Department of Computer Science and Engineering

Islamic University of Technology (IUT)

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Laboratory Report

CSE 4412 : Data Communication and Networking Lab

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Section	**: BSc in SWE(Group A)**
Semester	**: 4th Semester**
Academic Year	**: 2022-23**
Date	**: 06/04/2023**
Lab No	**: 08**

Title: Understanding the concept of VLAN and configuration of VLAN to multiple user groups in different locations.

Objective:

1. Understand VLAN
2. Configuration of VLAN

Devices Used In the Experiment:

1. Switch PT
2. PC PT
3. Copper Cross-Over Cables
4. Copper Straight-through cables

Theory:

VLAN Definition

Usage of VLAN:

Explain the usage of VLAN with an example with three different user groups situated in three different levels of an office building.

VLAN is a technique by which a network can be segmented such that network admin can divide the single physical network into multiple logical networks. This is particularly helpful for improving network performance, better security and simplifying the overall network management.

In the case of an office building there can be multiple types of staff involved in different areas of the company such as developer, R&D engineers and business analyst. These groups may have different requirements from a networking perspective and their traffic should be kept separate for the sake of security and performance.

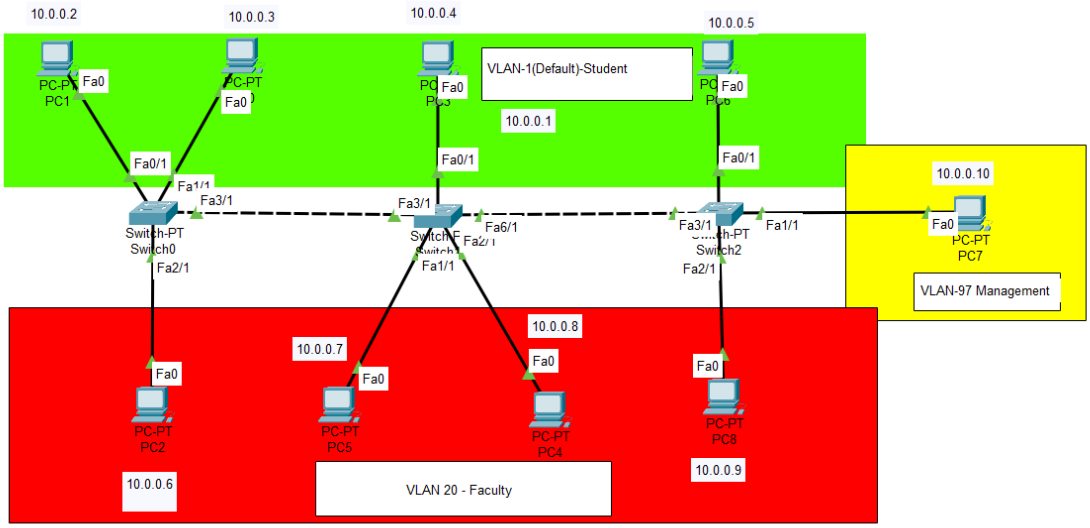
This can be established by creating 3 separate VLANs, one for each group. We can assign each VLAN to a specific set of switch ports for each floor. This will ensure that traffic between the users in the same group stays within their respective VLANs and does not mix with the traffic from other groups. So the developer team can be assigned a dedicated number of ports in the switch, the business analyst team can be assigned a different number of dedicated ports and the R&D engineers team a different number of

dedicated ports. These ports would not overlap and would thus allow these individuals to communicate securely and efficiently.

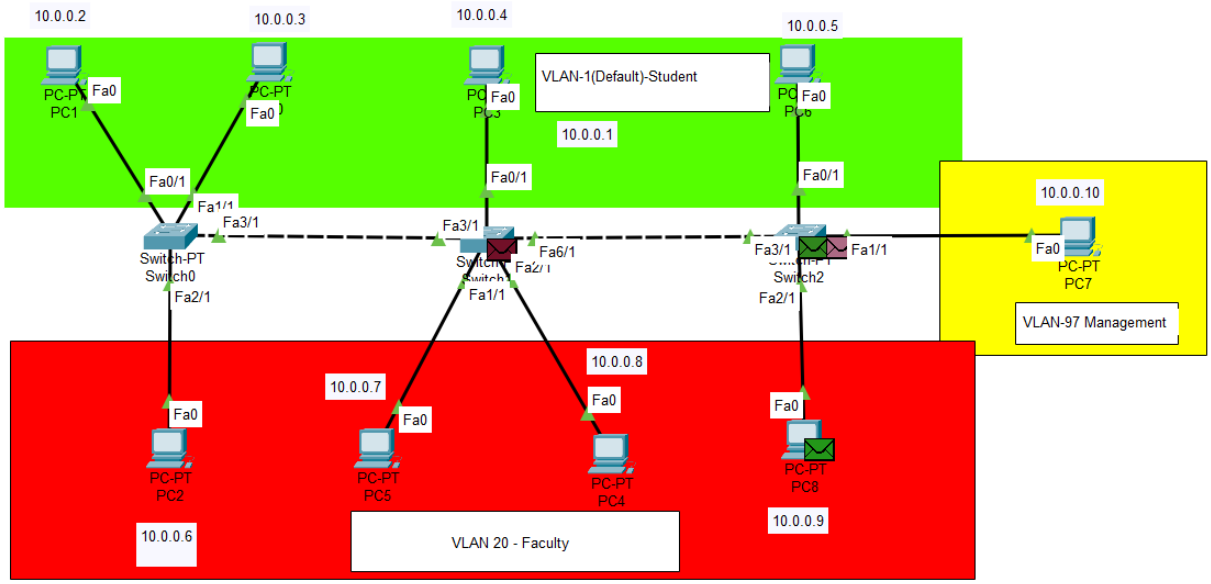
VLANs improve network performance by reducing broadcast traffic and optimizing network flow. A developer would not have to suffer from network congestion as a result of a congested network of business analysts. This allows faster response times for individual VLANs.

Diagram of the experiment:

(Take a screenshot of your lab task from packet tracer and paste here)



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1	PC3	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC6	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC6	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC2	PC8	ICMP		0.000	N	3	(edit)	(delete)



Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.006	Switch0	PC1	ICMP
	0.007	Switch1	Switch2	ICMP
	0.007	Switch2	PC8	ICMP
	0.007	PC6	Switch2	ICMP
	0.007	Switch2	Switch1	ICMP
	0.008	Switch2	PC6	ICMP
	0.008	PC8	Switch2	ICMP
	0.008	Switch2	Switch1	ICMP
	0.008	Switch1	Switch0	ICMP
	0.009	PC6	Switch2	ICMP
	0.009	Switch2	Switch1	ICMP
	0.009	Switch1	Switch0	ICMP
	0.009	Switch0	PC2	ICMP
	0.010	Switch2	Switch1	ICMP
	0.010	Switch1	Switch0	ICMP
	0.010	Switch0	PC1	ICMP
	0.011	Switch1	Switch0	ICMP
	0.011	Switch0	PC2	ICMP
	0.012	Switch0	PC1	ICMP

Reset Simulation | Constant Delay | Captured to: 0.012 s

Configuration of different Switches:

Commands for creating and naming a VLAN(Faculty) is shown below:

enable
configure terminal
vlan 20
name Faculty
exit

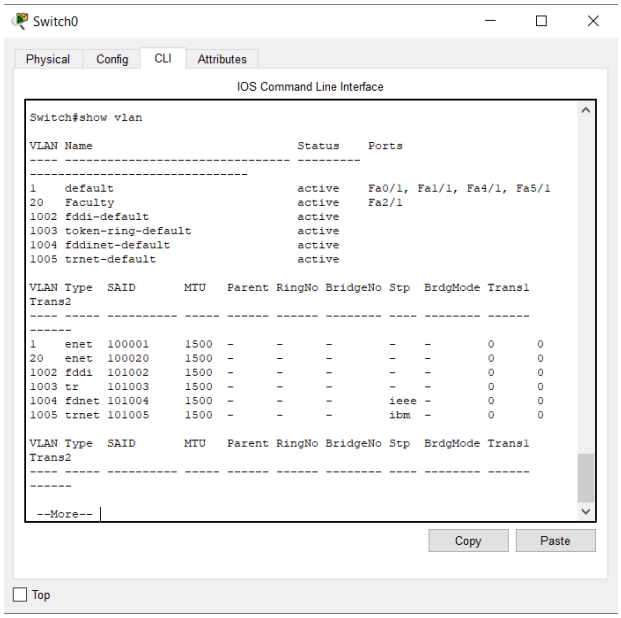
Commands for configuring VLAN for one switch is shown below(Switch-PT Switch 0)

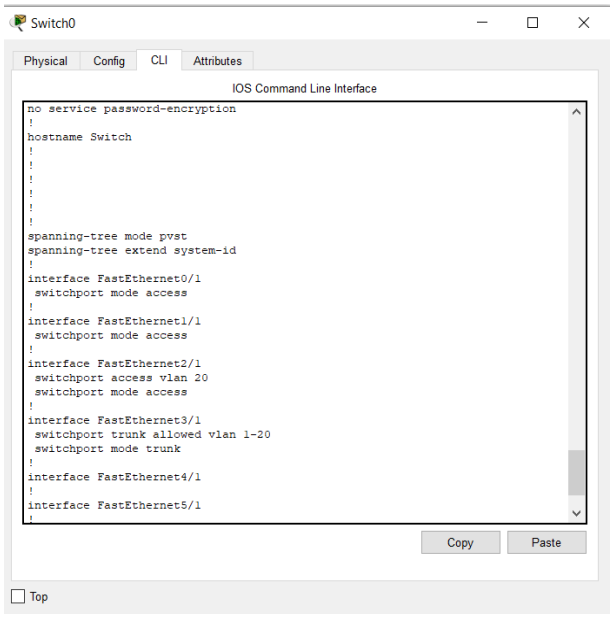
enable
configure terminal
int fa0/1
switchport mode access
switchport access vlan 1
exit
int fa1/1
switchport mode access
switchport access vlan 1
exit
int fa2/1
switchport mode access
switchport access vlan 20
exit
int fa3/1
switchport mode trunk
switchport trunk allowed vlan 1-20
exit

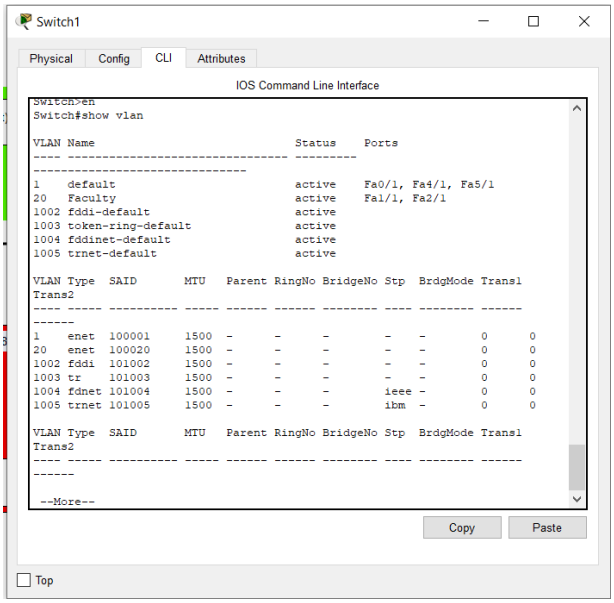
Observation:

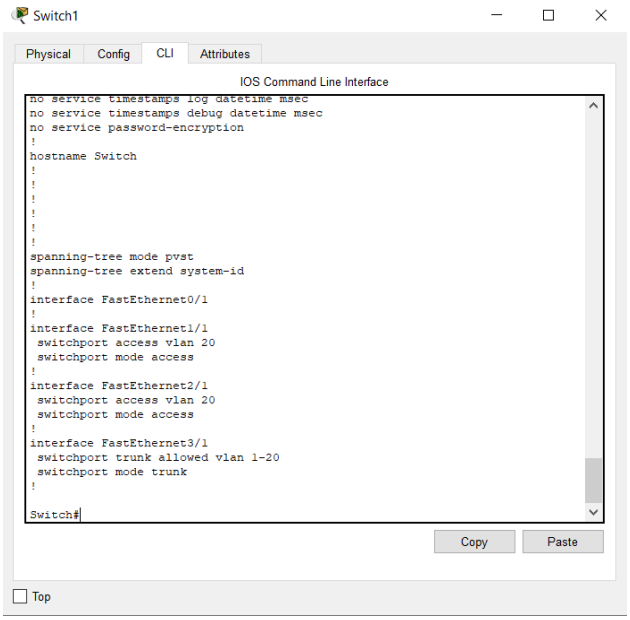
The screenshots of ***show vlan*** command in two switches are shown below:

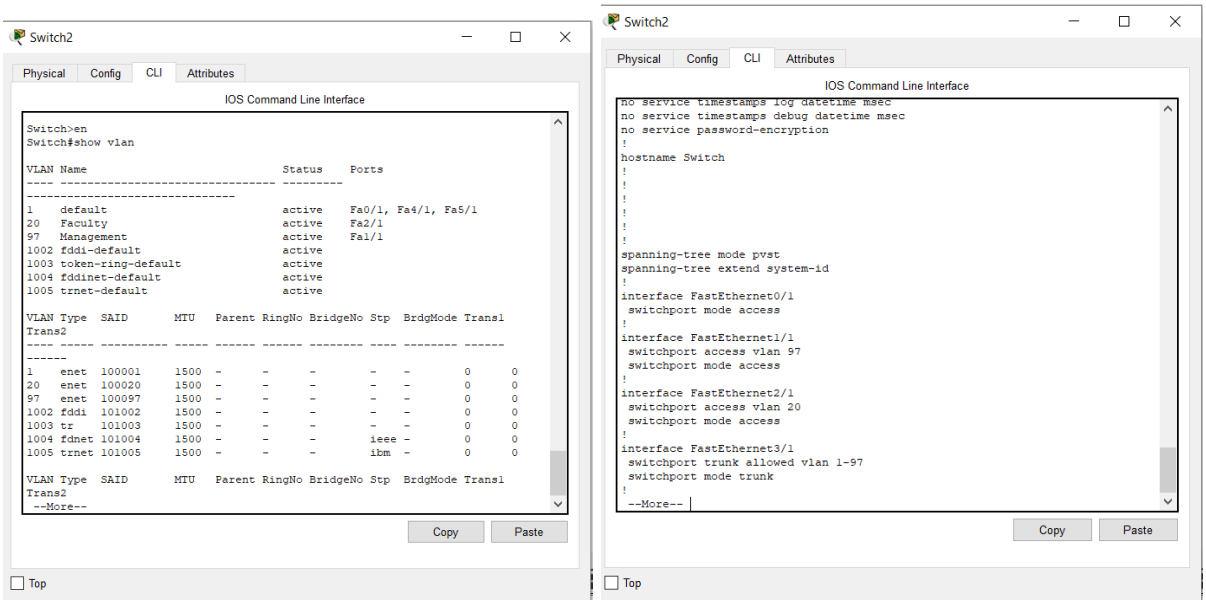
To see the interface with trunk access use ***show running-config***


Switch0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch#show vlan
VLAN Name Status Ports
---- -------------------------------- --------- -------------------------------
1 default active Fa0/1, Fa1/1, Fa4/1, Fa5/1
20 Faculty active Fa2/1
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
20 enet 100020 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
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
--More--
Copy
Paste
Top


Switch0
Physical
Config
CLI
Attributes
IOS Command Line Interface
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
switchport mode access
!
interface FastEthernet1/1
switchport mode access
!
interface FastEthernet2/1
switchport access vlan 20
switchport mode access
!
interface FastEthernet3/1
switchport trunk allowed vlan 1-20
switchport mode trunk
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
Copy
Paste
Top


Switch1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch>en
Switch#show vlan
VLAN Name Status Ports
---- -------------------------------- --------- -------------------------------
1 default active Fa0/1, Fa4/1, Fa5/1
20 Faculty active Fa1/1, Fa2/1
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
20 enet 100020 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
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
--More--
Copy
Paste
Top


Switch1
Physical
Config
CLI
Attributes
IOS Command Line Interface
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
switchport access vlan 20
switchport mode access
!
interface FastEthernet2/1
switchport access vlan 20
switchport mode access
!
interface FastEthernet3/1
switchport trunk allowed vlan 1-20
switchport mode trunk
!
Switch#
Copy
Paste
Top



One key observation is that the packets from a particular PC cannot reach a PC configured for a different VLAN. It only allows PC's within the same VLAN to communicate with each other. For PC's on different VLANs to communicate we require the use of a layer-3 device such as a router.

Challenges:

The biggest challenge I faced was configuring the switch using the trunk mode. I couldn't initially figure out how to actually add the trunk mode and it is supposed to be a form of inter-switch communication, upon later inspection I came to know that the trunk link is a point-to-point link that is capable of carrying traffic for multiple VLANs. When a packet enters a trunk port, it is tagged with a VLAN ID, indicating which VLAN it belongs to. When the packet reaches the other end of the trunk link, the receiving switch reads the VLAN ID and forwards the packet to the correct VLAN. Also another challenging part was

> Configure all three switches, so that the virtual terminal for remote access from end devices of VLAN 97

figuring out the instruction given

I couldn't initially understand the instruction, and I thought I had to configure the switch to communicate among the VLANs. Like in the student VLAN can communicate with the teacher VLAN and so on. But doing so should require a router as they are on different VLANs.