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a) What is the maximum number of IP addresses required in the subnet? Justify the maximum number.

Ans:

The maximum number of IP addresses required in a subnet is (10 + 1 +1+1) 13.

The maximum number is 13 because each department has 10 workstations (each has 1 IP address), 1 for network address, 1 for broadcast address and 1 for gateway address

b) How many bits are reserved for the hosts in the subnet mask? Write the default mask and subnet mask in classless addressing notation.

Ans:

4 bits are reserved for the hosts in the subnet mask

Default mask : 255.255.255.0 (or /24)

Subnet mask : 255.255.255.240 (or /28)

c) List the starting and ending range of the IP addresses assigned only to workstations for each subnet. Write the gateway for each department.

Ans:

(Workstations can be assigned IP address from this range)

Subnet 1 (Math):

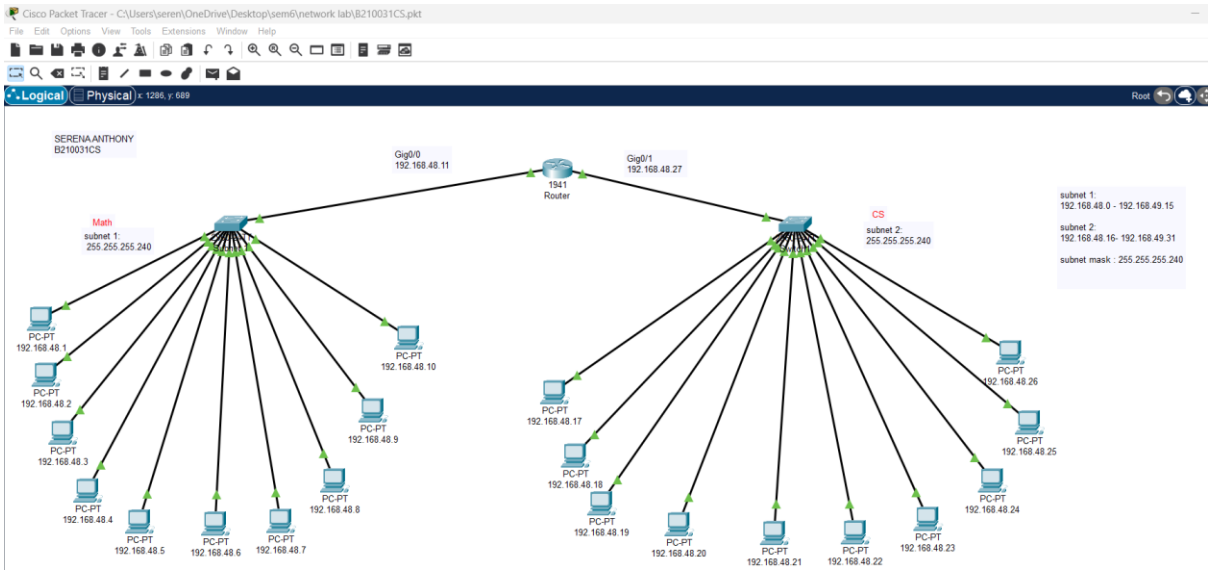
- Starting IP address => 192.168.48.1
- Ending IP address => 192.168.48.14
- Gateway for Subnet 1 => 192.168.48.11

Subnet 2 (CS):

- Starting IP address => 192.168.48.17
- Ending IP address => 192.168.48.30

- Gateway for Subnet 2=> 192.168.48.27

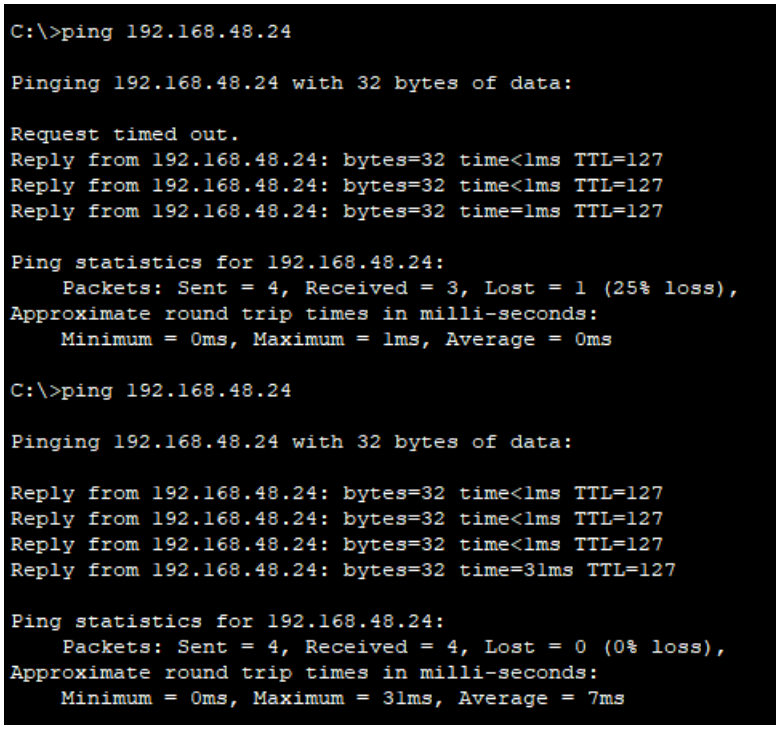
d) Create a network topology consisting of a router, layer two switches, and workstations. Use appropriate cables for connecting the router to a switch and from switch to the workstation. Configure the IP addresses for the router, subnet, and workstations. Label every device in the packet tracer with IP address. On top of this topology, include our name and roll number as label. Take a snapshot and attach it as figure in the answersheet.



e) Use the Terminal to check the connectivity from one workstation of subnet A to another workstation in subnet B. If there is no connectivity (messages such as destination not reachable, request timed out), justify. Take a snapshot and attach it as figure in the answer sheet.

Ans:

Here I am checking connectivity from A1 (192.168.48.1) to B1 (192.168.48.24)



There is a ‘Request Timed Out’ message which comes due to the ARP process taking time to resolve the MAC address corresponding to the IP address of device being pinged.

This failure happens because the remote router has to put the ping request on hold to send out an ARP broadcast to know the MAC address of the pinged device, then wait for a response and then send the first ping through. This delay is usually too long, therefore the initial ping request times out.

After the successful completion of ARP resolution, the MAC address of the destination device (192.168.48.24) is now available in the ARP cache of the sender and this mapping is maintained for a certain period of time (ARP cache timeout). Subsequent ping attempts do not need to wait for ARP resolution because the ARP cache is consulted first to obtain the MAC address of the destination, hence successful.

(If the destination is on a different network, the sender consults the routing table to determine the appropriate next hop router or interface for forwarding the packet. The routing table lookup may involve querying the routing cache to see if recently used routing information is available, thereby expediting the forwarding process.)

Therefore, the subsequent ping attempts succeed without timeouts, as we can see from the second ping command in the screenshot.