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FEBRUARY 22, 2022 / [#C++](#)

How to Install C and C++ Compilers on Windows



Md. Fahim Bin Amin

If you want to run C or C++ programs in your Windows operating system, then you need to have the right compilers.

The MinGW compiler is a well known and widely used software for installing GCC and G++ compilers for the C and C++ programming languages.

But many devs face difficulties when installing the compiler, so I am going to show you all the steps to do so in this article with screenshots to help you get it done.

I will be using Windows 11, but the same process is applicable for all other Windows operating systems unless you are using Windows XP (You need to change some steps in Windows XP).

If you'd like to watch the video I made on this topic as well, here it is:

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Install MSYS2

Firstly we need to download an executable file from MSYS2. Go to the official website of MSYS2: <https://www.msys2.org/>. The website looks like below as of today.

MSYS2

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MSYS2

Software Distribution and Building Platform for Windows

MSYS2 is a collection of tools and libraries providing you with an easy-to-use environment for building, installing and running native Windows software.

It consists of a command line terminal called `mintty`, bash, version control systems like git and subversion, tools like tar and awk and even build systems like autotools, all based on a modified version of `Cygwin`. Despite some of these central parts being based on Cygwin, the main focus of MSYS2 is to provide a build environment for native Windows software and the Cygwin-using parts are kept at a minimum. MSYS2 provides up-to-date native builds for GCC, mingw-w64, CPython, CMake, Meson, OpenSSL, FFmpeg, Rust, Ruby, just to name a few.

To provide easy installation of packages and a way to keep them updated it features a package management system called `Pacman`, which should be familiar to Arch Linux users. It brings many powerful features such as dependency resolution and simple complete system upgrades, as well as straight-forward and reproducible package building. Our package repository contains more than 2500 pre-built packages ready to install.

GitHub

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- Sponsors
- Authors and Contributors
- Donations

Alexey Pavlov (@alepxux)
Ray Donnelly (@mingwandroid)
Christoph Reiter (@lazka)

Scroll down a little bit until you find the download button for the executable file.

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For more details see [WHAT IS MSYS2?](#) which also compares MSYS2 to other software distributions and development environments like Cygwin, WSL, Chocolatey, Scoop, ... and ['Who Is Using MSYS2?'](#) to see which projects are using MSYS2 and what for.

Installation

1. Download the installer: [msys2-x86_64-20220128.exe](#)
2. Run the installer. MSYS2 requires 64 bit Windows 7 or newer.
3. Enter your desired **Installation Folder** (short ASCII-only path on a NTFS volume, no accents, no spaces, no symlinks, no subst or network drives, no FAT).

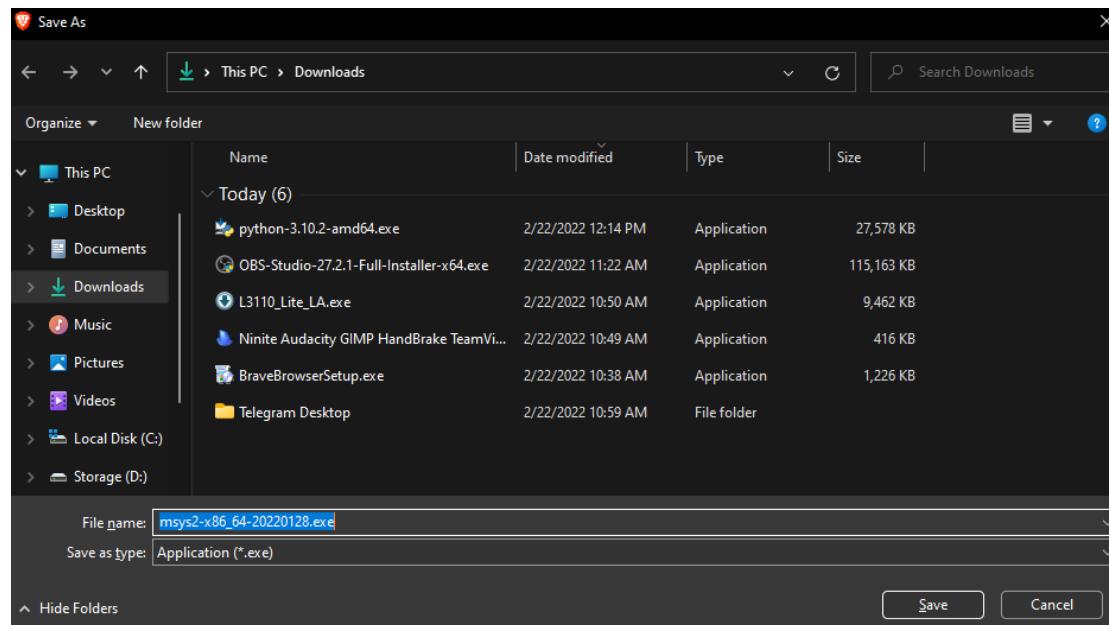
Verify with SHA256 checksum: 7d1e86477213c64dfc8fa2c28b891f878576db171df53f18014bb8679c7faa3e or [GPG signature by 0xf7a49b0ec](#).

MSYS2 64bit Setup

Installation Folder
Start Menu shortcuts
Installing

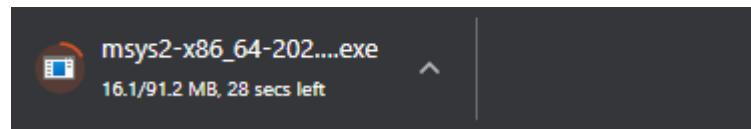
Please specify the directory where MSYS2 64-bit will be installed.

Simply click on the installer button and save the installer file in any place you want.

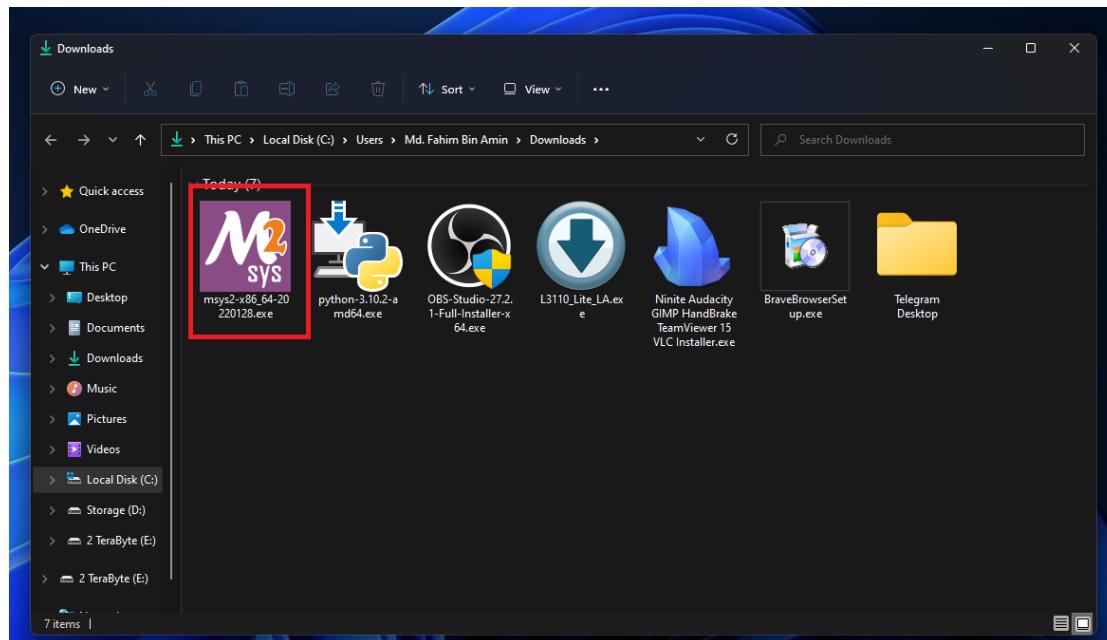


Finish downloading the executable file. It should not take much time depending on your internet speed.

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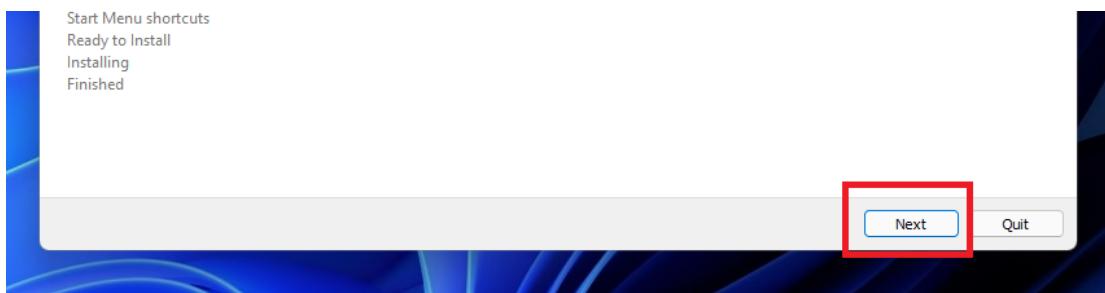
After downloading the file, we will get this executable file.



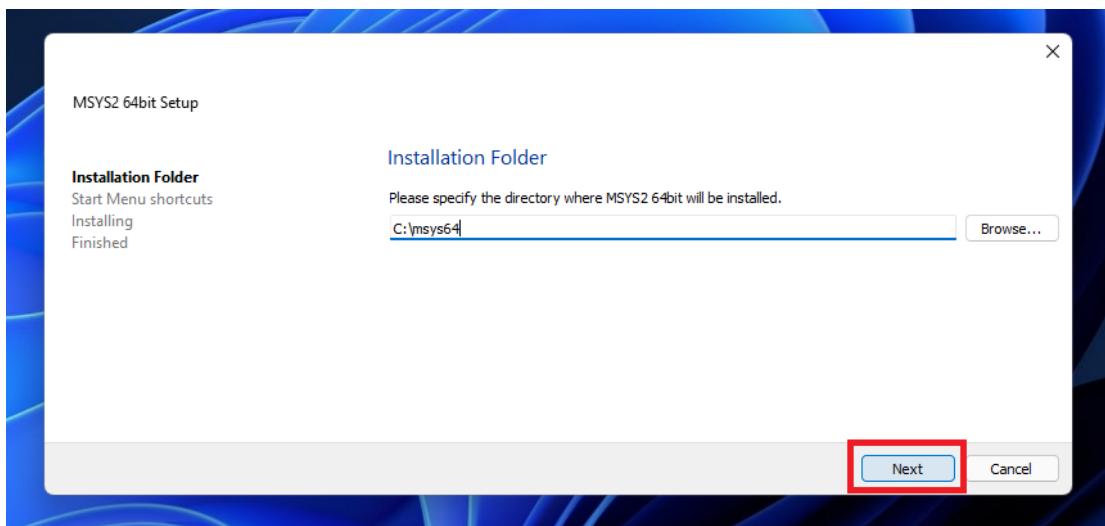
Double click on the executable file. Then click Next .



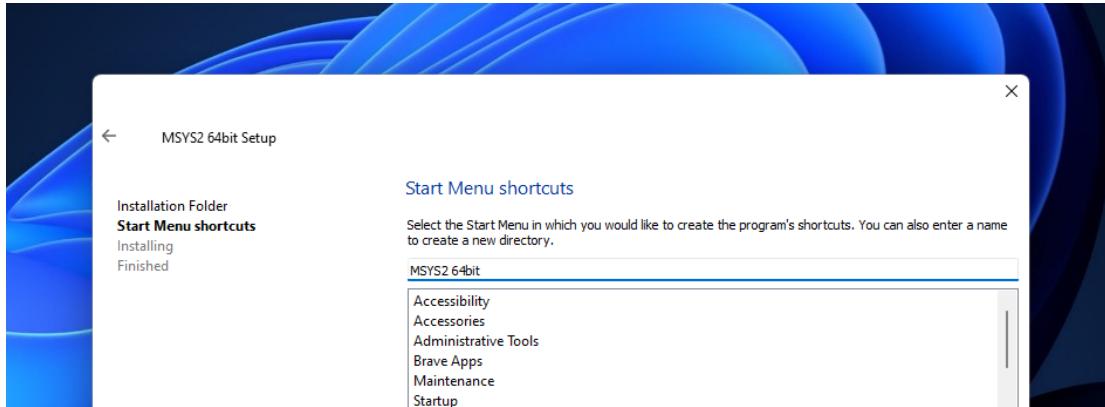
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Keep the name as it is, and click `Next`.

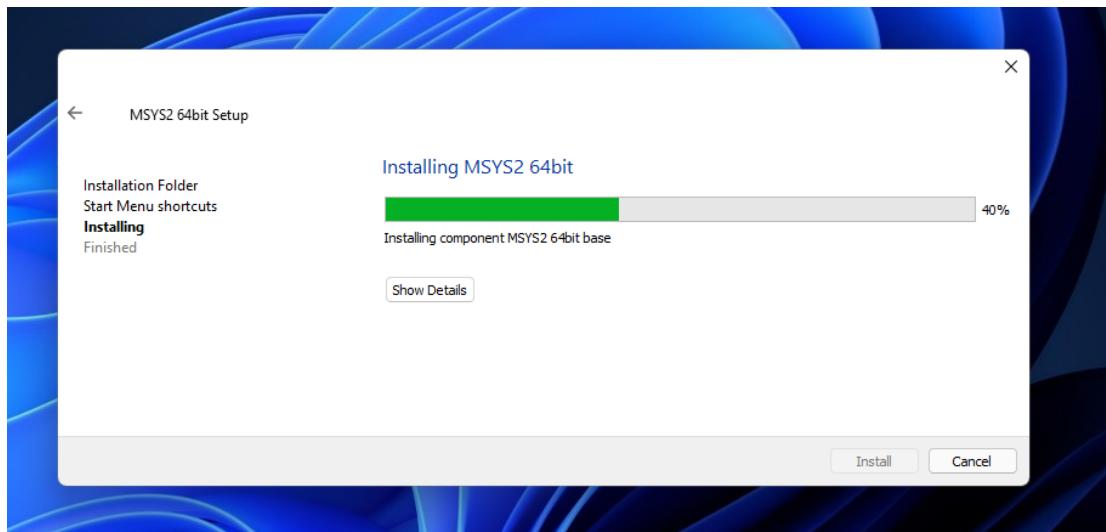


Keep all this as it is, and click `Next`.

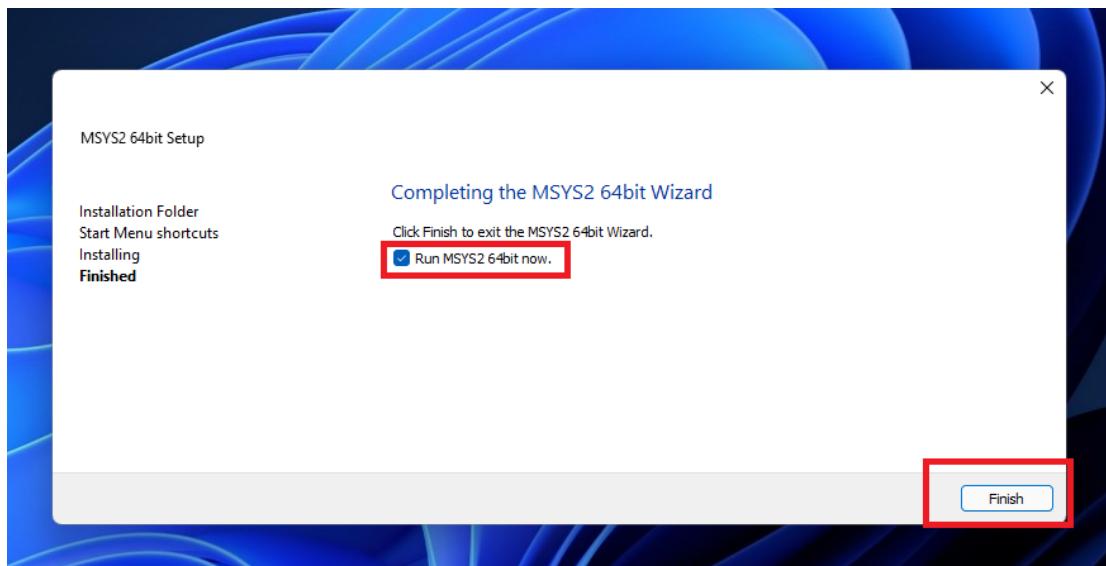


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Give it some time to finish the installation process.



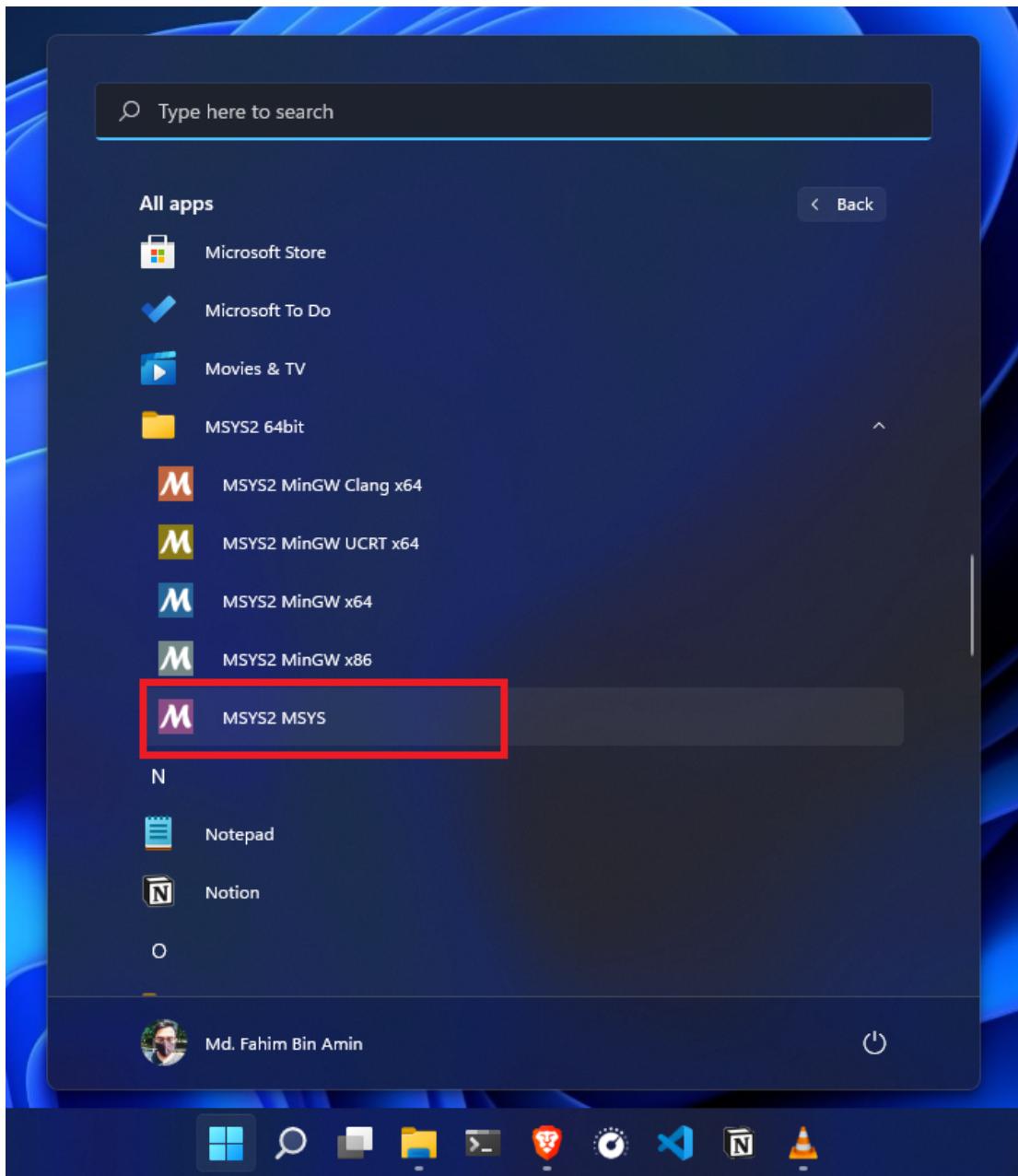
If you keep the checkmark, then the MSYS2 terminal will open once you click `Finish`.



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menu.

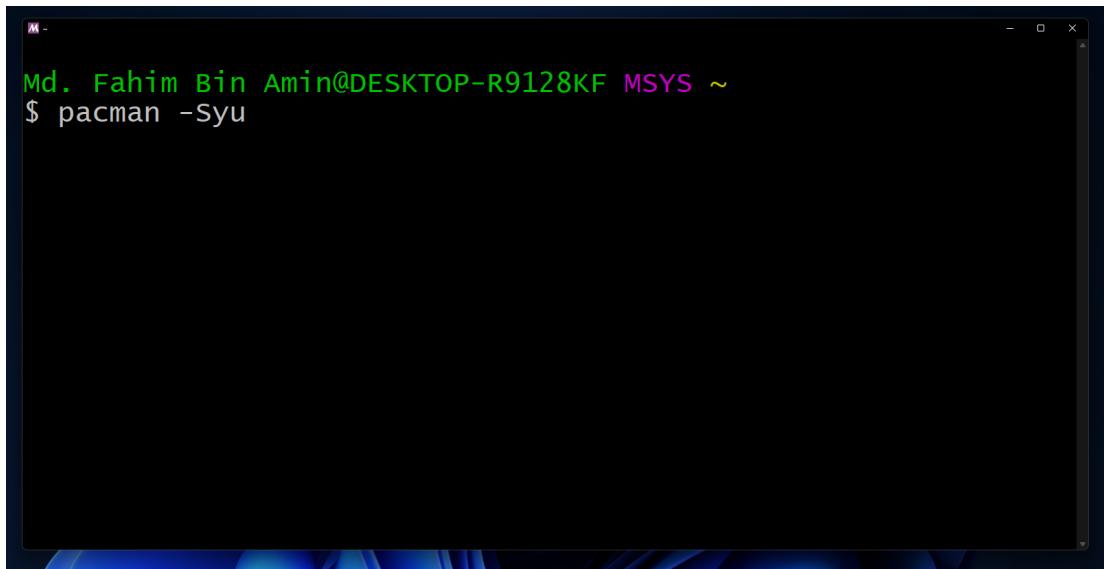
In that case, you have to click the start button > Search for MSYS2 and click on the terminal like in the following picture:



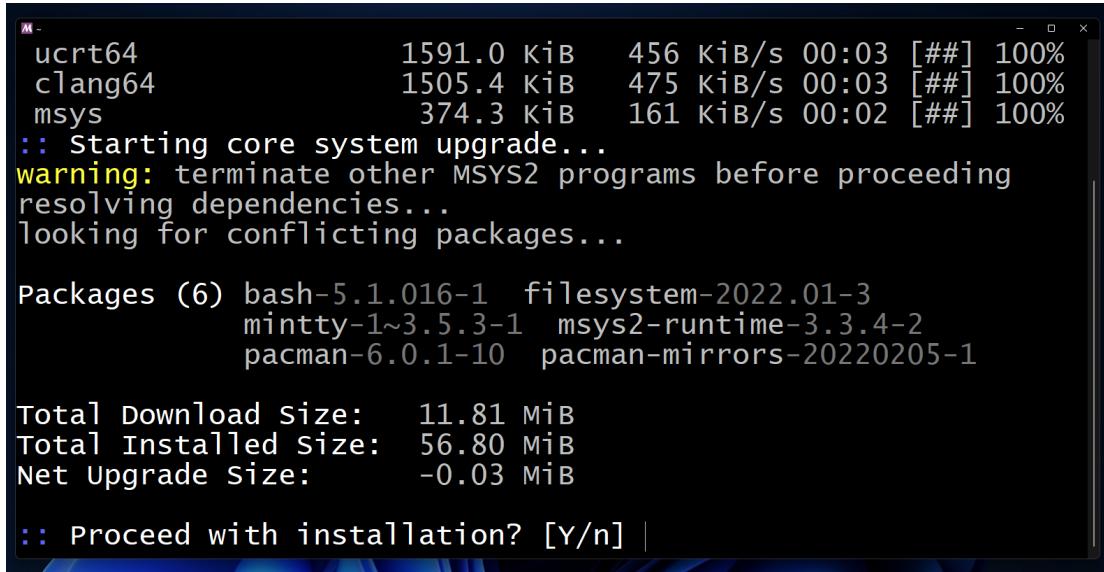
Let me assume that we have opened the MSYS2 MSYS terminal

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and the base packages.



Type `Y` and press the enter key if you get this type of installation prompt.



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```
msys      574.5 KiB  101 KiB/s 00:02 [##] 100%
:: Starting core system upgrade...
warning: terminate other MSYS2 programs before proceeding
resolving dependencies...
looking for conflicting packages...

Packages (6) bash-5.1.016-1 filesystem-2022.01-3
               mintty-1~3.5.3-1 msys2-runtime-3.3.4-2
               pacman-6.0.1-10 pacman-mirrors-20220205-1

Total Download Size: 11.81 MiB
Total Installed Size: 56.80 MiB
Net Upgrade Size: -0.03 MiB

:: Proceed with installation? [Y/n] Y
```

```
mintty-1~3.5.3-1 msys2-runtime-3.3.4-2
pacman-6.0.1-10 pacman-mirrors-20220205-1

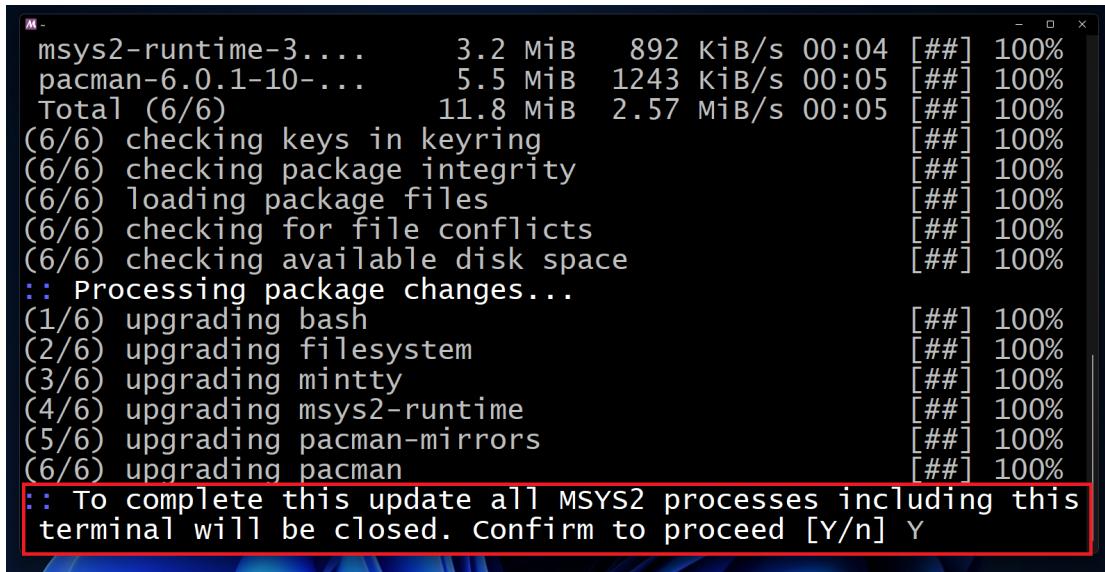
Total Download Size: 11.81 MiB
Total Installed Size: 56.80 MiB
Net Upgrade Size: -0.03 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
filesystem-2022.... 106.1 KiB  148 KiB/s 00:01 [##] 100%
mintty-1~3.5.3-1... 789.1 KiB  538 KiB/s 00:01 [##] 100%
bash-5.1.016-1-x... 672.0 KiB  669 KiB/s 00:02 [--] 29%
msys2-runtime-3.... 640.0 KiB  615 KiB/s 00:04 [--] 19%
pacman-6.0.1-10... 736.0 KiB  727 KiB/s 00:06 [--] 13%
pacman-mirrors-20220205-1-anyiB 1865 KiB/s 00:05 [--] 11%
Total (1/6)          2.8 MiB  2.75 MiB/s 00:03 [--] 23%
```

Type **Y** and press the enter key.

```
msys2-runtime-3.... 3.2 MiB  892 KiB/s 00:04 [##] 100%
pacman-6.0.1-10-... 5.5 MiB  1243 KiB/s 00:05 [##] 100%
Total (6/6)         11.8 MiB  2.57 MiB/s 00:05 [##] 100%
(6/6) checking keys in keyring
(6/6) checking package integrity
(6/6) loading package files
(6/6) checking for file conflicts
(6/6) checking available disk space
:: Processing package changes...
(1/6) upgrading bash
(2/6) upgrading filesystem
(3/6) upgrading mintty
(4/6) upgrading msys2-runtime
(5/6) upgrading pacman-mirrors
```

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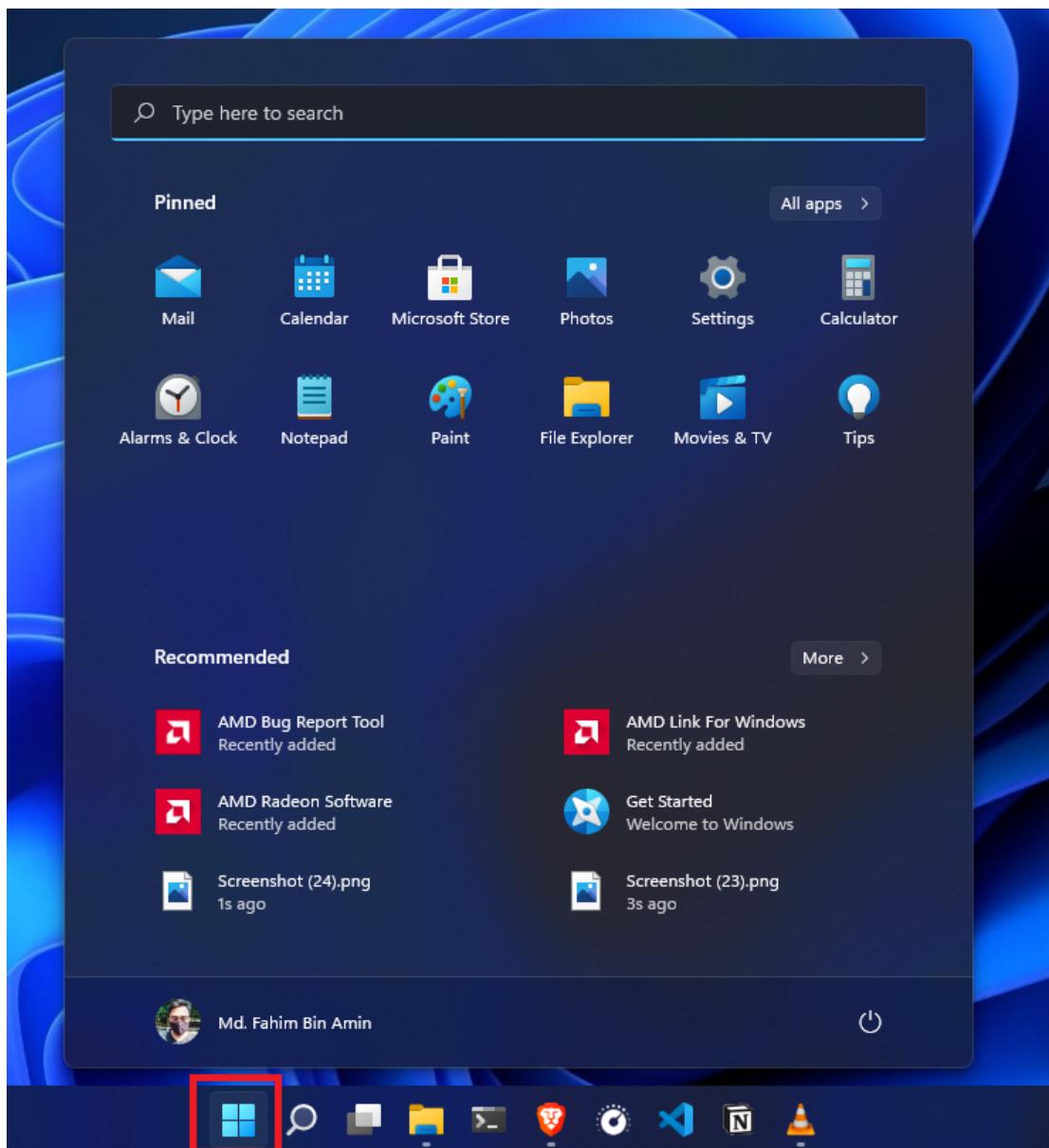


```
msys2-runtime-3....    3.2 MiB  892 KiB/s 00:04 [##] 100%
pacman-6.0.1-10-...    5.5 MiB  1243 KiB/s 00:05 [##] 100%
Total (6/6)      11.8 MiB  2.57 MiB/s 00:05 [##] 100%
(6/6) checking keys in keyring [##] 100%
(6/6) checking package integrity [##] 100%
(6/6) loading package files [##] 100%
(6/6) checking for file conflicts [##] 100%
(6/6) checking available disk space [##] 100%
:: Processing package changes...
(1/6) upgrading bash [##] 100%
(2/6) upgrading filesystem [##] 100%
(3/6) upgrading mintty [##] 100%
(4/6) upgrading msys2-runtime [##] 100%
(5/6) upgrading pacman-mirrors [##] 100%
(6/6) upgrading pacman [##] 100%
:: To complete this update all MSYS2 processes including this terminal will be closed. Confirm to proceed [Y/n] Y
```

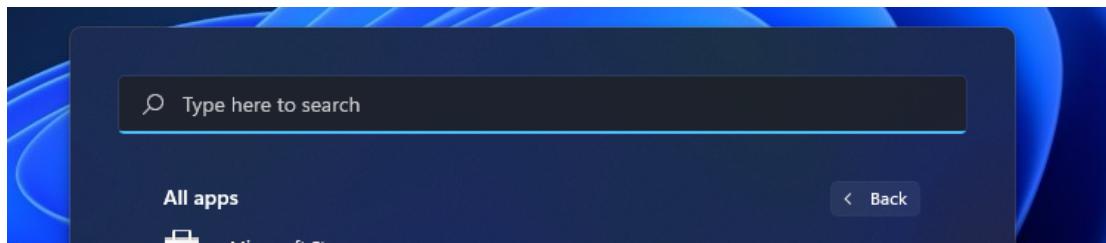
The terminal will be closed. We have to open the terminal manually and update the rest of the packages.

Click the start button.

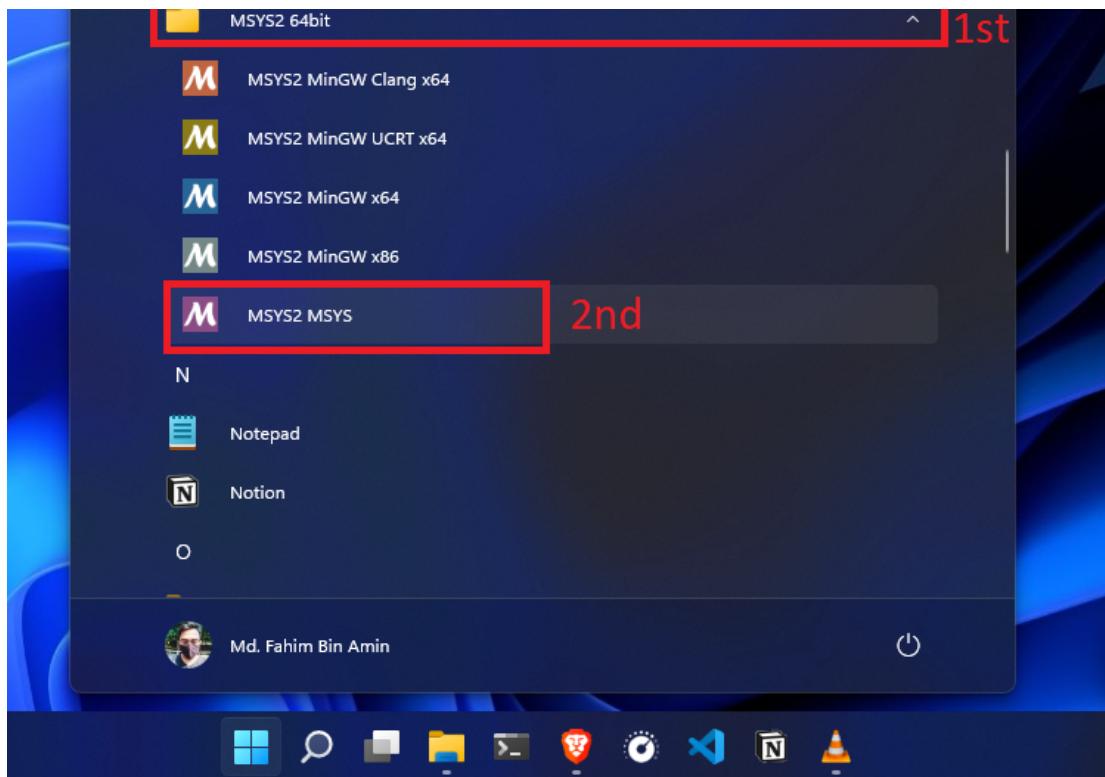
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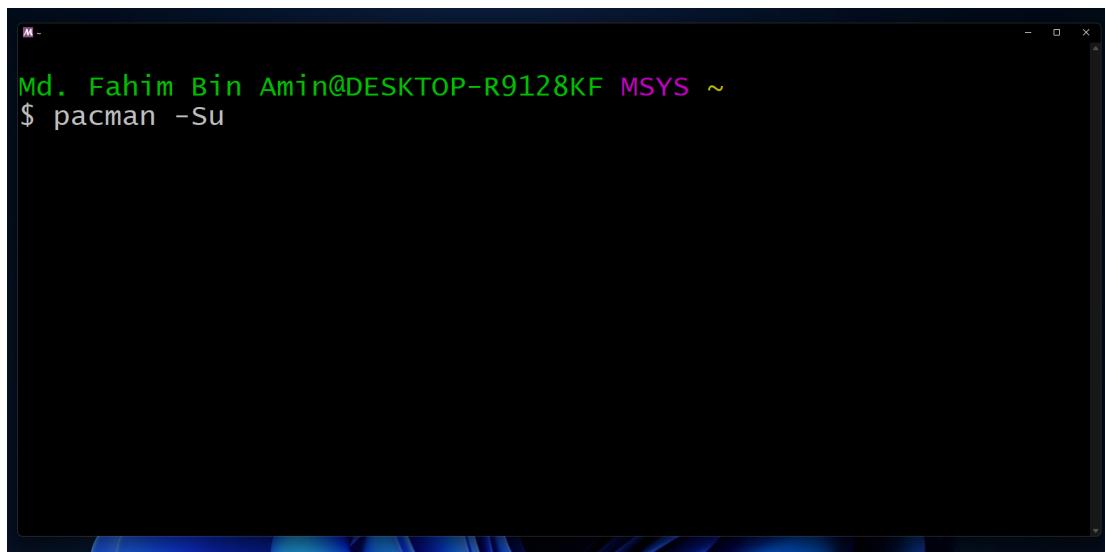
Search the folder named **MSYS2 64bit**. Click on the folder to expand and get the terminal. Open the terminal by clicking **MSYS2 MSYS**.



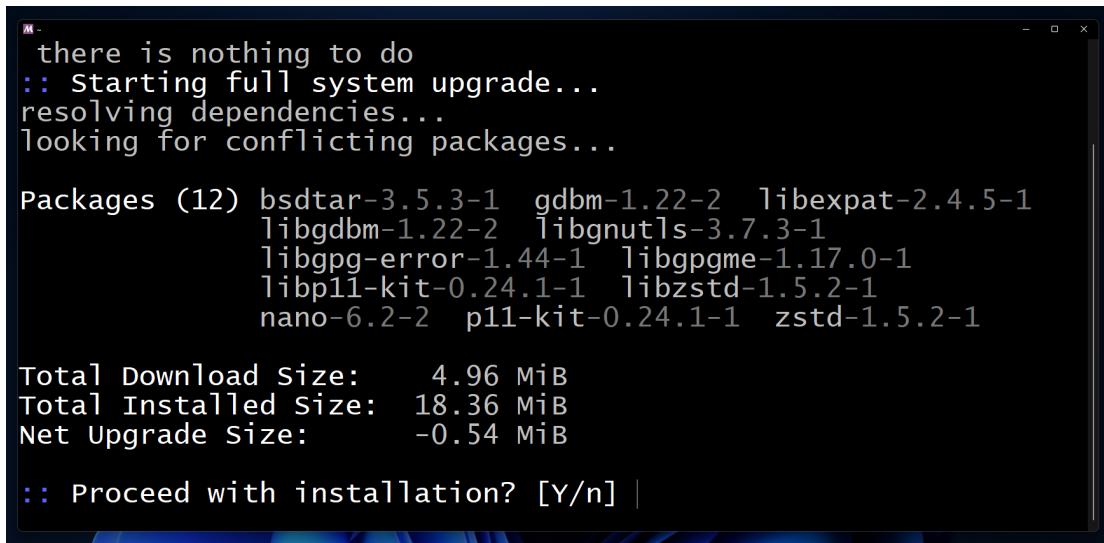
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Update the rest of the packages by applying the command, pacman - Su .



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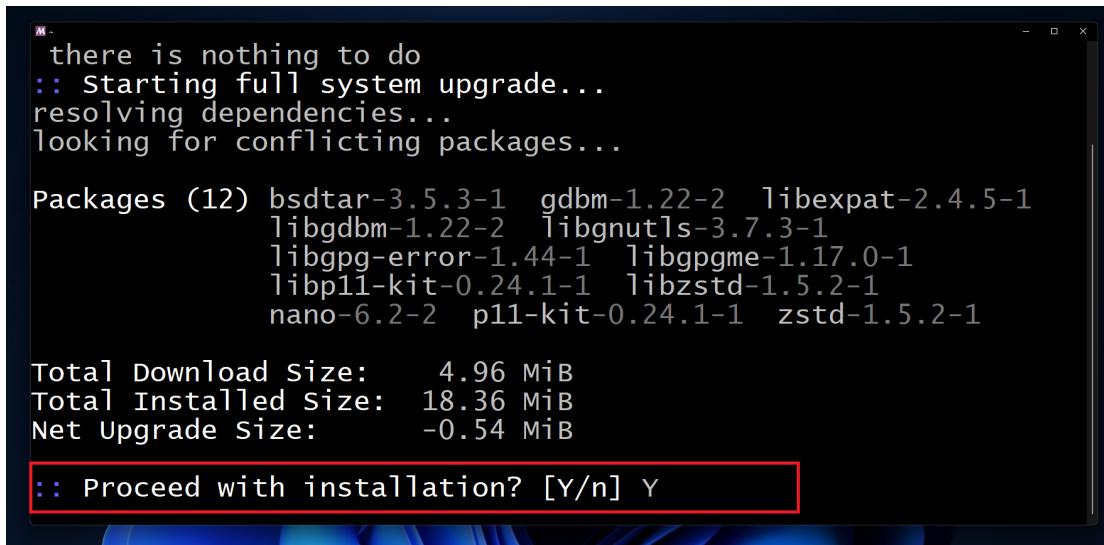


```
there is nothing to do
:: Starting full system upgrade...
resolving dependencies...
looking for conflicting packages...

Packages (12) bsdtar-3.5.3-1  gdbm-1.22-2  libexpat-2.4.5-1
                  libgdbm-1.22-2  libgnutls-3.7.3-1
                  libgpg-error-1.44-1  libgpgme-1.17.0-1
                  libp11-kit-0.24.1-1  libzstd-1.5.2-1
                  nano-6.2-2  p11-kit-0.24.1-1  zstd-1.5.2-1

Total Download Size:    4.96 MiB
Total Installed Size:  18.36 MiB
Net Upgrade Size:      -0.54 MiB

:: Proceed with installation? [Y/n] |
```



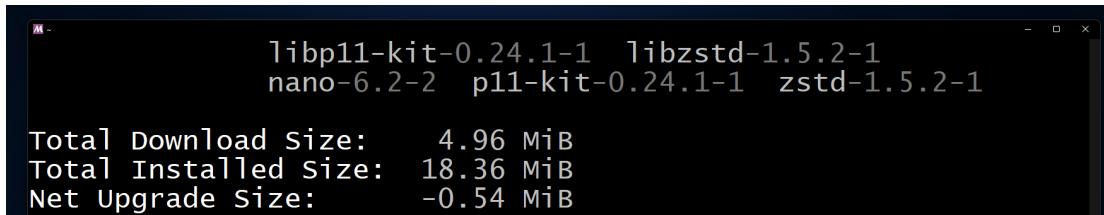
```
there is nothing to do
:: Starting full system upgrade...
resolving dependencies...
looking for conflicting packages...

Packages (12) bsdtar-3.5.3-1  gdbm-1.22-2  libexpat-2.4.5-1
                  libgdbm-1.22-2  libgnutls-3.7.3-1
                  libgpg-error-1.44-1  libgpgme-1.17.0-1
                  libp11-kit-0.24.1-1  libzstd-1.5.2-1
                  nano-6.2-2  p11-kit-0.24.1-1  zstd-1.5.2-1

Total Download Size:    4.96 MiB
Total Installed Size:  18.36 MiB
Net Upgrade Size:      -0.54 MiB

:: Proceed with installation? [Y/n] Y
```

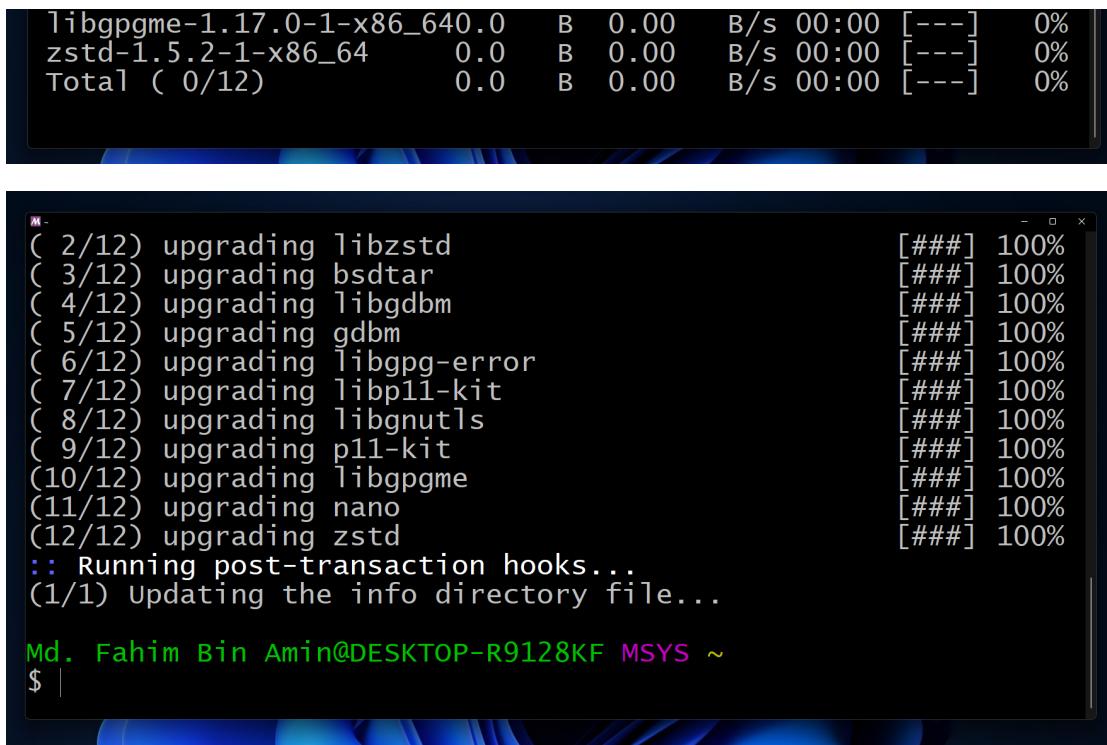
Wait a little to finish the installation.



```
libp11-kit-0.24.1-1  libzstd-1.5.2-1
nano-6.2-2  p11-kit-0.24.1-1  zstd-1.5.2-1

Total Download Size:    4.96 MiB
Total Installed Size:  18.36 MiB
Net Upgrade Size:      -0.54 MiB
```

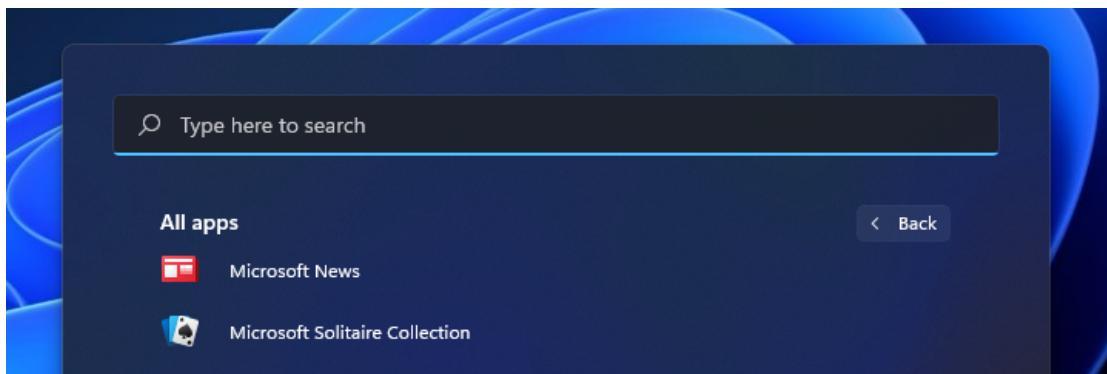
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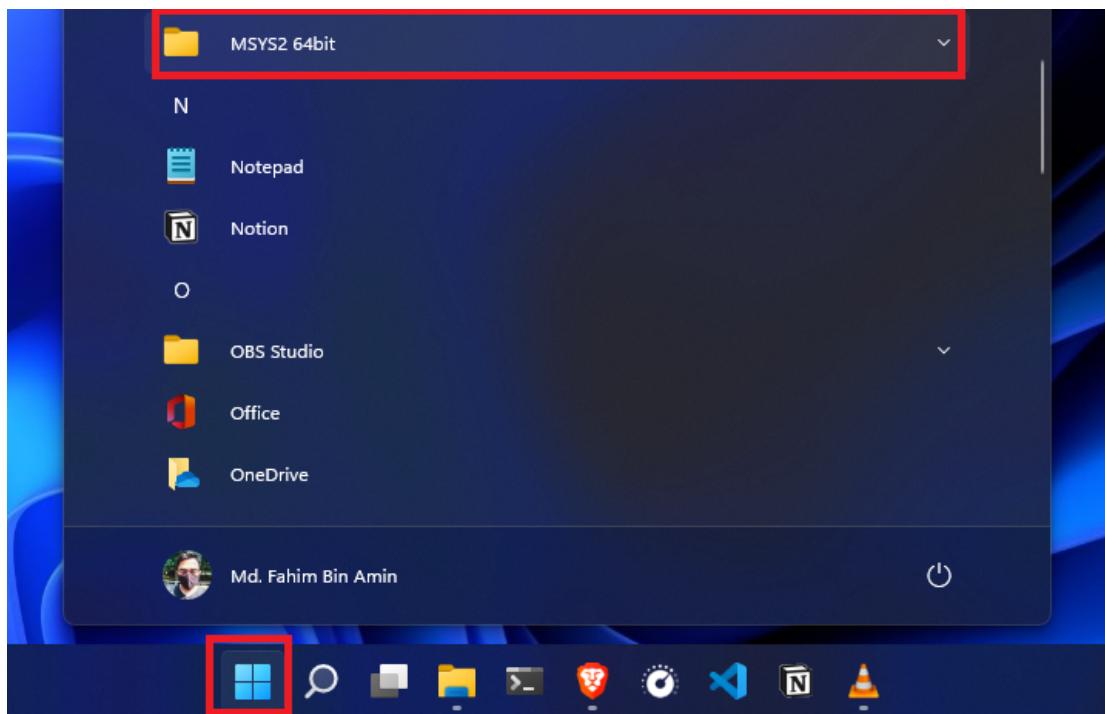
Close the window after finishing the installation.

Install the G++ and G++ Compilers

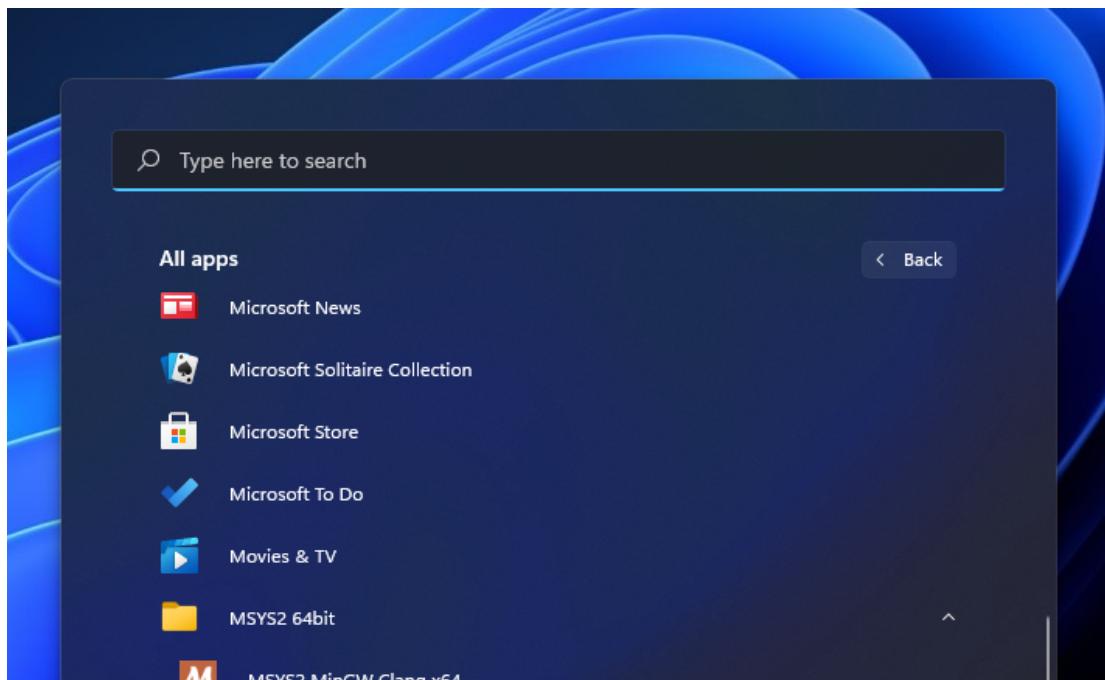
Click the start button. Find the **MSYS2 64bit** folder. Click on that folder to expand it.



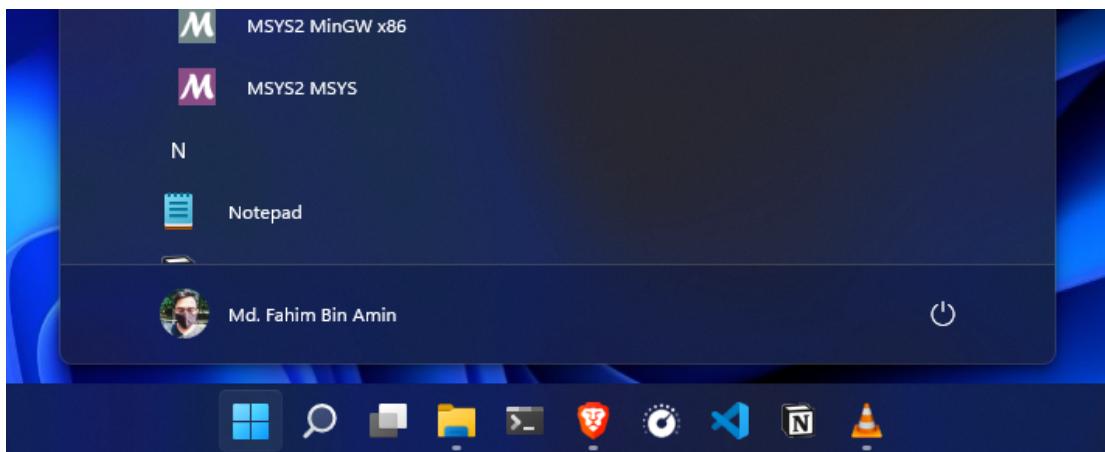
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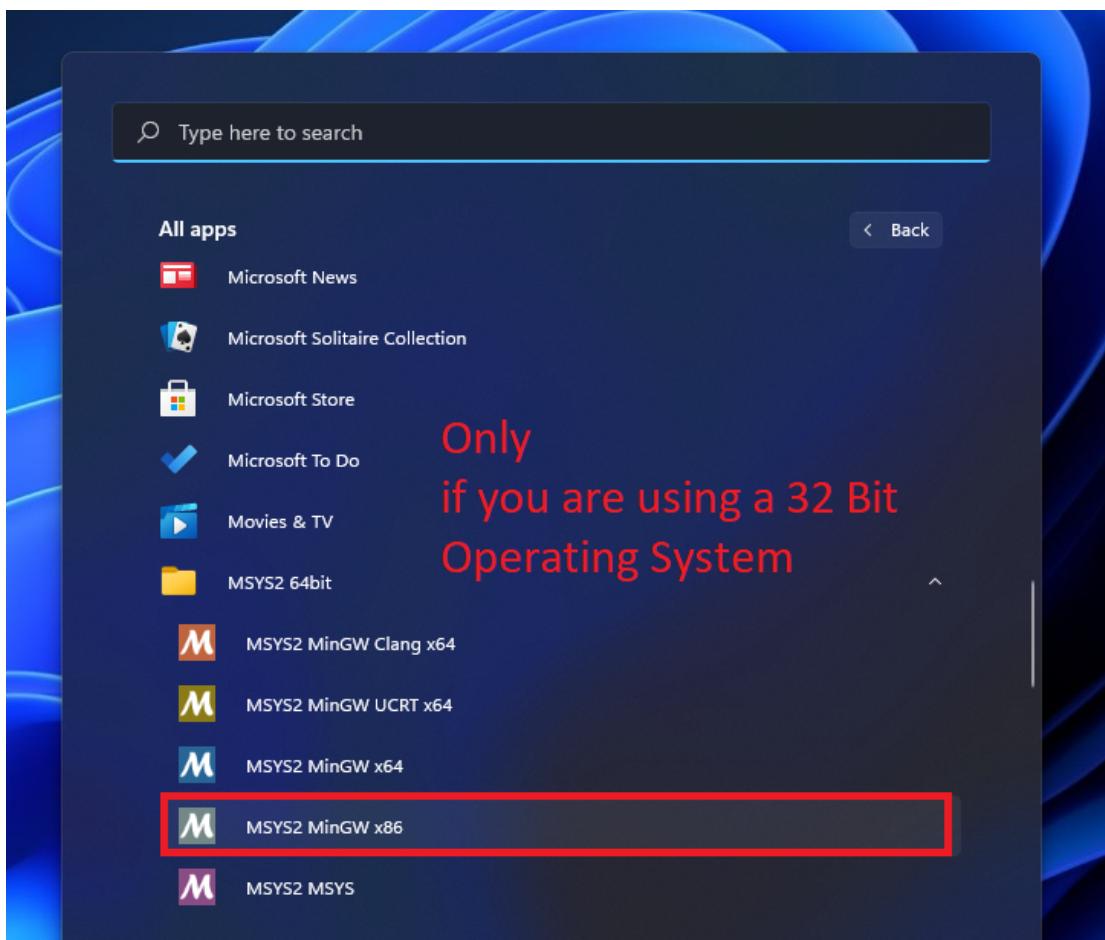
If you are using a **64 bit** operating system like I am, then we need to use the **MSYS2 MinGW x64** terminal. Click on the terminal to open that.



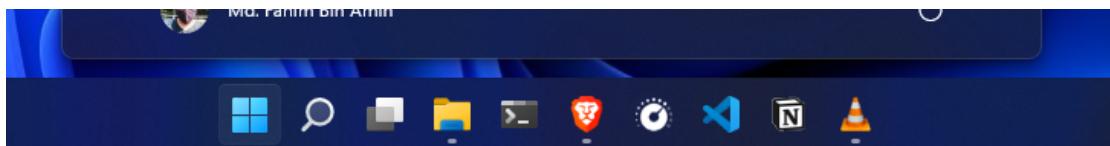
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⚠️ But, if you are using a **32 bit** operating system, then you have to use the **MSYS2 MinGW x86** terminal. Then, you need to open that terminal.

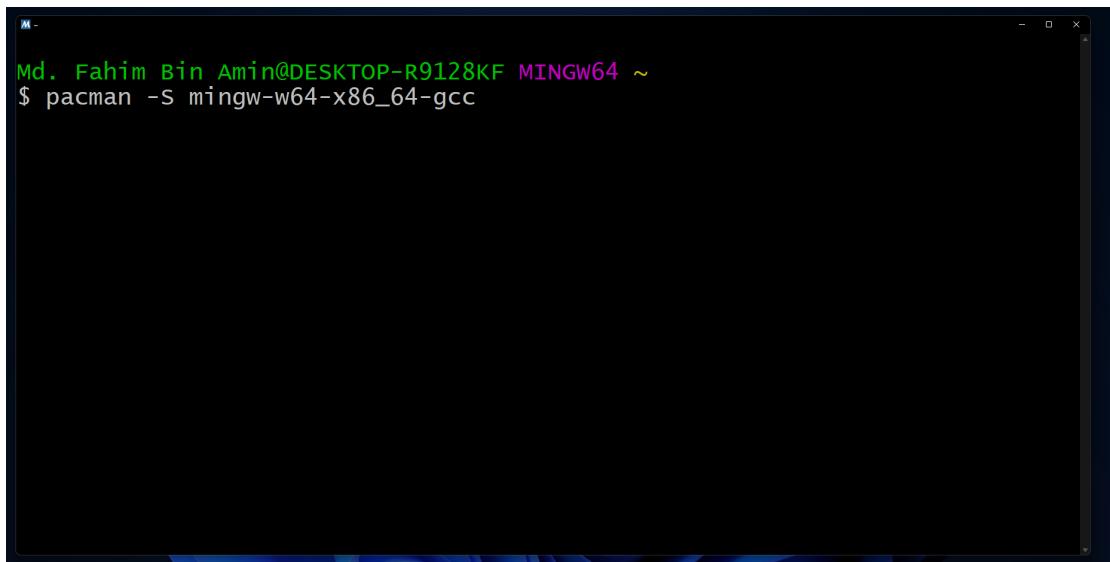


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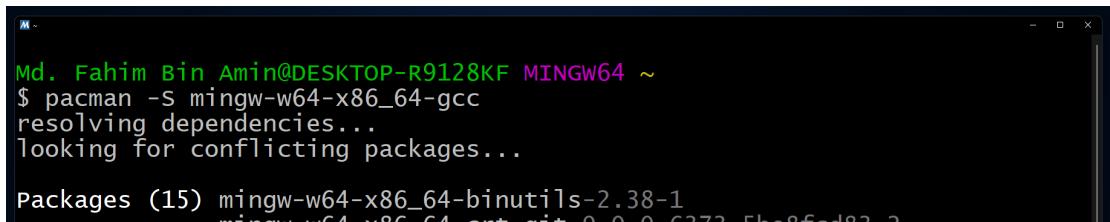


As I am using a **64 bit** operating system, I have opened the terminal for 64 bit. Apply the command `pacman -S mingw-w64-x86_64-gcc` to install the compilers.

 If you are using a **32 bit** operating system, then you have to apply the command `pacman -S mingw-w64-i686-gcc` in your 32 bit terminal.

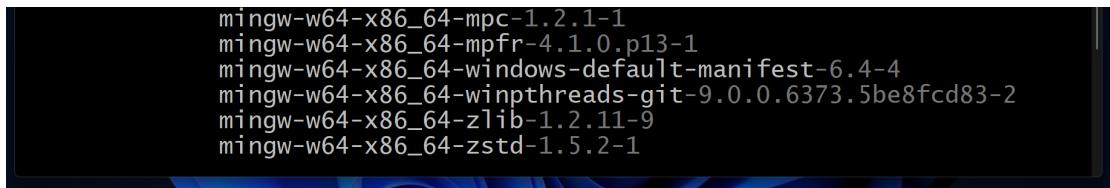


Wait for a little while.

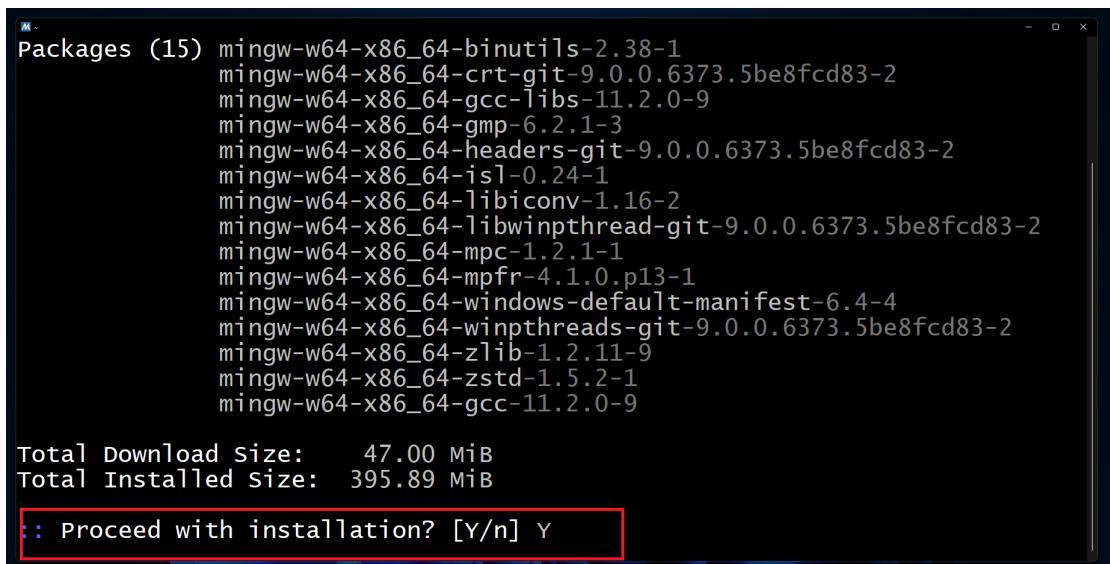
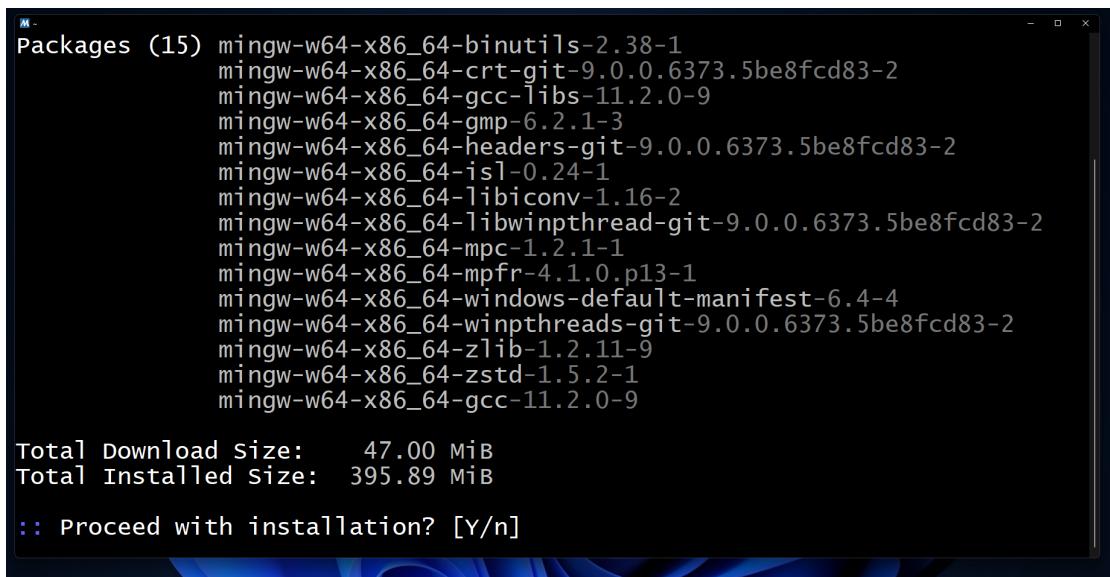


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Type **Y** or **y** and press the enter key if you get the installation prompts.



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```
mingw-w64-x86_64-mpc-1.2.1-1
mingw-w64-x86_64-mpfr-4.1.0.p13-1
mingw-w64-x86_64-windows-default-manifest-6.4-4
mingw-w64-x86_64-winpthread-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-zlib-1.2.11-9
mingw-w64-x86_64-zstd-1.5.2-1
mingw-w64-x86_64-gcc-11.2.0-9

Total Download Size: 47.00 MiB
Total Installed Size: 395.89 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
mingw-w64-x86_64-gcc-11.2.0-9-any
mingw-w64-x86_64-binutils-2.38-1-any0  B/s 00:00 [-----] 0%
mingw-w64-x86_64-headers-git-9.0.0.6373.5be8fc83-2-any-----] 0%
mingw-w64-x86_64-crt-git-9.0.0.6373.5be8fc83-2-any-----] 0%
mingw-w64-x86_64-isl-0.24-1-any 0.00  B/s 00:00 [-----] 0%
Total ( 0/15)          0.0  B 0.00  B/s 00:00 [-----] 0%
```

```
mingw-w64-x86_64-mpc-1.2.1-1
mingw-w64-x86_64-mpfr-4.1.0.p13-1
mingw-w64-x86_64-windows-default-manifest-6.4-4
mingw-w64-x86_64-winpthread-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-zlib-1.2.11-9
mingw-w64-x86_64-zstd-1.5.2-1
mingw-w64-x86_64-gcc-11.2.0-9

Total Download Size: 47.00 MiB
Total Installed Size: 395.89 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
mingw-w64-x86_64-gcc-11.2.0-9-any
mingw-w64-x86_64-binutils-2.38-1-any0  B/s 00:00 [-----] 0%
mingw-w64-x86_64-headers-git-9.0.0.6373.5be8fc83-2-any-----] 0%
mingw-w64-x86_64-crt-git-9.0.0.6373.5be8fc83-2-any-----] 0%
mingw-w64-x86_64-isl-0.24-1-any 0.00  B/s 00:00 [-----] 0%
Total ( 0/15)          0.0  B 0.00  B/s 00:00 [-----] 0%
```

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How to Install the Debugger

If you are using a **64 bit** operating system like I am, then you have to apply the command `pacman -S mingw-w64-x86_64-gdb`.

⚠ If you are using a **32 bit** operating system, then you have to apply the command `pacman -S mingw-w64-i686-gdb` in your 32 bit terminal.

```
:: Processing package changes...
( 1/15) installing mingw-w64-x86_64-libiconv      [#####
( 2/15) installing mingw-w64-x86_64-zlib          [#####
( 3/15) installing mingw-w64-x86_64-binutils       [#####
( 4/15) installing mingw-w64-x86_64-headers-git    [#####
( 5/15) installing mingw-w64-x86_64-crt-git        [#####
( 6/15) installing mingw-w64-x86_64-isl            [#####
( 7/15) installing mingw-w64-x86_64-gmp           [#####
( 8/15) installing mingw-w64-x86_64-mpfr          [#####
( 9/15) installing mingw-w64-x86_64-mpc           [#####
(10/15) installing mingw-w64-x86_64-libwinpthread... [#####
(11/15) installing mingw-w64-x86_64-gcc-libs       [#####
(12/15) installing mingw-w64-x86_64-windows-de...   [#####
(13/15) installing mingw-w64-x86_64-winpthread...   [#####
(14/15) installing mingw-w64-x86_64-zstd          [#####
(15/15) installing mingw-w64-x86_64-gcc           [#####
Md. Fahim Bin Amin@DESKTOP-R9128KF MINGW64 ~
$ pacman -S mingw-w64-x86_64-gdb
```

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```
mingw-w64-x86_64-libtasn1-4.18.0-1
mingw-w64-x86_64-libtre-git-r128.6fb7206-2
mingw-w64-x86_64-mpdecimal-2.5.1-1
mingw-w64-x86_64-ncurses-6.3-3
mingw-w64-x86_64-openssl-1.1.1.m-1
mingw-w64-x86_64-p11-kit-0.24.1-1
mingw-w64-x86_64-python-3.9.10-2
mingw-w64-x86_64-readline-8.1.001-1
mingw-w64-x86_64-sqlite3-3.37.2-1
mingw-w64-x86_64-tcl-8.6.11-5
mingw-w64-x86_64-termcap-1.3.1-6
mingw-w64-x86_64-tk-8.6.11.1-2
mingw-w64-x86_64-tzdata-2021e-1
mingw-w64-x86_64-xxhash-0.8.1-1
mingw-w64-x86_64-xz-5.2.5-2 mingw-w64-x86_64-gdb-11.2-2

Total Download Size: 44.35 MiB
Total Installed Size: 310.53 MiB

:: Proceed with installation? [Y/n]
```

```
Packages (15) mingw-w64-x86_64-binutils-2.38-1
mingw-w64-x86_64-crt-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-gcc-libs-11.2.0-9
mingw-w64-x86_64-gmp-6.2.1-3
mingw-w64-x86_64-headers-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-isl-0.24-1
mingw-w64-x86_64-libiconv-1.16-2
mingw-w64-x86_64-libwinpthread-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-mpc-1.2.1-1
mingw-w64-x86_64-mpfr-4.1.0.p13-1
mingw-w64-x86_64-windows-default-manifest-6.4-4
mingw-w64-x86_64-winthreads-git-9.0.0.6373.5be8fc83-2
mingw-w64-x86_64-zlib-1.2.11-9
mingw-w64-x86_64-zstd-1.5.2-1
mingw-w64-x86_64-gcc-11.2.0-9

Total Download Size: 47.00 MiB
Total Installed Size: 395.89 MiB

:: Proceed with installation? [Y/n] Y
```

Give it some time to finish the installation.

```
mingw-w64-x86_64-sqlite3-3.37.2-1
mingw-w64-x86_64-tcl-8.6.11-5
mingw-w64-x86_64-termcap-1.3.1-6
mingw-w64-x86_64-tk-8.6.11.1-2
mingw-w64-x86_64-tzdata-2021e-1
mingw-w64-x86_64-xxhash-0.8.1-1
mingw-w64-x86_64-xz-5.2.5-2 mingw-w64-x86_64-gdb-11.2-2

Total Download Size: 44.35 MiB
Total Installed Size: 310.53 MiB
```

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```
mingw-w64-x86_64-gdb-11.2-2-any 0.00 B/s 00:00 [-----] 0%
mingw-w64-x86_64-gettext-0.21-3-any00 B/s 00:00 [-----] 0%
Total ( 0/22) 0.0 B 0.00 B/s 00:00 [-----] 0%
```

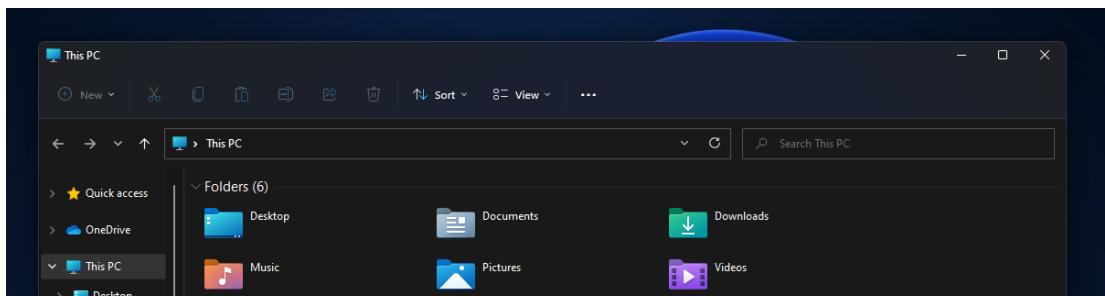
```
( 8/22) installing mingw-w64-x86_64-mpdecimal [#####] 100%
( 9/22) installing mingw-w64-x86_64-libtasn1 [#####] 100%
(10/22) installing mingw-w64-x86_64-p11-kit [#####] 100%
(11/22) installing mingw-w64-x86_64-ca-certifi... [#####] 100%
(12/22) installing mingw-w64-x86_64-openssl [#####] 100%
(13/22) installing mingw-w64-x86_64-termcap [#####] 100%
(14/22) installing mingw-w64-x86_64-readline [#####] 100%
(15/22) installing mingw-w64-x86_64-tcl [#####] 100%
(16/22) installing mingw-w64-x86_64-sqlite3 [#####] 100%
(17/22) installing mingw-w64-x86_64-tk [#####] 100%
(18/22) installing mingw-w64-x86_64-xz [#####] 100%
(19/22) installing mingw-w64-x86_64-tzdata [#####] 100%
(20/22) installing mingw-w64-x86_64-python [#####] 100%
(21/22) installing mingw-w64-x86_64-xxhash [#####] 100%
(22/22) installing mingw-w64-x86_64-gdb [#####] 100%
optional dependencies for mingw-w64-x86_64-gdb
mingw-w64-x86_64-python-pygments: for syntax highlighting

Md. Fahim Bin Amin@DESKTOP-R9128KF MINGW64 ~
$
```

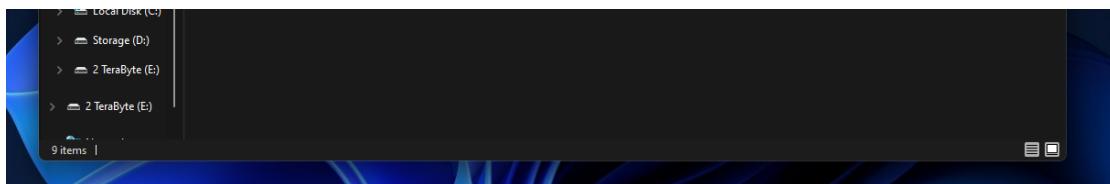
You can close the terminal.

How to Add the Directory to the Path of the Environment Variables

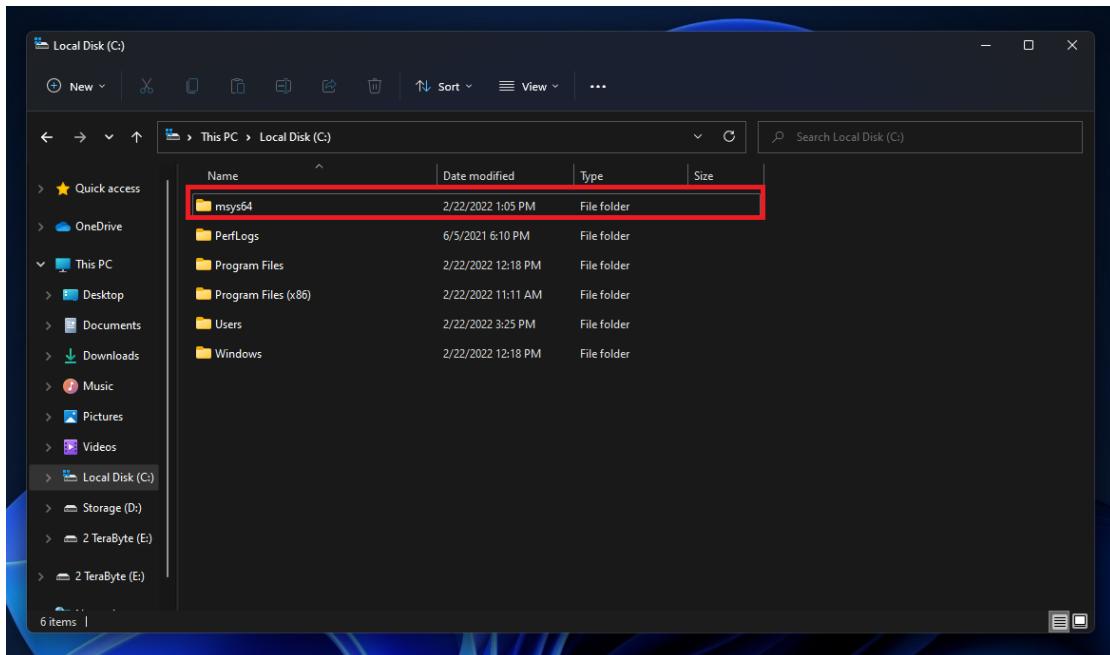
Open the file explorer.



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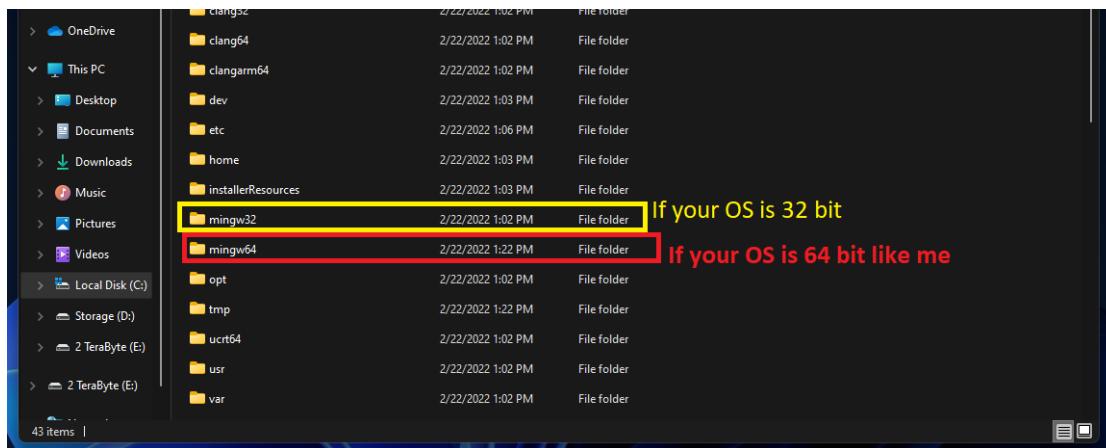
I am assuming that you have installed the MSYS into the default directory like I have. If you used custom directories, then you need to go to the directory where you installed it.



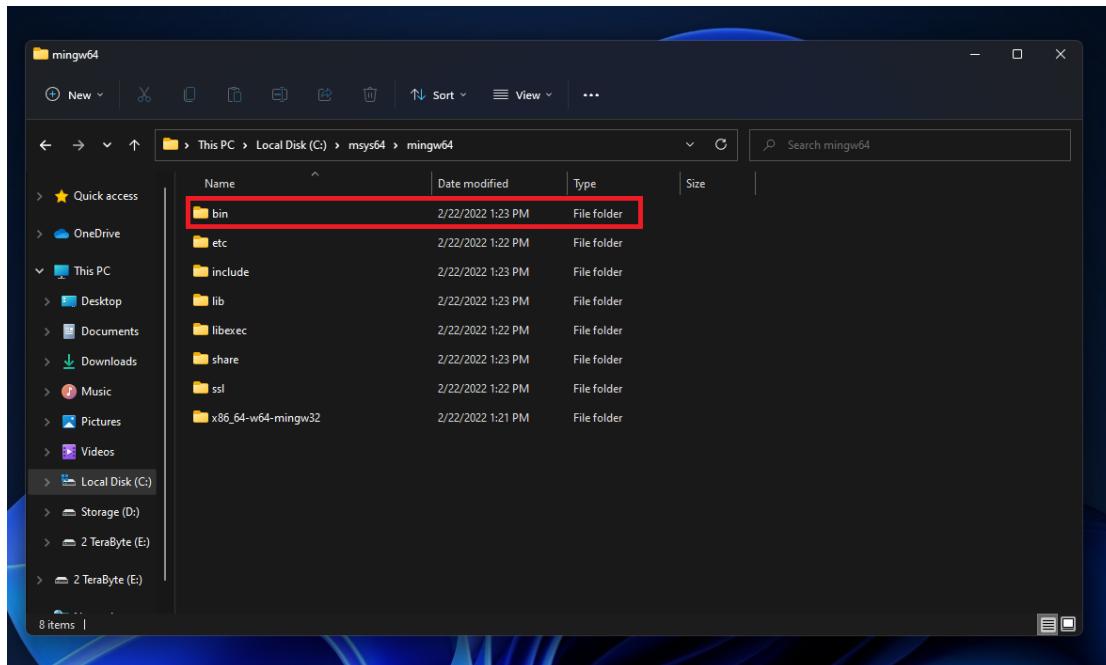
If you are using a 64 bit operating system like I am, then go to the **mingw64** folder.

⚠️ If you are using a 32 bit operating system, then go to the **mingw32** folder.

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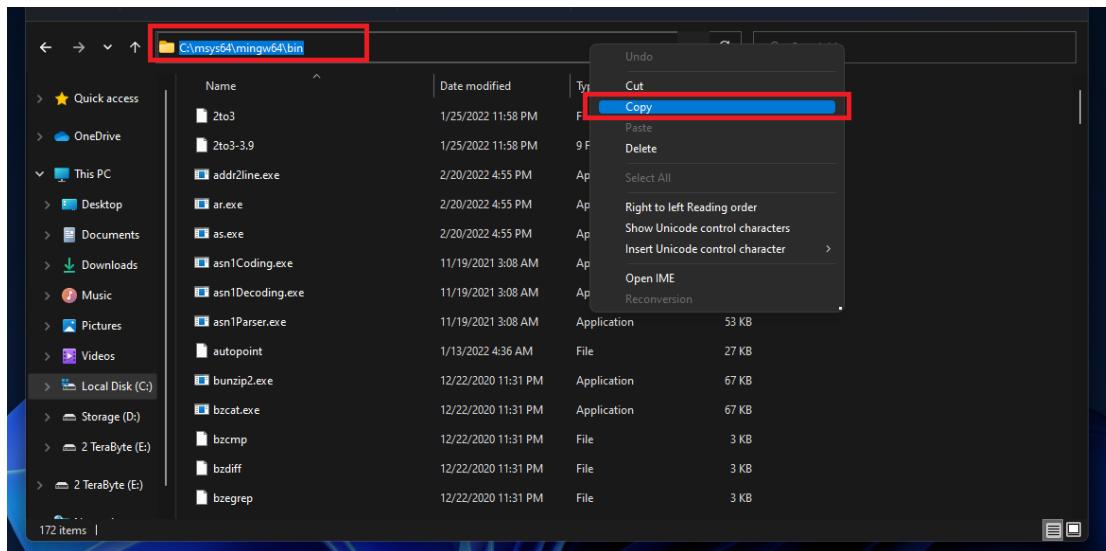
We have to go to the binary folder now. Go to the **bin** folder.



⚠️ If you are using a 32 bit operating system, then you have to go into your **mingw32** folder > **bin** folder.

Copy the directory.

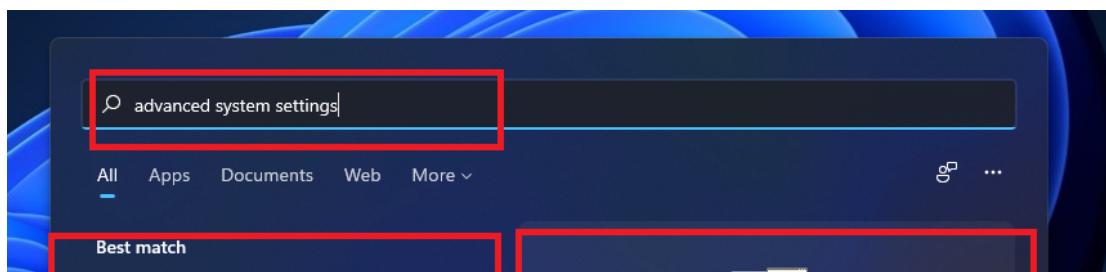
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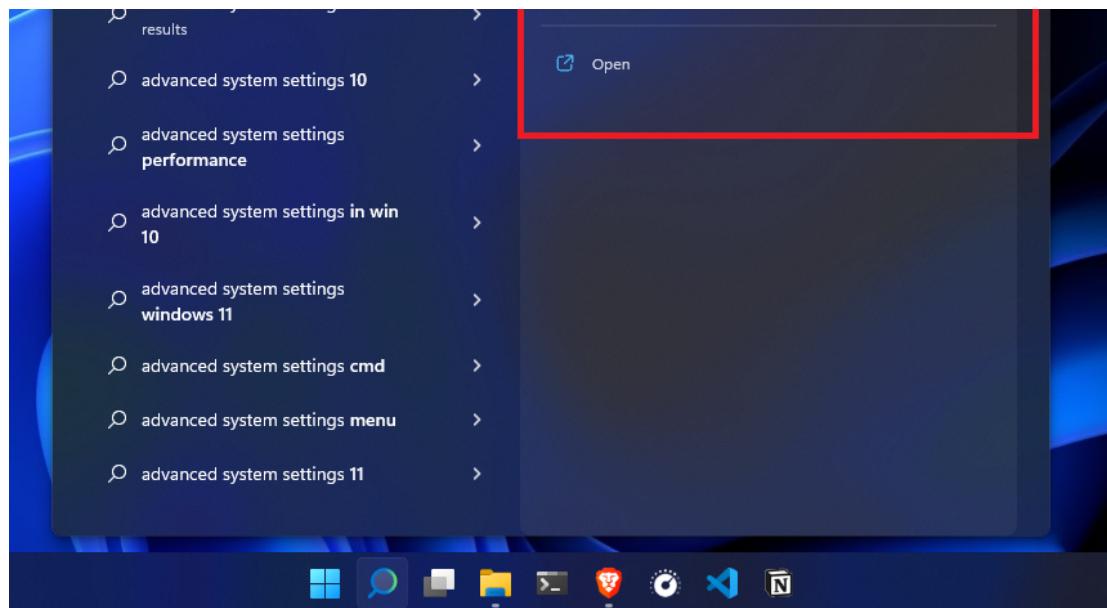
⚠️ If you are using a 32 bit operating system, and you also installed the MSYS2 in the default directory, then your directory should be like the following:

C:\msys64\mingw32\bin

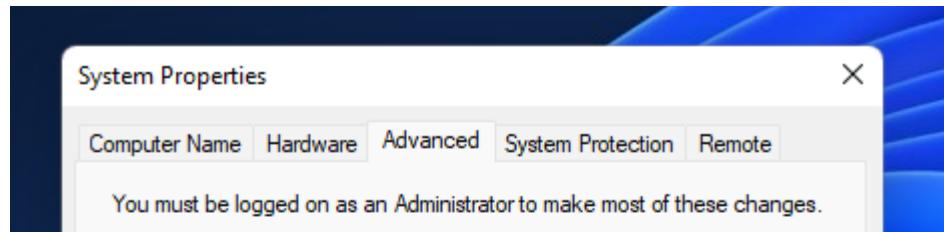
Open the **Advanced System Settings**. You can do that in many ways. A simple way is to simply click the start button and search for it like the below screenshot.



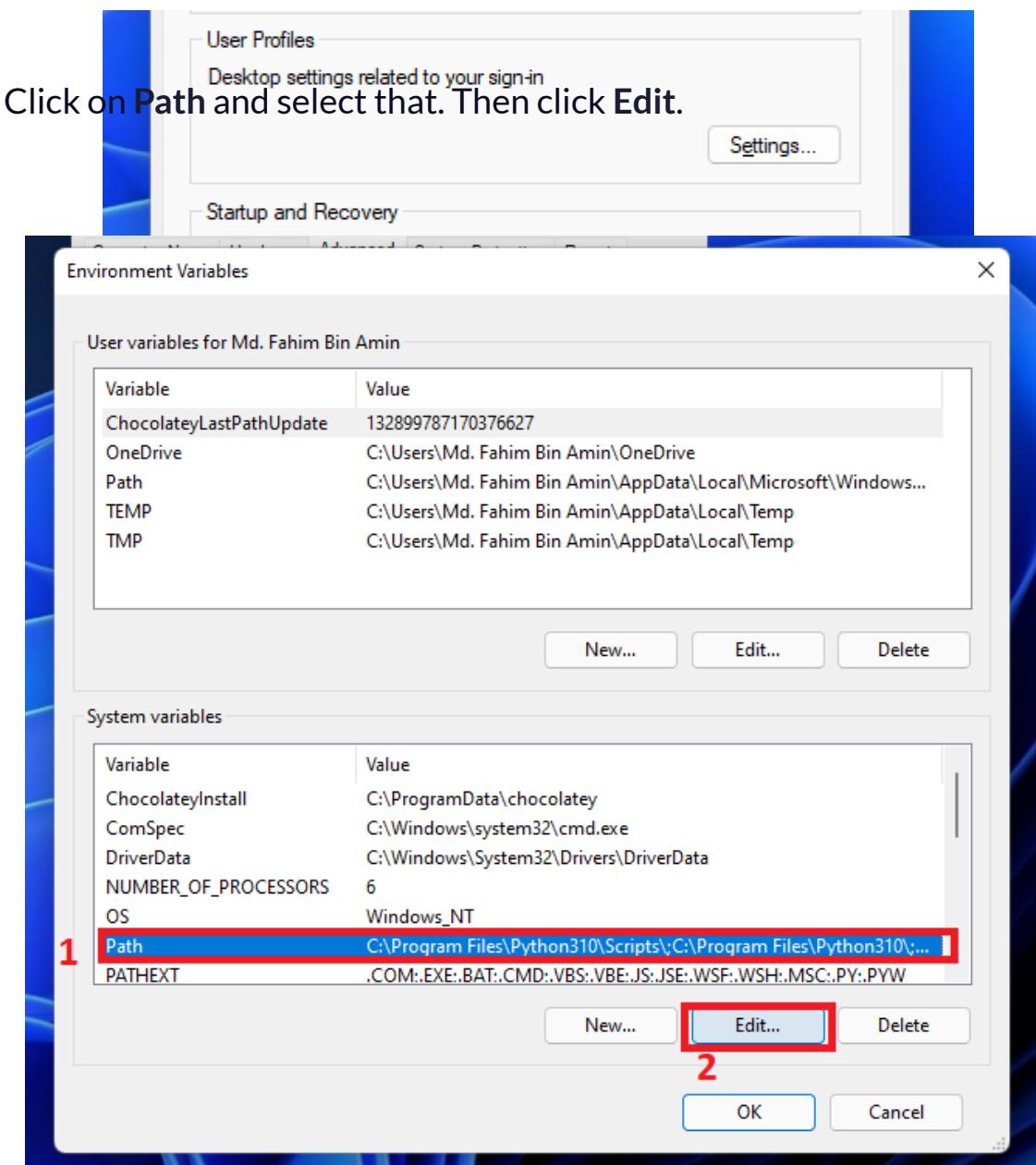
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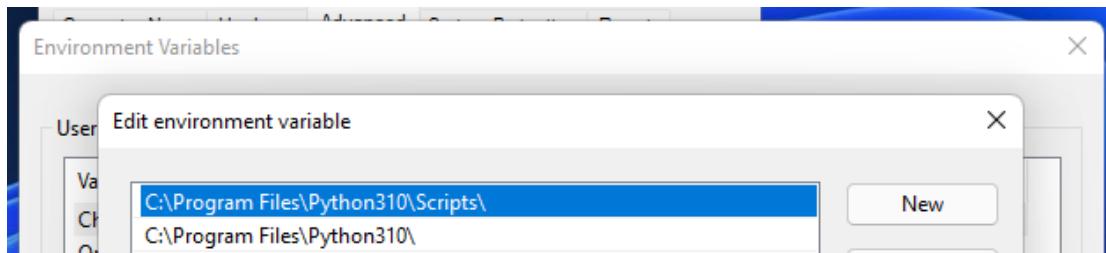
Click **Environment Variables** from the Advanced tab.



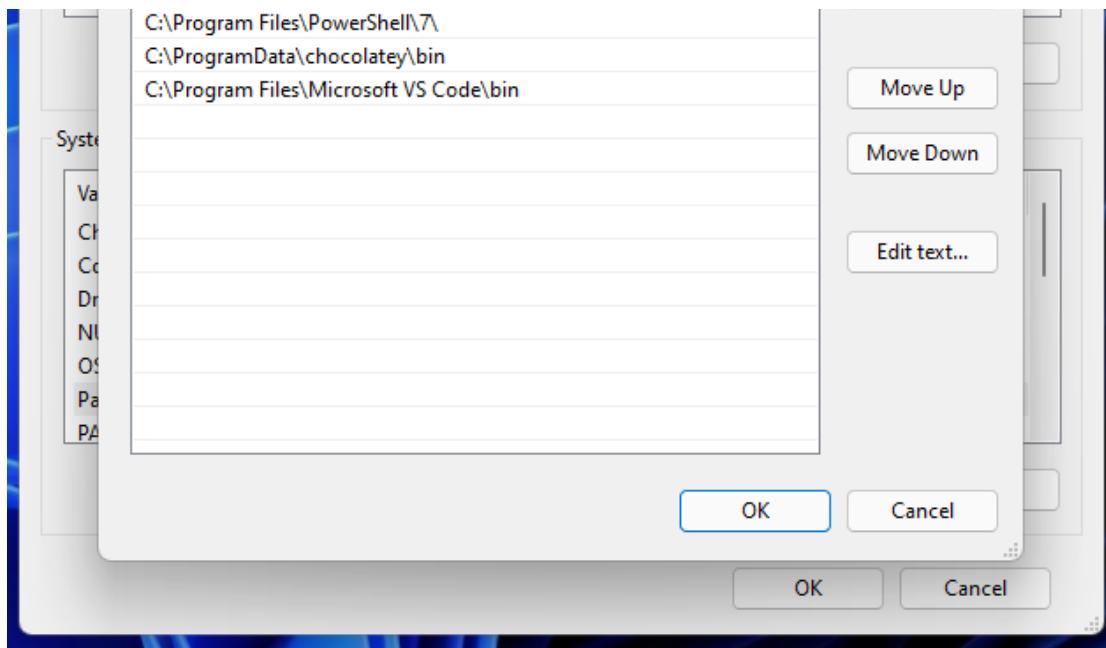
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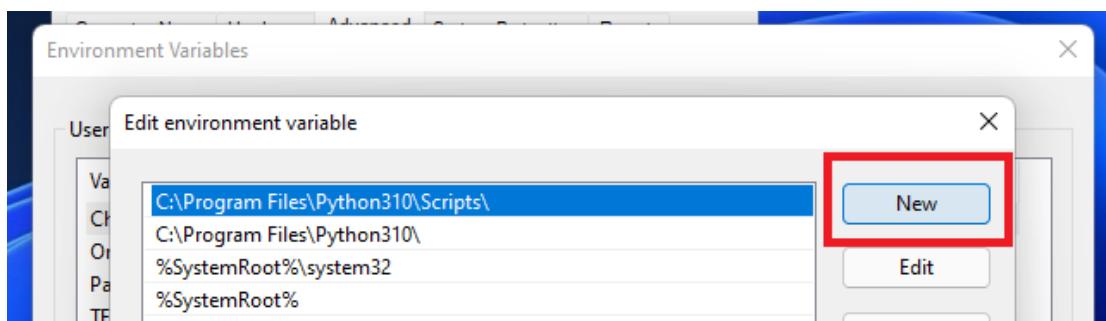
A window will appear as below:



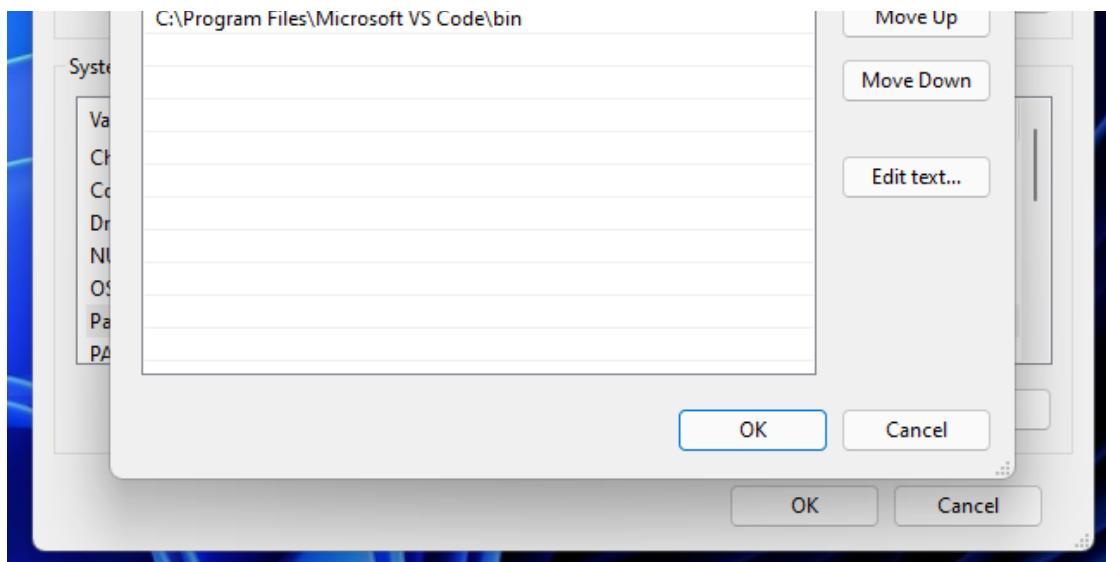
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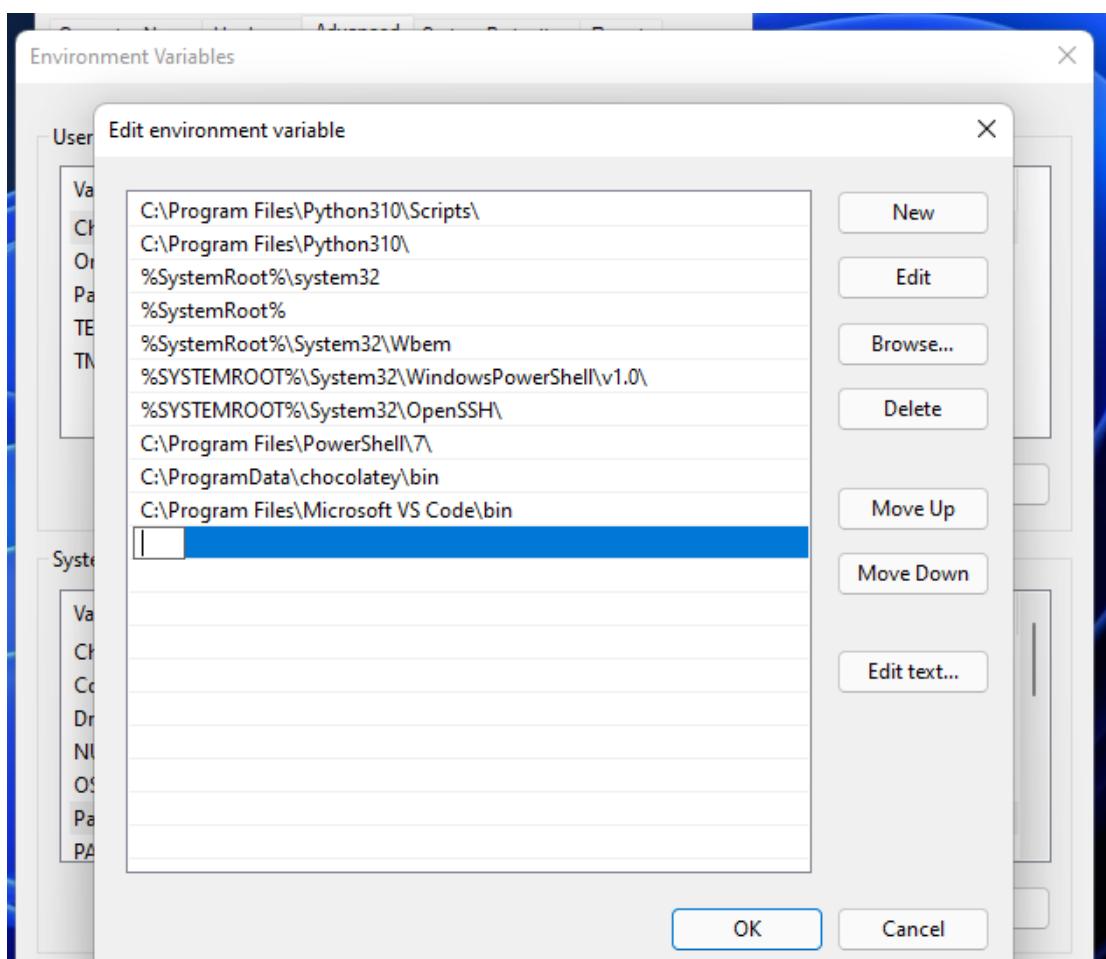
Click New.



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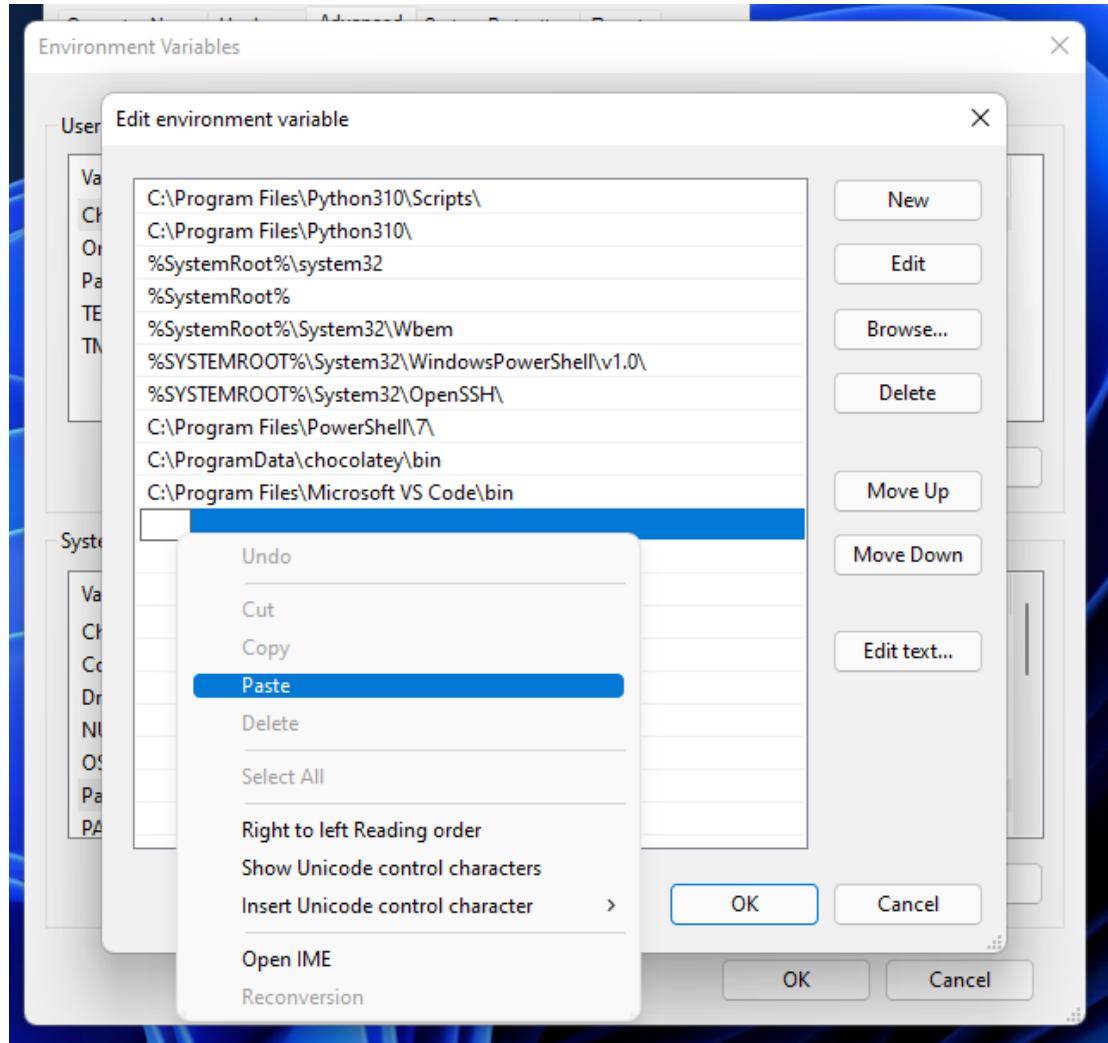


A blank box will appear.

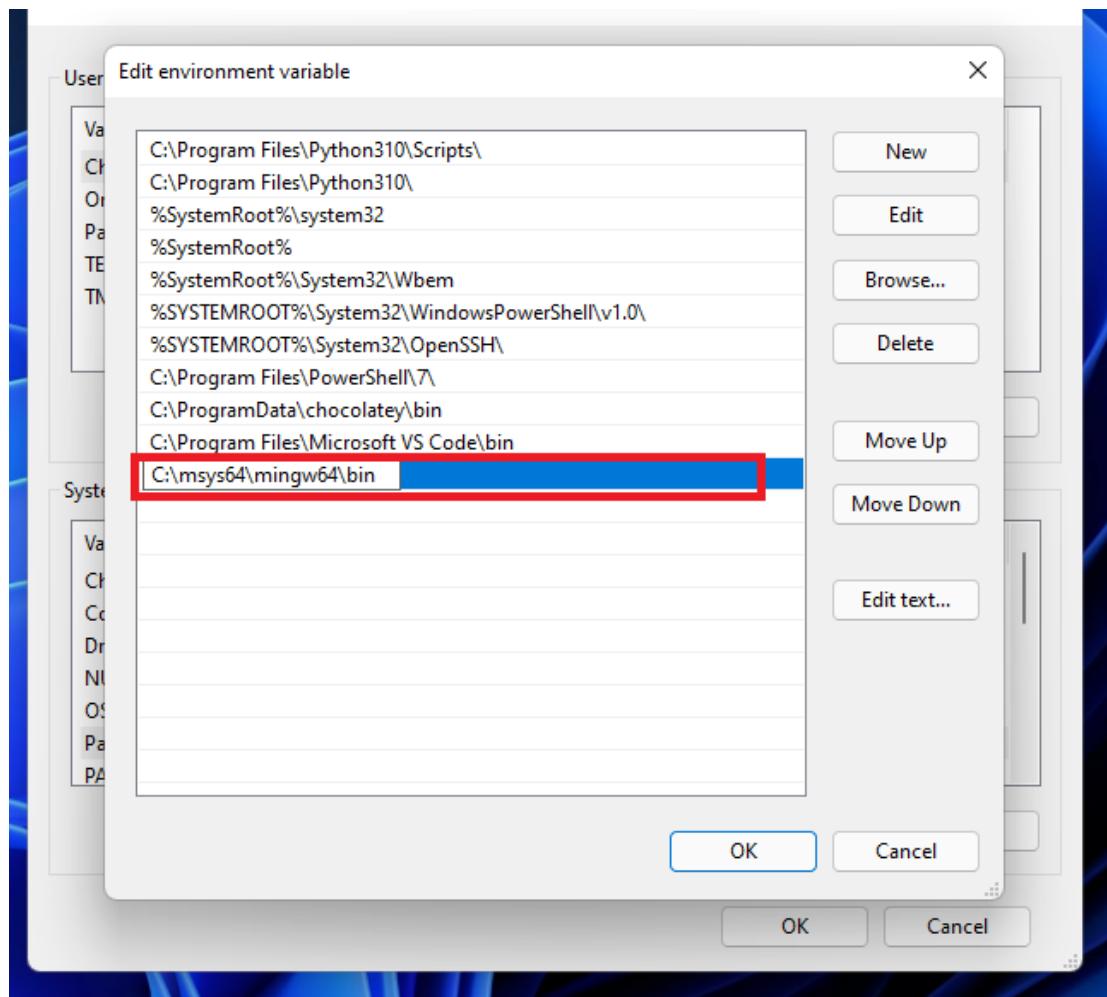


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Paste the directory here.

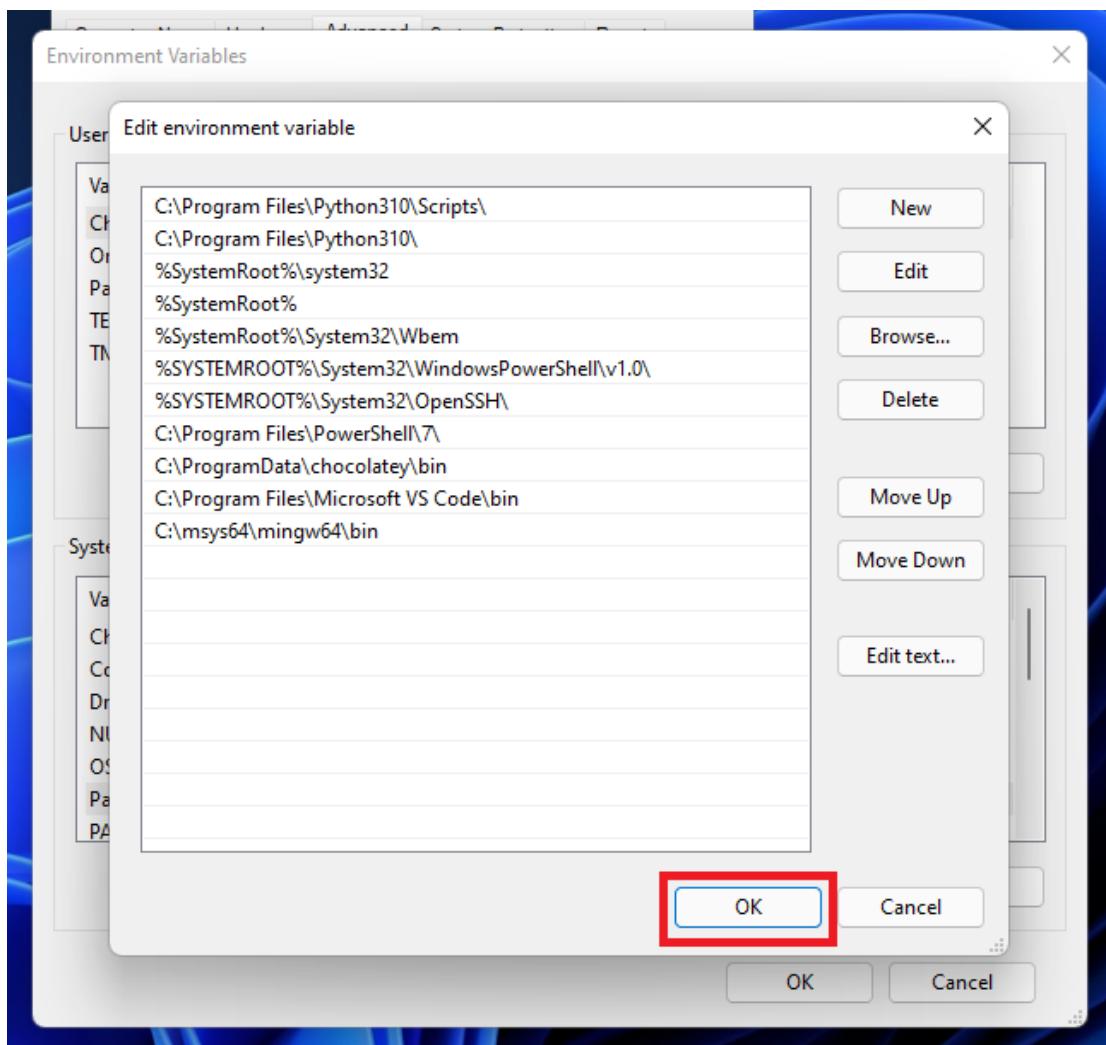


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Click OK.

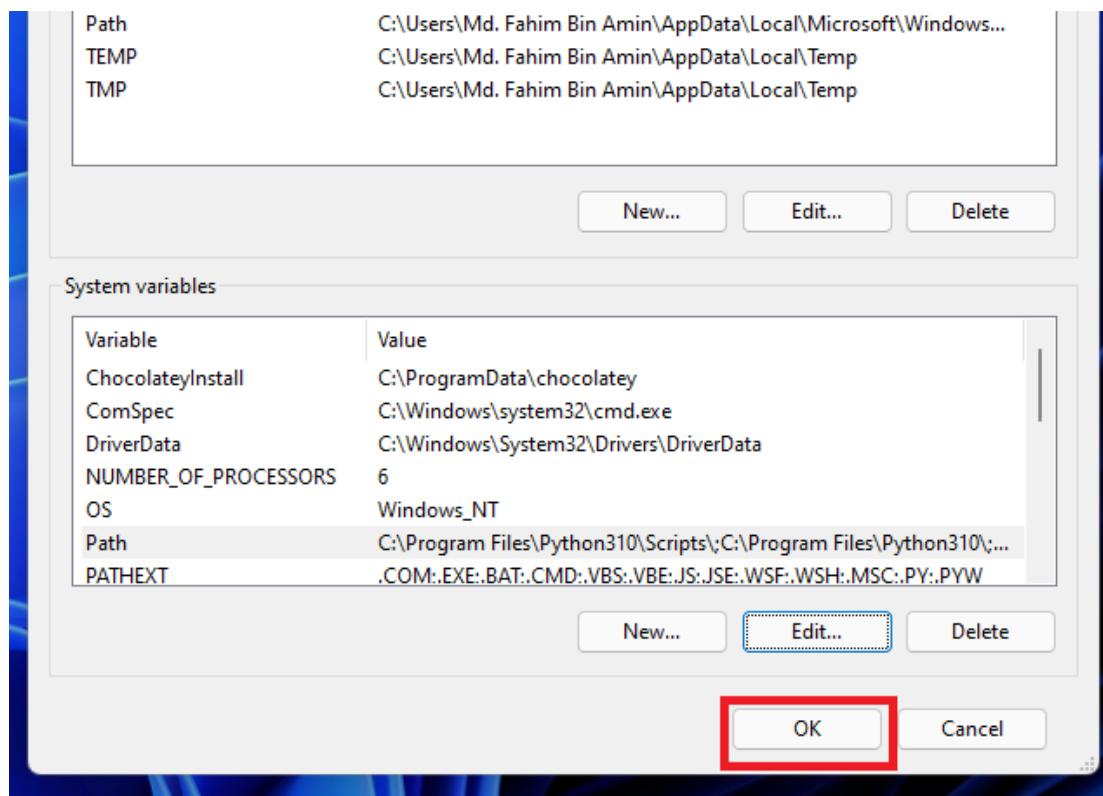
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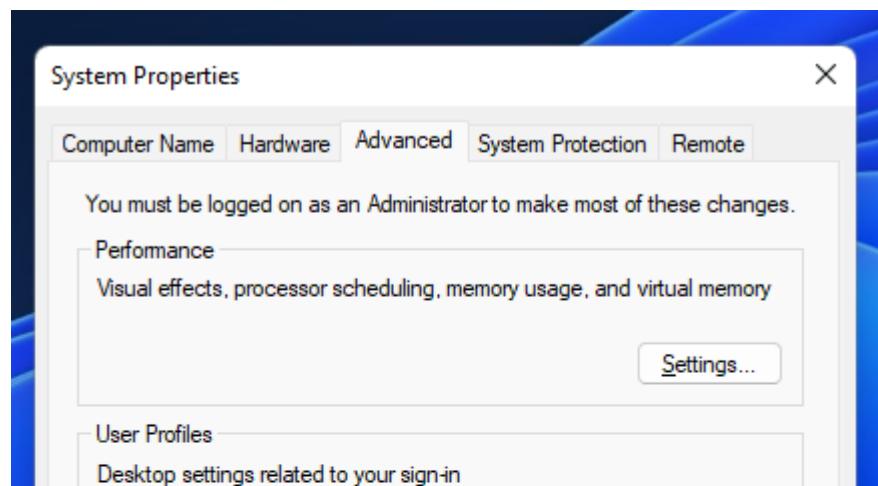
Click OK.



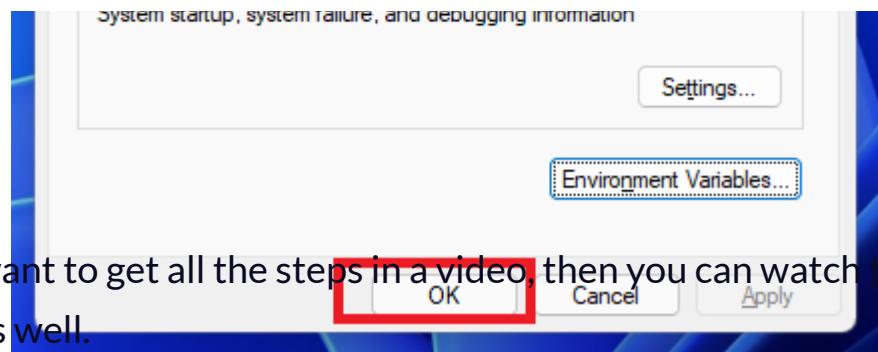
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Click OK.



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If you want to get all the steps in a video, then you can watch [this video as well](#).

Check the Install

Now it is time to check whether we have successfully installed all of the above or not.

Open the terminal / PowerShell / CMD and apply the commands serially:

For checking the **GCC** version:

```
gcc --version
```

```
PowerShell 7.2.1
Copyright (c) Microsoft Corporation.

https://aka.ms/powershell
Type 'help' to get help.

PS C:\Users\Md. Fahim Bin Amin> gcc --version
gcc.exe (Rev9, Built by MSYS2 project) 11.2.0
Copyright (C) 2021 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

PS C:\Users\Md. Fahim Bin Amin>
```

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FOR CHECKING THE G++ VERSION:

```
g++ --version
```

```
PS C:\Users\Md. Fahim Bin Amin> g++ --version
g++.exe (Rev9, Built by MSYS2 project) 11.2.0
Copyright (C) 2021 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

For checking the GDB version:

```
gdb --version
```

```
PS C:\Users\Md. Fahim Bin Amin> gdb --version
GNU gdb (GDB) 11.2
Copyright (C) 2022 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
PS C:\Users\Md. Fahim Bin Amin> |
```

Conclusion

I hope this article helps you install your compilers on the Windows

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THANKS A LOT FOR READING THE ENTIRE ARTICLE. IF YOU HAVE ANY SUGGESTIONS
then you may get in touch with me through my [twitter](#) or [LinkedIn](#)
accounts.

If you are into open source, then you can also follow me on [GitHub](#) as I
am very active in contributing to open source projects.

If you like programming-related tutorials, then I have two YouTube
channels. [In one channel, I publish Bengali content regularly, whereas](#)
[I publish English content regularly in my other channel.](#)

Have a wonderful day!



Md. Fahim Bin Amin

Microsoft Research Investigation Contributor to OSS || Author 
@freeCodeCamp || Actively helping the Bengali Localization Effort
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