PRIMER Update

2018

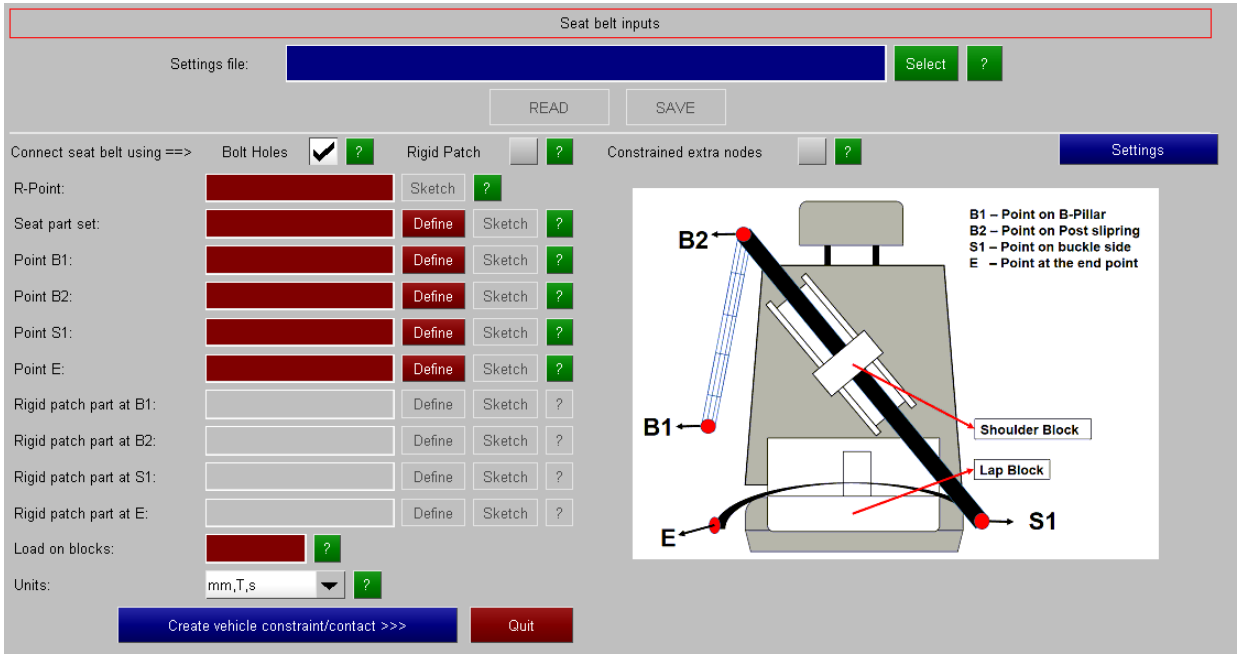
Version History

- **Version 14.0: March 2017** **First release of version 14**
- Version 14.1: August 2017 Bugfix release

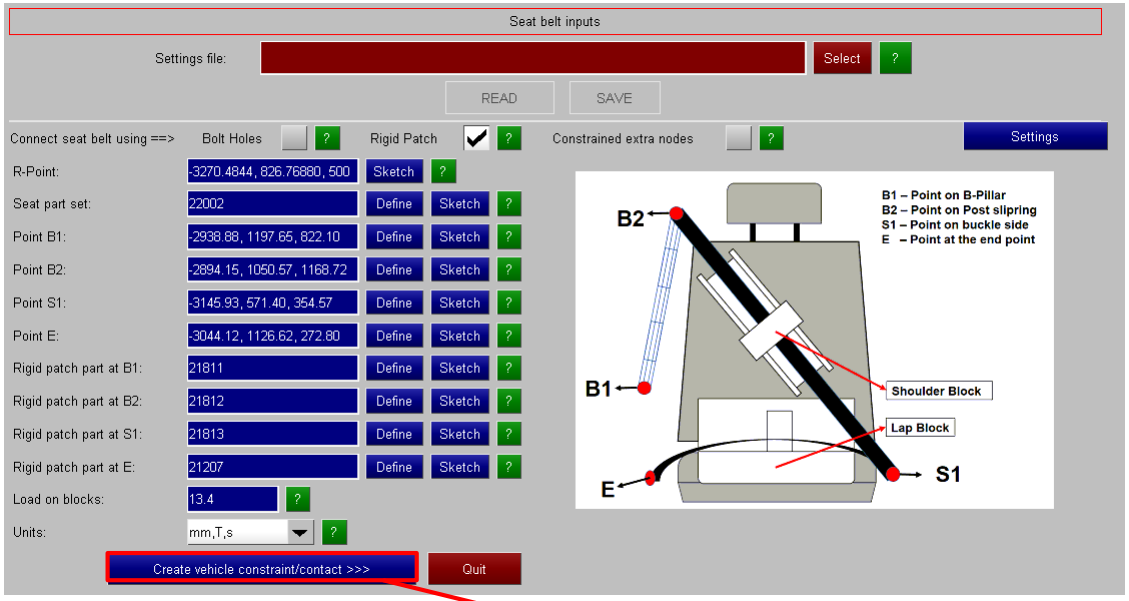
- **Version 15.0: March 2018** **First release of version 15**

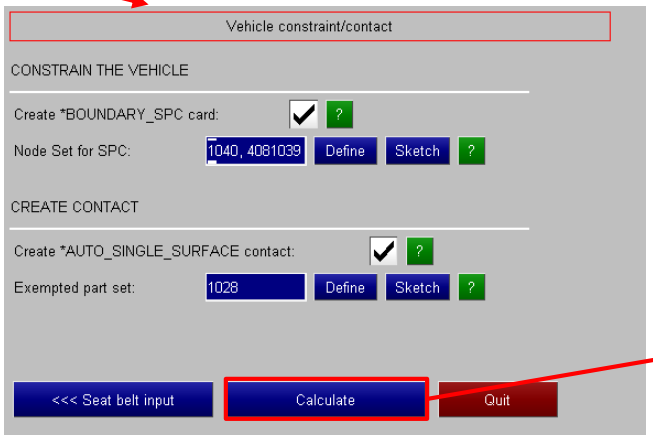
Seatbelt Anchorage Tool – v14.1

- Position the loading device and set up the analysis according to ECE R14
- This function is available in the Safety menu.

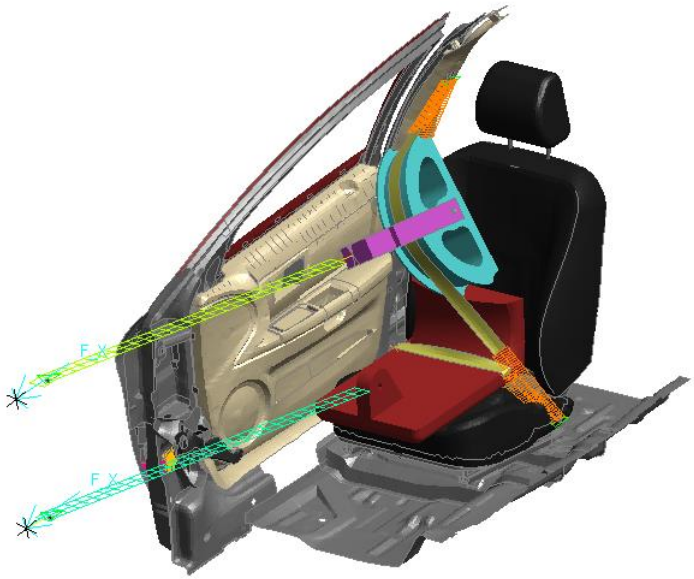


Seatbelt Anchorage Tool – v14.1

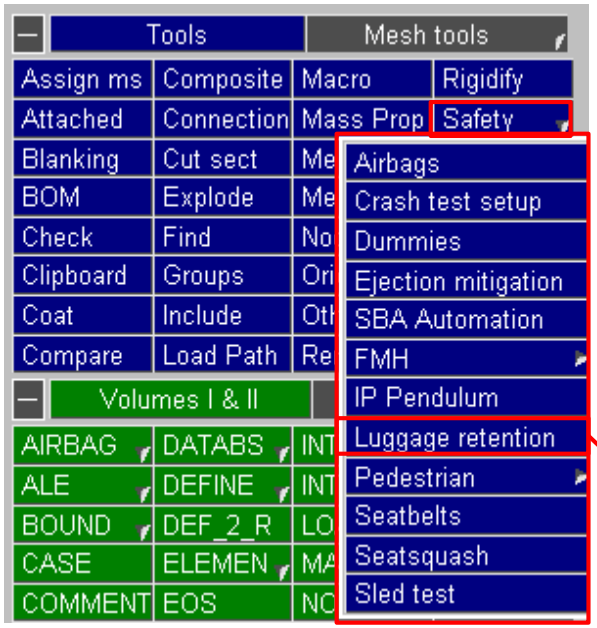




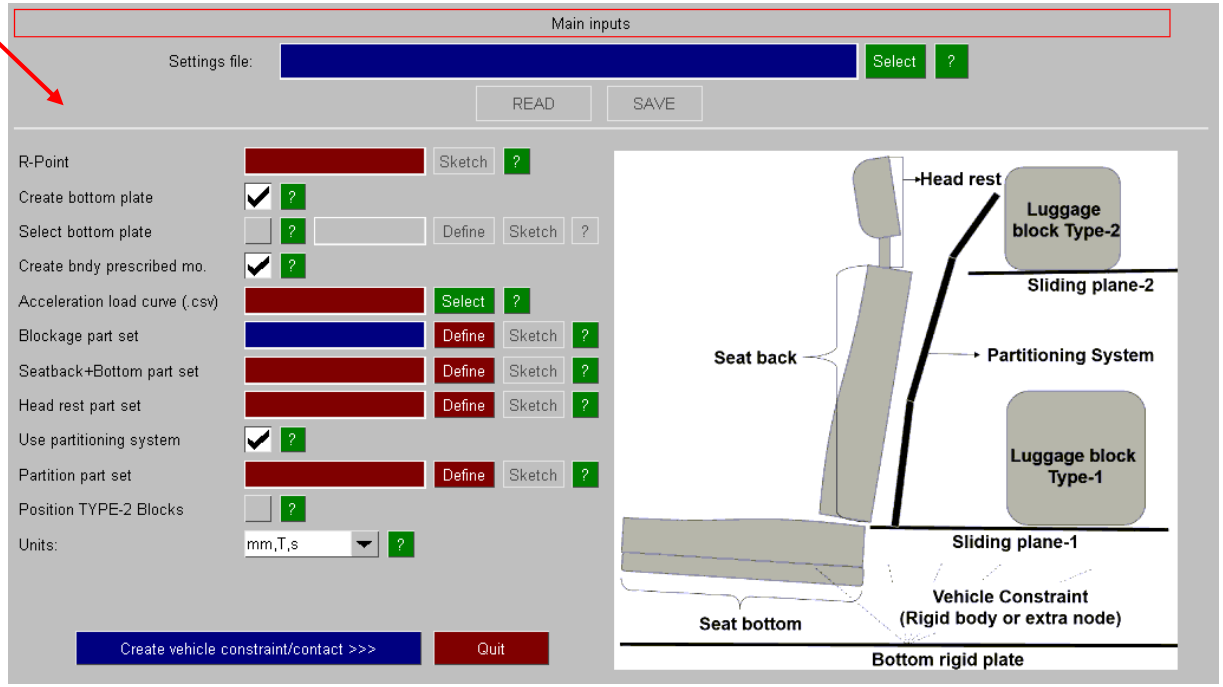
Output



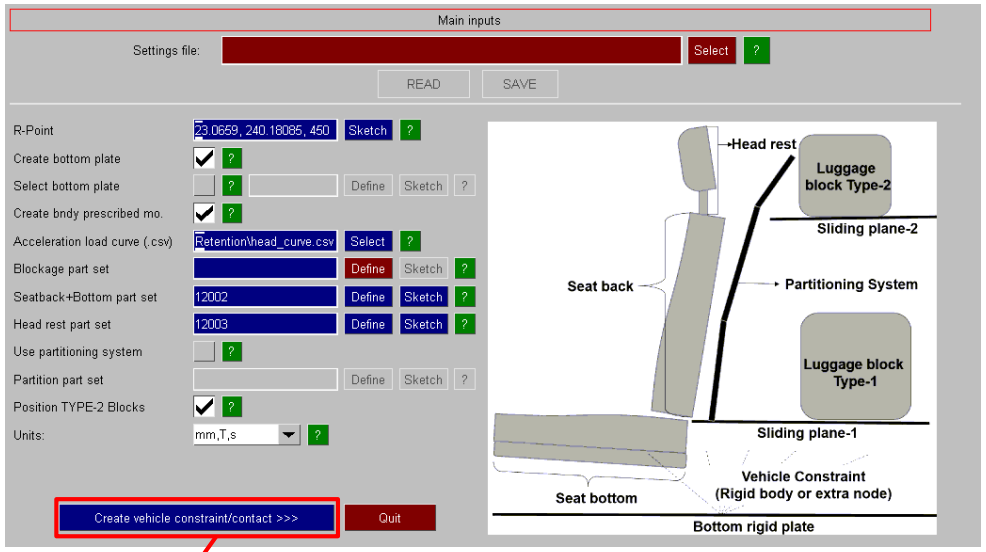
Luggage Retention Tool – v14.1

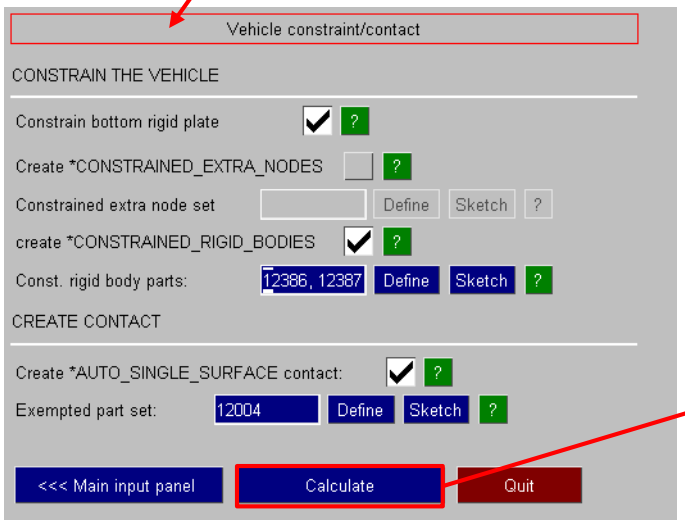


- Position the luggage blocks and set up the analysis according to ECE R17
- This function is available in the Safety menu.



Luggage Retention Tool – v14.1





Output

V15 – Due for Release March 2018

Keyword Support

- **PRIMER v15:**
  - Keywords: LS-DYNA up to **R10** fully supported.
  - Volumes I, II and III of the Keyword Manual.
  - Some development “R11” new keywords/fields also included.

✓ R10 Vol I Keywords

✓ R10 Vol II Materials

✓ R10 Vol III New solvers

Getting Started – Tools to Help New Users

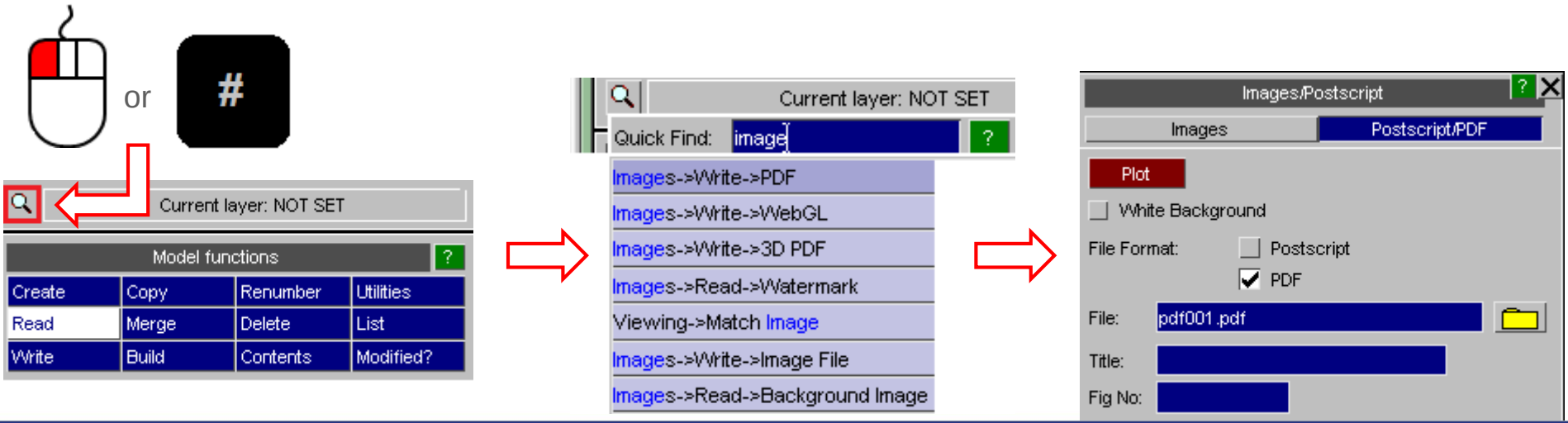
Quick Find

Quick Find

A ‘Quick Find’ feature has been added to allow users to search for and then quickly:

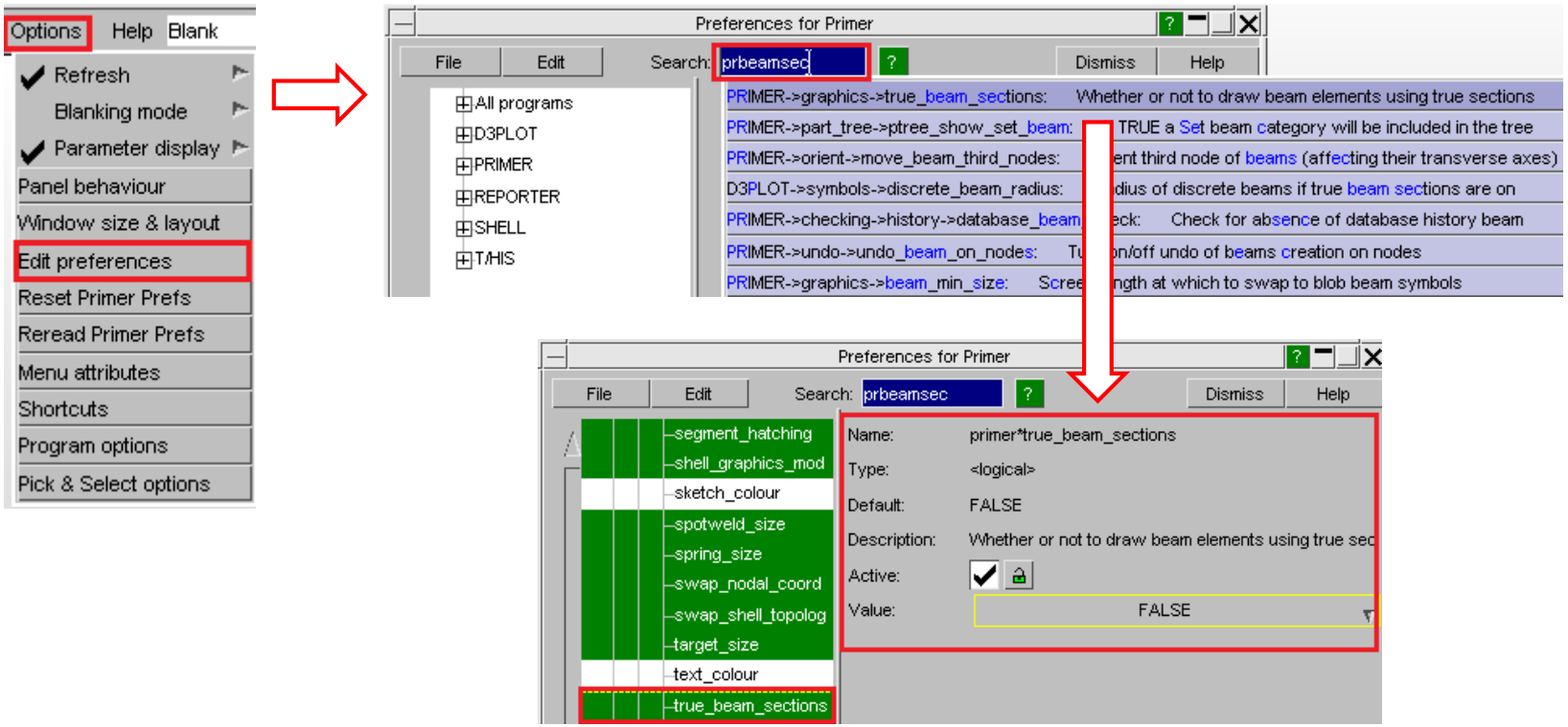
- Go to menus / functionality in PRIMER
- Open model entity edit panels
- Blank / Unblank / Only Include files
- Open specific pages in the LS-DYNA keyword PDF manual

It can be accessed by clicking on the magnifying glass below the tabs list or by pressing the ‘#’ key.



Quick Find

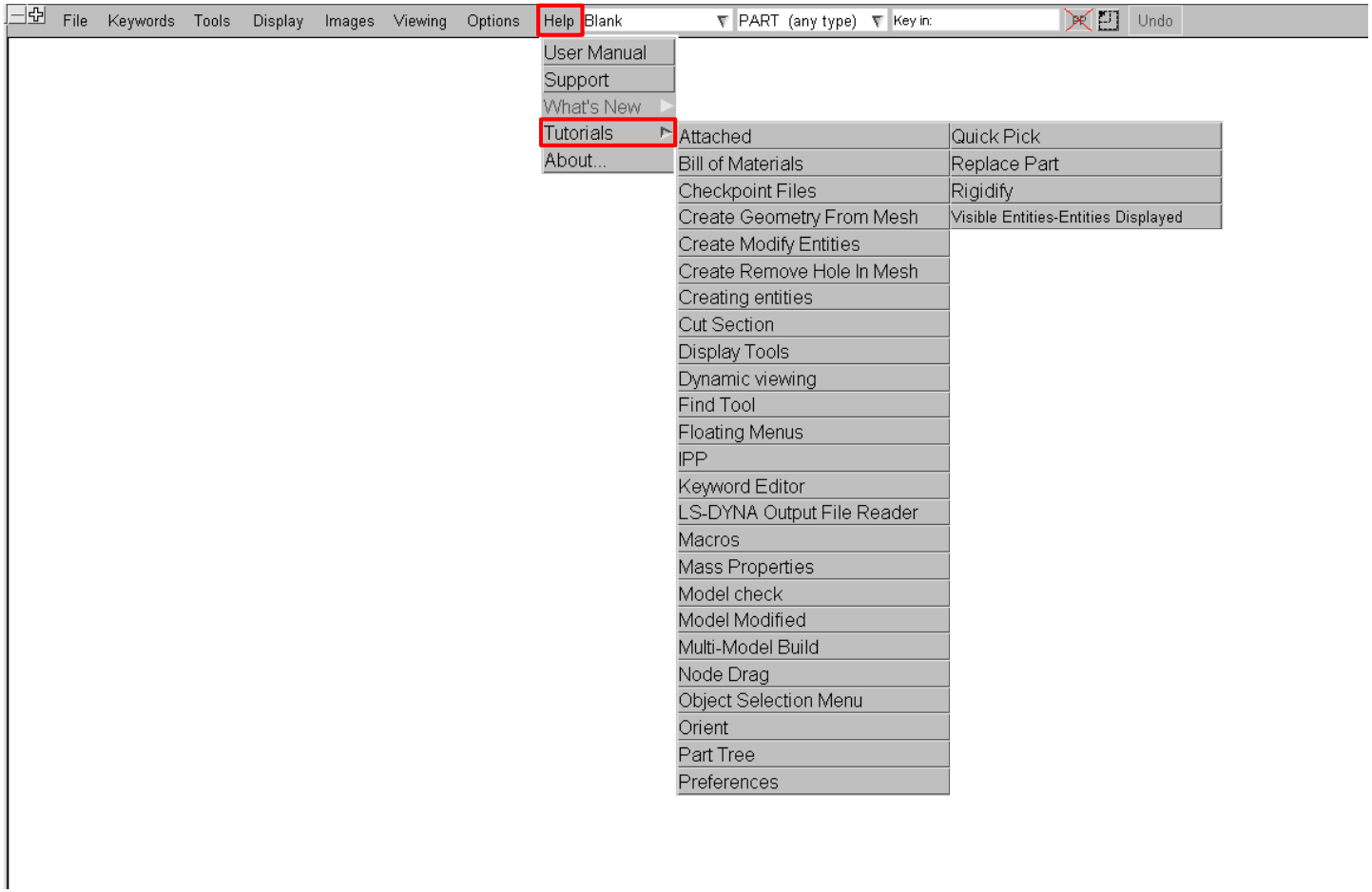
In addition to the main Quick Find button in PRIMER the Preferences Editor now also contains a search facility to help find preferences.



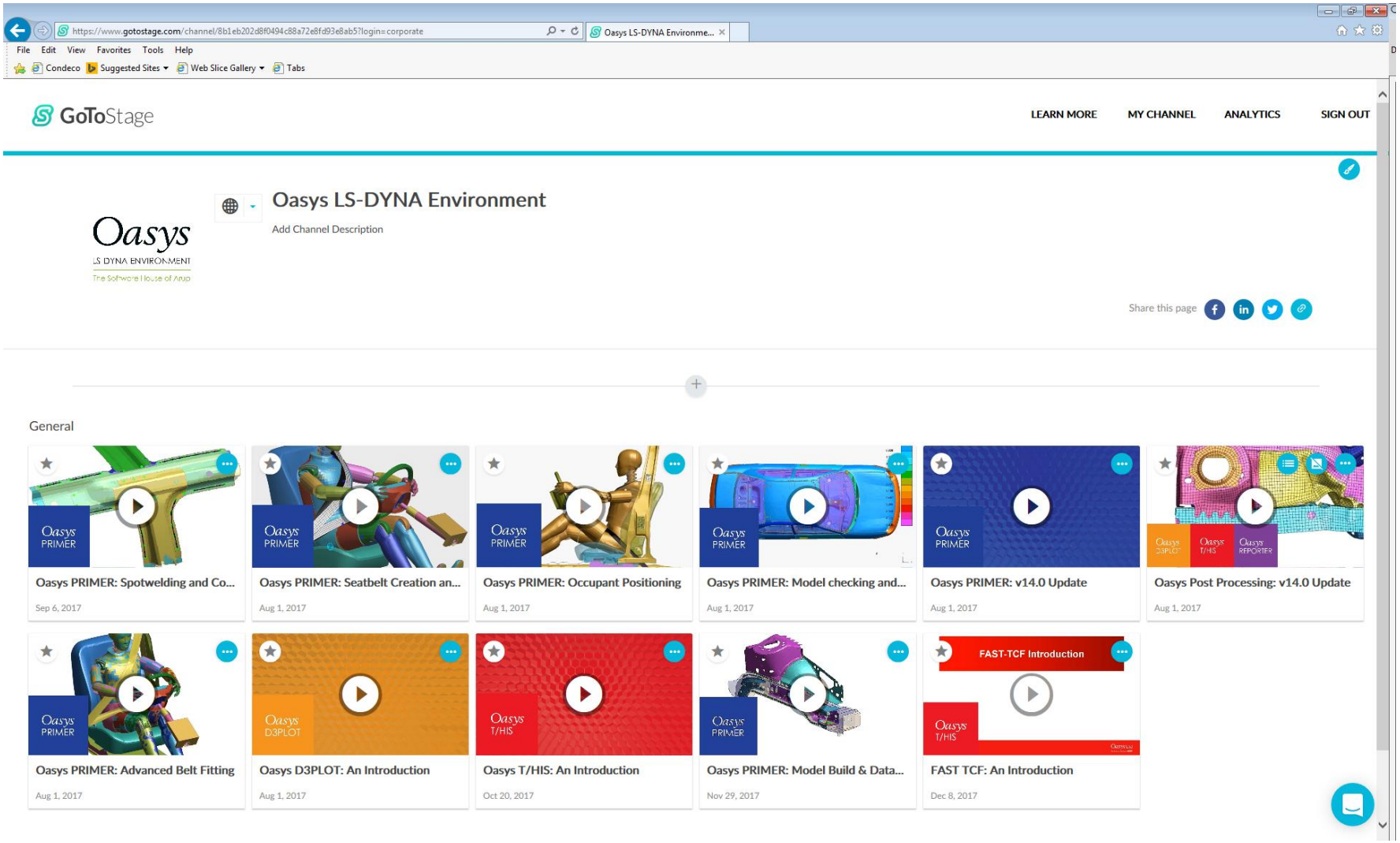
This works using the same ‘fuzzy’ matching method as the main Quick Find menu. The search terms contain the name of the program, the name of the nodes on the tree, the preference name and the description of it.

Tutorials

- PDF tutorials for PRIMER tools now available through the help panel:



Webinars


https://www.gotostage.com/channel/8b1eb202d8f0494c88a72e8fd93e8ab5?login=corporate
Oasys LS-DYNA Environme...
File Edit View Favorites Tools Help
Condeco Suggested Sites Web Slice Gallery Tabs
GoToStage
LEARN MORE
MY CHANNEL
ANALYTICS
SIGN OUT
Oasys LS-DYNA Environment
Add Channel Description
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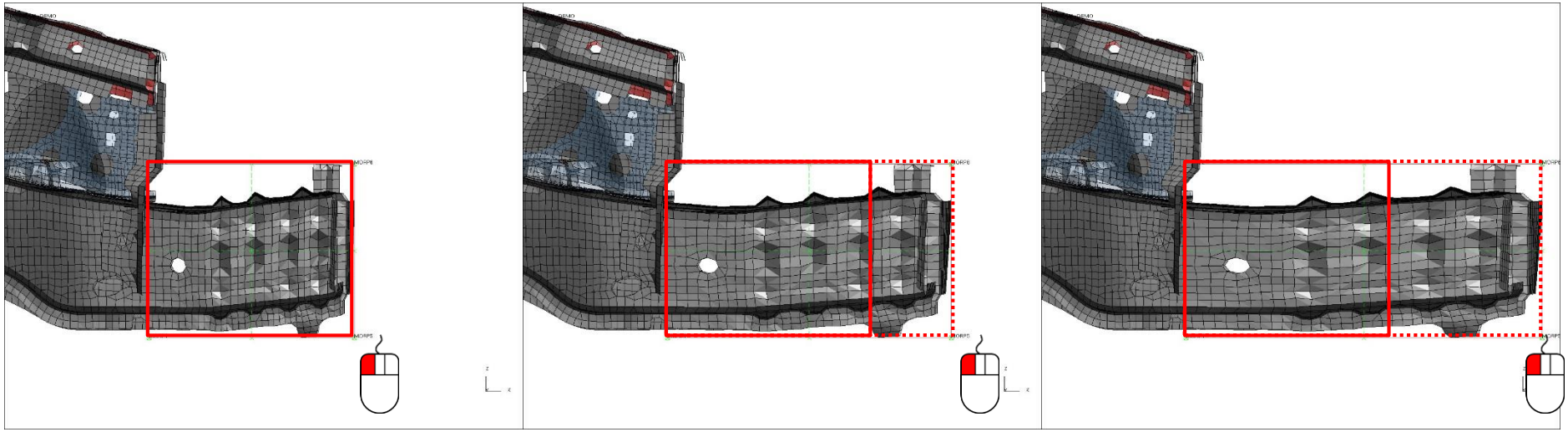
Sep 6, 2017
Oasys PRIMER: Seatbelt Creation an...
Aug 1, 2017
Oasys PRIMER: Occupant Positioning
Aug 1, 2017
Oasys PRIMER: Model checking and...
Aug 1, 2017
Oasys PRIMER: v14.0 Update
Aug 1, 2017
Oasys Post Processing: v14.0 Update
Aug 1, 2017
Oasys PRIMER: Advanced Belt Fitting
Aug 1, 2017
Oasys D3PLOT: An Introduction
Aug 1, 2017
Oasys T/HIS: An Introduction
Oct 20, 2017
Oasys PRIMER: Model Build & Data...
Nov 29, 2017
FAST-TCF Introduction
FAST TCF: An Introduction
Dec 8, 2017

Creating/Modifying your Model

Morphing

Morphing

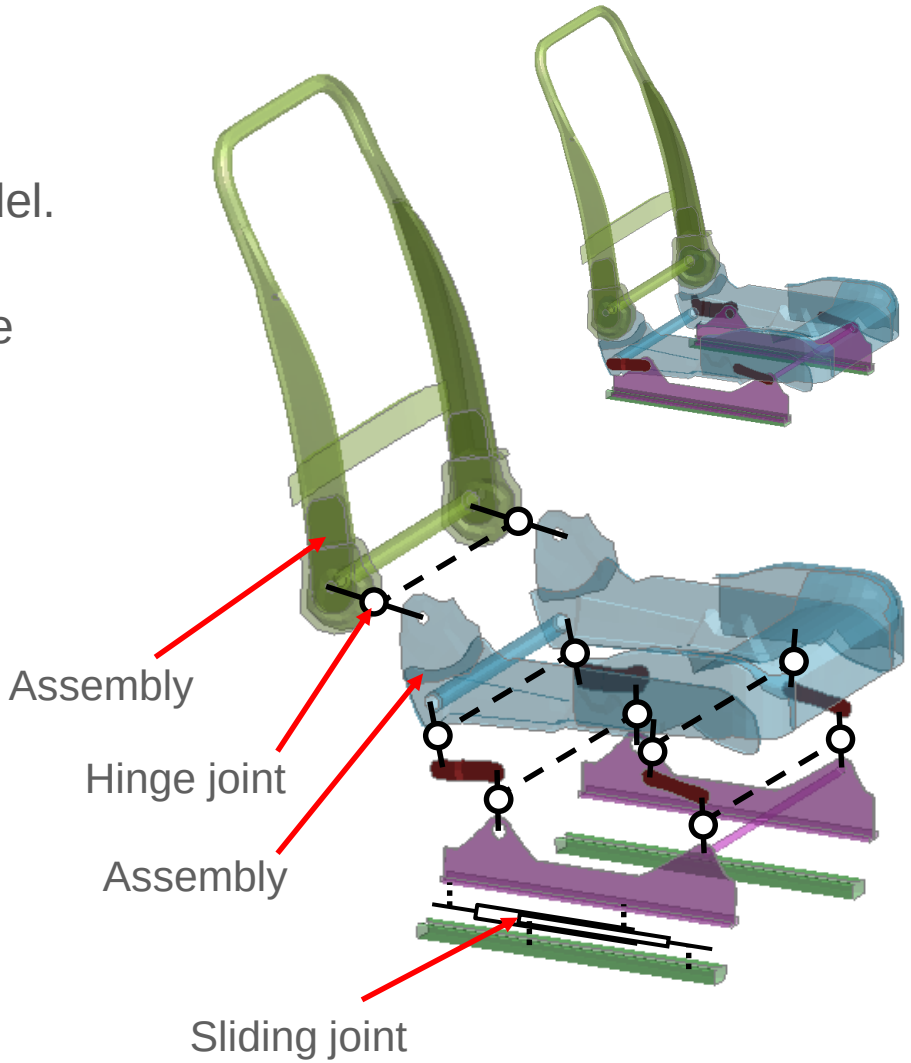
- In previous releases of PRIMER, you could use orient + interpolate to “morph” mesh.
- In v15 a new interactive morph tool has been introduced.
- The morph tool allows you to create bounding boxes around mesh. You can then interactively change the size and shape of the box which in turn changes the size and shape of the mesh.



Mechanisms

Mechanisms

- The mechanism tool in PRIMER allows the user to define linkages between assemblies within a model.
- Once the linkages are defined, PRIMER can be used to move the assemblies relative to each other.
- This tool is useful for positioning things such as seats:



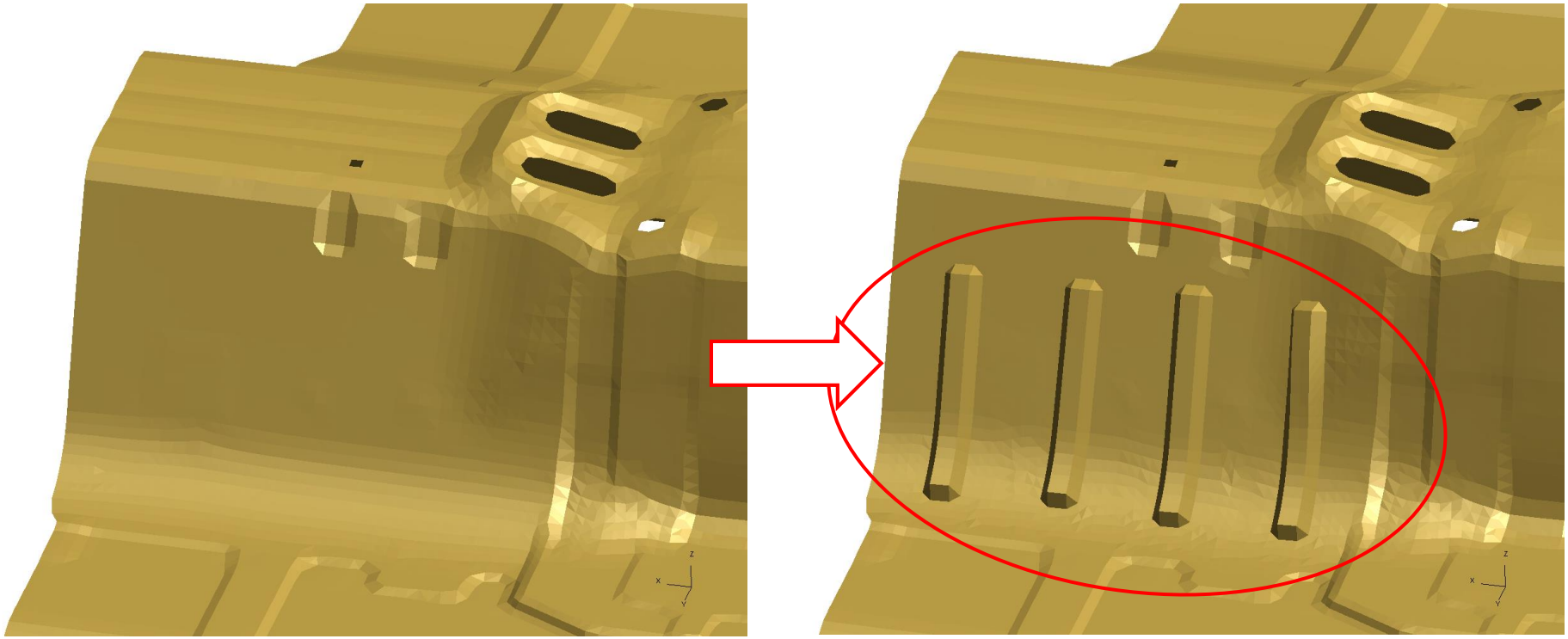
Mechanisms

- New additions to the mechanism tool for V15:
  - Ability to read more ANSA comments to convert ANSA kinetic entities into PRIMER mechanisms.
  - Addition of a new connection type – “coupler”. The new coupler type imposes a linear equation which allows you to link together mechanism connections.
  - This means when two connections are coupled the motion of one connection can be imposed on another such that rotation can be related to translation, and vice versa.
  - Rotation can also be coupled to rotation, and translation coupled with translation.

Swage/Bead Creation

Swage/Bead creation

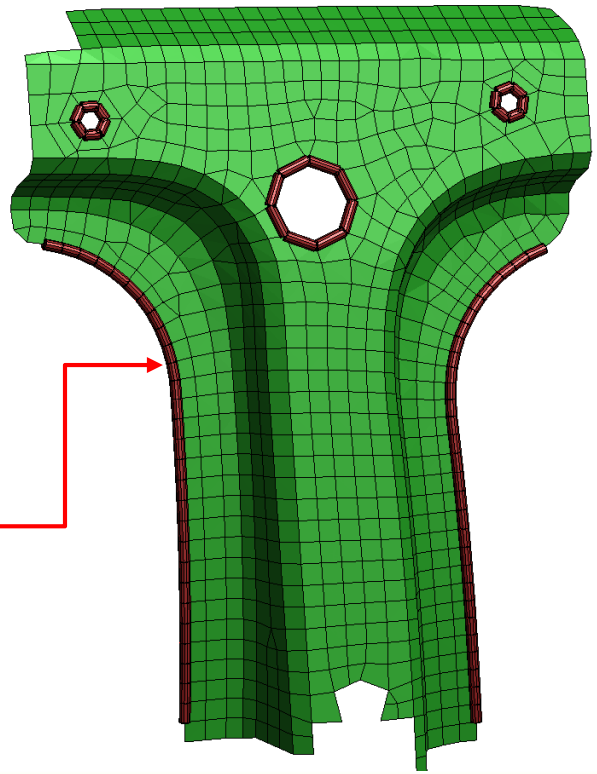
- A new tool has been added to easily create swages/beads in shell meshes.



Other Meshing Tools Updates

- Improved internal meshing engine which is used by a variety of tools within PRIMER:
  - Hole creation/removal.
  - Remesh area.
  - HAZ creation for spotwelds.

- New tool to create beams on selected nodes:
  - This allows you to create beams along a series of selected nodes easily:

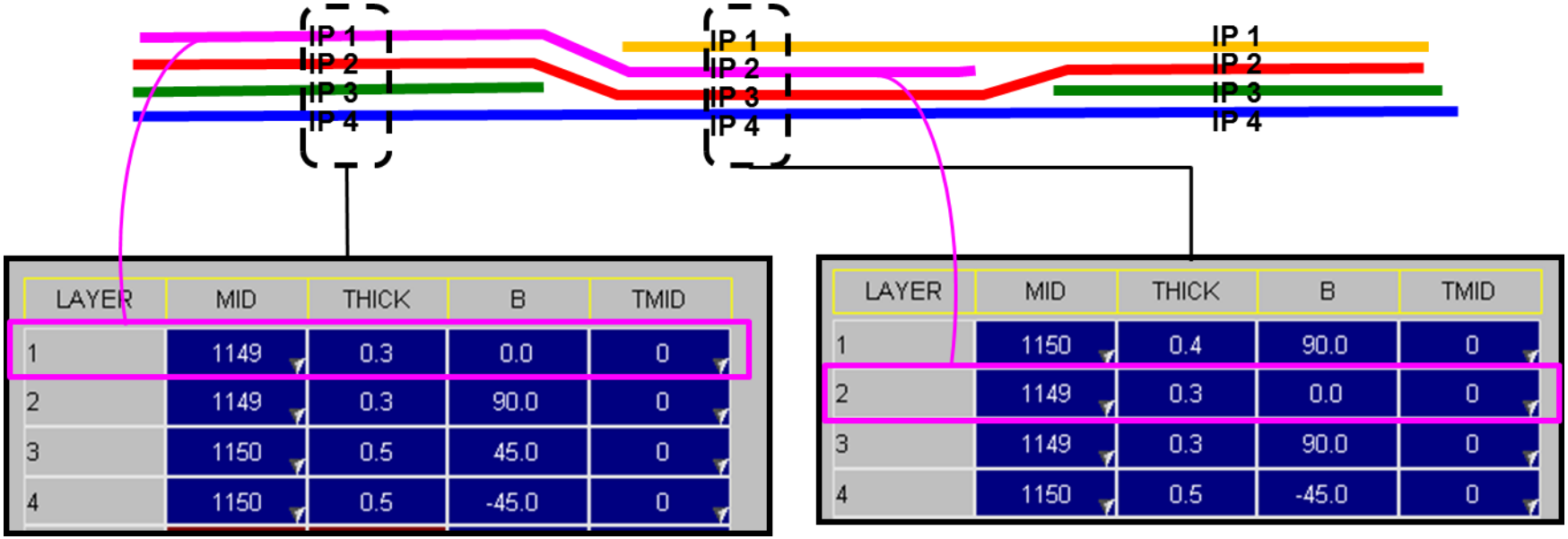


Easy to create beams along a series of nodes, for example on free edges

Composites

Composites

- PRIMER contains tools for creating, managing and modifying composite data in your LS-DYNA model:



LAYER	MID	THICK	B	TMID
1	1149	0.3	0.0	0
2	1149	0.3	90.0	0
3	1150	0.5	45.0	0
4	1150	0.5	-45.0	0

LAYER	MID	THICK	B	TMID
1	1150	0.4	90.0	0
2	1149	0.3	0.0	0
3	1149	0.3	90.0	0
4	1150	0.5	-45.0	0

- These tools have been improved, most notably in the ability to set orientation angles of the composite fibres.

Scripting

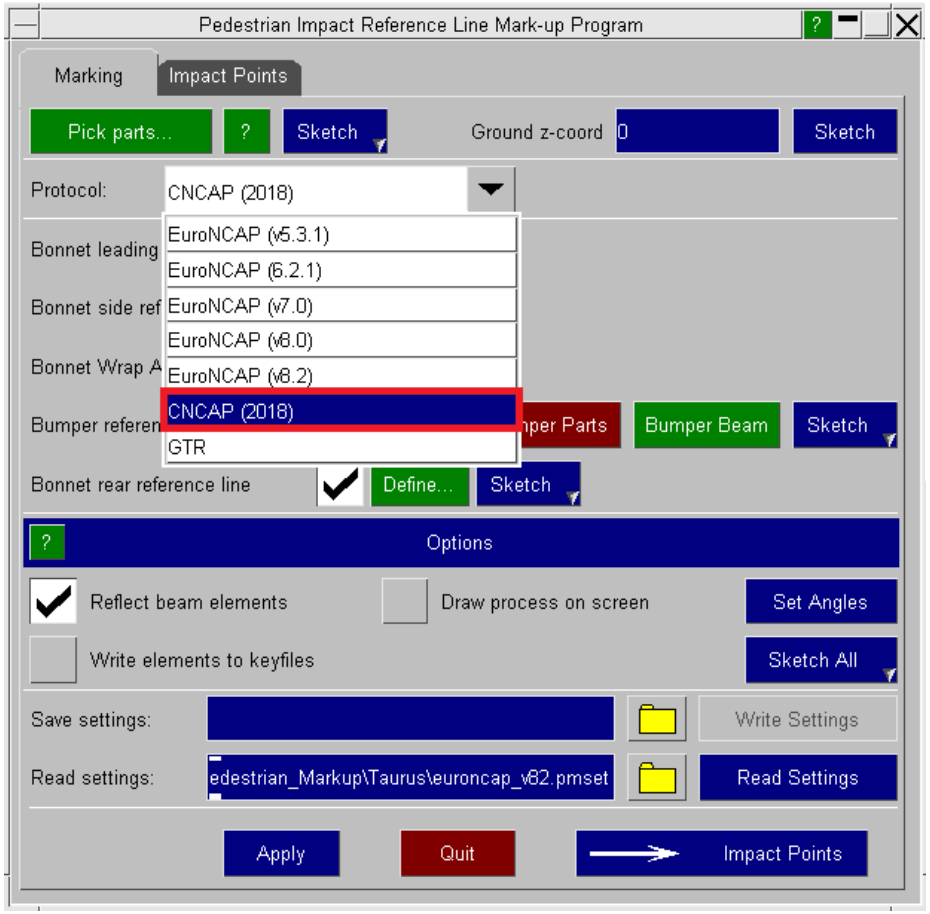
Scripting

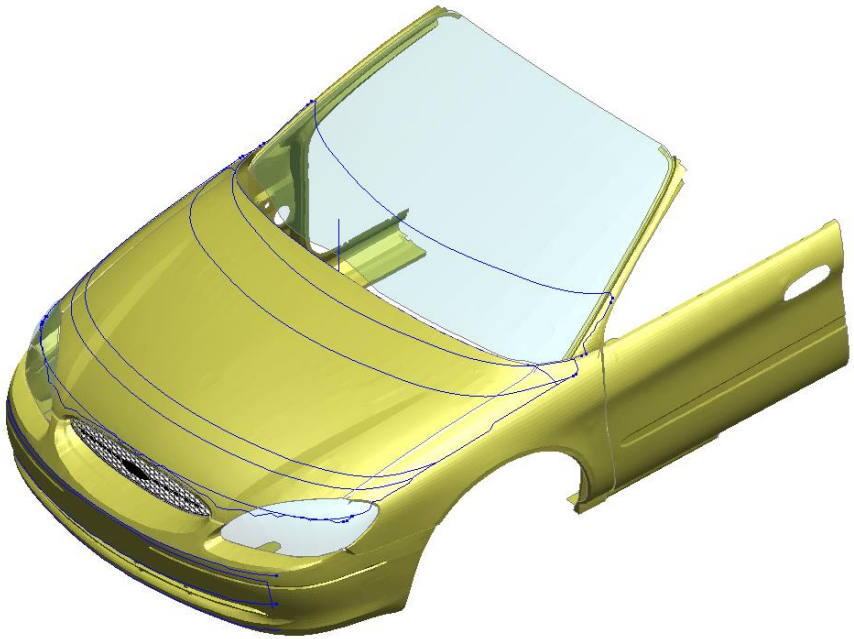
- Scripting continues to be an important and popular functionality within the Oasys software.
- The Oasys team are continuously adding more functionality to the JavaScript API's to allow users to create their own tools.
- For v15 the following has been added to the PRIMER API:
  - Added ability copy model flagged entities.
  - Added 24bit colour support for widget images.
  - New function to start interactive penetration fixing panel.
  - Added ability to control font size on widgets.
  - Added ability to specify de-clash options for RenumberFlagged() function.
  - Added ability to edit comments in the master file.
  - Added function to read CSV files easily.
- Also, the ability has been added to automatically run a script prier to keyout. This allows you to introduce questions/checks/reminders when writing out a model.

Pedestrian

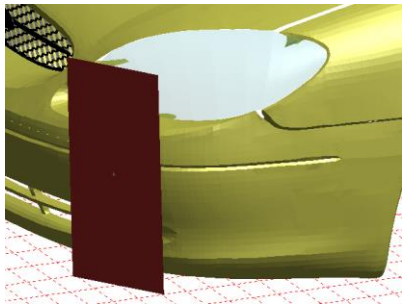
Pedestrian Markup

The CNCAP 2018 protocol can now be used to mark vehicles:





This uses the plate method to find the corner bumper.

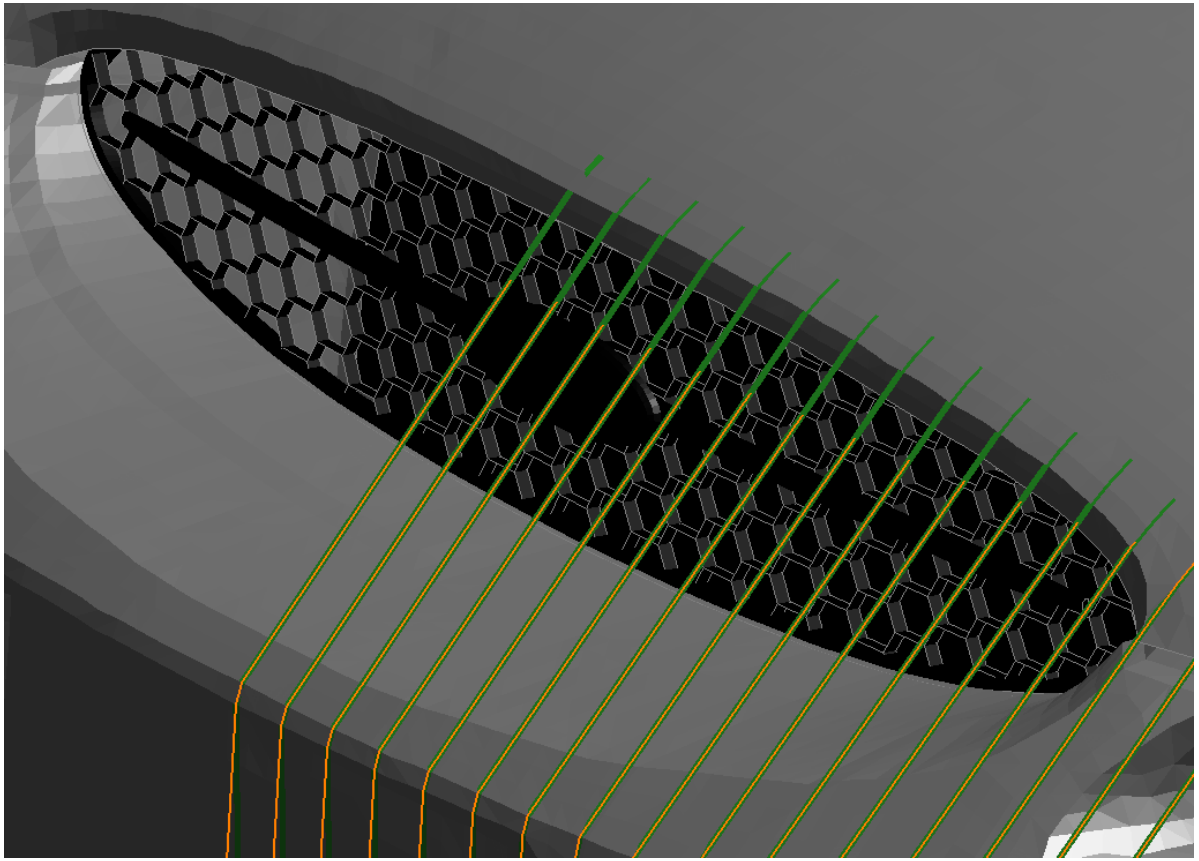


The GTR protocol now uses this method too.

Pedestrian Markup

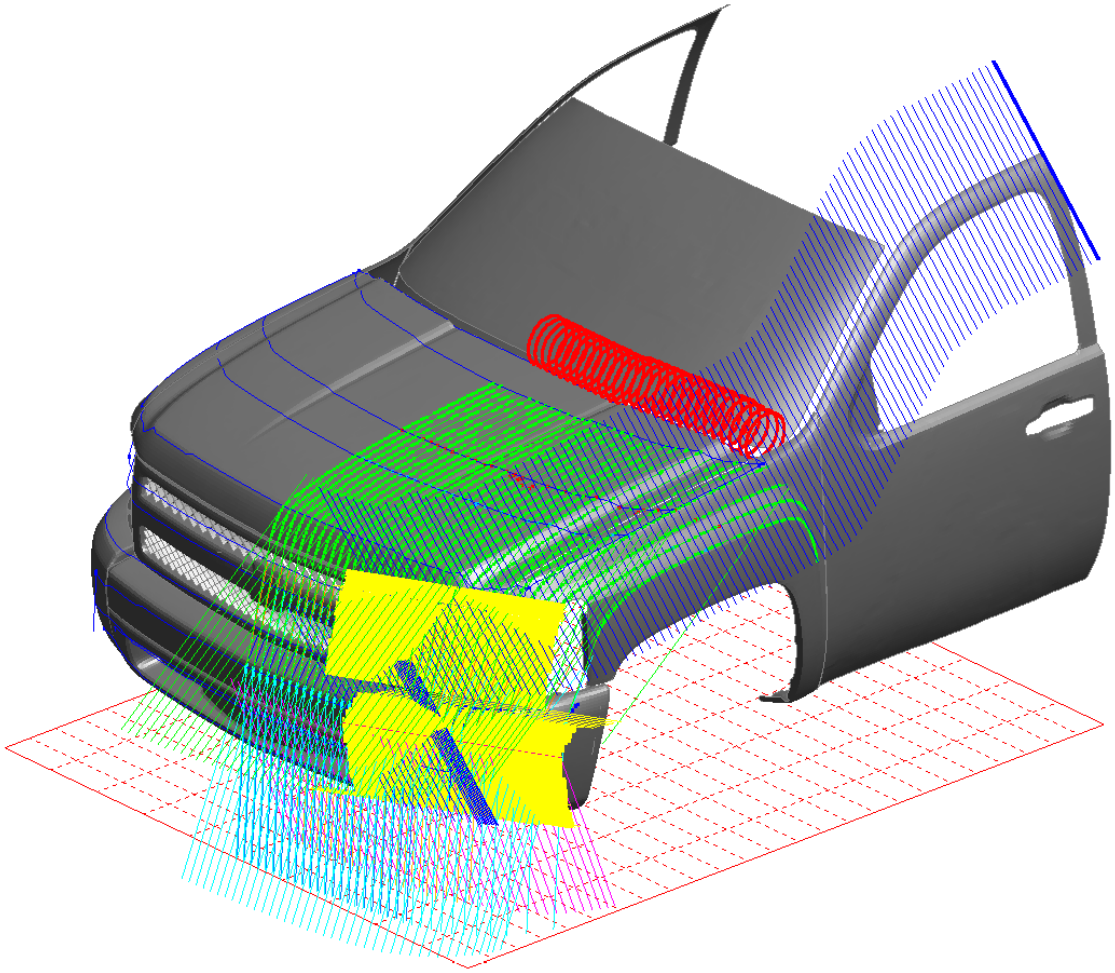
The outer surface around the front of the vehicle is now approximated using tape to span any gaps, for example in the grill area.

This is used in the WAD line calculations to stop points on the line falling into gaps.



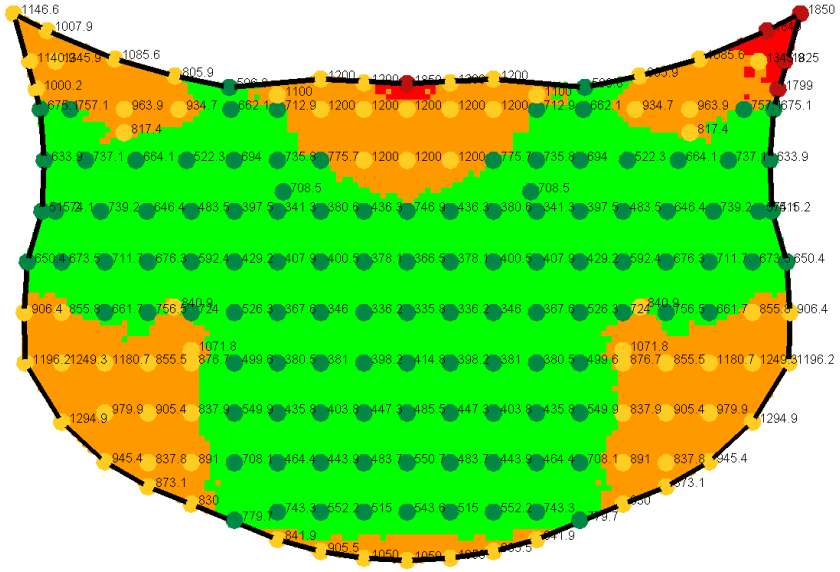
Pedestrian Markup

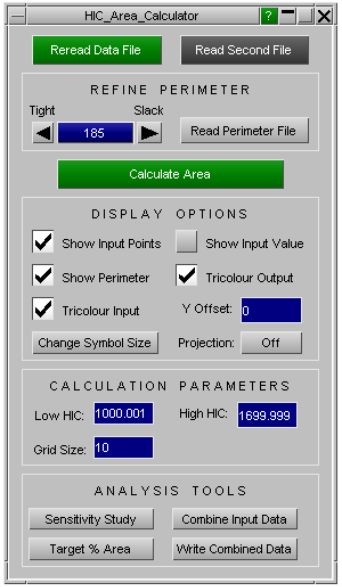
The sticks and tape used to markup the vehicle are now output to a separate model. They can then be used as references for making design changes.

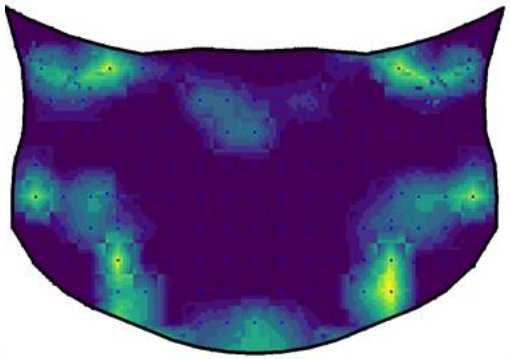


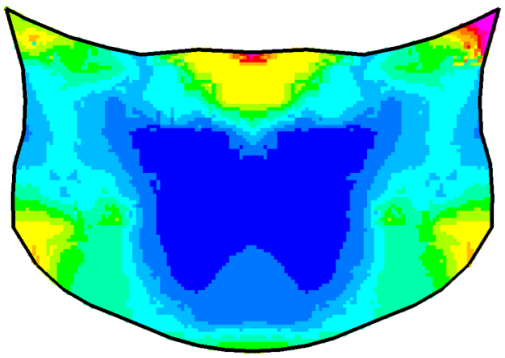
HIC Area Tool – Added in V14

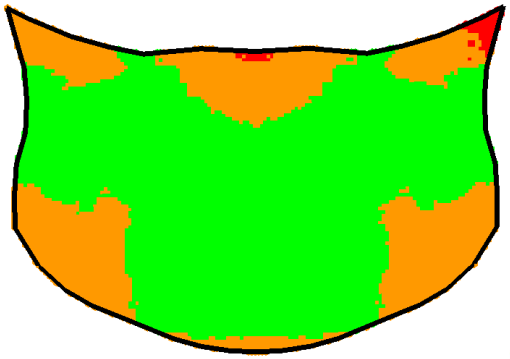
- New interactive tool for calculating and interpreting pedestrian head impact HIC area.





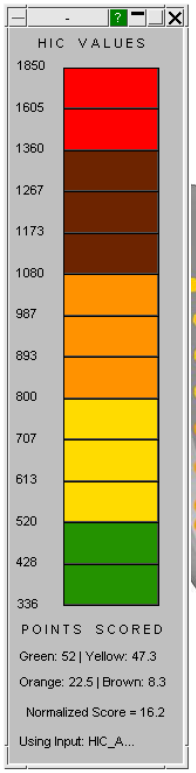




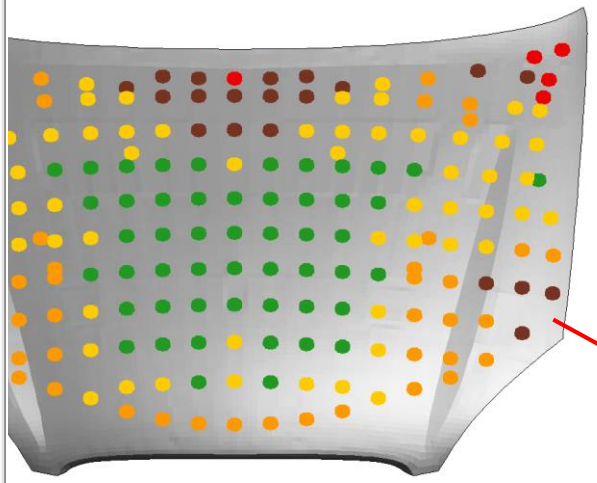


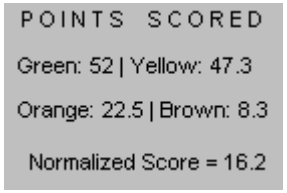
HIC Area Tool – V15 Enhancements

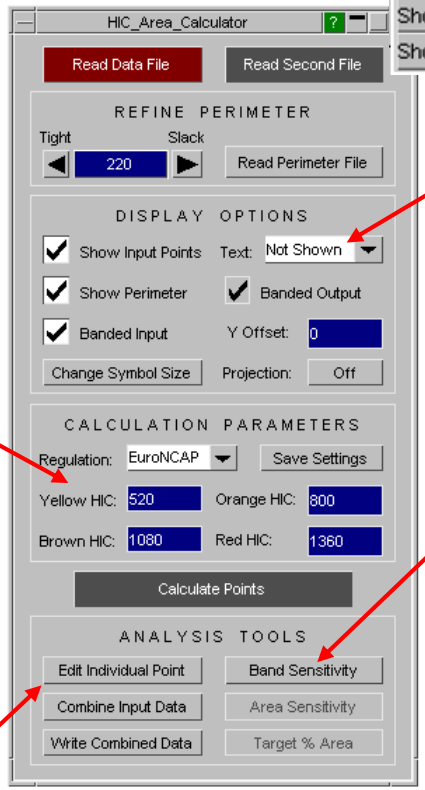
- New features and calculation methods added to HIC Area Tool:



New EuroNCAP v8 grid method score calculation.

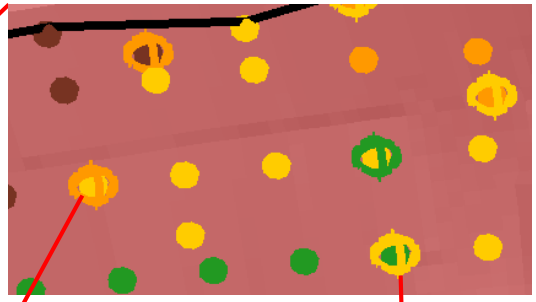






Now possible to assign and show a point name as an alternative to a value.

New tool to highlight which points are close to changing banding, based on an input HIC delta value.



Yellow close to turning orange.

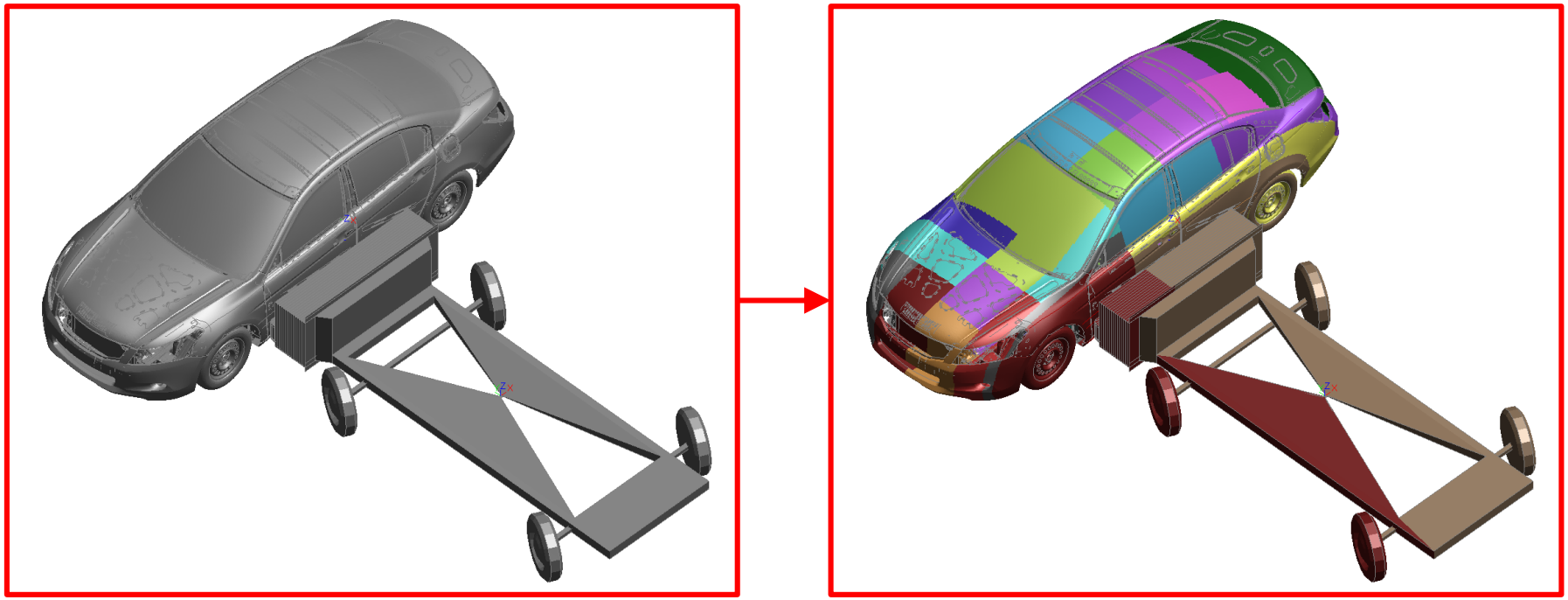
Green close to turning yellow.

Option to edit an individual point by clicking it on screen and typing a new HIC value.

Decomposition

Model Decomposition

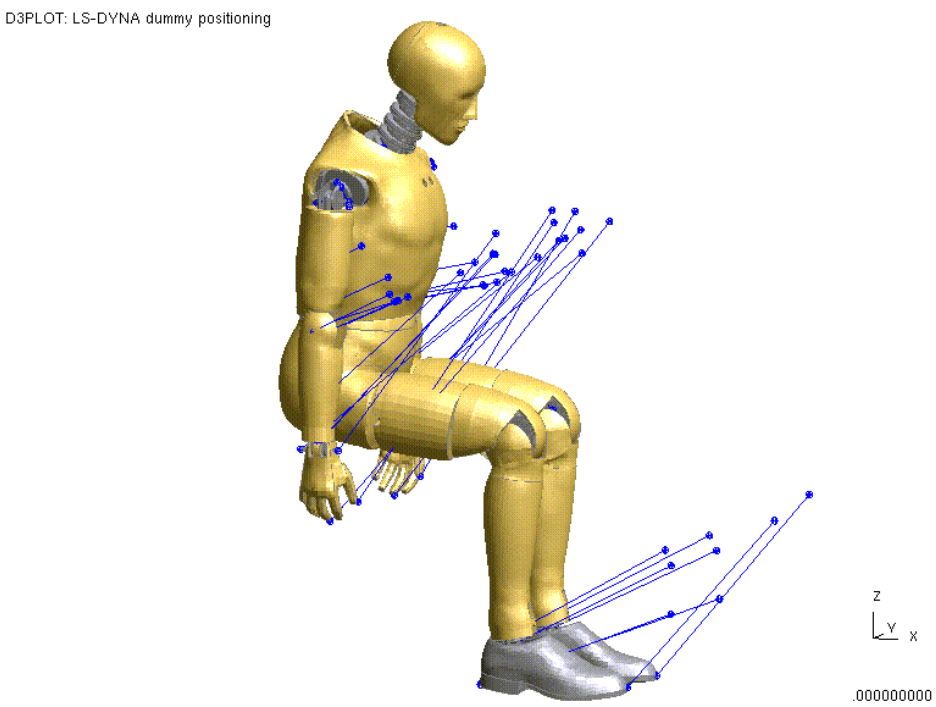
- New script allows you to easily see how a model has been split across multiple CPUs for LS-DYNA analysis.
- Reads a *decomp_parts.ses file (produced by *CONTROL_MPP_DECOMPOSITION_OUTDECOMP) and changes the colours of the shells, solids and beams in a model.

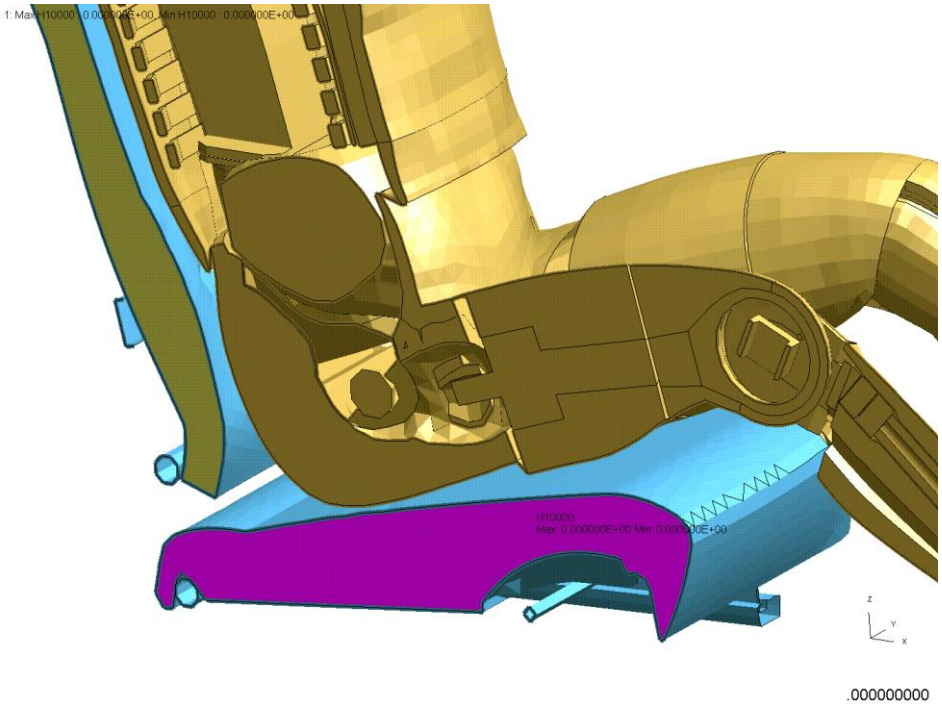


Occupants

Combined Dummy Positioning + Seatsquash

- PRIMER contains functionality to set-up simulation based occupant positioning and seatsquash separately.

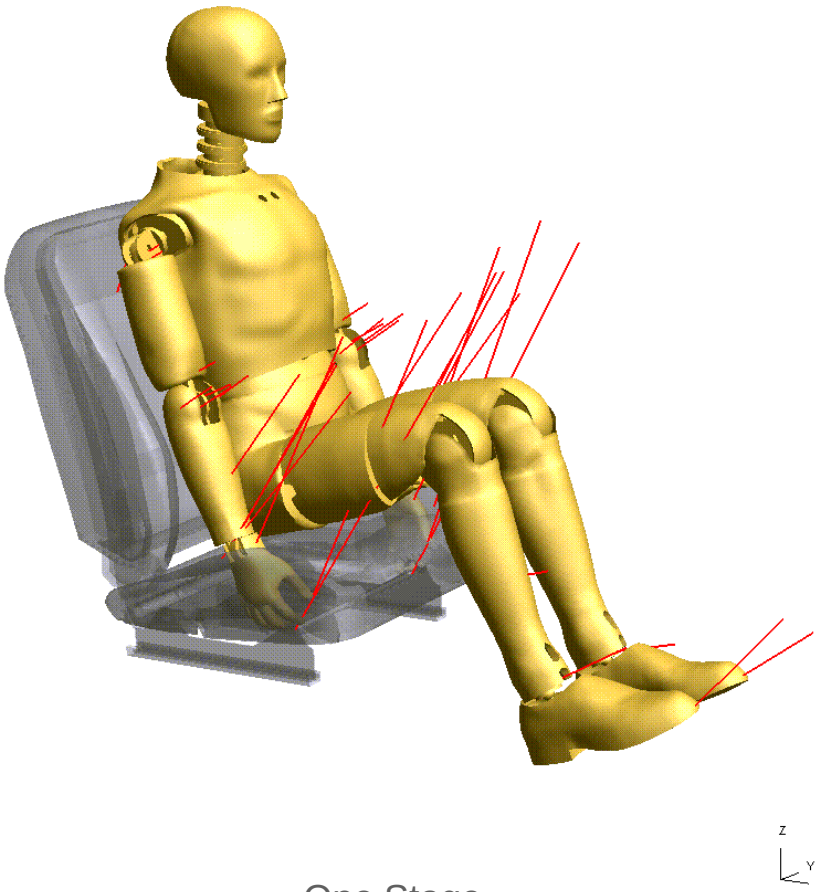




- New functionality had been added to combine these into one analysis.

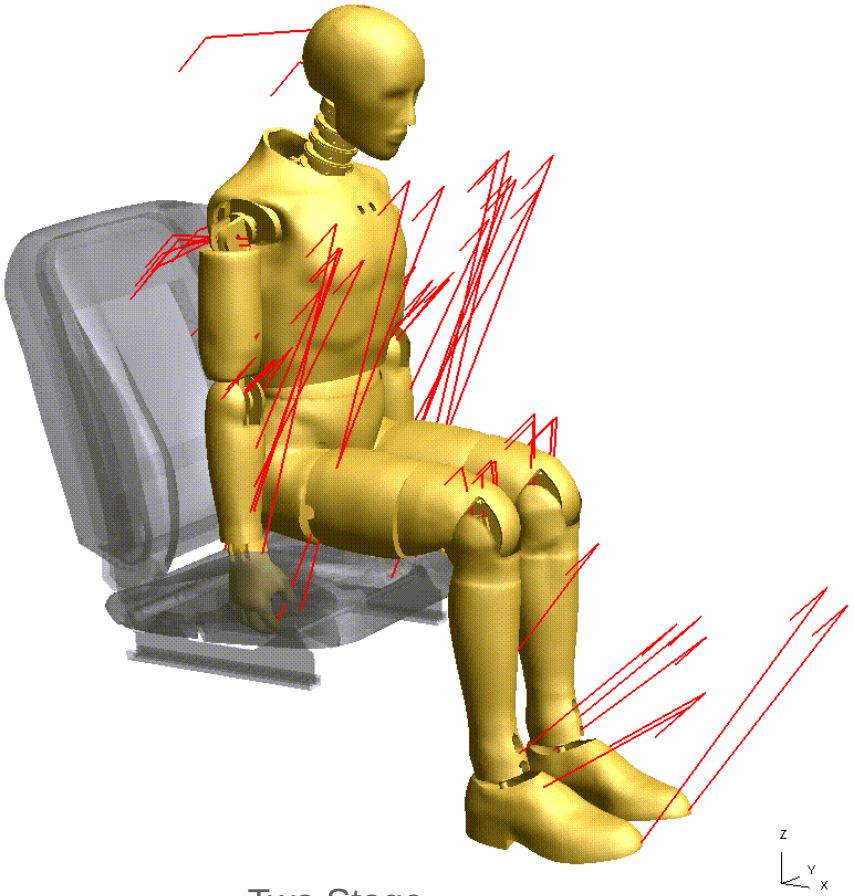
Combined Dummy Positioning + Seatsquash

D3PLOT: M1: occ rr + M2



One Stage

D3PLOT: M3: occ rr + M2



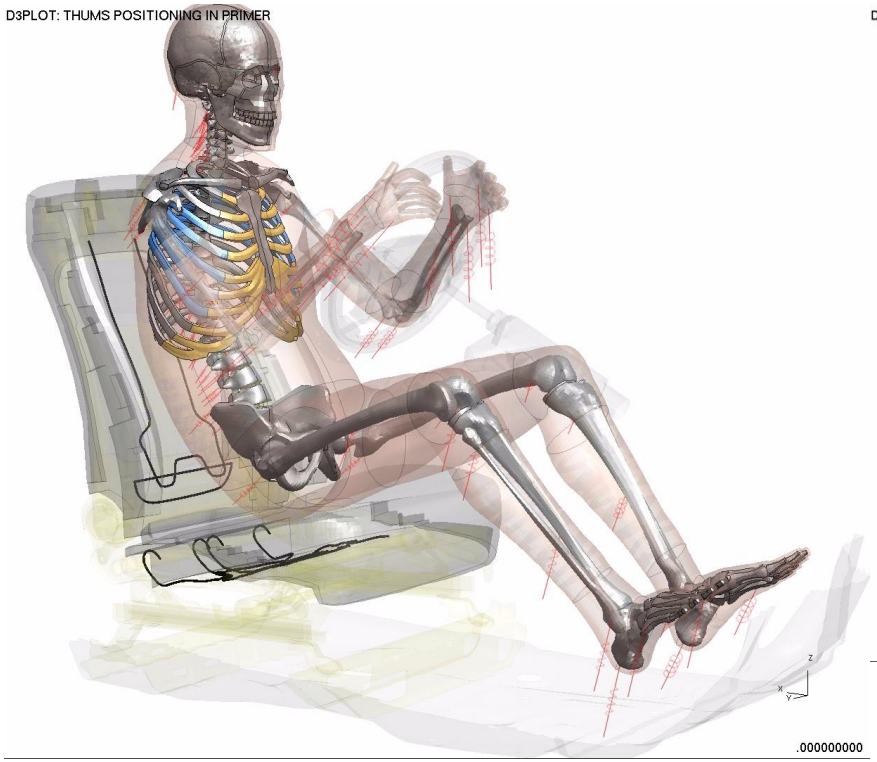
Two Stage

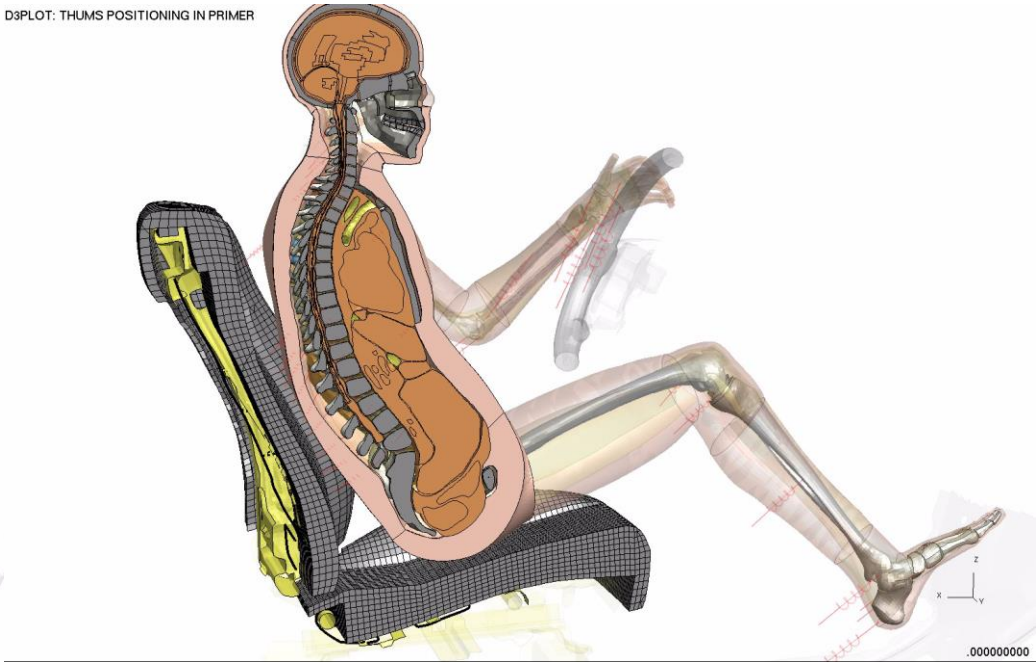
Combined Dummy Positioning + Seatsquash

- Additional features:
  - Ability to create multiple analyses in one operation.
  - “Displacement” based cables rather than “force” based gives the user more control in specifying termination times of analyses.
  - “Sequential” method which give more control in the user specifying start, intermediate and end positions.
  - Available through command line interface, which allows these tools to be driven as part of an automatic/batch process.

Combined Dummy Positioning + Seatsquash

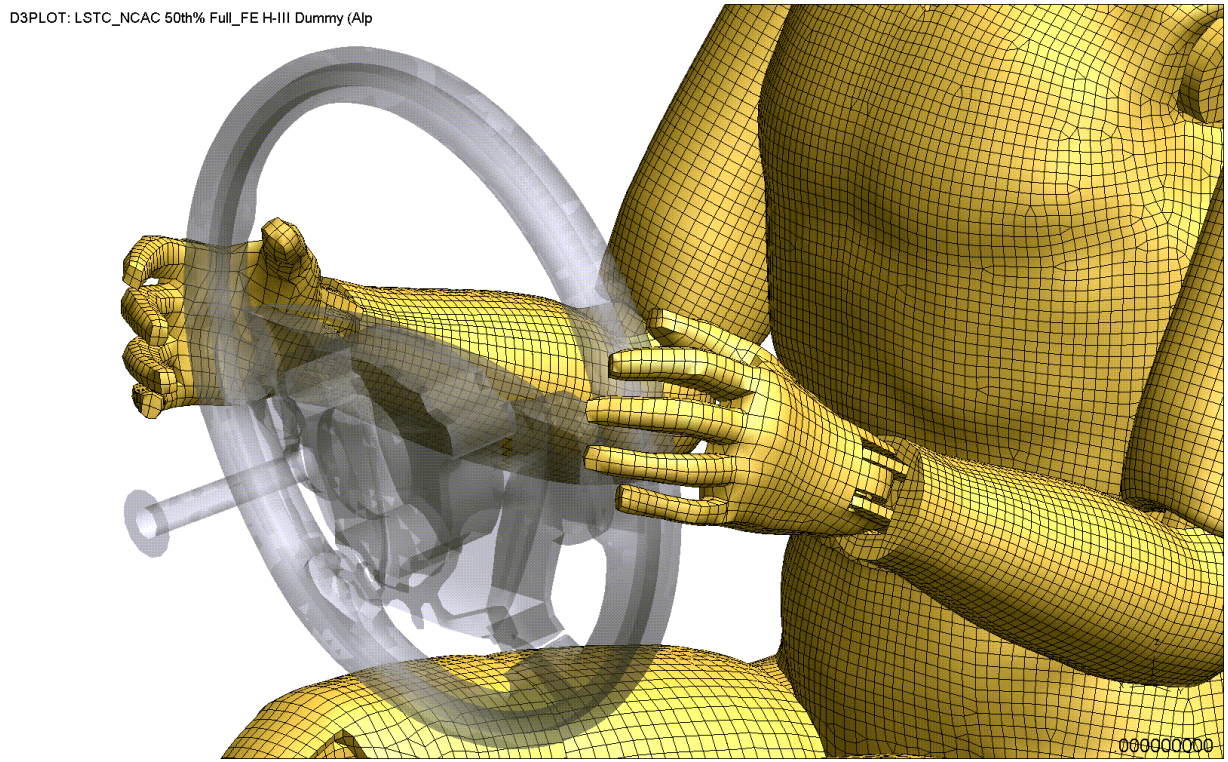
- Method used for positioning THUMS human model into a seat and final position.





Finger Positioning

- A new script is also included to easily create finger assemblies in a dummy model.
- This allows you to position fingers within PRIMER – which can feed into simulation based positioning.



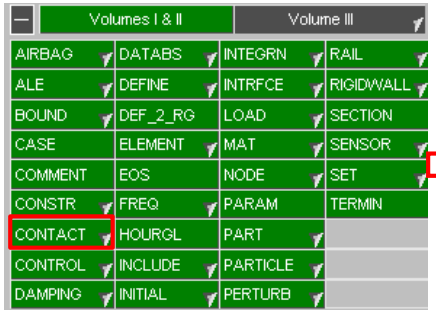
Model Investigation

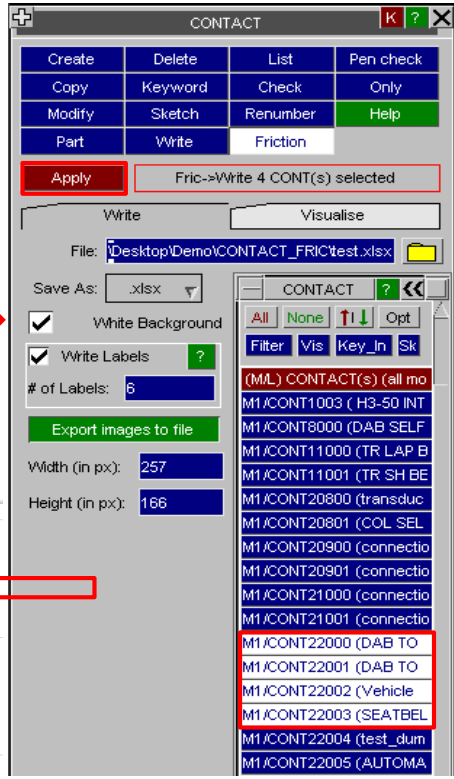
Friction

Investigating Friction

- Contact friction coefficient values are important in any LS-DYNA model.
- There are now a variety of ways of setting friction coefficient values used in contacts:
  - The *CONTACT card itself.
  - The *CONTROL_CONTACT card.
  - *PART_CONTACT cards.
  - *DEFINE_FRICTION cards.
- If you have a combination of the above methods, it can be difficult to understand which friction coefficient values are used in your model.
- New tools in PRIMER allow you to investigate these values.

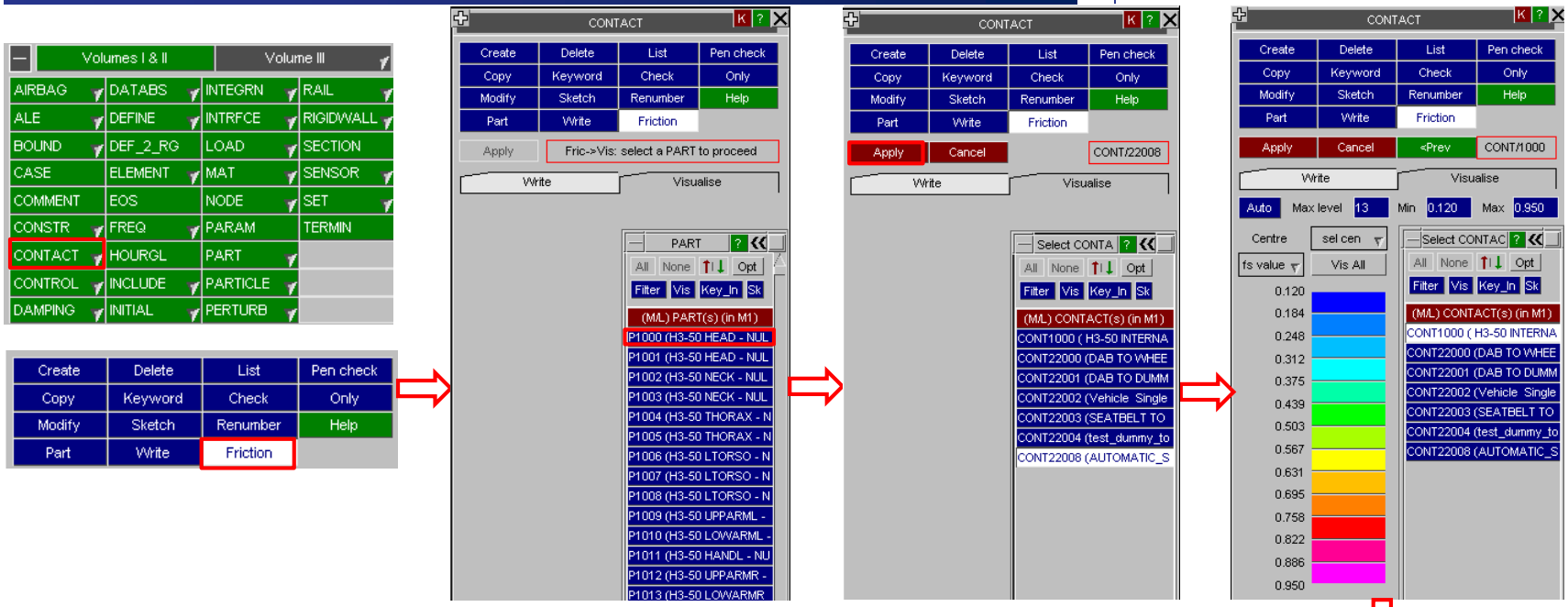
Contact Friction Write



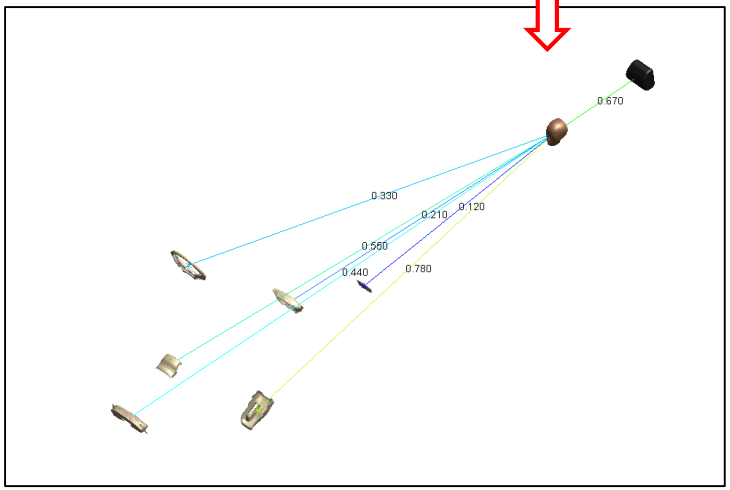


	Contact ID	Friction Type	#Parts in Slave Side	Slave Part ID(s)	Slave Part(s) Image	#Parts in Master Side	Master Part ID(s)	Master Part(s) Image	FS	FD	DC	VC
2	22002	*DEFINE_FRICTION card	2	21204 21103					0.15	0.16	0	0
3	22002	*DEFINE_FRICTION card	2	20204 20581					0.17	0.18	0	0
4	22002	*DEFINE_FRICTION default	784	1000 1001 1002 1003 1004 1005					0.34	0.24	0	0
9	22005	*PART_FRICTION	1	21204					0.2	0.2	0	0
10	22005	*CONTROL_CONTACT				1	21150		0.124	0.345	0	0
11	22005	*PART_FRICTION				1	21199		0.4	0.5	0	0

Contact Friction Plotting



- Select a part - then a list of all contacts which refers to the selected part will be shown.
- Select a contact from the list followed by ‘Apply’.
- All the parts in the selected contact will be shown in the exploded view.



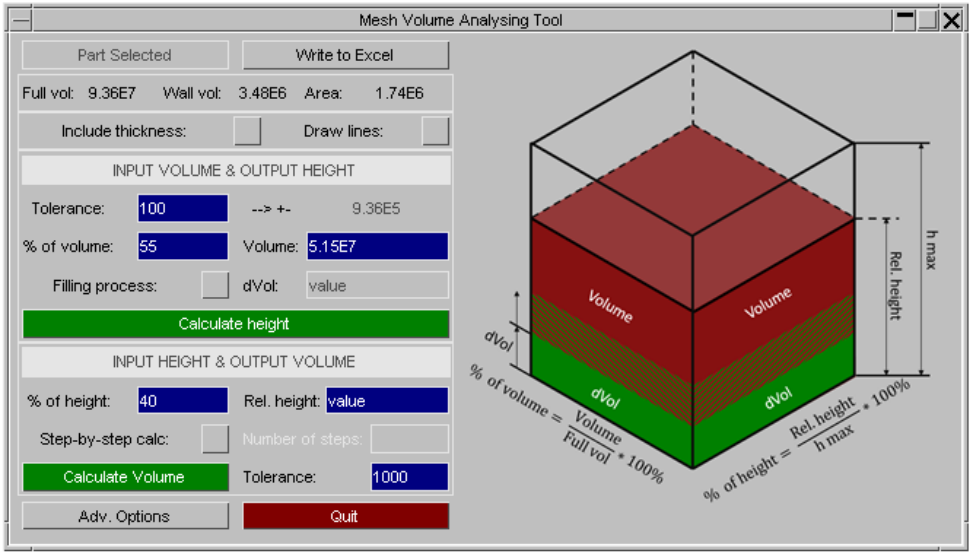
Volume Calculator

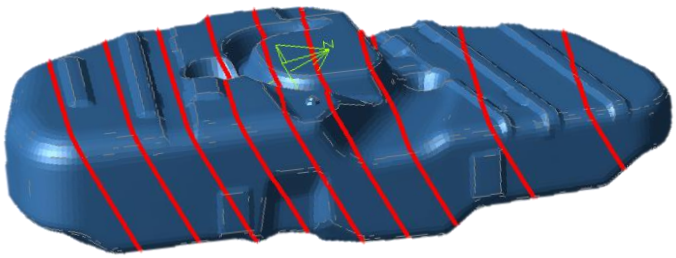
Mesh Volume Analysis Tool

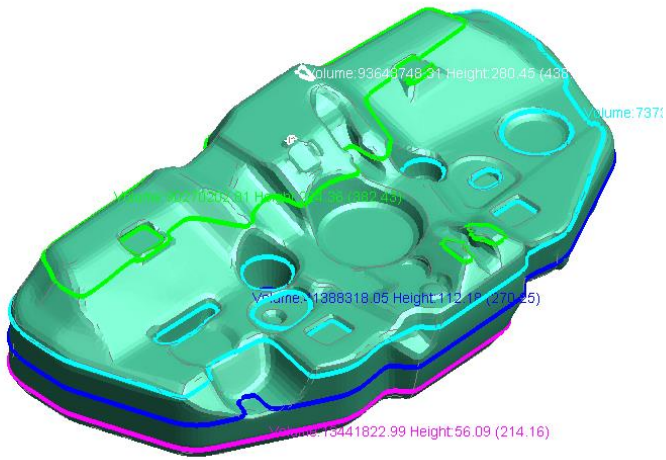
This is a tool for analysing the volume of closed meshes.

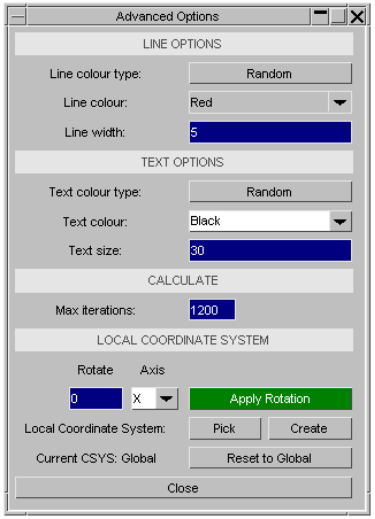
Key features include:

- Liquid line visualisation.
- Global or Local Coordinate Systems
- Calculations on fuel tank:
  - Full tank volume
  - Step-by-step volume calculation
  - Wetted surface
- Writing these results to Excel/CSV.





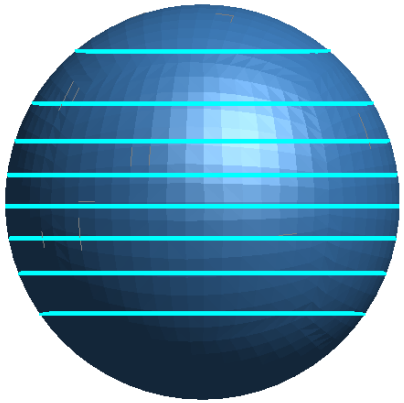




Mesh Volume Analysis Tool

Step-by-step volume calculation:

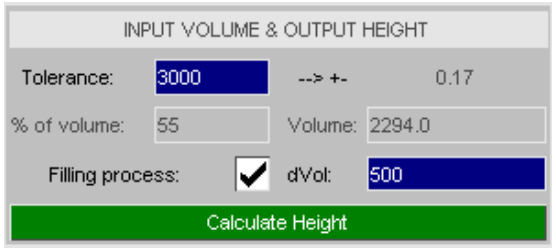
- Input volume - output height



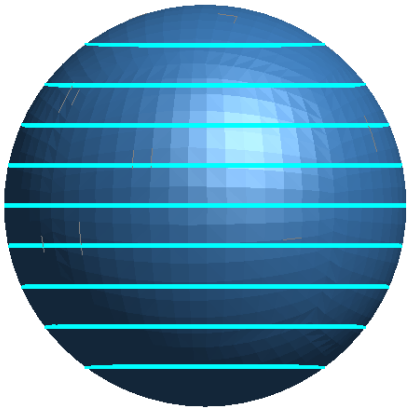
Excel results.

Relative height	Liquid volume	Wet surface
17.6	4000	1123
15.0	3500	958
13.1	3000	822
11.4	2500	720
9.8	2000	610
8.2	1500	501
6.4	1000	391
4.4	500	254

GUI panel.



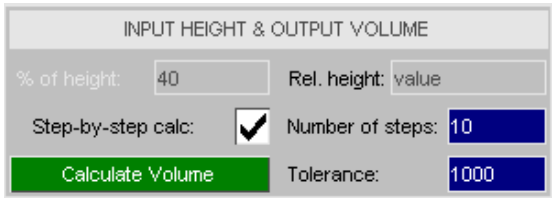
- Input height - output volume



Excel results.

Relative height	Liquid volume	Wet surface
20	4171	1254
18	4049	1154
16	3727	1015
14	3259	884
12	2689	760
10	2073	633
8	1456	490
6	886	358
4	424	238
2	113	91

GUI panel.



Wet surface area up to the line.

Model Check and Output

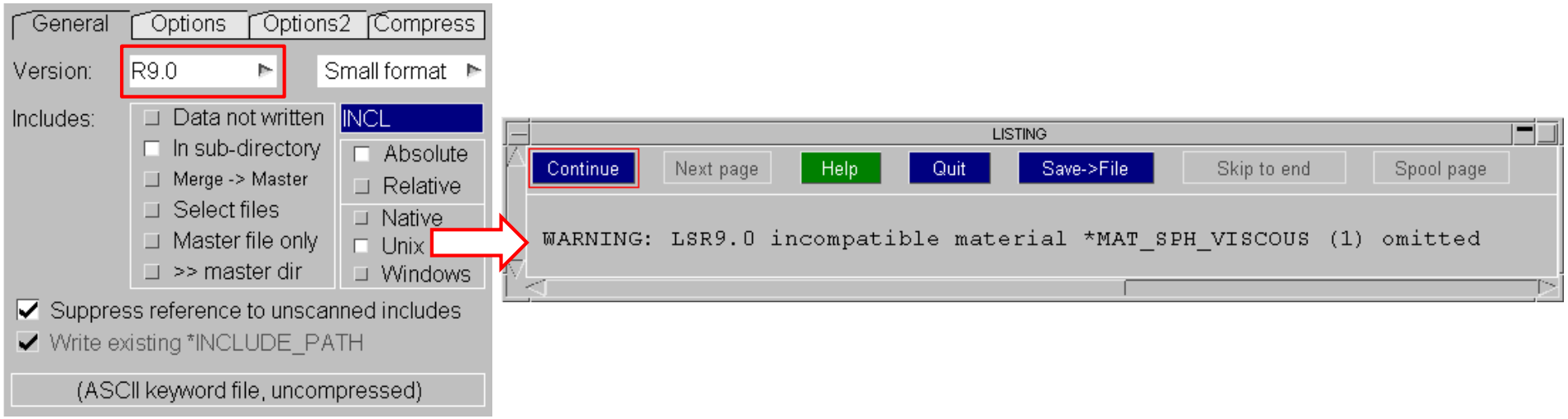
Model Check

- Model checking continues to be an integral part of PRIMER.
- ~500 new checks added into v15 compared to v14.
- Now ~7200 individual checks in PRIMER.

Model Check Reports Omitted Keyout Items

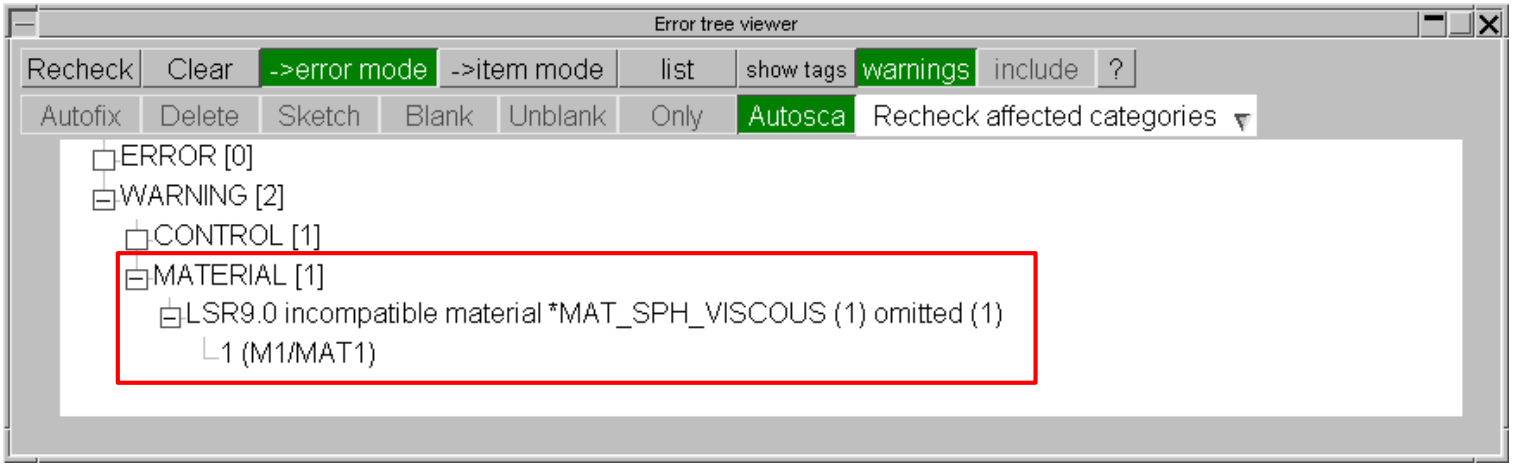
- When keyword output targets a version of LS-DYNA that pre-dates new keywords, or new data fields on existing keywords, PRIMER has historically reported this only during keyout itself, for example

- Example - *MAT_SPH_VISCOUS. This was added into LS-DYNA R10. If you have this keyword in your model and you write out with the output version set to R9 (or below) in PRIMER you will get the following message:



Model Check Reports Omitted Keyout Items

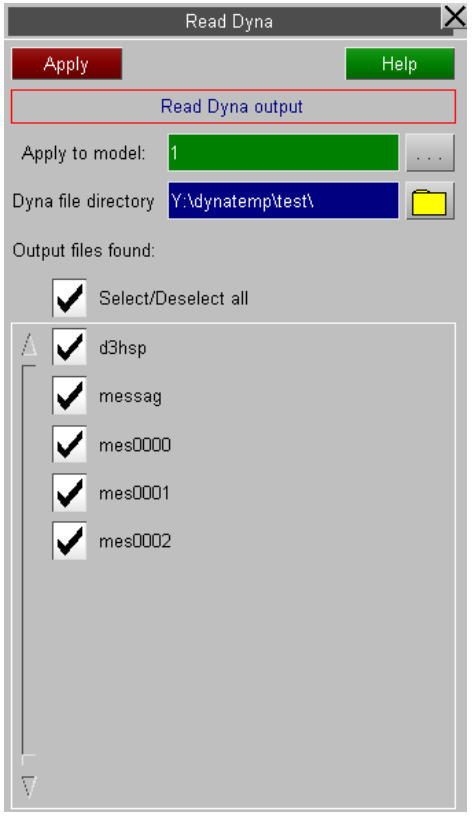
- This was annoying because you only discovered unsupported keywords when you came to write the model out to disk.
- This information is now captured during **Model Check** and is reported along with “ordinary” errors/warnings.



- These messages can be promoted to errors rather than warnings in the check options panel.

LS-DYNA Output File Reader

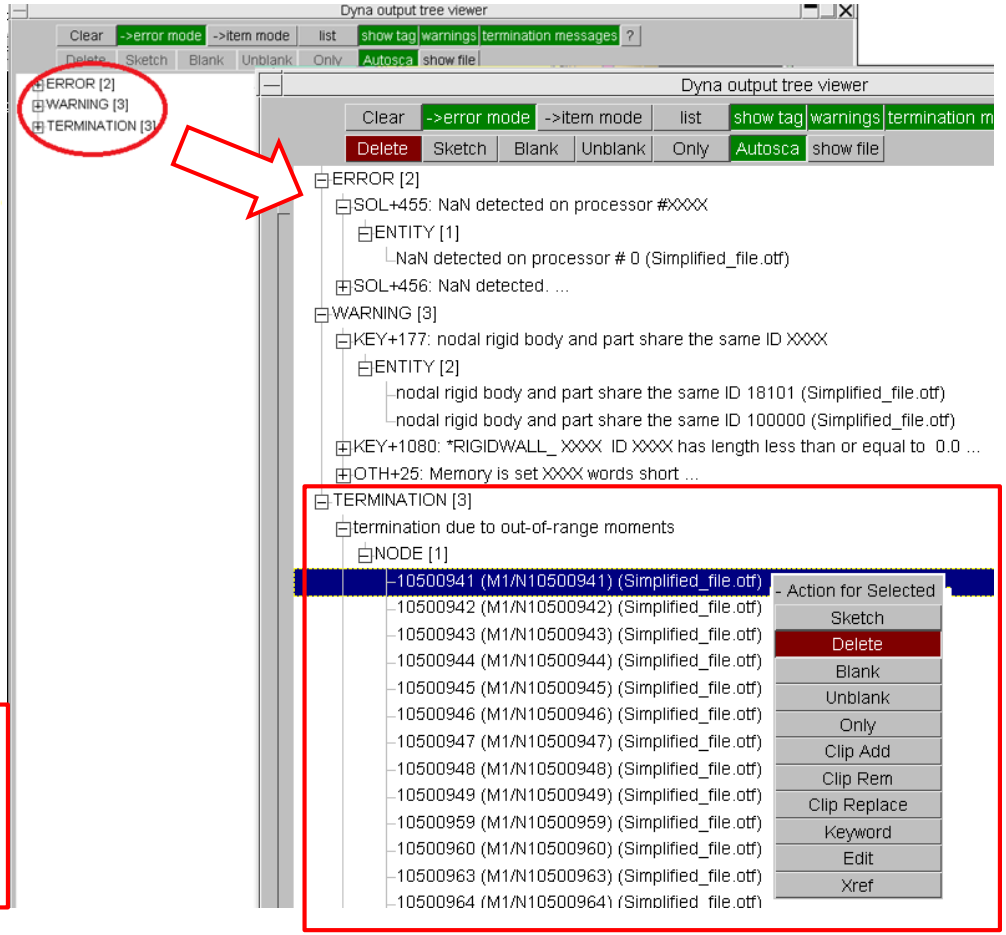
LS-DYNA Output File Reader – V14



LS-DYNA Output File Reader – V15

- In addition to errors and warnings, PRIMER can now read “termination” style messages:

```
*** Error 40456 (SOL+456) (processor # 0)
    NaN detected.

*** Warning 11080 (KEY+1080)
    *RIGIDWALL_GEOMETRIC_FLAT ID 1999 has length less than or equal t
    LENL = 0.0000E+00; LENM = 0.0000E+00;

*** Warning 70025 (OTH+25) (processor # 0)
    Memory is set 378702 words short
    increase the memory size to 52000000

*** Warning 70025 (OTH+25) (processor # 0)
    Memory is set 7192330 words short
    increase the memory size to 59192330

*** Warning 70025 (OTH+25) (processor # 0)
    Memory is set 821210 words short
    increase the memory size to 63192330

*** Warning 10177 (KEY+177)
    nodal rigid body and part share the same ID 18101

*** Warning 10177 (KEY+177)
    nodal rigid body and part share the same ID 100000

*** termination due to out-of-range moments
    number of nodes has out-of-range moments       402
Node list:
 10500941  10500942  10500943  10500944  10500945  10500946  10500947
 10500949  10500959  10500960  10500963  10500964  10500965  10500966
 10500968  10500969  10500970  10500971  10500981  10500983  10500985
 10500988  10500990  10500991  10500993  10500996  10500999  10501001
```

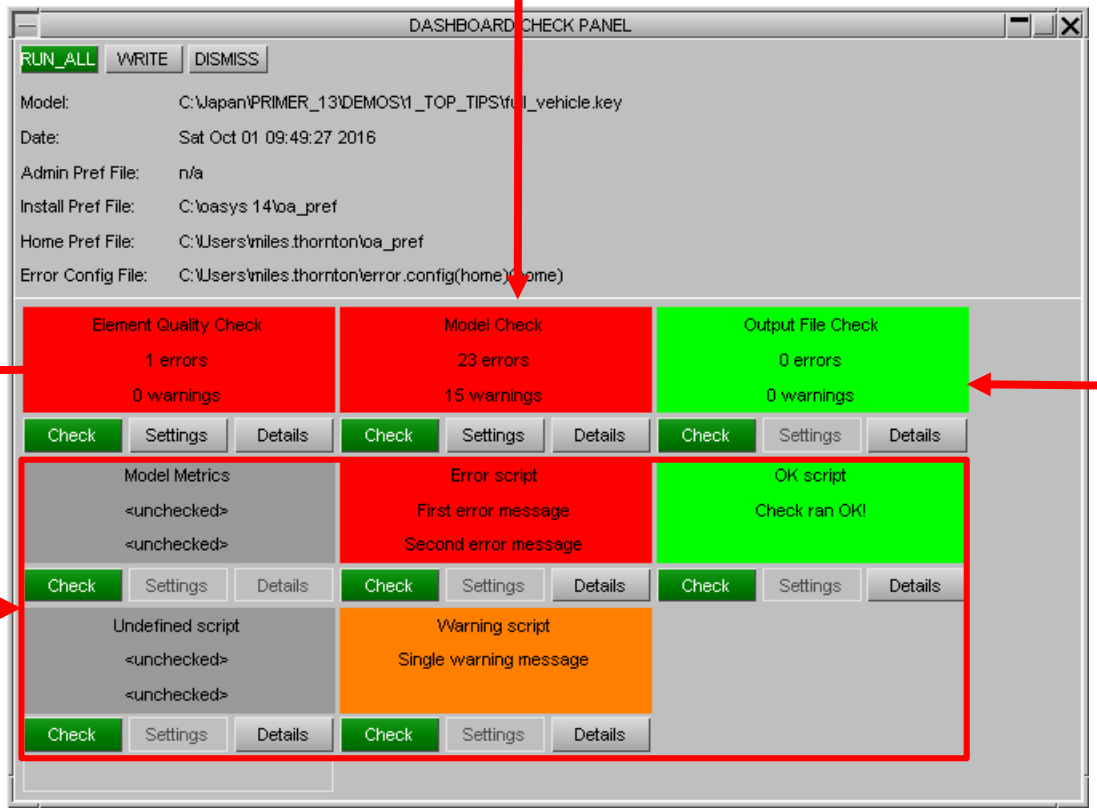


Dashboard

Dashboard for Model Checking and Health

Introduced in V14:

PRIMER model checks



Element quality

User defined checks/metrics

Errors/warnings from LS-DYNA

Model Read/Write

Improved Model Read and Write

- In V15 model read and write is faster:
  - Parallelisation and efficiency improvements mean that V15 reads a typical model in about 60% of the time of V14.
  - Model write is also faster taking about 70% of the time, but if a model has many include files then the speed up will be greater.
  - Input and output to a slow network disk are also improved due to better buffering and parallelisation.

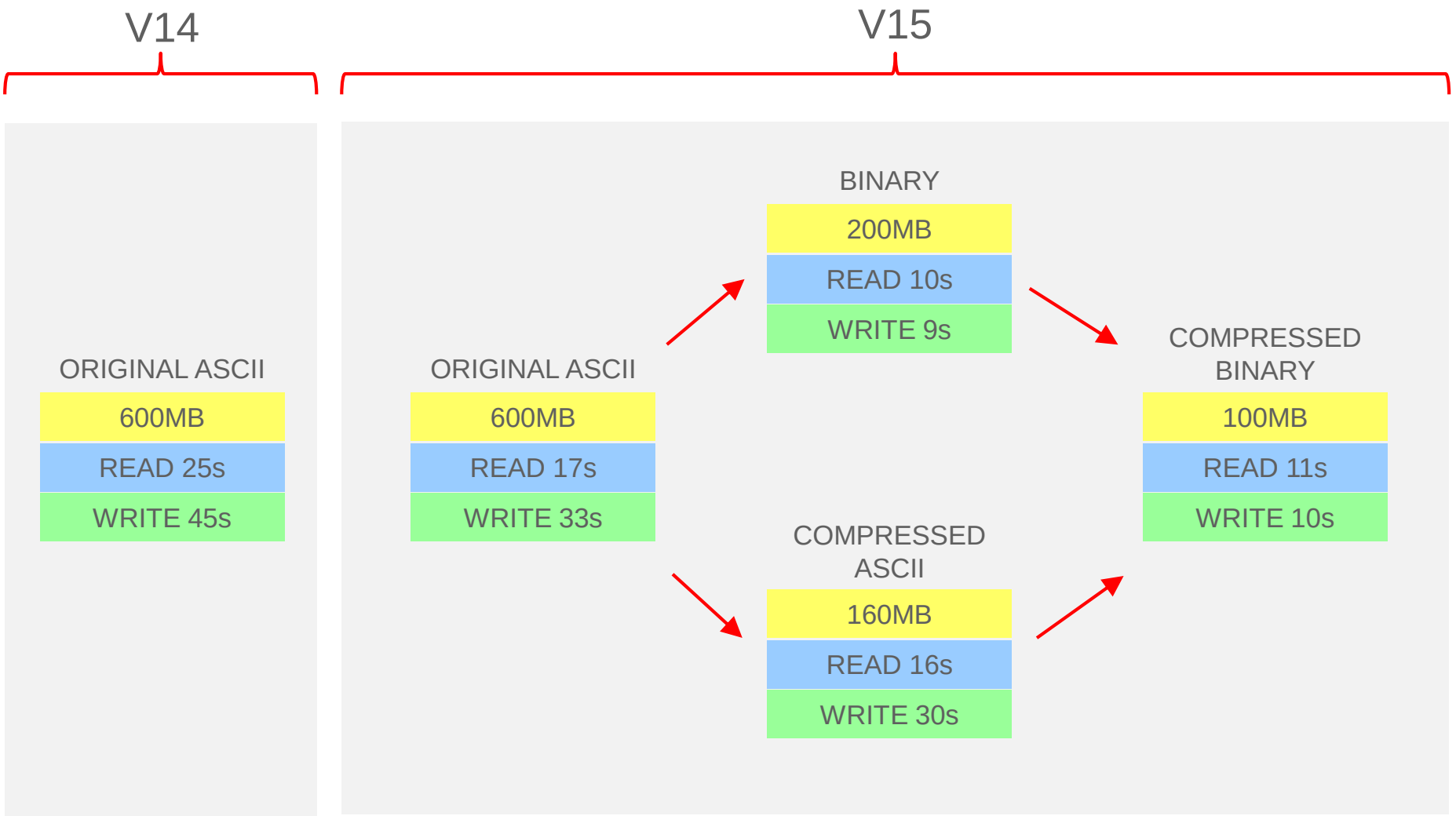
Improved Model Read and Write

- New optional “Binary” keyword output format added
  - Files start off in ASCII, so the tops of file (e.g. comments) remain readable.
  - After (new) *START_BINARY keyword they swap to binary.
  - Binary file size is typically 30% of original ASCII keyword file and writes to disk in about 25% of the time of the equivalent ASCII file. File read is also faster than ASCII as no conversion is needed.
  - Binary format preserves original formatting, and can be turned back into a normal ASCII formatted keyword file using a standalone programme as well as PRIMER.
  - Binary format is used for “Undo”, speeding up the disk i/o of this substantially.

Improved Model Read and Write

- Optional data compression has been added.
  - Files are compressed using standard zipping:
    - Unix/Linux - Gzip - (.gz)
    - Windows - Winzip - (.zip)
  - Models with multiple include files can be compressed into a single .zip archive containing master file and all includes in an embedded INCL directory.
  - The degree of compression is user-configurable, the default level giving file sizes about 25% of the original ASCII files.
  - Binary format can also be compressed, typically resulting in files that are < 20% of the size of the original ASCII files.

Improved Model Read and Write

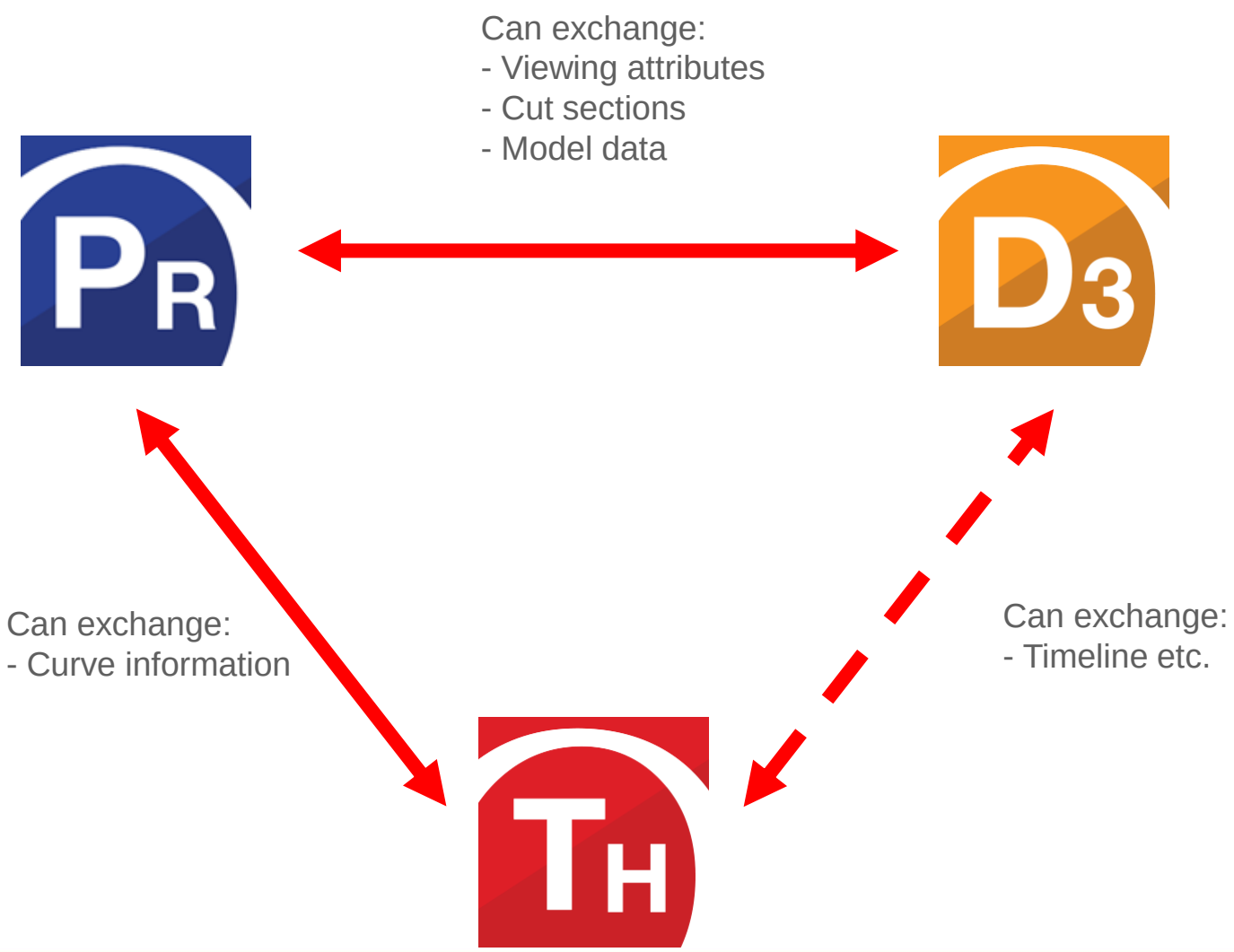


Integration With Post Processing

Pre-Post Integration

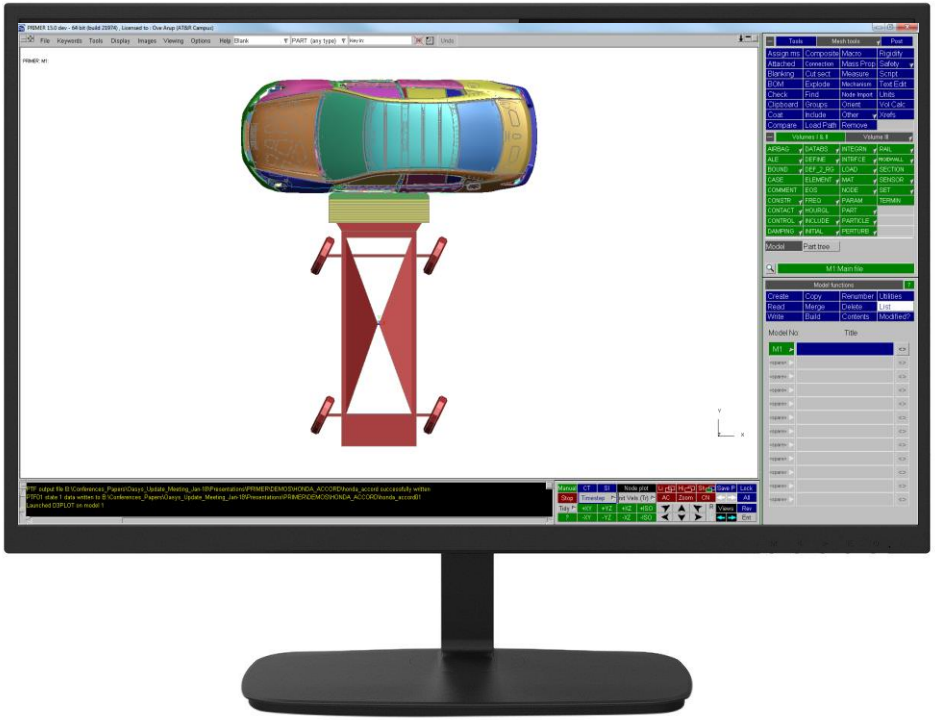
- With the Oasys products you would traditionally look at LS-DYNA input files and output files separately.
- It is often desirable to access both sets of information at the same time, for example:
  - With output results, wanting to look at material properties for a part that has failed.
  - In the input model, wanting to look at spotweld failure of a current analysis when deciding how to change your spotweld configuration.
- The ZTF file (written by PRIMER) allows some model information to be transferred to D3PLOT to aid this.
- In V15 there is also an ability to open one piece of software from another with the contents linked to allow easy access to both sets of information.

Pre-Post Integration



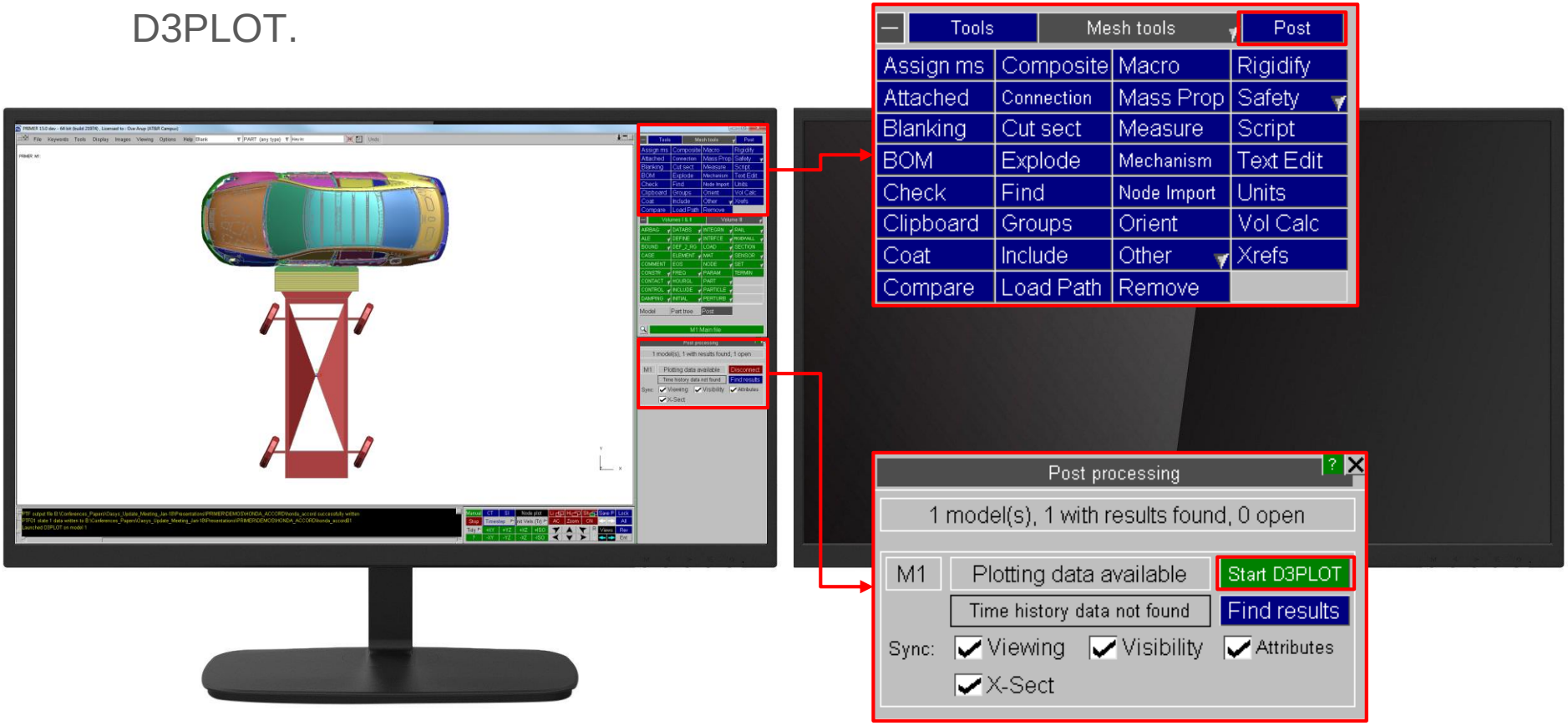
Pre-Post Integration - Example

- You are working in PRIMER – you want to view results information related to your model



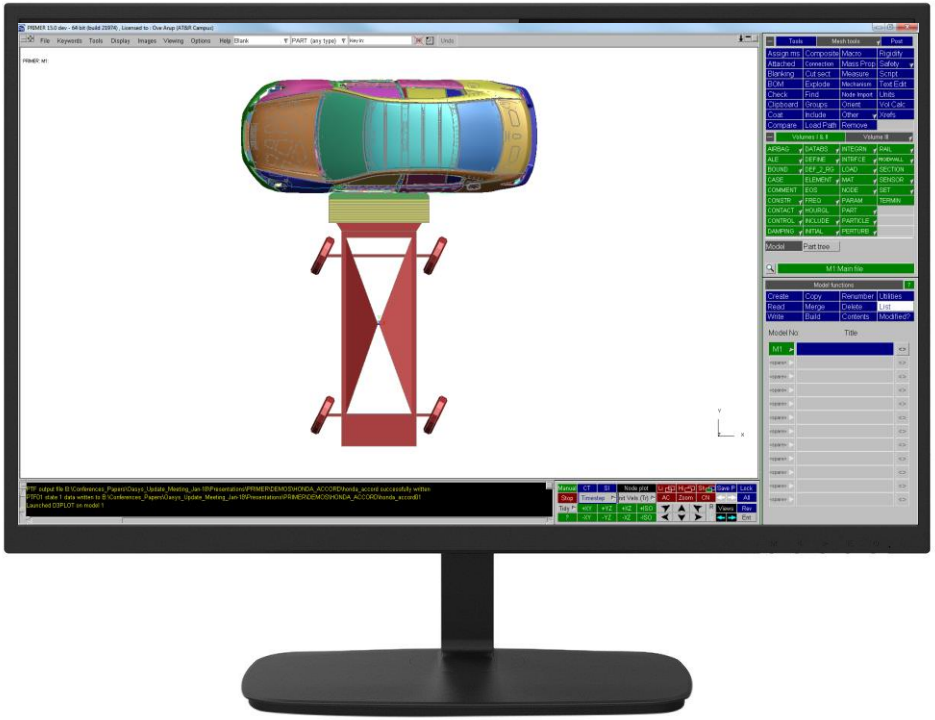
Pre-Post Integration - Example

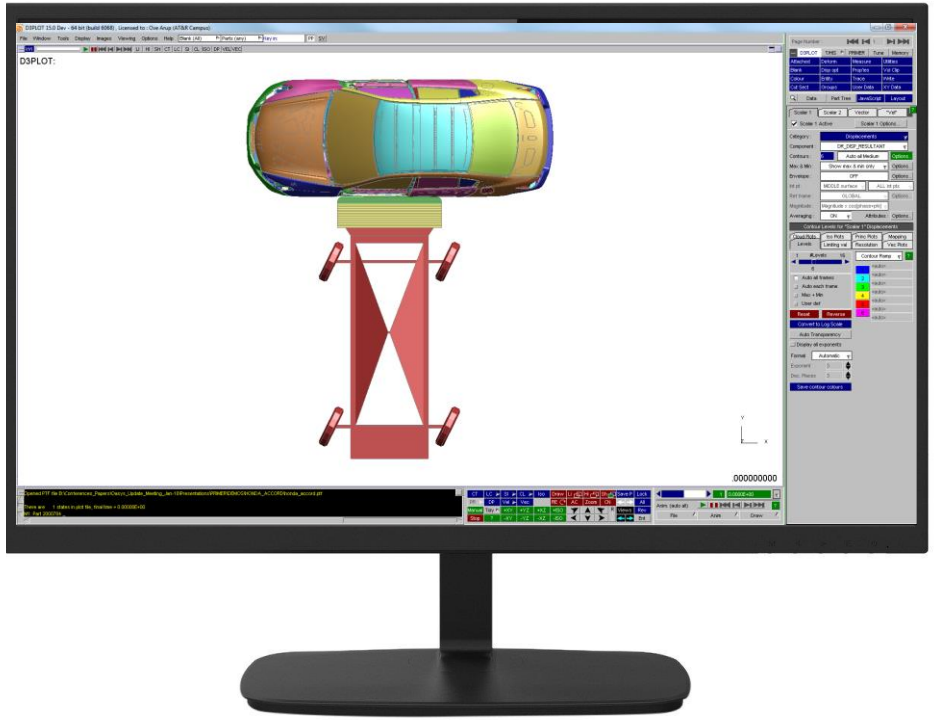
- New “Post” button allows you to launch D3PLOT/T/HIS from PRIMER.
- You can also launch PRIMER from D3PLOT.



Pre-Post Integration - Example

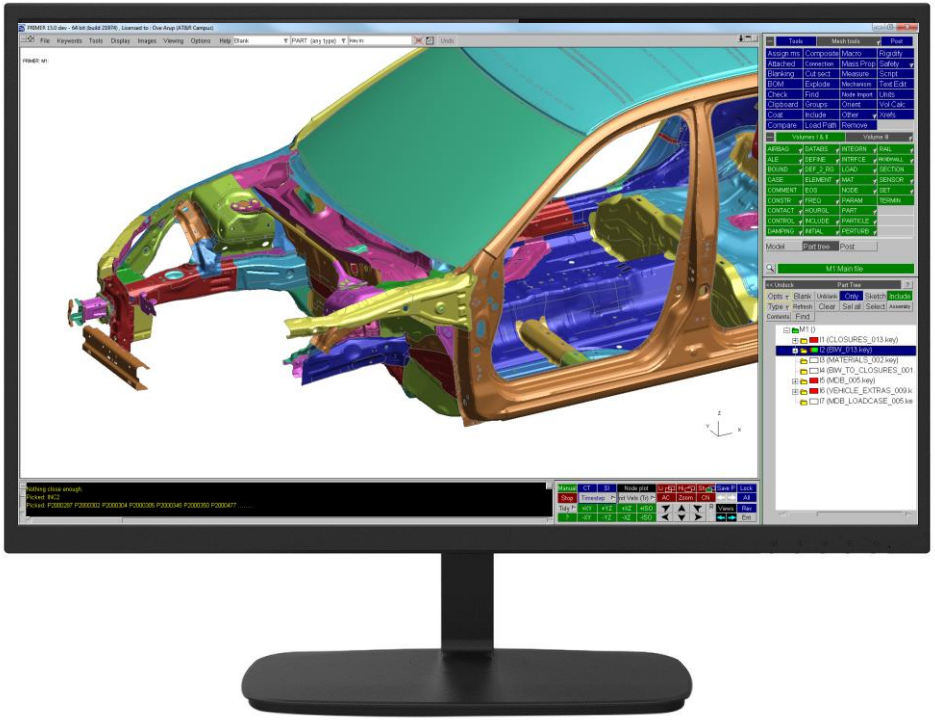
- D3PLOT opens and automatically reads results – view and blanking status are matched.
- This link works best on multiple monitors.





Pre-Post Integration - Example

- Blanking is automatically synced across the link – if you blank entities in one program, the blanking is automatically applied in the other.

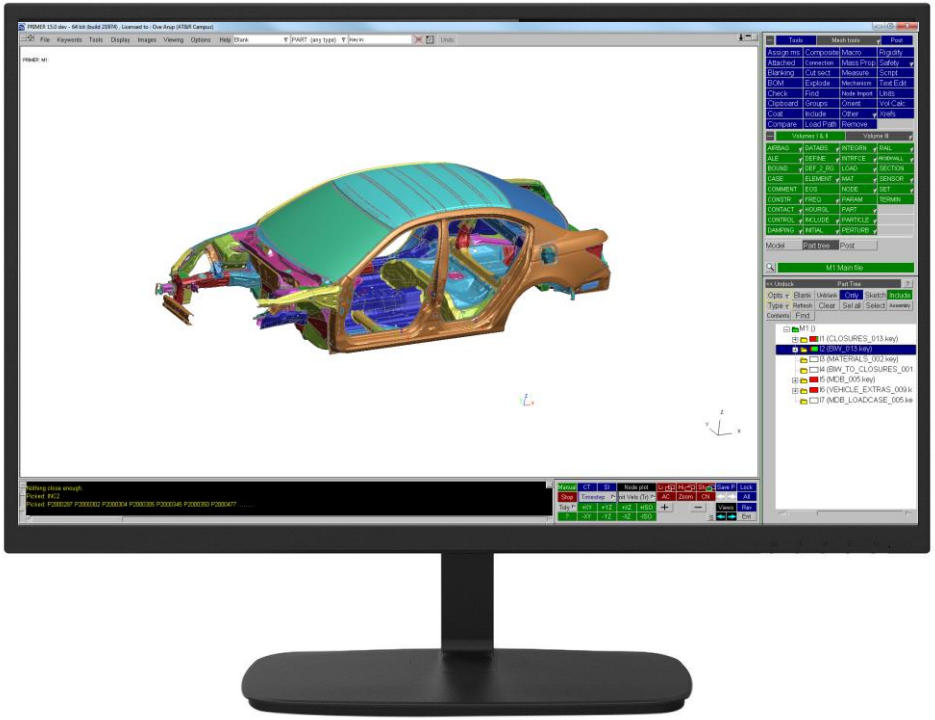


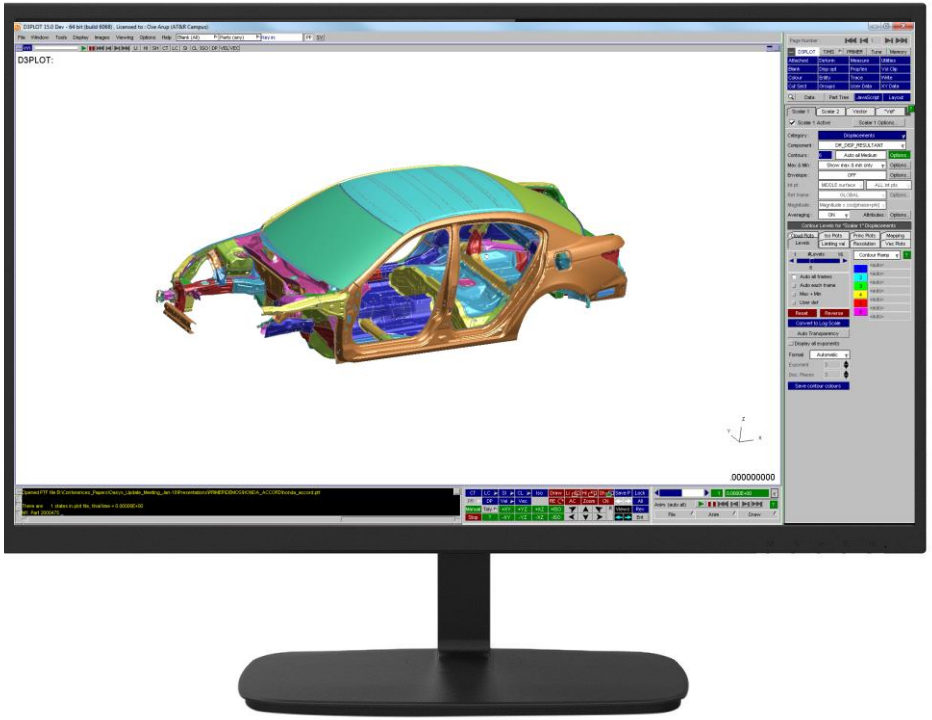
Pre-Post Integration - Example

- Dynamic rotation/translation/zooming is automatically synced across programs.

Pre-Post Integration - Example

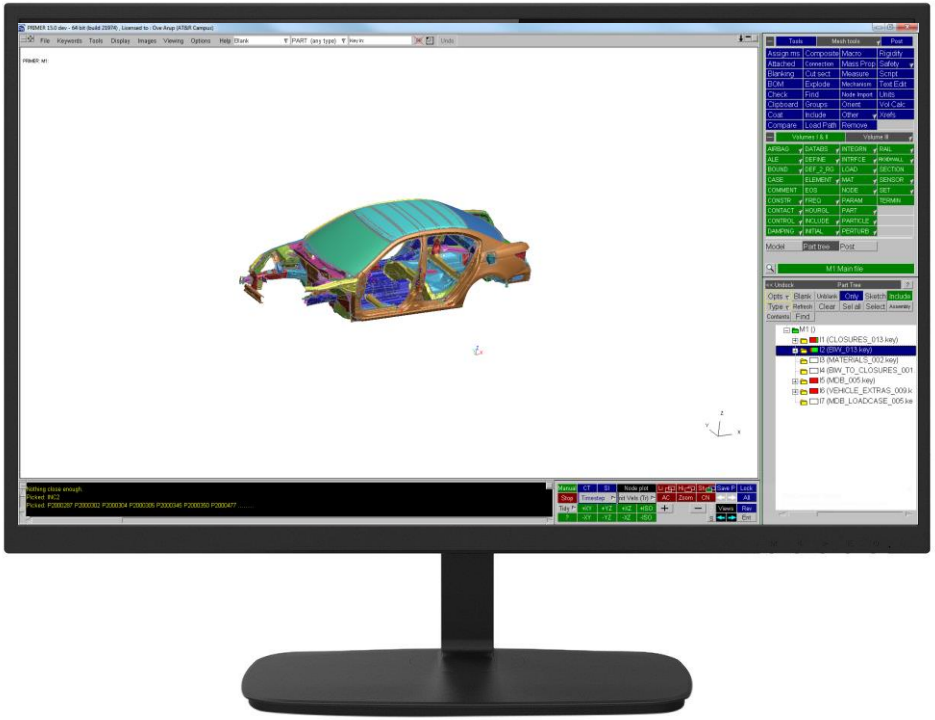
- Dynamic rotation/translation/zooming is automatically synced across programs.

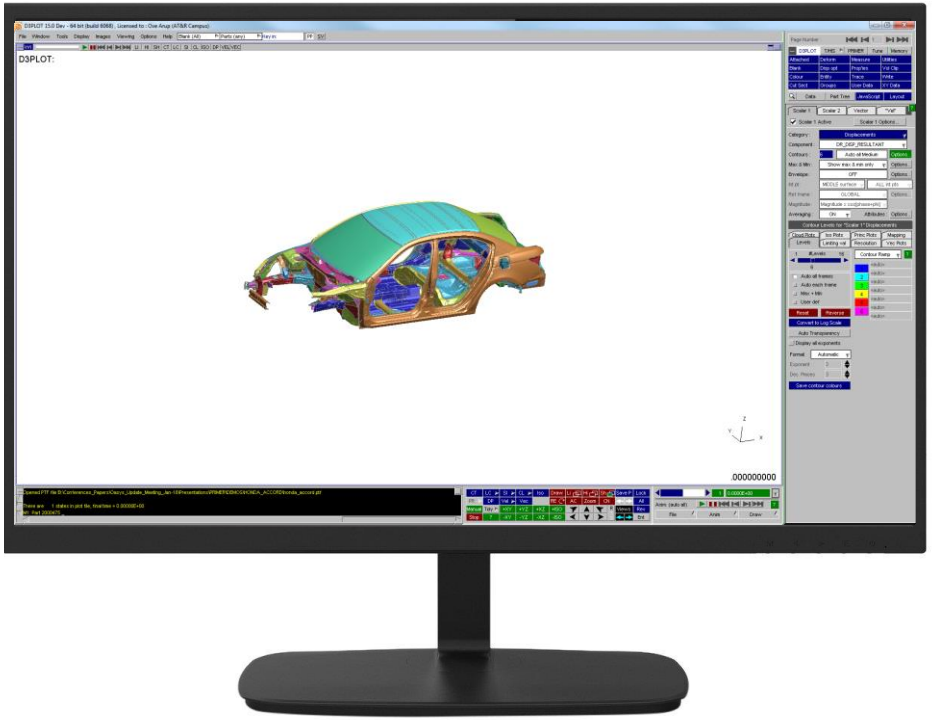




Pre-Post Integration - Example

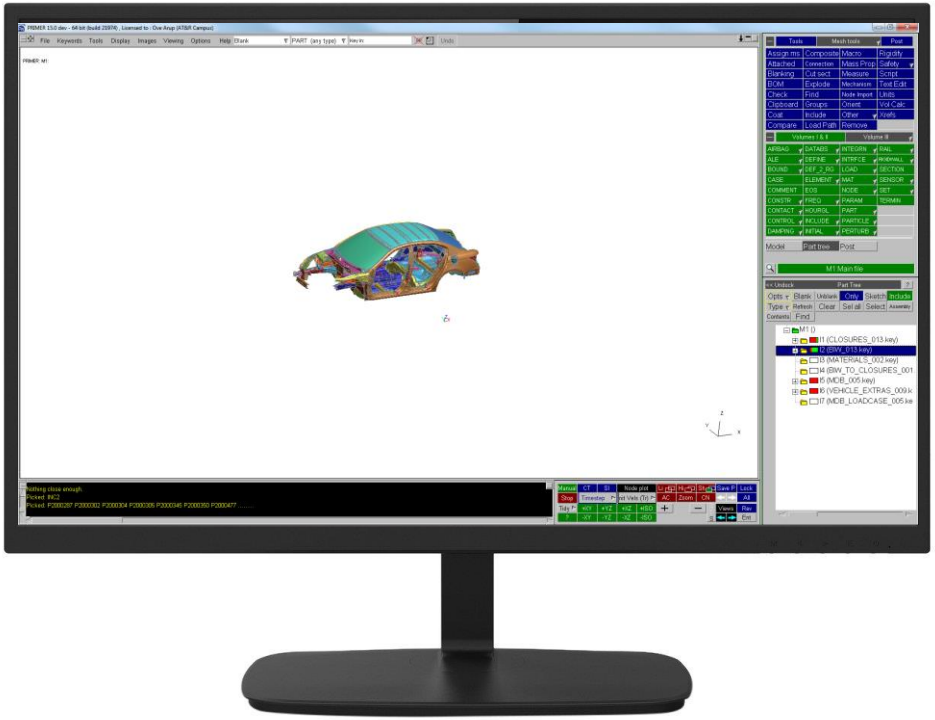
- Dynamic rotation/translation/zooming is automatically synced across programs.

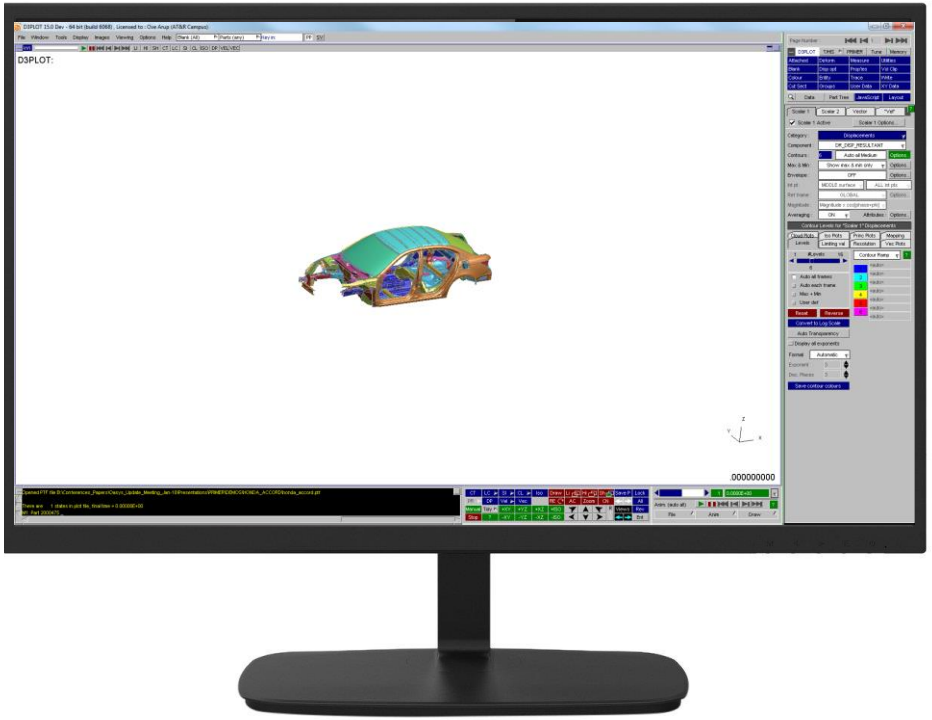




Pre-Post Integration - Example

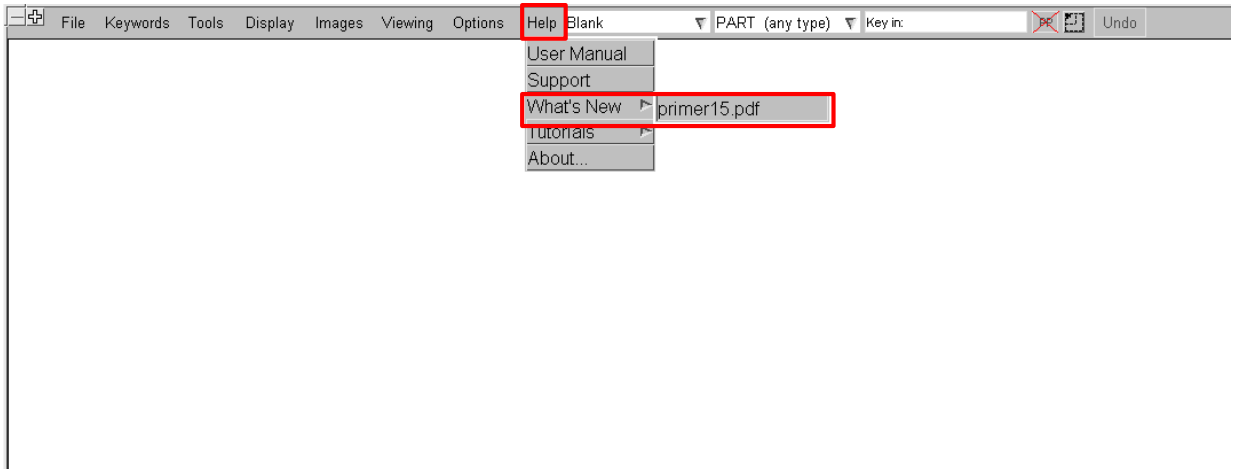
- Dynamic rotation/translation/zooming is automatically synced across programs.





Summary

- V15 to be released in March 2018.
- Visit www.arup.com/dyna for information and support.
- New webinars and tutorials are available.
- “What’s new” information available from within software:



PRIMER Update

2018