Desafío 5
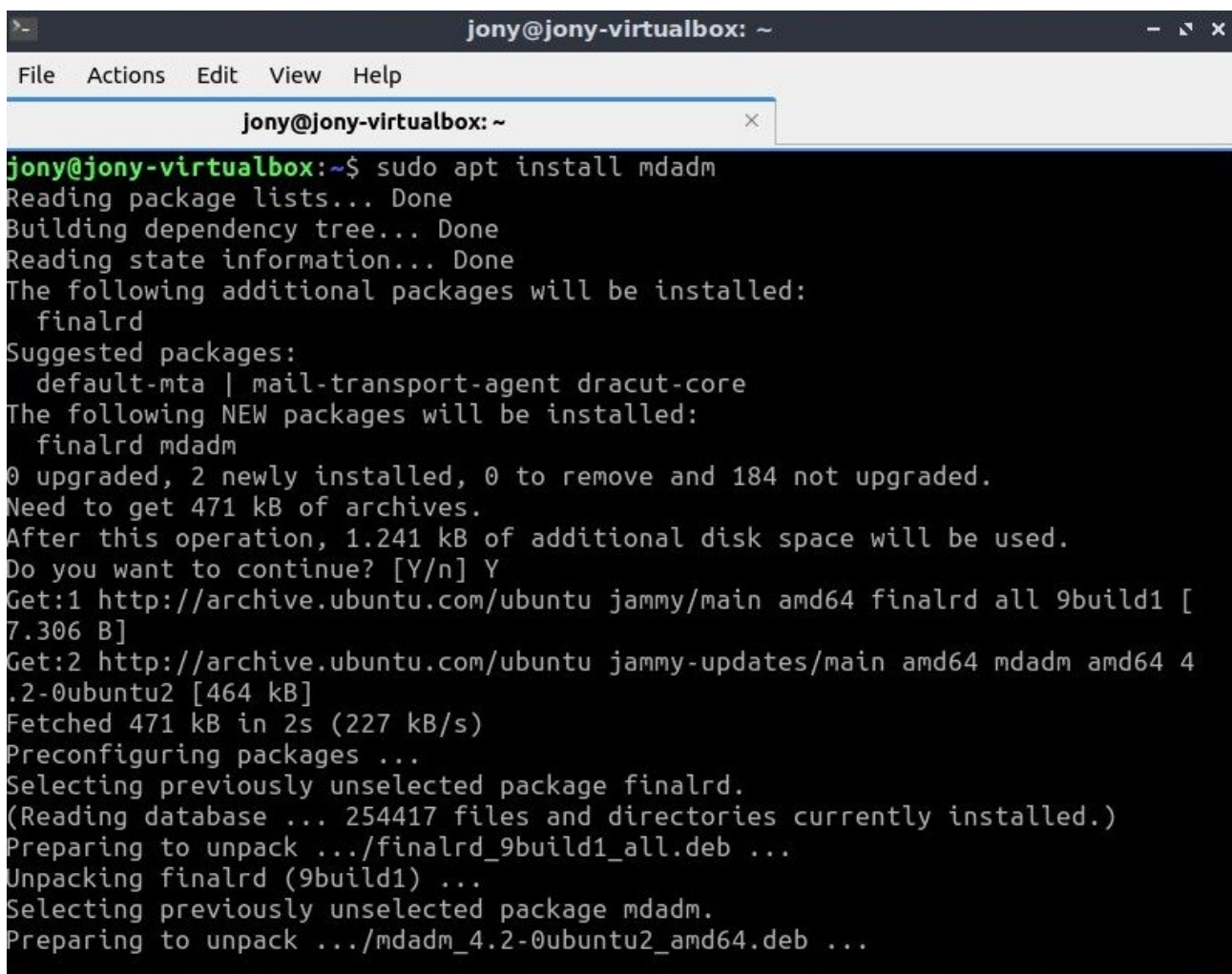## Creación de Volúmenes Lógicos y RAIDs en Linux

Objetivo:

Configurar volúmenes lógicos (LVM) y RAIDs en un sistema Ubuntu. La práctica cubrirá la creación de un RAID 1 para redundancia y la configuración de un volumen lógico para la gestión flexible del almacenamiento.

1. Instalar mdadm

```
sudo apt update

sudo apt install mdadm
```

2. Crear el RAID 1

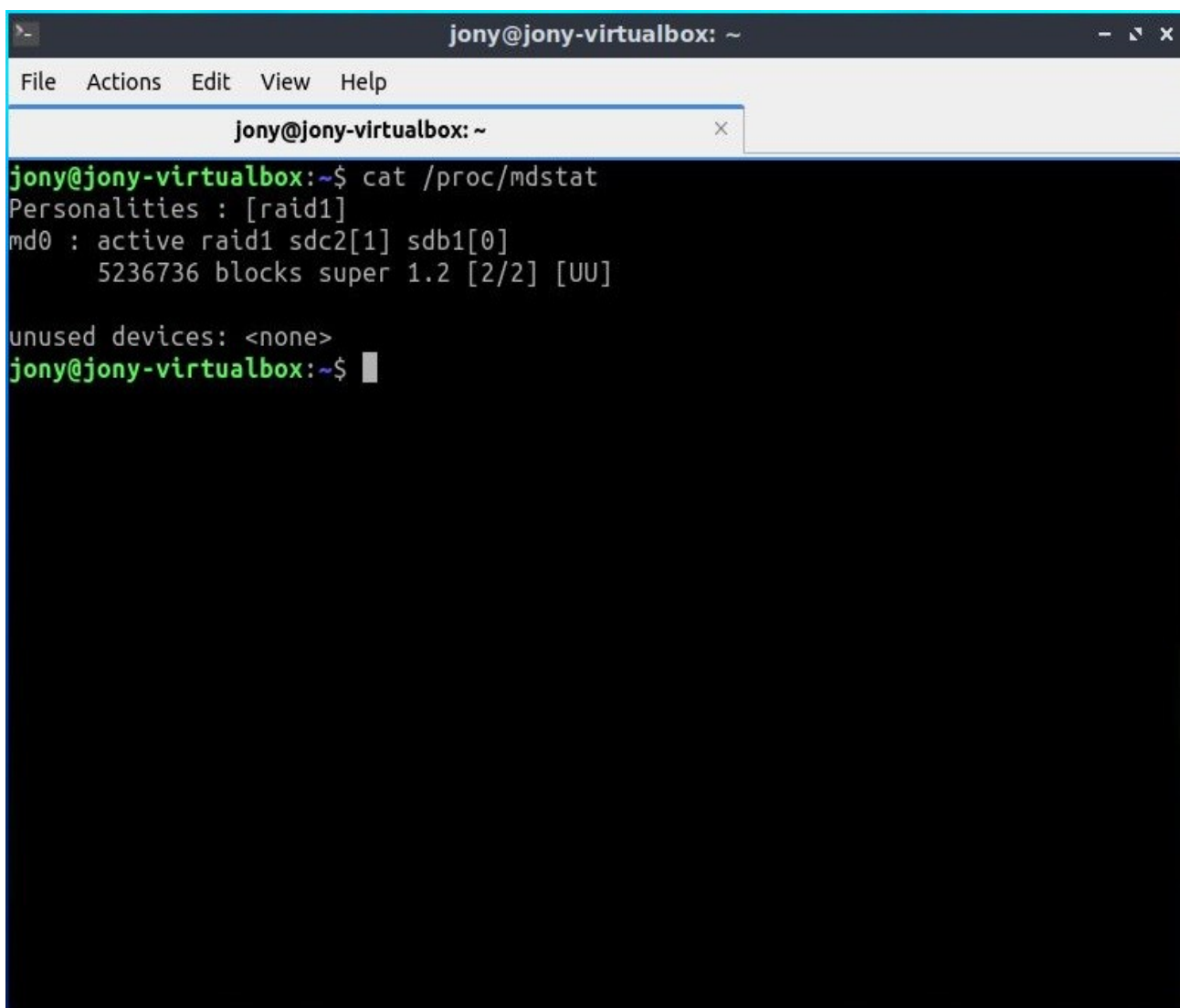Se usa `mdadm` para crear un RAID 1 con los dos discos:

```
sudo mdadm --create --verbose /dev/md0 --level=1 --raid-devices=2 /dev/sdb1
/dev/sdc1
```

3. Verificar el RAID

Comprobar el estado del RAID:

cat /proc/mdstat

sudo mdadm --detail /dev/md0

```
jony@jony-virtualbox:~$ sudo mdadm --detail /dev/md0
[sudo] password for jony:
/dev/md0:
           Version : 1.2
     Creation Time : Thu Jul 25 16:00:32 2024
        Raid Level : raid1
        Array Size : 5236736 (4.99 GiB 5.36 GB)
     Used Dev Size : 5236736 (4.99 GiB 5.36 GB)
      Raid Devices : 2
     Total Devices : 2
       Persistence : Superblock is persistent

       Update Time : Thu Jul 25 16:00:59 2024
             State : clean
    Active Devices : 2
   Working Devices : 2
    Failed Devices : 0
     Spare Devices : 0

Consistency Policy : resync

              Name : jony-virtualbox:0  (local to host jony-virtualbox)
              UUID : af573687:24bf32d4:29404594:ee9b1258
            Events : 17

    Number   Major   Minor   RaidDevice State
       0       8       17        0      active sync   /dev/sdb1
       1       8       34        1      active sync   /dev/sdc2
jony@jony-virtualbox:~$
```

4. Configurar el RAID para que se Inicie Automáticamente

Guardar la configuración del RAID:

sudo mdadm --detail --scan | sudo tee -a /etc/mdadm/mdadm.conf

sudo update-initramfs -u
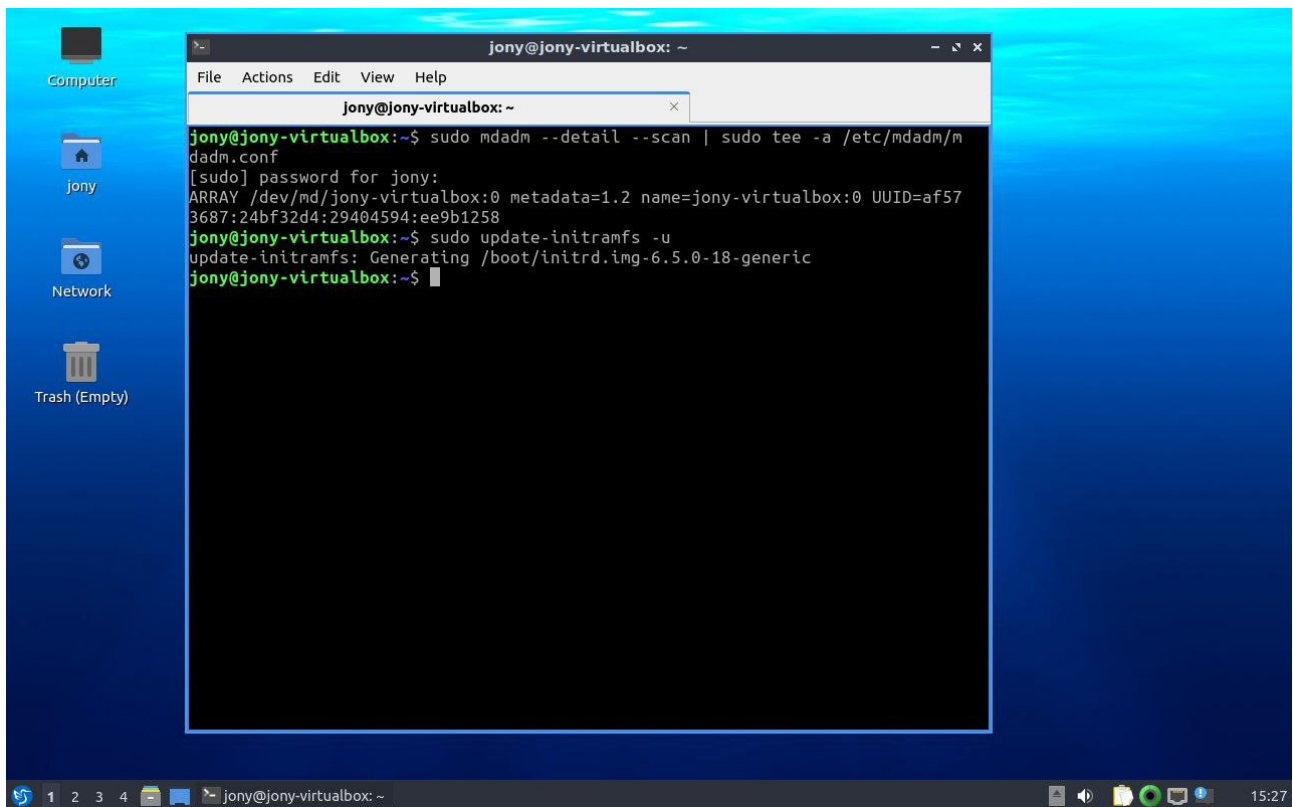
Configuración de Volúmenes Lógicos con LVM

1. Crear Volúmenes Físicos (PV)

sudo pvcreate /dev/md127

```
                    jony@jony-virtualbox: ~                    ×

Disk /dev/sdc: 5 GiB, 5368709120 bytes, 10485760 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: 0xce336971

Device     Boot Start      End  Sectors Size Id Type
/dev/sdc2        2048 10485759 10483712   5G 83 Linux


Disk /dev/md127: 4,99 GiB, 5362417664 bytes, 10473472 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
jony@jony-virtualbox:~$ cat /proc/mdstat
Personalities : [raid1] [linear] [multipath] [raid0] [raid6] [raid5] [raid4]
[raid10]
md127 : active (auto-read-only) raid1 sdb1[0] sdc2[1]
      5236736 blocks super 1.2 [2/2] [UU]

unused devices: <none>
jony@jony-virtualbox:~$ sudo pvcreate /dev/md127
  Physical volume "/dev/md127" successfully created.
jony@jony-virtualbox:~$ 
```

2. Crear un Grupo de Volúmenes (VG)

Crea un grupo de volúmenes llamado `vg_data`:

sudo vgcreate vg_data /dev/md0

```
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: 0xce336971

Device     Boot Start       End  Sectors Size Id Type
/dev/sdc2          2048 10485759 10483712   5G 83 Linux


Disk /dev/md127: 4,99 GiB, 5362417664 bytes, 10473472 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
jony@jony-virtualbox:~$ cat /proc/mdstat
Personalities : [raid1] [linear] [multipath] [raid0] [raid6] [raid5] [raid4]
[raid10]
md127 : active (auto-read-only) raid1 sdb1[0] sdc2[1]
      5236736 blocks super 1.2 [2/2] [UU]

unused devices: <none>
jony@jony-virtualbox:~$ sudo pvcreate /dev/md127
  Physical volume "/dev/md127" successfully created.
jony@jony-virtualbox:~$ sudo vgcreate vg_data /dev/md127
  Volume group "vg_data" successfully created
jony@jony-virtualbox:~$
```

3. Crear Volúmenes Lógicos (LV)

Crea un volumen lógico llamado `lv_data` dentro del grupo de volúmenes `vg_data`:

sudo lvcreate -n lv_data -l 100%FREE vg_data

```
Device      Boot Start       End  Sectors Size Id Type
/dev/sdc2        2048 10485759 10483712   5G 83 Linux


Disk /dev/md127: 4,99 GiB, 5362417664 bytes, 10473472 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
jony@jony-virtualbox:~$ cat /proc/mdstat
Personalities : [raid1] [linear] [multipath] [raid0] [raid6] [raid5] [raid4]
[raid10]
md127 : active (auto-read-only) raid1 sdb1[0] sdc2[1]
      5236736 blocks super 1.2 [2/2] [UU]

unused devices: <none>
jony@jony-virtualbox:~$ sudo pvcreate /dev/md127
  Physical volume "/dev/md127" successfully created.
jony@jony-virtualbox:~$ sudo vgcreate vg_data /dev/md127
  Volume group "vg_data" successfully created
jony@jony-virtualbox:~$ sudo lvcreate /n lv_data -l 100%FREE vg_data
[sudo] password for jony:
  Volume group name expected (no slash)
  Run `lvcreate --help' for more information.
jony@jony-virtualbox:~$ sudo lvcreate -n lv_data -l 100%FREE vg_data
  Logical volume "lv_data" created.
jony@jony-virtualbox:~$ █
```

4. Formatear y Montar el Volumen Lógico

Formatea el volumen lógico con el sistema de archivos ext4:

sudo mkfs.ext4 /dev/vg_data/lv_data

```
jony@jony-virtualbox:~$ sudo mkfs.ext4 /dev/vg_data/lv_data
mke2fs 1.46.5 (30-Dec-2021)
Creating filesystem with 1308672 4k blocks and 327680 inodes
Filesystem UUID: 6d87d2b2-a397-4856-9159-cc6cebce75ca
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

jony@jony-virtualbox:~$ █
```

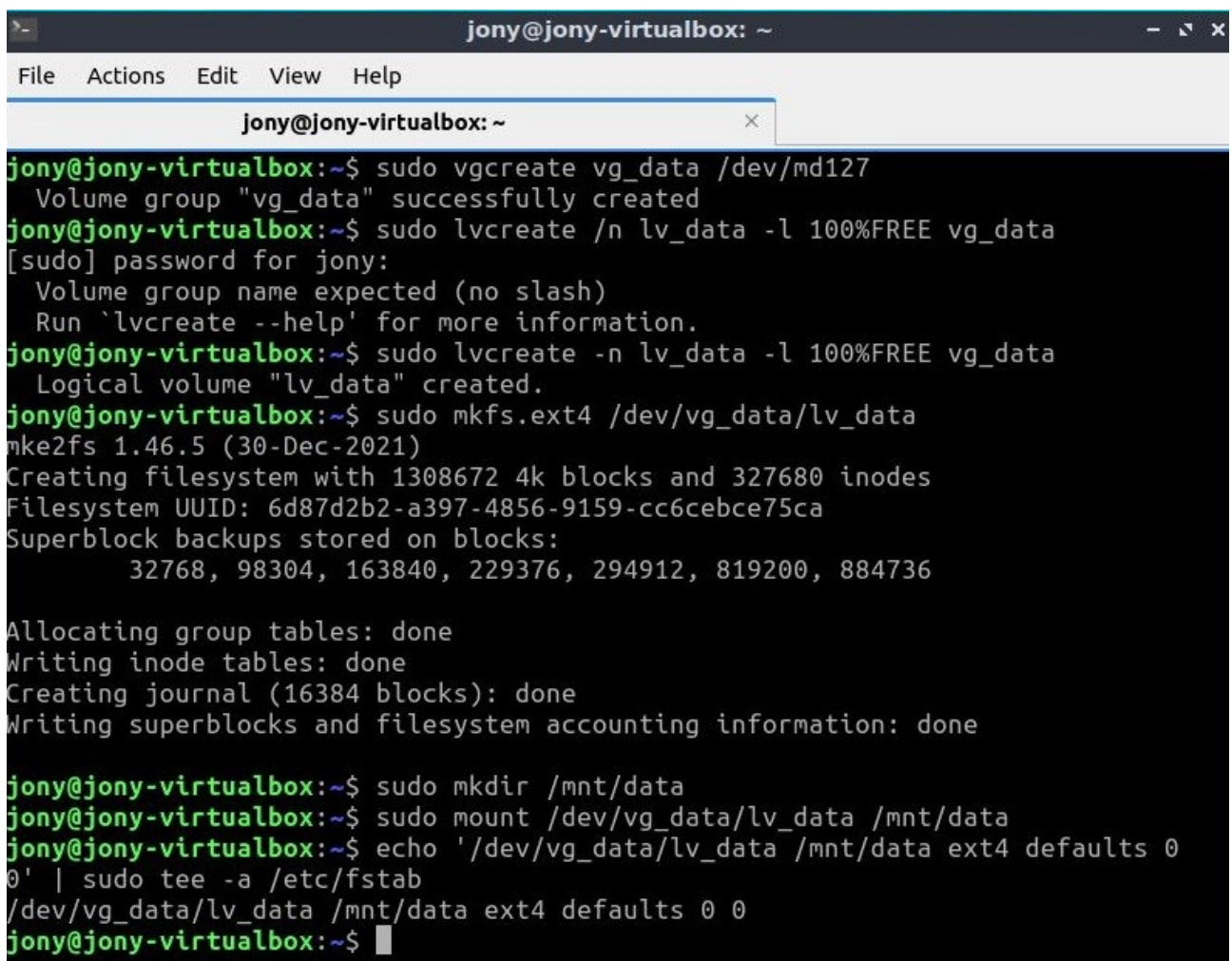Crea un punto de montaje y monta el volumen lógico:

sudo mkdir /mnt/data

sudo mount /dev/vg_data/lv_data /mnt/data

```
jony@jony-virtualbox:~$ sudo mkdir /mnt/data
jony@jony-virtualbox:~$ sudo mount /dev/vg_data/lv_data /mnt/data
jony@jony-virtualbox:~$ 
```

5. Configurar el Montaje Automático

Añade el volumen lógico a `/etc/fstab` para que se monte automáticamente al iniciar el sistema:

echo '/dev/vg_data/lv_data /mnt/data ext4 defaults 0 0' | sudo tee -a /etc/fstab

```
jony@jony-virtualbox: ~                                              – ⋯ ×
File   Actions   Edit   View   Help
          jony@jony-virtualbox: ~                         ×
jony@jony-virtualbox:~$ sudo vgcreate vg_data /dev/md127
  Volume group "vg_data" successfully created
jony@jony-virtualbox:~$ sudo lvcreate /n lv_data -l 100%FREE vg_data
[sudo] password for jony:
  Volume group name expected (no slash)
  Run `lvcreate --help' for more information.
jony@jony-virtualbox:~$ sudo lvcreate -n lv_data -l 100%FREE vg_data
  Logical volume "lv_data" created.
jony@jony-virtualbox:~$ sudo mkfs.ext4 /dev/vg_data/lv_data
mke2fs 1.46.5 (30-Dec-2021)
Creating filesystem with 1308672 4k blocks and 327680 inodes
Filesystem UUID: 6d87d2b2-a397-4856-9159-cc6cebce75ca
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

jony@jony-virtualbox:~$ sudo mkdir /mnt/data
jony@jony-virtualbox:~$ sudo mount /dev/vg_data/lv_data /mnt/data
jony@jony-virtualbox:~$ echo '/dev/vg_data/lv_data /mnt/data ext4 defaults 0
0' | sudo tee -a /etc/fstab
/dev/vg_data/lv_data /mnt/data ext4 defaults 0 0
jony@jony-virtualbox:~$ 
```
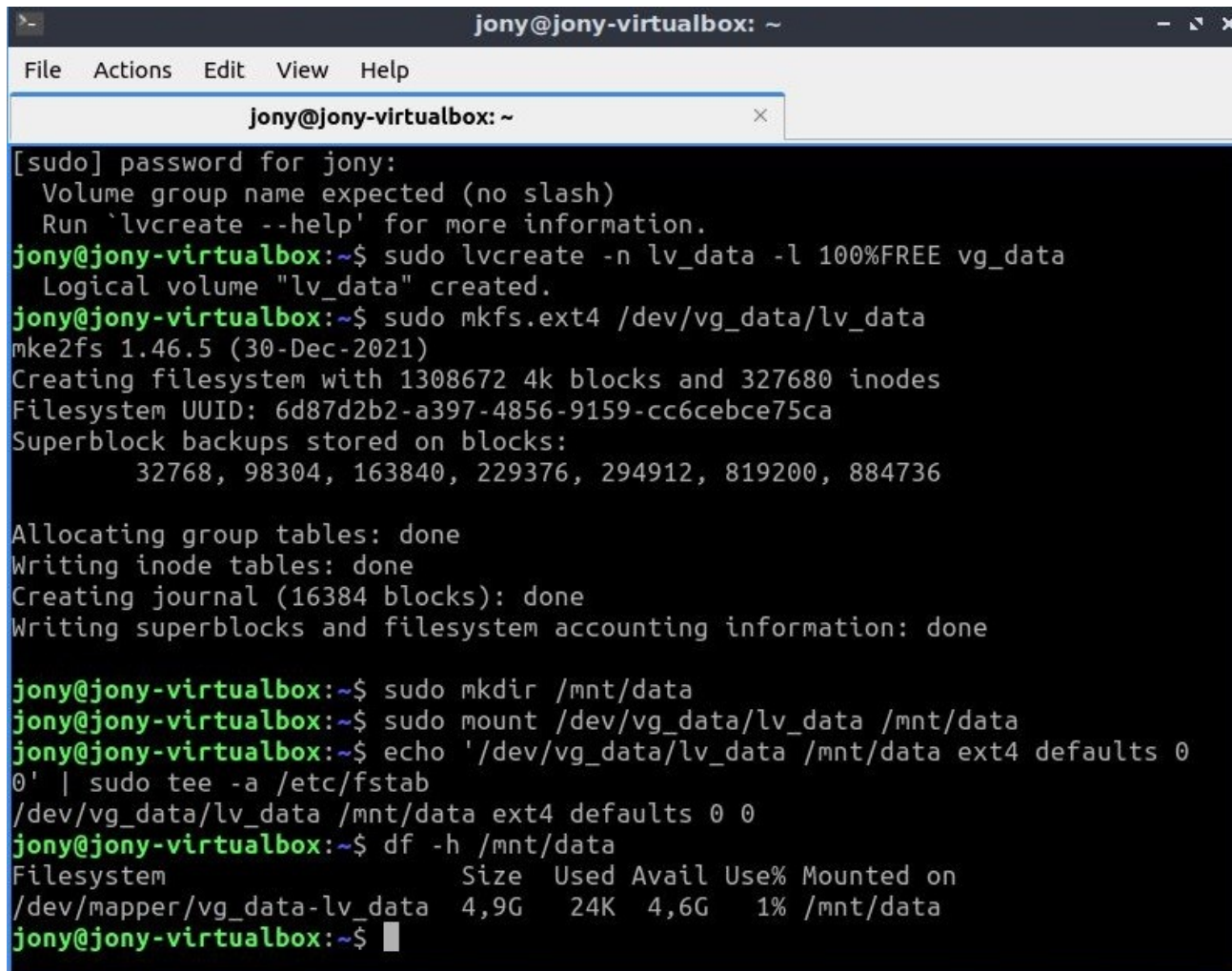
Verificación y Simulación de Recuperación Ante Fallos

1. Verificar el Volumen Lógico y RAID

Verifica que el volumen lógico está montado correctamente:

df -h /mnt/data

Comprueba el estado del RAID:

sudo mdadm --detail /dev/md127

```
jony@jony-virtualbox:~$ sudo mdadm --detail /dev/md127
/dev/md127:
           Version : 1.2
     Creation Time : Thu Jul 25 16:00:32 2024
        Raid Level : raid1
        Array Size : 5236736 (4.99 GiB 5.36 GB)
     Used Dev Size : 5236736 (4.99 GiB 5.36 GB)
      Raid Devices : 2
     Total Devices : 2
       Persistence : Superblock is persistent

       Update Time : Sat Jul 27 12:25:48 2024
             State : clean
    Active Devices : 2
   Working Devices : 2
    Failed Devices : 0
     Spare Devices : 0

Consistency Policy : resync

              Name : jony-virtualbox:0  (local to host jony-virtualbox)
              UUID : af573687:24bf32d4:29404594:ee9b1258
            Events : 19

    Number   Major   Minor   RaidDevice State
       0       8       17        0      active sync   /dev/sdb1
```

2. Simular un Fallo de Disco

Simula un fallo en uno de los discos del RAID:

sudo mdadm /dev/md0 --fail /dev/sdb1

sudo mdadm /dev/md0 --remove /dev/sdb1

```
     Used Dev Size : 5236736 (4.99 GiB 5.36 GB)
      Raid Devices : 2
     Total Devices : 2
       Persistence : Superblock is persistent

       Update Time : Sat Jul 27 12:25:48 2024
             State : clean
     Active Devices : 2
    Working Devices : 2
     Failed Devices : 0
      Spare Devices : 0

Consistency Policy : resync

              Name : jony-virtualbox:0  (local to host jony-virtualbox)
              UUID : af573687:24bf32d4:29404594:ee9b1258
            Events : 19

    Number   Major   Minor   RaidDevice State
       0       8       17        0        active sync   /dev/sdb1
       1       8       34        1        active sync   /dev/sdc2
jony@jony-virtualbox:~$ sudo mdadm /dev/md127 --fail /dev/sdb1
mdadm: set /dev/sdb1 faulty in /dev/md127
jony@jony-virtualbox:~$ sudo mdadm /dev/md127 --remove /dev/sdb1
mdadm: hot removed /dev/sdb1 from /dev/md127
jony@jony-virtualbox:~$
```

3. Reemplazar el Disco Fallido

Supón que reemplazas el disco fallido con uno nuevo (por ejemplo, /dev/sdd).

Crea una nueva partición en el disco nuevo y añadir el nuevo disco al RAID:

sudo mdadm /dev/md0 --add /dev/sdd1


```
jony@jony-virtualbox:~$ sudo mdadm /dev/md127 --add /dev/sdd1
mdadm: added /dev/sdd1
jony@jony-virtualbox:~$
```

4. Verificar la Recuperación del RAID

Verifica que el RAID está reconstruyéndose:

sudo mdadm --detail /dev/md127