Lab 10: Dynamic Routing with RIP and Router configuration with DHCP / DNS

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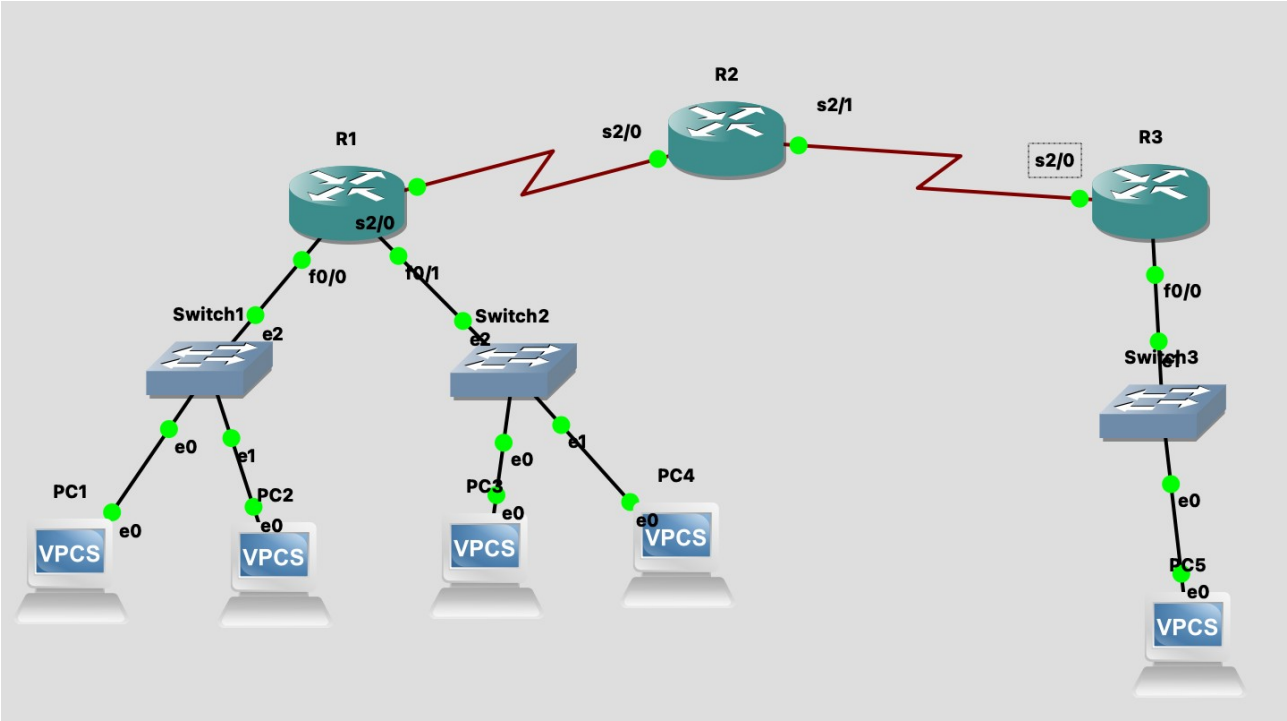
Lab Exercise 1

Design the Network with routing using RIP. Provide DHCP and DNS Configuration in R3

- **Configure the IP Addresses to the interfaces on the router R1,R2 and R3 and PCs**
- **Configure RIP on the routers.**
- **Configure R3 as the DNS Server with the Domain Name www.NAME.com. (Test using PC2)**
- **Configure R3 as the DHCP router with the following restrictions:**
  - **Usename POOL-CLASS-C for the hosts in the 192.168.10.0/24 Network.**
  - **Usename POOL-CLASS-B for the hosts in the 192.168.20.0/24 Network.**
  - **Exclude the first and the last host addresses.**
  - **Assign the DNS Server address during DHCP Configuration.**
  - **Assign appropriate DHCP relay agents.**
- **Test IP Configuration in hosts and Access to the DNS Server.**
- **Save the configurations on all routers.**

Network design



Configuring Router Interfaces

- **R1**
  - F0/0 – 192.168.10.254/24
  - F0/1 – 172.16.255.254/16

    - S2/0 – 30.30.30.1/27 (i.e, 255.255.255.224)
- **R2**
    - S2/0 – 30.30.30.2/27
    - S2/1 – 20.20.20.1/28 (i.e 255.255.255.240)

- **R3**
    - S2/0 – 20.20.20.2/28
    - F0/0 – 192.168.20.254/24

RIP in Routers

- **R1**
    - config t
    - router rip
    - version 2
    - network 192.168.10.0
    - network 172.16.0.0
    - network 30.30.30.0
- **R2**
    - config t
    - router rip
    - version 2
    - network 30.30.30.0
    - network 20.20.20.0

- **R3**
    - config t
    - router rip
    - version 2
    - network 20.20.20.0
    - network 192.168.20.0

Configuring R3 as DNS Server

- config t
- ip dns server
- ip name-server 8.8.8.8
- ip domain-name NAME.com
- ip host www.NAME.com 192.168.20.254

Configuring R3 as DHCP Router

- For network 192.168.10.0/24 -

  R3(config)#ip dhcp excluded-address 192.168.10.1
  R3(config)#ip dhcp excluded-address 192.168.10.254
  R3(config)#ip dhcp pool POOL-CLASS-C
  R3(dhcp-config)#network 192.168.10.0 255.255.255.0
  R3(dhcp-config)#default-router 192.168.10.254
  R3(dhcp-config)#dns-server 192.168.20.254
  R3(dhcp-config)#exit

- For network 192.168.20.0/24 –
  R3(config)#ip dhcp excluded-address 192.168.20.1
  R3(config)#ip dhcp excluded-address 192.168.20.254
  R3(config)#ip dhcp pool POOL-CLASS-B
  R3(dhcp-config)#network 192.168.20.0 255.255.255.0
  R3(dhcp-config)#default-router 192.168.20.254
  R3(dhcp-config)#dns-server 192.168.20.254
  R3(dhcp-config)#exit

Configure DHCP Relay on R1 and R2

- **R1**
  R1(config)# int f0/0
  R1(config-if)# ip helper-address 192.168.20.254

- **R2**
  R2(config)# int s2/1
  R2(config-if)# ip helper-address 192.168.20.254

Assigning IP addresses to PCs

```
PC1> dhcp
DDORA IP 192.168.10.2/24 GW 192.168.10.254
```

```
PC2> dhcp
DDORA IP 192.168.10.3/24 GW 192.168.10.254
```

```
PC5> dhcp
DDORA IP 192.168.20.2/24 GW 192.168.20.254
```

Testing Routing by pinging (PC5 to PC1)

```
PC5> ping 192.168.10.2

84 bytes from 192.168.10.2 icmp_seq=1 ttl=61 time=69.794 ms
84 bytes from 192.168.10.2 icmp_seq=2 ttl=61 time=58.626 ms
84 bytes from 192.168.10.2 icmp_seq=3 ttl=61 time=58.344 ms
84 bytes from 192.168.10.2 icmp_seq=4 ttl=61 time=45.915 ms
84 bytes from 192.168.10.2 icmp_seq=5 ttl=61 time=45.790 ms
```

Testing access to DNS server

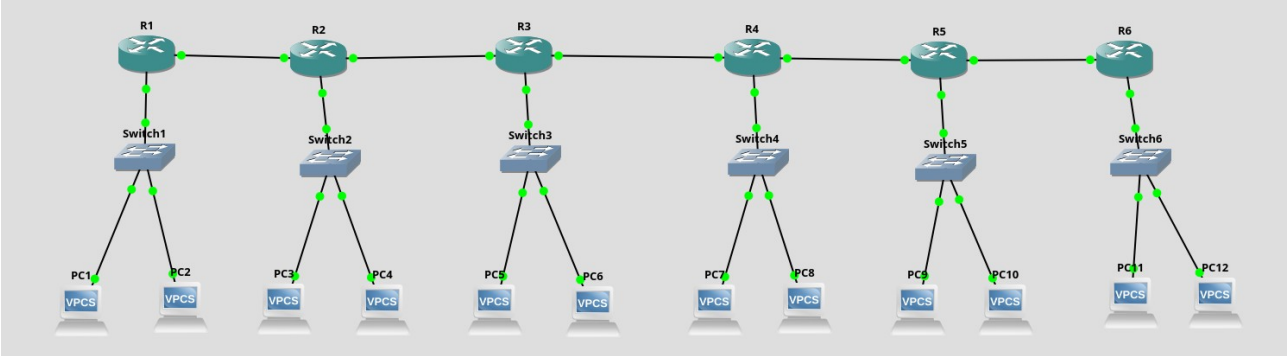
```
PC2> ping www.NAME.com
www.NAME.com resolved to 192.168.20.254

84 bytes from 192.168.20.254 icmp_seq=1 ttl=253 time=39.847 ms
84 bytes from 192.168.20.254 icmp_seq=2 ttl=253 time=47.506 ms
84 bytes from 192.168.20.254 icmp_seq=3 ttl=253 time=36.834 ms
84 bytes from 192.168.20.254 icmp_seq=4 ttl=253 time=37.780 ms
84 bytes from 192.168.20.254 icmp_seq=5 ttl=253 time=39.367 ms
```

Additional Exercise:

Build the nerwork by setting up the router as a DHCP server for LAN1, LAN 2 and LAN3. All other static IP addresses can be assigned. Routing should be done using RIP. Set up another router as DNS Server and verify all configurations.

Network Design



Network Topology:

- **Routers: R1, R2, R3, R4, R5, R6**
- **Switches: S1, S2, S3, S4, S5, S6**
- Each router is connected to a corresponding switch.
- Routers are interconnected as follows:
    - R1 ↔ R2
    - R2 ↔ R3
    - R2 ↔ R4
    - R3 ↔ R4
    - R4 ↔ R5
    - R5 ↔ R6

IP Address Assignments:

- **Router R1**
    - F0/0 – 192.168.1.1/24
    - F0/1 – 10.0.1.1/30 (to R2)
- **Router R2**

    - F0/0 – 10.0.1.2/30 (to R1)
    - F0/1 – 10.0.2.1/30 (to R3)
    - F0/2 – 10.0.3.1/30 (to R4)
- **Router R3**
    - F0/0 – 10.0.2.2/30 (to R2)
    - F0/1 – 10.0.4.1/30 (to R4)
- **Router R4**
    - F0/0 – 10.0.3.2/30 (to R2)
    - F0/1 – 10.0.4.2/30 (to R3)
    - F0/2 – 10.0.5.1/30 (to R5)
- **Router R5**
    - F0/0 – 10.0.5.2/30 (to R4)
    - F0/1 – 10.0.6.1/30 (to R6)
- **Router R6**
    - F0/0 – 10.0.6.2/30 (to R5)

Configuring Router Interfaces

Router R1 Configuration:

```
R1# configure terminal
R1(config)# interface FastEthernet0/0
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shutdown

R1(config)# interface FastEthernet0/1
R1(config-if)# ip address 10.0.1.1 255.255.255.252
R1(config-if)# no shutdown
```

Router R2 Configuration:

```
R2# configure terminal
R2(config)# interface FastEthernet0/0
R2(config-if)# ip address 10.0.1.2 255.255.255.252
R2(config-if)# no shutdown

R2(config)# interface FastEthernet0/1
R2(config-if)# ip address 10.0.2.1 255.255.255.252
R2(config-if)# no shutdown

R2(config)# interface FastEthernet0/2
R2(config-if)# ip address 10.0.3.1 255.255.255.252
R2(config-if)# no shutdown
```

Router R3 Configuration:

```
R3# configure terminal
R3(config)# interface FastEthernet0/0
R3(config-if)# ip address 10.0.2.2 255.255.255.252
R3(config-if)# no shutdown

R3(config)# interface FastEthernet0/1
R3(config-if)# ip address 10.0.4.1 255.255.255.252
R3(config-if)# no shutdown
```

Router R4 Configuration:

```
R4# configure terminal
R4(config)# interface FastEthernet0/0
R4(config-if)# ip address 10.0.3.2 255.255.255.252
R4(config-if)# no shutdown

R4(config)# interface FastEthernet0/1
R4(config-if)# ip address 10.0.4.2 255.255.255.252
R4(config-if)# no shutdown

R4(config)# interface FastEthernet0/2
R4(config-if)# ip address 10.0.5.1 255.255.255.252
R4(config-if)# no shutdown
```

Router R5 Configuration:

```
R5# configure terminal
R5(config)# interface FastEthernet0/0
R5(config-if)# ip address 10.0.5.2 255.255.255.252
R5(config-if)# no shutdown

R5(config)# interface FastEthernet0/1
R5(config-if)# ip address 10.0.6.1 255.255.255.252
R5(config-if)# no shutdown
```

Router R6 Configuration:

```
R6# configure terminal
R6(config)# interface FastEthernet0/0
R6(config-if)# ip address 10.0.6.2 255.255.255.252
R6(config-if)# no shutdown
```

Configuring RIP on Routers

Router R1:

```
R1# configure terminal
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# network 192.168.1.0
R1(config-router)# network 10.0.0.0
```

Router R2:

```
R2# configure terminal
R2(config)# router rip
R2(config-router)# version 2
R2(config-router)# network 10.0.0.0
```

Router R3:

```
R3# configure terminal
R3(config)# router rip
R3(config-router)# version 2
R3(config-router)# network 10.0.0.0
```

Router R4:

```
R4# configure terminal
R4(config)# router rip
R4(config-router)# version 2
R4(config-router)# network 10.0.0.0
```

Router R5:

```
R5# configure terminal
R5(config)# router rip
R5(config-router)# version 2
R5(config-router)# network 10.0.0.0
```

Router R6:

```
R6# configure terminal
R6(config)# router rip
R6(config-router)# version 2
R6(config-router)# network 10.0.0.0
```

Configuring R3 as a DNS Server

DNS Server Configuration on R3:

```
R3# configure terminal
R3(config)# ip dns server
R3(config)# ip domain-name example.com
R3(config)# ip host www.example.com 192.168.20.254
```

Configuring R3 as a DHCP Server

DHCP Configuration for R3:

For the 192.168.1.0/24 Network:

```
R1# configure terminal
R1(config)# interface FastEthernet0/0
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shutdown

R1(config)# interface FastEthernet0/1
R1(config-if)# ip address 10.0.1.1 255.255.255.252
R1(config-if)# no shutdown
```

For the 10.0.0.0/24 Network:

```
R2# configure terminal
R2(config)# interface FastEthernet0/0
R2(config-if)# ip address 10.0.1.2 255.255.255.252
R2(config-if)# no shutdown

R2(config)# interface FastEthernet0/1
R2(config-if)# ip address 10.0.2.1 255.255.255.252
R2(config-if)# no shutdown

R2(config)# interface FastEthernet0/2
R2(config-if)# ip address 10.0.3.1 255.255.255.252
R2(config-if)# no shutdown
```

Configure DHCP Relay on Routers

Router R1 Configuration:

```
R1# configure terminal
R1(config)# interface FastEthernet0/0
R1(config-if)# ip helper-address 192.168.1.1
```

Router R2 Configuration:

```
R2# configure terminal
R2(config)# interface FastEthernet0/1
R2(config-if)# ip helper-address 192.168.1.1
```

Assigning IP Addresses to PCs

- Ensure each PC is configured to obtain an IP address automatically via DHCP from R3.

Testing Connectivity

Testing Routing

- **Ping Test**: Test connectivity by pinging from PC1 to PC2, PC3, etc., across the network.

PC1 ping PC2:

```
C:\> ping 192.168.1.3
```

PC1 ping PC3:

```
C:\> ping 10.0.1.3
```

PC1 ping PC4:

```
C:\> ping 10.0.2.3
```

PC1 ping PC5:

```
C:\> ping 10.0.3.3
```

PC1 ping PC6:

```
C:\> ping 10.0.4.3
```

Testing Access to DNS Server

- Use the following command on a PC to verify DNS resolution:

```
:\> nslookup www.NAME.com
```

OUTPUT:

```
Reply from [IP address]: bytes=32 time<1ms TTL=128
```