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Innovation Intelligence®

Aufbau und Kontrolle von LS-Dyna Modellen in HyperCrash

Christian Alscher

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Graphical User Interface

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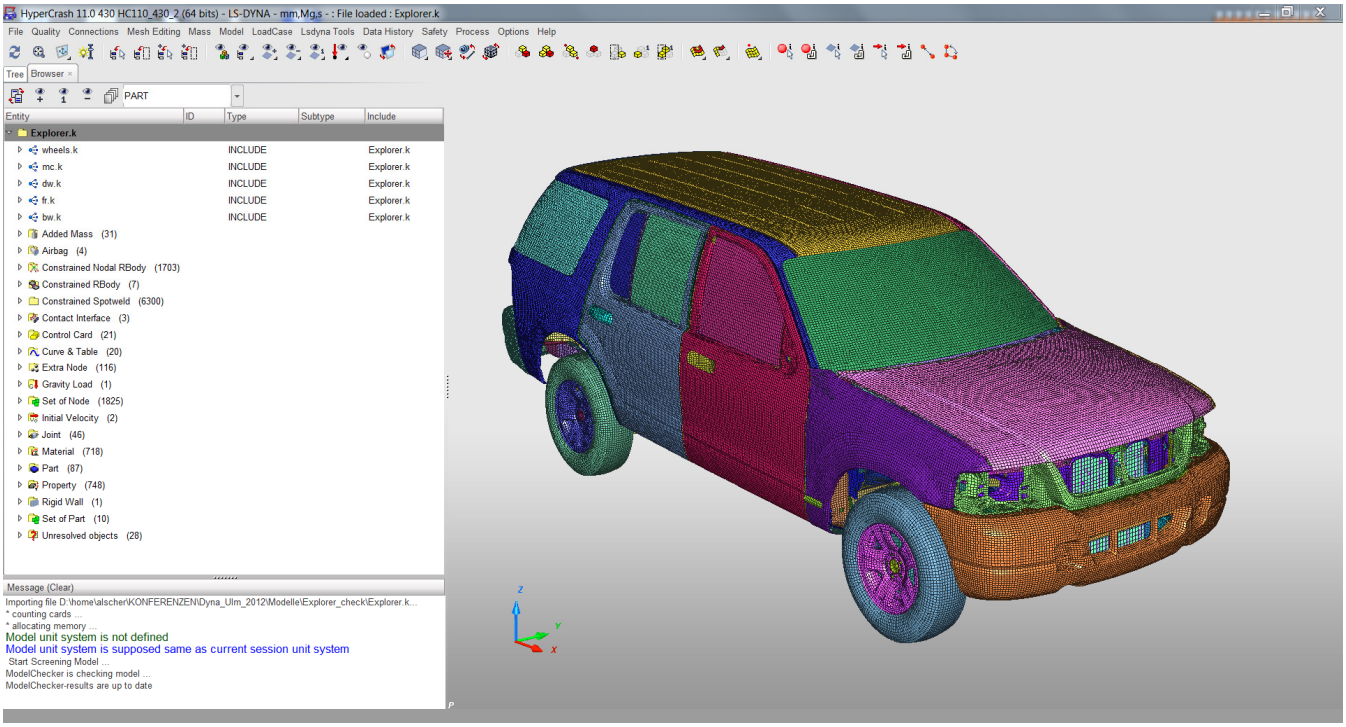

WebEx

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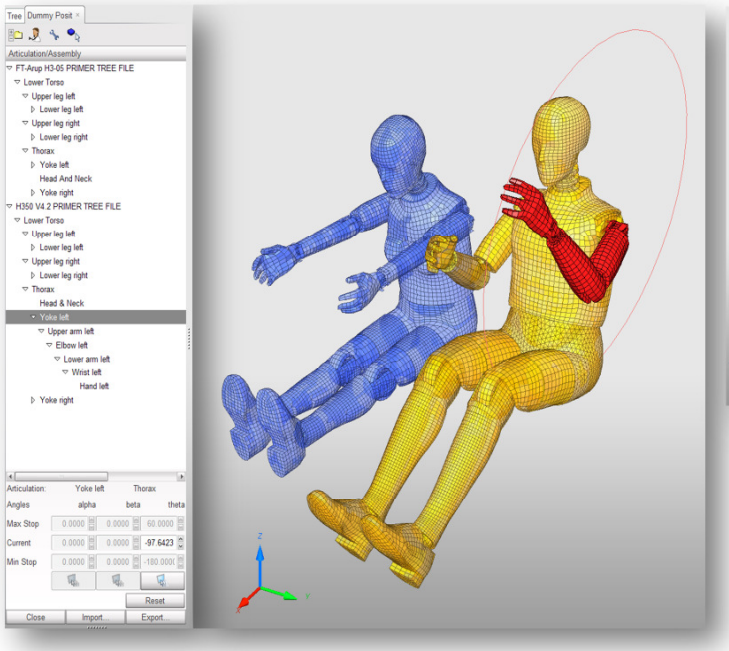
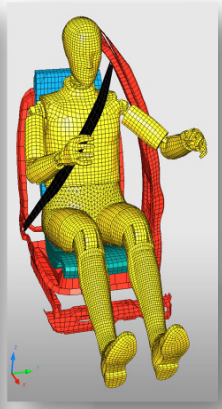
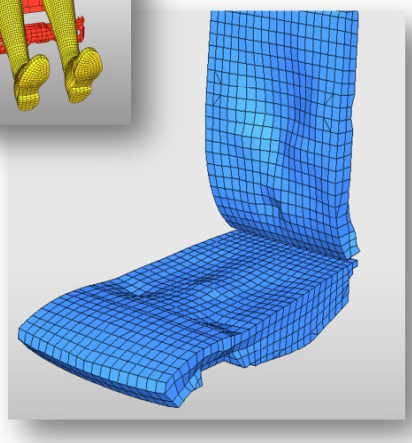
Safety Tools







Dummy Positioning
Belt Routing
Seat Deformer

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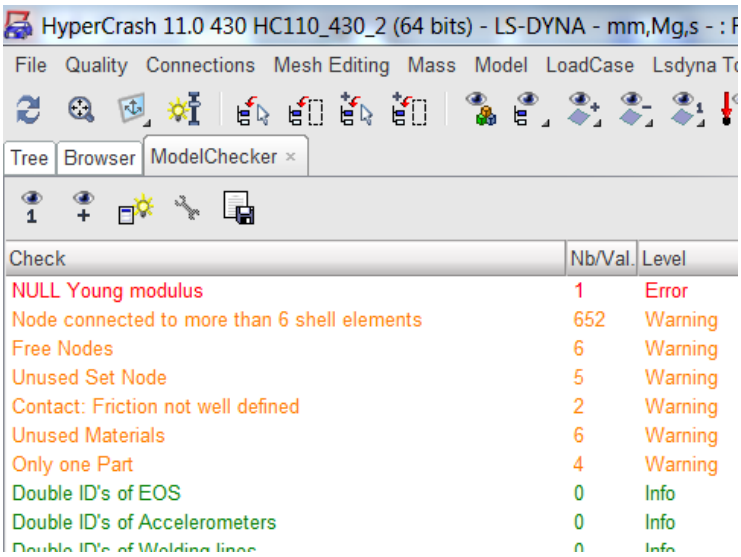
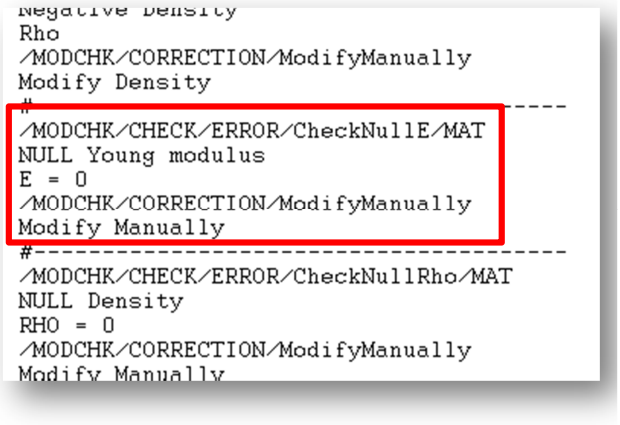
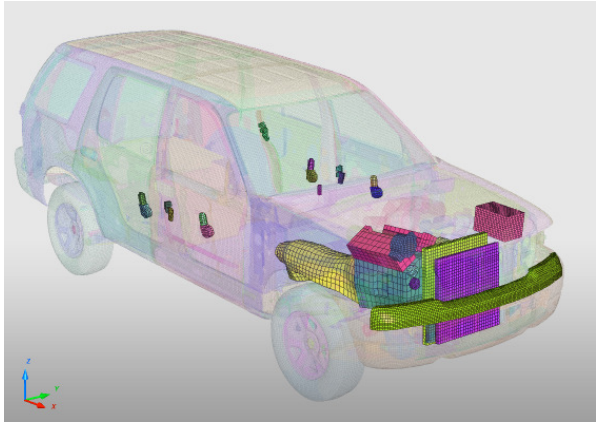
Model Checker





- Global model check with automatic fix tools to avoid modeling errors
- Individual checks can be added by a config file



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Replace Parts and Assemblies

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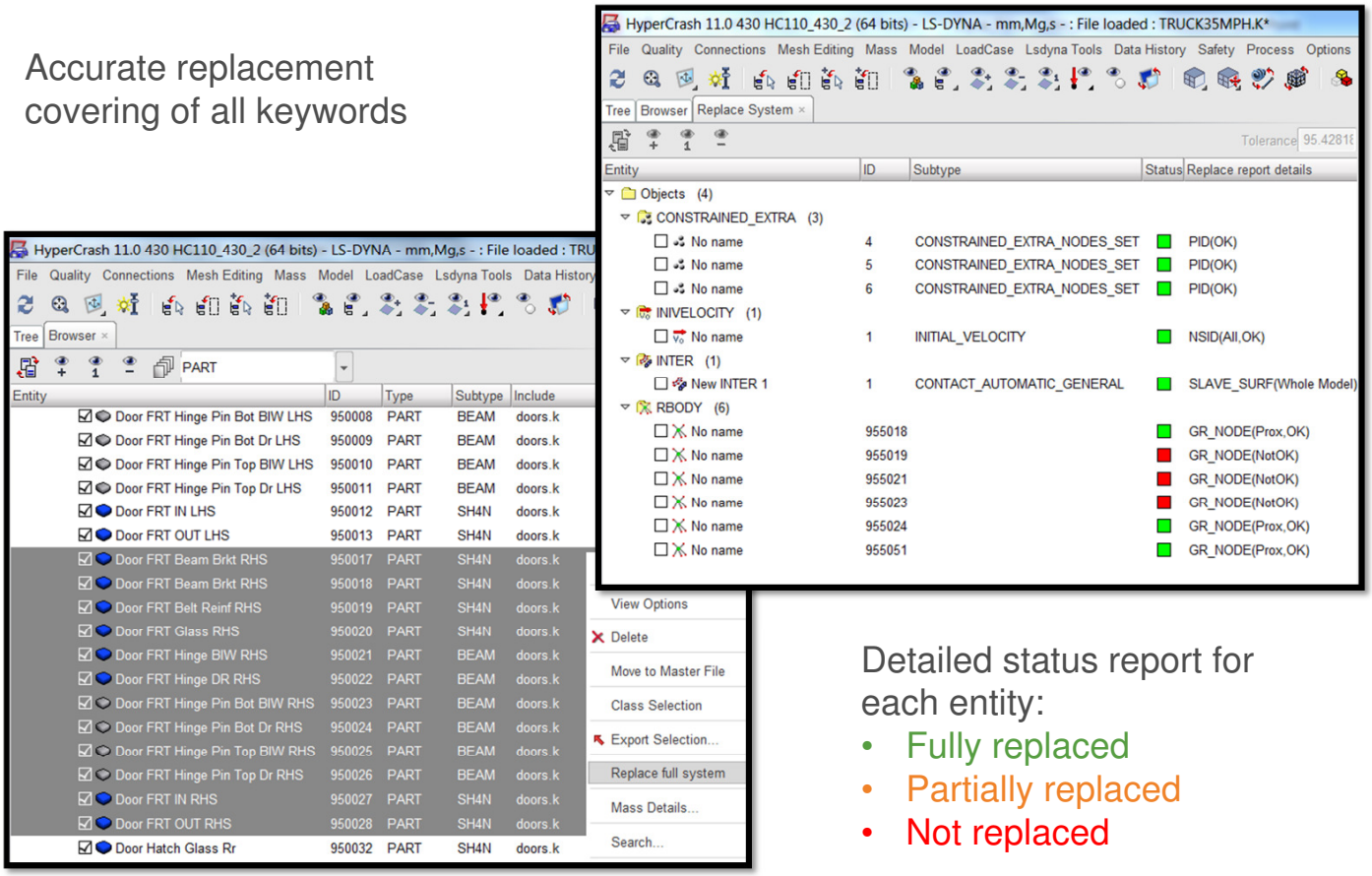
Accurate replacement covering of all keywords



Detailed status report for each entity:

- Fully replaced
- Partially replaced
- Not replaced

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*INCLUDE_TRANSFORMATION

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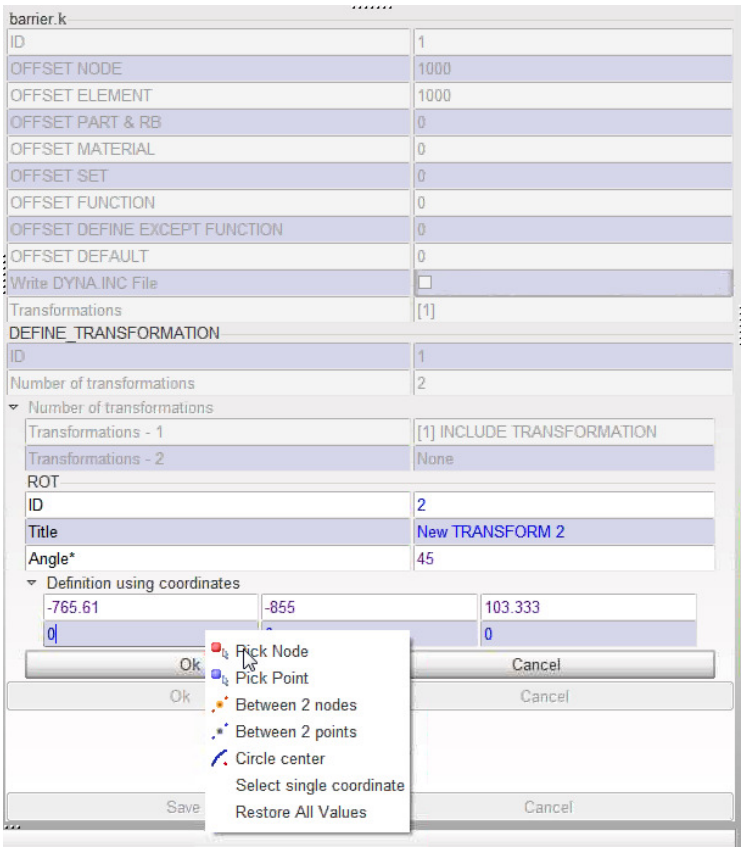
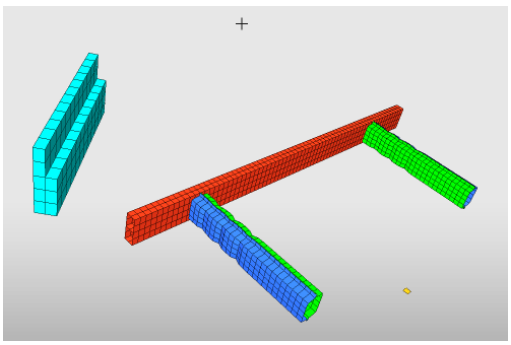


Include files with transformations (translation, rotation, scale) can be defined and managed in HyperCrash



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*PARAMETER

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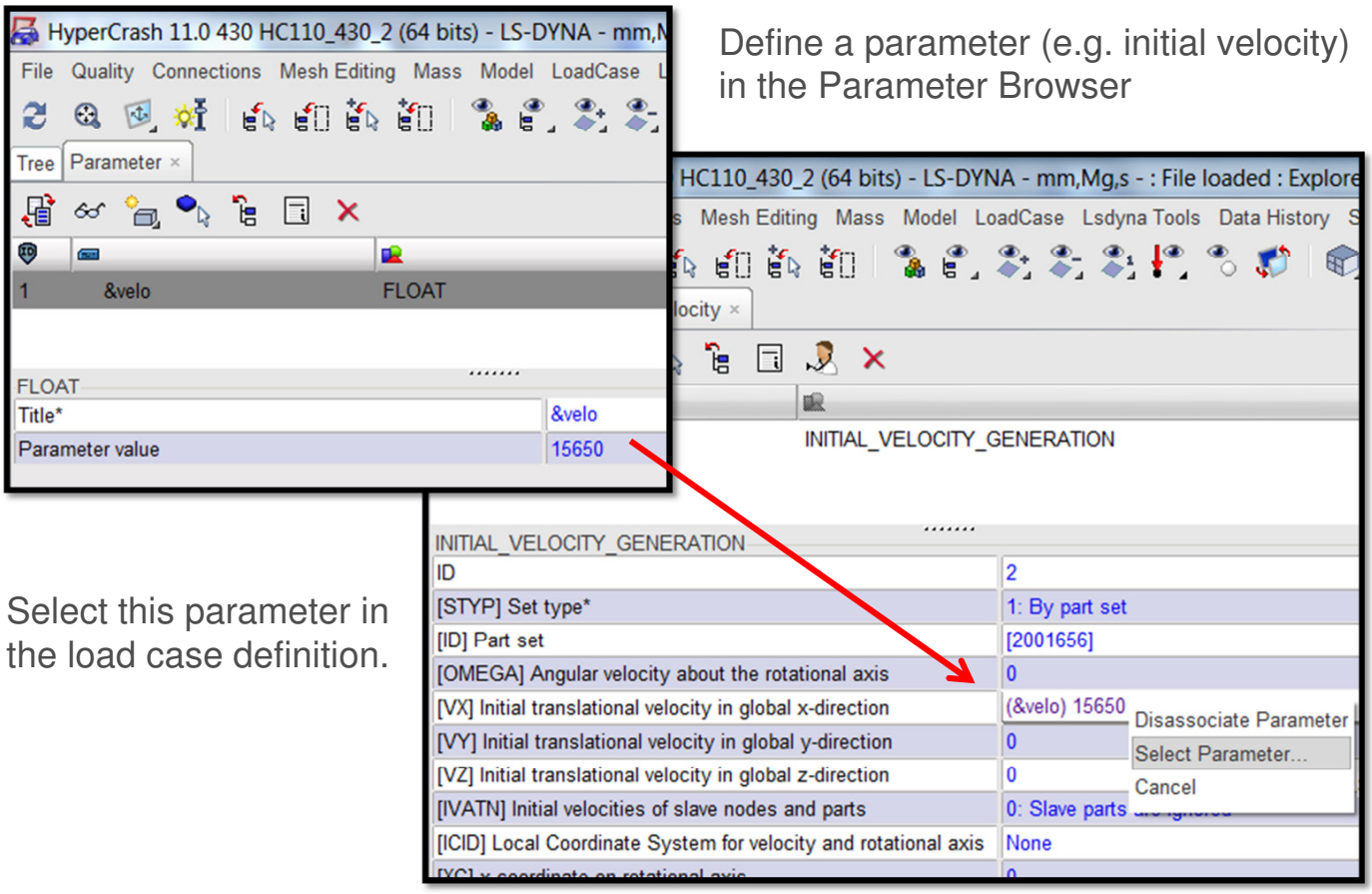

Define a parameter (e.g. initial velocity) in the Parameter Browser

Select this parameter in the load case definition.

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Connections

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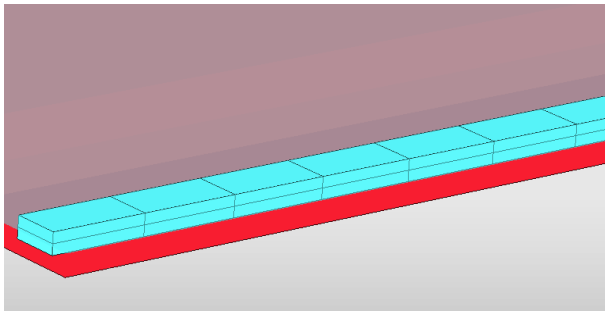
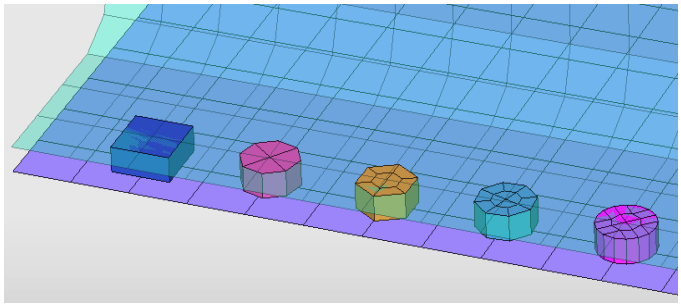
- Solid spotwelds: single HEXA or a cluster of 4, 6, 8, 12 and 16 combined solids
- Continuous glue modeling with different number of elements in width and height



Glue with continuous hexa modeling



Spotwelds with 1,4, 8, 12 or 16 cluster of solid elements

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Material and Property Data (BOM Data)

BOM_DATA_semi.csv - Microsoft Excel

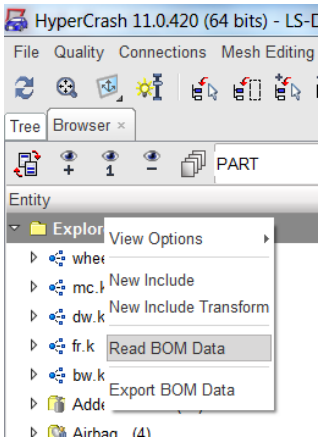
Datei | Start | Einfügen | Seitenlayout | Formeln | Daten | Überprüfen | Ansicht | PDF

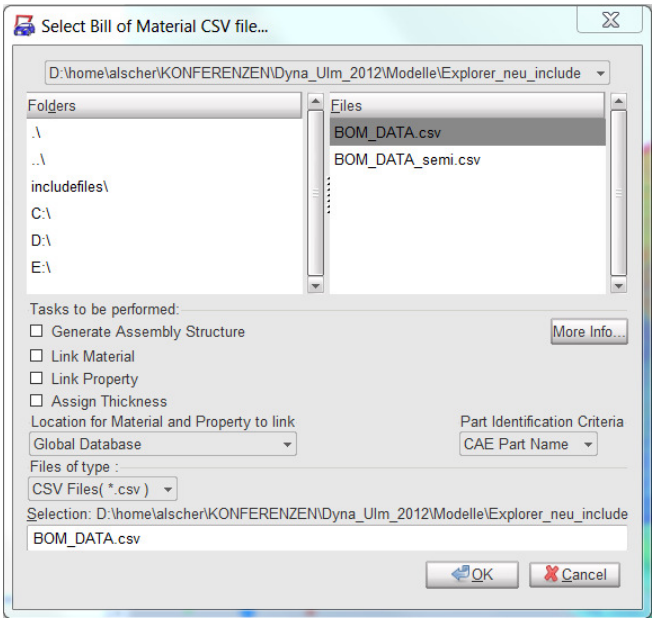
J1 | Thickness

	A	B	C	D	E	F	G	H	I	J
1	$Part Assembly	Cad part no	Part name	Cae part id	Target mass	Assembly	Assembly id	Material name	Section name	Thickness
2	0		109-bw-floor-rear	2000001	0			MAT_PLASTIC	bw-floor-rear	0.823
3	0		int-trans-access-cover	2000002	0			MAT_PLASTIC.141	int-trans-access-cover	0.89
4	0		bw-floor-front	2000003	0			MAT_PLASTIC.142	bw-floor-front	0.962

Define BOM data (material and property settings) in an Excel file

All BOM data is assigned automatically in HyperCrash





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LS-DYNA Mass Calculation

- HyperCrash offers an accurate mass calculation for LS-DYNA
- Mass information reported following LS-DYNA d3hsp file format structure:
  - Total Mass
  - Part Mass
  - Structural Mass
  - Nonstructural Mass
  - Lumped Mass

Parts

Mass Part Details

Mass | COG | Inertia

Entity	Id	Total mass	Part mass	Structural mass	Non structural mass	Lumped mass	Target mass	Delta mass
MODEL		1.132769116E+004	1.132769119E+004	6.793114796E+002	1.130538309E+004	1.200000000E+001	0.000000000E+000	1.132769116E+004
U222_Seat.dyn	0	1.132769119E+004	1.131569119E+004	6.793114796E+002	1.130538309E+004	1.200000000E+001	0.000000000E+000	1.132769119E+004
side_2dbelt	1	3.730487520E+003	3.730487520E+003	6.791655819E+002	3.730487400E+003	0.000000000E+000	3.940000000E-004	3.730487126E+003
bolt_10.0mm	2	8.000012284E+000	1.228365600E-005	2.117582368E-021	0.000000000E+000	8.000000000E+000	8.200000000E+000	-1.999877163E-001
baem_30mm_locked	3	1.315908787E+001	1.015908787E+001	0.000000000E+000	0.000000000E+000	3.000000000E+000	0.000000000E+000	1.315908787E+001
Ball2_R_Front_i	4	1.057299193E-007	1.057299193E-007	1.057299193E-007	0.000000000E+000	0.000000000E+000	0.000000000E+000	1.057299193E-007
Ball2_R_Front_i_l	5	1.057329854E-007	1.057329854E-007	1.057329854E-007	0.000000000E+000	0.000000000E+000	0.000000000E+000	1.057329854E-007
Ball2_R_Front_o	6	1.052302717E-007	1.052302717E-007	1.052302717E-007	0.000000000E+000	0.000000000E+000	0.000000000E+000	1.052302717E-007
Ball2_R_Front_o_l	7	1.052323486E-007	1.052323486E-007	1.052323486E-007	0.000000000E+000	0.000000000E+000	0.000000000E+000	1.052323486E-007
Ball2_R_up_Front_i	8	6.072458493E-008	6.072458493E-008	6.072458493E-008	0.000000000E+000	0.000000000E+000	0.000000000E+000	6.072458493E-008

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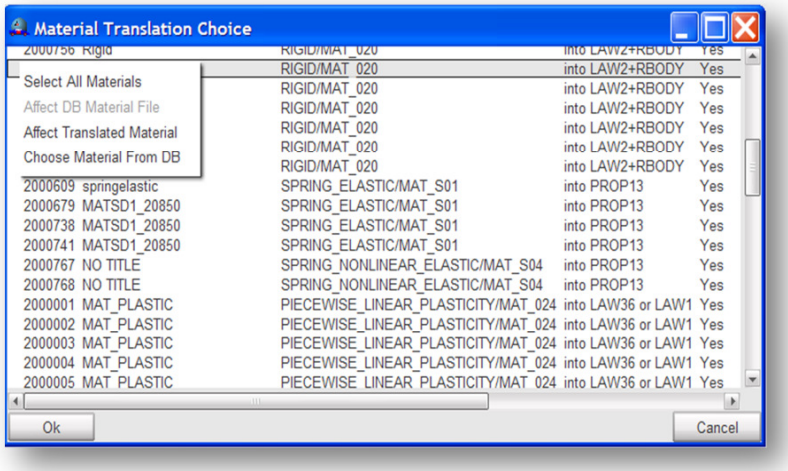
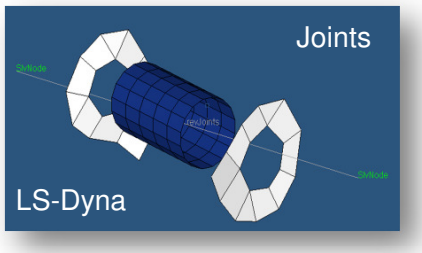
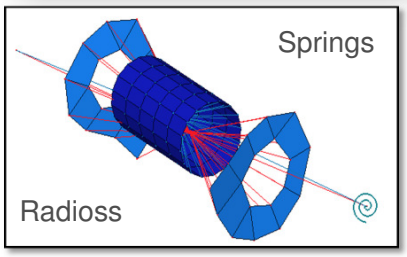
HyperCrash - Solver Conversion

- Interfaces to LS-Dyna, Radioss and PamCrash
- Powerful conversion framework based on engineering know-how to convert most of the model definitions, material cards and solver parameters







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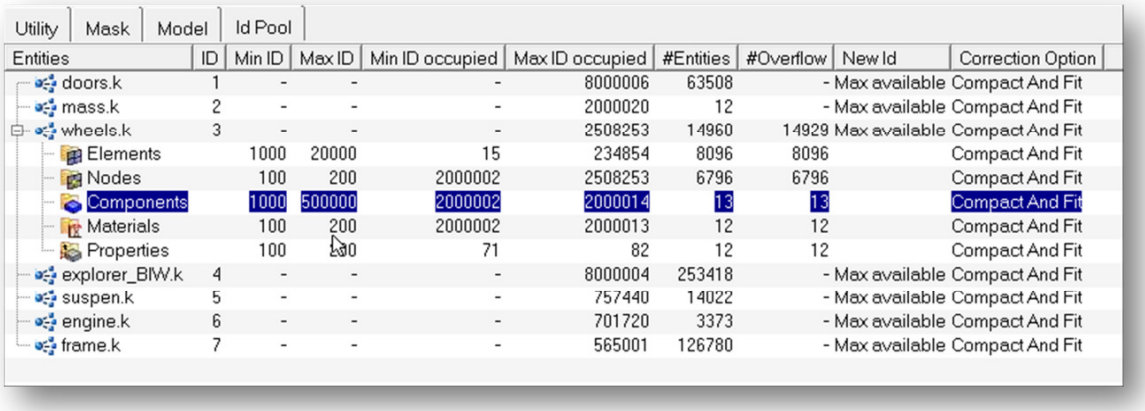
Version 12.0

ID Management

- New ID view to manage ID's for Include/Module
  - List ID range definitions in the module/include tree structure
  - Columns added to list to show defined ID Range , Occupied ID range, Overflows, correction option, New ID option



Entities	ID	Min ID	Max ID	Min ID occupied	Max ID occupied	#Entities	#Overflow	New Id	Correction Option
doors.k	1	-	-	-	8000006	63508		- Max available	Compact And Fit
mass.k	2	-	-	-	2000020	12		- Max available	Compact And Fit
wheels.k	3	-	-	-	2508253	14960	14929	Max available	Compact And Fit
Elements		1000	20000	15	234854	8096	8096		Compact And Fit
Nodes		100	200	2000002	2508253	6796	6796		Compact And Fit
Components		1000	500000	2000002	2000014	13	13		Compact And Fit
Materials		100	200	2000002	2000013	12	12		Compact And Fit
Properties		100	200	71	82	12	12		Compact And Fit
explorer_BIW.k	4	-	-	-	8000004	253418		- Max available	Compact And Fit
suspen.k	5	-	-	-	757440	14022		- Max available	Compact And Fit
engine.k	6	-	-	-	701720	3373		- Max available	Compact And Fit
frame.k	7	-	-	-	565001	126780		- Max available	Compact And Fit

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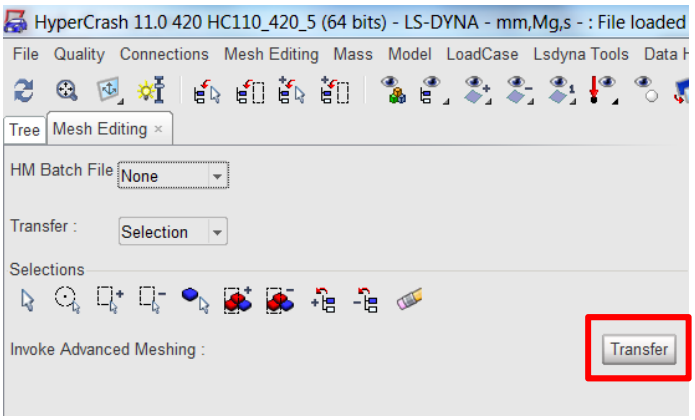
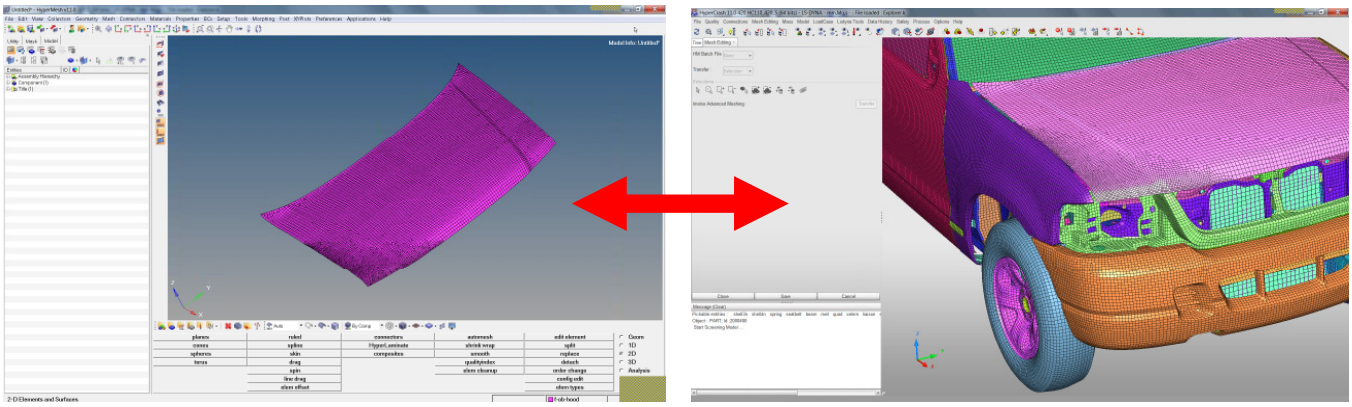
Advanced Meshing: Transfer to HyperMesh



WebEx



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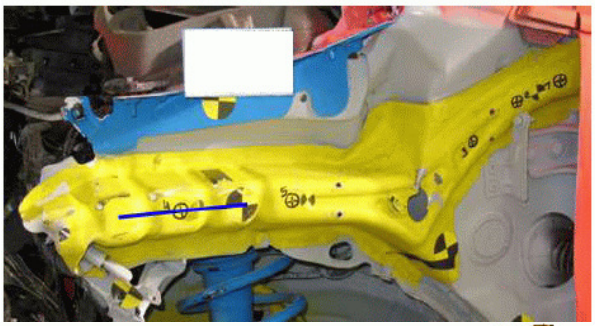
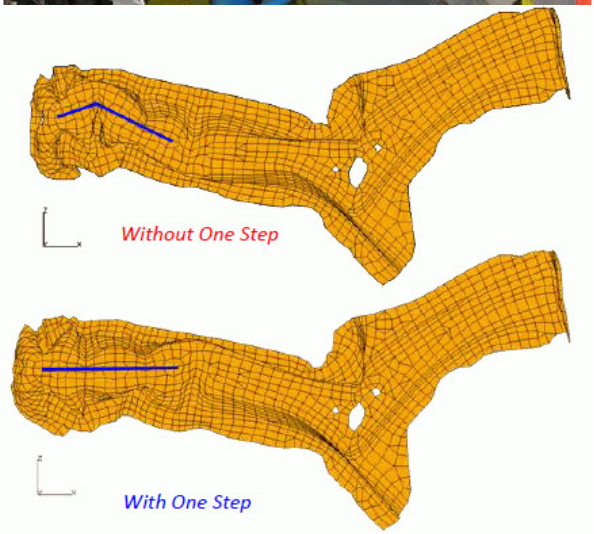
Stamping Results in Crash Analysis

Validation with Test Data
(*PSA, Altair EHTC 2010*)





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Stamping Results - Option 1

Map incremental analysis results

- Use accurate incremental stamping analysis with adaptive mesh followed by mapping of results to structural mesh
- Need stamping experts to define a feasible process which is difficult at the early product feasibility phase
- Time consuming to run large number of parts
- Possibility of error from mapping between somewhat different geometries

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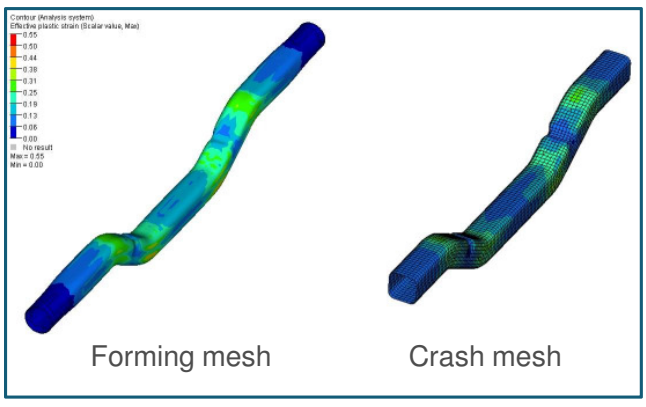
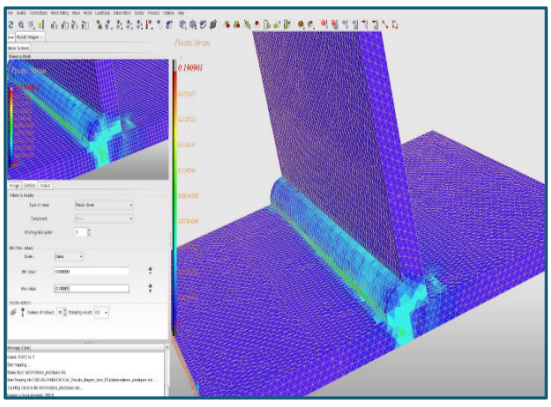
Stamping Results - Option 1: Results Mapper

- General purpose mapping tool inside HyperCrash
  - Map thickness, plastic strain, stresses, fiber orientation
  - Read forming data from Radioss, Dyna, AutoForm
  - Write mapped data to Radioss, Dyna, Abaqus input format
  - Map results between solids, hydro-formed parts
  - Handle symmetry
  - Fill holes
  - Batch process: Save and Replay





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Stamping Results: Option 2

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Use inverse analysis directly on structural mesh

- Use One Step stamping analysis on the structural mesh and directly include the stamping results with the structural model
- Addendum effect needs to be approximated with edge boundary condition
- Possible to run large number of parts within a short time
- Accurate enough for crash analysis

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Workflow

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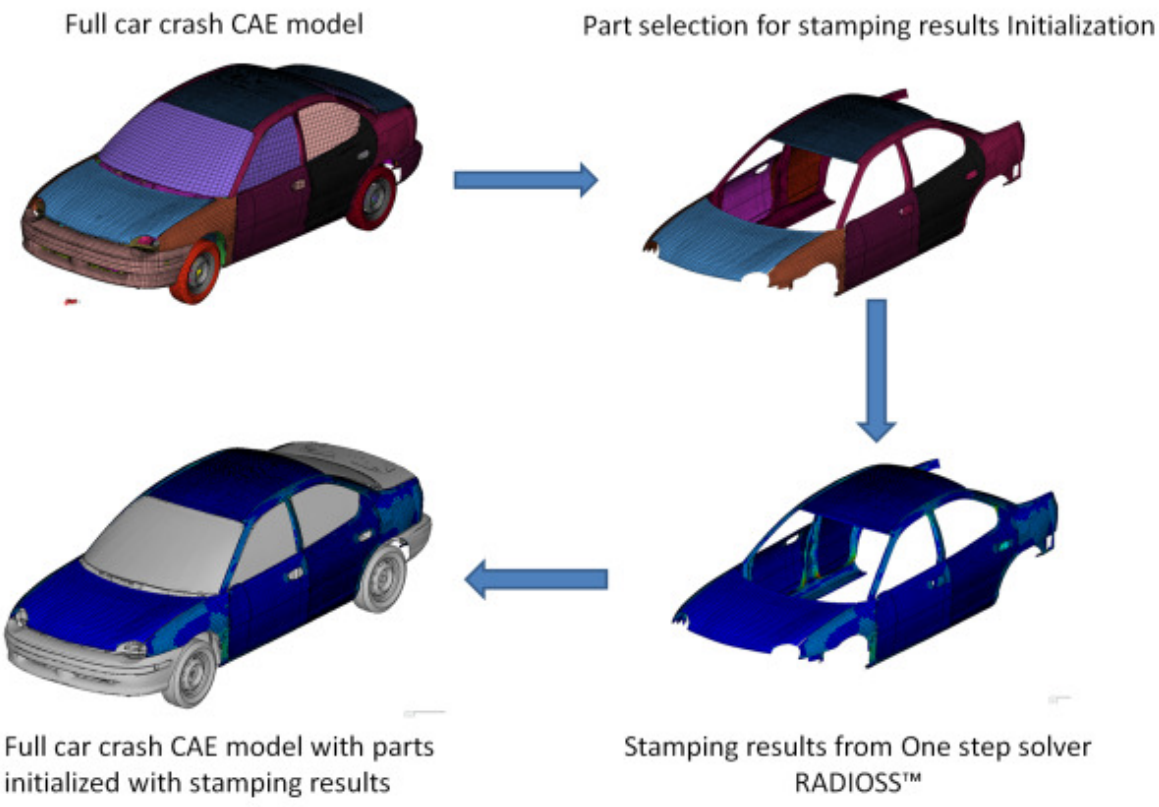

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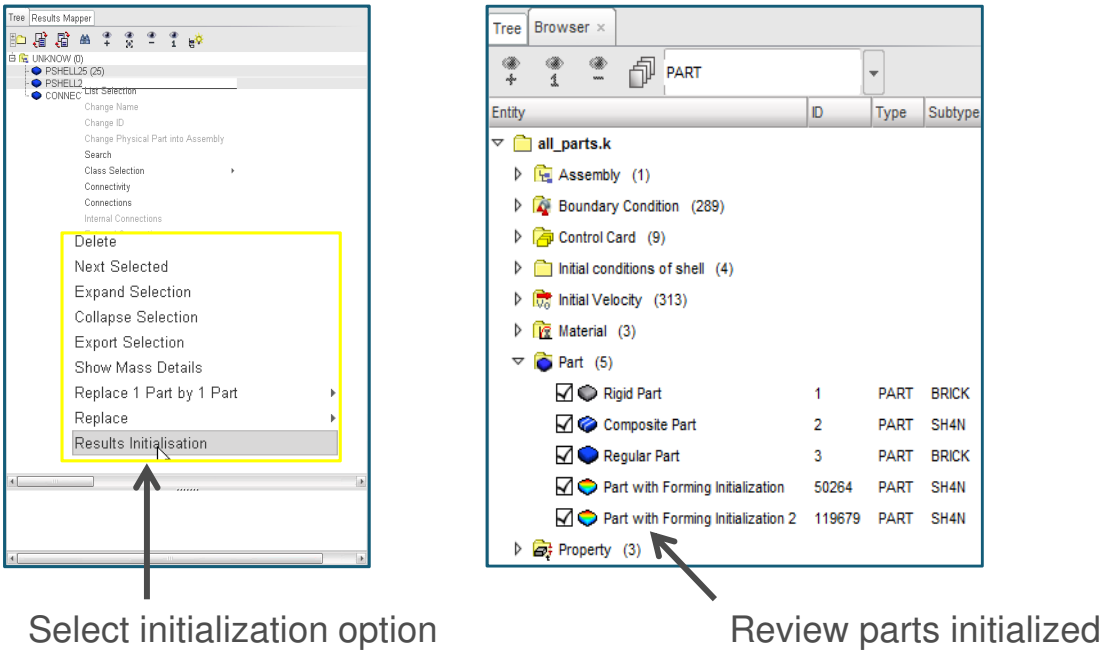
User Interface (HyperCrash)



Select initialization option

Review parts initialized

WebEx

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Case Study: Ford Taurus Side Impact Crash Model