DEPARTMENT OF TELECOMMUNICATION ENGINEERING
MEHRAN UNIVERSITY OF ENGINEERING & TECHNOLOGY, JAMSHORO
COMPUTER COMMUNICATION & NETWORKING
(2nd Semester, 3rd Year) LAB HANDOUT # 3

Name:karan kumar_____Roll No: 20ES62_____

Score:_____Signature of the Lab Tutor:_____Date: _____

OBJECTIVES

#	Topic	#. Of Lectures	CLO	Taxonomy level
6	**Apply** the knowledge of VLANs and **configure** it in L2/L3 switches.	3	1,2	C3, P5

OUTCOME(S)

a. An ability to apply knowledge of math, science, and engineering	**PLO1**: Engineering Knowledge:

RUBRICS:

Performance Metric	Exceeds expectation (4-5)	Meets expectations (2-3)	Does not meet expectations (0-1)	Score
Knowledge and application [PLO1]	Applies the appropriate knowledge and concepts to the problem with accuracy and proficiency; shows precise understanding of these knowledge and concepts.	Applies the relevant knowledge and concept to the problem, possibly in a roundabout way; understands the major points of the knowledge, with possible misunderstanding or failure to recall minor points;	Fails to apply relevant knowledge and concepts to the problem; misunderstands or fails to recall critical points.	
			Total Score	

PERFORMANCE OBJECTIVES

Upon successful completion of this experiment, the student will be able to:

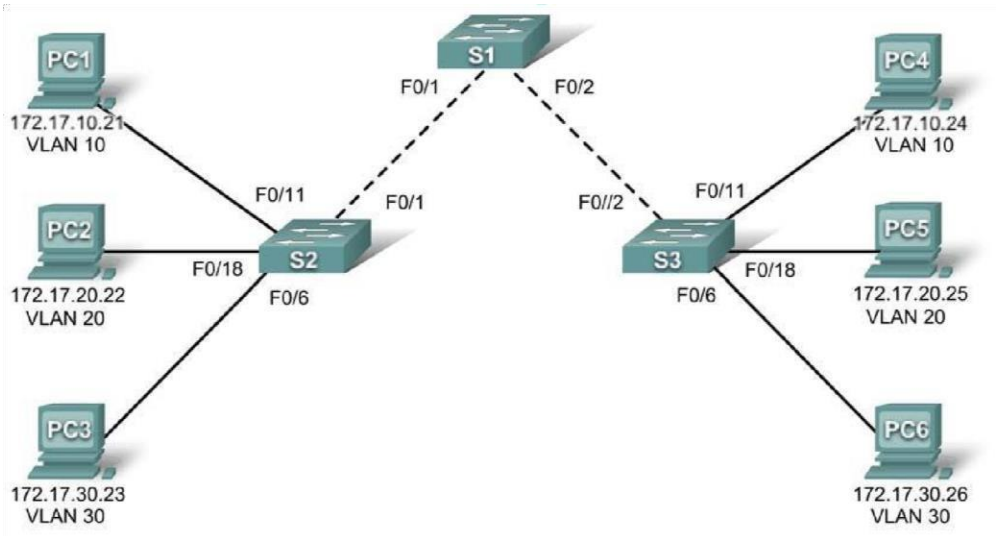
i. **Cable a network according to the topology diagram**
ii. **Perform basic configuration tasks on a switch**
iii. **Create VLANs**
iv. **Assign switch ports to a VLAN**
v. **Add, move, and change ports**
vi. **Verify VLAN configuration**

vii. Enable trunking on inter-switch connections
viii. Verify trunk configuration

Task 1: Prepare the Network

Step 1: Cable a **network** that is similar to the **one** in the **topology diagram.**

You can use any current switch in your lab as long as it has the required interfaces shown in the topology.



Note: If you use 2900 or 2950 switches, the outputs may appear different. Also, certain commands may be different or unavailable.

shutdown. Disable all ports on the switches:

Switch#**config term**

Addressing Table

Device (Hostname)	Interface	IP Address	Subnet Mask	Default Gateway
S1	VLAN 99	172.17.99.11	255.255.255.0	N/A
S2	VLAN 99	172.17.99.12	255.255.255.0	N/A
S3	VLAN 99	172.17.99.13	255.255.255.0	N/A
PC1	NIC	172.17.10.21	255.255.255.0	172.17.10.1
PC2	NIC	172.17.20.22	255.255.255.0	172.17.20.1
PC3	NIC	172.17.30.23	255.255.255.0	172.17.30.1
PC4	NIC	172.17.10.24	255.255.255.0	172.17.10.1
PC5	NIC	172.17.20.25	255.255.255.0	172.17.20.1
PC6	NIC	172.17.30.26	255.255.255.0	172.17.30.1

Initial Port Assignments (Switches 2 and 3)

Ports	Assignment	Network
Fa0/1 – 0/5	802.1q Trunks (Native VLAN 99)	172.17.99.0 /24
Fa0/6 – 0/10	VLAN 30 – Guest (Default)	172.17.30.0 /24
Fa0/11 – 0/17	VLAN 10 – Faculty/Staff	172.17.10.0 /24
Fa0/18 – 0/24	VLAN 20 – Students	172.17.20.0 /24

It is a good practice to disable any unused ports on the switches by putting them in

Switch(config)#**interface** range **fa0/1-24**
Switch(config-if-range)#**shutdown**
Switch(config-if-range)#**interface** range **gi0/1-2**
Switch(config-if-range)#**shutdown**

Task 2: Perform Basic Switch Configurations

Step 1: Configure the **switches according** to **the following guidelines.**

- Configure the switch hostname.
- Disable DNS lookup.
- Configure an EXEC mode password of **class**.
- Configure a password of **cisco** for console connections.
- Configure a password of **cisco** for vty connections.

Step 2: Re-enable the **user** ports on S2 and S3.

S2(config)#**interface** range fa0/6, fa0/11, fa0/18
S2(config-if-range)#**switchport** mode access
S2(config-if-range)#**no** shutdown

S3(config)#**interface** range fa0/6, fa0/11, fa0/18
S3(config-if-range)#**switchport** mode access
S3(config-if-range)#**no** shutdown

Task 3: Configure and Activate Ethernet Interfaces

Step 1: Configure the PCs.

You can complete this lab using only two PCs by simply changing the IP addressing for the two PCs specific to a test you want to conduct. For example, if you want to test connectivity between PC1 and PC2, then configure the IP addresses for those PCs by referring to the addressing table at the beginning of the lab. Alternatively, you can configure all six PCs with the IP addresses and default gateways.

Task 4: Configure VLANs on the Switch

Step 1: Create VLANs **on switch** S1.

Use the **vlan** *vlan-id* command in global configuration mode to add a VLAN to switch S1. There are four VLANS configured for this lab: VLAN 10 (faculty/staff); VLAN 20 (students); VLAN 30 (guest); and VLAN 99 (management). After you create the VLAN, you will be in vlan configuration mode, where you can assign a name to the VLAN with the **name** *vlan name* command. S1(config)#**vlan** 10
S1(config-vlan)#**name faculty/staff**
S1(config-vlan)#**vlan** 20
S1(config-vlan)#**name** students
S1(config-vlan)#**vlan** 30
S1(config-vlan)#**name** guest
S1(config-vlan)#**vlan** 99
S1(config-vlan)#**name** management
S1(config-vlan)#**end**
S1#

Step 2: **Verify that** the VLANs **have been created on** S1.

Use the **show vlan brief** command to verify that the VLANs have been created.

S1#**show** vlan brief

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/4, 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, Gi0/1
                                                 Gi0/2
10   faculty/staff                     active
20   students                          active
30   guest                             active
99   management                        active
```

Step 3: Configure and **name** VLANs **on switches** S2 and S3.

Create and name VLANs 10, 20, 30, and 99 on S2 and S3 using the commands from Step 1. Verify the correct configuration with the **show vlan brief** command.

What ports are currently assigned to the four VLANs you have created on S1?

_____

___

Step 4: Assign switch ports to **VLANs on** S2 and S3.

Refer to the port assignment table on page 1. Ports are assigned to VLANs in interface configuration mode, using the **switchport access vlan** *vlan-id* command. You can assign each port individually or you can use the **interface range** command to simplify this task, as shown here. The commands are shown for S3 only, but you should configure both S2 and S1 similarly.

S3(config)#**interface** range **fa0/6-10**
S3(config-if-range)#**switchport** access vlan **30**
S3(config-if-range)#**interface** range **fa0/11-17**
S3(config-if-range)#**switchport** access vlan 10
S3(config-if-range)#**interface** range **fa0/18-24**
S3(config-if-range)#**switchport** access vlan 20
S3(config-if-range)#**end**
S3#

Step 5: Determine which ports **have been added.**

Use the **show vlan** id vla*n-number* command on S2 to see which ports are assigned to VLAN 10.

Which ports are assigned to VLAN 10?

You can also view VLAN assignment information using the **show interfaces** *interface* **switchport** command.

Step 6: Assign the **management VLAN.**

A management VLAN is any VLAN that you configure to access the management capabilities of a switch. VLAN 1 serves as the management VLAN if you did not specifically define another VLAN. You assign the management VLAN an IP address and subnet mask. A switch can be managed via HTTP, Telnet, SSH,or SNMP. Because the out-of-the-box configuration of a Cisco switch has VLAN 1 as the default VLAN, VLAN 1 is a bad choice as the management VLAN. You do not want an arbitrary user who is connecting to a switch to default to the management VLAN. Recall that you configured the management VLAN as VLAN 99 earlier in this lab.

From interface configuration mode, use the **ip address** command to assign the management IP address to the switches. S1(config)#**interface** vlan **99**

S1(config-if)#**ip** address 172.17.99.11 **255.255.255.0**
S1(config-if)#**no shutdown**
S2(config)#**interface** vlan 99
S2(config-if)#**ip** address 172.17.99.12 **255.255.255.0**
S2(config-if)#**no shutdown**
S3(config)#**interface** vlan **99**
S3(config-if)#**ip** address 172.17.99.13 **255.255.255.0**
S3(config-if)#**no shutdown**

Assigning a management address allows IP communication between the switches, and also allows any host connected to a port assigned to VLAN 99 to connect to the switches. Because VLAN 99 is configured as the management VLAN, any ports assigned to this VLAN are considered management ports and should be secured to control which devices can connect to these ports.

Trunks are connections between the switches that allow the switches to exchange information for all VLANS. By default, a trunk port belongs to all VLANs, as opposed to an access port, which can only belong to a single VLAN.

A native VLAN is assigned to an 802.1Q trunk port. In the topology, the native VLAN is VLAN 99. An 802.1Q trunk port supports traffic coming from many VLANs (tagged traffic) as well as traffic that does not come from a VLAN (untagged traffic). The 802.1Q trunk port places untagged traffic on the native VLAN. Untagged traffic is generated by a computer attached to a switch port that is configured with the native VLAN. It is a best practice to use a VLAN other than VLAN 1 as the native VLAN.

Use the **interface range** command in global configuration mode to simplify configuring trunking.

S1(config)#**interface** range fa0/1-5
S1(config-if-range)#**switchport** mode trunk
S1(config-if-range)#**switchport** trunk native vlan **99**
S1(config-if-range)#**no shutdown**
S1(config-if-range)#**end**
S2(config)# **interface** range **fa0/1-5**
S2(config-if-range)#**switchport** mode **trunk**
S2(config-if-range)#**switchport** trunk native vlan **99**
S2(config-if-range)#**no shutdown** S2(config-if-range)#**end**
S3(config)# **interface** range **fa0/1-5**
S3(config-if-range)#**switchport** mode trunk
S3(config-if-range)#**switchport** trunk native vlan **99**
S3(config-if-range)#**no shutdown**
S3(config-if-range)#**end**

Verify that the trunks have been configured with the **show interface trunk** command.

S1#**show** interface **trunk**

Port Mode Encapsulation Status Native vlan
Fa0/1 on 802.1q trunking 99
Fa0/2 on 802.1q trunking 99

Port Vlans allowed on trunk
Fa0/1 1-4094
Fa0/2 1-4094

Port Vlans allowed and active in management domain
Fa0/1 1,10,20,30,99
Fa0/2 1,10,20,30,99
Port Vlans in spanning tree forwarding state and not pruned
Fa0/1 1,10,20,30,99
Fa0/2 1,10,20,30,99

Step 8: **Verify that** the **switches can communicate.**

From S1, ping the management address on both S2 and S3.
S1#**ping 172.17.99.12**
Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.17.99.12, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms
S1#**ping 172.17.99.13**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.17.99.13, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/1 ms

Step 9: **Ping several** hosts from PC2.

Ping from host PC2 to host PC1 (172.17.10.21). Is the ping attempt successful?

_____

Ping from host PC2 to the switch VLAN 99 IP address 172.17.99.12. Is the ping attempt successful? _____

Ping from host PC2 to host PC5. Is the ping attempt successful? _____

Step 10: Move PC1 into the same VLAN as PC2.

The port connected to PC2 (S2 Fa0/18) is assigned to VLAN 20, and the port connected to PC1 (S2 Fa0/11) is assigned to VLAN 10. Reassign the S2 Fa0/11 port to VLAN 20. You do not need to first remove a port from a VLAN to change its VLAN membership. After you reassign a port to a new VLAN, that port is automatically removed from its previous VLAN.

S2#**configure** terminal
Enter configuration commands, one per line. End with CNTL/Z.
S2(config)#**interface** fastethernet 0/11
S2(config-if)#**switchport** access vlan 20
S2(config-if)#**end**

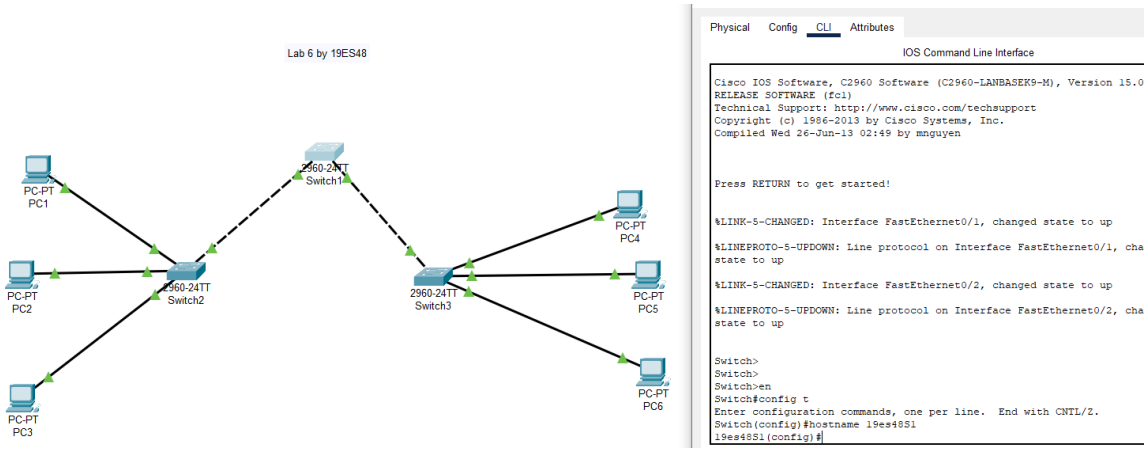
Ping from host PC2 to host PC1. Is the ping attempt successful? _____

Step 11: Change the IP **address and network on PC1.**

Change the IP address on PC1 to 172.17.20.21. The subnet mask and default gateway can remain the same. Once again, ping from host PC2 to host PC1, using the newly assigned IP address.
Is the ping attempt successful? _____

Why was this attempt successful?

TOPOLGY:

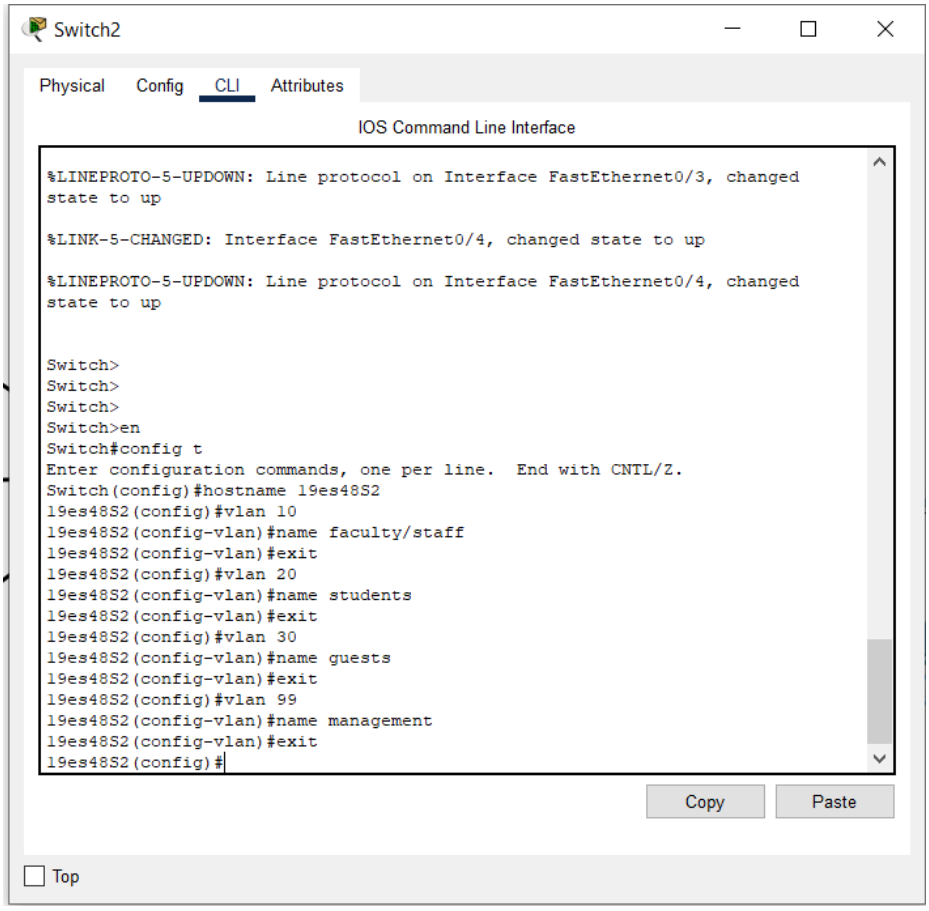


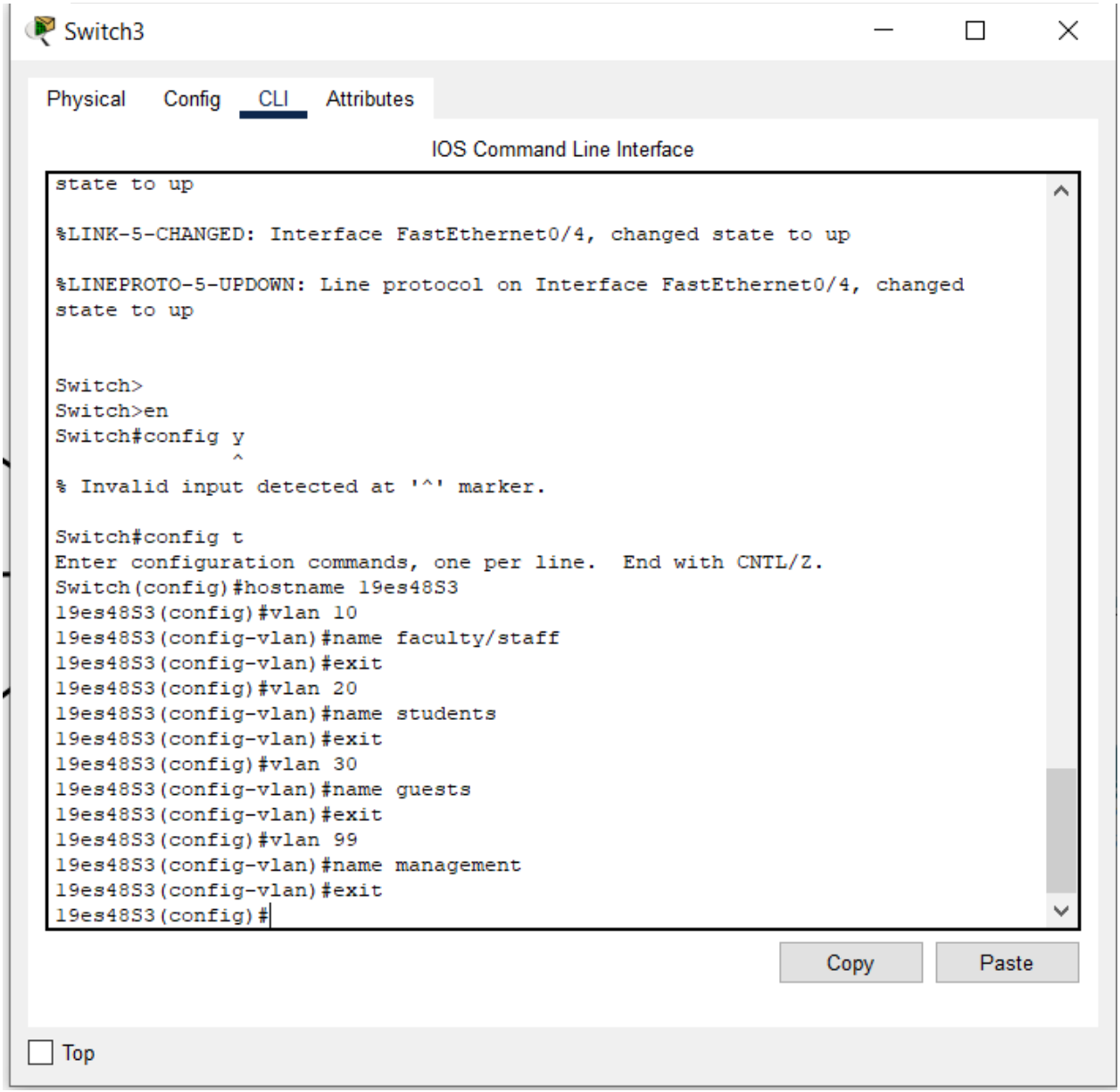
CONFIGURATION OF 19es48S1(S1):

```
19es48S1>en
19es48S1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
19es48S1(config)#vlan 10
19es48S1(config-vlan)#name faculty/staff
19es48S1(config-vlan)#exit
19es48S1(config)#vlan 20
19es48S1(config-vlan)#name students
19es48S1(config-vlan)#exit
19es48S1(config)#vlan 30
19es48S1(config-vlan)#name guests
19es48S1(config-vlan)#exit
19es48S1(config)#vlan 99
19es48S1(config-vlan)#name management
19es48S1(config-vlan)#exit
```

```
19es48S1(config)#do sh vl br

VLAN Name                                Status    Ports
---- ----------------------------------- ---------
-------------------------------
1    default                             active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                   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   faculty/staff                       active
20   students                            active
30   guests                              active
99   management                          active
1002 fddi-default                        active
1003 token-ring-default                  active
1004 fddinet-default                     active
1005 trnet-default                       active
19es48S1(config)#
```

Creating Same VLANs on S2 and S3:





Port Assignment on S2:

```
19es48S2(config)#int range fa0/6-10
19es48S2(config-if-range)#switchport mode access
19es48S2(config-if-range)#switchport access vlan 30
19es48S2(config-if-range)#exit
19es48S2(config)#int range 11-17
                           ^
% Invalid input detected at '^' marker.

19es48S2(config)#int range fa0/11-17
19es48S2(config-if-range)#switchport mode access
19es48S2(config-if-range)#switchport access vlan 10
19es48S2(config-if-range)#exit
19es48S2(config)#int range fa0/18-24
19es48S2(config-if-range)#switchport mode access
19es48S2(config-if-range)#switchport access vlan 20
19es48S2(config-if-range)#exit
19es48S2(config)#
```

```
19es48S2(config)#do sh vl br

VLAN Name                              Status    Ports
---- --------------------------------- ---------
-------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Gig0/1, Gig0/2
10   faculty/staff                     active    Fa0/11, Fa0/12, Fa0/13,
Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17
20   students                          active    Fa0/18, Fa0/19, Fa0/20,
Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24
30   guests                            active    Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10
99   management                        active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
19es48S2(config)#
```

Port Assignment on S2:

```
19es48S3(config-vlan)#exit
19es48S3(config)#int range fa0/6-10
19es48S3(config-if-range)#switchport mode access
19es48S3(config-if-range)#switchport access vlan 30
19es48S3(config-if-range)#exit
19es48S3(config)#int range fa0/11-17
19es48S3(config-if-range)#switchport mode access
19es48S3(config-if-range)#switchport access vlan 10
19es48S3(config-if-range)#exit
19es48S3(config)#int range fa0/18-24
19es48S3(config-if-range)#switchport mode access
19es48S3(config-if-range)#switchport access vlan 20
19es48S3(config-if-range)#exit
19es48S3(config)#
```

Port Assignment on S1:

```
19es48S1>
19es48S1>
19es48S1>en
19es48S1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
19es48S1(config)#int range fa0/6-10
19es48S1(config-if-range)#switchport mode access
19es48S1(config-if-range)#switchport access vlan 30
19es48S1(config-if-range)#exit
19es48S1(config)#int range fa0/11-17
19es48S1(config-if-range)#switchport mode access
19es48S1(config-if-range)#switchport access vlan 10
19es48S1(config-if-range)#exit
19es48S1(config)#int range fa0/18-24
19es48S1(config-if-range)#switchport mode access
19es48S1(config-if-range)#switchport access vlan 20
19es48S1(config-if-range)#exit
19es48S1(config)#
```

Configuring Native VLAN on each Switch:

S1:

```
19es48S1(config)#int vlan 99
19es48S1(config-if)#
%LINK-5-CHANGED: Interface Vlan99, changed state to up

19es48S1(config-if)#ip address 172.17.99.11 255.255.255.0
19es48S1(config-if)#no shutdown
19es48S1(config-if)#exit
19es48S1(config)#
```

S2:

```
19es48S2(config)#int vlan 99
19es48S2(config-if)#
%LINK-5-CHANGED: Interface Vlan99, changed state to up

19es48S2(config-if)#ip address 172.17.99.12 255.255.255.0
19es48S2(config-if)#no shutdown
19es48S2(config-if)#exit
19es48S2(config)#
```

S3:

```
19es48S3(config)#int vlan 99
19es48S3(config-if)#
%LINK-5-CHANGED: Interface Vlan99, changed state to up

19es48S3(config-if)#ip add 172.17.99.13 255.255.255.0
19es48S3(config-if)#no shutdown
19es48S3(config-if)#exit
19es48S3(config)#
```

Assigning Trunk Ports On VLAN 99:

S1:

```
19es48S1(config)#int range fa0/1-5
19es48S1(config-if-range)#switchport mode trunk


19es48S1(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to up

19es48S1(config-if-range)#
```

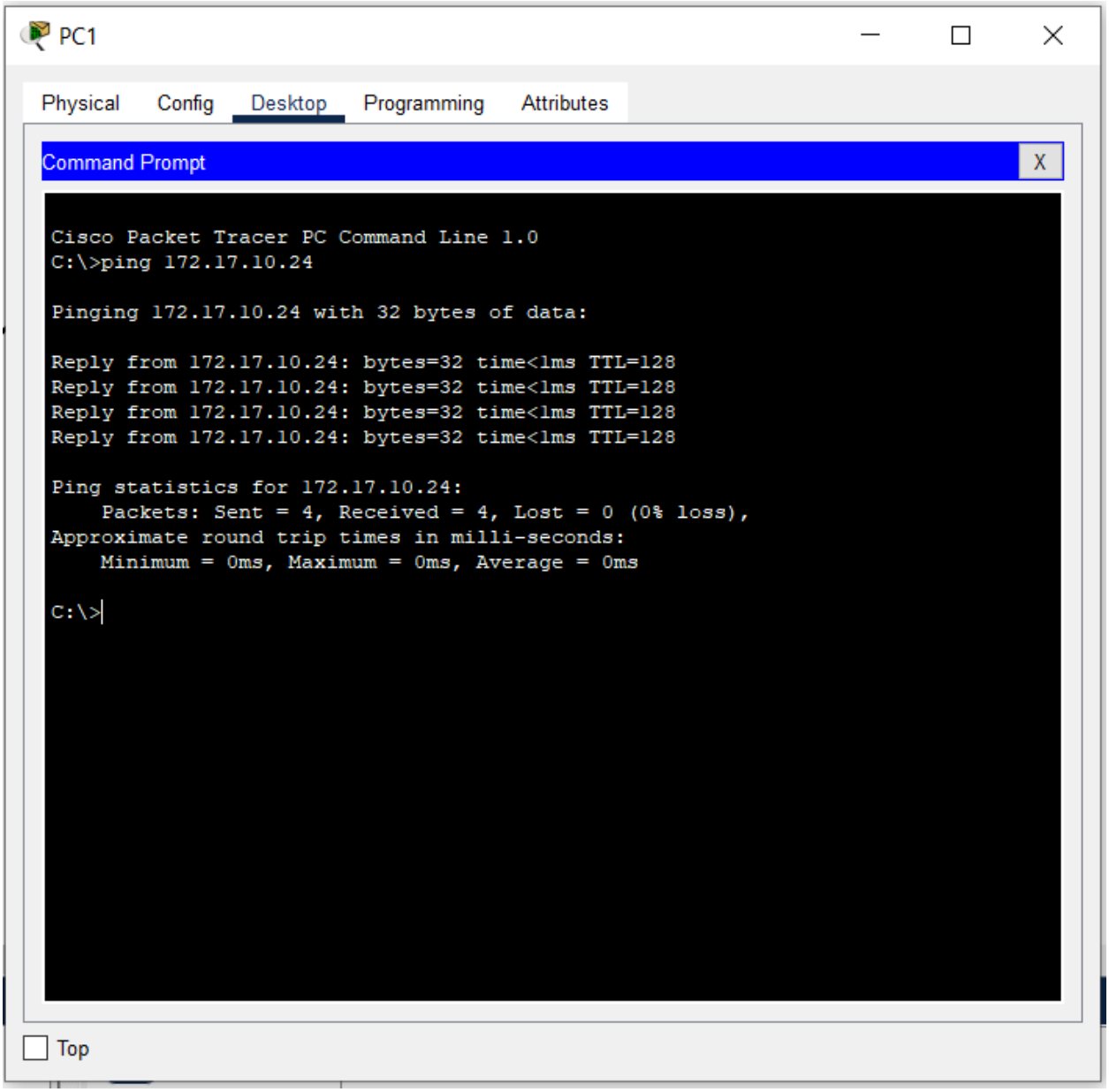
S2:

```
19es48S2(config)#int range fa0/1-5
19es48S2(config-if-range)#switchport mode trunk



19es48S2(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to up
```

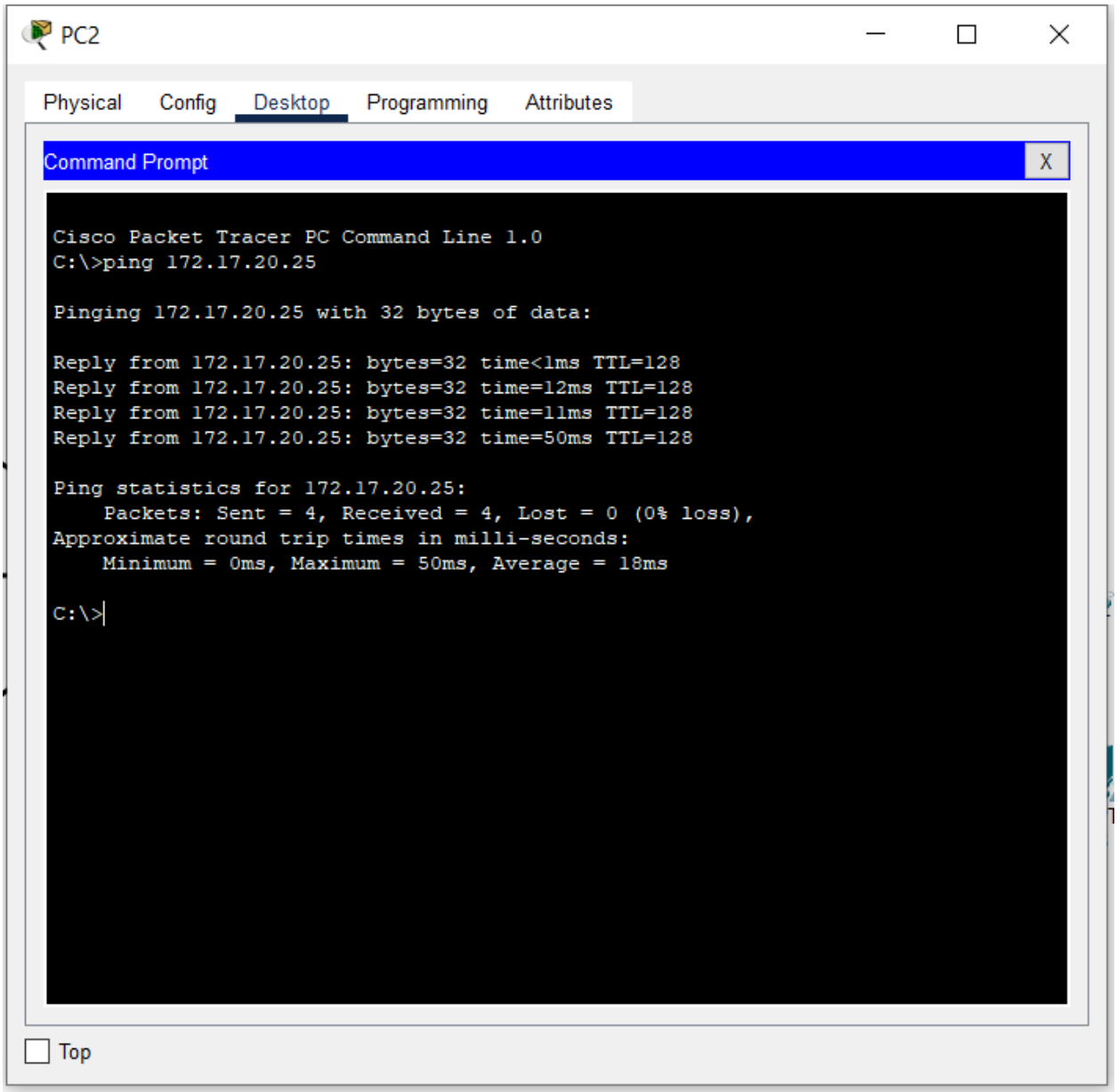
S3:

```
19es48S3(config)#int range fa0/1-5
19es48S3(config-if-range)#switchport mode trunk



19es48S3(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to up
```

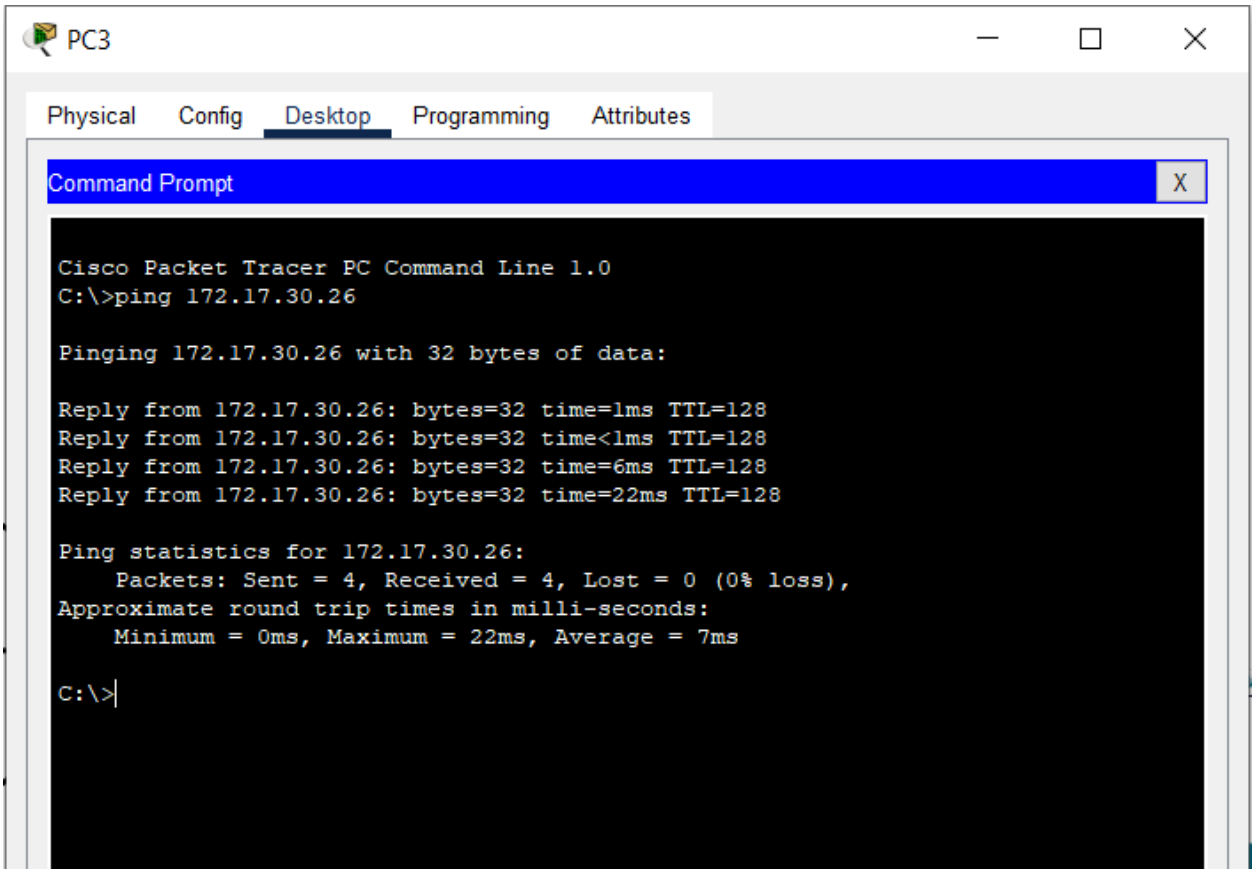
Communication From PC1 to PC 4:



Communication from PC 2 to PC 5:



Communication From PC3 to PC6:



FINAL CHECK LIST

1. Return all equipment and materials to their proper storage area.
2. Submit your answers to question, before the next laboratory.

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