Oasys Ltd LS-DYNA Environment Software

Release Notes

Version 16.0

Ove Arup and Partners Limited

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Contents

1 Introduction

The Oasys Ltd LS-DYNA Environment 16.0 suite, dated March 2019 is a full release which supersedes all previous releases.

This document lists the enhancements that have been made during development, and the bugs that have been fixed (since 15.1). Each "case id" referred to in these lists is unique and should be cited if more information or clarification are required.

1.1 Compatibility with LS-DYNA releases

The 16.0 release has been used and tested with LS-DYNA version R11.0, and supports all the keywords in volumes I, II and III of the R11.0 User's Manual dated October 2018.

LS-DYNA R9.0 is now the default keyword output format from PRIMER. (However output may be generated for later releases of LS-DYNA.)

1.2 Hardware platforms supported

The complete Oasys Ltd LS-DYNA Environment 16.0 is available on the following platforms:

Windows	Windows 7 Windows 10	64 bit
Linux	RedHat Enterprise 6.x, RedHat Enterprise 7.x SUSE Enterprise 12.2	64 bit

For simplicity of support and maintenance only the RedHat Enterprise 6.x build has been released on the website as this has been found to run on most machines.

If you require a different Linux build, please contact Oasys Ltd.

1.3 Graphics hardware supported

The default graphics protocol used on all platforms in the table above is OpenGL, which gives good quality 3D performance on a wide range of hardware.

"Legacy" X-Windows (2D only) graphics drivers remain in PRIMER on Linux platforms only, since these are used by a small minority of clients who display over a network of mixed machine types. However this X driver is not maintained or updated and will give poor performance, so it should only be used as a last resort. There are much better "thin wire" graphics solutions available today, and Oasys Ltd can give advice about these on request.

1.4   FLEXlm Licensing

The version 16.0 software has been compiled using version 11.14.1 of FLEXlm.

Customers still using a v15.0 or earlier license file will require a new license file to run v15.1 or v16 software, this will be backwards compatible for all versions.

The version 15.0 license file and license daemons are backwards compatible with both the 14.x and 13.x software releases. This means that any existing 14.x and 13.x software will continue to work with new license files and servers.

If you are not already using the license servers that shipped with the v15.x software we recommend that you update all of your Oasys Ltd LS-DYNA environment license servers with the files shipped with the version 16.0 software.

1.5   Important T/HIS JavaScript Update

If you are upgrading from version 14, any JavaScript written for T/HIS 14.0 and 14.1 which used data components will not run in version 16.0. If you are already using version 15.0 or later then your version 15 JavaScripts require no changes.

This is because in T/HIS 14.x the data component constants were global constants. They could over-write other variables used in the script. From T/HIS 15.0 onwards, data components are accessed by a `Component` class.

To correct your scripts which use data components make the following change to functions `QueryDataPresent()` and `GetDataFlagged()`:

Version 14.x:
```
m.QueryDataPresent(DX, Entity.NODE);
curve_array = m.GetDataFlagged(f, DX);
```

Version 15.x and 16.0:
```
m.QueryDataPresent(Component.DX, Entity.NODE);
curve_array = m.GetDataFlagged(f, Component.DX);
```

2   Bugs Fixed

The enhancements and bug-fixes for each program have been broken down into a series of topics. Within each topic enhancements and bug-fixes are listed by case ID.

2.1   PRIMER

2.1.1   Bugs Fixed in 16.0

Adhesive

- **Case 37558**

PRIMER was not using the 'Percentage made' setting for adhesive runs when reporting errors. This has been corrected.

Airbag

- **Case 39800**

PRIMER will set the VSCA and PSCA *AIRBAG fields to 1.0 if they are left at 0.0 by the user. This is because LS-DYNA can terminate if they are not set to the default values of 1.0. However, PRIMER only did this with the first airbag written out - if multiple airbags where present in the model the subsequent ones were written with these fields remaining at 0.0. This has been corrected.

- **Case 39750**

Primer didn't accept -ve load curve values for LCIDM LCIDT fields in *AIRBAG_HYBRID card. Fixed this problem.

- **Case 39200**

Reading of ill-conditioned *AIRBAG_SHELL_REFERENCE_GEOMETRY could cause SIGSEV when the edit panel was used. Now fixed.

- **Case 34915**

When display option was set to swapped coordinates, orientation of explicitly selected airbag reference geometry was changing the actual nodal coordinates instead of the reference ones. This wrong behaviour has been blocked and a help message added to direct the user to select the airbag parts if PRIMER is in swapped coordinates mode.

Belts

- **Case 39465**

Belt fitting from the command line /BELT command caused a crash when the following sequence was followed:
- + Read model
- + /BELT
- + PR_REFIT (to set refitting properties)
- + MAX_ITER 1000

+ DONE
+ REFIT

Then delete the model and repeat the process above, which caused a crash after 'MAX_ITER'.

This happened because the command-line belt fitting property update presumed that the fitting panel was 'live' (from the first iteration) when in fact it had been deleted when the model was deleted.

This has been fixed by using a more rigorous 'does the belt fitting panel exist?' test prior to updating it.

- **Case 39388**

A crash occurred during seatbelt remeshing that was traced to problems with 2d seatbelt elements 'coiled up inside' a retractor waiting to be pulled out. It appears that the topology and or connectivity of these internal elements contained errors, meaning that they could not be connected to the belt proper.

The crash occurred due to an internal error when trying to report the connectivity problem, and this has been fixed.

- **Case 39340**

When auto-refitting a seatbelt 'Old' geometry has to be moved over to 'New', and this could lead to nodes being duplicated in sets. This would only happen if:
- The node was at a 'fixed' location on the belt, typically at the ends, and so survived the remesh operation without being modified.
- The node was also in a node set that had no connection with the seatbelt.

Fixed by more careful inspection of set contents to see if a node is already present in them before copying it over.

Checking

- **Case 39820**

The check suppression comment was not being saved properly for materials with result that Primer failed to suppress the check when file was written and read back in. Now fixed.

- **Case 39594**

MAT_THERMAL_CHEMICAL_REACTION no longer displays spurious suffices in Check error tree panel.

- **Case 39385**

The node coincidence check for spherical joint was inconsistent with LS-DYNA R9.0 and above. Now fixed.

- **Case 38901**

Added keyout warnings for these Keyword Fields:
1. DEFINE_CPM_CHAMBERS: Suffix _TITLE is not supported for versions less than R8
2. AIRBAG_PARTICLE: Negative VD values should be supported from R9 onwards. Added a standard AIRBAG warning : This definition will require manual editing in order to run.

3. AIRBAG_PARTICLE: STYPE3=2 should be supported from R9 onwards. Added a
   standard AIRBAG warning : This definition will require manual editing in order to run.

- **Case 38829**

A model with illegal *CONSTRAINED_RIGID_BODY where PID was defined as zero caused
a crash in model check. Now fixed.

- **Case 38759**

The recheck function on check tree which applies after edit or auto-fix now takes account of any
categories that are excluded from checking on the main drop-down. This is particularly useful
when the lengthy contact checking is switched off.

- **Case 38608**

The value of *CONTROL_THERMAL_SOLVER <eqheat> variable was changing after a model
units conversion. This has now been fixed such that the value of does not change with a units
conversion.

- **Case 38273**

When deleting an entity, that is being referenced by a warning/error/message etc. in the Dyna
Output tree, via processes external to the Dyna Output tree, if the User were to then attempt to
edit that entity via the Dyna Output tree PRIMER would print out error statements/crash. This
has now been fixed.

- **Case 37683**

The user can now specify whether elements with MAT_NULL are included/ignored in element
quality checking (Tools → Check) and in element quality CT/SI plots. For Tools → Check,
including/ignoring null elements can be specified by a check box in the Tools → Check →
Options panel (labelled 'Ignore null elements'), as well as the preference
'ignore_null_part_element_checks'. For CT/SI plots, a set of radio buttons has been added to the
CT/SI element quality settings panel, which determine how null elements are drawn. Null
elements are included when 'Drawn normally' and ignored otherwise.

Clipboard

- **Case 39843**

On the clipboard the 'propagate selection' tool has been renamed 'Find referenced items' and the
logic modified to do that.

- **Case 39372**

The 'find referenced' function on the clipboard only found parameters which referenced the
directly selected items, when it should find any that reference items of the propagated selection.
Now fixed.

- **Case 39019**

On a model with connections with no layers defined, the find referenced tool on the clipboard
incorrectly selected these connections. Now fixed.

- **Case 38228**

The function finds referenced items on the clipboard did not behave sensibly when a contact with
exempted part sets was treated. This has been changed so a warning is given, and the part set is

left latent. The correct action may be to create an inverse part set and change m/sstyp to 2 on the contact before putting it on clipboard. This however is beyond the scope of clipboard.

Compare

- **Case 39528**

The compare tool which is used to compare FE mesh with IGES surface data using a contact type algorithm was running rather slowly due to less than optimal bucket setup. This has been improved considerably.

Composites

- **Case 39947**

It is now possible to locate a spot-weld accurately on a Shell Nurbs Patch element, as the location on the nurbs surface is now determined properly.

Connections

- **Case 39752**

Empty of modular bolt on connection table removes the section, material, etc associated with the bolt part if it can be cleaned up. Deletion of modular bolt on table, however, failed to remove the unwanted section, etc. Now fixed.

- **Case 39690**

A keyword file containing *CONNECTION data was written out using binary format, and then subsequently generated keyword input errors when read back into PRIMER.

In fact, the binary i/o was correct, but it exposed an error in the way a particular type of open-ended *CONNECTION spot-weld card was being processed during keyword input, and the fact that it has read in correctly up to now was pure luck. Now corrected, and it reads correctly in both ascii and binary formats.

- **Case 39637**

Part replace now has an option to process HAZ welds or not. Previously the processing was unconditional. With the option OFF, HAZ welds will not be unmade at the beginning of replace or re-made at the end. This means an imported mesh which has holes prepared to mate to the HAZ weld can simply be attached using the merge process, provided the HAZ shells belong to a different part to the main one.
There is a pref setting - part_replace_process_haz_connection: OFF

- **Case 39566**

Plotting of NRBs defined by SET_COLLECT did not respect convention that first node in the set is master node and consequently did not draw the expected 'spider'. Now fixed.

- **Case 39317**

Import of bolt module containing *DEFINE_CURVE can create unwanted *DEFINE_TABLE, *DEFINE_FUNC at same label in the entity list. These had to be removed before the model can re-read. Now fixed.

- **Case 38907**

Import of bolt module containing static items (e.g.*CONTROL) which clash with items in main model was causing SIGSEV. Clashing static items are now culled before import and should the operation fail for other reasons, it will now end gracefully.

Constraints

- **Case 38932**

Added drop down options for IDOF and DOF columns for *CONSTRAINED_INTERPOLATION and *CONSTRAINED_LINEAR respectively.

Contacts

- **Case 39819**

The contact penetration checker wrongly reversed the effect of shell reference surface offset NLOC, and suffix _OFFSET, for triangular elements. Quads were OK. This was caused by accidental reversal of the normal vector of triangular elements in this context, now fixed.

- **Case 39816**

When a contact surface used an 'excluded part set', that is type 6 for SSTYP (slave side) or MSTYP (master side) the contact checker could sometimes nevertheless include shell elements on excluded parts in the penetration check when the model contained solid or thick shell elements.

This was due to an error in the logic which looks for shell elements on faces of 3d elements in the contact (by default LS-DYNA prefers the shell in this situation). It would choose a shell on such a face without checking whether it was in an excluded part set.

An extra test has now been added which prevents excluded shells being chosen, correcting this problem.

- **Case 38663**

When dragging nodes without any shells (for example on solid elements) in the contact penetration fix panel with the local normals option, PRIMER corrupted the coordinates of the nodes, so the nodes and adjacent elements became invisible.

The movement vectors used for the dragging are based on adjacent shell normals. Now there is a message explaining this and suggesting other fix options when nodes on solids are selected. PRIMER leaves the coordinates of the affected nodes unchanged.

- **Case 37894**

When writing a *CONTACT definition with _MORTAR suffix in an LS-DYNA version not supporting _MORTAR (older than 971R5), the whole contact card was omitted from the keyword file. Now Primer writes it just without _MORTAR.

- **Case 37554**

For Tiebreak contacts, can now take negative values (except for when = -2, 2, 4) via the keyword edit panel. Additional model checks have also been added to display errors when is out of range.

- **Case 37102**

The correct tolerance for tiebreak contact checking is now applied. This is described in note 10 under *CONTACT of the LS-Dyna manual and is different for MPP and SMP.

Contour

- **Case 39204**

For highly warped shells or solids the calculation could give an artificially low warp angle because the maximum thresh-hold to keep the calculation well-conditioned was conservatively set to 135 deg. This has been increased to 180 deg and highly warped elements should now be reported correctly. An oa_pref (maximum_warpage_criterion) can be set in range 0...180.

- **Case 38043**

When doing a contour plot, 'Internal faces' is now always ON

Copy

- **Case 38833**

In some internal copy operations, for example when using the Copy button on the docked panel for a keyword or when saving selected items as a new model from the clipboard, a few keywords were not copied at all. This affected the following:

- *ELEMENT_INTERPOLATION_SHELL and *ELEMENT_INTERPOLATION_SOLID when no elements of other types were selected,
- *FREQUENCY_DOMAIN_ACOUSTIC_SOUND_SPEED when no frequency definitions of other types were selected,
- *NODE_MERGE_SET and *NODE_MERGE_TOLERANCE when no other *NODE_xxxx keywords were copied.

This has now been fixed.

Cut section

- **Case 38367**

Display option for true sections of shells and beams now has OPTT option for use of contact thickness. Cut section panel also has new options for beam plotting.

Database

- **Case 39619**

When creating a *DATABASE_CROSS_SECTION card the new definition was drawn but then a sketch was immediately done obscuring the card just created. The sketch is no longer done so you can see the section you have just created.

- **Case 39148**

The database was never designed to work with MAT_ADD_EROSION. User need to select MAT_ADD_EROSION on edit panel to read through database. Now manually turning on MAT_ADD_EROSION if it is being read from database panel to support it.

- **Case 38964**

Corrected keyword file read problem and added checks for DATABASE_RECOVER_NODE.

Deleting

- **Case 39503**

Clean up unused has been corrected to remove morph points when a morph box is removed by
clean-up.

- **Case 39456**

All Volume III panels are now unmapped on model delete (as per Volume I).

Dummies

- **Case 39770**

In the dummy positioner, 'Move nodes' panel, it is possible to move a point on an assembly to a
node position. This worked if the node label was typed in, but failed and generated error
messages if the popup was used to select or pick a node. Internal initialisation error, now fixed.

- **Case 39147**

The combined dummy and seatsquash tool did not work with the THOR dummy. After
positioning it, the model could end up with parts sticking out of the dummy. This has been fixed.

- **Case 39036**

Normally child assemblies in a PRIMER dummy definition rotate about a defined node on their
parent assembly, but it is legal (if unusual) to set that node to zero, meaning 'rotate about dummy
H-Point'.

This caused a crash in mechanism-style positioning (drag or move points) due to an internal error
that presumed the node would always be defined.

A warning has also been added to the dummy assembly check function, telling the use that while
this is legal it is unusual, and asks did he really mean that?

- **Case 38976**

Positioning a dummy multiple times could result in the model being scaled. This was due to
some internal problems with storing the direction cosines of assemblies, which could accumulate
and end up being significant. This has been fixed.

- **Case 38967**

The Unit of global damping is set to rad/sec.

Edit

- **Case 39481**

The *SECTION keyword editor is slightly unusual in that it treats the element formulation value
ELFORM as a (pseudo) keyword suffix. This is because changing ELFORM usually also
changes the layout and meaning of many fields on the card, so ergonomically it is closer to
'change a keyword suffix' than it is to 'change a data field'.

The special logic required to handle this was not working correctly if the ELFORM value on any row was changed to a value not currently present in any rows displayed by the editor. In effect it was not setting up the (pseudo) keyword suffix correctly, and this could result in lines 2 onwards not being displayed for that card and consequential errors from the data in these fields being zero. This has been fixed.

- **Case 39177**

The function to allow multiple picking of the nodes via the object menu has been fixed for create of Multiple *INITIAL_FOAM_REFERENCE_GEOMETRY cards.

- **Case 38965**

The quickfind function could not find some *CONTROL cards to create, modify, delete, etc. They have now been added to the list.

- **Case 38778**

A criticism of the keyword editor was that 'wide' (e.g. A70 or A80) character fields only extended to the width of subsequent numeric data columns, meaning that if data for a keyword only had one or two columns a character title field would be very narrow, making it difficult to see titles. A typical example was *DATABASE_HISTORY_xxx

This has now been corrected. Character fields now count towards the overall width of the keyword editor, so an A70 field will occupy the equivalent of 7x 10 wide columns.

- **Case 37939**

Modifying the entity label from edit panel and then doing 'UNDO' created a duplicate entity instead of relabelling the entity back to original label. Solved this problem.

- **Case 35658**

Parameter handling in Open ended keyword like *AIRBAG_SHELL_REFERENCE_GEOMETRY was missing in open lists. Fixed this.

Elements

- **Case 38835**

Keyword editors have been added for *ELEMENT_INTERPOLATION_SHELL & *ELEMENT_INTERPOLATION_SOLID which can be accessed via keyword → ELEMENT → INTERPOLATION_SHELL/SOLID.

Filename

- **Case 39856**

When writing a DCF (occupant position file) on LINUX, if you typed in the name of a file that did not exist, the file selector would give an error. This has been corrected.

Filtering

- **Case 38352**

When a text filter is applied to an object menu (for example for parts in the Blank or Remove menu), then All_Vis selected all entities on the menu, not just those remaining after applying the

filter. Now it respects the filter. Also, when screen-picking entities, only those remaining after the text filter are now actually selected.

- **Case 37727**

Preferences 'extensions_for_file_read_on_unix' and 'extensions_for_file_read_on_windows' are obsolete. These are both now served by 'extensions_for_file_read'.
The pref may be written either in the form '*.k* *.gz *.zip' or '*.k*;*.gz;*.zip'.

Geometry

- **Case 39574**

The Mesh → Geom tool could sometimes fail to mesh a surface if it tapered to a point. This has been fixed.

Graphics

- **Case 39652**

In the Entities panel, pressing the Geometry → All Geometry switch did not turn on/off the display of attached points. This has been fixed.

- **Case 39621**

Previous versions of PRIMER could sometimes write constraint labels (Node plot) multiple times on the screen if users modified associated data settings (Entities). These labels could even get displayed at slightly different locations if rotation or zoom operations were performed in the interim. This issue has now been fixed.

- **Case 39255**

The *DEFORMABLE_TO_RIGID keyword was handled in rather a half-baked way in PRIMER: not really drawn properly in all contexts and without a keyword editor. It has now been implemented 'Properly'. In summary:
  - D2R is now drawn 'Properly', as in its entity etc switches can be controlled from the entity panel.
  - This, among other things, means that 'Only' now works in the various contexts where you'd expect it to.
  - The original 'Only' capability on the [Keyword] D2R panel is now replaced with the standard version.
  - As part of this sketching now works, including find the centre for cross-hairs.
  - Autoscale and visibility calculations now work.
  - Picking and area selection now work.

(Note that a keyword editor for D2R was also added in PRIMER 16.0)

- **Case 39220**

The option colour by include file would result in SIGSEV in the drawing operation for items newly created. Now fixed.

- **Case 38011**

When parts are coated with shells (Mesh, Coat tool) it was sometimes the case that the new shell parts were not visible when the model was redrawn, making it hard to know whether the coating

had actually taken place on the correct parts.

The reason for this is that coating shells are coincident with the solid / thick shell faces that they coat, so one of the two element faces has to 'win' when they are drawn, and this tended to be the element of the part with the highest label since this is drawn last. So if the part of the coating shells had a lower label than the 3d part being coated the shells would not appear.

This has been fixed by changing the way coating shells are drawn while the 'coat' panel is open:

- They are lifted slightly above the underlying 3d element face, meaning that they will always be visible, regardless of the part label.

- They are drawn in a 'chequer-board' fashion, technically 'stippled', giving a patchwork effect in which alternate squares show coating and coated parts. This makes it possible to visualise both parts, and to verify that the correct elements are coated.

The degree of stippling, effectively the size of the squares, can be controlled.

- **Case 37173**

Model modified → Parts → geom: Wireframe disappears on zoom and reappears on rotate. Fixed the graphics issue.

- **Case 36751**

Contouring Shell Normals Levels & Forms menu not updating the colours in the shells when changing the Level Settings. Now fixed.

Help

- **Case 39217**

Added help panel for some of the volume III keywords.

Image

- **Case 38944**

The .png file reader in PRIMER (and the other Oasys software) worked correctly for the commonplace 8 bit and 24 bit .png formats, but failed or even crashed when it tried to read some of the less common .png formats, notably 1 bit deep black and white.

It has been rewritten to handle all the plausible .png file formats:

1 bit black and white
8 and 16 bit greyscale, with and without transparency
2, 4 and 8 bit indexed colour
8 and 16 bit RGB colour, with and without transparency

Note that the .png writer still only generates the common 8 bit indexed and 24 bit RGB file formats.

Include

- **Case 39659**

When filtering Include files in object menus using the Text filter the process would not work correctly the first time the menu was built, typically failing to show include files with names matching the filter. Any operation which caused the menu contents to be rebuilt would then show the correct include files.

Caused by an internal error which initially skipped all child include files if the master filename did not match the filter string, now fixed.

- **Case 38745**

The "add new child" directory icon of include tree refused to accept READ-ONLY files (windows only). Now fixed.

- **Case 38695**

PRIMER would crash when trying to input data in the field of *INCLUDE_UNITCELL. This has now been fixed.

Javascript API

- **Case 39832**

JSON files produced by the Model Check method would be invalid if there were errors or warnings for either character labels or sets using _COLLECT as in these cases the labels would not be integers and need quoting to make a valid JSON file. This is now fixed.

- **Case 39560**

The Xrefs GetType method could return the wrong value in some cases when items were deleted from a model in PRIMER. Now fixed.

- **Case 39507**

The FlagCut method in the CrossSection class did not work. Now fixed.

- **Case 39498**

If an InterpolationSpotweld.js file was put in the primer_library/scripts/check folder to add a custom check for Interpolation Spotwelds the script didn't run and an error message saying it was invalid was displayed. This has now been fixed.

- **Case 39239**

The FindLineStarting and FindLineContaining methods in the File class did not return undefined when if the file was at EOF (end of file). Now fixed.

- **Case 39151**

The return code from the System() command on Linux could occasionally be incorrect. Now fixed.

- **Case 39146**

Calling the Execute command many times on Linux could cause PRIMER to crash. Now fixed.

- **Case 39099**

LOAD_BODY Keyword now can be moved into desired INCLUDE file along with other keywords.

- **Case 38742**

Custom JavaScript checks were not working for some classes. Solved this problem.

Keyword

- **Case 39729**

PRIMER was incorrectly producing error messages for *BOUNDARY_CONVECTION when <HLCID> and <TLCID> were not specified but <HMULT> and <TMULT> were . This has been corrected, also with the addition of an error message indicating that <TLCID> and <TMULT> are both not set.

- **Case 39337**

The optional 5th card on the *CONSTRAINED_INTERPOLATED_SPOTWELD keyword was not being written out for LS-DYNA version R10. This has been corrected.

- **Case 39088**

Removed support for suffix _TITLE for *DEFINE_CPM_VENT as it is not supported in LS-Dyna.

- **Case 38192**

For *CONTROL_FORMING_UNFLANGING, a new option _OUTPUT and an additional card for the option (both introduced in R8) were missing. This has now been rectified.

- **Case 37885**

PRIMER now reads the _WRITE option for *INITIAL_LAG_MAPPING correctly.

- **Case 37658**

_EXCLUDE option has been added for create panel for INTERFACE_SPRINGBACK_EXCLUDE.

- **Case 37539**

When running a cleanup on a *DEFORMABLE_TO_RIGID with an empty part set, there was an error message. Now the *DEFORMABLE_TO_RIGID definition appears correctly on the deletion menu in this situation.

Kwd editor

- **Case 39902**

In the *CONTACT keyword editor the following sequence:

> + Highlight multiple rows
> + Change field SPR in one of the highlighted rows

Would result in the adjacent MPR field being changed in the highlighted rows that were not explicitly changed.

This was a generic Keyword Editor bug, so not related to *CONTACT, and was caused by copying 8 bytes for an integer data field instead of 4 bytes, causing changes to 'spill over' into the next data field to the right. This would only happen when multiple rows were highlighted for editing and would only affect the rows in which the original change had not been typed.

- **Case 39577**

Macro run on keyword editor of types that can use character labels (e.g. part keyword editor) would fail when trying to edit field of item defined with character label. Such labels need to be resolved to the Primer's internal (-ve) label to enable the macro.

Labels

- **Case 39861**

In the visualise renumber panel the 'free' ranges were not displayed correctly when at the start of the row (before the first 'used' block) or in the ALL row when between two used blocks with no space in-between. Now corrected.

Macro

- **Case 39335**

Macros did not work for the *ELEMENT_GENERALIZED_SHELL and *ELEMENT_GENERALIZED_SOLID editors. Now fixed.

- **Case 38931**

Macro recorded for *INCLUDE_UNITCELL was not working properly for ECN_ fields. Fixed this issue.

Mass

- **Case 38407**

When calculating Part Inertia properties on 'insert properties' function of part edit panel, Primer now includes the effect of user defined coordinate system CID. Additionally, the mass calculation has been improved to include slave rigid bodies and attached mass.

- **Case 37992**

For nodal massing, an option 'include attached mass of ASSM at higher label' has been added to the assign mass modify panel. This gives parity with part massing where over-massing definitions overwrite mass of junior ones. There is also a pref. The default for primer*assign_mass_includes_attached_mass is "free_and_lower" (consider only assign mass of lower label) but this may be changed to "all".

Materials

- **Case 39809**

Fields U_n, P_n on *MAT_USER_DEFINED are now written as integers if rounding permits if the preference 'enable_integers_for_mat_user_defined' is set to ON. By default they are written as floats as per the manual. If these fields are used as large labels (15 digits) then the preference needs to be on.

- **Case 38874**

The numbers of *MAT (STRUCTURAL), *NODE, *PART, and *RIGIDWALL keywords present were not always correctly shown e.g. in the Keyword → MAT popup box when other material keywords (such as *MAT_NONLOCAL) were present. This has now been fixed.

- **Case 37553**

Now *MAT_157 can be used with solid elements. Primer's material vs element compatibility tables have been updated.

Measure

- **Case 38726**

In the Vector input text box for 'Node to Node' Measure, the cursor position in the text box input for the Vector was set to the end by default, thus hiding the value of the X dimension. Corrected this behaviour by moving the cursor position to zeroth place in the input box, so that the text is shown as Left justified in the text box

Mechanism

- **Case 39918**

PRIMER crashed when reading a keyword file in which *POSITION data inside a mechanism had been hand-edited (and muddled up!) in a way that made it invalid. The crash was caused by the internal confusion that this caused.

This has been fixed by making the reading of *POSITION cards more robust, and in assembly position data can appear in any order or be missing altogether.

However, it must be stressed that hand-editing *POSITION data should ideally not be done, or if it must be done then with great care. If data are corrupt or missing PRIMER should no longer crash, but the results of trying to retrieve a garbled position are likely to be wrong and to 'pull the mechanism apart'.

- **Case 39777**

A problem arose with Mechanism positioning in PRIMER 15 if the mechanism definition contained saved positions (*POSITION data) and it was moved outside PRIMER.

In previous versions this wouldn't matter, but in PRIMER 15 the centroids of assemblies as defined in the reference *POSITION data block were used as part of the 'assemble data for dragging' process, so if these centroids were a long way from the actual assembly centres the mechanism would refuse to move because of the artificial moments implied by motion about a distant centroid.

This has been fixed by changing the definition of 'assembly centre' used for mechanism dragging to a value calculated dynamically from each assembly's current position, meaning that positioning is independent of any saved *POSITION data.

This in turn means that in PRIMER 16 it is acceptable once more to move (translate and/or rotate) a mechanism as a whole outside PRIMER. This will no longer affect the positioning process and saving / retrieval of stored positions will also still work.

However, if individual assemblies are moved relative to one another outside PRIMER then positioning will still work but saving and retrieval of saved positions may give the wrong result.

- **Case 39504**

Mechanisms and Dummies permit positions to be saved and restored, and this worked fine for the quasi-rigid bodies that made up the assemblies. It didn't work correctly for any 'stretches' applied to non-assembly structure, which tended to go more and more wrong as retrievals multiplied.

This was a logical error that has been solved by reverting to the pre-positioner status (equivalent to 'reset all') prior to restoring a position. This has two advantages: the first being that it fixes the logical error, the second being that a 'reset' restores all nodal coordinates and associated data precisely from backup storage, removing any small cumulative errors that may have built up from positioning in the meantime.

Menus

- **Case 38142**

Quick pick menu item 'Read S.P.' gives obscure idea what it does. A popup is added for the button that convey a better idea what the button does.

Merge

- **Case 34525**

On object menus for include file selection the name 'Master model' has been renamed to 'Master file'. This name appeared for example in the selection of a destination include in Model → Merge, and there the same term 'master model' is used at the same time for one of the source models, the other one of which is referred to as slave model. To avoid confusion, the master include file of any model is now referred to as 'Master file' in the menu.

Mesh

- **Case 39784**

Mesh Tools → Shell Box tool does not create the closed box if the number of elements in any of the axes=1. Fixed this.

- **Case 39325**

Reduced likelihood of creating rhombus shaped elements when meshing by enforcing max quad angle preference of 140 degrees.

- **Case 39192**

When splitting shells occasionally a node was not attached (depending on the attached shells). The logic to find nodes to attach has been improved.

- **Case 39087**

Remesh Area now produces consistent meshes if Reject is pressed before confirming.

- **Case 39058**

When using the remesh area tool if some manual fixed points were added and then a feature line
added or removed the fixed points would be deleted. Now fixed.

- **Case 39057**

When remeshing an area if the user clicked outside the area near a red shared/locked edge then
PRIMER could crash. Now fixed.

- **Case 38818**

While creating a Hole in PRIMER, if the Washer PART IDs are changed after the Hole is
initialized, the newer washer rings do not get created under the updated Part IDs. Fixed this.

- **Case 38595**

A pop up in Split elements panel was not clear about which type of elements it is applicable to.
Changed the text in the pop up to make it unambiguous.

- **Case 38279**

The mesh size used when remeshing around spotwelds is now the average edge length of the
surrounding shells rather than the maximum edge length. Consequently, surrounding shells no
longer increase in size when a connection is repeatedly remeshed.

- **Case 38024**

The calculation method for determining the coordinates of nodes, when creating
spherical/hemispherical/cylindrical meshes, has been altered such that better quality elements are
produced.

- **Case 37200**

Splitting quad shells into two triangles is now done such as to maximise the minimum resulting
triangle angles (rather than just splitting along line joining node 1 and node 3). This algorithm is
used in both shell splitting and tet meshing.

Model build

- **Case 39367**

The model-build-from-csv type GENERAL_TRANSLATE_PARAMETER was not processing
parameters correctly. This has now been fixed. This build type has no interactive panel support at
present.

Model modified

- **Case 38923**

Listing of differences in character data fields by model modified has been corrected to remove
leading space.

- **Case 38690**

Model modified sometimes didn't find existing differences in character data fields. This has now
been fixed for the following:
- FILENAME on *CONTROL_FORMING_PARAMETER_READ
- SE_FILENAME on *CONTROL_IMPLICIT_STATIC_CONDENSATION
- PTYPE on *DEFORMABLE_TO_RIGID

- PTYPEI and PTYPEJ on *DEFINE_FRICTION
- ANGTYP on *LOAD_BODY_GENERALIZED

- **Case 37655**

Model modified can give spurious warnings about differences between contacts particularly when run the second time when cached data is being used. The code has been revised so that re-use of contact interaction data is now more rigorous.

Morphing

- **Case 39314**

Nodes and coordinate systems from multiple models can be selected on the morph tab of the MORPH tool.

- **Case 39222**

In the Reset tab of the mesh morphing menu, morph boxes can be selected from all models when more than one model is in the current PRIMER session. However, when clicking the button to reset them, only boxes from one model were reset. This has now been fixed. In PRIMER 16.0 the Reset menu is now part of the Utilities tab.

- **Case 39193**

When creating a morph box interactively with all selected nodes in a plane parallel to one of the planes defined by the selected coordinate system, PRIMER created morph boxes where one or more side lengths of the cuboids were zero, so it had got coincident morph points at its corners. In PRIMER 15 there was already an option for the minimum morph box size in the program options, which is 10.0 by default, but that was not working as it should. This has now been fixed.

Also, there is a preference morph_box_min_size for this minimum size. This preference was there is PRIMER 15, but the documentation and entries on the preferences editor were incorrectly listing morph_threshold and morph_offset, which would not have been recognised by PRIMER.

- **Case 38979**

When a morph box is created in the Morph panel, the panel now automatically switches to the Morph tab.

Orient

- **Case 38764**

Orient to contact now performs physical contact test ignoring the logic which removes penetrations between rigid bodies which are slaved together. This logic remains for LS-DYNA contact analysis (where it is switchable) but in this context is inappropriate.

Output

- **Case 39748**

Writing out a DesignLink file for a model containing beams could cause PRIMER to crash. This has been fixed.

- **Case 39235**

PRIMER checks all *INCLUDE_TRANSFORMS for label offsets which, when the file is written out, could result in illegal -ve labels when subtracted from the current (transformed) label.

This check was slow when a big model contained many *INCLUDE_TRANSFORM definitions, since it performed [#includes] * [#contents of model] checks. This has been recoded to make it more efficient so that in the best (and normal) case of no errors the time taken is now [#includes] + [#contents of model]. It will become slower if errors are found, but this is quite unusual.

The effect is to speed up Model Check, and also the pre-keyout check for this problem.

- **Case 37861**

Users on Windows could experience very slow keyword output speeds if writing files in 'native' mode on slow networks, or networks with a very high latency.

This has been fixed by an internal change to how files are written to improve output buffering.

In addition, the Windows | Unix | Native output format selector on the pre-output check panel (last stage before keyout) was wrongly greyed out if the model had no include files. This is now fixed.

Parameter

- **Case 36755**

When reading or writing a model with 1000s of parameters with the same name, Primer can become very slow. This happened for example when there was a parameter in an include file which appeared 1000s of times in the model with different *INCLUDE_TRANSFORM statements. The speed of these operations has now been improved although the model is still a bit slower to process than models with the same number of parameters with different names.

- **Case 39987**

When editing the value of a character parameter on the top level editor, the Reset button became active, but clicking it would still have left the parameter with the new value. Now it correctly restores the old value.

- **Case 39011**

On the open-ended cards on *CONSTRAINED_SOIL_PILE parameters were sometimes replaced by their underlying values in PRIMER. Now the parameter references are kept correctly.

- **Case 38927**

In the *CONSTRAINED_INTERPOLATION edit panel, variables and would lose their parameter references after closing the panel. This has now been fixed.

- **Case 38644**

When typing a string with more than 70 characters without arithmetic operator into the edit panel for a parameter expression, PRIMER sometimes crashed or inserted empty lines in the expression. Now PRIMER rejects such a string with an error message because it cannot be a legal expression string.

- **Case 38198**

Parameters were not handled correctly for CMO, CON1 and CON2 on *CONSTRAINED_NODAL_RIGID_BODY. This affected both read/copy/write and the edit panel and has now been fixed.

- **Case 37459**

Suppose you merge two models with a destination include such that:
  - the master model contains a _LOCAL parameter in the destination include and a parameter with the same name without _LOCAL,
  - the slave model has got a parameter with that name in its master file.

If the value of the parameter in the slave model matches that of the global parameter in the master model, and the option 'Merge & rename' was selected, Primer sometimes attempted to merge the parameter in the slave model with the global parameter in the master model, and parameter references in the slave model would have been masked by the _LOCAL parameter from the master model, giving them a wrong value. Now Primer compares the _LOCAL parameter in the master model with that in the slave model when deciding whether or not to merge parameter definitions.

- **Case 37095**

When a *PARAMETER_DUPLICATION card with option 2 or 4 is present in the model, then LS-DYNA 'accepts' multiple definitions of the same parameter. In those cases PRIMER used the last definition for all references to that parameter and marked the other ones as ignored.

It has now become clearer that LS-DYNA does not ignore all definitions except for the last one, but the parameter references are treated in the same way as if the parameter definitions had got a _MUTABLE suffix. For example, if there are two parameters with the same name and without _LOCAL suffix in the model, the parameter duplication options 2 and 4 say that references to that parameter name between the two definitions reference the first parameter definition, whereas references after the second definition reference the second definition.

This is now how PRIMER handles these parameter duplication settings. On the edit panel, parameters which are treated as mutable due to duplication settings are now marked with a D symbol.

Part replace

- **Case 39307**

Remesh area did not work properly if the part concerned was latent. This restriction has been removed.

Part tree

- **Case 38456**

When undocking the part tree contents list table and expanding it, the newly visible button rows were only populated after moving the slider. Now they are populated immediately after resizing the table.

- **Case 37618**

In Part Tree contents, *SENSOR_DEFINE and *SENSOR_SWITCH keywords were shown incorrectly. Fixed this.

Pedestrian

- **Case 39428**

Head impact points for the GTR protocol could sometimes get duplicate labels. This has been fixed.

- **Case 39309**

The pedestrian markup tool could crash when writing out a csv file of impact points if the method for automatically creating head impact points was set to 'Nothing' and only manual points were created. This has been fixed.

- **Case 39054**

The semi-circular template used to join the rear reference line to the side reference line is now output to the model containing the reference sticks used to mark the vehicle.

- **Case 36973**

The way that the internal bumper reference line was calculated was incorrect in some circumstances.

When projecting the stick contact point to the bumper beam it was not searching the whole profile of the beam as potential points to project to. This has been fixed.

Penetrations

- **Case 39338**

The CT plot for contact penetrations has been improved so in the case where multiple nodes penetrate the same segment, the contour will correspond with the most penetrating.

Preferences

- **Case 39672**

In the [Model] Read, Options panel one option is 'Save keyin log to file', and a possible setting for this is the directory to contain the keyword input log.

This was getting saved as a preference by the 'Save keyword i/o settings' button, and would be read correctly when a new PRIMER session was started.

However if [Options] Reread Primer Prefs was used it would not be reread. Now fixed.

Program crash

- **Case 39887**

Primer could crash when merging a JavaScript with lots of include files if the include files did not have a trailing end-of-line character. Now fixed.

Program hanging

- **Case 39292**

If a model contained many thousands of *NODE_TRANSFORM definitions then PRIMER
would take a very long time to read in the model and as no feedback was given to the user (s)he
could think that PRIMER had crashed. This has been made significantly faster and feedback is
now given to show the progress.

Properties

- **Case 39864**

PRIMER no longer crashes when importing/exporting properties files if multiple models are
loaded and one hasn't been selected.

Read

- **Case 39579**

PRIMER crashed when reading a model that had the following characteristics:
+ Duplicate control cards in separate include files.
+ Those control cards used parameters.
The crash was due to internal problems processing the 'clone' definitions in this particular
situation. Now fixed.

- **Case 39463**

PRIMER would not give any warning messages or choices when reading duplicate 'static'
entities (CONTROL or DATABASE cards) when included in an INCLUDE_TRANSFORM.
This has been corrected.

- **Case 39366**

Now that PRIMER can write compressed files (.gz, .zip) and also files with binary format (.kby)
the search for filenames generally and include files particularly must consider more than just the
raw filename. The *INCLUDE statement in the parent file will always show the raw filename,
typically .key, but the file on disk might be .kby, .key.gz, or a range of other permutations and
PRIMER must search for all of these.

This introduces the problem that if a file is modified and written out again to the same directory
it may be in a different format, meaning for example that the directory has both filename.key and
filename.key.gz, which raises the question 'which file should be read by PRIMER?'

To solve this problem PRIMER now does the following:
+ For the master file it looks for the verbatim filename as specified for input, and if this is
found it uses that. Only if it is not found does it search for alternative syntax.

+ For include files it always looks both for the verbatim filename and any alternative syntax.

+ In both cases if the search turns up more than one candidate then a warning is printed to the
dialogue box and the most recently modified file is read.

- **Case 39003**

In very rare circumstances and 'undo' of edited data could go wrong, the exact criteria being:

+ The same data must be edited and 'undone' twice in succession.
+ The changed data must be the last item in the temporary 'undo' file.
+ That data line must have two or more trailing fields containing zero

This tripped an error that compression of data fields with trailing zeros got 'stuck' at its state when the first undo operation happened, and 'remembered' this during the second identical undo, causing data corruption.

Fixed by removing any dependence on remembered data.

- **Case 38811**

PRIMER failed to read a 'long' (large) format deck in which a *SET_GENERAL card put the type code (here 'PART') in columns 11 to 20 of the first data field. The error was that it expected the type code to be in the first 10 columns, and did not consider long format.

Fixed by making it consider the long format case correctly.

- **Case 37233**

The '.zip' file format allows the contents of an archive to be encrypted, and this caused problems in PRIMER which might hang when trying to read an encrypted file.

In PRIMER v15.1 the hang has been fixed, but the file will not be read, instead aborting the file read with an error.

In PRIMER 16 encryption is now detected, and the user will be prompted for a password so that the file can be read normally. Some minor changes to the way .zip files are read also means that PRIMER will be more likely to read an archive not written by itself in the first place.

Renumber

- **Case 39625**

Reinstated formal names in Renumber includes summary and details information boxes.

- **Case 38942**

Fixed an error/crash that occurred when opening Model → Renumber → Visualise with a model containing only unlabelled and LATENT entities.

Scripting

- **Case 36788**

When running lstc_dummy_file_read_script.js script, now PRIMER checks that there is information after the *END line. Otherwise a message is shown and the script is terminated.

- **Case 39889**

PRIMER's FMVSS201U script could fail the final model build step if the output csv filename contained spaces. This has now been fixed.

- **Case 39616**

The beam to iges script only worked if the beams in each part were connected and the beam were labelled in the order they were connected. This limitation has been removed and the script now works with any model.

- **Case 39093**

FMH Script - Points 4, 7, M, 12, 14, 16 and 17 calculations have been improved, and new prompts have been added to prevent user error.

- **Case 39027**

SBA script - Issue with unit of the load is fixed. User has to specify correct load value in the given unit system.

Loading beam was not aligned correctly which has been fixed now.

Translation was not available if seat has beam. Now translation of forming is available for all the cases.

- **Case 38977**

Volume calc tool available in Primer didn't work correctly if user selected a part from models other than first model. The tool also fails if the section of the selected part is latent. Fixed both the problems.

Seatsquash

- **Case 39206**

A crash occurred when setting up an LS-DYNA method seat-squash operation. This was due to the fact that the model contained a *SET_PART_ADD definition in which the option to define a range of labels using a -ve label was used, and the way this is stored internally caused an error in some circumstances.

In fact, the error was due to removal of unwanted items from sets, and could have occurred during any process that performed the 'delete from set' internal operation where this -ve label option was used.

This has now been fixed, but the fix involves leaving the -ve label intact in the set definition, i.e. leaving the designated range within the set 'as is'. Modellers wanting to control set contents precisely should probably avoid this syntax (and *SET_xxx_GENERAL) since it can lead to unintended consequences when model contents are manipulated.

- **Case 35033**

Parts which use *MAT_FABRIC where not being output to the dynain file when using the *INTERFACE_SPRINGBACK keyword in LS-DYNA R9.

The DYNA seatsquash method in PRIMER uses *INTERFACE_SPRINGBACK, so running the model in an R9 version of LS-DYNA meant that the nodal coordinates of *MAT_FABRIC parts could not be imported back into the model.

A new option has been added to the seatsquash menu to use
*DEFINE_CONSTRUCTION_STAGES instead, which does output *MAT_FABRIC parts. The
*INTERFACE_SPRINGBACK method is still the default (for backwards compatibility), but it
can be changed with the preference primer*squash_use_define_construction.

In addition, a check has been added when writing out a model which will issue a warning if the
LS-DYNA version is set to R9 and any part in the *INTERFACE_SPRINGBACK set uses
*MAT_FABRIC.

Sections

- **Case 37995**

*SECTION_SOLID_{OPTION} is now included in the keyword editor

Selection

- **Case 39709**

If you were editing a set for a nodal rigid body and using the 'hole' option in the object menu to
add nodes to the set, then it would not work if any of the nodes on the hole were already in the
set. Now fixed.

- **Case 39261**

The user interface could get 'locked out' in the following situation:
  - 'Show ambiguous' was turned on for ambiguous screen picks
  - Such a pick took place near the very top or right hand side borders of the master
    PRIMER window.

The 'list of ambiguous items' popup would try to map itself partially outside the confines of the
master window, causing an error and a failure to be drawn. However, since the UI locks input to
this window there was no way for the user to cancel it, resulting in lock out.

Fixed by clamping the position of that popup to lie within the bounds of the window.

- **Case 38182**

Selecting certain element types that have a long list of nodes (e.g.
ELEMENT_SHELL_NURBS_PATCH) by left clicking and dragging in the graphics window
could corrupt PRIMER, with unknown consequences. This has been fixed.

Sets

- **Case 37359**

Removing segments from a set by direct selection (e.g. by screen area) worked OK but selection
by the feature line method on the object menu failed to remove them. The segments in a set
under edit are actually scratch definitions so some extra work is required to enable this selection
method. Now fixed.

Shortcut

- **Case 37521**

Keyboard shortcut preferences in PRIMER did not consider the 'Clear' setting for any of the keys. Now the 'Clear' settings for any of the keys will be added into Preferences as an Empty string.

Text Editor

- **Case 38696**

On Windows 10 we have observed that using the Notepad++ editor for 'text edit' can cause problems as follows:

+ User opens a PRIMER editing panel, then uses 'text edit' to inspect the card in detail.

+ External text editor is closed, with or without changes.

+ Shortly afterwards user tries to re-open the card in the text editor, and is told that it is still being edited.

+ After some period of time, usually less than a minute, this problem seems to resolve itself and the card becomes editable again.

We have traced this problem to something in the way Windows opens and closes files using Notepad++, and in particular it seems that sometimes Notepad++ will 'hang onto' the file for up to a minute even though it is closed. The cause is unknown, and appears to be a Windows 10 gremlin, but there are various workarounds:

(1) Modify the default arguments to open Notepad++ using the following PRIMER preference:

primer*text_editor: 'C:\Program Files (x86)\Notepad++\notepad++.exe' -multiInst -notabbar -nosession

(2) Use a different text editor, eg wordpad, vim, etc. These can be defined using the same 'primer*text_editor' preference.

Transform

- **Case 39516**

If a keyword file contained a *NODE_TRANSFORM definition inside an *INCLUDE_TRANSFORM and PRIMER wrote a merged keyword file, the merged file would be incorrect. Now fixed.

- **Case 37579**

NODE_TRANSFORM cannot be used with SET_COLLECT. This error is now trapped in Primer and an error message is given.

Undo

- **Case 38032**

'Undo' of deletion of *AIRBAG_REFERENCE_GEOMETRY and *AIRBAG_SHELL_REFERENCE_GEOMETRY definitions on nodes and elements was not working correctly. When a *NODE card that has airbag reference geometry is deleted special measures have to be taken to preserve that extra geometry for 'restore after undo', and these were not working correctly. The same applied to *AIRBAG_SHELL_REFERENCE_GEOMETRY when the shell in question was deleted, and the deletion was then 'undone'.

These problems are now fixed.

User interface

- **Case 39626**

Upon clicking on 'Contact' in the 'Connection' panel, all of the buttons on this panel would shift down leaving some empty grey space at the top of the panel. This has now been fixed.

- **Case 39184**

Popups no longer appear on the main menu > Volume III keyword buttons where they should not.

- **Case 38943**

Delete recursive and Remove from sets buttons are now mapped on the *AIRBAG top level panel.

Volume 3

- **Case 39778**

The keyword *EM_CIRCUIT seems to need a new header for each circuit defined.

- **Case 39725**

In the LS-DYNA manual, *EM_EXTERNAL_FIELD is defined as a float, hence PRIMER was storing and writing this field as a float. However, the field's description suggests that it should be stored as an integer. Also, when a float is read in to LS-PP for this field, LS-PP returns errors. Therefore, has been changed to be stored and written as a integer in PRIMER.

Write

- **Case 38384**

A new option has been added to the PTF/d3plot writer in PRIMER. You can now force it to write a file that will have data slots available for writing data to multiple on plan points on Shells and Thick Shells.

This can be useful if you want to create a JavaScript UBIN component and write data to on plan points.

(If the model contains *INITIAL_STRESS_(T)SHELL cards with on plan points, PRIMER will automatically create a file with slots for this data, and the option is not required in this case.)

- **Case 37702**

Headers are now written for all *DEFINE_ADAPTIVE_SOLID_TO_SPH and *DEFINE_ADAPTIVE_SOLID_TO_SPH_ID keywords.

- **Case 37402**

LS-Dyna expects all the *EM_EOS_XXX keywords should be keyed-out under separate headers, PRIMER was outputting all instances of same type of keywords under one header. Fixed this.

Xref

- **Case 38424**

In some of the edit panels 'View Xrefs' button was not active if the entity is not referred by anything. The panels are changed such that the 'View Xrefs' button is always active.

2.2   D3PLOT

2.2.1   Bugs Fixed in 16.0

Blanking

- **Case 39649**

If a contact model (.ctf) is loaded without the Interface force segments and data option selected, the model only reads in nodes. In this case, if the user changed to the old blank menu, D3PLOT hung. This has been fixed**.**

- **Case 39586**

In the Blanking Menu D3PLOT could show incorrect list of selected parts when selecting from the screen and then deselecting some parts. The parts highlighted on the screen and the parts blanked were correct. This has been fixed.

Contour

- **Case 39258**

If a PR plot was generated when enveloping was on, incorrect results were shown. In D3PLOT v16.0 PR plotting has been disabled when enveloping is on to prevent this.

Component

- **Case 37458**

In D3PLOT v16.0 if the shell surface is set to MIN, MAX and MAG this also considers the mid-surface value for shell elements with an even number of through-thickness integration points. In previous versions of D3PLOT, MAX, MIN or MAG only looked across values at the shell through-thickness integration points. If a shell has an even number of through-thickness integration points there is not an integration point at the mid-surface. Previous versions of D3PLOT did not consider the computed mid-surface value (which could be separately plotted by selecting MIDDLE in the surface menu) in calculating MIN, MAX or MAG. For such cases, and for some components, the MIDDLE value could be, for example, lower than the MIN value.

Data components

- **Case 38790**

In the particular case of [magnified displacements] and [reference state] and [32 bit data file] D3PLOT would draw the current geometry without any displacement for the current state. The calculation of displacements for plotting, Write and XY data were not affected.

This error was introduced into D3PLOT v15.0 when the double precision (64 bit data file) calculation was added, it has been fixed in D3PLOT v16.0 onwards.

Dialogue command

- **Case 39458**

The dialogue command line option to set the number of contour levels would only allow up to 13 levels to be defined. This had been changed to allow up to 16 levels.

Filename

- **Case 39940**

On Linux if you ask to create database, and use the file selector to create a new file, it would give an error message 'File not found'. This is now fixed, and you can create a new file.

General

- **Case 39407**

When calculating a nodal trace D3PLOT would not respond to the STOP button. This has been fixed.

Graphics

- **Case 38768**

If the overlay mode for Beam parts was changed to 'No Overlay' using the Quick Pick option the overlay was still drawn using all edges. This has been fixed.

- **Case 38611**

On some remote Linux servers running VirtualGL the D3PLOT executable would refuse to start giving an error message saying 'Cannot get OpenGL rendering context'. This was caused by an incompatibility between the server and the way D3PLOT was trying to open the OpenGL graphics window. It has been fixed in D3PLOT v16.0 onwards.

Groups

- **Case 39273**

D3PLOT v15.0 would fail to read any binary group files (*.grp) generated by v15.0 or v14.0. Binary group files (*.grp) generated by older versions could be read. This has been fixed. D3PLOT v16.0 can read binary group files (*.grp) generated by all versions.

JavaScript API

- **Case 37661**

If the JavaScript functions `IsBlanked()`, `Blank()` or `Unblank()` were used when multiple models were loaded into D3PLOT the functions could check or set the blanking status in the wrong model even if `SetCurrentModel(model_id)` was called first. This has been fixed.

- **Case 37078**

`GetData` generated an error message for SPC_F and SPC_M. This has been fixed and `GetData` now extracts the data for these components.

Measure

- **Case 39359**

For a part part-part measure with multiple parts, if screen picking was used to select a part, the part could end up on both sides of the measure. Now when the user does this, the part is removed from the other side of the measure.

- **Case 36235**

In D3PLOT v16.0 it is now possible to pick nodes in a volume 3 domain (CESE, ICFD etc) within the measure menu.

Menus

- **Case 39688**

When using Quick Find to 'Open New Model', an extra carriage return keystroke could cause D3PLOT to lock up. This has been fixed.

- **Case 39657**

In version 15.1 some of the buttons in the Edit Window menu were not drawn correctly if you moved the mouse over a button with a popup menu attached to them.

- **Case 39457**

If the new style object menus were used to select things by screen area and the area selected by the user was of zero size (they had picked coincident points) then they could end up being locked out of all the other menus in D3PLOT (an X would appear if you moved the mouse). This has been fixed.

- **Case 38920**

In the 'DATA' menu under 'Min/Max Options', the 'Export to Write' option mapped the 'WRITE' menu as well as the Write Table, and the 'Export to XY Data' mapped the 'XY-DATA' menu as well as the XY Graph.

In D3PLOT v16.0 only the Write Table or the X-Y Graph are mapped and the right hand menu remains showing the 'DATA' menu with 'Min/Max Options' .

Metal forming

- **Case 37190**

In D3PLOT v16.0 the FLD plotting panel is now unmapped and reset when a new model is loaded. This is consistent with other menus in D3PLOT like WRITE and XY-DATA. Previously if you had an FLD plot open showing data for M1 and then you opened a new model (M2) the FLD plot options panel updated with model tabs and M2 was automatically selected. If you then closed M2, the FLD plot closed, even though valid data remained for M1.

Output

- **Case 37561**

D3PLOT could crash if it read in a PTF file (d3plot) or d3eigv file created by a model containing the *DATABASE_EXTENT_BINARY_COMP card. This crash was caused by this card

modifying some of the values in the ptf and d3eigv files and D3PLOT did not know about these
modified values. This has been fixed in D3PLOT v16.0.

Properties

- **Case 39932**

On Linux D3PLOT would fail to read in a properties file that had been written on a Windows
PC. This has been fixed.

- **Case 39302**

There are read errors if a properties file contains a very long filename in the $ File comment (in
excess of 230 characters). In D3PLOT v16.0 property files are written with very long filenames
split over multiple comment lines.

- **Case 39186**

When using multiple properties files in D3PLOT once items were blanked they would not re-
appear if a later properties file un-blanked them. This caused problems with child objects in
REPORTER. This has been fixed.

- **Case 39021**

If contact surfaces (or parts of them) were blanked and the blanking status was saved to a
properties file, the blanking status was not correctly set when the properties file was reloaded.
This has been fixed.

Quick pick

- **Case 38658**

D3PLOT would crash the user tried to select a set using Quick Pick with generic 'Sets' rather
than one of the specific set types. This is if a model contained set definitions (read from the ZTF
file). In D3PLOT v16.0 for Quick Picks users can are now restricted to choosing the entity type
to be one of the specific set types.

Read

- **Case 40026**

If you used the File->FAM_SIZE popup to change the maximum file size for family members,
D3PLOT would crash. It no longer crashes.

- **Case 39978**

Previously PrePost .db files had 'Hz' appended to the state timestep, e.g. '0.15 Hz'. The 'Hz' has
been removed.

- **Case 39256**

Due to an internal change in the data written to the D3RMS file by newer versions of LS-DYNA,
D3PLOT would read the D3RMS file but not display the geometry correctly. D3PLOT v16.0 has
been modified to automatically detect the two different file formats and supports both old and
new D3RMS files.

- **Case 38603**

Previously if D3PLOT detected a file which contained corrupt element topologies it would refuse to read the file. In D3PLOT v16.0 this has been changed so that D3PLOT now automatically substitutes node 1 for any invalid nodes and continues so that the file can still be processed and read into D3PLOT. If any elements are detected with corrupt topologies a warning message (including the number of elements) is written to the dialogue window.

Variables

- **Case 38513**

To export variables to REPORTER, the Variables panel need not be closed for variables to save to a capture when Capture or Update is pressed.

Volume 3

- **Case 39472**

D3PLOT would crash if a Vector plot of an EMAG Surface data component was plotted. This has been fixed. Plotting the magnitude of the same data component as a CT or SI plot already worked correctly.

- **Case 39471**

The shortcut key 'R' to reverse the blanking status of everything did not process EMAG surface elements correctly, and their blanking status was not set correctly. This has been fixed. Blanking EMAG surface elements using the BLANK menu already worked correctly.

- **Case 39459**

Volume 3 vector plots on solid elements caused D3PLOT v15.0 and v15.1 to crash. This bug has been fixed.

- **Case 36234**

In D3PLOT v16.0 the WRITE menu now supports Volume 3 elements and data components. In D3PLOT v15.0 and v15.1 Volume 3 elements could be selected, but an error message was displayed as no data components were supported.

Write

- **Case 39939**

If the WRITE table was undocked on LINUX it could disappear behind other application windows when a popup menu attached to any of the buttons in the WRITE table was mapped.

- **Case 39179**

If a command file was recorded that used any of the new style object menus (WRITE, BLANK, XY-DATA) then it would not play back in 'batch' mode and would sometimes fail if run interactively if there had been any changes to the model.
This is fixed in D3PLOT v16.0 so command files can be written and read in batch mode.
Unfortunately this change is not backwards compatible and any command files recorded in versions 14 or 15 that use these menus will not work in v16.0.

- **Case 38973**

If the WRITE Keyword option was used to export element information in Keyword format, then elements that had failed and been deleted were included. In D3PLOT v16.0 these elements are excluded by default and a new option to include failed elements has been added to the menu.

- **Case 38699**

Models with multiple IP solid results that were read in without a ZTF file would show the first IP value in the write table, but plot contours with a value based on the preference `d3plot*multi_ip_mode`. This has been corrected, so the Write Table now shows the same value as the contour plot, i.e. based on the preference `d3plot*multi_ip_mode`.

Shell elements with multiple on-plan IP results but no ZTF file would show the first IP value on both contour plots and in the Write Table. This has been changed, so that in both cases the value shown is based on the preference `d3plot*multi_ip_mode`.

XY Data

- **Case 39668**

In D3PLOT v16.0 the plotting of XY data has been sped up for plotting a large number of entities across a lot of states.

- **Case 38138**

In D3PLOT v16.0 partial state selection across multiple windows works properly. Previously you had to have some states selected in the first active window or some menu options would be greyed out. Under 'List selected' D3PLOT v16.0 lists the #states in each active window, rather than just the first active window.

- **Case 37549**

For XY Data when using "composite data" and "state selection by time", there could be extra empty curves created with corresponding error messages. In D3PLOT v16.0 these curves are not created.

- **Case 37505**

In the XY Data menu for "state selection by time", if a very small time interval was specified, D3PLOT could hang. In D3PLOT v16.0 this has been fixed and there is a (model dependent0 minimal value for the time interval.

2.3 T/HIS

2.3.1 Bugs Fixed in 16.0

Curve menu

- **Case 39279**

If the curve manager was undocked and made wider than the curve label, buttons always expanded to take up the full width available so as much of the curve label as possible could be displayed.

If, when the curve manager was docked, the right-hand menus were made wider then up to a certain point, the curve label buttons adjusted themselves to use all the available space. Eventually they reached a maximum after which if the panel is made any wider you ended up with unused space on the right.

This has been fixed in 16.0

Curves

- **Case 39775**

Fixed an issue where 'Sort by Name' would give curves an incorrect label.

Datum

- **Case 38605**

When a Y2-datum line was created, thus adding a Y2-axis if it was not there before, the Y2-axis buttons next to each curve in the curve manager were not displayed. This has been fixed in V16.0.

Dialogue command

- **Case 39706**

The manual stated that the command used to read PART GROUP data was 'P_G', however this did not work. Now 'P_G', 'P_' and 'PG' will all work.

- **Case 39015**

The global command 'Clear' and corresponding command 'CL' have been removed, they were previously replaced by the shortcut key 'b' and no longer did anything. The command 'GRO' was not working, it now does the same as 'PGR'. The commands GRAPH > MAP/UNMAP have also been removed from T/HIS.

FAST-TCF

- **Case 39285**

T/HIS could crash when generating a FAST-TCF script if any of the curves that were being captured in the script had been generated using the 'Window' curve operation.

- **Case 38746**

A FAST-TCF tag is attached to each curve generated through JavaScript. We can now use the curves generated in a JavaScript inside FAST-TCF.

Graphs

- **Case 38119**

When an axis is displayed with logscale turned on, the format of the values can now be changed with the 'Automatic', 'General' and 'Scientific' options.

- **Case 38912**

The FAST-TCF command

```
layout page 'n' graph 'm' position x,y, x,y
```

didn't update a graph's position correctly if graphs were only present on a single page. This has been fixed.

Integration

- **Case 40032**

The T/HIS->PRIMER link auto-locates a keyword deck by looking for either a .thf file or an .xtf file and then searching for a .key file with the same name (minus extension). There was an issue in previous versions that meant that T/HIS was, in fact, looking for a .thf file a second time (instead of a .xtf) if the first search failed. This has been fixed.

JavaScript API

- **Case 39842**

If a T/HIS JavaScript was created that used Windows and Widgets then the JavaScript would not run in T/HIS if T/HIS was being run as part of the D3PLOT>T/HIS link.

- **Case 39014**

Users can now update the curve unit system through the curve member property 'unit_system'.

- **Case 38747**

Curve tags assigned from inside a JavaScript didn't appear in the curve manager. This has been fixed.

- **Case 38735**

The JavaScript function Operate.Rs previously returned a single curve rather than the expected array of 5 output curves. This has been fixed.

- **Case 38681**

The pure Butterworth filter operation 'Pbut' in the JavaScript API, did not work correctly as the input arguments were not being read in properly. This has been fixed.

Licensing

- **Case 39492**

In version 15.0/15.1 a popup window was displayed when the software started if the license expired in less than 31 days. When this message was displayed the window included the following:

You can disable this message by setting the preference option:

*show_license_warning: FALSE

If this preference was set then the message was not displayed in D3PLOT but this preference did not work in either T/HIS or PRIMER.

This has been fixed in V16.0 and the preference is now applied correctly in all three programs.

LSDA (binout)

- **Case 39089**

T/HIS could fail to read data for some entities from the BNDOUT data in an LSDA (binout) file generated by the R11 release of LS-DYNA.

This problem was caused by a change to the internal file structure of the LSDA file in R11.
This has been fixed.

- **Case 33220**

If SSD or PSD data was present in a model, but also a THF file existed containing the data for the initial state, then previously only the THF was read and not the SSD or PSD data. This has been fixed so that if SSD or PSD data is present, then data for relevant entity types is always read from the binout file, even if a THF file exists.

Menus

- **Case 37429**

The Curves menu 'Blank' > 'Pick Visible' menu was not dismissing Picking after dismissing the menu. This has now been fixed.

Operations

- **Case 38956**

If the COMbine operation was used with 2 groups of curves each containing multiple curves then the output from some of the combine operations could be wrong if the pairs of curves didn't contain matching X-axis values. This has been fixed.

- **Case 38732**

Curve legend for the MAP operation will now be based on the second curve.

- **Case 38305**

The seismic response spectrum function (RS) was inaccurate for small regularization intervals. This has been fixed.

- **Case 37518**

Any checks relating to the maximum number of points on a curve have been removed and replaced with warning messages together with optional user termination in case a large number of points causes an operation to run slowly.

Read

- **Case 39678**

In some dialogue box read and write commands, such as for .cur files, spaces in filenames could cause the command to be processed incorrectly. This has been fixed.

- **Case 39417**

If the number of curves in a CSV file was changed after the file was first selected in the Read panel, then previously the CSV file was not always read correctly. This has been fixed.

- **Case 39133**

T/HIS could crash if rotational data components were read from the ASCII NODOUT file using a JavaScript. This has been fixed.

- **Case 38940**

T/HIS would crash if curves were read from a KEYWORD input file using the dialogue command:

/read kw filename

if the filename specified didn't include a path. This has been fixed.

- **Case 37502**

Data for Part 0 and Part -1 in ASCII matsum files, which occurs if there is non-structural kinetic energy in the model, is now summed and read into the global data component Lumped Kinetic Energy (LKE). This is consistent with LSDA binout files, which contain "lumped_kinetic_energy" data that corresponds to what would be the sum of Part 0 and Part -1 data from an ASCII matsum file.

Write

- **Case 39016**

If no model or display unit system was present, when a cur file containing a unit system was read in and written out, there would be no units written to the file. This has been fixed, the cur file will now contain the curve units in this case.

2.4   REPORTER

2.4.1   Bugs Fixed in 16.0

Filename

- **Case 39303**

When editing a variable of type 'Directory', if 'Browse…' was clicked to browse for a directory with a UNC path (e.g. *\\example.com\data\analysis\001*), the value returned would contain forward slashes (*//example.com/data/analysis/001*). Backslashes are now preserved.

Image

- **Case 38792**

PNG images with transparency would appear white in PDF output. Now fixed.

JavaScript API

- **Case 38772**

The red, green, blue and name properties in the Colour class did not work. When getting the property null would be returned instead of the correct value. Now fixed.

Library

- **Case 38711**

When running on Linux a warning 'libpng warning: iCCP: known incorrect sRGB profile' would be written to stdout. Now fixed.

Variables

- **Case 38791**

After a PRIMER, D3PLOT or T/HIS capture, the special read-only variables (e.g. REPORTER_TEMP) were being set as writeable, meaning that they would be mistakenly written to the template/report file if it was subsequently saved. Furthermore, after a capture, all variables were being changed to temporary variables. Both now fixed.

- **Case 38513**

To export variables to REPORTER, the Variables panel need not be closed for variables to save to a capture when Capture or Update is pressed.

Properties

- **Case 39186**

When using multiple properties files in D3PLOT once items were blanked they would not re-appear if a later properties file un-blanked them. This caused problems with child objects in REPORTER. This has been fixed.

2.5   SHELL

2.5.1   Bugs fixed in 16.0

Menus

- **Case 37585**

The DISPLAY textbox was not getting updated in the LS-DYNA Submission panel. This is now fixed.

- **Case 37383**

Previously, the text in one of the popup buttons off the 'Manual' link in the SHELL main window could be obscured by its thumbnail. This has been fixed.

Manual

- **Case 37437**

There was a correction in the manual. The Environment variable name should be LSTC_INTERNAL_CLIENT, not LSTC_NOCLIENT.

3 Enhancements

The enhancements and bug-fixes for each program have been broken down into a series of topics. Within each topic enhancements and bug-fixes are listed by case ID.

3.1 PRIMER

3.1.1 Enhancements in Version 16.0

Checking

- **Case 39227**

The DYNA output tree can now show the 100 smallest timestep messages from DYNA output files.

- **Case 38294**

Checks are added for EDGSET in SECTION
1) Error is shown if Part referrenced by nodes in EDGSET does not match the part that refers the section in seatbelt.
2) Error is shown if nodes in EDGESET are not on a free edge.

- **Case 37694**

By default, DYNA output check now searches for *.otf, *.prt, d3hsp, *.d3hsp, mes*, and *.mes*. An optional additional search has been added in which the user can specify the search criteria. This can include wildcards: '?' - represents one character, '*' - represents any number of characters. e.g. filename_??.* would find: filename_01.mes0000, filename_01.d3hsp, filename_01.otf, filename_01.prt, etc.

- **Case 37631**

Added the option for DYNA output check to search for, and read, DYNA output files compressed as .gz or .zip files. This option can be set under the preference primer*compressed_dyna_output_search:TRUE.

- **Case 36753**

Two new element quality checks have been added: Taper check and Tetra collapse check.

These checks can be performed via Check and displayed as CT/SI plots, as well as being printed out in a summary file. The checks have been added to the 'Element Quality' and 'Failed Criteria' CT/SI plots.

The Taper and Tet Collapse functions can also be called using the API.

Connections

- **Case 37728**

NRB bolt connections made across include files now by default use SET_NODE_COLLECT. There is a preference to revert this to the original behaviour (SET_NODE_LIST).

- **Case 34409**

Added a new column in connections table to output Hex Assembly (*DEFINE_HEX_SPOTWELD_ASSEMBLY) labels for spot-weld connections.

Contour

- **Case 38377**

A new JavaScript function has been added to plot contours:

For example: View.SetContourType(View.ELEMPROPS, View.FORMULATION);

- **Case 34712**

Ability to contour shells depending on the direction of the shell loads (Away, Towards, Both, None)

- **Case 31909**

New contouring options under Shell thickness: % thinning and % remaining which report the change in section on *ELEMENT_SHELL_THICKNESS from the dynain file

Dummies

- **Case 37741**

Multi stage positioning option for combined seatsquash and dummy positioning has been added. It will allow users to add multiple intermediate positions for dummy position and seat squash.

Added a tick box option next to each intermediate positions to write out dynain file for each intermediate stage during DYNA run by creating *DEFINE_CONSTRUCTION_STAGES cards for each intermediate position.

Command line support has also been added.

Edit

- **Case 39283**

*DEFORMABLE_TO_RIGID support in PRIMER has been improved in the following ways:
- There is now a keyword editor for all _AUTOMATIC suffix. This editor only shows the top two fixed rows of data, but it makes it possible to adjust values such as TIME in bulk. (The open-ended listing of D2R and R2D data can still be edited in the existing scalar editor.)

- Graphics of all sub-types of this keyword is now implemented fully. Previously it was only possible to 'sketch' them, or to perform a half-hearted 'Only' operation by showing parts. 'Only', 'Find', etc now all work properly.

- This also means that screen selection is also now fully implemented.

- In selection menus the distinction between the labelled _AUTOMATIC suffix and the other unlabelled suffices is now made where relevant. This means that where a labelled

_AUTOMATIC type needs to be selected it should no longer be possible to select the wrong type, which was possible before because the menu lists show PRIMER's internally allocated labels for those types.

Graphics

- **Case 38239**

Added visualisation of normal vector for RIGIDWALLs.

- **Case 34594**

Additional option in View→Contour plots→Shell normals→Vector which shows Shell elements normal direction as arrows. The same feature is also added in ELEMENT→Shell→ Align/Normal panel when 'Draw Normals' button is active.

- **Case 34337**

SPR. SPR2 and SPR3 can now be visualized. Primer calculates the points on each sheet using the spot-welder tool and draws large red blob to mark the master panel - the head of the rivet and smaller green blobs to mark the other sheets.

Iga

- **Case 35364**

Primer can now display iso-geometric surfaces defined with the keyword *ELEMENT_SHELL_NURBS_PATCH. Spot-weld connections can also be made between them and other shells/solid elements.

Image

- **Case 39153**

PRIMER 16.0 introduces the following changes to the handling of output image filenames:

- If an explicit filename (optionally, with path) is typed in or selected for one image type, say JPEG, that new filename and path will then become a seed for every image type. Changing to a different image type, say PNG, will not require users to browse to the user-defined path again. Instead the new seed name will be used for the PNG file with the appropriate extension (.png) and a unique increment added if needed.

- Extensions that are an obvious mismatch will be auto-corrected and a warning issued. For example, if a user attempts to write out a BMP with the filename myfile.gif, the filename will be changed to myfile.bmp automatically. The filename myfile.image will, however, not be auto-corrected.

- If a user-chosen filename exists, clicking the NEW_FILE option will not take the user back to the current working directory as was done in the past. Instead, a unique 3 digit increment will be appended to the same name to generate a new filename.

- A sub-folder (one level only) is now also automatically created as a part of image creation, if needed.

- All of the above now also applies to postscript files (PS and PDF), although the

handling of images and postscript files is kept disparate. So, choosing a new image name will not alter the default filename for movie or postscript files. Choosing a new postscript filename will, however, update the default filename for pdfs.

Include transform

- **Case 37872**

User can now pick nodes on multiple models if he/she chooses POS6P in DEFINE_TRANSFORM. Otherwise, Picking on multiple models is not allowed

Javascript api

- **Case 38780**

New interface keywords have been added to API:

- Interface Component
- Interface Linking edge

- **Case 38700**

The object returned from the Dummy GetPoint() method now includes a <hpt> property that is true if the point has been automatically generated by PRIMER at the H-point.

- **Case 35220**

Added JavaScript API FlagVisible() in PART class to flag unblanked parts in the model.

Keyword

- **Case 37848**

Node Coordinates (X,Y,Z) are displayed after user picks single node NID (and then ADD) in BOUNDARY→ PRESCRIBED FINAL GEOMETRY

Mass

- **Case 37082**

Optional control over the part CentreOfGravity calculation has been added to the javascript API. The settings given below are the defaults that would apply if no option was given.

var cofg = p.CentreOfGravity({slaveparts:true, transfermass:true, lumpedmass:false, nrbmass:false, timestepmass:false, plot:false});

You can now e.g. remove Rigid Body merges by setting "slaveparts:false" or include attached nrbs by "nrbmass:true"

Menus

- **Case 37423**

Various text suggestions are added in quick search
Import, open for model read
Export, save, close for model write
Connector for connection panel
Mask for entity panel
Align node for orient project to line
Find attached for attached
equivalence node for node merge panel
snapshot for capturing images

Mesh

- **Case 38549**

Shell element can be split in 3x3 way using Mesh tools → Split.

- **Case 37460**

Introduced a new parameter R1 for the swages creation panel to create swages mesh with 'Dome' like TOP surface and also to smoothen the SIDE surfaces of the swage.

Model build

- **Case 33089**

Added recent files selection popup menu for model build database file input.

Morphing

- **Case 39316**

Added new [Advanced Options] button on the Morph Tab for MORPH tool.

- **Case 37738**

In PRIMER 15 morph boxes have got 2 by 2 by 2 morph points at the corners of a cuboid. When morphing is applied, nodal coordinates are recalculated linearly in each parametric coordinate direction.

In PRIMER 16 this has been generalised to morph boxes with more morph points. In their original position they are still in a grid of cuboids. When morphing is applied, the nodal coordinates are recalculated using higher degree Bernstein polynomials in each coordinate direction. In other words, the calculation of the nodal coordinates is that of a 3-dimensional NURBS patch where the control points are the positions of the morph points.

There are also visibility switches to turn on and off corner, edge, face and internal morph points. There are also different options what morph points are interpolated when a given selection is dragged.

- **Case 37734**

Added new JavaScript API classes MorphPoint and MorphBox to allow access to the morphing functions in PRIMER.

- **Case 37042**

There are the following morphing additions in PRIMER 16:

On the Morph panel there is now a Utilities tab where morph boxes can be directly reset or deleted.

When morph points are dragged interactively or by selection, the current drag vector is dynamically displayed on the panel. It is now also possible to type in a vector to apply that morphing to the selection. This is useful for morphing on parts which should remain symmetric and where the same distance should be applied to different morph points (possibly in a different direction but the same distance). In PRIMER 15 there was already the option to type in an offset distance, but this was only available in selection mode and when a drag direction X, Y or Z was specified, but not for the drag directions Free and Mouse, which are most flexible and used more often. The offset vector text box in PRIMER 16 therefore needs fewer clicks.

- **Case 36355**

PRIMER can now apply morphing from command line arguments, which is in particular useful for optimisations with LS-OPT. The following has been added for this purpose:

- A post-*END keyword *MORPH_FLOW assigning vectors to morph points. The idea of this is that applying a variable value moves each morph point on the morph flow by that vector multiplied by the variable value, allowing morphing to be parametrised. Morph flows can be created and edited interactively or in the JavaScript API.
- A JSON variable file format: This lists variable names and values, which will be applied to the morph flow definitions.
- A new command line option -ls_opt= specifying the variable file name on the command, so PRIMER can apply morphing when it starts.

More detail about this can be found in the PRIMER manual and in the tutorial about morphing optimisation.

Nastran

- **Case 39083**

The default method for conversion of Dyna tied contact to Nastran RBE3 has been modified so that DOF=123456 (rotation constraint) formulation is no longer used for nodes that align to segment edges. Instead we use DOF=123 with very small weight factors for the uninvolved nodes. A switch [RBE3 with 2 indep nodes] permits reversion to the original behaviour, should users want it

Orient

- **Case 38481**

A contact thickness option has been added to contact orient which will over-rule the physical thicknesses of the parts when depenetrating or bringing to the point of contact.

- **Case 38234**

Orient tool now has option to translate by defined VECTORs.

- **Case 37739**

'add_gap' parameter is used in orient using contact feature. This option has now been added to dialogue command.

Part table

- **Case 38395**

Added support for CPARM8 on *PART_CONTACT on part table as new column.

Preferences

- **Case 39260**

'Text edit pref' has been added to the options drop-down. If user has permission to access the install directory, (s)he will be give choice of home or install preference file, otherwise the home preference file is opened.

- **Case 35344**

All settings in the main 'Keyword i/o options' panel can be saved via the new button 'Save Keyword i/o options', except for customised selections of 'Permit duplicate definitions'. New preferences have been added to account for the options that previously could not be saved as a preference. These are:

force_keyword_format
input_exception_BOUNDARY
input_exception_INITIAL
input_exception_LOAD
large_format_80cols
preread_parameters
single_card_ABAG
single_card_EQOS
single_card_HGLS
single_card_MATL

All of which can also be set via the edit preferences panel.

Renumber

- **Case 38859**

Added [FIX CLASH & POST RENUMBER] option for label clashes when adding or replacing INCLUDE files.

Rigidify

- **Case 38012**

CMO, CON1 and CON2 fields are added on Rigidify Panel.

Scripting

- **Case 39101**

FMH Script

  - Added grid lines for all planes to help with visualisation.
  - Added display of UR boundaries for RP1 visualisation.
  - Corrected FH1 and FH2 reference image, as well as improved RP2 reference image.

- **Case 39094**

FMH Script:

  - Improved GUI by changing to non-modal and adding settings options
  - Allowed impact point calculations for models with latent parts.
  - Added macro tags to check boxes, text boxes and buttons.

- **Case 39026**

Now user can control belt stiffness ratio between loading belt and the belt itself. Default belt stiffness ratio is set to 10. The option is available in the setting panel.

- **Case 37299**

A new command line argument -js_encrypt has been added so JavaScript files can be encrypted from the command line. It outputs a file in the same directory as the specified file, with the suffix '_encrypted.js'.

- **Case 34641**

FMH Script - SR2 can be calculated with respect to APR or BPR (or RPR if there is no B-pillar). The program uses APR by default. Added option to use BPR or RPR instead.

Undo

- **Case 37800**

UNDO option is now available for renumbering entities in a model.

Ztf

- **Case 38865**

A preference has been added (primer*ztf_output_composite_action) to save the chosen action when writing out a ztf file containing composite data. The actions correspond to those on a dialogue box that appears when attempting to write a ztf file containing composite data: 'Yes_Del', 'Yes', and 'No'.

3.2 D3PLOT

3.2.1 Enhancements in 16.0

Component

- **Case 38701**

D3PLOT v16.0 can now display a component that shows whether a shell element is in compression or tension on both sides of the element, i.e. when a shell element that is in bending is rotated on screen it will be contoured in blue when the compression face is visible and red when the tension face is visible. Tension or compression is determined based on the largest magnitude of the maximum and minimum principal stresses on the surface. Further contour bands are green for zero stress and grey for not computed.

The new data component is available under the 'Principal Stress' category and is called TC_SHELL_TENS_COMP.

Constraints

- **Case 34584**

D3PLOT can now read load definitions from the ZTF file v16.0 or later and can plot and contour the loads on the model. Loads are shown with arrow symbols. The following load types are supported: *LOAD_NODE_XXX, *LOAD_SEGMENT(_SET), *LOAD_SHELL(_SET), *LOAD_BEAM(_SET). Only load curves are supported, not functions.

Cut section

- **Case 34951**

In D3PLOT v16.0 a new option has been added to the cut-section +ve and -ve side options that will automatically draw that side using transparency.

Data components

- **Case 37730**

D3PLOT v16.0 can now read and display values for Strain Energy Density that can be output to the d3plot (PTF) and d3eigv files by setting ISED on *DATABASE_EXTENT_BINARY_COMP.

The new data component is available for Solids, Shells and Thick Shells and is available under the 'Element Energies' data component category.

- **Case 37564**

D3PLOT v16.0 can now read and display the residual forces and moments that can be written to the D3ITER file (set by D3ITCTL=1 on *CONTROL_IMPLICIT_SOLUTION) during an Implicit run.

These components are available under a new 'Residual Forces/Moments' data component category.

Image

- **Case 33971**

D3PLOT v16.0 introduces the following changes to the handling of output image filenames:

- If an explicit filename (optionally, with path) is typed in or selected for one image type, say JPEG, that new filename and path will then become a seed for every image type. Changing to a different image type, say PNG, will not require users to browse to the user-defined path again. Instead the new seed name will be used for the PNG file with the appropriate extension (.png) and a unique 3-digit increment added if needed.

- Extensions that are an obvious mismatch will be auto-corrected and a warning issued. For example, if a user attempts to write out a BMP with the filename myfile.gif, the filename will be changed to myfile.bmp automatically. The filename myfile.image will, however, not be auto-corrected.

- If a user-chosen filename exists, clicking the NEW_FILE option will not take the user back to the current working directory as was done in the past. Instead, a unique 3-digit increment will be appended to generate a new filename.

- A sub-folder (one level only) is now also automatically created as a part of image creation, if needed.

- All of the above also applies to movie files (AVI, MPEG and animated GIF) and to postscript files (PS and PDF). Choosing a new image name will not alter the default filename for movie or postscript files. Choosing a new postscript filename will, however, update the default filename for pdfs.

JavaScript API

- **Case 39409**

Added support for DriveMapFilename in the File class for both T/HIS and D3PLOT.

- **Case 39152**

Added IsVisible which returns JS_TRUE if an entity is visible and JS_FALSE otherwise.
An entity is considered 'visible' if the following conditions are all true:
- Not blanked
- The visibility switch is ON for type 'type_code'
- Is not empty, if type is PART
- The entity 'item' has not been deleted in the current state if the type is an element

- **Case 31901**

Added the Colour class. This allows colour constants such as Colour.RED to be used inside JavaScripts, as well as user-defined RGB colours via the function Colour.RGB().

Measure

- **Case 39403**

When doing a part-part measure it is possible to sketch the parts on each side of the measure. Previously it was not possible to remove the sketch without deleting the measure. The sketch button can now be used to turn the sketching on and off.

- **Case 39233**

When a measurement is created, the X, Y, Z coordinate and the vector are output to the dialogue window.

In D3PLOT v16.0 this has been added for node-to-part or part-to-part measures; and for the other types of measure the output has been reformatted to make it clearer.

An oa_pref preference `d3plot*measure_dialogue_format_vec_rows` has been added so users can change the output format from the old format (with the columns as node 1, node 2 and distance, and rows containing X, Y, Z) to the more common vector notation with the rows containing node 1, node 2 and distance and the columns as X, Y, Z.

- **Case 39154**

The data components menu correctly shows if geometry measure part-part data is available.

- **Case 36255**

Users can now set the number format of the measurement where it is used as an annotation on their plots.

- **Case 29137**

Users now have the option 'Transparent' that can be used to display the measurement label without a coloured background.

Output

- **Case 36510**

In the Write >> Keyword Data menu users can now request extra variables to be written to the *INITIAL_STRESS_XXX card for beams, shells, thick shells and solids.

PTF compress

- **Case 34678**

The Cutdown PTF menu (Utility->Compress) now automatically creates a subdirectory if needed when writing cutdown ptf files.

Read

- **Case 39000**

D3PLOT v16.0 now supports the D3ZCF file which contains zero-crossing frequencies with positive slope for results from a random vibration analysis.

The random vibration analysis is activated by the keyword

*FREQUENCY_DOMAIN_RANDOM_VIBRATION. The dump of this file is activated by the keyword *DATABASE_FREQUENCY_BINARY_D3ZCF.

- **Case 38999**

D3PLOT v16.0 now supports the D3ACC file which contains element acoustic pressure contribution and contribution percentage on selected field points from a boundary element acoustic analysis.

The acoustic analysis is activated by the keyword *FREQUENCY_DOMAIN_ACOUSTIC_BEM. The output of this file is activated by the keyword *DATABASE_FREQUENCY_BINARY_D3ACC.

- **Case 38998**

D3PLOT v16.0 now supports the binary plot file D3ACP which contains the acoustic pressure at field points in BEM acoustic analysis.

The field points are defined by the keyword *FREQUENCY_DOMAIN_ACOUSTIC_FRINGE_PLOT.

- **Case 38997**

D3PLOT v16.0 now supports the binary plot file D3ERP which contains ERP (equivalent radiated power) analysis results. The analysis is activated by the keyword *FREQUENCY_DOMAIN_SSD_ERP.

- **Case 27275**

D3PLOT v16.0 now supports the DCOMP (*DATABASE_EXTENT_BINARY) options 5 and 6 which can be used to reduce the size of the PTF (d3plot) files by removing data for nodes that are only connected to rigid bodies.

Settings file

- **Case 38646**

D3PLOT v16.0 introduces the ability to create "sessions" which can later be restored. This permits users to quickly revert to the state they were at when they last exited D3PLOT. Sessions may be saved explicitly or unconditionally upon exit using new preferences.

Sessions are a combination of, and an extension to, the functionality already provided by settings and properties files.
- Model names (results filenames) are embedded. A previously saved session may be loaded as is, or with a similar, but different, set of results files.
- Model attributes, visibility and other properties are restored.
- Model-independent information such as the "menu attributes" are saved in sessions.
- Extra information such as state selection for envelope plotting is included in session files.

Write

- **Case 37051**

D3PLOT v16.0 can now write *ELEMENT_SHELL_THICKNESS cards for thin shell elements from the Write KEYWORD Data menu. The thickness value written for each node is the nodal average value based on the connected shell elements.

XY plot

- **Case 37855**

XY data curves that are exported from D3PLOT to T/HIS now carry additional information such as model number, entity type and entity label. These may be used for curve filtering.

3.3 T/HIS

3.3.1 Enhancements in 16.0

Curve menu

- **Case 35579**

Added in functionality for moving and copying multiple curves in the T/HIS curve manager.

Curve table

- **Case 38972**

The curve table has had multiple new features added:
- Curve properties and injury values can now be displayed in the curve table.
- The columns that are displayed can be customized in the "View" popup and reordered by dragging column headers. Columns can also be hidden by right-clicking the headers.
- The choice of displayed columns can be saved to preferences.
- The whole curve table can be written out to either a .csv or .xlsx file.
- Curves can be annotated with a property or injury value by right-clicking the value in the curve table and selecting "Annotate".
- Options for customizing annotations can be found in the "Annotation options" popup. The options include the format of the displayed value, whether to highlight the relevant point on the curve and the ability to add either an automatic or user-defined label to the annotation.
- Curves can be operated on by right-clicking them in the curve table and selecting "Functions", then choosing the desired operation.

Curves

- **Case 25840**

Added a header to the 'Properties...' pop-up, accessed via right-clicking on a curve, which displays the curve number of the curve that the properties are associated with.
- **Case 38117**

New line widths have been added, so now any pixel width 1-10 can be chosen, rather than previously just 1,2,4,8.

Data access

- **Case 37093**

T/HIS can now read curvout data from both LSDA (binout) and ASCII (curvout) files. The curves are treated as entities and can be selected individually in the usual entity

list in the read panel. Any titles given to the curves will be written into the .ztf file by PRIMER and read into T/HIS.

FAST-TCF

- **Case 14968**

FAST-TCF variables relating to all curves have been added, which have the variable names: all_minx, all_maxx, all_miny, all_maxy, all_xatmin, all_xatmax, all_catmin, all_catmax. These return the min/max x value, min/max y value, x at min/max y value and curve number at min/max y value respectively, where these properties are taken over all curves in the current T/HIS session. In order to create these variables, the curve number word in the FAST-TCF command needs to be replaced with 'all'.

- **Case 22506**

The most recently created/edited curve or the curve with the highest ID can now be tagged in a FAST-TCF script using, respectively, the commands:

tag recent curve_tag

tag highest curve_tag

- **Case 36335**

Added an option to the FAST-TCF create panel, so that a user can choose to write entity names (when they exist), in place of IDs, into any generated FAST-TCF script. These names are then used to identify the entities when the user runs the script.

- **Case 37583**

Added commands colour and colour_rgb to FAST-TCF which allow the user to define up to 6 colours using either 6-digit hexadecimal format or three integer r g b format respectively. These commands will also be written into any FAST-TCF script that is generated in T/HIS if there are user-defined colours in the preferences file.

- **Case 38900**

When writing FAST-TCF script file for the curves generated through a JavaScript, FAST-TCF now adds a tag command for each curve generated. Now curves generated through JavaScript can be used inside FAST-TCF.

Graphics

- **Case 31263**

Added the option to change the colour of the legend label text to 'Curve' so that the text colour is the same as the curve which it represents.

Graphs

- **Case 34326**

Added 'Regres' operation with Linear, Polynomial (degree 1-4), Logarithmic and Exponential regression options. This works with JavaScript and FAST-TCF. The R^2 value for goodness of fit of the output curve is written into the label. The R^2 value along with the curve equation can be viewed via right-clicking the curve and selecting 'Properties'. In the case of linear regression extra statistical data for the curve is also given in this properties pop-up. 95% Confidence and prediction bands can also be displayed around any linear regression curve.

- **Case 38911**

Two new FAST-TCF commands are added to autohide and show the graph toolbar

    layout graph toolbar autohide
    layout graph toolbar show

Image

- **Case 39332**

T/HIS v16.0 introduces the following changes to the handling of output image filenames:

- If an explicit filename (optionally, with path) is typed in or selected for one image type, say JPEG, that new filename and path will then become a seed for every image type. Changing to a different image type, say PNG, will not require users to browse to the user-defined path again. Instead the new seed name (along with an increment) will be used for the PNG file with the appropriate extension (.png) and the increment modified if needed.

- Extensions that are an obvious mismatch will be auto-corrected and a warning issued. For example, if a user attempts to write out a BMP with the filename myfile.gif, the filename will be changed to myfile.bmp automatically. The filename myfile.image will, however, not be auto-corrected.

- If a user-chosen filename exists, clicking the NEW_FILE option will not take the user back to the current working directory as was done in the past. Instead, a unique 3-digit increment will be appended to the same name to generate a new filename.

- A sub-folder (one level only) is now also automatically created as a part of image creation, if needed.

- All of the above now also applies to postscript files (PS and PDF).

JavaScript API

- **Case 30468**

The function Colour.RGB has been added to the T/HIS JavaScript API, allowing JavaScript widgets to be coloured with general RGB colours. Objects in T/HIS such as curves, lines and text cannot be coloured using this function, they must be coloured from the defined set of colours or one of the six user-defined colours.

- **Case 31735**

Added a global JavaScript function SetCurrentDirectory to both T/HIS and PRIMER, which sets the current working directory to a given path. Also added the PRIMER JavaScript functions GetCurrentDirectory, GetStartInDirectory, GetInstallDirectory and GetPreferenceValue to T/HIS JavaScript.

- **Case 34909**

Added 'component' to curve properties in the JavaScript curve class. 'Curve.component' returns the JavaScript label for the component, which is used in the GetDataFlagged function call. For example SPC_FX for SPC X-force.

- **Case 36599**

A Page class has been added to the T/HIS JavaScript API with functions ReturnActivePage and SetActivePage, which return and set the current active page respectively.

- **Case 37957**

Added properties to Group class in JavaScript. These are values relating to all the curves in a group, such as the minimum and maximum y-values of any curve in the group.

- **Case 37959**

Functions have been added to the Page class in the JavaScript API, Page.AddGraph, Page.RemoveGraph, Page.Layout and Page.ReturnGraphs. Respectively, these allow graphs to be added and removed from pages, the layout of individual pages to be set and the graphs present on a page to be returned.

- **Case 39012**

T/HIS JavaScript Graph class can be used to create graphs and modify their properties such graph axis, label, units and legends.

- **Case 39326**

Created a Read class in the T/HIS JavaScript API. This has functions Read.Cur to read .cur files and Read.CSV to read CSV files, with a number of options to specify the format of the CSV file that is to be read in.

- **Case 39409**

Added support for DriveMapFilename in both T/HIS and D3PLOT.

- **Case 39493**

Added new functions Read.Key/LSPP/ISO/Bulk/DIAdem to read each of the corresponding file types into T/HIS from inside a JavaScript. Information on how to use these functions can be found in the users' manual.

LSDA (binout)

- **Case 38996**

T/HIS v16.0 has been updated so that the code used to read and extract data from the LSDA (binout) file is based on the R11 LS-DYNA source code.

Operations

- **Case 35455**

Changed behaviour for all operations, so that if all input curves are plotted on the secondary y-axis then the output curve will also be plotted on the secondary y-axis.

- **Case 39411**

Significantly improved the performance of the 'Rolling Average' operation when a time window has been specified for curves with a large number of points.

Preferences

- **Case 31728**

Added preferences 'hic_time_window' and 'hic_scale_factor', which allow the default time window and scale factor for the HIC automotive operation to be set to any positive real values.

- **Case 38910**

A new preference this*auto_hide has been introduced to auto hide the graph toolbar by default. It can accept either TRUE or FALSE. Default value is FALSE.

Read

- **Case 34154**

T/HIS now reads the SPC set IDs from both ASCII and LSDA files and allows force data to be plotted per set or per model. The force component chosen is summed over all SPCs in the set or model and output as a single curve.

- **Case 39005**

Added support for the latest AIRBAG and AIRBAG part data components.

- **Case 39006**

T/HIS can now read new BNDOUT data components X-,Y- and Z-moments for discrete nodal loads and velocity nodal loads from both LSDA and ASCII files.

Settings file

- **Case 38660**

User can now save and retrieve a T/HIS session. Users can also append/overlay two different T/HIS sessions.

Users can also generate a new session for a new run case just by updating the path of the LS-DYNA results from an existing session file.

T/HIS link

- **Case 36690**

Timelines can now be viewed for Data vs Data XY curves when taken across from D3PLOT to T/HIS. These timelines are represented as symbols rather than as lines, as is done for combined curves.

3.4 REPORTER

3.4.1 Enhancements in 16.0

Standard templates

- **Case 36964**

EuroNCAP Head Impact can now identify the row and column numbers from folder name of format *<zone>_<row>_<col>* if the key file does not follow this format. If both *.key* file and folder names do not follow the required format a warning will be thrown informing the user that the specific grid point will be skipped.

Tables

- **Case 38250**

Various new functions have been added to the Item class of the JavaScript API to enable control over Table and Autotable items. It is now possible to: insert/delete/resize rows/columns, merge/unmerge cells, get/set cell properties (e.g. text, alignment, font, colour, border width) and get/set cell conditions.

- **Case 38249**

Table and Autotable items can now be exported in Microsoft Excel format, complete with formatting (cell size, text alignment, font style, borders, colours, merged cells).

Text

- **Case 9008**

Previously, REPORTER only supported four fonts (Courier, Helvetica, Times, Symbol). REPORTER now supports many more fonts (TrueType, OpenType, and certain Type1 fonts), giving you greater control over the look of your reports, and allowing you to create templates that match your organisation's branding. Support for Chinese, Japanese, Korean and other non-Latin fonts is much improved.

3.5 SHELL

3.5.1 Enhancements in 16.0

Manuals

- **Case 37386**

In version 16.0, the "SHELL (What's New)" pdf listing new features for the SHELL can now be accessed easily by clicking on the "Manuals" button in the main SHELL window.

3.5.1 Enhancements in 16.0