Networks and Protocols
Lab 1

Simulation using Packet Tracer

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L3 New
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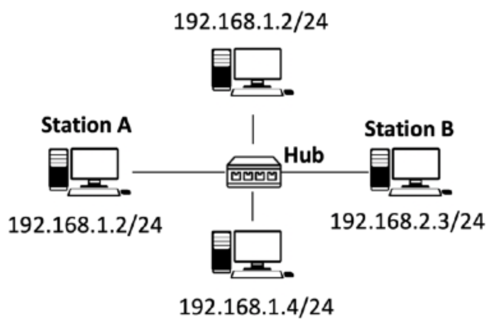
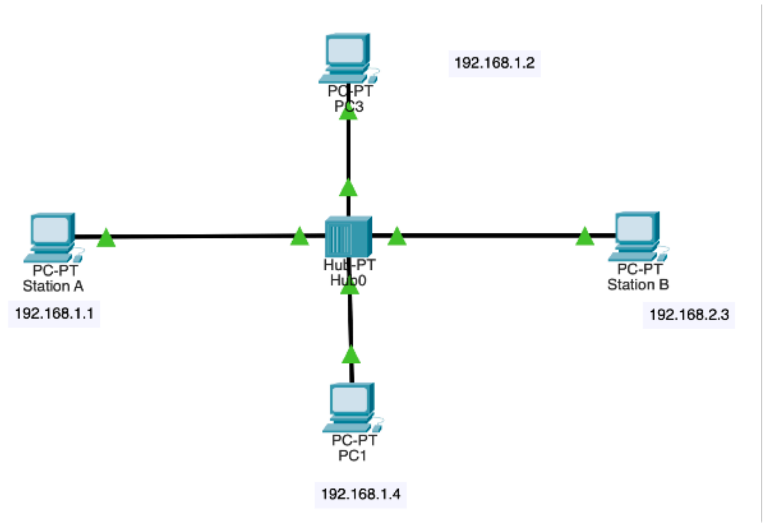
1. **Open Packet Tracer and create a first simple network corresponding to the first topology seen in tutorial 1 (Figure 1).**
2. **Configure the different computers with the given IP addresses and mask on the corresponding network cards.**

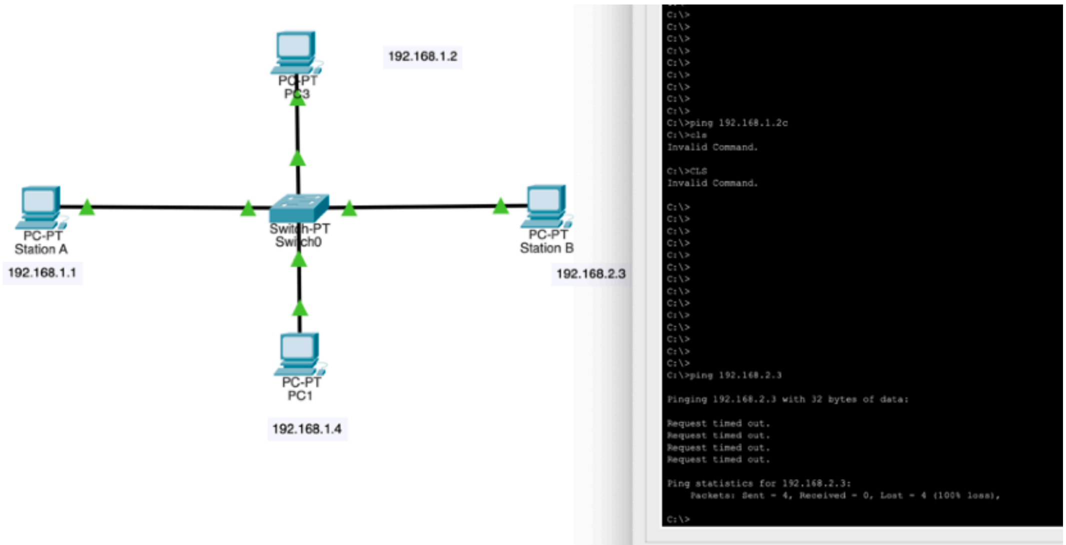




3. Questions:

A. Test the transmission of a simple PDU from station A to station B (by clicking first on the station A to define it as source and then click on B to define it as a destination)

To test the transmission I'm using the windows command `ping` to send a packet from Station A (192.168.1.1) to Station B (192.168.2.3)



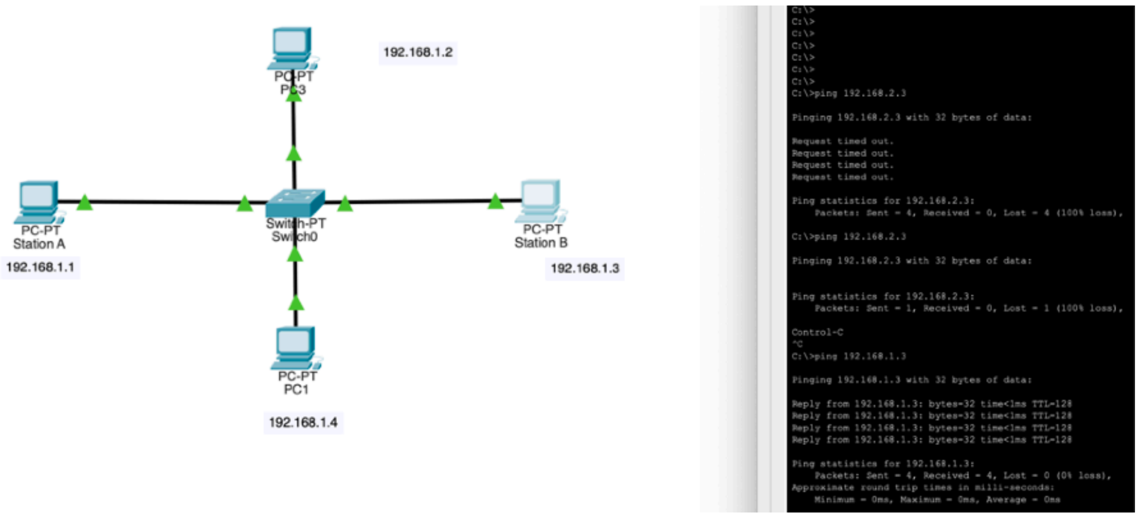
B. Follow the process using the simulation panel in the bottom right, what happens?

Request is timing out because the two Stations are not located in the same network:

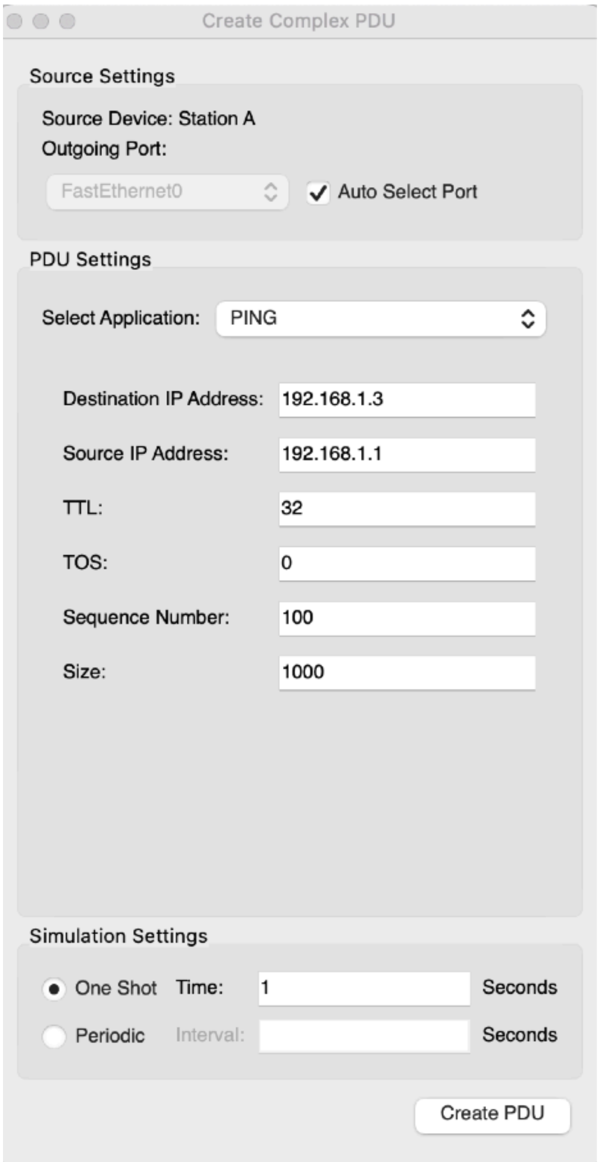
- Station A (192.168.**1**.1)
- Station B (192.168.**2**.3)

C. Locate to problem by clicking on the different Events and by analyzing the operations in the different layers. Correct it and test again.

By changing the address ip of Station B to match the network of the other PCs, we successfully have a reply: (192.168.**2**.3) to (192.168.**1**.3).



4. **Simulate a game update messages using complex PDU simulation from all clients to the server and from the server to all the clients. What happen's?**

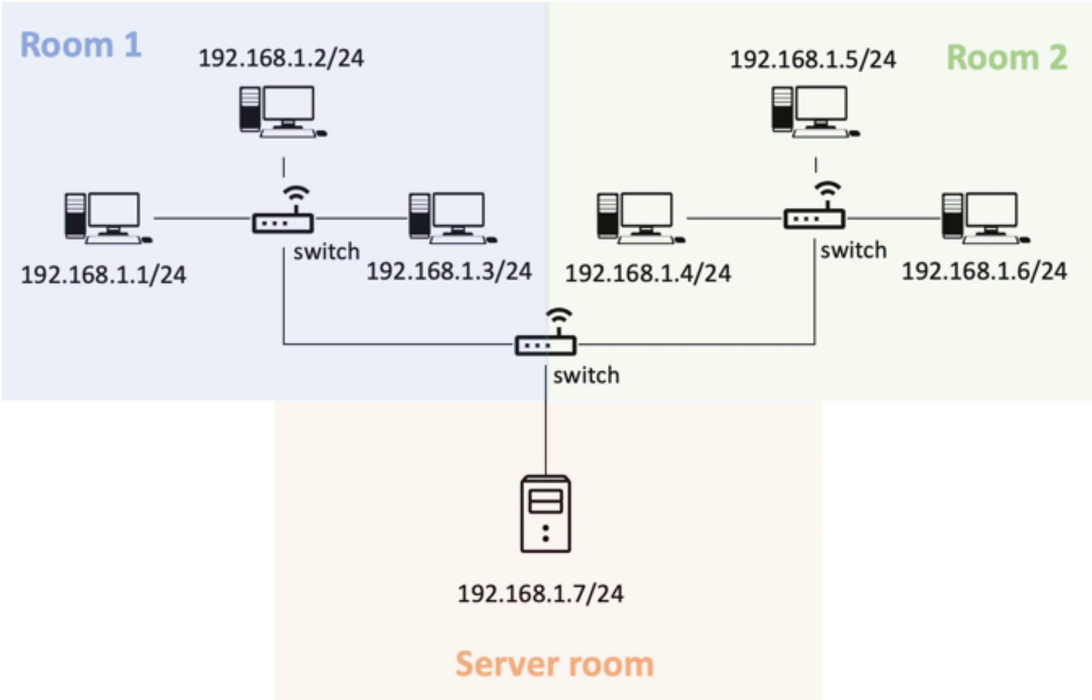


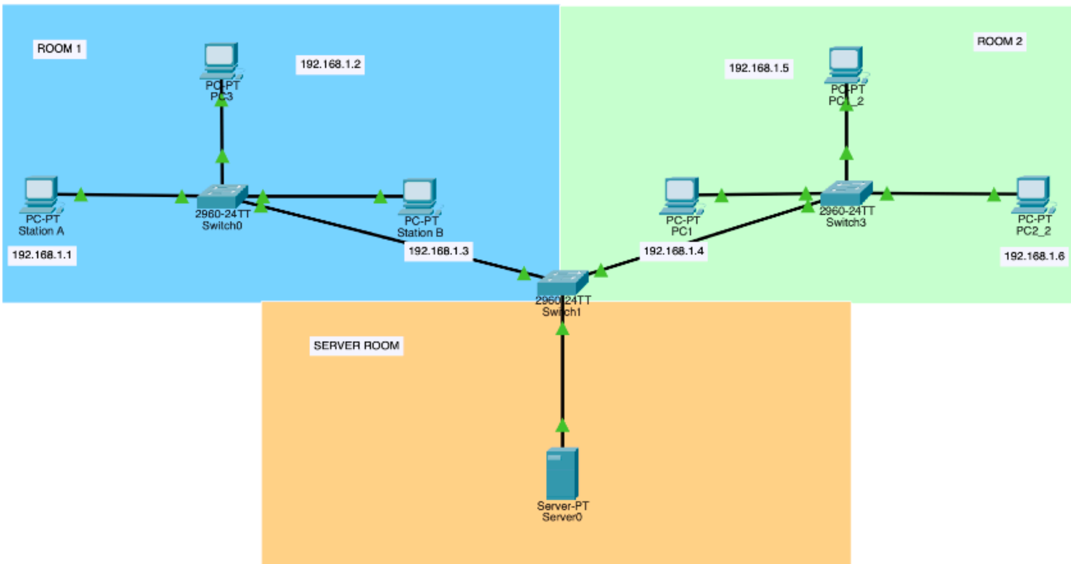
Every client send a packet to the server through the hub one at a time, but the hub fails to deliver.

5. **Replace the Hub with a Switch of type "2960". Replay the same simulation. Is there any difference?**

Every client send a packet to the server through the switch one at a time, and then get a response on at a time.

6. Extend the network as shown in the figure 2.

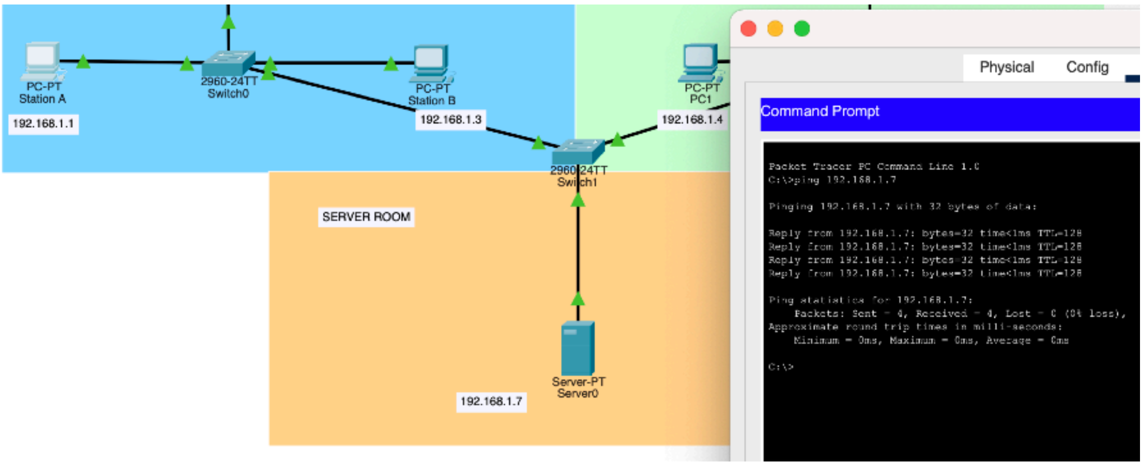




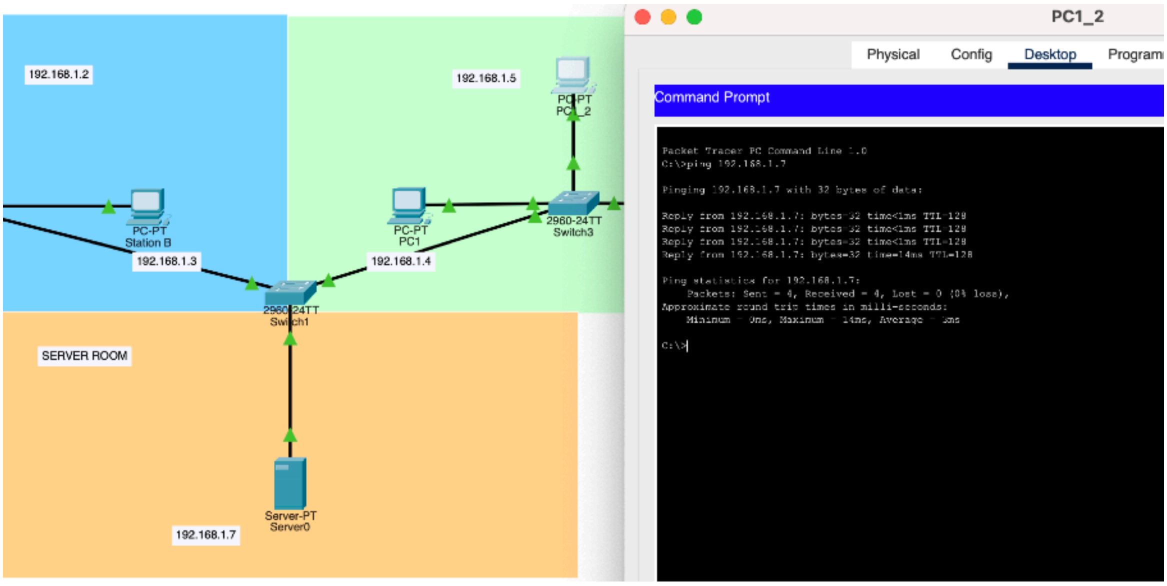
7. Test the connectivity and analyze the messages transfer.

We’re going to try to ping the server from different PCs.

Ping from Station A (192.168.1.1) to the Server (192.168.1.7)

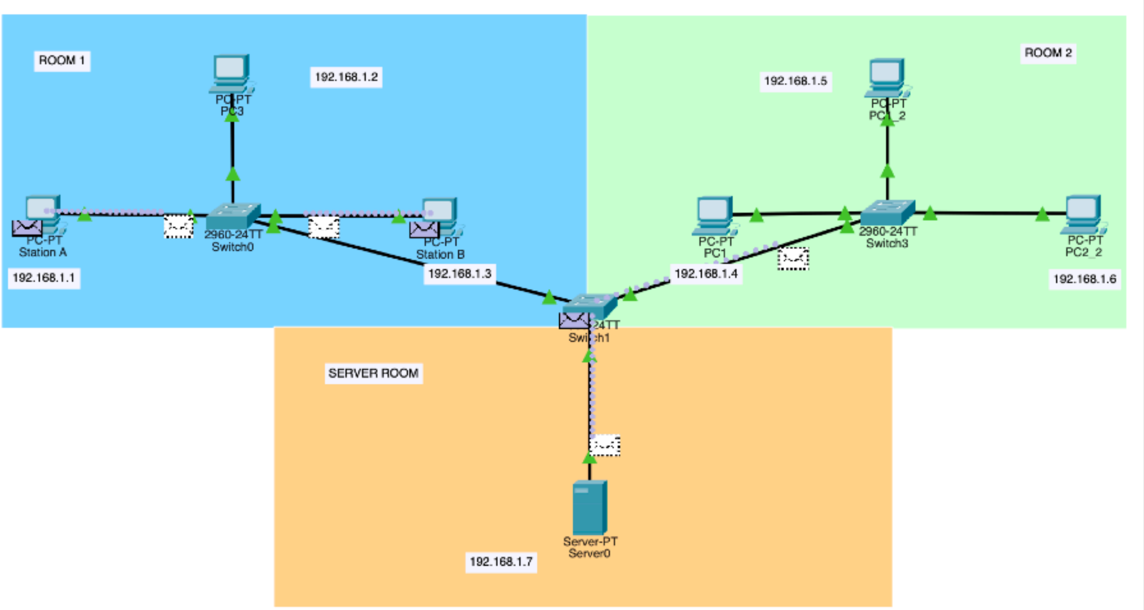


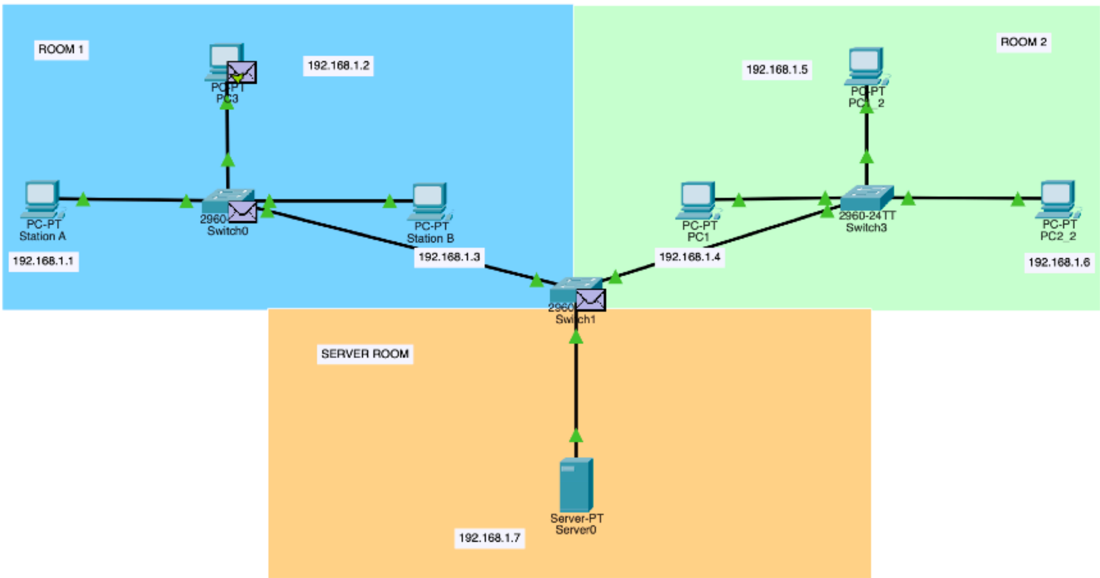
Ping from PC1_2 (192.168.1.5) to the Server (192.168.1.7)



8. Send a broadcast PDU using the address 255.255.255.255 from any client. What happens?

A broadcast PDU using address 255.255.255.255 will transfer a message to every entities in the network and then wait for the responses.

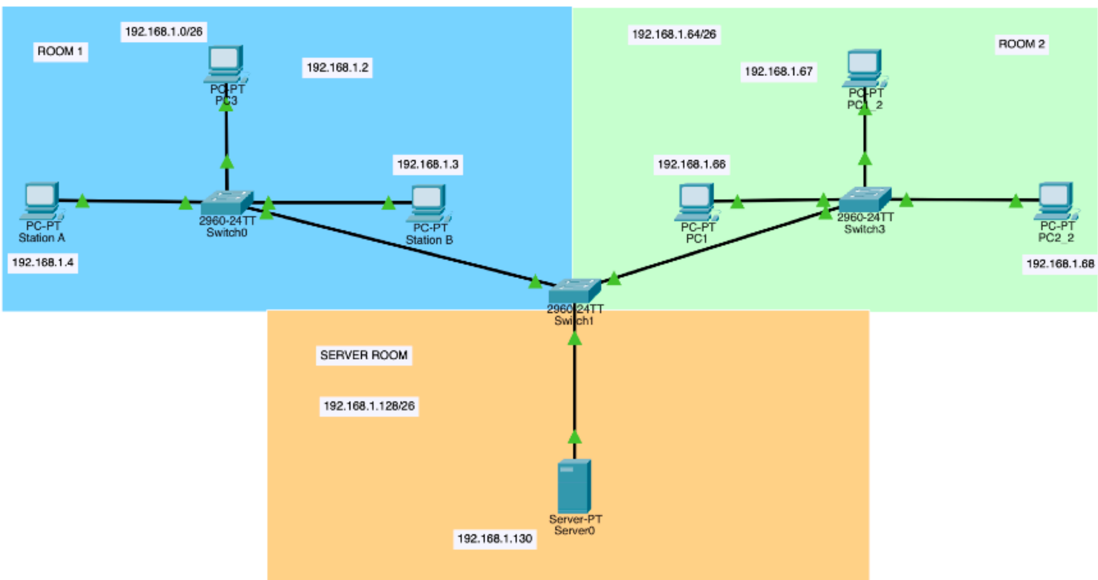




9. Divide a network into different subnetworks (broadcast domains) by attributing addresses to the computers using the address plan bellow (keep the same topology). Test the connectivity.

Subnetwork Address	Usable Host Range	Broadcast Address	Mask
192.168.1.0/26	192.168.1.1 - 192.168.1.62	192.168.1.63	255.255.255.192
192.168.1.64/26	192.168.1.65 - 192.168.1.126	192.168.1.127	255.255.255.192
192.168.1.128/26	192.168.1.129 - 192.168.1.190	192.168.1.191	255.255.255.192

For the three networks we will use the « usable host range » for each PC, starting by the second address available. For exemple, in the host range **192.168.1.1 - 192.168.162**, we will begin with 192.168.1.**2**.



This time, if we try to ping the Server (192.168.1.130) from Station A (192.168.1.4), we're getting **timed out**. It's because of each room being different **subnetworks**.

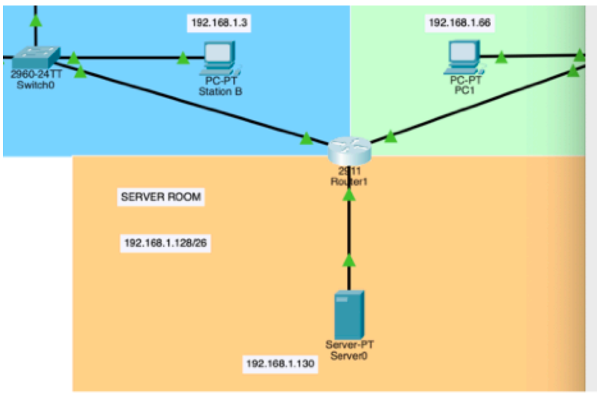
To solve this, we are going to use a router.

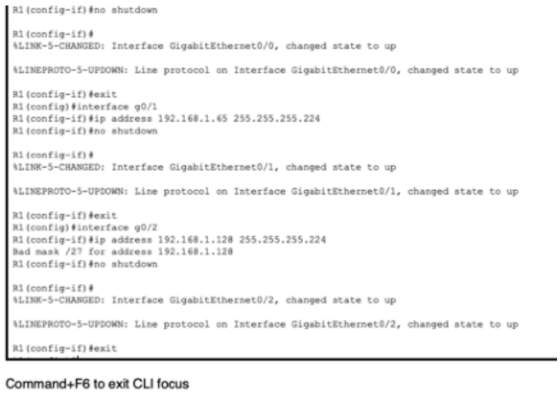
10. **Replace the switch with a router and assign addresses to its different interfaces, do not forget to turn on the interface (top left in the interface setting panel: the "on" check box).**

First of all, let's add the router. Once it's added, configure it through the CLI menu.

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip domain lookup
Router(config)#hostname R1
R1(config)#enable password
% Incomplete command.
R1(config)#enable password cisco
R1(config)#enable secret cisco
The enable secret you have chosen is the same as your enable password.
This is not recommended.  Re-enter the enable secret.
R1(config)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exec-timeout 0 0
R1(config-line)#exit
R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#logging synchronous
R1(config-line)#exit
R1(config)#banner motd @Welcome to EFREI by Anthony@
R1(config)#
```

Then we configure the router to accept connections from the different subnetworks.





```
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R1(config-if)#exit
R1(config)#interface g0/1
R1(config-if)#ip address 192.168.1.65 255.255.255.224
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R1(config-if)#exit
R1(config)#interface g0/2
R1(config-if)#ip address 192.168.1.128 255.255.255.224
Bad mask /27 for address 192.168.1.128
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

R1(config-if)#exit
```

Command+F6 to exit CLI focus

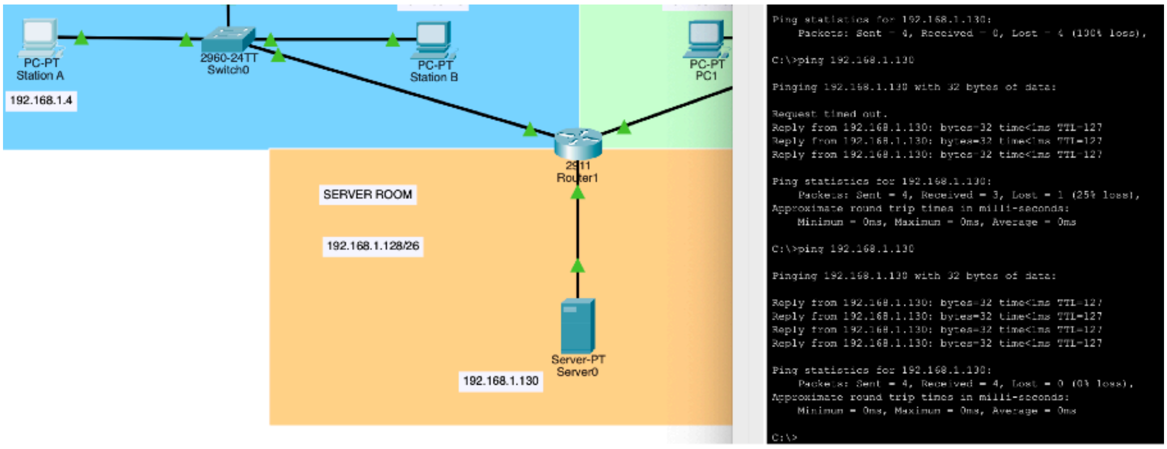
The routes now appear working (green).

11. **Create the necessary default gateway entries on the computers (config ® settings) using the router address.**

Then, for each subnetwork and for each station, we set the **Default Getaway** to the ip address attributed to the Router. For example, in the subnetwork 192.168.1.0, we attributed the ip 192.168.1.1 to communicate with the Router. So for each Station of the subnetwork, we will change the Default Getaway to 192.168.1.1, and the same for each station of each subnetwork.

12. Test the connectivity between clients from different networks and the server and analyze the messages transfer.

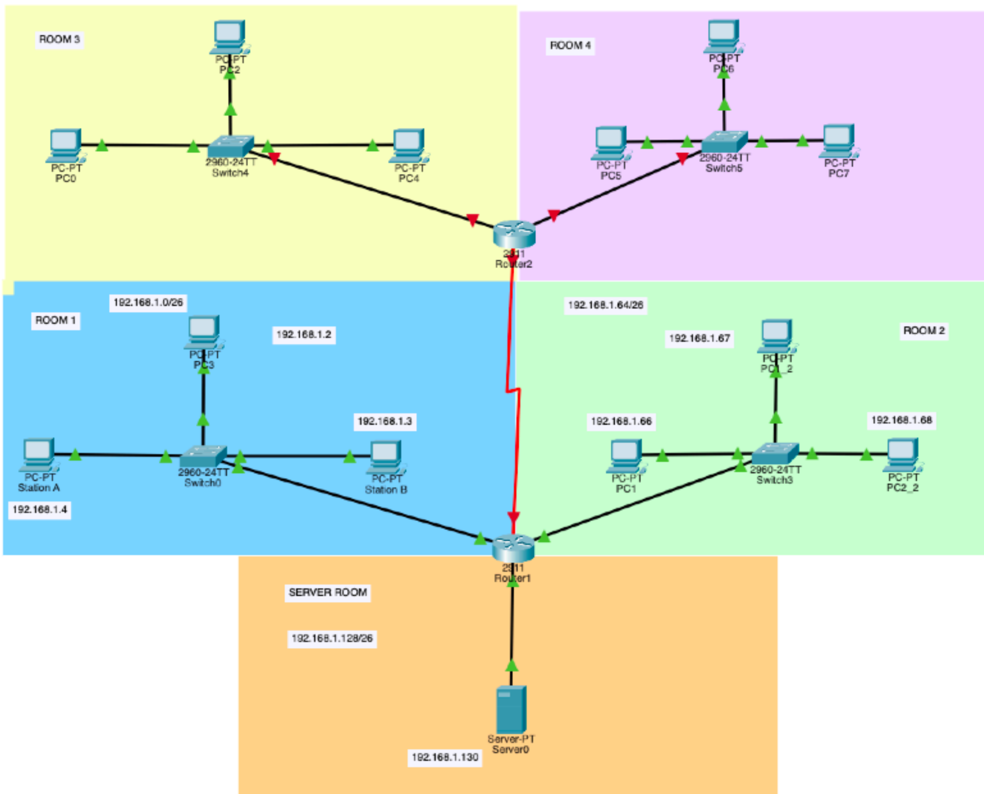
The connectivity from subnetwork 192.168.1.0 and the server is now working.



13. Is it possible to send a broadcast message from the server to clients? Test it, what happens?

The problem is, the Router is blocking the broadcast message. When sending the broadcast message, the router will not broadcast it and will only send back the ping to the server. It is not its function.

14. Add two other subnetworks as shown in Figure 3. Propose an address plan that matches this need, configure Router 1 and router 2 routing tables (config ® settings ® routing ® static) and the new computers' IP addresses/mask/gateway.



We need to create a new addressing plan for our network as the number of rooms grew. We now have 6 networks (2^3):

- ROOM 1
- ROOM 2
- ROOM 3
- ROOM 4
- SERVER ROOM
- SERIAL BETWEEN ROUTERS

As we have 2^3 = 8, the new mask is /27 = 255.255.255.224 = 1111.[…].11100000

The 8 possible networks are:

Network address	**Broadcast address**	**Host range**	**Name**
192.168.1. 000 00000	192.168.1. 000 11111	192.168.1.0 - 192.168.1.31	ROOM 1
192.168.1. 001 00000	192.168.1. 001 11111	192.168.1.32 - 192.168.1.63	ROOM 2
192.168.1. 010 00000	192.168.1. 010 11111	192.168.1.64 - 192.168.1.95	ROOM 3
192.168.1. 011 00000	192.168.1. 011 11111	192.168.1.96 - 192.168.1.127	ROOM 4
192.168.1. 100 00000	192.168.1. 100 11111	192.168.1.128 - 192.168.1.159	SERVER ROOM
192.168.1. 101 00000	192.168.1. 101 11111	192.168.1.160 - 192.168.1.191	SERIAL ROUTERS
192.168.1. 110 00000	192.168.1. 110 11111	192.168.1.192 - 192.168.1.223	
192.168.1. 111 00000	192.168.1. 111 11111	192.168.1.224 - 192.168.1.255	

Now we want the rooms 3 and 4 to communicate with the other rooms. To enable this, we need to route the requests from the 3-4 rooms through the Serial cable between the routers, thus giving the Router 2 access to the rooms 1-2-server and giving the Router 1 access to the rooms 3-4. To achieve this, we will be using the command `ip route`.

```
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.161
R2(config)#ip route 192.168.1.32 255.255.255.224 192.168.1.161
R2(config)#ip route 192.168.1.128 255.255.255.224 192.168.1.161
```

```
R1(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.162
R1(config)#ip route 192.168.1.96 255.255.255.224 192.168.1.162
```

To conclude, if we now try to ping the Server (192.168.1.130) from a PC in room 4 (192.168.1.99), it works.

```
C:\>ping 192.168.1.130

Pinging 192.168.1.130 with 32 bytes of data:

Reply from 192.168.1.130: bytes=32 time=42ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Reply from 192.168.1.130: bytes=32 time=41ms TTL=126
Reply from 192.168.1.130: bytes=32 time=27ms TTL=126

Ping statistics for 192.168.1.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 42ms, Average = 27ms
```

15. Test the final configuration by simulating game update messages with UDP application and port numbers

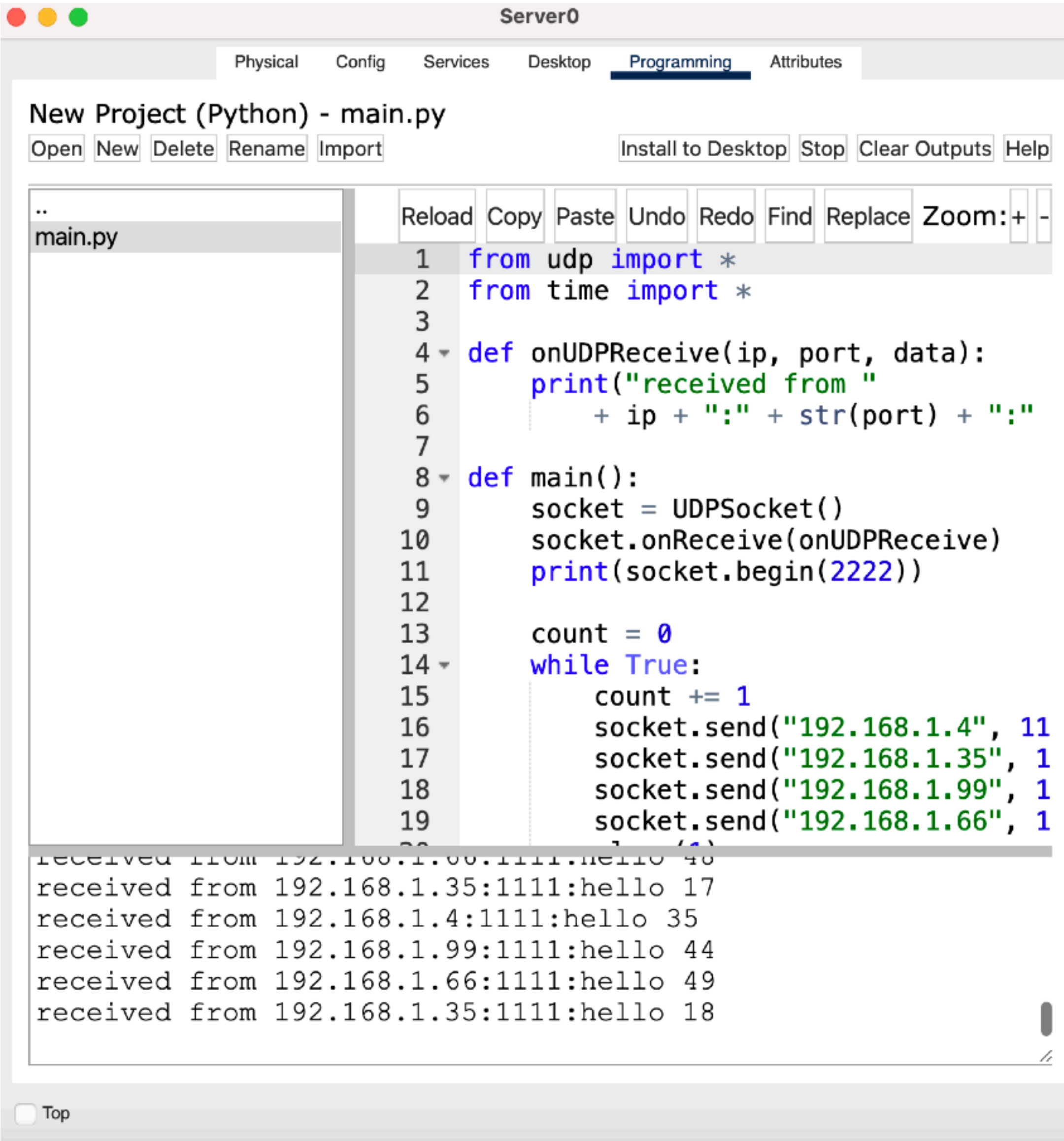
A. On the clients (only one client per network)

B. On the server

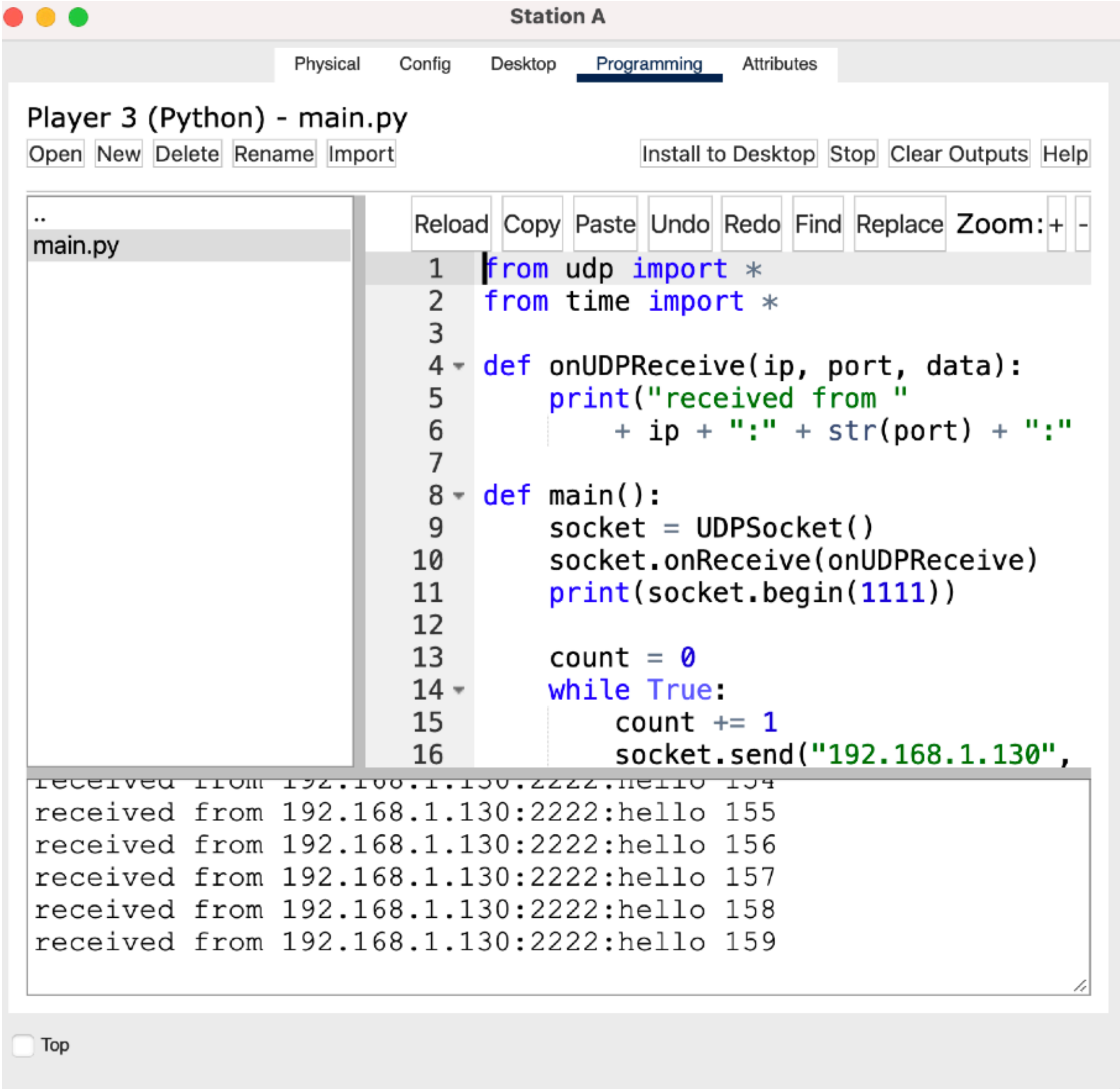
C. Run the different programs, launch and examine the simulation

The simulation runs smoothly. The server receive UDP Socket and send back a packet to confirm the reception.

On the Server:



On a client:


Station A
Physical
Config
Desktop
Programming
Attributes
Player 3 (Python) - main.py
Open
New
Delete
Rename
Import
Install to Desktop
Stop
Clear Outputs
Help
..
main.py
Reload
Copy
Paste
Undo
Redo
Find
Replace
Zoom:+
-
from udp import *
from time import *
def onUDPReceive(ip, port, data):
print("received from "
+ ip + ":" + str(port) + ":"
def main():
socket = UDPSocket()
socket.onReceive(onUDPReceive)
print(socket.begin(1111))
count = 0
while True:
count += 1
socket.send("192.168.1.130",
received from 192.168.1.130:2222:hello 155
received from 192.168.1.130:2222:hello 156
received from 192.168.1.130:2222:hello 157
received from 192.168.1.130:2222:hello 158
received from 192.168.1.130:2222:hello 159
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