Experiment 09

Dynamic Routing Using eNSP

9.1 Objectives

The main objectives of this experiment are

- To set up a simple network topology using eNSP software.
- To configure dynamic routing protocol on the routers and switches.

9.2 Theory

Dynamic routing is a network routing technique where network routers automatically exchange routing information with each other and dynamically update their routing tables based on the changes in the network topology. The goal of dynamic routing is to adapt to network changes, such as link failures or network congestion, and find the most efficient and optimal paths for data packets to reach their destinations.

In contrast, static routing is a manual routing technique where network administrators manually configure the routing tables of routers. In static routing, the network paths are pre-defined and do not change unless manually modified by the administrator. This method is suitable for small networks with a simple and stable topology where changes are infrequent.

In summary, static routing involves manually configuring routes, while dynamic routing uses routing protocols to automatically learn and adjust routes based on network changes. Dynamic routing offers advantages in terms of adaptability, scalability, and easier network management, making it preferable in most large and complex network environments. However, both routing methods have their use cases, and in some scenarios, a combination of both static and dynamic routing may be employed to create an efficient and reliable network infrastructure.

9.3 Required Apparatus

1. eNSP (Enterprise Network Simulation Platform) Software
2. A highly configured PC

9.4 Topology Diagram

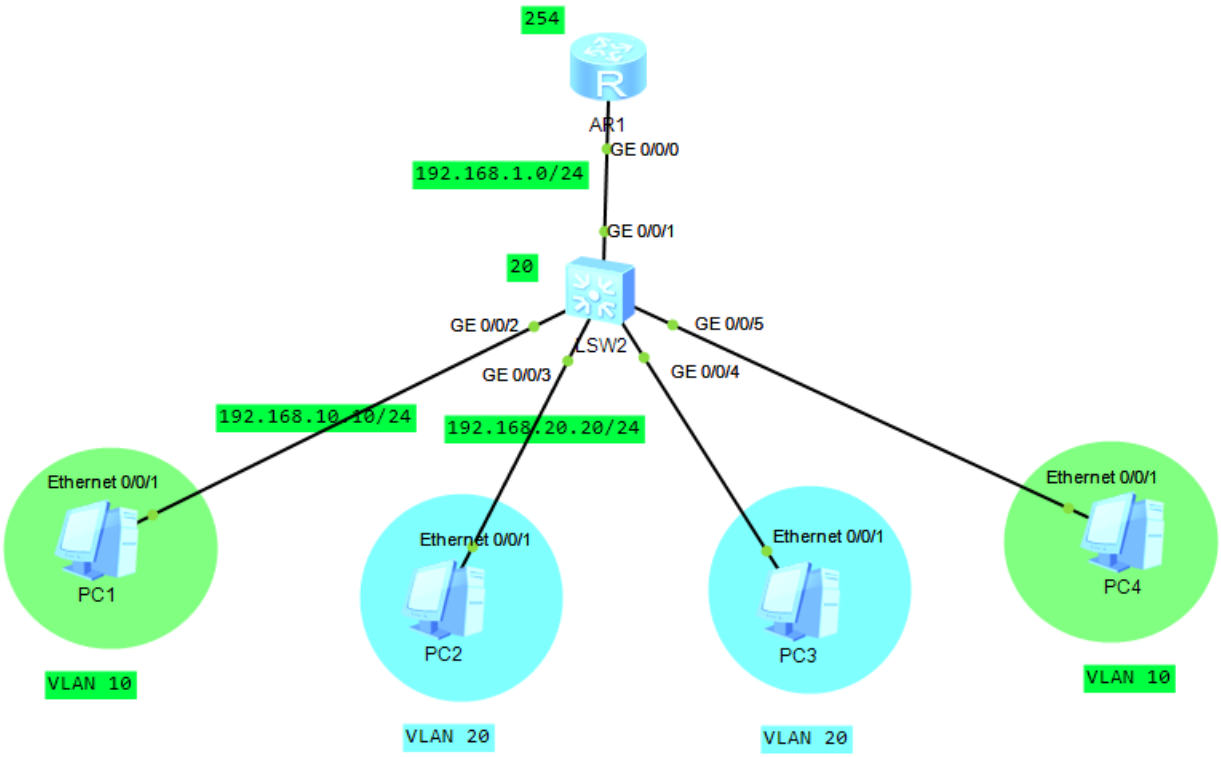

Figure 9.1: Basic Topology Diagram of dynamic Routing

9.5 Configuration

Router Configuration:

Router configuration for VLAN 10
<Huawei>Sys
[Huawei]sysname AR1
[AR1]dhcp enable
[AR1]int g0/0/0.10
[AR1-GigabitEthernet0/0/0.10]ip address 192.168.10.254 24
[AR1-GigabitEthernet0/0/0.10]dot1q termination vid 10
[AR1-GigabitEthernet0/0/0.10]arp broadcast enable
[AR1-GigabitEthernet0/0/0.10]dhcp select interface

Router configuration for VLAN 20

<AR1>sys
[AR1]int g0/0/0.20
[AR1-GigabitEthernet0/0/0.20]ip address 192.168.20.254 24
[AR1-GigabitEthernet0/0/0.20]dot1q termination vid 20
[AR1-GigabitEthernet0/0/0.20]arp broadcast enable
[AR1-GigabitEthernet0/0/0.20]dhcp select interface

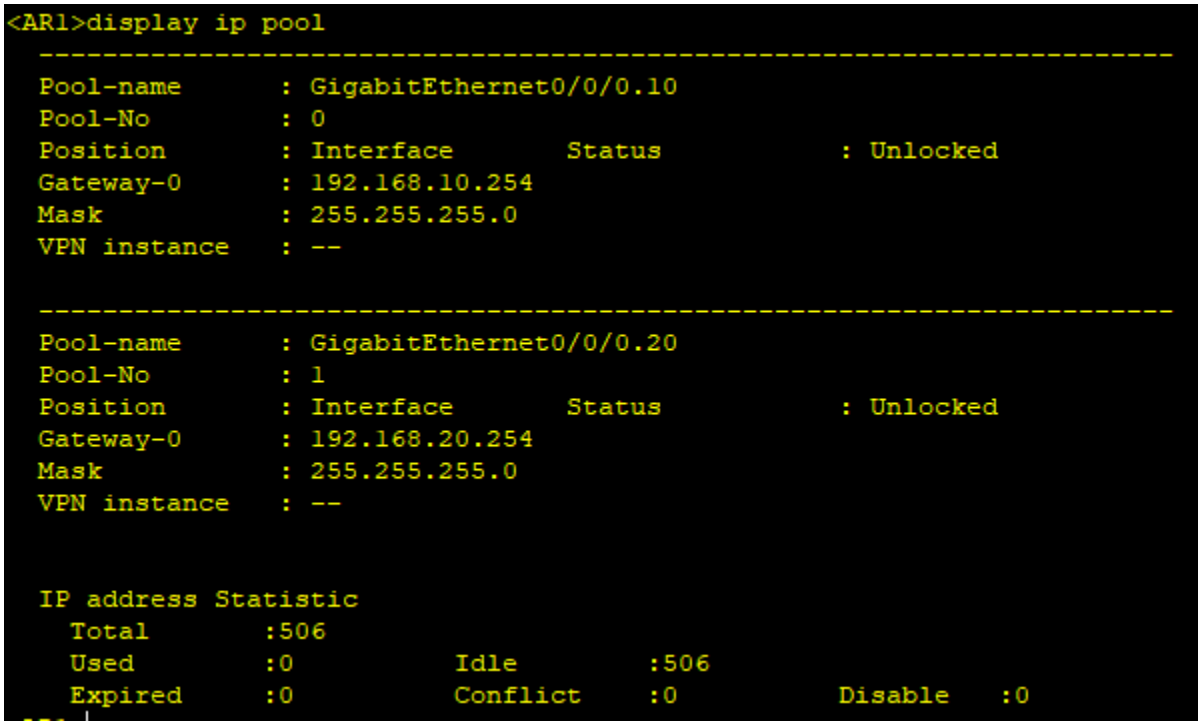

Fig 9.2: IP addresses for router

Switch Configuration:

Switch config for VLAN10

<Huawei>sys

<Huawei>system-view

[Huawei]sysname S1

[S1]vlan batch 10

[S1]dhcp enable

[S1]int vlan

```
[S1]int Vlanif 10
[S1-Vlanif10]ip address 192.168.10.10 24

[S1-Vlanif10]dhcp select global
[S1-Vlanif10]ip pool vlan10pool
Info:It's successful to create an IP address pool.
[S1-ip-pool-vlan10pool]network 192.168.10.0 mask 24
[S1-ip-pool-vlan10pool]
[S1-ip-pool-vlan10pool]gateway-list 192.168.10.254
[S1-ip-pool-vlan10pool]excluded-ip-address 192.168.10.10
[S1-ip-pool-vlan10pool]quit
[S1]int g0/0/1
[S1-GigabitEthernet0/0/1]port link-type trunk
[S1-GigabitEthernet0/0/1]port trunk allow-pass vlan all
[S1]int g0/0/2
[S1-GigabitEthernet0/0/2]port link-type access
[S1-GigabitEthernet0/0/2]port default vlan 10
[S1-GigabitEthernet0/0/2]quit
[S1]int g0/0/4
[S1-GigabitEthernet0/0/4]port link-type access
[S1-GigabitEthernet0/0/4]port default vlan 10

###### Switch config for VLAN20
<S1>sys
[S1]vlan batch 10 20
[S1]dhcp enable
[S1]int vlan
[S1]int Vlanif 20
[S1-Vlanif20]
[S1-Vlanif20]ip address 192.168.20.20 24
[S1-Vlanif20]dhcp select global
[S1-Vlanif20]ip pool vlan20pool
[S1-ip-pool-vlan20pool]network 192.168.20.0 mask 24
[S1-ip-pool-vlan20pool]gateway-list 192.168.20.254
[S1-ip-pool-vlan20pool]excluded-ip-address 192.168.20.20
[S1-ip-pool-vlan20pool]quit
```

[S1]int g0/0/3

[S1-GigabitEthernet0/0/3]port link-type access

[S1-GigabitEthernet0/0/3]port default vlan 20

[S1-GigabitEthernet0/0/3]quit

[S1]int g0/0/5

[S1-GigabitEthernet0/0/5]port link-type access

[S1-GigabitEthernet0/0/5]port default vlan 20

[S1-GigabitEthernet0/0/5]quit

Switch config for Router

[S1]int g0/0/1

[S1-GigabitEthernet0/0/1]port link-type trunk

[S1-GigabitEthernet0/0/1]port trunk allow-pass vlan all

```
<S1>display vlan
The total number of vlans is : 3
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------

1    common  UT:GE0/0/1(U)      GE0/0/6(D)      GE0/0/7(D)      GE0/0/8(D)
                GE0/0/9(D)      GE0/0/10(D)     GE0/0/11(D)     GE0/0/12(D)
                GE0/0/13(D)     GE0/0/14(D)     GE0/0/15(D)     GE0/0/16(D)
                GE0/0/17(D)     GE0/0/18(D)     GE0/0/19(D)     GE0/0/20(D)
                GE0/0/21(D)     GE0/0/22(D)     GE0/0/23(D)     GE0/0/24(D)

10   common  UT:GE0/0/2(U)      GE0/0/4(U)
             TG:GE0/0/1(U)

20   common  UT:GE0/0/3(U)      GE0/0/5(U)
             TG:GE0/0/1(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
10   enable  default       enable  disable    VLAN 0010
20   enable  default       enable  disable    VLAN 0020
```

Fig 9.3: VLAN Routing Table

9.6 Result

The results obtained from the testing phase showed the following:

IP Addresses:

Generated IP for the PCs are as follows:

```
PC>ipconfig

Link local IPv6 address.....: fe80::5689:98ff:fe18:2dce
IPv6 address.....: :: / 128
IPv6 gateway.....: ::
IPv4 address.....: 192.168.10.253
Subnet mask.....: 255.255.255.0
Gateway.....: 192.168.10.254
Physical address.....: 54-89-98-18-2D-CE
DNS server.....:
```

Fig 9.4: IP address for PC 1

```
PC>ipconfig

Link local IPv6 address.....: fe80::5689:98ff:fe09:7a32
IPv6 address.....: :: / 128
IPv6 gateway.....: ::
IPv4 address.....: 192.168.20.253
Subnet mask.....: 255.255.255.0
Gateway.....: 192.168.20.254
Physical address.....: 54-89-98-09-7A-32
DNS server.....:
```

Fig 9.5: IP address for PC 2

```
PC>ipconfig

Link local IPv6 address.....: fe80::5689:98ff:fe93:7d56
IPv6 address.....: :: / 128
IPv6 gateway.....: ::
IPv4 address.....: 192.168.10.252
Subnet mask.....: 255.255.255.0
Gateway.....: 192.168.10.254
Physical address.....: 54-89-98-93-7D-56
DNS server.....:
```

Fig 9.6: IP address for PC 3

```
PC>ipconfig

Link local IPv6 address.....: fe80::5689:98ff:fede:c25
IPv6 address.....: :: / 128
IPv6 gateway.....: ::
IPv4 address.....: 192.168.20.253
Subnet mask.....: 255.255.255.0
Gateway.....: 192.168.20.254
Physical address.....: 54-89-98-DE-0C-25
DNS server.....:
```

Fig 9.7: IP address for PC 4

Data Transmission:

```
PC>ping 192.168.20.252

Ping 192.168.20.252: 32 data bytes, Press Ctrl_C to break
From 192.168.20.252: bytes=32 seq=1 ttl=127 time=78 ms
From 192.168.20.252: bytes=32 seq=2 ttl=127 time=79 ms
From 192.168.20.252: bytes=32 seq=3 ttl=127 time=78 ms
From 192.168.20.252: bytes=32 seq=4 ttl=127 time=78 ms
From 192.168.20.252: bytes=32 seq=5 ttl=127 time=78 ms

--- 192.168.20.252 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 78/78/79 ms
```

Fig 9.8: Sending Message From PC 1 to PC 4

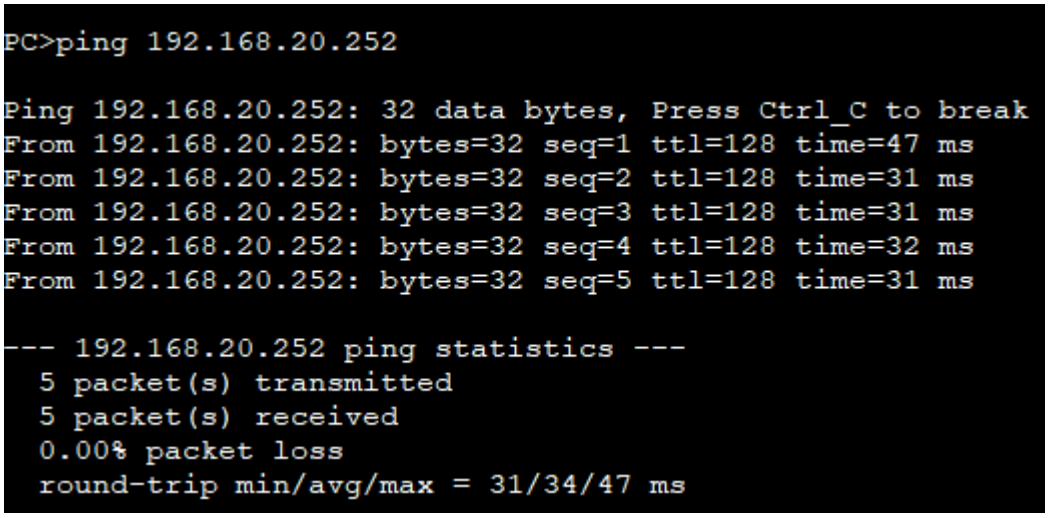

Fig 9.9: Sending Message From PC 2 to PC 4

9.7 Discussion and Conclusion

In the experiment on dynamic routing, several commands were utilized to configure network devices for different functionalities. The "dhcp enable" command enabled the Dynamic Host Configuration Protocol (DHCP) service on a device, allowing it to automatically assign IP addresses and network configurations to connected devices. Another command, "dot1q termination vid 10," was used to configure VLAN (Virtual Local Area Network) settings. It allowed the device to accept and process incoming frames tagged with VLAN ID 10, effectively segregating network traffic. Additionally, the "arp broadcast enable" command enabled ARP (Address Resolution Protocol) broadcast, allowing devices to map IP addresses to MAC addresses on the local network for communication. The "dhcp select interface" command designated a specific network interface through which the device would request an IP address from the DHCP server. Alternatively, the "dhcp select global" command set the DHCP client to use any available interface for IP address assignment. Furthermore, the "ip pool vlan10pool" command created an IP address pool for devices in VLAN 10. Lastly, the "port link-type trunk" command configured a network port on a switch to operate in trunk mode, enabling it to carry traffic from multiple VLANs across the same link. After the experiment's completion, it was reported that messages were successfully sent between two PCs, as they were automatically assigned appropriate IP addresses. The dynamic routing configurations allowed for efficient and automated network management, ensuring seamless communication and adaptability in response to network changes.