

Introduction to Linux Boot, Homework

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2 grudnia 2023

1 Removing GRUB

Steps:

- GRUB has been saved on a separate file on a disk
- GRUB in has been moved from /boot directory to directory /home/tomasz
- Virtual Machine has been rebooted
- Operating System does not boot anymore. See figure 1



Figure 1: Failed to boot OS on VM

2 GRUB recovery

After GRUB removing, OS on Virtual Machine cannot open. System recovery will be conducted via Live CD with Ubuntu Image. Steps to be taken:

- Create virtual cd disk with Ubuntu Image
- In VirtualBox enable Live CD by checking the box in Settings/Storage/ubuntu-22.04.3-desktop-amd64.iso/Attributes. See figure 2

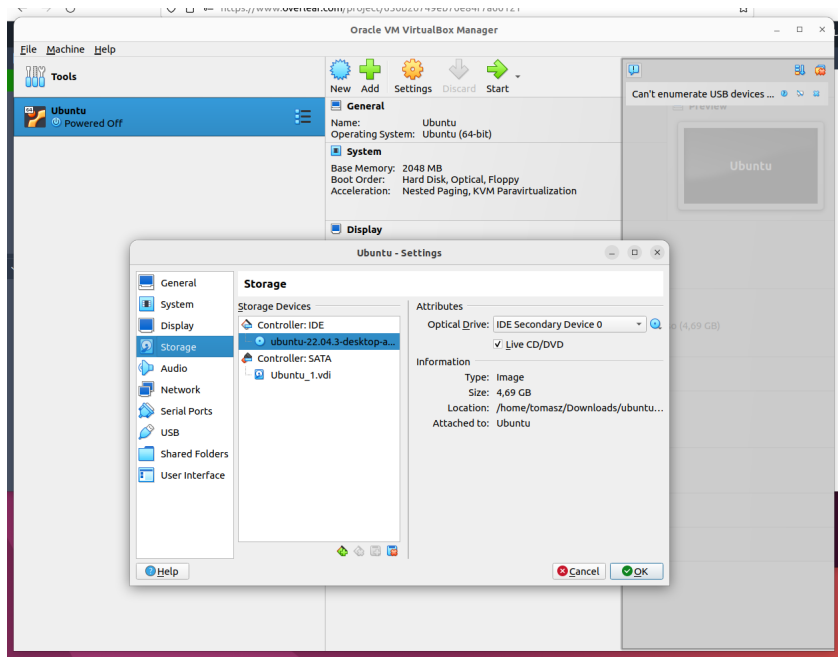


Figure 2: Virtual optical disk with Live CD enabled

- After creating Live CD, you have to insert it into Virtual Machine
- Then change boot order, so that CD is booted first. See figure 3

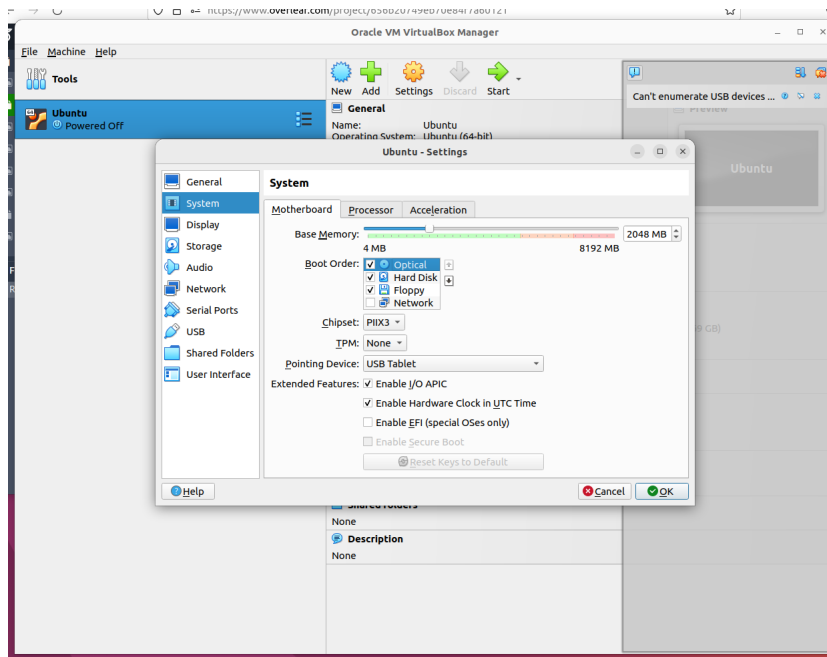


Figure 3: Changing boot order

- Run virtual machine
- In GRUB menu choose option Try or Install Ubuntu. See figure 4

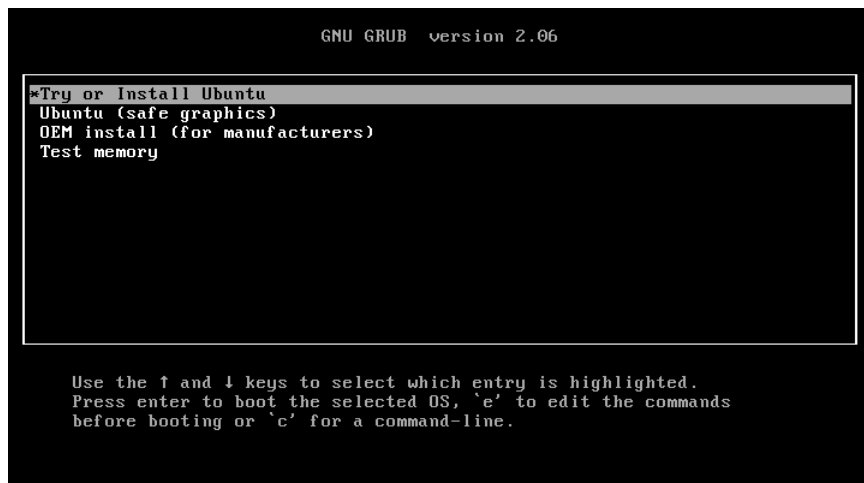


Figure 4: GRUB menu by booting from Live CD

- After successful booting of Ubuntu from Live CD choose option Install Ubuntu
- After logging into try ubuntu change virtual termin with key combination

`Fn + Right Ctrl + F3`

changed virtual terminal. See figure 5

```
ubuntu@ubuntu:/$ fdisk -l /dev/sda
fdisk: cannot open /dev/sda: Permission denied
ubuntu@ubuntu:/$ sudo fdisk -l /dev/sda
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: A38858CC-5A8C-4AC0-8003-5071EEB12666

Device      Start      End  Sectors  Size Type
/dev/sda1    2048     4096     2048    1M BIOS boot
/dev/sda2    4096 1054719 1050624   513M EFI System
/dev/sda3 1054720 41940991 40886272 19.5G Linux filesystem
ubuntu@ubuntu:/$
```

Figure 5: Third virtual terminal. List available partitions

In newly opened virtual terminal do the following steps:

- List available partitions:

`sudo fdisk -l /dev/sda`

- Output 5 shows that there are 3 partitions. We assume that partition with OS to be recover is in /dev/sda3

```
ubuntu@ubuntu:/$ fdisk -l /dev/sda
fdisk: cannot open /dev/sda: Permission denied
ubuntu@ubuntu:/$ sudo fdisk -l /dev/sda
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: WDC WD8000ISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: A38858CC-5A8C-4AC0-8003-5071EEB126B6

Device      Start      End  Sectors  Size Type
/dev/sda1    2048      4095     2048    1M BIOS boot
/dev/sda2    4096   1054719   1050624    51M EFI System
/dev/sda3   1054720 41940591 40885172 19.5G Linux filesystem
ubuntu@ubuntu:/$ sudo mount /dev/sda3 /mnt
mount: /mnt: /dev/sda3 already mounted on /mnt.
ubuntu@ubuntu:/$
```

Figure 6: Mounting linux partition

- Mount /dev/sda3 to /mnt. See figure 6

```
sudo mount /dev/sda3 /mnt
```

- list folder and files in /mnt. See figure 7

```
ls /mnt
```

- change apparent root directory

```

ubuntu@ubuntu:/$ fdisk -l /dev/sda
fdisk: cannot open /dev/sda: Permission denied
ubuntu@ubuntu:/$ sudo fdisk -l /dev/sda
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: A38858CC-5A8C-4AC0-8003-5071EEB126B6

Device      Start      End  Sectors  Size Type
/dev/sda1    2048      4095     2048    1M BIOS boot
/dev/sda2    4096   1054719   1050624    51M EFI System
/dev/sda3   1054720 41940991 40885272 19.5G Linux filesystem
ubuntu@ubuntu:/$ sudo mount /dev/sda3 /mnt
mount: /mnt: /dev/sda3 already mounted on /mnt.
ubuntu@ubuntu:/$ ls /mnt
bin  boot  cdrom  dev  etc  home  lib  lib32  lib64  libx32  lost+found  media  mnt  opt  proc  root  run  sbin  snap  srv  swapfile  sys  tmp  usr  var
ubuntu@ubuntu:/$

```

Figure 7: List files from /mnt

- Before removing GRUB, grub folder from /boot was moved to /home/tomasz. To recover GRUB you have to move it from /home/tomasz to /boot. See figure 8

```

root@ubuntu:/# ls
bin  boot  cdrom  dev  etc  home  lib  lib32  lib64  libx32  lost+found  media  mnt  opt  proc  root  run  sbin  snap  srv  swapfile  sys  tmp  usr  var
root@ubuntu:/# mv /home/tomasz/grub/ /boot/
root@ubuntu:/# ls /boot/
config-5.2.0-26-generic  initrd.img  memtest86+.bin  System.map-5.2.0-37-generic  vmlinuz.oid
config-5.2.0-37-generic  initrd.img-6.2.0-26-generic  memtest86+.elf  vmlinuz
efi                    initrd.img-6.2.0-37-generic  memtest86+_multiboot.bin  vmlinuz-5.2.0-26-generic
grub                  initrd.img.oid              System.map-5.2.0-26-generic  vmlinuz-5.2.0-37-generic
root@ubuntu:/# ls /boot/grub/
fonts  gfxblacklist.txt  grub.cfg  grubenv  i386-pc  locale  unicode.pf2  x86_64-efi
root@ubuntu:/# ls /boot/ grub
ls: cannot access 'grub': No such file or directory
/boot/:
config-5.2.0-26-generic  initrd.img  memtest86+.bin  System.map-5.2.0-37-generic  vmlinuz.oid
config-5.2.0-37-generic  initrd.img-6.2.0-26-generic  memtest86+.elf  vmlinuz
efi                    initrd.img-6.2.0-37-generic  memtest86+_multiboot.bin  vmlinuz-5.2.0-26-generic
grub                  initrd.img.oid              System.map-5.2.0-26-generic  vmlinuz-5.2.0-37-generic
root@ubuntu:/# ls /boot/grub
fonts  gfxblacklist.txt  grub.cfg  grubenv  i386-pc  locale  unicode.pf2  x86_64-efi
root@ubuntu:/#

```

Figure 8: Move GRUB folder back to /boot

- With

Fn + Right Ctrl + F2

get back to default virtual terminal

- In Console Terminal typed

```
shutdown now
```

to close virtual machine

- In virtual machine settings booting hierarchy has been changed.

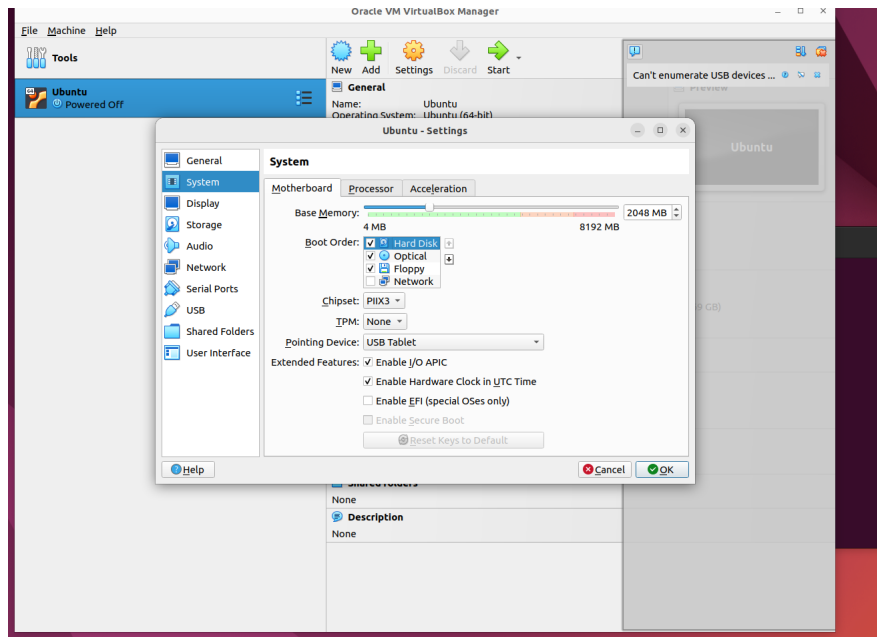


Figure 9: Changing boot hierarchy

- Virtual machine has been started. OS boots correctly.

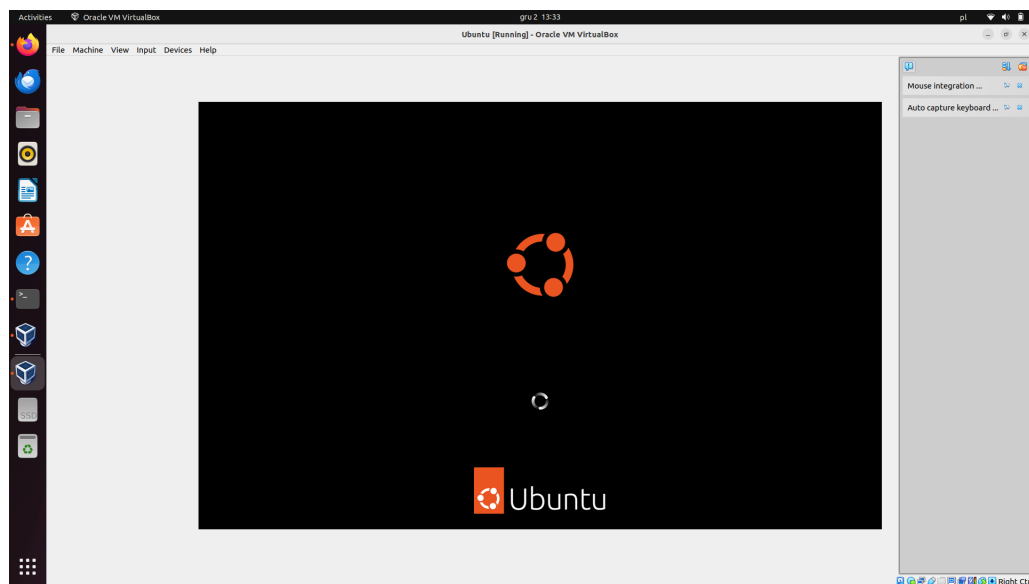


Figure 10: Ubuntu booting correctly

3 Results

After GRUB recovery, OS boots correctly.