

IBM XL C/C++ for Blue Gene/Q, V12.1



# Installation Guide

*Version 12.1*



IBM XL C/C++ for Blue Gene/Q, V12.1



# Installation Guide

*Version 12.1*

**Note**

Before using this information and the product it supports, read the information in “Notices” on page 41.

**First edition**

This edition applies to IBM XL C/C++ for Blue Gene/Q, V12.1 (Program 5799-AG1) 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.

© Copyright IBM Corporation 2003, 2012.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

---

# 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	xii
Technical support	xii
How to send your comments	xii

## Chapter 1. Before installing IBM XL C/C++ for Blue Gene/Q, V12.1 . . . . . 1

The installation image and packages	1
System prerequisites	3
Blue Gene/Q tool chain	5
Verifying the amount of hard disk space available	5
Verifying that the required GNU and Perl packages are installed	5
Previewing the license agreements	6

## Chapter 2. Basic installation . . . . . 7

Tasks for basic installation	7
Running the xlc_install utility for a new installation	8
xlc_install options	10

## Chapter 3. Advanced installation . . . . . 11

Tasks for advanced installation	11
Installing XL C/C++ to co-reside with earlier versions	12
Installing XL C/C++ to the same location as an earlier version	13
Installing XL C/C++ to a location separate from earlier versions	14
Querying for RPM package summaries	17

## Chapter 4. Installing an update . . . . . 19

Tasks for update installation.	19
Testing a PTF before you install it	20
Updating a basic installation using the xlc_install utility	20
Updating an advanced installation.	22

## Chapter 5. Configuring IBM XL C/C++ for Blue Gene/Q, V12.1 (for advanced users) . . . . . 23

Running the new_install utility	24
Running the vac_configure utility directly	24
vac_configure options.	25

## Chapter 6. After installing IBM XL C/C++ for Blue Gene/Q, V12.1 . . . . . 29

Testing the installation.	29
Enabling the man pages	30
Enabling the error messages.	31
Setting up the environment for the invocation commands.	32
Setting the <i>PATH</i> environment variable to include the path to the compiler invocations	32
Creating symbolic links to the compiler invocations	33
Enabling IBM License Metric Tool (ILMT) and Tivoli Asset Discovery for Distributed (TADd)	33
Accessing the local documentation	34
Viewing the HTML documentation	34
Viewing the PDF documentation	34
Viewing the manual pages	34
Querying for installed packages	34

## Chapter 7. Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1 . . . . . 37

Example: Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1	37
---	----

## Chapter 8. Troubleshooting the installation and configuration . . . . . 39

The specified directory <i>rpmlocation_path</i> does not exist.	39
<i>rpmlocation_path</i> does not contain . . . . .	39

## Notices . . . . . 41

Trademarks and service marks	43
------------------------------	----

## Index . . . . . 45



---

## About this information

This guide provides detailed installation instructions for IBM® XL C/C++ for Blue Gene®/Q, V12.1. 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. Please also read the README file in the root directory of your installation media, which contains current information about the compiler.

---

## Who should read this document

This document is intended for anyone responsible for installing IBM XL C/C++ for Blue Gene/Q, V12.1.

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*.

---

## 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 7.

### "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 11.

### "Update" installation

This scenario applies to users who have obtained a Program Temporary Fix (PTF) package for an existing XL C/C++ V12.1 installation.

For an overview of the steps required to install a PTF, refer to Chapter 4, "Installing an update," on page 19.

For highly specialized installation scenarios that are outside the scope of this document, refer to the Technotes at <http://www.ibm.com/software/awdtools/xlcpp/features/bg/>.

---

## 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 Blue Gene/Q, V12.1," on page 1	All users
Installation	Chapter 2, "Basic installation," on page 7	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 11	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 19	Users who want to update XL C/C++ V12.1 to the next fix level
	Chapter 6, "After installing IBM XL C/C++ for Blue Gene/Q, V12.1," on page 29	All users
Product removal	Chapter 7, "Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1," on page 37	Any user who needs to remove an XL C/C++ compiler from the system

---

## Conventions

### Typographical conventions

The following table shows the typographical conventions used in the IBM XL C/C++ for Blue Gene/Q, V12.1 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>bgxlc</b> and <b>bgxlc</b> ( <b>bgxlc++</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: bgx1c myprogram.c -03.

## 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  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++  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 begins  IBM  IBM extension ends	The text describes a feature that is an IBM extension to the standard language specifications.
C1X, or C1X begins  C1X  C1X ends	The text describes a feature that is introduced into standard C as part of C1X.
C++0x, or C++0x begins  C++0x  C++0x ends	The text describes a feature that is introduced into standard C++ as part of C++0x.

## 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.

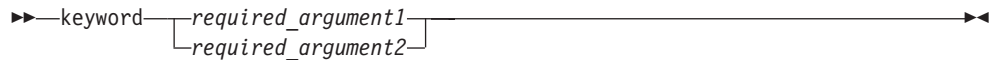
- Required items are shown on the horizontal line (the main path):



- 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.

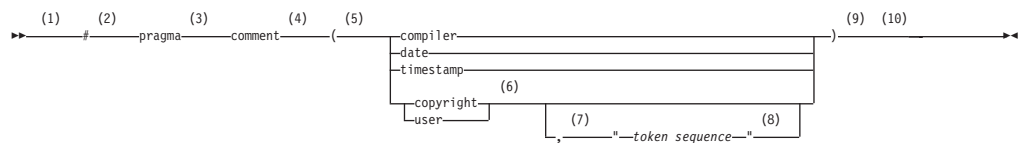


- Keywords are shown in nonitalic letters and should be entered exactly as shown.

- 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.

---

## 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 Blue Gene/Q, V12.1 Installation Guide*.

- Information center

The information center of searchable HTML files can be launched on a network and accessed remotely or locally. Instructions for installing and accessing the online information center are provided in the *IBM XL C/C++ for Blue Gene/Q, V12.1 Installation Guide*.

The information center of searchable HTML files is viewable on the web at <http://pic.dhe.ibm.com/infocenter/compbg/v121v141/index.jsp>.

- PDF documents

PDF documents are located by default in the `/opt/ibmcmp/vacpp/bg/12.1/doc/en_US/pdf/` directory. The PDF files are also available on the web at <http://www.ibm.com/software/awdtools/xlcpp/features/bg/library/>.

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 Blue Gene/Q, V12.1 Installation Guide, GC14-7362-00</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 Blue Gene/Q, V12.1, GC14-7361-00</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 Blue Gene/Q, V12.1 Compiler Reference, GC14-7363-00</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 Blue Gene/Q, V12.1 Language Reference, GC14-7364-00</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 Blue Gene/Q, V12.1 Optimization and Programming Guide, SC14-7365-00</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 the Adobe Reader. If you do not have the 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, and other articles, is available on the web at:

<http://www.ibm.com/software/awdtools/xlcpp/features/bg/library/>

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 14882:1998*, also known as C++98.
- *Information Technology - Programming languages - C++, ISO/IEC 14882:2003(E)*, also known as *Standard C++*.
- *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>.
- *ANSI/IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE Std 754-1985*.
- *OpenMP Application Program Interface Version 3.1*, available at <http://www.openmp.org>

## Other IBM information

- *Blue Gene/Q Hardware Overview and Installation Planning, SG24-7872*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/sg247872.html?Open>
- *Blue Gene/Q Hardware Installation and Maintenance Guide, SG24-7974*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/sg247974.html?Open>
- *Blue Gene/Q High Availability Service Node, REDP-4657*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/redp4657.html?Open>
- *Blue Gene/Q System Administration, SG24-7869*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/sg247869.html?Open>
- *Blue Gene/Q Application Development, SG24-7948*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/sg247948.html?Open>
- *Blue Gene/Q Code Development and Tools Interface, REDP-4659*, available at <http://www.redbooks.ibm.com/redpieces/abstracts/redp4659.html?Open>

## Other information

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

---

## Technical support

Additional technical support is available from the XL C/C++ Support page at <http://www.ibm.com/software/awdtools/xlcpp/features/bg/support/>. 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/awdtools/xlcpp/features/bg/>.

---

## 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 information, the part number of the information, 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 Blue Gene/Q, V12.1

This installation guide covers IBM XL C/C++ for Blue Gene/Q, V12.1. The term IBM XL C/C++ for Blue Gene/Q, V12.1 refers to the Blue Gene/Q compiler.

You must install IBM XL C/C++ for Blue Gene/Q, V12.1 on the Blue Gene/Q Front End Node. If you use an I/O Node to log in and compile Blue Gene/Q programs, you must install the compiler both on the Front End Node and I/O Node.

Before you install IBM XL C/C++ for Blue Gene/Q, V12.1, perform 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.

### 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 7. It uninstalls the evaluation copy and then installs the full product version.
- Install only the `vac.bg.lic` RPM packages for the full product version of the XL C/C++ compiler and run `vac_configure` to re-configure the compiler.

---

## The installation image and packages

The installation image for IBM XL C/C++ for Blue Gene/Q, V12.1 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.

### Installation packages

Table 5 on page 2 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 its file list, enter the following `rpm` query 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 15.

*Table 5. IBM XL C/C++ for Blue Gene/Q, V12.1 packages and default installation locations*

Package name	Package description	Default installation location
xlsmp.bg.msg.rte*	IBM SMP messages package	/opt/ibmcmp/msg/bg/
xlsmp.bg.rte*	IBM SMP runtime package	/opt/ibmcmp/lib/bg/ /opt/ibmcmp/lib64/bg/
xlsmp.bg.samples	IBM POMP samples package	Any location (optional)
xlsmp.bg.lib	IBM SMP static library package	/opt/ibmcmp/xlsmp/bg/3.1/
xlmass.bg.lib	IBM Mathematical Acceleration Subsystem (MASS) package (Not redistributable)	/opt/ibmcmp/xlmass/bg/7.3/
vacpp.bg.rte*	IBM XL C/C++ runtime package	/opt/ibmcmp/lib/bg/ /opt/ibmcmp/lib64/bg/
vacpp.bg.rte.lnk	IBM XL C/C++ runtime links package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/
vac.bg.lic	IBM XL C/C++ license package (Not redistributable)	/opt/ibmcmp/vac/bg/12.1/
vac.bg.lib	IBM XL C libraries package	/opt/ibmcmp/vac/bg/12.1/lib /opt/ibmcmp/vac/bg/12.1/lib64/
vac.bg.cmp	IBM XL C compiler package (Not redistributable)	/opt/ibmcmp/vac/bg/12.1/
vacpp.bg.lib	IBM XL C++ libraries package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/lib /opt/ibmcmp/vacpp/bg/12.1/lib64
vacpp.bg.cmp	IBM XL C++ compiler package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/
vacpp.bg.samples	IBM XL C/C++ ANSI class library samples package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/samples/
vacpp.bg.help.pdf	IBM XL C/C++ Help PDF documentation package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/doc/ /



Table 5. IBM XL C/C++ for Blue Gene/Q, V12.1 packages and default installation locations (continued)

Package name	Package description	Default installation location
vacpp.bg.man	IBM XL C/C++ man pages package (Not redistributable)	/opt/ibmcmp/vacpp/bg/12.1/man/

**Note:** /opt/ibmcmp is the default prefix for installation of images.

## Runtime environment

To run the Blue Gene/Q programs compiled by IBM XL C/C++ for Blue Gene/Q, V12.1, your system must be able to access the installed images of the compiler runtime environment.

- If you do not have an I/O node, you must copy the runtime packages, including the shared libraries and message catalogues (marked with an asterisk (\*) in Table 5 on page 2), to the /bgsys/linux/addpkgs folder. The shared libraries and message catalogues must be consistent with the XL compiler that is installed under the Front End node.
- If you use an I/O node to log in and compile Blue Gene/Q programs, you must copy the full set of runtime packages to the /bgsys/linux/addpkgs folder.

After the runtime packages have been updated, you must run the following script so that the updated packages are combined into the image that is used to start the I/O node:

```
/bgsys/drivers/ppcfloor/ramdisk/tool/bgqDistrofsPostInstall.sh -a
```

## National language support

IBM XL C/C++ for Blue Gene/Q, V12.1 messages support the following language locales:

- en\_US
- en\_US.utf8

English is the default national language and en\_US is the default locale. To enable the error messages for en\_US.utf8, see “Enabling the error messages” on page 31. Following installation, you can set the NLSPATH so that messages are displayed in a different language. See “Enabling the error messages” on page 31.

---

## System prerequisites

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

The following are the requirements for installing IBM XL C/C++ for Blue Gene/Q, V12.1:

- **Operating system:**

On the Blue Gene/Q Front End node, you can use the Red Hat Enterprise Linux 6.2 (RHEL 6.2) operating system, which is supported by the IBM Power® System servers.

- **Hardware:**

You can use any of the IBM Power Systems™ servers 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 5.

- **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 5

- Blue Gene®/Q tool chain and runtime environment packages. For information on these packages, see the redbooks referenced in the preface of this document, or contact your system administrator.
- GNU and Perl packages, as listed in the following tables. To verify that the required packages are installed, see “Verifying that the required GNU and Perl packages are installed” on page 5.

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

*Table 6. Required GNU and Perl packages for the RHEL 6.2 operating system*

Package name	Version requirements
gcc	4.4.5
gcc-c++	4.4.5
glibc*	2.12
glibc-devel*	2.12
libgcc*	4.4.5
libstdc++*	4.4.5
libstdc++-devel*	4.4.5
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 6.2 operating system.

**Note:** The 32-bit libraries are not installed by default on RHEL 6.2, they must be installed from the RHEL 6.2 operating system image.

To view the documentation that is packaged with IBM XL C/C++ for Blue Gene/Q, V12.1, 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)
- PDF viewer (to access PDF documentation)

## Blue Gene/Q tool chain

IBM XL C/C++ for Blue Gene/Q, V12.1 requires the Blue Gene/Q tool chain for cross-compilations.

The Blue Gene/Q tool chain default path is `/bgsys/drivers/ppcfloor`.

It is recommended that you install the tool chain to the default directory.

If the tool chain is not installed on your system, you will be able to complete the installation of IBM XL C/C++ for Blue Gene/Q, V12.1, however, configuration will fail.

## Verifying the amount of hard disk space available

IBM XL C/C++ for Blue Gene/Q, V12.1 requires about 300 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/ibmcmp/`):

```
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 Blue Gene/Q, V12.1, 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 a list of the required packages, see “System prerequisites” on page 3.

For lists of the required packages and version requirements for the supported Linux distribution, see Table 6 on page 4.

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 4.1.2 is installed, you will get a result similar to the following output:

```
gcc-c++-4.1.2-42.el5
```

---

## Previewing the license agreements

Before installing IBM XL C/C++ for Blue Gene/Q, V12.1, 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/ibmcmp/vacpp/bg/12.1/` directory with the same names as above.

---

## Chapter 2. Basic installation

IBM XL C/C++ for Blue Gene/Q provides an interactive utility, `xlc_install`, that walks you through a basic installation. You can use `xlc_install` to:

- Install IBM XL C/C++ for Blue Gene/Q, V12.1 on a system where no IBM XL compiler is currently installed.
- Replace an earlier version of XL C/C++ with IBM XL C/C++ for Blue Gene/Q, V12.1.
- Install IBM XL C/C++ for Blue Gene/Q, V12.1 to co-reside with an existing and lower version of XL C/C++ for Blue Gene/Q.
- Install IBM XL C/C++ for Blue Gene/Q, V12.1 on a system where IBM XL Fortran for Blue Gene/Q, V14.1 is already installed.

In this case, both compilers will use the IBM MASS library provided with IBM XL C/C++ for Blue Gene/Q, V12.1.

For information about installing IBM XL Fortran for Blue Gene/Q, V14.1 refer to the *IBM XL Fortran for Blue Gene/Q, V14.1 Installation Guide*.

- Install an update on a system where IBM XL C/C++ for Blue Gene/Q, V12.1 has already been installed.

In this case, use the procedure in “Updating a basic installation using the `xlc_install` utility” on page 20.

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 Blue Gene/Q, V12.1 with `xlc_install` utility on a system as long as *all* of the following conditions apply:

- You are installing the compiler to the default location, `/opt/ibmcomp/`.
- You are maintaining a single version of the product on your system.
- The Blue Gene/Q tool chain is installed in the default location, `/bgsys/drivers/ppcfloor`.

If any of these conditions does not apply, use the procedures in Chapter 3, “Advanced installation,” on page 11.

---

### 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 automatically uninstall any previously installed IBM XL C/C++ for Blue Gene/Q compiler, install the latest version, and configure the compiler, all through the use of a single installation tool.

Table 7. 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 3
Uninstall any previously installed packages of the same product type.	"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 34</li> <li>• "Testing the installation" on page 29</li> </ul>
Enable the compiler man pages.	"Enabling the man pages" on page 30
If your system locale is <i>not</i> en_US, enable the compile-time error messages for en_US.utf8your locale. Otherwise, you can skip this step.	"Enabling the error messages" on page 31
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 32

## 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 5.

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

- Checks for all prerequisite software packages
- Checks for the existence of the Blue Gene/Q tool chain in the default location
- Uninstalls any previously installed XL C/C++ for Blue Gene/Q components
- Installs all compiler packages into the default location, /opt/ibmcomp/
- 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 Blue Gene/Q, V12.1:

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 10.

- If another instance of IBM XL C/C++ for Blue Gene/Q is detected on your system, you are prompted to uninstall it. Confirm that you want to proceed with the uninstallation. If you choose not to uninstall the existing instance of the compiler, 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 Blue Gene/Q, V14.1, 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 and licensing information 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 32.

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

- `bgxlc`
- `bgxlc++`
- `bgxlC`
- `bgxlc_r`
- `bgxlc++_r`
- `bgxlC_r`

For more information on other specialized invocations that may be available, please refer to *IBM XL C/C++ for Blue Gene/Q, V12.1 Compiler Reference, “Invoking the compiler”*.

**Note:** Some command links are not created in `/usr/bin/`, either because they might delete user-defined, XL C/C++ for Linux or GCC-related invocations, or because they are not compiler invocation commands. They are `new_install`, `vac_configure`.

If all packages are successfully installed:

- A message is displayed confirming the successful installation.

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

- The configuration file is generated. Its location is `/opt/ibmcmp/vac/bg/12.1/etc/vac.cfg.$OSRelease.gcc$gccVersion`. For example, `/opt/ibmcmp/vac/bg/12.1/etc/vac.cfg.sles11.gcc432` or `/opt/ibmcmp/vac/bg/12.1/etc/vac.cfg.rhel6.2.gcc446`.
- The installation log is moved to its permanent location: `vacpp/bg/12.1/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. If *installation\_path* is not under the default install location `/opt/ibmcmp/`, it must be a directory under the root path `/bgsys/xlcompilers`.

**Note:** If this option is not used, the default installation location is `/opt/ibmcmp/`.

**-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 electronic image, it will automatically determine the source location of the packages.

**Note:** Normally, the `-rpmloc rpmlocation_path` option is not required in the installation invocation. If you use the utility directly from the CD, 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 20

**-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 Blue Gene/Q, V12.1 to the default location and use the procedure provided in Chapter 2, “Basic installation,” on page 7.

- You want to maintain more than one version of IBM XL C/C++ for Blue Gene/Q on the same system.
- You want to upgrade or update an existing version of IBM XL C/C++ for Blue Gene/Q 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.
- The Blue Gene/Q tool chain is installed in the default location, /bgsys/drivers/ppcfloor.

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. This nondefault location must be under the root directory /bgsys/xlcompilers. 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 vac\_configure utility. For configuration procedures, see Chapter 5, “Configuring IBM XL C/C++ for Blue Gene/Q, V12.1 (for advanced users),” on page 23.

---

### 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 8. 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 Blue Gene/Q .	Chapter 7, “Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1,” on page 37
Ensure that all system prerequisites are satisfied.	“System prerequisites” on page 3
Install IBM XL C/C++ for Blue Gene/Q, V12.1.	“Installing XL C/C++ to the same location as an earlier version” on page 13
Use the vac_configure tool to configure the compiler.	“Running the vac_configure utility directly” on page 24
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 34</li><li>• “Testing the installation” on page 29</li></ul>
Enable the compiler man pages.	“Enabling the man pages” on page 30

Table 8. Steps for installing to the same location as an earlier version (continued)

Task	Further information
If your system locale is <i>not</i> en_US, enable the compile-time error messages for en_US.utf8your locale. Otherwise, you can skip this step.	"Enabling the error messages" on page 31
Optional: Set up the environment to locate the invocation commands without the full path.	"Setting up the environment for the invocation commands" on page 32

If you want to install IBM XL C/C++ for Blue Gene/Q, V12.1 to a nondefault location, separate from any other versions of XL C/C++ on the same system, follow the steps in this table.

Table 9. 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 Blue Gene/Q.	Chapter 7, "Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1," on page 37
Ensure that all system prerequisites are satisfied.	"System prerequisites" on page 3
Install IBM XL C/C++ for Blue Gene/Q, V12.1.	"Installing XL C/C++ to a location separate from earlier versions" on page 14
Use the new_install or vac_configure tool to configure the compiler.	Chapter 5, "Configuring IBM XL C/C++ for Blue Gene/Q, V12.1 (for advanced users)," on page 23
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 34</li> <li>• "Testing the installation" on page 29</li> </ul>
Enable the compiler man pages.	"Enabling the man pages" on page 30
If your system locale is <i>not</i> en_US, enable the compile-time error messages for en_US.utf8your locale. Otherwise, you can skip this step.	"Enabling the error messages" on page 31
Optional: Set up the environment to locate the invocation commands without the full path.	"Setting up the environment for the invocation commands" on page 32

## 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 must use the rpm utility to perform an advanced installation.

To install IBM XL C/C++ for Blue Gene/Q, V12.1 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 Blue Gene/Q over the long term.

Multiple versions of IBM XL C/C++ for Blue Gene/Q 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 Blue Gene/Q, V12.1 in a separate location from all other versions of IBM XL C/C++ for Blue Gene/Q. To do so, follow one of the procedures in “Installing XL C/C++ to a location separate from earlier versions” on page 14.

## 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 Blue Gene/Q, V12.1 and update the runtime packages used by an existing version of IBM XL C/C++ for Blue Gene/Q, V9.0 in the same location.

This procedure assumes the following:

- You are installing IBM XL C/C++ for Blue Gene/Q, V12.1 to a location where IBM XL C/C++ for Blue Gene/Q, V9.0 has already been installed (by default, `/opt/ibmcmp/`).
- Your current working directory contains all IBM XL C/C++ for Blue Gene/Q, V12.1 packages, and no other RPM packages.
- The existing runtime component versions listed in Table 10 are installed in the same installation location (by default, `/opt/ibmcmp/`).

Table 10. XL C/C++ SMP and runtime packages

Existing XL C/C++ V9.0 runtime packages	New XL C/C++ V12.1 runtime packages
<code>xlsmp.bg.msg.rte-1.7.0.\$F-\$B</code>	<code>xlsmp.bg.msg.rte-3.1.0.0-\$B</code>
<code>xlsmp.bg.rte-1.7.0.\$F-\$B</code>	<code>xlsmp.bg.rte-3.1.0.0-\$B</code>
<code>xlsmp.bg.lib-1.7.0.\$F-\$B</code>	<code>xlsmp.bg.lib-3.1.0.0-\$B</code>
<code>vacpp.bg.rte-9.0.0.\$F-\$B</code>	<code>vacpp.bg.rte-12.1.0.0-\$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 Blue Gene/Q, V12.1, and update the IBM XL C/C++ for Blue Gene/Q, V9.0 XL SMP and runtime packages:

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

```
rpm -e vacpp.bg.rte-9.1.0.0-$B --nodeps
rpm -e xlsmp.bg.lib-1.7.0.0-$B --nodeps
rpm -e xlsmp.bg.rte-1.7.0.0-$B --nodeps
rpm -e xlsmp.bg.msg.rte-1.7.0.0-$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 Blue Gene/Q, V12.1, issue the following command:

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

3. As a precaution, make a backup copy of any existing configuration file.
4. Modify any existing IBM XL C/C++ for Blue Gene/Q, V9.0 configuration file to use the new configuration path:

```
sed -e "s/xlsmpl/1\7/xlsmpl/3\1/g"
< /etc/opt/ibmcmp/vac/bg/9.0/vac.cfg >
/etc/opt/ibmcmp/vac/bg/9.0/vac.cfg.new
mv /etc/opt/ibmcmp/vac/bg/9.0/vac.cfg.new
/etc/opt/ibmcmp/vac/bg/9.0/vac.cfg
```

**Note:** The IBM XL C/C++ for Blue Gene/Q, V9.0 path does not change.

5. Generate the default IBM XL C/C++ for Blue Gene/Q, V12.1 configuration file:

```
installation_path/vacpp/bg/12.1/bin/vac_configure -gcc /usr -gcc64 /usr
-ibmcmp installation_path/ installation_path/vac/bg/12.1/etc/vac.base.cfg
-o installation_path/vac/bg/12.1/etc/vac.cfg.$OSRelease.gcc$gccVersion
```

where *installation\_path* is the location in which all IBM XL C/C++ for Blue Gene/Q, V12.1 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, vac.cfg.sles11.gcc432, or vac.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. However, this location has to be under the root directory /bgsys/xlcompilers. For example, rather than installing all packages into the default directory /opt/ibmcmp/, you could install them to a directory such as /bgsys/xlcompilers/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, all of these locations must be under the root directory /bgsys/xlcompilers, and 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 15.

### 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 `xl_c_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
./xl_c_install -prefix installation_path
```

For additional arguments that you can specify for `xlc_install`, see “`xlc_install` options” on page 10.

- Use the `rpm` utility. Ensure that your current working directory contains all of the packages for IBM XL C/C++ for Blue Gene/Q, V12.1 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 under the root directory `/bgsys/xlcompilers`.

## 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/ibmcmp/` directory.

Table 11 provides information about which packages must be installed together in the same directory and which can be installed in different directories. Note that although packages might be installed in different directories, all of the these directories must be under the root directory `/bgsys/xlcompilers`.

Table 11. Rules for installing packages to multiple, non-default locations

Package Name	Package Description	Rules for installation to a non-default location
<code>xlsmp.bg.msg.rte</code>	IBM SMP messages package	All XL SMP packages must be installed in the same location. For the remainder of this document, the name <i>xlsmpprt_path</i> is used to refer to this location.
<code>xlsmp.bg.rte</code>	IBM SMP runtime package	
<code>xlsmp.bg.lib</code>	IBM SMP static library package	
<code>xlmass.bg.lib</code>	IBM Mathematical Acceleration Subsystem (MASS) package	Any location under root directory <code>/bgsys/xlcompilers</code> . For the remainder of this document, the name <i>xlmass_path</i> is used to refer to this location.
<code>vacpp.bg.rte</code>	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.
<code>vacpp.bg.rte.lnk</code>	IBM XL C/C++ runtime links package	
<code>vac.bg.lic</code>	IBM XL C/C++ license package	Any location under root directory <code>/bgsys/xlcompilers</code> . For the remainder of this document, the name <i>lic_path</i> is used to refer to this location.
<code>vac.bg.lib</code>	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.
<code>vac.bg.cmp</code>	IBM XL C/C++ compiler package	
<code>vacpp.bg.omp</code>	IBM XL C/C++ OpenMP package	

Table 11. Rules for installing packages to multiple, non-default locations (continued)

Package Name	Package Description	Rules for installation to a non-default location
vacpp.bg.lib	IBM XL C/C++ compiler libraries package	Must be installed in the same location as the other compiler and library packages above.
vacpp.bg.cmp	IBM XL C/C++ compiler package	
vacpp.bg.help.pdf	IBM XL C/C++ Help pdf documentation package	Any location under root directory /bgsys/xlcompilers (optional). For the remainder of this document, the name <i>doc_path</i> is used to refer to this location.
vacpp.bg.man	IBM XL C/C++ compiler man pages	Any location under root directory /bgsys/xlcompilers (optional). For the remainder of this document, the name <i>manpag_path</i> is used to refer to this location.
vacpp.bg.samples	IBM XL C/C++ samples package	Any location under root directory /bgsys/xlcompilers (optional). For the remainder of this document, the name <i>smpls_path</i> is used to refer to this location.

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/ibmcmp/ and corresponds to one of the appropriate paths listed in Table 11 on page 15.

#### 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 Blue Gene/Q, V12.1 issue the following commands in the order given:

```
rpm -ivh xlsmp.bg.msg.rte-3.1.0.0-$B.ppc64.rpm --prefix $SMPPath
rpm -ivh xlsmp.bg.rte.lnk-3.1.0.0-$B.ppc64.rpm --prefix $SMPPath
rpm -ivh xlsmp.bg.lib-3.1.0.0-$B.ppc64.rpm --prefix $SMPPath
rpm -ivh xlmass.bg.lib-7.3.0.0-$B.ppc64.rpm --prefix $MASSpath
rpm -ivh vacpp.bg.rte-12.1.0.0-$B.ppc64.rpm --prefix $RTEpath
rpm -ivh vacpp.bg.rte.lnk-12.1.0.0-$B.ppc64.rpm --prefix $RTEpath
rpm -ivh vac.bg.lic-12.1.0.0-$B.ppc64.rpm --prefix $LICpath
rpm -ivh vac.bg.lib-12.1.0.0-$B.ppc64.rpm --prefix $CMPpath
rpm -ivh vac.bg.cmp-12.1.0.0-$B.ppc64.rpm --prefix $CMPpath
rpm -ivh vacpp.bg.lib-12.1.0.0-$B.ppc64.rpm --prefix $CMPpath
rpm -ivh vacpp.bg.cmp-12.1.0.0-$B.ppc64.rpm --prefix $CMPpath
```

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

The sample programs and product documentation packages have no dependency on other RPM packages and can be installed in any order using the following commands:

```
rpm -ivh vacpp.bg.man-12.1.0.0-$B.ppc64.rpm --prefix $MANPAGpath
rpm -ivh vacpp.bg.samples-12.1.0.0-$B.ppc64.rpm --prefix $SAMPpath
rpm -ivh vacpp.bg.help.pdf-12.1.0.0-$B.ppc64.rpm --prefix $DOCpath
```

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

---

## 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 `vac.bg.lib-12.1.0.0-$B.ppc64.rpm` RPM file that has not yet been installed, issue the following command:

```
$ rpm --qf="%{summary}\n" -qp vac.bg.lib-12.1.0.0-100701.ppc64.rpm
```

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

```
IBM XL C/C++ for Blue Gene, V12.1 - C/C++ Compiler Libraries Package BGQ
```





---

## Chapter 4. Installing an update

An update, or program temporary fix (PTF), of IBM XL C/C++ for Blue Gene/Q, V12.1 provides a fix or multiple fixes to the product. You can download updates from the support website: <http://www.ibm.com/software/awdtools/xlcpp/features/bg/support/>.

Every PTF update package comes in tar.gz (compressed) format and includes a version of the `xlcpp_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 Blue Gene/Q, V12.1 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 `xlcpp_install` utility” on page 20. 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 22. If you want to try out a PTF before installing it, use the procedure in “Testing a PTF before you install it” on page 20.

---

### 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/ibmcomp/`, you must follow the steps outlined in the following table.

*Table 12. 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>xlcpp_install</code> tool to install the update packages.	“Updating a basic installation using the <code>xlcpp_install</code> utility” on page 20
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 34</li><li>• “Testing the installation” on page 29</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 32

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

*Table 13. 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>vac.bg.lic</code> .	“Updating an advanced installation” on page 22

Table 13. Steps for advanced installation: update installation (continued)

Task	Further information
Install update packages to the nondefault location.	"Updating an advanced installation" on page 22
Configure the compiler.	Chapter 5, "Configuring IBM XL C/C++ for Blue Gene/Q, V12.1 (for advanced users)," on page 23
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 34</li><li>• "Testing the installation" on page 29</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 32

---

## 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 XL C/C++ to a location separate from earlier versions" on page 14, using the **rpm** utility.

To configure the compiler, use the procedure described in "Running the `vac_configure` utility directly" on page 24.

### 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 22.

---

## 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 Blue Gene/Q, V12.1. 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 Blue Gene/Q, V12.1 if all the following conditions have been met:

- The base version of IBM XL C/C++ for Blue Gene/Q, V12.1 is already successfully installed in the `/opt/ibmcomp/` 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 Blue Gene/Q, V12.1 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 Blue Gene/Q, V12.1:

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, `dec2010` indicates a shipment date in December of 2010.)

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 10.

3. Confirm that you want to uninstall any previously installed IBM XL C/C++ for Blue Gene/Q, V12.1 packages.
4. Confirm that you want to uninstall any IBM SMP and MASS packages that were previously installed with IBM XL C/C++ for Blue Gene/Q.

**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 Blue Gene/Q, V14.1 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 32.

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

- `bgxlc`
- `bgxlc++`
- `bgxlC`
- `bgxlc_r`

- bgxlc++\_r
  - bgxlC\_r
7. If you customized the previously generated configuration file, manually edit *installation\_path/vac/bg/12.1/etc/vac.cfg* 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 Blue Gene/Q, V12.1, it is recommended that you first uninstall all IBM XL C/C++ for Blue Gene/Q, V12.1 packages except the license package, *vac.bg.lic*.

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 Blue Gene/Q, V12.1,” on page 37 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 11 to install the PTF packages to the location of your choice.

---

## Chapter 5. Configuring IBM XL C/C++ for Blue Gene/Q, V12.1 (for advanced users)

Before you can run IBM XL C/C++ for Blue Gene/Q, V12.1, 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 `vac_configure`, both located in the `installation_path/vacpp/bg/12.1/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/ibmcomp/`.

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 Blue Gene/Q, V12.1 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/vac/bg/12.1/etc/` directory.
- The Blue Gene/Q tool chain is installed in the default location, `/bgsys/drivers/ppcfloor`.

For instructions, see “Running the `new_install` utility” on page 24.

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

- You have multiple versions of IBM XL C/C++ for Blue Gene/Q installed on your system.
- You receive an error message from the `new_install` command. (See Chapter 8, “Troubleshooting the installation and configuration,” on page 39.)
- You want the generated configuration file to be placed in a location that is different from `installation_path/vac/bg/12.1/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.
- The Blue Gene/Q tool chain is installed in a non-default location.

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

For instructions, see “Running the `vac_configure` utility directly” on page 24.

---

## Running the new\_install utility

Use the new\_install utility that is provided with an instance of IBM XL C/C++ for Blue Gene/Q, V12.1 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/vac/bg/12.1/etc/vac.cfg*.
- 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 vac\_configure utility.
- Searches for the Blue Gene/Q tool chain in the default location: */bgsys/drivers/ppcfloor*.
- Installs the license file.
- Generates the configuration file in the default location *installation\_path/vac/bg/12.1/etc/vac.cfg*.

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

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

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

```
cd installation_path/vacpp/bg/12.1/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/ibmcmp/*.

2. Run the following command:  

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

---

## Running the vac\_configure utility directly

Use the vac\_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 vac\_configure utility:

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

```
cd installation_path/vacpp/bg/12.1/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/ibmcmp/*. If the compiler has been installed to multiple, non-default locations, the new\_install utility can be found in *\$CMPpath/vacpp/bg/12.1/bin/*.

2. Run the following command:

`./vac_configure options`

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

## **vac\_configure options**

The `vac_configure` command has the following syntax:



where:

**-h** Displays the help page for the `vac_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.

**-targetgcc path**  
Specifies the path where the Blue Gene/Q tool chain is installed. For example, if the Blue Gene/Q tool chain is installed in the default directory, you can specify:

`/bgsys/drivers/ppcfloor/gnu-linux/powerpc64-bgq-linux`

**-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 display only.

**-install**

Generates the default configuration file as *installation\_path/vac/bg/12.1/etc/vac.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, *vac.cfg.sles11.gcc432*, or *vac.cfg.rhel6.2.gcc446*. 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/ibmcmp/.

**-force** Forces the vac\_configure utility to overwrite any existing output file with the same name and path as that are specified by the **-o** or **-install** options. By default, if you do not use **-force**, vac\_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 Blue Gene/Q packages are installed (if all packages are installed in the same path). By default, the path is /opt/ibmcmp/.

**-mass xlmass\_path/xlmass/bg/7.3/**

Specifies the path where the xlmass package is installed. By default, the full path is /opt/ibmcmp/xlmass/bg/7.3/.

**-smprt xlsmp\_rt\_path/xlsmp/bg/3.1/**

Specifies the path where the xlsmp.bg.msg.rte, xlsmp.bg.rte, and xlsmp.bg.lib packages are installed. By default, the full path is /opt/ibmcmp/xlsmp/bg/3.1/.

**-vaclic lic\_path/vac/bg/12.1/**

Specifies the path where the vac.bg.lic package is installed. By default, the full path is /opt/ibmcmp/vac/bg/12.1/.

**-vacpprt xlrte\_path/vacpp/bg/12.1/**

Specifies the path where the vacpp.bg.rte and vacpp.bg.rte.lnk packages are installed. By default, the full path is /opt/ibmcmp/vacpp/bg/12.1/.

**-vac xlcmp\_path/vac/bg/12.1/**

Specifies the path where the vac.bg.cmp, vacppbg.omp.rte and vac.bg.lib packages are installed. By default, the full path is /opt/ibmcmp/vac/bg/12.1/.

**template\_config\_file\_name**

The input file that is used to construct the configuration file. By default,



this is `/opt/ibmcmp/vac/bg/12.1/etc/vac.base.cfg`. If you relocated the `vac.bg.cmp` package to *xlcmp\_path* but want to use the default template, specify:

`xlcmp_path/vac/bg/12.1/etc/vac.base.cfg`



---

## Chapter 6. After installing IBM XL C/C++ for Blue Gene/Q, V12.1

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 `xl_c_install` to install or update the product, or who have not created symbolic links during the installation process with `xl_c_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:

```
bgxlc hello.c -o hello
```

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

```
installation_path/vacpp/bg/12.1/bin/bgxlc 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/ibmcmp/`.

3. Compile the program:

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

```
bgxlc hello.c -o hello
```

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

```
/opt/ibmcmp/vacpp/bg/12.1/bin/bgxlc hello.c -o hello
```

4. Run the program by entering the following command:

```
./hello
```

The result is "Hello World!".

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

```
echo $?
```

The result is "0".

6. 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;
}
```

7. Compile the program:

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

```
bgxlc++ hello.cpp -o hello
```

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

```
installation_path/vacpp/bg/12.1/bin/bgxlc++ 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/ibmcmp/`.

8. Compile the program:

- If **Blue Gene/Q** short invocation commands have been set up, enter the following command:

```
bgxlc++ hello.cpp -o hello
```

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

```
/opt/ibmcmp/vacpp/bg/12.1/bin/bgxlc++ hello.cpp -o hello
```

9. Run the program :

```
./hello
```

The result should be "Hello World!".

10. Check the exit code of the program:

```
echo $?
```

The result should be "0".

---

## 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 Blue Gene/Q, V12.1 man pages support the following locales:

- `en_US`

- `en_US.utf8`

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. where:

- `installation_path` is the location where you have installed the XL C/C++ packages. By default, this is `/opt/ibmcmp/`.
- `LANG` is any of the language locales as shown in the preceding list.

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

```
export MANPATH=installation_path/vacpp/bg/12.1/man/LANG:$MANPATH
```

where `LANG` is either any of the language locales as shown in the preceding list.

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 34.

---

## 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. However, if your system uses the `en_US.utf8` encoding, 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:
xlsmprt_path/msg/%L/%N:
xlrte_path/msg/%L/%N:
xlcmp_path/vacpp/bg/12.1/msg/%L/%N
```

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

```
setenv NLSPATH $NLSPATH:
xlsmprt_path/msg/%L/%N:
xlrte_path/msg/%L/%N:
xlcmp_path/vacpp/bg/12.1/msg/%L/%N
```

where:

- `xlsmprt_path` is the installation location of the SMP packages. By default, this is `/opt/ibmcmp/`.
- `xlrte_path` is the installation location of the IBM XL C/C++ for Blue Gene/Q, V12.1 runtime packages. By default, this is `/opt/ibmcmp/`.
- `xlcmp_path` is the installation location of the IBM XL C/C++ for Blue Gene/Q, V12.1 compiler packages. By default, this is `/opt/ibmcmp/`.

### Accessing the compiler message catalogs from an I/O node

Before an I/O node can access the compiler message catalogs, it needs to know their location on the Front-end node. This section describes how to set up the I/O node so it can access these messages in a default or non-default location on a Front-end node.

### Default message location

The default location for the compiler message catalogs is `/opt/ibmcmp/`. To indicate this location to an I/O node, export `/opt/ibmcmp/` from the Front-end node and mount this path to the I/O node.

In the following example, the compiler is installed in the default directory `/opt/ibmcmp/vacpp/bg/12.1/` on the Front-end node called `frontend1`. There is one I/O node called `machine1`.

- At `frontend1`, add the following line to the `/etc/exports` file:  
`/opt/ibmcmp/ machine1`
- Run the following command to update the current NFS daemon of `frontend1`:  
`/usr/sbin/exportifs -ra`
- Make sure the empty directory `/opt/ibmcmp/` exists in `machine1`. Then, run the following command:  
`mount frontend1:/opt/ibmcmp/ /opt/ibmcmp/`

---

## 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 33.

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

To use IBM XL C/C++ for Blue Gene/Q, V12.1 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/vacpp/bg/12.1/bin/`
- If you are using the C shell, use the following command:  
`setenv PATH $PATH:installation_path/vacpp/bg/12.1/bin/`

where `installation_path` is the location where you have installed the compiler packages. By default, this is `/opt/ibmcmp/`.

**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, 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/vacpp/bg/12.1/bin/` directory.

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

- `bgxlc`
- `bgxlc++`
- `bgxlC`
- `bgxlc_r`
- `bgxlc++_r`
- `bgxlC_r`

Enter the following command to create a symbolic link:

```
ln -s installation_path/vacpp/bg/12.1/bin/invocation /usr/bin/invocation
```

where:

- *installation\_path* is the location where you have installed the compiler packages. By default, this is `/opt/ibmcmp/`.
- *invocation* is one of the compiler invocations (such as `bgxlc`) in `installation_path/vacpp/bg/12.1/bin/`.

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

This example assumes that all of IBM XL C/C++ for Blue Gene/Q, V12.1 is installed in the default location `/opt/ibmcmp/`.

```
ln -s /opt/ibmcmp/vacpp/bg/12.1/bin/bgxlc /usr/bin/bgxlc
```

---

## 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 Blue Gene/Q 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 Blue Gene/Q compiler use on that computer and can generate reports based on the information it collects.

If IBM XL C/C++ for Blue Gene/Q is installed in the default location, the signature files are in the `/opt/ibmcmp/vac/bg/12.1/properties/version/` directory. Otherwise, if IBM XL C/C++ for Blue Gene/Q is installed in a non-default location, the signature files are in the `$installation_path/vac/bg/12.1/properties/version/` directory, where `$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 Blue Gene/Q, V12.1 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 information center.

The information center is viewable on the web at <http://pic.dhe.ibm.com/infocenter/compbg/v121v141/index.jsp>.

### Viewing the PDF documentation

PDF versions of the IBM XL C/C++ for Blue Gene/Q, V12.1 product manuals are available in the `/doc/$LANG/pdf/` directory of the installation media (either product CD or electronic package) (CD).

After default installations, the PDF documentation can be found in the `/opt/ibmcmp/vacpp/bg/12.1/doc/$LANG/pdf/` directory. For nondefault installations, the PDF documentation is located in the `/installation_path/vacpp/bg/12.1doc/$LANG/pdf/` directory. `$LANG` can be `en_US`.

### 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 30.

To invoke a manual page, enter the following command:

```
man command
```

Example:

```
man bgxlc
```

---

## 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 vac.bg.cmp
```

The result is:

```
vac.bg.cmp-V.R.M.F-B
```

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

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 vac.bg -e xlsmp.bg -e xlmass.bg -e vacpp.bg
```

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.



---

## Chapter 7. Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1

IBM XL C/C++ for Blue Gene/Q, V12.1 does not provide a stand-alone uninstallation tool. You must use the Linux rpm utility to uninstall IBM XL C/C++ for Blue Gene/Q, V12.1.

### Notes:

- You must have the root user access to uninstall the compiler.
- Whenever you uninstall a package, specify the *V.R.M.F-B* (Version.Release.Modification.Fix-Build level) of the package. For information about how to determine the package's *V.R.M.F-B*, see “Querying for installed packages” on page 34.
- 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.

**Exception:** The sample programs and product documentation do not have any package dependencies. You can remove them in any order.

- You cannot uninstall packages that are required by other packages. For example, `xlomp.bg.rte` is a shared component if IBM XL Fortran for Blue Gene/Q, V14.1 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 `vac_configure` utility.

---

### Example: Uninstalling IBM XL C/C++ for Blue Gene/Q, V12.1

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.F-B* of 12.1.0.0-*\$B*.
- The IBM MASS library package has a *V.R.M.F-B* of 7.3.0.0-*\$B*.
- The IBM SMP library packages have a *V.R.M.F-B* of 3.1.0.0-*\$B*.

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

To uninstall IBM XL C/C++ for Blue Gene/Q, V12.1, take the following steps:

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

```
rpm -e vacpp.bg.cmp-12.1.0.0-$B
rpm -e vacpp.bg.lib-12.1.0.0-$B
rpm -e vac.bg.cmp-12.1.0.0-$B
rpm -e vac.bg.lib-12.1.0.0-$B
rpm -e vac.bg.lic-12.1.0.0-$B
rpm -e vacpp.bg.rte.lnk-12.1.0.0-$B
rpm -e vacpp.bg.rte-12.1.0.0-$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 Blue Gene/Q, V14.1" in the *XL Fortran Installation Guide*.

2. Issue the following commands to uninstall the packages of sample programs and product documentation:

```
rpm -e vacpp.bg.samples-12.1.0.0-$B
rpm -e vacpp.bg.man-12.1.0.0-$B
rpm -e vacpp.bg.help.pdf-12.1.0.0-$B

rpm -e vacpp.bg.samples-12.1.0-0
rpm -e vacpp.bg.man-12.1.0-0
rpm -e vacpp.bg.help.html-12.1.0-0
rpm -e vacpp.bg.help.pdf-12.1.0-0
```

3. 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 xlmass.bg.lib-7.3.0.0-$B
rpm -e xlsmp.bg.lib-3.1.0.0-$B
rpm -e xlsmp.bg.rte-3.1.0.0-$B
rpm -e xlsmp.bg.msg.rte-3.1.0.0-$B

rpm -e vacpp.bg.cmp-12.1.0-0
rpm -e vacpp.bg.lib-12.1.0-0
rpm -e vac.bg.cmp-12.1.0-0
rpm -e vac.bg.lib-12.1.0-0
rpm -e vac.bg.lic-12.1.0-0
rpm -e vacpp.bg.rte.lnk-12.1.0-0
rpm -e vacpp.bg.rte-12.1.0-0

rpm -e xlsmp.bg.lib-3.1.0-0
rpm -e xlsmp.bg.rte-3.1.0-0
rpm -e xlsmp.bg.msg.rte-3.1.0-0
```

---

## 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 will stay 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 Blue Gene/Q, V12.1.

---

### 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 10.

---

### `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

Ensure you have all of the packages listed in Table 5 on page 2 in the path before running the `xlc_install` utility again. 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 10.



---

## Notices

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

IBM World Trade Asia Corporation  
Licensing  
2-31 Roppongi 3-chome, Minato-ku  
Tokyo 106, Japan

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:**

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

Lab Director  
IBM Canada Ltd. Laboratory  
8200 Warden Avenue  
Markham, Ontario L6G 1C7  
Canada

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrates programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. You may copy, modify, and distribute these sample programs in any form without payment to IBM for the purposes of developing, using, marketing, or distributing application programs conforming to IBM's application programming interfaces.



Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. 1998, 2010.

---

## Trademarks and service marks

IBM, the IBM logo, and `ibm.com` are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at <http://www.ibm.com/legal/copytrade.shtml>.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, other countries, or both.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft and Windows are trademarks of Microsoft Corporation in the United States, other countries, or both.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.



---

# Index

## A

- advanced installation
  - example 16
  - overview 11
  - procedures 12
- advanced user, described v
- available space, determining 5

## B

- basic example, described ix
- basic installation
  - overview 7
  - procedure 8
- basic user, described v

## C

- co-residency
  - compilers 12
- configuration files
  - backup 23
  - customizing 23, 24
  - default 26
  - editing 24
  - generation 10, 26
  - modifying 23, 24
  - multiple 23
  - overwriting 26
  - renaming 26
  - security 37

## D

- debugging 39
- default installation 7
- documentation
  - man pages 34

## E

- environment variable 32
- error messages 31

## G

- GNU packages
  - required 3
  - verifying 5

## H

- hard disk space
  - required 3
  - verifying 5
- hardware requirements 3
- help 34
  - displaying 10

- help (*continued*)
  - html 34
  - man pages 30
  - pdf 34

## I

- IBM License Metric Tool 33
- ILMT 33
- installation
  - multiple versions 11, 12
  - options 10
  - package location 14, 15
  - specialized 15
  - testing 29
- installation CD 1
- installation image 1
- installation log 39
- installation utility
  - options 10
  - using 19
- invocation commands 32

## L

- languages 3
- locales 3

## M

- man pages 30
  - viewing 34

## N

- national language support 3
- nondefault installation 11

## O

- operating systems, supported 3

## P

- packages
  - installation 1
  - not found 39
  - querying 35
- PATH environment variable 32
- Perl packages
  - required 3
  - verifying 5
- preinstallation 1
- PTF 19

## Q

- querying
  - installed packages 35
  - RPM file summaries 17

## R

- Red Hat Package Manager (RPM) 1

## S

- software requirements 3
- symbolic links 8
  - creating 33

## T

- TADd 33
- temporary files
  - installation log 39
- testing
  - installation 29
  - PTF 20
- Tivoli Asset Discovery for Distributed 33
- tool chain 5

## U

- uninstallation
  - example 37
  - overview 37
- updates
  - applying 20
  - installation utility option 10
  - overview 19
  - prerequisites 21
  - steps 21
  - to a nondefault location 20
  - trying out 14, 20

## V

- verifying
  - GNU and Perl packages 5
  - hard disk space 5







Product Number: 5799-AG1

Printed in USA

GC14-7362-00

