

**GE-161L**

**Introduction to Information and Communication Technologies**

**Laboratory 02**

**Hardware and Operating Systems – II**

**Version: 1.0.0**

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## Learning Objectives:

- Use Windows Command Prompt for various command (go to the directory, make directory, remove directory, list directory, ...)
- Write and execute a batch program
- Install Oracle ® VirtualBox Virtual Machine
- Install Ubuntu variant of Linux Operating System

## Resources Required:

- Laptop or Desktop Computer
- Internet Access
- Oracle ® VirtualBox Setup
- Ubuntu Setup

## General Instructions:

- This is an individual lab, you are strictly **NOT** allowed to discuss your solution with your fellow colleagues, even not allowed asking how is he/she is doing, it may result in negative marking. You can **ONLY** discuss with your TAs or with me.
- Your TAs will be available in lab for your help. Alternatively, you can send me your queries via email.

| Teachers:          |                                 |  |
|--------------------|---------------------------------|--|
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## **Background and Overview:**

### **Microsoft ® Disk Operating System (MS-DOS)**

MS-DOS short for Microsoft Disk Operating System is an operating system for Intel x86-based personal computers. It was the most commonly used member of the DOS family of operating systems, and was the main operating system for IBM PC personal computers during the 1980s to the mid-1990s, until it was gradually superseded by operating systems offering a Graphical User Interface (GUI), in particular by various generations of the Microsoft Windows operating system.

In the personal computer operating systems like MS-DOS, a number of standard system commands were provided for common tasks such as listing files on a hard-disk or moving files. Over the several generations of MS-DOS, commands were added for the additional functions of the operating system. In the current Microsoft Windows operating system a text-mode command prompt window can still be used.

### **What is the Command Prompt?**

In Microsoft ® Windows operating systems, the Command Prompt is a program that emulates the input field in a text-based user interface screen with the Microsoft ® Windows Graphical User Interface (GUI). It can be used to execute commands and perform advanced administrative functions. It can also be used to troubleshoot and solve certain kinds of Microsoft ® Windows issues.

### **Why we are using Command Prompt?**

Command Prompt is faster than Microsoft ® Windows GUI. Here GUI is what we are looking, all the icons, mouse working. There are some software that only work in the command prompt. So, we should learn this. Most of networking tools are available on command prompt.

### **Batch Program**

Batch scripts are stored in simple text files containing lines with commands that get executed in sequence, one after the other automatically. These files have the special file name extension BAT or CMD. Batch files are used when a user wants to write multiple commands in a sequence which should be executed by the operating system in a batch (bundle or group one by one). Such a file is called batch file and the commands in the file are collectively called batch script. Typically, to create a batch file, notepad is used. This is the simplest tool for creation of batch files. Next is the execution environment for the batch scripts. One can double click the batch file to run batch script in it or this can also be done via the command prompt by simply typing the name of batch file.

In batch scripts besides using standard operating system commands, all programming features could be used which include defining variables, assign values to variables, using operators, getting input and printing output, using arrays, writing functions, checking conditions, using loops, defining structures, creating files etc.

## Activities:

### Pre-Lab Activity:

Task 01: Using Windows Command Line Interface: [Estimated 30 minutes / 30 Marks]

#### Accessing Command Line Interface:

There are a few ways to access the Command Line Interface (Command Prompt) in Windows. Below are the most convenient:

1. Type "command prompt" into the Start menu to search for it. You can also type "**cmd**" (the short name of the executable that runs the Command Prompt) if you prefer.
2. Press Win + R to open the Run box, then type "**cmd**" and press Enter to open it.
3. Press Win + X (or right-click the Start button) and choose Command Prompt from the menu. Depending on your Windows settings, this may show Windows PowerShell instead. PowerShell is more powerful than the Command Prompt, but can run all the same commands.

You'll then see a line like the below:

```
C:\Users\Username>
```

Here Username would be replaced by current user's login name at Windows operating system. In following screens user "Waqar" is logged in the system. Hence you will see similar screen as follows.

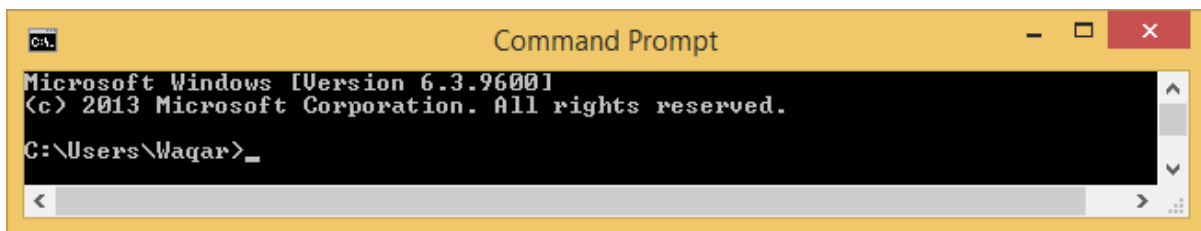


Fig. 1 (Open Command Prompt)

You can see contents of the same directory using Graphical User Interface of Microsoft ® Windows through Windows Explorer as follows.

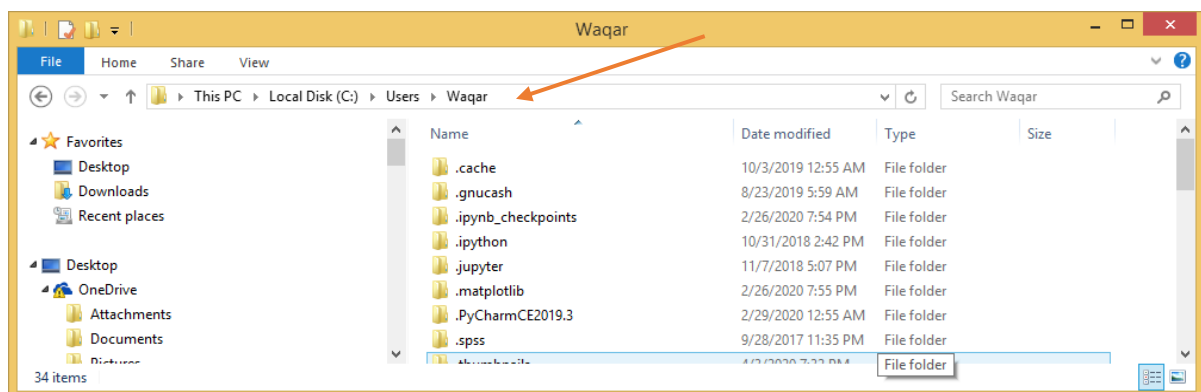


Fig. 2 (See Folder Path)

```
C:\Users\Waqar>
```

This is current working directory or current location. Any commands you run that rely on location (such as deleting files) will take place in this folder. Other CMD commands are more general and don't rely on you being in a specific location.

It's important to know that when working in the Command Prompt, you must type commands exactly as they should be. Since you're issuing commands directly to your computer, it won't understand if you type something wrong.

If you type a command that your computer doesn't recognize like “**abcdef**”, you'll see a message that says [Command] is not recognized... and Windows won't do anything.

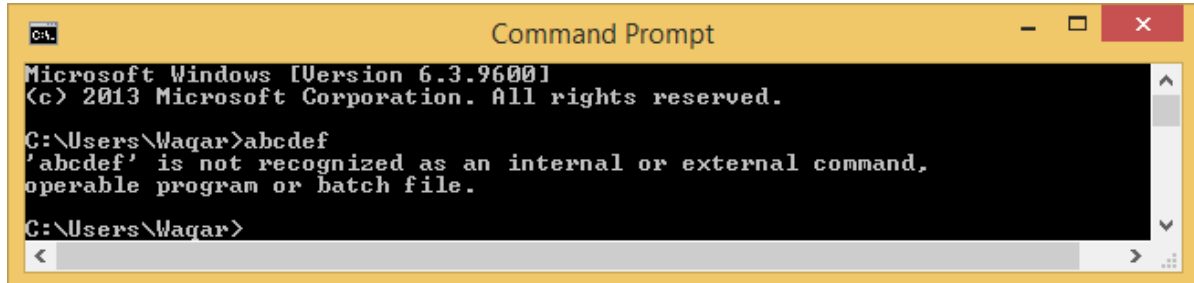


Fig. 3 (Invalid Command)

This isn't really a problem; what's more of a risk is accidentally typing the wrong command, or using a command in a way you didn't intend. For example, when trying to delete one file, you might accidentally tell it to delete an entire folder instead.

The command line will run whatever you tell it, as long as it's a valid option. So you should always double-check what you're about to do before you fire it off.

### Listing common Commands:

Typing **help** will list many common commands that you can use. These will get you started, so you don't have to go looking for command names on your own.

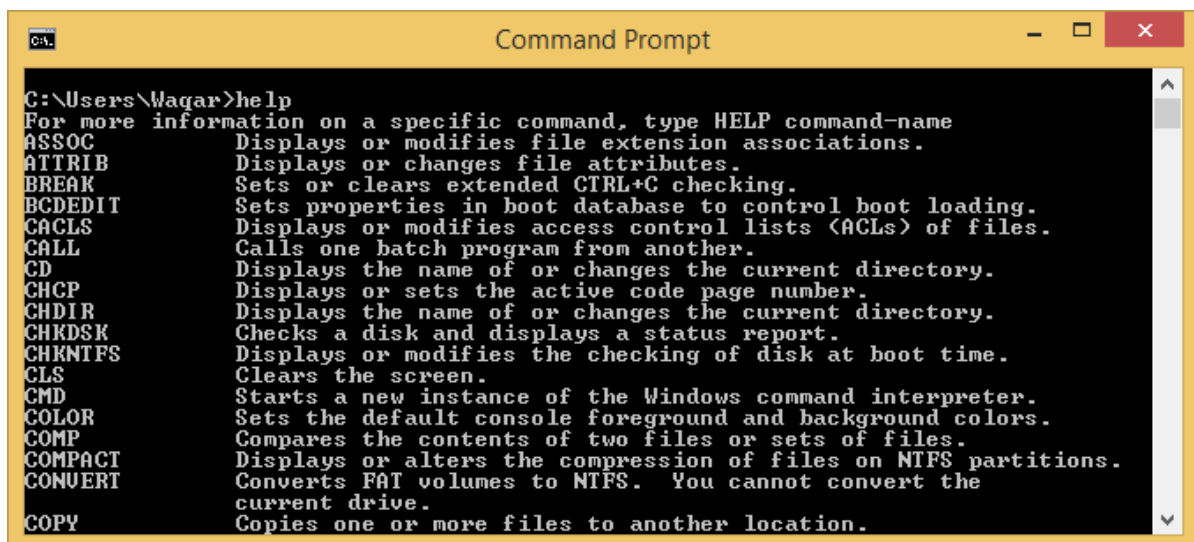


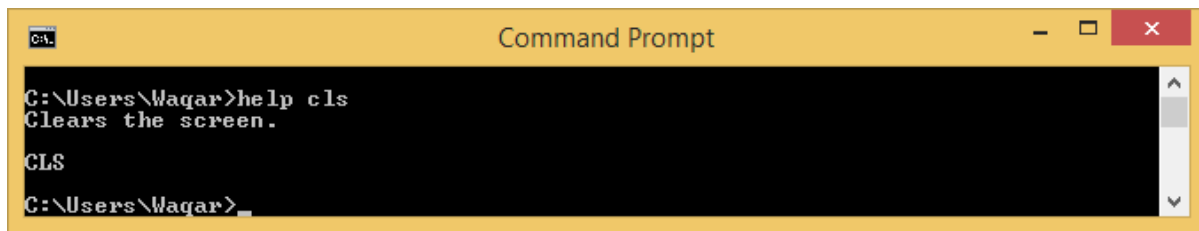
Fig. 4 (Listing Commands)

### Getting help about a Specific Command:

One can get help about any command using one of the following methods

1. Typing **help** and then the command name provide brief overview of the command. Like  
C:\Users\Waqar> help cls
2. Typing command name and then /?.

Like C:\Users\Waqar> cls /?



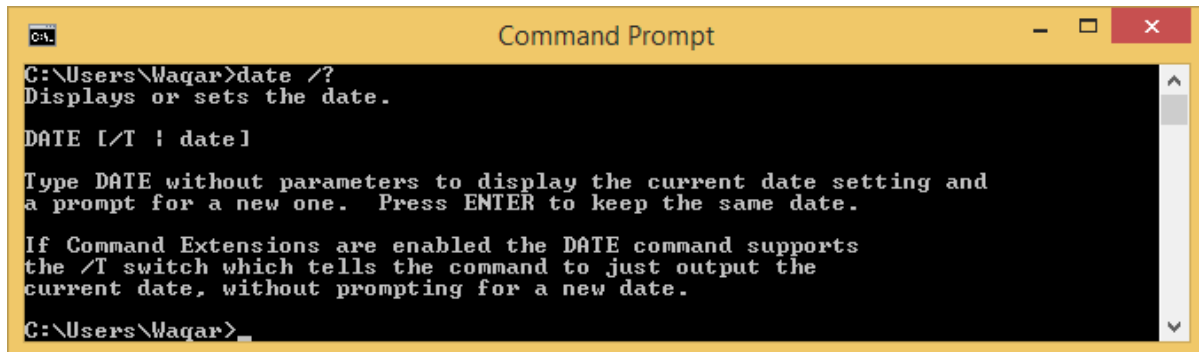
```

C:\Users\Waqar>help cls
Clears the screen.

CLS

C:\Users\Waqar>_
  
```

Fig. 5 (Getting Command Help)



```

C:\Users\Waqar>date /?
Displays or sets the date.

DATE [/T : date]

Type DATE without parameters to display the current date setting and
a prompt for a new one. Press ENTER to keep the same date.

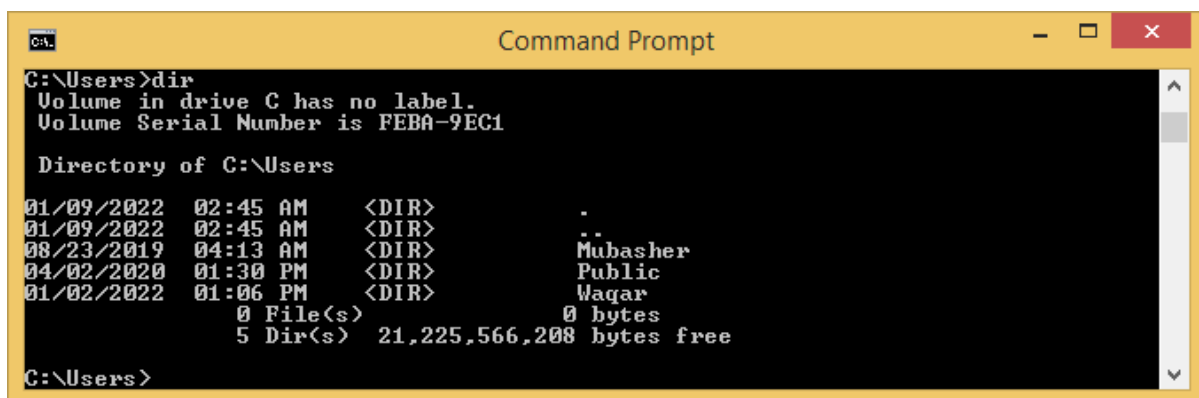
If Command Extensions are enabled the DATE command supports
the /T switch which tells the command to just output the
current date, without prompting for a new date.

C:\Users\Waqar>_
  
```

Fig. 6 (Getting Command Help)

### Listing and Changing Directories:

The **dir** command, which is short for directory, will list the contents of the folder that you're currently in. To see in which folder you are currently in, you can check this by looking at the folder that appears to the left of your current command which is "C:\Users\Waqar".



```

C:\Users>dir
Volume in drive C has no label.
Volume Serial Number is FEB0-9EC1

Directory of C:\Users

01/09/2022  02:45 AM    <DIR>          .
01/09/2022  02:45 AM    <DIR>          ..
08/23/2019  04:13 AM    <DIR>          Mubasher
04/02/2020  01:30 PM    <DIR>          Public
01/02/2022  01:06 PM    <DIR>          Waqar
               0 File(s)              0 bytes
               5 Dir(s)  21,225,566,208 bytes free

C:\Users>
  
```

Fig. 7 (DIR Command)

To change your current location, use **cd** (short for change directory) followed by the folder you want to visit. Available folders are marked with <DIR> when you run the **dir** command.

**cd** <new directory>

So for example, to move to **Desktop** folder from your default user folder, you would type

C:\Users\Waqar>**cd Desktop**

and to move up one folder, use the

**cd ..**

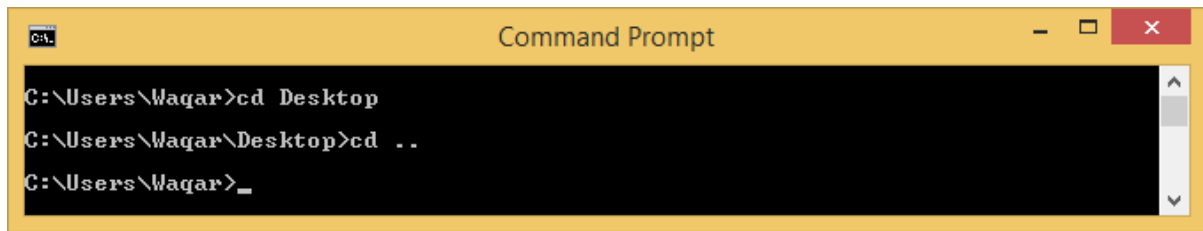


Fig. 8 (CD Command)

### Making Directories:

We use the command “**mkdir <directory-name>**” to make directory. To create a folder named “Videos” in the folder of Desktop, First we can go into folder Desktop and then make a new folder named Videos in it as follows

```
C:\Users\Waqar>cd Desktop
```

Now your current working directory is C:\Users\Waqar\Desktop>.

```
C:\Users\Waqar\Desktop>mkdir Videos
```

You can change your current working directory to Videos using cd command

```
C:\Users\Waqar\Desktop>cd Videos
```

```
C:\Users\Waqar\Desktop\Videos>
```

Now your current working directory is C:\Users\Waqar\Desktop\Videos>.

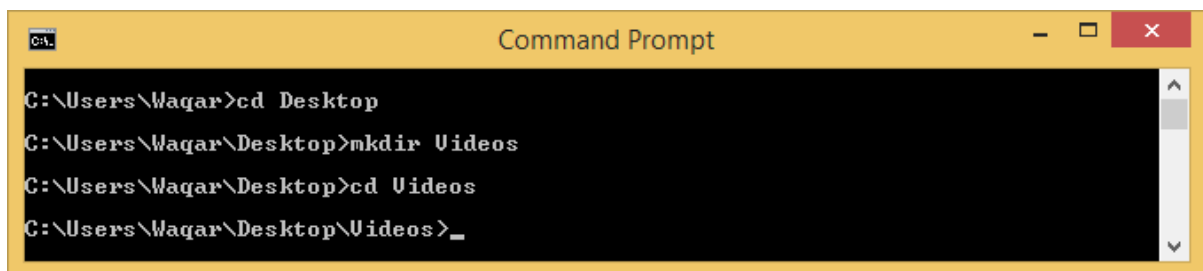


Fig. 9 (MKDIR Command)

### Changing multiple steps directories:

You can move to back-to-back directory with only one command as follows.

```
C:\Users\Waqar\Desktop\Videos>cd .. / ..
```

```
C:\Users\Waqar>
```

You can also move to next-to-next directory with only one command as follows.

Like there is a folder “**Videos**” in the folder name “**Desktop**”. You will use back-slash between directory names. So, you will do it with command:

```
C:\Users\Waqar>cd Desktop\Videos
```

```
C:\Users\Waqar\Desktop\Videos>
```



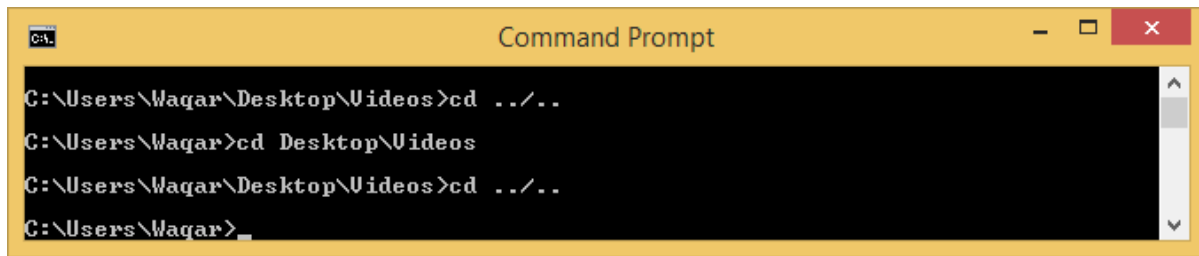


Fig. 10 (Jump Multiple Directory)

### Searching next directory with tab (Auto-Complete):

You can search next directory by writing some starting characters and then press tab to get other optional directories.

### Using relative path to go directory:

A relative path is calculated relative to your **current working directory** which is the directory you are currently in at a command prompt, as displayed by command `cd` without any directory name ahead of it.

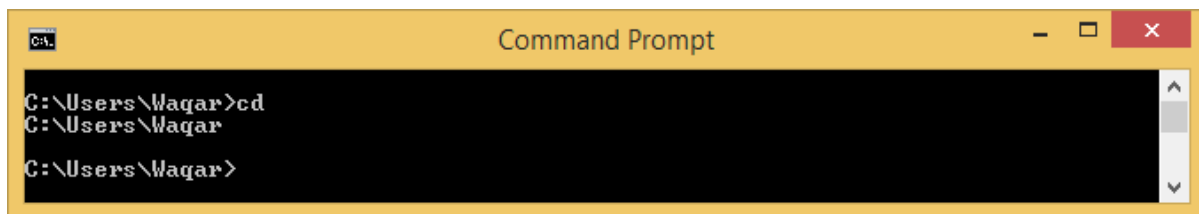


Fig. 11 (Current working Directory)

When we don't want to switch current working directory, we will use relative path for this.

If we are at `C:\Users\Waqar>` and want to display contents of Videos folder which is placed in Desktop folder without changing our current working directory. We will use relative path in **dir** command as follows.

```
C:\Users\Waqar>dir Desktop\Videos
```

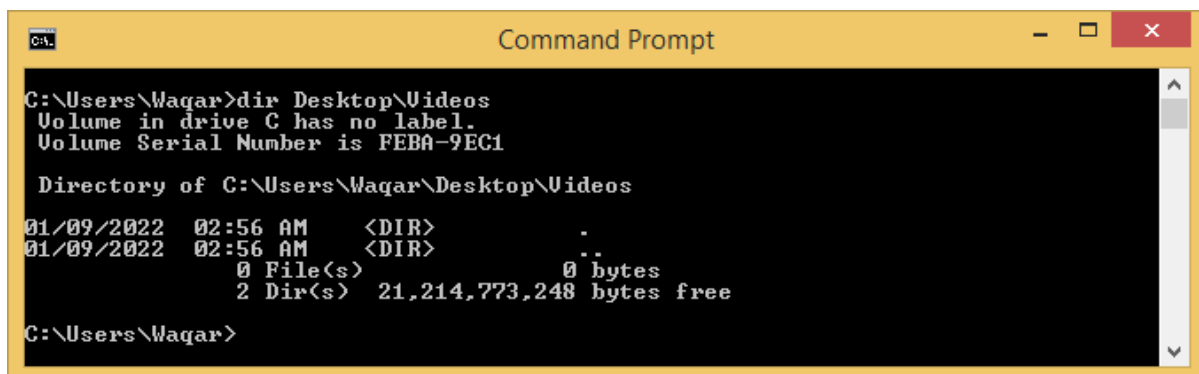


Fig. 12 (Relative Path)

Here you can see our current working directory is still remain Waqar but we use relative path to list files of Videos directory.

We can use `"/a"` switch with `"dir"` command to lists down all the hidden files and directories too.

### Clearing Screen:

To clear screen we have to enter command “**cls**”. It will screen whole command prompt screen.

C:\Users\Waqar>cls

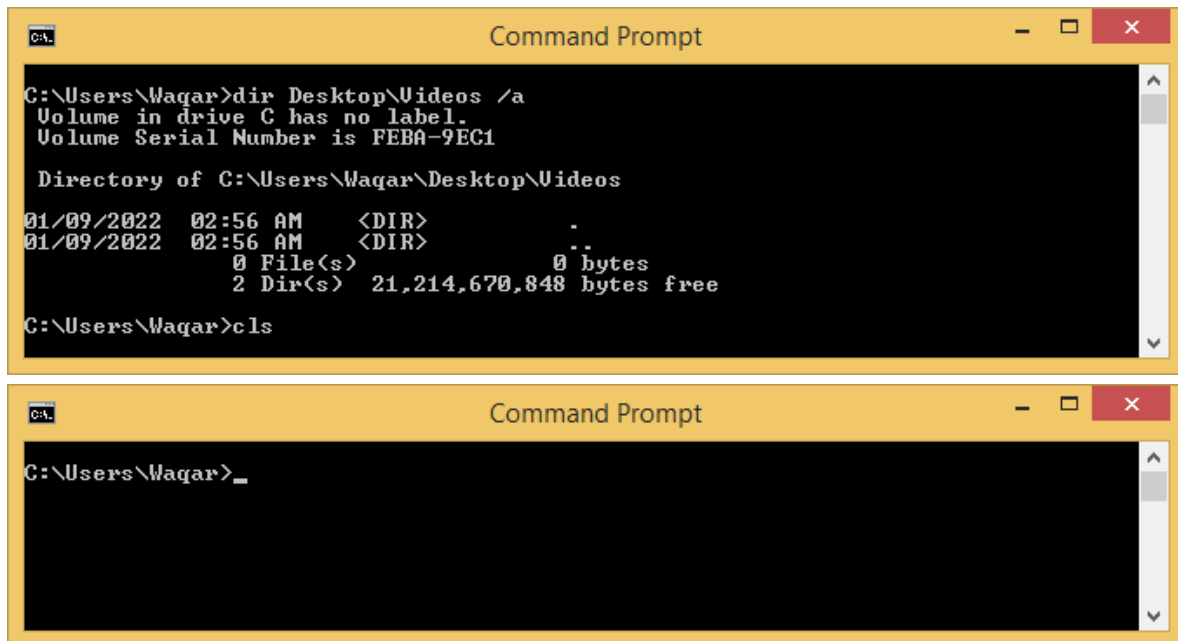


Fig. 13 (Clear Screen)

#### Listing the file with a specific extension:

If you want to list all the files in a directory which are in .bat extension.

We will use command:

C:\Users\Waqar>dir \*.bat

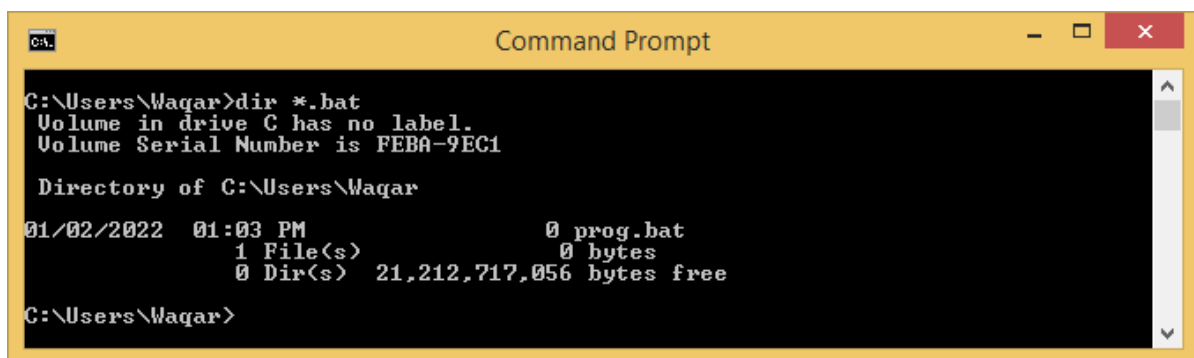


Fig. 14 (Search File with Specific Extension)

You can use up arrow “↑” at keyboard to see previously entered command at command prompt.

When you enter just the name of a file, that file would be opened by Windows.

#### Deleting a directory:

To delete a directory, use command “**rmdir <directory name>**”.

C:\Users\Waqar>rmdir Deaktop\Videos

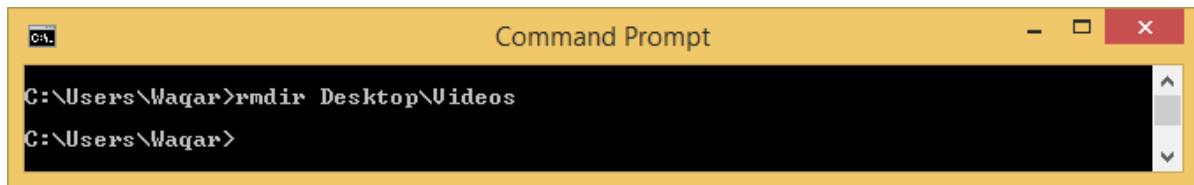


Fig. 15 (Remove Directory)

### Copying Files:

To copy a file, you will use the copy command. When you use the copy command, you must include two parameters. The first is the location and name of the file you want to copy, or the source. The second is the location to which you want to copy the file, or the destination. You separate the source and destination with a space. The copy command follows this pattern:

`copy <source> <destination>`

To copy the NOTEPAD.EXE files from the C:\Windows folder to the C:\Users\Waqar\Desktop folder

1. Go to C:\Windows directory by typing the following at the command prompt:

`C:\Users\Waqar>cd C:\Windows`

The command prompt should now look like the following:

`C:\Windows>`

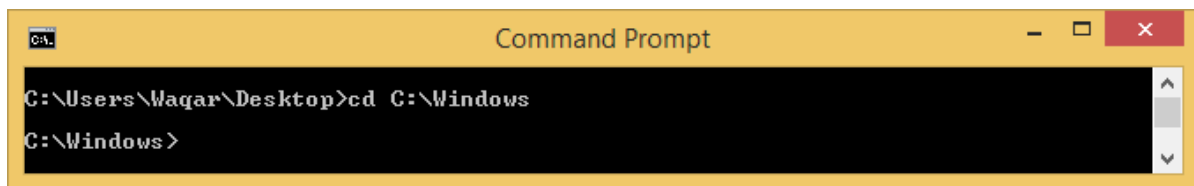


Fig. 16 (Absolute Path)

2. Make sure the file you are going to copy, NOTEPAD.EXE, is located in the Windows directory by using the dir command followed by a filename.

`C:\Windows>dir notepad.exe`

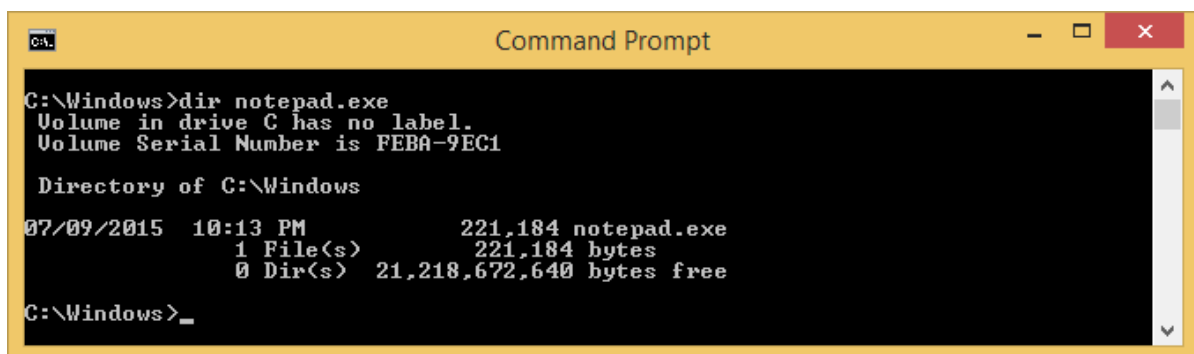


Fig.17 (Confirming File)

3. To copy the NOTEPAD.EXE file from the Windows folder to the "C:\Users\Waqar\Desktop" folder, type the following at the command prompt:

`C:\Windows>copy C:\Windows\notepad.exe C:\Users\Waqar\Desktop`

Here writing complete path starting from drives (C:\) to desired directory is call absolute path. The same command can be executed using relative path as follows

```
C:\Windows>copy notepad.exe ..\Users\Waqar\Desktop
```

Here as we are already in C:\Windows folder hence we can omit “C:\Windows” from “C:\Windows\notepad.exe”. To access the absolute destination “C:\Users\Waqar\Desktop” from our current working location relatively, we will first move one directory up using “..” and then from there we will locate your desired destination which is “Users\Waqar\Desktop”. Hence then complete relative path would become as ..\Users\Waqar\Desktop

The following message appears:

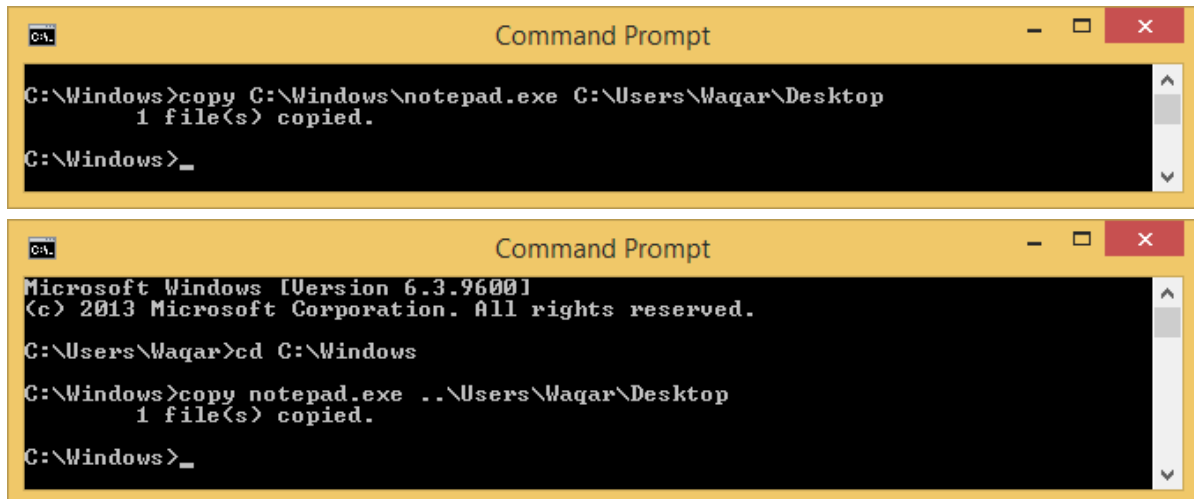


Fig. 18 (Copying File)

4. To confirm that you copied the files successfully, view the contents of the C:\Users\Waqar\Desktop folder by typing the following at the command prompt:

```
C:\Windows>dir C:\Users\Waqar\Desktop\notepad.exe
```

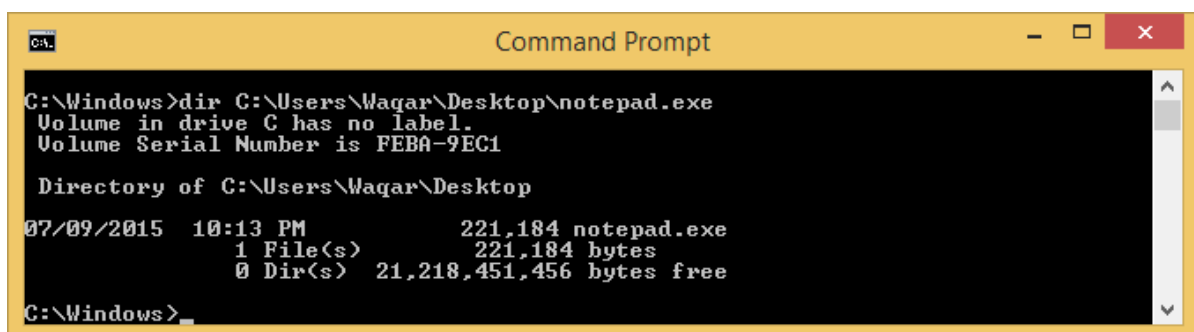


Fig. 19 (Confirming File)

### Renaming Files:

To rename a file, you will use the ren command. The ren command stands for "rename." When you use the ren command, you must include two parameters.

The first is the file you want to rename, and the second is the new name for the file. You separate the two names with a space. The ren command follows this pattern:

```
ren oldname newname
```

To rename the NOTEPAD.EXE file to PADNOTE.TXT, type the following at the command prompt:

```
C:\Users\Waqar\Desktop>ren notepad.exe padnote.txt
```

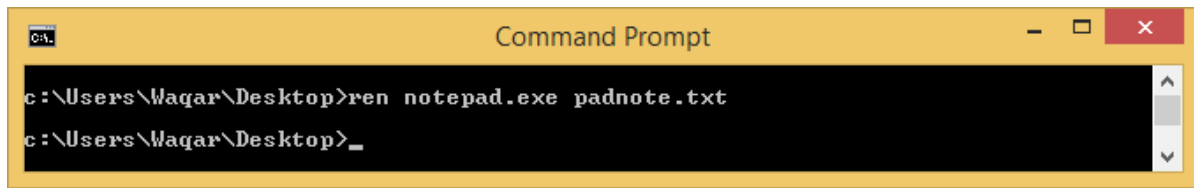


Fig. 20 (Renaming File)

To confirm that you renamed the file successfully, type the following at the command prompt, first is using relative path from current working directory, while second command is using absolute path:

```
C:\Users\Waqar\Desktop>dir padnote.txt
```

```
C:\Users\Waqar\Desktop>dir C:\Users\Waqar\Desktop\padnote.txt
```

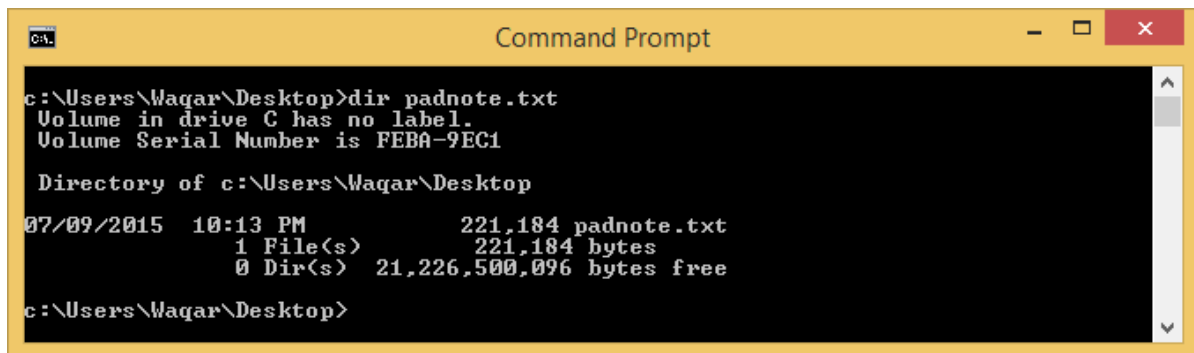


Fig. 21 (Conforming File)

### Deleting Files:

To delete a file, you will use the del command. The del command stands for "delete." If you don't have very much disk space, deleting files you no longer use is essential. The del command follows this pattern:

```
del filename
```

To delete the PADNOTE.TXT, type the following at the command prompt:

```
C:\Users\Waqar\Desktop>del padnote.txt
```

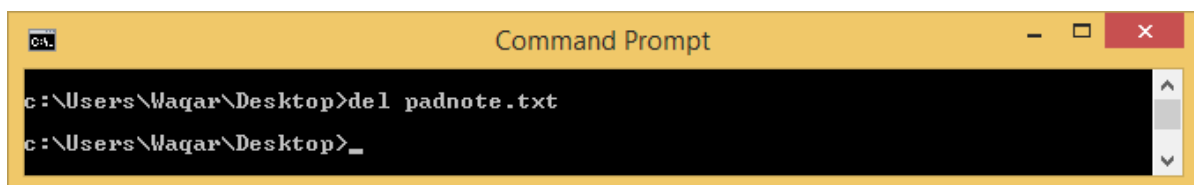


Fig. 22 (Deleting File)

To confirm that you deleted the file successfully, type the following at the command prompt:

```
C:\Users\Waqar\Desktop>dir padnote.txt
```

```
C:\Users\Waqar\Desktop>dir C:\Users\Waqar\Desktop\padnote.txt
```

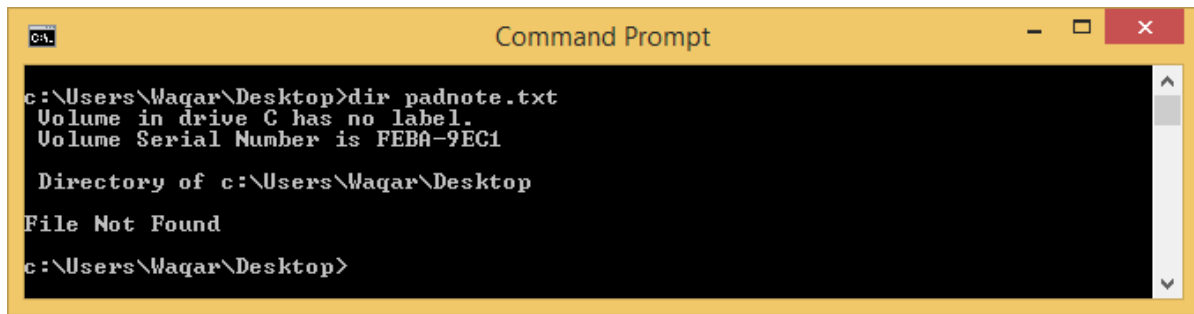


Fig. 23 (Confirming File Deletion)

### Creating a Batch file:

Typically, to create a batch file, notepad is used. This is the simplest tool for creation of batch files.

1. Open Notepad
2. Type command **dir** in the file and
3. Save this file with the name of "**d.bat**" in the Desktop folder.

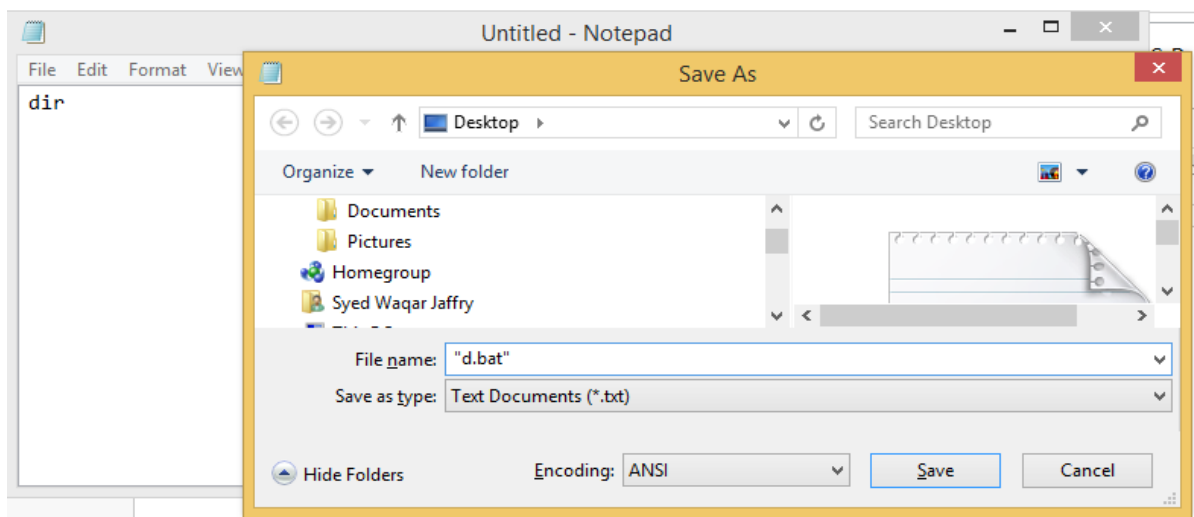


Fig. 24 (Creating Batch File)

### Executing a Batch file:

Following are the steps to execute a batch file at command prompt. Alternatively you can double click batch file in Windows operating system to execute.

1. Open the command prompt (cmd.exe).
2. Go to the location where the .bat file is stored.
3. Write the name of the file as shown in the following image and press the Enter button to execute the batch file.

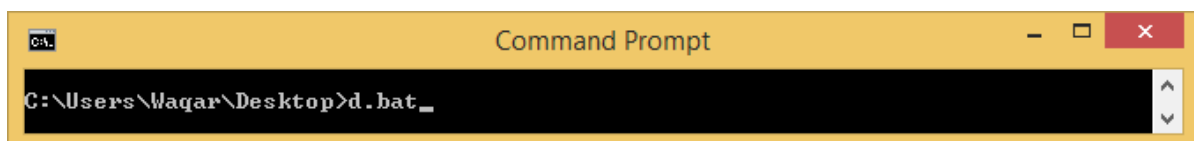


Fig. 25 (Executing a Batch File)

### Writing First Batch Script/Program

Open notepad and enter the following lines of code. Save the file as “List.cmd”.

```
@echo off
```

```
Rem This is for listing down all the files in the directory Program files
```

```
dir "C:\Program Files" > C:\lists.txt
```

```
echo "The program has completed"
```

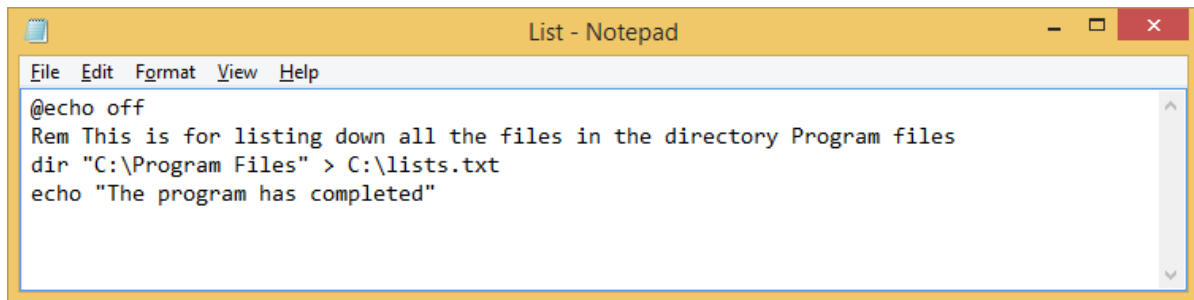


Fig. 26 (First Batch Program)

The above code does the following –

Uses the **echo off** command to ensure that the commands are not shown when the code is executed.

The **Rem** command is used to add a comment to say what exactly this batch file does.

The **dir** command is used to take the contents of the location **C:\Program Files**.

The ‘>’ command is used to redirect the output to the file **C:\lists.txt**.

Finally, the **echo** command is used to tell the user that the operation is completed.

When the above command “List.cmd” is executed, the names of all the files in “**C:\Program Files**” folder will be sent to the file “**C:\Lists.txt**” and at the command prompt the message “**The program has completed**” will be displayed.

**In-Lab Activities:****Task 01: Using Command****[30 minutes / 25 marks]**

Write the syntax and function of the following commands at Windows command line interface. Also attach the screenshot after running these on your computer. (Capture full terminal screen)

1. help
2. dir
3. dir /a
4. cd
5. cd ..
6. cd <directory\_name>
7. mkdir
8. rmdir
9. echo
10. tree

**Task 02: Creating Directory Hierarchy****[15 minutes / 15 marks]**

Create the same hierarchy as given below in your Desktop folder using Windows command line interface.

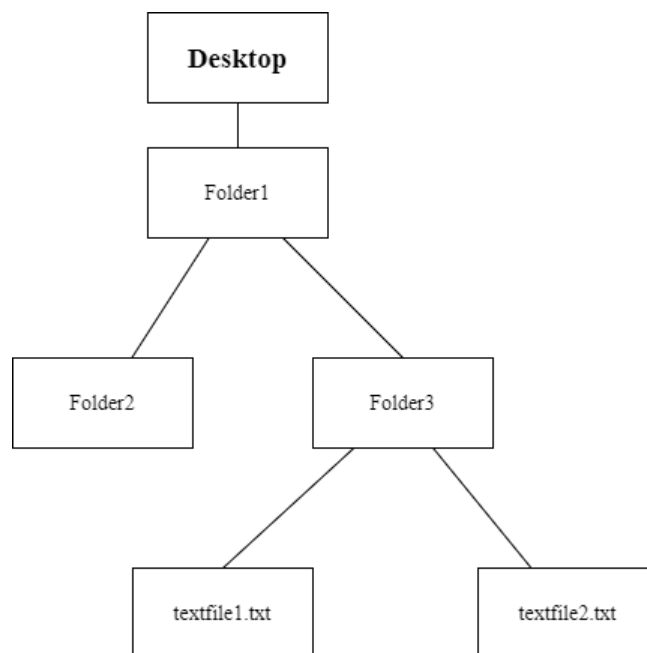


Fig. 27 (Creating Directory Hierarchy)

**Task 03: Writing a Batch Program****[15 minutes / 10 marks]**

Create a simple batch file named “dt.cmd” which first clears command prompt screen, and then displays current system date and time as follows

“Today’s date is [system date] and current time is [system time]”at the screen.





```
C:\Users\Waqar\Desktop>date
The current date is: Sun 01/09/2022
Enter the new date: <mm-dd-yy>
C:\Users\Waqar\Desktop>List.cmd

C:\Users\Waqar\Desktop>
Today's Date is Fri 01/07/2022 and current time is 4:47:44.62
C:\Users\Waqar\Desktop>
```

Fig. 28 (Batch Program Output)

## Post-Lab Activities:

Task 01: Installation of Oracle ® VirtualBox Virtual Machine

[Time 30 mins/ 10 marks]

Open your Browser.

Search “virtualbox”.

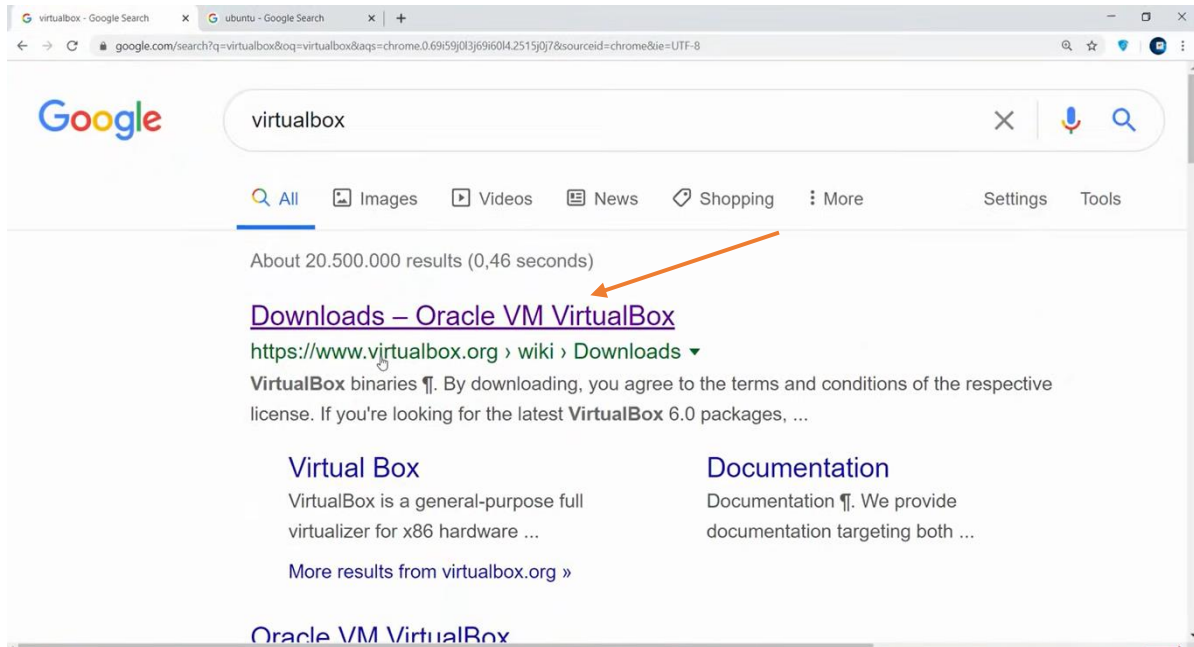


Fig. 29 (Search Virtual Box)

You will see this screen.

On side bar, Click on “Downloads”.

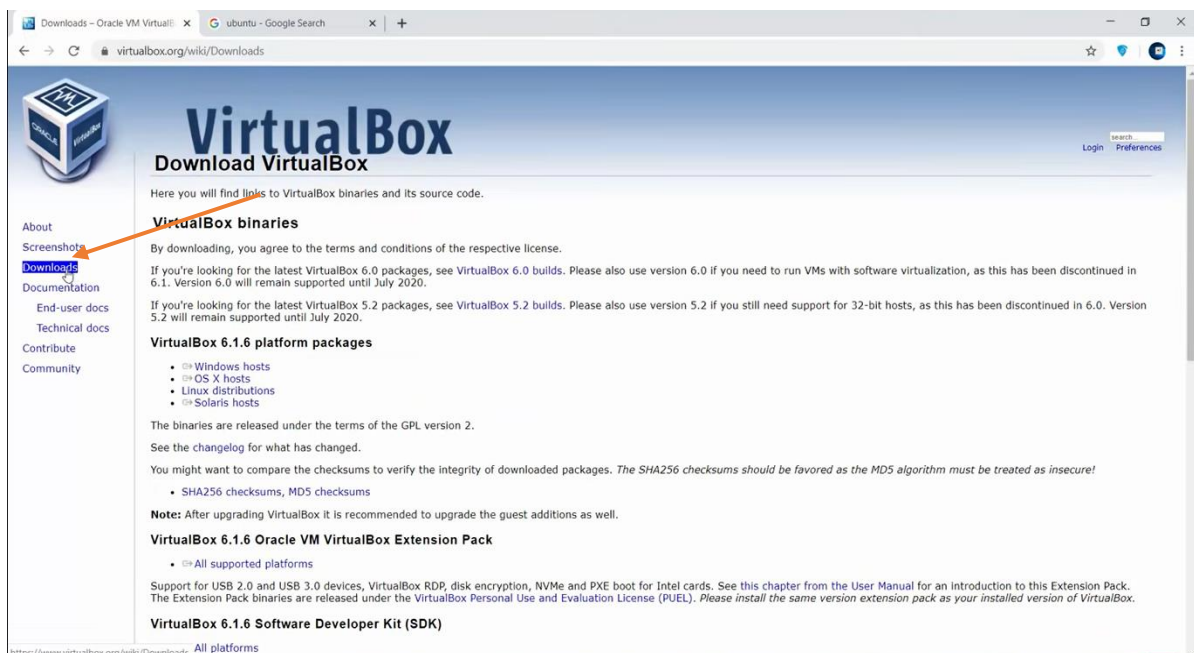


Fig. 30 (Click Downloads)

Select VirtualBox packages, if you’re using Microsoft ® Windows, then Click on “Windows hosts”.

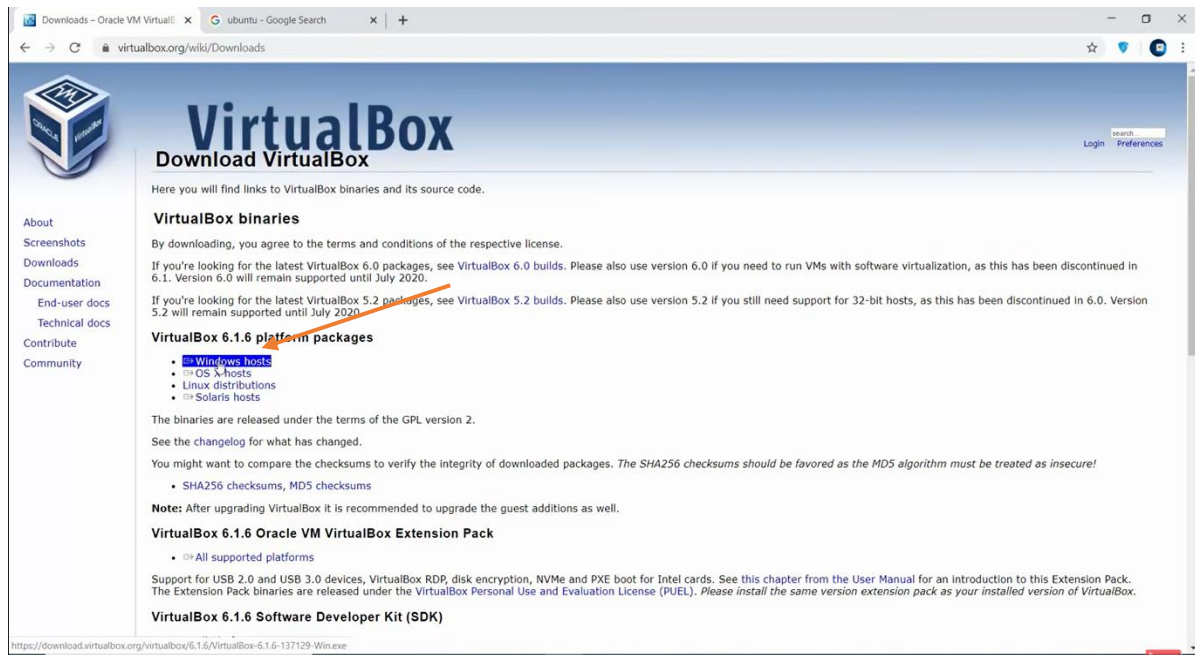


Fig. 31 (Virtual Box Packages)

After downloading, Double Click on file.

You will see a popup window.

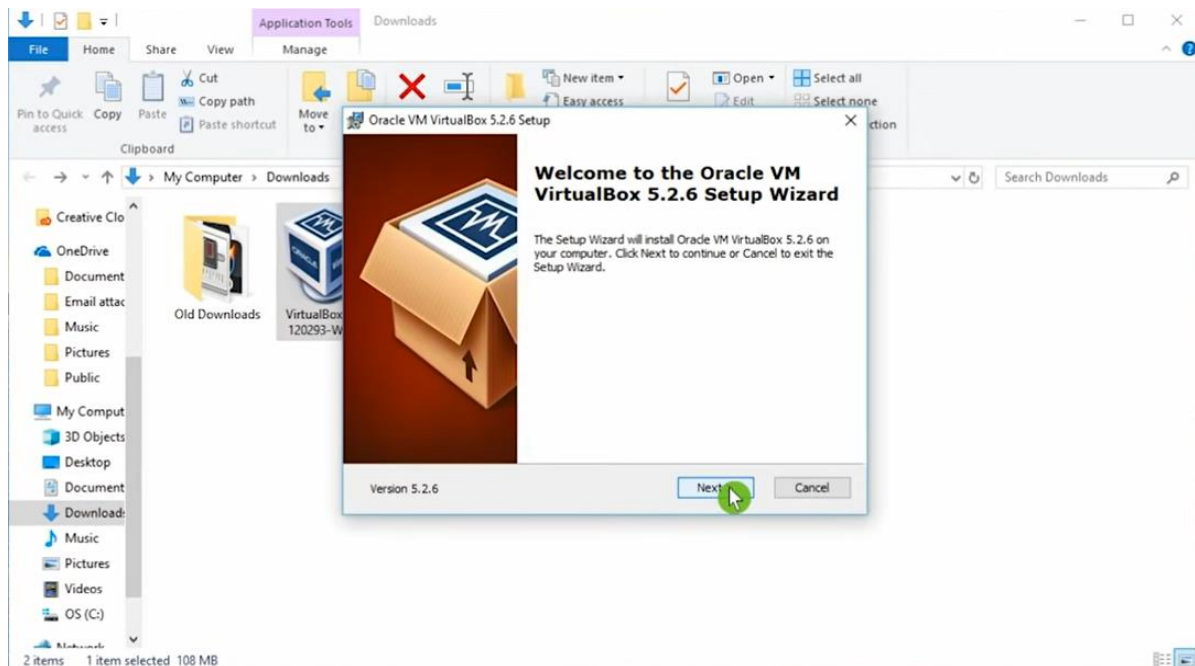


Fig. 32 (Welcome Screen)

Then you will see this Window, Click "Next".

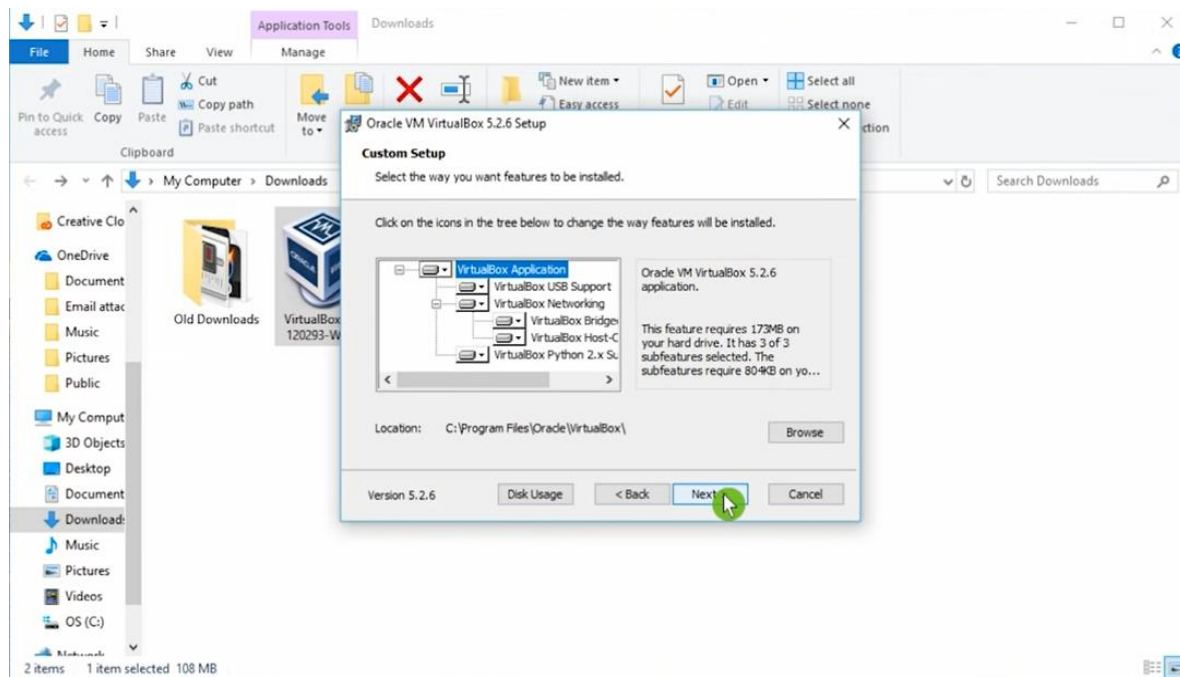


Fig. 33 (Custom Setup)

In this Window, select all check boxes and then Click “Next”.

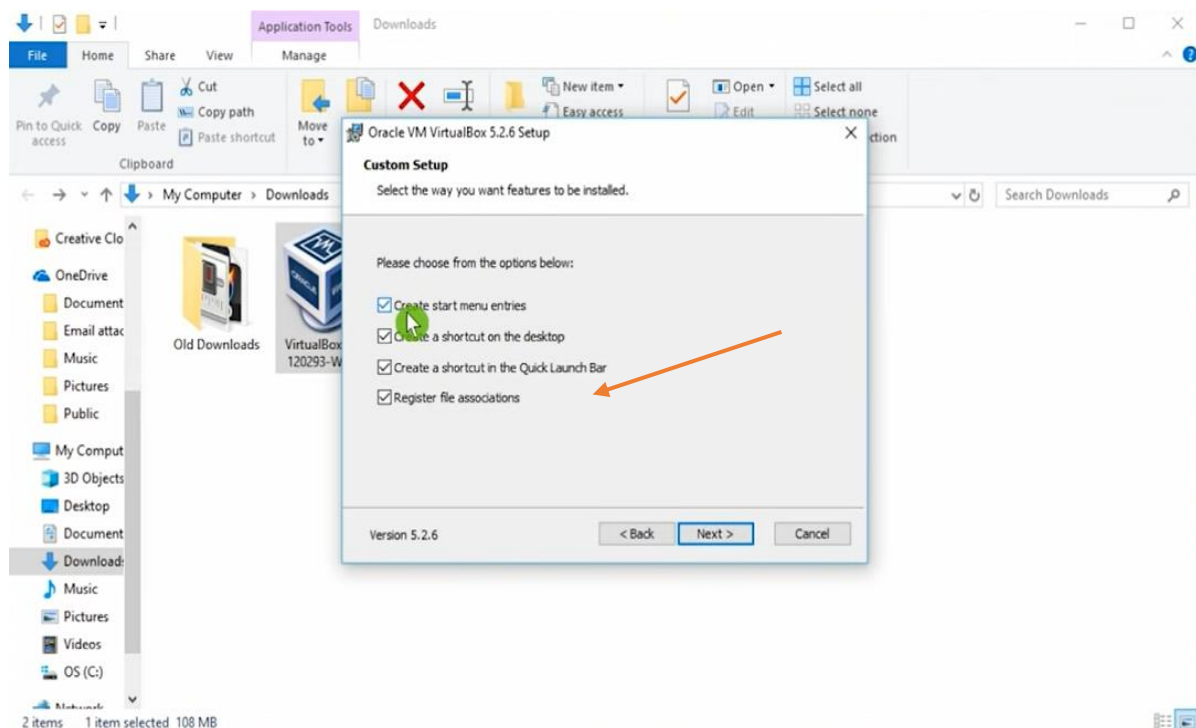


Fig. 34 (Select Features)

Warning: Network Interfaces

Click “Yes”.

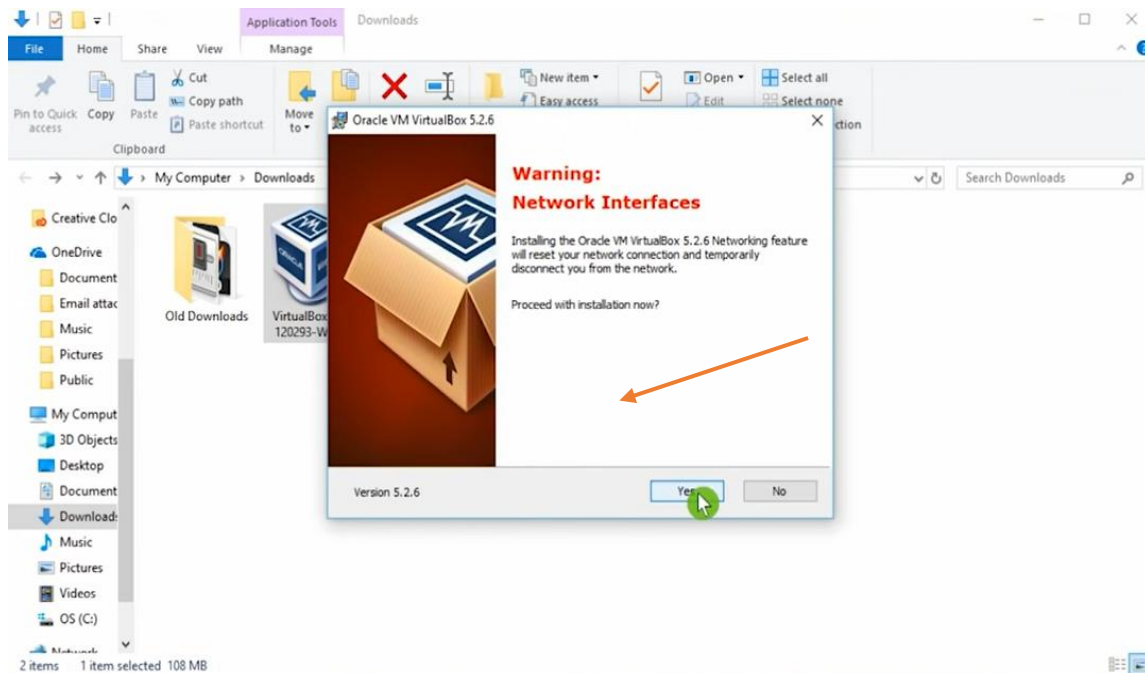


Fig. 35 (Network Interfaces)

Click **“Install”** button to start Installation.

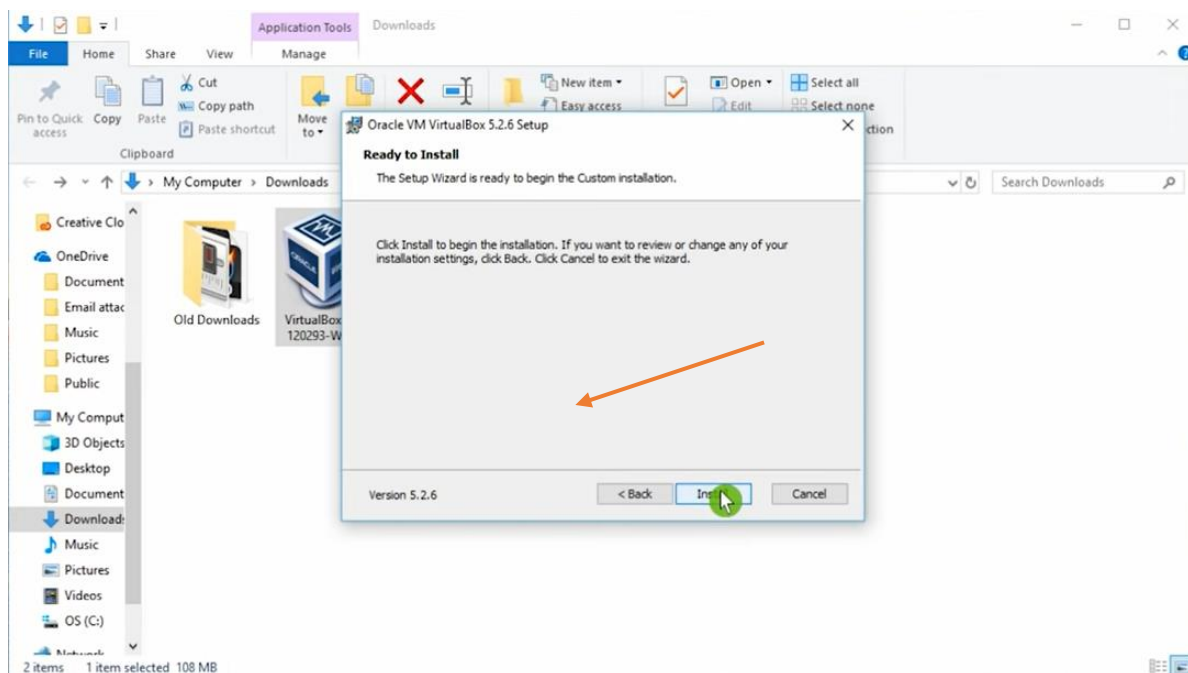


Fig. 36 (Ready to Install)

Click **“Finish”** to end with Installation.

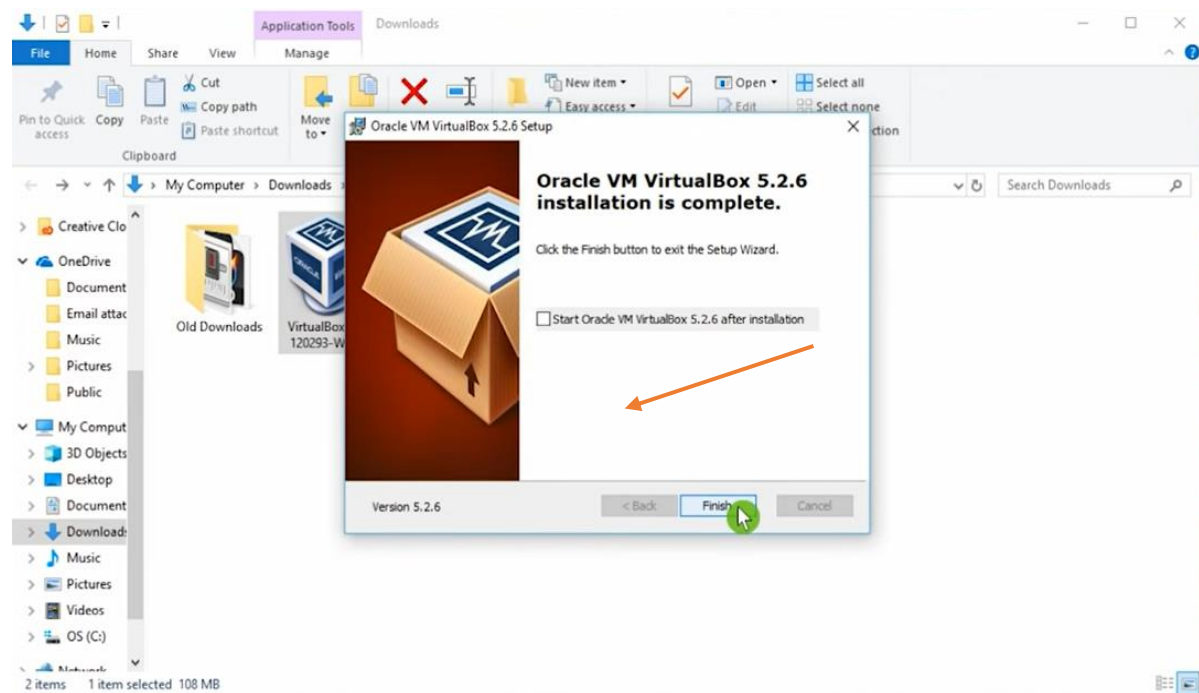


Fig. 37 (Finish Install)



## Task 02: Installation of Ubuntu variant of Linux Operating System

[Time 30mins / 10 marks]

Search “Ubuntu” on Google.

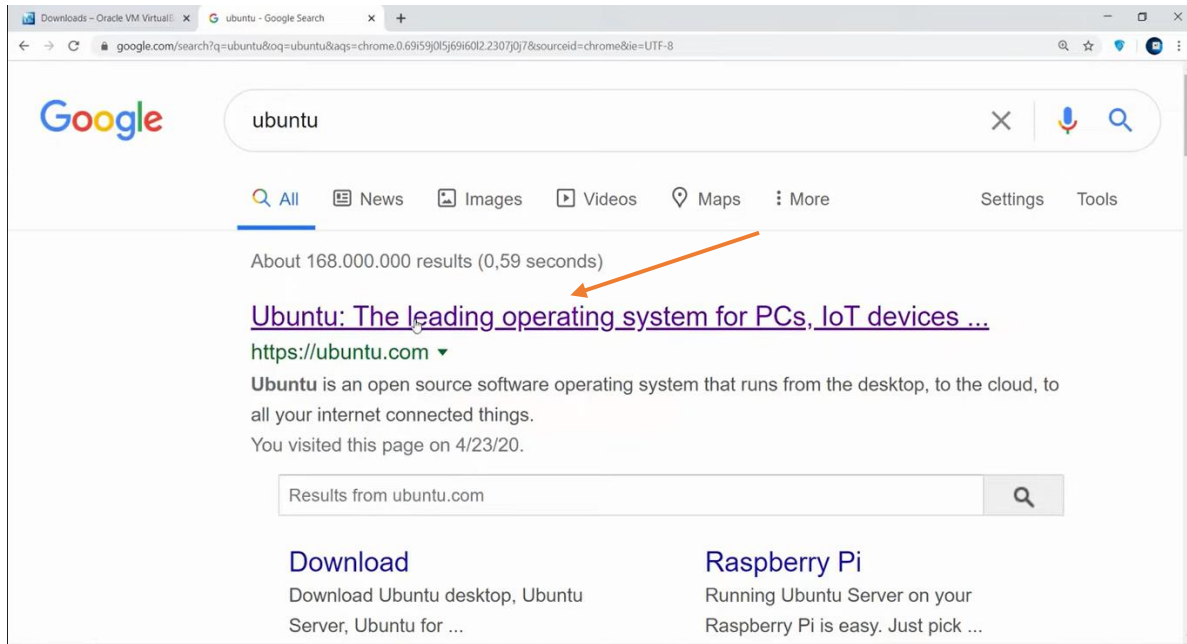


Fig. 38 (Search Ubuntu)

Open first website <https://ubuntu.com>.

You will see this interface.

Click on “Download” from top navigation bar.

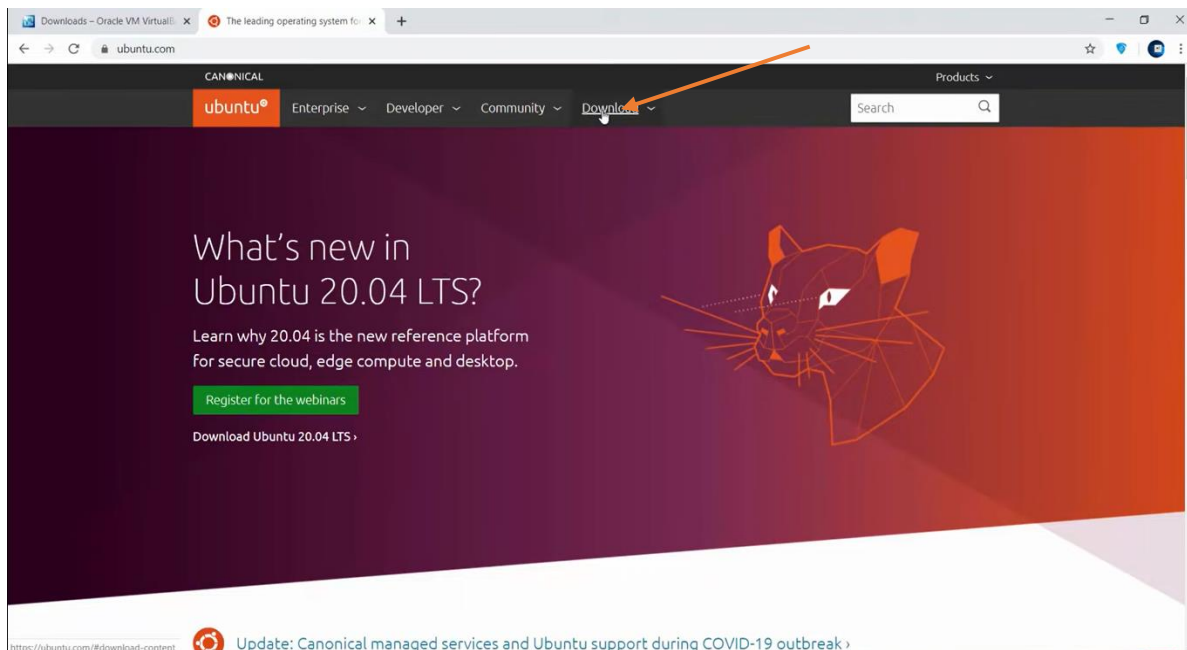


Fig. 39 (Go TO Downloads)

Click on “20.14 LTS”.

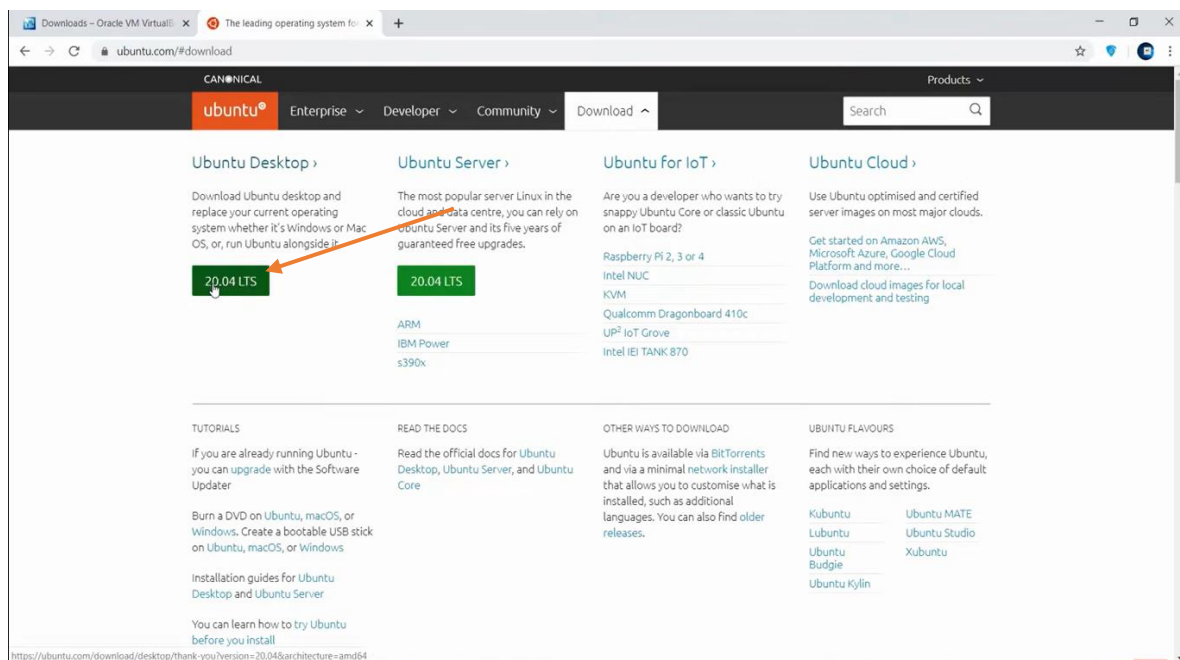


Fig. 40 (Start Downloading)

Then it will start downloading.

Setup Virtual Box:

Create a new Virtual Machine in Virtual Box.

Click on “New”.

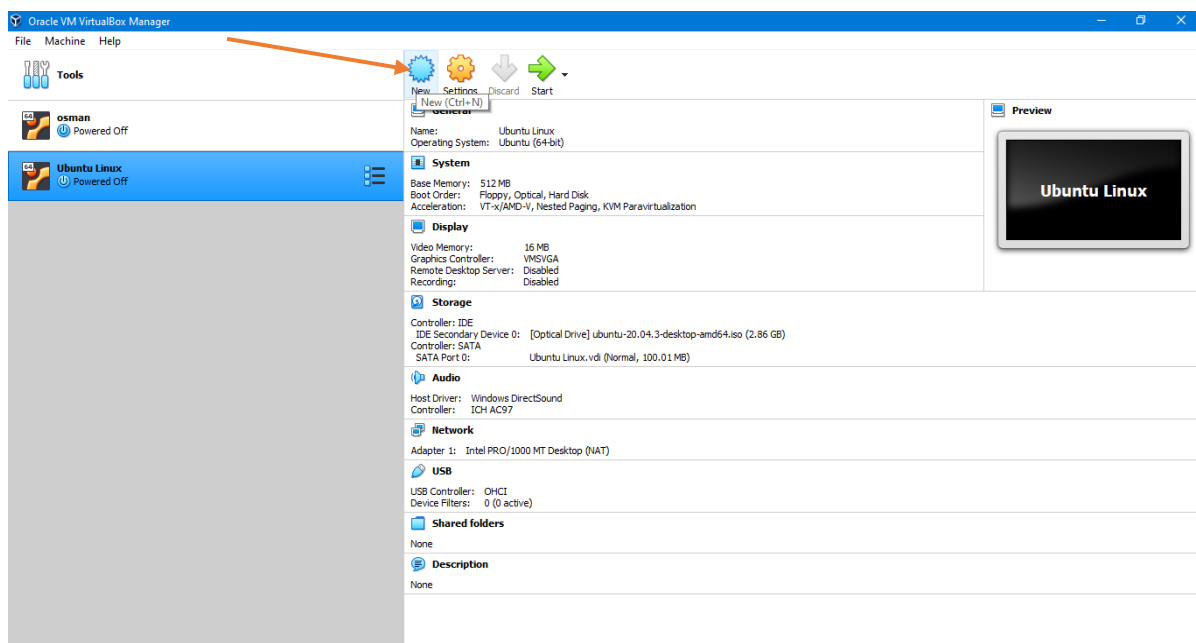


Fig. 41 (New Virtual Machine)

You see a Window with Title Create Virtual Machine.



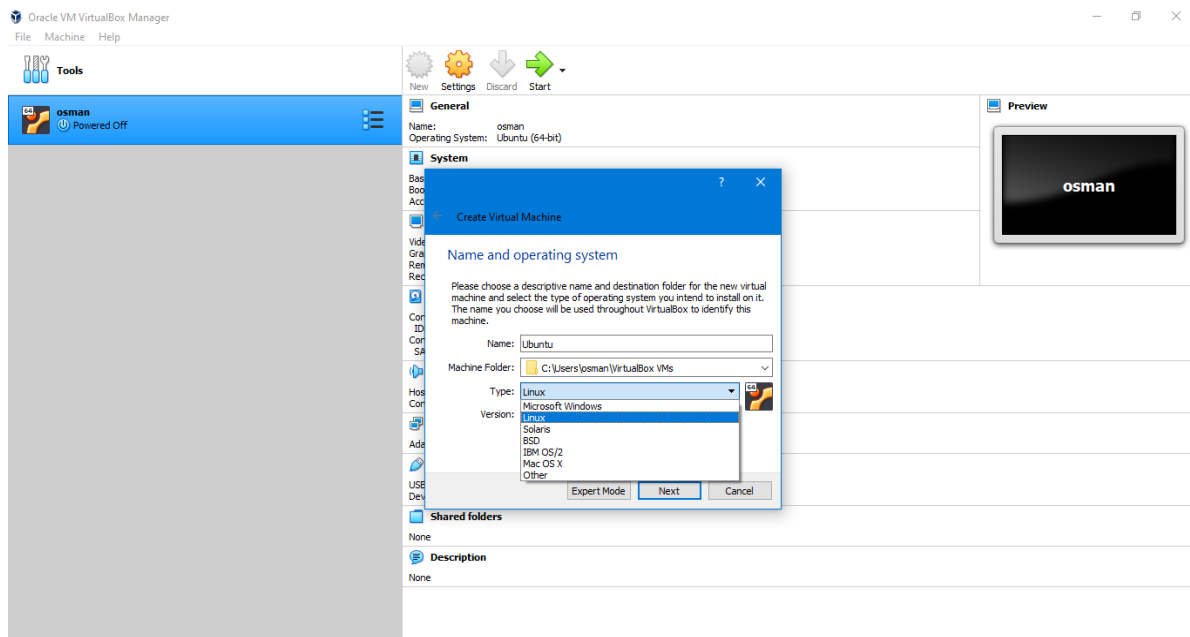


Fig. 42 (Create Virtual Machine)

Here, Linux Operating System is selected.

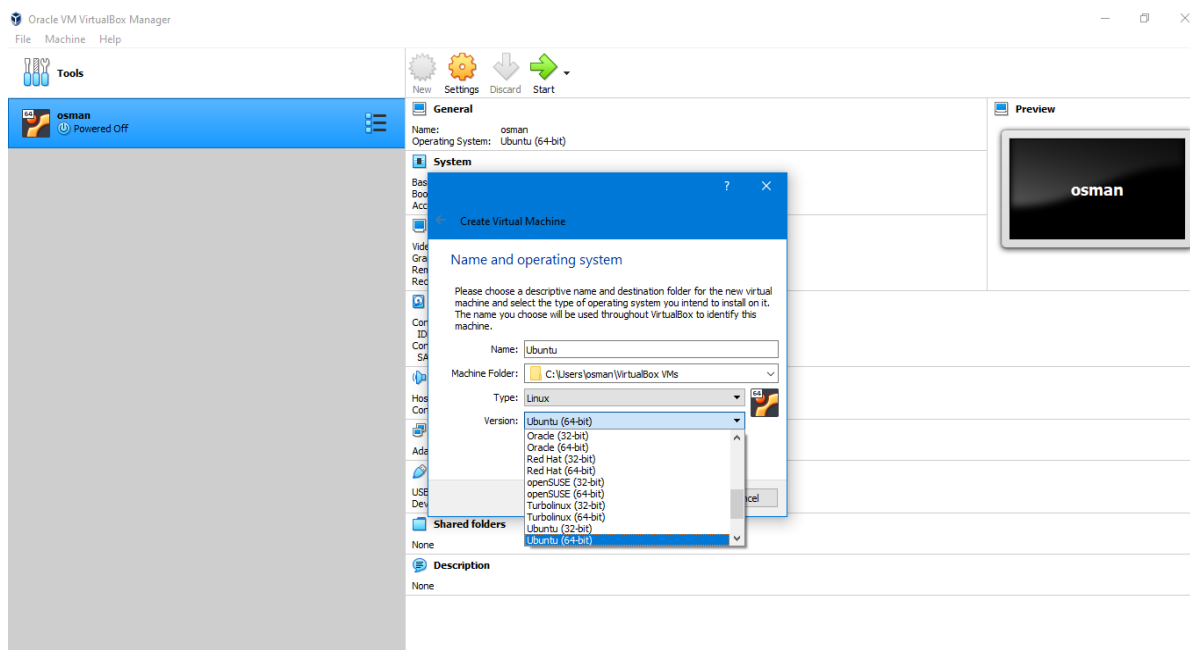


Fig. 43 (Create Virtual Machine)

Select Version.

You will select Ubuntu (64-bit).

Name your Virtual Machine.

Here, Virtual Machine is named as **“Ubuntu Linux”**

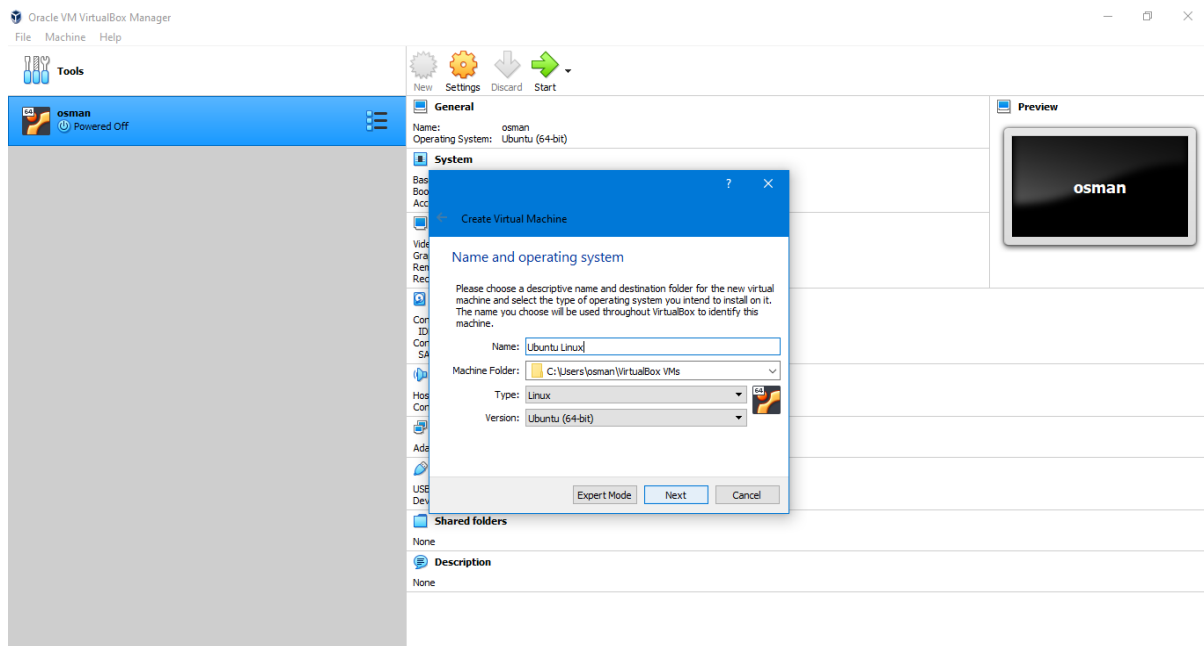


Fig. 44 (Name Virtual Machine)

Set size of Virtual Machine.

Here, size for Virtual Machine is 512MB.

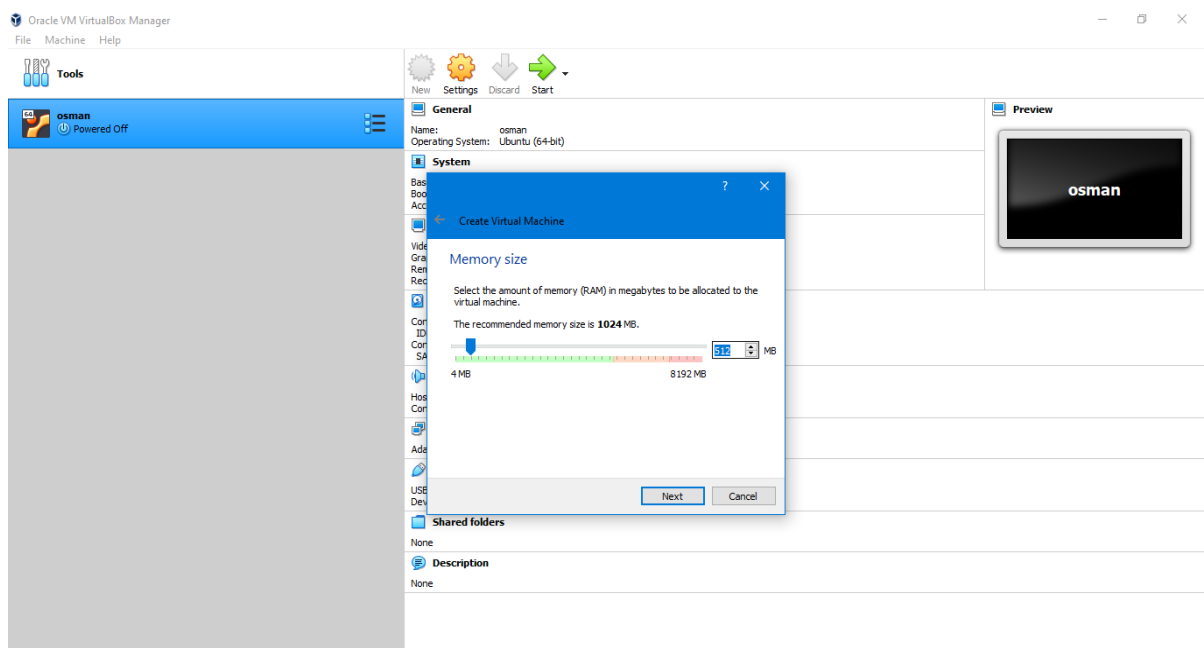


Fig. 45 (Memory Size)

Select **“Create a virtual hard disk now”**.

Click on **“Create”**.

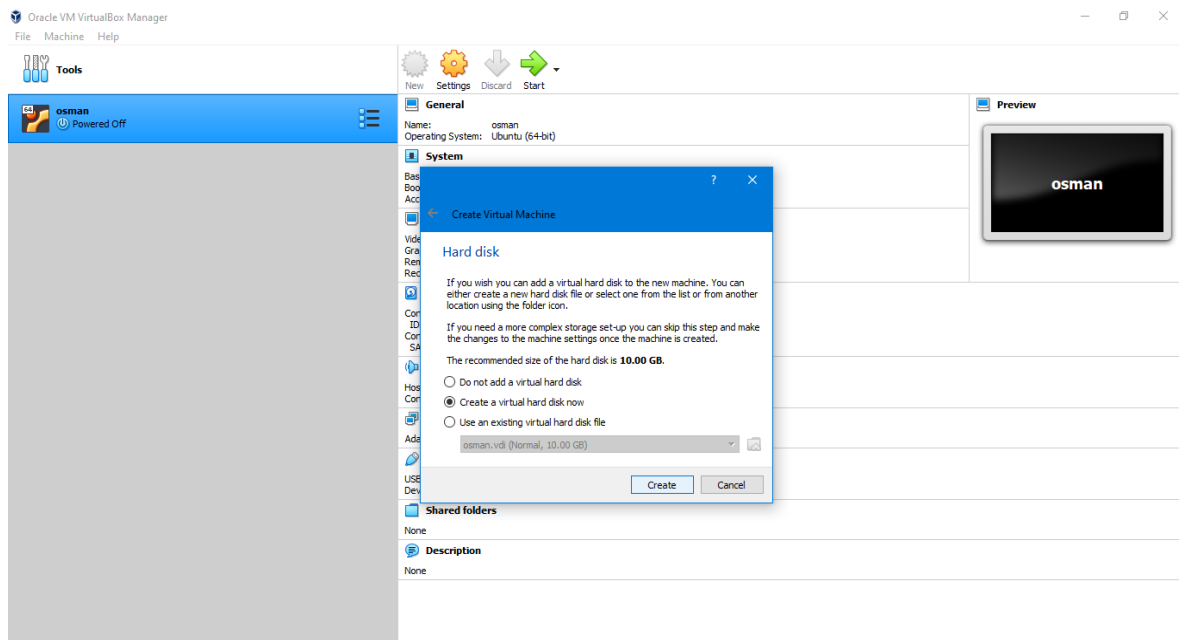


Fig. 46 (Hard Disk)

Hard Disk File Type:

You will select “VDI (VirtualBox Disk Image).”

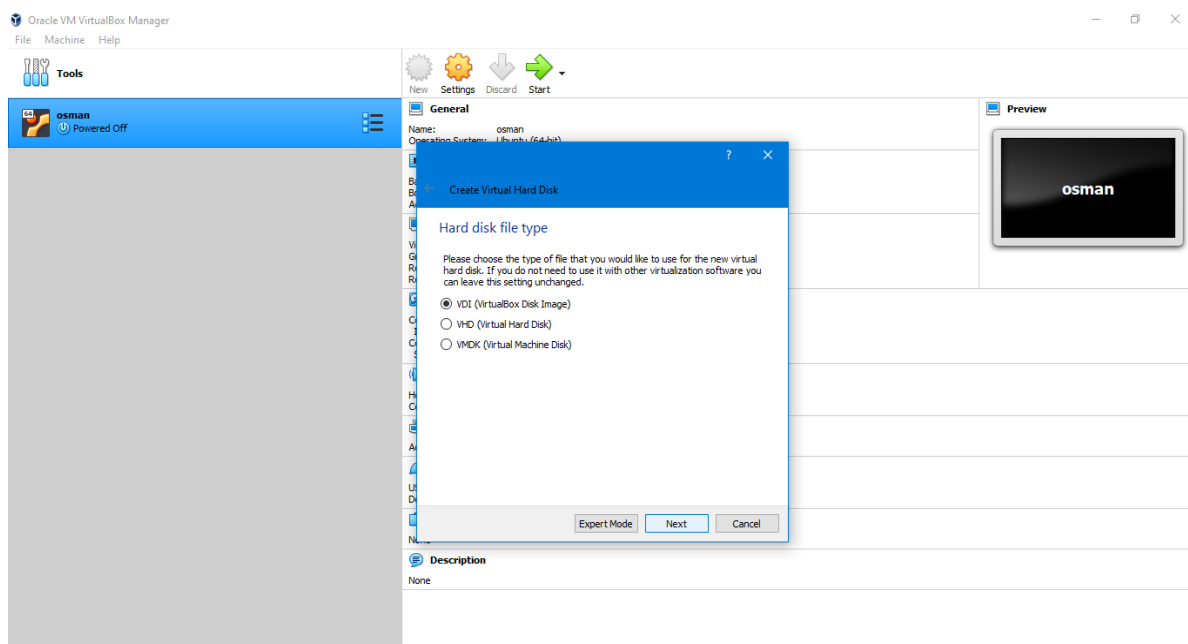


Fig. 47 (Hard Disk File Type)

Storage on Physical Hard Disk:

You will select “**Dynamically allocated**”.

Then Click on “**Next**”.

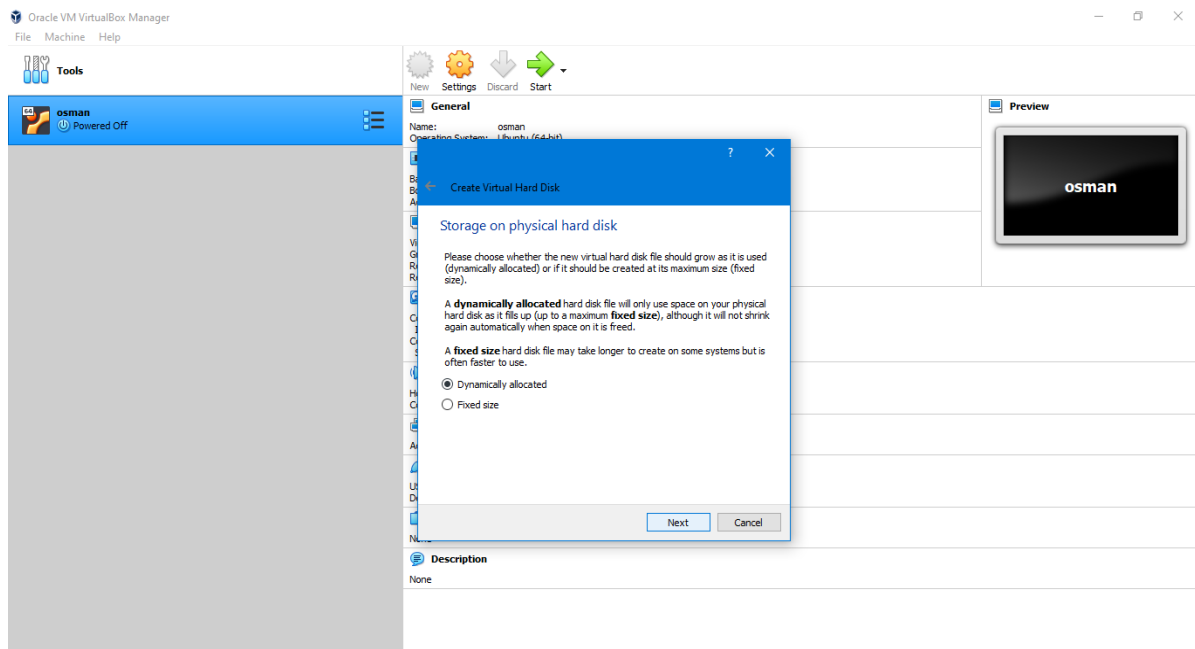


Fig. 48 (Dynamic Storage)

Then you will see final screen.

There will be new Virtual Machine named **“Ubuntu Linux”**.

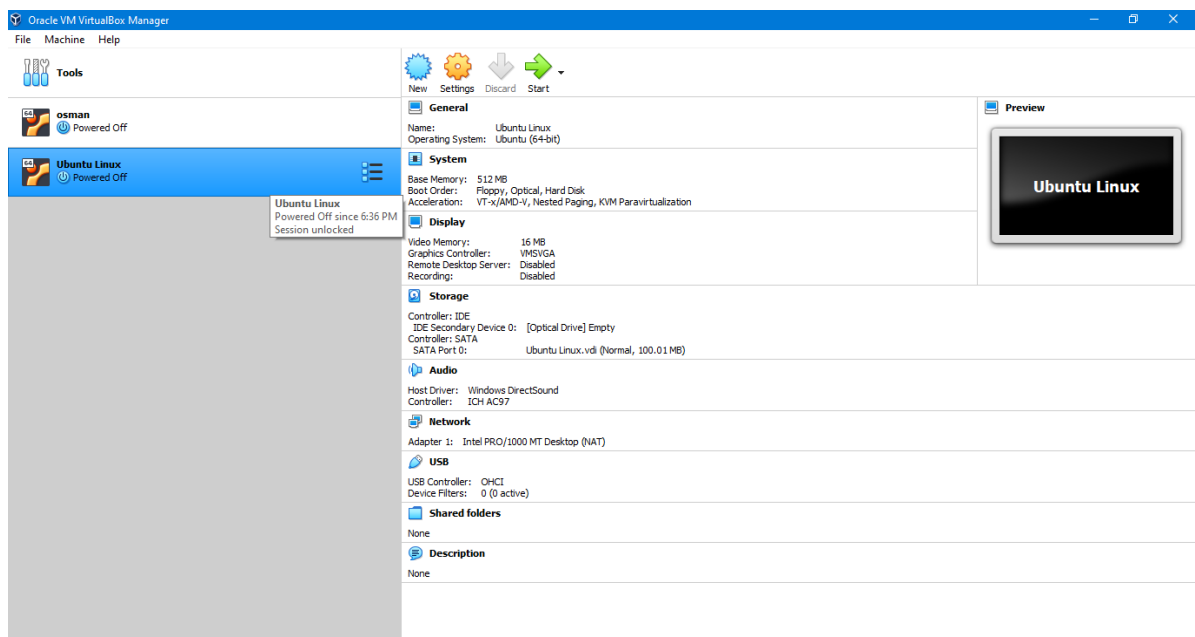


Fig. 49 (New Virtual Machine)

## Submissions:

- For Pre-Lab Activity:
  - Perform Pre-Lab as mentioned above.
  - Take screenshot of each step, (by name screenshot1.png screenshot2.png ...) and make a folder on Desktop by name "RollNo\_Pre-Lab\_02".
  - Save screenshots in folder "RollNo\_Pre-Lab\_02".
  - Then zip whole folder (RollNo\_Pre-Lab\_02.zip), and email to your respective TA.
- For In-Lab:
  - Perform mentioned tasks of In-Lab activity.
  - Make a folder on Desktop by name "RollNo\_In-Lab\_02".
  - Take screenshot of each and save in folder "RollNo\_In-Lab\_02".
- For Post-Lab:
  - Perform mentioned tasks of Post-Lab activity.
  - Make a folder on Desktop by name "RollNo\_Post-Lab\_02".
  - Take screenshot of each and save in folder "RollNo\_Post-Lab\_02".
  - Then zip whole folder (RollNo\_Post-Lab\_02.zip), and email to your respective TA.

## Evaluations Metric:

- All the Pre-Lab and Post-Lab tasks will be evaluated offline by TA's. In-Lab tasks would be evaluated in the Lab.
- Division of Pre-Lab marks: [30 marks]
  - Task 01 Using Command Prompt [20 marks]
  - Full Terminal Screenshots [05 marks]
  - Naming convention RollNo\_PreLab\_02 [05 marks]
- Division of In-Lab marks: [50 marks]
  - Task 01 Running Terminal Commands [25 marks]
  - Task 02 Making Hierarchy of Directories [15 marks]
  - Task 03 Batch Program [10 marks]
- Division of Post-Lab marks: [20 marks]
  - Task 01 Installation of VirtualBox [10 marks]
  - Task 02 Installation of Ubuntu Operating System in VirtualBox [10 marks]

## References and Additional Material:

- What is CLI  
[https://www.w3schools.com/whatis/whatis\\_cli.asp](https://www.w3schools.com/whatis/whatis_cli.asp)
- DOS Command Index  
<https://home.csulb.edu/~murdock/dosindex.html>
- List of DOS Commands  
[https://en.wikipedia.org/wiki/List\\_of\\_DOS\\_commands](https://en.wikipedia.org/wiki/List_of_DOS_commands)
- Batch Script Quick Guide  
[https://www.tutorialspoint.com/batch\\_script/batch\\_script\\_quick\\_guide.htm](https://www.tutorialspoint.com/batch_script/batch_script_quick_guide.htm)
- Windows Commands  
<https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/windows-commands>
- Download Virtual Box  
<https://www.virtualbox.org/wiki/Downloads>
- Download Ubuntu  
<https://ubuntu.com/download/desktop>

**Lab Time Activity Simulation Log:**

- Slot – 01 – 00:00 – 00:15: Settlement, Attendance and Lab Introduction
- Slot – 02 – 00:15 – 00:30: Demonstration of Pre-Lab Task (Command Prompt)
- Slot – 03 – 00:30 – 00:45: Demonstration of Pre-Lab Task (Command Prompt)
- Slot – 04 – 00:45 – 01:00: Demonstration of Pre-Lab Task (Command Prompt)
- Slot – 05 – 01:00 – 01:15: Demonstration of Pre-Lab Task (Command Prompt)
- Slot – 06 – 01:15 – 01:30: Tasks assignment and discussion about tasks
- Slot – 07 – 01:30 – 01:45: Activity time slot (Task 01: Running Terminal Commands)
- Slot – 08 – 01:45 – 02:00: Activity time slot (Task 01: Running Terminal Commands)
- Slot – 09 – 02:00 – 02:15: Activity time slot (Task 02: Making Directories and Files)
- Slot – 10 – 02:15 – 02:30: Activity time slot (Task 03: Writing Batch Program)
- Slot – 11 – 02:30 – 02:45: Elaboration of Post-Lab tasks
- Slot – 12 – 02:45 – 03:00: Elaboration of Post-Lab tasks