

Network Configuration Documentation: VLANs and DHCP Setup

Project Overview

This documentation demonstrates the design, configuration, and functionality of a small enterprise network implementing VLANs (Virtual Local Area Networks) and DHCP (Dynamic Host Configuration Protocol) using Cisco Packet Tracer. The network showcases fundamental networking concepts including network segmentation, inter-VLAN routing, and automated IP address management.

1. Network Design Overview

1.1 Topology Architecture

The network consists of the following components:

Network Devices:

- **1x Router (Router0):** Cisco router configured for inter-VLAN routing (Router-on-a-Stick) and DHCP server functionality
- **1x Multilayer Switch (Switch0):** Cisco 2960 switch configured with multiple VLANs for network segmentation
- **6x End Devices (PC-PT):** Client computers distributed across different VLANs

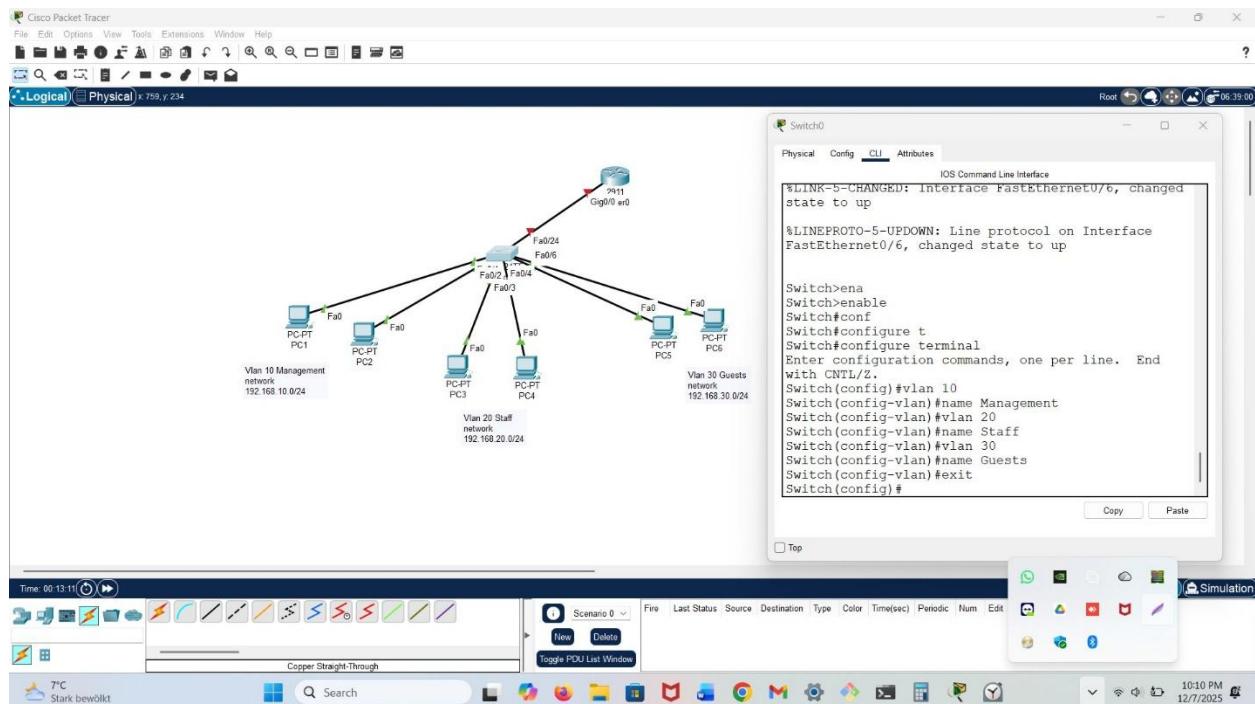
Network Segments: The network is divided into three logical VLANs to separate traffic based on organizational departments:

VLAN ID	VLAN Name	Network Address	Subnet Mask	Default Gateway	Connected Devices
VLAN 10	Management	192.168.10.0/24	255.255.255.0	192.168.10.1	PC1, PC2
VLAN 20	Staff	192.168.20.0/24	255.255.255.0	192.168.20.1	PC3, PC4
VLAN 30	Guests	192.168.30.0/24	255.255.255.0	192.168.30.1	PC5, PC6

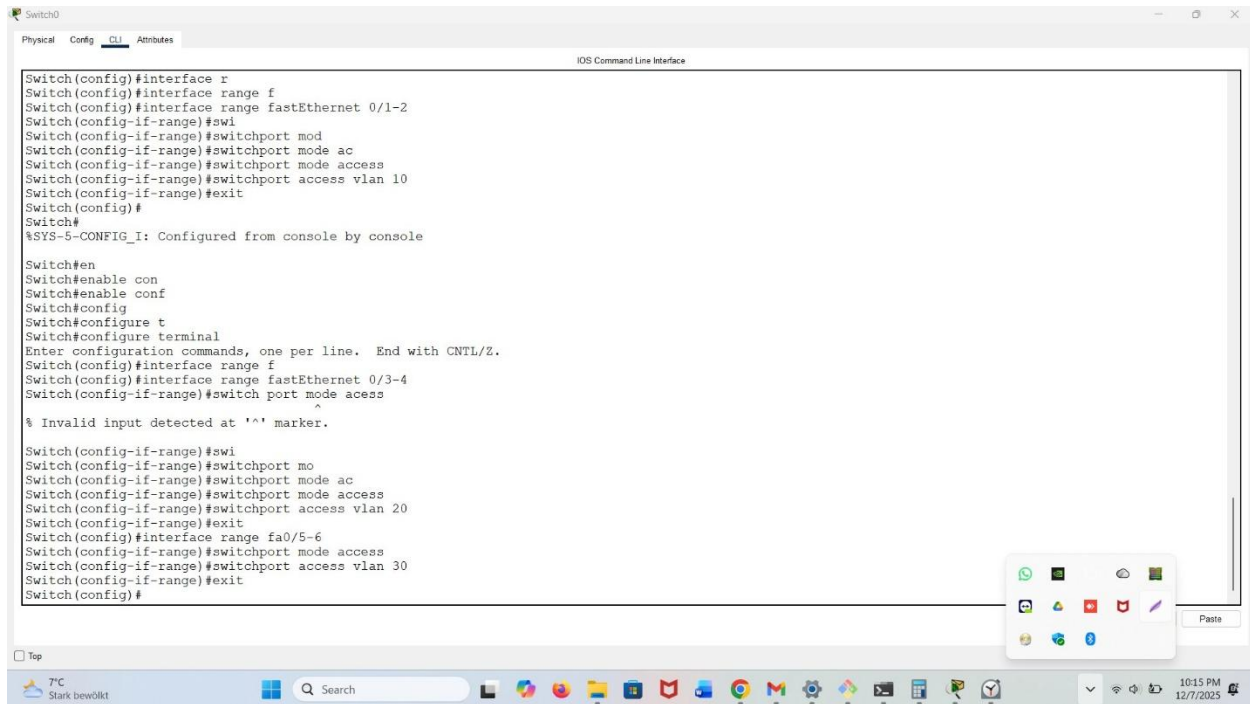
1.2 Design Rationale

- **VLAN Segmentation:** Separates network traffic for security, performance optimization, and logical organization
- **DHCP Implementation:** Automates IP address assignment, reducing administrative overhead and configuration errors
- **Router-on-a-Stick:** Enables inter-VLAN communication through a single physical router interface using subinterfaces

1. Create VLANs, First I Create vlan in my switch



2. Assign ports to VLANs via My switch



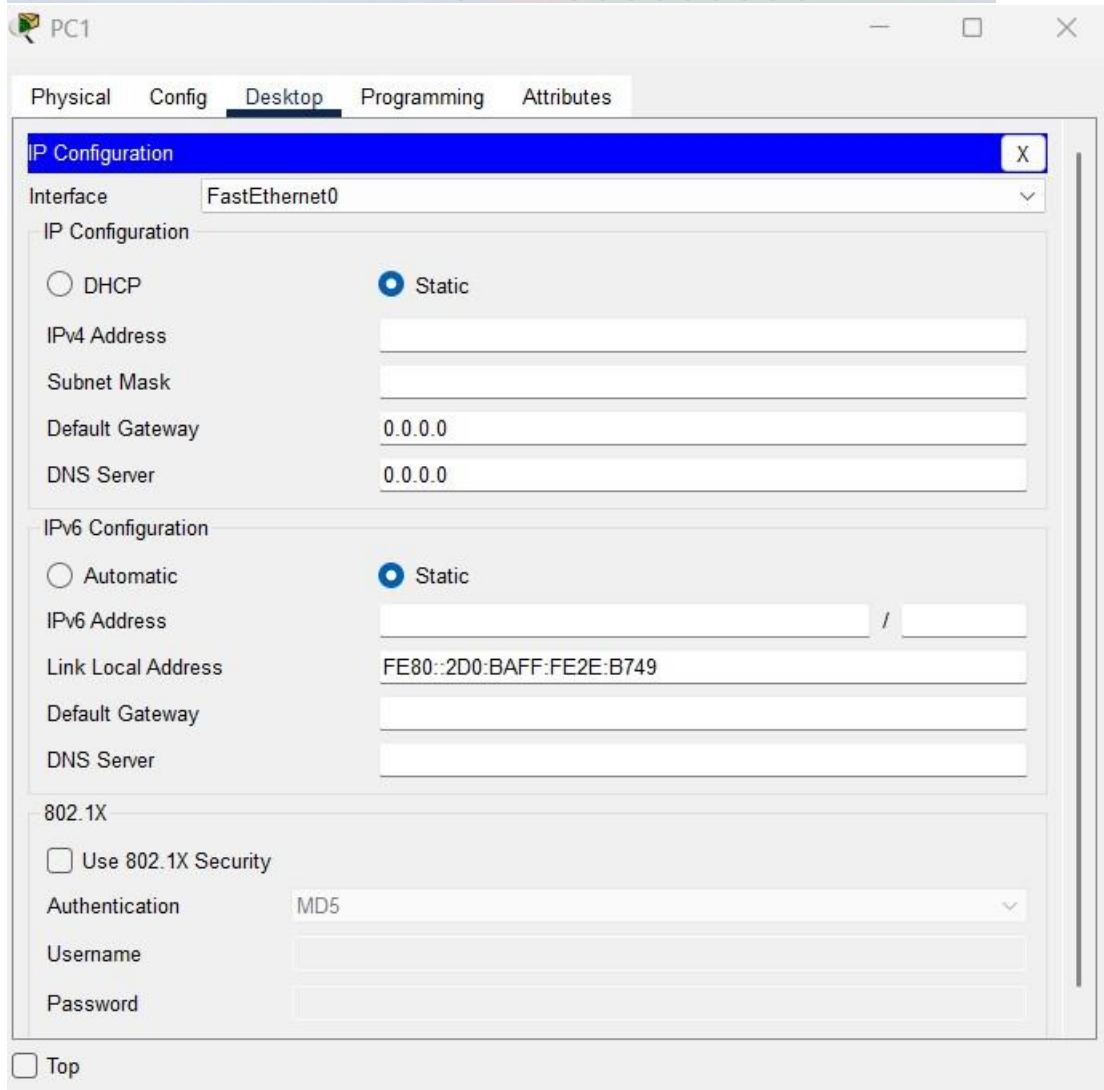
```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

Switch(config)#interface r
Switch(config)#interface range f
Switch(config)#interface range fastEthernet 0/1-2
Switch(config-if-range)#swl
Switch(config-if-range)#switchport mod
Switch(config-if-range)#switchport mode ac
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#en
Switch#enable con
Switch#enable conf
Switch#config
Switch#configure t
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface range f
Switch(config)#interface range fastEthernet 0/3-4
Switch(config-if-range)#switch port mode access
Switch(config-if-range)#swl
Switch(config-if-range)#switchport mo
Switch(config-if-range)#switchport mode ac
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#interface range fa0/5-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
Switch(config-if-range)#exit
Switch(config)#
```

3. Configure Router-on-a-Stick (Inter-VLAN Routing),

3.1 Create subinterfaces for VLANs



Cisco Packet Tracer

ABULLAHI NADR MOHAMED

CCNA LAB VLAN's and DHCP

PC1

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful

IPv4 Address 192.168.10.11

Subnet Mask 255.255.255.0

Default Gateway 192.168.10.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80:200:BAFF:FE2E:B749

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

Top

Time: 01:15:00

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit De

New Delete

Toggle POUI List Window

Copper Straight-Through

7°C Bewölkt

Search

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Cisco Packet Tracer

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CCNA LAB VLAN's and DHCP

PC3

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful

IPv4 Address 192.168.20.11

Subnet Mask 255.255.255.0

Default Gateway 192.168.20.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80:201:43FF:FE15:B734

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

Top

Time: 01:17:20

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit De

New Delete

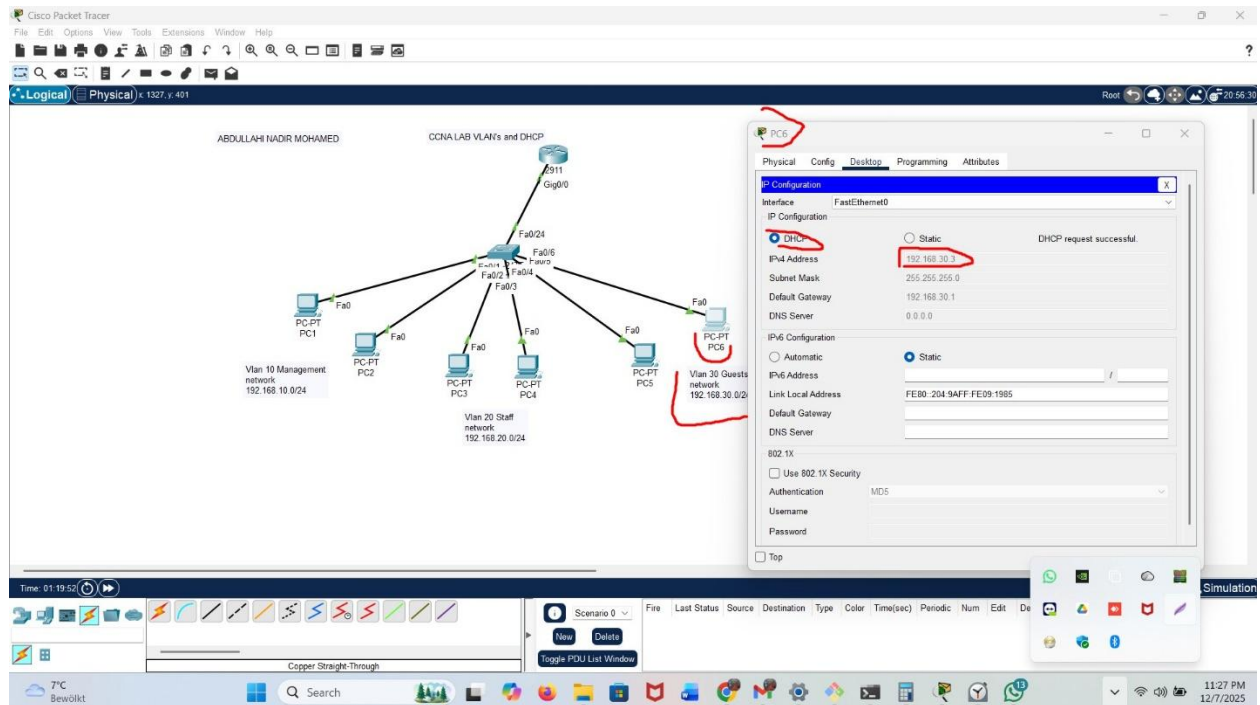
Toggle POUI List Window

Copper Straight-Through

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Search

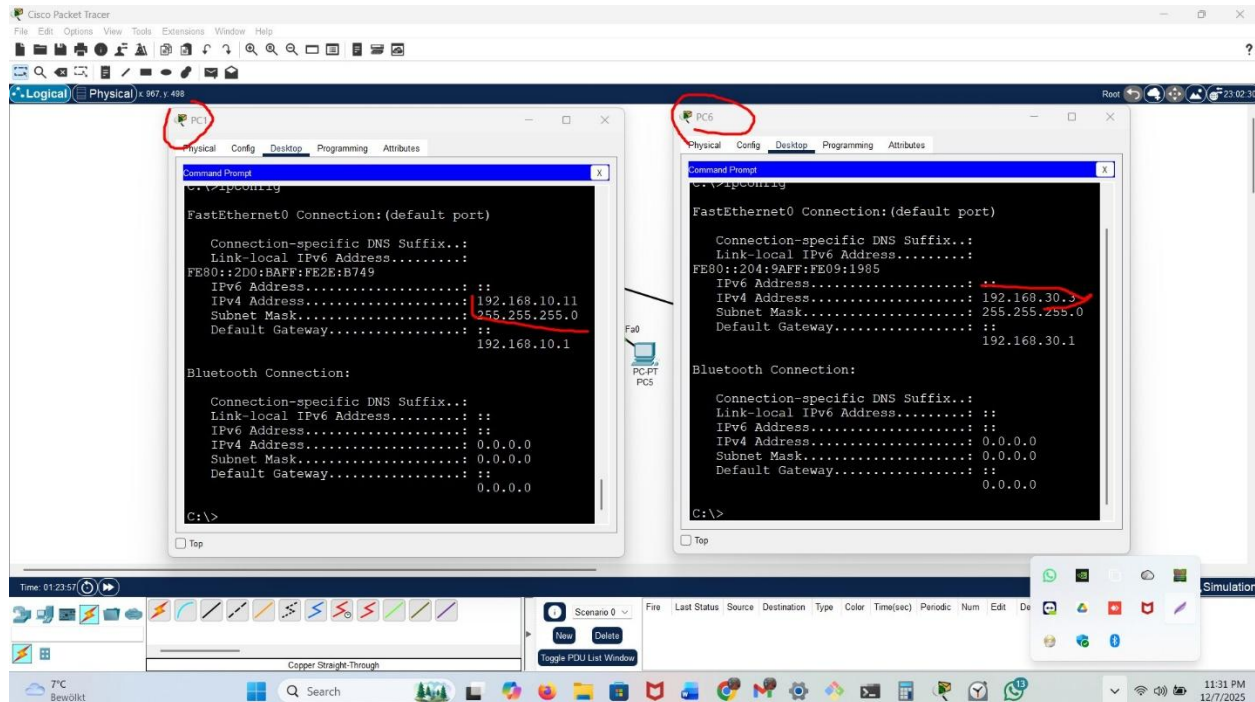
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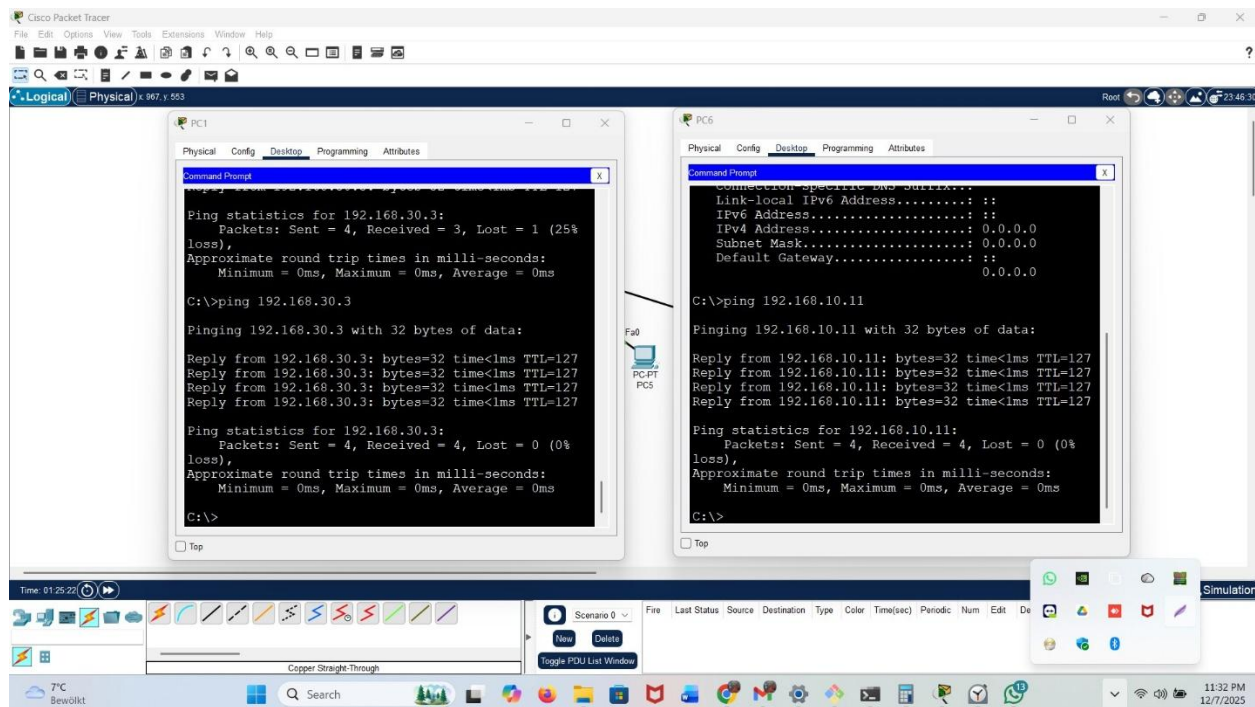


All the above steps when we going our devices (pc) enable DHCP automatically the device getting ipaddress from router as DHCP server.

This the last stage we make a testing our network using ping and simulation stage and you will see what's going on the process as screenshot in my pc.

As you see the below screenshot is pc1 and pc 6 to check their ipaddresses also there are different vlans, pc1 is vlan10 it's a management team while pc6 vlan30 and he's Guess Team.

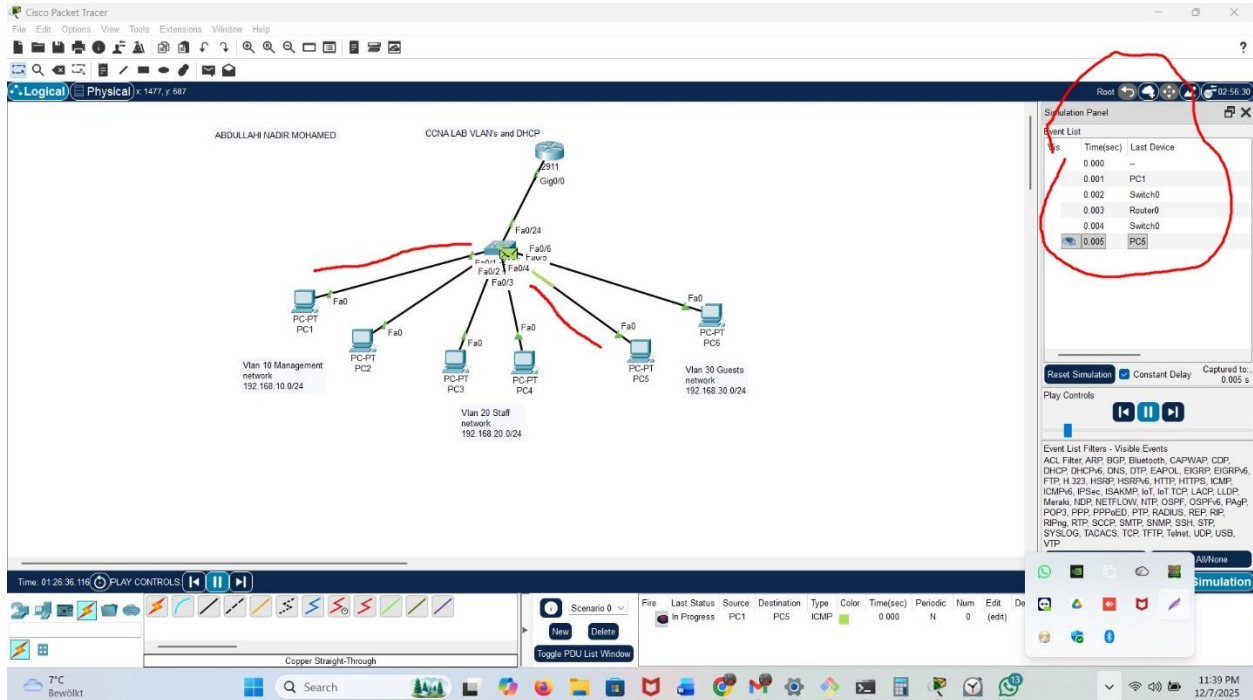




As you see the above screenshot we can see our ping success as we think, **pc1** from **vlan10** he can apply to ping **pc6** from **vlan30** Guess Team.

The below image shows when I ping pc1 to pc5 via the switch and router the packet going directly the destination.

So the source is pc1 from vlan10 management to our destination pc5 and you can see the simulation panel the stages.



The screenshot displays a network simulation environment. On the left, a topology view shows a PC-PT (PC6) connected to a switch (Fa0). Below this, a text box indicates "Vlan 30 Guests network 192.168.30.0/24".

On the right, the "Simulation Panel" is open, featuring an "Event List" table and "Play Controls".

Vis.	Time(sec)	Last Device
	0.003	Router0
	0.004	Switch0
	0.005	PC5
	0.006	Switch0
	0.007	Router0
	0.008	Switch0
	1.992	--
👁	1.993	--
👁	1.993	Switch0
👁	1.993	Switch0
👁	1.993	Switch0
👁	1.993	--

Below the event list, there are buttons for "Reset Simulation", "Constant Delay" (checked), and "Captured to: 1.993 s".

The "Play Controls" section includes a progress bar and three buttons: a left arrow, a play button, and a right arrow.

At the bottom, the "Event List Filters - Visible Events" list includes various protocols like ACL Filter, ARP, BGP, Bluetooth, CAPWAP, CDP, DHCP, DHCPv6, DNS, DTP, EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, IoT, IoT TCP, LACP, LLDP, Meraki, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PPPoE, PTP, RADIUS, REP, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, and VTP.

At the bottom of the interface, a table shows the status of a packet:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	De
🔥	Successful	PC1	PC5	ICMP	🟢	0.000	N	0	(edit)	

A red line is drawn across the bottom of the packet status table.

The maker you see will show the success our packet source ICMP pc1 to to destination PC5 successful.

