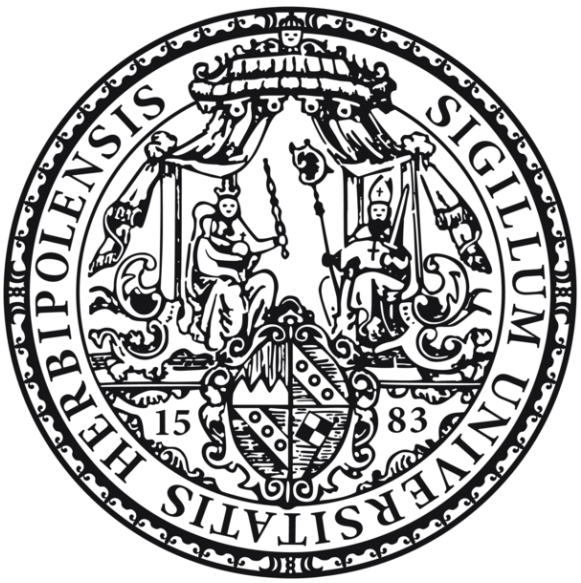
Hardwarepraktikum Internet-Technologien

Task 5: Router Configuration



Julius-Maximilians-Universität Würzburg

Chair of Computer Science III

A project report submitted by **Group 11**

Enrique Mesonero Ronco

Manuel Calvo Martín

Pablo E. Ortega Ureña

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5. Router Configuration

5.2. Configuration of the ports

First, we have made the necessary configurations of the router, renaming it, setting the password and configuring the new IP addresses, as well as making the necessary configurations in our system.

```
[admin@MikroTik] > system identity set name=Router-11
[admin@Router-11] >
```

Figure 5.1: Setting router name

```
[admin@Router-11] > user set 0 password="hwp"
[admin@Router-11] >
```

Figure 5.2: Setting router password

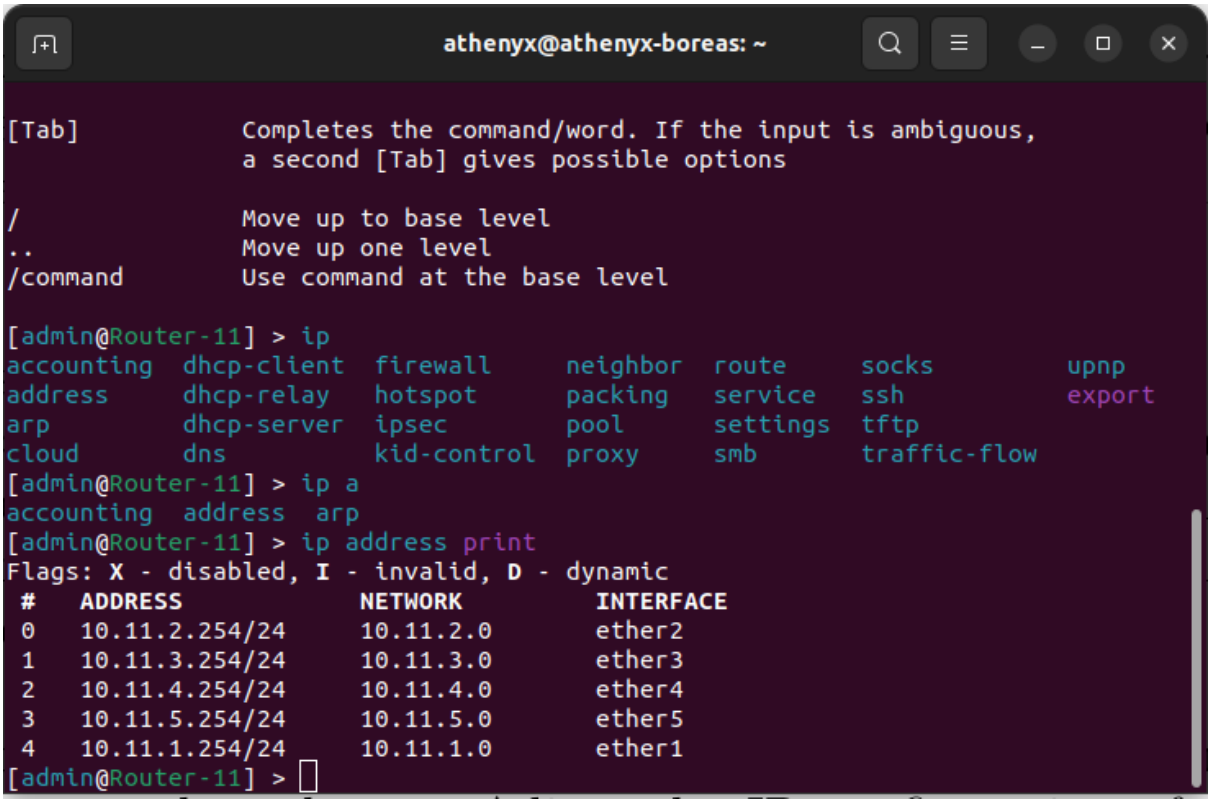


Figure 5.3: New IP addresses

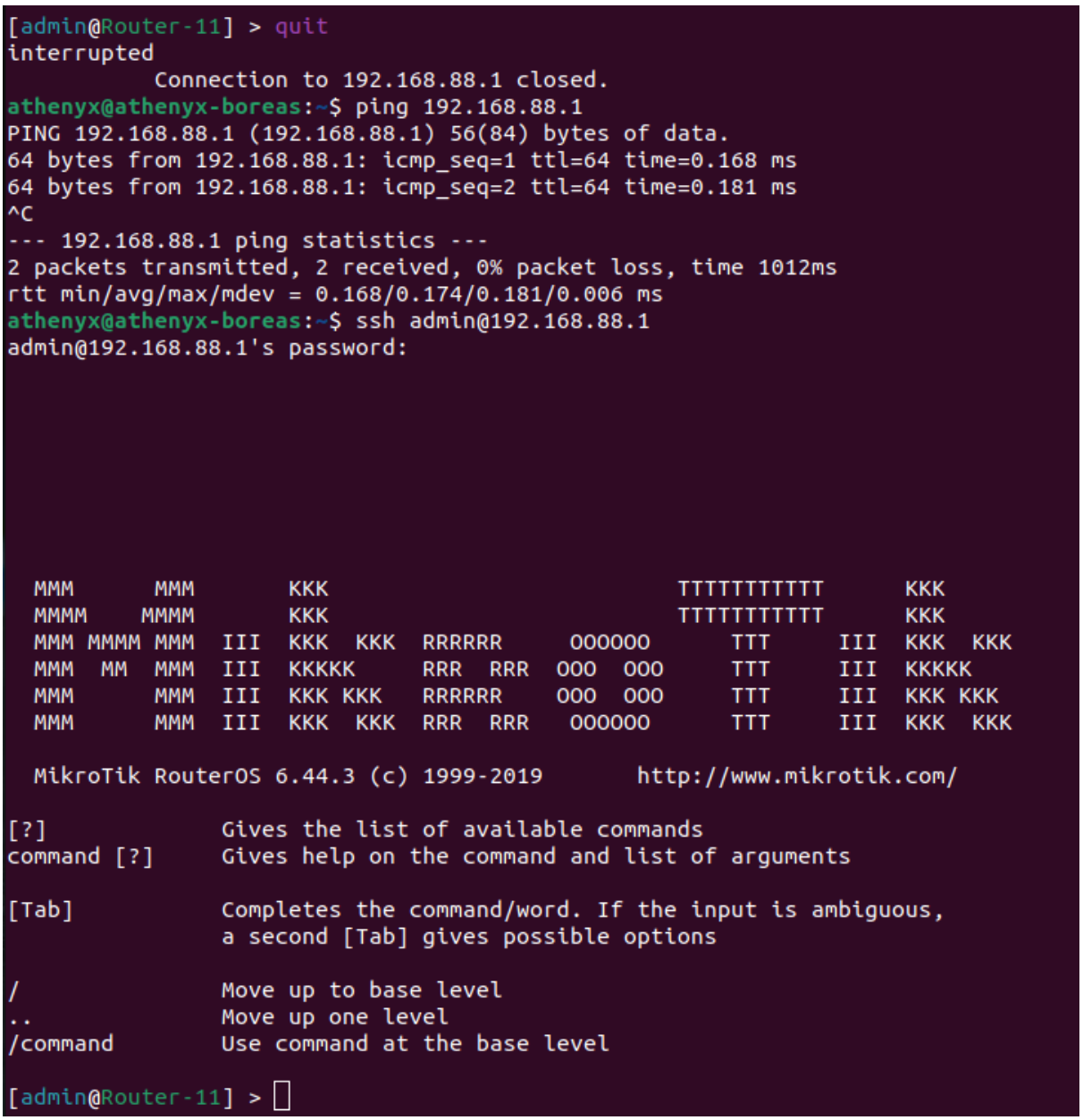


Figure 5.4: Connecting with new configuration

DST-Addresses: IP Address
Pref-SRC: Gateway Address
Gateway: Pin number
(Figure 5.5)

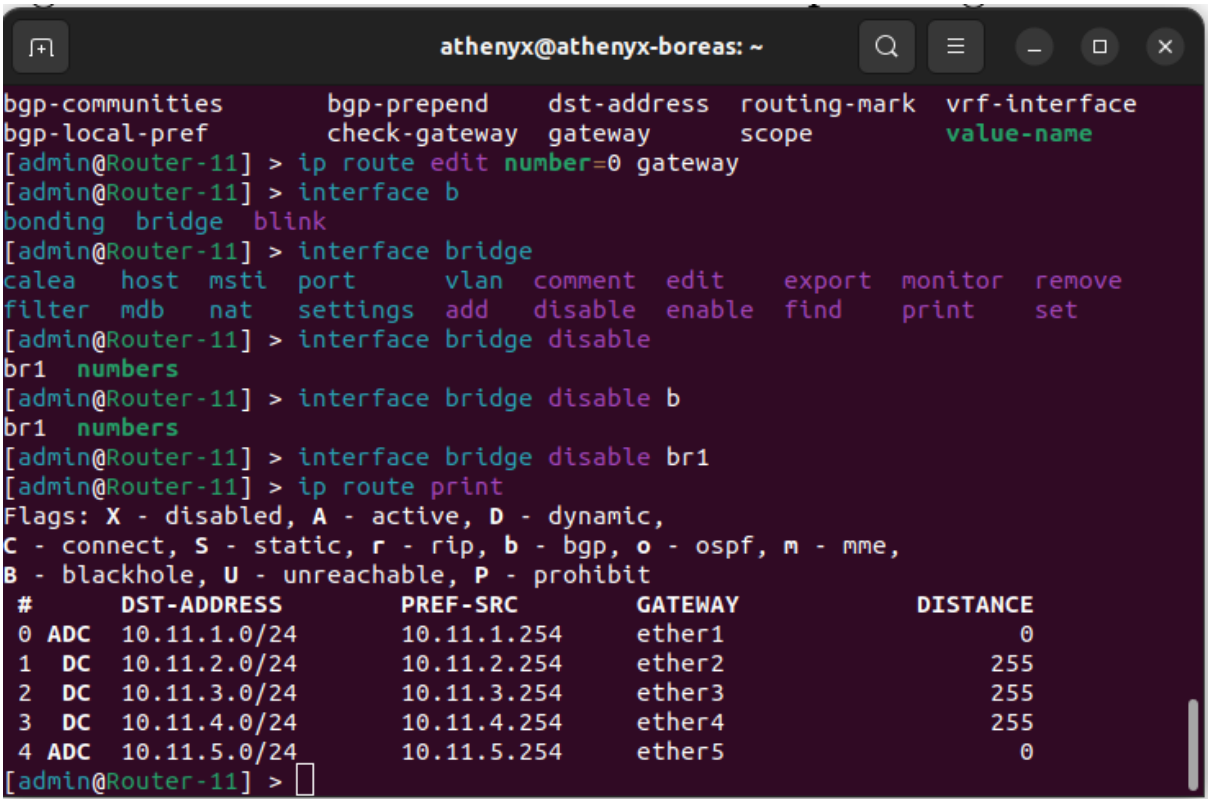


Figure 5.5: Gateways

Next, we ping the raspberry from the end device.

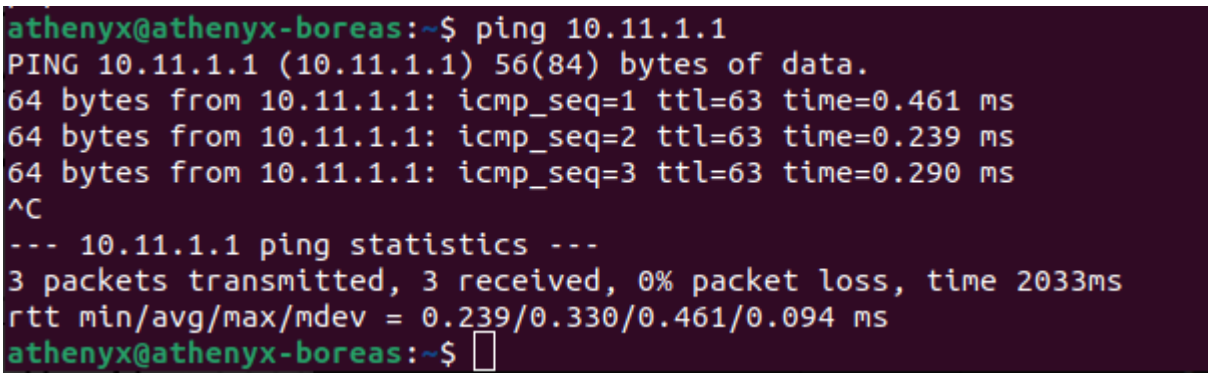


Figure 5.6: Pinging the Raspberry

(Note: To perform the ping, we had to deactivate the WLAN interface, otherwise it would not allow us to perform it, as it would default to it. We tried routing it manually but it would not work either.)

5.3. NAT Configuration

Next, we created the NAT and the filters, with the requirements of section 5.3., to subsequently carry out the necessary tests with the new configuration, trying to ping the Raspberry from the public end device. We saw that, from outside the network, unless it is done directly to the port it is not allowed. However, the other end device inside the same private network as the Raspberry is allowed, as that connection does not pass through the router.

```
[admin@Router-11] > ip firewall nat print
Flags: X - disabled, I - invalid, D - dynamic
 0    chain=srcnat action=masquerade out-interface=ether5

 1    chain=srcnat action=src-nat to-addresses=10.11.5.254
      src-address=10.11.5.0/24 out-interface=ether5
[admin@Router-11] >
```

Figure 5.7: Creation of NAT

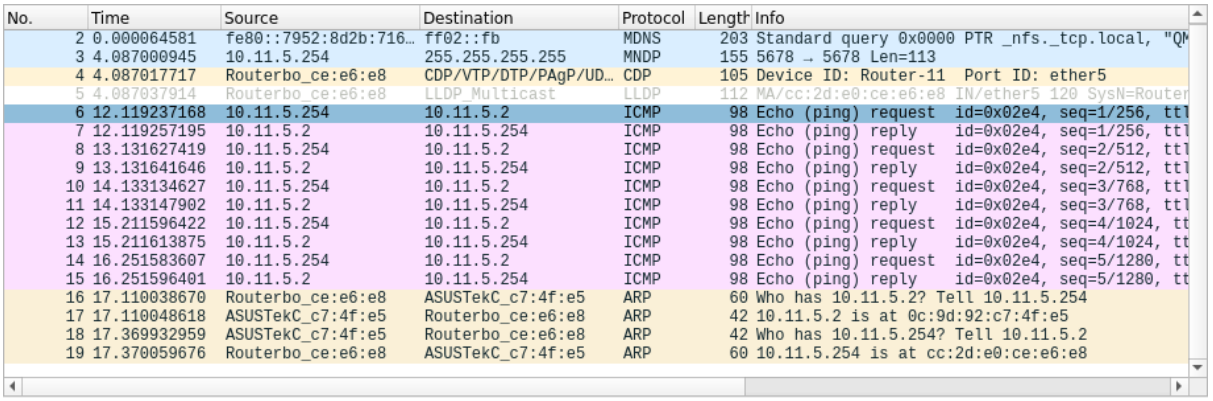
```
[admin@Router-11] > ip firewall filter add chain=forward connection-state=new co
nnection-nat-state=!dstnat src-address=10.11.5.0/24
[admin@Router-11] > ip firewall filter
add      disable  enable  find  print   reset-counters      set
comment  edit     export  move  remove  reset-counters-all  unset
[admin@Router-11] > ip firewall filter print
Flags: X - disabled, I - invalid, D - dynamic
 0    chain=forward connection-state=new connection-nat-state=!dstnat
      src-address=10.11.5.0/24
[admin@Router-11] >
```

Figure 5.8: Creation of filter

```
[admin@Router-11] > ip firewall filter print
Flags: X - disabled, I - invalid, D - dynamic
 0    chain=forward action=drop connection-state=new
      connection-nat-state=!dstnat src-address=10.11.5.0/24
[admin@Router-11] >
```

```
 2    chain=dstnat action=dst-nat to-addresses=10.11.1.1 to-ports=22
      protocol=tcp dst-address=10.11.5.254 dst-port=10022
[admin@Router-11] >
```

Figure 5.9: Filter configuration



No.	Time	Source	Destination	Protocol	Length	Info
2	0.000064581	fe80::7952:8d2b:716…	ff02::fb	MDNS	203	Standard query 0x0000 PTR _nfs._tcp.local, "QM
3	4.087000945	10.11.5.254	255.255.255.255	MNDP	155	5678 → 5678 Len=113
4	4.087017717	Routerbo_ce:e6:e8	CDP/VTP/DTP/PAgP/UD…	CDP	105	Device ID: Router-11 Port ID: ether5
5	4.087037914	Routerbo_ce:e6:e8	LLDP_Multicast	LLDP	112	MA/cc:2d:e0:ce:e6:e8 IN/ether5 120 SysN=Router
6	12.119237168	10.11.5.254	10.11.5.2	ICMP	98	Echo (ping) request id=0x02e4, seq=1/256, ttl
7	12.119257195	10.11.5.2	10.11.5.254	ICMP	98	Echo (ping) reply id=0x02e4, seq=1/256, ttl
8	13.131627419	10.11.5.254	10.11.5.2	ICMP	98	Echo (ping) request id=0x02e4, seq=2/512, ttl
9	13.131641646	10.11.5.2	10.11.5.254	ICMP	98	Echo (ping) reply id=0x02e4, seq=2/512, ttl
10	14.133134627	10.11.5.254	10.11.5.2	ICMP	98	Echo (ping) request id=0x02e4, seq=3/768, ttl
11	14.133147902	10.11.5.2	10.11.5.254	ICMP	98	Echo (ping) reply id=0x02e4, seq=3/768, ttl
12	15.211596422	10.11.5.254	10.11.5.2	ICMP	98	Echo (ping) request id=0x02e4, seq=4/1024, tt
13	15.211613875	10.11.5.2	10.11.5.254	ICMP	98	Echo (ping) reply id=0x02e4, seq=4/1024, tt
14	16.251583607	10.11.5.254	10.11.5.2	ICMP	98	Echo (ping) request id=0x02e4, seq=5/1280, tt
15	16.251596401	10.11.5.2	10.11.5.254	ICMP	98	Echo (ping) reply id=0x02e4, seq=5/1280, tt
16	17.110038670	Routerbo_ce:e6:e8	ASUSTekC_c7:4f:e5	ARP	60	Who has 10.11.5.2? Tell 10.11.5.254
17	17.110048618	ASUSTekC_c7:4f:e5	Routerbo_ce:e6:e8	ARP	42	10.11.5.2 is at 0c:9d:92:c7:4f:e5
18	17.369932959	ASUSTekC_c7:4f:e5	Routerbo_ce:e6:e8	ARP	42	Who has 10.11.5.254? Tell 10.11.5.2
19	17.370059676	Routerbo_ce:e6:e8	ASUSTekC_c7:4f:e5	ARP	60	10.11.5.254 is at cc:2d:e0:ce:e6:e8

Figure 5.10: Checking with Wireshark

```
athenyx@athenyx-boreas:~$ ping 10.11.1.1
PING 10.11.1.1 (10.11.1.1) 56(84) bytes of data.
^C
--- 10.11.1.1 ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1019ms

athenyx@athenyx-boreas:~$ ping 10.11.5.254 -p 10022
PATTERN: 0x100202
PING 10.11.5.254 (10.11.5.254) 56(84) bytes of data.
64 bytes from 10.11.5.254: icmp_seq=1 ttl=64 time=0.250 ms
64 bytes from 10.11.5.254: icmp_seq=2 ttl=64 time=0.223 ms
64 bytes from 10.11.5.254: icmp_seq=3 ttl=64 time=0.232 ms
64 bytes from 10.11.5.254: icmp_seq=4 ttl=64 time=0.240 ms
64 bytes from 10.11.5.254: icmp_seq=5 ttl=64 time=0.211 ms
^C
--- 10.11.5.254 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4091ms
rtt min/avg/max/mdev = 0.211/0.231/0.250/0.013 ms
athenyx@athenyx-boreas:~$
```

Figure 5.11: Pinging the Raspberry (Public device)

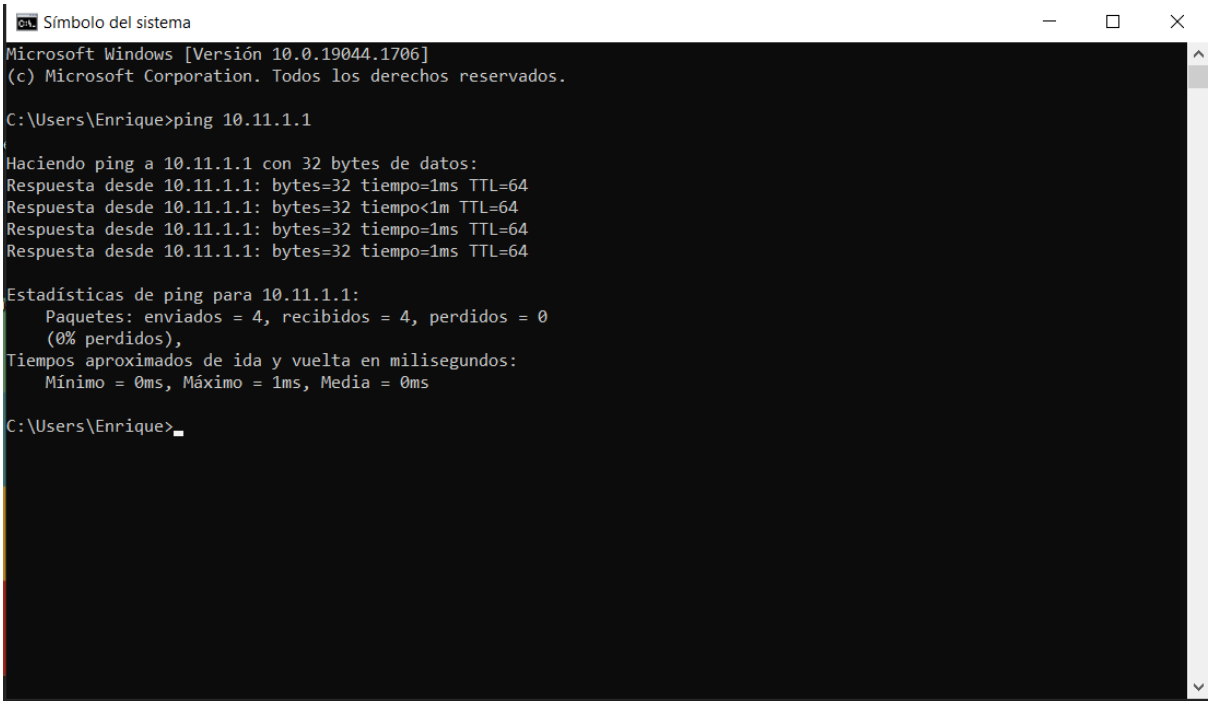


Figure 5.12: Pinging the Raspberry (Private device)

5.4. Remote subnets and routing protocols

5.4.1. New test configuration

First, we configure the switch and the router, assigning the IP 10.0.0.2/30 to the pòrt 1 of the switch and 10.0.0.1/30 to the router. Our bridge still retains the 10.11.1.3/24 IP address, which is also the gateway for the Raspberry. We make the connections between the switch and the router as shown in Figure 11 of the exercise, as well as the Raspberry and the two end devices. Both switch and router can communicate with each other using ping, but not our Raspberry and PC.

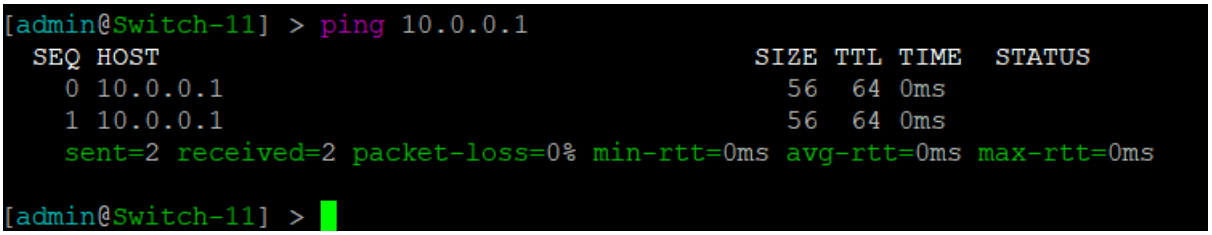


Figure 5.13: Pinging the router via switch

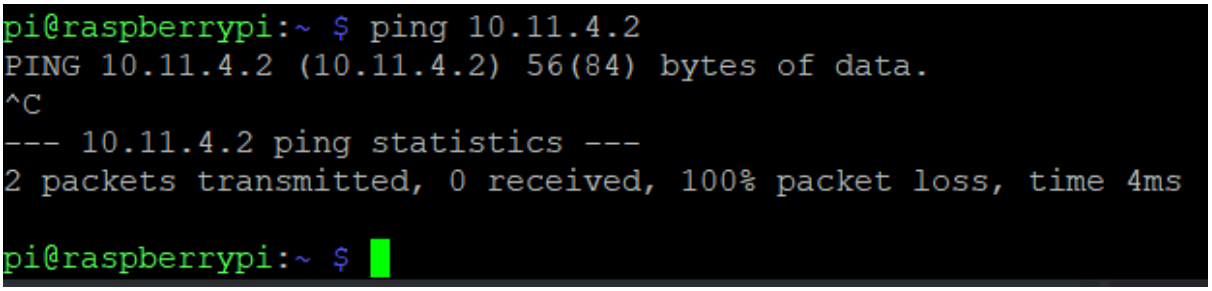


Figure 5.14: Trying to ping the public end device via Raspberry

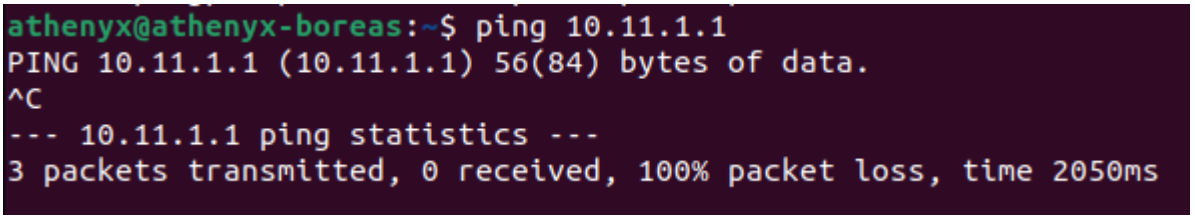


Figure 5.15: Trying to ping the Raspberry via public end device

5.4.2. Static routes

Following that, in order to make the connection between end devices possible, we add new routes under /ip route, both in the router and the switch. Our added routes have two flags, A, meaning it is active and S, meaning it is a static route created by us. The ping between the end devices now works.

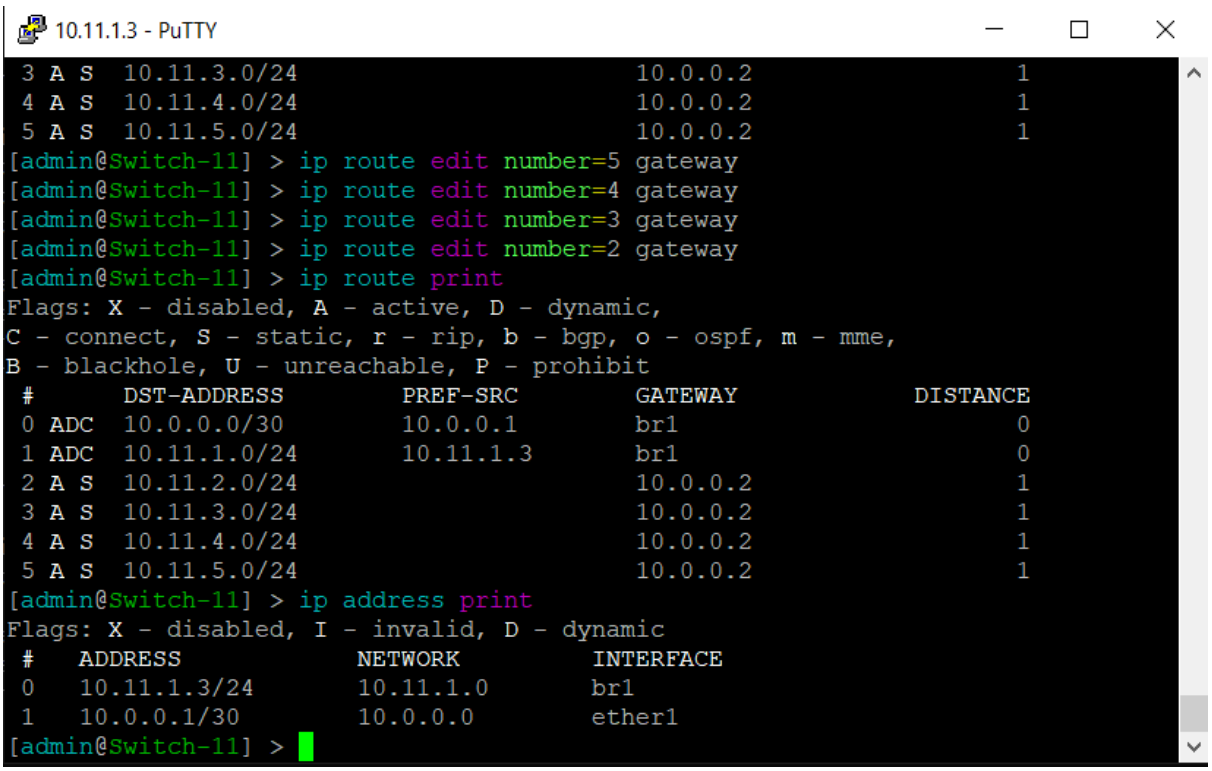


Figure 5.16: Static connections created (switch)

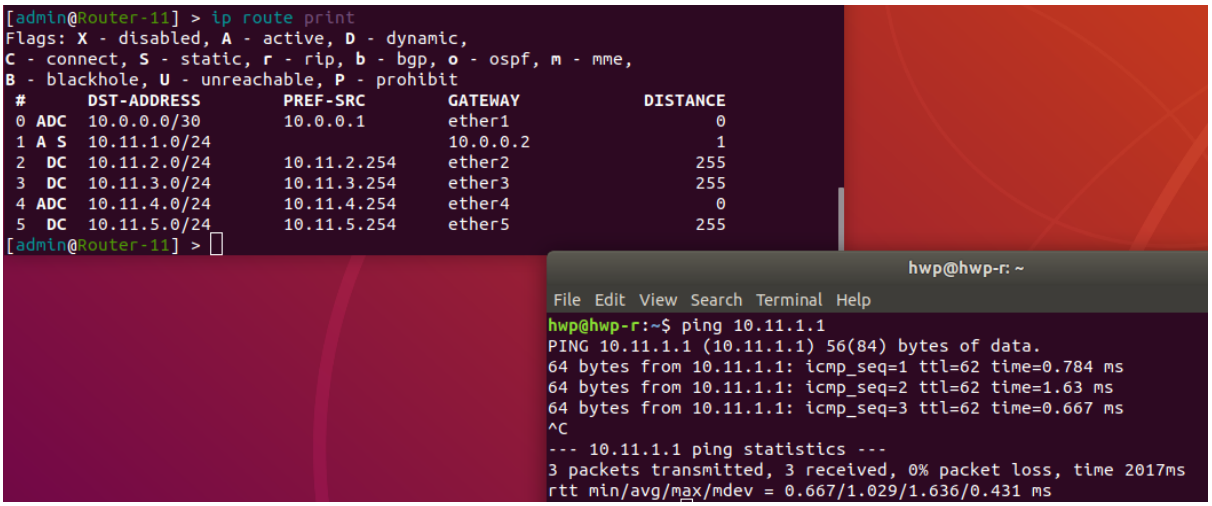


Figure 5.17: Static connections created (router) and proof of ping

5.3.3. Dynamic Routes and Routing Protocols

We remove the static routing routes from our switch and router devices. The ping no longer works. Then, we add the networks of both to the RIP protocol.

```
[admin@Router-11] > routing rip network remove numbers=0,1,2,3,4
[admin@Router-11] > routing rip network print
Flags: X - disabled
 #   NETWORK
[admin@Router-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.1        ether1                    0
 1  DC  10.11.2.0/24       10.11.2.254     ether2                  255
 2  DC  10.11.3.0/24       10.11.3.254     ether3                  255
 3 ADC  10.11.4.0/24       10.11.4.254     ether4                    0
 4  DC  10.11.5.0/24       10.11.5.254     ether5                  255
[admin@Router-11] >
```

Figure 5.18: Static connections deleted (router)

```
[admin@Router-11] > routing rip network print
Flags: X - disabled
 #   NETWORK
 0   10.0.0.0/30
 1   10.11.2.0/24
 2   10.11.3.0/24
 3   10.11.4.0/24
 4   10.11.5.0/24
[admin@Router-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.1        ether1                    0
 1 ADr  10.11.1.0/24                       10.0.0.2                120
 2  DC  10.11.2.0/24       10.11.2.254     ether2                  255
 3  DC  10.11.3.0/24       10.11.3.254     ether3                  255
 4 ADC  10.11.4.0/24       10.11.4.254     ether4                    0
 5  DC  10.11.5.0/24       10.11.5.254     ether5                  255
[admin@Router-11] >
```

Figure 5.19: Networks added to RIP protocol (router)

```
[admin@Switch-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.2        ether1                    0
 1 ADC  10.11.1.0/24       10.11.1.3       br1                       0
 2 ADr  10.11.4.0/24                       10.0.0.1                120
[admin@Switch-11] >
```

Figure 5.20: Networks added to RIP protocol (switch)

Again we tried to ping the end devices, now working successfully with the new RIP connection.

Finally, we removed the RIP connections and added the networks to the OSPF protocol. This time, it took more time for the route to appear on the route tables, but in the end it appeared, and the connection began working again.

```
[admin@Switch-11] > routing rip network remove numbers=0,1
[admin@Switch-11] > routing rip network print
Flags: X - disabled
 #   NETWORK
[admin@Switch-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.2        ether1                    0
 1 ADC  10.11.1.0/24       10.11.1.3       br1                       0
[admin@Switch-11] >
```

Figure 5.21: Remove RIP connections (switch)

```
[admin@Router-11] > routing rip network remove numbers=0,1,2,3,4
[admin@Router-11] > routing rip network print
Flags: X - disabled
 #   NETWORK
[admin@Router-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.1        ether1                    0
 1  DC  10.11.2.0/24       10.11.2.254     ether2                  255
 2  DC  10.11.3.0/24       10.11.3.254     ether3                  255
 3 ADC  10.11.4.0/24       10.11.4.254     ether4                    0
 4  DC  10.11.5.0/24       10.11.5.254     ether5                  255
[admin@Router-11] >
```

Figure 5.22: Remove RIP connections (router)

```
[admin@Switch-11] > routing ospf area print
Flags: X - disabled, I - invalid, * - default
 #    NAME                                AREA-ID         TYPE    DEFAULT-COST
 0  * backbone                            0.0.0.0         default
[admin@Switch-11] >
```

Figure 5.23: Seeing OSPF area (switch)

```
[admin@Router-11] > routing ospf area print
Flags: X - disabled, I - invalid, * - default
 #    NAME                                AREA-ID         TYPE    DEFAULT-COST
 0  * backbone                            0.0.0.0         default
[admin@Router-11] >
```

Figure 5.24: Seeing OSPF area (router)

```
[admin@Switch-11] > routing ospf network print
Flags: X - disabled, I - invalid
 #    NETWORK            AREA
 0    10.0.0.0/30        backbone
 1    10.11.1.0/24       backbone
[admin@Switch-11] >
```

Figure 5.25: Adding networks to OSPF protocol (switch)

```
[admin@Router-11] > routing ospf network print
Flags: X - disabled, I - invalid
 #    NETWORK            AREA
 0    10.0.0.0/30        backbone
 1    10.11.2.0/24       backbone
 2    10.11.3.0/24       backbone
 3    10.11.4.0/24       backbone
 4    10.11.5.0/24       backbone
[admin@Router-11] >
```

Figure 5.26: Adding networks to OSPF protocol (router)

```
[admin@Switch-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.2        ether1                    0
 1 ADC  10.11.1.0/24       10.11.1.3       br1                       0
 2 ADo  10.11.4.0/24                       10.0.0.1                110
[admin@Switch-11] >
```

Figure 5.27: Seeing OSPF network (switch)

```
[admin@Router-11] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
 #      DST-ADDRESS        PREF-SRC        GATEWAY            DISTANCE
 0 ADC  10.0.0.0/30        10.0.0.1        ether1                    0
 1 ADo  10.11.1.0/24                       10.0.0.2                110
 2  DC  10.11.2.0/24       10.11.2.254     ether2                  255
 3  DC  10.11.3.0/24       10.11.3.254     ether3                  255
 4 ADC  10.11.4.0/24       10.11.4.254     ether4                    0
 5  DC  10.11.5.0/24       10.11.5.254     ether5                  255
[admin@Router-11] >
```

Figure 5.28: Seeing OSPF network (router)

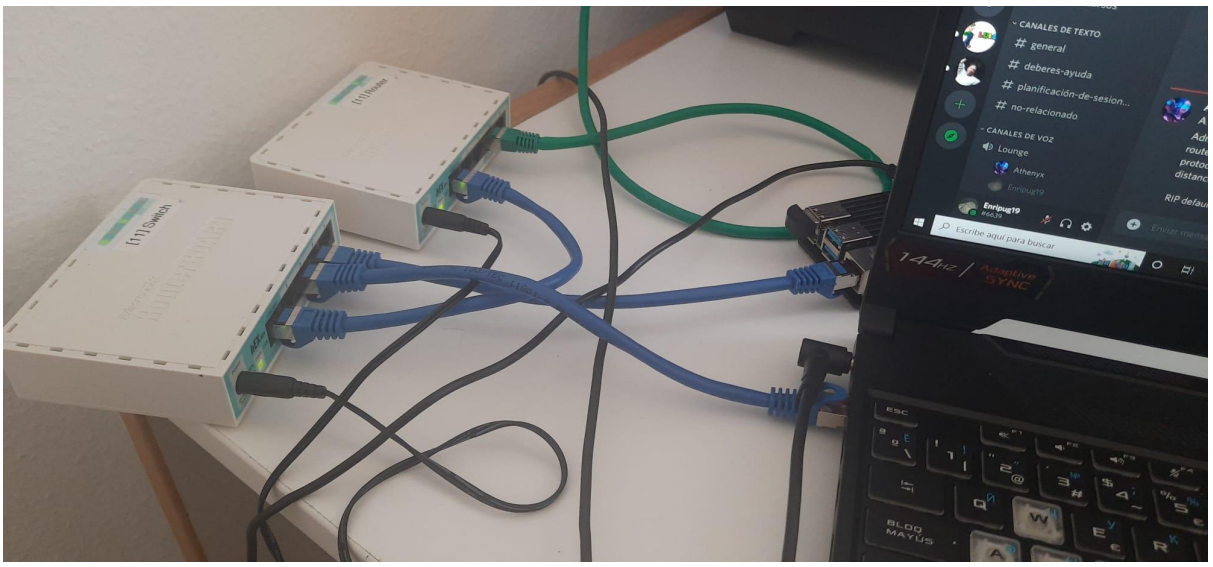


Figure 5.29: Physical connections