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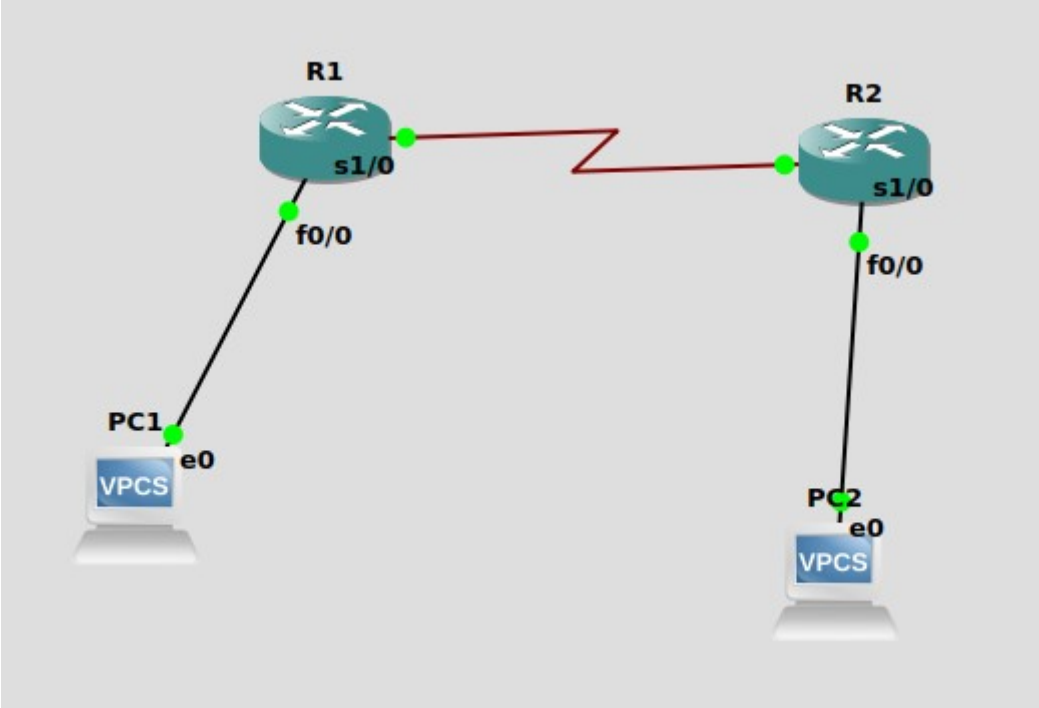
Lab 4

Sample network



IP addresses:

- PC1(e0) 10.0.0.1 default gateway 10.0.0.2
- R1(f0/0) 10.0.0.2
- R1(s1/0) 20.0.0.1
- R2(s1/0) 20.0.0.2
- R2(s1/0) 30.0.0.2
- PC2(e0) 30.0.0.1 default gateway 30.0.0.2

Setting up IP address of Router is done like this:

```
R1(config)#inter f0/0
R1(config-if)#ip address 10.0.0.2 255.0.0.0
R1(config-if)#no shut
R1(config-if)#
```

After initialising all IP addresses, we tried to contact PC1 from PC2. However, we could not reach the PC1 since the host is not connected to the destination.

```
PC2> ping 10.0.0.2

10.0.0.2 icmp_seq=1 timeout
10.0.0.2 icmp_seq=2 timeout
10.0.0.2 icmp_seq=3 timeout
10.0.0.2 icmp_seq=4 timeout
10.0.0.2 icmp_seq=5 timeout
```

Timeout indicated that our connections are working fine, however, the address needs to be routed in the router to communicate between networks.

We need to route the destination address to be able to reach it.

Routing R2

```
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
```

Routing R1

```
R1(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.2
```

The format is ip route <destination-server-address> <subnet mask> {next hop IP address}

After routing, you will be able to ping PC2.

```
PC1> ping 30.0.0.1

84 bytes from 30.0.0.1 icmp_seq=1 ttl=62 time=34.735 ms
84 bytes from 30.0.0.1 icmp_seq=2 ttl=62 time=30.439 ms
84 bytes from 30.0.0.1 icmp_seq=3 ttl=62 time=30.607 ms
84 bytes from 30.0.0.1 icmp_seq=4 ttl=62 time=30.487 ms
84 bytes from 30.0.0.1 icmp_seq=5 ttl=62 time=30.184 ms
```

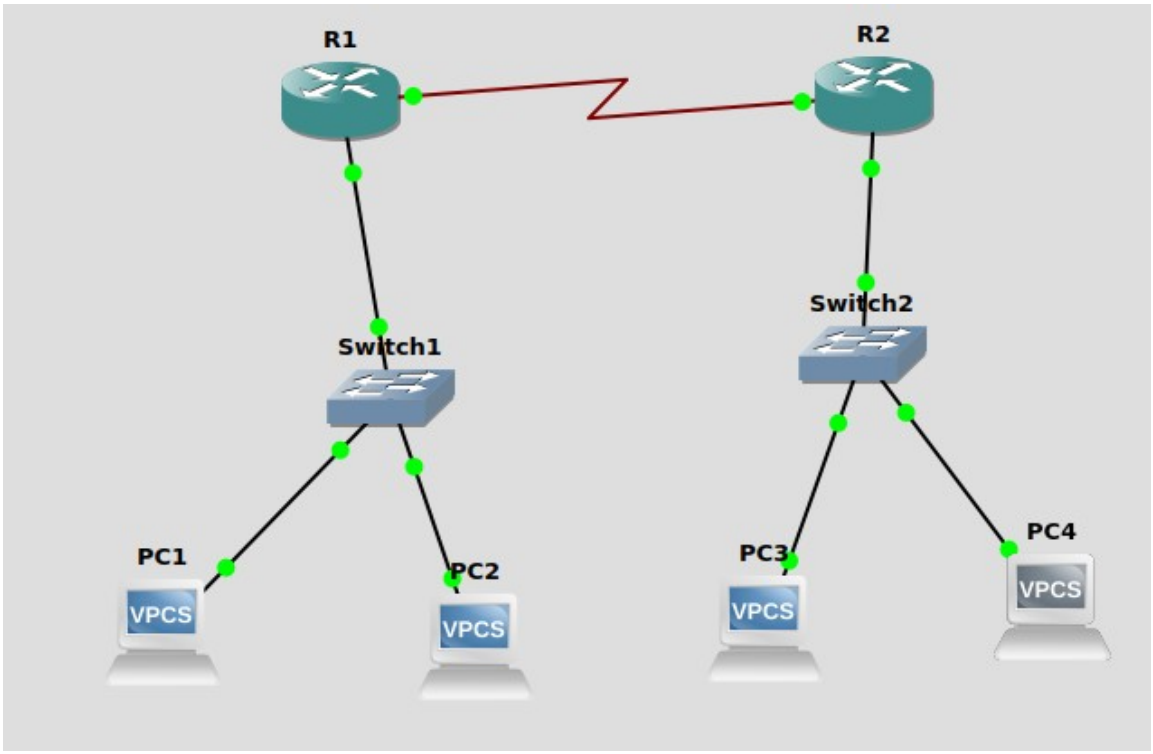
```
PC2> ping 10.0.0.1

84 bytes from 10.0.0.1 icmp_seq=1 ttl=62 time=25.688 ms
84 bytes from 10.0.0.1 icmp_seq=2 ttl=62 time=30.399 ms
84 bytes from 10.0.0.1 icmp_seq=3 ttl=62 time=29.894 ms
84 bytes from 10.0.0.1 icmp_seq=4 ttl=62 time=40.216 ms
84 bytes from 10.0.0.1 icmp_seq=5 ttl=62 time=40.184 ms
```

Wireshark on connection between PC2 and R2

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	ca:02:16:2a:00:00	ca:02:16:2a:00:00	LOOP	60	Reply
2	10.311251	Private_66:68:01	Broadcast	ARP	64	Who has 30.0.0.2? Tell 30.0.0.1 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
3	10.317567	ca:02:16:2a:00:00	Private_66:68:01	ARP	60	30.0.0.2 is at ca:02:16:2a:00:00
4	10.318795	30.0.0.1	10.0.0.1	ICMP	98	Echo (ping) request id=0x2871, seq=1/256, ttl=64 (reply in 6)
5	10.368296	ca:02:16:2a:00:00	ca:02:16:2a:00:00	LOOP	60	Reply
6	10.378505	10.0.0.1	30.0.0.1	ICMP	98	Echo (ping) reply id=0x2871, seq=1/256, ttl=62 (request in 4)
7	11.379802	30.0.0.1	10.0.0.1	ICMP	98	Echo (ping) request id=0x2971, seq=2/512, ttl=64 (reply in 8)
8	11.409367	10.0.0.1	30.0.0.1	ICMP	98	Echo (ping) reply id=0x2971, seq=2/512, ttl=62 (request in 7)
9	12.410872	30.0.0.1	10.0.0.1	ICMP	98	Echo (ping) request id=0x2a71, seq=3/768, ttl=64 (reply in 10)
10	12.440912	10.0.0.1	30.0.0.1	ICMP	98	Echo (ping) reply id=0x2a71, seq=3/768, ttl=62 (request in 9)
11	13.441966	30.0.0.1	10.0.0.1	ICMP	98	Echo (ping) request id=0x2b71, seq=4/1024, ttl=64 (reply in 12)
12	13.472502	10.0.0.1	30.0.0.1	ICMP	98	Echo (ping) reply id=0x2b71, seq=4/1024, ttl=62 (request in 11)
13	14.474125	30.0.0.1	10.0.0.1	ICMP	98	Echo (ping) request id=0x2c71, seq=5/1280, ttl=64 (reply in 14)
14	14.504070	10.0.0.1	30.0.0.1	ICMP	98	Echo (ping) reply id=0x2c71, seq=5/1280, ttl=62 (request in 13)

```
▸ Frame 2: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface 0
▸ Ethernet II, Src: Private_66:68:01 (00:50:79:66:68:01), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
▾ Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: Private_66:68:01 (00:50:79:66:68:01)
    Sender IP address: 30.0.0.1
    Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)
    Target IP address: 30.0.0.2
```

2)



R1 IP address: 20.0.0.1
R2 IP address: 20.0.0.2
R1 e0 IP address: 10.0.0.1
PC1 IP address: 10.0.0.2 defualt gateway 10.0.0.1
PC2 IP address: 10.0.0.3 defualt gateway 10.0.0.1
R2 e0 IP address: 30.0.0.1
PC3 IP address: 30.0.0.2 defualt gateway 30.0.0.1
PC4 IP address: 30.0.0.3 defualt gateway 30.0.0.1

Setting up R1:

```
R1(config)#inter s1/0
R1(config-if)#ip address 20.0.0.1 255.0.0.0
R1(config-if)#no shut
R1(config-if)#exit
*Oct 29 04:21:04.291: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
R1(config-if)#exit
*Oct 29 04:21:04.291: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Admin
istrative State Down
R1(config-if)#exit
*Oct 29 04:21:05.295: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0,
 changed state to up
R1(config-if)#exit
R1(config)#inter f0/0
R1(config-if)#ip address
*Oct 29 04:21:35.215: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0,
 changed state to down
R1(config-if)#ip address 10.0.0.1 255.0.0.0
R1(config-if)#no shut
R1(config-if)#exit
```

Setting up R2:

```
R2(config)#inter s1/0
R2(config-if)#ip address 20.0.0.2 255.0.0.0
R2(config-if)#no shut
R2(config-if)#
*Oct 29 04:21:40.839: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
*Oct 29 04:21:40.839: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Admin
istrative State Down
R2(config-if)#
*Oct 29 04:21:41.843: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0,
 changed state to up
R2(config-if)#exit
R2(config)#inter f0/0
R2(config-if)#ip address 30.0.0.1 255.0.0.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#
```

Pinging PC3 from PC4, no routing required since they are on the same network

```
PC4> ping 30.0.0.2

84 bytes from 30.0.0.2 icmp_seq=1 ttl=64 time=0.653 ms
84 bytes from 30.0.0.2 icmp_seq=2 ttl=64 time=0.884 ms
84 bytes from 30.0.0.2 icmp_seq=3 ttl=64 time=0.693 ms
84 bytes from 30.0.0.2 icmp_seq=4 ttl=64 time=0.853 ms
84 bytes from 30.0.0.2 icmp_seq=5 ttl=64 time=0.668 ms
```

Pinging PC1 from PC4:

```
PC4> ping 10.0.0.2

*30.0.0.1 icmp_seq=1 ttl=255 time=29.385 ms (ICMP type:3, code:1, Destination ho
st unreachable)
*30.0.0.1 icmp_seq=2 ttl=255 time=9.822 ms (ICMP type:3, code:1, Destination hos
t unreachable)
*30.0.0.1 icmp_seq=3 ttl=255 time=10.140 ms (ICMP type:3, code:1, Destination ho
st unreachable)
*30.0.0.1 icmp_seq=4 ttl=255 time=9.166 ms (ICMP type:3, code:1, Destination hos
t unreachable)
*30.0.0.1 icmp_seq=5 ttl=255 time=9.142 ms (ICMP type:3, code:1, Destination hos
t unreachable)
```

Need to set up routing

```
PC4> ping 10.0.0.2

10.0.0.2 icmp_seq=1 timeout
84 bytes from 10.0.0.2 icmp_seq=2 ttl=62 time=33.660 ms
84 bytes from 10.0.0.2 icmp_seq=3 ttl=62 time=40.613 ms
84 bytes from 10.0.0.2 icmp_seq=4 ttl=62 time=39.431 ms
84 bytes from 10.0.0.2 icmp_seq=5 ttl=62 time=38.835 ms
```

Routing R2

```
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
```

Routing R1

```
R1(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.2
```

Capturing packets on PC4 when ping request is made.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	Private_66:68:03	Broadcast	ARP	64	Who has 30.0.0.1? Tell 30.0.0.3 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
2	0.003747	ca:02:1e:82:00:00	Private_66:68:03	ARP	60	30.0.0.1 is at ca:02:1e:82:00:00
3	0.004336	30.0.0.3	10.0.0.2	ICMP	98	Echo (ping) request id=0x0f79, seq=1/256, ttl=64 (reply in 4)
4	0.034265	10.0.0.2	30.0.0.3	ICMP	98	Echo (ping) reply id=0x0f79, seq=1/256, ttl=62 (request in 3)
5	1.035823	30.0.0.3	10.0.0.2	ICMP	98	Echo (ping) request id=0x1079, seq=2/512, ttl=64 (reply in 6)
6	1.064901	10.0.0.2	30.0.0.3	ICMP	98	Echo (ping) reply id=0x1079, seq=2/512, ttl=62 (request in 5)
7	2.065712	30.0.0.3	10.0.0.2	ICMP	98	Echo (ping) request id=0x1179, seq=3/768, ttl=64 (reply in 8)
8	2.095593	10.0.0.2	30.0.0.3	ICMP	98	Echo (ping) reply id=0x1179, seq=3/768, ttl=62 (request in 7)
9	3.096734	30.0.0.3	10.0.0.2	ICMP	98	Echo (ping) request id=0x1279, seq=4/1024, ttl=64 (reply in 10)
10	3.125805	10.0.0.2	30.0.0.3	ICMP	98	Echo (ping) reply id=0x1279, seq=4/1024, ttl=62 (request in 9)
11	4.127164	30.0.0.3	10.0.0.2	ICMP	98	Echo (ping) request id=0x1379, seq=5/1280, ttl=64 (reply in 12)
12	4.156330	10.0.0.2	30.0.0.3	ICMP	98	Echo (ping) reply id=0x1379, seq=5/1280, ttl=62 (request in 11)

```
▾ Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: Private_66:68:03 (00:50:79:66:68:03)
    Sender IP address: 30.0.0.3
    Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)
    Target IP address: 30.0.0.1
```