Simcenter FLOEFD What's New in 2306

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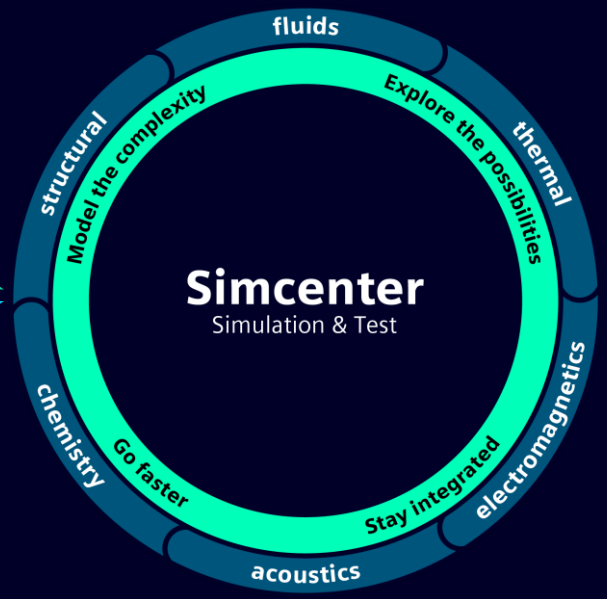
Model the complexity
Ensuring decision confidence

Explore the possibilities
Enabling insights

Go faster
Achieving speed and agility

Stay integrated
Connecting all activities



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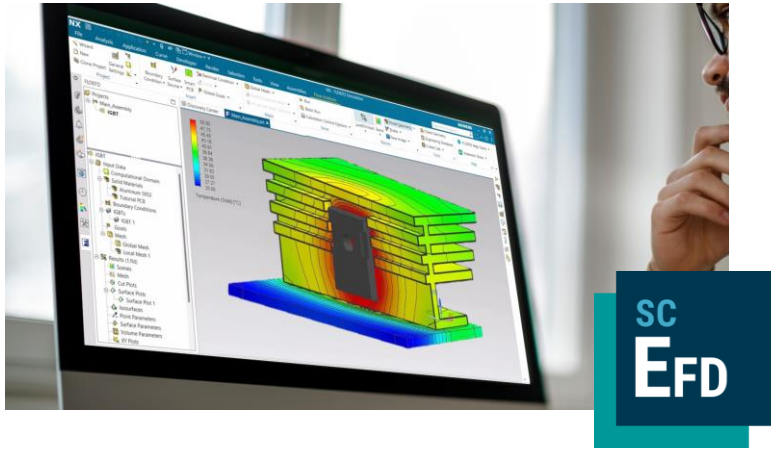
New Features in Simcenter FLOEFD 2306

Model the complexity

- **Electronics – Thermal Analysis**
  - IGBT compact model
  - BCI-ROM update
  - Component Explorer - Export and import thermal list
- **Electronics – Multiphysics**
  - Simcenter 3D NASTRAN non-linear solver connection
  - Structural Large displacement option (available for Simcenter 3D NASTRAN non-linear solver only)
  - Structural Tolerance based contacts
  - Structural User defined maximum aspect ratio in local mesh
  - Structural Goals for frequency analysis



Explore the possibilities

- EFDAPI - Improve API and automation (new API available as a BETA feature)

Go faster

- Mesher speed increase
- EDA Bridge import and Smart PCB generation speed increase

Stay integrated

- Simcenter 3D – Access Simcenter FLOEFD SC via SC3D value based licensing (tokens)
- Teamcenter FLOEFD item customization
- FMU Run on Linux
- Licensing - Upgraded to use Siemens Advanced Licensing Technology 2.2.0.0 (SALT)

SC 3D

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Model the complexity
Electronics – Thermal Analysis

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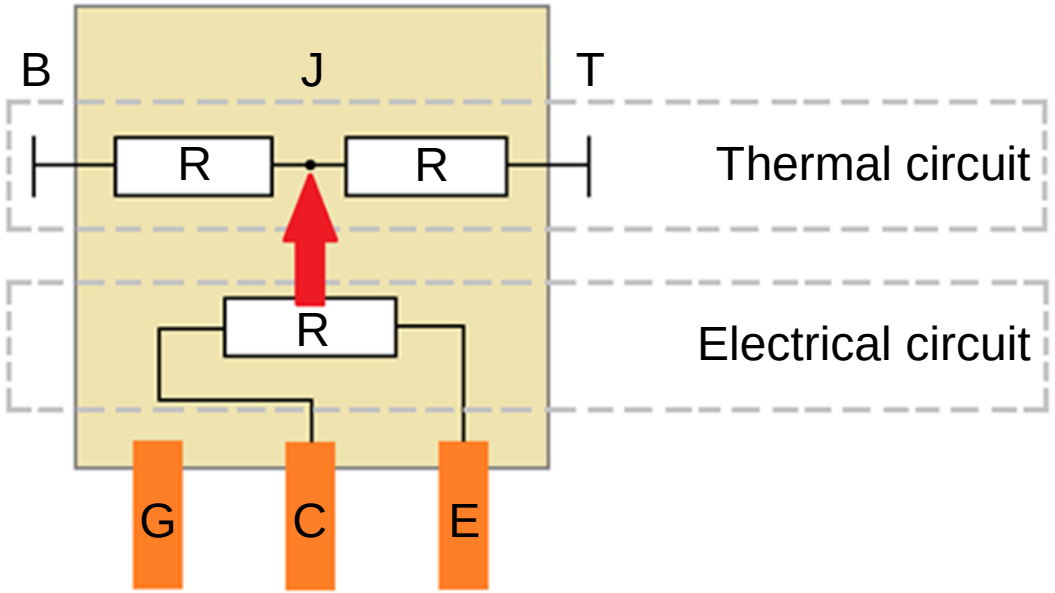
IGBT compact model

Convenient implementation of electronic component

Challenge: Predict junction temperature of an electrical element with a heat source determined by a non-linear Current–Voltage characteristic:

- Thermal model – 2R component
- Heat source – electrical power
- Current–Voltage characteristic – series of non-linear curves for different temperature values



Solution: IGBT compact model as a composition of Electrical Element and 2R component compact models

Input:

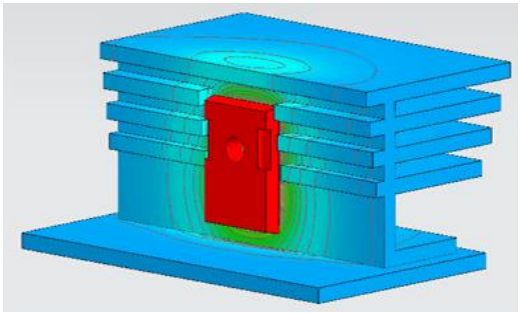
$R_{\text{junction to bottom}}$

$R_{\text{junction to top}}$

Voltage or Current

Output:

Junction Temperature



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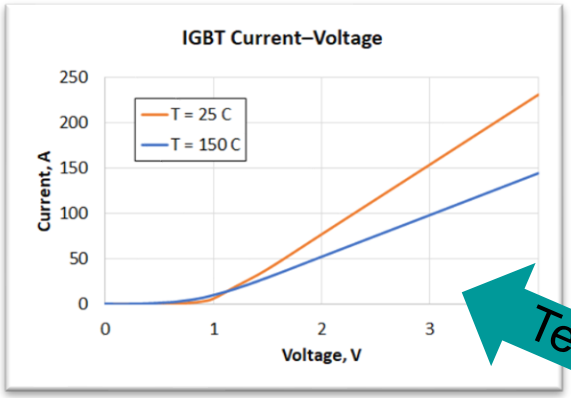
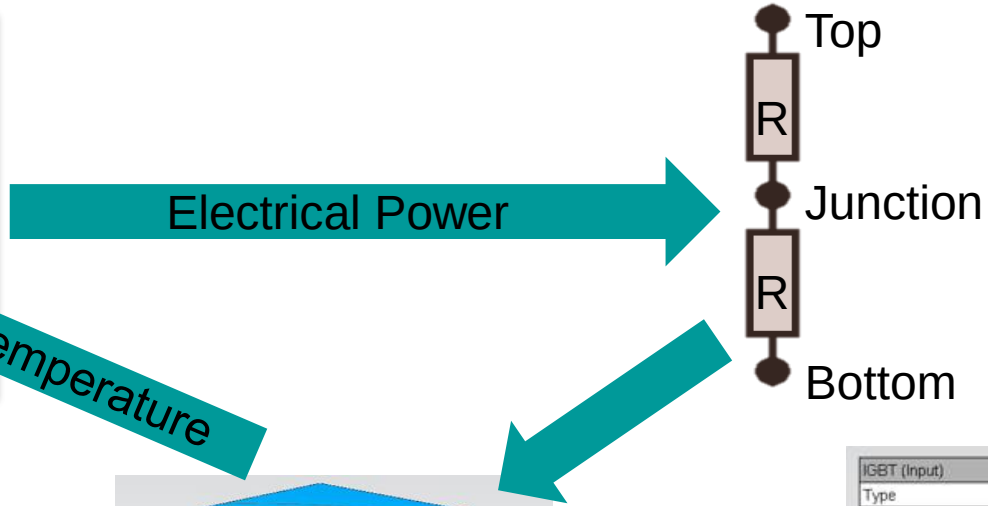
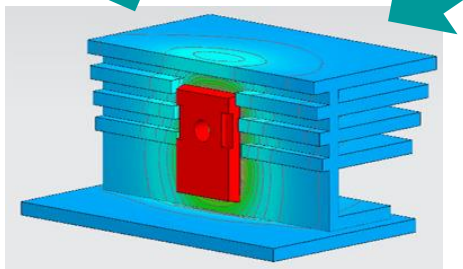
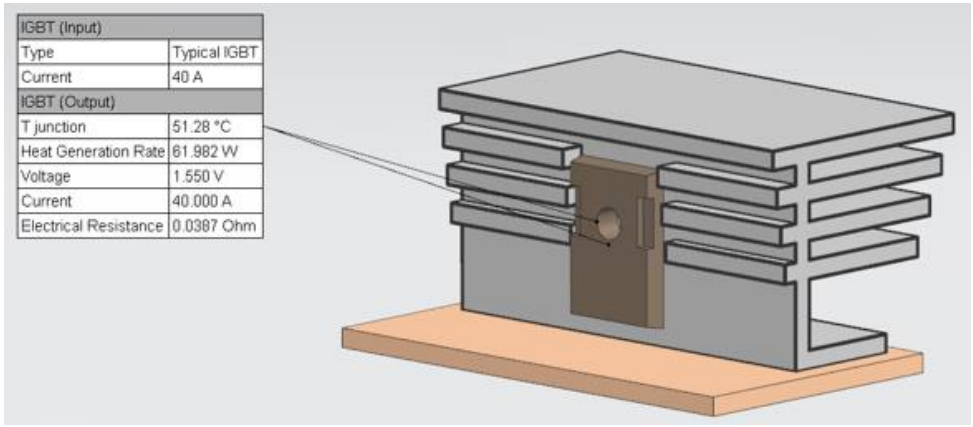
IGBT compact model: how it works

- Junction temperature is used for Electrical Power determination from I-V chart
- Resulting Electrical Power is applied to the model through the 2R component









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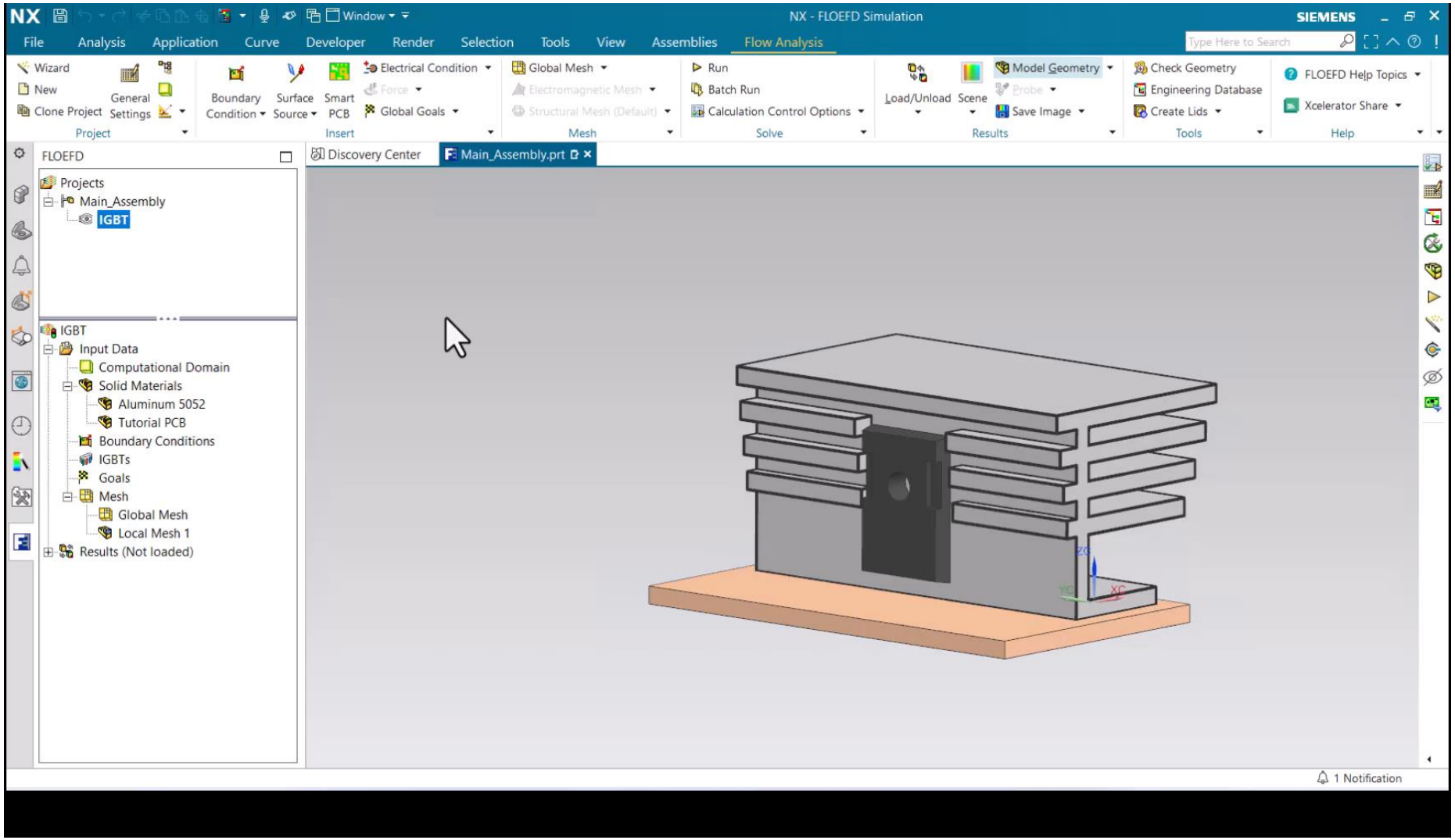
Video: IGBT compact model



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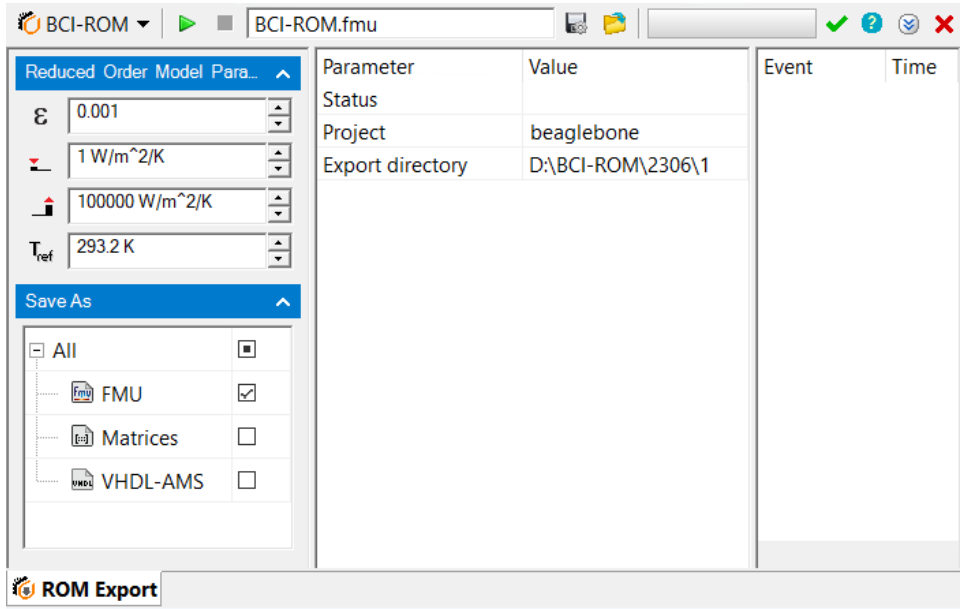
Reference temperature for BCI-ROM extraction

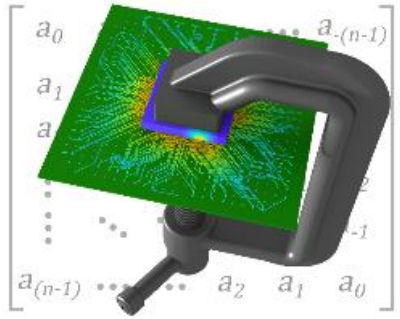
Simplify project definition for BCI-ROM extraction

Challenge: Prior BCI-ROM does not allow the use of materials with temperature dependent properties, so customer needs to substitute all dependencies with constant values. This procedure can be time consuming

Solution:

Use reference temperature to obtain constant values from dependencies automatically for all materials





Update to the latest BCI-ROM version

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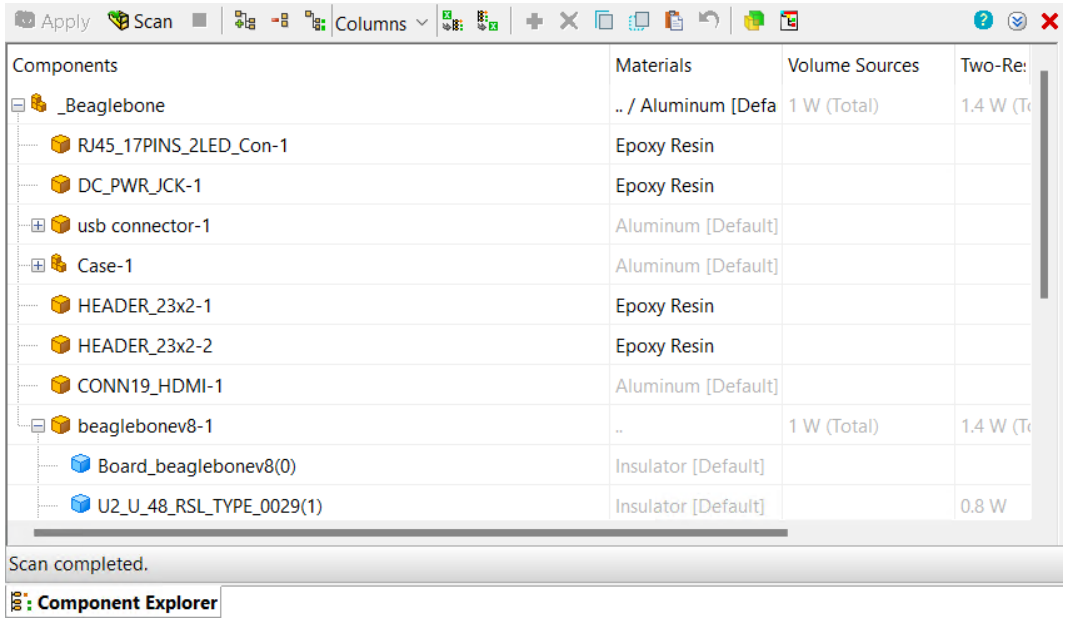
Component Explorer
Export and import of a component list

Convenient management of component attributes

Challenge: Manage large volume of component materials and properties through Excel spreadsheet

Solution: Ability to export and import a component list from the Component Explorer dialog

- Component materials
- Heat source and 2R power
- LED current



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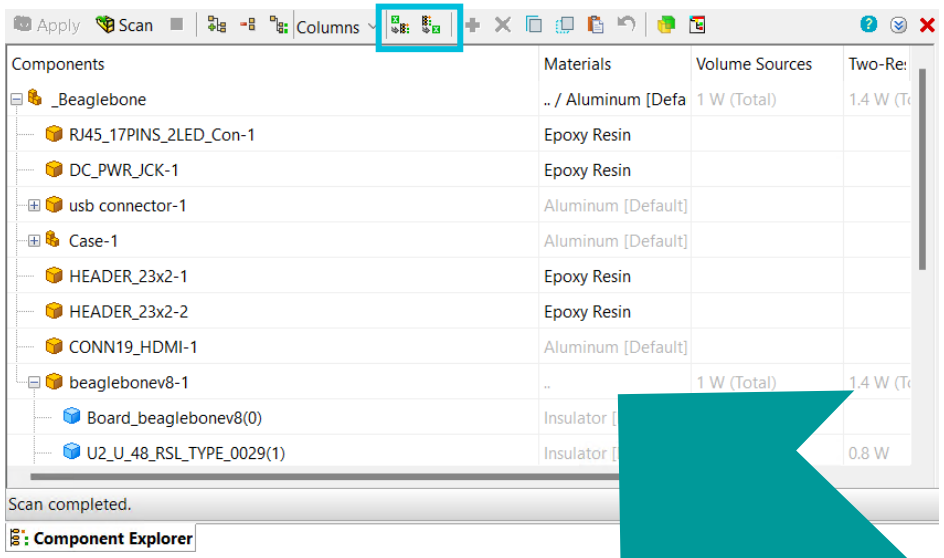
Component Explorer
Export and import of a component list



Component properties can be exported into an Excel spreadsheet then edited and imported back. The order of the components in the exported list follows the original designer's hierarchy. Properties available for editing:

- Component Material
- Volume source value
- 2R (instance from the library and power)
- LED (instance from the library and current)

	A	B	C	D	E	F	G
1	Components		Volume Sources	Printed Circuit Boards	Two-Resistor Components	Two-Resistor Components	LEDs
2	_Beaglebone		1 W (Total)		1.4 W (Total)	..	
3	RJ45_17PINS_2LED_Con-1						
4	DC_PWR_JCK-1	Epo					
5	HEADER_23x2-1	Epoxy					
6	HEADER_23x2-2	Epoxy Res					
7	beaglebonev8-1	..	1 W (Total)		1.4 W (Total)	..	
8	beaglebonev8-1/U2_U_48_RSL_TYPE_0029(1)	Insulator [Def			0.8 W	U2 [User Defined\beaglebonev8.prt\beaglebonev8]	
9	beaglebonev8-1/U4_SO8-25X75_TYPE_0026(2)	Typical Pla ackages]					
10	beaglebonev8-1/U5_AM33XX_15X15_TYPE_0032(3)	Typical ackages]	1 W				
11	beaglebonev8-1/U6_SOP8_DCT_TYPE_0025(4)	Typical Plastic Package [Pre-Defined\IC Packages]					
12	beaglebonev8-1/U8_DGN-16X60_TYPE_0002(5)	Typical Plastic Package [Pre-Defined\IC Packages]					
13	beaglebonev8-1/U11_QFN64S9X9P5_TYPE_0024(6)	Insulator [Default]			0.3 W	U11 [User Defined\beaglebonev8.prt\beaglebonev8]	
14	beaglebonev8-1/U12_BGA96_T9_P8_9X14_TYPE_0001(7)	Typical Plastic Package [Pre-Defined\IC Packages]					
15	beaglebonev8-1/U13_BGA153_P14_P5_11P5X13_TYPE_0012(8)	Typical Plastic Package [Pre-Defined\IC Packages]					
16	beaglebonev8-1/U14_QFN32_5X5MM_EP3P3MM_TYPE_0028(9)	Insulator [Default]			0.3 W	U14 [User Defined\beaglebonev8.prt\beaglebonev8]	
17	beaglebonev8-1/Y1_XTAL4_126-216SMD_TYPE_0013(10)	Typical Plastic Package [Pre-Defined\IC Packages]					

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Model the complexity
Electronics – Multiphysics

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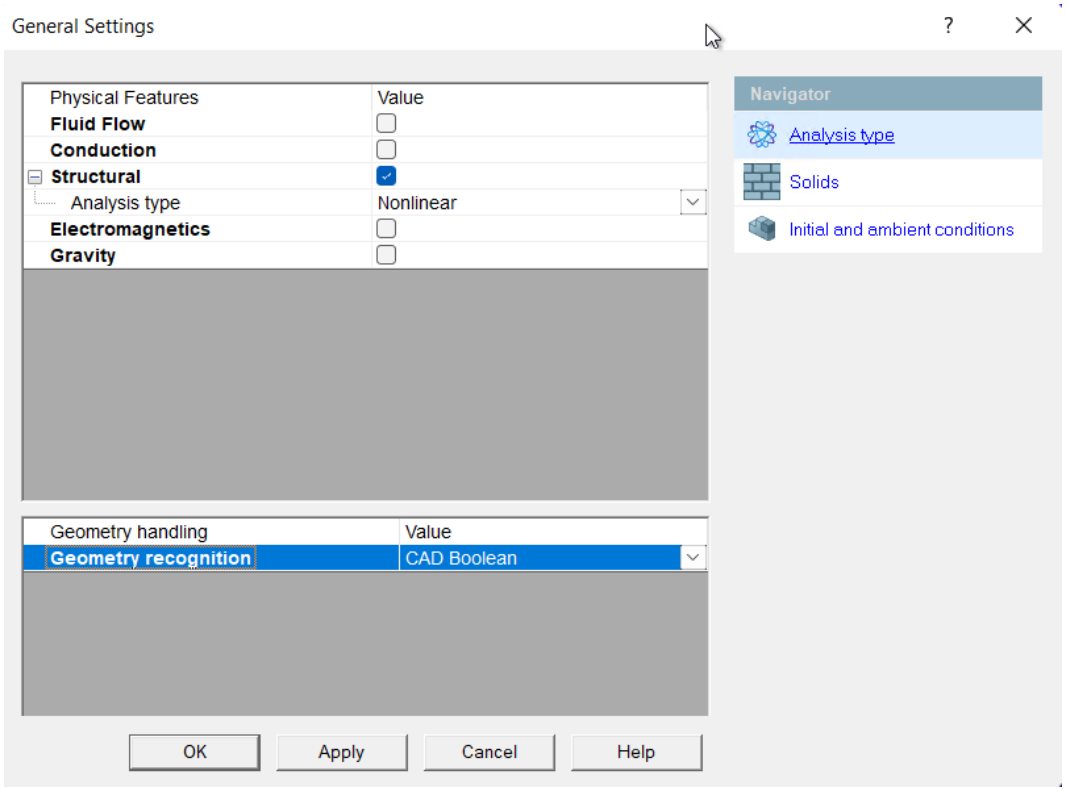
SC3D NASTRAN non-linear solver connection

Expand range of structural analysis applications

Challenge: Many structural analysis applications of interest in electronics require non-linear solver capabilities

Solution: Connect Simcenter FLOEFD with Simcenter 3D Nastran solver to access its non-linear functionality

- Leverage existing solutions in Simcenter portfolio
- Initial step to exploring further application areas
- SC3D Nastran solver 401 is used for Nonlinear analysis
- SC3D Nastran should be installed and licensed independently



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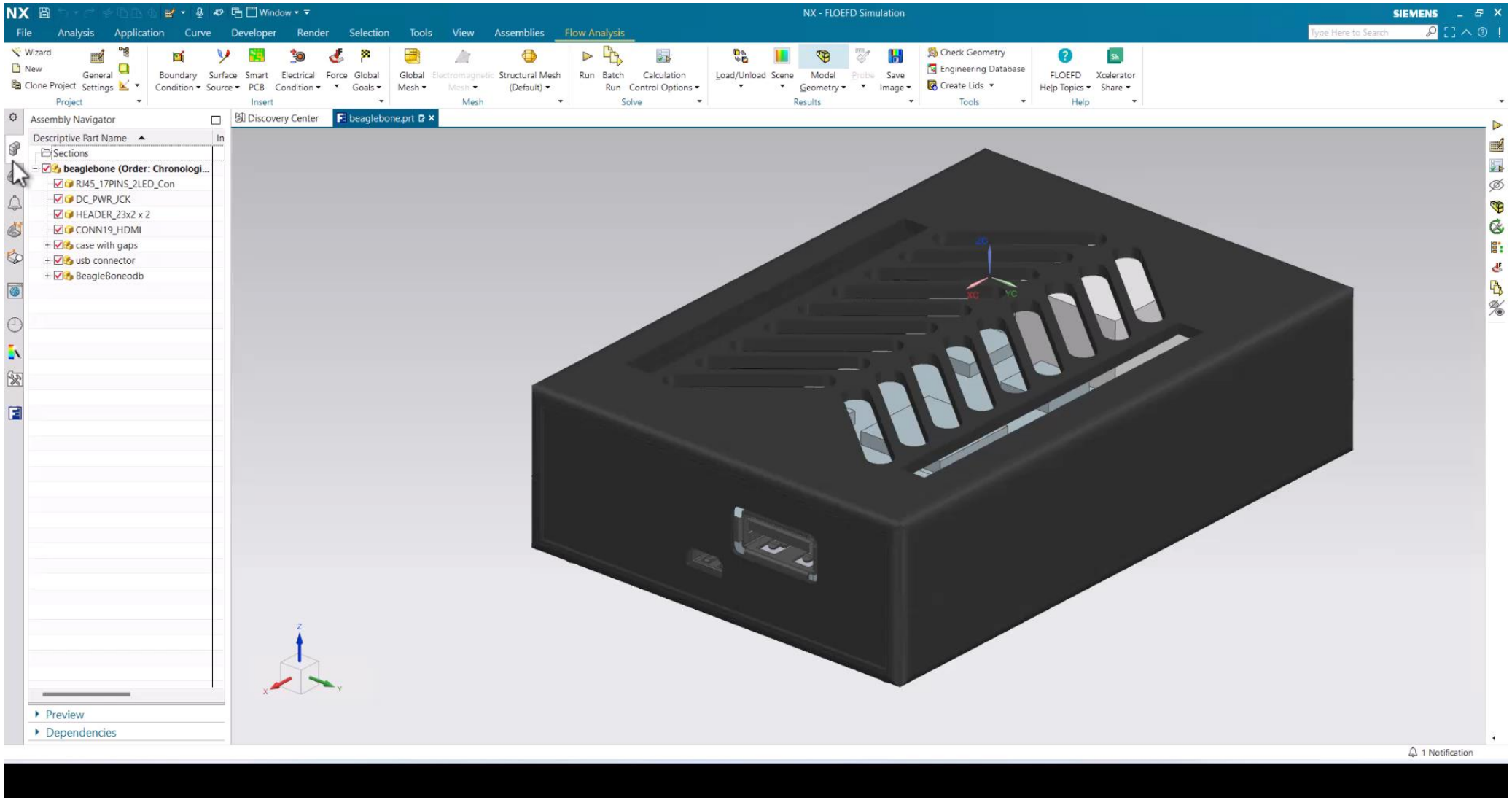
Video:SC3D NASTRAN non-linear solver connection



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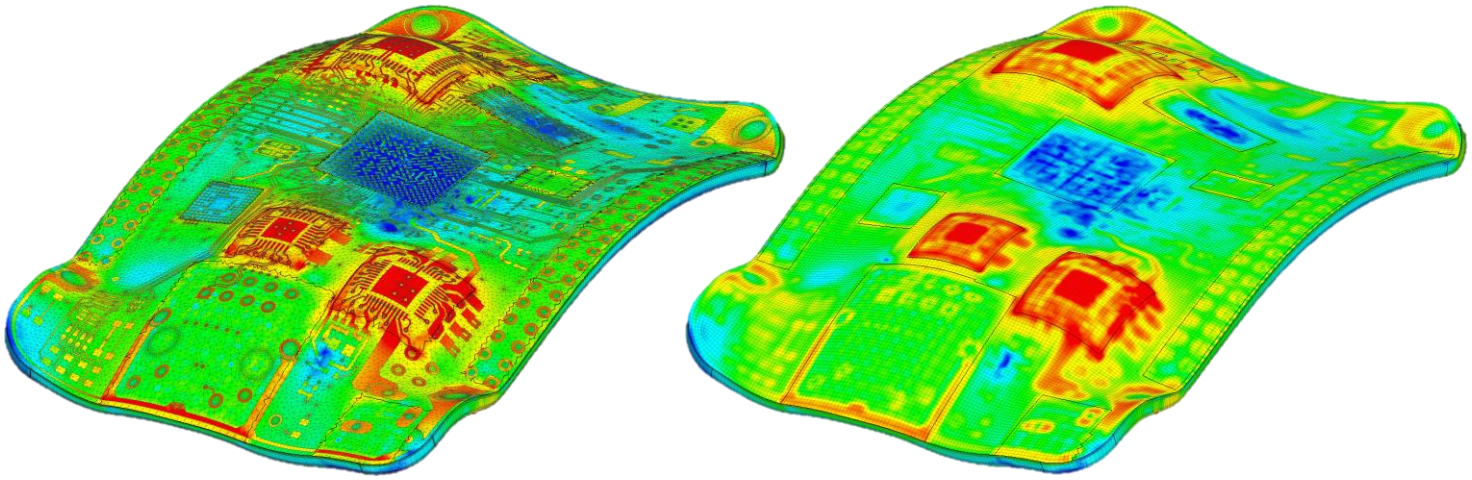
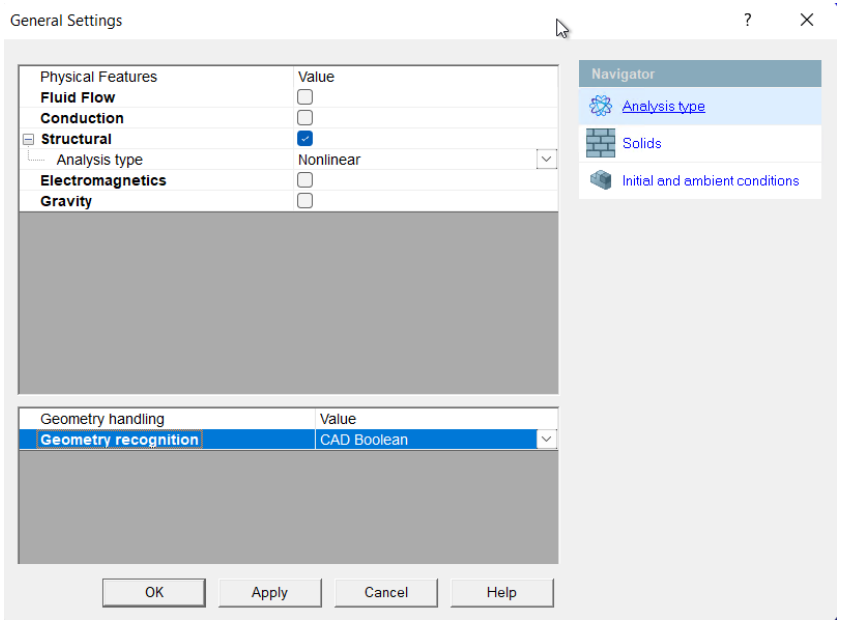
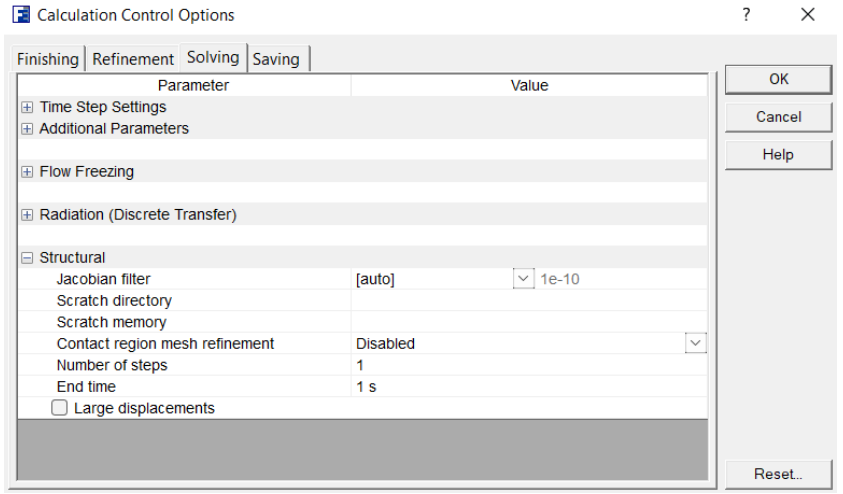
SC3D NASTRAN non-linear solver connection

Connection with the Simcenter 3D Nastran solver opens its non-linear capabilities to users from their familiar Simcenter FLOEFD interface:

- Set up project, run solver and process results as usual.
- SC3D Nastran solves Smart PCB with all nets for both levels of detail (fine and homogenized).
- Easier design space exploration by working with one model







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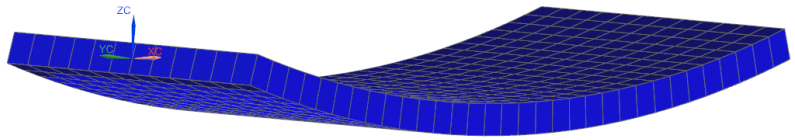
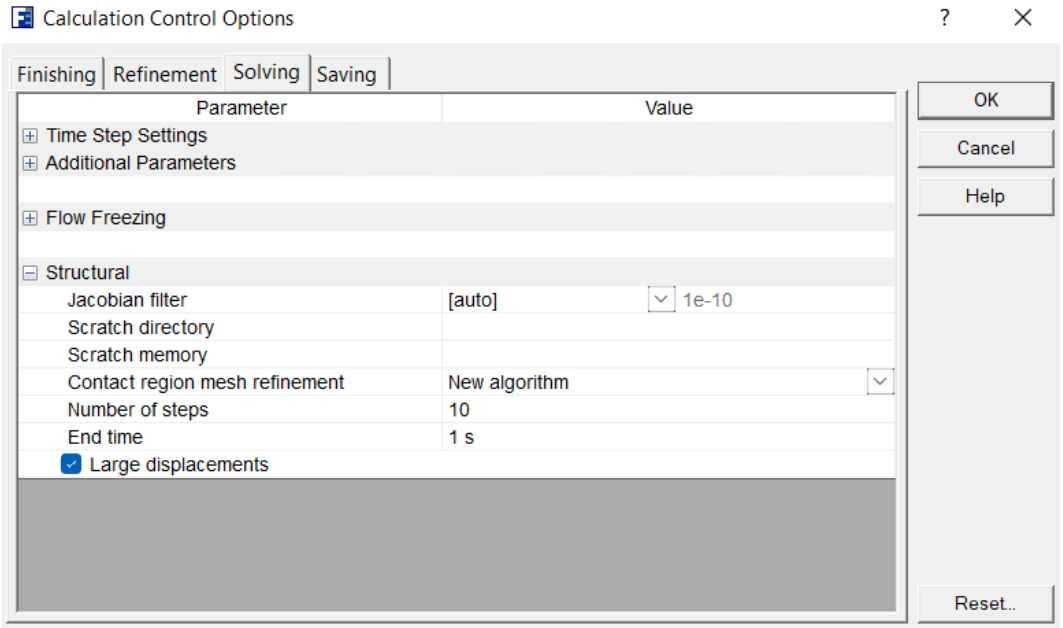
Structural: Large displacement

Analyze cases with large displacement

Challenge: Take into account structural non-linear behavior due to large displacement of geometry

Solution: Use Simcenter Nastran non-linear capabilities of iterative solver 401





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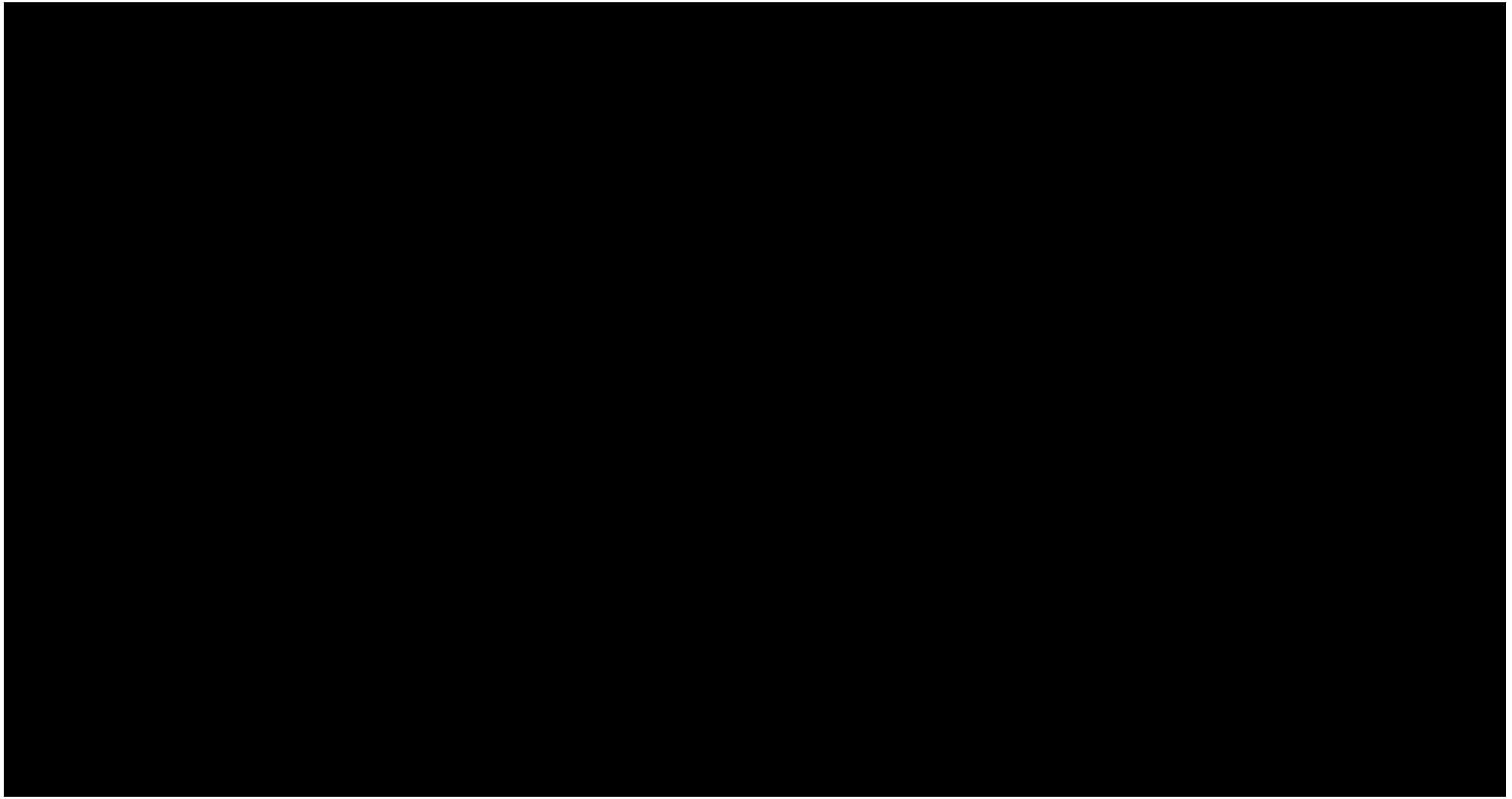
Video: Structural - Large displacement



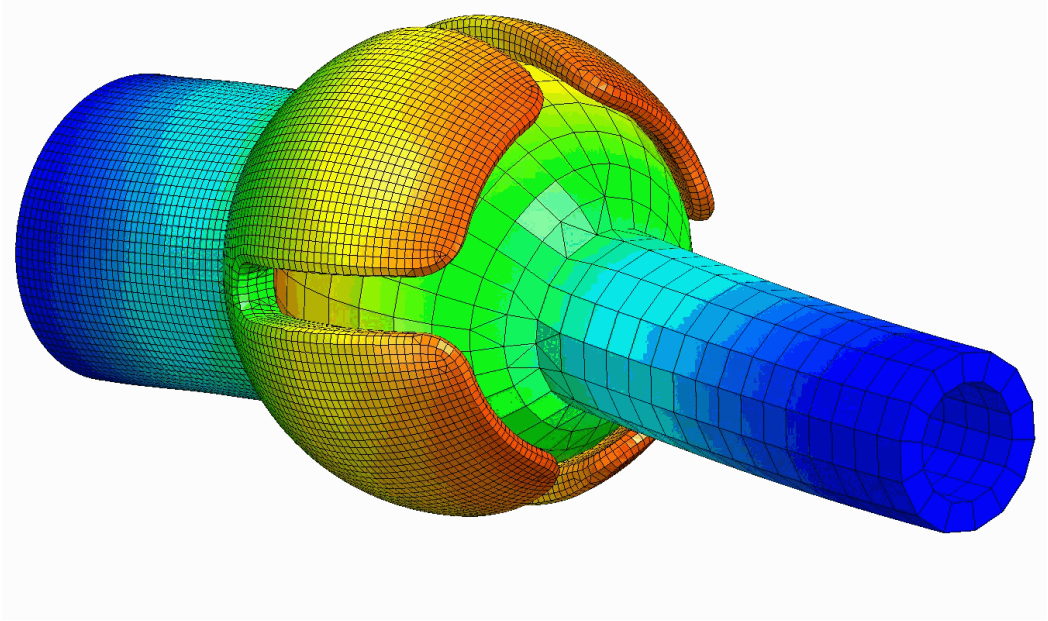
Structural: Tolerance based contacts

Improved options for contact definition

Challenge: Create contacts on surfaces of overlapping bodies or bodies with the gaps between them in preparation for structural analysis.

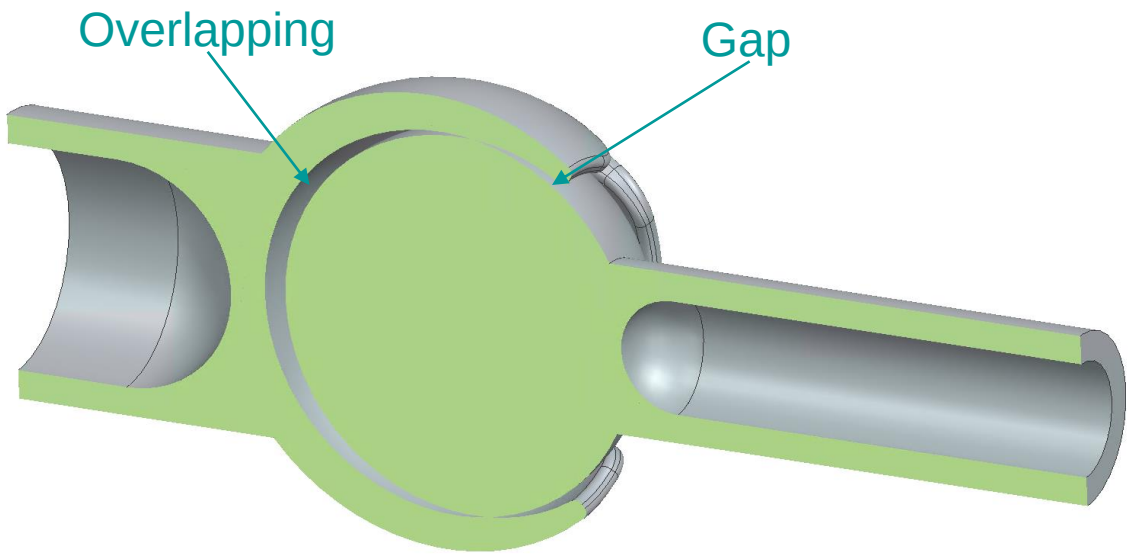
Solution: Tolerance based contacts: ability to specify tolerances and use them to create contacts between bodies with gaps

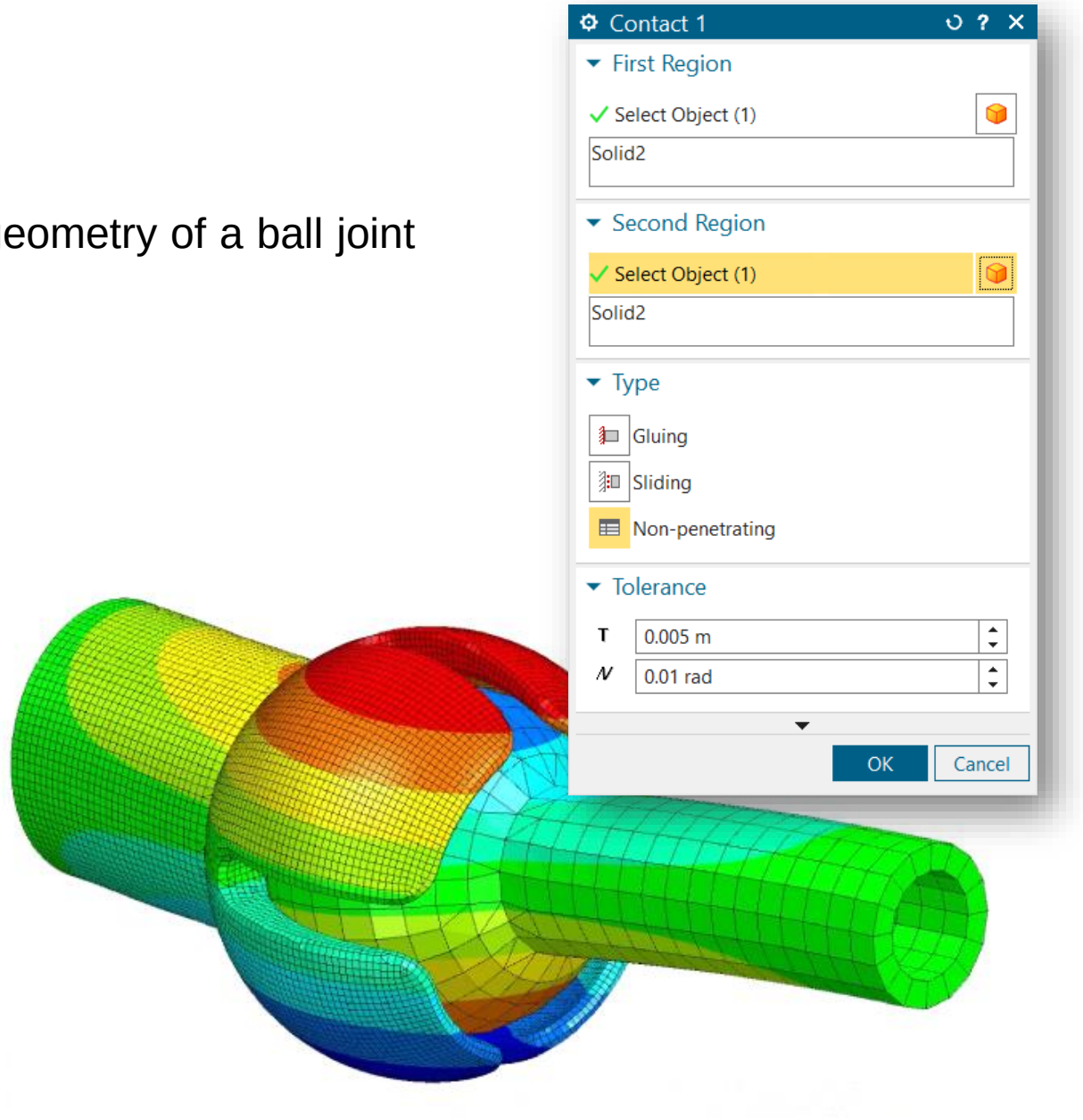
- Linear and angle tolerances for contacts
- Glue contact between bodies with gap



Structural: Tolerance based contacts

Example of a tolerance-based contact with non-ideal geometry of a ball joint with overlapping areas and regions with gaps





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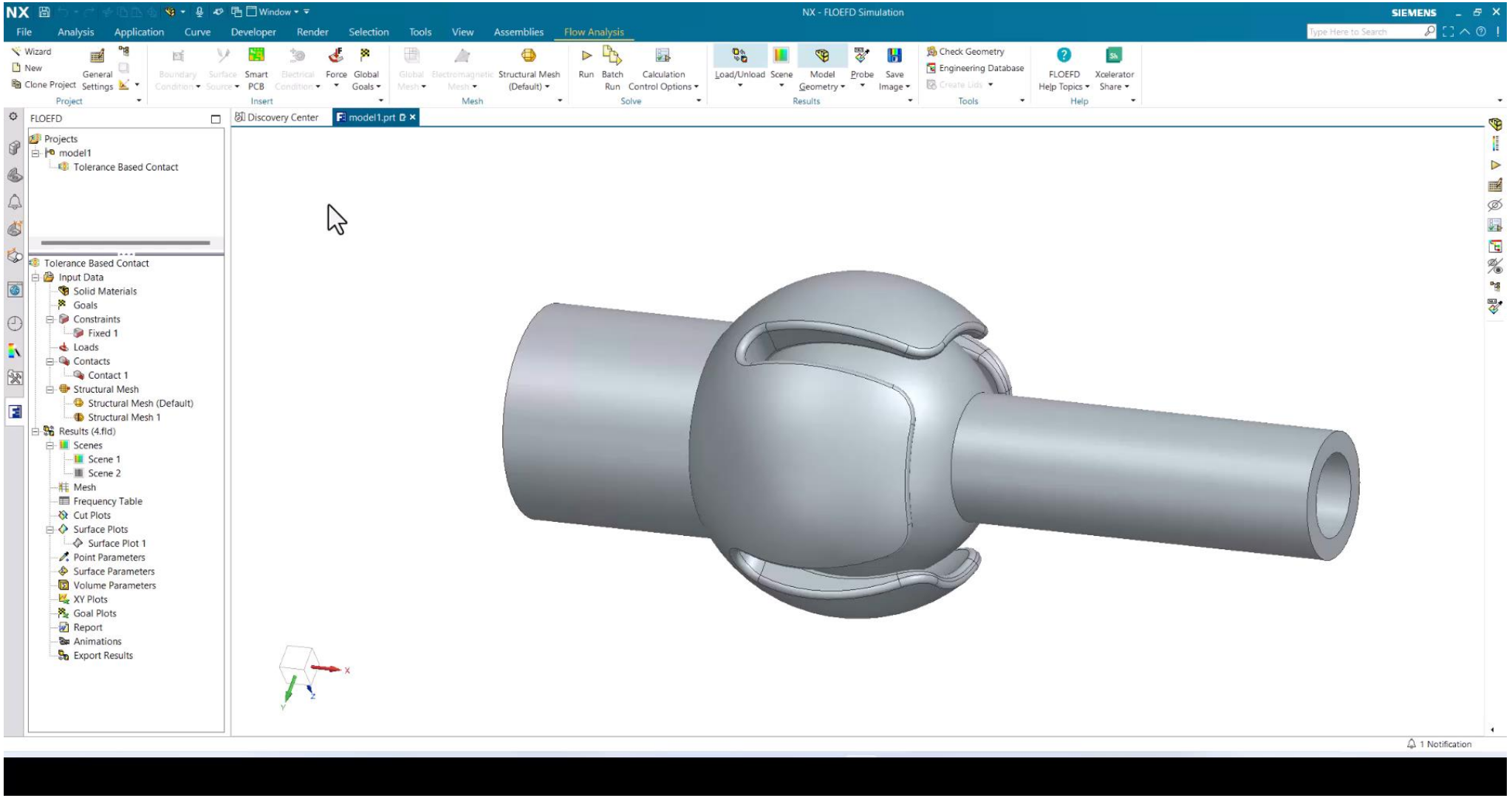
Video: Structural: Tolerance based contacts



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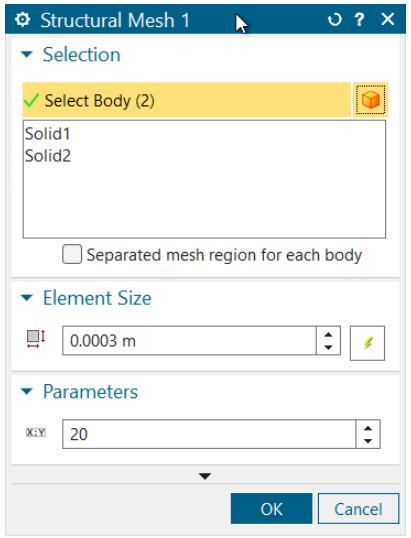
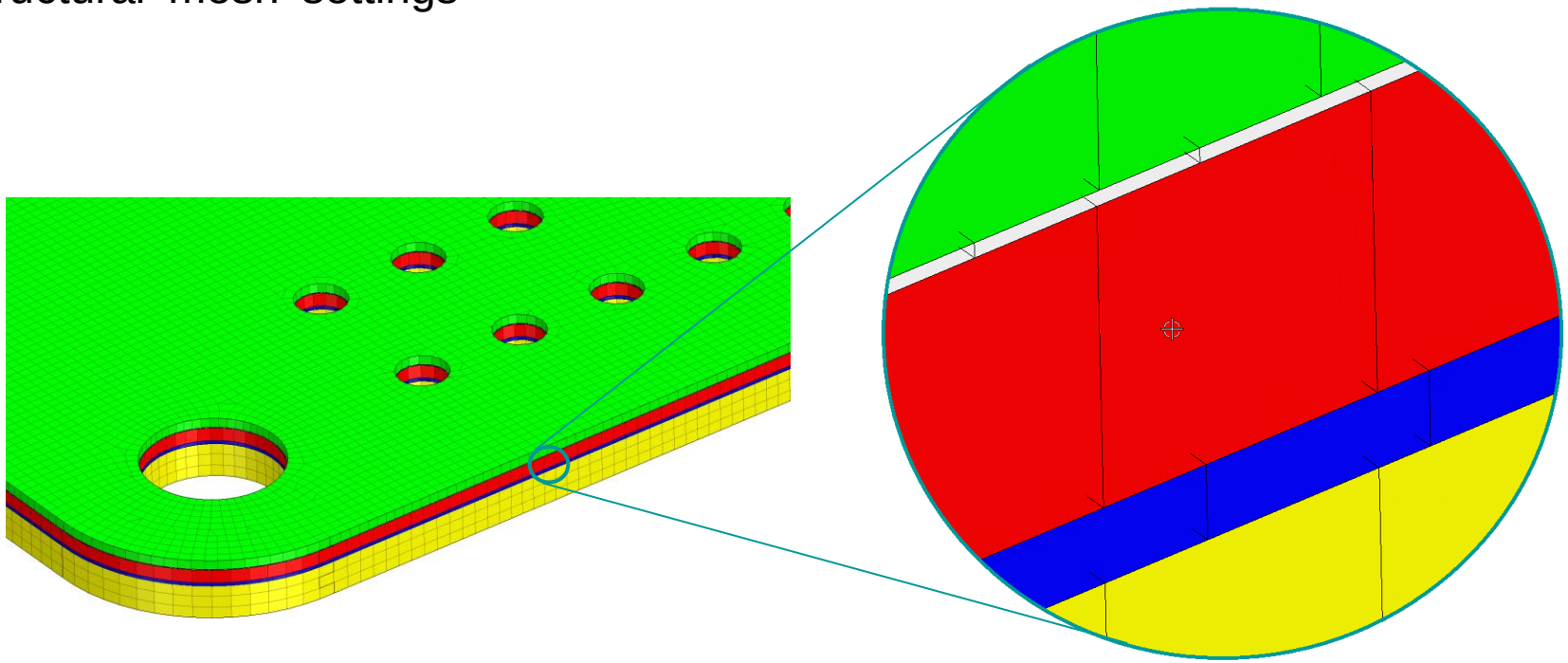
Structural: User defined maximum aspect ratio in local mesh

Increased meshing efficiency for handling thin components

Challenge: Create HEX dominant mesh for thin plates with high aspect ratio value, beyond the limitation of 1:4

Solution: Allow user to specify maximum aspect ratio for particular components in the Structural mesh settings dialog





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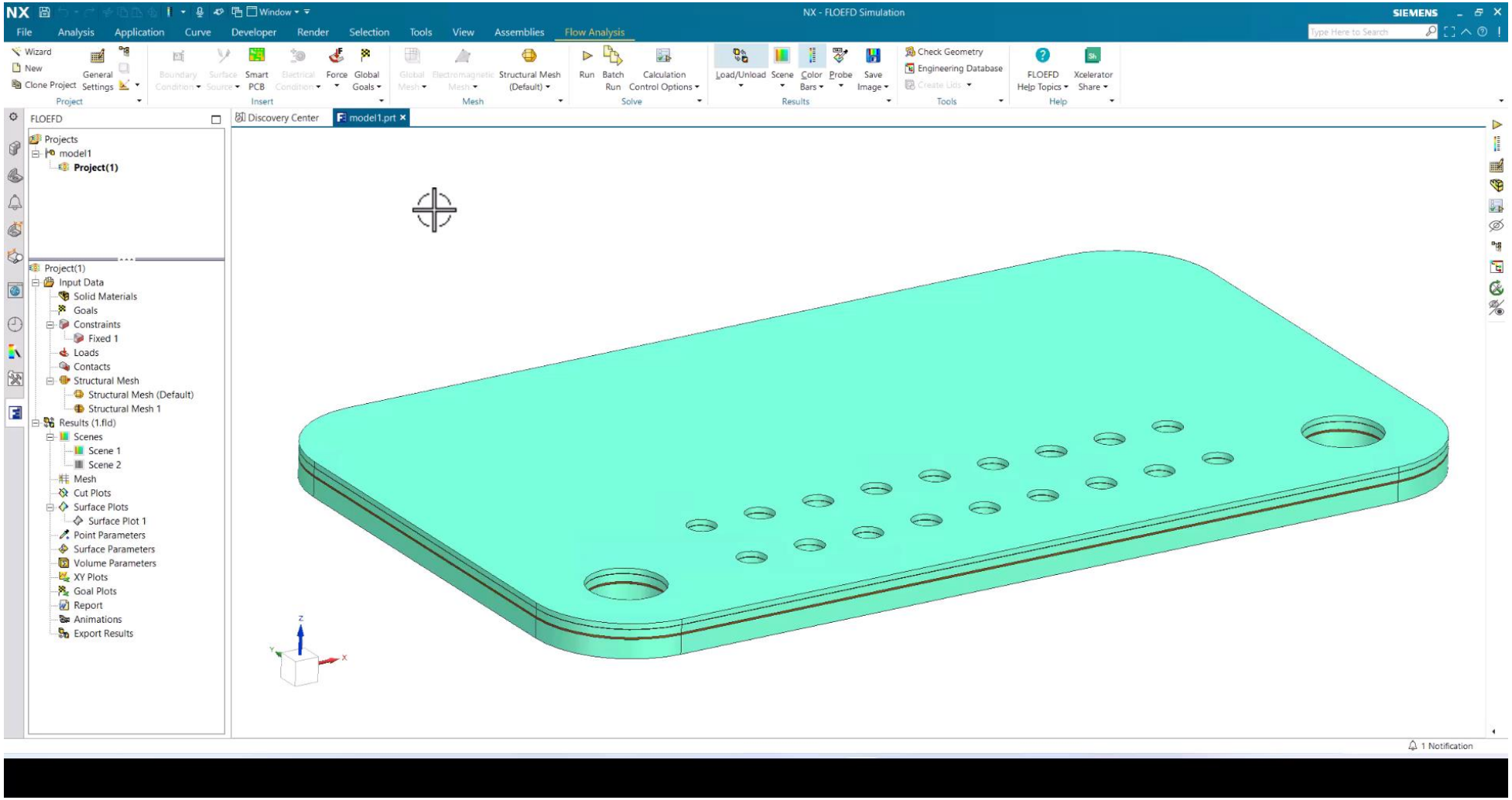
Video: Structural - User defined maximum aspect ratio in local mesh



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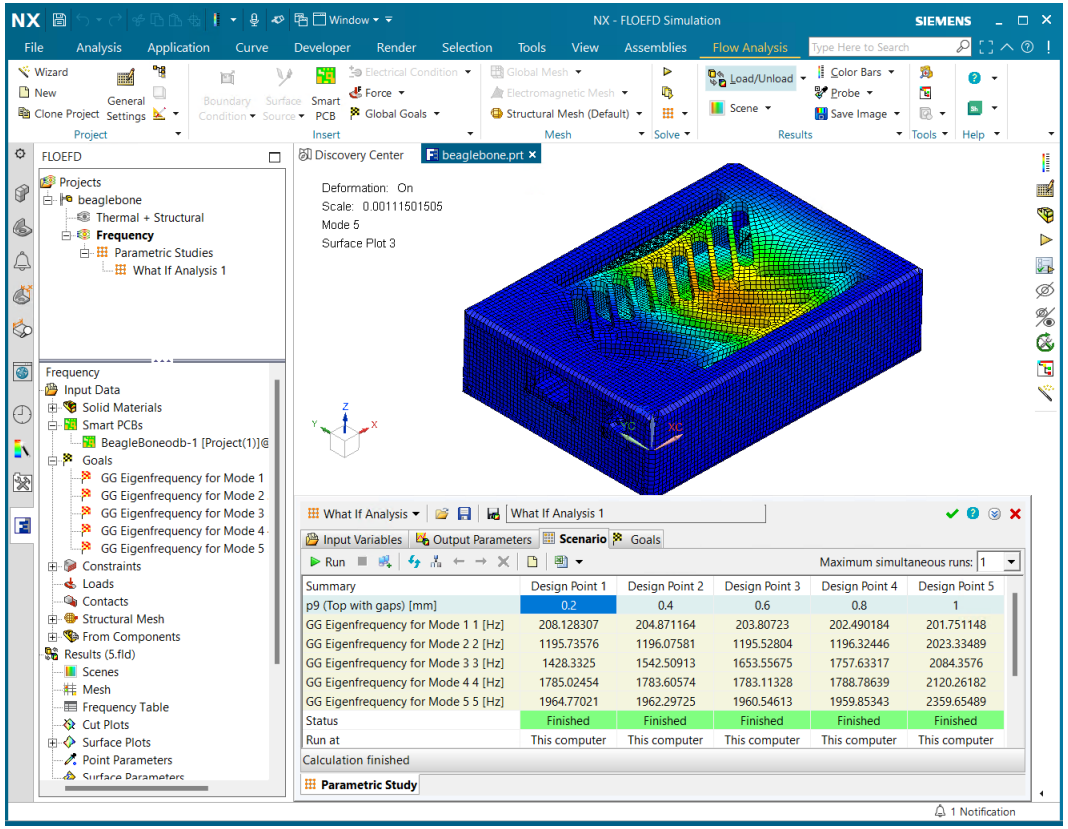
Structural: Goals for frequency analysis

Modal frequency parametrization with frequency values as goal functions

Challenge: Obtain eigenvalues of a frequency analysis as a goal function of a calculation, be able to conduct parametric study or optimization

Solution: add goals for frequencies



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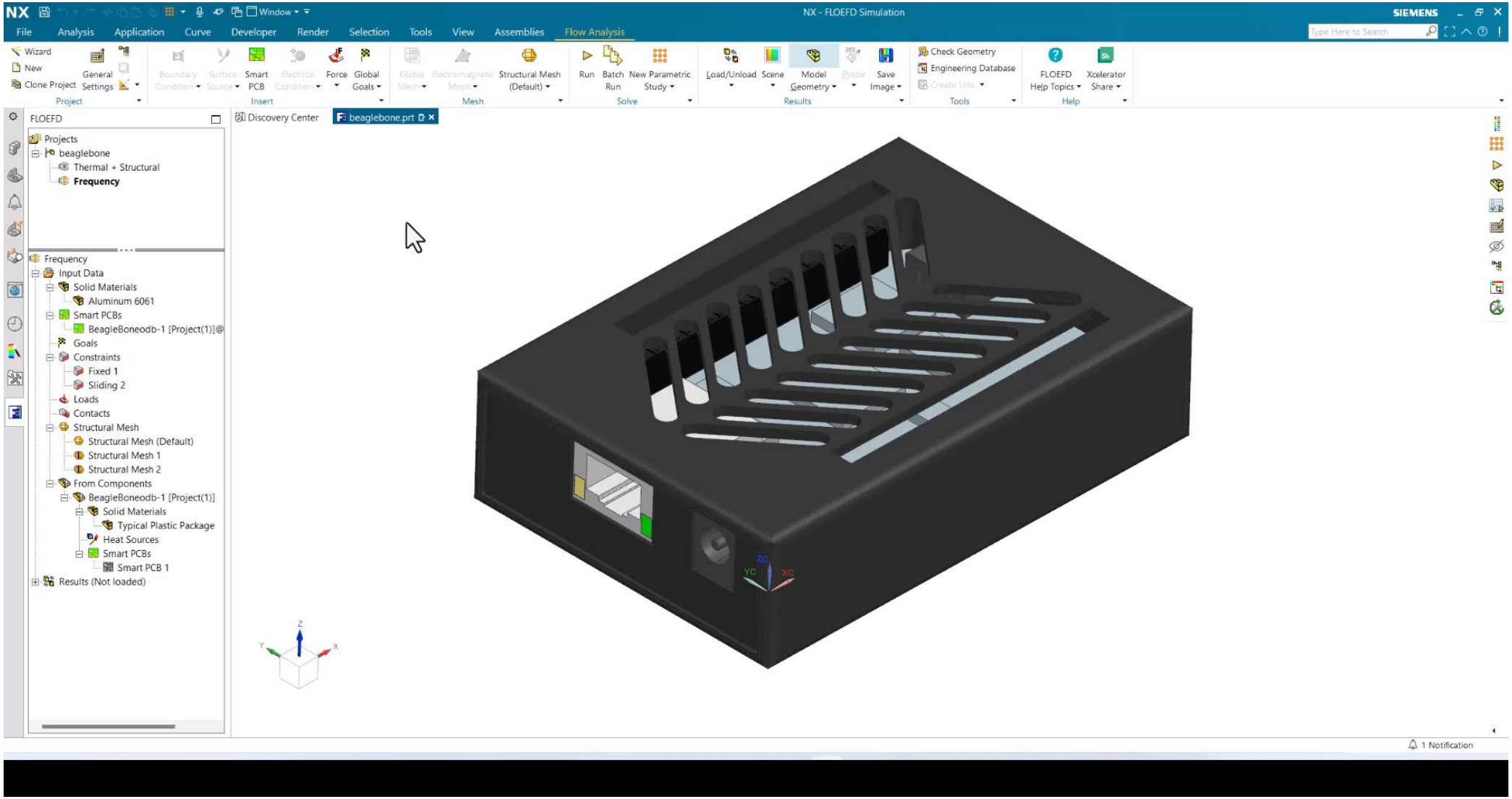
Video: Structural - Goals for frequency analysis



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Explore the possibilities

For customers only where containing Beta Features

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Beta

EFDAPI: Improve API and automation (new API available as a BETA feature)

Access to all existing FLOEFD features

Easy maintenance

Challenge: Existing API does not cover all FLOEFD functionality and requires significant effort to support and 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: apply time table for many features automatically

Beta

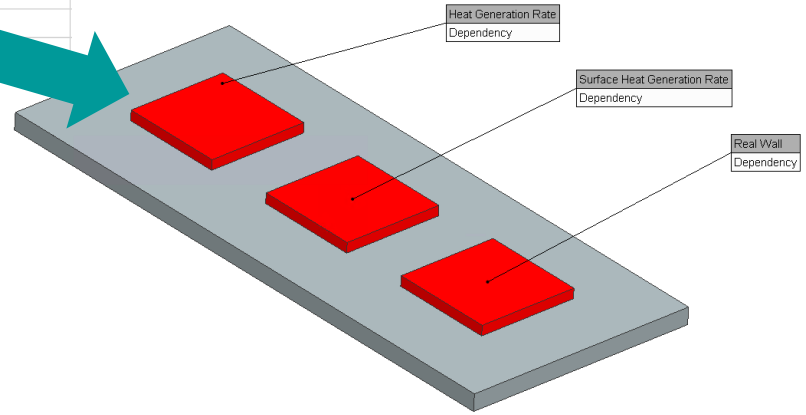
Example created to address an actual customer request:

- Xml file with the description of time dependent conditions (HTC, Surface and Volume Sources) is generated by third party software
- Script reads the file and applies time tables to the opened project

Data.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<Features>
    <Feature Type="Volume Source" Name="VS 1">
        <Parameter Name="efdHeatGenerationRate" Dependency_Type = "efdTimeTable">
            <String X="0" Y="11"/>
            <String X="0.1" Y="22"/>
        </Parameter>
    </Feature>
    <Feature Type="Boundary Condition" Name="HTC 1">
        <Parameter Name="efdHeatTransferCoefficient" Dependency_Type = "efdTimeTable">
            <String X="0" Y="33"/>
            <String X="0.1" Y="44"/>
        </Parameter>
        <Parameter Name="efdExternalFluidTemperature" Dependency_Type = "efdTimeTable">
            <String X="0" Y="5.5"/>
            <String X="0.1" Y="6.6"/>
        </Parameter>
    </Feature>
    <Feature Type="Surface Source" Name="SS 1">
        <Parameter Name="efdSurfaceHeatGenerationRate" Dependency_Type = "efdTimeTable">
            <String X="0" Y="7.7"/>
            <String X="0.1" Y="8.8"/>
        </Parameter>
    </Feature>
</Features>
```

	A	B	C	D
1				
2		**Product:**	EFDApiSrv.EFDLauncher.4.2306	
3		**XML:**	C:\EFDAPI_NX\Data.xml	
4		**PID:**	8456	
5				
6			Apply	
7				
8				



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Go faster

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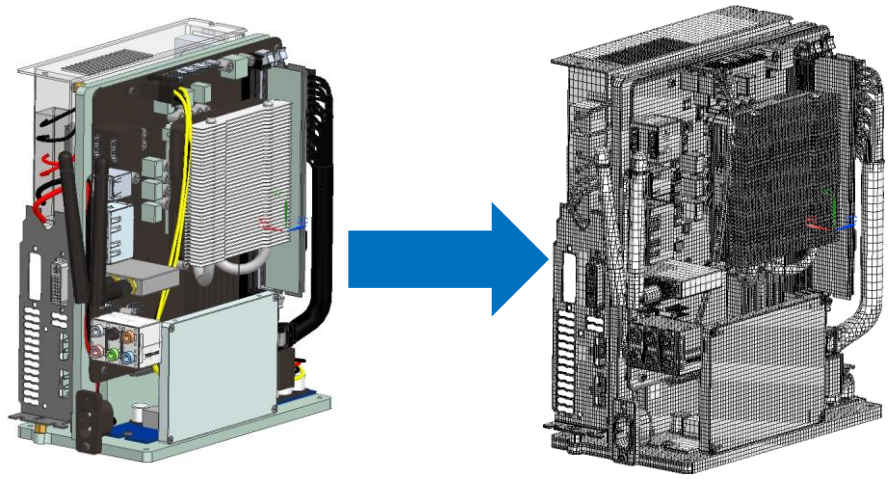
Smart Cell Cartesian mesh generator speed-up and optimization

Faster meshing, reduced resources

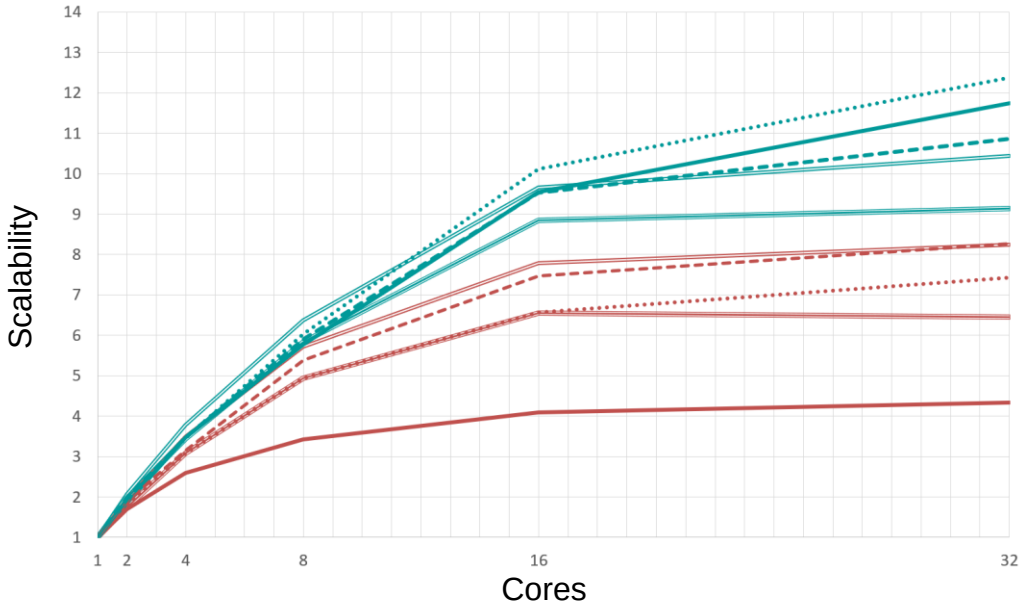
Challenge: Accelerate mesh generation time and reduce resulting mesh file size

Solution: Smart Cell Cartesian mesh generator optimization

- Scalability improvement:
  - 9-12x speedup on 32 cores for 10-20M cell model in 2306 compared to 3-7x in 2205
  - Meshing speed is ~2-3x faster on 32 cores in 2306 due to scalability



Mesh generation scalability



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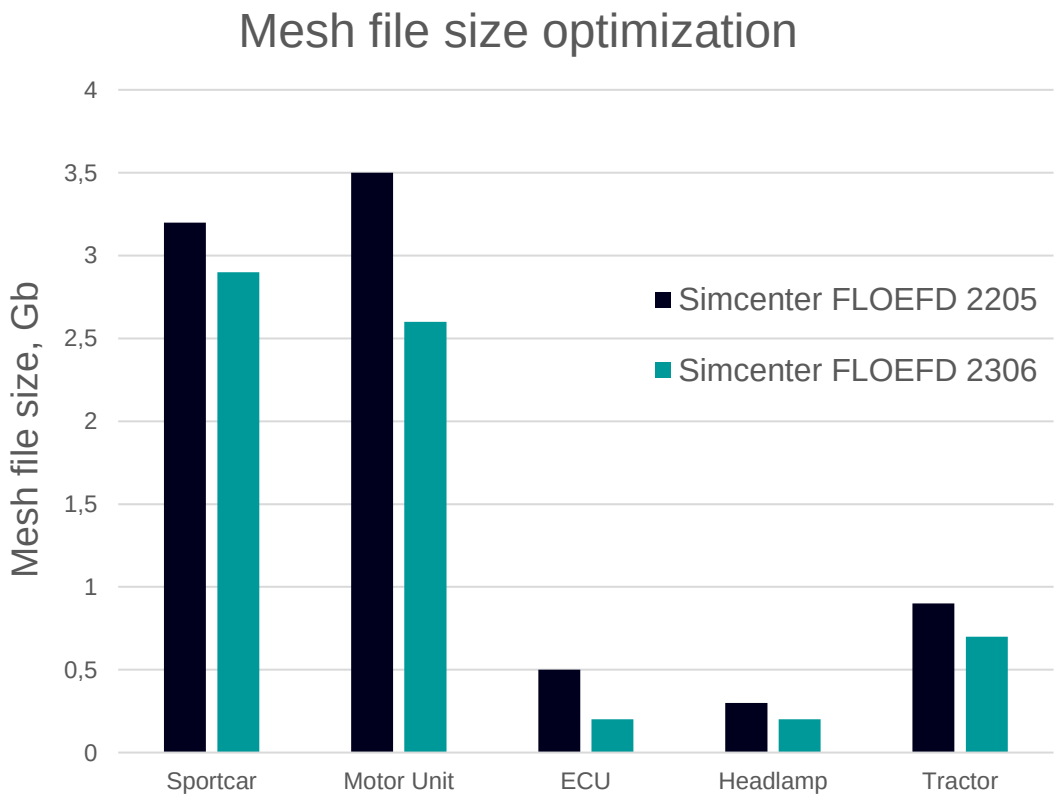
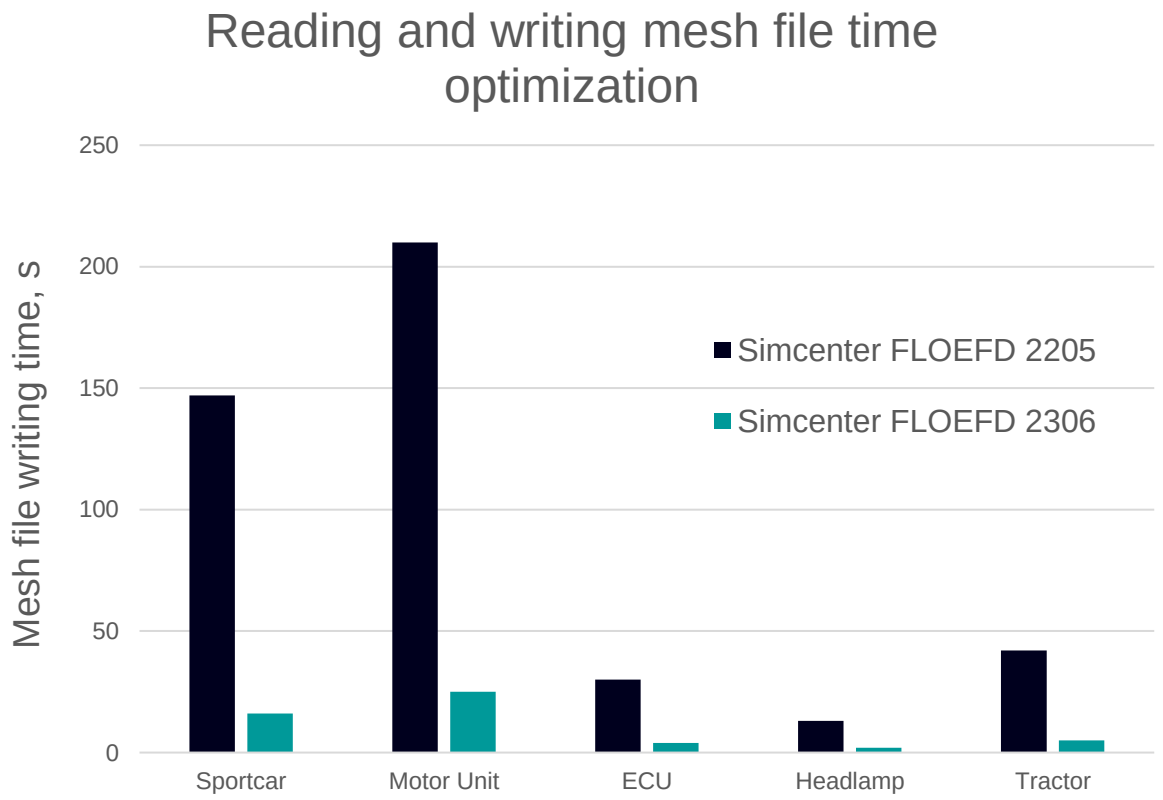
Cartesian mesh generator speed-up and optimization





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EDA Bridge import and Smart PCB generation speed increase

Faster PCB import

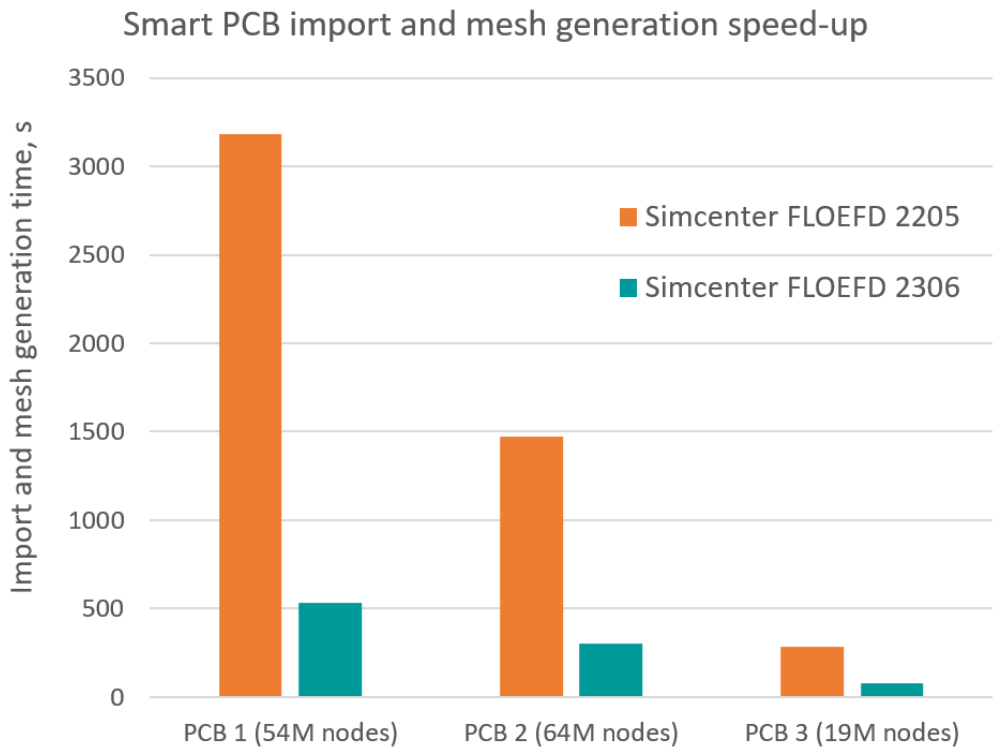
Intel(R) Xeon(R) Gold 6244 3.60 16 cores

Challenge: Decrease Smart PCB import time, speed-up other manipulations to the Smart PCB

Solution: Smart PCB mesh generation speed-up, optimization

Accelerated operations:

- Import and Smart PCB mesh generation
- Visualization
- Update after parameters changed



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Stay integrated

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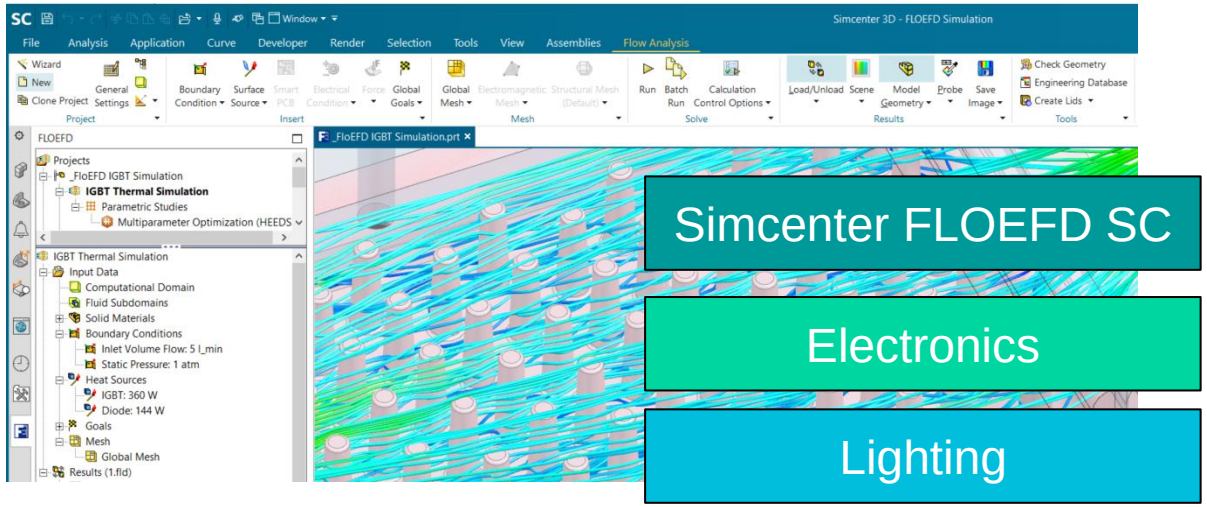
Simcenter FLOEFD SC

Stay integrated

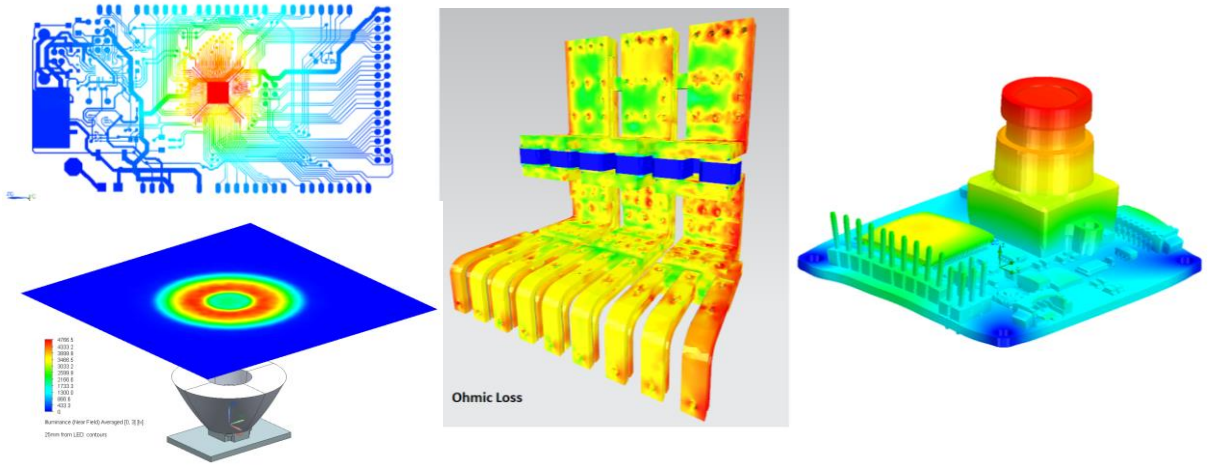
Access Simcenter FLOEFD from Simcenter 3D Desktop

- Incorporate FLOEFD into main Simcenter multi-disciplinary CAE platform
- Uses CLT licensing (and SALT...)
- Flexible licensing through SC3D tokens



Simcenter FLOEFD SC Electronics

- Simple licensing option providing all electronics-related functionality, including structural and EMAG



Simcenter FLOEFD SC Lighting

- Continued focus on core strength

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Simcenter FLOEFD SC

Streamlined portfolio focused on core verticals

Current

Re-packaged Simcenter FLOEFD SC options

Simcenter FLOEFD SC Base

Advanced

HVAC

Simcenter FLOEFD SC Base

ECC

Electronics Cooling

EDA Bridge

BCI-ROM + PC

T3STER Autocalibration

Power Electrification

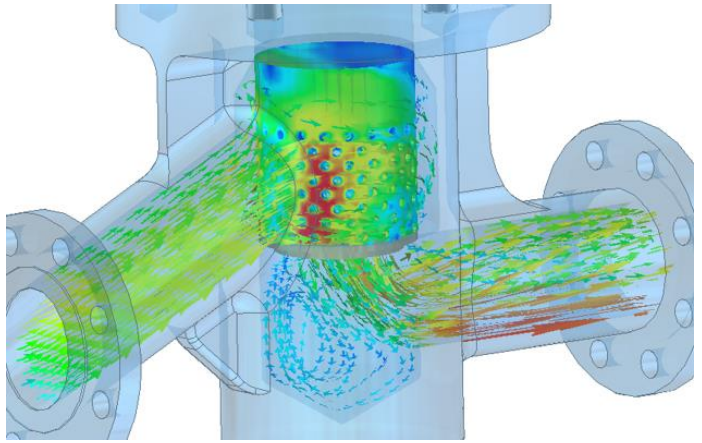
Structural

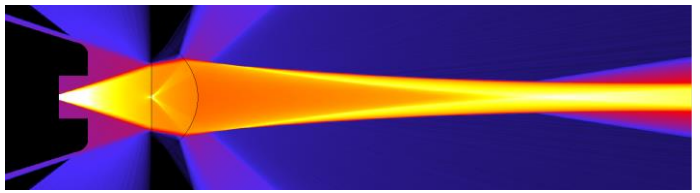
EMAG

Electronics

LED

Lighting





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Teamcenter FLOEFD item customization

Added flexibility in maintaining digital thread

Challenge: Customize Simcenter FLOEFD data model

Solution: Put Simcenter FLOEFD data model into an *.xml file and store it locally or in Teamcenter

TC_EFD_DataModel.xml

```
<?xml version="1.0" encoding="utf-8"?>
<EFDProject version="1.0" >
    <Item type="CAEAnalysis"/>
    <Revision type="CAEAnalysisRevision"/>
    <MasterForm type="CAEAnalysis Master"/>
    <MasterFormRevision type="CAEAnalysisRevision Master"/>
    <MasterFormRevisionData name="user_data_1"/>
    <ModelRelation type="TC_CAE_Target"/>
    <DatasetRelation type="IMAN_specification"/>
    <Datasets>
        <Reports type="CAEResults"
                 name="Reports"
                 description="FLOEFD images and reports"
                 tool="CAE_Dummy"
                 reference="Result"/>
        <Solver type="CAEResults"
                name="Solver"
                description="FLOEFD solver files"
                tool="CAE_Dummy"
                reference="Result"/>
        <Results type="CAEResults"
                 name="Results"
                 description="FLOEFD solver files"
                 tool="CAE_Dummy"
                 reference="Result"/>
        <AveragingData type="CAEResults"
                       name="Averaging"
                       description="FLOEFD averaging"
                       tool="CAE_Dummy"
                       reference="Result"/>
        <TransientData type="CAEResults"
                       name="Transient"
                       description="FLOEFD transient explorer"
                       tool="CAE_Dummy"
                       reference="Result"/>
        <WordDoc type="MSWord"
                 name=""
                 description="FLOEFD images and reports"
                 tool="MSWord"
                 reference="word"/>
        <WordDocX type="MSWordX"
                  name=""
```


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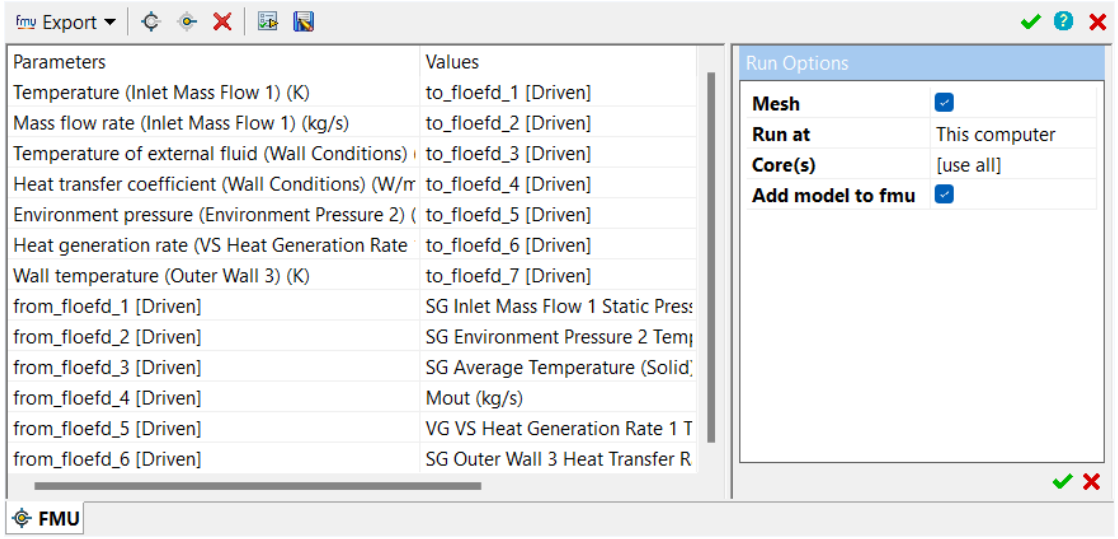
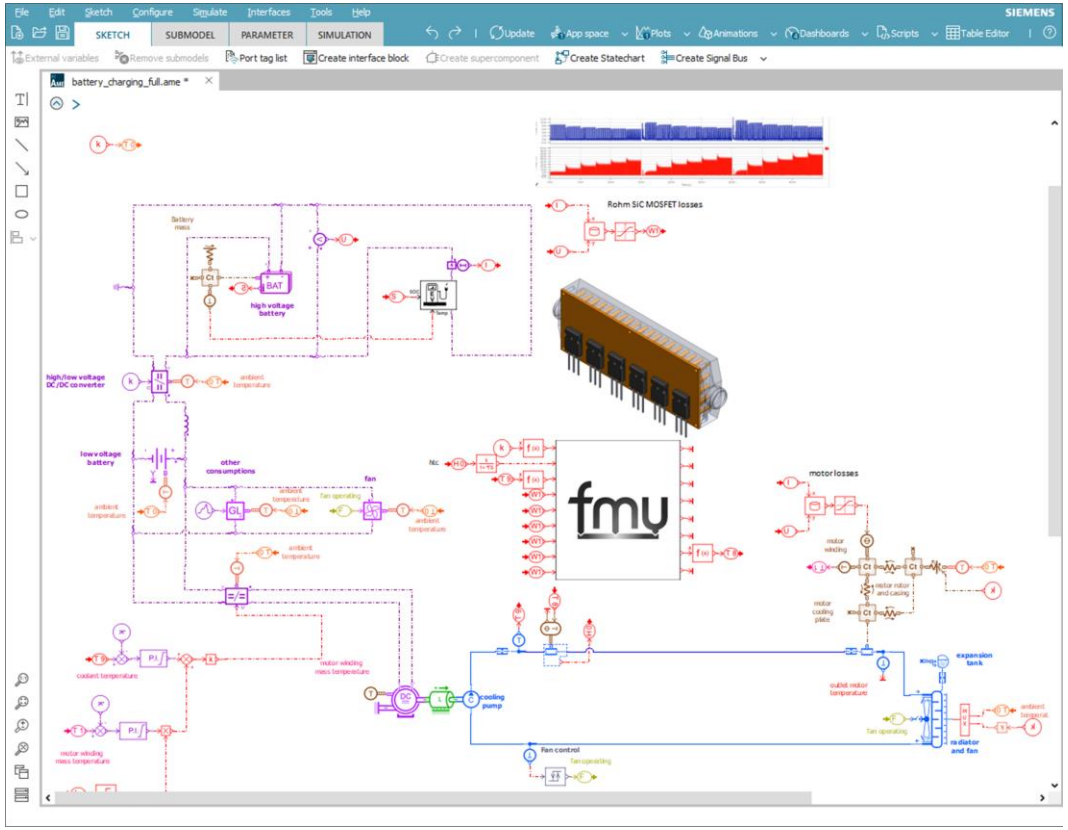
FMU: Run on Linux

Expand platform options for FMU usage

Challenge: Ability to use FLOEFD FMU on Linux systems

Solution: Store all necessary information including model geometry inside FMU exported from Simcenter FLOEFD to make it available for usage on Linux. Enhance Simcenter FLOEFD Linux solver to co-simulate with the FMU exported from other software





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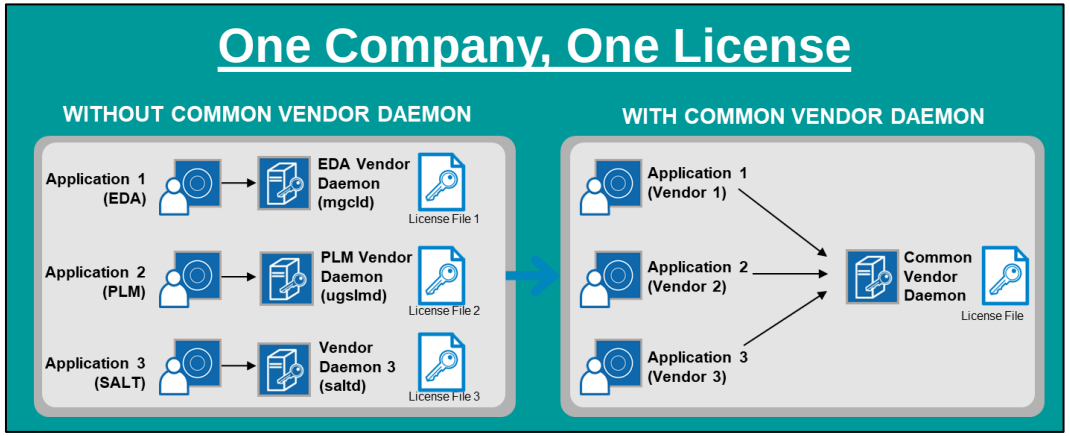
SALT Licensing

Challenge: Consolidate different legacy license systems to simplify and enhance licensing for our customer within all Siemens products.

Solution: FLOEFD now supports the Siemens License Server (2.2.0.0)

- Siemens Common Vendor Daemon, saltd, is used in place of legacy license servers
- Customers can use their existing licenses when upgrading to SLS.
- License Manager upgrade is required for 2306.
- License server installation no longer included in installation kit, now downloaded from Support Center
- Legacy license server will be automatically uninstalled during SLS installation



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