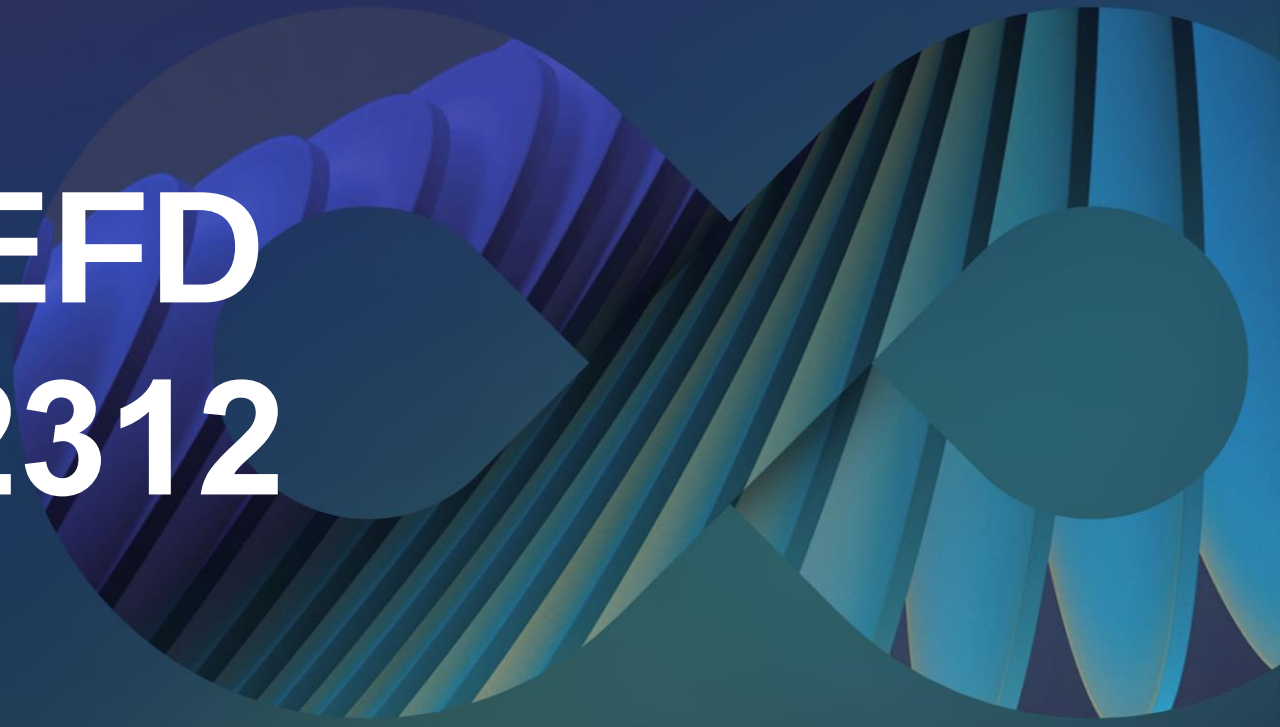
Simcenter FLOEFD What's New in 2312



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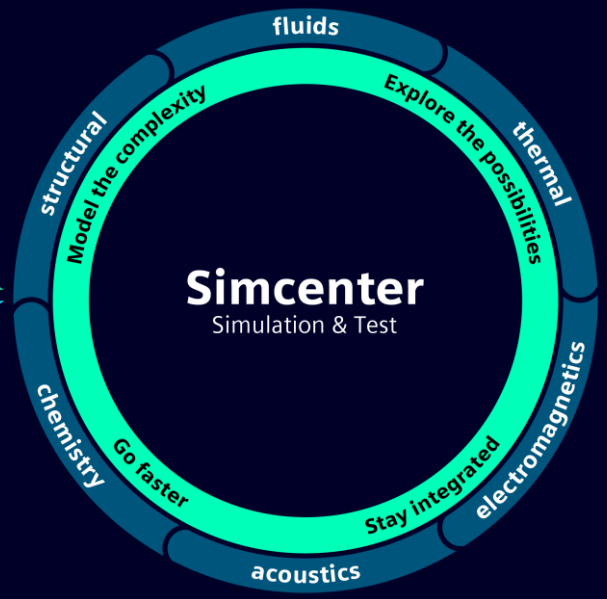
Model the complexity
Ensuring decision confidence

Explore the possibilities
Enabling insights

Go faster
Achieving speed and agility

Stay integrated
Connecting all activities



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New Features in Simcenter FLOEFD 2312

Model the complexity

Electronics – Thermal Analysis

- EDA Bridge: Independent thermal territories, scripting
- Package Creator: Additional component templates
- Reflow oven process simulation

Electronics – Multiphysics

- Structural: Non-linear materials
- Structural: Large strain
- Structural: MBO
- Structural: General contacts

Other

- X-Ray leakage analysis

Explore the possibilities

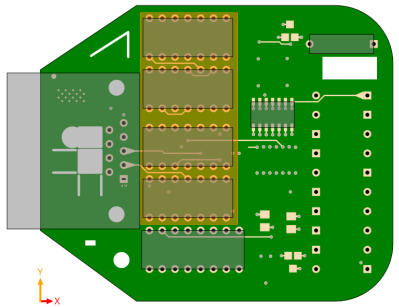
- EFDAPI - Improve API and automation
- Batch results processing without CAD on server side

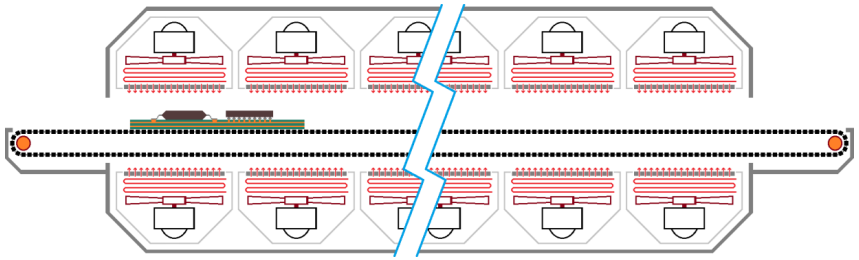
Go faster

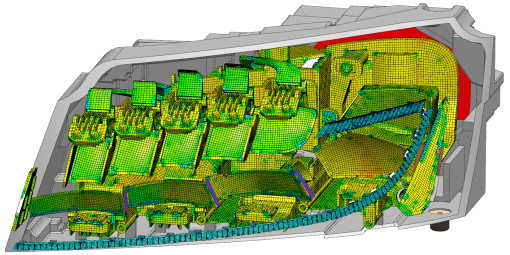
- Mesher speed increase for convergent/faceted/STL geometries
- Smart PCB: Speed/accuracy improvement

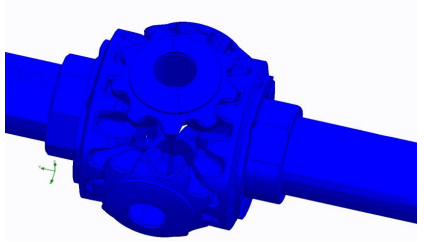
Stay integrated

- SCD5 format:
  - Export of FLOEFD fields to SCD5 file
  - Option in CGNS export to use SCD5 file as an input mesh
- Export scenes in JT format
- Common color bar
- Catia V5 R33 support
- Repackaging









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Model the complexity
Electronics – Thermal Analysis

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EDA Bridge: Independent thermal territory

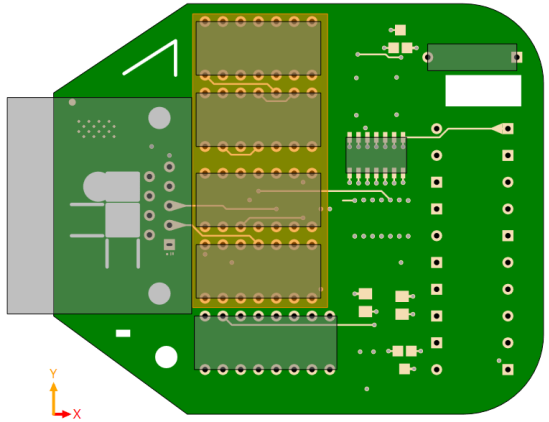
Get the PCB model fidelity you need quickly and easily

Challenge: Unable to create a thermal territory that is independent of a component which restricts the user from stretching the territory over multiple components.

Solution: Create a thermal territory that is not linked to a component and can be drawn freely at any position and with any aspect ratio.

Define Independent territories by:

1. Location (X and Y)
2. Size (Length and Width)



Thermal Territory Details

Name	IT- 1	
Territory State	Enabled	
Model Level	Layered (Detailed)	
Thermal Conductivity Calculation	Empirical	
SolderMask Model Level	Simple	
X Location (Origin)	0.04009	m
Y Location (Origin)	0.11532	m
Length (Xo)	0.05764	m
Width (Yo)	0.1521	m

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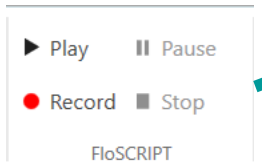
EDA Bridge: New scripting capabilities

Get the PCB model fidelity you need quickly and easily

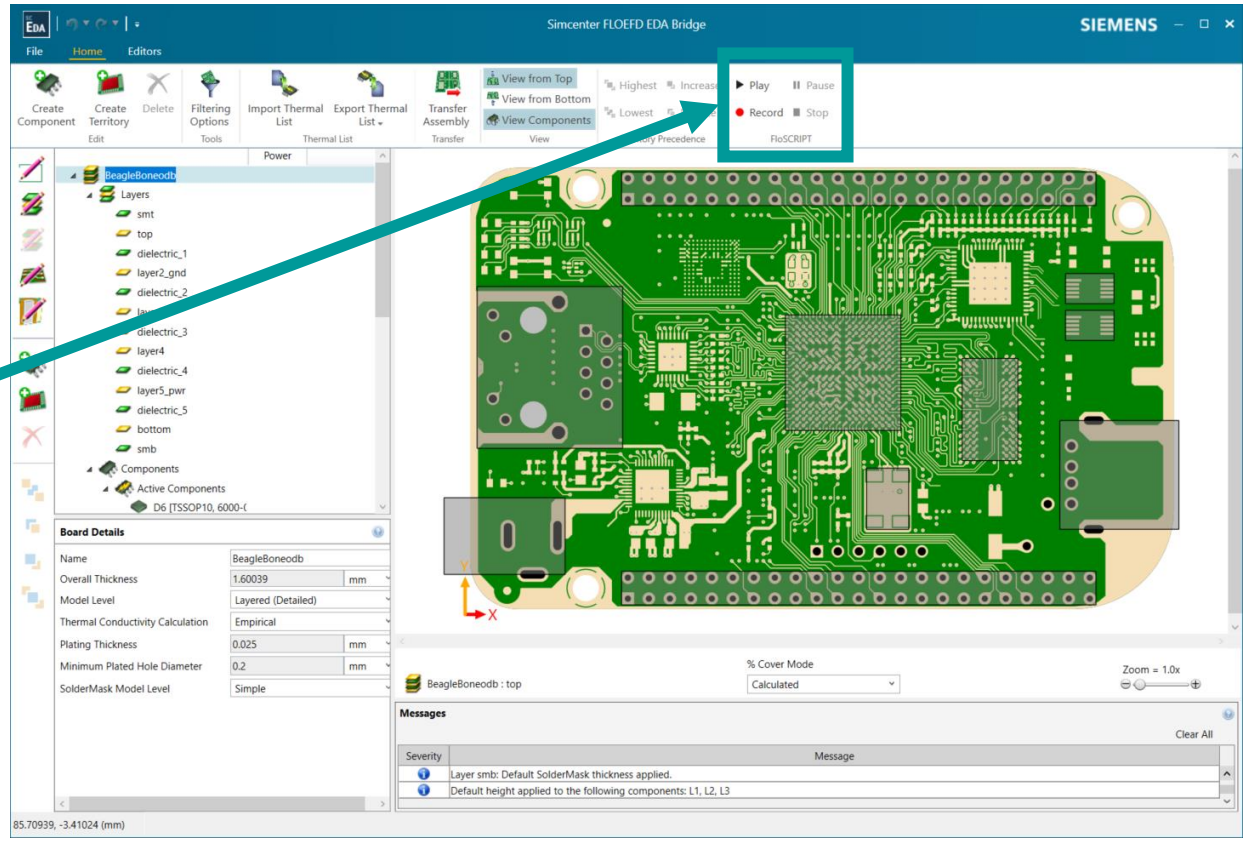
Challenge: Need to be able to investigate various board representations in a reproducible manner.

Solution: Record the workflow and playback with alternative designs.

- Controls added to record and playback scripts.
- Scripts can be edited to create workflow alterations.



- Note:
  - Scripting support is available for commands in the main window only at this time
  - Support for dialog windows is planned.



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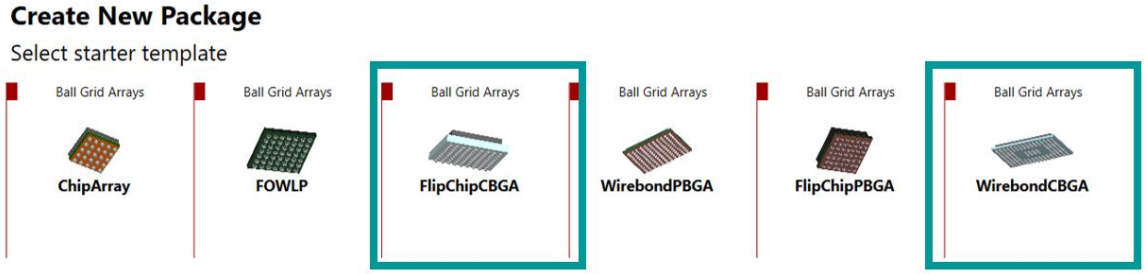
Package Creator update

Expand package modelling options of Package Creator

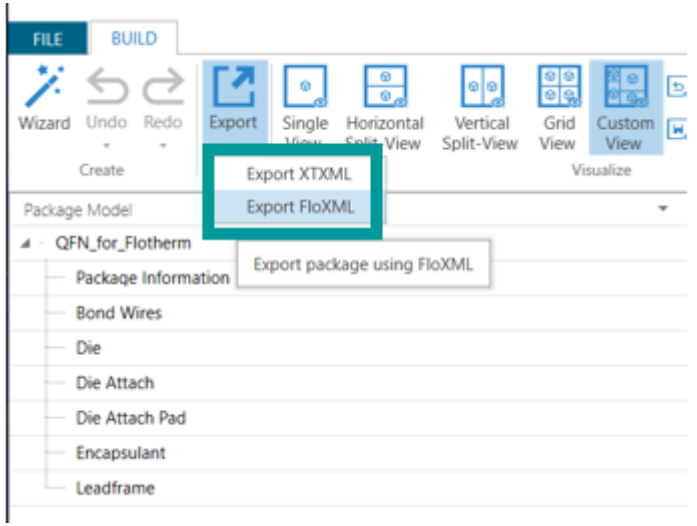
Challenge: Some requested IC package types are not available as templates

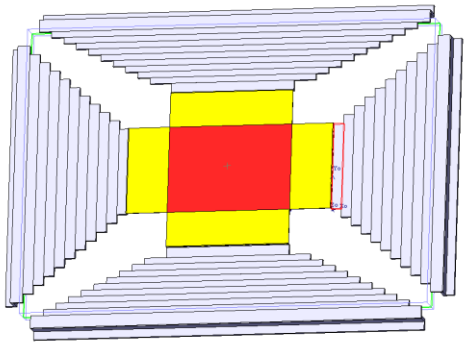
Solution: Update Package Creator to latest version, in synch with Flotherm XT



Enhancements:

- Accessibility improvements and UX update
- New package styles
  - Flip Chip CBGA
  - Wirebond CBGA
- Export Simcenter Flotherm-ready detailed models





Limitations:

- 2R compact model creation/export from Package Creator is not supported yet

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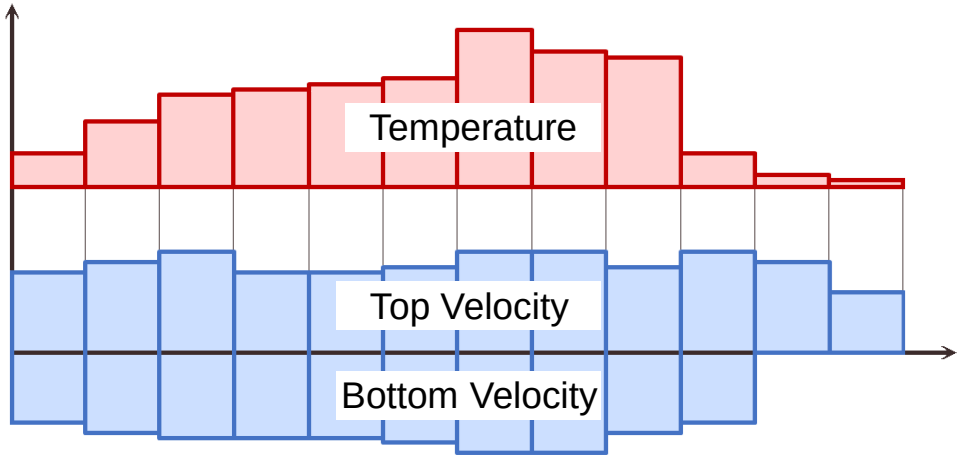
Reflow oven process simulation

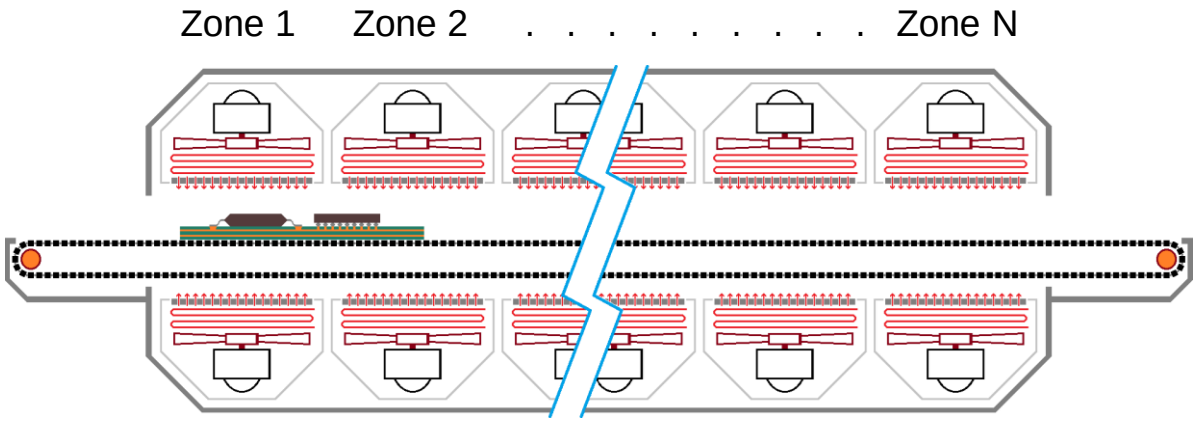
Convenient thermal analysis setup of a reflow oven process

Challenge: Difficulties in modeling the unsteady reflow oven process and predicting the time response of the temperature of components

Solution: Add capabilities to simplify analysis definition:

- Reflow project template: you can easily create new Reflow project using this template and adjust it in accordance with your requirements
- Project parameters automation through FLOEFD API: you can create or modify project parameters needed for Reflow and run Reflow parameters optimization





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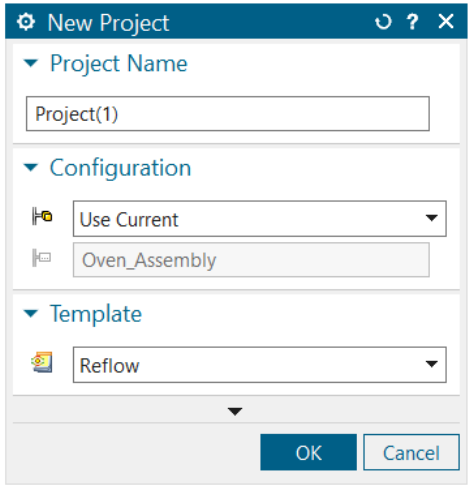
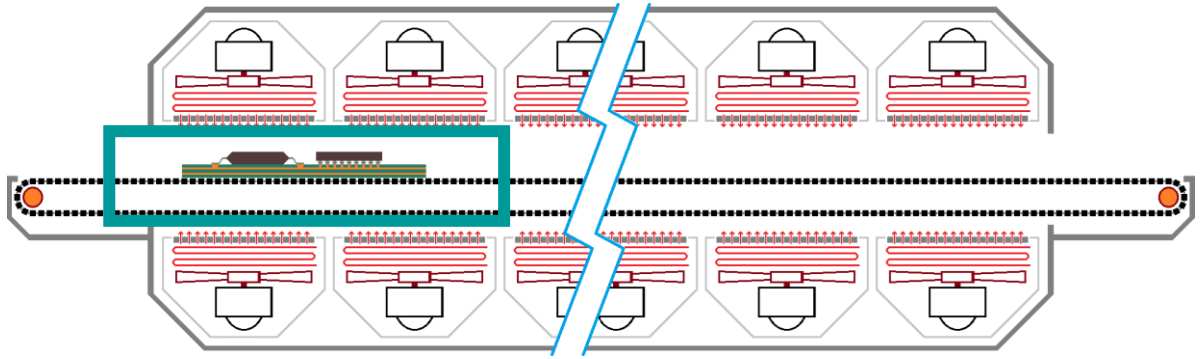
Reflow project

How to run Reflow thermal analysis with Simcenter FLOEFD:

- Create a hollow box (shown on the picture below with green): simulation is to be conducted inside this box, boundary conditions move while PCB stays fixed
- Create new project using the special Reflow project template
- Import EDA data
- Apply Reflow parameters (Temperature and Velocity charts)
- Reselect inner box faces for pre-created boundary conditions
- Add temperature goals to components
- Run simulation





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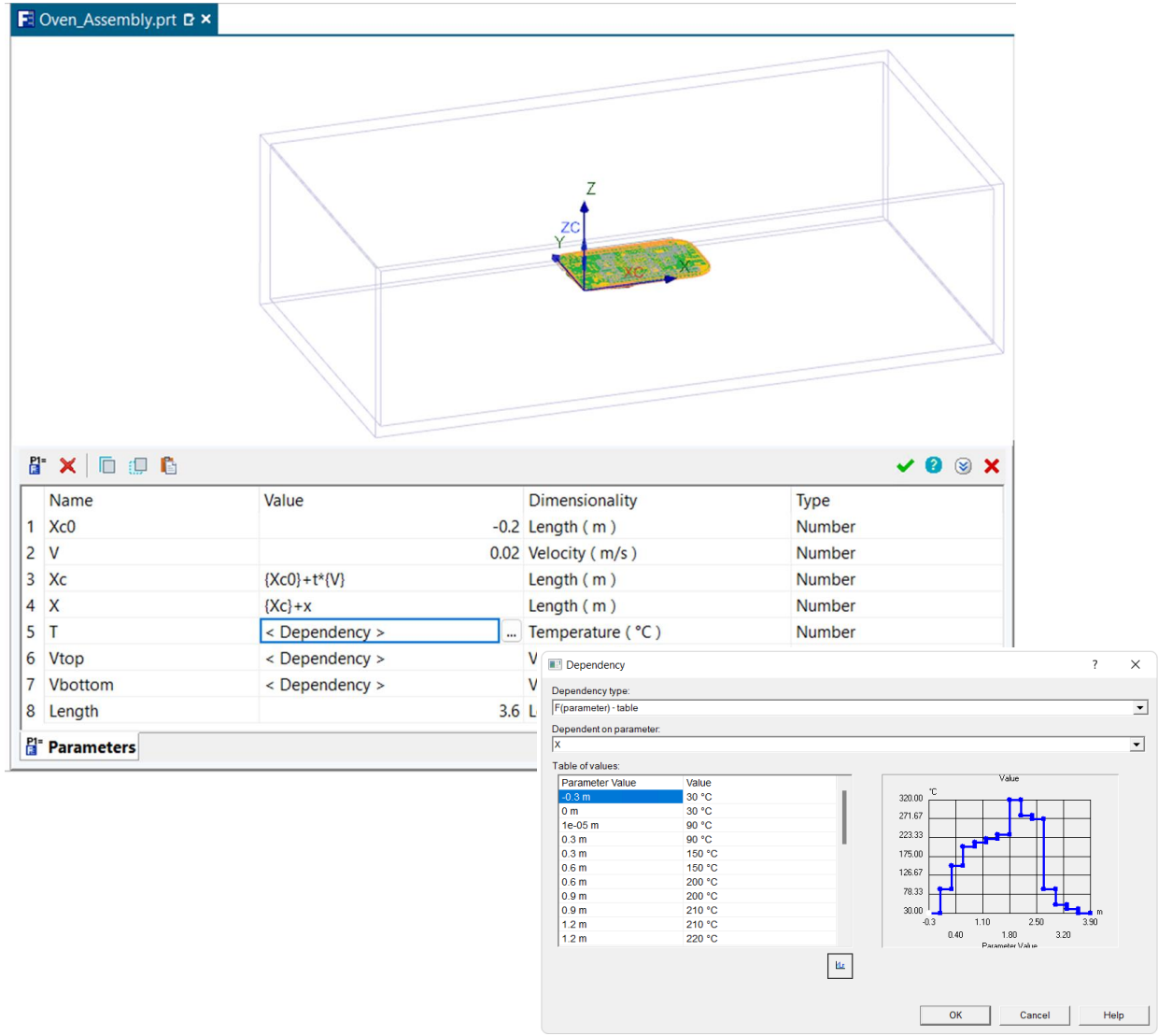
Reflow project parameters

Reflow project template contains pre-defined project parameters:

- Xc0 – initial position of the zero point of the simulation model relative to the oven
- Xc – current position of the zero point of simulation model relative to the oven
- V – conveyor speed
- X – point coordinate of simulation model relative to the oven
- T, Vtop and Vbottom – reflow process parameters dependent on coordinate relative to the oven
- Length – overall path of the PCB through oven (to determine calculation stopping criteria)



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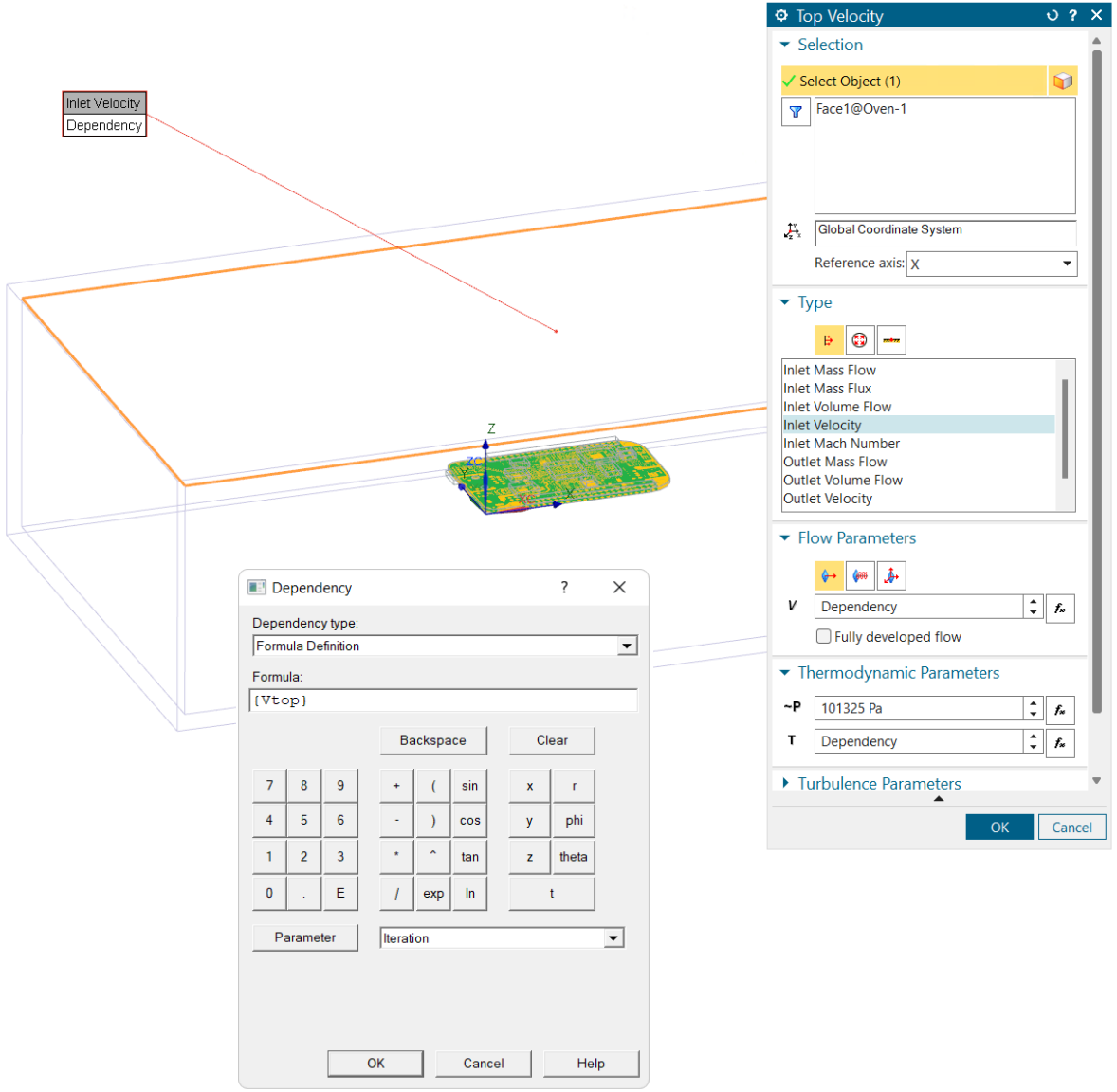
Reflow boundary conditions

Apply pre-defined boundary conditions to the internal box surfaces:

- Top Velocity and Bottom Velocity are on the top and bottom inner faces respectively
- Environment Pressure is on the front and back faces
- Ideal Wall is on the left and right faces



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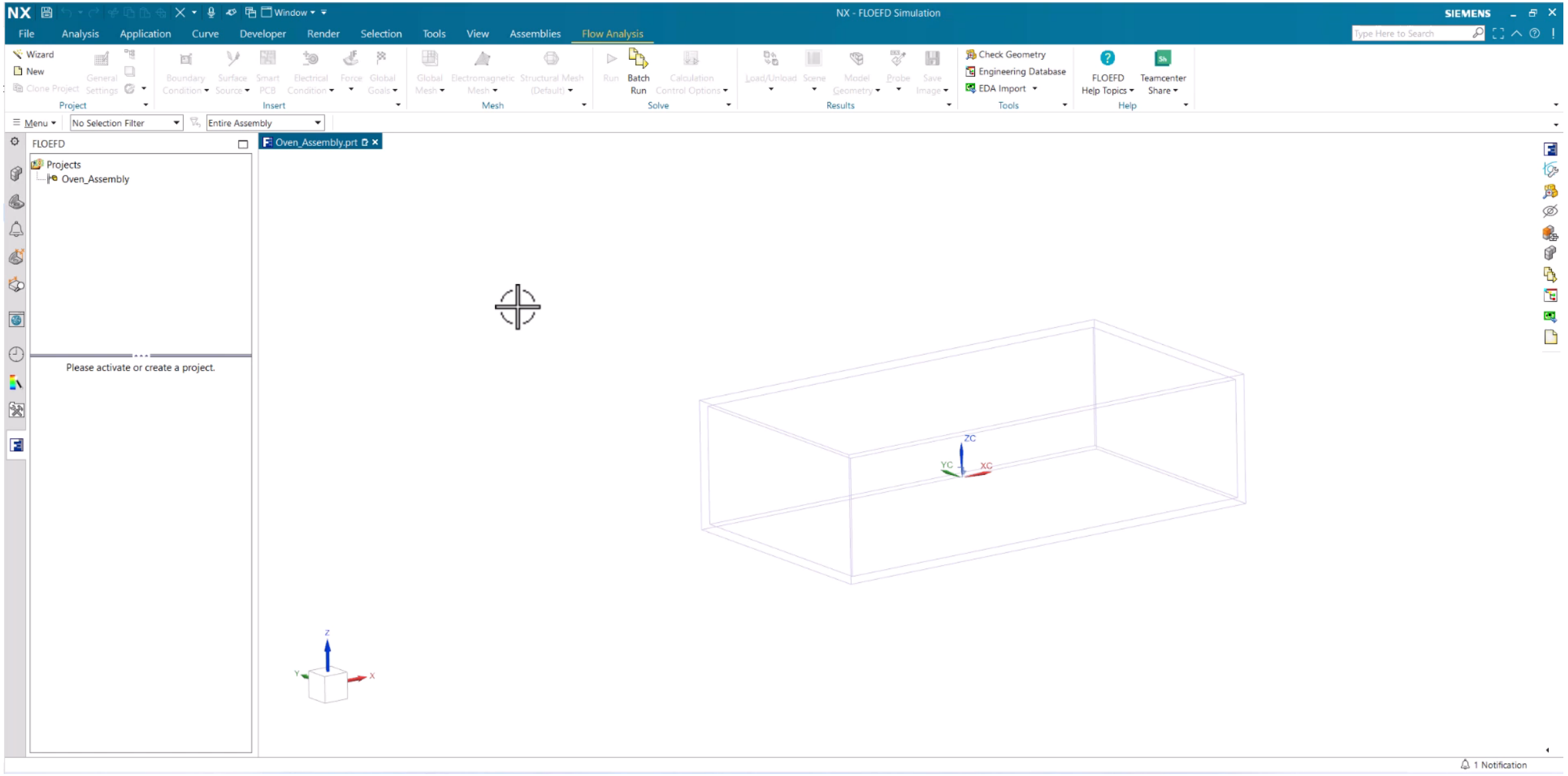
Reflow project



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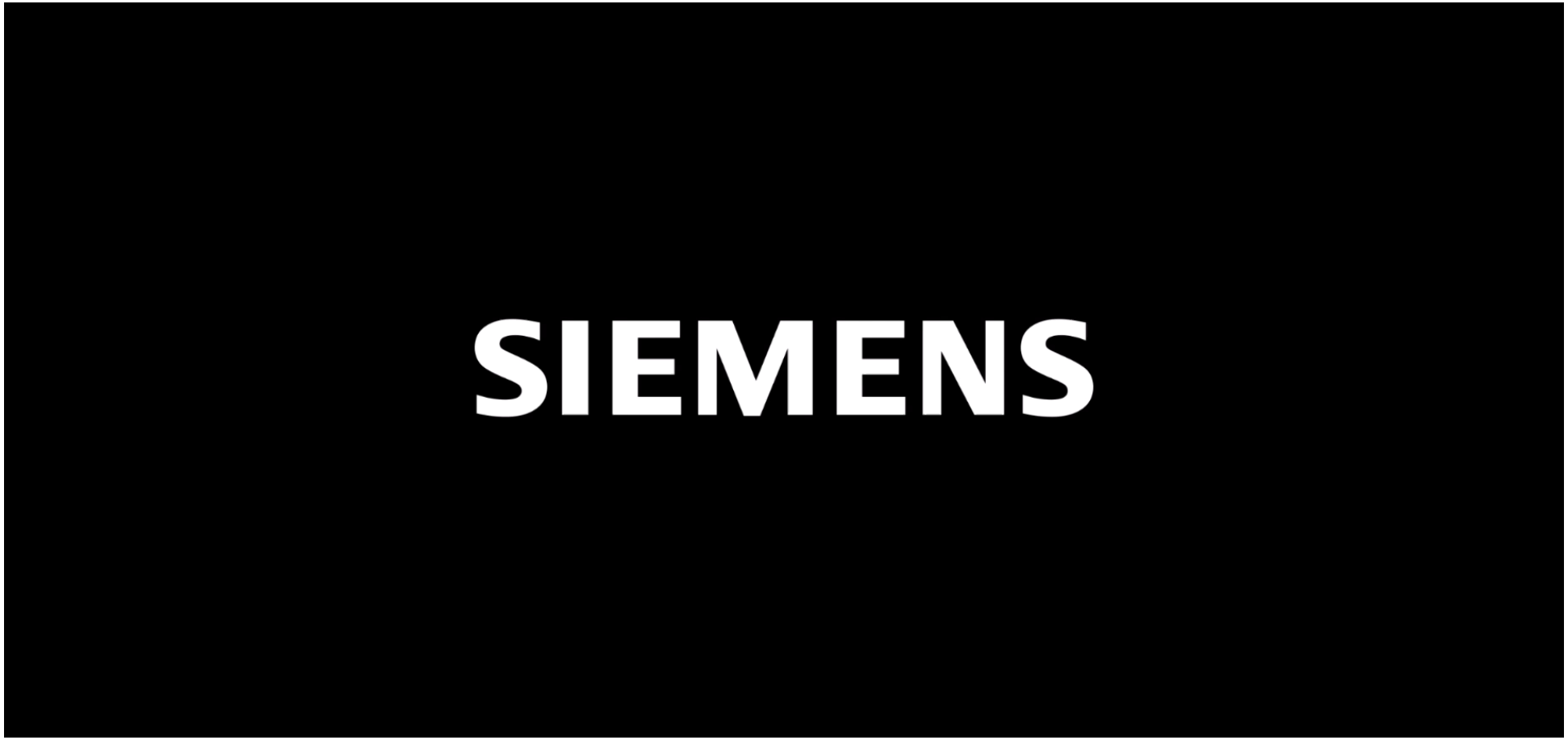
Reflow project



Model the complexity
Electronics – Multiphysics

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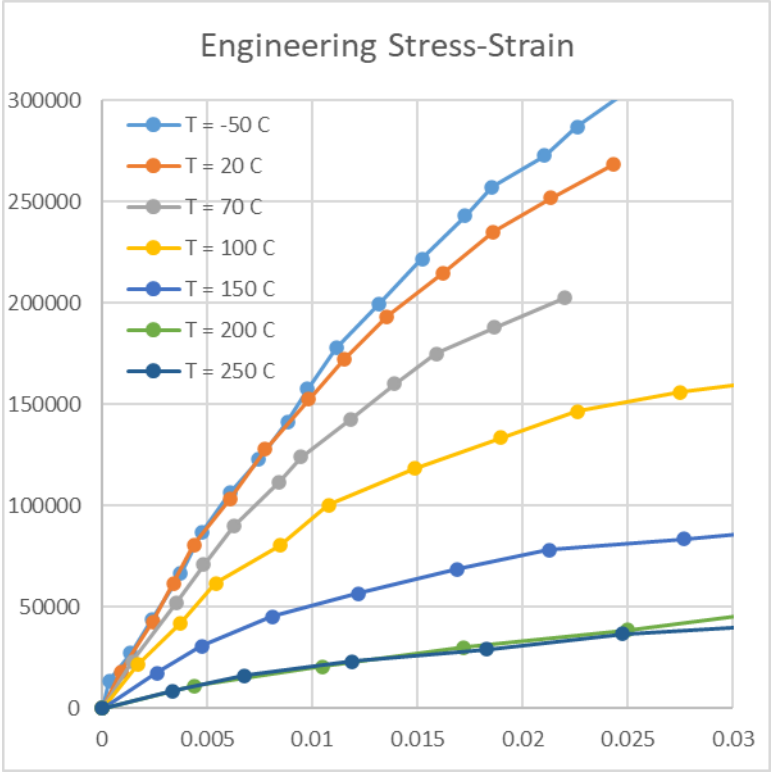
Structural: Non-linear materials

Increase range of materials that can be considered in structural analyses

Challenge: Some materials behave non-linearly and simulation cannot provide good accuracy without taking this into account

Solution: Enhance *Engineering Database* to be able to set Engineering Stress-Strain curves for solid materials and leverage existing capabilities of Simcenter 3D Nastran solver to run analysis



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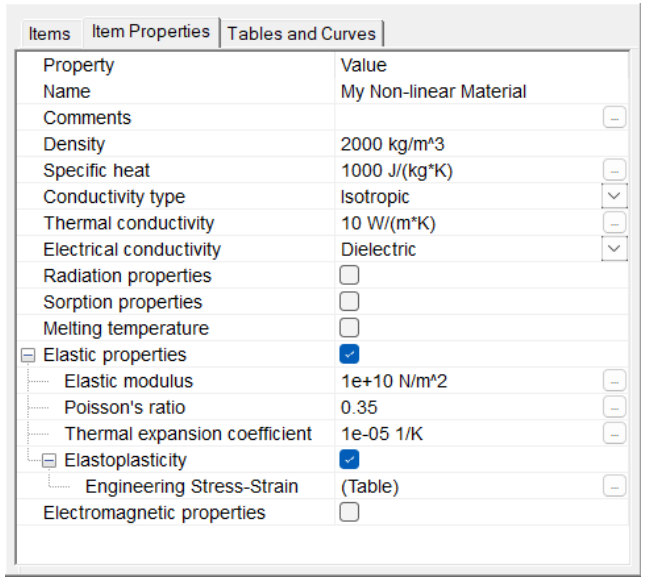
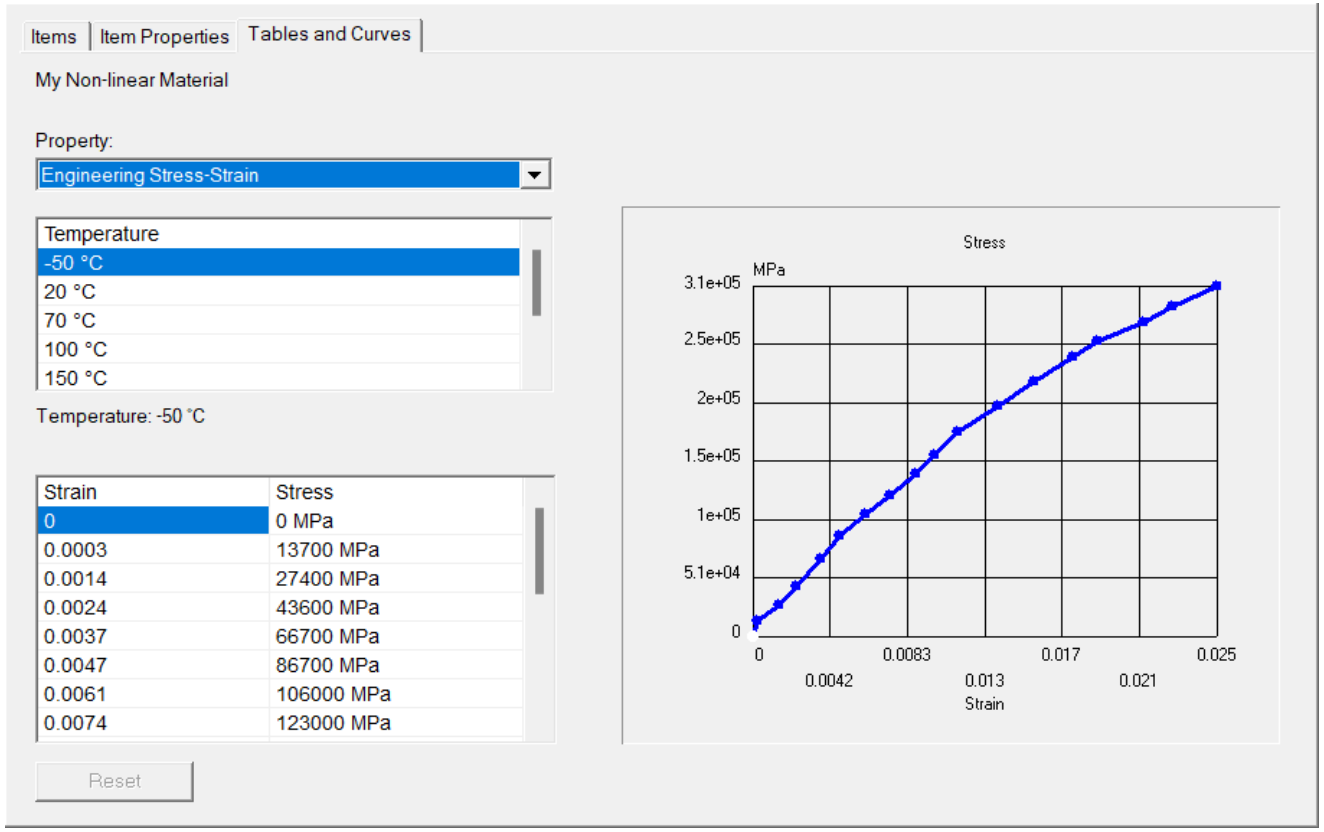
Structural: Non-linear materials

New option *Elastoplasticity* is now available for solid material properties and you can specify Engineering Stress-Strain curve if the option is enabled





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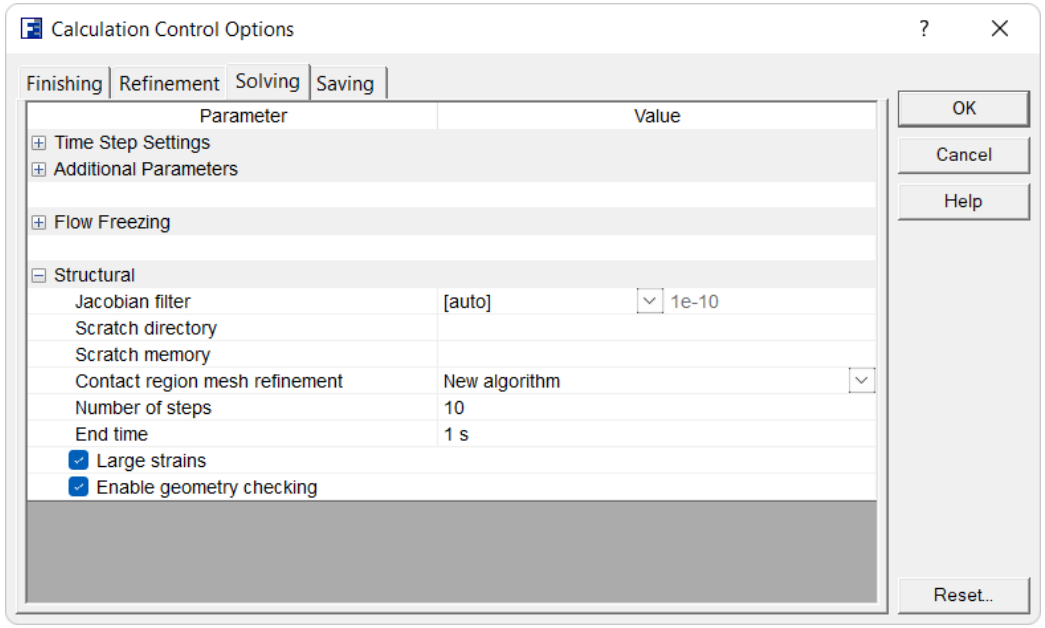
Structural: Large strains

True Stress/Strain is calculated

Challenge: Analyses with non-linear materials are calculated with Engineering Stress/Strain curve and cannot provide accurate results for the entire range of strains

Solution: Add *Large Strain* option to Calculation Control Option dialog to activate corresponding capability of Simcenter 3D Nastran 401 non-linear solver



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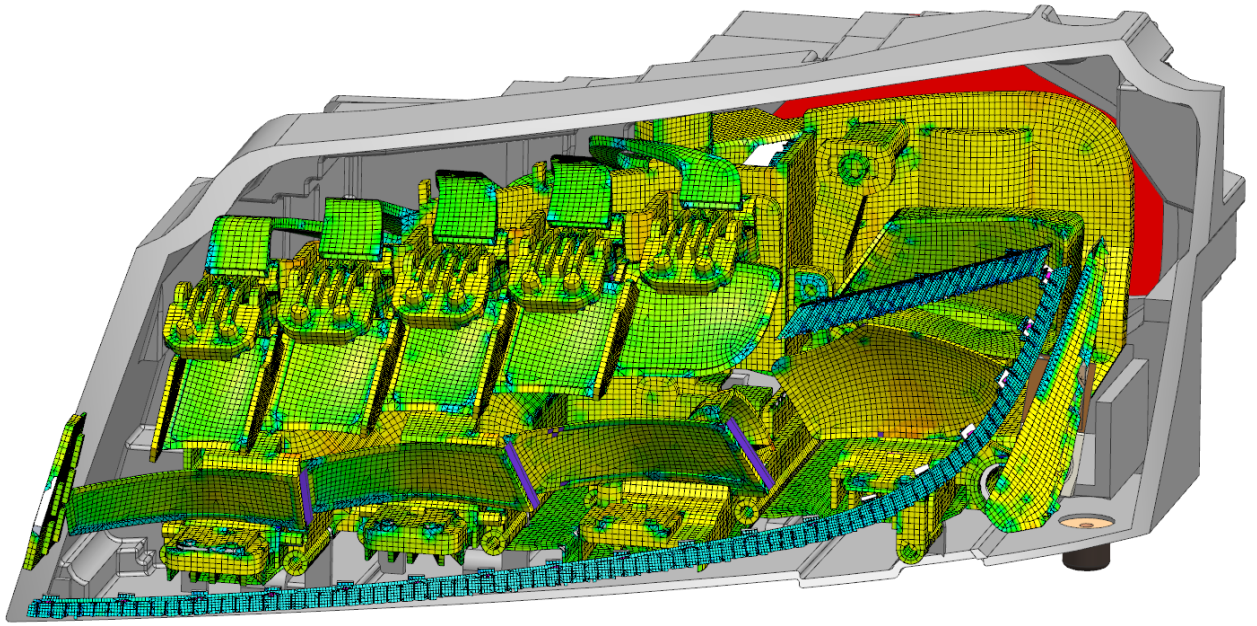
Structural: Mesh Boolean Operation

Create structural mesh faster even for extremely complex geometry

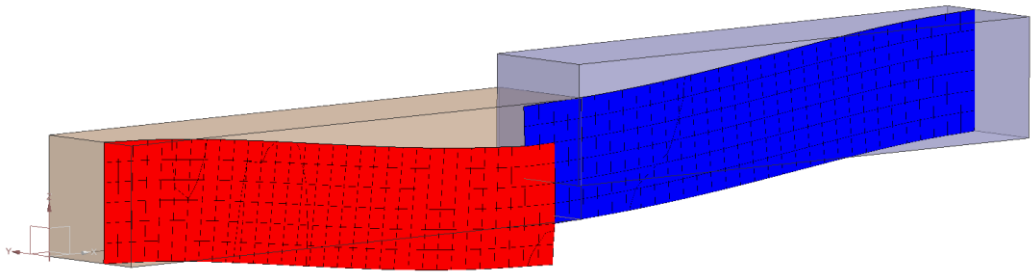
Challenge: Boolean operations for some of complex models cannot be completed using either CAD Boolean or Pre-processor Boolean approaches or process can take too much time

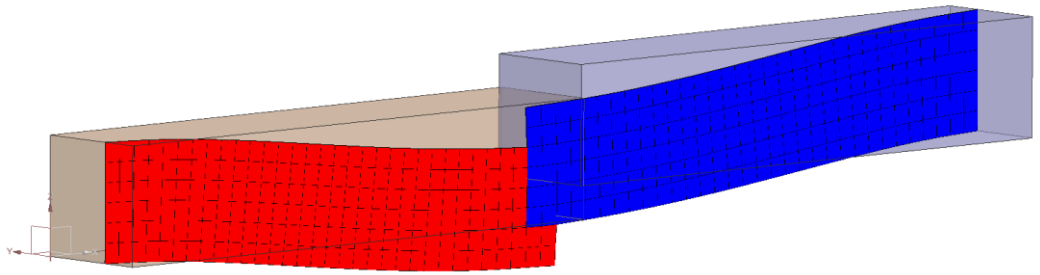
Solution: Enhance structural mesh generator and geometry preparation to support *Mesh Boolean* for Structural



Structural: Mesh Boolean Operation

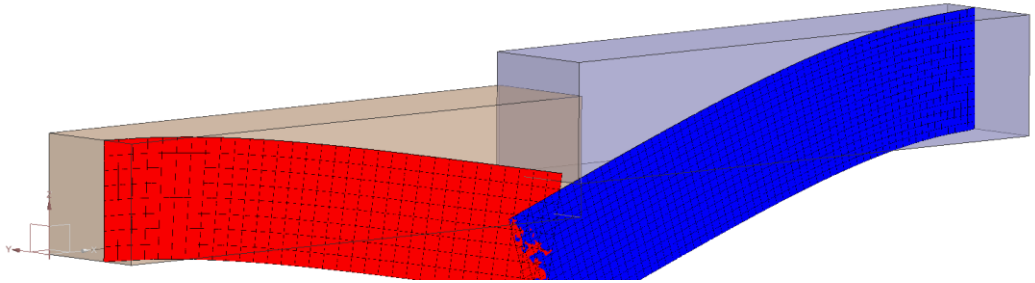
Results of mesh Boolean operation for Structural depend on mesh settings. If overlapping bodies belong to the same mesh region, the results of Boolean operations are the same as for Fluid & Thermal mesh: one body is cut by another in accordance with the material priorities:

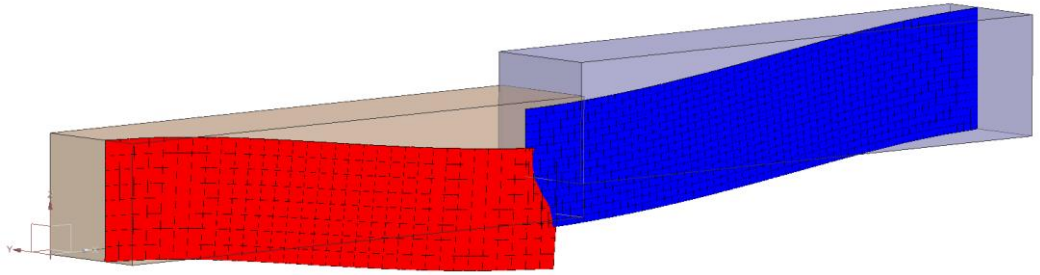




Structural: Mesh Boolean Operation

If overlapping bodies belong to different mesh region, the resulting meshes would be absolutely independent from each other (left animation). You can create a contact between them manually using a tolerance (right animation):





Structural: General Contacts

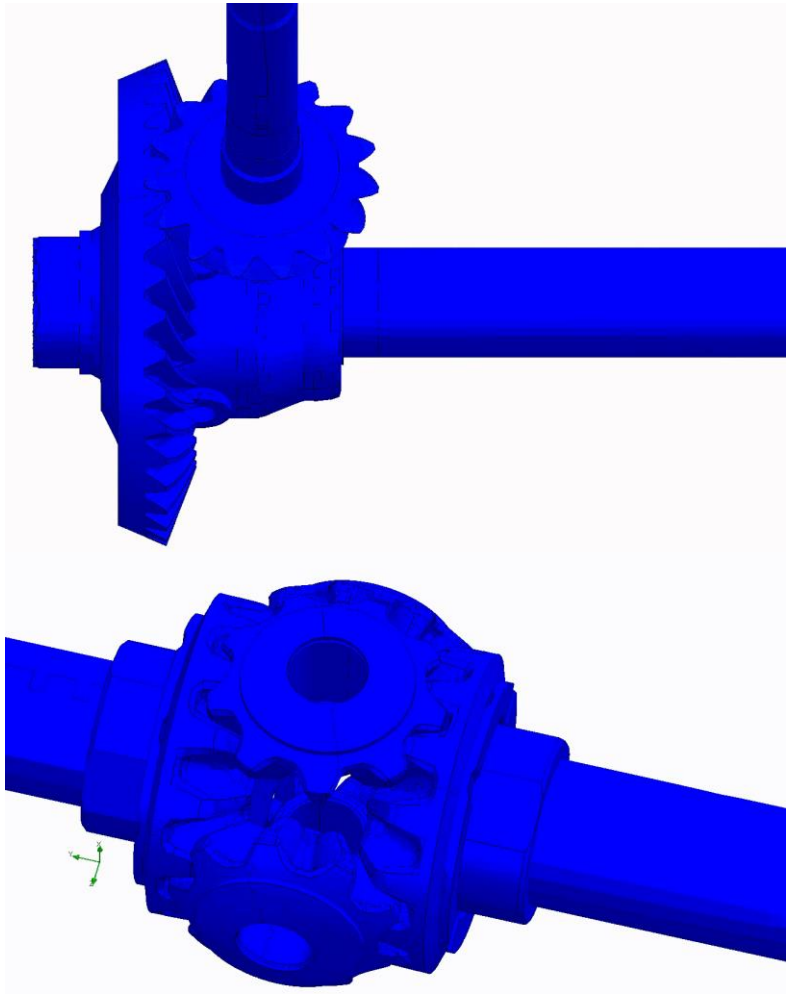
General contact type is available in Simcenter FLOEFD

Challenge: Contacts for structural analysis are created during setup before solver starts in Simcenter FLOEFD and cannot appear or disappear because of deformation process

Solution: Leverage existing capabilities of Simcenter 3D Nastran 401 non-linear solver.

General type of contact is set only if conditions are satisfied:

- Structural analysis type is *Non-linear*
- Contact type is *Non-penetrating*



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Model the complexity
Other

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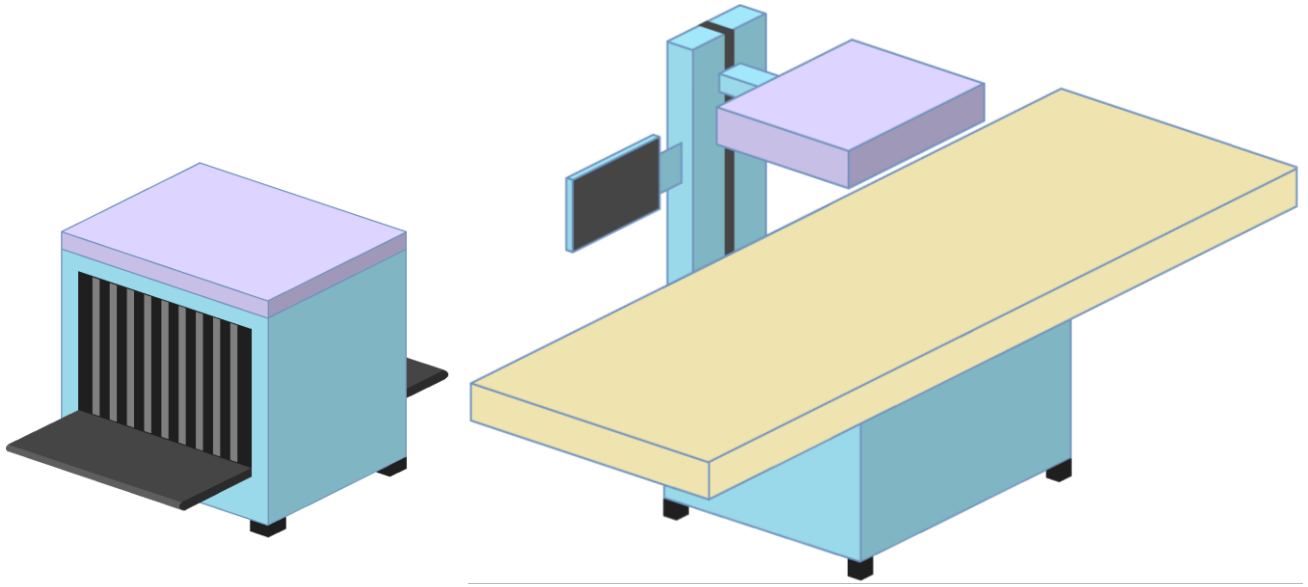
Structural: X-Ray leakage analysis

X-Ray leakage analysis is available

Challenge: Radiation wavelength range in Simcenter FLOEFD has lower limit of 100 nm, meaning X-Ray modeling is not available

Solution: remove wavelength limitation



Explore the possibilities

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EFDAPI: Improve API and automation

Access to all existing FLOEFD features
Easy maintenance

Challenge: Existing API does not cover all FLOEFD functionality and requires significant effort, both to support as well as to add access to new FLOEFD features

Solution:

- Provide new automatically generated EFDAPI to cover all FLOEFD features.
- The existing API will be maintained, but will not be enhanced further

```
Dim ProgID As String
Dim SRV As Object
Dim App As Object
Dim Doc As IDocument
Dim Project As IProject
Dim Features As IProjectFeatures
Dim Feature As Object
Dim Parameter As IExcelParam
Dim Item As Object
Dim X(2) As Double
Dim Y(2) As Double

ProgID = "EFDApiSrv.EFDLauncher.0.2306"
Set SRV = CreateObject(ProgID)
Set App = SRV.Attach2RunningCADInstance(PID)
```

```
Set Doc = App.GetActiveDoc()
Set Project = Doc.GetActiveProject()
Set Features = Project.GetFeatures()
Set Feature = Features.GetFeatureByName1("Feature 1")
Set Parameter = Feature.GetParameter(efdHeatGenerationRate)
Parameter.SetDependenceType efdTimeTable

X(0) = 0
Y(0) = 100
X(1) = 10
Y(1) = 50
X(2) = 20
Y(2) = 100

Parameter.SetTable X, Y, Array(1, 1), Array(0, 0)
```


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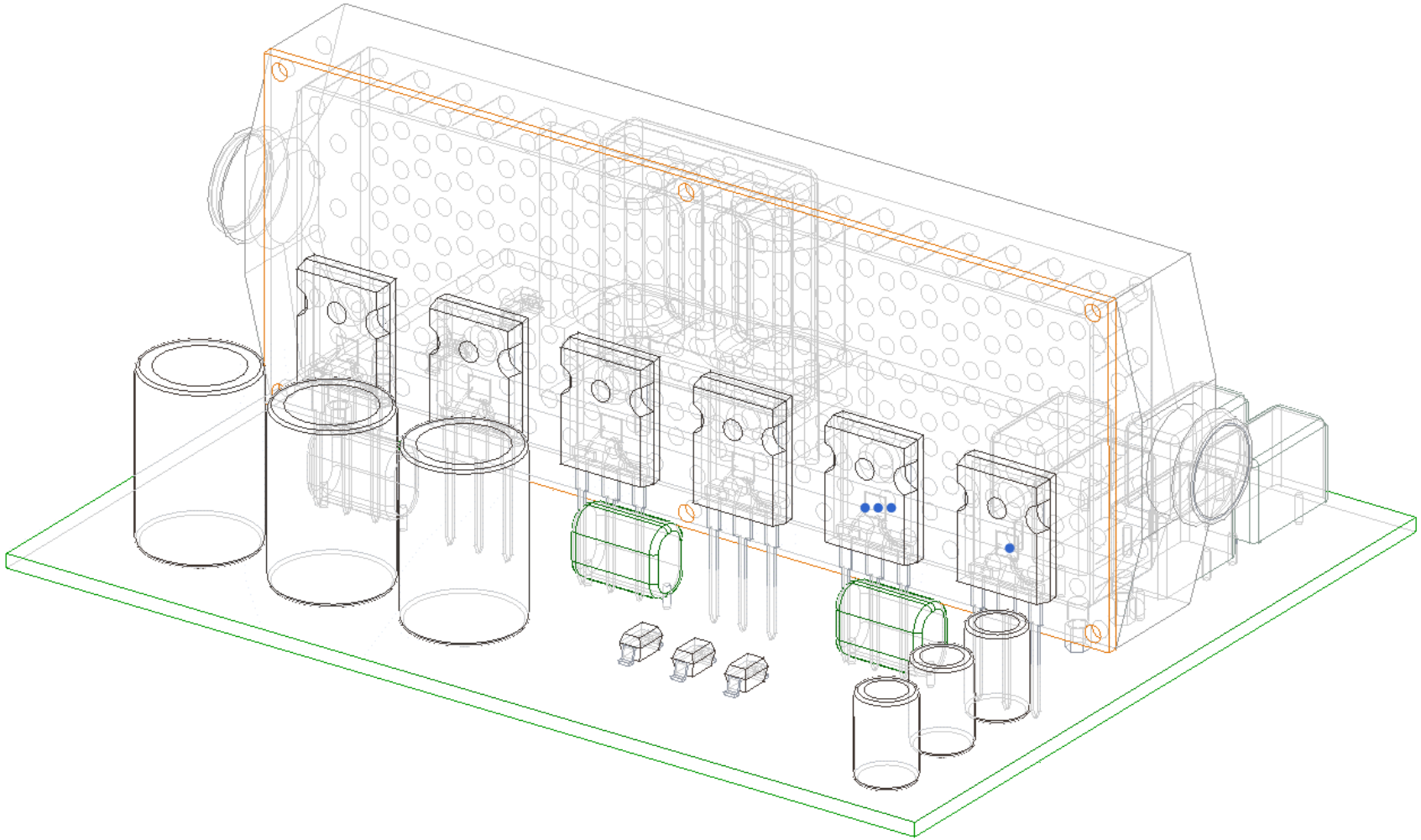
EFDAPI example: Boost Converter

Boost Converter example:

- Run CAD and open model
- Create FLOEFD project
- Set up all condition
- Run simulation
- Process the results



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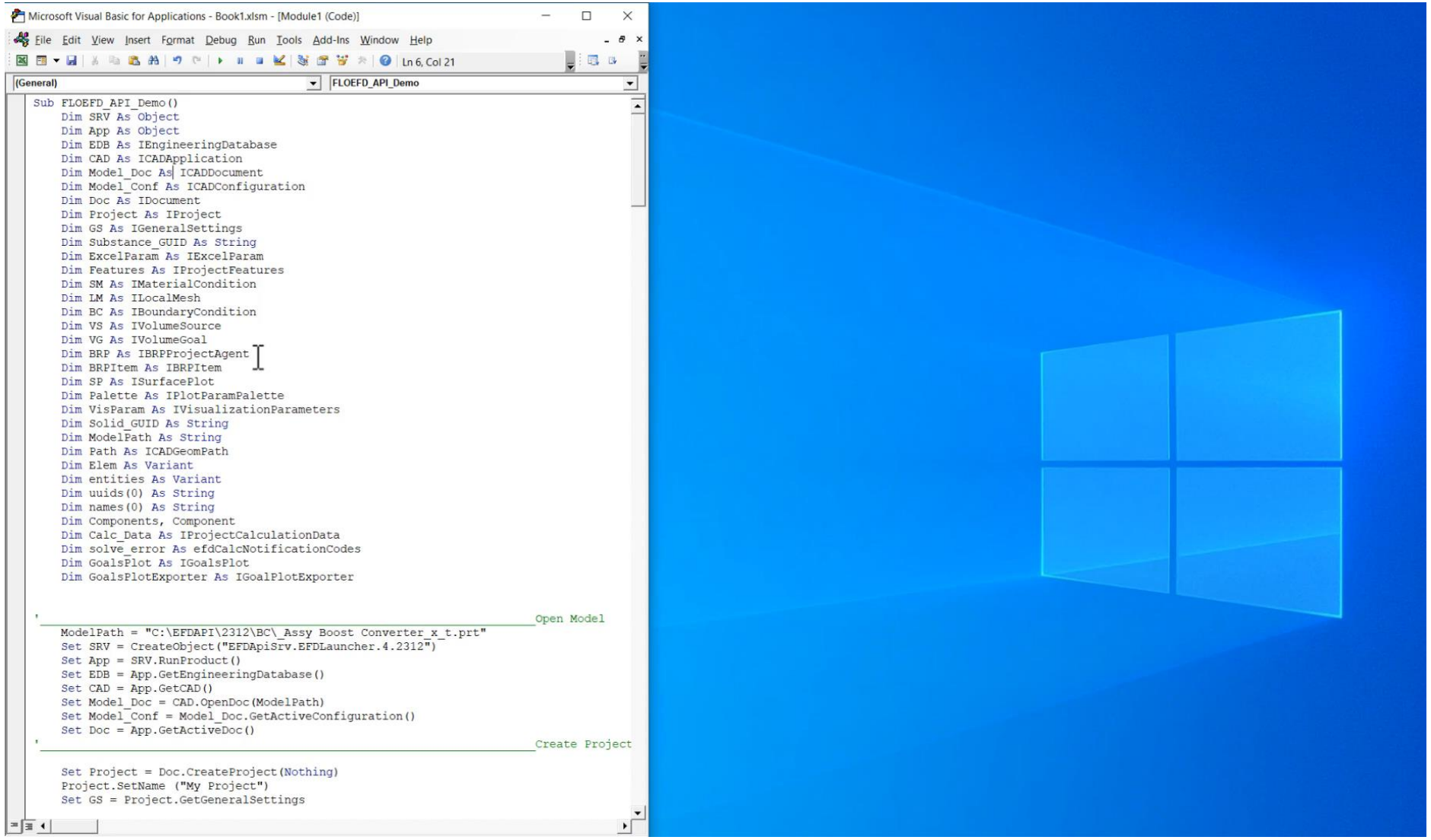
EFDAPI example: Boost Converter



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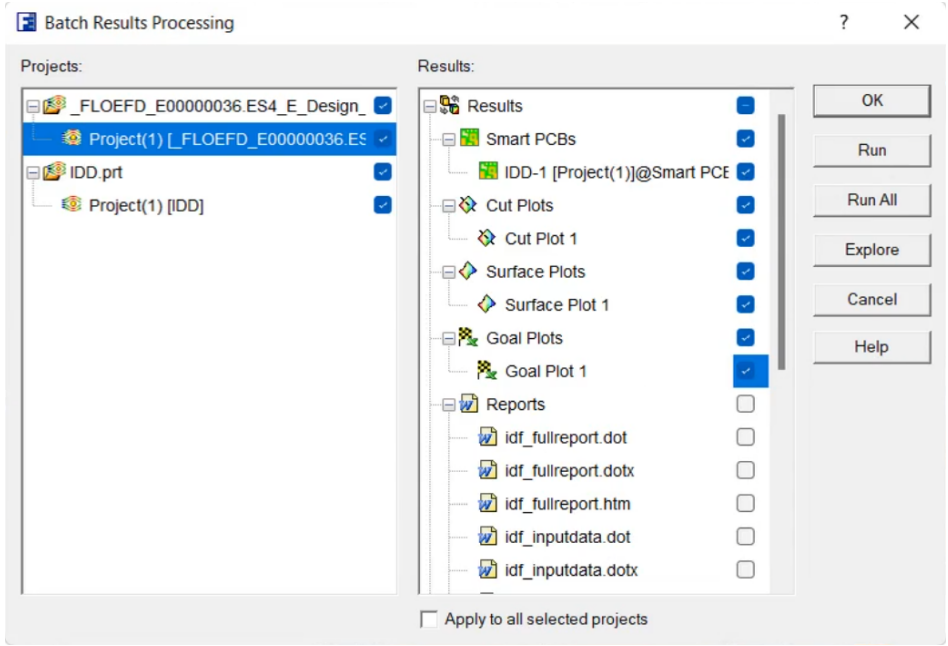
Batch results processing without CAD

Challenge: Simcenter FLOEFD project needs to be opened and results need to be loaded to create resulting images and spreadsheets automatically after calculation with the *Batch Results Processing* tool

Solution: Enhance *Batch Results Processing* tool to be able to generate results without CAD on solver side

- Command-Line Run Export generates necessary files for batch results processing on Windows or Linux machines
- Can run solver on remote server and batch process results on server at end of solver automatically without copying files back to client

Images and spreadsheets are created during solver process without CAD



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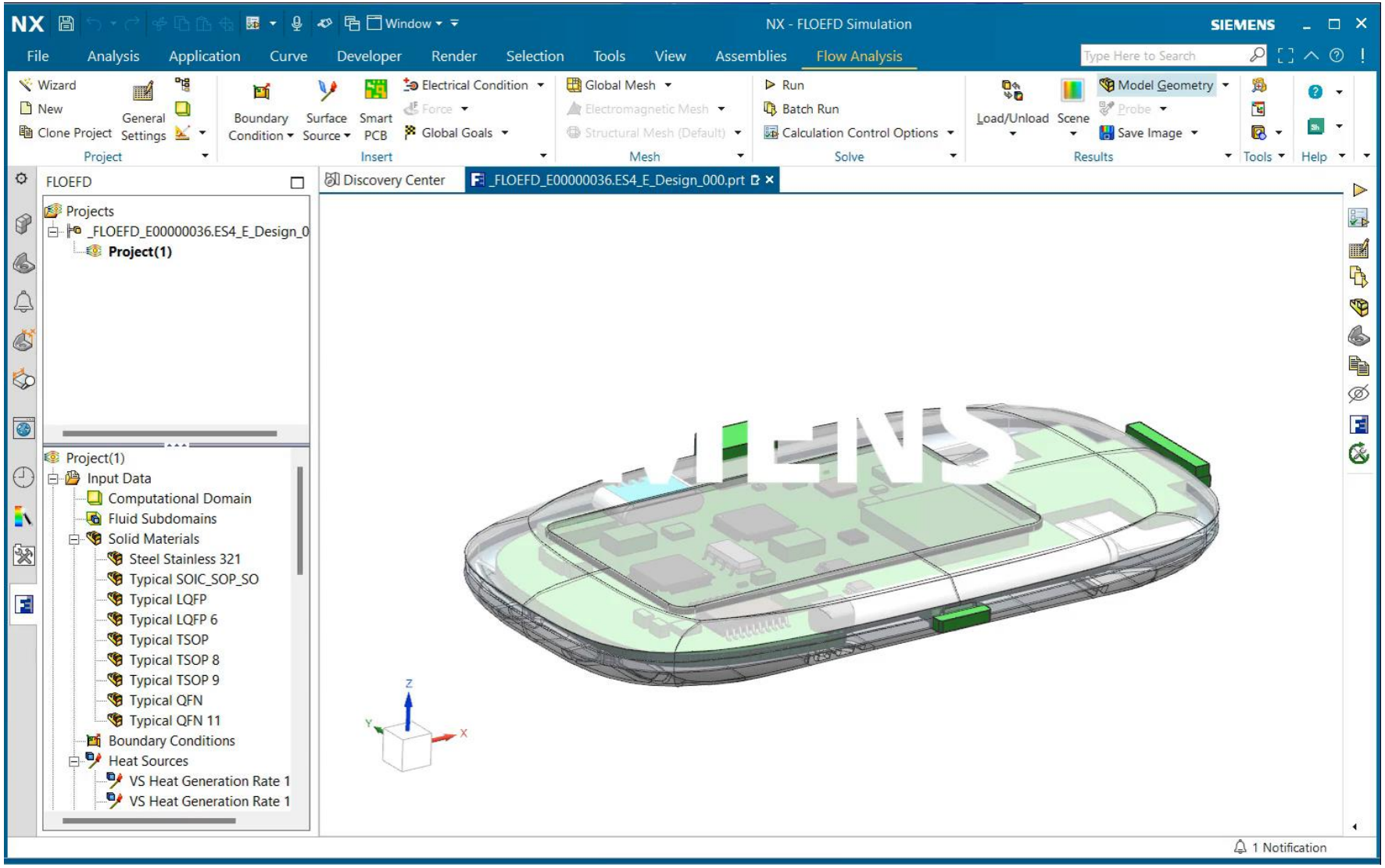
Batch results processing without CAD



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Go faster

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Mesher speed increase for convergent, faceted, and STL geometries

Fast mesh generation for convergent geometry

Challenge: Simcenter FLOEFD mesh generator is not optimized for geometry with faceted faces and it takes significant time to create a mesh

Solution:

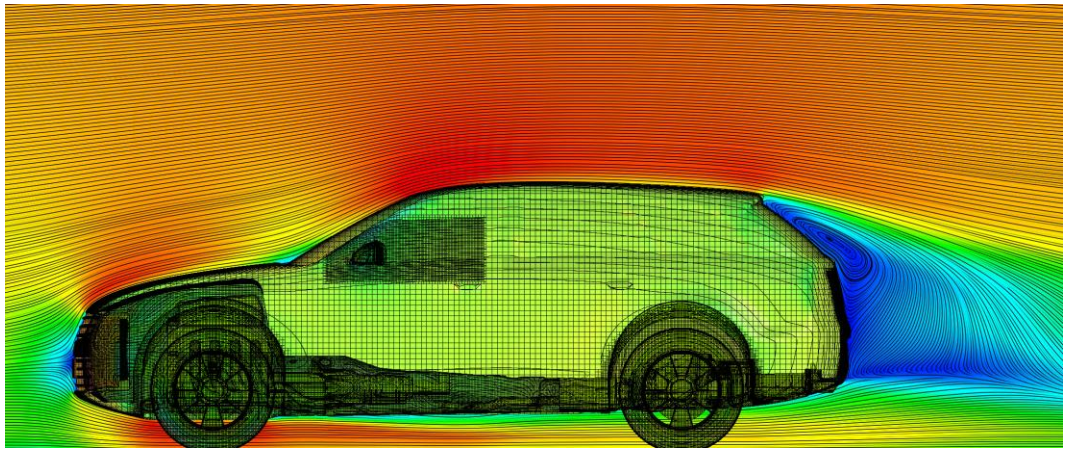
- Accelerate mesh generation for such geometries to make it to be as efficient as mesh generation for parametric solid geometry

Model: converted from STL as a convergent body

Mesh: 62 M cells

Time to generate mesh:

- 2306 version - 2 hours
- 2312 version - 12 minutes



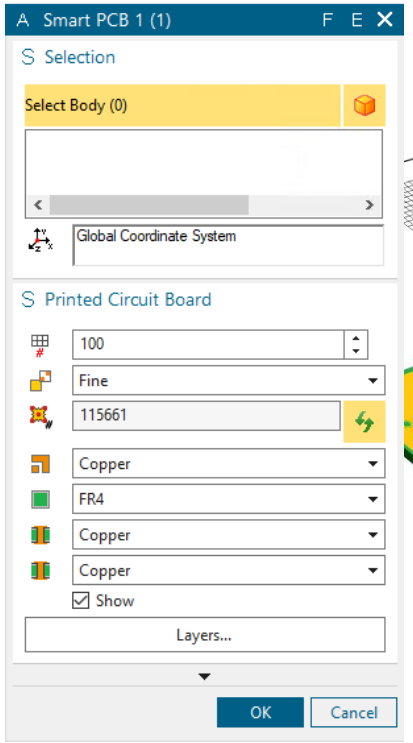
Smart PCB: Speed/accuracy improvement

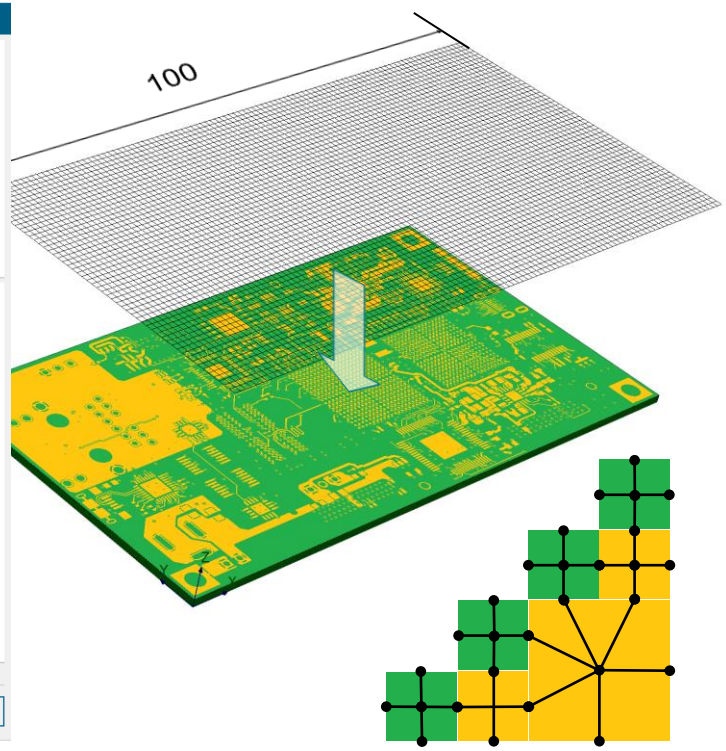
New Smart PCB solver is faster and more accurate

Challenge: Speed up Smart PCB thermal simulation and make calculation resources and results accuracy more predictable

Solution:

- Optimization of the Smart PCB thermal solver
- Investigation of the solver characteristics resulting in tuning default parameters to get more accurate results faster: change default Number of Tiles Per Longest Side default value from 100 to 300





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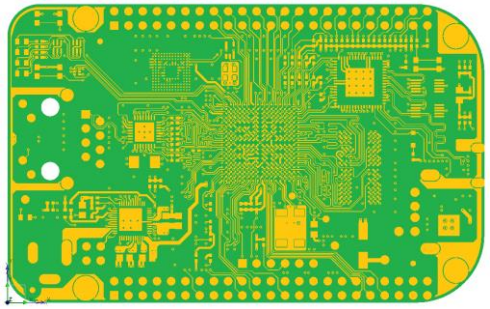
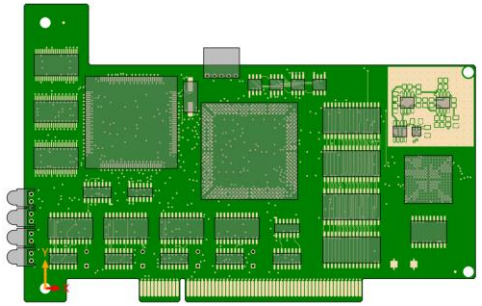
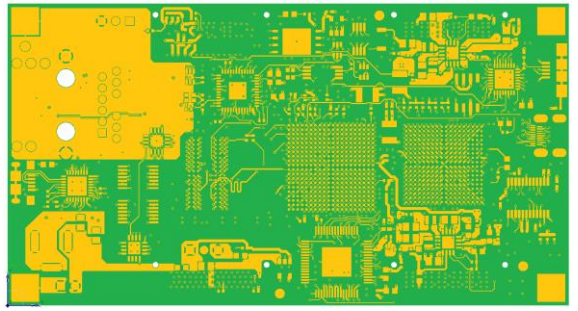
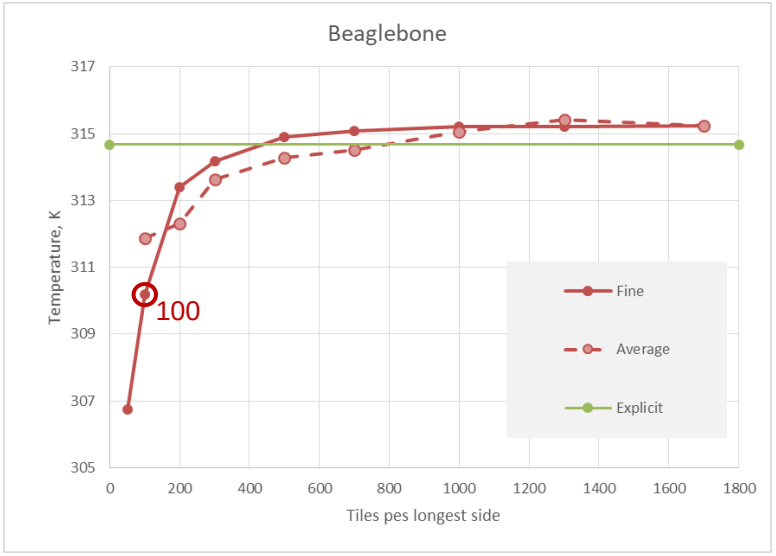
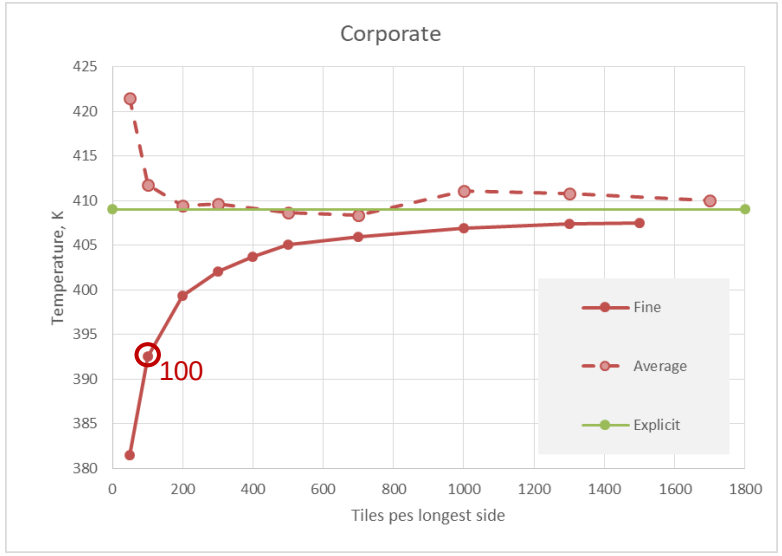
Smart PCB: Speed/accuracy improvement

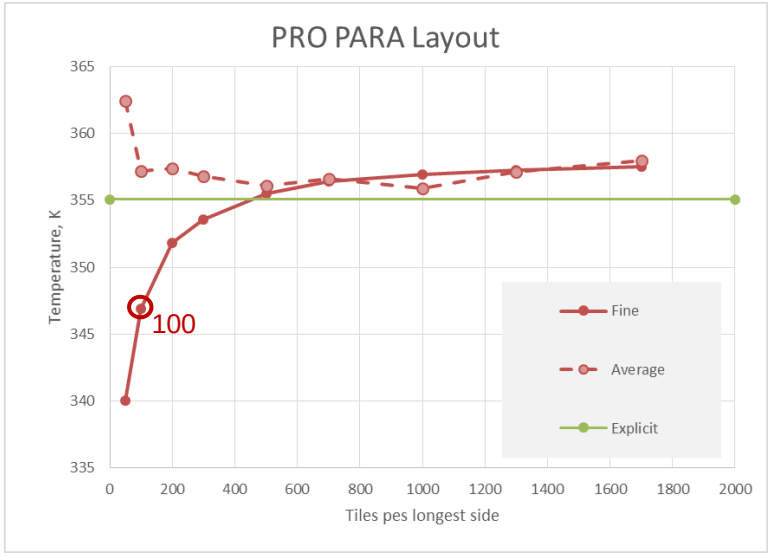












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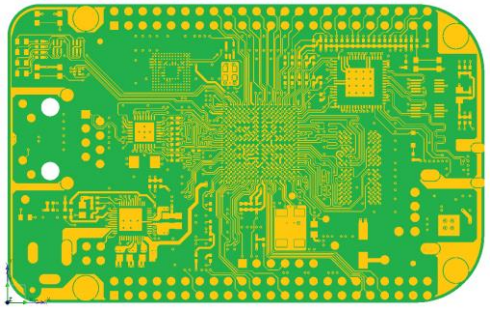
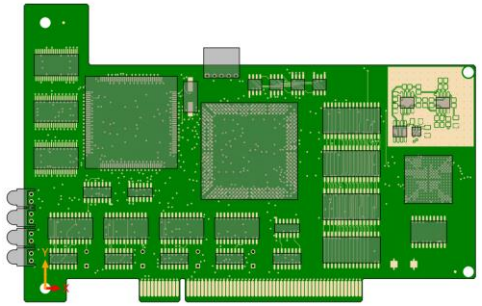
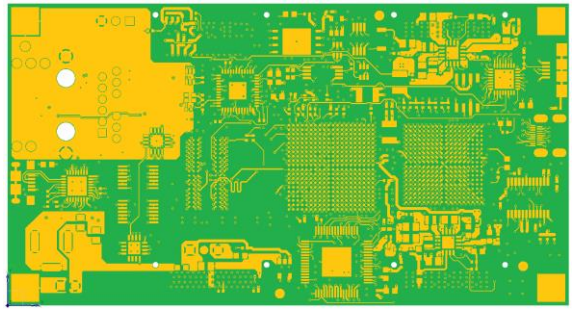
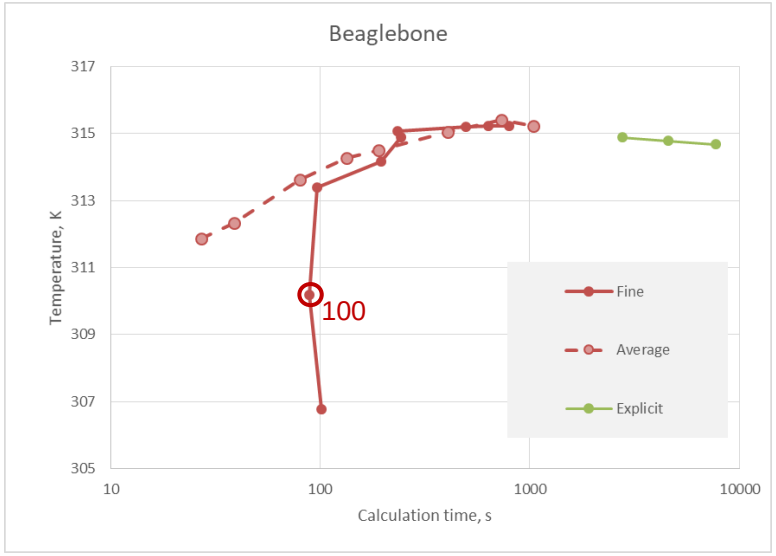
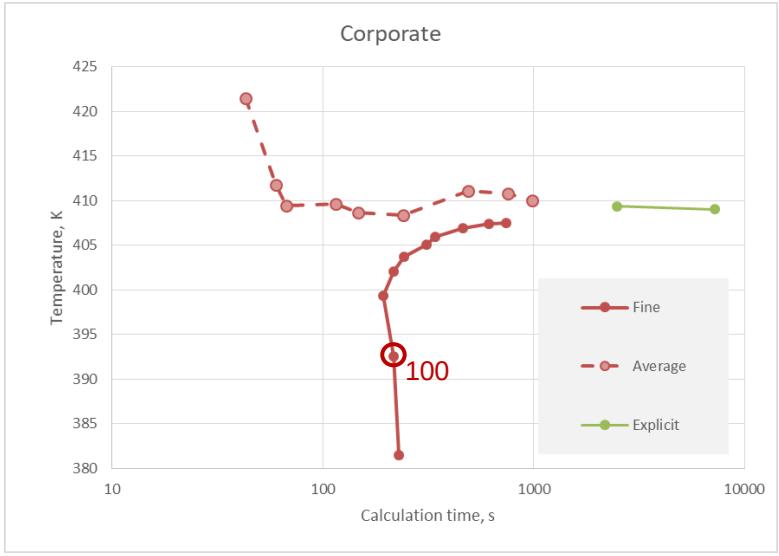
Smart PCB: Speed/accuracy improvement

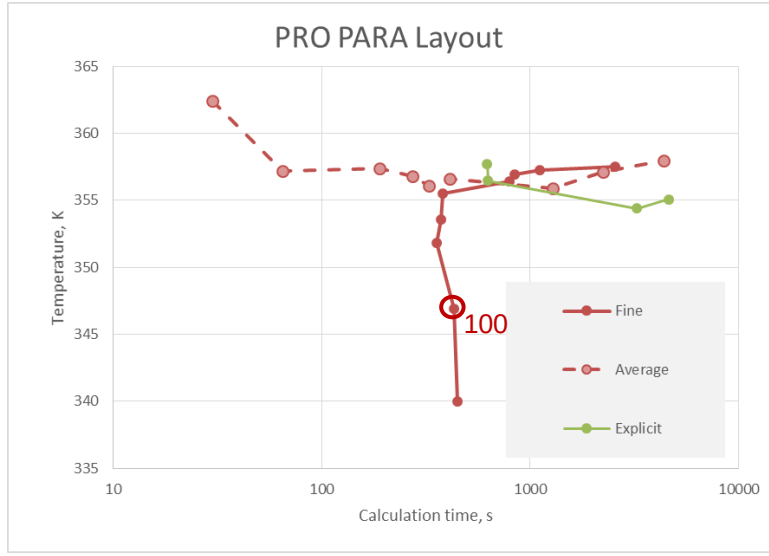












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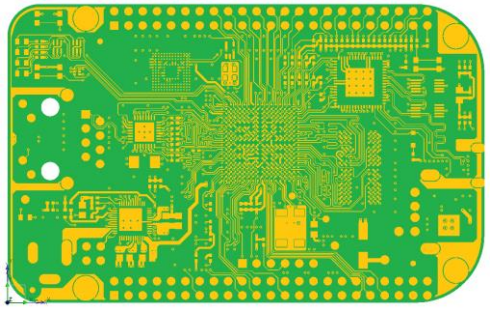
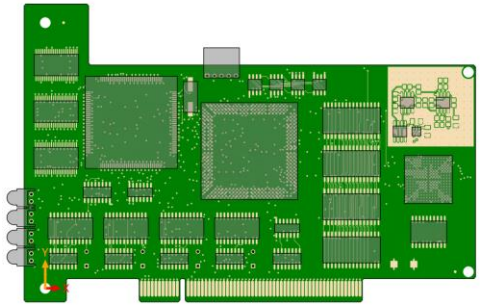
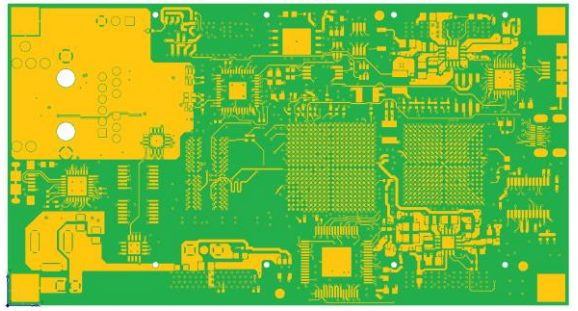
Smart PCB: Speed/accuracy improvement



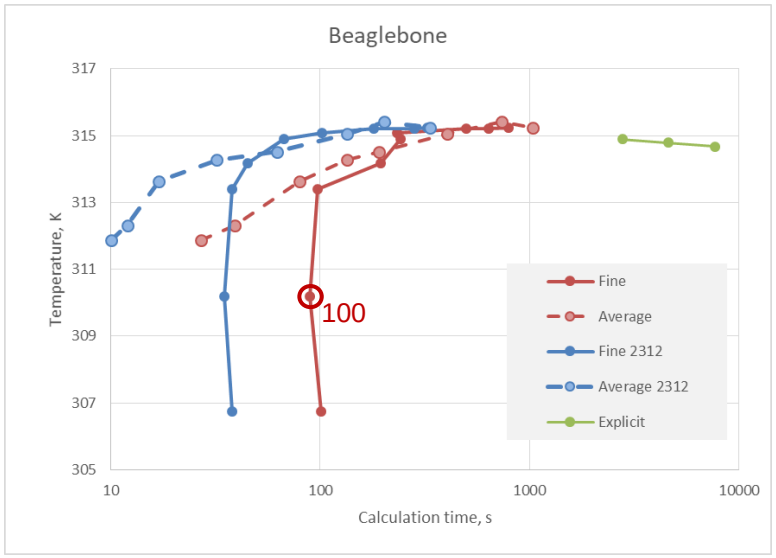
Speed up: 1.8 – 4 times

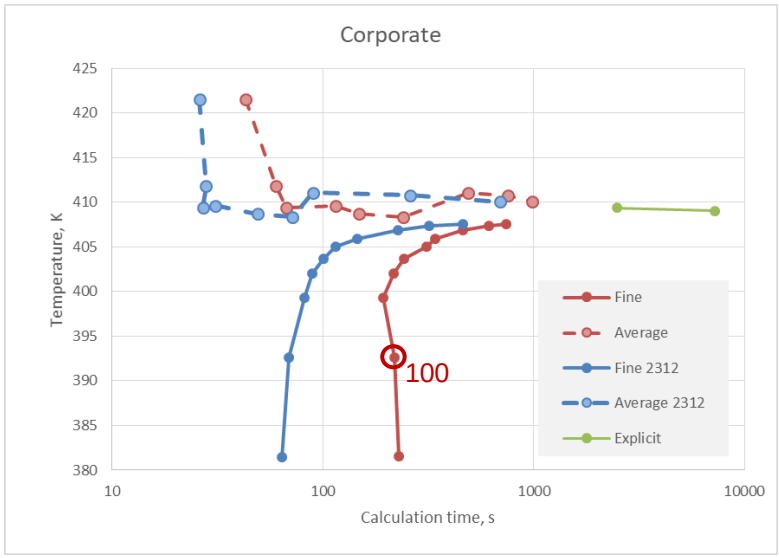


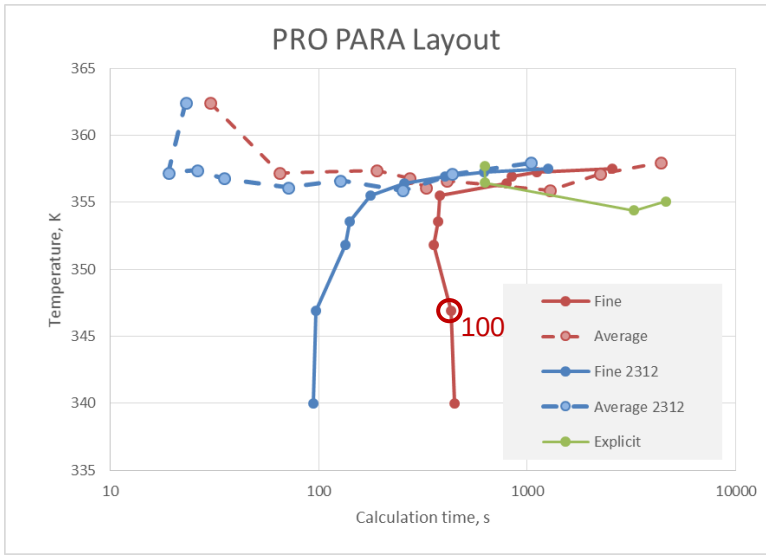
Speed up: 1.5 – 3 times



Speed up: 2 – 8 times







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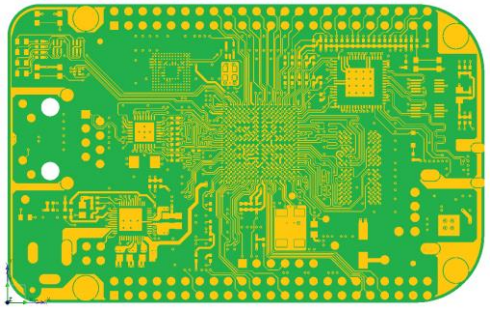
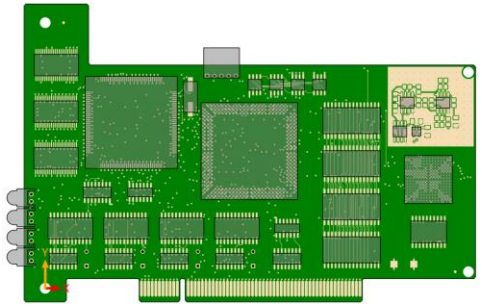
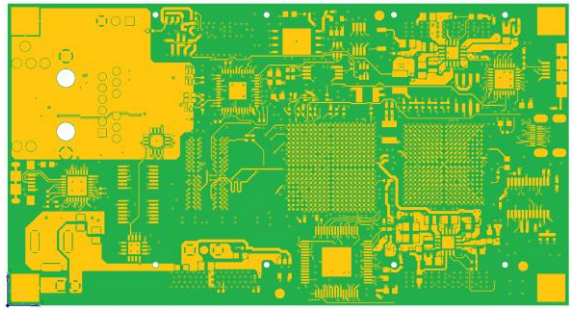
Smart PCB: Speed/accuracy improvement



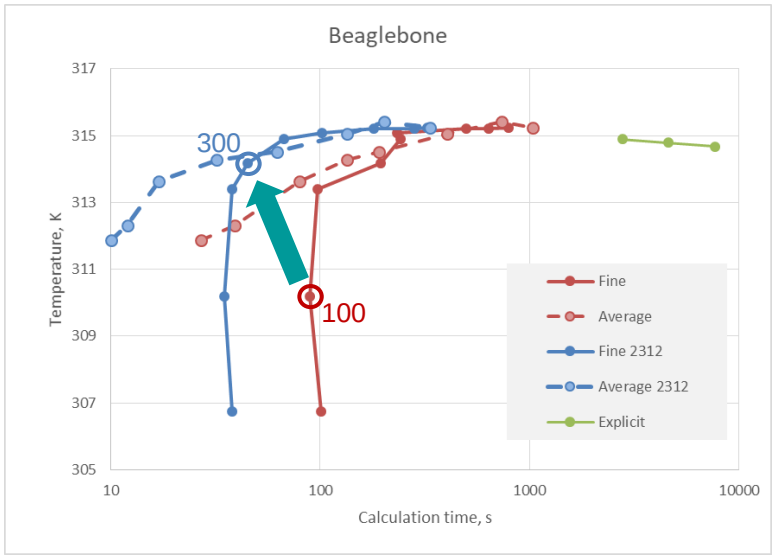
Speed up: 1.8 – 4 times

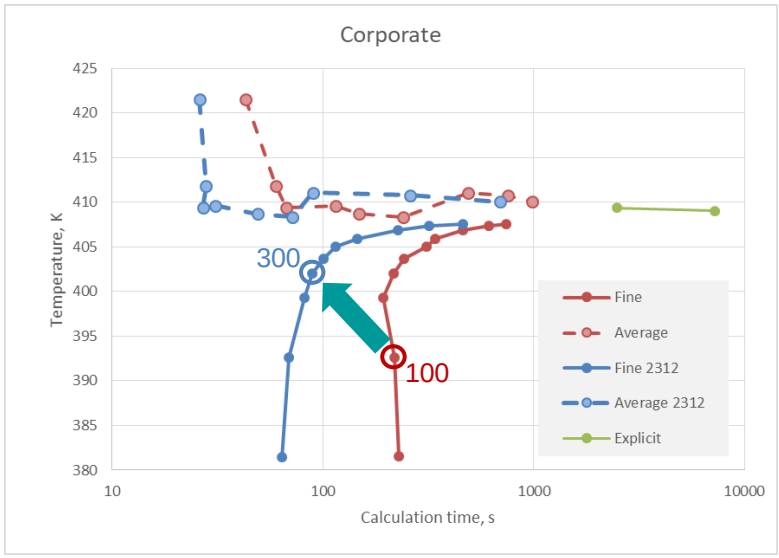


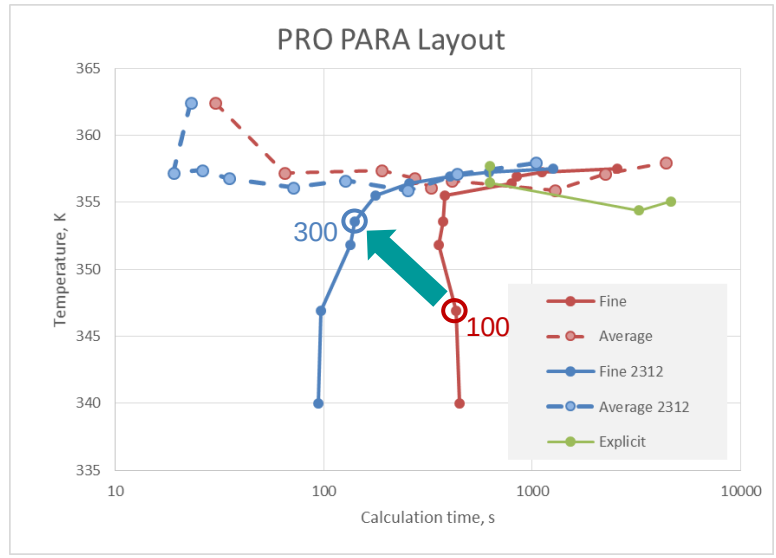
Speed up: 1.5 – 3 times



Speed up: 2 – 8 times







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Stay integrated

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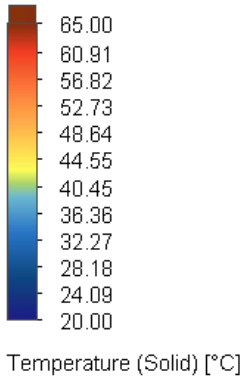
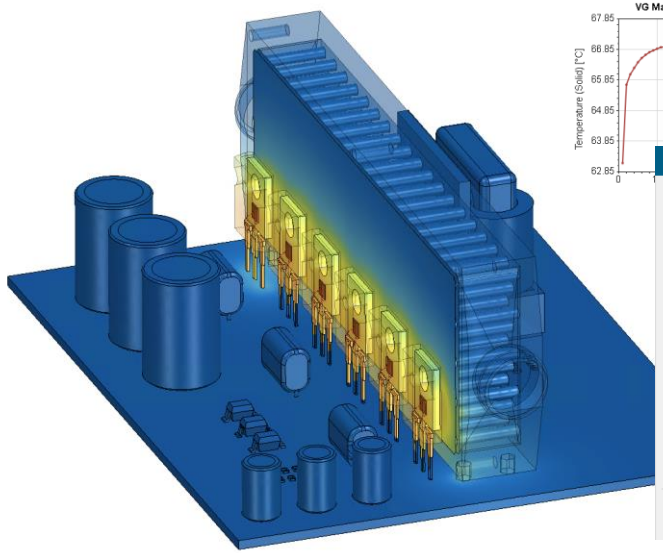
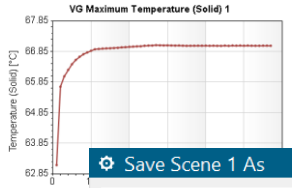
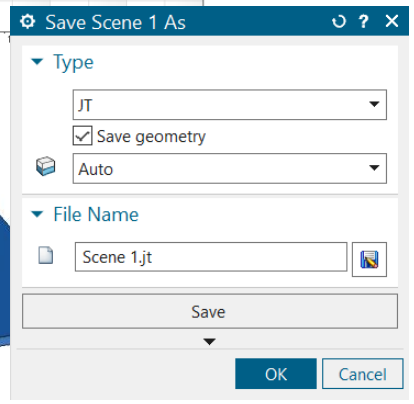
Stay integrated

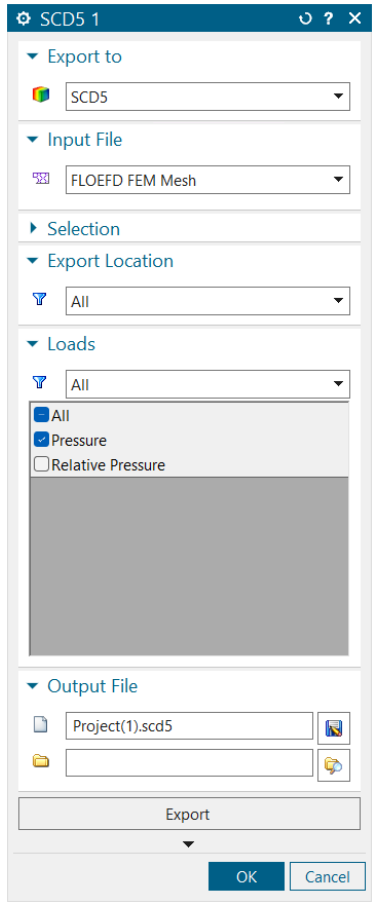
- Export of Simcenter FLOEFD fields to SCD5 file format
- Additional option in CGNS export dialog to use SCD5 as an input mesh file
- Export scenes in JT format
  - Leverage Teamcenter viewer
- Common color bar (available in 2306.0001)
- Catia V5 R33 support

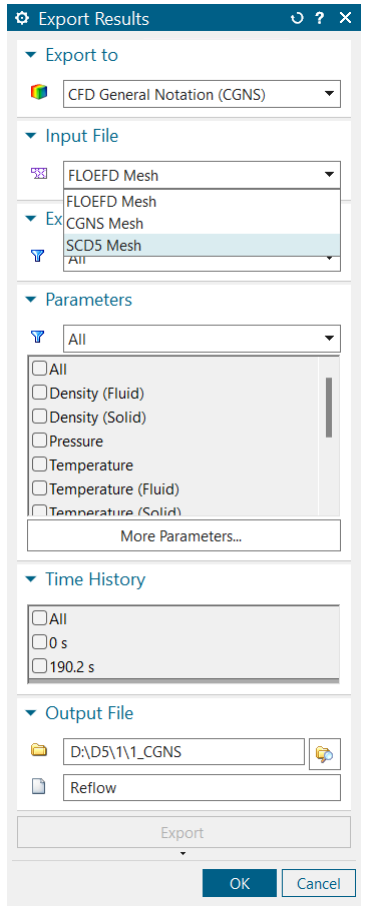












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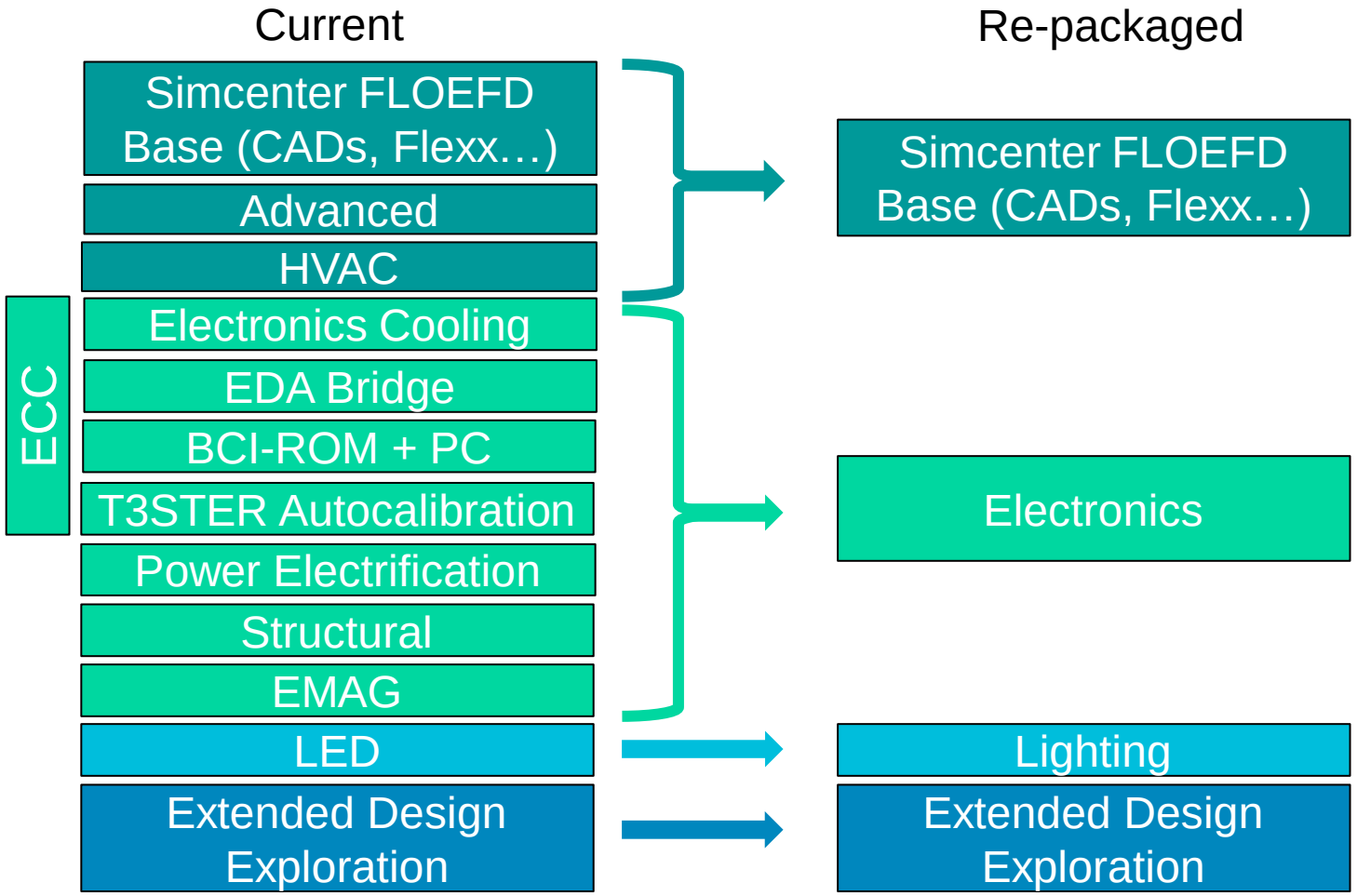
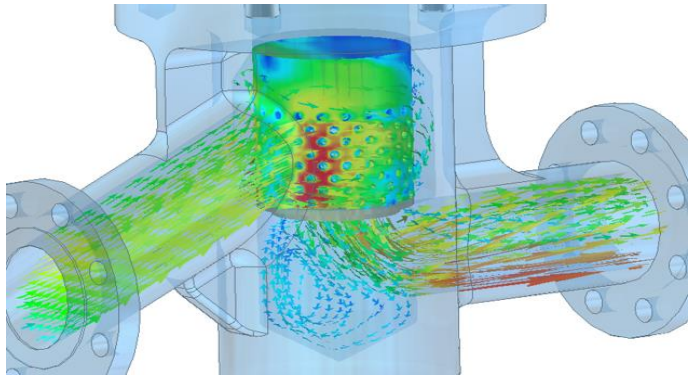
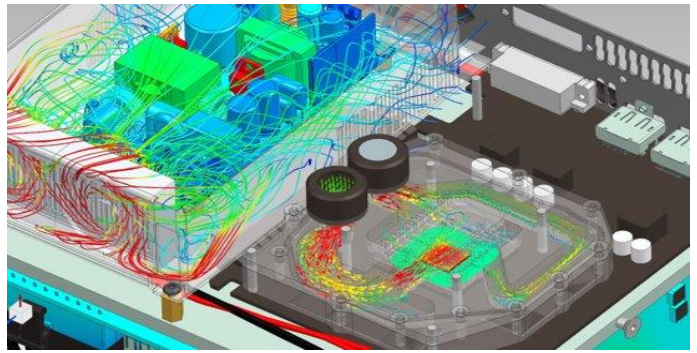
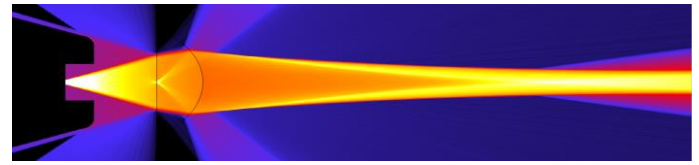
Simcenter FLOEFD Repackaging

Streamlined portfolio focused on core verticals









- New Part Numbers to be introduced in Q1 calendar year 2024
- Current packaging will continue to be sold to existing customers

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Thank You

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