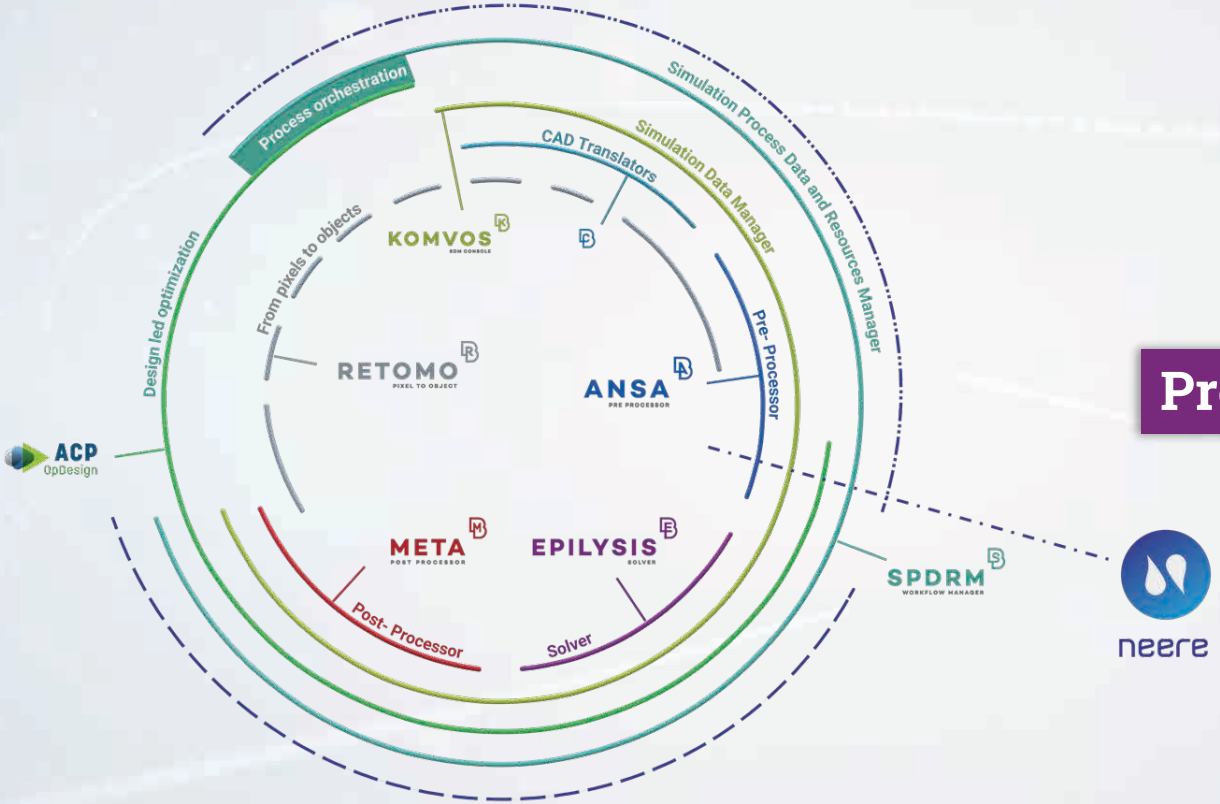
BETA

SIMULATION SOLUTIONS

EPILYSIS

SOLVER

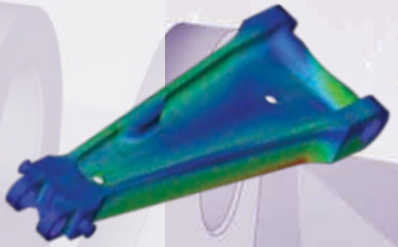
Products Map

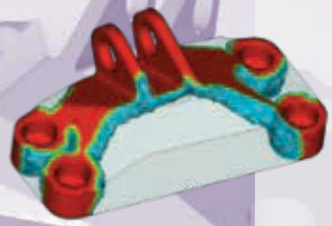


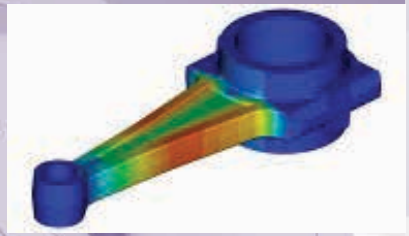
What is EPILYSIS ?

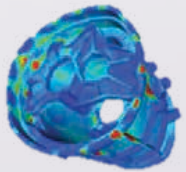
Linear Analyses

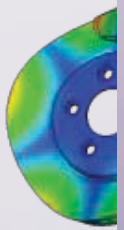
- Static (SOL101)
- Real Eigenvalue (SOL103)
- Complex Modal (SOL110)
- Direct Transient Response (SOL108)
- Direct Frequency Response (SOL109)
- Modal Transient Response (SOL111)
- Modal Frequency Response (SOL112)









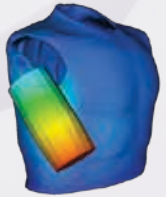


Optimization (SOL200)

- Sizing
- Topometry
- Topology
- Shape

Non-linear Contacts (SOL400)

- Linear Elements / Materials



Performance

MUMPS linear solver

MPI interface

MKL ILP64

Performance Upgrades

v22.0.x

Parameter LSOLVER with options:

1. MUMPS
2. PARDISO

- A mature solver with established track record in industry
- Excellent memory management
- Improved multi-threaded performance
- Reduces the performance penalty for large models

MUMPS linear solver

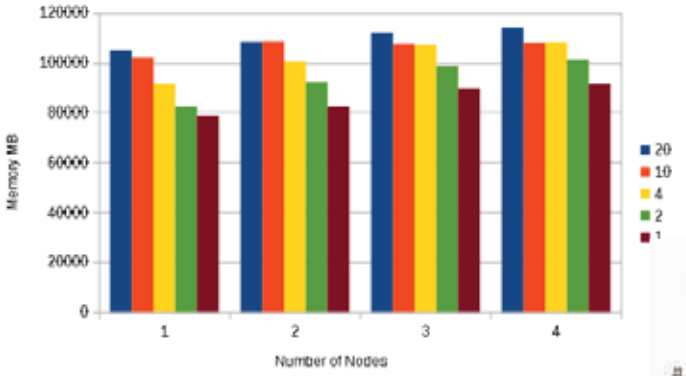
(Multifrontal Massively Parallel Sparse direct solver)

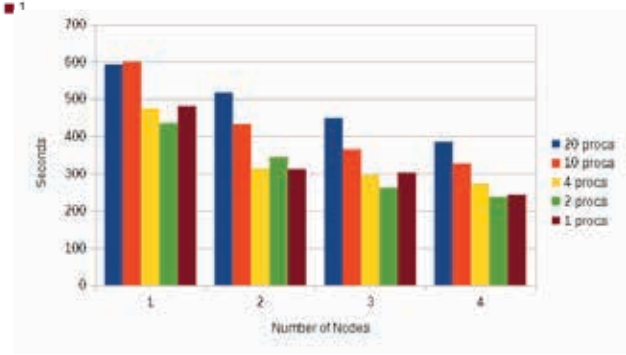
Performance Upgrades

v22.1.x

Current restrictions for solving with MPI:

- Supported for all static and dynamic solutions.
- Supported only for Linux machines with Intel processors.





High performance computing "Message Passing Interface (MPI)"

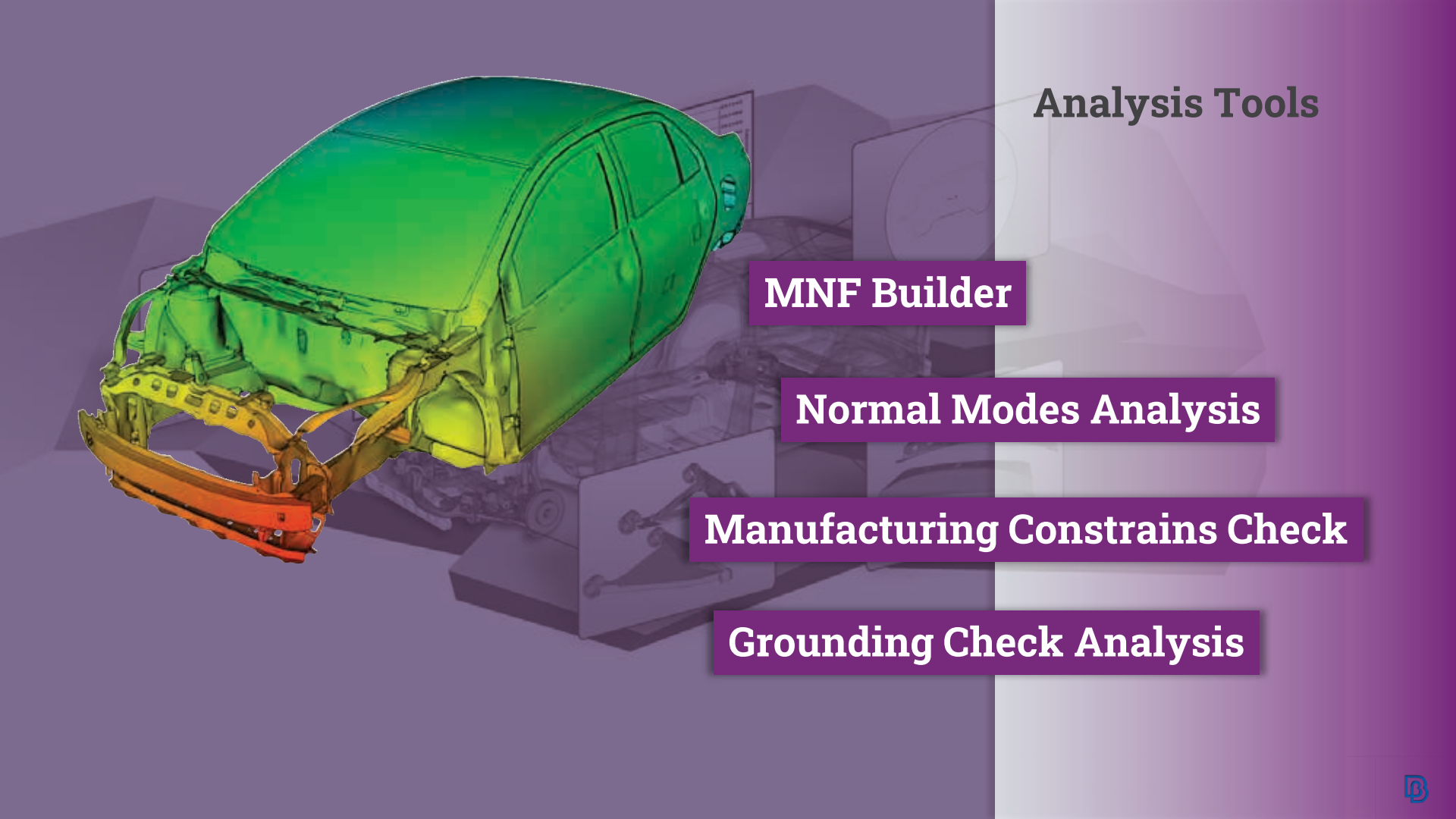
Performance Upgrades

v22.0.x

MKL LP64
Old 32bit MKL library had limitations in very large models and multiple loadcases.

MKL ILP64
New 64bit MKL library removes the limitations and larger models can be solved.

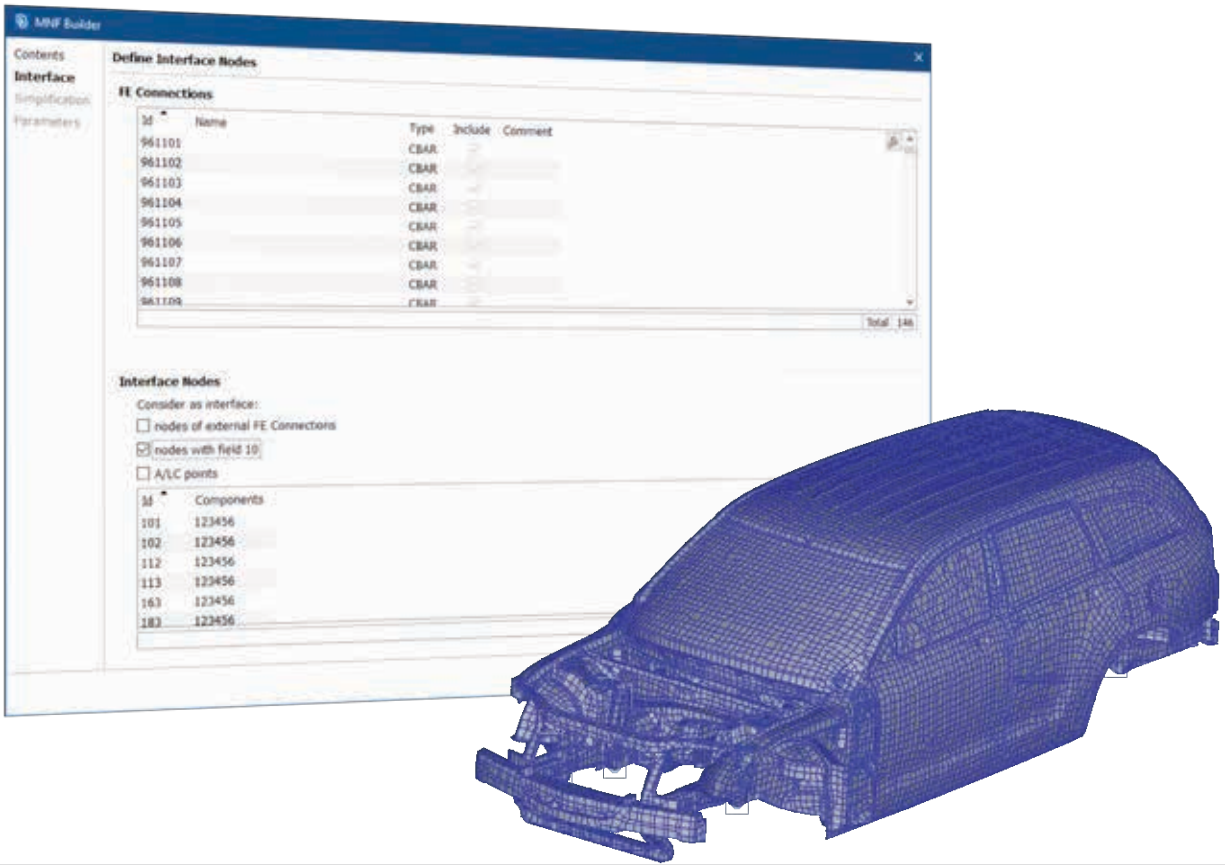
ILP64 64bit integers.



Analysis Tools

- MNF Builder
- Normal Modes Analysis
- Manufacturing Constrains Check
- Grounding Check Analysis

Analysis Tools



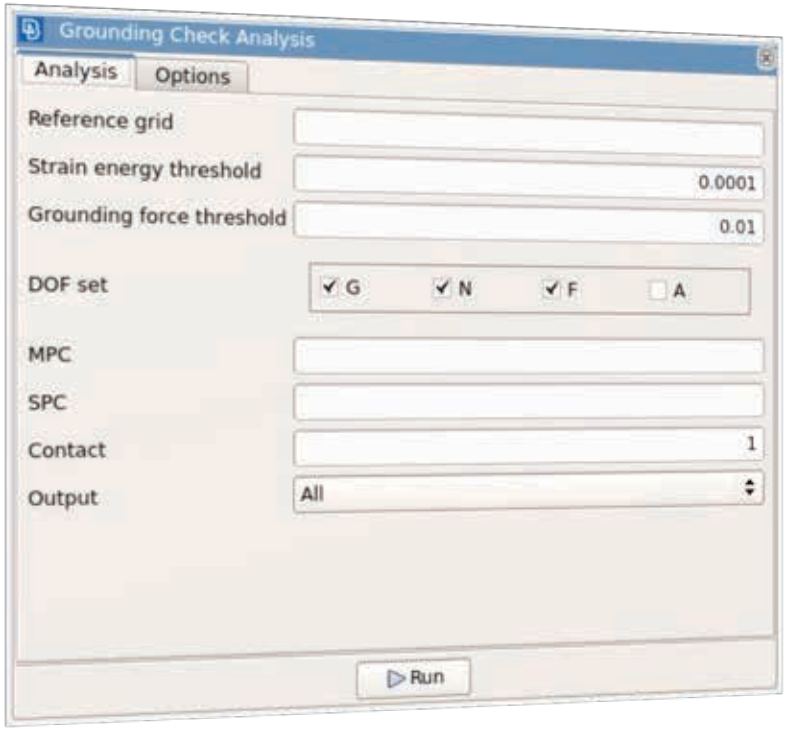
v22.0.x

MNF Builder

Instant modal reduced representations

Display Model to reduce size

Analysis Tools

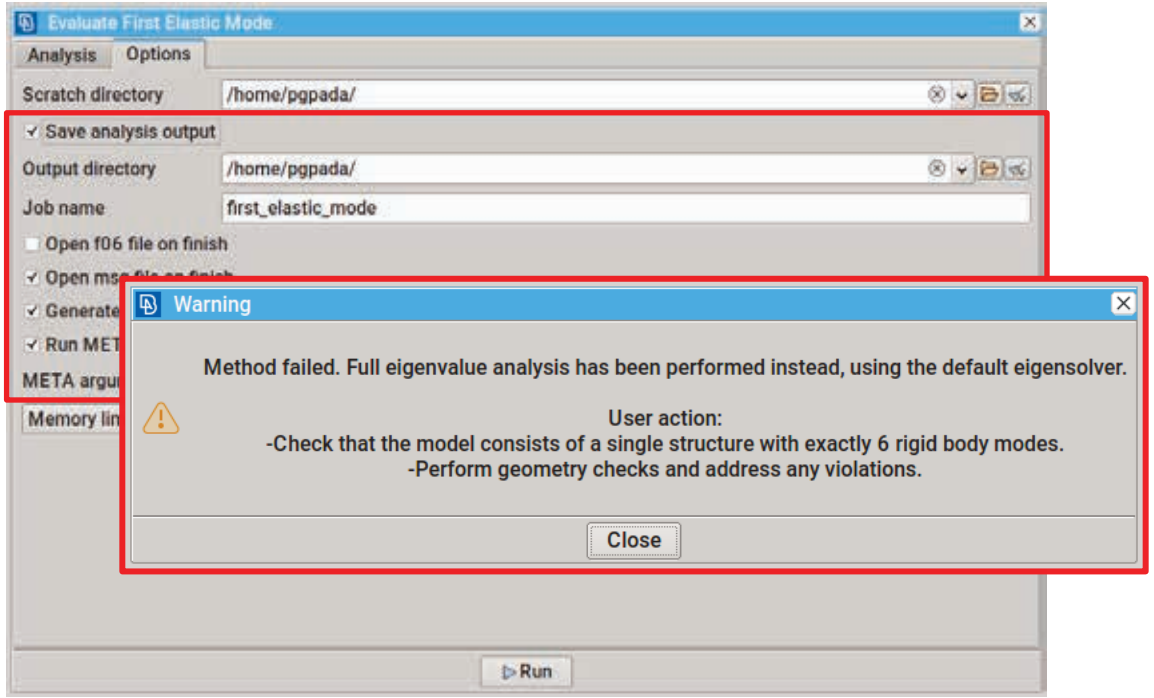


v22.0.x

Grounding Check

Quick identification of unexpected constraints in the model

Epilysis Tools

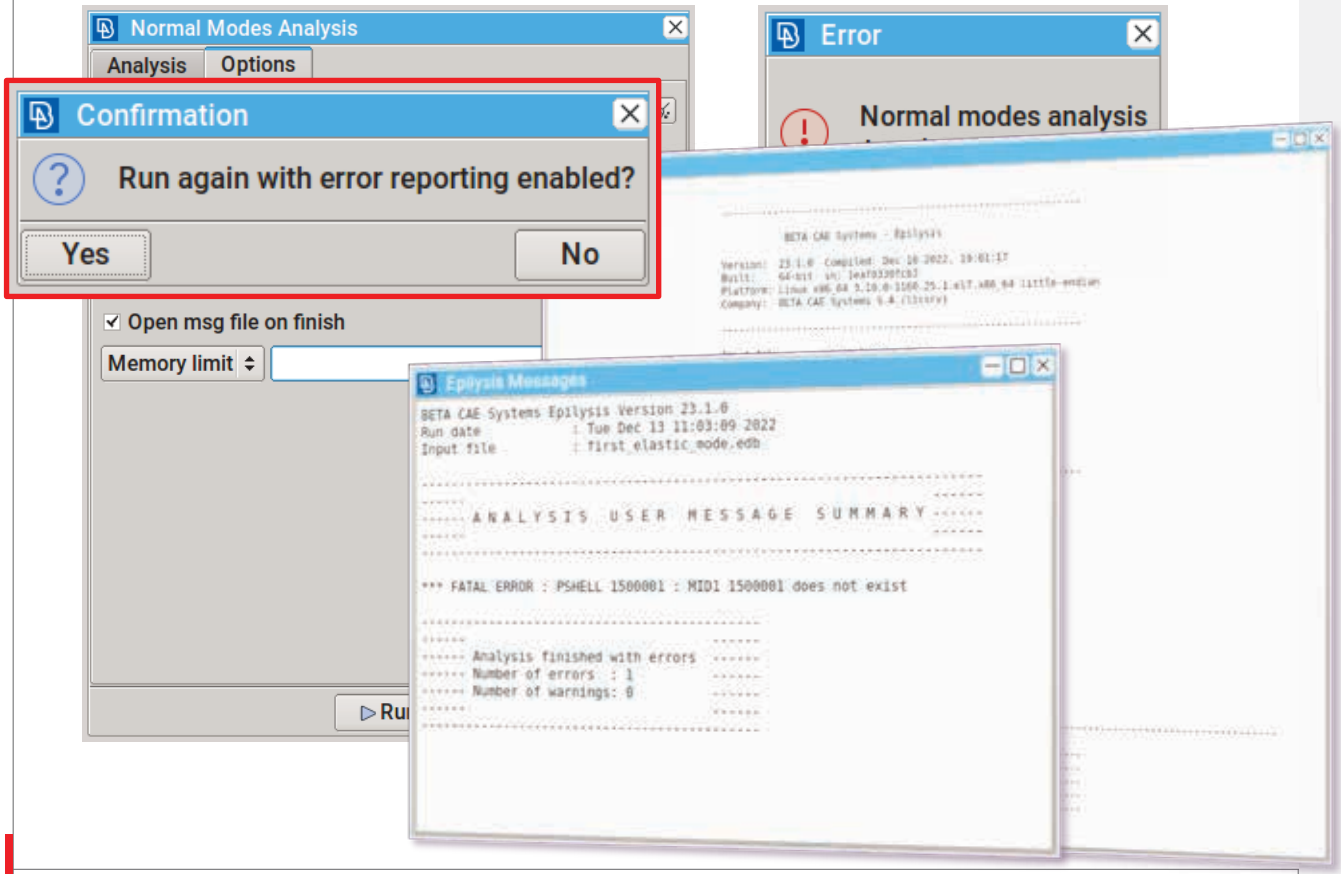


v23.1.x

Save analysis output in all Epilysis Tools

Output an op2 and “Run META” in the First Elastic Mode Evaluation

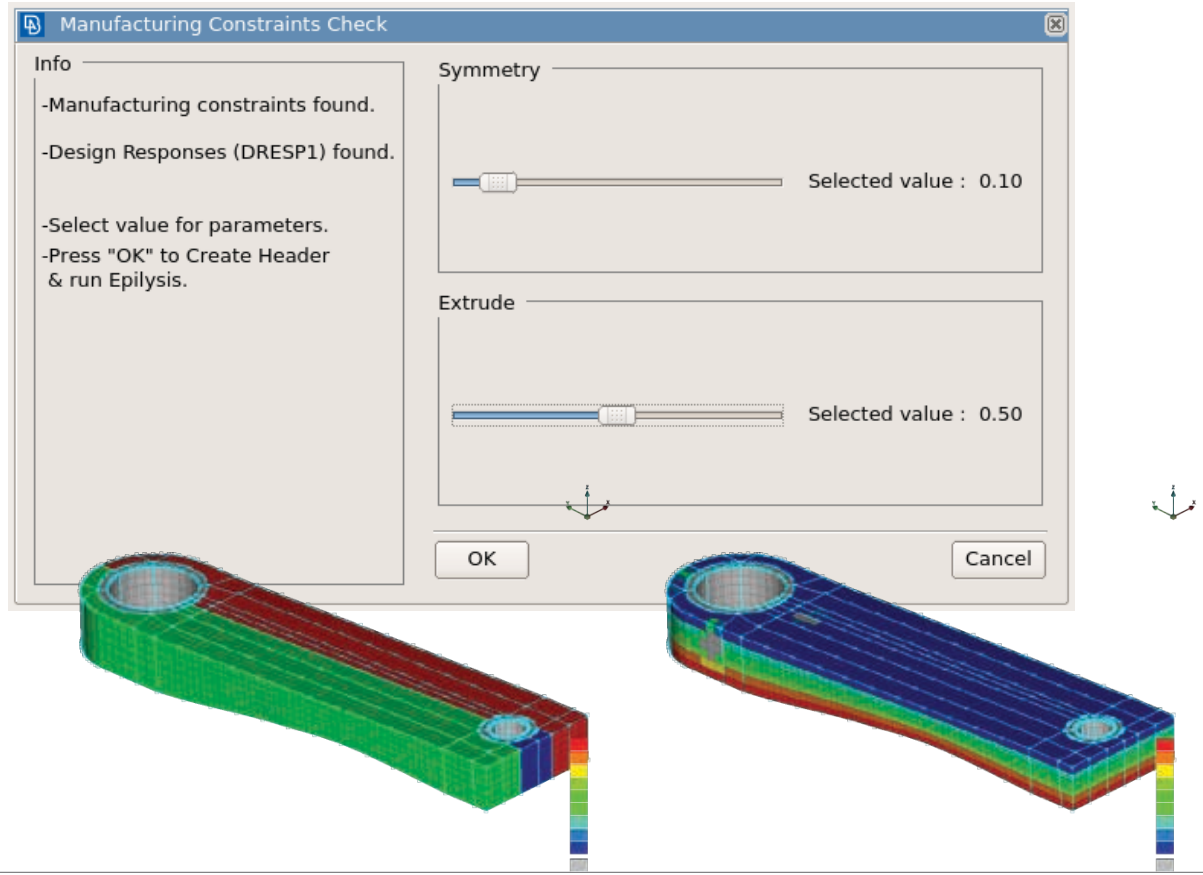
Epilysis Tools



Reporting in case of errors.

v23.1.x

Plugins

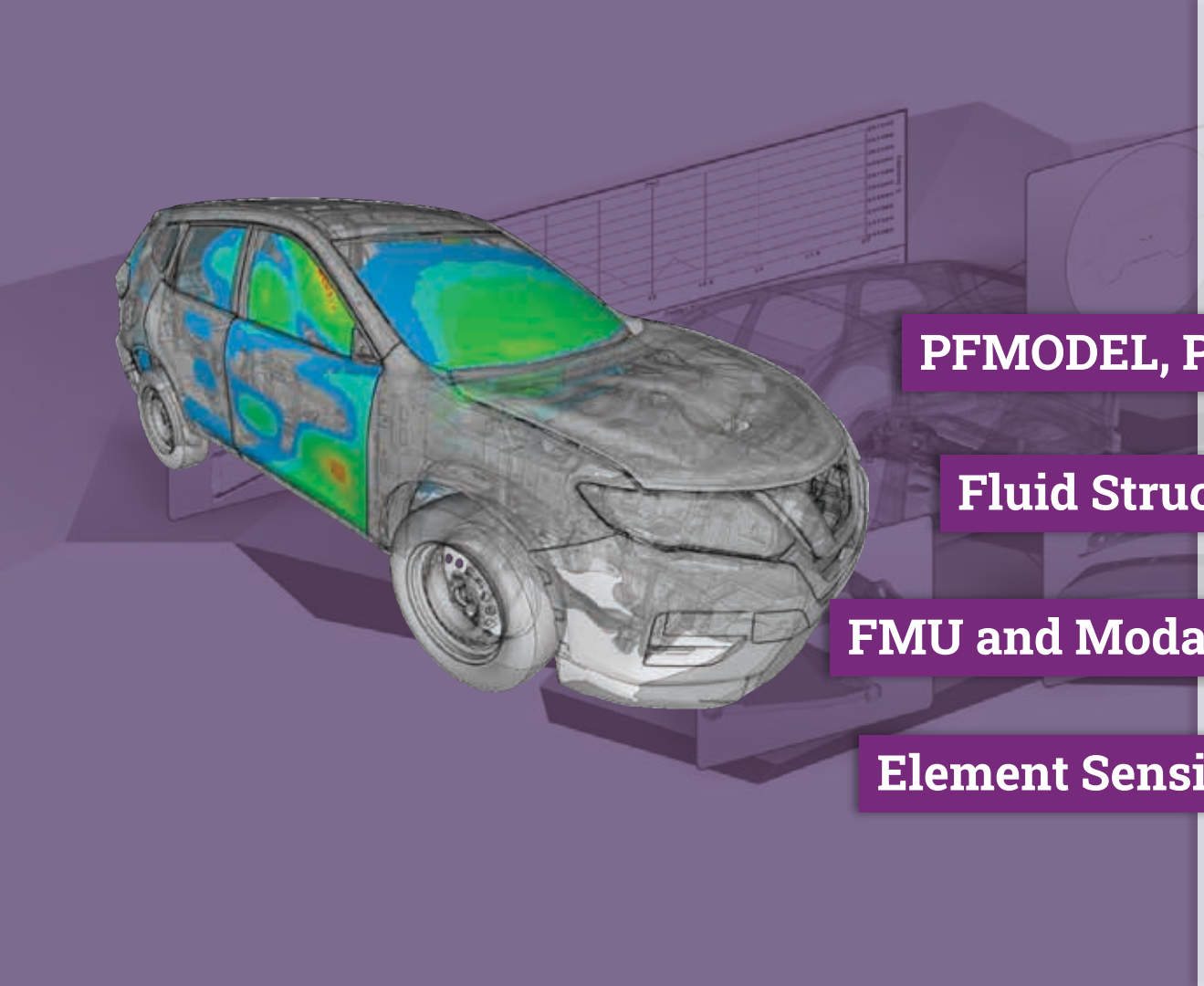


v22.0.x

Manufacturing Constraints Check

Quick identification of problematic areas in the model

Parameter: TOPCOUT



Dynamics

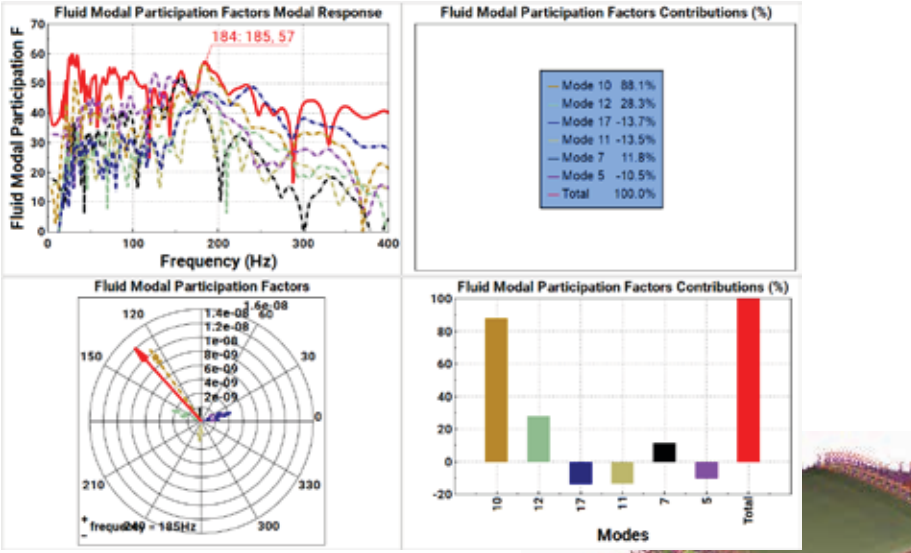
PFMODEL, PFPANEL, PFGRID

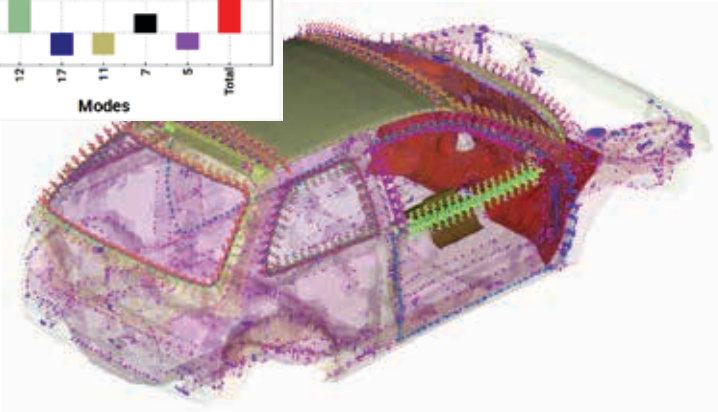
Fluid Structure Interaction

FMU and Modal Model

Element Sensitivity

PFMODE

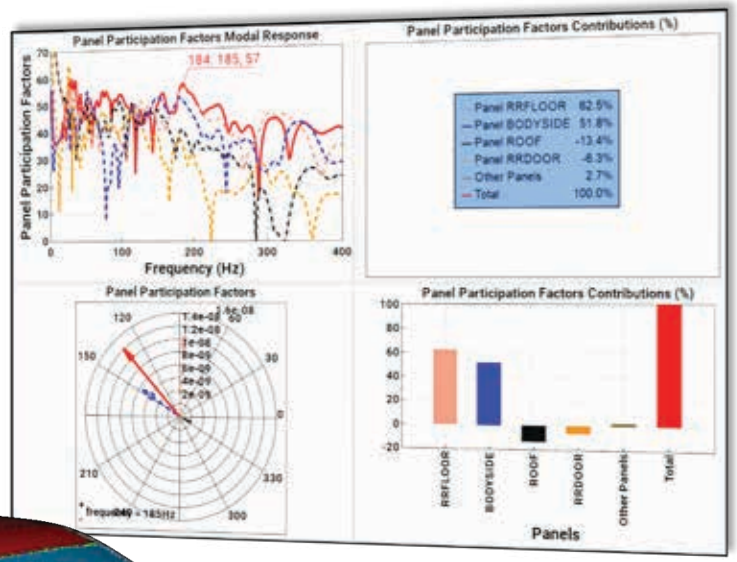


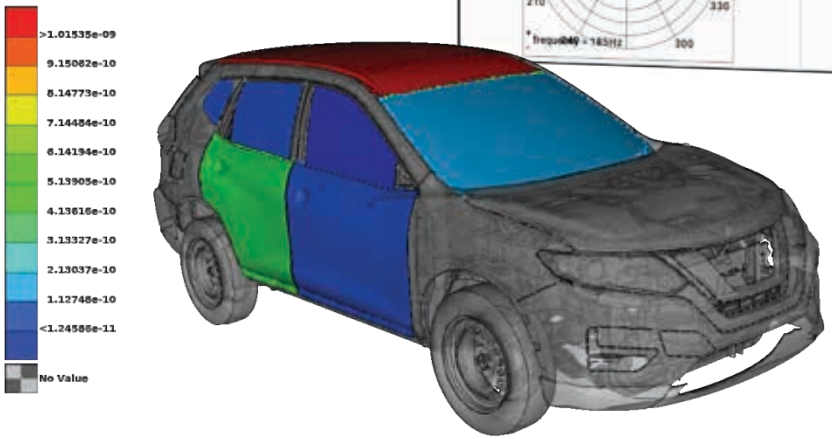


Support of PFMODE modal participation factors.

v22.1.x

PFPANEL



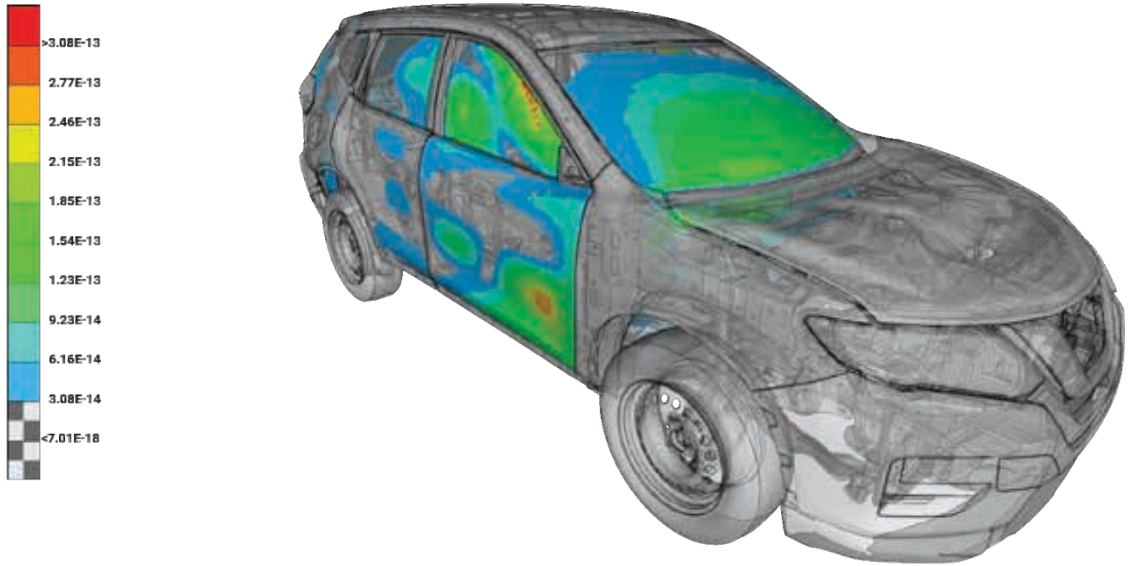


Participation Factors for Panel have been implemented through PFPANEL Command and PANEL entry.

v23.0.x

PFGRID

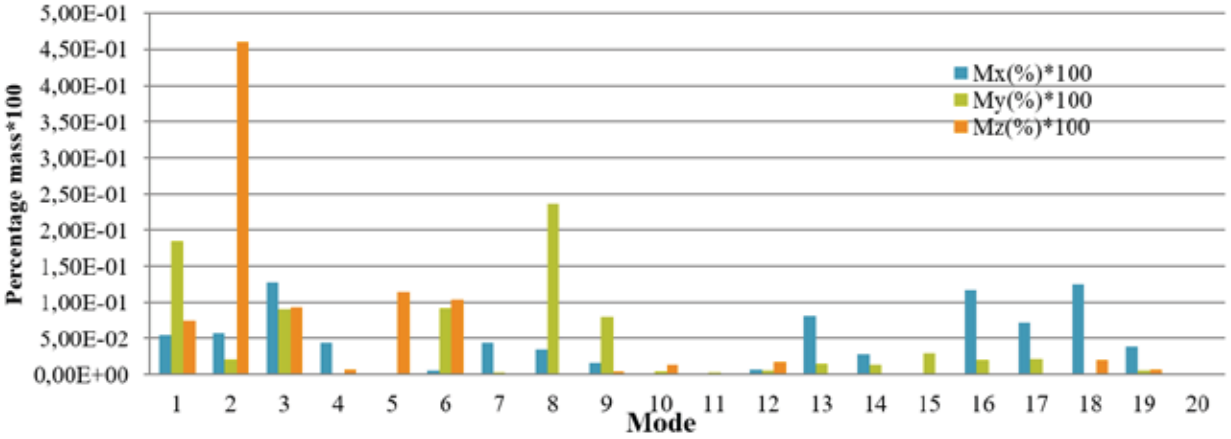
v23.0.x



Grid Participation Factors have been implemented through PFGRID Command.

The participation of the Fluid nodes on a Structural DOF response has been supported as an extra development.

MEFFMASS

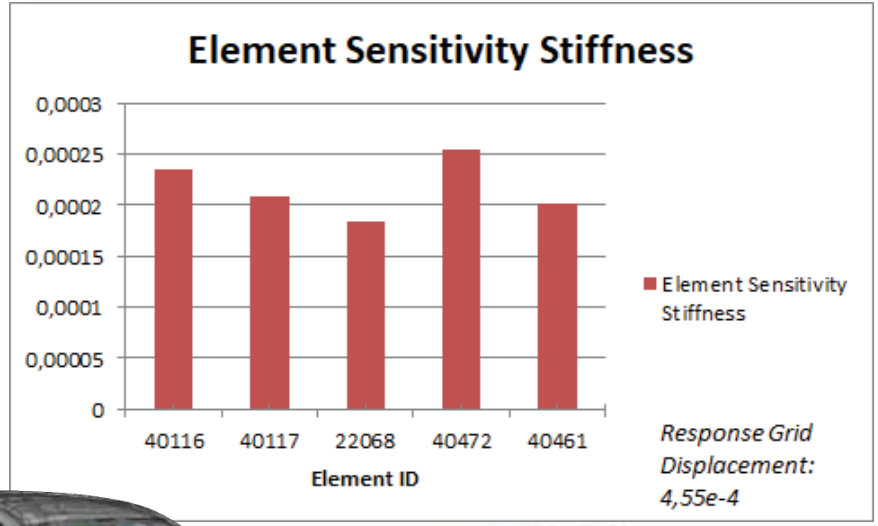


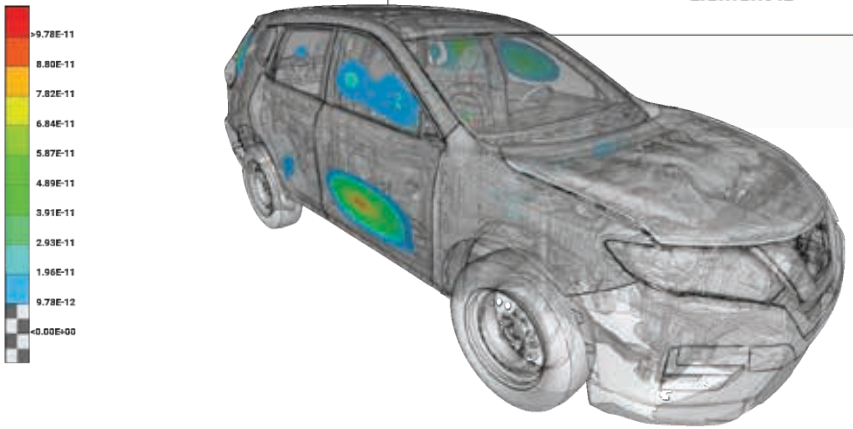
- MEFFMASS helps identify the direction and percentage of the mass that is moving in each mode.

v23.0.x

Modal effective mass command has been implemented

ELSENS

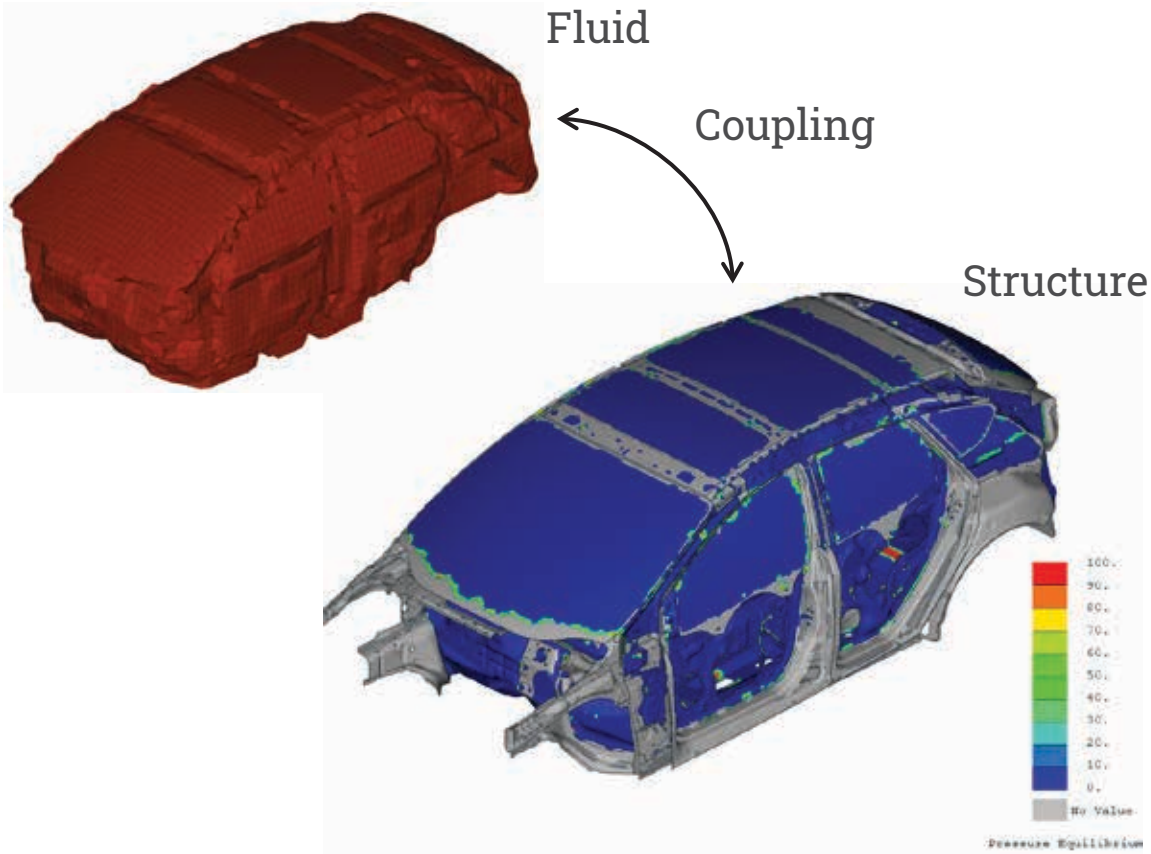




v23.0.x

Element Sensitivity output for SOL108/111 on specified Solution frequencies and Response DOFs has been added.

FSI

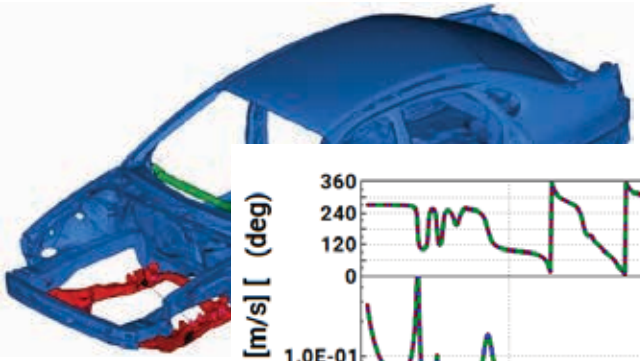


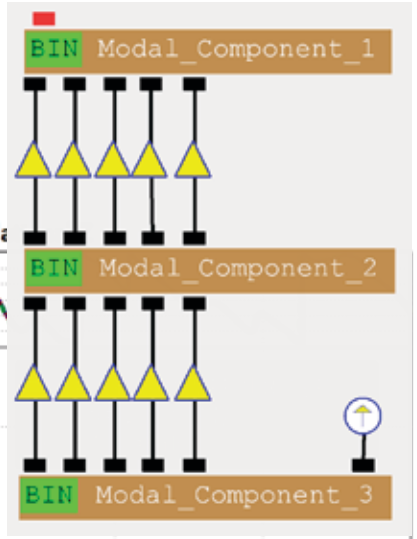
v23.0.x

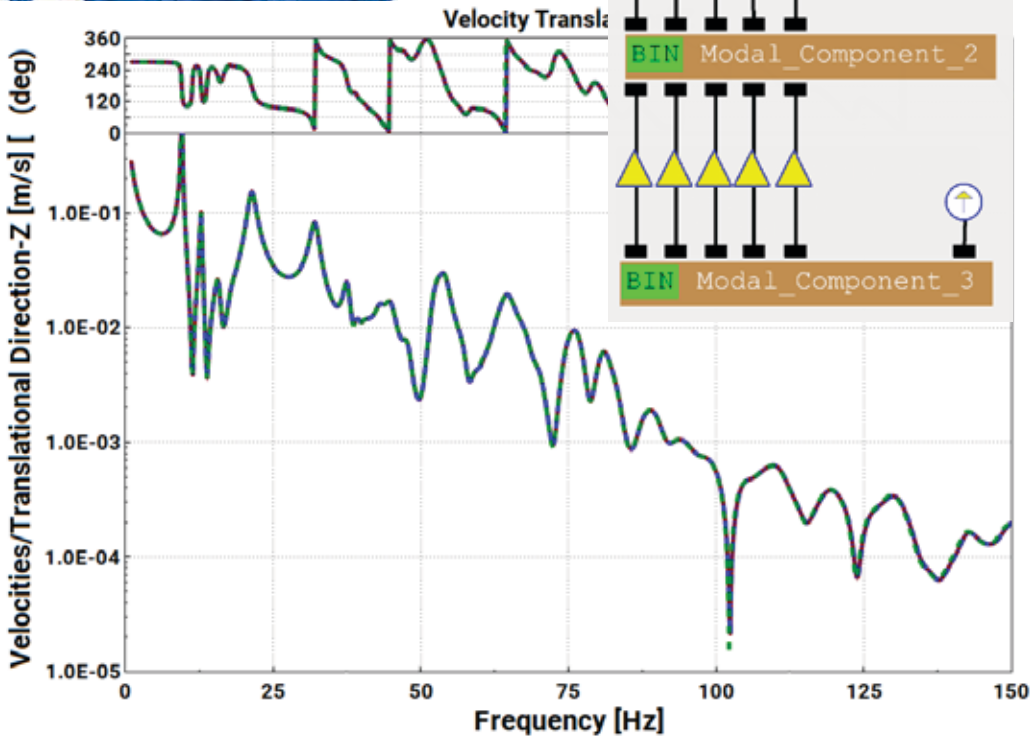
New Pressure Equilibrium Fluid Structure Interaction method has been implemented.

Session 7C:
Vibroacoustic coupling: A new Approach
Kostas Skolarikis

Modal Model







v23.1.x

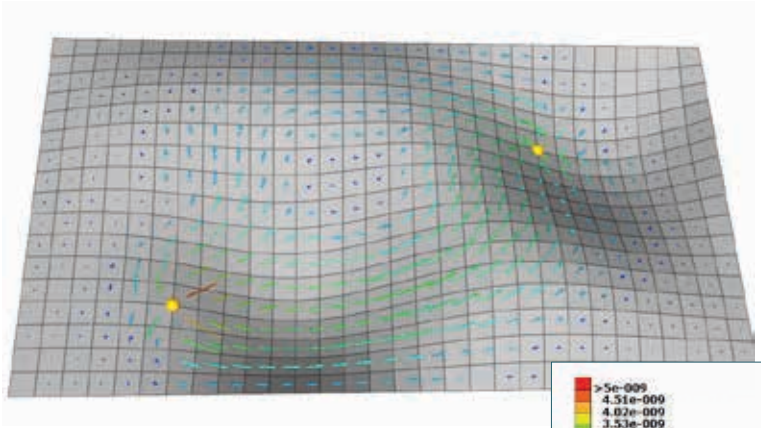
Fast SOL103

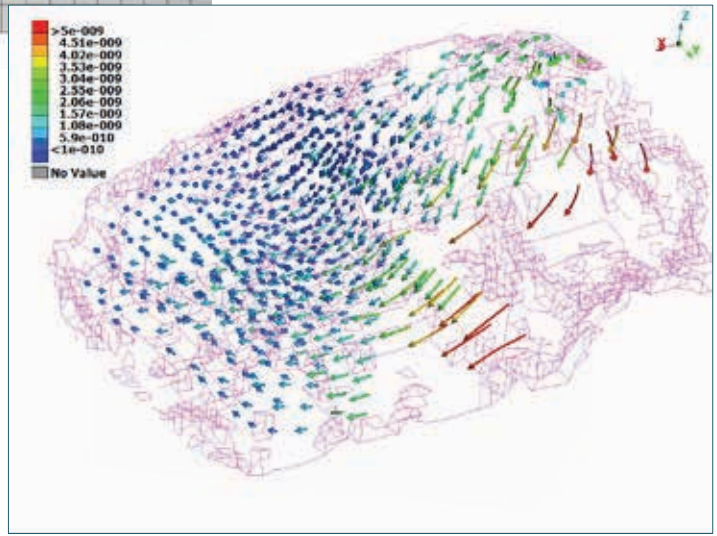
Epilysis

- Support of modal damping matrices BHH and KHH (input and output)

Session 7C:
Comparison of the numerical accuracy of Superelements and FRF Assembly
Markus Herbst

VINTENSITY / SINTENSITY





v24.0.x

Vibration and Sound Intensity

FMU

v23.0.x

Multibody Dynamics Export command

Generation of Function Mock-up Unit format State Space equations

AMLS

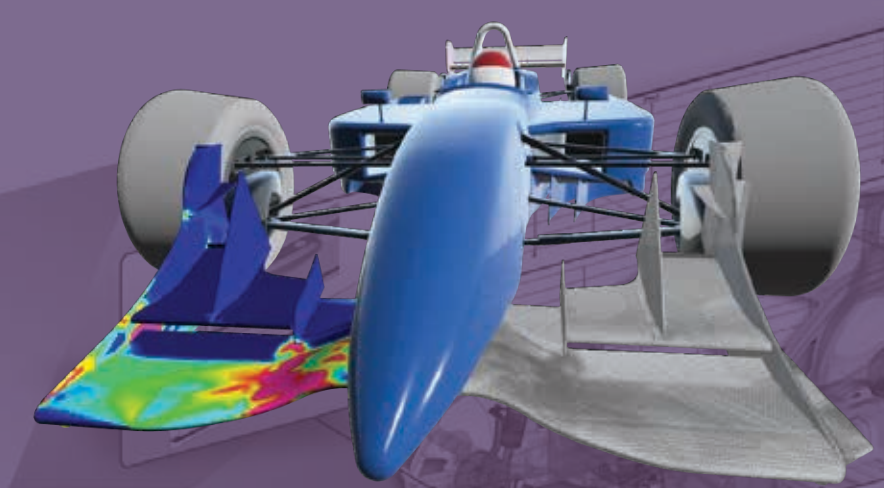
```
AMLS PARAMETERS
================================================================
PARAM,  AMLSBS   , 700
PARAM,  AMLSSS   , 3000
PARAM,  AMLSWG   , 1.500
PARAM,  AMLSWA   , 5.000
PARAM,  AMLSWD   , 0.800
PARAM,  AMLSWVB  , 1.700
PARAM,  AMLSWVS  , 1.100
PARAM,  AMLSHOUT, 0
PARAM,  AMLSHDOF, 2100
PARAM,  AMLSNEIG, 20
PARAM,  ALLDISP  , 6
PARAM,  AMLSRVT  , 0.000
PARAM,  P2MAP    , NO

AMLS INPUT TABLE
================================================================
NUMBER OF DOFS                                          : 140970
BLOCK SIZE                                              : 700
SUBTREE SIZE                                            : 3000
NUMBER OF RIGID BODY MODES KNOWN                        : 0
TOLERANCE FOR RIGID BODY MODES                          :    1.000 Hz
HIGHEST EXCITATION FREQUENCY                    (WF )   :  600.000 Hz
GLOBAL CUTOFF FREQUENCY                         (WG )   :  900.000 Hz
CUTOFF FREQUENCY FOR SUBSTRUCTURE EIGENVALUE    (WA )   : 4500.000 Hz
CUTOFF FREQUENCY FOR DISTILLED EIGENVALUE       (WD )   : 3600.000 Hz
CUTOFF FREQUENCY FOR SUBTREES  EIGENVALUE       (WVS)   :  990.000 Hz
CUTOFF FREQUENCY FOR BRANCH SUBSTRUCTURES       (WVB)   : 1530.000 Hz
OUTPUT DOF NUMBER                                       : 102
OUTPUT DOF NUMBER FOR THE TOP LEVEL                     : 102
```

v24.0.x

AMLS Enhancements

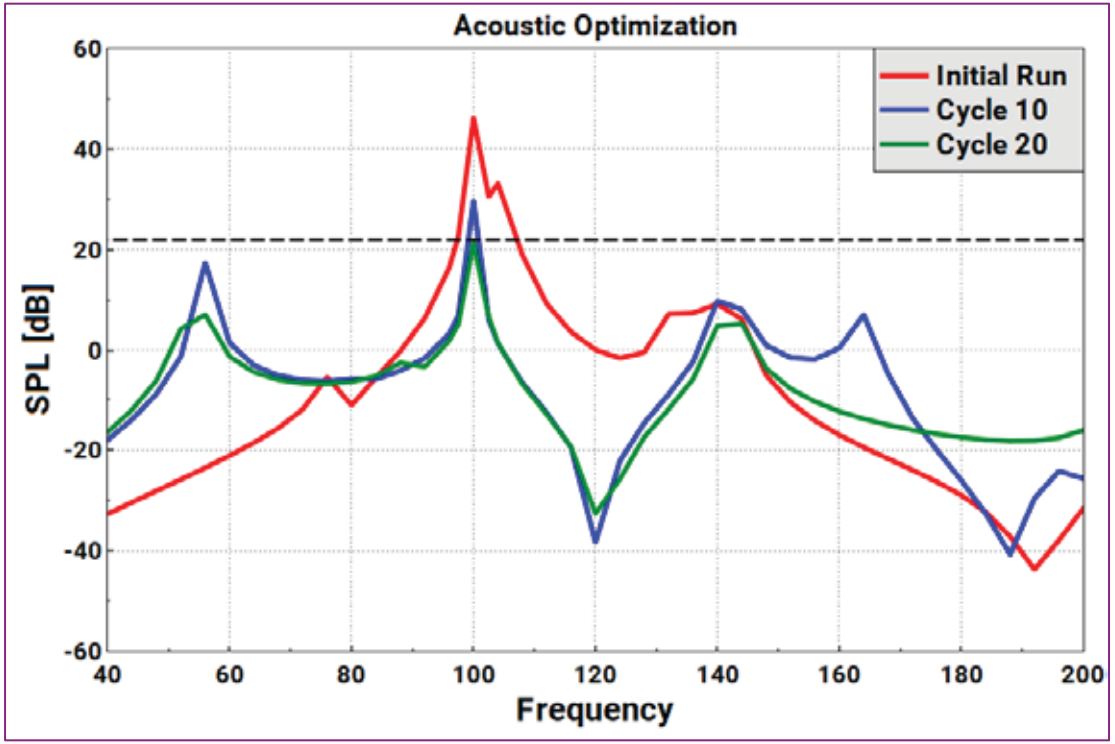
- Improved robustness
- Additional parameters for better control
- New information in f06



Optimization

- Optimization with Dynamic LCs
- Laminates Enhancements
- Cross-Section Optimization
- Orthotropic Materials

Optimization Enhancements

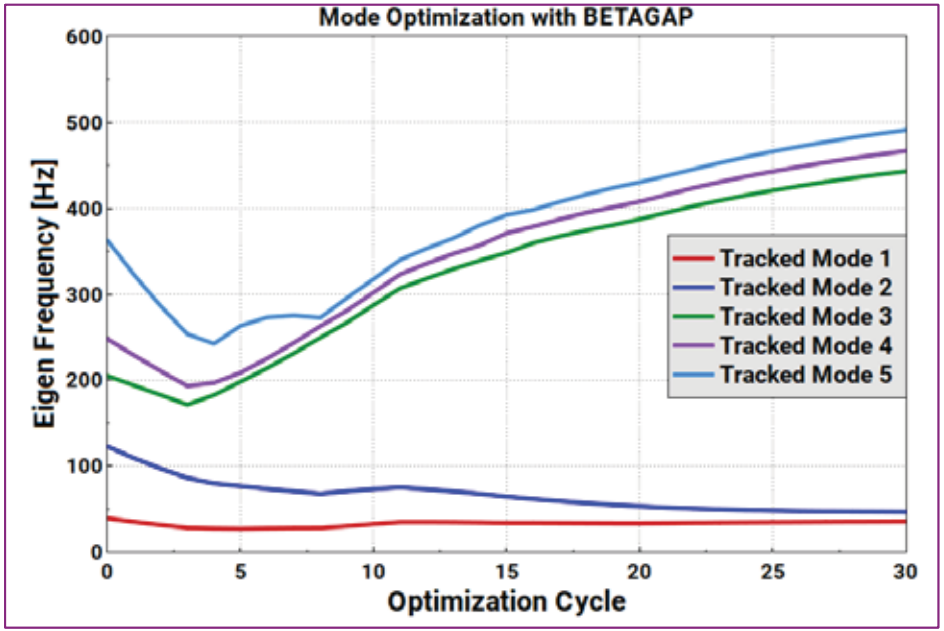


- PRESSURE Results Minimization
- Curve constraints
- Beta multiple minimization

v21.0.x

Optimization Enhancements

v21.0.x



Bound Formulation

Maximize the N-th natural frequency

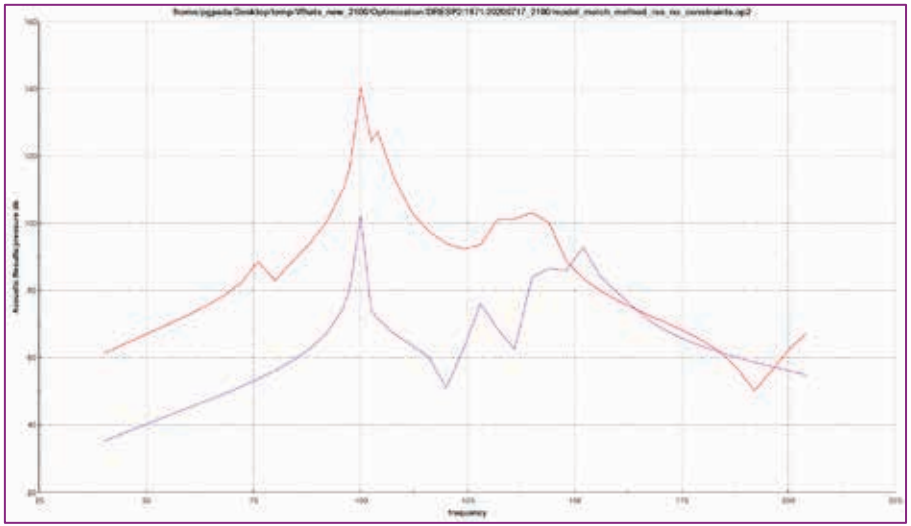
Maximize the gap between 2 consecutive natural frequencies.

Parameters:

- **BETAEIG**
- **BETAGAP**

Optimization Enhancements

- Least Squares
- Beta formulation
- Sum of square differences
- root of the sum of squares differences



v21.0.x

DRESP2 Enhancements
Curve matching

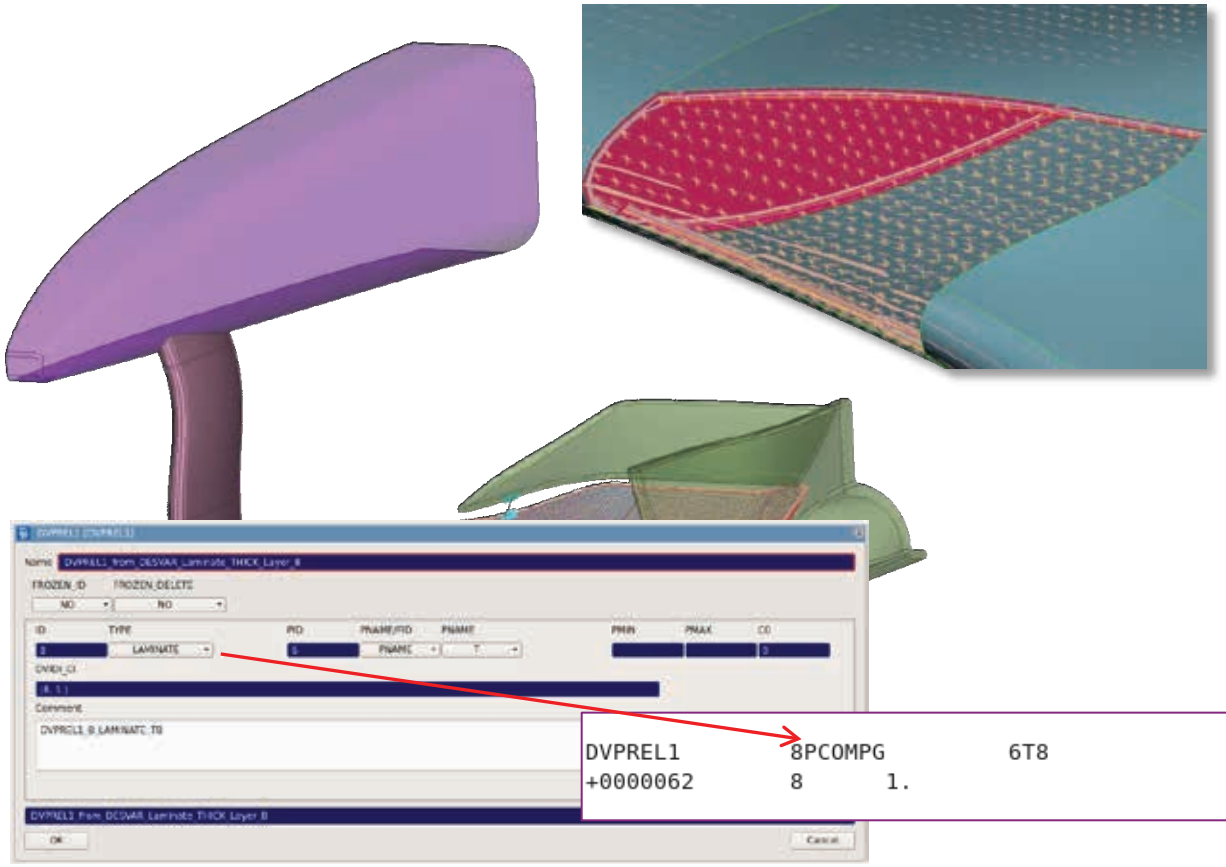
FUNC=MATCH

Parameter:

- **MATCHF, SSQ**
- **MATCHF, RSS**

Optimization Enhancements

v21.0.x

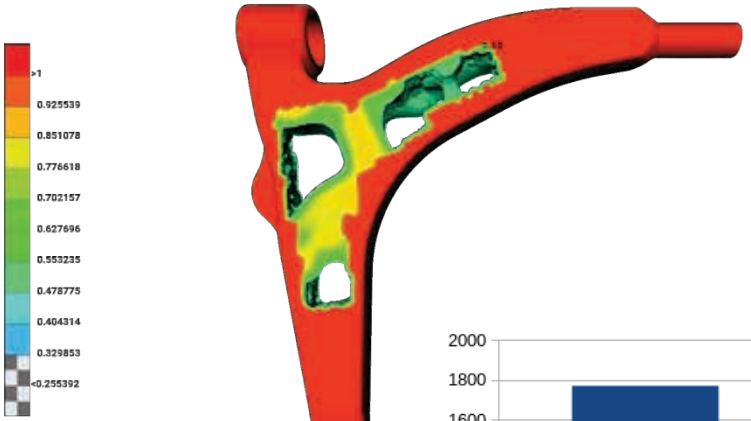


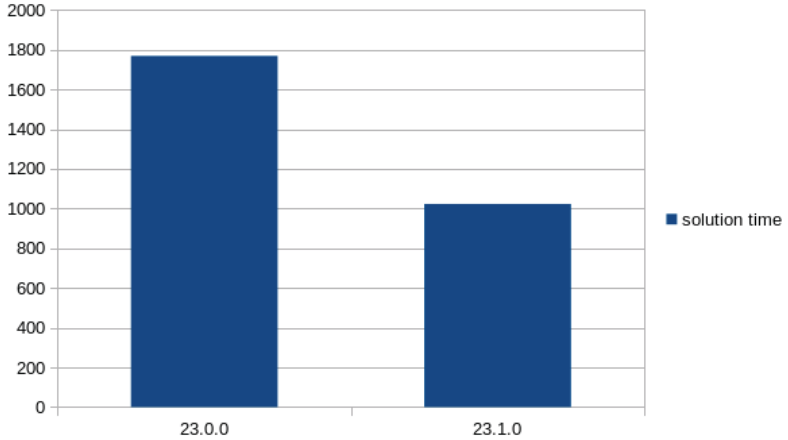
Laminates Enhancements

Support DVPREL of type PCOMPG and GPLY

Support DVPREL of type Laminate

MFREQ AMLS



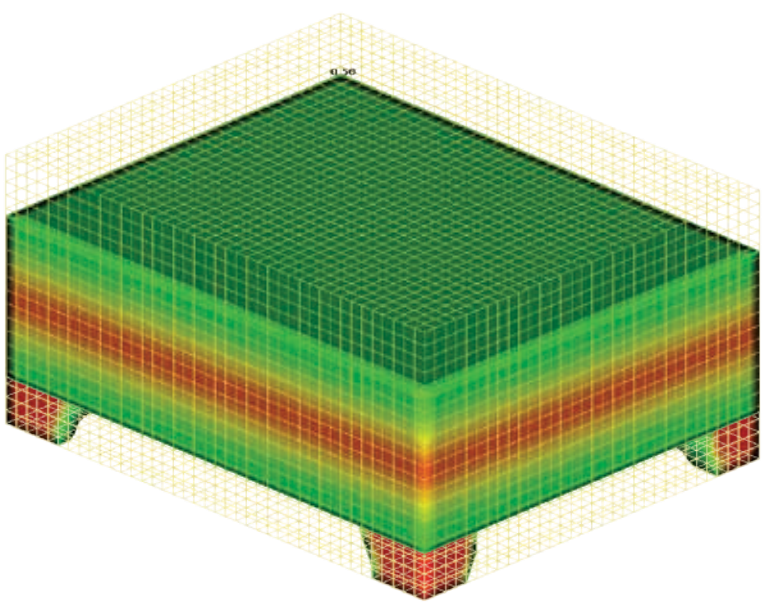


Calculation of the sensitivities in the AMLS in MFREQ analysis

v23.1.x

Optimization Enhancements

v22.0.x

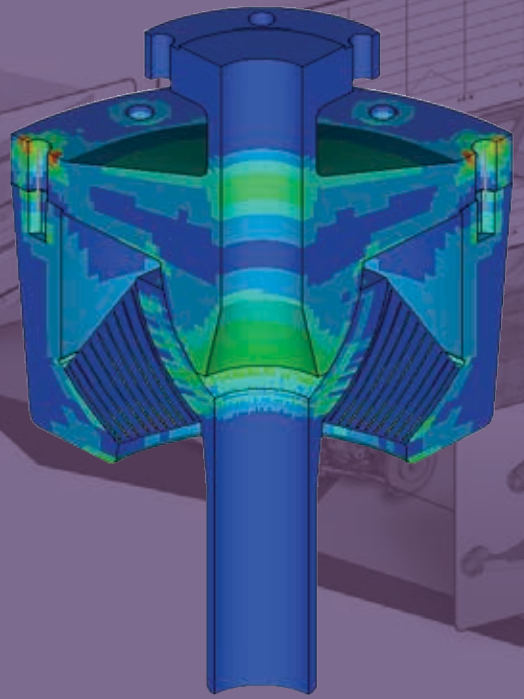


Dual Casting Constraint for Topology Optimization

Automatically adjustable middle plane

Parameter: MIDPLANE

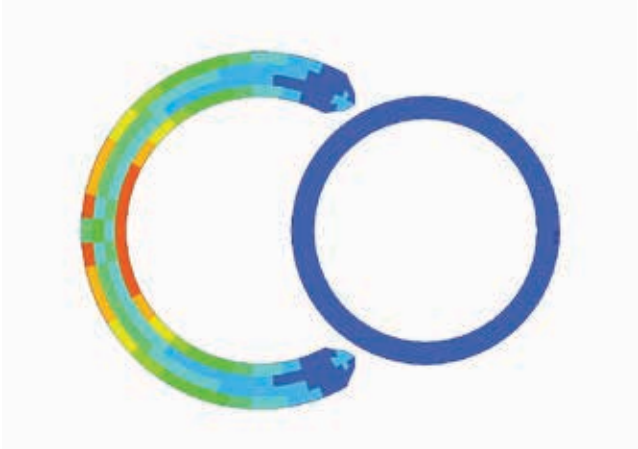
Contacts

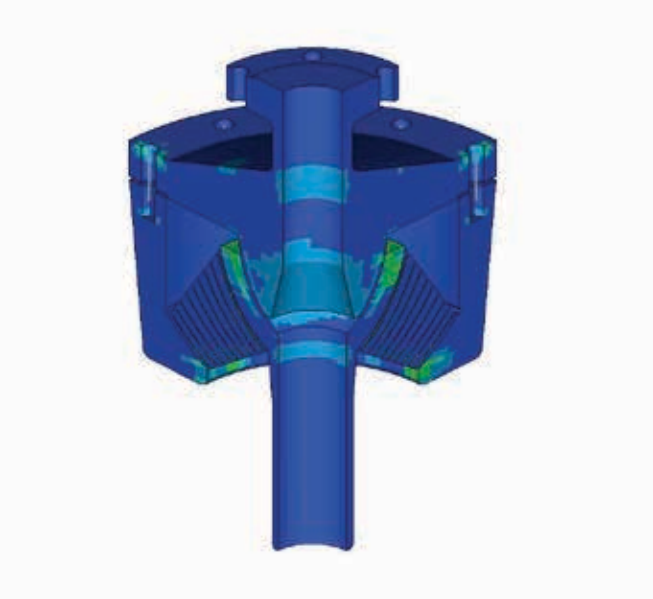


- Enhancements
- Friction
- Output options

Contact Enhancements

v21.1.x

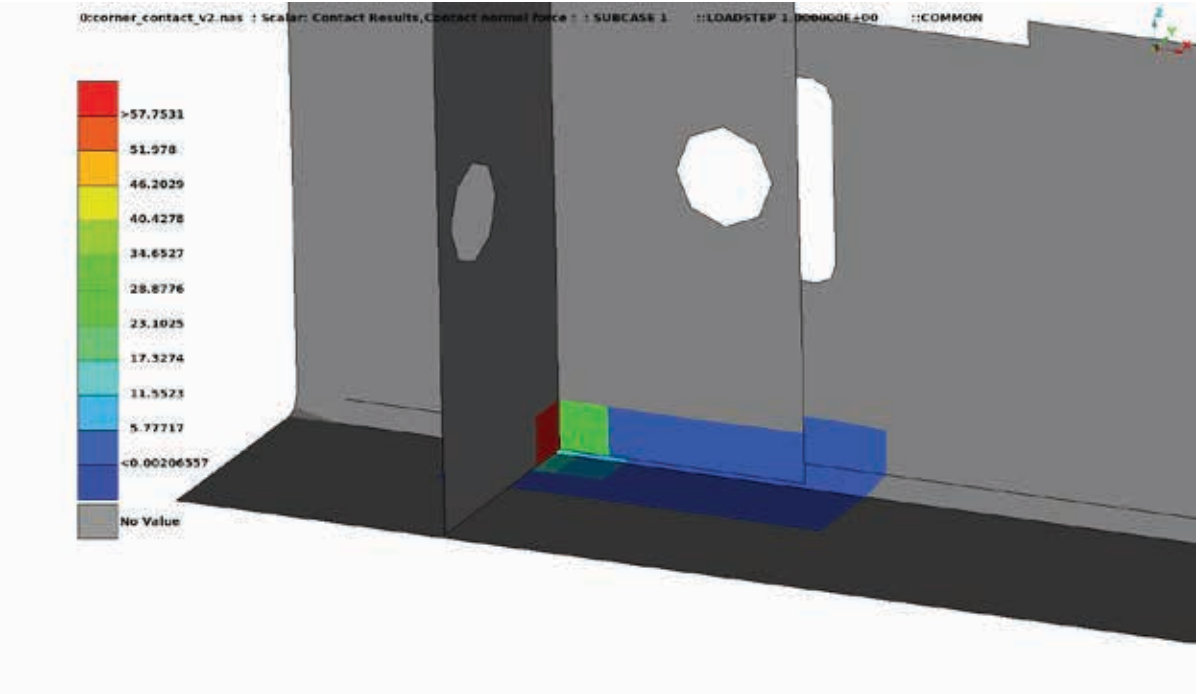




Improved:

- Contacts checking
- Penetration checking
- Slide checking

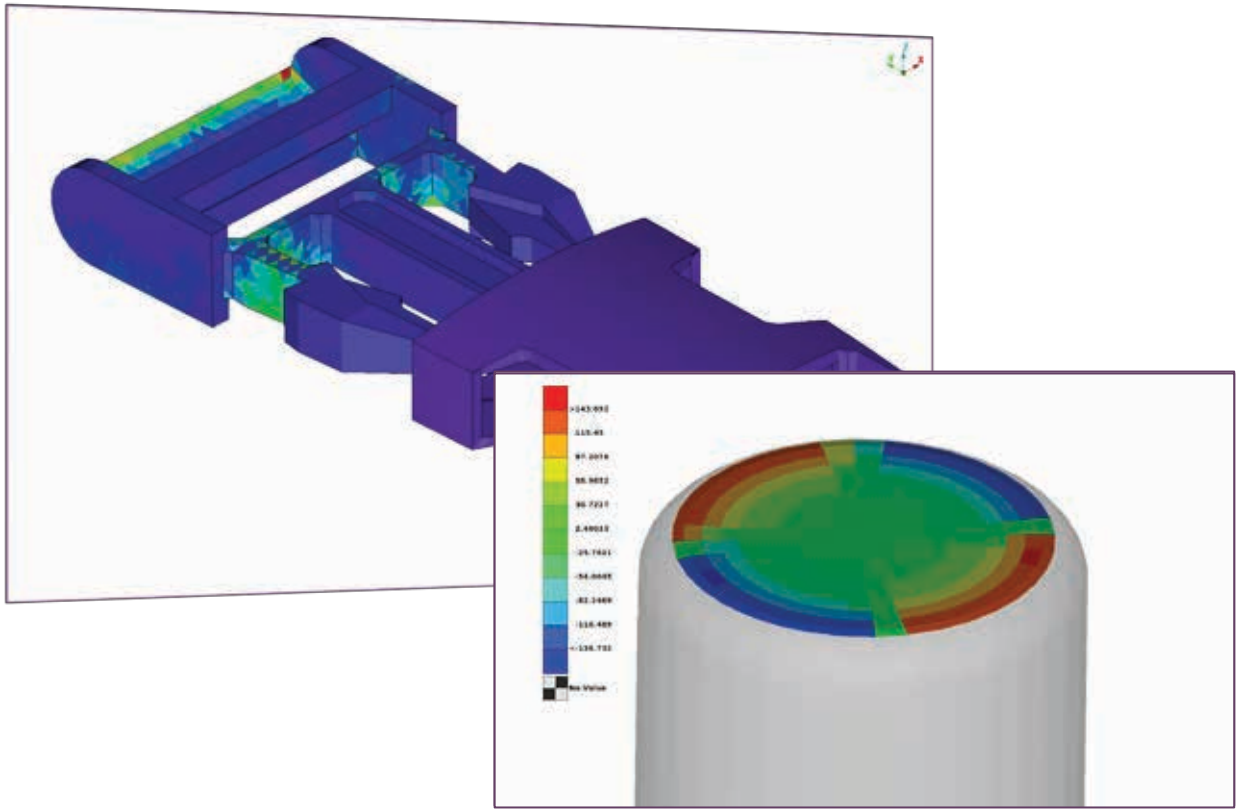
Contact detection



v23.1.x

Improvement in contact detection at corner elements

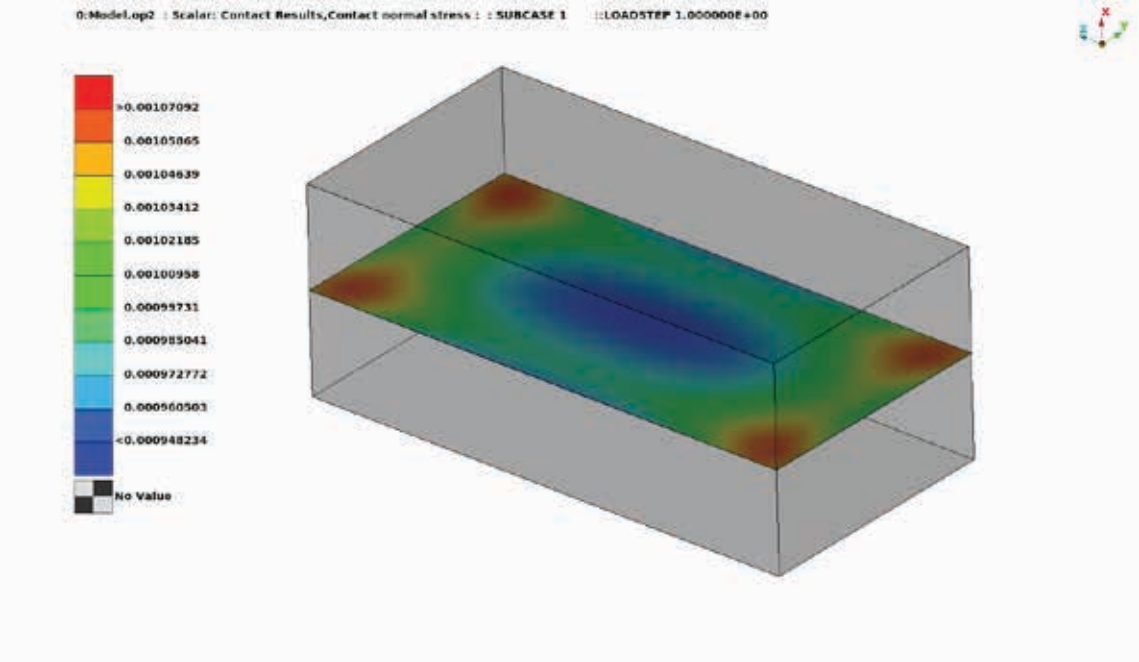
Friction



The bilinear Coulomb friction algorithm is implemented

v24.0.x

Convergence

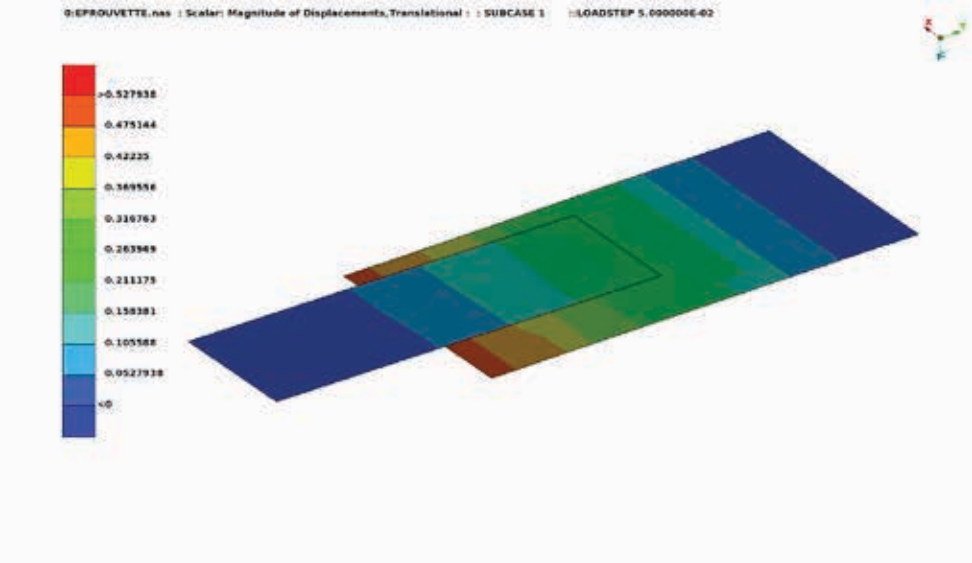


Convergence due to unconstrained body models.

v23.1.x

Maximum number of Separations

```
%5.00000E-02   1 11 4.71E-01 2.51E-04 1.04E-04  8.121  0   1   0  3.38E-07 8.994E-05 2.35E-06  5.366E-06     3109 3  1.00 0  0   0   11
       SEPARATION condition has been detected. Additional iterations will be performed.
*** USER INFO : BCONECT 2000, slave BCBODY 2501, master BCBODY 2001. Iteration   12  separation. Number of contacts : 87.
%5.00000E-02   1 12 2.80E-01 2.40E-04 8.68E-05  8.699  0   1   0  2.23E-07 8.996E-05 2.36E-06 -5.787E-06     1027 3  1.00 0  0   0   12
       SEPARATION condition has been detected. Additional iterations will be performed.
*** USER INFO : Separation checking is skipped. Maximum allowed number of iterations with separations has been reached for
                the current load increment.
```

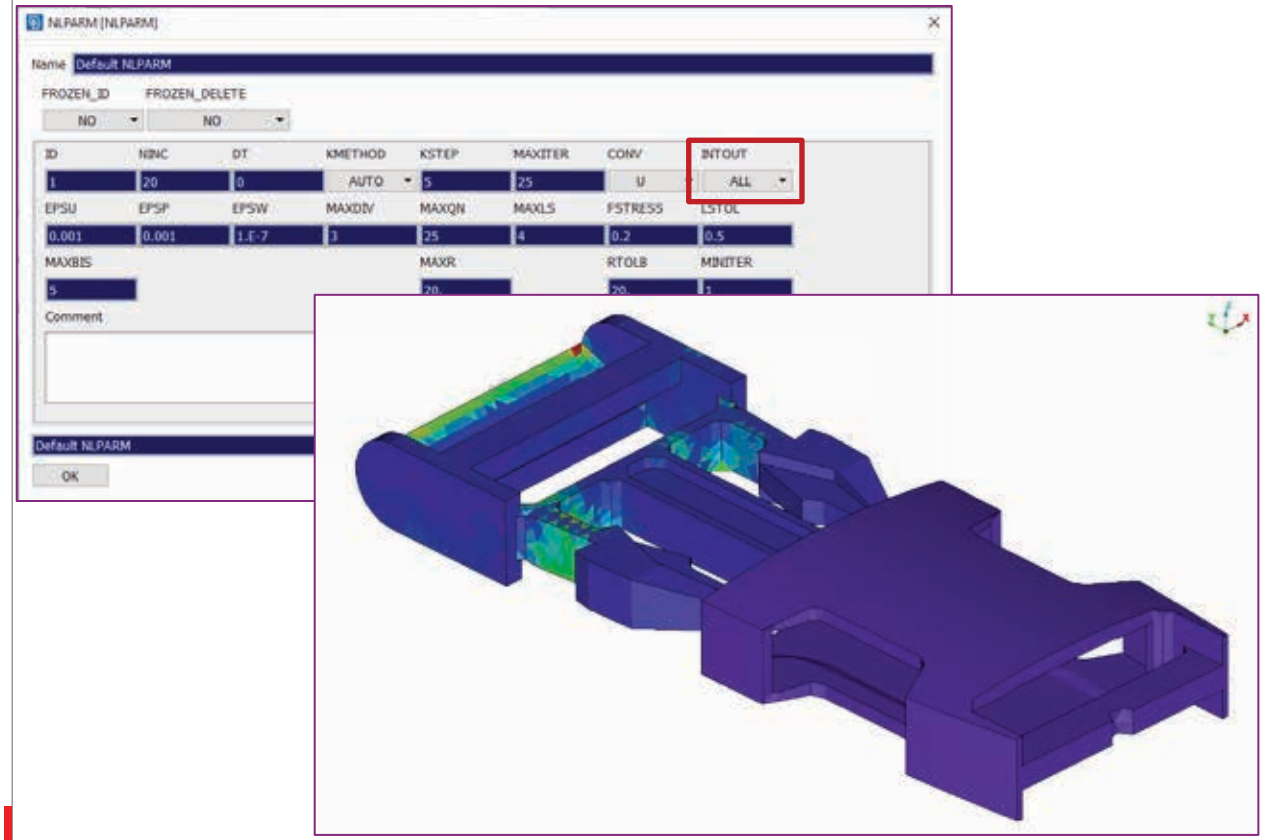


Option MAXSEP in BCPARA

Maximum number of iterations with separation allowed for each increment.

v23.1.x

Contact Enhancements



Support of option INTOUT in NLPARM.

v21.1.x

Contact Enhancements

v21.1.x

Messages regarding contact error and bias values.

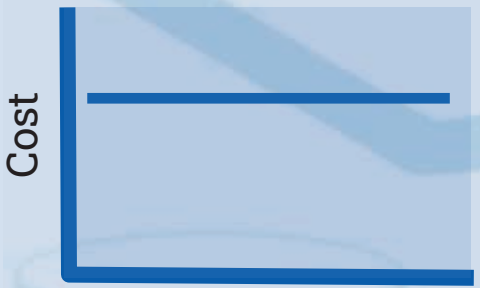
```
-------------------------------------------------------------------------------------------------------------------------
*** USER INFO : BCONECT    1, slave BCBODY    1, master BCBODY    2.
                Contact tolerance ERROR value = 5.000e-03. Contact tolerance BIAS value = 9.000e-01.
                Biased contact tolerance on the outside of the elements surface = 5.000e-04.
                Biased contact tolerance on the  inside of the elements surface = 9.500e-03.
*** USER INFO : BCONECT    1, slave BCBODY    1, master BCBODY    2.
                The search order is from BCBODY 1 to BCBODY 2.
*** USER INFO : Finite element model generated 1350 degrees of freedom.
*** USER INFO : AUTOSPC is active. 360 degrees of freedom were identified as stiffness singularities. These dofs were
                automatically constrained with single point constraints.

-------------------------------------------------------------------------------------------------------------------------
```

Messages regarding detected contacts

```
                        N O N - L I N E A R   I T E R A T I O N   M O D U L E   O U T P U T

       LOAD  NO.       - - ERROR FACTORS - -    CONV  ITR MAT NO.    AVG     TOTL       - - - - - DISP - - - - - -  LINE_S  NO. TOT TOT
       STEP  INC ITR  DISP     LOAD      WORK   RATE  DIV DIV BIS  R_FORCE   WORK      AVG        MAX     AT GRID C FACT NO QNV KUD ITR
*** USER INFO : BCONECT    1, slave BCBODY    1, master BCBODY    2. Iteration    1     initial. Number of contacts : 0.
*** USER INFO : BCONECT    1, slave BCBODY    1, master BCBODY    2. Iteration    1 penetration. Number of contacts : 1.
%1.00000E-01   1  1 1.00E+00 2.56E+01 2.56E+01  1.000  0   1   0  7.35E-07 7.689E-07 1.45E-03 -6.233E-02       22 3  0.41 0  0   0    1
```



Number of CPUs

SOL:
101,103,108,109,110,111,112,200,400

No extra licensing cost

No extra cost for AMLS & FastFR

No extra learning cost

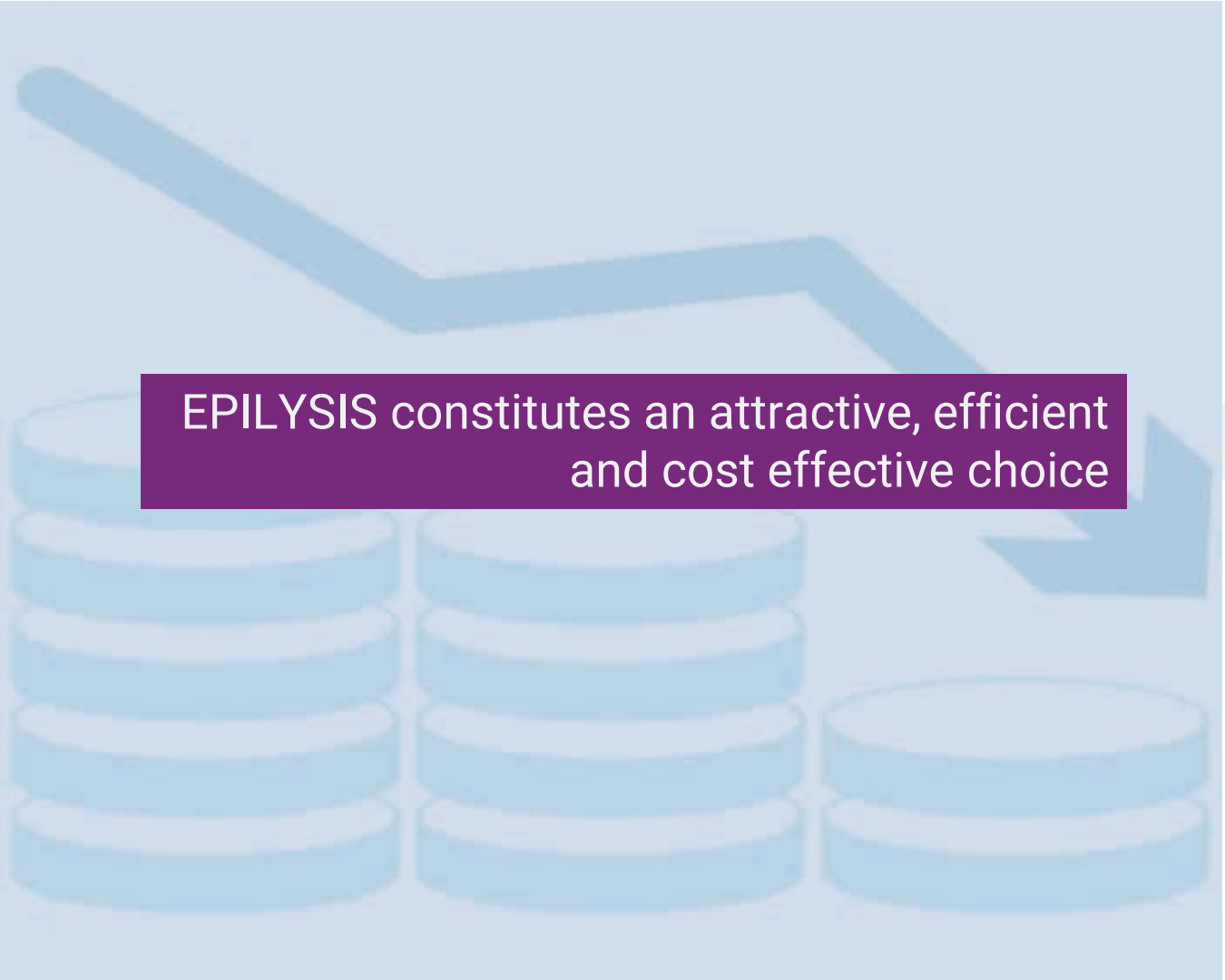
Not CPU-dependent

All features are included by default and use same credits

No extra licensing cost

No extra cost for AMLS & FastFR

No training & learning cost in cases where Nastran-based solvers are already being used

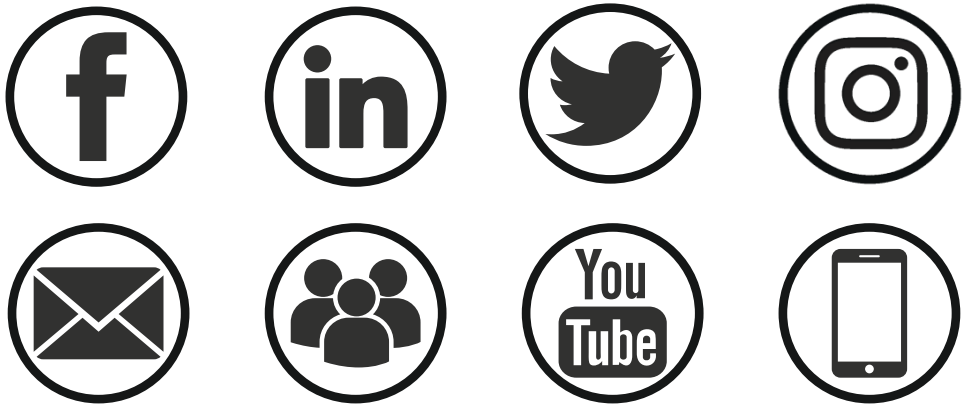


EPILYSIS constitutes an attractive, efficient and cost effective choice

EPILYSIS SOLVER

..... the right choice

BETA
SIMULATION SOLUTIONS



Stay connected