Computer Networking with Lab

(SWE 411)

Submitted By:

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Project Report

Experiment Title:

Establishment an internetwork for SWE building

Objective:

1. We build and configure an internetwork using a dynamic routing protocol (RIP)
2. We configure DHCP & create a wireless LAN (Wi-Fi) to extend a wired LAN
3. We configure and apply Standard ACLs
4. We use here Access Control Lists (ACLs) defined in Routers to control access in a network

Theory:

The reasons we perform the experiment:

We create here an internetwork for our SWE building

We do it for some reasons:

To gain practical knowledge to configure DHCP server, using a dynamic routing protocol and create ACL to control access in the network. Here, we also create a wireless LAN (Wi-Fi) to extend a wired LAN.

We try to find out:

Here, we try to find out that how router gives control to access in a network. We also find out that how a router gives IP in a host through DHCP server. And we also find out that how a wireless LAN sends packet in wired LAN through wireless router.

Brief Summary:

First of all, we need to use a Router to connect Switches. If we want to transmit a packet from one network to another network, then we must have different Switches. For connecting those Switches, we need a Router that can connect Switches. But we must have to configure the Router. Otherwise, the Router won't work. And for configuring the Router we need a PC and have to connect the PC with Router through Console cable.

In cisco packet tracer, the ports remain off by default. For that reason, we need to on the port manually for working with the ports. We can off the port if we want even after making them on.

Secondly, as we create multiple networks so here, we use more than one router. To Connect one router to another we need Serial DCE cable.

Straight-through and Crossover cables are common Ethernet network cables. There are 2 types of categories to use these cables. One category includes a Hub, Switch. And the second category includes PC, laptop, server, printer, router, etc. If we use the same category (e.g. laptop & server) then we use a crossover cable and if we use different types of the category (e.g. PC & Hub) then we use a straight-through cable. For serving different purposes we have to use different types of cables.

There are four-mode in Cisco Router named User EXEC mode, Privileged EXEC mode, Global configuration mode, other configuration modes. There are some specific functions for every mode. The configuration is performed in the Third and Fourth mode. But for working in the third and fourth mode, at first, we have to go through the first and second mode.

The DHCP Server feature is a full DHCP server implementation that assigns and manages IP addresses from specified address pools within the router to DHCP clients.

The Access Control List (ACL) is a collection of security rules or policies that allows or denies packets after looking at the packet headers and other attributes. Each permit or deny statement in the ACL is referred to as an access control entry (ACE).

When an ACL has been properly configured, we can apply it to an interface to filter traffic. The security appliance can filter packets in both the inbound and outbound direction on an interface. When an inbound ACL is applied to an interface, the security appliance analyzes packets against the ACEs after receiving them. If a packet is permitted by the ACL, the firewall continues to process the packet and eventually passes the packet to the defined interface.

Standard access control lists (ACLs) are router configuration scripts that control whether a router permits or denies packets based on the source address only. Tasks are: defining filtering criteria, configuring standard ACLs, applying ACLs to router interfaces, and verifying and testing the ACL implementation.

An IP address is consisting of 32 bits and every device has a unique IP address. Subnetting is a subnet mask of every IP. Subnet mask contains 1 for network bits and 0 for host bits for any IP address. For configuring the Router, IP address and subnet mask are must be needed.

Moreover, Wildcard bits contain 0 for network bits and 1 for host bits for any IP address. In inbound traffic, the router checks the rules first then process the router. On the other hand, in outbound traffic, the router process firstly then checks the rules.

Data & Observations:

Step 1: Physical Connections

- First of all, we create 7 LANs. In every LAN, there is one Switch and some PCs
- Then, we set up a connection among every LAN individually with Straight-through Cable because PC & Switch are in a different category
- After that, we tried to send a packet within the same LAN and it was successful. But when tried to send a packet from one LAN to another LAN, it failed. So, we took 7 routers
- Next, we set up 7 Routers
- Then, we connect the Routers with the Switches with Straight-through Cable as Router & Switch are in a different category
- After that, we connect the Routers between them through Serial DCE Cables
- Thus, we connect existing PCs to configure the routers through Console Cables. Because, without configuring the Router, the packet won't be sent

Step 2: IP Addressing Table

- Our Root Network is 10.168.92.0/22. Now, we configure all the PCs & Routers. Here, we create 14 subnets. So, we need to borrow 4 bits from the host bit. Thus, Subnet Mask for each subnet is 255.255.255.192. Now, we assign an IP Address and a default Gateway for every PCs

Step 3: Host Name

Here, we change the hostname. We take the hostname by default. We can change the hostname by this command:

For Router R1: (Router(config)# hostname R1)
For Router R2: (Router(config)# hostname R2)
For Router R3: (Router(config)# hostname R3)
For Router R4: (Router(config)# hostname R4)
For Router R5: (Router(config)# hostname R5)

For Router R6: (Router(config)# hostname R6)
For Router R7: (Router(config)# hostname R7)

Step 4: Adding IP Addresses

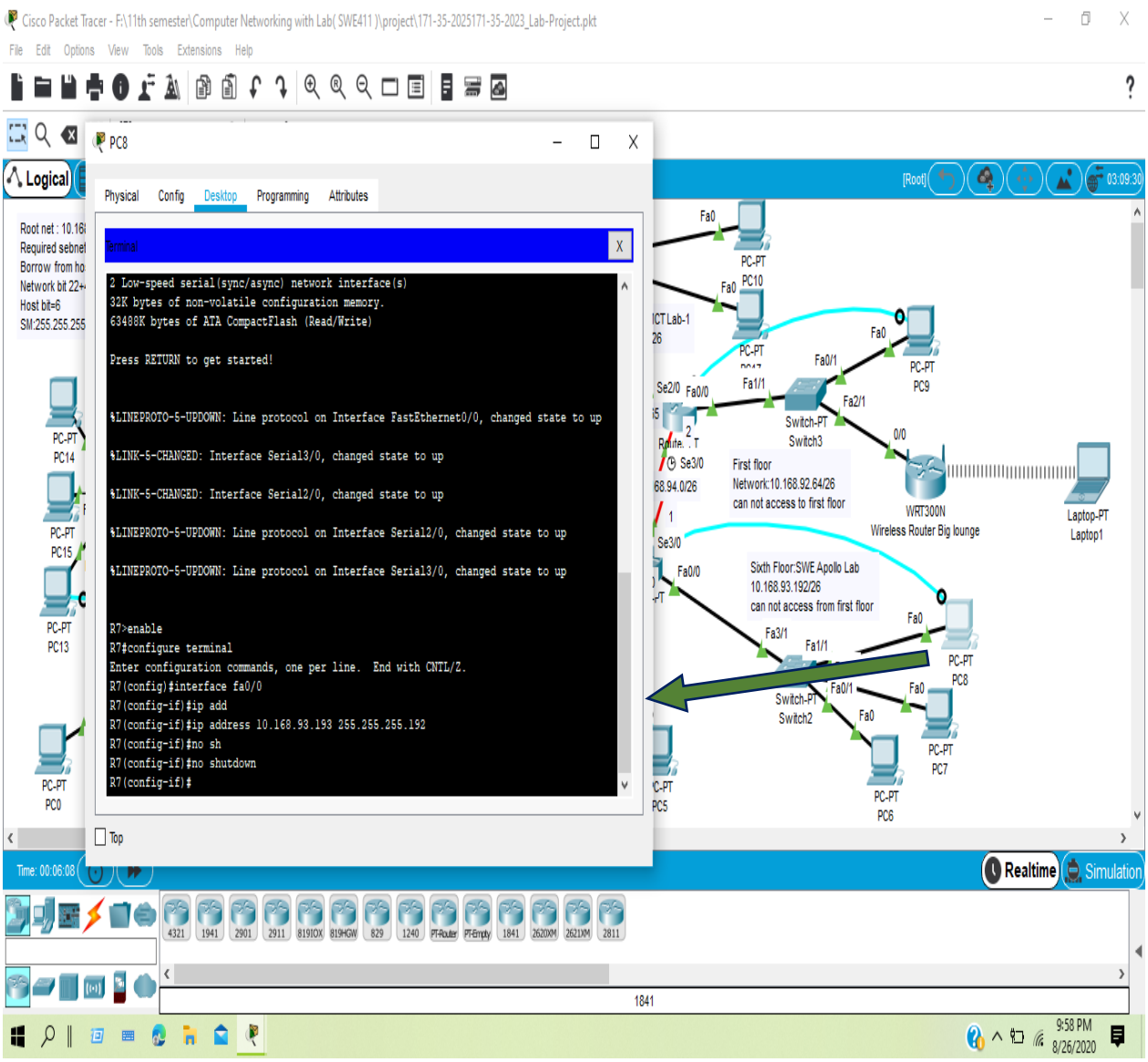
- Now, we add IP addresses to both an Ethernet and serial interface. For serial interface with the DCE cable, we'll need to also add the clocking with the clock rate command

- For serial interface with the DCE cable, we'll need to also add the clocking with the clock rate command

Step 5: Configure Ethernet & Serial interfaces

- Then, we set up an IP address, Subnet Mask, and make interface active(no shutdown) for Ethernet. Thus, we set up the default gateway for every LAN. Because without gateway it's impossible to send a packet from one LAN to other LAN

- After that, we set up an IP address, Subnet Mask, and make interface active (no shutdown) for Serial interfaces. To Configure DCE serial interface: Set IP address, Subnet mask, Clock Rate and make interface active (no shutdown)


Cisco Packet Tracer - F:\11th semester\Computer Networking with Lab(SWE411)\project\171-35-2025171-35-2023_Lab-Project.pkt
File Edit Options View Tools Extensions Help
PC8
Physical Config Desktop Programming Attributes
Terminal
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
Press RETURN to get started!
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
R7>enable
R7#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R7(config)#interface fa0/0
R7(config-if)#ip add
R7(config-if)#ip address 10.168.93.193 255.255.255.192
R7(config-if)#no sh
R7(config-if)#no shutdown
R7(config-if)#
Top
Logical
First floor
Network:10.168.92.64/26
can not access to first floor
Sixth Floor:SWE Apollo Lab
10.168.93.192/26
can not access from first floor
Switch-PT
Switch3
Switch-PT
Switch2
WRT300N
Wireless Router Big lounge
Laptop-PT
Laptop1
PC-PT
PC0
PC-PT
PC5
PC-PT
PC6
PC-PT
PC7
PC-PT
PC8
PC-PT
PC9
PC-PT
PC10
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15
Realtime
Simulation
1841
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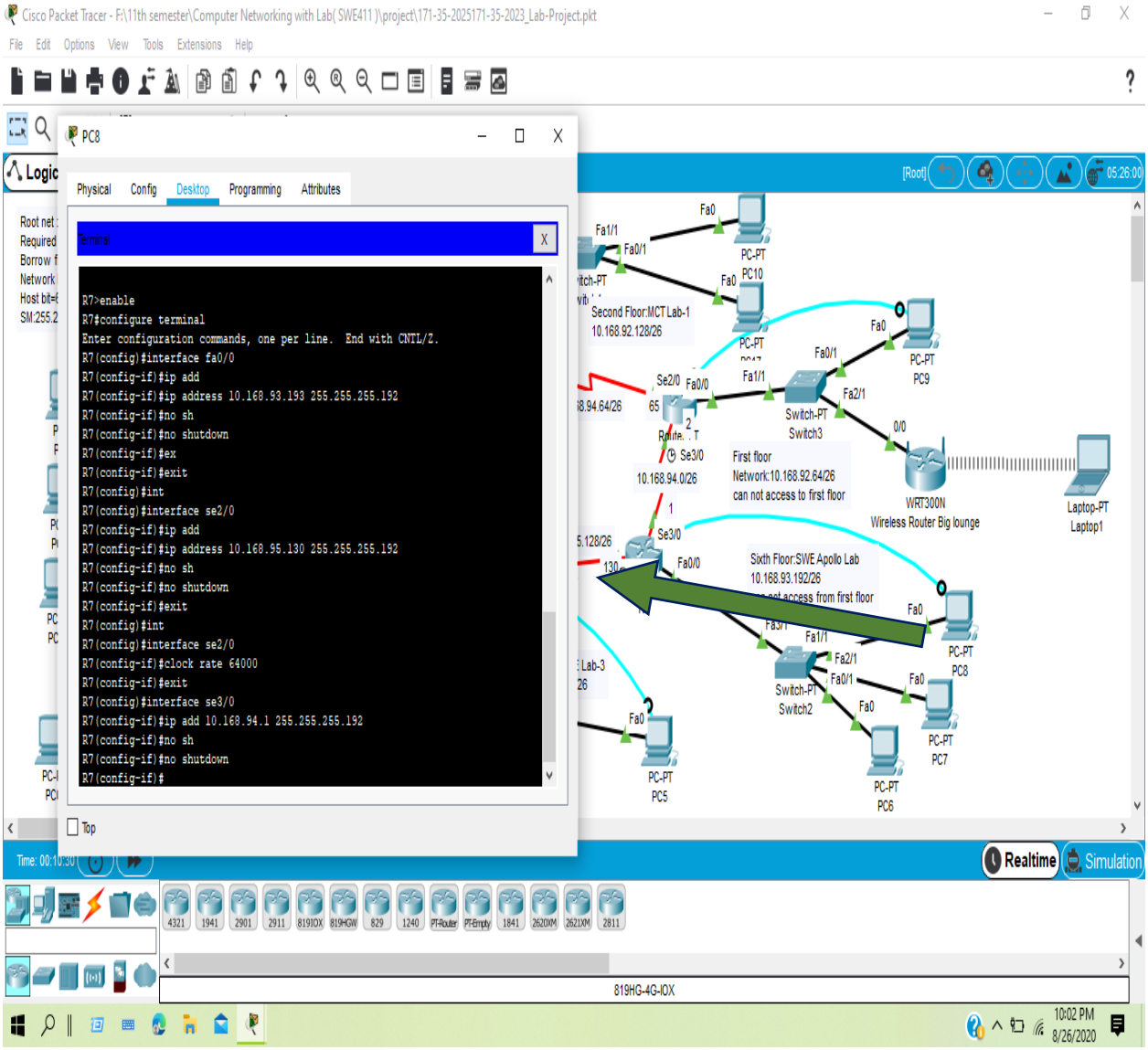
8/26/2020


Cisco Packet Tracer - F:\11th semester\Computer Networking with Lab(SWE411)\project\171-35-2025171-35-2023_Lab-Project.pkt
File Edit Options View Tools Extensions Help
PC8
Physical Config Desktop Programming Attributes
Terminal
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R7#configure terminal
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R7(config)#interface fa0/0
R7(config-if)#ip add
R7(config-if)#ip address 10.168.93.193 255.255.255.192
R7(config-if)#no sh
R7(config-if)#no shutdown
R7(config-if)#ex
R7(config-if)#exit
R7(config)#int
R7(config)#interface se2/0
R7(config-if)#ip add
R7(config-if)#ip address 10.168.95.130 255.255.255.192
R7(config-if)#no sh
R7(config-if)#no shutdown
R7(config-if)#exit
R7(config)#int
R7(config)#interface se2/0
R7(config-if)#clock rate 64000
R7(config-if)#exit
R7(config)#interface se3/0
R7(config-if)#ip add 10.168.94.1 255.255.255.192
R7(config-if)#no sh
R7(config-if)#no shutdown
R7(config-if)#
Top
Second Floor:MCT Lab-1
10.168.92.128/26
First floor
Network:10.168.92.64/26
can not access to first floor
10.168.94.0/26
Sixth Floor:SWE Apollo Lab
10.168.93.192/26
PC-PT PC10
PC-PT PC9
Switch-PT Switch3
WRT300N
Wireless Router Big lounge
Laptop-PT Laptop1
PC-PT PC8
Switch-PT Switch2
PC-PT PC7
PC-PT PC6
PC-PT PC5
Realtime
Simulation
819HG-4G-IOX
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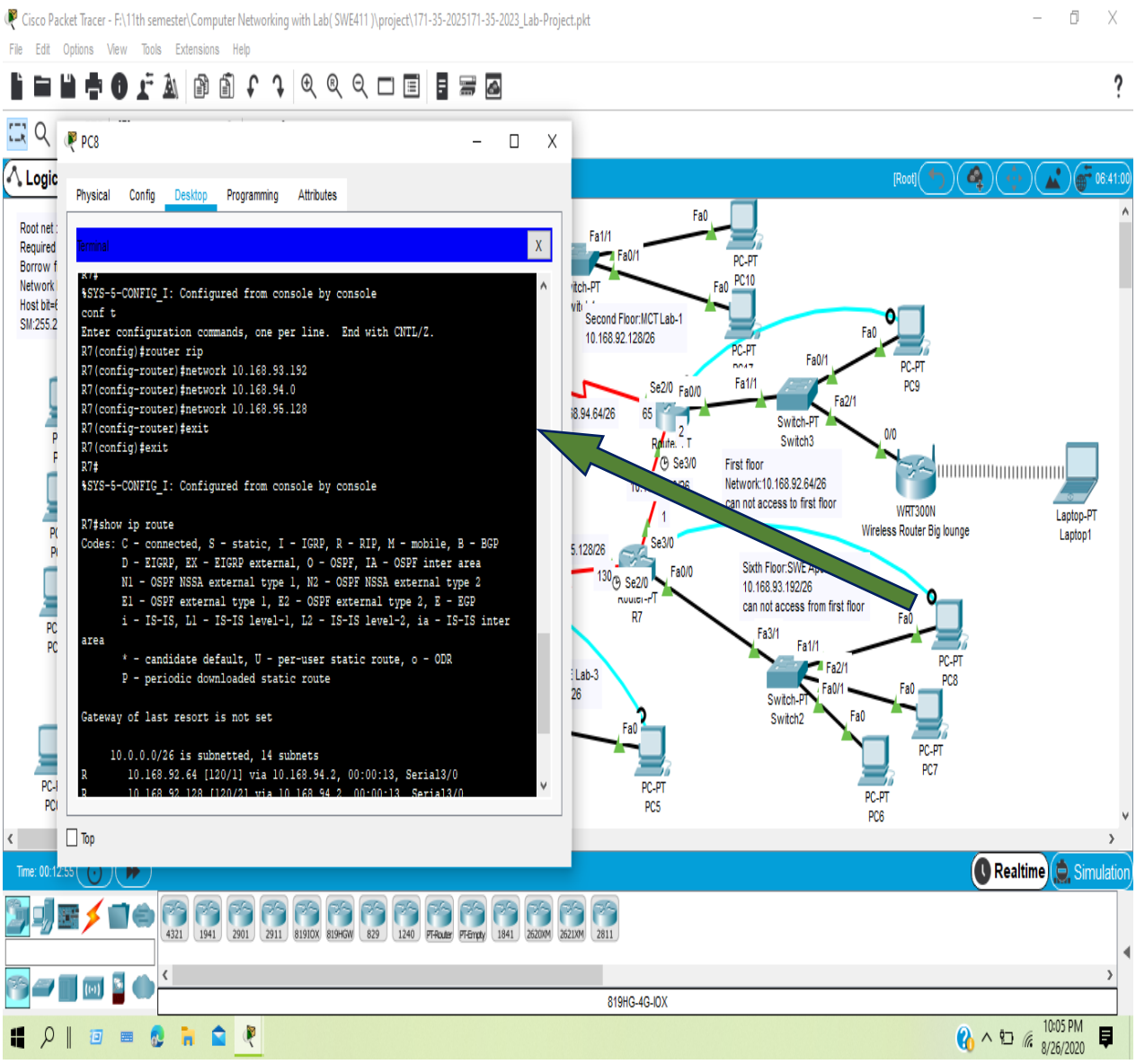
Step 6: Configure Dynamic Routes

- Here, we set up a **Dynamic Routing** using a dynamic routing protocol like RIP, for that reason, we'll need to enable a routing protocol and advertise the directly connected networks that we want to be advertised. To enable a dynamic routing protocol, enter global configuration mode and use the router command

- If we enter the router then we have to enable the global configuration prompt to a see a list of available routing protocols on the selected router

- To enable RIP, enter the command router rip in global configuration mode

- Once we are in routing configuration mode, enter the network address for each directly connected network, using the network command
- Now, we configure the Router R7 with PC8


Cisco Packet Tracer - F:\11th semester\Computer Networking with Lab(SWE411)\project\171-35-2025171-35-2023_Lab-Project.pkt
File Edit Options View Tools Extensions Help
PC8
Physical Config Desktop Programming Attributes
Terminal
%SYS-5-CONFIG_I: Configured from console by console
conf t
Enter configuration commands, one per line. End with CNTL/Z.
R7(config)#router rip
R7(config-router)#network 10.168.93.192
R7(config-router)#network 10.168.94.0
R7(config-router)#network 10.168.95.128
R7(config-router)#exit
R7(config)#exit
R7#
%SYS-5-CONFIG_I: Configured from console by console
R7#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/26 is subnetted, 14 subnets
R 10.168.92.64 [120/1] via 10.168.94.2, 00:00:13, Serial3/0
Top
Second Floor:MCT Lab-1
10.168.92.128/26
First floor
Network:10.168.92.64/26
can not access to first floor
Sixth Floor:SWE Lab-3
10.168.93.192/26
can not access from first floor
WRT300N
Wireless Router Big lounge
Laptop-PT
Laptop1
R7
Switch-PT
Switch3
Switch2
PC-PT
PC5
PC6
PC7
PC8
PC9
PC10
Realtime
Simulation
819HG-4G-IOX
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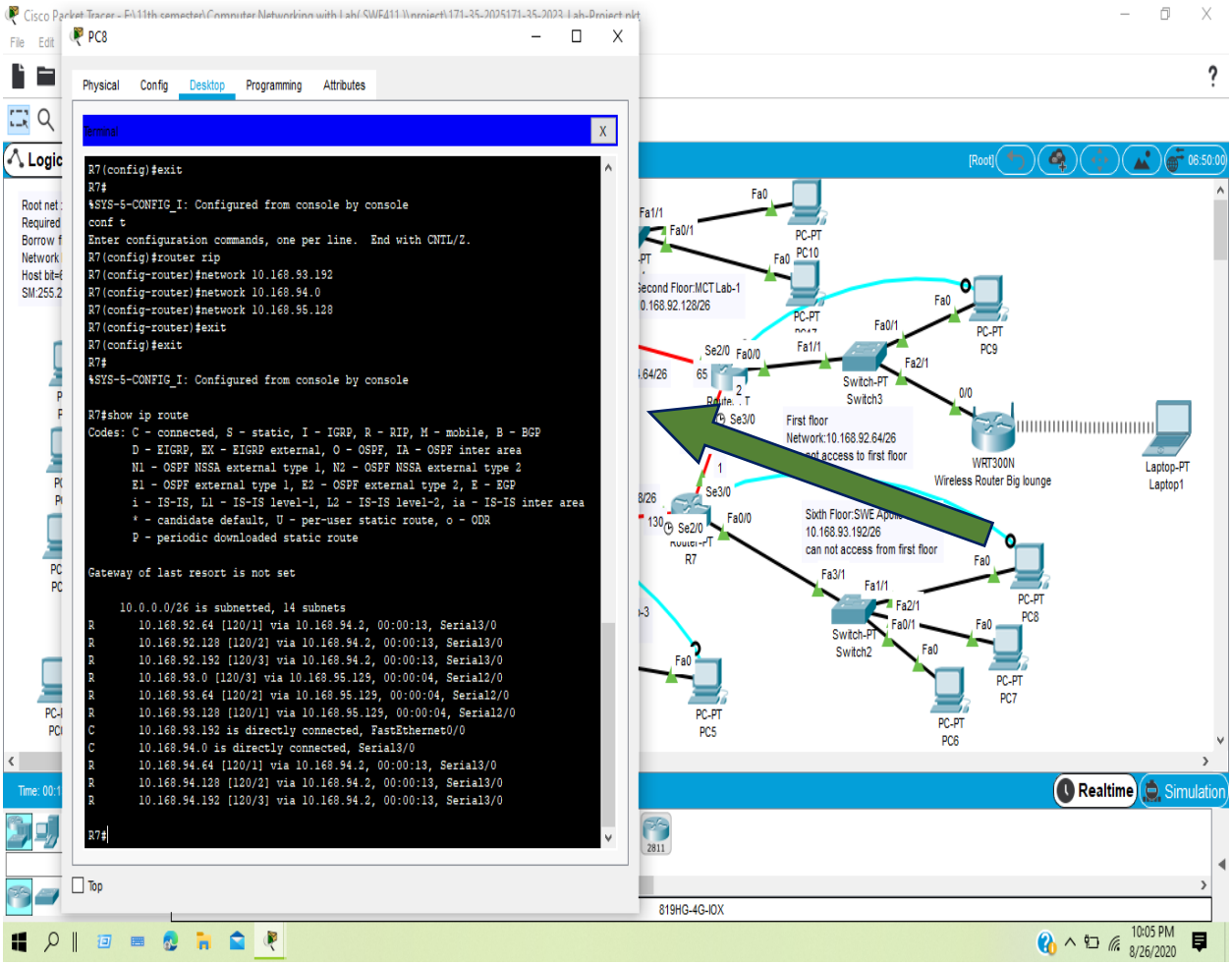
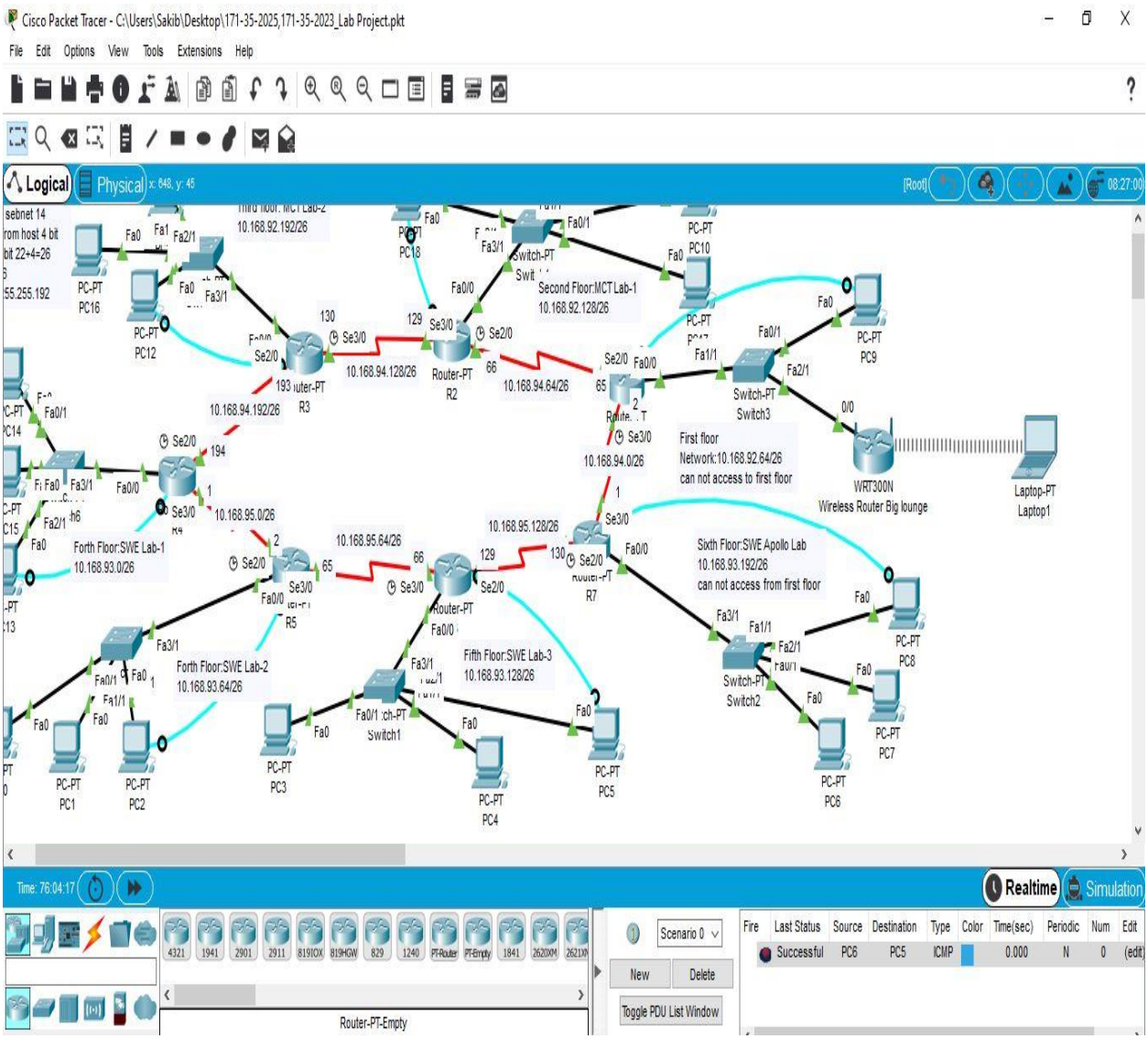


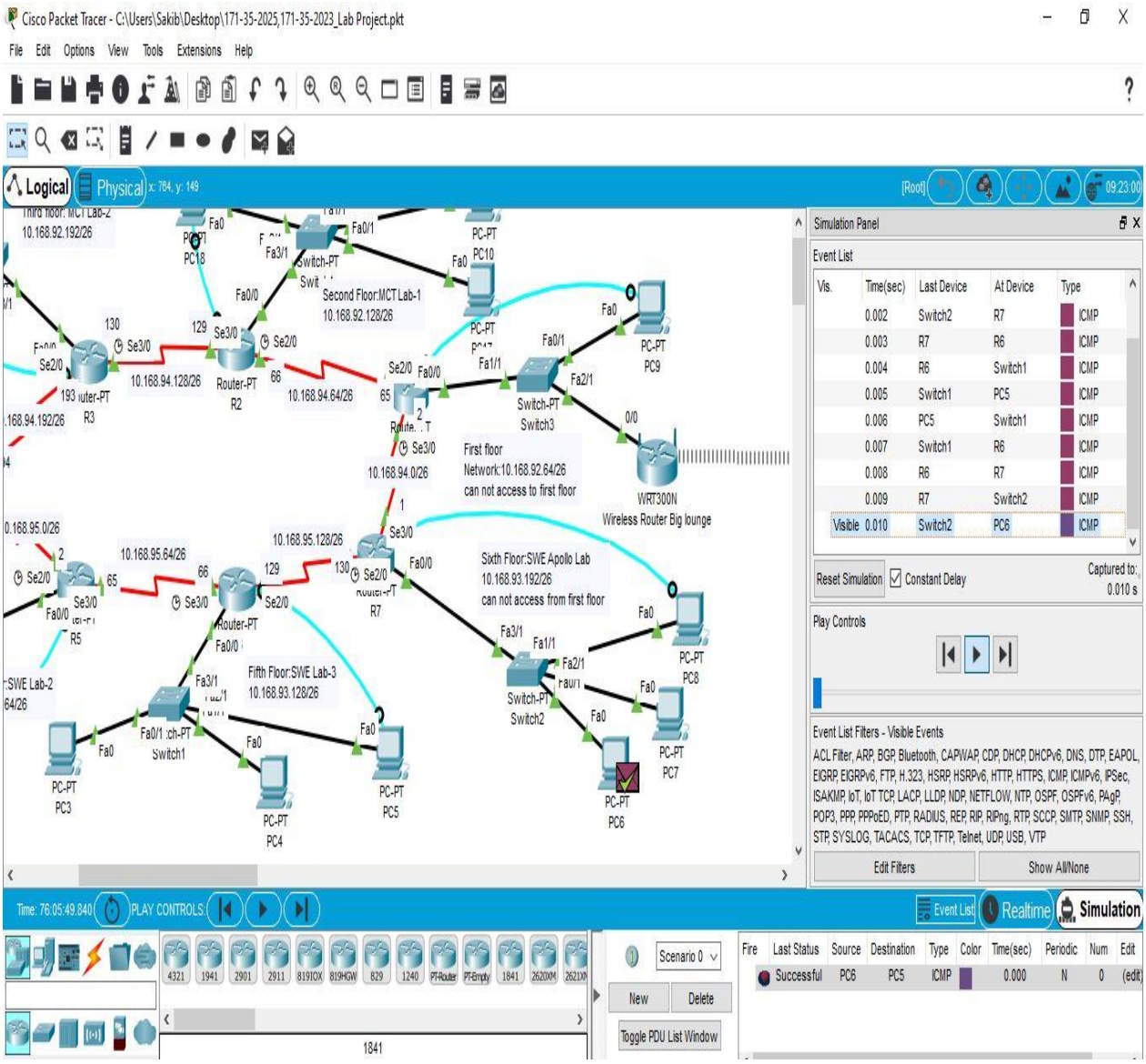
- Similarly, we configure Dynamic Routes for all router

- After setting up the gateway & configure Dynamic Routes for every LAN, we send a packet from one network to another. And it works successfully [N.B: At first, it may be failed in the 1st time but if we try again then it will be successful]

- Then, we send a packet from PC6 to PC5. In Realtime mode, the packet status is successful


Cisco Packet Tracer - C:\Users\Sakib\Desktop\171-35-2025,171-35-2023_Lab Project.pkt
File Edit Options View Tools Extensions Help
Logical
Physical
Router-PT R2
Router-PT R3
Router-PT R5
Router-PT R7
Router-PT
Switch-PT Switch1
Switch-PT Switch2
Switch-PT Switch3
Second Floor:MCT Lab-1
10.168.92.128/26
10.168.94.128/26
10.168.94.64/26
10.168.94.192/26
10.168.94.0/26
First floor
Network:10.168.92.64/26
can not access to first floor
Sixth Floor:SWE Apollo Lab
10.168.93.192/26
can not access from first floor
Forth Floor:SWE Lab-1
10.168.93.0/26
Forth Floor:SWE Lab-2
10.168.93.64/26
Fifth Floor:SWE Lab-3
10.168.93.128/26
10.168.95.0/26
10.168.95.64/26
10.168.95.128/26
WRT300N
Wireless Router Big lounge
Laptop-PT
Laptop1
PC-PT PC1
PC-PT PC2
PC-PT PC3
PC-PT PC4
PC-PT PC5
PC-PT PC6
PC-PT PC7
PC-PT PC8
PC-PT PC9
PC-PT PC10
PC-PT PC12
PC-PT PC16
PC-PT PC18
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Router-PT-Empty
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Successful
PC6
PC5
ICMP
0.000
N
0

- Finally, we send a packet from PC6 to PC5. We observe the activity for the network In the Simulation mode



Step 7: Verify Routing table and Test the network

Configure PC8 to receive an IP address through DHCP

- ✓ Click on the PC8
- ✓ Click on Desktop
- ✓ IP Configuration
- ✓ Select DHCP option to set PC8 to get dynamic IP from the DHCP Server
- ✓ Do the same for all PC's

Step 8: Configure a DHCP Server

Configure the R7 router as a DHCP server for the 10.168.93.192/26 subnet.

Now, Configure all the Router's like R7.

Step 9:

Step-01: Exclude statically assigned addresses

The DHCP server assumes that all IP addresses in a DHCP address pool subnet are available for assigning to DHCP clients. We must specify the IP addresses that the DHCP server should not assign to clients. These IP addresses are usually static addresses reserved for the router interface, switch management IP address, servers, and a local network printer. The IP DHCP excluded-address command prevents the router from assigning IP addresses within the configured range. The following commands exclude the first 10 IP addresses from each pool for the LANs attached to Switch1. These addresses will not be assigned to any DHCP clients.

R7(config)#**ip DHCP excluded-address 10.168.93.193 10.168.93.202**

Step-02: Configure the pool

Create the DHCP pool using the IP DHCP pool command and name it R7Fa0_0.

R7(config)#**ip dhcp pool R7Fa0_0**

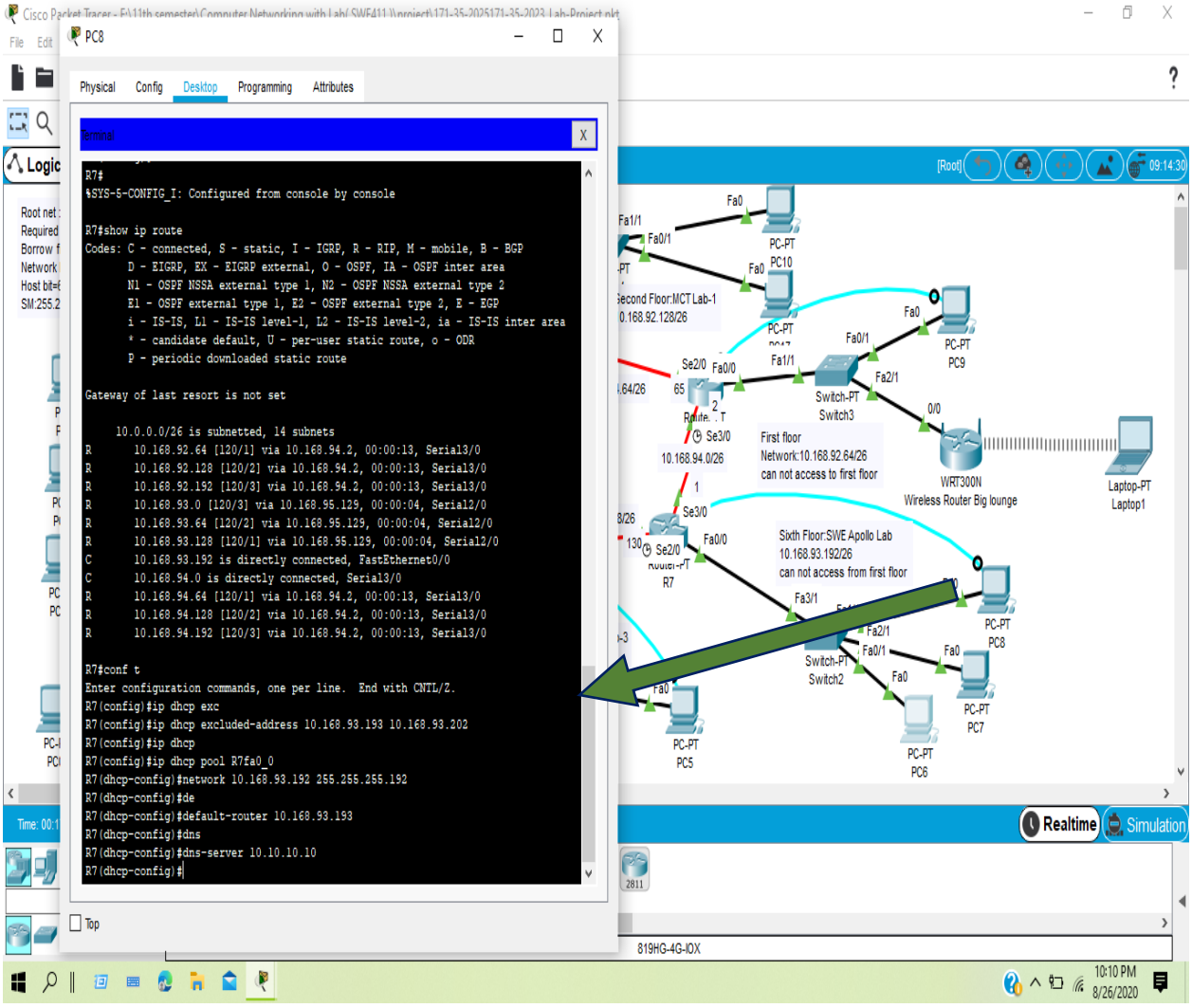
R7(dhcp-config) #**network 10.168.93.192 255.255.255.192**

Configure the default router and domain name server for the network. Clients receive these settings via DHCP, along with an IP address.

R7(dhcp-config) #**default-router 10.168.93.193**

R7(dhcp-config) #**dns-server 10.10.10.10**

Note: There is not a DNS server at 10.10.10.10. We are configuring the command for practice only.


PC8
Physical
Config
Desktop
Programming
Attributes
Terminal
R7#
%SYS-5-CONFIG_I: Configured from console by console
R7#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/26 is subnetted, 14 subnets
R 10.168.92.64 [120/1] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.92.128 [120/2] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.92.192 [120/3] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.93.0 [120/3] via 10.168.95.129, 00:00:04, Serial2/0
R 10.168.93.64 [120/2] via 10.168.95.129, 00:00:04, Serial2/0
R 10.168.93.128 [120/1] via 10.168.95.129, 00:00:04, Serial2/0
C 10.168.93.192 is directly connected, FastEthernet0/0
C 10.168.94.0 is directly connected, Serial3/0
R 10.168.94.64 [120/1] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.94.128 [120/2] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.94.192 [120/3] via 10.168.94.2, 00:00:13, Serial3/0
R7#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R7(config)#ip dhcp exc
R7(config)#ip dhcp excluded-address 10.168.93.193 10.168.93.202
R7(config)#ip dhcp
R7(config)#ip dhcp pool R7fa0_0
R7(dhcp-config)#network 10.168.93.192 255.255.255.192
R7(dhcp-config)#de
R7(dhcp-config)#default-router 10.168.93.193
R7(dhcp-config)#dns
R7(dhcp-config)#dns-server 10.10.10.10
R7(dhcp-config)#
Top
First floor
Network:10.168.92.64/26
can not access to first floor
Sixth Floor:SWE Apollo Lab
10.168.93.192/26
can not access from first floor
10.168.94.0/26
WRT300N
Wireless Router Big lounge
Laptop-PT
Laptop1
Switch-PT
Switch3
Switch2
R7
PC-PT
PC5
PC6
PC7
PC8
PC9
PC10
Realtime
Simulation
819HG-4G-IOX
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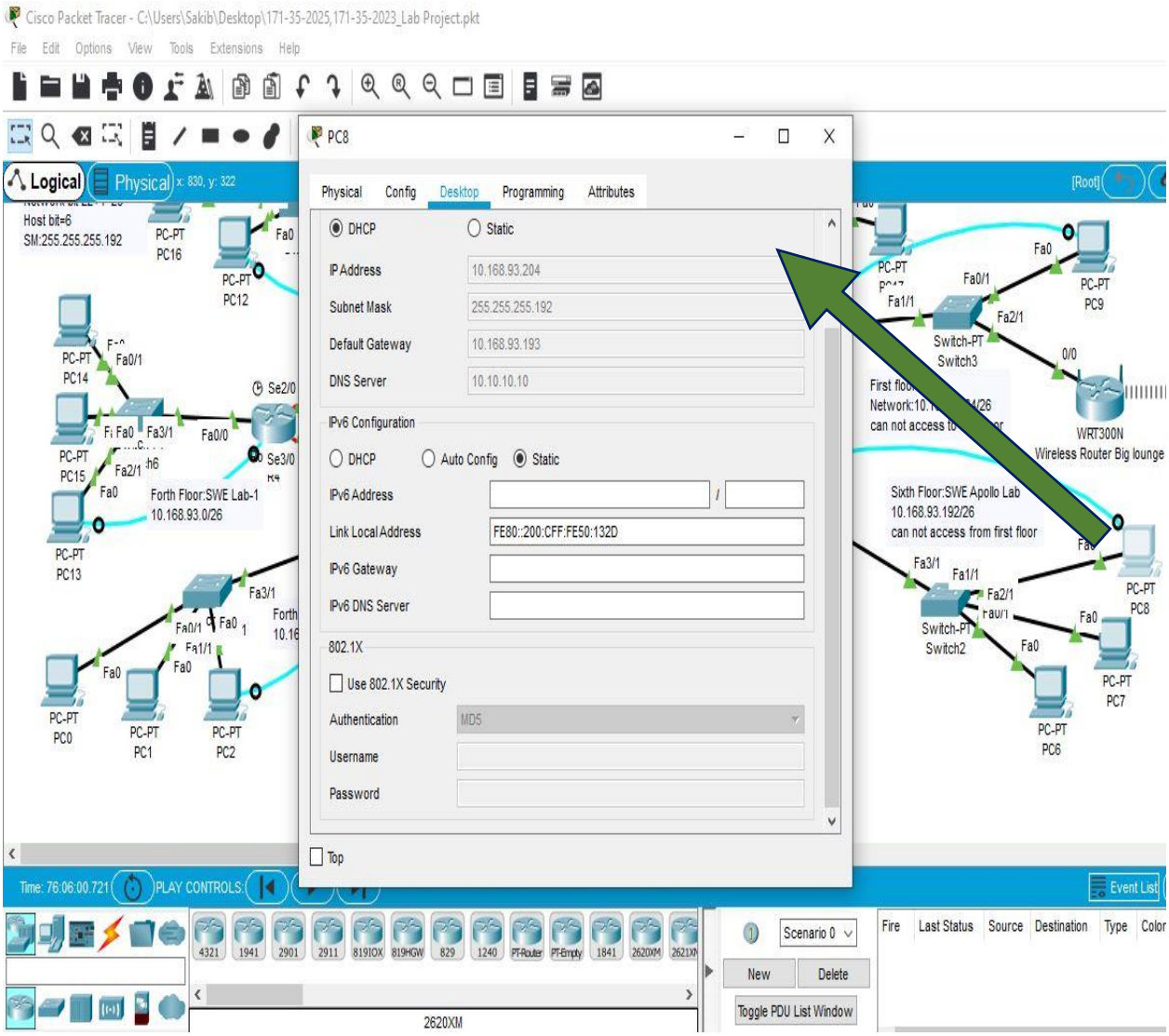
8/26/2020

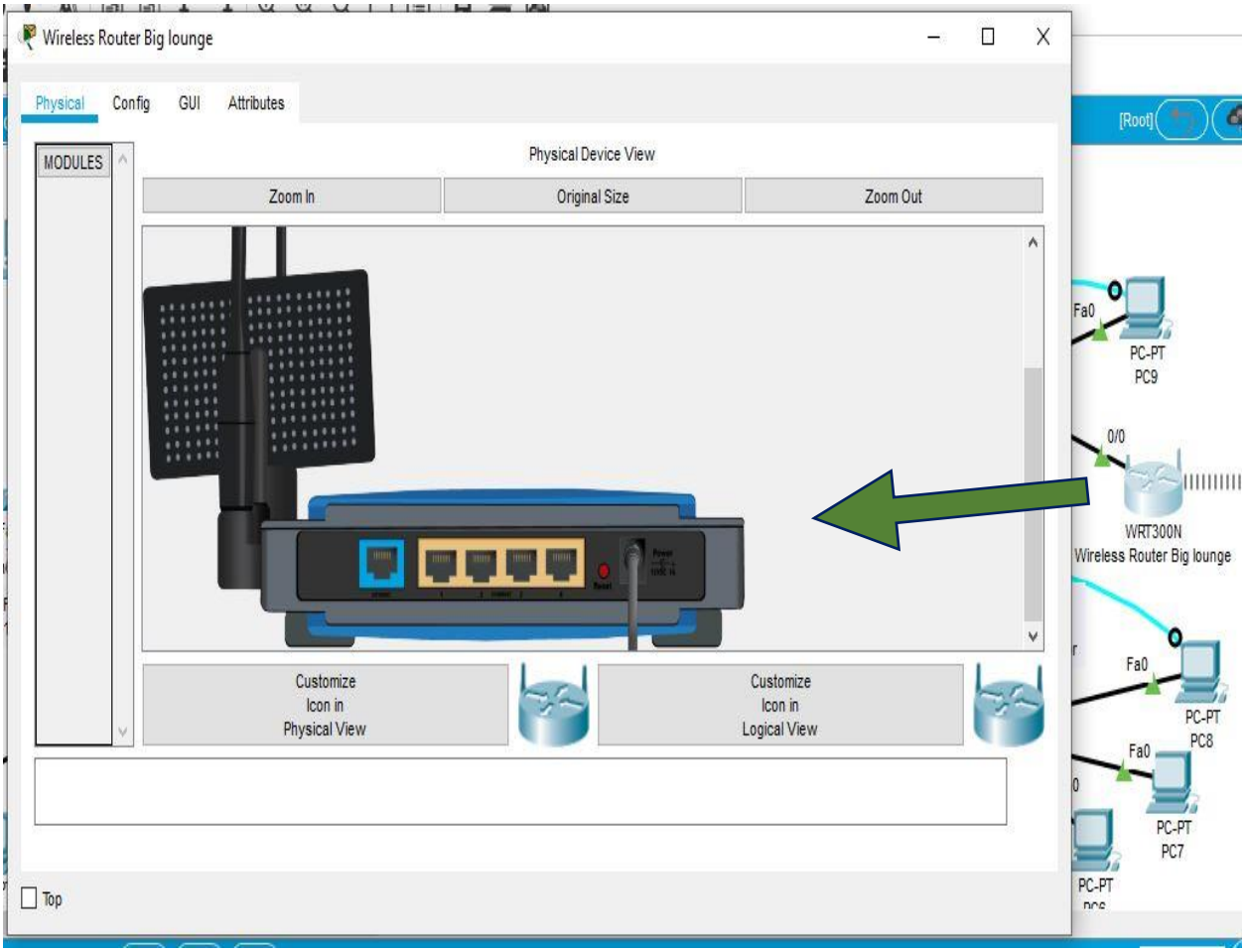
Specify the subnet to use when assigning IP addresses. DHCP pools automatically associate with an interface based on the network statement. The router R1 now acts as a DHCP server, handing out addresses in the **10.168.93.193/26** subnet starting with **10.168.93.204** for PC8.



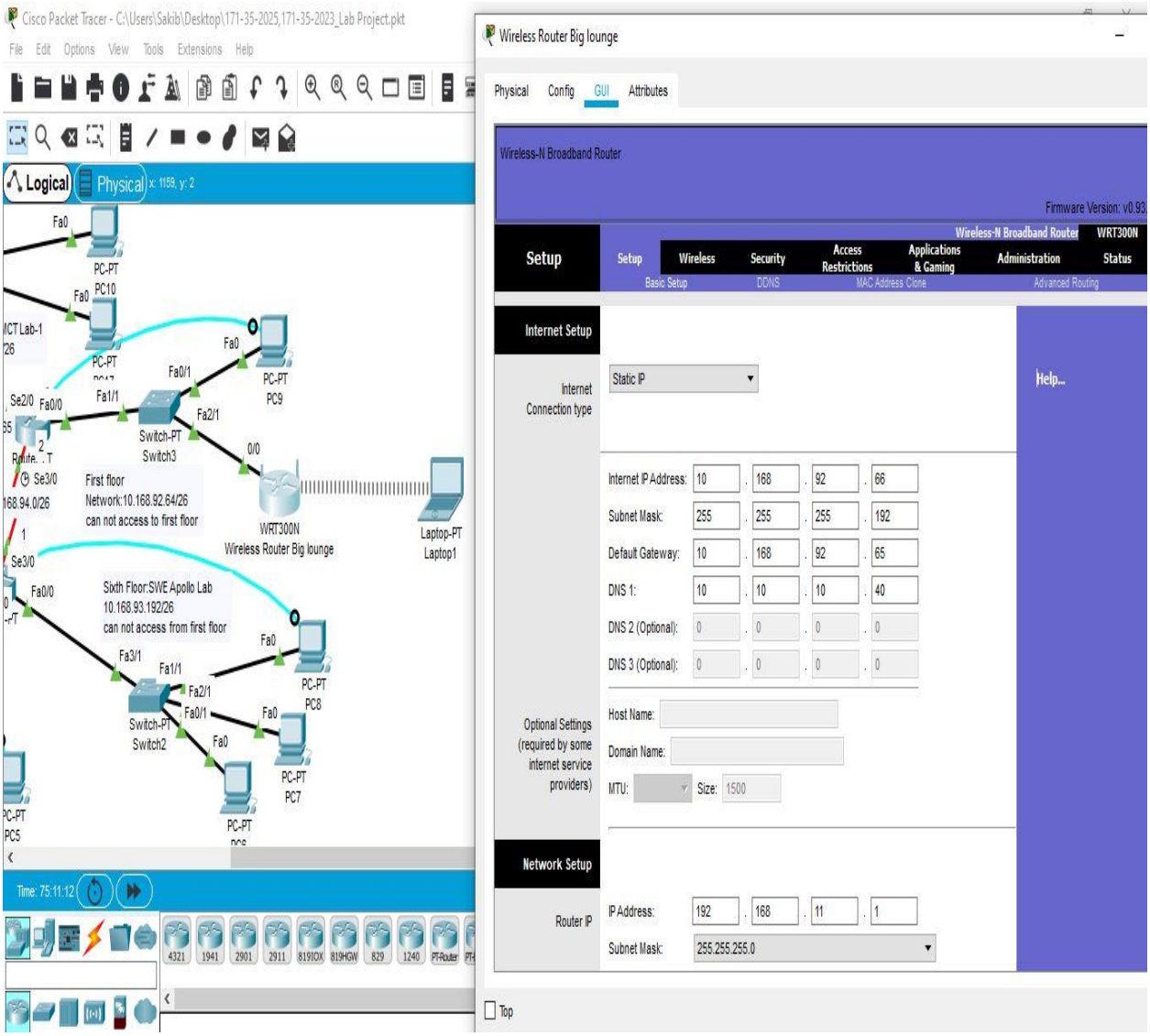
Step 10: Configure a Wireless Router to create a Wireless LAN (Wi-Fi)

Part 1: *Connect to the Wireless router*

- ✓ Now, we take a Wireless Router WRT300N
- ✓ Then, we connect the Automatically Choose Connection Type cable from Wireless Router Big Lounge to the Switch3
- ✓ After that, we click the Wireless Router Big Lounge and click the GUI
- ✓ As we configure multiple DHCP for Router R1, so for this LAN, we have to choose a static IP in the Internet Connection Type



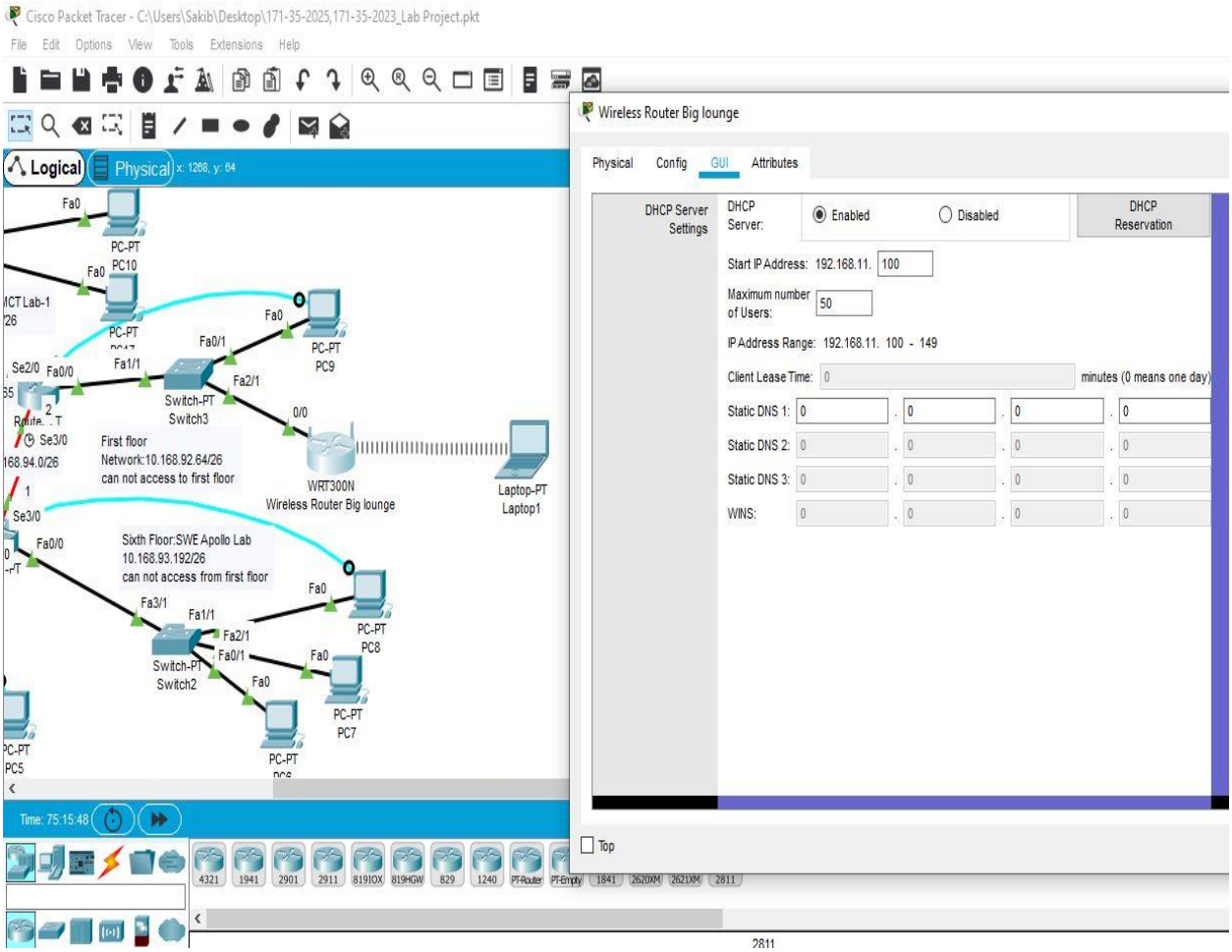
- ✓ Then enter the following static IP information:
  - Internet IP Address – 10.168.92.66
  - Subnet Mask –255.255.255.192
  - Default Gateway –192.168.11.1
  - DNS 1 –10.10.10.40



- ✓ After that, we configure the inside network parameters. Scroll down to the Network Setup section and configure the following information:

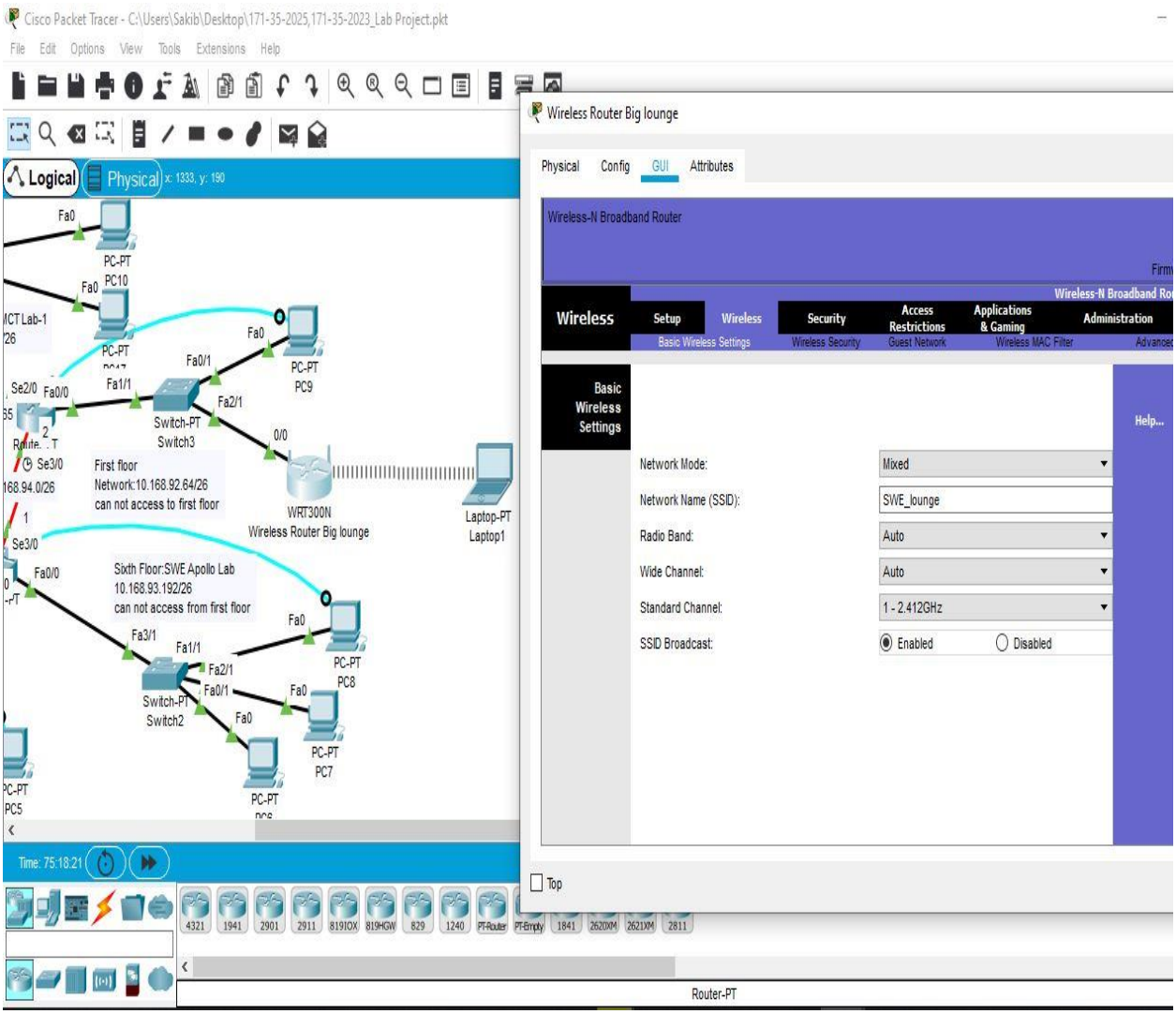
    - IP Address –192.168.11.1
    - Subnet Mask –255.255.255.192
    - Then we have to select DHCP Server Enable so that, the router can give Automatic IP to the host from the DHCP pool
    - Starting IP Address – Enter 100 for the last octet
    - Maximum number of Users – 50

    Note: The IP address range of the DHCP pool will only reflect the changes once you click 'Save Settings'



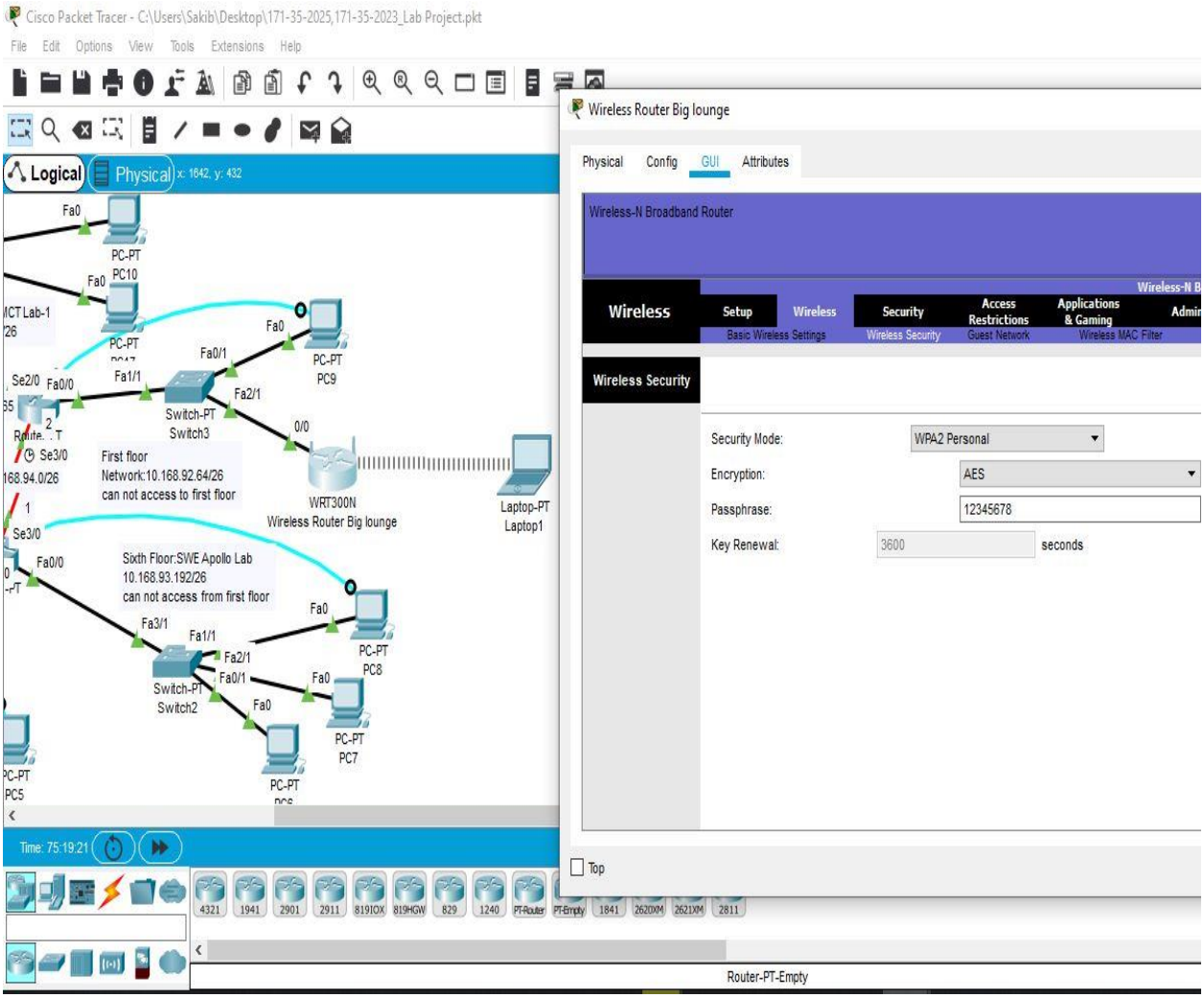
- ✓ Next, we Save the settings and reconnect to the router
    - Scroll to the bottom of the page and click Save Settings. If we move from one tab to another without saving, our configurations will be lost.

- ✓ Now, configure wireless connectivity for wireless devices
    - Click the Wireless tab and investigate the options in the dropdown list for Network Mode
    - Set the network mode for Mixed
    - Change the SSID to SWE_lounge
    - When a wireless client surveys the area searching for wireless networks, it detects any SSID broadcasts. SSID broadcasts are enabled by default
    - As we select network mode Mixed, so we set the radio band to Auto
    - Click Save Settings and then click Continue



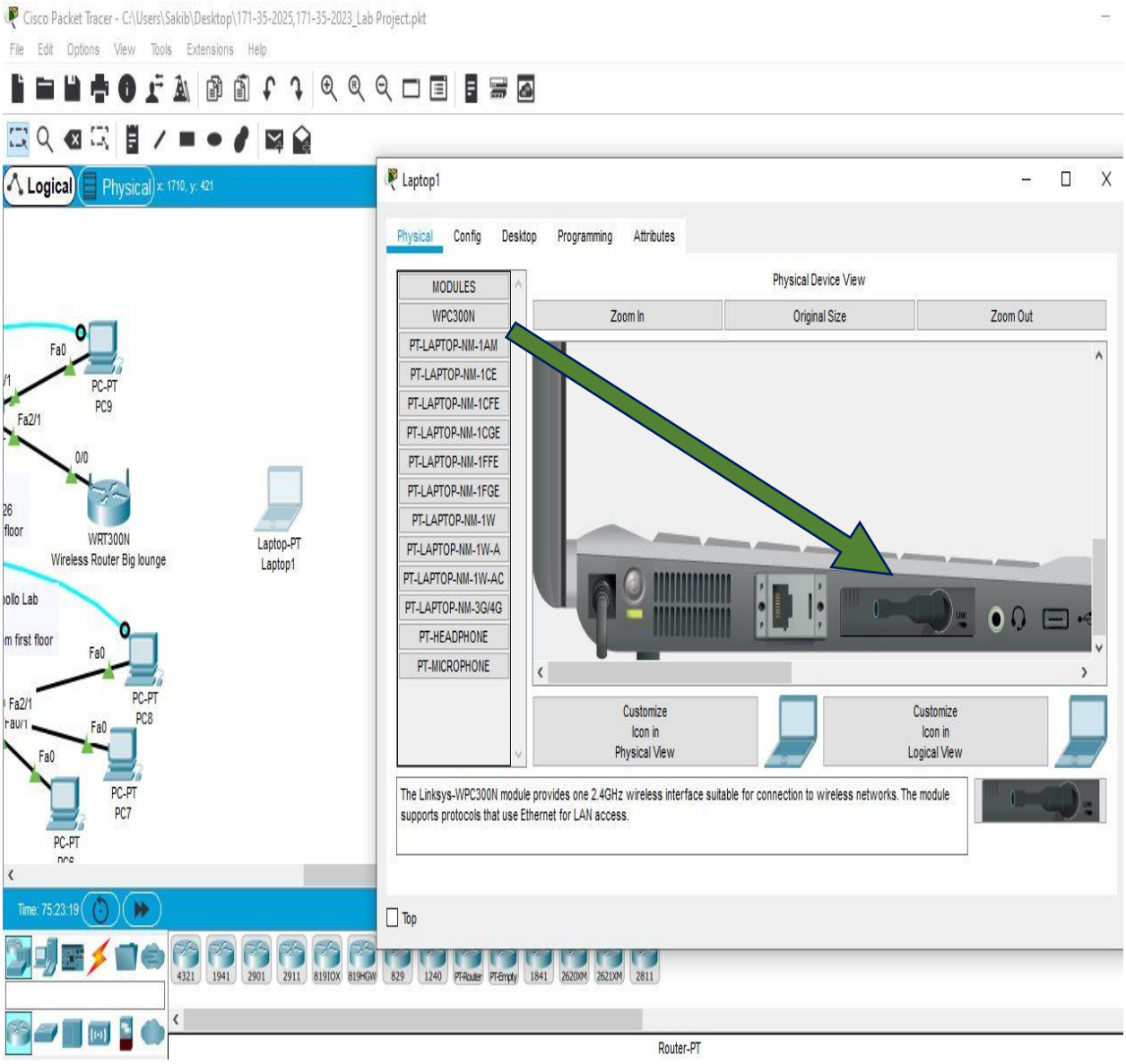
- ✓ Configure wireless security so that clients must authenticate to connect to the wireless network

    - Click the Wireless Security option under the Wireless tab
    - Set the Security Mode to WPA2 Personal
    - Leave the encryption mode to AES and set the passphrase to class 12345678
    - Click Save Settings and then click Continue

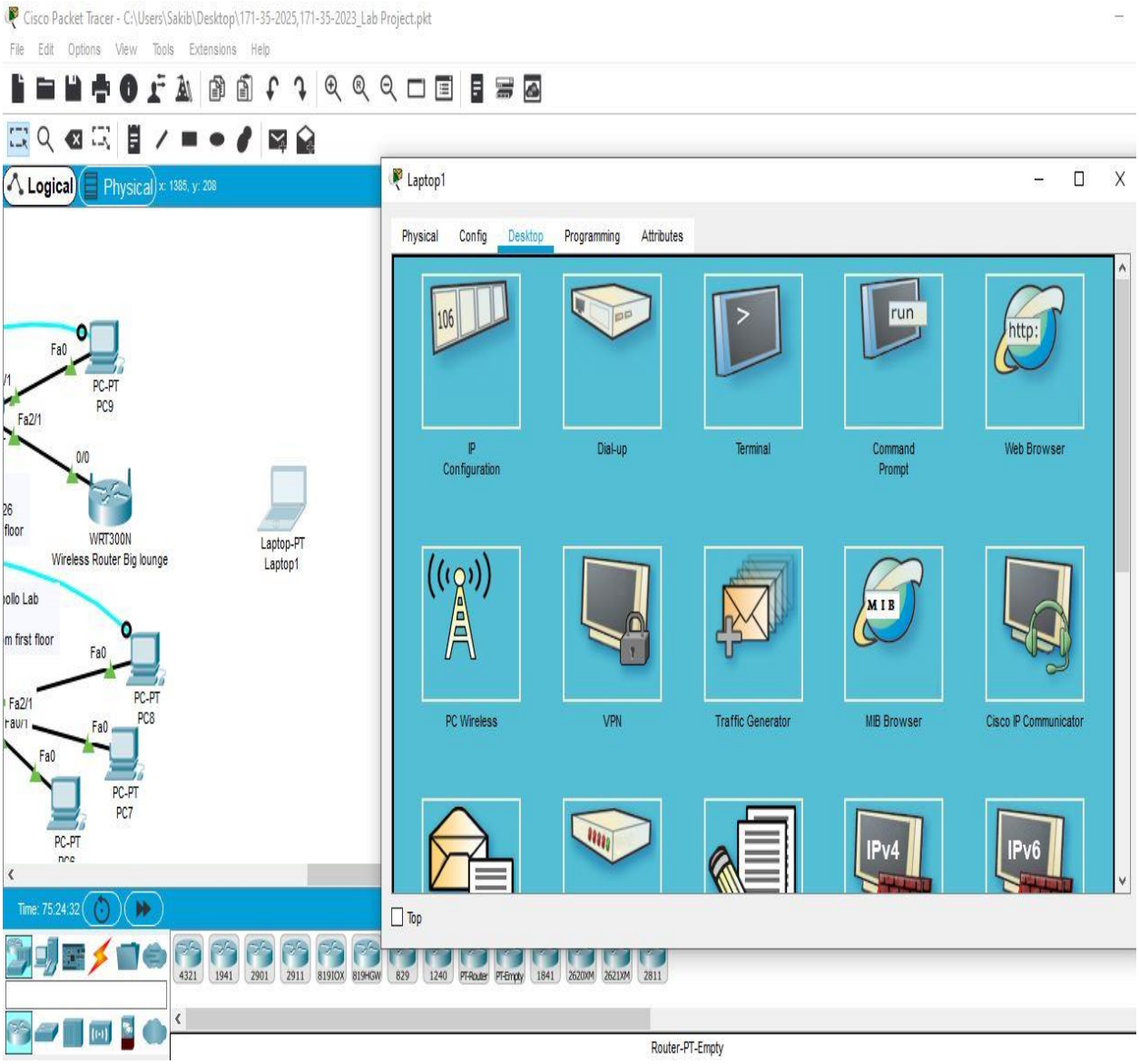


Part 2: *Configure and Verify Wireless Client Access*

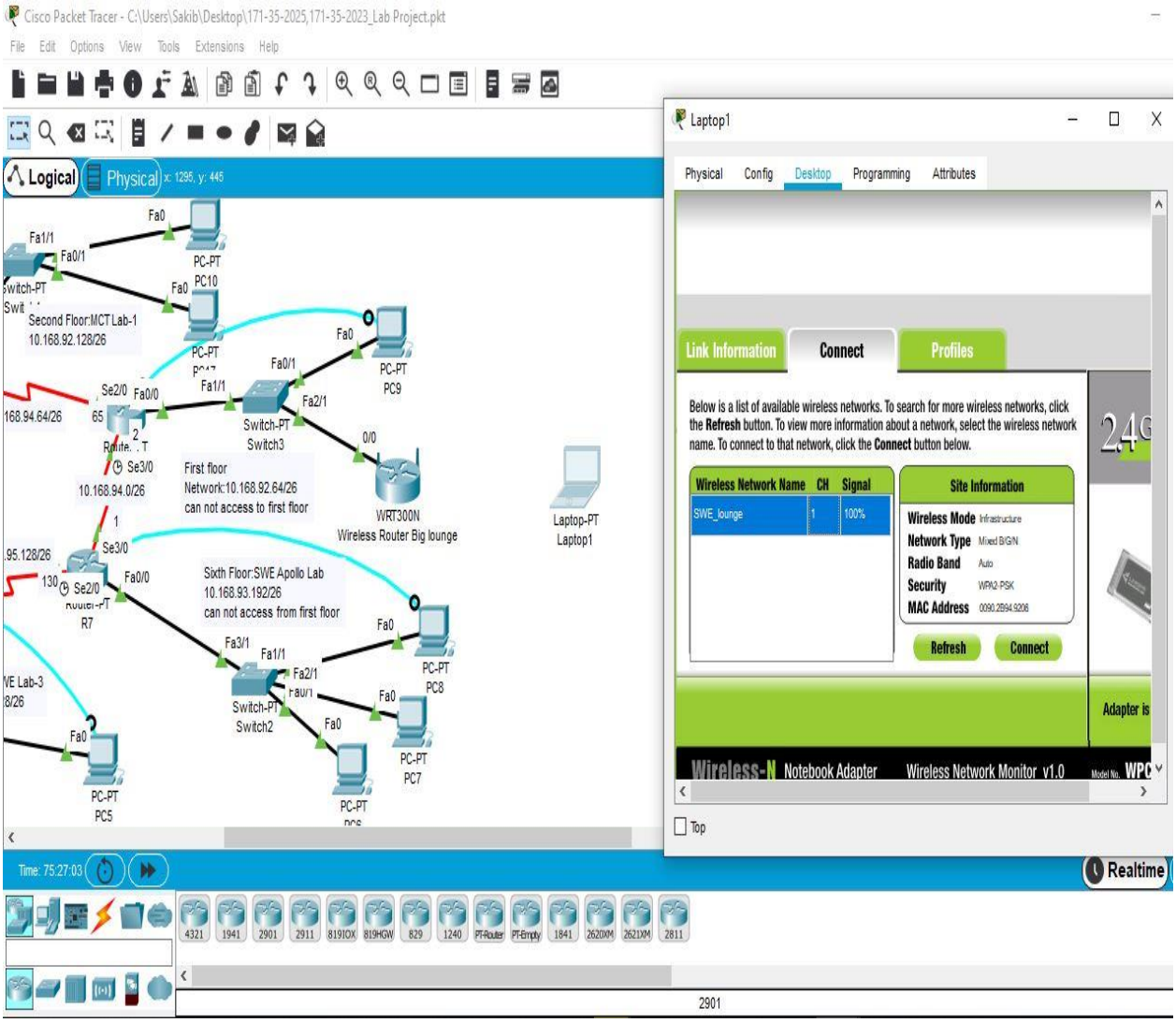
- ✓ Configure Laptop1 to access the wireless network
- ✓ If a wireless interface is not found, add a wireless interface (Laptop1> Physical> free slot WPC300N add)



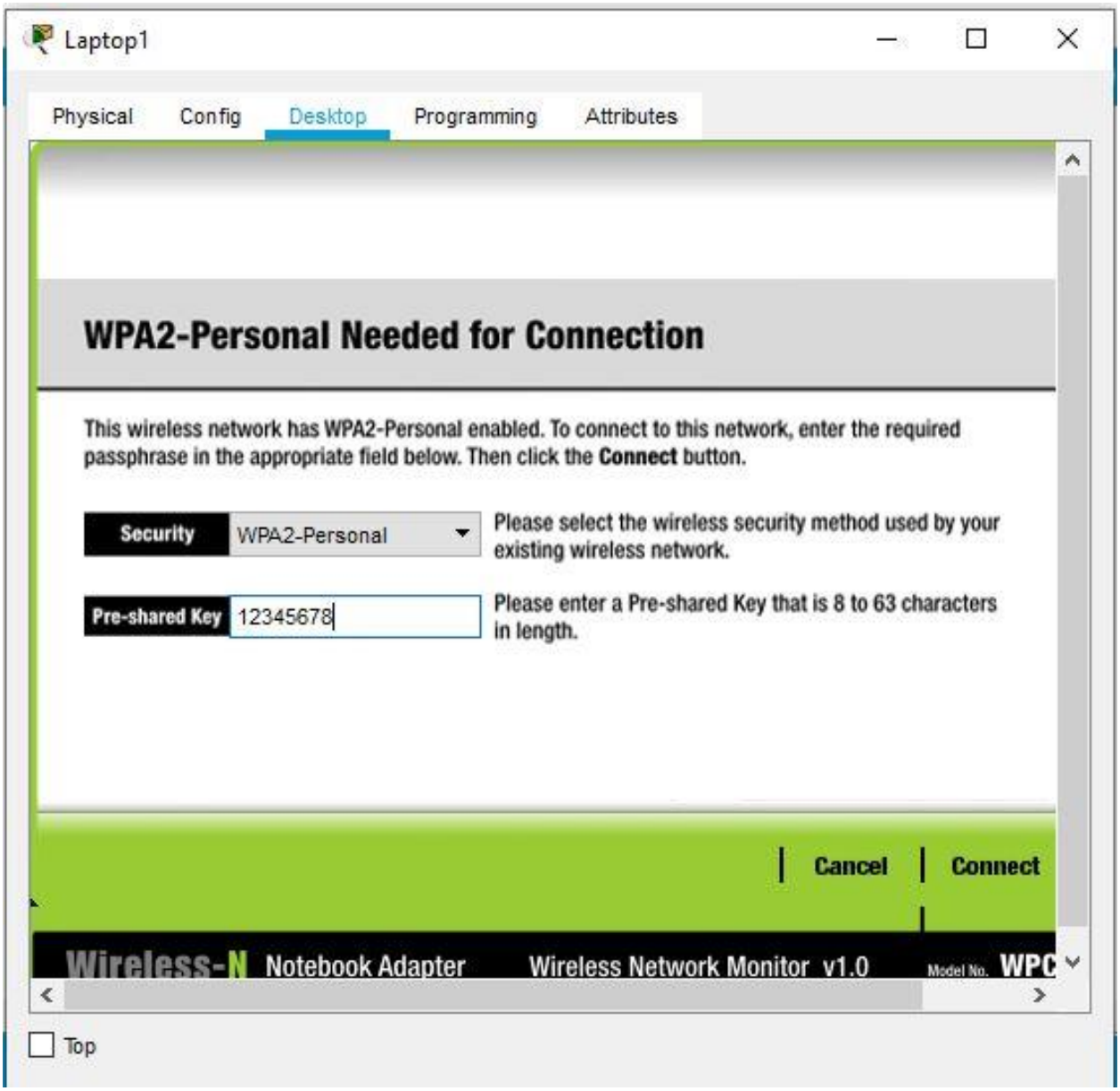
✓ Click Laptop1 and click Desktop > PC Wireless



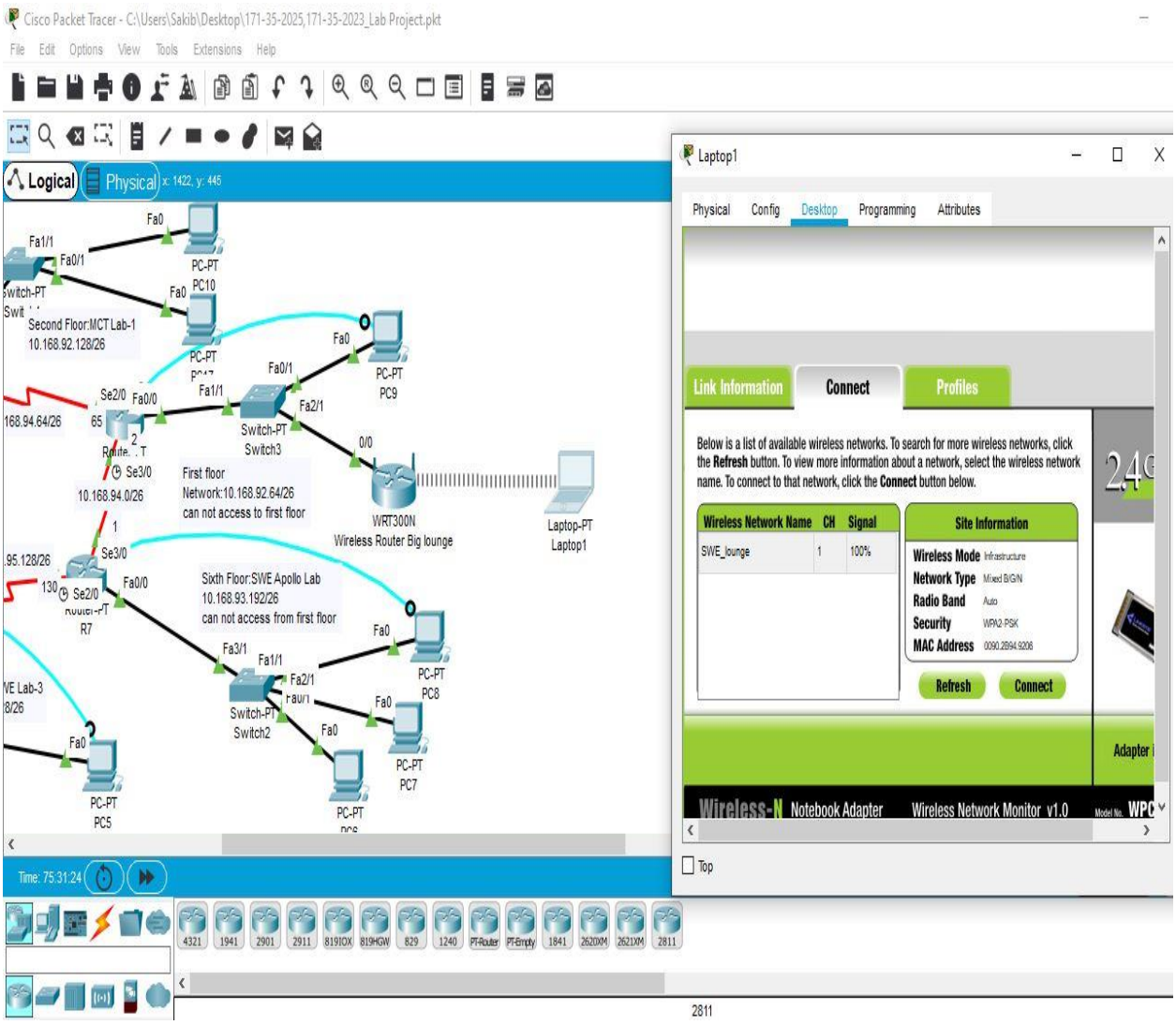
- ✓ Click the Connect tab and click Refresh, if necessary. We should see SWE_lounge listed under Wireless Network Name



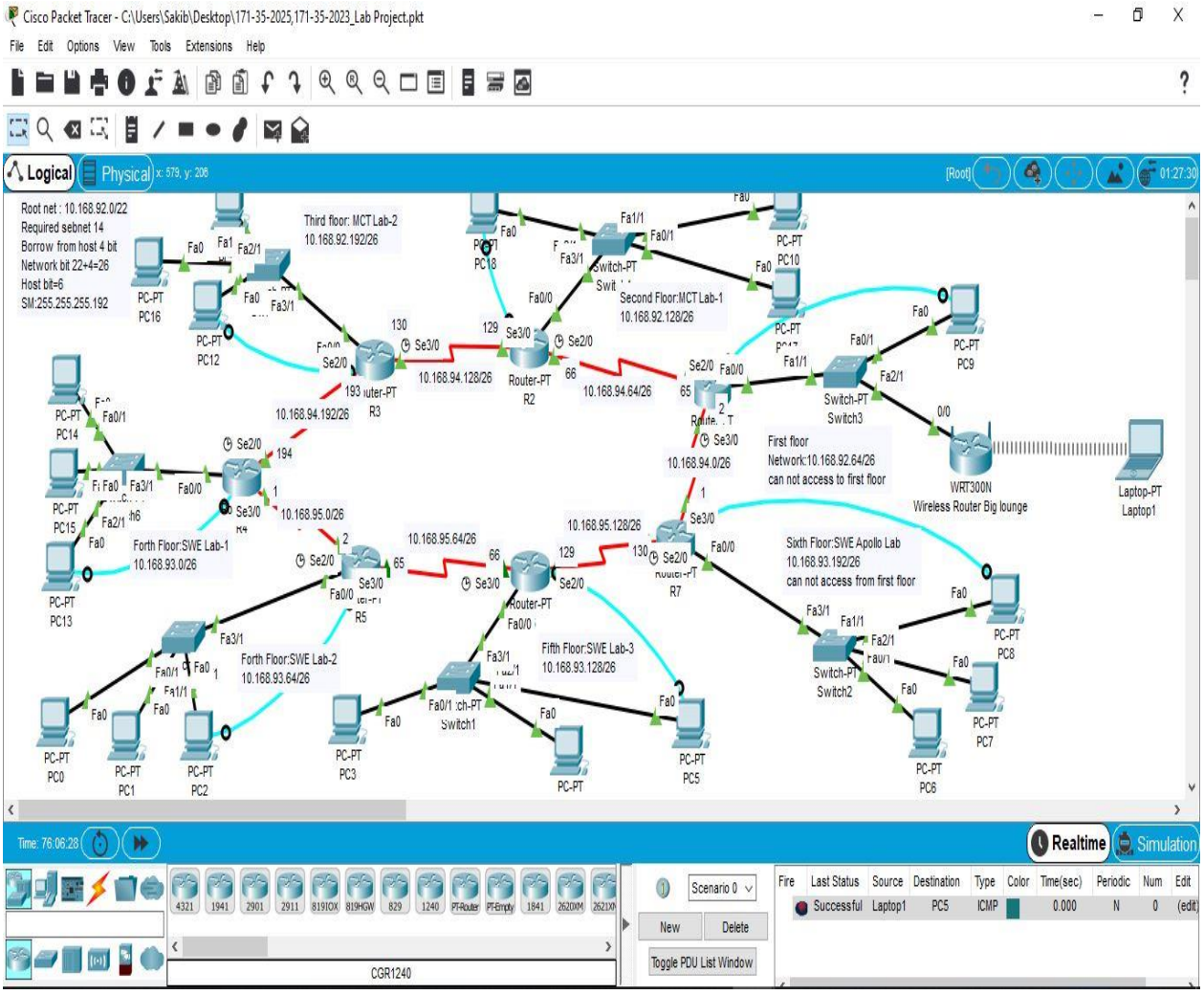
- ✓ Click SWE-lounge and click Connect
- ✓ The Pre-shared Key is the password we configured in Part 2. Now, enter the password and click Connect



✓ After click connect, the connection is established



- ✓ Now, we send a packet from Laptop1 to PC5. In Realtime Mode, the packet status is successful [N.B: At first, it may be failed in the 1st time but if we try again then it will be successful]



Step 11: Create Standard ACLs

- Creating an ACL using the number 1 on Router with a statement that denies access to the First Floor (10.168.92.64/26) network from the Apollo Lab (10.168.93.192/26) network

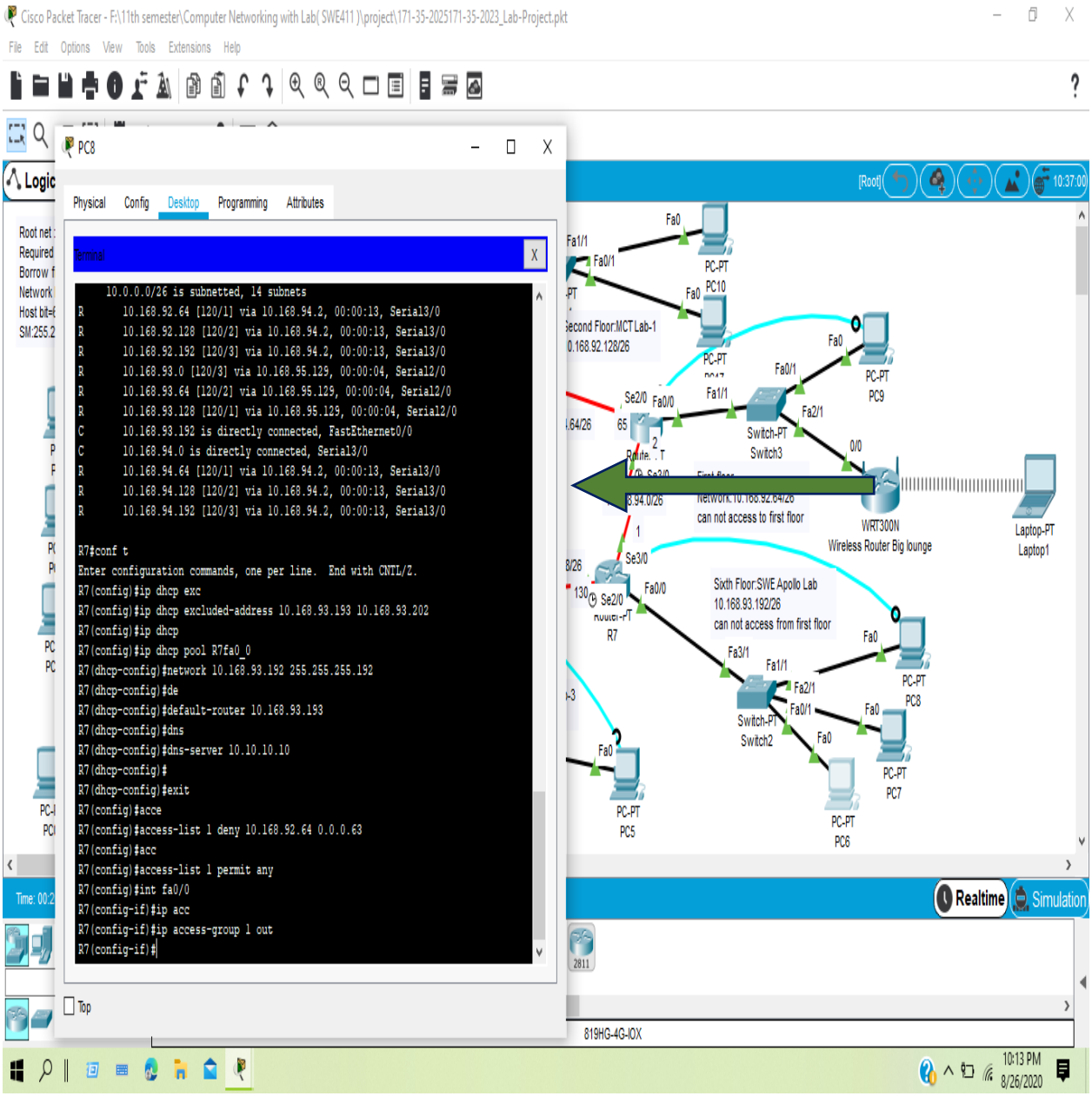
```
R7(config)#access-list 1 deny 10.168.92.64 0.0.0.63
```

- By default, an access list denies all traffic that does not match a rule. To permit all other traffic

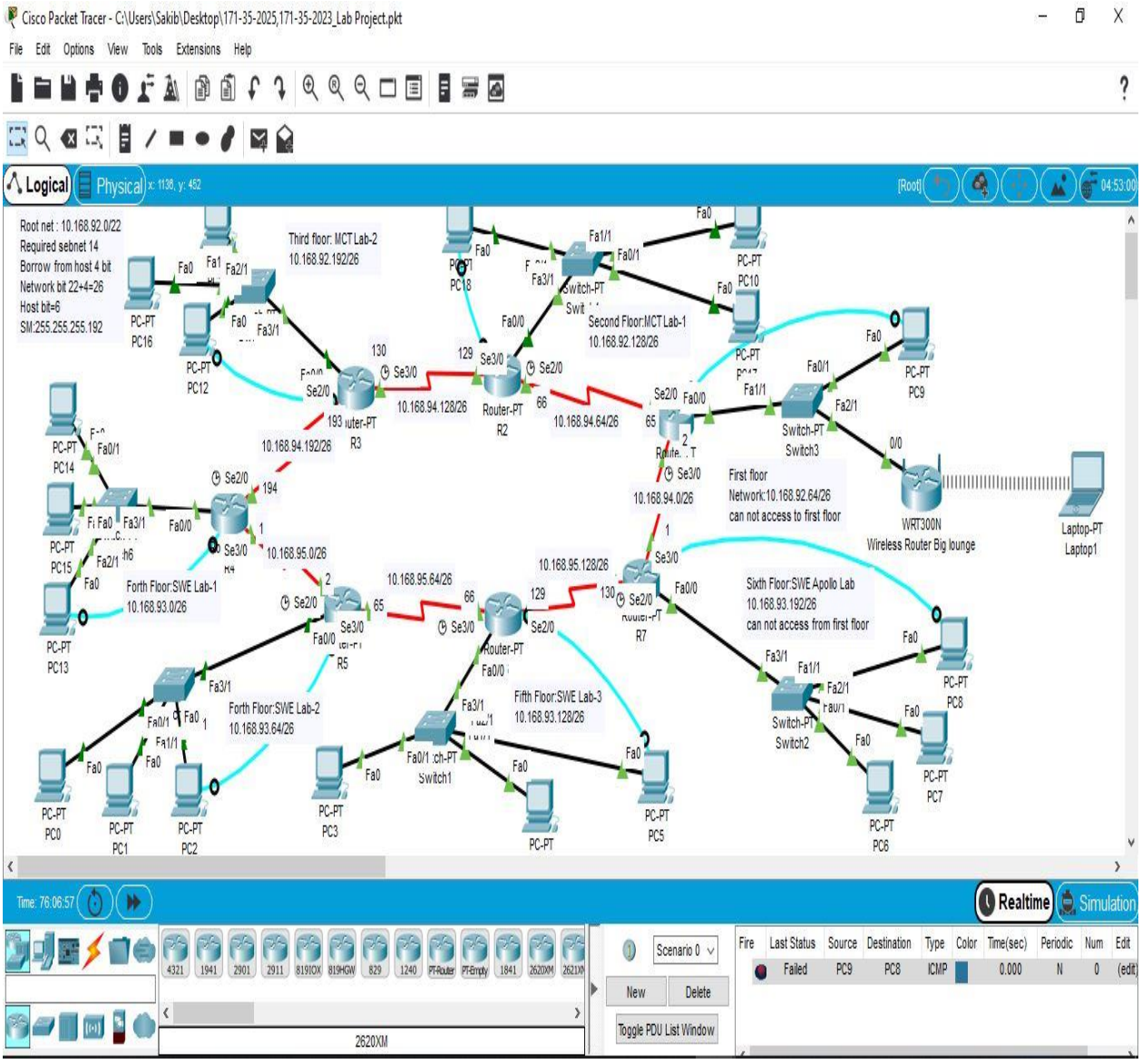
```
R7(config)#access-list 1 permit any
```

- For the ACL to actually filter traffic, it must be applied to some router operation. Apply the ACL by placing it for outbound traffic

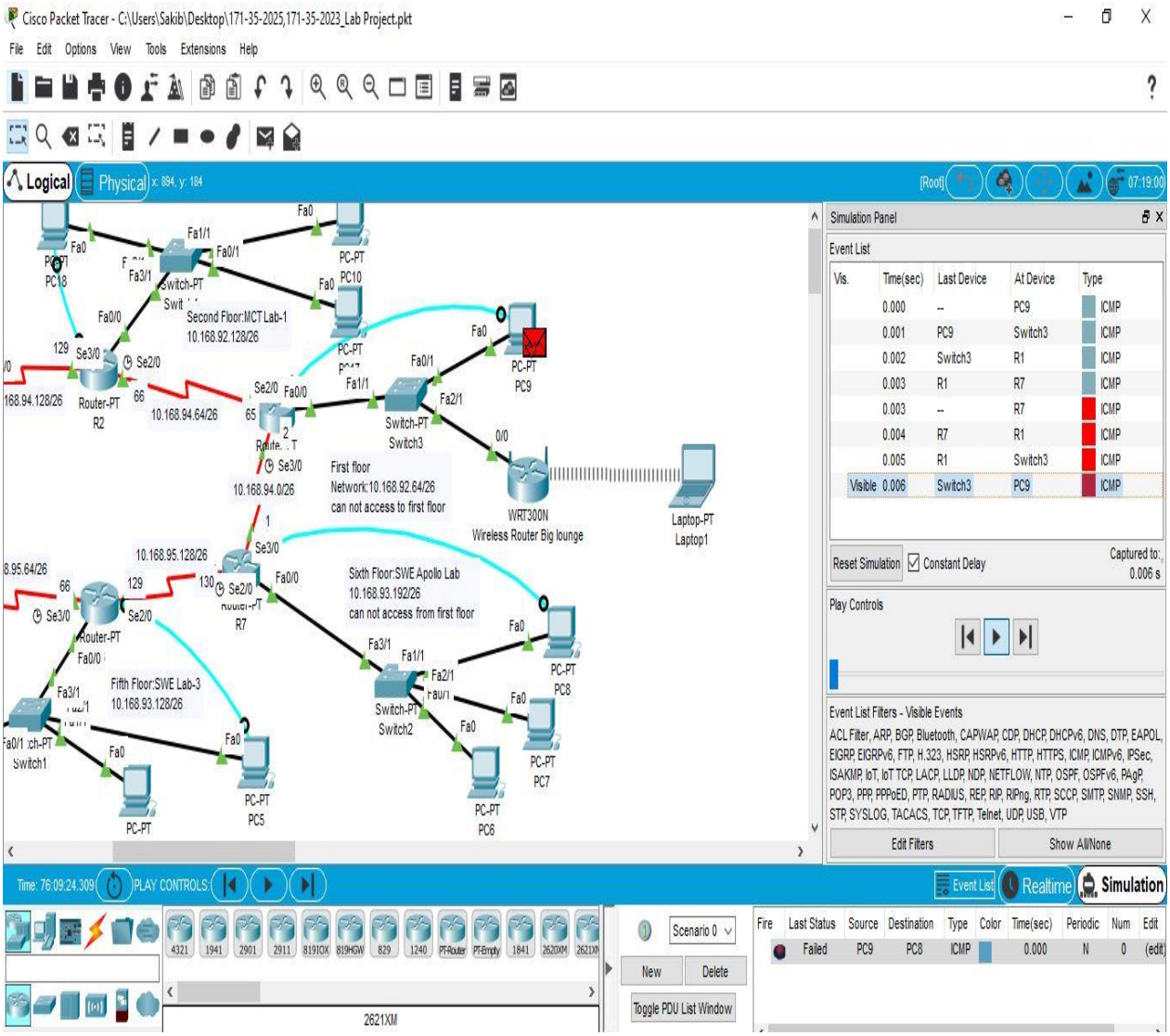
```
R7(config)#interface fastEthernet 0/0
R7(config-if) #ip access-group 1 out
```


Cisco Packet Tracer - F:\11th semester\Computer Networking with Lab(SWE411)\project\171-35-2025171-35-2023_Lab-Project.pkt
File Edit Options View Tools Extensions Help
PC8
Physical Config Desktop Programming Attributes
Terminal
10.0.0.0/26 is subnetted, 14 subnets
R 10.168.92.64 [120/1] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.92.128 [120/2] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.92.192 [120/3] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.93.0 [120/3] via 10.168.95.129, 00:00:04, Serial2/0
R 10.168.93.64 [120/2] via 10.168.95.129, 00:00:04, Serial2/0
R 10.168.93.128 [120/1] via 10.168.95.129, 00:00:04, Serial2/0
C 10.168.93.192 is directly connected, FastEthernet0/0
C 10.168.94.0 is directly connected, Serial3/0
R 10.168.94.64 [120/1] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.94.128 [120/2] via 10.168.94.2, 00:00:13, Serial3/0
R 10.168.94.192 [120/3] via 10.168.94.2, 00:00:13, Serial3/0
R7#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R7(config)#ip dhcp exc
R7(config)#ip dhcp excluded-address 10.168.93.193 10.168.93.202
R7(config)#ip dhcp
R7(config)#ip dhcp pool R7fa0_0
R7(dhcp-config)#network 10.168.93.192 255.255.255.192
R7(dhcp-config)#de
R7(dhcp-config)#default-router 10.168.93.193
R7(dhcp-config)#dns
R7(dhcp-config)#dns-server 10.10.10.10
R7(dhcp-config)#
R7(dhcp-config)#exit
R7(config)#acce
R7(config)#access-list 1 deny 10.168.92.64 0.0.0.63
R7(config)#acc
R7(config)#access-list 1 permit any
R7(config)#int fa0/0
R7(config-if)#ip acc
R7(config-if)#ip access-group 1 out
R7(config-if)#
Top
Second Floor:MCT Lab-1
10.168.92.128/26
can not access to first floor
Sixth Floor:SWE Apollo Lab
10.168.93.192/26
can not access from first floor
PC-PT PC10
PC-PT PC9
Switch-PT Switch3
WRT300N
Wireless Router Big lounge
Laptop-PT Laptop1
R7
Switch-PT Switch2
PC-PT PC8
PC-PT PC7
PC-PT PC6
PC-PT PC5
Realtime
Simulation
819HG-4G-IOX
10:13 PM
8/26/2020

- After applying ACL, we send a packet from PC9 to PC8. In **Realtime mode**, the packet status is unsuccessful. Because **ACL actually filters the traffic & follow the deny rules from the First Floor to the Apollo Lab**



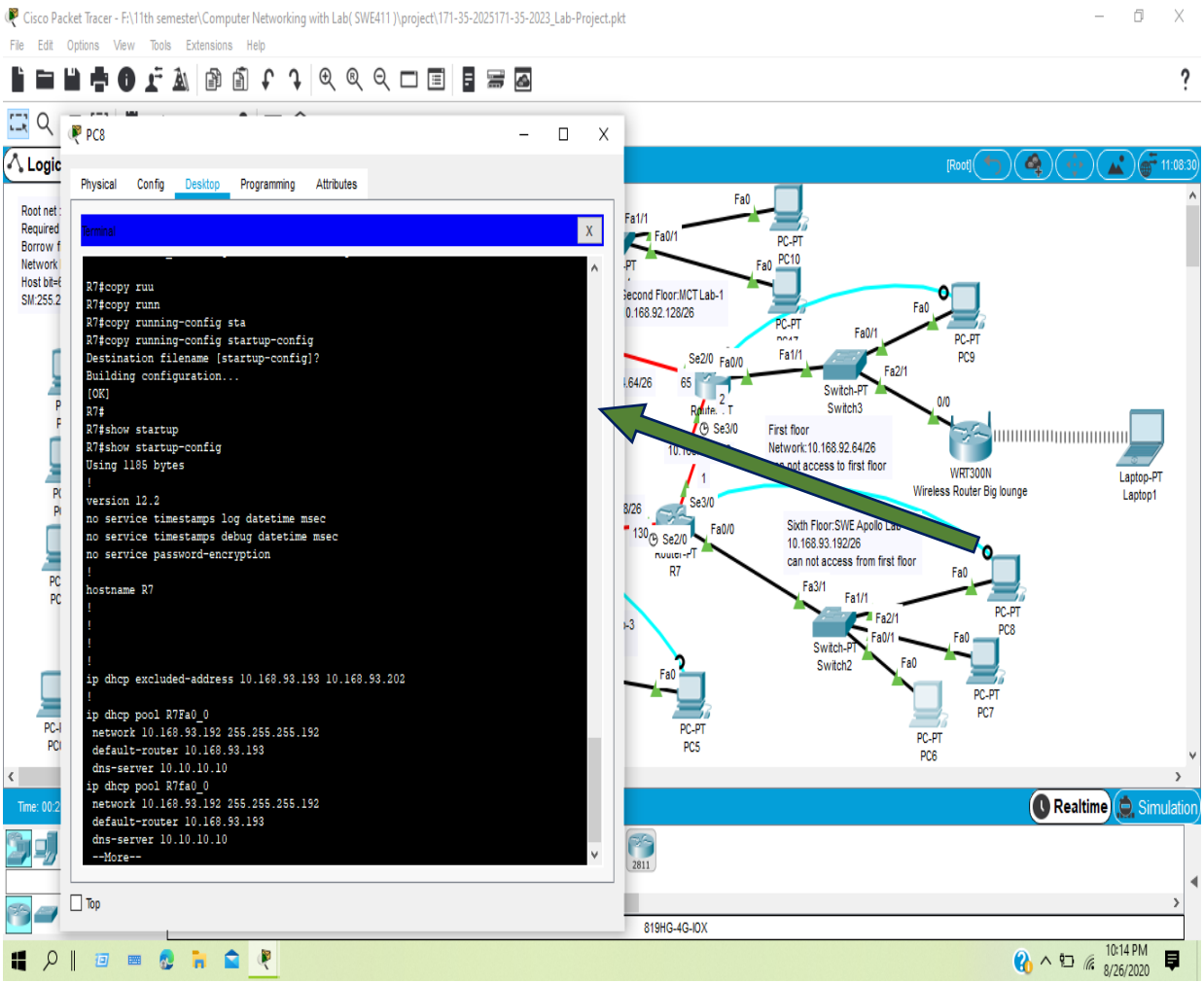
- Next, we send a packet from PC9 to PC8. We observe the activity for the network In the **Simulation mode**. Here, we see **ACL actually filters the traffic & follow the deny rules from the First Floor to the Apollo Lab**



Step 12: Verify Routing table and Test the network

- We use the show IP route command to verify that each router has all of the networks in the topology entered in the routing table. When we are finished with the routing configuration, return to privileged EXEC Mode and save the current configuration to NVRAM

- Now, we save the current configuration to NVRAM for R7 router with PC8



- Similarly, we save the current configuration to NVRAM for all routers

Discussion and Conclusion:

In this project, we use the Dynamic Host Configuration Protocol (DHCP). The DHCP Server feature is a full DHCP server implementation that assigns and manages IP addresses from specified address pools within the router to DHCP clients.

Here, the router works as a DHCP server to assign and manages IP addresses. The router can also exclude IP addresses for reservations. As a result, we can fix some static IP there which is used for different DHCP Lan & also for some different purposes like server, IP camera etc. We can create multiple DHCP in a router. Router can control all of these things.

We can also extend the network with Wireless Lan or Wi-Fi. So, the cost is reduced. As DHCP server assigns dynamic IP automatically so that cost is also reduced. Because Static IP is expensive.

Moreover, we use here RIP protocols in Dynamic Routes. In this protocol, all the router advertises its own links or networks to the other routers or networks. So, if any link fails then the router easily finds the other path to go to the destination. For this reason, it can transfer data successfully.

Next, we use Standard ACL, we denied a specific network address which means it does not accept any packets from that specific network. Here, the **Apollo Lab** does not give access to the **First Floor**. So, the **First Floor** doesn't send any packet to the **Apollo Lab**.

On the other hand, the **Apollo Lab** gives permission to send all of the networks except the **First Floor**. So, the **Other Floor** has access to the **Apollo Lab**. As a result, the **Other Floo**r can send packets to the **Apollo Lab** successfully.

Furthermore, we have to mind that we can't write one mode's command in any other mode. If we write one mode's command to any other mode, then it will never work. We can ignore this problem by noticing the symbol of every mode.

We always have to take any IP from the specific LAN's to configure and Subnet Mask of that PC. If we don't do it and want to take another IP address then we have to configure the PC with that IP address otherwise it won't work.

In cisco packet tracer, the ports remain off by default. For that reason, we need to on the port manually for working with the ports. We can off the port if we want even after making them on.

We can't connect or send any packet among different LAN without router and gateway. For that reason, we have to configure the router firstly. For configuring the router, IP address, Subnet Mask and Clock Rate are mandatory.

We always have to take the correct cable for providing a connection. If we do mistake by any chance then the packets won't be transmitted.

We have to save the current configuration to the startup configuration (NVRAM) at the end of the work. If any router shuts down manually or automatically then we may lose our current configuration. Then again, we have to configure.

So, we use here DHCP server as it has some benefits:

- ✓ **Reduced Internet access costs:** Using automatic IP address assignment at each remote site substantially reduces Internet access costs. Static IP addresses are considerably more expensive to purchase than are automatically allocated IP addresses.

- ✓ **Reduced client configuration tasks and costs:** Because DHCP is easy to configure, it minimizes operational overhead and costs associated with device configuration tasks and eases deployment by non-technical users.

- ✓ **Centralized management:** Because the DHCP server maintains configurations for several subnets, an administrator only needs to update a single, central server when configuration parameters change.

Besides that, we use Dynamic Routing protocol instead of Static Routing. In Dynamic Routing, all the router advertises its own links or networks to the other routers or networks. So, if any link fails or broken somehow, then the router easily finds the other path to go to the destination easily.

Moreover, we use Standard ACL. So, it is very easy to define in Routers to control access in a network. As a result, we can deny any networks & also we can permit any networks very easily.