

Red Hat Developer Toolset 1.1

1.1 Release Notes

Release Notes for Red Hat Developer Toolset 1.1

Edition 1



Matt Newsome

Red Hat, Inc

mnewsome@redhat.com

Douglas Silas

Red Hat, Inc Engineering Content Services

dhensley@redhat.com

Petr Kovář

Red Hat, Inc Engineering Content Services

pkovar@redhat.com

Eliška Slobodová

Red Hat, Inc Engineering Content Services

eslobodo@redhat.com

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1801 Varsity Drive
Raleigh, NC 27606-2072 USA
Phone: +1 919 754 3700
Phone: 888 733 4281
Fax: +1 919 754 3701

Abstract

Red Hat Developer Toolset is a Red Hat offering for developers on the Red Hat Enterprise Linux platform. Using a framework called Software Collections, an additional set of tools is installed into the `/opt` directory, as recommended by the UNIX Filesystem Hierarchy Standard. These tools are enabled by the user on demand using the supplied `sc1` utility. Red Hat Developer Toolset 1.1 provides current versions of the **GNU Compiler Collection**, **GNU Debugger** a number of **Performance Tools** and a variety of other utilities. These do not replace the Red Hat Enterprise Linux system versions of these tools, nor will they be used in preference to those system versions unless explicitly invoked using the `sc1` utility.

These *Release Notes* contain important information available at the time of release of Red Hat Developer Toolset 1.1. Known problems, resources, and other issues are discussed here. Read this document before beginning to use Red Hat Developer Toolset 1.1.

Table of Contents

1. Features

2. Changes in This Release

3. System Requirements

4. Usage

4.1. Guidance on Experimental Features in GCC version 4.7.x

5. Known Issues

6. Additional Resources

6.1. Red Hat Enterprise Linux Developer Program Group

6.2. Accessing Red Hat Documentation

A. Revision History

Chapter 1. Features

The Red Hat Developer Toolset 1.1 release provides the following tools:

- ▶ **GNU Compiler Collection (GCC)** version **4.7.2**;
- ▶ **GNU Debugger (GDB)** version **7.5**;
- ▶ **binutils** version **2.23.51**;
- ▶ **elfutils** version **0.154**;
- ▶ **SystemTap** version **1.8**;
- ▶ **Valgrind** version **3.8.1**;
- ▶ **OProfile** version **0.9.7**;
- ▶ **dwz** version **0.7**.

The following features are fully functional and stable in this 1.1 release:

- ▶ Building applications that are compliant with C89, C99 and C11 standards.
- ▶ Building applications that are compliant with C++98 and C++03 versions of C++.
- ▶ Building applications that are compliant with C++11.
- ▶ Building of Fortran applications.
- ▶ Building the above applications on Red Hat Enterprise Linux 5 and executing on Red Hat Enterprise Linux 5 or Red Hat Enterprise Linux 6.



Note

Building on Red Hat Enterprise Linux 6 and executing on Red Hat Enterprise Linux 5 will not be supported by this or later releases.

- ▶ Building the above applications on Red Hat Enterprise Linux 6 and executing on Red Hat Enterprise Linux 6.
- ▶ Building code compliant with OpenMP version 3.0 or lower (via **-fopenmp**).
- ▶ Using the **GCC** compiler's experimental Transactional Memory feature (via **-fgnu-tm**).
- ▶ Using the Red Hat Developer Toolset version of **GCC** with the Red Hat Enterprise Linux 6.2 or later version of the **Eclipse Integrated Development Environment (IDE)**.



Note

The Eclipse IDE is not available to Red Hat Enterprise Linux 5 users.

The following features are dependent on updates in specific versions of Red Hat Enterprise Linux:

- ▶ Building code compliant with OpenMP version 3.1 on Red Hat Enterprise Linux 6.3, and with OpenMP version 3.0 on any other Red Hat Enterprise Linux version. The ability to build such applications is enabled in Red Hat Enterprise Linux 6.3 or later and will be enabled in future releases of Red Hat Enterprise Linux 5.

Chapter 2. Changes in This Release

The Red Hat Developer Toolset 1.1 release includes the following changes over the previous Red Hat Developer Toolset release:

- ▶ Red Hat Developer Toolset 1.1 now includes the tools **elfutils**, **OProfile**, **Valgrind**, **SystemTap**, **dwz** and **gfortran**.
- ▶ Red Hat Developer Toolset 1.1 now contains the **dwz** utility for reducing the size of DWARF debug information.
- ▶ The **GCC** compiler has been updated to version 4.7.2 from version 4.7.1.
- ▶ The **GCC** compiler now includes the **GNU Fortran** compiler and the compiler's manual page.
- ▶ The **GCC** compiler now properly passes the **visibility** attribute from a class to its members.
- ▶ The **GCC** compiler now can link the **libquadmath** library even with the **-m32** option.
- ▶ **GCC** has been updated to ensure that the `std::list` and `std::pair` classes are ABI compatible with source code that is compliant with the C++03 standard.



Important

It is recommended that you use this new version of **GCC** to recompile any source code you previously compiled with the **-std=c++11**, **-std=gnu+11**, **-std=c++0x**, or **-std=gnu+0x** options.

- ▶ Previously, the **doxygen** utility required a newer version of the Python interpreter. This has been fixed with the Red Hat Developer Toolset 1.1 release so that **doxygen** now works with Python 2.4.3, as expected.
- ▶ Previously, the *devtoolset-1.1-binutils* package contained a manual page for the **windmc** utility, which was not included in Red Hat Developer Toolset. With the Red Hat Developer Toolset 1.1 release, this manual page is no longer included.
- ▶ Previously, it was not possible to display the manual page for the **scl** utility when Red Hat Developer Toolset was enabled. With this Red Hat Developer Toolset release, this bug has been fixed so that the manual page is now available in the Red Hat Developer Toolset environment.
- ▶ The raw disk activity metrics now provide more detailed information.
- ▶ When using **GCC** with Link Time Optimization turned on, the GNU BFD library could erroneously mark some linker-generated symbols as undefined. This resulted in an error during the link phase. This problem has been fixed so that the symbols are no longer marked as undefined.

Chapter 3. System Requirements

Red Hat Developer Toolset 1.1 contains RPM packages for both Red Hat Enterprise Linux 5 and Red Hat Enterprise Linux 6 running on 32-bit or 64-bit Intel or AMD architectures. Installation on PowerPC architecture is not supported. The correct packages must be installed according to the host operating system in use.

Red Hat Enterprise Linux 5 RPM packages can be used on supported versions of Red Hat Enterprise Linux 5 only, and Red Hat Enterprise Linux 6 RPM packages can be used on supported versions of Red Hat Enterprise Linux 6 only.

Chapter 4. Usage

For detailed information on Red Hat Developer Toolset, refer to the [Red Hat Developer Toolset 1.1 User Guide](#). The *User Guide* for Red Hat Developer Toolset 1.1 includes information on invocation and usage of the Red Hat Developer Toolset versions of the GNU Compiler Collections, GNU Debugger, and binutils.

4.1. Guidance on Experimental Features in GCC version 4.7.x

Red Hat Developer Toolset 1.1 includes **GCC** version 4.7.x. This new toolchain release includes a large number of feature enhancements and bug fixes in addition to performance improvements. It also contains some features that are considered experimental.

C++11

The **GCC** 4.7 compiler provides experimental support for building applications compliant with C++11 using the **-std=c++11** (or equivalent **-std=gnu++11**) command line options. As the upstream **GCC** community development does not guarantee C++11 ABI compatibility across major versions of **GCC**, the same applies to use of C++11 with Red Hat Developer Toolset.

Consequently, using the **-std=c++11** option is supported in Red Hat Developer Toolset 1.1 only when all C++ objects compiled with that flag have been built using the same major version of Red Hat Developer Toolset. The mixing of objects, binaries and libraries, built by the Red Hat Enterprise Linux 5 or 6 system toolchain **GCC** using the **-std=c++0x** or **-std=gnu++0x** flags, with those built with the **-std=c++11** or **-std=gnu++11** flags using the **GCC** in Red Hat Developer Toolset is explicitly not supported.

Additionally, as later major versions of Red Hat Developer Toolset may use a later major release of **GCC**, forward-compatibility of objects, binaries and libraries built with the **-std=c++11** or **-std=gnu++11** options cannot be guaranteed, and so is not supported.

The default language standard setting for Red Hat Developer Toolset is C++98. Any C++98-compliant binaries or libraries built in this default mode (or explicitly with **-std=c++98**) can be freely mixed with binaries and shared libraries built by the Red Hat Enterprise Linux 5 or 6 system toolchain **GCC**. Red Hat recommends use of this default **-std=c++98** mode for production software development.

Transactional Memory

The **GCC** 4.7 compiler includes experimental support for transactional memory. Users are advised that, when executing applications built with **-gnu-tm**, it is currently a prerequisite to also have the appropriate version of the **libitm.so.1** shared library installed. This library is installed by default for Red Hat Developer Toolset users as part of *libitm-4.7.0-*.rpm*. The library should be installed along with your application on any non-development machine where such applications will need to run. Red Hat plans to include this shared library as a standard component in future releases of Red Hat Enterprise Linux.

Chapter 5. Known Issues

For the list of features of the Red Hat Developer Toolset 1.1 release, refer to [Chapter 1, Features](#).

The following known issues are present in this release and may be fixed in later releases:

- ▶ When linking against one of the **elfutils** libraries using **-static -l<library >** does not work because the suffix was changed from **.a** to **.ar**. When Red Hat Enterprise Linux versions of **elfutils** static libraries are present, the program is linked against them instead of Developer Toolset versions. To work around this problem, provide the complete path to the static library, for example:

```
gcc -static somecfile.c /opt/rh/devtoolset-1.1/root/usr/lib/libelf.ar
```

- ▶ It is now possible to install Red Hat Developer Toolset 1.1 on the same machine as an earlier production release of Red Hat Developer Toolset. The previous installation will be upgraded.
- ▶ When updating Red Hat Developer Toolset 1.0 to Red Hat Developer Toolset 1.1, it is necessary to manually remove the *devtoolset-1.0-gcc-debuginfo* if installed. Otherwise, the update process will fail.
- ▶ An issue exists with C++11 exception-handling with *libstdc++* versions less than 4.1.2-52.el5_8.1 on Red Hat Enterprise Linux 5. The issue affects developers building applications with Red Hat Developer Toolset and end users of those applications when deployed to these systems. Users of Red Hat Enterprise Linux 5.6 or 5.8 should apply the **RHBA-2012:0527** or **RHBA-2012:13247 - gcc bug fix update** advisory, respectively, to resolve this issue. Note that future minor releases of Red Hat Enterprise Linux 5, later than 5.8, will include this fix automatically. The issue does not affect users of Red Hat Enterprise Linux 6.
- ▶ A very low-impact Red Hat Enterprise Linux 6 C++ demangler issue exists. When calling **abi::__cxa_demangle("e", 0, &length, &cc)**, **length** is not updated to the length of the demangled name. Users are not expected to encounter this issue.

Other notes:

- ▶ The default **Valgrind gdbserver** support (**--vgdb=yes**) can cause certain register and flags values to be not always up to date due to optimizations done by the **Valgrind** core. The **gdb** utility is therefore unable to show certain parameters or variables of programs running under **Valgrind**. To workaround this problem use **--vgdb=full** parameter. Note that programs can run slower under **Valgrind** when this parameter is used.
- ▶ Red Hat Developer Toolset primarily aims to provide a compiler for development of user applications for deployment on multiple versions of Red Hat Enterprise Linux. Operating system components, kernel modules and device drivers generally correspond to a specific version of Red Hat Enterprise Linux, for which the supplied base OS compiler is recommended.
- ▶ Red Hat Developer Toolset 1.1 supports C, C++ and Fortran development only. For other languages, please invoke the system version of **GCC** available on Red Hat Enterprise Linux.
- ▶ Red Hat Developer Toolset 1.1 **Valgrind** contains experimental support for some AVX2 instructions.
- ▶ Building an application with Red Hat Developer Toolset 1.1 on Red Hat Enterprise Linux (for example: Red Hat Enterprise Linux 5.8) and then executing that application on an earlier minor version (such as Red Hat Enterprise Linux 5.6) may result in runtime errors due to differences in non-toolchain components between Red Hat Enterprise Linux releases. Users are advised to check compatibility carefully. Red Hat only supports execution of an application built with Red Hat Developer Toolset on the same, or a later, supported release of Red Hat Enterprise Linux than the version used to build that application.
- ▶ All code in the non-shared library **libstdc++_nonshared.a** in Red Hat Developer Toolset 1.1 is licensed under the GNU General Public License v3 with additional permissions granted under Section 7, described in the GCC Runtime Library Exception version 3.1, as published by the Free Software Foundation.
- ▶ The compiler included in Red Hat Developer Toolset emits newer DWARF debugging records than

previous compilers available on Red Hat Enterprise Linux. These new debugging records improve the debugging experience in a variety of ways, particularly for C++ and optimized code. However, certain tools are not yet capable of handling the newer DWARF debug records. To generate the older style debugging records, use the options **-gdwarf-2 -gstrict-dwarf** or **-gdwarf-3 -gstrict-dwarf**.

- ▶ Some newer library features are statically linked into applications built with Red Hat Developer Toolset to support execution on multiple versions of Red Hat Enterprise Linux. This adds a small additional security risk as normal Red Hat Enterprise Linux errata would not change this code. If the need for developers to rebuild their applications due to such an issue arises, Red Hat will signal this via a security erratum. Developers are strongly advised not to statically link their entire application for the same reasons.
- ▶ Note that error messages related to a missing **libitm** library when using the **-fgnu-tm** option require the *libitm* package to be installed. You can install the package with the following command:

```
yum install libitm
```

- ▶ The **ccache** utility can be used with **GCC** included in Red Hat Developer Toolset by setting your environment correctly. For example:

```
~]$ scl enable devtoolset-1.1 '/usr/lib64/ccache/gcc -c foo.c'
```

Alternatively, you can create a shell with the Red Hat Developer Toolset version of **GCC** as the default compiler:

```
~]$ scl enable devtoolset-1.1 'bash'
```

After you have created the shell, run the following two commands:

```
~]$ export PATH=/usr/lib64/ccache${PATH:+:${PATH}}
```

```
~]$ gcc -c -o a.o a.c
```

- ▶ The Red Hat Developer Toolset 1.1 version of **SystemTap** does not support initscripts. Consequently, you cannot run **SystemTap** scripts as system services with this version of **SystemTap**.
- ▶ **OProfile** provides access to performance monitoring hardware only on physical machines. If you are using **OProfile** on a virtual machine guest, you need to force **OProfile** to use the timer mechanism with the following command:

```
~]$ opcontrol --deinit; modprobe oprofile timer=1
```

- ▶ To allow **OProfile** to use the hardware performance units on Red Hat Enterprise Linux 6, you need to disable watchdog timers with the following command:

```
~]$ echo 0 > /proc/sys/kernel/nmi_watchdog
```

- ▶ Because the **elfutils** libraries contained in Red Hat Developer Toolset 1.1 are linked to a client application statically, caution is advised when passing handles to *libelf*, *libdw*, and *libasm* data structures to external code and when passing handles received from external code to *libelf*, *libdw*, and *libasm*.

Be especially careful when an external library, which is linked dynamically against the system version of **elfutils**, is passed a pointer to a structure that comes from the Red Hat Developer Toolset 1.1 version of **elfutils** (or vice versa).

Generally, data structures used in the Red Hat Developer Toolset 1.1 version of **elfutils** are not compatible with the Red Hat Enterprise Linux system versions, and structures coming from one

should never be touched by the other.

In applications that use the Red Hat Developer Toolset 1.1 libraries, all code that was linked against the system version of the libraries should be recompiled against the libraries included in Red Hat Developer Toolset 1.1.

- ▶ EBL, a library used internally by libdw, was amended not to open back ends dynamically. Instead, a selection of back ends is compiled in the library itself: Intel x86 (i386), AMD64 / Intel 64 (x86_64), Intel Itanium, and IBM System z. Some functionality may not be available if the client wishes to work with ELF files from architectures other than those mentioned above.
- ▶ With the Red Hat Developer Toolset 1.1 release, you can now use **Valgrind**'s libmpiwrap wrapper with either the *openmpi* package or the *compat-openmpi* compatibility package. When using **Valgrind** on Red Hat Enterprise Linux 6, specify whether you want use the *openmpi* or *compat-openmpi* package by updating the **LD_PRELOAD** environment variable.

To use the *openmpi* package with the libmpiwrap wrapper, update **LD_PRELOAD** as follows:

```
LD_PRELOAD=/opt/rh/devtoolset-1.1/root/usr/lib64/valgrind/libmpiwrap-amd64-  
linux.so:/usr/lib64/openmpi/lib/libmpi.so /usr/lib64/openmpi/bin/mpirun  
valgrind ./mpi-hello
```

Where **mpi-hello** is compiled with the appropriate mpicc compiler.

To use the *compat-openmpi* package with the libmpiwrap wrapper, update **LD_PRELOAD** as follows:

```
LD_PRELOAD=/opt/rh/devtoolset-1.1/root/usr/lib64/valgrind/libmpiwrap-amd64-  
linux.so:/usr/lib64/compat-openmpi/lib/libmpi.so /usr/lib64/compat-  
openmpi/bin/mpirun valgrind ./mpi-hello
```

Where **mpi-hello** is compiled with the appropriate mpicc compiler.

To test that the above works as expected and the MPI calls are intercepted by the wrapper, set the environment variable **MPIWRAP_DEBUG** to **verbose**.

- ▶ Some packages managed by the **scl** utility include privileged services that require **sudo**. The system **sudo** clears environment variables and so Red Hat Developer Toolset includes its own **sudo** shell script, wrapping **scl enable**. This script does not currently parse or pass normal **sudo** options, only **sudo COMMAND ARGS . . .**. In order to use the system version of **scl** from within a Red Hat Developer Toolset-enabled shell, please use the **/usr/bin/sudo** binary.

Chapter 6. Additional Resources

For more information about Red Hat Developer Toolset 1.1 and Red Hat Enterprise Linux, refer to the resources listed below.

6.1. Red Hat Enterprise Linux Developer Program Group

Users of Red Hat Developer Toolset can access the Red Hat Enterprise Linux Developer Program Group in the Red Hat Customer Portal to get developer related information for the development tools available for Red Hat Enterprise Linux. In addition, users can find there developer related papers and videos on topics that are of interest to developers, for example RPM building, threaded programming, performance tuning, debugging, and so on.

- ▶ To visit the Red Hat Enterprise Linux Developer Program Group, log in to the [Customer Portal](#), click **Groups** at the top of the page and choose **Red Hat Enterprise Linux Developer Program** from the **Groups List**.

6.2. Accessing Red Hat Documentation

The **Red Hat Documentation** portal located at <https://access.redhat.com/knowledge/docs/> serves as a central source of all product documentation. It is translated in 22 languages and for each product, it provides different kinds of books from release and technical notes to installation, user, and reference guides in HTML, PDF, and EPUB formats.

The following is a brief list of documents that are directly or indirectly relevant to this book:

- ▶ [Red Hat Developer Toolset 1.1 User Guide](#) – The *User Guide* for Red Hat Developer Toolset 1.1 contains more information about installing and using this product.
- ▶ [Red Hat Developer Toolset 1.1 Software Collections Guide](#) – The *Software Collections Guide* for Red Hat Developer Toolset 1.1 explains the concept of Software Collections and documents Software Collections packaging.
- ▶ [Red Hat Enterprise Linux 6 Developer Guide](#) – The *Developer Guide* for Red Hat Enterprise Linux 6 provides detailed information on the Eclipse IDE, libraries and runtime support, compiling and building, debugging, and profiling.
- ▶ [Red Hat Enterprise Linux 6 Installation Guide](#) – The *Installation Guide* for Red Hat Enterprise Linux 6 provides more details on getting, installing, and updating the system.
- ▶ [Red Hat Enterprise Linux 5 Installation Guide](#) – The *Installation Guide* for Red Hat Enterprise Linux 5 provides more details on getting, installing, and updating the system.
- ▶ [Red Hat Enterprise Linux 6 Deployment Guide](#) – The *Deployment Guide* for Red Hat Enterprise Linux 6 documents relevant information regarding the deployment, configuration, and administration of Red Hat Enterprise Linux 6.
- ▶ [Red Hat Enterprise Linux 5 Deployment Guide](#) – The *Deployment Guide* for Red Hat Enterprise Linux 5 documents relevant information regarding the deployment, configuration, and administration of Red Hat Enterprise Linux 5.

Revision History

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