

IBM COBOL for Linux on x86 1.1

Installation Guide



Note

Before using this information and the product it supports, be sure to read the general information under [“Notices” on page 25](#).

First edition (October 2023)

This edition applies to Version 1.1 of IBM® COBOL for Linux® on x86 (program number 5737-L11) and to all subsequent releases and modifications until otherwise indicated in new editions. Make sure you are using the correct edition for the level of the product.

You can view or download softcopy publications free of charge in the [COBOL for Linux on x86 library](#).

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Preface

About this information

This information provides installation instructions for IBM COBOL for Linux on x86 1.1. It includes multiple installation procedures that you can follow based on your installation requirements and scenarios. Specific instructions are given in cases requiring atypical installation. It also shows you how to test the installation, view different types of product information, and apply maintenance fixes. Read it carefully before installing the compiler. Also read the README files in the directory tree of your installation media, which contains current information about the compiler.

Who should read this information

This information is intended for anyone who is responsible for installing, upgrading, and uninstalling IBM COBOL for Linux on x86 1.1.

How to use this information

This information provides installation, upgrading, and uninstallation instructions for IBM COBOL for Linux on x86.

How this information is organized

This information is organized to reflect the pre-installation, installation, post-installation, and product removal tasks for a IBM COBOL for Linux on x86 installation.

Table 1. Tasks of a COBOL for Linux on x86 installation	
Task	Chapters
Installation	Chapter 1, “Installing the compiler,” on page 1
Upgrading to the latest release	Chapter 2, “Upgrading to the latest release,” on page 17
Updating to the latest fix pack	Chapter 3, “Updating to the latest fix pack,” on page 19
Updating from the Evaluation version to the official version	Chapter 4, “Updating from Evaluation version to the official version,” on page 21
Uninstallation	Chapter 5, “Uninstalling the compiler,” on page 23

How to read the syntax diagrams

Use the following description to read the syntax diagrams in this information:

- Read the syntax diagrams from left to right, from top to bottom, following the path of the line.

The >>--- symbol indicates the beginning of a syntax diagram.

The ---> symbol indicates that the syntax diagram is continued on the next line.

The >--- symbol indicates that the syntax diagram is continued from the previous line.

The --->< symbol indicates the end of a syntax diagram.

Diagrams of syntactical units other than complete statements start with the >--- symbol and end with the ---> symbol.

- Required items appear on the horizontal line (the main path).

Format

►► STATEMENT — required item ►►

- Optional items appear below the main path.

Format

►► STATEMENT — optional item ►►

- When you can choose from two or more items, they appear vertically, in a stack.
If you *must* choose one of the items, one item of the stack appears on the main path.

Format

►► STATEMENT — required choice 1
required choice 2 ►►

If choosing one of the items is optional, the entire stack appears below the main path.

Format

►► STATEMENT — optional choice 1
optional choice 2 ►►

- An arrow returning to the left above the main line indicates an item that can be repeated.

Format

►► STATEMENT — repeatable item ►►

A repeat arrow above a stack indicates that you can make more than one choice from the stacked items, or repeat a single choice.

- Variables appear in *italic lowercase letters* (for example, *parm*). They represent user-supplied names or values.
- If punctuation marks, parentheses, arithmetic operators, or other such symbols are shown, they must be entered as part of the syntax.

How to use examples

The examples of program code in this information are written in lowercase, uppercase, or mixed case to demonstrate that you can write your programs in any of these ways.

To more clearly separate some examples from the explanatory text, they are presented in a monospace font.

COBOL keywords and compiler options that appear in text are generally shown in SMALL UPPERCASE. Other terms such as program variable names are sometimes shown in *an italic font* for clarity.

If you copy and paste examples from the PDF format documentation, make sure that the spaces in the examples (if any) are in place; you might need to manually add some missing spaces to ensure that COBOL source text aligns to the required columns per the "COBOL reference format" section in the *Language Reference*. Alternatively, you can copy and paste examples from the HTML format documentation and the spaces should be already in place.

How to send your comments

Your feedback is important in helping us to provide accurate and high-quality information. If you have comments about this document or any other documentation for this product, send your comments to compinfo@cn.ibm.com.

Be sure to include the name of the document, the publication number of the document, the version of the product, and, if applicable, the specific location, for example, page number or section heading of the text that you are commenting on.

When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way that IBM believes appropriate without incurring any obligation to you.

Accessibility

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

IBM COBOL for Linux on x86 uses the latest W3C Standard, WAI-ARIA 1.0, to ensure compliance to [US Section 508](#) and [Web Content Accessibility Guidelines \(WCAG\) 2.0](#). To take advantage of accessibility features, use the latest release of your screen reader in combination with the latest web browser that is supported by this product.

Keyboard navigation

This product uses standard navigation keys.

Interface information

You can use speech recognition software like a Text-to-speech (TTS) tool to view the output generated by the product.

The online product documentation is available in IBM Documentation, which is viewable from a standard web browser.

PDF files have limited accessibility support. With PDF documentation, you can use optional font enlargement, high-contrast display settings, and can navigate by keyboard alone.

To enable your screen reader to accurately read syntax diagrams, source code examples, and text that contains the period or comma PICTURE symbols, you must set the screen reader to speak all punctuation.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has established a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

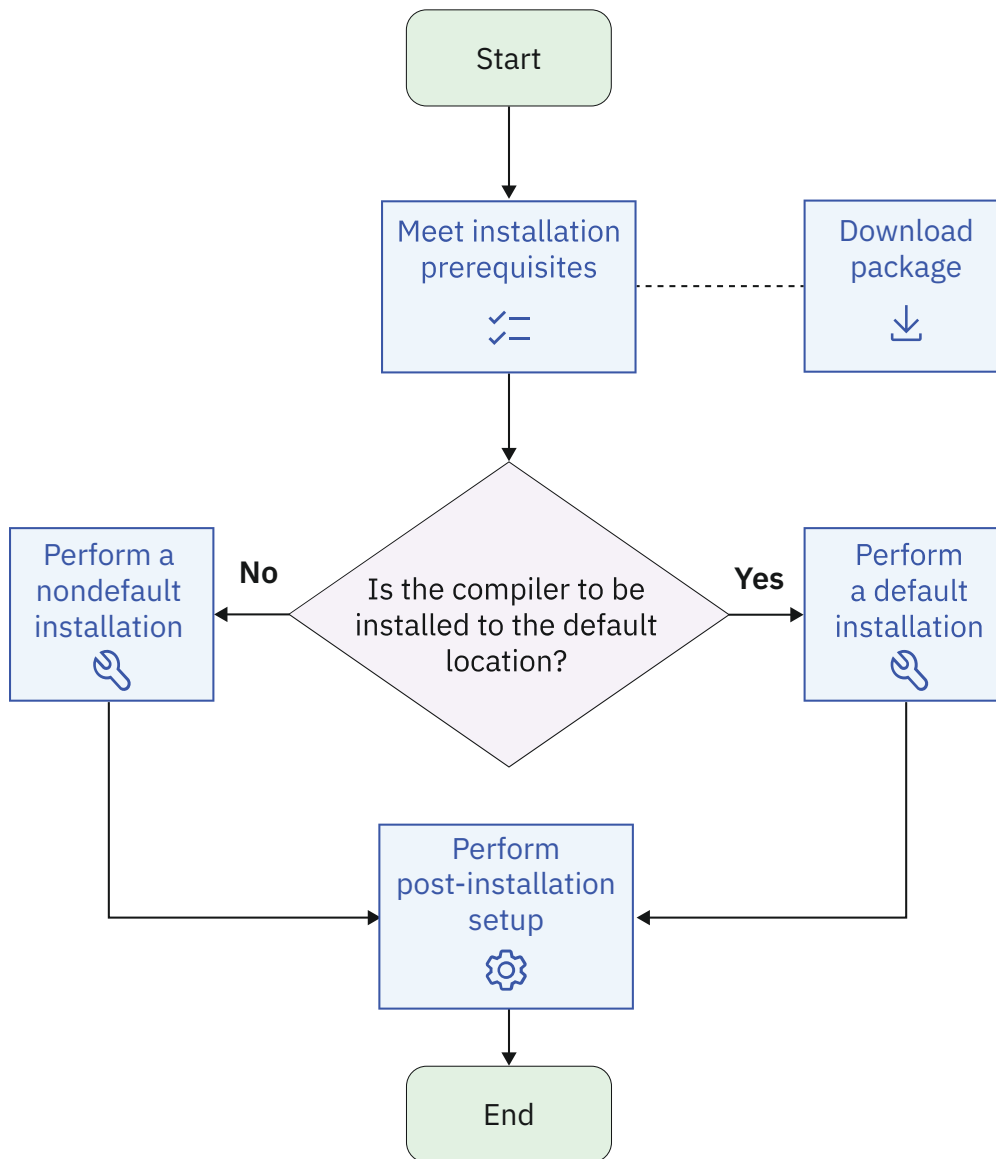
TTY service 800-IBM-3383 (800-426-3383) (within North America)

IBM and accessibility

For more information about the commitment that IBM has to accessibility, see [IBM Accessibility](#).

Chapter 1. Installing the compiler

This section outlines the steps required to install IBM COBOL for Linux on x86 1.1.



1. [“Prerequisites” on page 1](#)
2. <https://www.ibm.com/software/passportadvantage/>
3. [“Determining the installation procedure” on page 5](#)
4. [“Nondefault installation” on page 9](#)
5. [“Default installation” on page 6](#)
6. [“Post-installation setup” on page 11](#)

Prerequisites

Before installing IBM COBOL for Linux on x86 1.1, you must ensure all the prerequisites are met.

To prepare for installing IBM COBOL for Linux on x86 1.1, do the following tasks:

- Familiarize yourself with the installation image, which contains the installable compiler packages.

- Ensure that system prerequisites are met and that all required software packages are installed.
- Become either the root user or a user with administrator privileges.
- Optional: preview the license agreements.

The installation packages

Download and view the installation image for IBM COBOL for Linux on x86 1.1 before installation.

Download the electronic distribution package

The package for the licensed version is available for download at [IBM Passport Advantage®](#).

The installation image

The image includes the following files:

- README files and license agreement files
- An installation tool, `install`, to install and configure the compiler based on distribution.
- A subdirectory that contains files for the compiler, which includes the following files:
 - A README file
 - A set of RPM packages
 - A set of dpkg packages

Table 2 on page 2 lists the packages that are supplied with the installation image, and the default locations to which they are installed during a default installation. To view the package information and the package file list, enter the following `rpm` or `dpkg` command:

```
rpm -qpil package_name
```

```
dpkg -f package_name
```

Table 2. IBM COBOL for Linux on x86 1.1 packages and default installation locations		
Package name	Package description	Default installation location
cobol.cmp.1.1.0	IBM COBOL for Linux on x86 compiler package (Not redistributable)	/opt/ibm/cobol/1.1.0/
cobol.rte.1.1.0	IBM COBOL for Linux on x86 runtime environment package (Not redistributable)	/opt/ibm/cobol/rte
cobol.dbg.1.1.0	IBM COBOL for Linux on x86 debug engine package. (Not distributable)	/opt/ibm/cobol/debug
cobol.cmp.license.1.1.0	IBM COBOL for Linux on x86 license files (Not redistributable)	/opt/ibm/cobol/1.1.0

Note: /opt/ibm/ is the default prefix for installation of images. During installation you may choose to change the default location by modifying the prefix value. The runtime package is always installed to /opt/ibm/cobol/rte and the debug engine package is always installed to /opt/ibm/cobol/debug, since these packages are common across versions.

National language support

IBM COBOL for Linux on x86 1.1 compiler and messages support the following language locales:

- en_US
- en_US.iso88591 (or en_US.ISO-8859-1)
- en_US.utf8 (or en_US.UTF-8)
- ja_JP

English (en_US) is the default national language. Following the installation step, you can set the NLSPATH so that messages are displayed in a different language. See [“Enabling the error messages” on page 14](#).

System prerequisites

Ensure that your system meets all prerequisites before installing the product. Failure to meet the prerequisites causes the installation or configuration of the compiler to fail.

The requirements for installing IBM COBOL for Linux on x86 1.1 are listed below.

Supported platforms

You can use any of the following little endian operating systems on compatible x86-64 servers to run IBM COBOL for Linux on x86 1.1 and its generated object programs:

- Red Hat® Enterprise Linux (RHEL) 7.8 or higher
- Ubuntu Server (Ubuntu) 16.04 LTS, 18.04 LTS, or higher LTS

Hardware requirements

IBM COBOL for Linux on x86 1.1 and its generated object programs run on any x86-64 processor that is supported by your operating system distribution.

It is also recommended that you meet the following requirements:

- Approximately 260 MB for product packages
- Minimum of 2 GB of hard drive space for paging
- Minimum of 512 MB for temporary files
- 2 GB RAM minimum; 4 GB or more RAM recommended

Note: High levels of optimization and large applications can require more space for paging and temporary files, and can require more RAM.

To verify that you have enough hard disk space available, see [“Verifying the amount of hard disk space available” on page 4](#).

Software requirements: required programs

To determine which GNU and Perl packages are required to run the compiler on your operating system, consult the relevant table below. To verify that the required packages are installed, see [“Verifying that the required GNU and Perl packages are installed” on page 5](#).

Table 3. Minimum required GNU and Perl packages to run the compiler and build 32-bit COBOL applications on RHEL 7.8 or higher

Package name	Version requirements	Architecture requirement
gcc	4.8.5	x86_64
glibc.i686	2.17	i686
glibc-devel.i686	2.17	i686
libgcc.i686	4.8.5	i686
libstdc++.i686	4.8.5	i686
libquadmath.i686	4.8.5	i686
perl	5.16.3	x86_64

Table 4. Minimum required GNU and Perl packages to run the compiler and build 32-bit COBOL applications on Ubuntu 16.04 LTS, 18.04 LTS, or higher LTS

Package name	Version requirements	Architecture requirement
gcc-multilib	4:5.3.1	amd64
libc6:i386	2.17	i386
libc6-dev:i386	4.8.5	i386
libgcc1:i386	4.8.5	i386
libstdc++6:i386	4.8.5	i386
libquadmath0:i386	4.8.5	i386
perl	5.18.2	amd64

To view the online documentation for IBM COBOL for Linux on x86 1.1, you need the following environment and tools:

- A graphical desktop environment that supports web browsers and PDF viewers
- A frames-capable HTML browser (to access the IBM Documentation and other web pages)
- A PDF viewer (to access PDF documentation and licenses)

Software requirements: optional programs

To use IBM COBOL for Linux on x86 1.1 with optional programs such as Db2® and CICS®, additional products are required:

- Db2: COBOL applications that embed EXEC SQL statements require IBM Db2 Advanced Enterprise Server Edition for Linux, UNIX, and Windows 11.1, 11.5, or higher.

Note: If you are using a Db2 version that is earlier than Db2 11.5.6, you need to contact COBOL.Linux.Trial@ca.ibm.com to get and apply some additional copybook files.

- CICS: COBOL applications that embed EXEC CICS statements require either of the following products:
 - TXSeries® for Multiplatforms 9.1 PTF2 or higher
 - CICS TX 11.1

Verifying the amount of hard disk space available

IBM COBOL for Linux on x86 1.1 requires about 150 MB of hard disk storage space.

You can use the following command to determine the amount of space available in the default installation location (/opt/ibm):

```
df -h /opt
```

If you plan to install the compiler in a nondefault location, you can use the following command:

```
df -h installation_path
```

where *installation_path* represents the nondefault location.

Verifying that the required GNU and Perl packages are installed

If you use the `install` utility to install the compiler, you do not need to manually install the dependencies, because the `install` utility uses `yum` (on RHEL 7.8 or 7.9), `dnf` (on RHEL 8.0 or higher), or `apt-get` (on Ubuntu) to download and install the dependencies. If you are not using the `install` utility, follow the instructions in this topic to verify the required GNU and Perl packages that are installed.

For lists of the required packages and version requirements for each supported Linux distribution, see [“Software requirements: required programs”](#) on page 3.

All required packages can be obtained from your OS installation media.

To verify that the correct versions of the required packages are installed on your system, enter the following command once for each required package:

- **On RHEL**

```
rpm -q package_name
```

- **On Ubuntu**

```
dpkg -l package_name
```

If the package was installed, this command returns the name and the version number of the package. The version number must be the same as or higher than the version required for that package.

Previewing the license agreements

Before installing IBM COBOL for Linux on x86 1.1, you can preview the license agreements.

The terms and conditions for using IBM COBOL for Linux on x86 are specified in the following PDF files, which are located in the root directory of the distribution package:

- `LicenseAgreement.pdf`
- `LicenseInformation.pdf`

After default installation, the license files can be found in the `/opt/ibm/cobol/1.1.0` directory.

Determining the installation procedure

You must choose either the default or nondefault installation procedure to install the compiler.

Default installation

Installs IBM COBOL for Linux on x86 1.1 to the default directory, `/opt/ibm/cobol/1.1.0`. It is highly recommended that you install IBM COBOL for Linux on x86 1.1 to the default location by following the procedure provided in [“Default installation”](#) on page 6.

Nondefault installation

Installs IBM COBOL for Linux on x86 1.1 to a nondefault location. You must use the nondefault installation procedures provided in [“Nondefault installation”](#) on page 9 if any of the following scenarios applies to you:

- You want to install IBM COBOL for Linux on x86 to a nondefault location.

- You want to try out a new update of the compiler before removing an existing installation from the default location.

Notes:

- The COBOL Runtime Environment package is always installed in `/opt/ibm/cobol/rte`, regardless of whether the default or nondefault installation procedure is selected. The COBOL Runtime Environment is backward compatible. COBOL applications built with older versions of the compiler runs with newer versions of the COBOL Runtime Environment.
- The COBOL debug engine package is always installed in `/opt/ibm/cobol/debug`, regardless of whether the default or nondefault installation procedure is selected.

Default installation

The default installation installs the compiler to a default location. You are recommended to use the default installation procedure.

IBM COBOL for Linux on x86 provides a utility, `install`, that performs a default installation of IBM COBOL for Linux on x86 1.1 and its dependencies. You can use `install` to install the RPM packages on RHEL, or install the `dpkg` packages on Ubuntu.

During the installation with the `install` utility, you are prompted to accept or decline the license agreement. If you accept the agreement, the license files will be output to `.txt` files for your future reference. If you decline the agreement, the installation process exits; the compiler will remain unconfigured, and unusable.

Alternatively, you can use the system default package manager to install the packages. For example, you can use the `rpm` utility to install the RPM packages on RHEL, or you can use the `dpkg` utility to install the `dpkg` packages on Ubuntu.

If you are installing the compiler to a nondefault location, use the procedures in [“Nondefault installation”](#) on page 9.

Running the `install` utility

The `install` utility is the recommended tool for installing IBM COBOL for Linux on x86. It automatically installs the correct packages and all the required dependencies based on the distribution. The utility is located in the root directory of the installation image.

About this task

When you run the `install` utility for a new installation, it performs the following tasks:

- Install all prerequisite software packages (that use `yum`, `dnf`, `apt-get`, `rpm`, or `dpkg`).
- Install all compiler packages into the default location, `/opt/ibm/`.
- Automatically installs the license file and default configuration file.

Notes:

- To ensure that you have the privilege to run the `install` utility, become the root user or use the `sudo` command.
- If you are reinstalling the Evaluation version of IBM COBOL for Linux on x86 1.1 to extend the trial period, you must uninstall the Evaluation version first. See [Chapter 5, “Uninstalling the compiler,”](#) on [page 23](#) for how to uninstall the compiler.

Procedure

1. For users with physical media: If the product DVD or .iso image is mounted on the /cdrom directory in the system, issue the following commands:

```
cd /cdrom
sudo ./install
```

For users with an electronic download: If the tar.gz archive is located in the current directory, issue the following commands:

```
tar -xvzf package_name.tar.gz
sudo ./install
```

where *package_name* is the name of the product package that you downloaded.

2. Read the license agreement and licensing information. If you agree to the licensing terms, accept the license agreement to continue the installation.

Results

If all packages are successfully installed:

- The `install` script returns 0 and the following message is displayed confirming the successful installation:

```
Installation and configuration successful
```

- The configuration file is generated. Its location is `/opt/ibm/cobol/1.1.0/etc/cob2.cfg`. A symbolic link is also created in the `/opt/ibm/cobol/1.1.0/etc.d` directory, which points to the `cob2.cfg` file. You can create a copy of `cob2.cfg`, modify it, and change the symbolic link to point to it so that the compiler always reads your copy instead of the original.

Symbolic links to the `cob2` compiler invocation command and `cob2.cfg` config file are not automatically created in `/usr/bin` or `/etc` as you may have more than one compiler installed on your system. If you only have one compiler version that is installed, you can manually create the following links as a postinstallation step.

```
ln -s /opt/ibm/cobol/1.1.0/usr/bin/cob2 /usr/bin/cob2
ln -s /opt/ibm/cobol/1.1.0/etc/cob2.cfg /etc/cob2.cfg
```

An alternative to this step is to add the path that contains the compiler invocations to the `PATH` environment variable. See [“PATH” on page 13](#).

What to do next

After you complete the previous steps, proceed to [“Post-installation setup” on page 11](#) tasks such as [“Querying for installed packages” on page 11](#), [“Setting environment variables” on page 12](#), or [“Compiling a Hello World program to test the compiler installation” on page 13](#).

Running the alternative utility

To install IBM COBOL for Linux on x86 using the default installation procedure, the `rpm` utility is the alternative utility on RHEL, and the `dpkg` utility is the alternative utility on Ubuntu.

On RHEL

1. Install the prerequisite software packages.
 - On RHEL 7.8 or 7.9, use this command:

```
sudo yum install perl gcc glibc.i686 glibc-devel.i686 libgcc.i686 libstdc++.i686
libquadmath.i686
```

- On RHEL 8.0 or higher, use this command:

```
sudo dnf install perl gcc glibc.i686 glibc-devel.i686 libgcc.i686 libstdc++.i686
libquadmath.i686
```

2. Ensure that your current working directory contains all of the packages for IBM COBOL for Linux on x86 1.1 from either the DVD, .iso image, or electronic image, and then install the compiler packages into the default location, /opt/ibm, the compiler runtime package into the default location, /opt/ibm/cobol/rte, and the debug engine into the default location, /opt/ibm/cobol/debug:
 - For users with physical media: If the product DVD or .iso image is mounted on the /cdrom directory in the system, issue the following commands:

```
cd /cdrom
rpm -Uvh ./images/rhel/*.rpm
```

- For users with an electronic download: If the tar.gz archive is located in the current directory, issue the following commands:

```
tar -xvzf package_name.tar.gz
rpm -Uvh ./images/rhel/*.rpm
```

On Ubuntu

1. Install the prerequisite software packages using Advanced Package Tool (apt):

```
sudo apt-get install perl gcc-multilib libc6:i386 libc6-dev:i386 libgcc1:i386 libstdc++6:i386 libquadmath0:i386
```

2. Ensure that your current working directory contains all of the packages for IBM COBOL for Linux on x86 1.1 from either the DVD, .iso image, or electronic image, and then install the compiler packages into the default location, /opt/ibm, the compiler runtime package into the default location, /opt/ibm/cobol/rte, and the debug engine into the default location, /opt/ibm/cobol/debug:
 - For users with physical media: If the product DVD or .iso image is mounted on the /cdrom directory in the system, issue the following commands:

```
cd /cdrom
dpkg -iG ./images/ubuntu/*.deb
```

- For users with an electronic download: If the tar.gz archive is located in the current directory, issue the following commands:

```
tar -xvzf package_name.tar.gz
dpkg -iG ./images/ubuntu/*.deb
```

What to do next

After you complete the previous steps, proceed to “Post-installation setup” on page 11 tasks such as “Querying for installed packages” on page 11, “Setting environment variables” on page 12, or “Compiling a Hello World program to test the compiler installation” on page 13.

Querying for package summaries

Querying for the summary of a package is useful when you do not know which product the package belongs to. For instance, it might be useful if you moved or copied packages from the IBM COBOL for

Linux on x86 DVD or E-Image layout. The package summary includes a short description of the queried file.

On RHEL

To query for the summary of an RPM package that is not installed, issue the following command:

```
rpm --qf="%{summary}\n" -qp rpm_file_name
```

For instance, to query for the summary of the `cobol.cmp.1.1.0-1.1.0.0-$B.x86-64.rpm` RPM file that has not yet been installed, issue the following command:

```
rpm --qf="%{summary}\n" -qp cobol.cmp.1.1.0-1.1.0.0-$B.x86-64.rpm
```

The resulting output depends on the specific file queried. A typical example is shown below:

```
IBM COBOL for Linux on x86 1.1 (5737-L11) -compiler package (RHEL)
```

On Ubuntu

To query for the summary of a dpkg package that is not installed, issue this command:

```
dpkg -f pkg_file_name
```

where *pkg_file_name* is the full file name of the dpkg package that you want to query for a summary.

For instance, to query for the summary of the `cobol.cmp.1.1.0-1.1.0.0-$B_x86-64.deb` file that has not yet been installed, issue the following command:

```
dpkg -f cobol.cmp.1.1.0-1.1.0.0-$B_x86-64.deb
```

The resulting output depends on the specific file queried. A typical example is shown below:

```
Package: cobol.cmp.1.1.0
Version: 1.1.0.0-$B
Section: devel
Priority: extra
Architecture: x86-64
Maintainer: For issues in IBM COBOL for Linux on x86 compilers, open a Case (https://www.ibm.com/mysupport/s).
For issues in IBM COBOL for Linux on x86 evaluation version, visit the IBM COBOL for Linux on
x86 compiler community
(https://www.ibm.com/community/z/languages/cobol/).
Depends: perl (>= 5.18.2), gcc (>= 4.8.5), libc6 (>= 2.17),
libgcc1 (>= 4.8.5), libstdc++6 (>= 4.8.5), lib32quadmath0 (>=4.8.5)
Provides: cobol
Description: IBM COBOL for Linux on x86 1.1 (5737-L11) - compiler
Licensed Materials - Property of IBM.
IBM COBOL for Linux on x86 1.1 (5737-L11)
Copyright IBM Corp. 2021.
IBM is a registered trademark of IBM Corp. in the U.S.,
other countries or both.
US Government Users Restricted Rights -
Use, duplication or disclosure restricted by
GSA ADP Schedule Contract with IBM Corp.
```

Note: *\$B* is the build number of the package that is installed on your system.

Nondefault installation

The nondefault installation installs the compiler to a nondefault location. If you do not know which product the package belongs to, you can query for the summary of a package.

On RHEL, you use the `rpm` utility to install the compiler packages. On Ubuntu, you use `dpkg` and `chroot` utilities to install the compiler packages.

Installing IBM COBOL for Linux on x86 to a nondefault location

You can install all compiler packages to a single non-default location.

On RHEL

To install all compiler packages to a single nondefault directory, use the `rpm` utility. Ensure that your current working directory contains all of the packages for IBM COBOL for Linux on x86 1.1 and no other RPM packages.

1. Install the prerequisite software packages.

- If you are on RHEL 7.8 or 7.9, use this command:

```
yum install perl gcc glibc.i686 glibc-devel.i686 libgcc.i686 libstdc++.i686  
libquadmath.i686
```

- If you are on RHEL 8.0 or higher, use this command:

```
dnf install perl gcc glibc.i686 glibc-devel.i686 libgcc.i686 libstdc++.i686  
libquadmath.i686
```

2. From your current working directory, issue the following command:

```
rpm -Uvh cobol.cmp*.rpm --prefix installation_path
```

where *installation_path* is a directory that is not `/opt/ibm/`.

3. From your current working directory, issue the following command:

```
rpm -Uvh cobol.rte*.rpm
```

4. From your current working directory, issue the following command:

```
rpm -Uvh cobol.dbg*.rpm
```

The compiler packages are installed in *installation_path* directory, the compiler runtime is installed in the default location, `/opt/ibm/cobol/rte`, and the debug engine is installed in the default location, `/opt/ibm/cobol/debug`.

Note: The compiler runtime package must be installed in the default location, `/opt/ibm/cobol/rte` and the debug engine package must be installed in the default location, `/opt/ibm/cobol/debug`.

On Ubuntu

To install all compiler packages to a single nondefault directory, complete the following steps:

1. Set up the chroot. Some versions of Ubuntu come with a chroot, and some do not. If your Ubuntu version does not have a chroot, you have to install a chroot with the following commands:

```
apt update -y  
apt install schroot debootstrap -y  
VAR=`cat /etc/os-release | grep VERSION_CODENAME` && export $VAR  
echo $VERSION_CODENAME  
mkdir -p /path/to/ndi_dir && cd /path/to  
debootstrap $VERSION_CODENAME ndi_dir http://mirrors.usinternet.com/ubuntu/archive
```

2. Install dependencies inside the chroot directory with the following commands:

```
chroot /path/to/ndi_dir  
dpkg --add-architecture i386  
apt-get update  
apt-get install perl gcc-multilib libgcc1:i386 libc6:i386 libc6-dev:i386 libstdc++6:i386  
libquadmath0:i386  
exit
```

3. Ensure that your current working directory contains all of the packages for IBM COBOL for Linux on x86 1.1 from either the DVD, .iso image or electronic image, and no other debian (*.deb) packages, and then install the compiler inside the chroot directory with the following commands:

```
dpkg --root /path/to/ndi_dir -iG ./images/ubuntu/*.deb
# Compiler will now be at
/path/to/ndi_dir/opt/ibm/cobol/1.1.0/bin/cob2
```

What to do next

After you complete the previous steps, proceed to [“Post-installation setup”](#) on page 11 tasks such as [“Querying for installed packages”](#) on page 11, [“Setting environment variables”](#) on page 12, or [“Compiling a Hello World program to test the compiler installation”](#) on page 13.

Post-installation setup

There are some optional setup and verification procedures that you can use after you installed the compiler.

These are documented in the following sections:

- [“Querying for installed packages”](#) on page 11
- [“Setting environment variables”](#) on page 12
- [“Compiling a Hello World program to test the compiler installation”](#) on page 13
- [“Enabling the error messages”](#) on page 14
- [“Enabling man pages”](#) on page 14
- [“Installing the IBM Debug for Linux on x86 Remote Debug Eclipse User Interface”](#) on page 14
- [“Runtime Library Components ”](#) on page 15
- [“Inventory tracking and license compliance with IBM Licence Metric Tool”](#) on page 15
- [“Accessing information”](#) on page 16
- [“Accessing additional information”](#) on page 16

Querying for installed packages

To determine the Version.Release.Modification.Fix-Build level of a package or whether the package is a GA version or evaluation version, query for it by using the `rpm` or `dpkg` command.

On RHEL

To determine the Version.Release.Modification.Fix-Build level of an individual package, enter the following command:

```
rpm -qa cobol.cmp.1.1.0
```

The result is:

```
cobol.cmp.1.1.0-V.R.M.F-B
```

where *V.R.M.F-B* is the Version.Release.Modification.Fix-Build level of the compiler that is installed on the system.

To determine whether the package is a GA version or evaluation version, enter the following command to check the license files:

```
rpm -qa | grep cobol.cmp.license
```

If the result is like the following one, the package is a GA version:

```
cobol.cmp.license.V.R.M-V.R.M.F-B
```

If the result is like the following one, the package is an evaluation version:

```
cobol.cmp.license-eval.V.R.M-V.R.M.F-B
```

If the installation is not successful, you get a message indicating that the package is not installed.

To confirm the installation of all compiler packages, enter the following command:

```
rpm -qa | grep -e cobol.cmp.1.1.0 -e cobol.dbg.1.1.0
```

The result is a list containing all of the packages as shown in [Table 2 on page 2](#). If none of the packages is properly installed, there will be no output from the command.

On Ubuntu

To query for an individual package, enter the following command:

```
dpkg -p cobol.cmp.1.1.0
```

The result is:

```
Package cobol.cmp.1.1.0  
Version: V.R.M.F-B
```

where *V.R.M.F-B* is the Version.Release.Modification.Fix-Build level of the compiler that is installed on the system.

To determine whether the package is a GA version or evaluation version, enter the following command to check the license files:

```
dpkg -l | grep cobol.cmp.license
```

If the output contains `cobol.cmp.license.V.R.M`, the package is a GA version; if the output contains `cobol.cmp.license-eval.V.R.M`, the package is an evaluation version.

If the installation is not successful, you get a message indicating that the package is not installed.

To confirm the installation of all compiler packages, enter the following command:

```
dpkg -l | grep -e cobol.cmp.1.1.0 -e cobol.dbg.1.1.0
```

The result is a list containing all of the packages as shown in [Table 2 on page 2](#). If none of the packages was properly installed, there will be no output from the command.

Setting environment variables

Before using the compiler, verify that the environment variables *LANG*, *MANPATH*, *NLSPATH*, and *PATH* are set.

To determine the current setting of these variables, use this command:

```
echo "\n $LANG \n\n $NLSPATH \n\n $MANPATH \n\n $PATH"
```

LANG

Specifies the national language for message files. See [“National language support” on page 3](#).

The *LANG* environment variable can be set to any of the locales provided on the system.

The national language code for United States English is `en_US`. If the appropriate message catalogs was installed on your system, any other valid national language code can be substituted for `en_US`.

MANPATH

Optionally specifies the directory search path for finding man pages. See [“Enabling man pages” on page 14](#) for more information.

NLSPATH

Specifies the path name of the message files. See [“Enabling the error messages” on page 14](#) for more information.

PATH

Specifies the directory search path for the executable files of the compiler.

For example, when IBM COBOL for Linux on x86 is installed in the default location, to run the utilities (scu and gdgmgr), add the following directory to the PATH environment variable by entering this command:

```
export
PATH=$PATH:installation_path/cobol/1.1.0/bin:/opt/ibm/cobol/rte/bin:/opt/ibm/cobol/
debug/usr/bin
```

where *installation_path* is the target directory specified by the `--prefix` option of the nondefault installation command on RHEL, or the `/opt/ibm` directory under the root directory of chroot on Ubuntu.

Important: The LANG and NLSPATH environment variables are initialized when the operating system is installed and might differ from the ones you want to use.

Note: Additional environment variables may be required for building and running various COBOL applications. For more information, see "Compiler and runtime environment variables" in the *IBM COBOL for Linux on x86 Programming Guide*.

Compiling a Hello World program to test the compiler installation

To test the product installation and the critical search paths, build and run a simple program.

For example:

1. Create the following COBOL program:

```
[hello.cbl]
000100 IDENTIFICATION DIVISION.
000200 PROGRAM-ID. HELLO.
000300 AUTHOR. JOE PROGRAMMER.
000400 ENVIRONMENT DIVISION.
000500 DATA DIVISION.
000600 PROCEDURE DIVISION.
000700 MAINLINE.
000800 DISPLAY 'Hello World!'.
000900 STOP RUN.
```

2. Compile the test program. For example:

If you have set up the short invocation commands, enter the following command:

```
cob2 hello.cbl -o hello
```

If you have not set up the short invocation commands, enter the following command:

```
installation_path/cobol/1.1.0/usr/bin/cob2 hello.c -o hello
```

where *installation_path* is the installation location of the compiler packages. If the compiler is installed to the default location, *installation_path* is `/opt/ibm/`.

3. Run the program:

```
./hello
```

The expected result is that "Hello World!" is displayed on the screen.

4. Check the exit code of the program:

```
echo $?
```

The result should be zero.

Enabling the error messages

If your system uses the en_US locale and encoding, the compiler and runtime message catalogs are automatically configured to display correctly. However, if your system uses any other supported locale, you must set the NLSPATH environment variable so that the compiler and runtime functions can find the appropriate message catalogs after installation.

For example, to specify the Japanese locale with the ja_JP code page, use the following commands:

```
LANG=ja_JP
NLSPATH=$NLSPATH:/opt/ibm/cobol/1.1.0/usr/share/locale/%L/%N:/opt/ibm/cobol/rte/usr/share/
locale/%L/%N
export LANG NLSPATH
```

See [“National language support”](#) on page 3 for a list of supported language locales.

Enabling man pages

Man pages are provided for the compiler invocation commands and utilities (e.g. scu and gdgmgr). Man pages are provided in English only.

Before you can view the IBM COBOL for Linux on x86 utility man pages, you must add the man page directory to the MANPATH environment variable.

If you have installed IBM COBOL for Linux on x86 in the default location, enter the following command to update the MANPATH environment variable.

```
export
MANPATH=$MANPATH:/opt/ibm/cobol/1.1.0/man:/opt/ibm/cobol/rte/man
```

If you have installed IBM COBOL for Linux on x86 in a nondefault location, enter the following command to update the MANPATH environment variable.

```
export
MANPATH=$MANPATH:installation_path/cobol/1.1.0/man:/opt/ibm/cobol/rte/man
```

where *installation_path* is the target directory specified by the --prefix option of the nondefault installation command on RHEL, or the /opt/ibm directory under the root directory of chroot on Ubuntu.

To test whether the man pages have been successfully installed, open one or more of the man pages, as described in [“Viewing the man pages”](#) on page 16.

Installing the IBM Debug for Linux on x86 Remote Debug Eclipse User Interface

The Remote Debug Eclipse User Interface (p2 repository) is available as a set of Eclipse features that extend an existing Eclipse instance.

For more information on downloading the p2 repository and installing the features, see [IBM Debug for Linux on x86 Remote Debug Eclipse User Interface installation](#).

Runtime Library Components

The runtime library components in IBM COBOL for Linux on x86 1.1 cannot be redistributed with COBOL applications.

IBM COBOL for Linux on x86 1.1 is licensed under the Virtual processor Core (VPC) pricing metric. VPC is a unit of measurement that is used to determine the licensing cost of IBM products. It is based on the number of virtual cores (vCPUs) that are available to the product. A vCPU is a virtual core that is assigned to a virtual machine or a physical processor core if the server is not partitioned for virtual machines.

COBOL applications that run on a different virtual machine (or a different physical processor core if the server is not partitioned for virtual machines) than the one on which it was developed require IBM COBOL for Linux on x86 1.1 to be installed and licenses purchased for the vCPUs available to the product on that machine.

Inventory tracking and license compliance with IBM Licence Metric Tool

IBM License Metric Tool (ILMT) 9.2 can help you manage software inventory and license compliance by recognizing and monitoring the products that are installed and in use on your system.

Note:

- If you are using the trial version of IBM COBOL for Linux on x86, you can skip this task.
- ILMT is not part of the IBM COBOL for Linux on x86 compiler offering, and must be ordered and installed separately. To order and download IBM License Metric Tool, see "[Ordering and downloading License Metric Tool](#)" at the IBM License Metric Tool 9.2 documentation.

Inventory tracking

When installed and activated, ILMT scans your system for product inventory signatures that indicate whether a product is installed on your system. ILMT identifies the version, release, and modification levels of the product.

If IBM COBOL for Linux on x86 1.1 is installed in the default location, the inventory signature file is located in the `/opt/ibm/cobol/1.1.0/swidtag` directory. If IBM COBOL for Linux on x86 1.1 is installed in a nondefault location, the signature file is located in the `installation_path/cobol/1.1.0/swidtag` directory, where *installation_path* is the target directory that is specified by the `rpm --prefix` or `dpkg --root` option of the nondefault installation command. For more information, see the [IBM License Metric Tool 9.2 documentation](#).

License compliance

For licensing purposes, IBM COBOL for Linux on x86 1.1 is priced per Virtual Processor Core (VPC).

VPC is a unit of measurement that is used to determine the licensing cost of IBM products. It is based on the number of virtual cores (vCPUs) that are available to the product. A vCPU is a virtual core that is assigned to a virtual machine or a physical processor core if the server is not partitioned for virtual machines.

IBM® License Metric Tool (ILMT) is used to help you assess if you are compliant with licensing requirements. ILMT provides useful features for managing virtualized environments and measuring license utilization. ILMT discovers the software that is installed in your infrastructure, helps you to analyze the consumption data, and allows you to generate audit reports.

For more information, see the [IBM License Metric Tool 9.2 documentation](#).

Related information

[IBM License Metric Tool 9.2 documentation](#)

Accessing information

This section provides an overview of the information offered with the product. Information about the compiler, its utilities, and the COBOL programming language is provided through an HTML based IBM Documentation website on the IBM external web and through publications in Portable Document Format (PDF).

Accessing the Installation Guide, Quick Start Guide and License Agreement

The Installation Guide (install.pdf) is located in the root directory of the installation package.

The Quick Start Guide (quickstart.pdf) is located in the root directory of the product DVD installation image.

The License Agreement (LicenseAgreement.pdf) is located in the root directory of the installation package.

After installation, the license files can be found in /opt/ibm/cobol/1.1.0 directory.

Accessing PDF files

You can view and print this information by using the Adobe Acrobat Reader. If you don't have the Adobe Acrobat Reader program installed, you can download it from the Adobe website at <http://www.adobe.com>.

The following PDF files are available from the IBM COBOL for Linux on x86 library page:

- IBM COBOL for Linux on x86 1.1 Installation Guide (this information), GC28-3116, provides information about prerequisite products and steps for installing IBM COBOL for Linux on x86.
- IBM COBOL for Linux on x86 1.1 Programming Guide, SC28-3118, provides information about how to write, compile, link, and run IBM COBOL for Linux on x86 programs.
- IBM COBOL for Linux on x86 1.1 Language Reference, SC28-3117, describes the COBOL language supported by IBM COBOL for Linux on x86 1.1.

Viewing the man pages

Man pages are included for all compiler invocation commands and utilities (scu and gdgmgr).

For instructions about how to enable the man pages for viewing, see [“Enabling man pages” on page 14](#).

To invoke a man page, run this command:

```
man command
```

command is any IBM COBOL for Linux on x86 invocation or utility command.

Examples:

```
man cob2  
man scu  
man gdgmgr
```

Accessing additional information

For the latest information about IBM COBOL for Linux on x86, visit the [Fix List for IBM COBOL for Linux on x86](#).

Chapter 2. Upgrading to the latest release

If you are not using the latest release of the compiler, you can upgrade the compiler to the latest release.

You can find the latest release of IBM COBOL for Linux on x86 from the Fix list for IBM COBOL for Linux on x86.

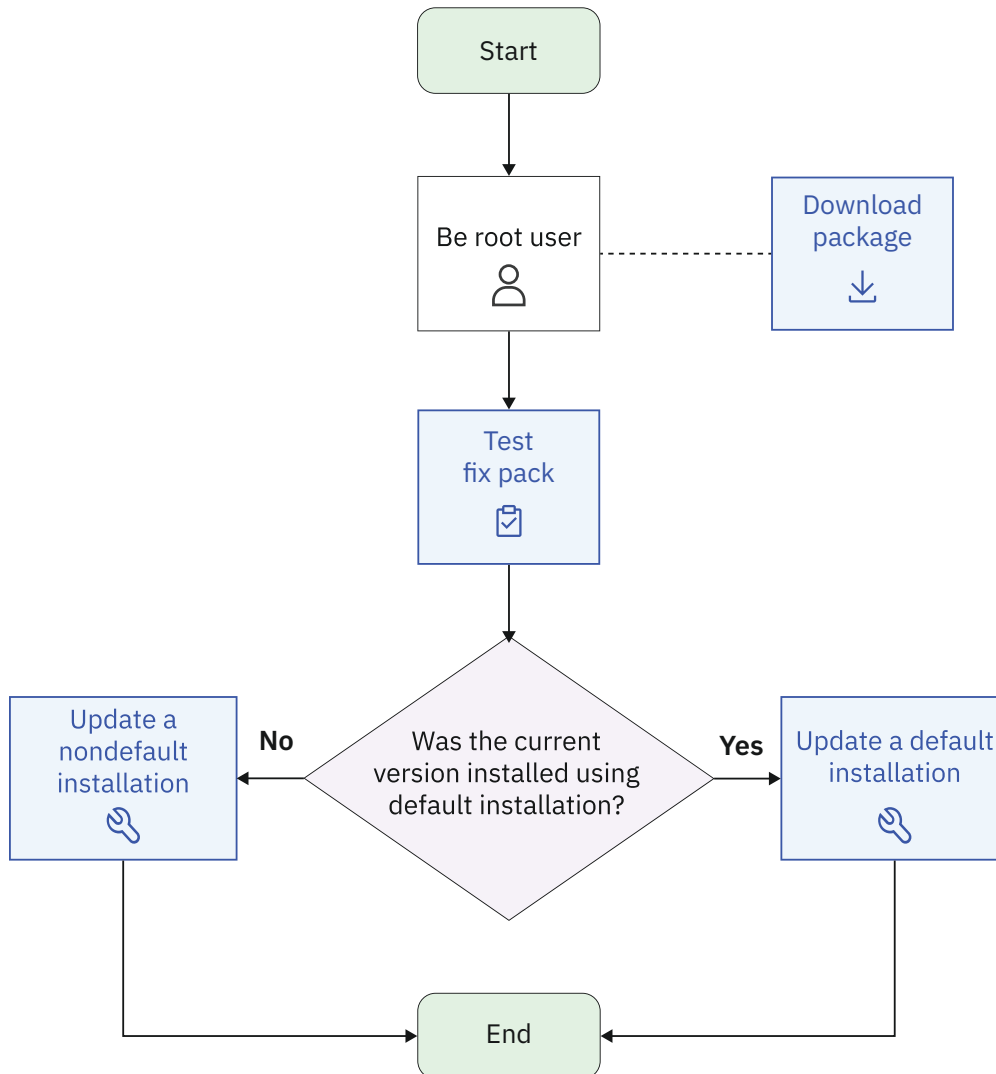
To upgrade the IBM COBOL for Linux on x86 compiler to the latest release, use the `install` utility as described in the latest release of [Chapter 1, “Installing the compiler,”](#) on page 1.

Chapter 3. Updating to the latest fix pack

A fix pack of IBM COBOL for Linux on x86 provides a fix or multiple fixes to the product.

You can download the latest compiler updates from the support website: Fix list for IBM COBOL for Linux on x86. You can also find the instructions at the Fix Central website.

The following diagram shows the procedure to apply an update to your compiler.



1. [Test fix pack](#)
2. [Download package](#)
3. [Update a nondefault installation](#)
4. [Update a default installation](#)

Every fix pack comes in the tar.gz (compressed) format and includes a version of the `install` utility that is customized to install only the update that accompanies it.

Testing a fix pack before you install it

You can try out a fix pack before you remove the existing compiler version from the system.

To try the fix pack, you can do either of the following tasks:

- Install the fix pack to another machine and test it. You must install the base compiler before you apply the fix pack.
- Install the fix pack to the same machine but a different location from where you installed the current compiler and test it. For example, if you installed the current compiler to a default location, you can install the fix pack to a nondefault location to test. You must install the base compiler to the nondefault location before you apply the fix pack. The nondefault installation procedure is described in [Installing IBM COBOL for Linux on x86 to a nondefault location](#).

Updating a default installation

Updates to the compiler are supplied as fix packs. You can follow the instructions in this section to download, decompress, and install the fix packs.

1. Download the fix pack that you want into an empty directory.
2. Restore the compressed file and extract the fix pack filesets from the downloaded package.

To decompress and unpack the TAR file, use the following command:

```
tar -zxvf package_name.tar.gz
```

where *package_name* is the name of the fix pack that you downloaded.

3. Install the fix pack:

- Run the `install` utility:

```
./install
```

- Alternatively, you can install the fix pack manually:

- **On RHEL:**

```
rpm -Uvh images/rhel/*.rpm
```

- **On Ubuntu:**

```
dpkg -iG images/ubuntu/*.deb
```

Chapter 4. Updating from Evaluation version to the official version

You can upgrade the evaluation version of the compiler to the licensed version by installing the licensed product on top of the evaluation package. By following the installation procedure for the licensed product package, you can install the compiler license. Shared filesets between the evaluation and licensed versions are reported as already installed.

On RHEL

If you are using the Evaluation version of IBM COBOL for Linux on x86 compiler on RHEL, use one of the following options to upgrade it to a full product version:

- Use `install` to install the full product version of the IBM COBOL for Linux on x86 as described in [“Default installation” on page 6](#).
- Alternatively, upgrade your Evaluation version by installing the license packages using the following command:

```
rpm -Uvh cobol.cmp.license.1.1.0-*.x86-64.rpm
```

On Ubuntu

If you are using the Evaluation version of IBM COBOL for Linux on x86 on Ubuntu, use one of the following options to upgrade it to a full product version:

- Use `install` to install the full product version of the IBM COBOL for Linux on x86 as described in [“Default installation” on page 6](#).
- Alternatively, upgrade your Evaluation version by installing the license packages using the following command:

```
dpkg -iG cobol.cmp.license.1.1.0-*_x86-64.deb
```

Chapter 5. Uninstalling the compiler

You must use the Linux `rpm` or `dpkg` utility to uninstall IBM COBOL for Linux on x86 1.1.

IBM COBOL for Linux on x86 1.1 does not provide a stand-alone uninstallation tool.

Notes:

- You must have root access to uninstall the compiler.
- Whenever you uninstall a package, specify the package name. For information about how to determine the package name, see [“Querying for installed packages” on page 11](#).
- It is recommended to uninstall all packages in a single command. If you prefer to uninstall by using multiple commands, uninstall packages in the reverse order in which they were installed before, that is, the last package that was installed is the first package that you remove.
- On Ubuntu, the `dpkg` utility provides the purge option, `-P`, which removes the configuration files that are under the compiler installation path. If you want to keep the configuration files while uninstalling the compiler, use the `-r` option with the `dpkg` command. Any configuration files generated outside of the compiler installation path, such as home directories, will not be removed.
- On RHEL, the `rpm` uninstallation command is equivalent to the `dpkg` purge (`-P`) option. All configuration files under the compiler installation path are removed. Any configuration files generated outside of the compiler installation path, such as home directories, will not be removed.

Example: Uninstalling IBM COBOL for Linux on x86 1.1

When uninstalling IBM COBOL for Linux on x86, you must remove the packages in a specific order to avoid dependency errors.

Notes:

- If you are uninstalling the Evaluation version of IBM COBOL for Linux on x86 1.1, replace `cobol.cmp.license.1.1.0` in the below commands with `cobol.cmp.license-eval.1.1.0`.
- The `sudo` command or becoming the root user ensures that you have the privilege to run the below commands.

On RHEL

To uninstall IBM COBOL for Linux on x86 1.1, issue the following commands in the order given below to uninstall those specific packages:

```
sudo rpm -e cobol.cmp.1.1.0 cobol.cmp.license.1.1.0 \  
cobol.rte.1.1.0 cobol.dbg.1.1.0
```

On Ubuntu

To uninstall IBM COBOL for Linux on x86 1.1 and remove the configuration files, issue the following commands in the order given below to uninstall those specific packages:

```
sudo dpkg -P cobol.cmp.1.1.0 cobol.cmp.license.1.1.0 \  
cobol.rte.1.1.0 cobol.dbg.1.1.0
```


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