

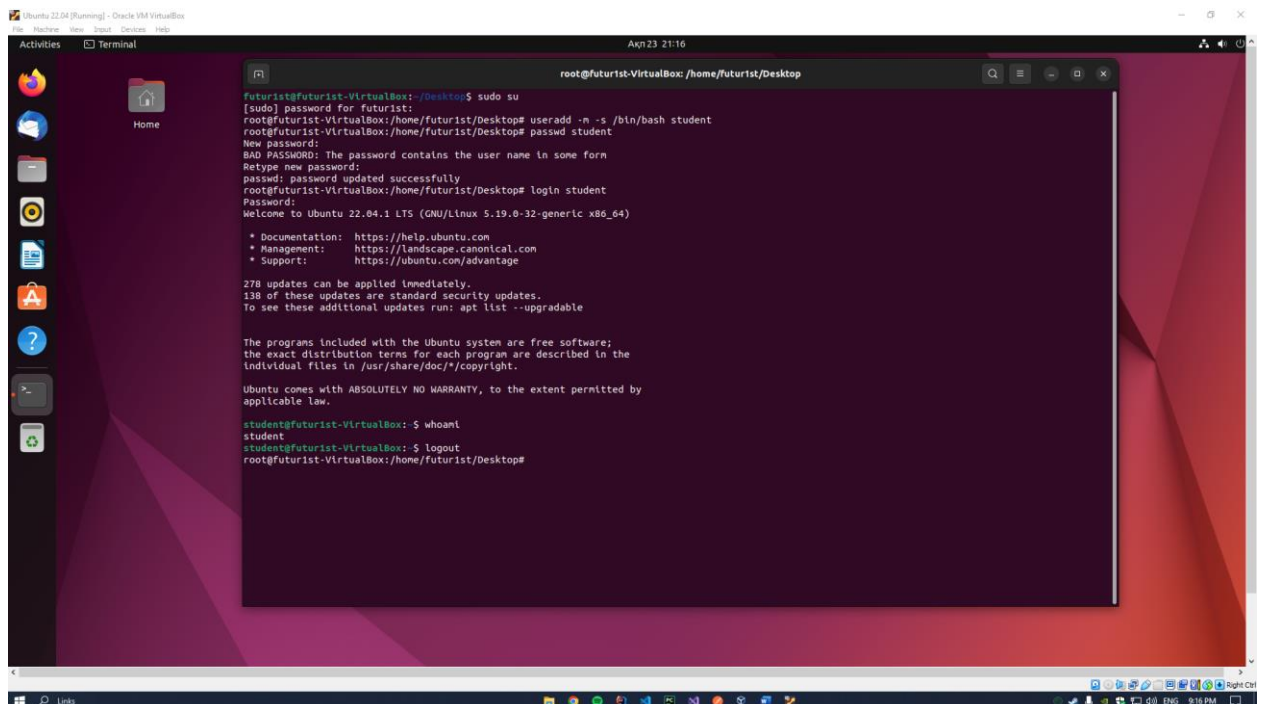
Template Final Exam

#	Full Name	Group
1	Myrzakhanov Abylaykhan	CS-2127N
2	Tuleshev Turan	CS-2127N
3	Turan Miras	CS-2129N

Link to the repository: https://github.com/Futur1stXD/Final_OSC.git

Step-by-step task completion:**Task 1:**

1. **sudo su**
2. **useradd -m -s /bin/bash student**
3. **passwd student**
4. **login student**
5. **whoami**
6. **logout**



```
root@futurist-VirtualBox: /home/futurist/Desktop
futurist@futurist-VirtualBox: ~/Desktop$ sudo su
[sudo] password for futurist:
root@futurist-VirtualBox: /home/futurist/Desktop# useradd -m -s /bin/bash student
root@futurist-VirtualBox: /home/futurist/Desktop# passwd student
New password:
BAD PASSWORD: The password contains the user name in some form
Retype new password:
passwd: password updated successfully
root@futurist-VirtualBox: /home/futurist/Desktop# login student
Password:
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.19.0-32-generic x86_64)

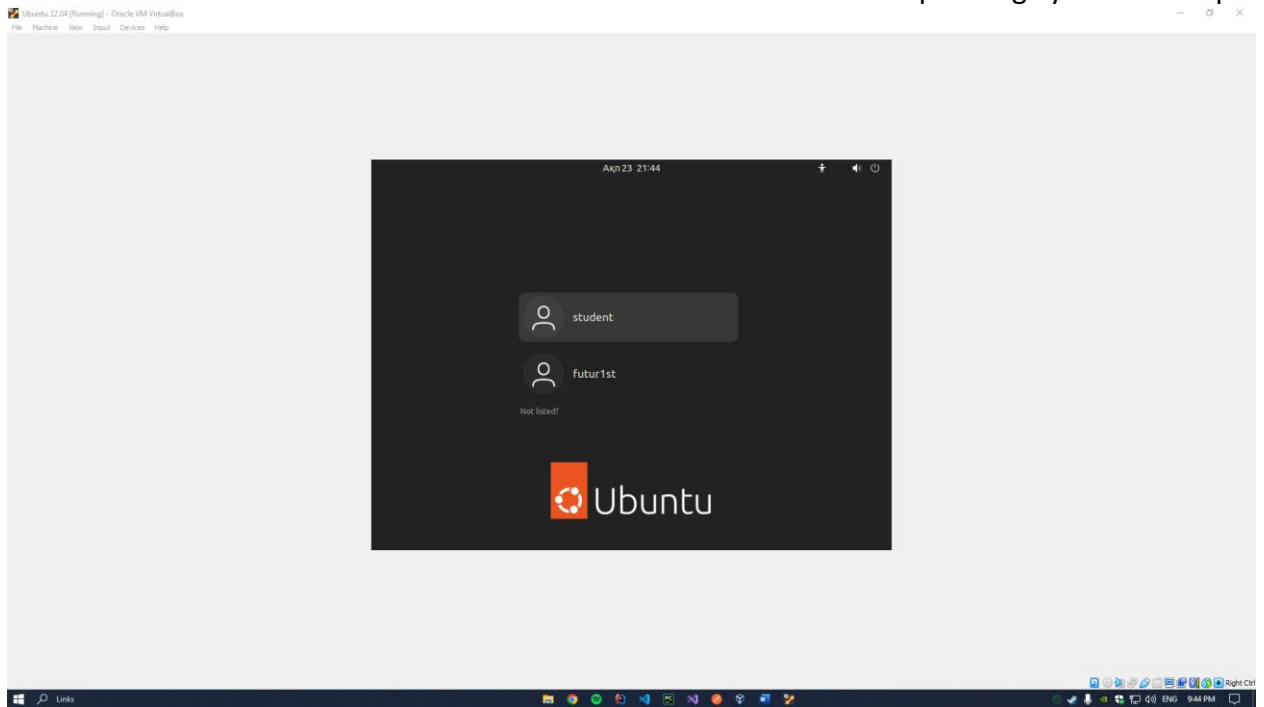
 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

278 updates can be applied immediately.
138 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

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

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

student@futurist-VirtualBox: $ whoami
student
student@futurist-VirtualBox: $ logout
root@futurist-VirtualBox: /home/futurist/Desktop#
```

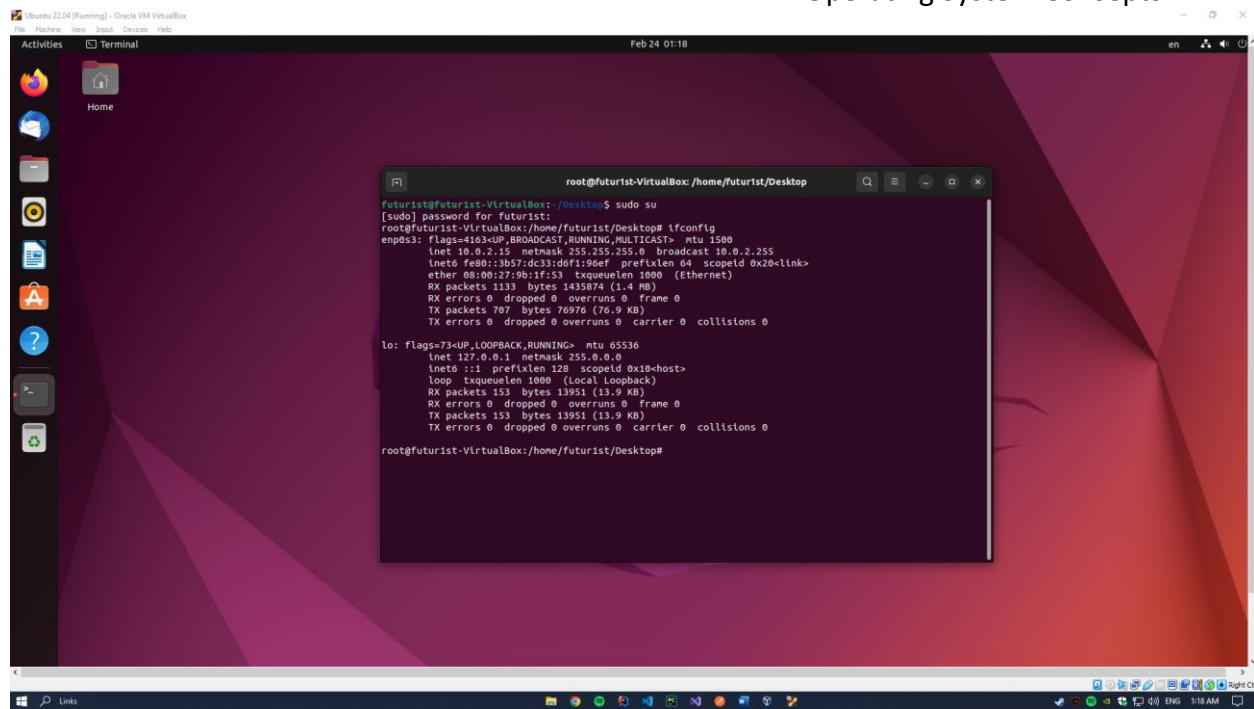


Screenshots of the code compilation result:

Task 2:

First method: Direct IP connection to the Internet

1. `sudo su`
2. `ifconfig`

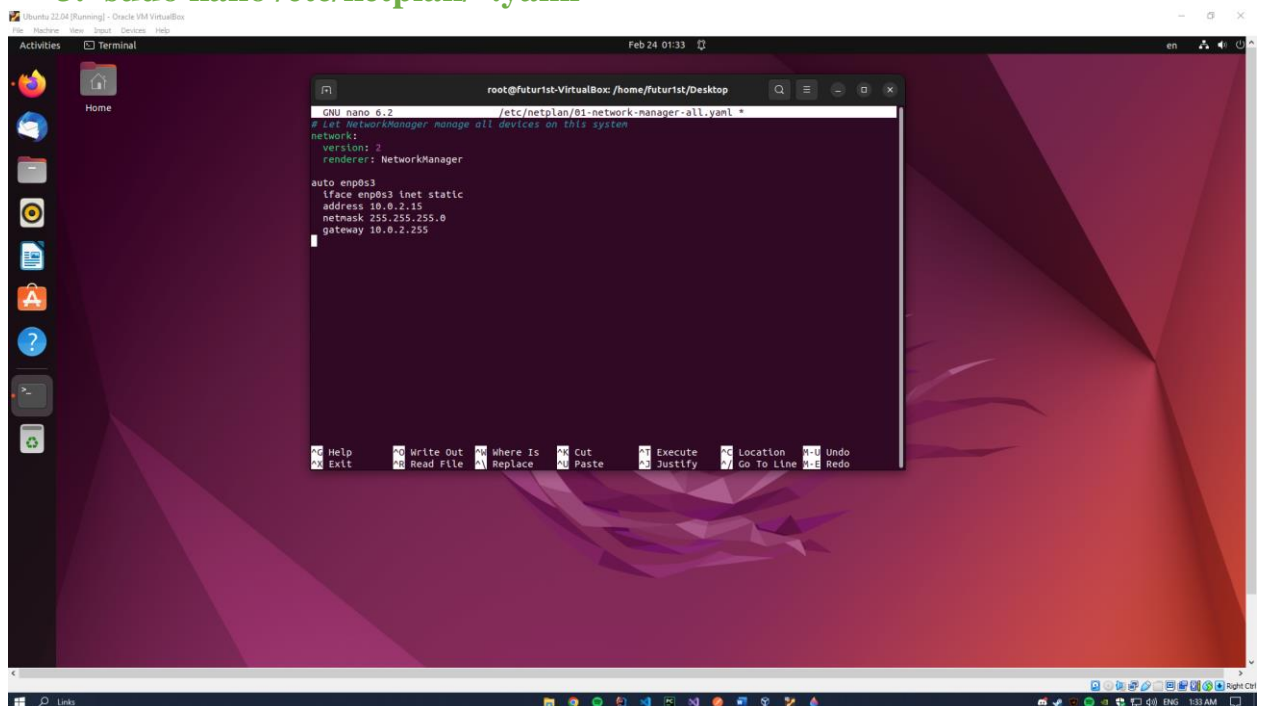


```
root@futura1st-VirtualBox: ~/home/futura1st/Desktop
futura1st@futura1st-VirtualBox: ~/Desktop$ sudo su
[sudo] password for futura1st:
root@futura1st-VirtualBox: ~/home/futura1st/Desktop# ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::3b57:dc31:d0f1:9def prefixlen 64 scopeid 0x2<link>
    ether 08:00:27:9b:1f:53 txqueuelen 1000 (Ethernet)
    RX packets 1133 bytes 1435874 (1.4 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 707 bytes 76976 (76.9 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 153 bytes 13951 (13.9 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 153 bytes 13951 (13.9 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@futura1st-VirtualBox: ~/home/futura1st/Desktop#
```

3. `sudo nano /etc/netplan/*.yaml`

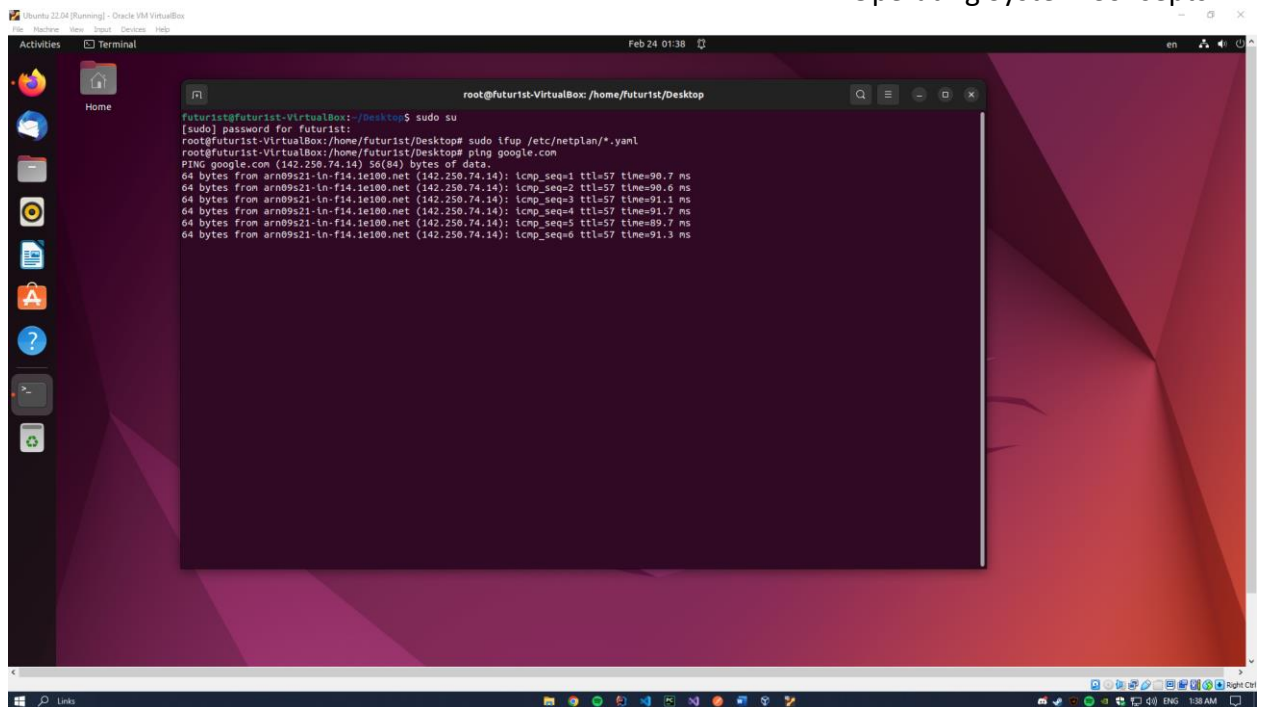


```
root@futura1st-VirtualBox: ~/home/futura1st/Desktop
GNU nano 6.2 /etc/netplan/01-network-manager-all.yaml
# Let NetworkManager manage all devices on this system
network:
  version: 2
  renderer: NetworkManager

auto enp0s3
iface enp0s3 inet static
  address 10.0.2.15
  netmask 255.255.255.0
  gateway 10.0.2.255
```

4. `sudo ifup /etc/netplan/*.yaml`

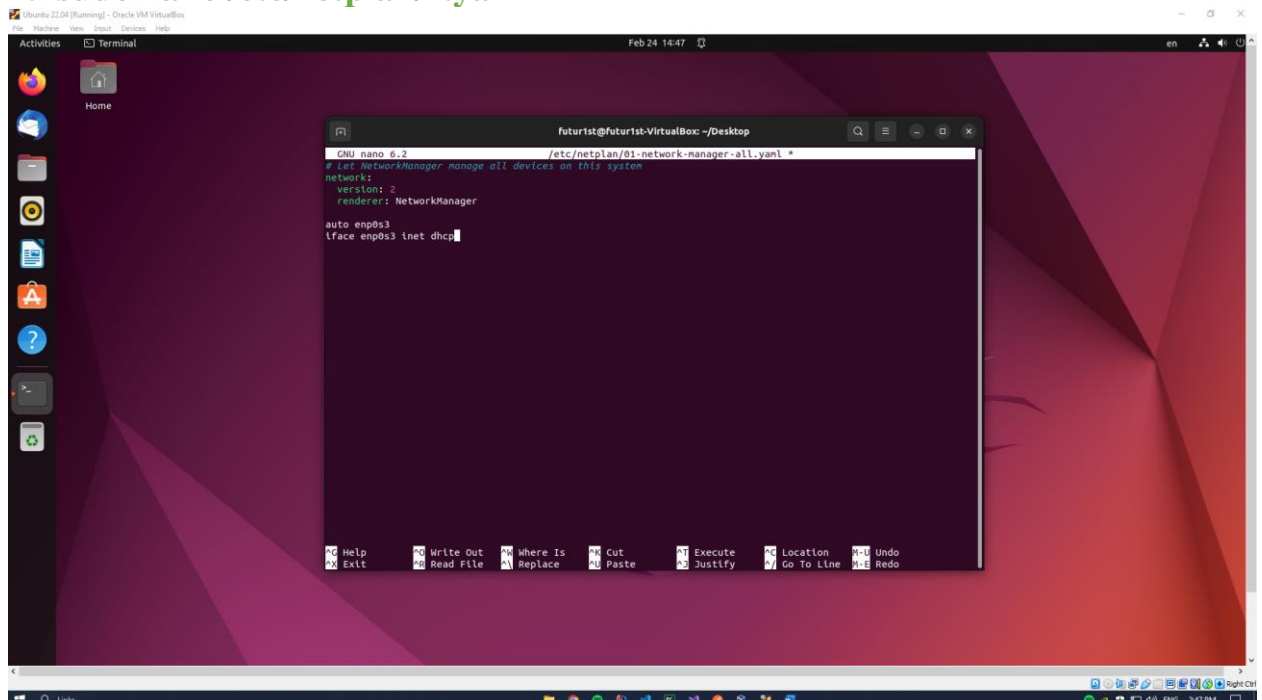
5. `ping google.com`



```
futurist@futurist-VirtualBox: ~/Desktop$ sudo su
[sudo] password for futurist:
root@futurist-VirtualBox: /home/futurist/Desktop# ifup /etc/netplan/*.yaml
root@futurist-VirtualBox: /home/futurist/Desktop# ping google.com
PING google.com (142.250.74.14) 56(84) bytes of data:
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=1 ttl=57 time=90.7 ms
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=2 ttl=57 time=90.0 ms
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=3 ttl=57 time=91.1 ms
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=4 ttl=57 time=91.7 ms
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=5 ttl=57 time=89.7 ms
64 bytes from arn09s21-ln-f14.1e100.net (142.250.74.14): icmp_seq=6 ttl=57 time=91.3 ms
```

Second method: Connection to NAT

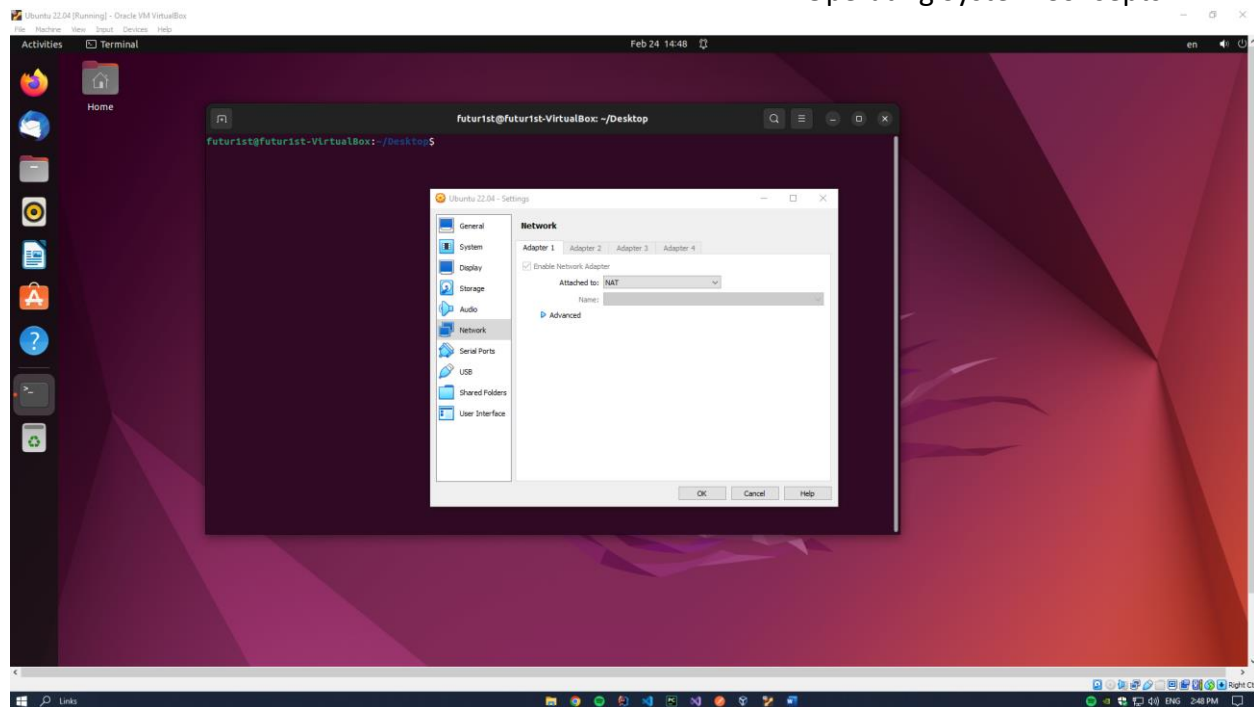
1. `ifconfig`
2. `sudo nano /etc/netplan/*.yaml`



```
GNU nano 6.2 /etc/netplan/01-network-manager-all.yaml
# Let NetworkManager manage all devices on this system
network:
  version: 2
  renderer: NetworkManager

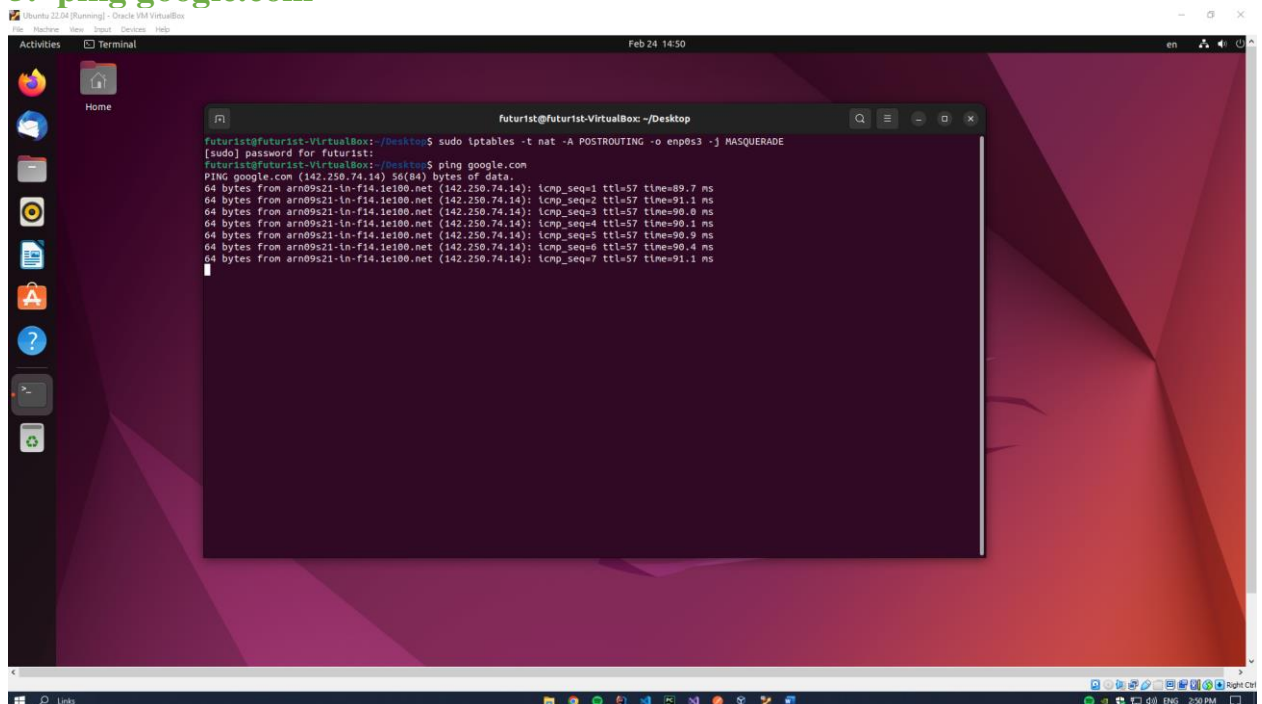
auto enp0s3
iface enp0s3 inet dhcp
```

3. Change in virtual machine setting connection to NAT



4. **sudo iptables -t nat -A POSTROUTING -o <host_interface> -j MASQUERADE**

5. **ping google.com**



Third method: Proxy

1. **Search in browser: Free proxy servers. In my example I use this site:**
<https://spys.one/en/>

Special Deal Proxy **55% OFF**

- 24/7 support
- Unlimited Connections
- Instant Proxy Switch Allowed
- Unlimited Bandwidth

Free Trial

Get Free Trial for Proxies for any purpose: SMM, SEO, Games, Scraping

Privateproxy.me [Open >](#)

SPY5.ONE/EN/ Free proxy list Proxy by ASN/ORG Proxy by cities Proxy list by country Proxy by ports Anonymous free proxy HTTP proxy list HTTP/S/SSL proxy Transparent proxy list SOCKS proxy list IPinfo

fine PROXY the right place to get high quality proxies

Free proxy list. HTTP, SSL/HTTPS, SOCKS proxies. Live proxy servers.

- Proxy servers sorted by country
- Proxies sorted by ASN/ORG
- Proxy servers sorted by cities
- Free SSL/HTTPS
- Proxy servers sorted by ports
- Squid proxy servers
- Microfit open proxies list
- Anonymous proxies
- IP checker / Anonymity test
- SOCKS proxy list
- Proxy list TXT

Proxy search (in the last 34865 checked)

Country | ALL 178 countries (34865 pr) | Port

Anonymity | All proxy | Last 100 | Proxy search

Top 12 proxy countries - Full list

- US United States
- ID Indonesia
- BR Brazil
- FR France
- DE Germany
- SG Singapore
- RU Russia
- CO Colombia
- NL Netherlands
- IN India
- BD Bangladesh

Last proxy servers

Proxy by ip:port	Proxy type	Anonymity	Country	Uptime	Check date
78.46.175.184.80	HTTP	HA	Germany	22% (104)	24-feb-2023 11:57
103.91.21.250.80	HTTP	NCA	India	14% (45)	24-feb-2023 11:55
199.5.133.194.80	HTTP	HA	United States	37% (76)	24-feb-2023 11:53
185.49.170.20.43626	HTTPS	HA	Spain	22% (40)	24-feb-2023 11:53
70.90.108.109.8080	HTTP	NCA	United States	18% (56)	24-feb-2023 11:52
216.109.73.65.34679	HTTP	HA	United States	13% (37)	24-feb-2023 11:50
180.180.218.250.8080	HTTPS	NCA	Thailand	14% (218)	24-feb-2023 11:50
8.209.198.247.80	HTTP	ANM	Japan	94% (144)	24-feb-2023 11:49
115.202.27.70.49160	HTTP	NCA	Germany	21% (11)	24-feb-2023 11:47
75.102.153.112.8089	HTTPS	NCA	United States	30% (9)	24-feb-2023 11:46
178.49.14.57.3128	HTTP	ANM	Russia	78% (39)	24-feb-2023 11:45
198.148.104.93.1994	HTTP	NCA	United States	75% (167)	24-feb-2023 11:45
64.225.4.17.9999	HTTPS	HA	United States	15% (2)	24-feb-2023 11:43
12.89.91.227.80	HTTP	ANM	United States	12% (225)	24-feb-2023 11:42
200.123.29.45.3128	HTTP	NCA	Peru	71% (5)	24-feb-2023 11:40
100.178.54.149.80	HTTP	ANM	Singapore	94% (64)	24-feb-2023 11:38
35.200.4.163.3128	HTTPS	HA	Japan	36% (165)	24-feb-2023 11:37
159.97.232.198.999	HTTPS	NCA	Vietnam	23% (5)	24-feb-2023 11:36
102.176.103.134.8080	HTTP	NCA	Guang	25% (35)	24-feb-2023 11:35
125.25.82.146.8080	HTTP	NCA	Thailand	23% (85)	24-feb-2023 11:34
95.174.98.125.80	HTTP	ANM	Russia	62% (13)	24-feb-2023 11:33
167.225.35.185.3128	HTTP	NCA	Germany	35% (32)	24-feb-2023 11:32
45.110.185.100.81	HTTP	NCA	Turkey	73% (12)	24-feb-2023 11:32
94.102.234.186.32650	HTTP	NCA	Montenegro	32% (7)	24-feb-2023 11:30
200.54.194.13.53281	HTTP	HA	Chile	12% (77)	24-feb-2023 11:30
200.109.191.161.80	HTTP	HA	United States	23% (372)	24-feb-2023 11:30

ТЫ ПОКОРИШЬ ВСЕХ С ЗЕРКАЛИН

Зеркало от провайдера и черных точек

2. export http_proxy=http:// 199.5.133.194:80
3. ping google.com

```

futuraist@futuraist-VirtualBox: ~/Desktop
futuraist@futuraist-VirtualBox:~/Desktop$ export http_proxy=http://199.5.133.194:80
futuraist@futuraist-VirtualBox:~/Desktop$ ping google.com
PING google.com (142.250.74.14): 56(84) bytes of data:
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=1 ttl=57 time=94.0 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=2 ttl=57 time=92.0 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=3 ttl=57 time=94.7 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=4 ttl=57 time=94.6 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=5 ttl=57 time=93.1 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=6 ttl=57 time=92.4 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=7 ttl=57 time=92.0 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=8 ttl=57 time=92.4 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=9 ttl=57 time=94.9 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=10 ttl=57 time=93.7 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=11 ttl=57 time=94.1 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=12 ttl=57 time=94.2 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=13 ttl=57 time=94.4 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=14 ttl=57 time=91.9 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=15 ttl=57 time=93.9 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=16 ttl=57 time=92.3 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=17 ttl=57 time=94.6 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=18 ttl=57 time=92.8 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=19 ttl=57 time=93.5 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=20 ttl=57 time=92.4 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=21 ttl=57 time=92.4 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=22 ttl=57 time=91.8 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=23 ttl=57 time=93.8 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=24 ttl=57 time=93.2 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=25 ttl=57 time=94.9 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=26 ttl=57 time=92.7 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=27 ttl=57 time=93.3 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=28 ttl=57 time=94.0 ms
64 bytes from arn09s21-lin-f14.1e100.net (142.250.74.14): icmp_seq=29 ttl=57 time=93.3 ms

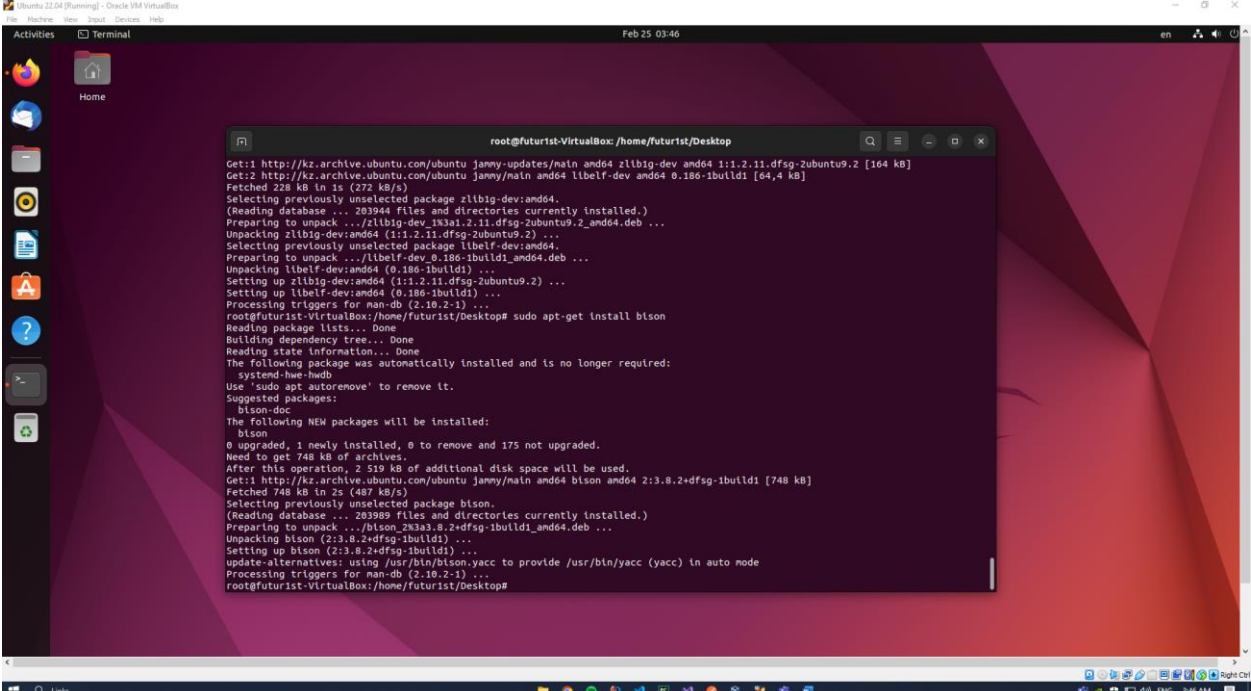
```

Screenshots of the code compilation result:

Task 3:

1. At first we need install this packages

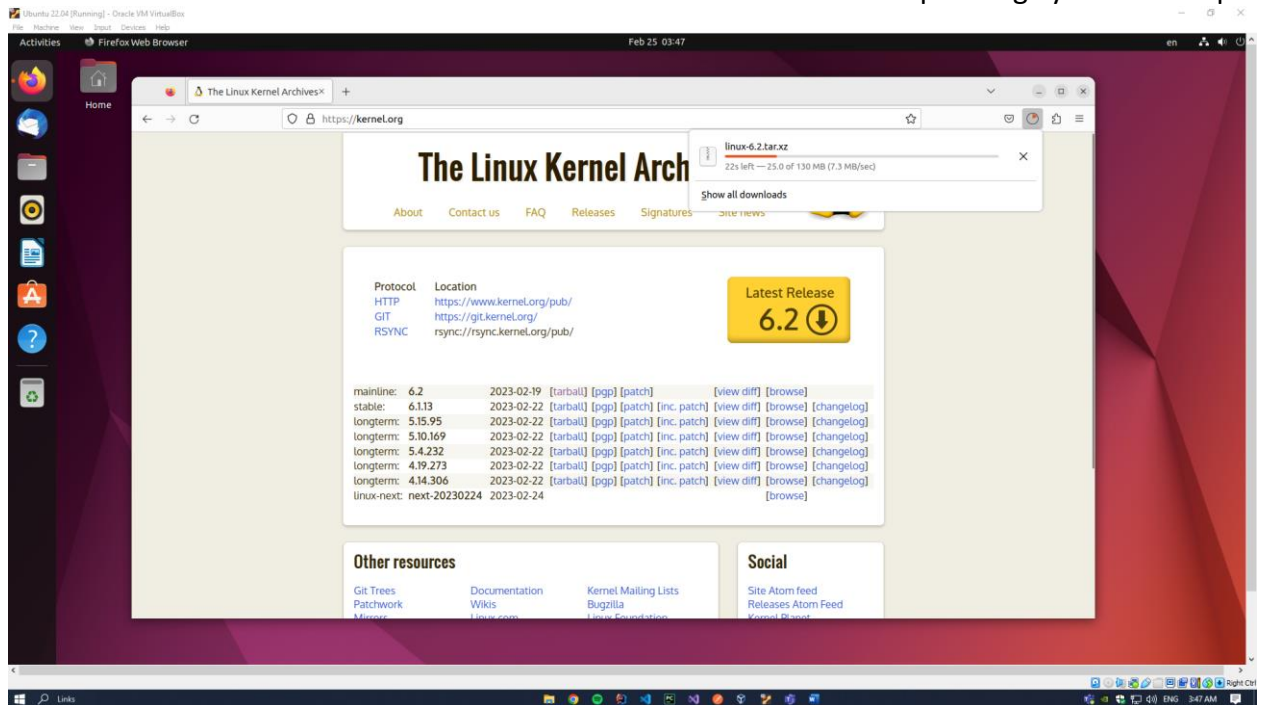
Package	Package description
git	Tracks and makes a record of all changes during development in the source code. It also allows reverting the changes.
fakerooot	Creates the fake root environment.
build-essential	Installs development tools such as C, C++, gcc, and g++.
ncurses-dev	Provides API for the text-based terminals.
xz-utils	Provides fast file compression and decompression.
libssl-dev	Supports SSL and TSL that encrypt data and make the internet connection secure.
bc (Basic Calculator)	Supports the interactive execution of statements.
flex (Fast Lexical Analyzer Generator)	Generates lexical analyzers that convert characters into tokens.
libelf-dev	Issues a shared library for managing ELF files (executable files, core dumps and object code)
bison	Converts grammar description to a C program.



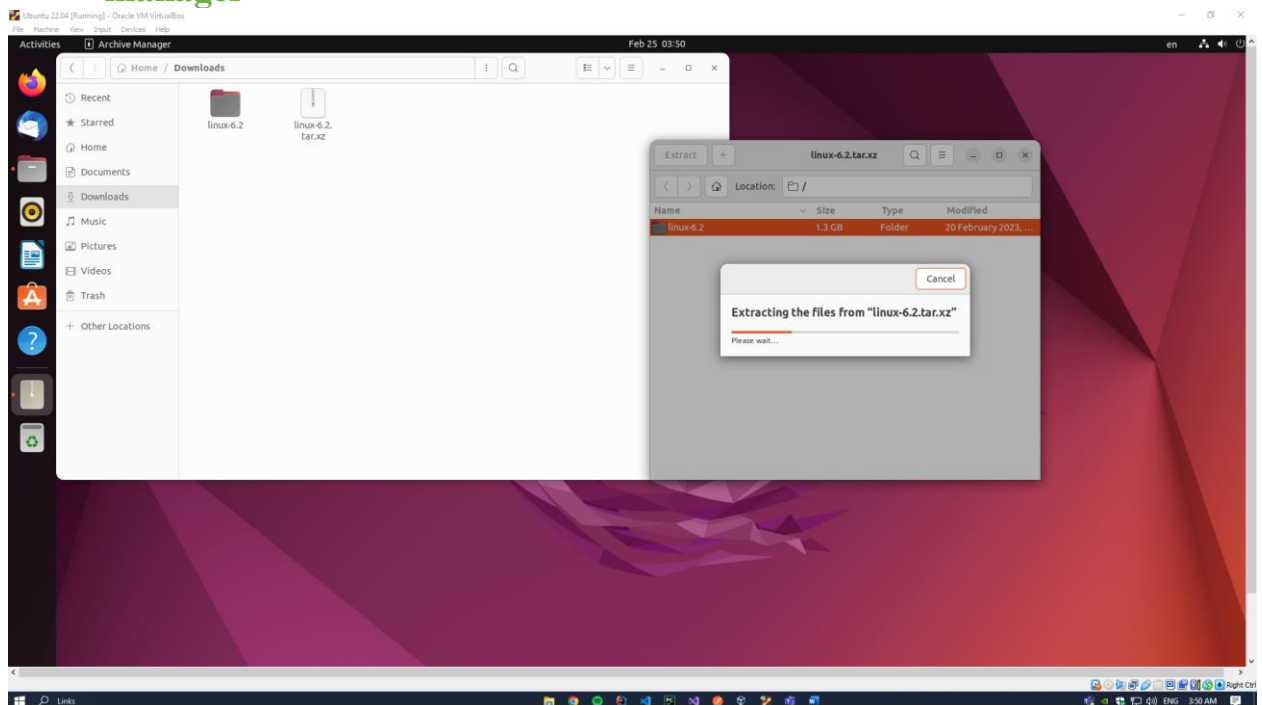
```

root@futura1st-VirtualBox: /home/futura1st/Desktop
Get:1 http://kz.archive.ubuntu.com/ubuntu jammy-updates/main amd64 zllbig-dev amd64 1:1.2.11.dfsg-2ubuntu9.2 [164 kB]
Get:2 http://kz.archive.ubuntu.com/ubuntu jammy/main amd64 libelf-dev amd64 0.186-1build1 [64,4 kB]
Fetched 228 kB in 1s (272 kB/s)
Selecting previously unselected package zllbig-dev:amd64.
(Reading database ... 203944 files and directories currently installed.)
Preparing to unpack .../zllbig-dev_1:1.2.11.dfsg-2ubuntu9.2_2_...
Unpacking zllbig-dev:amd64 (1:1.2.11.dfsg-2ubuntu9.2) ...
Selecting previously unselected package libelf-dev:amd64.
Preparing to unpack .../libelf-dev_0.186-1build1_amd64.deb ...
Unpacking libelf-dev:amd64 (0.186-1build1) ...
Setting up zllbig-dev:amd64 (1:1.2.11.dfsg-2ubuntu9.2) ...
Setting up libelf-dev:amd64 (0.186-1build1) ...
Processing triggers for man-db (2.10.2-1) ...
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  systemd-hwe-hwdb
Use 'sudo apt autoremove' to remove it.
Suggested packages:
  bison-doc
The following NEW packages will be installed:
  bison
0 upgraded, 1 newly installed, 0 to remove and 175 not upgraded.
Need to get 748 kB of archives.
After this operation, 2 519 kB of additional disk space will be used.
Get:1 http://kz.archive.ubuntu.com/ubuntu jammy/main amd64 bison amd64 2:3.8.2+dfsg-1build1 [748 kB]
Fetched 748 kB in 2s (487 kB/s)
Selecting previously unselected package bison.
(Reading database ... 203989 files and directories currently installed.)
Preparing to unpack .../bison_2:3.8.2+dfsg-1build1_amd64.deb ...
Unpacking bison (2:3.8.2+dfsg-1build1) ...
Setting up bison (2:3.8.2+dfsg-1build1) ...
update-alternatives: using /usr/bin/bison.yacc to provide /usr/bin/yacc (yacc) in auto mode
Processing triggers for man-db (2.10.2-1) ...
root@futura1st-VirtualBox: /home/futura1st/Desktop
  
```

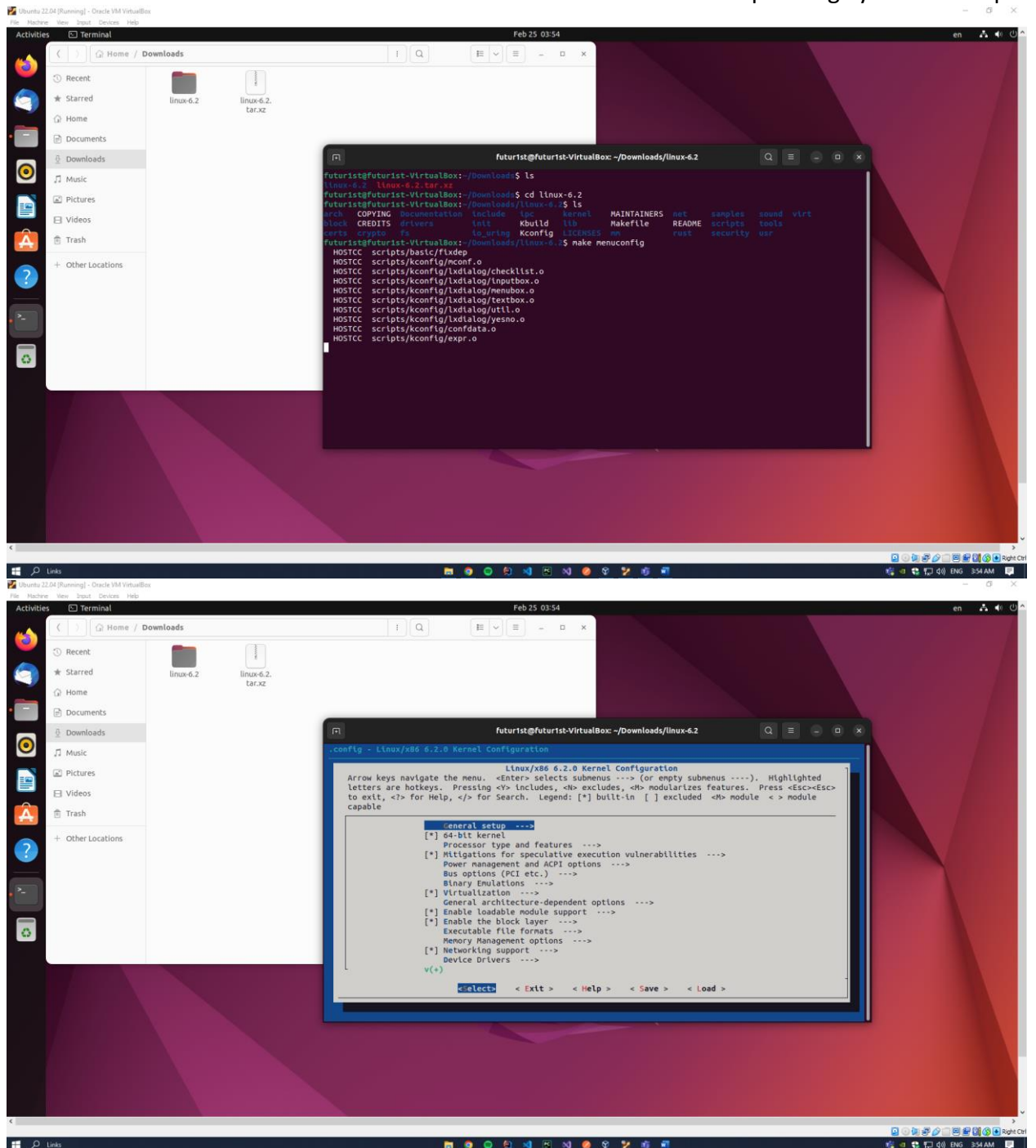
2. After that we download from [kernel.org](#) latest version of kernel

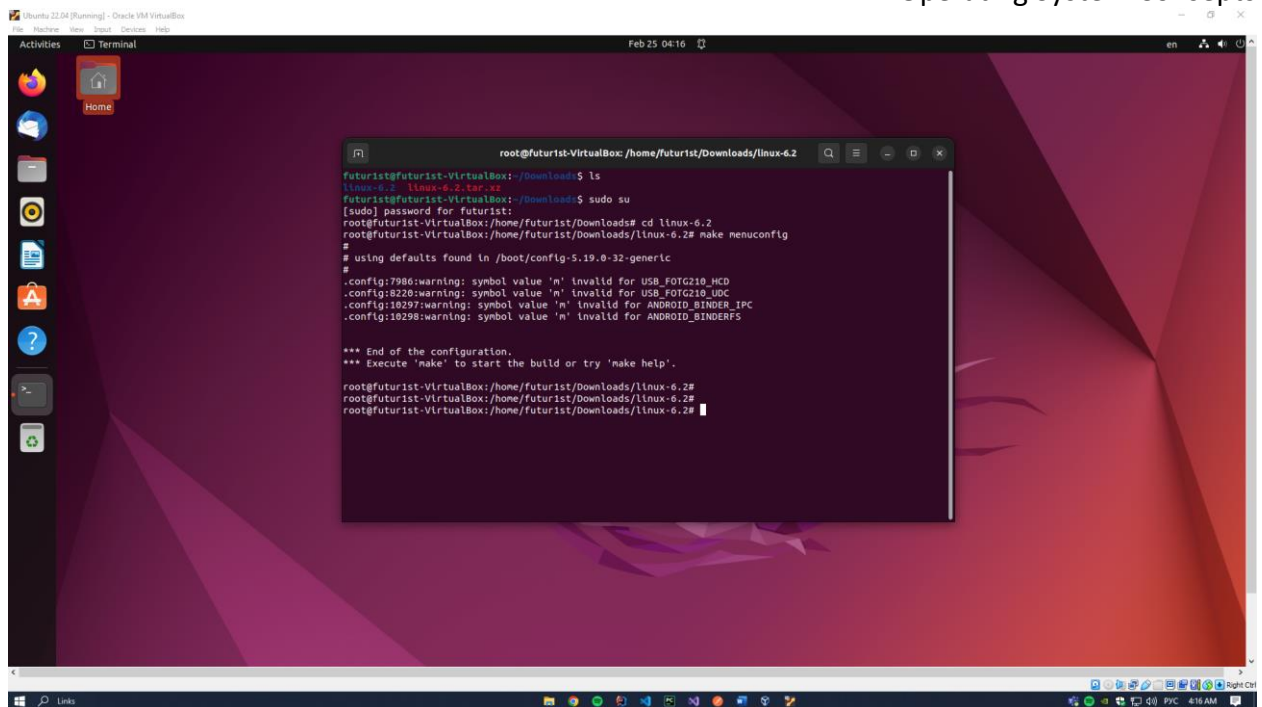


3. Unzip this file with command: `tar xvf linux-6.2.tar.xz` or Archive manager



4. After that we open this file in Terminal and do `make menuconfig`





```

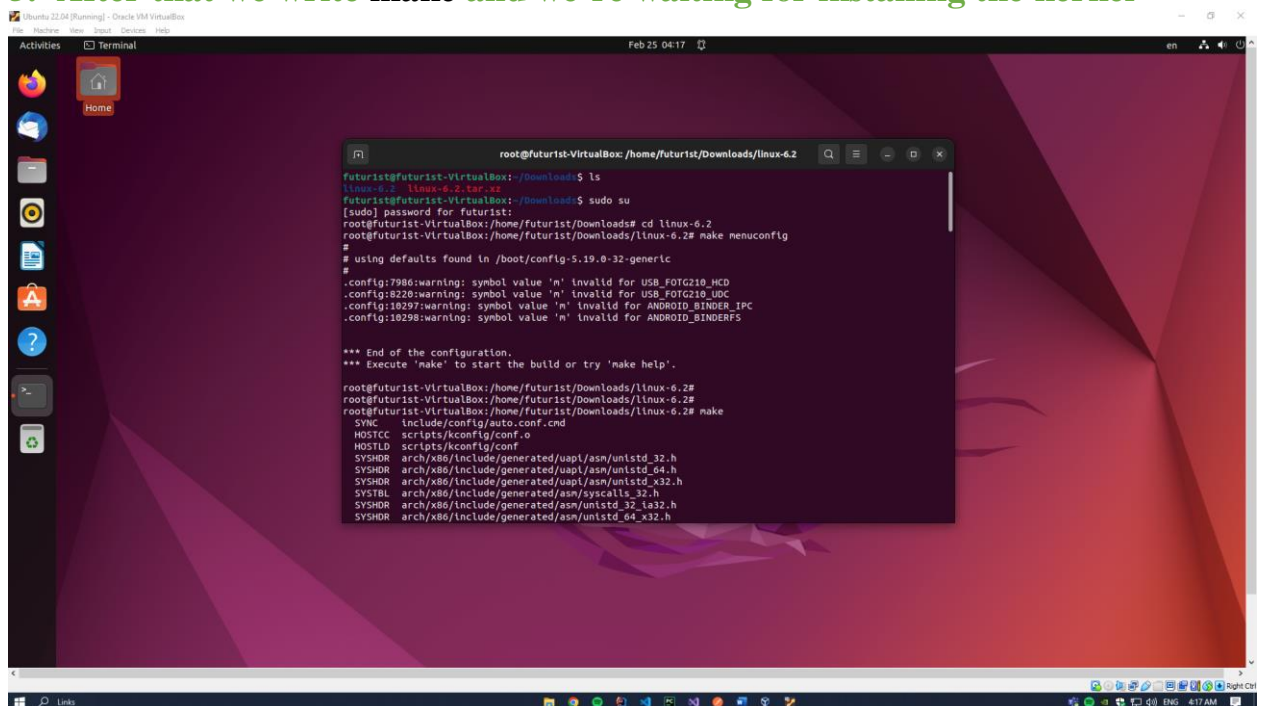
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2
futurist@futurist-VirtualBox:~/Downloads$ ls
linux-6.2  linux-6.2.tar.xz
futurist@futurist-VirtualBox:~/Downloads$ sudo su
[sudo] password for futurist:
root@futurist-VirtualBox: /home/futurist/Downloads# cd linux-6.2
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2# make menuconfig
#
# using defaults found in /boot/config-5.19.0-32-generic
#
.config:7986:warning: symbol value 'n' invalid for USB_FOTG210_MCD
.config:8220:warning: symbol value 'n' invalid for USB_FOTG210_UDC
.config:10297:warning: symbol value 'n' invalid for ANDROID_BINDER_IPC
.config:10298:warning: symbol value 'n' invalid for ANDROID_BINDERFS

*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.

root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2#
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2#
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2#

```

5. After that we write make and we're waiting for installing the kernel



```

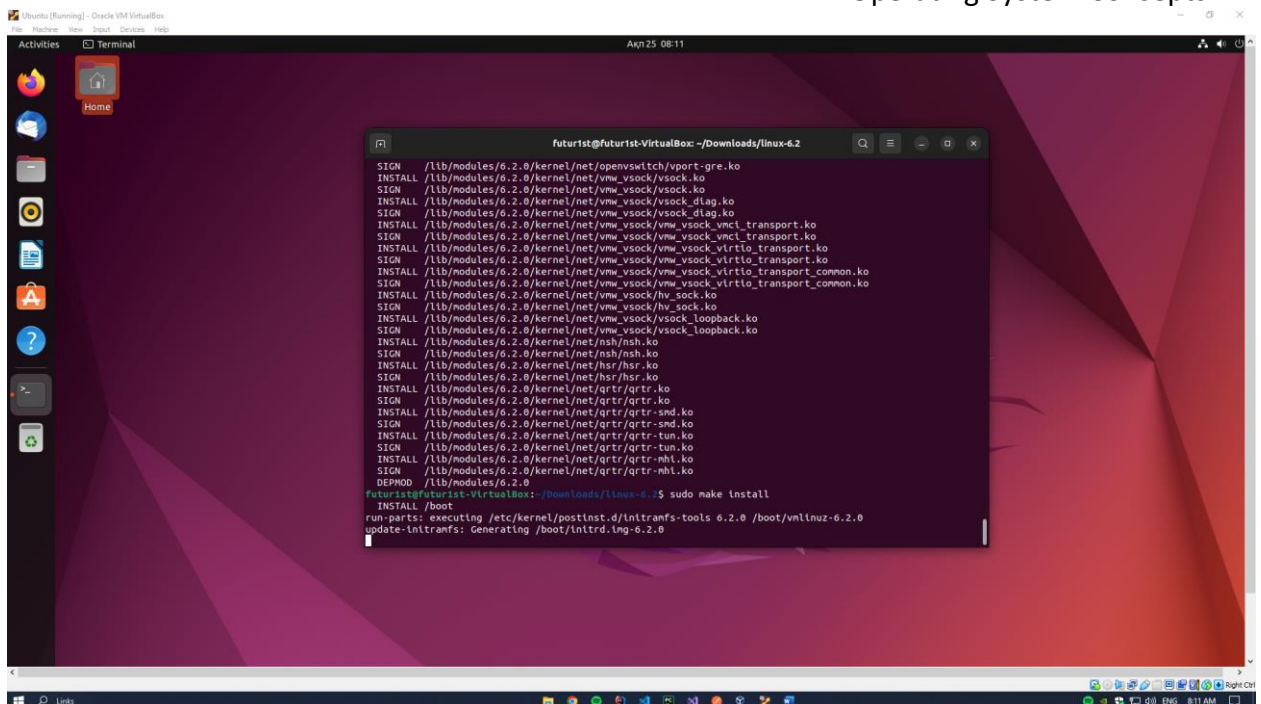
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2
futurist@futurist-VirtualBox:~/Downloads$ ls
linux-6.2  linux-6.2.tar.xz
futurist@futurist-VirtualBox:~/Downloads$ sudo su
[sudo] password for futurist:
root@futurist-VirtualBox: /home/futurist/Downloads# cd linux-6.2
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2# make menuconfig
#
# using defaults found in /boot/config-5.19.0-32-generic
#
.config:7986:warning: symbol value 'n' invalid for USB_FOTG210_MCD
.config:8220:warning: symbol value 'n' invalid for USB_FOTG210_UDC
.config:10297:warning: symbol value 'n' invalid for ANDROID_BINDER_IPC
.config:10298:warning: symbol value 'n' invalid for ANDROID_BINDERFS

*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.

root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2#
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2#
root@futurist-VirtualBox: /home/futurist/Downloads/linux-6.2# make
SYMC include/config/auto.conf.cmd
HOSTCC scripts/kconfig/conf.o
HOSTLD scripts/kconfig/conf
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
SYSTBL arch/x86/include/generated/asm/syscalls_32.h
SYSHDR arch/x86/include/generated/asm/unistd_32_la32.h
SYSHDR arch/x86/include/generated/asm/unistd_64_x32.h

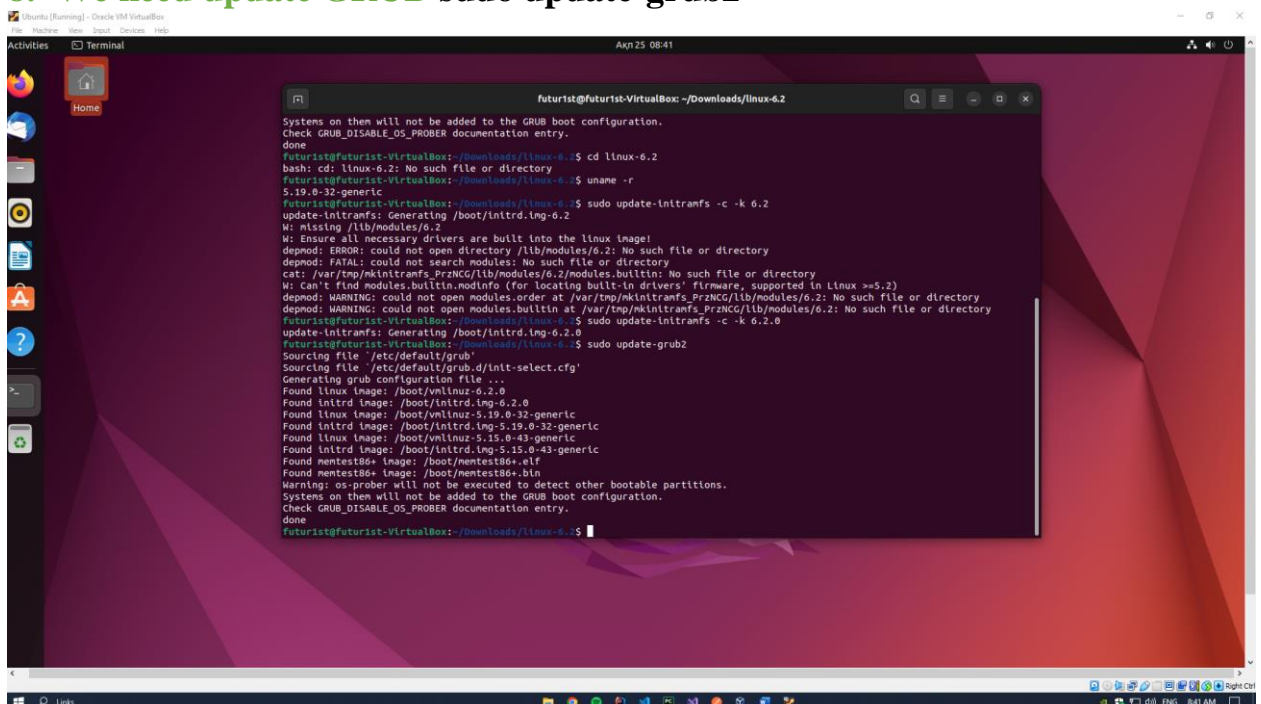
```





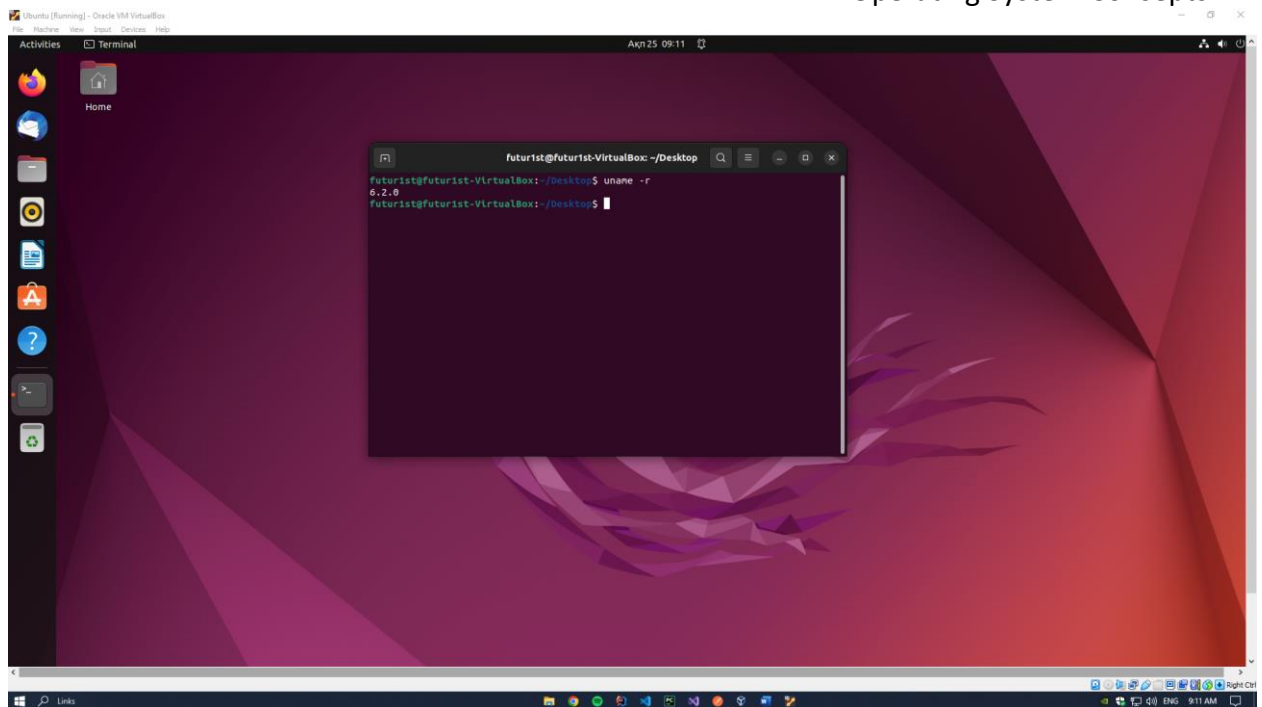
```
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2
SIGN /lib/modules/6.2.0/kernel/net/openvswitch/vport-gre.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vsock.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vsock.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vsock_diag.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vsock_diag.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_vnc1_transport.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_vnc1_transport.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_virtio_transport.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_virtio_transport.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_virtio_transport_common.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_virtio_transport_common.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/hv_sock.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/hv_sock.ko
INSTALL /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_loopback.ko
SIGN /lib/modules/6.2.0/kernel/net/vmw_vsock/vmw_vsock_loopback.ko
INSTALL /lib/modules/6.2.0/kernel/net/nsh/nsh.ko
SIGN /lib/modules/6.2.0/kernel/net/nsh/nsh.ko
INSTALL /lib/modules/6.2.0/kernel/net/hsr/hsr.ko
SIGN /lib/modules/6.2.0/kernel/net/hsr/hsr.ko
INSTALL /lib/modules/6.2.0/kernel/net/qtr/qtr.ko
SIGN /lib/modules/6.2.0/kernel/net/qtr/qtr.ko
INSTALL /lib/modules/6.2.0/kernel/net/qtr/qtr-snd.ko
SIGN /lib/modules/6.2.0/kernel/net/qtr/qtr-snd.ko
INSTALL /lib/modules/6.2.0/kernel/net/qtr/qtr-tun.ko
SIGN /lib/modules/6.2.0/kernel/net/qtr/qtr-tun.ko
INSTALL /lib/modules/6.2.0/kernel/net/qtr/qtr-nhl.ko
SIGN /lib/modules/6.2.0/kernel/net/qtr/qtr-nhl.ko
DEPMOD /lib/modules/6.2.0
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$ sudo make install
INSTALL /boot
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 6.2.0 /boot/vmlinuz-6.2.0
update-initramfs: Generating /boot/initrd.img-6.2.0
```

8. We need update GRUB sudo update-grub2

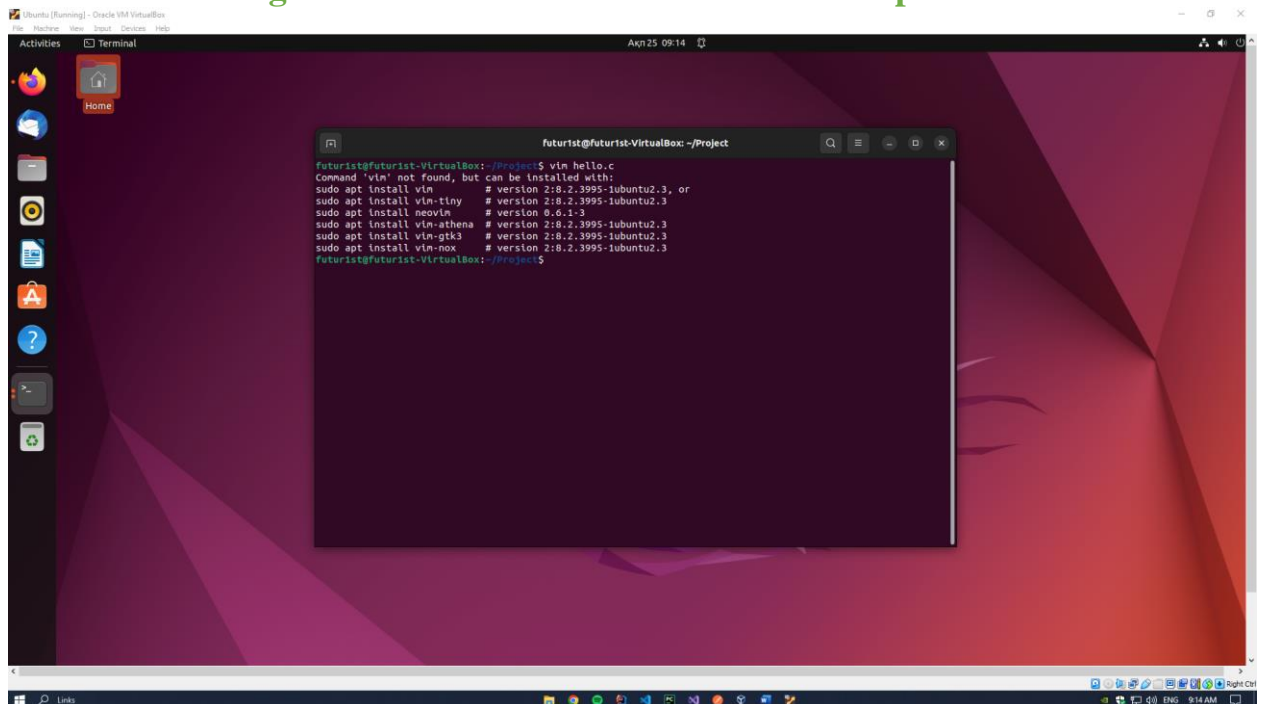


```
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2
Systems on them will not be added to the GRUB boot configuration.
Check GRUB_DISABLE_OS_PROBER documentation entry.
done
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$ cd linux-6.2
bash: cd: linux-6.2: No such file or directory
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$ uname -r
5.19.0-32-generic
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$ sudo update-initramfs -c -k 6.2
update-initramfs: Generating /boot/initrd.img-6.2
W: missing /lib/modules/6.2
W: Ensure all necessary drivers are built into the linux image!
depmod: ERROR: could not open directory /lib/modules/6.2: No such file or directory
depmod: FATAL: could not search modules: No such file or directory
cat: /var/tmp/mkinitramfs.Pr2NCG/lib/modules/6.2/modules.builtins: No such file or directory
W: Can't find modules.builtins.modinfo (for locating built-in drivers' firmware, supported in Linux >=5.2)
depmod: WARNING: could not open modules.order at /var/tmp/mkinitramfs.Pr2NCG/lib/modules/6.2: No such file or directory
depmod: WARNING: could not open modules.builtins at /var/tmp/mkinitramfs.Pr2NCG/lib/modules/6.2: No such file or directory
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$ sudo update-initramfs -c -k 6.2.0
update-initramfs: Generating /boot/initrd.img-6.2.0
Sourcing file /etc/default/grub
Sourcing file /etc/default/grub.d/init-select.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-6.2.0
Found initrd image: /boot/initrd.img-6.2.0
Found linux image: /boot/vmlinuz-5.19.0-32-generic
Found initrd image: /boot/initrd.img-5.19.0-32-generic
Found linux image: /boot/vmlinuz-5.15.0-48-generic
Found initrd image: /boot/initrd.img-5.15.0-48-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
Warning: os-prober will not be executed to detect other bootable partitions.
Systems on them will not be added to the GRUB boot configuration.
Check GRUB_DISABLE_OS_PROBER documentation entry.
done
futurist@futurist-VirtualBox: ~/Downloads/linux-6.2$
```

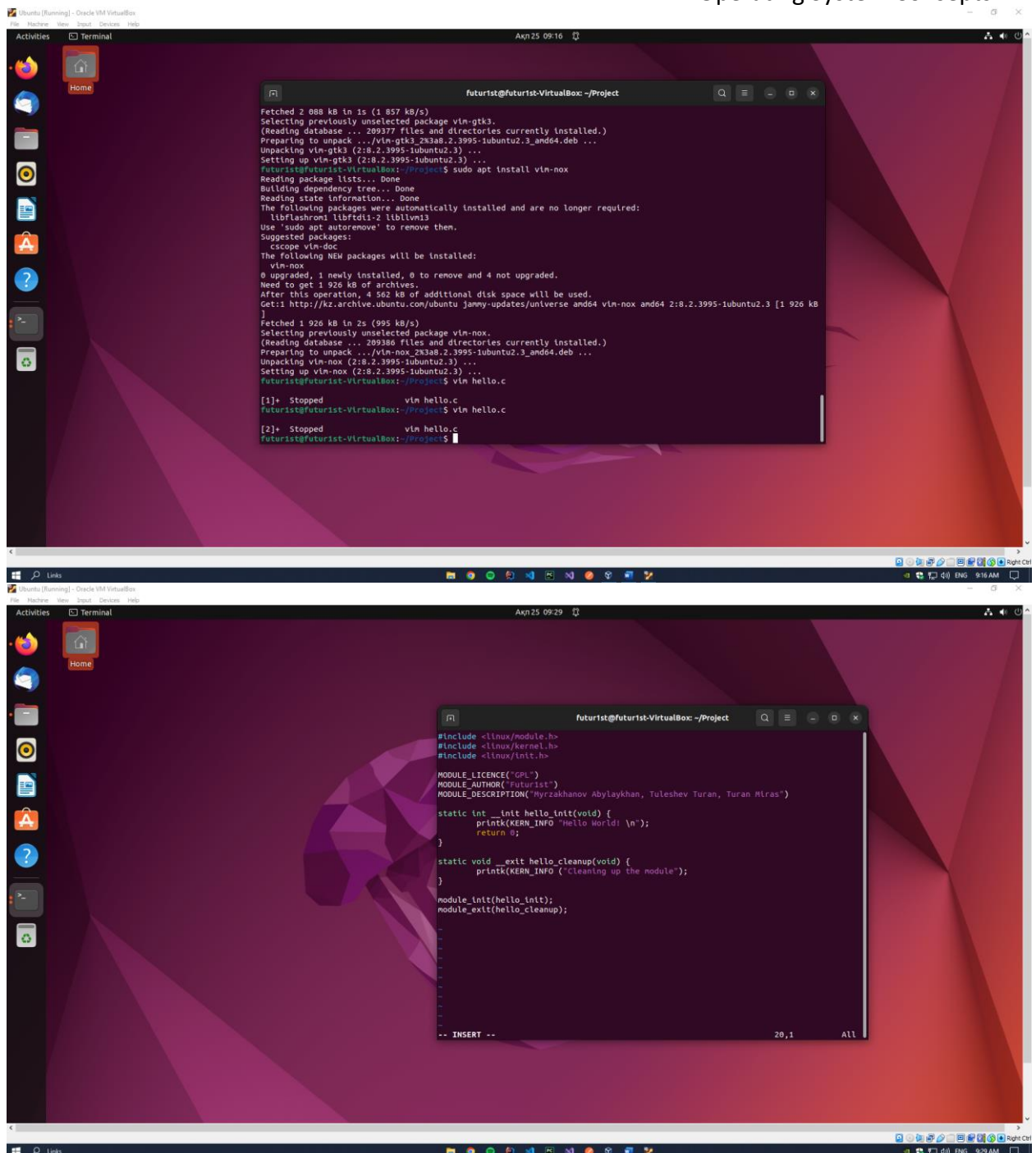
9. After that we restart our Linux and check the version of Kernel **uname -r**



10. Before writing basic Hello world we need install this packets



11. After we can start write Hello world.c with command `vim hello.c`



```
futurist@futurist-VirtualBox: ~/Project
fetched 2 088 kB in 1s (1 857 kB/s)
Selecting previously unselected package vim-gtk3.
(Reading database ... 209377 files and directories currently installed.)
Preparing to unpack .../vim-gtk3_2:8.2.3995-1ubuntu2.3_and64.deb ...
Unpacking vim-gtk3 (2:8.2.3995-1ubuntu2.3) ...
Setting up vim-gtk3 (2:8.2.3995-1ubuntu2.3) ...
futurist@futurist-VirtualBox: ~/Project$ sudo apt install vim-nox
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libflashromd libfdt1-2 liblvm2
Use 'sudo apt autoremove' to remove them.
Suggested packages:
  cscope vim-doc
The following NEW packages will be installed:
  vim-nox
0 upgraded, 1 newly installed, 0 to remove and 4 not upgraded.
Need to get 1 926 kB of archives.
After this operation, 4 562 kB of additional disk space will be used.
Get:1 http://kz.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 vim-nox amd64 2:8.2.3995-1ubuntu2.3 [1 926 kB]
Fetched 1 926 kB in 2s (995 kB/s)
Selecting previously unselected package vim-nox.
(Reading database ... 209386 files and directories currently installed.)
Preparing to unpack .../vim-nox_2:8.2.3995-1ubuntu2.3_and64.deb ...
Unpacking vim-nox (2:8.2.3995-1ubuntu2.3) ...
Setting up vim-nox (2:8.2.3995-1ubuntu2.3) ...
futurist@futurist-VirtualBox: ~/Project$ vim hello.c
[1]+  Stopped                  vim hello.c
futurist@futurist-VirtualBox: ~/Project$ vim hello.c
[2]+  Stopped                  vim hello.c
futurist@futurist-VirtualBox: ~/Project$

#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/init.h>

MODULE_LICENSE("GPL")
MODULE_AUTHOR("Futurist")
MODULE_DESCRIPTION("Myrzakhanov Abylaykhan, Tuleshev Turan, Turan Miras")

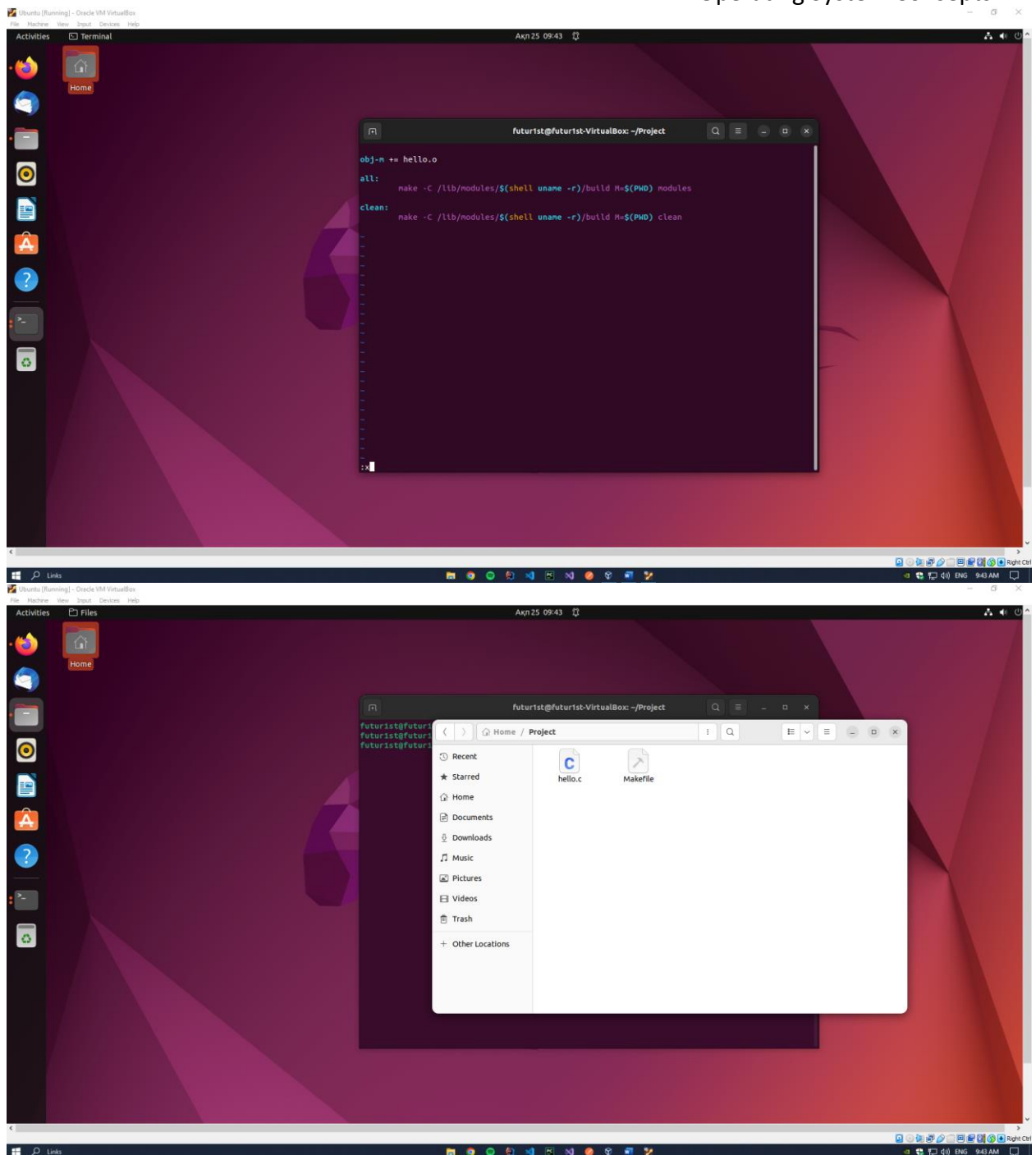
static int __init hello_init(void) {
    printk(KERN_INFO "Hello World! \n");
    return 0;
}

static void __exit hello_cleanup(void) {
    printk(KERN_INFO "Cleaning up the module");
}

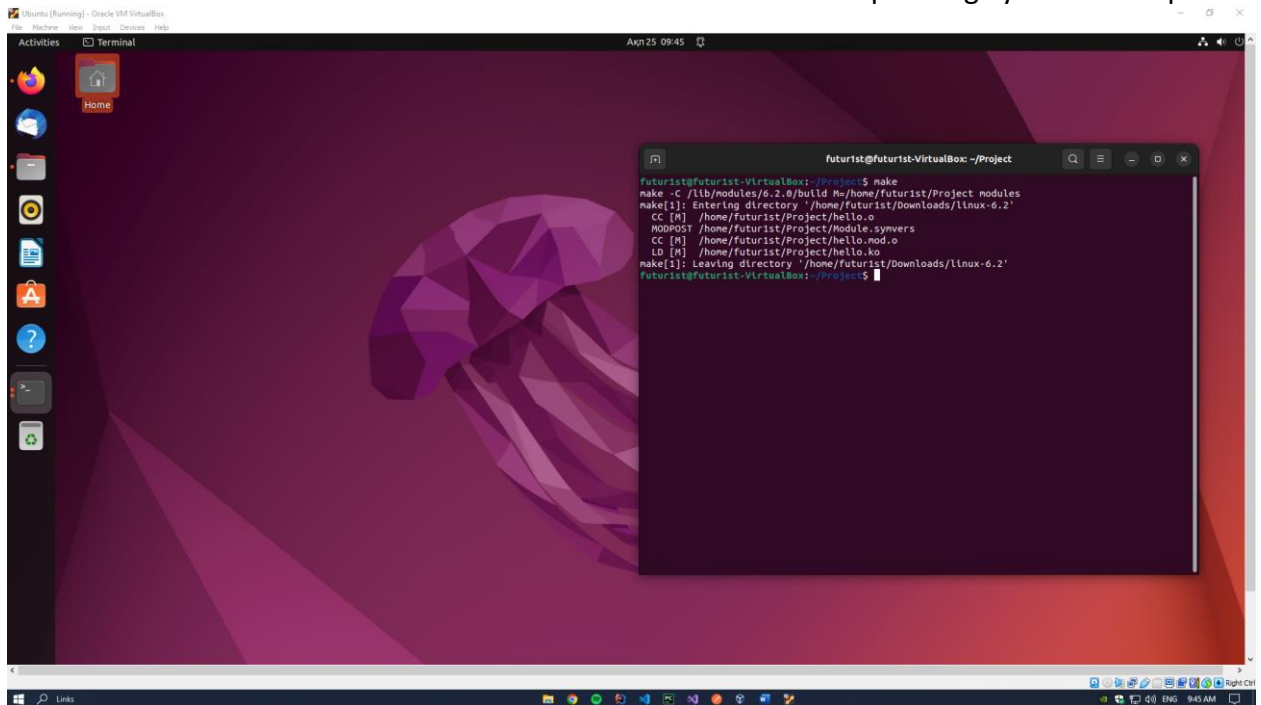
module_init(hello_init);
module_exit(hello_cleanup);

-- INSERT --
```

12. After we create file that will compile our code vim Makefile



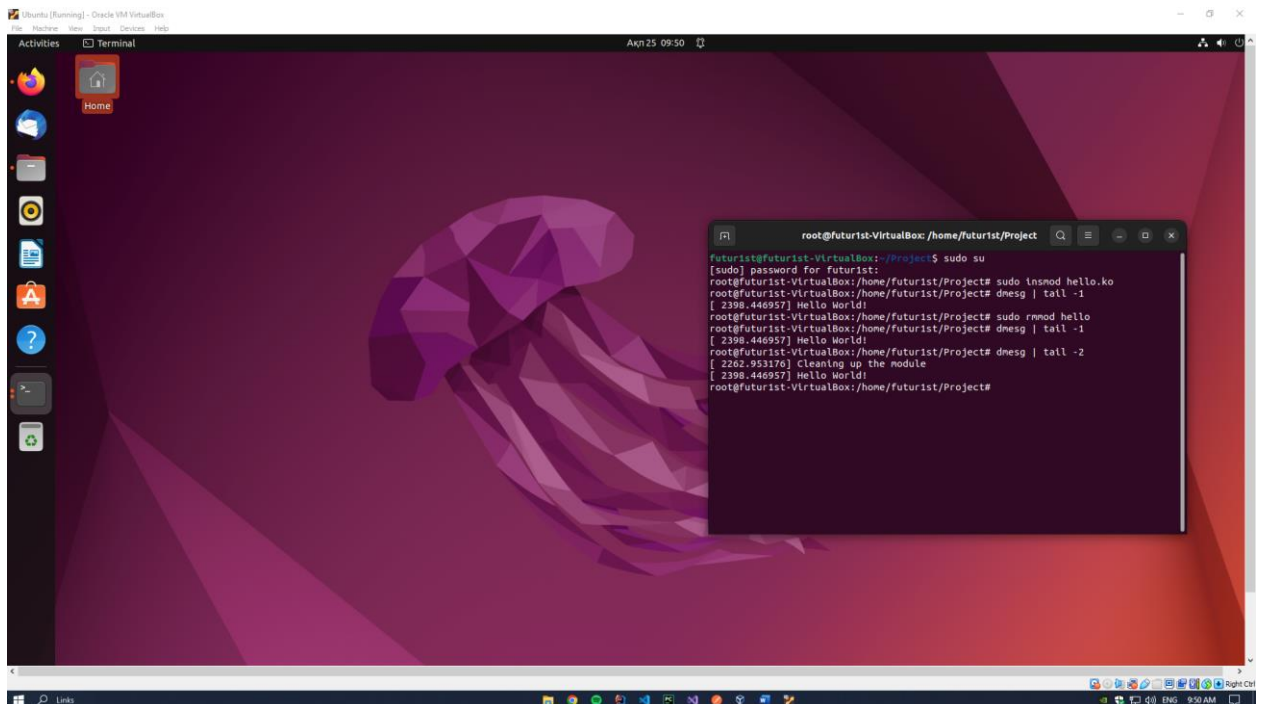
13. Write make for find some errors



The screenshot shows a Linux desktop environment with a purple and red geometric background. A terminal window is open, displaying the following commands and output:

```
futurist@futurist-VirtualBox: ~/Project
futurist@futurist-VirtualBox:~/Project$ make
make -C /lib/modules/6.2.0/build M=/home/futurist/Project modules
make[1]: Entering directory '/home/futurist/Downloads/linux-6.2'
CC [M] /home/futurist/Project/hello.o
MODPOST /home/futurist/Project/module.symvers
CC [M] /home/futurist/Project/hello.mod.o
LD [M] /home/futurist/Project/hello.ko
make[1]: Leaving directory '/home/futurist/Downloads/linux-6.2'
futurist@futurist-VirtualBox:~/Project$
```

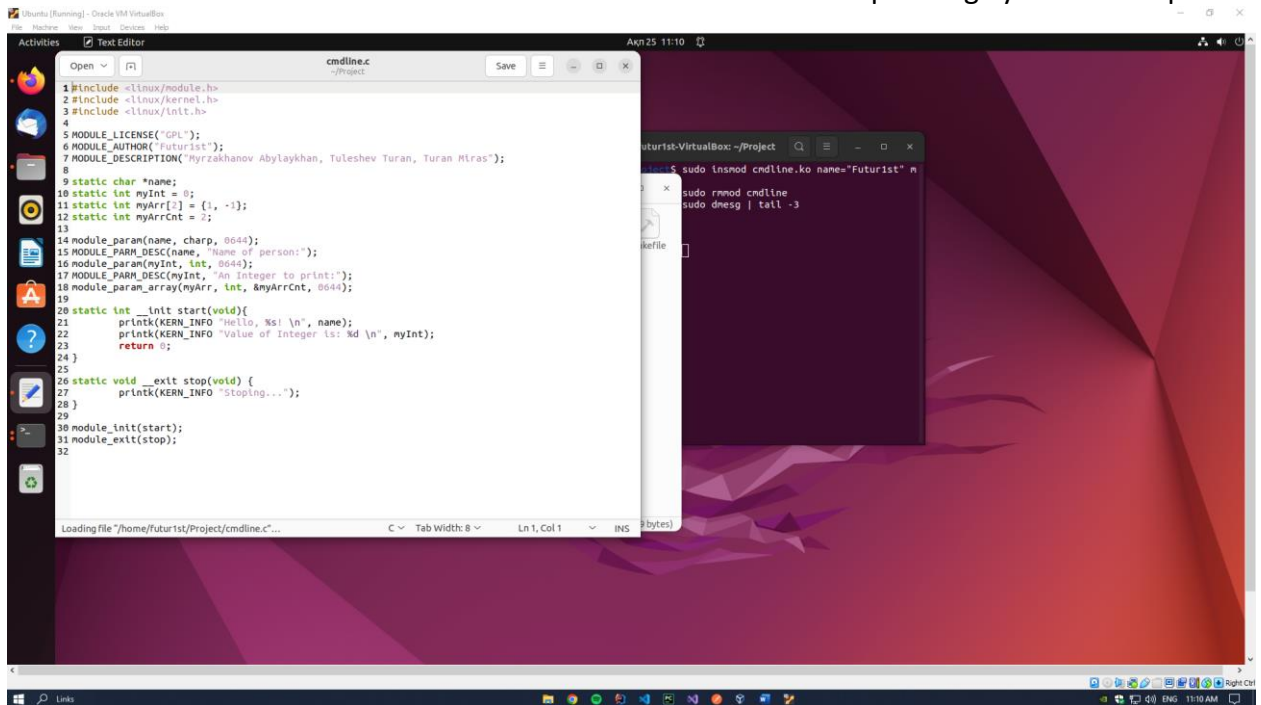
14. After that we turn on our code



The screenshot shows the same Linux desktop environment. A terminal window is open, displaying the following commands and output:

```
root@futurist-VirtualBox: /home/futurist/Project
futurist@futurist-VirtualBox:~/Project$ sudo su
[sudo] password for futurist:
root@futurist-VirtualBox: /home/futurist/Project# sudo insmod hello.ko
root@futurist-VirtualBox: /home/futurist/Project# dmesg | tail -1
[ 2398.446957] Hello World!
root@futurist-VirtualBox: /home/futurist/Project# sudo rmmod hello
root@futurist-VirtualBox: /home/futurist/Project# dmesg | tail -1
[ 2398.446957] Hello World!
root@futurist-VirtualBox: /home/futurist/Project# dmesg | tail -2
[ 2262.953176] Cleaning up the module
[ 2398.446957] Hello World!
root@futurist-VirtualBox: /home/futurist/Project#
```

Now we will write code on kernel, that will accept our values from CMD line



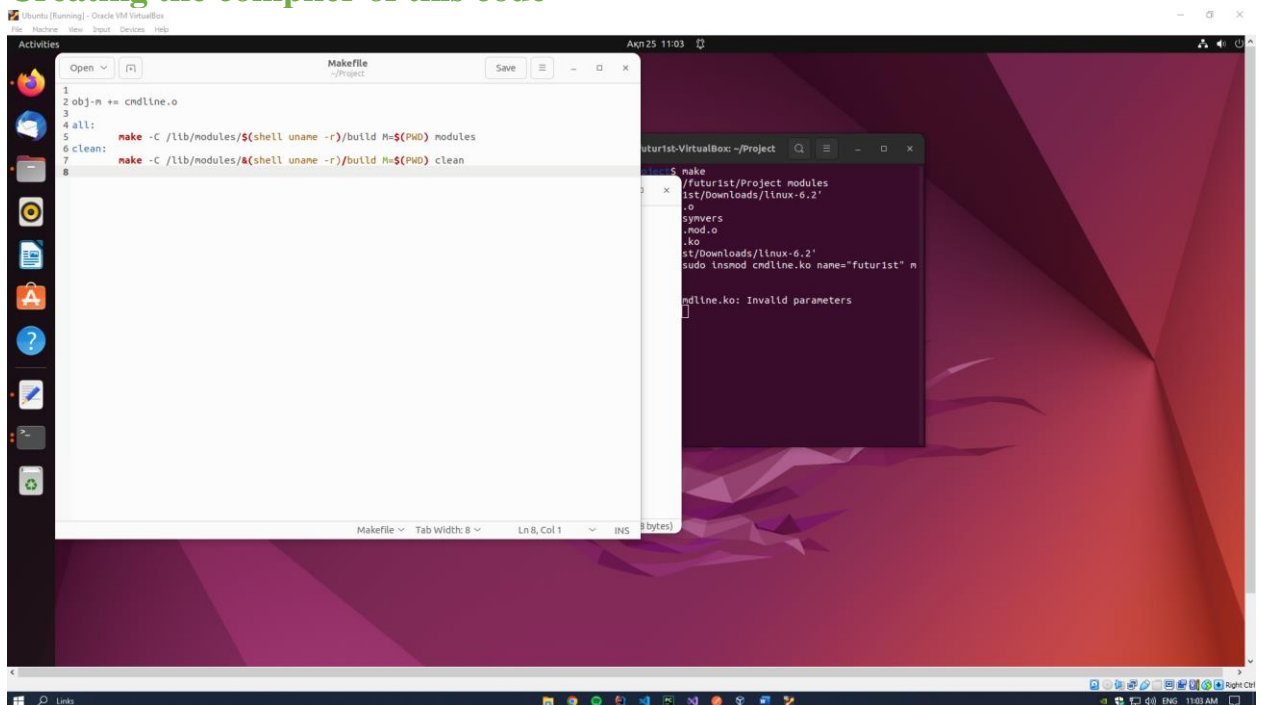
The screenshot shows a Linux desktop environment with a text editor open, displaying the source code for a kernel module named `cmdline.c`. The code includes headers for `linux/module.h`, `linux/kernel.h`, and `linux/init.h`. It defines a module license, author, and description. A static character `name` and an integer `myInt` are declared. A module parameter `myArr` is defined as an array of integers. The `__init` function `start` prints the module name and the value of `myInt`. The `__exit` function `stop` prints a stopping message. The module is initialized with `module_init(start)` and `module_exit(stop)`.

```
1 #include <linux/module.h>
2 #include <linux/kernel.h>
3 #include <linux/init.h>
4
5 MODULE_LICENSE("GPL");
6 MODULE_AUTHOR("Futurist");
7 MODULE_DESCRIPTION("Myrzakhanov Abylaykhan, Tuleshev Turan, Turan Miras");
8
9 static char *name;
10 static int myInt = 0;
11 static int myArr[] = {1, -1};
12 static int myArrCnt = 2;
13
14 module_param(name, charp, 0644);
15 MODULE_PARAM_DESC(name, "Name of person:");
16 module_param(myInt, int, 0644);
17 MODULE_PARAM_DESC(myInt, "An Integer to print:");
18 module_param_array(myArr, int, &myArrCnt, 0644);
19
20 static int __init start(void) {
21     printk(KERN_INFO "Hello, %s! \n", name);
22     printk(KERN_INFO "Value of Integer is: %d \n", myInt);
23     return 0;
24 }
25
26 static void __exit stop(void) {
27     printk(KERN_INFO "Stopping...");
28 }
29
30 module_init(start);
31 module_exit(stop);
32
```

In the background, a terminal window shows the commands used to compile and load the module:

```
sudo insmod cmdline.ko name="Futurist" m
sudo rmmod cmdline
sudo dmesg | tail -3
```

Creating the compiler of this code

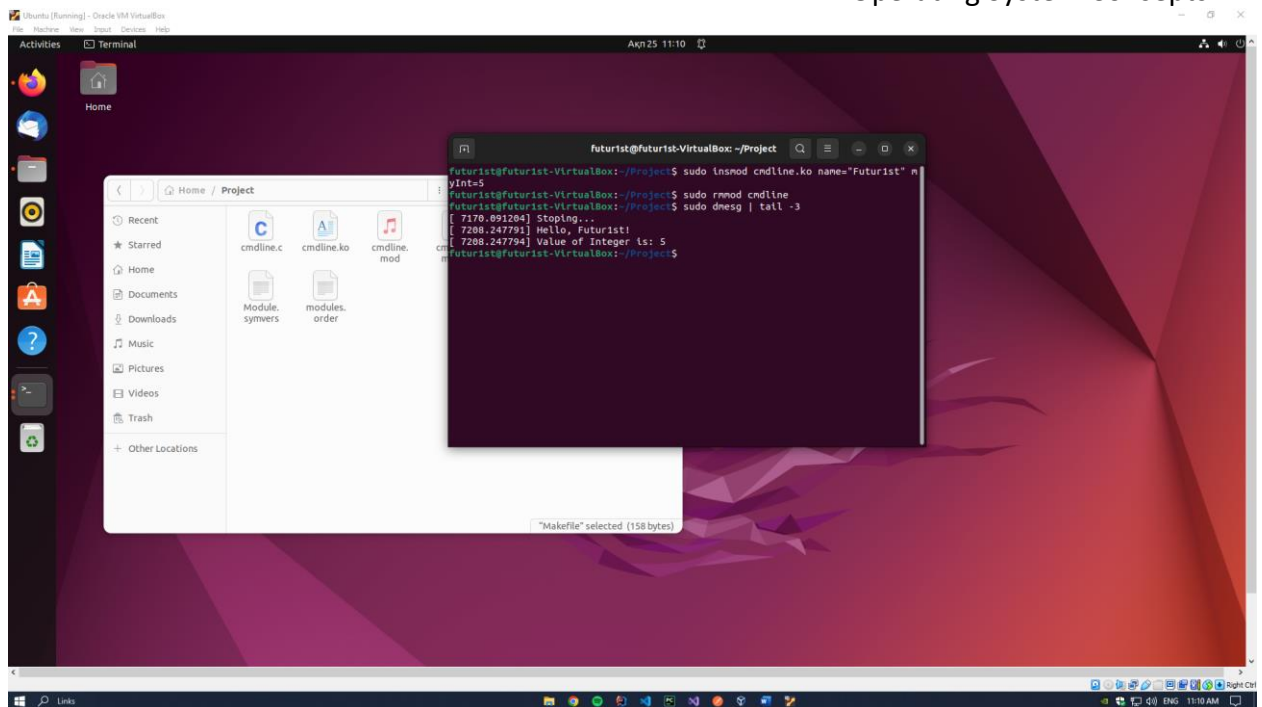


The screenshot shows a Linux desktop environment with a text editor open, displaying a `Makefile` for the `cmdline.c` module. The Makefile defines the object file `cmdline.o` and the module `cmdline.ko`. It uses the `obj-m` variable to specify the module name. The `all` target builds the module, and the `clean` target removes the module files.

```
1 obj-m += cmdline.o
2
3 all:
4     make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
5
6 clean:
7     make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
8
```

In the background, a terminal window shows the commands used to compile and load the module:

```
$ make
make[1]: Entering directory '/home/futurist/Project/modules'
make[1]: Leaving directory '/home/futurist/Project/modules'
$ sudo insmod cmdline.ko name="Futurist" m
$ sudo rmmod cmdline
$ sudo dmesg | tail -3
```



Conclusion:

We learned how to update and create our own kernel. They remembered how to install libraries on Linux OS and wrote their codes in C using the Linux Kernel. We think it was an unforgettable experience for us, thank you for such a wonderful course.