

CHAPTER 4

RESULTS AND DISCUSSION

4.1 The Results and Discussion on Router Development

4.1.1 Results

The **Figure 4.1** and **4.2** below showed the IP addresses scanned using Advanced LAN Scanner v1.0 BETA 1.

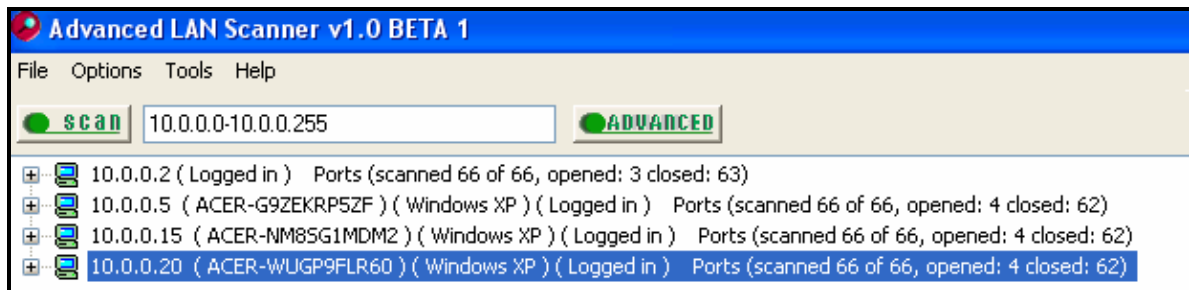


Figure 4.1 IP addresses scanned for range 10.0.0.0-10.0.0.255

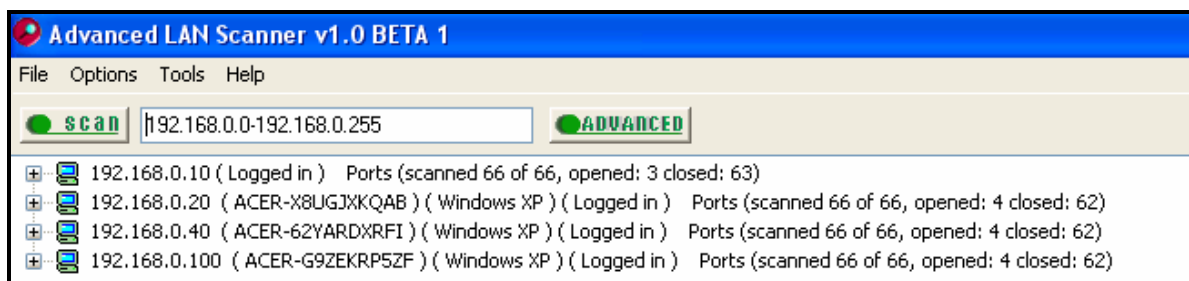


Figure 4.2 IP addresses scanned for range 192.168.0.0-192.168.0.255

4.1.2 Discussion

The PC based router aimed to functions and move the information of the interconnected PCs. The development of this router is using the routing software, Quagga that had daemons such as Zebra, RIPd, RIPngd, OSPFd, OSPF6d, and BGPd.

For the first stage, the router failed to connect the PC due to some errors, such as wrong static IP addresses and default gateway, cabling and NIC problems. However, after did the troubleshooting, the errors are fixed by correcting the configuration files and check the cable connections, and then I can run the router in the right way.

Once the router completed and run, the PCs will connected and the router that was develop for this project will do the routing process between all PCs. The Advanced LAN Scanner v1.0 BETA 1 software used to scan the connected PCs to the router.

Figure 4.1 and **Figure 4.2** showed that the PCs are connected through the router for both IP range used, which are 10.0.0.0-10.0.0.255 and 192.168.0.0-192.168.0.255.

4.2 The Results and Discussion for Design A

4.2.1 Results

- I. Ping from **PC A (10.0.0.5)** to IP address of loopback address (**127.0.0.1**), the default gateway (**10.0.0.2**) and destination PC, **PC B(192.168.0.20)**

```
Pinging 127.0.0.1 with 32 bytes of data:

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.1 Ping 127.0.0.1 from PC A (10.0.0.5)

```
Pinging 10.0.0.2 with 32 bytes of data:

    Reply from 10.0.0.2: bytes=32 time<1ms TTL=64

    Reply from 10.0.0.2: bytes=32 time<1ms TTL=64

    Reply from 10.0.0.2: bytes=32 time<1ms TTL=64

    Reply from 10.0.0.2: bytes=32 time<1ms TTL=64

Ping statistics for 10.0.0.2:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.2 Ping 10.0.0.2 from PC A (10.0.0.5)

```
Pinging 192.168.0.20 with 32 bytes of data:

    Reply from 192.168.0.20: bytes=32 time<1ms TTL=128

    Reply from 192.168.0.20: bytes=32 time<1ms TTL=128

    Reply from 192.168.0.20: bytes=32 time<1ms TTL=128

    Reply from 192.168.0.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.20:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.3 Ping 192.168.0.20 from PC A (10.0.0.5)

II. Ping from PC B (192.168.0.20) to loopback address (127.0.0.1), default gateway (192.168.0.10) and IP address of PC A (10.0.0.5);

```
Pinging 127.0.0.1 with 32 bytes of data:

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

    Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.4 Ping 127.0.0.1 from PC B (192.168.0.20)

```
Pinging 192.168.0.10 with 32 bytes of data:

    Reply from 192.168.0.10: bytes=32 time<1ms TTL=64

    Reply from 192.168.0.10: bytes=32 time<1ms TTL=64

    Reply from 192.168.0.10: bytes=32 time<1ms TTL=64

    Reply from 192.168.0.10: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.10:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.5 Ping 192.168.0.10 from PC B (192.168.0.20)

```
Pinging 10.0.0.5 with 32 bytes of data:

    Reply from 10.0.0.5: bytes=32 time<1ms TTL=128

    Reply from 10.0.0.5: bytes=32 time<1ms TTL=128

    Reply from 10.0.0.5: bytes=32 time<1ms TTL=128

    Reply from 10.0.0.5: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.5:

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Table 4.6 Ping 10.0.0.5 from PC B (192.168.0.20)

III. Ping from router PC to loopback address (127.0.0.1), default gateway 1 (10.0.0.2), default gateway 2 (192.168.0.10), PC A (10.0.0.2), and PC B (192.168.0.20).

Bytes	Source	Seq	Time	Units
64	127.0.0.1	1	0.036	ms
64	127.0.0.1	2	0.030	ms
64	127.0.0.1	3	0.034	ms
64	127.0.0.1	4	0.033	ms
64	127.0.0.1	5	0.033	ms
Time minimum: 0.03 ms				
Time average: 0.03 ms				
Time maximum: 0.04 ms				
Packets transmitted:5, Packets received:5, Packet loss:0%				

Table 4.7 Ping 127.0.0.1 from router PC

Bytes	Source	Seq	Time	Units
64	10.0.0.2	1	0.037	ms
64	10.0.0.2	2	0.030	ms
64	10.0.0.2	3	0.036	ms
64	10.0.0.2	4	0.034	ms
64	10.0.0.2	5	0.036	ms
Time minimum: 0.03 ms				
Time average: 0.03 ms				
Time maximum: 0.04 ms				
Packets transmitted:5, Packets received:5, Packet loss:0%				

Table 4.8 Ping 10.0.0.2 from router PC

Bytes	Source	Seq	Time	Units
64	10.0.0.5	1	0.170	ms
64	10.0.0.5	2	0.119	ms
64	10.0.0.5	3	0.104	ms
64	10.0.0.5	4	0.108	ms
64	10.0.0.5	5	0.110	ms
Time minimum: 0.10 ms				
Time average: 0.11 ms				
Time maximum: 0.17 ms				
Packets transmitted:5, Packets received:5, Packet loss:0%				

Table 4.9 Ping 10.0.0.5 from router PC

Bytes	Source	Seq	Time	Units
64	192.168.0.10	1	0.036	ms
64	192.168.0.10	2	0.029	ms
64	192.168.0.10	3	0.031	ms
64	192.168.0.10	4	0.032	ms
64	192.168.0.10	5	0.032	ms
Time minimum: 0.03 ms				
Time average: 0.03 ms				
Time maximum: 0.04 ms				
Packets transmitted:5, Packets received:5, Packet loss:0%				

Table 4.10 Ping 192.168.0.10 from router PC

Bytes	Source	Seq	Time	Units
64	192.168.0.20	1	3.05	ms
64	192.168.0.20	2	0.122	ms
64	192.168.0.20	3	0.121	ms
64	192.168.0.20	4	0.120	ms
64	192.168.0.20	5	0.119	ms
Time minimum: 0.12 ms				
Time average: 0.35 ms				
Time maximum: 3.05 ms				
Packets transmitted:5, Packets received:5, Packet loss:0%				

Table 4.11 Ping 192.168.0.20 from router PC

4.2.2 Discussion

The ping command used to determine whether each computer could communicate with every computer in the LAN. According to the results above, it showed the results of pinging IP address from PC A to PC B. The ping processes were done in Command Prompt, C:\WINDOWS\system32\cmd.exe, except for **III**; the router PC used SUSE Linux, so I can ping the IP addresses using Network Tools.

Pinging to IP address of loopback address (**127.0.0.1**) is to verify that TCP/IP if it is installed and configured correctly on the local computer. Both PCs ping the loopback address successfully.

The next is to Ping the IP address of both default gateway, **10.0.0.2** and **192.168.0.10** to verify that the default gateway is functioning and that we can communicate with a local host on the local network

The final is to ping the other PC connected to the develop router. PC A ping to PC B, and PC B ping to PC A.

The Ping statistics for **192.168.0.20** from PC A (**10.0.0.5**):

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

and Ping statistics for **10.0.0.5** from PC B (**192.168.0.20**):

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

The packet lost is verified and showed the packet lost for both PCs is 0%, which an immediate indication that the test was successful. This means that the router is doing its job and functions in the right way.

4.3 The Results and Discussion for Design B

4.3.1 Results

The following are figures showed the Windows Netmeeting on all PCs connected in Design B of this project.

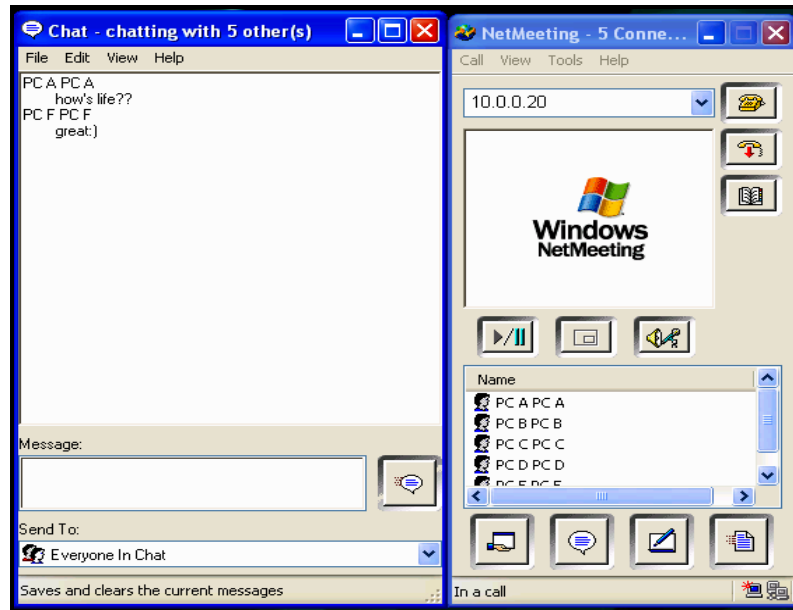


Figure 4.3 Windows Netmeeting on *PC A (192.168.0.100)*

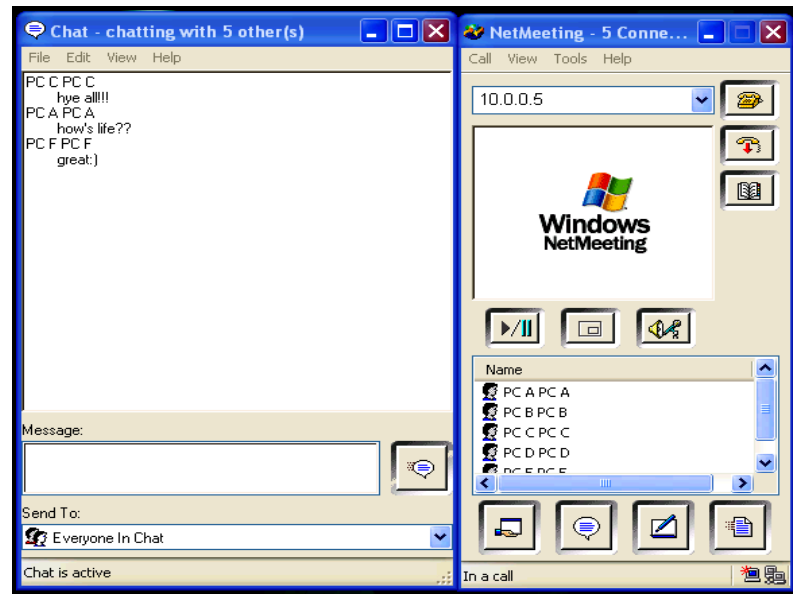


Figure 4.4 Windows Netmeeting on *PC B (192.168.0.40)*

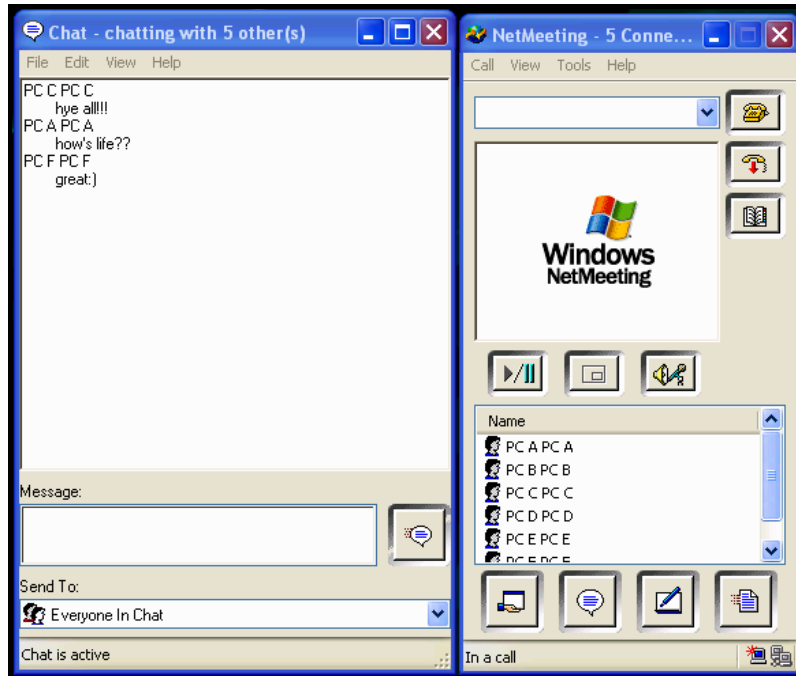


Figure 4.5 Windows Netmeeting on PC C (192.168.0.20)

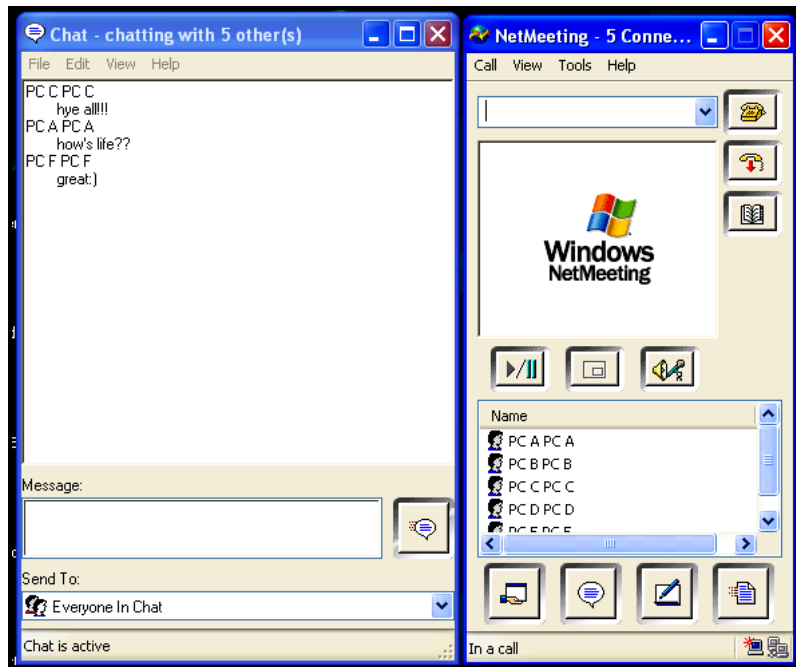


Figure 4.6 Windows Netmeeting on PC D (10.0.0.5)

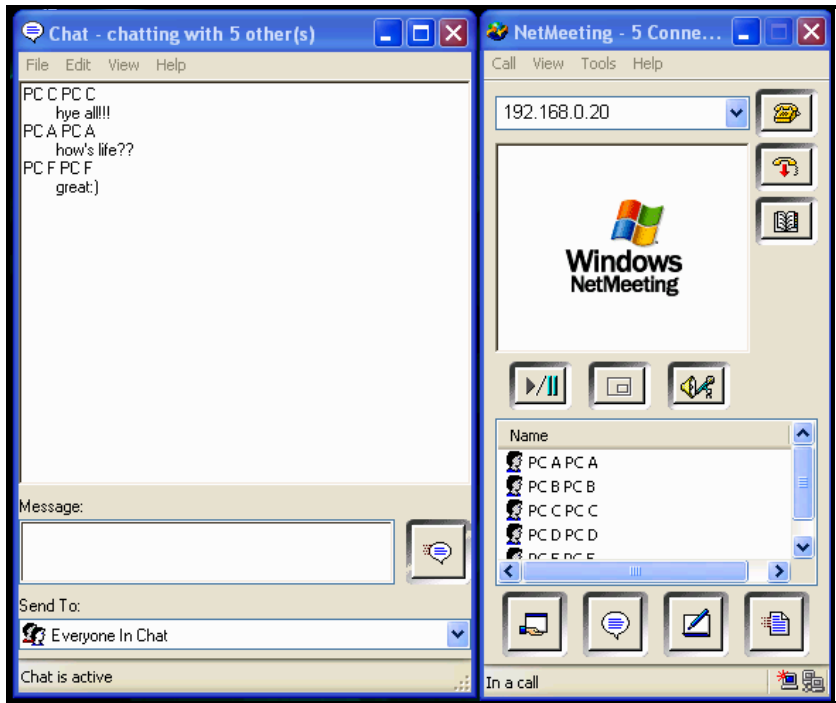


Figure 4.7 Windows Netmeeting on *PC E (10.0.0.15)*

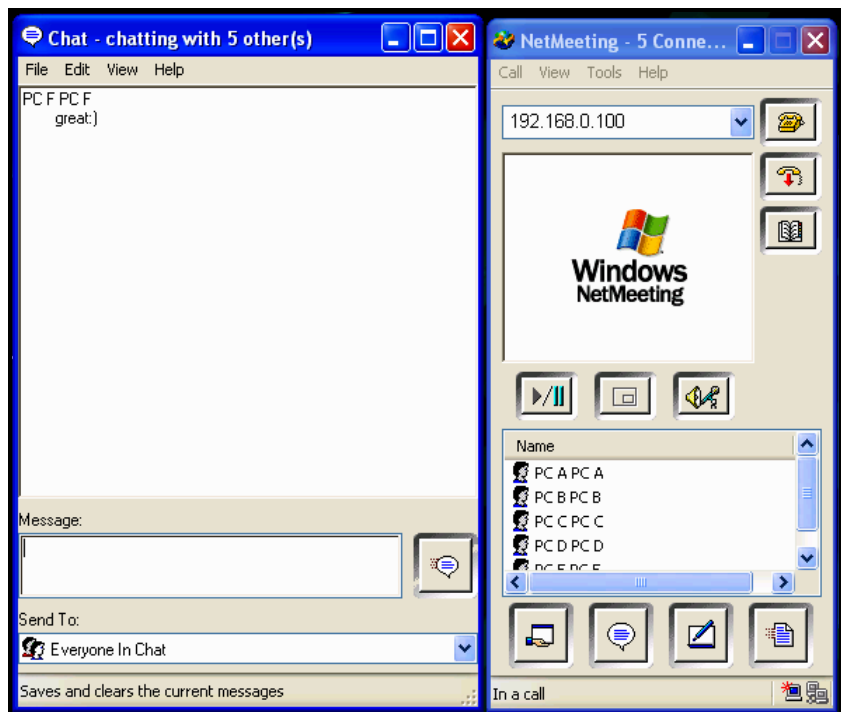


Figure 4.8 Windows Netmeeting on *PC F (10.0.0.20)*

4.3.2 Discussion for Design B

According to the **Figures 4.1 – 4.6** above, Windows Netmeeting used to show that the router is successfully moving information across an inter-network from a source to a destination. A PC A with an IP address **192.168.0.100** can send instant message to the other PC, for example PC F (**10.0.0.20**), or to all PCs connected to the router.

Compared to Design A, this design is more effective and selectable way to show the functions of the routing process and produces the results that was intended.

Design B includes router and switches; the router acts as a junction between two or more networks to transfer data packets among them. A router is different from a switch. A switch connects devices to form a Local area network (LAN).

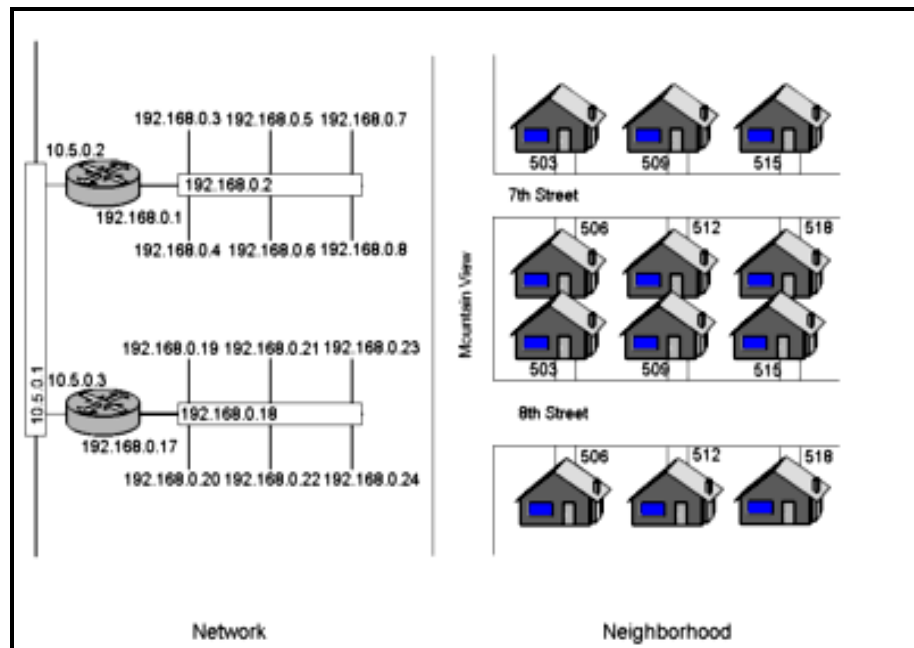


Figure 4.9 Routers are like intersections whereas switches are like streets [36]

To understand easily the Design B, is by refer to **Figure 4.7**. One easy illustration for the different functions of routers and switches is to think of switches as neighborhood streets, and the router as the intersections with the street signs. Each house on the street has an address within a range on the block. In the same way, a switch connects various devices each with their own IP address (es) on a LAN.

However, the switch knows nothing about IP addresses except its own management address. Routers connect networks together the way that on-ramps or major intersections connect streets to both highways and freeways, etc. The street signs at the intersection (routing table) show which way the packets need to flow.

So for example, a router at home connects the Internet Service Provider's (ISP) network (usually on an Internet address) together with the LAN in the home (typically using a range of private IP addresses) and a single broadcast domain. The switch connects devices together to form the LAN. Sometimes the switch and the router are combined together in one single package sold as a multiple port router.

In order to route packets, a router communicates with other routers using routing protocols and using this information creates and maintains a routing table. The routing table stores the best routes to certain network destinations, the "routing metrics" associated with those routes, and the path to the next hop router [37].

CHAPTER 5

BUSSINESS PLANNING

The business planning for this PC Based Router project is to commercial it to Computer Cafe, school computer labs, offices and campus with LAN network.

For Computer Café, this project can be used to share the 3D educational gaming, play NET games and LAN messaging. Applying this router as a part of the café can reduce cost because it needs only two NIC and save more time for its easy cabling.

This router is low cost to build and develop. For the computer labs and office, it must be an advantage. By using this router, the activities such as Network folder sharing, share printing, and share files in networking neighborhood is much easier and secure.