TNE20003 – Internet and Cybersecurity for Engineering Applications

Portfolio Task – Lab 3 Pass Task

Aims:

- To practice subnetting

- To understand how arp works

- To investigate how MAC addresses are used and how the CAM table in a switch is populated.

Preparation:

- View "Network Devices - Routers and Switches"

Due Date:

- Task1 must be completed before the lab and uploaded to Canvas. Your demonstrator will check the answers to the questions and your working out for task 1 and may ask questions during the lab session. Task 2 will be assessed via an online quiz. You must score the required minimum to pass the test. You will be allowed a number of attempts to pass the test at that grade level. You are encouraged to complete the test during the lab but if you do not, you must complete it before your next lab class.

Task 1.

Practice Subnetting

In this task, you will

- Subnet the given network (n/w) in the diagram below and allocate a subnet address to each relevant segment.
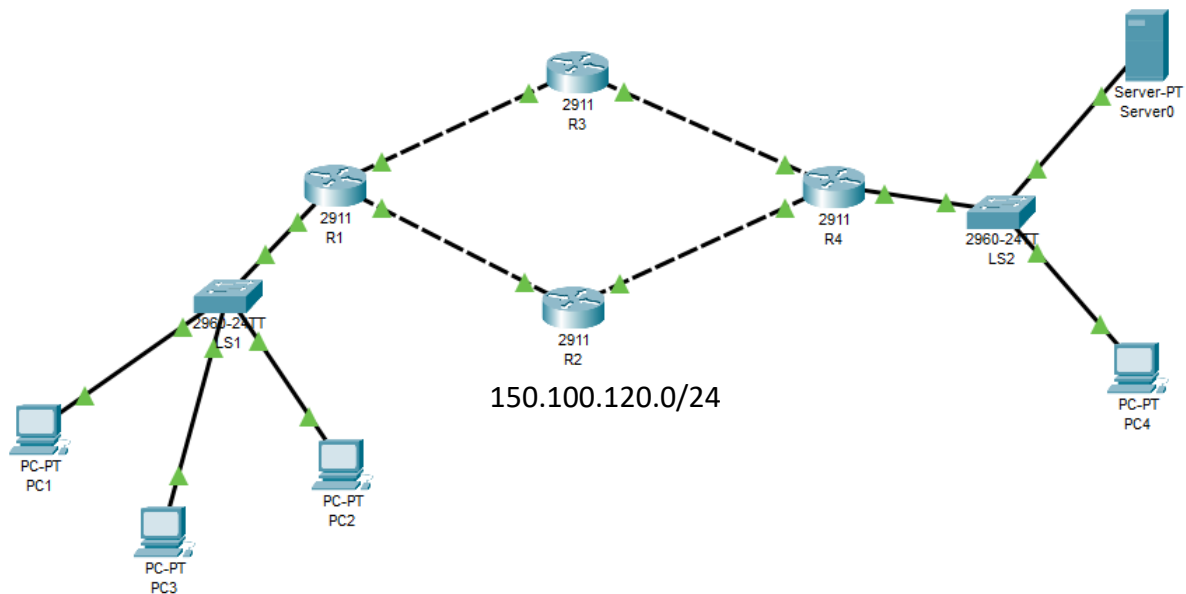

150.100.120.0/24

Figure 1

What is the subnetwork address of the IP given above????

How many n/ws do we need to build this n/w?   _____

How many bits need to be borrowed?   _____

What do the dotted lines connecting 2 routers mean?

Task 2.

Build the network provided in task 1 with Cisco Packet Tracer and observe the building of ARP tables in the PCs and CAM table in the switch

1. Implement the network shown in figure 1 above.

   The bottom left hand corner of the Packet tracer screen displays the icons that represent device categories or groups, such as **Routers(Rtr)**, **Switches(LS)**, or **End Devices**.

   Moving the cursor over the device categories will show the name of the category in the box. To select a device, first select the device category. When the device category is selected, the options within that category appear in the box next to the category listings. Select the device option that is required.

   a. Select **End Devices** from the options in the bottom left-hand corner. Drag and drop 4 PCs and 1 Server onto your design area.

   b. Select **Switch** from the options in the bottom left-hand corner. Add 2 2960 switches to your prototype network by dragging them onto your design area.

   c. Select **Router** from the options in the bottom left-hand corner. Add 4 2911 routers to your prototype network by dragging them onto your design area

   d. Double click on each of the devices and name them as per the network diagram in figure 1.

   e. Select **Connections** from the bottom left-hand corner. Choose a copper straight-through cable type. Click the first PC (PC1) and assign the cable to the **FastEthernet0** connector. Click the switch (LS1) and select **FastEthernet0/1** to connect to PC1.

   f. Select **Connections** from the bottom left-hand corner. Choose a copper straight-through cable type. Click the second PC (PC2) and assign the cable to the **FastEthernet0** connector. Click LS1 and select **FastEthernet0/2** to connect to PC2.

   g. Select **Connections** from the bottom left-hand corner. Choose a copper straight-through cable type. Click the third PC (PC3) and assign the cable to the **FastEthernet0** connector. Click LS1 and select **FastEthernet0/3** to connect to PC3.

   h. Select **Connections** from the bottom left-hand corner. Choose a copper straight-through cable type. Click the switch (LS1) and select **FastEthernet0/4** to connect to **GigabitEthernet0/0** of Rtr1.

   i. Repeat these steps for all of the other devices until they are all connected as per the n/w diagram in figure 1. Note when connecting 2 routers together you need to use a cross-over cable because they are like devices, ie both are DTEs. Or you can use a serial cable.

There should be green dots at both ends of each cable connection after the network has converged. If not, double check the cable type selected. Note with the routers in particular, you may need to turn that interface on by clicking the **"on"** button under the interface tab or by issuing the command **"no shut"** on the interface in the CLI mode. See below:

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#no shut
```

2. Configure Host names and IP Addresses on the PCs, the Server, the switches and the routers as per the n/w diagram in figure 1 above.

3. On each PC observe the current status of the ARP table by issuing the following command and note what is displayed.

   a. Click on the PC and choose "**desktop**" and then click on the **"command prompt"**
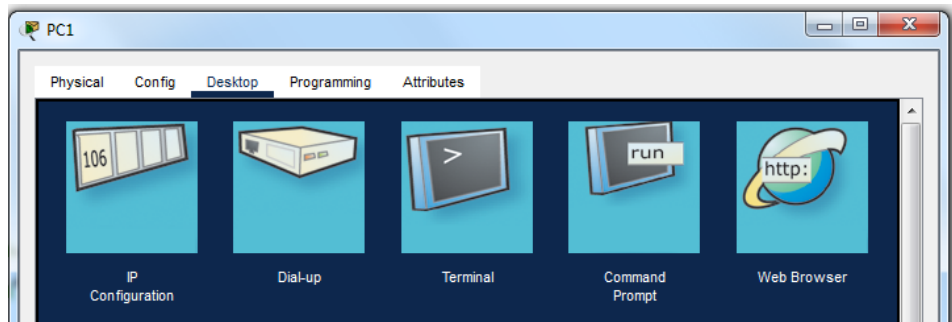
   b. When the **"command prompt"** window appears type **"arp -a"**

   c. Record what is displayed.

4. On the switch LS1 issue the following commands to see what is stored in the CAM table

   a. Choose the "**CLI"** mode

   b. Click enter until you see the following prompt: Switch>

c. Type **"enable"**

d. Type **"show arp"** what do you see? See pic below for guide

e. You can investigate the CAM table of the switch by typing **"show mac address-table"**. what do you see?

```
Switch>ena
Switch#sh arp

Switch#sh arp ?
  <cr>
Switch#sh mac ad
Switch#sh mac address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0001.42ad.9001    DYNAMIC     Fa0/4
Switch#
```

f. Whose MAC address could this be?

g. Before you leave the switch type the following commands to make sure it stays in the privileged mode of operation. See pic below for commands and steps.

```
LS1>
LS1>enable
LS1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
LS1(config)#line console 0
LS1(config-line)#exec
LS1(config-line)#exec-timeout 0 0
LS1(config-line)#
```

5. If want to observe the flow of data in PT between PC1 and PC2 follow the commands below or jump to step 6.

a. Switch to **Simulation Mode** in the bottom right-hand corner.

b. Click **Edit Filter** in the **Edit List Filter** area. In the event list filter, *only select* **ARP** and **ICMP** filters under IPv4 tab, deselect all other filters in the three tabs **IPV4, IPV6** and **Misc**.

c. Select a **Simple PDU** by clicking the **closed envelope** in the upper toolbar.

   With the envelop icon, click **PC2** to establish the source. Click **PC1** to establish the destination.

6. Let's investigate what happens to the **ARP** tables of the PC and the **CAM** table of LS1 when we issue some more pings.

a. Click on **PC2** and from the Desktop link choose the Command Prompt and type the following command when you see the prompt C:\>**"ping (put the IP address of PC1 here)"** and you should see something similar to the pic below

```
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=128
Reply from 192.168.10.1: bytes=32 time<1ms TTL=128
Reply from 192.168.10.1: bytes=32 time<1ms TTL=128
Reply from 192.168.10.1: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

b. Repeat steps 3 and 4 above to see if any of the tables have changed.

c. What did you observe? Did anything change in the CAM table of LS1. Explain it in your own words.

d. What happens to the CAM table in LS1 if you don't do anything for a period of time (more that 5 min)?

~~~~~ End of Lab ~~~~~