



Department of Computer Science and Engineering
Islamic University of Technology (IUT)
A subsidiary organ of OIC

Lab Report 03

CSE 4412: Data Communication and Networking Lab

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Section: B(Even)

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Title: Understanding the basics of Variable Length Subnet Mask (VLSM) and VLANs and Inter-VLAN communication

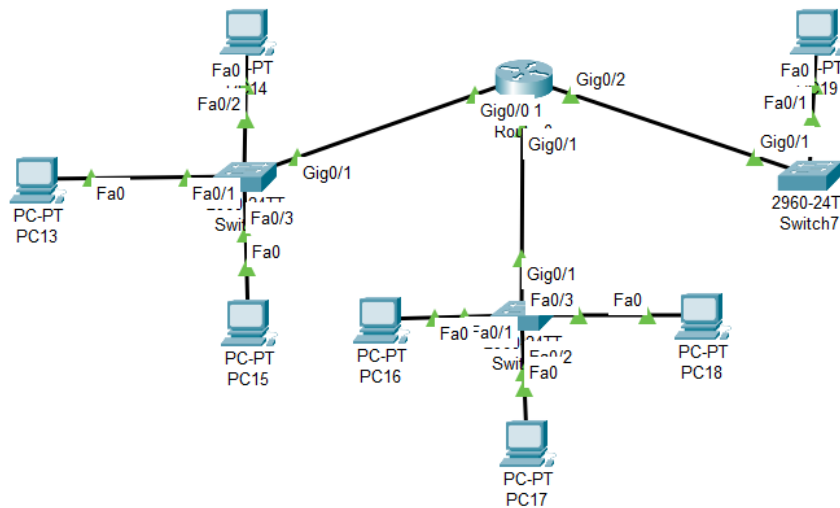
Objectives:

1. Define and describe the concept of VLAN
2. Describe the advantages of VLAN
3. Design and implement Inter-VLAN routing
4. Understand and implement VLSM

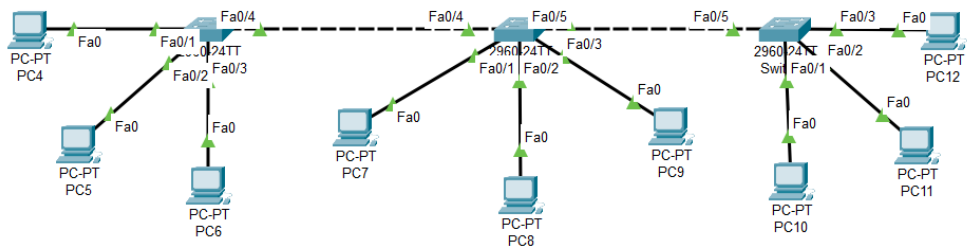
Diagram of the experiment:

(Provide screenshot of the final network topology. Make sure to label the network components.)

TASK #01:



TASK #02:



Working Procedure:

(Explain in brief how you completed the tasks. Provide necessary screenshots of used commands for each task.)

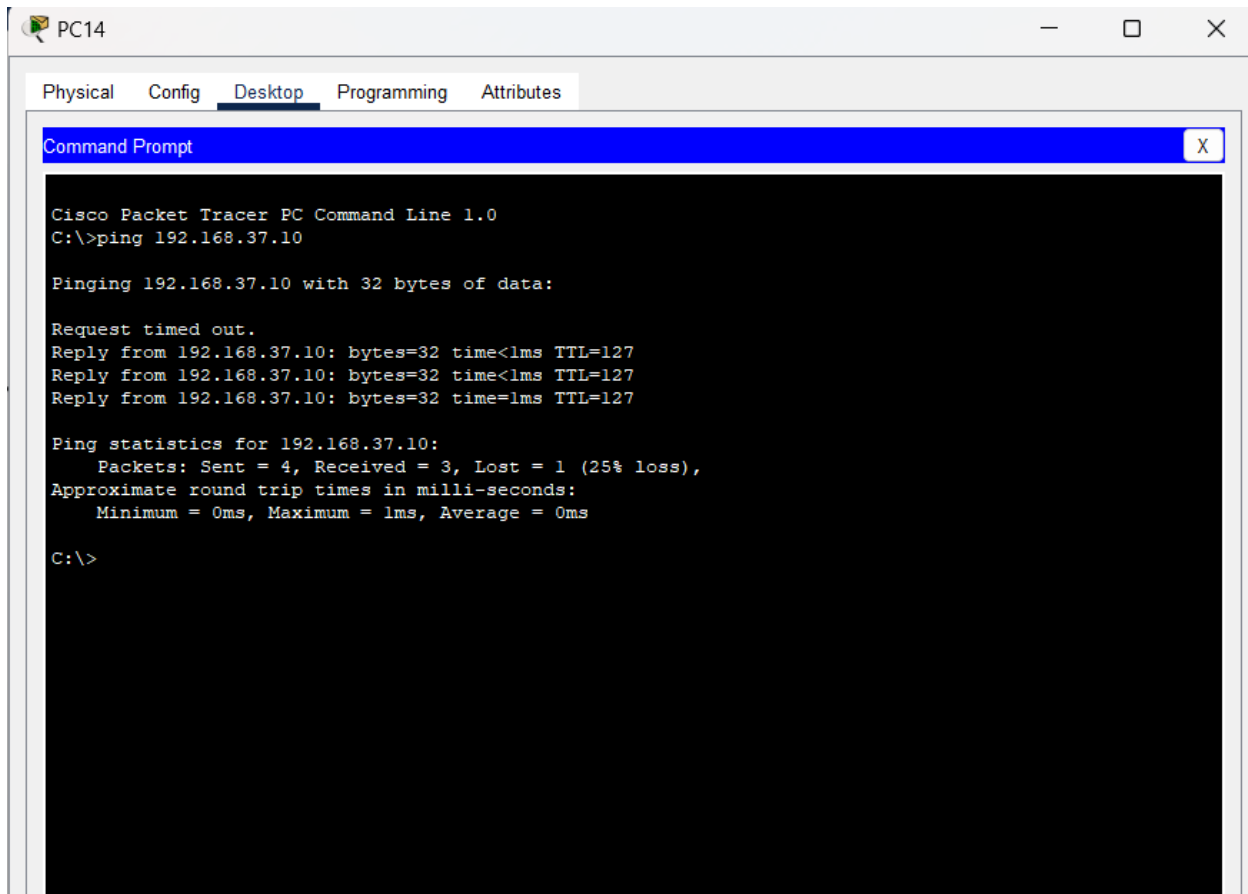
TASK #01:

For adding another network to the existing topology, I gave the following commands as shown in the screenshot.

```
Router(config)#interface gig
Router(config)#interface gigabitEthernet 0/0
Router(config-if)#ip address 192.168.17.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface gig
Router(config)#interface gigabitEthernet 0/1
Router(config-if)#ip address 192.168.27.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#wxit
Router(config-if)#^
% Invalid input detected at '^' marker.

Router(config-if)#exit
Router(config)#interface gig
Router(config)#interface gigabitEthernet 0/2
Router(config-if)#ip address 192.168.37.1 255.255.255.224
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
```

From a PC in the first network to the PC of the new network:



The screenshot shows a Cisco Packet Tracer PC window for PC14. The 'Desktop' tab is active, displaying a Command Prompt. The command 'ping 192.168.37.10' has been executed. The output shows that the ping failed with a 25% loss (1 out of 4 packets received). The statistics indicate that the round trip times were all 0ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.37.10

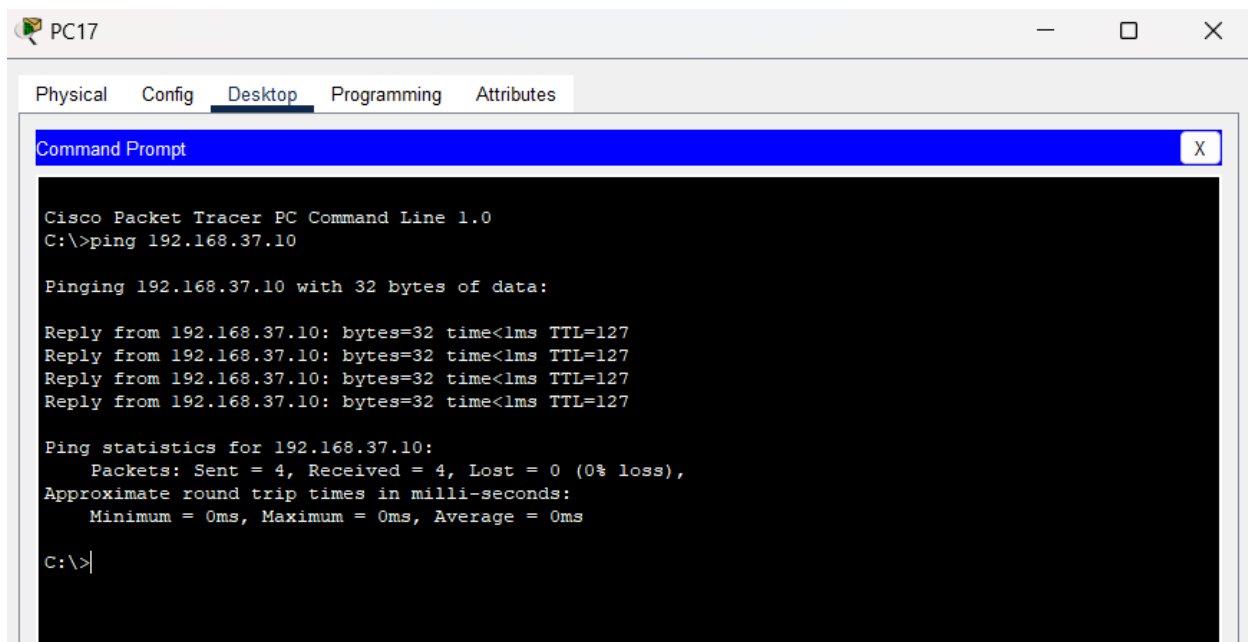
Pinging 192.168.37.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.37.10: bytes=32 time<1ms TTL=127
Reply from 192.168.37.10: bytes=32 time<1ms TTL=127
Reply from 192.168.37.10: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.37.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

From a PC in the second network to the PC in the new network:



The screenshot shows a Cisco Packet Tracer PC window for PC17. The 'Desktop' tab is active, displaying a Command Prompt. The command 'ping 192.168.37.10' has been executed. The output shows that the ping was successful with 0% loss (4 out of 4 packets received). The statistics indicate that the round trip times were all 0ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.37.10

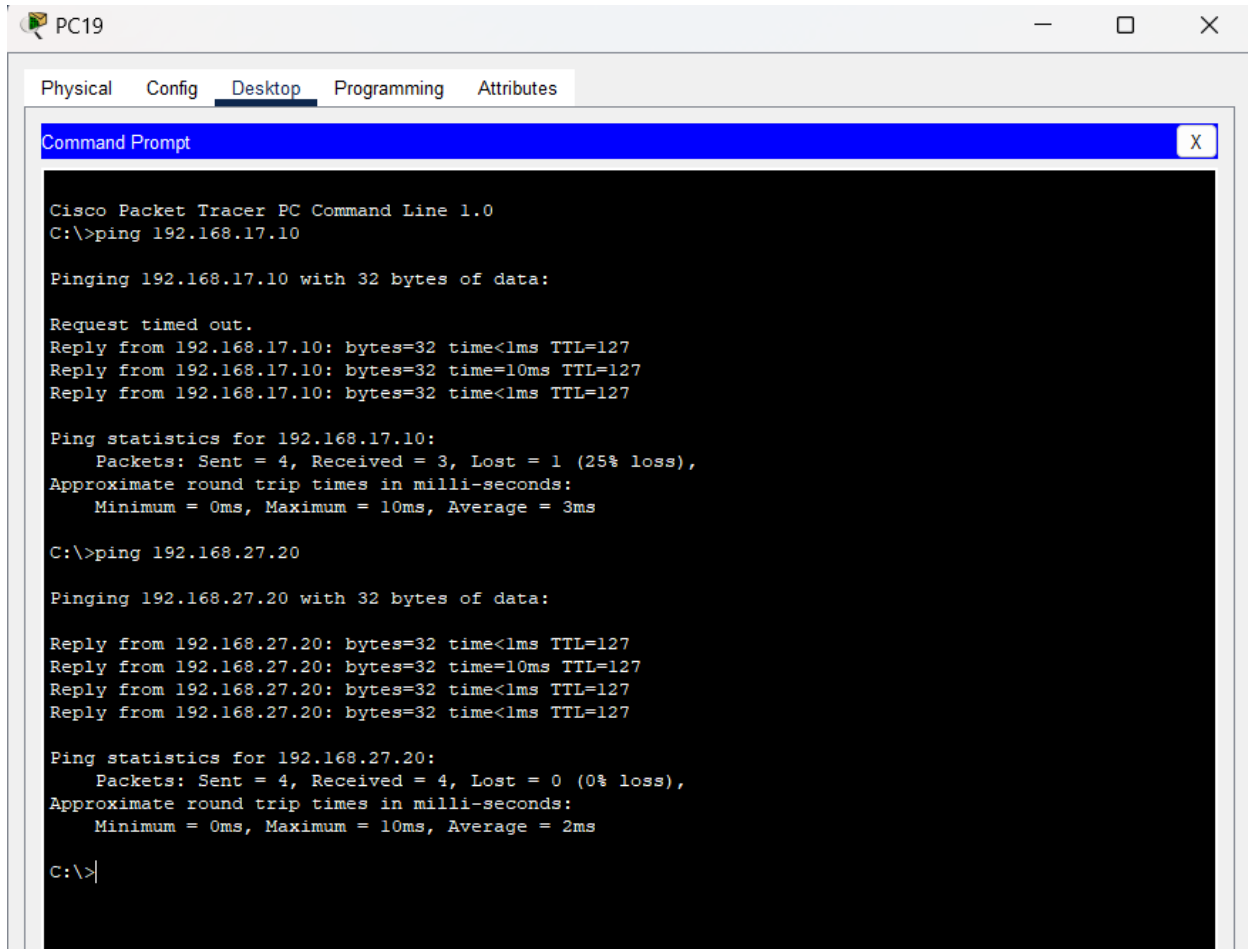
Pinging 192.168.37.10 with 32 bytes of data:

Reply from 192.168.37.10: bytes=32 time<1ms TTL=127
Reply from 192.168.37.10: bytes=32 time<1ms TTL=127
Reply from 192.168.37.10: bytes=32 time<1ms TTL=127
Reply from 192.168.37.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.37.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

From a PC in the new network to PCs in the first and second network:



The screenshot shows a Cisco Packet Tracer PC Command Prompt window for PC19. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, showing a Command Prompt window. The Command Prompt displays the output of two ping commands. The first command is 'ping 192.168.17.10', which shows a 25% loss of packets. The second command is 'ping 192.168.27.20', which shows 0% loss of packets.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.17.10

Pinging 192.168.17.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.17.10: bytes=32 time<1ms TTL=127
Reply from 192.168.17.10: bytes=32 time=10ms TTL=127
Reply from 192.168.17.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.17.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 3ms

C:\>ping 192.168.27.20

Pinging 192.168.27.20 with 32 bytes of data:

Reply from 192.168.27.20: bytes=32 time<1ms TTL=127
Reply from 192.168.27.20: bytes=32 time=10ms TTL=127
Reply from 192.168.27.20: bytes=32 time<1ms TTL=127
Reply from 192.168.27.20: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.27.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 2ms

C:\>
```

TASK #02:

For switch2:

First I configured the switch for the three VLANs and gave them names according to the given instructions. Then to allow access for communication I used the commands :

```
#interface Fast-Ethernet 0/4
```

```
#switchport mode trunk
```

(this command configures the interface as a trunk link)

```
#switchport trunk allowed vlan all.
```

```

Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit

```

```
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
10	Students	active	Fa0/1
20	Teachers	active	Fa0/2
30	Admin	active	Fa0/3
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
20	enet	100020	1500	-	-	-	-	-	0	0
30	enet	100030	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
------	------	------	-----	--------	--------	----------	-----	----------	--------	--------

```

Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#interface fast
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fas
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interfa
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit

```

For Switch 3:

Same as switch 2.

```

Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit

```

```
Switch#show vlan
```

VLAN Name	Status	Ports
1 default	active	Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24, Gig0/1 Gig0/2
10 Students	active	Fa0/1
20 Teachers	active	Fa0/2
30 Admin	active	Fa0/3
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
20	enet	100020	1500	-	-	-	-	-	0	0
30	enet	100030	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	-	-	-	-	-	0	0
10	enet	100010	-	-	-	-	-	0	0
20	enet	100020	-	-	-	-	-	0	0
30	enet	100030	-	-	-	-	-	0	0
1002	fddi	101002	-	-	-	-	-	0	0
1003	tr	101003	-	-	-	-	-	0	0
1004	fdnet	101004	-	-	-	ieee	-	0	0
1005	trnet	101005	-	-	-	ibm	-	0	0

```
Remote SPAN VLANs
```

```
Primary Secondary Type Ports
```



```
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#exit
```

For Switch 4:

Same as Switch 2.

```

Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#exit
Switch#

```

```
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/4, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
10	Students	active	Fa0/1
20	Teachers	active	Fa0/2
30	Admin	active	Fa0/3
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
20	enet	100020	1500	-	-	-	-	-	0	0
30	enet	100030	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2

```
Remote SPAN VLANs
```

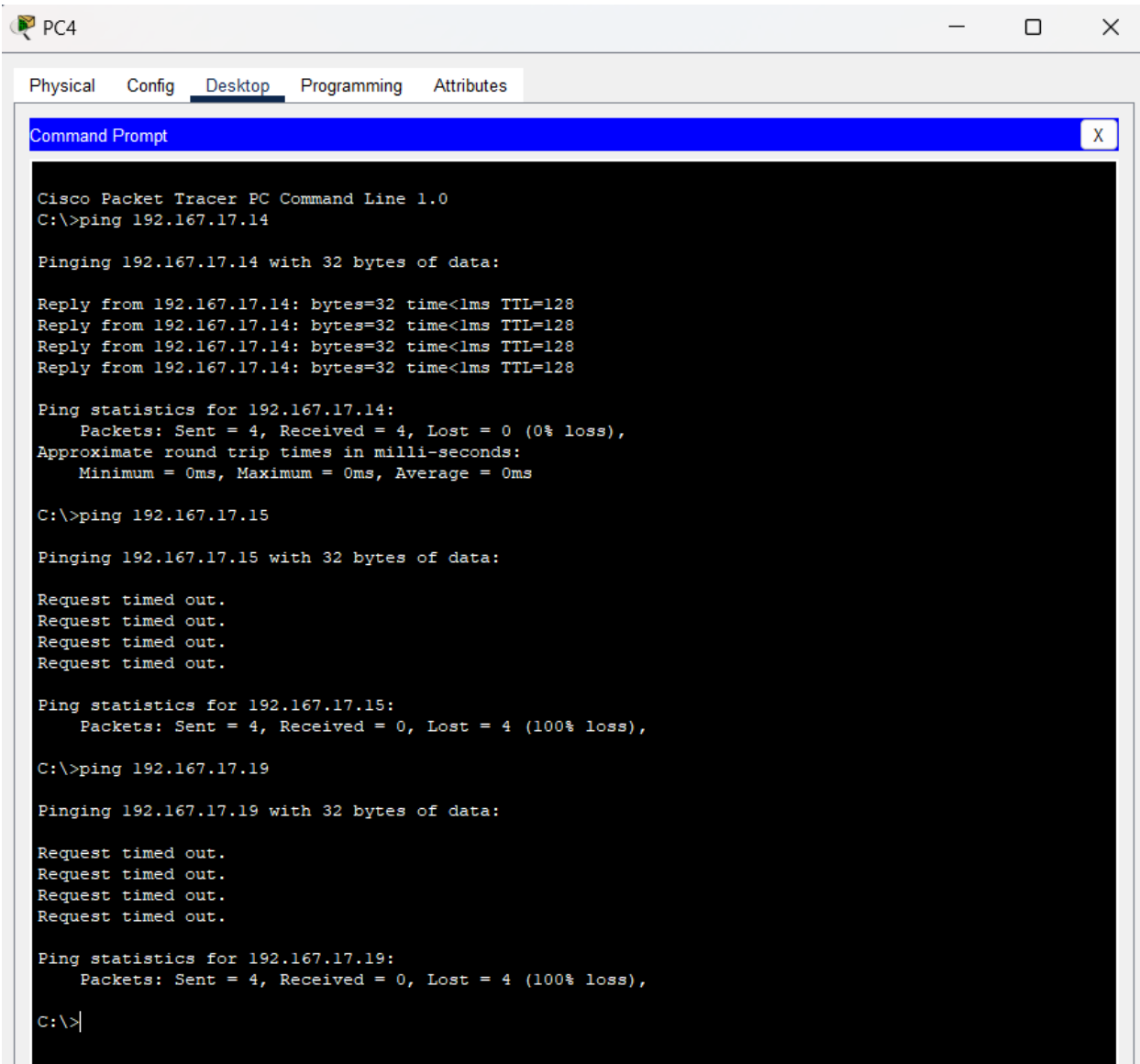
Primary	Secondary	Type	Ports

```

Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#

```

From a PC of VLAN 10 to other PC of VLAN 10 and other VLANs:



```
PC4
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.167.17.14

Pinging 192.167.17.14 with 32 bytes of data:

Reply from 192.167.17.14: bytes=32 time<1ms TTL=128
Reply from 192.167.17.14: bytes=32 time<1ms TTL=128
Reply from 192.167.17.14: bytes=32 time<1ms TTL=128
Reply from 192.167.17.14: bytes=32 time<1ms TTL=128

Ping statistics for 192.167.17.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.167.17.15

Pinging 192.167.17.15 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.15:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.167.17.19

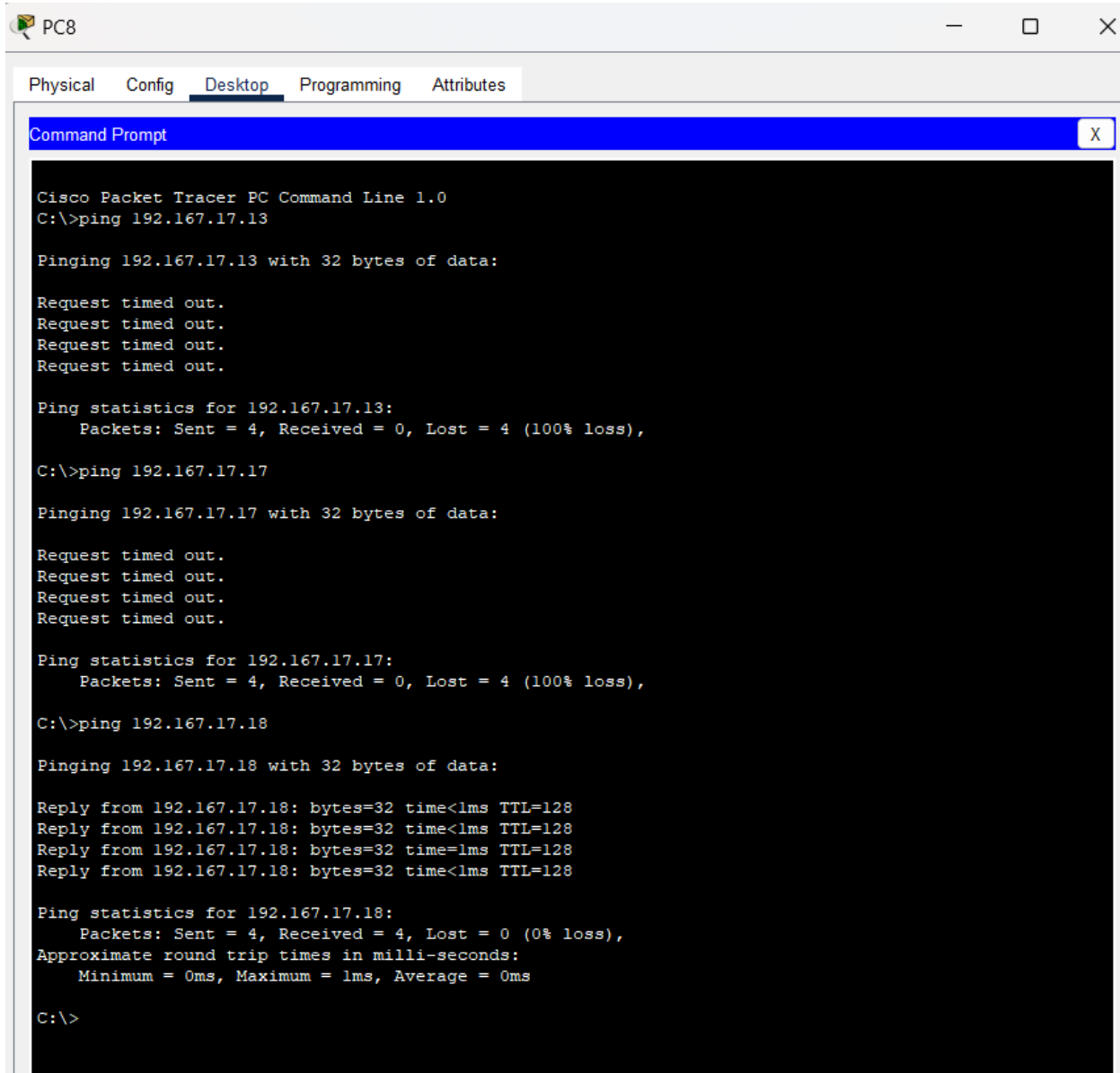
Pinging 192.167.17.19 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.19:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>|
```

From a PC of VLAN 20 to other PC of VLAN 20 and other VLANs:



```
PC8
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.167.17.13

Pinging 192.167.17.13 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.13:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.167.17.17

Pinging 192.167.17.17 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.17:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.167.17.18

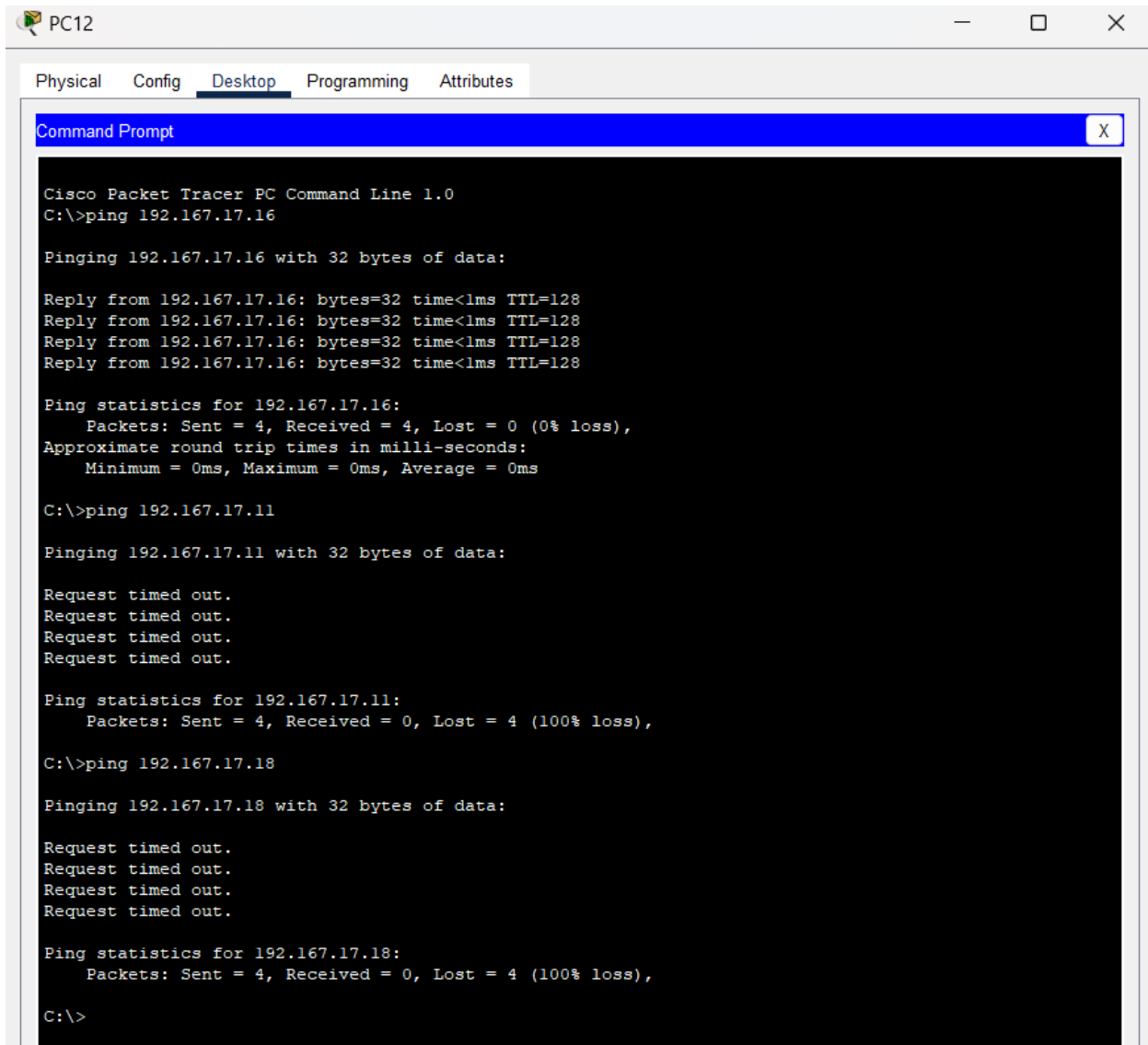
Pinging 192.167.17.18 with 32 bytes of data:

Reply from 192.167.17.18: bytes=32 time<1ms TTL=128
Reply from 192.167.17.18: bytes=32 time<1ms TTL=128
Reply from 192.167.17.18: bytes=32 time=1ms TTL=128
Reply from 192.167.17.18: bytes=32 time<1ms TTL=128

Ping statistics for 192.167.17.18:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

From a PC of VLAN 30 to other PC of VLAN 30 and other VLANs:



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.167.17.16

Pinging 192.167.17.16 with 32 bytes of data:

Reply from 192.167.17.16: bytes=32 time<1ms TTL=128
Reply from 192.167.17.16: bytes=32 time<1ms TTL=128
Reply from 192.167.17.16: bytes=32 time<1ms TTL=128
Reply from 192.167.17.16: bytes=32 time<1ms TTL=128

Ping statistics for 192.167.17.16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.167.17.11

Pinging 192.167.17.11 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.11:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.167.17.18

Pinging 192.167.17.18 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.167.17.18:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Questions (Answer to the point):

1. How many host bits are needed in the largest required subnet?

Ans: example:

Let, host amount is 21. So the bits needed are 5 as $2^5=32$ and $2^4=16$.

2. How many VLANs need to be configured to each of the switches?

Ans: The amount of VLANs that are given.

3. Which interfaces need Access Link?

Ans: Ethernet ports

4. Which interfaces need Trunk Link?

Ans: Two switches or switch to router

5. After configuring VLAN, what will happen if we broadcast?

Ans: After configuring VLANs, broadcasts are confined to the specific VLAN, limiting their impact to devices within that VLAN.

Challenges (if any):

It was kind of hard to keep track of all the configurations of the switches.