

IBM XL C/C++ for Linux, V13.1



# Installation Guide

*Version 13.1*



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*Version 13.1*

**Note**

Before using this information and the product it supports, read the information in “Notices” on page 43.

**First edition**

This edition applies to IBM XL C/C++ for Linux, V13.1 (Program 5765-J08; 5725-C73) 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.

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# Contents

<b>About this information</b>	<b>v</b>
Who should read this document.	v
How to use this document.	v
How this document is organized	vi
Conventions	vi
Related information.	ix
IBM XL C/C++ information	x
Standards and specifications	xi
Other IBM information.	xi
Other information	xi
Technical support	xii
How to send your comments	xii

## Chapter 1. Before installing IBM XL C/C++ for Linux, V13.1 . . . . . 1

The installation image and packages	2
System prerequisites.	4
Verifying the amount of hard disk space available	6
Verifying that the required GNU and Perl packages are installed	6
Previewing the license agreements	7

## Chapter 2. Basic installation . . . . . 9

Tasks for basic installation.	9
Running the xlc_install utility for a new installation	10
xlc_install options	12

## Chapter 3. Advanced installation . . . . . 13

Tasks for advanced installation.	13
Installing XL C/C++ to co-reside with earlier versions	15
Installing XL C/C++ to the same location as an earlier version	15
Installing XL C/C++ to a location separate from earlier versions	16
Running the IBM License Acceptance Process (LAP) tool	19
Querying for RPM package summaries	19

## Chapter 4. Installing an update . . . . . 21

Tasks for update installation.	21
Testing a PTF before you install it	22
Updating a basic installation using the xlc_install utility	22

Updating an advanced installation.	24
------------------------------------	----

## Chapter 5. Configuring IBM XL C/C++ for Linux, V13.1 (for advanced users) . 25

Running the new_install utility	26
Running the xlc_configure utility directly	26
xlc_configure options.	27

## Chapter 6. After installing IBM XL C/C++ for Linux, V13.1 . . . . . 31

Testing the installation.	31
Enabling utilization tracking.	32
Enabling the man pages	32
Enabling the error messages.	33
Setting up the environment for the invocation commands.	34
Setting the PATH environment variable to include the path to the compiler invocations	34
Creating symbolic links to the compiler invocations	35
Enabling IBM License Metric Tool (ILMT) and Tivoli Asset Discovery for Distributed (TADd)	35
Accessing the local documentation	36
Viewing the HTML documentation	36
Viewing the PDF documentation	37
Viewing the manual pages	37
Querying for installed packages	37

## Chapter 7. Uninstalling IBM XL C/C++ for Linux, V13.1 . . . . . 39

Example: Uninstalling IBM XL C/C++ for Linux, V13.1	39
---	----

## Chapter 8. Troubleshooting the installation and configuration . . . . . 41

The specified directory <i>rpmlocation_path</i> does not exist.	41
<i>rpmlocation_path</i> does not contain . . . . .	41

## Notices . . . . . 43

Trademarks and service marks	45
------------------------------	----

## Index . . . . . 47



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## About this information

This guide provides detailed installation instructions for IBM® XL C/C++ for Linux, V13.1. It guides you through multiple ways to perform tasks and directs you to reference information in cases requiring atypical installations. It also shows you how to test the installation, launch remotely-accessible HTML help, and view different types of documentation. Please read it carefully before installing the compiler. Please also read the README file in the root directory of your installation media, which contains current information about the compiler.

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## Who should read this document

This document is intended for anyone responsible for installing IBM XL C/C++ for Linux, V13.1.

The basic installation methods detailed in this document address the needs of the majority of users. Basic examples are tailored to reflect, as much as possible, the steps required to perform a basic installation.

The advanced installation method addresses the needs of users who require a customized installation for various purposes, such as maintaining more than one version of XL C/C++ on a single system. These are users who are familiar with compiler installations and with the file structures of the versions of the compiler products installed on the system. In this document, you are referred to as an *advanced user*.

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## How to use this document

This document provides procedures for three main installation scenarios:

### "Basic" installation

This scenario allows you to install a single version of XL C/C++ to a default location. This scenario is applicable to the majority of users, and is the recommended method of installation.

For an overview of the steps that you need to follow to perform a basic installation, refer to Chapter 2, "Basic installation," on page 9.

### "Advanced" installation

This scenario allows you to maintain multiple versions of XL C/C++ on a single system, or to install the compiler to a nondefault location. This scenario is only applicable to advanced users who have specialized needs, and is not recommended for the majority of users.

For an overview of the steps that you need to follow to perform an advanced installation, refer to Chapter 3, "Advanced installation," on page 13.

### "Update" installation

This scenario applies to users who have obtained a Program Temporary Fix (PTF) package for an existing XL C/C++ V13.1 installation.

For an overview of the steps required to install a PTF, refer to Chapter 4, "Installing an update," on page 21.

For highly specialized installation scenarios that are outside the scope of this document, refer to the Technotes at <http://www.ibm.com/software/products/us/en/xlcpp-linux/>.

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## How this document is organized

This book is organized to reflect the pre-installation, installation, post-installation, and troubleshooting phases of an XL C/C++ installation.

*Table 1. Phases of an XL C/C++ installation*

Phase	Chapters	User segment
Pre-installation	Chapter 1, "Before installing IBM XL C/C++ for Linux, V13.1," on page 1	All users
Installation	Chapter 2, "Basic installation," on page 9	Users who: <ul style="list-style-type: none"><li>• Want to use the simplest, most direct installation process</li><li>• Do not have any special requirements, such as the use of multiple versions of the compiler.</li></ul>
	Chapter 3, "Advanced installation," on page 13	Users who: <ul style="list-style-type: none"><li>• Want to install the compiler in a nondefault location</li><li>• Want to have multiple versions of the compiler on the same system</li></ul>
Post-installation	Chapter 4, "Installing an update," on page 21	Users who want to update XL C/C++ V13.1 to the next fix level
	Chapter 6, "After installing IBM XL C/C++ for Linux, V13.1," on page 31	All users
Product removal	Chapter 7, "Uninstalling IBM XL C/C++ for Linux, V13.1," on page 39	Any user who needs to remove an XL C/C++ compiler from the system

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## Conventions

### Typographical conventions

The following table shows the typographical conventions used in the IBM XL C/C++ for Linux, V13.1 information.

*Table 2. Typographical conventions*

Typeface	Indicates	Example
<b>bold</b>	Lowercase commands, executable names, compiler options, and directives.	The compiler provides basic invocation commands, <b>xlc</b> and <b>xlc</b> ( <b>xlc++</b> ), along with several other compiler invocation commands to support various C/C++ language levels and compilation environments.













Table 2. *Typographical conventions (continued)*

Typeface	Indicates	Example
<i>italics</i>	Parameters or variables whose actual names or values are to be supplied by the user. Italics are also used to introduce new terms.	Make sure that you update the <i>size</i> parameter if you return more than the <i>size</i> requested.
<u>underlining</u>	The default setting of a parameter of a compiler option or directive.	nomaf   <u>maf</u>
monospace	Programming keywords and library functions, compiler builtins, examples of program code, command strings, or user-defined names.	To compile and optimize myprogram.c, enter: xlc myprogram.c -O3.

## Qualifying elements (icons)

Most features described in this information apply to both C and C++ languages. In descriptions of language elements where a feature is exclusive to one language, or where functionality differs between languages, this information uses icons to delineate segments of text as follows:

Table 3. *Qualifying elements*

Qualifier/Icon	Meaning
C only, or C only begins   C only ends	The text describes a feature that is supported in the C language only; or describes behavior that is specific to the C language.
C++ only, or C++ only begins   C++ only ends	The text describes a feature that is supported in the C++ language only; or describes behavior that is specific to the C++ language.
IBM extension, or IBM extension begins   IBM extension ends	The text describes a feature that is an IBM extension to the standard language specifications.
C11, or C11 begins   C11 ends	The text describes a feature that is introduced into standard C as part of C11.
C++11, or C++11 begins   C++11 ends	The text describes a feature that is introduced into standard C++ as part of C++11.

## Syntax diagrams

Throughout this information, diagrams illustrate XL C/C++ syntax. This section will help you to interpret and use those diagrams.

- 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 command, directive, or statement.

The —**▶** symbol indicates that the command, directive, or statement syntax is continued on the next line.

The **▶**— symbol indicates that a command, directive, or statement is continued from the previous line.

The —**▶▶** symbol indicates the end of a command, directive, or statement.

Fragments, which are diagrams of syntactical units other than complete commands, directives, or statements, start with the **|**— symbol and end with the —**|** symbol.

- Required items are shown on the horizontal line (the main path):



- Optional items are shown below the main path:



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



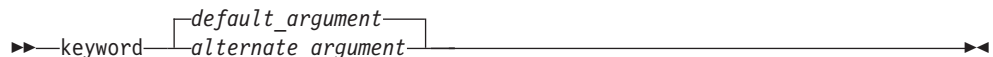
If choosing one of the items is optional, the entire stack is shown below the main path.



- An arrow returning to the left above the main line (a repeat arrow) indicates that you can make more than one choice from the stacked items or repeat an item. The separator character, if it is other than a blank, is also indicated:



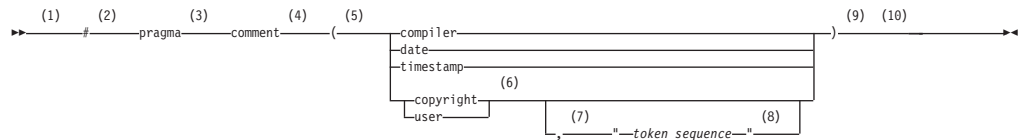
- The item that is the default is shown above the main path.



- Keywords are shown in nonitalic letters and should be entered exactly as shown.
- Variables are shown in italicized lowercase letters. They represent user-supplied names or values.
- If punctuation marks, parentheses, arithmetic operators, or other such symbols are shown, you must enter them as part of the syntax.

### Sample syntax diagram

The following syntax diagram example shows the syntax for the **#pragma comment** directive.



#### Notes:

- 1 This is the start of the syntax diagram.
- 2 The symbol # must appear first.
- 3 The keyword pragma must appear following the # symbol.
- 4 The name of the pragma comment must appear following the keyword pragma.
- 5 An opening parenthesis must be present.
- 6 The comment type must be entered only as one of the types indicated: compiler, date, timestamp, copyright, or user.
- 7 A comma must appear between the comment type copyright or user, and an optional character string.
- 8 A character string must follow the comma. The character string must be enclosed in double quotation marks.
- 9 A closing parenthesis is required.
- 10 This is the end of the syntax diagram.

The following examples of the **#pragma comment** directive are syntactically correct according to the diagram shown above:

```
#pragma comment(date)
#pragma comment(user)
#pragma comment(copyright,"This text will appear in the module")
```

### Examples in this information

The examples in this information, except where otherwise noted, are coded in a simple style that does not try to conserve storage, check for errors, achieve fast performance, or demonstrate all possible methods to achieve a specific result.

The examples for installation information are labelled as either *Example* or *Basic example*. *Basic examples* are intended to document a procedure as it would be performed during a basic, or default, installation; these need little or no modification.

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## Related information

The following sections provide related information for XL C/C++:

## IBM XL C/C++ information

XL C/C++ provides product information in the following formats:

- README files

README files contain late-breaking information, including changes and corrections to the product information. README files are located by default in the XL C/C++ directory and in the root directory of the installation CD.

- Installable man pages

Man pages are provided for the compiler invocations and all command-line utilities provided with the product. Instructions for installing and accessing the man pages are provided in the *IBM XL C/C++ for Linux, V13.1 Installation Guide*.

- Information center

The fully searchable HTML-based documentation is viewable on the web at [http://www.ibm.com/support/knowledgecenter/SSXVZZ\\_13.1.0/com.ibm.compilers.linux.doc/welcome.html](http://www.ibm.com/support/knowledgecenter/SSXVZZ_13.1.0/com.ibm.compilers.linux.doc/welcome.html).

- PDF documents

PDF documents are located by default in the `/opt/ibm/xlC/13.1.0/doc/LANG/pdf/` directory, where *LANG* is one of *en\_US*, *zh\_CN*, or *ja\_JP*. The PDF files are also available on the web at <http://www.ibm.com/support/docview.wss?uid=swg27036675>.

The following files comprise the full set of XL C/C++ product information:

Table 4. XL C/C++ PDF files

Document title	PDF file name	Description
<i>IBM XL C/C++ for Linux, V13.1 Installation Guide, SC27-4248-00</i>	install.pdf	Contains information for installing XL C/C++ and configuring your environment for basic compilation and program execution.
<i>Getting Started with IBM XL C/C++ for Linux, V13.1, SC27-4247-00</i>	getstart.pdf	Contains an introduction to the XL C/C++ product, with information on setting up and configuring your environment, compiling and linking programs, and troubleshooting compilation errors.
<i>IBM XL C/C++ for Linux, V13.1 Compiler Reference, SC27-4249-00</i>	compiler.pdf	Contains information about the various compiler options, pragmas, macros, environment variables, and built-in functions, including those used for parallel processing.
<i>IBM XL C/C++ for Linux, V13.1 Language Reference, SC27-4250-00</i>	langref.pdf	Contains information about the C and C++ programming languages, as supported by IBM, including language extensions for portability and conformance to nonproprietary standards.
<i>IBM XL C/C++ for Linux, V13.1 Optimization and Programming Guide, SC27-4251-00</i>	proguide.pdf	Contains information on advanced programming topics, such as application porting, interlanguage calls with Fortran code, library development, application optimization and parallelization, and the XL C/C++ high-performance libraries.

To read a PDF file, use Adobe Reader. If you do not have Adobe Reader, you can download it (subject to license terms) from the Adobe website at <http://www.adobe.com>.

More information related to XL C/C++ including IBM Redbooks® publications, white papers, tutorials, documentation errata, and other articles, is available on the web at:

<http://www.ibm.com/support/docview.wss?uid=swg27036675>

**Note:** Documentation errata is reflected only in the English version of the information center.

For more information about boosting performance, productivity, and portability, see the C/C++ café at <http://www.ibm.com/software/rational/cafe/community/ccpp>.

## Standards and specifications

XL C/C++ is designed to support the following standards and specifications. You can refer to these standards for precise definitions of some of the features found in this information.

- *Information Technology - Programming languages - C, ISO/IEC 9899:1990*, also known as C89.
- *Information Technology - Programming languages - C, ISO/IEC 9899:1999*, also known as C99.
- *Information Technology - Programming languages - C, ISO/IEC 9899:2011*, also known as C11. (Partial support)
- *Information Technology - Programming languages - C++, ISO/IEC 14882:1998*, also known as C++98.
- *Information Technology - Programming languages - C++, ISO/IEC 14882:2003*, also known as *Standard C++*.
- *Information Technology - Programming languages - C++, ISO/IEC 14882:2011*, also known as C++11. (Partial support)
- *Information Technology - Programming languages - Extensions for the programming language C to support new character data types, ISO/IEC DTR 19769*. This draft technical report has been accepted by the C standards committee, and is available at <http://www.open-std.org/JTC1/SC22/WG14/www/docs/n1040.pdf>
- *Draft Technical Report on C++ Library Extensions, ISO/IEC DTR 19768*. This draft technical report has been submitted to the C++ standards committee, and is available at <http://www.open-std.org/JTC1/SC22/WG21/docs/papers/2005/n1836.pdf>.
- *Altivec Technology Programming Interface Manual*, Motorola Inc. This specification for vector data types, to support vector processing technology, is available at [http://www.freescale.com/files/32bit/doc/ref\\_manual/ALTIVECPIM.pdf](http://www.freescale.com/files/32bit/doc/ref_manual/ALTIVECPIM.pdf).
- *ANSI/IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE Std 754-1985*.
- *OpenMP Application Program Interface Version 4.0 (Partial support)*, available at <http://www.openmp.org>

## Other IBM information

- *ESSL for AIX® V5.1/ESSL for Linux on POWER® V5.1 Guide and Reference* available at the Engineering and Scientific Subroutine Library (ESSL) and Parallel ESSL web page.

## Other information

- *Using the GNU Compiler Collection* available at <http://gcc.gnu.org/onlinedocs>

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## Technical support

Additional technical support is available from the XL C/C++ Support page at [http://www.ibm.com/support/entry/portal/overview/software/rational/xl\\_c~c++\\_for\\_linux](http://www.ibm.com/support/entry/portal/overview/software/rational/xl_c~c++_for_linux). This page provides a portal with search capabilities to a large selection of Technotes and other support information.

If you cannot find what you need, you can send email to [compinfo@ca.ibm.com](mailto:compinfo@ca.ibm.com).

For the latest information about XL C/C++, visit the product information site at <http://www.ibm.com/software/products/us/en/xlcpp-linux/>.

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## How to send your comments

Your feedback is important in helping to provide accurate and high-quality information. If you have any comments about this information or any other XL C/C++ information, send your comments by email to [compinfo@ca.ibm.com](mailto:compinfo@ca.ibm.com).

Be sure to include the name of the manual, the part number of the manual, the version of XL C/C++, and, if applicable, the specific location of the text you are commenting on (for example, a page number or table number).

---

## Chapter 1. Before installing IBM XL C/C++ for Linux, V13.1

Before you install IBM XL C/C++ for Linux, V13.1, do the following tasks:

- Consult the product README file for any last-minute updates.
- 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.

### Coexistence with previous version compilers

Installing this version of the compiler does not remove or change previous versions of the compiler, only the C++ runtime library and the SMP runtime library are migrated to the new versions. This was achieved by differentiating the installation files names from those of the previous versions, including the version, release and modification level (V.R.M) in the name, and installing to new locations that include V.R.M in the installation paths.

### Upgrading the evaluation copy of the XL C/C++ compiler

If you are using the evaluation copy of the XL C/C++ compiler, use one of the following options to upgrade it to a full product version:

- Use `xlc_install` to install the full product version of the XL C/C++ compiler as described in Chapter 2, “Basic installation,” on page 9. It uninstalls the evaluation copy and then installs the full product version.
- Alternatively, you can do the following tasks:

1. Install the new license packages using the following command:

```
rpm -Uvh new_license_package [--prefix $installation_path]
```

where *new\_license\_package* is the license package included in the package you are installing, and *\$installation\_path* is the target directory for installation that is specified by the `--prefix` option of the non-default installation (NDI) command.

2. Accept the new license using one of the following utilities:
  - The `new_install` utility with `-prefix $installation_path` when applicable
  - The LAP tool
3. Run the `xlc_configure` utility to reconfigure the compiler. If you used the `new_install` utility in step 2, skip this step.

If your compiler is installed in an NDI location, you must use the `--prefix` option to specify the installation path of the license RPM packages (`*-eval-license` and `*-license` packages) the same as that of the main compiler packages (`xl*` packages). Furthermore, when you run the `new_install` utility, you must use the `-prefix` option to specify the same path for the `xl*` packages.

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## The installation image and packages

The installation image for IBM XL C/C++ for Linux, V13.1 is available on an installation CD or for download from an IBM website to a local drive.

The image includes:

- READMEs, license agreement files, and documentation.
- A set of RPM packages.
- An installation tool, `xlc_install`, to install and configure the compiler for a basic installation.
- Utilization reporting tool package

### Installation packages

Table 5 lists the packages that are supplied with the installation image, and the default locations to which they are installed during a basic installation. You can use the `rpm` utility to review the packages. For example, to view package information and the package file list, enter the following `rpm` command:

```
rpm -qpil package_name
```

For the rules on installing packages to custom, nondefault locations, see “Installing packages to multiple, non-default locations” on page 17.

*Table 5. IBM XL C/C++ for Linux, V13.1 packages and default installation locations*

Package name	Package description	Default installation location
xlsmp.msg.rte	IBM SMP messages package	/opt/ibmcmp/msg/
xlsmp.rte	IBM SMP runtime package	/opt/ibmcmp/lib/ /opt/ibmcmp/lib64/
libxlsmp-devel	IBM SMP static library package	/opt/ibm/xlsmp/4.1.0/
libxlmass-devel	IBM Mathematical Acceleration Subsystem (MASS) package (Not redistributable)	/opt/ibm/xlmass/8.1.0/
vacpp.rte	IBM XL C/C++ runtime package	/opt/ibmcmp/lib/ /opt/ibmcmp/lib64/ /opt/ibmcmp/vacpp/13.1/lib
xlc-eval-license <sup>1</sup>	IBM XL C/C++ license package for the evaluation copy (Not redistributable)	/opt/ibm/xlC/13.1.0/lib/
xlc-license <sup>2</sup>	IBM XL C/C++ license package for XL C/C++ for Linux, V13.1(Not redistributable)	
libxlc-devel	IBM XL C/C++ libraries package	/opt/ibm/xlC/13.1.0/lib/ /opt/ibm/xlC/13.1.0/lib64/



Table 5. IBM XL C/C++ for Linux, V13.1 packages and default installation locations (continued)

Package name	Package description	Default installation location
xlc	IBM XL C/C++ compiler package (Not redistributable)	/opt/ibm/xlC/13.1.0/ /opt/ibm/xlC/13.1.0/samples/ /opt/ibm/xlC/13.1.0/doc/ /opt/ibm/xlC/13.1.0/man/
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. Only included in the evaluation copy of the XL C/C++ for Linux compiler.</li> <li>2. Only included in XL C/C++ for Linux, V13.1.</li> </ol>		

**Note:** /opt/ibm/ is the default prefix for installation of images. The C++ runtime package and SMP runtime package will still be installed in /opt/ibmcmp/ as previous versions for backward compatibility.

Table 6. Utilization reporting tool package 1.2

Package name	Package description	Default installation location
urt	Utilization reporting tool package	/opt/ibmurt /opt/ibmurt/1.2/ /opt/ibmurt/1.2/bin/ /opt/ibmurt/1.2/config/ /opt/ibmurt/1.2/msg

**Note:** The utilization reporting tool can be installed on the same machine as the compiler or on a different machine. You must use **rpm** utilities to install this package. It typically needs to be installed only once, no matter how many compiler installations you have. This tool is useful for those who are responsible for monitoring the overall compiler usage within an organization. Individual developers and build teams should not need to use this tool.

To install the utilization reporting tool, see the instructions provided in README.urt in the root directory of the installation image.

## National language support

IBM XL C/C++ for Linux, V13.1 messages support the following language locales:

- en\_US
- en\_US.utf8
- en\_US.UTF-8
- ja\_JP
- ja\_JP.eucjp
- ja\_JP.utf8
- ja\_JP.UTF-8
- zh\_CN
- zh\_CN.gb18030
- zh\_CN.gb2312
- zh\_CN.gbk
- zh\_CN.utf8

- zh\_CN.UTF-8

English is the default national language and en\_US is the default locale. Following installation, you can set the NLSPATH so that messages are displayed in a different language. See “Enabling the error messages” on page 33.

## System prerequisites

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

The following are the requirements for installing IBM XL C/C++ for Linux, V13.1:

- **Operating system:** You can use one of the following operating systems supported by the IBM Power Systems™ servers:
  - Red Hat Enterprise Linux 6.4 (RHEL 6.4) or later
  - Red Hat Enterprise Linux 7.0 (RHEL 7.0) or later
  - SUSE Linux Enterprise Server 11 Service Pack 2 (SLES 11 SP2) or later

- **Hardware:**

You can use any IBM Power Systems server as long as it is supported by your operating system distribution. For a complete list of the new IBM Power Systems servers, see <http://www.ibm.com/systems/power/hardware/>.

- **Storage:**

- Approximately 200 MB for product packages
- Minimum of 2 GB hard drive space for paging
- Minimum of 512 MB for temporary files

**Note:** High levels of optimization can require more space for paging and temporary files.

To verify that you have enough hard disk space available, see “Verifying the amount of hard disk space available” on page 6.

- **Required software:**

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 6

**Note:** Packages marked with an asterisk (\*) must be available in both 32-bit and 64-bit versions.

*Table 7. Required GNU and Perl packages for the RHEL 6.4 operating system*

Package name	Version requirements
gcc	4.4.7
gcc-c++	4.4.7
glibc*	2.12
glibc-devel*	2.12
libgcc*	4.4.7
libstdc++*	4.4.7
libstdc++-devel*	4.4.7
compat-libstdc++-33	3.2.3

Table 7. Required GNU and Perl packages for the RHEL 6.4 operating system (continued)

Package name	Version requirements
perl	5.0 or greater <b>Note:</b> Perl V5.8 is shipped and automatically installed with the RHEL 6.4 operating system.

**Note:** The 32-bit libraries are not installed by default on RHEL 6.4, they must be installed from the RHEL 6.4 operating system image.

Table 8. Required GNU and Perl packages for the RHEL 7.0 operating system

Package name	Version requirements
gcc	4.8.2
gcc-c++	4.8.2
glibc*	2.17
glibc-devel*	2.17
libgcc*	4.8.2
libstdc++*	4.8.2
libstdc++-devel*	4.8.2
compat-libstdc++-33	3.2.3
perl	5.0 or greater <b>Note:</b> Perl V5.8 is shipped and automatically installed with the RHEL 7.0 operating system.

**Note:** The 32-bit libraries are not installed by default on RHEL 7.0, they must be installed from the RHEL 7.0 operating system image.

Table 9. Required GNU and Perl packages for the SLES 11 SP2 operating system

Package name	Version requirements
gcc-32bit	4.3.4
gcc	4.3.4
gcc-c++	4.3.4
glibc-devel-32bit	2.11.3
glibc-devel	2.11.3
libgcc46-32bit	4.6.1
libgcc46	4.6.1
libstdc++46-32bit	4.6.1
libstdc++46	4.6.1
libstdc++43-devel-32bit	4.3.4
libstdc++43-devel	4.3.4
perl	5.0 or greater <b>Note:</b> Perl V5.10 is shipped and automatically installed with the SLES 11 SP2 operating system.

To view the documentation that is packaged with IBM XL C/C++ for Linux, V13.1, you will need:

- A graphical desktop environment (such as K Desktop Environment or GNOME) that supports web browsers and PDF viewers
- A frames-capable HTML browser (to access help and other web pages)
- A PDF viewer (to access PDF documentation)

## Verifying the amount of hard disk space available

IBM XL C/C++ for Linux, V13.1 requires about 200 MB of hard disk storage space. This amount of space accommodates the optional samples and documentation that are shipped with the product.

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 to a nondefault location, you can use the following command instead:

```
df -h installation_path
```

where *installation\_path* represents the nondefault location.

## Verifying that the required GNU and Perl packages are installed

Before you install IBM XL C/C++ for Linux, V13.1, you should verify that the required GNU and Perl packages were installed with the operating system.

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

For lists of the required packages and version requirements for each supported Linux distribution, see the following:

- For the RHEL 6.4 operating system, see Table 7 on page 4.
- For the RHEL 7.0 operating system, see Table 8 on page 5.
- For the SLES 11 SP2 operating system, see Table 9 on page 5.

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

```
rpm -q package_name
```

If the package has been installed, this command should return the name and version number of the package. The version number must be the same as or higher than the version requirement for that package.

### Example: Determining the installed version of gcc-c++

To see whether gcc-c++ is installed, query for the gcc-c++ package as follows:

```
rpm -q gcc-c++
```

If gcc-c++ version 4.3 is installed, you will get a result similar to the following output:

```
gcc-c++-4.3-62.198
```

---

## Previewing the license agreements

Before installing IBM XL C/C++ for Linux, V13.1, you can preview the license agreements.

The terms and conditions for using XL C/C++ are specified in the following PDF files, which are located in the root directory of the distribution package:

- LicenseAgreement.pdf
- license.pdf

After basic installation, the license files can be found in the `/opt/ibm/xlC/13.1.0/` directory with the same names as above.

**Note:** You can use the utilization tracking and reporting feature to ensure the compiler usage is compliant with the number of Concurrent User licenses you have purchased. For more information, see Tracking and reporting compiler usage in the *XL C/C++ Compiler Reference*.



---

## Chapter 2. Basic installation

IBM XL C/C++ for Linux provides an interactive utility, `xlc_install`, that walks you through a basic installation. You can use `xlc_install` to perform any of the following tasks:

- Install IBM XL C/C++ for Linux, V13.1 on a system where no IBM XL compiler is currently installed.
- Install IBM XL C/C++ for Linux, V13.1 on a system and update the XL C++ runtime library and SMP runtime library where an older version of IBM XL compiler is currently installed.
- Install IBM XL C/C++ for Linux, V13.1 on a system where IBM XL Fortran for Linux, V15.1 has already been installed.

In this case, both compilers will use the IBM MASS library provided with IBM XL C/C++ for Linux, V13.1.

For information about installing IBM XL Fortran for Linux, V15.1, refer to the *IBM XL Fortran for Linux, V15.1 Installation Guide*.

- Install an update on a system where IBM XL C/C++ for Linux, V13.1 has already been installed.

By running the `xlc_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 without installing the compiler and no files will be written to your system.

You should consider a basic installation of IBM XL C/C++ for Linux, V13.1 with the `xlc_install` utility on a system as long as *both* of the following conditions apply:

- You are installing the compiler to the default location, `/opt/ibm/`.
- You are maintaining a single version of the product on your system.

If either of these conditions does not apply, use the procedures in Chapter 3, “Advanced installation,” on page 13.

---

### Tasks for basic installation

This section lists the procedures you must perform before, during, and after a basic installation.

If the conditions listed in Chapter 2, “Basic installation” match your needs, then a basic installation is the easiest and fastest method you can use to install. A basic installation allows you to install the latest version of IBM XL C/C++ for Linux, and configure the compiler, all through the use of a single installation tool.

If you are using the basic installation to install IBM XL C/C++ for Linux, V13.1, the previous version of the XL compiler is not uninstalled, only the C++ runtime libraries and SMP runtime library are migrated to the new versions.

Table 10. Steps for basic installation

Task	For more information, see . . .
Become either the root user or a user with administrator privileges.	Documentation supplied with the operating system.
Ensure that all system prerequisites are satisfied.	"System prerequisites" on page 4
Uninstall any previously installed compiler runtime package of the same product type and SMP runtime package	"Running the xlc_install utility for a new installation"
Use the xlc_install tool to accept or decline the license.	"Running the xlc_install utility for a new installation"
Use the xlc_install tool to install and configure the compiler, using the default paths.	"Running the xlc_install utility for a new installation"
Confirm that the compiler packages were successfully installed, and test the installation.	<ul style="list-style-type: none"> <li>• "Querying for installed packages" on page 37</li> <li>• "Testing the installation" on page 31</li> </ul>
Enable the compiler man pages.	"Enabling the man pages" on page 32
If your system locale and/or encoding are <i>not</i> en_US, enable the compile-time error messages for your locale. Otherwise, you can skip this step.	"Enabling the error messages" on page 33
Optional: If you did not choose to create symbolic links to the compiler invocation commands during the installation process, set up the environment to locate the invocation commands without the full path. Otherwise, you can skip this step.	"Setting up the environment for the invocation commands" on page 34

## Running the xlc\_install utility for a new installation

The xlc\_install utility is the recommended tool for installing XL C/C++. It is located in the root directory of the installation image.

### About this task

**Note:** Because the xlc\_install utility is written in Perl, you must ensure that Perl is installed on your system before you run the utility. See "Verifying that the required GNU and Perl packages are installed" on page 6.

When you run the xlc\_install utility for a new installation, it performs the following tasks:

- Checks for all prerequisite software packages
- Uninstalls any previously installed XL C/C++ runtime package and SMP runtime package
- Installs all compiler packages into the default location, /opt/ibm/, except for the C++ runtime package and SMP runtime package, which are installed into the /opt/ibmcmp/ directory
- Automatically invokes the new\_install utility, which installs the license file and generates the default configuration file
- Optionally creates symbolic links in /usr/bin/ to the compiler invocation commands
- Generates an installation log in the /tmp/ directory



To run the `xlc_install` utility to install IBM XL C/C++ for Linux, V13.1:

1. If the product CD is mounted at the `/cdrom` directory in the system, issue the following commands:

```
cd /cdrom
./xlc_install
```

For additional arguments that you can specify for `xlc_install`, see “`xlc_install` options” on page 12.

- If another instance of IBM XL C/C++ for Linux is detected on your system in the same installation directory, you are prompted to uninstall the C++ runtime package and SMP runtime package. Confirm that you want to proceed with the uninstallation. If you choose not to uninstall the existing C++ runtime package and SMP runtime package, the installation process will end.
  - If other versions of the IBM SMP and MASS packages are detected on your system either alone or as part of an installation of IBM XL Fortran for Linux, V15.1, you are prompted to uninstall them. Confirm that you want to proceed with uninstalling the existing IBM SMP and MASS packages. If you choose not to uninstall the previously installed components, the installation process will end.
2. You are presented with the license agreement and licensing information. Read the license agreement and licensing information. If you agree to the licensing terms, accept the license agreement to continue installation.  
You are prompted to create symbolic links for the compiler invocations in the `/usr/bin/` directory.
  3. Optionally, create the symbolic links.

**Note:** An alternative to this step is to add the path that contains the compiler invocations to the `PATH` environment variable. See “Setting the `PATH` environment variable to include the path to the compiler invocations” on page 34.

If you chose to create symbolic links, the following links are created in the `/usr/bin/` subdirectory:

- `gxc`
- `gxc++`
- `gxC`
- `xc`
- `xc++`
- `xC`
- `xc_r`
- `xc++_r`
- `xC_r`

For more information on other specialized invocations that may be available, please refer to *IBM XL C/C++ for Linux, V13.1 Compiler Reference, “Invoking the compiler”*.

**Note:** Some command links are not created in `/usr/bin/`, either because they might delete user-defined or GCC-related invocations, or because they are not compiler invocation commands. These include:

- `c89`, `c89_r`, `c99`, `c99_r`, `cc`, `cc_r`
- `cleanpdf`, `mergepdf`, `new_install`, `resetpdf`, `showpdf`, `xlc_configure`

If all packages are successfully installed:

- The `xlc_install` Perl script returns 0 and the following messages are displayed confirming the successful installation:

```
"IBM XL C/C++ for Linux, V13.1" Version 13.1.0.0 has been  
successfully installed and configured under prefix "/opt/ibm".  
"IBM XL C/C++ for Linux, V13.1" Version 13.1.0.0 has been  
successfully installed.
```

**Note:** NLS is not supported for messages that are issued by the `xlc_install` utility.

- The configuration file is generated. Its location is `/opt/ibm/xlC/13.1.0/etc/xlc.cfg.$OSRelease.gcc$gccVersion`. For example, `/opt/ibm/xlC/13.1.0/etc/xlc.cfg.sles11.gcc432` or `/opt/ibm/xlC/13.1.0/etc/xlc.cfg.rhel6.2.gcc446`.
- The installation log is moved to its permanent location: `xlC/13.1.0/xlc_install.log`.

## xlc\_install options

The `xlc_install` utility provides the following options:

**-h** Displays the installation utility help page.

**-prefix** *installation\_path*  
Explicitly specifies the path to install all the compiler packages.

**Note:** If this option is not used, the default installation location is `/opt/ibm/`. The C++ runtime package and SMP runtime package will still be installed in `/opt/ibmcmp/` as previous versions for backward compatibility.

**-rpmloc** *rpmlocation\_path*  
Explicitly specifies the path where all compiler packages are located. The default *rpmlocation\_path* is `./images-x86/rpms` or `./images/rpms`, which is relative to the path of the installation tool.

**Note:** For most users, the `-rpmloc rpmlocation_path` option is not required in the installation invocation. If you use the utility directly from the CD or the electronic image, it will automatically determine the source location of the packages.

**-U** Updates the compiler to the *Version.Release.Modification.Fix-Build* (V.R.M.F-B) level that the installation utility version supports. For more information, see “Updating a basic installation using the `xlc_install` utility” on page 22

**Note:** The **-U** option cannot update the compiler to a different *Version.Release.Modification* (V.R.M) level.

**-v** Displays debugging information generated during the installation of the compiler.

**-vv** Displays extra debugging information generated during the installation of the compiler.

---

## Chapter 3. Advanced installation

It is highly recommended that you install IBM XL C/C++ for Linux, V13.1 to the default location and use the procedure provided in Chapter 2, “Basic installation,” on page 9. However, you must use alternative procedures if any of the following scenarios apply to you:

- You want to maintain more than one version of IBM XL C/C++ for Linux in a nondefault location on the same system.
- You want to update an existing version of IBM XL C/C++ for Linux that is installed in a nondefault location.
- You want to try out a new update of the compiler before removing an existing installation from the default location.

In all of these scenarios, you can use the `rpm` utility to install the compiler packages; you can also use the `xlc_install` utility to install the compiler packages to a single, nondefault location. After you have successfully installed the compiler packages to a nondefault location using the `rpm` utility, you need to manually configure the compiler environment using the `new_install` or `xlc_configure` utility. If you use the `xlc_configure` utility instead of the `new_install` utility to configure an installation that is not PTF updates, before you run the `xlc_configure` utility, you must manually run the IBM License Acceptance Process (LAP) tool to review and accept the license. For the instructions about using the LAP tool, see “Running the IBM License Acceptance Process (LAP) tool” on page 19. For configuration procedures, see Chapter 5, “Configuring IBM XL C/C++ for Linux, V13.1 (for advanced users),” on page 25.

---

### Tasks for advanced installation

This section lists the procedures you must perform before, during, and after an advanced installation.

If you want to maintain multiple versions of XL C/C++ in the same location on the same system, follow the steps in this table.

*Table 11. Steps for installing to the same location as an earlier version*

Task	Further information
Become either the root user or a user with administrator privileges.	Documentation supplied with the operating system
If you do not need to maintain multiple versions of the product on your system, remove any existing versions of IBM XL C/C++ for Linux .	Chapter 7, “Uninstalling IBM XL C/C++ for Linux, V13.1,” on page 39
Ensure that all system prerequisites are satisfied.	“System prerequisites” on page 4
Install IBM XL C/C++ for Linux, V13.1.	“Installing XL C/C++ to the same location as an earlier version” on page 15
Run the IBM License Acceptance Process (LAP) tool to review and accept the license.	“Running the IBM License Acceptance Process (LAP) tool” on page 19
Use the <code>xlc_configure</code> utility to configure the compiler.	“Running the <code>xlc_configure</code> utility directly” on page 26

Table 11. Steps for installing to the same location as an earlier version (continued)

Task	Further information
Confirm that the compiler packages were successfully installed, and test the installation.	<ul style="list-style-type: none"> <li>• “Querying for installed packages” on page 37</li> <li>• “Testing the installation” on page 31</li> </ul>
Enable the compiler man pages.	“Enabling the man pages” on page 32
If your system locale, your encoding, or both, are <i>not</i> en_US, enable the compile-time error messages for your locale. Otherwise, you can skip this step.	“Enabling the error messages” on page 33
Optional: Set up the environment to locate the invocation commands without the full path.	“Setting up the environment for the invocation commands” on page 34

If you want to install IBM XL C/C++ for Linux, V13.1 to a nondefault location, separate from any other versions of XL C/C++ on the same system, follow the steps in this table.

Table 12. Steps for installing to a location separate from earlier versions

Task	Further information
Become either the root user or a user with administrator privileges.	Documentation supplied with the operating system
If you do not need to maintain multiple versions of the product on your system, remove any existing versions of IBM XL C/C++ for Linux.	Chapter 7, “Uninstalling IBM XL C/C++ for Linux, V13.1,” on page 39
Ensure that all system prerequisites are satisfied.	“System prerequisites” on page 4
Install IBM XL C/C++ for Linux, V13.1.	“Installing XL C/C++ to a location separate from earlier versions” on page 16
If you will use the xlc_configure utility to configure the compiler, run the IBM License Acceptance Process (LAP) tool to review and accept the license.	“Running the IBM License Acceptance Process (LAP) tool” on page 19
Use the new_install or xlc_configure utility to configure the compiler.	Chapter 5, “Configuring IBM XL C/C++ for Linux, V13.1 (for advanced users),” on page 25
Confirm that the compiler packages were successfully installed, and test the installation.	<ul style="list-style-type: none"> <li>• “Querying for installed packages” on page 37</li> <li>• “Testing the installation” on page 31</li> </ul>
Enable the compiler man pages.	“Enabling the man pages” on page 32
If your system locale, your encoding, or both, are <i>not</i> en_US, enable the compile-time error messages for your locale. Otherwise, you can skip this step.	“Enabling the error messages” on page 33
Optional: Set up the environment to locate the invocation commands without the full path.	“Setting up the environment for the invocation commands” on page 34

---

## Installing XL C/C++ to co-reside with earlier versions

If you want to maintain more than one version of XL C/C++ on your system, you can use the `rpm` utility or `xlc_install` utility to perform an advanced installation.

To install IBM XL C/C++ for Linux, V13.1 to co-reside with earlier versions of XL C/C++ on the same system, you have the following options:

- You can install multiple versions in the same location, while forcing all versions to use the most recent runtime environment. This option is recommended if you want to continue using the different versions of IBM XL C/C++ for Linux over the long term.

Multiple versions of IBM XL C/C++ for Linux can co-reside in the same location as long as the most recently released version does not attempt to use runtime packages that pre-date it. If your existing version is installed in the default location, do not try to use `xlc_install` to install the additional version as it will remove the existing version. Instead, use the procedure in “Installing XL C/C++ to the same location as an earlier version”

- You can allow each version to use the runtime environment that was shipped with it. This option is recommended if you want to phase a migration to the later version. In this case, you will need to install IBM XL C/C++ for Linux, V13.1 in a separate location from all other versions of IBM XL C/C++ for Linux. To do so, follow one of the procedures in “Installing XL C/C++ to a location separate from earlier versions” on page 16.

## Installing XL C/C++ to the same location as an earlier version

### About this task

The following procedure describes how to install IBM XL C/C++ for Linux, V13.1 and update the runtime packages used by an existing version of IBM XL C/C++ for Linux, V12.1 in the same location.

This procedure assumes the following:

- You are installing IBM XL C/C++ for Linux, V13.1 to a location where IBM XL C/C++ for Linux, V12.1 has already been installed (by default, V12.1 is installed to the `/opt/ibmcmp/` directory, V13.1 is installed to the `/opt/ibm/` directory).
- Your current working directory contains all IBM XL C/C++ for Linux, V13.1 packages, and no other RPM packages.
- The existing runtime component versions listed in Table 13 are installed in the same installation location (by default, `/opt/ibmcmp/`).

*Table 13. XL C/C++ SMP and runtime packages*

Existing XL C/C++ V12.1 runtime packages	New XL C/C++ V13.1 runtime packages
<code>xlsmp.msg.rte-3.1.0.\$F-\$B</code>	<code>xlsmp.msg.rte-4.1.0.\$F-\$B</code>
<code>xlsmp.rte-3.1.0.\$F-\$B</code>	<code>xlsmp.rte-4.1.0.\$F-\$B</code>
<code>vacpp.rte-12.1.0.\$F-\$B</code>	<code>vacpp.rte-13.1.0.0.\$F-\$B</code>

**Note:** `$F` is the PTF number of the package currently installed on your system. `$B` is the build number of the package currently installed on your system.

To install IBM XL C/C++ for Linux, V13.1, and update the IBM XL C/C++ for Linux, V12.1 XL SMP and runtime packages:

1. Remove the existing runtime packages by issuing the following commands to avoid future dependency errors:

```
rpm -e vacpp.rte-12.1.0.0-$B --nodeps
rpm -e xlsmp.rte-3.1.0.0-$B --nodeps
rpm -e xlsmp.msg.rte-3.1.0.0-$B --nodeps
```

**Note:** This example shows package names with no applied updates.

2. To replace the deleted runtime packages and to install IBM XL C/C++ for Linux, V13.1, issue the following command:

```
rpm -ivh *.rpm
```

3. As a precaution, make a backup copy of any existing configuration file.
4. Generate the default IBM XL C/C++ for Linux, V13.1 configuration file:

```
installation_path/xlC/13.1.0/bin/xlc_configure -gcc /usr -gcc64 /usr
-ibmcmp installation_path/ -ibmrt installation_runtime_path/
installation_path/xlC/13.1.0/etc/xlc.base.cfg
-o installation_path/xlC/13.1.0/etc/xlc.cfg.$OSRelease.gcc$gccVersion
```

where *installation\_path* is the location in which all IBM XL C/C++ for Linux, V13.1 packages are installed (by default, /opt/ibm/) and *installation\_runtime\_path* is the location in which all IBM XL C/C++ for Linux, V13.1 runtime packages are installed (by default, /opt/ibmcmp/). *\$OSRelease* is the level of the Operating System, and *\$gccVersion* is the GCC version installed on the system. For example, xlc.cfg.sles11.gcc432, or xlc.cfg.rhel6.2.gcc446.

## Installing XL C/C++ to a location separate from earlier versions

### About this task

This section provides procedures for two possible installation scenarios:

- You can install all compiler packages to a single nondefault location. For example, rather than installing all packages into the default directory /opt/ibm/, you could install them to a directory such as /home/mydirectory/. The procedure for doing so is provided in “Installing all packages to a single, non-default location.”
- For highly specialized situations only, you can install groups of compiler packages to multiple, different locations. For example, you could install all the compiler library packages to one directory, the runtime environment packages to another directory, and so on. However, certain packages must be installed together in the same directory. Rules for installing packages into multiple nondefault directories, as well as procedures for doing so, are provided in “Installing packages to multiple, non-default locations” on page 17.

### Installing all packages to a single, non-default location

#### About this task

To install all compiler packages to a single non-default directory, you have the following options:

- Use the `xlc_install` utility. This option is recommended if you want to install all compiler packages to a single, non-default directory.

If the product CD is mounted at the /cdrom directory in the system, issue the following commands:

```
cd /cdrom
./xlc_install -prefix installation_path
```

For additional arguments that you can specify for `xlc_install`, see “`xlc_install` options” on page 12.

- Use the `rpm` utility. Ensure that your current working directory contains all of the packages for IBM XL C/C++ for Linux, V13.1 and no other RPM packages. From your current working directory, use the following command:

```
rpm -ivh *.rpm --prefix installation_path
```

In the preceding commands, *installation\_path* is a directory that is not `/opt/ibm/`.

### Updating multiple versions of PTFs installed under separate locations: About this task

#### Updating multiple versions of PTFs that are earlier than XL C/C++ for Linux V12.1

To update multiple versions of PTFs that are earlier than XL C/C++ for Linux V12.1, take the following steps:

1. Uninstall all previous packages except the `vac.lib` RPM package using the `rpm -e` command.  
If a package is the prerequisite of a different compiler, take the following steps:
  - a. Use the `--nodeps` option to uninstall the prerequisite package.
  - b. Reconfigure the compiler that has its prerequisite updated in Step 2 below.  
You can skip this step if both compilers are updated.
2. Install the PTF packages using the `rpm` utility with the following options if applicable:
  - If a previous version of compiler or PTFs are installed under prefix *\$CMPpath*, use the `--prefix $CMPpath` option.
  - If a later version of compiler is installed on the system, use the `--oldpackage` option.
3. Reconfigure the compiler by running the `vac_configure` utility. For instructions, see “Running the `xlc_configure` utility directly” on page 26. In XL C/C++ for Linux, V13.1, `vac_configure` is renamed to `xlc_configure`.
4. Test the updated compiler. For instructions, see “Testing the installation” on page 31.

#### Updating multiple versions of PTFs that are later than XL C/C++ for Linux V12.1

To update multiple versions of PTF that are later than XL C/C++ for Linux V12.1, take the following steps:

1. Run the `xlc_install` utility to install the PTF packages with the `-U` option. If a previous version of compiler or PTFs are installed under prefix *\$CMPpath*, use the `--prefix $CMPpath` option. When you are prompted with the “uninstall all previous installations” question, answer **yes**.
2. Test the updated compiler. For instructions, see “Testing the installation” on page 31.

### Installing packages to multiple, non-default locations About this task

For highly specialized situations only, you might need to install different packages to different locations.



**Note:** If you want to install packages in different subdirectories, do not install any packages in the /opt/ibm/ or /opt/ibmcmp/ directory.

Table 14 provides information about which packages must be installed together in the same directory and which can be installed in any directory.

*Table 14. Rules for installing packages to multiple, non-default locations*

Package Name	Package Description	Rules for installation to a non-default location
xlsmp.msg.rte	IBM SMP messages package	All XL SMP packages must be installed in the same location. For the remainder of this document, the name <i>xlsmprt_path</i> is used to refer to this location.
xlsmp.rte	IBM SMP runtime package	
libxlsmp-devel	IBM SMP static library package	
libxlmass-devel	IBM Mathematical Acceleration Subsystem (MASS) package	Any location. For the remainder of this document, the name <i>xlmass_path</i> is used to refer to this location.
vacpp.rte	IBM XL C/C++ runtime package	All XL C/C++ runtime packages must be installed in the same location. For the remainder of this document, the name <i>xlrte_path</i> is used to refer to this location.
xlc-eval-license <sup>1</sup>	IBM XL C/C++ license package for the evaluation copy	Any location. For the remainder of this document, the name <i>lic_path</i> is used to refer to this location.
xlc-license <sup>2</sup>	IBM XL C/C++ license package for XL C/C++ for Linux, V13.1	
libxlc-devel	IBM XL C/C++ compiler libraries package	All XL C/C++ compiler and library packages must be installed in the same location. For the remainder of this document, the name <i>xlcmp_path</i> is used to refer to this location.
xlc	IBM XL C/C++ compiler package	
<b>Notes:</b>		
1. Only included in the evaluation copy of the XL C/C++ for Linux compiler.		
2. Only included in XL C/C++ for Linux, V13.1. If you are installing a PTF, ignore the xlc-license package.		

To install a relocatable RPM package to any location other than the default location, issue the following command for each group of packages you want to install to a non-default directory:

```
rpm -ivh package --prefix package_installation_path
```

where *package\_installation\_path* is a directory other than /opt/ibm/ or /opt/ibmcmp/, and corresponds to one of the appropriate paths listed in Table 14.

#### **Example: Installing XL C/C++ to multiple non-default directories: About this task**

In order to avoid dependency errors during installation of IBM XL C/C++ for Linux, V13.1 issue the following commands in the order given:



```

rpm -ivh xlsmp.msg.rte-4.1.0.0-$B.ppc64.rpm --prefix $XLRTEpath
rpm -ivh xlsmp.rte-4.1.0.0-$B.ppc64.rpm --prefix $XLRTEpath
rpm -ivh libxlsmp-devel.4.1.0-4.1.0.0-$B.ppc64.rpm --prefix $SMPPpath
rpm -ivh libxlmass-devel.8.1.0-8.1.0.0-$B.ppc64.rpm --prefix $MASSpath

rpm -ivh vacpp.rte-13.1.0.0-$B.ppc64.rpm --prefix $RTEpath
rpm -ivh xlc-license.13.1.0-13.1.0.0-$B.ppc64.rpm --prefix $LICpath
rpm -ivh libxlc-devel.13.1.0-13.1.0.0-$B.ppc64.rpm --prefix $CMPpath
rpm -ivh xlc.13.1.0-13.1.0.0-$B.ppc64.rpm --prefix $CMPpath

```

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

---

## Running the IBM License Acceptance Process (LAP) tool

When you install a compiler that is not a PTF package, before you run the `xlc_configure` utility, you must manually run the IBM License Acceptance Process (LAP) tool to review and accept the license.

### About this task

**Note:** If you are already using the `new_install` or `xlc_install` utility, skip this step because the LAP tool is always run when you are running these utilities.

The instruction assumes the compiler main package is installed under prefix *\$CMPpath*, which is the location that `xlc` is installed.

- If the compiler is installed in the default location, the installation path is `/opt/ibm/`.
- If the compiler is installed in a non-default location, see “Installing XL C/C++ to a location separate from earlier versions” on page 16 for information about the non-default location prefix.

Take the following steps to run the LAP tool:

### Procedure

1. Change to the installation directory:  
`cd $CMPpath/xlc/13.1.0`
2. Run the LAP tool by specifying the following command:  
`lap/lapc -l $CMPpath/xlc/13.1.0/lap -s $CMPpath/xlc/13.1.0/lap`
3. Read the license agreement. During the running of the LAP tool, if your language preference is not available, exit the application and view the PDF version of the license (`license.pdf` under `$CMPpath/xlc/13.1.0` directory) before proceeding.
4. If you agree to the licensing terms, accept the license agreement. The successful return code of the LAP tool is 9.

---

## Querying for RPM package summaries

Querying for the summary of an RPM package is useful when you do not know which product the package belonged to. For instance, it might be useful if you have moved or copied packages from the XL C/C++ CD or E-Image layout. The RPM package summary includes a short description of the queried RPM file.

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

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

For instance, to query for the summary of the `libxlc-devel.13.1.0-13.1.0.0-$B.ppc64.rpm` RPM file that has not yet been installed, issue the following command:

```
$ rpm --qf="%{summary}\n" -qp libxlc-devel.13.1.0-13.1.0.0-130701.ppc64.rpm
```

The resulting output depends on the specific file queried, but the following is a typical example:

```
IBM XL C/C++ for Linux, V13.1 - C/C++ Compiler Libraries Package (SLES11/RHEL6/RHEL7)
```

---

## Chapter 4. Installing an update

An update, or program temporary fix (PTF), of IBM XL C/C++ for Linux, V13.1 provides a fix or multiple fixes to the product. You can download updates from the support website: [http://www.ibm.com/support/entry/portal/overview/software/rational/xl\\_c~c++\\_for\\_linux](http://www.ibm.com/support/entry/portal/overview/software/rational/xl_c~c++_for_linux).

Every PTF update package comes in tar.gz (compressed) format and includes a version of the `xl_c_install` utility that is customized to install only the update that accompanies it. If you have any version (including an earlier update) of IBM XL C/C++ for Linux, V13.1 installed on your system, you can apply the latest update. If you are applying the update to an installation in the default location, follow the procedure in “Updating a basic installation using the `xl_c_install` utility” on page 22. If you are applying the update to an installation in a non-default location, you must use one of the procedures in “Updating an advanced installation” on page 24. If you want to try out a PTF before installing it, use the procedure in “Testing a PTF before you install it” on page 22.

---

### Tasks for update installation

This section lists the procedures you must perform before, during, and after an update installation.

If the compiler has been installed to the default directory, `/opt/ibm/`, you must follow the steps outlined in the following table.

*Table 15. Steps for basic installation: update installation*

Task	Further information
Become either the root user or a user with administrator privileges.	Documentation supplied with the operating system
Use the <code>xl_c_install</code> tool to install the update packages.	“Updating a basic installation using the <code>xl_c_install</code> utility” on page 22
Confirm that the compiler packages have been successfully installed, and test the installation.	<ul style="list-style-type: none"><li>• “Querying for installed packages” on page 37</li><li>• “Testing the installation” on page 31</li></ul>
Optional: If you do not choose to create symbolic links to the compiler invocation commands during the update process, set up the environment to locate the invocation commands without the full path. Otherwise, you can skip this step.	“Setting up the environment for the invocation commands” on page 34

If the compiler has been installed to any directory other than `/opt/ibm/`, you must follow the steps outlined in the following table.

*Table 16. Steps for advanced installation: update installation*

Task	Further information
Become either the root user or a user with administrator privileges.	Documentation supplied with the operating system
Uninstall all XL C/C++ packages except <code>xl_c_license</code> .	“Updating an advanced installation” on page 24

Table 16. Steps for advanced installation: update installation (continued)

Task	Further information
Install update packages to the nondefault location.	"Updating an advanced installation" on page 24
Configure the compiler.	Chapter 5, "Configuring IBM XL C/C++ for Linux, V13.1 (for advanced users)," on page 25
Confirm that the compiler packages have been successfully installed, and test the installation.	<ul style="list-style-type: none"><li>• "Querying for installed packages" on page 37</li><li>• "Testing the installation" on page 31</li></ul>
Optional: Set up the environment to locate the invocation commands without the full path.	"Setting up the environment for the invocation commands" on page 34

---

## Testing a PTF before you install it

If you want to try out a new update to the compiler before you remove the existing version from the system, you must install the new update to a nondefault location.

### About this task

To install a PTF to a nondefault location, use the procedure described in "Installing packages to multiple, non-default locations" on page 17, using the **rpm** utility.

**Note:** If you are installing a different version of compiler but not a PTF to a separate location, use the procedure described in "Installing XL C/C++ to a location separate from earlier versions" on page 16.

To configure the compiler, use the procedure described in "Running the `xlc_configure` utility directly" on page 26.

### What to do next

After you have finished testing the new PTF and have verified that you want to replace the older version with the new update, install the PTF to the default location.

For instructions on how to use the `xlc_install` utility to install the new update, see "Updating a basic installation using the `xlc_install` utility."

If the existing version on the system was installed using an advanced installation, see "Updating an advanced installation" on page 24.

---

## Updating a basic installation using the `xlc_install` utility

The `xlc_install` utility is the recommended tool for updating a basic installation of IBM XL C/C++ for Linux, V13.1. It is located in the root directory of the installation image.

### About this task

You can use the `xlc_install` utility to update IBM XL C/C++ for Linux, V13.1 if all the following conditions have been met:

- The base version of IBM XL C/C++ for Linux, V13.1 is already successfully installed in the /opt/ibm/ directory.
- The update package has been uncompressed and unpacked on the system.

When you run the `xlc_install` utility to apply an update, it performs the following tasks:

- Checks for all prerequisite software packages
- Uninstalls IBM XL C/C++ for Linux, V13.1 packages
- Installs updated compiler packages into the default location
- Automatically invokes the `new_install` utility, which installs the license file, renames the old configuration file, and generates a new configuration file
- Optionally creates symbolic links in /usr/bin/ to the compiler invocation commands
- Generates an installation log in the /tmp/ directory

To run the `xlc_install` utility to apply an update for IBM XL C/C++ for Linux, V13.1:

1. Change to the directory in which you have unpacked the update package:

```
cd /home/root/update/xlc/mmmYYYY
```

where *mmmYYYY* is the month and year of the update shipment date. (For example, *dec2014* indicates a shipment date in December of 2014.)

2. Install the update by issuing the following command:

```
./xlc_install -U
```

For additional arguments that you can specify for `xlc_install`, see “`xlc_install` options” on page 12.

3. Confirm that you want to uninstall any previously installed IBM XL C/C++ for Linux, V13.1 packages.
4. Confirm that you want to uninstall any IBM SMP and MASS packages that were previously installed with IBM XL C/C++ for Linux.

**Note:** `xlc_install` uninstalls these packages from their existing location and reinstalls them to the default location, /opt/ibmcmp/. Therefore, if they were previously installed in a nondefault location as part of an IBM XL Fortran installation, you must run `xlf_configure` to reconfigure the IBM XL Fortran compiler to point to the default location for these packages. For procedures, see “Running the `xlf_configure` utility directly” in the *IBM XL Fortran for Linux, V15.1 Installation Guide*.

5. Accept the license agreement and licensing information.
6. Optionally, create the symbolic links for the compiler invocations in the /usr/bin/ directory.

**Note:** An alternative to this step is to add the path that contains the compiler invocations to the PATH environment variable. See “Setting the PATH environment variable to include the path to the compiler invocations” on page 34.

If you choose to create symbolic links, the following links are created in the /usr/bin/ subdirectory:

- `gxc`
- `gxc++`

- gxlC
  - xlc
  - xlc++
  - xlC
  - xlc\_r
  - xlc++\_r
  - xlC\_r
7. If you customized the previously generated configuration file, manually edit *installation\_path/xlC/13.1.0/etc/xlc.cfg.\$OSRelease.gcc\$gccVersion* to replicate those changes in the newly generated configuration file.

---

## Updating an advanced installation

To update an advanced installation of IBM XL C/C++ for Linux, V13.1, it is recommended that you first uninstall all IBM XL C/C++ for Linux, V13.1 packages except the license package, `xlc-license`.

If you attempt to install a new PTF to a location where an older PTF is currently installed, the installation of the new PTF will fail due to a location conflict: two files that belong to two different PTF levels cannot be installed to the same location at the same time. See Chapter 7, “Uninstalling IBM XL C/C++ for Linux, V13.1,” on page 39 for instructions on how to uninstall XL C/C++.

After the old packages have been uninstalled, follow the instructions in Chapter 3, “Advanced installation,” on page 13 to install the PTF packages to the location of your choice.

---

## Chapter 5. Configuring IBM XL C/C++ for Linux, V13.1 (for advanced users)

Before you can run IBM XL C/C++ for Linux, V13.1, you must configure (or re-configure) the compiler if any of the following conditions apply to you:

- You did not use `xlc_install` to install the compiler, or the configuration step failed with `xlc_install`.
- Compiler components were relocated after installation.

The compiler provides two configuration tools: `new_install` and `xlc_configure`, both located in the `installation_path/xlc/13.1.0/bin/` directory after installation.

**Note:** *installation\_path* is the installation location of the compiler packages. If the compiler is installed in the default location, *installation\_path* is `/opt/ibm/`.

It is recommended that you use the `new_install` utility to configure the compiler, provided that *all* of the following conditions are met:

- All IBM XL C/C++ for Linux, V13.1 compiler packages are installed in the same location, *installation\_path*.
- Only one version of GCC is installed in your system and it can be found in the `PATH` environment variable.
- You have root or administrator privileges.
- You want to generate the configuration file in the `installation_path/xlc/13.1.0/etc/` directory.

For instructions, see “Running the `new_install` utility” on page 26.

You should invoke the `xlc_configure` utility directly *only* when at least one of the following conditions is true:

- You have multiple versions of IBM XL C/C++ for Linux installed on your system.
- You receive an error message from the `new_install` command. (See Chapter 8, “Troubleshooting the installation and configuration,” on page 41.)
- You want the generated configuration file to be placed in a location that is different from `installation_path/xlc/13.1.0/etc/`.
- You have multiple versions of GCC installed on your system and you need to specify which GCC version you would like to reference in the configuration file.

**Note:** If you configure the compiler using `xlc_configure`, your output configuration file, `xlc.cfg.$OSRelease.gcc$gccVersion`, can be written to any location where you have write permission. You would not need root or administrative privileges.

For instructions, see “Running the `xlc_configure` utility directly” on page 26.

---

## Running the new\_install utility

Use the new\_install utility that is provided with an instance of IBM XL C/C++ for Linux, V13.1 compiler to configure an advanced installation if all compiler packages corresponding to this instance have been installed in the same location, and only one version of GCC is installed on your system.

### About this task

The new\_install utility performs the following tasks:

- Backs up any existing configuration file that is located in *installation\_path/xlC/13.1.0/etc/xlc.cfg.\$OSRelease.gcc\$gccVersion*.
- Queries the RPM database for the paths to the compiler packages and the paths to the 32-bit GCC (*gcc32path*) and the 64-bit GCC (*gcc64path*) in the *PATH* environment variable, and then uses the obtained values to run the xlc\_configure utility.
- Installs the license file.
- Generates the configuration file in the default location *installation\_path/xlC/13.1.0/etc/xlc.cfg.\$OSRelease.gcc\$gccVersion*.

**Note:** *installation\_path* is the installation location of the compiler packages. If the compiler is installed in the default location, *installation\_path* is */opt/ibm/*.

Take the following steps to run the new\_install utility:

1. Change to the directory that contains the compiler executable files:

```
cd installation_path/xlC/13.1.0/bin/
```

where *installation\_path* is the installation location of the compiler packages. If the compiler has been installed to the default location, *installation\_path* is */opt/ibm/*.

2. Run the following command:

```
./new_install -prefix installation_path
```

3. Read the license agreement and licensing information. If you agree to the licensing terms, accept the license agreement and licensing information.

---

## Running the xlc\_configure utility directly

Use the xlc\_configure utility to configure an advanced installation if multiple versions of XL C/C++ or multiple versions of GCC are installed on your system.

### About this task

Take the following steps to run the xlc\_configure utility:

1. Change to the directory that contains the compiler executables:

```
cd installation_path/xlC/13.1.0/bin/
```

where *installation\_path* is the installation location of the compiler packages. If the compiler is installed in the default location, *installation\_path* is */opt/ibm/*. If the compiler has been installed to multiple, non-default locations, the new\_install utility can be found in *\$CMPpath/xlC/13.1.0/bin/*.

2. Run the following command:

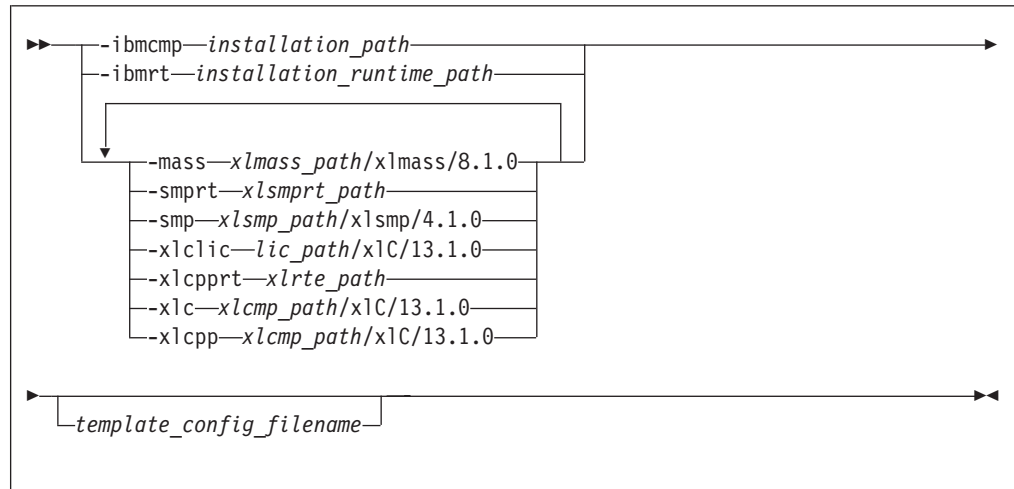
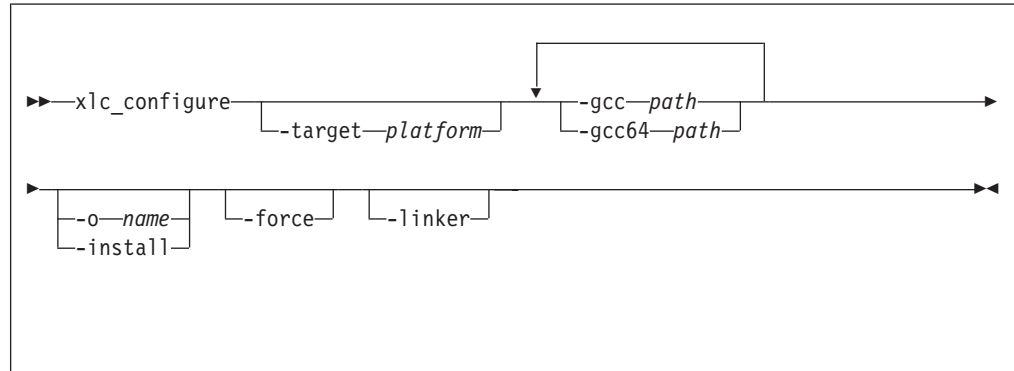
```
./xlc_configure options
```



For details about required arguments to the `xlc_configure` command, see “`xlc_configure` options.”

## `xlc_configure` options

The `xlc_configure` command has the following syntax:



where:

**-h** Displays the help page for the `xlc_configure` options.

**-target platform** Specifies the operating system platform. Valid names are:

- sles
- rhel

If you do not specify a value, the default is the one corresponding to the host operating system.

**-gcc path** Specifies the path where the native GCC bin/ directory is installed. For example, if the GCC command is `/usr/bin/gcc`, you can specify:

```
-gcc/usr
```

**-gcc64** *path*

Specifies the path where the native 64-bit GCC bin/ directory is installed. For example, if the 64-bit GCC command is /usr/bin/gcc -m64, you can specify:

-gcc64/usr

**-o** *file\_name*

Specifies the name of the configuration file to be generated. By default, output is written to the standard output only.

**-install**

Generates the default configuration file as *installation\_path*/xlc/13.1.0/etc/xlc.cfg.\$OSRelease.gcc\$gccVersion, where *\$OSRelease* is the level of the Operating System, and *\$gccVersion* is the GCC version installed on the system. For example, xlc.cfg.sles11.gcc432, or xlc.cfg.rhel6.4.gcc447. By default, output is written to the display only.

**Note:** *installation\_path* is the installation location of the compiler packages. If the compiler is installed in the default location, *installation\_path* is /opt/ibm/.

**-force** Forces the xlc\_configure utility to overwrite any existing output file with the same name and path as those that are specified by the **-o** or **-install** options. By default, if you do not use **-force**, xlc\_configure issues an error message and stops if the specified file already exists.

**-ibmcmp** *installation\_path*

Specifies the path where all of the IBM XL C/C++ for Linux packages except the runtime packages are installed (if all packages are installed in the same path). By default, the path is /opt/ibm/.

**-ibmrt** *installation\_runtime\_path*

Specifies the path where all of the IBM XL C/C++ for Linux runtime packages are installed. By default, the path is /opt/ibmcmp/.

**-mass** *xlmass\_path/xlmass/8.1.0/*

Specifies the path where the xlmass package is installed. By default, the full path is /opt/ibm/xlmass/8.1.0/.

**-smprt** *xlsmp\_path*

Specifies the path where the xlsmp.msg.rte and xlsmp.rte packages are installed. By default, the full path is /opt/ibmcmp/xlsmp/4.1/.

**-smp** *xlsmp\_path/xlsmp/4.1.0/*

Specifies the path where the libxlsmp-devel package is installed. By default, the full path is /opt/ibm/xlsmp/4.1.0/.

**-xlclic** *lic\_path/xlc/13.1.0/*

Specifies the path where the xlc-license package is installed. By default, the full path is /opt/ibm/xlc/13.1.0/lib/.

**-xlcpprt** *xlrte\_path*

Specifies the path where the vacpp.rte package is installed. By default, the full path is /opt/ibmcmp/vacpp/13.1/.

**-xlc** *xlcmp\_path/xlc/13.1.0/*

Specifies the C path where the xlc and libxlc-devel packages are installed. By default, the full path is /opt/ibm/xlc/13.1.0/.

**-xlcpp** *xlcmp\_path/xlc/13.1.0/*

Specifies the C++ path where the xlc and libxlc-devel packages are installed. By default, the full path is /opt/ibm/xlc/13.1.0/.

*template\_config\_file\_name*

The input file that is used to construct the configuration file. By default, this is `/opt/ibm/xlC/13.1.0/etc/xlc.base.cfg`. If you relocated the xlc package to *xlcmp\_path* but want to use the default template, specify:

`xlcmp_path/xlC/13.1.0/etc/xlc.base.cfg`



---

## Chapter 6. After installing IBM XL C/C++ for Linux, V13.1

After installing the compiler, you might need to follow the verification and setup procedures. These are documented in the following sections:

- Testing the installation: This section applies to all users.
- Enabling the man pages: This section applies to all users.
- Enabling the error messages: This section only applies to users whose system uses a locale or language encoding other than en\_US.
- Setting up the environment for the invocation commands: This section only applies to users who have not used `xlc_install` to install or update the product, or who have not created symbolic links during the installation process with `xlc_install`.
- Accessing the local documentation: This section applies to all users.
- Querying for installed packages: This section applies to all users.

---

### Testing the installation

To test the product installation and the critical search paths, build and run a sample application.

#### About this task

Take the following steps to build and run a “Hello World” application:

1. Create the following C program and name the source file `hello.c`:

```
#include <stdio.h>

int main(void)
{
    printf("Hello World!\n");
    return 0;
}
```

2. Compile the program:

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

```
xlc hello.c -o hello
```

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

```
installation_path/xlc/13.1.0/bin/xlc hello.c -o hello
```

where *installation\_path* is the installation location of the compiler packages. If the compiler has been installed to the default location, *installation\_path* is `/opt/ibm/`.

3. Run the program by entering the following command:

```
./hello
```

The result is "Hello World!".

4. Check the exit code of the program by entering the following command:

```
echo $?
```

The result is "0".

5. Create the following C++ program and name the source file `hello.cpp`:

```
#include <iostream>
using namespace std;

int main()
{
    cout << "Hello World!\n";
    return 0;
}
```

6. Compile the program:

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

```
xlc++ hello.cpp -o hello
```

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

```
installation_path/xlc/13.1.0/bin/xlc++ hello.cpp -o hello
```

where *installation\_path* is the installation location of the compiler packages. If the compiler has been installed to the default location, *installation\_path* is `/opt/ibm/`.

7. Run the program :

```
./hello
```

The result should be "Hello World!".

8. Check the exit code of the program:

```
echo $?
```

The result should be "0".

---

## Enabling utilization tracking

Utilization tracking can be used to detect whether the compiler usage exceeds your entitlement based on the number of Concurrent User licenses you have purchased.

Utilization tracking is disabled by default. You can enable it by modifying the entry **-qnoenabletracking** to **-qenabletracking** in the utilization tracking configuration file, `urtxlc_cpp1301linux.cfg`. Various other aspects of utilization tracking can also be specified in this file. In each installation of the compiler, there is a symlink named `urt_client.cfg` that points to the utilization tracking configuration file. You might need to change the symlink if you use a copy of the utilization tracking configuration file in a different location or if you use multiple copies of the file. For more information about utilization tracking, see *Configuring utilization tracking* in the *XL C/C++ Compiler Reference*.

---

## Enabling the man pages

Man pages are provided for the compiler invocation commands and other utilities that are supplied with the compiler.

The IBM XL C/C++ for Linux, V13.1 man pages support the following locales:

- `en_US`
- `en_US.utf8`
- `en_US.UTF-8`
- `ja_JP`
- `ja_JP.eucjp`

- ja\_JP.utf8
- ja\_JP.UTF-8
- zh\_CN
- zh\_CN.gb18030
- zh\_CN.gb2312
- zh\_CN.gbk
- zh\_CN.utf8
- zh\_CN.UTF-8

However, before you can read the compiler-supplied man pages, you must add the full directory path to the *MANPATH* environment variable. The command that accomplishes this depends on the Linux shell that you are using.

- To set the *MANPATH* environment variable using the Bourne, Korn, or BASH shell, use the following command:

```
export MANPATH=installation_path/xlc/13.1.0/man/LANG:$MANPATH
```

- To set the *MANPATH* environment variable using the C shell, use the following command:

```
setenv MANPATH installation_path/xlc/13.1.0/man/LANG:$MANPATH
```

where:

- *installation\_path* is the location where you have installed the XL C/C++ packages. By default, this is /opt/ibm/.
- *LANG* is any of the language locales as shown in the preceding list.

**Note:** To set this variable in the Bourne, Korn, or BASH shell so that it applies to all users, add the command to the file /etc/profile. To set it for a specific user only, add the command to the file .profile in the user's home directory. To set this variable in the C shell so that it applies to all users, add the command to the file /etc/csh.cshrc. To set it for a specific user only, add the command to the file .cshrc in the user's home directory. The environment variable is set each time the user logs in.

To test whether the manual pages have been successfully installed, open one or more of the manual pages as described in “Viewing the manual pages” on page 37.

---

## Enabling the error messages

If your system uses the en\_US locale and encoding, the compiler message catalogs are automatically configured to display correctly, regardless of whether you used the basic or advanced method of installation and configuration. However, if your system uses any other supported locale (for a list of supported language locales, see “National language support” on page 3), you must set the *NLSPATH* environment variable, so that the compiler and runtime functions can find the appropriate message catalogs after the installation.

The command to set the *NLSPATH* environment variable depends on the shell that you are using.

- If you are using the Bourne, Korn, or BASH shell, use the following command:

```
export NLSPATH=$NLSPATH:  
  xlsmp_path/msg/%L/%N:  
  xlrte_path/msg/%L/%N:  
  xlcmp_path/xlc/13.1.0/msg/%L/%N
```

- If you are using the C shell, use the following command:

```
setenv NLSPATH $NLSPATH:
    xlsmprrt_path/msg/%L/%N:
    xlrte_path/msg/%L/%N:
    xlcmp_path/xlC/13.1.0/msg/%L/%N
```

where:

- *xlsmprrt\_path* is the installation location of the SMP packages. By default, it is */opt/ibmcmp/*.
- *xlrte\_path* is the installation location of the IBM XL C/C++ for Linux, V13.1 runtime packages. By default, this is */opt/ibmcmp/*.
- *xlcmp\_path* is the installation location of the IBM XL C/C++ for Linux, V13.1 compiler packages. By default, this is */opt/ibm/*.

**Note:** To set this variable in the Bourne, Korn, or BASH shell so that it applies to all users, add the command to the file */etc/profile*. To set it for a specific user only, add the command to the file *.profile* in the user's home directory. To set this variable in the C shell so that it applies to all users, add the command to the file */etc/csh.cshrc*. To set it for a specific user only, add the command to the file *.cshrc* in the user's home directory. The environment variable is set each time the user logs in.

---

## Setting up the environment for the invocation commands

If you used the *xlc\_install* utility to install the compiler and you selected to create the symbolic links at that time, you have already set up the environment for the invocation commands. Do not perform the procedures in this section.

If you did not select to create the symbolic links when you installed the compiler and want to invoke the compiler without having to specify the full path, you must perform one of the following tasks:

- Set the *PATH* environment variable, as shown in “Setting the *PATH* environment variable to include the path to the compiler invocations.”
- Create symbolic links to the compiler invocation commands, as shown in “Creating symbolic links to the compiler invocations” on page 35.

## Setting the *PATH* environment variable to include the path to the compiler invocations

To use IBM XL C/C++ for Linux, V13.1 commands without typing the complete path, you can add the location of the compiler invocations to the *PATH* environment variable.

The command to set the *PATH* environment variable depends on the shell that you are using.

- If you are using the Bourne, Korn, or BASH shell, use the following command:  

```
export PATH=$PATH:installation_path/xlC/13.1.0/bin/
```
- If you are using the C shell, use the following command:  

```
setenv PATH $PATH:installation_path/xlC/13.1.0/bin/
```

where *installation\_path* is the location where you have installed the compiler packages. By default, this is */opt/ibm/*.

**Note:** To set this variable in the Bourne, Korn, or BASH shell so that it applies to all users, add the command to the file */etc/profile*. To set it for a specific user only, add the command to the file *.profile* in the user's home directory. To set this variable in the C shell so that it applies to all users, add the command to the file



/etc/csh.cshrc. To set it for a specific user only, add the command to the file .cshrc in the user's home directory. The environment variable is set each time the user logs in.

## Creating symbolic links to the compiler invocations

To use the compiler without typing the complete path, you can create symbolic links in the /usr/bin/ directory for the specific invocations that are contained in the *installation\_path*/xlc/13.1.0/bin/ directory.

If you have not already done so when you ran `xlc_install`, you can create the symbolic links for the following compiler invocations:

- `gxc`
- `gxc++`
- `gxlc`
- `xlc`
- `xlc++`
- `xlc`
- `xlc_r`
- `xlc++_r`
- `xlc_r`

Links to some invocations are not recommended, either because they delete user-defined or GCC invocations, or because they are not compiler invocation commands. These include the following commands:

- `c89`, `c89_r`, `c99`, `c99_r`, `cc`, `cc_r`
- `cleanpdf`, `mergepdf`, `new_install`, `resetpdf`, `showpdf`, `xlc_configure`

Enter the following command to create a symbolic link:

```
ln -s installation_path/xlc/13.1.0/bin/invocation /usr/bin/invocation
```

where:

- *installation\_path* is the location where you have installed the compiler packages. By default, this is /opt/ibm/.
- *invocation* is one of the compiler invocations (such as `xlc`) in *installation\_path*/xlc/13.1.0/bin/.

### Basic example: Creating a symbolic link to a compiler invocation

This example assumes that all of IBM XL C/C++ for Linux, V13.1 is installed in the default location /opt/ibm/.

```
ln -s /opt/ibm/xlc/13.1.0/bin/xlc /usr/bin/xlc
```

---

## Enabling IBM License Metric Tool (ILMT) and Tivoli Asset Discovery for Distributed (TADd)

IBM License Metric Tool (ILMT) and Tivoli® Asset Discovery for Distributed (TADd) can help you manage software usage metering and license allocation services on supported systems. In general, ILMT and TADd recognize and monitor the products that are installed and in use on your system.

**Note:** ILMT and TADd are not part of the IBM XL C/C++ for Linux offering, and must be ordered and installed separately.

Once installed and activated, ILMT and TADd scan your system for product inventory signatures that indicate whether a given product is installed on your system. ILMT and TADd also identify the version, release, and modification levels of the product. Inventory signature files are not updated after a PTF update package is installed.

ILMT and TADd, once deployed on a computer, collect information about the level and duration of IBM XL C/C++ for Linux compiler use on that computer and can generate reports based on the information it collects.

If IBM XL C/C++ for Linux is installed in the default location, the signature files are in the `/opt/ibm/xlC/13.1.0/properties/version/` directory. Otherwise, if IBM XL C/C++ for Linux is installed in a non-default location, the signature files are in the `$installation_path/xlC/13.1.0/properties/version/` directory, where `$installation_path` is the target directory for installation specified by `--prefix` option of the non-default installation command.

For more information, see IBM License Metric Tool and Tivoli Asset Discovery for Distributed.

---

## Accessing the local documentation

Help for IBM XL C/C++ for Linux, V13.1 is available in both HTML and PDF formats. Manual pages for the compiler invocation commands and other command utilities are also included.

### Viewing the HTML documentation

The product documentation is available in a fully searchable HTML-based Knowledge Center.

The Knowledge Center is viewable on the web at [http://www.ibm.com/support/knowledgecenter/SSXVZZ\\_13.1.0/com.ibm.compilers.linux.doc/welcome.html](http://www.ibm.com/support/knowledgecenter/SSXVZZ_13.1.0/com.ibm.compilers.linux.doc/welcome.html). You can also download a version of this information center containing the product documentation for IBM XL C/C++ for Linux, V13.1 and IBM XL Fortran for Linux, V15.1. This information center can be installed on any supported operating systems of IBM XL C/C++ for Linux, V13.1. It can be accessed with a web browser from the machine on which it is installed or from other computers on the same network.

#### Notes:

- You must have root access to launch and shut down the information center.
- The compressed information center package file is approximately 160 MB, and 220 MB when it is uncompressed.

Follow these steps to download the help system:

1. Go to the XL C/C++ compiler library page at <http://www.ibm.com/support/docview.wss?uid=swg27036675>. Download the information center package file `XLHelp-v131-v151-LINUX-64bit.tar.Z` from the download link on this page.
2. Extract the package on your machine. Run the following command to extract the files to a new directory at `./xlhelp`:  

```
zcat XLHelp-v131-v151-LINUX64.tar.Z | tar -xf -
```
3. Enter the new directory.  

```
cd ./xlhelp
```
4. You can review the licence information in the following two files:

- license.pdf
  - LicenseAgreement.pdf
5. Start the information center by running the following command:  
`./xlhelp &`
  6. You can access the information center either locally or remotely. You need to have a web browser installed on your machine to view the information center.
    - To access the information center locally, use this URL:  
`http://localhost:1315/help/index.jsp`
    - To access the information center remotely, use this URL:  
`http://machine_name:1315/help/index.jsp`  
 where *machine\_name* is the name of the computer on which the Eclipse server has been launched.
  7. To stop the information center, run this command:  
`./xlhelp_end`
  8. To remove the information center, you must first stop the information center, and remove the extracted directory `./xlhelp` using the following command:  
`rm -r ./xlhelp`

## Viewing the PDF documentation

PDF versions of the IBM XL C/C++ for Linux, V13.1 product manuals are available in the `/doc/$LANG/pdf/` directory of the installation media (either product CD or electronic package).

After default installations, the PDF documentation can be found in the `/opt/ibm/xlC/13.1.0/doc/$LANG/pdf/` directory. For nondefault installations, the PDF documentation is located in the `/installation_path/xlC/13.1.0doc/$LANG/pdf/` directory. `$LANG` can be `en_US`, `ja_JP`, or `zh_CN`.

## Viewing the manual pages

Man pages are included for all compiler invocation commands and utilities.

For instructions about how to enable the man pages for viewing, see “Enabling the man pages” on page 32.

To invoke a manual page, enter the following command:

```
man command
```

Example:

```
man xlc
```

---

## Querying for installed packages

To determine the Version.Release.Modification.Fix-Build level of a package, query for it using the `rpm` command.

### About this task

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

```
rpm -q xlc
```

The result is:

`xlc.V.R.M-V.R.M.F-B`

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

**Note:** The C++ runtime package and SMP runtime package still use `V.R.M.F-B` in the package names for backward compatibility.

If the installation was not successful, you will get a message indicating that the package has not been installed.

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

```
rpm -qa | grep -e xlc -e vacpp -e xlsmp -e xlmass
```

The result is a list containing all of the packages as shown in Table 5 on page 2. If none of the packages was properly installed, there will be no output from the command.

For more information about the `rpm` command, see the installation information in the Linux documentation at:

- Red Hat Enterprise Linux documentation page: [https://access.redhat.com/site/documentation/Red\\_Hat\\_Enterprise\\_Linux/](https://access.redhat.com/site/documentation/Red_Hat_Enterprise_Linux/)
- SUSE documentation page: <https://www.suse.com/documentation/>

---

## Chapter 7. Uninstalling IBM XL C/C++ for Linux, V13.1

IBM XL C/C++ for Linux, V13.1 does not provide a stand-alone uninstallation tool. You must use the Linux rpm utility to uninstall IBM XL C/C++ for Linux, V13.1.

### Notes:

- You must have root access to uninstall the compiler.
- Whenever you uninstall a package, specify the *V.R.M-V.R.M.F-B* (Version.Release.Modification-Version.Release.Modification.Fix-Build level) of the package. For information about how to determine the package's *V.R.M-V.R.M.F-B*, see “Querying for installed packages” on page 37.
- Always uninstall packages in the reverse order in which they have been installed, that is, the last package that has been installed is the first package that you remove.

**Note:** The C++ runtime package and SMP runtime package still use *V.R.M.F-B* in the package names for backward compatibility.

- You cannot uninstall packages that are required by other packages. For example, `libxlc-devel` is a shared component if IBM XL Fortran for Linux, V15.1 is also installed on the same system.
- The uninstallation commands do not remove any configuration files that have been generated by the `new_install` or `xlc_configure` utility.

---

### Example: Uninstalling IBM XL C/C++ for Linux, V13.1

When uninstalling XL C/C++, you must remove many of the packages in a specific order to avoid dependency errors.

In this example:

- The compiler packages have a *V.R.M-V.R.M.F-B* of 13.1.0-13.1.0.0-*\$B*.
- The IBM MASS library package has a *V.R.M-V.R.M.F-B* of 8.1.0-8.1.0.0-*\$B*.
- The IBM SMP library packages have a *V.R.M-V.R.M.F-B* of 4.1.0-4.1.0.0-*\$B*.

### Notes:

- *\$B* is the build number of the package that is currently installed on your system.
- The C++ runtime package and SMP runtime package still use *V.R.M.F-B* in the package names.

To uninstall IBM XL C/C++ for Linux, V13.1, take the following steps:

1. Issue the following commands in the order given below to uninstall those C or C++ specific packages.

```
rpm -e xlc.13.1.0-13.1.0.0-$B
rpm -e libxlc-devel.13.1.0-13.1.0.0-$B
rpm -e xlc-license.13.1.0-13.1.0.0-$B
rpm -e vacpp.rte-13.1.0.0-$B
```

**Note:** If you want to uninstall XL Fortran at the same time when uninstalling XL C/C++, uninstall all XL Fortran specific packages before proceeding. For a

complete list of XL Fortran specific packages and the order in which they must be uninstalled, see "Example: Uninstalling IBM XL Fortran for Linux, V15.1" in the *XL Fortran Installation Guide*.

2. Optional: If you have XL Fortran installed on your system, and want it to continue to function normally, do *not* uninstall the following packages. Otherwise, uninstall them in the order given below.

```
rpm -e libxlmass-devel.8.1.0-8.1.0.0-$B
rpm -e libxlsmp-devel.4.1.0-4.1.0.0-$B
rpm -e xlsmp.rte-4.1.0.0-$B
rpm -e xlsmp.msg.rte-4.1.0.0-$B
```

---

## Chapter 8. Troubleshooting the installation and configuration

The compiler generates messages to help you recognize and respond to error conditions. This section provides recommended responses.

At the beginning of the installation process, the installation utility creates a new log file in `/tmp/`. The temporary log files are uniquely named.

After the installation is completed successfully, the log file is moved to the default installation location for future reference. If the installation fails, the installation log is in the `/tmp/` directory. Regardless of whether the installation succeeds or fails, the file name of the corresponding installation log is displayed as part of the standard output.

Use the information in this section to help you respond to any problems you may encounter when you install and configure IBM XL C/C++ for Linux, V13.1.

---

### The specified directory `rpmlocation_path` does not exist.

#### Scenario

You are running the `xlc_install` utility to install the compiler to the default location when you get the following error message:

```
ERROR: The specified directory, "rpmlocation_path", does not exist.
```

#### Action

Ensure that you have specified the location of the existing compiler packages correctly. You might need to use the `-rpmloc rpmlocation_path` option if you moved the `xlc_install` utility to a different location than the one provided in the installation image. For more information, see “`xlc_install` options” on page 12.

---

### `rpmlocation_path` does not contain . . .

#### Scenario

You are running the `xlc_install` utility to install the compiler to the default location when you get the following error message:

```
ERROR: rpmlocation_path does not contain all of the RPM packages for the XL compiler.
```

#### Action

Before running the `xlc_install` utility again, ensure you have all of the packages listed in Table 5 on page 2 in the path. You might need to use the `-rpmloc rpmlocation_path` option if you have moved the `xlc_install` utility to a different location than the one provided in the installation image. For more information, see “`xlc_install` options” on page 12.





---

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# Index

## A

- advanced installation
  - example 18
  - overview 13
  - procedures 15
- advanced user, described v
- available space, determining 6

## B

- basic example, described ix
- basic installation
  - overview 9
  - procedure 10
- basic user, described v

## C

- co-residency
  - compilers 15
- configuration files
  - backup 25
  - customizing 25, 26
  - default 28
  - editing 26
  - generation 12, 28
  - modifying 25, 26
  - multiple 25
  - overwriting 28
  - renaming 28
  - security 39

## D

- debugging 41
- default installation 9
- documentation
  - man pages 37

## E

- environment variable 34
- error messages 33

## G

- GNU packages
  - required 4
  - verifying 6

## H

- hard disk space
  - required 4
  - verifying 6
- hardware requirements 4
- help 36
  - displaying 12

- help (*continued*)
  - html 36
  - man pages 32
  - pdf 37

## I

- IBM License Acceptance Process tool 19
- IBM License Metric Tool 35
- ILMT 35
- installation
  - multiple versions 13, 15
  - options 12
  - package location 16, 17
  - PTFs, multiple versions of 17
  - specialized 17
  - testing 31
- installation CD 2
- installation image 2
- installation log 41
- installation utility
  - options 12
  - using 21
- invocation commands 34

## L

- languages 3
- LAP 19
- locales 3

## M

- man pages 32
  - viewing 37

## N

- national language support 3
- nondefault installation 13

## O

- operating systems, supported 4

## P

- packages
  - installation 2
  - not found 41
  - querying 37
- PATH environment variable 34
- Perl packages
  - required 4
  - verifying 6
- preinstallation 2
- PTF 21

## Q

- querying
  - installed packages 37
  - RPM file summaries 19

## R

- Red Hat Package Manager (RPM) 2

## S

- software requirements 4
- symbolic links 10
  - creating 35

## T

- TADd 35
- temporary files
  - installation log 41
- testing
  - installation 31
  - PTF 22
- Tivoli Asset Discovery for Distributed 35

## U

- uninstallation
  - example 39
  - overview 39
- updates
  - applying 22
  - installation utility option 12
  - overview 21
  - prerequisites 23
  - steps 23
  - to a nondefault location 22
  - trying out 16, 22

## V

- verifying
  - GNU and Perl packages 6
  - hard disk space 6







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