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# **ROCgdb Documentation**

***Release 16.3***

**Advanced Micro Devices, Inc.**

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# INSTALL

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The AMD ROCm Debugger (ROCgdb) is the AMD source-level debugger for Linux, based on the [GNU Debugger \(GDB\)](#). ROCgdb enables heterogeneous debugging on the ROCm software that consists of an x86-based host architecture along with commercially available AMD GPU architectures supported by the [AMD Debugger API Library \(ROCdbgapi\)](#). ROCdbgapi is included with ROCm.

ROCgdb provides the following features:

- Debugs ROCm applications running on actual hardware
- Debugs applications without the potential variations introduced by simulation and emulation environments
- Offers a seamless debugging environment that allows simultaneous GPU and CPU code debugging within the same application, just like programming in HIP, which is a seamless extension of C++ programming
- Additional features to support debugging ROCm device code on top of the existing GDB debugging features, which are inherently present for debugging the host code
- Supports [HIP](#) kernel debugging
- Allows you to set breakpoints, single-step ROCm applications, and inspect and modify the memory and variables of any given thread running on the hardware

The code is open source and hosted at: <https://github.com/ROCm/ROCgdb>

Install

- [Installation](#)

How to

- [Quick start](#)
- 

To contribute to the documentation, refer to [Contributing to ROCm](#).

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## INSTALLING ROCgDB

This topic provides information required to build and install ROCgdb.

### 1.1 System requirements

- A system supporting ROCm. See the [supported operating systems](#).
- A C++17 compiler such as GCC 9 or Clang 5.
- AMD Debugger API Library (ROCdbgapi) that can be installed as part of the ROCm release using the `rocm-dbgapi` package.
- Install the required packages according to the OS:

#### Ubuntu

```
apt install bison flex gcc make ncurses-dev texinfo g++ zlib1g-dev \  
libexpat-dev python3-dev liblzma-dev libgmp-dev libmpfr-dev
```

#### RHEL

```
yum install -y epel-release centos-release-scl bison flex gcc make \  
texinfo texinfo-tex gcc-c++ zlib-devel expat-devel python3-devel \  
xz-devel gmp-devel ncurses-devel mpfr-devel
```

#### SLES

```
zypper in bison flex gcc make texinfo gcc-c++ zlib-devel libexpat-devel \  
python3-devel xz-devel gmp-devel ncurses-devel mpfr-devel
```

#### Note

ROCgdb might become unresponsive in SELinux-enabled distributions. To learn more about this issue, see [installation troubleshooting](#).

### 1.2 Building ROCgdb

An example command line to build ROCgdb on Linux:

```
cd rocgdb
mkdir build
cd build
./configure --program-prefix=roc \
--enable-64-bit-bfd --enable-targets="x86_64-linux-gnu,amdgcnc-amd-amdhsa" \
--disable-ld --disable-gas --disable-gdbserver --disable-sim --enable-tui \
--disable-gdbtk --disable-gprofng --disable-shared --with-expat \
--with-system-zlib --without-guile --without-babeltrace --with-lzma \
--with-python=python3
make
```

If ROCdbgapi is not installed in the system's default location, specify `PKG_CONFIG_PATH` to make the correct build configuration available to `pkg-config`. If ROCdbgapi is installed in `/opt/rocm-$ROCM_VERSION` (default for ROCm packages), use `PKG_CONFIG_PATH=/opt/rocm-$ROCM_VERSION/share/pkgconfig`.

If the system's dynamic linker is not configured to locate ROCdbgapi where it is installed, configure and build ROCgdb using `LDFLAGS="-Wl,-rpath=/opt/rocm-$ROCM_VERSION/lib"`. Alternatively, use `LD_LIBRARY_PATH` at runtime to indicate where ROCdbgapi is installed.

You can find the built ROCgdb executable in `build/gdb/gdb` and the user manual in `build/gdb/doc/gdb.info`.

## 1.3 Installing ROCgdb

To install ROCgdb, use:

```
make install
```

This installs ROCgdb in `<prefix>/bin/rocgdb`.

## 1.4 Installing libraries

To execute ROCgdb, you must install the ROCdbgapi library and its dependent Comgr library. These can be installed as part of the ROCm release using the `rocm-dbgapi` package:

- `librocm-dbgapi.so.0`
- `libamd_comgr.so`

To generate the ROCgdb user guide as a PDF, use:

```
make pdf
```

This generates the PDF in `build/gdb/doc/gdb.pdf`.

### Note

For ROCgdb user guide in HTML format, see [ROCgdb user guide](#).

## ROCGDB QUICK START

After *installing ROCgdb*, follow the *setup* to start debugging your application.

### 2.1 Setup

Before debugging, compile your software with debug information. To achieve this, add the `-g` flag to your compilation command. This generates debug information even when optimizations are turned on. Note that higher optimization levels make debugging more difficult, so it might be helpful to turn off these optimizations using the `-O0` compiler option.

### 2.2 Debugging using ROCgdb

To start debugging your application, follow these steps:

1. Run ROCgdb with your ROCm application.

```
rocgdb my_application
```

At this point the application is not running, but you'll have access to the debugger console. Here you can use every gdb option for host debugging and you can use them and extra ROCgdb specific features for device debugging.

2. Set a breakpoint before running the application with debugger.

```
tbreak my_app.cpp:458
```

This places a temporary breakpoint at the specified line. To start your application, use:

```
run
```

If the breakpoint is in the device code, the debugger shows the device and host threads. The device threads are not individual work items; instead, they represent a wavefront on the device. You can switch between the device wavefronts as you can between the host threads.

3. You can also switch between layouts, which allows you to use different layouts for different situations while debugging.

```
layout src  
layout asm
```

The `src` layout is the source code view, while the `asm` is the assembly view. For more layouts, see [GDB documentation](#).

```
info threads
```

The preceding command lists all threads with Id and information on where the thread is stopped.

4. To switch threads, use:

```
thread <id>
```

5. To take a step in the execution, use:

```
next  
  
# Alternatively you can use the shorthand  
  
n
```

6. To dump the content of the current wavefront's registers, use:

```
info registers  
  
# Alternatively you can use the shorthand  
  
i r
```

The preceding command only dumps the general purpose registers, which is all-inclusive data about the state of the current wavefront. To get data for all registers, use command `info all-registers`.

## 2.3 ROCgdb user guide

The [ROCgdb user guide](#) provides detailed information about using ROCgdb. This user guide is also installed in the following directories when you install ROCm:

- `/opt/rocm/share/info/rocgdb/gdb.info` as a texinfo file
- `/opt/rocm/share/doc/rocgdb/rocgdb.pdf` as a PDF file

For specific information about debugging heterogeneous programs on ROCm software, refer to the following chapters in the ROCgdb user guide:

- *Debugging Heterogeneous Programs*: It provides general information about debugging heterogeneous programs. It also discusses features and commands that are not currently implemented but provisionally planned for future versions.
- *Configuration-Specific Information > Architectures > AMD GPU*: It provides specific information about debugging heterogeneous programs on ROCm software with supported AMDGPU chips. This section also lists the implementation status and known issues of the current version.

You can use the standard [GDB](#) commands for both CPU and GPU code debugging.

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