

# Born2beroot 01: CBorn2beroot 01: Creating a Debian Virtual Machine

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In 42 School Projects

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17 Min read

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The 42 project Born2beroot explores the fundamentals of system administration by inviting us to install a virtual machine with VirtualBox. The server we will be creating must have the partition scheme defined in the subject as well as the Linux operating system of our choosing : CentOS or Debian. These are the topics we will examine in this article. Two future articles will tackle the configuration of Born2beroot and its bonuses.

Born2beroot : Installation | Configuration | Bonus

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## What is a Virtual Machine?

In many ways, a virtual machine (VM for short) is practically identical to a regular physical computer. Both have a CPU, some RAM, a hard drive and an internet connection if needed, and various operating systems and software can be installed within them. The only difference is that a physical computer uses its own hardware, whereas a virtual machine borrows the physical resources of its host. A virtual machine is therefore only code, a virtual computer within a physical server.

The software called hypervisor or virtual machine monitor (VMM) is responsible for creating and running virtual machines, as well as managing resources — like CPU, memory, and storage — among them.

## Advantages of a Virtual Machine

There are several benefits to a virtual machine:

- Running a different operating system than the physical computer without having to partition its hard drive or restart it.
- Installing old operating systems like DOS, even if the hardware is no longer compatible.
- Carrying an entire OS on a USB key for example, or transferring an entire machine from one computer to the next easily.
- Developing a program intended for a different OS and using software never intended to run on the physical machine's OS.
- Isolating a program of dubious origin, or even a virus, to handle it without risk to the physical computer. As a matter of fact, a virtual machine and its hard drives can easily be frozen, restarted, copied, transferred from one computer to the other, and deleted. Besides, it is possible to take a snapshot of the VM's state in order to restore it as it was at that moment.
- Installing several virtual machines on a limited number of physical computers, instead of having to multiply the number of physical machines. This saves on spending, on electricity and on maintenance time.

## Drawbacks of Virtual Machines

However, a virtual machine does have its drawbacks, especially concerning security and performance:

- The host computer must be able to handle virtualization: too little RAM leads to slowness and latency.
- If the host computer breaks down, the virtual machines might no longer be accessible unless there are backups on another physical machine.
- A physical computer is also more vulnerable to attacks if it runs several virtual machines rather than a single operating system.

## CentOS vs Debian for Born2beroot

For the Born2beroot project, we have a choice between two operating systems for our virtual machine: CentOS or Debian. These two GNU/Linux distributions are community-supported and open source. Both are well known for their stability and security.

### Debian

Launched in 1993, Debian is the oldest and most robust Linux distribution. Developed and maintained by a large community, it supports a wide variety of architectures and offers a large selection of packages. This OS is easy to update and its minimal installation saves on server resources and increases its security. Debian is a common operating system, whether it be for network servers or personal computers. However, Debian is not particularly user-friendly and requires interacting with the terminal. Moreover, it does not offer an Enterprise version.

### CentOS

CentOS on the other hand is specifically aimed at enterprise servers. Launched in 2004, CentOS (*Community enterprise Operating System*) is the free, open-source version of RHEL (*Red Hat Enterprise Linux*). Nearly identical and 100% compatible with RHEL. Quasiment identique et 100% compatible avec RHEL from a binary perspective, CentOS is widely used in the IT world. Indeed, it meets company requirements for security and stability and offers 10 year support for each of its

versions. Updating from one version to the next remains difficult however: a full installation of the new version is recommended.

In december 2020, the community put an end to the development of CentOS in favor of CentOS Stream. CentOS Stream is a more experimental and less stable version that precedes RHEL, whereas CentOS used to follow RHEL version releases closely.

For our Born2beroot project, CentOS is the one that interests us, not CentOS Stream. Despite the fact that CentOS is no longer being developed, it is still a good option to consider in order to explore enterprise-specific Linux distributions, RHEL in particular.

## Which OS to choose for Born2beroot?

There is no real “best” choice for Born2beroot. The rest of this article series will concentrate on Debian simply because it seems that it is more widely used on internet servers in general. For anyone curious about CentOS, Carol Daniel’s guide on Github is a great resource.

Below is a summary table of the major differences between CentOS and Debian:

	CentOS	Debian
Launch	2004	1993
Community	Red Hat Enterprise and community	Debian project community
Release Cycle	2 – 5 years (10 years support per version)	2 years (5 years support per version)

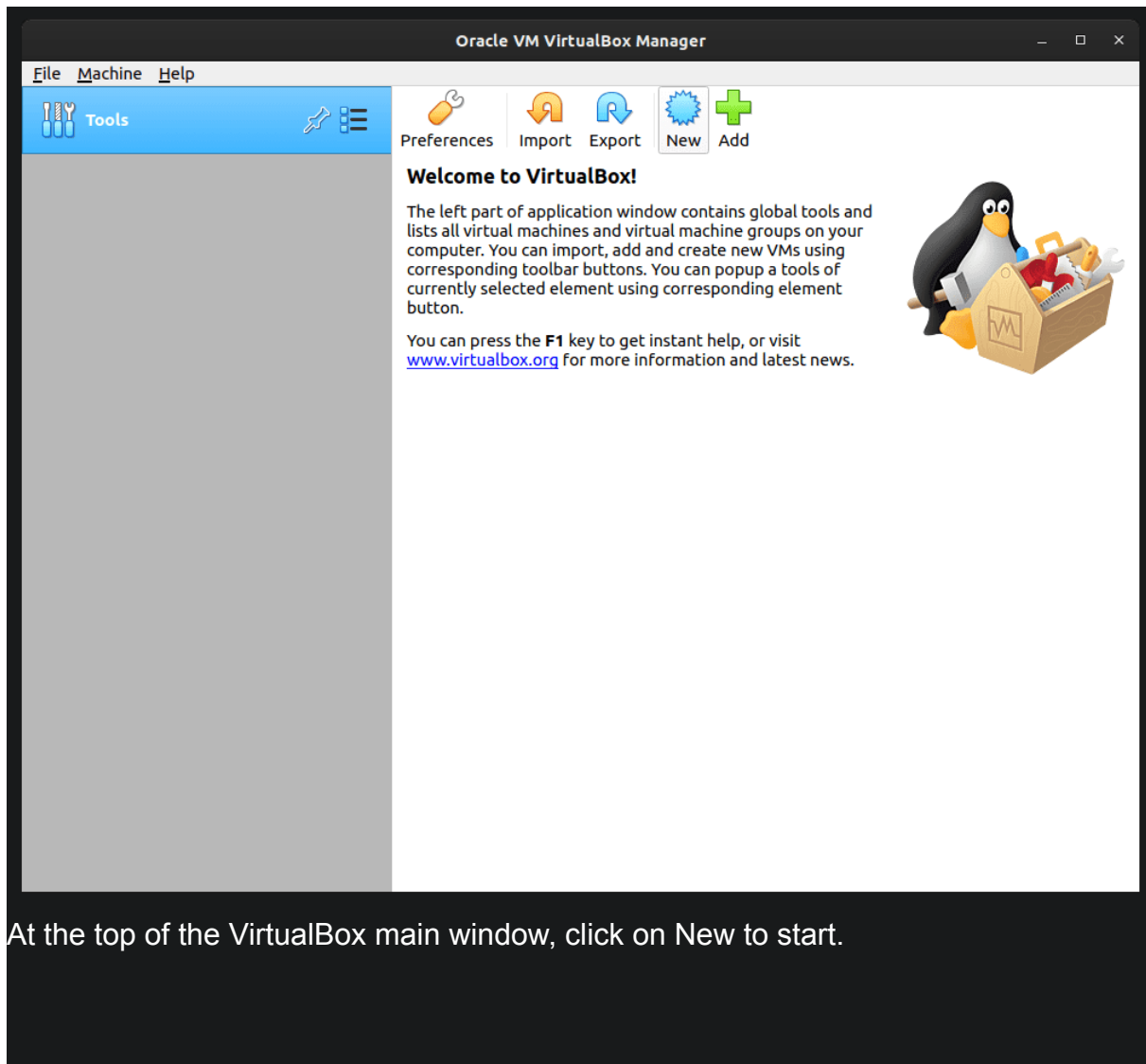
Update	Difficult. Full install of new major version recommended.	Easy. No need for reinstallation.
Supported Architectures	x86_64/AMD64, AArch64/ARM64 et ppc64el/ppc64le. (CentOS 7 : armhf/armhfp, i386, POWER9.)	x86_64/AMD64, AArch64/ARM64, armhf/armhfp, i386, ppc64el/ppc64le, MIPSel, MIPS64el et s390x.
Packet Manager	RPM, YUM/DNF	DEB, dpkg/APT
Number of Packets	Limited.	Large choice of packets.
Percentage of Servers [source]	9,7%	15,6%
State of the Project	Terminated December 2021.	In development.
Download	CentOS ISO images	Debian ISO images

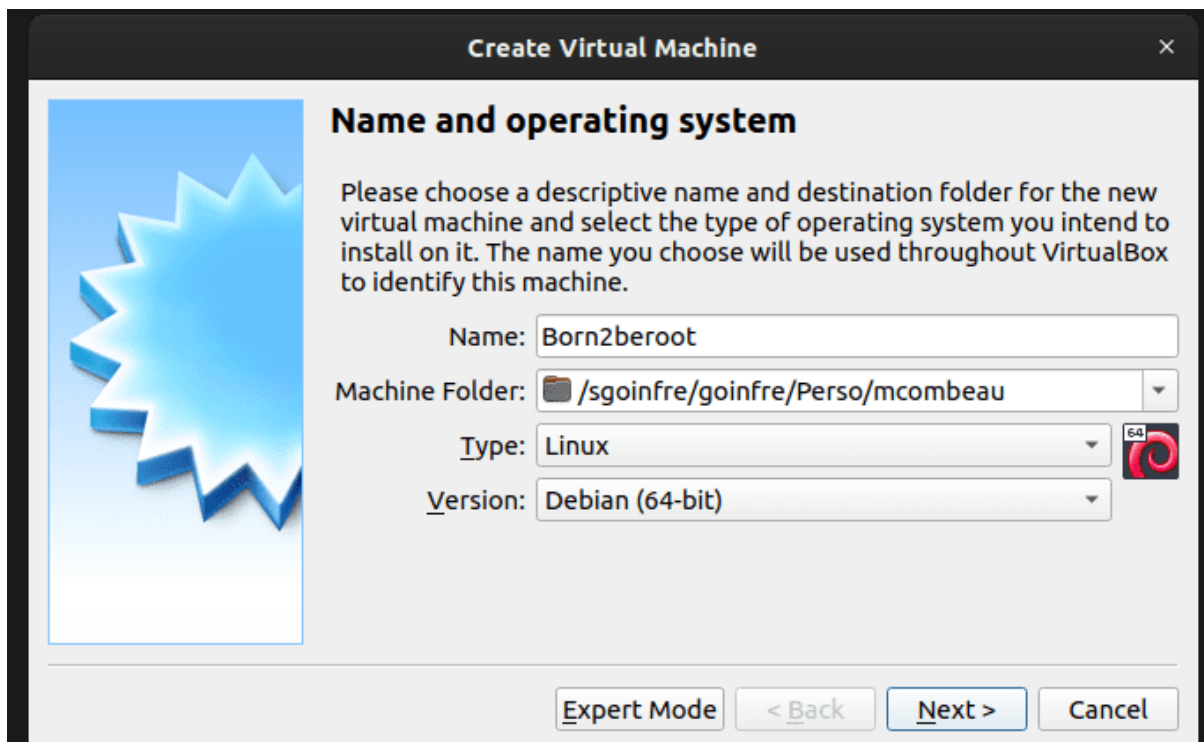
## Creating a Born2beroot Virtual Machine

In order to create our Born2beroot virtual machine, we will need two things:

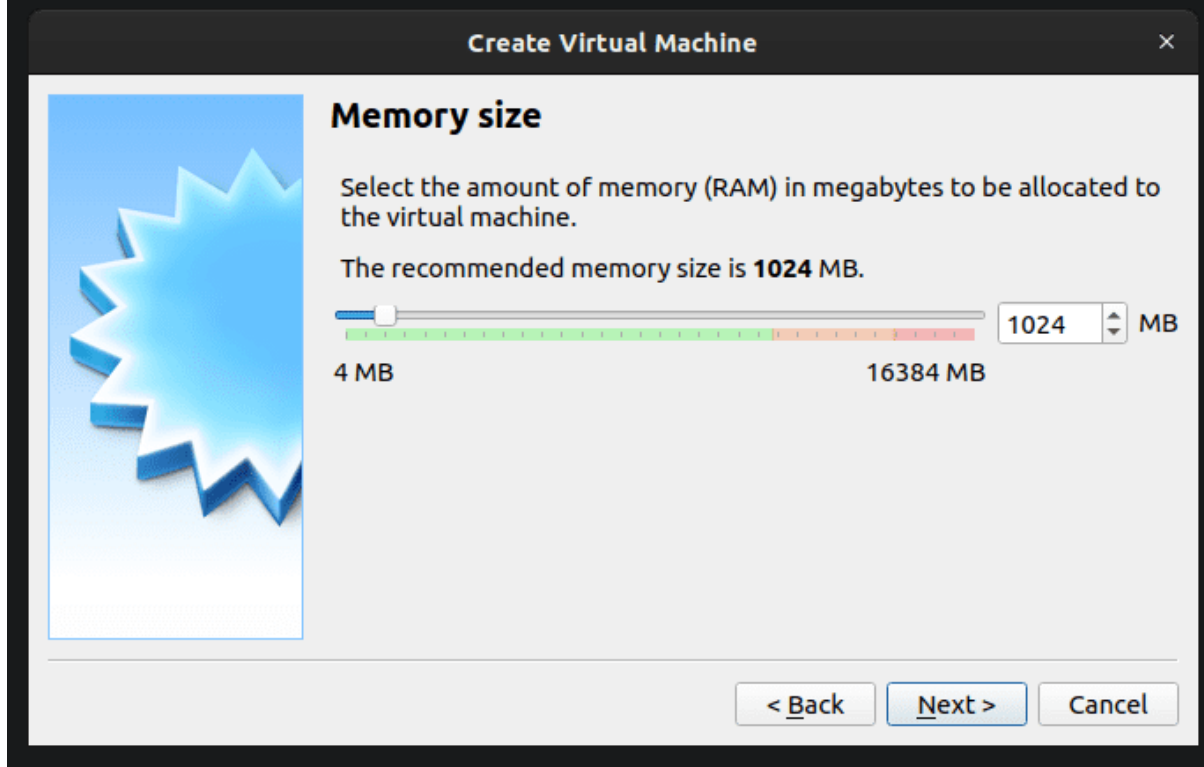
- Oracle VirtualBox which is already installed on the computers at 42. Otherwise, we can download it from the official website. At the time of this writing, it is version 6.1.
- The Debian disk image, which we can download from the official website. At the time of this writing, it is version 11.2.0. The ISO ending in “amd64-netinst.iso” is good enough.

Once VirtualBox is installed, we can start setting up our virtual machine.





Let's name the machine and decide where to install it. On the 42 computers, we should create the virtual machine in the `/sgoinfre/goinfre/Perso/my_login` folder for space concerns. Otherwise, we can put it on a large enough USB key or an external hard drive to be able to move it later.

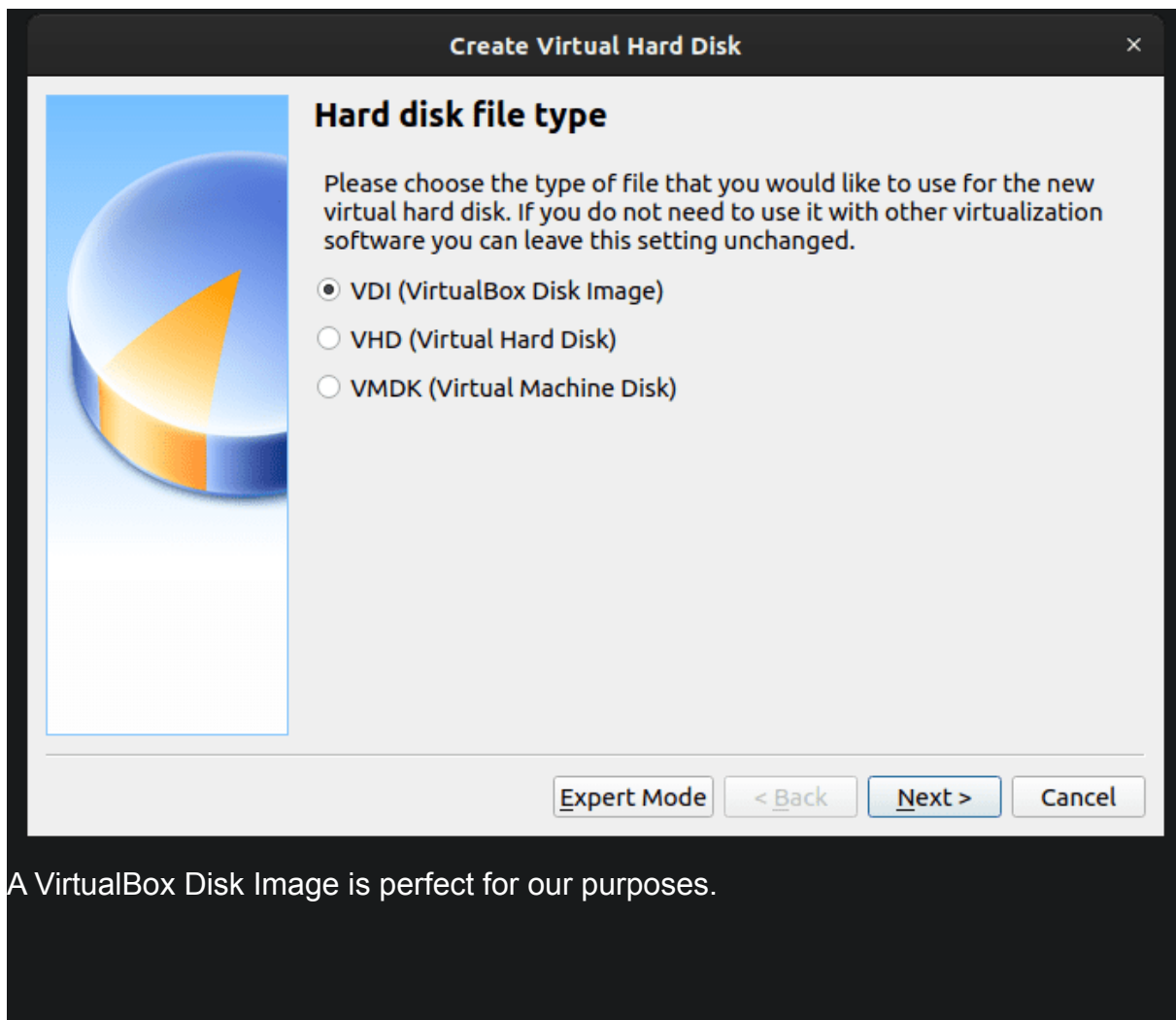


As far as the memory size goes, we can leave the default value, 1024 MB.



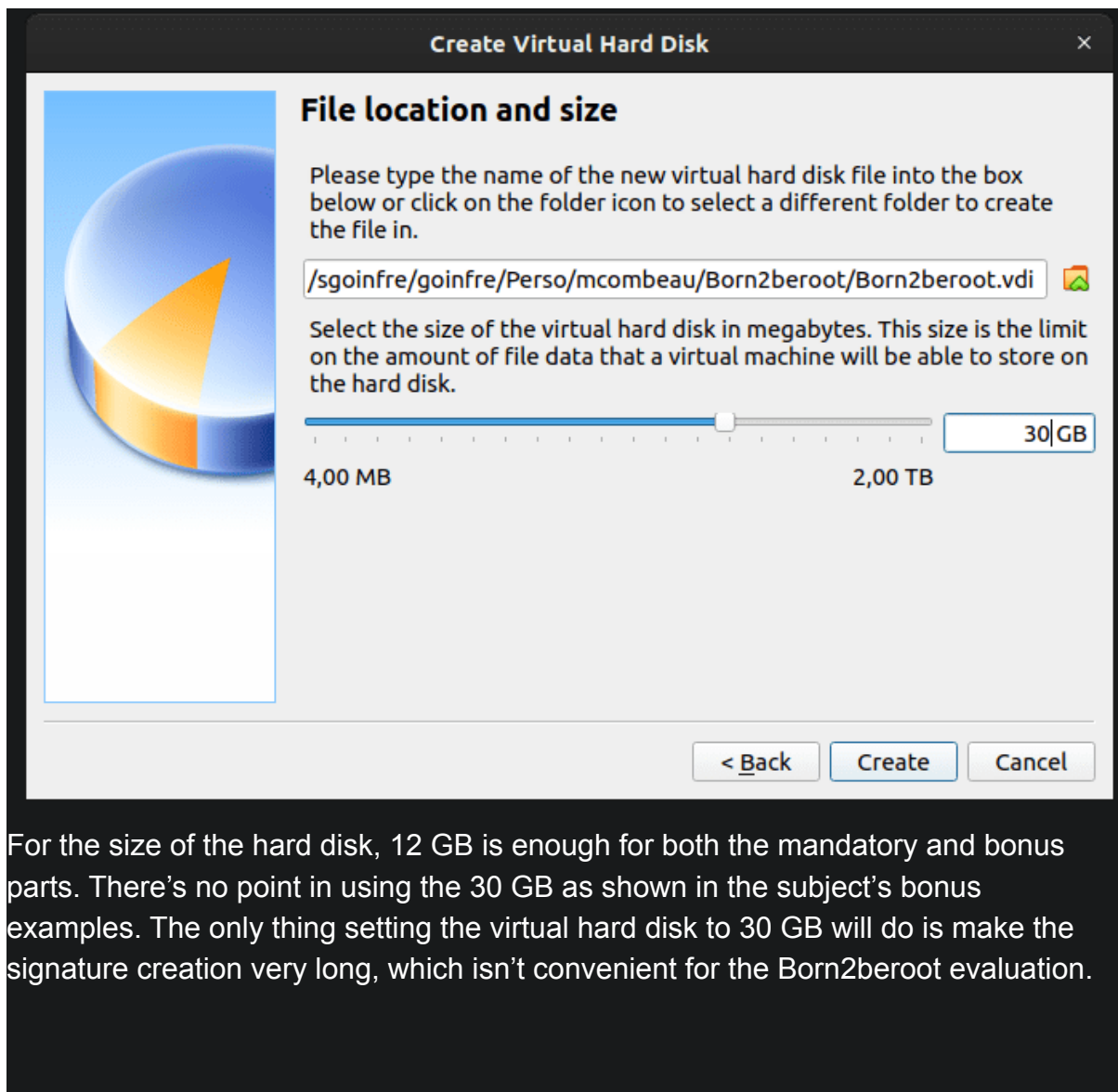
Now, we'd like to create a new virtual hard disk.



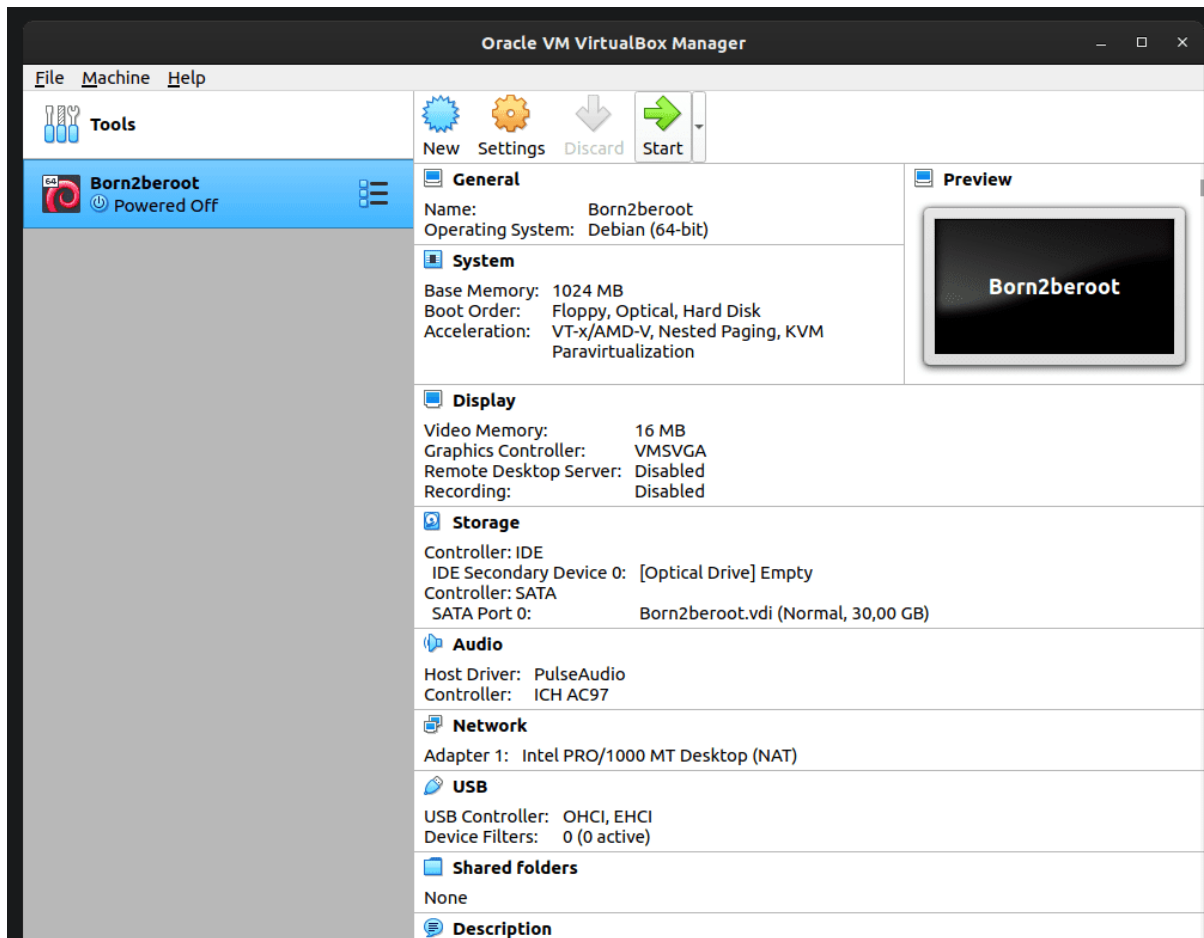




We can let the hard disk be dynamically allocated.



For the size of the hard disk, 12 GB is enough for both the mandatory and bonus parts. There's no point in using the 30 GB as shown in the subject's bonus examples. The only thing setting the virtual hard disk to 30 GB will do is make the signature creation very long, which isn't convenient for the Born2beroot evaluation.



There! Our Born2beroot virtual machine has been created!

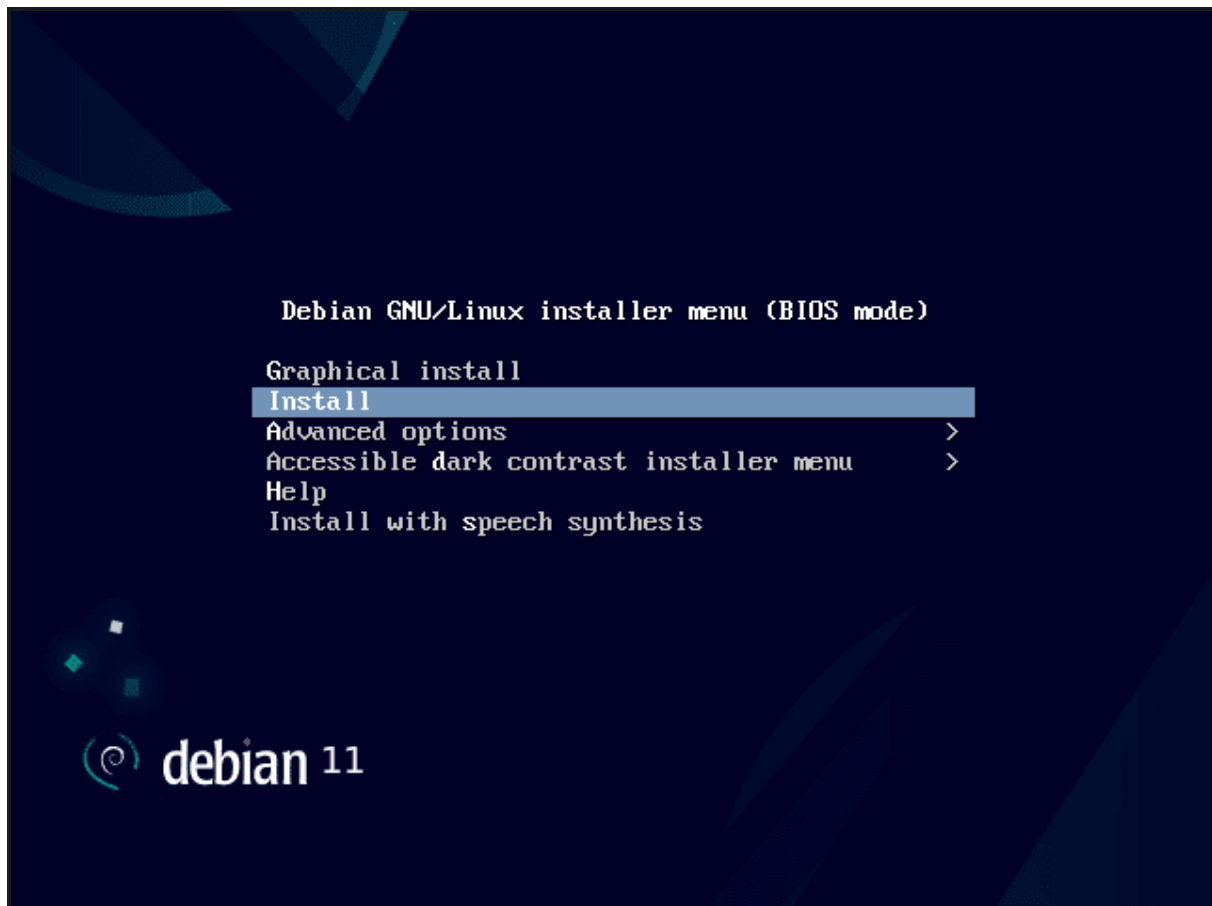
## Installing Debian on Born2beroot

Since the virtual machine has no operating system, VirtualBox will ask us to choose a disk to boot from when we start it up for the first time.

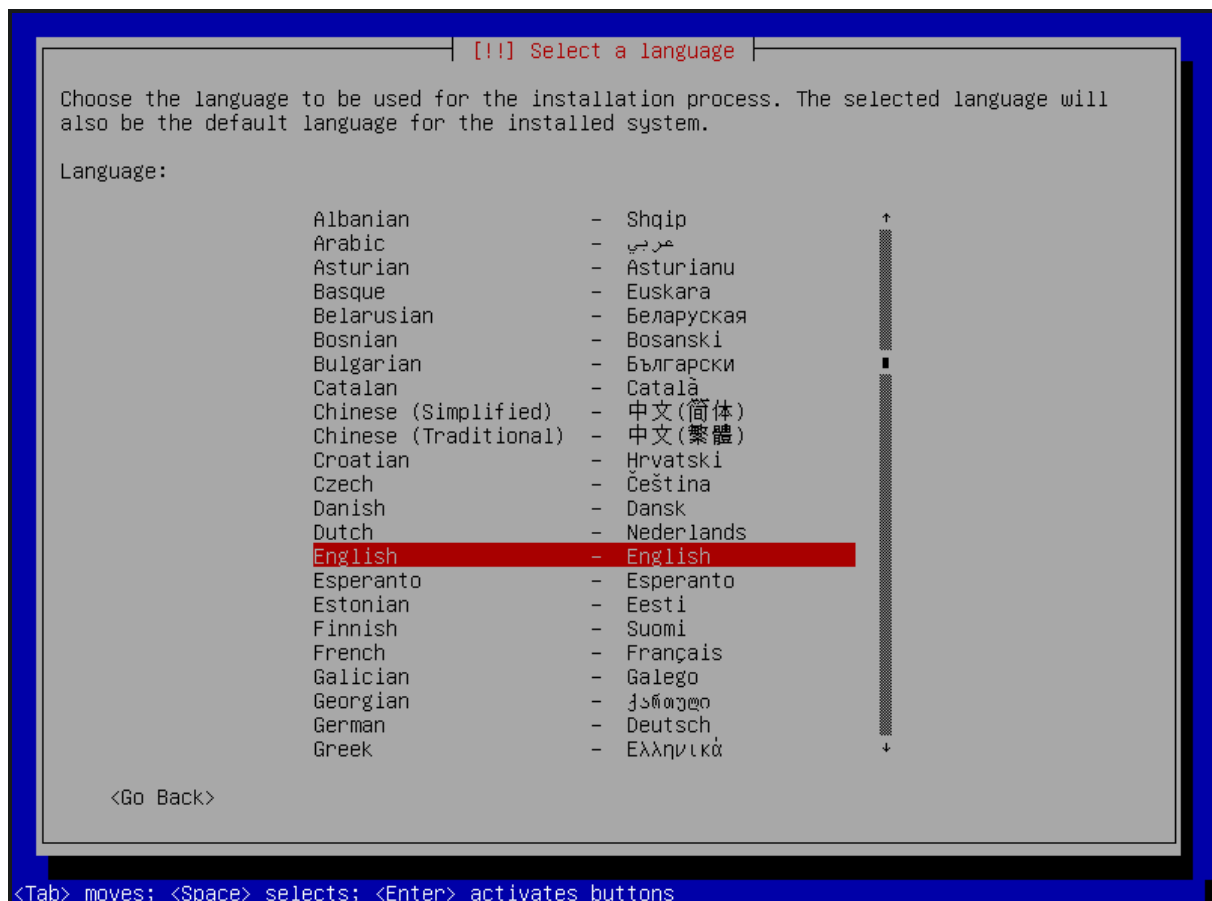


Here, we must choose the .iso file that we've previously downloaded, which contains all the necessary files to install Debian.

The machine will boot from that disk and a graphical interface will guide us through the Debian installation.

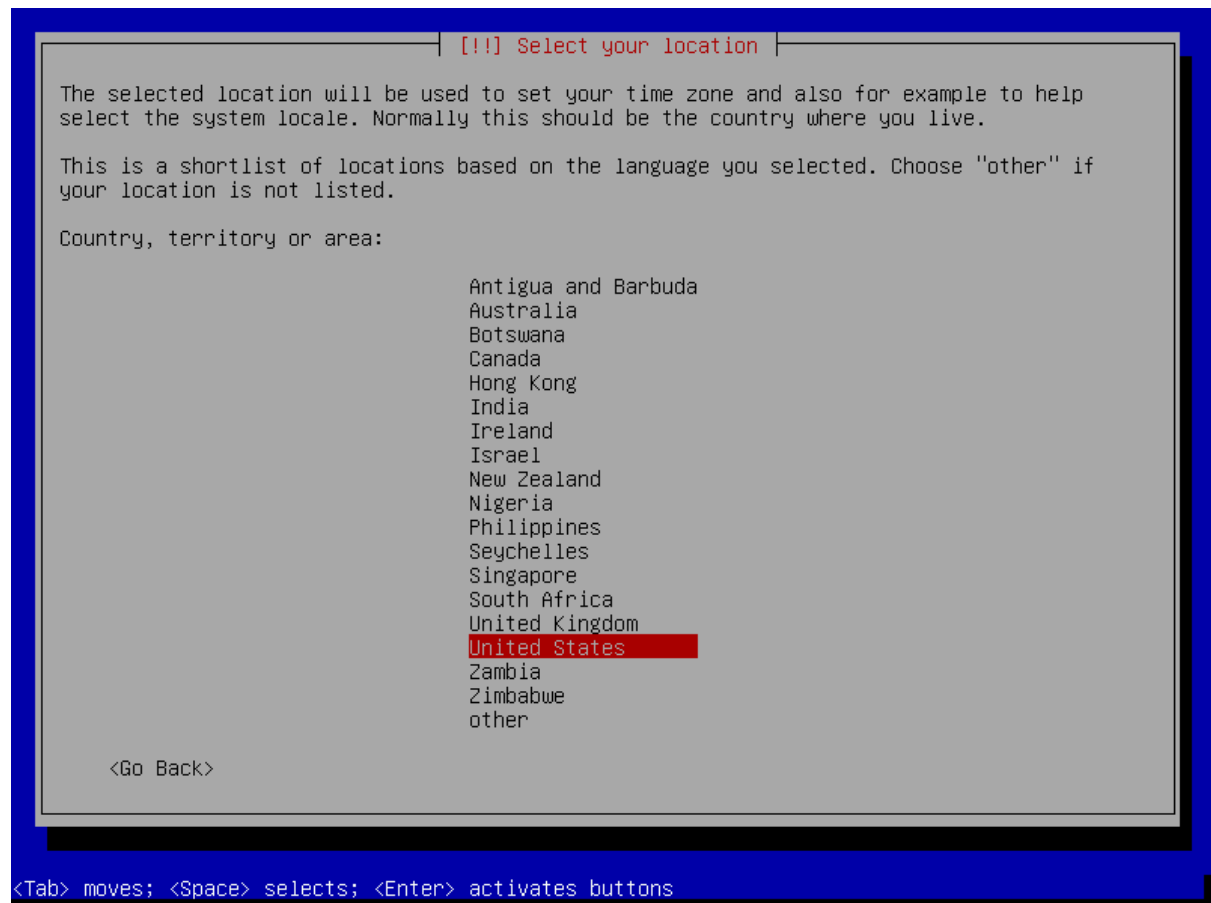


We must choose Install. A graphical interface is explicitly forbidden in the Born2beroot subject, we can therefore not choose "Graphical Install".



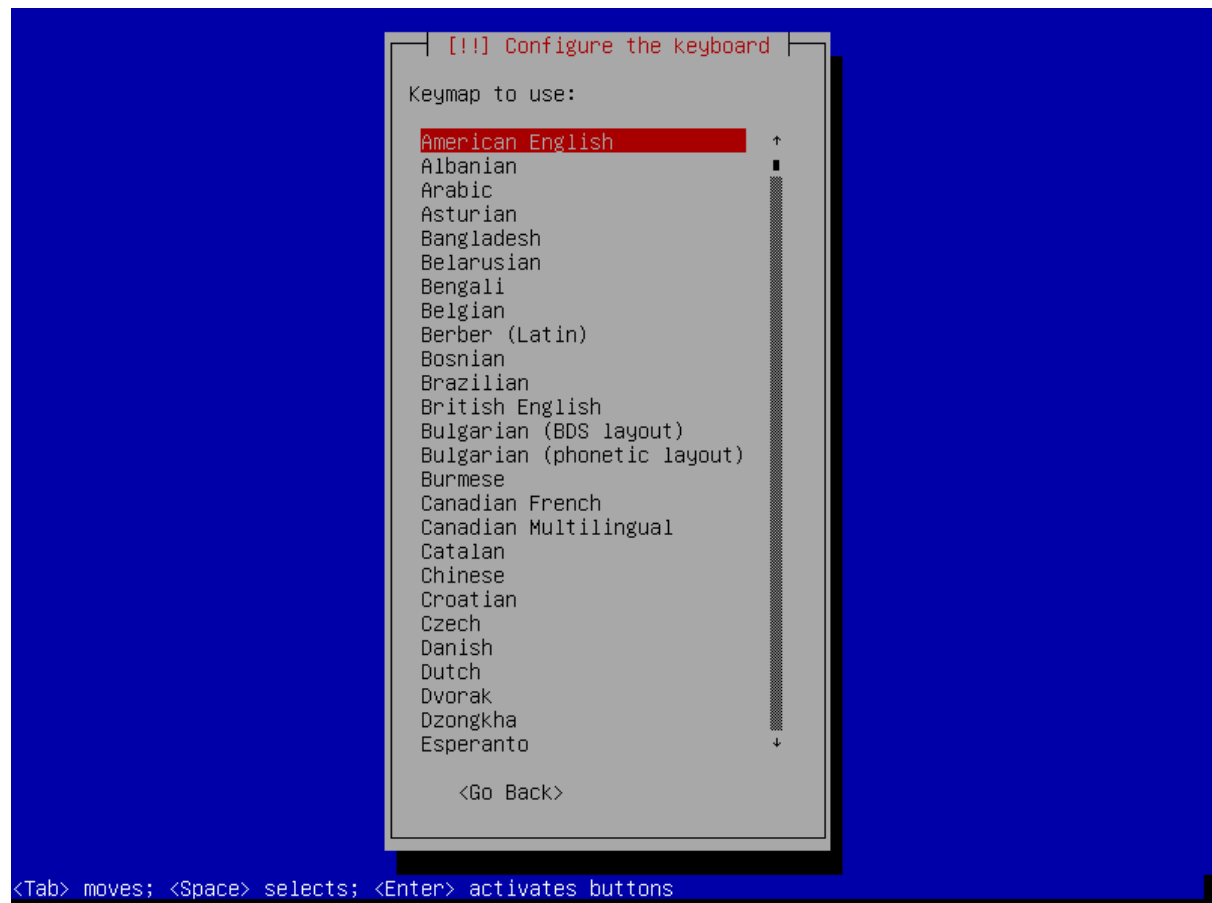
Let's choose the language that suits us best. In this case, English.

Let's choose the language that suits us best. In this case, English.



Then we will have to choose our geographic region. For some reason, choosing "other > France" results in an error after choosing English so let's just go with United States, even though the time zone will be wrong. The time zone doesn't really matter for Born2beroot.





Here we will choose the keyboard configuration. For a QWERTY keyboard, choose American English at the top of the list.

[!] Configure the network

Please enter the hostname for this system.

The hostname is a single word that identifies your system to the network. If you don't know what your hostname should be, consult your network administrator. If you are setting up your own home network, you can make something up here.

Hostname:

mcombeau42\_\_\_\_\_

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

As instructed in the Born2beroot subject, the hostname must be our intra login followed by 42 (i.e. mcombeau42).

[!] Configure the network

The domain name is the part of your Internet address to the right of your host name. It is often something that ends in .com, .net, .edu, or .org. If you are setting up a home network, you can make something up, but make sure you use the same domain name on all your computers.

Domain name:

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

We don't need to worry about any domain name, leave this field blank.

!!! Set up users and passwords

You need to set a password for 'root', the system administrative account. A malicious or unqualified user with root access can have disastrous results, so you should take care to choose a root password that is not easy to guess. It should not be a word found in dictionaries, or a word that could be easily associated with you.

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

The root user should not have an empty password. If you leave this empty, the root account will be disabled and the system's initial user account will be given the power to become root using the "sudo" command.

Note that you will not be able to see the password as you type it.

Root password:

101Dalmatians!\_\_\_\_\_

[\*] Show Password in Clear

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

For the super-user root, it's very important to define a strong password. To show the password in clear, select that option and press the space-bar. The next screen will of course ask us to confirm the password. Do not forget it!

[!!] Set up users and passwords

A user account will be created for you to use instead of the root account for non-administrative activities.

Please enter the real name of this user. This information will be used for instance as default origin for emails sent by this user as well as any program which displays or uses the user's real name. Your full name is a reasonable choice.

Full name for the new user:

mcombeau

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

Then we must create a new user, other than root. With a name ...

[!!] Set up users and passwords

Select a username for the new account. Your first name is a reasonable choice. The username should start with a lower-case letter, which can be followed by any combination of numbers and more lower-case letters.

Username for your account:

mcombeau\_\_\_\_\_

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

... a username (we will have to have a user with our intra login as username for our Born2beroot evaluation, so we might as well do that now) ...

[!!] Set up users and passwords

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

Choose a password for the new user:

42Born2Code!\_

[\*] Show Password in Clear

<Go Back> <Continue>

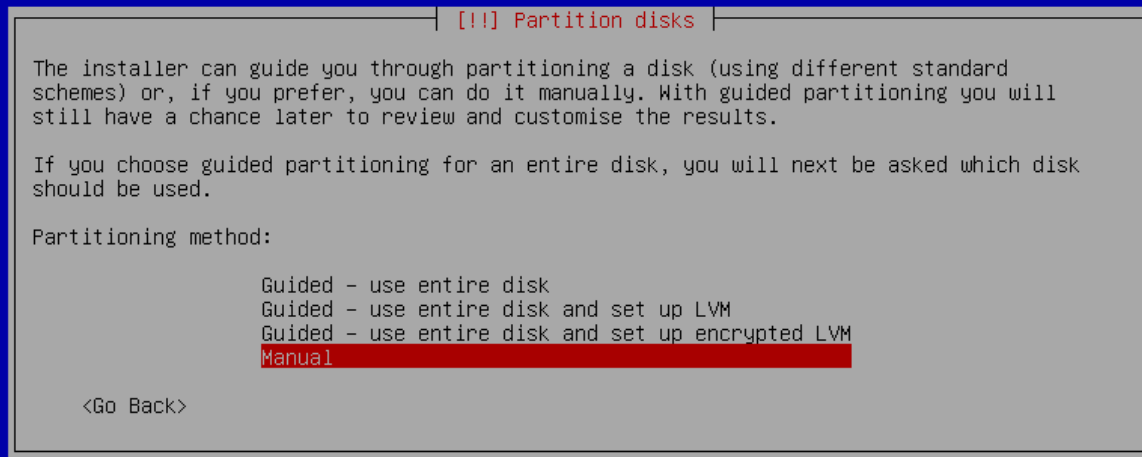
<Tab> moves; <Space> selects; <Enter> activates buttons

... and a strong password (preferably different from the root password) ... which we must confirm on the next screen.

Then we will have to choose our geographic region. For some reason, choosing "other > France" results in an error after choosing English so let's just go with United States, even though the time zone will be wrong. The time zone doesn't really matter for Born2beroot.

## Partitions, LVM and Encryption

This is the moment when we have to decide how to partition our virtual hard drive. The partitions for the bonuses are different from the partitions of the mandatory part, but in both cases, we can't count on the guided partition methods. Let's do it manually.



<Tab> moves; <Space> selects; <Enter> activates buttons

### Why Have Several Partitions?

We could very well have a single partition to contain all of the operating system's data, all of the software and all of the personal user files. The purpose of having several distinct partitions is to not put all our eggs in the same basket. If one file system becomes corrupted for example, only one of the partitions would be affected instead of the entire system.

The partitions we must have on our Born2beroot virtual machine are as follows:

- boot, containing the static files of the boot loader.
- root, containing the home directory for the root user.
- home, containing the user home directories.
- swap, a special partition that serves as a "workspace" for the operating system. It allows the OS to use this space as RAM overflow, which increases the system's efficiency.



For the bonus part, we must also have the following partitions:

- `var`, containing variable data.
- `srv`, containing data for services provided by the system.
- `tmp`, containing temporary files.
- `var/log`, containing log files.

In the example shown in Born2beroot's subject, we will notice three partitions, `sda1`, `sda2` and `sda5`. The latter has the type "crypt" and contains several other partitions such as `root`, `swap` and `home`, of "LVM" type. Of course, `crypt` indicates that the partition is encrypted, as per the subject requirements. (Let's also notice that the `sda1 /boot` partition is not encrypted!) But what does "LVM" mean?

What is LVM ?

The Logical Volume Manager (LVM for short) is a flexible and dynamic management system for Linux hard disk memory. It allows us to have as many partitions as necessary, and to resize, move and even freeze them, without having to restart the machine. This "virtual partitioning" system is very useful on a server, which must preserve stability and rapid management of its memory resources.

With LVM, a physical partition is assigned to a logical volume group and is then "partitioned" into several logical volumes. This is the case of the `sda5` partition in the Born2beroot subject example.

The `sda2` partition will automatically be created when we define an LVM partition. It is an extended partition which serves only as a container for the logical volumes and doesn't contain any other data.

## Manual Partitioning

For Born2beroot, we will have to create two partitions: a primary partition for the Debian boot loader files, and an encrypted logical partition to contain the LVM logical volumes.

### [[!]] Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning  
Configure iSCSI volumes

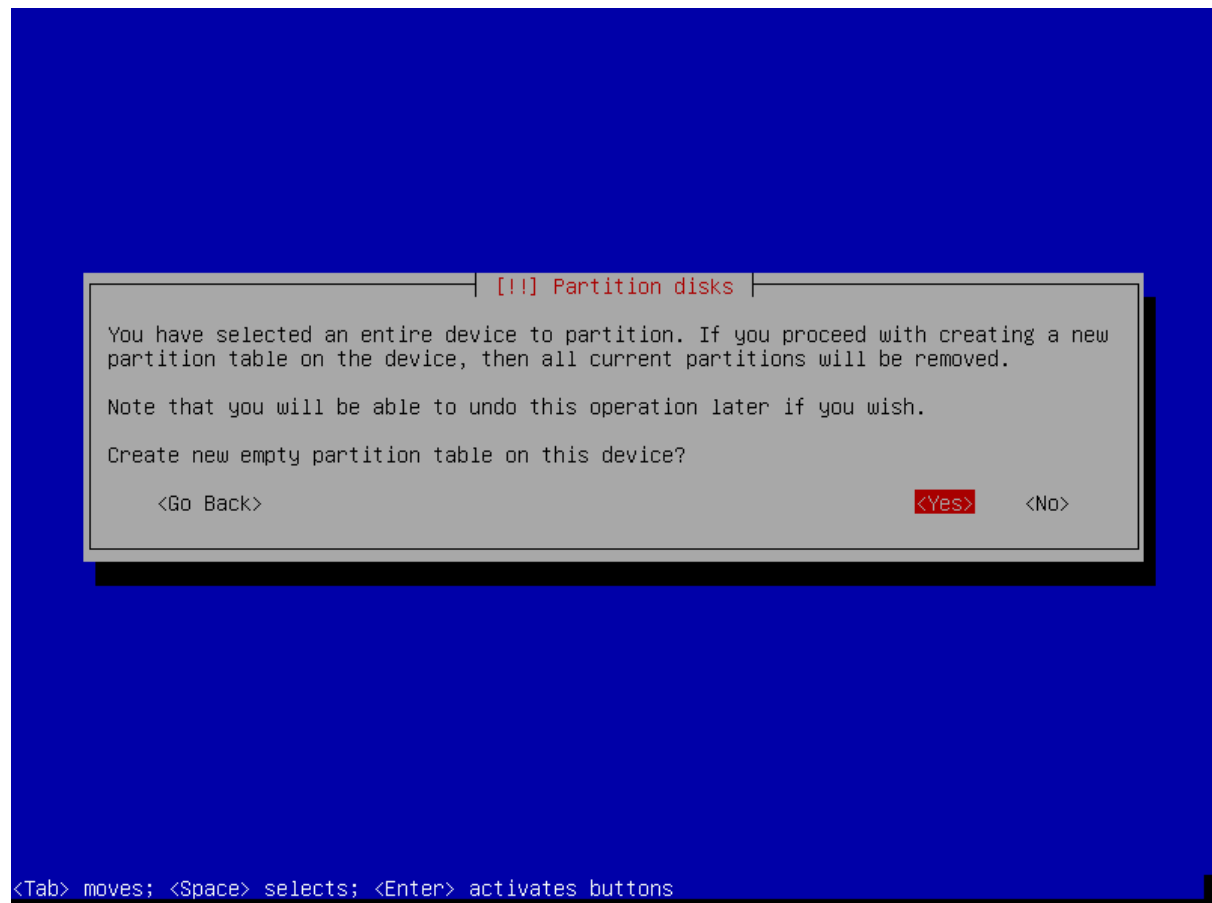
**SCSI2 (0,0,0) (sda) - 32.2 GB ATA VBOX HARDDISK**

Undo changes to partitions  
Finish partitioning and write changes to disk

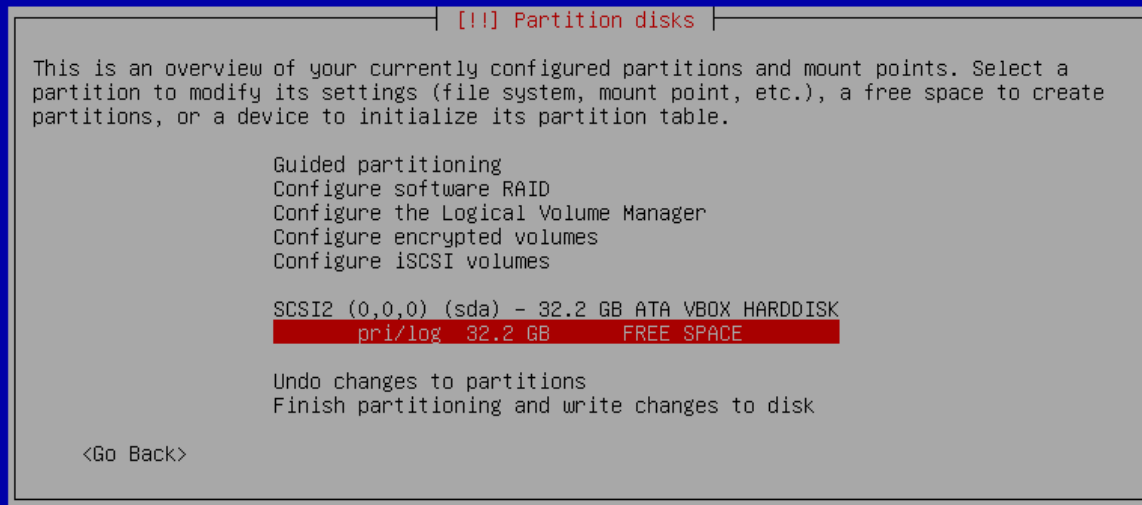
<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Here we must choose the disk we'd like to partition. There should only be one: SCSI (0, 0, 0) sda ... HARDDISK.

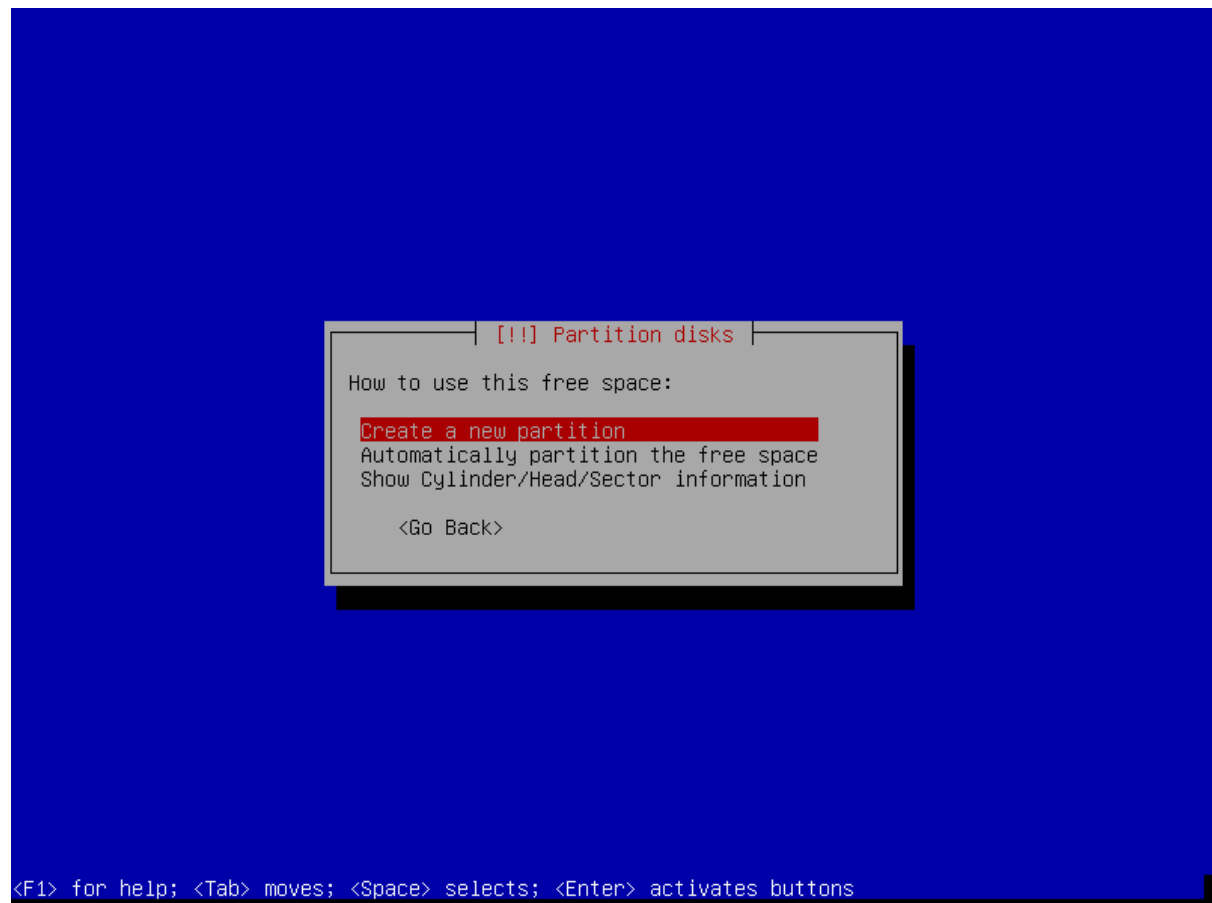


Then we will confirm that yes, we want to create a new empty partition table on this device.



<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

With the partition table created, we can now add the partitions we want. The first will be the `/boot` partition which should not be encrypted because it is required to start up the OS. Let's select the free space.



We will create a new partition in this free space.

!!! Partition disks

The maximum size for this partition is 32.2 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

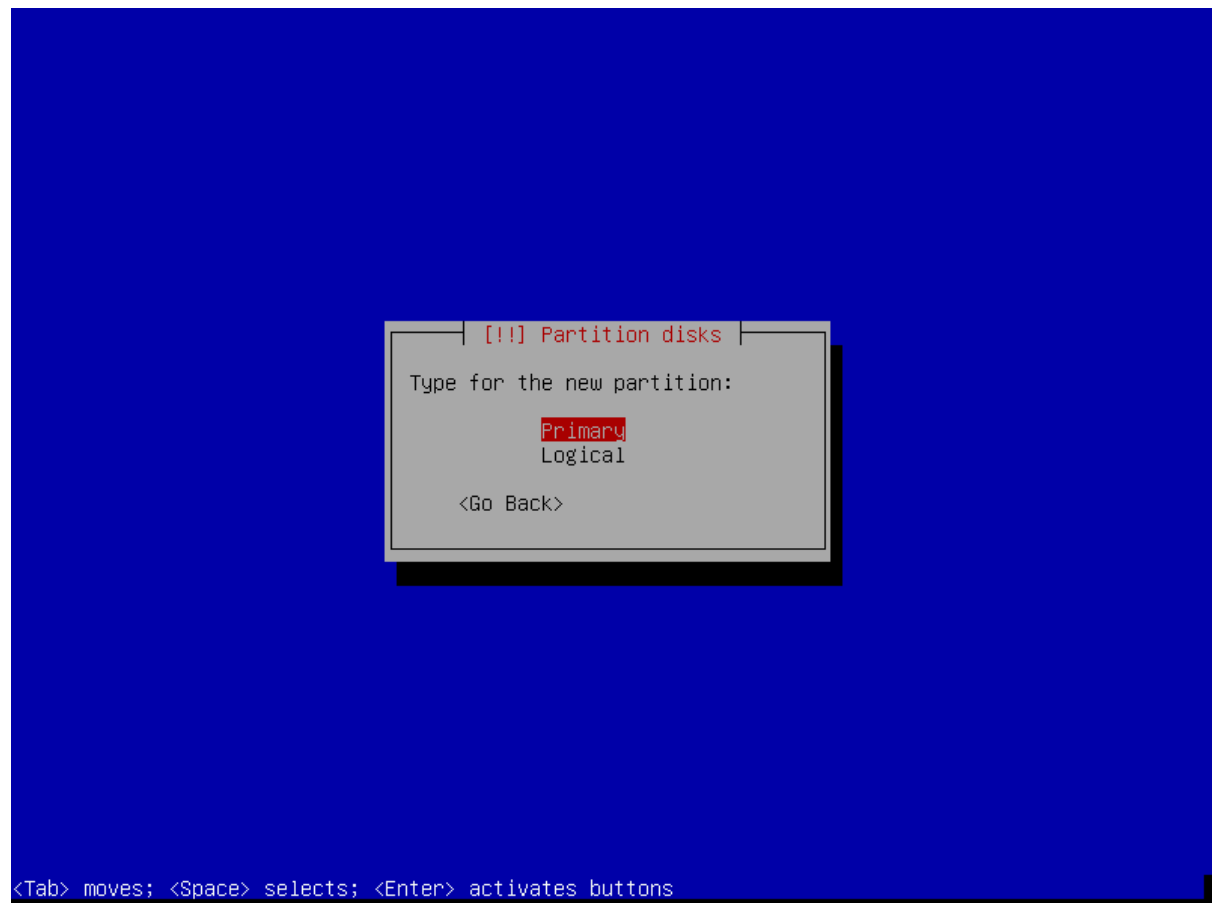
New partition size:

500 MB

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

500 MB is enough for the /boot partition.



This partition will be primary, not logical.

[[!]] Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

**Beginning**  
End

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

We want to put it at the beginning of the available space.



[!!] Partition disks

You are editing partition #1 of SCSI2 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as:	Ext4 journaling file system
Mount point:	/
Mount options:	defaults
Label:	none
Reserved blocks:	5%
Typical usage:	standard
Bootable flag:	off

Delete the partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Here, we need to indicate that this partition will be used as `/boot`, which means we must change its mount point.

[[!]] Partition disks

Mount point for this partition:

- / - the root file system
- /boot - static files of the boot loader**
- /home - user home directories
- /tmp - temporary files
- /usr - static data
- /var - variable data
- /srv - data for services provided by this system
- /opt - add-on application software packages
- /usr/local - local hierarchy

Enter manually  
Do not mount it

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

Let's select /boot, static files of the boot loader.

!!! Partition disks

You are editing partition #1 of SCSI2 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as:	Ext4 journaling file system
Mount point:	/boot
Mount options:	defaults
Label:	none
Reserved blocks:	5%
Typical usage:	standard
Bootable flag:	off

Delete the partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

We are now done setting up the partition.

Now that our `/boot` partition has been created, we need another partition to contain our LVM logical volumes.

### [[!]] Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning  
Configure software RAID  
Configure the Logical Volume Manager  
Configure encrypted volumes  
Configure iSCSI volumes

SCSI2 (0,0,0) (sda) - 32.2 GB ATA VBOX HARDDISK

#1	primary	499.1 MB	f	ext4	/boot
----	---------	----------	---	------	-------

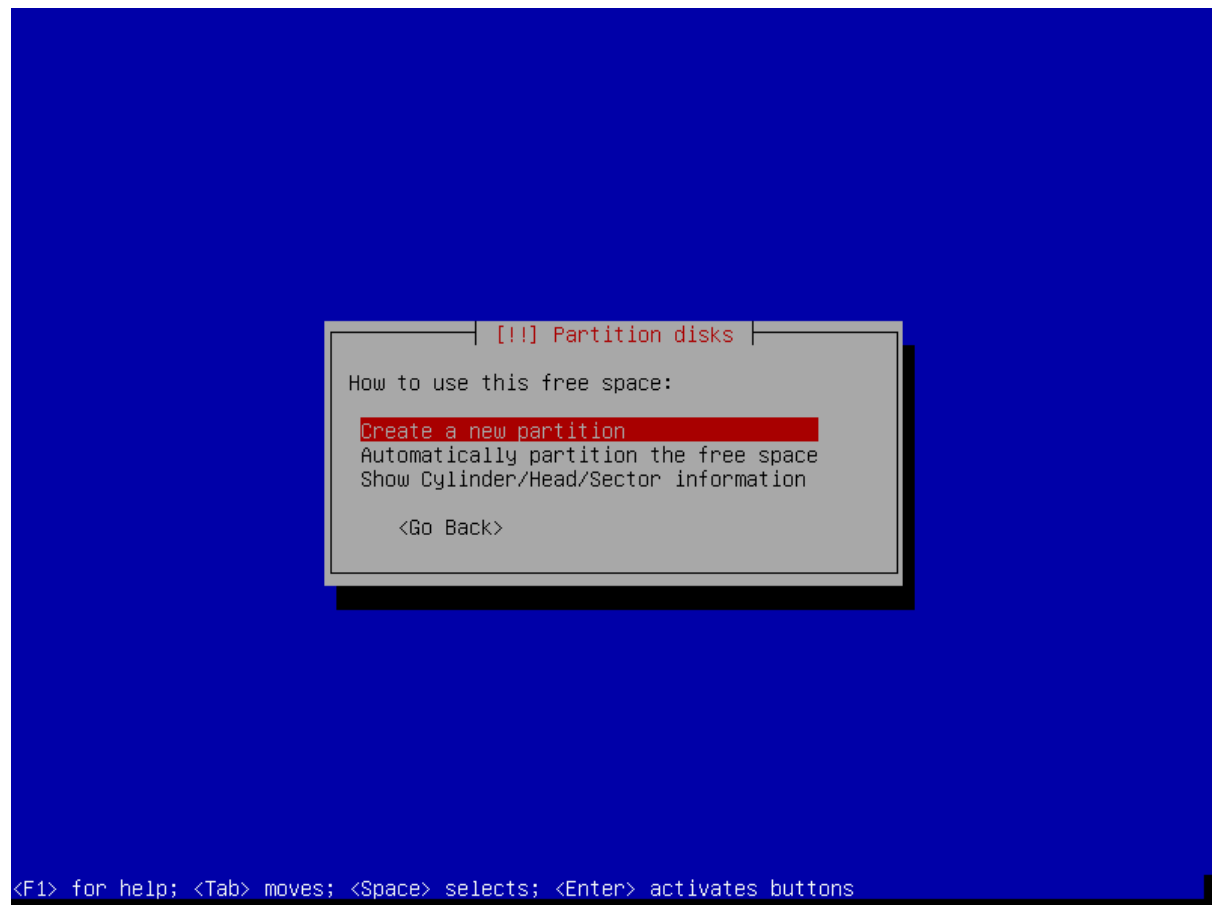
pr1/log	31.7 GB	FREE SPACE
---------	---------	------------

Undo changes to partitions  
Finish partitioning and write changes to disk

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Let's select the free space once more.



Once more, we will create a new partition.

!!! Partition disks

The maximum size for this partition is 31.7 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

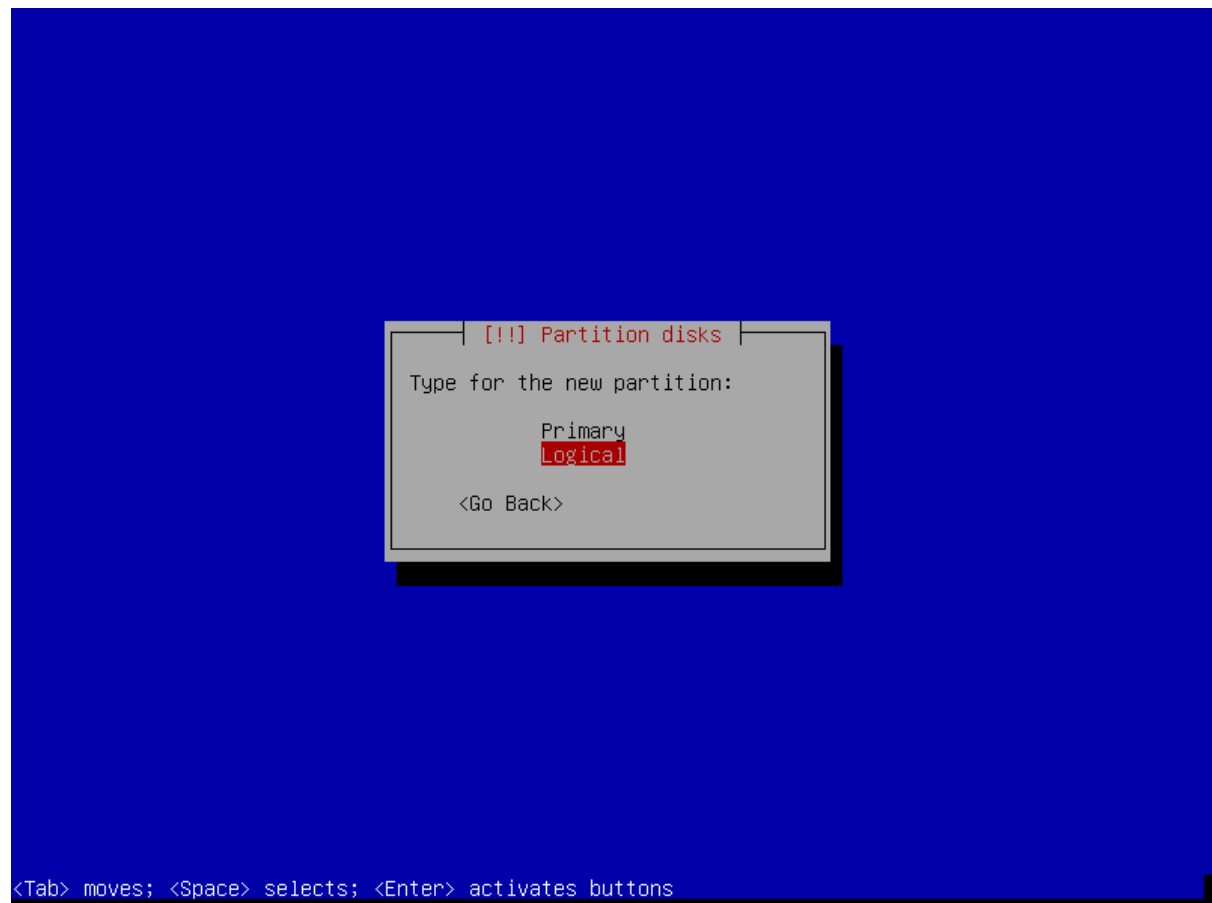
New partition size:

31.7 GB

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

It will be the size of all the rest of the free space we have. We can simply continue.



This time, it will be a logical partition, since we want logical volumes inside.

!!! Partition disks

You are editing partition #5 of SCSI2 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as:	Ext4 journaling file system
Mount point:	/
Mount options:	defaults
Label:	none
Reserved blocks:	5%
Typical usage:	standard
Bootable flag:	off

Delete the partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

For this LVM partition, we don't want any mount point. Let's modify that.



[!!] Partition disks

Mount point for this partition:

- / - the root file system
- /boot - static files of the boot loader
- /home - user home directories
- /tmp - temporary files
- /usr - static data
- /var - variable data
- /srv - data for services provided by this system
- /opt - add-on application software packages
- /usr/local - local hierarchy

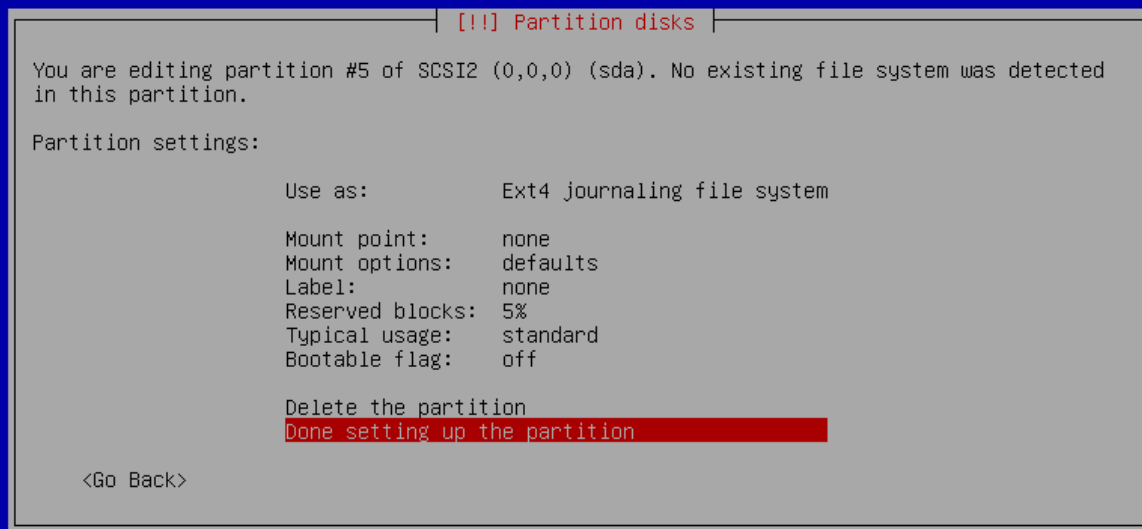
Enter manually

**Do not mount it**

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

We will tell the system not to mount this partition.



<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

We are done setting up the partition, for now, but we will have to manipulate it more before it is ready to use.

## Encrypting the Partition

The Born2beroot subject specifies that we must encrypt our partition, and that's a good practice. Careful, however, our partition `sda1` which contains the boot loader files, must not be encrypted!

## [[!]] Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

- Guided partitioning
- Configure software RAID
- Configure the Logical Volume Manager
- Configure encrypted volumes**
- Configure iSCSI volumes

SCSI2 (0,0,0) (sda) - 32.2 GB ATA VBOX HARDDISK

#1	primary	499.1 MB	f	ext4	/boot
#5	logical	31.7 GB	f	ext4	

- Undo changes to partitions
- Finish partitioning and write changes to disk

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Let's configure encrypted volumes.

!!! Partition disks

Before encrypted volumes can be configured, the current partitioning scheme has to be written to disk. These changes cannot be undone.

After the encrypted volumes have been configured, no additional changes to the partitions on the disks containing encrypted volumes are allowed. Please decide if you are satisfied with the current partitioning scheme for these disks before continuing.

The partition tables of the following devices are changed:  
SCSI2 (0,0,0) (sda)

The following partitions are going to be formatted:  
partition #1 of SCSI2 (0,0,0) (sda) as ext4  
partition #5 of SCSI2 (0,0,0) (sda) as ext4

Write the changes to disk and configure encrypted volumes?

<Yes>

<No>

<Tab> moves; <Space> selects; <Enter> activates buttons

Yes, we will confirm the partition scheme. As in the image above, we should have two partitions so far: partition #1 and #5.

### [!!] Partition disks

This menu allows you to configure encrypted volumes.

Encryption configuration actions

Create encrypted volumes

Finish

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

Let's create encrypted volumes.

[!!] Partition disks

Please select the devices to be encrypted.  
You can select one or more devices.

Devices to encrypt:

<input type="checkbox"/>	/dev/sda1	(499MB; ext4)
<input checked="" type="checkbox"/>	/dev/sda5	(31709MB; ext4)

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

Here we ONLY want to choose `/dev/sda5` to encrypt (select that disk and press space so that a star appears near it).

[[!]] Partition disks

You are editing partition #5 of SCSI2 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

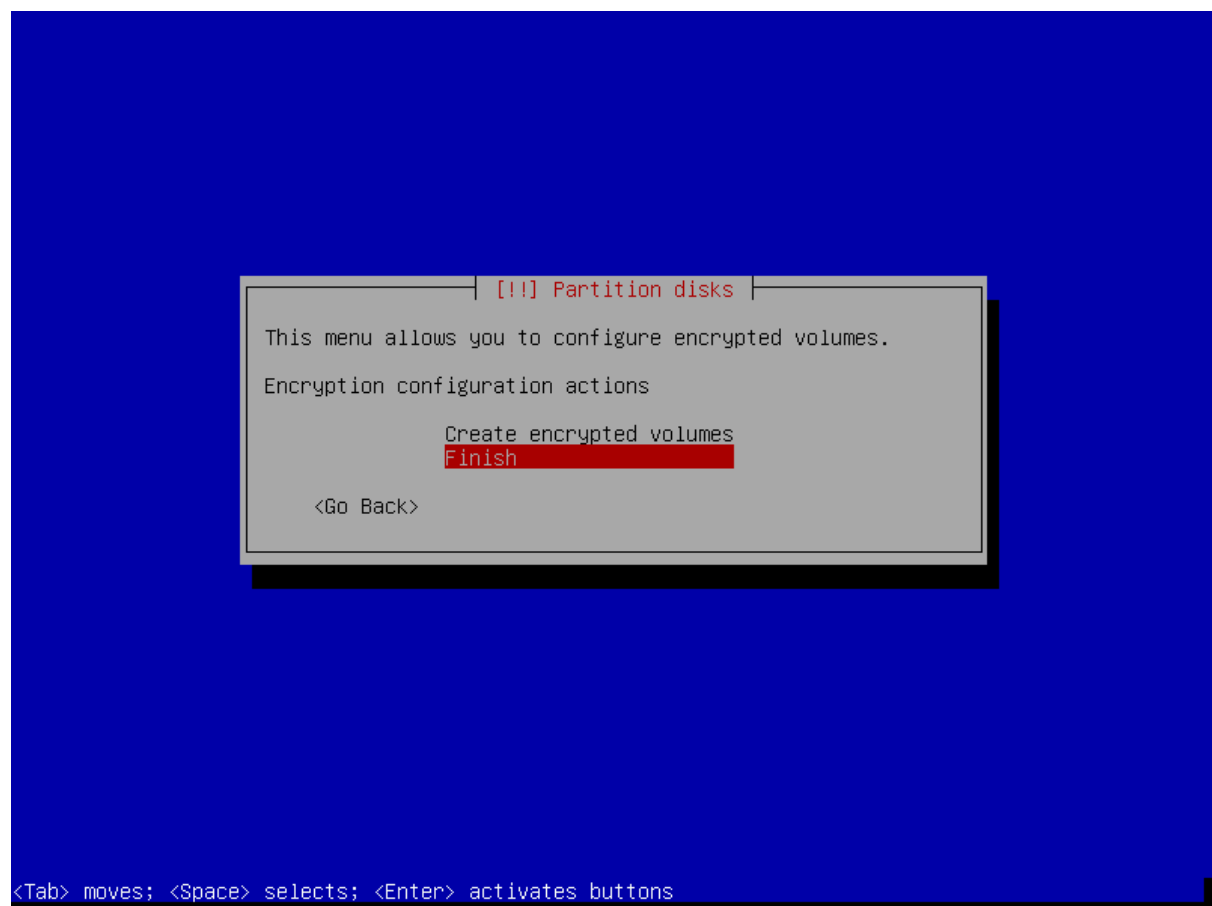
Use as:	physical volume for encryption
Encryption method:	Device-mapper (dm-crypt)
Encryption:	aes
Mount point:	none
Mount options:	defaults
Key size:	256
IV algorithm:	xts-plain64
Encryption key:	Passphrase
Erase data:	yes
Bootable flag:	off

Erase data on this partition  
Delete the partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

We're now done setting up the partition (for now....).



And we are finished configuring encrypted volumes.



[[!]] Partition disks

The data on SCSI2 (0,0,0), partition #5 (sda) will be overwritten with random data. It can no longer be recovered after this step has completed. This is the last opportunity to abort the erase.

Really erase the data on SCSI2 (0,0,0), partition #5 (sda)?

<Go Back>  <No>

<Tab> moves; <Space> selects; <Enter> activates buttons

Yes, we will format the `sda5` partition that we just encrypted. Now we must wait a while until `sda5` is ready.

[!!] Partition disks

You need to choose a passphrase to encrypt SCSI2 (0,0,0), partition #5 (sda).

The overall strength of the encryption depends strongly on this passphrase, so you should take care to choose a passphrase that is not easy to guess. It should not be a word or sentence found in dictionaries, or a phrase that could be easily associated with you.

A good passphrase will contain a mixture of letters, numbers and punctuation. Passphrases are recommended to have a length of 20 or more characters.

Encryption passphrase:

2001SpacePirates!Arr\_

[\*] Show Password in Clear

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

Once the installer is done erasing data on our encrypted partition, we must choose an encryption password. This password should be strong and we cannot forget it, otherwise we won't be able to access our Born2beroot machine! Then, of course, we have to confirm this password.

## Configuring LVM

Now that our `sda5` partition is nicely encrypted, it is time to create our logical volumes inside it. For the mandatory part of Born2beroot, we need three logical volumes: root, swap and home. If we want to do the bonuses, we need seven of them: root, swap, home, var, srv, tmp and var/log.

### [[!]] Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning

Configure software RAID

**Configure the Logical Volume Manager**

Configure encrypted volumes

Configure iSCSI volumes

Encrypted volume (sda5\_crypt) - 31.7 GB Linux device-mapper (crypt)

#1 31.7 GB f ext4

SCSI2 (0,0,0) (sda) - 32.2 GB ATA VBOX HARDDISK

#1 primary 499.1 MB F ext4 /boot

#5 logical 31.7 GB K crypto (sda5\_crypt)

Undo changes to partitions

Finish partitioning and write changes to disk

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Let's configure the Logical Volume Manager.

### !!! Partition disks

Before the Logical Volume Manager can be configured, the current partitioning scheme has to be written to disk. These changes cannot be undone.

After the Logical Volume Manager is configured, no additional changes to the partitioning scheme of disks containing physical volumes are allowed during the installation. Please decide if you are satisfied with the current partitioning scheme before continuing.

The partition tables of the following devices are changed:  
Encrypted volume (sda5\_crypt)

The following partitions are going to be formatted:  
Encrypted volume (sda5\_crypt) as ext4

Write the changes to disks and configure LVM?

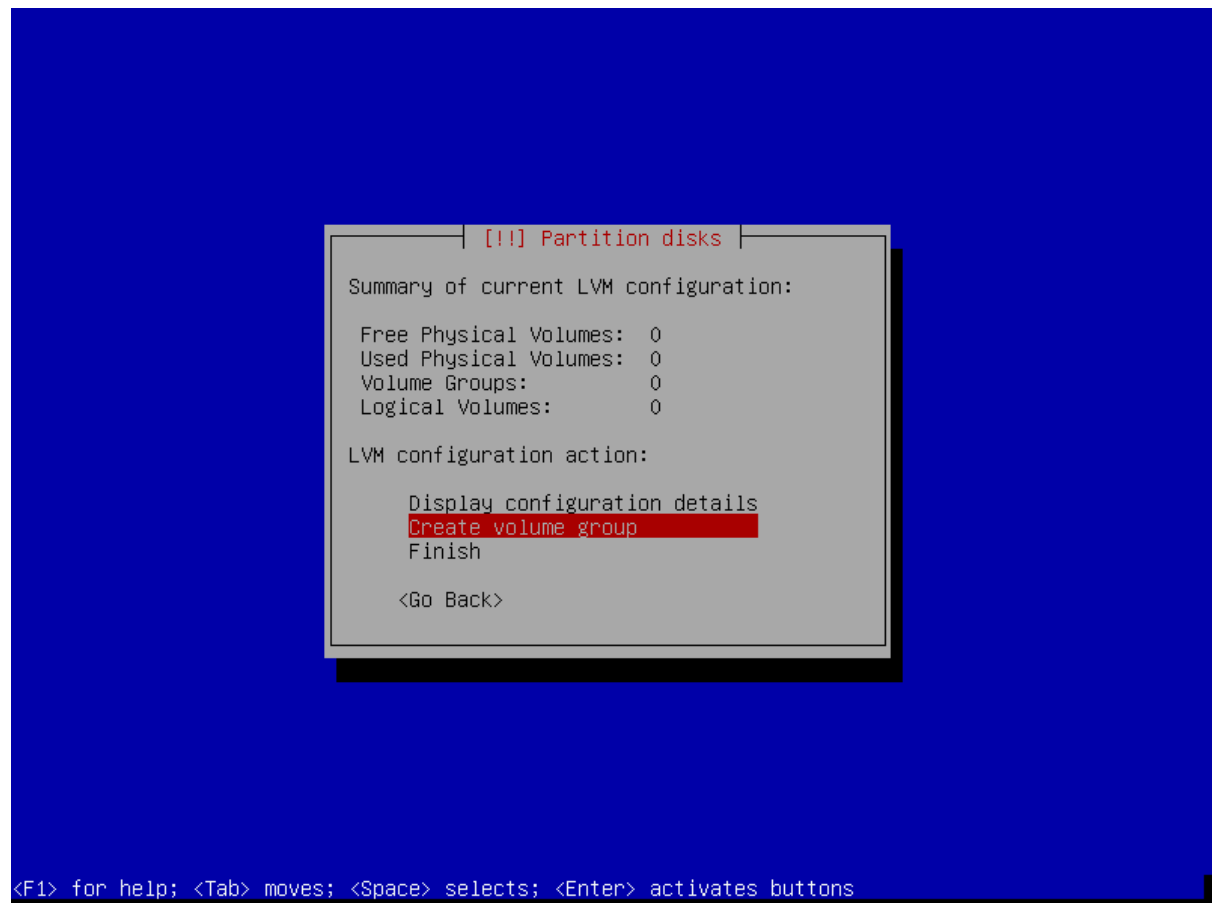
<Yes>

<No>

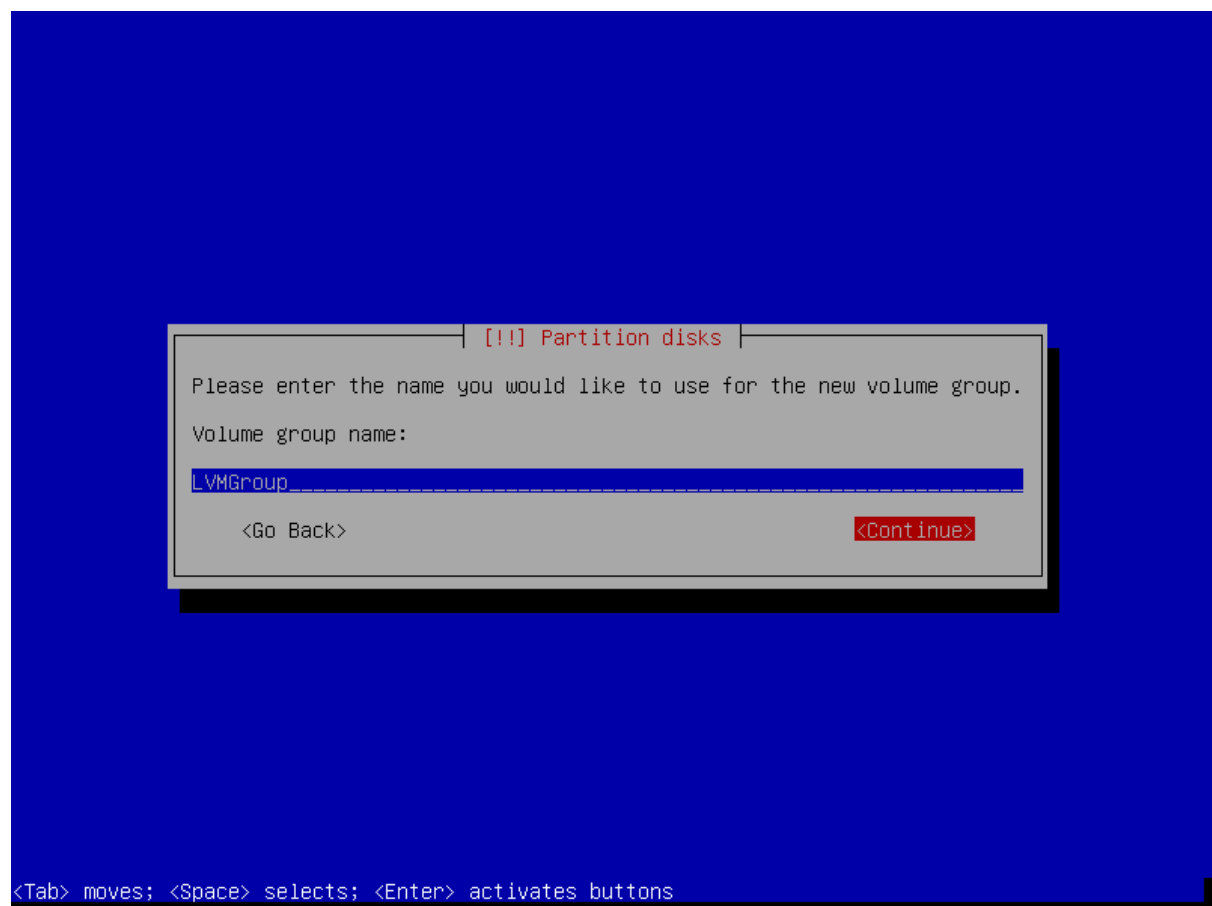
<Tab> moves; <Space> selects; <Enter> activates buttons

Yes, of course, we want to apply the changes and configure LVM.

Creating a Volume Group



In order for LVM to be able to manage our logical volumes, we first have to create a volume group.



We will call the group LVGroup, just like in the Born2beroot subject.

[!!!] Partition disks

Please select the devices for the new volume group.  
You can select one or more devices.  
Devices for the new volume group:

<input checked="" type="checkbox"/>	/dev/mapper/sda5_crypt	(31693MB; ext4)
<input type="checkbox"/>	/dev/sda1	(499MB; ext4)

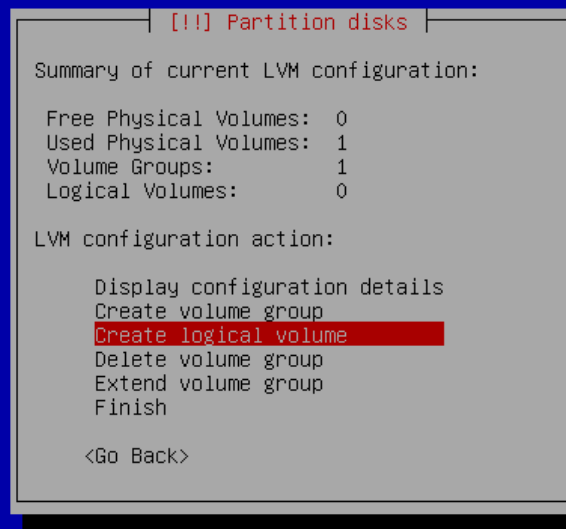
<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

Now, we should assign our encrypted logical partition to this volume group (select `sda5` and press space-bar so the star appears). Careful not to assign `sda1`!

### Create Logical Volumes

Now that we have our volume group and that our encrypted logical partition is assigned to it, we want to create our logical volumes one by one. Let's start with `root`, which must be present for both the mandatory and bonus parts.



<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Let's create our first logical volume.



[!!] Partition disks

Please select the volume group where the new logical volume should be created.

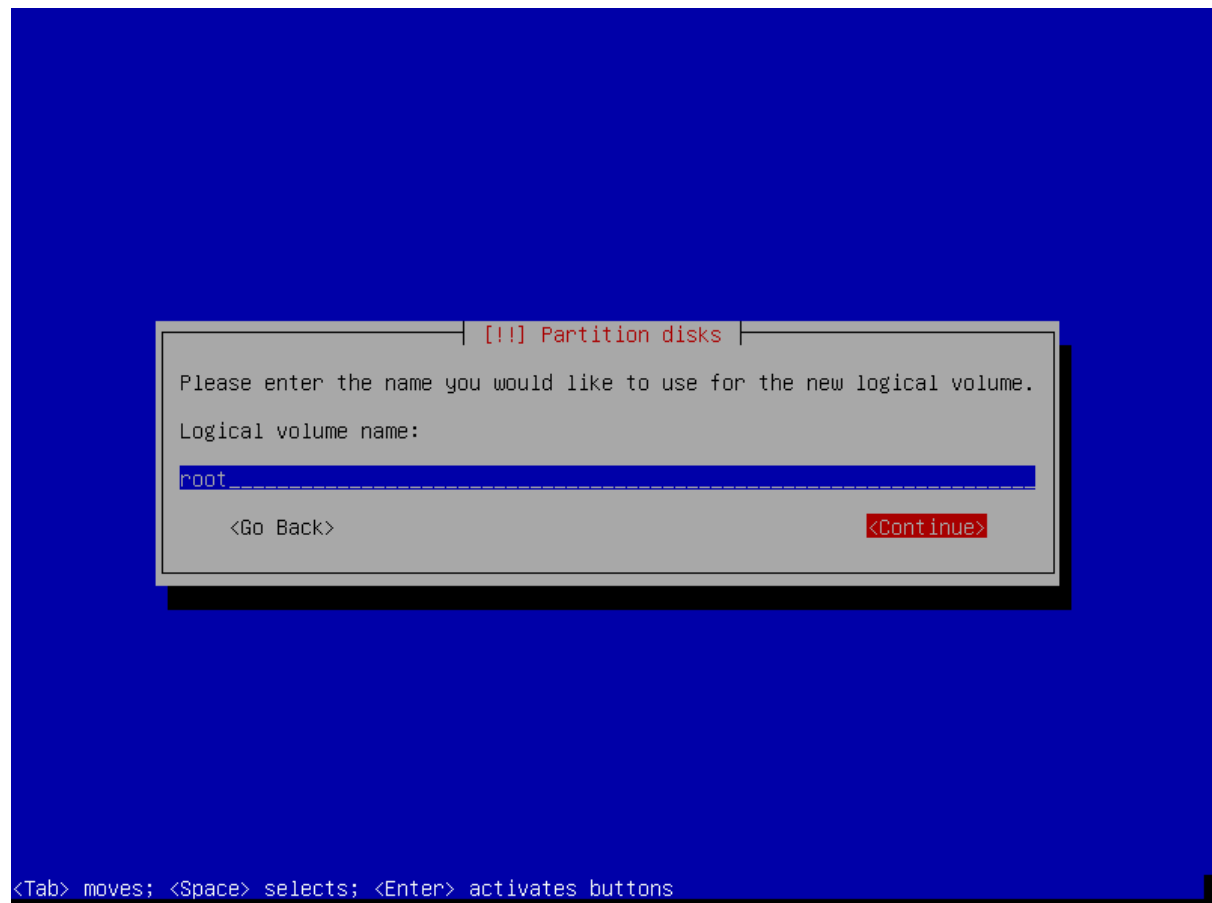
Volume group:

LVMGroup	(31692MB)
----------	-----------

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

The new logical volume will be created in the volume group that we just made, LVMGroup.



Let's give it a descriptive name. In this case, root.

[!!] Partition disks

Please enter the size of the new logical volume. The size may be entered in the following formats: 10K (Kilobytes), 10M (Megabytes), 10G (Gigabytes), 10T (Terabytes). The default unit is Megabytes.

Logical volume size:

10G

<Go Back> <Continue>

<Tab> moves; <Space> selects; <Enter> activates buttons

And we will give it a size. 10 GB as in the Born2beroot subject example is a bit much, better set it to 2.8 GB. That will be more than enough for both the mandatory and bonus parts.

We now have our first logical volume! Now we must continue to create our logical volumes until we have all the ones we need. There should be 3 for the mandatory part, 7 for the bonuses. These are the four steps:

- Create a logical volume
- Choose the group LVMGroup
- Name the volume
- Choose a size (check the subject examples)

We can check where we are in the list by Displaying the configuration details if we get lost. In the end, it should show something like this:

```
[!!] Partition disks

Current LVM configuration:
Unallocated physical volumes:
* none

Volume groups:
* LVMGroup (31692MB)
  - Uses physical volume: /dev/mapper/sda5_crypt (31692MB)
  - Provides logical volume: home (4999MB)
  - Provides logical volume: root (9999MB)
  - Provides logical volume: srv (2998MB)
  - Provides logical volume: swap (2298MB)
  - Provides logical volume: tmp (2998MB)
  - Provides logical volume: var (2998MB)
  - Provides logical volume: var-log (3997MB)

<Continue>
```

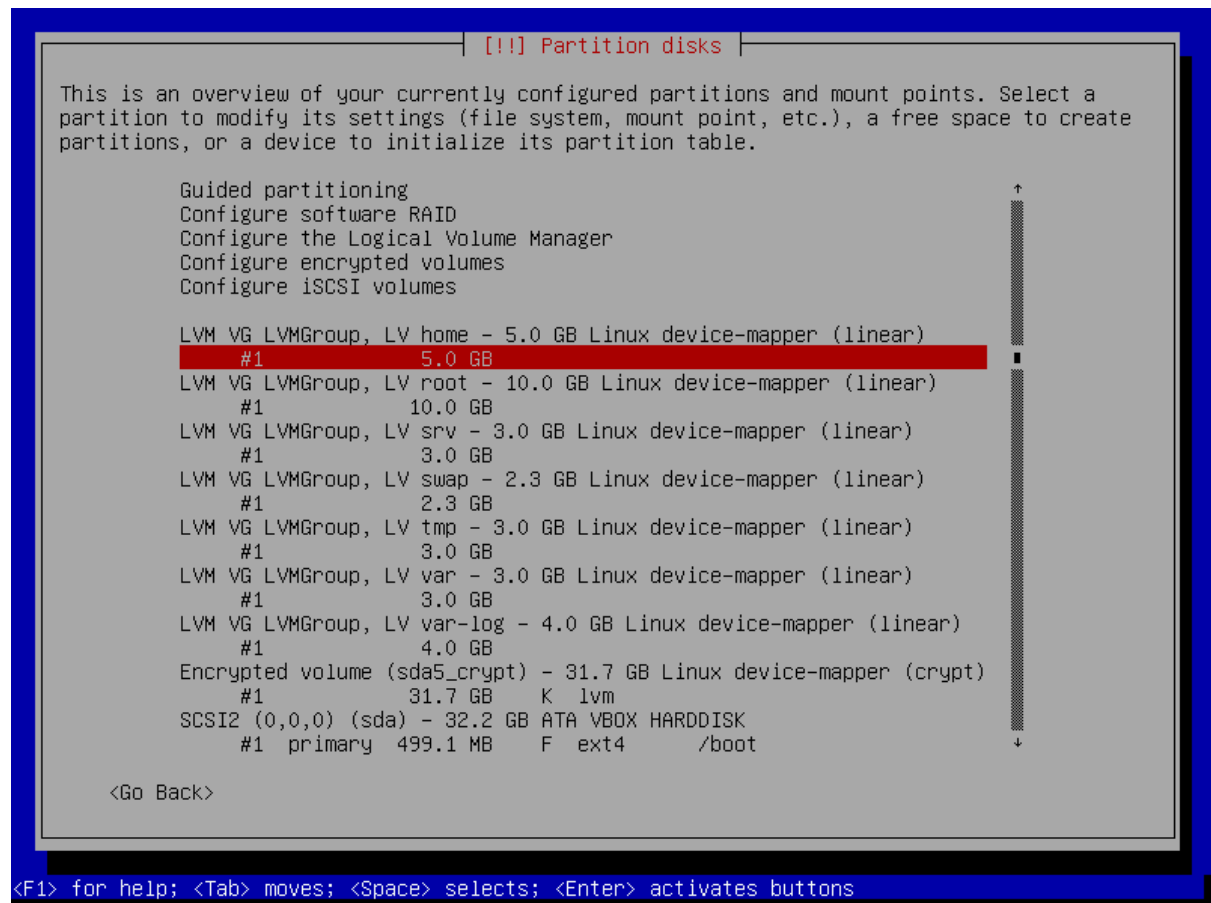
<Tab> moves; <Space> selects; <Enter> activates buttons

This is what the final LVM configuration for the bonus part of Born2beroot looks like. Note that the last one is named “var-log” (for some obscure reason, it will appear later as in the subject: var-log)

Once all the volumes are configured, we can choose to finish in the main menu.

### Configuring Logical Volumes

But it is not really finished! We now have to explain to Debian how to actually use each logical volume: which file system and which mount point to use.



Let's select the first logical volume, #1, right under the line displaying its group and name. The first one will be "home".

[!!] Partition disks

You are editing partition #1 of LVM VG LVMGroup, LV home. No existing file system was detected in this partition.

Partition settings:

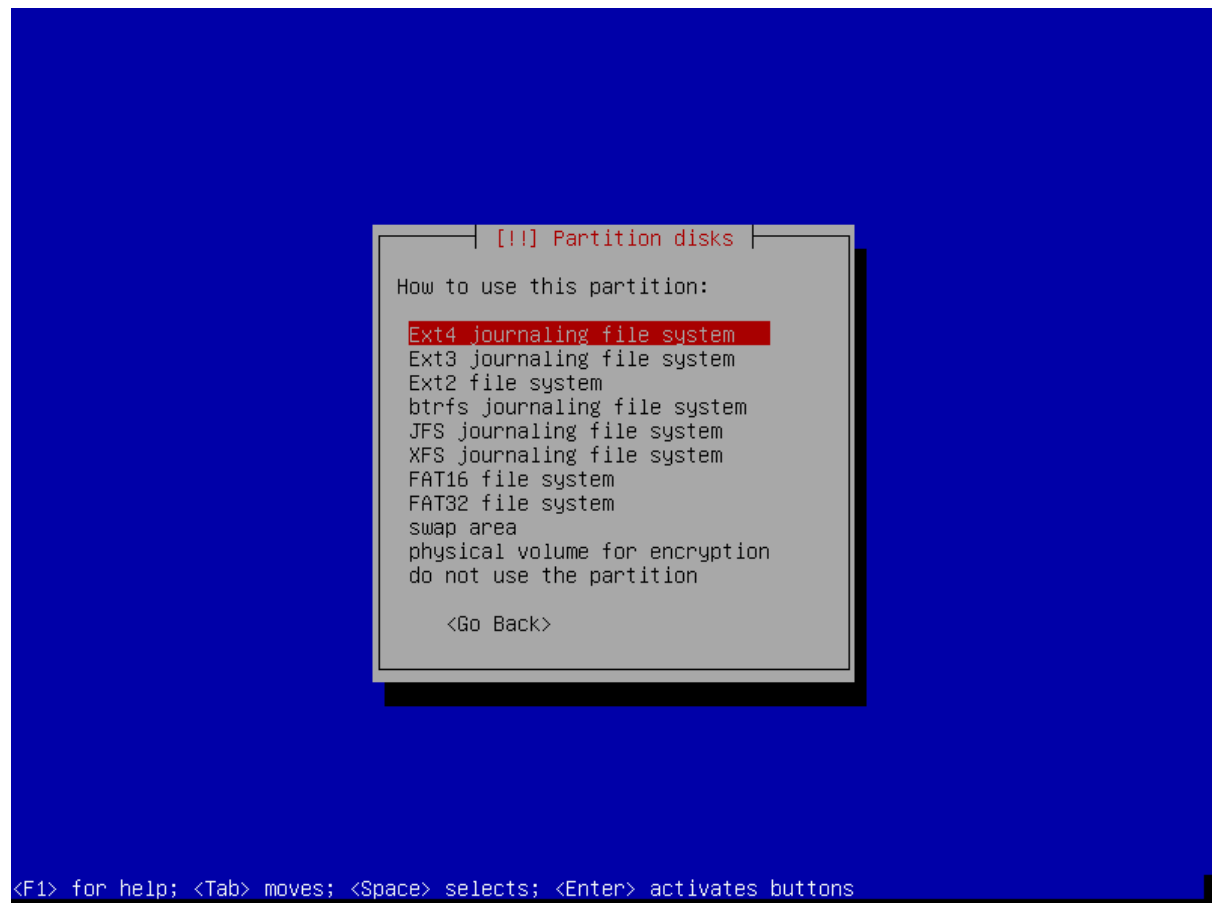
Use as: do not use

Erase data on this partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

We want to tell the system how to use this logical volume, so select Use as:...



We will give it the ext4 journaling file system.

!!! Partition disks

You are editing partition #1 of LVM VG LVMGroup, LV home. No existing file system was detected in this partition.

Partition settings:

Use as:	Ext4 journaling file system
Mount point:	none
Mount options:	defaults
Label:	none
Reserved blocks:	5%
Typical usage:	standard

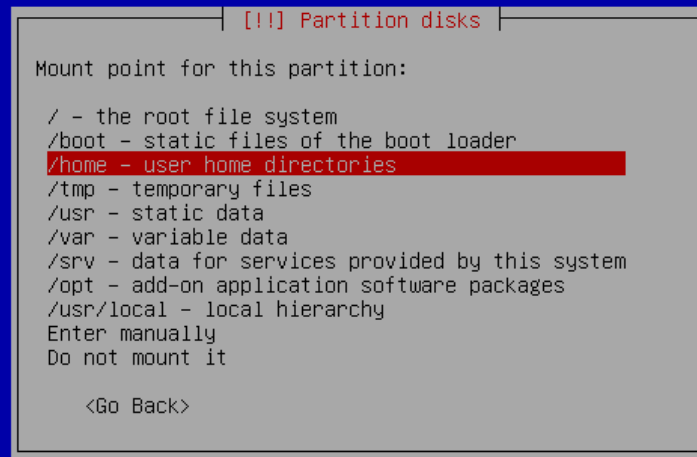
Erase data on this partition  
Done setting up the partition

<Go Back>

<F1> for help; <Tab> moves; <Space> selects; <Enter> activates buttons

Then, we will change it mount point. Let's note that the name of the logical volume is displayed for reference at the top of the screen. In this case, it's still "home".





<Tab> moves; <Space> selects; <Enter> activates buttons

Finally, we will tell the system to use this logical volume for the /home user directories. Then, we are done setting up this logical volume.

It is the same procedure for all the rest of the logical volumes:

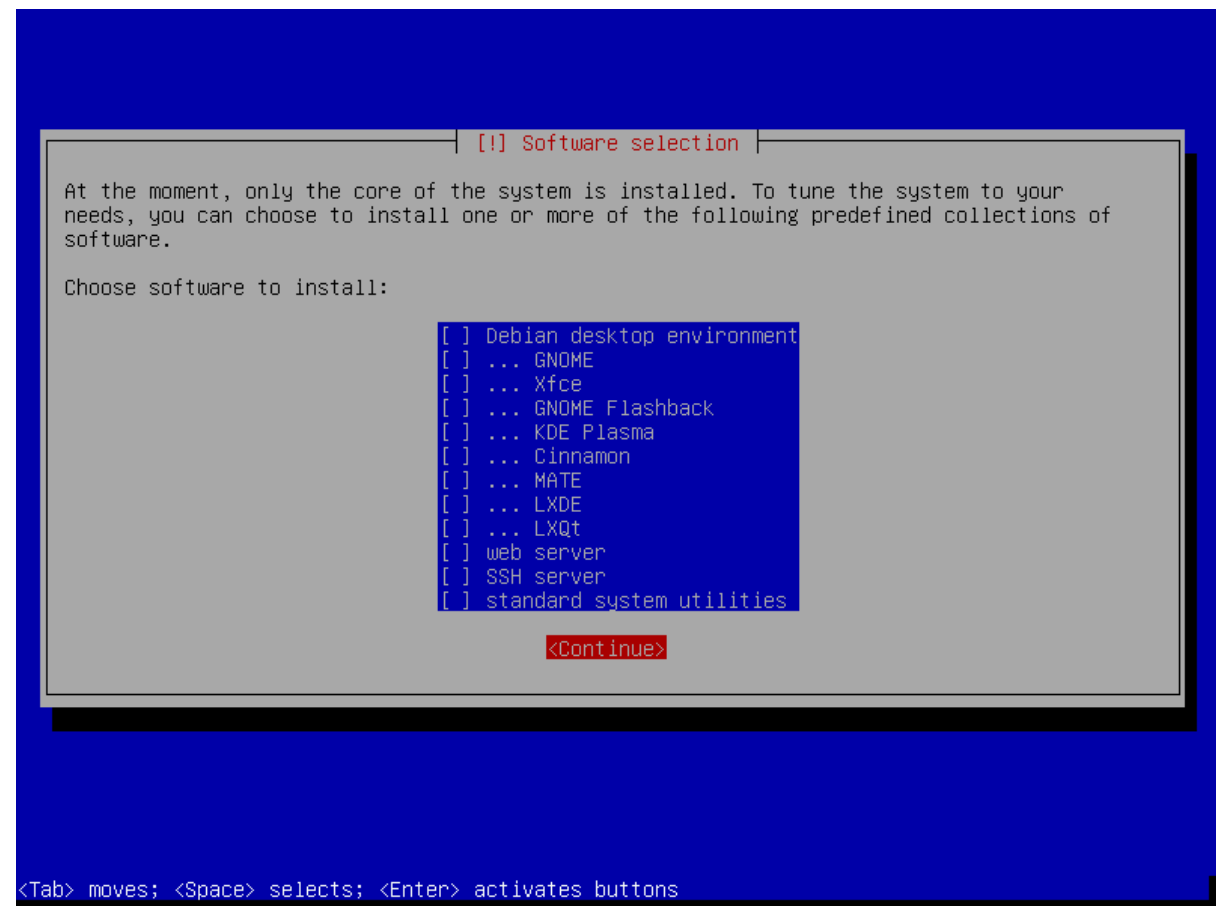
- Choose the volume
- Change “Use as”
- Choose ext4 (Except swap, where we should instead choose “swap” and finish right away)
- Change the mount point
- Choose the corresponding mount point depending on the volume name (for root, choose “/ – the root file system” and for var-log, choose “Enter manually” and type `/var/log`)

Finally, once we are certain that every volume is set up correctly, we can navigate all the way down the main page and select Finish partitioning and write changes to disk. Then yes on the next screen to confirm.

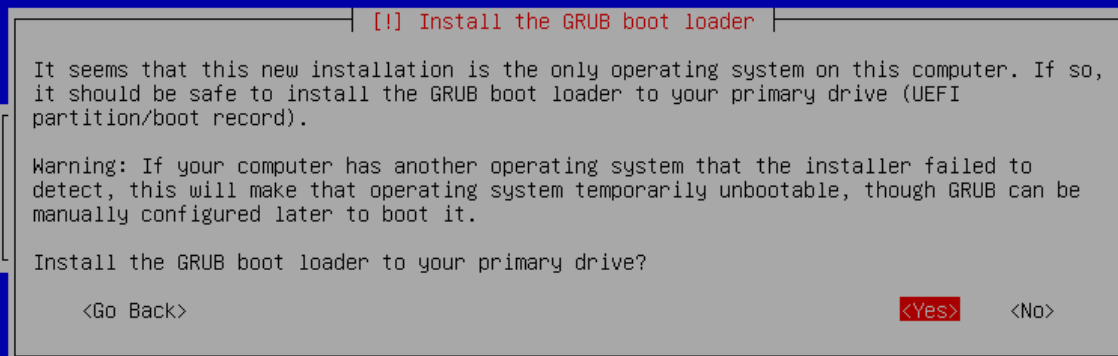
## Finishing the Debian Installation

The base system will now install, which means we will have to wait some more. There are still a few things to settle:

- We can say no to the scan.
- Then we must choose a country and a mirror to download Debian packages from. (i.e. France and deb.debian.org)
- We can leave the proxy field blank.
- And we don't need to participate in the statistical study, so no.



For the software selection, we don't want any. We will install what we need very soon. Uncheck all the starred options by selecting the option and pressing space before continuing.



<Tab> moves; <Space> selects; <Enter> activates buttons

However, yes, we do want to install GRUB (Grand Unified Bootloader).

### [!] Install the GRUB boot loader

You need to make the newly installed system bootable, by installing the GRUB boot loader on a bootable device. The usual way to do this is to install GRUB to your primary drive (UEFI partition/boot record). You may instead install GRUB to a different drive (or partition), or to removable media.

Device for boot loader installation:

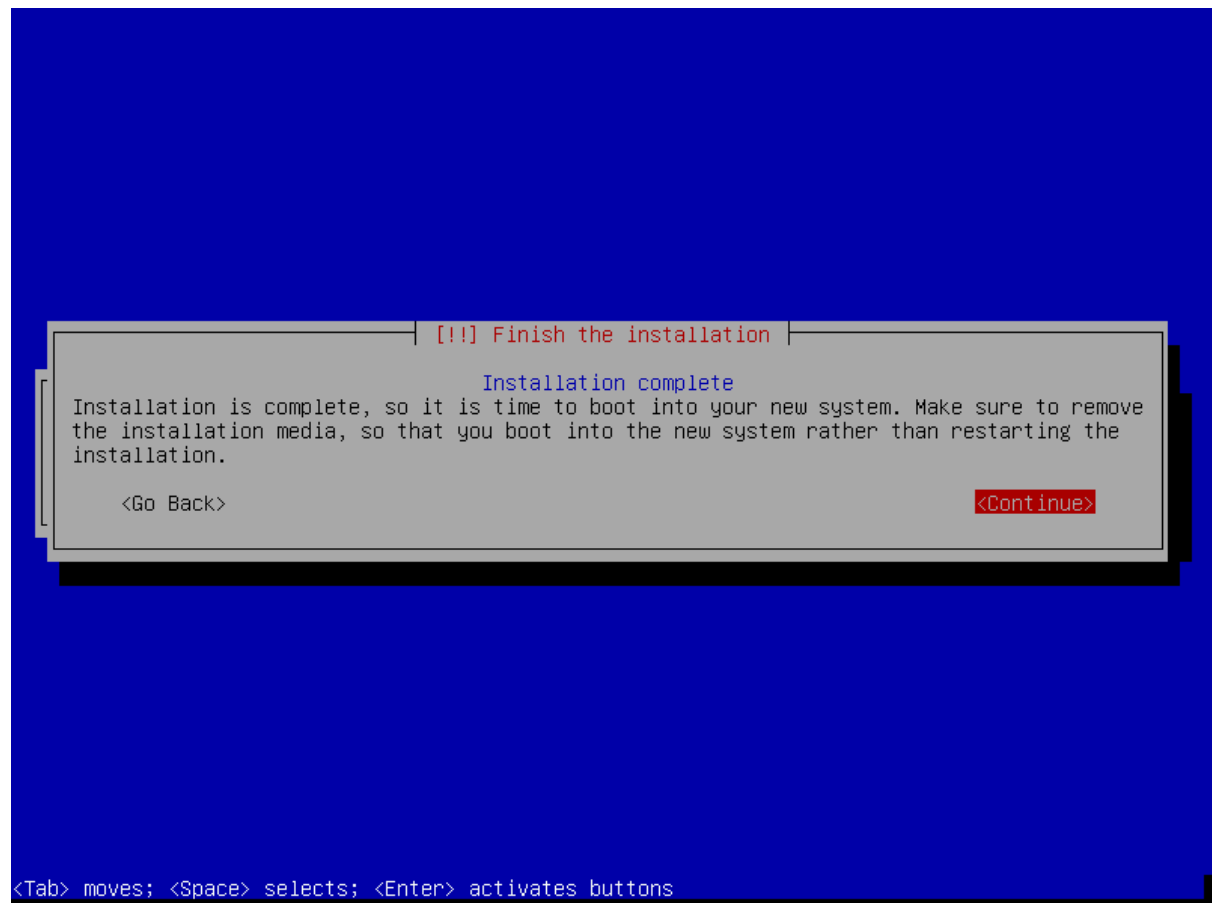
Enter device manually

`/dev/sda (ata-VBOX_HARDDISK_VB3191ca35-98f216a6)`

<Go Back>

<Tab> moves; <Space> selects; <Enter> activates buttons

And we will install it on `/dev/sda`.



After all our efforts, Debian is installed on our virtual machine, Born2beroot!

## Logging into Born2beroot

Now, we can restart the virtual machine. On boot, it will ask us for the password to decrypt the encrypted partition, and then the credentials of the user we created at the beginning of the installation process.

To verify that the installation was correct, we will want to immediately try a few commands:

- `cat /etc/os-release` to check the OS information,
- `lsblk` to check our partitions,
- `apt --version` to check if the packet manager is installed by default,
- `date` to check the time zone. If the time zone is incorrect, it's not very important for Born2beroot.

```

Debian GNU/Linux 11 mcombeau42 tty1

mcombeau42 login: mcombeau
Password:
Linux mcombeau42 5.10.0-11-amd64 #1 SMP Debian 5.10.92-2 (2022-02-28) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
mcombeau@mcombeau42:~$ lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINT
sda                                  8:0      0   30G  0 disk
├─sda1                              8:1      0  476M  0 part  /boot
├─sda2                              8:2      0    1K  0 part
└─sda5                              8:5      0  29.5G  0 part
   ├─sda5_crypt                    254:0    0  29.5G  0 crypt
   │   ├─LVVGGroup-swap            254:1    0   2.1G  0 lvm    [SWAP]
   │   ├─LVVGGroup-root            254:2    0   9.3G  0 lvm    /
   │   ├─LVVGGroup-home            254:3    0   4.7G  0 lvm    /home
   │   ├─LVVGGroup-tmp             254:4    0   2.8G  0 lvm    /tmp
   │   ├─LVVGGroup-srv             254:5    0   2.8G  0 lvm    /srv
   │   ├─LVVGGroup-var             254:6    0   2.8G  0 lvm    /var
   │   └─LVVGGroup-var--log        254:7    0   3.7G  0 lvm    /var/log
└─sr0                               11:0    1 1024M  0 rom
mcombeau@mcombeau42:~$ _

```

Now that our partitions are correct, we can focus on the various configurations that the Born2beroot subject requires, like the sudo installation, the password policy and the monitoring.sh script. All that and more will be in the next article!

Born2beroot : Installation | Configuration | Bonus | Subject [pdf]

## Sources and Further Reading

- VirtualBox User Manual [VirtualBox]
- Michael Klein, *What is a Virtual Machine?* [codecademy]
- W3Techs, *Usage statistics of Linux for websites* [W3Techs]
- Rich Alloway, *CentOS vs. Debian: Key Similarities and Differences* [OpenLogic]
- Nisal N, *Debian vs CentOS: Differences You Should Know* [1Gbits]
- Rich Bowen, *CentOS Project shifts focus to CentOS Stream* [CentOS]

- Karim Buzdar, *What is LVM (Logical Volume Management), and what are its Benefits?* [LinuxHint]
- Ubuntu Wiki, *LVM* [Ubuntu Wiki]
- Debian, *Appendix C. Partitioning for Debian* [Debian]
- Bertel King, *What Is a Linux Swap Partition? Everything You Need to Know* [MakeUseOf]