

Experiment 1:- Analyze the Computer Network Design using SWITCH and HUB in GNS3.

Switch Configure:

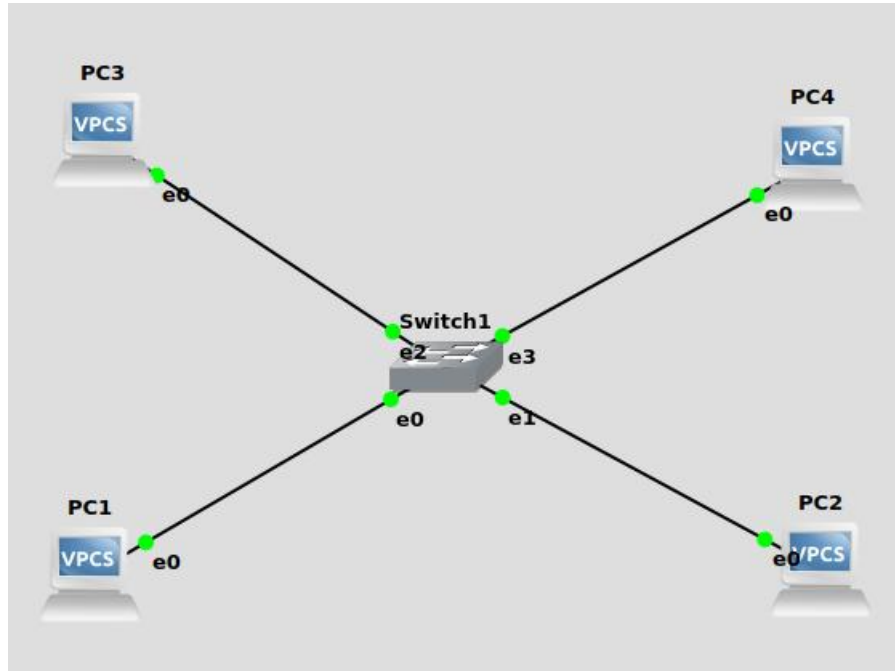


Fig: Switch

1. Drag & Drop 4 VPCs and make the required connections and click on start option to run all devices.
2. Set ip address for all VPCs as follows:
PC1>192.168.1.1/24 192.168.1.254
PC2>192.168.1.2/24 192.168.1.254
PC3>192.168.1.3/24 192.168.1.254
PC4>192.168.1.4/24 192.168.1.254

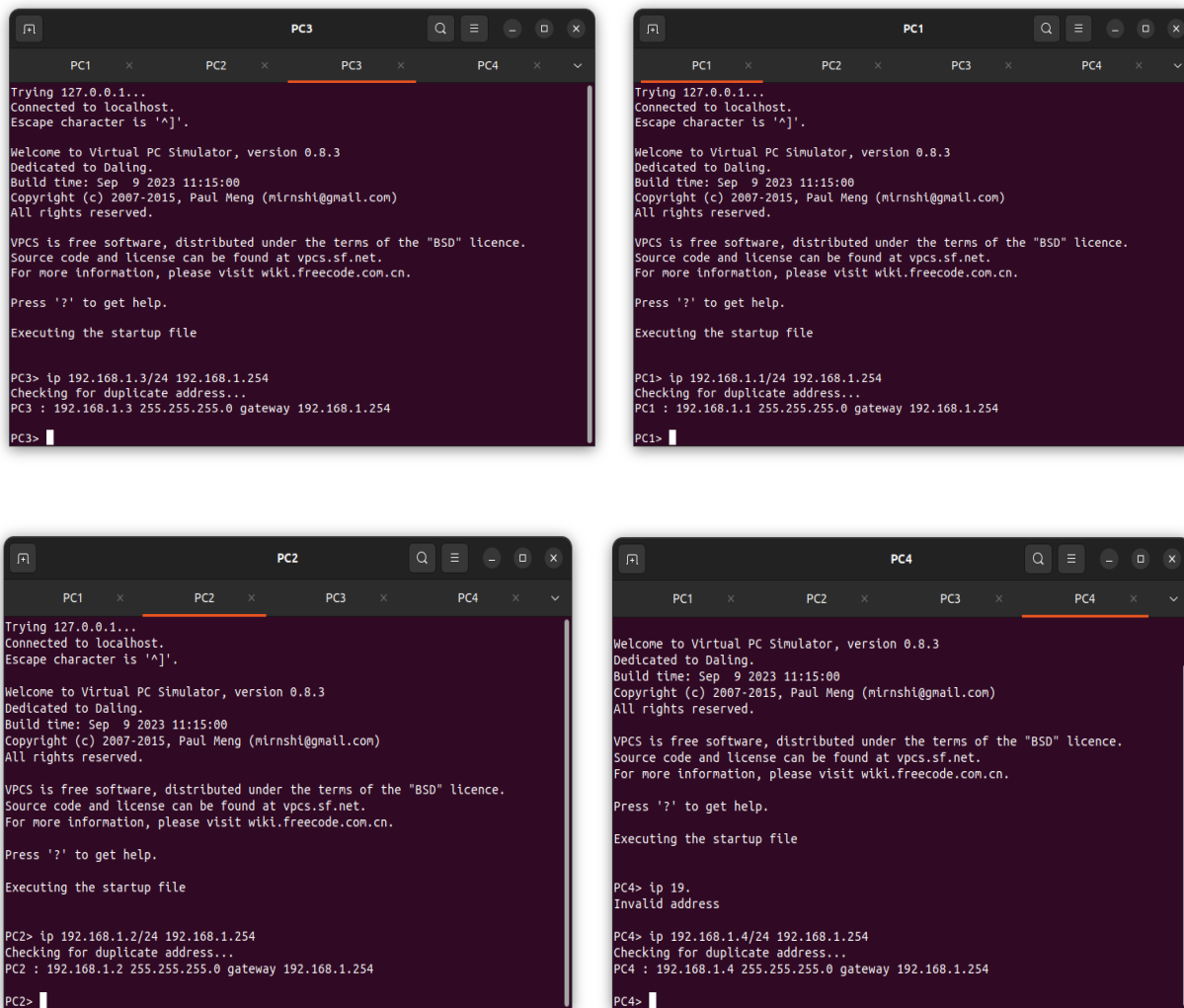


Fig: IP address for all 4 PC's.

3. Right click on PC4 & give start capture.

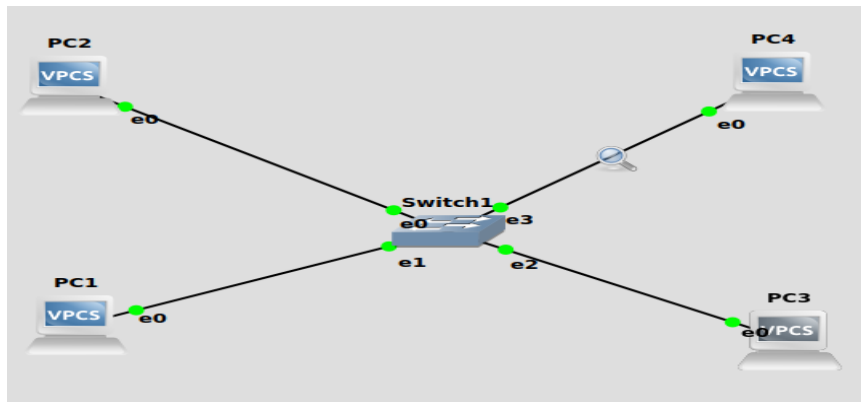


Fig: PC4 Start Capture Picture

4. PC1>ping 192.168.1.2 ->no data transfer
5. PC1>ping 192.168.1.3 ->no data transfer
6. PC1>ping 192.168.1.4 ->data transfer

```

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Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.405 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.964 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.723 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.719 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=0.548 ms

PC1> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=0.428 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=0.797 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=0.319 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=0.615 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=0.580 ms

PC1> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=0.171 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=0.325 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=0.497 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=0.348 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=0.366 ms
  
```

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	Private 60:08:00	Broadcast	ARP	64	Who has 192.168.1.2? Tell 192.168.1.1
2	12.483933	Private 60:08:00	Broadcast	ARP	64	Who has 192.168.1.3? Tell 192.168.1.1
3	23.332993	Private 60:08:00	Broadcast	ARP	64	Who has 192.168.1.4? Tell 192.168.1.1
4	23.332175	Private 60:08:03	Private 60:08:00	ARP	64	192.168.1.4 is at 00:50:79:06:08:03
5	23.333098	192.168.1.1	192.168.1.4	ICMP	98	Echo (ping) request id=0x43eb, seq=1/256, ttl=64 (reply in 6)
6	23.333189	192.168.1.4	192.168.1.1	ICMP	98	Echo (ping) reply id=0x43eb, seq=1/256, ttl=64 (request in 5)
7	24.334315	192.168.1.1	192.168.1.4	ICMP	98	Echo (ping) request id=0x44eb, seq=2/512, ttl=64 (reply in 8)
8	24.334484	192.168.1.4	192.168.1.1	ICMP	98	Echo (ping) reply id=0x44eb, seq=2/512, ttl=64 (request in 7)
9	25.335626	192.168.1.1	192.168.1.4	ICMP	98	Echo (ping) request id=0x45eb, seq=3/768, ttl=64 (reply in 10)
10	25.335916	192.168.1.4	192.168.1.1	ICMP	98	Echo (ping) reply id=0x45eb, seq=3/768, ttl=64 (request in 9)
11	26.336826	192.168.1.1	192.168.1.4	ICMP	98	Echo (ping) request id=0x47eb, seq=4/1024, ttl=64 (reply in 12)
12	26.337026	192.168.1.4	192.168.1.1	ICMP	98	Echo (ping) reply id=0x47eb, seq=4/1024, ttl=64 (request in 11)
13	27.338070	192.168.1.1	192.168.1.4	ICMP	98	Echo (ping) request id=0x48eb, seq=5/1280, ttl=64 (reply in 14)
14	27.338204	192.168.1.4	192.168.1.1	ICMP	98	Echo (ping) reply id=0x48eb, seq=5/1280, ttl=64 (request in 13)

Frame 1: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0

```

0000  ff ff ff ff ff 00 50 79 06 08 00 00 00 01  .....P yfh.....
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....P yfh.....
0020  ff ff ff ff ff c0 a8 01 02 00 00 00 00 00  .....
0030  00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
  
```

Fig: Wireshark Displaying the request reply through the connected VPCs and Captured PC.

HUB Configuration:-

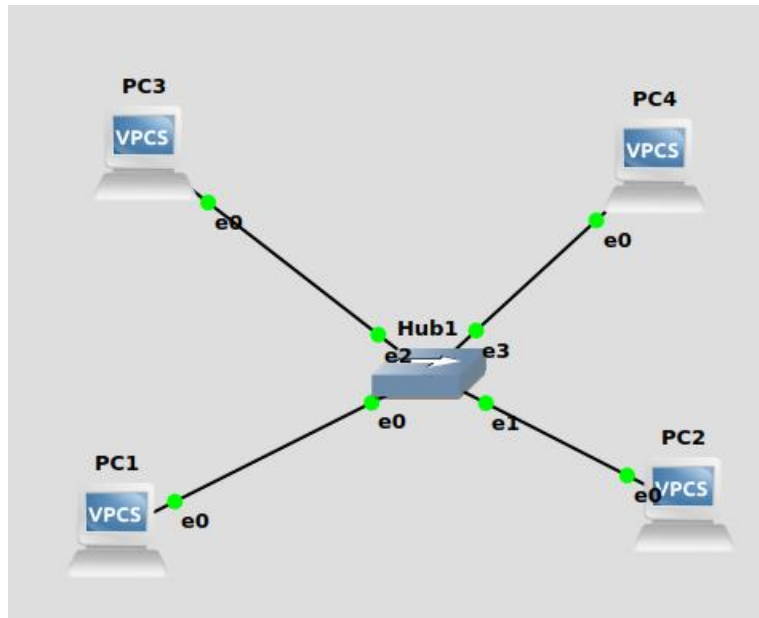


Fig: Hub

1. Drag & Drop 4 VPCs
2. Add Ethernet Hub and make a connection..
3. Set IP Address for all the VPCs.

```
PC3
PC1 x PC2 x PC3 x PC4 x
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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Executing the startup file

PC3> ip 192.168.1.3/24 192.168.1.254
Checking for duplicate address...
PC3 : 192.168.1.3 255.255.255.0 gateway 192.168.1.254
PC3> 
```

```
PC1
PC1 x PC2 x PC3 x PC4 x
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24 192.168.1.254
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0 gateway 192.168.1.254
PC1> 
```

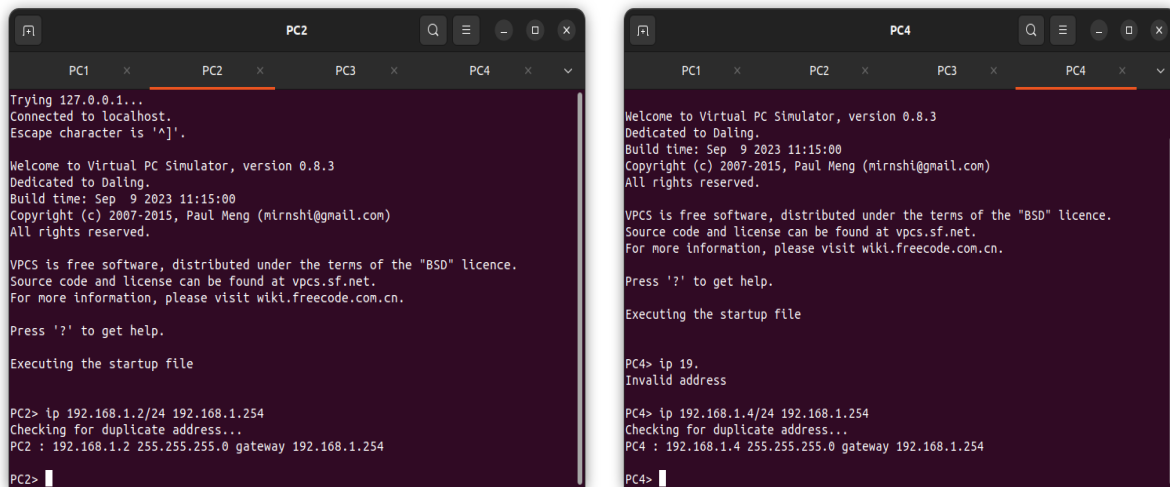


Fig: setting IP address for all VPCs.

4. Right click on PC4 and give Start Capture.

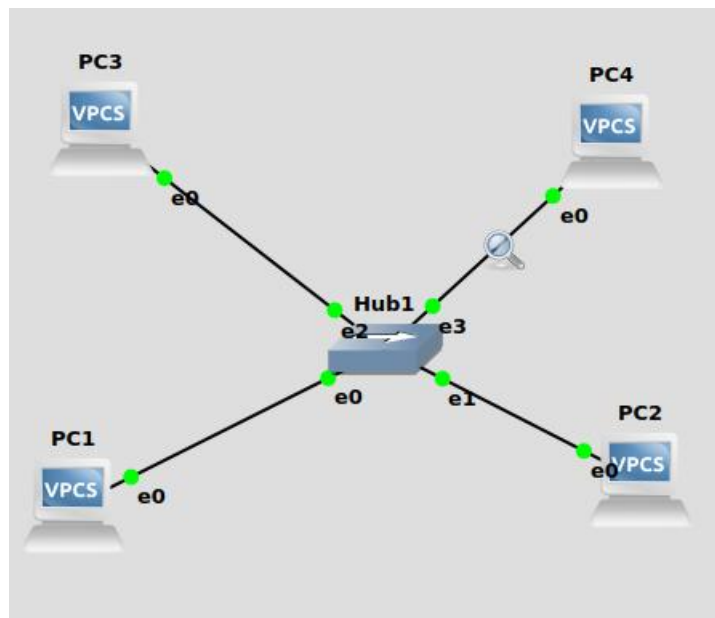


Fig: - PC4 Start Capture Picture

5. Ping all the VPCs using ping command
6. PC1>ping 192.168.1.2
7. PC1>ping 192.168.1.3
8. PC1>ping 192.168.1.4

Output:-

```

PC1
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

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Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> ping 192.168.1.2 -c 2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.298 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=1.026 ms

PC1> ping 192.168.1.3 -c 2
84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=9.329 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=0.638 ms

PC1> ping 192.168.1.4 -c 2
84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=0.684 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=0.775 ms

PC1>

```

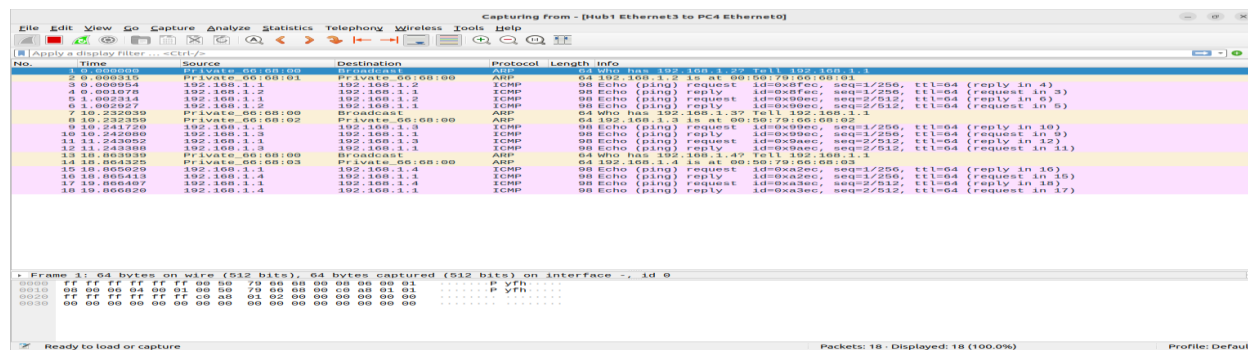


Fig: - Wireshark is displaying the request reply through the connected VPCs and Captured PC.

Experiment 2: - Analyze the Router in Computer Network Design using GNS3.

Objectives:

- To Learn about IP address Assignment for different sub networks
- To study the functions of ROUTER device
- To study the functions of SWITCH device

To start with the Lab exercise, create a topology as shown in Figure below.

Single router:-

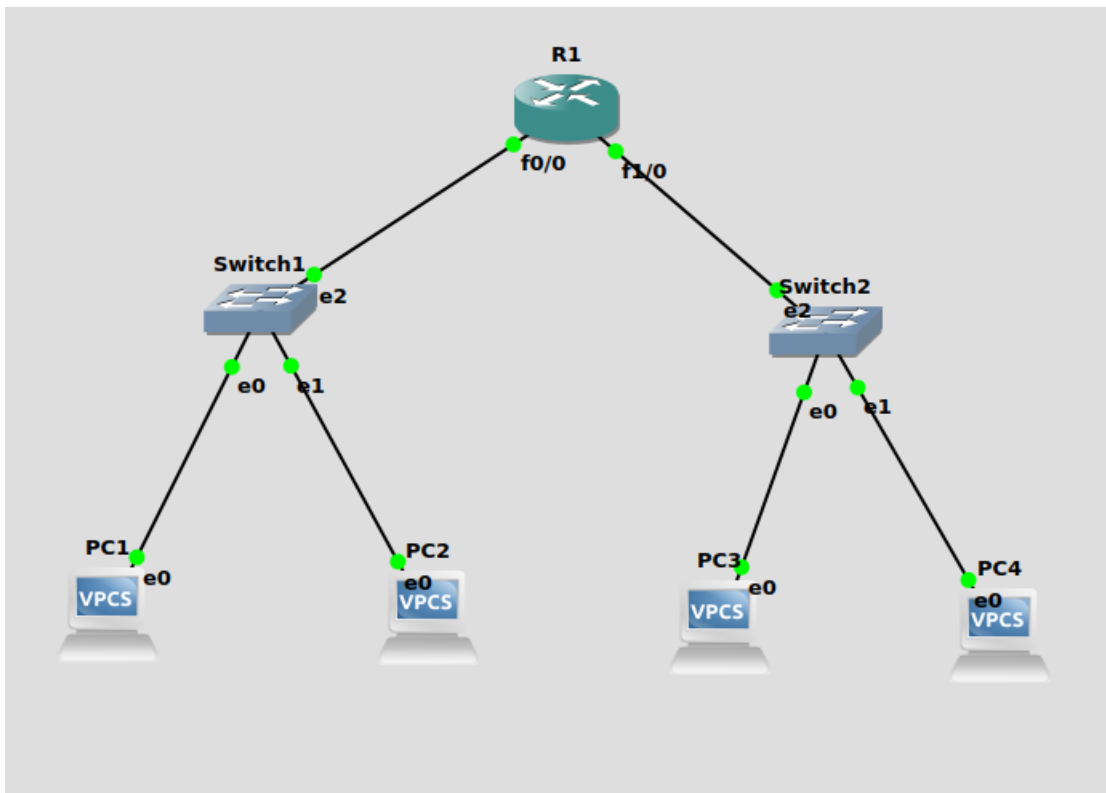


Fig:- Single Router Configuration

1. Drag & Drop 4 VPCs, 2 Switches, 1 Router
2. Make all the required connections and click on start button to start all the devices.
3. Set IP Address for all the VPCs as follows:
PC1>192.168.1.1/24 192.168.1.254
PC2>192.168.1.2/24 192.168.1.254
PC3>192.168.2.1/24 192.168.2.254
PC4>192.168.2.2/24 192.168.2.254

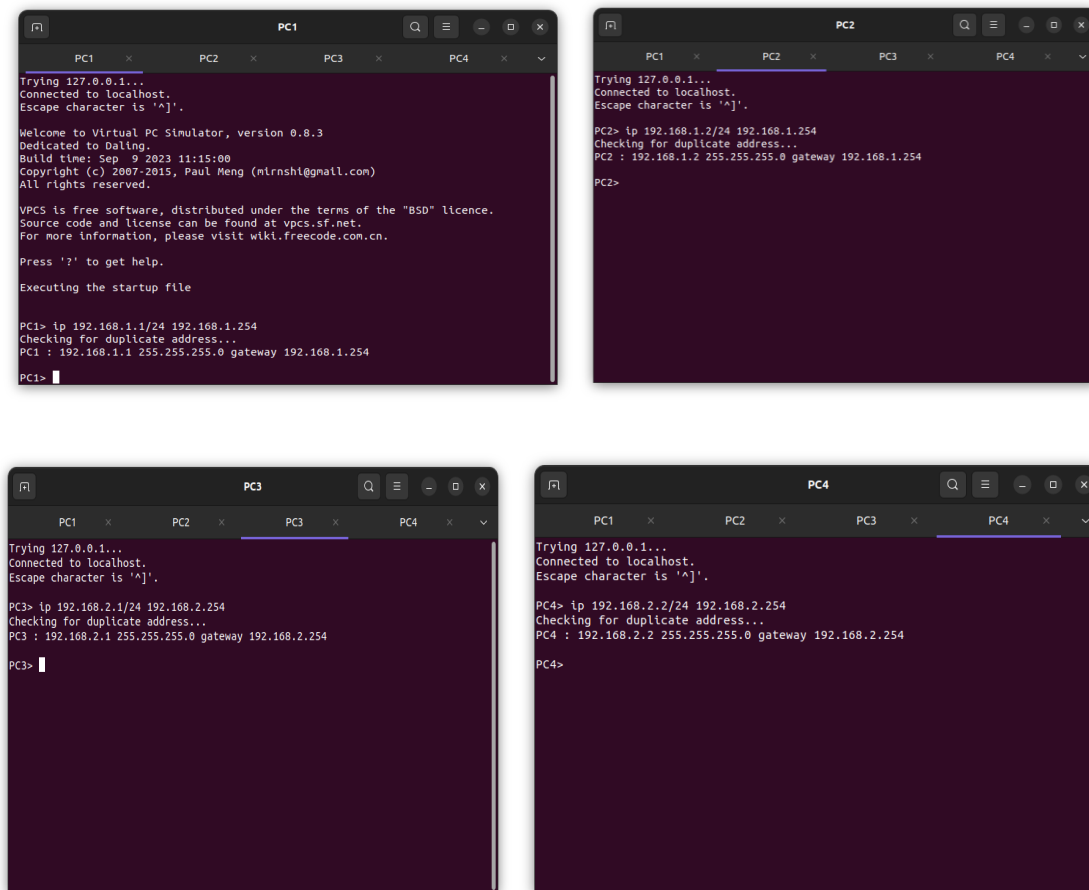


Fig:- Showing PC's IP address.

4. Click on PC1 and start capture
5. PC1>ping 192.168.1.1 ->data transfer takes place
6. PC1>ping 192.168.2.1 ->Host not reachable

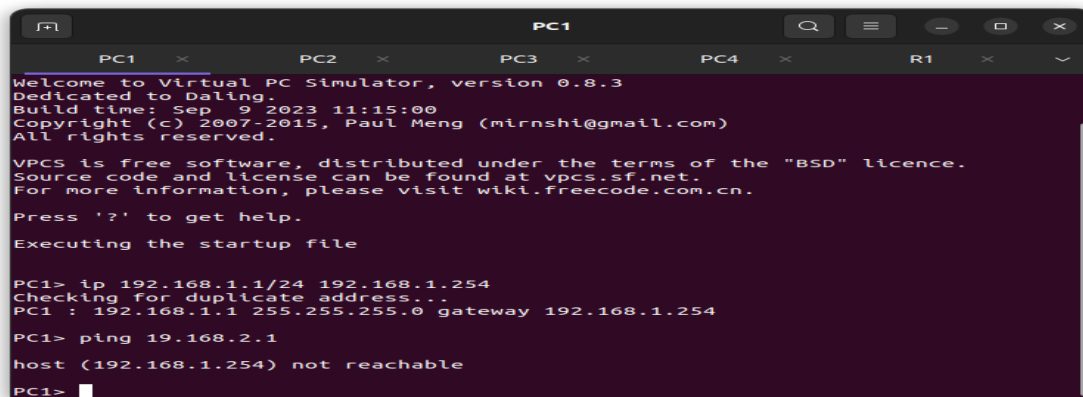


Fig: Ping PC1 to PC3.

Experiment 3:- Analyze the Computer Network Design using Two Routers in GNS3.

Double Router Configuration:

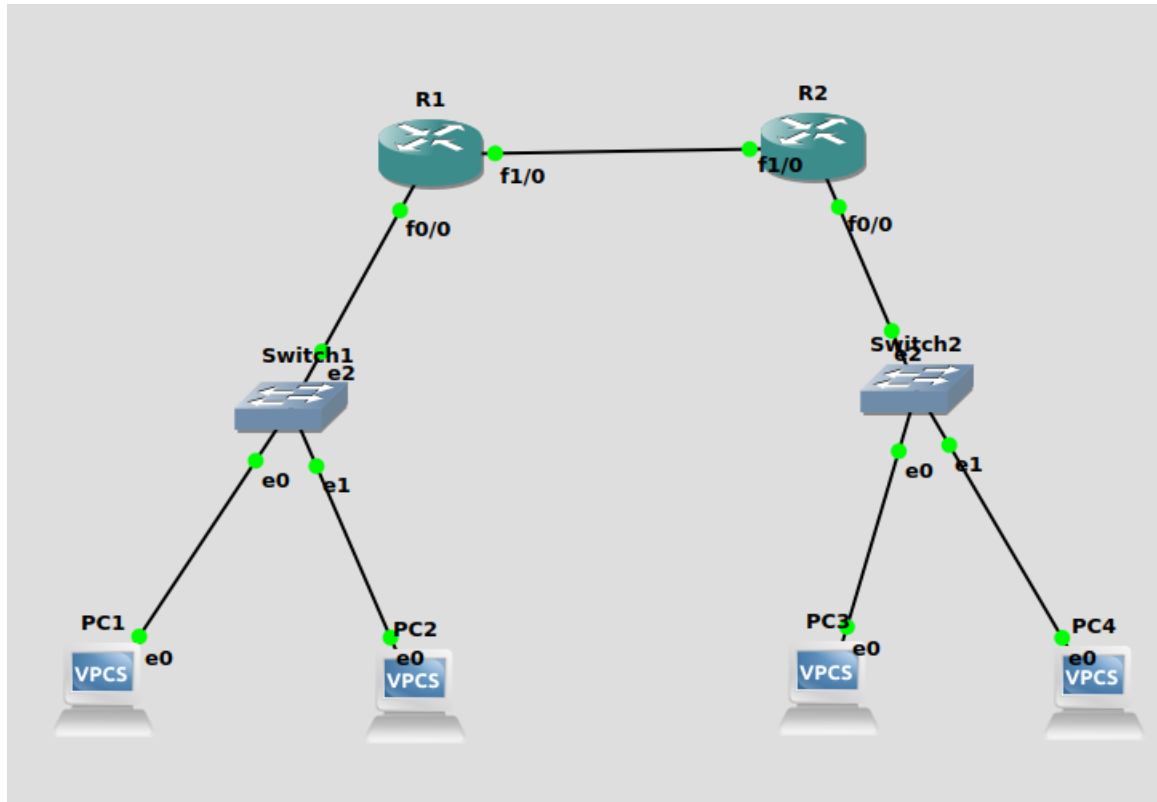


Fig: - Double Router Configuration

1. Drag & Drop 4 VPCs and 2 Switch and also add 2 Routers and make connection is shown in above figure.
2. Click on start button to start all devices.
3. Set Ip Address for all the VPCs as follows:

PC1>192.168.1.1/24 192.168.1.254

PC2>192.168.1.2/24 192.168.1.254

PC3>192.168.2.1/24 192.168.2.254

PC4>192.168.2.2/24 192.168.2.254

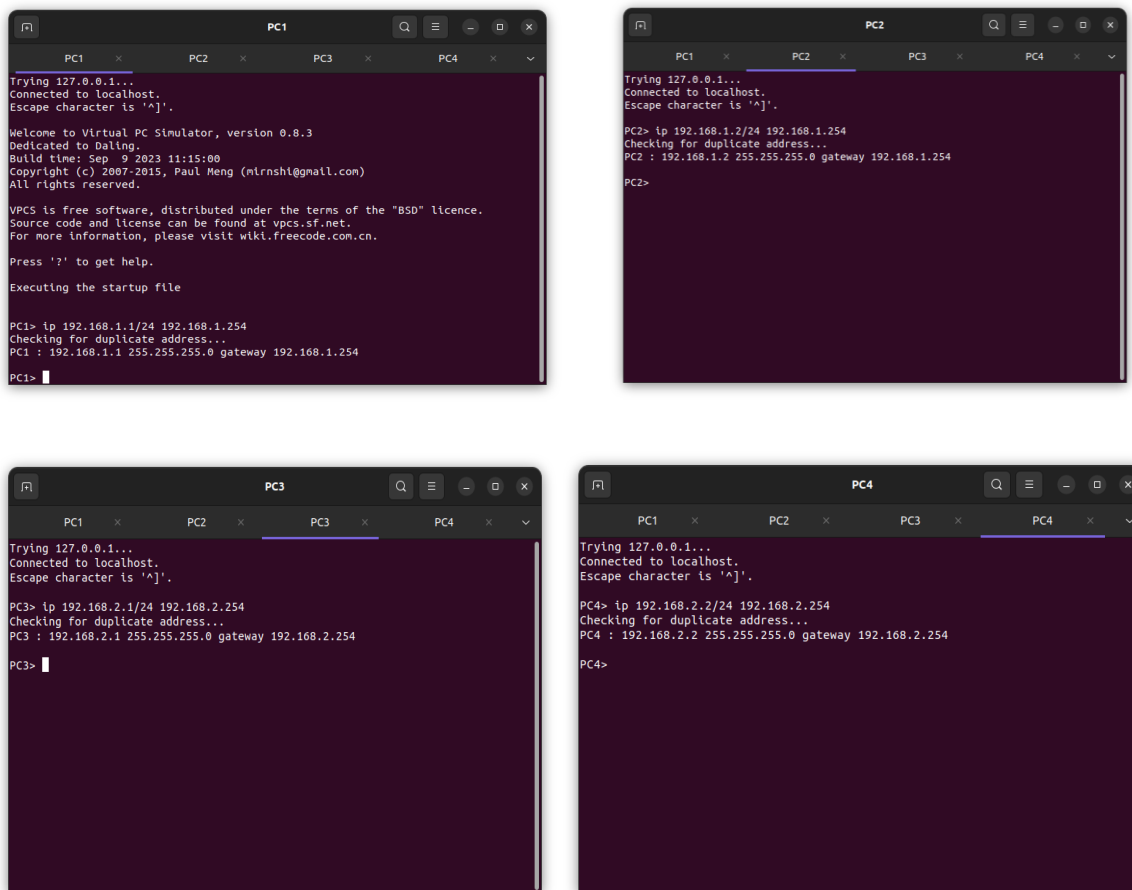


Fig:- Showing PC's IP address.

4. Click on PC1 and start capture
5. PC1>ping 192.168.1.1 ->data transfer takes place
6. PC1>ping 192.168.2.1 ->Host not reachable
7. Click on Router R1 and Write the below commands
R1#config t
R1 (config)#int f0/0
R1 (config)#ip address 192.168.1.254 255.255.255.0
R1 (config)#no shut
R1 (config)#exit

R1 (config)#int f1/0
R1 (config)#ip address 192.168.5.1 255.255.255.0
R1 (config)#no shut
R1 (config)#exit
8. Click on Router R2 and write below commands.
R2#config t

```
R2 (config)#int f0/0
R2 (config)#ip address 192.168.2.254 255.255.255.0
R2 (config)#no shut
R2 (config)#exit
```

```
R2 (config)#int f1/0
R2 (config)#ip address 192.168.5.2 255.255.255.0
R2 (config)#no shut
R2 (config)#exit
```

9. After the configuration, PC1>ping 192.168.2.1

```
PC1> ping 192.168.2.1
host (192.168.1.254) not reachable
```

PC1>ping 192.168.1.2

```
PC1> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.215 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.361 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.374 ms
```

10. Now give the Route for transferring the data through the 2 switches using below commands.
For Router R1:

R1#ip route 192.168.2.0 255.255.255.0 192.168.5.2

```
R1(config)#ip route 192.168.2.0 255.255.255.0 192.168.5.2
R1(config)#
```

For Router R2:

R2#ip route 192.168.1.0 255.255.255.0 192.168.5.1

```
R2(config-if)#ip route 192.168.1.0 255.255.255.0 192.168.5.1
R2(config)#
```

Now ping the VPCs.

PC1>ping 192.168.2.1

```
PC1> ping 192.168.2.1
84 bytes from 192.168.2.1 icmp_seq=1 ttl=63 time=24.607 ms
84 bytes from 192.168.2.1 icmp_seq=2 ttl=63 time=16.421 ms
84 bytes from 192.168.2.1 icmp_seq=3 ttl=63 time=15.117 ms
84 bytes from 192.168.2.1 icmp_seq=4 ttl=63 time=14.666 ms
84 bytes from 192.168.2.1 icmp_seq=5 ttl=63 time=15.963 ms
```

Experiment 4: -Analyze the Dynamic Host Configuration Protocol (DHCP) using GNS3.

Objectives: -

- Understand DHCP Service
- Analyzing DHCP Packets
- Understanding significance of Netmask value

DHCP Overview: -

The Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns IP addresses to devices on a network.

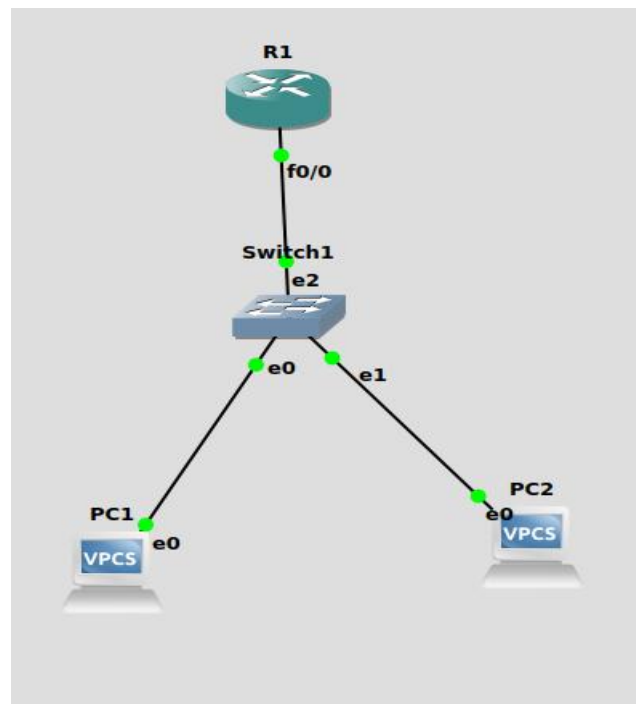


Fig:- Network Topology for DHCP Configuration

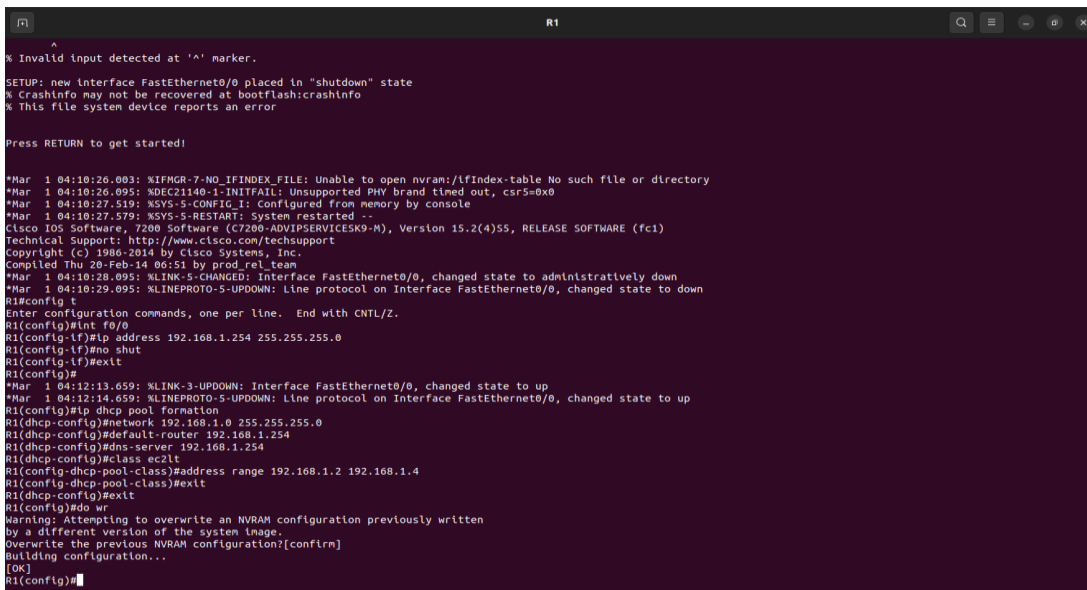
1. Drag and drop 2 VPCs, 1 Switch, 1 Router and make the connections as shown above.
2. Start all the devices.
3. In order to configure our router as a DHCP server the following commands are used.

Router Configuration:-

```
R1#config t
```

```
R1(config)#int f0/0
```

```
R1(config)#ip address 192.168.1.254 255.255.255.0
R1(config)#no shut
R1(config)#exit
R1(config)#ip dhcp pool formation
R1(dhcp-config) #network 192.168.1.0 255.255.255.0
R1(dhcp-config) #default-router 192.168.1.254
R1(dhcp-config) #dns-server 192.168.1.254
R1(dhcp-config) #class ec2lt
R1(config-dhcp-pool-class) #address range 192.168.1.2 192.168.1.4
R1(config-dhcp-pool-class) #exit
R1(dhcp-config) #exit
R1(dhcp-config) #do wr
```



```
R1
% Invalid input detected at '^' marker.
SETUP: new interface FastEthernet0/0 placed in "shutdown" state
% Crashinfo may not be recovered at bootflash:crashinfo
% This file system device reports an error

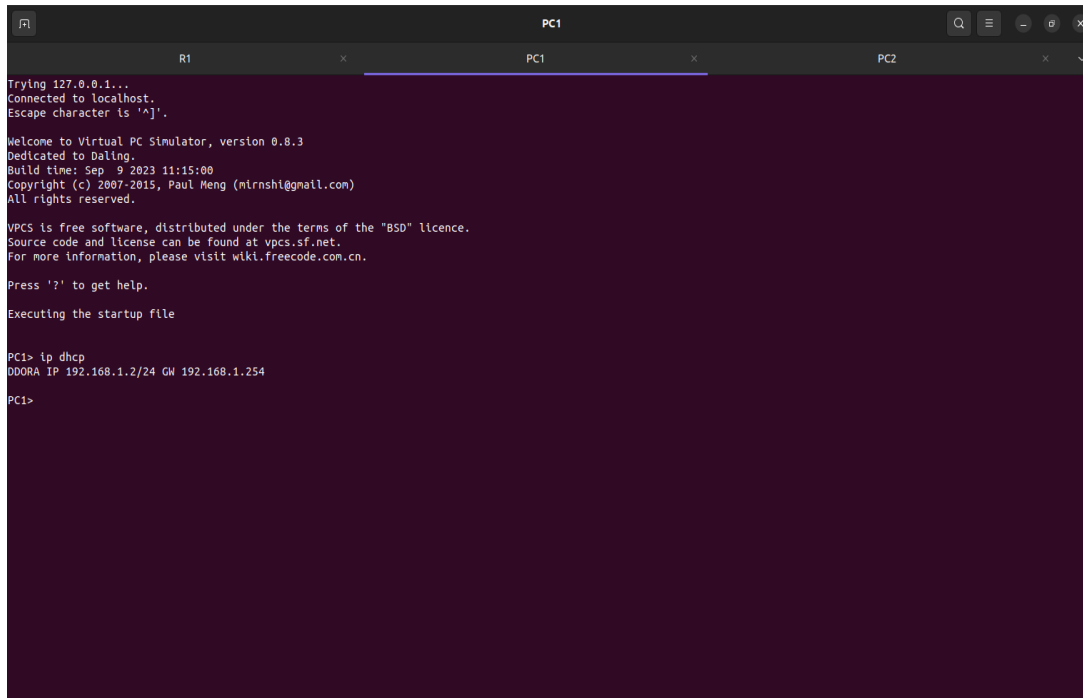
Press RETURN to get started!

*Mar  1 04:10:26.003: %IFWGR-7-NO_INDEX_FILE: Unable to open nvram:/ifindex-table No such file or directory
*Mar  1 04:10:26.095: %DEC21140-1-INITFAIL: Unsupported PHY brand timed out, csr5=0x0
*Mar  1 04:10:27.519: %SYS-5-CONFIG_I: Configured from memory by console
*Mar  1 04:10:27.579: %SYS-5-RESTART: System restarted --
Cisco IOS Software, 7200 Software (C7200-ADVIPSERVICESK9-M), Version 15.2(4)5S, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2014 by Cisco Systems, Inc.
Compiled Thu 20-Feb-14 06:51 by prod_rel_team
*Mar  1 04:10:28.095: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
*Mar  1 04:10:29.095: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int f0/0
R1(config-if)#ip address 192.168.1.254 255.255.255.0
R1(config-if)#no shut
R1(config-if)#exit
R1(config)#
*Mar  1 04:12:13.659: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 04:12:14.659: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config)#ip dhcp pool formation
R1(dhcp-config)#network 192.168.1.0 255.255.255.0
R1(dhcp-config)#default-router 192.168.1.254
R1(dhcp-config)#dns-server 192.168.1.254
R1(dhcp-config)#class ec2lt
R1(config-dhcp-pool-class)#address range 192.168.1.2 192.168.1.4
R1(config-dhcp-pool-class)#exit
R1(dhcp-config)#exit
R1(config)#do wr
Warning: Attempting to overwrite a NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[conflrm]
Building configuration...
[OK]
R1(config)#
```

Fig: - Router Configuration

4. The commands above will turn the interface on and assign an IP address.
5. Click the VPCS.

```
PC1>ip dhcp
```



The screenshot shows a terminal window titled 'PC1' within a 'Virtual PC Simulator' application. The terminal displays the following text:

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

Welcome to Virtual PC Simulator, version 0.8.3
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Press '?' to get help.

Executing the startup file

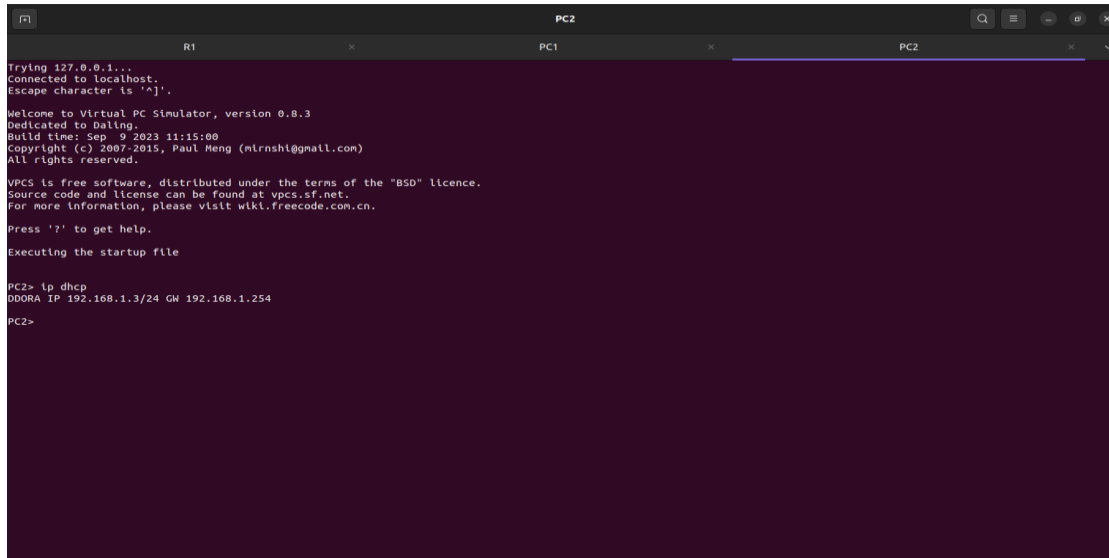
PC1> ip dhcp
DDOORA IP 192.168.1.2/24 GW 192.168.1.254

PC1>
```

Fig:-Showing PC1 IP address.

DDOORA 192.168.1.2 192.168.1.254 is the output

PC2>ip dhcp



The screenshot shows a terminal window titled 'PC2' within a 'Virtual PC Simulator' application. The terminal displays the following text:

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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Press '?' to get help.

Executing the startup file

PC2> ip dhcp
DDOORA IP 192.168.1.3/24 GW 192.168.1.254

PC2>
```

Fig:-Showing PC2 IP address.

DDOORA 192.168.1.4 192.168.1.254 is the output

Experiment 5: - Analyze the design of VLAN'S using GNS3.

Objectives:

- To understand Virtual Lan (VLAN) Concepts

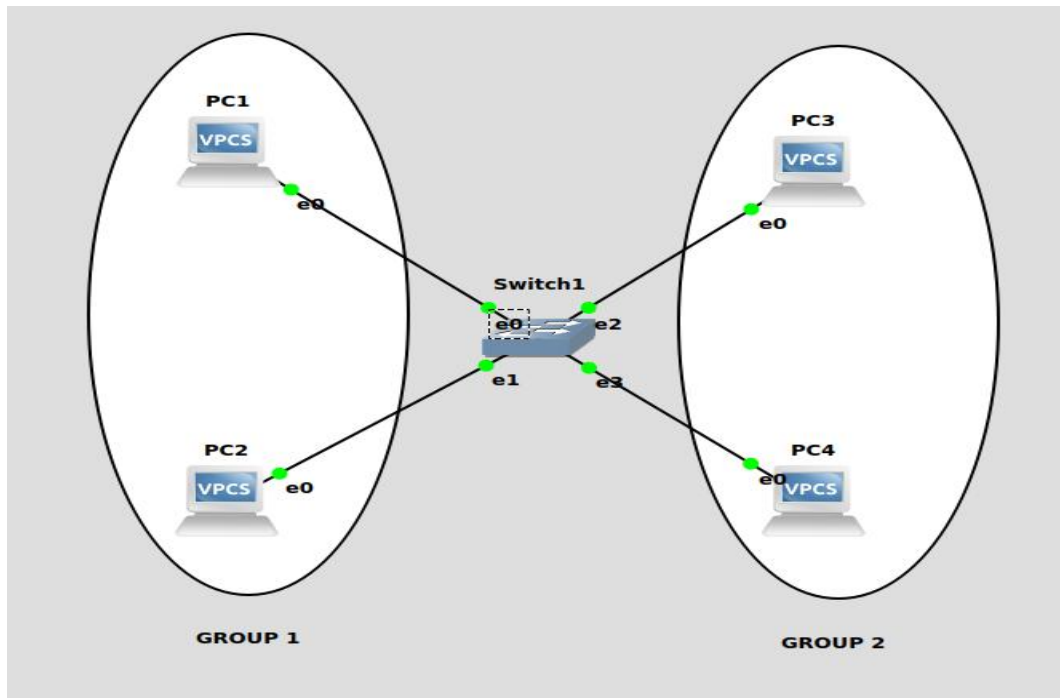


Fig: - VLANs Configuration

1.Set IP address for all VPCS as follows:

PC1>192.168.1.1/24

PC2>192.168.1.2/24

PC3>192.168.1.3/24

PC4>192.168.1.4/24

```
PC1
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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Press '?' to get help.
Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0
PC1>
```

```
PC2
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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Press '?' to get help.
Executing the startup file

PC2> ip 192.168.1.2/24
Checking for duplicate address...
PC2 : 192.168.1.2 255.255.255.0
PC2>
```

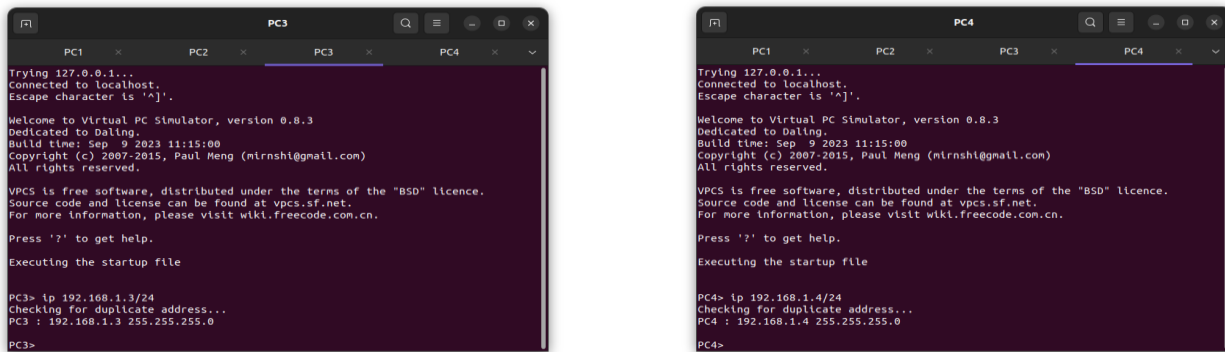



Fig:- IP address for all the PC'S.

2. After the IP address setting, ping the PC's.

PC1> ping 192.168.1.3

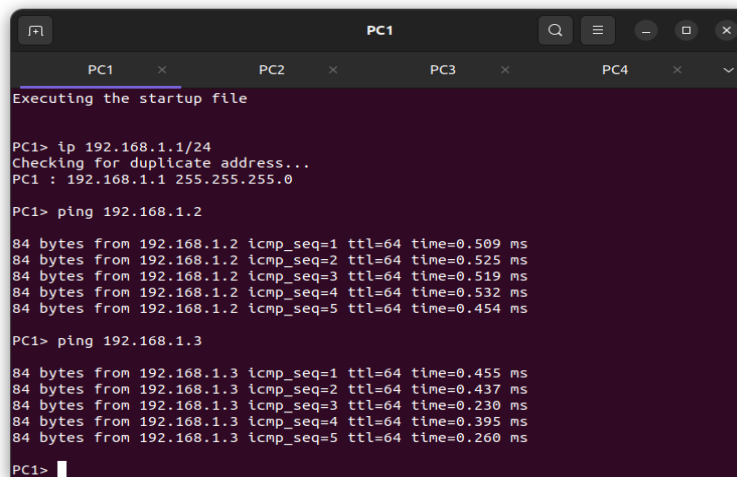


Fig: Ping PC1 to PC3

3. Before setting a LAN connection for VPCs we should remove the wired connection.

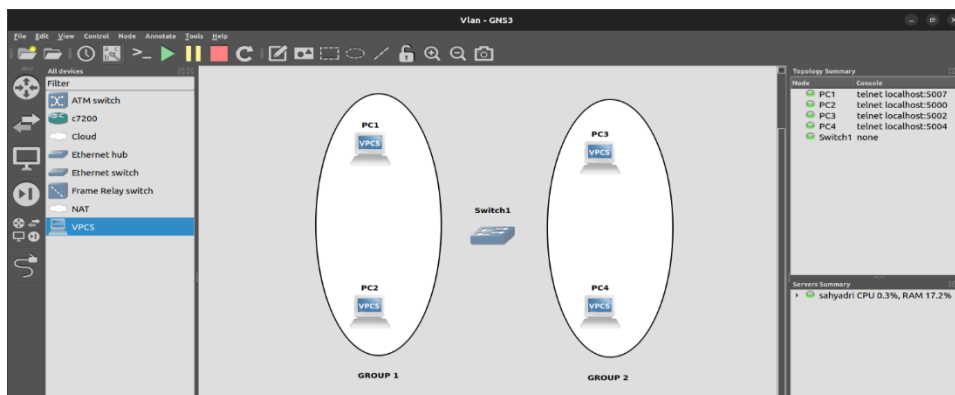
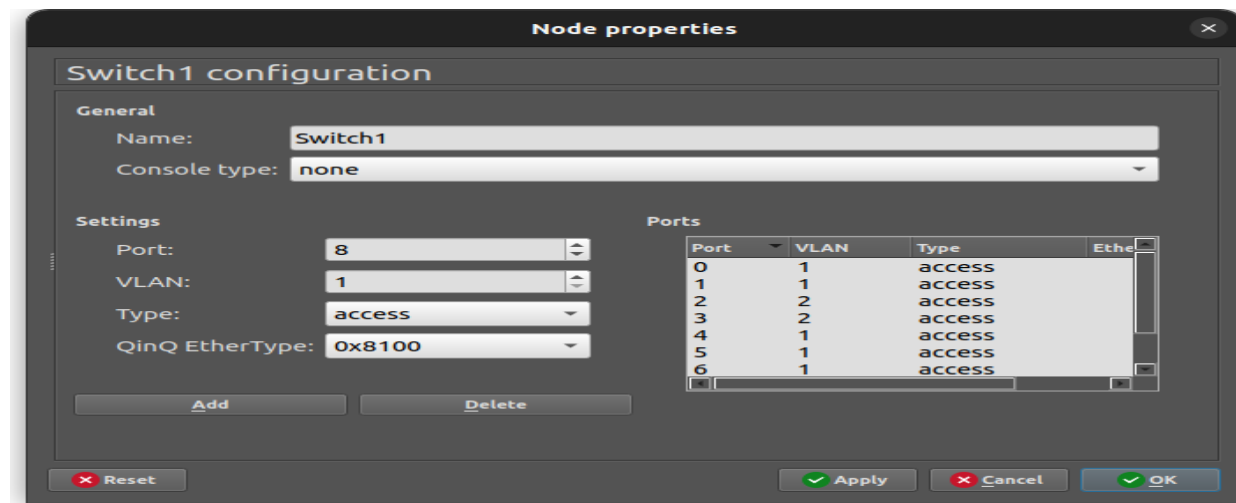


Fig: - deleting all the connections through the VPCS.

4. SWITCH Configuration: -

PORT	VLAN
0(PC1)	1-> ADD
1(PC2)	1-> ADD
2(PC3)	2-> ADD
3(PC4)	2->ADD



Check-> add-> Apply->&ok.

5. PC1>ping 192.168.1.3

```

PC1
-----
vpcs is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.cn.cn.
Press '?' to get help.
Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> ping 192.168.1.2
64 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.509 ms
64 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.525 ms
64 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.519 ms
64 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.532 ms
64 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=0.454 ms

PC1> ping 192.168.1.3
64 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=0.455 ms
64 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=0.437 ms
64 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=0.230 ms
64 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=0.395 ms
64 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=0.260 ms

PC1> ping 192.168.1.2
64 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.240 ms
64 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.340 ms
64 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.371 ms
64 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.495 ms
64 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=0.158 ms

PC1> ping 192.168.1.3
host (192.168.1.3) not reachable
PC1>

```