LS-Run User's Guide

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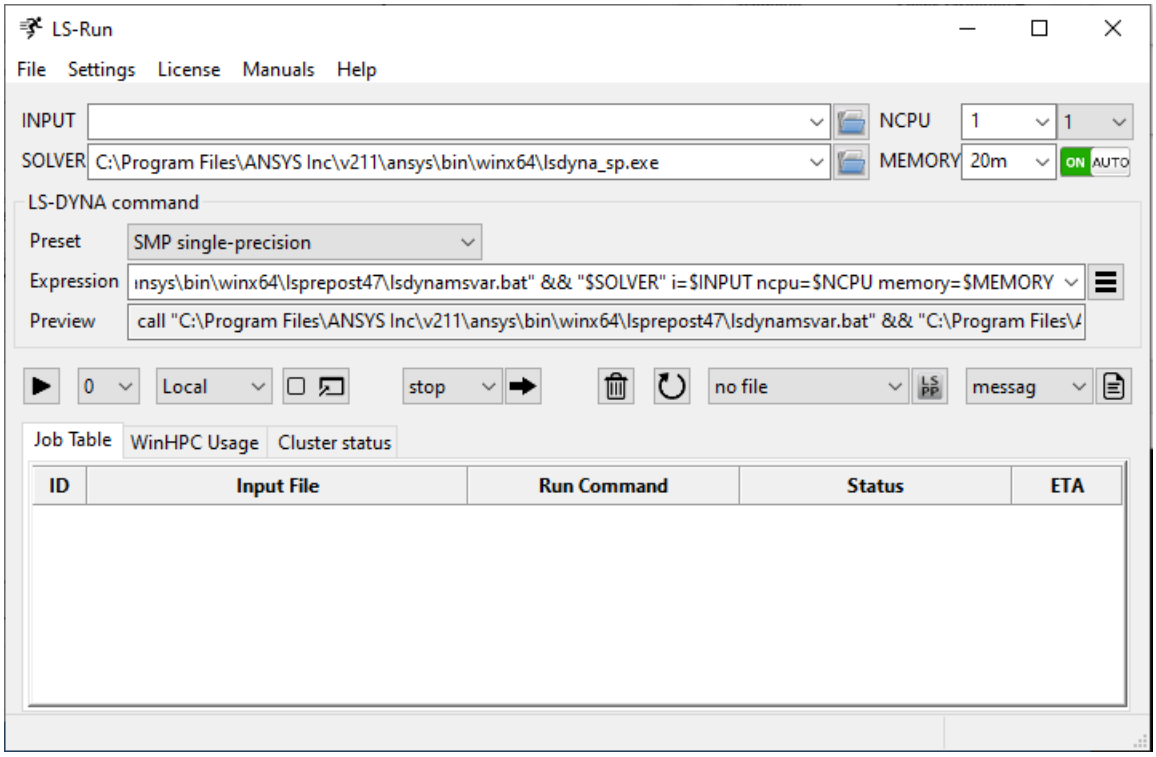
Chapter 1: Introduction

LS-Run can be used to start the LS-DYNA solver by executing a command. Various command line options can be used to activate different options in LS-DYNA. Please refer to the Execution Syntax section in the *Getting Started* chapter of the LS-DYNA Keyword User's Manual Volume I for a complete set of available arguments.

LS-Run features:

1. An interface to build the command that will start LS-DYNA
2. A Job Table with basic queuing functionality
3. The Status of running and finished jobs
4. Support for SMP/MPP LS-DYNA on both Windows and Linux systems

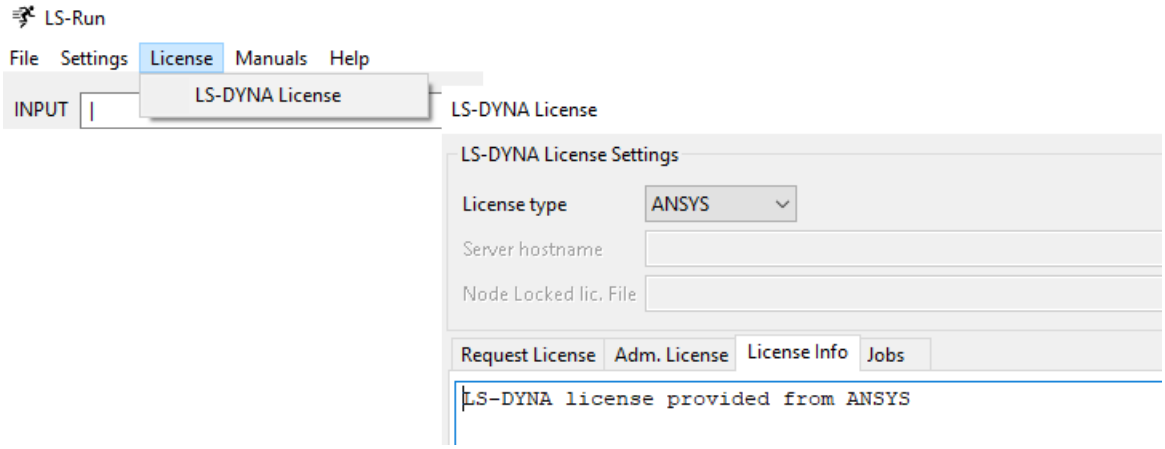


Chapter 2: Setting up LS-Run Jobs

You can set up your jobs using the various options in the LS-Run window and the LS-Run settings.

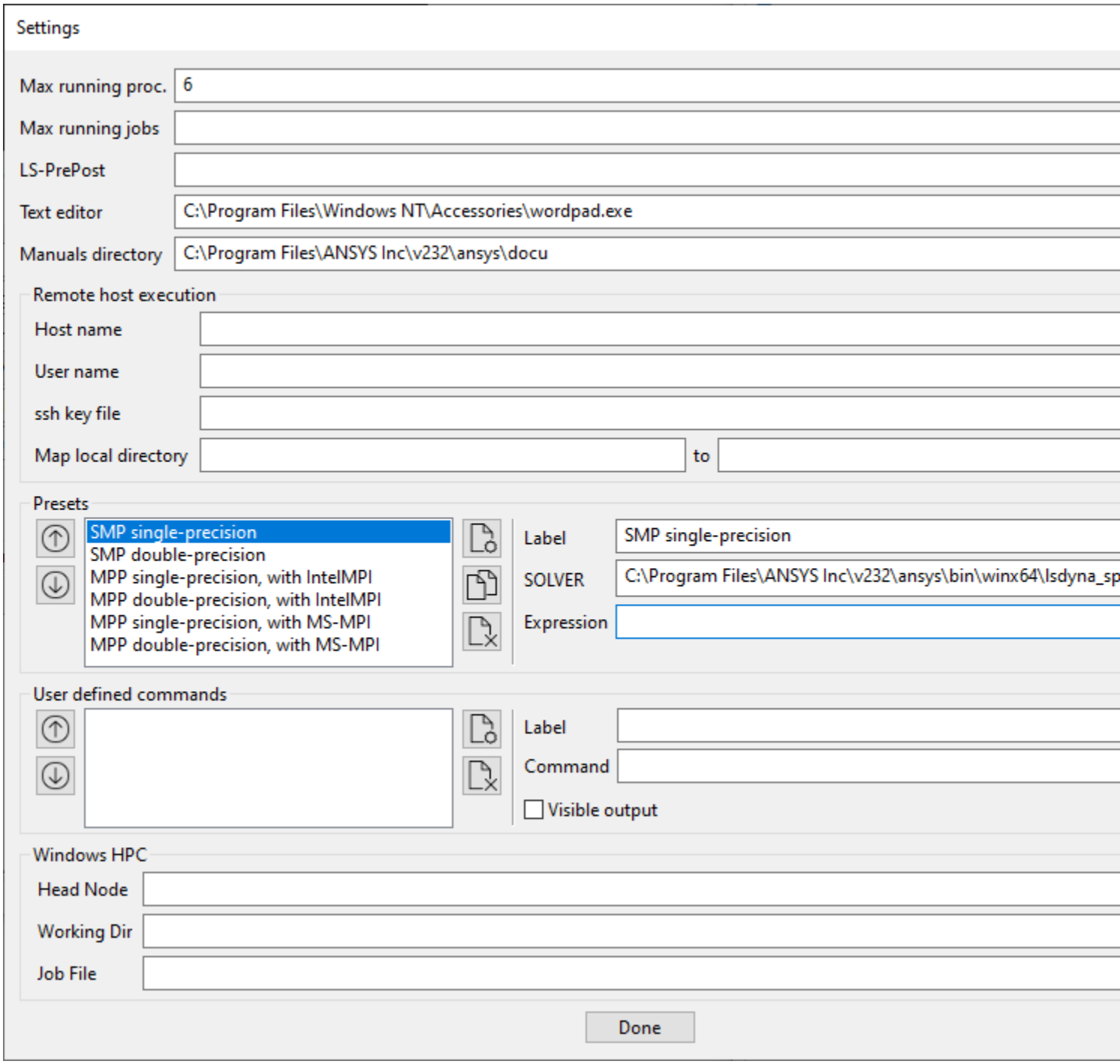
2.1. Licensing

By default, the **License type** is set to ANSYS. This license type should be used for any version of LS-DYNA that was part of an Ansys distribution. If you want to use a version of LS-DYNA that was purchased in another manner, you can use one of the other license types, as appropriate.



2.2. LS-Run Settings

There are a number of settings that allow you to configure your LS-Run installation. To view the settings, select **Settings** → **Settings**.



Available fields in the Settings panel allow you to perform the following types of configuration:

2.2.1. Setting Limits

There are several fields that allow you to set limits on jobs.

Max running proc.

Enter the maximum number of simultaneous running processes in the local queue (0=unlimited).

Max running jobs

Enter the maximum number of simultaneous running jobs in the local queue (0=unlimited).

2.2.2. Setting Paths

There are several path settings that make it convenient to access external applications from within LS-Run:

LS-PrePost

This path is automatically set to the location of LS-PrePost in your local Ansys installation.

Text editor

This is automatically set to the system default text editor. You can enter the path to the text editor you prefer. The text editor is used to open files related to entries in the Job Table.

Manuals directory

This is automatically set to the directory where the LS-DYNA Keyword Manuals reside in your Ansys installation.

2.2.3. Setting up Remote Execution

The following fields define the information needed to run LS-DYNA on a remote host:

Host name

Name of the remote computer. Check the Linux box to use "/" as the directory separator character.

User name

User name for the remote machine login.

ssh key file

Private ssh key if key file authentication is used.

Map local directory

A common file system must exist on client and server. The common disk area does not have to be mounted on the same location. For instance, if the file `H:\project\user\input.k` on the local Windows system is the same file as `/disk/proj/user/input.k` on the remote computer, you can specify this in the Settings by:

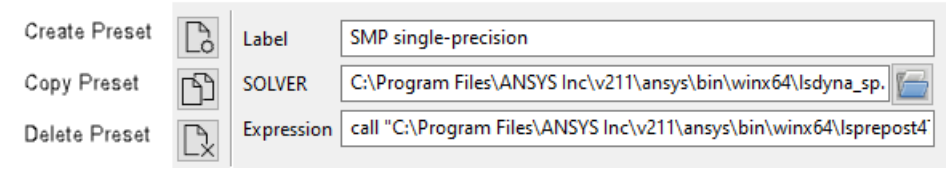
```
Map local dir [H:\project ] to [/disk/proj ].
```

2.2.4. Defining Version Presets

LS-DYNA 14.1 is the version that is installed in 2025 R2. The following presets are defined with their associated **SOLVER** and **Expression**:

- SMP single-precision
- SMP double-precision
- MPP single-precision with IntelMPI
- MPP double-precision with IntelMPI
- MPP single-precision with MS-MPI (not applicable on Linux)
- MPP double-precision with MS-MPI (not applicable on Linux)

If you have other versions of LS-DYNA installed, you can define presets for those versions. To do so, use the buttons and the fields to the right of the **Presets** list:



When you click the Create Preset button, a NewPreset entry appears in the list. Select it and fill in the **Label**, **SOLVER**, and **Expression** fields with the appropriate information.

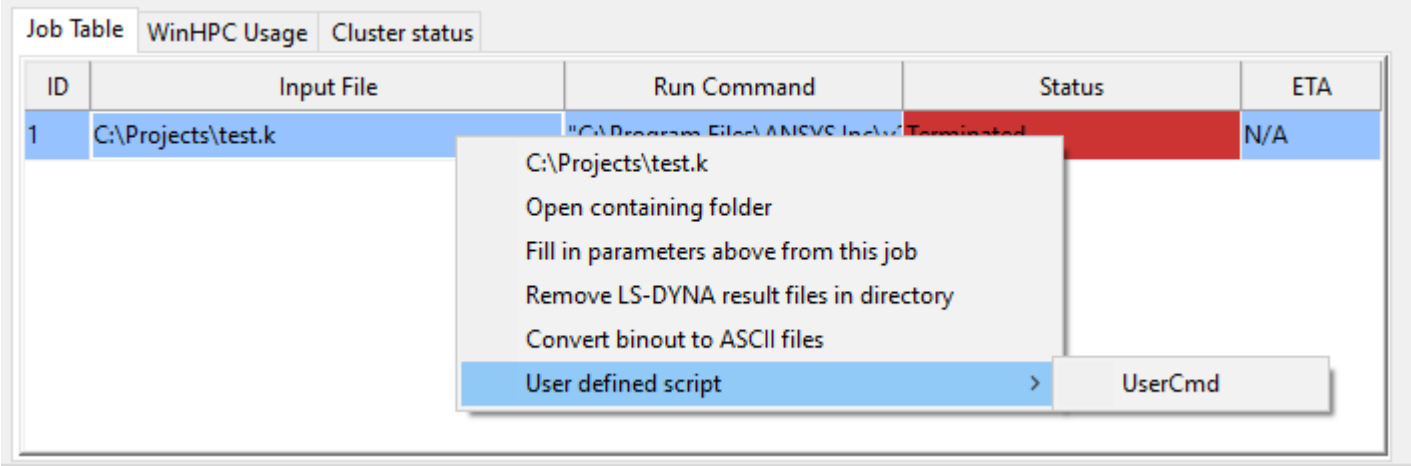
You can also select a preset and click the Copy Preset button to make a copy of an existing preset and modify its information to create a new preset.

To delete a preset, select it and click the Delete Preset button.

The presets can be rearranged with the up/down icons so that they come in the order you prefer. For instance if you add a new preset for, say R12.2 SMP, you may want to have this preset next to the R12.1 SMP preset.

2.2.5. User Defined Commands

User defined commands can be created in the Settings panel. Click on the Add icon to add a new command. You can define a label for each command, and rearranged the labels with the up/down icons. If you no longer need a command, select it and click the Delete icon to remove it. The commands can be accessed and executed in a run directory of a job by right-clicking that job and selecting a defined command.



2.2.6. Setting up HPC Jobs

The following fields define the information needed to run parallel processes using Windows HPC (not applicable on Linux):

Head Node

The Head Node for the cluster.

Working Dir

The location where LS-DYNA will be run. The default working directory is the one that contains the input file.

Job File

Two XML template files are available in the directory where LS-Prepost is installed. The `job-file_template.xml` is for running the job in the Working Dir location. The other, `job-file_local_template.xml`, runs the job in a temporary directory on a local Compute Node disk. When the simulation is finished, all result files are copied back to Working Dir.

The provided HPC XML template files can be customized to better match the situation on site. These parameters are replaced in the template file before submitting the job:

- $EXPRESSION - The LS-Run Expression
- $INPUTDIR - The path to the INPUT
- $WORKDIR - Working Dir as specified in Settings
- $NCPU - The LS-Run NCPU parameter

2.3. Setting Command Line Options

At the top of the LS-Run window, there are several fields that you can use to define common options used in the command line that starts the program execution. These fields are:

INPUT

Type in the file path or browse to the input file that you want to run. Files that you've accessed before will be available in the drop down list.

NCPU

Enter the number of processes that you want to use to run your job. For an SMP solution, if you enter a negative number it will cause the job to be run in a manner that will give you consistent results but will take longer.

SOLVER

The SOLVER field will be automatically set based on the Preset that is selected.

MEMORY

If memory toggle AUTO=ON, LS-Run will estimate the required memory for the analysis and provide a value for the MEMORY parameter. The estimate is made from the number of nodes in the current model.

2.4. Version Selection and Job Execution

Use the **Preset** drop down to select the version of LS-DYNA that you want to use for the job. The **Expression** field shows you the command created to run the job, including any of the variables used in the expression. The **Preview** field shows the command as it will be run with the values of the variables substituted.

The toolbar above the **Job Table** provides controls for submitting and viewing your jobs.

The first set of controls allows you to specify whether you want to run the job locally, on a remote host, or an HPC cluster, and whether you want this job to be dependent on another job in the queue.

2.4.1. Setting a Job Dependency

A job can be set to wait in queue until another job ID has finished with Normal Termination before it is started. This is specified with the job dependency option. Select the job that you want this job to wait for from the first drop down in the toolbar. If you select 0 there is no dependency. If you select -1, it will be dependent on the last job you submitted.

2.4.2. Selecting your Host

The command shown in the **Preview** field can either be executed on the computer running LS-Run, or it can be executed on a remote computer. Select Remote from the second drop-down in the toolbar to run the command on a remote computer. The computer specified in the Settings will be the execution host. The command will be executed in the directory where the input file is located. The `d3hsp` file for the job is expected to be in this directory also.

LS-Run can submit a job to a Windows HPC (High Performance Computing) cluster by selecting WinHPC from the drop-down. The job is submitted using the HPC job file specified in the Settings.

The currently running and queued HPC jobs can be viewed in the WinHPC Usage tab.

2.4.3. Starting a Job in a Command Window

The LS-DYNA job can be started in a new command prompt window if the command prompt icon is toggled. On Linux, it will be run in the terminal window where LS-Run was started. If this option is not activated, then the terminal output is written to the file lsrun.stdout.txt.

2.4.4. Adding Jobs to the Queue

When you have finished setting up the job, press the Add job to local queue button  .When a job is added, it will go to the top of the list of jobs in the job table. Once a job is in the queue, you can use the job table to control the execution of the job (see Monitoring and Reviewing Jobs (p. 15)). You can add as many jobs to the queue as you like.

Chapter 3: LS-DYNA Parallel Processing Capabilities

For large models, you can use the shared memory parallel processing (SMP) or the massively parallel processing (MPP) capabilities of LS-DYNA to shorten the elapsed time necessary to run an analysis. To use either of these features, you must purchase the appropriate number of Ansys LS-DYNA HPC licenses. The HPC license incorporates both SMP and MPP capabilities. Please contact your Ansys sales representative for more information on purchasing the appropriate licenses.

3.1. Shared Memory Parallel Processing

The shared memory parallel processing capabilities allow you to distribute model-solving power over multiple processes on the same machine. To use this feature efficiently, you must have at least as many cores in the computer as the number of LS-DYNA processes, and you must have an Ansys LS-DYNA HPC license for each process beyond the first one.

When you are using shared memory parallel processing, the calculations may be executed in different order, depending on CPU availability and the workload on each CPU. Because of this, you may see slight differences in the results when you run the same job multiple times. To avoid these differences, you can specify the number of CPUs as a negative number to maintain consistency. Maintaining consistency can result in an increase of up to 15% in CPU time.

3.2. Massively Parallel Processing

The massively parallel processing (MPP) capabilities of LS-DYNA allow you to run the LS-DYNA solver over a cluster of machines or use multiple processors on a single machine. To use the LS-DYNA MPP feature, you must have an Ansys LS-DYNA HPC license for each process beyond the first one.

Before running an analysis using LS-DYNA MPP, you must have supported MPI software correctly installed, and the machines running LS-DYNA MPP must be properly configured.

Table 3.1: LS-DYNA MPP MPI Support on Windows and Linux

MPI version for DYNA MPP	64-bit Windows	64-bit Linux
Intel MPI	X	X
MS MPI	X	n/a

The output files produced by LS-DYNA MPP are standard LS-DYNA output files and are not compatible with Ansys. Therefore, you must use LS-DYNA postprocessors to view the results.

3.3. Configuring LS-DYNA in Parallel

To run LS-DYNA in parallel on a single machine, no additional setup is required.

To run an analysis with LS-DYNA in parallel on a cluster, some configuration is required as described in the following sections:

3.3.1. Prerequisites for Running LS-DYNA in Parallel

If you are running on a single machine, there are no additional requirements for running a distributed solution.

If you are running across multiple machines (for example, a cluster), your system must meet these additional requirements to run a distributed solution.

- Homogeneous network: All machines in the cluster must be the same type, OS level, chip set, and interconnects.
- You must be able to remotely log in to all machines, and all machines in the cluster must have identical directory structures (including the Ansys 2025 R2 installation, MPI installation, and working directories). Do not change or rename directories after you've launched LS-DYNA.
- All machines in the cluster must have Ansys 2025 R2 installed, or must have an NFS mount to the Ansys 2025 R2 installation. If not installed on a shared file system, Ansys 2025 R2 must be installed in the same directory path on all systems.
- All machines must have the same version of MPI software installed and running. Table 3.2: Platforms and MPI Software (p. 12) shows the MPI software and version level supported for each platform.

3.3.2. MPI Software

The MPI software supported by LS-DYNA in parallel depends on the platform (see Table 3.2: Platforms and MPI Software (p. 12)).

The files needed to run LS-DYNA in parallel using Intel MPI are included on the installation media and are installed automatically when you install Ansys 2025 R2. Therefore, when running on a single machine (for example, a laptop, a workstation, or a single compute node of a cluster) on Windows or Linux, or when running on a Linux cluster, no additional software is needed. However, when running on multiple Windows machines you must use a cluster setup, and you must install the MPI software separately as described later in this section.

Table 3.2: Platforms and MPI Software

Platform	MPI Software
Linux	Intel MPI 2018.3.222
Windows 10 (single machine)	Intel MPI 2018.3.210[a]
Windows Server 2016 (cluster)	Microsoft HPC Pack (MS MPI v10.1.12)

[a] MS MPI is an alternative to Intel MPI for a single machine on Windows.

3.3.3. Installing the Software

Install Ansys 2025 R2 following the instructions in the *Ansys, Inc. Installation Guides* for your platform. Be sure to complete the installation, including all required post-installation procedures.

To run LS-DYNA in parallel on a cluster, you must:

- Install Ansys 2025 R2 on all machines in the cluster, in the exact same location on each machine.
- For Windows, you can use shared drives and symbolic links. Install Ansys 2025 R2 on one Windows machine (for example, `C:\Program Files\ANSYS Inc\V252`) and then *share* that installation folder. On the other machines in the cluster, create a symbolic link (at `C:\Program Files\ANSYS Inc\V252`) that points to the UNC path for the shared folder. On Windows systems, you must use the Universal Naming Convention (UNC) for all file and path names for LS-DYNA in parallel to work correctly.
- For Linux, you can use the exported NFS file systems. Install Ansys 2025 R2 on one Linux machine (for example, at `/ansys_inc/v252`), and then export this directory. On the other machines in the cluster, create an NFS mount from the first machine to the same local directory (`/ansys_inc/v252`).

Installing MPI software on Windows

You can install Intel MPI from the installation launcher by choosing **Install MPI for Ansys Parallel Processing**. For installation instructions see Intel-MPI 2021.8.0 Installation Instructions in the *Ansys, Inc. Installation Guides*.

Microsoft HPC Pack (Windows HPC Server 2016)

You must complete certain post-installation steps before running LS-DYNA in parallel on a Microsoft HPC Server 2016 system. The post-installation instructions provided below assume that Microsoft HPC Server 2016 and Microsoft HPC Pack (which includes MS MPI) are already installed on your system. The post-installation instructions can be found in the following README files:

```
Program Files\ANSYS Inc\V252\tp\MPI\WindowsHPC\README.mht
```

or

```
Program Files\ANSYS Inc\V252\tp\MPI\WindowsHPC\README.docx
```

The user must be a registred user on the HPC cluster.

"Client utilities" from Microsoft HPC Pack must be installed on the computer which submits the job. Use the same version of HPC Pack as is used on the HPC cluster.

Store the credentials for submitting to the cluster by running this command:

`hpccred setcreds /user:`*`MYDOMAIN\myusername`*` /scheduler:`*`myhpcserver`*

in a command prompt after substituting MYDOMAIN, myusername and myhpcserver.

The input and solver files have to be accessible on the Compute Nodes on the cluster. This typically means that the input and solver files should be placed on a disk share, specified in LS-Run with their UNC paths; in other words starting with \\FILESERVER\.

Chapter 4: Monitoring and Reviewing Jobs

The middle and right sets of buttons on the toolbar above the **Job Table** allow you to control and review your jobs.

4.1. The Job Table

The jobs will start in the order they were added, provided there are enough resources available and the job dependency is fulfilled. Resources (running processes and running jobs) are occupied by a job if the **Status** for the job is "Cleaning LS-DYNA results", "Waiting (LS-DYNA not yet started)", "Running" or "Stopped (Waiting for LS-DYNA to finish)". If a job can't be started due to a dependency, LS-Run will continue and check the remaining jobs to see if any of those can be started.

The number of running processes resources for a job is specified by the number in the NCPU field when the job is added. The maximum number of running processes are specified in the Settings. This is typically set to the number of cores in the computer if running LS-DYNA on the local computer. If doing so, it will prevent LS-Run from starting more LS-DYNA processes on the computer than the number of cores available. There is also an option to set a maximum number of simultaneously running jobs.

The columns in the job table can be customized by right-clicking on the column labels. Any property for a job can be displayed or hidden. New columns will be inserted at the clicked location.

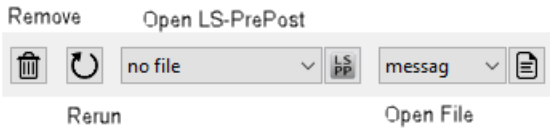
The job run directory can be opened in the file explorer by right-clicking a job and selecting "Open containing folder".

4.2. Using Sense Switches during Simulation

The second set of buttons in the toolbar provides access to the LS-DYNA sense switches. LS-DYNA sense switches can be sent to the selected job during the simulation by creating a sense switch file (d3kil) in the input file directory. This includes stopping a running job. See LS-DYNA Keyword User's Manual Volume I for more information on using sense switches.

A job stopped with "sw1" will create a `d3dump` file. This file can be used to continue the simulation by doing a simple restart analysis. This is done by right-clicking on the job and select "Continue with simple restart".

4.3. Post Simulation Actions



The final set of buttons in the toolbar provide the following capabilities:

- Remove - Removes the currently selected job from the job table. Right-clicking the button provides options to remove all jobs, or jobs that are finished, from the job table. It does not however delete any files or stop any jobs.
- Re-run - Deletes existing LS-DYNA result files and re-run the job with the same command in the same directory.
- LS-PrePost - Select an output file and click this button to open the file in LS-PrePost to view results.
- Open File - select any of the job files listed and click the button to open the file in the text editor you specified in the settings.