Restarting LS-DYNA

- A "restart" is a continuation of an LS-DYNA run from a particular point in time.
- "Simple restart" means no changes to the model are introduced and so no keyword input deck need accompany the restart.
- Changes to the model can be introduced in a restart if a keyword input deck is included.
  - Small restart
  - Full restart

Dump File

- Any restart requires a binary "dump file" which contains a complete record of the model (stress, strain, deformation, etc) at a particular point in time.
  - Binary dump files are written during an analysis at intervals according to *DATABASE_BINARY_D3DUMP and/or *DATABASE_BINARY_RUNRSF
  - d3dump files accumulate whereas runrsf files are overwritten
  - A binary d3dump file is, by default, written at the normal termination of a run
    - "d=nodump" on the execution line prevents output of d3dump
  - The number of runrsf files retained is controlled by the parameter NR in *DATABASE_BINARY_RUNRSF.
    - Default is NR=1
    - If NR is greater than 1, the runrsf files are written in cyclical fashion.

Rules for Restarts

- Use the same LS-DYNA executable (version, precision, platform, etc.) as in the run that produced the dump file.
  - There are exceptions but it's best to follow the above rule.
- Use same numbers of processors in the restart as in the run that produced the dump file.

1st Type: Simple Restart

- Restart made from any dump file written prior to termination time.
  - Typical application is to restart a run that was halted prematurely due to system crash or shutdown.
- Goal is just to continue the analysis without changing anything.
- No input changes, not even termination time, and thus no keyword input file is specified on the execution line.
- Sample execution line:

```
lsdyna r=d3dump01
```

2nd Type: Small Restart

- Only certain types changes to the model are permitted. Some of the changes allowed in a small restart are:
  - Change termination time
  - Change output intervals
  - Change time step controls
  - Modify load curves (number of data points in curve must not change)
  - Add nodal constraints
  - Delete contacts, parts, elements
  - Switch parts from deformable to rigid, or vice versa
- See the *RESTART section in the User's Manual for the keyword commands permitted in a small restart input deck.

Small Restart (cont'd)

- Need a binary dump file *and* a small input deck
- The input deck might look like this…

```
*KEYWORD
*CONTROL_TERMINATION
15e-03
*DATABASE_BINARY_D3PLOT
1e-5
*DELETE_PART
4,5
*DELETE_CONTACT
3
*END
```

- The execution line…

```
lsdyna i=restart-input.k r=d3dump01
```

3rd Type: Full Restart

- Changes of a general nature can be made in a full restart, including addition of parts, loads, and contacts.
- Sample execution line

  SMP: lsdyna i=fulldeck.k **r=d3dump01**

  MPP: lsdyna i=fulldeck.k **n=d3full01**

where fulldeck.k is a complete keyword input deck for the model you want to use moving forward in time.

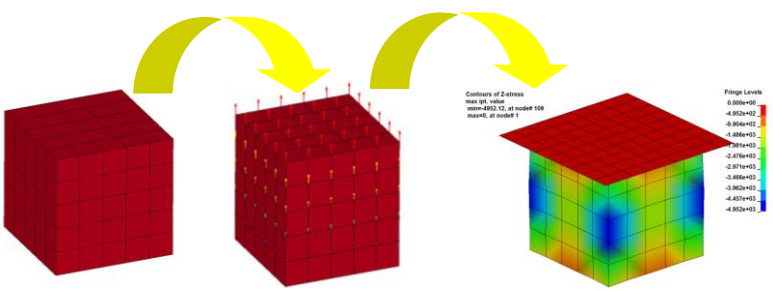
Full Restart (cont'd)

- Guidelines for fulldeck.k
  - Include keyword input for anything that is to be retained from the original run… (*PART, *SECTION, *MAT, *CONTACT, *LOAD, etc.). Normally, you would just copy the original input deck and strip out anything you don't want to retain.
  - Also include keyword input for new parts, materials, contacts, loads, etc.
  - Include all relevant *DATABASE and *CONTROL commands.
  - Include the command *STRESS_INITIALIZATION.
    - Signals to LS-DYNA this is a full retart and that stress, strain, displacement, etc. are to be initialized for specified, pre-existing parts.
  - Do not use *INITIAL_VELOCITY for nodes carried over from previous run. Use *CHANGE_VELOCITY_*option* to modify velocities of such nodes.
  - Preexisting contacts that are to be retained should include the _ID option so that the contact ID numbers in the original input deck match those in the full restart input deck.

Full Restart (cont'd)

- Regarding output from a full restart:
  - Binary output (d3plot) from a full restart will blend seamlessly with previous output.
  - ASCII output (glstat, matsum, etc.) from a full restart appends to pre-existing ASCII output only if *CONTROL_OUTPUT with **IASCII**=1 in included in the full restart deck.
    - Without this command, ASCII output from full restart overwrites pre-existing ASCII output.
- Lastly, there may be a suitable alternative to using a full restart.
  - For example, a "dynain" file can be written at the conclusion of the original run by including the command *INTERFACE_SPRINGBACK_LSDYNA in the original input deck. This dynain file can be included in a subsequent keyword input deck to initialize nodal coordinates and element history variables (stress, strain, etc).

Exercise 8



- Use a full deck restart.
- Add material and contacts.
- Remove single point constraints.