

DAY 12

DATE:12/05/2025

NAME: ANNIE JOHN

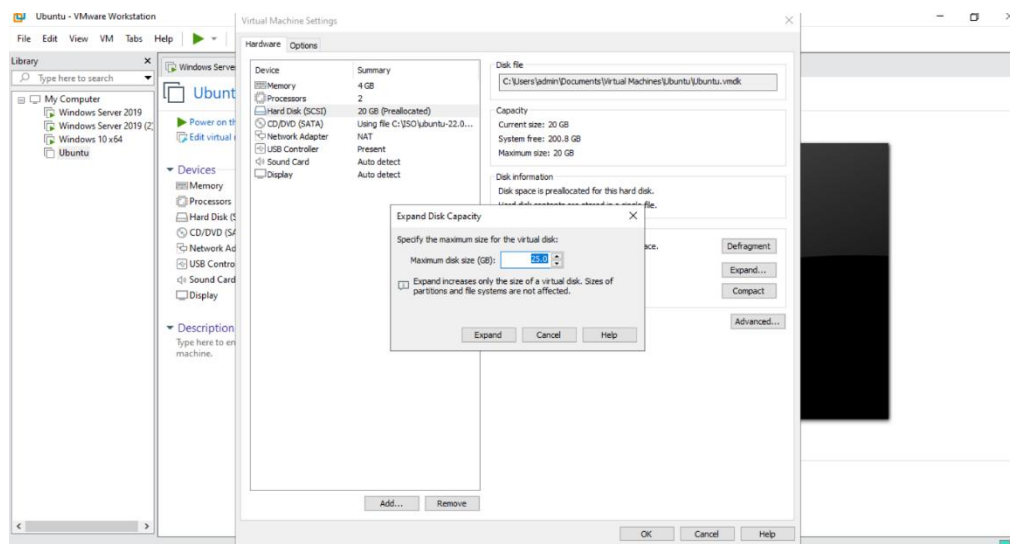
USER ID:27739

Batch: 25VID0885_DC_Batch4

TITLE: DISK MANAGEMENT - EXPANDING AND CREATING NEW VOLUME IN LINUX, INSTALLATION OF APACHE, LVM AND CONFIGURATION

➤ **Extend Volume**

1. **Step1:** Edit virtual machine settings->Hard disk->choose expand->expand the volume as required.



2. **Step 2:** To check volume

- Command – lsblk

```

root@Annie:/home/annie# lsblk
NAME        MAJ:MIN RM   SIZE RO TYPE MOUNTPOINTS
loop0        7:0      0     4K  1 loop /snap/bare/5
loop1        7:1      0   74.3M  1 loop /snap/core22/1612
loop2        7:2      0   73.9M  1 loop /snap/core22/1963
loop3        7:3      0  271.2M  1 loop /snap/firefox/4848
loop4        7:4      0  241.5M  1 loop /snap/firefox/6103
loop5        7:5      0  505.1M  1 loop /snap/gnome-42-2204/176
loop6        7:6      0   516M  1 loop /snap/gnome-42-2204/202
loop7        7:7      0   91.7M  1 loop /snap/gtk-common-themes/1535
loop8        7:8      0   12.9M  1 loop /snap/snap-store/1113
loop9        7:9      0   12.2M  1 loop /snap/snap-store/1216
loop10       7:10     0   38.8M  1 loop /snap/snapd/21759
loop11       7:11     0   50.9M  1 loop /snap/snapd/24505
loop12       7:12     0    500K  1 loop /snap/snapd-desktop-integration/178
loop13       7:13     0    568K  1 loop /snap/snapd-desktop-integration/253
sda          8:0      0   25G   0 disk
├─sda1       8:1      0     1M   0 part
├─sda2       8:2      0   513M   0 part /boot/efi
└─sda3       8:3      0  19.5G   0 part /
sdb          8:16     0     5G   0 disk
sr0         11:0     1   4.4G   0 rom  /media/annie/Ubuntu 22.04.5 LTS amd64
root@Annie:/home/annie#

```

3. **Step 3:** Use command `df -Th`. The command `df -Th` is used in Linux to display disk space usage along with the filesystem type in a human-readable format. Here we can see the size is not extended.

```

root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs           tmpfs     387M  1.7M  386M   1% /run
/dev/sda3       ext4      20G   13G   6.0G  67% /
tmpfs           tmpfs     1.9G     0   1.9G   0% /dev/shm
tmpfs           tmpfs     5.0M  4.0K   5.0M   1% /run/lock
/dev/sda2       vfat      512M   6.1M  506M   2% /boot/efi
tmpfs           tmpfs     387M  104K  387M   1% /run/user/1000
/dev/sr0        iso9660   4.5G   4.5G     0 100% /media/annie/Ubuntu 22.04.5 LTS am
d64

```

4. **Step 4:** Command `growpart` is used
 It resizes a partition, not the filesystem inside it.
 Useful when you've increased the size of a disk (e.g., from 20GB to 25GB) and want the existing partition (like `/dev/sda3`) to take up the new space->use command `resize2fs /dev/sda3`.

```
root@Annie: /home/annie
root@Annie:/home/annie# growpart /dev/sda/
Command 'growpart' not found, but can be installed with:
apt install cloud-guest-utils
root@Annie:/home/annie# apt install cloud-guest-utils
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  cloud-guest-utils
0 upgraded, 1 newly installed, 0 to remove and 71 not upgraded.
Need to get 18.5 kB of archives.
After this operation, 66.6 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 cloud-guest-utils all
  0.32-22-g45fe84a5-0ubuntu1 [18.5 kB]
Fetched 18.5 kB in 1s (19.1 kB/s)
Selecting previously unselected package cloud-guest-utils.
(Reading database ... 202641 files and directories currently installed.)
Preparing to unpack .../cloud-guest-utils_0.32-22-g45fe84a5-0ubuntu1_all.deb ...
Unpacking cloud-guest-utils (0.32-22-g45fe84a5-0ubuntu1) ...
Setting up cloud-guest-utils (0.32-22-g45fe84a5-0ubuntu1) ...
Processing triggers for man-db (2.10.2-1) ...
```

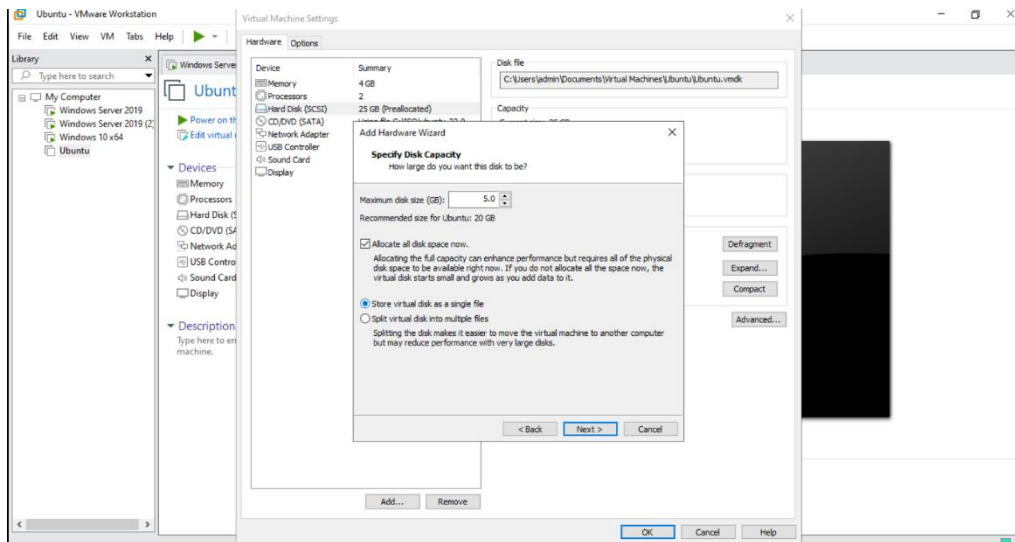
```
root@Annie: /home/annie
loop0 7:0 0 4K 1 loop /snap/bare/5
loop1 7:1 0 74.3M 1 loop /snap/core22/1612
loop2 7:2 0 73.9M 1 loop /snap/core22/1963
loop3 7:3 0 271.2M 1 loop /snap/firefox/4848
loop4 7:4 0 241.5M 1 loop /snap/firefox/6103
loop5 7:5 0 505.1M 1 loop /snap/gnome-42-2204/176
loop6 7:6 0 516M 1 loop /snap/gnome-42-2204/202
loop7 7:7 0 91.7M 1 loop /snap/gtk-common-themes/1535
loop8 7:8 0 12.9M 1 loop /snap/snap-store/1113
loop9 7:9 0 12.2M 1 loop /snap/snap-store/1216
loop10 7:10 0 38.8M 1 loop /snap/snapd/21759
loop11 7:11 0 50.9M 1 loop /snap/snapd/24505
loop12 7:12 0 500K 1 loop /snap/snapd-desktop-integration/178
loop13 7:13 0 568K 1 loop /snap/snapd-desktop-integration/253
sda 8:0 0 25G 0 disk
├─sda1 8:1 0 1M 0 part
├─sda2 8:2 0 513M 0 part /boot/efi
└─sda3 8:3 0 19.5G 0 part /
sdb 8:16 0 5G 0 disk
sr0 11:0 1 4.4G 0 rom /media/annie/Ubuntu 22.04.5 LTS amd64
root@Annie:/home/annie# growpart /dev/sda 3
CHANGED: partition=3 start=1054720 old: size=40886272 end=41940992 new: size=513
74047 end=52428767
root@Annie:/home/annie#
```

5. Step 5: Use command df -Th

```
root@Annie: /home/annie
root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs           tmpfs     387M  1.7M  386M   1% /run
/dev/sda3       ext4      24G   13G   11G  54% /
tmpfs           tmpfs     1.9G    0  1.9G   0% /dev/shm
tmpfs           tmpfs     5.0M  4.0K  5.0M   1% /run/lock
/dev/sda2       vfat      512M   6.1M  506M   2% /boot/efi
tmpfs           tmpfs     387M 100K  387M   1% /run/user/1000
/dev/sr0        iso9660   4.5G  4.5G    0 100% /media/annie/Ubuntu 22.04.5 LTS am
d64
root@Annie:/home/annie#
```

➤ Create new volume

1. Step 1: Power off the vm->Edit vm settings->Go to hard disk
->click on add->add volume->power on vm.



2. Step 2: Create a directory using command `mkdir /dir1`
3. Step 3: Create a file system using command –
`Mkfs.ext4 /dev/sdb`

```

root@Annie: /home/annie
d64
root@Annie:/home/annie# mkfs.ext4 /dev/sdb
mke2fs 1.46.5 (30-Dec-2021)
Creating filesystem with 1310720 4k blocks and 327680 inodes
Filesystem UUID: 9d5e1ca0-e220-4959-a027-b364e4bc7295
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@Annie:/home/annie# df -Th
Filesystem      Type      Size      Used Avail Use% Mounted on
tmpfs           tmpfs     387M      1.7M  386M   1% /run
/dev/sda3       ext4      24G       13G   11G  54% /
tmpfs           tmpfs     1.9G      0     1.9G   0% /dev/shm
tmpfs           tmpfs     5.0M      4.0K   5.0M   1% /run/lock
/dev/sda2       vfat      512M      6.1M   506M   2% /boot/efi
tmpfs           tmpfs     387M     100K   387M   1% /run/user/1000
/dev/sr0        iso9660    4.5G     4.5G    0 100% /media/annie/Ubuntu 22.04.5 LTS am
d64
root@Annie:/home/annie#

```

4. Step 4: The last step is mounting - Mounting is the process of attaching a storage device or filesystem (like a hard drive, USB, ISO file, or partition) to a specific directory in the Linux directory tree so that you can access its contents ->validate using the command `df -Th`.


```

root@Annie:/home/annie# mount /dev/sdb /dir1
root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs           tmpfs     387M  1.7M  386M   1% /run
/dev/sda3       ext4      24G   13G   11G  54% /
tmpfs           tmpfs     1.9G   0    1.9G   0% /dev/shm
tmpfs           tmpfs     5.0M   4.0K  5.0M   1% /run/lock
/dev/sda2       vfat      512M   6.1M  506M   2% /boot/efi
tmpfs           tmpfs     387M  100K  387M   1% /run/user/1000
/dev/sr0        iso9660   4.5G   4.5G   0 100% /media/annie/Ubuntu 22.04.5 LTS an
d64
/dev/sdb        ext4      4.9G   24K   4.6G   1% /dir1
root@Annie:/home/annie#

```

➤ Apache Configuration

- Apache HTTP Server (often just called Apache) is one of the most widely used web servers in the world. It serves web pages to users in response to their requests via a web browser.

1. Step 1: Install Apache->using the command apt install Apache.

```

root@Annie:/home/annie# apt install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap
0 upgraded, 8 newly installed, 0 to remove and 71 not upgraded.
Need to get 1,922 kB of archives.
After this operation, 7,728 kB of additional disk space will be used.
Do you want to continue? [Y/n]

```

- Type y and continue with installation. Always check status of Apache using `systemctl status apache2`.

```

root@Annie:/home/annie# systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor prese
   Active: active (running) since Mon 2025-05-12 13:41:56 IST; 7h ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 801 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUC
 Main PID: 888 (apache2)
    Tasks: 55 (limit: 4544)
   Memory: 8.0M
      CPU: 7.016s
   CGroup: /system.slice/apache2.service
           └─888 /usr/sbin/apache2 -k start
             └─891 /usr/sbin/apache2 -k start
               └─893 /usr/sbin/apache2 -k start

May 12 13:41:51 Annie systemd[1]: Starting The Apache HTTP Server...
May 12 13:41:55 Annie apachectl[825]: AH00558: apache2: Could not reliably dete
May 12 13:41:56 Annie systemd[1]: Started The Apache HTTP Server.
lines 1-17/17 (END)

```

2. Step 2: Check IP address of your server using command `hostname -I`.

```

root@Annie:/home/annie# hostname -I
192.168.126.136
root@Annie:/home/annie#

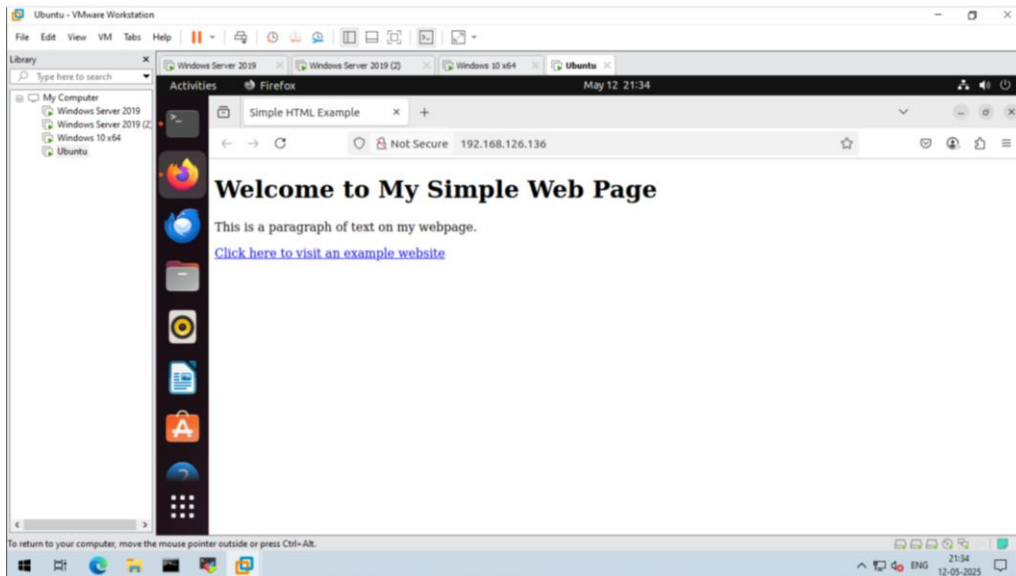
```

3. Step 3: Open the Firefox or chrome search the ip.



- It will show apache2 default page. First, we have to change the directory using command `"cd /var/www/html/"` We have to change the html code using vi command, by removing already existing one using rm command (`rm index.html`) and now open vi

<filename> edit and save using (esc->:wq!). Again go to Firefox and refresh the page.



- **LVM** - LVM stands for Logical Volume Manager. It's a powerful tool for managing disk space more flexibly than traditional partitioning.
 - **pvcreate** – Initializes a physical storage device or partition as a **Physical Volume (PV)** for use with LVM.
 - **pvdisplay** – Shows detailed information about existing **Physical Volumes**.
 - **vgcreate** – Creates a **Volume Group (VG)** by combining one or more physical volumes.
 - **lvcreate** – Creates a **Logical Volume (LV)** from a specified volume group.
 - **lvremove** – Deletes a **Logical Volume**, freeing up space in the volume group.
1. Step 1: Install LVM using the command `apt install lvm2` -> click yes and continue with installation.


```
root@Annie: /home/annie
└─lvmgrp-lv1 252:0 0 3G 0 lvm /dir2
sdc 8:32 0 10G 0 disk
sr0 11:0 1 4.4G 0 rom /media/annie/Ubuntu 22.04.5 LTS amd64
root@Annie:/home/annie# pvcreate /dev/sdc
Physical volume "/dev/sdc" successfully created.
root@Annie:/home/annie# pvdisplay
--- Physical volume ---
PV Name                /dev/sdb
VG Name                lvmgrp
PV Size                5.00 GiB / not usable 4.00 MiB
Allocatable            yes
PE Size                4.00 MiB
Total PE               1279
Free PE                511
Allocated PE           768
PV UUID                zIeYST-mjHX-x0P3-vjnA-71mQ-bgs7-7GSHCC

"/dev/sdc" is a new physical volume of "10.00 GiB"
--- NEW Physical volume ---
PV Name                /dev/sdc
VG Name                lvmgrp
PV Size                10.00 GiB
Allocatable            NO
PE Size                0
Total PE               0
Free PE                0
Allocated PE           0
PV UUID                G3Gt1t-7Req-u4vW-YRud-CmpW-p0YU-Qd68bI
root@Annie:/home/annie#
```

5. Step 5: Create volume group using command `vgcreate`
<groupname> <device name>. check by using `vgdisplay`.

```
root@Annie:/home/annie# vgcreate lvmgrp1 /dev/sdc
Volume group "lvmgrp1" successfully created
root@Annie:/home/annie# vgdisplay
--- Volume group ---
VG Name                lvmgrp1
System ID
Format                 lvm2
Metadata Areas         1
Metadata Sequence No   1
VG Access               read/write
VG Status               resizable
MAX LV                 0
Cur LV                 0
Open LV                 0
Max PV                 0
Cur PV                 1
Act PV                 1
VG Size                <10.00 GiB
PE Size                4.00 MiB
Total PE               2559
Alloc PE / Size        0 / 0
Free PE / Size         2559 / <10.00 GiB
VG UUID                RnW2s1-Lh1G-N0yV-VOHV-P5aQ-d2zc-z1eYUy

--- Volume group ---
VG Name                lvmgrp
System ID
Format                 lvm2
Metadata Areas         1
Metadata Sequence No   2
```

6. Step 6: Create logical volume

```
root@Annie: /home/annie
Cannot process volume group lvmgrp2
root@Annie:/home/annie# lvcreate -n lv2 -L 5g lvmgrp1
Logical volume "lv2" created.
root@Annie:/home/annie# lvs
--- Logical volume ---
LV Path                /dev/lvmgrp1/lv2
LV Name                 lv2
VG Name                 lvmgrp1
LV UUID                 B1ToMP-WU6g-Hq3Z-TPn1-q0Gg-re25-b6ALXz
LV Write Access         read/write
LV Creation host, time  Annie, 2025-05-12 21:58:33 +0530
LV Status                available
# open                  0
LV Size                 5.00 GiB
Current LE              1280
Segments                1
Allocation               inherit
Read ahead sectors      auto
- currently set to     256
Block device            252:1

--- Logical volume ---
LV Path                /dev/lvmgrp1/lv1
LV Name                 lv1
VG Name                 lvmgrp1
LV UUID                 03pA2E-wMX1-dpe3-yhYs-x7nu-nyNZ-nAZnVe
LV Write Access         read/write
LV Creation host, time  Annie, 2025-05-12 13:47:56 +0530
LV Status                available
# open                  1
```

7. Step 7: Validate using `df -Th`. If not there we have to mount.

```
root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs           tmpfs     387M  1.8M  386M   1% /run
/dev/sda3       ext4      24G   13G   11G  54% /
tmpfs           tmpfs     1.9G    0  1.9G   0% /dev/shm
tmpfs           tmpfs     5.0M   4.0K  5.0M   1% /run/lock
/dev/sda2       vfat      512M   6.1M  506M   2% /boot/efi
tmpfs           tmpfs     387M  104K  387M   1% /run/user/1000
/dev/sr0        iso9660   4.5G   4.5G    0 100% /media/annie/Ubuntu 22.04.5 LTS amd64
/dev/mapper/lvmgrp-lv1 ext4      2.9G   24K   2.8G   1% /dir2
root@Annie:/home/annie#
```

8. Step 8: Now to mount we have first to create directory using `mkdir` <directory name>->then create filesystem using `mkfs -t <file system name><device name>`. Check using `df -Th`.

```
dev/mapper/lvmgrp-lv1 ext4      2.9G   24K   2.8G   1% /dir2
root@Annie:/home/annie# mkdir dir3
root@Annie:/home/annie# ls
2 3 Desktop dir1 dir2 dir3 Documents Downloads file1 Music Pictures Public snap Templates Vide
root@Annie:/home/annie# mkfs -t ext4 /dev/lvmgrp1/lv1
```

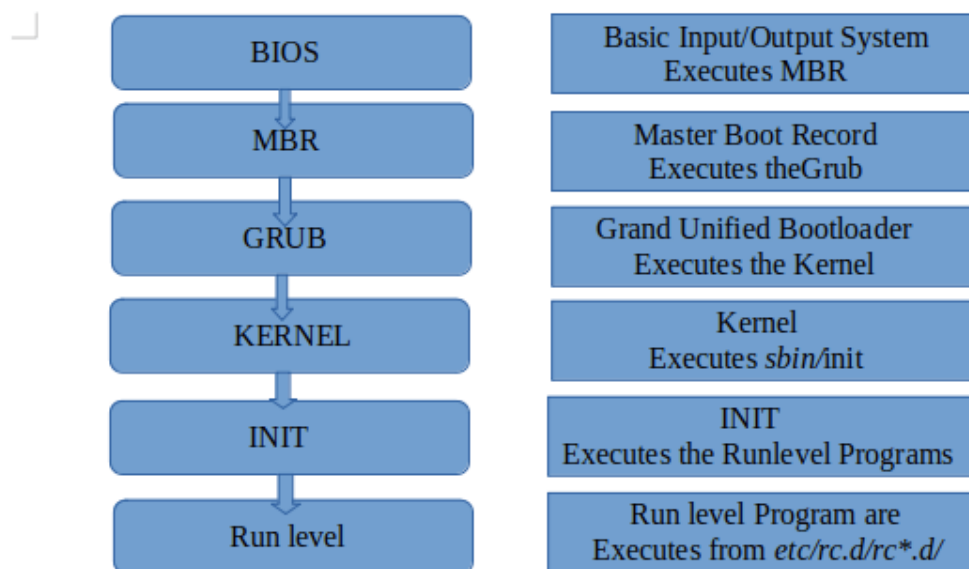
```
root@Annie: /home/annie
root@Annie:/home/annie# mkdir dir3
root@Annie:/home/annie# ls
2 3 Desktop dir1 dir2 dir3 Documents Downloads file1 Music Pictures Public snap Templates Videos
root@Annie:/home/annie# mkfs -t ext4 /dev/lvmgrp1/lv1
mkfs 1.46.5 (30-Dec-2021)
The file /dev/lvmgrp1/lv1 does not exist and no size was specified.
root@Annie:/home/annie# ^C
root@Annie:/home/annie# mkfs -t ext4 /dev/lvmgrp1/lv2
mkfs 1.46.5 (30-Dec-2021)
Creating filesystem with 1310720 4k blocks and 327680 inodes
Filesystem UUID: 33a15690-6262-48bc-ba4d-5a28c8768123
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs            tmpfs     387M   1.8M  386M   1% /run
/dev/sda3        ext4      24G    13G   11G   54% /
tmpfs            tmpfs     1.9G     0   1.9G   0% /dev/shm
tmpfs            tmpfs     5.0M   4.0K   5.0M   1% /run/lock
/dev/sda2        vfat      512M   6.1M   506M   2% /boot/efi
tmpfs            tmpfs     387M   104K   387M   1% /run/user/1000
/dev/sr0         iso9660    4.5G   4.5G     0 100% /media/annie/Ubuntu 22.04.5 LTS amd64
/dev/mapper/lvmgrp-lv1 ext4       2.9G    24K    2.8G   1% /dir2
root@Annie:/home/annie#
```

```
root@Annie:/home/annie# mount /dev/lvmgrp1/lv2 /dir3
root@Annie:/home/annie# df -Th
Filesystem      Type      Size  Used Avail Use% Mounted on
tmpfs            tmpfs     387M   1.8M  386M   1% /run
/dev/sda3        ext4      24G    13G   11G   54% /
tmpfs            tmpfs     1.9G     0   1.9G   0% /dev/shm
tmpfs            tmpfs     5.0M   4.0K   5.0M   1% /run/lock
/dev/sda2        vfat      512M   6.1M   506M   2% /boot/efi
tmpfs            tmpfs     387M   104K   387M   1% /run/user/1000
/dev/sr0         iso9660    4.5G   4.5G     0 100% /media/annie/Ubuntu 22.04.5 LTS amd64
/dev/mapper/lvmgrp-lv1 ext4       2.9G    24K    2.8G   1% /dir2
/dev/mapper/lvmgrp1-lv2 ext4       4.9G    24K    4.6G   1% /dir3
root@Annie:/home/annie#
```

➤ Boot Process



1. BIOS (Basic Input/Output System)

- What it does: Initializes the hardware (keyboard, disk, RAM, etc.).
- Next step: Loads and executes the MBR.
- Location: Stored on the motherboard.

2. MBR (Master Boot Record)

- What it does: It contains the bootloader information.
- Next step: Loads the GRUB (or any bootloader).
- Location: First 512 bytes of the bootable disk.

3. GRUB (Grand Unified Bootloader)

- What it does: Provides a menu to select which OS/kernel to boot.
- Next step: Loads and executes the selected Kernel.

4. Kernel

- What it does: Core of the OS; handles hardware, mounts root filesystem.
- Next step: Executes the */sbin/init* program (or a replacement like *systemd* in modern distros).

5. INIT

- What it does: Initializes the system processes as per the runlevel.
- Next step: Runs scripts and services required for the system to operate.

6. Run Level

- What it does: Defines the state of the machine (e.g., single-user mode, multi-user mode, GUI, etc.).
- Scripts location: */etc/rc.d/rc*.d/*
 - For example: */etc/rc.d/rc3.d/* contains scripts for runlevel 3.