

Operating System

Project

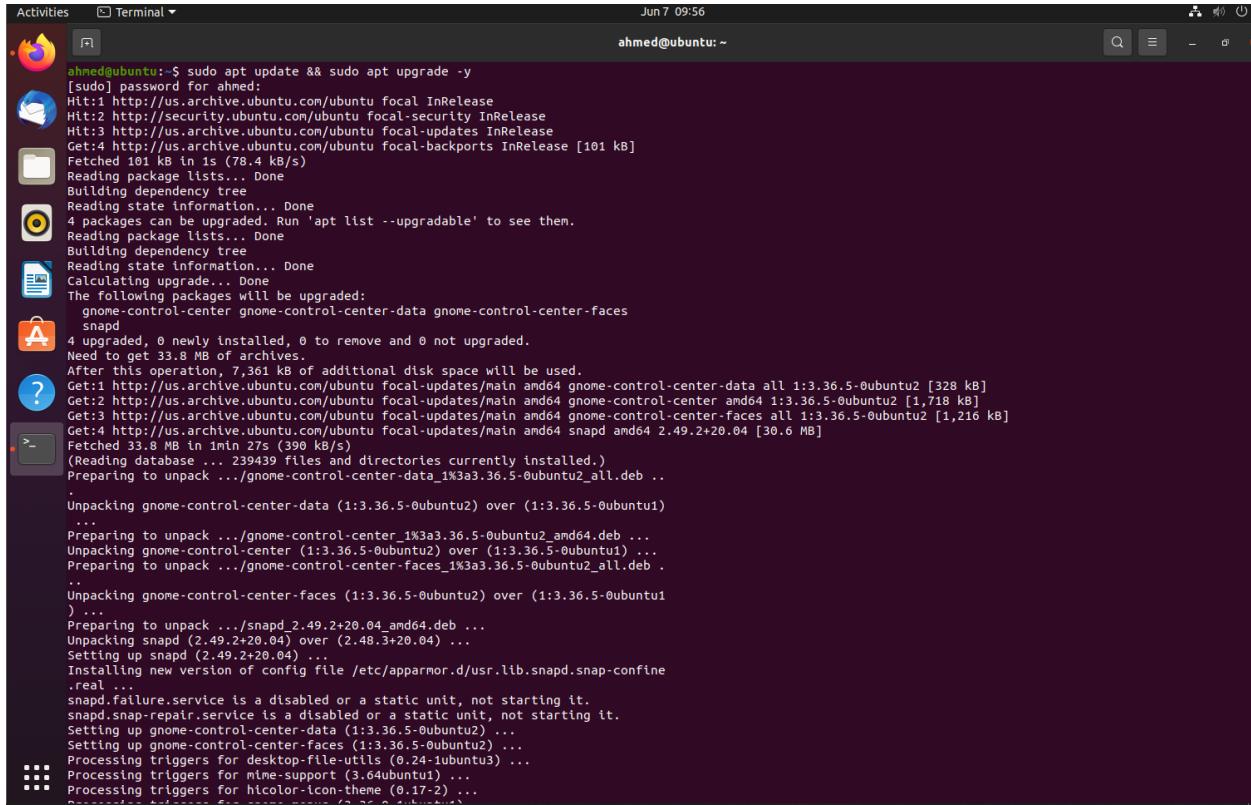
Team Members:

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Steps of Adding the system call:

1. Fully update your operating system.

```
sudo apt update && sudo apt upgrade -y
```



A screenshot of a Linux desktop environment showing a terminal window titled "Terminal". The terminal window has a dark background and displays the command "ahmed@ubuntu:~\$ sudo apt update && sudo apt upgrade -y" followed by its output. The output shows the progress of updating the package lists from the Ubuntu archive, upgrading 4 packages, and then installing 4 new packages (gnome-control-center-data, gnome-control-center, gnome-control-center-faces, and snapd). The terminal window is part of a desktop interface with other icons visible in the dock.

```
ahmed@ubuntu:~$ sudo apt update && sudo apt upgrade -y
[sudo] password for ahmed:
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease
Get:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Fetched 101 kB in 1s (78.4 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
4 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  gnome-control-center gnome-control-center-data gnome-control-center-faces
  snapd
4 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 33.8 MB of archives.
After this operation, 7,361 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 gnome-control-center-data all 1:3.36.5-0ubuntu2 [328 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 gnome-control-center amd64 1:3.36.5-0ubuntu2 [1,718 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 gnome-control-center-faces all 1:3.36.5-0ubuntu2 [1,216 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 snapd amd64 2.49.2+20.04 [30.6 MB]
Fetched 33.8 MB in 1min 27s (390 kB/s)
(Reading database ... 239439 files and directories currently installed.)
Preparing to unpack .../gnome-control-center-data_1%3a3.36.5-0ubuntu2_all.deb ...
.
Unpacking gnome-control-center-data (1:3.36.5-0ubuntu2) over (1:3.36.5-0ubuntu1)
.
Preparing to unpack .../gnome-control-center_1%3a3.36.5-0ubuntu2_amd64.deb ...
Unpacking gnome-control-center (1:3.36.5-0ubuntu2) over (1:3.36.5-0ubuntu1)
.
Preparing to unpack .../gnome-control-center-faces_1%3a3.36.5-0ubuntu2_all.deb .
.
Unpacking gnome-control-center-faces (1:3.36.5-0ubuntu2) over (1:3.36.5-0ubuntu1)
).
Preparing to unpack .../snapd_2.49.2+20.04_amd64.deb ...
Unpacking snapd (2.49.2+20.04) over (2.48.3+20.04) ...
Setting up snapd (2.49.2+20.04) ...
Installing new version of config file /etc/apparmor.d/usr.lib.snapd.snap-confine.real ...
snapd.failure.service is a disabled or a static unit, not starting it.
snapd.snap-repair.service is a disabled or a static unit, not starting it.
Setting up gnome-control-center-data (1:3.36.5-0ubuntu2) ...
Setting up gnome-control-center-faces (1:3.36.5-0ubuntu2) ...
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
```

2. Download and install the essential packages to compile kernels.

```
sudo apt install build-essential libncurses-dev libssl-dev libelf-dev bison flex -y
```

install vim :

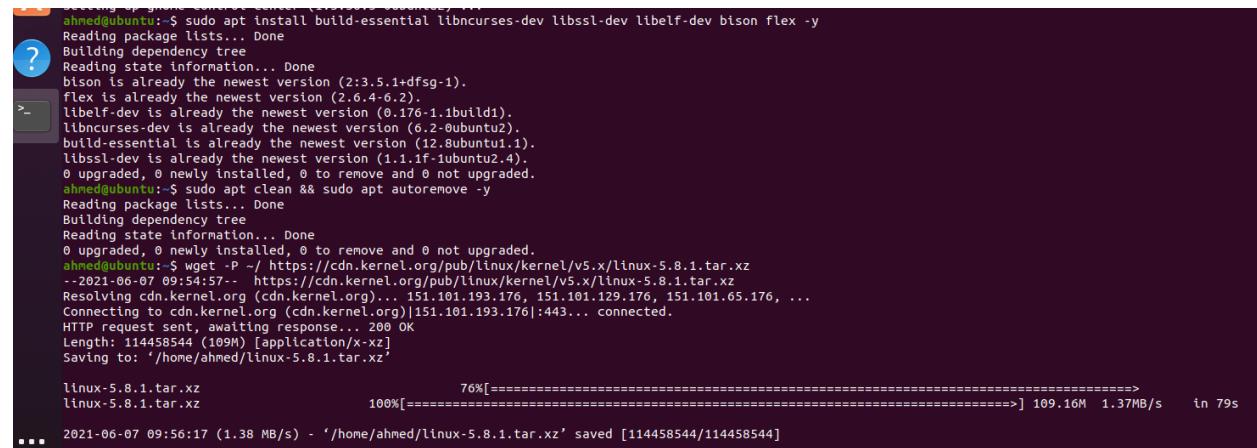
```
sudo apt install vim -y
```

3.Clean up your installed packages.

```
sudo apt clean && sudo apt autoremove -y
```

4.Download the source code of the latest stable version of the Linux kernel

```
wget -P ~/  
https://cdn.kernel.org/pub/linux/kernel/v5.x/  
linux-5.8.1.tar.xz
```

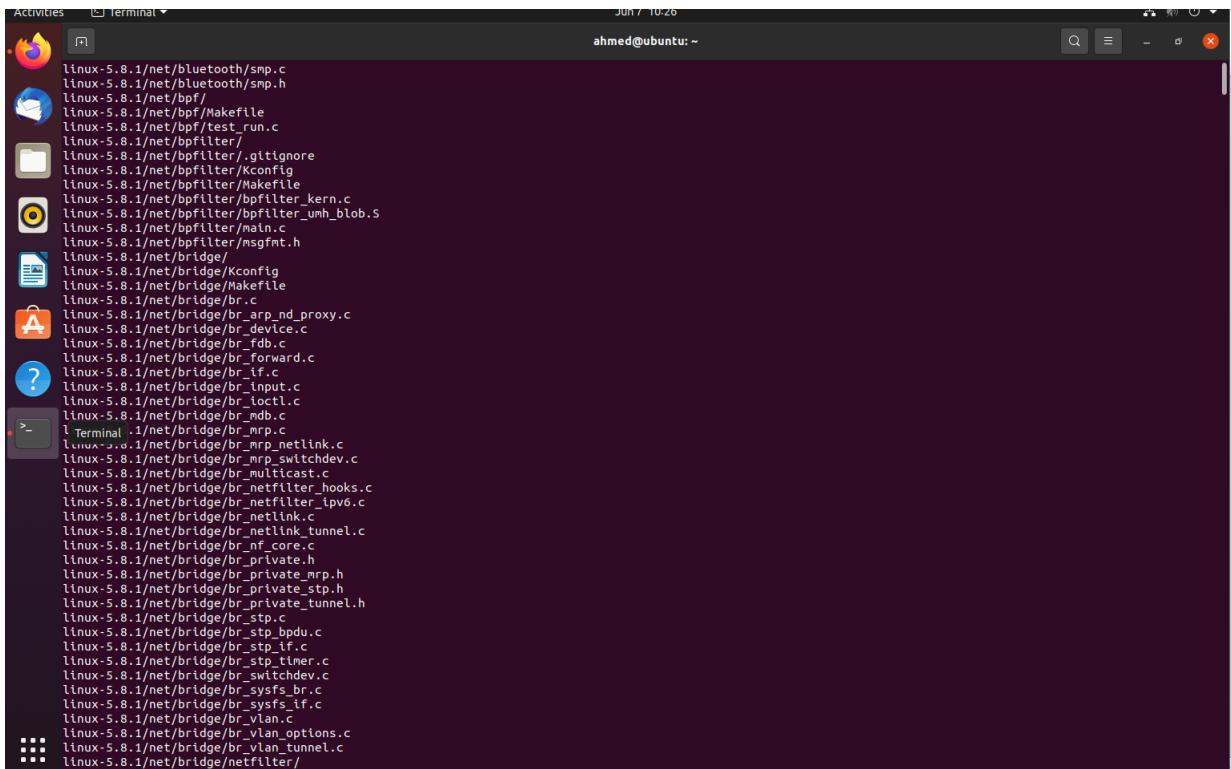


```
ahmed@ubuntu:~$ sudo apt install build-essential libncurses-dev libssl-dev libelf-dev bison flex -y  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
bison is already the newest version (2:3.5.1+dfsg-1).  
flex is already the newest version (2.6.4-6.2).  
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.  
ahmed@ubuntu:~$ 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.  
ahmed@ubuntu:~$ wget -P ~/ https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.8.1.tar.xz  
--2021-06-07 09:54:57-- https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.8.1.tar.xz  
Resolving cdn.kernel.org (cdn.kernel.org)... 151.101.193.176, 151.101.129.176, 151.101.65.176, ...  
Connecting to cdn.kernel.org (cdn.kernel.org)|151.101.193.176|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 114458544 (109M) [application/x-xz]  
Saving to: '/home/ahmed/linux-5.8.1.tar.xz'  
  
linux-5.8.1.tar.xz 76%[=====]>  
linux-5.8.1.tar.xz 100%[=====] 109.16M 1.37MB/s in 79s  
2021-06-07 09:56:17 (1.38 MB/s) - '/home/ahmed/linux-5.8.1.tar.xz' saved [114458544/114458544]
```

5.Unpack the tarball you just downloaded to your home folder.

```
tar -xvf ~/linux-5.8.1.tar.xz -C ~
```

then reboot your computer.



6. Change your working directory to the root directory of the recently unpacked source code.

```
cd ~/linux-5.8.1/
```

7.Create the home directory of your system call.

```
mkdir hello
```

8.Create a C file for your system call.

```
nano hello/hello.c  
and write the code:
```

```
#include <linux/kernel.h>
#include <linux/syscalls.h>

SYSCALL_DEFINE0(identity)

{
    printk("Hello from KERNEL team.\n");
    return 0;
}
```



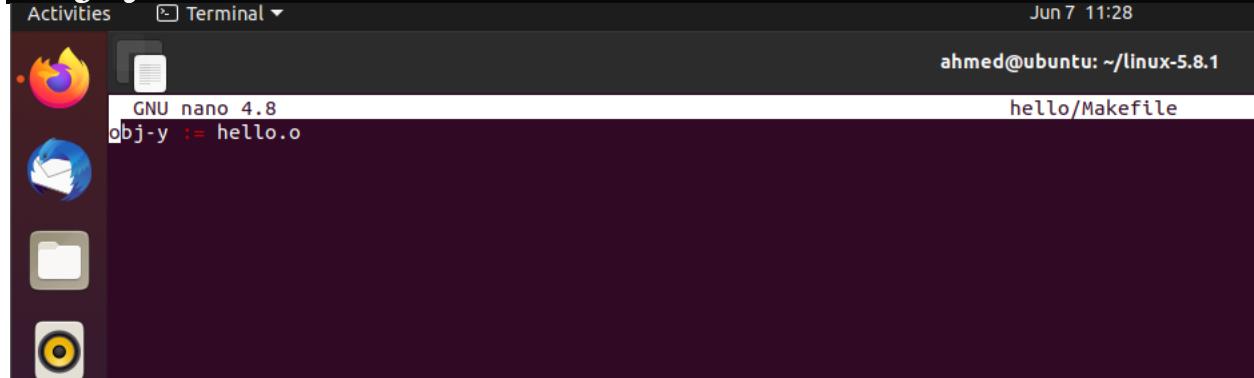
```
Activities Terminal ▾ Jun 7 11:24
ahmed@ubuntu: ~/linux-5.8.1
GNU nano 4.8
#include <linux/kernel.h>
#include <linux/syscalls.h>
SYSCALL_DEFINE0(identity)
{
    printk("Hello from KERNEL team\n");
    return 0;
}
```

9. Create a Makefile for your system call.

```
nano hello/Makefile
```

and write the code:

```
obj-y := hello.o
```



- write the following commands:

```
uname -r
```

5.8.0-55-generic

```
cd ~/linux-5.8.1/
```

mkdir hello(created Directory to add system call).

```
? linux-5.8.1/virt/kvm/asynchronous_pf.h  
linux-5.8.1/virt/kvm/async_pf.h  
linux-5.8.1/virt/kvm/coalesced_mmio.c  
linux-5.8.1/virt/kvm/coalesced_mmio.h  
linux-5.8.1/virt/kvm/eventfd.c  
linux-5.8.1/virt/kvm/irqchip.c  
linux-5.8.1/virt/kvm/kvm_main.c  
linux-5.8.1/virt/kvm/vfio.c  
linux-5.8.1/virt/kvm/vfio.h  
linux-5.8.1/virt/lib/  
linux-5.8.1/virt/lib/Kconfig  
linux-5.8.1/virt/lib/Makefile  
linux-5.8.1/virt/lib/irqbypass.c  
ahmed@ubuntu:~$ uname -r  
5.8.0-55-generic  
ahmed@ubuntu:~$ cd ~/linux-5.8.1/  
ahmed@ubuntu:~/linux-5.8.1$ mkdir identity  
ahmed@ubuntu:~/linux-5.8.1$ mkdir hello  
ahmed@ubuntu:~/linux-5.8.1$ cd hello  
ahmed@ubuntu:~/linux-5.8.1$ nano hello/hello.c
```

```
Use "fg" to return to nano.
```

```
[1]+ Stopped nano hello/hello.c  
ahmed@ubuntu:~/linux-5.8.1$ cd ..  
ahmed@ubuntu:~/linux-5.8.1$ nano hello/hello.c  
ahmed@ubuntu:~/linux-5.8.1$ nano hello/Makefile  
ahmed@ubuntu:~/linux-5.8.1$ nano Makefile  
ahmed@ubuntu:~/linux-5.8.1$
```

10. write command :

cd .. (we need to go back to linux-5.12.9 directory)

Add the home directory of your system call to the main Makefile of the kernel.

Open the Makefile with the following command.

nano Makefile

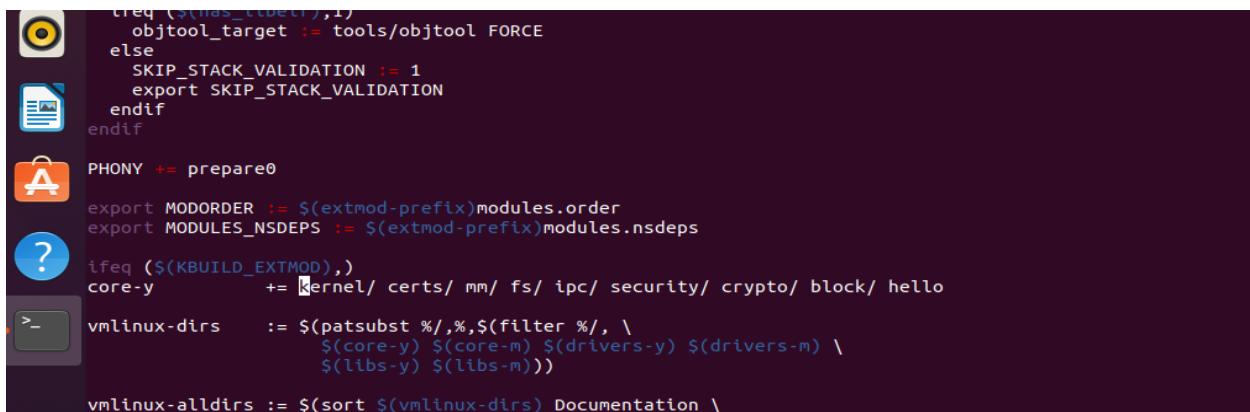
and find the following line:

Search for core-y. In the second result, you will see a series of directories.

core-y += kernel/ mm/ fs/ ipc/ security/ cryptop/ block/

And change it to:

core-y += kernel/ mm/ fs/ ipc/ security/ cryptop/ block/ hello/



```
treq ($has_ctool),1)
objtool_target := tools/objtool FORCE
else
SKIP_STACK_VALIDATION := 1
export SKIP_STACK_VALIDATION
endif
endif
PHONY += prepareo
export MODORDER := ${extmod-prefix}modules.order
export MODULES_NSDEPS := ${extmod-prefix}modules.nsdeps
ifeq (${KBUILD_EXTMOD},)
core-y      += kernel/ certs/ mm/ fs/ ipc/ security/ crypto/ block/ hello
vmlinux-dirs := $(patsubst %,%,$(filter %, \
$(core-y) $(core-m) $(drivers-y) $(drivers-m) \
$(libs-y) $(libs-m)))
vmlinux-alldirs := $(sort $(vmlinux-dirs) Documentation \
```

Add a corresponding function prototype for your system call to the header file of system calls.

Open the header file with the following command.

```
nano include/linux/syscalls.h
```

Navigate to the bottom of it and write the following code just above #endif.

```
asmlinkage long sys_identity(void);
```

11. Add your system call to the kernel's system call table.

Open the table with the following command.

```
nano arch/x86/entry/syscalls/syscall_64.tbl
```

12. Navigate to the bottom of it. You will find a series of x32 system calls. Scroll to the section above it. This is the section of your interest. Add the following code at the end of this section respecting the chronology of the row as well as the format of the column. Use Tab for space.

440 common hello sys_hello

13. Configure the kernel.

Make sure the window of your terminal is maximized.

Open the configuration window with the following command.

make menuconfig

Use **Tab** to move between options. Make no changes to keep it in default settings.

14. Find out how many logical cores you have.

nproc

→ 2 , so we have 2 cores.

make clean

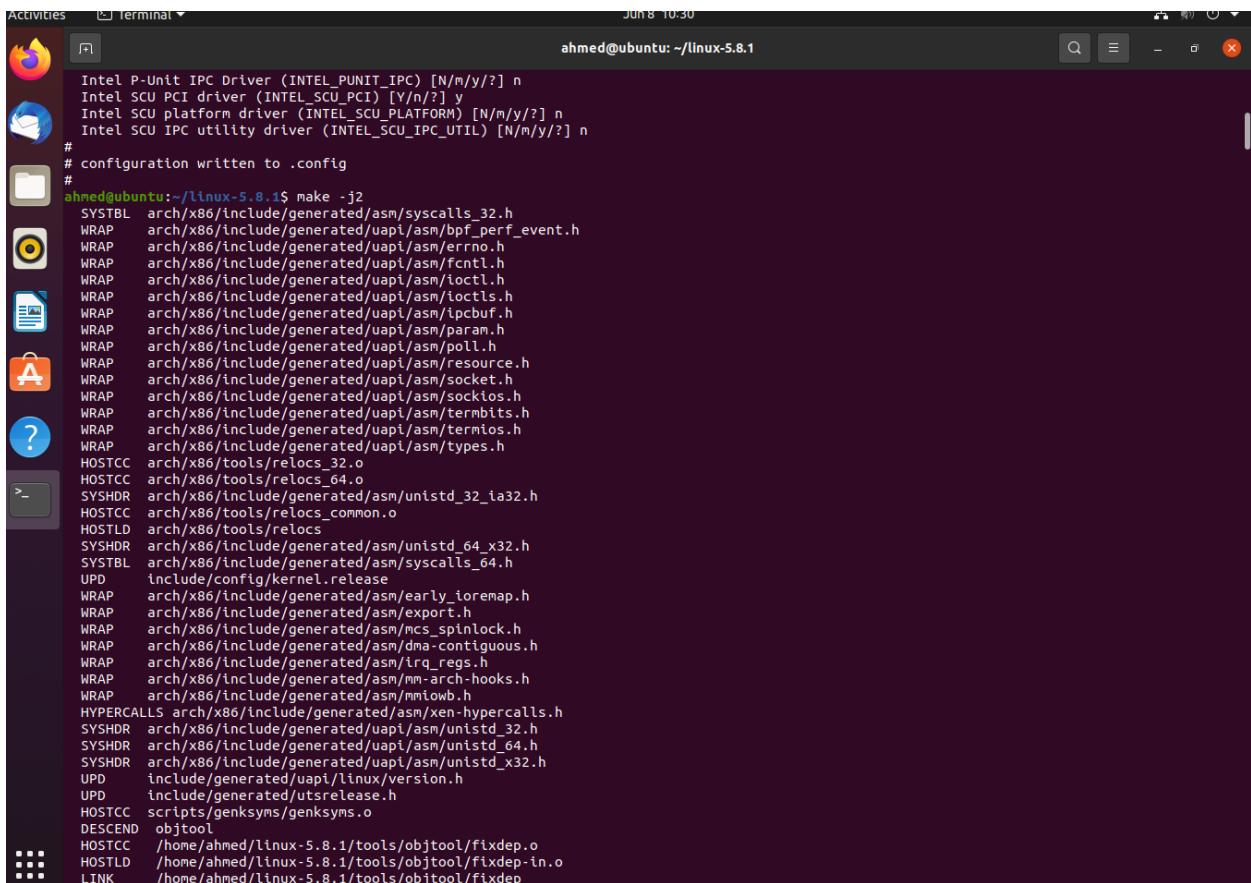
make mrproper

make menuconfig

make localmodconfig

15.compile kernel's source code.

```
make -j2
```



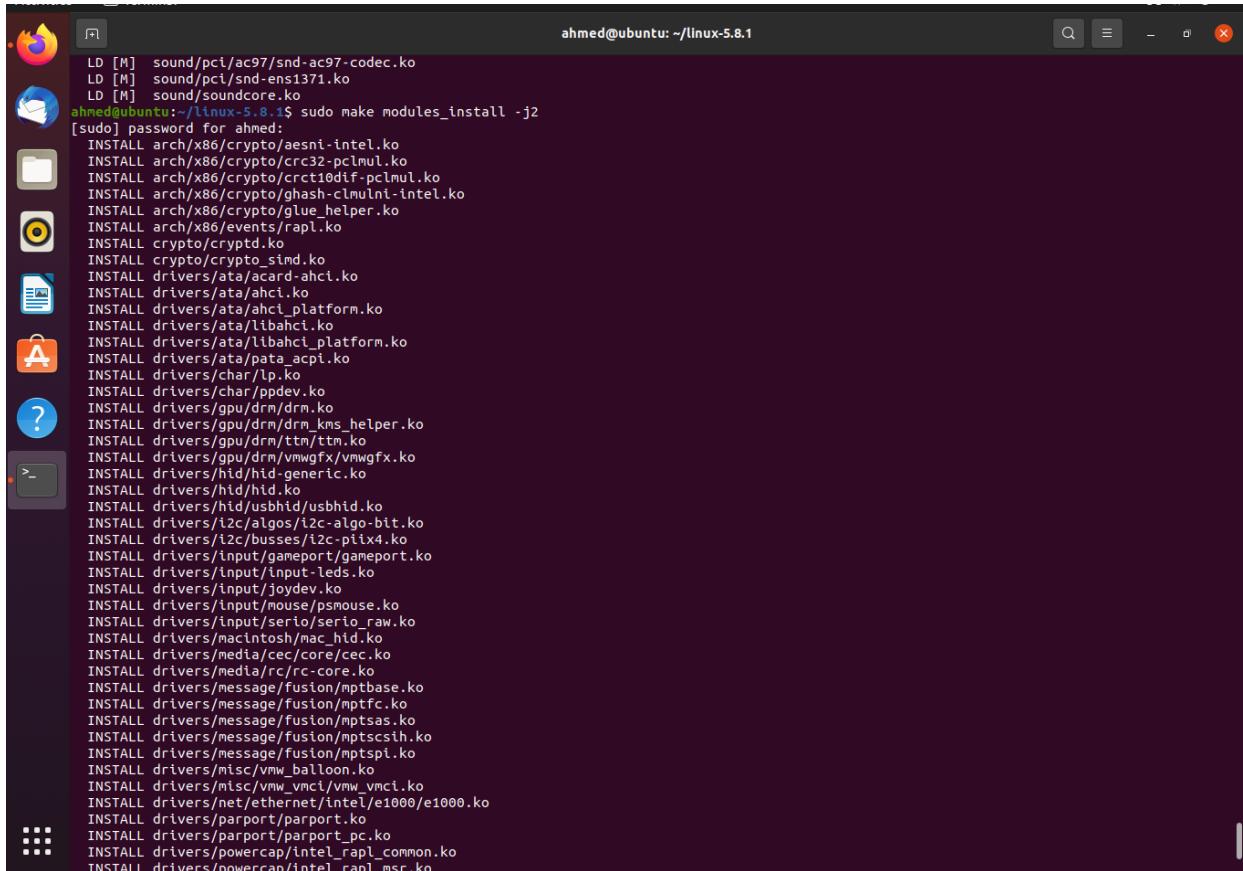
A screenshot of an Ubuntu desktop environment. A terminal window is open in the center, showing the command 'make -j2' being run. The terminal output lists numerous files being compiled, including assembly files like syscalls_32.h, syscalls_64.h, and various header files such as unistd.h, errno.h, fcntl.h, and socket.h. The terminal window has a dark theme and is titled 'ahmed@ubuntu: ~/linux-5.8.1'. The background shows the standard Unity interface with icons for the Dash, Home, and other applications.

```
Intel P-Unit IPC Driver (INTEL_PUNIT_IPC) [N/m/y/?] n
Intel SCU PCI driver (INTEL_SCU_PCI) [Y/n/?] y
Intel SCU platform driver (INTEL_SCU_PLATFORM) [N/m/y/?] n
Intel SCU IPC utility driver (INTEL_SCU_IPC_UTIL) [N/m/y/?] n

#
# configuration written to .config
#
ahmed@ubuntu:~/linux-5.8.1$ make -j2
SYSTBL arch/x86/include/generated/asm/syscalls_32.h
WRAP arch/x86/include/generated/uapi/asm/bpf_perf_event.h
WRAP arch/x86/include/generated/uapi/asm/errno.h
WRAP arch/x86/include/generated/uapi/asm/fcntl.h
WRAP arch/x86/include/generated/uapi/asm/loctls.h
WRAP arch/x86/include/generated/uapi/asm/loctls.h
WRAP arch/x86/include/generated/uapi/asm/ipcbuf.h
WRAP arch/x86/include/generated/uapi/asm/param.h
WRAP arch/x86/include/generated/uapi/asm/poll.h
WRAP arch/x86/include/generated/uapi/asm/resource.h
WRAP arch/x86/include/generated/uapi/asm/socket.h
WRAP arch/x86/include/generated/uapi/asm/sockios.h
WRAP arch/x86/include/generated/uapi/asm/termbits.h
WRAP arch/x86/include/generated/uapi/asm/termios.h
WRAP arch/x86/include/generated/uapi/asm/types.h
HOSTCC arch/x86/tools/relocs_32.o
HOSTCC arch/x86/tools/relocs_64.o
SYSHDR arch/x86/include/generated/asm/unistd_32_la32.h
HOSTCC arch/x86/tools/relocs_common.o
HOSTLD arch/x86/tools/relocs
SYSHDR arch/x86/include/generated/asm/unistd_64_x32.h
SYSTBL arch/x86/include/generated/asm/syscalls_64.h
UPD include/config/kernel.release
WRAP arch/x86/include/generated/asm/early_ioremap.h
WRAP arch/x86/include/generated/asm/export.h
WRAP arch/x86/include/generated/asm/mcs_spinlock.h
WRAP arch/x86/include/generated/asm/dma-contiguous.h
WRAP arch/x86/include/generated/asm/irq_regs.h
WRAP arch/x86/include/generated/asm/mm-arch-hooks.h
WRAP arch/x86/include/generated/asm/mmiowb.h
HYPERCALLS arch/x86/include/generated/asm/xen-hypcalls.h
SYSHDR arch/x86/include/generated/uapi/asm/unistd_32.h
SYSHDR arch/x86/include/generated/uapi/asm/unistd_64.h
SYSHDR arch/x86/include/generated/uapi/asm/unistd_x32.h
UPD include/generated/uapi/linux/version.h
UPD include/generated/utsrelease.h
HOSTCC scripts/genksyms/genksyms.o
DESCEND objtool
HOSTCC /home/ahmed/linux-5.8.1/tools/objtool/fixdep.o
HOSTLD /home/ahmed/linux-5.8.1/tools/objtool/fixdep-in.o
LINK /home/ahmed/linux-5.8.1/tools/objtool/fixdep
```

16. Prepare the installer of the kernel.

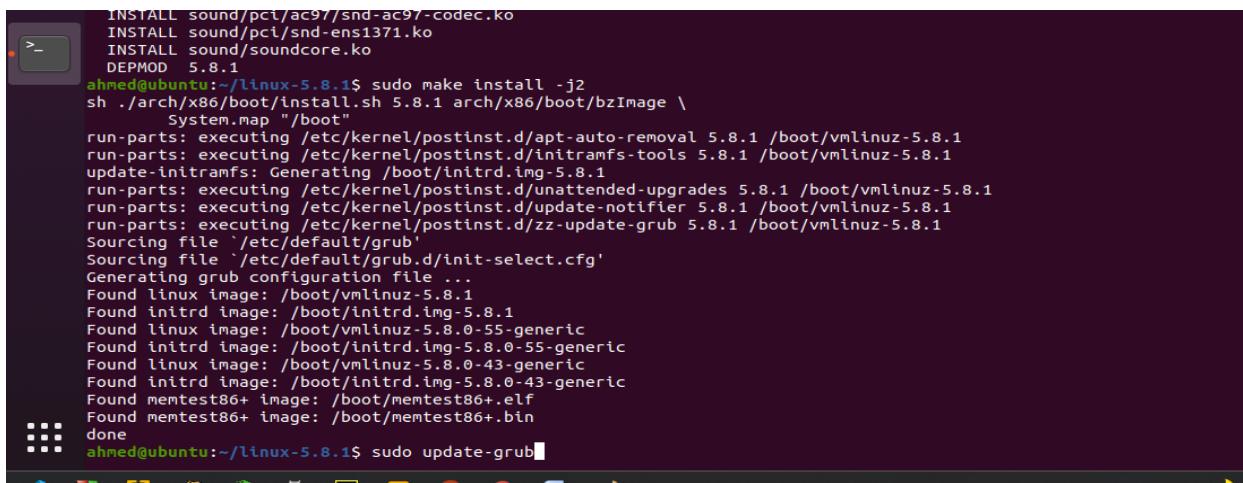
```
sudo make modules_install -j2
```



```
ahmed@ubuntu: ~/linux-5.8.1
LD [M] sound/pct/ac97/snd-ac97-codec.ko
LD [M] sound/pct/snd-ens1371.ko
LD [M] sound/soundcore.ko
ahmed@ubuntu:~/linux-5.8.1$ sudo make modules_install -j2
[sudo] password for ahmed:
[  1%] sound/pct/ac97/snd-ac97-codec.ko
[  1%] sound/pct/snd-ens1371.ko
[  1%] sound/soundcore.ko
[  1%] crypto/aesni-intel.ko
[  1%] crypto/crc32-pcmul.ko
[  1%] crypto/crct10dif-pcmul.ko
[  1%] crypto/ghash-clmulni-intel.ko
[  1%] crypto/glue_helper.ko
[  1%] events/rapl.ko
[  1%] crypto/cryptd.ko
[  1%] crypto/crypto_simd.ko
[  1%] drivers/ata/acard-ahci.ko
[  1%] drivers/ata/ahci.ko
[  1%] drivers/ata/ahci_platform.ko
[  1%] drivers/ata/libahci.ko
[  1%] drivers/ata/libahci_platform.ko
[  1%] drivers/ata/pata_acpi.ko
[  1%] drivers/char/tp.ko
[  1%] drivers/char/tpd.ko
[  1%] drivers/gpu/drm/drm.ko
[  1%] drivers/gpu/drm/drm_kms_helper.ko
[  1%] drivers/gpu/drm/ttm/ttm.ko
[  1%] drivers/gpu/drm/vmwgfx/vmwgfx.ko
[  1%] drivers/hid/hid-generic.ko
[  1%] drivers/hid/hid.ko
[  1%] drivers/hid/usbhid/usbhid.ko
[  1%] drivers/i2c/algos/i2c-algo-bit.ko
[  1%] drivers/i2c/busses/i2c-pix4.ko
[  1%] drivers/input/gameport/gameport.ko
[  1%] drivers/input/input-leds.ko
[  1%] drivers/input/joydev.ko
[  1%] drivers/input/mouse/psmouse.ko
[  1%] drivers/input/serio/serio_raw.ko
[  1%] drivers/macintosh/nac_hid.ko
[  1%] drivers/media/cec/cec.ko
[  1%] drivers/media/rc/rc-core.ko
[  1%] drivers/message/fusion/mptbase.ko
[  1%] drivers/message/fusion/mptfc.ko
[  1%] drivers/message/fusion/mptsa.s.ko
[  1%] drivers/message/fusion/mptscsih.ko
[  1%] drivers/message/fusion/mptsp1.ko
[  1%] drivers/misc/vmw_balloon.ko
[  1%] drivers/net/vmcl/vmcl/vmci.ko
[  1%] drivers/net/ethernet/intel/e1000/e1000.ko
[  1%] drivers/parport/parport.ko
[  1%] drivers/parport/parport_pc.ko
[  1%] drivers/powercap/intel_rapl_common.ko
[  1%] drivers/powercan/intel_rapl_msr.ko
```

17. Install the kernel.

```
sudo make install -j2
```



```
ahmed@ubuntu:~/linux-5.8.1$ sudo make install -j2
sh ./arch/x86/boot/install.sh 5.8.1 arch/x86/boot/bzImage \
    System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 5.8.1 /boot/vmlinuz-5.8.1
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 5.8.1 /boot/vmlinuz-5.8.1
update-initramfs: Generating /boot/initrd.img-5.8.1
run-parts: executing /etc/kernel/postinst.d/unattended-upgrades 5.8.1 /boot/vmlinuz-5.8.1
run-parts: executing /etc/kernel/postinst.d/update-notifier 5.8.1 /boot/vmlinuz-5.8.1
run-parts: executing /etc/kernel/postinst.d/zz-update-grub 5.8.1 /boot/vmlinuz-5.8.1
Sourcing file '/etc/default/grub'
Sourcing file '/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.8.1
Found initrd image: /boot/initrd.img-5.8.1
Found linux image: /boot/vmlinuz-5.8.0-55-generic
Found initrd image: /boot/initrd.img-5.8.0-55-generic
Found linux image: /boot/vmlinuz-5.8.0-43-generic
Found initrd image: /boot/initrd.img-5.8.0-43-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
ahmed@ubuntu:~/linux-5.8.1$ sudo update-grub
```

18. Update the bootloader of the operating system with the new kernel.

```
sudo update-grub
```

```
done
ahmed@ubuntu:~/linux-5.8.1$ sudo update-grub
Sourcing file '/etc/default/grub'
Sourcing file '/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.8.1
Found initrd image: /boot/initrd.img-5.8.1
Found linux image: /boot/vmlinuz-5.8.0-55-generic
Found initrd image: /boot/initrd.img-5.8.0-55-generic
Found linux image: /boot/vmlinuz-5.8.0-43-generic
Found initrd image: /boot/initrd.img-5.8.0-43-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
ahmed@ubuntu:~/linux-5.8.1$
```

19. reboot the computer

```
sudo reboot
```

20. check the version of your current kernel

```
uname -r
```

It should display → 5.8.1

21. Change your working directory to your home directory.

```
cd ~
```

22. Create a C file to generate a report of the success or failure of your system call.

Create the C file with the following command.

```
nano report.c
```

and write the code: →

```
#include <linux/kernel.h>
#include <sys/syscall.h>
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include <errno.h>

#define __NR_identity 440

long identity_syscall(void)
{
    return syscall(__NR_identity);
}

int main(int argc, char *argv[])
{
    long activity;
    activity = identity_syscall();
```

```
if(activity < 0)
{
    perror("Sorry, not found !");
}

else
{
    printf("Congratulations, KERNEL team ");
}

return 0;
}
```

23.Compile the C file you just created.

```
gcc -o report report.c
```

24. Run the C file you just compiled.

```
./report
```

```
ahmed@ubuntu:~$ uname -r
5.8.1
ahmed@ubuntu:~$ cd ~
ahmed@ubuntu:~$ nano report.c
ahmed@ubuntu:~$ gcc -o report report.c
ahmed@ubuntu:~$ ./report
ahmed@ubuntu:~$ ./report
Congratulations, KERNEL team ahmed@ubuntu:~$
```

It should displays: →

Congratulations, KERNEL team

25. Check the last line of the dmesg output.

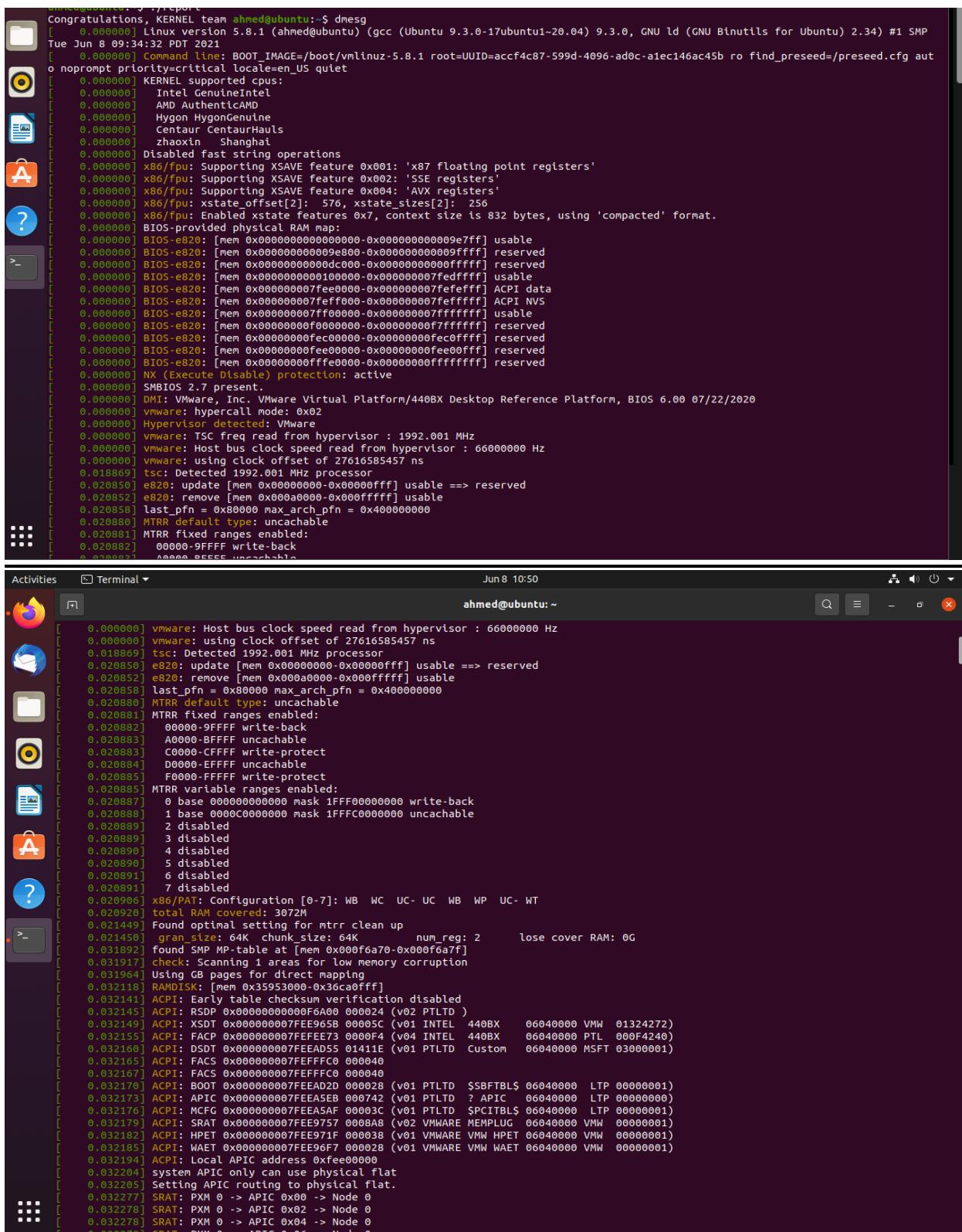
dmesg

it should display →

hello From KERNEL team

```
[ 166.004247] audit: type=1326 audit(1623174250.772:50): auid=1000 uid=1000 gid=1000 ses=3 subj=snap.snap-store.ubuntu-software (enforce)
pid=1844 comm="pool-org.gnome." exe="/snap/snap-store/518/usr/bin/snap-store" sig=0 arch=c000003e syscall=93 compat=0 ip=0x7f54d19c84e7 co
de=0x50000
[ 263.157726] Hello from KERNEL team.
[ 304.239020] Hello from KERNEL team.
ahmed@ubuntu:~$
```

Screenshots of the last step in details:



The screenshot shows two terminal windows side-by-side. Both windows are running on a dark-themed desktop environment with icons for various applications like file manager, terminal, browser, and system settings.

The left terminal window displays the dmesg command output. It shows the kernel boot process, including CPU detection (Intel GenuineIntel), memory mapping, and various device drivers (X86_FPU, BIOS-e820, DMIC, VMWARE, etc.) being initialized. Key messages include:

- Congratulations, KERNEL team ahmed@ubuntu:~\$ dmesg
- [0.000000] Linux version 5.8.1 (ahmed@ubuntu) (gcc (Ubuntu 9.3.0-17ubuntu1~20.04) 9.3.0, GNU ld (GNU Binutils for Ubuntu) 2.34) #1 SMP
- [0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-5.8.1 root=UUID=accf4c87-599d-4096-ad0c-a1ec146ac45b ro find_preseed=/preseed.cfg auto
- [0.000000] noprompt priority=critical locale=en_US quiet
- [0.000000] KERNEL supported cpus:
- [0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
- [0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
- [0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
- [0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
- [0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'compacted' format.
- [0.000000] BIOS-supported physical RAM map:
- [0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000e7fff] usable
- [0.000000] BIOS-e820: [mem 0x000000000000e800-0x000000000000ffff] reserved
- [0.000000] BIOS-e820: [mem 0x0000000000dc000-0x000000000000ffff] reserved
- [0.000000] BIOS-e820: [mem 0x000000000010000-0x00000000007fedffff] usable
- [0.000000] BIOS-e820: [mem 0x00000000007fee0000-0x00000000007fefefff] ACPI data
- [0.000000] BIOS-e820: [mem 0x00000000007feff000-0x00000000007feffff] ACPI NVS
- [0.000000] BIOS-e820: [mem 0x00000000007ff00000-0x00000000007fffffff] usable
- [0.000000] BIOS-e820: [mem 0x0000000000f000000-0x0000000000f7ffffff] reserved
- [0.000000] BIOS-e820: [mem 0x0000000000fec0000-0x0000000000fec0ffff] reserved
- [0.000000] BIOS-e820: [mem 0x0000000000fee0000-0x0000000000fee0ffff] reserved
- [0.000000] BIOS-e820: [mem 0x0000000000ffre0000-0x0000000000fffffff] reserved
- [0.000000] NX (Execute Disable) protection: active
- [0.000000] SMBIOS 2.7 present.
- [0.000000] DMI: VMware, Inc. VMware Virtual Platform/440BX Desktop Reference Platform, BIOS 6.00 07/22/2020
- [0.000000] vmware: hypercall mode: 0x02
- [0.000000] Hypervisor detected: VMware
- [0.000000] vmware: TSC freq read from hypervisor : 1992.001 MHz
- [0.000000] vmware: Host bus clock speed read from hypervisor : 66000000 Hz
- [0.000000] vmware: using clock offset of 27616585457 ns
- [0.018869] tsc: Detected 1992.001 MHz processor
- [0.020850] e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
- [0.020852] e820: remove [mem 0x0000a000-0x000fffff] usable
- [0.020858] last_pfn = 0x80000 max_arch_pfn = 0x400000000
- [0.020880] MTTR default type: uncachable
- [0.020881] MTTR fixed ranges enabled:
- [0.020882] 00000-9FFFF write-back
- [0.020883] A0000-BFFFF uncachable
- [0.020884] C0000-CFFFF write-protect
- [0.020885] D0000-EFFFF uncachable
- [0.020885] F0000-FFFFF write-protect
- [0.020885] MTTR variable ranges enabled:
- [0.020887] 0 base 00000000000 mask 1FFF00000000 write-back
- [0.020888] 1 base 0000C000000 mask 1FFFC0000000 uncachable
- [0.020889] 2 disabled
- [0.020890] 3 disabled
- [0.020890] 4 disabled
- [0.020890] 5 disabled
- [0.020891] 6 disabled
- [0.020891] 7 disabled
- [0.020906] x86/PAT: Configuration [0-7]: WB WC UC- UC WB WP UC- WT
- [0.020920] total RAM covered: 3072M
- [0.021449] Found optimal setting for mtrr clean up
- [0.021450] gran_size: 64K chunk_size: 64K num_reg: 2 lose cover RAM: 0G
- [0.031892] found SMP MP-table at [mem 0x000f6a70-0x000f6a7f]
- [0.031917] check: Scanning 1 areas for low memory corruption
- [0.031964] Using GB pages for direct mapping
- [0.032118] RAMDISK: [mem 0x35953000-0x36ca0fff]
- [0.032141] ACPI: Early table checksum verification disabled
- [0.032145] ACPI: RSDP 0x00000000000f6a00 000024 (v02 PTLTD)
- [0.032149] ACPI: XSDT 0x000000007FEE965B 00005C (v01 INTEL 440BX 06040000 VMW 01324272)
- [0.032155] ACPI: FACP 0x000000007FEEF73 0000F4 (v04 INTEL 440BX 06040000 PTL 000F4240)
- [0.032160] ACPI: DSDT 0x000000007FEEAD55 01411E (v01 PTLTD Custom 06040000 MSFT 03000001)
- [0.032165] ACPI: FACS 0x000000007FEFFFC0 000040
- [0.032167] ACPI: FACS 0x000000007FEFFFC0 000040
- [0.032170] ACPI: BOOT 0x000000007FEEAD20 000028 (v01 PTLTD \$SBFTBLS 06040000 LTP 00000001)
- [0.032173] ACPI: APIC 0x00000000007FEEA5EB 000742 (v01 PTLTD ? APIC 06040000 LTP 00000000)
- [0.032176] ACPI: MCFG 0x000000007FEEA5AF 00003C (v01 PTLTD \$PCITBLS 06040000 LTP 00000001)
- [0.032179] ACPI: SRAT 0x000000007FEE9757 0008A8 (v02 VMWARE MEMPLUG 06040000 VMW 00000001)
- [0.032182] ACPI: HPET 0x00000000007FEE971F 000038 (v01 VMWARE VMW HPET 06040000 VMW 00000001)
- [0.032185] ACPI: WAKE 0x000000007FEE96F7 000028 (v01 VMWARE VMW WAET 06040000 VMW 00000001)
- [0.032194] ACPI: Local APIC address 0xf0000000
- [0.032204] system APIC only can use physical flat
- [0.032205] Setting APIC routing to physical flat.
- [0.032277] SRAT: PXM 0 -> APIC 0x00 -> Node 0
- [0.032278] SRAT: PXM 0 -> APIC 0x02 -> Node 0
- [0.032278] SRAT: PXM 0 -> APIC 0x04 -> Node 0

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```
[0.032303] SRAT: PXM 0 -> APIC 0x80 -> Node 0
[0.032303] SRAT: PXM 0 -> APIC 0x82 -> Node 0
[0.032304] SRAT: PXM 0 -> APIC 0x84 -> Node 0
[0.032304] SRAT: PXM 0 -> APIC 0x86 -> Node 0
[0.032305] SRAT: PXM 0 -> APIC 0x88 -> Node 0
[0.032305] SRAT: PXM 0 -> APIC 0x8a -> Node 0
[0.032305] SRAT: PXM 0 -> APIC 0x8c -> Node 0
[0.032306] SRAT: PXM 0 -> APIC 0x8e -> Node 0
[0.032306] SRAT: PXM 0 -> APIC 0x90 -> Node 0
[0.032307] SRAT: PXM 0 -> APIC 0x92 -> Node 0
[0.032307] SRAT: PXM 0 -> APIC 0x94 -> Node 0
[0.032307] SRAT: PXM 0 -> APIC 0x96 -> Node 0
[0.032308] SRAT: PXM 0 -> APIC 0x98 -> Node 0
[0.032308] SRAT: PXM 0 -> APIC 0x9a -> Node 0
[0.032309] SRAT: PXM 0 -> APIC 0x9c -> Node 0
[0.032309] SRAT: PXM 0 -> APIC 0x9e -> Node 0
[0.032309] SRAT: PXM 0 -> APIC 0xa0 -> Node 0
[0.032310] SRAT: PXM 0 -> APIC 0xa2 -> Node 0
[0.032310] SRAT: PXM 0 -> APIC 0xa4 -> Node 0
[0.032311] SRAT: PXM 0 -> APIC 0xa6 -> Node 0
[0.032311] SRAT: PXM 0 -> APIC 0xa8 -> Node 0
[0.032311] SRAT: PXM 0 -> APIC 0xaa -> Node 0
[0.032312] SRAT: PXM 0 -> APIC 0xac -> Node 0
[0.032312] SRAT: PXM 0 -> APIC 0xae -> Node 0
[0.032313] SRAT: PXM 0 -> APIC 0xb0 -> Node 0
[0.032313] SRAT: PXM 0 -> APIC 0xb2 -> Node 0
[0.032313] SRAT: PXM 0 -> APIC 0xb4 -> Node 0
[0.032314] SRAT: PXM 0 -> APIC 0xb6 -> Node 0
[0.032314] SRAT: PXM 0 -> APIC 0xb8 -> Node 0
[0.032315] SRAT: PXM 0 -> APIC 0xba -> Node 0
[0.032315] SRAT: PXM 0 -> APIC 0xbc -> Node 0
[0.032315] SRAT: PXM 0 -> APIC 0xbe -> Node 0
[0.032316] SRAT: PXM 0 -> APIC 0xc0 -> Node 0
[0.032316] SRAT: PXM 0 -> APIC 0xc2 -> Node 0
[0.032317] SRAT: PXM 0 -> APIC 0xc4 -> Node 0
[0.032317] SRAT: PXM 0 -> APIC 0xc6 -> Node 0
[0.032317] SRAT: PXM 0 -> APIC 0xc8 -> Node 0
[0.032318] SRAT: PXM 0 -> APIC 0xca -> Node 0
[0.032318] SRAT: PXM 0 -> APIC 0xcc -> Node 0
[0.032318] SRAT: PXM 0 -> APIC 0xce -> Node 0
[0.032319] SRAT: PXM 0 -> APIC 0xd0 -> Node 0
[0.032319] SRAT: PXM 0 -> APIC 0xd2 -> Node 0
[0.032320] SRAT: PXM 0 -> APIC 0xd4 -> Node 0
[0.032320] SRAT: PXM 0 -> APIC 0xd6 -> Node 0
[0.032320] SRAT: PXM 0 -> APIC 0xd8 -> Node 0
[0.032321] SRAT: PXM 0 -> APIC 0xda -> Node 0
[0.032321] SRAT: PXM 0 -> APIC 0xdc -> Node 0
[0.032322] SRAT: PXM 0 -> APIC 0xde -> Node 0
[0.032322] SRAT: PXM 0 -> APIC 0xe0 -> Node 0
[0.032322] SRAT: PXM 0 -> APIC 0xe2 -> Node 0
```

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```
[0.032332] ACPI: SRAT: Node 0 PXM 0 [mem 0x00100000-0x7fffffff]
[0.032333] ACPI: SRAT: Node 0 PXM 0 [mem 0x80000000-0xbfffffff] hotplug
[0.032335] NUMA: Node 0 [mem 0x00000000-0x000fffff] + [mem 0x00100000-0x7fffffff] -> [mem 0x00000000-0x7fffffff]
[0.032342] NODE_DATA(0) allocated [mem 0x7fd6000-0x7fffffff]
[0.032579] Zone ranges:
[0.032580]   DMA      [mem 0x0000000000001000-0x00000000000fffff]
[0.032580]   DMA32     [mem 0x000000000100000-0x0000000007fffffff]
[0.032581]   Normal    empty
[0.032582]   Device    empty
[0.032582] Movable zone start for each node
[0.032585] Early memory node ranges
[0.032585]   node 0: [mem 0x0000000000001000-0x00000000000dffff]
[0.032586]   node 0: [mem 0x000000000000100000-0x0000000007fedffff]
[0.032587]   node 0: [mem 0x0000000007ff00000-0x0000000007fffffff]
[0.032594] Zeroed struct page in unavailable ranges: 131 pages
[0.032595] Initmem setup node 0 [mem 0x0000000000001000-0x0000000007fffffff]
[0.032596] On node 0 totalpages: 524157
[0.032597]   DMA zone: 64 pages used for memmap
[0.032597]   DMA zone: 23 pages reserved
[0.032598]   DMA zone: 3997 pages, LIFO batch:0
[0.047989]   DMA32 zone: 8128 pages used for memmap
[0.047991]   DMA32 zone: 520160 pages, LIFO batch:63
[0.054851]   DMA32 zone: 520160 pages, LIFO batch:63
[0.054851] ACPI: PM-Timer IO Port: 0x1008
[0.054854] ACPI: Local APIC address 0fee00000
[0.054858] system APIC only can use physical flat
[0.054870] ACPI: LAPIC_NMI (acpi_id[0x00] high edge lint[0x1])
[0.054870] ACPI: LAPIC_NMI (acpi_id[0x01] high edge lint[0x1])
[0.054871] ACPI: LAPIC_NMI (acpi_id[0x02] high edge lint[0x1])
[0.054871] ACPI: LAPIC_NMI (acpi_id[0x03] high edge lint[0x1])
[0.054872] ACPI: LAPIC_NMI (acpi_id[0x04] high edge lint[0x1])
[0.054872] ACPI: LAPIC_NMI (acpi_id[0x05] high edge lint[0x1])
[0.054873] ACPI: LAPIC_NMI (acpi_id[0x06] high edge lint[0x1])
[0.054873] ACPI: LAPIC_NMI (acpi_id[0x07] high edge lint[0x1])
[0.054873] ACPI: LAPIC_NMI (acpi_id[0x08] high edge lint[0x1])
[0.054874] ACPI: LAPIC_NMI (acpi_id[0x09] high edge lint[0x1])
[0.054874] ACPI: LAPIC_NMI (acpi_id[0x0a] high edge lint[0x1])
[0.054875] ACPI: LAPIC_NMI (acpi_id[0x0b] high edge lint[0x1])
[0.054875] ACPI: LAPIC_NMI (acpi_id[0x0c] high edge lint[0x1])
[0.054875] ACPI: LAPIC_NMI (acpi_id[0x0d] high edge lint[0x1])
[0.054876] ACPI: LAPIC_NMI (acpi_id[0x0e] high edge lint[0x1])
[0.054876] ACPI: LAPIC_NMI (acpi_id[0x0f] high edge lint[0x1])
[0.054877] ACPI: LAPIC_NMI (acpi_id[0x10] high edge lint[0x1])
[0.054877] ACPI: LAPIC_NMI (acpi_id[0x11] high edge lint[0x1])
[0.054878] ACPI: LAPIC_NMI (acpi_id[0x12] high edge lint[0x1])
[0.054878] ACPI: LAPIC_NMI (acpi_id[0x13] high edge lint[0x1])
[0.054878] ACPI: LAPIC_NMI (acpi_id[0x14] high edge lint[0x1])
[0.054879] ACPI: LAPIC_NMI (acpi_id[0x15] high edge lint[0x1])
[0.054879] ACPI: LAPIC_NMI (acpi_id[0x16] high edge lint[0x1])
[0.054880] ACPI: LAPIC_NMI (acpi_id[0x17] high edge lint[0x1])
[0.054880] ACPI: LAPIC_NMI (acpi_id[0x18] high edge lint[0x1])
```

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```
[ 0.054921] ACPI: LAPIC_NMI (acpi_id[0x78] high edge lint[0x1])
[ 0.054922] ACPI: LAPIC_NMI (acpi_id[0x79] high edge lint[0x1])
[ 0.054922] ACPI: LAPIC_NMI (acpi_id[0x7a] high edge lint[0x1])
[ 0.054922] ACPI: LAPIC_NMI (acpi_id[0x7b] high edge lint[0x1])
[ 0.054923] ACPI: LAPIC_NMI (acpi_id[0x7c] high edge lint[0x1])
[ 0.054923] ACPI: LAPIC_NMI (acpi_id[0x7d] high edge lint[0x1])
[ 0.054924] ACPI: LAPIC_NMI (acpi_id[0x7e] high edge lint[0x1])
[ 0.054924] ACPI: LAPIC_NMI (acpi_id[0x7f] high edge lint[0x1])
[ 0.054958] IOAPIC[0]: apic_id 1, version 32, address 0xfc000000, GSI 0-23
[ 0.054962] INT_SRC_OVR (bus 0 bus_irq 0 global_irq 2 high edge)
[ 0.054965] ACPI: IRQ0 used by override.
[ 0.054965] ACPI: IRQ0 used by override.
[ 0.054968] Using ACPI (MADT) for SMP configuration information
[ 0.054970] ACPI: HPET id: 0xb008af01 base: 0xfed00000
[ 0.054974] TSC deadline timer available
[ 0.054981] smpboot: Allowing 128 CPUs, 126 hotplug CPUs
[ 0.054993] PM: hibernation: Registered nosave memory: [mem 0x00000000-0x00000fff]
[ 0.054994] PM: hibernation: Registered nosave memory: [mem 0x0009e000-0x0009ffff]
[ 0.054994] PM: hibernation: Registered nosave memory: [mem 0x0009f000-0x0009ffff]
[ 0.054995] PM: hibernation: Registered nosave memory: [mem 0x00aa0000-0x00dbfff]
[ 0.054995] PM: hibernation: Registered nosave memory: [mem 0x00dc0000-0x000ffff]
[ 0.054996] PM: hibernation: Registered nosave memory: [mem 0x7fee0000-0x7feffff]
[ 0.054996] PM: hibernation: Registered nosave memory: [mem 0x7feff000-0x7feffff]
[ 0.054998] [mem 0x80000000-0xffffffff] available for PCI devices
[ 0.054999] Booting paravirtualized kernel on VMware hypervisor
[ 0.055001] clocksource: refined-jiffies: mask: 0xffffffff max_cycles: 7645519600211568 ns
[ 0.055001] setup_percpu: NR_CPUS:8192 nr_cpumask_bits:128 nr_cpu_ids:128 nr_node_ids:1
[ 1.936047] percpu: Embedded 56 pages/cpu s192512 r8192 d28672 u262144 alloc1*c2097152
[ 1.936667] percpu-alloc: s192512 r8192 d28672 u262144 alloc1*c2097152
[ 1.936668] percpu-alloc: [0] 000 001 002 003 004 005 006 007
[ 1.936670] percpu-alloc: [0] 008 009 010 011 012 013 014 015
[ 1.936672] percpu-alloc: [0] 016 017 018 019 020 021 022 023
[ 1.936675] percpu-alloc: [0] 024 025 026 027 028 029 030 031
[ 1.936677] percpu-alloc: [0] 032 033 034 035 036 037 038 039
[ 1.936679] percpu-alloc: [0] 040 041 042 043 044 045 046 047
[ 1.936681] percpu-alloc: [0] 048 049 050 051 052 053 054 055
[ 1.936683] percpu-alloc: [0] 056 057 058 059 060 061 062 063
[ 1.936685] percpu-alloc: [0] 064 065 066 067 068 069 070 071
[ 1.936687] percpu-alloc: [0] 072 073 074 075 076 077 078 079
[ 1.936689] percpu-alloc: [0] 080 081 082 083 084 085 086 087
[ 1.936691] percpu-alloc: [0] 088 089 090 091 092 093 094 095
[ 1.936693] percpu-alloc: [0] 096 097 098 099 100 101 102 103
[ 1.936696] percpu-alloc: [0] 104 105 106 107 108 109 110 111
[ 1.936698] percpu-alloc: [0] 112 113 114 115 116 117 118 119
[ 1.936700] percpu-alloc: [0] 120 121 122 123 124 125 126 127
[ 1.936705] Built 1 zonelists mobility grouping on. Total pages: 515944
[ 1.936767] Policy zone: DMA32
[ 1.936769] Kernel command line: BOOT_IMAGE=/boot/vmlinuz-5.8.1 root=UUID=accf4c87-599d-4096-ad0c-a1ec146ac45b ro find_preseed=/preseed.
cfg auto noprompt priority=critical locale=en_US quiet
```

Activities Terminal Jun 8 10:52 ahmed@ubuntu: ~

```
[ 3.024181] pci 0000:00:18.7: bridge window [mem 0xe5b00000-0xe5bfffff 64bit pref]
[ 3.026584] ACPI: PCI Interrupt Link [LNKA] (IRQs 3 4 5 6 7 *9 10 11 14 15)
[ 3.026602] ACPI: PCI Interrupt Link [LNKB] (IRQs 3 4 5 6 7 9 10 *11 14 15)
[ 3.026737] ACPI: PCI Interrupt Link [LNKC] (IRQs 3 4 5 6 7 9 *10 11 14 15)
[ 3.026812] ACPI: PCI Interrupt Link [LNKD] (IRQs 3 4 5 6 *7 9 10 11 14 15)
[ 3.047662] iommu: Default domain type: Translated
[ 3.047662] pci 0000:00:0f:0: vgaarb: setting as boot VGA device
[ 3.047662] pci 0000:00:0f:0: vgaarb: VGA device added: decodes=io+mem,owns=io+mem,locks=none
[ 3.047662] pci 0000:00:0f:0: vgaarb: bridge control possible
[ 3.047662] vgaarb: loaded
[ 3.047662] SCSI subsystem initialized
[ 3.047662] libata version 3.00 loaded.
[ 3.047662] ACPI: bus type USB registered
[ 3.047662] usbcore: registered new interface driver usbfs
[ 3.047662] usbcore: registered new interface driver hub
[ 3.047662] usbcore: registered new device driver usb
[ 3.047662] pps_core: linuxPPS API ver. 1 registered
[ 3.047662] pps_core: Software ver. 5.3.6 - Copyright 2005-2007 Rodolfo Giometti <giometti@linux.it>
[ 3.047662] PTP clock support registered
[ 3.050268] EDAC MC: Ver: 3.0.0
[ 3.053147] NetLabel: Initializing
[ 3.053147] NetLabel: domain hash size = 128
[ 3.053147] NetLabel: protocols = UNLABELED CIPSOv4 CALIPSO
[ 3.053147] NetLabel: unlabeled traffic allowed by default
[ 3.054014] PCI: Using ACPI for IRQ routing
[ 3.081862] PCI: pci_cache_line_size set to 64 bytes
[ 3.082675] e820: reserve RAM buffer [mem 0x0009e800-0x0009ffff]
[ 3.082677] e820: reserve RAM buffer [mem 0x7fe00000-0x7fffffff]
[ 3.107152] hpet0: at MMIO 0xfed00000, IRQs 2, 8, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
[ 3.107169] hpet0: 16 comparators, 64-bit 14.318180 MHz counter
[ 3.110338] clocksource: Switched to clocksource tsc-early
[ 4.173066] VFS: Disk quotas dquot_6.0.0
[ 4.173054] VFS: Dquot-cache hash table entries: 512 (order 0, 4096 bytes)
[ 4.173194] AppArmor: AppArmor Filesystem Enabled
[ 4.173221] pnp: PnP ACPI init
[ 4.173424] system 00:00: [io 0x1000-0x103f] has been reserved
[ 4.173425] system 00:00: [io 0x1040-0x104f] has been reserved
[ 4.173427] system 00:00: [io 0x0cf0-0x0cf1] has been reserved
[ 4.173431] system 00:00: Plug and Play ACPI device, IDs PNP0c02 (active)
[ 4.173455] pnp 00:01: Plug and Play ACPI device, IDs PNP0b00 (active)
[ 4.173467] pnp 00:02: Plug and Play ACPI device, IDs PNP0303 (active)
[ 4.173478] pnp 00:03: Plug and Play ACPI device, IDs VMW0003 PNP0f13 (active)
[ 4.173688] system 00:04: [mem 0xfed00000-0xfed03fff] has been reserved
[ 4.173691] system 00:04: Plug and Play ACPI device, IDs PNP0i03 PNP0c01 (active)
[ 4.175321] pnp 00:05: Plug and Play ACPI device, IDs PNP0501 (active)
[ 4.175711] system 00:06: [io 0xfc00-0xfcff] has been reserved
[ 4.175712] system 00:06: [mem 0xf0000000-0xf7ffff] has been reserved
[ 4.175713] system 00:06: [mem 0xfe800000-0xfe9fffff] has been reserved
[ 4.175716] system 00:06: Plug and Play ACPI device, IDs PNP0c02 (active)
```

Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)

Player | Jun 8 10:52

Activities Terminal ahmed@ubuntu: ~

```
[4.197930] pci_bus 0000:0c: resource 0 [io 0x9000-0x9fff]
[4.197931] pci_bus 0000:0c: resource 1 [mem 0xfc00000-0xfcfffff]
[4.197931] pci_bus 0000:0c: resource 2 [mem 0xe750000-0xe75fffff 64bit pref]
[4.197932] pci_bus 0000:0d: resource 0 [io 0xd000-0xdfff]
[4.197932] pci_bus 0000:0d: resource 1 [mem 0xfc0b0000-0xfcfffff]
[4.197933] pci_bus 0000:0d: resource 2 [mem 0xe710000-0xe71fffff 64bit pref]
[4.197934] pci_bus 0000:0e: resource 1 [mem 0xfc70000-0xfcfffff]
[4.197934] pci_bus 0000:0e: resource 2 [mem 0xe6d0000-0xe6dfffff 64bit pref]
[4.197935] pci_bus 0000:0f: resource 1 [mem 0xfc30000-0xfc3fffff]
[4.197935] pci_bus 0000:0f: resource 2 [mem 0xe690000-0xe69fffff 64bit pref]
[4.197936] pci_bus 0000:10: resource 1 [mem 0xfb0000-0xfbfffff]
[4.197936] pci_bus 0000:10: resource 2 [mem 0xe650000-0xe65fffff 64bit pref]
[4.197937] pci_bus 0000:11: resource 1 [mem 0xfb00000-0xfbfffff]
[4.197938] pci_bus 0000:11: resource 2 [mem 0xe610000-0xe61fffff 64bit pref]
[4.197938] pci_bus 0000:12: resource 1 [mem 0xfb70000-0xfb7fffff]
[4.197939] pci_bus 0000:12: resource 2 [mem 0xe5d0000-0xe5dfffff 64bit pref]
[4.197939] pci_bus 0000:13: resource 0 [io 0x6000-0x6fff]
[4.197940] pci_bus 0000:13: resource 1 [mem 0xfd200000-0xfd2fffff]
[4.197940] pci_bus 0000:13: resource 2 [mem 0xe780000-0xe78fffff 64bit pref]
[4.197941] pci_bus 0000:14: resource 0 [io 0xa000-0xafff]
[4.197941] pci_bus 0000:14: resource 1 [mem 0xfce0000-0xfcfffff]
[4.197942] pci_bus 0000:14: resource 2 [mem 0xe740000-0xe74fffff 64bit pref]
[4.197943] pci_bus 0000:15: resource 0 [io 0xe000-0xefff]
[4.197943] pci_bus 0000:15: resource 1 [mem 0xfc00000-0xfcfffff]
[4.197944] pci_bus 0000:15: resource 2 [mem 0xe700000-0xe70fffff 64bit pref]
[4.197944] pci_bus 0000:16: resource 1 [mem 0xfc60000-0xfc6fffff]
[4.197945] pci_bus 0000:16: resource 2 [mem 0xe6c0000-0xe6cfffff 64bit pref]
[4.197945] pci_bus 0000:17: resource 1 [mem 0xfc200000-0xfc2fffff]
[4.197946] pci_bus 0000:17: resource 2 [mem 0xe680000-0xe68fffff 64bit pref]
[4.197947] pci_bus 0000:18: resource 1 [mem 0xfb00000-0xfbfffff]
[4.197947] pci_bus 0000:18: resource 2 [mem 0xe640000-0xe64fffff 64bit pref]
[4.197948] pci_bus 0000:19: resource 1 [mem 0xbfa0000-0xbfafffff]
[4.197948] pci_bus 0000:19: resource 2 [mem 0xe600000-0xe60fffff 64bit pref]
[4.197949] pci_bus 0000:1a: resource 1 [mem 0xfb60000-0xfb6fffff]
[4.197949] pci_bus 0000:1a: resource 2 [mem 0xe5c0000-0xe5cfffff 64bit pref]
[4.197950] pci_bus 0000:1b: resource 0 [io 0x7000-0x7fff]
[4.197950] pci_bus 0000:1b: resource 1 [mem 0xfd10000-0xfd1fffff]
[4.197951] pci_bus 0000:1b: resource 2 [mem 0xe770000-0xe77fffff 64bit pref]
[4.197952] pci_bus 0000:1c: resource 0 [io 0xb000-0xbfff]
[4.197952] pci_bus 0000:1c: resource 1 [mem 0xfc00000-0xfcfffff]
[4.197953] pci_bus 0000:1c: resource 2 [mem 0xe730000-0xe73fffff 64bit pref]
[4.197953] pci_bus 0000:1d: resource 1 [mem 0xfc90000-0xfc9fffff]
[4.197954] pci_bus 0000:1d: resource 2 [mem 0xe6f0000-0xe6fffff 64bit pref]
[4.197954] pci_bus 0000:1e: resource 1 [mem 0xfc50000-0xfc5fffff]
[4.197955] pci_bus 0000:1e: resource 2 [mem 0xe6b0000-0xe6bfffff 64bit pref]
[4.197955] pci_bus 0000:1f: resource 1 [mem 0xfc10000-0xfc1fffff]
[4.197956] pci_bus 0000:1f: resource 2 [mem 0xe670000-0xe67fffff 64bit pref]
[4.197957] pci_bus 0000:20: resource 1 [mem 0xfb00000-0xfbfffff]
[4.197957] pci_bus 0000:20: resource 2 [mem 0xe630000-0xe63fffff 64bit pref]
[4.197957] pci_bus 0000:21: resource 1 [mem 0xbfb0000-0xbfbfffff]
```

Activities Terminal Jun 8 10:53 ahmed@ubuntu:~

```
[ 5.316993] pcieport 0000:00:15.3: pciehp: Slot #163 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.318334] pcieport 0000:00:15.4: PME: Signaling with IRQ 28
[ 5.318451] pcieport 0000:00:15.4: pciehp: Slot #164 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.319799] pcieport 0000:00:15.5: PME: Signaling with IRQ 29
[ 5.319910] pcieport 0000:00:15.5: pciehp: Slot #165 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.321120] pcieport 0000:00:15.6: PME: Signaling with IRQ 30
[ 5.321216] pcieport 0000:00:15.6: pciehp: Slot #166 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.322429] pcieport 0000:00:15.7: PME: Signaling with IRQ 31
[ 5.322526] pcieport 0000:00:15.7: pciehp: Slot #167 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.323693] pcieport 0000:00:16.0: PME: Signaling with IRQ 32
[ 5.323802] pcieport 0000:00:16.0: pciehp: Slot #192 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.324979] pcieport 0000:00:16.1: PME: Signaling with IRQ 33
[ 5.325088] pcieport 0000:00:16.1: pciehp: Slot #193 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.326213] pcieport 0000:00:16.2: PME: Signaling with IRQ 34
[ 5.326309] pcieport 0000:00:16.2: pciehp: Slot #194 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.327302] pcieport 0000:00:16.3: PME: Signaling with IRQ 35
[ 5.327391] pcieport 0000:00:16.3: pciehp: Slot #195 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.328449] pcieport 0000:00:16.4: PME: Signaling with IRQ 36
[ 5.328537] pcieport 0000:00:16.4: pciehp: Slot #196 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.329664] pcieport 0000:00:16.5: PME: Signaling with IRQ 37
[ 5.329689] pcieport 0000:00:16.5: pciehp: Slot #197 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.330713] pcieport 0000:00:16.6: PME: Signaling with IRQ 38
[ 5.330789] pcieport 0000:00:16.6: pciehp: Slot #198 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.331772] pcieport 0000:00:16.7: PME: Signaling with IRQ 39
[ 5.331848] pcieport 0000:00:16.7: pciehp: Slot #199 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.332814] pcieport 0000:00:17.0: PME: Signaling with IRQ 40
[ 5.332891] pcieport 0000:00:17.0: pciehp: Slot #224 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.333877] pcieport 0000:00:17.1: PME: Signaling with IRQ 41
[ 5.333953] pcieport 0000:00:17.1: pciehp: Slot #225 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.334931] pcieport 0000:00:17.2: PME: Signaling with IRQ 42
[ 5.335007] pcieport 0000:00:17.2: pciehp: Slot #226 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.336055] pcieport 0000:00:17.3: PME: Signaling with IRQ 43
[ 5.336158] pcieport 0000:00:17.3: pciehp: Slot #227 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
```

Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)

Activities Terminal Jun 8 10:53 ahmed@ubuntu:~

```
[ 5.348189] pcieport 0000:00:18.6: PME: Signaling with IRQ 54
[ 5.348263] pcieport 0000:00:18.6: pciehp: Slot #262 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.349210] pcieport 0000:00:18.7: PME: Signaling with IRQ 55
[ 5.349293] pcieport 0000:00:18.7: pciehp: Slot #263 AttnBtn+ PwrCtrl+ MRL- AttnInd- PwrInd- HotPlug+ Surprise- Interlock- NoCompl+ IbPr
esDis- LLACTRep+
[ 5.349916] shpchp: Standard Hot Plug PCI Controller Driver version: 0.4
[ 5.349975] intel_idle: Please enable MWAIT in BIOS SETUP
[ 5.350281] ACPI: AC Adapter [ACAD] (on-line)
[ 5.350365] input: Power Button as /devices/LNXSYSTM:00/lnxpwrbn:00/input/input0
[ 5.350411] ACPI: Power Button [PWRF]
[ 5.351162] Serial: 8250/16550 driver, 32 ports, IRQ sharing enabled
[ 5.374223] 00:05: ttyS0 at I/O 0x3f8 (irq = 4, base_baud = 115200) is a 16550A
[ 5.388765] Linux agpgart interface v0.103
[ 5.388888] agpgart-intel 0000:00:00.0: Intel 440BX Chipset
[ 5.398661] agpgart-intel 0000:00:00.0: AGP aperture is 256M @ 0x0
[ 5.465412] loop: module loaded
[ 5.465691] ata_piix 0000:00:07.1: version 2.13
[ 5.466879] scsi host0: ata_piix
[ 5.467507] scsi host1: ata_piix
[ 5.467587] ata1: PATA max UDMA/33 cmd 0x1f0 ctl 0x3f6 bmdma 0x1060 irq 14
[ 5.467588] ata2: PATA max UDMA/33 cmd 0x170 ctl 0x376 bmdma 0x1068 irq 15
[ 5.467996] libphy: Fixed MDIO Bus: probed
[ 5.467910] tun: Universal TUN/TAP device driver, 1.6
[ 5.467954] PPP generic driver version 2.4.2
[ 5.468015] VFIO - User Level meta-driver version: 0.3
[ 5.468091] ehci_hcd: USB 2.0 'Enhanced' Host Controller (EHCI) Driver
[ 5.468120] ehci-pci: EHCI PCI platform driver
[ 5.469093] ehci-pci 0000:02:03.0: EHCI Host Controller
[ 5.469101] ehci-pci 0000:02:03.0: new USB bus registered, assigned bus number 1
[ 5.469448] ehci-pci 0000:02:03.0: cache line size of 64 is not supported
[ 5.469477] ehci-pci 0000:02:03.0: irq 17, to mem 0xfd5ef000
[ 5.482539] ehci-pci 0000:02:03.0: USB 2.0 started, EHCI 1.00
[ 5.482629] usb usb1: New USB device found, idVendor=1d6b, idProduct=0002, bcdDevice= 5.08
[ 5.482631] usb usb1: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 5.482632] usb usb1: Product: EHCI Host Controller
[ 5.482633] usb usb1: Manufacturer: Linux 5.8.1 ehci_hcd
[ 5.482634] usb usb1: SerialNumber: 0000:02:03.0
[ 5.482739] hub 1-0:1.0: USB hub found
[ 5.482744] hub 1-0:1.0: 6 ports detected
[ 5.482975] ehci-platform: EHCI generic platform driver
[ 5.482990] ohci_hcd: USB 1.1 'Open' Host Controller (OHCI) Driver
[ 5.482993] ohci-pci: OHCI PCI platform driver
[ 5.483011] ohci-platform: OHCI generic platform driver
[ 5.483017] uhci_hcd: USB Universal Host Controller Interface driver
[ 5.483658] uhci_hcd 0000:02:00.0: UHCI Host Controller
[ 5.483667] uhci_hcd 0000:02:00.0: new USB bus registered, assigned bus number 2
[ 5.483725] uhci_hcd 0000:02:00.0: detected 2 ports
[ 5.483949] uhci_hcd 0000:02:00.0: irq 18, to base 0x000002080
[ 5.484071] uhci_hcd: New UCR domain found, idVendor=1d6b, idProduct=0001, hdevName=uhc1
```

Activities Terminal Jun 8 10:54 ahmed@ubuntu: ~

```
[ 5.506421] device-mapper: ioctl: 4.42.0-ioctl (2020-02-27) initialised: dm-devel@redhat.com
[ 5.506444] platform eisa.0: Probing EISA bus 0
[ 5.506470] platform eisa.0: EISA: Cannot allocate resource for mainboard
[ 5.506471] platform eisa.0: Cannot allocate resource for EISA slot 1
[ 5.506472] platform eisa.0: Cannot allocate resource for EISA slot 2
[ 5.506473] platform eisa.0: Cannot allocate resource for EISA slot 3
[ 5.506473] platform eisa.0: Cannot allocate resource for EISA slot 4
[ 5.506474] platform eisa.0: Cannot allocate resource for EISA slot 5
[ 5.506474] platform eisa.0: Cannot allocate resource for EISA slot 6
[ 5.506475] platform eisa.0: Cannot allocate resource for EISA slot 7
[ 5.506475] platform eisa.0: Cannot allocate resource for EISA slot 8
[ 5.506476] platform eisa.0: EISA: Detected 0 cards
[ 5.506478] intel_pstate: CPU model not supported
[ 5.506684] ledtrig-cpu: registered to indicate activity on CPUs
[ 5.506881] intel_pmc_core intel_pmc_core: initialized
[ 5.506963] drop_monitor: Initializing network drop monitor service
[ 5.507406] NET: Registered protocol family 10
[ 5.507551] input: AT Translated Set 2 keyboard as /devices/platform/i8042/serio0/input/input1
[ 5.514046] Segment Routing with IPv6
[ 5.514060] NET: Registered protocol family 17
[ 5.514115] Key type dns_resolver registered
[ 5.514311] IPI shorthand broadcast: enabled
[ 5.514318] sched_clock: Marking stable (5498257132, 15996418)->(6778916238, -1264662688)
[ 5.514449] registered taskstats version 1
[ 5.51458] Loading compiled-in X.509 certificates
[ 5.51245] Loaded X.509 cert "time autogenerated kernel key": 5b4b9f4a58d42afe1cd9551e7605a3627ba12ca1'
[ 5.51269] zswap: loaded using pool lzo/zbud
[ 5.515703] Key type .fsckscript registered
[ 5.515703] Key type .fsckscript registered
[ 5.515704] Key type fscrypt-provisioning registered
[ 5.518074] Key type encrypted registered
[ 5.518077] AppArmor: AppArmor sha1 policy hashing enabled
[ 5.518082] ima: No TPM chip found, activating TPM-bypass!
[ 5.518090] ima: Allocated hash algorithm: sha1
[ 5.518095] ima: No architecture policies found
[ 5.518105] evm: Initialising EVM extended attributes:
[ 5.518106] evm: security.selinux
[ 5.518106] evm: security.SMACK64
[ 5.518106] evm: security.SMACK64EXEC
[ 5.518106] evm: security.SMACK64TRANSMUTE
[ 5.518107] evm: security.SMACK64MAP
[ 5.518107] evm: security.apparmor
[ 5.518107] evm: security.ima
[ 5.518107] evm: security.capability
[ 5.518108] evm: HMAC attrs: 0x1
[ 5.534300] PM: Magic number: 9:536:693
[ 5.534553] acpiLNXCPU:34: hash matches
[ 5.535099] RAS: Correctable Errors collector initialized.
[ 5.652858] Freeing unused decrypted memory: 2040K
[ 5.652851] Freeing unused kernel memory (initially memory): 26132K
```

Activities Terminal Jun 8 10:54 ahmed@ubuntu: ~

```
[ 21.5280435] audit: type=1400 audit(1623174106.509:4): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_filter"
pid=625 comm="apparmor_parser"
[ 21.5211181] audit: type=1400 audit(1623174106.509:5): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_groff" p
id=625 comm="apparmor_parser"
[ 21.710572] audit: type=1400 audit(1623174106.697:6): apparmor="STATUS" operation="profile_load" profile="unconfined" name="lsb_release"
pid=629 comm="apparmor_parser"
[ 21.817032] audit: type=1400 audit(1623174106.805:7): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/sbin/tc
pdump" pid=630 comm="apparmor_parser"
[ 21.848423] audit: type=1400 audit(1623174106.837:8): apparmor="STATUS" operation="profile_load" profile="unconfined" name="nvidia_modpr
obe" pid=632 comm="apparmor_parser"
[ 21.849259] audit: type=1400 audit(1623174106.837:9): apparmor="STATUS" operation="profile_load" profile="unconfined" name="nvidia_modpr
obe"/kmod" pid=632 comm="apparmor_parser"
[ 22.192312] audit: type=1400 audit(1623174107.181:10): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/sn
apd/snap-confine" pid=633 comm="apparmor_parser"
[ 22.193249] audit: type=1400 audit(1623174107.181:11): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/sn
apd/snap-confine//mount-namespace-capture-helper" pid=633 comm="apparmor_parser"
[ 27.973210] kauditd_prntk_skb: 16 callbacks suppressed
[ 27.973211] audit: type=1400 audit(1623174112.961:28): apparmor="STATUS" operation="profile_load" profile="unconfined" name="libreoffice
-soffice" pid=638 comm="apparmor_parser"
[ 27.974581] audit: type=1400 audit(1623174112.965:29): apparmor="STATUS" operation="profile_load" profile="unconfined" name="libreoffice
-soffice//gpg" pid=638 comm="apparmor_parser"
[ 29.315202] audit: type=1400 audit(1623174114.305:30): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/snap/snapd
/12057/usr/lib/snapd/snap-confine" pid=644 comm="apparmor_parser"
[ 29.316452] audit: type=1400 audit(1623174114.305:31): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/snap/snapd
/12057/usr/lib/snapd/snap-confine//mount-namespace-capture-helper" pid=654 comm="apparmor_parser"
[ 29.496823] NET: Registered protocol family 40
[ 29.591857] audit: type=1400 audit(1623174114.581:32): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap-update
-ns.snap-store" pid=655 comm="apparmor_parser"
[ 29.621782] audit: type=1400 audit(1623174114.609:33): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-s
tore.hook_configure" pid=656 comm="apparmor_parser"
[ 29.823115] audit: type=1400 audit(1623174114.813:34): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-s
tore.ubuntu-software" pid=662 comm="apparmor_parser"
[ 29.855859] audit: type=1400 audit(1623174114.845:35): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-s
tore.snap-store" pid=661 comm="apparmor_parser"
[ 30.075021] audit: type=1400 audit(1623174115.065:36): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-s
tore.ubuntu-software-local-file" pid=662 comm="apparmor_parser"
[ 34.992375] audit: type=1400 audit(1623174119.981:37): apparmor="DENIED" operation="capable" profile="/usr/sbin/cups-browsed" pid=811 co
mm="cups-browsed" Capability=23 capname="sys.nice"
[ 37.531783] e1000: ens33 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: None
[ 37.553603] IPv6: ADDRCONF(NETDEV_CHANGE): ens33: link becomes ready
[ 41.215718] audit: type=1400 audit(1623174126.205:38): apparmor="STATUS" operation="profile_replace" profile="unconfined" name="/snap/sn
apd/12057/usr/lib/snapd/snap-confine" pid=1000 comm="apparmor_parser"
[ 41.239099] audit: type=1400 audit(1623174126.229:39): apparmor="STATUS" operation="profile_replace" profile="unconfined" name="/snap/sn
apd/12057/usr/lib/snapd/snap-confine//mount-namespace-capture-helper" pid=1000 comm="apparmor_parser"
[ 43.111358] audit: type=1400 audit(1623174128.101:40): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip
ping" profile="unconfined" name="snap-update-ns.snap-store" pid=1002 comm="apparmor_parser"
[ 43.120725] audit: type=1400 audit(1623174128.109:41): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip
ping" profile="unconfined" name="snap.snap-store.hook.configure" pid=1044 comm="apparmor_parser"
[ 43.124649] audit: type=1400 audit(1623174128.113:42): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip
```

```

Activities Terminal Jun 8 10:54 ahmed@ubuntu:~ [ 21.520435] audit: type=1400 audit(1623174106.509:4): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_filter" pid=625 comm="apparmor_parser" [ 21.521118] audit: type=1400 audit(1623174106.509:5): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_groff" pid=625 comm="apparmor_parser" [ 21.710572] audit: type=1400 audit(1623174106.697:6): apparmor="STATUS" operation="profile_load" profile="unconfined" name="lsb_release" pid=629 comm="apparmor_parser" [ 21.817032] audit: type=1400 audit(1623174106.805:7): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/sbin/tc pdump" pid=630 comm="apparmor_parser" [ 21.848433] audit: type=1400 audit(1623174106.837:8): apparmor="STATUS" operation="profile_load" profile="unconfined" name="nvidia_modprobe" pid=632 comm="apparmor_parser" [ 21.849259] audit: type=1400 audit(1623174106.837:9): apparmor="STATUS" operation="profile_load" profile="unconfined" name="nvidia_modprobe//kmod" pid=632 comm="apparmor_parser" [ 22.192312] audit: type=1400 audit(1623174107.181:10): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/snappyd/snap-confine" pid=633 comm="apparmor_parser" [ 22.193249] audit: type=1400 audit(1623174107.181:11): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/snappyd/snap-confine//mount-namespace-capture-helper" pid=633 comm="apparmor_parser" [ 27.973209] kaudits_printk_skb: 16 callbacks suppressed [ 27.973211] audit: type=1400 audit(1623174112.961:28): apparmor="STATUS" operation="profile_load" profile="unconfined" name="libreoffice-soffice" pid=634 comm="apparmor_parser" [ 27.974581] audit: type=1400 audit(1623174112.965:29): apparmor="STATUS" operation="profile_load" profile="unconfined" name="libreoffice-soffice/gpg" pid=638 comm="apparmor_parser" [ 29.315202] audit: type=1400 audit(1623174114.305:30): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/snap/snapd/12057/usr/lib/snapd/snap-confine" pid=654 comm="apparmor_parser" [ 29.316452] audit: type=1400 audit(1623174114.305:31): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/snap/snapd/12057/usr/lib/snapd/snap-confine//mount-namespace-capture-helper" pid=654 comm="apparmor_parser" [ 29.490823] NET: Registered protocol family 40 [ 29.591857] audit: type=1400 audit(1623174114.581:32): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap-update-ns.snap-store" pid=655 comm="apparmor_parser" [ 29.621702] audit: type=1400 audit(1623174114.609:33): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-store.hook.configure" pid=656 comm="apparmor_parser" [ 29.823115] audit: type=1400 audit(1623174114.813:34): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-store.ubuntu-software" pid=662 comm="apparmor_parser" [ 29.855859] audit: type=1400 audit(1623174114.845:35): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-store.snap-store" pid=661 comm="apparmor_parser" [ 30.075021] audit: type=1400 audit(1623174115.065:36): apparmor="STATUS" operation="profile_load" profile="unconfined" name="snap.snap-store.ubuntu-software-local-file" pid=663 comm="apparmor_parser" [ 34.992375] audit: type=1400 audit(1623174119.981:37): apparmor="DENIED" operation="capable" profile="/usr/sbin/cups-browsed" pid=811 comm="cups-browsed" capability=23 capname="sys_nice" [ 37.531732] e1000: ens33 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: None [ 37.553603] IPv6: ADDRCONF(NETDEV_CHANGE): ens33: link becomes ready [ 41.215718] audit: type=1400 audit(1623174126.205:38): apparmor="STATUS" operation="profile_replace" profile="unconfined" name="/snap/snappyd/12057/usr/lib/snapd/snap-confine" pid=1000 comm="apparmor_parser" [ 41.239699] audit: type=1400 audit(1623174126.229:39): apparmor="STATUS" operation="profile_replace" profile="unconfined" name="/snap/snappyd/12057/usr/lib/snapd/snap-confine//mount-namespace-capture-helper" pid=1000 comm="apparmor_parser" [ 43.111358] audit: type=1400 audit(1623174128.101:40): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip ping" profile="unconfined" name="snap.update-ns.snap-store" pid=1002 comm="apparmor_parser" [ 43.126725] audit: type=1400 audit(1623174128.109:41): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip ping" profile="unconfined" name="snap.snap-store.hook.configure" pid=1044 comm="apparmor_parser" [ 43.124949] audit: type=1400 audit(1623174128.113:42): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip ping" profile="unconfined" name="snap.snap-store.snap-store" pid=1045 comm="apparmor_parser" [ 43.130371] audit: type=1400 audit(1623174128.121:43): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip ping" profile="unconfined" name="snap.snap-store.ubuntu-software" pid=1046 comm="apparmor_parser" [ 43.133204] audit: type=1400 audit(1623174128.121:44): apparmor="STATUS" operation="profile_replace" info="same as current profile, skip ping" profile="unconfined" name="snap.snap-store.ubuntu-software-local-file" pid=1047 comm="apparmor_parser" [ 55.996793] rfkill: input handler disabled [ 69.708147] rfkill: input handler enabled [ 87.921149] rfkill: input handler disabled [ 95.547293] audit: type=1400 audit(1623174180.312:45): apparmor="DENIED" operation="capable" profile="/snap/snapd/12057/usr/lib/snapd/snap-confine" pid=1844 comm="snap-confine" capability=4 capname="fsetid" [ 103.436692] audit: type=1326 audit(1623174188.202:46): auid=1000 uid=1000 gid=1000 ses=3 subj==snap.snap-store.ubuntu-software (enforce) pid=1844 comm="snap-store" exe="/snap/snap-store/518/usr/bin/snap-store" sig=0 arch=c000003e syscall=314 compat=0 ip=0x7f54d19d2639 code=0 x50000 [ 108.138950] audit: type=1400 audit(1623174192.906:47): apparmor="DENIED" operation="open" profile="snap.snap-store.ubuntu-software" name="/etc/PackageKit/Vendor.conf" pid=1844 comm="snap-store" requested_mask="r" denied_mask="r" fsuid=1000 ouid=0 [ 165.533402] audit: type=1400 audit(1623174250.300:48): apparmor="DENIED" operation="open" profile="snap.snap-store.ubuntu-software" name="/var/lib/snapd/hostfs/usr/share/gdm/greeter/applications/gnome-initial-setup.desktop" pid=1844 comm="pool-org.gnome." requested_mask="r" denied_mask="r" fsuid=1000 ouid=0 [ 165.575778] audit: type=1400 audit(1623174250.344:49): apparmor="DENIED" operation="open" profile="snap.snap-store.ubuntu-software" name="/var/lib/snapd/hostfs/usr/share/gdm/greeter/applications/gnome-initial-setup.desktop" pid=1844 comm="pool-org.gnome." requested_mask="r" denied_mask="r" fsuid=1000 ouid=0 [ 166.004247] audit: type=1326 audit(1623174250.772:50): auid=1000 uid=1000 gid=1000 ses=3 subj==snap.snap-store.ubuntu-software (enforce) pid=1844 comm="pool-org.gnome." exe="/snap/snap-store/518/usr/bin/snap-store" sig=0 arch=c000003e syscall=93 compat=0 ip=0x7f54d19c84e7 code=0 x50000 [ 263.157726] Hello from KERNEL team. [ 304.239020] Hello from KERNEL team. ahmed@ubuntu:~$ [ 166.004247] audit: type=1326 audit(1623174250.772:50): auid=1000 uid=1000 gid=1000 ses=3 subj==snap.snap-store.ubuntu-software (enforce) pid=1844 comm="pool-org.gnome." exe="/snap/snap-store/518/usr/bin/snap-store" sig=0 arch=c000003e syscall=93 compat=0 ip=0x7f54d19c84e7 code=0 x50000 [ 263.157726] Hello from KERNEL team. [ 304.239020] Hello from KERNEL team. ahmed@ubuntu:~$ 
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References:

- <https://medium.com/anubhav-shrimal/adding-a-hello-world-system-call-to-linux-kernel-dad32875872>
- <https://dev.to/jasper/adding-a-system-call-to-the-linux-kernel-5-8-1-in-ubuntu-20-04-lts-2ga8>