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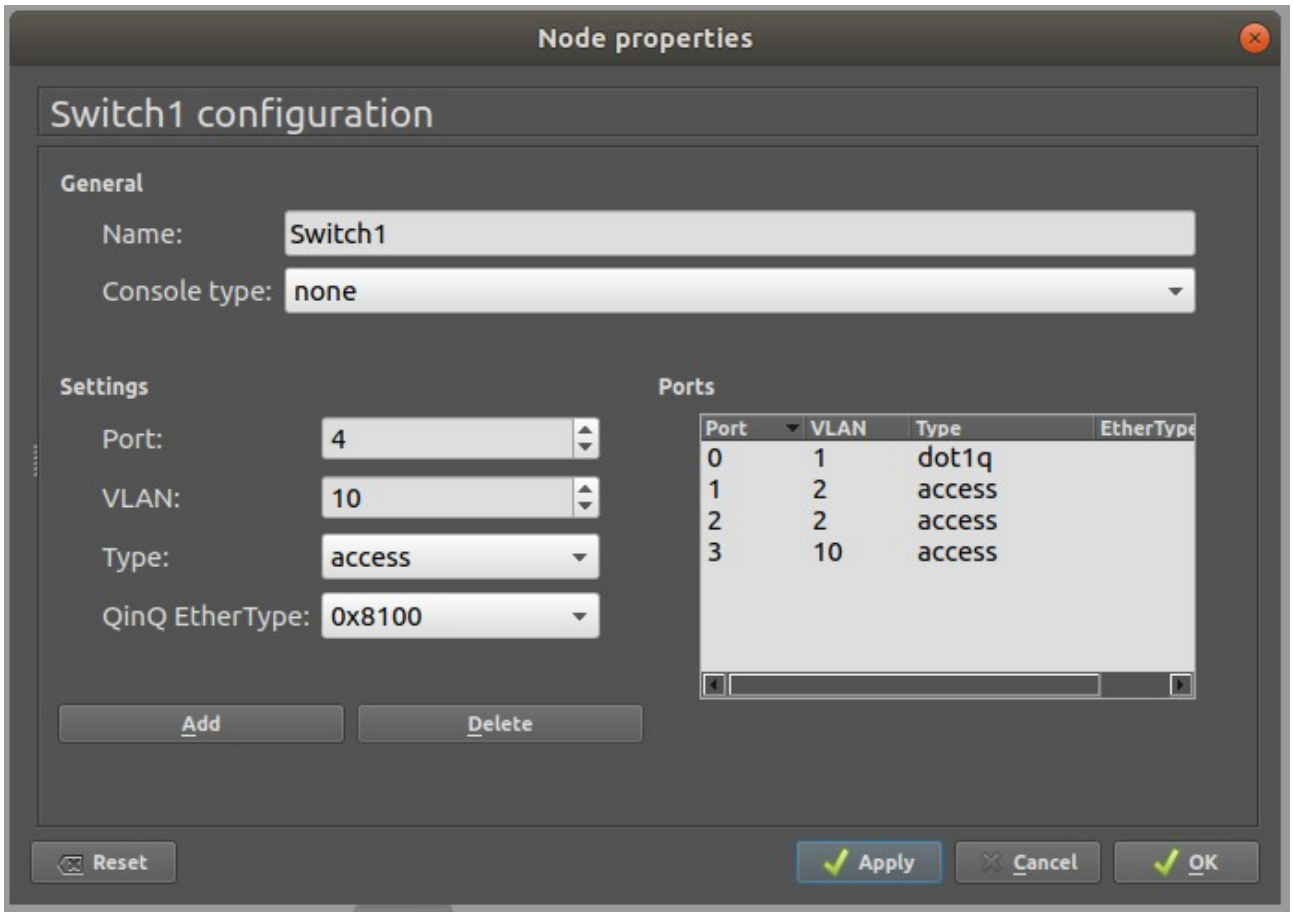
Lab 7

Design of VLANs Using GNS3

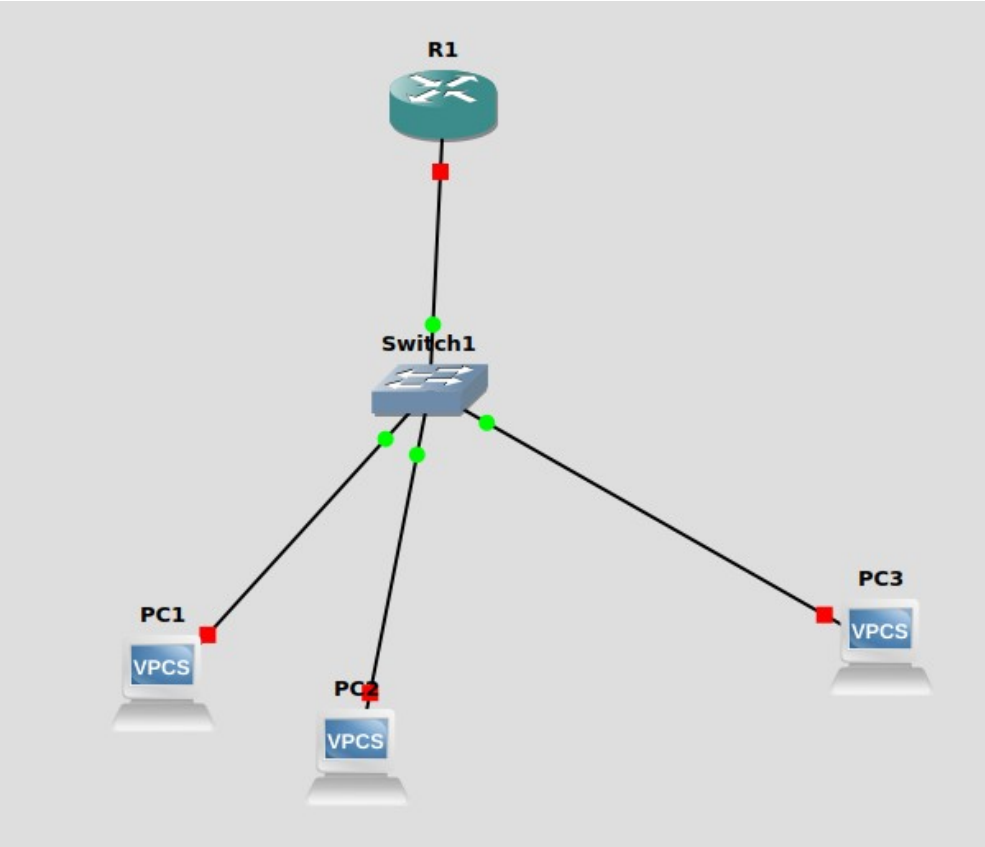
1)

First we need to configure the switch to the port numbers, VLAN numbers and the type of connection.



Port 0 – dot1q type connection for the router to route between VLANS. The standard defines a system of VLAN tagging for Ethernet frames and the accompanying procedures to be used by bridges and switches in handling such frames.
Port 1 – access type for VLAN 2
Port 2 – access type for VLAN 2
Port 3 – access type for VLAN 3

After configuring, we are ready to make connections between the devices.



Configure Router

On the interface f0/0 we are connected to the switch. Now we must assign it the address 192.168.10.1 with the mask 255.255.255.240(total number of addresses available are 16).

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int f0/0
R1(config-if)#ip address 192.168.10.1 255.255.255.240
```

On the same router, we must configure VLAN 2 which is accessible through the switch using trunk. We do this by switching to the sub interface on the console by the command **int f0/0.2,** here 2 is the VLAN number.
We assign it the ip address 192.168.1.65 with mask 255.255.255.192 i.e we have 64 addresses on this network.

```
R1(config-if)#int f0/0.2
R1(config-subif)#encapsulation dot1q
% Incomplete command.

R1(config-subif)#encapsulation dot1q 2
R1(config-subif)#ip address 192.168.1.65 255.255.255.192
```

On the same router, we must configure VLAN 10 which is accessible through the switch using trunk.
We do this by switching to the sub interface on the console by the command **int f0/0.10,** here 10 is the VLAN number.
We assign it the ip address 192.168.1.129 since VLAN 2 has the last address 192.168.1.128 with mask 255.255.255.224 i.e we have 32 addresses on this network.

```
R1(config-subif)#interface f0/0.10
R1(config-subif)#encapulation dot1q 10
                        ^
% Invalid input detected at '^' marker.

R1(config-subif)#encapsulation dot1q 10
R1(config-subif)#ip address 192.168.1.129 255.255.255.224
```

Configuring PC

Configuring PC1 with address 192.168.1.66 with default gateway 192.168.1.65

```
PC1> ip 192.168.1.66/26 192.168.1.65
Checking for duplicate address...
PC1 : 192.168.1.66 255.255.255.192 gateway 192.168.1.65
```

Configuring PC2 with address 192.168.1.67 with default gateway 192.168.1.65

```
PC2> ip 192.168.1.67/26 192.168.1.65
Checking for duplicate address...
PC2 : 192.168.1.67 255.255.255.192 gateway 192.168.1.65
```

Configuring PC3 with address 192.168.1.130 with default gateway 192.168.1.129

```
PC3> ip 192.168.1.130/27 192.168.1.129
Checking for duplicate address...
PC3 : 192.168.1.130 255.255.255.224 gateway 192.168.1.129
```

Pinging PC2 from PC1(same network)

```
PC1> ping 192.168.1.67

84 bytes from 192.168.1.67 icmp_seq=1 ttl=64 time=0.631 ms
84 bytes from 192.168.1.67 icmp_seq=2 ttl=64 time=0.714 ms
84 bytes from 192.168.1.67 icmp_seq=3 ttl=64 time=0.848 ms
84 bytes from 192.168.1.67 icmp_seq=4 ttl=64 time=0.911 ms
84 bytes from 192.168.1.67 icmp_seq=5 ttl=64 time=0.931 ms
```

Pinging PC3 from PC1(different network)

```
PC1> ping 192.168.1.130

84 bytes from 192.168.1.130 icmp_seq=1 ttl=63 time=18.264 ms
84 bytes from 192.168.1.130 icmp_seq=2 ttl=63 time=20.376 ms
84 bytes from 192.168.1.130 icmp_seq=3 ttl=63 time=19.641 ms
84 bytes from 192.168.1.130 icmp_seq=4 ttl=63 time=20.588 ms
84 bytes from 192.168.1.130 icmp_seq=5 ttl=63 time=19.794 ms
```

Wireshark:

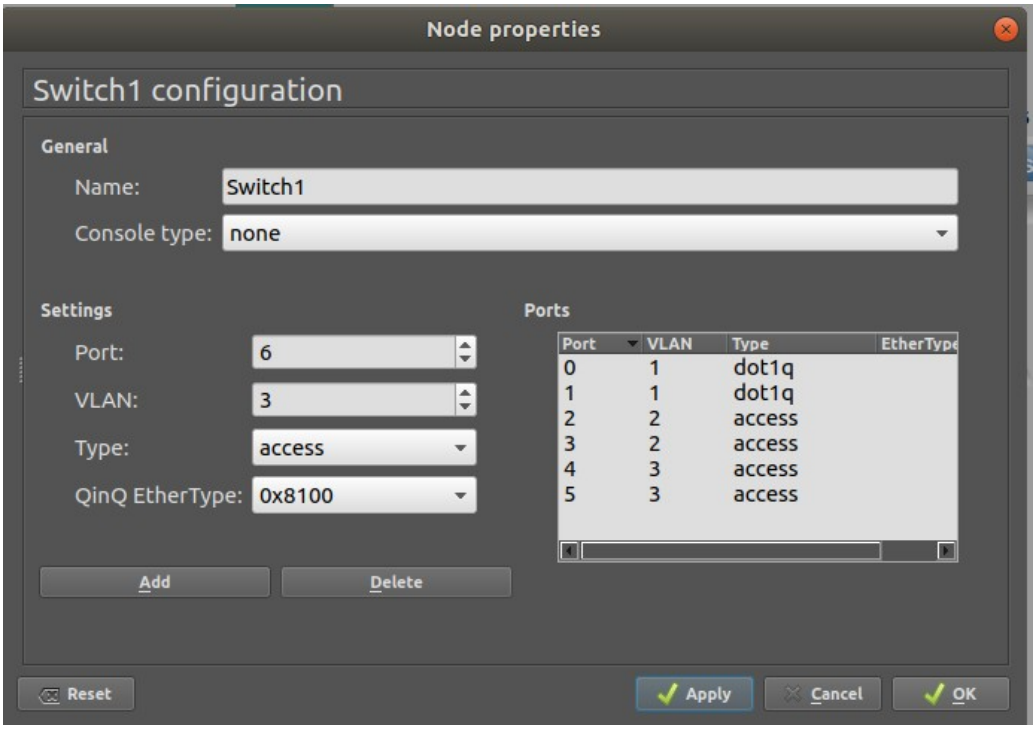
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request
2	0.017850	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply
3	1.018936	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request
4	1.038923	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply
5	2.040204	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request
6	2.059383	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply
7	3.060270	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request
8	3.080462	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply
9	4.081534	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request
10	4.100972	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply

ARP showing only the default gateway address as the destination, even though on same router, is on another VLAN so after reaching the router, router routes it to the correct subnet.

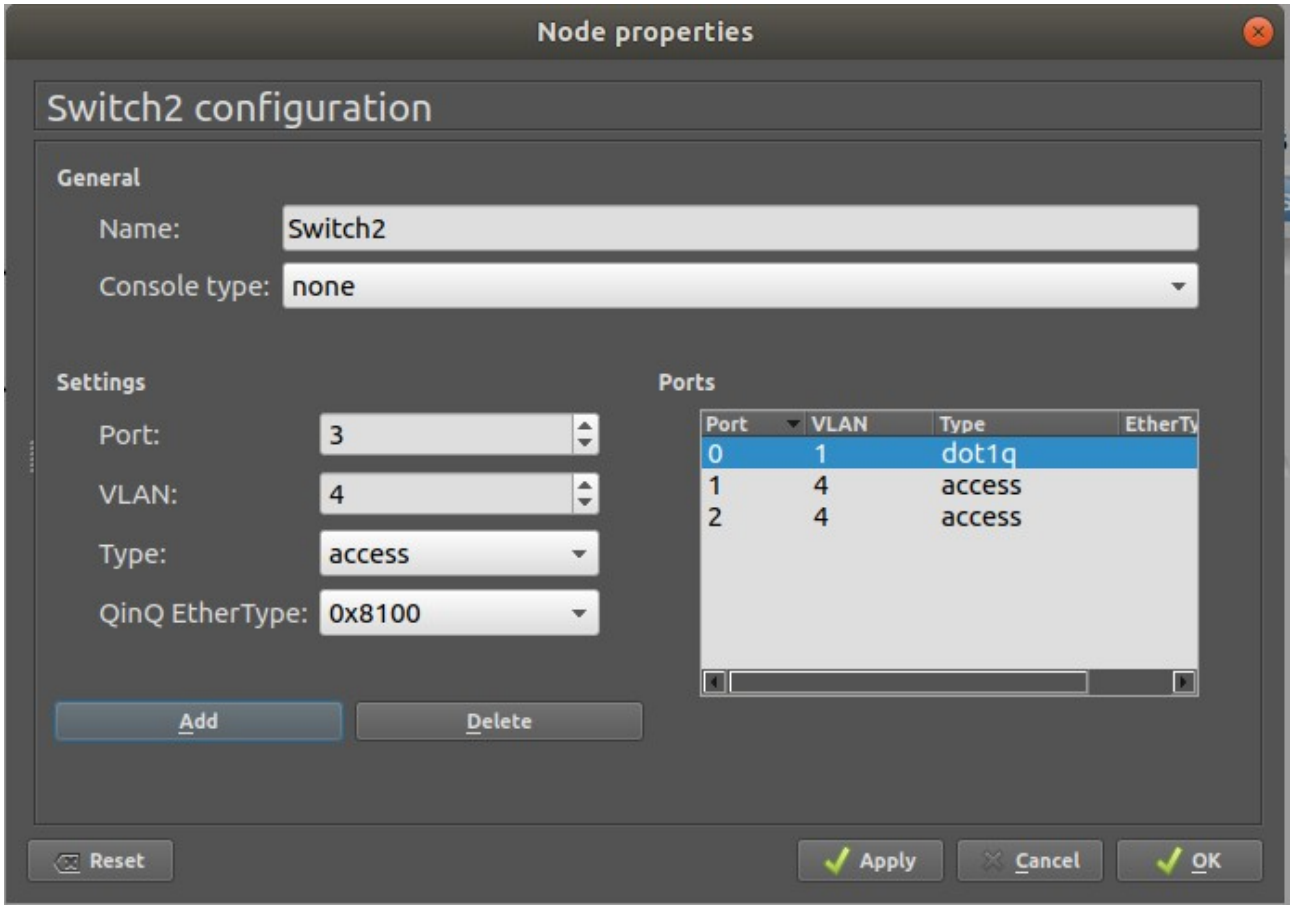
```
PC1> show arp

ca:01:39:0c:00:00  192.168.1.65 expires in 79 seconds
```

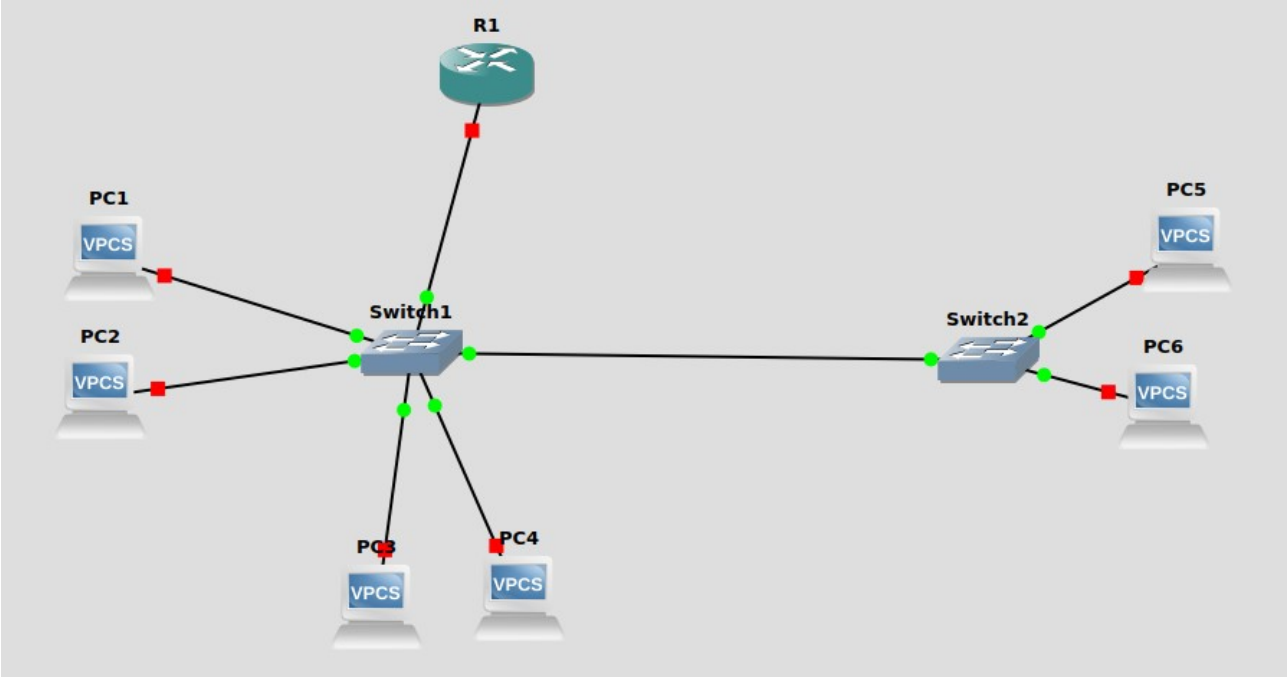
2)
First we need to configure the switch 1 and 2 to the port numbers, VLAN numbers and the type of connection. Standard practice is to assign VLAN 1 for all the trunk ports. Port 2 and 3 are connected to PC 1 and 2 in VLAN 2. Port 4 and 4 are connected to PC 3 and 4 in VLAN 3.



In switch 2, first port is the trunk port. VLAN assigned to it is 1. VLAN 4 in port 1 and 2 for VLAN 4.



Then we can make the connections,



Configure Router

On the interface f0/0 we are connected to the switch. Now we must assign it the address 10.10.1.1 with the mask 255.255.255.0(total number of addresses available are 256).

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int f0/0
R1(config-if)#ip address 10.10.1.1 255.255.255.0
R1(config-if)#no shut
```

Configuring VLAN 2
We do this by switching to the sub interface on the console by the command **int f0/0.2,** here 2 is the VLAN number.
We assign it the ip address 10.10.1.65 with mask 255.255.255.192 i.e we have 64 addresses on this network.

```
R1(config-if)#int f0/0.2
R1(config-subif)#encapsulate dot1q 2
                           ^
% Invalid input detected at '^' marker.

R1(config-subif)#encapsulation dot1q 2
R1(config-subif)#ip address 10.10.10.65 255.255.255.192
```

Configuring VLAN 3

We do this by switching to the sub interface on the console by the command **int f0/0.3,** here 3 is the VLAN number.
We assign it the ip address 10.10.1.129 with mask 255.255.255.224 i.e we have 32 addresses on this network.

```
R1(config-subif)#int f0/0.3
R1(config-subif)#encapsulation dot1q 3
R1(config-subif)#ip address 10.10.10.129 255.255.255.224
R1(config-subif)#
```

Configuring VLAN 4
Even though VLAN 4 is not directly connected to the router, it is accessible through trunk ports.
We do this by switching to the sub interface on the console by the command **int f0/0.4,** here 4 is the VLAN number.
We assign it the ip address 10.10.1.129 with mask 255.255.255.224 i.e we have 32 addresses on this network.

```
R1(config-subif)#int f0/0.4
R1(config-subif)#encapsulation dot1q 4
R1(config-subif)#ip address 10.10.10.196 255.255.255.224
```

Network details:

VLAN 2
PC1 – 10.10.10.66/26 default gateway 10.10.10.65
PC2 – 10.10.10.67/26 dafault gateway 10.10.10.65

VLAN3
PC3 – 10.10.10.130/27 dafault gateway 10.10.10.129
PC4 – 10.10.10.131/27 dafault gateway 10.10.10.129

VLAN 4
PC5 – 10.10.10.197/27 dafault gateway 10.10.10.196
PC6 – 10.10.10.198/27 dafault gateway 10.10.10.196

Pinging PC6(VLAN 4) from PC1(VLAN 2):

```
PC1> ping 10.10.10.198

84 bytes from 10.10.10.198 icmp_seq=1 ttl=63 time=19.686 ms
84 bytes from 10.10.10.198 icmp_seq=2 ttl=63 time=30.145 ms
84 bytes from 10.10.10.198 icmp_seq=3 ttl=63 time=19.552 ms
84 bytes from 10.10.10.198 icmp_seq=4 ttl=63 time=19.689 ms
84 bytes from 10.10.10.198 icmp_seq=5 ttl=63 time=19.973 ms
```

Successful capture:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	Private_66:68:00	Broadcast	ARP	64	Who has 10.10.10.65?
2	0.002297	ca:01:3c:e4:00:00	Private_66:68:00	ARP	60	10.10.10.65 is at ca
3	0.003121	10.10.10.66	10.10.10.198	ICMP	98	Echo (ping) request
4	0.022514	10.10.10.198	10.10.10.66	ICMP	98	Echo (ping) reply
5	1.023001	10.10.10.66	10.10.10.198	ICMP	98	Echo (ping) request
6	1.052815	10.10.10.198	10.10.10.66	ICMP	98	Echo (ping) reply
7	2.053920	10.10.10.66	10.10.10.198	ICMP	98	Echo (ping) request
8	2.073036	10.10.10.198	10.10.10.66	ICMP	98	Echo (ping) reply
9	3.073634	10.10.10.66	10.10.10.198	ICMP	98	Echo (ping) request
10	3.093011	10.10.10.198	10.10.10.66	ICMP	98	Echo (ping) reply
11	4.093775	10.10.10.66	10.10.10.198	ICMP	98	Echo (ping) request
12	4.113340	10.10.10.198	10.10.10.66	ICMP	98	Echo (ping) reply

ARP showing only the default gateway address as the destination, as the address are private in VLAN, so after reaching the router, router routes it to the correct subnet.

```
PC1> show arp

ca:01:3c:e4:00:00  10.10.10.65 expires in 48 seconds
```

Pinging PC6(VLAN 4) from PC3(VLAN 3)

```
PC3> ping 10.10.10.198

84 bytes from 10.10.10.198 icmp_seq=1 ttl=63 time=30.881 ms
84 bytes from 10.10.10.198 icmp_seq=2 ttl=63 time=19.610 ms
84 bytes from 10.10.10.198 icmp_seq=3 ttl=63 time=19.649 ms
84 bytes from 10.10.10.198 icmp_seq=4 ttl=63 time=20.779 ms
84 bytes from 10.10.10.198 icmp_seq=5 ttl=63 time=20.389 ms
```

Pinging PC4(VLAN 3) from PC1(VLAN 1)

```
PC1> ping 10.10.10.131

10.10.10.131 icmp_seq=1 timeout
84 bytes from 10.10.10.131 icmp_seq=2 ttl=63 time=17.646 ms
84 bytes from 10.10.10.131 icmp_seq=3 ttl=63 time=19.173 ms
84 bytes from 10.10.10.131 icmp_seq=4 ttl=63 time=19.365 ms
84 bytes from 10.10.10.131 icmp_seq=5 ttl=63 time=19.109 ms
```