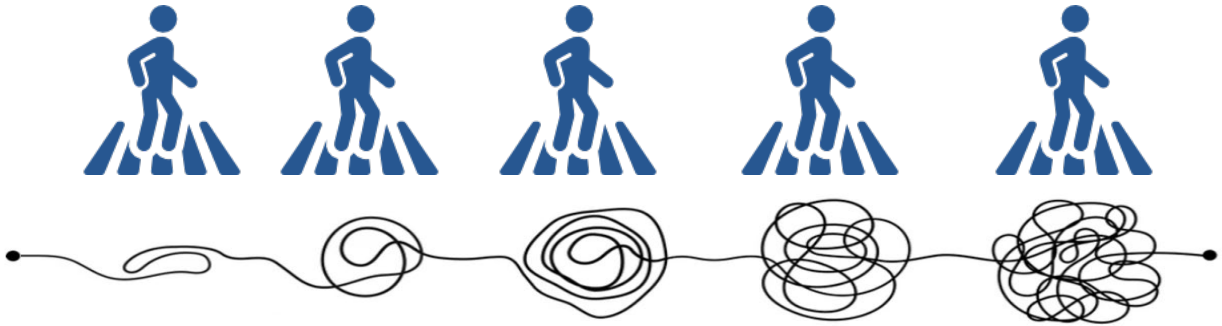
BETA
SIMULATION SOLUTIONS

An enhanced modular approach for addressing the complexity of pedestrian analysis

N. Tsartsarakis, A. Lioras

physics on screen



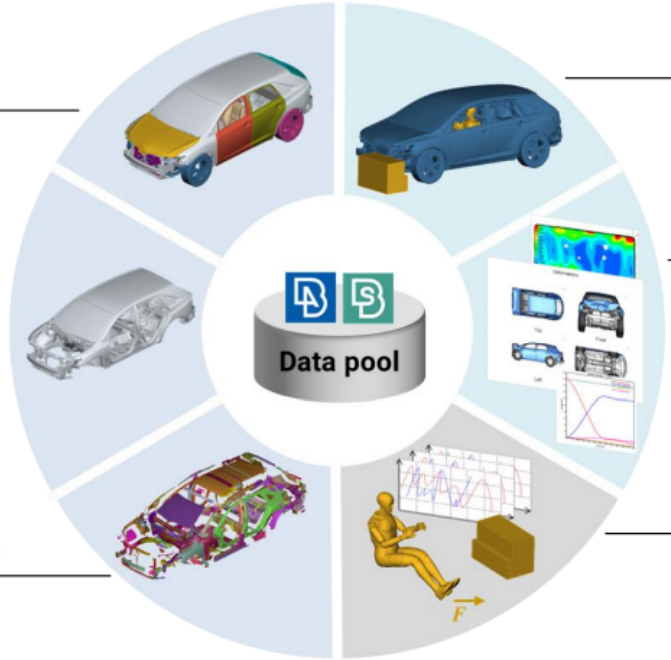
Introduction

- Complexity of Pedestrian analysis
  - Different Loadcases
  - Large numbers of solver runs
  - Handling of post process data (reports,images,curves)
  - Numerous model iterations with a subset of solved target points

Introduction

- Requirements:
  - Efficient visualization
  - Interaction with automation processes
  - Comparison between model variations
  - Combine it with Modular approach

Modular approach



Simulation Models

Vehicle configurations
Analysis requirements

Simulation Runs

Simulated phenomena
Analyst iterations

Subsystems

Variants
CAD releases
Representations
Analyst iterations

Results

Key results
Reports

Parts & Connections

CAD Versions
FE representations

Library data

Material data
Header files
Dummies and Barriers
Measurement data
Loadcase Templates

- Complete solution for the run complexity
  - Subsystem
  - Simulation Model
  - Loadcase
  - Simulation Run
- Enables traceability
- Identify relationships
- Generate Iterations

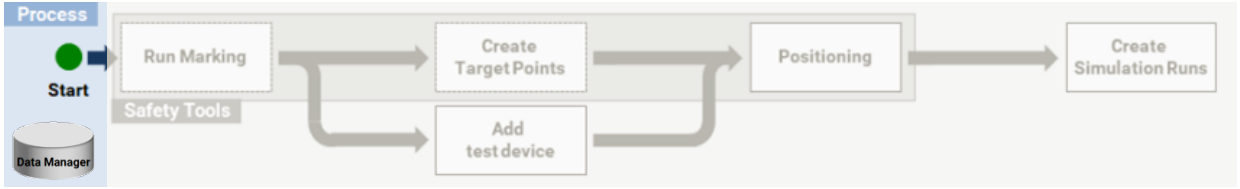
Simulation Data Management systems

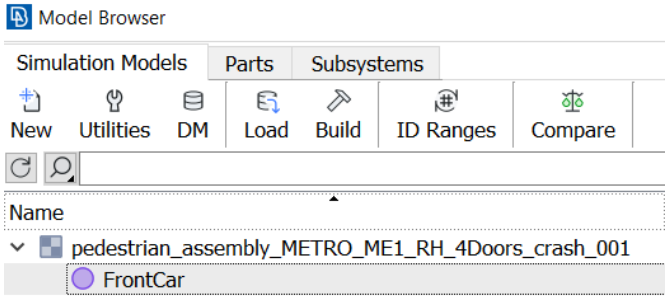
	File-based DM	Server-based DM
Server	-	SPDRM Server
Client (desktop)	KOMVOS	
Client (embedded in BETA Suite Apps)	ANSA & META	

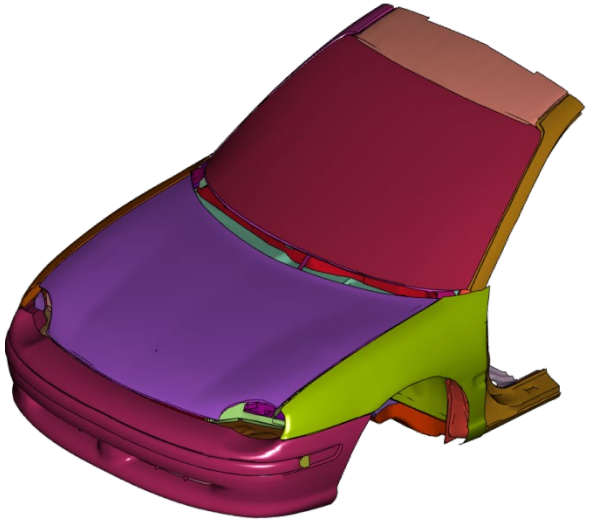
- Two Simulation Data Management solutions
  - File-based DM
  - Server-based DM (SPDRM)
- KOMVOS:
  - Standalone front-end application
- ANSA & META:
  - Pre and Post processor
  - Interaction with DM

Build Modular Pedestrian Loadcase in ANSA

- Start with a specific Simulation Model

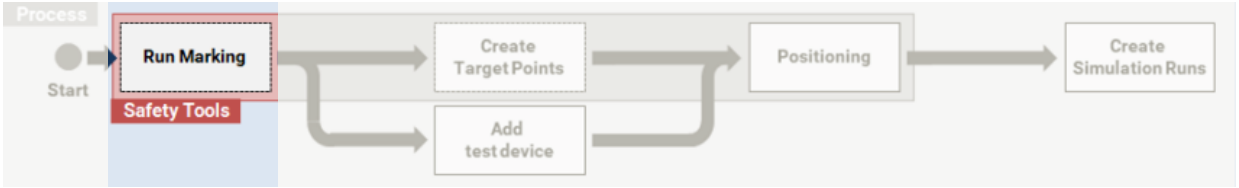


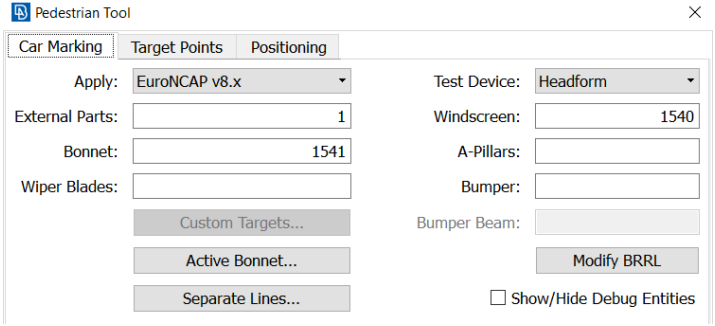




Build Modular Pedestrian Loadcase in ANSA

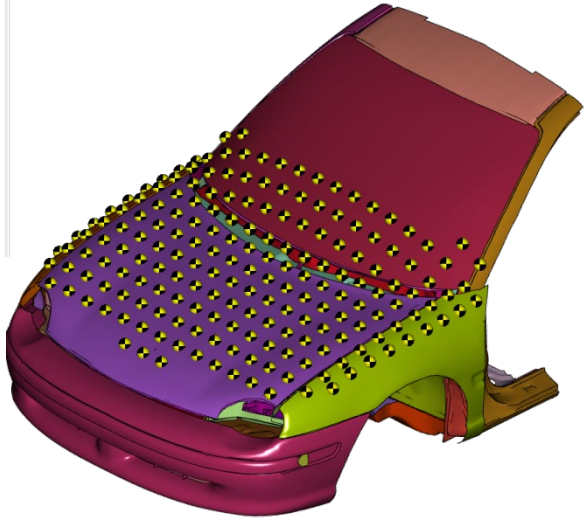
- Start with a specific Simulation Model
- Mark using Pedestrian tool of ANSA



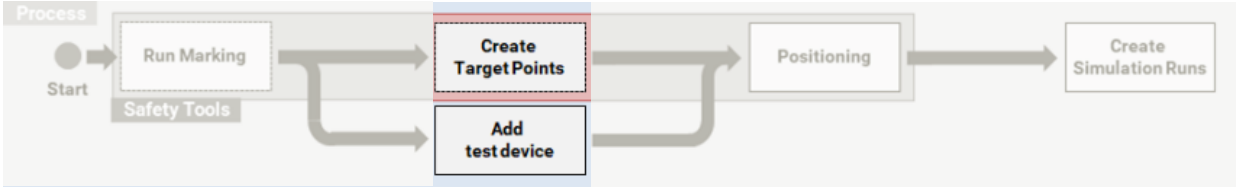


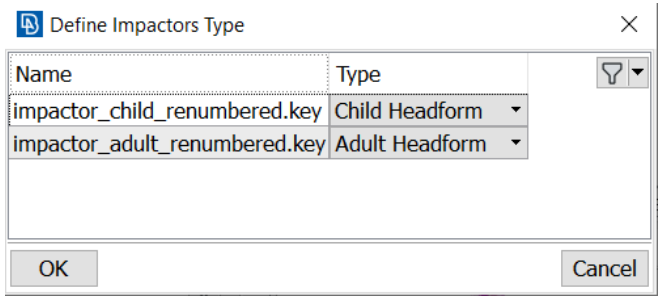
Available for...

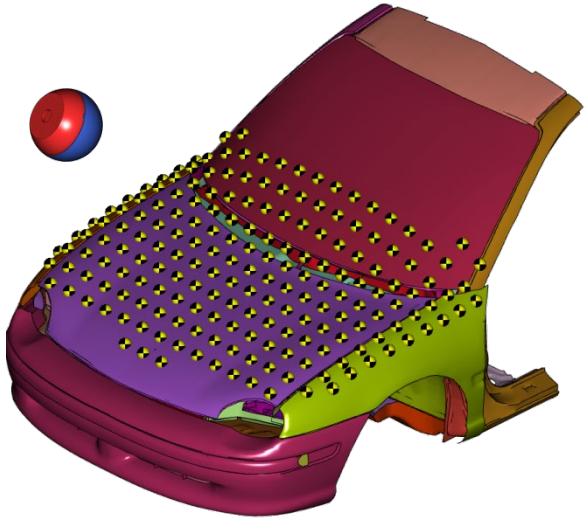
EuroNCAP
GTR-9
C-NCAP
JNCAP
KNCAP
C-IASI
ANCAP
TRIAS 63
GB/T-China
...



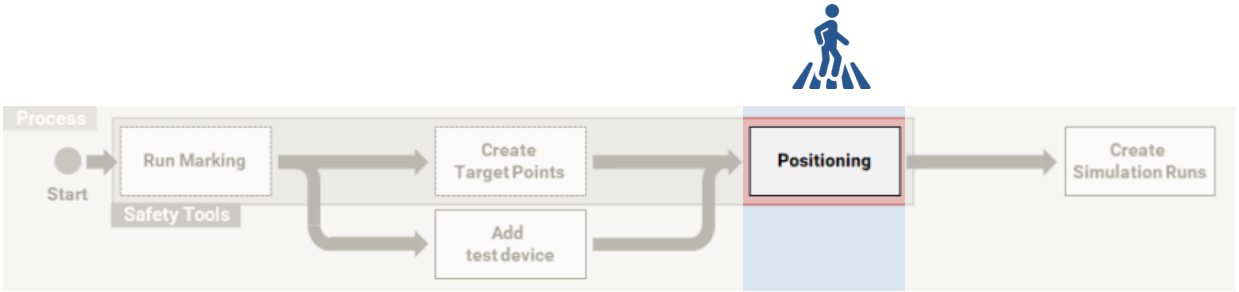
Build Modular Pedestrian Loadcase in ANSA

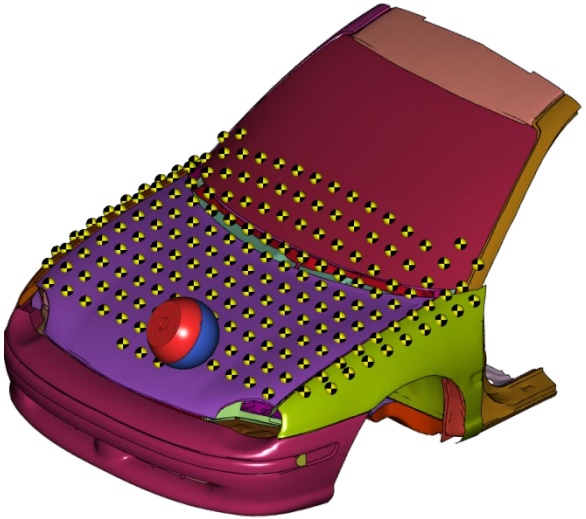






- Start with a specific Simulation Model
- Mark using Pedestrian tool of ANSA
- Add Impactors from DM library

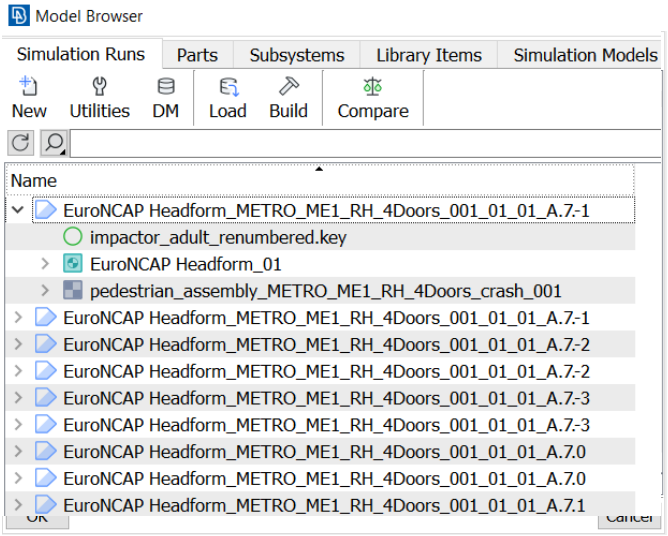




Build Modular Pedestrian Loadcase in ANSA

- Start with a specific Simulation Model
- Mark using Pedestrian tool of ANSA
- Add Impactors from DM library
- Position impactor for all target points

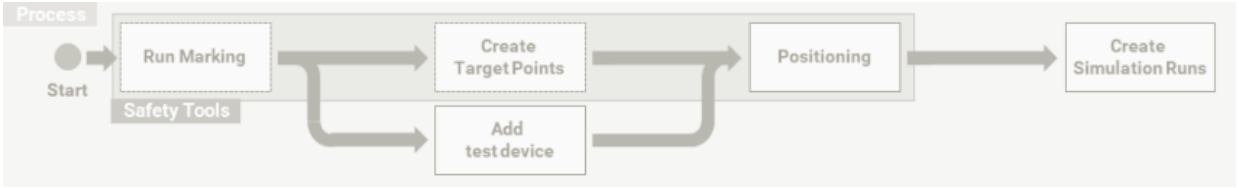
Build Modular Pedestrian Loadcase in ANSA

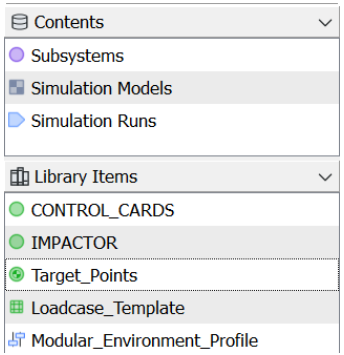


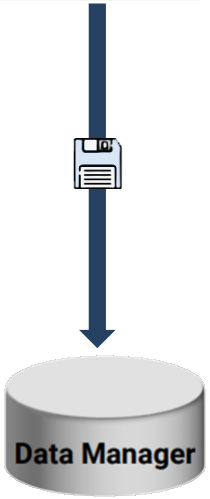
- Start with a specific Simulation Model
- Mark using Pedestrian tool of ANSA
- Add Impactors from DM library
- Position impactor for all target points
- Create Simulation Runs

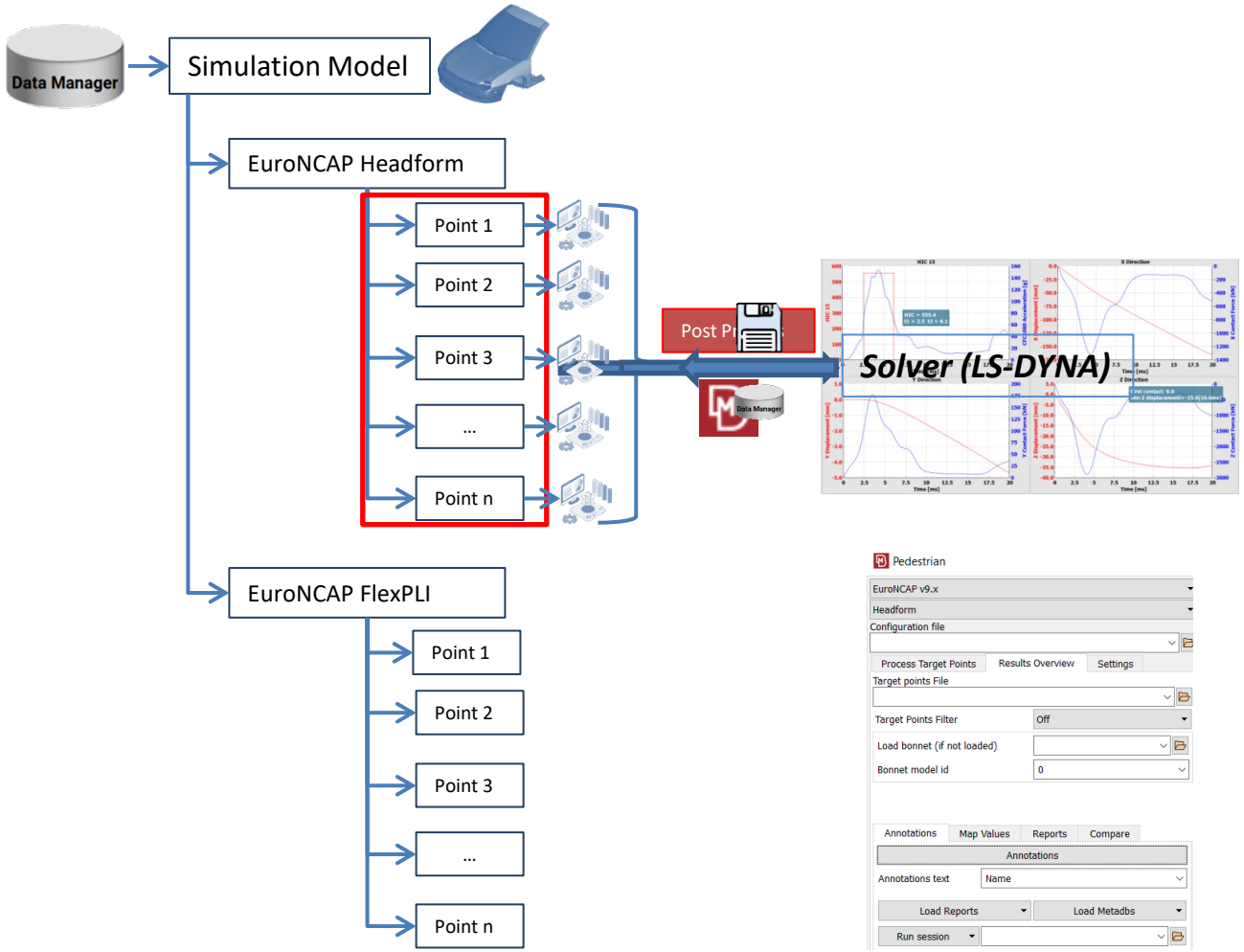
Build Modular Pedestrian Loadcase in ANSA

- Store Items in DM
  - Simulation Model
  - Loadcase
  - Simulation Run
  - Transformations for each target point



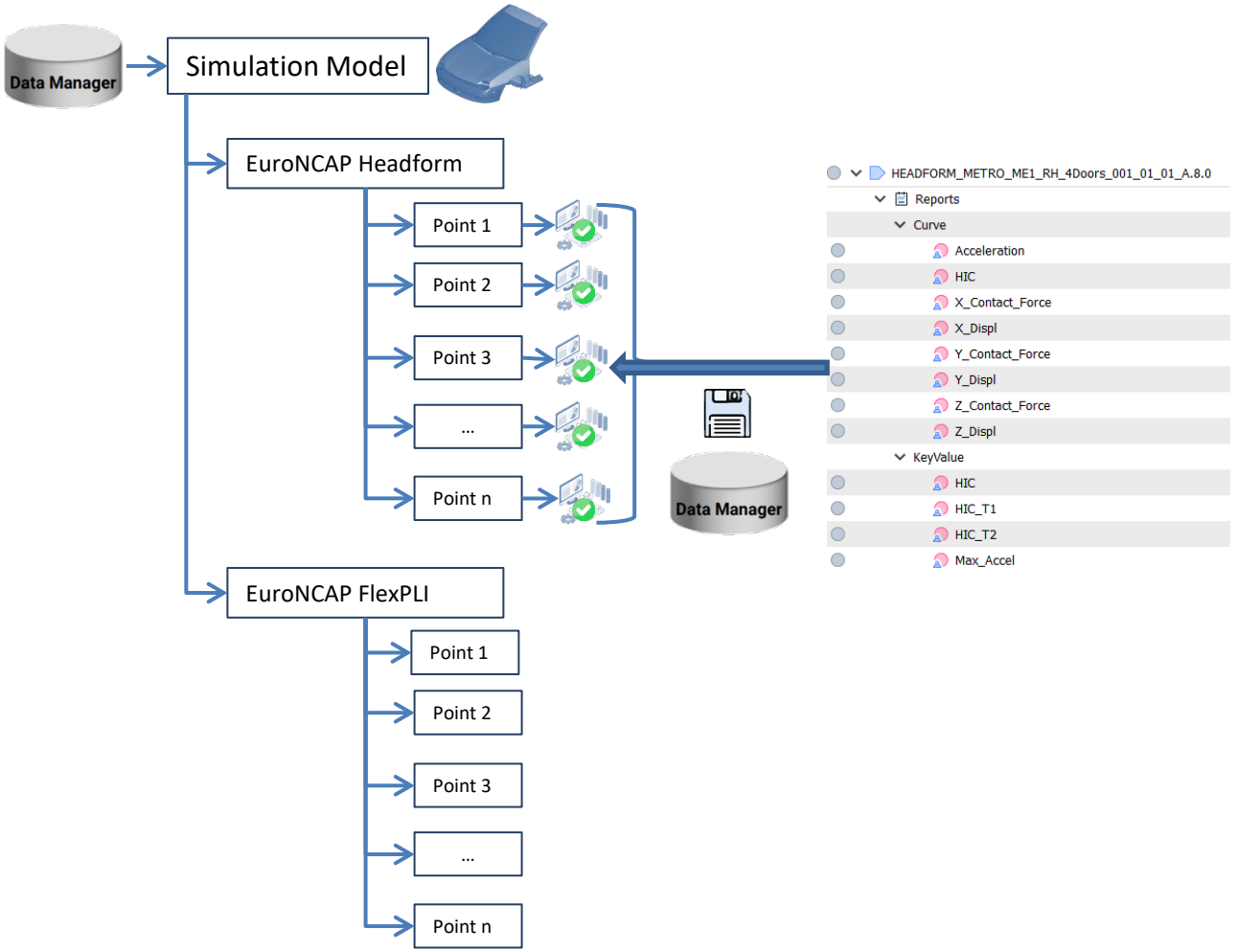






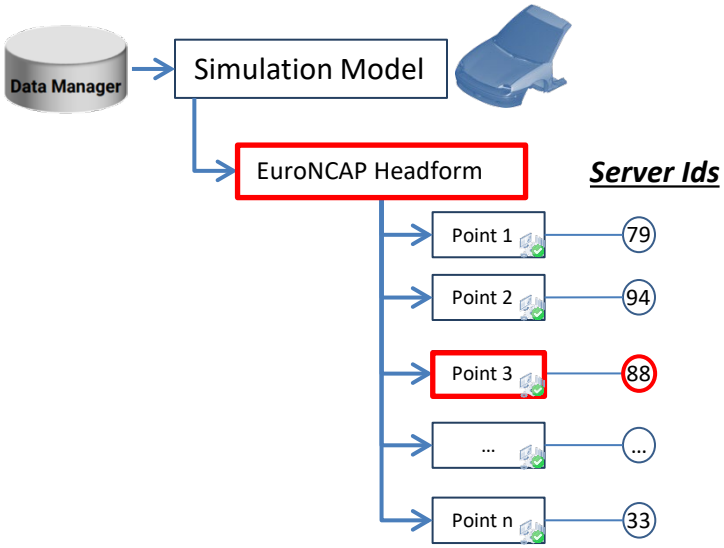
Post-process Pedestrian Loadcase from DM

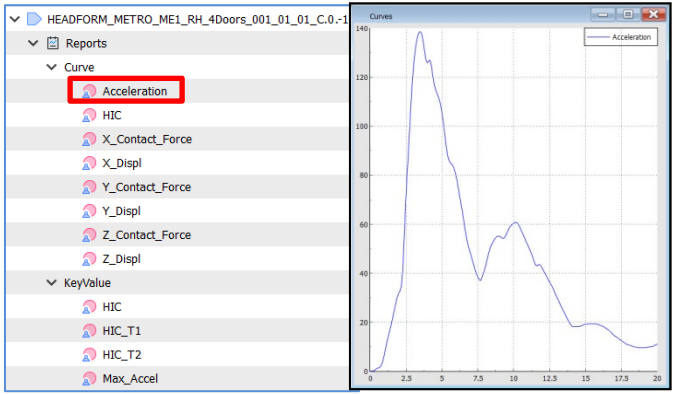
- Solve Simulation Runs (LS-DYNA)
- Store Solver output results(e.g. d3plot/binout) under relative simulations
- Apply post-process actions on specific simulations
- Close interaction with Pedestrian tool of META

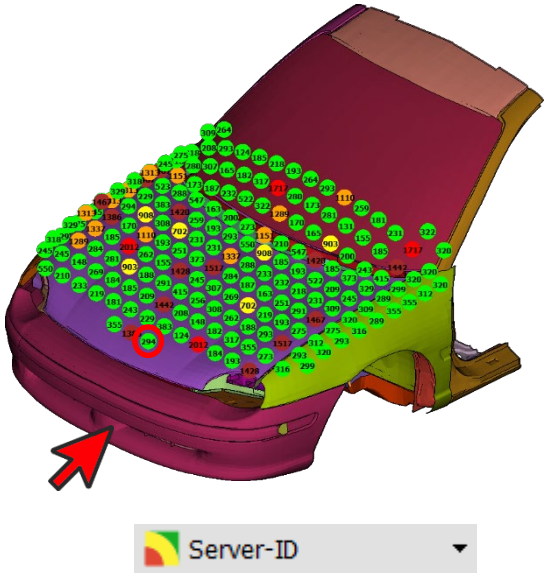


Post-process Pedestrian Loadcase from DM

- Store results in DM under relative Simulation Runs

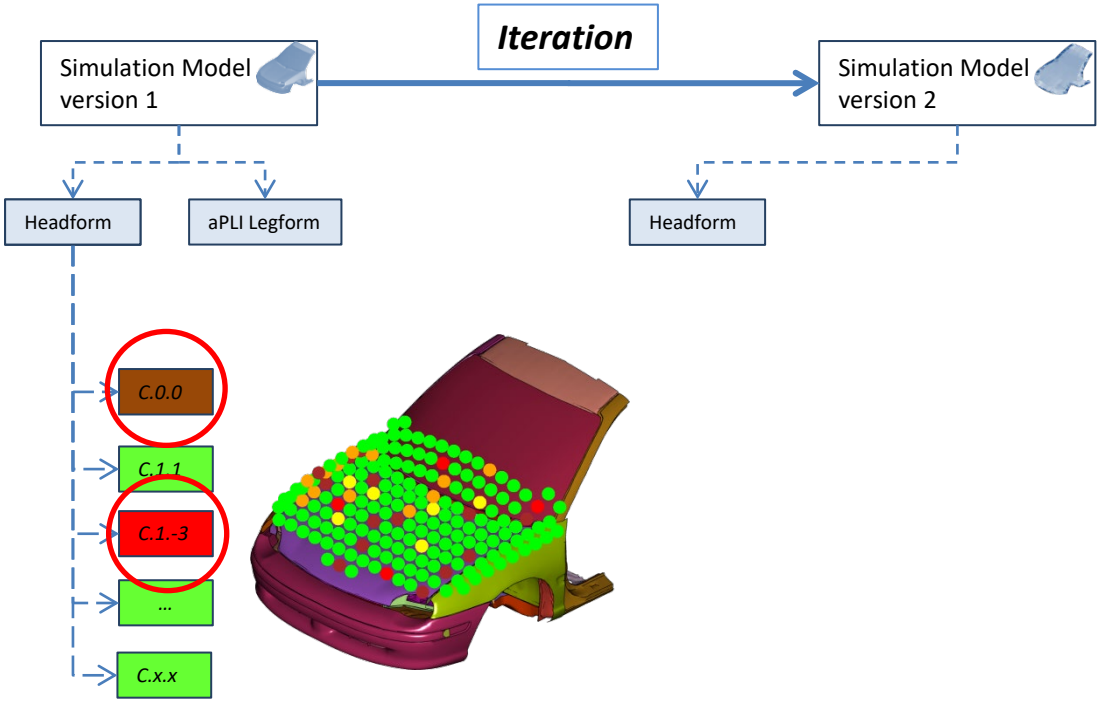






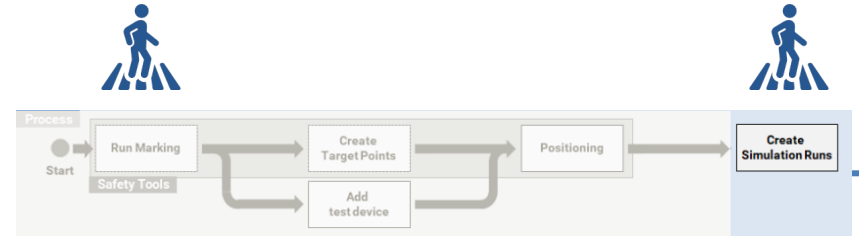
Post-process Pedestrian Loadcase from DM

- Achieve overview visualization of key results
- Data linked to Simulation Runs
- Get data visualization of selected Simulation Runs

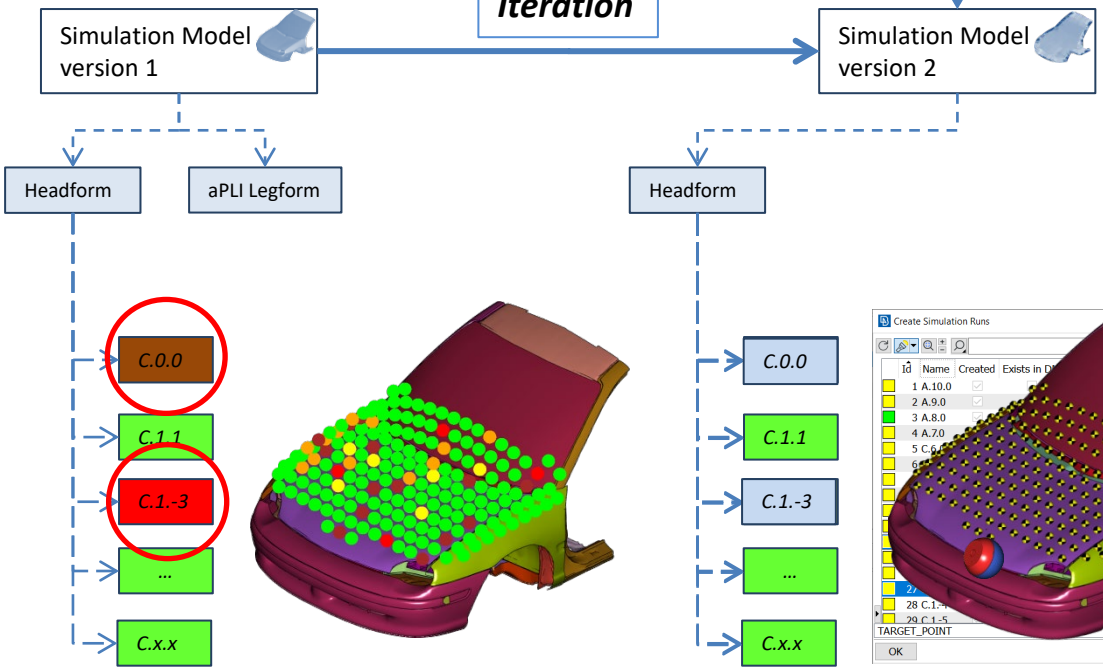


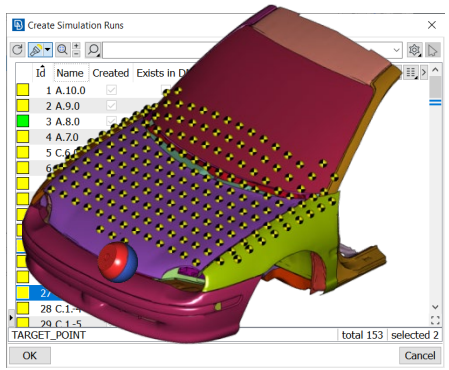
Post-process Pedestrian Loadcase from DM

- Identify points that need improvement
- Create Simulation Model iteration
- Use the Loadcase from the Parent Model



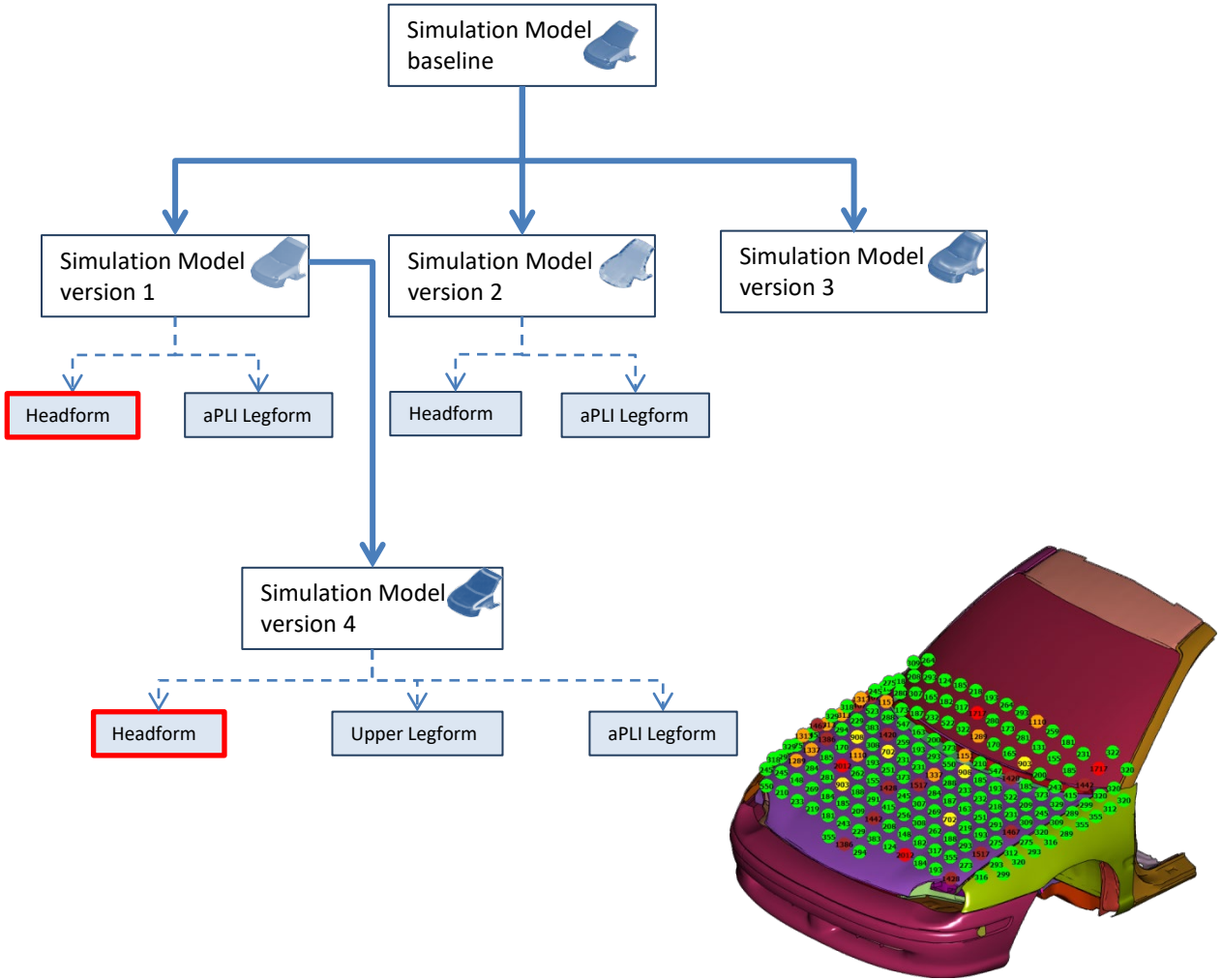
OR





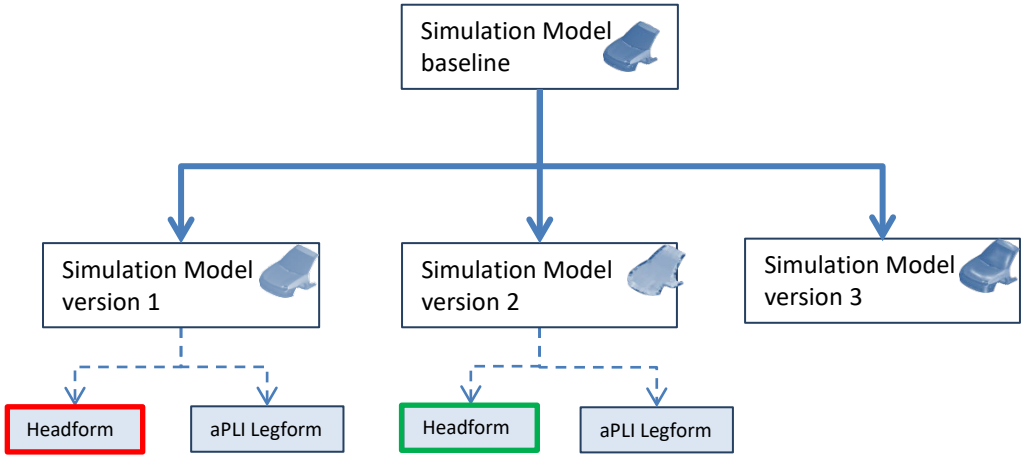
Post-process Pedestrian Loadcase from DM

- Create Simulations Runs for the model variant directly (e.g. changes in underhood parts)
- Rerun Marking if needed(e.g. changes in the exterior)
- Achieve new overview



Post-process Pedestrian Loadcase from DM

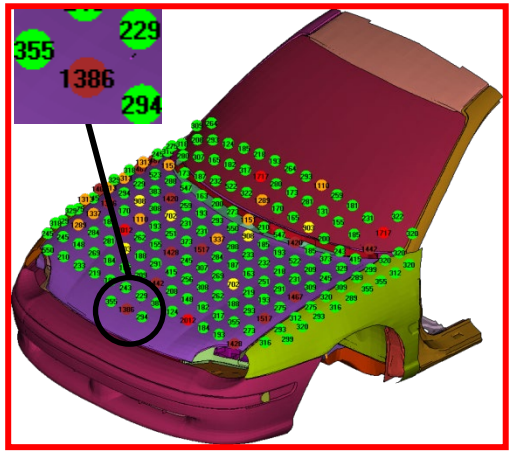
- Include key values of previous Simulation Model versions

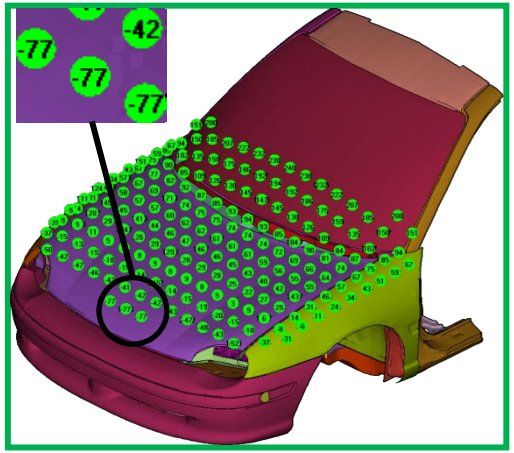


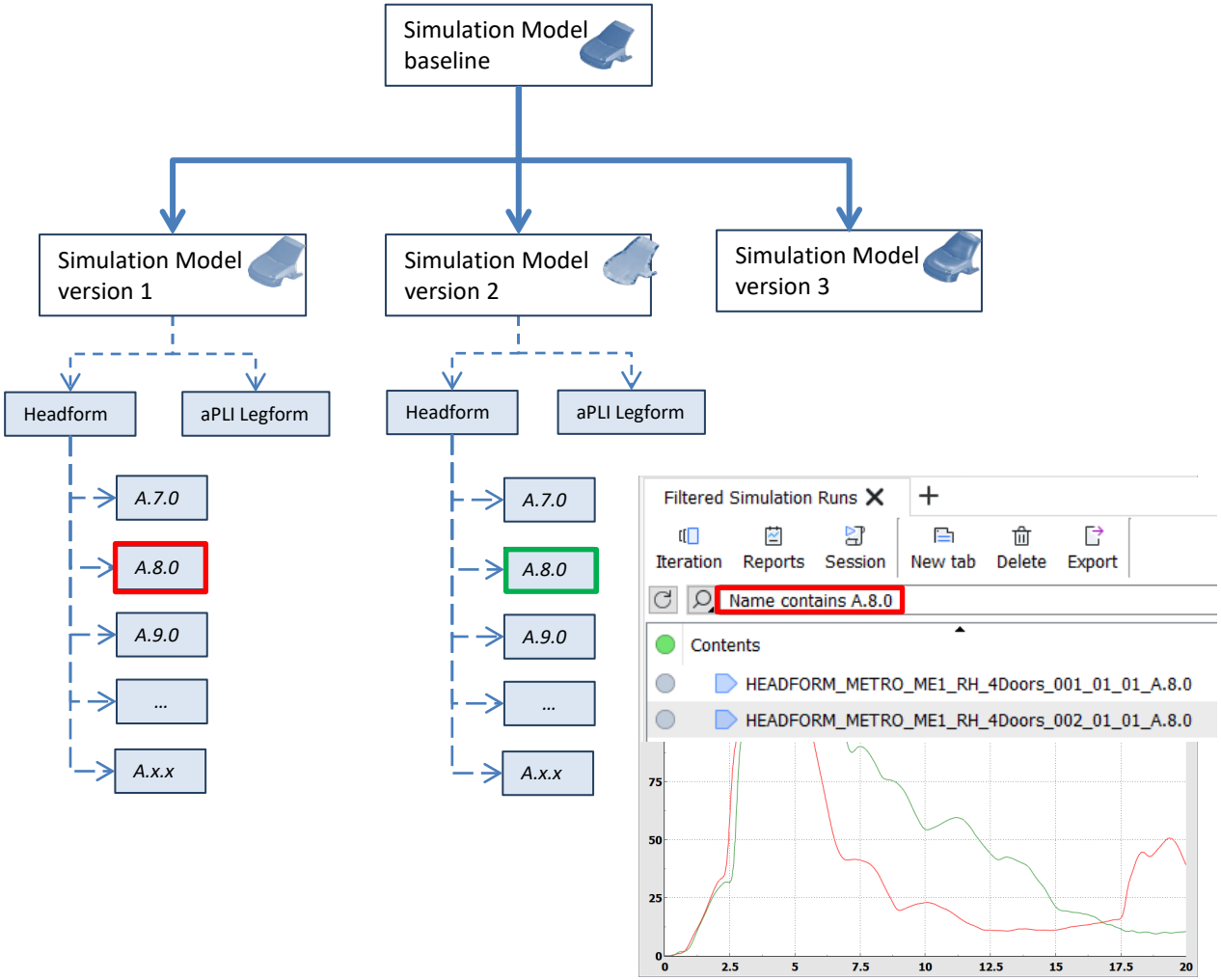
Post-process Pedestrian Loadcase from DM

- Include key values of previous Simulation Model versions
- Compare overview between different model iterations
- Calculate key value differences

HIC Difference

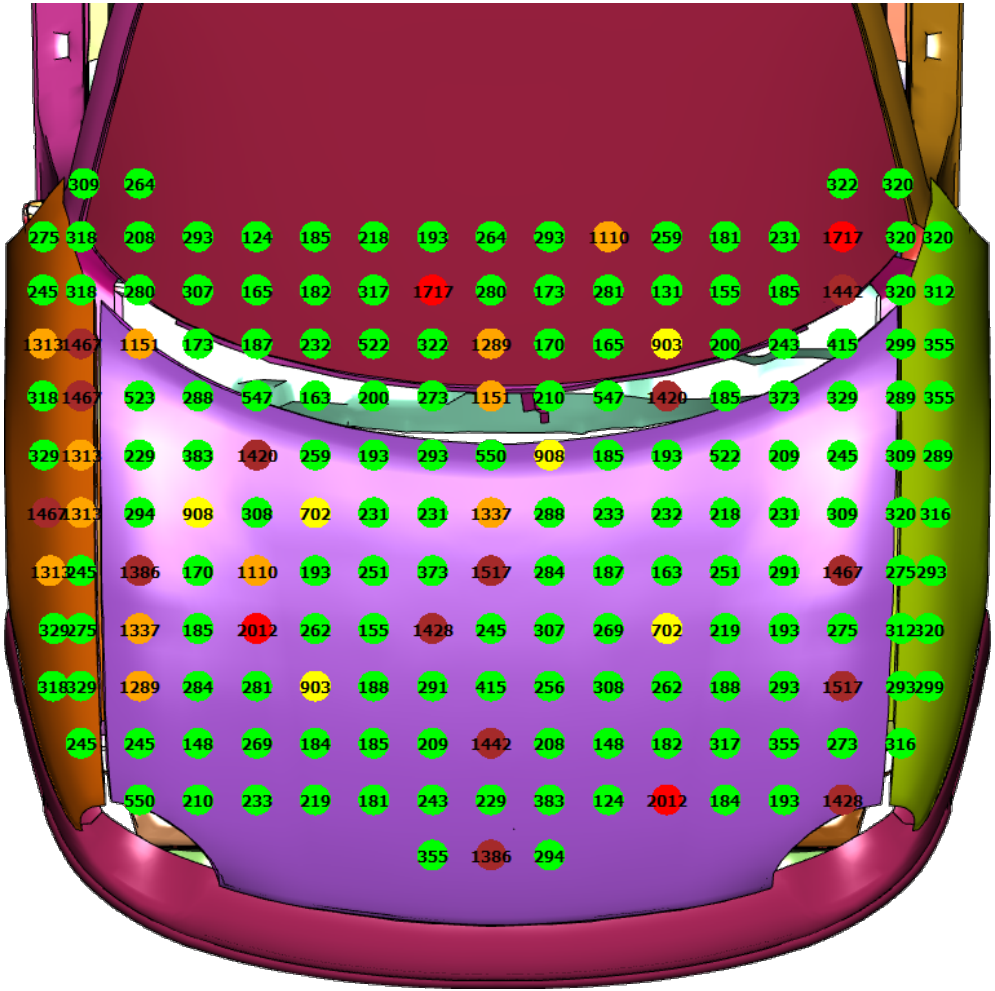






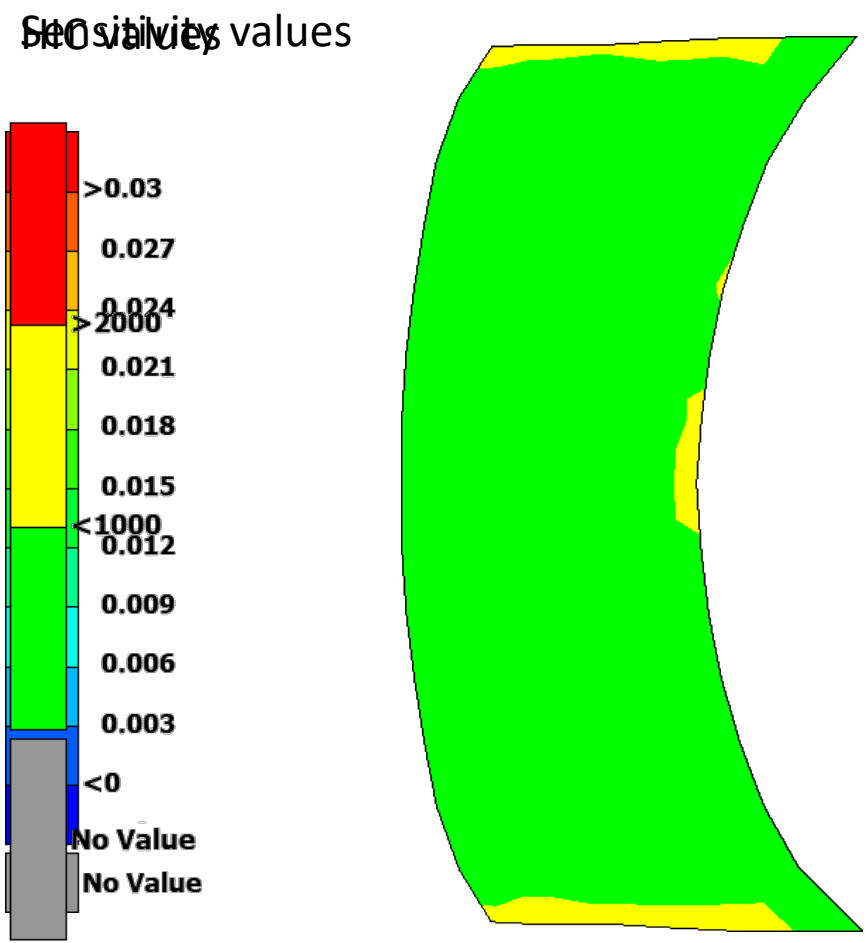
Post-process Pedestrian Loadcase from DM

- Query filtering to isolate specific entities
- Compare key values between different model iteration
- Compare curve data in the same plot



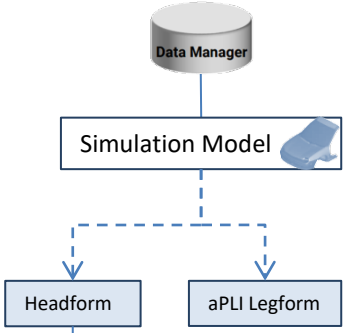
Post-process Pedestrian Loadcase from DM

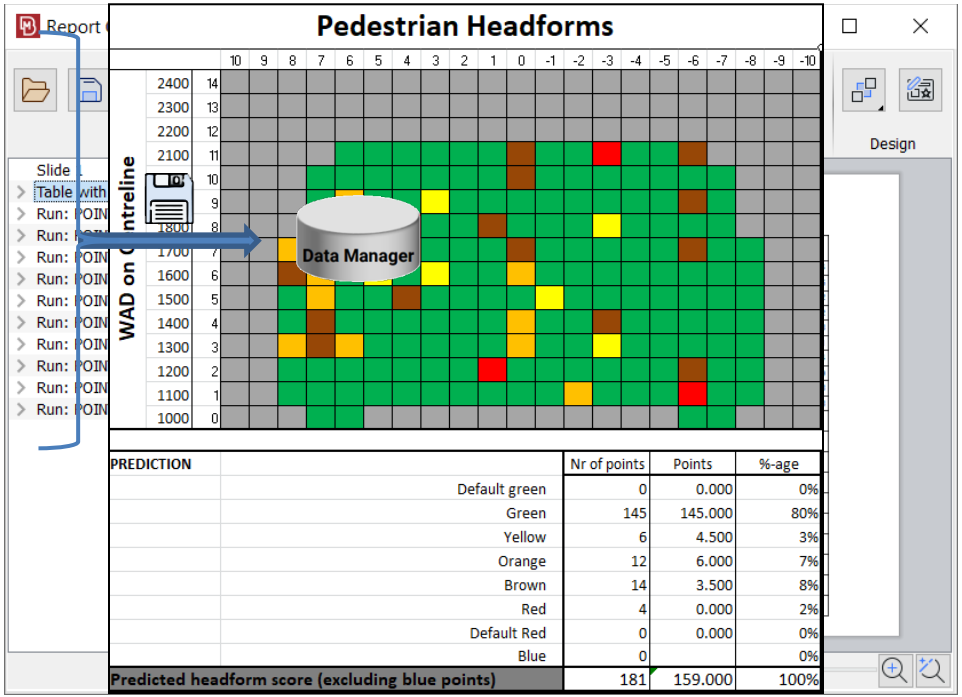
- Apply band sensitivity analysis
- Identify target points with HIC value close to band limits
- Border line of circular points is colored respectively



Post-process Pedestrian Loadcase from DM

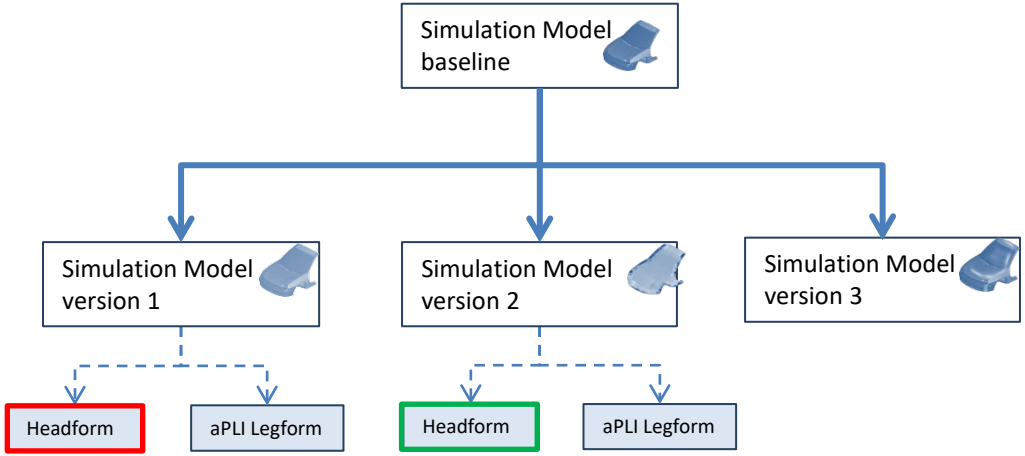
- Apply area sensitivity analysis for EU Phase
- Identify subareas with highest sensitivity to HIC changes

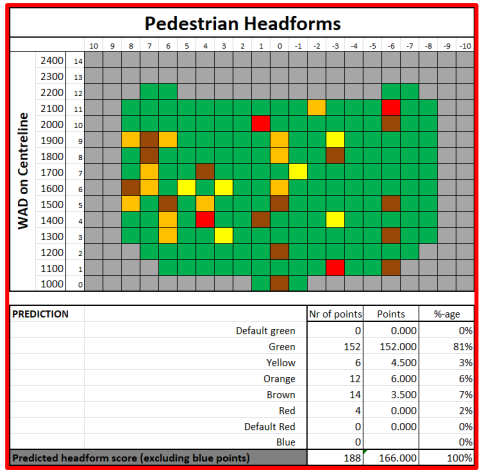




Post-process Pedestrian Loadcase from DM

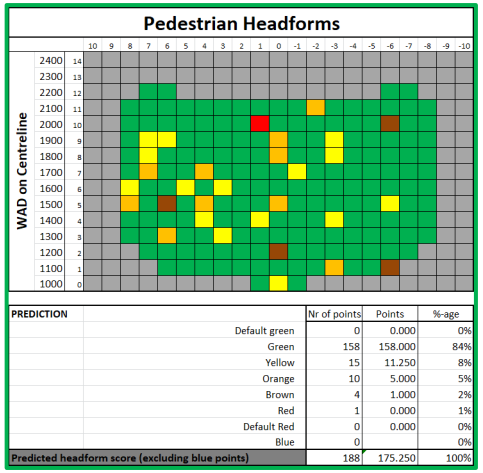
- Calculate overview report
- Generate EuroNCAP spreadsheet
- Save in DM under respective Loadcase





PREDICTION	Nr of points	Points	%-age
Default green	0	0.000	0%
Green	152	152.000	81%
Yellow	6	4.500	3%
Orange	12	6.000	6%
Brown	14	3.500	7%
Red	4	0.000	2%
Default Red	0	0.000	0%
Blue	0		0%
Predicted headform score (excluding blue points)	188	166.000	100%

TOTAL SCORE: 21.191



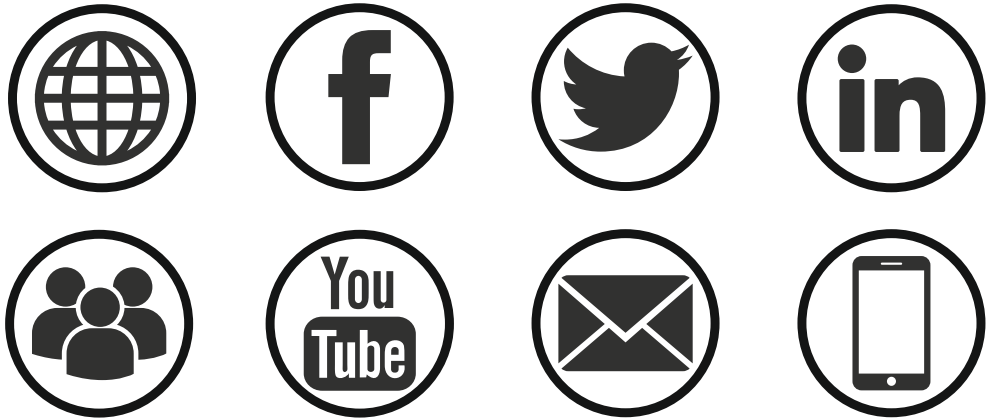
PREDICTION	Nr of points	Points	%-age
Default green	0	0.000	0%
Green	158	158.000	84%
Yellow	15	11.250	8%
Orange	10	5.000	5%
Brown	4	1.000	2%
Red	1	0.000	1%
Default Red	0	0.000	0%
Blue	0		0%
Predicted headform score (excluding blue points)	188	175.250	100%

TOTAL SCORE: 22.372

Post-process Pedestrian Loadcase from DM

- Calculate overview report
- Generate EuroNCAP spreadsheet
- Save in DM under respective Loadcase
- Compare EuroNCAP spreadsheets between different model iterations

BETA
SIMULATION SOLUTIONS



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