

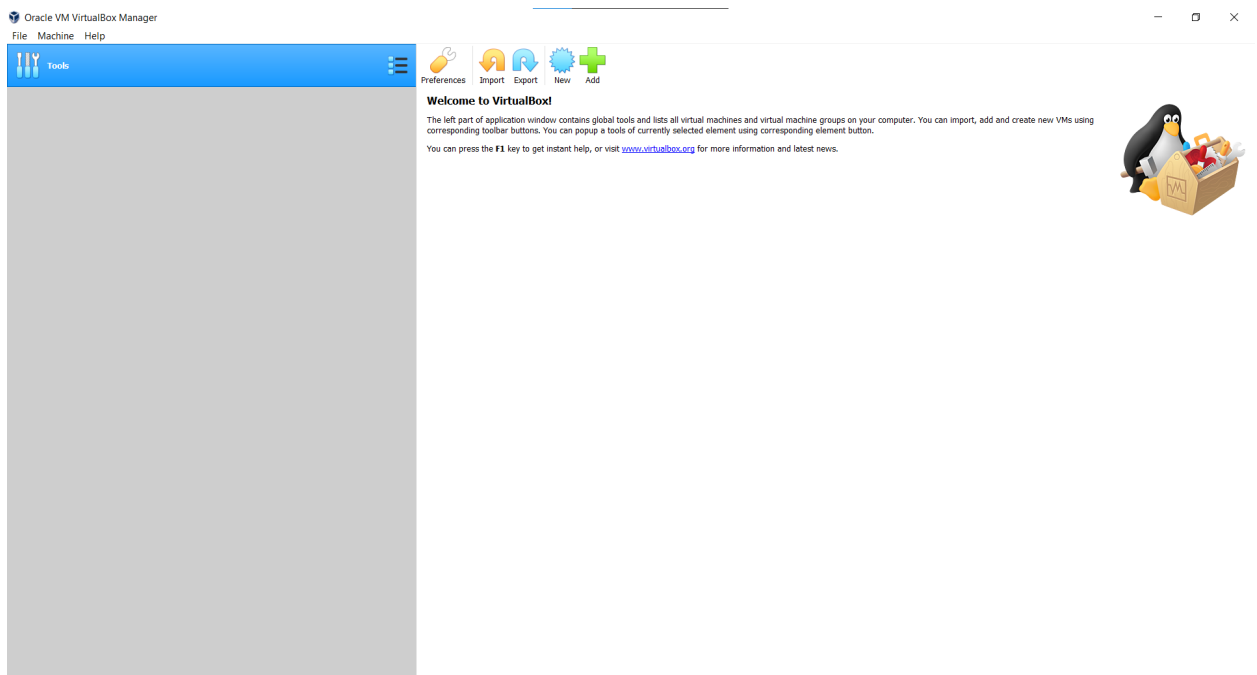
# Algorithm Design and Programming Fundamentals

## MCA SEM-1

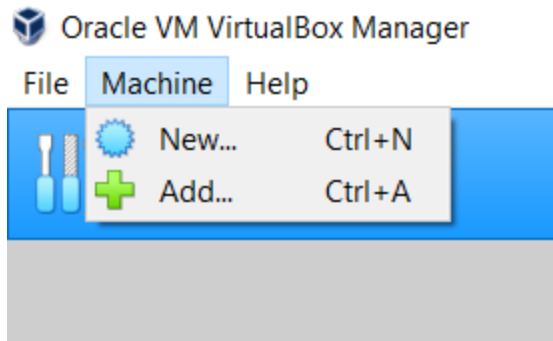
### Basic C Programs - I

#### Part-I - Linux Machine Setup

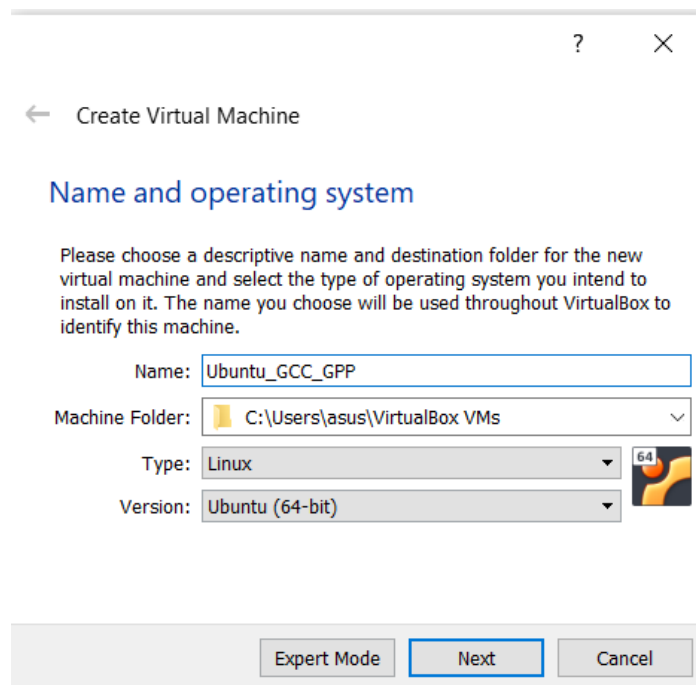
1. Download Oracle Virtual Box [For setting up virtual machine in your computer]  
<https://www.virtualbox.org/wiki/Downloads>
2. Download Ubuntu Operating System.  
<https://ubuntu.com/download/desktop>
3. Start Oracle Virtual Box.



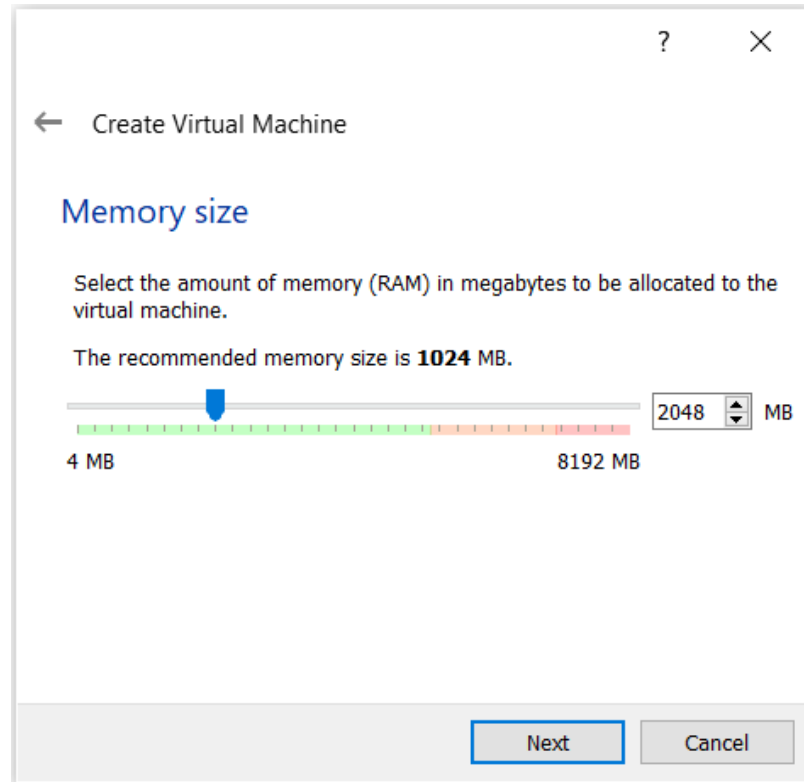
4. Click on New to create a new virtual machine.



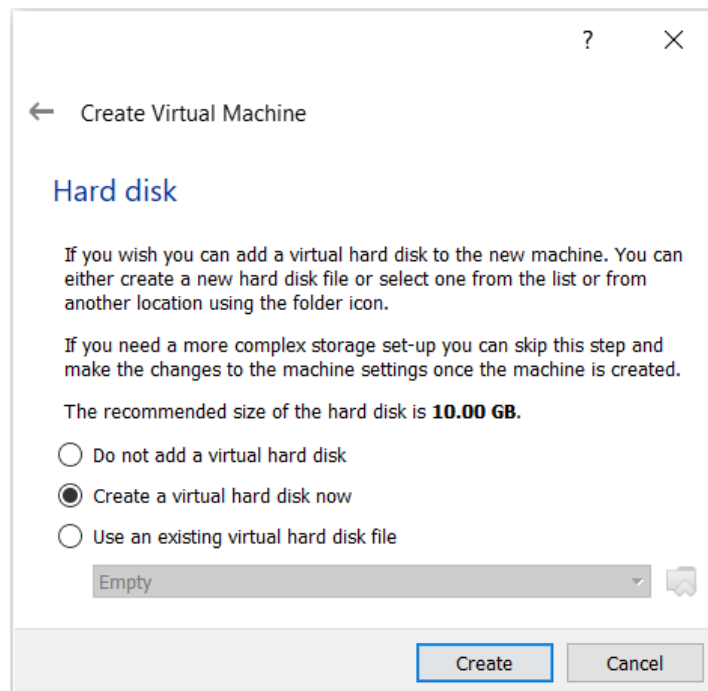
5. Give proper name to the virtual machine to be created. Select the Type as Linux and appropriate version.



6. Select memory for the virtual machine then click next.



7. Choose the HDD type and then click Create. It is recommended to select a virtual hard drive.



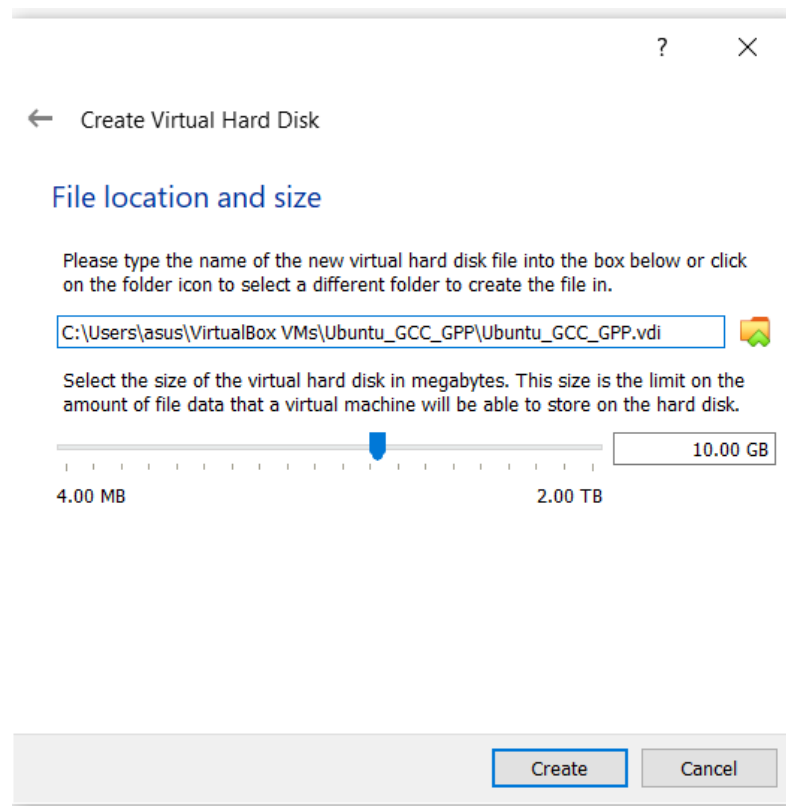
8. Choose the format for the virtual hard drive. (VDI is recommended)

The screenshot shows a Windows-style dialog box titled "Create Virtual Hard Disk". It has a back arrow and a title bar with a question mark and a close button. The main heading is "Hard disk file type". Below it, a paragraph explains that the user should choose the file type for the new virtual hard disk, noting that it can be left unchanged if not used with other virtualization software. Three radio button options are listed: "VDI (VirtualBox Disk Image)" (which is selected), "VHD (Virtual Hard Disk)", and "VMDK (Virtual Machine Disk)". At the bottom, there are three buttons: "Expert Mode", "Next" (highlighted with a blue border), and "Cancel".

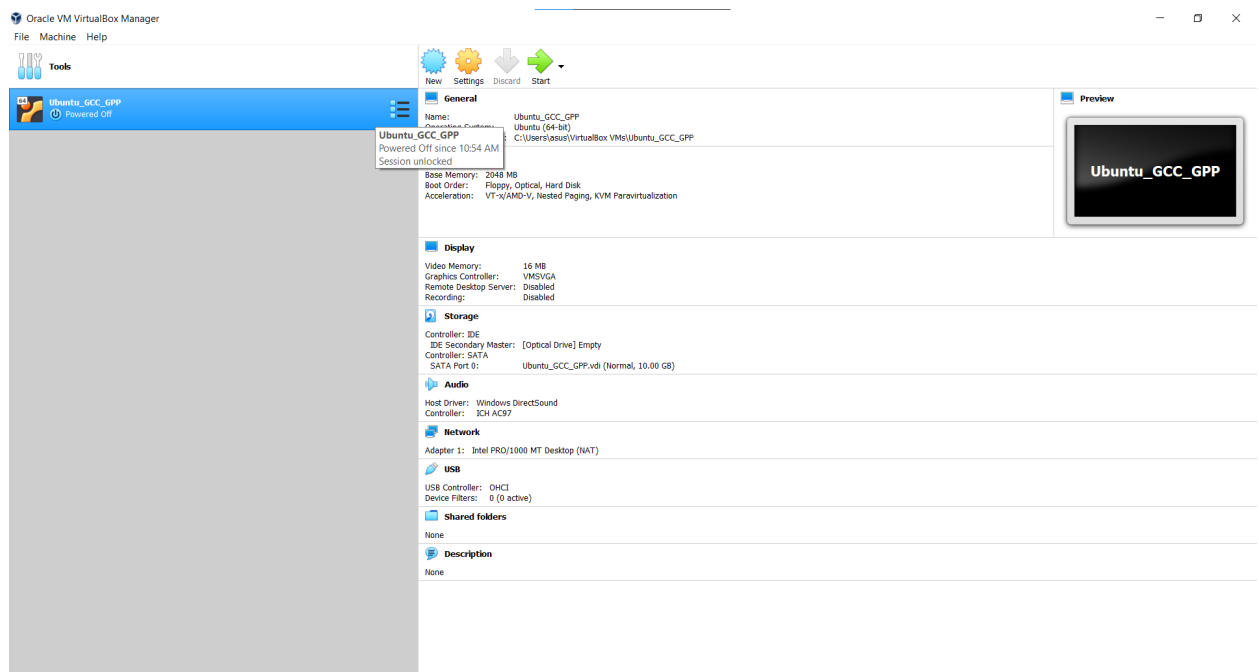
9. Choose allocation type for virtual hard drive. It is recommended to keep dynamic size.

The screenshot shows the second step of the "Create Virtual Hard Disk" dialog box. The heading is "Storage on physical hard disk". A paragraph explains the choice between dynamically allocated and fixed size. It states that a "dynamically allocated" file grows as it is used, while a "fixed size" file is created at its maximum size. It further explains that dynamically allocated files only use space as they fill up (up to the maximum fixed size) and do not shrink when space is freed. Conversely, fixed size files may take longer to create but are faster to use. Two radio button options are shown: "Dynamically allocated" (selected) and "Fixed size". At the bottom, there are two buttons: "Next" (highlighted with a blue border) and "Cancel".

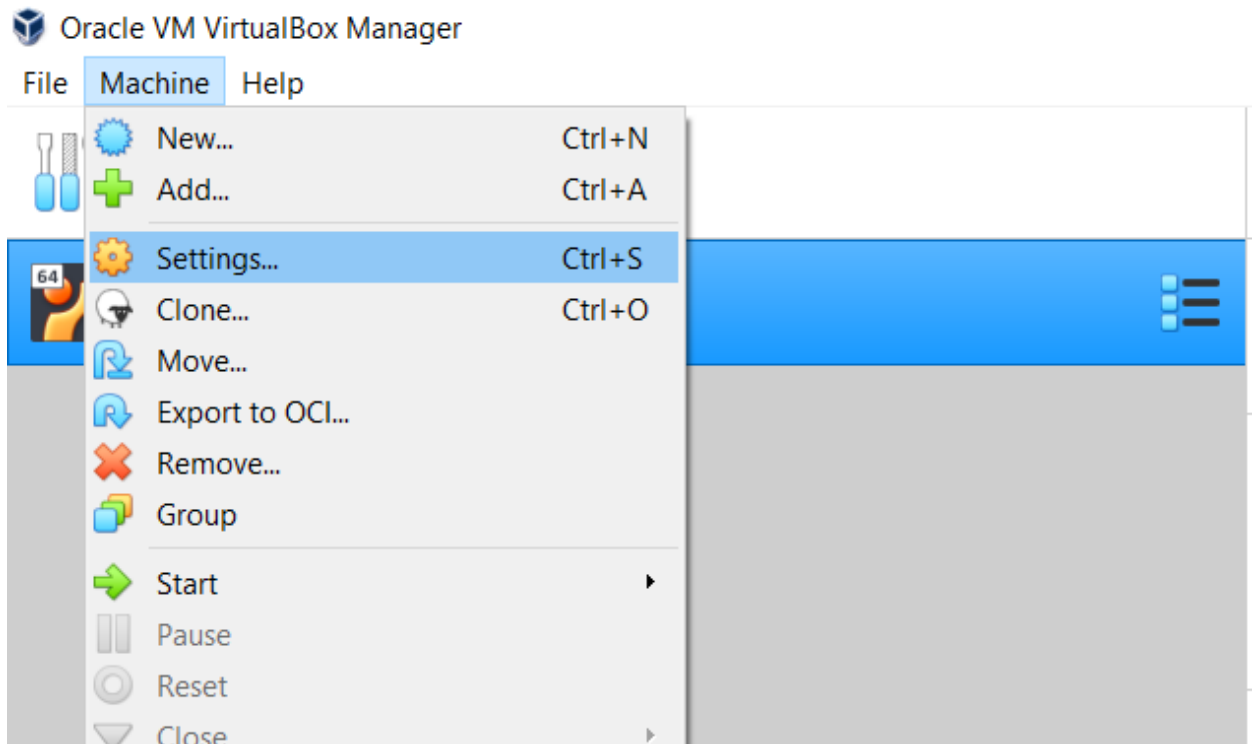
10. You can name the virtual hard drive and its size here then click create.



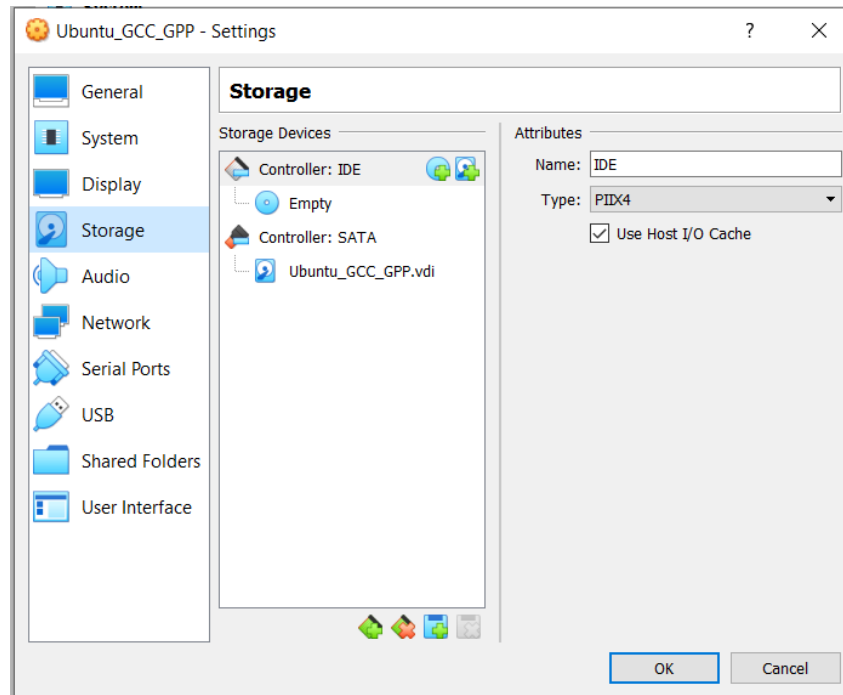
11. You will see a new virtual machine create now. Next we have to install operating system on the virtual machine.



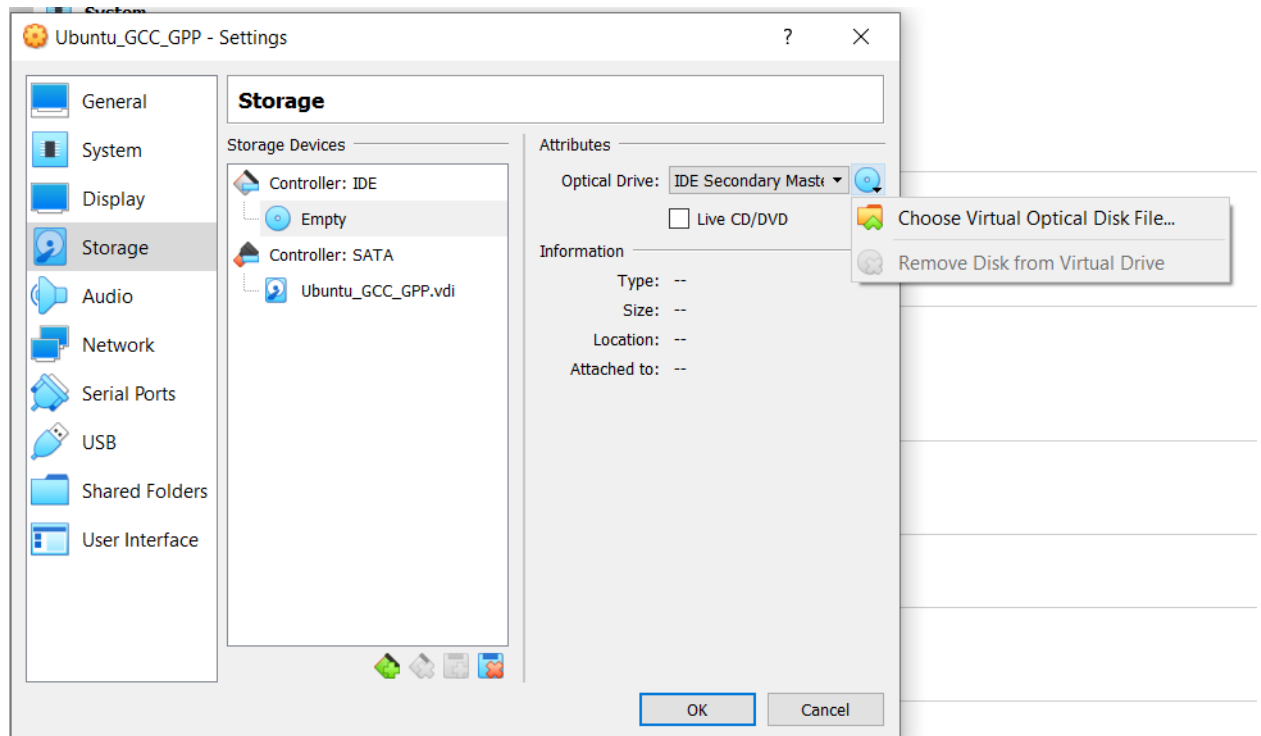
12. Click on Setting from the Machines menu. This will open a settings window for the selected virtual machine.



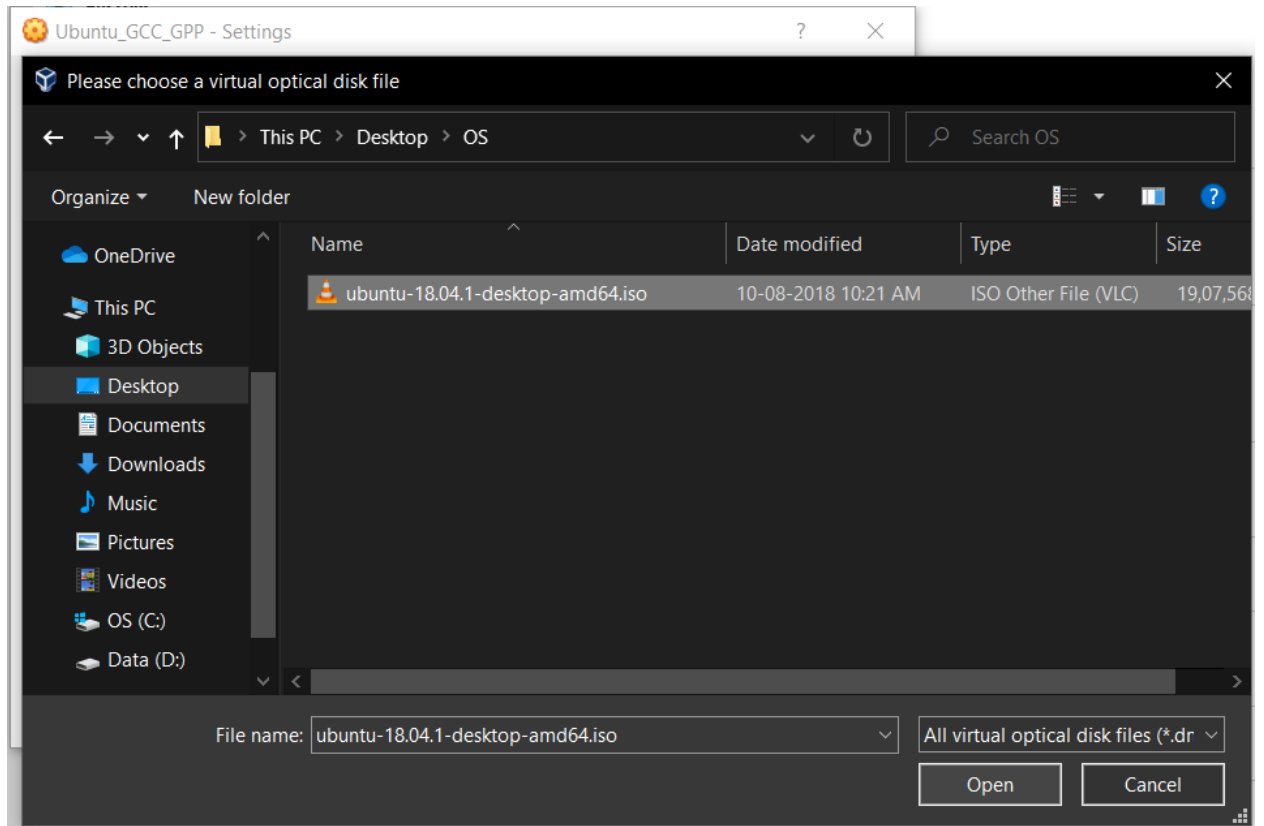
13. In the Settings window click on Storage option. Here you can see the virtual hard disk and an IDE drive option.  
Now We have to load the operating system image into the optical drive.  
Select the Empty IDE controller.



14. Click on the disk icon. This will let you choose the ISO image of Ubuntu OS.

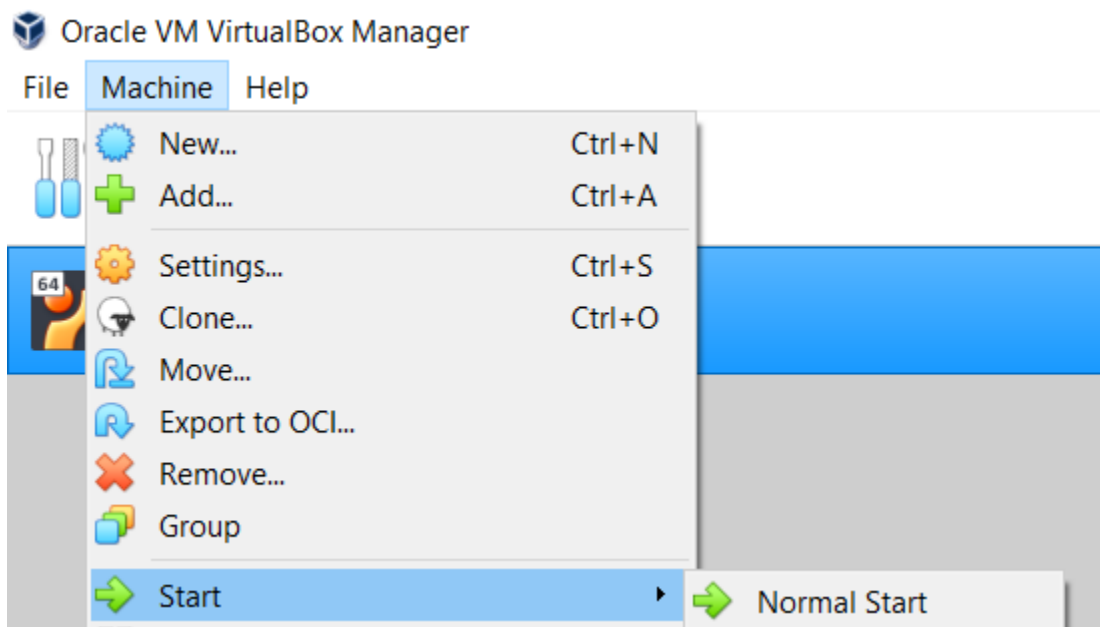


15. Choose the ISO of operating system. Click on Open and then OK.



16. Now we can start the virtual machine and continue with the installation process of the operating system.

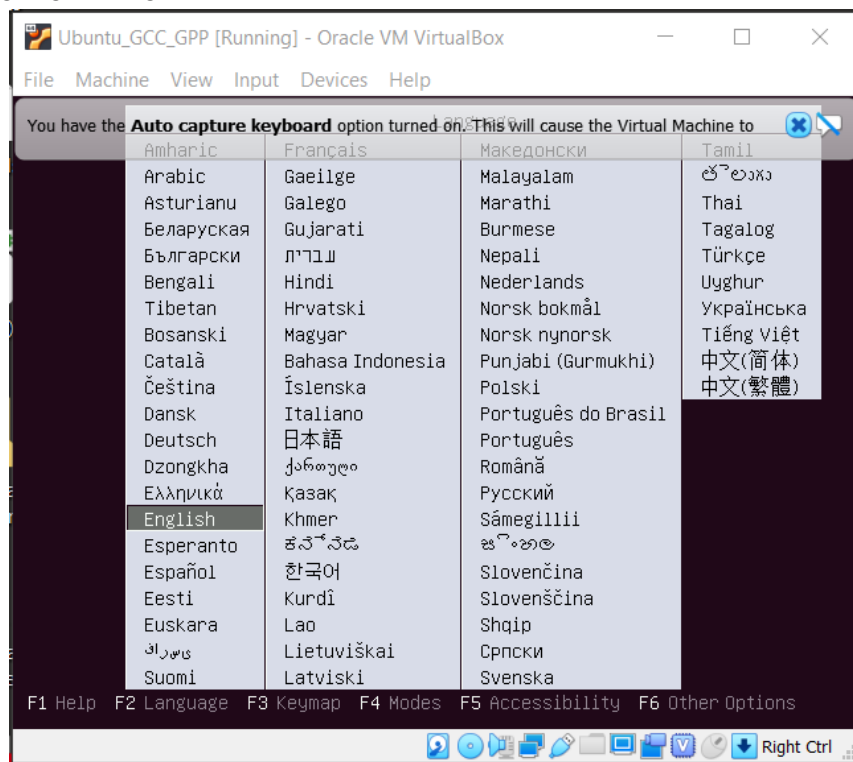
Click on Start [Normal Start] from the Machine Menu.



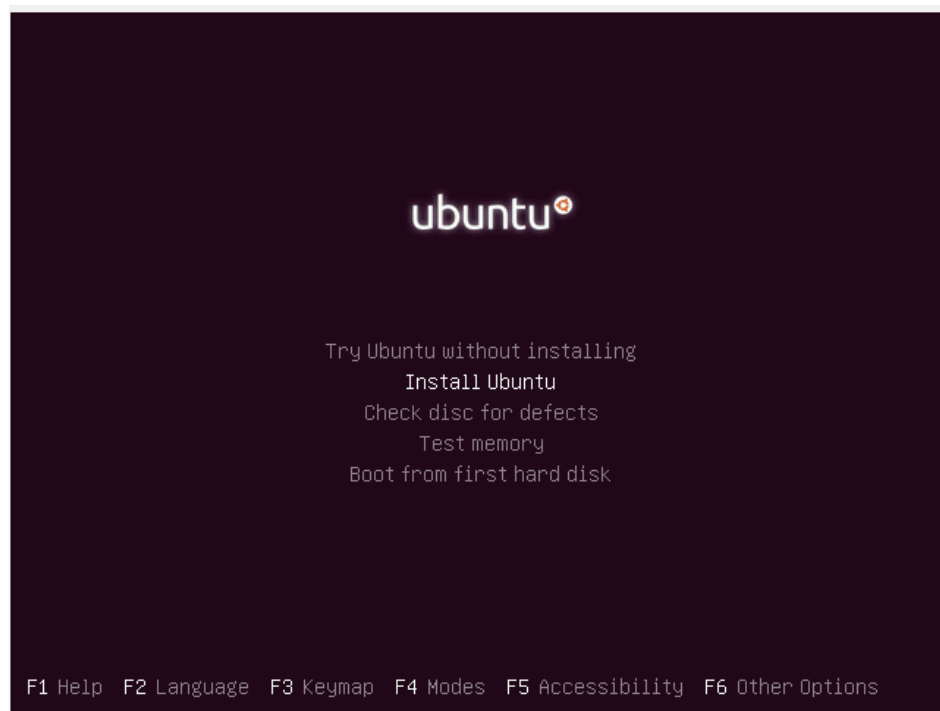


17. You will see the following screen once the machine has started. This is the process for installing Ubuntu OS.

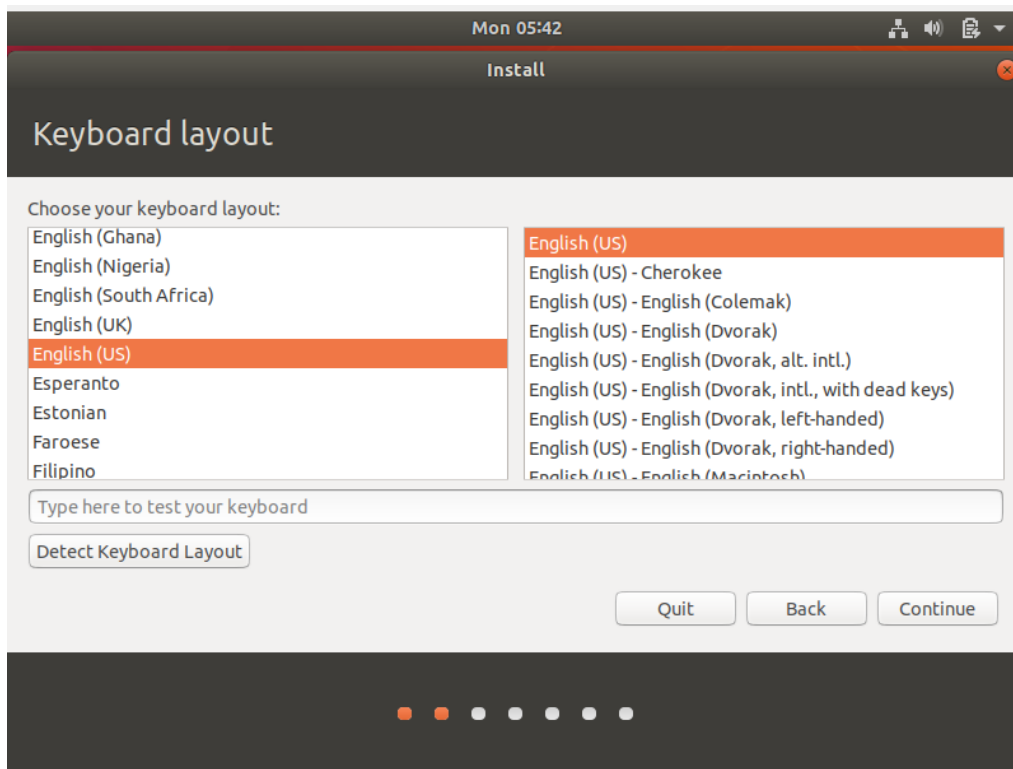
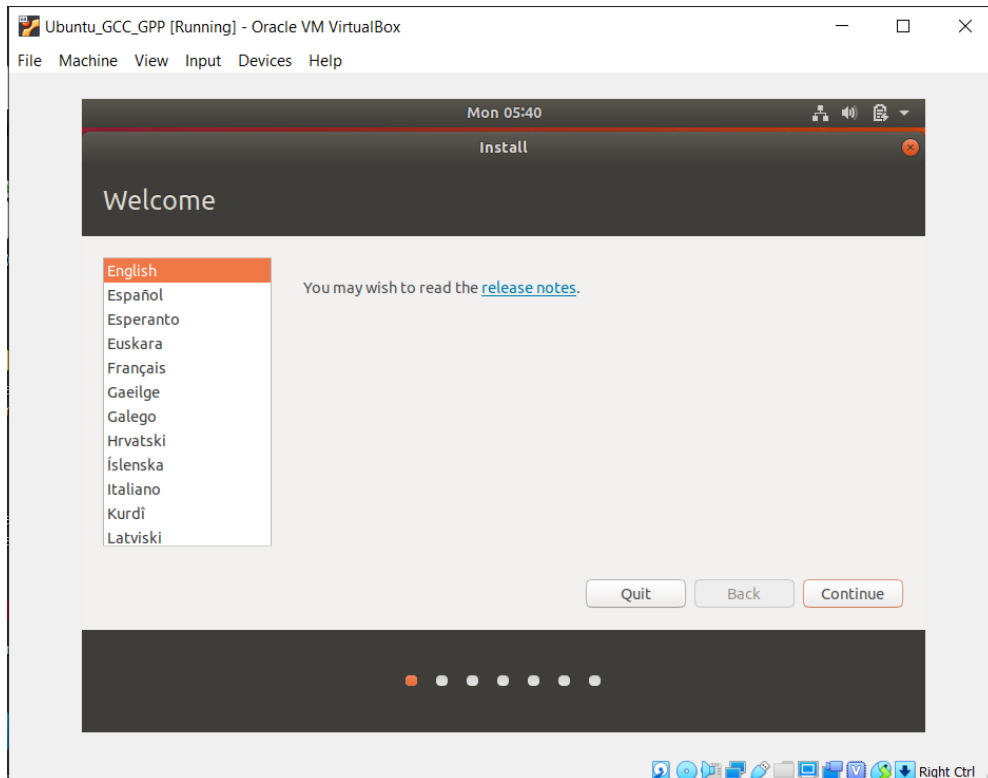
Select Language - English

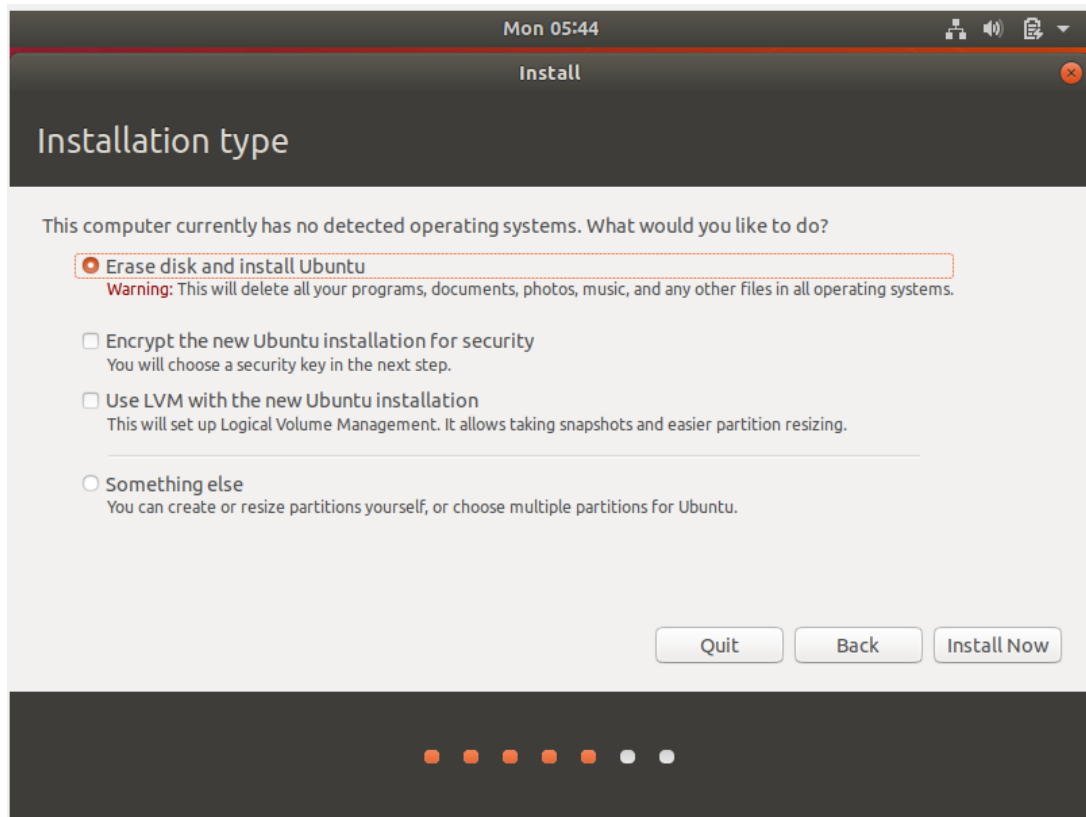
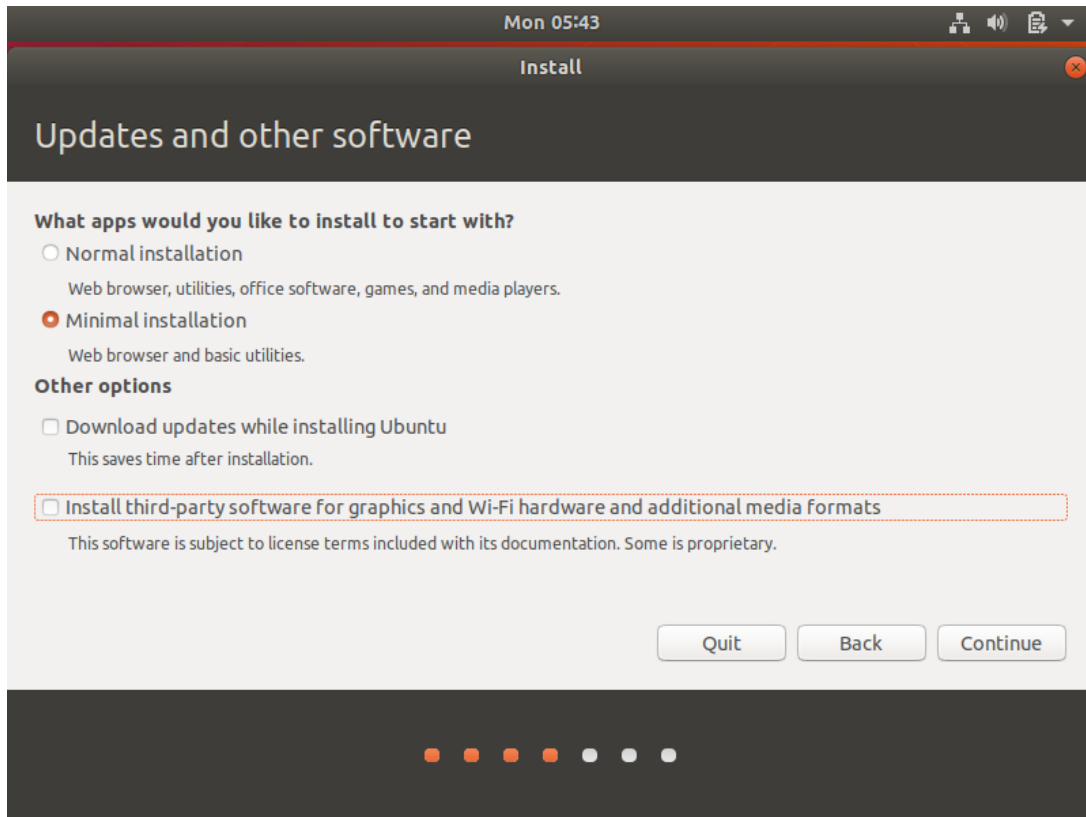


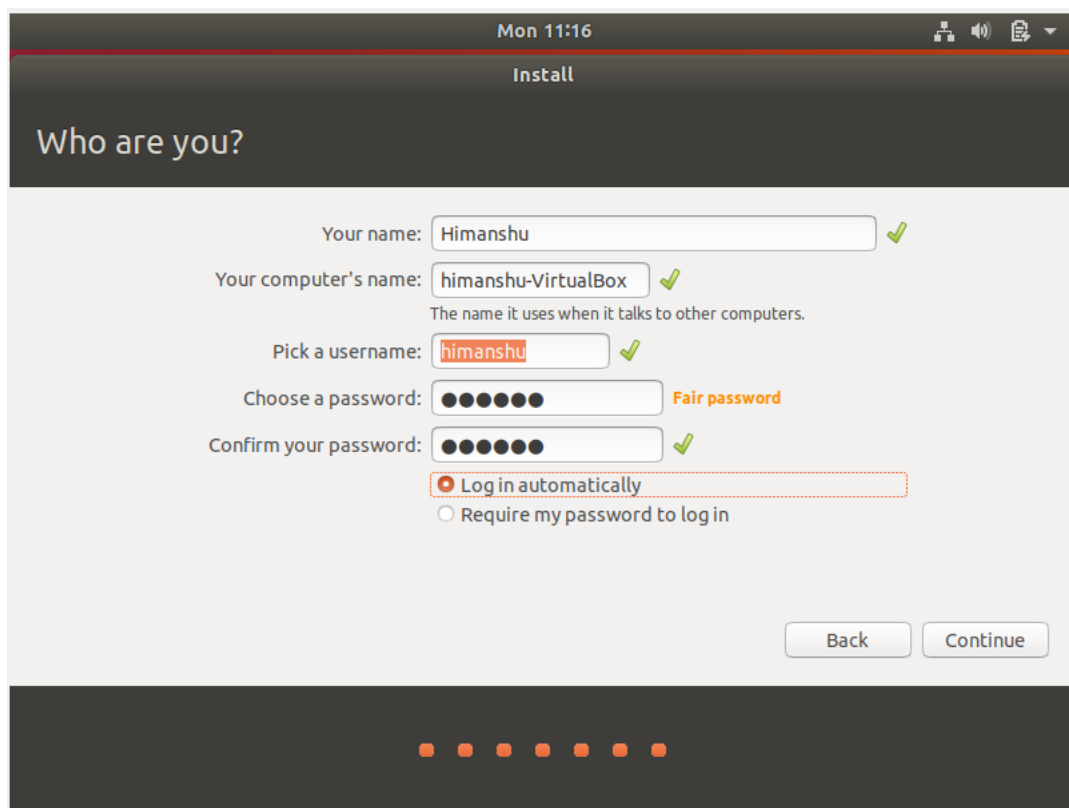
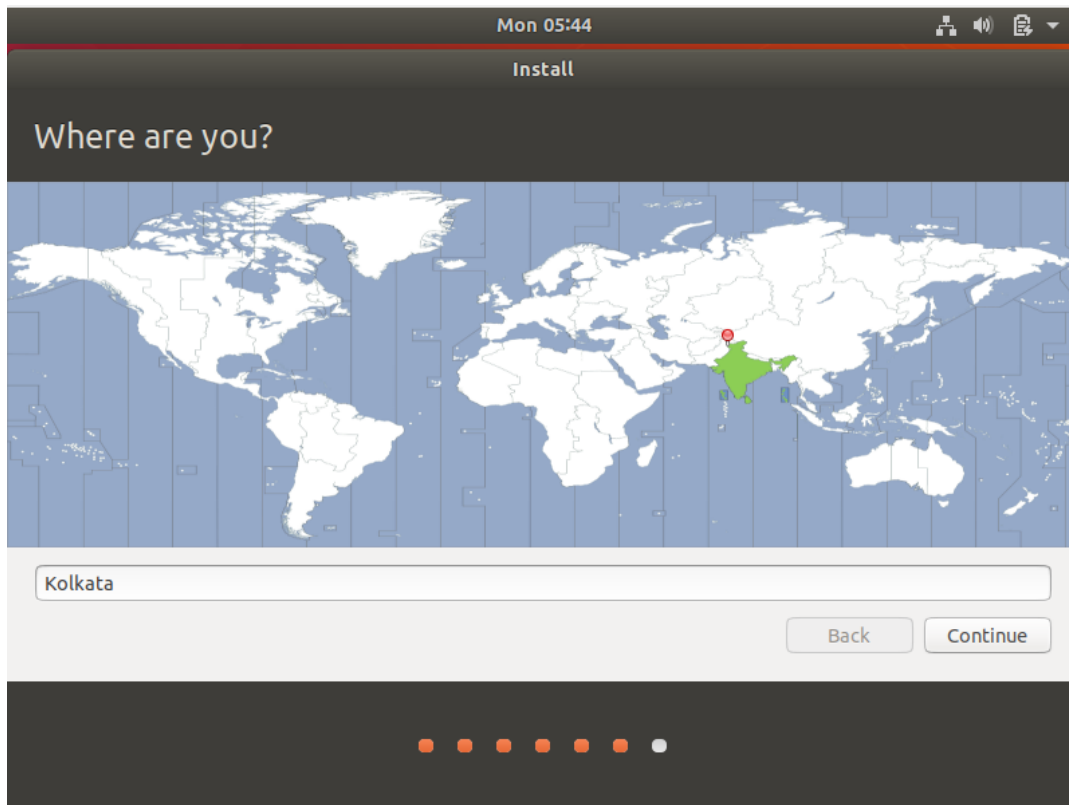
18. Click in Install Ubuntu

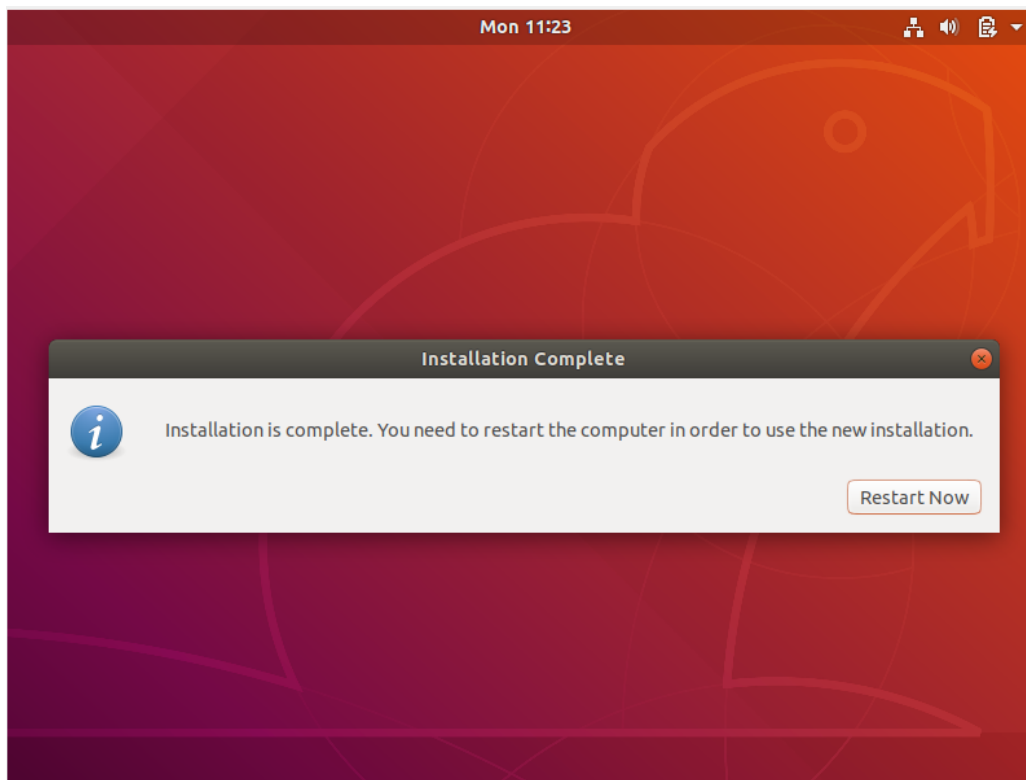
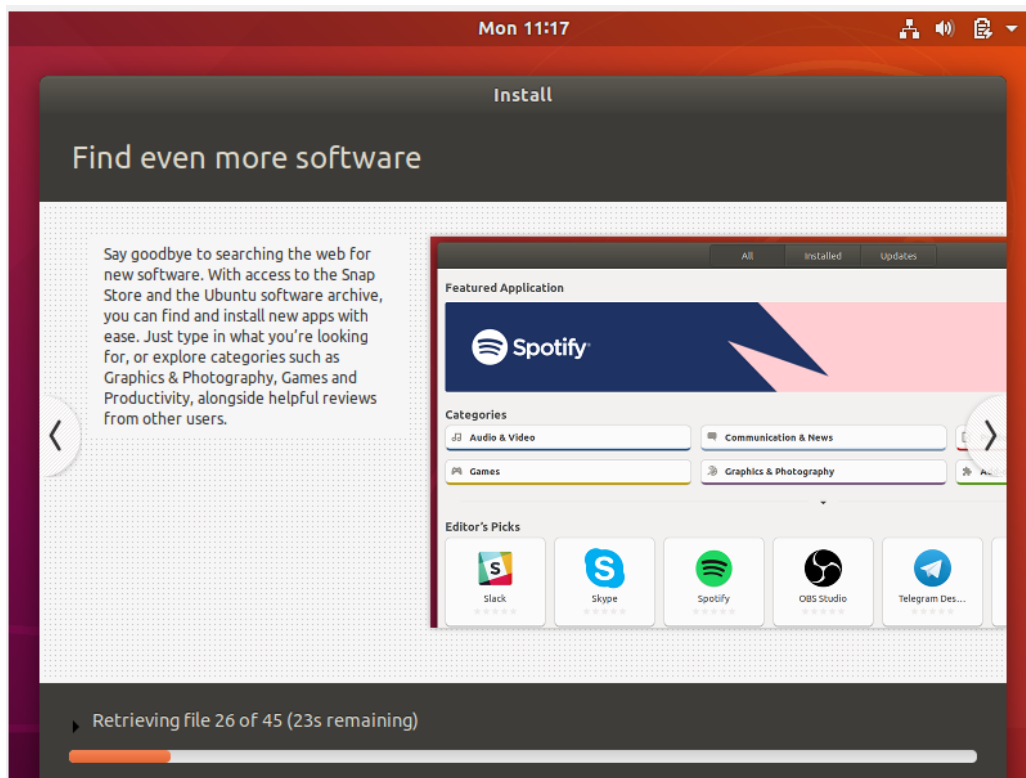


19. Go through the installation wizard for installation.  
Below screens shows basic installation instructions.

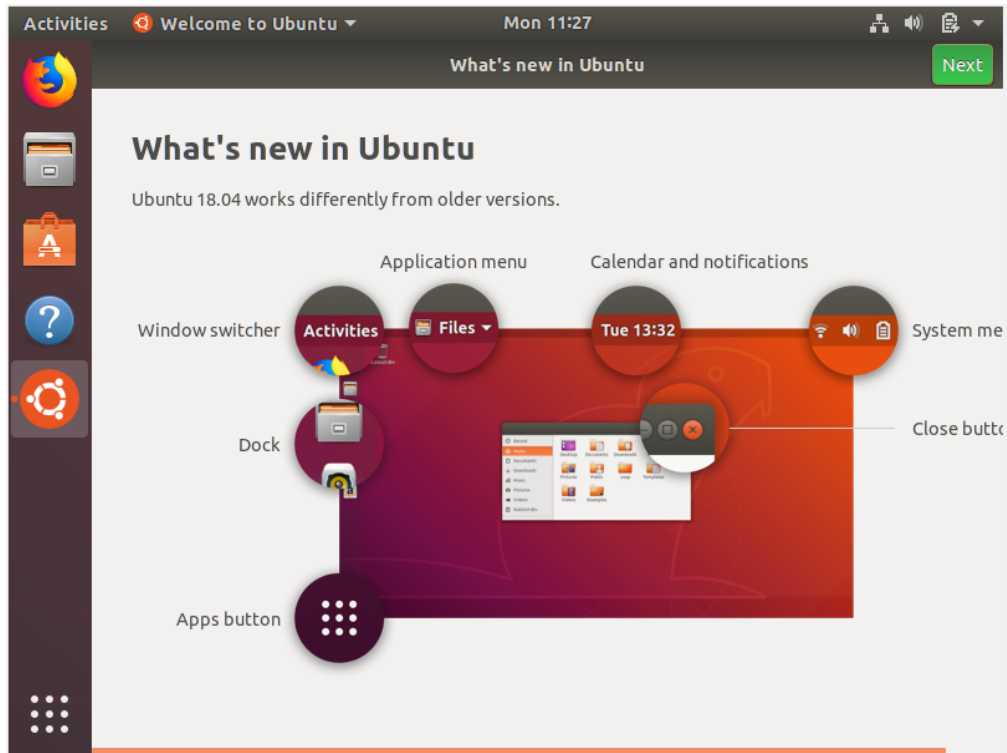




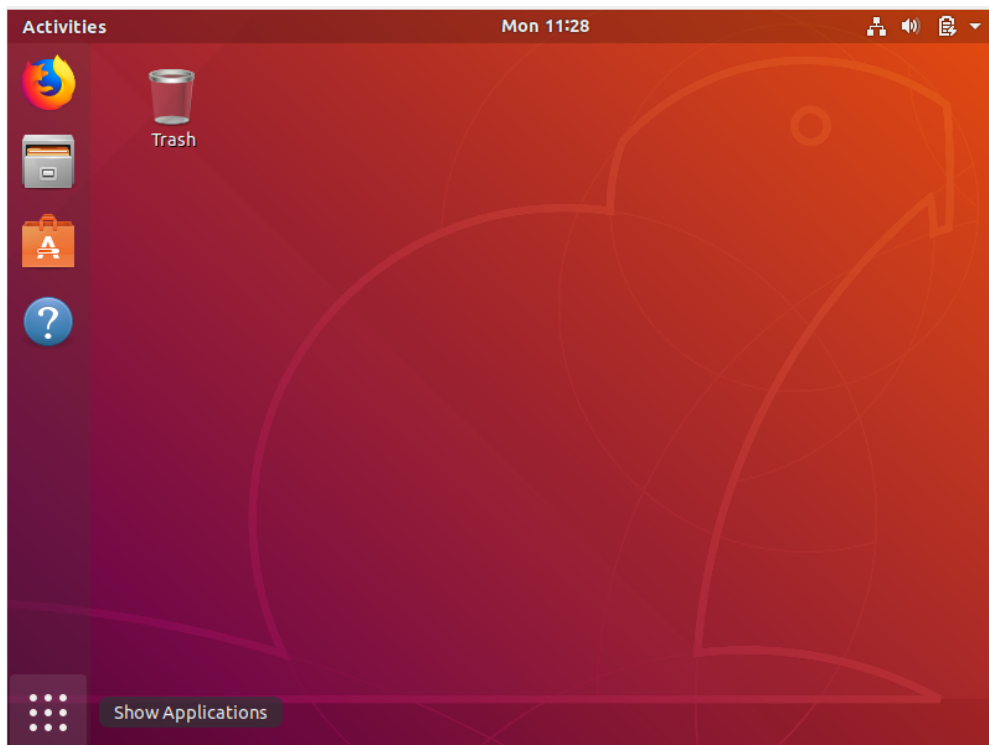




At last you can click enter after restarting the machine.



20. Open Terminal from the bottom left corner of the screen



21. Type the following command in the window to update packages in OS.

*sudo apt-get update*

```
himanshu@himanshu-VirtualBox:~$ sudo apt-get update
[sudo] password for himanshu:
Hit:1 http://in.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://in.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu bionic-security InRelease
```

22. Type following command to install GCC.

*sudo apt-get install gcc*

```
himanshu@himanshu-VirtualBox:~$ sudo apt-get install gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  cpp cpp-7 gcc-7 gcc-7-base gcc-8-base libasan4 libatomic1 libc-dev-bin
  libc6 libc6-dbg libc6-dev libcc1-0 libcilkrts5 libgcc-7-dev libgcc1
  libgomp1 libitm1 liblsan0 libmpx2 libquadmath0 libstdc++6 libtsan0
  libubsan0 linux-libc-dev manpages-dev
Suggested packages:
  cpp-doc gcc-7-locales gcc-multilib make autoconf automake libtool flex
  bison gcc-doc gcc-7-multilib gcc-7-doc libgcc1-dbg libgomp1-dbg libitm1-dbg
  libatomic1-dbg libasan4-dbg liblsan0-dbg libtsan0-dbg libubsan0-dbg
  libcilkrts5-dbg libmpx2-dbg libquadmath0-dbg glibc-doc
The following NEW packages will be installed:
  gcc gcc-7 libasan4 libatomic1 libc-dev-bin libc6-dev libcilkrts5
  libgcc-7-dev libitm1 liblsan0 libmpx2 libquadmath0 libtsan0 libubsan0
  linux-libc-dev manpages-dev
The following packages will be upgraded:
  cpp cpp-7 gcc-7-base gcc-8-base libc6 libc6-dbg libcc1-0 libgcc1 libgomp1
  libstdc++6
10 upgraded, 16 newly installed, 0 to remove and 608 not upgraded.
Need to get 18.7 MB/36.0 MB of archives.
After this operation, 76.4 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

23. To check if the installation of GCC is completed successfully you can use the following command.

`gcc -v`

```
himanshu@himanshu-VirtualBox:~$ gcc -v
Using built-in specs.
COLLECT_GCC=gcc
COLLECT_LTO_WRAPPER=/usr/lib/gcc/x86_64-linux-gnu/7/lto-wrapper
OFFLOAD_TARGET_NAMES=nvptx-none
OFFLOAD_TARGET_DEFAULT=1
Target: x86_64-linux-gnu
Configured with: ../src/configure -v --with-pkgversion='Ubuntu 7.5.0-3ubuntu1~18.04' --with-bugurl=file:///usr/share/doc/gcc-7/README.Bugs --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --prefix=/usr --with-gcc-major-version-only --program-suffix=-7 --program-prefix=x86_64-linux-gnu- --enable-shared --enable-linker-build-id --libexecdir=/usr/lib --without-included-gettext --enable-threads=posix --libdir=/usr/lib --enable-nls --enable-bootstrap --enable-clocale=gnu --enable-libstdcxx-debug --enable-libstdcxx-time=yes --with-default-libstdcxx-abi=new --enable-gnu-unique-object --disable-vtable-verify --enable-libmplex --enable-plugin --enable-default-pie --with-system-zlib --with-target-system-zlib --enable-objc-gc=auto --enable-multiarch --disable-werror --with-arch-32=i686 --with-abi=m64 --with-multilib-list=m32,m64,mx32 --enable-multilib --with-tune=generic --enable-offload-targets=nvptx-none --without-cuda-driver --enable-checking=release --build=x86_64-linux-gnu --host=x86_64-linux-gnu --target=x86_64-linux-gnu
Thread model: posix
gcc version 7.5.0 (Ubuntu 7.5.0-3ubuntu1~18.04)
```

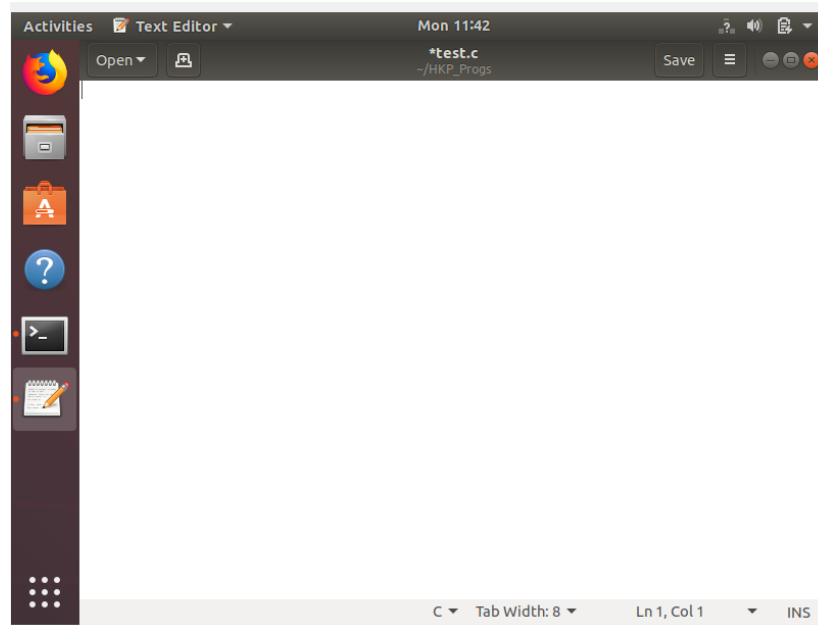
24. You can create your working directory and switch to it.

```
himanshu@himanshu-VirtualBox:~$ mkdir HKP_Progs
himanshu@himanshu-VirtualBox:~$ cd HKP_Progs/
```

25. To create any C program you can use editors for example gedit.  
The following command will open a new file called test.c for editing.

```
himanshu@himanshu-VirtualBox:~/HKP_Progs$ gedit test.c &
[1] 6318
```





26. Type your program here.

```
Open ▾  *test.c  Save  ⓘ  ⌵  ✕  
~/HKP_Progs  
  
#include <stdio.h>  
  
int main()  
{  
    printf("Hello Students\n");  
    return 1;  
}
```

27. To compile the program in GCC you can use the following command.

```
gcc -o test test.c
```

This will compile the test.c file and name the store the compiled version in the name test.

To run the file use following command.

```
./test
```

```
himanshu@himanshu-VirtualBox:~/HKP_Progs$ gcc -o test test.c  
himanshu@himanshu-VirtualBox:~/HKP_Progs$ ./test  
Hello Students  
himanshu@himanshu-VirtualBox:~/HKP_Progs$
```

## **Part - II**

### **Basic C Programs**

- A. Write down the steps to perform operations of following programs. Draw appropriate flowchart for the same.
- B. Perform the following programs using GCC. Write down the commands to compile and run the program.
  - Write a C program to print "Hello DDU".
  - Write a simple C program to add two numbers.
  - Write a simple C program to subtract two numbers.
  - Write a simple C program to multiply two numbers.
  - Write a simple C program to divide two numbers.