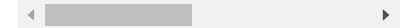


# Cygwin & MinGW (for Windows)

## How To Install and Get Started

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### 1. How to Install Cygwin

Cygwin (pronounced as SIG-win) = GNU + Cygnus + Windows. The mother site for Cygwin is [www.cygwin.com](http://www.cygwin.com).

According to the developers, "Cygwin is a Open-source *Linux*-like environment for *Windows*. It consists of two parts:

- A DLL (`cygwin1.dll`) which acts as a Linux API emulation layer providing substantial Linux API functionality.
- A collection of tools which provide Linux look and feel."

To install Cygwin:

#### Step 1: Download Setup

Goto Cygwin mother site @ <https://www.cygwin.com> ⇒ Click "Install Cygwin" ⇒ Download the setup program "`setup-x86_64.exe`" (64-bit Windows) or "`setup-x86.exe`" (32-bit Windows).

#### Step 2: Run Setup to Select, Download & Install Cygwin Packages

Run "`setup-x86_64.exe`" ⇒ Install from Internet ⇒ select a directory (avoid installing in "Program Files" because of that "blank" character) ⇒ choose "Local Package Directory" which saves the downloaded installation files ⇒ Direct Connection ⇒ choose a download mirror site.

Select the packages that you wish to install.

**Important:** For programmers, you certainly need to open the "Devel" (Development) category and select "gcc", "g++", "gdb", "make", and others, which are not part of the default selection.

Browse thru all the categories. Complete the installation process. You can always re-run "setup" to install additional packages later.

#### Step 3: Setup PATH

Include the Cygwin Binary directory (`bin`) in the PATH environment variable.

Suppose that your Cygwin is installed in directory "`c:\cygwin`". From "Control Panel" ⇒ (Optional) System and Security ⇒ System ⇒ Advanced System Settings ⇒ "Advanced" tab ⇒ Environment Variables ⇒ System Variables ⇒ Select variable named "PATH" ⇒ Edit ⇒ Add "`c:\cygwin\bin;`" in front of the existing PATH entry. Note that the semi-colon serves as the *directory separator* to separate Cygwin from the rest of directory paths.

#### Step 4: Verify Cygwin

Start the Cygwin Command shell (bash or sh) by running "`cygwin.bat`". You shall see the command prompt "\$". You may need to create the users' group and password files by running the following commands:

```
$ mkpasswd -l > /etc/passwd
$ mkgroup -l > /etc/group
```

Try out some Unix commands (you need to read a Unix book - there is no short-cut in learning), e.g.,

\$ ls	List the current directory
\$ dir	Similar to "ls"
\$ pwd	Print (or display) the current working directory
\$ cd <i>newdir</i>	Change current working directory to <i>newdir</i>
\$ cd ..	Change current working directory to its "parent" directory
\$ cd /	Change current working directory to its "root" directory

Need help? Try:

\$ man <i>command</i>	Display the manual pages for <i>command</i>
\$ man -k <i>keyword</i>	Display commands containing <i>keyword</i>
\$ man -f <i>command</i>	Display a brief description of <i>command</i>
\$ whatis <i>command</i>	Same as "man -f <i>command</i> "
\$ info <i>command</i>	Display the information pages for <i>command</i>
\$ help	Display the help menu

On bash shell, after setting the directory to the the "root" (via "cd /"), you could find a directory called "cygdrive" (via "ls" or "dir"), where all the hard disks are mounted. "cd cygdrive" and "ls" lists all the hard disks, e.g., "c", "d", etc.

You may mount your C drive ("c:") as "/c" instead of the default "/cygdrive/c" via this command:

\$ mount c: \c	Mount Drive "C:" as "\c"
\$ mount	Display the current mounts

You could invoke the Cygwin programs and utilities via the Windows' Command Prompt ("cmd.exe") instead of bash shell (provided the PATH is set properly), e.g.,

> ls -aLR
> man gcc

## 2. How to install MinGW

[To Check] Is MinGW obsoleted by MinGW-W64, which supports both 32-bit and 64-bit Windows?

MinGW (short for "Minimalist GNU for Windows"), is a minimalist (i.e., small but fewer features compared with cygwin) development environment for native Microsoft Windows applications, in particular:

1. A port of the GNU Compiler Collection (GCC), including C, C++, ADA and Fortran compilers;
2. GNU Binutils for Windows (assembler, linker, archive manager).
3. MSYS (short for "Minimal SYStem"), is a bash Shell command line interpreter.

To install MinGW:

1. Goto MinGW mother site at <http://www.mingw.org/> ⇒ Downloads ⇒ Installer ⇒ click on "mingw-get-inst" link to download the installer.
2. Run the downloaded installer.
  - a. Set the installation directory. (Try to use a directory name without spaces, e.g., "d:\myproject\mingw". Try not to install under "Program Files" or "Desktop".)
  - b. In MinGW Installation Manager, select "Installation" ⇒ "Update Catalogue" ⇒ Select all packages in "Basic Setup" ⇒ continue.
3. Setup environment variable PATH to include "<MINGW\_HOME>/bin" where <MINGW\_HOME> is the MinGW installed directory that you have chosen in the previous step.
4. Verify the GCC installation by listing the version of gcc, g++ and gdb:

```
> gcc --version
g++ (GCC) 4.8.1
.....

> g++ --version
g++ (GCC) 4.8.1
```

```
.....  
> gdb --version  
GNU gdb (GDB) 7.6.1  
.....
```

### 3. How to install MinGW-w64

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MinGW-w64 is a fork of MinGW to support 64-bit Windows (as well as the 32-bit windows). The mother site is <http://mingw-w64.org/doku.php>.

You can install MinGW-W64 under "Cygwin" by selecting these packages (under "Devel" category):

- mingw64-x86\_64-gcc-core: 64-bit C compiler for native 64-bit Windows. The executable is "x86\_64-w64-mingw32-gcc".
- mingw64-x86\_64-gcc-g++: 64-bit C++ compiler for native 64-bit Windows. The executable is "x86\_64-w64-mingw32-g++".
- mingw64-i686-gcc-core: 64-bit C compiler for native 32-bit Windows. The executable is "i686-w64-mingw32-gcc".
- mingw64-i686-gcc-g++: 64-bit C++ compiler for native 32-bit Windows. The executable is "i686-w64-mingw32-g++".

To check the versions:

```
// 32-bit Windows  
$ i686-w64-mingw32-gcc --version  
i686-w64-mingw32-gcc (GCC) 6.4.0  
$ i686-w64-mingw32-g++ --version  
i686-w64-mingw32-g++ (GCC) 6.4.0  
  
// 64-bit Windows  
$ x86_64-w64-mingw32-gcc --version  
x86_64-w64-mingw32-gcc (GCC) 6.4.0  
$ x86_64-w64-mingw32-g++ --version  
x86_64-w64-mingw32-g++ (GCC) 6.4.0
```

You can also install MinGW-W64 stand-alone by downloading and run the installer.

### 4. Writing C/C++ Programs using GCC in Cygwin or MinGW (under Windows)

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Read "GCC and Make".

#### REFERENCES & RESOURCES

1. Cygwin Mother Site @ [www.cygwin.com](http://www.cygwin.com).
2. MinGW mother site @ [www.mingw.org](http://www.mingw.org).

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Latest version tested: Cygwin64, MinGW ??  
Last modified: January, 2017

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