



## STREAMLINING CONCEPT STRUCTURE ENGINEERING FOR FASTER, SMARTER DEVELOPMENT



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# EFFICIENT ENGINEERING WITH MODELING & SIMULATION

## Streamlining Concept Structure Engineering for Faster, Smarter Development

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# CONTENT

- **Concept Engineering Introduction**
- **Modules & Interface Functionalities**
- **Generic Skeleton Body Model**

# CHALLENGES



AVAILABILITY OF CONCEPT MODEL FOR SIMULATION



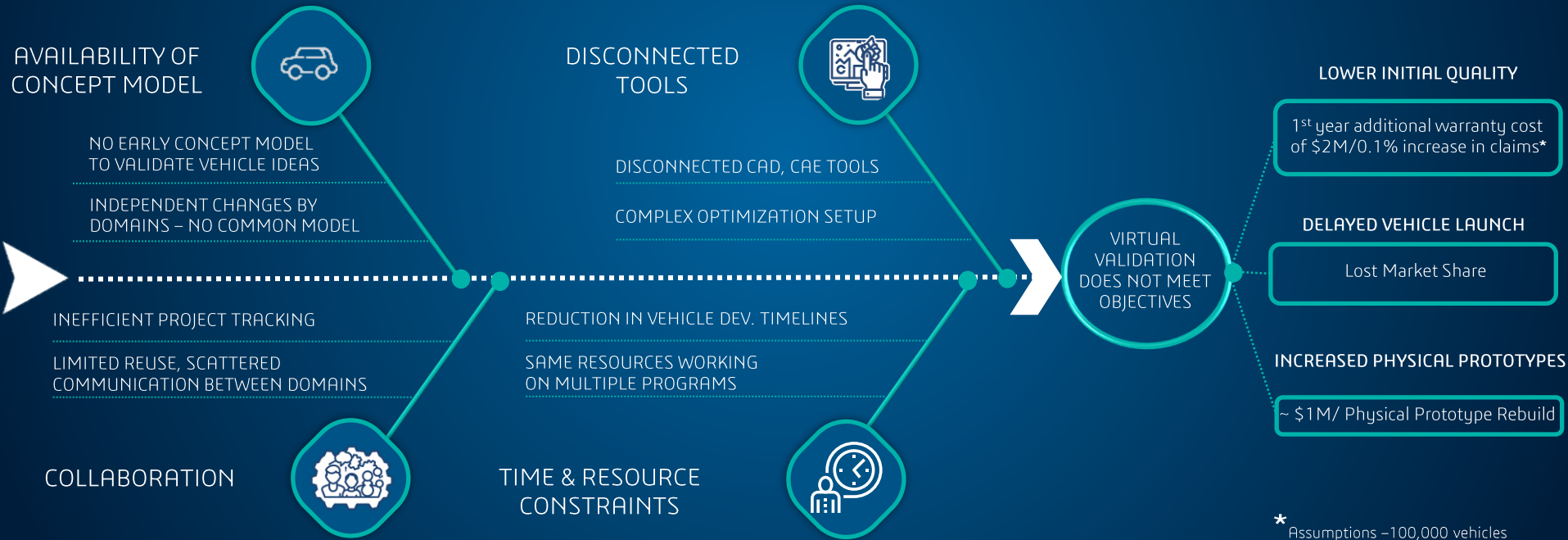
DISCONNECTED TOOLS



COLLABORATION



TIME & RESOURCE CONSTRAINTS



\* Assumptions – 100,000 vehicles sold in the year for \$20,000 each

# CHALLENGES



AVAILABILITY OF CONCEPT MODEL FOR SIMULATION



DISCONNECTED TOOLS



COLLABORATION



TIME & RESOURCE CONSTRAINTS

**SOLUTION :**



**Concept Engineering**

Flexible and robust parametric design



Fast and collaborative modeling



Associativity of design and simulation



Process automation and design exploration



**Harmonized end-to-end platform**



# CHALLENGES



AVAILABILITY OF CONCEPT MODEL FOR SIMULATION



DISCONNECTED TOOLS



COLLABORATION



TIME & RESOURCE CONSTRAINTS

## SOLUTION: Concept Engineering | Key Differentiators

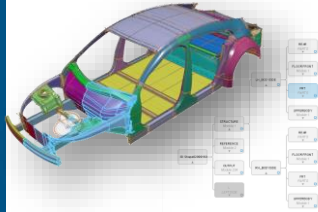
### RESILIENT DESIGN



UPDATE STRATEGIES TO ENSURE MODEL ROBUSTNESS AND FLEXIBILITY



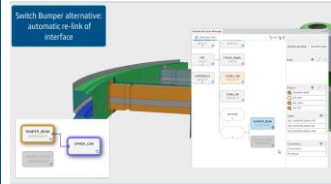
### WATERTIGHT MODULES



MODULES CAN BE RE-USED, RE-POSITIONED, RE-CONNECTED



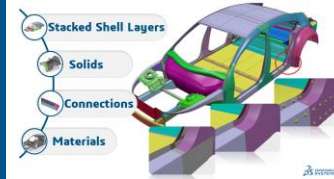
### INTERFACES & MAPPING



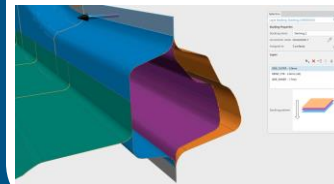
SEMANTIC INTERFACES TECHNOLOGY FOR AUTOMATIC ASSEMBLY



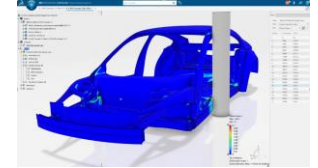
### PROPERTIES as Attributes



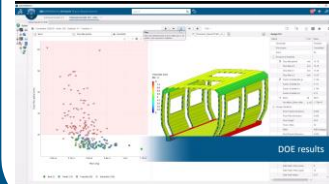
FUNCTIONALITY TO CREATE MULTI-LAYER DESIGNS FROM SINGLE-LAYER 3DEXPERIENCE SURFACES



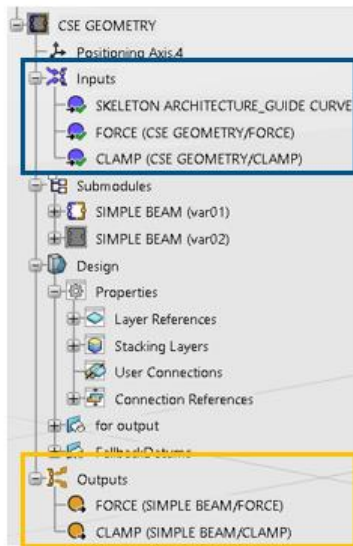
### SIMULATION & EXPLORATION



READY-TO-SIMULATE MODELS - BASED ON STACKING, MATERIAL THICKNESS & CONNECTION PROPERTIES

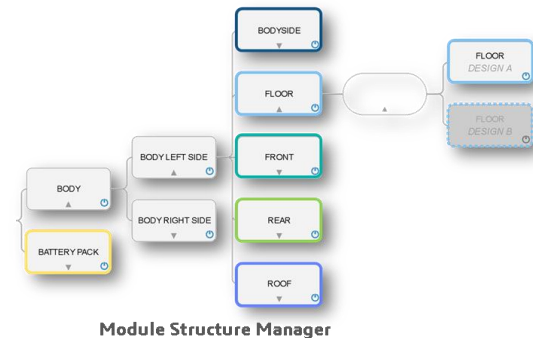


# MODULES AND INTERFACES



A **module** is a container for:

- ✓ Any geometries (wireframe, surfaces and solids)
- ✓ Can contain sub-modules
- ✓ Properties for materials, layers, stackings and connection
- ✓ Parameters and formulas
- ✓ Using **Input interfaces** (Inputs) and **Output interfaces** (Outputs)
- ✓ Support switching of module alternatives and excluding them from the design



## Input interfaces

Input information for the design of the module

- ✓ Parameters
- ✓ Geometry features
- ✓ Interfaces for mapping (projection technology)

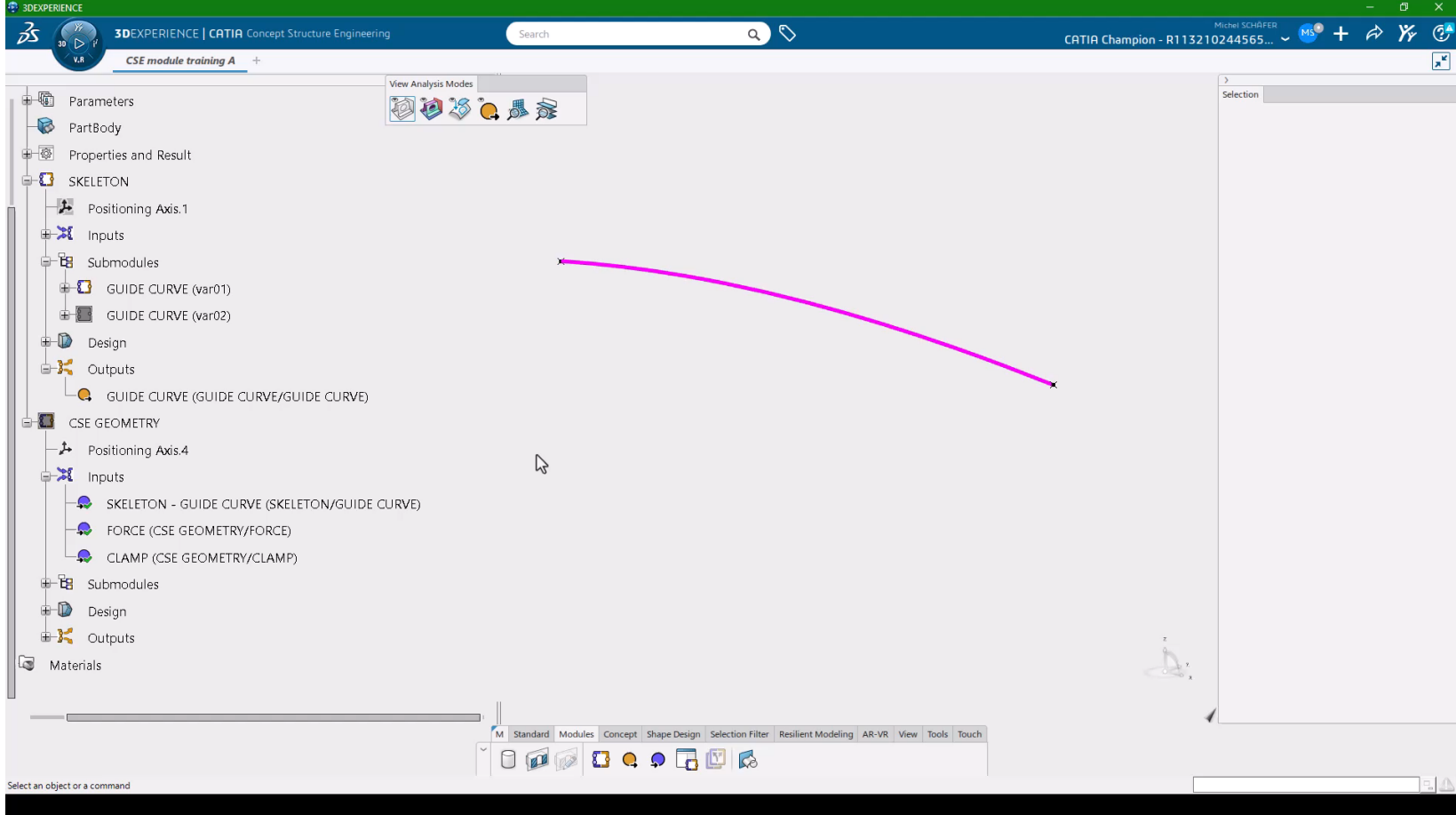


## Output interfaces

Output information of the design of the module

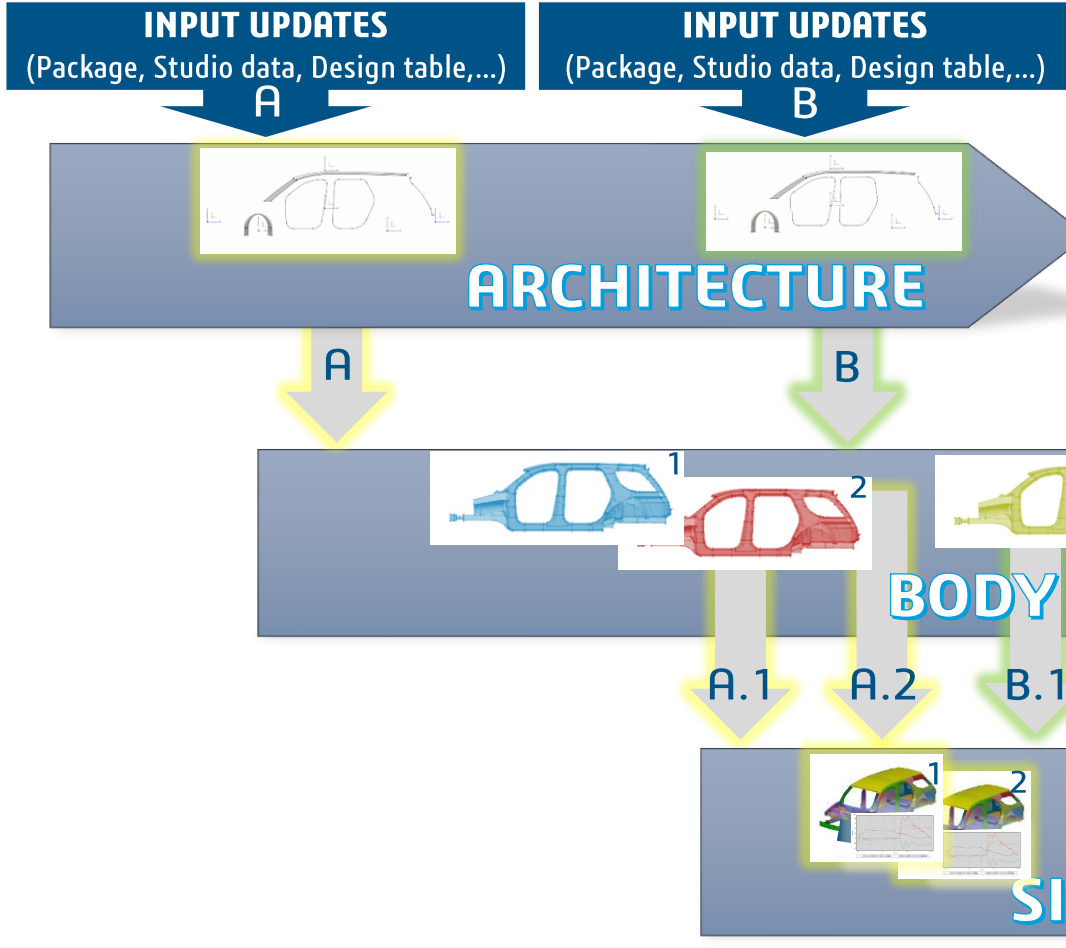
- ✓ Parameters
- ✓ Geometry features
- ✓ Interfaces for mapping (projection technology)

# MODULES FEATURE DEMO





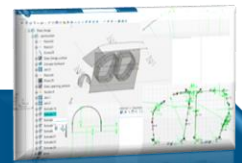
# Product development



FINAL CONCEPT

# Product development

INPUT UPDATES (Package, Studio data, Design table, ...)



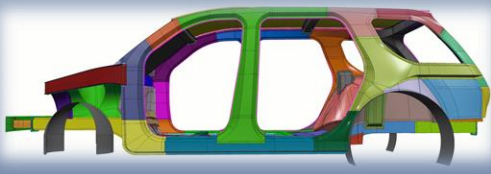
TEMPLATE of Archetypes



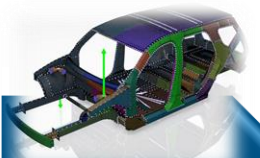
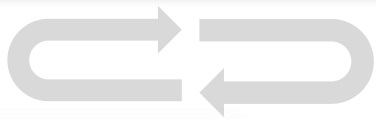
ARCHITECTURE



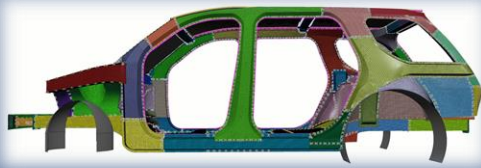
TEMPLATE of Modules



BODY DESIGN



TEMPLATE of Scenarios

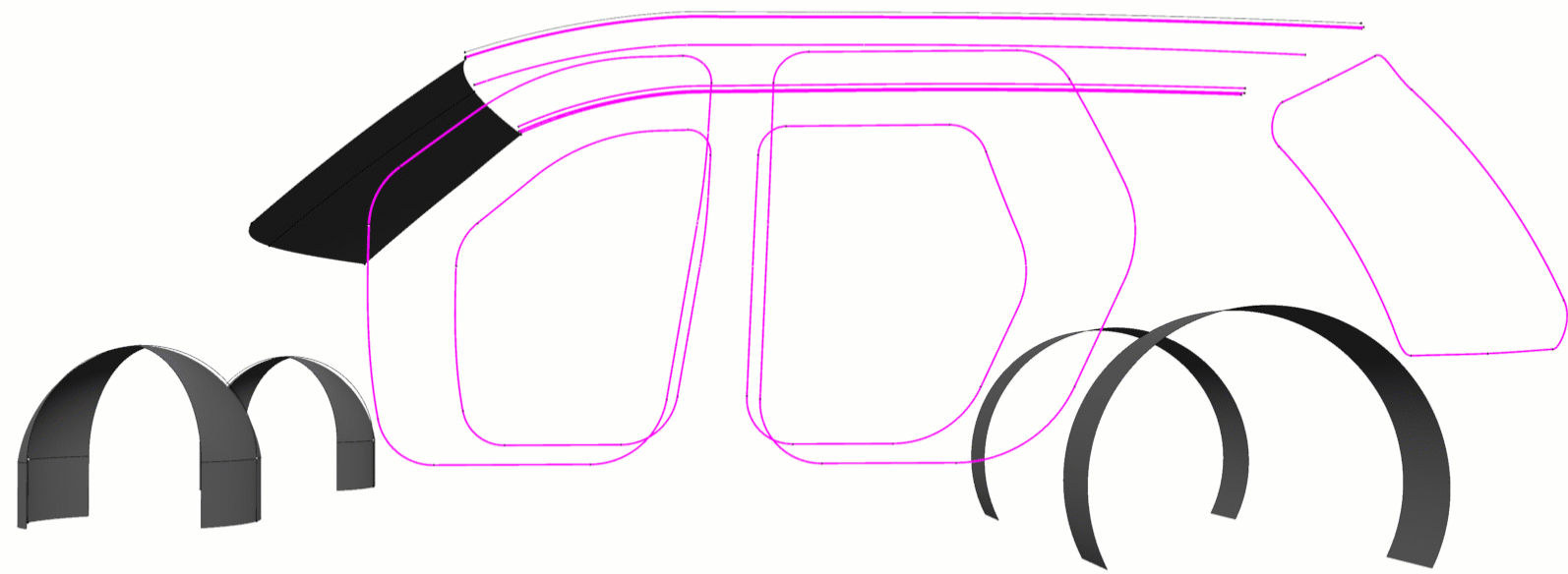


SIMULATION

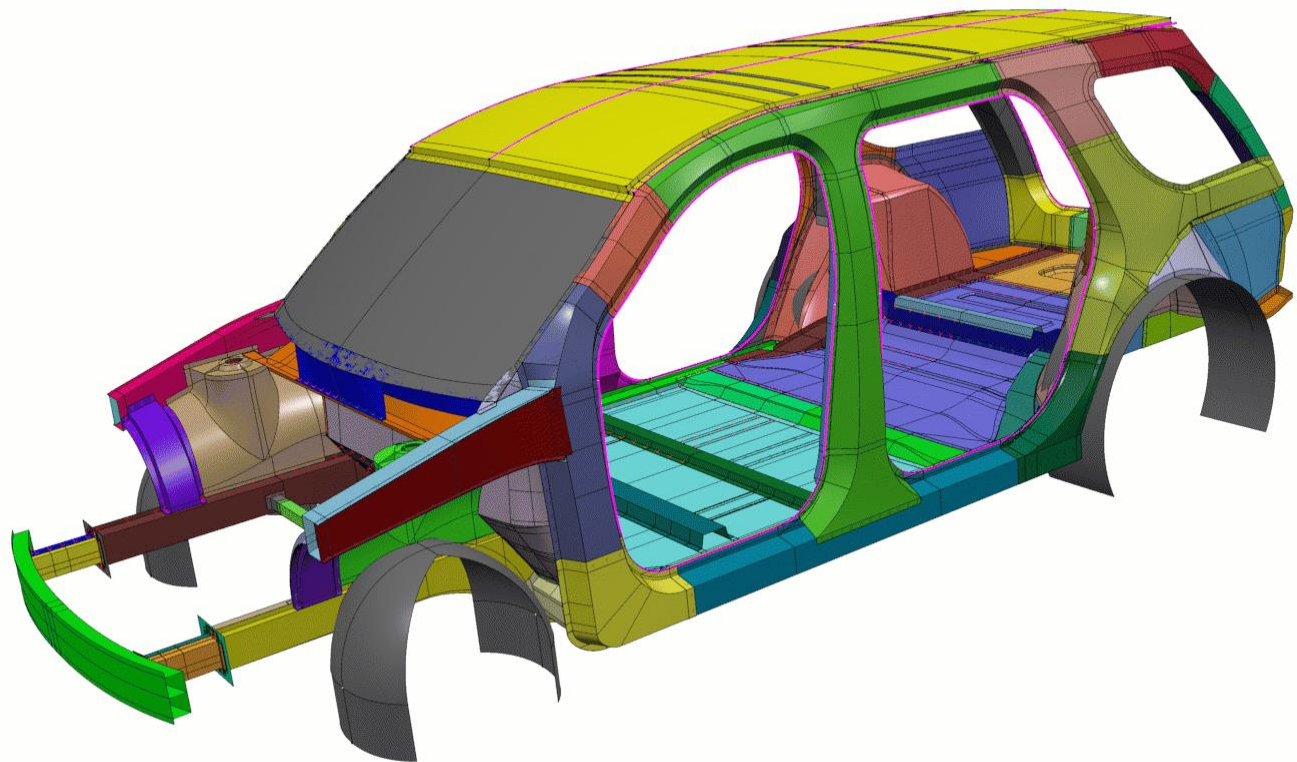
FINAL CONCEPT

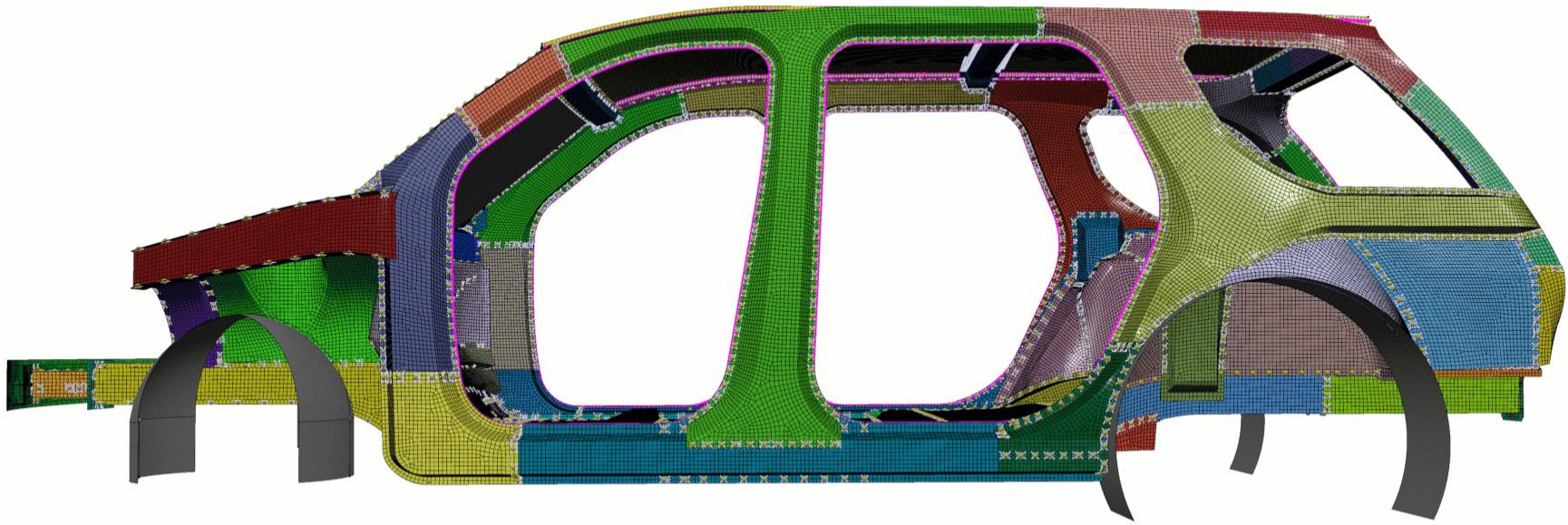


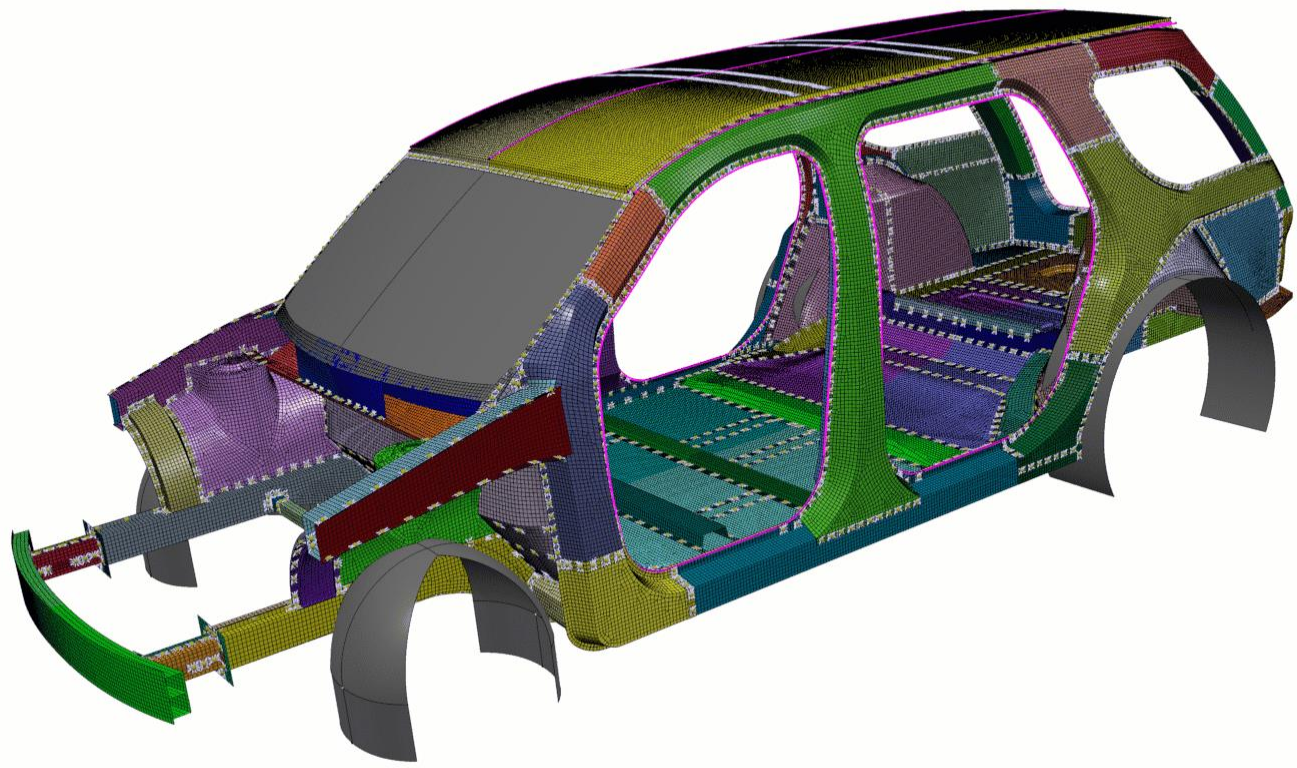
FINAL CONCEPT



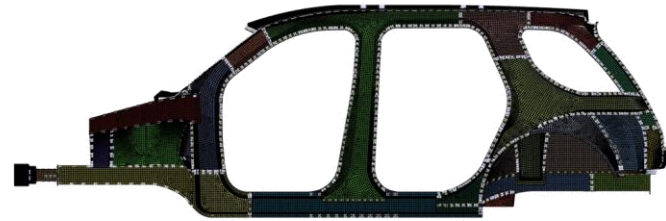
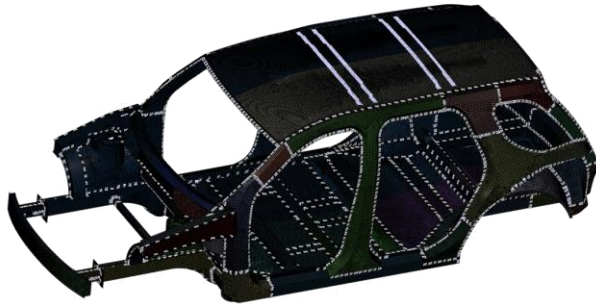
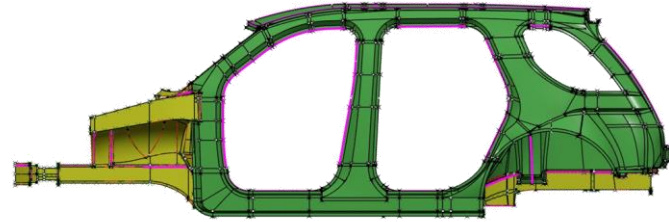
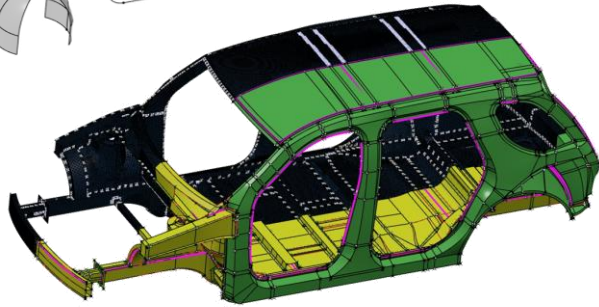
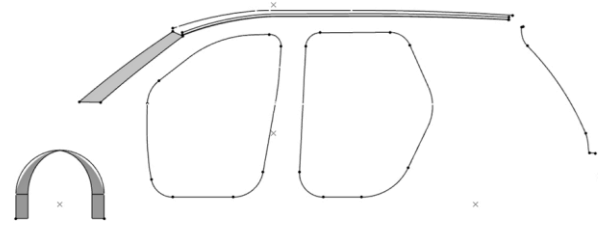
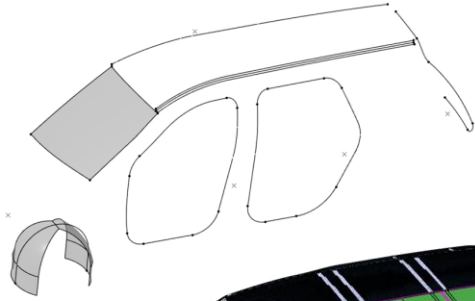






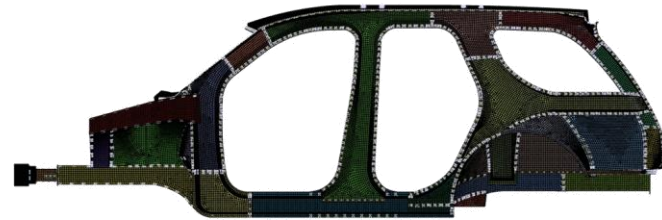
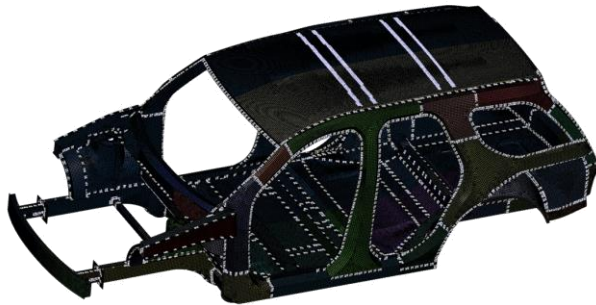
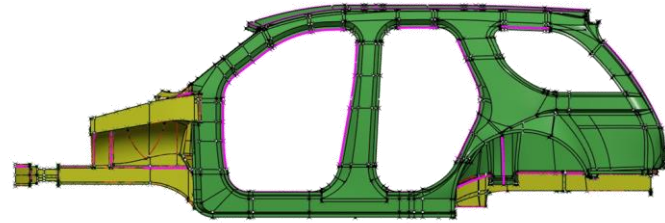
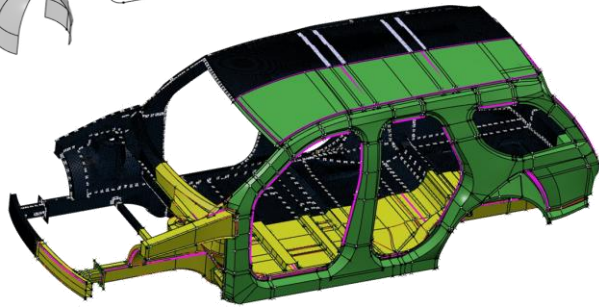
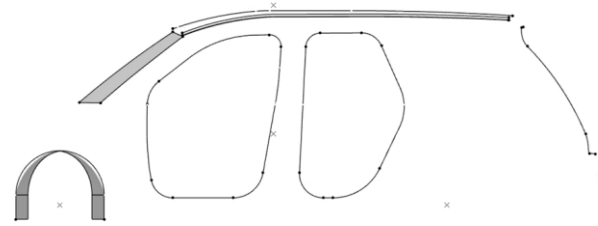
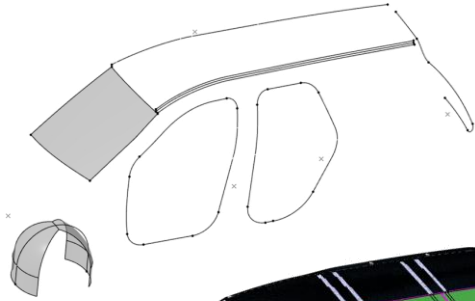


# REAR OVERHANG

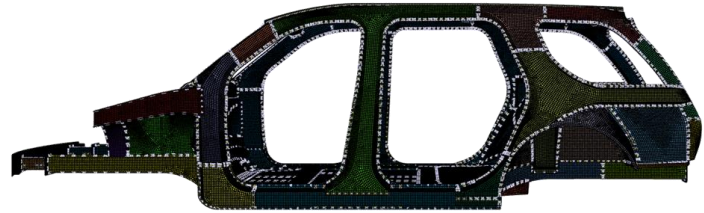
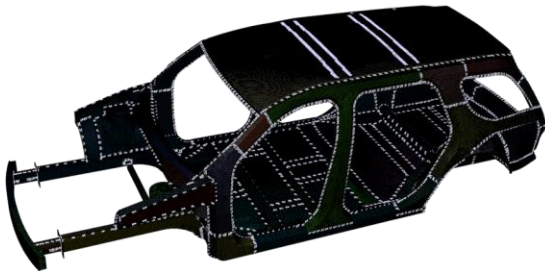
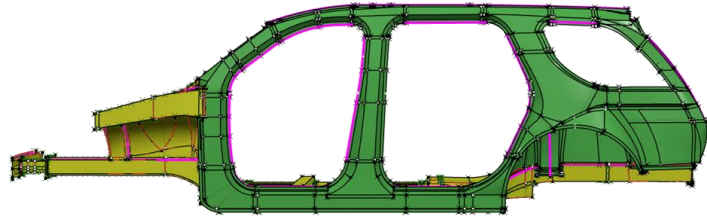
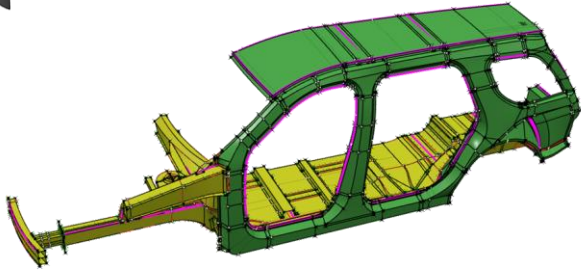
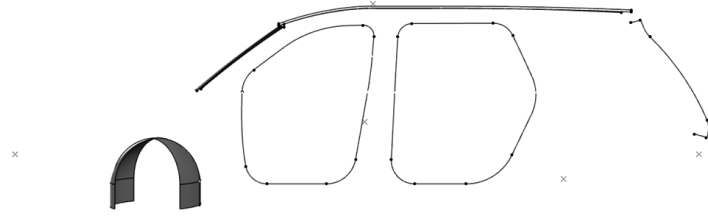
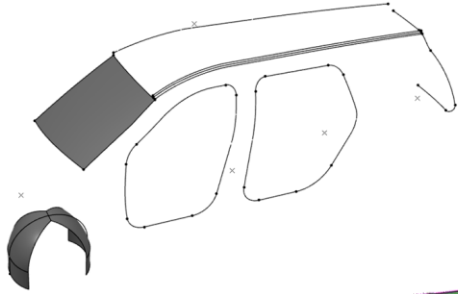




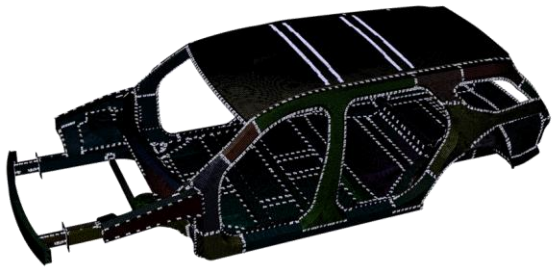
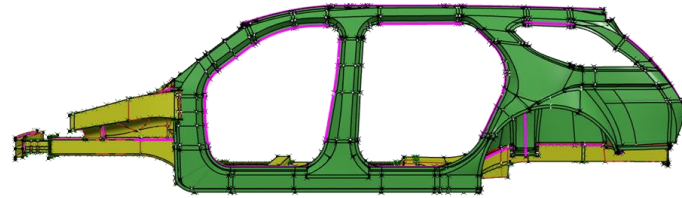
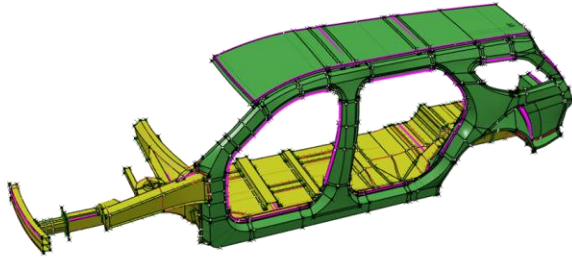
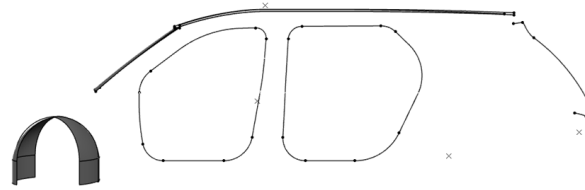
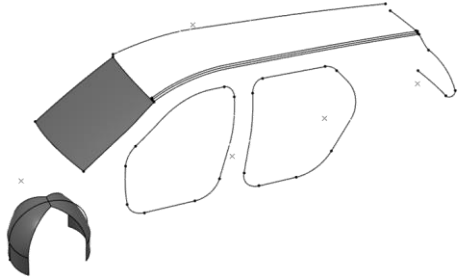
# WHEELBASE REAR



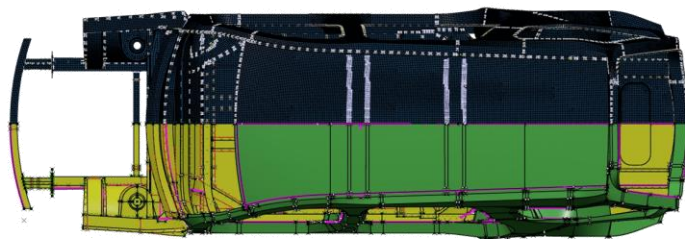
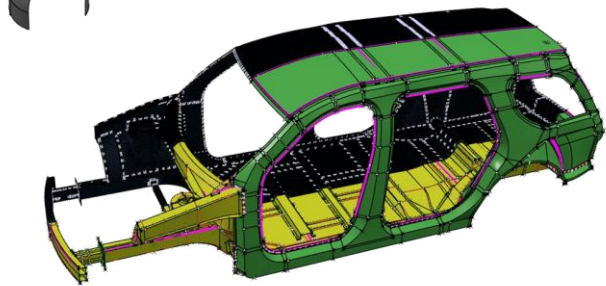
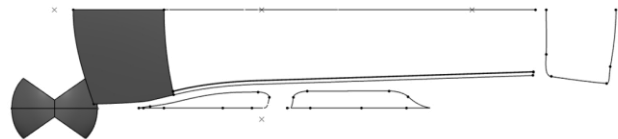
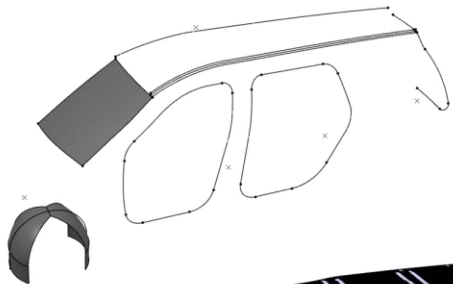
# FRONT OVERHANG



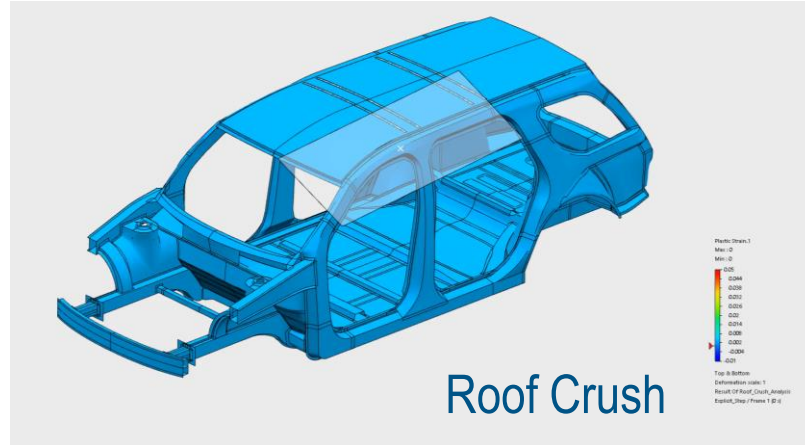
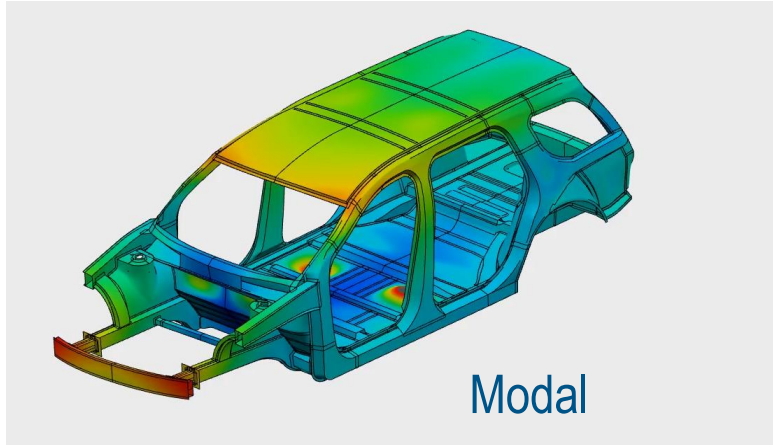
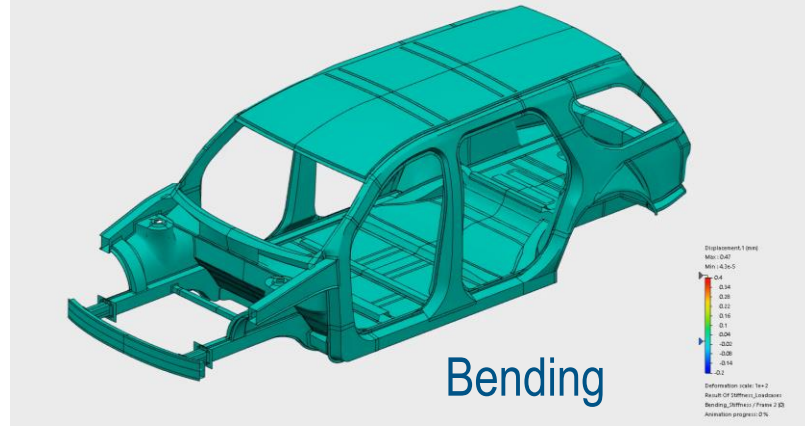
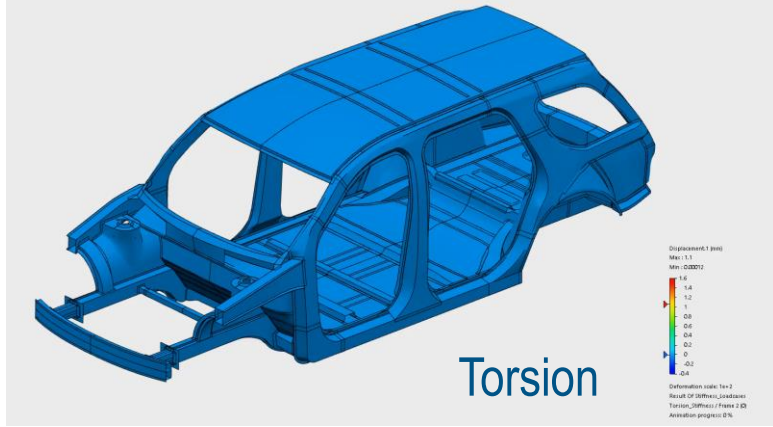
# ROOF HEIGHT



# TRACK WIDTH



# ANY DISCIPLINE TO BE ASSESSED

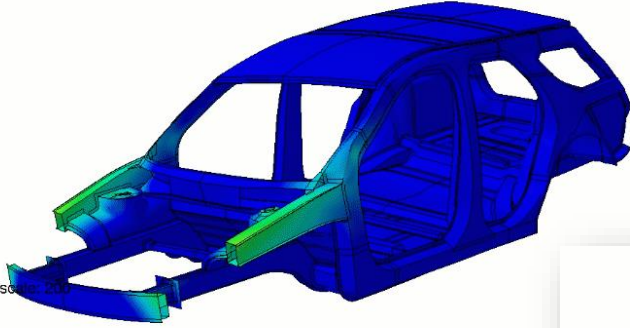


# PARAMETRIC CHANGE AND SIMULATION RESULTS

Displacement.8 (mm)  
Max : 0.826  
Min : 0

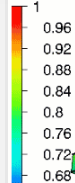


Deformation scale: 200

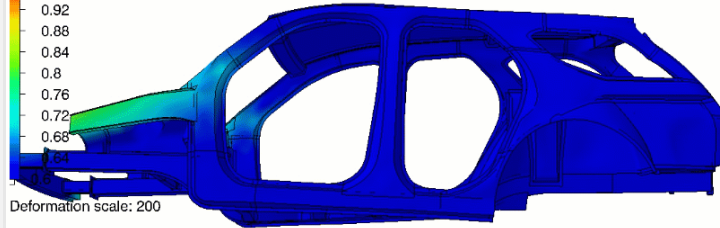


Name	Unit	Value
Feasibility		Best
Run phase		Completed
Rank		1
<input type="checkbox"/> Response Variables		
Mass_Mass Sensor_1	kg	289
Maximum_Displacement Magnitude_1	mm	3.783
Maximum_Von Mises Stress_1	n_...	1.485e+8
<input type="checkbox"/> Design Variables		
RearWheel_X	mm	2720
<input type="checkbox"/> Others		

Displacement.8 (mm)  
Max : 0.826  
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Name	Unit	Value
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<input type="checkbox"/> Response Variables		
Mass_Mass Sensor_1	kg	289
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RearWheel_X	mm	2720
<input type="checkbox"/> Others		

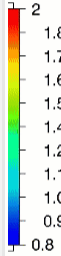
## Torsion

# PARAMETRIC CHANGE AND SIMULATION RESULTS

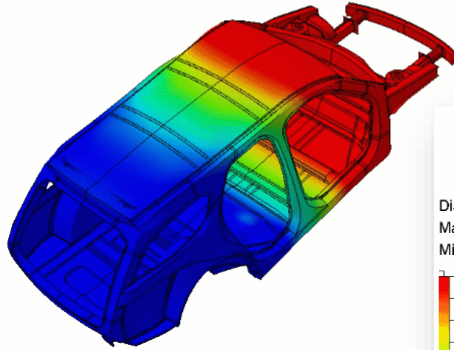
Displacement.2 (mm)

Max : 3.78

Min : 0



Deformation scale: 200



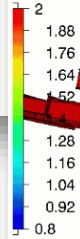
## Bending

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<input type="checkbox"/> Design Variables		
RearWheel_LX	mm	2720
<input type="checkbox"/> Others		

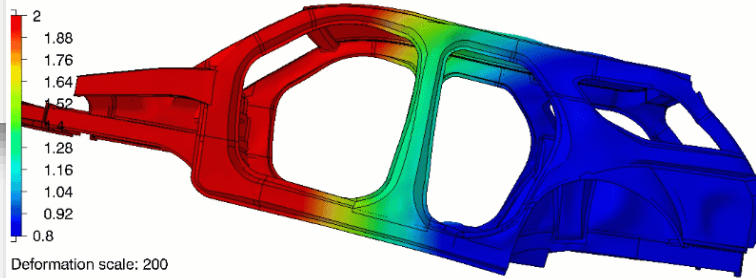
Displacement.2 (mm)

Max : 3.78

Min : 0



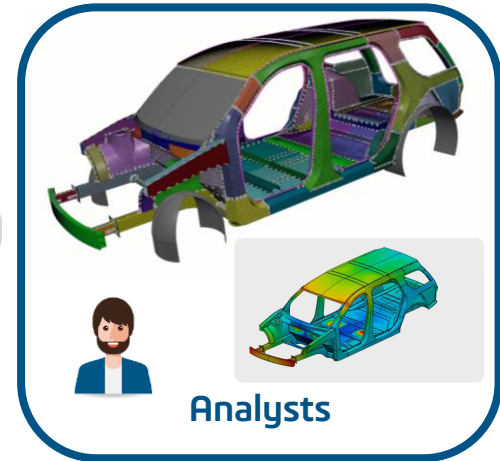
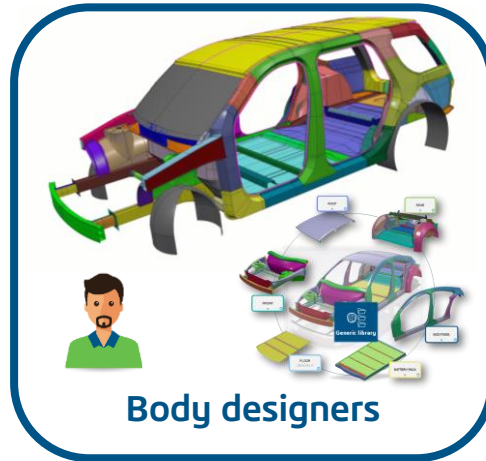
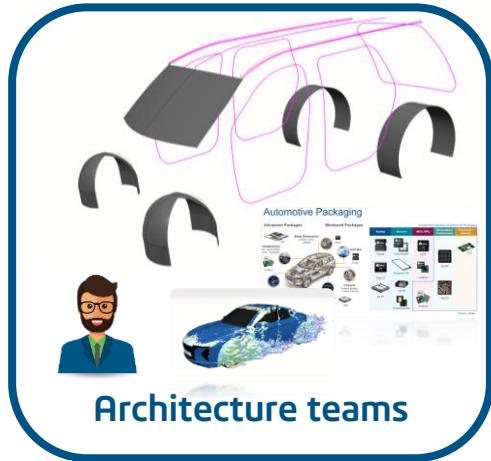
Deformation scale: 200



Name	Unit	Value
Feasibility		Best
Run phase		Completed
Rank		1
<input type="checkbox"/> Response Variables		
Mass_Mass Sensor_1	kg	289
Maximum_Displacement Magnitude_1	mm	3.783
Maximum_Von Mises Stress_1	n_...	1.485e+8
<input type="checkbox"/> Design Variables		
RearWheel_LX	mm	2720
<input type="checkbox"/> Others		

# TAKEAWAYS

- Vehicle architecture teams can work together with body designers and analysts
- Start program by template of an highly flexible architecture model adapting to architectural changes
- Concept Engineering on 3DEXPERIENCE allows to link architecture data dynamically to concept design, simulation and even DoE or optimization procedures





THANK YOU FOR YOUR INTEREST

