Department of Computer Science and Engineering
Islamic University of Technology (IUT)
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Lab Report 03

CSE 4512: Computer Networks Lab

Name:Md. Abdullah Al Jubaer Gem
Student ID:210041226
Section:2B
Semester:5th
Academic Year:2023-2024

Date of Submission:29-09-2024

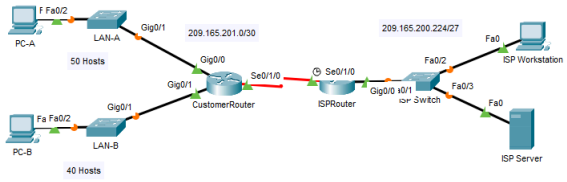
Title: Understanding the basics of IP subnetting and Variable Length Subnet Mask (VLSM) and to know Secure Shell (SSH) and Telnet basics.

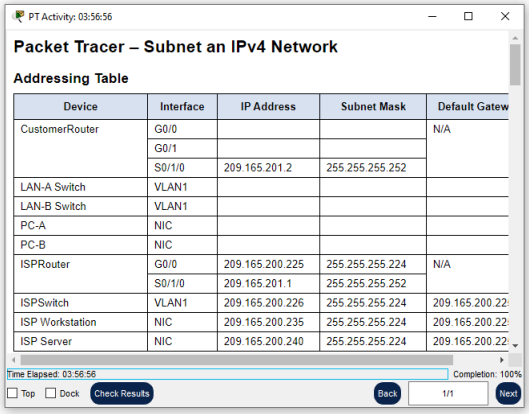
Objectives:

1.Understand the basics of IP Subnetting
2. Learn to subnet a network following given specifications
3. Understand Variable Length Subnet Mask (VLSM) addressing scheme
4. Learn to design and implement VLSM in a network

Diagram of the experiment:

(Provide screenshot of the final network topology. Make sure to label the network components.)
TASK #01:





Activity Results

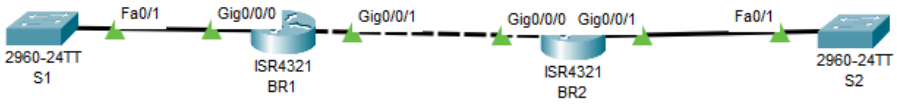
Congratulations 210041226! You completed the activity.

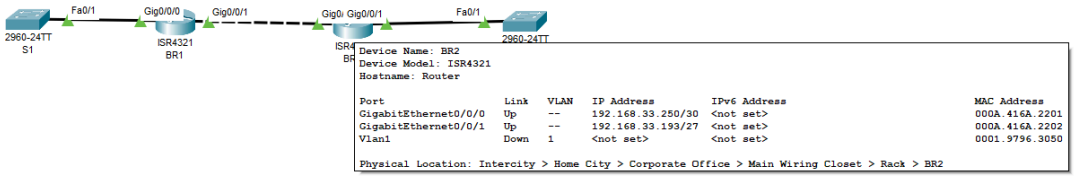
Overall Feedback | Assessment Items | Connectivity Tests

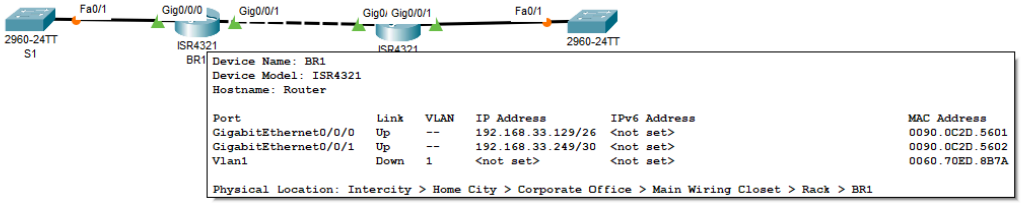
Expand/Collapse All | Show Incorrect Items

Assessment Items	Status	Points	Component(s)	Feedback
Network				
CustomerRouter				
Console Line				
Login	Correct	1	Physical	
Password	Correct	1	Other	
Enable Secret	Correct	1	Other	
Host Name	Correct	1	Other	
Ports				
GigabitEthernet0/0				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
GigabitEthernet0/1				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
LAN-A				
Default Gateway	Correct	1	Ip	
Ports				
Vlan1				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
LAN-B				
Default Gateway	Correct	1	Ip	
Ports				
Vlan1				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
PC-A				
Default Gateway	Correct	1	Ip	
Ports				
FastEthernet0				
IP Address	Correct	1	Ip	
Subnet Mask	Correct	1	Ip	
PC-B				
Default Gateway	Correct	1	Ip	
Ports				
FastEthernet0				
IP Address	Correct	1	Ip	
Subnet Mask	Correct	1	Ip	

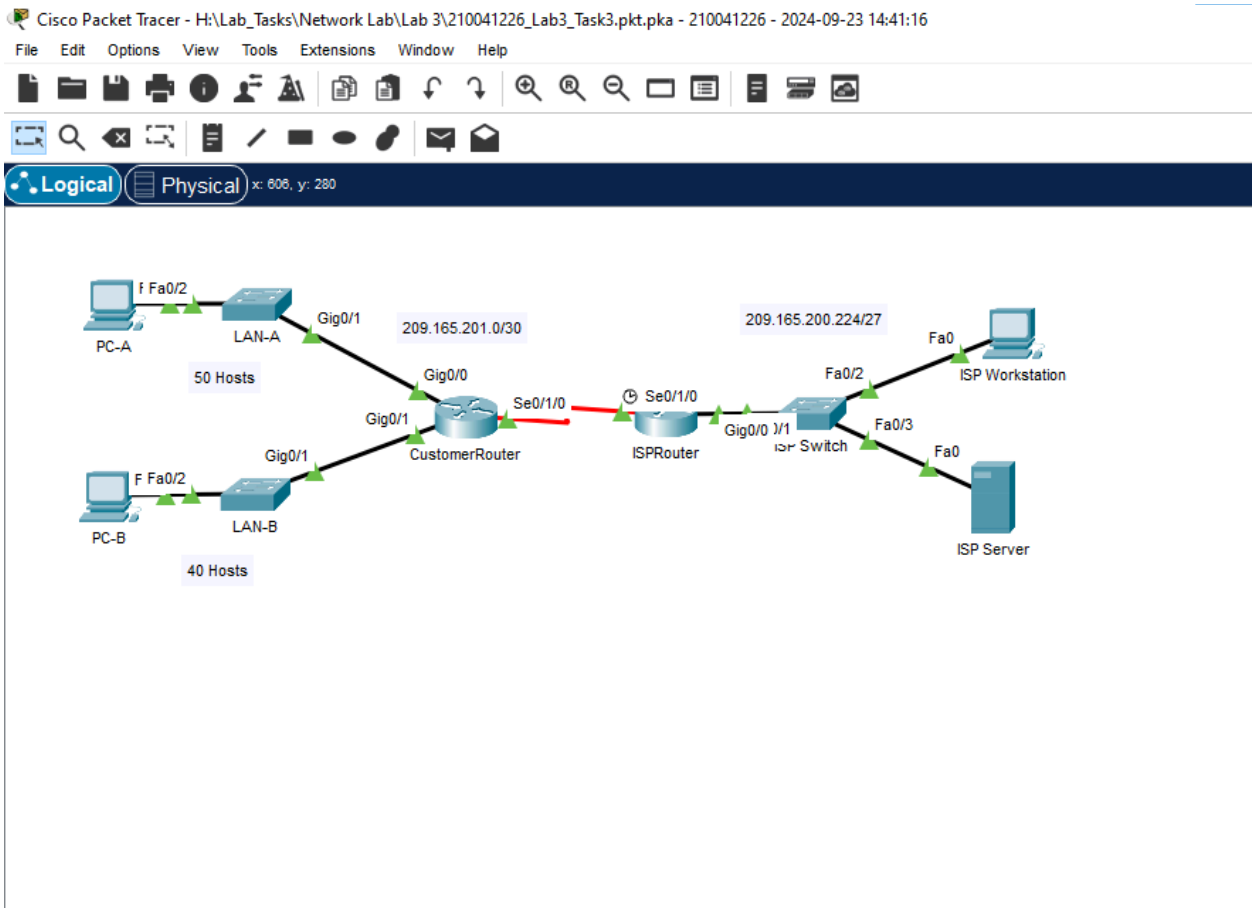
TASK #02:


Fa0/1
Gig0/0/0
Gig0/0/1
Gig0/0/0
Gig0/0/1
Fa0/1
2960-24TT
S1
ISR4321
BR1
ISR4321
BR2
2960-24TT
S2


Fa0/1
Gig0/0/0
Gig0/0/1
Gig0/
Gig0/0/1
Fa0/1
2960-24TT
S1
ISR4321
BR1
2960-24TT
Device Name: BR2
Device Model: ISR4321
Hostname: Router
Port Link VLAN IP Address IPv6 Address MAC Address
GigabitEthernet0/0/0 Up -- 192.168.33.250/30 <not set> 000A.416A.2201
GigabitEthernet0/0/1 Up -- 192.168.33.193/27 <not set> 000A.416A.2202
Vlan1 Down 1 <not set> <not set> 0001.9796.3050
Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > BR2


Fa0/1
Gig0/0/0
Gig0/0/1
Gig0/
Gig0/0/1
Fa0/1
2960-24TT
S1
ISR4321
BR1
2960-24TT
Device Name: BR1
Device Model: ISR4321
Hostname: Router
Port Link VLAN IP Address IPv6 Address MAC Address
GigabitEthernet0/0/0 Up -- 192.168.33.129/26 <not set> 0090.0C2D.5601
GigabitEthernet0/0/1 Up -- 192.168.33.249/30 <not set> 0090.0C2D.5602
Vlan1 Down 1 <not set> <not set> 0060.70ED.8B7A
Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > BR1

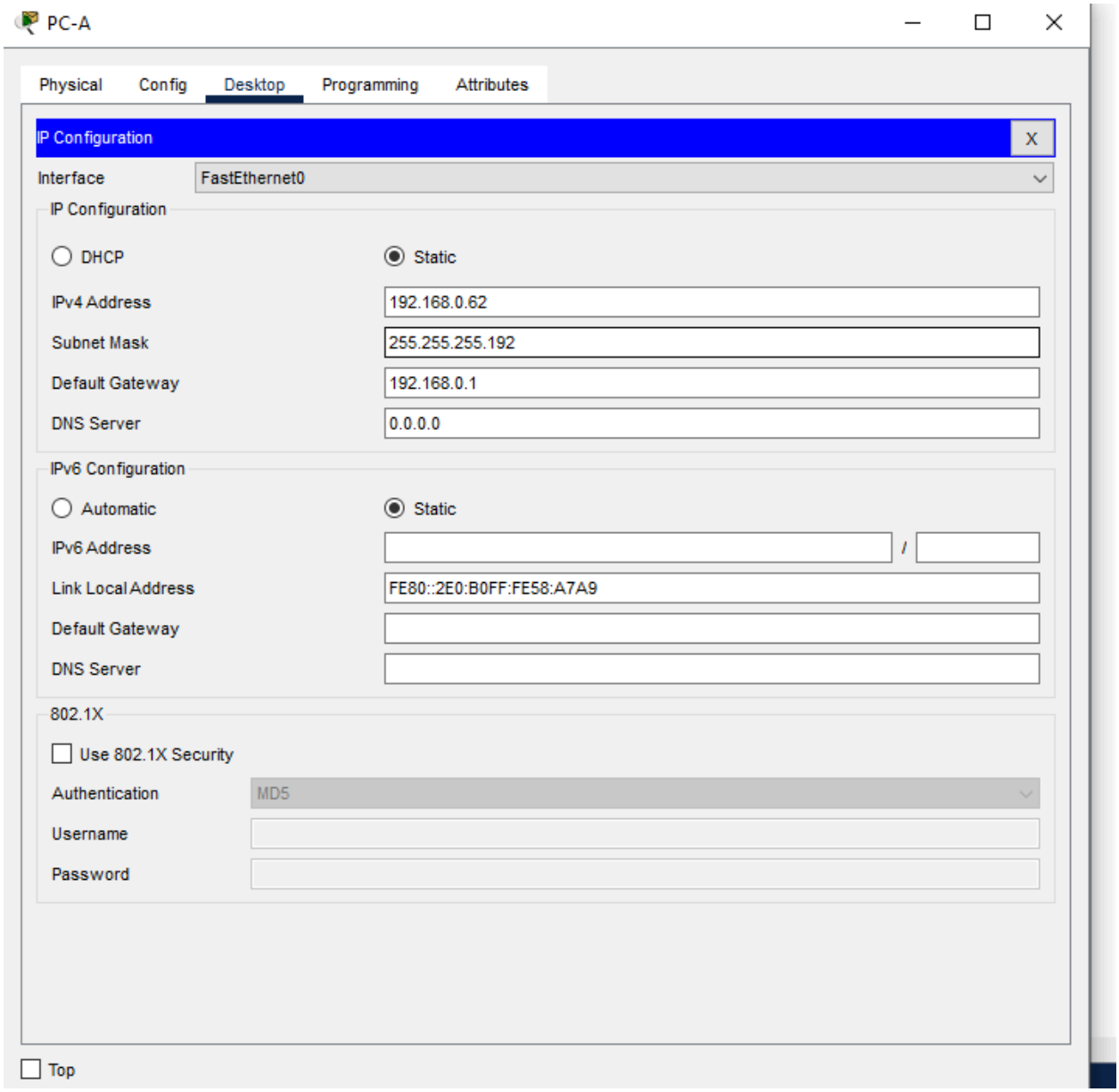
TASK #03:



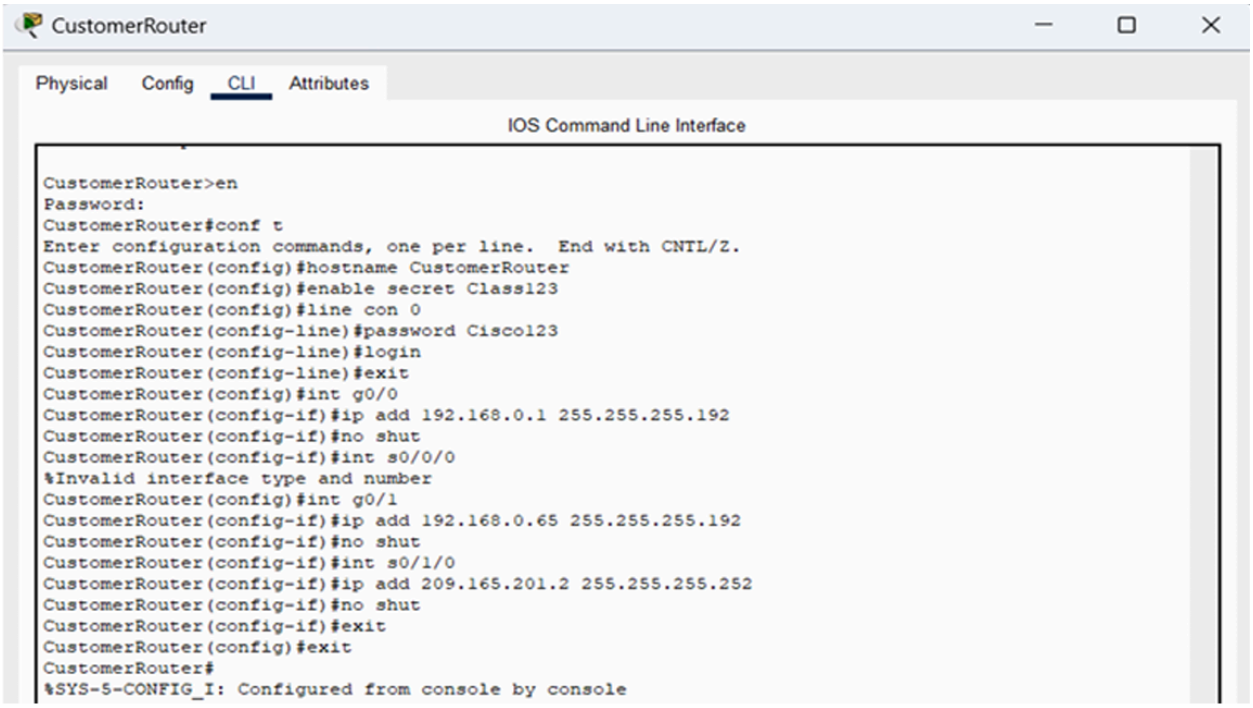
Working Procedure:

TASK #01:

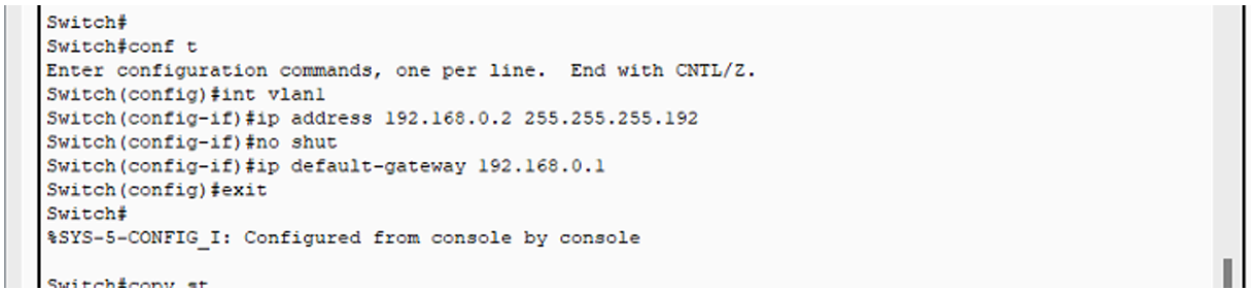
1. First the IP addresses and the network addresses of each component were calculated then the PCs were first assigned the IPs along with the subnet masks



2. The default gateway was also set
3. Then the routers were configured according to need



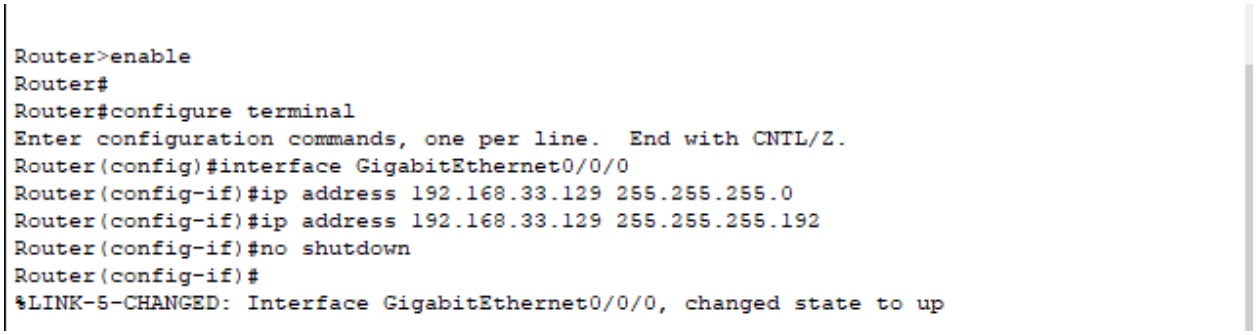
4.
5. Then the switches were configured to set their vlan



6. After that tests were done to check if the configuration was working

TASK #02:

1. Firstly all the necessary routers and switches were imported then connected.
2. Then the routers were configured . Firstly the connection with the switch was configured
3. To configure that firstly all the necessary network , host and ip addresses were calculated

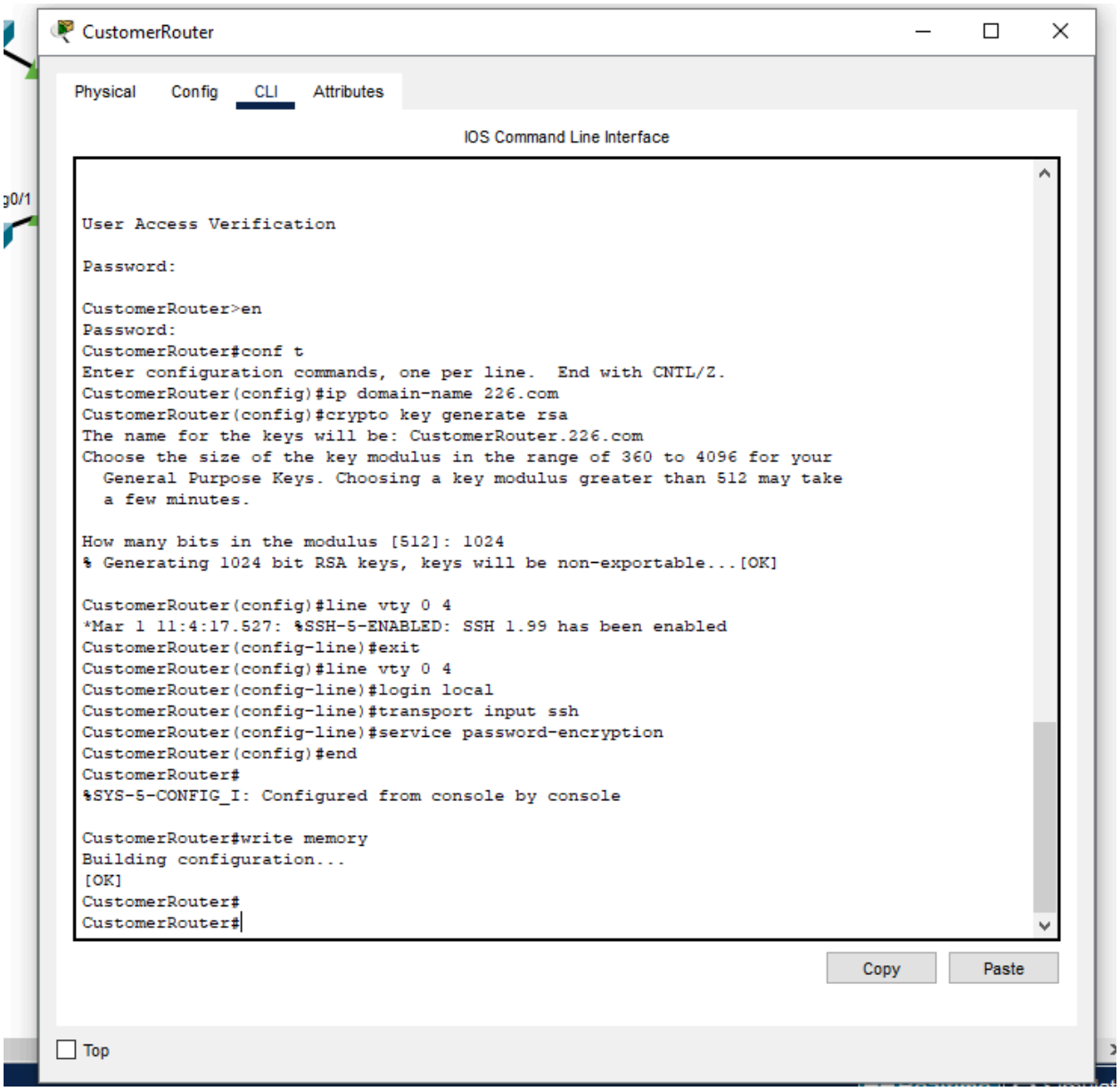


4. After configuring the router to switch connection the router to router connection was configured

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip address 192.168.33.249 255.255.255.192
Router(config-if)#ip address 192.168.33.249 255.255.255.252
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
```

TASK #03:

1. Firstly the domain name was set to 226.com
2. An RSA key was generated for SSH encryption, a local admin user was created and SSH for secure access was configured.
3. After that, VTYlines were set to accept only SSH connections and enabled local login for authentication.
4. Finally,all passwords were encrypted and the configuration was saved to ensure secure remote access via SSH.



Fill in the missing IP address in the addressing table (Task #01):

Fill in the addressing table with missing IP Address following the steps in **Step 2 of Part 1:**

Device	Interface	IP Address	Subnet Mask	Default Gateway
CustomerRouter	**G0/0**	**192.168.0.1**	**255.255.255.192**	**N/A**
	G0/1	**192.168.0.65**	**255.255.255.192**	
	S0/1/0	**209.165.201.2**	**255.255.255.252**	

Lan-A Switch	**VLAN1**	**192.168.0.2**	**255.255.255.192**	
Lan-B Switch	**VLAN1**	**192.168.0.66**	**255.255.255.192**	
PC-A	**NIC**	**192.168.0.62**	**255.255.255.192**	
PC-B	**NIC**	**192.168.0.126**	**255.255.255.192**	
ISPRouter	**G0/0**	**209.165.200.225**	**255.255.255.224**	**N/A**
	S0/1/0	**209.165.201.1**	**255.255.255.252**	
ISP Switch	**VLAN1**	**209.165.200.226**	**255.255.255.224**	**209.165.200.225**
ISP Workstation	**NIC**	**209.165.200.235**	**255.255.255.224**	**209.165.200.225**
ISP Server	**NIC**	**209.165.200.240**	**255.255.255.224**	**209.165.200.225**

Table: Addressing Table

Design the VLSM Address Scheme (Task 2):

Calculate the information that you obtained in **Part 1** to fill in the following table

Subnet Description	Number of Hosts Needed	Network Address /CIDR	First Host Address	Broadcast Address
BR1 LAN	**40**	**192.168.33.128/25**	**192.168.33.129**	**192.168.33.191**
BR2 LAN	**25**	**192.168.33.192/27**	**192.168.33.193**	**192.168.33.223**
BR2 IoT LAN	**5**	**192.168.33.224/29**	**192.168.33.225**	**192.168.33.231**
BR2 CCTV LAN	**4**	**192.168.33.232/29**	**192.168.33.233**	**192.168.33.239**
BR2 HVAC C2LAN	**4**	**192.168.33.240/29**	**192.168.33.241**	**192.168.33.247**
BR1-BR2 Link	**2**	**192.168.33.248/30**	**192.168.33.249**	**192.168.33.251**

Questions (Answer to the point):

TASK #01 - Part 1 – Step 1:

1. How many host addresses are needed in the largest required subnet?
   Ans: 50
2. What is the minimum number of subnets required?
   Ans:4
3. The network that you are tasked to subnet is 192.168.0.0/24. What is the /24 subnet mask in binary?
   Ans: 11111111.11111111.11111111.00000000
4. The subnet mask is made up of two portions, the network portion, and the host portion. This is represented in the binary by the ones and the zeros in the subnet mask.
   Questions:
   In the network mask, what do the ones represent?
   Ans: Network Part
   In the network mask, what do the zeros represent?

Ans:Host part

5. To subnet a network, bits from the host portion of the original network mask are changed into subnet bits. The number of subnet bits defines the number of subnets.
   Questions:
   Given each of the possible subnet masks depicted in the following binary format, how many subnets and how many hosts are created in each example?
   a. (/25) 11111111.11111111.11111111.10000000
      Dotted decimal subnet mask equivalent:
      Ans: 255.255.255.128
      Number of subnets? Number of hosts?
      Ans:126
      (/26) 11111111.11111111.11111111.11000000
      Dotted decimal subnet mask equivalent:
      Ans: 255.255.255.192
      Number of subnets? Number of hosts?
      Ans:62
   b. (/27) 11111111.11111111.11111111.11100000
      Dotted decimal subnet mask equivalent:
      Ans: 255.255.255.224
      Number of subnets? Number of hosts?
      Ans:30
   c. (/28) 11111111.11111111.11111111.11110000
      Dotted decimal subnet mask equivalent:
      Ans: 255.255.255.240
      Number of subnets? Number of hosts?
      Ans:14
   d. (/29) 11111111.11111111.11111111.11111000
      Dotted decimal subnet mask equivalent:
      Ans: 255.255.255.248
      Number of subnets? Number of hosts?
      Ans:6 hosts per subnet
   e. (/30) 11111111.11111111.11111111.11111100
      Dotted decimal subnet mask equivalent:
      Ans:255.255.255.252
      Number of subnets? Number of hosts?
      Ans:2

2. Considering your answers above, which subnet masks meet the required number of minimum host addresses?
   Ans:/25 , /26

3. Considering your answers above, which subnet masks meets the minimum number of subnets required?
   Ans: /26, /27, /28, /29 and /30
4. Considering your answers above, which subnet mask meets both the required minimum number of hosts and the minimum number of subnets required?
   Ans:

When you have determined **(Step 1 of Part 1)** which subnet mask meets all of the stated network requirements, derive each of the subnets. List the subnets from the fast to last in the table. Remember that the first subnet is 192.168.0.0 with the chosen subnet mask.

Subnet Address	Prefix	Subnet Mask

TASK #01 - Part 3:

a. Determine if PC-A can communicate with its default gateway. Do you get a reply?
   Ans:Yes
b. Determine if PC-B can communicate with its default gateway. Do you get a reply?
   Ans: Yes
c. Determine if PC-A can communicate with PC-B. Do you get a reply?
   Ans:Yes

TASK #02 - Part 1 – Step 1:

1. How many host addresses are available in a /25 network?
   Ans: 126
2. What is the total number of host addresses needed in the topology diagram?
   Ans:80
3. How many subnets are needed in the network topology?
   Ans:6

TASK #02 - Part 1 – Step 2: Determine the largest subnet.

1. What is the subnet description (e.g., BR1 LAN or BR1-BR2 link)?
   Ans: BR1 LAN
2. How many IP addresses are required in the largest subnet?
   Ans:40
3. What subnet mask can support that many host addresses?
   Ans: 255.255.255.192
4. How many total host addresses can that subnet mask support?
   Ans:62
5. Can you subnet the 192.168.33.128/25 network address to support this subnet?
   Ans:yes
6. What are the network addresses that would result from this subnetting?
   Ans:192.168.33.128 /26 and 192.168.33.192 /26

TASK #02 - Part 1 – Step 3: Determine the second largest subnet.

1. What is the subnet description?
   Ans:BR2 LAN
2. How many IP addresses are required in the second largest subnet?
   Ans:25
3. What subnet mask can support that many host addresses?
   Ans:255.255.255.224
4. How many total host addresses can that subnet mask support?
   Ans:30
5. Can you subnet the remaining subnet again and still support this subnet?
   Ans:Yes
6. What are the network addresses that would result from this subnetting?
   Ans: 192.168.33.192 /27 and 192.168.33.224 /27

TASK #02 - Part 1 – Step 4: Determine the third largest subnet.

1. What is the subnet description?
   Ans:BR2 IoT LAN
2. How many IP addresses are required in the third largest subnet?
   Ans:5
3. What subnet mask can support that many host addresses?
   Ans:255.255.255.248
4. How many total host addresses can that subnet mask support?

Ans:6

5. Can you subnet the remaining subnet again and still support this subnet?
   Ans:Yes
6. What are the network addresses that would result from this subnetting?
   Ans:192.168.33.224 /29, 192.168.33.232 /29, 192.168.33.240 /29 and 192.168.33.248 /29

TASK #02 - Part 1 – Step 5: Determine the fourth largest subnet.

1. What is the subnet description?
   Ans: BR1-BR2 Link
2. How many IP addresses are required in the fourth largest subnet?
   Ans:2
3. What subnet mask can support that many host addresses?
   Ans:255.255.255.252
4. How many total host addresses can that subnet mask support?
   Ans:2
5. Can you subnet the remaining subnet again and still support this subnet?
   Ans:Yes
6. What are the network addresses that would result from this subnetting?
   Ans: 192.168.33.248/30 and 192.168.33.252/30

TASK #02 – Reflection Question:

1. Can you think of a shortcut for calculating the network addresses of consecutive /30 subnets?
   Ans:Find the network address of /30 then keep adding 4 to this one to get the next one

Challenges (if any):

1. Difficulty calculating the IP address , subnet masks of each device by VLSM
2. Understanding how to configure SSH and password encryption and secret class
3. As SSH and Telnet was not taught in class understanding how and what purpose it serves was a bit difficult
4. The tasks are far too long and tiring to be done for a lab