COMPUTER NETWORKS LAB:

Install Cisco Packet Tracer for Lab session:

- Win + R key
- \acts-ecserver
- Software folder
- drag and drop cisco packet tracer installer into desktop
- enter admin username and password/create a account and install.

Rules for IP addressing:

IPv4 Addressing:

- IPv4 = 32 bit IP addressing system.
- it starts from 0.0.0.0 to 255.255.255.255
- note that each digit is represented by 8 bit binary number, so the range of each digit is from 0-255.
- There are (256)^4 = 4,294,967,296 IPv4 addresses in total.
- Every machine in the world should have an IPv4 address that is one of these many IPv4 addresses.

Subnetting:

- All computers in the world cannot be connected to each other or to a hub can cause lot of network congestion.
- This is why subnetting is used to modularize the network.
- Every sub-network should have similar IP addressing, this is called subnetting.
- Note how telephone numbers from a particular country have a common country code.
- Similarly, a section of IP address should give information on which sub-network does an IP address belong to.
- There is something called hierarchical addressing.
- In an IP address, there is some portion that gives information about the subnet ID and other portion gives a specific ID for different number of machines that can be configured in that subnet.

Subnet mask:

- IP address for every machine contains two very important points of data:
- IP address
- subnet mask
- You may ask, what is the significance of subnet mask?
- Subnet mask is used to represent or identify which subnet a particular IP address belongs to.
- The Bitwise AND operation of IP Address and Subnet mask gives us the subnet ID.
- For example: if IP = 1.1.1.1, Subnet Mask = 255.0.0.0, then Subnet ID = 1.0.0.0
- other example: IP = 2.2.2.2, Subnet Mask = 255.0.0.0, then Subnet ID = 2.0.0.0
- Therefore, by changing the Subnet Mask, you can change the Subnet ID of a machine while keeping the IP Address as same.
- If two machines that belong to two different subnets, then they can't communicate with each other.
- For two machines to communicate, they should belong to same subnet.
- This is why in Cisco packet tracer, machine with 1.1.1.1 cannot communicate with machine with 2.2.2.2 while subnet mask for both machines was 255.0.0.0, because these two machines belong to two different subnets and thus cannot communicate with each other.
- In order to connect machines from two subnets, we will use a router

Using slash notation along with IP address to show subnet mask:

- IP addresses in a subnet can be represented with slash notation.
- if you hover over a PC, you will see ip address as (w.x.y.x)/n
- here n represents number of set bits (1s) in the subnet mask.
- so for example: 255.255.255.128 means n = 25
- for: 255.0.0.0 means n = 8
- for: 255.128.0.0 means n = 9
- Also note that, 2^(32 - n) = number of machines that can be configured in the subnet.

- This is because first n bits are part of subnet ID and therefore, only rest of bits can change for different machines in that subnet.

What information can you infer from IP address slash notation?:

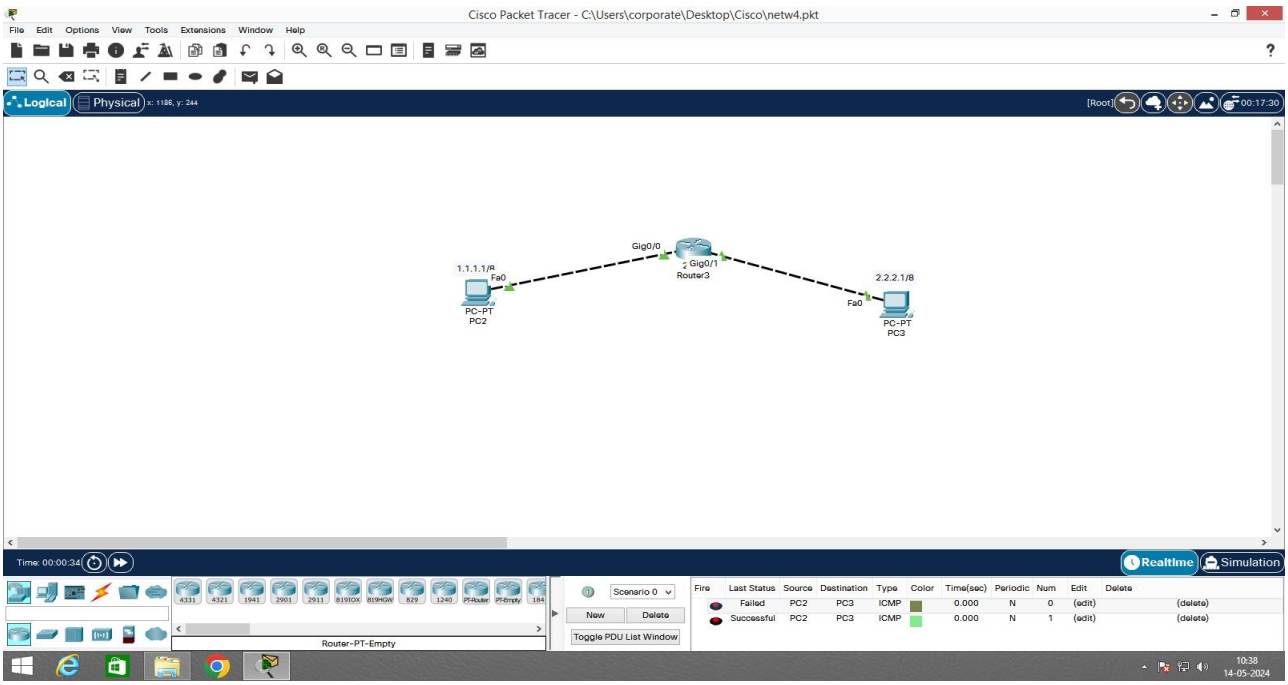
- Take for example: 1.1.1.0/24, what can you infer?
- Subnet mask: 255.255.255.0
- Number of machines that can be configured = 2^(32 - 24) = 2^8 = 256.
- First Usable address: 1.1.1.1
- Last usable address: 1.1.1.254
- Broadcast address: 1.1.1.255

Routing Configuration in Cisco packet tracer:

- There is some extra configuration that needs to be done for routers to work properly.
- In Cisco packet tracer, make sure you always show port labels.
- give ip address to each end machine's interface
- for each of router's interface, you have to give IP address that belongs to same subnet as the computers it connects to.
- If you have router 2901, it has 2 interfaces, and can connect to two different subnets.
- so if there are 2 subnets, each of routers interface will have ip address such that each interface belongs to that particular connecting machine's subnet.
- Also make sure ports of both interfaces are on.
- You also have to set the default gateway for each end machine as the router interface's IP address that the end machine connects to.
- After this you can run PDU, first it will fail, then the second time it will be successful.
- This is because router does not know the MAC address of each connecting end machine.
- Therefore, the first time it run an Address Resolution Protocol (ARP) to collect the MAC addresses of all end machines.
- This is why it fails the first time.
- Once all MAC address are collected, it will work as intended.

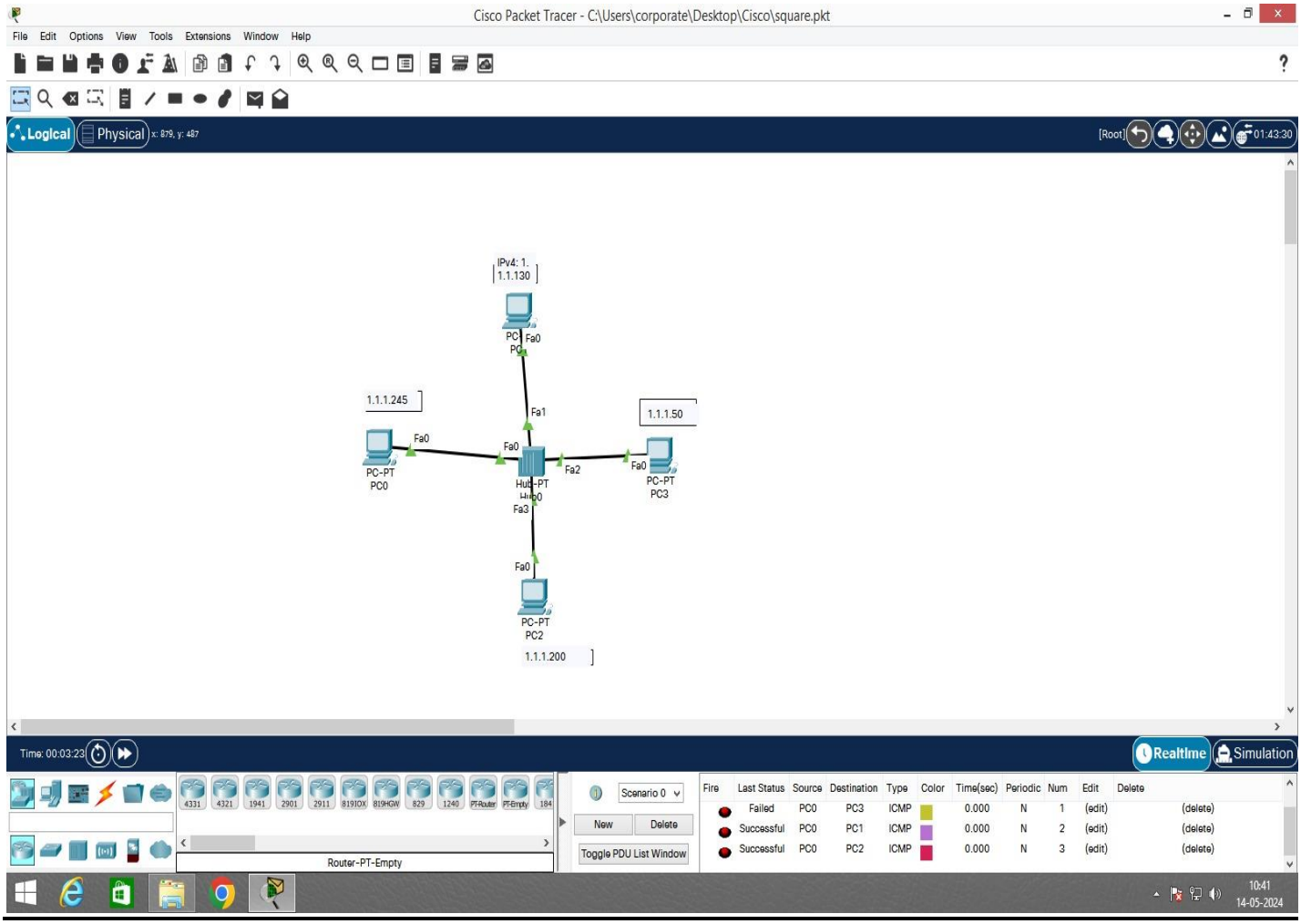
1.Create a network of just client pc and server is basic pinging:

- Drag a PC and go to config to give it static ip 1.1.1.1
- Drag a Server and go to config to give it static ip 1.1.1.2
- IP address that don’t work: 5.1.1.1 (There are some rules to be followed to assign ip addresses).
- Use packets, click pc and then server, then run in real time, then run simulation.



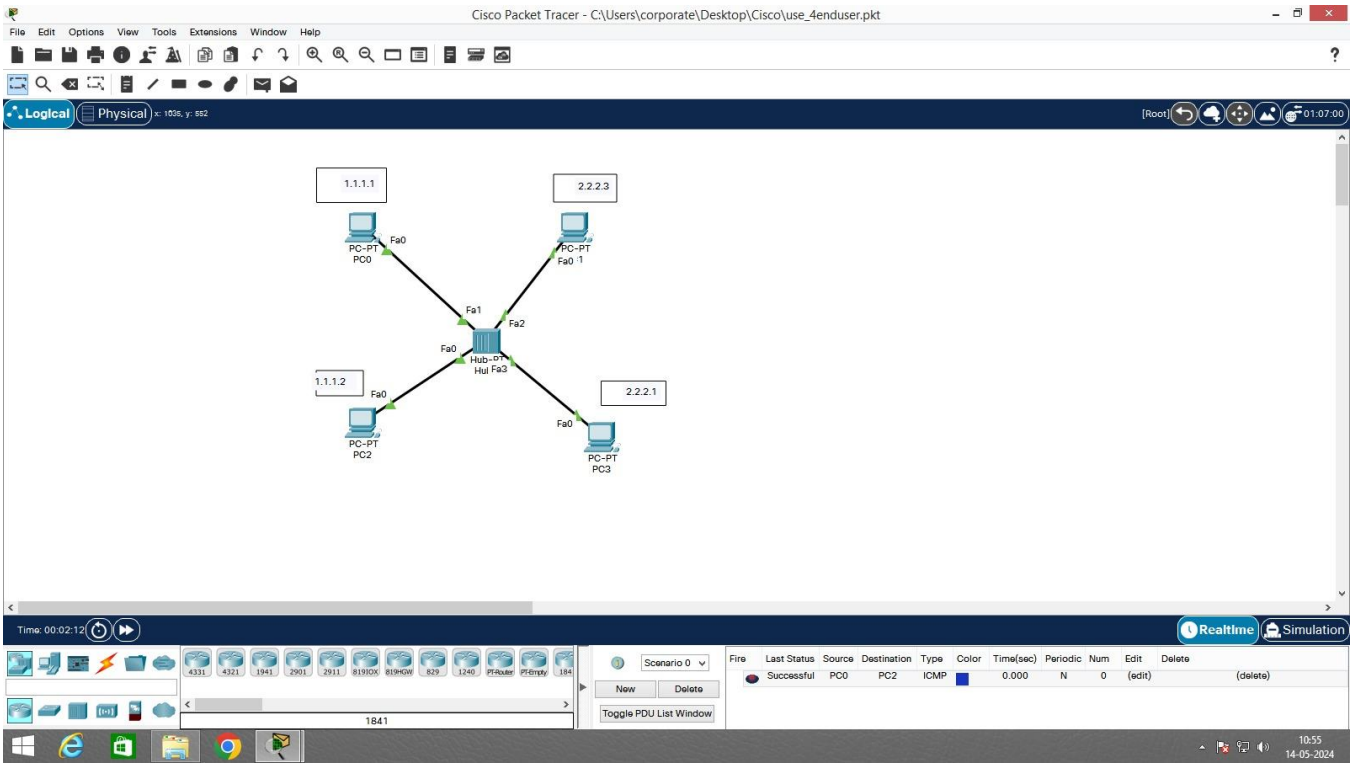
2.Create 4 PCs with following ips and subnets:

- PC1: ip: 1.1.1.5
- PC2: ip: 1.1.1.130
- PC3: ip: 1.1.1.50
- PC4: ip: 1.1.1.200
- Connect them all with a hub.
  - Observations:
  - PC2 -> PC4 successful
  - PC1 -> PC3 successful
  - everything else fails.
- Explanation:
  - PC2 subnet ID: 1.1.1.50
  - PC3 subnet ID: 1.1.1.200
  - PC4 subnet ID: 1.1.1.245
  - PC1 subnet ID: 1.1.1.120
- Therefore, you can see that PC1 and PC3 belong to the same subnet also, you can see that PC2 and PC4 belong to the same subnet

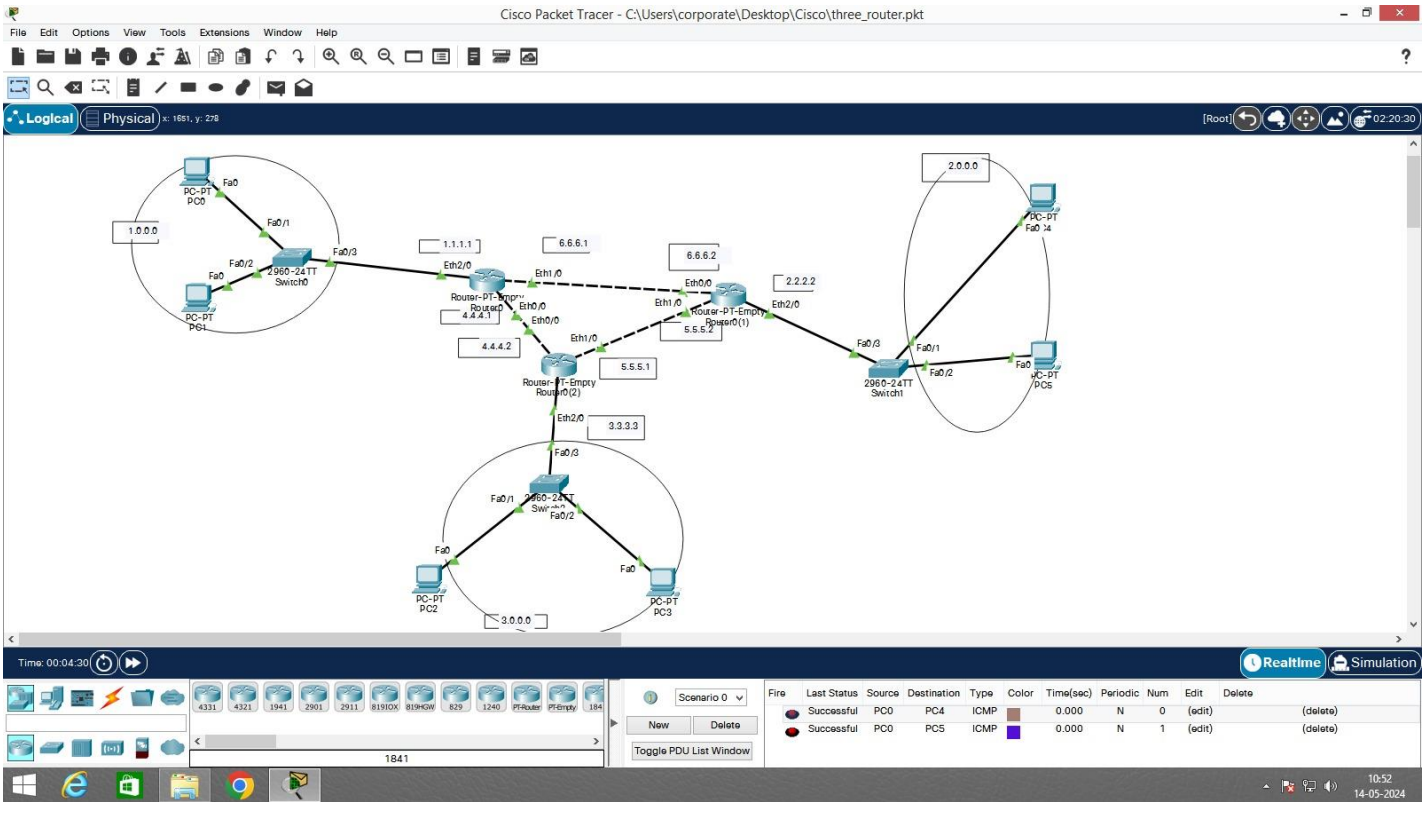


3.Connecting 4 computers with hub:

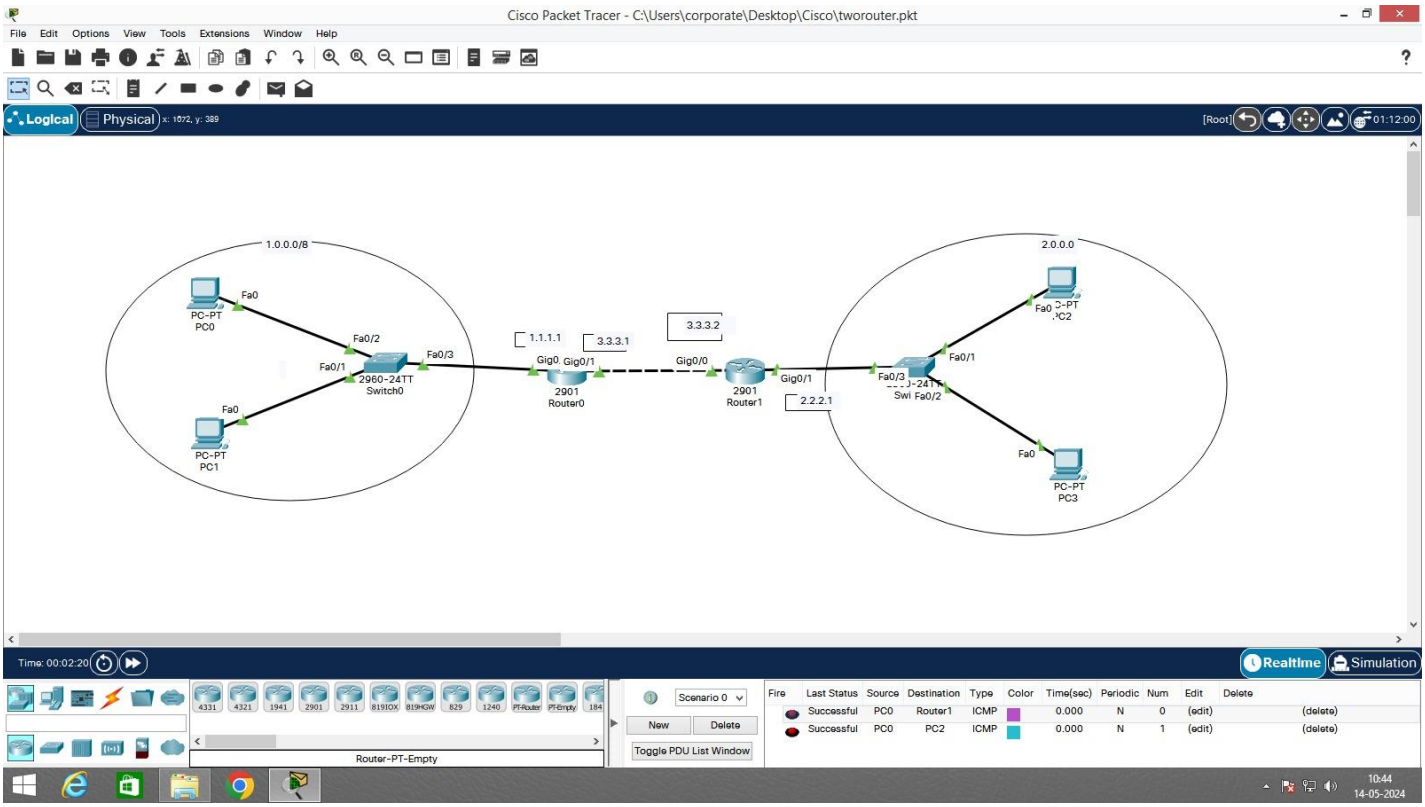
- 4 pcs with ips from 1.1.1.1 to 1.1.1.4
- 4 pcs with ips from 1.1.1.1 to 1.1.1.2 and 2.2.2.1 to 2.2.2.2
- use packets from one machine to another
- do 2 packets simultaneously, Notice that you will get packet collision.
- Also notice that hub sends packets to everyone, every time



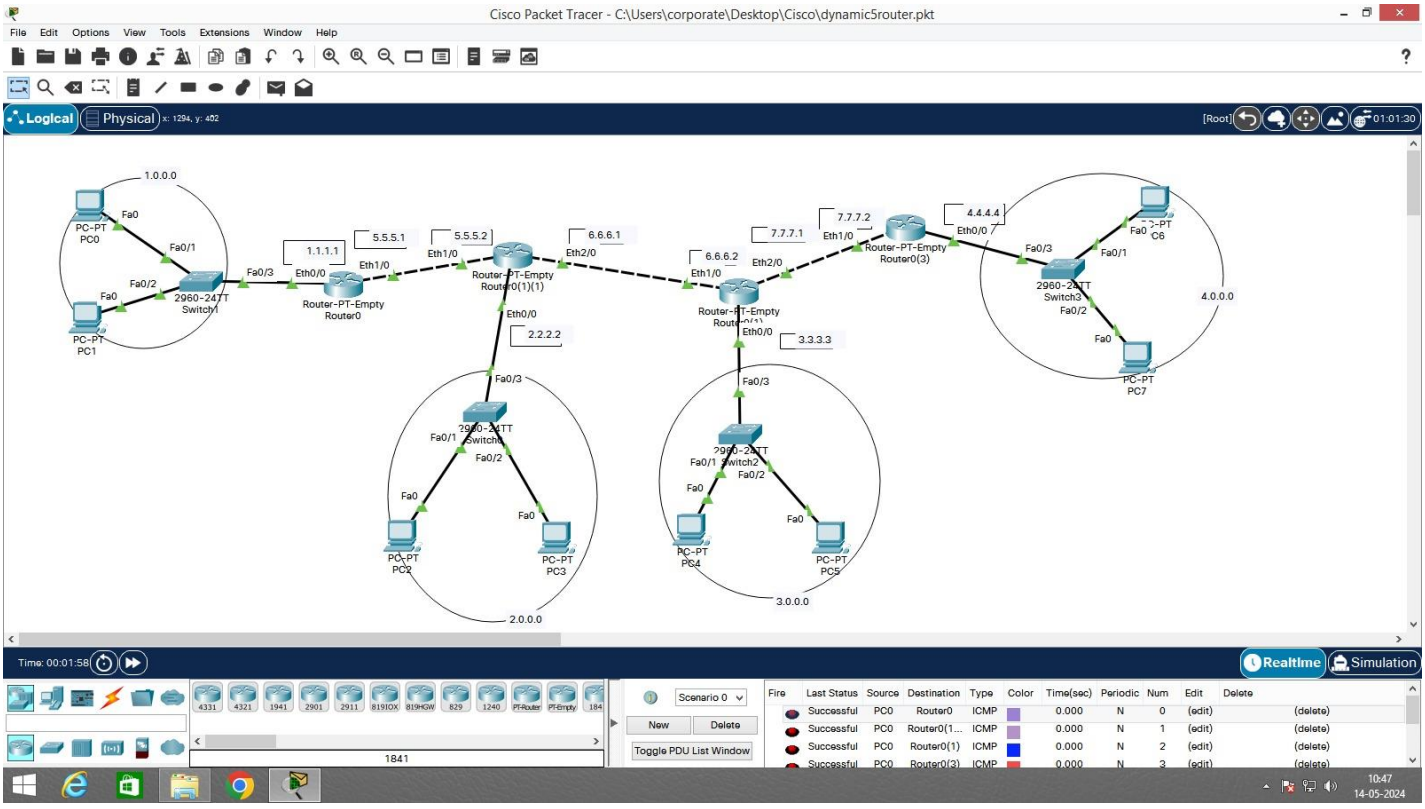
4. Static routing with 3 subnets:



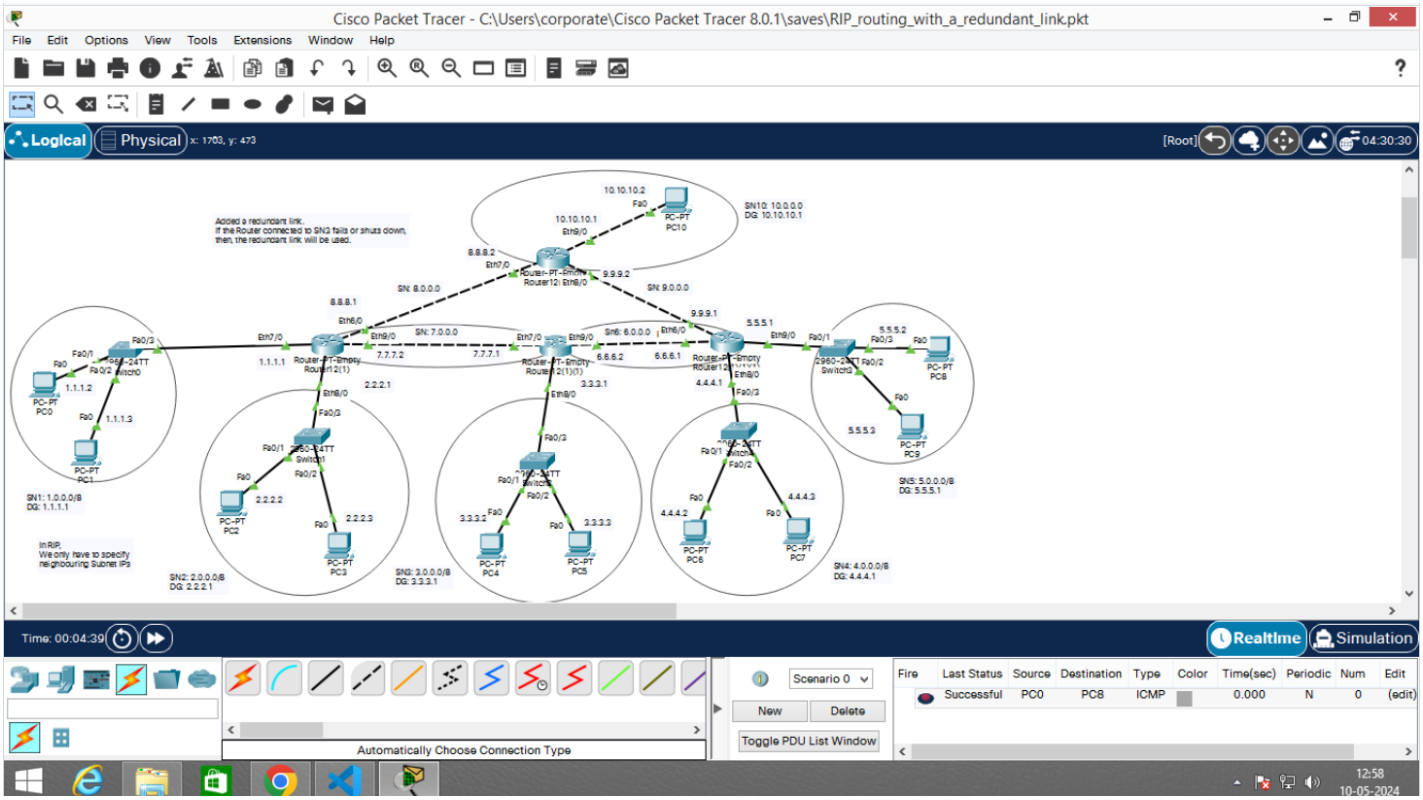
5. Static routing:



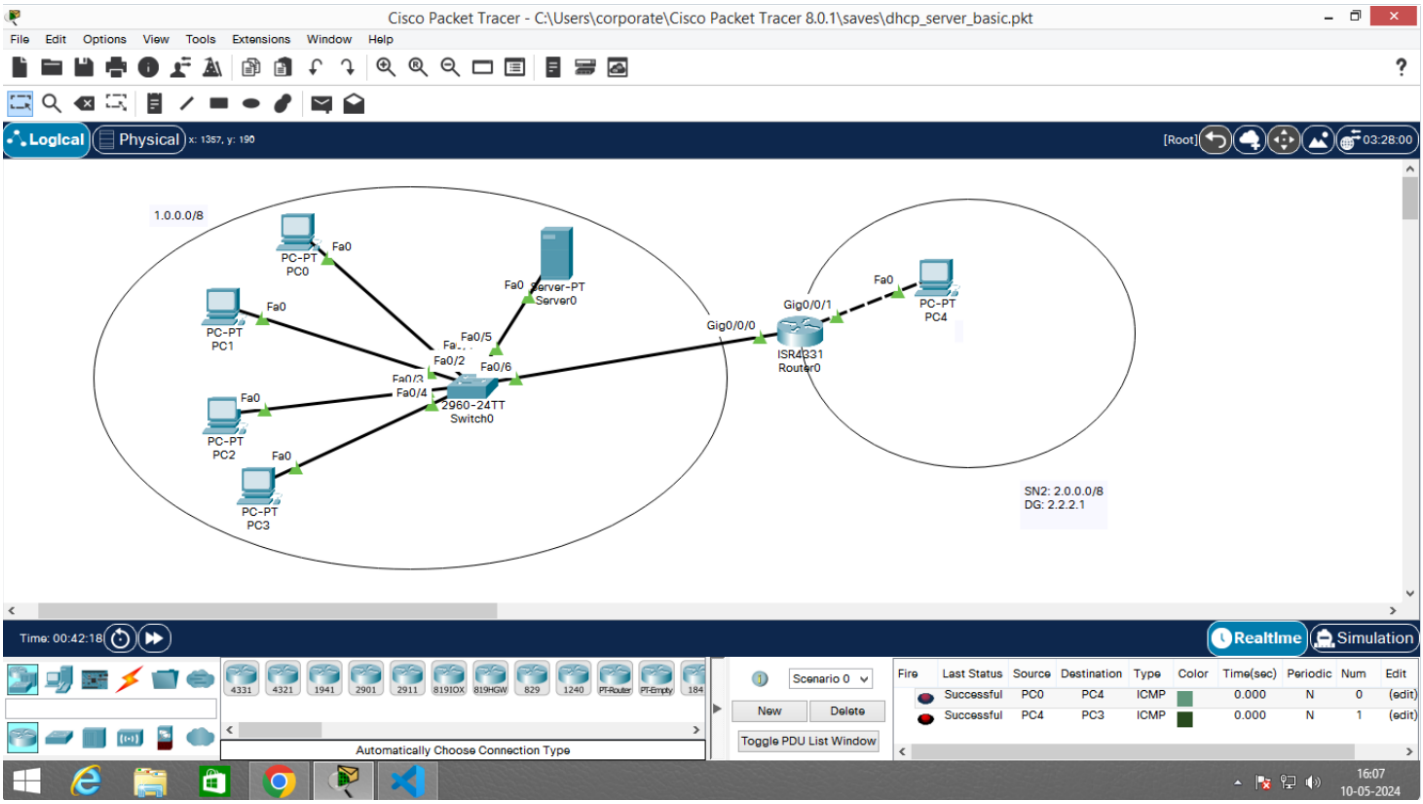
6. RIP routing protocol:



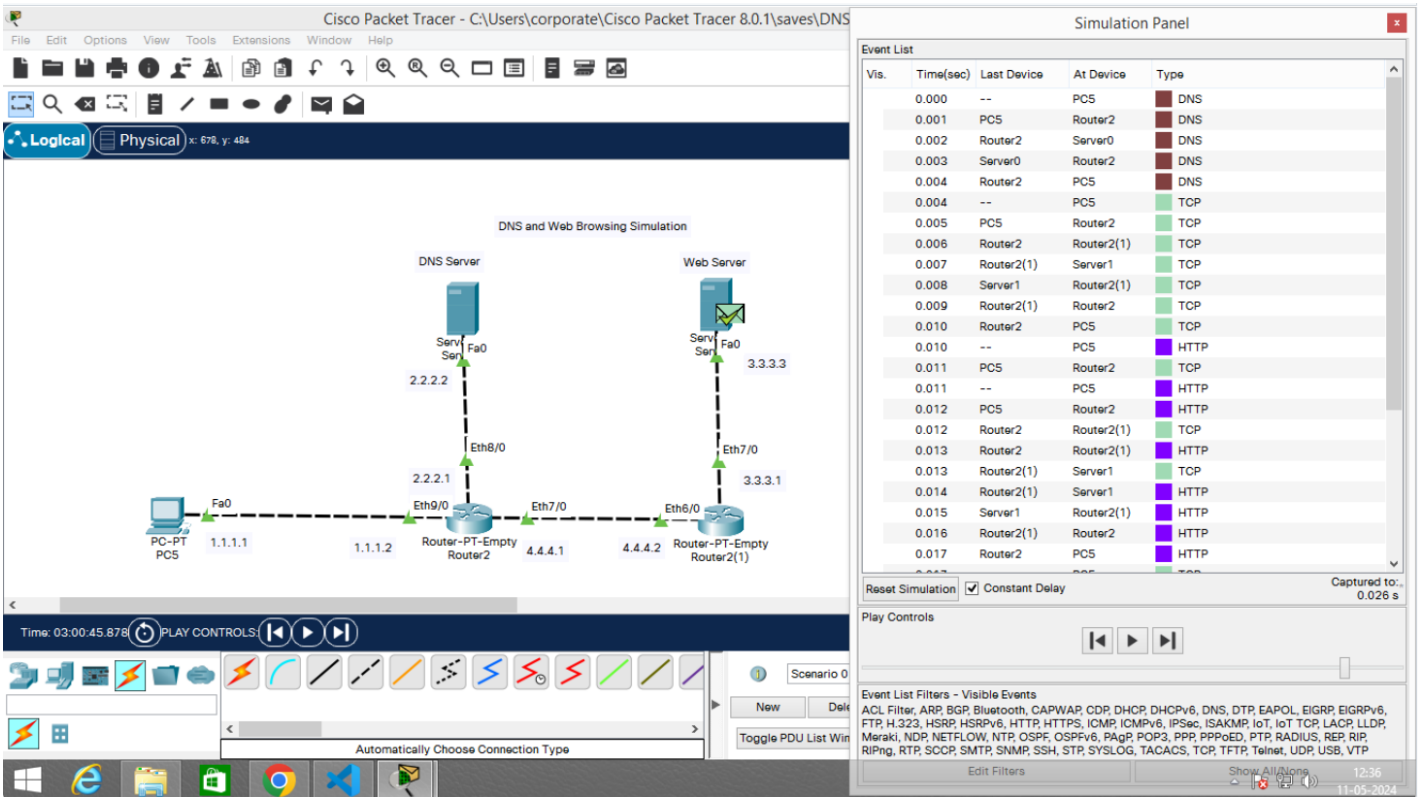
7. RIP routing with redundant link:



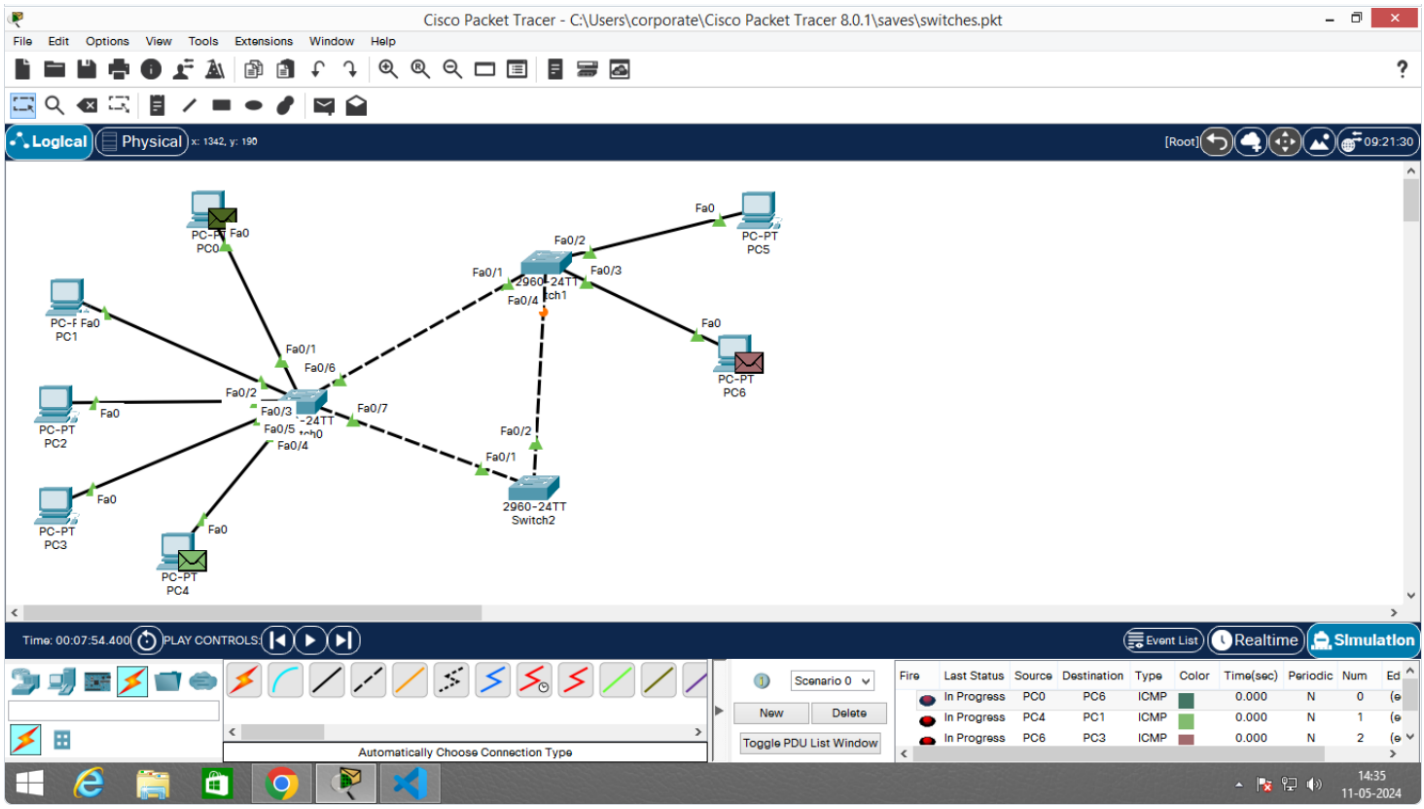
8. DHCP Basic:



9. DNS and WEB browsing:



10. Switches:



11. Including all(Assignment question with answer):