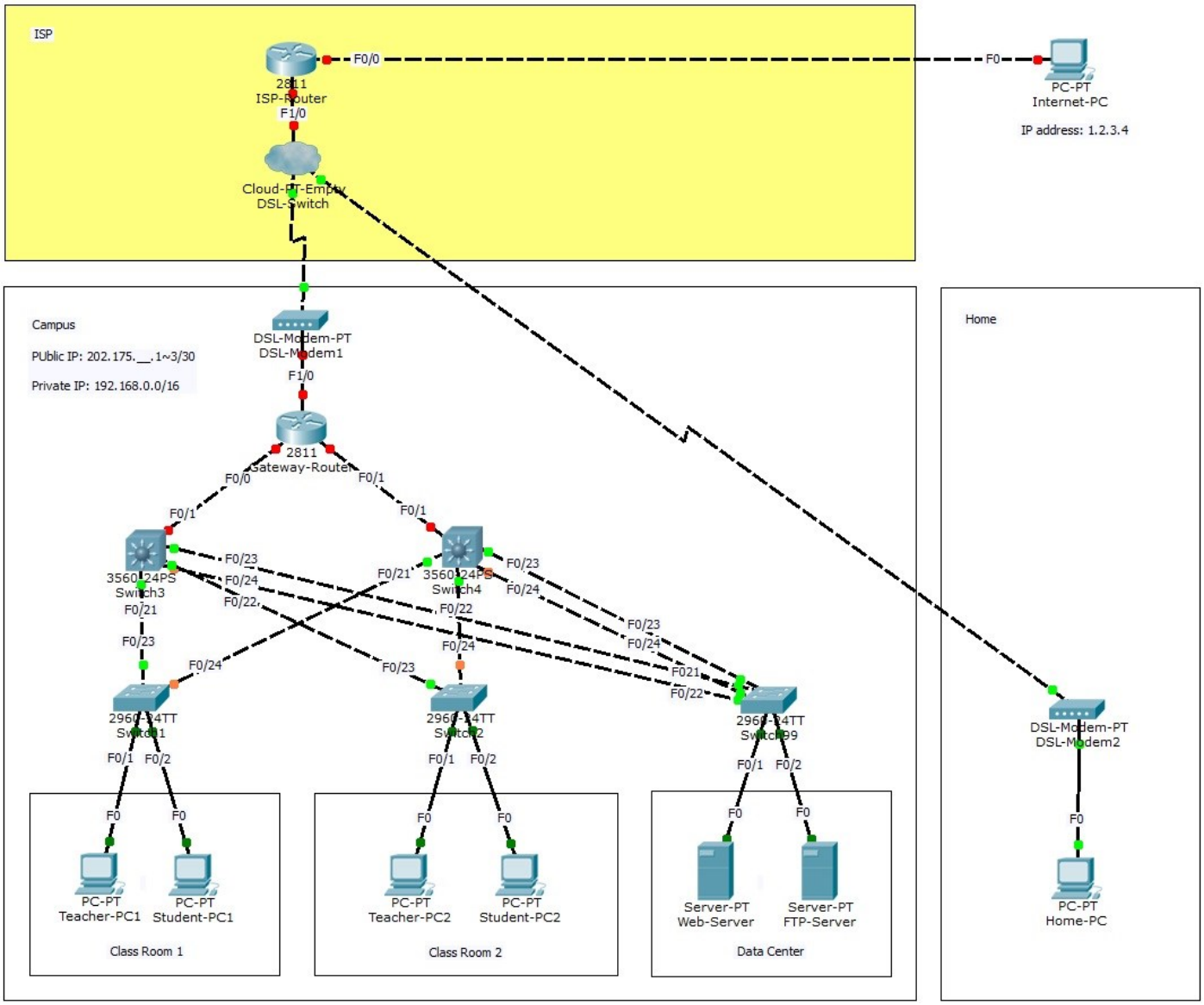
Lab 5.DSL

Objective

- Understand the WAN technologies of DSL.

Topology



Address Scheme for NAT		
	Public IPv4 addresses	Private IPv4 addresses
Teacher-PC1~2 Student-PC1~2	202.175.__11.1/30	192.168.__11.101~199/24 192.168.__22.101~199/24
Web-Server FTP-Server	202.175.__11.2 202.175.__11.3	192.168.__99.101 192.168.__99.102

Host name	Interface	IPv4/IPv6 address	VLAN ID
Switch1	F0/1	N/A	VLAN 11
	F0/2	N/A	VLAN 22
	F0/23~24	N/A	All VLANs (trunk)
Switch2	F0/1	N/A	VLAN 11
	F0/2	N/A	VLAN 22
	F0/23~24	N/A	All VLANs (trunk)
Switch3	F0/1	N/A	VLAN 101
	F0/21~24	N/A	All VLANs (trunk)
	Vlan 11	IPv4: 192.168. 11. 1/24	SVI
	Vlan 22	IPv4: 192.168. 22. 1/24	SVI
	Vlan 99	IPv4: 192.168. 99. 1/24	SVI
	Vlan 101	IPv4: 192.168.101. 2/24	SVI
Switch4	F0/1	N/A	VLAN 102
	F0/21~24	N/A	All VLANs (trunk)
	Vlan 11	IPv4: 192.168. 11. 2/24	SVI
	Vlan 22	IPv4: 192.168. 22. 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 99
	F0/2	N/A	VLAN 99
	F0/21~24	N/A	All VLANs (trunk)
Gateway-Router (DHCP-Server)	F0/0	IPv4: 192.168.101. 1/24	N/A
	F0/1	IPv4: 192.168.102. 1/24	N/A
	F1/0 (PPPoE)	IPv4: 202.175. 0. 2~100/24 (DHCP)	N/A
Teacher-PC1~2	F0	IPv4: 192.168. 11.101~199/24 (DHCP)	N/A
Student-PC1~2	F0	IPv4: 192.168. 22.101~199/24 (DHCP)	N/A
Web-Server	F0	IPv4: 192.168. 99.101/24	N/A
FTP-Server	F0	IPv4: 192.168. 99.102/24	N/A
ISP-Router	F0/0	IPv4: 1. 1. 1. 1/8	N/A
	F1/0 (PPPoE)	IPv4: 202.175. 0. 1/24	N/A
Internet-PC	F0	IPv4: 1. 2. 3. 4/8	N/A
Home-PC	F0 (PPPoE)	IPv4: 202.175. 0. 101~199/24 (DHCP)	N/A

Part 1 - DSL for personal users.

Step 1 - Configure DSL in the provider's site.

1. Create a local pool of addresses that will be assigned to the PPPoE subscribers.
   ISP-Router(config)# ***ip local pool*** Personal-PPPoEPool 202.175.0.101 202.175.0.199

2. Create the virtual template for the subscriber-facing interface.
   (Note: When a PPPoE subscriber initiates a session with the provider router, the provider router automatically spawns a virtual interface to represent that point-to-point connection.)
   ISP-Router(config)# ***interface Virtual-Template*** 1
   ISP-Router(config-if)# ***ip unnumbered FastEthernet*** 1/0
   ISP-Router(config-if)# ***peer default ip address pool*** Personal-PPPoEPool
   (Note: The PPPoE subscribers will be assigned a negotiated address from the local pool.)
   ISP-Router(config-if)# ***ppp authentication chap callin***
   (Note: Authenticate the PPPoE subscribers with CHAP.)
   (Note: PPP can use PAP or CHAP to authenticate clients, but CHAP is preferred.)

3. Create a user account for the PPPoE subscribers to login.
   ISP-Router(config)# ***username*** User1 ***password*** Hello

4. Create the VPN group for the PPPoE subscribers.
   ~~ISP-Router(config)# ***vpdn enable***~~
   ~~ISP-Router(config)# ***vpdn-group*** PPPoEGroup~~
   ~~ISP-Router(config-vpdn)# ***accept-dialin***~~
   ~~ISP-Router(config-vpdn-acc-in)# ***protocol pppoe***~~
   ~~ISP-Router(config-vpdn-acc-in)# ***virtual-template*** 1~~

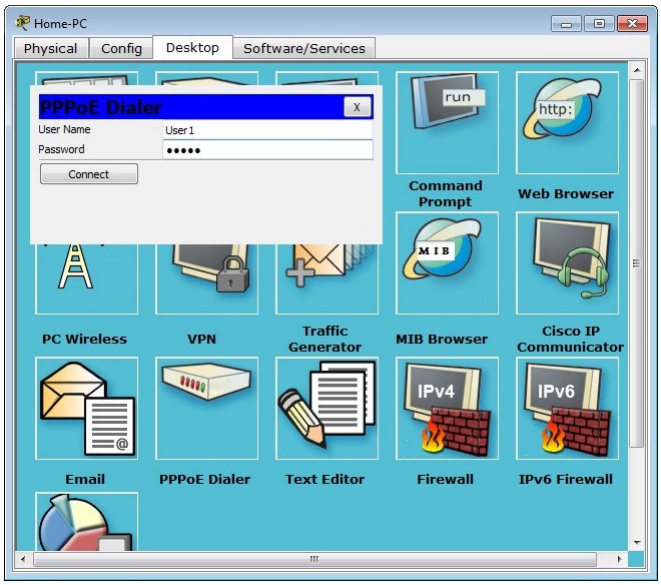
5. Configure the physical interface (e.g. FastEthernet 1/0) that connected to the PPPoE subscribers.
   ISP-Router(config)# ***bba-group pppoe MyGroup***
   ISP-Router(config-bba)#***virtual-template 1***
   ~~ISP-Router(config-bba)#sessions per-mac limit 2~~

   ISP-Router(config)# ***interface FastEthernet*** 1/0
   ISP-Router(config-if)# ***ip address*** 202.175.0.1 255.255.255.0
   ISP-Router(config-if)# ***pppoe enable group MyGroup***
   ISP-Router(config-if)# ***no shutdown***

6. Configure the physical interface (e.g. FastEthernet 0/0) that connected to the Internet.
   ISP-Router(config)# ***interface FastEthernet*** 0/0
   ISP-Router(config-if)# ***ip address*** 1.1.1.1 255.0.0.0
   ISP-Router(config-if)# ***no shutdown***

Step 2 - Configure DSL in the subscriber's site.

7. Connect the PPPoE subscriber to the DSL network from Home-PC, using the applications, PPPoE Dialer.



8. Verify a notification indicating the PPPoE session has successfully formed in ISP-Router:

   Output of ISP-Router:

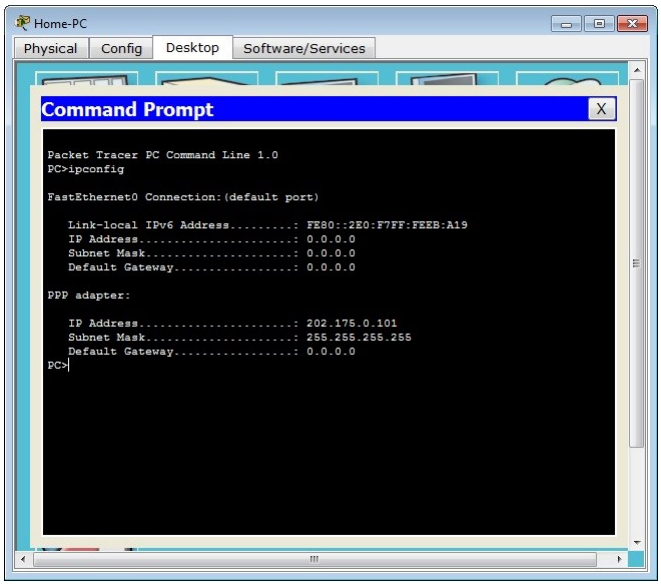
```
%LINK-5-CHANGED: Interface Virtual-Access1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state to
up
```

9. Display the IP address of the virtual-access interface in ISP-Router.
   ISP-Router# ***show ip interface brief***

   Output of ISP-Router:

```
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        1.1.1.1         YES manual up                    up
FastEthernet0/1        unassigned      YES unset  administratively down down
FastEthernet1/0        202.175.0.1     YES manual up                    up
Serial1/0/0            unassigned      YES unset  administratively down down
Serial1/0/1            unassigned      YES unset  administratively down down
Virtual-Template1      202.175.0.1     YES TFTP   down                  down
Vlan1                  unassigned      YES unset  administratively down down
Virtual-Access1        unassigned      YES unset  up                    up
Virtual-Access1.1      202.175.0.1     YES TFTP   up                    up
```

10. Display the IPv4 address of Home-PC, using the applications, Command Prompt.
    Home-PC:\> ***ipconfig***



Output of Home-PC:

```
PC>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.....: FE80::2E0:F7FF:FEEB:A19
   IP Address.....: 0.0.0.0
   Subnet Mask.....: 0.0.0.0
   Default Gateway.....: 0.0.0.0

PPP adapter:

   IP Address.....: 202.175.0.101
   Subnet Mask.....: 255.255.255.255
   Default Gateway.....: 0.0.0.0
```

11. Test the IP connectivity from Home-PC to Internet-PC using ***ping***.
    Home-PC:\> ***ping*** 1.2.3.4

Output of Home-PC:

```
PC>ping 1.2.3.4

Pinging 1.2.3.4 with 32 bytes of data:

Request timed out.
Reply from 1.2.3.4: bytes=32 time=108ms TTL=127
Reply from 1.2.3.4: bytes=32 time=90ms TTL=127
Reply from 1.2.3.4: bytes=32 time=70ms TTL=127

Ping statistics for 1.2.3.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 70ms, Maximum = 108ms, Average = 89ms
```

Part 2 - DSL for enterprise users.

Step 1 - Configure DSL in the provider's site.

12. Create a DHCP pool of addresses that will be assigned to the PPPoE subscribers.
    ISP-Router(config)# ***ip dhcp excluded-address*** 202.175.0.1 202.175.0.1

    ISP-Router(config)# ***ip dhcp pool*** Enterprise-PPPoEPool
    ISP-Router(dhcp-config)# ***network*** 202.175.0.0 255.255.255.0
    ISP-Router(dhcp-config)# ***default-router*** 202.175.0.1

Step 2 - Configure DSL in the subscriber's site.

13. Configure the physical interface (e.g. FastEthernet 1/0) that connected to the PPPoE provider.
    Gateway-Router(config)# ***interface FastEthernet*** 1/0
    Gateway-Router(config-if)# ***ip address dhcp***
    Gateway-Router(config-if)# ***pppoe enable***
    Gateway-Router(config-if)# ***no shutdown***

14. Wait for a notification indicating the PPPoE session has successfully formed and an IP address is obtained by DHCP in Gateway-Router:

    Output of Gateway-Router:

```
%DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet1/0 assigned DHCP address
202.175.0.2, mask 255.255.255.0, hostname Gateway-Router
```

15. Display the IP address of the physical interface (e.g. FastEthernet 1/0) that connected to the PPPoE provider.
    Gateway-Router# ***show ip interface brief***

    Output of Gateway-Router:

```
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES unset  administratively down down
FastEthernet0/1        unassigned      YES unset  administratively down down
FastEthernet1/0        202.175.0.2     YES DHCP   up                    up
Serial1/0/0            unassigned      YES unset  administratively down down
Serial1/0/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

16. Display the routing table of Gateway-Router.
    Gateway-Router# ***show ip route***

Output of Gateway-Router:

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 202.175.0.1 to network 0.0.0.0

C    202.175.0.0/24 is directly connected, FastEthernet1/0
S*   0.0.0.0/0 [254/0] via 202.175.0.1
```

17. What route is created by the DHCP?
    A static default route with a next-hop of 202.175.0.1.

18. Test the IP connectivity from Gateway-Router to Internet-PC using ***ping***.
    Gateway-Router# ***ping*** 1.2.3.4

    Output of Gateway-Router:

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.2.3.4, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 66/74/85 ms
```

Step 3 - Assign the public IP addresses to the PPPoE subscribers.

19. Configure the static route in ISP-Router.
    ISP-Router(config)# ***ip route*** 202.175.11.0 255.255.255.252 202.175.0.2