

# **CSP450 NCC Project 1**

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## Project Overview

This project aims to configure a small local network using an Aruba 6300 switch and two Kali VMs. Each VM is placed on a different VLAN and assigned an IP address via DHCP. The primary objectives include enabling communication between VMs via SSH using key-based authentication, verifying DHCP assignments, confirming internet access, and capturing relevant network traffic with Wireshark.

## Key Definitions

### **VLANs (Virtual Local Area Networks)**

VLANs allow the division of a physical network into multiple virtual segments, treating each as an independent network. In this project, VLANs are used to separate and manage traffic between two distinct networks.

### **DHCP (Dynamic Host Configuration Protocol)**

DHCP is a protocol that automatically provides IP addresses to devices on a network. When a device connects, it is assigned an IP address from a predefined pool. In this project, specific IP address pools are configured for each VLAN.

### **IP Routes**

IP routes determine how data is forwarded across networks. In this setup, static routes are manually configured on each device to ensure traffic meant for other networks is sent in the correct direction.

### **SSH (Secure Shell)**

SSH is a protocol that allows users to securely access and control remote devices via the command line, as though they were working directly on the device.

# Subnet Calculation

## Base IP Range and Subnet Information

- Provided IP range: 172.16.X.X/16 - This is a private Class B network range that covers a large block of IPs (from 172.16.0.0 to 172.16.255.255).
- Custom Subnet Mask: /26 - This means subnet mask = 255.255.255.192, which allows:  
Total addresses: 64  
Usable addresses: 62 (excluding network address and broadcast address)

## Subnetting Logic

With a /26 subnet:

- Each subnet has 64 IP addresses
- The first address is the network address (not assignable to a host)
- The last address is the broadcast address (also not assignable)
- So, assignable IP range = middle 62 addresses

## Determining Each Student's VLAN IP Range

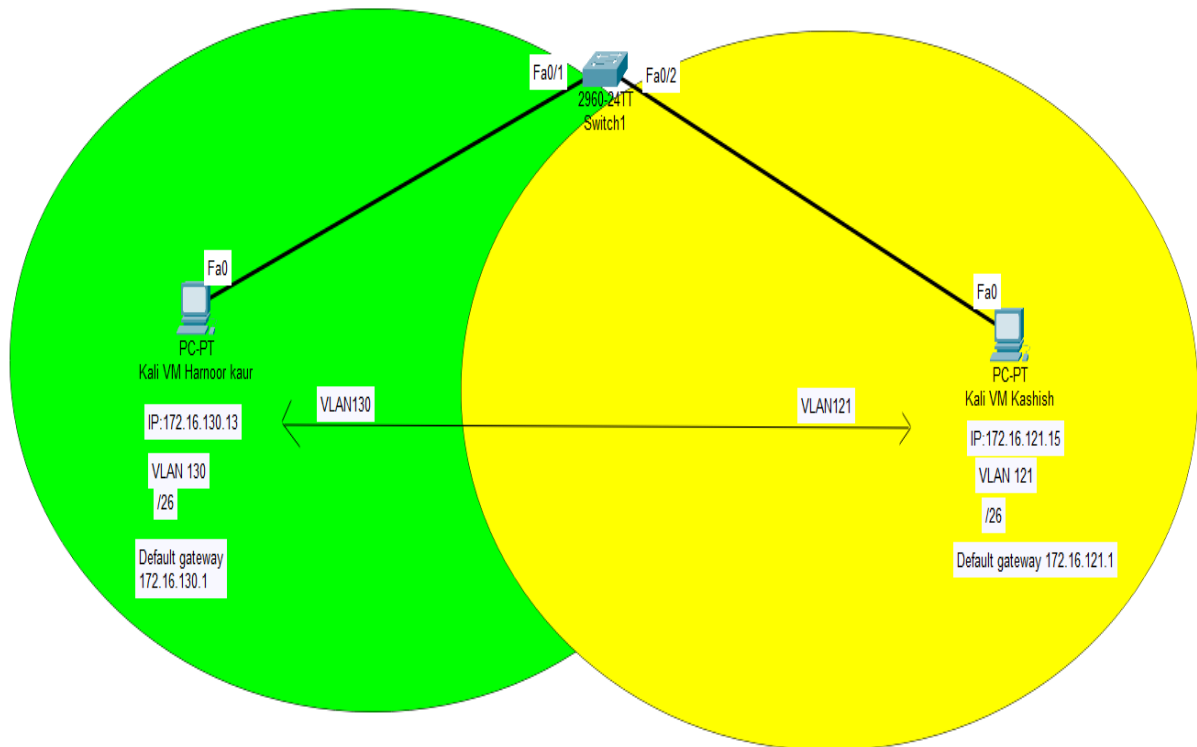
### Harnoor (Student A): VLAN 130

- Subnet: 172.16.130.0/26
  - Network address: 172.16.130.0
  - Broadcast address: 172.16.130.63
  - Usable IPs: 172.16.130.1 to 172.16.130.62
  - Gateway IP: Chosen as 172.16.130.1 (commonly the first usable IP)
  - Assigned IP: 172.16.130.13 (falls within the usable range)

### Kashish (Student B): VLAN 121

- Subnet: 172.16.121.0/26
  - Network address: 172.16.121.0
  - Broadcast address: 172.16.121.63
  - Usable IPs: 172.16.121.1 to 172.16.121.62
  - Gateway IP: 172.16.121.1
  - Assigned IP: 172.16.121.15

# Network Topology



# Implementation (Detailed)

## Step 1: Accessing the Switch

Access to the Aruba 6300 switch was established through the management port:

1. Connected Ethernet from management port to the host machine.
2. On the host PC, the correct **network adapter** (connected to the switch) was identified through the network settings.
3. The adapter's **IPv4 configuration** was manually set with the following:
  - **IP Address:** 10.10.10.22
  - **Subnet Mask:** 255.255.255.240
4. To access the switch, **SSH was launched using PuTTY**, and a connection was made to the switch's **management IP address:** 10.10.10.17.

## Step 2: VLAN Configuration

VLANs were configured to separate traffic from each VM:

vlan 130

vlan 121

Then, the physical interfaces were assigned to the corresponding VLANs:

interface 1/1/1

no shutdown

no routing

vlan access 130

interface 1/1/2

no shutdown

no routing

vlan access 121

## Step 3: DHCP Configuration

Each VLAN interface was assigned an IP address to serve as the gateway:

interface vlan 130

ip address 172.16.130.1/26

no shutdown

```
interface vlan 121
```

```
ip address 172.16.121.1/26
```

```
no shutdown
```

DHCP server was configured for both VLANs:

```
dhcp-server vrf default
```

```
pool pool1
```

```
range 172.16.130.2 172.16.130.20 prefix-len 26
```

```
default-router 172.16.130.1
```

```
exit
```

```
pool pool2
```

```
range 172.16.121.2 172.16.121.20 prefix-len 26
```

```
default-router 172.16.121.1
```

```
exit
```

```
enable
```

## Step 4: Confirmation on Clients

On both Kali VMs:

1. Set the network interface to DHCP (automatic).
2. Verified IP addresses using the `ip a` command:
  - Harnoor's VM: 172.16.130.13
  - Kashish's VM: 172.16.121.15
3. Used `ip route` to confirm default gateway routing.
4. Ensured one interface is bridged to the switch while another is set to NAT for internet access.

## Step 5: IP Routes and SSH Setup

1. **Routing:**
  - Verified routes were added by DHCP via `ip route`.
2. **SSH Configuration:**

- Installed SSH: `sudo apt install openssh-server`
- Created a new non-admin user.
- Generated SSH key-pairs using `ssh-keygen`
- Copied public keys using `ssh-copy-id`:
- `ssh-copy-id -i ~/.ssh/id_rsa.pub kashish121@172.16.121.15`
- `ssh-copy-id -i ~/.ssh/id_rsa.pub harnoor130@172.16.130.13`

### **Here is another way that we used to Generate an SSH Key on Kali Linux**

1. Open the terminal on your Kali Linux system.
2. Type **ssh-keygen -t rsa** and press Enter.
3. Press Enter to accept the default save location.
4. SSH key pair is now created and saved in the `.ssh` folder.
5. To view the public key, type **cat ~/.ssh/id\_rsa.pub**.
6. Copy the public key to share with the partner.
7. Send the public key (`id_rsa.pub`) to each other via email.
8. On both systems open the terminal.
9. Create the `.ssh` directory if it doesn't exist:

**mkdir -p ~/.ssh**

**chmod 700 ~/.ssh**

10. Open the `authorized_keys` file:

**nano ~/.ssh/authorized\_keys**

11. Paste the public key into the file, then save and exit.

12. Set the correct permissions:

**chmod 600 ~/.ssh/authorized\_keys**

13. Restart the SSH service (if needed):

**sudo systemctl restart ssh**



### 3. **Disable Root SSH Access:**

- Edited /etc/ssh/sshd\_config:
- PermitRootLogin no
- Restarted SSH service: `sudo systemctl restart ssh`

## Step 6: Testing the Network Configuration

### 1. **Ping Tests:**

- Successfully pinged partner VM and gateway.

### 2. **SSH Tests:**

- SSH from my VM to switch and partner's VM was successful using SSH keys.
- Attempted root SSH access was correctly denied.

### 3. **Wireshark Capture:**

- Captured all SSH requests/responses and confirmed packet exchange.

# Appendix A: Wireshark Captures

Harnoor's IP: 172.16.130.13

Kashish's IP: 172.16.121.15

Harnoor's VM → Switch 172.16.130.1

The screenshot shows a Kali Linux VM running in VMware Workstation. The terminal window displays the following commands and output:

```
harnoor130@kali:~$ sudo ip link set eth0 up
harnoor130@kali:~$ sudo ip link set eth1 down
harnoor130@kali:~$ ping 172.16.121.15
PING 172.16.121.15 (172.16.121.15) 56(84) bytes of data:
64 bytes from 172.16.121.15: icmp_seq=1 ttl=63 time=0.8 ms
64 bytes from 172.16.121.15: icmp_seq=2 ttl=63 time=1.10 ms
64 bytes from 172.16.121.15: icmp_seq=3 ttl=63 time=1.10 ms
64 bytes from 172.16.121.15: icmp_seq=4 ttl=63 time=1.78 ms
64 bytes from 172.16.121.15: icmp_seq=5 ttl=63 time=1.14 ms
64 bytes from 172.16.121.15: icmp_seq=6 ttl=63 time=1.56 ms
64 bytes from 172.16.121.15: icmp_seq=7 ttl=63 time=1.16 ms
64 bytes from 172.16.121.15: icmp_seq=8 ttl=63 time=1.72 ms
64 bytes from 172.16.121.15: icmp_seq=9 ttl=63 time=1.77 ms
64 bytes from 172.16.121.15: icmp_seq=10 ttl=63 time=2.22 ms
^C
--- 172.16.121.15 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9017ms
rtt min/avg/max/mdev = 1.184/3.033/16.765/4.591 ms
harnoor130@kali:~$
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student@172.16.130.1's password:
Last login: 2025-05-29 23:04:36 from 172.16.121.15
User 'student' has logged in 62 times in the past 30 days
c390c
```

The Wireshark packet capture shows traffic on the eth0 interface. The capture filter is 'eth0:live capture in progress'. The packet list shows various protocols including Spanning Tree Protocol, TCP, SSHv2, and SSHv1. The packet details pane shows the structure of the captured packets, including Ethernet II, Internet Protocol Version 4, and Hypertext Transfer Protocol.

Kashish's VM → Switch 172.16.121.1

The screenshot shows a Kali Linux VM running in VMware Workstation. The terminal window displays the following commands and output:

```
kashish121@kali:~$
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student@172.16.121.1's password:
client_input_hostkeys: hostkeys.foreach failed for /home/kashish121/.ssh/known_hosts: Permission denied
Last login: 2025-05-29 22:51:49 from 172.16.121.15
User 'student' has logged in 61 times in the past 30 days
c390c
```

The Wireshark packet capture shows traffic on the eth0 interface. The capture filter is 'eth0:live capture in progress'. The packet list shows various protocols including Spanning Tree Protocol, TCP, SSHv2, and SSHv1. The packet details pane shows the structure of the captured packets, including Ethernet II, Internet Protocol Version 4, and Hypertext Transfer Protocol.

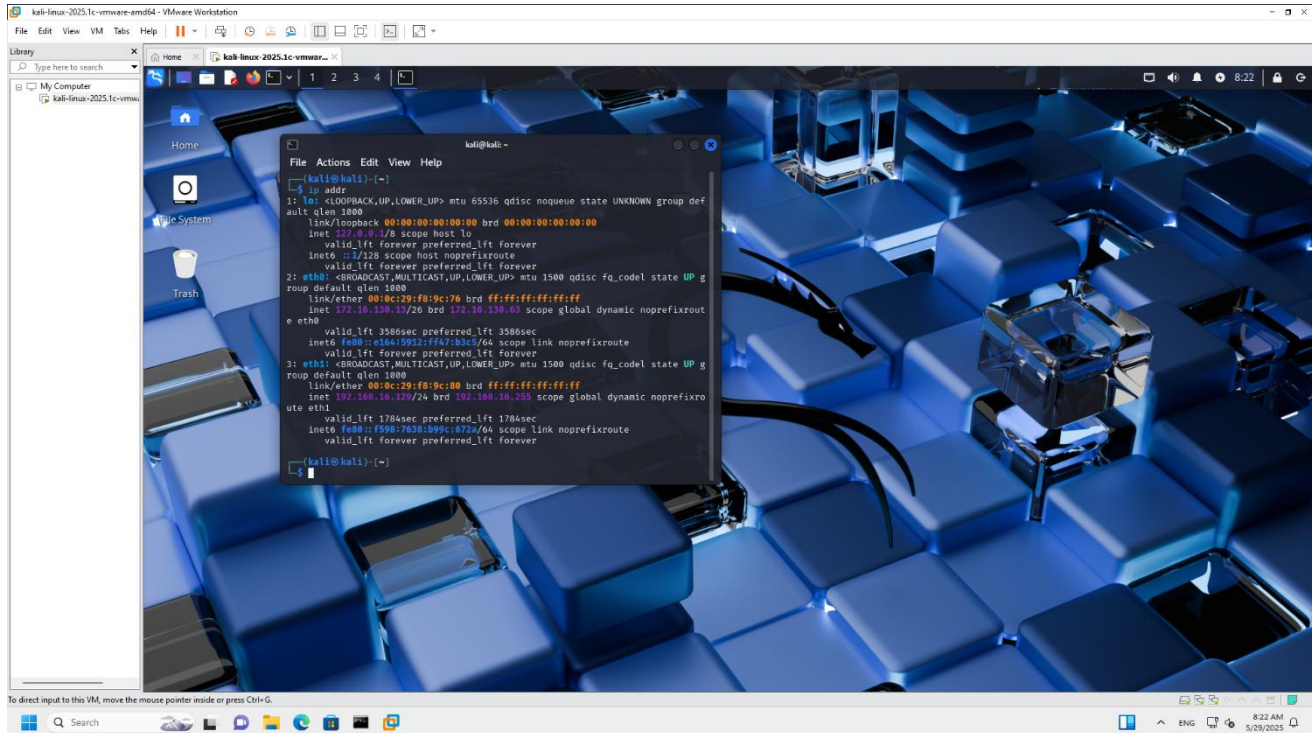




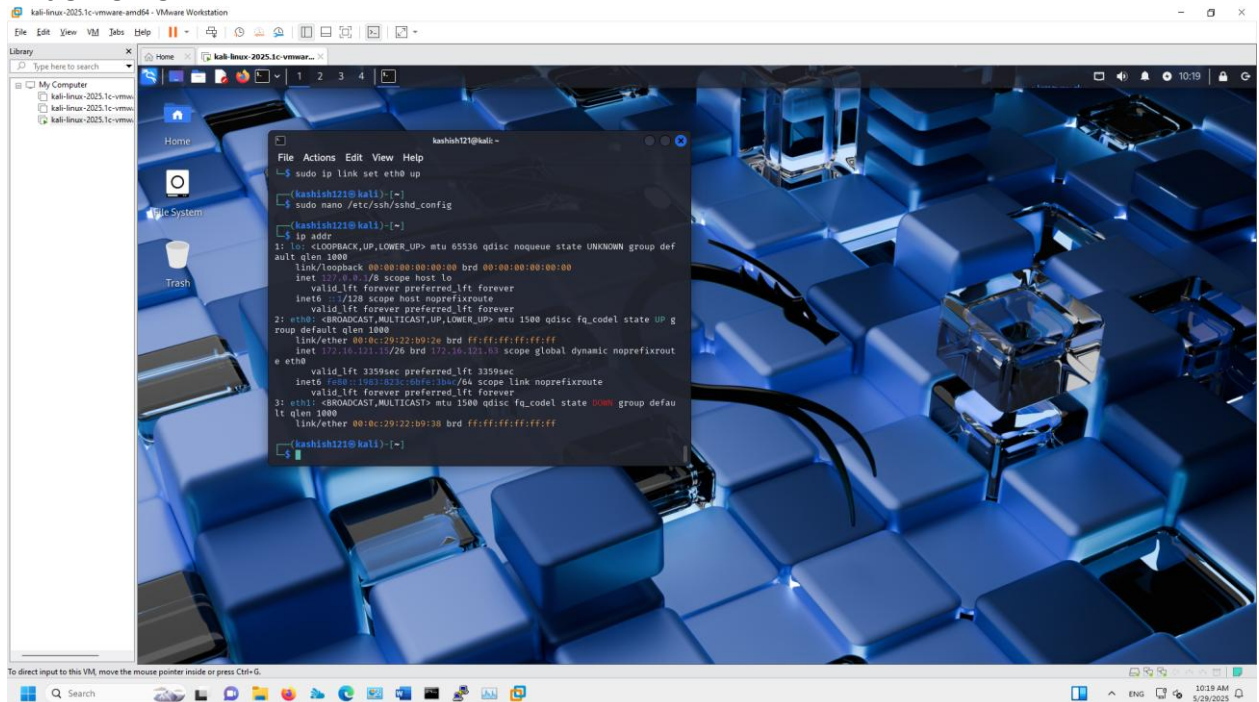
# Appendix B: Commands on VMs

## Terminal command 'ip a'

### Harnoor's VM

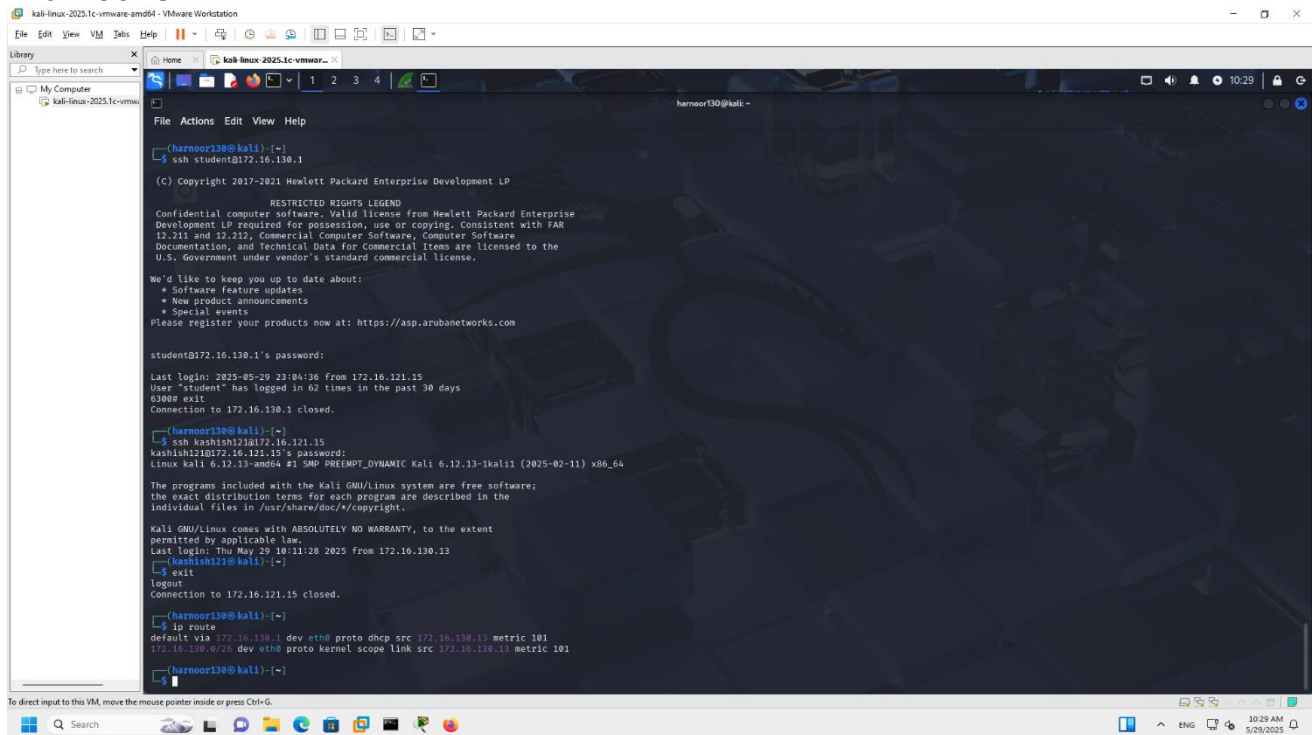


### Kashish's VM

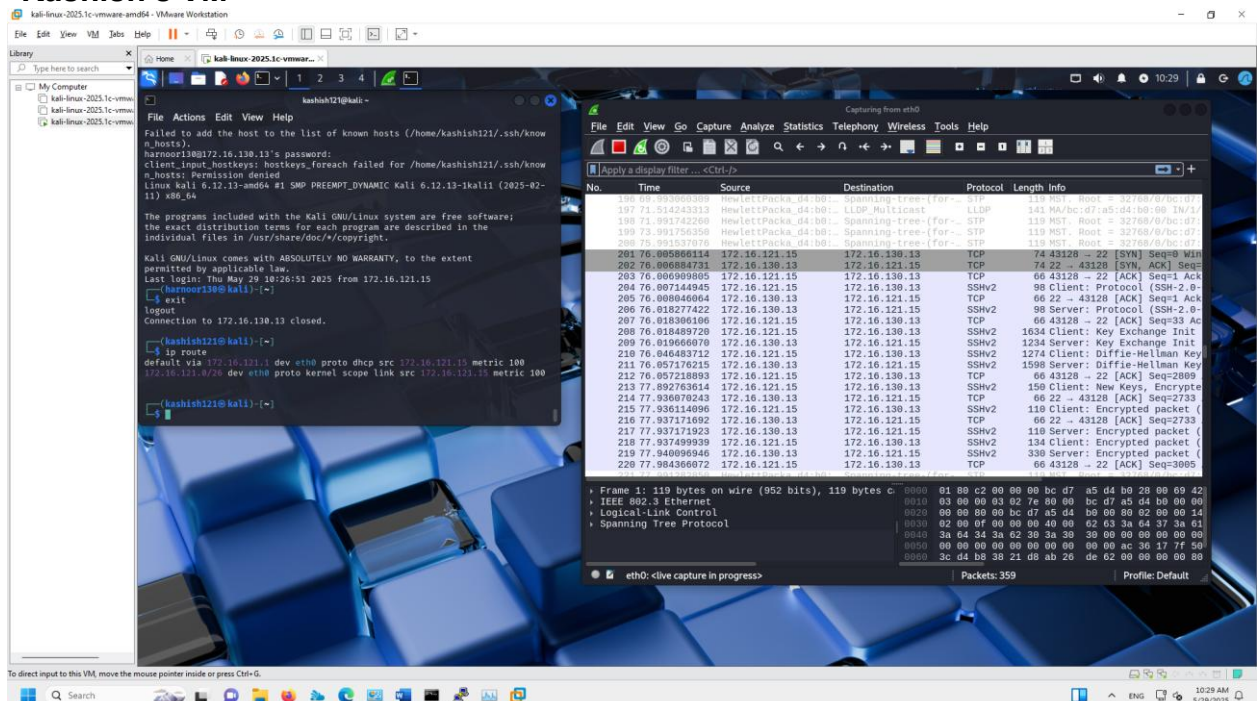


# Terminal Command 'ip route'

## Harnoor's VM



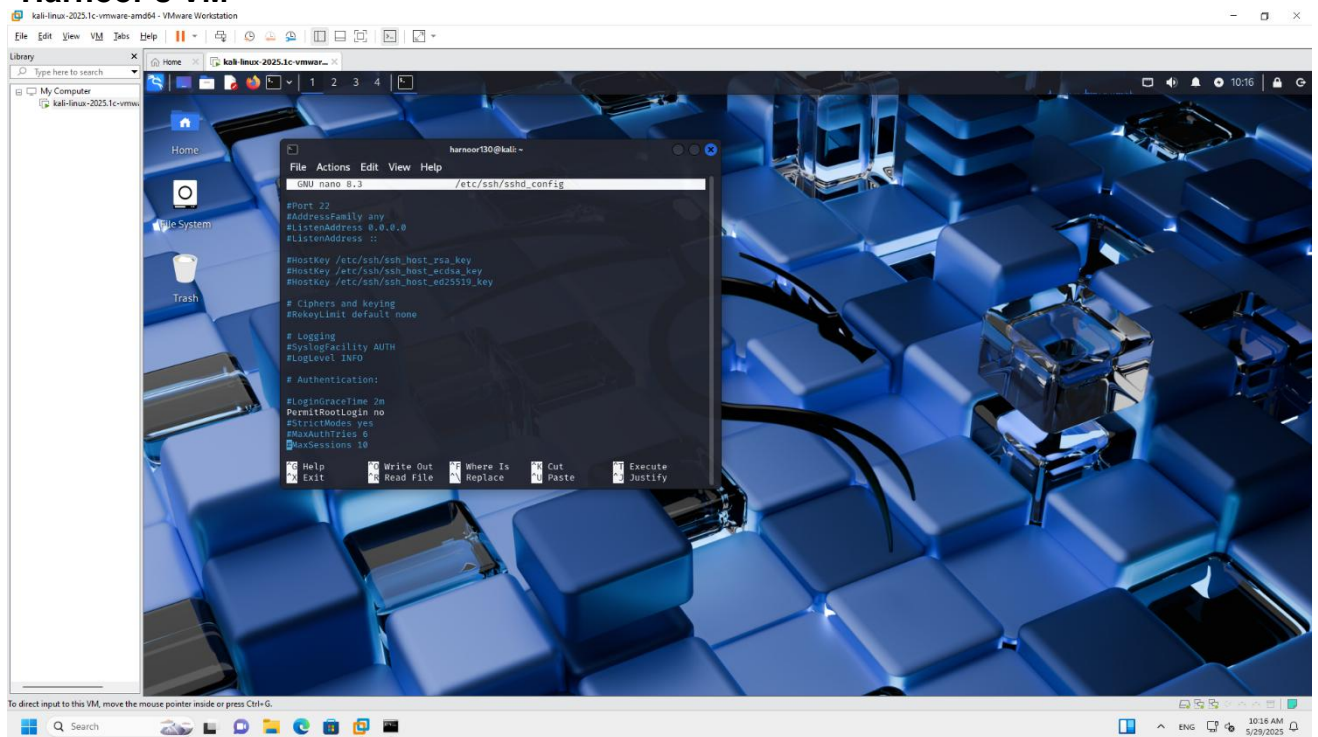
## Kashish's VM



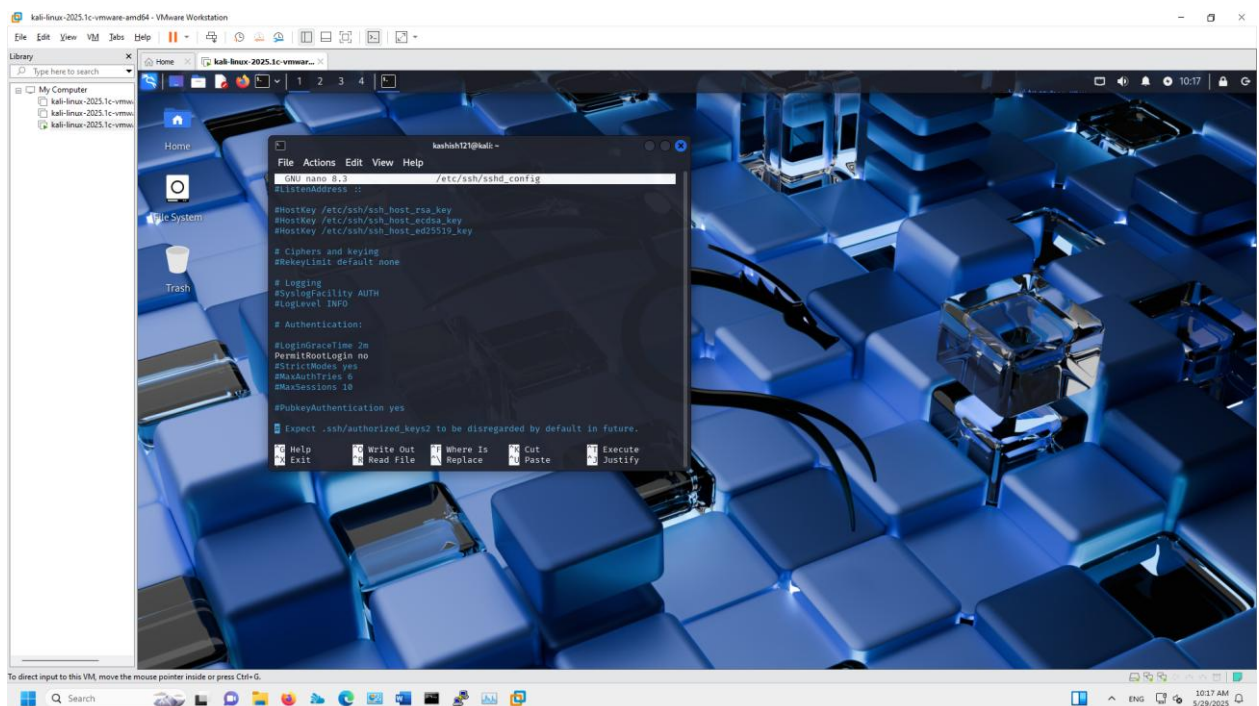


# Terminal command 'cat /etc/ssh/sshd\_config'

## Harnoor's VM

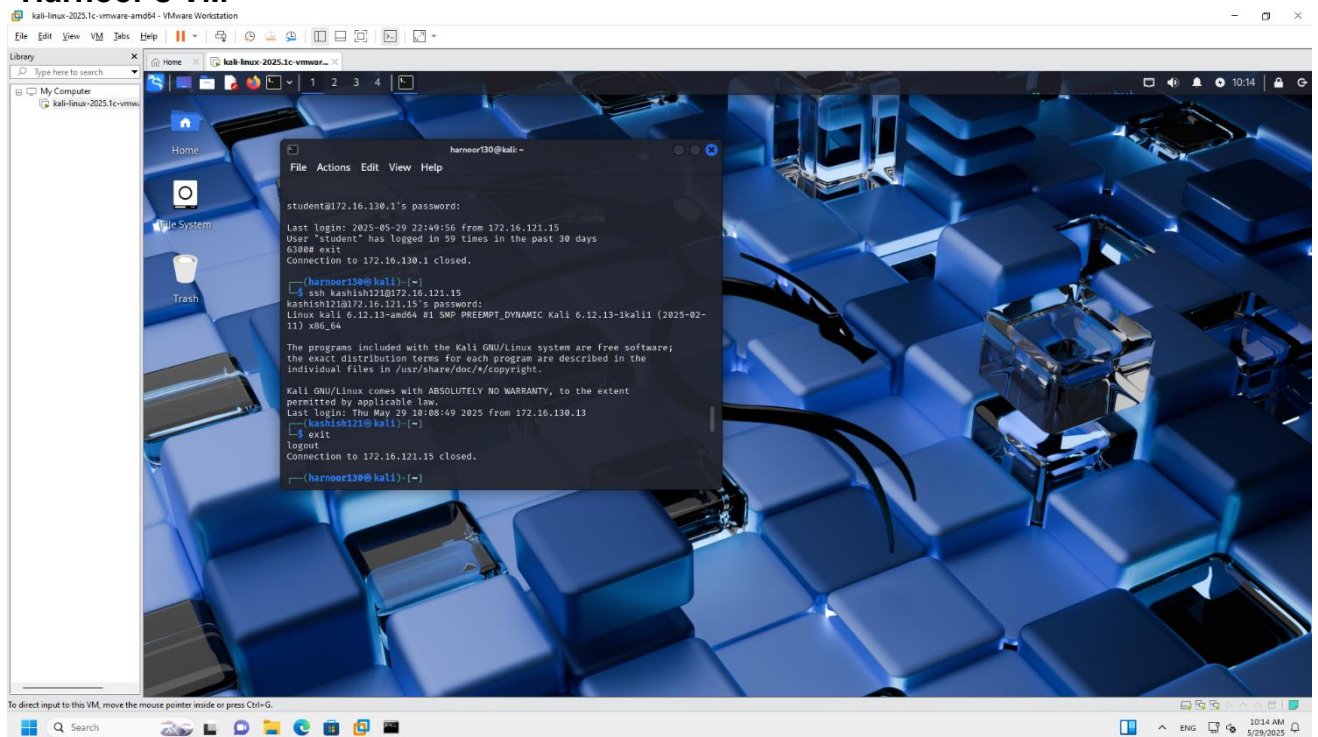


## Kashish's VM

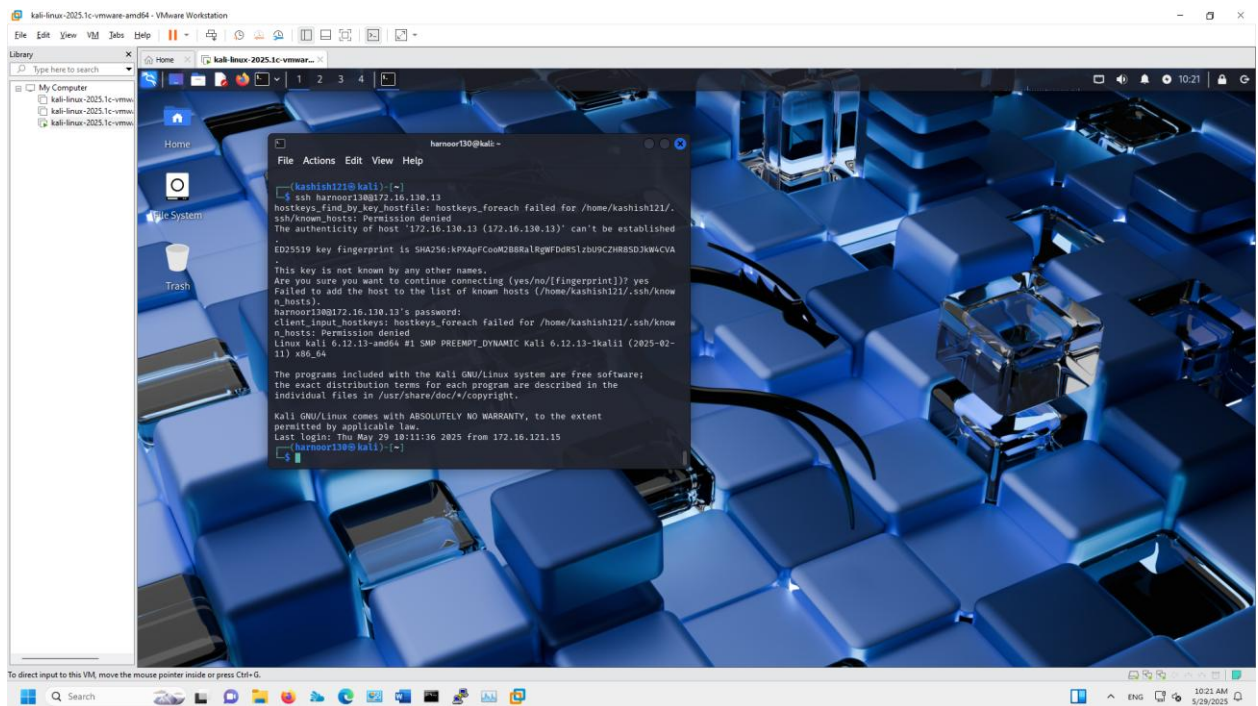


# SSH into partners VM

## Harnoor's VM



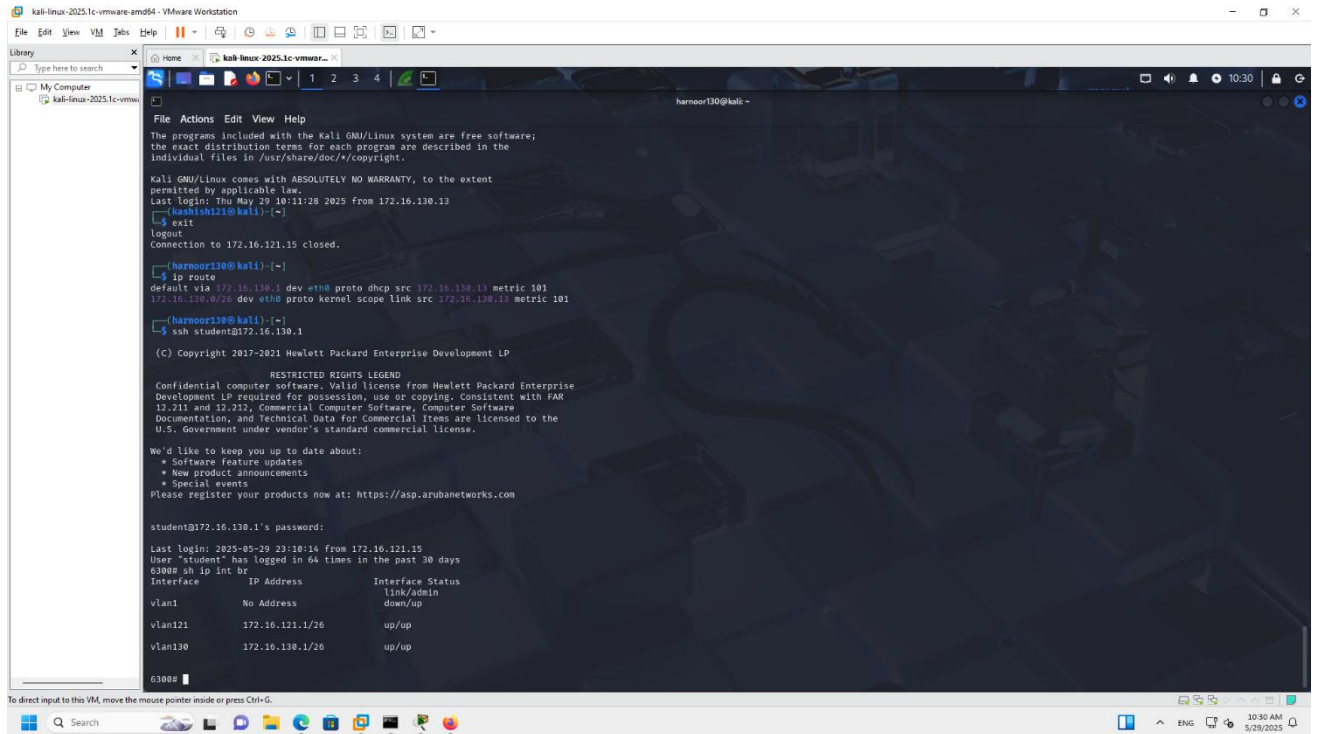
## Kashish's VM





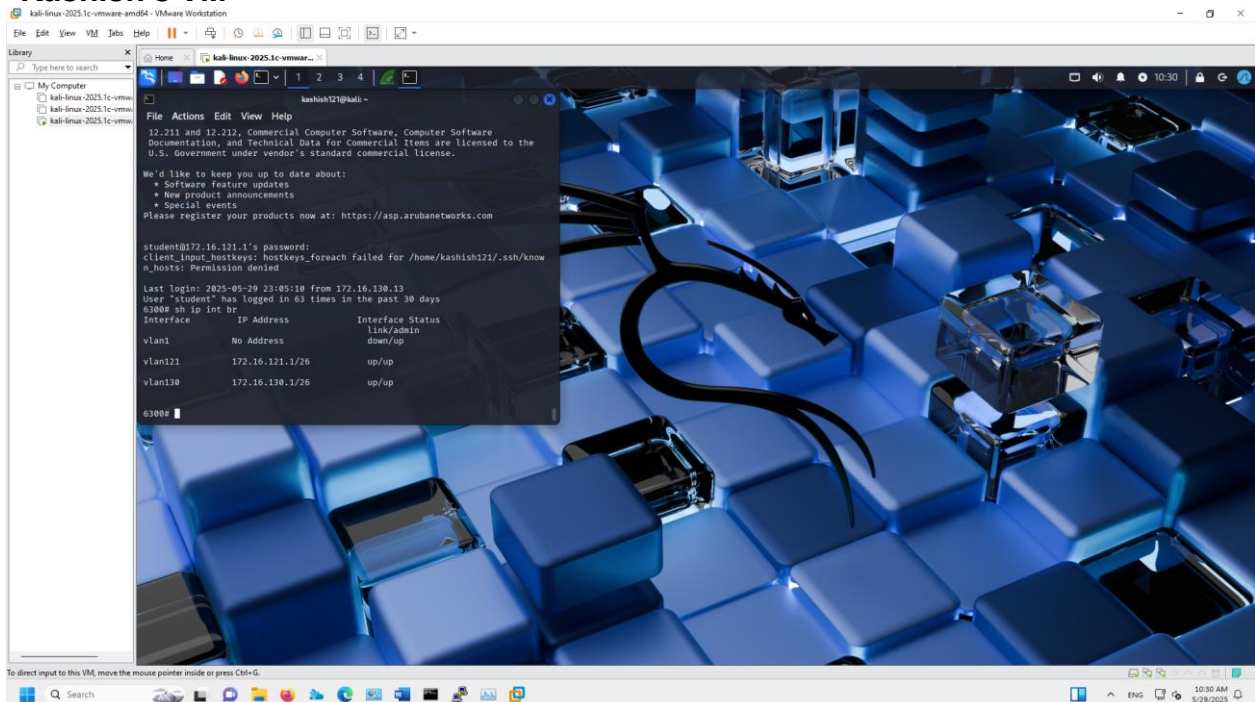
# Appendix C: Commands on Switch

sh ip int br



Harnoor's VM

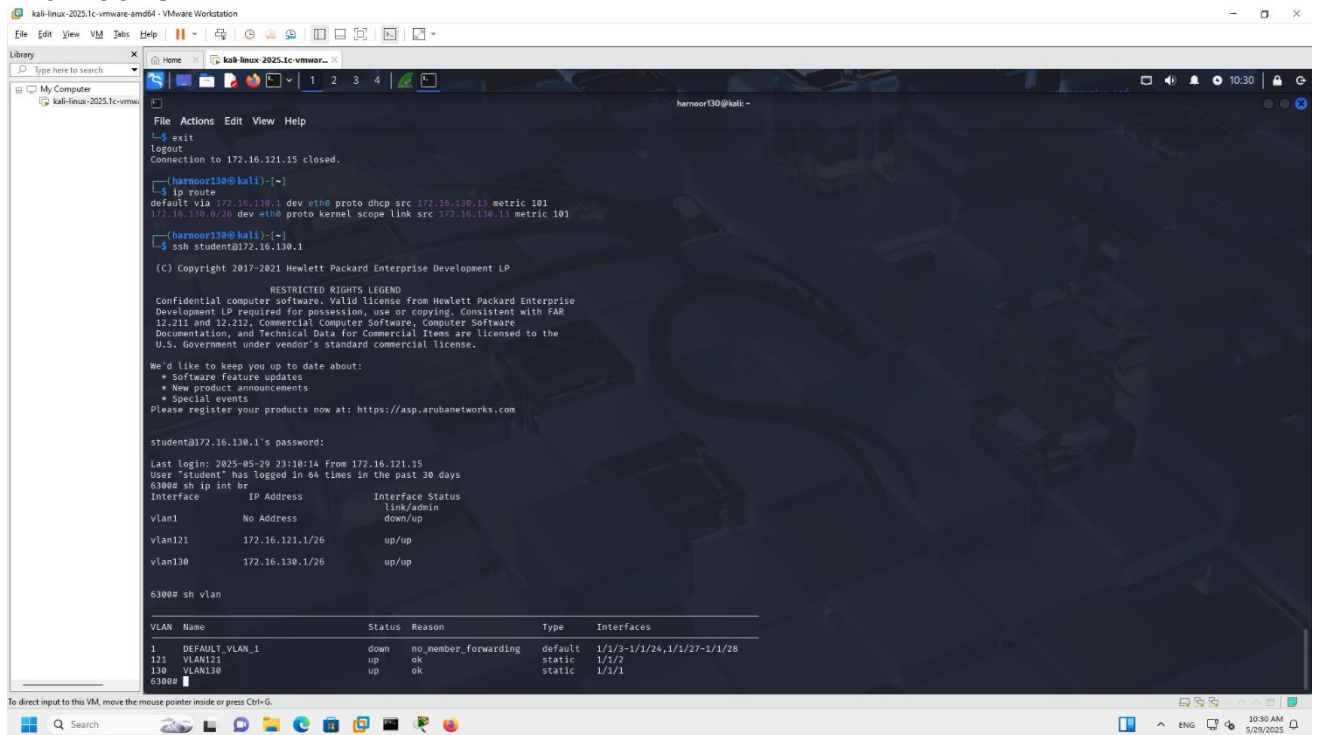
Kashish's VM





sh vlan

## Harnoor's VM



The screenshot shows a Kali Linux terminal window titled 'kali-linux-2025.1c-vmware-amd64 - VMware Workstation'. The user is logged in as 'harnoor130@kali'. The terminal output shows the following commands and results:

```
harnoor130@kali:~$ ip route
default via 172.16.130.1 dev eth0 proto dhcp src 172.16.130.13 metric 101
172.16.130.0/24 dev eth0 proto kernel scope link src 172.16.130.13 metric 101

harnoor130@kali:~$ ssh student@172.16.130.1

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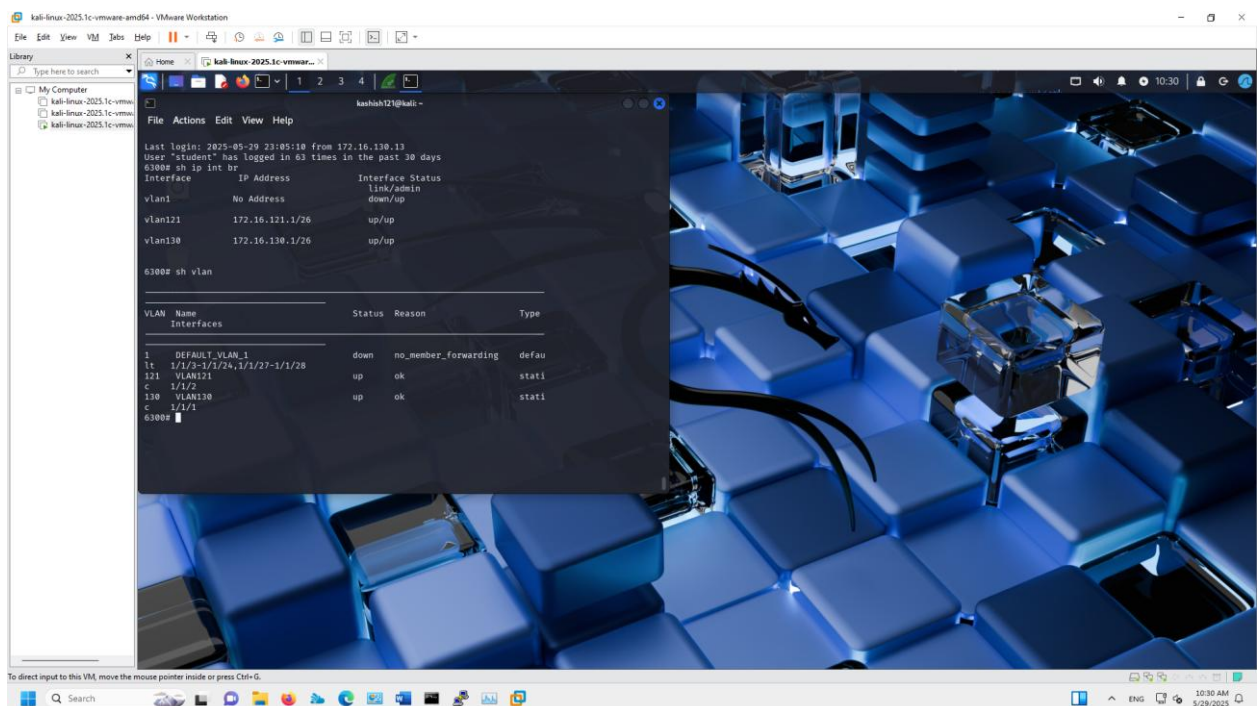
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student@172.16.130.1's password:
Last login: 2025-05-29 23:10:14 from 172.16.121.15
User "student" has logged in 04 times in the past 30 days
6300s sh ip int br
Interface    IP Address      Interface Status
              link/admin
vlan1        No Address      down/up
vlan121      172.16.121.1/26 up/up
vlan130      172.16.130.1/26 up/up

6300s sh vlan

VLAN  Name              Status Reason              Type  Interfaces
1     DEFAULT_VLAN_1    down  no_member_forwarding  default 1/1/2-1/1/24,1/1/27-1/1/28
121   VLAN121          up    ok                    static  1/1/2
130   VLAN130          up    ok                    static  1/1/1
6300s
```

## Kashish's VM



The screenshot shows a Kali Linux terminal window titled 'kali-linux-2025.1c-vmware-amd64 - VMware Workstation'. The user is logged in as 'kashish121@kali'. The terminal output shows the following commands and results:

```
kashish121@kali:~$ ip route
default via 172.16.130.1 dev eth0 proto dhcp src 172.16.130.13 metric 101
172.16.130.0/24 dev eth0 proto kernel scope link src 172.16.130.13 metric 101

kashish121@kali:~$ ssh student@172.16.130.1

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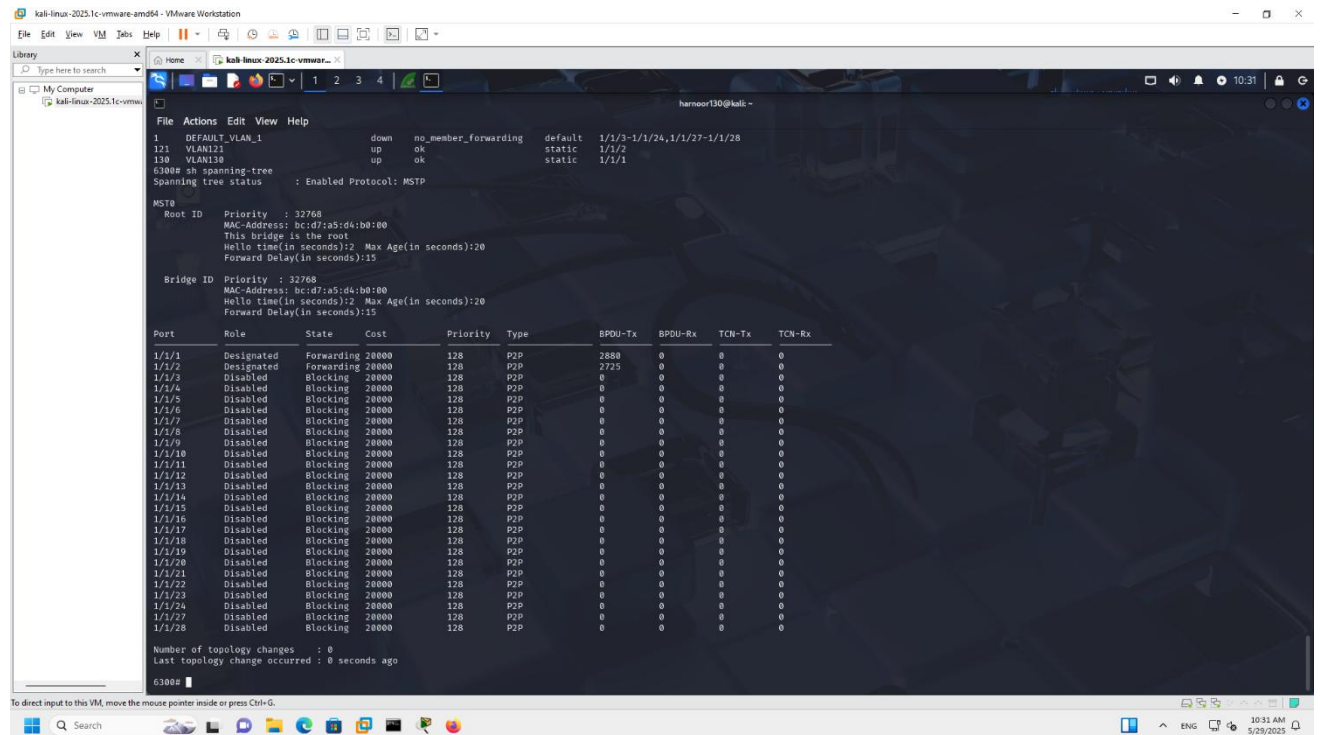
We'd like to keep you up to date about:
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* New product announcements
* Special events
Please register your products now at: https://asp.arubanetworks.com

student@172.16.130.1's password:
Last login: 2025-05-29 23:05:10 from 172.16.130.13
User "student" has logged in 03 times in the past 30 days
6300s sh ip int br
Interface    IP Address      Interface Status
              link/admin
vlan1        No Address      down/up
vlan121      172.16.121.1/26 up/up
vlan130      172.16.130.1/26 up/up

6300s sh vlan

VLAN  Name              Status Reason              Type  Interfaces
1     DEFAULT_VLAN_1    down  no_member_forwarding  default 1/1/2-1/1/24,1/1/27-1/1/28
121   VLAN121          up    ok                    static  1/1/2
130   VLAN130          up    ok                    static  1/1/1
6300s
```

# sh spanning-tree



The screenshot shows a Kali Linux VM window titled "kali-linux-2025.1c-vmware-amd64 - VMware Workstation". The terminal window displays the output of the command `6300# sh spanning-tree`. The output shows the spanning-tree status for MST0, including the root ID, priority, MAC address, and a table of port roles, states, costs, priorities, and types. The table lists 28 ports, all of which are in a "Blocking" state. The root ID is 32768, and the MAC address is bc:d7:a5:d4:b0:00. The output also shows the number of topology changes and the last topology change occurred.

```
1  DEFAULT_VLAN_1      down  no_member_forwarding  default  1/1/3-1/1/24,1/1/27-1/1/28
121 VLAN121            up    ok                    static   1/1/2
130 VLAN130            up    ok                    static   1/1/1
6300# sh spanning-tree
Spanning tree status      : Enabled Protocol: MSTP

MST0
Root ID  Priority      : 32768
MAC-Address: bc:d7:a5:d4:b0:00
This bridge is the root
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

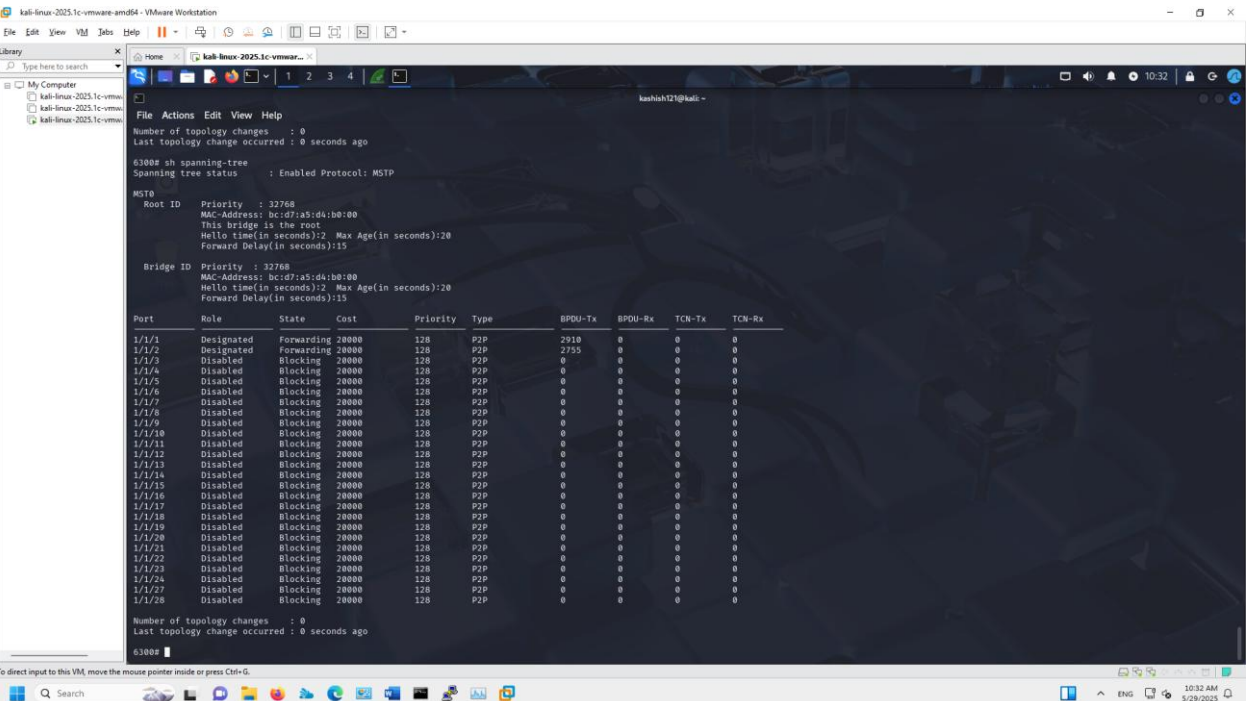
Bridge ID Priority      : 32768
MAC-Address: bc:d7:a5:d4:b0:00
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Port    Role      State      Cost      Priority  Type      BPDU-Tx  BPDU-Rx  TCN-Tx  TCN-Rx
1/1/1   Designated Forwarding 20000     128      P2P      2880     0         0         0
1/1/2   Designated Forwarding 20000     128      P2P      2725     0         0         0
1/1/3   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/4   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/5   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/6   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/7   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/8   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/9   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/10  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/11  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/12  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/13  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/14  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/15  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/16  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/17  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/18  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/19  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/20  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/21  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/22  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/23  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/24  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/27  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/28  Disabled   Blocking 20000     128      P2P      0         0         0         0

Number of topology changes : 0
Last topology change occurred : 0 seconds ago
6300#
```

## Harnoor's VM

## Kashish's VM



The screenshot shows a Kali Linux VM window titled "kali-linux-2025.1c-vmware-amd64 - VMware Workstation". The terminal window displays the output of the command `6300# sh spanning-tree`. The output shows the spanning-tree status for MST0, including the root ID, priority, MAC address, and a table of port roles, states, costs, priorities, and types. The table lists 28 ports, all of which are in a "Blocking" state. The root ID is 32768, and the MAC address is bc:d7:a5:d4:b0:00. The output also shows the number of topology changes and the last topology change occurred.

```
Number of topology changes : 0
Last topology change occurred : 0 seconds ago
6300# sh spanning-tree
Spanning tree status      : Enabled Protocol: MSTP

MST0
Root ID  Priority      : 32768
MAC-Address: bc:d7:a5:d4:b0:00
This bridge is the root
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority      : 32768
MAC-Address: bc:d7:a5:d4:b0:00
Hello time(in seconds):2  Max Age(in seconds):20
Forward Delay(in seconds):15

Port    Role      State      Cost      Priority  Type      BPDU-Tx  BPDU-Rx  TCN-Tx  TCN-Rx
1/1/1   Designated Forwarding 20000     128      P2P      2910     0         0         0
1/1/2   Designated Forwarding 20000     128      P2P      2755     0         0         0
1/1/3   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/4   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/5   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/6   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/7   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/8   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/9   Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/10  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/11  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/12  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/13  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/14  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/15  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/16  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/17  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/18  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/19  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/20  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/21  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/22  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/23  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/24  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/27  Disabled   Blocking 20000     128      P2P      0         0         0         0
1/1/28  Disabled   Blocking 20000     128      P2P      0         0         0         0

Number of topology changes : 0
Last topology change occurred : 0 seconds ago
6300#
```

# sh dhcp-server leases

## Harnoor's VM

The screenshot shows a terminal window titled "harnoor130@kali -". The terminal output includes the following information:

```
This bridge is the root
Hello time(in seconds):2 Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority : 32768
MAC-Address: bc:d7:a5:d4:b0:00
Hello time(in seconds):2 Max Age(in seconds):20
Forward Delay(in seconds):15
```

Port	Role	State	Cost	Priority	Type	BPDU-Tx	BPDU-Rx	TCN-Tx	TCN-Rx
1/1/1	Designated	Forwarding	20000	128	P2P	2880	0	0	0
1/1/2	Designated	Forwarding	20000	128	P2P	2725	0	0	0
1/1/3	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/4	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/5	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/6	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/7	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/8	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/9	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/10	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/11	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/12	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/13	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/14	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/15	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/16	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/17	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/18	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/19	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/20	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/21	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/22	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/23	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/24	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/27	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/28	Disabled	Blocking	20000	128	P2P	0	0	0	0

Number of topology changes : 0  
Last topology change occurred : 0 seconds ago

```
63088 sh dhcp-server leases
```

IP-Address	Client-Id	Expiry-Time	Client-Hostname	VRF-Name	Link-Address
172.16.121.7	01cc:96:e5:1d:db:10	00:06:52 30/05/2025	NHK1270-11-0810	default	cc:96:e5:1d:db:10
172.16.121.14	0100:0c:29:78:c5:5e	23:13:23 29/05/2025	kali	default	00:0c:29:78:c5:5e
172.16.121.15	0100:0c:29:22:b9:2e	23:55:29 29/05/2025	kali	default	00:0c:29:22:b9:2e
172.16.130.13	0100:0c:29:f8:9c:76	23:57:55 29/05/2025	kali	default	00:0c:29:f8:9c:76
172.16.130.18	0100:13:3b:e3:96:ee	00:07:23 30/05/2025	NHK1270-12-22AB	default	00:13:3b:e3:96:ee

## Kashish's VM

The screenshot shows a terminal window titled "kashish1210@kali -". The terminal output includes the following information:

```
This bridge is the root
Hello time(in seconds):2 Max Age(in seconds):20
Forward Delay(in seconds):15

Bridge ID Priority : 32768
MAC-Address: bc:d7:a5:d4:b0:00
Hello time(in seconds):2 Max Age(in seconds):20
Forward Delay(in seconds):15
```

Port	Role	State	Cost	Priority	Type	BPDU-Tx	BPDU-Rx	TCN-Tx	TCN-Rx
1/1/1	Designated	Forwarding	20000	128	P2P	2910	0	0	0
1/1/2	Designated	Forwarding	20000	128	P2P	2755	0	0	0
1/1/3	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/4	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/5	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/6	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/7	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/8	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/9	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/10	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/11	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/12	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/13	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/14	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/15	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/16	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/17	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/18	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/19	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/20	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/21	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/22	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/23	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/24	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/27	Disabled	Blocking	20000	128	P2P	0	0	0	0
1/1/28	Disabled	Blocking	20000	128	P2P	0	0	0	0

Number of topology changes : 0  
Last topology change occurred : 0 seconds ago

```
63088 sh dhcp-server leases
```

IP-Address	Client-Id	Expiry-Time	Client-Hostname	VRF-Name	Link-Address
172.16.121.7	01cc:96:e5:1d:db:10	00:06:52 30/05/2025	NHK1270-11-0810	default	cc:96:e5:1d:db:10
172.16.121.14	0100:0c:29:78:c5:5e	23:13:23 29/05/2025	kali	default	00:0c:29:78:c5:5e
172.16.121.15	0100:0c:29:22:b9:2e	23:55:29 29/05/2025	kali	default	00:0c:29:22:b9:2e
172.16.130.13	0100:0c:29:f8:9c:76	23:57:55 29/05/2025	kali	default	00:0c:29:f8:9c:76
172.16.130.18	0100:13:3b:e3:96:ee	00:07:23 30/05/2025	NHK1270-12-22AB	default	00:13:3b:e3:96:ee

## Appendix D: Switch Script Commands

```
enable
configure terminal

vlan 130
vlan 121

interface 1/1/1
    no shutdown
    no routing
    vlan access 130

interface 1/1/2
    no shutdown
    no routing
    vlan access 121

interface vlan 130
    ip address 172.16.130.1/26
    no shutdown

interface vlan 121
    ip address 172.16.121.1/26
    no shutdown

dhcp-server vrf default
    pool pool1
        range 172.16.130.2 172.16.130.20 prefix-len 26
        default-router 172.16.130.1

        exit
    pool pool2
        range 172.16.121.2 172.16.121.20 prefix-len 26
        default-router 172.16.121.1

        exit

enable
```

## Challenges Faced

During the implementation of the CSP450 Project 1a, we encountered several challenges related to SSH key exchange and VM communication. Below are the key issues and how we resolved them:

### SSH Key Exchange Issues

- **Problem:** Initially, ssh-copy-id did not work as expected due to firewall restrictions and SSH settings.
- **Solution:** We exported the .pub key manually and sent it via email. On the partner's VM, we created the ~/.ssh/authorized\_keys file and pasted the key there manually.

### Internet Access on VMs

▪ **Problem:** Both VMs had internet access issues because they were only connected to the switch using **Bridged mode**.

▪ **Solution:** We added two network adapters to each VM. One was set to **Bridged Adapter** (for VLAN access), and the other was set to **NAT** (for internet access). This allowed simultaneous access to both the switch and the internet.