $s(t) = s \circ f(t)$ Type Surface material default + C Linear Phase 0 s 🕶 Radiation Edit C PowerLaw On time 5 s 🕶 C Exponential 10 s 🔻 Offtime Temperature limit default C -C Sinusoidal 0.0 Off value C Piecewise linear Fix values Square wave 💥 Cancel 👶 Reset 😡 Done 🧹 Update 🕜 Help 👷 New 🍰 Reset V Update 🙆 Delete 💥 Cancel 🕢 Done 🕜 Help Copy from

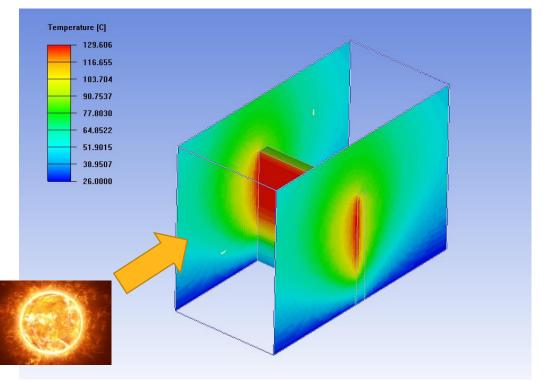
Modeling (Cont'd)

- DO solar irradiation model on flow boundary
 - Solar irradiation applied as DO intensity at inflow/outflow boundaries
 - Turn on when "Enable interaction with participating solids" option is checked
- DO solar model vs Ray-tracing
 - Not the same!
 - Ray-tracing applies solar load as heat flux at incident wall using solar absorptivity and distributes evenly reflected solar load
 - DO model treats solar load by adding solar flux to intensity in given direction
 - RTE solved with full interaction with participating solids and opaque/transparent boundaries

• Net wall radiation flux
$$q_{rad} = \epsilon \int_{\mathbf{s}.\mathbf{n}>0} \mathbf{I}(\mathbf{s}) \mathbf{s} \cdot \mathbf{n} \, d\Omega - n^2 \epsilon \sigma T_w^4$$



Enabling DO solar model

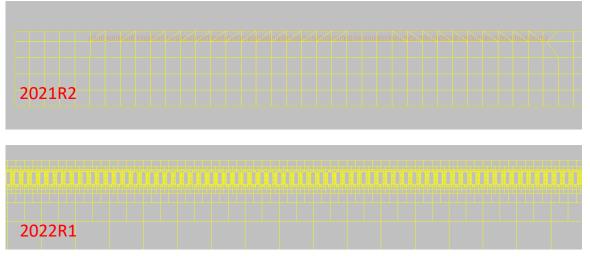


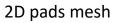
Solar load on wood block using DO



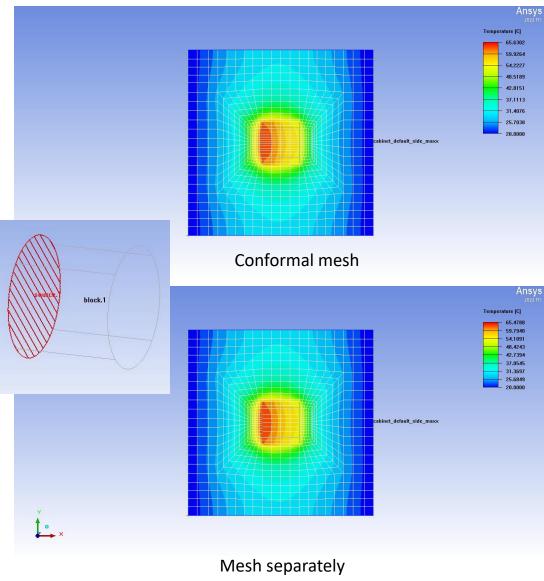
Meshing Enhancements

- Size controls for 2d objects in 2.5D Meshing
 - Level, proximity and curvature size functions





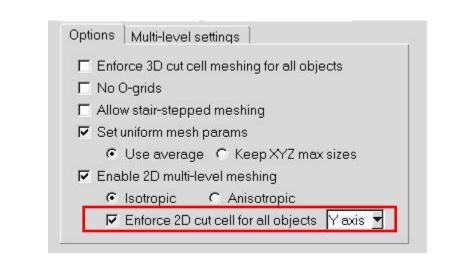
- 2D objects on internal couplings (BETA)
 - Allows 2D object on meshed separately object boundary
 - Set ICEPAK_MAKE_INTERNAL_COUPLING_MAP=1

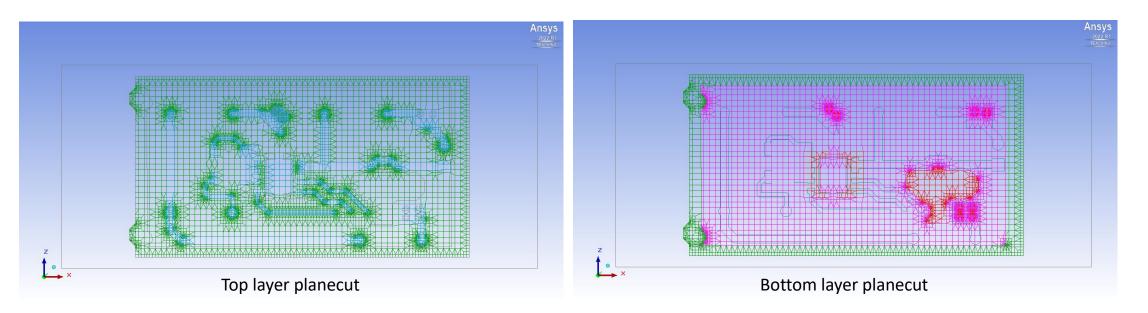




Meshing Enhancements (Cont'd)

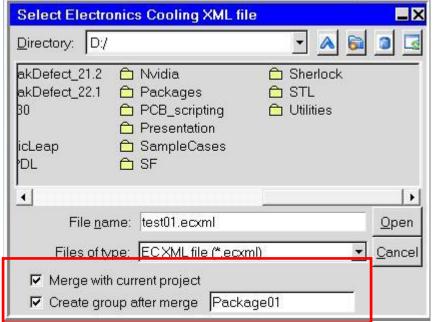
- Auto mesh-separately for 2D objects (BETA)
 - Applicable only when <u>2D direction is specified</u>
 - Objects with common elevation ranges grouped into separate "assembly"
 - Local "assembly" avoids imprinting all outlines to single plane
 - Set ICEPAK_ENABLE_BETA_FEATURES="hdm_2.5d_blocking"

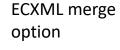




Miscellaneous

- Network node names in Power/Temp limits setup
 - Format: intN (name)
- ECXML enhancements
 - Option to merge into current project
 - Group assignment during merge





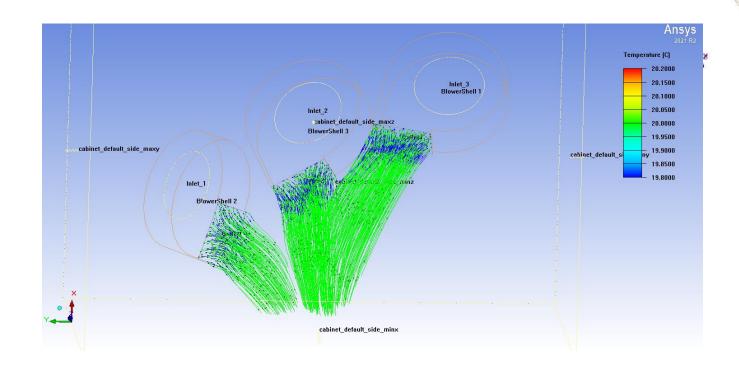
Network	Node	Power .
anti_end_brg	int0 (anti_end_balls)	20
dri∨e_end_brg	int0 (dri∨e_end_balls)	20
ext_air_flow	int0 (ext_air_int)	0
int_air_flow	int0 (exc_in_b2)	0
int_air_flow	int1 (exc_et_c1)	0
int_air_flow	int2 (exc_st_d2)	0
int_air_flow	int3 (exc_ag_d3)	0
int_air_flow	int4 (exc_hh_d4)	0
int_air_flow	int5 (gen_et_e1)	0
int_air_flow	int6 (gen_bi_f1)	0
int_air_flow	int7 (gen_ag_f2)	114
int_air_flow	int8 (gen_ro_f3)	0
int_air_flow	int9 (gen_et_g1)	0
int_air_flow	int10 (pmg_ag_h2)	10
int_air_flow	int11 (pmg_ms_h3)	0
int_air_flow	int12 (pmg_hh_h4)	0
int_air_flow	int13 (pmg_et_i1)	0
int_air_flow	int14 (gen_out_j1)	
int_air_flow	int15 (pmg_out_j2)	0
int_air_flow	int16 (gen_in_b1)	0
int_air_flow	bound1 (out_bound)	0
rect_theta_jc	int0 (rect_junc)	60
Total power		224
4		1
Default temperat	ure limit 20 C - All to	default Unset all
All temperatures	in C 🗸	

Network node names



Miscellaneous (Cont'd)

- CAD fan flow direction determined by z-axis
 - Decoration updated to show flow direction



Inlet 1 Blowerschell 2 Ruttate 02	Fans [Outlet1] Image: Calify and the second system Info Geometry Properties Notes Model as Calify and the second system Image: Calify and the second system Image: Calify and the second system Orientation Z-txis X-txis Image: Calify and the second system V 0.16166 Image: Calify and the second system Image: Calify and the second system V 0.16166 Image: Calify and the second system Image: Calify and the second system V 0.16166 Image: Calify and the second system Image: Calify and the second system V 0.1616227 Image: Operation and the second system Image: Calify and the second system V 0.161627 Image: Operation and the second system Image: Calify and the second system V 0.16162 Image: Operation and the second system Image: Calify and the second system V 0.1617 Image: Calify and the second system Image: Calify and the second system V 0.1617 Image: Calify and the second system Image: Calify and the second system V 0.1617 Image: Calify and the second system Image: Calify and the second system V
	✓ Update 🙀 New 🖇 Reset 🚱 Delete
	Copy from O Done Cancel O Help
Fans [Outlet1] ■X Info Geometry Properties Notes Fan type Internal ■ Elevation time ● ● Positive C Negative ● Optimized ● ● Fan flow Swirt Optimes Fan flow Swirt Optimes Fan flow Swirt Optimes Flow type Linear Elevative Flow rate 0.004719474 m3/s • C Non-linear Head pressure 1 C Fixed Image pressure Nm2 • Total temperature ambient © ■ Species Species Edit ■ ■ Fix values Image Image Preset	
Update 🔤 😪 New	Seset Delete
Copy from ODone	Cancel 💡 Help

