

List of Experiments

Sl. No.	Name of the Experiment	Date of Experiment	Remarks
1	Operating system (OS) and Administration		
2	Install and configure virtual machine – Virtual box		
3	File and Directory Commands		
4	Process creation and Management		
5	Process Synchronization		
6	Memory Management		
7	Shell Programming		
8	Automation of System Tasks		
9	Network Management		
10	User Authentication		
11	System/Log monitoring commands and System Information/Maintenance Commands		
12	Domain Name Service (DNS)		
13	Storage Management		

01 – Operating system (OS) and Administration

An **Operating system** (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs. In other words, an *Operating System* (OS) is software that acts as an interface between computer hardware components and the user.

1. Types of OS installation

Attended installation:

- An installation process usually **needs a user who attends** it to make choices, such as accepting or declining an end-user license agreement (EULA), specifying preferences such as the installation location, supplying passwords or assisting in product activation.
- In graphical environments, installers that offer a **wizard-based interface** are common.
- Attended installers may ask users to help mitigate the errors.
 - For example, if the disk in which the computer program is being installed was full, the installer may ask the user to specify another target path or clear enough space in the disk.

Silent installation:

- An installation that does not display messages or windows during its progress.
- "Silent installation" is NOT the same as "unattended installation". [All silent installations are unattended but not all unattended installations are silent.]
- In bigger organizations where thousands of users work, deploying the applications becomes a typical task and for that reason silent installation is performed so that the application is installed in background without affecting the work of user.

Unattended installation:

- An installation that is performed without user interaction during its progress or with no user present at all.
- One of the reasons to use this approach is to automate the installation of a large number of systems.

- An unattended installation either does not require the user to supply anything or has received all necessary input prior to the start of installation. Such input may be in the form of command line switches or an answer file, a file that contains all the necessary parameters.
 - For example, if the installation medium was faulty, the installer should fail the installation, as there is no user to fix the fault or replace the medium. Unattended installers may record errors in a computer log for later review.

Headless installation:

- Installation performed without using a computer monitor connected.
- In attended forms of headless installation, another machine connects to the target machine (for example, via a local area network) and takes over the display output.
- Since a headless installation does not need a user at the location of the target computer, unattended headless installers may be used to install a program on multiple machines at the same time.

Scheduled or Automated installation:

- An installation process that runs on a preset time or when a predefined condition meet the requirements, as opposed to an installation process that starts explicitly on a user's command.
 - For example, a system administrator willing to install a later version of a computer program that is being used can schedule that installation to occur when that program is not running.
- An operating system may automatically install a device driver for a device that the user connects.

Clean installation:

- A clean installation is one that is done in the absence of any interfering elements such as old versions of the computer program being installed or leftovers from a previous installation.
- The clean installation of an operating system is an installation in which the target disk partition is erased before installation.

- Since the interfering elements are absent, a clean installation may succeed where an unclean installation may fail or may take significantly longer.

Network installation:

Network installation (**netinstall**), is an installation of a program from a shared network resource that may be done by installing a minimal system before proceeding to download further packages over the network.

This may simply be a copy of the original media but software publishers which offer site licenses for institutional customers may provide a version intended for installation over a network.

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2. Boot methods

Bootting is the process of starting a computer as initiated via hardware such as a button or by a software command.

Types of Booting:

- **Warm Booting:** The Warm Booting is that in which system starts from the starting or from initial state means.
 - In the Warm Booting the system will be started from its beginning state means, first, the user will press the **Power Button**, then this will read all the instructions from the ROM and the Operating System will be automatically gets loaded into the System (RAM).
- **Cold Booting:** The Cold Booting is that in which System automatically starts when the system is in a running state.
 - For example, due to Light Fluctuation, the system will automatically **restarts**. In this, chances of damaging of system are more. The system will now be start from its initial state, so some files may be damaged because they are not properly stored into the system.

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3. File System and Formatting:

File System:

- A file system is a process of managing how and where data on a storage disk, which is also referred to as file management or FS.

- It is a logical disk component that compresses files separated into groups, which is known as directories.
- The file system enables user to view a file in the current directory as files are often managed in a hierarchy.
- It is abstract to a human user and related to a computer; hence, it manages a disk's internal operations.
- NTFS is the most common file system in modern times (Windows OS).
- Without file management, it would be impossible for a file with the same name to exist and also impossible to remove installed programs and recover specific files.

Examples of File Systems:

The examples of file systems are given below:

- **FAT:** FAT is a type of file system, which is developed for hard drives. It stands for **File Allocation Table**. On hard drives and other computer systems, it helps to manage files on Microsoft operating systems. In devices like digital cameras, flash memory, and other portable devices, it is also often found that is used to store file information. It also helps to extend the life of a hard drive as it minimizes the wear and tears on the hard disc. Now a days later versions of Microsoft Windows like Windows XP, Vista, 7, and 10 as use NTFS.
 - The **FAT8, FAT12, FAT32, FAT16** are all the different types of FAT (for file allocation table).
- **GFS:** A GFS is a file system, which stands for Global File System. It has the ability to make enable multiple computers to act as an integrated machine. When the physical distance of two or more computers is high, and they are unable to send files directly with each other, a GFS file system makes them capable of sharing a group of files directly. A computer can organize its I/O to preserve file systems with the help of a global file system.
- **HFS:** HFS (Hierarchical file system) is the file system that is used on a Macintosh computer for creating a directory at the time a hard disk is formatted. Generally, its basic function is to organize or hold the files on a Macintosh hard disk. Apple is not capable of supporting to write to or format HFS disks since when OS X came on the market. Also, HFS-formatted drives are not recognized by Windows computers as HFS is a Macintosh

format. With the help of WIN32 or NTFS file systems, Windows hard drives are formatted.

- **NTFS:** NTFS is the file system, which stands for NT file system and stores and retrieves files on Windows NT operating system and other versions of Windows like Windows 2000, Windows XP, Windows 7, and Windows 10. Sometimes, it is known as the **New Technology File System**. As compared to the FAT and HFS file system, it provides better methods of file recovery and data protection and offers a number of improvements in terms of extendibility, security, and performance.
- **UDF:** A UDF is a file system, stands for **Universal Disk Format** and used first developed by OSTA (Optical Storage Technology Association) for ensuring consistency among data written to several optical media. It is used with CD-ROMs and DVD-ROMs and is supported on all operating systems. Now, it is used in the process of CD-R's and CD-RW's, called packet writing.

Formatting:

Formatting is a process of preparing the storage device to store the data. Formatting storage device will erase the earlier contents of the device.

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4. Post installation tasks:

Post Installation task is the set of steps to be carried out to ensure that the installation is complete and went smoothly.

Post Installation Tasks for Ubuntu Operating System:

- **Online accounts**

The first step allows user to configure online accounts, in case user want to integrate the desktop with different services.

- **Livepatch**

Livepatch is a service that allows the installation of some updates that would generally require a system reboot, such as those of the kernel.

- **Help improve Ubuntu**

In this step user can choose whether or not to send data from his system to Ubuntu. The option is activated by default. The user can verify the secrecy of the data being sent beforehand. The results are used to improve Ubuntu.

- **Privacy**

If required, a user can enable location services so that apps can determine user geographic location. All the applications installed by default on Ubuntu are free software.

- **You are ready to start!**

The last screen shows some featured applications -some of which are not free software with the option to open the software center to install them.

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Work on Practice Session

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02 – Install and configure virtual machine – Virtual box

Virtual Box:

VirtualBox is a cross-platform virtualization application. It installs on existing operating systems and also it extends the capabilities of the existing computer so that it can run multiple operating systems (it means, inside multiple virtual machines) at the same time.

- **Host operating system (host OS):** the operating system of the physical computer on which VirtualBox was installed.
- **Guest operating system (guest OS):** the operating system that is running inside the virtual machine.
- **Virtual machine (VM).** When running, a VM is the special environment that VirtualBox creates for guest operating system.

VirtualBox's main features:

<ul style="list-style-type: none">• Portability• No hardware virtualization required• Guest Additions: shared folders, seamless windows, 3D virtualization• Multigeneration branched snapshots.• Clean architecture; unprecedented modularity.	<ul style="list-style-type: none">• Great hardware support<ul style="list-style-type: none">○ Guest multiprocessing (SMP)○ USB 2.0 device support○ Hardware compatibility○ Full ACPI support (Advanced Configuration and Power Interface)○ Multiscreen resolutions○ Built-in iSCSI support• Remote machine display
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Host operating systems:

- **Windows hosts** (Windows XP, Windows 7, Windows Server 2003, 2008, Vista etc)
- **Mac OS X hosts** (Leopard 32-bit, Snow Leopard 32/64 - bit)
- **Linux hosts** (Ubuntu, Debian, Fedora, Mandriva etc)

Installing Virtual Box on Hosts:

- Open Terminal
- Be sure about Internet Connection is there
- Type the command **sudo apt-get install virtualbox**
- Type **virtualbox** in terminal or select virtual box from installed programs list.

Installing Virtual Box from OFFLINE software:

- get the Virtual Machine image for linux distribution from Oracle Website
- Example: for Ubuntu 18.3 – Get the Image for Ubuntu 16.04
- https://download.virtualbox.org/virtualbox/6.1.32/virtualbox-6.1_6.1.32-149290~Ubuntu~xenial_amd64.deb
 - (Choose appropriate image from repository according to current Host Linux OS distribution)
- Go to the Downloads → Select the Downloaded Virtual Box Software → Open → Check for the Compatibility (if not compatible, download the suitable image from oracle website) → Install the Virtual Machine Software.

Creating Virtual Machine:

- Open the Virtualbox and click on New to create a **new** VM, give name of user choice, select Linux & version as 32 bit or 64 bit depending upon user system architecture
- Give RAM Memory to the VM. **Generally 1024 Mbytes**
- Select the hard disk space, **Go for 20.00 GB.**
- Create **New Hard Drive** or Select one from the list or from another location. **Go for Create a Virtual hard drive now.**
- Select the type of the file from the new virtual hard drive. **Go for VDI (Virtual Box Disk Image)**
- Choose whether the new virtual disk file should be allocated as it is used (Dynamic) or if it should be created fully allocated at its maximum size (Fixed Size). **Go for Dynamically Allocated.**
- **Summary:** Will display the Virtual disk parameters. If these settings are correct, press the **Create** button and it will create a new virtual disk file.

Installing Guest Operating System:

- ✓ Make sure the location of Guest OS iso in host OS.
- ✓ Select the Virtual disk in Virtual Box Manager (VBM), then select **Settings**.
- ✓ Select **Storage** Tab, Select **Controller IDE**, then select **Empty**. Then click on CD symbol at **Attributes** frame, and then select the Guest OS iso File (*Choose Virtual Optical Disk File*).

- ✓ Click the Start Button on VBM toolbar.
- ✓ This wizard will help us to perform the steps necessary for installing an Operating System onto this virtual machine. Follow the steps for installing the Guest OS.

Experiments to be conducted (If Required...):

- **Demonstrate use of Snap Shots in Guest OS**
 - The changes made in the guest can be stored in the form of snapshots. And it can be restored (Rolled back) whenever, previous changes are required.
 - To take the snapshot, the VM that the user is working with must NOT be running.
 - User can restore a snapshot if the VM is either in a saved state or powered off.
 - To restore a state, do the following.
 1. Select the VM to work with from the left pane in the main window.
 2. Click the Snapshots button in the upper right corner.
 3. Right-click the snapshot that the user wants to restore.
 4. Click Restore Snapshot (**Figure C**).
 5. In the resulting window, uncheck the box for Create A Snapshot Of The Current Machine State.
 6. Click Restore.
 7. Allow the restore to complete.
- **Share folders between Guest and Host using Guest Additions Image...**
 1. **Settings in Host Virtual Box Manager (VBM):**
 1. Select Guest OS in Host VBM → Select “**Shared Folders**” in Settings → Select “**Add Share +**”
 2. Select the folder to be shared in Host OS in “**Folder Path**”
 3. Selected Folder will appear in “**Folder Name**”, if required check “ **Read Only**”, “**Auto-Mount**”, “**Make Permanent**”. Click **Ok**
 2. **Settings in Guest Virtual Box Manager:**
 1. Select Guest OS → Select “**Devices**” in Menu Bar → Select “**Insert Guest Additions CD Image ...**”. Continue with running the Installation.
 2. Add this Guest user to Virtualbox by executing the Command (only in case of Linux Guest operating system, This step is NOT needed in case of Windows Guest Operating System)
sudo usermod -a -G vboxsf (user login Name)

3. Restart the Guest OS.
 4. Check the Shared Host Folder appear in Guest OS
- **Communicate between Guest and Host using ping command.**

Virtual Box Settings in Host Virtual Box Manager:

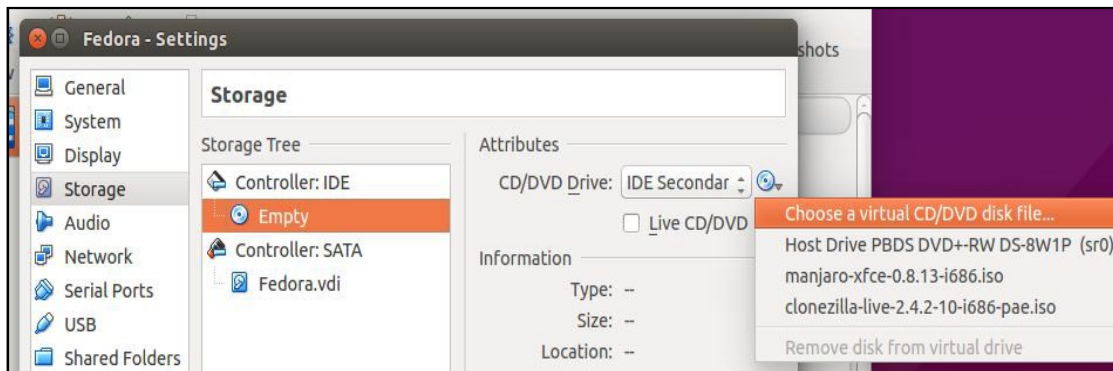
1. In Virtual Box Manager, Select “**File**”, → “**Preferences**” → Network → Host only Networks (Tab).
2. Select icon for adding “**New Host only Networks**” (See vboxnet0 gets added”
3. Change the properties of vboxnet0
4. Change the IP Address to valid Class-C Address (Say 192.100.100.5).

Guest VBM Settings in Virtual Box:

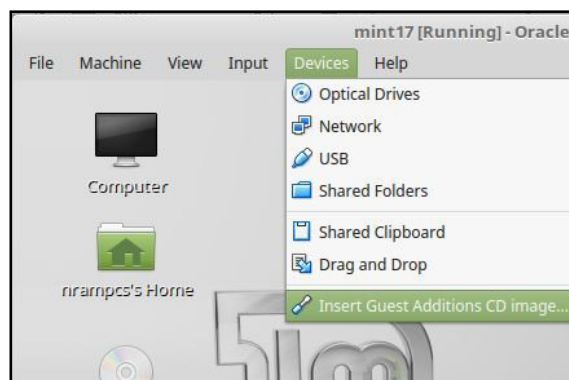
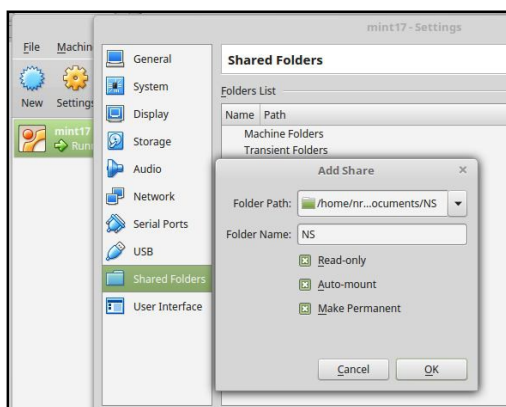
- Select Guest OS in Virtual Box. Select settings for Network.
- Change the settings for Network. - Select “**Adapter 1**” Tab – Change “**Attached to**” to “**Host-only-Adapter**”
- Select the “**Advanced**” Frame and Select “**Allow All**” in “**Promiscuous Mode**”. Click “**Ok**”
- Go to Guest OS. And assign one valid IP Address to the Guest OS (Say 192.100.100.6)
- Use Ping command to check the Communication between 192.100.100.5 and 192.100.100.6.

Screen Shots (working Virtual Box in Linux Operating System – Host is Linux):





Snap Shot:





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Download and Install a Terminal Emulator:

- A Terminal emulator is a computer program that reproduces a video terminal within some other display structure (i.e., remote machine desktop will be appeared in local machine as a terminal).
 - In other words, the Terminal emulator has the ability to make a dumb machine appear like a client computer networked to the server.
- The terminal emulator allows an end-user to access the console as well as its applications such as text user interface and command-line interface.
- **Examples for Terminal Emulator:** Terminator, ROXTerm, Eterm, Tilix, LXTerminal, Konsole, Kitty, st, Gnome-Terminal, Terminology, Deepin Terminal, xterm, LilyTerm, Extraterm, mate-terminal, DomTerm, TermKit

Example 1: xterm

- The **xterm** terminal application is a standard terminal emulator for the X Window System
- Installation:

```
sudo apt-get update
```

```
sudo apt-get install xterm
```

Example 2: mate-terminal

- MATE Terminal is a terminal emulation application to access a UNIX shell in the MATE environment. With it, one can run any application that is designed to run on VT102, VT220, and xterm terminals.
- MATE Terminal also has the ability to use multiple terminals in a single window (tabs) and supports management of different configurations (profiles).
- MATE Terminal is a fork of GNOME-Terminal.
- Installation:

```
sudo apt-get update -y
```

```
sudo apt-get install -y mate-terminal
```

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Significance of man Command

- **man** command in Linux is used to display the **user manual** of any command that run on the terminal.
- It provides a detailed view of the command which includes NAME, SYNOPSIS, DESCRIPTION, OPTIONS, EXIT STATUS, RETURN VALUES, ERRORS, FILES, VERSIONS, EXAMPLES, AUTHORS and SEE ALSO.
- **Every manual is divided into the following sections:**
 - Executable programs or shell commands
 - System calls (functions provided by the kernel)
 - Library calls (functions within program libraries)
 - Games
 - Special files (usually found in /dev)
 - File formats and conventions eg /etc/passwd
 - Miscellaneous (including macro packages and conventions),
 - System administration commands
- **Syntax**
 - `man [SECTION-NUM] [COMMAND NAME]`

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