Operating System report

how to add your system call the Linux OS kernel

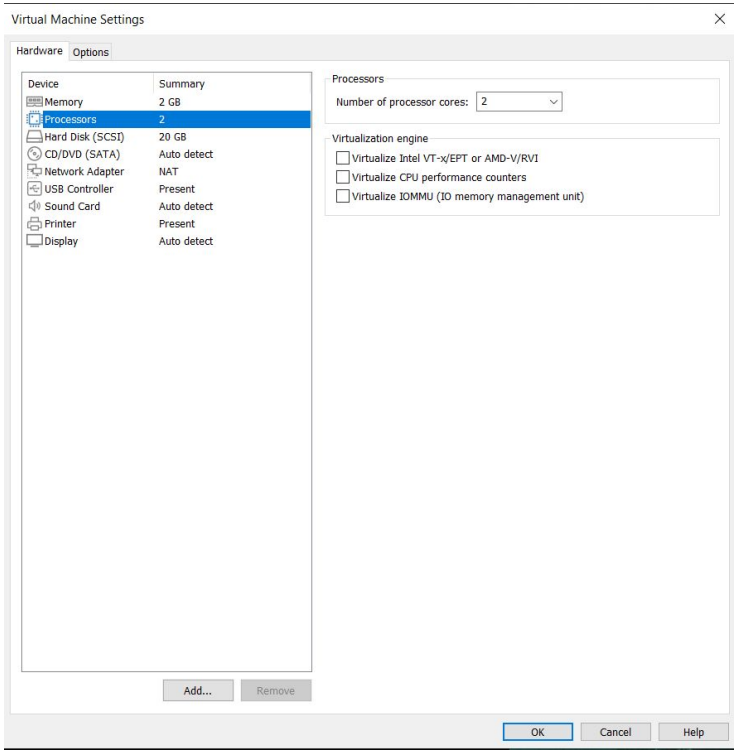
Name Member

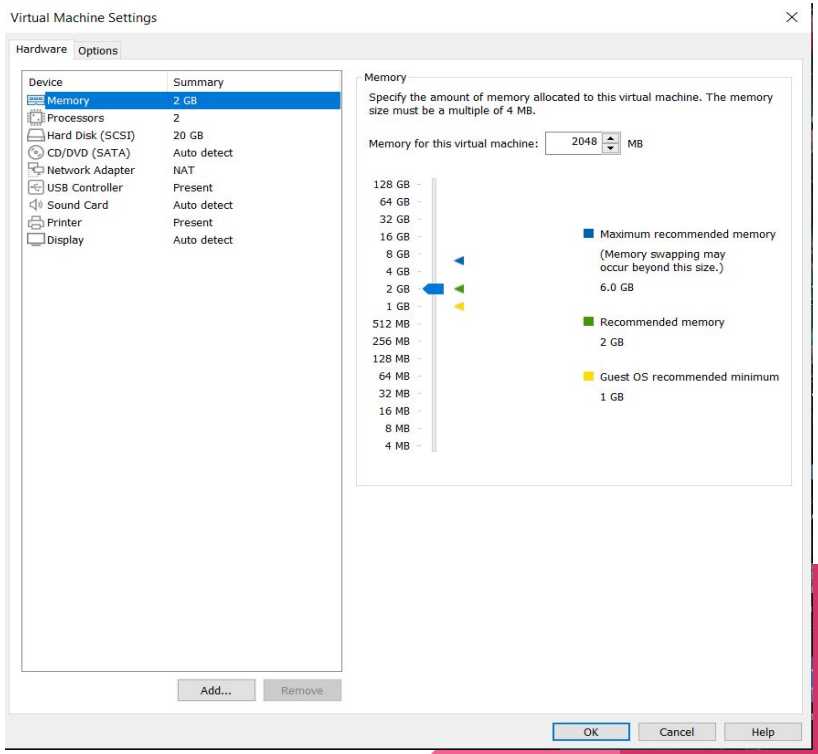
1-Mohamed Atef Hussien

2-Mohamed Ahmed Abdullah

3-Abdelrhman Essam Youseif

CPU cores, RAM capacity

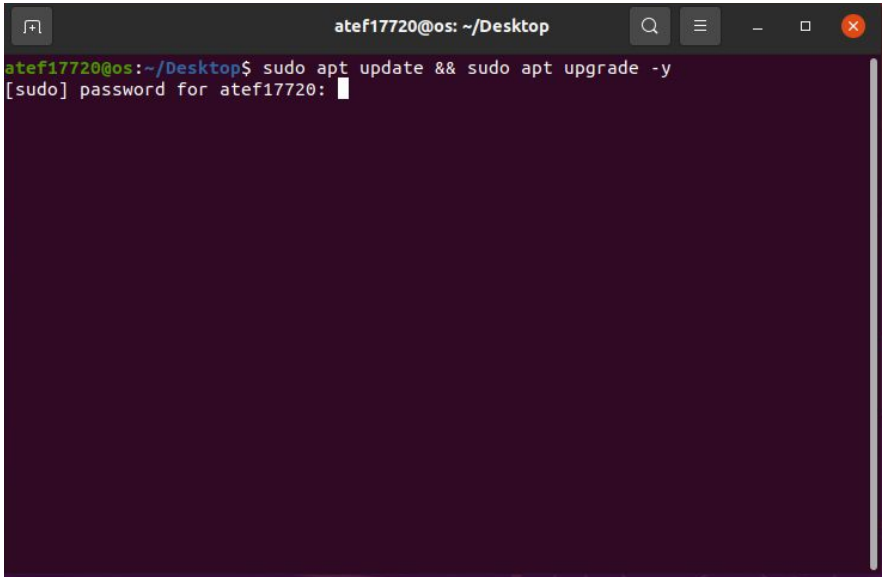




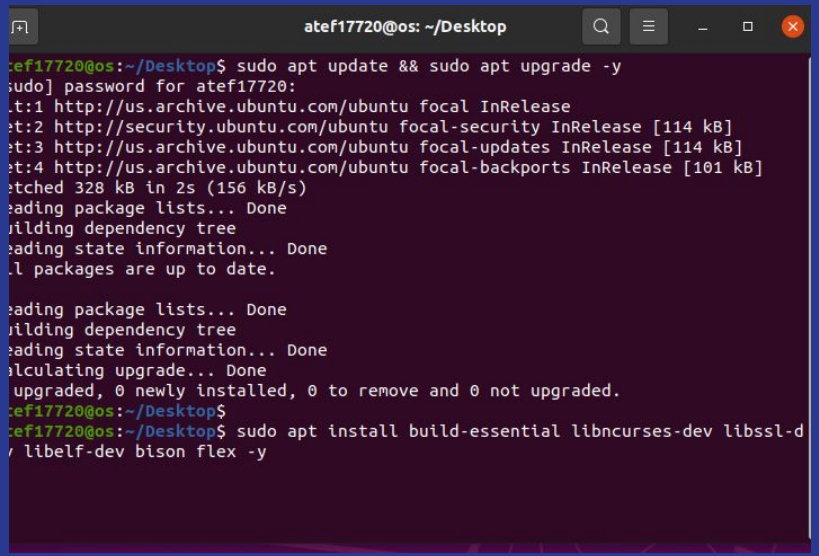
1 – Preparation

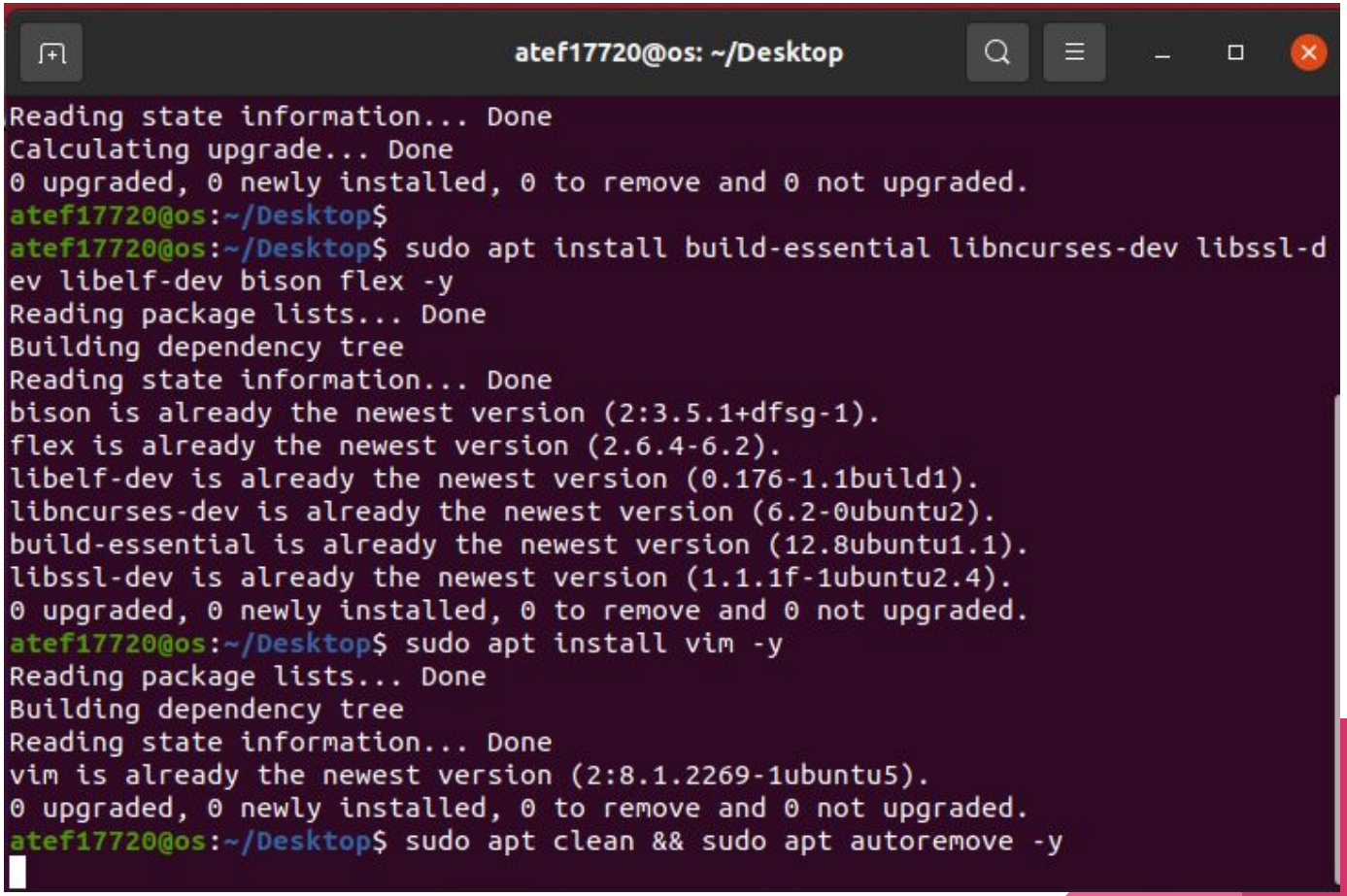
1.1 - Fully update your operating system

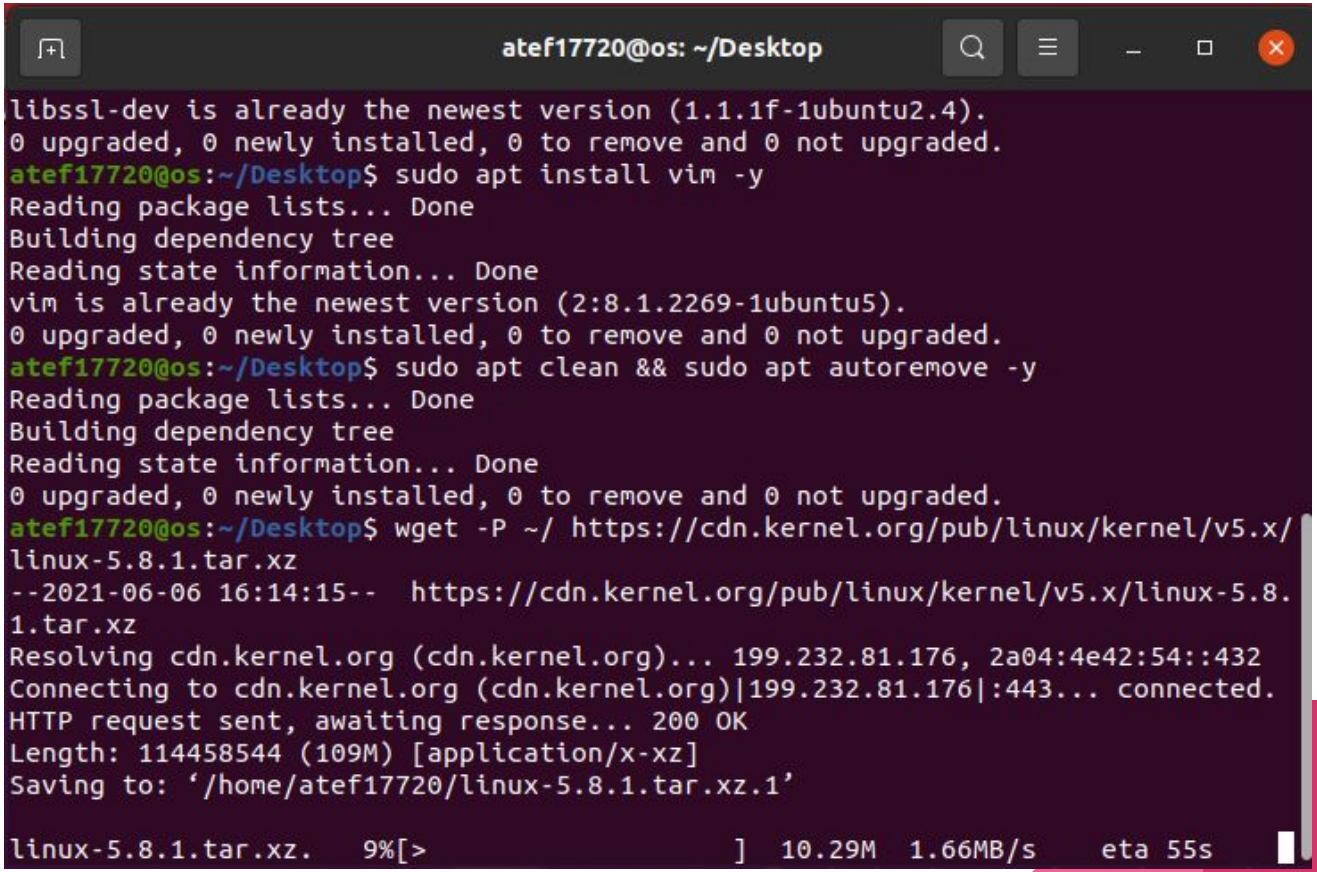
We downloaded all necessary tools to add a basic system call to the Linux kernel and run it



1.2 – Download and install the essential packages to compile kernels



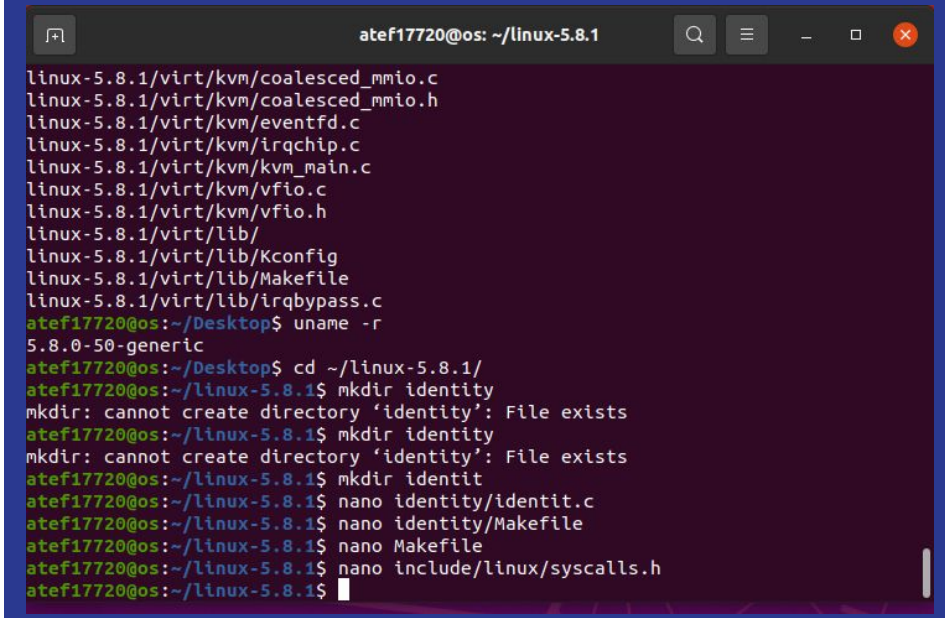

atef17720@os: ~/Desktop
Reading state information... Done
Calculating upgrade... Done
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$
atef17720@os:~/Desktop$ sudo apt install build-essential libncurses-dev libssl-d
ev libelf-dev bison flex -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
bison is already the newest version (2:3.5.1+dfsg-1).
flex is already the newest version (2.6.4-6.2).
libelf-dev is already the newest version (0.176-1.1build1).
libncurses-dev is already the newest version (6.2-0ubuntu2).
build-essential is already the newest version (12.8ubuntu1.1).
libssl-dev is already the newest version (1.1.1f-1ubuntu2.4).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$ sudo apt install vim -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
vim is already the newest version (2:8.1.2269-1ubuntu5).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$ sudo apt clean && sudo apt autoremove -y

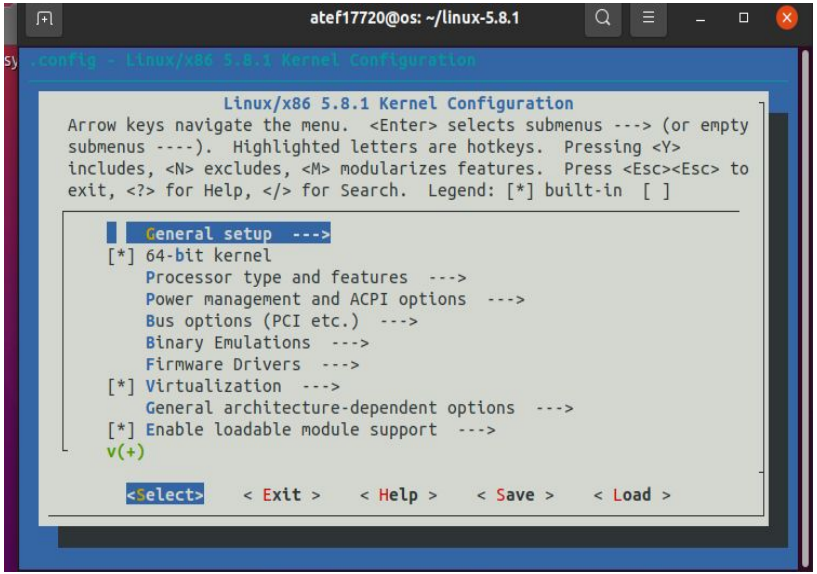

atef17720@os: ~/Desktop
libssl-dev is already the newest version (1.1.1f-1ubuntu2.4).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$ sudo apt install vim -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
vim is already the newest version (2:8.1.2269-1ubuntu5).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$ sudo apt clean && sudo apt autoremove -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
atef17720@os:~/Desktop$ wget -P ~/ https://cdn.kernel.org/pub/linux/kernel/v5.x/
linux-5.8.1.tar.xz
--2021-06-06 16:14:15-- https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.8.
1.tar.xz
Resolving cdn.kernel.org (cdn.kernel.org)... 199.232.81.176, 2a04:4e42:54::432
Connecting to cdn.kernel.org (cdn.kernel.org)|199.232.81.176|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 114458544 (109M) [application/x-xz]
Saving to: ‘/home/atef17720/linux-5.8.1.tar.xz.1’
linux-5.8.1.tar.xz.   9%[>   ] 10.29M 1.66MB/s   eta 55s

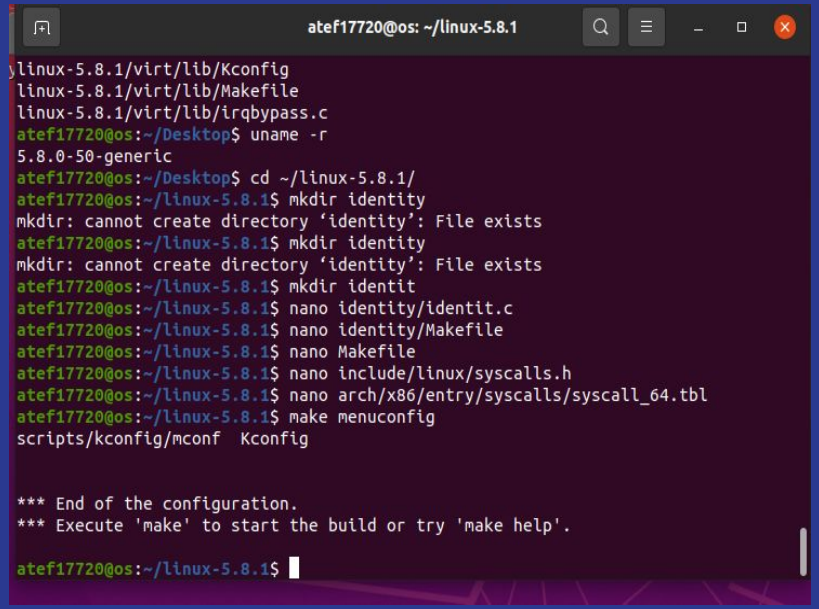
2-Creation

we write a basic system call in C and integrate it into the new kernel.

2.1 - Check the version of your current kernel.
2.2 - Change your working directory to the root directory of the recently unpacked source code
2.3 - Create the home directory of your system call.
2.4 - Create a C file for your system call
2.5 - Create a Makefile for your system call.
2.7 - Add a corresponding function prototype for your system call to the
2.8 - Add your system call to the kernel's system call table.




atef17720@os: ~/linux-5.8.1
.config - Linux/x86 5.8.1 Kernel Configuration
Linux/x86 5.8.1 Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ]
General setup --->
[*] 64-bit kernel
Processor type and features --->
Power management and ACPI options --->
Bus options (PCI etc.) --->
Binary Emulations --->
Firmware Drivers --->
[*] Virtualization --->
General architecture-dependent options --->
[*] Enable loadable module support --->
v(+)
<Select> < Exit > < Help > < Save > < Load >


atef17720@os: ~/linux-5.8.1
linux-5.8.1/virt/lib/Kconfig
linux-5.8.1/virt/lib/Makefile
linux-5.8.1/virt/lib/irqbypass.c
atef17720@os:~/Desktop$ uname -r
5.8.0-50-generic
atef17720@os:~/Desktop$ cd ~/linux-5.8.1/
atef17720@os:~/linux-5.8.1$ mkdir identity
mkdir: cannot create directory ‘identity’: File exists
atef17720@os:~/linux-5.8.1$ mkdir identity
mkdir: cannot create directory ‘identity’: File exists
atef17720@os:~/linux-5.8.1$ mkdir identit
atef17720@os:~/linux-5.8.1$ nano identity/identit.c
atef17720@os:~/linux-5.8.1$ nano identity/Makefile
atef17720@os:~/linux-5.8.1$ nano Makefile
atef17720@os:~/linux-5.8.1$ nano include/linux/syscalls.h
atef17720@os:~/linux-5.8.1$ nano arch/x86/entry/syscalls/syscall_64.tbl
atef17720@os:~/linux-5.8.1$ make menuconfig
scripts/kconfig/mconf Kconfig
*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.
atef17720@os:~/linux-5.8.1$

3 - Installation

3.1 - Configure the kernel.
3.2 - Find out how many logical cores you have.

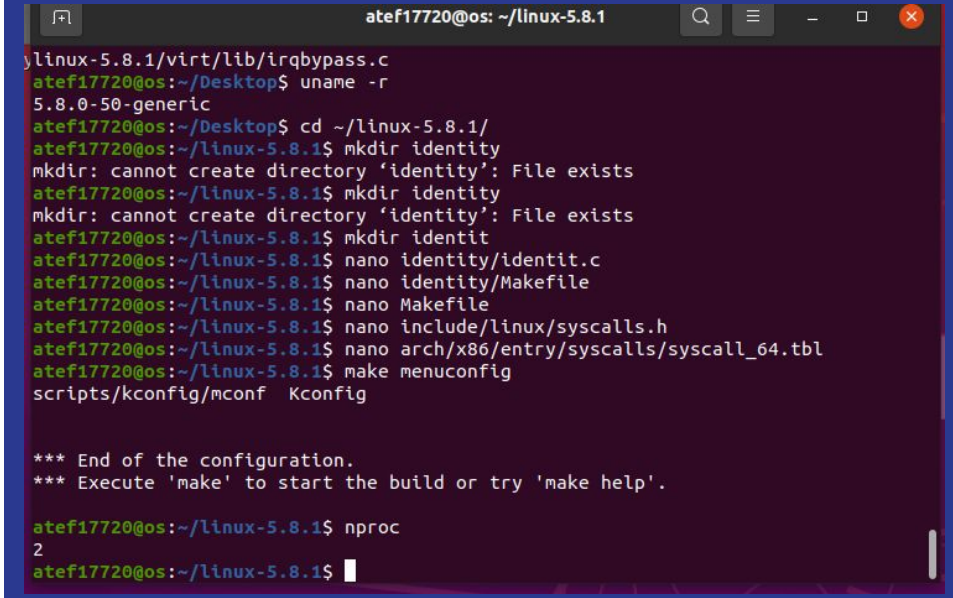
3.3 - Compile the kernel's source code.

3.4 - Prepare the installer of the kernel.

3.5 - Install the kernel.

3.6 - Update the bootloader of the operating system with the new kernel.

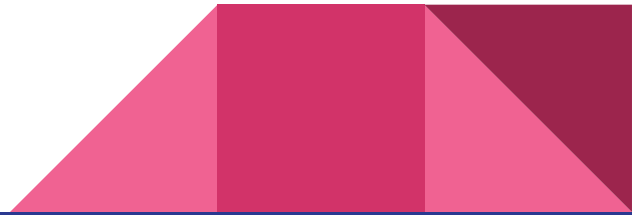
3.7 - Reboot your computer.



```
atef17720@os:~/linux-5.8.1$ cd
atef17720@os:~$ nano report.c
atef17720@os:~$ gcc -o report report.c
atef17720@os:~$ ./report
Congratulations, mohamed atef! Your system call is functional. Run the command d
mesg in the terminal and find out!
atef17720@os:~$
```

4 - References

https://www.kernel.org/doc/html/latest/process/adding-syscalls.html

https://dev.to/jasper/adding-a-system-call-to-the-linux-kernel-5-8-1-in-ubuntu-20-04-lts-2ga8

https://medium.com/anubhav-shrimal/adding-a-hello-world-system-call-to-linux-kernel-dad32875872