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# LOTUS ENGINEERING AND THE OASYS LS-DYNA ENVIRONMENT

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Principal Engineer – Advanced Simulation

Lotus Engineering





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Principal Engineer – Advanced Simulation

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# OASYS LS-DYNA ENVIRONMENT

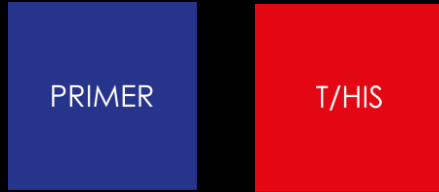


# SOFTWARE UTILIZATION BY TEAMS

## CRASH



## NVH



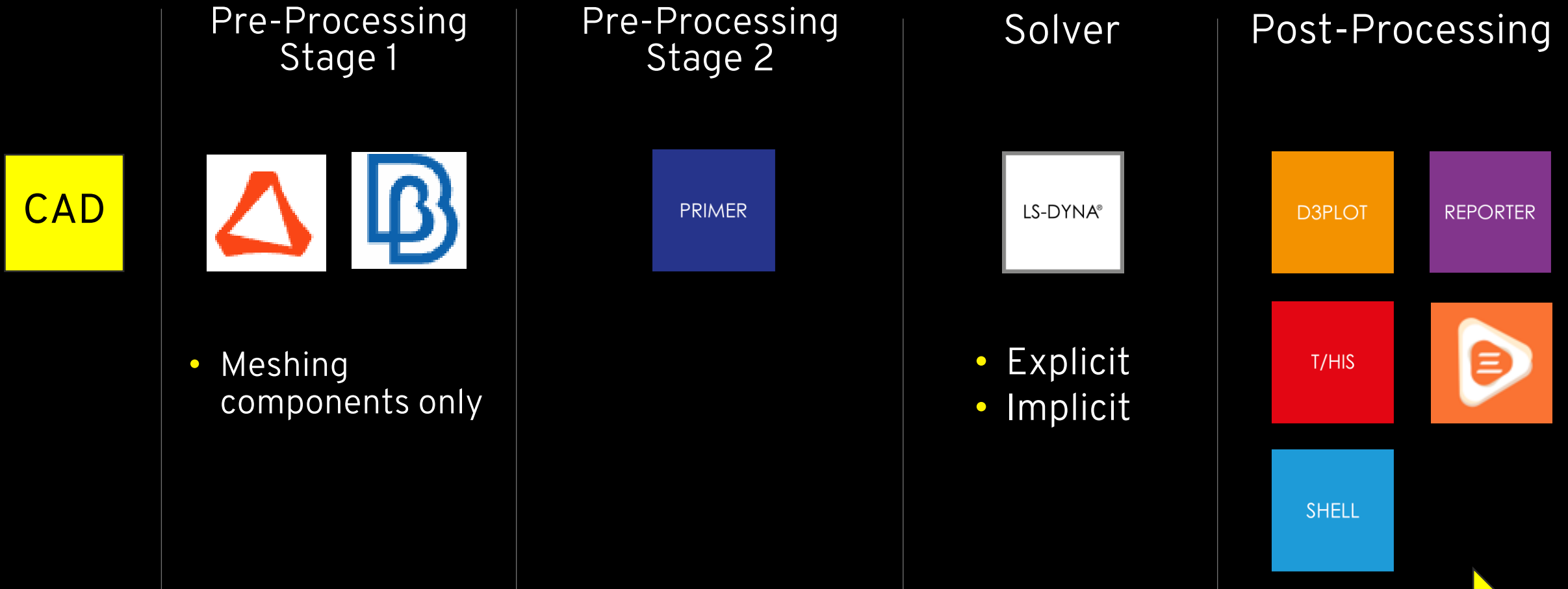
## DURABILITY



## CFD

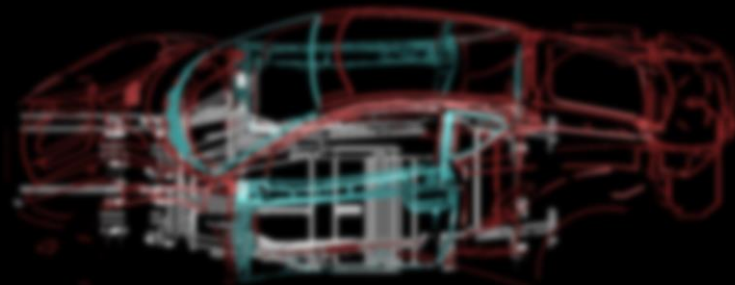
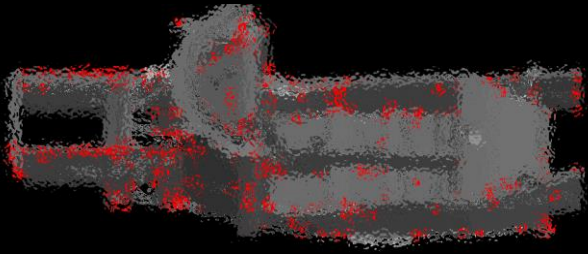
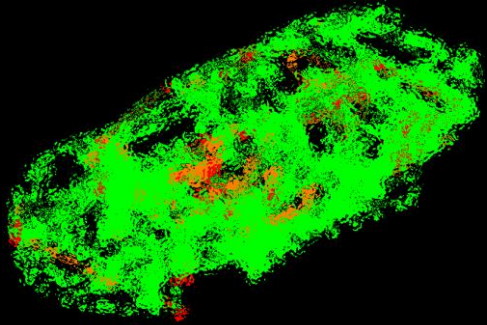
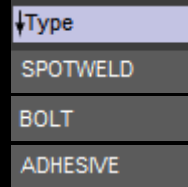
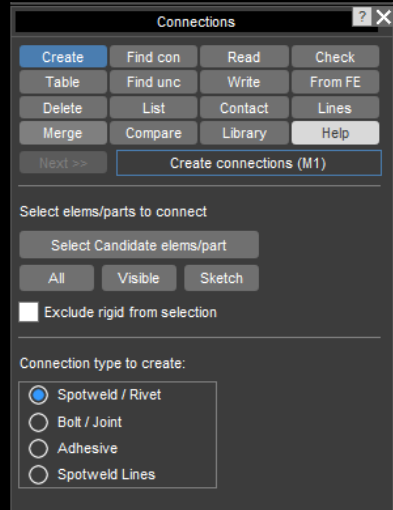


# OVERALL LS-DYNA CAE CRASH WORKFLOW

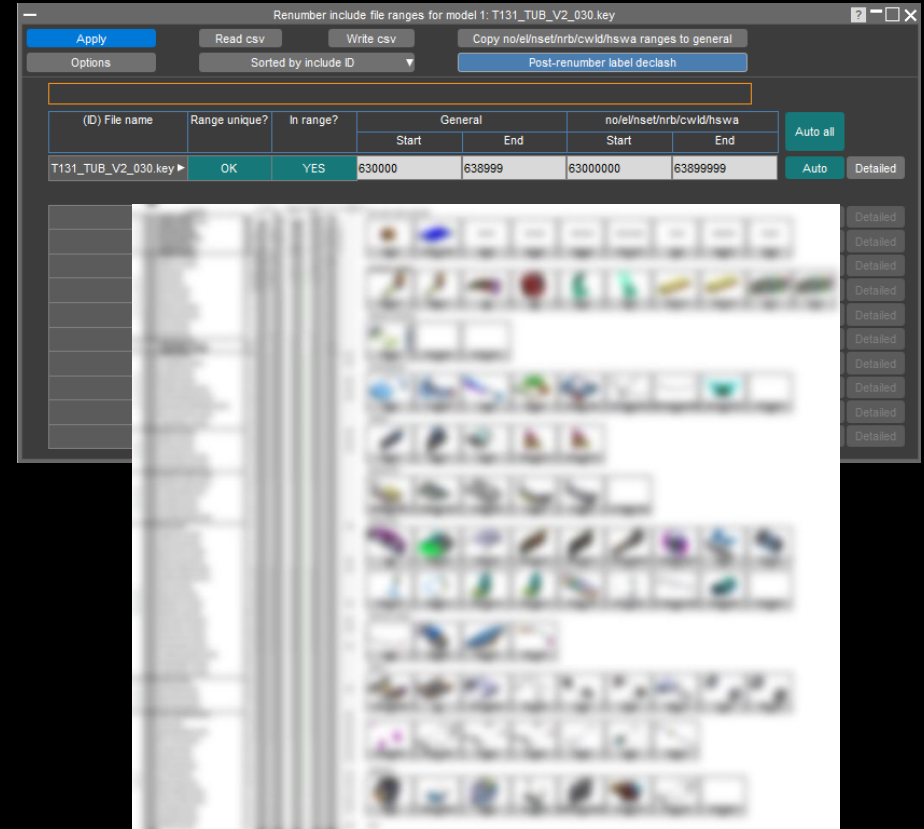


Basic Lotus Engineering CAE Crash-Team Workflow

## Connections



## Renumbering

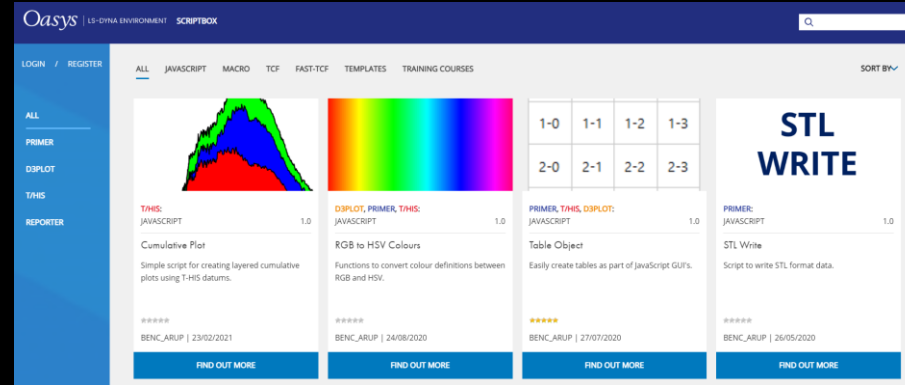


# Oasys PRIMER

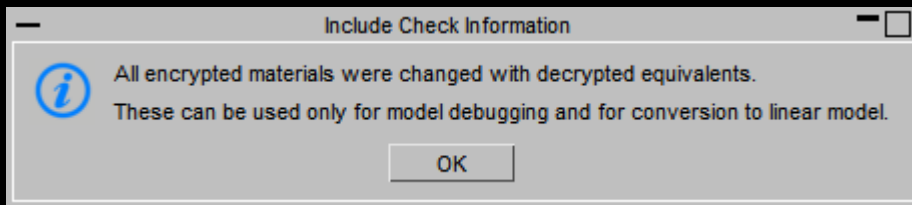
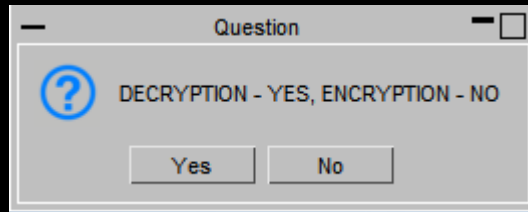
PRIMER

## Scripts in Javascript

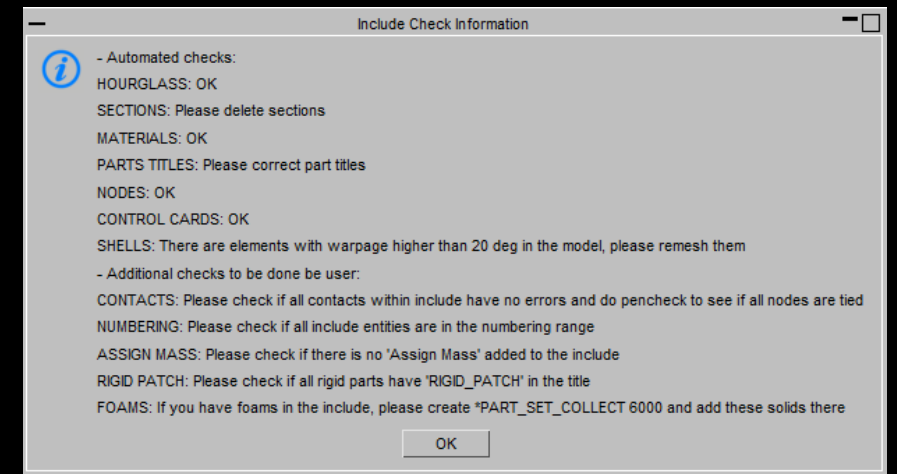
It started from...



Encrypted material handling



Various Additional Model Checks



And many more...

# Oasys PRIMER



## Model Check

## LS-DYNA Check

CHECK LS-DYNA MODEL

Dismiss Recheck Autofix Tree view Help

Check (model 1)

Grand Totals		92	85521	85318
Entity type	(No.)	# errors	# warn	# fixable
CONNECTION	1114	41	0	0
CONSTRAINED	791	0	891	841
CONTACT	3	1	2	0
CONTROL	1	0	2	0
DEFINE	276	0	36	0
ELEMENT	644855	0	84448	84441
HOURGLASS	6	0	0	0
INCLUDE FILE	7	6	0	6
MATERIAL	521	19	28	24
NODE	726419	0	6	6
PART	649	24	102	0
SECTION	1672	0	2	0
SET	844	1	4	0

Error tree viewer

Recheck Clear ->error mode ->item mode list show tags warnings include ?

Autofix Delete Sketch Blank Unblank Only Autosca Write xml Recheck affected category

- ERROR [14]
  - CONNECTION [4]
  - CONTACT [1]
  - INCLUDE FILE [3]
  - MATERIAL [4]
  - PART [1]
  - SET\_PART [1]
- WARNING [20]
  - NODAL\_RIGID\_BODY [2]
  - CONTACT [1]
  - CONTROL [2]
  - DEFINE\_COORDINATE [1]
  - SOLID [2]
  - BEAM [2]
  - SHELL [1]
  - MATERIAL [5]
  - NODE [1]
  - PART [1]
  - SECTION [1]

Check

Apply Options Rules FAST-TCF

LS-DYNA Elem Qual Dashboard Pen Check

Check model 1

Check model: 1

Reference model:

Reference file:

Check Categories: All categories active

Check Includes: All active

Custom Preference File

Read

Reset Primer Preferences

Open Error Configuration File

Dyna output tree viewer

Errors and Warnings Load Profile Contact Profile Message Profile Decomposition

Clear ->error mode ->item mode list show tags warnings termination messages smallest timesteps ?

Delete Sketch Blank Unblank Only Autosca show files Error termination

- ERROR [2]
  - KEY+133: input data failed with: XXXX errors
    - ENTITY [2]
      - input data failed with: 24 errors (mes0000)
      - input data failed with: 24 errors
  - KEY+304: XXXX...
  - PART [24]
- WARNING [5]
  - KEY+130: reading encrypted input...
  - KEY+135: writing to XXXX is disabled since some input lines are encrypted
  - KEY+138: XXXX Set number XXXX is empty at 2th input
  - KEY+408: merged nodal rigid body ID XXXX with nodal...
  - KEY+408: 1 nodal rigid body merged due to shared common nodes.
- TERMINATION [0]
- TIMESTEPS [0]



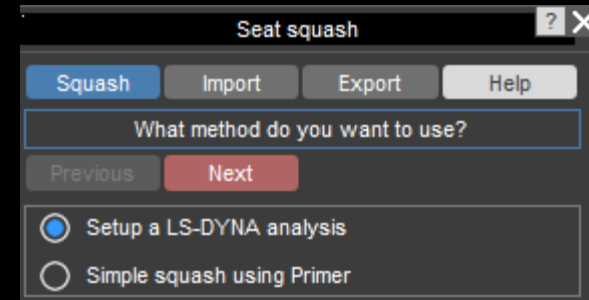
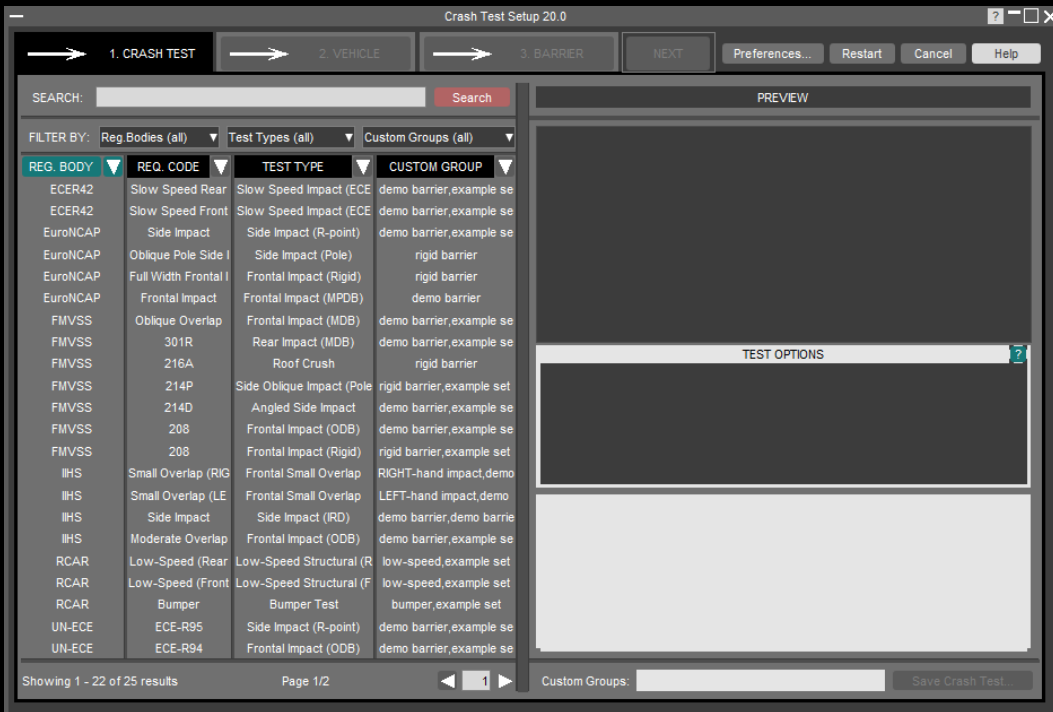
# Oasys PRIMER

PRIMER

## Crash Test Setup

## Model build

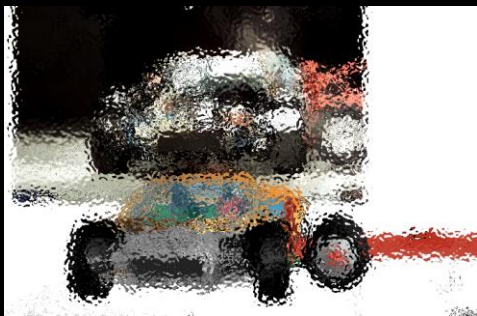
## Seatsquash



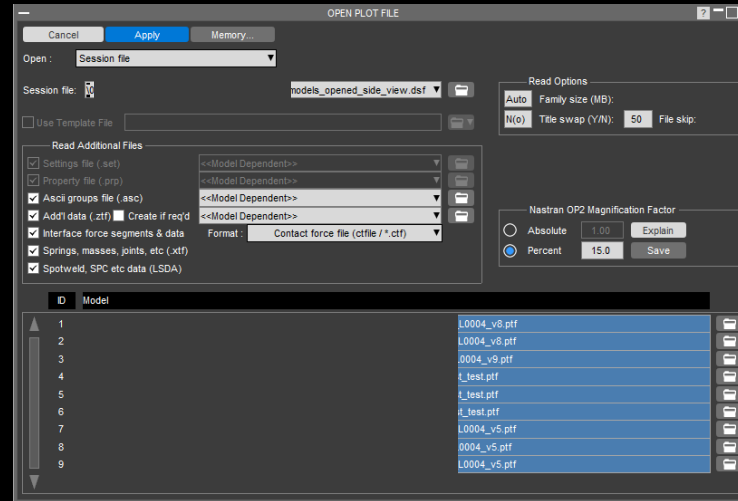
# Oasys D3PLOT



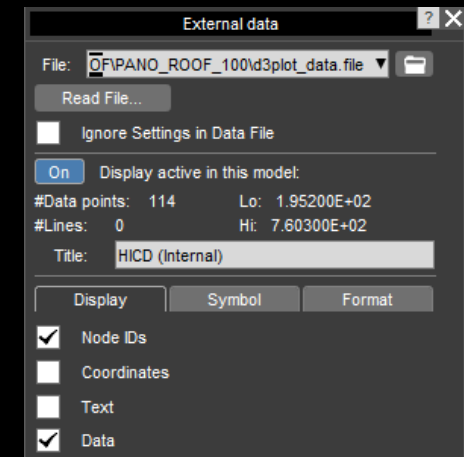
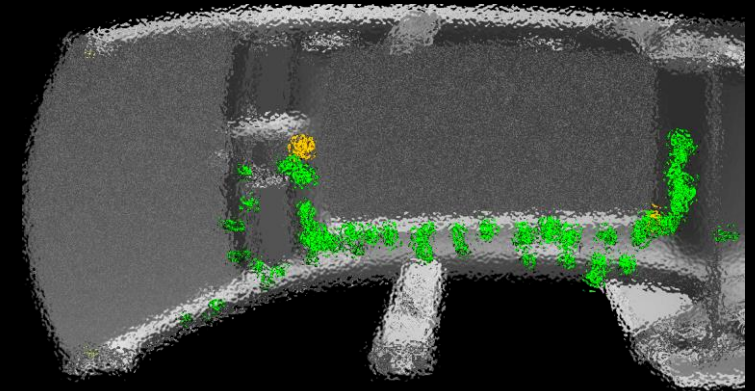
## Background Movie Match



## Session files



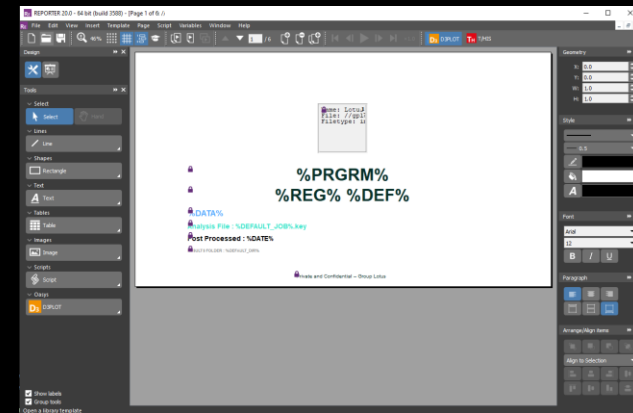
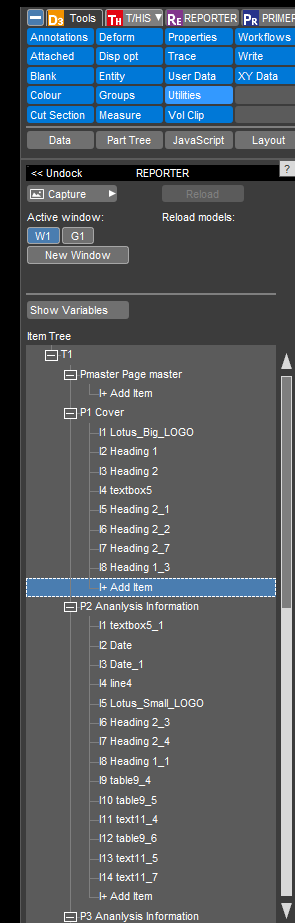
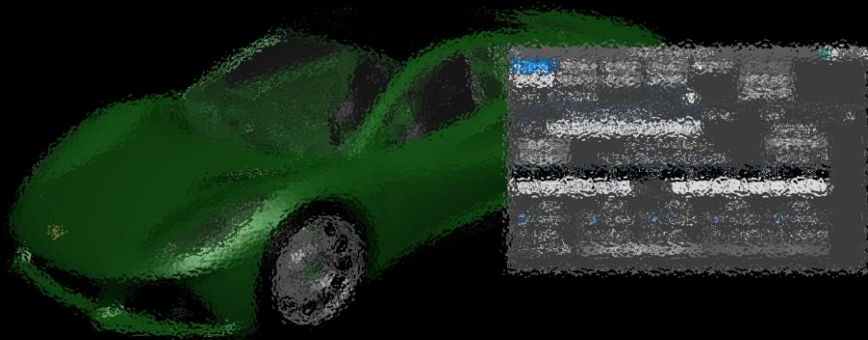
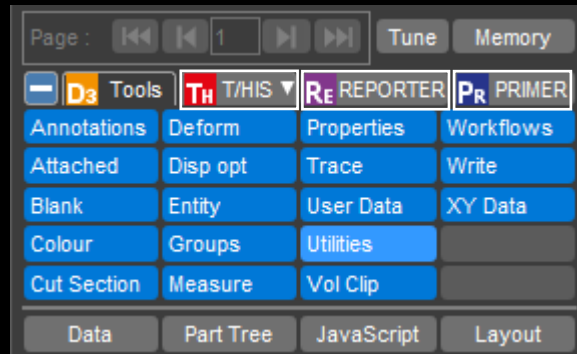
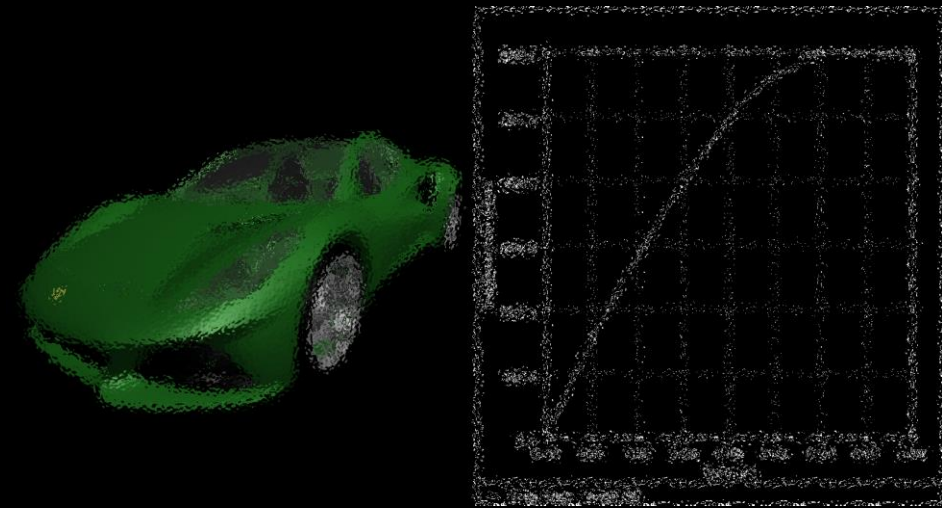
## External Data (Blob Plot Display)



# Oasys D3PLOT



Oasys D3PLOT link with Oasys T/HIS, Oasys PRIMER and Oasys REPORTER



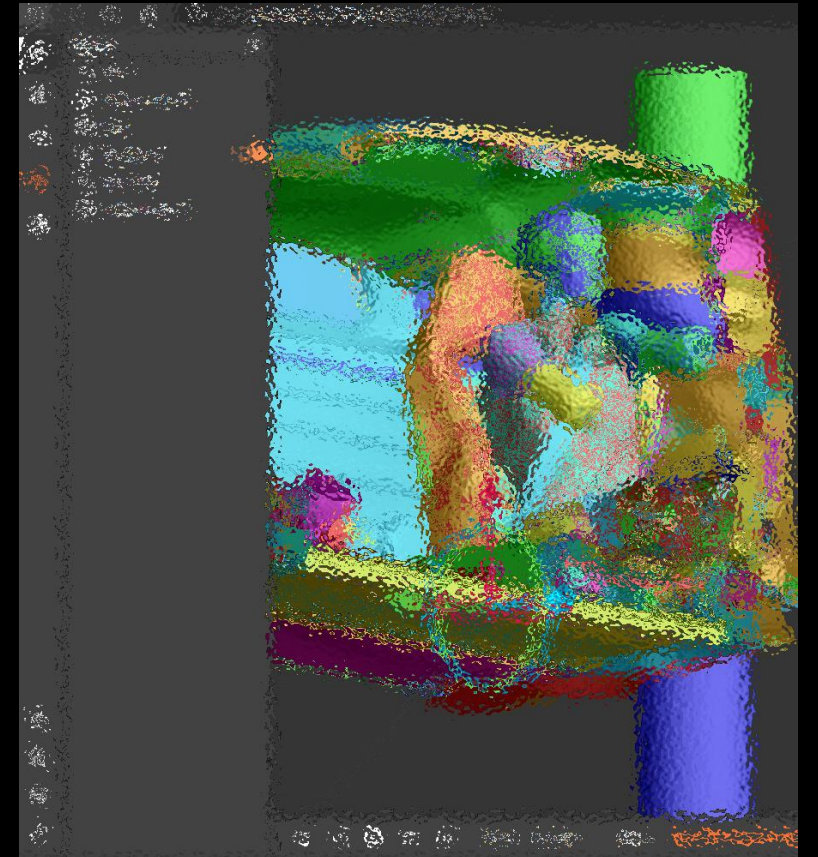
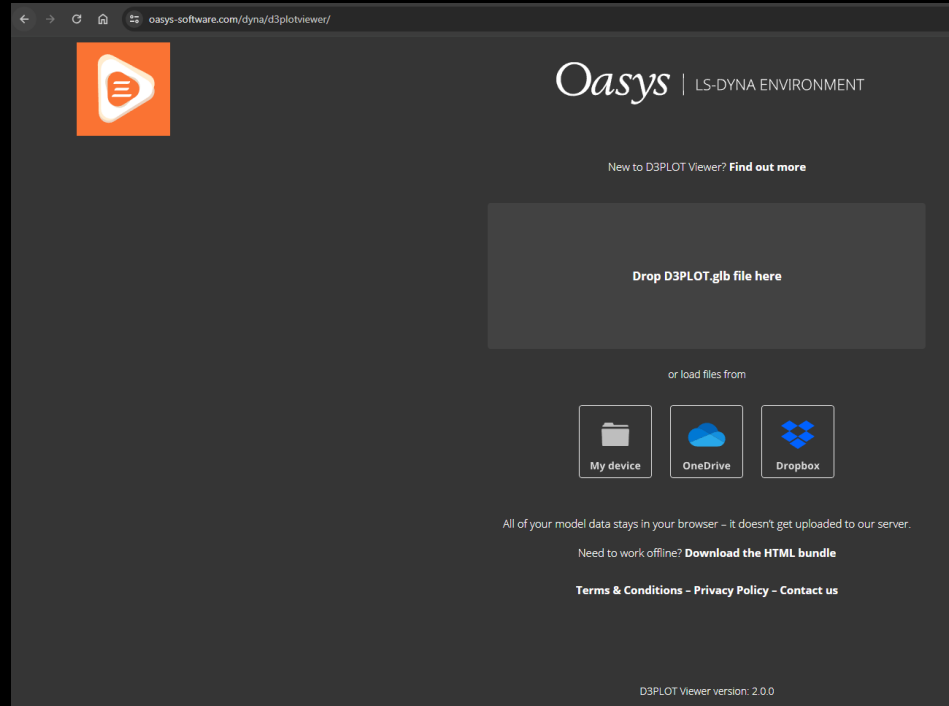
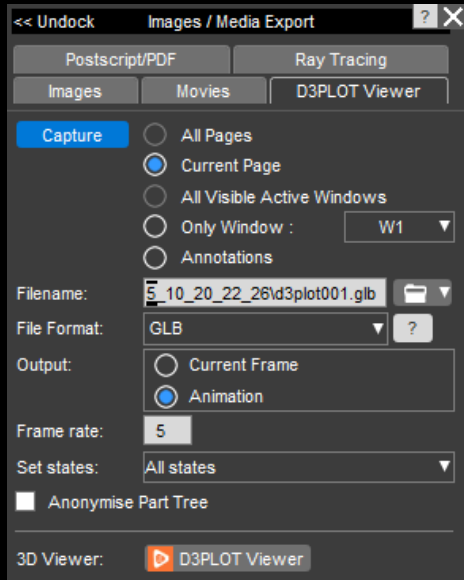


# D3PLOT Viewer



CAE Engineer

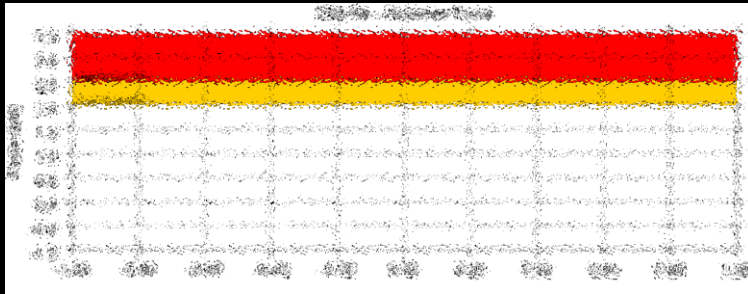
Safety Engineer (typically without CAE toolbox experience)



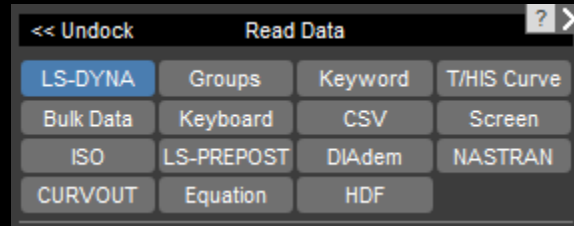
# Oasys T/HIS



## Datum lines



## Different file formats



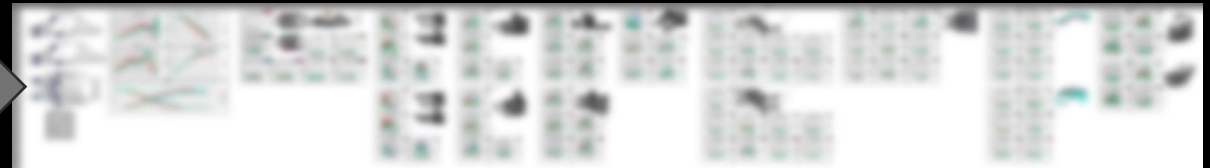
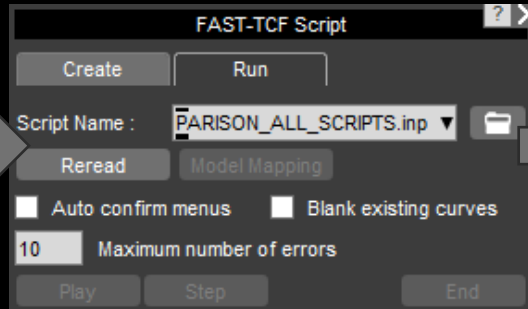
## Curve Correlation



## Oasys T/HIS (FAST-TCF) – MS Excel Integration

```

^FIMP_COMPARISON_ALL_SCRIPTS.inp
1  inc Do:      p
2  inc En:      e.inp
3  inc Fr:      ember_Cowl.inp
4  inc Fr:      nt_LH_RH.inp
5  inc In:      ings.inp
6  inc Lo:      _LH_RH.inp
7  inc Sw:      _RH.inp
8  inc Tu:      Rail_LH_RH.inp
9  inc Up:      th_Sill_LH_RH.inp
10 inc Up:      re_LH_RH.inp
11 inc Vel:     TDD_Velocity.inp
    
```



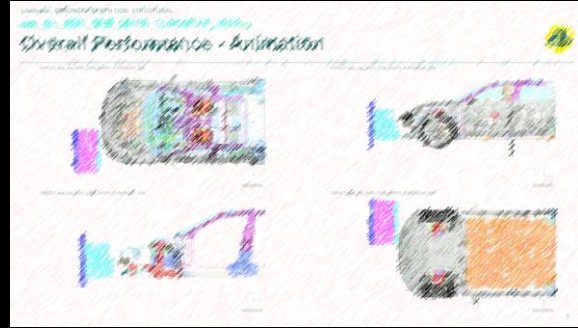
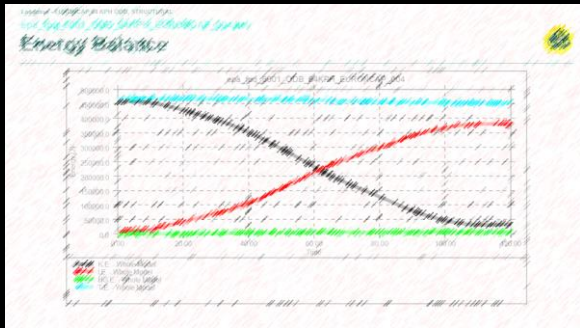


# Oasys REPORTER

REPORTER

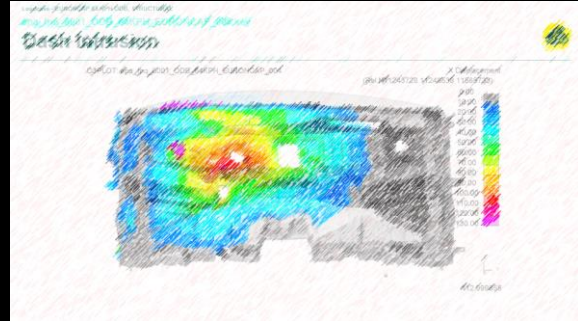
## Comprehensive User Reports

## “reporter\_variables” file import into Excel

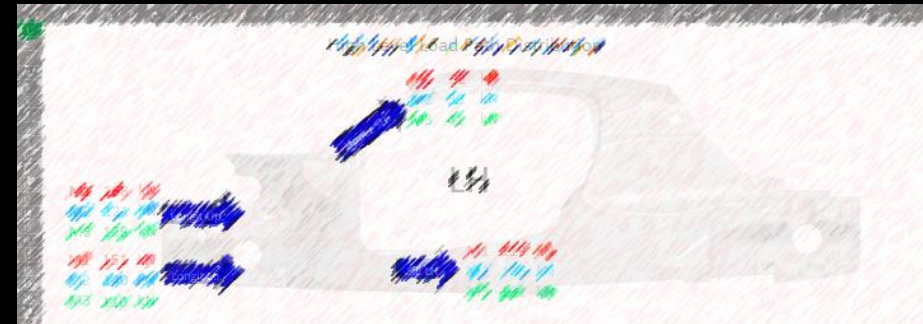


Analysis Information

Parameter	Value
Analysis Type	Explicit
Element Type	Shell
Material Type	Steel
Time Step	0.0001
Total Time	0.1
Number of Elements	10000
Number of Nodes	5000
Number of Degrees of Freedom	15000
Number of Constraints	1000
Number of Contact Pairs	50
Number of Contact Elements	1000
Number of Contact Nodes	500
Number of Contact Degrees of Freedom	1500
Number of Contact Constraints	100
Number of Contact Contact Pairs	50
Number of Contact Contact Elements	1000
Number of Contact Contact Nodes	500
Number of Contact Contact Degrees of Freedom	1500
Number of Contact Contact Constraints	100



```
reporter_variables [X]
1 VAR A-PILLAR_LOAD_DESCRIPTION="
2 VAR BUMPER_BEAM_FORCE_DESCRIPTORI
3 VAR CRASH_BOX_FORCE_DESCRIPTORI
4 VAR CURVE_3_MAX_DESCRIPTOR="PU
5 VAR CURVE_5_MAX_DESCRIPTOR="TI
6 VAR DASH_INTRUSION_DESCRIPTOR="
7 VAR DEF_DESCRIPTOR=" VALUE="
8 VAR DEFAULT_DIR_DESCRIPTOR="
9 VAR DEFAULT_JOB_DESCRIPTOR="
10 VAR ITEM_11_CURVE_1_MIN_DESCRIPTORI
11 VAR ITEM_13_M1_DX_DESCRIPTORI
12 VAR ITEM_13_M1_DY_DESCRIPTORI
13 VAR ITEM_14_ALL_CURVES_MANY_DESCRIPTORI
14 VAR ITEM_14_ALL_CURVES_MIN_DESCRIPTORI
15 VAR LLP_FORCE_DESCRIPTOR="LLP_
16 VAR LOWER_MEMBERS_LOAD_DESCRIPTORI
17 VAR LOWER_MEMBER_LOAD_DESCRIPTORI
18 VAR MAX_ACCELERATION_DESCRIPTORI
19 VAR MAX_DISPLACEMENT_DESCRIPTORI
20 VAR PROGRAM_DESCRIPTOR="Program
21 VAR PULSE_DESCRIPTOR="Maximum
22 VAR RES_DESCRIPTOR=" VALUE="
23 VAR SHOTGUN_LOAD_DESCRIPTOR="S
24 VAR SIDE_CRASH_MEMBER_DESCRIPTORI
25 VAR SILL_LOAD_DESCRIPTOR="Sill
26 VAR SUBFRAME_LOAD_DESCRIPTOR="
27 VAR TDD_DESCRIPTOR="Maximum y"
28 VAR TERMINATION_STATUS_DESCRIPTORI
29 VAR TUNEL_LOAD_DESCRIPTOR="Tun
30 VAR VELL_0_DESCRIPTOR="X whe
```

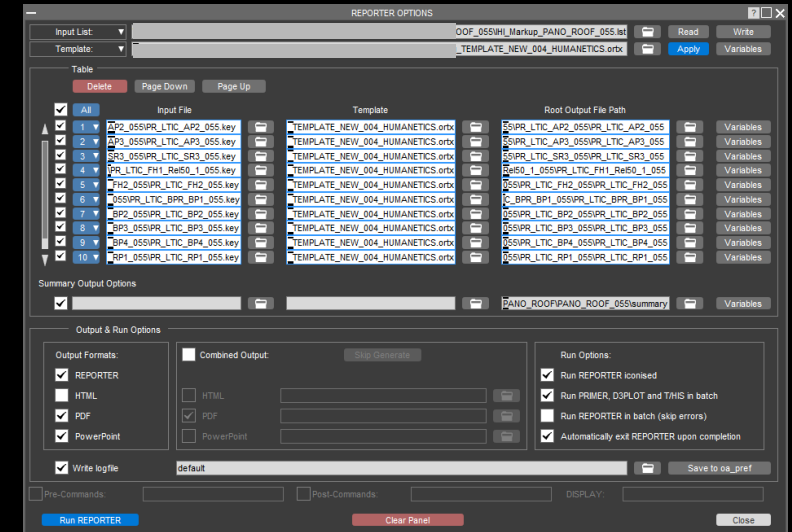
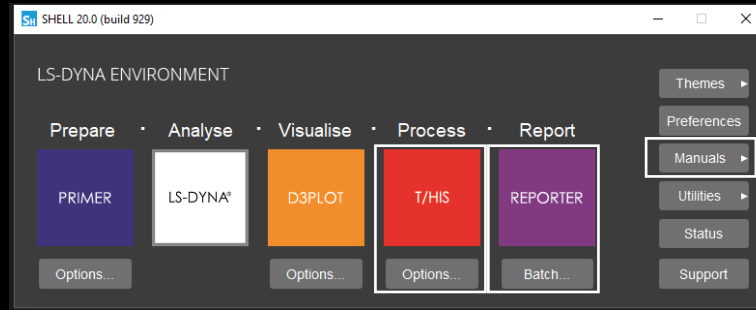
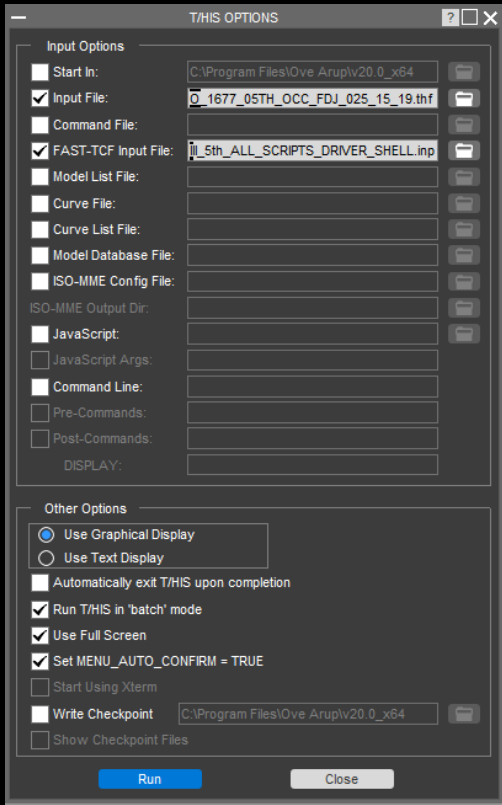


# Oasys SHELL

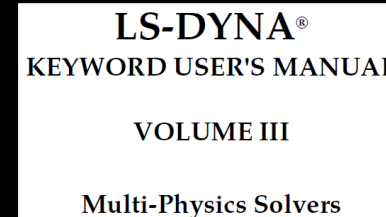
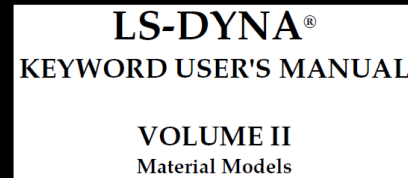
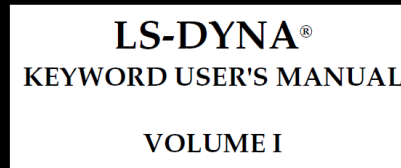


## Oasys T/HIS Batch Script Execution

## Oasys REPORTER Batch Script Execution



## LS-DYNA Manuals



## SUMMARY AND NEXT STEPS

- Oasys Products maximize the crash team's efficiency.
- Excellent support.
- Robust software.
- Oasys Software is utilized in every project involving design iterations.

Next to review:

- REPORTER Viewer
- Python API
- Workflows



THANK YOU.

