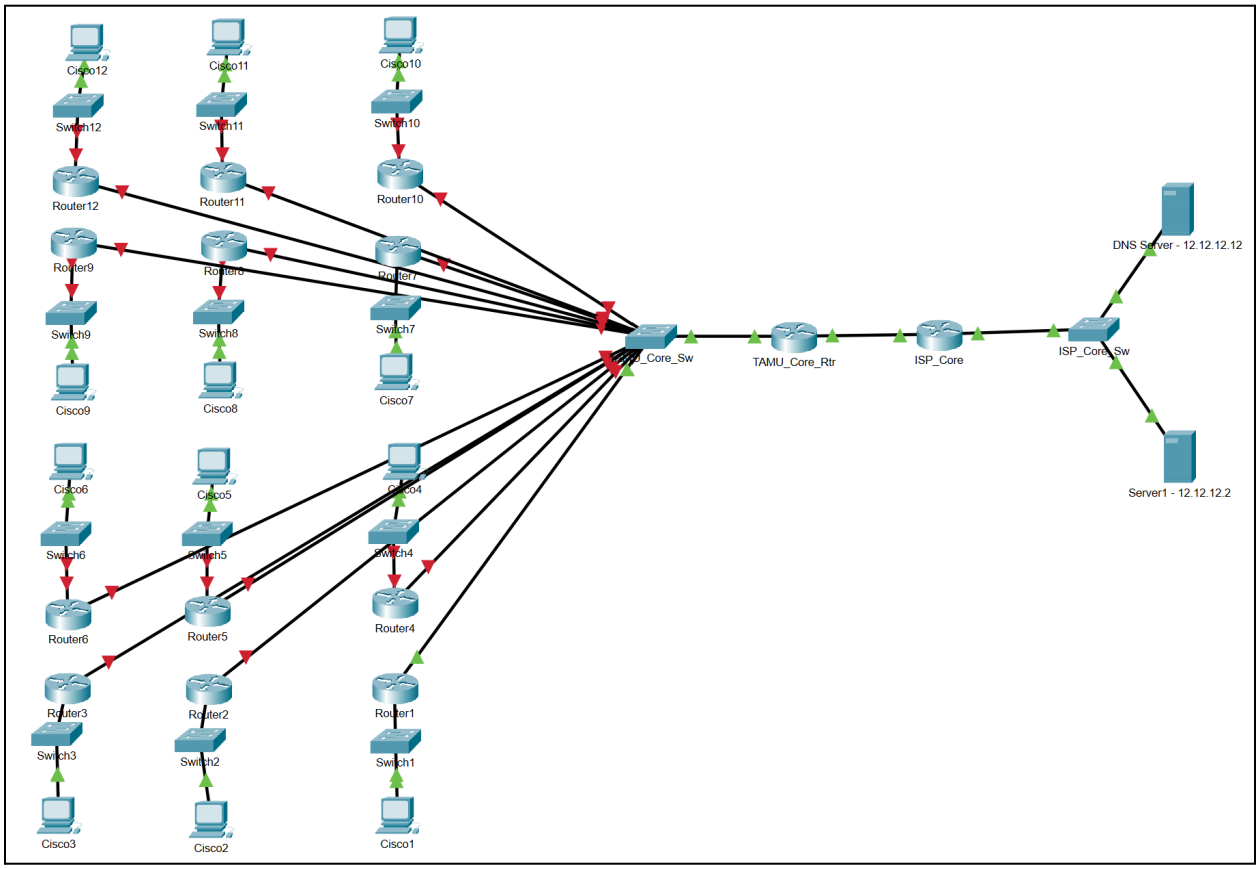
Routing: Spring 2023

Purpose:
Students will learn how to configure DHCP, OSPF, and NAT on their respective LANs, then test connectivity to the entire network by sending DNS requests to access a website on an external network.

Note: Any direction that includes an “X” is representative of the station number you are working at. Please enter the station number you are at anytime there is an “X”.



Part 1:
As always, we need to subnet our network address block 192.168.1.0 /24 into 4 subnets.

- On a scratch sheet of paper, subnet the network 192.168.1.0 /24 into 4 networks.
- Record the first address range

Part 2:
Next, we will configure the PC for DHCP.

- Follow the instructions below to enable the DHCP on the PC
    - Control Panel> Network and Internet> Network and Sharing Center> Change adapter settings> Ethernet> Properties> Internet Protocol Version 4 (TCP/IPv4)> Obtain an IP address automatically> OK.
    - DO NOT CLICK THE RED X, CLICK OK TO SAVE CONFIGURATIONS.

Part 3:
Next, we need to install basic configurations on the router such as hostname and the enable mode password.

- Use the following commands to name the router
    - `router> enable`
    - `router# configure terminal`
    - `router(config)# hostname CiscoX`
    - `CiscoX(config)# enable secret aggies`
    - `CiscoX(config)# service password-encryption`
    - `CiscoX(config)# banner motd "Welcome to Cisco Academy at TAMU!"`

- Use the following commands to configure SSH on the router
    - `CiscoX(config)# username texas password aggies`
    - `CiscoX(config)# ip domain-name tamu.com`

- `CiscoX(config)# crypto key generate rsa general-keys modulus 1024`
- `CiscoX(config)# ip ssh version 2`
- `CiscoX(config)# line vty 0 4`
- `CiscoX(config-line)# login local`
- `CiscoX(config-line)# transport input ssh`
- `CiscoX(config-line)# end`
- `CiscoX# copy run start`

Part 4:

Now, we need to configure the port addresses and a DHCP pool on the router.

- Use the following commands to configure the IP addresses on the router's ports
  - `CiscoX# configure terminal`
  - `CiscoX(config)#interface g0/0/1`
  - `CiscoX(config-if)# ip address 10.1.X.1 255.255.255.0`
  - `CiscoX(config-if)# no shutdown`
  - `CiscoX(config-if)# exit`
  - `CiscoX(config)# interface g0/0/0`
  - `CiscoX(config-if)# ip address 192.168.1.1 255.255.255.192`
  - `CiscoX(config-if)# no shutdown`
  - `CiscoX(config-if)# exit`

- Use the following commands to configure a DHCP pool on the router
  - `CiscoX(config)# ip dhcp excluded-address 192.168.1.1`
  - `CiscoX(config)# ip dhcp pool TAMUX`
  - `CiscoX(dhcp-config)# network 192.168.1.0 255.255.255.192`
  - `CiscoX(dhcp-config)# default-router 192.168.1.1`
  - `CiscoX(dhcp-config)# dns-server 12.12.12.12`
  - `CiscoX(dhcp-config)# end`

- `CiscoX# copy run start`
- `CiscoX# show ip dhcp binding`

Part 5:

Next, we will NAT our internal network so that we protect our LAN, while also conserving subnet blocks. We will be using PAT specifically, which takes effect with the “overload” command

- Use the following commands to configure PAT on the router
  - `CiscoX# configure terminal`
  - `CiscoX(config)# int g0/0/0`
  - `CiscoX(config-if)# ip nat inside`
  - `CiscoX(config-if)exit`
  - `CiscoX(config)# int g0/0/1`
  - `CiscoX(config-if)# ip nat outside`
  - `CiscoX(config-if)# exit`
  - `CiscoX(config)# ip access-list standard NAT-ACL`
  - `CiscoX(config-std-nacl)# permit 192.168.1.0 0.0.0.63`
  - `CiscoX(config-std-nacl)# exit`
  - `CiscoX(config)# ip nat inside source list NAT-ACL int g0/0/1 overload`

Part 6:

Now, instead of configuring the rest of the router using the console cable, we will use SSH.

Note: If you are unable to connect, open your command prompt and release your current IP configuration and request a new one from the router with the renew command.

- Unplug the blue console cable from the router.
- Open Putty
- In the address bar, type the following IP address

- `192.168.1.1`

- Click Open
- When prompted, enter the following credentials that we configured earlier
  - `Username: texas`
  - `Password: aggies`
- Enter the password we configured for enable mode
  - `Password: aggies`

Part 7:

We will now configure OSPF on the router through SSH.

- Use the following commands to configure OSPF on the router
  - `CiscoX> enable`
  - `CiscoX# configure terminal`
  - `CiscoX(config)# router ospf 1`
  - `CiscoX(router-config)# router-id 1.1.1.X`
  - `CiscoX(router-config)# network 10.1.X.0 0.0.0.255 area 0`
  - `CiscoX(router-config)# network 192.168.1.0 0.0.0.63 area X`
  - `CiscoX(router-config)#end`
  - `CiscoX# copy run start`

Part 8:

Next, we need to verify that OSPF has been configured correctly and is working properly.

- Type the following command to check the OSPF information on your router
  - `CiscoX# show run | section ospf`
- Type the following command to see what routes your router has discovered
  - `CiscoX# show ip route`
- Type the following command to make sure your router has found its neighbors
  - `CiscoX# show ip ospf neighbor`

Part 9:
Next, we will set a default route. This will allow you to access networks outside of the internal network, where our DNS server is located.

- Use the following commands to configure a default-route on the router
  - `CiscoX(config)# ip route 0.0.0.0 0.0.0.0 10.1.X.2`

Part 10:
Now we will verify connectivity on the network using the ping command.

- Open command prompt and type the following
  - `C:\Users\CiscoX> ping 192.168.1.1`

- Then test connectivity to the DNS server
  - `C:\Users\CiscoX> ping 12.12.12.12`

Part 11:
Finally, we will access the website aggie-facts.cisco and have WireShark running network analysis.

- Open up WireShark…
- Open Microsoft Edge
- In the URL bar, enter the IP address of the website
  - `http://12.12.12.12`

Part 12:
Now, we need to wipe the router of all the configurations we've done.

- Use the following commands to wipe the router
  - `CiscoX# write erase`
  - `CiscoX# reload`

Conclusion:

Now you know how to proficiently enable a router to use OSPF, DHCP, and NAT. You have also learned valuable troubleshooting skills ranging from DHCP caches to routing table entries.