

sm1act04 - Linux boot process. GRUB (linux boot manager). Dual boot Linux-Windows

GENERAL CONDITIONS

1- Deadline:

- DAW1: On **21/27-10-2025** teacher will check that your new virtual machine is working properly
- ASIX1: On **23/24-10-2025** teacher will check that your new virtual machine is working properly

PART 1: LISTENING AND READING

a) Play the following videoclip: <https://www.youtube.com/watch?v=XpFsMB6FoOs> and answer the questions in the following [quiz about the linux boot process](#).

b) Play the following videoclips:

- <https://www.youtube.com/watch?v=HeCrh3-sQvs>
- <https://www.youtube.com/watch?v=pJ607nDnyE0>

Afterwards, answer the questions in the following [quiz about the operating system kernel explained](#)

PART 2: DUAL BOOT OF LINUX AND WINDOWS WITH THE LINUX BOOT MANAGER GRUB2

2.1 – Installing Linux and Windows and GRUB2

a) Create a new virtual machine with the following specifications:

- Name and operating system:
 - Name: **sm1act04**
 - ISO image: **<not selected>**
 - Type: **Linux**
 - Subtype: **Debian**
 - Version: **Debian (64-bit)**
- Hardware:
 - Base Memory: **3072MB**
 - Processors: **2**
- Hard Disk:
 - Select → **Create a virtual hard disk now**
 - Hard Disk File Location and Size:
 - Disk Size → **30GB**
- System:
 - Motherboard:
 - Boot Order: 1st- Optical, 2nd- Hard Disk, 3rd – Floppy (disabled), 4th Network (disabled)
 - Processor:
 - Enable PAE/NX
- Audio: **Disabled**
- Network: **NAT**
- USB: **Disabled**
- Shared Folders: **None**
- Description: **Dual Boot Linux – Windows with GRUB2**

Follow this [video](#) to create your virtual machine

- b) Install **Windows Server 2025** (or equivalent) without graphical user experience:
- Add the ISO image **en-us_windows_server_2025_x64_dvd_b7ec10f3.iso** (or equivalent):
 - First step: Select *Storage->Controller IDE* → *Empty*
 - Second step: Select *Attributes* → *Optical Drive* → *IDE Secondary Device 0*
 - Third step: Select  → *Choose a disk file* → Find and select the windows ISO image.
 - Start the virtual machine.
 - Follow this [video](#) to install Windows 2025 Server (or equivalent) on your virtual machine
- c) Install **Debian 13.1.0** and without Desktop environment and **GRUB2**:
- Remove **en-us_windows_server_2025_x64_dvd_b7ec10f3.iso**
 - Add **debian-13.1.0-amd64-DVD-1.iso**
 - Start the virtual machine
 - Follow this [video](#) to install Debian 13.1.0 and GRUB2 on your virtual machine
- d) Check your installation:
- GRUB2 shows a menu with the following options:
 - Debian GNU/Linux
 - Advanced options for Debian GNU/Linux
 - Windows Recovery Environment (on /dev/sda1)
 - You can boot **Windows Server 2025** and gain access to the system as **Administrator** if you select the **third** option.
 - You can boot **Debian 13.1.0** and gain access to the system as **root** or your user if you select the **first** option.

PART 3: BASIC GRUB 2 CONFIGURATION

3.1- Configuration files and commands

- a) You can change any aspect of the **GRUB 2** menu by:
- Editing the **/etc/default/grub** configurations file.
 - Renaming and changing permissions of files located in **/etc/grub.d**.
- b) Whenever you change the GRUB configuration you must run the command: **sudo update-grub**. If you do not run this command, GRUB does not change its configuration and it will still work with the old configuration.

3.2- Configuration file /etc/default/grub

- a) **/etc/default/grub** must be open with **nano** and with the help of **sudo**, because it is a configuration file.
- b) Changing the values of variables in the **/etc/default/grub** file allows you to modify many aspects of how the system boots and how **GRUB2** displays its menu. Some of the most important variables are the following:
- **GRUB_DEFAULT**: It specifies the ordinal number of the default menu entry. Menu entries are numbered starting with **0** (0 specifies the first menu entry).
 - **GRUB_TIMEOUT**: It specifies the number of seconds GRUB waits before booting the operating system by default.
 - **GRUB_DISABLE_RECOVERY**: It specifies whether or not **update-grub** generates recovery-mode menu entries. Commented out by default. Default value is **false**, which means that entries are generated.
 - **d) GRUB_DISABLE_SUBMENU**: It disables ("**y**") or enables (with **#**) submenus. This option is not available by default and must be added manually at the end of the file.
 - **NOTE**: Lines starting with **#** are not evaluated. These lines are comments.

3.3- Files in /etc/grub.d

- a) The files in this folder are processed during execution of **update-grub**. For each file in the directory, **update-grub** checks if the execution permission is set or not. If the execution permission is set then, the file is processed otherwise, is not processed.
- b) The order of **GRUB 2** menu entries is based on the order of the file names in the directory. Each filename begins with a number that determines its order in the folder and therefore in the menu.
- c) Some of the most important files are the following:
- **10_linux**: It loads the menu entries for the installed distribution. Creates a menu entry for each kernel in **/boot**. A kernel is specified by a file named **vmlinuz-***.
 - **30_os-prober**: It is the script that will scan the hard disks for other operating systems (Windows, Linux on other partitions,...) and add them to the boot menu.
- d) These files must be executable if you want that **update-grub** processess them. If you do not want that **update-grub** process one of the files, remove the execute permission from the file running:

```
sudo chmod -x <filename>
```

where **<filename>** should be changed with the real filename you want to change.

- e) If you do want that **update-grub** processes one of the files, set the file execute permissions running:

```
sudo chmod +x <filename>
```

where **<filename>** should be changed with the real filename you want to change.

3.4- Command update-grub

- a) **update-grub** is a command for updating the **GRUB 2** menu taking into consideration:
- The contents of the **/etc/default/grub** file
 - If the execution permission of files in the **/etc/grub.d**.

- b) **update-grub** must be run with root permission with the help of **sudo**.

3.5- Example

Follow this [video](#) if you want to configure **GRUB** for waiting **30 seconds** before booting the operating system by default (if no key is pressed).

PART 4: UNINSTALL OLD LINUX KERNELS

- a) Gain access to the system and run the command:

```
uname -r
```

and check the current version of the kernel running on your virtual computer.

- b) Run the command:

```
dpkg --get-architecture | grep "linux-image"
```

and check the list of all kernels installed on your virtual machine.

c) Remove old kernels running:

```
sudo apt-get --purge remove linux-image-<old version>+deb13-amd64
```

where **<old version>** must be changed to real value of any old version installed on your system.

d) Check that old kernels were removed running again the command:

```
dpkg --get-selections | grep "linux-image"
```

PART 5 - CHECKING CONFIGURATIONS

- 1- Boot **Windows Server 2025** (or equivalent)
- 2- Boot Debian Linux **13.1.0**.
- 3- Remove old versions of the Linux Kernel.
- 4- Configure **GRUB 2** according to the following specifications:
 - It waits **3** seconds before booting the operating system by default.
 - **The Windows Server** is the menu default menu entry, but it is not the first entry.
- 5- Configure **GRUB 2** according to the following specifications:
 - It waits **3** seconds before booting the operating system by default.
 - **Windows Server** is the first menu entry.
 - **Windows Server** is the menu default menu entry.
 - Remove the **Advanced options for Debian GNU/Linux** submenu.
 - Remove the **recovery mode options**
- 6- Configure **GRUB 2** according to the following specifications:
 - It waits **3** seconds before booting the operating system by default.
 - The **Advanced options for Debian GNU/Linux** submenu is removed.
 - The **recovery mode option** is removed.
 - The **Windows Server** menu entry is removed.
- 7- Restore **GRUB 2** to the **initial conditions**:
 - It waits **5** seconds before booting the operating system by default.
 - The **Debian GNU/Linux** entry is the first and default menu entry.
 - The **Advanced options for Debian GNU/Linux** submenu is displayed again.
 - The **recovery mode option** is displayed again.
 - The **Windows Server** menu entry is the third one and it is displayed again.