# Cray Programming Environments Installation Guide

S–2372–1506

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RECORD OF REVISION

S-2372-1506 Published June 2015 Updated to support use of IMPS image directories on all Cray XE, Cray XK, and Cray XC series systems.

S–2372–119 Published September 2014 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.9 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.19 or later running on Cray XC30 and Cray XC30-AC systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.35 or later running on Cray XE and Cray XK systems. Introduces support for Intel® "Haswell" processors.

S–2372–113 Published February 2014 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.8 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.13 or later running on Cray XC30 and Cray XC30-AC systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.29 or later running on Cray XE and Cray XK systems. Supports Intel® Xeon Phi™ coprocessors.

S–2372–112 Published January 2014 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.8 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.12 or later running on Cray XC30 and Cray XC30-AC systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.25 or later running on Cray XE and Cray XK systems.

S–2372–109 Published September 2013 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.5 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.09 or later running on Cray XC30 and Cray XC30-AC systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.25 or later running on Cray XE and Cray XK systems.

S–2372–105 Published May 2013 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.1 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.05 or later running on Cray XC30 and Cray XC30-AC systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.17 or later running on Cray XE and Cray XK systems.

S–2372–102 Published March 2013 Documents the installation, configuration, and use of the Cray PE Installer utility release 1.0 on all systems. Supports the Cray Developer Toolkit (CDT) release 1.02 or later running on Cray XC30 systems. Supports the Cray Application Developer's Toolkit (CADE) release 6.17 or later running on Cray XE and Cray XK systems.

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## Procedures

# Introduction [1]

This guide documents the installation, configuration, and use of the `craype-installer.pl` utility on Cray XE, Cray XK, and Cray XC series systems. This guide describes how to install:

- The `craype-installer.pl` utility on all systems
- The Cray Developer Toolkit (CDT) on Cray XC series systems.
- The Cray Application Developer's Environment (CADE) on Cray XE or Cray XK systems.
- Either CDT or CADE (depending on the associated Cray system) on Cray Development and Login (CDL) hosts running CLE and the *CLE Support Package* (see **Note**, below)
- Either CDT or CADE (depending on the associated Cray system) on standalone ("whitebox") Linux systems running the appropriate version of SLES 11 and the associated CLE Support Package

The information in this guide is intended for system administrators receiving their first release of this product or upgrading from a previous release. This guide assumes the administrator has a good understanding of Cray and Linux system administration.

**Note:** Cray terminology pertaining to External Services systems has changed. Particularly, esLogin hosts are superseded by Cray Development and Login (CDL) hosts, esMS systems are Cray Integrated Management Services (CIMS) systems, and the esFS system by the Lustre File System by Cray (CLFS). For the purposes of this release of this guide, however, these terms can be treated as interchangeable.

**Note:** In earlier software releases, the operating system software components needed to support CADE on CDL hosts or standalone Linux systems were included in the Cray Application Developer's Environment Supplement (CADES) and installed as part of the CADE installation process. Beginning with CLE 4.1, these software components are included in the CLE software distribution, packaged as the CLE Support Package, and installed using the instructions provided in *Installing CLE Support Package on a Cray Development and Login (CDL) Node* (S–2528).

Note especially that the CLE Support Package **must** be installed on your CDL host or standalone Linux system **before** beginning installation of CDT/CADE. If the CLE Support Package components are not installed, the CDT/CADE installation will abort.

## 1.1 About Cray Programming Environments

The CDT and CADE packages consist of the software components needed to support developing, compiling, executing, debugging, and analyzing code on Cray XE, Cray XK, and Cray XC series systems. Individual Programming Environment (PE) RPM files are packaged in ISO images for monthly PE releases.

CDT/CADE contains the latest general-availability feature and update releases for Cray-distributed PE products, and may also include multiple versions of some products in order to satisfy dependencies and for compatibility purposes. With some exceptions, the CDT/CADE packages do not contain separately licensed software such as third-party compilers or debuggers. The exact contents of the CDT/CADE package vary from system to system and release to release, but in general, they contain the software listed below.

For more information on the specific versions of products included in a particular CDT/CADE package, see the monthly release announcement or the *README* file in the CDT/CADE package. Additionally, each ISO image contains two data files: `cray_product_info.yaml`, which specifies assorted CDT/CADE product information, and `install_manifest.yaml`, which provides the installer with information about every package on the ISO. These files are required in order to determine which packages should be installed on the system.

**Note:** All Cray Programming Environments requires the use of the Modules application to manage multiple versions of products and libraries. All CADE packages include Modules. Beginning with CLE 4.2, Modules is included in CLE, and therefore not distributed in the CDT package.

### 1.1.1 CDT Components

The Cray Developer Toolkit (CDT) package for Cray XC series systems contains the following components.

- Cray Compiling Environment (CCE)

  **Note:** Included for convenience, but installed only if a valid CCE license is located on the system.

- Reveal
- Cray Performance Measurement and Analysis Tools (CPMAT)

  **Note:** Included for convenience and installed automatically, but usable only if a valid CPMAT license is located on the system.

- Cray Scientific and Math Libraries (CSML)
- Cray Message Passing Toolkit (CMPT)
- Cray Debugger Support Tools (CDST)

- Cray Environment Setup and Compiling Support (CENV)
- Third Party Products (TPP)
- GNU Fortran, C, and C++ Compilers

### 1.1.2 CADE Components

The Cray Application Developer's Environment (CADE) package for Cray XE or Cray XK systems contains the following components.

- Cray Scientific and Math Libraries (CSML)
- Cray Message Passing Toolkit (CMPT)
- Cray Debugger Support Tools (CDST)
- Cray Environment Setup and Compiling Support (CENV)
- Third Party Products (TPP)
- GNU Fortran, C, and C++ Compilers
- Modules

## 1.2 Installation Prerequisites

Before beginning installation, note the following requirements.

- The installation process must be run as `root`. If you attempt to run the process as a user without root privileges, the installation aborts.
- The Cray PE Installer requires that the Perl Programming Language and RPM Package Manager be installed on the SMW, CDL host, or standalone Linux system on which the installation process is to be run. In addition, specific version requirements may be found in the Cray PE Installer release notes.
- Cray Linux Environment (CLE) must be installed on the boot node of your Cray system before the Cray PE Installer can be used to install CDT/CADE on each shared root.
- If installing on a CDL host or standalone Linux system, the base version of the operating system being used on the CDL host or standalone Linux system must match the base version of the CLE operating installed on the Cray system. For example, if the Cray system is running CLE 4.1 (SLES 11, SP1), the CDL host or standalone Linux system must also be running SLES 11, SP1.

  If the base versions do not match, users will be able to write and compile code on the CDL or standalone Linux system, but the resulting executable may not run correctly on the targeted Cray system.
- If installing on a CDL host or standalone Linux system, all SLES distributed components installed on the Cray system must also be installed on the CDL host or standalone Linux system.

- If installing the Intel Composer XE (all Cray systems) or PathScale Compiler Suite (Cray XE and Cray XK systems only), install the compilers using the instructions provided by the vendor **before** installing the CDT/CADE package. If you do not do so, the installation process will produce a dependency error.

  If you do not intend to install these compilers, or intend to install them but have not yet done so, verify that the `INSTALL_INTEL_LIBRARIES` and/or `INSTALL_PATHSCALE_LIBRARIES` variables in the `install-`*product*`.yaml` configuration file are set to `NO`. For more information, see Configuring the Cray PE Installer on page 14 and Appendix B, Example `install-cdt.yaml` File on page 25.

- If installing the Intel Composer XE, Cray recommends installing the entire Intel Math Kernel Library.

- If installing the PGI Fortran/C/C++ Server on Cray XC30, Cray XE, and Cray XK systems, or CDL or CIMS systems attached to these systems, see Appendix E, Installing the PGI Fortran/C/C++ Server on page 35 for more instructions. Cray produces a special RPM file which should be used to install the PGI compilers on these systems.

  If installing the PGI Fortran/C/C++ Server on standalone Linux ("white box") systems, install the compilers using the media and instructions provided by the vendor. Again, see Appendix E, Installing the PGI Fortran/C/C++ Server on page 35 for additional information.

  In either case, install the compilers **before** installing the CDT/CADE package. If you do not do so, the installation process will produce a dependency error. If you do not intend to install the PGI Compilers, or intend to install them but have not yet done so, verify that the `INSTALL_PGI_LIBRARIES` variable in the `install-`*product*`.yaml` configuration file is set to `NO`. For more information, see Configuring the Cray PE Installer on page 14 and Appendix B, Example `install-cdt.yaml` File on page 25.

- The Cray CCE compiler RPM is included in CDT for convenience and dependency resolution. However, this RPM is installed only if a valid license for CCE is already on the system, and if the `INSTALL_CCE_LIBRARIES` variable in the `install-`*product*`.yaml` configuration file is set to `YES`.

  **Note:** The CCE RPM is included in CDT only. It is not included in CADE.

- The Cray Reveal application and Cray Performance Measurement and Analysis Tools (CPMAT) are included in CDT for convenience and are installed on Cray XC series systems automatically. However, these utilities can be used only if you have a valid license for CPMAT installed on your system.

- Many separately licensed software components require the FlexNet license manager. If you do not have this software already installed on

your system or network, install it using the instructions found in the file `cray-flexnet-installation-instructions.txt`, which is provided in the FlexNet package.

For more information about installation and managing FlexNet, see the *Cray Compiling Environment Release Overview and Installation Guide* (S–5212). For information about activating the CPMAT license key, see the *Cray Performance Measurement and Analysis Tools Installation Guide* (S–2474).

# Installation [2]

There are two basic ways in which to use the Cray PE Installer.

- From the SMW, when installing CDT/CADE on:
  - shared root directories on the Cray system boot node
  - a CDL host managed by a Cray Integrated Management Services (CIMS) node running Bright Cluster Manager
  - an unmanaged CDL host
- On a standalone Linux system

In either case, follow these steps.

1. Install the installer.
2. Configure the `install-`*product*`.yaml` file.
3. Run the Cray PE Installer.
4. Optionally, review the installation logs.

## 2.1 Installing the Cray PE Installer

Installing the Cray PE Installer is required the first time you use it but optional for subsequent installs.

**Procedure 1. Installing the Cray PE Installer on an SMW**

1. As `crayadm`, log on to the SMW.

   ```
   % ssh crayadm@smw
   ```

2. Assume superuser privileges.

   ```
   smw:~# su -
   ```

3. Load and mount the distribution media.

   ```
   smw:~# mount /dev/cdrom /media/cdrom
   ```

4. Locate the installer installation file.

   ```
   smw:~# cd /media/cdrom/installer
   ```

5. Use the `rpm` command to install the installer.

   ```
   smw:~# rpm -ivh craype-installer-version.x86_64.rpm --upgrade
   ```

The installation process returns progress messages and comments upon completion.

```
Preparing...            ########################################### [100%]
   1:craype-installer   ########################################### [100%]

# Copy the install.yaml template to a directory where you will
# modify it and use it in the current and future installations
```

6. Unmount and remove the distribution media.

   ```
   smw:~# umount /media/cdrom
   ```

7. If you are done performing system administration work, log out of the SMW.

   ```
   smw:~# exit
   logout
   %
   ```

**Procedure 2. Installing the Cray PE Installer on an unmanaged CDL or Standalone Linux System**

You must have administrative or `root` privileges in order to install this software.

1. Login as a user with administrative or `root` privileges.
2. Mount the distribution media.

   ```
   # mount /dev/cdrom /media/cdrom
   ```

3. Locate the installation file on the distribution media.

   ```
   # cd /media/cdrom/installer
   ```

4. Use the `rpm` command to install the installer.

   ```
   # rpm -ivh craype-installer-version.x86_64.rpm --upgrade
   ```

5. Unmount and remove the distribution media.

   ```
   # umount /media/cdrom
   ```

## 2.2 Configuring the Cray PE Installer

The Cray PE Installer uses the configuration file `install-`*product*`.yaml`. You must populate this file before using the Cray PE Installer for the first time, but updating this file for subsequent installations is optional.

Two versions of this file are provided: `install-cdt.yaml` for installing CDT on Cray XC30 and Cray XC30-AC systems and associated systems running CLE 5.0 or later, and `install-cade.yaml` for installing CADE on Cray XE or Cray XK systems and associated systems running CLE 4.0, 4.1, or 4.2.

If desired, you can create multiple copies of configuration files to suit different installation scenarios and rename them as required. To specify which file to use for a given run of the installer, specify the `--install-yaml-path` argument when running the installer. For more information, see Appendix A, Installer Command Line Arguments on page 23.

If you run the installer from an SMW, the `install-`*product*`.yaml` can be configured to install the same *product* on multiple boot node shared roots, managed CDL image directories on an CIMS server, and unmanaged CDL hosts during a single run of the installer. This type of installation is recommended for keeping the software in sync across different parts of the Cray system. For more information, see the sections titled "Boot Node Configuration," "CIMS/esMS Configuration," and "Unmanaged CDL/esLogin Configuration" in code listing provided in Appendix B, Example `install-cdt.yaml` File on page 25.

**Note:** This type of cross-system installation presumes that you have configured passwordless ssh between the SMW and the target system(s). If you have **not** configured passwordless ssh between the SMW and the target system(s), use these options cautiously, as you will be prompted for the root password each time the installation process performs an `ssh` or `scp` operation. On a large system, this can result in being prompted for passwords hundreds of times.

If your site does not allow the use of passwordless ssh, see Appendix F, An Alternative to Passwordless ssh on page 37.

### Procedure 3. Configuring `install.yaml`

1. After you finish installing the Cray PE Installer, the template files are placed in this directory.

   `/opt/cray/craype-installer/`*version*`/conf/`

   A listing of the `install-cdt.yaml` file can be found in Appendix B, Example `install-cdt.yaml` File on page 25, with additional information provided in Appendix C, `install.yaml` Keywords on page 29. The example `install-cdt.yaml` file is extensively documented with embedded comments.

2. Copy the template file to a convenient working directory. For example, if you are installing CDT and already in your working directory on an SMW, enter this command:

```
smw:~# cp /opt/cray/craype-installer/version/conf/install-cdt.yaml ./install-cdt.yaml
```

3. Edit the `install-`*product*`.yaml` file as desired. Pay particular attention to the following points.

   - You **must** specify the correct `CRAY_CPU_TARGET` for your system. This variable determines which libraries are installed on your system, which can have profound effects on code performance.

If your system has multiple CPU types—for example, both Interlagos and Abu Dhabi CPUs—specify the lowest common denominator, which in this example would be `interlagos`.

- You **must** specify at least one of the following installation targets: `BOOTNODE_HOSTNAME`, `ESMS_HOSTNAME`, and/or `UNMANAGED_ESLOGINS`. If you do not specify at least one installation target, nothing will be installed.
- You **must** specify the `LOGS_DIR`, which is the directory where the installer is to write log files. Also, verify that this directory exists and is writable.
- You **must** specify the `ISO_MOUNT_DIR`, which is the directory where the ISO is mounted.
- If you are running the installer from an SMW and installing the product on multiple boot node shared roots or CDL/esLogin hosts, and if you have **not** configured passwordless ssh from the SMW to the remote machines, be advised that you will be prompted for the root password each time the installation process performs an `ssh` or `scp` operation. On a large system, this can result in being prompted for passwords hundreds of times.

  If your site does not allow the use of passwordless ssh, see Appendix F, An Alternative to Passwordless ssh on page 37.
- Verify that all the `INSTALL_`*`COMPILER`*`_LIBRARIES` keywords are set correctly to reflect the compilers you do or do not have installed on your system, and that you are installing the compilers and their associated libraries in the correct order. For more information, see Installation Prerequisites on page 9.

4. Configure the other installation variables as required and save the resulting file.

### 2.2.1 Installed File Locations

The installation process will install Cray-developed packages under `/opt/cray/`*`name/version`* and third-party products (typically) in `/opt/`*`name`*. Module files are installed in either `/opt/modulefiles` or `/opt/cray/modulefiles`.

The dynamic libraries for Cray products are installed in `/opt/cray/lib64`. This path is added to the library search path for `ldconfig` to update the cache for shared libraries.

### 2.2.2 `/etc/*rc.local` File Changes

The installer does **not** modify the `/etc/*rc.local` files. After installation is complete, you may want to edit the `/etc/bash.bashrc.local` file, the `/etc/csh.cshrc.local` file, and other `*rc.local` files, depending on the shells in use on your system, in order to modify the users' default module environment.

**Cray recommends that system administrators add the following line to the SITE-set-up section:**

```
module use /opt/modulefiles /opt/cray/modulefiles
```

For more information on updating `/etc/*rc.local` files and related issues, see *Managing System Software for the Cray Linux Environment* (S-2393), section "Configuring the Default Programming Environment (PE)."

## 2.3 Running the Cray PE Installer

After the Cray PE Installer is installed and the `install-`*product*`.yaml` file is configured as required, follow these steps to install the CDT/CADE package.

> **Note:** If installing on a CDL host or a standalone Linux system, note that the CLE Support Package must be installed on your CDL host or standalone Linux system **before** beginning installation of CDT/CADE, or else the CDT/CADE installation will abort. For CLE 4.1 and later systems, the CLE Support Package is included in the CLE software distribution and installed using the instructions provided in *Installing CLE Support Package on a Cray Development and Login (CDL) Node* (S–2528).
>
> For CLE 4.0 systems only, the CLE Support Package components are included in the Cray Application Developer's Environment Supplement (CADES), release 3.17 or later. This package is available for download from Cray and is installed using the instructions provided in the *Cray Application Developer's Environment Installation Guide* (S–2465).

Programming Environment components can be installed at any time when the Cray system is actively booted. The installer can update the booted partition, as well as any non-booted shared root partitions. It is recommended that installations using the `--set-default` option be done during dedicated system administration time, or at least preceded by a `wall` message warning users that the system-wide defaults and dynamically linked libraries are about to change. PE software installation typically takes about 15 minutes. The Cray system does not need to be rebooted after PE component installation.

### Procedure 4. Running the Cray PE Installer

1. Log on as a user with administrative or root privileges. For example, on the SMW, log on as `crayadm`.

   ```
   % ssh crayadm@smw
   ```

2. Load the Cray PE Installer module.

   ```
   smw:~# module load craype-installer
   ```

3. Mount the CDT/CADE installation media or ISO file.

   ```
   smw:~# mount -r -o loop product-version.iso /mnt
   ```

4. Verify that the `ISO_MOUNT_DIR` variable in the `.yaml` configuration file points to the mount point for the installation media or ISO file.

5. Use the `craype-installer.pl` command to launch the installation process, specifying the configuration file to use and other arguments as needed. See Appendix A, Installer Command Line Arguments on page 23 for more information about installer command-line arguments.

   a. To install new PE components without making them default, use a command like this one:

   ```
   smw:~# craype-installer.pl --install --install-yaml-path install-cdt.yaml
   ```

   b. To install new PE components and make them default, use a command like this one:

   ```
   smw:~# craype-installer.pl --install --set-default --install-yaml-path install-cdt.yaml
   ```

   **Note:** If you plan to use the installer `--set-default` argument to make the software you are about to install default, either run the installation during dedicated time or use `wall` or an equivalent command to warn users that the system defaults are about to be changed.

   **Note:** If you install a particular PE package on the system and no previously installed version of the same package has been made default, the newly installed package **will** be made the default, regardless of whether or not the `--set-default` argument is used. This is a function of RPM behavior and not `craype-installer.pl`.

   c. As the installer runs, a number of informational messages are displayed:

   ```
   Determining which RPM's need to be installed ....................................
   Perform dependency check …
   Install the RPM's …
   Confirm that all RPM's are installed ....................................
   ```

6. After the installer completes, unmount the installation media.

   ```
   smw:~# umount /mnt
   ```

# 2.4 Optional Post-installation Tasks

## 2.4.1 Updating the `/etc/*rc.local` Files

The installer does not modify the `/etc/*rc.local` files. After installation is complete, you may want to edit the `/etc/bash.bashrc.local` file, the `/etc/csh.cshrc.local` file, and other `*rc.local` files, depending on the shells in use on your system, in order to modify the users' default module environment.

Cray recommends that system administrators add the following line to the SITE-set-up section:

```
module use /opt/modulefiles /opt/cray/modulefiles
```

For more information on updating `/etc/*rc.local` files and related issues, see *Managing System Software for the Cray Linux Environment* (S–2393), section "Configuring the Default Programming Environment (PE)."

## 2.4.2 Reviewing the Installation Logs

Each time the installer runs, it creates a subdirectory in the location specified in `LOGS_DIR` with the name *YYYY-MM-DD*, and then writes from two to four log files, depending on how the installer was run. You may want to review these log files.

The *##* in each log file name is a run number. Each time the installer is rerun on a given day, the run number is incremented and additional log files are written.

- `install-##.log` — This file contains detailed information including commands and command output for the entire installation process. This log is generated each time the installer is run using the `--install` argument.
- `install_reasons-##.log` — This file lists the RPM files from the manifest file included with the installer and the reasons why each RPM was or was not selected to be installed. This log is generated each time the installer is run using the `--install` argument.
- `set_default-##.log` — This file contains detailed information including commands, command output, and scripts executed for the entire installation process. This log is generated each time the installer is run using the `--set-default` argument.
- `set_default_reasons-##.log` — This file lists the RPM files from the manifest file included with the installer and the reasons why each RPM was or was not selected to be made default. This log is generated each time the installer is run using the `--set-default` argument.

### 2.4.3 Setting the Release as Default

Most sites typically install newly released PE software components as nondefault and then allow users to configure their environments manually in order to try out the new releases. At some later point in time, the system administrator then sets the newly released PE software components to be the default versions.

Installed PE software components can be made default either by following the steps described in Procedure 5 (below) or by running one of the `set_default` scripts that are generated automatically during installation. These scripts are described in Using the `set_default` scripts on page 21.

**Note:** If you plan to use the installer to make a given CDT/CADE release the default, either run the installation during dedicated time or use `wall` or an equivalent command to warn users that the system-wide defaults and dynamically linked libraries are about to be changed.

**Procedure 5. Making a new PE release the default**

Follow these steps to make the PE components in a given CDT or CADE release the system-wide defaults.

1. Mount the CDT/CADE installation media or ISO file.

   ```
   smw:~# mount -r -o loop product-version.iso /mnt
   ```

   **Note:** This step is required because the installer needs access to the `cray_product_info.yaml` and `install_manifest.yaml` files on the ISO that was used to install these specific PE components.

2. Run the installer, using the `--set-default` argument.

```
smw:~# craype-installer.pl --set-default --install-yaml-path install-product.yaml
```

   **Note:** Using the `--set-default` argument makes **all** the PE software packages in the specified *product*`-`*version*`.iso` package default, even if no RPM files are actually installed by this run of the installer. This is a change from earlier Cray PE installers, which set only specified software components to default. This behavior was changed in order to prevent potential dependency issues.

   **Note:** If you install a particular PE package on the system and no previously installed version of the same package has been made default, the newly installed package **will** be made the default, regardless of whether or not the `--set-default` argument is used. This is a function of RPM behavior and not `craype-installer.pl`.

3. Unmount the installation media or ISO file.

   ```
   smw:~# umount /mnt
   ```

### 2.4.3.1 Using the `set_default` scripts

During the installation process, the installer generates one or more scripts in `/opt/cray/$pe_product/$release`, where `$pe_product` is either `cdt` or `cade`. To make a PE release the default, execute the desired script.

- `set_default_$product_$version_boot_node` - executes the `set_default` scripts in the shared root on the boot node
- `set_default_$product_$version_esms` - executes the `set_default` scripts in one or more esLogin images on your esMS
- `set_default_$product_$version_unmanaged_eslogins` - executes the `set_default` scripts on one or more unmanaged esLogin machines
- `set_default_$product_$version_localhost` - executes the `set_default` scripts on the local esLogin

# Installer Command Line Arguments [A]

The `craype-install.pl` command supports the following arguments. The `--install-yaml-path` argument is required. All others are optional.

`--install` Install the RPM files for this release.

`--set-default`

Run the `set_default` script for each RPM file included in this release.

**Note:** Using this argument sets **all** the PE software packages included in this release as default, regardless of which individual RPM files are being installed in any specific run of the installer. This is a change from earlier Cray PE installers, which set only the selected individual packages to default. This behavior was changed in order to prevent potential dependency issues.

If this behavior is not wanted, the individual `set_default` scripts for each RPM can be run manually whenever desired. The `set_default` scripts create links in `/opt/cray/lib64` to the new version(s) and run the `ldconfig` command to configure the dynamic linker. For more information, see the `set_pe_default`(8) and `ldconfig`(8) man pages.

`--install-yaml-path`

Specify the `install.yaml` file to use.

`-cce-license-file-path`

If the CCE compiler license file is installed in a location other than `/opt/cray/cce/cce.lic`, use this argument to specify the alternate location.

`-cle-version` *release*

Use this argument to specify the CLE release that is installed on the system, if the normal information files are not available.

`--network [gem|ari]`

Use this argument to specify the Cray system network type (Gemini for Cray XE or Cray XK systems, Aries for Cray XC30 systems), if the normal information files are not available.

`--version` Display the installer version number.

`--verbose` Display detailed information about the installation process.

# Example `install-cdt.yaml` File [B]

A template for the `install-`*product*`.yaml` configuration file is included in the `craype-installer` RPM file and installed in `/opt/craype-installer/`*version*`/conf`. Copy this template to your system and edit it as needed.

You can keep multiple versions of the `install-`*product*`.yaml` file. Use the `--install-yaml-path` argument to specify which configuration file to use when running the `craype-installer.pl` command.

The following template file is for reference purposes. It must be edited and site-specific configuration information must be specified before it can be used.

**Note:** Cray terminology pertaining to External Services systems has changed. Particularly, esLogin hosts are superseded by Cray Development and Login (CDL) hosts, esMS systems are Cray Integrated Management Services (CIMS) systems, and the esFS system by the Lustre File System by Cray (CLFS). For the purposes of this release of this guide, however, these terms can be treated as interchangeable.

```
#-------------------------------------------------------------------------------
# Customer Programming Environment (PE) Installer
# Copyright 2012 - 2015 Cray Inc. All Rights Reserved.
#-------------------------------------------------------------------------------
# This YAML file was written based on the YAML v1.3 spec. for more
# information see: http://yaml.org/refcard.html
#-------------------------------------------------------------------------------
# NOTES:
# When running the installer on an esLogin, the BOOTNODE and ESMS properties
# will be ignored because they do not apply.
#
---

#-------------------------------------------------------------------------------
# If your system has MAMU nodes, then you need to set this keyword to YES
# so that the cray-snplauncher RPM will be installed.
#
# IMPORTANT: If you have used previous versions of  the craype-installer
# before, you will need to add this keyword to your install-$product.yaml
# file.
#
# Examples:
#  HAS_MAMU_NODES : YES
#  HAS_MAMU_NODES : NO
#-------------------------------------------------------------------------------
HAS_MAMU_NODES : NO

#-------------------------------------------------------------------------------
```

```
# The following are the valid values that can be specified with the
# ACCELERATORS keyword.
#
#       FERMI KEPLER KNIGHTS_CORNER   NONE
#
# Examples:
#  ACCELERATORS : FERMI
#  ACCELERATORS : KEPLER
#  ACCELERATORS : KNIGHTS_CORNER
#  ACCELERATORS : FERMI,KEPLER (if your system has both FERMI and KEPLER)
#  ACCELERATORS : FERMI,KEPLER,KNIGHTS_CORNER
#
# NONE means that the system does not have an accelerator.
#  ACCELERATORS : NONE
#-------------------------------------------------------------------------
ACCELERATORS                        : NONE

# FUTURE: the following NETWORK_TYPE keyword is currently not used
NETWORK_TYPE                        : NONE

#-------------------------------------------------------------------------
# CRAY_CPU_TARGET
#-------------------------------------------------------------------------
#   abudhabi
#   abudhabi-cu
#   barcelona
#   haswell
#   interlagos
#   interlagos-cu
#   istanbul
#   ivybridge
#   mc12
#   mc8
#   sandybridge
#   shanghai
#-------------------------------------------------------------------------
CRAY_CPU_TARGET                     : NEED-TO-SPECIFY

#-------------------------------------------------------------------------
# Boot Node Configuration
#-------------------------------------------------------------------------
# If you don't want to install onto any of the shared roots on the boot node,
# set BOOTNODE_HOSTNAME to NONE. Otherwise see the following information on
# setting the BOOTNODE keywords.
#
# BOOTNODE_HOSTNAME
#   The hostname of your boot node.
#
# BOOTNODE_ROOT_DIRS
#    A list of one or more shared root directories on the boot node.
#    Specify the list of directories using standard YAML format like:
#       - /rr/current
#       - /rr/cle-4.1
#-------------------------------------------------------------------------
BOOTNODE_HOSTNAME                   : NONE
BOOTNODE_ROOT_DIRS                  :
    - /rr/current
```

```
#-------------------------------------------------------------------------------
# esMS Configuration
#-------------------------------------------------------------------------------
# If you don't have an esMS, or don't want to install into an esLogin images
# on your esMS, set ESMS_HOSTNAME to NONE. Otherwise see the following
# information on setting the ESMS keywords.
#
# ESMS_HOSTAME
#    The hostname of your esMS server.
# ESMS_TEMP_DIR
#    The directory on the esMS where RPM's will be scp'd before installing
#    them.
# ESMS_IMAGE_DIRS
#    A list of one or more esLogin image directories on the esMS server.
#    Specify the list of directories using standard YAML format like:
#       - /cm/images/image1
#       - /cm/images/image2
#-------------------------------------------------------------------------------
ESMS_HOSTNAME                       : NONE
ESMS_IMAGE_DIRS                     :
    - /cm/images/<your image name>

#-------------------------------------------------------------------------------
# Unmanaged esLogin Configuration
#-------------------------------------------------------------------------------
# If you don't have any unmanaged esLogins attached to your Cray system, or
# don't want to install on your unmanaged esLogins, set UNMANAGED_ESLOGINS
# to NONE. Otherwise see the following information on setting the
# UNMANAGED_ESLOGIN  keywords.
#
# UNMANAGED_ESLOGINS : NONE
#    Specify NONE if you have no unmanaged esLogins
#
# UNMANAGED_ESLOGINS:
#     - eslogin1
#     - eslogin2
#
# NOTE: notice the difference between specifying NONE vs. specifying one or
# more esLogin hostnames.
# 1) When specifying NONE, the NONE keyword MUST be on the same line as the
#    UNMANAGED_ESLOGINS keyword.
# 2) When specifying one or more esLogin hostnames, each hostname MUST exist
#    on it's own line, preceded with 4 spaces, a hyphen and another space.
#-------------------------------------------------------------------------------
UNMANAGED_ESLOGINS  : NONE

#-------------------------------------------------------------------------------
# The following can be used to specify one or more IMPS Image Directories
# on the SMW. To use this, remove NONE
#
#   IMAGE_DIRECTORIES : NONE
#
# then add one or more IMPS Image Directories that you want to install PE
# into.
#
#   IMAGE_DIRECTORIES :
#      - /var/opt/cray/imps/image_roots/pe_compute_image
#      - /var/opt/cray/imps/image_roots/pe_login_image
```

```
#-------------------------------------------------------------------------
IMAGE_DIRECTORIES : NONE

# Directory where you would like log files to be written by the installer.
LOGS_DIR                          : NEED-TO-SPECIFY

# Directory where you mounted the CADE/CDT ISO.
ISO_MOUNT_DIR                     : NEED-TO-SPECIFY

# Compiler specific libraries, should we install them or not? (YES/NO)
INSTALL_CCE_LIBRARIES             : YES
INSTALL_GNU_LIBRARIES             : YES
INSTALL_INTEL_LIBRARIES           : NO
INSTALL_PATHSCALE_LIBRARIES       : NO
INSTALL_PGI_LIBRARIES             : NO
```

# install.yaml Keywords [C]

**Note:** Cray terminology pertaining to External Services systems has been changed. Particularly, esLogin hosts are superseded by Cray Development and Login (CDL) hosts, esMS systems are Cray Integrated Management Services (CIMS) systems, and the esFS system by the Lustre File System by Cray (CLFS). For the purposes of this release of this guide, however, these terms can be treated as interchangeable.

`ACCELERATOR`

A comma-separated list of the type(s) of GPU accelerator(s) installed on your system. The current valid values are `FERMI`, `KEPLER`, and `KNIGHTS_CORNER`. If installing on a system with more than one type of accelerator, specify the accelerators in a comma-delimited list: for example, `FERMI,KEPLER`. If installing on a system without GPU accelerators, enter `NONE`.

Default: `NONE`

`BOOTNODE_HOSTNAME`

The hostname of your bootnode. If you do not want to install on your bootnode, enter `NONE`.

Default: `boot`

`BOOTNODE_ROOT_DIRS`

A list of one or more shared root directories on the bootnode on which you want to install software.

Default: unset

`CRAY_CPU_TARGET`

(Required) This defines the CPU type on your system, which in turn determines which CPU-specific optimized libraries are installed. Use of the correct CPU-specific libraries is extremely important to obtaining best performance from your Cray system.

If your system has multiple CPU types—for example, both Interlagos and Abu Dhabi CPUs—specify the lowest common denominator, which in this example would be `interlagos`.

Default: unset, must be specified

`ESMS_HOSTNAME`

The hostname of your CIMS/esMS. If your system does not use an CIMS/esMS, enter `NONE`.

Default: `NONE`

`ESMS_IMAGE_DIRS`

A list of one or more CDL/esLogin image directories on your CIMS/esMS.

Default: unset

`HAS_MAMU_NODES`

If your system has MAMU nodes, this keyword must be set to `YES` so that the `cray-snplauncher` RPM will be installed.

If you are using `craype-installer` to update an existing installation, you must add this keyword to your existing `install-`*product*`.yaml` file(s) in order to install the `cray-snplauncher` RPM.

If your system does not have MAMU nodes, this keyword can be ignored.

Default: `NO`

`IMAGE_DIRECTORIES`

Specify one or more IMPS Image Directories on the SMW. To use this, remove `NONE` and add or more IMPS Image Directories that you want to install PE into.

Default: `NONE`

`INSTALL_CCE_LIBRARIES`

(Required) Set to `YES` to install the libraries built with the CCE compiler.

Default: `NO`

`INSTALL_GNU_LIBRARIES`

(Required) Set to `YES` to install the libraries built with the gcc compiler.

Default: NO

INSTALL_INTEL_LIBRARIES

(Required) Set to YES to install the libraries built with the Intel compiler.

Default: NO

INSTALL_PATHSCALE_LIBRARIES

(Required) Set to YES to install the libraries built with the Pathscale compiler.

Default: NO

INSTALL_PGI_LIBRARIES

(Required) Set to YES to install the libraries built with the PGI compiler.

Default: NO

ISO_MOUNT_DIR

(Required) The directory where the CADE/CDT ISO is mounted. For example, if the ISO is mounted under /mnt/cdt, set this to /mnt/cdt/cray-dist/pe-packages.

Default: unset, must be specified

LOGS_DIR (Required) Specify the directory where the installer writes log files.

Default: unset, must be specified

NETWORK_TYPE

Reserved for future use.

UNMANAGED_ESLOGINS

If you have an unmanaged CDL/esLogin (that is, one not managed by the Bright Cluster Manager software) attached to your Cray system, specify the hostname of the CDL/esLogin here.

Default: NONE

# Cray CPU Targets [D]

The following CPU targets are supported by this release and are valid values for `CRAY_CPU_TARGET`.

`abudhabi` AMD Abu Dhabi CPUs

`abudhabi-cu`

AMD Abu Dhabi CPUs, optimized for Compute Unit Affinity

**Note:** For more information about Compute Unit Affinity, see the `aprun`(1) man page and *Using Compute Unit Affinity on Cray Systems* (S–0030).

`barcelona` AMD Barcelona CPUs

`haswell` Intel® "Haswell" processors

`interlagos` AMD Interlagos CPUs

`interlagos-cu`

AMD Interlagos CPUs, optimized for Compute Unit Affinity

**Note:** For more information about Compute Unit Affinity, see the `aprun`(1) man page and *Using Compute Unit Affinity on Cray Systems* (S–0030).

`istanbul` AMD Istanbul CPUs

`ivybridge` Intel Ivy Bridge CPUs

`mc12` AMD Magny Cours 12-core CPUs

`mc8` AMD Magny Cours 8-core CPUs

`sandybridge`

Intel Sandy Bridge CPUs

`shanghai` AMD Shanghai CPUs

# Installing the PGI Fortran/C/C++ Server [E]

## E.1 On Cray XC30, Cray XE, and Cray XK Systems

Cray is licensed to repackage the PGI Fortran/C/C++ Server with modulefile support into an RPM for distribution to sites using Cray XC30, Cray XE, or Cray XK systems, or CDL or CIMS systems attached to such systems. If you are installing the PGI compilers on such a system, note the following points:

- The Cray PGI RPM is not included on distribution media or in the CADE ISO image. Instead, it is available for download from the Cray download site.
- The Cray PGI RPM must be installed before installing CADE. If the PGI RPM is not installed first, attempting to install CADE may produce dependency errors in compiler-dependent libraries. In this case, the `INSTALL_PGI_LIBRARIES` keyword in the `install-`*product*`.yaml` file should be set to `NO` until the required compiler is installed.
- The Cray PGI RPM uses an Expect script in the post-install section of the spec file in order to automate the installation of the PGI compiler. Since the RPM uses an Expect script, it requires access to `/dev/ptys` and `/proc`.
- To install the Cray PGI RPM, use this command:

  % **rpm -ihv pgi-*version*.x86_64.rpm**

- To make the installed version the default version, execute this script:

  % **/opt/cray/admin-pe/set_default_files/set_default_pgi_*version***

- By default, the PGI installation script installs the compiler in `/opt/pgi`. For correct operation with the modulefile in `cray-pgisup`, the compiler must be installed in `/opt/pgi/`*version* instead; for example, in `/opt/pgi/12.10.0`.
- By default, the PGI installation script asks if you want to install MPICH1. Cray recommends that you answer `no`, as an optimized version of MPICH2 is already packaged in the Cray Message Passing Toolkit (MPT).
- After installation is complete, PDF files of the PGI documentation can be found in `/opt/pgi/`*version*`/linux86-64/`*version*`/doc/`.

## E.2 On Standalone Linux Systems

The Cray PGI RPM for Cray XC30, Cray XE, and Cray XK systems cannot be installed on standalone Linux ("white box") systems. Instead, install the compilers using the media and instructions provided by the vendor. In addition, note these points:

- The PGI Fortran/C/C++ Server must be installed before installing CDT. If it is not installed first, attempting to install CDT may produce dependency errors in compiler-dependent libraries. In this case, the `INSTALL_PGI_LIBRARIES` keyword in the `install-`*product*`.yaml` file should be set to `NO` until the required compiler is installed.
- Portland Group distributes software as a `tar` file that contains a compiler and an installer, along with other files. The PGI installation script installs different files, depending on the characteristics of the host machine and the questions the system administrator answers.
- By default, the PGI installation script installs the compiler in `/opt/pgi`. For correct operation, the compiler must be installed in `/opt/pgi/`*version* instead; for example, in `/opt/pgi/12.10.0`.
- By default, the PGI installation script asks if you want to install MPICH1. Cray recommends that you answer no, as a newer and better-optimized version of MPICH is already packaged in the Cray Message Passing Toolkit (MPT).
- After installation is complete, PDF files of the PGI documentation can be found in `/opt/pgi/`*version*`/linux86-64/`*version*`/doc/`.

# An Alternative to Passwordless ssh [F]

If your site does not allow the use of passwordless ssh, the following alternative method can be used instead.

### Procedure 6. Alternative Validation Method

1. Generate an `ssh` key pair for the root user on the SMW, unless you have already generated one that includes a passphrase.

   **Note:** Be sure to specify a passphrase, as this passphrase is used when adding the private key to `ssh-agent`, as shown below.

```
% ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Enter passphrase (empty for no passphrase): passphrase
Enter same passphrase again: passphrase
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
29:b8:06:04:85:89:d6:3e:42:2e:27:03:23:90:51:54 root@trondra
The key's randomart image is:
+--[ RSA 2048]----+
|*O=.E            |
|O+ .             |
|*.o              |
|++.o .   .       |
|.+o o . S        |
|   . . .         |
|    o            |
|   .             |
|                 |
+-----------------+
```

2. Copy your public key file to the remote machine, i.e., the boot node, CIMS, or CDLs.

```
% ssh-copy-id -i /root/.ssh/id_rsa.pub root@boot
```

   You will be prompted to enter the `root` password.

3. `ssh` to the remote machine and verify that the public key file was successfully copied.

```
% ssh root@boot
```

   You should be prompted for the passphrase, rather than for your password:

```
Enter passphrase for key '/root/.ssh/id_rsa':
```

4. Start `ssh-agent`.

   ```
   % ssh-agent $SHELL
   ```

5. Add your private key to `ssh-agent`.

   ```
   % sh-add
   Enter passphrase for /root/.ssh/id_rsa: passphrase
   Identity added: /root/.ssh/id_rsa (/root/.ssh/id_rsa)
   ```

6. Test the connection with the remote machine.

   ```
   % ssh root@boot
   ```

   This time you should **not** be prompted for a password or passphrase.

   Assuming this is the case, proceed with the next step.

7. Run the `craype-installer.pl`, as described in Running the Cray PE Installer on page 17.

8. After installation is complete, remove the identities from `ssh-agent`.

   ```
   % ssh-add -d /root/.ssh/id_rsa
   Identity removed: /root/.ssh/id_rsa (/root/.ssh/id_rsa.pub)
   ```

9. Exit the `ssh-agent $SHELL`, which terminates `ssh-agent`.

   ```
   % exit
   ```