**Lab 3.WANs Technology**

**Objective**

* Understand the WANs Technologies, including dedicated, circuit-switched and packet-switched networks.

**Topology**

**Diagram

Description automatically generated**

**Address Scheme**

**Inside:**

|  |  |  |  |
| --- | --- | --- | --- |
| Host name | Interface | IPv4/IPv6 address | Memo |
| Switch1 | F0/1 | N/A | VLAN ID = 11 |
| F0/2 | N/A | VLAN ID = 22 |
| F0/3 | N/A | VLAN ID = 88 |
| F0/23~24 | N/A | VLAN ID = All VLANs (trunk) |
| Switch2 | F0/1 | N/A | VLAN ID = 11 |
| F0/2 | N/A | VLAN ID = 22 |
| F0/3 | N/A | VLAN ID = 88 |
| F0/23~24 | N/A | VLAN ID = All VLANs (trunk) |
| Switch3 | F0/1 | N/A | VLAN ID = 101 |
| F0/6 | N/A | VLAN ID = 66 |
| F0/21~24 | N/A | VLAN ID = All VLANs (trunk) |
| Vlan 11 | IPv4: 192.168. 11. 1/24 | SVI |
| Vlan 22 | IPv4: 192.168. 22. 1/24 | SVI |
| Vlan 66 | IPv4: 192.168. 66. 1/24 | SVI |
| Vlan 88 | IPv4: 192.168. 88. 1/24 | SVI |
| Vlan 99 | IPv4: 192.168. 99. 2/24 | SVI |
| Vlan 101 | IPv4: 192.168.101. 2/24 | SVI |
| Switch4 | F0/1 | N/A | VLAN ID = 102 |
| F0/21~24 | N/A | VLAN ID = All VLANs (trunk) |
| Vlan 11 | IPv4: 192.168. 11. 2/24 | SVI |
| Vlan 22 | IPv4: 192.168. 22. 2/24 | SVI |
| Vlan 88 | IPv4: 192.168. 88. 2/24 | SVI |
| Vlan 99 | IPv4: 192.168. 99. 2/24 | SVI |
| Vlan 102 | IPv4: 192.168.102. 2/24 | SVI |
| Switch99 | F0/1 | N/A | VLAN ID = 99 |
| F0/2 | N/A | VLAN ID = 99 |
| F0/3 | N/A | VLAN ID = 99 |
| F0/6 | N/A | VLAN ID = 99 |
| F0/21~24 | N/A | VLAN ID = All VLANs (trunk) |
| Gateway-Router1 | F0/0 | IPv4: 192.168.101. 1/24 | N/A |
| F0/1 | IPv4: 192.168.102. 1/24 | N/A |
| F1/0  (PPPoE) | IPv4: 201.201.201. 2/24 (Static) | N/A |
| Modem0/0/0 | IPv4: 172. 16. 1. 1/24 | Phone no. = 85322222222 |
| S1/0/0  (FrameRelay) | IPv4: 172. 16. 2. 1/24 | DLCI = 103, 104 |
| IPv6-Router | F0/0 | IPv6: 2001:2345:6789: 66:: 6/64 | N/A |
| F0/1 | IPv4: 192.168. 66. 6/24 | N/A |
| Router99 | F0/0 | IPv6: 2001:2345:6789: 99:: 6/64 |  |
| F0/1 | IPv4: 192.168. 99. 6/24 |  |
| Gateway-Router3 | F0/0 | IPv4: 192.168. 33. 1/24 |  |
| S1/0/0  (FrameRelay) | IPv4: 172. 16. 2. 3/24 | DLCI = 301 |
| Gateway-Router4 | F0/0 | IPv4: 192.168. 44. 1/24 |  |
| S1/0/0  (FrameRelay) | IPv4: 172. 16. 2. 4/24 | DLCI = 401 |
|  |  |  |  |
| Teacher-PC1~2 | F0 | IPv4: 192.168. 11.101~199/24 | N/A |
| Student-PC1~2 | F0 | IPv4: 192.168. 22.101~199/24 | N/A |
| Guest-Laptop1~2 | F0 | IPv4: 192.168. 88.101~199/24 | N/A |
| IPv6-PC1~2  IPv6-Laptop |  | IPv6: 2001:2345:6789: 66::?:?:?:?/64 |  |
| DSL-PC | F0 | IPv4: 201.201.201.101~199/24 (DHCP via ISP) |  |
| Dialup-PC | Modem0 | IPv4: 202.202.202.101~199/24 (DHCP via ISP)  Or  IPv4: 172. 16. 1.101~199/24 (DHCP via Gateway-Router1) | Phone no. = 85333333333 |
| Branch-PC3 | F0 | IPv4: 192.168. 33.101~199/24 (DHCP via Gateway-Router1) |  |
| Branch-PC4 | F0 | IPv4: 192.168. 44.101~199/24 (DHCP via Gateway-Router1) |  |
|  |  |  |  |
| Web-Server  FTP Server  DHCP-Server  IPv6-Server | F0  F0  F0  F0 | IPv4: 192.168. 99.101/24  IPv4: 192.168. 99.102/24  IPv4: 192.168. 99.103/24  IPv6: 2001:2345:6789. 99::106/64 | N/A |

**Outside:**

|  |  |  |  |
| --- | --- | --- | --- |
| ISP-Router | F0/0 | IPv4: 1. 1. 1. 1/8 | N/A |
| F1/0  (PPPoE) | IPv4: 201.201.201. 1/24 | N/A |
| Modem0/0/0 | IPv4: 202.202.202. 1/24 | Phone no. = 85311111111 |
| Internet-PC | F0/0 | IPv4: 1. 2. 3. 4/8 | N/A |

**Translation:**

|  |  |  |
| --- | --- | --- |
| Addressing Scheme for NAT | | |
|  | Public IPv4 addresses | Private IPv4 addresses |
| Teacher-PC1~2  Student-PC1~2  Guest-PC1~2  Branch-PC3  Branch-PC4 | 200.200.123.1/29 | 192.168. 11. 0/24  192.168. 22. 0/24  192.168. 88. 0/24  192.168. 33. 0/24  192.168. 44. 0/24 |
| Web-Server  FTP Server | 200.200.123.2  200.200.123.3 | 192.168. 99.101/24  192.168. 99.102/24 |

**Part 1 – Dedicated Network.**

Requirement:

1.1 Gateway-Router -> Internet-PC using Enterprise DSL

1.2 DSL-PC -> Internet-PC using Personal DSL

Step 1 – Enterprise DSL

1. configure the DSL on the provider’s site (e.g. ISP-Router)

Reference 5.Q5

2. configure the DSL on the subscriber’s site. (e.g. Gateway-Router1)

Reference 5.Q13

3. test the connectivity of the DSL connection.

Step 2 – Personal DSL

4. configure the DSL on the provider’s site (e.g. ISP-Router)

Reference 5.Q1~5

5. configure the DSL on the subscriber’s site. (e.g. DSL-PC)

Reference 5.Q7~11

6. test the connectivity of the DSL connection.

**Part 2 – Circuit-switched Network.**

Requirement:

2.1 Dialup-PC -> Internet-PC using analog dialup

2.2 Dialup-PC -> Teacher-PC/Student-PC/Servers using analog dialup

Step 3 – Analog dialup

7. configure analog dialup on the provider’s site (e.g. ISP-Router)

Reference 6.Q1~3

8. configure analog dialup on the campus’s site (e.g. Gateway-Router1)

Reference 6.Q10~12

9. configure analog dialup on the subscriber’ site (e.g. Dialup-PC)

Reference 6.Q5~9; Q14~18

10. test the connectivity of the analog dialup connection.

**Part 3 – Packet-switched Network.**

Requirement:

3.1 Branch-PC -> Teacher-PC/Student-PC/Servers using Frame Relay

3.2 Branch-PC -> Internet-PC

Step 4 – Frame Relay

11. configure frame relay on all site (including Gateway-Router1~3~4)

Reference 7.Q1,2,5,6,12~14

Step 5 – Routing

12. configure the routing information, dhcp, and nat, so that all PCs can ping each other.

13. test the connectivity of the frame relay connection.