

Intel® Parallel Studio XE 2016

Installation Guide for Linux* OS

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1 Introduction

This document explains how to install the Intel® Parallel Studio XE on a Linux* OS system. You can install the product from the command line or using the graphical user interface (GUI). Depending on the license you have, the installer performs the installation of one of the following product editions:

- Intel® Parallel Studio XE Composer Edition
- Intel® Parallel Studio XE Professional Edition
- Intel® Parallel Studio XE Cluster Edition

For differences in contents of each edition, see Release Notes.

Read the Prerequisites section below to see whether you want to configure the Intel® Parallel Studio XE on a single file server, or a distributed install will better fit your needs. If your login account does not have administrative access, and the installation directory requires system administrative write privileges (for example, `/opt/intel`), you may need the assistance from your system administrator in installing the associated software packages on your cluster system.

To install the Intel® Parallel Studio XE on Linux* OS, you can use:

- **Offline Installer** package that contains all the components of the product
- **Online Installer** – a small installation file that downloads and installs only specified components of the product. The installer downloads the components prior to the installation, so you can install the product in the offline mode and/or on another machine using the `--download-only` option.

The Intel® Parallel Studio XE installer automatically makes the appropriate selection of binaries, scripts, and text files from its installation archive based on the Intel® architecture of the host system where the installation process is initiated. You do not have to worry about selecting the correct software component names for the given Intel® architecture.

Intel® Parallel Studio XE 2016 introduces a major change to the 'Named-user' licensing scheme provided as default for the 2016 licenses. The 'Named-user' license provisions in the Intel software EULA have changed to only allow the software to be installed on up to three systems. See *Release Notes* for details.

2 Prerequisites

Before you begin the installation, you need to decide what installation method you need:

- An install of the software on a single file server that is accessible to all nodes of the cluster.
- A distributed install where the software components are installed on each node of the cluster.

For a distributed install, you need to create a `machines.LINUX` file, or use the existing `machines.LINUX` file to deploy the appropriate software components amongst the nodes of the

cluster. The `machines.LINUX` file contains a list of the computing nodes for the cluster. The format is one host name per line.

The host name should be the same as the result from the Linux command `hostname`. The following shows an example of the content for the file `machines.LINUX`, where a contrived cluster consists of eight nodes:

```
clusternode1
clusternode2
clusternode3
clusternode4
clusternode5
clusternode6
clusternode7
clusternode8
```

A line of text in the example above is considered a comment line if the first column contains the "#" symbol. The first node in the list is the master node. The remaining nodes are the compute nodes. The text `clusternode1` and `clusternode2`, for example, represent the names of two of the nodes in a contrived computing cluster.

You can also use the contents of the `machines.LINUX` file to construct an `mpd.hosts` file for the multi-purpose daemon (MPD) protocol. The MPD protocol is used for running MPI applications that use the Intel® MPI Library.

After you decided on the method of installation, complete the following preparation steps:

1. On the system where the Intel® Parallel Studio XE components are to be installed, it is recommended to create a staging area in a directory such as `/tmp`. For example: `/tmp/psxe_staging_area`, where `psxe_staging_area` is an acronym for the Intel® Parallel Studio XE staging area.
2. Go to the Intel® Software Development Products Registration Center site and provide the product serial number information. Your serial number (for example, C111-12345678) can be found within the e-mail receipt of your product purchase. Once the admission has been granted into the registration center, you will be able to access the Intel® Premier Support web page for software support.
3. Place the Intel® Parallel Studio XE license file provided to you in a common location or a directory pointed to by the `INTEL_LICENSE_FILE` environment variable. Common locations for the attached license file are:
    - `/opt/intel/licenses` for installation with root privileges
    - `~/intel/licenses` for a regular user

    You and/or the system administrator must set the environment variable `INTEL_LICENSE_FILE` to the directory path where the Intel software licenses will reside

before starting an installation of Intel® Parallel Studio XE Cluster Edition. For example, the syntax for setting the `INTEL_LICENSE_FILE` environment variable may be as follows:

```
export INTEL_LICENSE_FILE=/opt/intel/licenses
```

Do not change the file name because the `.lic` extension is critical.

4. **(Offline Installer only)** The installer package for the Intel® Parallel Studio XE has the following naming convention:

   `parallel_studio_xe_<major>[_beta].tgz`

   where `<major>` is the product release version. For example:
   `parallel_studio_xe_2016.tgz`

   The command `tar -xvzf parallel_studio_xe_<major>[_beta].tgz` creates a subdirectory `parallel_studio_xe_<major>[_beta]`.

   Change to that directory with the shell command:
   `cd parallel_studio_xe_<major>[_beta]`

   Make sure that `machines.LINUX` file is in this folder. Otherwise, you will have to provide an alternative path to this file.

5. The installer uses the digital signature validation of the Red Hat* Package Manager (RPM) packages. Use the `--signature PUBLIC_KEY.PUB` option to point to the `PUBLIC_KEY.PUB` file provided in the installation package.

   If you run the installation without the `--signature` option, you must be connected to the internet to download the public key.

   Alternatively, you can use the `--ignore-signature` option to skip the signature validation.

6. You can use the `expect` shell script file `sshconnectivity.exp` provided in the installation package to establish secure shell connectivity on a cluster system. The expect script is a tool for automating interactive applications. To run `sshconnectivity.exp`, the expect run-time software needs to be installed on your Linux* OS system. To make sure that the expect run-time software is properly installed, type: `which expect`

   If you encounter the "`Command not found.`" error message, you can download the expect software package from: http://expect.nist.gov/

   The syntax for the `sshconnectivity.exp` command is as follows:

   ```
   ./sshconnectivity.exp machines.LINUX
   ```

   The expect shell script creates or updates the `~/.ssh` directory on each node of the cluster beginning with the master node which is the first name listed in the `machines.LINUX` file. This script will prompt you for your password twice. Upon successful completion of the script, the following message fragment appears:

   ```
   ...
   ************************************************************************
   Node count = 4
   Secure shell connectivity was established on all nodes.
   ```

```
...
**********************************************************************
...
```

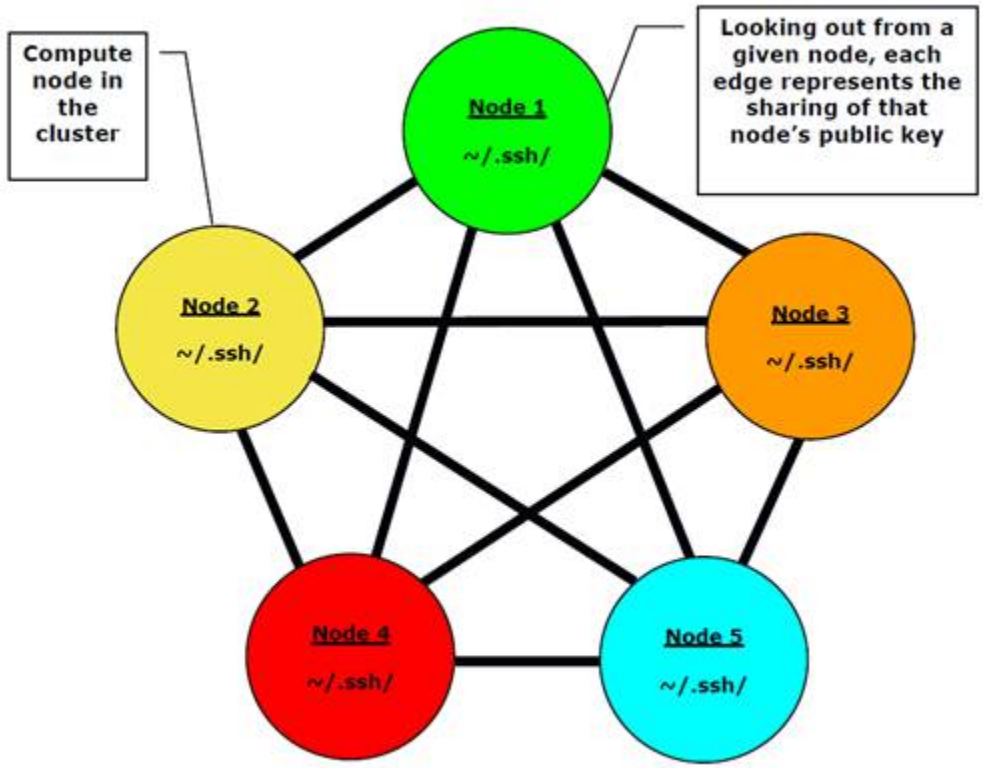
A log of the transactions for this script is recorded in `/tmp/sshconnectivity.<login-name>.log` where `<login-name>` is a meta-symbol for your actual login.

The shell script `sshconnectivity.exp` removes the write access capability on the group and other "permission categories" for the user's home directory. Otherwise, a password prompt will continue to be issued for any secure shell activity.

This process of establishing secure shell connectivity is demonstrated by the following graph. In this graph, a vertex represents a cluster computing node, and an edge between two vertices connotes that the two cluster computing nodes have exchanged public keys for secure shell connectivity. Secure shell connectivity is intended to provide secure, encrypted communication channels between two or more cluster nodes over an insecure network.

The script `sshconnectivity.exp` calls the appropriate secure shell utilities to generate a private key and a public key for each node of the cluster.

Secure Shell Connectivity for a Computing Cluster



For the complete graph example in the figure above, suppose there are nodes (vertices) `1` to `n` in the cluster. For a given node `i`, nodes `1` to `i - 1` and nodes `i + 1` to `n` are provided with the public key from node `i`. The user's public keys for a given node are stored in the `~/.ssh` folder associated with the user's home directory for that computing node. Since there are `n - 1` edges to a given node `i` in the figure above, the node `i` will have `n- 1` public keys in the `~/.ssh` folder that were provided by the other `n - 1` nodes in the cluster. This example represents a computing cluster that has a total of five nodes. The edges connecting a node indicate that the node has received four public keys from the remaining computing nodes. Also looking out from a given node indicates that the given node has provided its own public key to the remaining nodes that are reachable through the four edge paths.

If the home directory for a cluster is shared by all of the cluster nodes, for example, all of the nodes use the same `~/.ssh` folder, the connectivity illustrated in the figure above is represented through the contents of the `~/.ssh/known_hosts` file.

Once secure shell connectivity is established, you are ready to install the Intel® Parallel Studio XE.

3 Installation

3.1 Using Online Installer

Choose one of the following installation options:

- Install the product on current machine with no interruptions during the installation. The installer will download and install the selected components automatically. This process requires an active internet connection.

  To start the installation, run the online installer script. A typical script name may look as follows:

  `parallel_studio_xe_2016_online.sh`

  Follow the installation wizard instructions. Installation from the command line, through the graphical user interface and silent installation are described in detail further in the document.
- Install on another system, or offline. Download the installation package with only selected components and use the package later or on another machine. Do the following:
  1. Run the installation script with the --download-only option. Use the `--download-dir <folder>` option to set the location where the installation package will be downloaded. The default download location is `/tmp/<username>`.

     Avoid using relative paths in the `--download-dir` option. This may cause unexpected problems during the installation
  2. Follow the installation wizard instructions. You will be able to:
     - Select the product activation method
     - Select the architecture for which you want to build your applications

- Select the components to download

Once you have completed these steps, the installer will download the customized installation package to the download location.

3. Go to the download location and run the `install.sh` or `install_GUI.sh` script to start the installation. Installation from the command line, through the graphical user interface and silent installation are described in detail further in the document.

   You can also use this package to install the product on another machine. This step does not require internet connection.

3.2 Installation Through Command Line Interface (CLI)

To install the Intel Parallel Studio XE from the command line, complete the steps described below:

1. Run the `install.sh` script located at the top level of your installation archive. If you want to use the Online Installer, run the `parallel_studio_xe_2016_beta_online.sh` script. The **Welcome** dialog appears.
2. Press the "Enter" key to continue the installation. If your system is configured correctly, the installation proceeds to the activation step. Otherwise, the **Missing Optional Prerequisite(s)** or the **Missing Critical Prerequisite(s)** dialog appears.

   You can continue the installation with missing optional prerequisites. However, if you are missing any critical prerequisites, you need to fix the issue and restart the installation. When you are done, proceed to the next step.
3. Read and accept the terms of the End User License Agreement (EULA). After reading the EULA, type "`accept`" and press "Enter" to continue the installation.
4. In the following dialog, select the activation option you can use:
   1. Use the existing license (default)
   2. Use a serial number
   3. Evaluate the product (unavailable in Beta releases)
   4. Use a license file or Intel® Software License Manager

   If you use option 4, the installer prompts to choose you between:

   - Offline activation
   - Activation using a license manager

   If you choose offline activation, you can proceed to provide the path to the license file location.
5. Choose whether you want to participate in the Intel® Software Improvement Program. If you opt in, Intel will automatically receive anonymous information about how you use your current and future Intel® Software Development Products. You can stop participating at any time.

   This dialog is unavailable in Beta releases, opt-in is enabled by default.

6. Choose between installation on a single cluster node and a distributed installation. By default a single-node installation is selected.

   If you choose the distributed installation, the following options are available:

   - Configuration type
   - File name for the cluster nodes list
   - Number of parallel installations
   - Check for shared installation directory

7. The next dialog summarizes the selected installation options, including the installation directory and the components to install. To start the installation immediately with the currently selected options, enter 1. Otherwise, enter 2 to proceed to the customization dialogs described below:

   1. Select the architectures for which you want to build your applications. By default, IA-32 and Intel® 64 architectures are selected.
   2. Review the main configuration dialog. The sub-options of this dialog enable you to:
      - Choose the installation directory (for example, `/opt/intel`)
      - Select components to install
      - Modify the advanced options

8. If you chose any open-source components to be installed with this product, the **Installation of Open Source Components** dialog displays your selection.
9. Press the "Enter" key to start the installation. When all the selected components are installed, the **Complete** dialog appears.

3.3 Installation Through Graphical User Interface (GUI)

To install the product using the GUI, complete the steps described below:

1. Run the `install_GUI.sh` script located at the top level of your installation archive. If you want to use the Online Installer, run the `parallel_studio_xe_2016_beta_online.sh` script with the `--gui-mode` option.

   The **Welcome** dialog appears. The left-side panel of the installation window provides a progress report showing the current stage of the installation process:

   - Welcome
   - Prerequisites
   - License agreement
   - Activation
   - Intel® Software Improvement Program (unavailable in Beta)
   - Options

- Installation
- Complete

Click the **Next** button to continue.

2. Review the **Prerequisites** dialog box to see whether your system is properly configured for the Intel Parallel Studio XE installation. You can proceed with the installation if you are missing optional prerequisites. However, if you are missing any critical prerequisites, you need to fix the issue before you can continue. When you are done, click the **Next** button.
3. Read and accept the terms of the End User License Agreement (EULA) by selecting the corresponding radio button. Click the **Save** button to save the text of the license agreement to your system.
4. Choose one of the activation options by selecting the corresponding radio button:
    - Use existing license - choose this option if you have a valid license file.
    - Use serial number to activate and install product - choose this option if you have a serial number. This option requires an internet connection.
    - Evaluate this product (no serial number required) - choose this option if you do not have a serial number or if you want to activate the product at a later time. This option is not available for Beta releases.
    - Choose alternative activation - choose this option if you want to do one of the following:
        - Activate offline
        - Use a license manager

    When done, click **Next** to continue.
5. Choose between installation on a single cluster node and a distributed installation on multiple nodes by selecting the corresponding radio button. If you decide to install the product on all nodes of your cluster, you must provide the path to the `machines.LINUX` file that lists all nodes of your cluster, and enter the number of parallel installations you want to perform.
6. Choose whether you want to participate in the Intel® Software Improvement Program. If you opt in, Intel may automatically receive anonymous information about how you use your current and future Intel® Software Development Products.

    This dialog is unavailable in Beta releases, opt-in is enabled by default.
7. Review the **Installation Summary** to see whether the selected installation options meet your needs. To change the selection, click the **Customize installation** button and proceed to change the following options:
    - Choose an alternative installation directory
    - Select target architecture(s) for your applications to run on. By default, IA-32 and Intel® 64 architectures are selected.

- Select the components to install.
- Configure advanced options of the product components.

To proceed with the installation, click the Install button.

8. If applicable, review the list of the open-source components to be installed with this product. The **Installation of Open Source Components** dialog box displays your selection.
9. Click **Next** to start the installation. When all the selected components are installed, the **Complete** window is displayed.

3.4 Silent Install Mode

You can install the Intel® Parallel Studio XE using the silent installation mode that does not require human interaction. This helps you install the Intel® Parallel Studio XE software on clusters that contain many nodes.

To install the product in silent mode, do the following:

1. Revise the `silent.cfg` configuration file according to your needs. For the Offline Installer, this file is provided in the installation package. For the Online Installer, the configuration file is downloaded to the temporary folder when you run the installer. By default, this folder is `/tmp/<username>`.

   Make sure you have changed the `ACCEPT_EULA` value to `accept` to start the installation.
2. Run the installation script with the `--silent=<path_to_silent.cfg>` option.

4 Installation Folders

Following a successful installation, the files associated with Intel® Parallel Studio XE appear on your host system. The following table indicates the default structure and identifies the file types stored in each subfolder. Note that some of the folders below may be missing depending on the edition of Intel Parallel Studio XE you have installed.

The default installation directory is: `/opt/intel`

Folder	Description
`advisor_xe`	Symbolic link to the latest version if Intel® Advisor XE
`advisor_xe_2016`	Symbolic link to the latest update if Intel® Advisor XE 2016
`advisor_xe_2016.x.xx.xxxxxx`	Subdirectory for Intel® Advisor XE
`bin`	Subdirectory containing symbolic links to Intel® Parallel Studio XE compilers and libraries binary files
`clck`	Subdirectory for Intel® Cluster Checker

clck_latest	Symbolic link to the latest version of Intel® Cluster Checker
compilers_and_libraries	Symbolic link to the latest version of the Intel® Parallel Studio XE compilers and libraries products
compilers_and_libraries_2016	Subdirectory containing symbolic links to Intel® Parallel Studio XE 2016 compilers and libraries products
compilers_and_libraries_2016.x.xxx	Subdirectory for each update of the Intel® Parallel Studio XE 2016 compilers and libraries products
daal	Symbolic link to the Intel® Data Analytics Acceleration Library subdirectory
debugger_2016	Subdirectory containing debugger of Intel® Parallel Studio XE 2016
documentation_2016	Subdirectory for the Intel® Parallel Studio XE 2016 documentation
ide_support_2016	Subdirectory containing IDE support of Intel® Parallel Studio XE 2016
imb	Subdirectory for Intel® MPI Benchmarks packages (old versions) and symbolic links (newer version)
impi	Subdirectory for Intel® MPI Library packages (old versions) and symbolic links (newer version)
include	Symbolic link to Intel® Parallel Studio XE compilers and libraries include subdirectory
inspector_xe	Symbolic link to the latest version of Intel® Inspector XE
inspector_xe_2016	Symbolic link to the latest update of Intel® Inspector XE 2016
inspector_xe_2016.x.xx.xxxxxx	Subdirectory for Intel® Inspector XE 2016
ipp	Symbolic link to the Intel® Integrated Performance Primitives subdirectory
ism	Subdirectory for Intel® Software Manager
itac	Subdirectory for Intel® Trace Analyzer and Collector
itac_9.1	Symbolic to link to the latest update of Intel® Trace Analyzer and Collector 9.1
itac_latest	Symbolic link to the latest version of Intel® Trace Analyzer and Collector
lib	Symbolic link to the Intel® Parallel Studio XE compilers and libraries subdirectory
licenses	Subdirectory containing license files

man	Symbolic link to the Intel® Parallel Studio XE Composer Edition manuals subdirectory
mkl	Symbolic link to the Intel® Math Kernel Library subdirectory
parallel_studio_xe_2016.x.xxx • bin • licensing • <component links>	Subdirectory for Intel® Parallel Studio XE 2016 with the uninstall scripts and symbolic links to the installed components Location of psxevars.[c]sh and sshconnectivity.exp Location of the licensing files
samples_2016	Subdirectory containing samples/tests for Intel® Parallel Studio XE 2016
tbb	Symbolic link to the Intel® Threading Building Block subdirectory
vtune_amplifier_xe	Symbolic link to the latest version of Intel® VTune Amplifier XE
vtune_amplifier_xe_2016	Symbolic link to the latest update of Intel® VTune Amplifier XE 2016
vtune_amplifier_xe_2016.x.xx.xxxxxx	Subdirectory for Intel® VTune Amplifier XE 2016

5 Getting Started

See the Getting Started page to get the information about the components installed and instructions on how to get started with the product.

The document is located at:

```
<install_dir>/documentation_2016/en/ps2016/getstart_*.htm
```

6 Uninstalling the Product

To uninstall the Intel® Parallel Studio XE on Linux* OS, you can use the shell scripts `uninstall.sh` or `uninstall_GUI.sh` located at:

```
<install-dir>/parallel_studio_xe_2016.x.xxx/bin
```

When invoking this script, follow the prompts for the uninstall process.

7 Installer Options

7.1 Offline Installer Options

Option	Description
`-h, --help`	Print help message
`-v, --version`	Print the version information
`-s, --silent <file>`	Run the installation silently using the settings in the configuration file
`-d, --duplicate <file>`	Run the installation interactively, record the user input into the configuration file
`-t, --tmp-dir <folder>`	Set a custom temporary folder
`-l, --lang`	Set the user interface language
`--user-mode`	Run the installation with the current user privileges
`--signature <file>`	Set the public key file for digital signature validation of the Red Hat* Package Manager (RPM) packages
`--ignore-signature`	Skip the signature validation
`--ignore-cpu`	Skip CPU model check
`--nonrpm-db-dir <folder>`	Set a directory to store the product installation database
`--SHARED_INSTALL`	Install the product to a network-mounted drive or shared file system for multiple users

7.2 Online Installer Options

Option	Description
`-h, --help`	Print help message
`-v, --version`	Print the version information
`-t, --tmp-dir <folder>`	Set a custom temporary folder
`-D, --download-dir <folder>`	Set a custom download folder
`-o, --download-only`	Download the installation package without installing the product
`-s, --silent <file>`	Run the installation silently using the settings in the configuration file

`-d, --duplicate <file>`	Run the installation interactively, record the user input into the configuration file
`--cli-mode`	Run the installation in command-line mode
`--gui-mode`	Run the installation in graphical mode
`--user-mode`	Run the installation with the current user privileges
`--signature <file>`	Set the public key file for digital signature validation of the Red Hat* Package Manager (RPM) packages
`--ignore-signature`	Skip the signature validation
`--nonrpm-db-dir <folder>`	Set a directory to store the product installation database
`--SHARED_INSTALL`	Install the product to a network-mounted drive or shared file system for multiple users
`--http-proxy http://HOST:PORT`	Specify the HTTP proxy
`--https-proxy https://HOST:PORT`	Specify the HTTPS proxy

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