

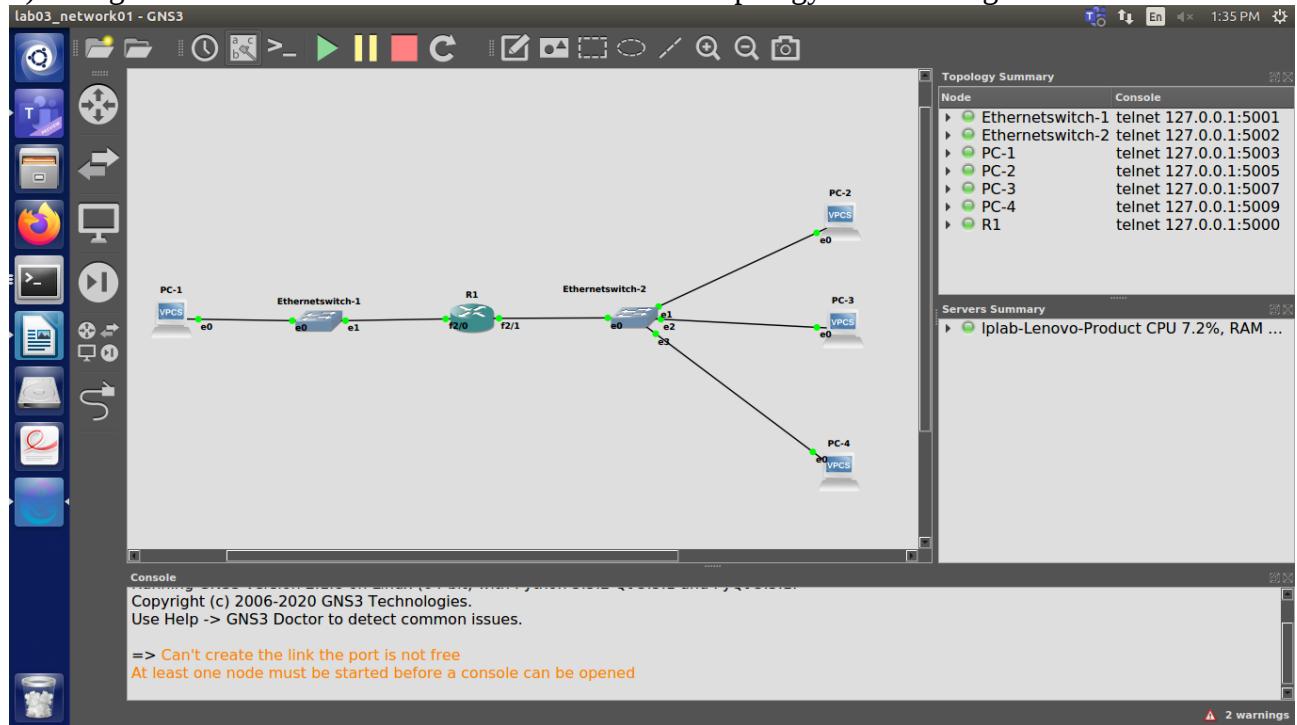
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1)Configure the hosts and the router to conform to the topology shown in Figure 5.2



2)Add Router1 as default gateway on all hosts. (PC1, PC2, PC3, andPC4).

The screenshot shows three terminal windows. The top window (PC-2) runs the command `ip 10.0.2.10/24 10.0.2.138`. The middle window (PC-3) runs `ip 10.0.2.137/29 10.0.2.138`. The bottom window (PC-4) runs `ip 10.0.2.139/24 10.0.2.138`. All three hosts are checking for duplicate addresses and setting Router1 as their gateway.

```
Press '?' to get help.  
Executing the startup file  
  
PC-2> ip 10.0.2.10/24 10.0.2.138  
Checking for duplicate address...  
PC1 : 10.0.2.10 255.255.255.0 gateway 10.0.2.138  
  
PC-2>  
  
For more information, please visit wiki.freecode.com.cn.  
  
Press '?' to get help.  
Executing the startup file  
  
PC-3> ip 10.0.2.137/29 10.0.2.138  
Checking for duplicate address...  
PC1 : 10.0.2.137 255.255.248 gateway 10.0.2.138  
  
PC-3>  
  
For more information, please visit wiki.freecode.com.cn.  
  
Press '?' to get help.  
Executing the startup file  
  
PC-4> ip 10.0.2.139/24 10.0.2.138  
Checking for duplicate address...  
PC1 : 10.0.2.139 255.255.255.0 gateway 10.0.2.138  
  
PC-4>
```

(3) Issue ping commands from PC1

```
PC-1> ping 10.0.2.139
10.0.2.139 icmp_seq=1 timeout
84 bytes from 10.0.2.139 icmp_seq=2 ttl=63 time=20.224 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=63 time=14.410 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=63 time=15.135 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=63 time=14.669 ms
```

```
PC-1> █
```

- i) Clear the ARP table on all PCs.

The image shows three terminal windows against a blue background. Each window has a title bar labeled 'Terminal'.

- PC-1 Terminal:** Displays the output of a 'ping' command to 10.0.2.139. It shows five successful echo replies with varying round-trip times (20.224 ms, 14.410 ms, 15.135 ms, 14.669 ms). Below the ping output, the command 'clear arp' is entered and executed.
- PC-2 Terminal:** Shows the execution of a startup file. It performs an IP configuration (ip 10.0.2.10/24 10.0.2.138) and checks for duplicate addresses. It then executes 'clear arp'.
- PC-3 Terminal:** Similar to PC-2, it executes a startup file, configures its IP (ip 10.0.2.137/29 10.0.2.138), checks for duplicates, and clears its ARP table.
- PC-4 Terminal:** Similar to the others, it executes a startup file, configures its IP (ip 10.0.2.139/24 10.0.2.138), checks for duplicates, and clears its ARP table.

- ii) Start Wireshark on PC1 and on PC3, and set the capture filter to capture ICMP and ARP packets only.

arp or icmp

No.	Time	Source	Destination	Protocol	Length	Info
2	2020-12-14 13:46:04.032765	Private_66:68:..	Broadcast	ARP	64	Who has 10.0.1.10 Tell 10.0.1.10 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
3	2020-12-14 13:46:04.036669	ca:01:0f:a4:00:..	Private_66:68:..	ARP	60	10.0.1.1 is at ca:01:0f:a4:00:08
4	2020-12-14 13:46:04.036972	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) request id=0x41f, seq=1/256, ttl=64 (no response found!)
5	2020-12-14 13:46:06.037775	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) request id=0x41f, seq=2/512, ttl=64 (reply in 6)
6	2020-12-14 13:46:06.057958	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) reply id=0x41f, seq=2/512, ttl=63 (request in 5)
7	2020-12-14 13:46:07.058962	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) request id=0x41f, seq=3/768, ttl=64 (reply in 8)
8	2020-12-14 13:46:07.073865	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) reply id=0x41f, seq=3/768, ttl=63 (request in 7)
9	2020-12-14 13:46:08.074833	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) request id=0x41f, seq=4/1024, ttl=64 (reply in 10)
10	2020-12-14 13:46:08.093663	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) reply id=0x41f, seq=4/1024, ttl=63 (request in 9)
11	2020-12-14 13:46:09.095042	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) request id=0x41f, seq=5/1280, ttl=64 (reply in 12)
12	2020-12-14 13:46:09.111266	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) reply id=0x41f, seq=5/1280, ttl=63 (request in 11)

Terminal

```
PC1 : 10.0.1.10 255.255.255.0 gateway 10.0.1.1

PC-1> ping 10.0.2.139
10.0.2.139 icmp_seq=1 timeout
84 bytes from 10.0.2.139 icmp_seq=2 ttl=63 time=20.224 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=63 time=14.410 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=63 time=15.135 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=63 time=14.669 ms

Frame 2: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface 64
Ethernet II, Src: Private_66:68:00 (00:0c:29:66:68:00)
Internet Protocol Version 4, Src: 10.0.1.10 (10.0.1.10), Dst: 10.0.2.137 (10.0.2.137)
Address Resolution Protocol (request)
PC-1> clear arp

PC-1> ping 10.0.2.137
10.0.2.137 icmp_seq=1 timeout
84 bytes from 10.0.2.137 icmp_seq=2 ttl=63 time=20.388 ms
84 bytes from 10.0.2.137 icmp_seq=3 ttl=63 time=15.178 ms
84 bytes from 10.0.2.137 icmp_seq=4 ttl=63 time=19.299 ms
84 bytes from 10.0.2.137 icmp_seq=5 ttl=63 time=16.665 ms

0000 ff ff ff ff ff ff 00 50 79 66 68 00
0010 00 00 00 04 00 01 00 50 79 66 68 00
0020 ff ff ff ff ff ff 00 00 01 01 00 00
0030 00 00 00 00 00 00 00 00 00 00 00 00
PC-1>
PC-1>
```

Packets: 12 - Displayed: 11 (91.7%) Profile: Default

arp or icmp

No.	Time	Source	Destination	Protocol	Length	Info
2	2020-12-14 13:47:19.984829	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) request id=0x8ff, seq=1/256, ttl=64 (reply in 3)
3	2020-12-14 13:47:20.003769	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) reply id=0x8ff, seq=1/256, ttl=63 (request in 2)
4	2020-12-14 13:47:21.004865	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) request id=0x91f, seq=2/512, ttl=64 (reply in 5)
5	2020-12-14 13:47:21.019728	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) reply id=0x91f, seq=2/512, ttl=63 (request in 4)
6	2020-12-14 13:47:22.020840	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) request id=0x92f, seq=3/768, ttl=64 (reply in 7)
7	2020-12-14 13:47:22.035469	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) reply id=0x92f, seq=3/768, ttl=63 (request in 6)
8	2020-12-14 13:47:23.036767	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) request id=0x93f, seq=4/1024, ttl=64 (reply in 9)
9	2020-12-14 13:47:23.055917	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) reply id=0x93f, seq=4/1024, ttl=63 (request in 8)
10	2020-12-14 13:47:24.056992	10.0.2.137	10.0.1.10	ICMP	98	Echo (ping) request id=0x94f, seq=5/1280, ttl=64 (reply in 11)
11	2020-12-14 13:47:24.071997	10.0.1.10	10.0.2.137	ICMP	98	Echo (ping) reply id=0x94f, seq=5/1280, ttl=63 (request in 10)

Terminal

```
PC-3> ping 10.0.1.10
84 bytes from 10.0.1.10 icmp_seq=1 ttl=63 time=19.218 ms
84 bytes from 10.0.1.10 icmp_seq=2 ttl=63 time=15.048 ms
84 bytes from 10.0.1.10 icmp_seq=3 ttl=63 time=14.858 ms
84 bytes from 10.0.1.10 icmp_seq=4 ttl=63 time=19.535 ms
84 bytes from 10.0.1.10 icmp_seq=5 ttl=63 time=15.244 ms

Frame 2: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: Private_66:68:02 (00:0c:29:66:68:02), Dst: ca:01:0f:a4:00:39 (ca:01:0f:a4:00:39)
Internet Protocol Version 4, Src: 10.0.2.137, Dst: 10.0.1.10
Internet Control Message Protocol
```

PC-3>

Packets: 11 - Displayed: 10 (90.9%) Profile: Default

- iii) Issue a ping command from PC1 to PC3 for at least two sends (-c2).

```
PC-1> ping 10.0.2.137
10.0.2.137 icmp_seq=1 timeout
84 bytes from 10.0.2.137 icmp_seq=2 ttl=63 time=20.388 ms
84 bytes from 10.0.2.137 icmp_seq=3 ttl=63 time=15.178 ms
84 bytes from 10.0.2.137 icmp_seq=4 ttl=63 time=19.299 ms
84 bytes from 10.0.2.137 icmp_seq=5 ttl=63 time=16.665 ms
```

iv) Save the output of the ping command at PC1 and the output of Wireshark on PC1 and PC3.

No.	Time	Source	Destination	Protocol	Length	Info
2	2020-12-14 12:46:04.002765	Private_66:68:..	Broadcast	ARP	64	61 Who has 10.0.1.1? Tell 10.0.1.1:0 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
3	2020-12-14 12:46:04.003660	ca:01:0f:a4:00:39	Private_66:68:..	ARP	60	10.0.1.1 is at ca:01:0f:a4:00:39
4	2020-12-14 12:46:04.003672	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) request id=0x41ff, seq=1/256, ttl=64 (no response found!)
5	2020-12-14 12:46:06.003775	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) request id=0x461f, seq=2/512, ttl=64 (reply in 6)
6	2020-12-14 12:46:06.005708	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) reply id=0x461f, seq=2/512, ttl=63 (request in 5)
7	2020-12-14 12:46:07.005802	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) request id=0x471f, seq=3/768, ttl=64 (reply in 8)
8	2020-12-14 12:46:07.073865	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) reply id=0x471f, seq=3/768, ttl=63 (request in 7)
9	2020-12-14 12:46:09.074832	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) request id=0x481f, seq=4/1024, ttl=64 (reply in 10)
10	2020-12-14 12:46:09.093662	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) reply id=0x481f, seq=4/1024, ttl=63 (request in 9)
11	2020-12-14 13:46:00.009504	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) request id=0x491f, seq=5/1280, ttl=64 (reply in 12)
12	2020-12-14 13:46:00.111206	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) reply id=0x491f, seq=5/1280, ttl=63 (request in 11)

PC1 : 10.0.1.10 255.255.255.0 gateway 10.0.1.1

```

PC-1> ping 10.0.2.139
10.0.2.139 icmp_seq=1 timeout
84 bytes from 10.0.2.139 icmp_seq=2 ttl=63 time=20.224 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=63 time=14.410 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=63 time=15.135 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=63 time=14.669 ms

Frame 2: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface 0
Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:02), Dst: ca:01:0f:a4:00:39 (ca:01:0f:a4:00:39)
Address Resolution Protocol (request)
PC-1> clear arp

PC-1> ping 10.0.2.137
10.0.2.137 icmp_seq=1 timeout
84 bytes from 10.0.2.137 icmp_seq=2 ttl=63 time=20.388 ms
84 bytes from 10.0.2.137 icmp_seq=3 ttl=63 time=15.178 ms
84 bytes from 10.0.2.137 icmp_seq=4 ttl=63 time=19.299 ms
84 bytes from 10.0.2.137 icmp_seq=5 ttl=63 time=16.665 ms

```

PC-1> PC-1>

No.	Time	Source	Destination	Protocol	Length	Info
2	2020-12-14 13:47:10.004820	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) request id=0x8ffff, seq=1/256, ttl=64 (reply in 3)
3	2020-12-14 13:47:20.003760	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) reply id=0x8ffff, seq=1/256, ttl=63 (request in 2)
4	2020-12-14 13:47:21.004865	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) request id=0x901f, seq=2/512, ttl=64 (reply in 5)
5	2020-12-14 13:47:22.004728	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) reply id=0x911f, seq=2/512, ttl=63 (request in 4)
6	2020-12-14 13:47:22.020840	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) request id=0x921f, seq=3/768, ttl=64 (reply in 7)
7	2020-12-14 13:47:22.035469	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) reply id=0x921f, seq=3/768, ttl=63 (request in 6)
8	2020-12-14 13:47:23.036767	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) request id=0x931f, seq=4/1024, ttl=64 (reply in 9)
9	2020-12-14 13:47:23.055917	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) reply id=0x931f, seq=4/1024, ttl=63 (request in 8)
10	2020-12-14 13:47:24.056592	10.0.2.137	10.0.1.10	ICMP	08	Echo (ping) request id=0x941f, seq=5/1280, ttl=64 (reply in 11)
11	2020-12-14 13:47:24.071997	10.0.1.10	10.0.2.137	ICMP	08	Echo (ping) reply id=0x941f, seq=5/1280, ttl=63 (request in 10)

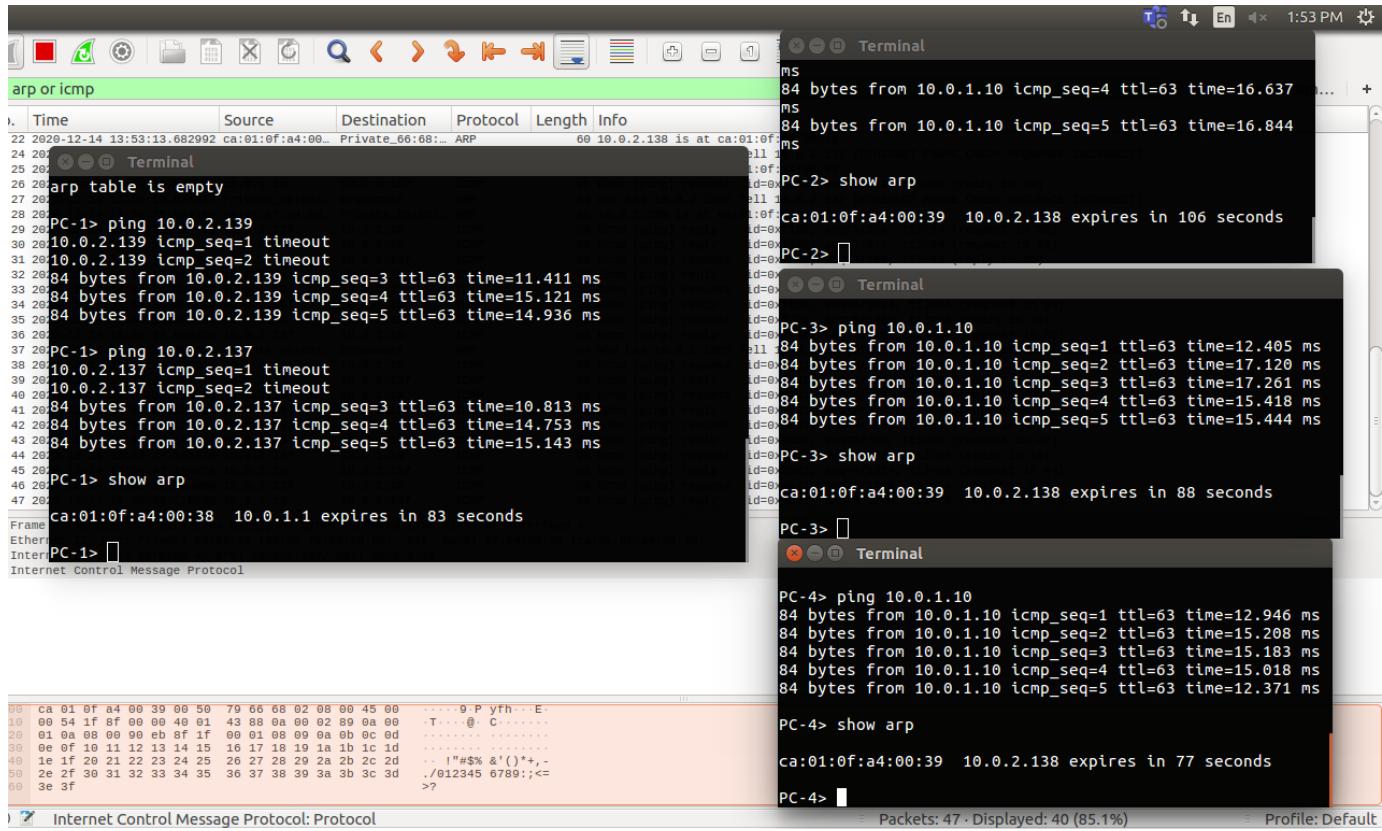
PC-3> ping 10.0.1.10
84 bytes from 10.0.1.10 icmp\_seq=1 ttl=63 time=19.218 ms
84 bytes from 10.0.1.10 icmp\_seq=2 ttl=63 time=15.048 ms
84 bytes from 10.0.1.10 icmp\_seq=3 ttl=63 time=14.858 ms
84 bytes from 10.0.1.10 icmp\_seq=4 ttl=63 time=19.535 ms
84 bytes from 10.0.1.10 icmp\_seq=5 ttl=63 time=15.244 ms

PC-3>

No.	Time	Source	Destination	Protocol	Length	Info
0000	ca:01:0f:a4:00:50	10.0.2.137	10.0.1.10	ICMP	08	9 P yrh E
0010	00:54:1f:87:00:49	10.0.1.10	10.0.2.137	ICMP	08	T @ C .....
0020	00:00:00:00:00:00	10.0.2.137	10.0.1.10	ICMP	08	.....
0030	0e:0f:10:11:12:13	10.0.2.137	10.0.1.10	ICMP	08	.....
0040	1e:0f:20:21:22:23	10.0.2.137	10.0.1.10	ICMP	08	!#\$% &()*)+,-
0050	2e:2f:30:31:32:33	10.0.2.137	10.0.1.10	ICMP	08	./012345 6789:;<=
0060	3e:3f:00:00:00:00	10.0.2.137	10.0.1.10	ICMP	08	>?

PC-3> Internet Control Message Protocol: Protocol

(4) Save the ARP tables, routing tables, and routing caches of each host.



(5) Issue ping commands from PC3 to PC4

```
PC-3> ping 10.0.2.139
84 bytes from 10.0.2.139 icmp_seq=1 ttl=64 time=0.295 ms
84 bytes from 10.0.2.139 icmp_seq=2 ttl=64 time=0.368 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=64 time=0.400 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=64 time=0.405 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=64 time=0.379 ms

PC-3> █
```

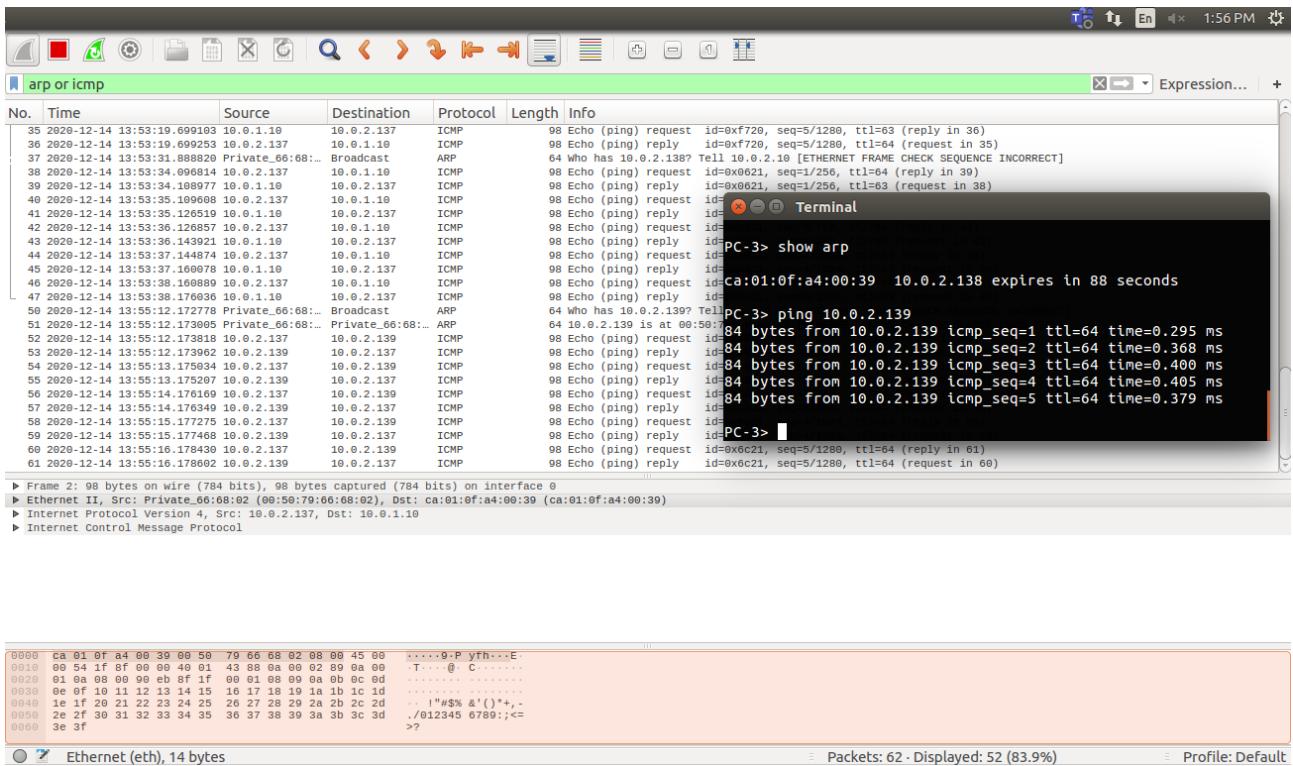
i) Clear the ARP table on all PCs.

The image shows four terminal windows side-by-side, each representing a different computer (PC1, PC2, PC3, and PC4) running a terminal application. Each window displays the results of a series of network configuration and diagnostic commands.

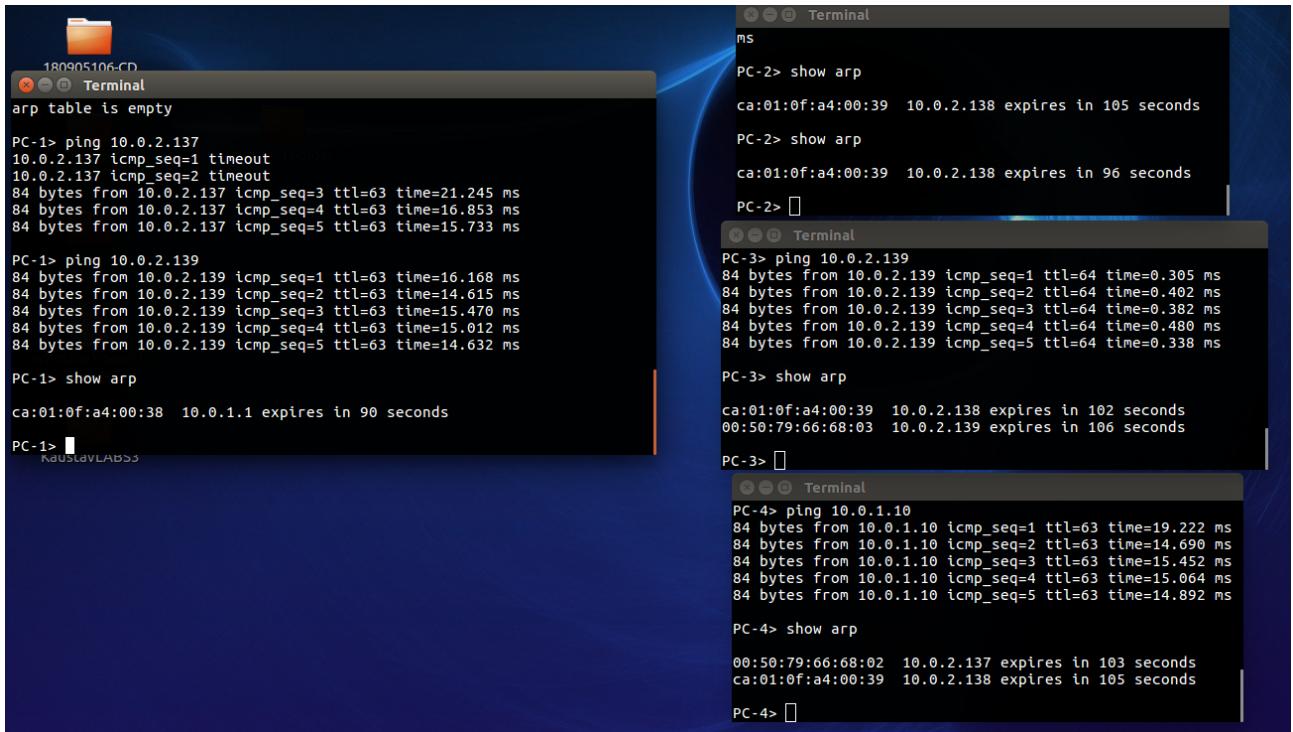
- PC1 Terminal:** Shows the execution of 'ip' and 'ping' commands. It includes output for 'ip 10.0.1.10/24 10.0.1.1' and 'ping 10.0.2.139'. The user also runs 'clear arp'.
- PC2 Terminal:** Shows the execution of 'ip' and 'clear arp' commands. It includes output for 'ip 10.0.2.10/24 10.0.2.138' and 'clear arp'.
- PC3 Terminal:** Shows the execution of 'ip' and 'clear arp' commands. It includes output for 'ip 10.0.2.137/29 10.0.2.138' and 'clear arp'.
- PC4 Terminal:** Shows the execution of 'ip' and 'clear arp' commands. It includes output for 'ip 10.0.2.139/24 10.0.2.138' and 'clear arp'.

In all terminals, the user has run 'clear arp' after performing other network operations. The terminals are part of a Kali Linux desktop environment, as indicated by the background and window title bar.

- ii) Start Wireshark on PC3, and set the capture filter to capture ICMP and ARP packets only.



- iii) Check the ARP table, routing table, and routing cache of each host.



Issue a ping command from PC3 to PC4 for at least three sends (-c 3). Save the output of the ping command and the output of Wireshark on PC3. Save the ARP table, routing table, and routing cache of PC3. Please note that these are the table entries from Step 4 after the ping commands are issued.

```
PC-3> ping 10.0.2.139
84 bytes from 10.0.2.139 icmp_seq=1 ttl=64 time=0.331 ms
84 bytes from 10.0.2.139 icmp_seq=2 ttl=64 time=0.339 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=64 time=0.402 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=64 time=0.425 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=64 time=0.409 ms
```

```
PC-3> [REDACTED]
Terminal
Executing the startup file

PC-4> ip 10.0.2.139/24 10.0.2.138
Checking for duplicate address...
PC1 : 10.0.2.139 255.255.255.0 gateway 10.0.2.138

PC-4> clear arp

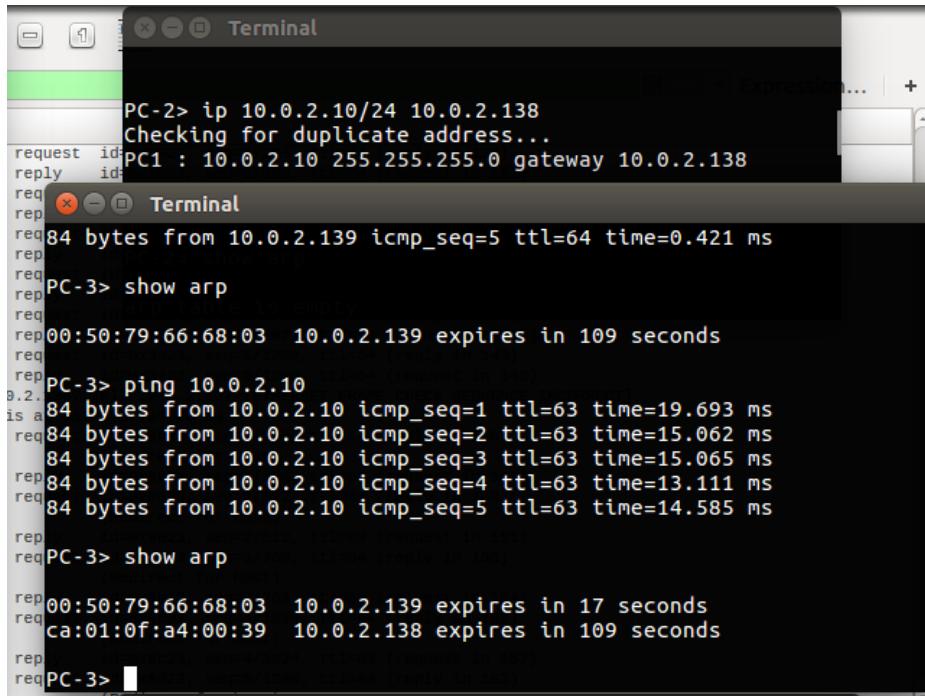
PC-4> show arp

arp table is empty
```

Time	Date	Source IP	Destination IP	Protocol	
99	2020-12-14	14:00:05.645834	10.0.2.137	10.0.2.139	ICMP
1...	2020-12-14	14:00:05.645997	10.0.2.139	10.0.2.137	ICMP
1...	2020-12-14	14:00:06.647025	10.0.2.137	10.0.2.139	ICMP
1...	2020-12-14	14:00:06.647190	10.0.2.139	10.0.2.137	ICMP
1...	2020-12-14	14:00:07.648196	10.0.2.137	10.0.2.139	ICMP
1...	2020-12-14	14:00:07.648407	10.0.2.139	10.0.2.137	ICMP
1...	2020-12-14	14:00:08.649397	10.0.2.137	10.0.2.139	ICMP
1...	2020-12-14	14:00:08.649577	10.0.2.139	10.0.2.137	ICMP
1...	2020-12-14	14:00:09.650533	10.0.2.137	10.0.2.139	ICMP
1...	2020-12-14	14:00:09.650743	10.0.2.139	10.0.2.137	ICMP

```
> Frame 2: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
> Ethernet II, Src: Private_66:68:02 (00:50:79:66:68:02), Dst: ca:01:0f:a4:00:39 (ca:
> Internet Protocol Version 4, Src: 10.0.2.137, Dst: 10.0.1.10
> Internet Control Message Protocol
```

- Repeat Step 4, but this time issues a ping from PC3 to PC2. Note that once an entry is made in the routing cache, you cannot repeat the previous experiment to obtain the same results. You have to wait until the routing cache is reset or you can delete all the routing caches on all devices.

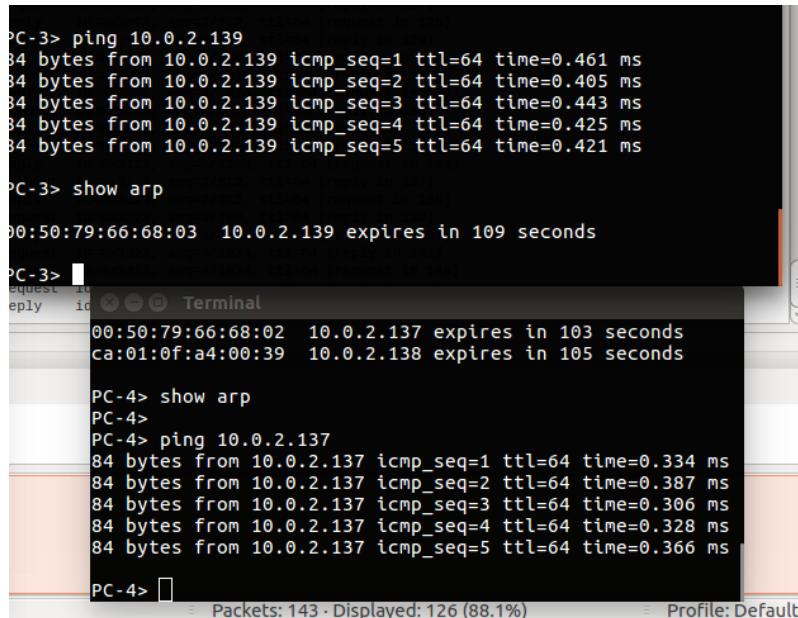


The screenshot shows two terminal windows. The top window is titled 'Terminal' and shows the command 'ip 10.0.2.10/24 10.0.2.138' being issued on PC-2. It also displays the output of 'show arp' which includes an entry for PC1 with MAC address 00:50:79:66:68:03. The bottom window is also titled 'Terminal' and shows the command 'ping 10.0.2.10' on PC-3. The output shows five ICMP echo replies from PC1, each with a different sequence number (seq=1 to seq=5) and increasing time values (from 0.421 ms to 19.693 ms). The ping command is then repeated, and the output shows the same five replies again, indicating that the previous entries in the routing cache are still valid.

```

PC-2> ip 10.0.2.10/24 10.0.2.138
Checking for duplicate address...
request id:PC1 : 10.0.2.10 255.255.255.0 gateway 10.0.2.138
req rep
req rep
req rep
req PC-3> show arp
req rep
req rep 00:50:79:66:68:03 10.0.2.139 expires in 109 seconds
req rep
req rep PC-3> ping 10.0.2.10
req rep 84 bytes from 10.0.2.10 icmp_seq=1 ttl=63 time=19.693 ms
req rep 84 bytes from 10.0.2.10 icmp_seq=2 ttl=63 time=15.062 ms
req rep 84 bytes from 10.0.2.10 icmp_seq=3 ttl=63 time=15.065 ms
req rep 84 bytes from 10.0.2.10 icmp_seq=4 ttl=63 time=13.111 ms
req rep 84 bytes from 10.0.2.10 icmp_seq=5 ttl=63 time=14.585 ms
req rep
req PC-3> show arp
req rep
req rep 00:50:79:66:68:03 10.0.2.139 expires in 17 seconds
req rep ca:01:0f:a4:00:39 10.0.2.138 expires in 109 seconds
req rep
req PC-3>

```



The screenshot shows three terminal windows. The first window (PC-3) shows a ping to 10.0.2.139 and a 'show arp' command. The second window (PC-4) shows a 'show arp' command. The third window (PC-4) shows a ping to 10.0.2.137. The output for the ping shows five ICMP echo replies from PC3, each with a different sequence number (seq=1 to seq=5) and increasing time values (from 0.334 ms to 0.387 ms). The ping command is then repeated, and the output shows the same five replies again, indicating that the previous entries in the routing cache are still valid.

```

PC-3> ping 10.0.2.139
84 bytes from 10.0.2.139 icmp_seq=1 ttl=64 time=0.461 ms
84 bytes from 10.0.2.139 icmp_seq=2 ttl=64 time=0.405 ms
84 bytes from 10.0.2.139 icmp_seq=3 ttl=64 time=0.443 ms
84 bytes from 10.0.2.139 icmp_seq=4 ttl=64 time=0.425 ms
84 bytes from 10.0.2.139 icmp_seq=5 ttl=64 time=0.421 ms

PC-3> show arp
00:50:79:66:68:03 10.0.2.139 expires in 109 seconds

PC-3> [REDACTED]
request id: Terminal
reply id: [REDACTED]
00:50:79:66:68:02 10.0.2.137 expires in 103 seconds
ca:01:0f:a4:00:39 10.0.2.138 expires in 105 seconds

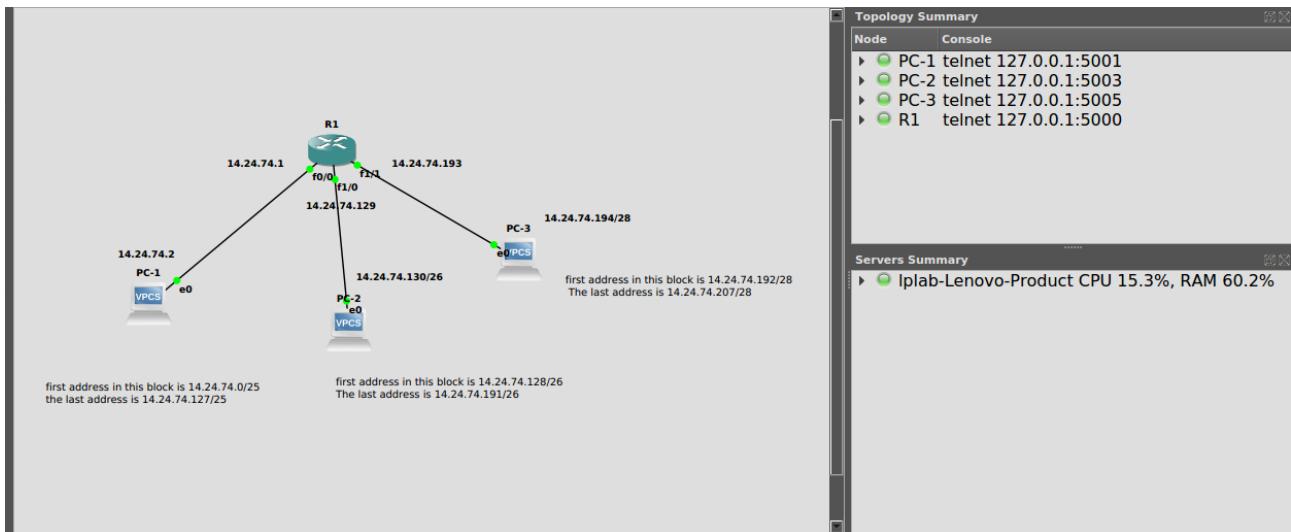
PC-4> show arp
PC-4>
PC-4> ping 10.0.2.137
84 bytes from 10.0.2.137 icmp_seq=1 ttl=64 time=0.334 ms
84 bytes from 10.0.2.137 icmp_seq=2 ttl=64 time=0.387 ms
84 bytes from 10.0.2.137 icmp_seq=3 ttl=64 time=0.306 ms
84 bytes from 10.0.2.137 icmp_seq=4 ttl=64 time=0.328 ms
84 bytes from 10.0.2.137 icmp_seq=5 ttl=64 time=0.366 ms

PC-4> [REDACTED]

```

## PART 3 SUBNETTING

**Q2.** An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets: one subblock of 10 addresses, one subblock of 60 addresses, and one subblock of 120 addresses. Design the subblocks. Use the topology shown below.



```
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

Welcome to Virtual PC Simulator, version 0.6.1
Dedicated to Daling.
Build time: Apr  3 2018 13:45:00
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC-1> ip 14.24.74.2/25 14.24.74.1
Checking for duplicate address...
PC1 : 14.24.74.2 255.255.255.128 gateway 14.24.74.1

PC-1> ping 14.24.74.194
14.24.74.194 icmp_seq=1 timeout
14.24.74.194 icmp_seq=2 timeout
84 bytes from 14.24.74.194 icmp_seq=3 ttl=63 time=17.908 ms
84 bytes from 14.24.74.194 icmp_seq=4 ttl=63 time=15.740 ms
84 bytes from 14.24.74.194 icmp_seq=5 ttl=63 time=15.625 ms

PC-1>
```

```
R1
*Dec 14 14:56:32.007: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/1 Physical Port Administra
tive State Down
*Dec 14 14:56:33.007: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1
, changed state to up
R1(config-if)#^Z
R1#sho
*Dec 14 14:56:36.675: %SYS-5-CONFIG_I: Configured from console by console
R1#sho
R1#show ip in
R1#show ip interface bri
R1#show ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/0    14.24.74.1     YES manual up       up
FastEthernet1/0    14.24.74.129   YES manual up       up
FastEthernet1/1    14.24.74.193   YES manual up       up
FastEthernet2/0    unassigned     YES unset administratively down down
R1#
```

Terminal

```
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC-2> ip 14.24.74.130/26 14.24.74.129
Checking for duplicate address...
PC1 : 14.24.74.130 255.255.255.128 gateway 14.24.74.129
```

Terminal

```
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

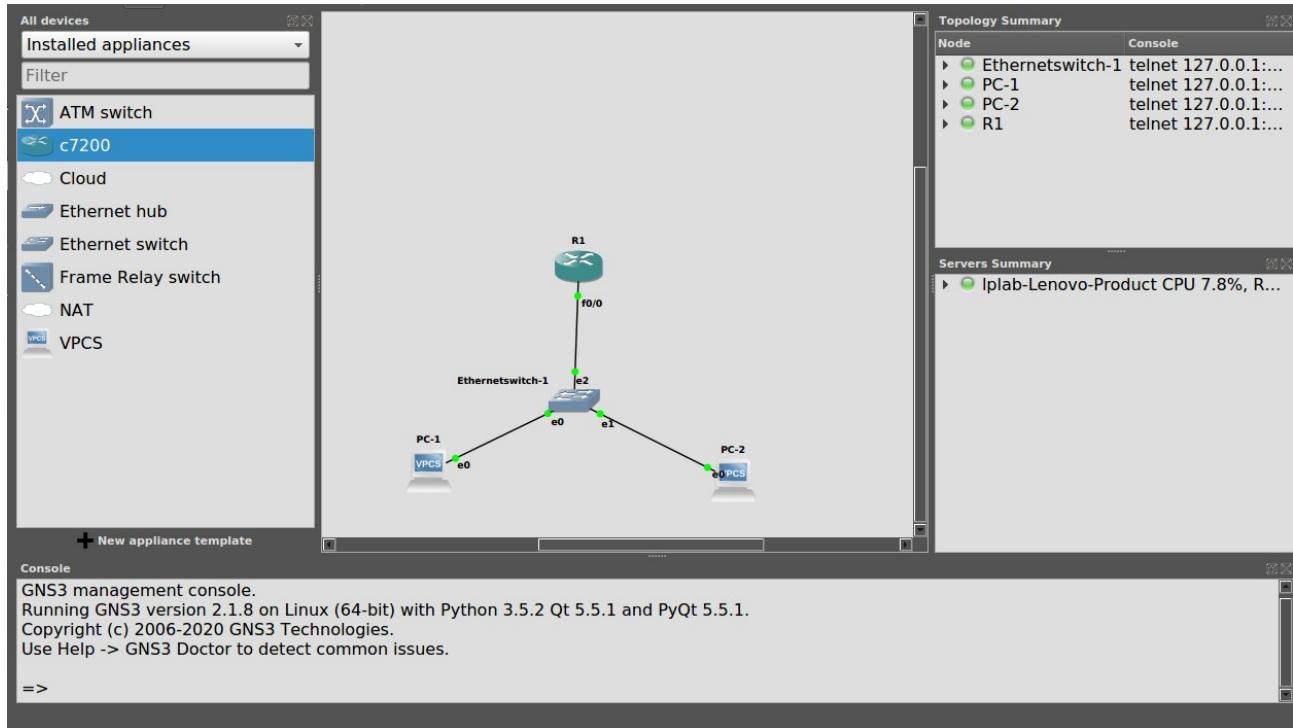
Press '?' to get help.

Executing the startup file

PC-3> ip 14.24.74.194/28 14.24.74.193
Checking for duplicate address...
PC1 : 14.24.74.194 255.255.255.240 gateway 14.24.74.193
```

## Q 7.1

Configure two VMs that will be used to test connectivity from end to end and R1 will serve as a DHCP server to distribute IP addresses. The diagram below details the current setup:



```

R1
*Dec 14 16:02:57.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to down
*Dec 14 16:02:57.303: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1, changed state to down
*Dec 14 16:02:57.335: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/2, changed state to down
*Dec 14 16:02:57.339: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/3, changed state to down
R1#
R1#
R1#
R1#
R1#down
Translating "down"
Translating "down"
% Unknown command or computer name, or unable to find computer address
R1#ena
R1#enable
R1#conf t
R1#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip add
R1(config)#int f0/0
R1(config-if)#ip add
R1(config-if)#ip address 192.168.3.1 255.255.255.0
R1(config-if)#no shu
R1(config-if)#no shutdown
R1(config-if)#
*Dec 14 16:05:11.523: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Dec 14 16:05:11.523: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 14 16:05:12.523: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#ip dhcp pool pool1
R1(dhcp-config)#network 192.168.3.0 255.255.255.0
R1(dhcp-config)#default-
R1(dhcp-config)#default-router 192.168.3.1
R1(dhcp-config)#

```

**Terminal**

```

Welcome to Virtual PC Simulator, version 0.6.1
Dedicated to Daling.
Build time: Apr 3 2018 13:45:00
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" license.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.
Executing the startup file

```

**Terminal**

```

PC-2> dhcp
DDORA IP 192.168.3.3/24 GW 192.168.3.1
PC-2>

```

## WIRESHARK RESULTS

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x74df406c
2	0.035237	ca:01:19:ef:00:08	Broadcast	ARP	60	Who has 192.168.3.2? Tell 192.168.3.1
3	1.000098	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x74df406c
4	5.000257	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
5	6.000786	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
6	7.001318	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
7	12.694438	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
8	53.375974	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0xfe33236b
9	53.380266	ca:01:19:ef:00:08	Broadcast	ARP	60	Who has 192.168.3.3? Tell 192.168.3.1
10	54.376064	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0xfe33236b
11	55.100870	192.168.3.1	192.168.3.3	DHCP	342	DHCP Offer - Transaction ID 0xfe33236b
12	55.100942	192.168.3.1	192.168.3.3	DHCP	342	DHCP Offer - Transaction ID 0xfe33236b
13	57.376145	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0xfe33236b
14	57.384893	192.168.3.1	192.168.3.3	DHCP	342	DHCP ACK - Transaction ID 0xfe33236b
15	58.376269	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
16	59.377204	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
17	60.377617	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
18	74.683273	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
19	137.169725	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
20	199.901450	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
21	262.467121	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
22	324.977808	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
23	387.510769	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
24	450.234602	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
25	507.531115	ca:01:19:ef:00:08	DEC-MOP-Remote-Console	0x6002	77	DEC DNA Remote Console
26	512.743088	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x74df406c
2	0.035237	ca:01:19:ef:00:08	Broadcast	ARP	60	Who has 192.168.3.2? Tell 192.168.3.1
3	1.000098	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x74df406c
4	5.000257	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
5	6.000786	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
6	7.001318	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.2 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
7	12.694438	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
8	53.375974	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0xfe33236b
9	53.380266	ca:01:19:ef:00:08	Broadcast	ARP	60	Who has 192.168.3.3? Tell 192.168.3.1
10	54.376064	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0xfe33236b
11	55.100870	192.168.3.1	192.168.3.3	DHCP	342	DHCP Offer - Transaction ID 0xfe33236b
12	55.100942	192.168.3.1	192.168.3.3	DHCP	342	DHCP Offer - Transaction ID 0xfe33236b
13	57.376145	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0xfe33236b
14	57.384893	192.168.3.1	192.168.3.3	DHCP	342	DHCP ACK - Transaction ID 0xfe33236b
15	58.376269	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
16	59.377204	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
17	60.377617	Private_66:68:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.3.3 (Request) [ETHERNET FRAME CHECK SEQUENCE IN...]
18	74.683273	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
19	137.169725	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
20	199.901450	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
21	262.467121	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
22	324.977808	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
23	387.510769	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
24	450.234602	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0
25	507.531115	ca:01:19:ef:00:08	DEC-MOP-Remote-Console	0x6002	77	DEC DNA Remote Console
26	512.743088	ca:01:19:ef:00:08	CDP/VTP/DTP/PAgP/UDLD	CDP	338	Device ID: R1 Port ID: FastEthernet0/0

## Q 7.2 Configure DHCP server at R1 for the PART 2 Q2 Subnet configuration and topology.

```
R1#  
R1#  
R1#  
R1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
R1(config)#int f0/0  
R1(config-if)#ip add  
R1(config-if)#ip address 14.24.74.1 255.255.255.128  
R1(config-if)#no shut  
R1(config-if)#  
*Dec 14 16:45:26.431: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up  
R1(config-if)#  
*Dec 14 16:45:26.431: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down  
*Dec 14 16:45:27.431: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up  
R1(config-if)#exit  
R1(config)#ip dhcp pool pool1  
R1(dhcp-config)#network 14.24.74.0 255.255.255.128  
R1(dhcp-config)#def  
R1(dhcp-config)#default-router 14.24.74.1  
R1(dhcp-config)#exit  
R1(config)#int f0/1  
      ^  
% Invalid input detected at '^' marker.  
  
R1(config)#int f1/0  
R1(config-if)# ip add  
R1(config-if)# ip address 14.24.74.129 255.255.255.192  
      ^  
% Invalid input detected at '^' marker.  
  
R1(config-if)# ip address 14.24.74.129 255.255.255.192  
R1(config-if)#no shut  
R1(config-if)#  
*Dec 14 16:51:00.739: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up  
R1(config-if)#  
*Dec 14 16:51:00.739: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down  
*Dec 14 16:51:01.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
```

R1

```
R1(config-if)# ip address 14.24.74.129 255.255.255.192
R1(config-if)#no shut
R1(config-if)#
*Dec 14 16:51:00.739: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R1(config-if)#
*Dec 14 16:51:00.739: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 14 16:51:01.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#ip dhx
R1(config)#ip dhcp pool pool2
R1(dhcp-config)#defau
R1(dhcp-config)#net
R1(dhcp-config)#network 14.24.74.128 255.255.255.192
R1(dhcp-config)#def
R1(dhcp-config)#default-router 14.24.74.129
R1(dhcp-config)#exit
R1(config)#int f1/1
R1(config-if)#ip addre
R1(config-if)#ip address 14.24.74.193 255.255.255.240
R1(config-if)#no shut
R1(config-if)#exit
*Dec 14 16:52:48.499: %LINK-3-UPDOWN: Interface FastEthernet1/1, changed state to up
R1(config-if)#exit
*Dec 14 16:52:48.499: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/1 Physical Port Administrative State Down
*Dec 14 16:52:49.499: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1, changed state to up
R1(config-if)#exit
R1(config)#ip dhcp pool pool3
R1(dhcp-config)#netwoi
R1(dhcp-config)#netwo
R1(dhcp-config)#network 14.24.74.192 255.255.255.240
R1(dhcp-config)#def
R1(dhcp-config)#default-router 14.24.74.193
R1(dhcp-config)#exit
R1(config)#exit
R1#
```

Terminal

```
PC-1> dhcp
DsORA IP 14.24.74.2/25 GW 14.24.74.1

PC-1> show ip

NAME      : PC-1[1]
IP/MASK   : 14.24.74.2/25
GATEWAY   : 14.24.74.1
DNS       :
DHCP SERVER : 14.24.74.1
DHCP LEASE  : 86397, 86400/43200/75600
MAC        : 00:50:79:66:68:02
LPORT      : 10000
RHOST:PORT : 127.0.0.1:10001
MTU:       : 1500

PC-1>
```

Terminal

```
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC-2> dhcp
DsORA IP 14.24.74.130/26 GW 14.24.74.129

PC-2> show ip

NAME      : PC-2[1]
IP/MASK   : 14.24.74.130/26
GATEWAY   : 14.24.74.129
DNS       :
DHCP SERVER : 14.24.74.129
DHCP LEASE  : 86397, 86400/43200/75600
MAC        : 00:50:79:66:68:00
LPORT      : 10004
RHOST:PORT : 127.0.0.1:10005
MTU:       : 1500

PC-2>
```

```
Terminal  
Press '?' to get help.  
Executing the startup file /etc/xdg/autostart/freecode.com.desktop  
PC-3> dhcp  
DDORRR  
Can't get ip address from dhcp server  
PC-3> show ip  
NAME : PC-3[1]  
IP/MASK : 0.0.0.0/0  
GATEWAY : 0.0.0.0  
DNS :  
DHCP SERVER : 14.24.74.193  
DHCP LEASE : 0, 0/0/0  
MAC : 00:50:79:66:68:01  
LPORT : 10002  
RHOST:PORT : 127.0.0.1:10003  
MTU : 1500  
PC-3> █
```