



INSTITUT PROVENÇANA

Pràctica 5.2

**Configuració del protocol de xarxa
en sistemes operatius lliures mitjançant
la línia de comandes**

MÒDUL 1:

SISTEMES INFORMÀTICS

UNITAT FORMATIVA 1:

INSTAL·LACIÓ, CONFIGURACIÓ

I EXPLOTACIÓ DEL SISTEMA INFORMÀTIC

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Curs 2022/2023

1. Sol·licita la informació dels paràmetres de configuració de totes les targetes de xarxa instal·lades al teu sistema. Comprova si l'adaptador de la xarxa està en mode NAT.

```

eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86394sec preferred_lft 86394sec
    inet6 fe80::8632:662b:eadf:f594/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
eina@ubuntu:~$
  
```

2. Sol·licita informació dels paràmetres de configuració de la targeta de xarxa Ethernet instal·lada al teu sistema

```

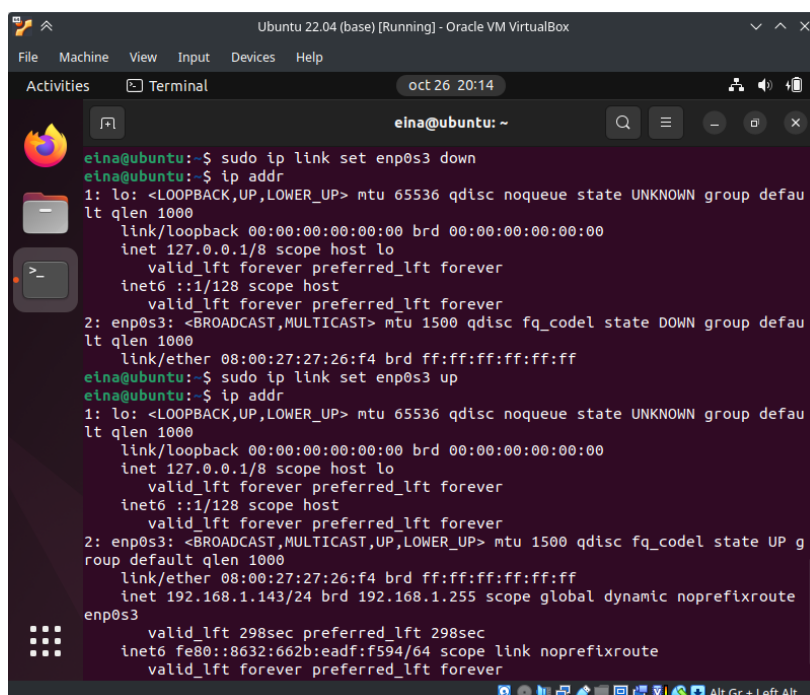
eina@ubuntu:~$ ip addr show enp0s3
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86358sec preferred_lft 86358sec
    inet6 fe80::8632:662b:eadf:f594/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
eina@ubuntu:~$
  
```

3. Configura l'adaptador de la xarxa per estigui en mode pont (bridge). Torna a demanar la informació dels paràmetres de configuració de la targeta de xarxa Ethernet instal·lada al teu sistema. Han canviat els paràmetres de configuració de la targeta de xarxa? Per què?

```

eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.143/24 brd 192.168.1.255 scope global dynamic noprefixroute
    enp0s3
        valid_lft 292sec preferred_lft 292sec
    inet6 fe80::8632:662b:eadf:f594/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
eina@ubuntu:~$
  
```

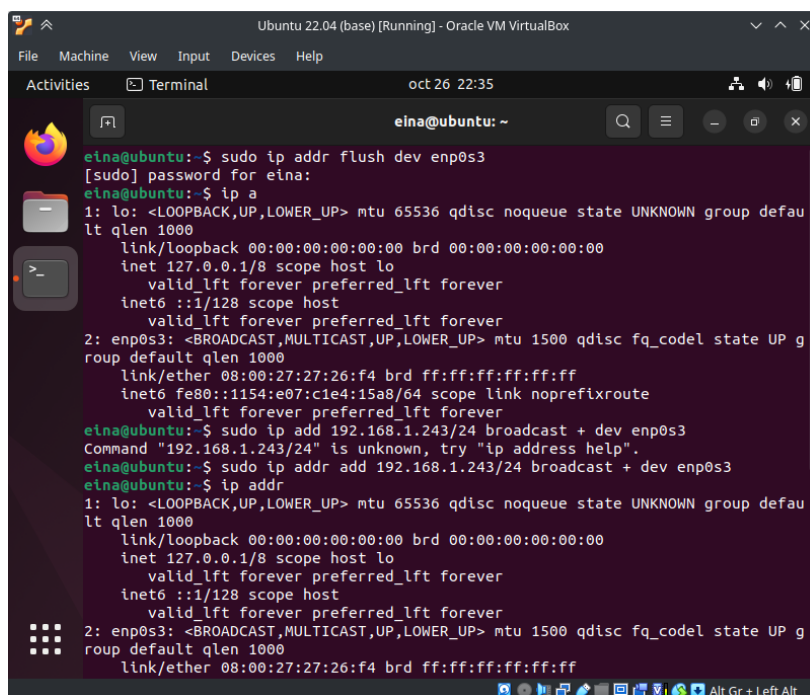
4. Desactiva i torna a activar la targeta de xarxa. Torna a demanar la informació dels paràmetres de configuració de la targeta de xarxa Ethernet. Han canviat els paràmetres de configuració de la targeta de xarxa? Per què?



```

eina@ubuntu: ~
eina@ubuntu:~$ sudo ip link set enp0s3 down
eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST> mtu 1500 qdisc fq_codel state DOWN group defau
lt qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
eina@ubuntu:~$ sudo ip link set enp0s3 up
eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.143/24 brd 192.168.1.255 scope global dynamic noprefixroute
        enp0s3
        valid_lft 298sec preferred_lft 298sec
    inet6 fe80::8632:662b:eadf:f594/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
  
```

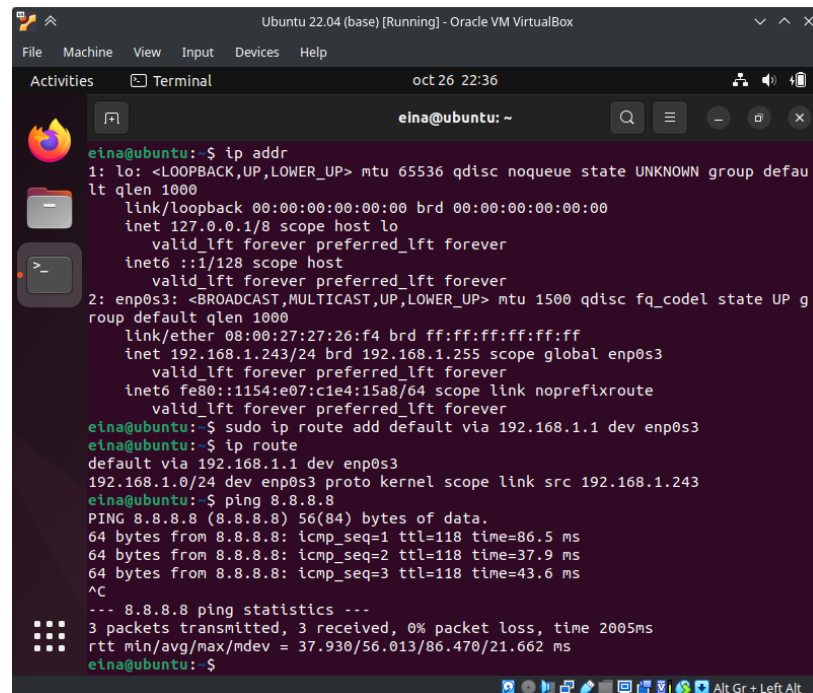
5. Configura manualment els paràmetres de configuració de la targeta de xarxa Ethernet des de la línia de comandes. Assigna una nova IP, que serà igual a l'antiga, però sumant 100 al quart octet (sempre i quan, la inicial, no sigui superior a 154, ja que si és així, seria major a 254). La resta de paràmetres han de quedar coherents als de la nova IP. Comprova si els canvis han tingut efecte.



```

eina@ubuntu:~$ sudo ip addr flush dev enp0s3
[sudo] password for eina:
eina@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:26:f4:ff brd ff:ff:ff:ff:ff:ff
    inet6 fe80::1154:e07:c1e4:15a8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
eina@ubuntu:~$ sudo ip add 192.168.1.243/24 broadcast + dev enp0s3
Command "192.168.1.243/24" is unknown, try "ip address help".
eina@ubuntu:~$ sudo ip addr add 192.168.1.243/24 broadcast + dev enp0s3
eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:26:f4:ff brd ff:ff:ff:ff:ff:ff
  
```

6. Afegeix una passarel·la (la adreça al router o gateway) als paràmetres de configuració de la targeta de xarxa Ethernet per tal de disposar de connexió externa (a Internet)



```

eina@ubuntu:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:27:26:f4 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.243/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::1154:e07:c1e4:15a8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
eina@ubuntu:~$ sudo ip route add default via 192.168.1.1 dev enp0s3
eina@ubuntu:~$ ip route
default via 192.168.1.1 dev enp0s3
192.168.1.0/24 dev enp0s3 proto kernel scope link src 192.168.1.243
eina@ubuntu:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=118 time=86.5 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=118 time=37.9 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=118 time=43.6 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 37.930/56.013/86.470/21.662 ms
eina@ubuntu:~$
  
```

7. Consulta les taules d'encaminament del teu host i interpreta un parell de línies.

```
eina@ubuntu:~$ route
      target         gateway         source         proto  scope  dev  tbl
  /usr/bin/route: 48: shift: can't shift that many
      default         192.168.1.1         dhcp
169.254.0.0/ 16         link enp0s3
192.168.1.0/ 24         link enp0s3
127.0.0.0/ 8         local 127.0.0.1 kernel host lo local
127.0.0.1         local 127.0.0.1 kernel host lo local
127.255.255.255 broadcast 127.0.0.1 kernel link lo local
192.168.1.143         local 192.168.1.143 kernel host enp0s3 local
192.168.1.255 broadcast 192.168.1.143 kernel link enp0s3 local
:::1         kernel lo
fe80::/ 64         kernel enp0s3
:::1         local kernel lo local
fe80::8632:662b:eadf:f594         local kernel enp0s3 local
eina@ubuntu:~$ ip route
default via 192.168.1.1 dev enp0s3 proto dhcp metric 100
169.254.0.0/16 dev enp0s3 scope link metric 1000
192.168.1.0/24 dev enp0s3 proto kernel scope link src 192.168.1.143 metric 100
eina@ubuntu:~$
```

8. Consulta les taules arp del teu host

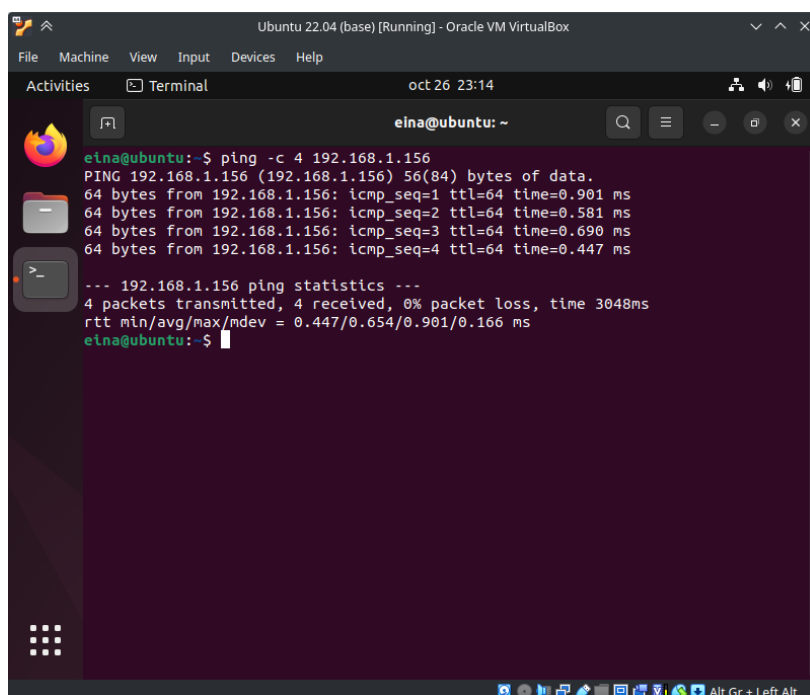
```
eina@ubuntu:~$ ip neighbour
192.168.1.1 dev enp0s3 lladdr 70:0b:01:3f:64:f2 REACHABLE
eina@ubuntu:~$
```

9. Accedeix a l'arxiu de configuració de la xarxa d'Ubuntu i configura manualment els paràmetres de configuració de la targeta de xarxa Ethernet, assignant una nova IP estàtica, obtinguda de sumar 1 al quart octet de la IP antiga. La resta de paràmetres han de quedar coherents als de la nova IP, i has de disposar de connexió externa (a Internet).

El fitxer `/etc/network/interfaces` no existeix en instal·lacions modernes des que Ubuntu 17.10 va deprecia el paquet `ifupdown`.¹

10. Comprova a l'ordre `ifconfig`, si els canvis han tingut efecte. Si no és així, restaura el servei de xarxa i tornar-lo a provar.

11. Comprova la connectivitat de la teva màquina amb la teva màquina amfitriona (la virtual haurà d'estar en mode pont) enviant-li 4 paquets de 64 bytes.



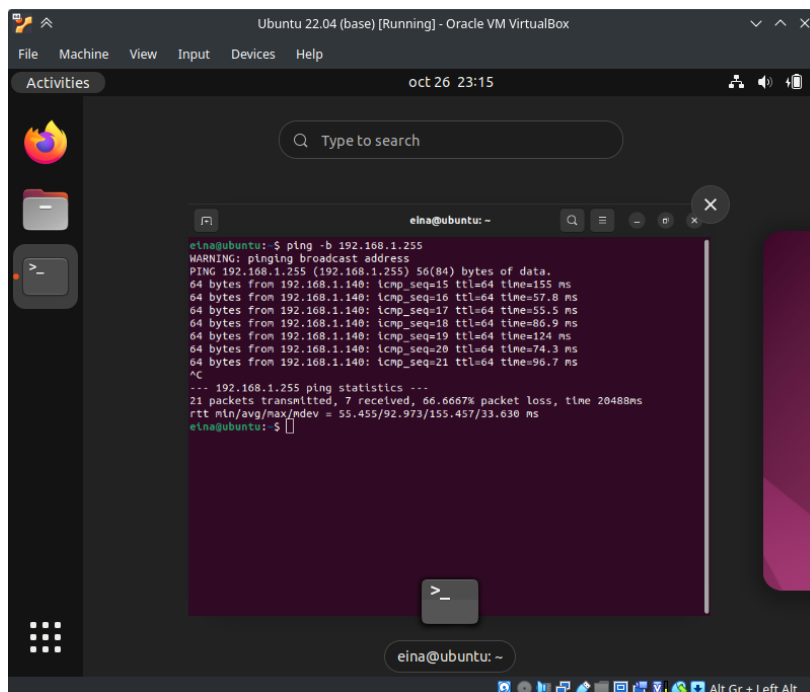
```

eina@ubuntu: ~
eina@ubuntu:~$ ping -c 4 192.168.1.156
PING 192.168.1.156 (192.168.1.156) 56(84) bytes of data:
64 bytes from 192.168.1.156: icmp_seq=1 ttl=64 time=0.901 ms
64 bytes from 192.168.1.156: icmp_seq=2 ttl=64 time=0.581 ms
64 bytes from 192.168.1.156: icmp_seq=3 ttl=64 time=0.690 ms
64 bytes from 192.168.1.156: icmp_seq=4 ttl=64 time=0.447 ms

--- 192.168.1.156 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3048ms
rtt min/avg/max/mdev = 0.447/0.654/0.901/0.166 ms
eina@ubuntu:~$
  
```

¹https://wiki.ubuntu.com/ArtfulAardvark/ReleaseNotes#Network_configuration

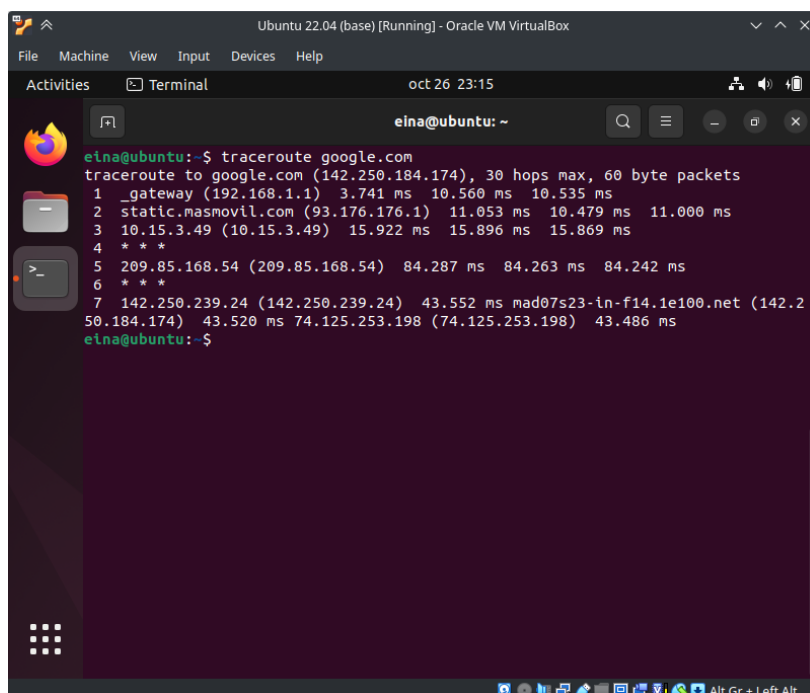
12. Fes un ping a la adreça broadcast.



```

eina@ubuntu:~$ ping -b 192.168.1.255
WARNING: pinging broadcast address
PING 192.168.1.255 (192.168.1.255) 56(84) bytes of data:
64 bytes from 192.168.1.140: icmp_seq=15 ttl=64 time=155 ms
64 bytes from 192.168.1.140: icmp_seq=16 ttl=64 time=57.8 ms
64 bytes from 192.168.1.140: icmp_seq=17 ttl=64 time=55.5 ms
64 bytes from 192.168.1.140: icmp_seq=18 ttl=64 time=86.9 ms
64 bytes from 192.168.1.140: icmp_seq=19 ttl=64 time=124 ms
64 bytes from 192.168.1.140: icmp_seq=20 ttl=64 time=74.3 ms
64 bytes from 192.168.1.140: icmp_seq=21 ttl=64 time=96.7 ms
^C
--- 192.168.1.255 ping statistics ---
21 packets transmitted, 7 received, 66.6667% packet loss, time 20488ms
rtt min/avg/max/mdev = 55.455/92.973/155.457/33.630 ms
eina@ubuntu:~$
  
```

13. Esbrina tots els routers pels quals passen els paquets TCP/IP fins a arribar al servidor de Google.



```

eina@ubuntu:~$ traceroute google.com
traceroute to google.com (142.250.184.174), 30 hops max, 60 byte packets
 1 _gateway (192.168.1.1) 3.741 ms 10.560 ms 10.535 ms
 2 static.masmovil.com (93.176.176.1) 11.053 ms 10.479 ms 11.000 ms
 3 10.15.3.49 (10.15.3.49) 15.922 ms 15.896 ms 15.869 ms
 4 * * *
 5 209.85.168.54 (209.85.168.54) 84.287 ms 84.263 ms 84.242 ms
 6 * * *
 7 142.250.239.24 (142.250.239.24) 43.552 ms mad07s23-in-f14.1e100.net (142.2
50.184.174) 43.520 ms 74.125.253.198 (74.125.253.198) 43.486 ms
eina@ubuntu:~$
  
```

14. Accedeix a l'arxiu de configuració de la xarxa d'Ubuntu i fes que el servidor DHCP del centre configuri els paràmetres de la targeta de xarxa Ethernet. Comprova amb l'ordre **ifconfig**, si els canvis han tingut efecte. Si no és així, restaura el servei de xarxa i tornar-lo a provar.

15. Quin és el nom del teu host? Canvia'l pel de "**ord4rtoctect_IP**" on "**4rtoctect_IP**" és el número corresponent al 4t octet de la IP del host.

```
Ubuntu 22.04 (base) [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal oct 26 23:16
eina@ubuntu: ~
eina@ubuntu:~$ sudo hostname ord143
eina@ubuntu:~$ hostname
ord143
eina@ubuntu:~$
```

16. Configura com servidors DNS de la configuració TCP/IP, el servidors de noms de Google i Xtec.

```

# Do not edit.
# This file might be symlinked as /etc/resolv.conf. If you're looking at
# /etc/resolv.conf and seeing this text, you have followed the symlink.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 8.8.8.8
nameserver 213.176.161.16
options edns0 trust-ad
search home
~
~
~
"/etc/resolv.conf" 24L, 946B written
22,25 Bot

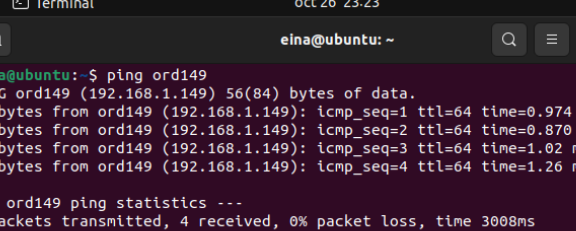
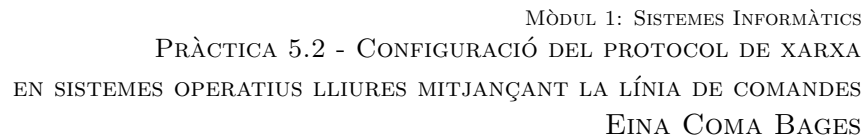
```

17. Fes un ping a la IP al host del teu company i al nom del mateix host del teu company. Què succeeix? Fes que el ping que fas al nom del host del teu company sigui exitós.

```

eina@ubuntu:~$ ping 192.168.1.149
PING 192.168.1.149 (192.168.1.149) 56(84) bytes of data.
64 bytes from 192.168.1.149: icmp_seq=1 ttl=64 time=1.64 ms
64 bytes from 192.168.1.149: icmp_seq=2 ttl=64 time=1.21 ms
64 bytes from 192.168.1.149: icmp_seq=3 ttl=64 time=0.940 ms
64 bytes from 192.168.1.149: icmp_seq=4 ttl=64 time=0.929 ms
^C
--- 192.168.1.149 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3027ms
rtt min/avg/max/mdev = 0.929/1.179/1.635/0.286 ms
eina@ubuntu:~$ ping ord149
ping: ord149: Name or service not known
eina@ubuntu:~$

```



The screenshot shows a terminal window titled "Ubuntu 22.04 (base) [Running] - Oracle VM VirtualBox". The terminal prompt is `eina@ubuntu: ~`. The user has entered the command `ping ord149`. The output shows four successful ping requests to 192.168.1.149, each receiving 64 bytes of data. The round-trip times are 0.974 ms, 0.870 ms, 1.02 ms, and 1.26 ms. The terminal also displays the standard ping statistics summary: 4 packets transmitted, 4 received, 0% packet loss, and a total time of 3008ms. The RTT statistics are: min/avg/max/mdev = 0.870/1.031/1.264/0.144 ms.

```
Ubuntu 22.04 (base) [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal oct 26 23:23
eina@ubuntu: ~
eina@ubuntu:~$ ping ord149
PING ord149 (192.168.1.149) 56(84) bytes of data:
64 bytes from ord149 (192.168.1.149): icmp_seq=1 ttl=64 time=0.974 ms
64 bytes from ord149 (192.168.1.149): icmp_seq=2 ttl=64 time=0.870 ms
64 bytes from ord149 (192.168.1.149): icmp_seq=3 ttl=64 time=1.02 ms
64 bytes from ord149 (192.168.1.149): icmp_seq=4 ttl=64 time=1.26 ms
^C
--- ord149 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3008ms
rtt min/avg/max/mdev = 0.870/1.031/1.264/0.144 ms
eina@ubuntu:~$
```

18. Fes que al sol·licitar la pàgina web del Barça surti la pagina del R. Madrid, i a l'inrevés.

The screenshot shows a terminal window titled "Ubuntu 22.04 (base) [Running] - Oracle VM VirtualBox". The terminal is running on a host named "elina@ubuntu: ~". The user has executed two ping commands. The first command is "ping realmadrid.com", which shows a successful connection with a TTL of 249 and a time of 72.6 ms. The second command is "ping fcbarcelona.es", which also shows a successful connection with a TTL of 56 and a time of 27.0 ms. The terminal output includes detailed statistics for both pings, such as packets transmitted, received, and lost, as well as round-trip time (RTT) statistics.

```

elina@ubuntu:~$ ping realmadrid.com
PING realmadrid.com (18.154.41.108) 56(84) bytes of data.
64 bytes from realmadrid.com (18.154.41.108): icmp_seq=1 ttl=249 time=72.6 ms
64 bytes from realmadrid.com (18.154.41.108): icmp_seq=2 ttl=249 time=68.2 ms
^C
--- realmadrid.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1004ms
rtt min/avg/max/mdev = 68.206/70.409/72.612/2.203 ms
elina@ubuntu:~$ ping fcbarcelona.es
PING fcbarcelona.es (23.37.173.172) 56(84) bytes of data.
64 bytes from fcbarcelona.es (23.37.173.172): icmp_seq=1 ttl=56 time=27.0 ms
64 bytes from fcbarcelona.es (23.37.173.172): icmp_seq=2 ttl=56 time=66.8 ms
^C
--- fcbarcelona.es ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 27.043/46.922/66.802/19.879 ms
elina@ubuntu:~$

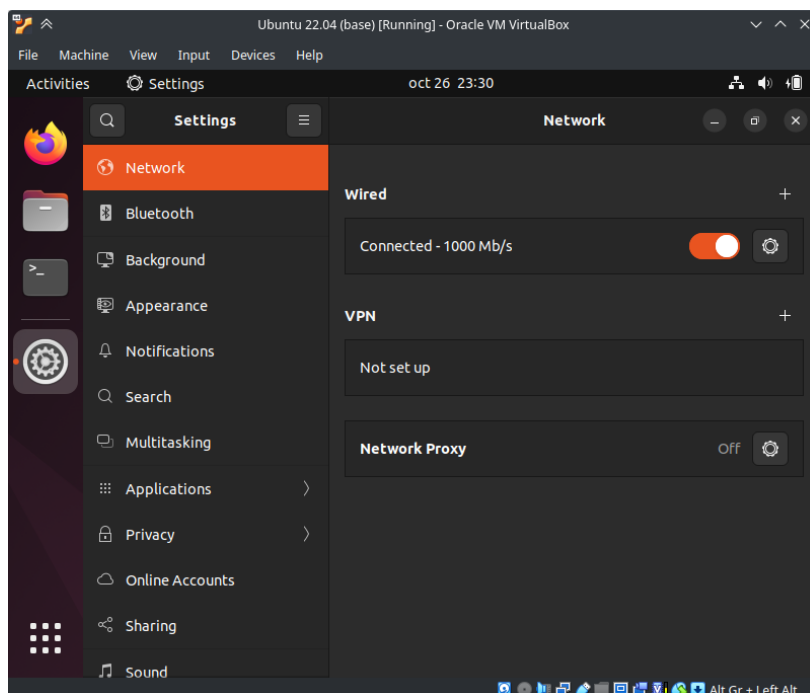
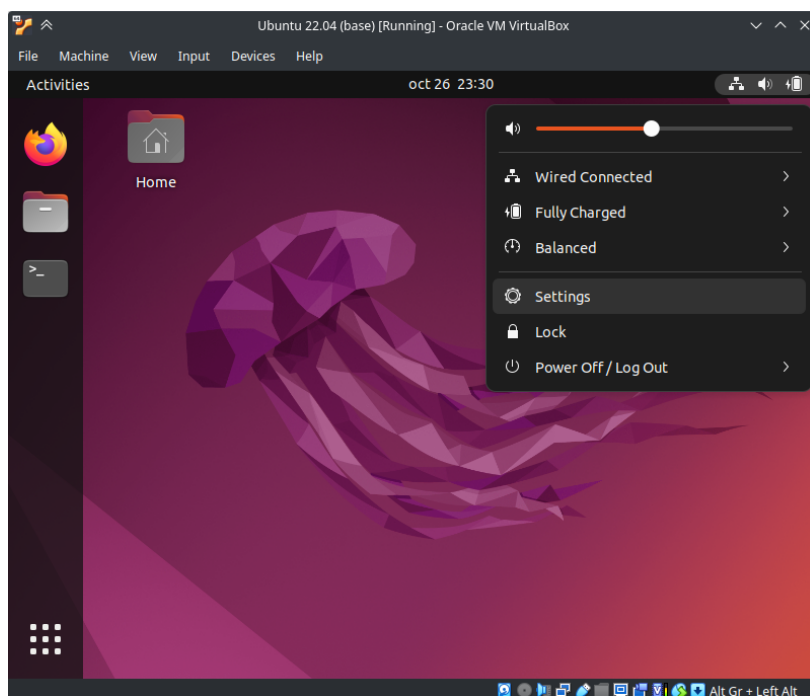
```

[illegible]

19. Visualitza l'arxiu `/etc/nsswitch.conf` i indica l'ordre amb la qual el “resolver” fa la resolució de noms.

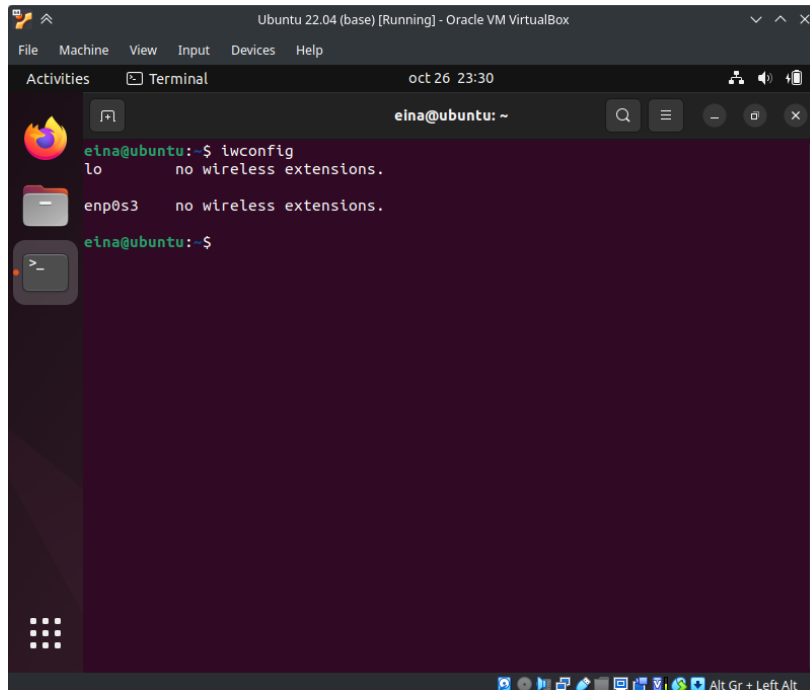
20. Què informació ens dona l'ordre **netstat**?

21. Indica com s'accedeix a les eines de configuració de la xarxa en mode gràfic.



22. Sol·licita la informació dels paràmetres de configuració de la targeta de

xarxa inalàmbrica del teu sistema.



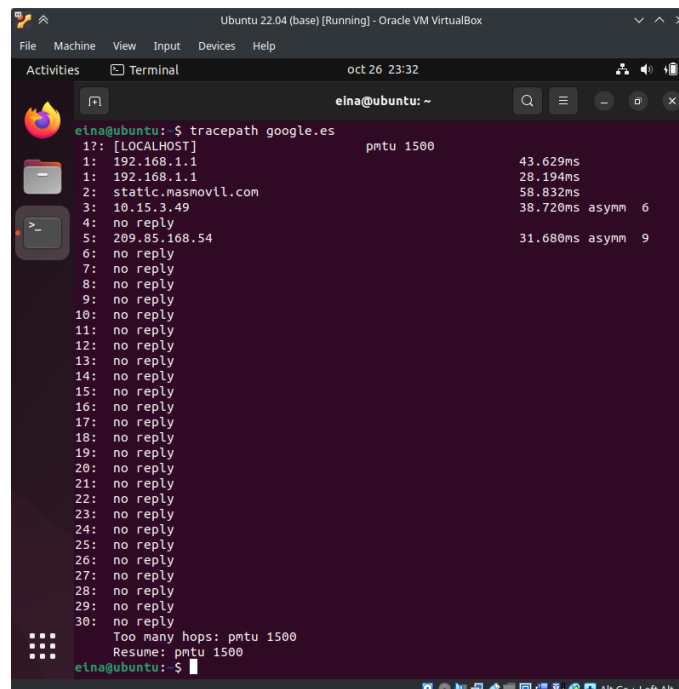
```

eina@ubuntu:~$ iwconfig
lo                no wireless extensions.

enp0s3            no wireless extensions.

eina@ubuntu:~$
  
```

23. Executa l'ordre **tracert** *www.google.es*



```

eina@ubuntu:~$ tracert google.es
  0:  [LOCALHOST]                                pmtu 1500
  1:  192.168.1.1                                  43.629ms
  1:  192.168.1.1                                  28.194ms
  2:  static.masmovil.com                         58.832ms
  3:  10.15.3.49                                    38.720ms asymm  6
  4:  no reply
  5:  209.85.168.54                                31.680ms asymm  9
  6:  no reply
  7:  no reply
  8:  no reply
  9:  no reply
 10:  no reply
 11:  no reply
 12:  no reply
 13:  no reply
 14:  no reply
 15:  no reply
 16:  no reply
 17:  no reply
 18:  no reply
 19:  no reply
 20:  no reply
 21:  no reply
 22:  no reply
 23:  no reply
 24:  no reply
 25:  no reply
 26:  no reply
 27:  no reply
 28:  no reply
 29:  no reply
 30:  no reply
      Too many hops: pmtu 1500
      Resume: pmtu 1500
eina@ubuntu:~$
  
```



*24. Executa l'ordre **nmap -n -sP -PE 192.168.19.1,254**. Què fa?*

Envia a les IPs 192.168.19.1 i 192.168.19.254 una sol·licitud ICMP de tipus 8 (-PE), sense resoldre DNS (-n) ni escanejar-ne els ports (-sP àlies d'-ns, ja que el primer complia la mateixa funció en versions antigues).