

P10: Networking with Application Layer II (DHCP, DNS)

Q1: Understand the Basics of DHCP and DNS

An application layer is an abstraction layer that specifies the shared communications protocols and interface methods used by hosts in a communications network. The application layer abstraction is used in both of the standard models of computer networking: The Internet Protocol Suite (TCP/IP) and the OSI model. Although both models use the same term for their respective highest-level layer, the detailed definitions and purposes are different.

DHCP

It stands for Dynamic Host Configuration Protocol (DHCP). It gives IP addresses to hosts. There is a lot of information a DHCP server can provide to a host when the host is registering for an IP address with the DHCP server. Port number for DHCP is 67, 68.

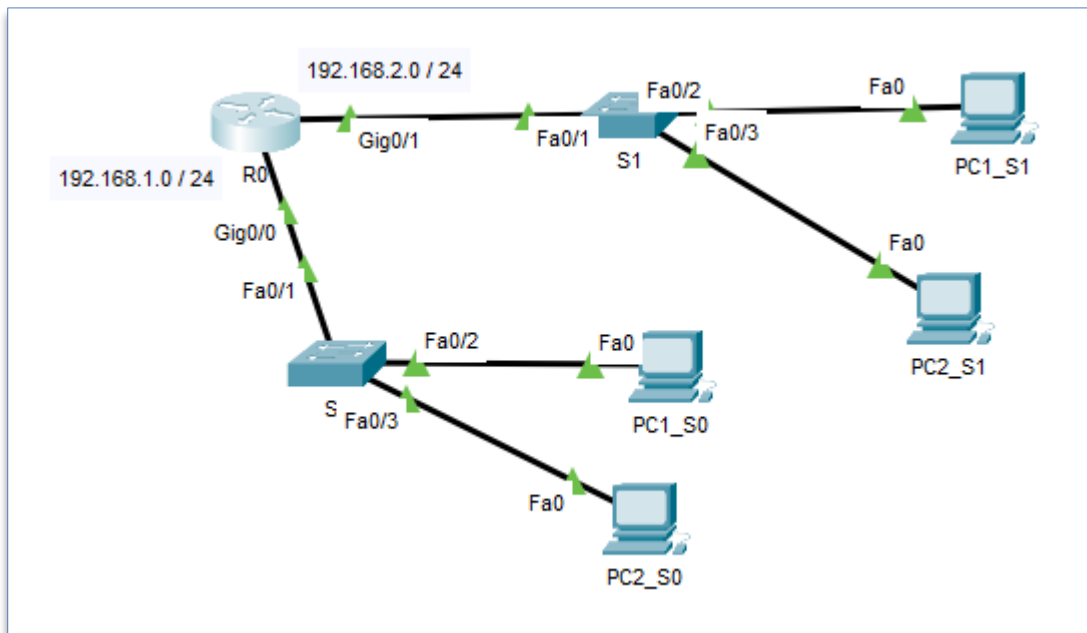
DNS

It stands for Domain Name System. Every time you use a domain name, therefore, a DNS service must translate the name into the corresponding IP address. For example, the domain name www.abc.com might translate to 198.105.232.4.

Port number for DNS is 53.

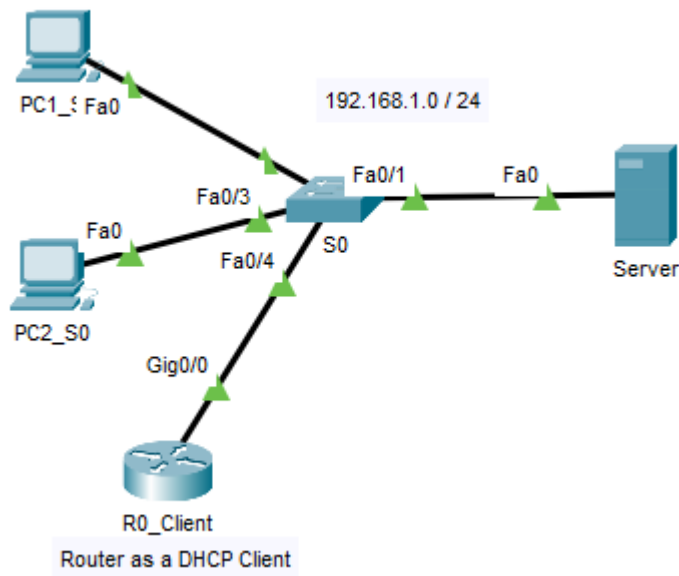
Q2: Configuring a DHCP Service on a Router

- Open **PTLab 10.2.pka** and implement the network shown below:



Q3: Configuring a DHCP Service on a Server PC

- Create a new .pkt file and implement the network shown below:

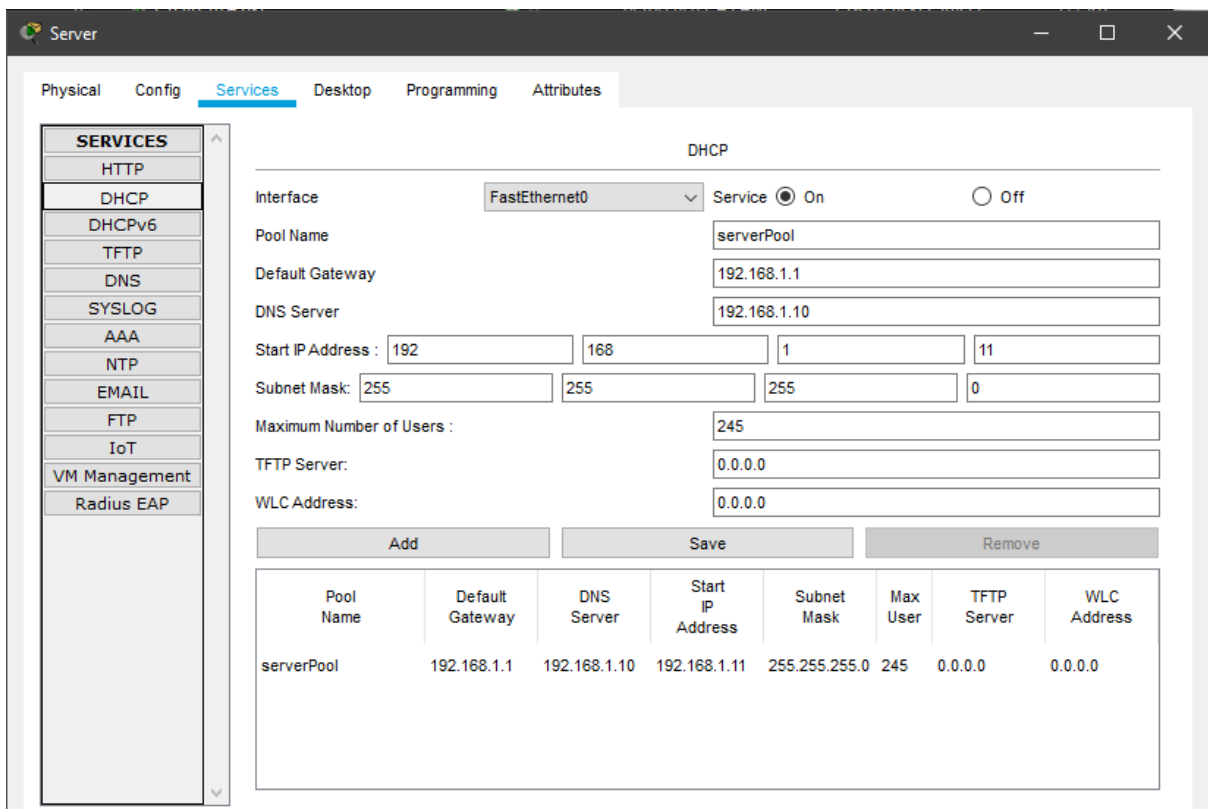


- Note:** PCs and R0_Client are configured as **DHCP Clients**
- To configure the Router as a DHCP client


```

R0_Client(config)# int Gig0/0
R0_Client(config-if)# ip address dhcp
      
```

- Configure the (DHCP) Server as shown below:



Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 192.168.1.1

DNS Server: 192.168.1.10

Start IP Address: 192.168.1.11

Subnet Mask: 255.255.255.0

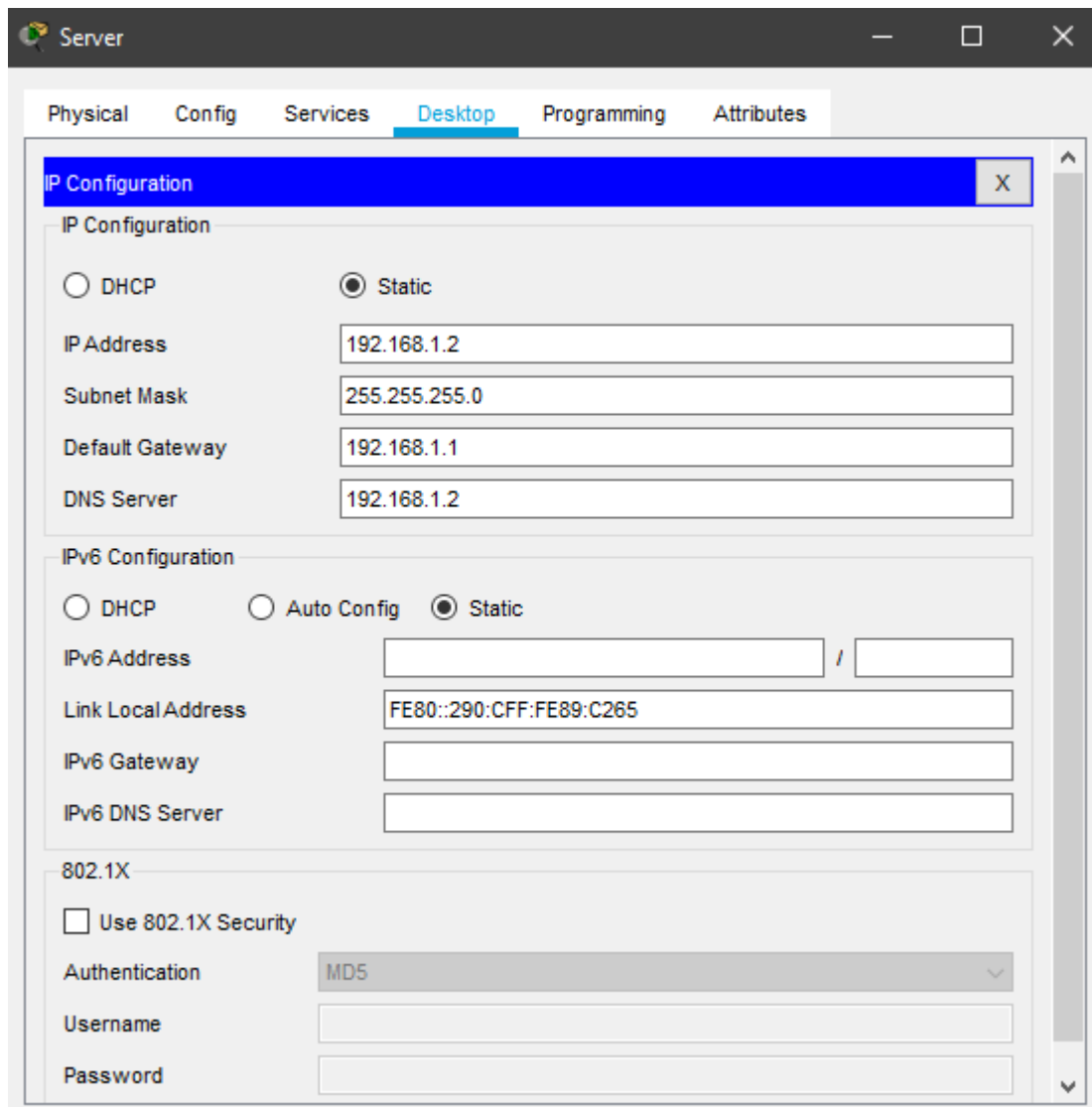
Maximum Number of Users: 245

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Add Save Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	192.168.1.1	192.168.1.10	192.168.1.11	255.255.255.0	245	0.0.0.0	0.0.0.0



The screenshot shows the 'Server' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing the following settings:

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	192.168.1.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	192.168.1.2

Below the IP Configuration section is the 'IPv6 Configuration' section:

IPv6 Configuration		
<input type="radio"/> DHCP	<input type="radio"/> Auto Config	<input checked="" type="radio"/> Static
IPv6 Address		
Link Local Address	FE80::290:CFF:FE89:C265	
IPv6 Gateway		
IPv6 DNS Server		

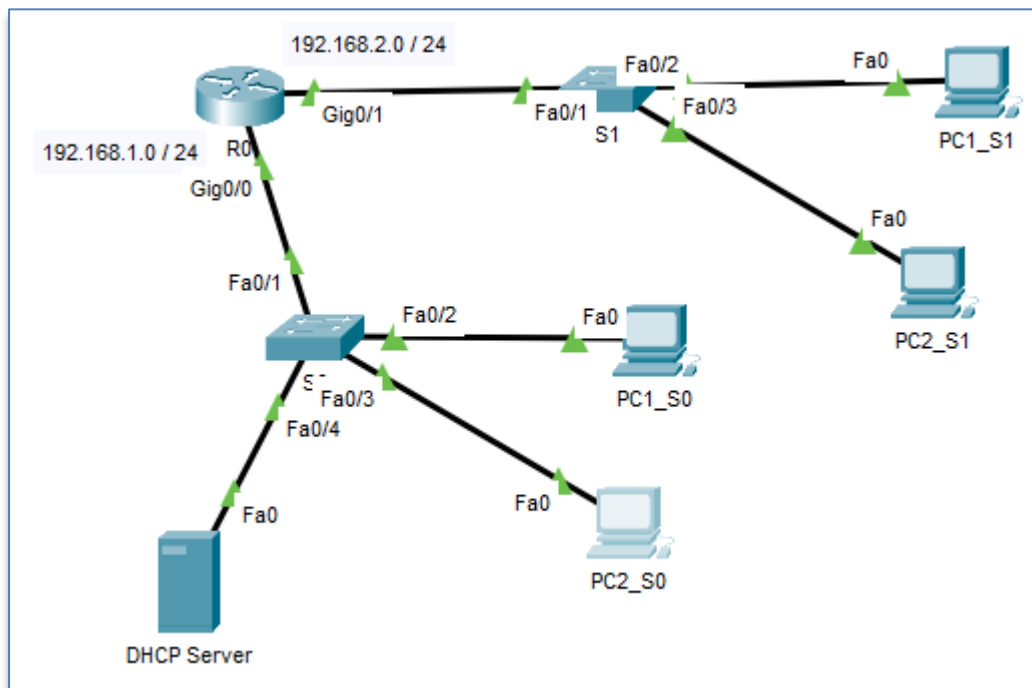
At the bottom is the '802.1X' section:

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

- Send an ICMP message from PC1_S0 to R0_Client, PC2_S0 client (must be successful)
- **What is the critical problem in this configuration where a router is configured to obtain the default gateway address from a DHCP Server.**

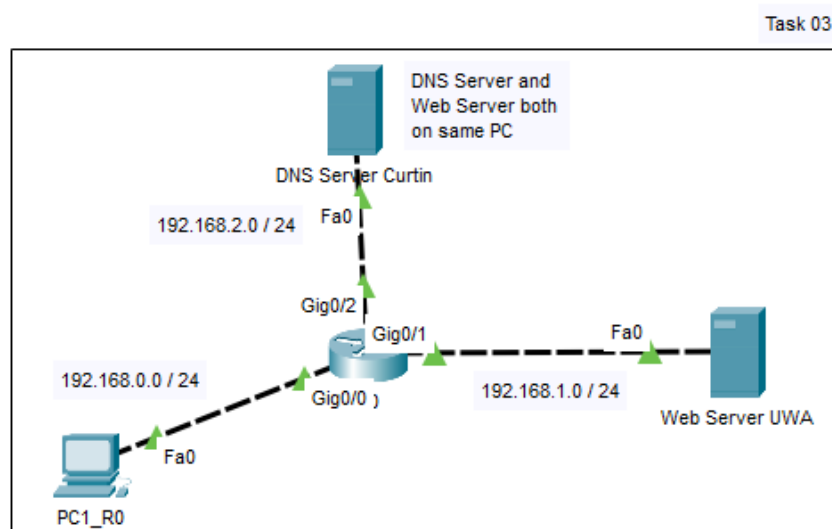
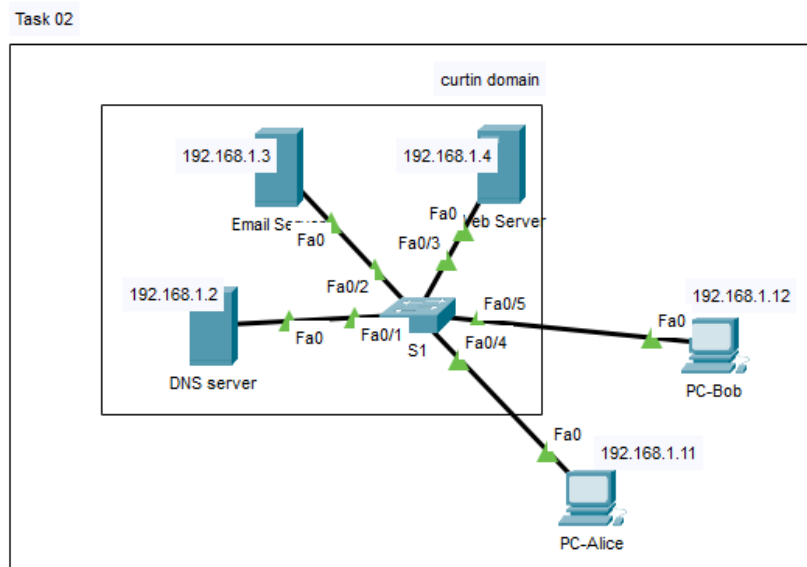
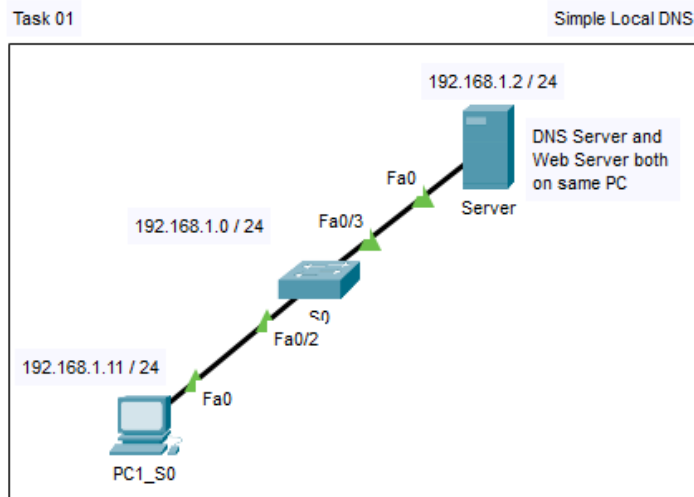
Q4: Configuring a DHCP Relay Agent

- Open **PTLab 10.4.pka** and implement the network shown below:



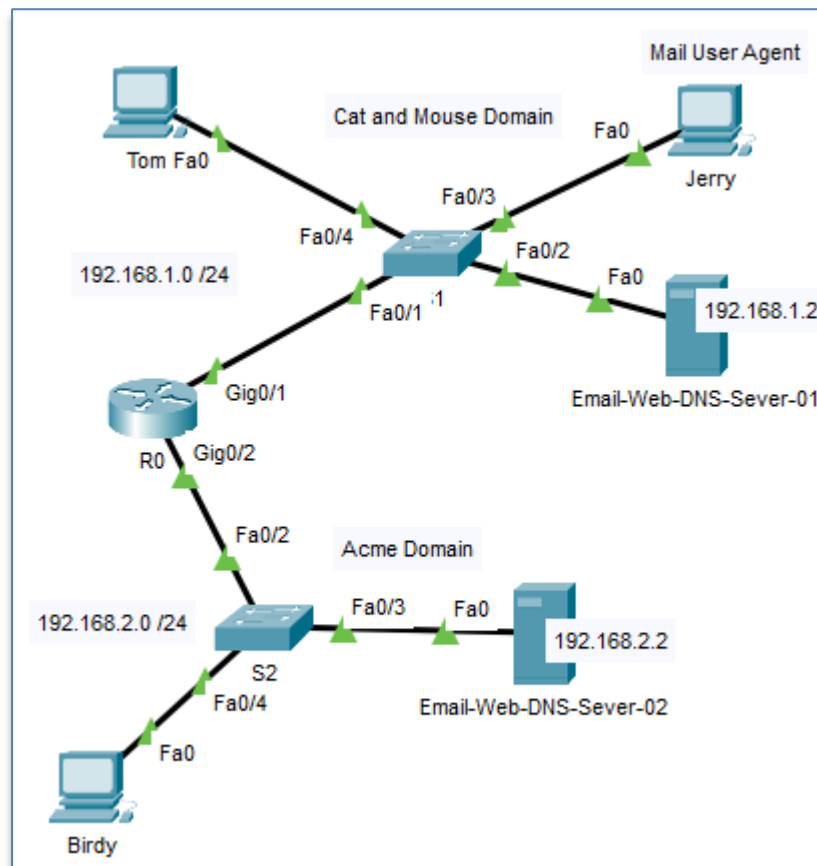
Q5: Configuring a Private/Local DNS Server (Single Level)

- Open **PTLab 10.5.pka** and implement the networks shown below:



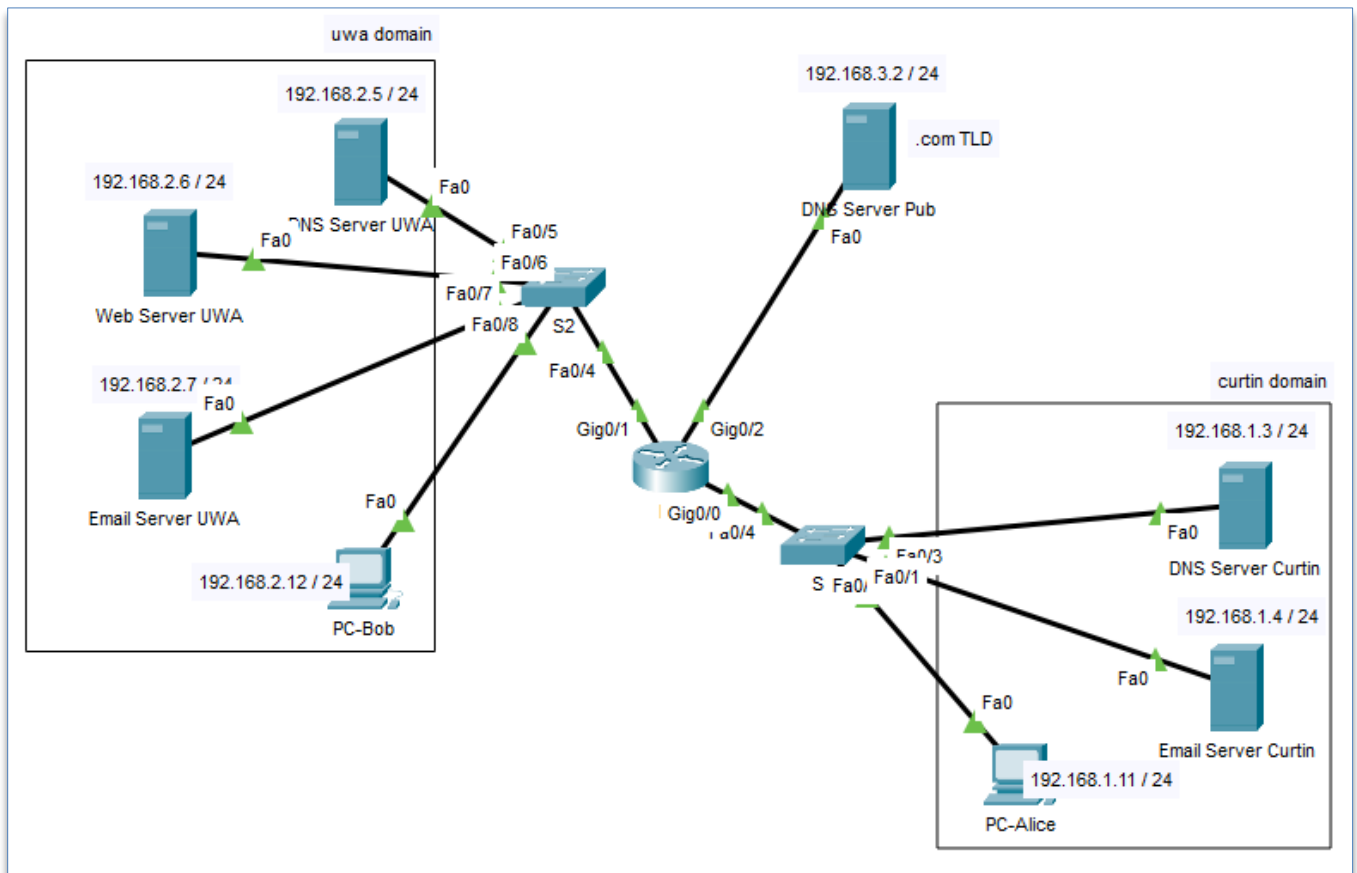
Q6: Configuring Two Local DNS/Email Servers

- Open **PTLab 10.6.pka** and implement the network shown below:



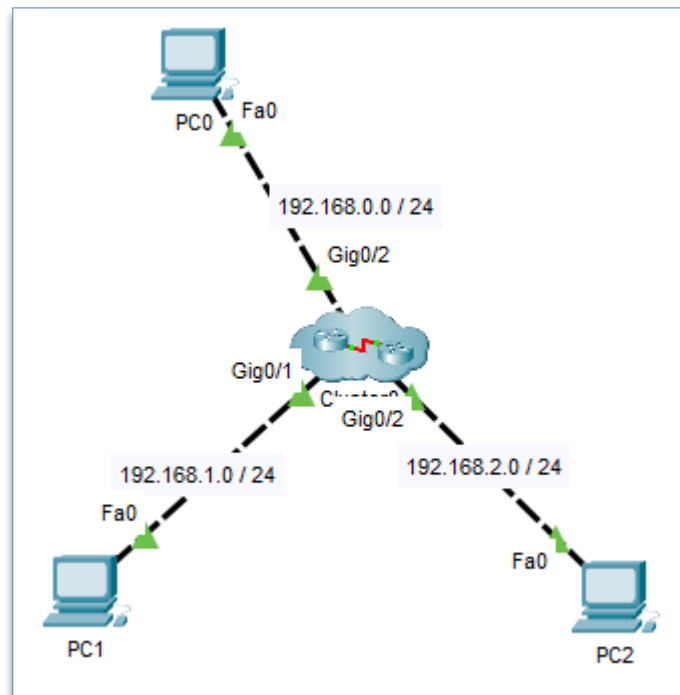
Q7: Configuring Multi-level DNS Servers

- Open **PTLab 10.7.pka** and implement the network shown below:



Q8: Configuring a p2p Network

- Open **PTLab 10.8.pka** and implement the network shown below:



Q7: Try me! Questions

1. In Q4, what would happen if R0 is also configured as a DHCP Server (additionally to the DHCP Server PC)?
Will the network be stable?
2. In Q4, how does the DHCP Server know which pool to be used when a DHCP Discover message is received from PC1_S0 and PC1_S1?
3. In Q4, Configure two VLANs (Student- VLANID:20 and Staff- VLANID:30) on Switch **S1**.
 - a. Assign PC1_S1, PC2_S2 to Student VLAN and Staff VLAN
 - b. Perform necessary configurations on the router so that the PCs on VLANs could obtain IP addresses from the existing **DHCP Server**
4. In Q7, what is the significance of having a SOA record at **DNS Server UWA** and another SOA record at **DNS Server Pub**? What would happen if the SOA record is removed at **DNS Server Pub**?
5. In Q7, it is explained why Alice's email to bob@uwa.com did not reach bob's inbox at **Email Server UWA**. On the same ground, explain why Alice's email (from alice@curtin.com) to bob@curtin.com reach bob's inbox in Q4? (Hint: Switch to simulation mode and observe the DNS resolution process in sending the email)
6. In Q7, add necessary DNS entries so that bob@uwa.com can send an email to alice@curtin.com successfully.
7. In Q7, do necessary configuration changes in order to change **.com** domains to **.edu.au** domains (e.g. curtin.com => curtin.edu.au, uwa.com => uwa.edu.au, bob@uwa.com => bob@uwa.com.au, etc.). Note that **.edu** and **.au** domains are same level TLDs (Hint: you may use two TLD servers, one for **.au**, another for **.edu**)

Summary

1. Configuring a DHCP Service on a Router
2. Configuring a DHCP Service on a Server PC
3. Configuring a DHCP Relay Agent
4. Configuring a Private/Local DNS Server (Single Level)
5. Configuring Two Local DNS/Email Servers
6. Configuring Multi-level DNS Servers
7. Configuring a p2p Network
8. **Try me! Questions**



WELL DONE!