Lab Number: 8 Date:2025/08/17

Title: Creating VLAN and VLAN Trunking using Packet Tracer

THEORY:

1. VLAN (Virtual Local Area Network)

A Virtual Local Area Network (VLAN) is a logical segmentation of a physical network into smaller, isolated broadcast domains. VLANs allow devices in different physical locations to communicate as if they are on the same network, improving network efficiency, security, and manageability.

- Purpose of VLANs:
  - Reduce broadcast traffic by segmenting the network.
  - Improve security by isolating sensitive data traffic.
  - Simplify network management by grouping devices logically rather than physically.
- Types of VLANs:
  - Default VLAN – All switch ports belong to it by default (usually VLAN 1).
  - Data VLAN – Used to carry user-generated traffic.
  - Voice VLAN – Used for VoIP traffic.
  - Management VLAN – Used for network management traffic like SSH, Telnet, or SNMP.

2. VLAN Trunking

VLAN Trunking is the process of carrying traffic from multiple VLANs over a single physical link between network devices (like switches or routers). Instead of requiring separate physical links for each VLAN, a trunk line can carry traffic for many VLANs using VLAN tags.

- Key Characteristics:
  - Uses trunk ports configured on switches.
  - Employ protocols like IEEE 802.1Q for VLAN tagging.

- Allows VLAN information to be preserved when packets travel between switches.

- 802.1Q Tagging Process:
  - Adds a 4-byte VLAN tag to Ethernet frames.
  - Tag contains VLAN ID and priority information.
  - Tag is removed before forwarding the frame to end devices.

3. VLAN Architecture

VLAN Architecture defines how virtual networks are organized and managed within a physical network. Each VLAN is a separate broadcast domain, identified by a unique VLAN ID, with end devices connected through **access ports** assigned to that VLAN. Traffic between switches is carried over **trunk ports** using tagging protocols like IEEE 802.1Q, which preserve VLAN information. The switch's **switching fabric** ensures that frames are forwarded only within their VLAN, maintaining isolation, improving security, and reducing broadcast traffic, while allowing flexible network segmentation independent of physical layout.

Component Used

Hardware: Switches, Ethernet Cables and Devices

Software: Cisco Packet Tracer

Network Diagram

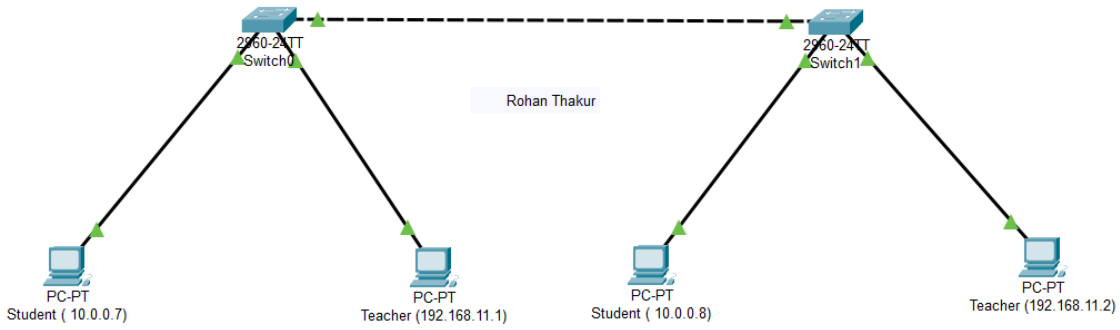


Fig: Network Map for VLAN

Configuration Steps

The following steps outline the process of creating the VLAN network depicted in the diagram using Cisco Packet Tracer.

Step 1: Open the Cisco Packet Tracer

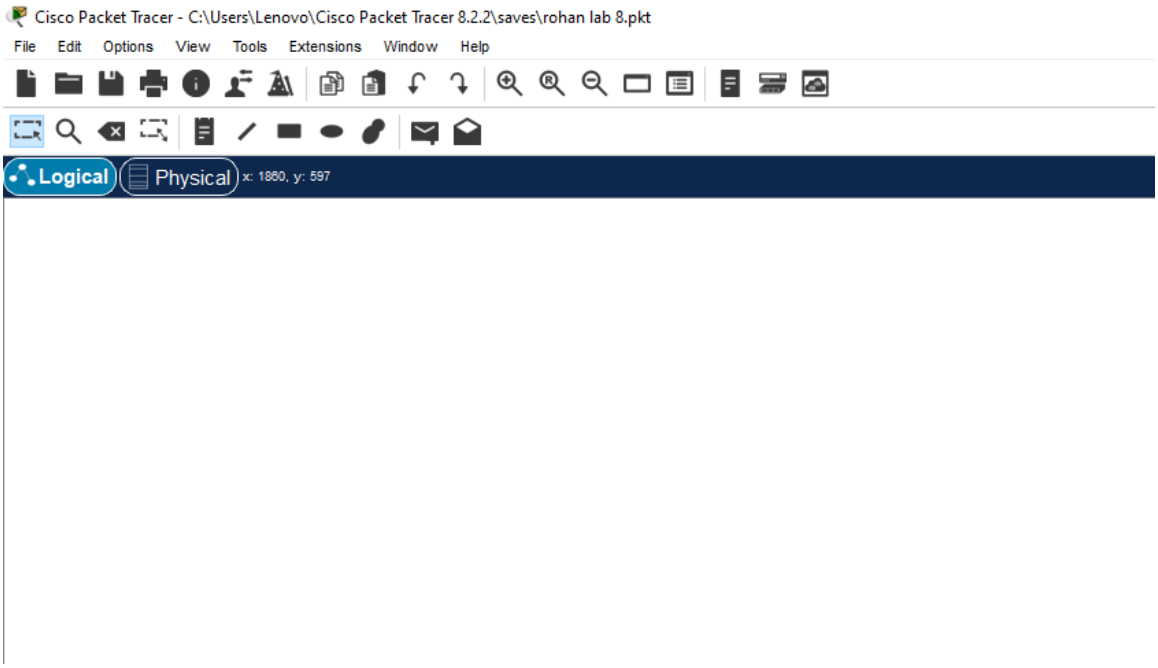


Fig: Workspace of the Cisco Packet Tracer

Step 2: Add the required network devices to the workspace and connect them appropriately.

Add the appropriate number of devices and add them to the workspace from the Device Type Selection Box which includes two 2960-24TT switch and 4 PC. Connect them using the copper straight through wires and ensure the connection is made properly.

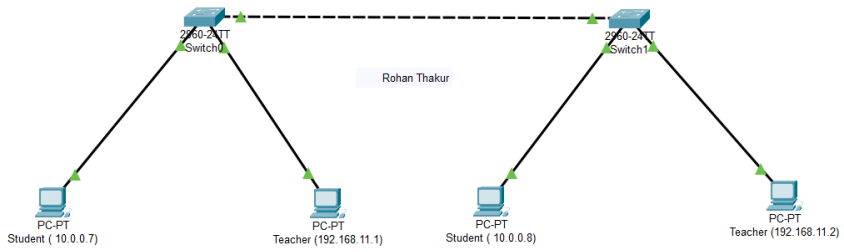


Fig: Connection between the devices in the VLAN

Step 3: Configure the IP Address

Click on the Devices and select the IP configuration in the Desktop Option. Enter the required Ip address for each device.

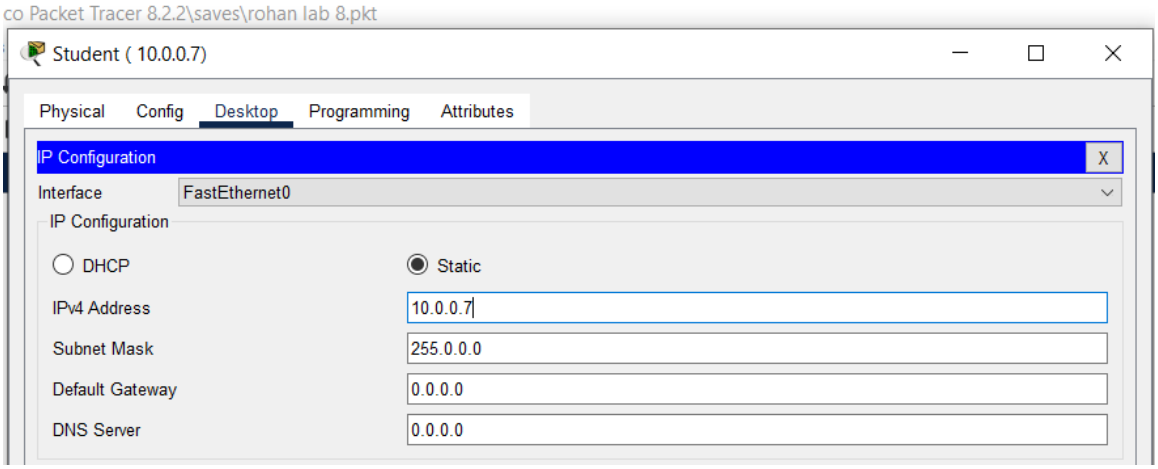


Fig: Ip Configuration

Step 4: Configuring VLANS:

Create VLAN on both Switches and assign the port to both switches and truncation in both switches.

Code for the VLAN configuration

Switch#config t

Switch(config)#vlan 7

Switch(config-vlan)#name student

Switch(config-vlan)#vlan 17

Switch(config-vlan)#name teacher

Switch(config-vlan)#exit

Switch(config)#

Code for Assigning Ports:

Switch#config t

Switch(config)#int Fa 0/1

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 7

Switch(config-if)#int Fa 0/2

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 17

Switch(config-if)#exit

Switch(config)#exit

Code for Trunking Switches:

Switch#config t

Switch(config)#int fa 0/3

Switch(config-if)#switchport mode trunk

Switch(config-if)#exit

Switch(config)#exit

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    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
7    student                           active    Fa0/1
17   teacher                           active    Fa0/2
20   VLAN0020                          active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#
```

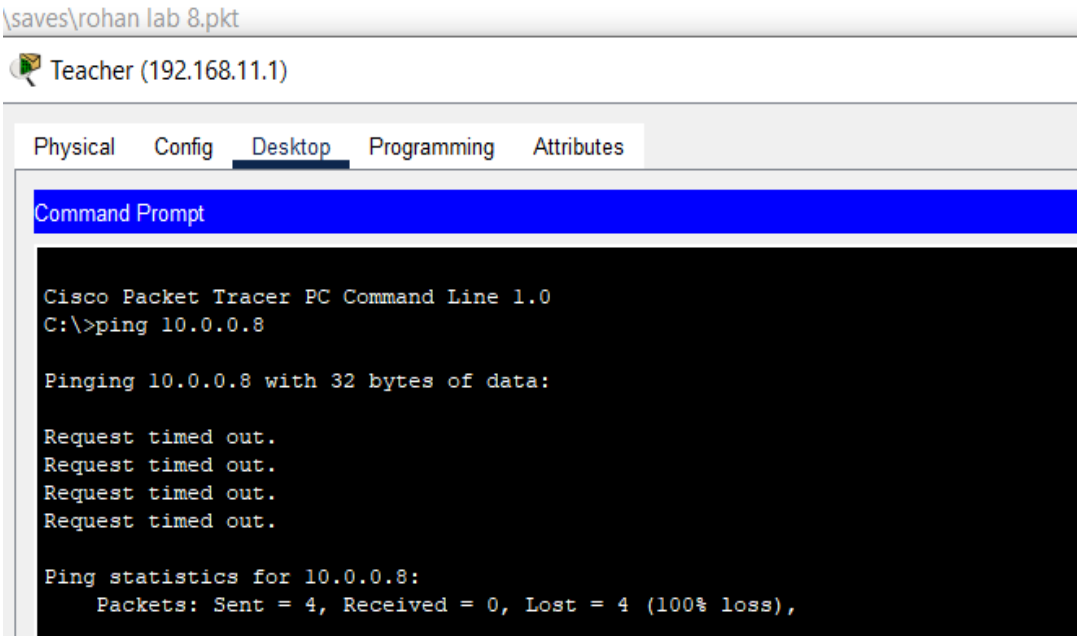
Fig: Assigning ports to VLAN

```
Switch#enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int Fa 0/3
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%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

Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

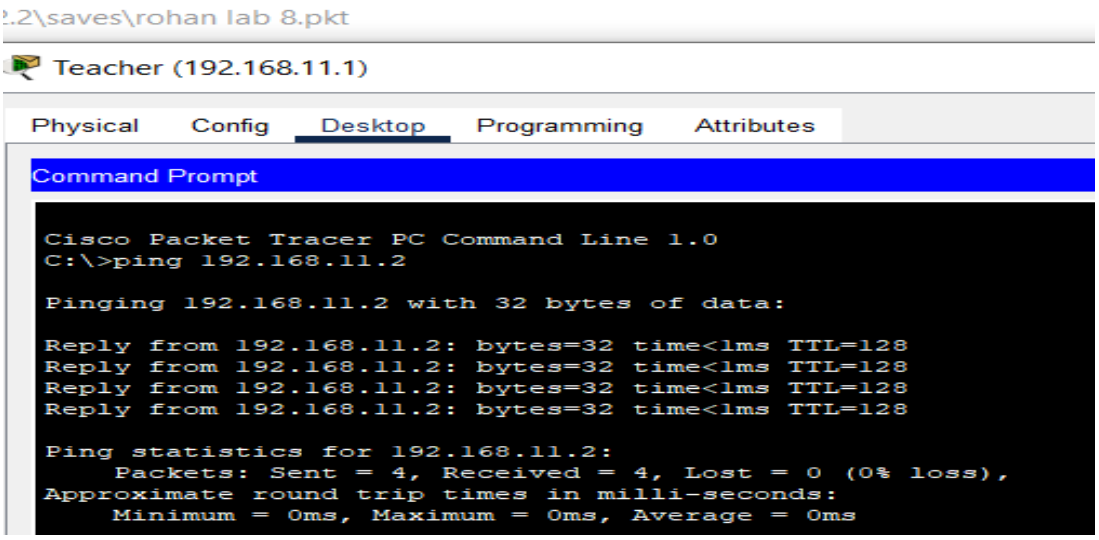
Fig: Configuration Trunking between switches

Testing and Validation:

We can test whether the network is working, ping other devices on the network from each PC. Use the "*ping <IP address of the other device"*>. If the connection is successful then it gets replies from the other device.



Connectivity between Teacher and Student



Connectivity between Teacher and Teacher

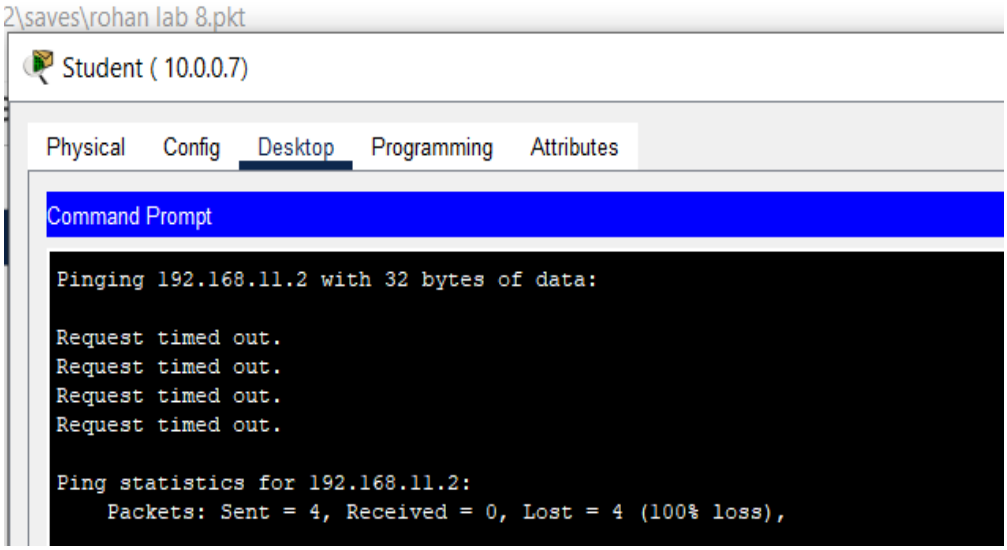
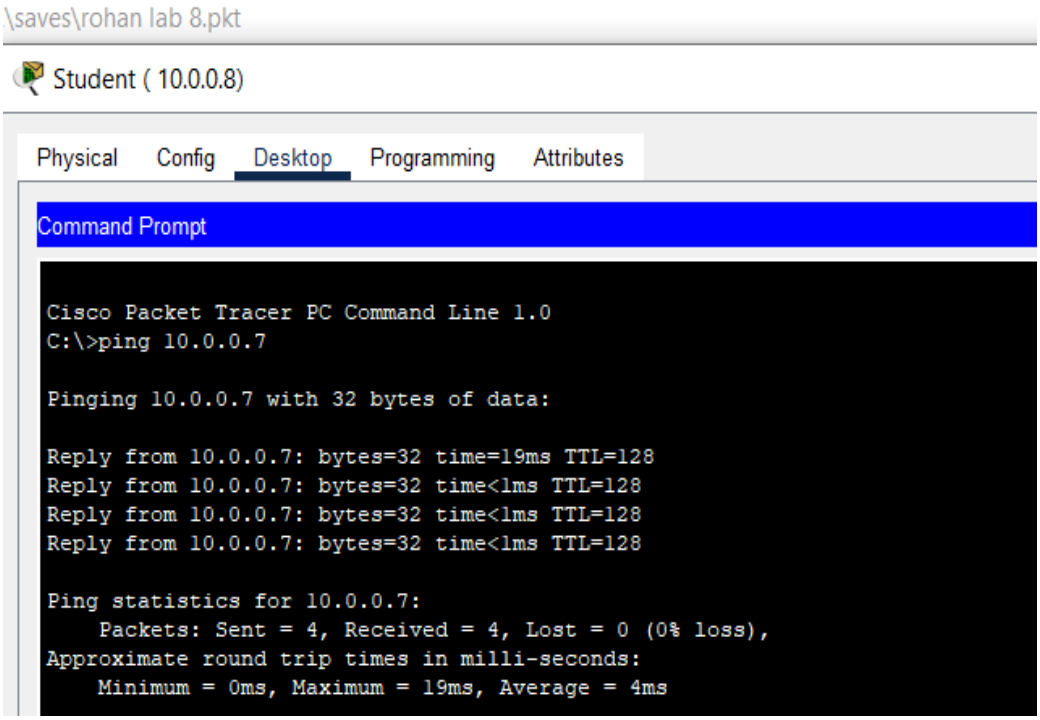


Fig Connectivity Between Student and Teacher



Connectivity between Student and Student

Addressing Table.

The addressing table of the VLAN is as follows:

Device	Interface	IPv4 Address	Subnet	Switch Port	VLAN No	VLAN Name	Link
PC1	NIC	10.0.0.8	255.0.0.0	Fa0/2	7	Student	Access
PC2	NIC	192.168.11.1	255.255.255.0	Fa0/1	17	Teacher	Access
PC3	NIC	10.0.0.7	255.0.0.0	Fa0/2	7	Student	Access
PC4	NIC	192.168.11.2	255.255.255.0	Fa0/1	17	Teacher	Access

Conclusion:

In this lab, we successfully configured inter-switch communication using VLANs and trunking in Cisco Packet Tracer. Separate VLANs were created for students (VLAN 7) and teachers (VLAN 17) on both switches, and the respective PC ports were assigned to their VLANs. Trunk links were configured on the inter-switch ports with matching native VLANs and identical allowed VLAN lists to ensure proper VLAN tagging and forwarding across the switches. By resolving the native VLAN mismatch and ensuring consistent configurations on both devices, hosts in the same VLAN but on different switches were able to communicate successfully, confirming the correct implementation of VLAN segmentation and trunking.