

# 6CS005 High Performance Computing

## Pre-Requisite Workshop 2 Part 1: Compile and Run C Program in Ubuntu

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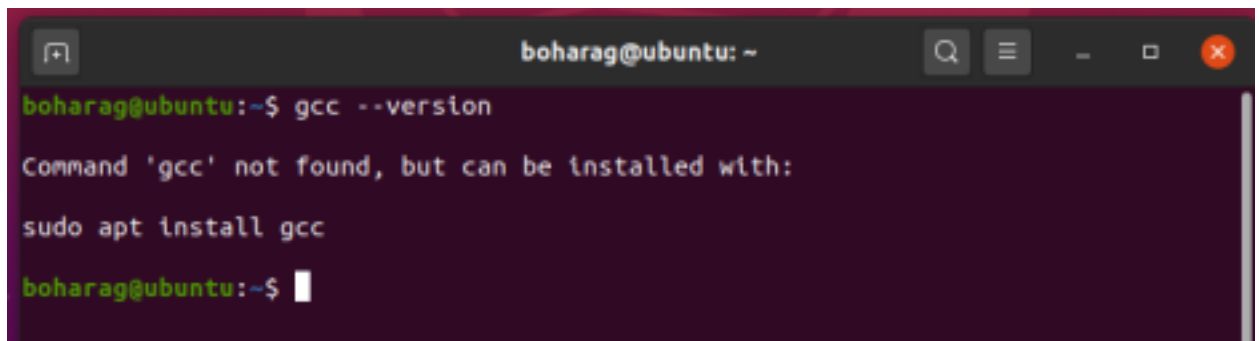
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### Install GCC in Ubuntu

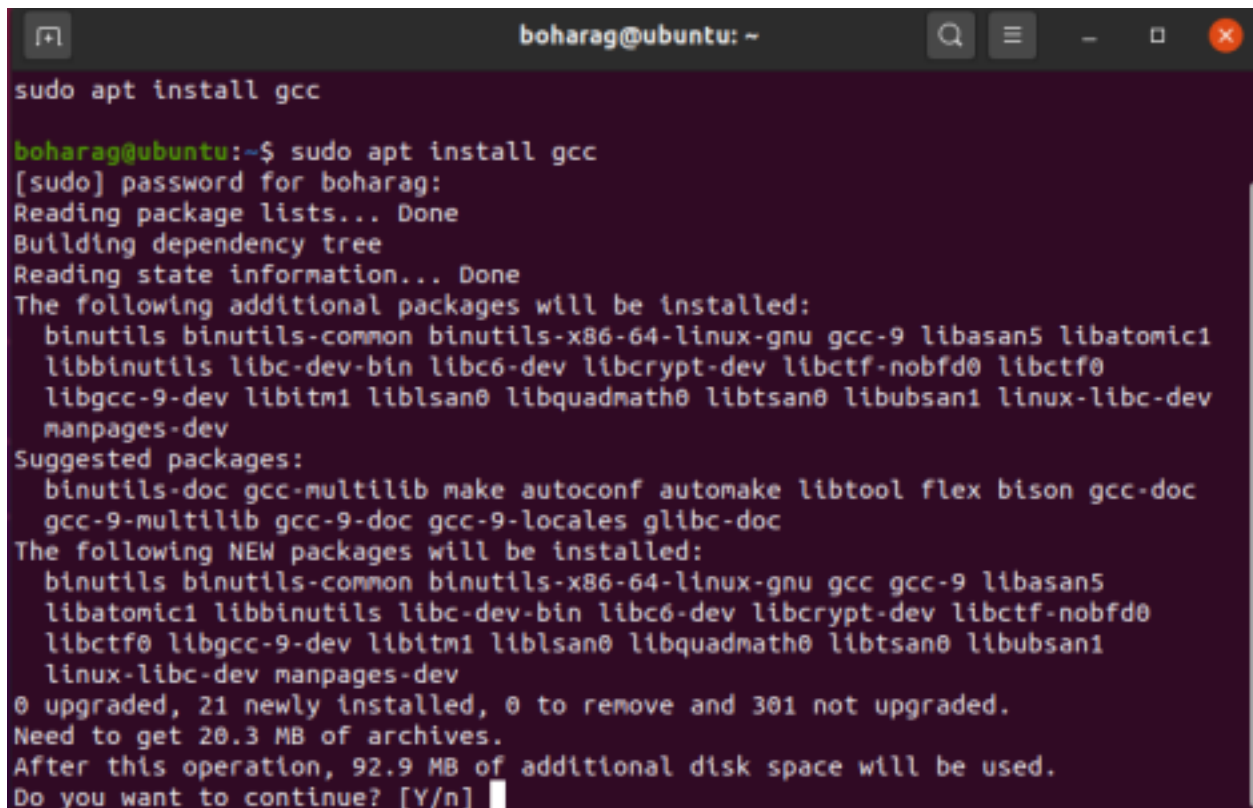
1. First check if you have gcc installed with command `gcc --version`

A terminal window titled 'boharag@ubuntu: ~' with search, menu, and window control icons. The terminal shows the command 'gcc --version' being executed. The output is 'Command 'gcc' not found, but can be installed with: sudo apt install gcc'. The prompt returns to 'boharag@ubuntu:~\$' with a cursor.

```
boharag@ubuntu:~$ gcc --version
Command 'gcc' not found, but can be installed with:
sudo apt install gcc
boharag@ubuntu:~$
```

2. If gcc is installed it will display the version else it will give you the command to install gcc `sudo apt install gcc`

3. Now execute the command ‘sudo apt install gcc’ and it will proceed as shown:

A terminal window titled 'boharag@ubuntu: ~' with search, menu, and window control icons in the title bar. The terminal shows the command 'sudo apt install gcc' and its output. The output includes package lists, dependency tree building, state information, a list of additional packages to be installed, suggested packages, a list of new packages to be installed, and disk space requirements. It ends with a prompt 'Do you want to continue? [Y/n]' where 'Y' has been entered.

```
boharag@ubuntu: ~  
sudo apt install gcc  
  
boharag@ubuntu:~$ sudo apt install gcc  
[sudo] password for boharag:  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  binutils binutils-common binutils-x86-64-linux-gnu gcc-9 libasan5 libatomic1  
  libbinutils libc-dev-bin libc6-dev libcrypt-dev libctf-nobfd0 libctf0  
  libgcc-9-dev libitm1 liblsan0 libquadmath0 libtsan0 libubsan1 linux-libc-dev  
  manpages-dev  
Suggested packages:  
  binutils-doc gcc-multilib make autoconf automake libtool flex bison gcc-doc  
  gcc-9-multilib gcc-9-doc gcc-9-locales glibc-doc  
The following NEW packages will be installed:  
  binutils binutils-common binutils-x86-64-linux-gnu gcc gcc-9 libasan5  
  libatomic1 libbinutils libc-dev-bin libc6-dev libcrypt-dev libctf-nobfd0  
  libctf0 libgcc-9-dev libitm1 liblsan0 libquadmath0 libtsan0 libubsan1  
  linux-libc-dev manpages-dev  
0 upgraded, 21 newly installed, 0 to remove and 301 not upgraded.  
Need to get 20.3 MB of archives.  
After this operation, 92.9 MB of additional disk space will be used.  
Do you want to continue? [Y/n] Y
```

4. Select ‘Y’ to continue, it will proceed as shown:

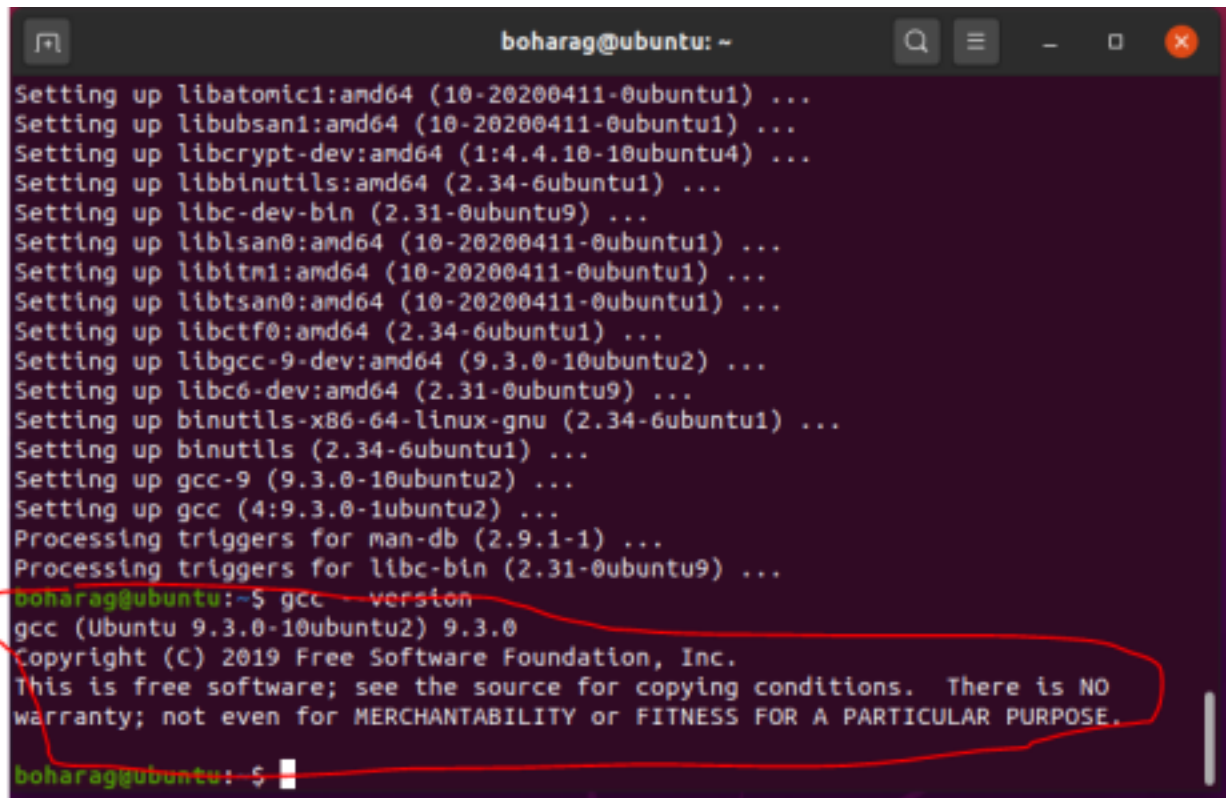
```
boharag@ubuntu: ~  
buntu1 [46.6 kB]  
Get:5 http://us.archive.ubuntu.com/ubuntu focal/main amd64 binutils-x86-64-linux  
-gnu amd64 2.34-6ubuntu1 [1,614 kB]  
Get:6 http://us.archive.ubuntu.com/ubuntu focal/main amd64 binutils amd64 2.34-6  
ubuntu1 [3,376 B]  
Get:7 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libitm1 amd64 10-2020  
0411-0ubuntu1 [26.3 kB]  
Get:8 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libatomic1 amd64 10-2  
0200411-0ubuntu1 [9,284 B]  
Get:9 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libasan5 amd64 9.3.0-  
10ubuntu2 [395 kB]  
Get:10 http://us.archive.ubuntu.com/ubuntu focal/main amd64 liblsan0 amd64 10-20  
200411-0ubuntu1 [144 kB]  
Get:11 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libtsan0 amd64 10-20  
200411-0ubuntu1 [319 kB]  
Get:12 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libubsan1 amd64 10-2  
0200411-0ubuntu1 [136 kB]  
Get:13 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libquadmath0 amd64 1  
0-20200411-0ubuntu1 [146 kB]  
Get:14 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libgcc-9-dev amd64 9  
.3.0-10ubuntu2 [2,359 kB]  
Get:15 http://us.archive.ubuntu.com/ubuntu focal/main amd64 gcc-9 amd64 9.3.0-10  
ubuntu2 [8,234 kB]  
37% [15 gcc-9 13.6 kB/8,234 kB 0%] 377 kB/s 38s
```

5. If everything goes fine it will be completed as:

```
boharag@ubuntu: ~  
Setting up linux-libc-dev:amd64 (5.4.0-47.51) ...  
Setting up libctf-nobfd0:amd64 (2.34-6ubuntu1) ...  
Setting up libasan5:amd64 (9.3.0-10ubuntu2) ...  
Setting up libquadmath0:amd64 (10-20200411-0ubuntu1) ...  
Setting up libatomic1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libubsan1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ...  
Setting up libbinutils:amd64 (2.34-6ubuntu1) ...  
Setting up libc-dev-bin (2.31-0ubuntu9) ...  
Setting up liblsan0:amd64 (10-20200411-0ubuntu1) ...  
Setting up libitm1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libtsan0:amd64 (10-20200411-0ubuntu1) ...  
Setting up libctf0:amd64 (2.34-6ubuntu1) ...  
Setting up libgcc-9-dev:amd64 (9.3.0-10ubuntu2) ...  
Setting up libc6-dev:amd64 (2.31-0ubuntu9) ...  
Setting up binutils-x86-64-linux-gnu (2.34-6ubuntu1) ...  
Setting up binutils (2.34-6ubuntu1) ...  
Setting up gcc-9 (9.3.0-10ubuntu2) ...  
Setting up gcc (4:9.3.0-1ubuntu2) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for libc-bin (2.31-0ubuntu9) ...  
boharag@ubuntu:~$
```

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6. Now you can check whether gcc is installed successfully with command `gcc --version`. It will give the details of version installed.

A terminal window titled 'boharag@ubuntu: ~' showing the installation of various Ubuntu packages. The output lists several libraries being set up, including libatomic1, libubsan1, libcrypt-dev, libbinutils, libc-dev-bin, liblsan0, libitm1, libtsan0, libctf0, libgcc-9-dev, libc6-dev, binutils-x86-64-linux-gnu, binutils, gcc-9, and gcc. After the installation, the user enters the command 'gcc --version'. The output shows 'gcc (Ubuntu 9.3.0-10ubuntu2) 9.3.0' followed by the GNU GPL license text. A red circle highlights the command and its output.

```
boharag@ubuntu: ~  
Setting up libatomic1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libubsan1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libcrypt-dev:amd64 (1:4.4.10-10ubuntu4) ...  
Setting up libbinutils:amd64 (2.34-6ubuntu1) ...  
Setting up libc-dev-bin (2.31-0ubuntu9) ...  
Setting up liblsan0:amd64 (10-20200411-0ubuntu1) ...  
Setting up libitm1:amd64 (10-20200411-0ubuntu1) ...  
Setting up libtsan0:amd64 (10-20200411-0ubuntu1) ...  
Setting up libctf0:amd64 (2.34-6ubuntu1) ...  
Setting up libgcc-9-dev:amd64 (9.3.0-10ubuntu2) ...  
Setting up libc6-dev:amd64 (2.31-0ubuntu9) ...  
Setting up binutils-x86-64-linux-gnu (2.34-6ubuntu1) ...  
Setting up binutils (2.34-6ubuntu1) ...  
Setting up gcc-9 (9.3.0-10ubuntu2) ...  
Setting up gcc (4:9.3.0-1ubuntu2) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for libc-bin (2.31-0ubuntu9) ...  
boharag@ubuntu:~$ gcc --version  
gcc (Ubuntu 9.3.0-10ubuntu2) 9.3.0  
Copyright (C) 2019 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.  
boharag@ubuntu:~$
```

7. Now you have successfully installed gcc and you are ready to compile your C programs.

## Compile and Run C Program

1. Use a text editor to write the C source code.

For example, type the command below command to create the file `hello.c`

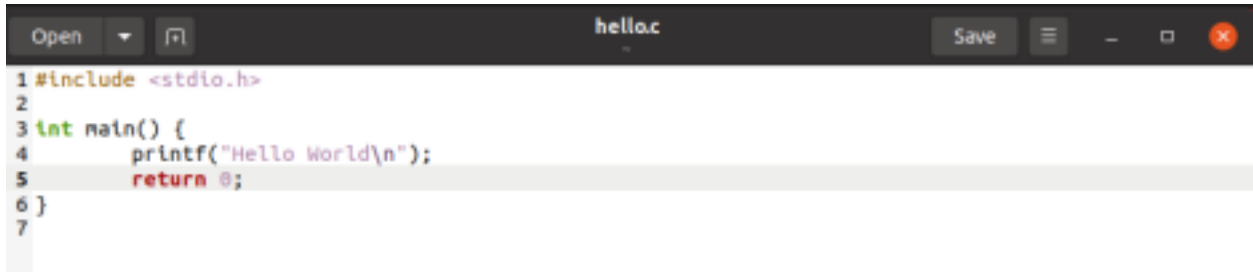
`gedit hello.c`

It will open empty file with name `hello.c` for you to enter the source code.

2. Now enter the C source code below:

```
#include <stdio.h>  
  
int main() {  
    printf("Hello World\n");  
    return 0;  
}
```

3. Close the editor window



```
1 #include <stdio.h>
2
3 int main() {
4     printf("Hello World\n");
5     return 0;
6 }
7
```

4. Compile the program with below command:

`gcc hello.c -o hello`

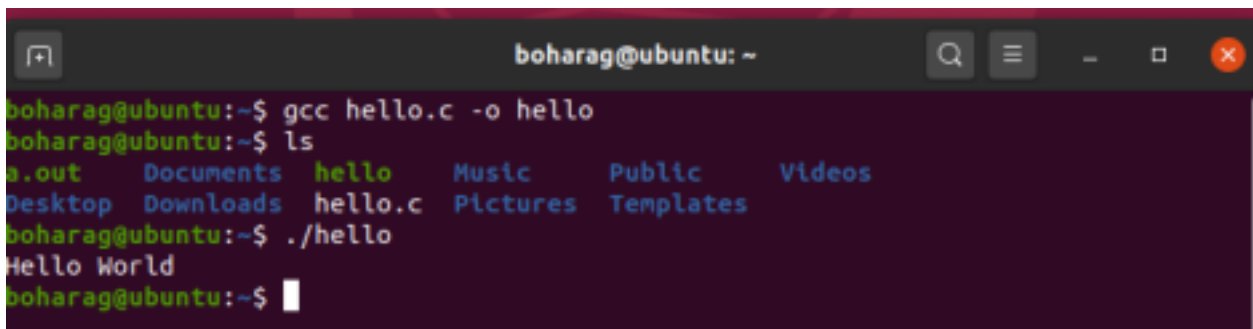
This command will invoke the GNU C compiler to compile the file `hello.c` and output (-o) the result to an executable called `hello`.

5. Now execute the program with below command:

`./hello`

This should result in the output

Hello World



```
boharag@ubuntu: ~
boharag@ubuntu:~$ gcc hello.c -o hello
boharag@ubuntu:~$ ls
a.out  Documents  hello  Music  Public  Videos
Desktop Downloads hello.c Pictures Templates
boharag@ubuntu:~$ ./hello
Hello World
boharag@ubuntu:~$
```

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