

CYB613: Operating Systems Theory and Administration
Lab5: Managing Local Storage

Objective:

To learn how to create and manage local storage in Linux OS

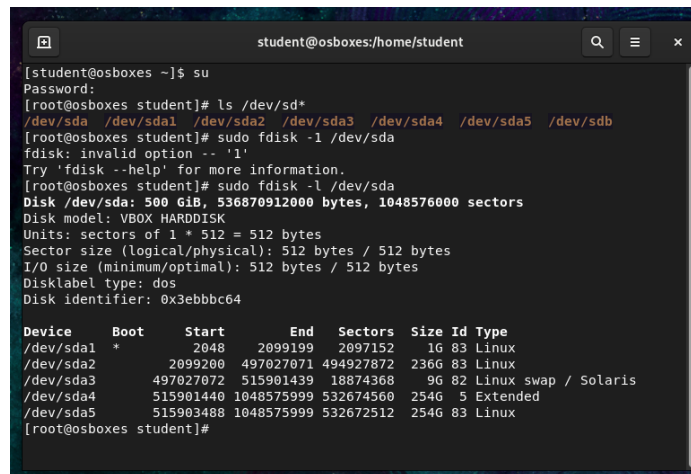
Complete Lab 10.1, 10.2 and 10.3 for chapter 10: Managing Local Storage

Rename this lab sheet to [CYB613.lab5.firstName.lastName.docx](#)

Lab 10.1: Creating Partitions and Filesystems

Follow steps 1 thru 16, no need to paste a screen shot.

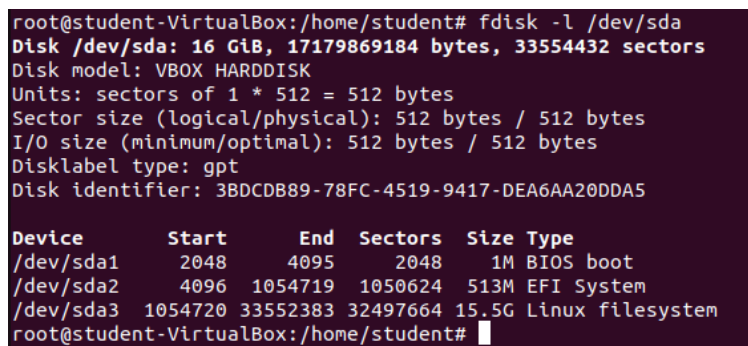
- Step 17: Paste a screenshot, below, for step 17 display the partition table of `/dev/sda`



```

student@osboxes: ~/home/student
[student@osboxes ~]$ su
Password:
[root@osboxes student]# ls /dev/sd*
/dev/sda /dev/sda1 /dev/sda2 /dev/sda3 /dev/sda4 /dev/sda5 /dev/sdb
[root@osboxes student]# sudo fdisk -l /dev/sda
fdisk: invalid option -- 'l'
Try 'fdisk --help' for more information.
[root@osboxes student]# sudo fdisk -l /dev/sda
Disk /dev/sda: 500 GiB, 536870912000 bytes, 1048576000 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x3ebbbc64

Device Boot      Start         End      Sectors  Size Id Type
/dev/sda1 *        2048       2099199     2097152    1G 83 Linux
/dev/sda2          2099200     497027071    494927872    236G 83 Linux
/dev/sda3          497027072    515901439    18874368     9G 82 Linux swap / Solaris
/dev/sda4          515901440    1048575999    532674560    254G  5 Extended
/dev/sda5          515903488    1048575999    532672512    254G 83 Linux
[root@osboxes student]#
  
```



```

root@student-VirtualBox:/home/student# fdisk -l /dev/sda
Disk /dev/sda: 16 GiB, 17179869184 bytes, 33554432 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 3BDCDB89-78FC-4519-9417-DEA6AA20DDA5

Device      Start        End      Sectors  Size Type
/dev/sda1    2048         4095       2048     1M BIOS boot
/dev/sda2    4096       1054719    1050624    513M EFI System
/dev/sda3   1054720    33552383    32497664    15.5G Linux filesystem
root@student-VirtualBox:/home/student#
  
```

- Step 18: Paste a screen shot, below, for step 19 to display the partition table of `/dev/sdb`

```

student@osboxes:/home/student
Try 'fdisk --help' for more information.
[root@osboxes student]# sudo fdisk -l /dev/sda
Disk /dev/sda: 500 GiB, 536870912000 bytes, 1048576000 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x3ebbbc64

   Device   Boot      Start         End      Sectors   Size Id Type
/dev/sda1   *          2048        2099199       2097152    1G 83 Linux
/dev/sda2                2099200       497027071     494927872   236G 83 Linux
/dev/sda3          497027072     515901439     18874368    9G 82 Linux swap / Solaris
/dev/sda4          515901440     1048575999     532674560   254G  5 Extended
/dev/sda5          515903488     1048575999     532672512   254G 83 Linux
[root@osboxes student]# sudo fd
fdformat fdisk
[root@osboxes student]# sudo fdisk -l /dev/sdb
Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[root@osboxes student]#
  
```

```

root@student-VirtualBox:/home/student# fdisk -l /dev/sdb
Disk /dev/sdb: 100 MiB, 104857600 bytes, 204800 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
  
```

-
- Step 19: Paste a screenshot, below, of executing `fdisk /dev/sdb` command showing the entries you selected for the new primary partition on `/dev/sdb` device
-

```

student@osboxes:/home/student — sudo fdisk /dev/sdb
[root@osboxes student]# sudo fdisk /dev/sdb
Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x69e91484.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-41943039, default 2048): +25M
Value out of range.
First sector (2048-41943039, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-41943039, default 41943039): +
M25
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-41943039, default 41943039):
Created a new partition 1 of type 'Linux' and of size 20 GiB.

Command (m for help):
  
```

```

student@osboxes:/home/student
[student@osboxes ~]$ ls /dev/sd*
/dev/sda  /dev/sda2  /dev/sda4  /dev/sdb
/dev/sda1 /dev/sda3  /dev/sda5  /dev/sdb1
[student@osboxes ~]$ fdisk -l /dev/sdb
Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x69e91484

Device      Boot Start      End  Sectors  Size Id Type
/dev/sdb1                2048 41943039 41940992  20G 83 Linux
[student@osboxes ~]$
  
```

```

root@student-VirtualBox:/home/student# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0xfa5fdd02.
  
```

```

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-204799, default 2048):
Last sector, +/-sectors or +/-size[K,M,G,T,P] (2048-204799, default 204799): +25M

Created a new partition 1 of type 'Linux' and of size 25 MiB.
  
```

```

root@student-VirtualBox:/home/student# fdisk -l /dev/sdb
Disk /dev/sdb: 100 MiB, 104857600 bytes, 204800 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xfa5fdd02

Device      Boot Start      End  Sectors  Size Id Type
/dev/sdb1                2048  53247   51200   25M 83 Linux
  
```

- Step 20: list the command you used, below.

`sudo mkfs.ext4 /dev/sdb1`

```
student@osboxes:/home/student

[root@osboxes student]# fdisk -l /dev/sdb
Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x69e91484

Device      Boot Start      End  Sectors  Size Id Type
/dev/sdb1                2048 41943039 41940992  20G 83 Linux
[root@osboxes student]# sudo mkfs.ext4 /dev/sdb1
mke2fs 1.46.2 (28-Feb-2021)
Creating filesystem with 5242624 4k blocks and 1310720 inodes
Filesystem UUID: 95730285-ee8c-4d6b-b0e8-0d5bf56348aa
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

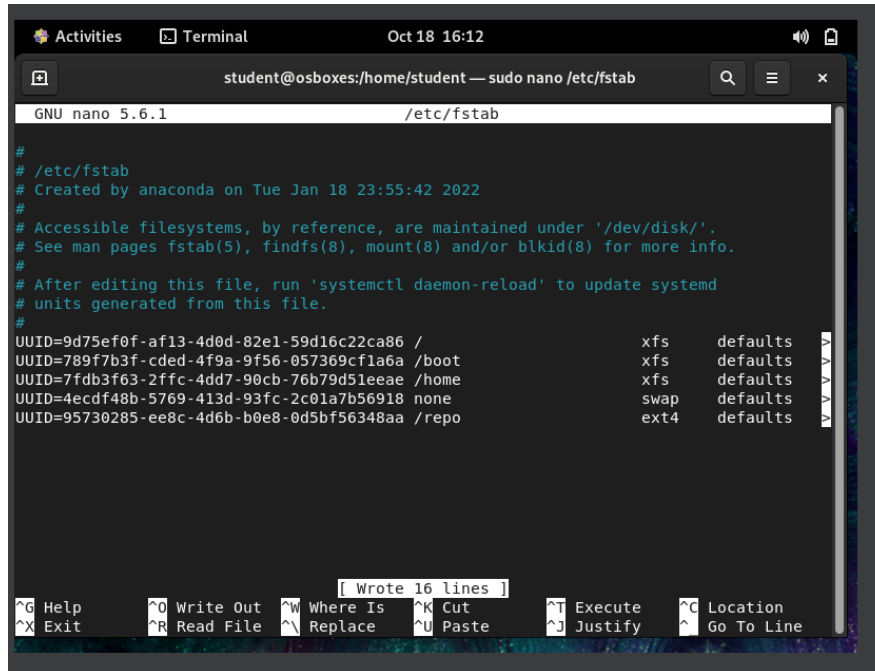
[root@osboxes student]#
```

- Step 21: list the commands you used, below.

```
sudo mkdir /repo
sudo mount /dev/sdb1 /repo/
sudo blkid /dev/sdb1
```

```
student@osboxes:/home/student

[root@osboxes student]# sudo mkdir /repo
[root@osboxes student]# sudo mount /dev/sdb1 /repo/
[root@osboxes student]# sudo blkid /dev/sdb1
/dev/sdb1: UUID="95730285-ee8c-4d6b-b0e8-0d5bf56348aa" BLOCK_SIZE="4096" TYPE="ext4"
PARTUUID="69e91484-01"
[root@osboxes student]#
[root@osboxes student]# sudo nano /etc/fstab
[root@osboxes student]#
```



```

GNU nano 5.6.1 /etc/fstab

#
# /etc/fstab
# Created by anaconda on Tue Jan 18 23:55:42 2022
#
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.
#
# After editing this file, run 'systemctl daemon-reload' to update systemd
# units generated from this file.
#
UUID=9d75ef0f-af13-4d0d-82e1-59d16c22ca86 /                xfs     defaults
UUID=789f7b3f-cded-4f9a-9f56-057369cf1a6a /boot           xfs     defaults
UUID=7fdb3f63-2ffc-4dd7-90cb-76b79d51eeae /home          xfs     defaults
UUID=4ecd48b-5769-413d-93fc-2c01a7b56918 none           swap    defaults
UUID=95730285-ee8c-4d6b-b0e8-0d5bf56348aa /repo          ext4    defaults
  
```

Lab 10.2: Mounting Filesystems at Boot

Scenario: You now have a new partition (*/dev/sdb1*) with an ext4 filesystem mounted under */repo*. Configure the system so this partition will automatically be mounted during the boot process. Use the following parameters:

- Assign the label *repo* to the filesystem. Use the label, not the device name, to perform the mount.
- For mount options, do not allow SUID programs on this filesystem.
- For FSCK check, use the value *1*.
- For dump level, use the value *0*.

Configure the system for this automatic mount and then test the mount before rebooting the system.

Perform the steps necessary to complete this section and provide necessary screenshot showing your work, below

```

student@osboxes:/home/student

[root@osboxes student]# sudo e2label /dev/sdb1 repo
[root@osboxes student]# sudo blkid
/dev/sdb1: LABEL="repo" UUID="95730285-ee8c-4d6b-b0e8-0d5bf56348aa" BLOCK_SIZE="4096"
" TYPE="ext4" PARTUUID="69e91484-01"
/dev/sda2: UUID="9d75ef0f-af13-4d0d-82e1-59d16c22ca86" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-02"
/dev/sda5: UUID="7fdb3f63-2ffc-4dd7-90cb-76b79d51eeae" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-05"
/dev/sda3: UUID="4ecdf48b-5769-413d-93fc-2c01a7b56918" TYPE="swap" PARTUUID="3ebbbc6
4-03"
/dev/sda1: UUID="789f7b3f-cded-4f9a-9f56-057369cf1a6a" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-01"
[root@osboxes student]#

student@osboxes:/home/student

[root@osboxes student]# sudo e2label /dev/sdb1 repo
[root@osboxes student]# sudo blkid
/dev/sdb1: LABEL="repo" UUID="95730285-ee8c-4d6b-b0e8-0d5bf56348aa" BLOCK_SIZE="4096"
" TYPE="ext4" PARTUUID="69e91484-01"
/dev/sda2: UUID="9d75ef0f-af13-4d0d-82e1-59d16c22ca86" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-02"
/dev/sda5: UUID="7fdb3f63-2ffc-4dd7-90cb-76b79d51eeae" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-05"
/dev/sda3: UUID="4ecdf48b-5769-413d-93fc-2c01a7b56918" TYPE="swap" PARTUUID="3ebbbc6
4-03"
/dev/sda1: UUID="789f7b3f-cded-4f9a-9f56-057369cf1a6a" BLOCK_SIZE="512" TYPE="xfs" P
ARTUUID="3ebbbc64-01"
[root@osboxes student]# sudo nano /etc/fstab
[root@osboxes student]# sudo umount /repo
[root@osboxes student]# sudo mount -a
mount: /repo: /dev/sdb1 already mounted or mount point busy.
[root@osboxes student]# df -h | grep /repo/
[root@osboxes student]# df -h | grep /repo
/dev/sdb1      20G   24K   19G    1% /repo
[root@osboxes student]# df -h | grep /repo/
[root@osboxes student]#

```

```

root@student-VirtualBox: /home/student

student@student-VirtualBox:~$ sudo su
[sudo] password for student:
root@student-VirtualBox: /home/student#

root@student-VirtualBox: /home/student# nano /etc/fstab

```

```

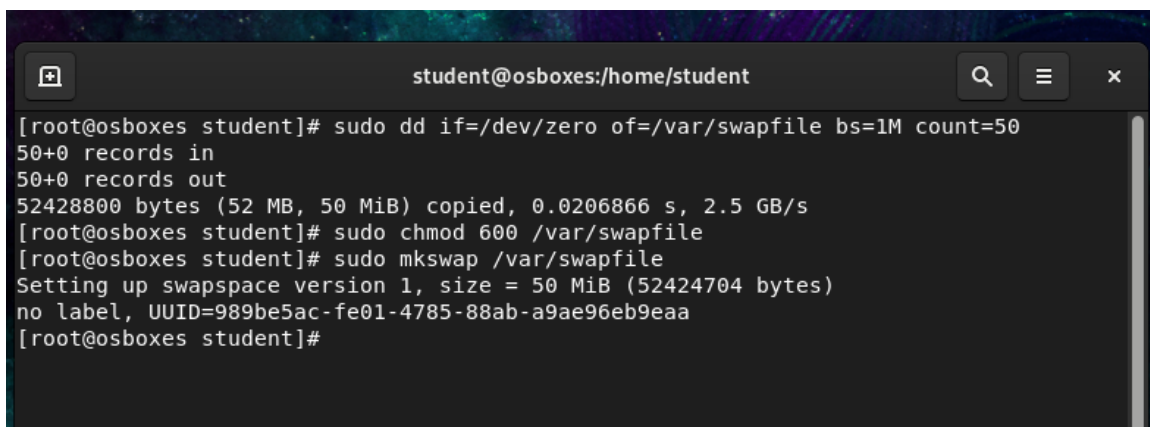
GNU nano 6.2 /etc/fstab
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda3 during installation
UUID=4c6043f0-c263-40df-b337-3412723e0e05 / ext4 errors=remount-ro 0 1
# /boot/efi was on /dev/sda2 during installation
UUID=EB4C-415E /boot/efi vfat umask=0077 0 1
/swapfile none swap sw 0 0
LABEL=repo /repo ext4 nosuid 1 0

root@student-VirtualBox:/home/student# umount /repo
root@student-VirtualBox:/home/student# mount -a
  
```

Lab 10.3 Managing Swap Devices

Scenario: Create two new swap devices. One swap device should be a 50MB file named `/var/swapfile`. The second swap device should be a swap partition (`/dev/sdb2`) that is 50MB in size. These swap devices should be automatically enabled during each boot process. (Use the UUID of the partition for this.)

Perform the steps necessary to complete this section and provide necessary screenshot showing your work, below



```

student@osboxes:/home/student
[student@osboxes ~]$ sudo dd if=/dev/zero of=/var/swapfile bs=1M count=50
50+0 records in
50+0 records out
52428800 bytes (52 MB, 50 MiB) copied, 0.0206866 s, 2.5 GB/s
[student@osboxes ~]$ sudo chmod 600 /var/swapfile
[student@osboxes ~]$ sudo mkswap /var/swapfile
Setting up swapspace version 1, size = 50 MiB (52424704 bytes)
no label, UUID=989be5ac-fe01-4785-88ab-a9ae96eb9eaa
[student@osboxes ~]$
  
```



```
student@osboxes:/home/student — sudo fdisk /dev/sdb

Setting up swap space version 1, size = 50 MiB (52424704 bytes)
no label, UUID=989be5ac-fe01-4785-88ab-a9ae96eb9eaa
[root@osboxes student]# sudo fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to umount all file systems, and swapoff all swap
partitions on this disk.

Command (m for help): n

All space for primary partitions is in use.

Command (m for help): p
Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
```

```
student@osboxes:/dev

Command (m for help): n
Partition type
  p   primary (0 primary, 0 extended, 4 free)
  e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 2
First sector (2048-41943039, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-41943039, default 41943039): +50
M

Created a new partition 2 of type 'Linux' and of size 50 MiB.
Partition #2 contains a ext4 signature.

Do you want to remove the signature? [Y]es/[N]o: t
Do you want to remove the signature? [Y]es/[N]o: y

The signature will be removed by a write command.

Command (m for help): t
Selected partition 2
Hex code or alias (type L to list all): 82
```



```
student@osboxes:/dev

[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: error: /dev/sdb1 is mounted; will not make swapspace
[root@osboxes dev]# sudo swapon /var/swapfile
swapon: /var/swapfile: swapon failed: Device or resource busy
[root@osboxes dev]# sudo swapon /dev/sdb1
swapon: /dev/sdb1: read swap header failed
[root@osboxes dev]# sudo umount /dev/sdb1
[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: /dev/sdb1: warning: wiping old ext4 signature.
Setting up swapspace version 1, size = 20 GiB (21473783808 bytes)
no label, UUID=51d6fc20-f6f8-4b68-a4aa-43afe9136bfc
[root@osboxes dev]# swapon --show
NAME          TYPE          SIZE USED PRIO
/dev/sda3     partition    9G   0B   -2
/var/swapfile file          50M   0B   -3
[root@osboxes dev]#
```

```
student@osboxes:/dev

[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: error: /dev/sdb1 is mounted; will not make swapspace
[root@osboxes dev]# sudo swapon /var/swapfile
swapon: /var/swapfile: swapon failed: Device or resource busy
[root@osboxes dev]# sudo swapon /dev/sdb1
swapon: /dev/sdb1: read swap header failed
[root@osboxes dev]# sudo umount /dev/sdb1
[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: /dev/sdb1: warning: wiping old ext4 signature.
Setting up swapspace version 1, size = 20 GiB (21473783808 bytes)
no label, UUID=51d6fc20-f6f8-4b68-a4aa-43afe9136bfc
[root@osboxes dev]# swapon --show
NAME          TYPE          SIZE USED PRIO
/dev/sda3     partition    9G   0B   -2
/var/swapfile file          50M   0B   -3
[root@osboxes dev]# sudo blkid /dev/ssdb1
[root@osboxes dev]# sudo nano /etc/fstab
[root@osboxes dev]# sudo mount -a
```

```
student@osboxes:/dev
[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: error: /dev/sdb1 is mounted; will not make swapspace
[root@osboxes dev]# sudo swapon /var/swapfile
swapon: /var/swapfile: swapon failed: Device or resource busy
[root@osboxes dev]# sudo swapon /dev/sdb1
swapon: /dev/sdb1: read swap header failed
[root@osboxes dev]# sudo umount /dev/sdb1
[root@osboxes dev]# sudo mkswap /dev/sdb1
mkswap: /dev/sdb1: warning: wiping old ext4 signature.
Setting up swapspace version 1, size = 20 GiB (21473783808 bytes)
no label, UUID=51d6fc20-f6f8-4b68-a4aa-43afe9136bfc
[root@osboxes dev]# swapon --show
NAME      TYPE      SIZE USED PRI0
/dev/sda3  partition 9G    0B   -2
/var/swapfile file       50M   0B   -3
[root@osboxes dev]# sudo blkid /dev/ssdb1
[root@osboxes dev]# sudo nano /etc/fstab
[root@osboxes dev]# sudo mount -a
mount: /repo: can't find UUID=95730285-ee8c-4d6b-b0e8-0d5bf56348aa.
mount: /repo: can't find LABEL=repo.
[root@osboxes dev]# S
```

```
[root@osboxes ~]# ls
afs  boot  etc  lib  media  opt  repo  run  srv  tmp  var
bin  dev  home  lib64  mnt  proc  root  sbin  sys  usr
[root@osboxes ~]# swapon --show
NAME      TYPE      SIZE USED PRI0
/dev/sda3  partition 9G    0B   -2
/var/swapfile file       50M   0B   -3
[root@osboxes ~]# free -h
total        used        free      shared  buff/cache   available
Mem:         1.7Gi       133Mi       1.5Gi       5.0Mi       129Mi       1.5Gi
Swap:        9.0Gi         0B        9.0Gi
```

```
root@student-VirtualBox:/home/student# fallocaate -l 50M /var/swapfile
```

```
root@student-VirtualBox:/home/student# chmod 600 /var/swapfile
```

```
root@student-VirtualBox:/home/student# mkswap /var/swapfile
```

```
root@student-VirtualBox:/home/student# swapon /var/swapfile
```

```
root@student-VirtualBox:/home/student# echo '/var/swapfile none swap sw 0 0'>> /etc/fstab
```

```
root@student-VirtualBox:/home/student# fdisk /dev/sdb
```

Welcome to fdisk (util-linux 2.37.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to umount all file systems, and swapoff all swap
partitions on this disk.

Command (m for help): n

Partition type

 p primary (1 primary, 0 extended, 3 free)

 e extended (container for logical partitions)

Select (default p): p

Partition number (2-4, default 2): 2

First sector (53248-204799, default 53248):

Last sector, +/-sectors or +/-size{K,M,G,T,P} (53248-204799, default 204799): +50M

Created a new partition 2 of type 'Linux' and of size 50 MiB.

Command (m for help): w

The partition table has been altered.

Syncing disks.

```
root@student-VirtualBox:/home/student# ls /dev/sd*
```

```
/dev/sda /dev/sda1 /dev/sda2 /dev/sda3 /dev/sdb /dev/sdb1 /dev/sdb2
```

```
root@student-VirtualBox:/home/student# blkid /dev/sdb2
```

```
/dev/sdb2: PARTUUID="fa5fdd02-02"
```

```
root@student-VirtualBox:/home/student# echo 'UUID=fa5fdd02-02 swap default 0 0' >> /etc/fstab
```

```
root@student-VirtualBox:/home/student# cat /etc/fstab
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda3 during installation
UUID=4c6043f0-c263-40df-b337-3412723e0e05 / ext4 errors=remount-ro 0 1
# /boot/efi was on /dev/sda2 during installation
UUID=EB4C-415E /boot/efi vfat umask=0077 0 1
/swapfile none swap sw 0 0
LABEL=repo /repo ext4 nosuid 1 0
/var/swapfile none swap sw 0 0
UUID=fa5fdd02-02 swap default 0 0
root@student-VirtualBox:/home/student#
```

```
root@student-VirtualBox:/home/student# swapon --show
NAME          TYPE SIZE USED PRIO
/swapfile     file 1.7G  0B   -2
/var/swapfile file  50M  0B   -3
```