Ubuntu

Install and Use Btrfs on Ubuntu 20.04 LTS

3 years ago • by Shahriar Shovon

Btrfs (B-Tree Filesystem) is a modern copy-on-write (CoW) filesystem for Linux. It aims to implement many advanced filesystem features while focusing on fault tolerance, repair, and easy administration. The Btrfs filesystem is designed to support the requirement of high performance and high-capacity storage servers.

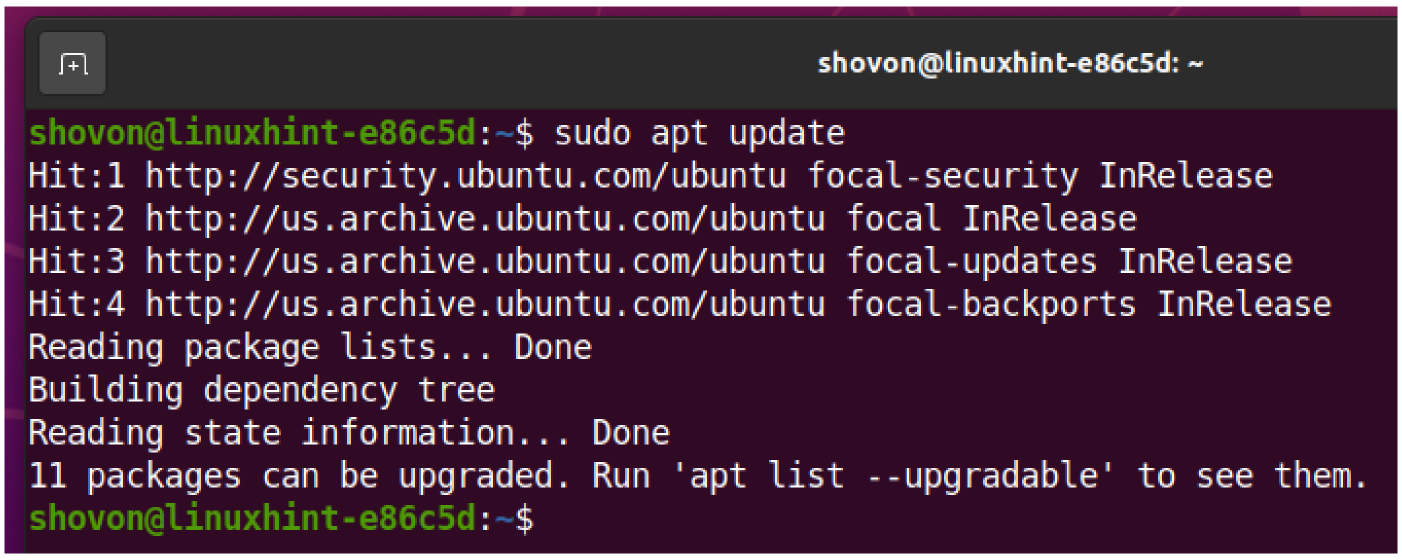
If you want to learn more about the Btrfs filesystem, check my article **Introduction to Btrfs Filesystem.**
In this article, I am going to show you how to install and use Btrfs on Ubuntu 20.04 LTS. So, let's get started.

Installing Btrfs Filesystem

The Btrfs filesystem package is available in the official package repository of Ubuntu 20.04 LTS, so you can easily install it from there.

First, update the APT package repository cache with the following command:

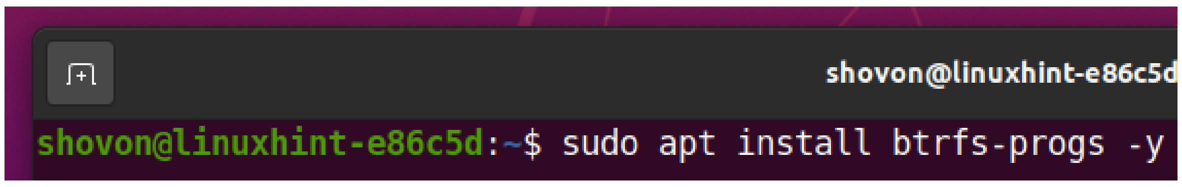
```
$ sudo apt update
```



```
shovon@linuxhint-e86c5d: ~
shovon@linuxhint-e86c5d:~$ sudo apt update
Hit:1 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:2 http://us.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
11 packages can be upgraded. Run 'apt list --upgradable' to see them.
shovon@linuxhint-e86c5d:~$
```

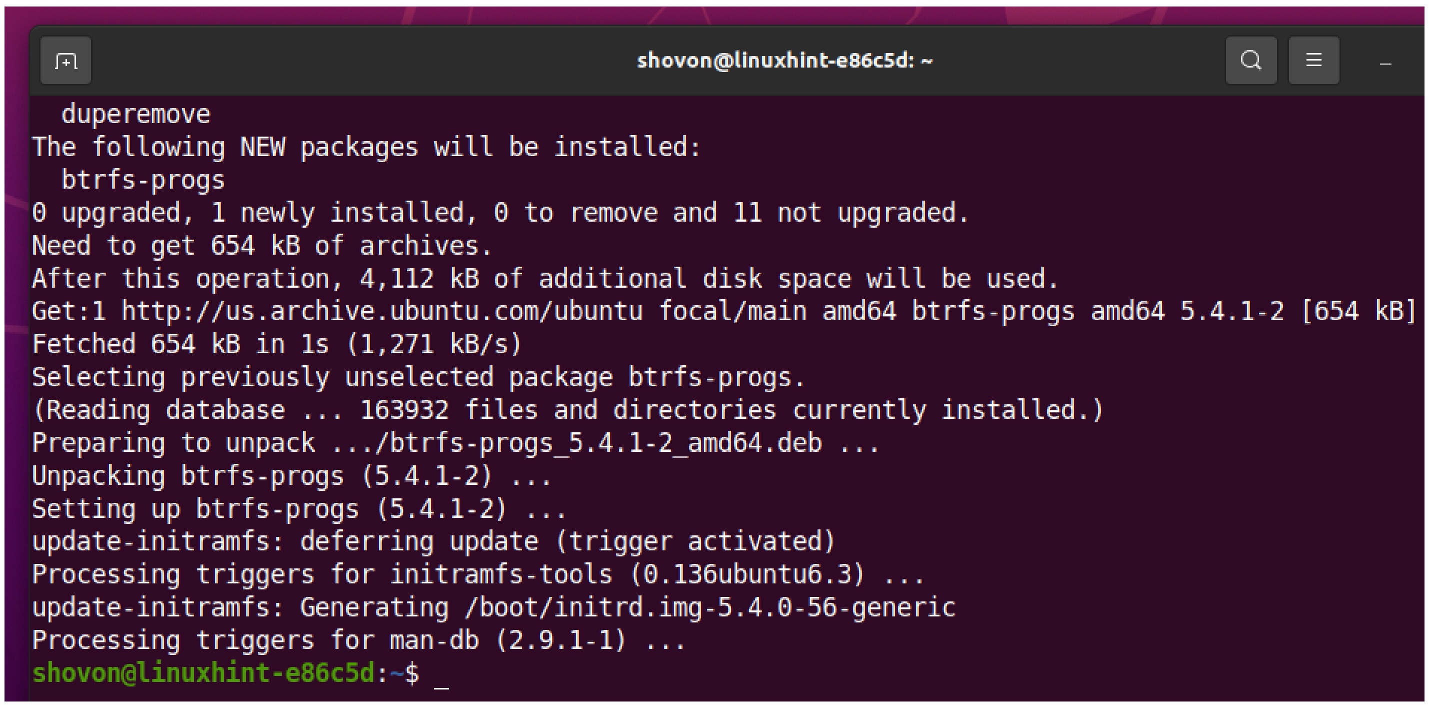
To install the Btrfs filesystem on Ubuntu 20.04 LTS, run the following command:

```
$ sudo apt install btrfs-progs -y
```



```
shovon@linuxhint-e86c5d
shovon@linuxhint-e86c5d:~$ sudo apt install btrfs-progs -y
```

The Btrfs filesystem should be installed.



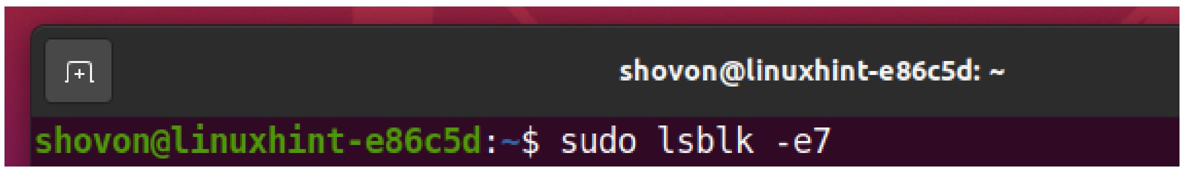
```
  duperemove
The following NEW packages will be installed:
  btrfs-progs
0 upgraded, 1 newly installed, 0 to remove and 11 not upgraded.
Need to get 654 kB of archives.
After this operation, 4,112 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu focal/main amd64 btrfs-progs amd64 5.4.1-2 [654 kB]
Fetched 654 kB in 1s (1,271 kB/s)
Selecting previously unselected package btrfs-progs.
(Reading database ... 163932 files and directories currently installed.)
Preparing to unpack .../btrfs-progs_5.4.1-2_amd64.deb ...
Unpacking btrfs-progs (5.4.1-2) ...
Setting up btrfs-progs (5.4.1-2) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for initramfs-tools (0.136ubuntu6.3) ...
update-initramfs: Generating /boot/initrd.img-5.4.0-56-generic
Processing triggers for man-db (2.9.1-1) ...
shovon@linuxhint-e86c5d:~$ _
```

Partitioning the Disk

You don't have to partition your HDD/SSD to create a Btrfs filesystem; you can create it on your bare unpartitioned HDD/SSD. But you may want to partition your HDD/SSD before you format your HDD/SSD with the Btrfs filesystem.

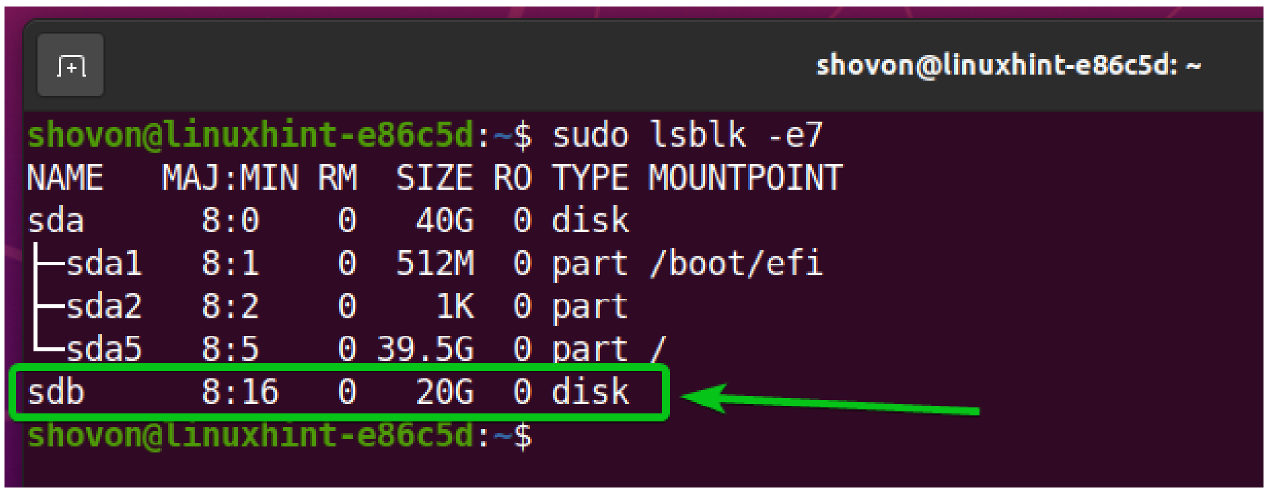
You can list all the storage devices and partitions of your computer with the following command:

```
$ sudo lsblk -e7
```



```
shovon@linuxhint-e86c5d:~$ sudo lsblk -e7
```

I have an HDD **sdb** on my computer, as you can see in the screenshot below. I will be partitioning the HDD **sdb** and formatting the partitions with the Btrfs filesystem for the demonstration in this article.

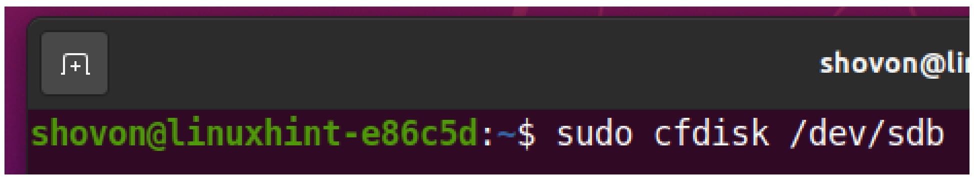


```
shovon@linuxhint-e86c5d:~$ sudo lsblk -e7
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda      8:0    0   40G  0 disk
├─sda1   8:1    0  512M  0 part /boot/efi
├─sda2   8:2    0    1K  0 part
└─sda5   8:5    0 39.5G  0 part /
sdb      8:16   0   20G  0 disk
shovon@linuxhint-e86c5d:~$
```

To partition the HDD **sdb**, I will use the **cfdisk** partitioning tool.

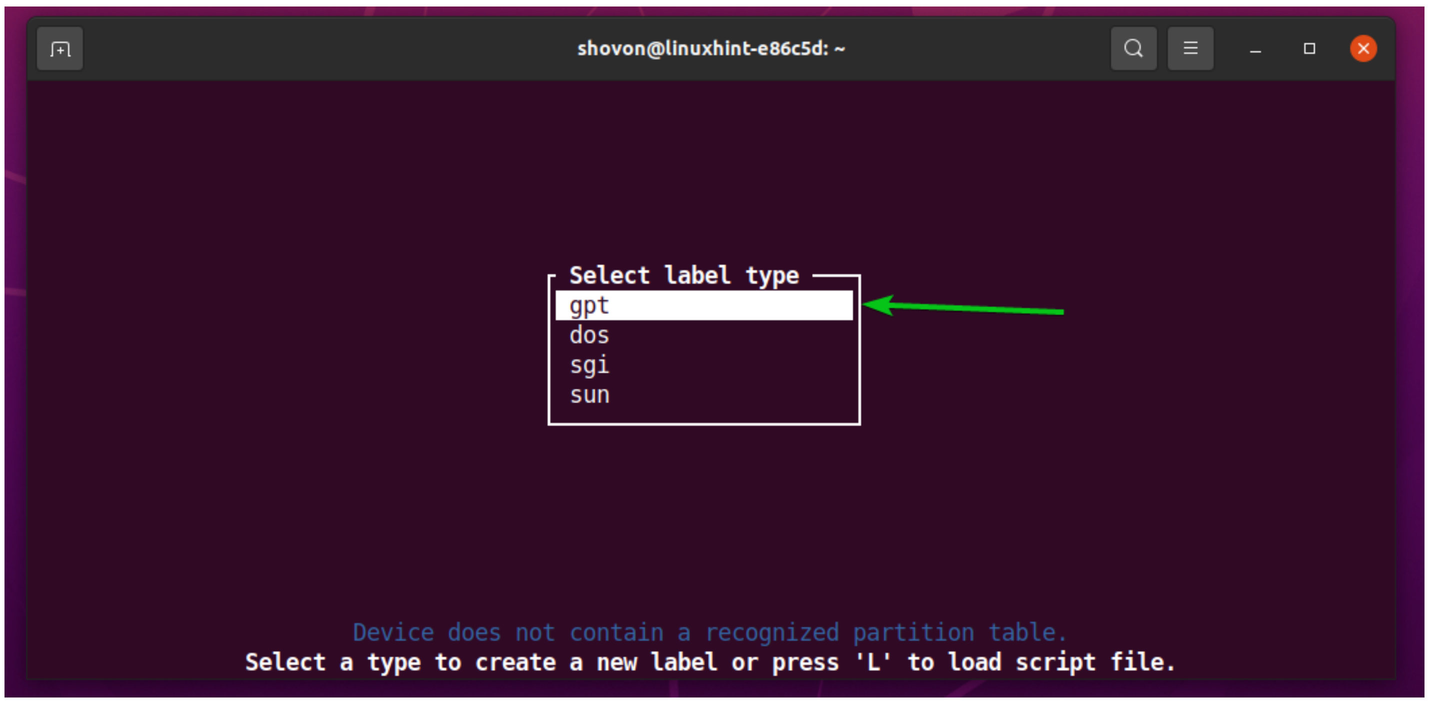
You can open the HDD **sdb** with the **cfdisk** partitioning tool as follows:

```
$ sudo cfdisk /dev/sdb
```



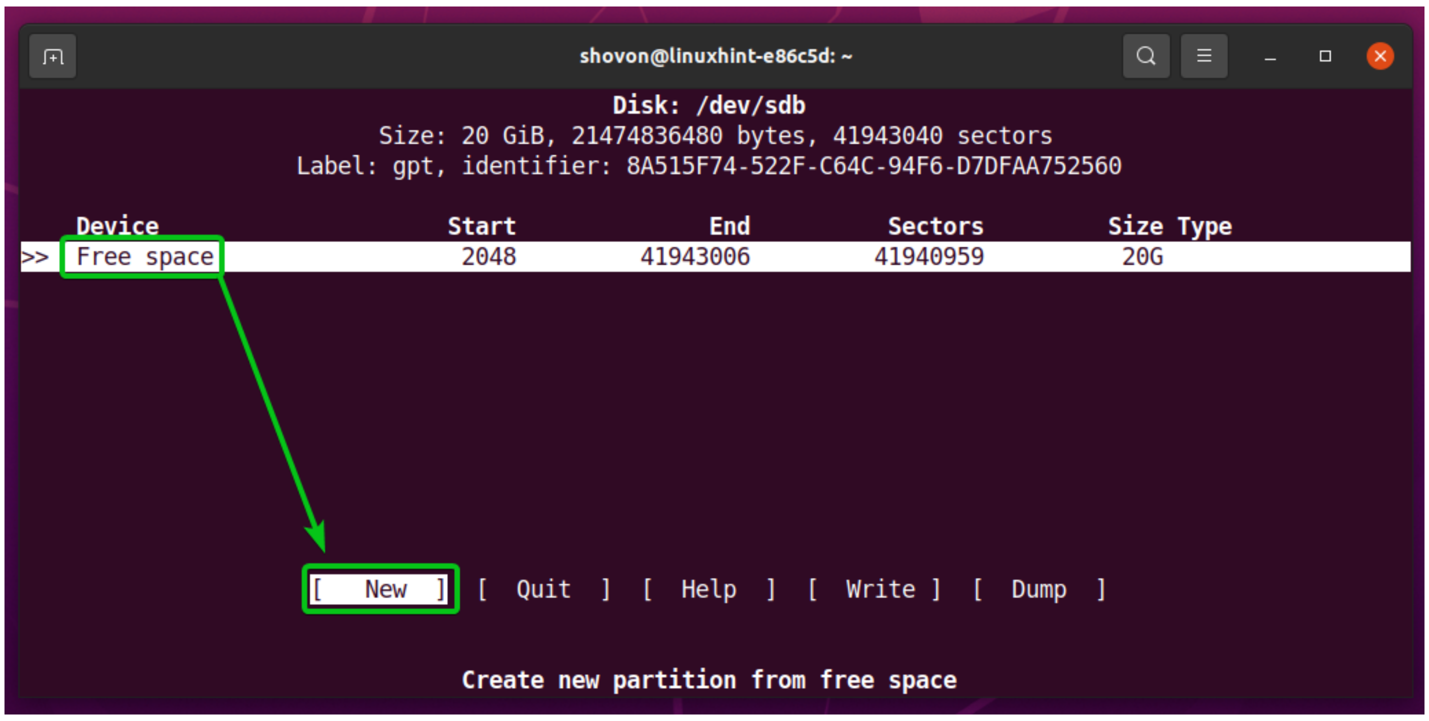
```
shovon@linuxhint-e86c5d:~$ sudo cfdisk /dev/sdb
```

Select **gpt** and press **<Enter>.**



```
Select label type
gpt
dos
sgi
sun

Device does not contain a recognized partition table.
Select a type to create a new label or press 'L' to load script file.
```

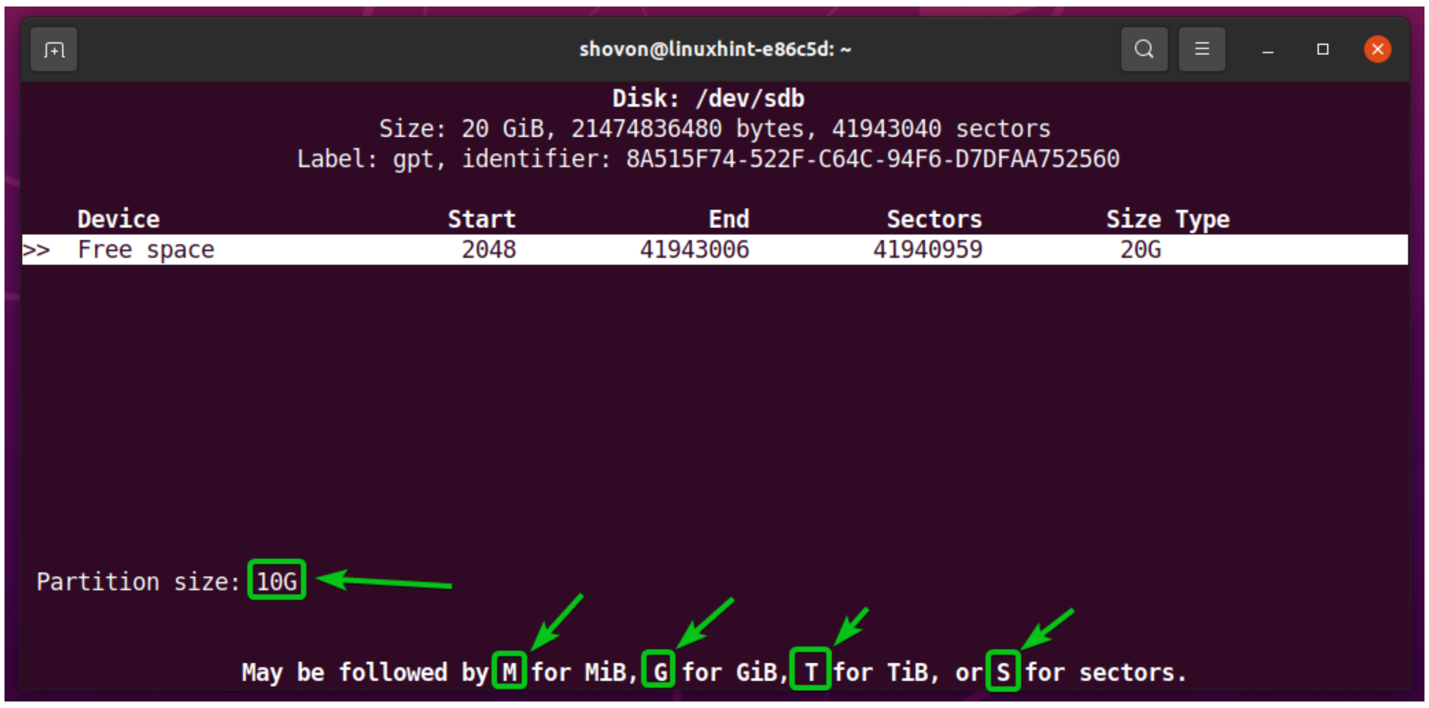
To create a new partition, select **Free space**, then select **[New]**, and press **<Enter>.**



```
                         Disk: /dev/sdb
         Size: 20 GiB, 21474836480 bytes, 41943040 sectors
   Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                     Start          End        Sectors     Size Type
>>  Free space                  2048     41943006       41940959      20G

          [  New  ]  [  Quit  ]  [  Help  ]  [  Write ]  [  Dump  ]

                    Create new partition from free space
```

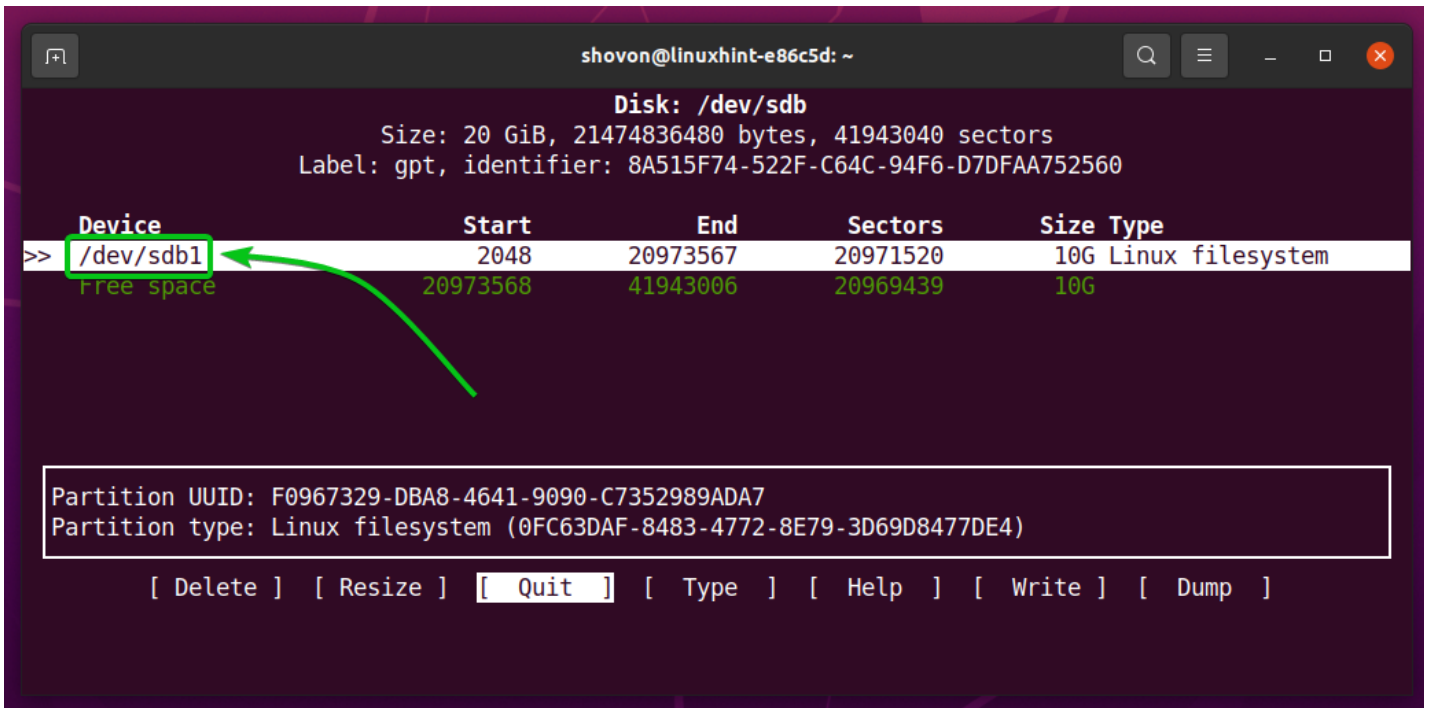
Type in the size of the partition you want to create. I will create a 10 GB partition. So, I will type in **10G**.

You can use the following symbols to create partitions of different sizes/units:
M – partition size in megabyte unit
G – partition size in gigabyte unit
T – partition size in terabyte unit
S –number of sectors you want to use for the partition
Once you're done, press **<Enter>.**



```
                         Disk: /dev/sdb
         Size: 20 GiB, 21474836480 bytes, 41943040 sectors
   Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                     Start          End        Sectors     Size Type
>>  Free space                  2048     41943006       41940959      20G

 Partition size: 10G

        May be followed by M for MiB, G for GiB, T for TiB, or S for sectors.
```

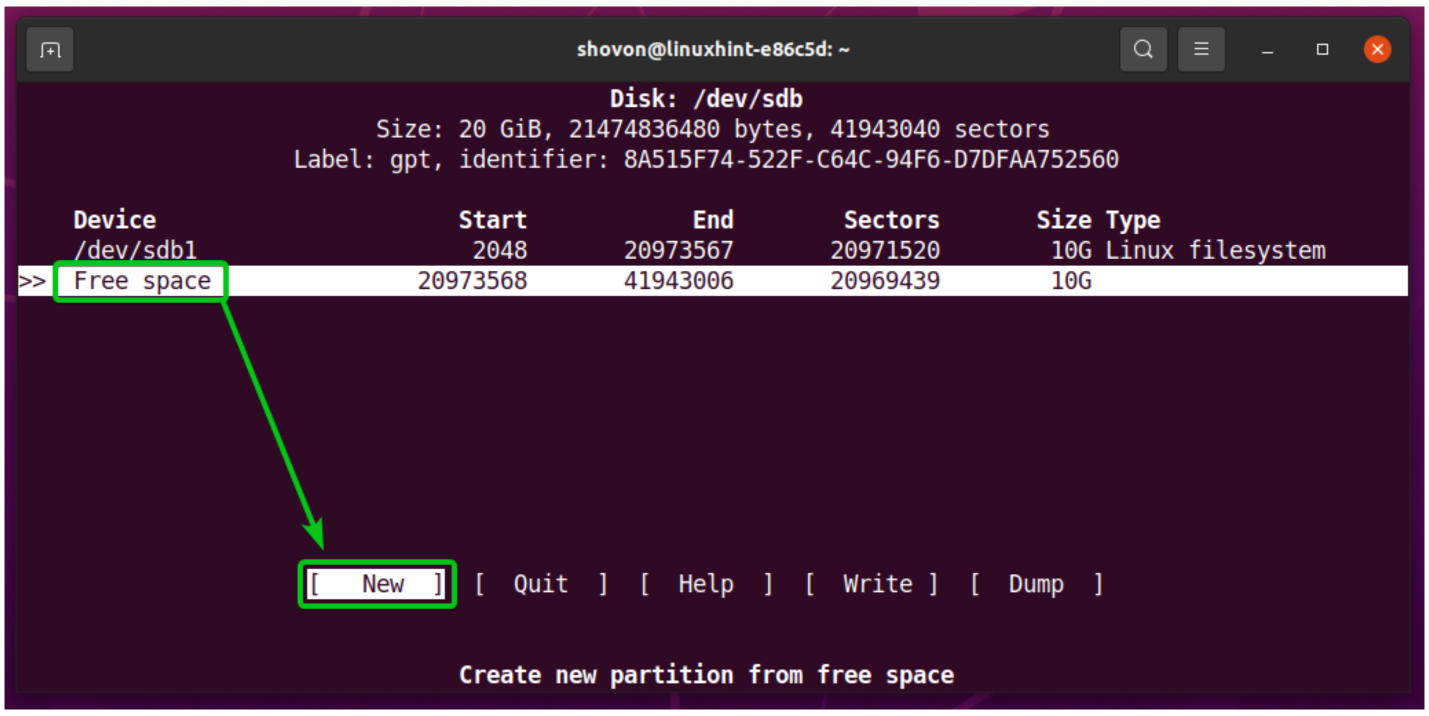
A new partition (**sdb1** in my case) should be created.



```
                              Disk: /dev/sdb
              Size: 20 GiB, 21474836480 bytes, 41943040 sectors
          Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
>>  /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
    Free space           20973568   41943006    20969439     10G

 Partition UUID: F0967329-DBA8-4641-9090-C7352989ADA7
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

        [ Delete ]  [ Resize ]  [  Quit  ]  [  Type  ]  [  Help  ]  [  Write ]  [  Dump  ]
```

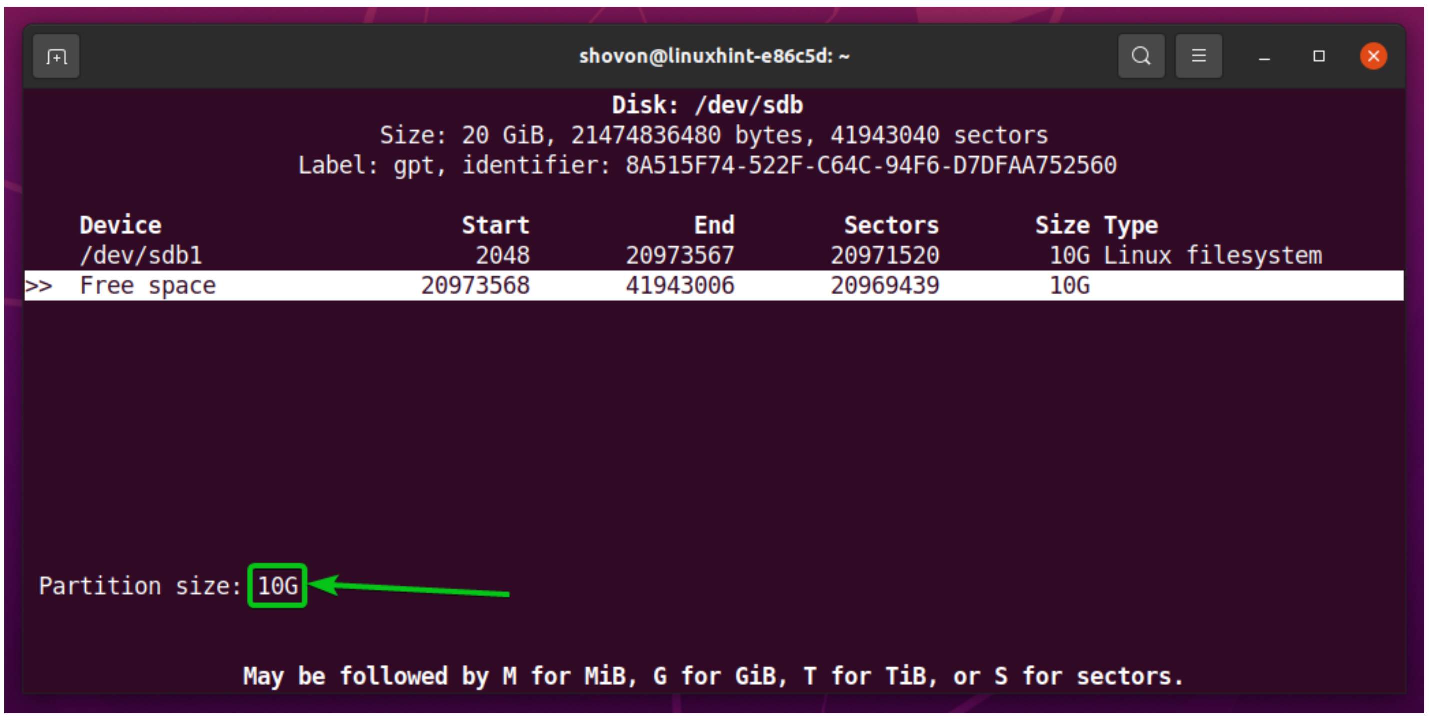
Let’s create another partition.

To do that, select the **Free space**, then select **[New]**, and press **<Enter>.**



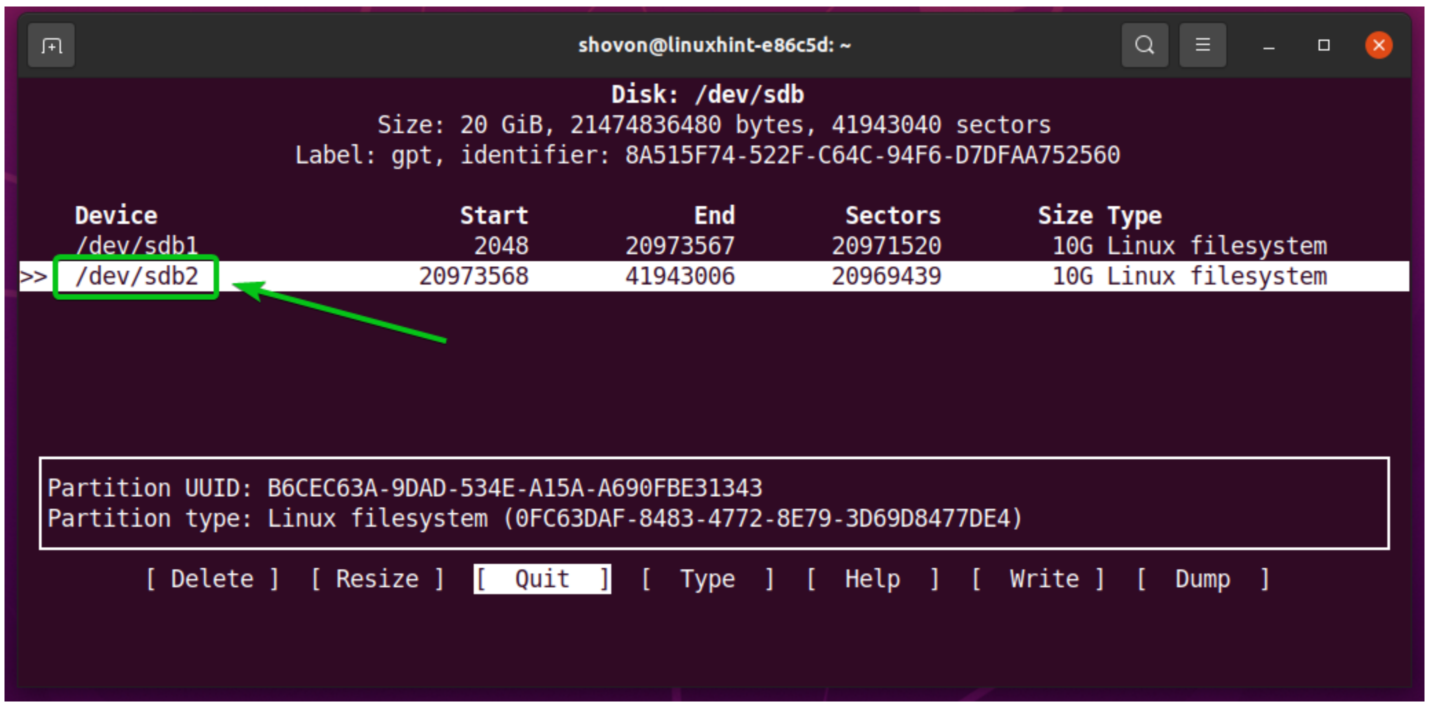
```
                              Disk: /dev/sdb
              Size: 20 GiB, 21474836480 bytes, 41943040 sectors
          Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
    /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
>>  Free space           20973568   41943006    20969439     10G

                  [   New   ]  [  Quit  ]  [  Help  ]  [  Write ]  [  Dump  ]

                          Create new partition from free space
```

Type in the size of the partition, and press **<Enter>.**



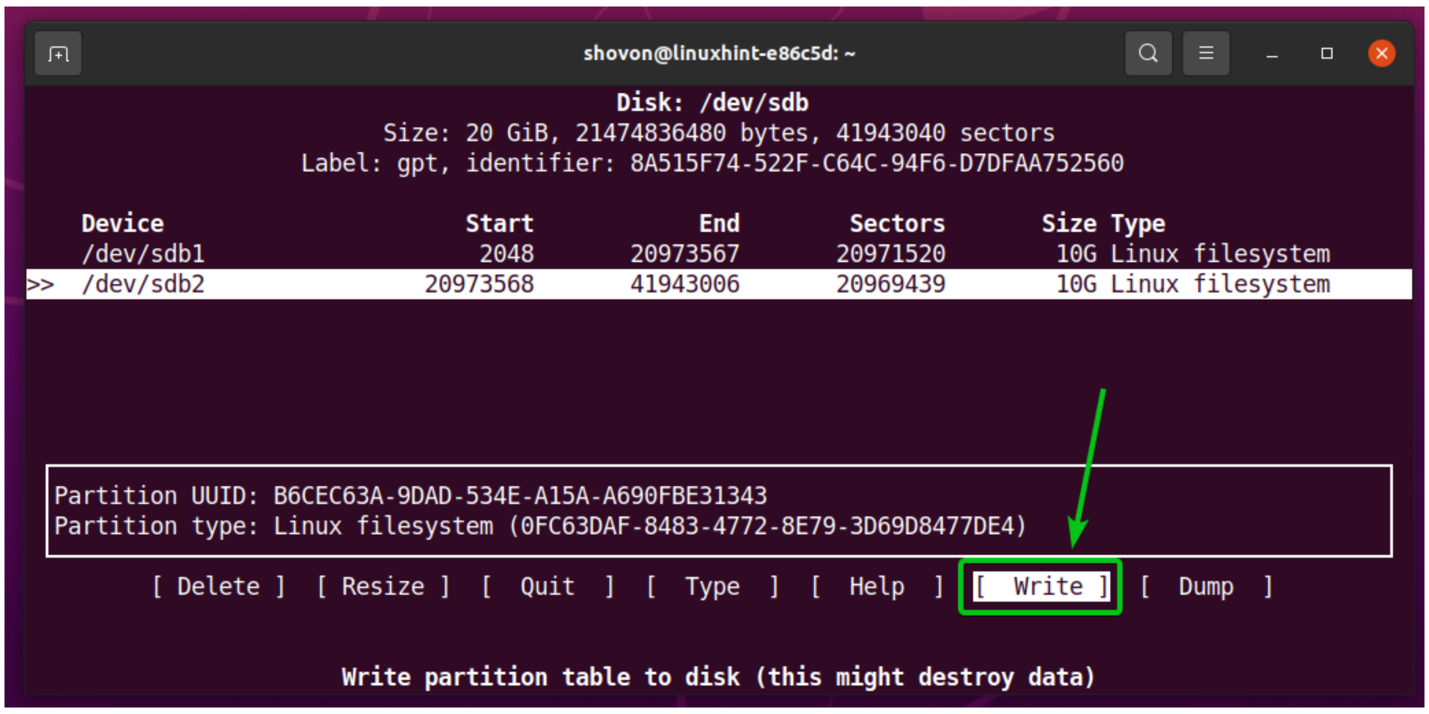
```
                              Disk: /dev/sdb
              Size: 20 GiB, 21474836480 bytes, 41943040 sectors
          Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
    /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
>>  Free space           20973568   41943006    20969439     10G

 Partition size: 10G

            May be followed by M for MiB, G for GiB, T for TiB, or S for sectors.
```

A new partition (**sdb2** in my case) should be created.



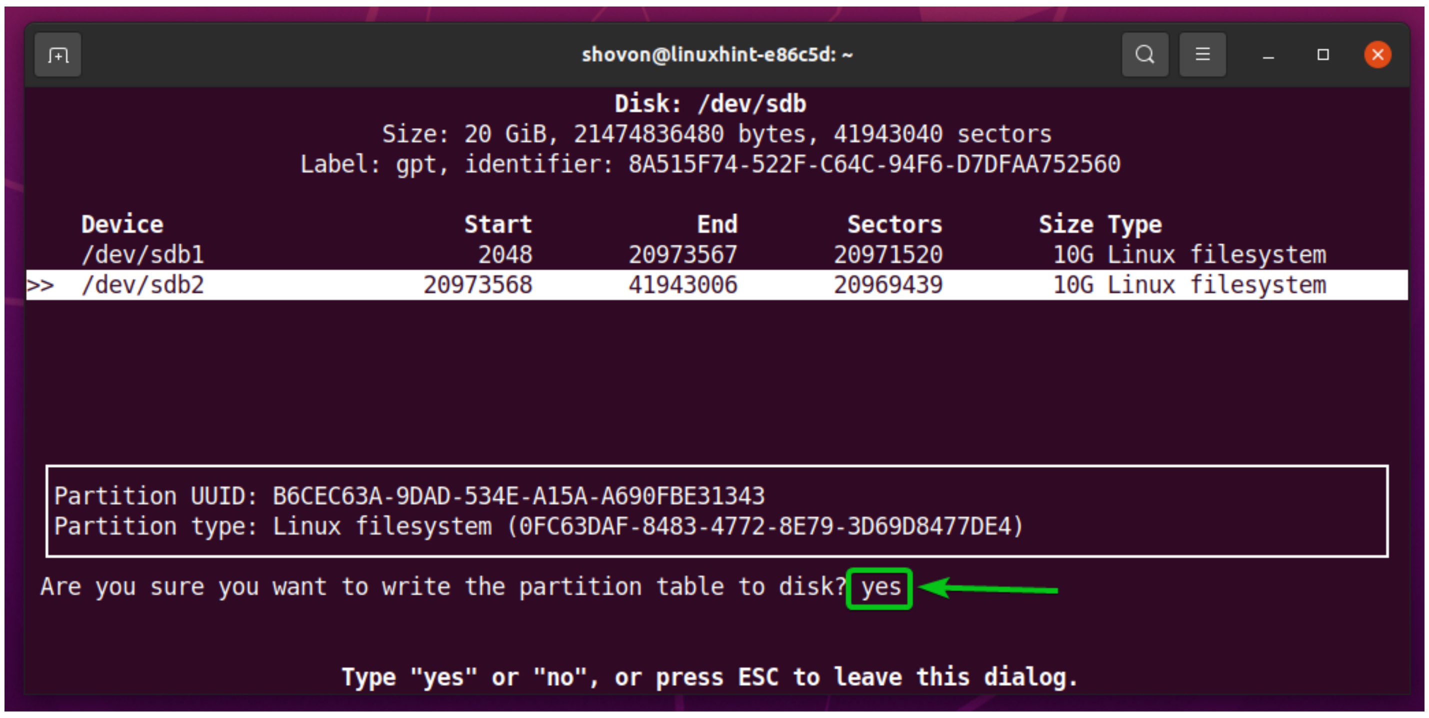
```
                          Disk: /dev/sdb
          Size: 20 GiB, 21474836480 bytes, 41943040 sectors
      Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
    /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
>>  /dev/sdb2            20973568   41943006    20969439     10G Linux filesystem

 Partition UUID: B6CEC63A-9DAD-534E-A15A-A690FBE31343
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

     [ Delete ]  [ Resize ]  [  Quit  ]  [  Type  ]  [  Help  ]  [  Write ]  [  Dump  ]
```

To write the changes to the disk, select **[Write]** and press **<Enter>.**



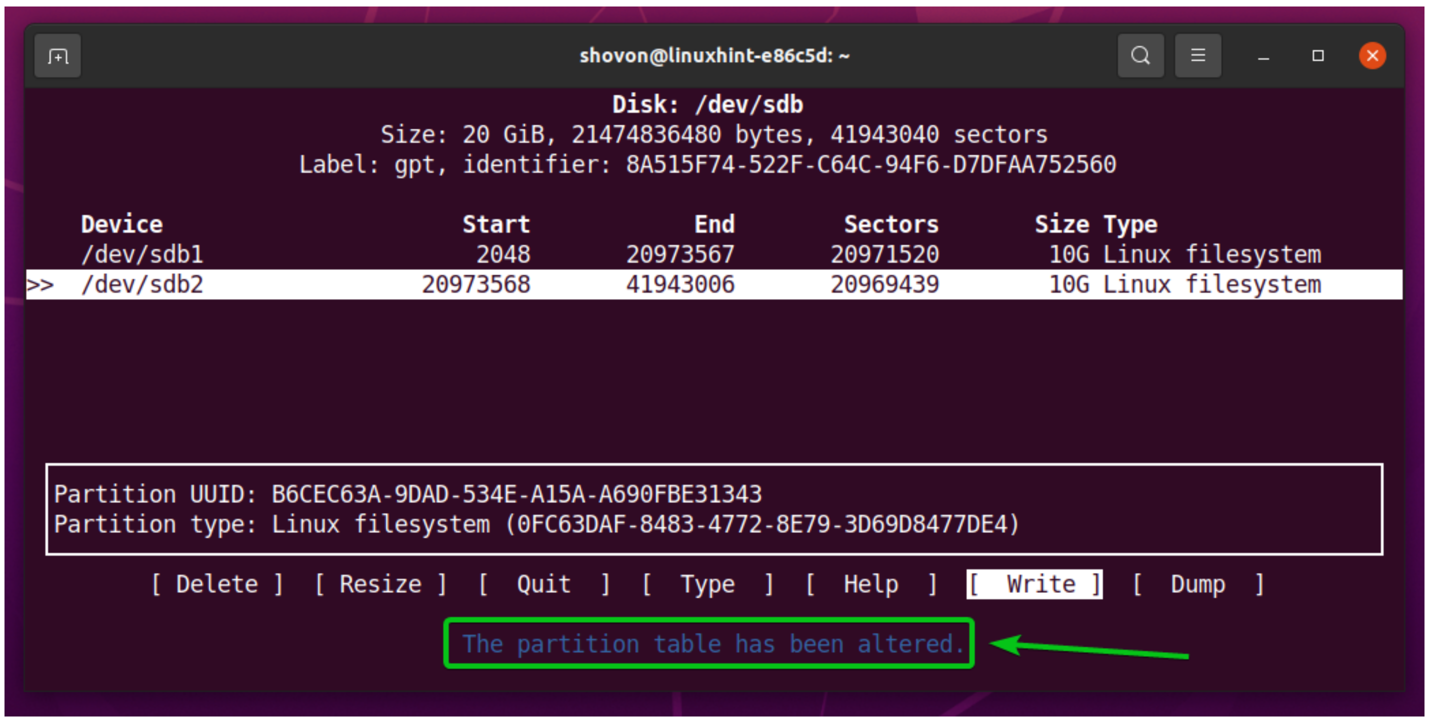
```
                          Disk: /dev/sdb
          Size: 20 GiB, 21474836480 bytes, 41943040 sectors
      Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
    /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
>>  /dev/sdb2            20973568   41943006    20969439     10G Linux filesystem

 Partition UUID: B6CEC63A-9DAD-534E-A15A-A690FBE31343
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

     [ Delete ]  [ Resize ]  [  Quit  ]  [  Type  ]  [  Help  ]  [  Write ]  [  Dump  ]

             Write partition table to disk (this might destroy data)
```

To confirm the changes, type in **yes** and press **<Enter>.**



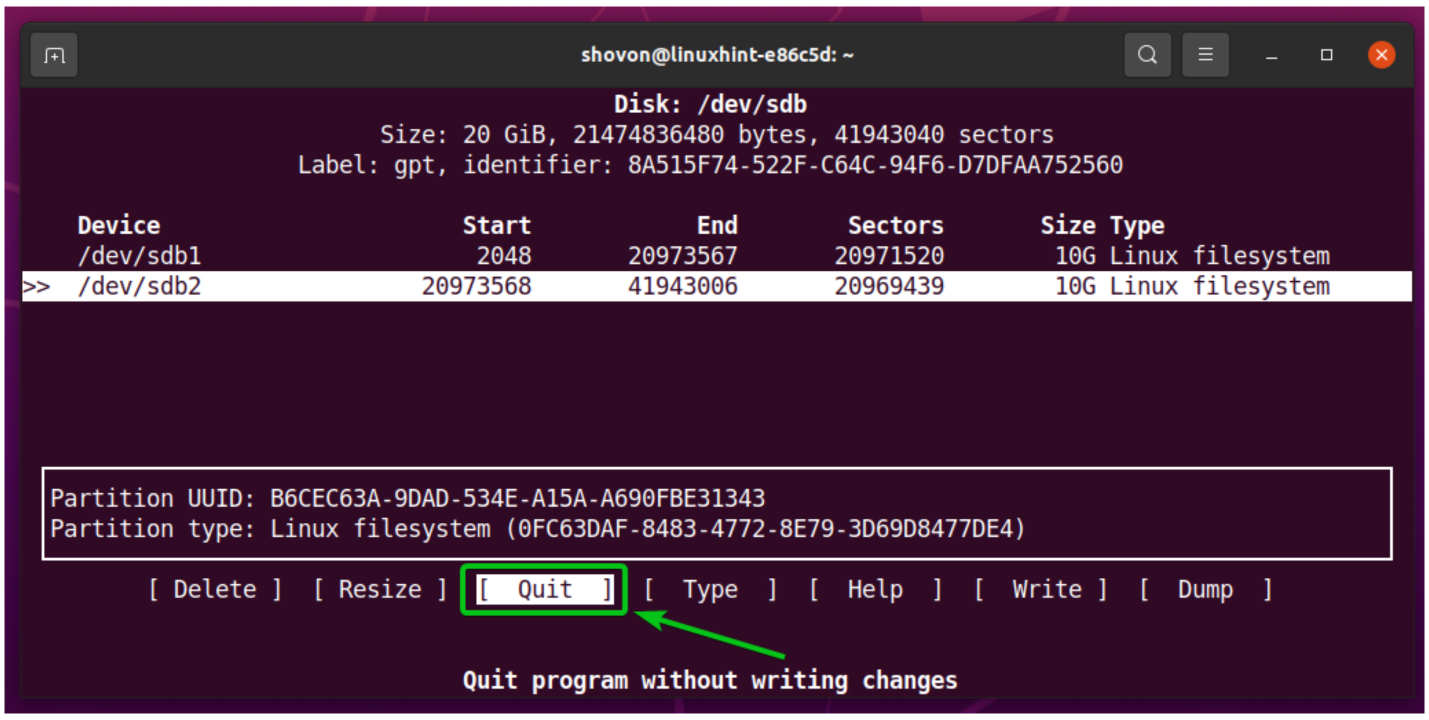
```
                          Disk: /dev/sdb
          Size: 20 GiB, 21474836480 bytes, 41943040 sectors
      Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                  Start        End     Sectors    Size Type
    /dev/sdb1                2048   20973567    20971520     10G Linux filesystem
>>  /dev/sdb2            20973568   41943006    20969439     10G Linux filesystem

 Partition UUID: B6CEC63A-9DAD-534E-A15A-A690FBE31343
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

 Are you sure you want to write the partition table to disk? yes

             Type "yes" or "no", or press ESC to leave this dialog.
```

The partition table should be saved to the disk.



```
                         Disk: /dev/sdb
          Size: 20 GiB, 21474836480 bytes, 41943040 sectors
      Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                 Start       End     Sectors     Size Type
    /dev/sdb1               2048  20973567    20971520      10G Linux filesystem
>>  /dev/sdb2           20973568  41943006    20969439      10G Linux filesystem

 Partition UUID: B6CEC63A-9DAD-534E-A15A-A690FBE31343
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

    [ Delete ]  [ Resize ]  [  Quit  ]  [  Type  ]  [  Help  ]  [  Write ]  [  Dump  ]

                      The partition table has been altered.
```

To quit **cfdisk** program, select **[Quit]** and press **<Enter>.**

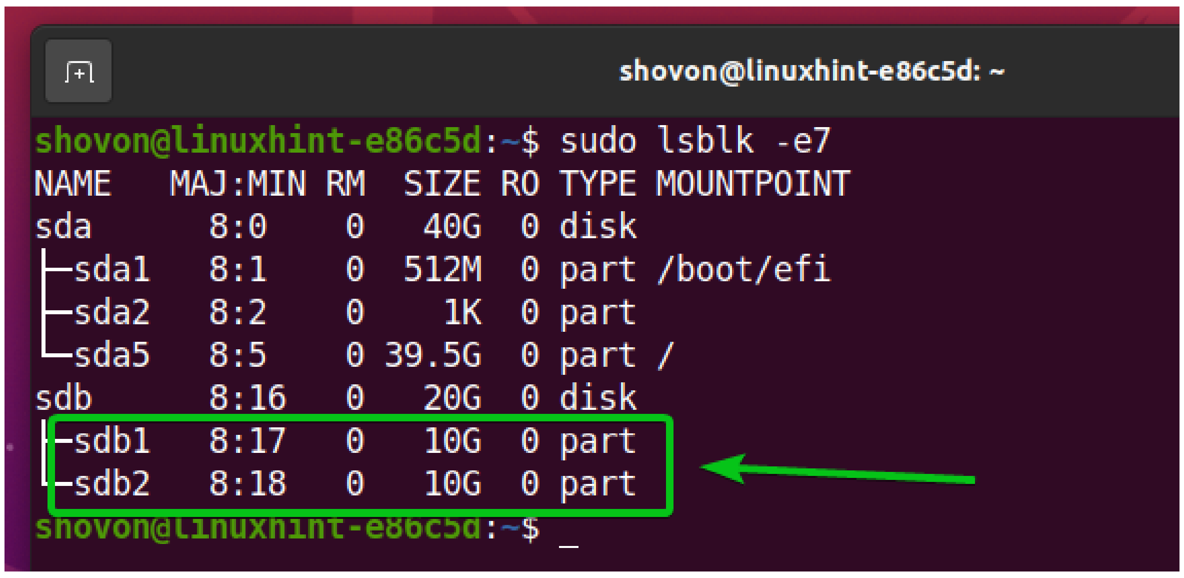


```
                         Disk: /dev/sdb
          Size: 20 GiB, 21474836480 bytes, 41943040 sectors
      Label: gpt, identifier: 8A515F74-522F-C64C-94F6-D7DFAA752560

    Device                 Start       End     Sectors     Size Type
    /dev/sdb1               2048  20973567    20971520      10G Linux filesystem
>>  /dev/sdb2           20973568  41943006    20969439      10G Linux filesystem

 Partition UUID: B6CEC63A-9DAD-534E-A15A-A690FBE31343
 Partition type: Linux filesystem (0FC63DAF-8483-4772-8E79-3D69D8477DE4)

    [ Delete ]  [ Resize ]  [  Quit  ]  [  Type  ]  [  Help  ]  [  Write ]  [  Dump  ]

                     Quit program without writing changes
```

Formatting a Disk with Btrfs Filesystem

In this section, I am going to show you how to format a partition with the Btrfs filesystem. I have created 2 partitions, **sdb1** and **sdb2**, in the earlier section of this article. I will format the partition **sdb1** with the Btrfs filesystem for the demonstration.

```
$ sudo lsblk -e7
```

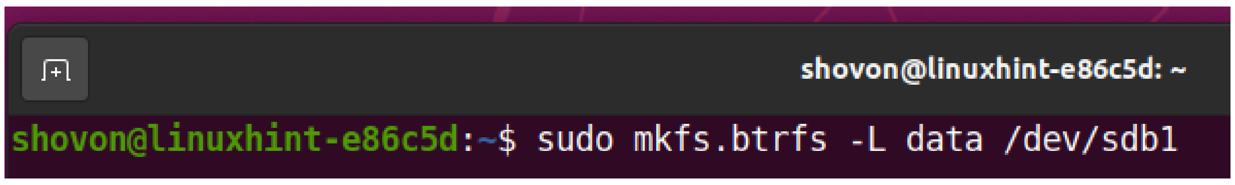


```
shovon@linuxhint-e86c5d:~$ sudo lsblk -e7
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda      8:0    0   40G  0 disk
├─sda1   8:1    0  512M  0 part /boot/efi
├─sda2   8:2    0    1K  0 part
└─sda5   8:5    0 39.5G  0 part /
sdb      8:16   0   20G  0 disk
├─sdb1   8:17   0   10G  0 part
└─sdb2   8:18   0   10G  0 part
shovon@linuxhint-e86c5d:~$ _
```

To format the partition **sdb1** with the Btrfs filesystem, run the following command:

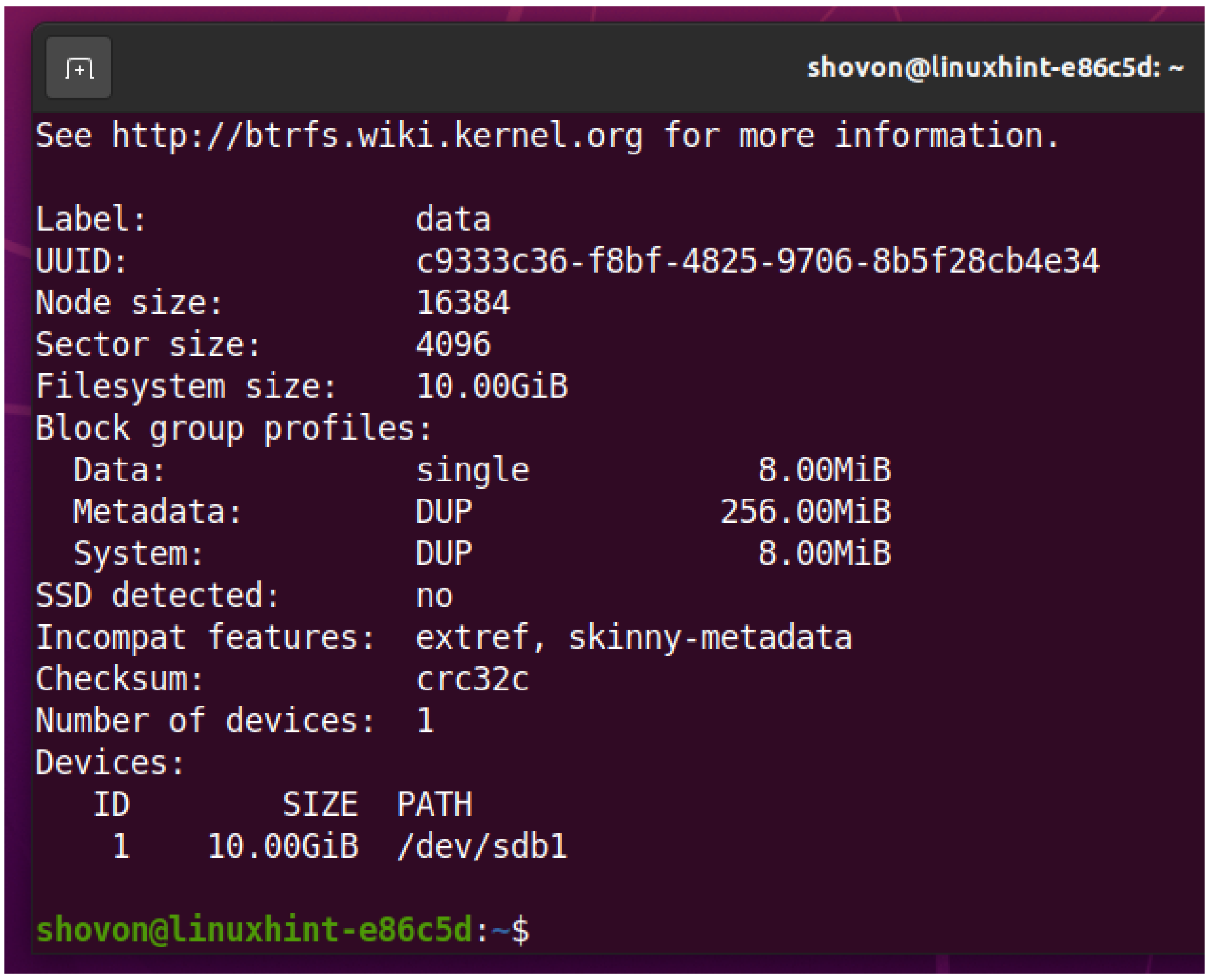
```
$ sudo mkfs.btrfs -L data /dev/sdb1
```

NOTE: Here, the **-L** flag sets the label of the partition. In this case, the partition label is **data.**



```
shovon@linuxhint-e86c5d:~$ sudo mkfs.btrfs -L data /dev/sdb1
```

The partition **sdb1** should be formatted with the Btrfs filesystem.



```
See http://btrfs.wiki.kernel.org for more information.

Label:              data
UUID:               c9333c36-f8bf-4825-9706-8b5f28cb4e34
Node size:          16384
Sector size:        4096
Filesystem size:    10.00GiB
Block group profiles:
  Data:             single            8.00MiB
  Metadata:         DUP             256.00MiB
  System:           DUP               8.00MiB
SSD detected:       no
Incompat features:  extref, skinny-metadata
Checksum:           crc32c
Number of devices:  1
Devices:
   ID        SIZE  PATH
    1    10.00GiB  /dev/sdb1

shovon@linuxhint-e86c5d:~$
```

Mounting a Btrfs Filesystem

To mount a Btrfs filesystem, you need to create a directory (mount point) where you can mount the Btrfs filesystem.

To create a directory/mount point **/data**, run the following command:

```
$ sudo mkdir -v /data
```

Once the **/data** mount point is created, you can mount the **sdb1** Btrfs filesystem on the **/data** mount point with the following command:

```
$ sudo mount /dev/sdb1 /data
```

The Btrfs partition **sdb1** should be mounted in the **/data** mount point, as you can see in the screenshot below.

```
$ sudo lsblk -e7
```

Checking Btrfs Filesystem Usage Information

Checking the usage information of your Btrfs filesystem is very important, and there are many ways to check it. Let's see some of them.

You can use the following command to see the usage summary of all the Btrfs filesystems on your computer:

```
$ sudo btrfs filesystem show
```

The usage summary of all the Btrfs filesystems on your computer should be displayed. You should find the following usage information here:

- The label of each of the Btrfs filesystems on your computer.
- The UUID of each of the Btrfs filesystems on your computer.
- The total number of devices added to each of the Btrfs filesystems on your computer.
- The disk usage information of each of the storage devices added to each of the Btrfs filesystems on your computer.

To find disk usage information about a specific Btrfs filesystem mounted on a specific directory path (e.g., **/data**), run the following command:

```
$ sudo btrfs filesystem usage /data
```

As you can see, a lot of disk usage information about the Btrfs partition mounted on the **/data** mount point is displayed.

On the top, you should find the total disk size of the Btrfs filesystem.

You should also find the amount of disk space the Btrfs filesystem has allocated (reserved for storing data) and the amount of disk space that is used from the allocated/reserved disk space.

You should also find the amount of disk space the Btrfs filesystem did not allocate (did not reserve for storing data) yet and the estimated amount of disk space (allocated and unallocated) that is still available for storing new data.

On the bottom, you should find the following information:

- The total amount of disk space allocated and used for data from all the storage devices added to the Btrfs filesystem.
- The amount of disk space allocated for data in each of the storage devices added to the Btrfs filesystem.
- The total amount of disk space allocated and used for metadata from all the storage devices added to the Btrfs filesystem.

- The amount of disk space allocated for metadata in each of the storage devices added to the Btrfs filesystem.
- The total amount of disk space allocated and used for the Btrfs system data from all the storage devices added to the Btrfs filesystem.
- The amount of disk space allocated for the Btrfs system data in each of the storage devices added to the Btrfs filesystem.
- The amount of unallocated disk space in each of the storage devices added to the Btrfs filesystem.

On the bottom, you should also find the method (i.e., **single**, **DUP**) that is used to allocate disk space for the data, metadata, and system data:

- For **single-**mode allocation, the Btrfs filesystem will keep only one instance of the allocation. There won't be any duplicates.
- For **DUP** mode allocation, the Btrfs filesystem will allocate the disk space in different parts of the filesystem for the same purpose. So, multiple copies (usually two) of the same data will be kept on the filesystem.
- Usually, the **data** is allocated in the **single** mode. The **metadata** and the **system** data are allocated in **DUP** mode.
- In **single** mode, notice that the Btrfs filesystem can use all the allocated disk space.
- In **DUP** mode, notice that the Btrfs filesystem can use half the disk space from the total allocated disk space.

To see the summary of the disk space allocated and used for the data, metadata, and system of a Btrfs filesystem mounted in the **/data** directory, run the following command:

```
$ sudo btrfs filesystem df /data
```

You can also list the disk usage information of each of the files and directories of the Btrfs filesystem mounted on the **/data** directory as follows:

```
$ sudo btrfs filesystem du /data
```

In the end, the disk usage summary of all the files and directories of the **/data** btrfs filesystem should be displayed.

To only see the disk usage summary of the files and directories of the Btrfs filesystem mounted on the **/data** directory, run the following command:

```
$ sudo btrfs filesystem du -s /data
```

Adding More Storage Devices to a Btrfs Filesystem

If you need more disk space on your Btrfs filesystem, you can add more storage devices or partitions to the Btrfs filesystem to expand the disk space of the filesystem.

For example, to add the partition **sdb2** on the Btrfs filesystem mounted on the **/data** directory, run the following command:

```
$ sudo btrfs device add /dev/sdb2 /data
```

As you can see, the new partition **sdb2** is added to the Btrfs filesystem mounted on the **/data** directory.

```
$ sudo btrfs device usage /data
```

As you can see, the size of the Btrfs filesystem mounted on the **/data** directory has increased.

```
$ df -h -x squashfs -x tmpfs -x devtmpfs
```

Mounting a Btrfs Filesystem at Boot Time

Once you have set up a Btrfs filesystem, you don't want to mount it manually every time you boot your computer, rather mount it in automatically. Let's see how to do that.

First, find the UUID of the Btrfs filesystem mounted on the **/data** directory as follows:

```
$ sudo btrfs filesystem show /data
```

In my case, the UUID of the Btrfs filesystem is **c9333c36-f8bf-4825-9706-8b5f28cb4e34**. It will be different for you. So, make sure to replace it with yours from now on.

Open the **/etc/fstab** file with the nano text editor as follows:

```
$ sudo nano /etc/fstab
```

At the end of the **/etc/fstab** file, type in the following line:

```
UUID=c9333c36-f8bf-4825-9706-8b5f28cb4e34       /data    btrfs    defaults    0 0
```

Once you're done, press **<Ctrl> + X**, followed by **Y**, and then **<Enter>** to save the **/etc/fstab** file.

For the changes to take effect, reboot your computer with the following command:

```
$ sudo reboot
```

Once your computer boots, you should see that the Btrfs filesystem is correctly mounted in the **/data** directory at boot time, as you can see in the screenshot below.

```
$ df -h -x squashfs -x tmpfs -x devtmpfs
```

Conclusion

In this article, I have shown you how to install and use the Btrfs filesystem on Ubuntu 20.04 LTS. This information imparted here should help you get started with the Btrfs filesystem on Ubuntu 20.04 LTS.

#btrfs

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