LAB 6 – pair 5

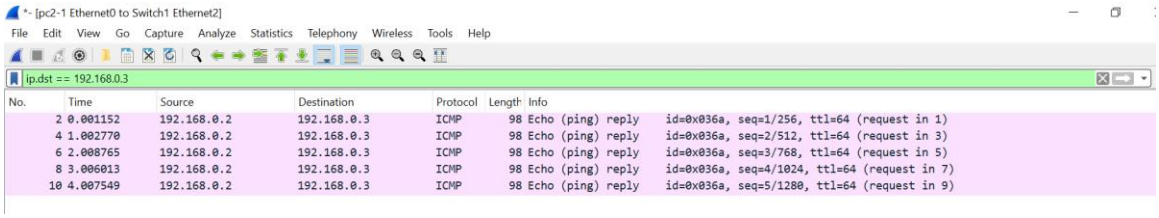
Nadav Biran

Shir Moshe

2. working with display filter in Wireshark

Ping from pc3 to pc2

2.9

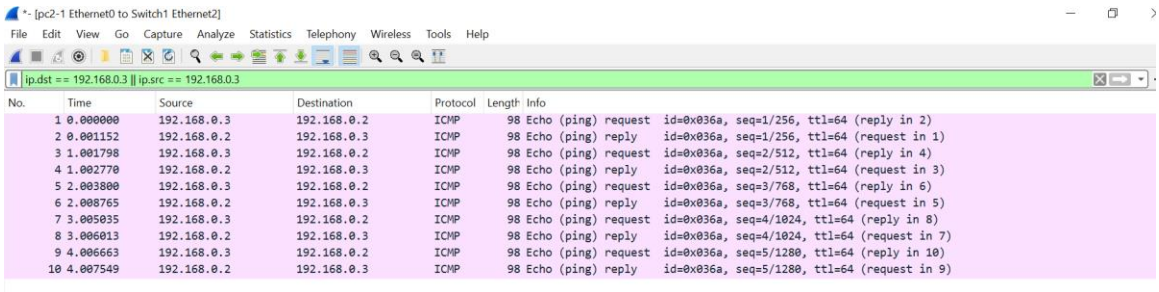


2.10

ICMP

Type	Code	description
0	0	echo reply (ping)
3	0	dest. network unreachable
3	1	dest host unreachable
3	2	dest protocol unreachable
3	3	dest port unreachable
3	6	dest network unknown
3	7	dest host unknown
4	0	source quench (congestion control - not used)
8	0	echo request (ping)
9	0	route advertisement
10	0	router discovery
11	0	TTL expired
12	0	bad IP header

2.11

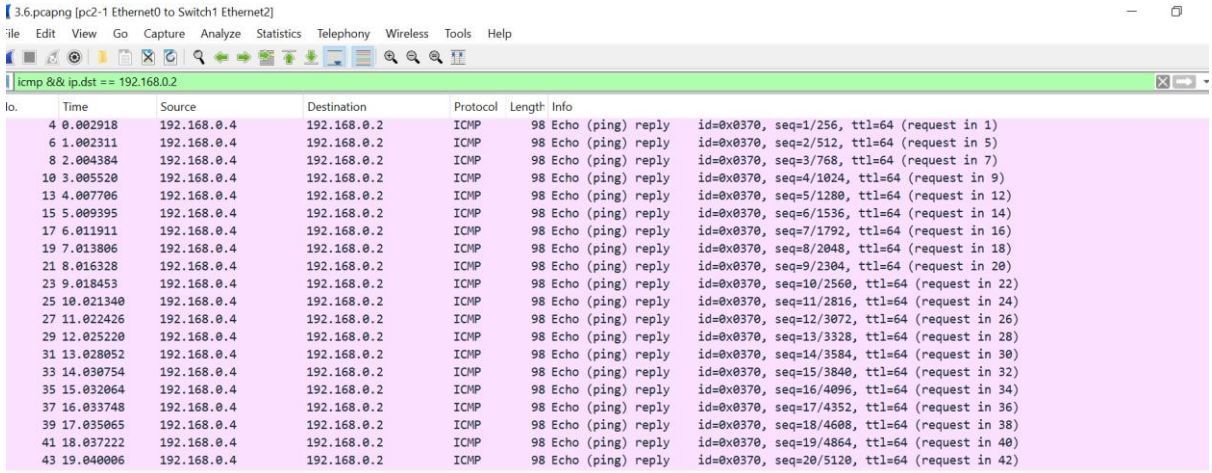


2.12

12 packets.

3. More complex display filter in Wireshark

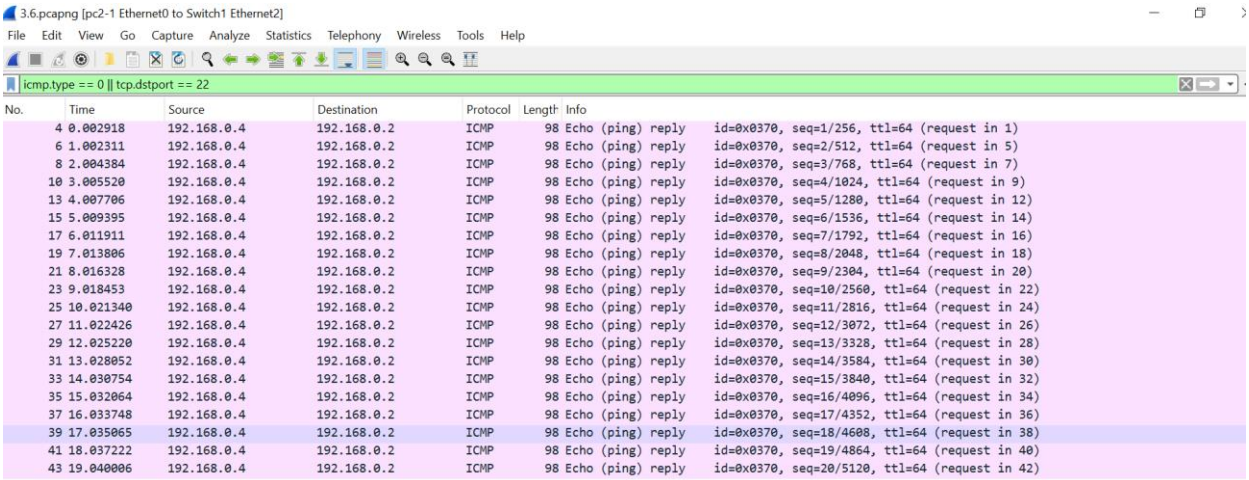
3.8



lo.	Time	Source	Destination	Protocol	Length	Info
4	0.002918	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=1/256, ttl=64 (request in 1)
6	1.002311	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=2/512, ttl=64 (request in 5)
8	2.004384	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=3/768, ttl=64 (request in 7)
10	3.005520	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=4/1024, ttl=64 (request in 9)
13	4.007706	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=5/1280, ttl=64 (request in 12)
15	5.009395	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=6/1536, ttl=64 (request in 14)
17	6.011911	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=7/1792, ttl=64 (request in 16)
19	7.013806	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=8/2048, ttl=64 (request in 18)
21	8.016328	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=9/2304, ttl=64 (request in 20)
23	9.018453	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=10/2560, ttl=64 (request in 22)
25	10.021340	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=11/2816, ttl=64 (request in 24)
27	11.022426	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=12/3072, ttl=64 (request in 26)
29	12.025220	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=13/3328, ttl=64 (request in 28)
31	13.028052	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=14/3584, ttl=64 (request in 30)
33	14.030754	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=15/3840, ttl=64 (request in 32)
35	15.032064	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=16/4096, ttl=64 (request in 34)
37	16.033748	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=17/4352, ttl=64 (request in 36)
39	17.035065	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=18/4608, ttl=64 (request in 38)
41	18.037222	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=19/4864, ttl=64 (request in 40)
43	19.040006	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=20/5120, ttl=64 (request in 42)

3.9

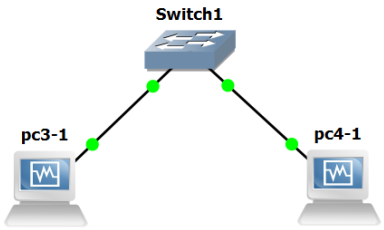
3.10



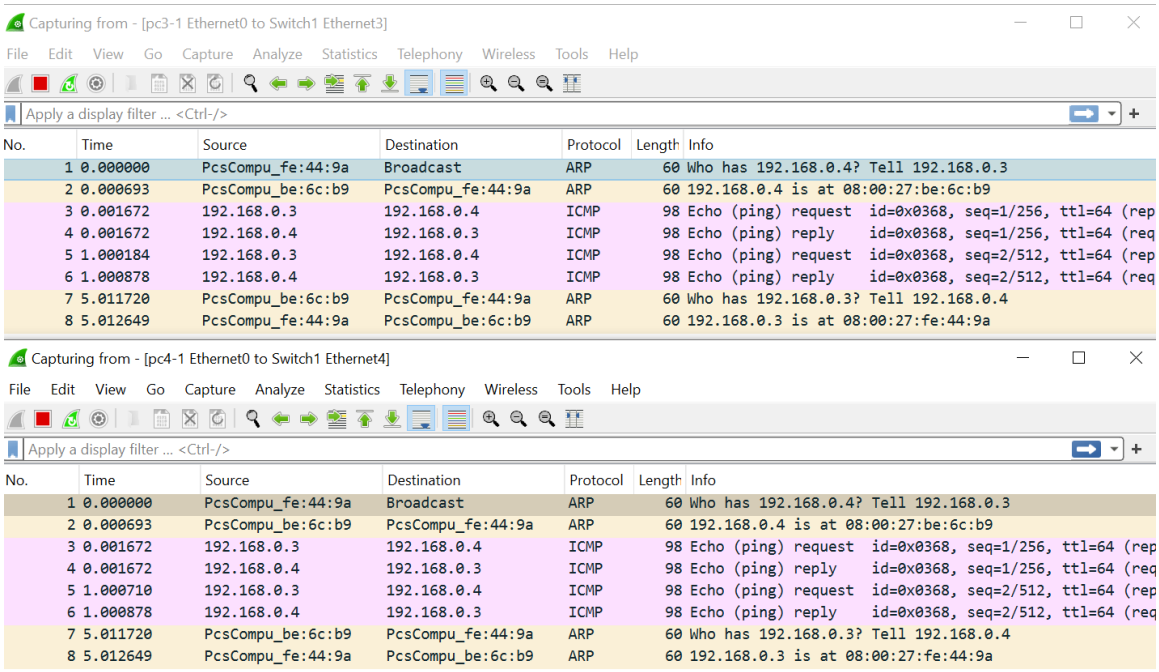
No.	Time	Source	Destination	Protocol	Length	Info
4	0.002918	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=1/256, ttl=64 (request in 1)
6	1.002311	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=2/512, ttl=64 (request in 5)
8	2.004384	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=3/768, ttl=64 (request in 7)
10	3.005520	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=4/1024, ttl=64 (request in 9)
13	4.007706	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=5/1280, ttl=64 (request in 12)
15	5.009395	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=6/1536, ttl=64 (request in 14)
17	6.011911	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=7/1792, ttl=64 (request in 16)
19	7.013806	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=8/2048, ttl=64 (request in 18)
21	8.016328	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=9/2304, ttl=64 (request in 20)
23	9.018453	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=10/2560, ttl=64 (request in 22)
25	10.021340	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=11/2816, ttl=64 (request in 24)
27	11.022426	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=12/3072, ttl=64 (request in 26)
29	12.025220	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=13/3328, ttl=64 (request in 28)
31	13.028052	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=14/3584, ttl=64 (request in 30)
33	14.030754	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=15/3840, ttl=64 (request in 32)
35	15.032064	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=16/4096, ttl=64 (request in 34)
37	16.033748	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=17/4352, ttl=64 (request in 36)
39	17.035065	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=18/4608, ttl=64 (request in 38)
41	18.037222	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=19/4864, ttl=64 (request in 40)
43	19.040006	192.168.0.4	192.168.0.2	ICMP	98	Echo (ping) reply id=0x0370, seq=20/5120, ttl=64 (request in 42)

5. Moving from switching to routing

5.8

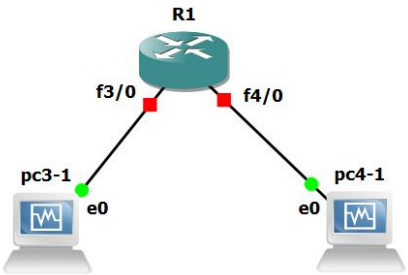


ping from pc3 to pc4

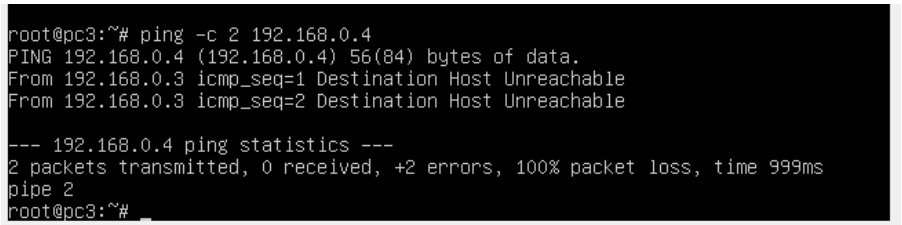


1. 2 massages of ARP: pc3 with MAC add …9a ask (broadcast destination MAC add) what is the MAC add of ip…04?
   Pc4 send back to pc3 ARP massage that his IP is at …b9 MAC add.
2. 4 massages of IMCP: pc3 sand ping request to pc 4 with IP dest …04, and pc 4 send back a replay ping with IP dest …03.

5.10



5.11



The ping didn't work.

5.13.1

See describe on 5.9.

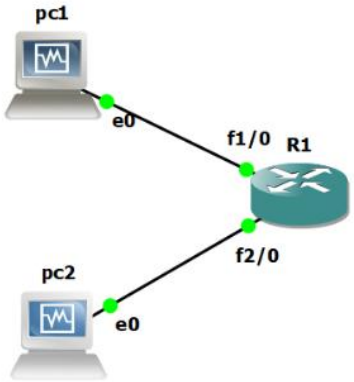
5.14.3

The router has IP address for itself, therefore when the packet from pc1 has sent and receive by the router, the router doesn't recognize it as ii relevant for it and dropped it.

In order to resolve the problem we must initially configurate the ip of the router.

6.Configuring Cisco Router Interfaces

6.2



6.3

Configure pc1 with IP: 192.168.1.0, eth0

Configure pc2 with IP: 192.168.2.0, eth0

6.5

F1/0: R1#configure terminal

R1(config)#interface FastEthernet1/0

R1(config-if)#ip address 192.168.1.254 255.255.255.0

R1(config-if)#no shutdown

R1(config-if)#end

F2/0: R1#configure terminal

R1(config)#interface FastEthernet2/0

R1(config-if)#ip address 192.168.2.254 255.255.255.0

R1(config-if)#no shutdown

R1(config-if)#end

7.Configuring Static Routing Table on a Linux PC

7.2 – 7.7

Reboot all the network component.

ARP table empty -on pc 1/2 use the command: *arp* ,on router R1: *sh ip arp*

Build the static table on pc1*: route add -net 192.168.2.0* (ip subnet of pc 2) *netmask 255.255.255.0 gw 192.168.1.254* (ip of the getway on the router).

Build the static table on pc2*: route add -net 192.168.1.0* (ip subnet of pc 1) *netmask 255.255.255.0 gw 192.168.2.254* (ip of the getway on the router).

Then use the commnd *route* to get the ARP table:

On router control:

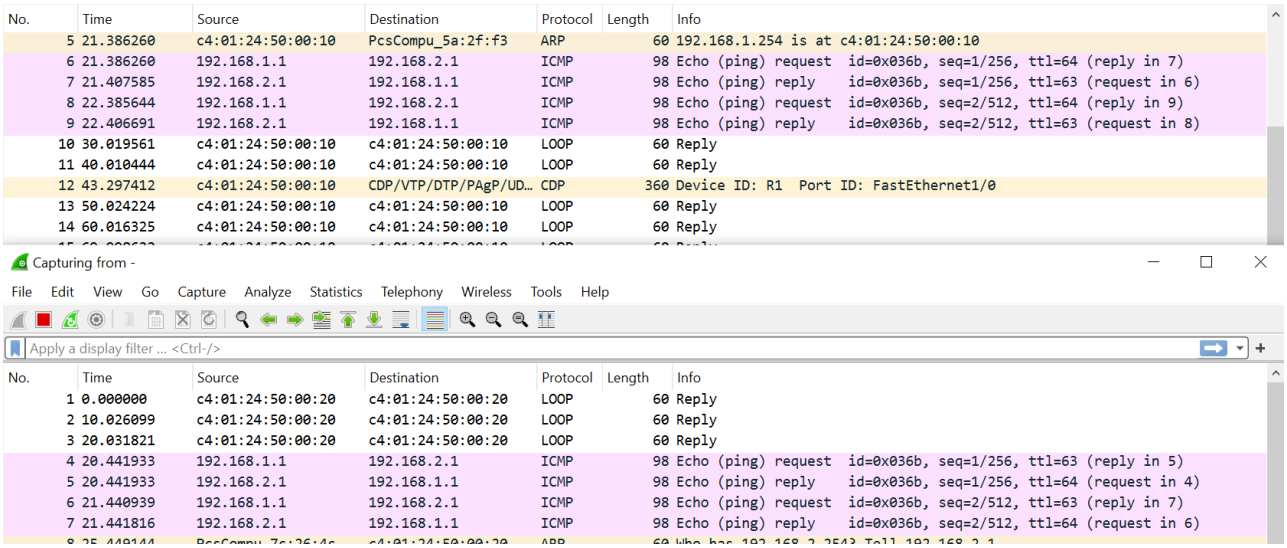
```
Ubuntu 14.04 LTS pc1 tty1

pc1 login: root
Password:
Last login: Mon Dec 19 19:47:33 IST 2022 on tty1
Welcome to Ubuntu 14.04 LTS (GNU/Linux 3.13.0-24-generic i686)

 * Documentation:  https://help.ubuntu.com/
root@pc1:~# arp
root@pc1:~# route add -
-host  -net
root@pc1:~# route add -net 192.168.2.0 netmask 255.255.255.0 gw 192.168.1.254
root@pc1:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.1.0     *               255.255.255.0   U     0      0        0 eth0
192.168.2.0     192.168.1.254   255.255.255.0   UG    0      0        0 eth0
root@pc1:~#
```

```
Ubuntu 14.04 LTS pc2 tty1

pc2 login: root
Password:
Last login: Mon Dec 19 19:48:33 IST 2022 on tty1
Welcome to Ubuntu 14.04 LTS (GNU/Linux 3.13.0-24-generic i686)

 * Documentation:  https://help.ubuntu.com/
root@pc2:~# arp
root@pc2:~# arp
root@pc2:~# route add -net 192.168.1.0 netmask 255.255.255.0 gw 192.168.2.254
root@pc2:~# rooute
No command 'rooute' found, did you mean:
 Command 'route' from package 'net-tools' (main)
rooute: command not found
root@pc2:~# _
```

R1:

```
R1#sh ip arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  192.168.1.254           -   c401.2450.0010  ARPA   FastEthernet1/0
Internet  192.168.2.254           -   c401.2450.0020  ARPA   FastEthernet2/0
R1#
```

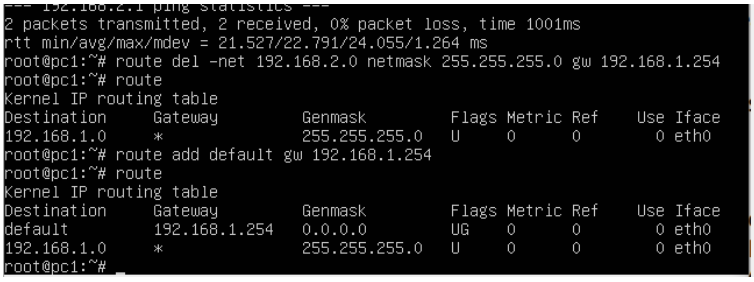
7.8



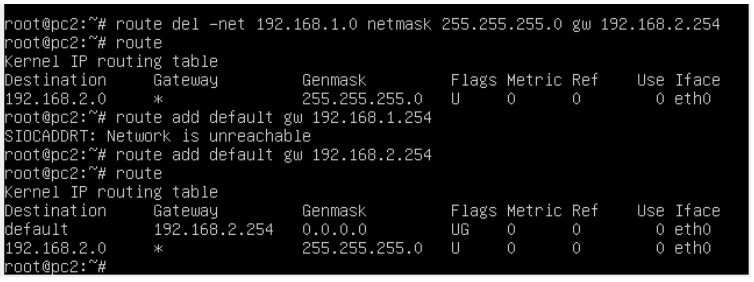
No.	Time	Source	Destination	Protocol	Length	Info
5	21.386260	c4:01:24:50:00:10	PcsCompu_5a:2f:f3	ARP	60	192.168.1.254 is at c4:01:24:50:00:10
6	21.386260	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036b, seq=1/256, ttl=64 (reply in 7)
7	21.407585	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x036b, seq=1/256, ttl=63 (request in 6)
8	22.385644	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036b, seq=2/512, ttl=64 (reply in 9)
9	22.406691	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x036b, seq=2/512, ttl=63 (request in 8)
10	30.019561	c4:01:24:50:00:10	c4:01:24:50:00:10	LOOP	60	Reply
11	40.010444	c4:01:24:50:00:10	c4:01:24:50:00:10	LOOP	60	Reply
12	43.297412	c4:01:24:50:00:10	CDP/VTP/DTP/PAgP/UD…	CDP	360	Device ID: R1 Port ID: FastEthernet1/0
13	50.024224	c4:01:24:50:00:10	c4:01:24:50:00:10	LOOP	60	Reply
14	60.016325	c4:01:24:50:00:10	c4:01:24:50:00:10	LOOP	60	Reply

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	c4:01:24:50:00:20	c4:01:24:50:00:20	LOOP	60	Reply
2	10.026099	c4:01:24:50:00:20	c4:01:24:50:00:20	LOOP	60	Reply
3	20.031821	c4:01:24:50:00:20	c4:01:24:50:00:20	LOOP	60	Reply
4	20.441933	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036b, seq=1/256, ttl=63 (reply in 5)
5	20.441933	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x036b, seq=1/256, ttl=64 (request in 4)
6	21.440939	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036b, seq=2/512, ttl=63 (reply in 7)
7	21.441816	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x036b, seq=2/512, ttl=64 (request in 6)

7.9-1.10: Delete the static routes and configure a default gateway:

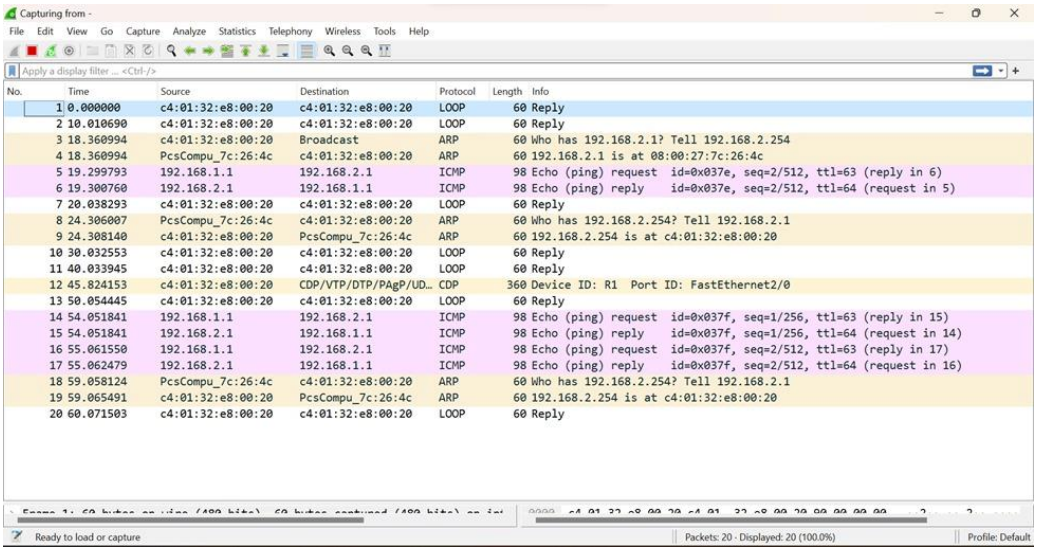


```
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 21.527/22.791/24.055/1.264 ms
root@pc1:~# route del -net 192.168.2.0 netmask 255.255.255.0 gw 192.168.1.254
root@pc1:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.1.0     *               255.255.255.0   U     0      0        0 eth0
root@pc1:~# route add default gw 192.168.1.254
root@pc1:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         192.168.1.254   0.0.0.0         UG    0      0        0 eth0
192.168.1.0     *               255.255.255.0   U     0      0        0 eth0
root@pc1:~#
```



```
root@pc2:~# route del -net 192.168.1.0 netmask 255.255.255.0 gw 192.168.2.254
root@pc2:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.2.0     *               255.255.255.0   U     0      0        0 eth0
root@pc2:~# route add default gw 192.168.1.254
SIOCADDRT: Network is unreachable
root@pc2:~# route add default gw 192.168.2.254
root@pc2:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         192.168.2.254   0.0.0.0         UG    0      0        0 eth0
192.168.2.0     *               255.255.255.0   U     0      0        0 eth0
root@pc2:~#
```

7.11: ping from pc1 to pc2



No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
2	10.010690	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
3	18.360994	c4:01:32:e8:00:20	Broadcast	ARP	60	Who has 192.168.2.1? Tell 192.168.2.254
4	18.360994	PcsCompu_7c:26:4c	c4:01:32:e8:00:20	ARP	60	192.168.2.1 is at 08:00:27:7c:26:4c
5	19.299793	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037e, seq=2/512, ttl=63 (reply in 6)
6	19.300760	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x037e, seq=2/512, ttl=64 (request in 5)
7	20.038293	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
8	24.306007	PcsCompu_7c:26:4c	c4:01:32:e8:00:20	ARP	60	Who has 192.168.2.254? Tell 192.168.2.1
9	24.308140	c4:01:32:e8:00:20	PcsCompu_7c:26:4c	ARP	60	192.168.2.254 is at c4:01:32:e8:00:20
10	30.032553	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
11	40.033945	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
12	45.824153	c4:01:32:e8:00:20	CDP/VTP/DTP/PAgP/UD…	CDP	360	Device ID: R1 Port ID: FastEthernet2/0
13	50.054445	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply
14	54.051841	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037f, seq=1/256, ttl=63 (reply in 15)
15	54.051841	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x037f, seq=1/256, ttl=64 (request in 14)
16	55.061550	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037f, seq=2/512, ttl=63 (reply in 17)
17	55.062479	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply id=0x037f, seq=2/512, ttl=64 (request in 16)
18	59.058124	PcsCompu_7c:26:4c	c4:01:32:e8:00:20	ARP	60	Who has 192.168.2.254? Tell 192.168.2.1
19	59.065491	c4:01:32:e8:00:20	PcsCompu_7c:26:4c	ARP	60	192.168.2.254 is at c4:01:32:e8:00:20
20	60.071503	c4:01:32:e8:00:20	c4:01:32:e8:00:20	LOOP	60	Reply

7.12

Build the static table on pc1*: route add -net 192.168.2.0* (ip subnet of pc 2) *netmask 255.255.255.0 gw 192.168.1.254* (ip of the getway on the router).

7.13

Destination : The destination network or destination host.

Gateway : The gateway address or '*' if none set.

Genmask : The netmask for the destination net; 255.255.255.255 for a host destination and 0.0.0.0 for the default route.

Flags : Possible flags include

U (route is up)

H (target is a host)

G (use gateway)

R (reinstate route for dynamic routing)

D (dynamically installed by daemon or redirect)

M (modified from routing daemon or redirect)

A (installed by addrconf)

C (cache entry)

! (reject route)

Metric : The distance to the target (usually counted in hops). It is not used by recent kernels, but may be needed by routing daemons.

Ref : Number of references to this route. (Not used in the Linux kernel.)

Use : Count of lookups for the route. Depending on the use of -F and -C this will be either route cache misses (-F) or hits (-C).

Iface : Interface to which packets for this route will be sent.

7.14 see above

7.15

פעם ראשונה שלחנו פינג והראוטר לא ידע לאן לשלוח כי בטבלת ארפ שלו לא היה את הכתובת מאק של מחשב 2. בפינג השני המחשב כבר הופיע בטבלה והראוטר ידע לאן לנתב. נשים לב שאחכ ככשלחנו שוב 2 פינגים שניהם הגיעו.

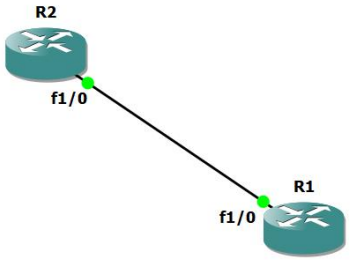
7.17

4	14.478834	192.168.1.1	192.168.2.1	ICMP	98 Echo (ping) request id=0x037b, seq=1/256, ttl=64 (reply in 5)
5	14.499408	192.168.2.1	192.168.1.1	ICMP	98 Echo (ping) reply id=0x037b, seq=1/256, ttl=63 (request in 4)
6	15.480891	192.168.1.1	192.168.2.1	ICMP	98 Echo (ping) request id=0x037b, seq=2/512, ttl=64 (reply in 7)
7	15.528875	192.168.2.1	192.168.1.1	ICMP	98 Echo (ping) reply id=0x037b, seq=2/512, ttl=63 (request in 6)

ttl

8.Topology 3 Configuration

8.2



8.3

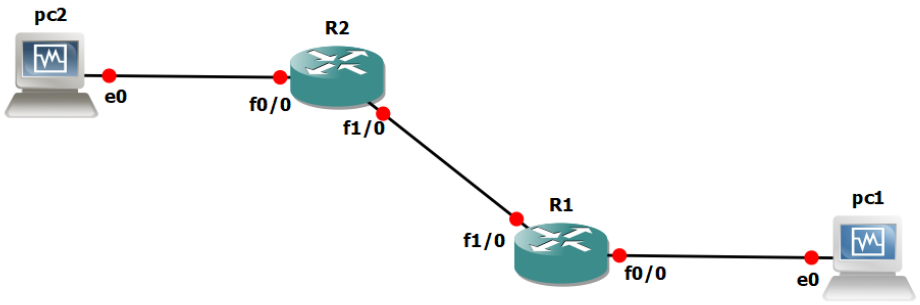
```
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#inter
R1(config)#interface Fast
R1(config)#interface FastEthernet1/0
R1(config-if)#ip address 10.5.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#end
R1#
```

```
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface Fas
R2(config)#interface FastEthernet1/0
R2(config-if)#ip address 10.5.1.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#end
R2#p
*Mar  1 00:15:35.231: %SYS-5-CONFIG_I: Configured from console by console
R2#ping 10.5.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.5.1.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 64/70/76 ms
R2#
```

R1#configure terminal *R1(config)#interface FastEthernet1/0* *R1(config-if)#ip address 10.5.1.1 255.255.255.0* *R1(config-if)#no shutdown* *R1(config-if)#end*	*R2#configure terminal* *R2(config)#interface FastEthernet1/0* *R2(config-if)#ip address 10.5.1.2 255.255.255.0* *R2(config-if)#no shutdown* *R2(config-if)#end*

9.Configuring Static Routing Table on a Cisco Router

9.1 Topology 3.1



9.5

R1#configure terminal *R1(config)#interface FastEthernet0/0* *R1(config-if)#ip address 192.168.1.254 255.255.255.0* *R1(config-if)#no shutdown* *R1(config-if)#end*	*R2#configure terminal* *R2(config)#interface FastEthernet0/0* *R2(config-if)#ip address 192.168.2.254 255.255.255.0* *R2(config-if)#no shutdown* *R2(config-if)#end*

9.6 Add default getway:

Route add default gw 192.168.1.254

Route add default gw 192.168.2.254

9.7

Pc1

```
Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
R1#
```

Pc2

```
Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
R2#
```

9.11

```
root@pc1:~# ping -c 3 192.168.2.1
PING 192.168.2.1 (192.168.2.1) 56(84) bytes of data.
From 192.168.1.254 icmp_seq=1 Destination Host Unreachable
From 192.168.1.254 icmp_seq=2 Destination Host Unreachable
From 192.168.1.254 icmp_seq=3 Destination Host Unreachable

--- 192.168.2.1 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 2004ms

root@pc1:~#
```

9.13

R1#configure terminal *R1(config)#* #ip route 192.168.2.0 255.255.255.0 10.5.1.2 *R1(config-if)#end*	*R2#configure terminal* *R2(config)#* #ip route 192.168.1.0 255.255.255.0 10.5.1.1 *R2(config-if)#end*

9.14

```
Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.2.0/24 [1/0] via 10.5.1.2
R1#
Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
S    192.168.1.0/24 [1/0] via 10.5.1.1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
R2#
```

9.15

```
PING 192.168.2.1 (192.168.2.1) 56(84) bytes of data.
64 bytes from 192.168.2.1: icmp_seq=3 ttl=62 time=28.0 ms

--- 192.168.2.1 ping statistics ---
3 packets transmitted, 1 received, 66% packet loss, time 2000ms
rtt min/avg/max/mdev = 28.085/28.085/28.085/0.000 ms
root@pc1:~# _
```

PC2-R2

icmp

No.	Time	Source	Destination	Protocol	Length	Info
10	59.962674	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
11	59.962674	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply

R1-R2

icmp

No.	Time	Source	Destination	Protocol	Length	Info
13	38.896681	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
14	39.898002	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
15	39.913347	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply

PC1-R1

icmp

No.	Time	Source	Destination	Protocol	Length	Info
7	27.989762	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
8	28.976073	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
9	29.976122	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request
11	30.004012	192.168.2.1	192.168.1.1	ICMP	98	Echo (ping) reply

9.16

13	74.850360	192.168.1.254	192.168.1.1	ICMP	70	Destination unreachable (Host unreachable)
14	75.826537	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036f, seq=2/512, t
15	75.829462	192.168.1.254	192.168.1.1	ICMP	70	Destination unreachable (Host unreachable)
16	76.829157	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x036f, seq=3/768, t
17	76.831181	192.168.1.254	192.168.1.1	ICMP	70	Destination unreachable (Host unreachable)

הפינג מגיע לראוטר והראוטר מחזיר בתגובה שהוא לא יודע מי ההוסט של הכתובת איי פי ששלחנו ביעד, כי לא אמרנו לו שמאחורי הראוטר השני יושבת הסאבנט הרצויה.

9.17

נשים לב שחסרה השורה עם S

בגלל שלא הגדרנו לראוטר 1 שמאחורי ראוטר 2 יושבת הסאבנט 192.168.2.0

```
Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.2.0/24 [1/0] via 10.5.1.2
R1#
```

9.18

רואים בטבלה

9.19

2 פינגים לא הגיעו ליעד. פינג 1 נשלח ונעצר בראוטר 1 (שהיה צריך לבדוק מה הכתובת MAC של היעד, ולכן זרק את הפינג). לאחר שהוסיף לטבלת הARP את הכתובת הוא יכל לנתב את פינג 2 הלאה לראוטר 2. ראוטר 2 פגש לראשונה בכתובת IP של היעד של 2PC ואז ראוטר 2 זרק את הפינג כדי ללמוד את הMAC של 2PC. ולכן רק הפינג השלישי הגיע ליעד.

10. Observing Traceroute based on configure 9

10.2-3

traceroute 192.168.2.1 *on pc 1*

10.4

show interfaces *to get the MAC of each port (press space to get the others port)*

ifconfig *to get the MAC of pc*

R1

```
FastEthernet0/0 is up, line protocol is up
  Hardware is Gt96k FE, address is c401.1b7c.0000 (bia c401.1b7c.0000)
  Internet address is 192.168.1.254/24
FastEthernet0/1 is administratively down, line protocol is down
  Hardware is Gt96k FE, address is c401.1b7c.0001 (bia c401.1b7c.0001)
```

R2

```
FastEthernet0/0 is up, line protocol is up
  Hardware is Gt96k FE, address is c402.50b4.0000 (bia c402.50b4.0000)
  Internet address is 192.168.2.254/24
FastEthernet0/1 is administratively down, line protocol is down
  Hardware is Gt96k FE, address is c402.50b4.0001 (bia c402.50b4.0001)
```

10.6

הפקודה traceroute 192.168.2.1 אומרת לנו מה הניתוב (דרך מי צריך לעבור) כדי להגיע לכתובת IP שמצוינת בפקודה.

```
root@pc1:~# traceroute 192.168.2.1
traceroute to 192.168.2.1 (192.168.2.1), 30 hops max, 60 byte packets
 1  192.168.1.254 (192.168.1.254)  6.362 ms  16.110 ms  26.302 ms
 2  10.5.1.2 (10.5.1.2)  36.888 ms  47.075 ms  57.479 ms
 3  192.168.2.1 (192.168.2.1)  68.007 ms  78.866 ms  89.108 ms
root@pc1:~#
```

10.7

1. מחשב 1 שולח הודעה עם TTL 1. ומגריל מספר פורט בין 33434 לבין 33534.
2. כשההודעה מגיע לראוטר 1 הTTL יורד ל0 ואז חוזרת הודעת ICMP שמודיעה שהTTL לא הספיק.
3. מחשב 1 ישלח שוב הודעת UDP הפעם TTL= 2.
4. ראוטר 1 יעביר את ההודעה להופ הבא- ראוטר 2, ויוריד את TTL ל 1.
5. ראוטר 2 יוריד את TTL ל 0 ויחזיר הודעת ICMP שה TTL לא הספיק (כשאר כתובת ה source היא של ראוטר 2).
6. שוב נשלח הודעה עם TTL=3 ואז מחשב 2 שהוא היעד המקורי של ההודעה יקבל אותה, ויחזיר למחשב 1 הודעה : **ICMP Destination/PORT Unreachabl**

ההודעה הזאת מגיעה בגלל שבכל פעם הגרלנו מספר פורט בין 33434 לבין 33534.

** נשים לב שלכל TTL נשלח 3 פעמים הודעה על מנת לחשב את הזמנים של הround trip time.

10.8

רואים ב wireshark את הפקטות שנשלחות, ואת ההודעות ICMP שחוזרות. אפשר לראות שהיעד שלהן הוא תמיד מחשב 1. בנוסף ה TTL שלהן הוא גדול.

10.9

אם יש בעיה בקשר בין שני ראוטרים בדרך ליעד, אז ב traceroute נקבל שיש פ

11. Multiple Matches in the Routing Table Topology 3.2

11.2

לא לשכוח לקנפג את הפורטים שמחוברים למחשבים (וכמובן הפקודה configure terminal

R1(config)#ip route 10.5.0.0 255.255.0.0 10.5.1.61 *IP subnet does not exist*

R1(config)#ip route 10.5.3.0 255.255.255.0 10.5.1.71 *IP subnet does not exist*

R1(config)#ip route 10.5.3.9 255.255.255.255 10.5.1.81 *IP subnet does not exist*

11.3

show ip route

```
Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 4 subnets, 3 masks
S       10.5.3.9/32 [1/0] via 10.5.1.81
S       10.5.3.0/24 [1/0] via 10.5.1.71
C       10.5.1.0/24 is directly connected, FastEthernet1/0
S       10.5.0.0/16 [1/0] via 10.5.1.61
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.2.0/24 [1/0] via 10.5.1.2
R1#
```

11.4-5

אם צריך להוסיף גטוואיי דיפולטיבי למחשב: **pc1% route add default gw 192.168.1.254*

ולקנפג פורטים 0/0 כמו ב9.5, וב9.13

pc1% ping –c 1 10.5.3.9

pc1% ping –c 1 10.5.3.14

pc1% ping –c 1 10.5.4.1

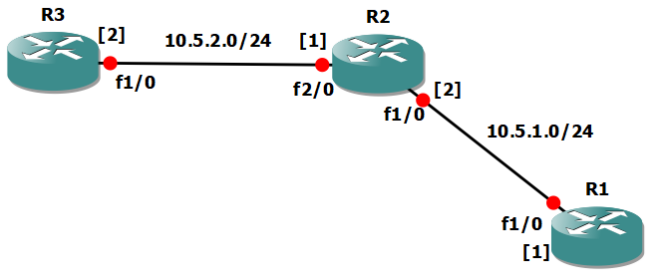
```
root@pc1:~# ping -c 1 10.5.3.9
PING 10.5.3.9 (10.5.3.9) 56(84) bytes of data.

--- 10.5.3.9 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms

root@pc1:~# ping -c 1 10.5.3.14
PING 10.5.3.14 (10.5.3.14) 56(84) bytes of data.

--- 10.5.3.14 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms

root@pc1:~# ping -c 1 10.5.4.1
PING 10.5.4.1 (10.5.4.1) 56(84) bytes of data.

--- 10.5.4.1 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms

root@pc1:~#
```

11.7

11.8

12. Topology 4 Configuration Topology 4

12.2



12.3

show ip route עם לבדוק חלקית- מקונפגים להיות אמורים 2R 1R*

R1#configure terminal	***R2#configure terminal***	***R2#configure terminal***	***R3#configure terminal***
R1(config)#interface FastEthernet1/0	*R2(config)#interface FastEthernet1/0*	*R2(config)#interface FastEthernet2/0*	*R2(config)#interface FastEthernet1/0*
R1(config-if)#ip address 10.5.1.1 255.255.255.0	*R2(config-if)#ip address 10.5.1.2 255.255.255.0*	*R2(config-if)#ip address 10.5.2.1 255.255.255.0*	*R2(config-if)#ip address 10.5.2.2 255.255.255.0*
R1(config-if)#no shutdown	*R2(config-if)#no shutdown*	*R2(config-if)#no shutdown*	*R2(config-if)#no shutdown*
R1(config-if)#end	*R2(config-if)#end*	*R2(config-if)#end*	*R2(config-if)#end*

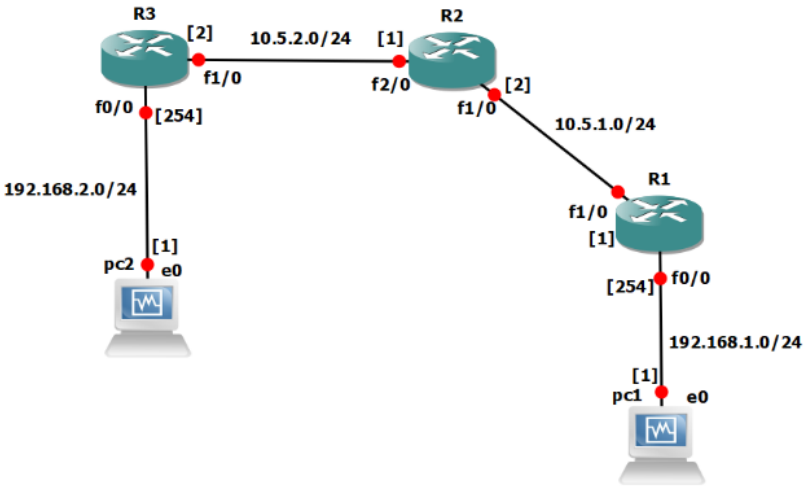
12.4

R1#ping 10.5.1.2

R2#ping 10.5.2.2

13. Meaning of Default Routes Topology 4.1

13.1



13.2

Static configure (*ifconfig*)

13.3

R1#configure terminal *R1(config)#interface FastEthernet0/0* *R1(config-if)#ip address 192.168.1.254 255.255.255.0* *R1(config-if)#no shutdown* *R1(config-if)#end*	*R3#configure terminal* *R3(config)#interface FastEthernet0/0* *R3(config-if)#ip address 192.168.2.254 255.255.255.0* *R3(config-if)#no shutdown* *R3(config-if)#end*

13.4

pc1% route add default gw 192.168.1.254

pc2% route add default gw 192.168.2.254

13.5

configure R2 (port1/0) as default

R1#configure terminal

R1(config)#ip route 0.0.0.0 0.0.0.0 10.x.1.2

R1(config)#end

13.6

R2:

configure terminal

ip route 0.0.0.0 0.0.0.0 FastEthernet2/0

end

R3:

configure terminal

ip route 0.0.0.0 0.0.0.0 FastEthernet0/0

end

13.8

show ip route

R1

```
Gateway of last resort is 10.5.1.2 to network 0.0.0.0

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.1.0 is directly connected, FastEthernet1/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.2.0/24 [1/0] via 10.5.1.2
S*   0.0.0.0/0 [1/0] via 10.5.1.2
```

R2

```
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     10.0.0.0/24 is subnetted, 2 subnets
C       10.5.2.0 is directly connected, FastEthernet2/0
C       10.5.1.0 is directly connected, FastEthernet1/0
S    192.168.1.0/24 [1/0] via 10.5.1.1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 is directly connected, FastEthernet2/0
R2#
```

R3

```
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     10.0.0.0/24 is subnetted, 1 subnets
C       10.5.2.0 is directly connected, FastEthernet1/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 is directly connected, FastEthernet0/0
R3#
```

13.10

ping –c 5 192.168.10.1

13.13

```
root@pc1:~# ping -c 5 192.168.10.1
PING 192.168.10.1 (192.168.10.1) 56(84) bytes of data.

--- 192.168.10.1 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4029ms
```

כי אין IP כזה ברשת

13.14

On link R1 R2 : (show interfaces)

R1 שואל בברודקאסט מה הכתובת MAC של IP 10.5.1.2, 2R מחזיר לו שהיא נמצאת בפורט השני שלו (0\0) (שואל תכלס איפה ה getway הדיפולטיבי שלו)

33	130.661919	c4:01:1b:7c:00:10	Broadcast	ARP	60 Who has 10.5.1.2? Tell 10.5.1.1
34	130.672627	c4:02:50:b4:00:10	c4:01:1b:7c:00:10	ARP	60 10.5.1.2 is at c4:02:50:b4:00:10

On link R2 R3

הפורט השני של 2R שואל בברודקאסט למי יש אייפי 192.168.10.1 ופורט 1/0 של 3R עונה

שהיא נמצאת אצלו בפורט השני (port 0/0)

29	111.704373	c4:02:50:b4:00:20	Broadcast	ARP	60 Who has 192.168.10.1? Tell 10.5.2.1
30	111.724595	c4:03:07:1c:00:10	c4:02:50:b4:00:20	ARP	60 192.168.10.1 is at c4:03:07:1c:00:10

on link R3 pc2

3R שואל פעמיים בברודקאסט למי שייכת הכתובת אייפי 192.168.2.254

10	72.875690	c4:03:07:1c:00:00	Broadcast	ARP	60 Who has 192.168.10.1? Tell 192.168.2.254
11	74.888272	c4:03:07:1c:00:00	Broadcast	ARP	60 Who has 192.168.10.1? Tell 192.168.2.254

13.15

בלינק r2 1r בסה"כ נבדקת כתובת המאק של הדיפולט getway של 1r שהגדרנו אותה בצורה מיידית לפורט 1/0 בr2. אם הכתובת יעד בחבילה לא בסאבנט מתחת לראוטר 1 הוא שולח ישירות לראוטר 2.

בלינק r2 r3 נשלחת הודעת ברודקאסט מפורט 2/0 בראוטר 2 השואלת למי יש את הכתובת אייפי 192.168.10.1 וזה מכיוון שהפורט מוגדר כדיפולט ולא הכתובת אייפי של הפורט ב r3

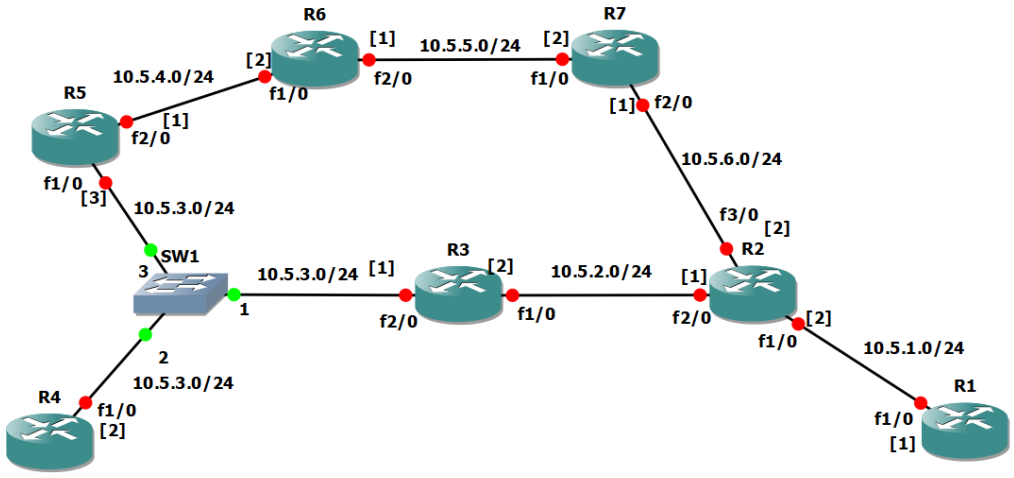
בלינק r3 pc2 שולחים פעמיים בברודקאסט שאלה למי יש כתובת איי פי 192.168.10.1 ולא מקבלים מענה.

13.16

כי לקודמים היה לאן להעביר אותה, מישהו הגיב להם, אבל אחרי שראוטר 3 שאל אף אחד לא ענה.

14. Topology 6 Configuration Topology 6

14.3



14.4

R1:

configure terminal *interface FastEthernet1/0* *ip address 10.5.1.1 255.255.255.0* *no shutdown* *end*

R2

configure terminal *interface FastEthernet1/0* *ip address 10.5.1.2 255.255.255.0* *no shutdown* *end*	*configure terminal* *interface FastEthernet2/0* *ip address 10.5.2.1 255.255.255.0* *no shutdown* *end*	*configure terminal* *interface FastEthernet3/0* *ip address 10.5.6.2 255.255.255.0* *no shutdown* *end*

R3

configure terminal *interface FastEthernet1/0* *ip address 10.5.2.2 255.255.255.0* *no shutdown* *end*	*configure terminal* *interface FastEthernet2/0* *ip address 10.5.3.1 255.255.255.0* *no shutdown* *end*

R4

```
configure terminal
interface FastEthernet1/0
ip address 10.5.3.2 255.255.255.0
no shutdown
end
```

R5

```
configure terminal
interface FastEthernet1/0
ip address 10.5.3.3 255.255.255.0
no shutdown
end
```

```
configure terminal
interface FastEthernet2/0
ip address 10.5.4.1 255.255.255.0
no shutdown
end
```

R6

```
configure terminal
interface FastEthernet1/0
ip address 10.5.4.2 255.255.255.0
no shutdown
end
```

```
configure terminal
interface FastEthernet2/0
ip address 10.5.5.1 255.255.255.0
no shutdown
end
```

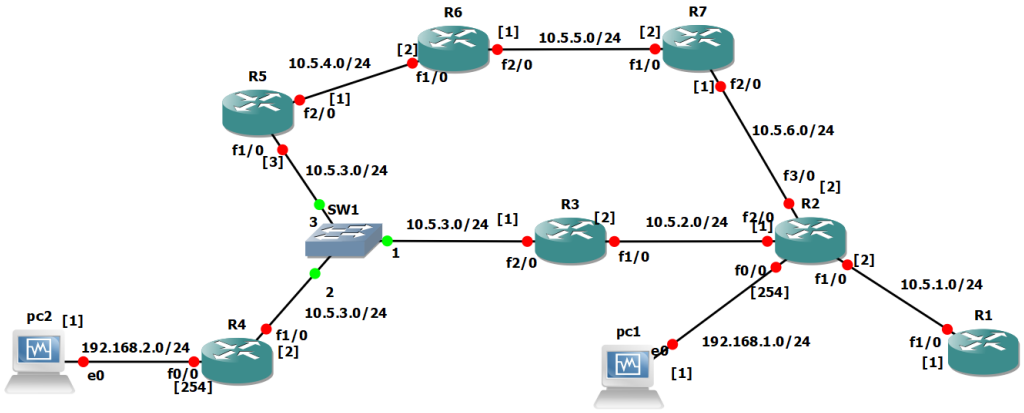
R7

```
configure terminal
interface FastEthernet1/0
ip address 10.5.5.2 255.255.255.0
no shutdown
end
```

```
configure terminal
interface FastEthernet2/0
ip address 10.5.6.1 255.255.255.0
no shutdown
end
```

15. Observing Routing Loops Topology 6.1

15.2



15.3

R2 *configure terminal* *interface FastEthernet0/0* *ip address 192.168.1.254 255.255.255.0* *no shutdown* *end*	*R4* *configure terminal* *interface FastEthernet0/0* *ip address 192.168.2.254 255.255.255.0* *no shutdown* *end*

15.4

pc1% route add default gw 192.168.1.254

pc2% route add default gw 192.168.2.254

15.5

Router	Default	Configure
R2	10.5.2.2	*configure terminal* *ip route 0.0.0.0 0.0.0.0 10.5.2.2* *end*
R3	10.5.3.3	*configure terminal* *ip route 0.0.0.0 0.0.0.0 10.5.3.3* *end*
R5	10.5.4.2	*configure terminal* *ip route 0.0.0.0 0.0.0.0 10.5.4.2* *end*
R6	10.5.5.2	*configure terminal* *ip route 0.0.0.0 0.0.0.0 10.5.5.2* *end*
R7	10.5.6.2	*configure terminal* *ip route 0.0.0.0 0.0.0.0 10.5.6.2* *end*

15.7

PC1: traceroute 192.168.2.1

```
 2  10.5.2.2 (10.5.2.2)  50.567 ms  93.061 ms  135.768 ms
 3  10.5.3.3 (10.5.3.3)  61.007 ms  72.227 ms  82.363 ms
 4  10.5.4.2 (10.5.4.2)  103.745 ms  114.217 ms  125.400 ms
 5  10.5.5.2 (10.5.5.2)  146.250 ms  157.193 ms  168.220 ms
 6  10.5.6.2 (10.5.6.2)  178.844 ms  179.328 ms  181.280 ms
 7  10.5.2.2 (10.5.2.2)  181.899 ms  170.612 ms  171.652 ms
 8  10.5.3.3 (10.5.3.3)  170.785 ms  171.542 ms  170.835 ms
 9  10.5.4.2 (10.5.4.2)  171.109 ms  170.775 ms  170.328 ms
10  10.5.5.2 (10.5.5.2)  169.174 ms  170.125 ms  170.057 ms
11  10.5.6.2 (10.5.6.2)  168.988 ms  168.424 ms  169.010 ms
12  10.5.2.2 (10.5.2.2)  169.061 ms  167.998 ms  169.414 ms
13  10.5.3.3 (10.5.3.3)  169.385 ms  169.493 ms  169.322 ms
14  10.5.4.2 (10.5.4.2)  169.860 ms  169.708 ms  170.316 ms
15  10.5.5.2 (10.5.5.2)  170.167 ms  170.357 ms  170.867 ms
16  10.5.6.2 (10.5.6.2)  171.183 ms  170.181 ms  171.083 ms
17  10.5.2.2 (10.5.2.2)  171.124 ms  168.748 ms  169.253 ms
18  10.5.3.3 (10.5.3.3)  169.604 ms  167.871 ms  169.448 ms
19  10.5.4.2 (10.5.4.2)  169.587 ms  167.815 ms  168.258 ms
20  10.5.5.2 (10.5.5.2)  168.547 ms  167.768 ms  168.352 ms
21  10.5.6.2 (10.5.6.2)  168.343 ms  167.521 ms  168.189 ms
22  10.5.2.2 (10.5.2.2)  168.686 ms  168.111 ms  169.641 ms
23  10.5.3.3 (10.5.3.3)  169.696 ms  168.892 ms  170.462 ms
24  10.5.4.2 (10.5.4.2)  169.271 ms  168.465 ms  169.989 ms
25  10.5.5.2 (10.5.5.2)  170.310 ms  169.914 ms  170.339 ms
26  10.5.6.2 (10.5.6.2)  170.236 ms  170.336 ms  170.679 ms
27  10.5.2.2 (10.5.2.2)  202.481 ms  202.441 ms  202.648 ms
28  10.5.3.3 (10.5.3.3)  202.593 ms  201.739 ms  202.474 ms
29  10.5.4.2 (10.5.4.2)  202.403 ms  202.605 ms  203.067 ms
30  10.5.5.2 (10.5.5.2)  202.217 ms  201.738 ms  202.947 ms
root@pc1:~#
```

15.9

ping –c 1 192.168.2.1

15.11

27	100.869838	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=59 (no response found!)
28	100.901763	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=54 (no response found!)
29	100.933934	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=49 (no response found!)
30	100.965617	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=44 (no response found!)
31	100.997100	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=39 (no response found!)
32	101.029585	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=34 (no response found!)
33	101.061819	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=29 (no response found!)
34	101.093351	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=24 (no response found!)
35	101.125453	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=19 (no response found!)
36	101.156967	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=14 (no response found!)
37	101.188863	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=9 (no response found!)
38	101.221161	192.168.1.1	192.168.2.1	ICMP	98	Echo (ping) request id=0x037a, seq=1/256, ttl=4 (no response found!)
39	101.253531	10.5.4.2	192.168.1.1	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

ה seq number זהה לאורך כל הדרך

15.12

ה ttl יורד כל פעם ב- 5,

15.13

כי יש הגבלה של 64 לTTL , וכאשר ה ttl יורד לאפס הפקטה מתה

15.14

כי אם יש מסלול ארוך אז סתם הפקטה תיפול מוקדם