Installation Guides

Ansys

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Installation Guide for Linux

Ansys

ANSYS, Inc.
Southpointe
2600 Ansys Drive
Canonsburg, PA 15317
ansysinfo@ansys.com
http://www.ansys.com
(T) 724-746-3304
(F) 724-514-9494

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Revision Information

The information in this guide applies to all Ansys, Inc. products released on or after this date, until superseded by a newer version of this guide. This guide replaces individual product installation guides from previous releases.

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Chapter 1: Installation Prerequisites for Linux

This document describes the steps necessary to correctly install and configure all Ansys, Inc. products on Linux platforms for Release 2024 R1. These products include:

- Electronics
  - Ansys Icepak (includes Ansys CFD-Post)
- Fluids
  - Ansys Dynamic Reporting
  - Ansys CFD-Post only
  - Ansys CFX (includes Ansys CFD-Post)
  - Ansys Chemkin
  - Ansys EnSight
  - Ansys FENSAP-ICE
  - Ansys Fluent (includes Ansys CFD-Post)
  - Ansys Forte
  - Ansys ICEM CFD
  - Ansys Model Fuel Library (Encrypted)
  - Ansys Polyflow (includes Ansys CFD-Post)
  - Ansys Reaction Workbench
  - Ansys TurboGrid
- Ansys Geometry Interfaces
  - ACIS
  - CATIA, Version 5
  - NX
  - Parasolid
- Optical

  - Ansys Speos HPC
- PIDO (Optimization)
  - Ansys optiSLang
- Platform
  - DCS (Distributed Compute Services
  - Remote Solve Manager Standalone Services
- Structures
  - Ansys Additive
  - Ansys Aqwa
  - Ansys Autodyn
  - Ansys LS-DYNA
  - Ansys Customization Files for User-Programmable Features
  - Ansys Mechanical Products (includes Mechanical APDL, Mechanical and Ansys Composite PrepPost, where supported)
  - Ansys Motion
  - Ansys Sherlock

Notes

Not all products may be available on all Linux platforms. See the remainder of this document for detailed information on which products are available on which platforms.

At Release 2024 R1, Ansys BladeGen, Vista CCD, Vista CPD, Vista RTD, and Vista AFD are not supported on Linux platforms.

Ansys Workbench is installed by default as product components to most Ansys, Inc. products. Ansys Workbench is not installed as part of the products under Ansys Additional Tools. Ansys Workbench includes the following applications:

- DesignModeler
- Design Exploration
- Meshing
- Remote Solve Manager
- Fluent Meshing
- EKM Client

Important Notice

If you wish to run multiple releases of Ansys, Inc. software, you **MUST** install them chronologically (that is, Release 2023 R2 followed by Release 2024 R1). If you install an earlier release after installing Release 2024 R1, you will encounter licensing issues that may prevent you from running any products/releases. If you need to install an earlier release after you have already installed Release 2024 R1, you **MUST** uninstall Release 2024 R1, then re-install the releases in order.

1.1. System Prerequisites

Ansys, Inc. Release 2024 R1 products are supported on the Linux platforms and operating system levels listed in the following tables. Patches listed may be superseded by newer versions; see your vendor for the most current version. See the individual Platform Certification Specifics in this guide for more information on specific platform requirements. For up-to-date information on hardware platforms or operating systems that have been certified, go to the Platform Support section of the Ansys Website.

Table 1.1: Supported Linux Platforms

Platform	Processor	Operating System	Platform architecture (directory name)	Availability
Linux x64	EM64T/Opteron 64	Red Hat Enterprise Linux 7.8 - 7.9, Red Hat Enterprise Linux 8.4 - 8.8 , SUSE Linux Enterprise Server and Desktop 12 SP5, SUSE Linux Enterprise Server and Desktop 15 SP2 - SP4, CentOS 7.8 - 7.9, Ubuntu LTS Desktop and Server 20.04 & 22.04	linx64	Download / USB
For detailed and current support information, see the Platform Support section of the Ansys Website.				

Supported Platforms for High Performance Computing

See the discussions on Configuring Distributed Ansys (p. 1) and Configuring Ansys CFX Parallel (p. 7) for detailed information on supported platforms for distributed computing.

Supported Products By Platform

For a complete list of products supported by each platform, see the **Platform Support by Application** PDF on the Platform Support section of the Ansys Website.

1.1.1. CAD Support

The following CAD and auxiliary programs are supported on the indicated products and platforms. Products are:

A = Mechanical APDL

W = Ansys Workbench

I = Ansys ICEM CFD (standalone and Ansys Workbench Readers)

Table 1.2: CAD Support by Platform

	Linux x64
CATIA 4.2.4	A, I
CATIA V5 R2022	W, I
CATIA V6 R2023.x	W, I
Parasolid 35.1	A, W, I
ACIS 2022	A, W, I 1
NX 22065, 2212 5, 2306 5	A, W, I
STEP AP203, AP214, AP 242	A, W, I
IGES 4.0, 5.2, 5.3	A 2, W, I 3
GEMS	I
Rhinoceros	I4

1. For Ansys ICEM CFD standalone, ACIS 18.0.1 is the supported version for all platforms.
2. MAPDL supports 5.1 by default, but 5.2 is also supported if the IOPTN command is used.
3. IGES Versions 4.0, 5.2, and 5.3 are supported.
4. Support limited to Rhinoceros 3 and earlier.
5. Support limited to SuSE Linux Enterprise 15.

1.2. Disk Space and Memory Requirements

You will need the disk space shown here for each product for installation and proper functioning. The numbers listed here are the maximum amount of disk space you will need. Depending on the options selected for each product and shared product features, you may require less disk space when installing multiple products.

Product	Disk Space (GB)
Ansys Additive	37.0
Ansys Aqwa	22.0
Ansys Autodyn	22.0
Ansys CFD Post only	22.7
Ansys CFX	23.1
Ansys Chemkin	24.9
Ansys Customization Files for User-Programmable Features	22.8
Distributed Computing Services	10.5
Ansys Dynamic Reporting	24.3
Ansys EnSight	25.8

Product	Disk Space (GB)
Ansys FENSAP-ICE	23.2
Ansys Fluent	36.9
Ansys Forte	28.1
Ansys Geometry Interfaces	12.5
Ansys ICEM CFD	22.5
Ansys Icepak	31.6
Ansys LS-DYNA	23.2
Ansys Mechanical Products	36.0
Ansys Model Fuel Library (Encrypted)	24.9
Ansys Motion	24.4
Ansys optiSLang	18.1
Ansys Polyflow	35.3
Ansys Reaction Workbench	24.9
Ansys Remote Solve Manager	15.7
Ansys Sherlock	33.8
Ansys Speos HPC	9.6
Ansys TurboGrid	23.0
Disk space required to install all products:	65.6

Memory Requirements

You must have a minimum of 8 GB of memory to run product installations, 16 or 32 GB of memory is recommended.

1.3. Requirements for the GPU Accelerator in Mechanical APDL

Your system must meet the following requirements to use the GPU accelerator capability in Mechanical APDL. For information on the most recently tested GPU cards, see the **GPU Accelerator Capabilities** PDF on the Platform Support section of the Ansys Website.

- The machine(s) being used for the simulation must contain at least one GPU card. The following cards are recommended:

  AMD Instinct™ MI100, MI210, MI250, MI250x

  NVIDIA H100

  NVIDIA A10, A16, A30, A40, A100

  NVIDIA RTX A4000, A5000, A6000

  NVIDIA Tesla Series (any model)

  NVIDIA Quadro RTX 6000, RTX 8000

  NVIDIA Quadro GV100

  NVIDIA Quadro GP100

- When using the sparse solver or eigensolvers based on the sparse direct solver (for example, Block Lanczos or subspace), only GPU devices with significant double precision performance (FP64) are recommended in order to achieve optimal performance. These include the following models:

  AMD Instinct™ MI100, MI210, MI250, MI250x
  NVIDIA H100
  NVIDIA A30, A100
  NVIDIA Tesla Series P100
  NVIDIA Tesla Series V100
  NVIDIA Quadro GV100
  NVIDIA Quadro GP100

- GPU devices with at least 16GB of on-card memory are recommended in order to achieve meaningful acceleration for most simulations in which the GPU card can be used.

- For NVIDIA GPU cards, the driver version must be 525.60.13 or newer.

- For AMD GPU cards, the following AMD link lists their

  To install the AMD driver, you must perform the three-step procedure summarized below and described in detail with specific Linux commands for different operating systems on the AMD page: .

  1. Download the "amdgpu-install" script to your system using the appropriate commands for your operating system. Note that the version of amdgpu-install must come from the ROCm 5.7.0 page, and you only need to download the installer script (the full ROCm package is not needed).

  2. Install the "kernel-mode driver" with the following command

     ```
     sudo amdgpu-install --usecase=dkms
     ```

  3. Install the “libdrm-amdgpu” library to your operating system using the appropriate commands.

- To utilize a GPU device that is not on the recommended list of cards, set the following environment variable:

  ANSGPU_OVERRIDE=1

  This is most beneficial when you wish to run on newer GPUs that were not available at the time of release of this version of the Ansys program. If you choose to use this environment variable, you should ensure that the GPU device that you wish to use is sufficiently powerful, in terms of both double-precision compute power and on-card memory, to achieve meaningful acceleration for your simulation. Using this environment variable with an underpowered CPU may actually decelerate your simulation.

1.4. Additional Hardware and Software Requirements

- Based upon your platform version and installed products you may need to install additional Linux libraries and packages. For a list of libraries and packages by product, see Installation Troubleshooting - Mechanical APDL (p. 110).

- Intel 64 / AMD64 system with a supported operating system version installed
- 8 GB of RAM
- 128 GB free on the hard drive is recommended
- A current default web browser must be installed to view the **Ansys internet-based help documentation**.

  For a complete list of supported browsers, see the **Browser Support** PDF on the Platform Support section of the Ansys Website.

  Note that Google Chrome does not support the Linux platforms that Ansys supports.

  For a local copy of the product documentation on your system, download an installable version from the Ansys Download Center. Instructions for installing the Local Help are included with the download package.
- TCP/IP for the license manager (see the Ansys Licensing Guide for more information on TCP/IP)
- Approximately twice as much swap space as memory. The amount of memory swap space on the system may limit the size of the model that can be created and/or solved.
- Discrete graphics card with the latest drivers and compatible with the supported operating systems. For full functionality, use of a recent NVIDIA Quadro or AMD FirePro card with at least 1 GB of discrete video memory and supporting OpenGL version 4.5 or above. Intel Iris Pro Integrated graphics has also been used successfully.

  For information on the most recently tested graphics cards, see the **Graphics Cards Tested**PDF on the Platform Support section of the Ansys Website.

  Note:

  – **Vendor Legacy Support:** To be compatible, legacy GL 4.5 compliant cards should still be within the official legacy support period of their respective graphics vendor, and must still be receiving regular driver updates. Visit the appropriate vendor websites to review legacy hardware lists.

- A minimum screen resolution of: 1024 x 768 (4:3 aspect ratio), 1366 x 768 (16:9 aspect ratio) or 1280 x 800 (16:10 aspect ratio) with minimum 24 bit color. A higher screen resolution such as 1920x1080 (16:9) or 1920x1200 (16:10) is strongly recommended for most applications.

  Note:

  – A number of cosmetic display issues have been reported when running the installation program on Linux platforms using AMD graphics cards. These issues do not affect the installation functionality.

  – **Ultra High Definition (4K) Graphics Cards:** Use of Ultra High Definition (4K) graphics cards may cause a number of cosmetic display issues (including enlarged

or reduced text and incorrect positioning of option labels). These issues do not affect the functionality of the installation program.

- X11, OpenGL graphics libraries
- Mesa-libGL (OpenGL) is required to run data-integrated Ansys Workbench applications such as Mechanical.
- For most applications, a three-button mouse is required to access all available functionality.
- PDF reader software is required to read the installation guides and other user documentation.
- Running Ansys Fluent or Ansys CFX on Cray systems requires a minimum of Cray Linux Environment 6.0 update 03 (based on SUSE Linux Enterprise Server 12).
- For Ansys CFX on Cray systems, in order to use the command-line application `cfx5mondata`, you must ensure that library `libsmime3.so` is installed.

1.4.1. Speos HPC Software Requirements

Speos software offers the ability to run simulation jobs on a Linux cluster using the GPU Cores of the machines. Speos HPC requires a minimum NVIDIA Quadro P6000 graphic adapter with a NVIDIA driver 535.104.05.

Chapter 2: Platform Details

Linux

For ALL 64-bit Linux platforms, OpenMotif, and Mesa libraries should be installed. These libraries are typically installed during a normal Linux installation. You will also need the xpdf or evince package to view the online help.

2.1. Required Linux Libraries and Packages by Product

You need to install the following libraries and packages based upon your platform version and installed products. For current platform information, see the Platform Support section of the Ansys Website.

For Red Hat and CentOS, you may need to install and enable the EPEL (Extra Packages for Enterprise Linux) repo in order to install some of the packages in these lists.

For Ubuntu, you may need to enable 32-bit support in order to install some of the packages in these lists. The following command will enable 32-bit support on Ubuntu:

```
sudo dpkg --add-architecture i386 && sudo apt-get update
```

Click the links below for a complete list of libraries and packages for your product:

Table 2.1: Common Packages Required for All Products (except License Manager)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	glibc.i686 alsa-lib at-spi2-atk at-spi2-core atk avahi-libs bzip2-libs cairo cairo-gobject cups-libs dbus-libs elfutils-libelf elfutils-libs expat fribidi gdk-pixbuf2 glib2 glibc glibc-devel graphite2 gtk3 gzip harfbuzz keyutils-libs krb5-libs libXcomposite libXcursor libXdamage libXfixes libXi libXinerama libXrandr libXrender libattr libblkid libcap libcom_err libdrm libepoxy libglvnd libglvnd-egl libgpg-error libjpeg-turbo libmount libselinux libthai libuuid libwayland-client libwayland-cursor libwayland-egl libwayland-server libxcb libxkbcommon mesa-libgbm nspr nss nss-softokn-freebl nss-util pango redhat-lsb-core systemd-libs tar which xorg-x11-fonts-100dpi xorg-x11-fonts-75dpi

Operating System	Packages
Red Hat Enterprise Linux and CentOS 8	glibc.i686 alsa-lib at-spi2-atk at-spi2-core atk avahi-libs cairo cairo-gobject cups-libs dbus-libs expat fribidi gdk-pixbuf2 glib2 glibc glibc-devel gnutls graphite2 gtk3 gzip harfbuzz keyutils-libs krb5-libs libXcomposite libXcursor libXdamage libXfixes libXi libXinerama libXrandr libXrender libblkid libcap libcom_err libdatrie libdrm libepoxy libgcrypt libgpg-error libidn2 libjpeg-turbo libmount libnsl libselinux libtasn1 libthai libunistring libuuid libwayland-client libwayland-cursor libwayland-egl libwayland-server libxcb libxcrypt libxkbcommon mesa-libgbm nettle nspr nss nss-util p11-kit pango pcre2 redhat-lsb-core systemd-libs tar which xorg-x11-fonts-100dpi xorg-x11-fonts-75dpi
Red Hat Enterprise Linux 9 and Rocky Linux 9	glibc.i686 alsa-lib at-spi2-atk at-spi2-core atk avahi-libs cairo cairo-gobject cups-libs dbus-libs expat fribidi gdk-pixbuf2 glib2 glibc glibc-devel gnutls graphite2 gtk3 gzip harfbuzz json-glib keyutils-libs krb5-libs libXcomposite libXcursor libXdamage libXfixes libXi libXinerama libXrandr libXrender libblkid libcap libcom_err libdatrie libdrm libepoxy libffi libgcrypt libgpg-error libicu libidn2 libjpeg-turbo libmount libnsl libselinux libstemmer libtasn1 libthai libtracker-sparql libunistring libuuid libwayland-client libwayland-cursor libwayland-egl libwayland-server libxcb libxkbcommon libxml2 mesa-libgbm nettle nspr nss nss-util openssl-libs p11-kit pango pcre2 redhat-lsb-core systemd-libs tar which xorg-x11-fonts-100dpi xorg-x11-fonts-75dpi
SUSE Linux Enterprise Server and Desktop 12	glibc-32bit Mesa-libEGL1 cups-libs glibc glibc-devel gzip krb5 libXcomposite1 libXcursor1 libXdamage1 libXfixes3 libXi6 libXinerama1 libXrandr2 libXrender1 libasound2 libatk-1_0-0 libatk-bridge-2_0-0 libatspi0 libavahi-client3 libavahi-common3 libcairo-gobject2 libcairo2 libcap2 libcom_err2 libdatrie1 libdbus-1-3 libdrm2 libepoxy0 libexpat1 libffi4 libgbm1 libgdk_pixbuf-2_0-0 libgio-2_0-0 libglib-2_0-0 libgmodule-2_0-0 libgobject-2_0-0 libgraphite2-3 libgtk-3-0 libharfbuzz0 libjpeg62 libkeyutils1 libpango-1_0-0 libselinux1 libthai0 libuuid1 libxcb-dri2-0 libxcb-dri3-0 libxcb-present0 libxcb-render0 libxcb-shm0 libxcb-sync1 libxkbcommon0 libxshmfence1 mozilla-nspr mozilla-nss tar which
SUSE Linux Enterprise Server and Desktop 15	glibc-32bit glibc glibc-devel gzip krb5 libXcomposite1 libXcursor1 libXdamage1 libXfixes3 libXi6 libXinerama1 libXrandr2 libXrender1 libasound2 libatk-1_0-0 libatk-bridge-2_0-0 libatspi0 libavahi-client3 libavahi-common3 libblkid1 libcairo-gobject2 libcairo2 libcap2 libcom_err2 libcups2 libdatrie1 libdbus-1-3 libdrm2 libepoxy0 libexpat1 libffi7 libgbm1 libgcrypt20 libgdk_pixbuf-2_0-0 libgio-2_0-0 libglib-2_0-0 libglvnd libgmodule-2_0-0 libgnutls30 libgobject-2_0-0 libgpg-error0 libgraphite2-3 libgtk-3-0 libharfbuzz0 libhogweed4 libidn2-0 libjpeg62 libkeyutils1 libmount1 libnettle6 libp11-kit0 libpango-1_0-0 libselinux1 libsystemd0 libtasn1-6 libthai0 libunistring2 libuuid1 libwayland-client0 libwayland-cursor0 libwayland-egl1 libwayland-server0 libxcb-render0 libxcb-shm0 libxkbcommon0 mozilla-nspr mozilla-nss tar which
Ubuntu 20.04 LTS	libc6:i386 debianutils gzip libasound2 libatk-bridge2.0-0 libatk1.0-0 libatspi2.0-0 libavahi-client3 libavahi-common3 libblkid1 libc6 libcairo-gobject2 libcairo2 libcom-err2 libcups2 libdatrie1 libdbus-1-3 libdrm2 libepoxy0 libexpat1 libffi7 libfribidi0 libgbm1 libgcrypt20 libgdk-pixbuf2.0-0 libglib2.0-0 libgnutls30 libgpg-error0 libgraphite2-3 libgssapi-krb5-2 libgtk-3-0 libharfbuzz0b libhogweed5 libidn2-0 libjpeg62 libk5crypto3 libkeyutils1 libkrb5-3 libkrb5support0 libmount1 libnettle7 libnspr4 libnss3 libp11-kit0 libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0 libpcre2-8-0 libpcre3 libselinux1 libsystemd0 libtasn1-6 libthai0 libunistring2 libuuid1 libwayland-client0 libwayland-cursor0 libwayland-egl1 libwayland-server0 libxcb-render0 libxcb-shm0 libxcomposite1 libxcursor1 libxdamage1 libxfixes3 libxi6 libxinerama1 libxkbcommon0 libxrandr2 libxrender1 lsb-core tar xfonts-100dpi xfonts-75dpi

Operating System	Packages
Ubuntu 22.04 LTS	libc6:i386 debianutils gzip libasound2 libatk-bridge2.0-0 libatk1.0-0 libatspi2.0-0 libavahi-client3 libavahi-common3 libblkid1 libc6 libc6-i386 libcairo-gobject2 libcairo2 libcap2 libcom-err2 libcups2 libdatrie1 libdbus-1-3 libdrm2 libepoxy0 libexpat1 libffi8 libfribidi0 libgbm1 libgcrypt20 libgdk-pixbuf-2.0-0 libglib2.0-0 libgnutls30 libgpg-error0 libgraphite2-3 libgssapi-krb5-2 libgtk-3-0 libharfbuzz0b libhogweed6 libidn2-0 libjpeg62 libk5crypto3 libkeyutils1 libkrb5-3 libkrb5support0 libmount1 libnettle8 libnspr4 libnss3 libp11-kit0 libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0 libpcre2-8-0 libpcre3 libselinux1 libsystemd0 libtasn1-6 libthai0 libunistring2 libuuid1 libwayland-client0 libwayland-cursor0 libwayland-egl1 libwayland-server0 libxcb-render0 libxcb-shm0 libxcomposite1 libxcursor1 libxdamage1 libxfixes3 libxi6 libxinerama1 libxkbcommon0 libxrandr2 libxrender1 lsb-core tar xfonts-100dpi xfonts-75dpi

Table 2.2: Packages Required for the Installer to Run

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	bzip2-libs expat fontconfig freetype glib2 glibc libICE libSM libX11 libXau libXext libpng libuuid libxcb libxkbcommon libxkbcommon-x11 pcre xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm zlib
Red Hat Enterprise Linux and CentOS 8	bzip2-libs expat fontconfig freetype glib2 glibc gmp gnutls libICE libSM libX11 libX11-xcb libXau libXext libffi libidn2 libpng libtasn1 libunistring libuuid libxcb libxkbcommon libxkbcommon-x11 nettle p11-kit pcre xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	bzip2-libs fontconfig freetype glib2 glibc graphite2 harfbuzz libICE libSM libX11 libX11-xcb libXau libXext libbrotli libpng libuuid libxcb libxkbcommon libxkbcommon-x11 libxml2 pcre xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
SUSE Linux Enterprise Server and Desktop 12	fontconfig glibc libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libbz2-1 libexpat1 libfreetype6 libglib-2_0-0 libgthread-2_0-0 libpcre1 libpng16-16 libuuid1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxkbcommon0 libz1
SUSE Linux Enterprise Server and Desktop 15	fontconfig glibc libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libbz2-1 libexpat1 libfreetype6 libglib-2_0-0 libgthread-2_0-0 libpcre1 libpng16-16 libuuid1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxkbcommon0 libz1

Operating System	Packages
Ubuntu 20.04 LTS	libbsd0 libc6 libexpat1 libfontconfig1 libfreetype6 libglib2.0-0 libice6 libpcre3 libpng16-16 libsm6 libuuid1 libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxkbcommon-x11-0 libxkbcommon0 zlib1g
Ubuntu 22.04 LTS	libbrotli1 libbsd0 libc6 libexpat1 libfontconfig1 libfreetype6 libglib2.0-0 libice6 libmd0 libpcre3 libpng16-16 libsm6 libuuid1 libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxkbcommon-x11-0 libxkbcommon0 zlib1g

Table 2.3: ACIS Geometry Interface

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libgcrypt libibverbs libpng12 libquadmath libstdc++ libtasn1 libtiff libuuid-devel libxml2 libxslt lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libibverbs libomp libpng libpng12 libquadmath libstdc++ libtiff libuuid-devel libxml2 libxslt lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	abseil-cpp fontconfig grpc grpc-cpp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libibverbs libnl3 libomp libpng libpng12 libquadmath libtiff libuuid-devel libwebp libxslt libzstd lz4-libs motif pcre pixman re2 sqlite-libs ucx xz-libs
SUSE Linux Enterprise Server and Desktop 12	abseil-cpp fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-xfixes0 libxcb1 libxml2-2 libxslt1
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 librdmacm1 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1 libxml2-2 libxslt1

Operating System	Packages
Ubuntu 20.04 LTS	libbsd0 libcurl4-gnutls-dev libelf1 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev
Ubuntu 22.04 LTS	libbsd0 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libpython3.10 libquadmath0 libre2-9 libsm6 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev

Table 2.4: Additive

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls gstreamer1 gstreamer1-plugins-base gtk2 jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libnotify libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt libzstd lz4 nettle nss-softokn numactl-libs openldap openssl-libs orc p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib elfutils-libelf fontconfig gmp gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnotify libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn numactl-libs openldap openssl-libs orc pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib elfutils-libelf fontconfig gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libnotify libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn numactl-libs openldap orc pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libgcc_s1 libgnutls28 libgstreamer-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 libncurses6 libnettle4 libnghttp2-14 libnotify4 libnuma1 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 libzstd1 perl
SUSE Linux Enterprise	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libgcc_s1 libgstreamer-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 libncurses6 libnghttp2-14 libnl3-200 libnotify4 libnuma1

Operating System	Packages
Server and Desktop 15	libomp5-devel libopenssl1_1 liborc-0_4-0 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 libzstd1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdrm-amdgpu1 libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 libnghttp2-14 libnotify4 libnuma1 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libtinfo6 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdrm-amdgpu1 libdw1 libegl1 libelf1 libfontconfig1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 libnghttp2-14 libnotify4 libnuma1 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libtinfo6 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.5: Ansys Dynamic Reporting

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib gnutls gstreamer1 gstreamer1-plugins-base hunspell jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap orc p11-kit perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib gmp gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap orc perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux	cyrus-sasl-lib gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt libzstd lz4-libs

Operating System	Packages
9 and Rocky Linux 9	nss-softokn openldap openldap-compat orc perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	hunspell libXft2 libXss1 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxkbcommon-x11-0 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	libXft2 libXss1 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1 libzstd1

Table 2.6: Customization Files for User Programmable Features

Operating System	Packages
Red Hat Enterprise Linux and	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs

Operating System	Packages
CentOS 7	
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1

Operating System	Packages
	libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.7: Aqwa

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14

Operating System	Packages
	libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.8: Autodyn

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1

Operating System	Packages
Enterprise Server and Desktop 15	libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.9: Catia, Version 5 Geometry Interface

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libgcrypt libibverbs libpng12 libquadmath libstdc++ libtasn1 libtiff libuuid-devel libxml2 libxslt lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libibverbs libomp libpng libpng12 libquadmath libstdc++ libtiff libuuid-devel libxml2 libxslt lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	abseil-cpp fontconfig grpc grpc-cpp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libibverbs libnl3 libomp libpng libpng12 libquadmath libtiff libuuid-devel libwebp libxslt libzstd lz4-libs motif pcre pixman re2 sqlite-libs ucx xz-libs
SUSE Linux Enterprise Server and	abseil-cpp fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-xfixes0 libxcb1 libxml2-2 libxslt1

Operating System	Packages
Desktop 12	
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 librdmacm1 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1 libxml2-2 libxslt1
Ubuntu 20.04 LTS	libbsd0 libcurl4-gnutls-dev libelf1 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev
Ubuntu 22.04 LTS	libbsd0 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libpython3.10 libquadmath0 libre2-9 libsm6 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev

Table 2.10: CFD-Post only

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4

Operating System	Packages
Enterprise Server and Desktop 12	libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.11: CFX (includes CFD-Post)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs

Operating System	Packages
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1

Table 2.12: Chemkin

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs

Operating System	Packages
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1

Operating System	Packages
	libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.13: DCS (Distributed Compute Services)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig gmp gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libgcc libgcrypt libgfortran5 libibverbs libquadmath libtasn1 libtiff libxml2 libxslt lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libgcc libgfortran libibverbs libomp libpng libquadmath libtiff libxml2 libxslt lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	fontconfig hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libgfortran libibverbs libnl3 libomp libpng libquadmath libtiff libwebp libxcrypt-compat libxslt libzstd lz4-libs motif pcre pixman ucx xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgfortran5 libgmp10 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng16-16 libquadmath0 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-xfixes0 libxcb1 libxml2-2 libxslt1
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgfortran5 libgmp10 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng16-16 libquadmath0 librdmacm1 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1 libxml2-2 libxslt1
Ubuntu 20.04 LTS	libbsd0 libcrypt1 libcurl4-gnutls-dev libfontconfig1 libgfortran5 libgmp10 libhwloc15 libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1
Ubuntu 22.04 LTS	libbsd0 libcrypt1 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libgfortran5 libgmp10 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libucx0 libudev1

Operating System	Packages
	libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1

Table 2.14: EnSight

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	audit-libs compat-opensm-libs cyrus-sasl-lib freetype gnutls gstreamer1 gstreamer1-plugins-base gtk2 hunspell jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl libcurl-devel libfontenc libgcc libgcrypt libglvnd-glx libibverbs libidn libpng libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nettle nss-softokn openldap openssl-libs orc p11-kit pam pciutils-libs pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux and CentOS 8	audit-libs brotli bzip2-libs cyrus-sasl-lib freetype gmp gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl-devel libcurl-minimal libfontenc libgcc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libomp libpng libpsl libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nss-softokn openldap orc pam pciutils-libs perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	audit-libs bzip2-libs cyrus-sasl-lib freetype gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libbrotli libcap-ng libcurl-devel libcurl-minimal libeconf libevent libfontenc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libnl3 libomp libpng libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt nss-softokn openldap openldap-compat orc pam pciutils-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
SUSE Linux Enterprise Server and Desktop 12	Mesa-libGL1 Mesa-libglapi0 hunspell libX11-6 libX11-xcb1 libXau6 libXdmcp6 libXext6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-glx0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxslt1 pam perl
SUSE Linux Enterprise Server and Desktop 15	libX11-6 libXau6 libXdmcp6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0

Operating System	Packages
	libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 pam perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontenc1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libfontenc1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1

Table 2.15: FENSAP-ICE

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs

Operating System	Packages
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.16: Fluent (includes CFD-Post)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	audit-libs compat-opensm-libs cyrus-sasl-lib freetype gnutls gstreamer1 gstreamer1-plugins-base gtk2 hunspell jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl libcurl-devel libfontenc libgcc libgcrypt libglvnd-glx libibverbs libidn libpng libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nettle nss-softokn openldap openssl-libs orc p11-kit pam pciutils-libs pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux and	audit-libs brotli bzip2-libs cyrus-sasl-lib freetype gmp gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl-devel libcurl-minimal libfontenc libgcc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libomp libpng libpsl libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nss-softokn openldap

Operating System	Packages
CentOS 8	orc pam pciutils-libs perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	audit-libs bzip2-libs cyrus-sasl-lib freetype gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libbrotli libcap-ng libcurl-devel libcurl-minimal libeconf libevent libfontenc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libnl3 libomp libpng libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt nss-softokn openldap openldap-compat orc pam pciutils-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
SUSE Linux Enterprise Server and Desktop 12	Mesa-libGL1 Mesa-libglapi0 hunspell libX11-6 libX11-xcb1 libXau6 libXdmcp6 libXext6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-glx0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxslt1 pam perl
SUSE Linux Enterprise Server and Desktop 15	libX11-6 libXau6 libXdmcp6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 pam perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontenc1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libfontenc1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1

Operating System	Packages
	libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1

Table 2.17: Forte (includes EnSight)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib gnutls gstreamer1 gstreamer1-plugins-base hunspell jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap orc p11-kit perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib gmp gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap orc perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libXScrnSaver libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt libzstd lz4-libs nss-softokn openldap openldap-compat orc perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	hunspell libXft2 libXss1 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxkbcommon-x11-0 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	libXft2 libXss1 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 perl

Operating System	Packages
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1 libzstd1

Table 2.18: ICEM CFD

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	libICE.i686 libSM.i686 libX11.i686 libXau.i686 libXt.i686 libgcc.i686 libstdc++.i686 libuuid.i686 libxcb.i686 compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	libICE.i686 libSM.i686 libX11.i686 libXau.i686 libXt.i686 libgcc.i686 libstdc++.i686 libuuid.i686 libxcb.i686 brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	libICE.i686 libSM.i686 libX11.i686 libXau.i686 libXt.i686 libgcc.i686 libstdc++.i686 libuuid.i686 libxcb.i686 cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise	libICE6-32bit libSM6-32bit libX11-6-32bit libXau6-32bit libXt6-32bit libgcc_s1-32bit libstdc++6-32bit libuuid1-32bit libxcb1-32bit fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8

Operating System	Packages
Server and Desktop 12	libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	libX11-6-32bit libXau6-32bit libXt6-32bit libgcc_s1-32bit libstdc++6-32bit libxcb1-32bit fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libgcc1:i386 libstdc++6:i386 libx11-6:i386 libxt6:i386 libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libgcc-s1:i386 libstdc++6:i386 libx11-6:i386 libxt6:i386 libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.19: Icepak (includes CFD-Post)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-libf2c-34.i686 compat-libstdc++-33.i686 libX11.i686 libXau.i686 libXext.i686 libgcc.i686 libglvnd-glx.i686 libxcb.i686 audit-libs compat-opensm-libs cyrus-sasl-lib freetype gnutls gstreamer1 gstreamer1-plugins-base hunspell jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl libcurl-devel libfontenc libgcc libgcrypt libglvnd-glx libibverbs libidn libpng libpng12 libquadmath libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nettle nss-softokn openldap openssl-libs orc p11-kit pam pciutils-libs pcre perl-libs pixman qt3 ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux	libX11.i686 libXau.i686 libXext.i686 libgcc.i686 libglvnd-glx.i686 libxcb.i686 audit-libs brotli bzip2-libs cyrus-sasl-lib freetype gmp gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl-devel libcurl-minimal libfontenc libgcc libglvnd libglvnd-egl libglvnd-glx libibverbs

Operating System	Packages
and CentOS 8	libnghttp2 libomp libpng libpng12 libpsl libquadmath libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nss-softokn openldap orc pam pciutils-libs perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	libX11.i686 libXau.i686 libXext.i686 libgcc.i686 libglvnd-glx.i686 libxcb.i686 audit-libs bzip2-libs cyrus-sasl-lib freetype gstreamer1 gstreamer1-plugins-base hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libbrotli libcap-ng libcurl-devel libcurl-minimal libeconf libevent libfontenc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libnl3 libomp libpng libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt nss-softokn openldap openldap-compat orc pam pciutils-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
SUSE Linux Enterprise Server and Desktop 12	Mesa-libGL1-32bit Mesa-libglapi0-32bit libX11-6-32bit libX11-xcb1-32bit libXau6-32bit libXdamage1-32bit libXext6-32bit libXfixes3-32bit libXxf86vm1-32bit libdrm2-32bit libexpat1-32bit libg2c33-32bit libgcc_s1-32bit libstdc++33-32bit libxcb-dri2-0-32bit libxcb-dri3-0-32bit libxcb-glx0-32bit libxcb-present0-32bit libxcb-sync1-32bit libxcb1-32bit libxshmfence1-32bit Mesa-libGL1 Mesa-libglapi0 hunspell libX11-6 libX11-xcb1 libXau6 libXdmcp6 libXext6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpci3 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-glx0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxslt1 pam perl
SUSE Linux Enterprise Server and Desktop 15	libX11-6-32bit libXau6-32bit libXext6-32bit libgcc_s1-32bit libglvnd-32bit libxcb1-32bit libX11-6 libXau6 libXdmcp6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libibverbs1 libjbig2 libldap-2_4-2 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpci3 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libpsl5 libquadmath0 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 pam perl
Ubuntu 20.04 LTS	libgcc1:i386 libgl1:i386 libstdc++5:i386 libx11-6:i386 libxext6:i386 libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontenc1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libkrb5-26-heimdal libldap-2.4-2 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0

Operating System	Packages
	libxcb-xinerama0 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libgcc-s1:i386 libgl1:i386 libstdc++5:i386 libx11-6:i386 libxext6:i386 libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libfontenc1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libldap-2.5-0 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1

Table 2.20: Ansys, Inc. License Manager

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	bzip2-libs expat fontconfig freetype glib2 glibc libICE libSM libX11 libXau libXext libXrender libgcc libpng libstdc++ libuuid libxcb pcre redhat-lsb-core zlib
Red Hat Enterprise Linux and CentOS 8	bzip2-libs expat fontconfig freetype glib2 glibc gmp gnutls libICE libSM libX11 libXau libXext libXrender libffi libgcc libidn2 libpng libstdc++ libtasn1 libunistring libuuid libxcb nettle p11-kit pcre redhat-lsb-core zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	bzip2-libs fontconfig freetype glib2 glibc graphite2 harfbuzz libICE libSM libX11 libXau libXext libXrender libbrotli libgcc libpng libstdc++ libuuid libxcb libxml2 pcre redhat-lsb-core xz-libs zlib
SUSE Linux Enterprise Server and Desktop 12	fontconfig glibc libICE6 libSM6 libX11-6 libXau6 libXext6 libXrender1 libbz2-1 libexpat1 libfreetype6 libgcc_s1 libglib-2_0-0 libgthread-2_0-0 libpcre1 libpng16-16 libstdc++6 libuuid1 libxcb1 libz1
SUSE Linux Enterprise Server and Desktop 15	fontconfig glibc libICE6 libSM6 libX11-6 libXau6 libXext6 libXrender1 libbz2-1 libexpat1 libfreetype6 libgcc_s1 libglib-2_0-0 libgthread-2_0-0 libpcre1 libpng16-16 libstdc++6 libuuid1 libxcb1 libz1
Ubuntu 20.04 LTS	libbsd0 libc6 libexpat1 libfontconfig1 libfreetype6 libgcc-s1 libglib2.0-0 libice6 libpcre3 libpng16-16 libsm6 libstdc++6 libuuid1 libx11-6 libxau6 libxcb1 libxdmcp6 libxext6 libxrender1 zlib1g

Operating System	Packages
Ubuntu 22.04 LTS	libbrotli1 libbsd0 libc6 libexpat1 libfontconfig1 libfreetype6 libgcc-s1 libglib2.0-0 libice6 libmd0 libpcre3 libpng16-16 libsm6 libstdc++6 libuuid1 libx11-6 libxau6 libxcb1 libxdmcp6 libxext6 libxrender1 zlib1g

Table 2.21: LS-DYNA

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gtk2 libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libibverbs libicu libidn libnotify libogg libpng12 libsecret libssh2 libstdc++ libtasn1 libtheora libvorbis libxml2 libxshmfence libxslt lz4 nss-softokn openjpeg2 openldap openssl-libs p11-kit pcre perl-libs ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli bzip2-libs cyrus-sasl-lib fontconfig gtk2 hwloc-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnotify libogg libomp libpng12 libpsl libsecret libssh libstdc++ libtheora libvorbis libxml2 libxshmfence libxslt lz4-libs nss-softokn openjpeg2 openldap openssl-libs pcre perl-devel ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	bzip2-libs cyrus-sasl-lib fontconfig gtk2 hwloc-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libnotify libogg libomp libpng12 libpsl libsecret libssh libtheora libvorbis libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openjpeg2 openldap pcre perl-devel ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libavutil56 libbz2-1 libcurl4 libgcc_s1 libgcrypt20 libgpg-error0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libldap-2_4-2 liblzma5 libnghttp2-14 libnotify4 libogg0 libopenjp2-7 libopenssl1_0_0 libp11-kit0 libpcre1 libpng12-0 libsasl2-3 libsecret-1-0 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtheora0 libucm0 libucp0 libucs0 libuct0 libudev1 libvdpau1 libvorbis0 libvorbisenc2 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libavutil56 libbz2-1 libcurl4 libgcc_s1 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnotify4 libnuma1 libogg0 libomp5-devel libopenjp2-7 libopenssl1_1 libpcre1 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsecret-1-0 libsoftokn3 libssh4 libstdc++6 libtheoradec1 libtheoraenc1 libucm0 libucp0 libucs0 libuct0 libudev1 libva-drm2 libva2 libvdpau1 libvorbis0 libvorbisenc2 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl

Operating System	Packages
Ubuntu 20.04 LTS	libasn1-8-heimdal libavutil56 libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libnotify4 libogg0 libopenjp2-7 libperl-dev libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libsecret-1-0 libssh-4 libssl1.1 libtheora0 libudev1 libva-drm2 libva-x11-2 libva2 libvdpau1 libvorbis0a libvorbisenc2 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libavutil56 libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libfontconfig1 libglvnd0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libmfx1 libnghttp2-14 libnotify4 libogg0 libopenjp2-7 libperl-dev libpsl5 librtmp1 libsasl2-2 libsecret-1-0 libssh-4 libssl3 libtheora0 libucx0 libudev1 libva-drm2 libva-x11-2 libva2 libvdpau1 libvorbis0a libvorbisenc2 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.22: Mechanical Products

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls gstreamer1 gstreamer1-plugins-base gtk2 jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libnotify libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt libzstd lz4 nettle nss-softokn numactl-libs openldap openssl-libs orc p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xterm
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib elfutils-libelf fontconfig gmp gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnotify libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn nss-softokn-freebl numactl-libs openldap openssl-libs orc pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xterm
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib elfutils-libelf fontconfig gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libnotify libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn nss-softokn-freebl numactl-libs openldap orc pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xterm
SUSE Linux	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libfreebl3 libgcc_s1 libgnutls28 libgstreamer-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0

Operating System	Packages
Enterprise Server and Desktop 12	libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 libncurses6 libnettle4 libnghttp2-14 libnotify4 libnuma1 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 libzstd1 perl xterm
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libfreebl3 libgcc_s1 libgstreamer-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 libncurses6 libnghttp2-14 libnl3-200 libnotify4 libnuma1 libomp5-devel libopenssl1_1 liborc-0_4-0 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 libzstd1 perl xterm
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdrm-amdgpu1 libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 libnghttp2-14 libnotify4 libnuma1 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libtinfo6 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1 xterm
Ubuntu 22.04 LTS	libbrotli1 libbz2-1.0 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdrm-amdgpu1 libdw1 libegl1 libelf1 libfontconfig1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 libnghttp2-14 libnotify4 libnuma1 liborc-0.4-0 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libtinfo6 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1 xterm

Table 2.23: Model Fuel Library (Encrypted)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs

Operating System	Packages
Linux and CentOS 8	nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1

Operating System	Packages
	libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.24: Motion

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14

Operating System	Packages
	libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.25: NX Geometry Interface

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libgcrypt libibverbs libpng12 libquadmath libstdc++ libtasn1 libtiff libuuid-devel libxml2 libxslt lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libibverbs libomp libpng libpng12 libquadmath libstdc++ libtiff libuuid-devel libxml2 libxslt lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	abseil-cpp fontconfig grpc grpc-cpp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libibverbs libnl3 libomp libpng libpng12 libquadmath libtiff libuuid-devel libwebp libxslt libzstd lz4-libs motif pcre pixman re2 sqlite-libs ucx xz-libs
SUSE Linux Enterprise Server and Desktop 12	abseil-cpp fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-xfixes0 libxcb1 libxml2-2 libxslt1
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 librdmacm1 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1 libxml2-2 libxslt1

Operating System	Packages
Ubuntu 20.04 LTS	libbsd0 libcurl4-gnutls-dev libelf1 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev
Ubuntu 22.04 LTS	libbsd0 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libpython3.10 libquadmath0 libre2-9 libsm6 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev

Table 2.26: optiSLang

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	flac-libs fontconfig freetype gsm jbigkit-libs libICE libSM libX11 libXau libXext libXtst libXxf86vm libasyncns libgcrypt libglvnd-glx libglvnd-opengl libogg libreoffice-ure libsndfile libtiff libvorbis libxkbcommon-x11 libxml2 lz4 mesa-libGLU octave openssl-libs pcre pixman pulseaudio-libs pulseaudio-libs-glib2 tcp_wrappers-libs xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	bzip2-libs flac-libs fontconfig freetype gmp gsm jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXtst libXxf86vm libasyncns libglvnd libglvnd-egl libglvnd-glx libglvnd-opengl libogg libpng libreoffice-ure libsndfile libtiff libvorbis libxkbcommon-x11 libxml2 lz4-libs mesa-libGLU pcre pixman pulseaudio-libs pulseaudio-libs-glib2 xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	bzip2-libs flac-libs fontconfig freetype gsm jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXtst libXxf86vm libasyncns libbrotli libglvnd libglvnd-egl libglvnd-glx libglvnd-opengl libogg libpng libreoffice-ure libsndfile libtiff libvorbis libwebp libxcrypt-compat libxkbcommon-x11 libzstd lz4-libs mesa-libGLU opus pcre pixman pulseaudio-libs pulseaudio-libs-glib2 xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	Mesa-libglapi0 fontconfig libFLAC8 libGLU1 libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXtst6 libXxf86vm1 libbz2-1 libfreetype6 libgcrypt20 libgpg-error0 libgthread-2_0-0 libjbig2 libjpeg8 libjson-c2 liblzma5 libogg0 libopenssl1_0_0 libpcre1 libpixman-1-0 libpng16-16 libpulse-mainloop-glib0 libpulse0 libsndfile1 libspeex1 libsystemd0 libtiff5 libvorbis0 libvorbisenc2 libwayland-client0 libwrap0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2
SUSE Linux Enterprise	fontconfig libFLAC8 libGLU1 libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXtst6 libXxf86vm1 libbz2-1 libfreetype6 libgmp10 libgthread-2_0-0 libjbig2 libjpeg8 liblz4-1 liblzma5 libogg0 libpcre1 libpixman-1-0 libpng16-16 libpulse-mainloop-glib0

Operating System	Packages
Server and Desktop 15	libpulse0 libsndfile1 libspeex1 libtiff5 libvorbis0 libvorbisenc2 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2
Ubuntu 20.04 LTS	libapparmor1 libasyncns0 libbsd0 libcrypt1 libegl1 libflac8 libfontconfig1 libfreetype6 libglu1-mesa libglvnd0 libglx0 libgmp10 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libogg0 libopengl0 libpixman-1-0 libpng16-16 libpulse-mainloop-glib0 libpulse0 libsm6 libsndfile1 libtiff5 libvorbis0a libvorbisenc2 libwebp6 libwrap0 libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxkbcommon-x11-0 libxml2 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libapparmor1 libasyncns0 libbrotli1 libbsd0 libcrypt1 libdeflate0 libegl1 libflac8 libfontconfig1 libfreetype6 libglu1-mesa libglvnd0 libglx0 libgmp10 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libogg0 libopengl0 libopus0 libpixman-1-0 libpng16-16 libpulse-mainloop-glib0 libpulse0 libsm6 libsndfile1 libtbb12 libtiff5 libvorbis0a libvorbisenc2 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxkbcommon-x11-0 libxml2 libxtst6 libxxf86vm1 libzstd1

Table 2.27: Parasolid Geometry Interface

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libgcrypt libibverbs libpng12 libquadmath libstdc++ libtasn1 libtiff libuuid-devel libxml2 libxslt lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcc libibverbs libomp libpng libpng12 libquadmath libstdc++ libtiff libuuid-devel libxml2 libxslt lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	abseil-cpp fontconfig grpc grpc-cpp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libcurl-devel libibverbs libnl3 libomp libpng libpng12 libquadmath libtiff libuuid-devel libwebp libxslt libzstd lz4-libs motif pcre pixman re2 sqlite-libs ucx xz-libs
SUSE Linux Enterprise Server and	abseil-cpp fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-xfixes0 libxcb1 libxml2-2 libxslt1

Operating System	Packages
Desktop 12	
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng12-0 libpng16-16 libquadmath0 librdmacm1 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1 libxml2-2 libxslt1
Ubuntu 20.04 LTS	libbsd0 libcurl4-gnutls-dev libelf1 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev
Ubuntu 22.04 LTS	libbsd0 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libpython3.10 libquadmath0 libre2-9 libsm6 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxslt1.1 libxt6 libzstd1 uuid-dev

Table 2.28: Polyflow (includes CFD-Post)

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	audit-libs compat-opensm-libs cyrus-sasl-lib freetype gnutls gstreamer1 gstreamer1-plugins-base gtk2 hunspell jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl libcurl-devel libfontenc libgcc libgcrypt libglvnd-glx libibverbs libidn libpng libssh2 libstdc++ libtasn1 libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nettle nss-softokn openldap openssl-libs orc p11-kit pam pciutils-libs pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux and CentOS 8	audit-libs brotli bzip2-libs cyrus-sasl-lib freetype gmp gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libcap-ng libcurl-devel libcurl-minimal libfontenc libgcc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libomp libpng libpsl libssh libstdc++ libtiff libxkbcommon-x11 libxml2 libxshmfence libxslt nss-softokn openldap orc pam pciutils-libs perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib
Red Hat Enterprise Linux 9 and Rocky Linux 9	audit-libs bzip2-libs cyrus-sasl-lib freetype gstreamer1 gstreamer1-plugins-base gtk2 hwloc-libs jbigkit-libs libX11 libXScrnSaver libXau libXdmcp libXext libXft libXtst libXxf86vm libbrotli libcap-ng libcurl-devel libcurl-minimal libeconf libevent libfontenc libglvnd libglvnd-egl libglvnd-glx libibverbs libnghttp2 libnl3 libomp libpng libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxkbcommon-x11 libxshmfence libxslt nss-softokn openldap openldap-compat orc pam pciutils-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs zlib

Operating System	Packages
SUSE Linux Enterprise Server and Desktop 12	Mesa-libGL1 Mesa-libglapi0 hunspell libX11-6 libX11-xcb1 libXau6 libXdmcp6 libXext6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgnutls28 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libp11-kit0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-glx0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxslt1 pam perl
SUSE Linux Enterprise Server and Desktop 15	libX11-6 libXau6 libXdmcp6 libXfont1 libXft2 libXss1 libXtst6 libXxf86vm1 libaudit1 libbz2-1 libcurl4 libfontenc1 libfreetype6 libgcc_s1 libgstapp-1_0-0 libgstaudio-1_0-0 libgstpbutils-1_0-0 libgstreamer-1_0-0 libgsttag-1_0-0 libgstvideo-1_0-0 libgthread-2_0-0 libgtk-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel liborc-0_4-0 libpci3 libpcre1 libpixman-1-0 libpng16-16 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libunwind libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxcb1 libxkbcommon-x11-0 libxml2-2 libxshmfence1 libxslt1 pam perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontenc1 libglvnd0 libgssapi3-heimdal libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdw1 libegl1 libelf1 libfontenc1 libglvnd0 libgstreamer-plugins-base1.0-0 libgstreamer1.0-0 libgtk2.0-0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblzma5 libnghttp2-14 liborc-0.4-0 libpam0g libpci3 libperl-dev libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libunwind8 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxdmcp6 libxft2 libxkbcommon-x11-0 libxml2 libxshmfence1 libxslt1.1 libxss1 libxtst6 libxxf86vm1

Table 2.29: Reaction Workbench

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs

Operating System	Packages
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1

Operating System	Packages
	libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.30: Remote Solve Manager Standalone Services

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gmp gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libgfortran5 libibverbs libidn libquadmath libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 motif nettle nss-softokn openldap openssl-libs p11-kit pcre pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib fontconfig gmp hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libgfortran libglvnd libglvnd-egl libibverbs libnghttp2 libomp libpsl libquadmath libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs motif nss-softokn openldap openssl-libs pcre pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libICE libSM libX11 libX11-xcb libXau libXext libXft libXmu libXp libXt libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libgfortran libglvnd libglvnd-egl libibverbs libnghttp2 libnl3 libomp libpsl libquadmath libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs motif nss-softokn openldap pcre pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgfortran5 libgmp10 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libquadmath0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxml2-2 libxslt1
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgfortran5 libgmp10 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpsl5 libquadmath0 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxml2-2 libxshmfence1 libxslt1

Operating System	Packages
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libbsd0 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libfontconfig1 libgfortran5 libglvnd0 libgmp10 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libice6 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libpixman-1-0 libpsl5 libquadmath0 libroken18-heimdal librtmp1 libsasl2-2 libsm6 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxshmfence1 libxslt1.1 libxt6 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libbsd0 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libgfortran5 libglvnd0 libgmp10 libhwloc15 libibverbs1 libice6 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libmd0 libnghttp2-14 libpixman-1-0 libpsl5 libquadmath0 librtmp1 libsasl2-2 libsm6 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libx11-xcb1 libxau6 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xfixes0 libxcb-xinerama0 libxcb-xkb1 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxml2 libxmu6 libxshmfence1 libxslt1.1 libxt6 libxtst6 libxxf86vm1 libzstd1

Table 2.31: Sherlock

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt libzstd lz4 nettle nss-softokn numactl-libs openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	brotli cyrus-sasl-lib elfutils-libelf fontconfig gmp hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn numactl-libs openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux 9 and Rocky Linux 9	cyrus-sasl-lib elfutils-libelf fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs ncurses-libs nss-softokn numactl-libs openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2

Operating System	Packages
Enterprise Server and Desktop 12	liblzma5 libncurses6 libnettle4 libnghttp2-14 libnuma1 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 libzstd1 perl
SUSE Linux Enterprise Server and Desktop 15	fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libdrm_amdgpu1 libelf1 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libncurses6 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 libzstd1 perl
Ubuntu 20.04 LTS	libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdrm-amdgpu1 libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libnuma1 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libtinfo6 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libdrm-amdgpu1 libegl1 libelf1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libnuma1 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libtinfo6 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

Table 2.32: Speos HPC

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	compat-opensm-libs fontconfig freetype gmp gnutls jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgcrypt libgfortran5 libglvnd-glx libgomp libibverbs libquadmath libtasn1 libtiff lz4 motif nettle openssl-libs p11-kit pcre pixman ucx xz-libs
Red Hat Enterprise Linux and CentOS 8	bzip2-libs fontconfig freetype gmp hwloc-libs jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libcurl-devel libffi libgfortran libglvnd libglvnd-glx libgomp libibverbs libomp libpng libquadmath libtiff lz4-libs motif openssl-libs pcre pixman ucx xz-libs
Red Hat Enterprise Linux 9 and	bzip2-libs fontconfig freetype hwloc-libs jbigkit-libs libICE libSM libX11 libXau libXext libXft libXmu libXp libXt libbrotli libcurl-devel libgfortran libglvnd libglvnd-glx libgomp libibverbs libnl3 libomp libpng libquadmath libtiff libwebp libzstd lz4-libs motif pcre pixman sqlite-libs ucx xz-libs

Operating System	Packages
Rocky Linux 9	
SUSE Linux Enterprise Server and Desktop 12	Mesa-libGL1 Mesa-libglapi0 fontconfig libICE6 libSM6 libX11-6 libX11-xcb1 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libXxf86vm1 libbz2-1 libcurl4 libfreetype6 libgfortran5 libgmp10 libgnutls28 libgomp1 libhogweed2 libibverbs1 libjbig2 libjpeg8 liblzma5 libnettle4 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng16-16 libquadmath0 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-glx0 libxcb-xfixes0 libxcb1
SUSE Linux Enterprise Server and Desktop 15	fontconfig libICE6 libSM6 libX11-6 libXau6 libXext6 libXft2 libXm4 libXmu6 libXp6 libXt6 libbz2-1 libcurl4 libfreetype6 libgfortran5 libgmp10 libgomp1 libibverbs1 libjbig2 libjpeg8 liblz4-1 liblzma5 libnl3-200 libnuma1 libomp5-devel libpcre1 libpixman-1-0 libpng16-16 libquadmath0 librdmacm1 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb1
Ubuntu 20.04 LTS	libbsd0 libcurl4-gnutls-dev libfontconfig1 libfreetype6 libgfortran5 libgl1 libglvnd0 libglx0 libgmp10 libgomp1 libhwloc15 libibverbs1 libice6 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libudev1 libwebp6 libx11-6 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxmu6 libxt6 libzstd1
Ubuntu 22.04 LTS	libbrotli1 libbsd0 libcurl4-gnutls-dev libdeflate0 libfontconfig1 libfreetype6 libgfortran5 libgl1 libglvnd0 libglx0 libgmp10 libgomp1 libhwloc15 libibverbs1 libice6 libjbig0 libjpeg-turbo8 liblz4-1 liblzma5 libmd0 libpixman-1-0 libpng16-16 libquadmath0 libsm6 libtiff5 libucx0 libudev1 libwebp7 libx11-6 libxau6 libxcb1 libxdmcp6 libxext6 libxft2 libxm4 libxmu6 libxt6 libzstd1

Table 2.33: TurboGrid

Operating System	Packages
Red Hat Enterprise Linux and CentOS 7	libgcc.i686 compat-opensm-libs cyrus-sasl-lib fontconfig gnutls jbigkit-libs libXft libXtst libXxf86vm libcurl libcurl-devel libgcc libgcrypt libibverbs libicu libidn libpng12 libssh2 libstdc++ libtasn1 libtiff libxml2 libxshmfence libxslt lz4 nettle nss-softokn openldap openssl-libs p11-kit pcre perl-libs pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat Enterprise Linux and CentOS 8	libgcc.i686 brotli cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libcurl-devel libcurl-minimal libgcc libglvnd libglvnd-egl libibverbs libicu50 libnghttp2 libomp libpng12 libpsl libssh libstdc++ libtiff libxml2 libxshmfence libxslt lz4-libs nss-softokn openldap openssl-libs pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
Red Hat	libgcc.i686 cyrus-sasl-lib fontconfig hwloc-libs jbigkit-libs libXft libXtst libXxf86vm libbrotli libcurl-devel libcurl-minimal libevent libglvnd libglvnd-egl libibverbs libicu50

Operating System	Packages
Enterprise Linux 9 and Rocky Linux 9	libnghttp2 libnl3 libomp libpng12 libpsl libssh libtiff libwebp libxcrypt libxcrypt-compat libxshmfence libxslt libzstd lz4-libs nss-softokn openldap pcre perl-devel pixman ucx xcb-util xcb-util-image xcb-util-keysyms xcb-util-renderutil xcb-util-wm xz-libs
SUSE Linux Enterprise Server and Desktop 12	libgcc_s1-32bit fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgnutls28 libgthread-2_0-0 libhogweed2 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblzma5 libnettle4 libnghttp2-14 libopenssl1_0_0 libp11-kit0 libpcre1 libpixman-1-0 libpng12-0 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtasn1-6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libwayland-client0 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-util1 libxcb-xkb1 libxml2-2 libxslt1 perl
SUSE Linux Enterprise Server and Desktop 15	libgcc_s1-32bit fontconfig libXft2 libXtst6 libXxf86vm1 libcurl4 libgcc_s1 libgthread-2_0-0 libibverbs1 libjbig2 libjpeg8 libldap-2_4-2 liblz4-1 liblzma5 libnghttp2-14 libnl3-200 libnuma1 libomp5-devel libopenssl1_1 libpcre1 libpixman-1-0 libpng12-0 libpsl5 librdmacm1 libsasl2-3 libsoftokn3 libssh4 libstdc++6 libtiff5 libucm0 libucp0 libucs0 libuct0 libudev1 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxml2-2 libxshmfence1 libxslt1 perl
Ubuntu 20.04 LTS	libgcc1:i386 libasn1-8-heimdal libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libegl1 libelf1 libfontconfig1 libglvnd0 libgssapi3-heimdal libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhwloc15 libhx509-5-heimdal libibverbs1 libicu66 libjbig0 libjpeg-turbo8 libkrb5-26-heimdal libldap-2.4-2 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 libroken18-heimdal librtmp1 libsasl2-2 libssh-4 libssl1.1 libtiff5 libudev1 libwebp6 libwind0-heimdal libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1
Ubuntu 22.04 LTS	libgcc-s1:i386 libbrotli1 libcrypt1 libcurl4 libcurl4-gnutls-dev libdeflate0 libegl1 libfontconfig1 libglvnd0 libhwloc15 libibverbs1 libicu70 libjbig0 libjpeg-turbo8 libldap-2.5-0 liblz4-1 liblzma5 libnghttp2-14 libperl-dev libpixman-1-0 libpsl5 librtmp1 libsasl2-2 libssh-4 libssl3 libtiff5 libucx0 libudev1 libwebp7 libxcb-icccm4 libxcb-image0 libxcb-keysyms1 libxcb-randr0 libxcb-render-util0 libxcb-shape0 libxcb-sync1 libxcb-util1 libxcb-xkb1 libxft2 libxml2 libxshmfence1 libxslt1.1 libxtst6 libxxf86vm1 libzstd1

2.2. Additional Library Details

Ansys Workbench

If you are running Ansys Workbench using the KDE desktop environment, set the focus stealing prevention level to "None" to prevent the project save dialog boxes from appearing behind the application window:

1. Use the **`kcontrol`** command to launch the KDE Control Center.

2. In the Control Center window, select **Desktop> Window Behavior> Advanced**.

3. Change **Focus Stealing Prevention Level** to None.

4. Click **Apply**.

If you are running on KDE 4 or if the **kcontrol** command does not exist, use System Settings to set the focus stealing prevention setting level to "None":

1. Use the **systemsettings** command to launch the System Settings.

2. In the System Settings window, select **General> Window Behavior> Focus**.

3. Change **Focus Stealing Prevention Level** to None.

4. Click **Apply**.

Ansys Mechanical, DesignModeler or Meshing Editor

When using Ansys Mechanical, DesignModeler or Meshing Editor on the Red Hat Enterprise Linux 8 platform, you must install the libnsl and libnsl2 system libraries.

Semaphore Limit

On some Linux systems, Ansys Workbench reaches a system limit on the number of semaphores in the Linux configuration. In this case, you will see a message similar to the following:

sem_lock->semop->op_op: Invalid argument

sem_unlock->semctl: Invalid argument

To increase the number of semaphores, run the following command as owner or root:

```
% echo 256 40000 32 32000 > /proc/sys/kernel/sem
```

This modification takes effect immediately, but is reset at the next reboot. To avoid resetting the limit when rebooting, add the above command to one of your system's startup scripts by copying the command into a file called `mod_sem` and then setting up the following links to execute the file each time you restart your system:

```
cp mod_sem /etc/init.d
ln -s /etc/init.d/mod_sem /etc/rc3.d/S61mod_sem
ln -s /etc/init.d/mod_sem /etc/rc5.d/S61mod_sem
```

Mechanical, Meshing, and DesignModeler Applications

If you are using a localized operating system (such as French or German), you must set the `mwcontrol` VisualMainWin control on any machines running these applications in order for these applications to recognize the correct numerical format. Ansys Workbench must already be installed before setting this control.

First, you need to ensure that the `/v241/aisol/WBMWRegistry/` directory has write permissions. From the `/v241/aisol/` directory, issue the following command:

```
chmod -R 777 WBMWRegistry/
```

Then, use the following procedure to set `mwcontrol` for your locale:

1. cd to <*wb_install directory*>/v241/aisol
2. Issue the following command:

```
./.workbench -cmd mwcontrol
```

3. On the **MainWin Control Panel**, select **Regional Settings**.
4. Select the **Regional Settings** tab.
5. Change the language in the dropdown to match the language you want to use.
6. Check the **Set as system default locale** option.
7. Click **Apply** to accept the changes, and then click **OK** to dismiss the **Change Regional Settings** notification.

Using Fluent with MPI

On some operating systems, the default amount of physical memory that can be pinned/locked by a user application is set to a low value and must be explicitly increased. A value recommended by Intel is 90% of the physical memory. Therefore, the following should be added to the `/etc/security/limits.conf` file:

```
* hard memlock unlimited
* soft memlock unlimited
```

The need for increasing the limits may be indicated by the following error message with Platform MPI:

```
fluent_mpi.16.0.0: Rank 0:1: MPI_Init: ibv_create_cq() failed
fluent_mpi.16.0.0: Rank 0:1: MPI_Init: Can't initialize RDMA device
fluent_mpi.16.0.0: Rank 0:1: MPI_Init: MPI BUG: Cannot initialize RDMA protocol
libibverbs: Warning: RLIMIT_MEMLOCK is 32768 bytes.
This will severely limit memory registrations
```

When Fluent is launched by a scheduler (like PBSPro, SGE, etc.), these limits may be reset by the scheduler. You may check running the "limit" command within and without the scheduler to compare. Any differences indicate the issue above.

If you use PBSPro, add **`ulimit -l unlimited`** directly in the `pbs_mom` startup script, and let PBS reload the `pbs_mom`.

If you use SGE, you must change the startup script `/etc/init.d/sgeexecd` to include the **`ulimit -l unlimited`** command as shown in the following example:

```
-- BEGIN --
if [ "$startup" = true ]; then
# execution daemon is started on this host!
echo " starting SGE_execd"
exec 1>/dev/null 2>&1
ulimit -l unlimited
$bin_dir/SGE_execd
else
-- END --
```

Once this modification is in place, restart SGE to set the correct memory limits on the SGE daemon and any invoked processes.

Using Mechanical APDL with MPI

On some operating systems, the default amount of physical memory that can be pinned/locked by a user application is set to a low value and must be explicitly increased. A value recommended by Intel is 90% of the physical memory. Therefore, the following should be added to the `/etc/security/limits.conf` file:

```
* hard memlock unlimited
* soft memlock unlimited
```

This behavior has been observed on Intel MPI 4.1.3, but might also occur on Platform MPI 9.1.4.2.

System Libraries

On 64-bit Linux (linx64) systems, the Ansys Release 2024 R1 executable is looking for system libraries that do not have revision numbers appended to the end of their file names. On some SUSE systems, the graphics libraries all have revision numbers appended to the end of the library filenames. In these cases, Ansys quits because the loader cannot find all of the libraries that it is looking for. When running Ansys Release 2024 R1, the loader will inform you that it is unable to locate a specific library (for example, `libXm.so`).

To add the missing libraries in the list, install the indicated devel package via yum or zypper as root.

Table 2.34: RHEL/CentOS

Missing Library	Devel Package
libGLU.so	mesa-libGLU-devel
libXm.so	motif-devel
libXp.so	libXp-devel
libXt.so	libXt-devel
libXext.so	libXext-devel
libXi.so	libXi-devel
libX11.so	libX11-devel
libSM.so	libSM-devel
libICE.so	libICE-devel

Table 2.35: SLES

Missing Library	Devel Package
libGLU.so	glu-devel
libXm.so	motif-devel
libXp.so	libXp-devel
libXt.so	libXt-devel
libXext.so	libXext-devel
libXi.so	libXi-devel
libX11.so	libX11-devel
libSM.so	libSM-devel

Missing Library	Devel Package
libICE.so	libICE-devel

For Linux, you may need the following:

```
ln -sf /usr/lib64/libXm.so.4.0.0 /usr/lib64/libXm.so.3
```

The revision numbers appended to the filenames on the left may be different on your system.

Intel Linux

Ansys was built and tested on Red Hat using the compilers as noted in Table 2.36: Compiler Requirements for All Linux Versions (p. 55).

For Ansys Workbench and Ansys Autodyn, you may need to increase the stack size. We recommend setting it to 1 GB. Add the following to your configuration file:

For the Bourne (bash) shell:

```
ulimit -s 1024000
```

For the C (csh) shell:

```
limit stacksize 1024000
```

Other shells may have different settings. Refer to your shell documentation for specific details.

Intel Xeon EM64T

If you are running on Intel's Xeon EM64T system, we recommend that you turn CPU hyperthreading off (default is on). A system administrator needs to reboot the system and enter the BIOS to turn the hyperthreading option off.

2.3. Utilizing CPU Hyperthreading Technology with Ansys CFD Solvers

Hyperthreading technology uses one processor core to run more than one task at a time. Ansys does not recommend using hyperthreading technology in conjunction with Ansys CFD Solvers (Fluent, CFX and Fluids). We recommend that you turn CPU hyperthreading off (default is on). A system administrator needs to reboot the system and enter the BIOS to turn the hyperthreading option off.

2.4. Compiler Requirements for Linux Systems

Table 2.36: Compiler Requirements for All Linux Versions

Mechanical APDL, Ansys Workbench Compilers*	CFX Compilers*	Fluent Compilers*	Autodyn Compilers*	Chemkin and Forte Compilers*
Intel OneAPI 2023.1.0 Classic compiler (version 2021.9.0) (FORTRAN, C, C++) and GCC 8.2.0 (for user-programmable features)	Intel OneAPI 2023.1.0 Classic compiler (version 2021.9.0) FORTRAN (for custom solver modeling using User Fortran) and GCC 8.2.0 (for custom mesh import/export executables)	Red Hat and CentOS 7 and SUSE 12.x: GCC 4.8.5 Red Hat and CentOS 8.1: GCC 8.3.1 SUSE 15.1: GCC 7.5.0	Intel OneAPI 2023.1.0 Classic compiler (version 2021.9.0) (FORTRAN, C, C++) and GCC 8.2.0 (for user-programmable features)	Intel OneAPI 2023.1.0 Classic C++ compiler (version 2021.9.0) and Intel OneAPI 2023.1.0 Classic FORTRAN compiler (version 2021.9.0) (for Chemkin API, Chemkin user-programmed subroutines and FORTE output user routines.)

* Compilers are required only if you are using User-Programmable Features (UPF), User Defined Functions (UDF), or other customization options.

When installing the GCC 8.2.0 compiler for use with Ansys Mechanical APDL and Autodyn, see Compiler Requirements for Linux Systems (p. 55) for detailed installation instructions.

Note:

The software compiler versions listed above may not correspond to the latest releases available from Intel but can be downloaded separately from the respective vendors' customer sites. If you need to purchase/obtain Intel Fortran, note that you must register on Intel's customer website with your Intel Fortran license information. Once logged into Intel's customer site, you have the option of downloading previous releases.

2.5. Select Your Installation

The next step is to select your installation type. Select the option below that matches your installation.

- Installing Ansys Products for a Stand-alone Linux System (p. 57)
- Installing Ansys Products and the License Server on Different Linux Machines (p. 69)

Chapter 3: Installing Ansys Products for a Stand-alone Linux System

This section explains how to install Ansys, Inc. products, including Ansys client licensing, as well as the Ansys, Inc. License Manager.

The default installation expects you to be logged in as root. You can install as non-root; however, if you are not logged in as root, you will not be able to set the `/ansys_inc` symbolic link and may potentially experience permission problems. The inability to set the `/ansys_inc` symbolic link will in no way inhibit your ability to run Ansys, Inc. products; it is provided as a convenience.

If you do not use the `/ansys_inc` symbolic link, you must install all releases into a common directory to ensure license manager compatibility and availability among releases and products.

If you did not use the `/ansys_inc` symbolic link, you must replace all references to `/ansys_inc/v241` or `<install_dir>` with the actual installation path you used.

Before You Begin

We recommend that you have the following information available before you begin this installation:

- An account on the Ansys customer site. If you do not have an account, you may register at www.ansys.com/customercommunity to receive your own account.
- Your license file from Ansys, Inc., saved to a temporary directory. For more information, see Registering the License Server (p. 67).
- Open port numbers for both the FLEXlm and Ansys Licensing Interconnect. Defaults are 1055 and 2325, respectively. To verify that these port numbers are available, open a command line and enter the following command:

  ```
  netstat -a -t
  ```

  You will see a list of active ports. If 1055 and 2325 are listed, they are already in use and cannot be used for Ansys, Inc. licensing. In this case, you will need to specify different port numbers where indicated later in this installation.
- Your local machine's name, to specify as the license server.

> **Note:**
>
> In order for Ansys products to operate normally, it is necessary to have name resolution (communication by host name) between the license server machine and the client machine.

You should also verify that you are running on a supported platform. Ansys, Inc. products support 64-bit Linux systems running Red Hat, SUSE Linux Enterprise 12, SUSE Linux Enterprise Server 15, CentOS and Ubuntu. For current platform information, see the Platform Support section of the Ansys Website.

Verify that you have sufficient disk space to download, uncompress, and install the products you are installing. Approximate disk space requirements for each product are shown in Disk Space and Memory Requirements (p. 4).

If you have any problems with--or questions about--the installation process, log a Service Request on the Ansys customer site to have a Systems Support Specialist assist you.

This section is divided into four sets of instructions:

- Product Download Instructions: This set of instructions describes the download and extraction process.
- Product Installation with Client Licensing: This set of instructions describes the product installation, including the client licensing portion.
- License Manager Installation: This set of instructions describes the license manager installation.
- Post-Installation Procedures for All Products: This is a set of instructions that describes any configuration steps that may be required for the various products.

Both the product and the license manager will be installed on the same machine. *You must complete both the client licensing portion and the license manager installation in order to run Ansys, Inc. products.*

3.1. Pre-Installation Instructions for Download Installations

Before downloading the installation files, you need to accurately determine your platform type. Versions that are optimized for different chip sets from the same vendor can have similar names, causing confusion. We strongly recommend that you run the `getFLEXid` script on each machine first. This script will output the correct platform name for each machine on which it is run. This script can be obtained from the Ansys website, by clicking **Support>Licensing>Capture License Server Info**.

3.2. Product Download Instructions

To download the installation files from our website, you will need to have a current technical support agreement.

Depending on the product/platform combination(s) you choose, you may need to download multiple files.

1. From the Ansys customer site, www.ansys.com/customercommunity, click **Downloads > Current Release**.
2. Select your installation operating system (**Windows x64** or **Linux x64**).
3. Select the type of files you wish to download:
   - **Primary Packages**: Individual full packages for the primary Ansys products.
   - **ISO Images**: ISO images for the DVD installation.

4. Click the appropriate download option.
5. Select your desired download directory and click **Save**.
6. Repeat this process for each download file.
7. To download **Add-On Packages**, **Tools** or **Academic Packages**, click the + to the right of the appropriate product group title to display the download options and download as required.
8. After all downloads have been completed, uncompress each package using standard uncompression utilities for your specific platform. We strongly recommend that you extract the files into new, temporary directories.

- Continue with the steps described in Product Installation (p. 61).

3.3. Installing from a USB Drive

Note:

Do not use the mounted directory as your working directory. Do not "cd" or "Change Directory" to /run/media/<user>/ANSYS241 or /media/ANSYS241 and then run INSTALL as this may cause unmounting and ejecting issues.

CentOS 7.8 through 7.9

Insert the USB drive into an appropriate USB slot on your computer. Continue with the steps described in Product Installation (p. 61).

Note:

With some SuSE Linux configurations, the USB auto-mount function may cause the INSTALL command to appear as lowercase. Using the lowercase install command may cause extraneous files to be left behind after the Ansys product installation. To correct this lowercase issue, un-mount the USB drive and manually re-mount the drive prior to installing Ansys products.

Red Hat Enterprise 7.8 through 7.9, SUSE Linux Enterprise 12 SP5 and SUSE Linux Enterprise Server 15 SP2 - SP4

For these versions, the default auto-mount function permission shows read-only which does not allow you to install the Ansys products. To address this issue, manually mount the USB by following the steps below.

1. In a root shell, run the following command to determine the usb drive location:

   ```
   df -hT
   ```

   From the results of the df -ht command, locate the device boot data. The device boot data should be in a format similar to /dev/xxxx, where **xxxx** is the USB location. You will use the device boot data when editing the fstab below.

2. Create a mounting point by running the following command:

   ```
   mkdir -p /run/media/<username>/ANSYS241
   ```

3. Edit the fstab to mount the USB with read/execute permissions.

   ```
   vi /etc/fstab
   ```

   Inserting the following line:

   ```
   /dev/xxxx /run/media/<username>/ANSYS241 auto owner,defaults 0 0
   ```

   Replace "xxxx" with USB location from the device boot data.

4. Run the following command to execute the fstab:

   ```
   mount -a
   ```

5. Continue with the steps described in Product Installation (p. 61).

3.4. Mounting the DVD Instructions for DVD Installations (Linux x64 Only)

Note:

Do not use the mounted directory as your working directory. Do not "cd" or "Change Directory" to /run/media/<user>/ANSYS241 or /media/ANSYS241 and then run INSTALL as this may cause unmounting and ejecting issues.

If you install Ansys, Inc. products from the installation media (DVD), you will need to run the installation procedure using either a locally- or remotely-mounted DVD, depending on your site's system.

Note:

Typically, a Linux system will mount a local DVD for you under /media/ANSYS241 or /media/<user>/ANSYS241/INSTALL.

Locally-Mounted DVD Procedure

1. Insert the first installation DVD.

2. In a root shell, run the following command to determine the device drive location:

   ```
   df -hT
   ```

3. Continue with the steps described in Product Installation (p. 61).

If the target machine does not have a DVD reader, first follow the steps for locally-mounted DVD, and then follow the procedure below for remotely-mounted DVDs:

Remotely-Mounted DVD Procedure

1. Add the *dvdrom_dir* directory to the `/etc/exports` file on the machine with the DVD device. A sample `/etc/exports` entry is:

   ```
   /dvdrom_dir *(ro)
   ```

   or

   ```
   /dvdrom_dir (ro)
   ```

2. Run **exportfs** to export the *dvdrom_dir* directory:

   ```
   exportfs –a
   ```

   Check the manual page for 'exports' for the correct syntax, as different Linux versions can have different syntax.

3. Log on to the machine where you wish to install Ansys, Inc. products and issue the following commands:

   ```
   mkdir dvdrom_dir2
   mount -t nfs Host:cdrom_dir dvdrom_dir2
   ```

   where *Host* is the hostname of the machine where the DVD device is located.

   Run **man exports** for more information.

4. Continue with the steps described in Product Installation (p. 61).

3.5. Product Installation

1. Depending on your media type, start the installation process:

   For downloaded installation packages:

   After uncompressing your downloaded installation packages (<PRODUCT>_<REVN>_<platform>.zip & tar), navigate to the directory where you extracted the files. Run `./INSTALL`. This file will reside in the directory where you untarred the downloaded files.

   For USB or DVD installations:

   Run `./INSTALL` which is found in the mounted location of the USB or DVD. You should not use the mounted directory as your current working directory to run the INSTALL as this may cause unmounting and ejecting issues.

   The installer should be run using the absolute path which may vary depending on your platform and configuration. Common examples are:

   /media/<user>/ANSYS241/INSTALL

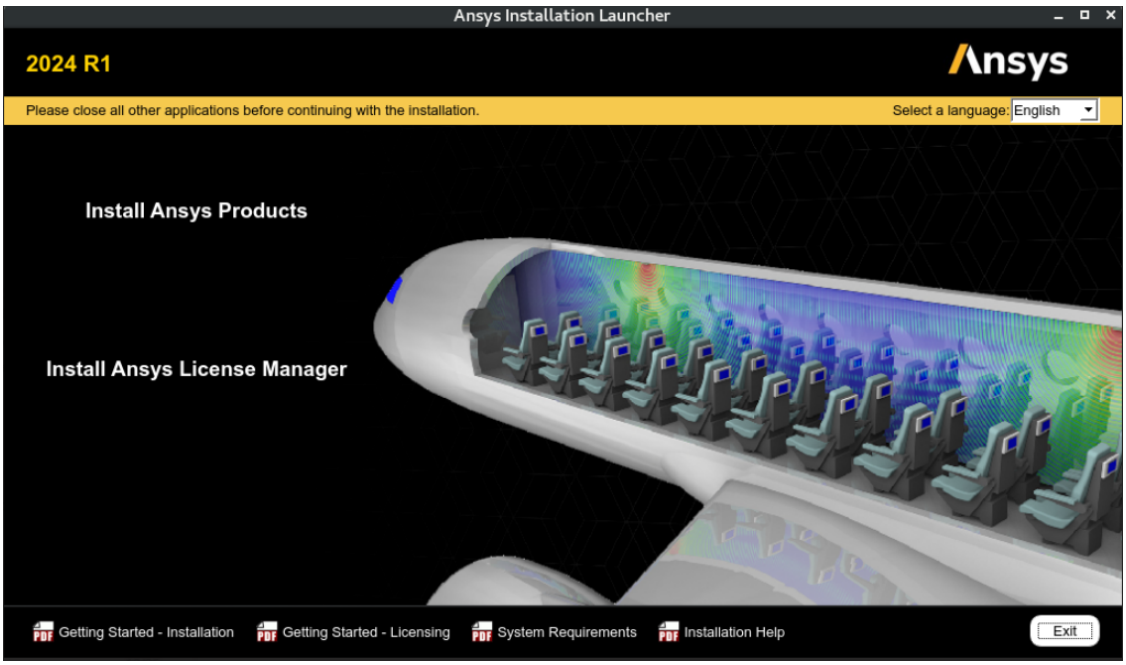
/media/ANSYS241/INSTALL

Note:

In order to eject the DVD on RedHat, you may need to use the eject command.

```
eject /media/ANSYS241
```

2. The Ansys, Inc. Installation Launcher appears.



From the options along the left side of the launcher you can install Ansys products and the Ansys License Manager.

The Ansys Quick Start Installation Guide, Ansys Quick Start Licensing Guide, System Requirements Guide and complete Installation Help Guide can be accessed through the options located along the bottom of the launcher.

Select the language you want to use from the drop-down menu in the upper right corner. English is the default.

3. Click the **Install Ansys Products** option.

4. The license agreement appears. Read the agreement, and if you agree to the terms and conditions, select **I Agree**. Click **Next**, located on the right side of the screen.

Note:

The question mark icon located in the upper right side of each installation screen displays an explanation of the functionality available on that screen. The letter "I" icon displays information about the release version of the installation software.

5. The directory where you wish to install the Ansys, Inc. products is shown in the **Install Directory** field. You can install the products into any directory you wish, but you must have write permissions to the directory you choose. The default is `/ansys_inc`. We recommend using the default directory.

   The **Symbolic Link** option is available only if you are installing as root and is enabled (checked) by default. If you choose to disable (uncheck) the symbolic link or are installing as a non-root user, substitute the directory path where you installed the product for all subsequent occurrences of `/ansys_inc` in this guide.

   We strongly recommend that you use the **Symbolic Link** option. If you do not use this option, you must install all releases into a common directory to ensure license manager compatibility and availability among releases and products.

   If you have already installed the Ansys Workbench Framework for Ansoft, you must install any additional Ansys, Inc. products into the same directory.

   Click **Next**.

6. If this is a first time installation, you are prompted to enter your license server specification. If you already have an existing license server specification file, you will not see this window and proceed directly to the next step.

   Enter your Ansys Licensing Interconnect port number and your Ansys FlexNet port number. Defaults are provided and will work in most cases. You may need to check with your IT department to confirm that the default port numbers are valid or to get different port numbers if necessary.

   Specify the hostname for your license server machine(s).

   Click **Next**.

7. All products available in the installation package(s) you downloaded are listed in a tree view. A checkmark to the left of the product signifies that the product and all related "child" products are enabled for installation while a grey box indicates that some, but not all products are enabled for installation. You can expand the tree to select any additional products you wish to install.

   The installation program attempts to query your license server to pre-select your installation options. If the query is successful, the following message is displayed:

   Review and change the pre-selected installation options if necessary

   You can select or deselect any combination of products. Ansys Workbench is automatically installed with most Ansys, Inc. products; there is no individual product selection for Ansys Workbench.

   If you select the **Ansys Geometry Interfaces** option, you are presented with additional installation steps. These steps are completed on the **CAD Configuration** screens which are displayed when you click **Next**. For additional information on completing these steps, see Specifying CAD Configurations (p. 64).

   You will also see an estimate of the disk space required to install all of the selected components, and the disk space you have available. The actual amount of disk space required may be less, but if you choose to run the installation with insufficient disk space available, we strongly recommend

that you review the log files at the end of the installation to verify that all products were installed correctly. Installation log files are written to the installation directory.

Note:

On a first time installation, if you chose to install any Ansys Geometry Interfaces, ensure that you have also selected at least one Ansys, Inc. product as part of the installation. Installing an Ansys Geometry Interface without an underlying Ansys, Inc. product on a first time installation may cause installation errors.

Select the products you want to install and click **Next**.

The dates on the licensing files being installed are compared to any that may already exist on your machine. (This may take a few moments.)

8. A summary screen appears listing your installation selections. Review this list carefully to verify that it is correct. When you are sure all selections are correct, click **Next** to begin the installation.

9. The installation progress screen displays a status bar towards the bottom of the installation window. This status bar tracks the percentage of packages that have been installed on your computer. Depending on the number of products you have selected, the installation time required could be lengthy. You will not be able to interrupt the installation process. Please be patient while the installation completes.

   Note:

   Clicking the **View Details Progress Log** button opens a second window that displays the name of each product package as it is uncompressed and installed.

   Click **Next** to continue the installation.

10. The product installation window reappears with a message noting that the installation is complete. A **Launch Survey Upon Exiting** option is included here. Clicking **Exit** while the **Launch Survey Upon Exiting** is enabled causes your default browser to open, displaying the product survey. Disabling (un-checking) the **Launch Survey Upon Exiting** option and then clicking **Exit** skips the survey.

    The Ansys, Inc. Installation Launcher appears. For this stand-alone installation, you must complete the License Manager installation (next) to run Ansys, Inc. products.

3.5.1. Specifying CAD Configurations

Selecting the **Ansys Geometry Interfaces** option, from the product selection screen and clicking **Next** displays a series of configuration screens for your geometry interfaces.

1. On the first screen, you are asked to select one of the following three configuration options:

   - Selecting the **Yes, I will make my selections** option and clicking **Next** walks you through a several configuration steps. If you select this option, you can configure the appropriate geometry interface properties by following the steps described below.

- Selecting the **No. Skip configuration. I will configure later** option and clicking **Next** ignores the geometry interface configuration at this time. After you make this selection, the installation continues as described in the Product Installation (p. 61) step #8. You can use this option if you have not yet installed the related CAD programs, or do not know the requested information. If you skip these steps, you will need to configure these geometry interfaces using the **Product & CAD Configuration Manager** before you can successfully import models into Ansys products. See Configuring CAD Products (p. 101) for more information on using the **Product & CAD Configuration Manager**.

2. After selecting the **Yes, I will make my selections** option and clicking **Next** (bullet point #1 above), you are presented with a check list of the geometry interfaces. You can choose which geometry interfaces you would like to configure by enabling the appropriate check box(es). Note that the configuration is not performed for any geometry interface check box that is disabled. You will have to do that at a later time by following the steps in the Configuring CAD Products (p. 101) section.

3. If you selected the interface for **NX**, a third screen is displayed. In this case follow the steps below. If you did not select **NX** the installation continues as described in the Product Installation (p. 61) step #8.

   If you choose the associative interface and the UGII environment variables were not set, you will need to specify the NX installation path for an existing NX installation.

4. Once you have completed the **NX** configuration, click **Next**. The installation continues as described in the Product Installation (p. 61) step #8.

3.5.2. Ansys License Manager Installation

Follow the instructions below to install the Ansys, Inc. License Manager on your Linux machine. Because you will not be using a network server, you must install and configure the Ansys, Inc. License Manager on your machine. The License Manager controls access to the Ansys, Inc. products you have purchased.

1. Navigate to the directory where you extracted the files. Run `./INSTALL -LM`. If you downloaded the license manager installation package, this file will reside in the directory where you untarred the downloaded files. If you are running from a DVD, this file will reside in the top level of the DVD.

2. You may see a warning stating that if the license manager is currently running, it will be shut down. This installation assumes that you have not previously installed the products or the licensing on this machine, and you are not pointing to a network license server machine. You may safely ignore this message and click **OK**.

3. Select the language you want to use. English is the default.

4. The license agreement appears. Read the agreement, and if you agree to the terms and conditions, select **I Agree**. Click **Next**, located on the right side of the screen.

5. The directory where you wish to install the Ansys, Inc. License Manager is shown in the **Install Directory** field. You can install the License Manager into any directory you wish, but you must

have write permissions to the directory you choose. The default is `/ansys_inc`. We recommend using the default directory. You must use the same directory where the products were installed.

Note:

You are unable to change the installation directory for a computer that currently contains an instance of the Ansys, Inc. License Manager or Ansys Electromagnetics License Manager. To change the installation directory location, you must first uninstall any previous versions of both products.

6. The Ansys, Inc. License Manager is selected as the only product available to install. As with the product installation, the required and available disk space numbers are shown. Click **Next**.

7. A summary screen appears that lists the products to be installed. Because this is a license manager installation, the Ansys, Inc. License Manager is the only product listed.

   Click **Next**. The license manager installation begins.

   The Ansys, Inc. License Manager is now being installed and configured on your system. After the License Manager installation has been completed, the **Launch License Management Center upon exiting** option is included on the screen. The **Ansys License Management Center** is a browser-based user interface that centralizes many of the Ansys product licensing administrative functions. If you do not wish to launch the License Management Center, clear the **Launch License Management Center upon exiting** option.

8. Click **Exit** to close the **License Manager Installation** screen.

9. Click **Exit** to close the Ansys, Inc. Installation Manager.

10. Open a terminal window and navigate to your Ansys installation. The following table lists the default paths to start the Ansys products you have installed.

Application Locations

Application	How to Launch
ACP	`/ansys_inc/v241/ACP/ACP.sh`
CFD-Post	`/ansys_inc/v241/cfdpost`
CFX	`/ansys_inc/v241/CFX/bin/<productname>` Where <*productname*> can be *cfx5*, *cfx5launch*, *cfx5pre*, *cfx-solve*, or *cfx5post*.
FLUENT	`/ansys_inc/v241/fluent/bin/fluent`
ICEM CFD	`/ansys_inc/v241/icemcfd/icemcfd`
ICEPAK	`/ansys_inc/v241/icepak/icepak`
PolyFlow	`/ansys_inc/v241/polyflow/bin/polyflow`
TurboGrid	`/ansys_inc/v241/TurboGrid/bin/cfxtg`
Sherlock	`/ansys_inc/v241/sherlock/runSherlock`

Application	How to Launch
Workbench	`/ansys_inc/v241/Framework/bin/Linux64/runwb2`

3.5.2.1. Registering the License Server

If you are a new user who has not received a license file for your server or if you add or change a license server machine, follow this procedure to register your license server information. See the Ansys Licensing Guide for more information on selecting license servers (Selecting License Server Machines) and on using the Ansys License Management Center (License Server Administration Using Ansys License Management Center).

1. Open the **Ansys License Management Center**. To run the **Ansys License Management Center** on Linux run the following script:

   ```
   /shared_files/licensing/start_lmcenter
   ```

2. Click the **Get System Hostid Information** option to display your system ID code(s).

3. Select the system ID you wish to use and click **SAVE TO FILE**.

   A text file containing your system ID information is created.

4. Forward this text file to your Ansys sales representative so that a license file can be created for you.

5. Add your license files though the **Ansys License Management Center**. For these steps, see Adding a License.

After completing the installation process, refer to Post-Installation Instructions (p. 83).

Chapter 4: Installing Ansys Products and the License Server on Different Linux Machines

This section explains how to install Ansys, Inc. products, including Ansys client licensing, as well as the Ansys, Inc. License Manager.

This installation process requires you to perform the following steps:

1. Install the Ansys License Manager on one or more "server" computers. (This step is not necessary if a license server is already available on your network.) See Ansys License Manager Installation (p. 78) for more information.

2. Install the Ansys Products on one or more "client" computers. (It is not necessary to install the Ansys License Manager on the "client" computers.) See Product Installation (p. 73) for more information.

The default installation expects you to be logged in as root. You can install as non-root; however, you will not be able to set the `/ansys_inc` symbolic link and may potentially experience permission problems. The inability to set the `/ansys_inc` symbolic link will in no way inhibit your ability to run Ansys, Inc. products; it is provided as a convenience when navigating to the `/ansys_inc` directory.

If you do not use the `/ansys_inc` symbolic link, you must install all releases into a common directory to ensure license manager compatibility and availability among releases and products.

If you did not use the `/ansys_inc` symbolic link, you must replace all references to `/ansys_inc/v241` or `<install_dir>` with the actual installation path you used.

Before You Begin

We recommend that you have the following information available before you begin this installation:

- An account on the Ansys customer site. If you do not have an account, you may register at www.ansys.com/customercommunity to receive your own account.

- Your license file from Ansys, Inc., saved to a temporary directory. For more information, see Registering the License Server (p. 79).

- Open port numbers for both the FLEXlm and Ansys Licensing Interconnect. Defaults are 1055 and 2325, respectively. To verify that these port numbers are available, open a command line and enter the following command:

  ```
  netstat -a -t
  ```

  You will see a list of active ports. If 1055 and 2325 are listed, they are already in use and cannot be used for Ansys, Inc. licensing. In this case, you will need to specify different port numbers where indicated later in this installation.

- Your local machine's name, to specify as the license server.

> **Note:**
>
> In order for Ansys products to operate normally, it is necessary to have name resolution (communication by host name) between the license server machine and the client machine.

You should also verify that you are running on a supported platform. Ansys, Inc. products support 64-bit Linux systems running Red Hat, SUSE Linux Enterprise 12, SUSE Linux Enterprise Server 15, CentOS and Ubuntu. For current platform information, see the Platform Support section of the Ansys Website.

Verify that you have sufficient disk space to download, uncompress, and install the products you are installing. Approximate disk space requirements for each product are shown in Disk Space and Memory Requirements (p. 4).

If you have any problems with--or questions about--the installation process, log a Service Request on the Ansys customer site to have a Systems Support Specialist assist you.

This section is divided into four sets of instructions:

- Product Download Instructions: This set of instructions describes the download and extraction process.
- Product Installation with Client Licensing: This set of instructions describes the product installation, including the client licensing portion.
- License Manager Installation: This set of instructions describes the license manager installation.
- Post-Installation Procedures for All Products: This is a set of instructions that describes any configuration steps that may be required for the various products.

For this procedure, the product and the license manager will be installed on separate machines. *You must complete both the client licensing portion and the license manager installation in order to run Ansys, Inc. products.*

4.1. Pre-Installation Instructions for Download Installations

Before downloading the installation files, you need to accurately determine your platform type. Versions that are optimized for different chip sets from the same vendor can have similar names, causing confusion. We strongly recommend that you run the `getFLEXid` script on each machine first. This script will output the correct platform name for each machine on which it is run. This script can be obtained from the Ansys website, in the Licensing Support area under "Capture License Server Info".

4.2. Product Download Instructions

To download the installation files from our website, you will need to have a current technical support agreement.

Depending on the product/platform combination(s) you choose, you may need to download multiple files.

1. From the Ansys customer site, www.ansys.com/customercommunity, click **Downloads** > **Current Release**.
2. Select your installation operating system (**Windows x64** or **Linux x64**).
3. Select the type of files you wish to download:
   - **Primary Packages**: Individual full packages for the primary Ansys products.
   - **ISO Images**: ISO images for the DVD installation.
4. Click the appropriate download option.
5. Select your desired download directory and click **Save**.
6. Repeat this process for each download file.
7. To download **Add-On Packages**, **Tools** or **Academic Packages**, click the + to the right of the appropriate product group title to display the download options and download as required.
8. After all downloads have been completed, uncompress each package using standard uncompression utilities for your specific platform. We strongly recommend that you extract the files into new, temporary directories.

- Continue with the steps described in Product Installation (p. 73).

4.3. Installing from a USB Drive

Note:

Do not use the mounted directory as your working directory. Do not "cd" or "Change Directory" to /run/media/<user>/ANSYS241 or /media/ANSYS241 and then run INSTALL as this may cause unmounting and ejecting issues.

CentOS 7.8 through 7.9

Insert the USB drive into an appropriate USB slot on your computer. Navigate to the root directory of the USB drive and run ./INSTALL. Continue with the steps described in Product Installation (p. 73).

Note:

With some SuSE Linux configurations, the USB auto-mount function may cause the INSTALL command to appear as lowercase. Using the lowercase install command may cause extraneous files to be left behind after the Ansys product installation. To correct this lowercase issue, un-mount the USB drive and manually re-mount the drive prior to installing Ansys products.

Red Hat Enterprise 7.8 through 7.9, SUSE Linux Enterprise 12 SP5 and SUSE Linux Enterprise Server 15 SP2 - SP4

For these versions, the default auto-mount function permission shows read-only which does not allow you to install the Ansys products. To address this issue, manually mount the USB by following the steps below.

1. In a root shell, run the following command to determine the usb drive location:

   ```
   df -hT
   ```

   From the results of the df -ht command, locate the device boot data. The device boot data should be in a format similar to /dev/xxxx, where **xxxx** is the USB location. You will use the device boot data when editing the fstab below.

2. Create a mounting point by running the following command:

   ```
   mkdir -p /run/media/<username>/ANSYS241
   ```

3. Edit the fstab to mount the USB with read/execute permissions.

   ```
   vi /etc/fstab
   ```

   Inserting the following line:

   ```
   /dev/xxxx /run/media/<username>/ANSYS241 auto owner,defaults 0 0
   ```

   Replace "xxxx" with USB location from the device boot data.

4. Run the following command to execute the fstab:

   ```
   mount -a
   ```

5. Continue with the steps described in Product Installation (p. 61).

4.4. Mounting the DVD Instructions for DVD Installations (Linux x64 Only)

Note:

Do not use the mounted directory as your working directory. Do not "cd" or "Change Directory" to /run/media/<user>/ANSYS241 or /media/ANSYS241 and then run INSTALL as this may cause unmounting and ejecting issues.

If you install Ansys, Inc. products from the installation media (DVD), you will need to run the installation procedure using either a locally- or remotely-mounted DVD, depending on your site's system.

Note:

Typically, a Linux system will mount a local DVD for you under /media/ANSYS241.

Locally-Mounted DVD Procedure

1. Insert the first installation DVD.

2. In a root shell, run the following command to determine the device drive location:

```
df -hT
```

3. Continue with the steps described in Product Installation (p. 61).

If the target machine does not have a DVD reader, first follow the steps for locally-mounted DVD, and then follow the procedure below for remotely-mounted DVDs:

Remotely-Mounted DVD Procedure

1. Add the *dvdrom_dir* directory to the `/etc/exports` file on the machine with the DVD device. A sample `/etc/exports` entry is:

   ```
   /dvdrom_dir *(ro)
   ```

   or

   ```
   /dvdrom_dir (ro)
   ```

2. Run **exportfs** to export the *dvdrom_dir* directory:

   ```
   exportfs –a
   ```

   Check the manual page for 'exports' for the correct syntax, as different Linux versions can have different syntax.

3. Log on to the machine where you wish to install Ansys, Inc. products and issue the following commands:

   ```
   mkdir dvdrom_dir2
   mount -t nfs Host:cdrom_dir dvdrom_dir2
   ```

   where *Host* is the hostname of the machine where the DVD device is located.

   Run **`man exports`** for more information.

4. Continue with the steps described in Product Installation (p. 61).

4.5. Product Installation

1. Depending on your media type, start the installation process:

   For downloaded installation packages:

   After uncompressing your downloaded installation packages (<PRODUCT>_<REVN>_<platform>.zip & tar), navigate to the directory where you extracted the files. Run `./INSTALL`. This file will reside in the directory where you untarred the downloaded files.

   For USB or DVD installations:

   Run `./INSTALL` which is found in the mounted location of the USB or DVD. You should not use the mounted directory as your current working directory to run the INSTALL as this may cause unmounting and ejecting issues.

The installer should be run using the absolute path which may vary depending on your platform and configuration. Common examples are:

/media/<user>/ANSYS241/INSTALL

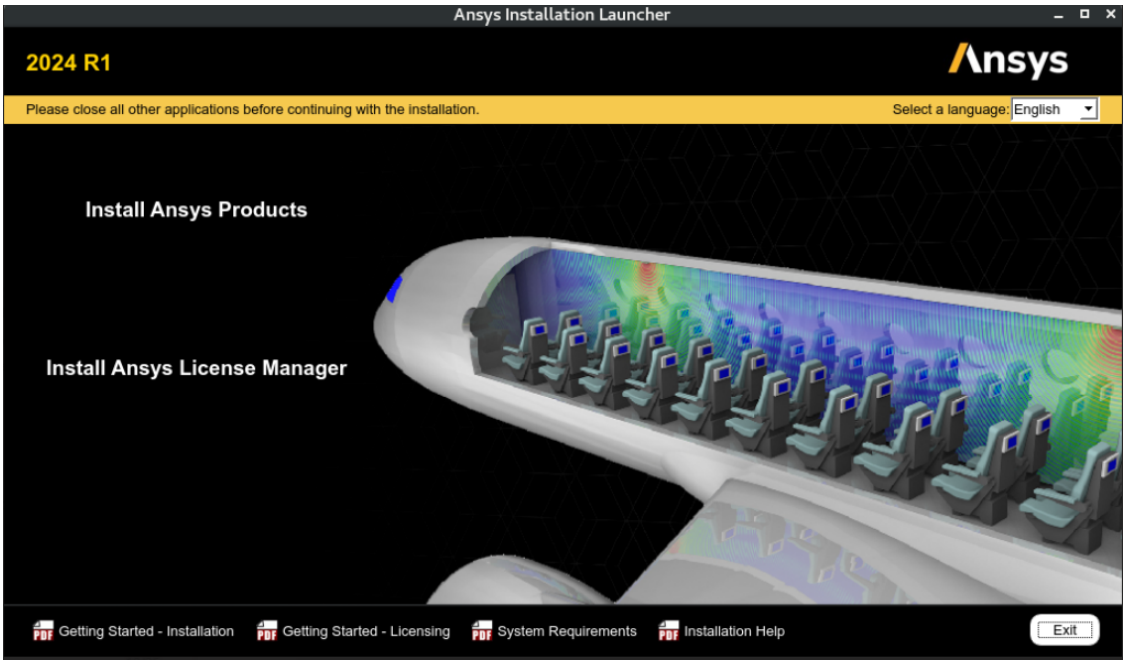
/media/ANSYS241/INSTALL

Note:

In order to eject the DVD on RedHat, you may need to use the eject command.

```
eject /media/ANSYS241
```

2. The Ansys, Inc. Installation Launcher appears.



From the options along the left side of the launcher you can install Ansys products and the Ansys License Manager.

The Ansys Quick Start Installation Guide, Ansys Quick Start Licensing Guide, System Requirements Guide and complete Installation Help Guide can be accessed through the options located along the bottom of the launcher.

Select the language you want to use from the drop-down menu in the upper right corner. English is the default.

3. Click the **Install Ansys Products** option.

4. The license agreement appears. Read the agreement, and if you agree to the terms and conditions, select **I Agree**. Click **Next**, located on the right side of the screen.

   Note:

   The question mark icon located in the upper right side of each installation screen displays an explanation of the functionality available on that screen. The letter "I" icon displays information about the release version of the installation software.

   When installing more than one platform or if you are installing a platform other than your current machine type, you will need to select the platform(s) on which you want to install the Ansys, Inc. products. The platform on which you launched the installation will be selected by default and is shown at the bottom of the window. You can choose as many platforms as you want; however, you must run the platform configuration procedure (see *Run the Product & CAD Configuration Manager* in Network Installation and Product and CAD Configuration (p. 80)) for each platform other than your current machine type. See Network Installation and Product and CAD Configuration (p. 80) for specific instructions on how to configure a shared installation directory across multiple machines using a common network file system.

5. The directory where you want to install the Ansys, Inc. products is shown in the **Install Directory** field. You can install the products into any directory you want, but you must have write permissions to the directory you choose. The default is `/ansys_inc`. We recommend using the default directory.

   The **Symbolic Link** option is available only if you are installing as root and is enabled (checked) by default. If you choose to disable (uncheck) the symbolic link or are installing as a non-root user, substitute the directory path where you installed the product for all subsequent occurrences of `/ansys_inc` in this guide.

   We strongly recommend that you use the **Symbolic Link** option. If you do not use this option, you must install all releases into a common directory to ensure license manager compatibility and availability among releases and products.

   If you have already installed the Ansys Workbench Framework for Ansoft, you must install any additional Ansys, Inc. products into the same directory.

   Click **Next**.

6. If this is a first time installation, you are prompted to enter your license server specification. If you already have an existing license server specification file, you will not see this window and proceed directly to the next step.

   Enter your Ansys Licensing Interconnect port number and your Ansys FlexNet port number. Defaults are provided and will work in most cases. You may need to check with your IT department to confirm that the default port numbers are valid or to get different port numbers if necessary.

   Specify the hostname for your license server machine(s).

   Click **Next**.

7. All products available in the installation package(s) you downloaded are listed in a tree view. A checkmark to the left of the product signifies that the product and all related "child" products are

enabled for installation while a grey box indicates that some, but not all products are enabled for installation. You can expand the tree to select any additional products you wish to install.

The installation program attempts to query your license server to pre-select your installation options. If the query is successful, the following message is displayed:

Review and change the pre-selected installation options if necessary

You can select or deselect any combination of products. Ansys Workbench is automatically installed with most Ansys, Inc. products; there is no individual product selection for Ansys Workbench.

If you select the **Ansys Geometry Interfaces** option, you are presented with additional installation steps. These steps are completed on the **CAD Configuration** screens which are displayed when you click **Next**. For additional information on completing these steps, see Specifying CAD Configurations (p. 77).

You will also see an estimate of the disk space required to install all of the selected components, and the disk space you have available. The actual amount of disk space required may be less, but if you choose to run the installation with insufficient disk space available, we strongly recommend that you review the log files at the end of the installation to verify that all products were installed correctly. Installation log files are written to the installation directory.

Note:

On a first time installation, if you chose to install any Ansys Geometry Interfaces, ensure that you have also selected at least one Ansys, Inc. product as part of the installation. Installing an Ansys Geometry Interface without an underlying Ansys, Inc. product on a first time installation may cause installation errors.

Select the products you want to install and click **Next**. The dates on the licensing files being installed are compared to any that may already exist on your machine. (This may take a few moments.)

8. A summary screen appears listing your installation selections. Review this list carefully to verify that it is correct. When you are sure all selections are correct, click **Next** to begin the installation.

9. The installation progress screen displays a status bar towards the bottom of the installation window. This status bar tracks the percentage of packages that have been installed on your computer. Depending on the number of products you have selected, the installation time required could be lengthy. You will not be able to interrupt the installation process. Please be patient while the installation completes.

Note:

Clicking the **View Details Progress Log** button opens a second window that displays the name of each product package as it is uncompressed and installed.

Click **Next** to continue the installation.

10. The product installation window reappears with a message noting that the installation is complete. A **Launch Survey Upon Exiting** option is included here. Clicking **Exit** while the **Launch Survey Upon Exiting** is enabled causes your default browser to open, displaying the product survey. Dis-

abling (un-checking) the **Launch Survey Upon Exiting** option and then clicking **Exit** skips the survey.

11. If you have installed Ansys, Inc. products on a file server, follow the instructions under Network Installation and Product and CAD Configuration (p. 80).

4.5.1. Specifying CAD Configurations

Selecting the **Ansys Geometry Interfaces** option, from the product selection screen and clicking **Next** displays a series of configuration screens for your geometry interfaces.

1. On the first screen, you are asked to select one of the following three configuration options:

   - Selecting the **Yes, I will make my selections** option and clicking **Next** walks you through a several configuration steps. If you select this option, you can configure the appropriate geometry interface properties by following the steps described below.

   - Selecting the **No. Skip configuration. I will configure later** option and clicking **Next** ignores the geometry interface configuration at this time. After you make this selection, the installation continues as described in the Product Installation (p. 61) step #8. You can use this option if you have not yet installed the related CAD programs, or do not know the requested information. If you skip these steps, you will need to configure these geometry interfaces using the **Product & CAD Configuration Manager** before you can successfully import models into Ansys products. See Configuring CAD Products (p. 101) for more information on using the **Product & CAD Configuration Manager**.

2. After selecting the **Yes, I will make my selections** option and clicking **Next** (bullet point #1 above), you are presented with a check list of the geometry interfaces. You can choose which geometry interfaces you would like to configure by enabling the appropriate check box(es). Note that the configuration is not performed for any geometry interface check box that is disabled. You will have to do that at a later time by following the steps in the Configuring CAD Products (p. 101) section.

3. If you selected the interface for **NX**, a third screen is displayed. In this case follow the steps below. If you did not select **NX** the installation continues as described in the Product Installation (p. 61) step #8.

   If you choose the associative interface and the UGII environment variables were not set, you will need to specify the NX installation path for an existing NX installation.

4. Once you have completed the **NX** configuration, click **Next**. The installation continues as described in the Product Installation (p. 61) step #8.

4.5.2. Ansys License Manager Installation

After you have installed the Ansys products on your client machines, follow the instructions below to install the Ansys, Inc. License Manager on your license server machine. The License Manager controls access to the Ansys, Inc. products you have purchased.

Note:

It is not necessary to install the Ansys License Manager on the client computers.

1. Navigate to the directory where you extracted the files. Run `./INSTALL -LM`. If you downloaded the license manager installation package, this file will reside in the directory where you untarred the downloaded files. If you are running from a DVD, this file will reside in the top level of the DVD.

2. You may see a warning stating that if the license manager is currently running, it will be shut down. If you have not previously installed the products or the licensing on this machine, and you are not pointing to a network license server machine, you may safely ignore this message and click **OK**.

3. Select the language you want to use. English is the default.

4. The license agreement appears. Read the agreement, and if you agree to the terms and conditions, select **I Agree**. Click **Next**, located on the right side of the screen.

5. The directory where you want to install the Ansys, Inc. License Manager is shown in the **Install Directory** field. You can install the License Manager into any directory you want, but you must have write permissions to the directory you choose. The default is `/ansys_inc`. We recommend using the default directory. You must use the same directory where the products were installed.

   Note:

   You are unable to change the installation directory for a computer that currently contains an instance of the Ansys, Inc. License Manager or Ansys Electromagnetics License Manager. To change the installation directory location, you must first uninstall any previous versions of both products.

6. The Ansys, Inc. License Manager is selected as the only product available to install. As with the product installation, the required and available disk space numbers are shown. Click **Next**.

7. A summary screen appears that lists the products to be installed. Because this is a license manager installation, the Ansys, Inc. License Manager is the only product listed.

   Click **Next**. The license manager installation begins.

   The Ansys, Inc. License Manager is now being installed and configured on your system. After the License Manager installation has been completed, the **Launch License Management Center upon exiting** option is included on the screen. The **Ansys License Management Center** is a browser-based user interface that centralizes many of the Ansys product licensing administrative

functions. If you do not want to launch the License Management Center, clear the **Launch License Management Center upon exiting** option.

8. Click **Exit** to close the **License Manager Installation** screen.

9. Click **Exit** to close the Ansys, Inc. Installation Manager.

10. Open a terminal window and navigate to your Ansys installation. The following table lists the default paths to start the Ansys products you have installed.

Application Locations

Application	How to Launch
ACP	`/ansys_inc/v241/ACP/ACP.sh`
CFD-Post	`/ansys_inc/v241/cfdpost`
CFX	`/ansys_inc/v241/CFX/bin/<productname>` Where <*productname*> can be *cfx5*, *cfx5launch*, *cfx5pre*, *cfx-solve*, or *cfx5post*.
FLUENT	`/ansys_inc/v241/fluent/bin/fluent`
ICEM CFD	`/ansys_inc/v241/icemcfd/icemcfd`
ICEPAK	`/ansys_inc/v241/icepak/icepak`
PolyFlow	`/ansys_inc/v241/polyflow/bin/polyflow`
TurboGrid	`/ansys_inc/v241TurboGrid/bin/cfxtg`
Sherlock	`/ansys_inc/v241/sherlock/runSherlock`
Workbench	`/ansys_inc/v241/Framework/bin/Linux64/runwb2`

4.5.2.1. Registering the License Server

If you are a new user who has not received a license file for your server or if you add or change a license server machine, follow this procedure to register your license server information. See the Ansys Licensing Guide for more information on selecting license servers (Selecting License Server Machines) and on using the Ansys License Management Center (License Server Administration Using Ansys License Management Center).

1. Open the **Ansys License Management Center**. To run the **Ansys License Management Center** on Linux run the following script:

   ```
   /shared_files/licensing/start_lmcenter
   ```

2. Click the **Get System Hostid Information** option to display your system ID code(s).

3. Select the system ID you wish to use and click **SAVE TO FILE**.

   A text file containing your system ID information is created.

4. Forward this text file to your Ansys sales representative so that a license file can be created for you.

5. Add your license files though the **Ansys License Management Center**. For these steps, see Adding a License.

4.5.3. Network Installation and Product and CAD Configuration

To complete a network installation (where the product is installed on one machine and one or more clients access that installation to run the product) to a file server machine, follow the steps below. These steps apply to the following products: Mechanical APDL, Ansys Workbench, Ansys CFX, Ansys ICEM CFD, Ansys Fluent, Ansys Polyflow, Ansys Icepak and Remote Solve Manager (RSM).

A network installation must be homogeneous, although you can install on different operating systems.

You must complete the following steps to run products across a network:

We strongly recommend that these steps be performed by the same non-root user. Installing and configuring as different users may create permissions problems. Likewise, installing and/or configuring as a root user may also result in permissions problems.

4.5.3.1. Export the `/ansys_inc` Directory

If you are installing an Ansys, Inc. product on a file server, you need to export the `/ansys_inc` directory to all client machines so that all users can access the program. You will also need to share the Ansys directory if the machine you are installing on does not have a DVD/USB drive or an internet connection for downloading files and you need to share files with a machine that does have a DVD/USB drive or internet connection.

The instructions below assume Ansys, Inc. products were installed in the specified directory.

1. Install the Ansys, Inc. products. The following example uses `/usr/ansys_inc`.
2. Export the `ansys_inc` directory by adding the following line to the `/etc/exports` file:

   ```
   /usr/ansys_inc
   ```

   The default behavior on Linux provides read-only access from all clients. To enable read/write permission from all clients, use *(rw):

   ```
   /usr/ansys_inc *(rw)
   ```

   Alternatively, if the installing user is root, use:

   ```
   /usr/ansys_inc *(rw,no_root_squash)
   ```

3. Run

   ```
   exportfs -a
   ```

4. On all client computers, mount the `ansys_inc` directory.

If you perform a network install where you want the clients to be able to modify the licensing configuration, you need to consider the NFS write options for the exported file system as shown in the above examples. You also need local permissions to the licensing directory (`/shared_files/licensing/`) if you want to be able to create the `install_licconfig.log` that the license configuration produces.

If you need to transfer the files from a Windows machine with a DVD drive to a Linux machine without one, copy the DVD contents using a Samba mount or some other transfer method that is safe to use between Windows and Linux.

If sharing the Ansys directory between Linux machines, you must use the same mount point for both the client and server. For example, if you installed to a file server in a directory named `/apps/ansys_inc` and you did not choose the symbolic link to `/ansys_inc`, then you must mount this directory on the client machine using `/apps/ansys_inc` as the mount point. If you did choose the symbolic link to `/ansys_inc` during installation on the file server, you must either use `/ansys_inc` as the mount point on the client or you must create a symbolic link to `/ansys_inc` on the client machine. (The symbolic link is created by default during installation if you installed as root).

4.5.3.2. Run the Product & CAD Configuration Manager on All Client Machines

For network installations, you must run this step on every client machine.

Note:

The username and user ID utilized when running the Product & CAD Configuration Manager must be the same as the installing server user.

1. On each client machine, issue the following command to run the **Product & CAD Configuration Manager**:

```
/ansys_inc/v241/ProductConfig.sh
```

2. Select **Configure Products & CAD**.
3. Select the products you want to configure and click **Next**.

Note:

Ansys Workbench is configured when Mechanical APDL, Ansys CFX, Ansys Fluent, Ansys Polyflow, or Remote Solve Manager Standalone Services is selected. CFD-Post is configured when either Ansys CFX, Ansys Fluent, Ansys Polyflow or Ansys Icepak is configured.

4. When the configuration is complete, click **Exit**.

After completing the installation process, refer to Post-Installation Instructions (p. 83).

Important:

If you use network installation and wish to disable the Ansys Product Improvement Program (APIP) for all clients from a central location, perform the following steps on the file server:

1. Navigate to the installation directory: `[Drive:]\v241\commonfiles\globalsettings`
2. Open the file **ANSYSProductImprovementProgram.txt**.
3. Change the value from "on" to "off" and save the file.

Chapter 5: Post-Installation Instructions

The following post-installation procedures apply to all Ansys, Inc. products. Individual products may have additional post-installation procedures; refer to the following sections for each product.

Note:

If the installation program reported any errors, review the installation error file (install.err) located in the Ansys Inc directory. Contact your Ansys Support representative if you have any questions.

After the product is installed, you need to establish some system settings, including path names and environment variables. See your shell documentation or man pages file for the shell being used for specific instructions on setting paths and environment variables.

1. Add the following paths to all users' login startup files (that is, `.cshrc`, `.profile`, or `.login` files).

`/ansys_inc/v241/ansys/bin`	(or appropriate path to the individual products' executables)
`/ansys_inc/shared_files/licensing/lic_admin`	(contains ANSLIC_ADMIN utility)

2. Set the following environment variables based on the behavior you want. Set the environment variables following the conventions of your shell. For example, to set an environment variable in the C shell, type:

```
setenv environment_variable value
```

For example, to set the **DISPLAY** environment variable, you type the following, where *dev* is the workstation hostname or IP address on which to display graphics:

```
setenv DISPLAY dev:0.0
```

DISPLAY - set this to the IP address or hostname of the workstation to which the users will output their analysis results. Note that the X server must have permission to connect to the host machine.

If you will be using connection functionality, you may have additional environment variables to set. See the section Configuring CAD Products (p. 101) later in this guide for more information.

3. Set the license manager to start automatically at boot time. For platform-specific instructions, see License Manager Automatic Startup Instructions in the Ansys Licensing Guide.

4. Designate server(s) for license checkout and establish necessary user privileges (recommended but not required). For information on these tasks, see ANSYS Licensing Settings Utility in the Ansys Licensing Guide.

5. Make a backup copy of the `/ansys_inc` directory using a tape backup command such as `tar`.

6. Verify the installation by logging out as root (if you installed as root) and logging back in as a regular user and then starting the product to verify that it starts and runs correctly.

Quality Assurance Services:

If you require verification of your Ansys software installation, Ansys, Inc. offers Quality Assurance services for some applications. If you are interested in this service, go to the Quality Assurance link under About Ansys on the Ansys web site or call the Ansys, Inc. Corporate Quality Group at (724) 746-3304.

5.1. Post-Installation Procedures for Mechanical APDL and Ansys Workbench Products

The following post-installation procedures apply only to the Mechanical APDL and Ansys Workbench products. These are in addition to the post-installation procedures in the previous section.

1. Set the following environment variables based on the behavior you want. Set the environment variables following the conventions of your shell. Not all of these are required for all integrated Ansys Workbench products (such as Ansys Autodyn), but setting them correctly for Ansys Workbench will in no way hinder the performance of the other products.

   The **ANSYS241_DIR** environment variable sets the location of the Ansys directory hierarchy. The default value is `/ansys_inc/v241/ansys`. You probably will not need to reset this variable, unless you change the location of the installed files.

   The **ANSYSLIC_DIR** environment variable sets the location of the Ansys licensing directory hierarchy. The default value is `/ansys_inc/shared_files/licensing`. You probably will not need to reset this variable, unless you change the location of the licensing files.

   ANSYS241_PRODUCT - set this to the correct product variable to run Mechanical APDL to start with the correct product without specifying the **-p** command modifier each time. See the **Ansys Product to License Feature Mapping** table located on **Installation and Licensing Help and Tutorials** page of the **Ansys Customer Portal** for a list of valid product variables.

   ANSYS_LOCK - set to ON (default) to create file locks to prevent users from opening a new job with the same name and in the same directory as the current job.

   Ansys241_WORKING_DIRECTORY - set this variable to the directory you want designated as your working directory. The working directory setting in the launcher will reflect this setting.

   ANSYS241_MAT161 - set this environment variable to 1 to enable use of the LS-DYNA *MAT_COMPOSITE_MSC material (requires an LS-DYNA MAT_161 license).

ANSYS241_MAT162 - set this environment variable to 1 to enable use of the LS-DYNA *MAT_COMPOSITE_DMG_MSG material (requires an LS-DYNA MAT_162 license).

ANSBROWSER - set this environment variable to the browser on your system (specify the full path) if the automatic browser detection fails. A browser is needed to view HTML reports and help for the **ANS_ADMIN** utility and the Mechanical APDL launcher. By default, **ANSBROWSER** points to one of several Linux browsers, based on the browser specified in your path (if any).

If you will be using connection functionality, you may have additional environment variables to set. See the section Configuring CAD Products (p. 101) later in this guide for more information.

2. Create or update the `at.` files. The `at.allow` file should contain the username of all users allowed to run batch jobs; the `at.deny` file should contain the username of users who are not permitted to run batch jobs. The files consist of one username per line and can be modified only by the superuser. If neither file exists, only root will be able to run batch jobs.

   The `at.` files are located in the `/etc` directory on Linux machines.

3. Specify the product order as it will appear in the Mechanical APDL launcher (optional). If you want to specify product order, use the **ANSLIC_ADMIN** utility. See the Ansys Licensing Guide for more information.

Explicit Dynamics, Rigid Dynamics, My Computer Background, and Remote Solve Manager (RSM) Users:

If you are running Ansys Workbench on a multi-user RSM machine, the 'My Computer, Background' Solve Process Settings will likely not function as expected due to write permissions for RSM working directories. In this situation, we strongly recommend that you set up RSM as a daemon. For more information see Starting the RSM Launcher Service Automatically at Boot Time for Linux in the *Remote Solve Manager User's Guide*.

This issue also affects Rigid Dynamics and Explicit Dynamics using both 'My Computer' and 'My Computer, Background' Solve Process Settings.

5.1.1. Post-Installation Procedures for Ansys CFX

The following post-installation procedures apply only to the Ansys CFX product.

The Linux installation of Ansys CFX or Ansys TurboGrid automatically installs the Sun Java 2 Runtime Environment in the `/ansys_inc/v241/commonfiles/jre` directory. Regardless of whether you have modified your setup files, you can still run Ansys CFX commands by specifying the full pathname of the commands you want to run. This procedure may be useful if you have several releases of Ansys CFX installed and you want to run more than one release.

Unless you want to run Ansys CFX commands by typing their full path names, for example *`cfxroot`*`/bin/cfx5` (where *`cfxroot`* is the directory in which Ansys CFX is installed), your command search paths must be modified to search the directory *`cfxroot`*`/bin`. This can be done by one of the following methods:

Modification of individual user setup files

You can select **Tools> Configure User Startup Files** from the Ansys CFX Launcher to modify your own setup files: `.login` for the C shell, `.profile` for the Bourne and Korn shells. The utility can also be run from the command line by entering:

```
cfxroot/bin/cfx5setupuser
```

If this modification is done, the Ansys CFX software will be available every time you log in, just by running the Ansys CFX commands by name. This method has the advantage that it need not be done by the system administrator, but has the disadvantage that it must be done by each user.

Use the `-h` option to view the optional commands.

If you choose to modify your setup files, you will see a message indicating that your setup files have been changed. You will then need to log out and log in again or source your setup files before you can use the software.

Manual execution of a setup script each time the software is used

You can also use the **Tools** menu of the launcher to launch an editor to create new setup scripts which need to be run each time you want to use the Ansys CFX software. This method has the advantage of not requiring changes to existing setup files and allows you to use different versions of Ansys CFX software by running different setup files. The disadvantages are that all users must create their own setup files and run them manually in every session in which they want to run Ansys CFX software.

Having created the setup files, users of the C shell then need to do the following to run Ansys CFX:

```
source ~/cfx5.login
cfx5
```

Having created the setup files, users of the Bourne or Korn shell then need to do the following before running Ansys CFX:

```
.$HOME/cfx5.profile
cfx5
```

Modification of system setup files

The system administrator modifies the setup files (normally `/etc/profile`), which are run by all users during login, to include the directory *`cfxroot`*`/bin` in the command search path. While this has the advantage of only one file needing to be modified in order to allow all users to use the software, it also:

- Affects users regardless of whether they use Ansys CFX
- Can only be done by the root user
- Is system dependent

Refer to your system documentation for information about which files to change for your workstations.

5.1.1.1. Setting up Ansys TurboGrid Release 2024 R1

Manual modification of individual user setup files

To start Ansys TurboGrid without using full pathnames every time you want to run the Ansys TurboGrid software, your path must be altered to include the Ansys TurboGrid directory. This can be done by adding the following line to the `.login` and `.cshrc` files in your home directory:

```
set path=(cfxroot/bin $path)
```

and these lines to the `.profile` file in your home directory, and also the `.bash_profile` if it exists:

```
PATH=cfxroot/bin:$PATH
export PATH
```

and these lines to the `.dtprofile` file in your home directory:

```
PATH=cfxroot/bin:$PATH \
export PATH
```

With the path altered in this way, you can start Ansys TurboGrid in the current working directory by typing **`cfxtg`**.

Modification of system setup files

The system administrator modifies the setup files (normally `etc/profile`), which are run by all users during login, to include the directory *`cfxroot`*`/bin` in the command search path. While this method has the advantage that only one file must be modified to allow all users to use the software, it:

- Affects users regardless of whether they use Ansys TurboGrid
- Can only be done by the root user
- Is system dependent

Refer to your system documentation for information about which files to change for your workstations.

5.1.1.2. Using the Ansys CFX Launcher to Set Up Users

To create setup files to be merged or run manually, start the Ansys CFX Launcher using the command:

```
 cfxroot/bin/cfx5
```

and select **Tools> Configure User Startup Files**. This option runs *`cfxroot`*`/bin/cfx5setupuser` that modifies your setup files or writes the necessary commands to files, which you can merge manually with your existing setup files.

If you choose to modify your setup files, you will see a message indicating that your setup files have been changed. You will then need to log out and log in again or source your setup files before you can use the software.

User setup can also be run from the command line by entering:

```
cfxroot/bin/cfx5setupuser
```

Enter the flag `-h` to view the optional commands.

5.1.2. Post-Installation Procedures for Ansys Fluent

To start Ansys Fluent without using full pathnames every time you want to run the Fluent software, your path must be altered to include the Ansys Fluent `bin` directory. You can do this in the C shell and its derivatives by entering:

```
set path = (/ansys_inc/v241/fluent/bin $path)
```

or in the Bourne/Korn shell or bash, by entering:

```
PATH=(/ansys_inc/v241/fluent/bin $path)
export PATH
```

We recommend adding these statements to your `$HOME/.cshrc` (C shell), `$HOME/.profile` (Bourne/Korn shell), or `$HOME/.bashrc` (bash shell) file for regular use.

After installing the Ansys Fluent software, you will need to reset the default values in the Ansys Fluent launcher as follows:

1. Verify that the **FLUENT_INC** environment variable is not set.

   Remove the **FLUENT_INC** setting from your `.cshrc`, `.profile`, or `.bashrc` file if you have added it for previous versions. Verify that the environment variable is unset by typing:

   ```
   printenv FLUENT_INC
   ```

   This command should not return anything.

2. Add the following paths to all users' login startup files:

   ```
   <install_dir>/ansys_inc/v241/fluent/bin
   ```

3. Run the following command:

   ```
   <install_dir>/ansys_inc/v241/fluent/bin/fluent
   ```

4. Click **Default**.

5. Click **Yes** when asked if you want to discard the LAUNCHER history.

6. Click **Cancel** if you do not want to start Fluent at this time. The new defaults will have been saved.

Refer to the *Ansys Fluent Quick Start Guide* for more information.

5.1.3. Post-Installation Procedures for Ansys Polyflow

Polyflow no longer requires the **FLUENT_INC** environmental variable. It should be deleted as is recommended for Fluent:

- Remove the **FLUENT_INC** setting from your `.cshrc`, `.profile`, or `.bashrc` file if you have added it for previous versions. Verify that the environment variable is unset by typing:

  ```
  printenv FLUENT_INC
  ```

  This command should not return anything.

5.1.4. Post-Installation Procedures for Ansys ICEM CFD

The following post-installation procedures apply only to the Ansys ICEM CFD product.

1. Add the following paths to all users' login startup files (that is, `.cshrc` or `.login` files).

   /ansys_inc/v241/icemcfd/linux64_amd/bin

2. Add the following environment variable to all users' login startup files.

   ICEM_ACN - set to `/ansys_inc/v241/icemcfd/linux64_amd`

3. Start Ansys ICEM CFD by typing **`icemcfd`**.

5.1.5. Post-Installation Procedures for Ansys Autodyn

The following post-installation procedures apply only to the AUTODYN product.

Add the following paths to all users' login startup files (that is, `.cshrc` or `.login` files).

```
/ansys_inc/v241/autodyn/bin
```

5.1.6. Post-Installation Procedures for Ansys FENSAP-ICE

Software Launch

To launch FENSAP-ICE, execute:

`<install_dir>/ansys_inc/v241/fensapice/bin/fensapiceGUI`

Command Line Tools

To use Ansys FENSAP-ICE command line tools without using full pathnames, you will want to run FENSAP-ICE with your path altered to include the fensapice/bin directory. You can do this in the C shell and its derivatives by entering:

`setenv PATH <install_dir>/ansys_inc/v241/fensapice/bin/:$PATH`

or in the Bourne/Korn shell or bash, by entering:

`export PATH=<install_dir>/ansys_inc/v241/fensapice/bin/:$PATH`

We recommend adding these statements to your $HOME/.cshrc (C shell), $HOME/.profile (Bourne/Korn shell), or $HOME/.bashrc (bash shell) file for regular use.

To run fensapiceGUI or nti_3dview from the $PATH, without a leading access path, the environment must define the location of the installation directory. This is done by setting the NTI_PATH variable to the proper <install_dir>/ansys_inc/v241/fensapice/bin/ directory.

Launching Ansys FENSAP-ICE with a Wrapper Script

For convenience, a wrapper script can be set-up by the system administrator in order to quickly launch FENSAP-ICE along with any required environment variables. For example, a fensapiceR18.sh file could contain:

```
#!/bin/bash

export ANSYS_LIC_DIR=<install_dir>/ansys_inc/shared_files/licensing/

<install_dir>/ansys_inc/v241/fensapice/bin/fensapiceGUI $*
```

The script then requires to be set in the $PATH and have execution permissions set (chmod a+rx).

Workbench Extension

Some features of FENSAP-ICE are available in Workbench through the use of an extension. The plug-in is provided in the following directory:

```
<install_dir>/ansys_inc/v180/fensapice/workbench/FENSAPICE-WB R24.1.wbex
```

While in Ansys Workbench, install the plug-in using the **Extensions > Install Extension** menu. You can then set it to load automatically at startup in the **Extensions > Manage Extensions** menu.

See Getting Started with FENSAP-ICE in Workbench for further details on running FENSAP-ICE in Workbench.

Ansys Licensing

The Ansys Licensing System is used by default. No special configuration is required if the Ansys License contains a feature enabling FENSAP-ICE and the Ansys R2024 R1 package is installed.

Ansys License Server Information will be recognized from the environment variables set on the system. See the Client Environment Variable Settings section of the Ansys Licesing Guide for more information.

If the **NTI_LICENSE_FILE** environment variable has been set, FENSAP-ICE will instead use legacy NTI FLEXLm licensing. To force the use of Ansys Licensing and ignore the NTI_LICENSE_FILE option, set an environment variable as **ANSYS_LICENSE_FILE_ONLY=1**

NTI Licensing

Legacy license keys from prior to Ansys R2024 R1 use the NTI FLEXLm license system. The option for NTI licensing must then be enabled in the licensing.txt file <install_dir>/ansys_inc/v241/fensapice/config/licensing.txt or by setting up the **NTI_LICENSE_FILE** environment variable.

Modify the licensing.txt file to contain the license server information **NTI_LICENSE_FILE=port@server**.

The default port is 27000.

For instructions on how to set-up the NTI license server or on how to force a specific licensing system, refer to the appropriate sections in the FENSAP-ICE Manual.

5.1.7. Post-Installation Procedures for Ansys Sherlock

The following post-installation procedures apply only to the Ansys Sherlock product.

To launch Ansys Sherlock, execute:

```
<install_dir>/ansys_inc/v241/sherlock/runSherlock
```

To use Ansys Sherlock without requiring the full pathname, add the following paths to all users' login startup files (this is, .cshrc or .login files)

```
/ansys_inc/v241/sherlock/ansys_inc/v241/sherlock
```

5.1.8. Post-Installation Procedures for Other Products

ACP

When running ACP on Red Hat Enterprise Linux 7, the libpng12 and compat-libtiff3 libraries are required to be installed. You can install these by issuing the following commands with superuser privileges:

```
yum install libpng12
yum install compat-libtiff3
```

5.2. Ansys Quality Assurance Services Application Control

Ansys offers a QA Services application control feature to permit access only to software covered by Ansys QA Services. This control is enabled through the definition of an environment variable. For customers with QA Services Agreements, information about which applications are included under the scope is provided to the contact designated on the QA Services Agreement.

The Linux installer for Ansys Products does not offer an activation option. The environment variable should be set using linux commands appropriate to the shell. For example, C shell would use:

```
setenv ENABLE_ANSYS_QA_SERVICES211 1
```

The command to set the environment variable can be added to the user's .cshrc, .profile, or .login file.

Once activated, applications will notify you at launch that the QA Services option has been enabled. The flag is read at the startup of an application and will either enable or disable the entire application. Features within the application will not be selectively enabled or disabled. Applications that are within the scope of Ansys' QA Services will have a pop up dialog box, a note in the Help About menu, and details written to the header of the output file where applicable. Applications that are not within the scope of Ansys' QA Services will be blocked from launching with a dialog notifying the user that the QA Services option is active. Various utilities may not be blocked by the QA Services application control (Viewer, etc).

There is an option in the pop up dialog to not show the notification in the future.

For more information on Ansys Quality Services, visit the Ansys website and go to **Products & Services > Services & Support > Quality Assurance > Quality Assurance Services**.

5.3. Product Localization

Some Ansys, Inc. products are available in multiple languages, including English, German, and French. For those products that are localized, you are able to view the GUI and messages in the specified language. See your specific product documentation for instructions on choosing a localized version of the product.

Note:

To view Localization Support Requirements for the current release of Ansys products, see **Ansys customer site> Knowledge Resources> Online Documentation> Documentation Information**.

All products that are localized define the language via the `languagesettings.txt` file. In most cases, you will not have to manually edit this file. If you do need to edit it manually, you can use one of the following values:

en-us (English, default)

de (German)

fr (French)

Ansys, Inc. applications will look for the `languagesettings.txt` file in the following locations, in order:

1. `$Home/.ansys/v241`
2. `<install_dir>/ansys_inc/v241/commonfiles/language`

Ansys, Inc. licensing also looks for the `languagesettings.txt` in the licensing languages subdirectories in order to display the **ANSLIC_ADMIN** utility and the Ansys, Inc. Licensing Interconnect message and log files in a different language.

Some products are not fully localized but offer only the messages in a translated version. See the following section for instructions on translated message file installation.

5.3.1. Translated Message File Installation for Mechanical APDL

If your Ansys sales representative has supplied you with message files in your local language, use the following procedures to install and access these files. You must create new message files for each release because error messages may occur in a different order for each release.

1. Create a language-named subdirectory (for example, `fr` for French) under the `/docu` directory:

   ```
   mkdir /ansys_inc/v241/ansys/docu/fr
   ```

2. Copy the message files `msgcat.241`, `msgidx.241`, and `msgfnm.241` into that subdirectory.

3. Access these files from the Language Selection option of the launcher or via the **-l** command line option:

```
ansys241 -l fr
```

5.4. Launching Ansys, Inc. Products

To launch Ansys, Inc. products on Linux platforms, issue the appropriate command from the list below. The paths specified assume that you installed the product using the symbolic link to /ansys_inc. If you did not, substitute your installation path for the path given below.

Table 5.1: Startup Commands

Product	Command	Notes
Mechanical APDL	`/ansys_inc/v241/ansys/bin/ansys241`	For a complete list of command line options, see Starting an Ansys Session from the Command Level in the *Operations Guide*.
Ansys Workbench	`/ansys_inc/v241/Framework/bin/<platform>/runwb2`	
Ansys CFX	`/ansys_inc/v241/CFX/bin/cfx5`	
Ansys Fluent	`/ansys_inc/v241/fluent/bin/fluent`	For a complete list of command line and launcher options, see *Starting Ansys Fluent* in the *Fluent Users Guide*.
Ansys ICEM CFD	`/ansys_inc/v241/icemcfd/<platform>/bin/icemcfd`	
Ansys Polyflow	`/ansys_inc/v241/polyflow/bin/polyman`	Starts the POLYFLOW MANager. For any other tool, use `/ansys_inc/v241/polyflow/bin/<tool>`
Ansys CFD-Post	`/ansys_inc/v241/CFD-Post/bin/cfdpost`	
Ansys Icepak	`/ansys_inc/v241/Icepak/bin/icepak`	
Ansys TurboGrid	`/ansys_inc/v241/TurboGrid/bin/cfxtg`	
Ansys Autodyn	`/ansys_inc/v241/autodyn/bin/autodyn241`	solver only
Ansys ACP	`/ansys_inc/v241/ACP/ACP.sh`	
Ansys Sherlock	`/ansys_inc/v241/sherlock/runSherlock`	

Chapter 6: Silent Mode Operations

Ansys, Inc. supports silent mode operations, including installation, product configuration/unconfiguration, and uninstall.

You can specify the following product flags. These flags are all valid for a silent install. However, because of the way the products are packaged, not all of these flags may be valid for a silent configuration/unconfiguration, or uninstall.

Product Flags

Product	***product_flag***
Ansys Aqwa	-aqwa
Ansys Autodyn	-autodyn
Ansys CFX	-cfx
Ansys CFD-Post	-cfdpost
Ansys Chemkin	-chemkinpro
Ansys Customization Files	-ansyscust
Ansys EnSight	-ensight
Ansys FENSAP-ICE	-fensapice
Ansys Forte	-forte
Ansys Fluent	-fluent
Ansys ICEM CFD	-icemcfd
Ansys Motion	-motion
Ansys Mechanical APDL	-mechapdl
Ansys LS-DYNA	-lsdyna
Ansys Model Fuel Library (Encrypted)	-mfl
Ansys optiSLang	-optislang
Ansys Polyflow	-polyflow
Ansys Reaction Workbench	-reactionwb
Ansys Sherlock	-sherlock
Ansys Speos HPC	-speoshpc
Ansys TurboGrid	-turbogrid
Note: Installing any of the above products will install Ansys Workbench.	
ACIS Geometry Interface	-acis
Ansys Icepak	-icepak

Product	*product_flag*
Ansys Remote Solve Manager Standalone Services	-rsm
CATIA 5 Reader	-catia5_reader
Distributed Compute Services	-dcs
NX Geometry Interface Plugin	-ug_plugin
Parasolid Geometry Interface	-parasolid

For more information on which products are included with each installation, see Applications Included with Each Product (p. 113).

6.1. Silent Product and License Manager Installation

Caution:

A silent license manager installation could shut down the Ansys, Inc. License Manager, affecting other users who are using that license server machine.

You can deploy an Ansys, Inc. product installation in silent mode. The general form to run a silent product installation, including the client licensing, is:

```
INSTALL -silent -install_dir path -product_flag
```

If no product flags from the list above are specified, all available products will be installed. To install specific products, run the silent install with any combination of the product flags listed above (not all products are available on all platforms). For example, to install only TurboGrid and Icepak, issue the following command:

```
INSTALL -silent -install_dir "/ansys_inc/" -turbogrid -icepak
```

Additional command line arguments are available; see the list below.

To install the Ansys, Inc. License Manager on Linux systems that will act as license servers, you must run the `INSTALL` command with the -LM option:

```
INSTALL -silent -LM -install_dir path
```

The silent license manager installation is valid only for the default Licensing Configuration option "Run the Ansys Licensing Interconnect with FLEXlm." See the Ansys Licensing Guide for more information.

You can use the following arguments when running a silent installation. Note that some options are available only for a silent license manager installation.

`-silent`	Initiates a silent installation.
`-help`	Displays a list of valid arguments for a silent installation.
`-install_dir` *path*	Specifies the directory to which the product or license manager is to be installed. If you want to install to the default location, you can omit the `-install_dir` argument. The default location is `/ansys_inc` if the symbolic link is set; otherwise, it will default to `/usr/ansys_inc`.

-product_flag	Specifies one or more products to install specific products. If you omit the *-product_flag* argument, all products will be installed. See the list of valid *product_flags* below.
-productfile *path*	You can specify an options file that lists the products you want to install. To do so, you must provide a full path to a file containing desired products. See Specifying Products with an Options File (p. 98) below for more details.
-licfilepath *path*	Specifies the location of the license file to install. If the path is not specified or if the path is the same as the existing license file, the license file will not be installed. Valid only when doing a silent license manager installation (INSTALL -LM).
-setliclang *language*	Specifies a language to use for the **ANSLIC_ADMIN** utility and the Ansys, Inc. Licensing Interconnect log file. Use the language directory name in the language subdirectory of the licensing directory (en-us, fr, de, etc.) as the *language* value. This flag can be used during a GUI installation as well. Valid only when doing a license manager installation (INSTALL -LM).
-licserverinfo	Specifies information to be used by the client for the license server. Valid only in conjunction with a silent installation (INSTALL). The format is: Single license server: *LI_port_number*:*FLEXlm_port_number*:*hostname* Example: 2325:1055:abc Three license servers: *LI_port_number*:*FLEXlm_port_number*:*hostname1*,*hostname2*,*hostname3* Example: 2325:1055:abc,def,xyz The default values for the Licensing Interconnect and FlexNet port numbers (2325 and 1055, respectively) will be used if they are not specified. However, you do need to include the colons. Example: ::abc or ::abc,def,xyz Information specified via -licserverinfo will be appended to existing information in the ansyslmd.ini file. To change information already in your ansyslmd.ini file, you must use the **ANSLIC_ADMIN** utility.
-lang	Specifies a language to use for the products.

Any messages will be written to the appropriate installation log files. Installation log files are located in the installation directory: `install.log` contains installation messages, and `install_licconfig.log` contains licensing installation messages. In rare circumstances with a silent licensing installation, the licensing installation messages may not be written to the `install_licconfig.log` (for example, if the silent licensing installation aborts); in these cases, you may find error messages in the `.ansys_install_temp_licconfig_<user>_<index>.log` file, located in `$HOME/.ansys`.

For more information on the silent license manager installation, see the Ansys Licensing Guide.

Specifying Products with an Options File

You can also specify an options file on the command line using the `-productfile path` option. The options file can have any name and extension, but the path must include the full path and filename, including any extension used. The options file can specify which products you want to install. The options file can contain all possible products, with the products you do not want to install commented out, or it can contain only the products you want to install. An example options file is shown below. In the example, Aqwa is commented out using an acceptable comment indicator. When using the options file, do not include the dash (-) before the product name.

Options file example:

```
mechapdl
ansyscust
autodyn
turbogrid
fluent
polyflow
icepak
optislang
#aqwa
```

6.2. Silent Product Configuration/Unconfiguration

You can also run the `ProductConfig` utility via command line (that is, silent mode) to configure products.

To run in silent mode, from each client machine, run the `ProductConfig` with the `-silent` option:

```
/ansys_inc/v241/ProductConfig.sh -silent
```

> **Note:**
>
> On an HPC cluster environment, prerequisites must be installed on each cluster execution node.

Use the *`-product_flag`* argument to specify which products should be configured. If you do not specify one or more products, all products that have been installed will be configured. The valid *`product_flags`* are listed in the Product Flags (p. 95) table.

Errors will be written to the ${HOME}/.ansys/v241/ directory on the client machine.

6.3. Silent Media Installation

To run a silent installation from the media, you can either:

- Copy the contents of each DVD to a folder on the machine's hard disk such that the `241-<number>.dvd` files of each DVD are located in the same directory. You can then proceed with the silent installation as described earlier.
- Place all of the media in separate drives (any combination of virtual ISO mounts or hardware drives) so that they can be accessed simultaneously during the installation. Then run the silent installation as described earlier, but include the additional `-media_dir2 <path>` and `-media_dir3 <path>` options as needed for each drive:

  ```
  INSTALL -silent -install_dir <path> -product_flag -media_dir2 <path> -media_dir3 <path>
  ```

  The installer uses the mount directory from which it was launched as the first media path; you need to specify only the location of the subsequent DVD(s) using the `-media_dir2` and `-media_dir3` options shown in the example above.

6.3.1. Silent Uninstall

You can also run the uninstall silently by issuing the following command:

```
/ansys_inc/v241/ans_uninstall241 –silent
```

The silent uninstall will automatically uninstall all products for this release and delete the v241 directory and all subdirectories. You will not be prompted for confirmation.

To uninstall individual products, use the *`product_flags`* listed in the Product Flags (p. 95) table in conjunction with the `-silent` argument.

Note:

Geometry interfaces cannot be uninstalled using these commands.

For example, to uninstall only TurboGrid and Icepak, issue the following command:

```
/ansys_inc/v241/ans_uninstall241 –silent -turbogrid -icepak
```

You can also issue the `-help` option to see a list of valid arguments for a silent uninstall.

A record of the uninstall process will be written to `ansys_inc/install.log`. Any error messages will be written to `ansys_inc/install.err`.

Chapter 7: Configuring CAD Products

The connection functionality of all supported CAD products is included with the Ansys release media, and all CAD functionality except is installed by default. To use the connection functionality, you need to ensure that the product is properly licensed and set any necessary environment variables or other configuration as appropriate. See the manuals for the individual CAD products for information about environment variables and other configuration requirements.

For complete information about the files you can import, see the *Mechanical APDL Connection User's Guide*.

The following sections describe any post-installation configuration procedures that are required.

7.1. Using the Product & CAD Configuration Manager

The **Product & CAD Configuration Manager** utility allows you to configure geometry interfaces for Ansys Workbench on Linux systems. CAD configuration is typically handled during the product installation; however, if you chose to skip those steps, or if you make changes to your local CAD configuration between releases (for example, you move or update your CAD package, or remove it entirely), you can use this utility. Note that only Associative Interface mode for NX is supported on Linux. However, the ANSYS NX menu and the active connection for the Associative Interface is NOT available on Linux because the interface operates in passive mode Linux.

This document describes how to use the **Product & CAD Configuration Manager** to progress through the configuration process.

1. Run the following command to start the **Product & CAD Configuration Manager**, substituting the full installation path if different than `/ansys_inc`:

   ```
   /ansys_inc/v241/ProductConfig.sh.
   ```

2. From the **Product & CAD Configuration Manager**, click **Configure Products & CAD**.

3. From the product selection screen, verify that the **Ansys Geometry Interfaces** selection is enabled and click **Next** to continue the configuration.

4. The next screen the provides you with the option to select which geometry interfaces to configure. Select the desired interfaces and click **Next** .

5. If you chose the **NX** interface and the UGII environment variables were not set, you will need to specify the **NX installation** path for an existing **NX** installation.

   Once you have completed the **NX** configuration, click **Next**.

6. When all of your CAD products have been successfully configured, click **Exit**.

Administrative users can review the log file produced by the most recent Product & CAD Configuration in ansys_inc/v241/CADConfigLogs/Latest/CADConfigurationMgr.log, while the non-admin user configuration record is stored in /tmp/ANSYS/v191/CADConfigLogs/Latest. Historical configurations are maintained in the corresponding <Ansys Version>/<Date>/CADConfigurationMgr_<Time>.log. Any errors are recorded in CADConfigurationMgr.err located immediately in CADConfigLogs directory.

You can review the **Product & CAD Configuration Manager** log file, CADConfigurationMgr.log, in /ansys_inc. If you do not have write permissions to the /ansys_inc directory, the log file will be written to $TEMP. If you have not defined $TEMP, the log file is written to /tmp. When /tmp is not accessible, this file will be written to the current working directory.

7.1.1. Unconfiguring

If you need to unconfigure any of your CAD products, follow the steps above, but choose **Unconfigure Products & CAD** from the **Product & CAD Configuration Manager**.

7.1.2. Running the CAD Configuration Manager in Batch Mode

You can configure Ansys Geometry Interfaces by supplying the CAD Configuration Manager with arguments specific to the CAD sources you want to make available. The following table contains a list of supported arguments.

The command to run the CAD Configuration Manager in batch mode on Linux is:

```
/ansys_inc/v241/Framework/bin/Linux64/runwb2 -cmd mono /ansys_inc/v241/commonfiles/CAD/bin/linx64/
 Ans.CadInt.CADConfigurationUtility.exe -arguments
```

Argument	Value	Comment
UNCONFIGURE_SPECIFIED	None	Results in any specified CAD sources being unconfigured. When this flag is absent, the **Product & CAD Configuration Manager** will attempt to unconfigure all designated CAD sources.
UNCONFIGURE	None	Results in all CAD sources being disabled along with prerequisite libraries.
UG_CONFIG_WB	None	Configure/unconfigure NX Geometry Interface to Workbench. The argument UGII_BASE_DIR must also be specified for the configure operation.
UGII_BASE_DIR	Full path to NX installation (quotations are required if there are spaces in the path).	This should agree with environment variable **UGII_BASE_DIR**. Not required with unconfigure operation.
CATIA_READER	None	Configure/unconfigure CatiaV5 Reader.

Note:

All arguments require a dash (-) before them in order to be properly recognized by the CAD Configuration Manager. Arguments' values should not have a dash preceding them.

For example, you can configure the CATIA READER Geometry Interface to Ansys Workbench from the command line by using the following:

```
/ansys_inc/v241/aisol/.workbench -cmd -NoMW  mono /ansys_inc/v241/commonfiles/CAD/bin/linx64/
Ans.CadInt.CADConfigurationUtility.exe -CATIA_READER
```

where /ansys_inc/v241 is the installation directory you specified.

To unconfigure the same CAD Interface, the command would be:

```
/ansys_inc/v241/aisol/.workbench -cmd -NoMW  mono /ansys_inc/v241/commonfiles/CAD/bin/linx64/
Ans.CadInt.CADConfigurationUtility.exe -unconfigure_specified -CATIA_READER
```

Although the argument order does not matter, an argument value must immediately follow its argument.

7.1.3. NX Configuration

Running the **Product & CAD Configuration Manager** for NX performs the following steps to activate the NX associative reader:

- Registers the NX Associative Geometry Interface for Ansys Workbench by copying the file `UGNX#.Component.XML` from `/ansys_inc/v241/aisol/CADIntegration/UG` to either `/ansys_inc/v241/commonfiles/registry/linx64/append` when the configuration manager is in administrative mode or to `$HOME/.config/ANSYS/241/UserRegFiles_`*`NNNN`*`/append`, when the **Product & CAD Configuration Manager** is run by a non-administrator. The **Product & CAD Configuration Manager** ensures that only one version of the file exists in the target location.

  UGNX# is the NX version detected by the **Product & CAD Configuration Manager**, and *NNNN* is a numeric identifier appended to the `UserRegFiles` directory.

- You must specify the environment variable **UGII_BASE_DIR**. The **UGII_BASE_DIR** must point to the install location supplied to the **Product & CAD Configuration Manager**. The Workbench Associative Interface for NX will not work without this variable being set properly, as this is required for proper startup of the CAD.

- Prior to configuring a client of a network install, the client system must have its **UGII_BASE_DIR** point to the same version of NX as designated on the server system. This must be done before running **Product & CAD Configuration Manager** or the **Product Configuration Tool**. For more information, see Network Installation and Product and CAD Configuration (p. 80).

Chapter 8: Uninstalling the Software

To uninstall a product, issue the following command:

```
/ansys_inc/v241/ans_uninstall241
```

Alternatively, if you are using the Mechanical APDL product, you can use the **Uninstall** option of the **ANS_ADMIN** utility. To launch **ANS_ADMIN**, issue the following command:

```
/ansys_inc/v241/ansys/bin/ans_admin241
```

1. From the uninstall panel, click **Select Products to Uninstall**.

   If you are not a superuser, you will see a warning message, and then the uninstall continues.

2. A list of products that are installed appears. Select those products you want to uninstall and click **Continue**. Then click **OK** to confirm the list of products to be uninstalled.

3. When the uninstall has completed, click **Finish**.

In the case of a platform (file server) installation, the uninstall will remove the selected product(s) from all of the Linux platforms.

Chapter 9: Troubleshooting

9.1. Installation Troubleshooting

This section lists problems and error messages that you may encounter while installing and/or running Ansys, Inc. products. After each situation description or error message is the user action required to correct the problem.

You can also find answers to commonly-asked questions on our Ansys customer site. After you log in to the Ansys customer site, select **Knowledge Resources> Solutions**.

For information on licensing-related errors, see the Troubleshooting section of the Ansys License Management Guide .

9.1.1. Gathering Diagnostic Information

There are situations which require licensing-related information to be gathered for diagnostic and troubleshooting purposes. At times it may be necessary to provide this information to technical support.

The client-related diagnostic information can be gathered by using the Ansys Licensing Settings Utility. For more information, see, Gathering Diagnostics in the **Ansys Licensing Settings Utility** section of the **Ansys Licensing Guide**.

The server-related diagnostic information can be gathered by using **Ansys License Management Center** or by using the standalone `gatherdiagnostics` script.

9.1.2. The GUI Installation Process Hangs

- If the GUI installation process appears to "hang" during file extraction, with no activity appearing in the message window, press **ENTER** on the command window used to start the installation. When the installation is complete, check the message window carefully for any installation errors or warnings; however, this situation rarely causes installation errors.
- If the installation does not progress beyond the extraction of any single file during the file extraction phase, you may have insufficient disk space in the temporary directory that the file extraction utility uses. Be aware that some components require a lengthy extraction time; we recommend allowing up to 30 minutes for these components to extract if you are running on a particularly old or slow system.

  To resolve this problem, remove files from your $TEMP directory to free up disk space, or increase the size of any disk quotas on your $TEMP directory.

9.1.3. The Target Machine Does Not Have a DVD Drive

If the target machine does not have a DVD drive, we recommend that you download the installation files from the Ansys customer site. For more information on downloading files from the Ansys customer site, see Product Download Instructions (p. 58). Use a USB Flash drive or follow the instructions in Mounting the DVD Instructions for DVD Installations (Linux x64 Only) (p. 60) to mount to a machine that does have a DVD drive.

9.1.4. Product & CAD Configuration Manager Help Does Not Load

If the help for the **Product & CAD Configuration Manager** does not load into your default browser, set the **BROWSER** environment variable to the path of your HTML viewer (such as Mozilla or Firefox) and restart the **Product & CAD Configuration Manager**.

9.1.5. Cannot Enter Data in Text Fields

SUSE

On some SUSE Linux systems, if you cannot enter data in text fields during the installation or when using the **ANSLIC_ADMIN** utility, you may be encountering a Tcl incompatibility. To correct the problem, unset the following environment variables before running the installation or the **ANSLIC_ADMIN** utility:

QT_IM_MODULE

XMODIFIERS

GTK_IM_MODULE

You should reset these environment variables when you are finished running the installation or using **ANSLIC_ADMIN**. Do not permanently unset these environment variables as doing so could affect other applications.

9.1.6. Download and Installation Error Messages

The current platform type is not selected and is not included in current download files. Make sure that you are using the correct media or downloaded file. Continuing with a platform installation may require additional post-install configuration.

Do you want to continue?

This message occurs if you have selected a platform for installation that does not match the files you are trying to install (either from the installation DVD, USB or from downloaded installation files).

Cannot find file <*product*>.tar in directory <*dvd_dir*>

This error may appear during the Ansys installation if you have entered the wrong DVD pathname. Check Mounting the DVD Instructions for DVD Installations (Linux x64 Only) (p. 60) and enter the correct pathname for your platform.

Licensing files currently installed for <*platform*> are more recent than those on the installation media. The <*platform*> files will not be installed and will be deselected.

This message appears during an Ansys, Inc. product installation if the installed license manager files are newer than the ones being installed. You should always use the newest files. However, due to system format changes or other unlikely scenarios, the date check could produce incorrect results. To override the date check and force the installation to always install the files from the media, regardless of the file dates, re-run the installation with the `-nodatecheck` option. We strongly recommend that you exercise caution when running the installation with the `-nodatecheck` option; installing older license files can result in licensing errors and the inability to run Ansys, Inc. products.

9.1.7. System-related Error Messages

Error, could not open display.

Either the **DISPLAY** environment variable is not correct or the `xhosts` command was not properly set. See the *Mechanical APDL Basic Analysis Guide* for specific graphics information.

*****Error, ANSYS241_DIR environment variable is not set. This is a fatal error – exiting.**

This message indicates that the **ANSYS241_DIR** environment variable was not set where necessary for licensing. This environment variable (which is set in the scripts that run Ansys) should be set to the release-specific installation directory.

9.1.8. High Performance Computing Error Messages

The following error messages are associated with the High Performance Computing solvers.

mpid: Error: HP MPI version incompatibility detected

You may encounter this or a similar message if you attempt to use Ansys 2024 R1 with a different version of MPI than is supported. See the *Parallel Processing Guide* for a complete list of supported MPI versions.

9.1.9. INSTALL Command Appears as Lowercase in USB Installation

With some SuSE Linux configurations, the USB auto-mount function may cause the INSTALL command to appear as lowercase. Using the lowercase install command may cause extraneous files to be left behind after the Ansys product installation.

To correct this lowercase issue, un-mount the USB drive and manually re-mount the drive prior to installing Ansys products.

9.2. Installation Troubleshooting - Graphics

The items listed below apply to issue relating to graphics cards and drivers.

9.2.1. DesignModeler and Mechanical APDL Crash When Using the Latest AMD Graphics Drivers

With the AMD 18.Q1 graphics driver two issues have been discovered:

- Launching DesignModeler causes a libgl error to output in the terminal. Immediately after this error the Ansys application crashes and forces you back to the login screen.
- Importing a geometry file into a static structural system shows a green check mark, but upon launching Mechanical APDL the Ansys application crashes and forces you back to the login screen.

AMD is aware of this issue and plans to address the problem.

If you experience either issue, perform the following work-around suggested by AMD.

Issue the following commands:

ln -sf /opt/amdgpu-pro/lib64/libGL.so.1.2 /usr/lib64/libGL.so.1

ln -sf /opt/amdgpu-pro/lib64/libGL.so.1.2 /usr/lib64/libGL.so

9.3. Installation Troubleshooting - Mechanical APDL

The items listed below apply only to the Mechanical APDL product.

9.3.1. Your batch jobs terminate when you log out of a session

On some systems, you may need to use the 'nohup' option to allow batch jobs to continue running after you log out of a session. If you are running via the Launcher, select **Options> Use 'nohup' To Start Batch Runs With Output Sent to 'File Only.'** We do not recommend using this setting on systems that automatically set 'nohup.'

9.3.2. Mechanical APDL Documentation File for User Interface Error Messages

Missing or erroneous documentation files for user interface. Command ignored.

Verify that the documentation list file for the user interface exists in the `/ansys_inc/v241/ansys/gui/en-us/UIDL` subdirectory.

```
ls -l  /ansys_inc/v241/ansys/gui/en-us/UIDL/menulist.ans
```

The system should respond with:

```
-rw-r--r-- 1 root 23 Jan  8 11:50 /ansys_inc/v241/ansys/gui
     /en-us/UIDL/menulist.ans
```

Make sure that the pathnames in the `menulist.ans` file are correct.

9.3.3. Launcher Error Messages

Some of the more common error messages follow. See the Ansys Licensing Guide for licensing-related launcher messages.

*****Cannot create required <*profile*> file. Therefore, cannot write to profile information during this launcher session.**

If you see this error, you cannot add or modify profile information during this launcher session. Verify that you have write access to the directory and restart the launcher session. Typically, this directory is `C:\Documents and Settings\<user name>\Application Data\Ansys\v241\launcher` on Windows or `~/.ansys/v241/launcher` on Linux.

9.3.4. FORTRAN Runtime Error Messages

The following error messages occur if you are running Mechanical APDL in a directory in which the user does not have write permission, or if Mechanical APDL files (that is, `Jobname.RST`, `Jobname.DB`) exist in the current directory but you do not have write permissions to the files. The specific messages that appear on each system are shown below.

9.3.4.1. Intel Linux 64 Systems

Input/Output Error 177: Create Failure

In Procedure: fappnd

At Line: 72

Statement: Formatted WRITE

Unit: 19

9.3.4.2. Intel EM64T Linux x64 Systems

forrtl: Permission denied

forrtl: severe (9): permission to access file denied, unit 19, file /build/v241/ansys/objs

9.3.4.3. AMD Opteron Linux x64 Systems

*****ERROR**

Unable to open file /build/v241/ansys/objs/file.err for WRITE. Check directory and file permissions.

9.4. Installation Troubleshooting - Ansys Workbench

9.4.1. Startup or Graphics Problems

To minimize graphics problems, always verify that you are running the latest graphics drivers provided by your computer's hardware manufacturer.

If you are running Ansys Workbench on Linux and experience problems at startup or with the GUI or graphics displaying correctly, and you are running in accelerated graphics mode, you may need to relaunch Ansys Workbench using the -oglmesa flag to activate software rendering:

```
runwb2 -oglmesa
```

If Ansys Workbench detects that graphics problems are causing crashes, it will automatically switch to software rendering. Ansys Workbench also will use software rending mode by default when running on a remote display, or on a local display if the hardware does not appear to be accelerated.

To revert to accelerated graphics mode, launch Ansys Workbench using the -oglhw flag:

```
runwb2 -oglhw
```

9.5. Installation Troubleshooting - Ansys CFX

9.5.1. CFX Distributed Parallel Runs Fail

On some SLES machines (typically ones with more than one network card), the default configuration of `/etc/hosts` will cause CFX distributed parallel runs to fail. In such cases, the problem might be solved by editing the `/etc/hosts` file to remove all lines that contain redundant loopback addresses. Do not remove the line with the first loopback address, which is typically 127.0.0.1.

9.6. Contacting Technical Support

Technical Support can be accessed from www.ansys.com/support.

ANSYS Contacts & Locations can be found here.

Chapter 10: Applications Included with Each Product

The following table displays which Ansys, Inc. applications are included with each of the product installation options.

Product Install Option	Silent Install Option	What is Included?
Electronics		
Icepak (includes Ansys CFD-Post)	-icepak	CFD-Post, Icepak
Fluids		
CFD-Post only	-cfdpost	Workbench, CFD-Post, Distributed Compute Services
CFX (includes Ansys CFD-Post)	-cfx	Workbench, CFX, CFD-Post, Distributed Compute Services
Chemkin	-chemkinpro	Workbench, Chemkin, Distributed Compute Services
EnSight	-ensight	EnSight, Workbench [], Distributed Compute Services
FENSAP-ICE	-fensapice	Workbench, FENSAP-ICE, CFD-Post, Distributed Compute Services
Fluent (includes Ansys CFD-Post)	-fluent	Workbench, Fluent, CFD-Post, Distributed Compute Services
Forte	-forte	Workbench, Forte, Distributed Compute Services
ICEM CFD	-icemcfd	Workbench, ICEM CFD
Model Fuel Library (Encrypted)	-mfl	Workbench, Chemkin, Model Fuel Library (Encrypted), Distributed Compute Services
Polyflow (includes Ansys CFD-Post)	-polyflow	Workbench, CFD-Post, Polyflow, Fluent, Distributed Compute Services
Reaction Workbench	-reactionwb	Workbench, Chemkin, Reaction Workbench, Distributed Compute Services
TurboGrid	-turbogrid	Workbench, TurboGrid, Distributed Compute Services
Ansys Geometry Interfaces		
ACIS Geometry Interface	-acis	Geometry Interface for ACIS

Product Install Option	Silent Install Option	What is Included?
CATIA, Version 5 Geometry Interface	-catia5	Geometry Interface for CATIA, Version 5
NX Geometry Interface	-ug_reader, -ug_plugin	Geometry Interface for NX
Parasolid Geometry Interface	-parasolid	Geometry Interface for Parasolid
Optical		
Speos HPC	-speoshpc	Workbench, SPEOS HPC
PIDO (Optimization)		
optiSLang	-optislang	Workbench, optiSLang
Platform		
Distributed Compute Services	-dcs	Distributed Compute Services
Remote Solve Manager Stand Alone Services	-rsm	Remote Solve Manager
Structures		
Additive	-additive	Workbench, Additive, Additive Prep, Distributed Compute Services
Aqwa	-aqwa	Workbench, Aqwa
Autodyn	-autodyn	Workbench, Autodyn
Customization Files	-ansyscust	Workbench, Mechanical APDL User-Programmable Feature, Distributed Compute Services
LS-DYNA	-lsdyna	Workbench, Ansys LS-DYNA
Mechanical Products	-mechapdl	Workbench, Mechanical APDL, Ansys Composite PrepPost, Distributed Compute Services
Motion	-motion	Workbench, Motion
Sherlock	-sherlock	Workbench, Sherlock, Mechanical APDL

1. Workbench includes the Workbench Framework, DesignModeler, DesignXplorer, Minerva and Remote Solve Manager.

2. Enabling the **Ansys Geometry Interfaces** option provides you with the ability to select and configure each of the geometry interfaces.

Installation Guide for Windows

Ansys
ANSYS, Inc.
Southpointe
2600 Ansys Drive
Canonsburg, PA 15317
ansysinfo@ansys.com
http://www.ansys.com
(T) 724-746-3304
(F) 724-514-9494

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Revision Information

The information in this guide applies to all Ansys, Inc. products released on or after this date, until superseded by a newer version of this guide. This guide replaces individual product installation guides from previous releases.

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Chapter 1: Installation Prerequisites for Windows

This document describes the steps necessary to correctly install and configure all Ansys, Inc. products on Windows platforms for Release 2024 R1. These products include:

- Additional Tools
  - Ansys Viewer
- Design
  - Ansys Discovery
  - Ansys SpaceClaim
- Electronics
  - Ansys Icepak (includes Ansys CFD-Post)
- Fluids
  - Ansys Dynamic Reporting
  - Ansys CFD-Post only
  - Ansys CFX (includes Ansys CFD-Post)
  - Ansys Chemkin
  - Ansys EnSight
  - Ansys FENSAP-ICE
  - Ansys Fluent (includes Ansys CFD-Post)
  - Ansys Forte
  - Ansys ICEM CFD
  - Ansys Model Fuel Library
  - Ansys Polyflow (includes Ansys CFD-Post)
  - Ansys Reaction Workbench
  - Ansys TurboGrid
- Ansys Geometry Interfaces

  - AutoCAD
  - ACIS
  - CATIA, Version 4
  - CATIA, Version 5
  - CATIA, Version 6
  - Creo Elements/Direct Modeling
  - Creo Parametric
  - Inventor
  - JTOpen
  - NX
  - Parasolid
  - Solid Edge
  - SOLIDWORKS
- Optical
  - Ansys Speos
  - Speos HPC
  - Speos for NX - Includes options for Speos for NX 2206, 2212, 2306 and 2312
- PIDO (Optimization)
  - Ansys optiSLang
- Platform
  - Ansys Distributed Compute Services
  - Ansys Remote Solve Manager Standalone Services
- Structures
  - Ansys Additive
  - Ansys Aqwa
  - Ansys Autodyn
  - Ansys Customization Files
  - Ansys LS-DYNA

– Material Calibration App

– Ansys Mechanical Products (includes Ansys Mechanical and Mechanical APDL)

– Ansys Motion

– Ansys Sherlock

– Ansys Sound - SAS (Analysis & Specification)

Note:

Ansys Workbench is installed by default as product components to most Ansys, Inc. products. Ansys Workbench is not installed as part of the products under Ansys Additional Tools, nor with the CFD-Post only option. Ansys Workbench includes the following applications:

- The Mechanical Application
- DesignModeler
- DesignXplorer
- Meshing
- Remote Solve Manager
- Fluent Meshing
- EKM Client
- GRANTA Selector
- GRANTA MI
- Minerva
- SpaceClaim Direct Modeler

Caution:

While **SpaceClaim Direct Modeler** and **Ansys SpaceClaim** can be installed on the same computer, only one of the applications can be configured with Ansys Workbench at any given time. Users can choose which version to configure via the CAD Configuration Manager utility.

- SpaceClaim CATIA V5 Interface
- ECAD

Because some of these applications can be run as standalone applications without Ansys Workbench, you will see some but not all of these listed separately as options when you

uninstall. In such cases, you will need to select those options in order to uninstall those components.

Where supported, IGES and STEP Geometry Interfaces will be installed.

Some procedures apply only to specific products and are so noted.

Important Notice

If you want to run multiple releases of Ansys, Inc. software, you **MUST** install them chronologically (for example., Release 2023 R2 followed by Release 2024 R1). If you install an earlier release after installing Release 2024 R1, you will encounter licensing issues that may prevent you from running any products/releases. If you need to install an earlier release after you have already installed Release 2024 R1, you **MUST** uninstall Release 2024 R1, then re-install the releases in order.

Summary of New and Changed Features

The following features are new or changed at Release 2024 R1. Review these items carefully.

- The Ansys installer supports Speos plugin for NX 2312.
- The Ansys installer now displays Nexus as Dynamic Reporting.

1.1. System Prerequisites

Ansys 2024 R1 is supported on the following Windows platforms and operating system levels. For up-to-date information on hardware platforms or operating systems that have been certified, see the Platform Support section of the Ansys Website.

Table 1.1: Supported Windows Platforms

Processor	Operating System	Platform architecture (directory name)	Availability
x64 (64-bit)	Windows 10 (Professional, Enterprise & Education), Windows 11 (Professional, Enterprise & Education), Windows Server 2019 Standard, Windows Server 2022 Standard	winx64	Download, USB

Note:

Home editions of Windows operating systems are not supported.

For detailed and current support information, see the Platform Support section of the Ansys Website.

Supported Products By Platform

For a complete list of products supported by each platform, see the **Platform Support by Application** PDF on the Platform Support section of the Ansys Website.

Supported Platforms for High Performance Computing

See the discussions on Configuring Distributed Ansys (p. 1) and Configuring Ansys CFX Parallel (p. 7) for detailed information on supported platforms for distributed computing.

1.1.1. CAD Support

The following CAD and auxiliary programs are supported on the indicated products and platforms (where the CAD product is supported on the noted platforms). Products are:

A = Mechanical APDL

W = Ansys Workbench

I = Ansys ICEM CFD (standalone and Ansys Workbench Readers)

Table 1.2: CAD Support by Platform

Product	Windows 10 4	Windows 11
CATIA 4.2.4	A, W, I	A, W
CATIA V5–6R2023	A, W, I	A, W
CATIA V5 (CADNexus CAPRI CAE Gateway V4.00.0) V5-6R2021, V5-6R2022, V5-6R2023	W, I2	W
CATIA V6 R2023x	W, I	W, I
Parasolid 35.1	A, W, I	W
Creo Parametric 10.0	A, W, I	A, W, I
Creo Parametric 9.0	A, W, I,	A, W,
Creo Parametric 8.0	A, W, I	A, W, I
Creo Parametric 7.0	A, W, I	A, W, I
ACIS 2022	A, W, I 1	A, W
NX 2206 6, 2212 6, 2306 6, 2312 6	A, W, I, S	W
SOLIDWORKS 2022	W, I	W
SOLIDWORKS 2021	W, I	
SOLIDWORKS 2020	W, I	
SOLIDWORKS 2019	W, I	
Solid Edge 2022	W, I	W, I
Solid Edge 2021	W, I	
Inventor 2024	W, I	
Inventor 2023	W, I	
Autodesk AutoCAD 2024	W, I	W, I
Autodesk AutoCAD 2023	W, I5	W, I
IGES 3	A, W, I	W
JT 10.5	W, I	W
STEP AP203, AP214, AP242	W, I	

Product	Windows 10 [4]	Windows 11
Creo Elements/Direct Modeling 20.6	W, I	
Creo Elements/Direct Modeling 20.5	W, I	
GEMS	I	
IDI MS8/9	I	
Rhinoceros 6.0	W, I	W
SketchUp 2021	W, I	
Revit 2022	W	W
SpaceClaim	W	

1. For ICEM CFD standalone, ACIS 18.0.1 is the supported version for all platforms.
2. Requires V5-6R2016 or later.
3. IGES Versions 4.0, 5.2, and 5.3 are supported.
4. Professional, Education and Enterprise
5. Requires operating system's Anniversary Update version 1607 or higher
6. Microsoft Visual C++ Redistributable 2019 x64 required.

Note:

View the latest supported CAD packages at ansys.com> Solutions> Solutions by Role> IT Professionals> Platform Support> CAD Support.

1.2. Disk Space and Memory Requirements

You will need the disk space shown here for each product for installation and proper functioning. The numbers listed here are the maximum amount of disk space you will need for each Ansys, Inc. product. Depending on the options selected for each product and shared product features, you may require less disk space when installing multiple products.

Product	Disk Space (GB)
Ansys Additive	25.1
Ansys Aqwa	19.0
Ansys Autodyn	18.5
Ansys CFD-Post only	18.5
Ansys CFX	18.8
Ansys Chemkin	19.2
Ansys Customization Files for User-Programmable Features	11.1
Ansys Discovery	29.1
Distributed Computing Services	8.8

Product	Disk Space (GB)
Ansys Dynamic Reporting	20.0
Ansys EnSight	21.2
Ansys FENSAP-ICE	18.8
Ansys Fluent	29.0
Ansys Forte	21.6
Ansys Geometry Interfaces	10.5
Ansys ICEM CFD	18.9
Ansys Icepak	19.8
Ansys LS-DYNA	20.0
Material Calibration App	22.2
Ansys Mechanical Products	22.1
Ansys Model Fuel Library (Encrypted)	19.2
Ansys Motion	19.3
Ansys optiSLang	17.4
Ansys Polyflow	27.7
Ansys Reaction Workbench	19.2
Ansys Remote Solve Manager Standalone Services	11.3
Ansys Sherlock	20.6
Ansys Sound: SAS	9.5
SpaceClaim	15.4
Ansys Speos	21.7
Speos HPC	8.7
Speos for NX 2206	11.5
Speos for NX 2212	11.5
Speos for NX 2306	11.5
Speos for NX 2312	11.5
Ansys TurboGrid	10.5
Ansys Viewer	10.3
Disk space required to install all products	66.2

Product installations also require an additional 500 MB of free disk space during an installation.

Memory Requirements

You must have a minimum of 8 GB of memory to run product installations; 16 or 32 GB of memory is recommended.

1.3. Software Prerequisites

You must have the following software installed on your system. Administrator privileges are required to install these files. These software prerequisites are installed automatically when you launch the product installation. If, after installing the Ansys products, you need to check your system for these software prerequisites or re-install any of them at a later date, open the Product & CAD Configuration Manager and select **Check for Required Prerequisites** or **Install Required Prerequisites**.

- A minimum version of Microsoft .NET Framework 4.6.2 is required.

  Note:

  If your computer does not have Microsoft .NET Framework 4.6.2 installed, the installation program installs .NET 4.6.2 as a prerequisite and may require a system restart after exiting the installation and before running any Ansys products.

- Microsoft .NET Framework 4.8 is required for Ansys Discovery installation.
- Microsoft Visual C++ 2012 Redistributable (32 and 64 bit versions)
- Microsoft Visual C++ 2013 Redistributable (32 and 64 bit versions)
- Microsoft Visual C++ 2017 Redistributable (32 and 64 bit versions)

  Prior to installing, you can find the executables for the software prerequisites in the root `\prereq` directory of the media/download package.

1.4. Requirements for the GPU Accelerator in Mechanical APDL

Your system must meet the following requirements to use the GPU accelerator capability in Mechanical APDL. For information on the most recently tested NVIDIA GPU cards, see the **GPU Accelerator Capabilities** PDF on the Platform Support section of the Ansys Website.

- The machine(s) being used for the simulation must contain at least one NVIDIA GPU card. The following cards are recommended:

  NVIDIA H100
  NVIDIA A10, A16, A30, A40, A100
  NVIDIA RTX A4000, A5000, A6000
  NVIDIA Tesla Series (any model)
  NVIDIA Quadro RTX 6000, RTX 8000
  NVIDIA Quadro GV100
  NVIDIA Quadro GP100

- When using the sparse solver or eigensolvers based on the sparse direct solver (for example, Block Lanczos or subspace), only NVIDIA GPU devices with significant double precision performance (FP64) are recommended in order to achieve optimal performance. These include the following models:

NVIDIA H100

NVIDIA A30, A100

NVIDIA Tesla Series P100, V100

NVIDIA Quadro GV100

NVIDIA Quadro GP100

- NVIDIA GPU devices with at least 16GB of on-card memory are recommended in order to achieve meaningful acceleration for most simulations in which the GPU card can be used.
- For NVIDIA GPU cards, the driver version must be 527.41 or newer. For optimal performance on Windows, the TCC (Tesla Compute Cluster) driver mode is recommended when using Tesla series GPU cards. Some limitations exist when using this driver mode. Check your GPU card documentation for more details on how to set this driver mode and the existing limitations.
- To utilize a NVIDIA GPU device that is not on the recommended list of cards, set the following environment variable:

  ANSGPU_OVERRIDE=1

  This is most beneficial when you wish to run on newer NVIDIA GPUs that were not available at the time of release of this version of the Ansys program. If you choose to use this environment variable, you should ensure that the NVIDIA GPU device that you wish to use is sufficiently powerful, in terms of both double-precision compute power and on-card memory, to achieve meaningful acceleration for your simulation. Using this environment variable with an underpowered CPU may actually decelerate your simulation.

Note:

On Windows, the use of Remote Desktop may disable the use of a GPU device. Launching Mechanical APDL through the Ansys Remote Solve Manager (RSM) when RSM is installed as a service may also disable the use of a GPU. In these two scenarios, the GPU accelerator capability cannot be used. Using the TCC (Tesla Compute Cluster) driver mode, if applicable, can circumvent this restriction.

1.5. Additional Hardware and Software Requirements

- Intel 64 / AMD64 system with the correct operating system version installed
- 8 GB of RAM (Minimum)
- 128 GB free on the hard drive is recommended
- A current default web browser must be installed to view the **Ansys internet-based help documentation**.

  For a complete list of supported browsers, see the **Browser Support** PDF on the Platform Support section of the Ansys Website.

For a local copy of the product documentation on your system, download an installable version from the Ansys Download Center. Instructions for installing the Local Help are included with the download package.

- Discrete graphics card with the latest drivers and compatible with the supported operating systems. For full functionality, use of a recent NVIDIA Quadro or AMD FirePro card with at least 1 GB of discrete video memory and supporting OpenGL version 4.5 or above. Intel Iris Pro Integrated graphics has also been used successfully.

  For information on the most recently tested graphics cards, see the **Graphics Cards Tested** PDF on the Platform Support section of the Ansys Website.

  For Ansys Discovery, see Product Installation

  Note:

  – **Vendor Legacy Support:** To be compatible, legacy GL 4.5 compliant cards should still be within the official legacy support period of their respective graphics vendor, and must still be receiving regular driver updates. Visit the appropriate vendor websites to review legacy hardware lists.

- A minimum screen resolution of: 1024 x 768 (4:3 aspect ratio), 1366 x 768 (16:9 aspect ratio) or 1280 x 800 (16:10 aspect ratio) with minimum 24 bit color. A higher screen resolution such as 1920x1080 (16:9) or 1920x1200 (16:10) is strongly recommended for most applications.

  Note:

  – Some combinations of graphics card type, operating system, and MPEG resolution fail to play MPEGs properly. You may be able to get normal playback results simply by changing the MPEG settings. Alternatively, you can upgrade your graphics card.

  – **Ultra High Definition (4K) Graphics Cards:** Use of Ultra High Definition (4K) graphics cards may cause a number of cosmetic display issues (including enlarged or reduced text and incorrect positioning of option labels). These issues do not affect the functionality of the installation program.

- Microsoft Mouse or a mouse. Most applications require a three-button mouse.
- If you use a 3Dconnexion product, ensure that you have the latest version of the drivers installed.
- Approximately twice as much swap space as memory. The amount of memory swap space on the system may limit the size of the Ansys model that can be created and/or solved.
- TCP/IP for the license manager (see the Ansys Licensing Guide for more information on TCP/IP).

  Although TCP/IP is included as part of the operating system, it may not be installed by default. When TCP/IP is installed, it must be bound to a network adapter. On machines that are connected to an internal network, TCP/IP must be bound to a network card such as an Ethernet adapter. The vast majority of systems using TCP/IP will fall into this category. On machines that connect to the internet or corporate intranet through a modem, TCP/IP can be bound to the Remote Access Service. Also,

the Autodial option of the Internet Options must be disabled so that the machine does not attempt to connect to the Internet every time Ansys is run. See the Ansys Licensing Guide for more information.

- Microsoft Internet Explorer (IE) 11 or greater is recommended for proper operation of Ansys Workbench. Once the correct version of IE is installed, it does not have to be your default Internet browser. After installation, simply run your preferred browser and reestablish it as the default.
- PDF reader software is required to read the installation guides and other user documentation.

  To access our help system videos, Ansys recommends that you set Windows Media Player as your default.

1.5.1. Ansys Discovery Requirements

Prior to installing Discovery products, verify that your installation computer has the following prerequisites.

Operating System Requirements

One of the following:

- Microsoft® Windows 10 version 21H2 or later (Professional, Enterprise & Education)
  - Supported Releases: General Availability Channel and Long-Term Servicing Channel (Windows 10 Only)
- Microsoft® Windows 11 version 21H2 or later (Professional, Enterprise & Education)
- Microsoft® Windows Server 2019 (Standard) or Windows Server 2022 (Standard)

System Requirements

- 64-bit Intel or AMD system
- Disk Space and Memory:
  - 32 GB RAM or greater
  - 32 GB disk space

Video Card Requirements

User systems should have a dedicated graphics card for Discovery. As detailed in the table below, Discovery's minimum and recommended video card requirements differ depending on the product stage and solver being used.

For information on the most recently tested graphics cards, see the Platform Support section of the Ansys Website and view the **Graphics Cards Tested** PDF for your release.

Note:

With a 4K monitor, Ansys recommends use of a video card with more than 4 GB of dedicated video memory.

Table 1.3: Discovery Stages and Video Card Requirements

Discovery Stage and Solver	Minimum Video Card Requirements	Recommended Video Card Requirements
• Model stage	Dedicated graphics card with the latest vendor drivers supporting OpenGL version 4.6 and a minimum of 2 GB of dedicated video memory	Dedicated NVIDIA Quadro or AMD Radeon Pro graphics card with the latest vendor drivers supporting OpenGL version 4.6 and a minimum of 4 GB of dedicated video memory
• Refine stage with Fluent solver • Refine stage with MAPDL solver	Dedicated graphics card with the latest vendor drivers supporting OpenGL version 4.6 and a minimum of 2 GB of dedicated video memory	Dedicated NVIDIA Quadro or AMD Radeon Pro graphics card with the latest vendor drivers supporting OpenGL version 4.6 and a minimum of 4 GB of dedicated video memory
• Explore stage • Refine stage with LiveGX solver	• Dedicated NVIDIA GPU, Maxwell series or newer • 4 GB of dedicated video memory **Note:** Update your graphics card to the latest drivers from the NVIDIA website prior to installation. At a minimum, you must be using driver version 456.38. With AMD cards and non-compliant NVIDIA cards, Discovery still functions but access to	• Dedicated NVIDIA GPU, Pascal series or newer • 8 GB dedicated video memory **Note:** Update your graphics card to the latest drivers from the NVIDIA website prior to installation. At a minimum, you must be using driver version 456.38. With AMD cards and non-compliant NVIDIA cards, Discovery still functions but access to

Discovery Stage and Solver	Minimum Video Card Requirements	Recommended Video Card Requirements
	the Explore stage, or to the Refine stage using the LiveGX solver, is disabled.	the Explore stage, or to the Refine stage using the LiveGX solver, is disabled.

Unsupported Video Cards

The following cards are no longer supported at 2024 R1. In general, Discovery maintains support for as long as NVIDIA drivers and SDKs allow:

- Consumer
  - GeForce 600 series (for example, GeForce GT625)
    - → NVIDIA GeForce GT 630
    - → NVIDIA GeForce GT 640
    - → NVIDIA GeForce GT 730
    - → NVIDIA GeForce GT 740
    - → NVIDIA GeForce GTX 645
    - → NVIDIA GeForce GTX 650
    - → NVIDIA GeForce GTX 650 Ti
    - → NVIDIA GeForce GTX 650 Ti Boost
    - → NVIDIA GeForce GTX 660
    - → NVIDIA GeForce GTX 660 Ti
    - → NVIDIA GeForce GTX 670
    - → NVIDIA GeForce GTX 680
    - → NVIDIA GeForce GTX 690
    - → NVIDIA GeForce GTX 760
    - → NVIDIA GeForce GTX 760 Ti OEM
    - → NVIDIA GeForce GTX 760 (192-bit)

    - → NVIDIA GeForce GTX 770
    - → NVIDIA GeForce GTX 780
    - → NVIDIA GeForce GTX TITAN
- ProViz
  - Quadro Kxxx series
    - → Quadro 410/420
    - → Quadro K600/620
    - → Quadro K[1/2/4]200
    - → Quadro K2000D
    - → Quadro K[2/4/5]000
  - Quadro Kx000M series
    - → Quadro K[1/2/3/4/5]000M
  - Quadro Kx100M series
    - → Quadro K500M
    - → Quadro K[1/2/3/4/5]100M
- Datacenter
  - GRID K520 (AWS EC2 g2 instance)
  - Tesla K10

Miscellaneous Requirements

- Microsoft .NET Framework 4.8
- Microsoft ASP.NET Core Runtime 6.0
- Microsoft .NET Desktop Runtime 6.0
- Microsoft .NET Runtime 6.0
- Microsoft .NET SDK 6.0
- Microsoft Visual C++ 2019 x64 Redistributable
- OpenCL 1.2
- Windows Media Player is required for viewing the videos that appear on the Ansys Discovery Welcome Screen

Reporting Issues to Ansys Customer Support

If you encounter issues running Discovery, follow this procedure:

1. Open the Windows command prompt as administrator.
2. Run this command:

   "<ansys-install-location>/Framework/bin/Win64/Ans.DriverSetup.exe" --check-system-compatibility

3. Capture the output of the command and include it when contacting Ansys customer support.

1.5.2. 3Dconnexion Product Support

Only specific Ansys applications have been tested for manipulating the model (turning, zooming, panning, etc.) with the 3Dconnexion products. While these 3Dconnexion products do provide significantly enhanced 3D control over viewing the model, they do not function as a mouse replacement and selection operations still require a mouse. For a complete list of 3Dconnexion products certified with the current release of Ansys applications, see the **3Dconnexion Devices Certification** PDF on the Platform Support section of the Ansys Website

To use a 3Dconnexion product with the listed products, you must download and install the appropriate Microsoft Windows driver for your version of Windows. Refer to http://www.3dconnexion.com for more information on using Space products and to download the appropriate drivers.

Spaceball/Connexion3D functionality in Ansys Discovery

- Only the "FIT" built in function is supported.
- Most of the other operations can be simulated by mapping Connexion functions to keyboard shortcuts supported in Ansys Discovery.

1.5.3. Ansys Additive Requirements

The Ansys Additive application uses ports 5000, 7000, 7933, 7934, 7935, 8125, 8181, 9002, 9042, and 9711 to allow communication among the components in the application. See Ansys Additive will not start immediately after installation (p. 90) to troubleshoot if these ports are not open.

All other requirements for Additive are the same as the default requirements for all Ansys products.

1.5.4. Speos Software Requirements

With the exception of the graphics adapter, the requirements for Ansys Speos are the same as the default requirements for all other Ansys products. Ansys Speos requires a minimum NVIDIA Quadro P5200 graphics adapter with a 537.13 NVIDIA driver.

Note:

Ansys certifies one Nvidia driver per release for Speos. That means other or subsequent drivers are not officially supported and may not work.

Regional Settings

When using "Regional Settings>Additional Settings", you must use a dot as decimal symbol and a space as digit grouping symbol.

1.5.4.1. Speos for NX Requirements

To be able to use Speos for NX during a Siemens NX installation, you must install the Programming Tool module for the NX 2206 version and subsequent (NX 2212, NX 2306 and NX 2312).

1.5.4.2. Ansys Optical Labs Requirements

This page presents the hardware and software requirements of the Ansys Optical Labs. The Ansys Optical Labs are exclusively integrated in Ansys SPEOS installation.

The workstation should meet or exceed the following requirements.

Graphic Adapter

Only required for 3D Energy Density Lab and Virtual Reality Lab.

Table 1.4: 3D Energy Density Lab and Virtual Reality Lab Graphics

3D Energy Density Lab	Virtual Reality Lab
• NVIDIA graphics processor • Support of OpenGL v2.1 minimum	• AMD or NVIDIA graphics processor • Support of OpenCL 1.2 minimum • Support of OpenGL v2.1 minimum SDK OpenCL is not required for GPU since it is included with the drivers. Active Stereoscopy can only be done on QUADRO and FIREPRO cards. • HDR only supports the NVIDIA graphics processor. Refer to your GPU specifications to ensure HDR compatibility.

Additional VR Lab Requirements

Examples of Speos 360 Files Memory Requirements

This table contains a list of characteristics associated to Speos 360 files and the corresponding GPU memory required for a correct display.

The following examples are for a 1920*1080 screen resolution.

Resolution	Size (GB)	Number of layers	Stereo	Cache size			
				1024 MB	2048 MB	3072 MB	4096 MB
5000*5000	14.4	13	✗	-	✓	✓	✓
10000*10000	15.3	2	✗	✓	✓	✓	✓
2000*2000	1	4	✗	✓	✓	✓	✓
2000*2000	6.51	21	✗	-	-	✓	✓
2400*2400	9.92	6	✓	-	✓	✓	✓
2048*2048	14.4	30	✓	-	-	✓	✓
5000*5000	28.8	26	✗	-	-	-	✓
5000*5000	57.7	26	✓	-	-	-	-

Network and Access Requirements for VR Lab in Multiscreen

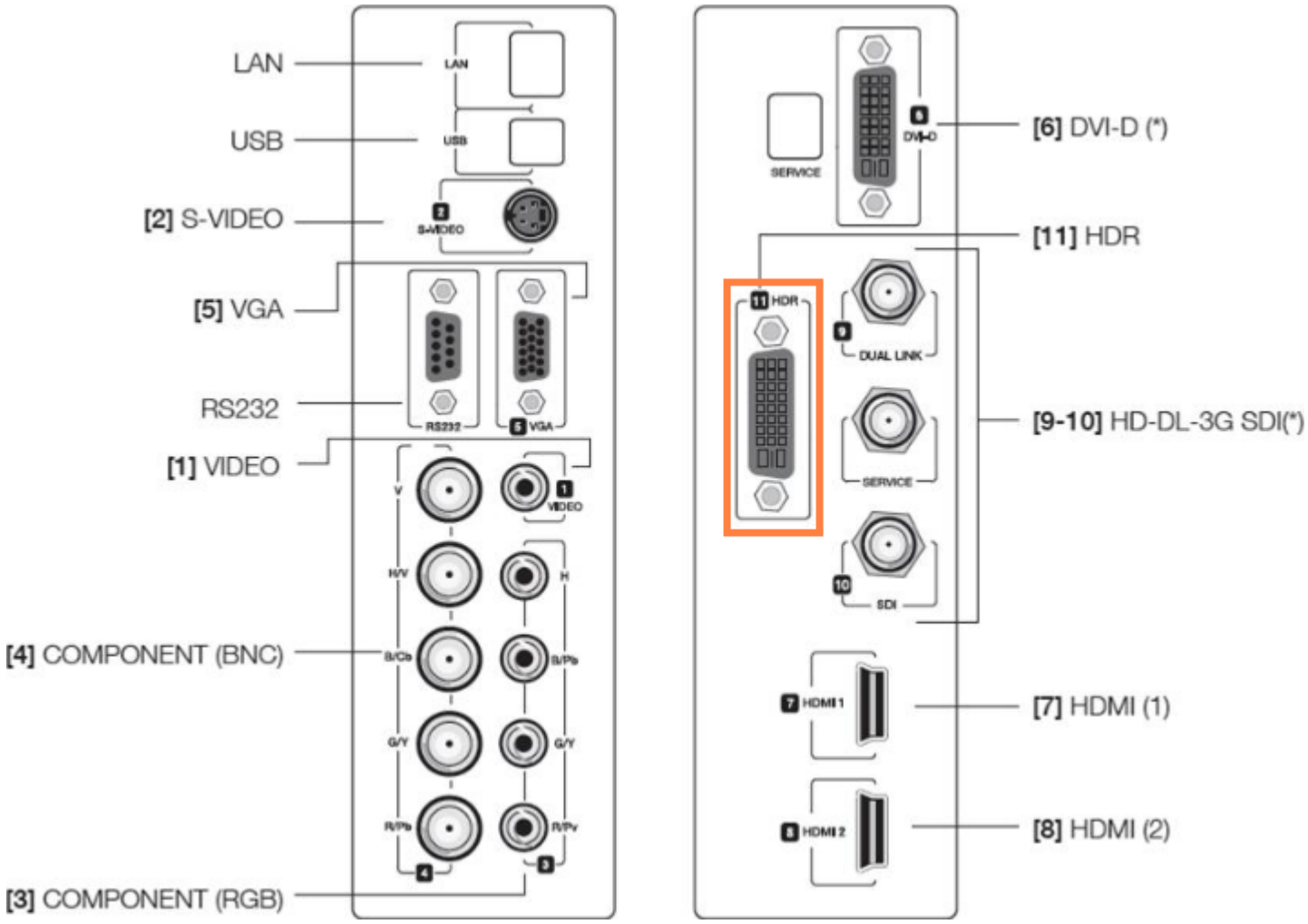
- Port 51008 must be available for the OPTIS Daemon in TCP.
- Port 51004 must be available for Virtual Reality Lab in TCP.
- Port 51005 must be available for Virtual Reality Lab in multicast UDP.
- Maximal Transmission Unit value must be set to default value (1500 bytes).

SIM2 HDR monitor for Virtual Reality Lab

- HDR47 Series monitor
- SIM2 HDR monitor has to be dedicated for rendering and a standard monitor for interface.
- High Dynamic Range DVI signal connector (#11).

Note:

Press F1 key on the remote control to activate the HDRI mode. See your SIM2 HDR display user manual for more information.



1.6. Third-Party Software and other Security Considerations

The following third-party products are used as part of the installation process. In order for the installation to work properly, you must allow access to these products.

Product Name	Executable Name
Tcl	tclsh.exe
Tk	want.exe
Perl	perl.exe
7zip	7z.exe
Microsoft .NET Framework	.net

Chapter 2: Platform Details

Windows 10 and 11 User Account Control (UAC)

Windows 10 and 11 use a feature called User Account Control (UAC) to control privileges and automatically reduce the potential of security breaches in the operation system. However, UAC limits your accessibility to system areas and can cause unpredictable behavior in Ansys, Inc. products.

Ansys, Inc. requires that you have full administrative privileges when installing any software on Microsoft Windows 10 and 11. Non-administrative accounts do not usually have the permissions required to access system areas that installation programs often need to modify. "Full administrative privileges" means that you are running as administrator with UAC turned off, or you are running as administrator with UAC turned on and **Run as Administrator** selected. Because of changes to the UAC functionality, it is necessary that you right-click and select **Run as Administrator** from the context menu when installing to Windows 10 or 11.

Recommended Installation Options:

- UAC turned off and install with full administrative privileges (using **Run as Administrator** from the context menu)

When installing Ansys, Inc. products, we strongly recommend that you use the recommended options above. If UAC is enabled, we recommend that you turn UAC off before installing Ansys, Inc. products, and then turn it back on when finished installing. You must be an administrative user in order to disable UAC.

Follow the instructions for your operating system for disabling UAC.

Once you have installed your applications, you can enable UAC again.

Installing with UAC on Windows 10 and 11

If you cannot disable UAC and need to install with UAC on, you must run all applications, including the installation setup, as an administrator. Otherwise, the files may be written to `AppData\Local\VirtualStore\<path>` (or similar) rather than directly to `<path>`, if `<path>` is a protected directory (such as `C:\Program Files`). As a result, some applications and utilities may behave unpredictably.

If you cannot disable UAC, you should perform the following functions:

- Always run **ANSLIC_ADMIN**, the **File Association** utility, and the **Product & CAD Configuration Manager** by selecting the utility or application from the **Start** menu and right-mouse clicking and selecting **Run as Administrator**.

- Set your Start menu shortcuts to always run as administrator with the following procedure (or similar):

1. Right-click the shortcut you wish to modify and select **Open File Location** from the options located at the bottom of your screen.
2. Right-click the shortcut file that is displayed and click **Properties** from the menu.
3. From the **Properties** dialog box, click **Advanced** on the **Shortcut** tab.
4. Select **Run as administrator** and click **OK**.
5. Click **OK**.

Notes about UAC

When installing Ansys, Inc. products, including the license manager, on Windows 10 machines, you need to be aware of several factors involving User Access Control (UAC):

You should install the Ansys, Inc. License Manager using the same permissions as you used to install the product.

If you install both the product and the license manager with full administrative privileges, the product and licensing installation and configuration will proceed as normal.

If you install as an administrative user with UAC turned on, you may encounter unpredictable behavior with both the product and license manager installations and subsequent behavior. As an administrator, you should choose to install and run applications with full administrative privileges to avoid any unpredictable situations. We strongly recommend against running with UAC on and not selecting **Run as Administrator**. These situations are described below.

1. If you have UAC turned on and you do not install (and run) with full administrative privileges, be aware that files may be written to and read from the `%localappdata%\VirtualStore\` location (in the case of licensing, to `%localappdata%\VirtualStore\Program Files\ANSYS Inc\Shared Files\Licensing`) instead of to the <*os drive*>.

   In this situation, **ANSLIC_ADMIN** settings, such as **Specify the License Server Machine**, will indicate that files are being written to and read from <*os drive*>`\Program Files\ANSYS Inc\Shared Files\Licensing`. Log files may behave in the same way. However, when you view the `ansyslmd.ini` file located in <*os drive*>`\Program Files\ANSYS Inc\Shared Files\Licensing`, you will not see the **ANSLIC_ADMIN** settings you specified.

2. To ensure that files are correctly written to and read from <*os drive*>`\Program Files\ANSYS Inc\Shared Files\Licensing`, you should always run with full administrative privileges by selecting **Run as Administrator**.

3. If you are not running with full administrative privileges, you will not be able to use those **ANSLIC_ADMIN** options that require administrative privileges, such as starting and stopping the license manager.

2.1. Utilizing CPU Hyperthreading Technology with Ansys CFD Solvers

Hyperthreading technology uses one processor core to run more than one task at a time. Ansys does not recommend using hyperthreading technology in conjunction with Ansys CFD Solvers (Fluent and

CFX). We recommend that you turn CPU hyperthreading off (default is on). A system administrator needs to reboot the system and enter the BIOS to turn the hyperthreading option off.

2.2. Compiler Requirements for Windows Systems

The following compilers are required only if you will be using User-Programmable Features (UPFs), User-Defined Functions (UDFs), or other customization options.

Table 2.1: Compiler Requirements for All Windows Versions

Mechanical APDL, Ansys Workbench Compilers	CFX Compilers	Fluent Compilers*	Autodyn Compilers	Chemkin and Forte Compilers
Microsoft Visual Studio Professional 2019 Version 16.0.22 (including the MS C++ compiler), Intel OneAPI 2023.1.0 Classic C++ compiler (version 2021.9.0) and Intel OneAPI 2023.1.0 Classic FORTRAN compiler (version 2021.9.0)	Microsoft Visual Studio Professional 2019 Version 16.0.22 (including the MS C++ compiler), Intel OneAPI 2023.1.0 Classic C++ compiler (version 2021.9.0) and Intel OneAPI 2023.1.0 Classic FORTRAN compiler (version 2021.9.0)	Microsoft Visual Studio 2017, 2019, and 2022 (all including the MS C++ compiler), and Clang 10.0.0** compilers	Microsoft Visual Studio Professional 2019 Version 16.0.22 (including the MS C++ compiler), Intel OneAPI 2023.1.0 Classic C++ compiler (version 2021.9.0) and Intel OneAPI 2023.1.0 Classic FORTRAN compiler (version 2021.9.0)	Microsoft Visual Studio Professional 2019 Version 16.0.22, Intel OneAPI 2023.1.0 Classic C++ compiler (version 2021.9.0) and Intel OneAPI 2023.1.0 Classic FORTRAN compiler (version 2021.9.0) (for Chemkin API, Chemkin user-programmed subroutines and FORTE output user routines.)

* For UDFs, these supported compilers are recommended but optional, as a built-in compiler (Clang 10.0.0) is provided as part of the Fluent installation. You should enable the built-in compiler if the compiler you installed is an older version that is not supported; if Fluent determines that neither Microsoft Visual Studio nor Clang is installed on your computer, the built-in compiler is used automatically. For details, see Compiling a UDF Using the GUI in the *Fluent Customization Manual*.

** This compiler is only supported for compiling UDFs, and will only be used if Fluent determines that Microsoft Visual Studio is not installed on your computer.

Note:

The software compiler versions listed above may not correspond to the latest releases available from Intel and Microsoft but can be downloaded separately from the respective vendors' customer sites. If you need to purchase/obtain Intel Fortran, note that you must register on Intel's customer website with your Intel Fortran license information. Once logged into Intel's customer site, you have the option of downloading previous releases. For Microsoft Visual Studio, an MSDN subscription is required, which allows you to download previous releases. Note that purchasing the latest Microsoft Visual Studio

software without an MSDN subscription may not entitle you to download previous releases.

2.3. Select Your Installation

The next step is to select your installation type. Select the option below that matches your installation.

- Installing Ansys Products for a Stand-alone Windows System (p. 23)
- Installing Ansys Products and the License Manager on Different Windows Machines (p. 35)

Chapter 3: Installing Ansys Products for a Stand-alone Windows System

This section includes the steps required for installing Ansys, Inc. products and licensing configuration on one Windows machine.

You can follow these instructions while actually installing the products and setting up the license server. To do so, simply use the selections that are pertinent to you and insert your specific information where noted.

Before You Begin

We recommend that you have the following information available before you begin this installation:

- An account on the Ansys customer site. If you do not have an account, you may register at www.ansys.com/customercommunity to receive your own account.
- Your license file from Ansys, Inc., saved to a temporary directory. For more information, see Registering the License Server (p. 33).
- Open port numbers for FlexNet and Ansys Licensing Interconnect. Defaults are 1055 and 2325, respectively. To verify that these port numbers are available, open a command line and enter the following command:

  ```
  netstat -a -p tcp
  ```

  You will see a list of active ports. If 1055 and 2325 are listed, they are already in use and cannot be used for Ansys, Inc. licensing. In this case, you will need to specify different port numbers where indicated later in this installation.
- Your local machine's hostname, to specify as the license server.

> **Note:**
>
> In order for Ansys products to operate normally, it is necessary to have name resolution (communication by host name) between the license server machine and the client machine.

You should also verify that you are running on a supported platform.

Verify that you have sufficient disk space to download, uncompress, and install the products you will be installing.

If you have any problems with--or questions about--the installation process, log a Service Request on the Ansys customer site to have a Systems Support Specialist assist you.

These instructions are divided into four sections:

- Product Download/DVD Instructions: This set of instructions describes the download and extraction process.
- Product Installation with Client Licensing: This set of instructions describes the product installation, including the client licensing portion.
- License Manager Installation: This set of instructions describes the license manager installation.
- Post-Installation Procedures for All Products: This is a set of instructions that describes any configuration steps that may be required for the various products.

For this installation, both the product and the license manager will be installed on the same machine. *You must complete both the client licensing portion and the license manager installation in order to run Ansys, Inc. products.*

3.1. Downloading the Installation Files

To download the installation files from our website, you will need to have a current technical support agreement.

Depending on the product/platform combination(s) you choose, you may need to download multiple files.

1. From the Ansys customer site, www.ansys.com/customercommunity, click **Downloads > Current Release**.
2. Select your installation operating system (**Windows x64** or **Linux x64**).
3. Select the type of files you wish to download:
   - **Primary Packages**: Individual full packages for the primary Ansys products.
   - **ISO Images**: ISO images for the DVD installation.
4. Click the appropriate download option.
5. Select your desired download directory and click **Save**.
6. Repeat this process for each download file.
7. To download **Add-On Packages**, **Tools** or **Academic Packages**, click the + to the right of the appropriate product group title to display the download options and download as required.
8. After all downloads have been completed, uncompress each package using standard uncompression utilities for your specific platform. We strongly recommend that you extract the files into new, temporary directories.
9. Begin the product installation as described in Installing Ansys, Inc. Products (p. 25).

3.1.1. Installing from a USB Drive

To install Ansys, Inc. products from a USB drive, insert the USB drive into a USB slot on your computer. Locate and right-click the **setup.exe** file stored at the root level of the USB and select **Run as administrator**. Continue with the steps described in Installing Ansys, Inc. Products (p. 25).

3.1.2. Installing from a DVD

To install Ansys, Inc. products from a DVD, place the DVD in your DVD drive. If autorun is enabled, the installation will begin automatically. If autorun is disabled, locate and right-click the `setup.exe` file contained on the DVD and select **Run as administrator**. Continue with the steps described in Installing Ansys, Inc. Products (p. 25).

The application prompts you to change DVDs during the installation. Make sure you have all installation DVDs before beginning the installation.

3.2. Installing Ansys, Inc. Products

This section explains how to install Ansys, Inc. products.

Note:

Ansys requires users to install all products by using the right-click option **Run as administrator**.

.

3.2.1. Product Installation with Client Licensing

To install Ansys, Inc. products with client licensing, follow the steps below.

Note:

You must also install the Ansys, Inc. License Manager on at least one server machine in order to run Ansys, Inc. products. See Ansys License Manager Installation (p. 31) for license manager installation instructions.

---

1. Save all data and close all Windows applications before continuing.
2. If you downloaded the installation files or if you are installing from a DVD or USB with autorun disabled, browse to the location of the `setup.exe` file. Right-click the `setup.exe` file and select **Run as administrator**.

   The Ansys, Inc. Installation Launcher appears.

From the options on the left side of the launcher you can install Ansys products, MPI for Ansys Parallel Processing, and the Ansys License Manager. The MPI for Ansys Parallel Processing installation steps are displayed when you click the **Install MPI for Ansys Parallel Processing** link.

The Ansys Quick Start Installation Guide, Ansys Quick Start Licensing Guide, System Requirements Guide and complete Installation Help Guide can be accessed through the options located along the bottom of the launcher.

3. Select the language you want to use from the drop-down menu in the upper right corner. English is the default.

4. Click the **Install Ansys Products** option.

   The license agreement appears.

> **Note:**
>
> The question mark icon located in the upper right side of each installation screen displays an explanation of the functionality available on that screen. The letter "I" icon displays information about the release version of the installation software.

5. Read the agreement, and if you agree to the terms and conditions, select **I Agree**. Click **Next**, located on the right side of the screen.

6. The directory where you want to install the Ansys, Inc. products is shown in the **Install Directory** field. You can install the products into any directory you want, but you must have write permis-

sions to the directory you choose. The default is `C:\Program Files\ANSYS Inc`. We recommend using the default directory.

Note:

You must install all Ansys, Inc. products into the same location. Installing products into different locations can cause product components to fail. If you choose an install directory via the Browse feature, the installation will automatically append `\ANSYS Inc\` to the chosen directory. The installation path can have a maximum of 100 characters, except on AUTODYN, which has a maximum of 40 characters.

- Leave the **Associate file extensions with Ansys products** check box enabled. This allows you to double-click files from Windows Explorer to launch the various products.
- If you are using an application that can utilize Ansys QA Services, select the **Enable Ansys QA Services with supported applications (QA Service Agreement required)** option. Note that the Ansys QA Services option requires a separate Quality Assurance Service Agreement. Do not select this option if you have not obtained a Quality Assurance Service Agreement.

  Alternatively, this option can be set by opening the system control panel and adding the following:

  ```
  ENABLE_ANSYS_QA_SERVICES211 = 1
  ```

  For more information on ANSYS Quality Services, visit our website at: https://www.ansys.com/About-ANSYS/quality-assurance/quality-assurance-services.

Click **Next**.

7. If this is a first time installation, you are prompted to enter your license server specification. If you already have an existing license server specification file, you will not see this window and proceed directly to the next step.

   Enter your Ansys Licensing Interconnect port number and your Ansys FlexNet port number. Defaults are provided and will work in most cases. You may need to check with your IT department to confirm that the default port numbers are valid or to get different port numbers if necessary.

   Specify the hostname for your license server machine(s).

   Click **Next**.

8. All products available in the installation package(s) you downloaded are listed in a tree view. A checkmark to the left of the product signifies that the product and all related "child" products are enabled for installation while a grey box indicates that some, but not all products are enabled for installation. You can expand the tree to select any additional products you wish to install.

   The installation program attempts to query your license server to pre-select your installation options. If the query is successful, the following message is displayed:

   Review and change the pre-selected installation options if necessary

   If the installation program was unable to query your license server, this message is not displayed and the default installation options are selected.

You can select or deselect any combination of products. Ansys Workbench is automatically installed with most Ansys, Inc. products; there is no individual product selection for Ansys Workbench.

Selecting either the **Ansys Additional Tools > Optical Addon > Speos for Creo Parametric** or **Speos for NX** options presents you with additional installation steps. These steps are completed on the **SpeosCAD Configuration** screen. For additional information on completing these steps, see Configuring Speos CAD Interfaces (p. 31).

If you are installing **Speos** and you are willing to use the CAD Connection V3 (through the Block Recording), select the **Ansys Geometry Interfaces** option.

If you select the **Ansys Geometry Interfaces** option, you are presented with additional installation steps. These steps are completed on the **CAD Configuration** screens which are displayed when you click **Next**. For additional information on completing these steps, see Specifying CAD Configurations (p. 29).

An estimate of the disk space required to install all of the selected components, and the disk space you have available is displayed. The actual amount of disk space required may be less, but if you choose to run the installation with insufficient disk space available, we strongly recommend that you review the log files at the end of the installation to verify that all products were installed correctly. Installation log files are written to the installation directory.

Note:

On a first time installation, if you chose to install any Ansys Geometry Interfaces, ensure that you have also selected at least one Ansys, Inc. product as part of the installation. Installing an Ansys Geometry Interface without an underlying Ansys, Inc. product on a first time installation may cause installation errors.

Select/deselect the products you want to install and click **Next**.

The dates on the licensing files being installed are compared to any that may already exist on your machine. (This may take a few moments.)

9. A summary of the selected installation data appears. Review the information carefully, and if correct, click **Next** to continue the installation.

10. The installation progress screen displays a status bar towards the bottom of the installation window. This status bar tracks the percentage of packages that have been installed on your computer. Depending on the number of products you have selected, the installation time required could be lengthy. You will not be able to interrupt the installation process. Please be patient while the installation completes.

Note:

Clicking the **View Details Progress Log** button opens a second window that displays the name of each product package as it is uncompressed and installed.

The installation program will first check your system to determine if you have the necessary prerequisites. If the prerequisites are not already on your system, the prerequisites will be installed automatically.

Note:

If prerequisite components necessary for the installation of the Ansys products were installed, depending on your existing machine configuration, the following message may be displayed:

Software prerequisites have been installed.

A system restart may be required after exiting the installation and before using any Ansys Products.

If a system restart is required, a restart error message will be written to the install.err error file. The install.err error file is located in the installation directory.

Click **Next** to continue the installation.

11. The product installation window reappears with a message noting that the installation is complete. A **Launch Survey Upon Exiting** option is included here. Clicking **Exit** while the **Launch Survey Upon Exiting** is enabled causes your default browser to open, displaying the product survey. Disabling (un-checking) the **Launch Survey Upon Exiting** option and then clicking **Exit** skips the survey.

    The Ansys, Inc. Installation Launcher appears. For this stand-alone installation, you must complete the License Manager installation (next) to run Ansys, Inc. products.

3.2.1.1. Specifying CAD Configurations

Selecting the **Ansys Geometry Interfaces** option, from the product selection screen and clicking **Next** displays a series of configuration screens for your geometry interfaces.

1. On the first screen, you are asked to select one of the following three configuration options:

    - Selecting the **Yes, automatically configure my interfaces** option and clicking **Next** determines if each CAD system is installed on your computer. If the CAD is installed, this option sets the configuration to appropriate associative interface. If the CAD is not installed, the configuration is set to reader. Geometry interfaces without a detectable license will not be configured. After you make this selection, the installation continues as described in the Product Installation with Client Licensing (p. 25) step #9.

    - Selecting the **Yes, I will make my selections** option and clicking **Next** walks you through a several manual configuration steps. If you select this option, you can configure the appropriate geometry interface properties by following the steps described below.

    - Selecting the **No. Skip configuration. I will configure later** option and clicking **Next** ignores the geometry interface configuration at this time. After you make this selection, the installation continues as described in the Product Installation with

Client Licensing (p. 25) step #9. You can use this option if you have not yet installed the related CAD programs, or do not know the requested information. If you skip these steps, you will need to manually configure these geometry interfaces using the **Product & CAD Configuration Manager** before you can successfully import models into Ansys products. See Configuring CAD Products (p. 71) for more information on using the **Product & CAD Configuration Manager**.

2. After selecting the **Yes, I will make my selections** option and clicking **Next** (bullet point #2 above), you are presented with a check list of the geometry interfaces. You can manually choose which geometry interfaces you would like to configure by enabling the appropriate check box(es). Note that the configuration is not performed for any geometry interface check box that is disabled. You will have to do that at a later time by following the steps in the Configuring CAD Products (p. 71) section.

   When you have selected the appropriate interfaces, click **Next**.

3. The next screen the provides you with the option of selecting the reader or associative interface for each enabled geometry interface.

   Configure each geometry interface option and click **Next**.

4. If you selected the associative interface for **Creo Parametric** or **NX**, a third screen is displayed. In this case follow the steps below. If you did not select **Creo Parametric** or **NX** the installation continues as described in the Product Installation with Client Licensing (p. 25) step #9.

   Creo Parametric

   You may need to specify the Creo Parametric command, and the full Creo Parametric installation path (`C:\Program Files\PTC\Creo 6.0.0.0\Parametric` by default) for an existing Creo Parametric installation.

   NX

   If you choose the associative interface and the UGII environment variables were not set, you may need to specify the NX installation path for an existing NX installation. If you are an administrative user, a file required to load the NX plug-in is placed in the administrative user's Application Data folder by default, which may not be accessible by other, non-administrative users. To allow non-administrative users to run, you will need to define the environment variable **UGII_CUSTOM_DIRECTORY_FILE** prior to installation and specify a location where other users have read access. Alternatively, you can run the **Product & CAD Configuration Manager** after the installation and provide an updated location for the NX Custom Directory File Path.

5. Once you have completed the **Creo Parametric** or **NX** configuration, click **Next**. The installation continues as described in the Product Installation with Client Licensing (p. 25) step #9.

3.2.1.2. Configuring Speos CAD Interfaces

Selecting the **Ansys Additional Tools > Optical Addon > Speos for Creo Parametric** or **Speos for NX** options from the product selection screen and clicking **Next** displays an interactive configuration screen for your Speos CAD interfaces.

Note:

If you have selected the **Geometry Interfaces** option in addition to any Speos CAD Interface option and clicked **Next**, the geometry interface configuration screens are displayed *before* the Speos CAD Interface configuration screens.

---

1. From the list of Speos CAD Interfaces displayed, select the check boxes that appropriately reflect your system. You must select at least one interface to continue the installation.
2. As you select a checkbox, an **Installation Path** field is displayed. Click **Browse** and locate the folder containing the existing CAD installation that corresponds to the check box.

Note:

The installation program attempts to query your system to determine the path to the appropriate CAD program.. If the installation can find your CAD program, the **Installation Path** field is prepopulated this information.

---

3. Once you have located the appropriate folder, click the **Select Folder** option.
4. Perform this process for each Speos CAD Interface you require. Alternatively, you can enable the Skip Speos CAD Configuration option to configure the interfaces at a later time. For more information, see Using the Product & CAD Configuration Manager (p. 71).
5. After completing the configuration of the Speos CAD Interfaces, click **Next**. The installation continues as described in the Product Installation with Client Licensing (p. 25) step #9.

3.2.2. Ansys License Manager Installation

Follow the instructions below to install and configure the Ansys License Manager on your local Windows machine. You must be an administrative user to install the Ansys License Manager on Windows. The License Manager controls access to the Ansys, Inc. products you have purchased. You must complete the License Manager installation to run Ansys, Inc. products.

1. If the Installation Launcher is not open, right-click the setup.exe file and select **Run as administrator**.
2. Select **Install Ansys License Manager**.
3. The installation launcher appears.
4. You are notified that the license manager, if running, will be shut down. Click **OK**.

5. The License Agreement screen appears. Read the license agreement, and if you agree, click **I Agree** to accept the terms and click **Next**, located on the right side of the screen. You must select **I Agree** to continue with the installation.

6. Specify the installation directory and click **Next** to continue. You can accept the default or specify an alternate path and the directory name where the license manager is to be installed. The installation directory is set to `<OS_Drive>\Program Files\ANSYS Inc` by default. You must have administrative privileges for the directory you specify. In addition, the directory:

   - must be a local directory
   - must be a local, fixed-media drive
   - cannot be a UNC or relative path
   - cannot be a short (8.3) file name format path
   - cannot be a symbolic link or junction
   - cannot use wide character names/paths

   Note:

   You are unable to change the installation directory for a computer that currently contains an instance of the Ansys, Inc. License Manager or Ansys Electromagnetics License Manager. To change the installation directory location, you must first uninstall any previous versions of both products.

   The Ansys, Inc. License Manager is the only component available and is selected to be installed. The amount of disk space required and the disk space available appear at the bottom of the window. Be sure that you have sufficient space before continuing.

7. Click **Next** to continue.

8. A summary of the selected installation data appears. Review the information carefully, and if correct, click **Next** to continue the installation.

   The Ansys License Manager is now being installed and configured on your system. After the License Manager installation has been completed, the **Launch License Management Center upon exiting** option is included on the screen. The **Ansys License Management Center** is a browser-based user interface that centralizes many of the Ansys product licensing administrative functions. If you do not want to launch the License Management Center, clear the **Launch License Management Center upon exiting** option.

9. Click **Exit** to close the **License Manager Installation** screen.

10. When the license manager installation is complete, click **Exit**. A new Start Menu item named **Ansys, Inc. License Manager** will be created automatically. It will include selections for the **License Management Center**, the *Ansys, Inc. Licensing Guide*, the *FlexNet License Administration Guide and the **ANSLIC_ADMIN** utility*.

3.2.2.1. Registering the License Server

If you are a new user who has not received a license file for your server or if you add or change a license server machine, follow this procedure to register your license server information. See the Ansys Licensing Guide for more information on selecting license servers (Selecting License Server Machines) and on using the Ansys License Management Center (License Server Administration Using Ansys License Management Center).

1. Open the **Ansys License Management Center**.
2. Click the **Get System Hostid Information** option to display your system ID code(s).
3. Select the system ID you wish to use and click **SAVE TO FILE**.

   A text file containing your system ID information is created.
4. Forward this text file to your Ansys sales representative so that a license file can be created for you.
5. Add your license files though the **Ansys License Management Center**. For these steps, see Adding a License.

After completing the installation process, refer to Post-Installation Instructions (p. 49)

Chapter 4: Installing Ansys Products and the License Manager on Different Windows Machines

This section describes installing Ansys, Inc. products on one Windows machine and installing the Ansys, Inc. License Manager on a different Windows machine that will act as a license server.

This installation process requires you to perform the following steps:

1. Install the Ansys License Manager on one or more "server" computers. (This step is not necessary if a license server is already available on your network.) See Ansys License Manager Installation (p. 46) for more information.

2. Install the Ansys Products on one or more "client" computers. (It is not necessary to install the Ansys License Manager on the "client" computers.) See Installing Ansys, Inc. Products (p. 37) for more information.

You can follow these instructions while actually installing the products and setting up the license server. To do so, simply use the selections that are pertinent to you and insert your specific information where noted.

Before You Begin

We recommend that you have the following information available before you begin this installation:

- An account on the Ansys customer site. If you do not have an account, you may register at www.ansys.com/customercommunity to receive your own account.

- Your license file from Ansys, Inc., saved to a temporary directory. For more information, see Registering the License Server (p. 47).

- Open port numbers for FlexNet and Ansys Licensing Interconnect on your license server machine. Defaults are 1055 and 2325, respectively. To verify that these port numbers are available, open a command line on the server machine and enter the following command:

  ```
  netstat -a -p tcp
  ```

  You will see a list of active ports. If 1055 and 2325 are listed, they are already in use and cannot be used for Ansys, Inc. licensing. In this case, you will need to specify different port numbers where indicated later in this tutorial.

- The hostname of the machine that will act as a license server.

> **Note:**
>
> In order for Ansys products to operate normally, it is necessary to have name resolution (communication by host name) between the license server machine and the client machine.

You should also verify that you are running on a supported platform. Ansys, Inc. supports 64-bit systems running Windows 10 and 11.

Verify that you have sufficient disk space to download, uncompress, and install the products you will be installing.

For network installations, the same UNC paths or mapped drive letters must be used on the server and all client computers. Failure to use matching UNC paths or mapped letter drives can cause server communication issues or loss of product functionality.

If you have any problems with--or questions about--the installation process, log a Service Request on the Ansys customer site to have a Systems Support Specialist assist you.

This installation is divided into four sets of instructions:

- Product Download/DVD Instructions: This set of instructions describes the download and extraction process.
- Product Installation with Client Licensing: This set of instructions describes the product installation, including the client licensing portion.
- License Manager Installation: This set of instructions describes the license manager installation.
- Post-Installation Procedures for All Products: This is a set of instructions that describes any configuration steps that may be required for the various products.

For this procedure, the product and the license manager will be installed on separate Windows machines. *You must complete both the client licensing portion and the license manager installation in order to run Ansys, Inc. products.*

4.1. Downloading the Installation Files

To download the installation files from our website, you will need to have a current technical support agreement.

Depending on the product/platform combination(s) you choose, you may need to download multiple files.

1. From the Ansys customer site, www.ansys.com/customercommunity, click **Downloads > Current Release**.
2. Select your installation operating system (**Windows x64** or **Linux x64**).
3. Select the type of files you wish to download:

- **Primary Packages**: Individual full packages for the primary Ansys products.
- **ISO Images**: ISO images for the DVD installation.

4. Click the appropriate download option.
5. Select your desired download directory and click **Save**.
6. Repeat this process for each download file.
7. To download **Add-On Packages**, **Tools** or **Academic Packages**, click the + to the right of the appropriate product group title to display the download options and download as required.
8. After all downloads have been completed, uncompress each package using standard uncompression utilities for your specific platform. We strongly recommend that you extract the files into new, temporary directories.
9. Begin the product installation as described in Installing Ansys, Inc. Products (p. 37)

4.1.1. Installing from a USB Drive

To install Ansys, Inc. products from a USB drive, insert the USB drive into a USB slot on your computer. Locate and right-click the **setup.exe** file stored at the root level of the USB and select **Run as administrator**. Continue with the steps described in Installing Ansys, Inc. Products (p. 37).

4.1.2. Installing from a DVD

To install Ansys, Inc. products from a DVD, place the DVD in your DVD drive. If autorun is enabled, the installation will begin automatically. If autorun is disabled, locate and right-click the `setup.exe` file contained on the DVD and select **Run as administrator**. Continue with the steps in Installing Ansys, Inc. Products (p. 37).

If you are installing from media, the application prompts you to change DVDs during the installation. Make sure you have all installation DVDs before beginning the installation.

4.2. Installing Ansys, Inc. Products

This section explains how to install Ansys, Inc. products.

Note:

Ansys requires users to install all products by using the right-click option **Run as administrator**.

4.2.1. Product Installation with Client Licensing

To install Ansys, Inc. products, including client licensing, follow the steps below.

Note:

You must also install the Ansys, Inc. License Manager on at least one server machine in order to run Ansys, Inc. products. See Ansys License Manager Installation (p. 46) for license manager installation instructions.

1. Save all data and close all Windows applications before continuing.

2. If you downloaded the installation files or if you are installing from a DVD or USB with autorun disabled, navigate to the location of the `setup.exe` file. Right-click the `setup.exe` file and select **Run as administrator**.

   The Ansys, Inc. Installation Launcher appears.

   From the options on the left side of the launcher you can install Ansys products, MPI for Ansys Parallel Processing, and the Ansys License Manager. The MPI for Ansys Parallel Processing installation steps are displayed when you click the **Install MPI for Ansys Parallel Processing** link.

   The Ansys Quick Start Installation Guide, Ansys Quick Start Licensing Guide, System Requirements Guide and complete Installation Help Guide can be accessed through the options located along the bottom of the launcher.

3. Select the language you want to use from the drop-down menu in the upper right corner. English is the default.

4. Click the **Install Ansys Products** option.

The license agreement appears.

Note:

The question mark icon located in the upper right side of each installation screen displays an explanation of the functionality available on that screen. The letter "I" icon displays information about the release version of the installation software.

5. Read the agreement, and if you agree to the terms and conditions, click **I Agree**. Click **Next**, located on the right side of the screen.

6. The directory where you want to install the Ansys, Inc. products is shown in the **Install Directory** field. You can install the products into any directory you want, but you must have write permissions to the directory you choose. The default is `C:\Program Files\ANSYS Inc`. We recommend using the default directory.

   Note:

   You must install all Ansys, Inc. products into the same location. Installing products into different locations can cause product components to fail. If you choose an install directory via the Browse feature, the installation will automatically append `\ANSYS Inc\` to the chosen directory. The installation path can have a maximum of 100 characters, except on AUTODYN, which has a maximum of 40 characters. For a network installation, the same UNC paths or mapped drive letters must be used on the server and all client computers.

   - Leave the **Associate file extensions with Ansys products** check box enabled. This allows you to double-click files from Windows Explorer to launch the various products.
   - If you are using an application that can utilize Ansys QA Services, select the **Enable Ansys QA Services with supported applications (QA Service Agreement required)** option. Note that the Ansys QA Services option requires a separate Quality Assurance Service Agreement. Do not select this option if you have not obtained a Quality Assurance Service Agreement. For more information on Ansys Quality Services, visit our website at: https://www.ansys.com/About-ANSYS/quality-assurance/quality-assurance-services.
   - If you specify a network location as the installation directory, you should select the **Add .NET security exceptions on the above install directory** option. This option allows the .NET binaries that are located under the `\ANSYS Inc` directory on the shared machine to be run from the network.

     To understand the implications of this security exception for .NET, contact your system administrator or see Configuring Security Policy on Microsoft's website.
   - Used with network installations, this option allows the .NET binaries that are located under the **\ANSYS Inc** directory on the shared machine to be run from the network.

   Click **Next**.

7. If this is a first time installation, you are prompted to enter your license server specification. If you already have an existing license server specification file, you will not see this window and proceed directly to the next step.

   Enter your Ansys Licensing Interconnect port number and your Ansys FlexNet port number. Defaults are provided and will work in most cases. You may need to check with your IT department to confirm that the default port numbers are valid or to get different port numbers if necessary.

   Specify the hostname for your license server machine(s).

   Click **Next**.

8. All products available in the installation package(s) you downloaded are listed in a tree view. A checkmark to the left of the product signifies that the product and all related "child" products are enabled for installation while a grey box indicates that some, but not all products are enabled for installation. You can expand the tree to select any additional products you wish to install.

   The installation program attempts to query your license server to pre-select your installation options. If the query is successful, the following message is displayed:

   Review and change the pre-selected installation options if necessary

   If the installation program was unable to query your license server, this message is not displayed and the default installation options are selected.

   You can select or deselect any combination of products. Ansys Workbench is automatically installed with most Ansys, Inc. products; there is no individual product selection for Ansys Workbench.

   Selecting either the **Ansys Additional Tools > Optical Addon > Speos for Creo Parametric** or **Speos for NX** options presents you with additional installation steps. These steps are completed on the **SpeosCAD Configuration** screen. For additional information on completing these steps, see Configuring Speos CAD Interfaces (p. 45).

   If you are installing **Speos** and you are willing to use the CAD Connection V3 (through the Block Recording), select the **Ansys Geometry Interfaces** option.

   If you select the **Ansys Geometry Interfaces** option, you are presented with additional installation steps. These steps are completed on the **CAD Configuration** screens which are displayed when you click **Next**. For additional information on completing these steps, see Specifying CAD Configurations (p. 44).

   An estimate of the disk space required to install all of the selected components, and the disk space you have available is displayed. The actual amount of disk space required may be less, but if you choose to run the installation with insufficient disk space available, we strongly recommend that you review the log files at the end of the installation to verify that all products were installed correctly. Installation log files are written to the installation directory.

   Note:

   On a first time installation, if you chose to install any Ansys Geometry Interfaces, ensure that you have also selected at least one Ansys, Inc. product as part of the installation. Installing an Ansys Geometry Interface without an underlying Ansys, Inc. product on a first time installation may cause installation errors.

Select/deselect the products you want to install and click **Next**.

The dates on the licensing files being installed are compared to any that may already exist on your machine. (This may take a few moments.)

9. A summary of the selected installation data appears. Review the information carefully, and if correct, click **Next** to continue the installation.

10. The installation progress screen displays a status bar towards the bottom of the installation window. This status bar tracks the percentage of packages that have been installed on your computer. Depending on the number of products you have selected, the installation time required could be lengthy. You will not be able to interrupt the installation process. Please be patient while the installation completes.

    Note:

    Clicking the **View Details Progress Log** button opens a second window that displays the name of each product package as it is uncompressed and installed.

    The installation program will first check your system to determine if you have the necessary prerequisites. If the prerequisites are not already on your system, the prerequisites will be installed automatically.

    Note:

    If prerequisite components necessary for the installation of the Ansys products were installed, depending on your existing machine configuration, the following message may be displayed:

    Software prerequisites have been installed.

    A system restart is may be required after exiting the installation and before using any Ansys Products.

    If a system restart is required, a restart error message will be written to the install.err error file. The install.err error file is located in the installation directory.

    Click **Next** to continue the installation.

11. The product installation window reappears with a message noting that the installation is complete. A **Launch Survey Upon Exiting** option is included here. Clicking **Exit** while the **Launch Survey Upon Exiting** is enabled causes your default browser to open, displaying the product survey. Disabling (un-checking) the **Launch Survey Upon Exiting** option and then clicking **Exit** skips the survey.

4.2.1.1. Network Server and Product Configuration

To complete a network installation (where the product is installed on one machine and multiple clients access that installation to run the product) to a file server machine, follow the steps below. A network installation must be homogeneous, although you can install on different operating systems.

1. Install the product(s) to be shared in a location that all clients can access. Install all platforms that this machine will host as described in Product Installation with Client Licensing (p. 38).

   You must share the entire `\ANSYS Inc` directory, not just the `\v241` directory. If mapping a drive to the shared location, it must be mapped to the `\ANSYS Inc` folder.

2. Open the Product & CAD Configuration Manager (`\\`*`fileservermachine`*`\ANSYS Inc\v241\ProductConfig.exe`). Select **Install Required Prerequisites**. You must be logged in as an administrative user to install the prerequisites. This step must be completed on all client Windows systems.

3. A configuration status screen appears. This screen displays the required prerequisite installation process. Once the process is complete, click **Exit**. The Product & CAD Configuration Manager remains open.

4. On each Windows client, update the .NET security settings. By default, the .NET Framework prevents applications from being run over a network. In order to install over a network, each Windows client that accesses the shared directory requires a modification to its security settings. This modification allows the .NET binaries that are located under the `\ANSYS Inc` directory on the shared machine to be run from the network. To make this modification from the Product & CAD Configuration Manager, select **Add .NET security exception for Ansys, Inc. products**. You must have administrative privileges to modify the security policy.

   To understand the implications of this security exception for .NET, contact your system administrator or see Configuring Security Policy on Microsoft's website.

   Alternatively, you can allow network execution manually rather than using the **Add .NET security exception for Ansys, Inc. products** option of the Product & CAD Configuration Manager. The **Add .NET security exception for Ansys, Inc. products** option runs the Caspol utility, which is located under the .NET Framework installation, in `C:\Windows\Microsoft.NET\Framework64\v2.0.50727` for a 64-bit machine. You can run this utility manually in a command prompt window to open full trust to files on the shared drive.

   On a 64-bit machine, run the following command:

   ```
   <os drive>\Windows\Microsoft.NET\Framework64\v2.0.50727\Caspol.exe -m -ag
        <CodeGroup> -url file://x:/* FullTrust
   ```

   where *x* is the mapped drive or UNC path where the product is installed, and *CodeGroup* is the appropriate Caspol permissions level. We recommend a *CodeGroup* setting of 1.2. If that setting does not work or is not appropriate for your environment, see the Caspol documentation available from Microsoft or contact your system administrator.

   You must install Caspol as an administrative user. If running this from the command line on Windows 10 or 11, you must start the command prompt as Administrator, or the command will fail.

5. If you are sharing the Mechanical APDL product, edit the `tlbrlist241.ans` file, located in `\v241\ansys\gui\en-us\toolbars` on the Windows file server. The file should read as follows:

   ```
   \\fileservermachine\ANSYS Inc\v241\ansys\gui\en-us\toolbars\ANSYSSTANDARD.TLB
   \\fileservermachine\ANSYS Inc\v241\ansys\gui\en-us\toolbars\ANSYSABBR.TLB
   \\fileservermachine\ANSYS Inc\v241\ansys\gui\en-us\toolbars\ANSYSGRAPHICAL.TLB
   ```

6. For all types of network installations, from each client Windows machine, you will need to run `ProductConfig.exe`. If the Product & CAD Configuration Manager has been closed, reopen it as described above.

7. Select **Configure Products & CAD**.

8. Select the products and CAD options you want to configure. Click **Configure**.

   Note:

   CFD-Post is automatically configured when CFX, Fluent, Polyflow, or Icepak is configured, or if CFD-Post is selected.

9. An informational message box appears as each product is configured.

   All operations and error messages that are encountered while using the product and CAD configuration (or unconfiguration) option are written to the `productConfig.txt` file in the %TEMP% directory of the client machine. No log files are written to the machine that is hosting `ProductConfig.exe`.

   Note:

   ProductConfig.exe can also be run in batch mode using the '-silent' flag, which may be useful for automating configuration for multiple systems or across a Microsoft Windows HPC cluster. For more information see Silent Mode Operations (p. 61).

10. If you selected any CAD options, your will need to complete additional configuration steps. These steps are completed on the **CAD Configuration** screen which is displayed when you click **Next**. For additional information on completing these steps, see Specifying CAD Configurations (p. 44).

11. When the configuration is completed, you will see shortcuts to each product in Windows under **Start > Ansys 2024 R1**.

Unconfigure

To unconfigure products or CAD options that have previously been shared, use the following procedure:

1. From each client machine, in Windows 10 and 11 (**Start > Ansys 2024 R1> Product & CAD Configuration 2024 R1**).

2. Select **Unconfigure Products & CAD**.

3. Select the products and CAD options you want to unconfigure and click **Next**. When unconfiguring products, be aware that WB/Common should be unconfigured last, after all other products are unconfigured. If you are unconfiguring some but not all products, do NOT unconfigure WB/Common, or your remaining products will not run correctly.

CFD-Post

CFD-Post can be configured as a standalone product; however, as a standalone product, it is also automatically configured with Fluent, Polyflow, and Icepak. To unconfigure CFD-Post, you must select all of these products to unconfigure, regardless if they are configured locally.

- If you choose to unconfigure standalone CFD-Post without unconfiguring the other products, you will not be able to proceed with the unconfigure. You will need to revise your selections before continuing.
- If you choose to unconfigure all of the other products that include CFD-Post but you do not select CFD-Post, then CFD-Post will not be unconfigured.

4. The user interface billboard displays the status of each product as it is unconfigured. The shortcuts to each product are now removed.

4.2.1.2. Specifying CAD Configurations

Selecting the **Ansys Geometry Interfaces** option, from the product selection screen and clicking **Next** displays a series of configuration screens for your geometry interfaces.

1. On the first screen, you are asked to select one of the following three configuration options:
   - Selecting the **Yes, automatically configure my interfaces** option and clicking **Next** determines if each CAD system is installed on your computer. If the CAD is installed, this option sets the configuration to appropriate associative interface. If the CAD is not installed, the configuration is set to reader. Geometry interfaces without a detectable license will not be configured. After you make this selection, the installation continues as described in the Product Installation with Client Licensing (p. 38) step #9.
   - Selecting the **Yes, I will make my selections** option and clicking **Next** walks you through a several manual configuration steps. If you select this option, you can configure the appropriate geometry interface properties by following the steps described below.
   - Selecting the **No. Skip configuration. I will configure later** option and clicking **Next** ignores the geometry interface configuration at this time. After you make this selection, the installation continues as described in the Product Installation with Client Licensing (p. 38) step #9. You can use this option if you have not yet installed the related CAD programs, or do not know the requested information. If you skip these steps, you will need to manually configure these geometry interfaces using the **Product & CAD Configuration Manager** before you can successfully import models into Ansys products. See Configuring CAD Products (p. 71) for more information on using the **Product & CAD Configuration Manager**.
2. After selecting the **Yes, I will make my selections** option and clicking **Next** (bullet point #2 above), you are presented with a check list of the geometry interfaces. You can manually choose which geometry interfaces you would like to configure by enabling the appropriate check box(es). Note that the configuration is not performed for any geometry interface

check box that is disabled. You will have to do that at a later time by following the steps in the Configuring CAD Products (p. 71) section.

When you have selected the appropriate interfaces, click **Next**.

3. The next screen the provides you with the option of selecting the reader or associative interface for each enabled geometry interface.

   Configure each geometry interface option and click **Next**.

4. If you selected the associative interface for **Creo Parametric** or **NX**, a third screen is displayed. In this case follow the steps below. If you did not select **Creo Parametric** or **NX** the installation continues as described in the Product Installation with Client Licensing (p. 38) step #9.

   Creo Parametric

   You may need to specify the Creo Parametric command, and the full Creo Parametric installation path (`C:\Program Files\PTC\Creo 6.0.0.0\Parametric` by default) for an existing Creo Parametric installation.

   NX

   If you choose the associative interface and the UGII environment variables were not set, you may need to specify the NX installation path for an existing NX installation. If you are an administrative user, a file required to load the NX plug-in is placed in the administrative user's Application Data folder by default, which may not be accessible by other, non-administrative users. To allow non-administrative users to run, you will need to define the environment variable **UGII_CUSTOM_DIRECTORY_FILE** prior to installation and specify a location where other users have read access. Alternatively, you can run the **Product & CAD Configuration Manager** after the installation and provide an updated location for the NX Custom Directory File Path.

5. Once you have completed the **Creo Parametric** or **NX** configuration, click **Next**. The installation continues as described in the Product Installation with Client Licensing (p. 38) step #9.

4.2.1.3. Configuring Speos CAD Interfaces

Selecting the **Ansys Additional Tools** > **Optical Addon** > **Speos for Creo Parametric** or **Speos for NX** options from the product selection screen and clicking **Next** displays an interactive configuration screen for your Speos CAD interfaces.

Note:

If you have selected the **Geometry Interfaces** option in addition to any Speos CAD Interface option and clicked **Next**, the geometry interface configuration screens are displayed *before* the Speos CAD Interface configuration screens.

---

1. From the list of Speos CAD Interfaces displayed, select the check boxes that appropriately reflect your system. You must select at least one interface to continue the installation.

2. As you select a checkbox, an **Installation Path** field is displayed. Click **Browse** and locate the folder containing the existing CAD installation that corresponds to the check box.

   Note:

   The installation program attempts to query your system to determine the path to the appropriate CAD program.. If the installation can find your CAD program, the **Installation Path** field is prepopulated this information.

3. Once you have located the appropriate folder, click the **Select Folder** option.

4. Perform this process for each Speos CAD Interface you require. Alternatively, you can enable the Skip Speos CAD Configuration option to configure the interfaces at a later time. For more information, see Using the Product & CAD Configuration Manager (p. 71).

5. After completing the configuration of the Speos CAD Interfaces, click **Next**. The installation continues as described in the Product Installation with Client Licensing (p. 38) step #9.

4.2.2. Ansys License Manager Installation

Because you will be using a network server, you must install and configure the Ansys, Inc. License Manager on the server machine. The License Manager controls access to the Ansys, Inc. products you have purchased.

Note:

It is not necessary to install the Ansys License Manager on the client computers.

1. On the server machine, navigate to the directory where the installation packages reside. Right-click the `setup.exe` file and select **Run as administrator**. The Ansys, Inc. Installation Launcher appears. Click **Install Ansys License Manager**.

2. You will see a warning stating that if the license manager is currently running, it will be shut down. You may safely ignore this message and click **OK**.

3. The license agreement appears. Read the agreement, and if you agree to the terms and conditions, click **I Agree**. Click **Next**, located on the right side of the screen.

4. The directory where the license manager will be installed is shown in the **Install Directory** field. Accept the default directory and click **Next**.

   Note:

   You are unable to change the installation directory for a computer that currently contains an instance of the Ansys, Inc. License Manager or Ansys Electromagnetics License Manager. To change the installation directory location, you must first uninstall any previous versions of both products.

5. The Ansys, Inc. License Manager is selected as the only product available to install. As with the product installation, the required and available disk space numbers are shown. Click **Next**.

6. A summary screen appears that lists the products to be installed. Because this is a license manager installation, the Ansys, Inc. License Manager is the only product listed.

   Click **Next**. The license manager installation begins.

   After the License Manager installation has been completed, the **Launch License Management Center upon exiting** option is included on the screen. The **Ansys License Management Center** is a browser-based user interface that centralizes many of the Ansys product licensing administrative functions. If you do not want to launch the License Management Center, clear the **Launch License Management Center upon exiting** option.

7. Click **Exit** to close the **License Manager Installation** screen.

8. Click **Exit** to close the Ansys, Inc. Installation Launcher.

9. From the machine on which the products were installed, choose **Start> Programs> Ansys 2024 R1> <*product*>** to launch the Ansys, Inc. products that you have installed.

4.2.2.1. Registering the License Server

If you are a new user who has not received a license file for your server or if you add or change a license server machine, follow this procedure to register your license server information. See the Ansys Licensing Guide for more information on selecting license servers (Selecting License Server Machines) and on using the Ansys License Management Center (License Server Administration Using Ansys License Management Center).

1. Open the **Ansys License Management Center**.

2. Click the **Get System Hostid Information** option to display your system ID code(s).

3. Select the system ID you wish to use and click **SAVE TO FILE**.

   A text file containing your system ID information is created.

4. Forward this text file to your Ansys sales representative so that a license file can be created for you.

5. Add your license files though the **Ansys License Management Center**. For these steps, see Adding a License.

After completing the installation process, refer to Post-Installation Instructions (p. 49)

Chapter 5: Post-Installation Instructions

The following post-installation procedures apply to all Ansys, Inc. products. Individual products may have additional post-installation procedures; refer to the following sections for each product:

Note:

If the installation program reported any errors, review the installation error file (install.err) located in the Ansys Inc directory. Contact your Ansys Support representative if you have any questions.

It may also be necessary to establish some system settings, including path names and environment variables. See your operating system documentation for specific instructions on setting paths and environment variables.

1. Set the following environment variables based on the behavior you want.

   - The **ANSYSLIC_DIR** environment variable sets the location of the Ansys licensing directory hierarchy. The default value is `C:\Program Files\ANSYS Inc\Shared Files\Licensing`. You probably will not need to reset this variable, unless you change the location of the licensing files.

   To set environment variables:

   Windows 10 or 11: Right-click **Start** and choose **Control Panel**. Click **Advanced System Settings>System>Advanced System Settings>Environment Variables**. Click **New**. Type the name in the Variable Name field and the desired setting in the Variable Value field. Click **OK** on all dialog boxes.

   If you have any command prompts or console windows open when you set or reset environment variables, those windows need to be closed and restarted in order to pick up the new settings.

2. Set the home directory. To set a home directory in Windows, you need to set a **HOMEDRIVE** environment variable to the desired drive letter (including the colon) and a **HOMEPATH** environment variable to the desired path. For example:

   ```
   HOMEDRIVE=C:
   HOMEPATH=\Users\Mine
   ```

3. Set the license manager to start automatically at boot time. For platform-specific instructions, see License Manager Automatic Startup Instructions in the Ansys Licensing Guide.

4. Designate server(s) for license checkout and establish necessary user privileges (recommended but not required). For information on these tasks, see Ansys Licensing Settings Utility in the Ansys Licensing Guide.

5. Verify the product installation by selecting each product from the **Start** menu to verify that they each start and run correctly. You must be pointing to a valid license server machine before you can verify the installation.

6. If you chose not to set file associations during the installation, you may want to run the File Association utility now to configure the Ansys file types. Administrative privileges are required to run this utility

   For Windows 10 or 11, right-click the **Start Screen> All apps> Ansys 2024 R1> File Association 2024 R1**.

   For network installations, run the File Association utility on each client computer.

   You can also run the File Association utility in silent mode:

   ```
   <install_dir>\v241\installer\instcore\fileassoc.exe -silent
   ```

   You can see help on the `fileassoc.exe` by issuing `-help`. File associations are as follows:

Ansys, Inc. Product	File Extension
Mechanical APDL	`.db`, `.dbb`, `.grph`
Ansys CFD-Post	`.mres`, `.res`
Ansys CFX	`.cfx`, `.cvf`, `.def`, `.mdef`
Ansys Composite PrepPost	`.acph5`
Ansys Fluent	`.cas`
Ansys ICEM CFD	`.prj`, `.tin`, `.uns`
Ansys Workbench	`.ad`, `.agdb`, `.aqdb`, `.bgd`, `.cmdb`, `.dsdb`, `.engd`, `.fedb`, `.mechdat`, `.meshdat`, `.pmdb`, `.wbdb`, `.wbpj`, `.wbpz`

Quality Assurance Services:

If you require verification of your Ansys software installation, Ansys, Inc. offers Quality Assurance services for some applications. If you are interested in this service, visit the Ansys website and go to **Products & Services > Services & Support > Quality Assurance > Quality Assurance Services** or call the Ansys, Inc. Corporate Quality Group at (724) 746-3304.

5.1. Post-Installation Procedures for Mechanical APDL and Ansys Workbench Products

The following post-installation procedures apply only to the Mechanical APDL and Ansys Workbench products. These are in addition to the post-installation procedures noted above for all products.

- Set the following environment variables based on the behavior you want. Set the environment variables following the conventions of your operating system. Not all of these are required for all integrated Ansys Workbench products (such as Ansys Autodyn), but setting them correctly for Ansys Workbench will in no way hinder the performance of the other products.

  - The **ANSYS241_DIR** environment variable sets the location of the Ansys directory hierarchy. The default value is `c:\Program Files\ANSYS Inc\V241\ANSYS`. You probably will not need to reset this variable, unless you change the location of the installed files.

  - **ANSYS241_PRODUCT** - set this to the correct product variable to run Mechanical APDL to start with the correct Mechanical APDL product without specifying the **-p** command modifier each time.

  - **ANS_CONSEC** - set this to YES to disable Mechanical APDL dialog boxes and allow multiple jobs to run consecutively without waiting for user input. Settings for **ANS_CONSEC** are:

Value of ANS_CONSEC	Batch Dialog Box	GPF Dialog Box on Error
Not defined/default	No	Yes
YES	No	No
NO	Yes	Yes

  - **ANSYS_LOCK** - set to ON (default) to create file locks to prevent users from opening a new job with the same name and in the same directory as the current job.

  - **ANSYS241_MAT161** - set this environment variable to 1 to enable use of the LS-DYNA *MAT_COMPOSITE_MSC material (requires an LS-DYNA MAT_161 license).

  - **ANSYS241_MAT162** - set this environment variable to 1 to enable use of the LS-DYNA *MAT_COMPOSITE_DMG_MSG material (requires an LS-DYNA MAT_162 license).

  - **LSTC_LICENSE** - This is an LS-DYNA environment variable that controls which license manager is used by the LS-DYNA executable. It is set to Ansys during installation; changing this environment variable will prevent Ansys LS-DYNA from using your Ansys licenses when running the executable.

Configuring MPI Software

Installing MPI for Ansys Parallel Processing (p. 59) gives instructions for installing MPI software, for use with Ansys Parallel Processing. This section mentions the following set-password batch scripts, for caching your login/password credentials:

- `"setimpipassword.bat", for Intel MPI`

- `"setpcmpipassword.bat", for IBM MPI`

If, when running any of your simulations, you get an error message relating to an inability to connect to the hydra_service, you will need to run the corresponding set-password script. Note that because some Ansys products require processing in parallel, it may be necessary to run the set-password script even if you are not performing parallel processing.

5.1.1. Post-Installation Procedures for Ansys Fluent

After installing the Ansys Fluent software, you will need to reset the default values in the Ansys Fluent launcher as follows:

1. Verify that the **FLUENT_INC** environment variable is not set. From the Control Panel, select **System** and click the **Advanced** tab. Click **Environment Variables**. Find and delete the **FLUENT_INC** variable.
2. In Windows 10 or 11, **Start > All apps> Ansys 2024 R1> FLUENT 2024 R1**.
3. Click **Default**.
4. Click **Yes** when asked if you want to discard the LAUNCHER history.
5. Click **Cancel** if you do not want to start Fluent at this time. The new defaults will have been saved.

Please refer to the *Ansys Fluent Quick Start Guide* for more information.

The default Intel MPI in Fluent release 2023 R2 fails to install the hydra service when installing Intel MPI from the Ansys Installation Launcher on Windows. Workaround: You must make sure that the appropriate services have been configured to run by the administrator as follows:

```
"c:\Program Files (x86)\Intel\oneAPI\mpi\2021.8.0\bin\hydra_service.exe"
-install
```

5.1.2. Post-Installation Procedures for Ansys Polyflow

Polyflow no longer requires the **FLUENT_INC** environmental variable. It should be deleted as is recommended for Fluent:

- From the Control Panel, select **System** and click the **Advanced** tab. Click **Environment Variables**. Find and delete the **FLUENT_INC** variable.

5.1.3. Post-Installation Procedures for ICEM CFD

If you are running ICEM CFD over the network, you may not be able to access ICEM CFD Help using the Help menu. To access ICEM CFD Help, navigate to `commonfiles\help\en-us` in the installation directory on the server machine and copy the file `icemcfd_help.chm` to your local machine. Double-click the local copy to view the help.

5.1.4. Post-Installation Procedures for Ansys FENSAP-ICE

Software Launch

After installing Ansys FENSAP-ICE, the software will be accessible through **Start > All Programs > Ansys 2024 R1 > Fluid Dynamics > FENSAP-ICE 2024 R1**.

Workbench Extension

Some features of FENSAP-ICE are available in Workbench through the use of an extension. The plug-in is provided in the following directory:

```
<install_dir>/ansys_inc/v241/fensapice/workbench/FENSAPICE-WB R24.1.wbex
```

While in Ansys Workbench, install the plug-in using the **Extensions > Install Extension** menu. You can then set it to load automatically at startup in the **Extensions > Manage Extensions** menu.

See Getting Started with FENSAP-ICE in Workbench for further details on running FENSAP-ICE in Workbench.

Licensing

The Ansys Licensing System is used by default. No special configuration is required if the Ansys License contains a feature enabling FENSAP-ICE and the Ansys R2024 R1 package is installed.

NTI Licensing

Legacy license keys from prior to Ansys R2024 R1 use the NTI FLEXLm license system. The option for NTI licensing must then be enabled in the licensing.txt file <install_dir>/ansys_inc/v241/fensapice/config/licensing.txt or by setting up the **NTI_LICENSE_FILE** environment variable.

Modify the licensing.txt file to contain the license server information **NTI_LICENSE_FILE=port@server**.

The default port is 27000.

For instructions on how to set-up the NTI license server or on how to force a specific licensing system, refer to the appropriate sections in the FENSAP-ICE Manual.

5.1.5. Post-Installation Information for Ansys Speos

The following post-installation procedures apply only to the Ansys Speos products.

Speos Environment Variables

An environment variable describes the resource that must be recovered by the computer. The following table lists all the environment variables that can be used in the bat files.

Note:

The file paths provided below depend on your operating system and product version.
Never insert spaces between a variable and its value.

Application	Environment Variable	Description	Default value if not existing
Any Speos	OPTIS_BASE_PATH	Optical Products directory in program files	%AWP_ROOT221%\Optical Products\

AnySpeos	OPTIS_SOFTWARE_BASE_PATH	Speos Software directory inside Optical Products	%AWP_ROOT221%\Optical Products\<softname>
Any Speos	OPTIS_VIEWERS_PATH	Viewers installation directory inside Optical Products	%OPTIS_BASE_PATH%\Viewers
Any Speos	OPTIS_APPLICATION_DATA_PATH	ProgramData path	%programdata%\Ansys\v2XX\Optica Products\
Any Speos	OPTIS_USER_APPLICATION_DATA_PATH	Main AppData path	%appdata%\Ansys\v2XX\Optical Products\
Speos	SPACECLAIM_OEM_XML	Xml file path. Used by SpaceClaim to find the xml file defining the customization for the application being considered as Speos product instead of SpaceClaim	Mandatory
Speos	SPEOSSC_RESOURCES_PATH	Folder path. Used by the xml file set in SPACECLAIM_OEM_XML to provide SpaceClaim with the required Speos customization resources (manifest, icons, default user configuration)	Mandatory
Speos for NX	SPEOS_NX_DIR	The path to the Speos for NX application folder containing binaries, icons, dlx files ...)	Mandatory
Speos for NX	UGII_CUSTOM_DIRECTORY_FILE	It is an NX environment variable which allows to define the .dat required for NX application. We usually set the ANSYS_SPEOS_NX_DIR variable.	Mandatory

Batch Files Examples

This section gives information about .bat file commands and provides batch files examples. Batch (.bat) files are plain text files. They contain a series of commands that are executed by the Windows command-line interpreter.

Speos Example:

```
set Version=2021 R2

set ANSYS_Version=212

TITLE Speos V%ANSYS_Version%

REM please update this path

set SPEOSSC_PATH=D:\Ansys_Speos_Folder\ANSYS SPEOS %SSC_VERSION%\

set SPEOS_download_dir=D:\Ansys_Speos_Folder\%Version%

set EAP_SPEOS_STRIDE=1

set SERVER_SPACECLAIM=C:\Program Files\ANSYS Inc

set SPACECLAIM_PATH=%SERVER_SPACECLAIM%\v%ANSYS_Version%\scdm

set OPTIS_BASE_PATH=%SPEOS_download_dir%

set OPTIS_SOFTWARE_BASE_PATH=%SPEOS_download_dir%\Speos

set SPEOSSC_RESOURCES_PATH=%SPEOS_download_dir%\Speos\bin\Resources

set SPACECLAIM_OEM_XML=%SPEOSSC_RESOURCES_PATH%\SPEOS_SCCustomization.xml

start "" "%SPEOS_download_dir%\Speos\bin\AnsysSpeosLauncher.exe"
"%SPACECLAIM_PATH%\SpaceClaim.exe" /AddInManifestFile="%SPEOS_down-
load_dir%\Speos\bin\SpeosSC.Manifest.xml"
```

Speos for NX Example:

```
echo off

cls

set SPEOSVersion=241

set NX_RELEASE=2212

TITLE Speos for NX %Version%

REM please update this path

set SPLM_LICENSE_SERVER=29000@LIC_SERVER_TO_MODIFY

REM Replace NXPTR101 with your license module

set UGS_LICENSE_BUNDLE=NXPTR101

set OPTIS_BASE_PATH=\\SHARED_STORAGE\v%SPEOSVersion%\Optical
Products\Speos for NX

set OPTIS_SOFTWARE_BASE_PATH=%OPTIS_BASE_PATH%\NX_SPEOS_%NX_RELEASE%
```

```
set SPEOS_NX_DIR=%OPTIS_SOFTWARE_BASE_PATH%

REM please update the content of the *.dat file below with the
SPEOS_NX_DIR value

set UGII_CUSTOM_DIRECTORY_FILE=%OPTIS_BASE_PATH%\speos_custom_dir_%NX_RE-
LEASE%.dat

REM Allows automation without SPEOS for NX started

Path=%Path%;%SPEOS_NX_DIR%\application\

call "\\SHARED_STORAGE\Siemens\NX2212\NXBIN\ugraf.exe" -NX
```

5.1.5.1. Integrating Speos for NX as an add-on on a Server

You can use this procedure to launch NX with Speos for NX as add-on from a dedicated server on your localcomputer.

Note:

Prior to performing the following procedure, you must install Speos for NX and NX on the server.

To integrate Speos for NX:

1. On the server, in the **custom_dirs.dat** file (that may be located in the NX installation on the server), add the path to the **NX_SPEOS_XXXX** folder. The following example orders NX to launch Speos for NX as add-on when launching NX.

   Example: `\\yourserverpath\Speos for NX\NX_SPEOS_XXXX`

2. On your local computer, in the NX Startup bat file, set the following environment variables:

   a. `UGII_CUSTOM_DIRECTORY_FILE = \\yourserverpath\custom_dirs.dat`

      This will inform the Startup bat file where to find the custom_dirs.dat file on the server.

   b. `UGII_VENDOR_OPTIS = \\yourserverpath\Speos for NX\NX_SPEOS_XXXX`

3. On the server, modify the SpeosNXApp.men file (that may be located in Speos for NX\NX_SPEOS_XXXX\startup) according to the site needs.

   This file includes the NX "menuscript" commands to insert the Speos for NX application button in the NX application menu.

4. On the server, share the folders where NX (example: \\yourseverpath\Siemens\NXXXXX) and Speos for NX (example: \\yourserverpath\Ansys Inc\v2XX) are installed, in order for your local machine to access the files.

5. Launch NX from your local machine.

For more information on add-on integration, please refer to the NX documentation.

5.1.6. Post-Installation Procedures for Other Products

FEMGV

For Ansys Aqwa customers, FEMGV is also available as a separate, standalone installation, available via media or the Ansys customer site Download Center.

5.2. Launching Ansys, Inc. Products

To launch Ansys, Inc. products on Windows 10 or 11 platforms, choose the product from the Ansys 2024 R1 program group under **All apps**.

For Mechanical APDL, you can also use the launcher:

Windows 10 or 11: Start> All apps> Ansys 2024 R1> Mechanical APDL Product Launcher 2024 R1.

5.3. Running the ANS_ADMIN Utility for Mechanical APDL /Ansys Workbench Products

You may need to run the **ANS_ADMIN** utility to relink Mechanical APDL if you use the customization tools. For more information on individual options available with this utility, see the online help accessible from **Help** buttons on the utility dialog boxes. You can launch **ANS_ADMIN** without administrative privileges, but some of the options require administrative privileges. If certain options are grayed out, you do not have the necessary system administrator privileges necessary for that option, or the corresponding product may not be installed.

To run the ANS_ADMIN utility from Windows 10 or 11, right-click the **All apps> Ansys 2024 R1> ANS_ADMIN 2024 R1**.

5.4. Product Localization

Many Ansys, Inc. products are available in multiple languages, including English, German, French, and Japanese. For those products that are localized, you are able to view the GUI and messages in the specified language. See your specific product documentation for instructions on choosing a localized version of the product.

Note:

To view Localization Support Requirements for the current release of Ansys products, see **Ansys customer site> Knowledge Resources> Online Documentation> Documentation Information**.

All products that are localized define the language via the `languagesettings.txt` file. In most cases, you will not have to manually edit this file. If you do need to edit it manually, you can use one of the following values:

en-us (English, default)

de (German)

fr (French)

ja (Japanese)

Ansys, Inc. applications will look for the `languagesettings.txt` file in the following locations, in order:

1. `%appdata%\ANSYS\v241`
2. `<install_dir>\ANSYS Inc\v241\commonfiles\Language`

Ansys, Inc. licensing also looks for the `languagesettings.txt` in the licensing languages subdirectories in order to display the server **ANSLIC_ADMIN** utility and the Ansys, Inc. Licensing Interconnect message and log files in a different language.

Some products are not fully localized but offer only the messages in a translated version. See the following section for instructions on translated message file installation.

5.4.1. Translated Message File Installation for Mechanical APDL /Ansys Workbench Products

If your Ansys, Inc. sales representative has supplied you with message files translated into your local language, use the following procedure to install and access these files from within Mechanical APDL:

1. Create an appropriately named subdirectory to hold the message files. For example, if your local language is French, create a directory in the following location:

   ```
   <os drive>\Program Files\ANSYS Inc\V241\ANSYS\docu\fr
   ```

2. Copy the message files (`msgcat.241`, `msgidx.241`, and `msgfnm.241`) into the newly created subdirectory.

3. Access these message files by using the `-l` command line option. For example:

   ```
   ansys241 -l fr
   ```

   Or, when you are running Mechanical APDL from the Mechanical APDL launcher, choose the **Language Selection** option and then pick the desired language.

You must create a newly translated message file for each release of Mechanical APDL because error messages may occur in a different order for each release.

Chapter 6: Installing MPI for Ansys Parallel Processing

The following installation procedures describe the process for installing Intel-MPI for use with Ansys Parallel Processing.

6.1. Intel-MPI 2021.8.0 Installation Instructions

Products that utilize Ansys Parallel Processing use MPI (message-passing interface) software. When run on a single computer, they can use the software from within their installation folders. However, if you need to use multiple computers to run a simulation, you will need to perform a separate, official install of the appropriate product software on each of the computers.

To install the Intel-MPI for use with Ansys Parallel Processing:

1. From the Ansys Installation Launcher, click **Install MPI for Ansys Parallel Processing**.
2. Click **Install Intel MPI**.

   A dialog box displaying the default extraction location for the **Intel MPI Library Runtime Environment** installation software is displayed.
3. Verify that the extraction location is correct and then click **Extract**.

   The **Intel MPI Library Runtime Environment Update for Windows OS Installer** installation program is displayed.
4. Click **Next**.
5. Read the **Software License Agreement** carefully. If you agree with the license agreement, click **I accept the terms of the license** and then click **Next**.
6. Verify the software installation destination and the components to be installed and click **Next**.
7. When the installation is complete, click **Finish**.

To cache your Windows password, open a Command Prompt window and run:

```
"%AWP_ROOT241%\commonfiles\MPI\Intel\2021.8.0\Windows\setimpipassword.bat"
```

Note:

To run earlier versions of Ansys Products, set the Intel-MPI environment variable "I_MPI_SMPD_VERSION_CHECK=disable".

6.2. Microsoft MPI 10.0 Installation Instructions

Products that utilize Ansys Parallel Processing use MPI (message-passing interface) software. When run on a single computer, they can use the software from within their installation folders. However, if you need to use multiple computers to run a simulation (for products where this is supported), you will need to perform a separate, official install of the appropriate product software on each of the computers.

To install the Microsoft MPI for use with Ansys Parallel Processing:

1. From the Ansys Installation Launcher, click **Install MPI for Ansys Parallel Processing**.
2. Click **Install Microsoft MPI**.
3. The Microsoft Welcome screen is displayed. Click **Next** to continue
4. Read the **Software License Agreement** carefully. If you agree with the license agreement, click **I accept the terms of the license agreement**and then click **Next**.
5. Select the default installation directory for the installation and then click **Next**.
6. The **Ready to Install Microsoft MPI** screen is displayed. Click **Install** to begin the installation.
7. When the installation is complete, click **Finish**.

Chapter 7: Silent Mode Operations

Ansys, Inc. supports silent mode operations, including installation, configuring/unconfiguring, and uninstalling.

Note:

Ansys, Inc. requires that you have full administrative privileges when installing any software on Microsoft Windows. Non-administrative accounts do not usually have the permissions required to access system areas that installation programs often need to modify. "Full administrative privileges" means that you are running as administrator with UAC turned off, or you are running as administrator with UAC turned on and **Run as Administrator** selected.

Windows uses a feature called User Account Control (UAC) to control privileges and automatically reduce the potential of security breaches in the operation system. However, UAC limits your accessibility to system areas and can cause unpredictable behavior in Ansys, Inc. products, as noted below.

You can specify the following product flags. These flags are all valid for a silent install. However, because of the way the products are packaged, not all of these flags may be valid for a silent configuration/unconfiguration or uninstall. Not all products are available on all platforms.

For silent mode operations, if you do not specify any product arguments, all available products will be installed, configured, or uninstalled.

Product Flags

Product	***product_flag***
Ansys Additive	-additive
Ansys Aqwa	-aqwa
Ansys Autodyn	-autodyn
Ansys CFD-Post	-cfdpost
Ansys CFX	-cfx
Ansys Chemkin	-chemkinpro
Ansys Customization Files	-ansyscust
Ansys Discovery	-discovery
Ansys Discovery SpaceClaim	-spaceclaim
Ansys Dynamic Reporting	-adr
Ansys EnSight	-ensight
Ansys FENSAP-ICE	-fensapice

Product	***product_flag***
Ansys Fluent	-fluent
Ansys Forming	-forming
Ansys Forte	-forte
Ansys ICEM CFD	-icemcfd
Ansys LS-DYNA	-lsdyna
Ansys Mechanical APDL	-mechapdl
Material Calibration App	-matcal
Ansys Model Fuel Library (Encrypted)	-mfl
Ansys Motion	-motion
Ansys optiSLang	-optislang
Ansys Polyflow	-polyflow
Ansys Reaction Workbench	-reactionwb
Ansys Sherlock	-sherlock
Ansys Speos	-speos
Ansys Speos HPC	-speoshpc
Ansys TurboGrid	-turbogrid
Note: Installing any of the above products will install Ansys Workbench.	
ACIS	-acis
Ansys Icepak	-icepak
Ansys SpaceClaim Configuration*	-sc_config
Ansys Viewer	-aview
AutoCAD Plugin	-acad_plugin
AutoCAD Reader	-acad_reader
Autodesk Inventor Plugin	-adinventor_plugin
Autodesk Inventor Reader	-adinventor_reader
CATIA V4	-catia4
CATIA 5 Plugin	-catia5_plugin
CATIA 5 Reader	-catia5_reader
CATIA V6	-catia6
Creo Elements/Direct Modeling	-cocreate
Creo Parametric Plugin	-proe_plugin
Creo Parametric Reader	-proe_reader
Fusion 360	-fusion360
JTOpen	-jtopen
Distributed Compute Services	-dcs
NX Plugin	-ug_plugin

Product	***product_flag***
NX Reader	-ug_reader
Parasolid	-parasolid
Remote Solve Manager Standalone Services	-rsm
Solid Edge Plugin	-solidedge_plugin
Solid Edge Reader	-solidedge_reader
SOLIDWORKS Plugin	-solidworks_plugin
SOLIDWORKS Reader	-solidworks_reader
Ansys Sound: Analysis and Specification	-soundsas
SpaceClaim Direct Modeler Configuration*	-scdm_config
* The SpaceClaim Direct Modeler Configuration and Ansys SpaceClaim Configuration product flags perform product configuration only and and DO NOT perform any product installation functions. SpaceClaim Direct Modeler is installed as part of WorkBench while Ansys SpaceClaim is a stand-alone application. While SpaceClaim Direct Modeler and Ansys SpaceClaim can be installed on the same computer, only one of the applications can be configured with Ansys Workbench at any given time.	
The following silent flags are used to introduce the Ansys Workbench into the appropriate CAD application. Each set of commands includes a configuration flag and a flag specifying the path where the CAD application is installed. For the Creo Parametric path flags, select the *Parametric* folder located in the Creo installation directory. For the NX path flags, select the folder where *ugraf.exe* is installed.	
Speos for Creo Parametric6	-speoscreo6 -speoscreo6path "<path>"
Speos for Creo Parametric7	-speoscreo7 -speoscreo7path "<path>"
Speos for Creo Parametric8	-speoscreo8 -speoscreo8path "<path>"
Speos for NX 2206	-speosnx2206 speosnx2206path "<path>"
Speos for NX 2212	-speosnx2212 speosnx2212path "<path>"
Speos for NX 2306	-speosnx2306 speosnx2306path "<path>"
Speos for NX 2312	-speosnx2312 speosnx2312path "<path>"

For more information on which products are included with each installation, see Applications Included with Each Product (p. 95).

7.1. Silent Product and License Manager Installation

Caution:

A silent license manager installation could shut down the Ansys, Inc. License Manager, affecting other users who are using that license server machine.

You can deploy an Ansys, Inc. product installation in silent mode. The general form to run a silent product installation, including the client licensing, from the **Start>Run** menu is:

```
setup.exe -silent -product_flag
```

Note:

In Windows it is necessary to run silent commands from an administrator prompt. To access a Run as Administrator command prompt, click **Start Screen**> **All apps**> right-click the **Command Prompt Icon**> select **Run as Administrator**.

The above form will install the products specified (see the list of *product_flags* in the previous section). Additional command line arguments are available; see the list below.

For example, to install TurboGrid and Icepak to the default installation directory, issue the following command:

```
setup.exe -silent -install_dir "C:\Program Files\ANSYS Inc" -turbogrid -icepak
```

Note:

If you do not specify a product flag, all products will be installed. Where multiple geometry interfaces types are offered, the "reader" option will be installed.

To install the Ansys License Manager on Windows systems that will act as license servers, you must run `setup.exe` with the `-LM` option:

```
setup.exe -silent -LM
```

The silent license manager installation is valid only for the default Licensing Configuration option "Run the Ansys Licensing Interconnect with FLEXlm." See Silent License Manager Installation Instructions of the Ansys Licensing Guide for more information.

If you are installing the license manager to a non-default installation directory, you can use the silent installation method, but only for the initial installation. To change the license manager installation directory for future installations, you will need to uninstall the license manager before reinstalling to a different directory.

You can use the following arguments when running a silent installation:

`-silent`	Initiates a silent installation.

`-install_dir "path"`	Specifies the directory to which the product is to be installed. For the installation directory, you must enclose the path in quotes if you have spaces in the pathname. If you want the product to install to the default location, you can omit the `-install_dir` argument. The default location is `<os drive>:\Program Files\ANSYS Inc\`.
`-product_flag`	Specifies one or more products to install. If you omit the `-product_flag` argument, all products will be installed. See the list of valid `product_flags` above.
`-productfile "path"`	You can specify an options file that lists the products you want to install. To do so, you must provide a full path to a file containing desired products. See Specifying Products with an Options File (p. 67) for more details.
`-caspol`	Allows the .NET binaries that are located under the `\ANSYS Inc` directory on the shared machine to be run from the network. You must have administrative privileges to modify the security policy. Use this option when you specify a network location as the installation directory. To understand the implications of this security exception for .NET, contact your system administrator or see Configuring Security Policy on Microsoft's website.
`-help`	Displays a list of valid arguments for a silent installation.
`-licfilepath "path"`	Specifies the location of the license file to install. If the path is not specified or if the path is the same as the existing license file, the license file will not be installed. Valid only when doing a silent license manager installation (`setup.exe -LM`).
`-setliclang language`	Specifies a language to use for the server **ANSLIC_ADMIN** utility and the Ansys, Inc. Licensing Interconnect log file. Use the language directory name in the language subdirectory of the licensing directory (`en-us`, `fr`, `de`, etc.) as the `language` value. This flag can be used during a GUI installation as well. Valid only when doing a license manager installation (`setup.exe -LM`).

`-licserverinfo`	Specifies information to be used by the client for the license server. Valid only in conjunction with a silent installation (`setup.exe`). The format is:
	
	Single license server:
	
	`LI port number:FLEXlm port number:hostname`
	
	Example:
	
	2325:1055:abc
	
	Three license servers:
	
	`LI port number:FLEXlm port number:hostname1,hostname2,hostname3`
	
	Example:
	
	"2325:1055:abc,def,xyz"
	
	The default values for the Licensing Interconnect and FlexNet port numbers (2325 and 1055, respectively) will be used if they are not specified. However, you do need to include the colons. In a three-server environment, you also need to enclose the values in quotes (Windows only).

	Example: ::abc or "::abc,def,xyz" Information specified via `-licserverinfo` will be appended to existing information in the `ansyslmd.ini` file. To change information already in your `ansyslmd.ini` file, you must use the **ANSLIC_ADMIN** utility.
`-lang`	Specifies a language to use for the products.
-autodetect_cads	Automatically determines if each CAD system is installed on your computer. If the CAD is installed, the appropriate associative interface is enabled. If the CAD is not installed, the reader interface is enabled.

Caution:

To avoid the possibility of installation failure, we strongly recommend that you place quotation marks around all paths contained in command line arguments.

Example:

```
-install_dir “C:\Program Files\ANSYS Inc”

-productfile “C:\temp\optionsfile”
```

The silent installation process will automatically close certain applications, possibly resulting in lost data. You should always close all programs before starting a silent install. A silent install will first install any necessary prerequisites that are not already on your system and then continue with the installation. You must have administrative privileges to install prerequisites; if not, the silent install will exit and write a message to the log file.

Microsoft .NET Framework 4.6.2 is now required for running Ansys products. If your installation computer(s) does not have .NET 4.6.2 installed, the installation program will install .NET 4.6.2 as a prerequisite and may require a system restart after exiting the installation and before running any Ansys products. If this is the case, a restart message can be found in the install.err error file.

Installation log files are located in the installation directory: `install.log` contains installation messages, and `install_licconfig.log` contains licensing installation messages. In rare circumstances with a silent licensing installation, the licensing installation messages may not be written to the `install_licconfig.log` (for example, if the silent licensing installation aborts); in these cases, you may find error messages in the `.ansys_install_temp_licconfig_<user>_<index>.log` file, located in %TEMP%.

For more information on the silent license manager installation, see Silent License Manager Installation Instructions of the Ansys Licensing Guide.

Specifying Products with an Options File

You can also specify an options file on the command line using the `-productfile "path"` option. The options file can specify which products you want to install. The options file can contain all possible products, with the products you do not want to install commented out, or it can contain only the products you want to install. An example options file is shown below. In the example, Creo Parametric and NX are commented out using the acceptable comment indicators. When using the options file, do not include the dash (-) before the product name.

Options file example:

```
mechapdl
ansyscust
autodyn
cfdpost
cfx
optislang
turbogrid
fluent
polyflow
icepak
::proe
REM ug
```

To run with NX and Creo Parametric:

- NX: Verify that your UGII environment variables are set, and the configuration will pick them up automatically.
- Creo Parametric: Verify that the following environment variables are set:

  PROE_START_CMD241=`C:\Program Files\PTC\Creo 5.0\Parametric\bin\parametric1.bat` (or your Creo Parametric start command)

  PROELOADPOINT= C:\Program Files\<*Creo_dir*>

Silent Prerequisites Installation

The Ansys, Inc. product installation requires several prerequisites. These prerequisites often require administrative permissions to install. If you want to install as a non-administrative user but require prerequisites, you can install the prerequisites separately by running `ProductConfig.exe` from the top level directory as an administrator. You can also install the prerequisites silently using the following command:

```
ProductConfig.exe -silent
```

Note:

On an HPC cluster environment, prerequisites must be installed on each cluster execution node.

7.1.1. Silent Product Configuration/Unconfiguration

You can also run the `ProductConfig.exe` via command line (that is, silent mode) to configure or unconfigure products.

From each client machine, run the `ProductConfig.exe -silent` with the following options specified on separate lines (see the example below): `-config`, `-unconfig`, `-prereqs`, `-caspol`, and *`-product_flag`*. These options are described below.

- `-config`/`-unconfig` -- Use with the `-silent` option to indicate that products should be configured/unconfigured.
- `-prereqs` -- Required to install the necessary prerequisites on your system. Prerequisites must be installed once on each machine.
- `-caspol` -- Required to modify the necessary .NET security settings to allow the product to run across the network. This option must be run once on each machine.
- *`-product_flag`* -- Use to specify which products should be configured; see the above list of Product Flags (p. 61). If you do not specify one or more products, all products that have been installed will be configured.
- Use the `-help` option for a list of commands available for use with `ProductConfig.exe`.

An example command for silent configuration is:

```
"\\machineabc\Program Files\ANSYS Inc\v241\ProductConfig.exe" -silent -prereqs
"\\machineabc\Program Files\ANSYS Inc\v241\ProductConfig.exe" -silent -caspol
"\\machineabc\Program Files\ANSYS Inc\v241\ProductConfig.exe" -silent -config -<product_flag>
```

Note:

When performing -config on one or more products, the -prereqs and -caspol options must be run prior to running the -config option as shown in the example above.

All operations and error messages that are encountered while using the silent product configuration/unconfiguration option are written to the `productConfig.txt` file in the %TEMP% directory of the client machine. No log files are written to the machine that is hosting `ProductConfig.exe`.

7.1.2. Silent Media Installation

To run a silent installation from the media, you can either:

- Copy the contents of each DVD to a folder on the machine's hard disk such that the `241-<number>.dvd` files of each DVD are located in the same directory. You can then proceed with the silent installation as described earlier.
- Place all of the media in separate drives (any combination of virtual ISO mounts or hardware drives) so that they can be accessed simultaneously during the installation. Then run the silent installation as described earlier, but include the additional `-media_dir2 <path>` and `-media_dir3 <path>` options as needed for each drive:

```
setup.exe -silent -product_flag -media_dir2 <path>
```

The installer uses the mount directory from which it was launched as the first media path; you need to specify only the location of the subsequent DVD(s) using the `-media_dir2` and `-media_dir3` options shown in the example above.

7.1.3. Silent Uninstall

To run a silent uninstall, run the following from some location other than the `\v241` directory:

```
C:\> <installation path>\v241\Uninstall.exe -silent
```

The silent uninstall will unconfigure and remove all products and remove the entire `\v241` directory, including any user files or subdirectories that you have added to the `\v241` directory.

To uninstall individual products, use the *`product_flags`* listed in the Product Flags (p. 61) table in conjunction with the `-silent` argument.

Note:

Geometry interfaces cannot be uninstalled using these commands.

For example, to uninstall only TurboGrid and Icepak, issue the following command:

```
C:\> <installation path>\v241\Uninstall.exe -silent -turbogrid -icepak
```

You can also issue the `-help` option to see a list of valid arguments for a silent uninstall.

Uninstalling CFD-Post

CFD-Post can be installed as a standalone product. As a standalone product, it is also automatically installed with Fluent, Polyflow, and Icepak. To uninstall the standalone version of CFD-Post, you must specify `-cfdpost` as well as all of the above products that you have installed.

Note that CFD-Post is also installed with CFX; however, you do not need to uninstall CFX to uninstall the standalone version of CFD-Post, and uninstalling the standalone version of CFD-Post will not remove the CFD-Post capability from CFX.

Chapter 8: Configuring CAD Products

The connection, geometry interface, and other CAD functionality for all supported CAD products is included with the Ansys release media. Select the CAD systems you want to install during the installation process. If you choose not to install CAD systems during the installation, you can install them at a later date.

To run the connection or geometry interface functionality, you need to:

1. Ensure that the CAD product is correctly installed and licensed.
2. Ensure that you have the correct Ansys, Inc. license(s).
3. Run the installation setup.

For complete information about the files you can import and the platforms supported by the connection capability, see the *Mechanical APDL Connection User's Guide*. For more information about geometry interface information in Ansys Workbench, see the topics **Attach to Active CAD Geometry** and **Import External Geometry File** in the Ansys DesignModeler help.

Caution:

Be sure to install Mechanical APDL and the connection functionality from the same release. If you attempt to run the latest connection functionality on a machine that is running an earlier release of Mechanical APDL, or vice versa, the connection may fail.

The connection for Creo Parametric requires you to run Mechanical APDL, Creo Parametric and the connection for Creo Parametric on the same machine. The connection for NX requires you to run Mechanical APDL, NX, and the connection for NX on the same machine. The connections for CATIA, SAT, and Parasolid do not require any additional CAD installation.

For CAD installation and configuration troubleshooting, see Installation Troubleshooting - CAD Packages (p. 94).

8.1. Using the Product & CAD Configuration Manager

The **Product & CAD Configuration Manager** allows you to configure geometry interfaces for Mechanical APDL and Ansys Workbench. CAD configuration is typically handled during the product installation; however, if you chose to skip those steps, or if you make changes to your local CAD configuration between releases (for example, you install, move, or update your CAD package, or remove it entirely), you can use this utility.

Configuring Geometry Interfaces for the First Time

1. From Windows, right-click the **Start > Ansys 2024 R1> Product & CAD Configuration 2024 R1**.

2. From the **Product & CAD Configuration Manager**, click **Configure Products & CAD**.

3. From the product selection screen, verify that the Ansys Geometry Interfaces selection is enabled and click **Next** to continue the configuration.

4. You are asked to select one of the following two options:

   - Selecting the **Automatically detect my CAD installation and configure it** option and clicking **Next** determines if each CAD system is installed and configured on your computer. The installation detects the CAD installs and displays the geometry interfaces that are configured. Click **Next** to continue the automatic configuration. If the CAD is installed but not configured, this option sets the configuration to appropriate associative interface. If the CAD is not installed, the configuration is set to reader. When the automatic configuration is complete, click **Exit**.

   - Selecting the **I will manually make my selections** option and clicking **Next** walks you through a several manual configuration steps. If you select this option, you can configure the appropriate geometry interface properties by following the steps described below.

5. After selecting the **I will manually make my selections** option and clicking **Next** (bullet point #2 above), you are presented with a check list of the geometry interfaces. You can manually choose which geometry interfaces you would like to configure by enabling the appropriate check box(es).

   When you have selected the appropriate interfaces, click **Next**.

6. The next screen the provides you with the option of selecting the reader or associative interface for each enabled geometry interface.

   Configure each geometry interface option and click **Next**.

7. If you selected the associative interface for **Creo Parametric** or **NX**, a third screen is displayed. In this case follow the instructions described in this step. If you did not select **Creo Parametric** or **NX** the installation continues as described in the step #8 below.

   Creo Parametric

   You may need to specify the Creo Parametric command, and the full Creo Parametric installation path (`C:\Program Files\PTC\Creo 7.0.0.0\Parametric` by default) for an existing Creo Parametric installation.

   NX

   If you choose the associative interface and the UGII environment variables were not set, you may need to specify the NX installation path for an existing NX installation. If you are an administrative user, a file required to load the NX plug-in is placed in the administrative user's Application Data folder by default, which may not be accessible by other, non-administrative users. To allow non-administrative users to run, you will need to define the environment variable **UGII_CUSTOM_DIRECTORY_FILE** prior to performing Product & CAD Configuration Manager functions and specify a location where other users have read access.

   Once you have completed the **Creo Parametric** or **NX** configuration, click **Next**.

8. When all of your CAD products have been successfully configured, click **Exit**.

Administrative users can review the log file produced by the most recent **Product & CAD Configuration Manager** in Ansys Inc\v241\CADConfigLogs\Latest\CADConfigurationMgr.log, while the non-admin user configuration record is stored in %TEMP%\Ansys\v241\CADConfigLogs\Latest. Historical configurations are maintained in the corresponding 241\<Date>\CADConfigurationMgr_<Time>.log. Any errors are recorded in CADConfigurationMgr.err located immediately in CADConfigLogs folder. For administrators a log capturing product uninstall is stored in %TEMP%\Ansys\v193\CADConfigLogs\UninstallFinalLog.

Important:

If you change your source from reader to associative plug-in or vice-versa (Creo Parametric, NX, SOLIDWORKS, Autodesk Inventor, SolidEdge, AutoCAD or CATIA V5), you must first unconfigure the existing source and then configure using the new source.

8.1.1. Unconfiguring

If you need to unconfigure any of your CAD products, follow the steps above, but choose **Unconfigure Products & CAD** from the **Product & CAD Configuration Manager**.

8.1.2. Running the CAD Configuration Manager in Batch Mode

You can configure Ansys Geometry Interfaces by supplying the CAD Configuration Manager with arguments specific to the CAD sources you want to make available. The following table contains a list of supported arguments.

The command to run the CAD Configuration Manager in batch mode on Windows is:

```
"<installpath>\commonfiles\CAD\bin\winx64\Ans.CadInt.CADConfigurationUtility.exe"
     -arguments
```

Argument	Value	Comment
UNCONFIGURE_SPECIFIED	None	Results in any specified CAD sources being unconfigured. When this flag is absent, the CAD Configuration Manager will attempt to configure all designated CAD sources.
UNCONFIGURE	None	Results in all CAD sources being disabled along with prerequisite libraries.
Either: PE_CONFIG_WB or PE_CONFIG_WBSPATIAL	None	Specify Creo Parametric source as either the associative plug-in or the reader (Spatial, no Creo Parametric install required). When the plug-in is specified, additional arguments PROELOADPOINT and PROE_START_CMD are required.
PROELOADPOINT	Full path to Creo Parametric installation (quotes required on Windows).	Not required with unconfigure operation.
PROE_START_CMD	Full path to command used to	Not required with unconfigure operation.

Argument	Value	Comment
	launch Creo Parametric (quotes required on Windows)	
Either: UG_CONFIG_WB or UG_CONFIG_WBSPATIAL	None	Specify NX source as either the associative plug-in or the reader (Spatial, no NX install required). When the plug-in is specified, the argument UGII_BASE_DIR must also be specified.
UGII_BASE_DIR	Full path to NX installation	This should agree with environment variable **UGII_BASE_DIR**. Not required with unconfigure operation.
Either: CATIA5_READER or CATIA_CAPRI	None	Specify CATIA V5 source as either the Reader (Spatial, no CATIA install required) or CAPRI (CADNexus install required).
OSDM_CONFIG	None	Configure/unconfigure Creo Elements/Direct Modeling.
Either: INVENTOR_CONFIG or INVENTOR_CONFIG_WBSPATIAL	None	Specify Inventor source as either the associative plug-in or the reader (Spatial, no Inventor install required).
Either: SOLIDWORKS_CONFIG or SW_CONFIG_WBSPATIAL	None	Specify SOLIDWORKS source as either the associative plug-in or the reader (Spatial, no SOLIDWORKS install required).
Either: SOLIDEDGE_CONFIG or SOLIDEDGE_CONFIG_SPATIAL	None	Specify Solid Edge source as either the associative plug-in or the reader (Spatial, no Solid Edge install required).
Either: ACAD_CONFIG or ACAD_CONFIG_SPATIAL	None	Specify AutoCAD source as either the plug-in or the reader (Spatial, no AutoCAD install required).
JTOPEN_CONFIG	None	Configure/unconfigure JT.
CATIA4_CONFIG	None	Configure/unconfigure CATIA v4.
CATIA6_CONFIG	None	Configure/unconfigure CATIA v6.

Note:

All arguments require a dash (-) before them in order to be properly recognized by the CAD Configuration Manager. Arguments' values should not have a dash preceding them.

For example, you can configure Creo Parametric and SOLIDWORKS Geometry Interfaces to Ansys Workbench from the command line by using the following:

```
"<installpath>\commonfiles\CAD\bin\winx64\Ans.CadInt.CADConfigurationUtility.exe"
-SW_CONFIG -PE_CONFIG_WB -PROELOADPOINT "C:\Program Files\PTC\Creo 7.0.0.0\Parametric"
-PROE_START_CMD "C:\Program Files\PTC\Creo 2.0\Parametric\bin\parametric.bat"
```

where *installpath* is the same as the value of environment variable **%AWP_ROOT241%**, *platform* is the value of environment variable **%ANSYS_SYSDIR%**, and Creo Parametric is installed to `C:\Program Files\PTC\Creo 7.0.0.0\Parametric`.

To unconfigure the same CAD Interfaces, the command would be:

```
"<installpath>\commonfiles\CAD\bin\winx64\Ans.CadInt.CADConfigurationUtility.exe"
-unconfigure_specified -SW_CONFIG -PE_CONFIG_WB
```

Although the argument order does not matter, an argument value must immediately follow its argument.

8.1.3. Network Considerations

When Workbench is installed to a network location (made available from a mapped network drive), any configuration actions will make the selected geometry interfaces available/unavailable only to the user who is currently logged in. To make changes that apply to all users, the configure/unconfigure action must be run as an administrator logged into the system hosting the Workbench installation. Configuration actions performed as an administrator on this server machine will impact all users on all machines referencing that install, except for users who have overridden the server configuration by configuring for themselves.

For loading associative geometry interfaces into their respective CAD environments, when the Workbench installation is referenced from a network location:

- A local administrator's configuration changes will set up associative CAD interfaces to load into the CAD environment of all local users, when that scope is selected (applicable to AutoCAD, Inventor, SOLIDWORKS, Solid Edge, Creo Elements/Direct and NX).
- The associative geometry interface for Creo Parametric will load into the CAD environment of all users when the CAD installation is writable for that administrative user. Otherwise, it will load only into the CAD environment of the administrator who is currently logged in, and each additional user must be configured individually.

CAD Readers for JT, Creo Parametric, Inventor, NX, CATIAV5, CATIAV6, AutoCAD, Solid Edge and SOLIDWORKS may not fully unconfigure on a client of a network installation, even when this action is attempted by a client's administrator. An administrative user on the server must execute an unconfigure action, using Product & CAD Configuration Manager, in order for these interfaces to be fully deactivated on the client.

There is a limitation in the **Product and CAD Configuration Manager** which prevents you from configuring a different geometry interface type (other than the server specified type) on a network install's client system. To address this issue, run the CAD Configuration Manager on the client system and change the geometry interface to the desired type (Reader vs. Associative).

8.1.4. Uninstalling

> **Warning:**
>
> Do not proceed with an uninstall for CAD-specific unconfigure actions or you will leave some Ansys Workbench products unusable.

8.2. Performing Non-Administrator CAD Configuration

In some scenarios, a non-administrative user may need to make configuration changes to the installed external CAD applications that can be modified. Generally, the external CAD applications that can be modified by a non-administrative user are those that do not require a change to the system registry.

The external CAD applications that cannot be configured by non-administrative users are:

- Solid Edge (associative)
- SolidWorks (associative)
- Creo Elements/Direct

Configuring Non-Administrator CAD Options

1. From Windows, right-click the **Start > Ansys 2024 R1> Product & CAD Configuration 2024 R1**.
2. When the **Product & CAD Configuration Manager** opens, click **Configure Products & CAD**.
3. If available, the next screen the provides you with the option of selecting the reader or associative interface for each installed geometry interface that a non-administrative user can modify.

   Configure each geometry interface option and click **Next**.
4. If you selected the associative interface for **Creo Parametric** or **NX**, an additional screen is displayed. In this case follow the steps below. If you did not select **Creo Parametric** or **NX** the installation continues as described in step #7.
5. **Creo Parametric**

   You may need to specify the Creo Parametric start command, and the full Creo Parametric installation path (`C:\Program Files\PTC\Creo 7.0.0.0\Parametric` by default) for an existing Creo Parametric installation.
6. **NX**

   If you choose the associative interface and the UGII environment variables were not set, you may need to specify the NX installation path for an existing NX installation and the NX Custom Directory File Path.

   After entering the information for **Creo Parametric** and/or **NX**, click **Next**.
7. Once you have completed updating all configuration options, or if no selectable CAD options are installed, the **Summary** page displays which CADs are being configured. Click **Next** to start the configuration update process.
8. When the configuration process is complete, click **Exit** to close the **Product & CAD Configuration Manager**.

Unconfiguring Non-Administrator CAD Options

1. From Windows, right-click the **Start > Ansys 2024 R1> Product & CAD Configuration 2024 R1**.

2. When the **Product & CAD Configuration Manager** opens, click **Unconfigure Products & CAD**.
3. You are presented with a check list of the geometry interfaces you can unconfigure as a non-administrative user. You can manually choose which geometry interfaces you would like to unconfigure by enabling the appropriate check box(es).
4. When you have selected the appropriate interfaces to unconfigure, click **Next**.
5. The **Summary** page displays which CADs are being unconfigured. Click **Next** to start the unconfiguration process.
6. When the unconfiguration process is complete, click **Exit** to close the **Product & CAD Configuration Manager**.

8.3. Creo Parametric Configuration

Running the **Product & CAD Configuration Manager** for Creo Parametric performs the following steps to activate the Creo Parametric plug-in:

- Sets the environment variable **PROE_START_CMD241** to the file used to launch Creo Parametric (for example `C:\Program Files\PTC\Creo 7.0.0.0\Parametric\bin\parametric.bat`).
- For administrative installations, adds the Ansys 2024 R1 entry to the `config.pro` file located in <*creo_path*>`\text`. An example for Creo Parametric would be:

  ```
  PROTKDAT C:\Program Files\PTC\Creo 7.0.0.0\Common Files\text
  ```

- Updates the `WBPlugInPE.dat` file referenced in the `config.pro` file, so that it contains information for loading the WorkBench Plug-In and the Mechanical APDL Connection.
- Registers the Plug-In file `WBPlugInPECOM.dll` referenced in the `WBPlugInPE.dat` file.
- When Workbench is installed on a network location and the local administrator has write permissions to <*creo_path*>`\text`, a version-specific `WBPlugInPE241.dat` file will be created and placed in that folder. However, when <*creo_path*>`\text` is unwriteable, both the `config.pro` and the `WBPlugInPE241.dat` will be placed in either %HOME% or %HOMEDRIVE%%HOMEPATH%.

If you do not have write access to your Ansys Workbench installation, you may encounter the following error when attempting to import Creo Parametric models without an active CAD session:

`No write access, please choose another startup directory for trail file creation.`

To prevent this issue, add the following line to your `config.pro` file:

```
trail_dir $TEMP
```

WBPlugInPE.dat File Contents

The `WBPlugInPE.dat` file should look like this example:

```
NAME WB241PluginProWF
EXEC_FILE E:\Program Files\ANSYS Inc\V241\AISOL\CADIntegration\ProE\
     winx64\WBPlugInPECOM.dll
```

```
TEXT_DIR E:\Program Files\ANSYS Inc\V241\AISOL\CADIntegration\ProE\
     ProEPages\Language\<locale>
STARTUP dll
delay_start FALSE
allow_stop TRUE
unicode_encoding FALSE
END

NAME ac4pro241dll
exec_path E:\Program Files\ANSYS Inc\V241\ANSYS\ac4\bin\pro\winx64\ac4pro.exe
text_path E:\Program Files\ANSYS Inc\V241\ANSYS\ac4\data\pro\text
STARTUP dll
delay_start FALSE
allow_stop TRUE
unicode_encoding FALSE
unicode_encoding FALSE
revision 24.0
end
```

Do not delete any of these lines. If you modify this file, do NOT enter a carriage return after the END line. The file may be customized with other information. If these lines are deleted, or if the `WBPlugInPE.dat` file is not present in any of the directories in the search path, Creo Parametric will not load Ansys-related CAD interfaces. You should typically never have to edit these files for path information contained within them. Paths are determined by environment variable settings, which are set automatically during installation. If you encounter problems when attempting to run Creo Parametric, use the **Product & CAD Configuration Manager** to reconfigure rather than attempting to edit files directly.

Following an update of an existing Creo Parametric 7.0 installation to a different maintenance release , the Ansys Workbench Associative Plug-In will no longer be configured. To reactivate your plug-in, follow the steps described in Using the Product & CAD Configuration Manager (p. 71).

In order for **Product & CAD Configuration Manager** to successfully perform configuration of the Creo Parametric Associative Geometry Interface it is required that the Windows Operating System's decimal separator be the same symbol when running configuration as it was when the original Creo Parametric installation was performed.

8.3.1. Configuring the Connection for Creo Parametric

All Creo Parametric users must have copies of the `WBPlugInPE.dat` file and the `config.anscon.241` (connection for Creo Parametric) files. The `config.anscon.241` file is placed in the `Program Files\ANSYS Inc\V241\ansys\ac4\data\winx64` directory. `config.anscon.241` must be copied into the user's working directory at the time Creo Parametric is started. The `WBPlugInPE.dat` file is placed in the `Program Files\ANSYS Inc\V241\AISOL\CADIntegration\%ANSYS_PROEWF_VER%\ProEPages\config` directory. This file defines the name of the executable, the path to the executable, the path to the message file, and the current revision of Creo Parametric.

Note:

If the ANSGeom menu in Creo Parametric does not appear correctly, copy the `config.anscon.241` file into your working directory and restart Creo Parametric.

If Mechanical APDL Connection fails to load into Creo Parametric 8.0.0.0, see **AnsysMechanical APDL Connection does not load into Creo Parametric 8.0.0.0** (p. 94).

8.3.1.1. The WBPlugInPE.dat File and config.pro File

Creo Parametric uses the `WBPlugInPE.dat` file to locate related executables such as the connection for Creo Parametric.

Mechanical APDL/Ansys Workbench also requires a `config.pro` file.

- The `config.pro` file resides <*path-to-creo-parametric*>`\..\Common Files\`<*Creo Ship Code*>`\text` for Creo Parametric. The *Creo Ship Code* is a three digit number preceded by a single letter. The ship code is specified in the Creo Parametric installation log, which can be found in <*path-to-creo-parametric*>`\bin\pim\xml\creobase.xml`. In the cases that the crebase.xml file is missing, the ship code can be determined by looking in the Windows Registry using regedit. For Creo 7.0.0.0 the value is located in HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\PTC\PTC Creo Parametric\7.0.0.0\<DateCode>. <Datecode> is an integer reflecting the date of the Creo build.

The `config.pro` file contains a PROTKDAT line that points to the `WBPlugInPE.dat` file. This file is generated either during the product install or by running the **Product & CAD Configuration Manager** to configure the Mechanical APDL /Ansys Workbench products for Creo Parametric.

The <*proe_platform*> variable is the name that Creo Parametric gives to its platform directories:

WBPlugInPECOM

Hardware Platform	**Ansys Platform** <*platform*>	**Creo Parametric Platform** <*proe_platform*>
Win 7 x64	winx64	x86e_win64

8.3.1.2. The config.pro File

A typical `config.pro` file might look like the following example. This example has an entry for Ansys Workbench. You may have other Creo Parametric specific customizations.

```
PROTKDAT E:\Program Files\ANSYS Inc\V241\AISOL\CADIntegration\$ANSYS_PROEWF_VER\
     ProEPages\config\WBPlugInPE.dat
```

8.3.1.3. The config.anscon.241 File

Users who launch Mechanical APDL from Creo Parametric will need the information from the `config.anscon.241` file. This file is installed for all users in the `\ac4\data\winx64` subdirectory. You typically do not need to edit this file. Here is a sample `config.anscon.241` file:

```
ANSYS_CMD %AWP_ROOT241%\ANSYS\bin\%ANSYS_SYSDIR%\ansys241.exe
ANSYS_GRAPHIC_DEVICE WIN32
ANSYS_SOLVER Sparse**
ANSYS_SELECTED_LAYERS 1-256**
ANSYS_GEOMETRY_TYPE Solids Only**
ANSYS_NEUTRAL_FORMAT Yes**
ANSYS_PRODUCT_NAME ANE3FL
```

**These variables are not supported by Creo Parametric and are ignored by Creo Parametric.

See *Setting Mechanical APDL Configuration Parameters* in the *Connection User's Guide* for more information about the `config.anscon.241` file.

8.3.2. Creo Parametric Environment Variables

Most environment variables are set during product installation. In general, you will not need to reset these variables. Check the manuals for the individual CAD products for information about environment variables and their settings.

PROE_START_CMD241

Specifies the name of the `.bat` file which launches Creo Parametric on the system. The path to the executable should be already set if the Creo Parametric installation path has been defined for the **PATH** environment setting.

PROE_START_CMD241 Default = `C:\Program Files\PTC\Creo 7.0.0.0\Parametric\bin\parametric.bat`

8.4. NX Configuration

Running the **Product & CAD Configuration Manager** for NX performs the following steps to activate the NX plug-in:

- If not already existing, sets the environment variable **UGII_CUSTOM_DIRECTORY_FILE** to %APPDATA%`\ANSYS\v241\Unigraphics\custom_dirs.dat`.
- If not already present, adds an entry to the `custom_dirs.dat` file specifying the location of the Plug-In, for example, `C:\Program Files\ANSYS Inc\V241\AISOL\CADIntegration\UnigraphicsNX\winx64`.
- Registers the Plug-In file (`DSPlugInUGCOM.dll`). For the previous example, these files would be located in `C:\Program Files\ANSYS Inc\V241\AISOL\CADIntegration\UnigraphicsNX\winx64\startup`.

8.4.1. Configuring the Connection for NX

User-Defined Environment Variables

You will need to have the following environment variable set if you will be running the connection for NX product from inside NX.

UGII_BASE_DIR

The environment variable **UGII_BASE_DIR** must be defined for proper operation of NX and the Ansys Workbench Plug-In for NX. This environment variable is typically created by the NX installer; however, in rare cases, you may have to create/update it. In these situations, the **NX Installation Location** field will be left blank within the **Product & CAD Configuration Manager**'s NX tab.

When multiple NX versions are installed on a system, the **UGII_BASE_DIR** environment variable must be set to the install path of the NX version to be launched, prior to starting that version of the CAD. Otherwise errors will be encountered during CAD startup and the plug-in will not load.

For example, if switching from NX 11.0 to run NX 12.0, you must update **UGII_BASE_DIR** to the NX 12.0 path before starting NX 12.0.

8.5. Configuring CADNexus/CAPRI CAE Gateway for CATIA V5

The CADNexus/CAPRI CAE Gateway for CATIA V5 product is available for Ansys Workbench. The Ansys Workbench-specific portions are included in the installation. However, to run this product, you must complete the configuration as follows:

1. Install Ansys Workbench according to the instructions in this guide.
2. Install CATIA V5 and DSLS licensing (requires a CATIAV5 license key MD2, HD2 or ME2).
3. From the Ansys customer site, download the CADNexus/CAPRI CAE Gateway for CATIA V5 for your platform to a temporary folder. (Do not download to a folder containing blank spaces in the folder name, for example, Program Files). Follow the download procedures described in Downloading the Installation Files (p. 24).
4. Extract the contents of the zip file using your standard zip utility.
5. Install CADNexus/CAPRI CAE Gateway for CATIA V5 using the appropriate exe for your platform.
6. Follow the instructions on the CAPRI installation screens to complete the installation. When specifying the component to install, you will need to select the desired CatiaV5 release under CAPRI CAD Applications. When asked if CAPRI should set the environment variables, click **Yes**.
7. Run the **Product & CAD Configuration Manager** and select the **Catia V5: CADNexus/CAPRI CAE Gateway** option to complete the configuration as described in Using the Product & CAD Configuration Manager (p. 71).

Note:

Using the **Product & CAD Configuration Manager** to set up the CADNexus/CAPRI CAE Gateway does not require administrative rights, although installing that product (step 5) requires these rights. However, if you want to reconfigure to use the Ansys Workbench Reader for Catia V5, administrative rights are required.

If you want to revert to the standard CATIA V5 interface, run the **Product & CAD Configuration Manager** and select the **Catia V5: Standard Interface** option to complete the configuration as described in Using the Product & CAD Configuration Manager (p. 71).

You cannot run the standard CATIA V5 interface simultaneously with the CADNexus/CAPRI CAE Gateway for CATIA V5 interface.

8.6. Configuring AutoCAD

Running the Product & CAD Configuration Manager for AutoCAD performs the following steps to active the plug-in:

1. Creates the folders %PROGRAMFILES%\AnsysWB.bundle and %PROGRAMFILES%\Autodesk\ApplicationPlugins\AnsysWB.bundle\Contents\v241\Winx64\AutoCAD

2. Copies the following folders from the Workbench installation into the bundle's AutoCAD sub-folders:

   - All files within <Ansys 24.1 Install Path>\aisol\CADIntegration\DWG\winx64 are copied to %PROGRAMFILES%\ApplicationPlugins\AnsysWB.bundle\Contents\v241\winx64\AutoCAD\2013

   - All files within <Ansys 24.1 Install Path>\aisol\CADIntegration\DWG\images are copied to %PROGRAMFILES%\Autodesk\ApplicationPlugins\AnsysWB.bundle\Contents\v241\winx64\AutoCAD\Resources

   - All folders within <Ansys 24.1 Install Path>aisol\CADIntegration\DWG\Language are copied to %PROGRAMFILES%\Autodesk\ApplicationPlugins\AnsysWB.bundle\Contents\v241\winx64\AutoCAD\Resources\Language

3. Finally a %PROGRAMFILES%\Autodesk\ApplicationPlugins\AnsysWB.bundle\PackageContents.XML file is created with the following contents:

```
<?xml version="1.0" encoding="utf-8"?>
 <ApplicationPackage ProductCode="{6C6B872A-2ECF-4272-B7B7-1CA69B1EAD08}" HelpFile="./Contents/v194/Winx64/Aut
   <CompanyDetails Name="Ansys, Inc." Email=" " Url="www.ansys.com" Phone=" " />
   <RuntimeRequirements SeriesMax="R22.1" SeriesMin="R22.0" Platform="AutoCAD" OS="Win64" />
   <Components Description="64bit Component">
     <RuntimeRequirements SeriesMax="R22.1" SeriesMin="R22.0" Platform="AutoCAD" OS="Win64" />
     <ComponentEntry AppName="WB2019 R2PlugInDWG" ModuleNameWin64="./Contents/v194/Winx64/AutoCAD/2018/WB194P
       <Commands GroupName="ANSYS_Workbench_Geometry_Interface">
         <Command Local="WB194STARTWB" Global="WB194STARTWB" />
         <Command Local="WB194STARTASIM" Global="WB194STARTASIM" />
         <Command Local="WB194HELP" Global="WB194HELP" />
         <Command Local="WB194ABOUT" Global="WB194ABOUT" />
       </Commands>
     </ComponentEntry>
     <ComponentEntry AppName="AnsysWB2019 R2" ModuleName="./Contents/v194/Winx64/AutoCAD/Resources/Language/e
   </Components>
 </ApplicationPackage>
```

Chapter 9: Uninstalling the Software

Use this process to uninstall any Ansys, Inc. product that was installed using the Unified Installation process.

Note to CFX Users

The provided uninstall tool cannot uninstall MPI services. If you have CFX products installed that you are uninstalling, you must stop the MPI services before continuing with the uninstall:

1. As an administrator, go to the **Run** window and type `Services.msc`.
2. Search for "IBM Platform MPI Remote Launch" and if found, click **Stop**.
3. Search for "Intel(R) MPI Library Process Manager" and if found, click **Stop**.
4. Continue with the uninstallation procedure, below.

Uninstall Procedure for All Users

All users should use the following procedure to uninstall Ansys, Inc. products.

1. Close all applications that are currently running.
2. From Windows, right-click the **Start > Ansys 2024 R1> Uninstall Ansys 2024 R1**. You must uninstall with the same or higher privileges than were used to install the product, and we strongly recommend uninstalling as the same user who installed the product originally.
3. Select the product(s) to be uninstalled and unconfigured and click **Uninstall Selected Item(s)**. Not all products and product components may be listed individually.
4. You will be asked to save all data and close all Windows applications before continuing. Click **OK**.
5. You will be asked if you are sure you want to uninstall the selected products. Click **Yes**.
6. A message appears indicating that the uninstallation is complete. Click **OK**.

> **Note:**
>
> After all the desired products are uninstalled, you are presented with a message stating that any files or directories that were not recognized by our uninstall program remain. These remaining files typically include such things as .udf files, user customized documentation, and various routines. If these files are no longer required, remove them manually.

CFD-Post

CFD-Post can be installed as a standalone product; however, as a standalone product, it is also automatically installed with Fluent, Polyflow, and Icepak. To uninstall CFD-Post, you must uninstall all of the above products that you have installed.

- If you choose to uninstall standalone CFD-Post without uninstalling the other products, the uninstall program will not uninstall CFD-Post.
- If you choose to uninstall all of the other products that include standalone CFD-Post but you do not select CFD-Post, then CFD-Post will not be removed.

Individual product directories may not be removed if they contain components that are shared with other products that have not been uninstalled. However, the uninstalled product will no longer run.

In the case of a platform (file server) installation, the uninstall will remove the selected product(s) from all of the Windows platforms.

This procedure removes the specified Ansys, Inc. program from your system but will not remove the Ansys licensing components. Follow the steps in Uninstalling Licensing Components (p. 84) to uninstall the licensing components.

Uninstalling Ansys Discovery Components

When performing an uninstall of any Ansys product on a computer that contains both Ansys Products and Ansys Discovery, you must uninstall ALL Ansys Products as well as all Ansys Discovery components. Depending on your original installation order, you may be presented with a product selection menu during the uninstall process. If you are presented with this menu, you must select all Ansys products. Failure to uninstall all Ansys products could cause the remaining installed Ansys products to stop working.

9.1. Uninstalling Licensing Components

Before proceeding with the following steps to remove the Ansys licensing components from your system, make certain that there are no Ansys, Inc. products on this machine or any other machines on the network that rely on these Ansys licensing components.

License Servers

Follow these steps on a license server machine:

1. Stop the Ansys, Inc. License Manager via the **Ansys License Management Center**.
2. Uninstall the Ansys, Inc. License Manager service. You must use the following command to do so:

   ```
   "C:\Program Files\ANSYS Inc\Shared Files\Licensing\<platform>\ansysli_server"
        -k uninstall
   ```

3. Delete the Licensing subdirectory.
4. Remove the **Ansys, Inc. License Manager** folder from the **Start** menu.
5. Remove the **ANSYSLIC_DIR** and the **ANSYSLIC_SYSDIR** environment variables, if set.

Clients

Follow these steps on client machines:

1. Delete the Licensing subdirectory.
2. Remove the **Ansys 2024 R1> Ansys Client Licensing** folder from the **Start** menu or from the **Apps** screen.

Chapter 10: Troubleshooting

10.1. Installation Troubleshooting

This section lists problems and error messages that you may encounter while installing and/or running Ansys, Inc. products. After each situation description or error message is the user action required to correct the problem.

You can also find answers to commonly asked questions on our Ansys customer site. After you log in to the Ansys customer site, select **Knowledge Resources> Solutions**.

For information on licensing-related errors, see the Troubleshooting section of the Ansys License Management Guide .

10.1.1. Using ANSLIC_ADMIN to Gather Diagnostic Information

There are situations which require licensing-related information to be gathered for diagnostic and troubleshooting purposes. At times it may be necessary to provide this information to technical support.

The client-related diagnostic information can be gathered by using the Ansys Licensing Settings Utility. For more information, see, Gathering Diagnostics in the **Ansys Licensing Settings Utility** section of the **Ansys Licensing Guide**.

The server-related diagnostic information can be gathered by using **Ansys License Management Center** or by using the standalone `gatherdiagnostics` script.

You can also use the `AnsysInstallationDiagnostics.exe`, in the `\v241\instutil` directory, for additional installation diagnostics. This tool is helpful to diagnose installation and runtime issues. One or more log files will be generated either at the same location as the tool or in your temporary directory, depending on directory permissions. The log files are intended to help Ansys, Inc. technical support personnel expedite any technical issues. It is useful to have the files ready to provide before contacting Technical Support.

10.1.2. Uninstall Gives Access Denied Error Message

If you run the uninstall utility as a non-administrative user, you may get access denied error messages when removing product components. Run the uninstall as an administrative user, and close all applications before running the uninstall.

10.1.3. Uninstall on a Windows 7 or Windows 10 System Gives Compatibility Error Message

If you uninstall an Ansys, Inc. product on a Windows 7 or Windows 10 system using the Ansys, Inc. Uninstall utility, you may see the following error message:

This program might not have installed correctly.

If this program didn't install correctly, try reinstalling using settings that are compatible with this version of Windows.

This message is caused by the Windows Program Compatibility Assistant and can safely be ignored. Click **Cancel** and continue with the uninstall.

10.1.4. A .chm File Does Not Display Properly Across a Network

Help system `.chm` files may not display topics correctly when you try to use a Universal Naming Convention (UNC) path to open the file on a network shared folder, typical with a Network Configuration install. This is a known issue. See security update 896358 and 840315 on the Microsoft support site for more information on this problem and Microsoft's recommended fix.

If you are running ICEM CFD over the network and you have applied this security update, you may not be able to access ICEM CFD Help using the Help menu. To access ICEM CFD Help, navigate to `commonfiles\help\en-us` in the installation directory on the server machine and copy the file `icemcfd_help.chm` to your local machine. Double-click the local copy to view the help.

10.1.5. Products Crash with an Application Error

On Windows Server 2008 systems, Ansys applications may crash with an application error if the DEP (Data Execution Prevention) flag is set. To check your DEP setting, right mouse click **My Computer**, and select **Properties**. Select the **Advanced** tab, and under **Performance**, click **Settings**. Then select the **Data Execution Prevention** tab.

If DEP is set, you will need to add Ansys to the list of exceptions. For more information on DEP and how to change the settings, see security update 875352 on the Microsoft support site.

10.1.6. Product Installation Does Not Create Start Menu Item for Ansys and CAD Plugins Do Not Work

On a Windows 7 or Windows 10 system, if you install Ansys, Inc. products but do not see a Start Menu/Apps item and your CAD plugins do not work, the TEMP environment variable may be pointing to an inaccessible location. For example, it may point to a location such as `%USERPROFILE%\Local Settings\Temp`. As a result, the product installation could end without configuring the product correctly. You should ensure that the TEMP variable points to a valid location, such as `%USERPROFILE%\AppData\Local\Temp`.

10.1.7. Product Installation Displays Security Warning Dialogs or Silent Product Installation Hangs on a Network Install

If you see a security warning dialog box during a GUI installation/product configuration, or if your installation hangs during a silent installation, you may need to modify your security settings. Set the machine you are installing from as a trusted site and allow launching of unsafe applications so that the prerequisite installation can complete. Then re-run the installation. Contact your system administrator or refer to your operating system documentation for details on modifying security settings.

Alternatively, you can run the prerequisite check to verify that you have all the necessary prerequisites. If necessary, install any prerequisites and rerun the installation:

1. Run `PreReqCheck.exe` from the top level directory.
2. Install any missing prerequisites by running `InstallPreReqs.exe` from the top level directory as an administrator.
3. When the prerequisites have finished installing, run the installation as you normally would (GUI or silently).

10.1.8. System-related Error Messages

*****Error, Ansys241_DIR environment variable is not set. This is a fatal error – exiting.**

This message indicates that the **Ansys241_DIR** environment variable was not set where necessary for licensing. This environment variable should be set to the installation directory.

Unexpected error: Request for the permission of type ... failed.

If you encounter this type of message on a server configuration, you may need to set the machine as a trusted site. On a Windows 7 or Windows 10 machine, in the Control Panel, select **Network and Internet**, select **Internet Options**, and select **Security**. Click **Trusted Sites** and click **Sites**. Add the machine as **`file://servername`**.

10.1.9. CasPol Error Messages

ERROR: Not enough arguments, no permission set specified

If you are configuring to a server with spaces in the path and get this error, then you must put quotes around your server specification as shown in the following example:

```
C:\Users\>C:\Windows\Microsoft.NET\Framework\v2.0.50727\CasPol.exe -m -a
g 1.2 -url file://"\\machineabc\ANSYS Inc\*" FullTrust
```

10.1.10. Installing Prerequisites May Require a System Restart

The installation program checks your system to determine if you have the necessary prerequisites. If the prerequisites are not already on your system, the prerequisites will be installed automatically. In some cases, a system restart may be required after exiting the installation and before using any Ansys Products.

If a system restart is required, a restart error message will be written to the install.err error file. The install.err error file is located in the installation directory.

Note:

Microsoft .NET Framework 4.6.2 is now required for running Ansys products. If your installation computer does not have .NET 4.6.2 installed, the Ansys installation program will install .NET 4.6.2 as a prerequisite and may require a system restart after exiting the installation and before running any Ansys products.

10.1.11. Confirmation Messages Open Behind the Installer Display in Windows

Because of a known issue in Windows, confirmation messages displayed by the Ansys Installer occasionally open behind the installer display. In such a case, a pulsing task bar icon is the only visible notification that a confirmation message is open. Manually bring the confirmation message to the foreground. Accept the message and continue the installation process.

10.1.12. Start menu shortcuts are successfully created but are not displayed in the Start Menu

This issue is a result of a Windows limitation on the number of Start Menu shortcuts that can be displayed. A work around for this issue is to remove folders containing unneeded start menu shortcuts from the Start Menu/Programs folder. This will cause the Start Menu to be populated with the shortcuts that were not previously visible. To remove the unneeded shortcuts:

1. Navigate to `%ProgramData%\Microsoft\Windows\Start Menu\Programs`.
2. Move the program folders containing the unneeded shortcuts to a location outside of the Start Menu path above.
3. Verify that the shortcuts that were not previously visible are displayed. If not, reboot your Windows system.

10.1.13. Ansys Additive will not start immediately after installation

If Ansys Additive generates an error: "Problem starting the application...," it is likely the Additive application is attempting to use a port number that is already in use by another application. You will need to change the port number of the conflicting application or run Additive inside a Virtual Machine.

Background: Due to the technology used in converting our original web application to a desktop application, Ansys Additive uses static port assignments. This is a current limitation of Additive. In most cases this is not a problem, but there may be times when you have another program that is already using the assigned ports. The workaround is to determine which other application is using the common port and reconfigure the port number for that other application. The alternative is to run Ansys Additive on a Virtual Machine.

To Troubleshoot: As described in Ansys Additive Requirements (p. 15), the port numbers Additive uses are 5000, 7000, 7933, 7934, 7935, 8125, 8181, 9002, 9042, and 9711. Go through one-by-one to identify where the problem is.

At the Windows Command Prompt, enter:

```
netstat -aon | findstr 5000
```

- If nothing happens in response to the netstat command, then you know port 5000 is free. Continue on to the next port number, 7000, and so on through all the Additive port numbers.
- If you see something like this:

```
TCP 0.0.0.0:50001 0.0.0.0 LISTENING XXXX
```

then you know port 5000 is being used by an application with a process ID (PID) of XXXX. To determine which application it is, enter:

```
tasklist /fi “pid eq XXXX”
```

and you will see something like this:

```
Image Name            PID    Session Name    Session#    Mem Usage
==================    ===
ApplicationXYZ.exe    XXXX
```

If possible, reassign the port number in the settings for ApplicationXYZ. This may only be possible by running the installer for ApplicationXYZ.

If it’s not possible to alter the port number(s) of the conflicting application(s), you will have to run Additive inside a Virtual Machine.

10.2. Installation Troubleshooting - Mechanical APDL and Ansys Workbench Products

The items listed below apply only to the Mechanical APDL and/or Ansys Workbench products.

10.2.1. The Mechanical APDL Launcher is Excessively Slow to Start

If the Mechanical APDL launcher takes an excessively long time to startup (Windows only), make sure the hostnames in the `ansyslmd.ini` file and in the **ANSYSLMD_LICENSE_FILE** and the **ANSYSLI_SERVERS** environment variables are typed correctly and that the hosts specified by the hostnames exist. Replacing hostnames with IP addresses may improve the speed as well. Also verify that the port number is correct.

10.2.2. Display Problems on Windows

This situation applies only to Windows systems running Mechanical APDL.

Windows includes a function called Aero that may cause Mechanical APDL graphing or plotting problems in 3-D mode on some systems. If this problem occurs, disable the Windows Aero theme in Windows 7 when running Mechanical APDL.

10.2.3. ANS_ADMIN Error Messages

Grayed out options

If certain options are grayed out, your account may not have the necessary system administrator privileges necessary to run those options.

10.2.4. Mechanical APDL Product Launcher Error Messages

Some of the more common error messages follow. See the Ansys Licensing Guide for licensing-related launcher messages.

*****Cannot create required <*profile*> file. Therefore, cannot write to profile information during this launcher session.**

If you see this error, you cannot add or modify profile information during this launcher session. Verify that you have write access to the directory and restart the launcher session. Typically, this directory is `C:\Documents and Settings\<user name>\Application Data\ANSYS\v241\launcher` on Windows or `~/.ansys/v241/launcher/` on UNIX.

*****No Ansys product installations found.**

Verify your Mechanical APDL product installation. If the desired product was not installed, install it.

10.2.5. Distributed Mechanical APDL IBM Platform MPI Error Messages

You may encounter the following message when setting up IBM Platform MPI or running Distributed Mechanical APDL using IBM Platform MPI.

Error executing Mechanical APDL. Refer to System-related Error Messages in the Mechanical APDL online help. If this was a Distributed Mechanical APDL job, verify that your MPI software is installed correctly, check your environment settings, or check for an invalid command line option.

You may see this error if you did not correctly run the set password bat file. Verify that you completed this item according to the IBM MPI installation readme instructions.

You may also see this error if ANSYS `Inc\v241\ansys\bin\<winx64>` is not in your PATH.

If you need more detailed debugging information, use the following:

1. Open a Command Prompt window and set the following:

   ```
   SET ANS_SEE_RUN=TRUE
   SET ANS_CMD_NODIAG=TRUE
   ```

2. Run the following command line: **`ansys241 -b -dis -i myinput.inp -o myoutput.out`**.

10.2.6. Ansys Workbench Products Troubleshooting

This section lists problems and error messages that you may encounter while installing and/or running Ansys Workbench. After each situation description or error message is a user action required to correct the problem. Always try the suggested user action before contacting your technical support representative.

Problem Situations

CAD System Plug-In Menus Do Not Appear for NX or Creo Parametric

Ansys Workbench on Windows platforms will append its information to an existing customization file for NX and/or Creo Parametric. If no customization file exists, Ansys Workbench will create a

file. For NX, Ansys Workbench looks for the `custom_dirs.dat` file in the directory specified via the **UGII_CUSTOM_DIRECTORY_FILE** environment variable. For Creo Parametric, Ansys Workbench looks for the `config.pro` file in the %HOMEDRIVE%%HOMEPATH% directory. In addition, during setup of the Creo Parametric Geometry Interface, Ansys Workbench will also append its information to the `config.pro` file located in the Creo Parametric installation path, under the `\text` directory.

If Ansys Workbench encounters a read-only file, it will not be able to write the necessary information to the file. In this case, you will need to revise the permissions on the file and manually add the appropriate Ansys Workbench-specific information in order for the Ansys menu to appear in NX or Creo Parametric.

Script Errors When Running Ansys Workbench

If you encounter script errors such as "Error: Unable to create object microsoft.XMLDOM," you may need to install the latest version of Microsoft's MSXML. Visit Microsoft's MSXML site for more information on downloading and installing MSXML.

Ansys Workbench Error Messages

*****Unable to connect to Solver Manager.**

Another application might be using the Solver Manager port (10002 by default). Try changing the port number by editing the `Ansys.SolverManager.exe.config` file located in the installation directory at `\AISOL\Bin\<platform>`.

If you are getting the "Unable to connect to Solver Manager" error message or are having difficulty launching other applications/editors, it is also possible that the Windows hosts file has been corrupted. Make sure that localhost is specified in the Windows `<os drive>:\Windows\system32\drivers\etc\hosts` file.

10.3. Installation Troubleshooting - Ansys CFX

The items listed below apply only to the Ansys CFX products.

10.3.1. TurboGrid Mouse Behavior Problems

Depending on the graphics card and driver version, you may experience problems with the accuracy of mouse clicks in the 3D Viewer. For example, you may try to insert a control point at a given location by using the mouse, but the control point appears at a location far from where you clicked the mouse. If you experience such problems, try lowering the hardware acceleration setting of your graphics card.

10.4. Installation Troubleshooting - Ansys Speos

The items listed below apply only to the Ansys Speos related products.

10.4.1. Speos Network Installation Causes High Network Bandwidth Utilization

Cause:

The Speos licensing writes temporary files every 4 seconds into the Windows %TMP% directory on the local computer. Each time Speos licensing writes the files, Windows Defender scans the executable file responsible for writing them, Spaceclaim.exe. As Spaceclaim.exe is installed on the network, there is an important network bandwidth consumption every 4 seconds.

Solution:

In the batch that launches the network installation of Speos, set the Windows %TMP% environment variable to use a directory that is not scanned by Windows Defender, ideally a network path.

10.5. Installation Troubleshooting - CAD Packages

The items listed below apply only to the installation and configuration of the CAD packages.

10.5.1. AnsysMechanical APDL Connection does not load into Creo Parametric 8.0.0.0

Cause:

This can be caused by installing the CAD package without including the **Legacy Toolkit Application Runtime**.

Solution:

The resolution is to reconfigure/reinstall Creo 8 or later with that option selected.

10.6. Contacting Technical Support

Technical Support can be accessed from www.ansys.com/support.

ANSYS Contacts & Locations can be found here.

Chapter 11: Applications Included with Each Product

The following table displays which Ansys, Inc. applications are included with each of the product installation options.

Product Install Option	Silent Install Option	What is Included?
Additional Tools		
Viewer	-aview	Ansys Remote Solve Manager
Design		
Discovery	-discovery	Workbench [1], Ansys Discovery
SpaceClaim	-spaceclaim	Workbench [1], Ansys SpaceClaim
Electronics		
Icepak (includes Ansys CFD-Post)	-icepak	CFD-Post, Icepak
Fluids		
Ansys Dynamic Reporting	-adr	Ansys Dynamic Reporting
CFD-Post only	-cfdpost	Workbench [1], CFD-Post, Distributed Compute Services
CFX (includes Ansys CFD-Post)	-cfx	Workbench [1], CFX, CFD-Post, Distributed Compute Services
Chemkin	-chemkinpro	Workbench [1], Chemkin, Distributed Compute Services
EnSight	-ensight	EnSight, Workbench [1], Distributed Compute Services
FENSAP-ICE	-fensapice	Workbench [1], FENSAP-ICE, CFD-Post, Distributed Compute Services
Fluent (includes Ansys CFD-Post)	-fluent	Workbench [1], Fluent, CFD-Post, Distributed Compute Services
Forte	-forte	Workbench [1], Forte, Distributed Compute Services
ICEM CFD	-icemcfd	Workbench [1], ICEM CFD
Model Fuel Library (Encrypted)	-mfl	Workbench [1], Chemkin, Model Fuel Library (Encrypted), Distributed Compute Services
Polyflow (includes Ansys CFD-Post)	-polyflow	Workbench [1], CFD-Post, Polyflow, Fluent, Distributed Compute Services

Product Install Option	Silent Install Option	What is Included?
Reaction Workbench	-reactionwb	Workbench [1], Chemkin, Reaction Workbench, Distributed Compute Services
TurboGrid	-turbogrid	Workbench [1], TurboGrid, Distributed Compute Services
Ansys Geometry Interfaces [2]		
ACIS Geometry Interface	-acis	Geometry Interface for ACIS
AutoCAD Geometry Interface	-acad_reader, -acad_plugin	Geometry Interface for AutoCAD
CATIA, Version 4 Geometry Interface	-catia4	Geometry Interface for CATIA, Version 4
CATIA, Version 5 Geometry Interface	-catia5_reader, -catia5_plugin	Geometry Interface for CATIA, Version 5
CATIA, Version 6 Geometry Interface	-catia6	Geometry Interface for CATIA, Version 6
Creo Elements/Direct Modeling Geometry Interface	-cocreate	Geometry Interface for Creo Elements/Direct Modeling
Creo Parametric Geometry Interface (formerly Pro/ENGINEER)	-proe_reader, -proe_plugin	Geometry Interface for Creo Parametric (formerly Pro/ENGINEER)
Inventor Geometry Interface	-adinventor_reader, -adinventor_plugin	Geometry Interface for Inventor
JTOpen Geometry Interface	-jtopen	Geometry Interface for JTOpen
NX Geometry Interface	-ug_reader, -ug_plugin	Geometry Interface for NX
Parasolid Geometry Interface	-parasolid	Geometry Interface for Parasolid
Solid Edge Geometry Interface	-solidedge_reader, -solidedge_plugin	Geometry Interface for Solid Edge
SOLIDWORKS Geometry Interface	-solidworks_reader, -solidworks_plugin	Geometry Interface for SOLIDWORKS
Optical		
Speos	-speos	Workbench [1], SPEOS
Speos HPC	-speoshpc	Workbench [1], SPEOS HPC
Speos for NX 2206	-speosnx2206	Ansys Speos for NX 2206
Speos for NX 2212	-speosnx2212	Ansys Speos for NX 2212
Speos for NX 2306	-speosnx2306	Ansys Speos for NX 2306
Speos for NX 2312	-speosnx2312	Ansys Speos for NX 2312

Product Install Option	Silent Install Option	What is Included?
PIDO (Optimization)		
optiSLang	-optislang	Workbench [1], optiSLang
Platform		
Distributed Compute Services	-dcs	Distributed Compute Services
Remote Solve Manager Stand Alone Services	-rsm	Remote Solve Manager
Structures		
Additive	-additive	Workbench [1], Additive, Additive Prep, Distributed Compute Services
Aqwa	-aqwa	Workbench [1], Aqwa
Autodyn	-autodyn	Workbench [1], Autodyn
Customization Files	-ansyscust	Workbench [1], Mechanical APDL User-Programmable Feature, Distributed Compute Services
LS-DYNA	-lsdyna	Workbench [1], Ansys LS-DYNA
Material Calibration App	-matcal	Materials Calibration App
Mechanical Products	-mechapdl	Workbench [1], Mechanical APDL, Ansys Composite PrepPost, Distributed Compute Services
Motion	-motion	Workbench [1], Motion
Sherlock	-sherlock	Workbench [1], Sherlock, Mechanical APDL
Ansys Sound: SAS	-soundsas	Ansys Sound: Analysis and Specification

1. Workbench includes the Workbench Framework, DesignModeler, DesignXplorer, SpaceClaim Direct Modeler, SpaceClaim CATIA V5 Interface, ECAD, Minerva, EKM CLient, Remote Solve Manager. GRANTA Selector and GRANTA MI.

2. Enabling the **Ansys Geometry Interfaces** option provides you with the ability to select and configure each of the geometry interfaces.

3. For specific information on the silent commands for Ansys Speos, see Silent Mode Operations (p. 61).

Configuring High Performance Computing

Ansys

ANSYS, Inc.
Southpointe
2600 Ansys Drive
Canonsburg, PA 15317
ansysinfo@ansys.com
http://www.ansys.com
(T) 724-746-3304
(F) 724-514-9494

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Configuring a Distributed-Memory Parallel (DMP) Analysis

This section explains how to configure your network/cluster to run a DMP Analysis. It is important that you follow these steps in order to run successfully in a distributed environment.

You will need an Ansys HPC license for each processor after the first four. For example, if you want to run six processors, you will need two HPC licenses. Some products cannot use all HPC functionality, as noted in the following table.

Table 1: Products with Limited HPC Functionality

Product	DMP Capability	SMP Capability	VT Accelerator Capability
Ansys Academic Teaching Products	Yes	4 processors default limit	Yes
Ansys LS-DYNA	No	No	No
Ansys DesignSpace	No	2 processors max	No

1. Setting up a DMP Analysis

This section describes the prerequisites, including software requirements, for running a DMP analysis and the steps necessary to set up the environment for DMP processing.

The following topics are available:

1.1. Prerequisites for Running a DMP Analysis

Whether you are running on a single machine or multiple machines, the following condition is true:

- By default, a DMP analysis uses four cores and does not require any HPC licenses. Additional licenses are needed to run a distributed solution with more than four cores. Several HPC license options are available. For more information, see HPC Licensing.

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 2024 R1 installation, MPI installation, and working directories). Do not change or rename directories after you've launched Mechanical APDL. For more information, see Directory Structure Across Machines.
- All machines in the cluster must have Ansys 2024 R1 installed, or must have an NFS mount to the Ansys 2024 R1 installation. If not installed on a shared file system, Ansys 2024 R1 must be installed in the same directory path on all systems.
- All machines must have the same version of MPI software installed and running. The table below shows the MPI software and version level supported for each platform.

1.1.1. MPI Software

The MPI software supported for DMP processing depends on the platform (see the table below).

The files needed to use Intel MPI, MS MPI, or Open MPI are included on the installation media and are installed automatically when you install Ansys 2024 R1. 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 (see Installing the Software (p. 3) later in this section).

Table 2: Platforms and MPI Software

Platform	MPI Software[a]
Linux	Intel MPI 2021.10.0 (default)[b] Intel MPI 2018.3.222 (optional) Open MPI 4.0.5 (optional)[c]
Windows 10 or Windows 11 Windows Server 2022 or Windows Server 2019 (single machine)	Intel MPI 2021.10.0 (default) MS MPI v10.1.12 (optional)
Windows Server 2019 (cluster)	Windows Server 2019 HPC Pack [d]

[a] Ansys chooses the default MPI based on robustness and performance. The optional MPI versions listed here are available if necessary for troubleshooting (see Using an alternative MPI version).

[b] If Mechanical APDL detects a Mellanox OFED driver version older than 5.0 or an AMD cluster with InfiniBand using any OFED, then Intel MPI 2018.3.222 is automatically set as the default. If it detects an AMD cluster with Amazon EFA, then the default is set to Open MPI 4.0.5 instead.

[c] Mellanox OFED driver version 4.4 or higher is required.

[d] If you are running across multiple Windows machines, you must use Microsoft HPC Pack (MS MPI) and the HPC Job Manager to start a DMP run (see Starting a DMP Analysis).

1.1.2. Installing the Software

Install Ansys 2024 R1 following the instructions in the *Ansys, Inc. Installation Guide* for your platform. Be sure to complete the installation, including all required post-installation procedures.

To run on a cluster, you must:

- Install Ansys 2024 R1 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 2024 R1 on one Windows machine (for example, `C:\Program Files\ANSYS Inc\V241`) and then *share* that installation folder. On the other machines in the cluster, create a symbolic link (at `C:\Program Files\ANSYS Inc\V241`) 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 the DMP analysis to work correctly.
- For Linux, you can use the exported NFS file systems. Install Ansys 2024 R1 on one Linux machine (for example, at `/ansys_inc/v241`), 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/v241`).

Installation files for MS MPI on Windows

Microsoft MPI is installed and ready for use as part of the Ansys 2024 R1 installation, and no action is needed if you are running on a single machine. If you require MS MPI on another machine, the installer can be found at `C:\Program Files\ANSYS Inc\V241\commonfiles\MPI\Microsoft\10.1.12498.18\Windows\MSMpiSetup.exe`

Microsoft HPC Pack 2019 (Windows Server 2019)

You must complete certain post-installation steps before running a DMP analysis on a Microsoft HPC Server 2019 system. The post-installation instructions provided below assume that Microsoft Windows Server 2019 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:

`C:\Program Files\ANSYS Inc\V241\commonfiles\MPI\WindowsHPC\README.mht`

or

`C:\Program Files\ANSYS Inc\V241\commonfiles\MPI\WindowsHPC\README.docx`

Microsoft HPC Pack examples are also located in `C:\Program Files\ANSYS Inc\V241\commonfiles\MPI\WindowsHPC`. Jobs are submitted to the Microsoft HPC Job Manager either from the command line or the Job Manager GUI.

To submit a job via the GUI, go to **Start> All Programs> Microsoft HPC Pack> HPC Job Manager**. Then click on **Create New Job from Description File**.

1.2. Setting Up the Cluster Environment for DMP

After you've ensured that your cluster meets the prerequisites and you have Ansys 2024 R1 and the correct version of MPI installed, you need to configure your distributed environment using the following procedure.

1. Obtain the machine name for each machine on the cluster.

   Windows 10 (or Windows 11) and Windows Server 2019:

   From the **Start** menu, pick **Settings >System >About**. The full computer name is listed under **PC Name**. Note the name of each machine (not including the domain).

   Linux:

   Type **`hostname`** on each machine in the cluster. Note the name of each machine.

2. **Linux only:** First determine if the cluster uses the secure shell (ssh) or remote shell (rsh) protocol.

   - **For ssh:** Use the ssh-keygen command to generate a pair of authentication keys. Do not enter a passphrase. Then append the new public key to the list of authorized keys on each compute node in the cluster that you wish to use.
   - **For rsh:** Create a `.rhosts` file in the home directory. Add the name of each compute node you wish to use on a separate line in the `.rhosts` file. Change the permissions of the `.rhost` file by issuing: **`chmod 600 .rhosts`**. Copy this `.rhosts` file to the home directory on each compute node in the cluster you wish to use.

   Verify communication between compute nodes on the cluster via ssh or rsh. You should not be prompted for a password. If you are, correct this before continuing. Note, all compute nodes must be able to communicate with all other compute nodes on the cluster (or at least all other nodes within the same partition/queue as defined by a job scheduler) via rsh or ssh without being prompted for a password. For more information on using ssh/rsh without passwords, search online for "Passwordless SSH" or "Passwordless RSH", or see the man pages for ssh or rsh.

3. **Windows only:** Verify that all required environment variables are properly set. If you followed the post-installation instructions described above for Microsoft HPC Pack (Windows HPC Server), these variables should be set automatically.

   On the head compute node, where Ansys 2024 R1 is installed, check these variables:

   ANSYS241_DIR=C:\Program Files\ANSYS Inc\v241\ansys

   ANSYSLIC_DIR=C:\Program Files\ANSYS Inc\Shared Files\Licensing

   where `C:\Program Files\ANSYS Inc` is the location of the product install and `C:\Program Files\ANSYS Inc\Shared Files\Licensing` is the location of the licensing install. If your installation locations are different than these, specify those paths instead.

   On Windows systems, you must use the Universal Naming Convention (UNC) for all Ansys, Inc. environment variables on the compute nodes for DMP to work correctly.

   On the compute nodes, check these variables:

ANSYS241_DIR=*head_node_machine_name*\ANSYS Inc\v241\ansys

ANSYSLIC_DIR=*head_node_machine_name*\ANSYS Inc\Shared Files\Licensing

4. **Windows only:** Share out the ANSYS `Inc` directory on the head node with full permissions so that the compute nodes can access it.

1.2.1. Optional Setup Tasks

The tasks explained in this section are optional. They are not required to run a DMP analysis correctly, but they may be useful for achieving the most usability and efficiency, depending on your system configuration.

On Linux systems, you can also set the following environment variables:

- **ANSYS_NETWORK_START** - This is the time, in seconds, to wait before timing out on the start-up of the client (default is 15 seconds).
- **ANSYS_NETWORK_COMM** - This is the time to wait, in seconds, before timing out while communicating with the client machine (default is 5 seconds).
- **ANS_SEE_RUN_COMMAND** - Set this environment variable to 1 to display the actual command issued by the program.

On Windows systems, you can set the following environment variables to display the actual command issued by the program:

- **ANS_SEE_RUN** = TRUE
- **ANS_CMD_NODIAG** = TRUE

1.2.2. Using the `mpitest` Program

The `mpitest` program performs a simple communication test to verify that the MPI software is set up correctly. The `mpitest` program should start without errors. If it does not, check your paths and permissions; correct any errors and rerun.

When running the mpitest program, you must use an even number of processes. We recommend you start with the simplest test between two processes running on a single node. This can be done via the procedures outlined here for each platform and MPI type.

The command line arguments `-np`, `-machines`, and `-mpifile` work with the `mpitest` program in the same manner as they do in a DMP analysis (see Starting a DMP Analysis via Command Line).

On Linux:

For Intel MPI (default), issue the following command:

```
mpitest241 -np 2
```

which is equivalent to:

```
mpitest241 -machines machine1:2
```

For Open MPI, issue the following command:

```
mpitest241 -mpi openmpi -np 2
```

which is equivalent to:

```
mpitest241 -mpi openmpi -machines machine1:2
```

On Windows:

For Intel MPI (default), issue the following command.

```
ansys241 -np 2 -mpitest
```

1.2.3. Interconnect Configuration

Using a slow interconnect reduces the performance you experience in a distributed parallel simulation. For optimal performance, we recommend an interconnect with a high communication bandwidth (2000 megabytes/second or higher) and a low communication latency (5 microseconds or lower). This is due to the significant amount of data that must be transferred between processes during a distributed parallel simulation.

Distributed-memory parallelism is supported on the following interconnects. Not all interconnects are available on all platforms; see the Platform Support section of the Ansys Website for a current list of supported interconnects. Other interconnects may work but have not been tested.

- InfiniBand (recommended)
- Omni-Path (recommended)
- GigE

On Windows x64 systems, use the Network Wizard in the Compute Cluster Administrator to configure your interconnects. See the Compute Cluster Pack documentation for specific details on setting up the interconnects. You may need to ensure that Windows Firewall is disabled for distributed-memory parallelism to work correctly.

2. Running a Distributed Job

For information on running a DMP analysis after you have configured your environment , see the *Parallel Processing Guide*.

Configuring Ansys CFX Parallel

If you have purchased the Ansys CFX-Solver parallel option, you will need to follow the procedures in this chapter to ensure that users can execute Ansys CFX jobs in parallel. Parallel communication methods are available that use MPI (Message Passing Interface). Platform-specific versions of MPI are available in some instances.

The Ansys CFX-Solver parallel option is supported on all platforms that support the CFX-Solver.

The following topics are discussed:

1. Ansys CFX Windows Parallel Setup

The following topics are discussed:

1.1. Requirements

- Ansys CFX-Solver must be installed on all hosts that are to be used for a parallel run, or in a location accessible to all hosts.
- Local parallel runs use Intel MPI (default) for communication. For local parallel operation, the required MPI components are included as part of the Ansys CFX installation and no additional MPI installation or configuration are required.
- To run distributed parallel (where follower processes run on hosts other than the host with the leader process), the desired MPI service must be installed, configured, and started on all involved hosts. In addition, you must make host information available to the leader host. These tasks are discussed in Setting Up Intel MPI for Windows (p. 8).

1.2. Host Specification

For distributed parallel operation, hosts might need to be predefined in the `hostinfo.ccl` configuration file. See Ansys CFX Hosts Specification (p. 14) for details.

1.3. Setting Up Intel MPI for Windows

To install, configure, and start the Intel MPI service on a given host, install Intel MPI using the Ansys installation launcher. After installing Intel MPI in this way, the MPI service is automatically configured and started. For more information, see Product Installation with Client Licensing (p. 25).

1.3.1. Enabling Intel MPI Parallel Through a Windows Firewall

To enable Intel MPI parallel processing through a Windows firewall:

1. Click **Start** > **Windows System** > **Control Panel**.
2. From the **Control Panel** dialog box, open **Windows Defender Firewall**.

   If you do not see **Windows Defender Firewall** listed, click **System and Security** then open **Windows Defender Firewall**.
3. Allow the following programs through the firewall:
   - <Ansys Inc installation path>\v241\CFX\bin\<CFX5OS>\solver-mpi.exe
   - <Ansys Inc installation path>\v241\CFX\bin\<CFX5OS>\double\solver-mpi.exe
   - <Ansys Inc installation path>\v241\CFX\tools\multiport\mpi\win64\intel\bin\mpiexec.exe
   - %I_MPI_ROOT%\intel64\bin\hydra_service.exe

1.4. Setting up and Running Microsoft Windows HPC 2019

To set up running Microsoft Windows HPC 2019, steps must be taken so that:

- The installed software is on a shared location that can be accessed by all hosts.
- The working directory is a shared location.
- A mechanism is provided so that all local paths can be properly resolved.

To prepare for running Ansys CFX with Microsoft Windows HPC 2019, you can follow the steps below (terms in angle brackets < > should be replaced with the required entry):

1. Install Ansys Licensing, Ansys Workbench and Ansys CFX on the head node.
2. Share the installation directory.

   For example, on a typical installation share `C:\Program Files\ANSYS Inc` as `\\<`*`HeadNodeName`*`>\Ansys Inc` where <*HeadNodeName*> is the name of the head node.
3. Install the Ansys prerequisites on all of the cluster nodes.

   You can do this either by:

   - Executing the following commands directly on each node:

```
\\<HeadNodeName>\ANSYS Inc\v241\prereq\2019vcredist_x64.exe /quiet
\\<HeadNodeName>\ANSYS Inc\v241\prereq\2019vcredist_x86.exe /quiet
\\<HeadNodeName>\ANSYS Inc\v241\prereq\ndp472-kb4054530-x86-x64-allos-enu.exe /q
\\<HeadNodeName>\ANSYS Inc\v241\prereq\ndp48-x86-x64-allos-enu.exe /q
```

- or by using the `clusrun` command on the head node to execute these commands on all the nodes (refer to your Microsoft Windows HPC documentation for details).

4. Share the working directory of the head node.

   For example, share `C:\Users\<UserName>` as `\\<HeadNodeName>\<UserName>` where `<UserName>` is the username.

   Alternatively, share the working directory of the submitting machine.

   For example, share `C:\Users\<UserName>` on the submitting machine as `\\<SubmitHostName>\<UserName>` where `<SubmitHostName>` is the name of the submitting machine.

5. If the submitting machine is different from the server head node, it is necessary to install the client utilities of 'HPC Pack 2019' on the submitting machine. This is available for download from Microsoft. This sets the `CCP_HOME` environment variable, enabling the 'Submit to Windows HPC Queue' start method in the CFX-Solver Manager.

   To ensure that the client installation includes the necessary software components, the installation should be carried out using the full installation (`.zip` file rather than `.msi` file) and choosing the option "Install only the client utilities" from the HPC Pack 2019 installer.

6. On the submitting machine, create `%USERPROFILE%\.cfx\cfxccs_options.txt` with the following content to define the required job submission options:

   `PATHMAP=C:\Program Files\ANSYS Inc;\\<HeadNodeName>\ANSYS Inc`

   `PATHMAP=C:\Users\<UserName>;\\<HeadNodeName>\<UserName>` or `PATHMAP=C:\Users\<UserName>;\\<SubmitHostName>\<UserName>` if the working directory has been shared from the submitting machine.

   `CLUSTERHOST=<HeadNodeName>` to be used when submitting jobs from machines other than the head node.

   `PROPAGATE_PARAMETRIC_LICENSE=1` an optional setting to enable parametric licensing. Note that in this case, the submitting machine must have appropriate firewall settings to allow the cluster node(s) to access the license. Typically, this is achieved by adding the executable `C:\Program Files\ANSYS Inc\v231\licensingclient\winx64\ansyscl.exe` to the list of firewall exceptions on the submitting machine.

   `ACCOUNT=<OtherUserDomain>\<OtherUserName>` to be used when submitting jobs using different credentials, where `<OtherUserDomain>` and `<OtherUserName>` are the domain and username of another user, respectively.

   `PROCESSORSPERSOLVER=2` an optional setting (default setting is 1) that allocates the number of cores per partition. This is typically used on hosts that are limited by memory bandwidth such as Xeon-based machines.

7. Set up Ansys Workbench for a network as described in Network Installation and Product Configuration (p. 41).

To submit a job:

1. Start the CFX-Solver Manager (either using CFX standalone or from Ansys Workbench) on the submitting machine using the software installed on the head node.
2. Ensure that the **Run Mode** on the **Run Definition** tab of the CFX-Solver Manager is set to `Submit to Windows HPC Queue`. Otherwise, set up the CFX-Solver Manager as normal.
3. Click **Start Run** on the CFX-Solver Manager to start the simulation. The first time a simulation is run, supply the required credentials that are prompted (this prompt may appear behind the CFX-Solver Manager window). You may elect to have these credentials saved to avoid repeated prompting of these credentials.

Note:

1. %USERPROFILE% is typically:

   `C:\Users\<UserName>`

2. For Ansys Workbench with Parameters and Design Points, start the CFX-Solver Manager, ensure that the **Run Mode** on the **Run Definition** tab of the CFX-Solver Manager is set to `Submit to Windows HPC Queue`, set the number of processes, then click **Save Settings**. When the user clicks **Update all Design Points**, each parameter or design point will be solved on the cluster.

---

2. Ansys CFX Linux Parallel Setup

The following topics are discussed:

2.1. Requirements

- The Ansys CFX-Solver must be installed on all hosts that are to be used for a parallel run, or in a location accessible to all hosts.
- To run distributed parallel (where follower processes run on a different host from the leader process), remote or secure shell access must be available from the leader nodes (systems on which parallel runs will be started) to follower nodes (systems on which the Ansys CFX-Solver will actually run). See Setting Up Remote Access on Linux (p. 11), below.
- You must have the same username on all systems.

2.2. Host Specification

For distributed parallel operation, hosts might need to be predefined in the `hostinfo.ccl` configuration file. See Ansys CFX Hosts Specification (p. 14) for details.

2.3. Setting Up Remote Access on Linux

Each system that will be used as a follower node must be configured to allow access via remote shell commands from the leader node. This can be done globally for all users or on a per-user basis.

Often, networks where ssh, rsh or rlogin are used frequently will already be configured to allow remote access to all users. If this is the case, nothing more need be done.

The CFX5RSH environment variable is used to select the remote shell protocol. By default, `CFX5RSH=ssh` is set. If you want to use rsh, then set `CFX5RSH=rsh` either in the environment or in the cfx5rc file (see Resources Set in cfx5rc Files in the *CFX Introduction*).

In either case, ssh or rsh, the remote machine must not prompt for a password when you run remote commands.

2.3.1. Testing Remote Access

You can test remote access using ssh using the command:

```
ssh unixhost echo working
```

You can test remote access using rsh for a Linux follower node using the command:

```
rsh unixhost echo working
```

2.3.2. Set Up of ssh

If you use ssh for remote access, consult your system documentation on how to set up ssh between machines so that it does not require the user to enter a password.

2.3.3. Global Set Up of rsh

This method, which is used to allow remote access for all users, depends on whether NIS is used to maintain netgroups, as well as common password and group databases. If this is not the case, then you should log in to each follower node as root and create a file called `/etc/hosts.equiv` containing a line:

```
<leader>
```

where <*leader*> is the hostname of the leader node. See your system documentation for more information about the use of rsh and the syntax of the `hosts.equiv` file.

If NIS is used to control remote access, then a netgroup must be created for users of Ansys CFX by the root user on the NIS leader server, and a line such as the one below added to `/etc/hosts.equiv` on each follower node by the root user:

```
+@<netgroup>
```

where <*netgroup*> is the name of a netgroup to which users of Ansys CFX belong. A detailed description of how to configure NIS is beyond the scope of this manual. See your system documentation for more information about NIS.

2.3.4. Individual User Setup for rsh

An individual user can create a file called `.rhosts` in their home directory on each follower containing a line:

```
<leader> <user>
```

where <*leader*> is the hostname of the leader and <*user*> is the user's username on the leader. This file should be made readable only by the user, for example, by running:

```
chmod 600 ~/.rhosts
```

2.4. Using Intel MPI (Message Passing Interface Library)

Most Linux systems support the Intel MPI run mode. Intel MPI is the preferred parallel run mode on most of the supported Ansys CFX platforms.

Intel MPI supports several network fabrics including:

- Shared memory, typically used for intra-host communication.
- DAPL-capable network fabrics, such as Infiniband, iWarp, Dolphin and XPMEM (through DAPL).
- TCP/IP-capable network fabrics, such as Ethernet and InfiniBand (through IPoIB).
- TMI-capable network fabrics including Qlogic and Myrianet (through Tag Matching Interface).
- OFA-capable network fabrics including InfiniBand (through OFED verbs).

Intel MPI is automatically installed with Ansys CFX in the <CFXROOT>`/../commonfiles/` directory. You do not need a license from Intel to run the Ansys CFX-Solver using Intel MPI.

Intel MPI run modes are selected in the Ansys CFX-Solver Manager or on the command line (using the `-start-method` command line option) using the "Intel MPI Local Parallel" or "Intel MPI Distributed Parallel" start method options.

2.4.1. Environment Variables

In most cases, the default settings are sufficient and it may not be necessary to set any environment variables.

Ansys CFX uses the environment variable `CFX5_IMPI_DIR` to select which Intel MPI installation is used. The default setting points to the version that is automatically installed by Ansys CFX in the <CFXROOT>`/../commonfiles/MPI/Intel` directory. You can use `cfx5info -v` to find the current settings for `CFX5_IMPI_DIR` and other environment variables. If you want to use a different Intel MPI version, you can install that version in an alternative location and set `CFX5_IMPI_DIR` to that location.

There are several environment variables that can be used to control Intel MPI that may provide additional flexibility that is not directly accessible through the Ansys CFX start-up scripts. For example, environment variables are available for network fabric selection (discussed briefly below), process pinning control, and collective operation control.

Any of these environment variables can be set by modifying the start command in the `etc/start-methods.ccl` file and using the Intel MPI options `-env` and/or `-genv` (an example of this usage is given in the section on network fabric selection). More detail on all options and environment variables is available in the Intel MPI documentation.

Some useful environment variables include those described below. If these environment variables are set, the start-up scripts automatically set them for your Ansys CFX runs.

I_MPI_MPD_REMSH

Specifies which method is used by Intel MPI to spawn jobs on remote machines. The Intel MPI default is ssh. However, by default the Ansys CFX software sets this to be the same as the setting used for CFX5RSH, and rsh if CFX5RSH is not set. This variable is applicable only to Linux.

I_MPI_FABRICS and I_MPI_FABRICS_LIST

Specifies the network fabrics to be used and the order in which Intel MPI searches for them.

I_MPI_HYDRA_IFACE

Specifies the network interface, for example "eth0".

2.4.2. Network Fabric Selection

Intel MPI start methods use the default network fabric selection built into Intel MPI. The default order in which Intel MPI checks for fabrics is DAPL, OFA, TCP, TMI. The environment variable `I_MPI_FABRICS_LIST` controls the search order used by Intel MPI.

If you want to force selection of a specific network fabric, then you can either set the `I_MPI_FABRICS` environment variable or modify the start command in the `etc/start-methods.ccl` file and add the necessary command line flags (for example: `-env IMPI_FABRICS shm:dapl` to select the combination of shared memory and DAPL fabrics).

The following table shows how Intel MPI searches for drivers for the various network fabrics:

Interconnect	1st attempt	2nd attempt
shm	N/A	N/A
DAPL	Environment variable `I_MPI_DAT_LIBRARY`	`libdat.so` or `libdat.so.1` for DAPL 1.2 providers and `libdat2.so` or `libdat2.so.1` for DAPL 1.2 providers
TCP	N/A	N/A
TMI	Environment variable `I_MPI_TMI_LIBRARY`	`libtmi.so`
OFA	Environment variable `I_MPI_OFA_LIBRARY`	`libibverbs.so`

For example, Intel MPI expects that the DAT shared library for the DAPL network fabric is located either in the default library search path or in a specific location if a full path is specified. If the shared library cannot be found, Intel MPI will not take advantage of the DAPL network fabric. To fix this, you will have to install the shared libraries into the correct location or set the environment variable `I_MPI_DAT_LIBRARY` to point to the correct DAT shared library.

There are other environment variables not documented here that provide further control over network fabric selection. These are described in the Intel MPI documentation.

2.5. Using Cray MPI (Message Passing Interface Library)

The Ansys CFX-Solver supports Cray's native implementation of MPI on the Cray Linux Environment (CLE) using the start method 'Cray MPI Distributed Parallel'.

Cray MPI is closely integrated with the batch queuing system and interconnects used on Cray systems.

Cray MPI is the recommended method of running on Cray systems, as opposed to using Cluster Compatibility Mode (CCM) with a different MPI.

When starting a solver run, the Cray MPI start method may be specified on the command line using the option: `-start-method "Cray MPI Distributed Parallel"`, having reserved the required processing elements via the built-in batch queuing system.

2.5.1. Cray MPI Options

The `aprun` command, which can be modified, is used by the start method to launch the job. Other options available from Cray are described in the documentation for `aprun`.

Note that numa node memory containment is enforced, using the `-ss` option. The default method used by Cray MPI to allocate processes to CPU cores is appropriate when all cores are used. However, if it is intended that each host is only partly utilized (for example, because of the memory requirements of the run), this can result in asymmetric utilization. In such cases, the `-S` option can be used to limit the number of processes per numa node. For example, `-S 4` would limit the number of processes per numa node to 4.

3. Ansys CFX Hosts Specification

For distributed parallel operation, it is necessary to specify the hosts on which the Ansys CFX-Solver will run. Hosts may be predefined in the `hosts.ccl` configuration file, or be specified at the time of the run.

3.1. Predefinition of Hosts

For convenience, predefinition of hosts is recommended. However, in the following cases, hosts must be predefined:

- If the installation location differs between hosts.
- If any host name contains certain characters (e.g. underscores).
- On Linux systems, if remote host interrogation is disabled.

In all other cases, host predefinition is not mandatory, although it is strongly recommended if:

- The Ansys CFX-Solver is started from the CFX-Solver Manager because the user can then select from a list of available hosts.
- Using hosts with different speeds.

3.2. Host Specification at Run Time from the CFX-Solver Manager

Instead of predefining hosts, the CFX-Solver Manager may be used to specify hosts on a per-run basis. More details are available in Selecting Parallel Hosts in the *CFX-Solver Manager User's Guide*.

Tip:

If an individual user wants to use a host that is not present in either the `hostinfo.ccl` in the installation `config` directory or the user's own version of this file, then the user can add this host to the list for a particular run by using the CFX-Solver Manager. However, this would have to be done each time a run is started.

3.3. Host Specification at Run Time from the cfx5solve Command

If the Ansys CFX-Solver is run from the command line using the `cfx5solve` command, hosts do not necessarily need to be predefined. More details on using the `cfx5solve` command are available in Command-Line Use in the *CFX-Solver Manager User's Guide*.

For example, if all runs are launched using the `cfx5solve` command and the hostnames are known, predefinition of hosts is usually not necessary.

The same applies to a cluster environment, where all runs are launched via a queueing system and hosts are automatically specified by a script.

3.4. Remote Host Interrogation

Remote host interrogation is a mechanism that allows Ansys CFX to determine the details of remote hosts automatically. By default, it is enabled on Linux and disabled on Windows. In most cases, these defaults are sensible, however they may be overridden by setting the environment variable CFX_SOLVE_DISABLE_REMOTE_CHECKS as shown below:

Value of CFX_SOLVE_DISABLE_REMOTE_CHECKS	Result
0	Enable remote host interrogation (default on Linux)
1	Disable remote host interrogation (default on Windows)

This environment variable can be specified in your environment or your user `cfx5rc.txt` file or site `cfx5rc.txt` file. For details, see Resources Set in cfx5rc Files in the *CFX Introduction*.

If remote host interrogation is enabled, then remote- or secure-shell access must be available from the leader host (the system on which parallel runs will be started) to follower hosts (other systems

on which the Ansys CFX-Solver will run). You must be able to execute an `rsh` or `ssh` command on the remote host *without typing in your password*. Remote host interrogation is not recommended on Windows unless your systems are already set up to allow this type of access.

On Windows systems, any hosts not predefined are assumed to have the same specification as the host on which the run is started, unless remote host interrogation is enabled.

On Linux systems, if remote host interrogation is disabled, all hosts must be predefined.

3.5. The hostinfo.ccl File

This file is a database containing information about the available hosts and where Ansys CFX has been installed on each of them. The file is used by the Ansys CFX-Solver when preparing a parallel run.

During installation, a default `hostinfo.ccl` file containing one entry for the local host is created in the `<CFXROOT>/config/` directory of the Ansys CFX installation. This file must be readable by all users of the software.

The `hostinfo.ccl` file may be modified either by using the `cfx5parhosts` utility or by editing the `hostinfo.ccl` configuration file.

3.5.1. Editing the hostinfo.ccl File

This file is written using the CFX Command Language (CCL). It defines a set of HOST DEFINITION objects, one for each available node.

For example, on a Linux system:

```
SIMULATION CONTROL:
  EXECUTION CONTROL:
    PARALLEL HOST LIBRARY:
      HOST DEFINITION: kangaroo
        Installation Root = /ansys_inc/v%v/CFX
      END
      HOST DEFINITION:wallaby
        Installation Root = /usr/local/cfx
        Host Architecture String = linux-amd64
        Number of Processors = 16
        Relative Speed = 1.7
      END
      HOST DEFINITION: mypc
        Remote Host Name = my_pc
      END
    END
  END
END
```

Or, on a Windows system:

```

SIMULATION CONTROL:
  EXECUTION CONTROL:
    PARALLEL HOST LIBRARY:
      HOST DEFINITION: hostname1
        Installation Root = C:\Program Files\ANSYS Inc\v%v\CFX
        Host Architecture String = winnt-amd64
      END
    END
```

```
  END
END
```

If you manually create your `hostinfo.ccl` file, you must ensure that the `SIMULATION CONTROL...END` wrapper is present.

None of the values for each host are mandatory, and the following empty host definition is perfectly valid:

```
HOST DEFINITION: parakeet
END
```

Host names are limited to the set of valid CCL object names. In particular, they must not contain full stops (.) or underscores (_) and must start with a letter.

If a `hostinfo.ccl` file does not already exist when Ansys CFX is installed, one will be created containing the installation host. You can add hosts to the `hostinfo.ccl` file using the `cfx5parhosts` utility, or by modifying the file using a text editor. Individual users may also create their own versions of this file in:

- Linux: `~/.hostinfo.ccl`
- Windows: `%HOMEDRIVE%\%HOMEPATH%\.hostinfo.ccl`

which will be used in preference if it exists.

For most installations, it will be necessary to supply only the `Installation Root` parameter, which should point to the <CFXROOT> directory in which Ansys CFX is installed. On mixed architectures, you may find it useful to supply the `Number of Processors` and/or `Relative Speed` parameters. Some time may be saved at start-up by providing the `Host Architecture String` parameter explicitly, for example, using the `cfx5parhosts` utility.

The available parameters for the `hostinfo.ccl` file are as follows:

Installation Root

This is set to the <CFXROOT> installation directory on this host. If it is set to the special string `none`, this indicates that there is no Ansys CFX installation on the remote host, which can sometimes be useful if only the solver binary is available.

Host Architecture String

Ansys CFX will use this value to select the most appropriate solver executable for this node. These strings can be obtained by giving the command **`<CFXROOT>/bin/cfx5info -os`** on the node in question. When these short **`os`** values (for example, linux-amd64) are given in this position, the generic solver executable will always be used for this host. The string can also be set to the actual architecture of the remote host (for example, intel_xeon64.sse2_linux2.3.4), which is determined by giving the command **`<CFXROOT>/bin/cfx5info -arch`**. If these longer strings are used then CFX could use this information to select between solvers optimized for specific architectures. However, since there are currently no solvers optimized for specific architectures, this extra information is currently unused.

Number of Processors

As implied, this is the number of processors on the machine. It is used for display purposes only and can be safely omitted.

Relative Speed

The Relative Speed is a real number that is used by the Ansys CFX-Solver when partition sizes are calculated. The ratio of relative speeds of each host is used to determine the size of each partition. As an example, consider a parallel run involving two machines, one with a relative speed of 2.0 and the other with a relative speed of 1.0. The faster machine would work on a partition size twice as large as the slower machine in this case.

The numbers themselves are arbitrary; as a guide you may want to set 1.0 for a 1 GHz processor, 0.75 for a 750 MHz processor, and so on. If a relative speed entry is not entered, a default of 1.0 is assumed for that host.

You can obtain relative speed values using the `cfx5parhosts` utility.

Remote Host Name

To include hosts in the parallel run with names that contain, for example, underscore characters, you can add the `Remote Host Name` parameter to the `HOST DEFINITION` with the correct network name for the host and use a readable alias as the name of the object.

Solver Executable

A solver executable may be explicitly supplied, if necessary. This is usually only required when using `Installation Root = none`, and is recommended for advanced users only. The following substitutions are made on the string:

%r	root directory of the installation
%p	parallel suffix for the executable
%v	version of Ansys CFX being run
%o	operating system string
%a	architecture subdirectory specification; for example, linux/double

If it is not supplied, this parameter has the default value "%r/bin/%a/solver%p.exe".

3.5.2. Adding Hosts for Parallel Processing with the cfx5parhosts Utility

You can add new hosts to Ansys CFX's database for parallel runs using the `cfx5parhosts` utility:

```
CFXROOT\bin\cfx5parhosts argument list
```

where *`argument list`* corresponds to one or more of the arguments listed below:

Argument	Description
-add *`host`*[,*`host`*,...]	Add information about the named hosts to the file. This assumes that Ansys CFX is installed in the

Argument	Description
	same directory on each listed host as on the host on which you are running. <host> may be specified as [<user>@]<hostname>[:<Ansys CFX root>] if the username or the Ansys CFX installation root directory differs from the local host. To add a set of separately installed Windows hosts to the hostinfo.ccl file, where the installation may be in a different place on each host, the recommended method is to gather the hostinfo.ccl files created on each host by the installation process, and merge them together using the `-merge` switch.
-add-slurm *`host`*[,*`host`*,...] -add-uge *`host`*[,*`host`*,...]	Add information about the named SLURM or UGE host(s) to the file. Unless the `-no-update` option is specified, the system will be queried and the resulting job submission information added.
-benchmark	Runs a standard benchmark case, and fills in the Relative Speed for the local host.
-benchmark-parts	Number of partitions to use when benchmarking
-file *`file`*	Use the specified file as the `hostinfo.ccl` file.
-merge *`file`*	Merge host information from the named file.
-no-update	After modifying the file, write back the information available without attempting to fill in any missing pieces.
-strict	Used with `-update`. Normally, hosts that exist on the network but that cannot be connected to with rsh or ssh are included in the resulting file with a comment. This switch will exclude these hosts.
-system	Use the system host file. This is the default.
-update	Updates the specified host information file. If any hosts do not have an architecture specified in the existing `hostinfo.ccl` file (for example, because it was added via the `-add` switch), it will connect to the host and query it to fill in the `Host Architecture String` parameter. This is the default behavior. Note that if the `Installation Root` parameter is incorrect for the host, it will use the standard system commands to guess a generic architecture string. This can happen if you use `-add` to include a host with a different installation directory than the local one.

Argument	Description
-user	Use the per-user host file.

Note:

Command line help is available by providing the -h argument.

Configuring the Speos HPC Environment

This section describes the post installation steps necessary to set up the Speos HPC environment. Speos HPC configuration should be performed in order to run successfully in a distributed environment.

Speos HPC installation is covered by the Ansys unified installer.

1. Speos HPC Installation Overview

This page outlines the steps to be taken prior to the Speos HPC environment configuration.

Before proceeding to the Cluster and SPEOS Core interface set-up, make sure that the following conditions are met:

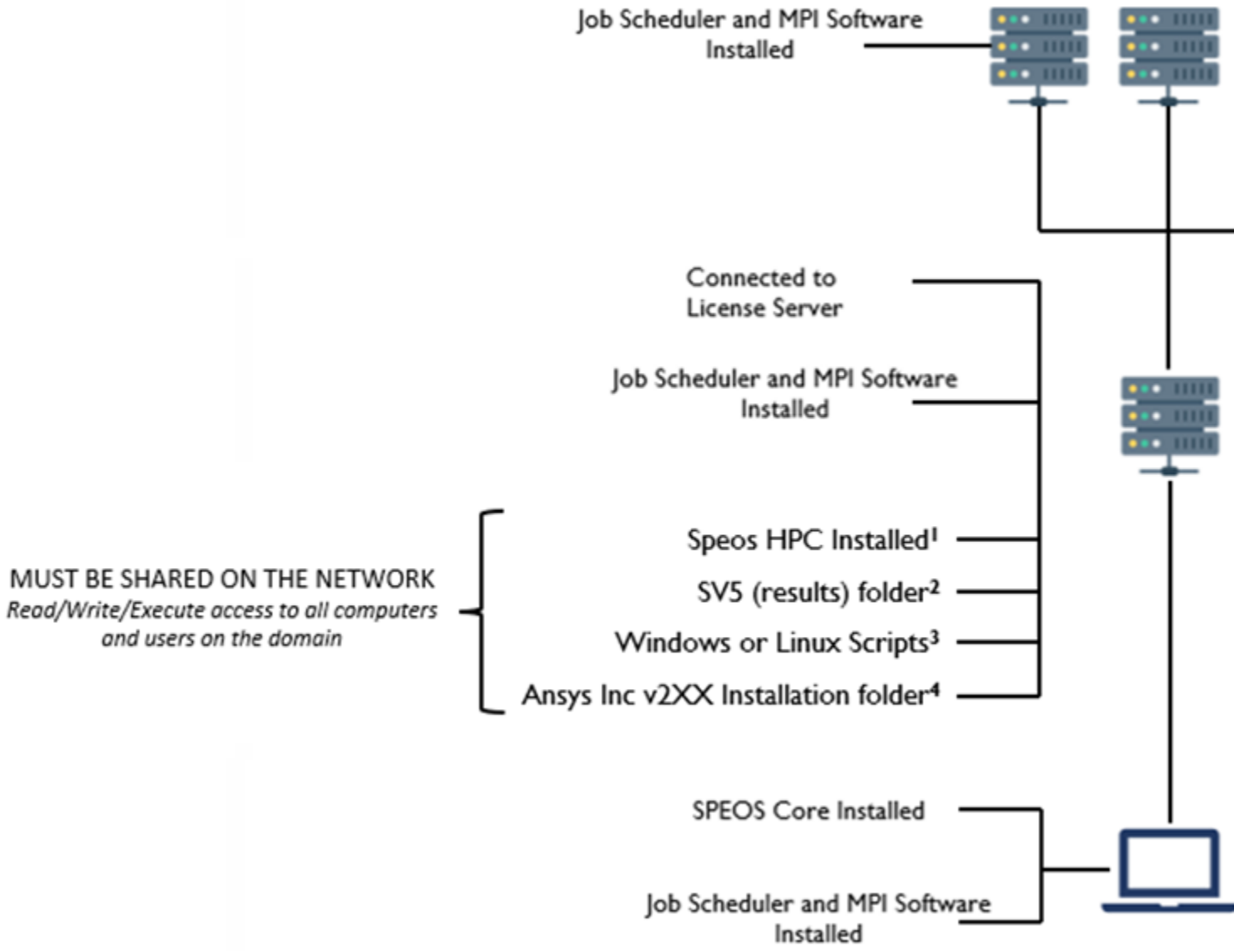
1. Your environment meets the prerequisites for distributed computing (p. 1) and the system requirements.

   Note:

   For up-to-date information on hardware platforms or operating systems that have been certified, go to the Platform Support section of the Ansys Website

2. Speos HPC is installed on the cluster machine used for parallel processing.
3. An MPI (message passing interface) software is installed on each machine of the cluster.
4. A scheduler is installed on the workstation, head node and compute nodes. (optional but strongly recommended). For more information, see **Scheduler Installation for Speos HPC on Windows** (p. 40).
5. Speos HPC license is installed and configured.

Example of Speos HPC environment setup



[1]**Speos HPC Installed** corresponds to the **Binary folder on the cluster** in the Speos HPC cluster configuration in Speos Core.

[2]**SV5 (results) folder** corresponds to the **Simulation folder on the cluster** in the Speos HPC cluster configuration in Speos Core.

[3]**Windows or Linux Scripts** corresponds to the **Simulation script template folder** in the Speos HPC cluster configuration in Speos Core.

[4]Make sure to share with the headnode and compute nodes the v2XX folder where Ansys products are installed. Inside the v2XX folder, the nodes must be able to find the Speos HPC folder and the licensingclient folder.

Note:

The licensingclient directory must be located in the Speos HPC folder or up to two folders above the Speos HPC folder.

2. Speos HPC on Linux

After ensuring that the cluster meets the system prerequisites for distributed computing (p. 1), and that Speos HPC installation is complete, proceed to the configuration of the Speos HPC cluster environment.

Note:

The cluster must be configured by an Information Technician.

2.1. Testing the MPI Program

Once Speos HPC installation is complete, perform a communication test to verify that the MPI software is set up correctly.

1. Log on to the Head Node of the cluster.
2. Load the MPI Library in your environment.
3. Launch ./SPEOSHPC.x.
   - If SPEOSHPC returns a version, the configuration is correct.
   - If you get an error when loading the shared library, check if the **redists_SPEOSHPC_Intel** folder is located in SPEOSHPC.x folder and if the MPI Library is correctly loaded in your environment.

2.2. Speos HPC on Linux using SPEOS Core

To run your simulation in a Linux environment using the SPEOS Core interface:

1. Download and install an emulator and a SFTP client to be able to communicate with the cluster machine (p. 24).
2. Create (p. 24) script files to be stored in a shared folder on the cluster. These script files will be used as template for SPEOS Core users.
3. Launch SPEOS Core and configure the cluster parameters  . To configure the cluster parameters, see Accessing a Linux Cluster from Windows in the Speos HPC User's Guide.

2.2.1. Accessing a Linux Cluster from Windows

If you are a first time user willing to access the Speos HPC cluster, download and install PuTTY and WinSCP.

- PuTTY allows you to connect to a Linux machine from a Windows machine, using a secured connection, and emulates a Linux console.
- WinSCP is a SFTP client for Windows allowing you to transfer securely files from a local machine to a remote machine.

Configuring PuTTY

1. Ask your Information Technician for the login access of the cluster Head Node (Host Name or IP address, and username).
2. In the **PuTTY Configuration** window, in the **Session** category, specify the Head Node **Host Name (or IP address)** of the cluster.

   If the connection type that the Information Technician configured is SSH, you may require Public and Private Keys to access the Head Node.
3. In the **Connection** category, in the **Data** sub-category, specify the **Auto-login username**.
4. In the **Session** category, in the **Saved Sessions** field, name the session and click **Save**.

Configuring WinSCP

Once you have configured PuTTY, configure WinSCP to transfer the files between the Head Node and your computer.

1. In the **Login - WinSCP** window, click **Tools** and select **Import Sites**.
2. Select the **Import from** PuTTY.
3. Select the site corresponding to the cluster.

   The site corresponds to the session you configured on PuTTY.
4. Click **OK**.

2.2.2. Configuring the Script Files

Six simulation script template files must be configured to use the Speos HPC interface:

- 1 script to check the simulation: **CheckMySimulation**
- 1 script to run the simulation: **RunMySimulation**

  The CheckMySimulation and RunMySimulation scripts contain variables (p. 25) among the provided list that are automatically replaced by the parameters defined in the Speos HPC interface.
- 1 script to submit the CheckMySimulation script to the scheduler: **SubmitCheckMySimulation**

- 1 script to submit the RunMySimulation script to the scheduler: **SubmitRunMySimulation**
- 1 script to control the running simulation or the simulation being checked: **RunCommandMySimulation**
- 1 script to cancel the simulation job: **CancelMySimulation**

  The scripts contain variables (p. 25) among the provided list that are automatically replaced by the parameters defined in the Speos HPC interface.

- 1 script to retrieve the job id: **Parsejobid** (useful for SLURM)

These six scripts are unique for each cluster. They must be placed in a shared folder with reading, writing and execute access rights to all computers and users on the domain.

To understand how to create the scripts, here are script template examples:

- RunMySimulation (p. 27)
- CheckMySimulation (p. 29)
- SubmitRunMySimulation (p. 28)
- SubmitCheckMySimulation (p. 30)
- RunCommandMySimulation (p. 30)
- CancelMySimulation (p. 31)
- ParseJobID (p. 31)

Note:

The examples provided are created to be read by a LSF scheduler. The scripts will depend on your scheduler.

2.2.2.1. Speos HPC Variables

The table presents the variables you can use to create the simulation script templates.

Table 3: List of Variables

Variable	Description	Can be used in
$(SPEOSHPC_EXE)	Full path to Speos HPC executable.	CheckMySimulation RunMySimulation RunCommandMySimulation
$(SV5PATH)	Full path to the exported simulation system.	CheckMySimulation RunMySimulation RunCommandMySimulation
$(FILE_OUTPUT)	Full path to the output file of scheduler.	CheckMySimulation RunMySimulation

Variable	Description	Can be used in
$(FILE_ERROR)	Full path to the error file of scheduler.	CheckMySimulation RunMySimulation
$(FILE_CHECKKO)	Full path to the file named CHECKKO.	CheckMySimulation
$(FILE_RUNKO)	Full path to the file named RUNKO.	RunMySimulation
$(LANG)	String corresponding to code page converter.	CheckMySimulation RunMySimulation
$(JOBNAME)	Job name.	RunMySimulation
$(JOB_ID)	Job identifier.	CancelMySimulation
$(JOB_ID_PATH)	File path that will contain the job ID at the submitting time.	SubmitCheckMySimulation SubmitRunMySimulation
$(NODES)	Number of nodes used by simulation.	RunMySimulation
$(WALLCLOCK)	Maximum job time.	RunMySimulation
$(PARAM)	String containing simulation parameters.	RunMySimulation
$(SPEOSHPC_CMD)	Control command options (-merge, -stop 1, ...).	RunCommandMySimulation
$(PATH_CHECK_SCRIPT)	Full path to check script.	SubmitCheckMySimulation
$(PATH_RUN_SCRIPT)	Full path to run script.	SubmitRunMySimulation
$(MAIL_ADDRESS)	User email address.	SubmitCheckMySimulation SubmitRunMySimulation

2.2.2.2. Command Line Switches

Table 4: MPI Command Line Switches

MPI Command Line Switch	Description
-launcher	Defines the connection type to launch the mpiexec.hydra
-hosts	Defines the list of the hosts that will run the jobs.
-mpi	Defines which Message Passing Interface to use (example: IntelMPI, OpenMPI)
-n (or -np)	Defines the total number of processes. **Note:** Speos HPC only uses one process.
-ppn	Defines the number of process per nodes. **Note:** Speos HPC only uses one process per node.

For more information, refer to the Intel MPI documentation, or in the linux terminal enter the following command line: `mpiexec -help`.

Table 5: Speos Command Line Switches

Speos Command Line Switch	Description
-speos	Defines the input data to be computed by Speos HPC.
-threads	Defines the number of threads per node on which to run the job.
-gpu	Allows you to run the simulation using the GPU resources of the cluster.

2.2.2.3. RunMySimulation Script

RunMySimulation.sh script is the template of the submission script to the scheduler. It contains scheduler commands, a call MPI environment loading and Speos HPC launch command.

In the following template example:

- We want SPEOSHPC to use 1 task per node, that's why we use (for PBS and Slurm respectively) :

  #PBS -l select=$(NODES):mpiprocs=1

  #PBS -l place=scatter

  And

  #SBATCH --ntasks-per-node=1

  #SBATCH --exclusive

- If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** command line as shown in the script below.
- The -threads option will limit the number of threads per nodes if you want to use the maximum number of threads on your machines you could use –threads 999

2.2.2.3.1. PBS – RunMySimulation Script

```
#!/bin/bash
#PBS -N "$(JOBNAME)"
#PBS -l walltime=00:$(WALLCLOCK):00
#PBS -q main
#PBS -o "$(FILE_OUTPUT)"
#PBS -e "$(FILE_ERROR)"
#PBS -l select=$(NODES):mpiprocs=1
#PBS -l place=scatter


# Load the user environment
export ANSYSLMD_LICENSE_FILE=1055@LICENSE_SERVER
export TMPDIR=/tmp
export PBS_O_PATH=$PATH

source /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

################################
```

```
# SPEOSHPC command line options
##############################

# Distribute my SPEOSHPC simulation on 2 computers for 10 seconds in this example.
mpiexec.hydra -launcher ssh -np $(NODES) "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG) -threads 50
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


qstat --version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | head -n 4
locale | head -n 1
```

2.2.2.3.2. SLURM – RunMySimulation Script

```
#!/bin/bash
#SBATCH -o "$(FILE_OUTPUT)"
#SBATCH -e "$(FILE_ERROR)"
#SBATCH -J "$(JOBNAME)"
#SBATCH -n $(NODES)
# spread the tasks evenly among the nodes
#SBATCH --ntasks-per-node=1
#SBATCH --exclusive
#SBATCH -t 00:$(WALLCLOCK):00

# Load the INTEL redistribuables

export ANSYSLMD_LICENSE_FILE=LICENSE_SERVER
export TMPDIR="/tmp"

##############################
# SPEOSHPC command line options
##############################

. /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

hostlist=$(scontrol show node ${SLURM_JOB_NODELIST} | awk '/NodeAddr=/ {print $1}' | cut -f2 -d= | paste -s

mpiexec.hydra -launcher ssh -hosts ${hostlist} -ppn 1 "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


sinfo –version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | grep "PRETTY"
locale | head -n 1
```

2.2.2.4. SubmitRunMySimulation Script

SubmitRunMySimulation.sh script is the script submission command on the cluster.

Submit job according to scheduler

2.2.2.4.1. PBS – SubmitRunMySimulation Script

```
# Submit job according to scheduler
qsub "$(PATH_RUN_SCRIPT)" > $(JOB_ID_PATH)
```

2.2.2.4.2. SLURM – SubmitRunMySimulation Script

```
# Submit job according to scheduler
sbatch "$(PATH_RUN_SCRIPT)" > $(JOB_ID_PATH)
```

2.2.2.5. CheckMySimulation Script

CheckMySimulation.sh script is the checking version of the RunMySimulation.sh script. The only difference is that you must set CheckMySimulation.sh script to run on only one node and activate the -check Speos HPC command which initializes and stops a simulation before running.

2.2.2.5.1. PBS – CheckMySimulation Script

```
#!/bin/bash
#PBS -N "$(JOBNAME)"
#PBS -l walltime=00:$(WALLCLOCK):00
#PBS -q main
#PBS -o "$(FILE_OUTPUT)"
#PBS -e "$(FILE_ERROR)"
#PBS -l select=1:mpiprocs=1
#PBS -l place=scatter


# Load the user environment
export ANSYSLMD_LICENSE_FILE=1055@LICENSE_SERVER
export TMPDIR=/tmp
export PBS_O_PATH=$PATH

source /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

################################
# SPEOSHPC command line options
################################

# Distribute my SPEOSHPC simulation on 2 computers for 10 seconds in this example.
mpiexec.hydra -launcher ssh -np 1 "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG) -threads 50 -mpi I
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.



   qstat --version
        mpiexec -V | head -n 1
        ldd --version | head -n 1
        cat /etc/*release* | head -n 4
        locale | head -n 1
```

2.2.2.5.2. SLURM – CheckMySimulation Script

```
#!/bin/bash
#SBATCH -o "$(FILE_OUTPUT)"
#SBATCH -e "$(FILE_ERROR)"
#SBATCH -J "$(JOBNAME)"
#SBATCH -n 1
# spread the tasks evenly among the nodes
#SBATCH --ntasks-per-node=1
#SBATCH --exclusive
#SBATCH -t 00:$(WALLCLOCK):00

# Load the INTEL redistribuables

export ANSYSLMD_LICENSE_FILE=LICENSE_SERVER
export TMPDIR="/tmp"

 ################################
 # SPEOSHPC command line options
```

```
 ################################

. /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

hostlist=$(scontrol show node ${SLURM_JOB_NODELIST} | awk '/NodeAddr=/ {print $1}' | cut -f2 -d= | paste -s

"/ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/bin/mpiexec.hydra" -launcher ssh -machinefile hosts
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


sinfo --version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | grep "PRETTY"
locale | head -n 1
```

2.2.2.6. SubmitCheckMySimulation Script

SubmitCheckMySimulation.sh script is the script submission command on the cluster.

2.2.2.6.1. PBS – SubmitCheckMySimulation Script

```
# Submit job according to scheduler
qsub "$(PATH_CHECK_SCRIPT)" > $(JOB_ID_PATH)
```

2.2.2.6.2. SLURM – SubmitCheckMySimulation Script

```
# Submit job according to scheduler
sbatch "$(PATH_CHECK_SCRIPT)"
```

2.2.2.7. RunCommandMySimulation Script

RunCommandMySimulation.sh script is used to run Speos HPC control commands.

You do not need to submit it to the scheduler.

You can execute it only on the login node, as it only send a command to Speos HPC which is running a simulation.

2.2.2.7.1. PBS – RunCommandMySimulation Script

```
# Load the user environment

# Run control command of SPEOSHPC
#./SPEOSHPC.x -sv5 "../SV5/DirectSimulation/LG_50M_Colorimetric.sv5/LG_50M_Colorimetric.sv5" -stop 0
"$(SPEOSHPC_EXE)" -sv5 "$(SV5PATH)" $(SPEOSHPC_CMD)
```

2.2.2.7.2. SLURM – RunCommandMySimulation Script

```
# Load the INTEL redistribuables
. /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

export ANSYSLMD_LICENSE_FILE=LICENSE_SERVER
export TMPDIR="/tmp"

#./SPEOSHPC.x -sv5 "../SV5/DirectSimulation/LG_50M_Colorimetric.sv5/LG_50M_Colorimetric.sv5" -stop 0
"$(SPEOSHPC_EXE)" -sv5 "$(SV5PATH)" $(SPEOSHPC_CMD)
```

2.2.2.8. CancelMySimulation

CancelMySimulation.sh script is used to cancel a pending or a starting job.

2.2.2.8.1. PBS – CancelMySimulation Script

```
qdel $(JOB_ID)
```

2.2.2.8.2. SLURM – CancelMySimulation Script

```
scancel $(JOB_ID)
```

2.2.2.9. ParseJobID

ParseJobID allows to retrieve only the job id and create a *.txt file with only the job id provided, to be then used in the other scripts.

ParseJobID is useful for SLURM scheduler.

```
# parse output of scheduler submitting command to get job id
sed -i "s~Submitted batch job ~~" $(JOB_ID_PATH)
```

2.2.3. Speos HPC on Linux using Scripts

To run a simulation in a Linux environment using scripts and command lines, download and install an emulator and a SFTP client on workstations that will need to communicate with the cluster machine.

- PuTTY allows you to connect to a Linux machine from a Windows machine, using a secured connection, and emulates a Linux console.
- WinSCP is a SFTP client for Windows allowing you to transfer securely files from a local machine to a remote machine.

2.2.3.1. Configuring PuTTY

1. Ask your Information Technician for the login access of the cluster Head Node (Host Name or IP address, and username).
2. In the **PuTTY Configuration** window, in the **Session** category, specify the Head Node **Host Name (or IP address)** of the cluster.

   If the connection type that the Information Technician configured is SSH, you may require Public and Private Keys to access the Head Node.
3. In the **Connection** category, in the **Data** sub-category, specify the **Auto-login username**.
4. In the **Session** category, in the **Saved Sessions** field, name the session and click **Save**.

2.2.3.2. Configuring WinSCP

Once you have configured PuTTY, configure WinSCP to transfer the files between the Head Node and your computer.

1. In the **Login - WinSCP** window, click **Tools** and select **Import Sites**.
2. Select the **Import from** PuTTY.
3. Select the site corresponding to the cluster.

   The site corresponds to the session you configured on PuTTY.
4. Click **OK**.

3. Speos HPC on Windows

After ensuring that the cluster meets the system prerequisites for distributed computing (p. 1), and that Speos HPC installation is complete, proceed to the configuration of the Speos HPC cluster environment.

Note:

The cluster must be configured by an Information Technician.

3.1. Speos HPC on Windows using SPEOS Core

To run your simulation in a Windows environment using the SPEOS Core interface:

1. Configure (p. 32) script files to be stored in a shared folder on the cluster. These script files will be used as template for SPEOS Core users.
2. Launch SPEOS Core and configure the cluster parameters  . For more information, see Accessing the Windows HPC Cluster in the Speos HPC User's Guide.

3.1.1. Configuring the Script Files

To use the Speos HPC interface, you need to provide the six following simulation script templates:

- 1 script to check the simulation: **CheckMySimulation**
- 1 script to run the simulation: **RunMySimulation**
- 1 script to submit the CheckMySimulation script to the scheduler: **SubmitCheckMySimulation**
- 1 script to submit the RunMySimulation script to the scheduler: **SubmitRunMySimulation**
- 1 script to control the running simulation or the simulation being checked: **RunCommandMySimulation**
- 1 script to cancel the simulation job: **CancelMySimulation**

The scripts contain variables (p. 34) among the provided list that are automatically replaced by the parameters defined in the Speos HPC interface.

These six scripts are unique for each cluster and must be created once. They must be placed in a shared folder with reading, writing and execute access rights to all computers and users on the domain.

CheckMySimulation.bat

In this script change the "SchedulerName".

```
echo off
chcp 65001
job submit /scheduler:"SchedulerName" /jobtemplate:default /jobname:CheckSimulation /stdout:"$(FILE_OUTPUT)" /s

if %ERRORLEVEL% NEQ 0 (
 echo Submission error - error code %ERRORLEVEL%
 echo > "$(FILE_CHECKKO)"
 )
```

RunMySimulation

In this script change the "SchedulerName", "ServerName"

> **Note:**
>
> If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** command line as shown in the script below. The **-gpu** command line is in BETA mode for the 2022 R2 release.

```
echo off
chcp 65001
job submit /scheduler:"SchedulerName" /jobtemplate:default /jobname:"$(JOBNAME)" /stdout:"$(FILE_OUTPUT)" /stde

if %ERRORLEVEL% NEQ 0 (
 echo Submission error - error code %ERRORLEVEL%
 echo > "$(FILE_RUNKO)"
 )
```

SubmitCheckMySimulation

```
echo off
chcp 65001
"$(PATH_CHECK_SCRIPT)" > $(JOB_ID_PATH)
```

SubmitRunMySimulation

```
echo off
chcp 65001
"$(PATH_RUN_SCRIPT)" > $(JOB_ID_PATH)
```

RunCommandMySimulation

```
echo off
chcp 65001
"$(SPEOSHPC_EXE)" -sv5 "$(SV5PATH)" $(SPEOSHPC_CMD)
```

CancelMySimulation

In this script change the "SchedulerName". **CancelMySimulation** script is only used to cancel a pending or a starting job.

```
echo off
chcp 65001
job cancel $(JOB_ID) /scheduler:"SchedulerName"
```

3.1.2. Speos HPC Variables

The table presents the variables you can use to create the simulation script templates.

Table 6: List of Variables

Variable	Description	Can be used in...
$(SPEOSHPC_EXE)	Full path to Speos HPC executable.	CheckMySimulation RunMySimulation RunCommandMySimulation
$(SV5PATH)	Full path to the exported simulation system.	CheckMySimulation RunMySimulation RunCommandMySimulation
$(FILE_OUTPUT)	Full path to the output file of scheduler.	CheckMySimulation RunMySimulation
$(FILE_ERROR)	Full path to the error file of scheduler.	CheckMySimulation RunMySimulation
$(FILE_CHECKKO)	Full path to the file named CHECKKO.	CheckMySimulation
$(FILE_RUNKO)	Full path to the file named RUNKO.	RunMySimulation
$(LANG)	String corresponding to code page converter.	CheckMySimulation RunMySimulation
$(JOBNAME)	Job name.	RunMySimulation
$(JOB_ID)	Job identifier.	CancelMySimulation
$(JOB_ID_PATH)	File path that will contain the job ID at the submitting time.	SubmitCheckMySimulation SubmitRunMySimulation
$(NODES)	Number of nodes used by simulation.	RunMySimulation
$(WALLCLOCK)	Maximum job time.	RunMySimulation
$(PARAM)	String containing simulation parameters.	RunMySimulation
$(SPEOSHPC_CMD)	Control command options (-merge, -stop 1, ...).	RunCommandMySimulation
$(PATH_CHECK_SCRIPT)	Full path to check script.	SubmitCheckMySimulation
$(PATH_RUN_SCRIPT)	Full path to run script.	SubmitRunMySimulation
$(MAIL_ADDRESS)	User email address.	SubmitCheckMySimulation SubmitRunMySimulation

3.2. Speos HPC on Windows using Scripts

To run a simulation in a Windows environment using scripts and command lines:

1. Make sure Speos HPC installation is complete for both the client station and the cluster environment.
2. Connect to the cluster using a job scheduler.

4. Speos HPC using the GPU Resources

HPC simulations are not limited to CPU. It can run a simulation using GPU resources thanks to CUDA cores. Better performance results have been achieved using GPU resources.

As of now, a GPU simulation requires 32 optishpc capabilities per GPU.

4.1. GPU Requirements

NVIDIA Quadro P6000 graphics adapter with a 525.89.02 NVIDIA driver.

Only NVIDIA GPU graphics adapters are supported.

Caution:

Be aware that the RAM needed for your simulation depends on your project. For instance, you may have a huge number of sensors with a high resolution which will require substantial RAM.

4.2. GPU Limitations

For more information on GPU Limitation refer to GPU Simulation Limitations.

4.3. Configuring the Scripts Files

Script Files in the context of GPU Simulations are the same script files as the CPU Simulation. You will just need to add the **-gpu** switch to the command line in the script.

4.3.1. Configuring the Scripts File for Speos HPC on Linux

On the Linux platform, two scripts can incorporate the **-gpu** switch:

- RunMySimulation Script (for PBS and SLURM)

- CheckMySimulation Script (for PBS and SLURM)

> **Warning:**
>
> SPEOS HPC cannot target a specific number of GPU adapters. It will take all GPU adapters in the node.

4.3.1.1. PBS – RunMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

> **Important:**
>
> You need to modify the script by adding the **LICENSE_SERVER** and the correct version used **vXXX**.

> **Note:**
>
> If you need to adjust the number of GPU devices to be used by Speos HPC when running a simulation, you can add the following command line:
>
> `export CUDA_VISIBLE_DEVICES="0;1;2"`
>
> 0,1,2 signifies that three GPU devices will be used to run the simulation.

```
#!/bin/bash
#PBS -N "$(JOBNAME)"
#PBS -l walltime=00:$(WALLCLOCK):00
#PBS -q main
#PBS -o "$(FILE_OUTPUT)"
#PBS -e "$(FILE_ERROR)"
#PBS -l select=$(NODES):mpiprocs=1
#PBS -l place=scatter


# Load the user environment
export ANSYSLMD_LICENSE_FILE=1055@LICENSE_SERVER
export TMPDIR=/tmp
export PBS_O_PATH=$PATH

source /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

################################
# SPEOSHPC command line options
################################

# Distribute my SPEOSHPC simulation on 2 computers for 10 seconds in this example.
mpiexec.hydra -launcher ssh -np $(NODES) "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG) -threads 50 -
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


qstat --version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | head -n 4
```

4.3.1.2. SLURM – RunMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

Important:

You need to modify the script by adding the **LICENSE_SERVER** and the correct version used **vXXX**.

Note:

If you need to adjust the number of GPU devices to be used by Speos HPC when running a simulation, you can add the following command line:

```
export CUDA_VISIBLE_DEVICES="0;1;2"
```

0,1,2 signifies that three GPU devices will be used to run the simulation.

```
#!/bin/bash
#SBATCH -o "$(FILE_OUTPUT)"
#SBATCH -e "$(FILE_ERROR)"
#SBATCH -J "$(JOBNAME)"
#SBATCH -n $(NODES)
# spread the tasks evenly among the nodes
#SBATCH --ntasks-per-node=1
#SBATCH --exclusive
#SBATCH -t 00:$(WALLCLOCK):00

# Load the INTEL redistribuables

export ANSYSLMD_LICENSE_FILE=LICENSE_SERVER
export TMPDIR="/tmp"

################################
# SPEOSHPC command line options
################################

. /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

hostlist=$(scontrol show node ${SLURM_JOB_NODELIST} | awk '/NodeAddr=/ {print $1}' | cut -f2 -d= | paste -sd

mpiexec.hydra -launcher ssh -hosts ${hostlist} -ppn 1 "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG)
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


sinfo –version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | grep "PRETTY"
locale | head -n 1
```

4.3.1.3. PBS – CheckMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

Important:

You need to modify the script by adding the **LICENSE_SERVER** and the correct version used **vXXX**.

```
#!/bin/bash
#PBS -N "$(JOBNAME)"
#PBS -l walltime=00:$(WALLCLOCK):00
#PBS -q main
#PBS -o "$(FILE_OUTPUT)"
#PBS -e "$(FILE_ERROR)"
#PBS -l select=1:mpiprocs=1
#PBS -l place=scatter


# Load the user environment
export ANSYSLMD_LICENSE_FILE=1055@LICENSE_SERVER
export TMPDIR=/tmp
export PBS_O_PATH=$PATH

source /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

##############################
# SPEOSHPC command line options
##############################

# Distribute my SPEOSHPC simulation on 2 computers for 10 seconds in this example.
mpiexec.hydra -launcher ssh -np 1 "$(SPEOSHPC_EXE)" -speos "$(SV5PATH)" $(PARAM) $(LANG) -threads 50 -mpi Int
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.



   qstat --version
        mpiexec -V | head -n 1
        ldd --version | head -n 1
        cat /etc/*release* | head -n 4
        locale | head -n 1
```

4.3.1.4. SLURM – CheckMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

Important:

You need to modify the script by adding the **LICENSE_SERVER** and the correct version used **vXXX**.

```
#!/bin/bash
#SBATCH -o "$(FILE_OUTPUT)"
#SBATCH -e "$(FILE_ERROR)"
#SBATCH -J "$(JOBNAME)"
#SBATCH -n 1
# spread the tasks evenly among the nodes
#SBATCH --ntasks-per-node=1
```

```
#SBATCH --exclusive
#SBATCH -t 00:$(WALLCLOCK):00

# Load the INTEL redistribuables

export ANSYSLMD_LICENSE_FILE=LICENSE_SERVER
export TMPDIR="/tmp"

 ##############################
 # SPEOSHPC command line options
 ##############################

. /ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/env/vars.sh

hostlist=$(scontrol show node ${SLURM_JOB_NODELIST} | awk '/NodeAddr=/ {print $1}' | cut -f2 -d= | paste -sd

"/ansys_inc/vXXX/commonfiles/MPI/Intel/2021.8.0/linx64/bin/mpiexec.hydra" -launcher ssh -machinefile hosts -p
# NOTE: if you want to run simulation using GPU of the cluster, add the -gpu switch in the command line.
# NOTE: the -threads command line is useless when using the -gpu switch in the command line.


sinfo --version
mpiexec -V | head -n 1
ldd --version | head -n 1
cat /etc/*release* | grep "PRETTY"
locale | head -n 1
```

4.3.2. Configuring the Scripts File for Speos HPC on Windows

On the Windows platform, two scripts can incorporate the **-gpu** switch:

- RunMySimulation Script
- CheckMySimulation Script

> **Warning:**
>
> SPEOS HPC cannot target a specific number of GPU adapters. It will take all GPU adapters in the node.

4.3.2.1. RunMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

> **Important:**
>
> You need to modify the script by adding the **LICENSE_SERVER**..

```
echo off
chcp 65001
job submit /scheduler:"SchedulerName" /jobtemplate:default /jobname:"$(JOBNAME)" /stdout:"$(FILE_OUTPUT)" /st

if %ERRORLEVEL% NEQ 0 (
 echo Submission error - error code %ERRORLEVEL%
 echo > "$(FILE_RUNKO)"
 )
```

4.3.2.2. CheckMySimulation Script

If you want to run a simulation using the GPU of the cluster, you can add the **-gpu** switch to the command line as shown in the following script:

Important:

You need to modify the script by adding the **LICENSE_SERVER**..

```
echo off
chcp 65001
job submit /scheduler:"SchedulerName" /jobtemplate:default /jobname:CheckSimulation /stdout:"$(FILE_OUTPUT)"

if %ERRORLEVEL% NEQ 0 (
 echo Submission error - error code %ERRORLEVEL%
 echo > "$(FILE_CHECKKO)"
 )
```

5. Scheduler Installation for Speos HPC on Windows

A scheduler is an application that allows you to schedule and monitor the execution of the simulation jobs that you submit to a cluster of computers.

Installing a scheduler is not mandatory, but is strongly recommended. We provide you with instructions describing the linstallation process for RSM scheduler or Windows HPC.

To access these instructions, log on to the **Ansys Customer Portal** and click **Downloads > Installation and Licensing Help and Tutorials**. The installation instructions can be found under the **Installation** section of the page.

6. Speos HPC without Job Scheduler

Note:

Working without a HPC job scheduler is not recommended.

Speos HPC can be used without job scheduler when you prefer manipulating the application using command lines, or when Windows Server cannot be installed.

Here is an example of a command line with Microsoft MPI:

```
mpiexec -machinefile Machines.txt -wdir %SPEOSHPCDIR% "%SPEOSHPC%" -SV5 "%SV5%" %SIMULATIONPARAMS%


set SPEOSHPCDIR=\\station_name\speoshpc\Optis\SPEOSHPC_2016\
set SPEOSHPC=%SPEOSHPCDIR%SPEOSHPC.exe
set SV5=\\station_name\speoshpc\SV5\DOM_DirectSimulation_43s_2400by1600.sv5\DOM_DirectSimulation_43s_2400by1600.sv5
SET SIMULATIONPARAMS=-threads 8 -mtime 1
```

Available options for the SPEOSHPC.exe command:

- speoshpc -h: display help.

- speoshpc -v: display the version.
- speoshpc -sv5 sv5fullpath: full path to the .sv5 file to use for the simulation.
- speoshpc -threads nn: number of threads per node (limited by the license)
- speoshpc -nbrays nnnn: number of rays / passes for the Monte Carlo Direct or Inverse simulations.
- speoshpc -lang "CodePage_Converter_Name": used to support existing SV5 files which have been saved with a Windows code page.
- speoshpc -disablefiles : disable all .lpf, .lp3, .ray, .tm25ray output files.

The following options can be combined:

- speoshpc -stime nnnn: run the simulation during nnnn seconds (only Monte Carlo simulations).
- speoshpc -mtime nnnn: run the simulation during nnnn minutes (only Monte Carlo simulations).
- speoshpc -htime nnnn: run the simulation during nnnn hours (only Monte Carlo simulations).
- speoshpc -dtime nnnn: run the simulation during nnnn days (only Monte Carlo simulations).
- speoshpc Remark: for Inverse simulations with many sensor, the specified simulation time is for each sensor.

The following options can be combined (the minimum default value is 1 hour):

- speoshpc -hsave nnnn: merge and save the intermediate results every nnnn hours (only Monte Carlo simulations).
- speoshpc -dsave nnnn: merge and save the intermediate results every nnnn days (only Monte Carlo simulations).
- speoshpc -nosave: disable the merge and save of intermediate results.

IBM Platform MPI with High (>4096) Process Count

The Platform MPI software included with Ansys products allows for a maximum of 4096 processes to be included in a single parallel calculation. You will need to obtain an additional license from International Business Machines Corp. (IBM) for higher process counts. Alternatively, you can use the "Intel MPI" option in the settings for your parallel calculation.