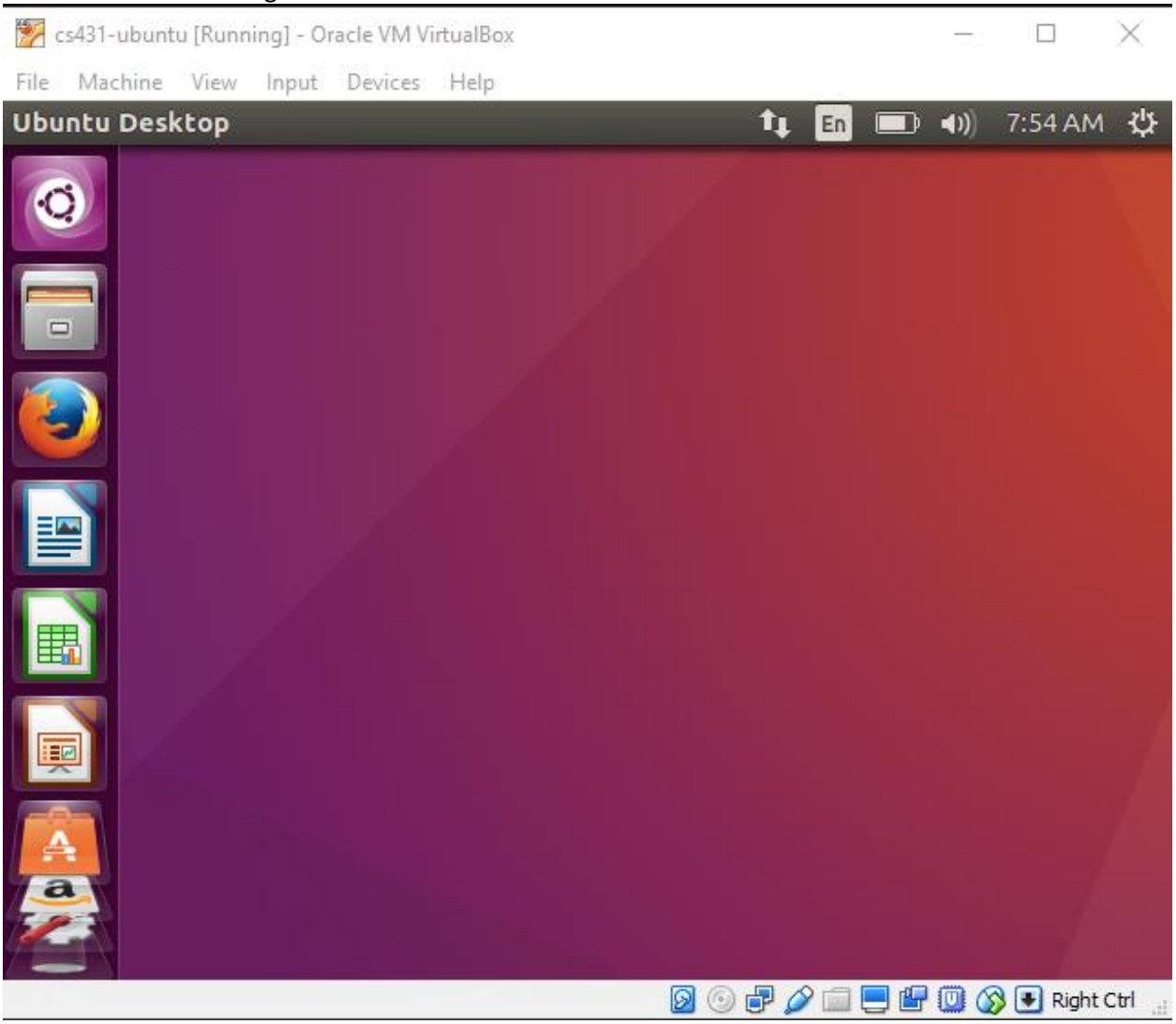
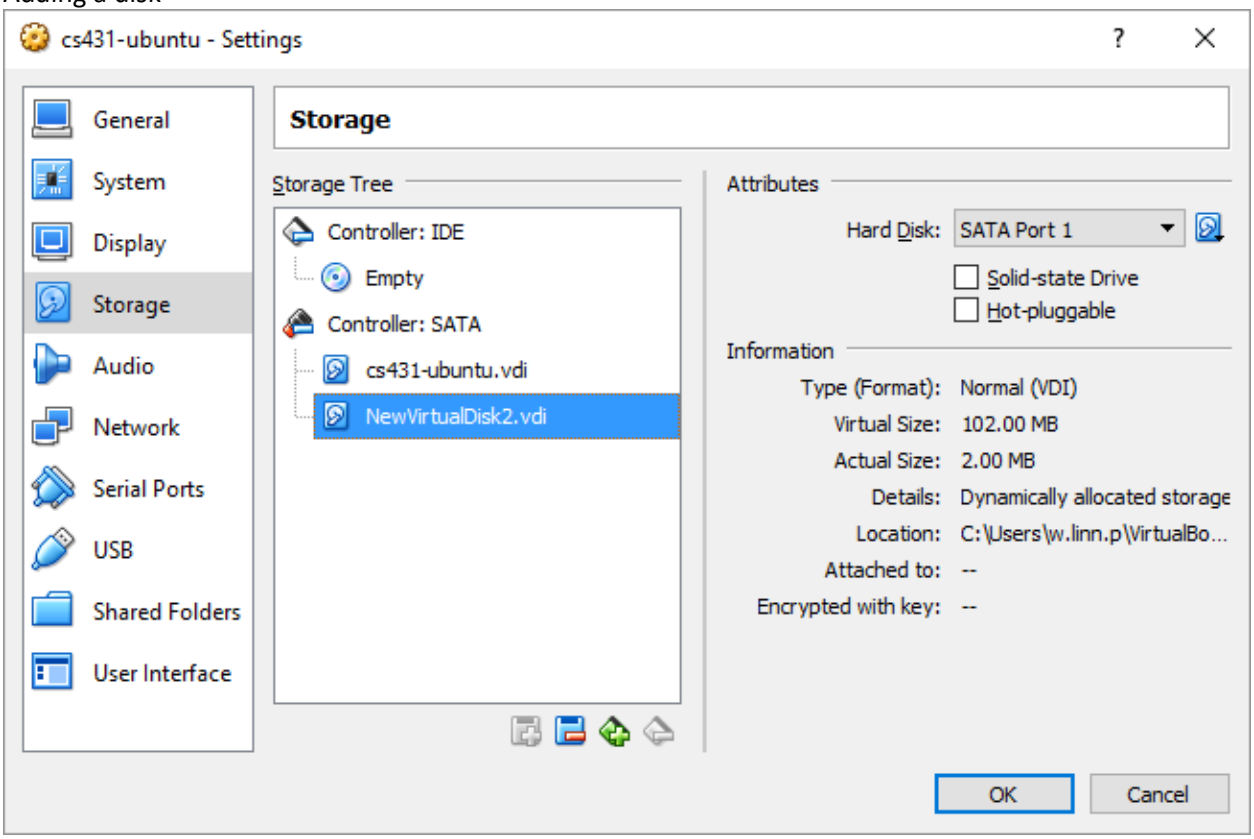
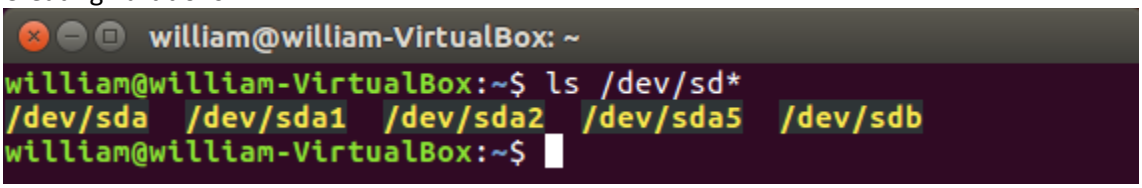
Virtual Box Ubuntu Image



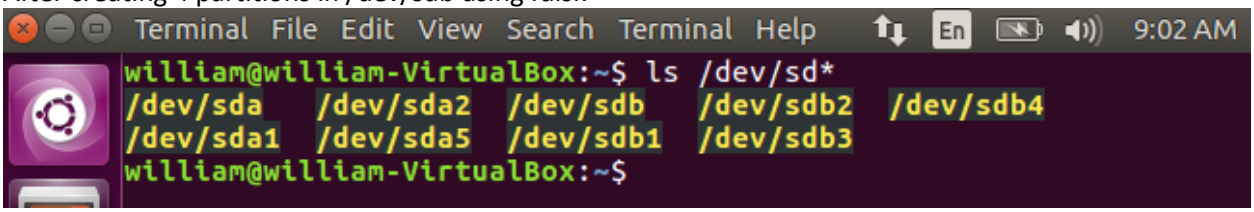
Adding a disk



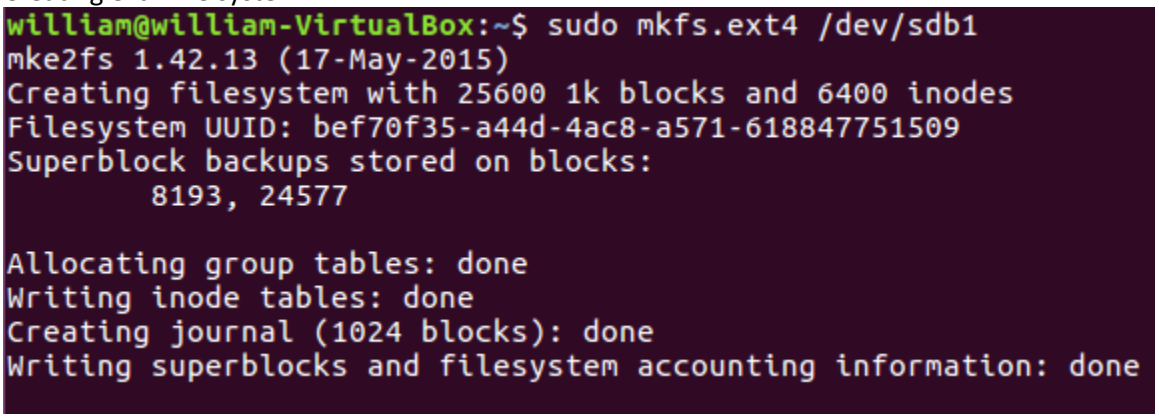
Creating Partitions



After creating 4 partitions in /dev/sdb using fdisk



Creating ext4 File system



Automatically mounted.

```
william@william-VirtualBox:/$ df -ah
Filesystem      Size  Used Avail Use% Mounted on
sysfs              0     0     0    - /sys
proc               0     0     0    - /proc
udev             980M     0  980M   0% /dev
devpts             0     0     0    - /dev/pts
tmpfs            200M  3.7M  197M   2% /run
/dev/sda1         16G  3.7G   12G  25% /
securityfs         0     0     0    - /sys/kernel/security
tmpfs           1000M  572K 1000M   1% /dev/shm
tmpfs            5.0M  4.0K  5.0M   1% /run/lock
tmpfs           1000M     0 1000M   0% /sys/fs/cgroup
cgroup             0     0     0    - /sys/fs/cgroup/systemd
pstore             0     0     0    - /sys/fs/pstore
cgroup             0     0     0    - /sys/fs/cgroup/memory
cgroup             0     0     0    - /sys/fs/cgroup/net_cls,net_pr
io
cgroup             0     0     0    - /sys/fs/cgroup/blkio
cgroup             0     0     0    - /sys/fs/cgroup/perf_event
cgroup             0     0     0    - /sys/fs/cgroup/cpu,cpuacct
cgroup             0     0     0    - /sys/fs/cgroup/freezer
cgroup             0     0     0    - /sys/fs/cgroup/cpuset
cgroup             0     0     0    - /sys/fs/cgroup/hugetlb
cgroup             0     0     0    - /sys/fs/cgroup/devices
cgroup             0     0     0    - /sys/fs/cgroup/pids
systemd-1          0     0     0    - /proc/sys/fs/binfmt_misc
debugfs            0     0     0    - /sys/kernel/debug
mqueue             0     0     0    - /dev/mqueue
hugetlbfs          0     0     0    - /dev/hugepages
fusectl            0     0     0    - /sys/fs/fuse/connections
tmpfs            200M   60K  200M   1% /run/user/1000
gvfsd-fuse         0     0     0    - /run/user/1000/gvfs
/dev/sdb1         24M  311K   22M   2% /media/william/bef70f35-a44d-
4ac8-a571-618847751509
william@william-VirtualBox:/$
```

Creating Swap Space

```
william@william-VirtualBox:/$ free -m
              total        used        free      shared  buff/cache
   available
Mem:           1999         570         832           6         597
        1248
Swap:          2045           0        2045
```

Creating swap space and adding it

```
william@william-VirtualBox:/$ sudo mkswap /dev/sdb2
[sudo] password for william:
Setting up swapspace version 1, size = 25 MiB (26210304 bytes)
no label, UUID=6d90bc5f-dbd8-4155-8a88-4b736027e851
william@william-VirtualBox:/$ swapon /dev/sdb2
swapon: cannot open /dev/sdb2: Permission denied
william@william-VirtualBox:/$ sudo swapon /dev/sdb2
william@william-VirtualBox:/$ free -mh
              total        used        free      shared  buff/cache
   available
Mem:           2.0G        570M        831M        6.1M        598M
       1.2G
Swap:          2.0G          0B        2.0G
william@william-VirtualBox:/$ free -m
              total        used        free      shared  buff/cache
   available
Mem:           1999         570         831           6         598
       1248
Swap:          2070           0        2070
```

Total area increased from 2045 to 2070.

After restarting the machine,

```
william@william-VirtualBox:~$ free -m
              total        used        free      shared  buff/cache
   available
Mem:           1999         569         735           5         694
       1256
Swap:          2045           0        2045
```

Editing /etc/fstab

```
william@william-VirtualBox:~/Desktop$ 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>  <pa
ss>
# / was on /dev/sda1 during installation
UUID=5a5f185b-aab3-416c-aeed-d227e2a4edda /               ext4    e
rrors=remount-ro 0       1
# swap was on /dev/sda5 during installation
UUID=816f3e74-b25b-4bcb-8f60-986ff5098584 none            swap    s
w               0       0
/dev/sdb2       swap    swap    defaults        0       0
william@william-VirtualBox:~/Desktop$
```

FAILED in free –m. Did not see the extra space.

getUUID for /devsdb2

```
william@william-VirtualBox:~/Desktop$ blkid /dev/sdb2
/dev/sdb2: UUID="6d90bc5f-dbd8-4155-8a88-4b736027e851" TYPE="swap" PARTUUID="78f
e517d-02"
```

Update fstab using UUID instead of /dev/sb2. free –m works. extra space is added.

```
william@william-VirtualBox:~/Desktop$ 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/sda1 during installation
UUID=5a5f185b-aab3-416c-aeed-d227e2a4edda /               ext4    errors=remount-ro 0
 1
# swap was on /dev/sda5 during installation
UUID=816f3e74-b25b-4bcb-8f60-986ff5098584 none            swap    sw              0       0
UUID=6d90bc5f-dbd8-4155-8a88-4b736027e851       swap    swap    defaults        00
william@william-VirtualBox:~/Desktop$ free -m
              total        used        free      shared  buff/cache   available
Mem:           1999         780         266          18         953         994
Swap:          2070           2        2068
william@william-VirtualBox:~/Desktop$
```

Based on fstab documentation.

file system	mount point	type	option	dump	pass
/dev/sdb2	swap	swap	defaults	0	0

From “man fstab”

The first field (fs_spec).

> This field describes the block special device or remote filesystem to be mounted.
>
> For ordinary mounts, it will hold (a link to) a block special device node (as created by mknod(8)) for the device to be mounted, like `/dev/cdrom' or `/dev/sdb7'. For NFS mounts, this field is <host>:<dir>, e.g., `knuth.aeb.nl:/'. For filesystems with no storage, any string can be used, and will show up in df(1) output, for example. Typical usage is `proc' for procfs; `mem', `none', or `tmpfs' for tmpfs. Other special filesystems, like udev and sysfs, are typically not listed in fstab.
>
> LABEL=<label> or UUID=<uuid> may be given instead of a device name. This is the recommended method, as device names are often a coincidence of hardware detection order, and can change when other disks are added or removed. For example, `LABEL=Boot' or `UUID=3e6be9de-8139-11d1-9106-a43f08d823a6'. (Use a filesystem-specific tool like e2label(8), xfs_admin(8), or fatlabel(8) to set LABELs on filesystems).
>
> It's also possible to use PARTUUID= and PARTLABEL=. These partitions identifiers are supported for example for GUID Partition Table (GPT).
>
> See mount(8), blkid(8) or lsblk(8) for more details about device identifiers.
>
> Note that mount(8) uses UUIDs as strings. The string representation of the UUID should be based on lower case characters.

The second field (fs_file).

This field describes the mount point (target) for the filesystem. For swap partitions, this field should be specified as `none'. If the name of the mount point contains spaces these can be escaped as `\040'.

The third field (fs_vfstype).

This field describes the type of the filesystem. Linux supports many filesystem types: ext4, xfs, btrfs, f2fs, vfat, ntfs, hfsplus, tmpfs, sysfs, proc, iso9660, udf, squashfs, nfs, cifs, and many more. For more details, see mount(8).

An entry swap denotes a file or partition to be used for swapping, cf. swapon(8). An entry none is useful for bind or move mounts.

More than one type may be specified in a comma-separated list.

mount(8) and umount(8) support filesystem subtypes. The subtype is defined by '.subtype' suffix. For example 'fuse.sshfs'. It's recommended to use subtype notation rather than add any prefix to the first fstab field (for example 'sshfs#example.com' is deprecated).

The fourth field (fs_mntops).

This field describes the mount options associated with the filesystem.

It is formatted as a comma-separated list of options. It contains at least the type of mount (ro or rw), plus any additional options appropriate to the filesystem type (including performance-tuning options). For details, see mount(8) or swapon(8).

Basic filesystem-independent options are:

defaults
use default options: rw, suid, dev, exec, auto, nouser, and async.

noauto do not mount when "mount -a" is given (e.g., at boot time)

user allow a user to mount

owner allow device owner to mount

comment
or x-<name> for use by fstab-maintaining programs

nofail do not report errors for this device if it does not exist.

The fifth field (fs_freq).

This field is used by dump(8) to determine which filesystems need to be dumped. Defaults to zero (don't dump) if not present.

The sixth field (fs_passno).

This field is used by fsck(8) to determine the order in which filesystem checks are done at boot time. The root filesystem should be specified with a fs_passno of 1. Other filesystems should have a fs_passno of 2. Filesystems within a drive will be checked sequentially, but filesystems on different drives will be checked at the same time to utilize parallelism available in the hardware. Defaults to zero (don't fsck) if not present.

After restarting the VM, free –m still retains swap space from sdb2

```
william@william-VirtualBox:~$ free -m
              total        used        free      shared  buff/cache   available
Mem:           1999         560         931           6         508        1269
Swap:          2070           0        2070
```

Creating Temporary Storage as instructed.

```
william@william-VirtualBox:~$ 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/sda1 during installation
UUID=5a5f185b-aab3-416c-aeed-d227e2a4edda /               ext4    errors=remount
-ro 0       1
# swap was on /dev/sda5 during installation
UUID=816f3e74-b25b-4bcb-8f60-986ff5098584 none            swap    sw
  0       0
UUID=6d90bc5f-dbd8-4155-8a88-4b736027e851       swap    swap    defaults       0
0
temp    /mnt/temp       tmpfs   defaults,size=10M       0       0
william@william-VirtualBox:~$ ls /mnt/-l
ls: cannot access '/mnt/-l': No such file or directory
william@william-VirtualBox:~$ ls /mnt/ -l
total 0
drwxrwxrwt 2 root root 40 Feb 25 10:44 temp
william@william-VirtualBox:~$
```

Creating a RAID1 Mirror
Created /dev/md0

```
Device     Boot  Start    End Sectors Size Id Type
/dev/sdb1         2048  53247   51200  25M 83 Linux
/dev/sdb2        53248 104447   51200  25M 83 Linux
/dev/sdb3       104448 155647   51200  25M 83 Linux
/dev/sdb4       155648 206847   51200  25M 83 Linux
william@william-VirtualBox:~$ sufo mdadm --create --verbose /dev/md
0 --level=mirror --raid-devices=2 /dev/sdb3 /dev/sdb4
No command 'sufo' found, did you mean:
 Command 'sumo' from package 'sumo' (universe)
 Command 'sudo' from package 'sudo-ldap' (universe)
 Command 'sudo' from package 'sudo' (main)
sufo: command not found
william@william-VirtualBox:~$ sufo mdadm --create --verbose /dev/md
0 --level=mirror --raid-device^C2 /dev/sdb3 /dev/sdb4^C
0 --level=mirror --raid-devices=2 /dev/sdb3 /dev/sdb4
william@william-VirtualBox:~$ ^C
william@william-VirtualBox:~$ sudo mdadm --create --verbose /dev/md
0 --level=mirror --raid-devices=2 /dev/sdb3 /dev/sdb4
mdadm: Note: this array has metadata at the start and
    may not be suitable as a boot device.  If you plan to
    store '/boot' on this device please ensure that
    your boot-loader understands md/v1.x metadata, or use
    --metadata=0.90
mdadm: /dev/sdb4 appears to be part of a raid array:
       level=raid0 devices=0 ctime=Wed Dec 31 16:00:00 1969
mdadm: partition table exists on /dev/sdb4 but will be lost or
       meaningless after creating array
mdadm: size set to 25536K
Continue creating array? y
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.
william@william-VirtualBox:~$
```

Printing /proc/mdstat

```
william@william-VirtualBox:~$ cat /proc/mdstat
Personalities : [linear] [multipath] [raid0] [raid1] [raid6] [raid5
] [raid4] [raid10]
md0 : active raid1 sdb4[1] sdb3[0]
      25536 blocks super 1.2 [2/2] [UU]

unused devices: <none>
william@william-VirtualBox:~$
```

Creating encrypted drive

```
william@william-VirtualBox:~$ sudo cryptsetup -y -v luksFormat /dev
/md0

WARNING!
========
This will overwrite data on /dev/md0 irrevocably.

Are you sure? (Type uppercase yes): YES
Enter passphrase:
Verify passphrase:
Command successful.
william@william-VirtualBox:~$
```

Initializing the volume with name backup2:

```
william@william-VirtualBox:~$ sudo cryptsetup luksOpen /dev/md0 bac
kup2
Enter passphrase for /dev/md0:
william@william-VirtualBox:~$ ls -l /dev/mapper/backup2
lrwxrwxrwx 1 root root 7 Feb 25 12:26 /dev/mapper/backup2 -> ../dm-
0
william@william-VirtualBox:~$
```

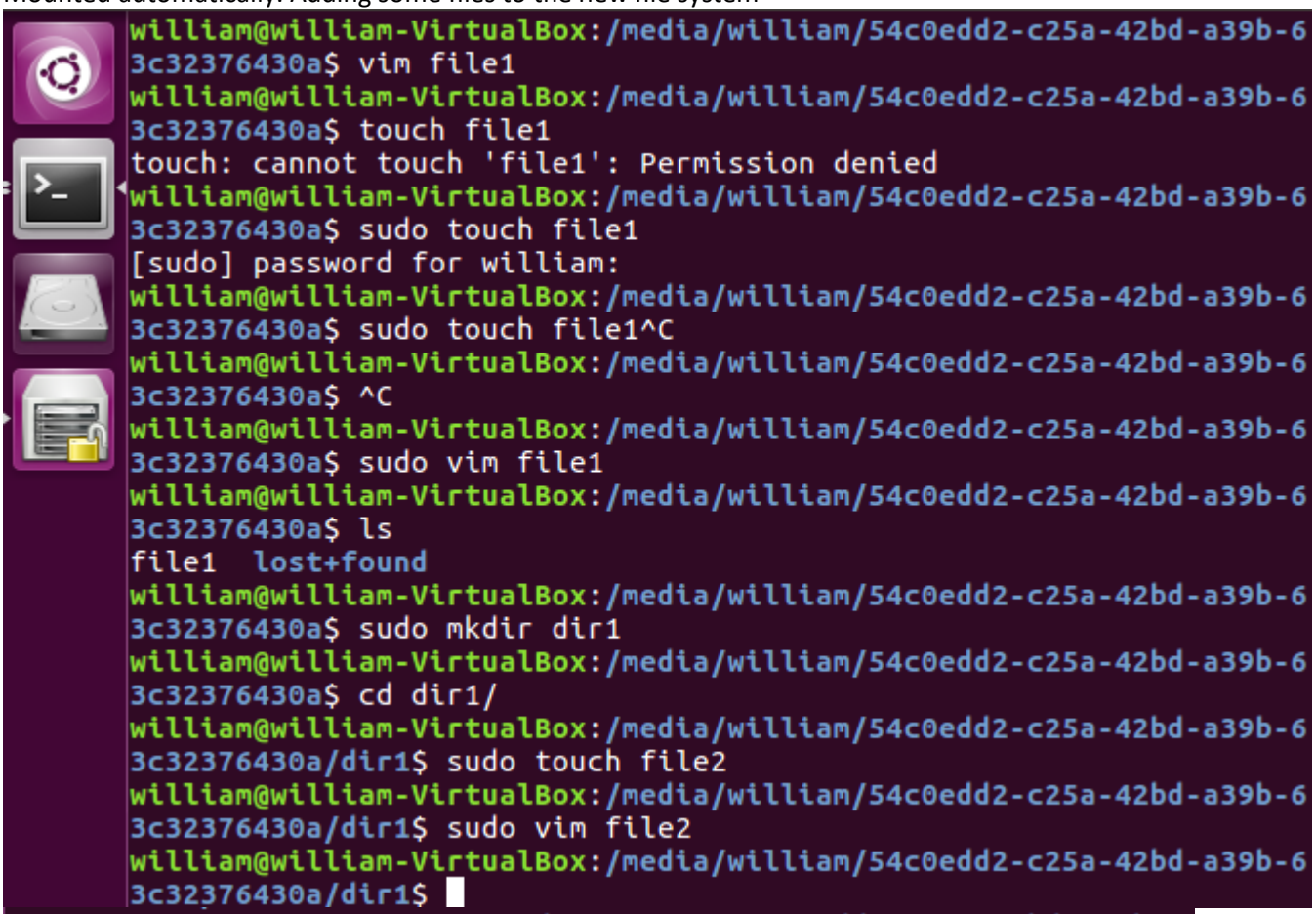
Creating file system on that volume

```
william@william-VirtualBox:~$ sudo mkfs.ext4 /dev/mapper/backup2
mke2fs 1.42.13 (17-May-2015)
Creating filesystem with 23488 1k blocks and 5880 inodes
Filesystem UUID: 54c0edd2-c25a-42bd-a39b-63c32376430a
Superblock backups stored on blocks:
        8193

Allocating group tables: done
Writing inode tables: done
Creating journal (1024 blocks): done
Writing superblocks and filesystem accounting information: done

william@william-VirtualBox:~$
```

Mounted automatically. Adding some files to the new file system




```
william@william-VirtualBox:/media/william/54c0edd2-c25a-42bd-a39b-6
3c32376430a$ ls -al
total 19
drwxr-xr-x  4 root root  1024 Feb 25 12:34 .
drwxr-x---+ 3 root root  4096 Feb 25 12:32 ..
drwxr-xr-x  2 root root  1024 Feb 25 12:34 dir1
-rw-r--r--  1 root root    12 Feb 25 12:33 file1
drwx------  2 root root 12288 Feb 25 12:28 lost+found
william@william-VirtualBox:/media/william/54c0edd2-c25a-42bd-a39b-6
3c32376430a$
```

Mounting manually after unmounting by UI.

```
william@william-VirtualBox:~$ sudo mount /dev/mapper/backup2 /media
/
william@william-VirtualBox:~$ ls /media/ -l
total 14
drwxr-xr-x 2 root root  1024 Feb 25 12:34 dir1
-rw-r--r-- 1 root root    12 Feb 25 12:33 file1
drwx------ 2 root root 12288 Feb 25 12:28 lost+found
william@william-VirtualBox:~$
```

Still containing file1 and directory created.

Unmounting /media, closing the file system with LukClose, and verifying