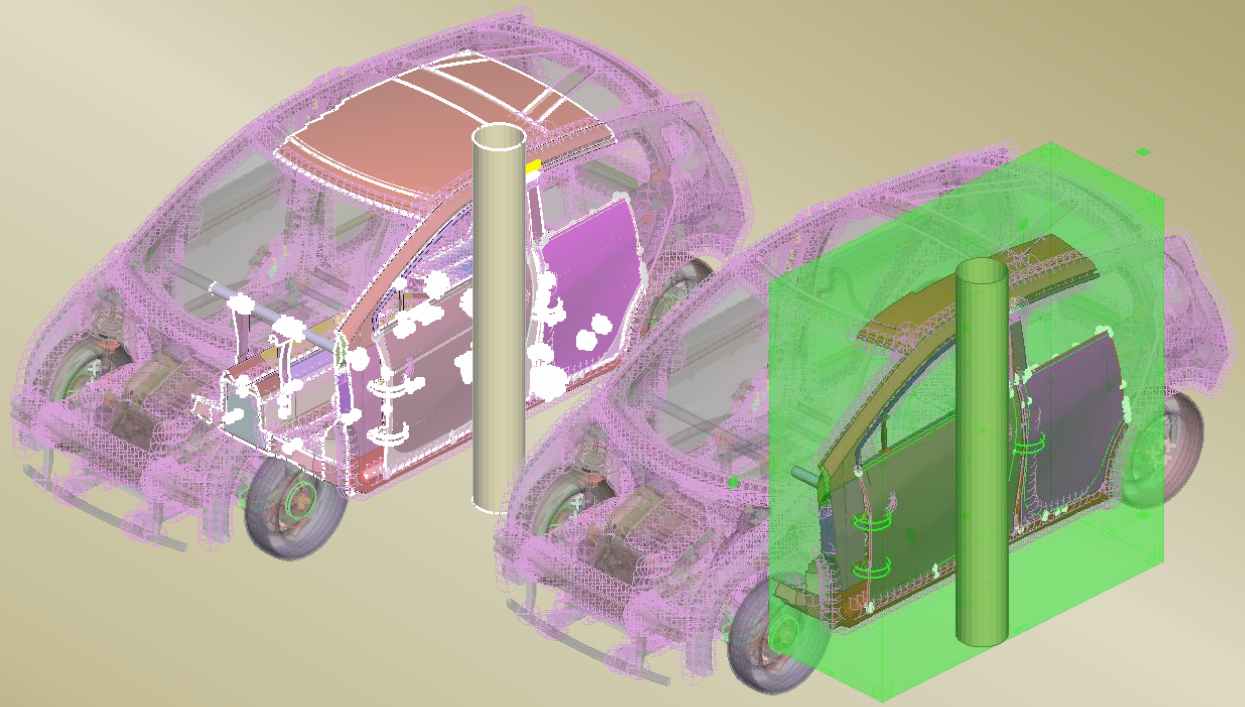


BETA
SIMULATION SOLUTIONS

Substructuring tools for effective pre- and post-processing

Nikolaos Nikoglou
BETA CAE Systems

physics on screen

- ***Why is there a need for substructuring?***

Major bottlenecks in:

- ***Crash simulations***
- ***Optimization tasks*** *(iterative analyses)*
- ***Combination*** *of the above*

- ❑ ***Computational time***
- ❑ ***Requirements for computational resources***

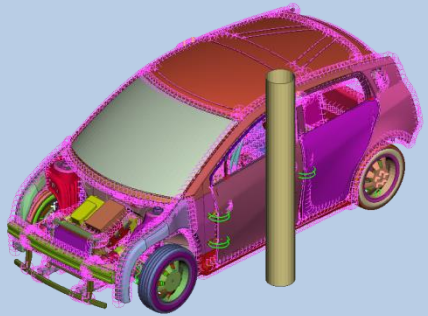
- ***What is substructuring?***

Substructuring → method for studying in detail, a specific ***region of interest*** of a full model

- ***What is substructuring?***

Substructuring → method for studying in detail, a specific ***region of interest*** of a full model

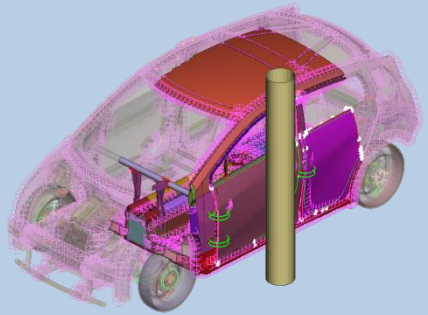
Original full model



- ***What is substructuring?***

Substructuring → method for studying in detail, a specific ***region of interest*** of a full model

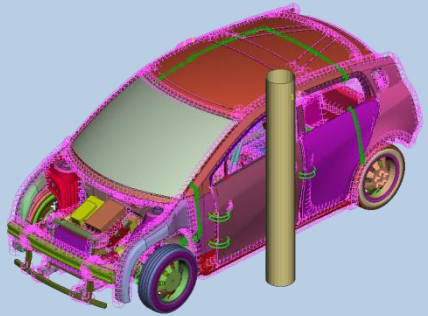
Substructure definition



- ***What is substructuring?***

Substructuring → method for studying in detail, a specific ***region of interest*** of a full model

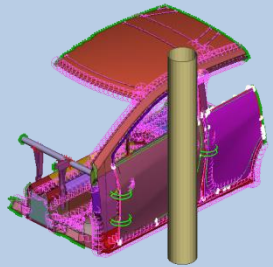
Base model



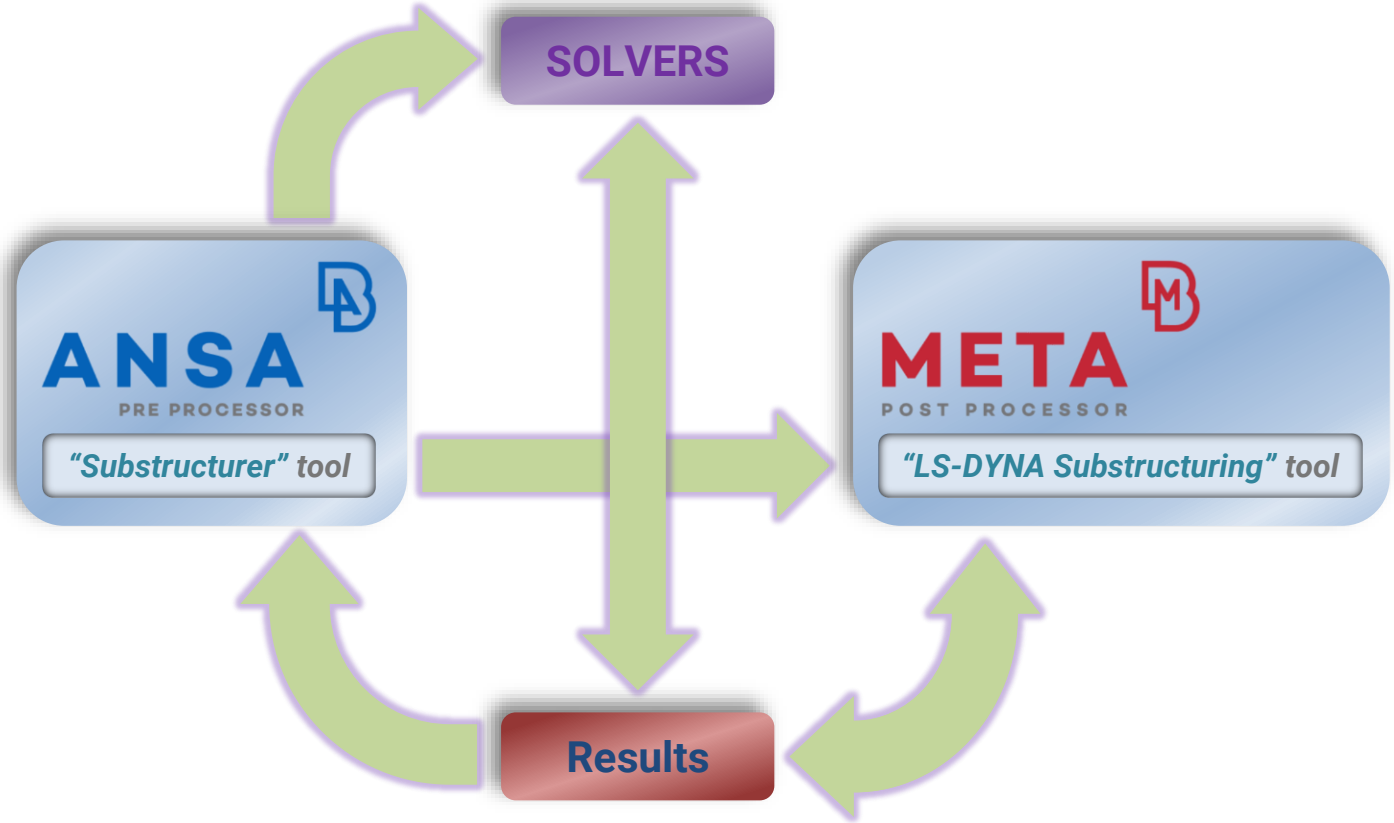
- ***What is substructuring?***

Substructuring → method for studying in detail, a specific ***region of interest*** of a full model

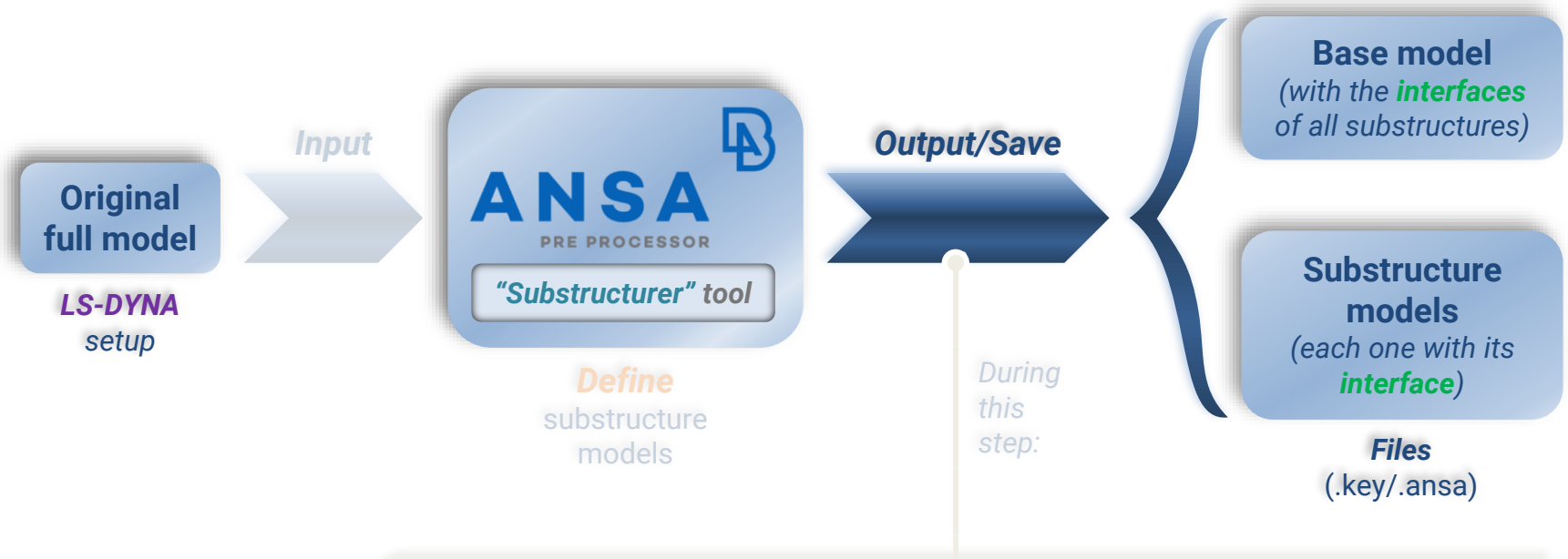
Substructure model



ANSA / META Suite Workflow



ANSA "Substructurer" tool – Defining the models



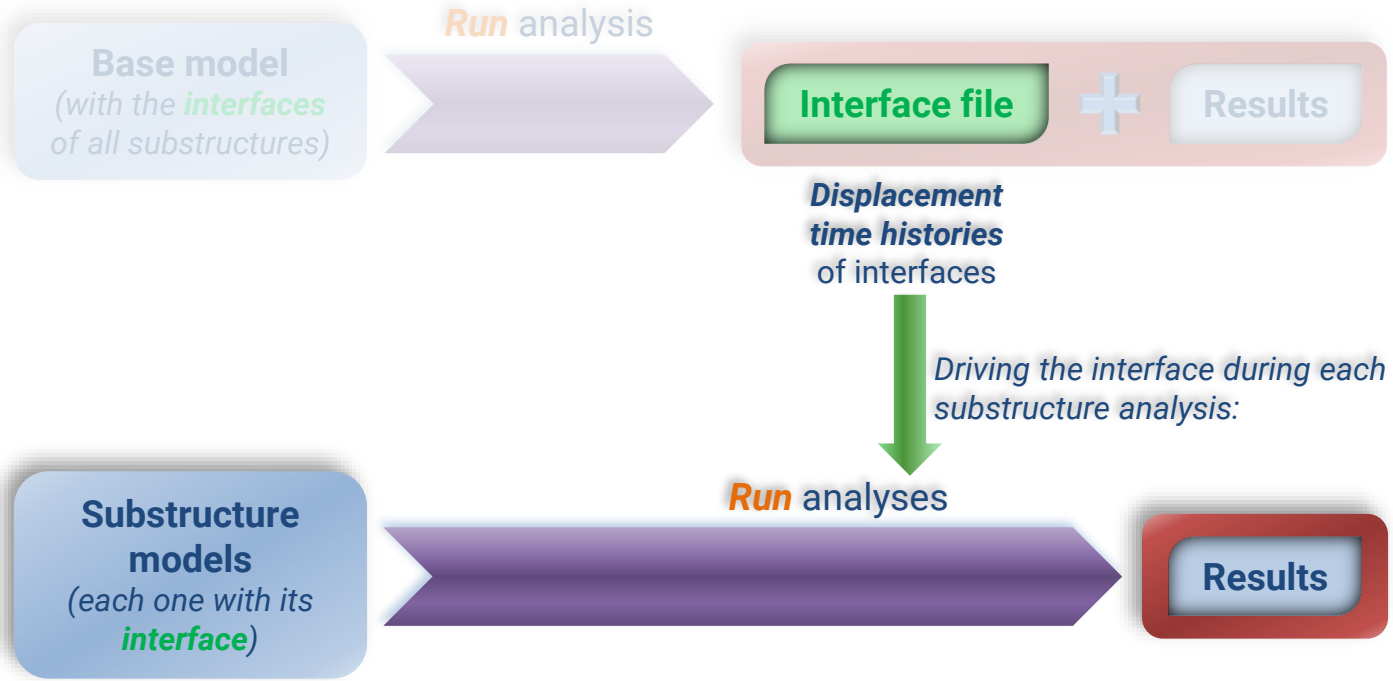
Base model
*(with the **interfaces** of all substructures)*

Substructure models
*(each one with its **interface**)*

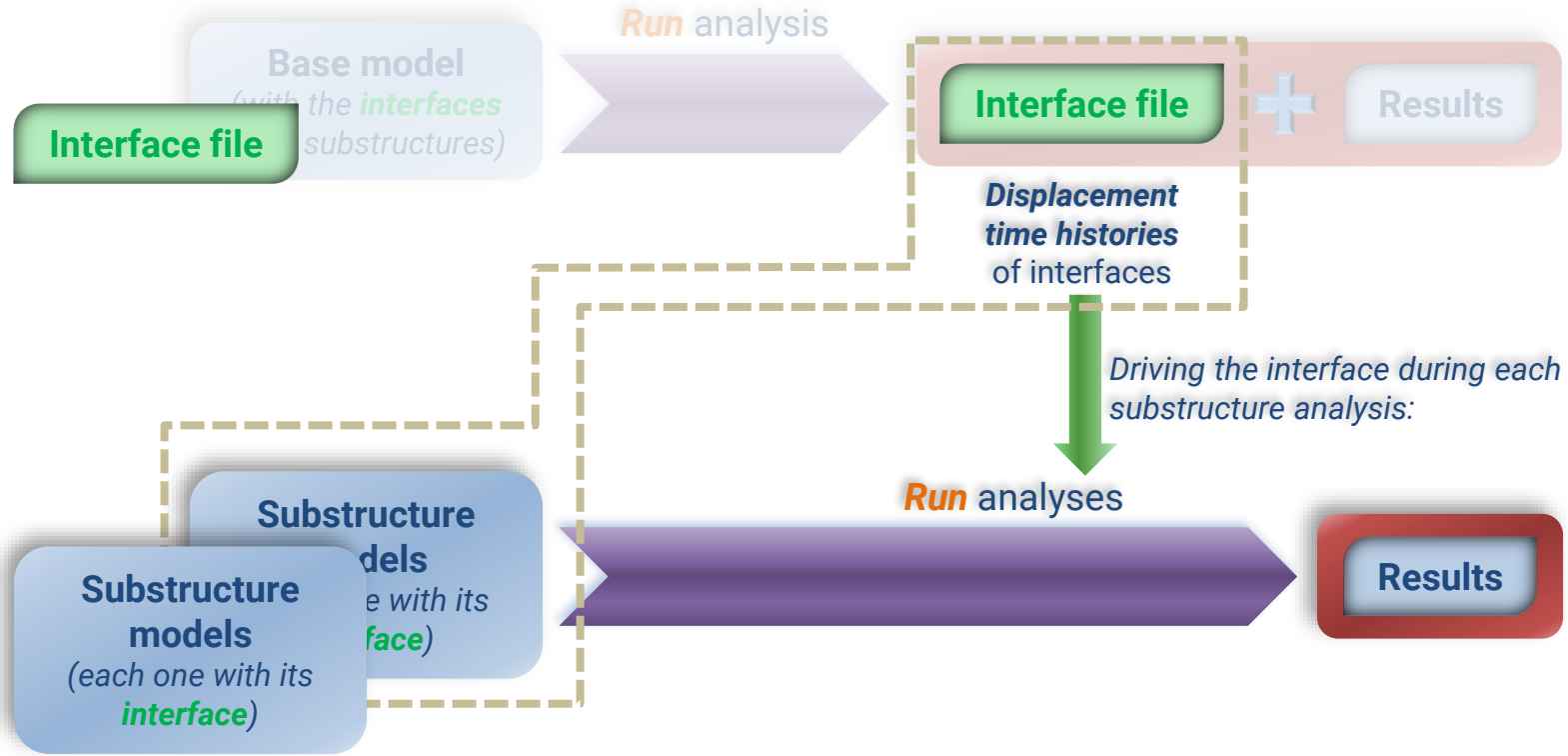
Base model
*(with the **interfaces** of all substructures)*

Substructure models
*(each one with its **interface**)*

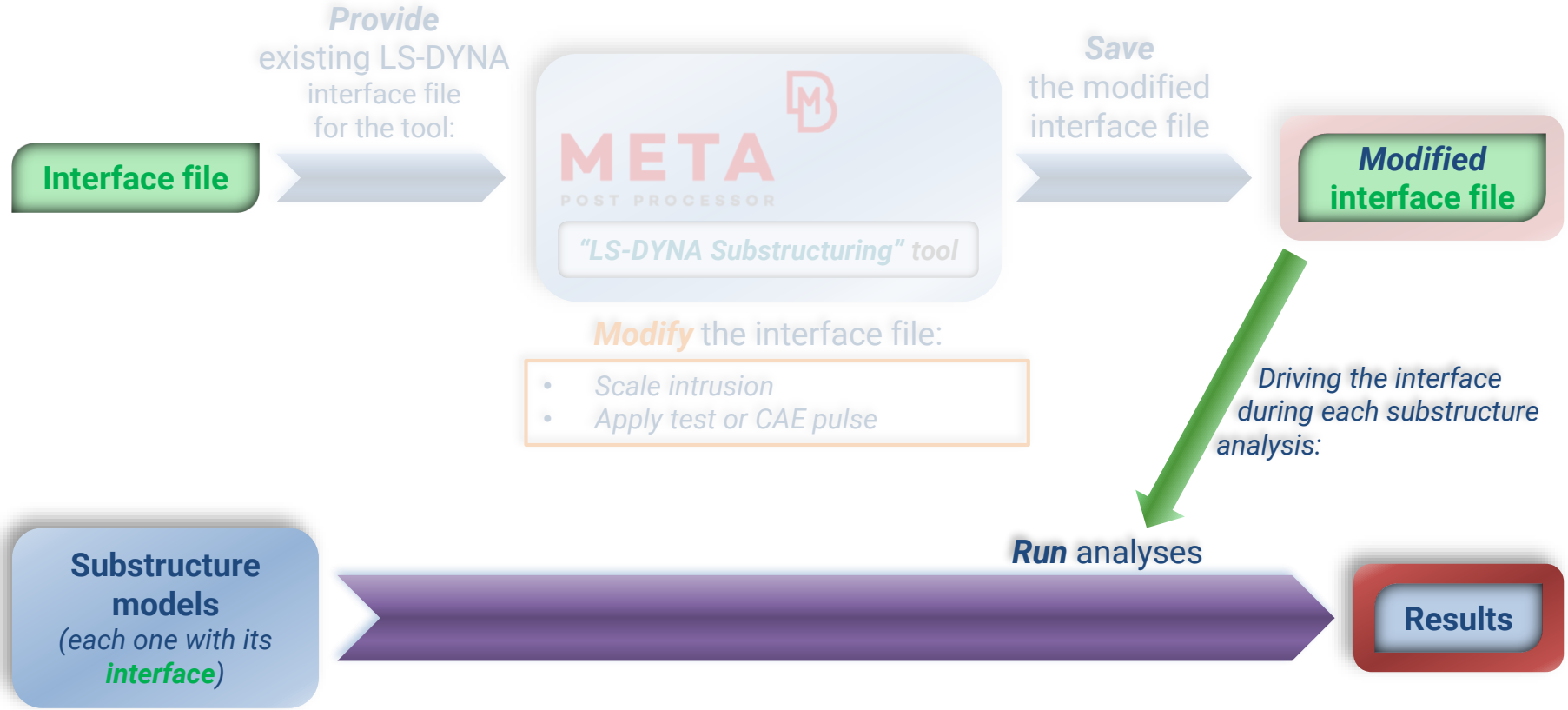
ANSA "Substructurer" tool – Performing the models' analyses



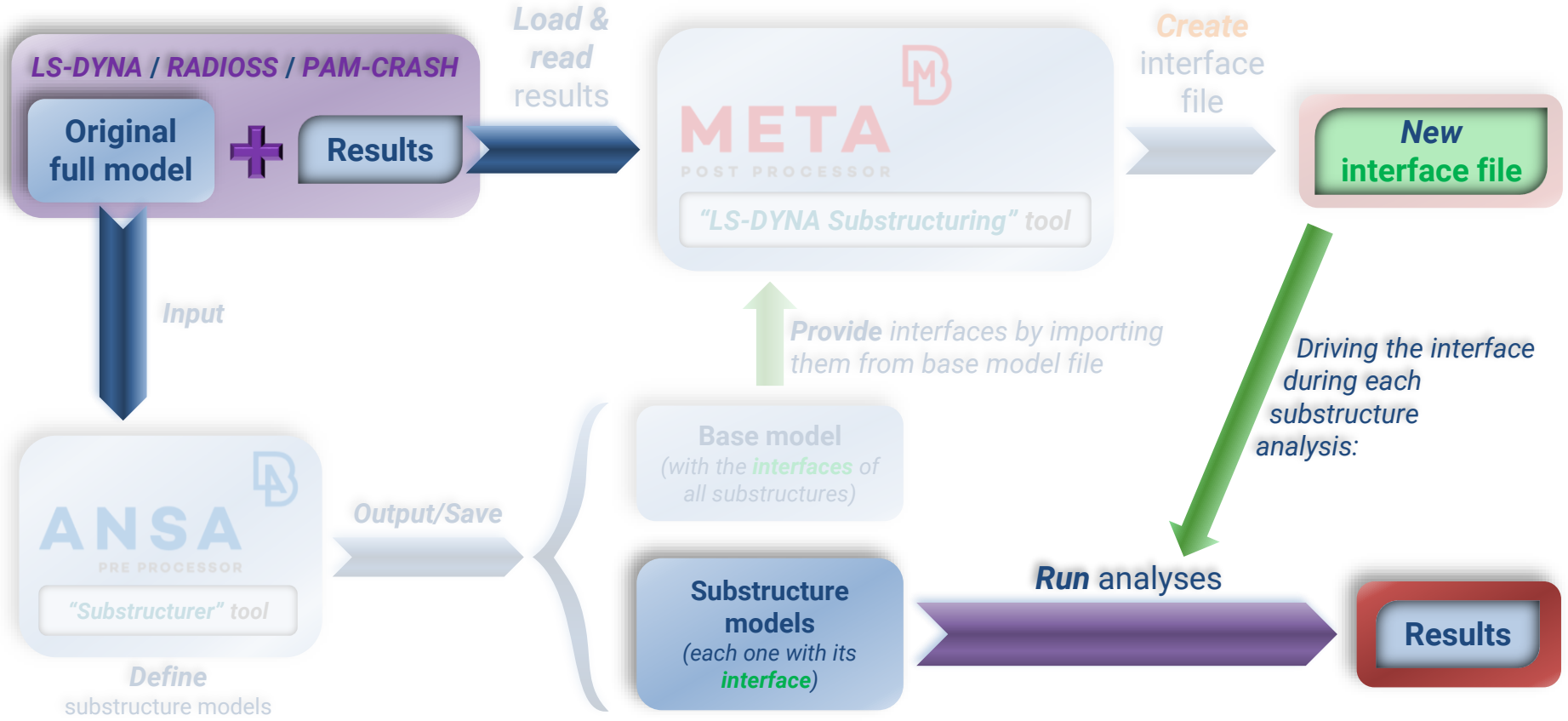
META "LS-DYNA Substructuring" tool – Modifying existing LS-DYNA interface file



META "LS-DYNA Substructuring" tool – Modifying existing LS-DYNA interface file



META "LS-DYNA Substructuring" tool – Creating new LS-DYNA interface file



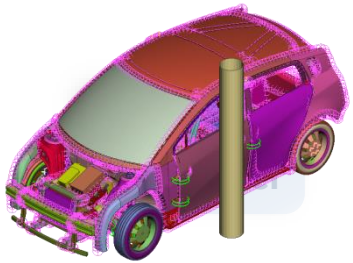
ANSA

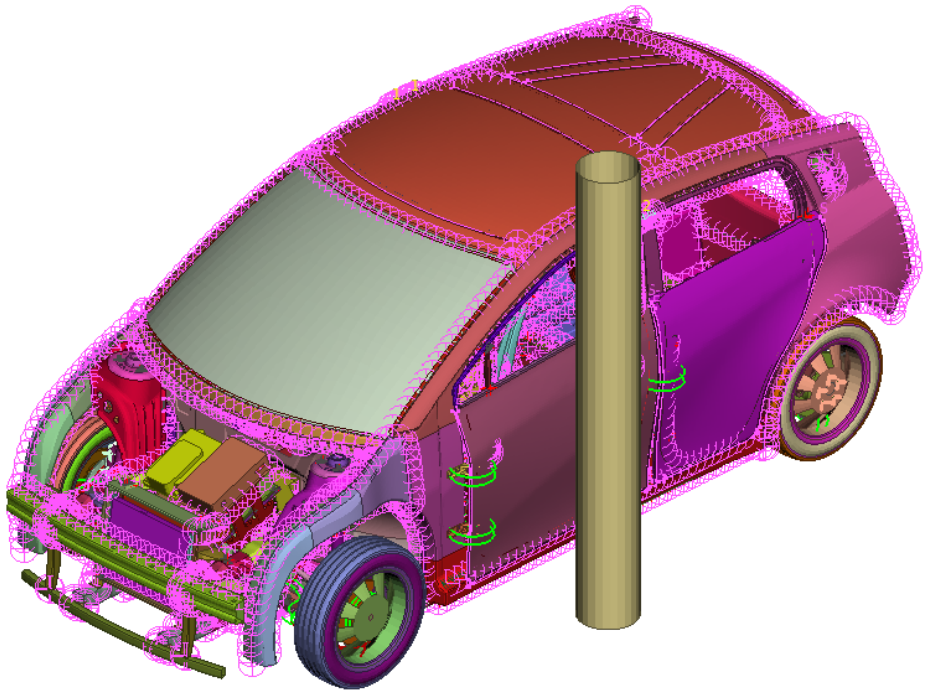
PRE PROCESSOR

“Substructurer” tool

“Substructurer” – Original full model

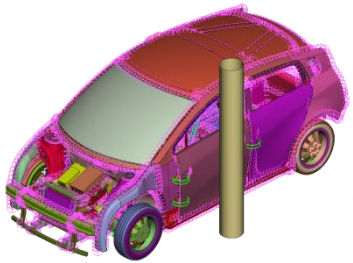
Original
full model





“Substructurer” – Definition of substructure models

Original full model



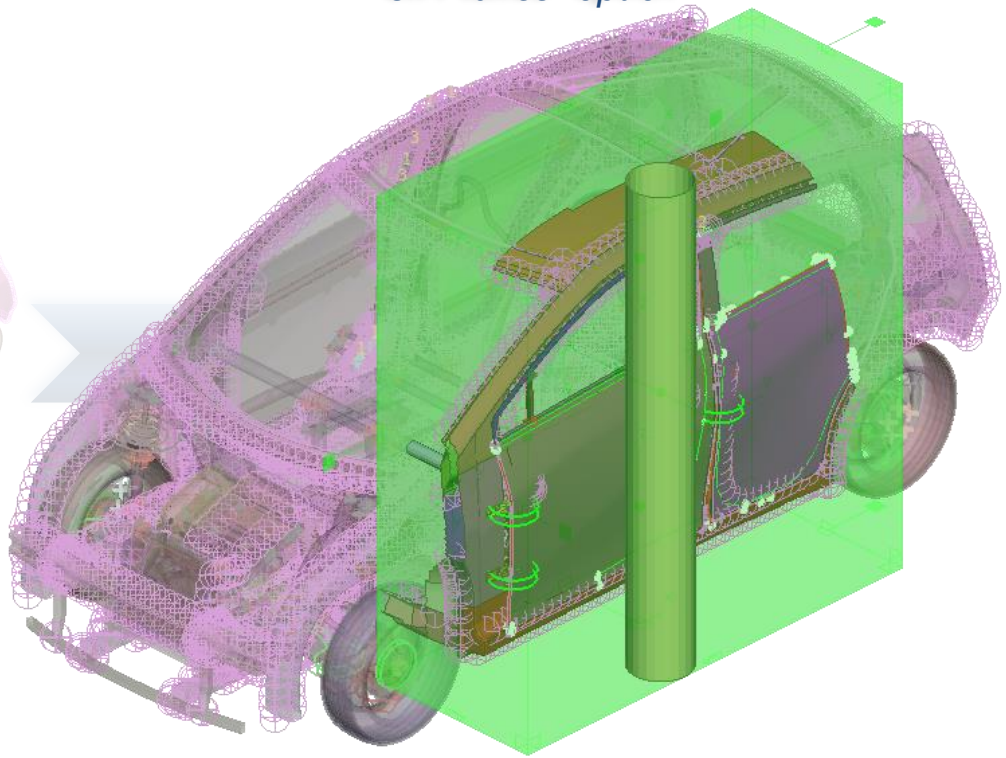
ANSA PRE PROCESSOR

“Substructurer” tool

"Substructurer" – Definition of substructure models

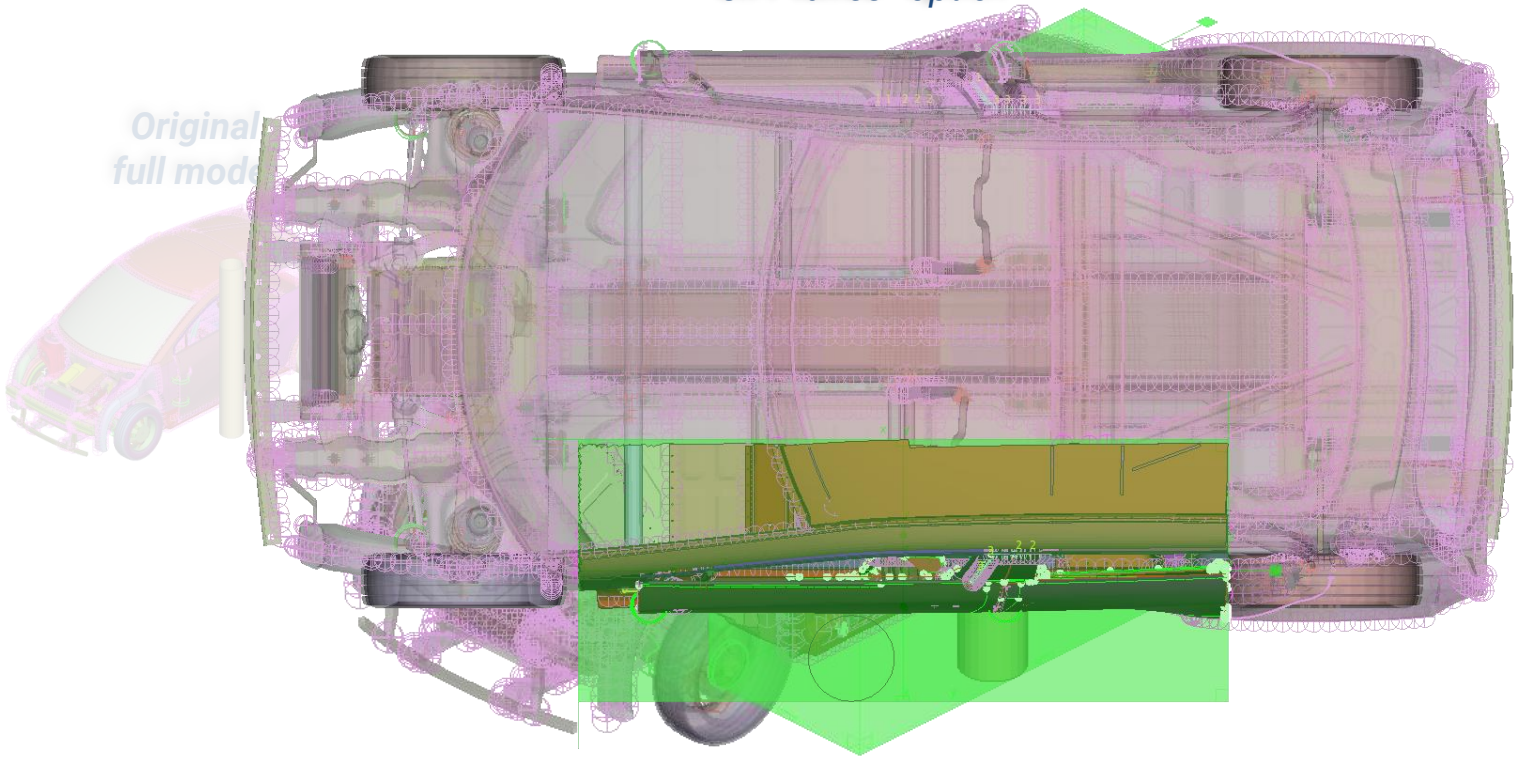
1st substructure model definition:
***"On Planes"** option*

Original full model



“Substructurer” – Definition of substructure models

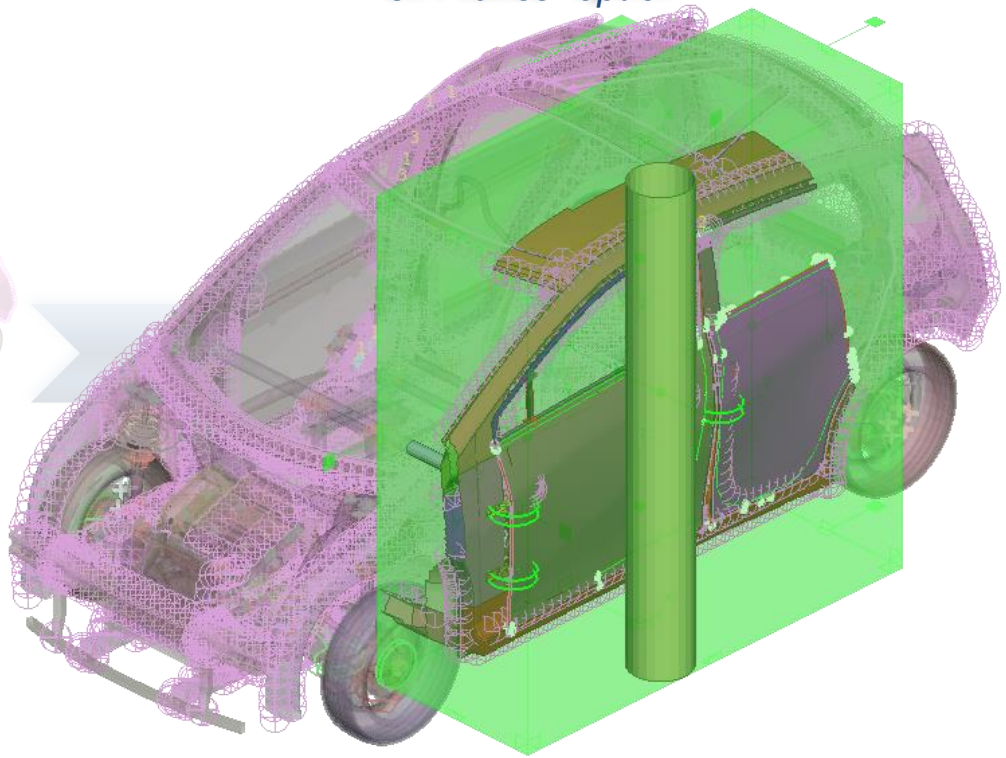
1st substructure model definition:
***“On Planes”** option*



"Substructurer" – Definition of substructure models

1st substructure model definition:
***"On Planes"** option*

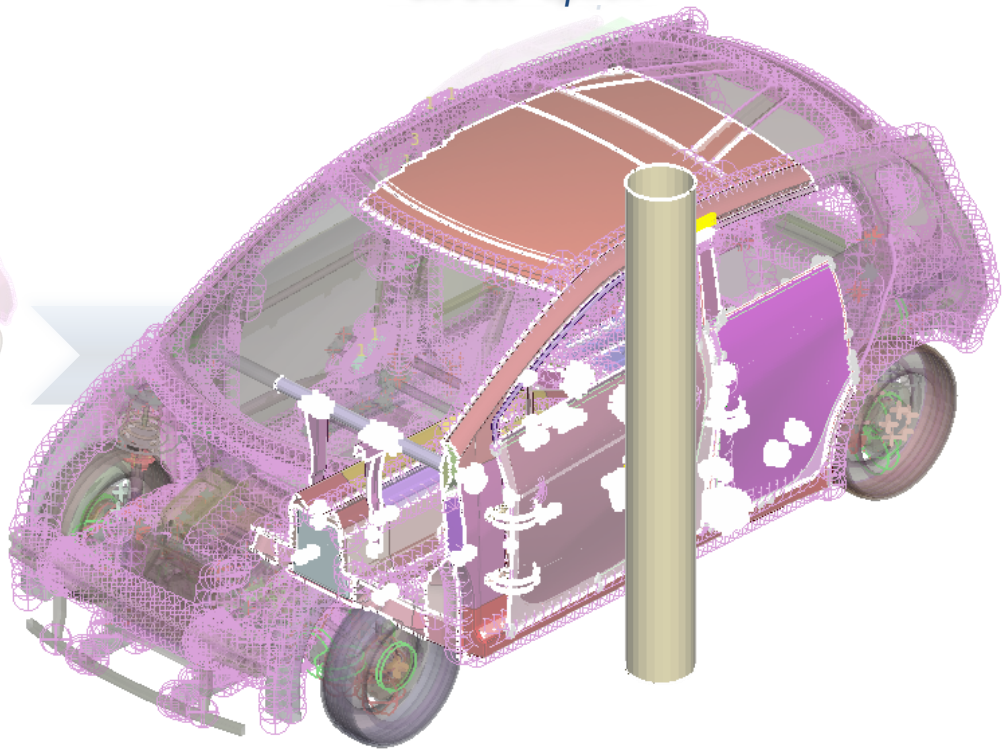
Original full model



“Substructurer” – Definition of substructure models

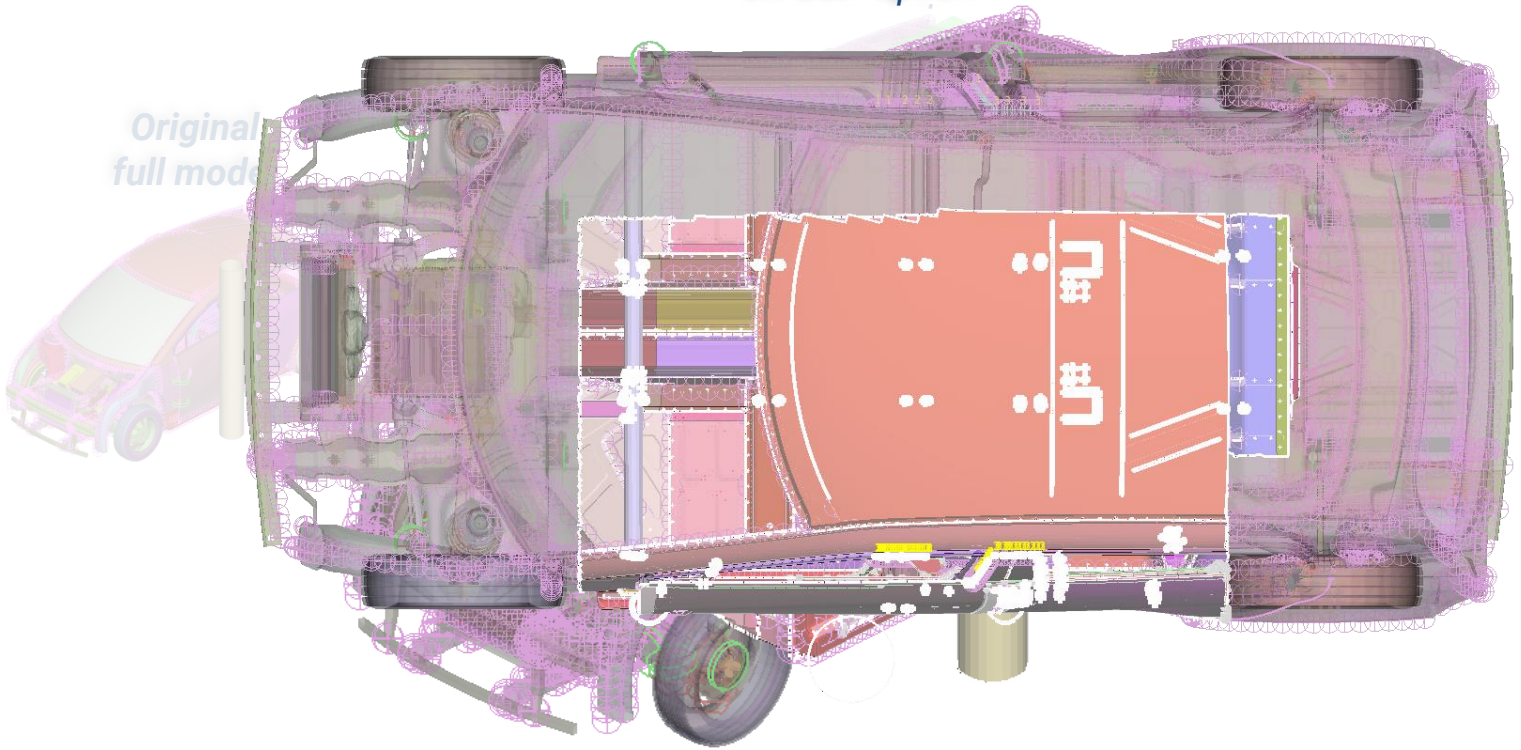
2nd substructure model definition:
***“On Set”** option*

Original full model



"Substructurer" – Definition of substructure models

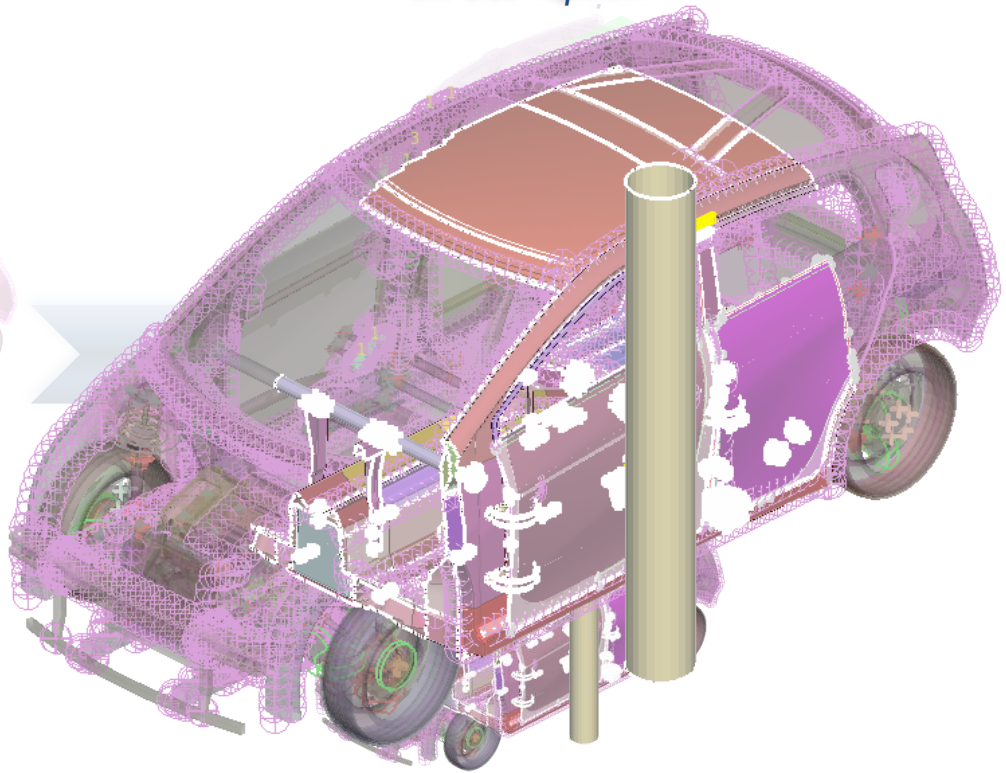
2nd substructure model definition:
***"On Set"** option*



“Substructurer” – Definition of substructure models

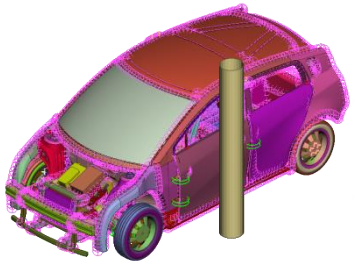
2nd substructure model definition:
***“On Set”** option*

Original
full model

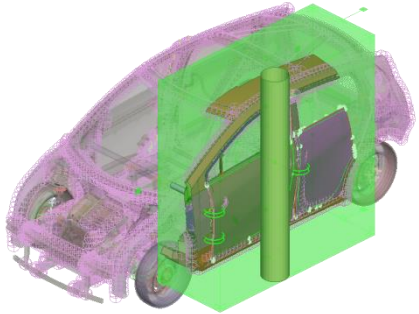


"Substructurer" – Final models

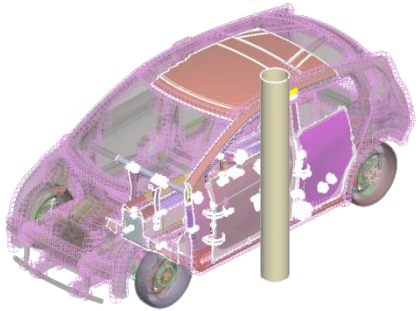
Original full model



1st substructure model definition:
"On Planes" option



2nd substructure model definition:
"On Set" option



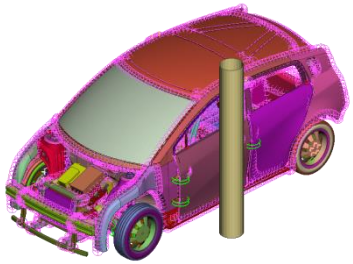
Base model

1st substructure model

2nd substructure model

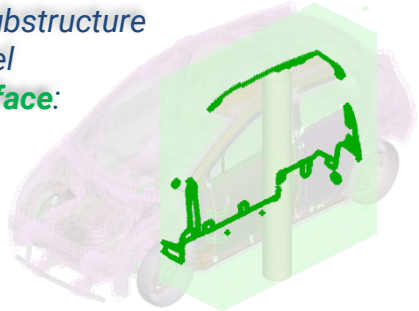
"Substructurer" – Final models

Original full model



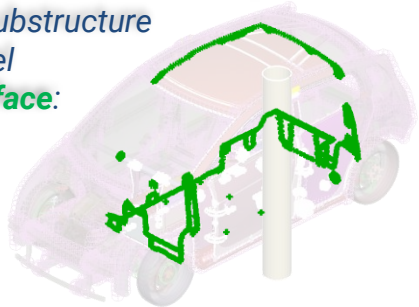
1st substructure model definition:
"On Planes" option

1st substructure model **interface**:



2nd substructure model definition:
"On Set" option

2nd substructure model **interface**:



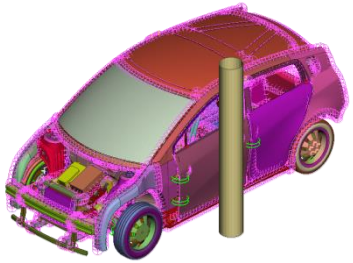
Base model

1st substructure model

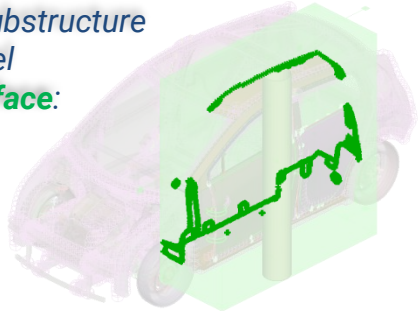
2nd substructure model

“Substructurer” – Final models

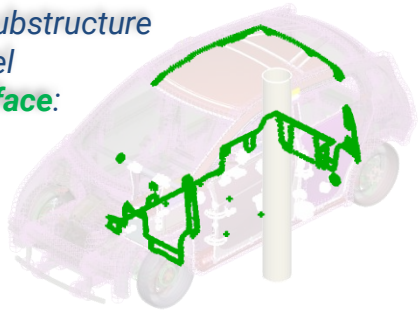
Original full model



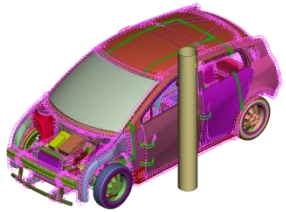
1st substructure model interface:



2nd substructure model interface:



Base model

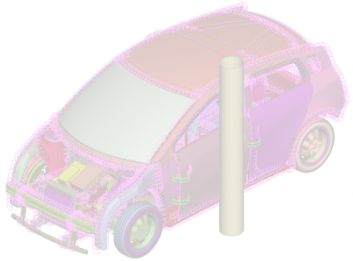


1st substructure model

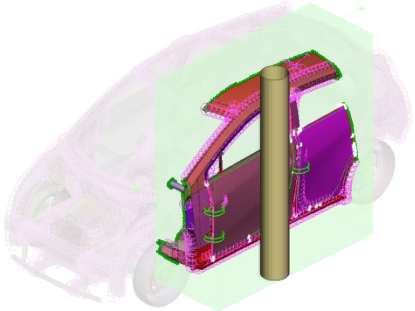
2nd substructure model

“Substructurer” – Final models

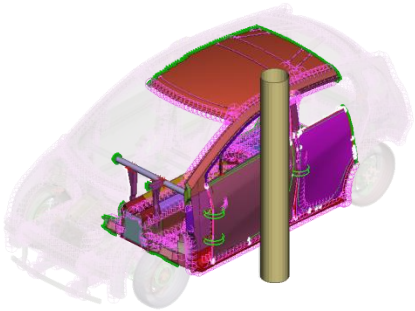
Original full model



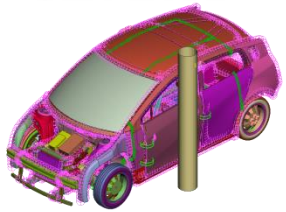
1st substructure model **interface** + **definition**:



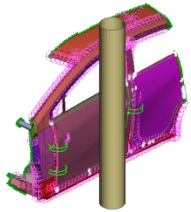
2nd substructure model **interface** + **definition**:



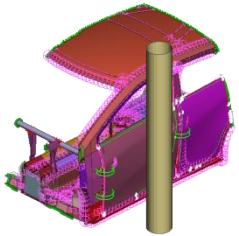
Base model



1st substructure model

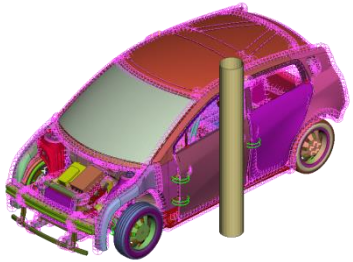


2nd substructure model

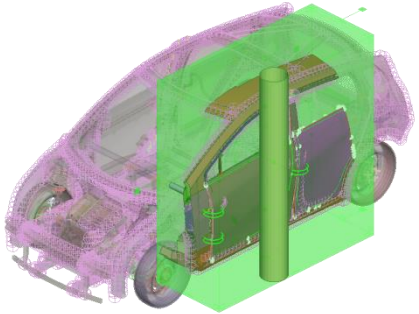


"Substructurer" – Complete process

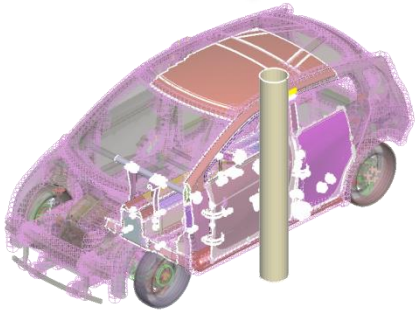
Original full model



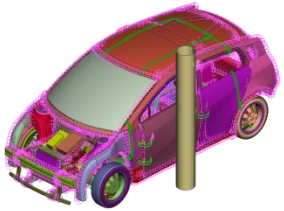
1st substructure model definition:
"On Planes" option



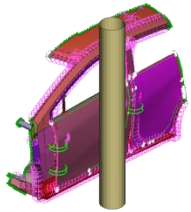
2nd substructure model definition:
"On Set" option



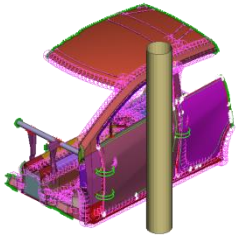
Base model



1st substructure model



2nd substructure model



META

POST PROCESSOR

“LS-DYNA Substructuring” tool

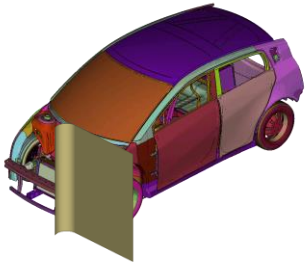
- ***Creation***
  *of a new **LS-DYNA interface file***
- ***Modification***
  *of an existing **LS-DYNA interface file***

- **Creation**
  of a new ***LS-DYNA interface file***

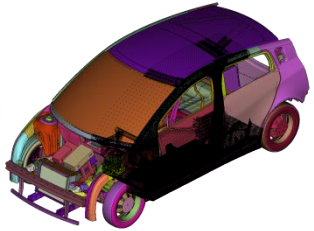
- **Modification**
  of an existing ***LS-DYNA interface file***

"LS-DYNA Substructuring" – Creating new LS-DYNA interface file

Original full model ***results***

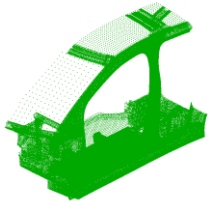


Provided ***interface set***

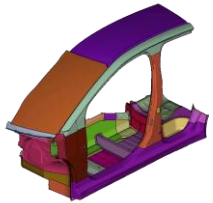


Create new interface file:

Interface file *(Displacement time histories of nodes in interface set)*



Substructure model ***results***

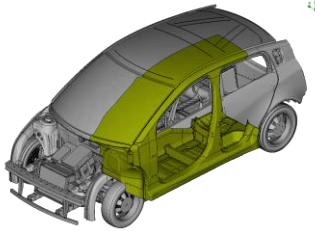


“LS-DYNA Substructuring”

- **Creation**
  of a new **LS-DYNA interface file**
- **Modification**
  of an existing **LS-DYNA interface file**

"LS-DYNA Substructuring" – Modifying existing LS-DYNA interface file

Base model

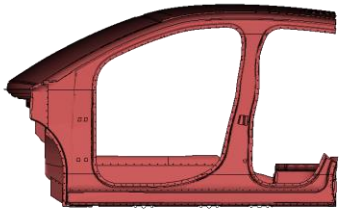


Substructure model

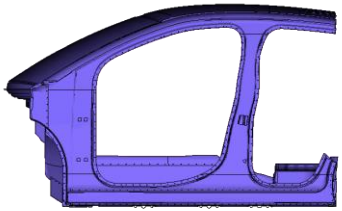
Modify the interface file:

Scale intrusion

1st step: Remove RBM

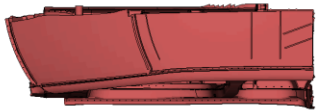


2nd step: Scale up "X" intrusion by 20%



Apply test or **CAE pulse**

1st step: Remove RBM



2nd step: Apply alternative RBM

BETA
SIMULATION SOLUTIONS

Stay connected