



Groundbreaking
Simulation Solutions

physics on screen

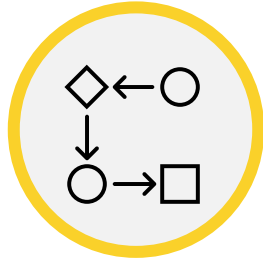
Streamlining Simulation Run preparation with an end-to-end modular methodology

Irene Makropoulou

Industry Challenges and Goals



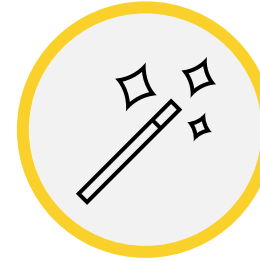
**Raise productivity
with traceability**



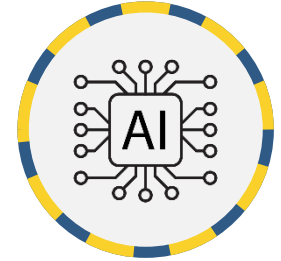
**Industrialize &
Standardize**



**Onboard
analysts**



Automate



AI & ML

Simulation Data Management

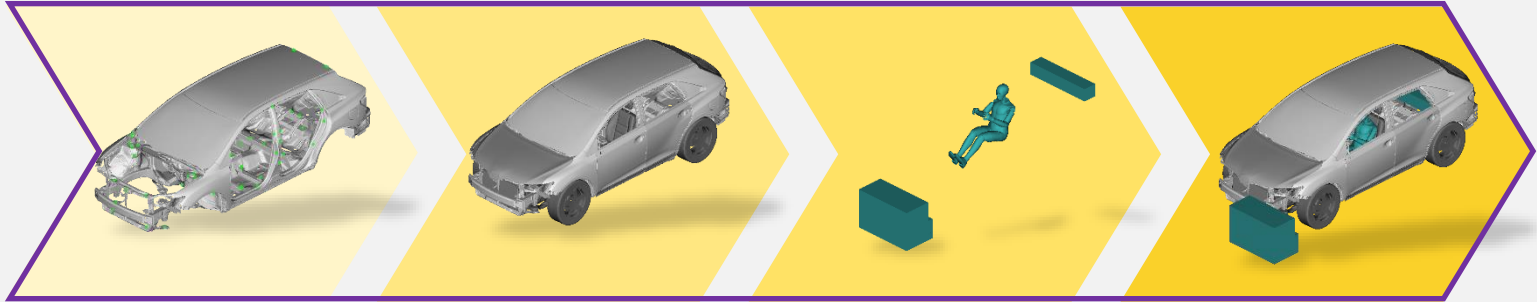
Simulation Process Management

Streamlined Simulation Run preparation

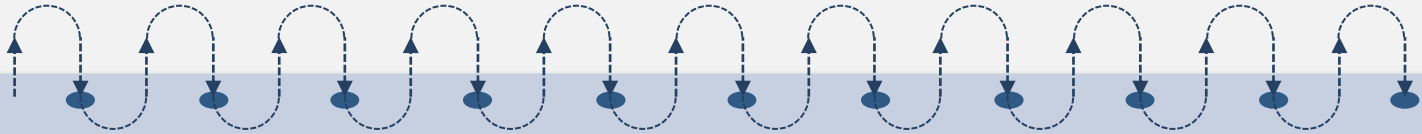
Modular
Environment



Process
Management



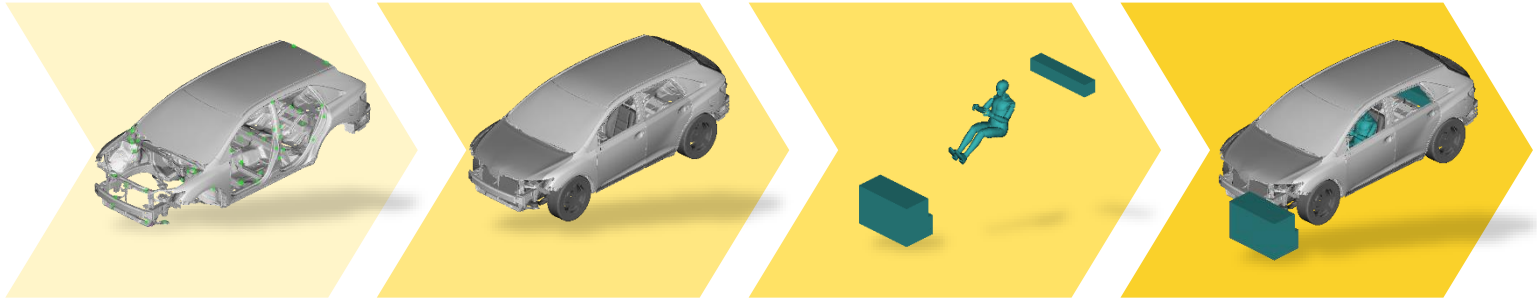
Data
Management



Streamlined Simulation Run preparation - The "Build Process"



Process Management



Discipline

Target Solver

Process Library



Data Management



The “Build Process” - How it works



Model Browser

Subsystems Simulation Models

Name	Build Status
<input checked="" type="radio"/> Subassembly 1	<input type="radio"/>
<input checked="" type="radio"/> Subassembly 2	<input type="radio"/>

Details Build


Name	Build Status
Realize Internal Connections	<input type="radio"/>
Realize Internal GEBs	<input type="radio"/>
Source Numbering Rules	<input type="radio"/>
Subsystem Checks	<input type="radio"/>

Out-of-the-box, extensible by Script and Checks

The “Build Process” - How it works

Model Browser

Subsystems Simulation Models

Name	Build Status
 Model Assembly	<input type="radio"/>

Details Build

Name	Build Status
Load Base Modules	<input type="radio"/>
Realize Internal Connections & GEBs	<input type="radio"/>
Source Numbering Rules	<input type="radio"/>
Check Assembly Status	<input type="radio"/>
Model Assembly Checks	<input type="radio"/>

Out-of-the-box, extensible by Script and Checks

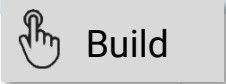
Different Build Process at each modeling stage

The “Build Process” - How it works

Model Browser

Subsystems Simulation Models

Name	Build Status
<input type="radio"/> Subassembly 1	<input checked="" type="radio"/>
<input type="radio"/> Subassembly 2	<input type="radio"/>

 Build

Details Build

Name	Build Status
Realize Internal Connections	<input checked="" type="radio"/>
Realize Internal GEBs	<input checked="" type="radio"/>
Source Numbering Rules	<input checked="" type="radio"/>
Subsystem Checks	<input checked="" type="radio"/>

Out-of-the-box, extensible by Script and Checks

Different Build Process at each modeling stage

The “Build Process” - How it works



Model Browser

Subsystems Simulation Models

Name	Build Status
Subassembly 1	●
Subassembly 2	●

Build

Details Build

Name	Build Status
Realize Internal Connections	●
Realize Internal GEBs	●
Source Numbering Rules	●
Subsystem Checks	●

Out-of-the-box, extensible by Script and Checks

Different Build Process at each modeling stage

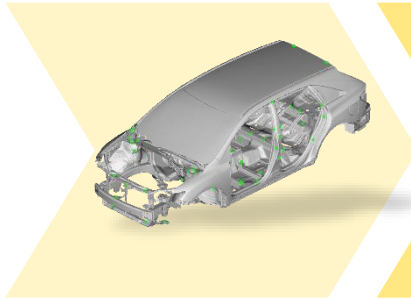
Visual indication of Build Status

Output of each Action stored in the ANSA file

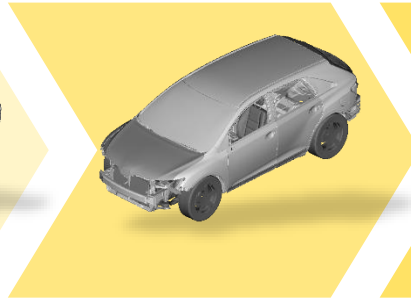
Build before Save

Halt save if Build fails

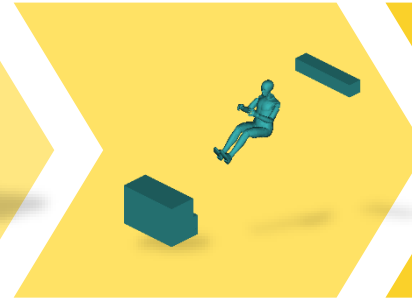
The “Build Process” - Scope



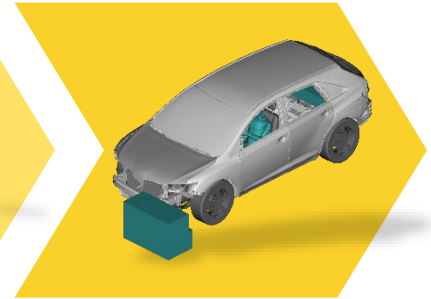
From **meshed parts**
and **connections** to
Subsystems



From **Subsystems**
to **Model Assembly**

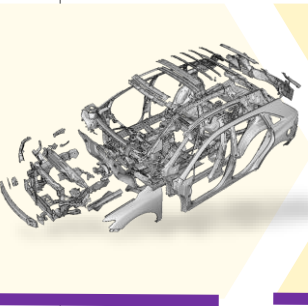


From **Library Files** to
Loadcase Templates

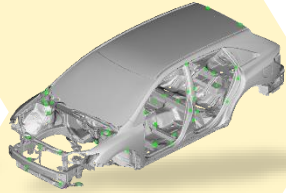


From **Model Assembly**
and **Loadcase Template**
to **Simulation Run**

The “Build Process” - Latest advances



From **translated parts** to **meshed parts**



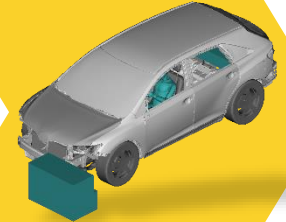
From **Regular** to **Reduced** Subsystems



From **Subsystems** to **Model Assembly** through **plain Connections**

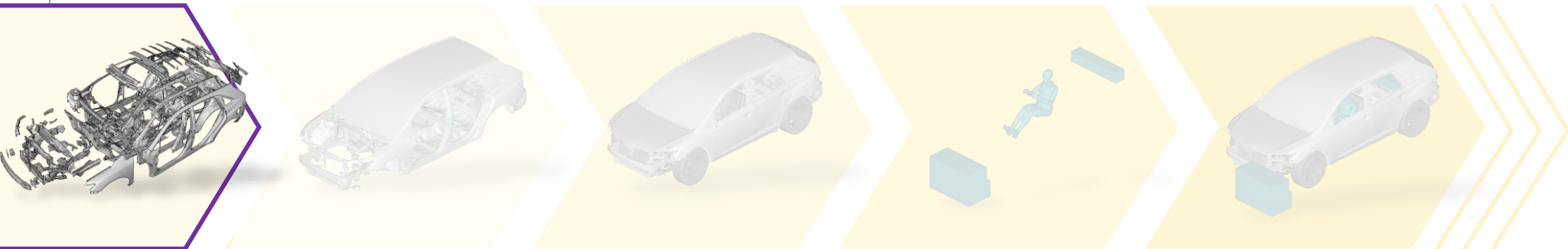


From **Target Points** to **Loadcase Templates**



From **parametric models** to **DOE Studies**

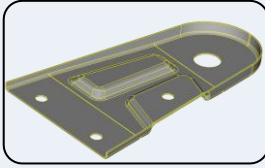
“Build Process” for Parts



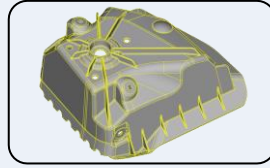
From **translated parts** to **meshed parts**

“Build Process” for Parts - Overall workflow

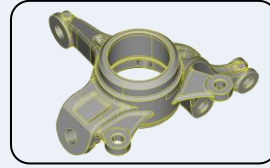
Part Type



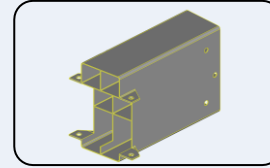
Sheet metal



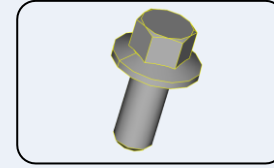
Casting



Solid



Extrusion



Fastener

“Build Process” for Parts - Overall workflow

Part Type

Sheet metal

Casting

Solid

Extrusion

Fastener

Target Treatment

Common

Surface Mesh

Volume Mesh

Casting

Extrusion

Connection

3D Rep

Overall workflow

CAD files
Translation

Part Type
Detection

Set Target
Treatment

Build

“Build Process” for Parts - How it works

Part Type

Sheet metal

Casting

Solid

Extrusion

Fastener

Target Treatment

Common

Surface Mesh

Volume Mesh



Casting





Extrusion

Connection

3D Rep

Overall workflow

Name	Part Type	Treatment
 Part 1	Sheet metal	Surface Mesh
 Part 2	Casting	Build

Name	Build Status
Check source representation	
Skin	
Check Skin Result	
Set Representation	

 common



“Build Process” for Parts - How it works

Part Type

Sheet metal

Casting

Solid

Extrusion

Fastener

Target Treatment

Common

Surface Mesh

Volume Mesh



Casting





Extrusion


Connection

3D Rep

Overall workflow

Name	Part Type	Treatment
 Part 1	Sheet metal	Surface Mesh
 Part 2	Casting	Build

Name	Build Status
Check source representation	
Meshing	
Check Mesh Result	
Set Representation	

 surface_mesh_5mm

 Data repository

“Build Process” for Parts - How it works

Part Type

Sheet metal

Casting

Solid

Extrusion

Fastener

Target Treatment

Common

Surface Mesh

Volume Mesh



Casting





Extrusion


Connection

3D Rep

Overall workflow

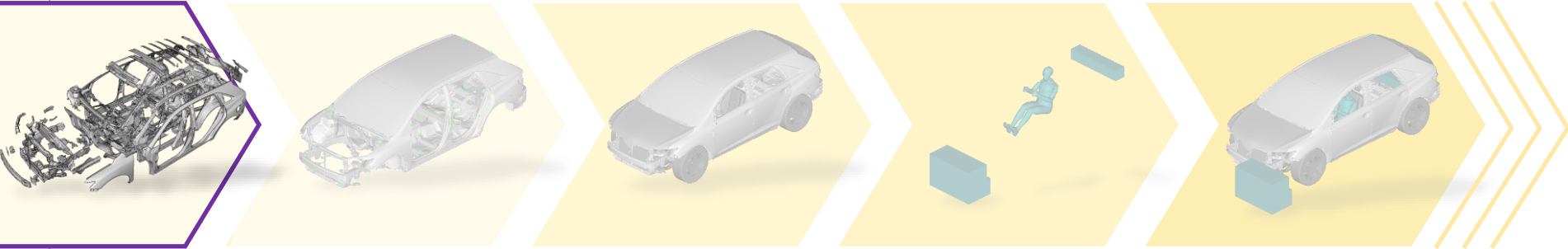
Name	Part Type	Treatment
 Part 1	Sheet metal	Surface Mesh
 Part 2	Casting	Casting

Name	Build Status
Check source representation	
Casting	
Check Result	
Set Representation	

 casting



“Build Process” for Parts - Value Added



Revamping Model Build: AI and Part Build
at the service of CAE modeling teams

Day 2 Thursday June 15, 2023

16:00 - 17:00 (Session 7E | Venus)

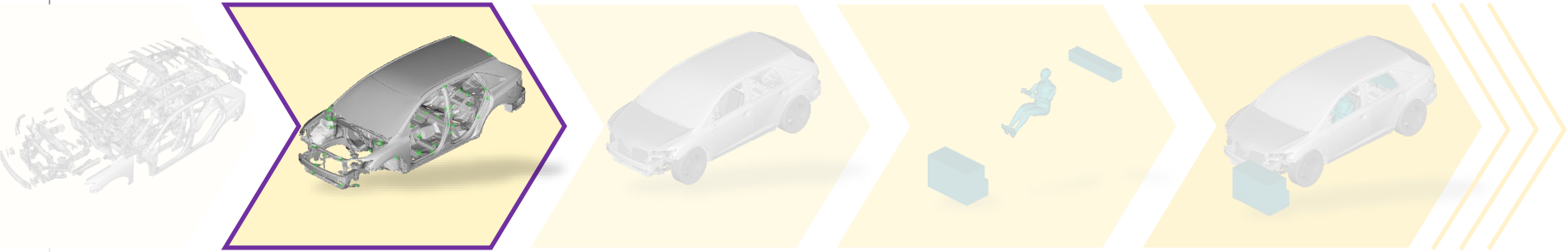
No need for custom scripts for parts processing

Only define mesh parameters

Effortless error tracking and correction

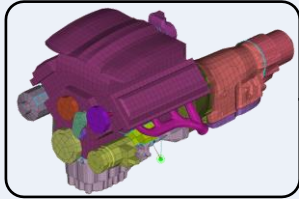
No need for comprehensive process log files

“Build Process” for Reduced Subsystems



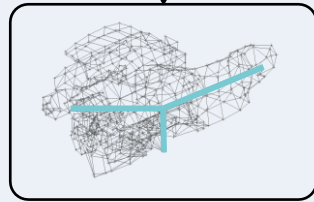
From **Regular** to
Reduced
Subsystems

“Build Process” for Reduced Subsystems - Overall workflow



Wizard

Regular Subsystem



Superelement

Build

Save in DM

Create Simulation Runs

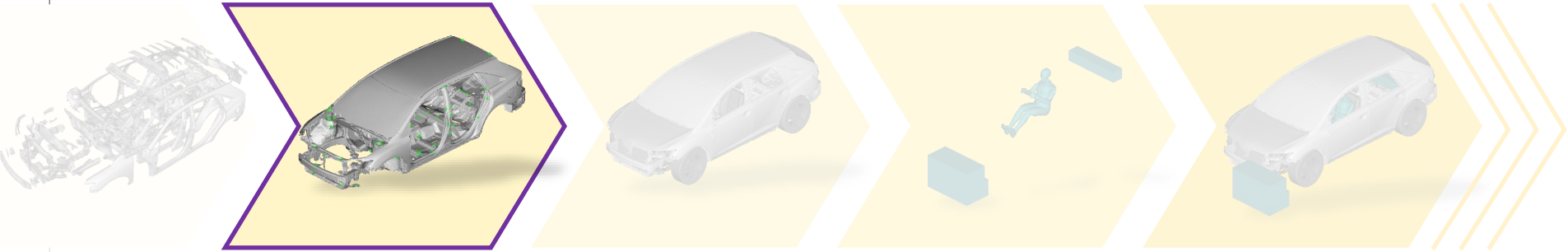
Superelement
Not solved

Submit to HPC

Superelement
Solved



“Build Process” for Reduced Subsystems - Value Added



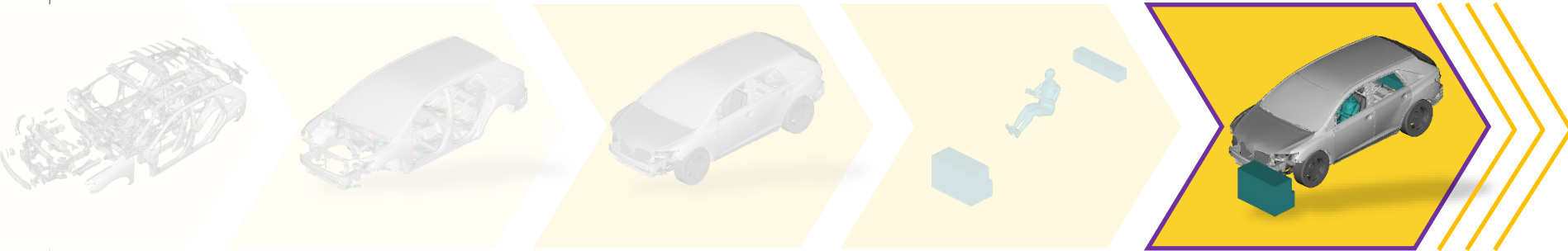
Version control Reduced and Display Subsystems

Create Variations of Reduced Subsystems

Keep track of model origin

Submit reduction run locally or on HPC

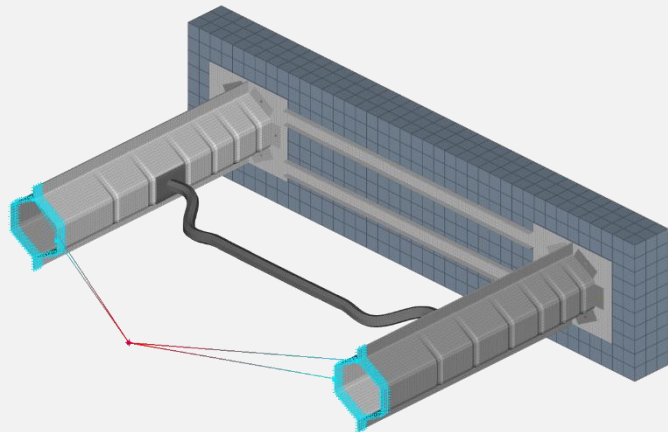
Robustness and Optimization Studies



From **parametric models** to
DOE Studies

Robustness and Optimization Studies - Parametric Modular Models

With Solver Parameters

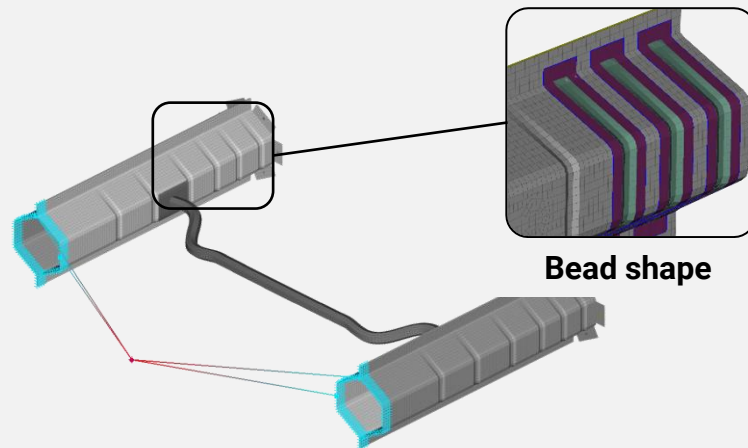


Parameterization with MB Parameters

Start from Run

Only new Runs are generated

With Morph Parameters



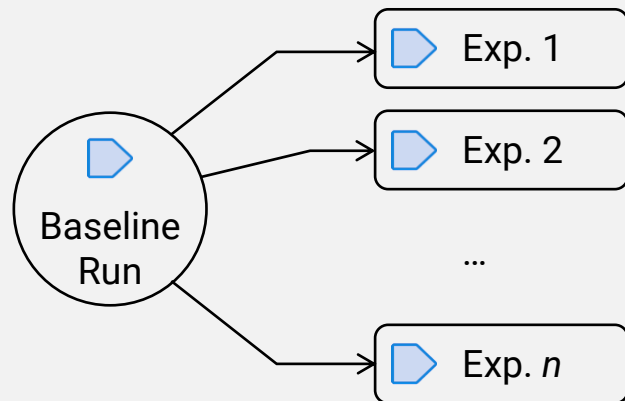
Parameterization with morphing parameters

Start from Subsystem

New Subsystems, Models & Runs are generated

Robustness and Optimization Studies - Parametric Modular Models

With Solver Parameters

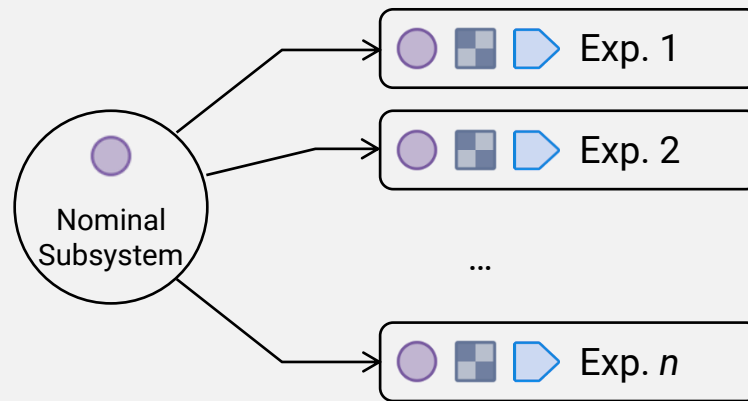


Parameterization with MB Parameters

Start from Run

Only new Runs are generated

With Morph Parameters



Parameterization with morphing parameters

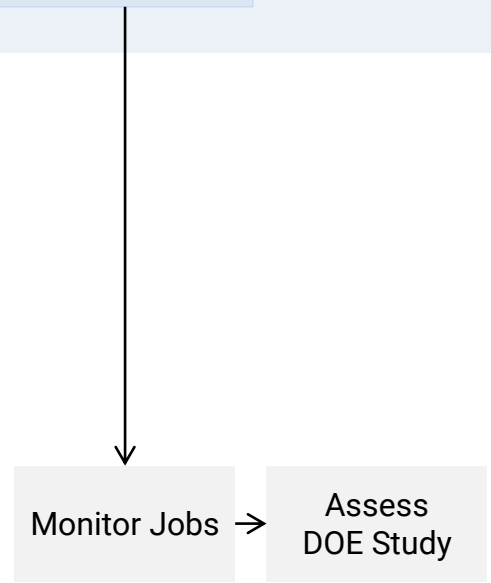
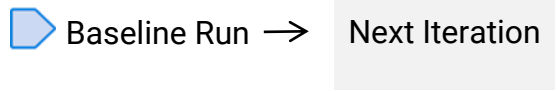
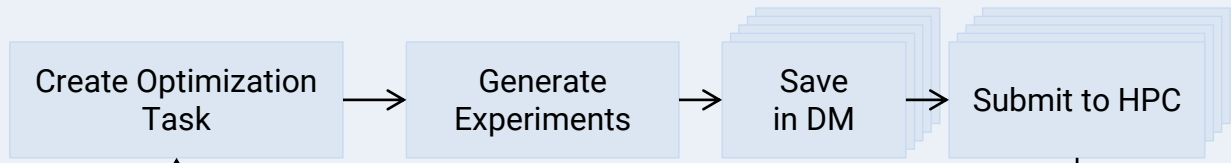
Start from Subsystem

New Subsystems, Models & Runs are generated

Robustness and Optimization Studies - Overall workflow



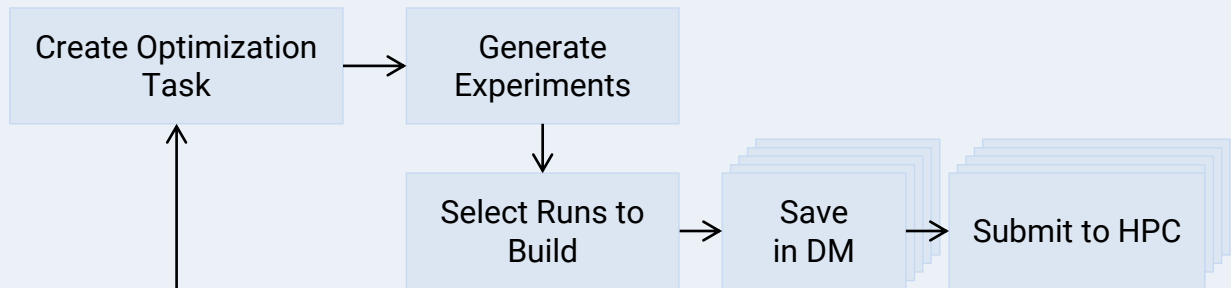
Optimization Tool



Robustness and Optimization Studies - Overall workflow



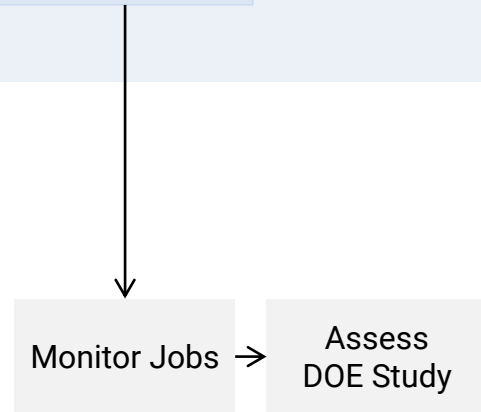
Optimization Tool



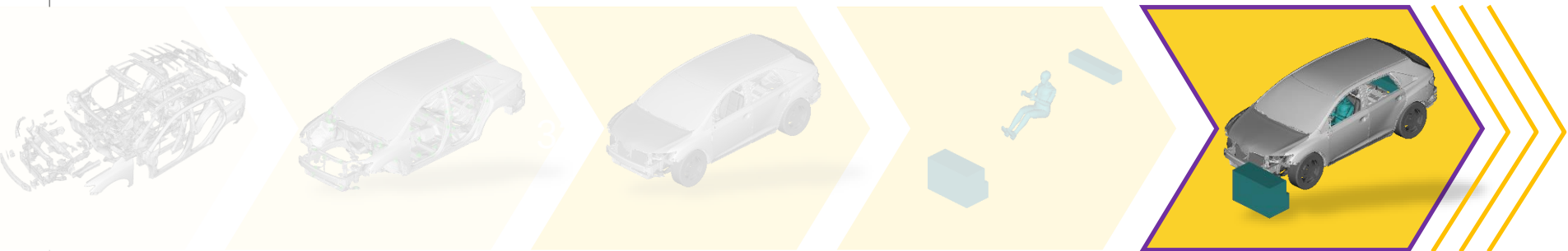
Nominal Subsystem



Next Iteration



Robustness and Optimization Studies - Value Added



Design Optimization in the Modular Environment: from setup to HPC submission and post-processing
Day 2 Thursday June 15, 2023
17:00 - 17:30 (Session 7E | Venus)

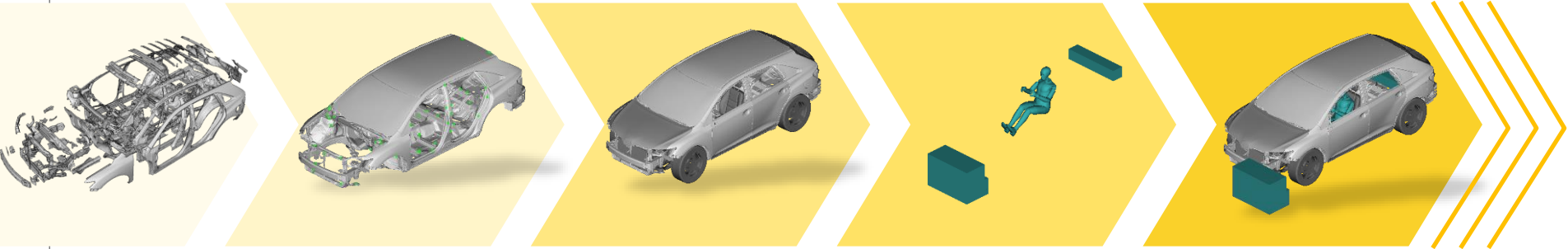
Solutions for all optimization scenarios

Modular storage ensures minimum data footprint

HPC Submission of experiments through ANSA

Create Optimization Studies with ML

End-to-end Modular Methodology

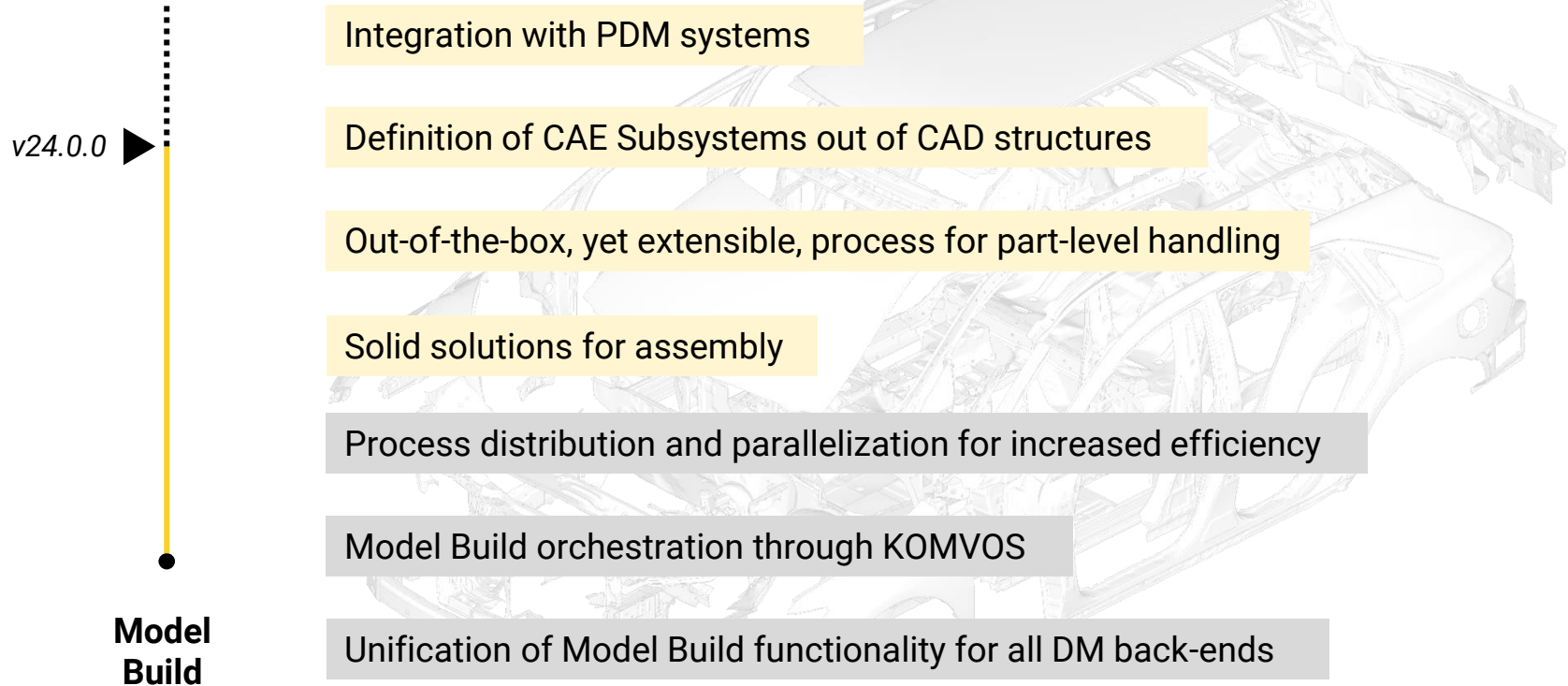


Are we there yet?

Where do we stand?

What are we up to?

Model Build: Current status and future course



Simulation Run Management for Crash/Safety: Current status and future course

v24.0.0



Out-of-the-box, yet extensible, process for crash-specific model assembly

Set-up of shareable Loadcase Templates

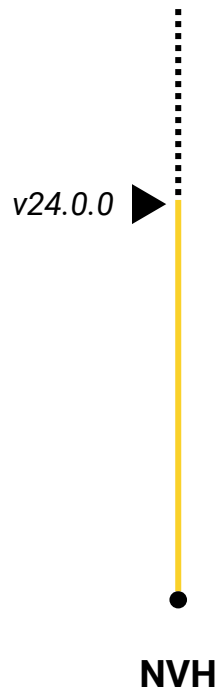
Support of all Pedestrian protection & Occupant safety protocols

Robustness and Optimization Studies on parametric models

One-click Build for multiple Simulation Runs

Crash/Safety

Simulation Run Management for NVH: Current status and future course



Out-of-the-box, yet extensible, process for NVH-specific model assembly

Loadcase Headers to cover all Nastran Loadcases

Nastran Restarts and Loads from file

Reduced Models (SE)

Robustness and Optimization Studies on parametric models

Complete integration of NVH Console capabilities

One-click Build for multiple Simulation Runs

Simulation Run Management for Durability: Current status and future course

v24.0.0



Out-of-the-box, yet extensible, process for model assembly

Linear / non-linear Subsystems derivation for different Loadcases

Loadcase Headers to cover all Nastran and Abaqus Loadcases

Nastran Restarts and Loads from file

Reduced Models (SE)

Robustness and Optimization Studies on parametric models

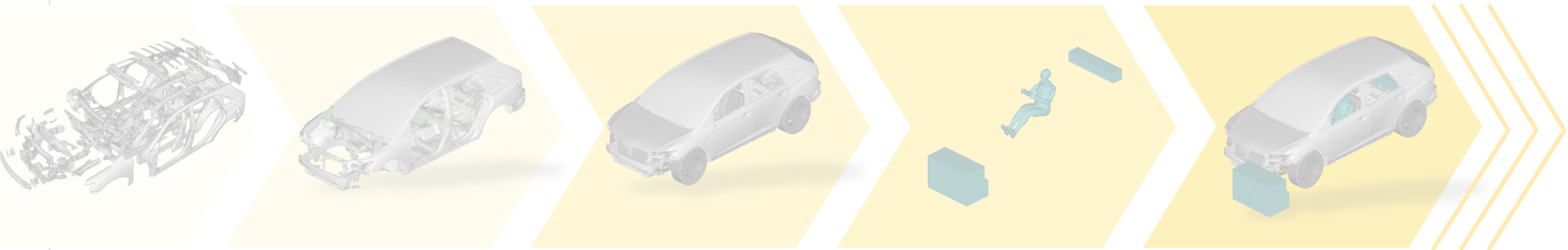
Integration of Model Cut in Build Process

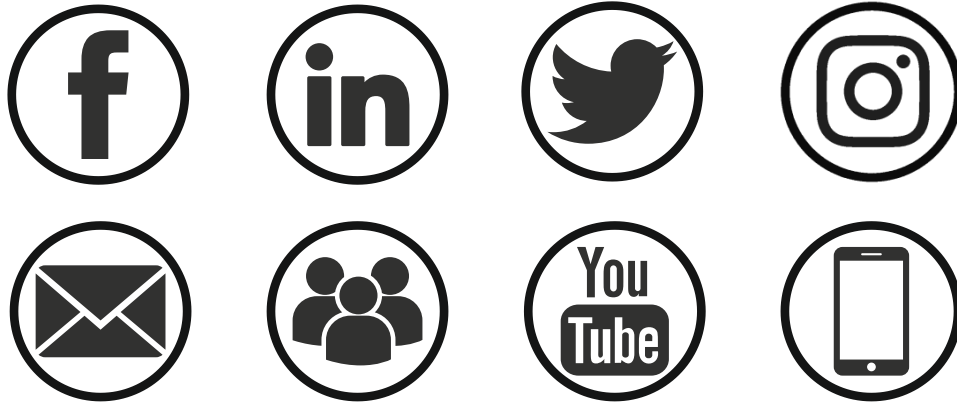
One-click Build for multiple Simulation Runs

**Strength/
Durability**

In closing

- Built-in methodologies for Simulation Run preparation
- Covers mainstream workflows and variations
- End-to-end process coverage
- Standardization - Automation - Traceability





Stay connected