

Lab Assignment-01

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Use Cisco Packet Tracer

1. Design of Topology using network devices.

Bus Topology:

Bus Topology (3 Switches + 3 PCs) – Packet Tracer Guide

Devices & IP Plan:

Device	Connection	IP Address	Subnet Mask
PC0	Switch0 Fa0/1	10.10.10.1	255.255.255.0
PC1	Switch1 Fa0/1	10.10.10.2	255.255.255.0
PC2	Switch2 Fa0/1	10.10.10.3	255.255.255.0

All in VLAN 1, no router needed.

1. Place Devices

1. Open **File** → **New**.
2. From **End Devices**, drag 3 × PC-PT → rename PC0, PC1, PC2.
3. From **Switches**, drag 3 × 2950-24 (or 2960) → rename Switch0, Switch1, Switch2.
4. Arrange: Switch0 (left), Switch1 (center), Switch2 (right). Place each PC near its switch.

2. Cable Connections

PC → Switch (Straight-through):

- PC0 FastEthernet ↔ Switch0 Fa0/1
- PC1 FastEthernet ↔ Switch1 Fa0/1

- PC2 FastEthernet ↔ Switch2 Fa0/1

Switch → Switch (Crossover or Auto):

- Switch0 Fa0/24 ↔ Switch1 Fa0/24
- Switch1 Fa0/23 ↔ Switch2 Fa0/24

Links turn green when active.

3. Configure PC IPs

For each PC:

Desktop → IP Configuration → Enter:

- **PC0:** 10.10.10.1, Mask 255.255.255.0, Gateway blank
- **PC1:** 10.10.10.2, Mask 255.255.255.0, Gateway blank
- **PC2:** 10.10.10.3, Mask 255.255.255.0, Gateway blank

4. (Optional) Switch Management IPs

Example – Switch0:

enable

configure terminal

hostname Switch0

interface vlan 1

ip address 10.10.10.10 255.255.255.0

no shutdown

exit

interface fa0/1

description Connected_to_PC0

switchport mode access

no shutdown

exit

```
interface fa0/24
description To_Switch1
no shutdown
end
write memory
```

5. Verification

From PC0 Command Prompt:

```
ping 10.10.10.2
```

```
ping 10.10.10.3
```

From Switch CLI:

```
show interface status
```

```
show mac address-table
```

```
show vlan brief
```

```
show cdp neighbors
```

6. Troubleshooting

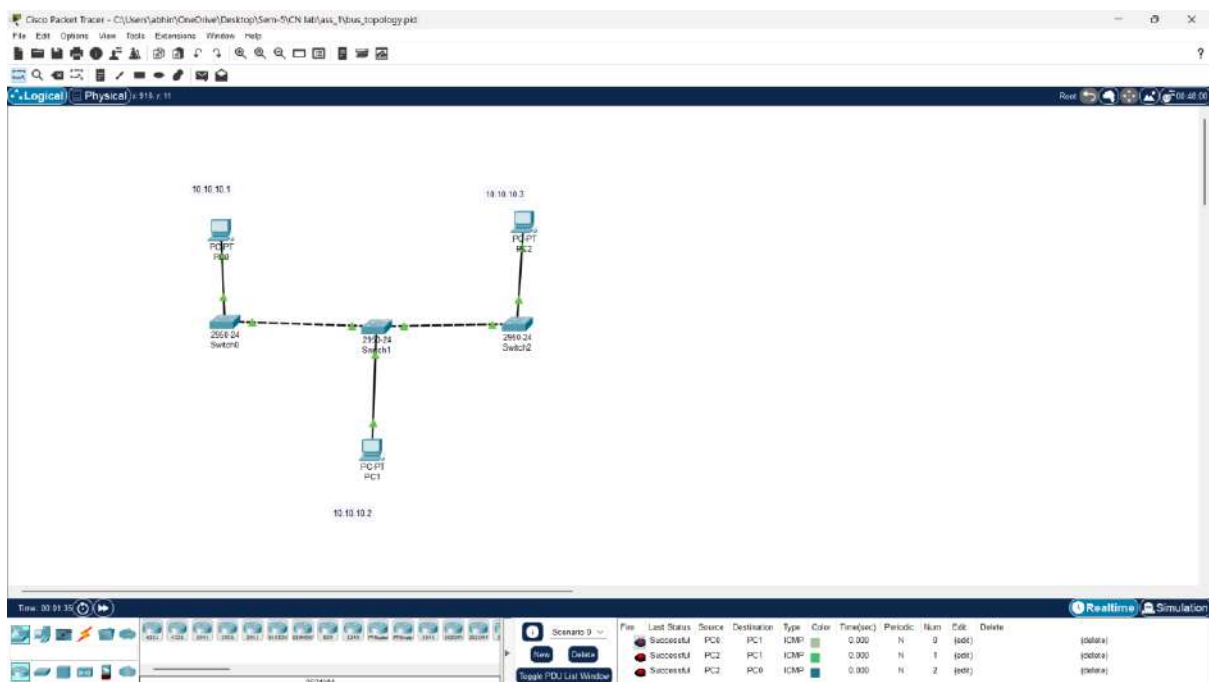
- Check LEDs (green = active).
 - Ensure all IPs are in **10.10.10.x /24**.
 - If port down: interface fa0/x → no shutdown.
 - For VLAN mismatch: switchport access vlan 1.
 - Check MAC table: show mac address-table.
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7. Save Project

- **File → Save** in Packet Tracer
 - write memory in switch CLI
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Quick Steps Recap:

1. Add 3 PCs, 3 switches.
2. Connect PCs to switches (straight-through).
3. Connect switches to each other (crossover/auto).
4. Assign PC IPs (10.10.10.1–3 /24).
5. (Optional) Assign switch VLAN1 IPs.
6. Ping to test.
7. Save work.



Mesh Topology:

Step 1: Launch Cisco Packet Tracer

1. Open Cisco Packet Tracer on your computer
2. Create a new blank project

Step 2: Add Multiple PCs

1. In the bottom-left device selection panel, click on "End Devices"
2. Select the "Generic PC" icon
3. Instead of placing PCs one by one, we'll use the "Place Multiple Devices" feature:

- Right-click on the workspace and select "Place Multiple Devices"
- In the dialog box that appears:
 - Select "PC" as the device type
 - Enter the number of PCs you want (e.g., 700)
 - Choose either a linear or grid arrangement
 - Click "OK"

Step 3: Rename the PCs

1. To rename PCs in bulk:
 - Select all PCs you want to rename (click and drag or Ctrl+A)
 - Right-click and select "Edit Attributes"
 - In the "Display Name" field, enter "PC" as the base name
 - Check the "Increment" option and set the starting number
 - Click "OK" to apply

Step 4: Add a Switch (Optional)

If you want to connect these PCs to a network:

1. From the device selection panel, choose "Switches"
2. Select an appropriate switch (like a 2960 for small networks or a larger one for many devices)
3. Place the switch on the workspace

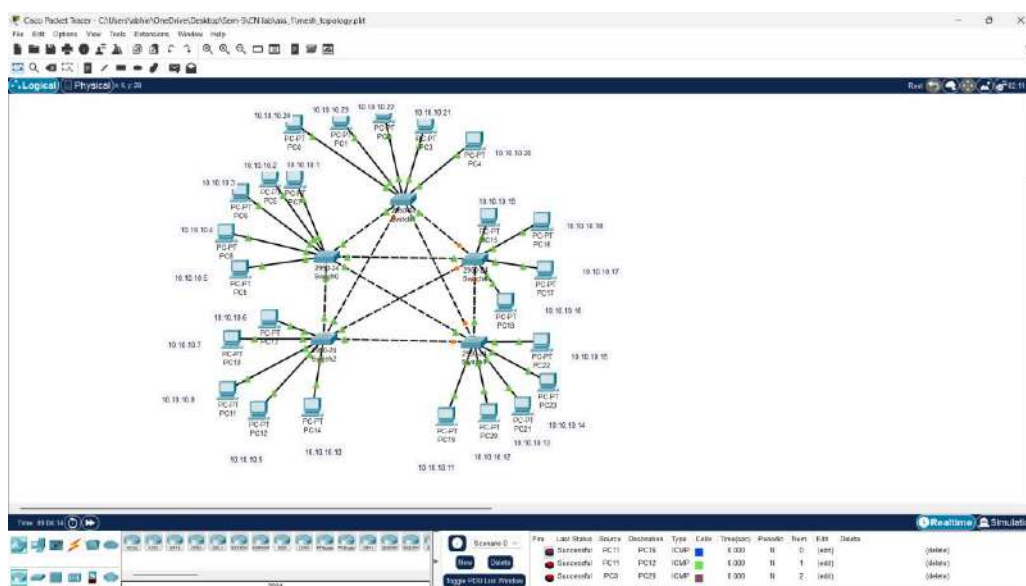
Step 5: Connect PCs to the Switch

1. Select the "Connections" tool from the left panel
2. Choose "Copper Straight-Through" cable
3. Connect each PC to the switch:
 - Click on a PC, select the FastEthernet0 port
 - Click on the switch, select an available port
 - Repeat for all PCs (this will be time-consuming for 700 PCs)

Step 6: Configure IP Addresses (Optional)

To assign IP addresses in bulk:

1. Select all PCs
2. Right-click and choose "Edit Attributes"
3. Navigate to the "Desktop" tab > "IP Configuration"
4. Set the base IP address (e.g., 192.168.1.1)
5. Enable the increment option for the last octet
6. Set the subnet mask (e.g., 255.255.255.0)
7. Click "OK"



Star Topology:

1. Place Devices

1. **File** → **New** in Packet Tracer.
2. From **End Devices**: drag 6 × **PC-PT**. Rename PC1–PC6.
3. From **Switches**: drag 1 × **2960** (or generic switch). Rename Switch0.
4. Arrange PCs around the switch.

2. Connect Devices

- **Tool:** Connections → Copper **Straight-Through** (PC↔Switch).

- Connect PC1–PC6 to **Switch0** using Fa0/1–Fa0/6.
 - Green LEDs = link up.
-

3. Configure PC IPs

For each PC: **Desktop** → **IP Configuration** → enter:

PC	IP Address	Subnet Mask	Gateway (blank)
----	------------	-------------	-----------------

PC1	10.10.10.1	255.255.255.0	
-----	------------	---------------	--

PC2	10.10.10.2	255.255.255.0	
-----	------------	---------------	--

PC3	10.10.10.3	255.255.255.0	
-----	------------	---------------	--

PC4	10.10.10.4	255.255.255.0	
-----	------------	---------------	--

PC5	10.10.10.5	255.255.255.0	
-----	------------	---------------	--

PC6	10.10.10.6	255.255.255.0	
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4. (Optional) Basic Switch Setup

Switch works at L2 by default — config below adds management IP & access ports.

CLI Script:

```
enable
configure terminal
hostname Switch0
interface range fa0/1 - 6
description Connected_to_PCs
switchport mode access
switchport access vlan 1
no shutdown
exit
```

interface vlan 1

ip address 10.10.10.254 255.255.255.0

no shutdown

exit

end

write memory

- Management IP **10.10.10.254** lets you ping/manage switch from PCs.
 - Skip ip default-gateway unless adding a router.
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5. Verify Connectivity

From PC:

ping 10.10.10.2

ping 10.10.10.6

From Switch:

show interface status

show mac address-table

show vlan brief

Optional: Switch to *Simulation Mode* → send ping → watch ARP & ICMP frames.

6. Troubleshooting

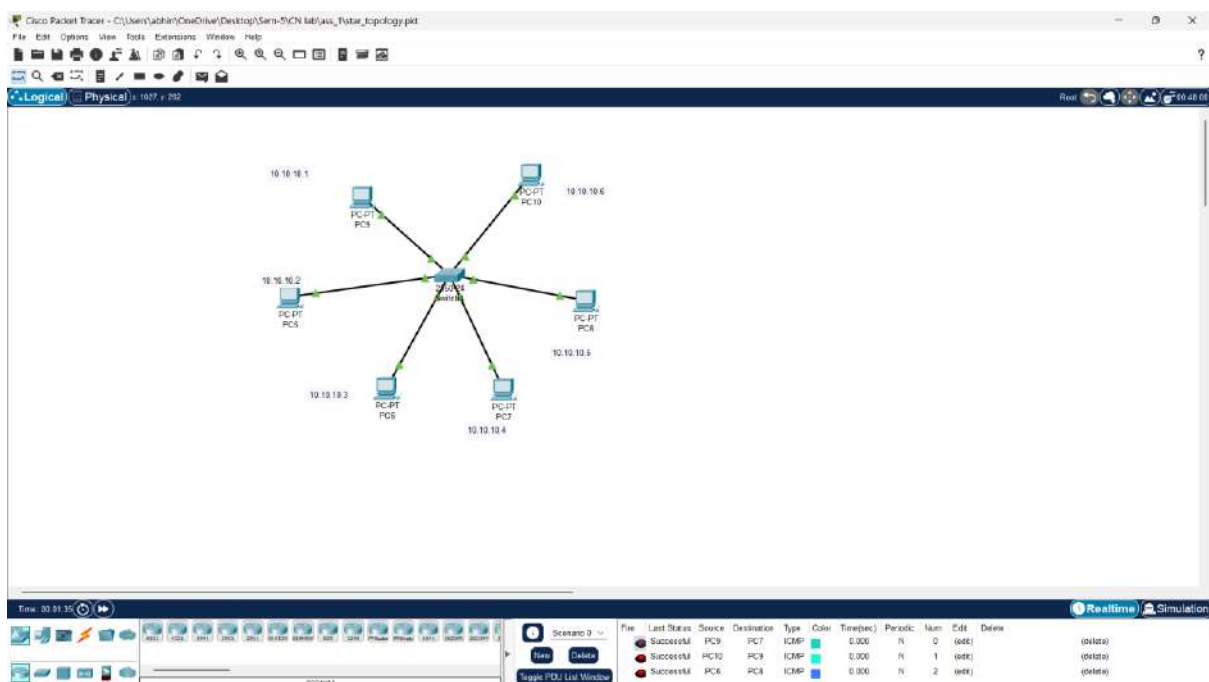
- **LEDs:** Green = up; red/orange = check cable/port.
- **IPs:** Same subnet (10.10.10.x /24), no duplicates.
- **Ports:** If down:
interface fa0/x → no shutdown.
- **VLANs:** Keep all in VLAN 1 (default).
- **MAC table:** show mac address-table should list PCs' MACs.

7. Save

- **Packet Tracer:** File → Save.
 - **Switch CLI:** write memory.
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Quick Checklist (copy this):

1. Add 6 PCs, 1 switch.
2. Straight-through cables PC→Switch.
3. Assign IPs 10.10.10.1–6 /24.
4. (Optional) Switch mgmt IP = 10.10.10.254.
5. Ping to verify.
6. Save project.



2. Design and Configuring LAN and VLAN

LAN:

LAN with Router & 2 Switches – Quick Build Guide

Goal:

Router connects two LANs:

- **Left LAN:** 10.10.10.0/24 (PC4, PC5, SwitchLeft)
 - **Right LAN:** 192.168.11.0/24 (PC6, PC7, SwitchRight)
- Router routes between both subnets.
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1. Device List

- **Router:** ISR4331 / 2911 / any with ≥ 2 Gigabit ports.
 - **Switches:** 2960 ($\times 2$).
 - **PCs:** PC-PT $\times 4$.
 - **Cables:** Copper Straight-Through.
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2. Topology & Wiring**1. Placement**

Router at center-top, SwitchLeft on left, SwitchRight on right, PCs below switches.

2. Connections

- Router G0/0 \rightarrow SwitchLeft Gi0/1
 - Router G0/1 \rightarrow SwitchRight Gi0/1
 - SwitchLeft Fa0/1 \rightarrow PC4 Fa0
 - SwitchLeft Fa0/2 \rightarrow PC5 Fa0
 - SwitchRight Fa0/1 \rightarrow PC6 Fa0
 - SwitchRight Fa0/2 \rightarrow PC7 Fa0
-

3. PC IP Configuration

(Desktop \rightarrow IP Configuration)

Left LAN

PC	IP Address	Mask	Gateway
PC4	10.10.10.1	255.255.255.0	10.10.10.3
PC5	10.10.10.2	255.255.255.0	10.10.10.3

Right LAN

PC	IP Address	Mask	Gateway
PC6	192.168.11.1	255.255.255.0	192.168.11.3
PC7	192.168.11.2	255.255.255.0	192.168.11.3

4. Router Configuration (Router2)

(CLI – copy/paste)

enable

configure terminal

hostname Router2

! Left LAN

interface g0/0

description Link-to-SwitchLeft

ip address 10.10.10.3 255.255.255.0

no shutdown

exit

! Right LAN

interface g0/1

description Link-to-SwitchRight

ip address 192.168.11.3 255.255.255.0

no shutdown

exit

end

copy running-config startup-config

Note: Routers have IP routing enabled by default.

5. Switch Configuration

SwitchLeft

pgsql

Copy code

enable

configure terminal

hostname SwitchLeft

no ip domain-lookup

! Access ports for PCs

interface range fa0/1 - 2

switchport mode access

switchport access vlan 1

spanning-tree portfast

exit

! Uplink to Router

interface gi0/1

switchport mode access

switchport access vlan 1

description Uplink-to-Router2-G0/0

no shutdown

exit

end

copy running-config startup-config

SwitchRight (same, change hostname & uplink description to match Router2 G0/1)

6. Verification Commands

Router

show ip interface brief

show ip route

ping 10.10.10.1

ping 192.168.11.1

PCs (Desktop → Command Prompt)

ping <own gateway>

ping <PC on other LAN>

Switch

sql

show vlan brief

show mac address-table

7. Troubleshooting Checklist

- **Interface down?** no shutdown on router; check cable & port.
- **PC can't ping gateway?** Verify IP/mask/gateway, link LED, VLAN 1 config.
- **No inter-LAN ping?** Ensure both router interfaces are up/up; check show ip route.
- **MAC/ARP check:**
 - Router: show arp
 - PC: arp -a

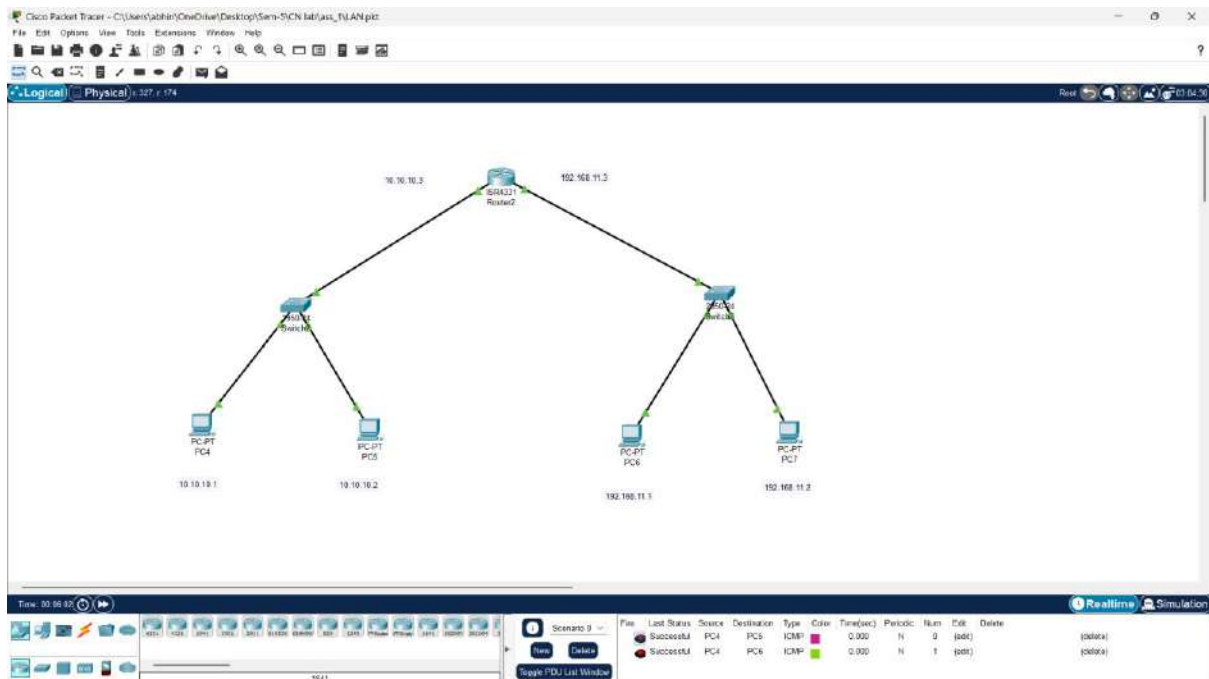
8. Optional Add-ons

- **DHCP** on a server or router for auto IP assignment.
- **Switch Management IP:**
 - interface vlan 1
 - ip address 10.10.10.10 255.255.255.0
 - no shutdown
 - ip default-gateway 10.10.10.3
- **Security:** Port security, ACLs.

Quick Build Summary

1. Place 1 Router, 2 Switches, 4 PCs.

2. Cable: PC→Switch (Fa), Switch→Router (Gi).
3. Assign PC IPs/gateways.
4. Configure router G0/0 & G0/1 IPs.
5. Set switch ports to access VLAN 1.
6. Test pings within LAN and across LANs.
7. Save configs (copy run start).



VLAN:

VLAN + Inter-VLAN Routing (Router-on-a-Stick)

1) Devices Needed

- Router (e.g., 2811 ISR) × 1
- Switch (2960) × 1
- PC-PT × 4
- Copper Straight-Through cables

2) Physical Topology & Cabling

- Switch Fa0/1 ↔ PC0 Fa0

- Switch Fa0/2 ↔ PC1 Fa0
 - Switch Fa0/3 ↔ PC2 Fa0
 - Switch Fa0/4 ↔ PC3 Fa0
 - Router Gi0/0 ↔ Switch Gi0/1 (*uplink trunk*)
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3) IP Addresses

VLAN 10 (Pink)

- PC0 → 10.10.10.1 / 255.255.255.0, GW 10.10.10.3
- PC1 → 10.10.10.2 / 255.255.255.0, GW 10.10.10.3

VLAN 11 (Yellow)

- PC2 → 192.168.11.1 / 255.255.255.0, GW 192.168.11.3
 - PC3 → 192.168.11.2 / 255.255.255.0, GW 192.168.11.3
-

4) Switch Config

enable

conf t

hostname Switch0

vlan 10

name PINK

vlan 11

name YELLOW

int range fa0/1-2

switchport mode access

switchport access vlan 10

spanning-tree portfast

```
int range fa0/3-4
  switchport mode access
  switchport access vlan 11
  spanning-tree portfast

int gi0/1
  switchport mode trunk
  switchport trunk allowed vlan 10,11
  no shutdown
end
wr
```

5) Router Config

```
enable
conf t
hostname Router2
int gi0/0
  no ip address
  no shutdown

int gi0/0.10
  encapsulation dot1Q 10
  ip address 10.10.10.3 255.255.255.0

int gi0/0.11
  encapsulation dot1Q 11
```


ip address 192.168.11.3 255.255.255.0

end

wr

6) Verification

- **Switch:**
show vlan brief → check ports in correct VLAN
show interfaces trunk → trunk active
 - **Router:**
show ip int brief → subinterfaces up
show ip route → both subnets present
 - **PC Ping Tests:**
 1. Ping gateway
 2. Ping same-VLAN peer
 3. Ping cross-VLAN peer
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7) Troubleshooting

- **Trunk down:** Check Gi0/1 mode & no shutdown.
 - **No gateway ping:** Check PC IP & VLAN assignment.
 - **Subinterface down:** Ensure physical int is no shutdown.
 - **Encapsulation errors:** Match VLAN ID between switch & router.
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Final Checklist

- Correct cabling
- VLANs created + ports assigned
- Trunk between switch & router
- Router subinterfaces (or L3 switch SVIs)

- PC gateways set
- Ping test passed

