

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

Switch Configure:

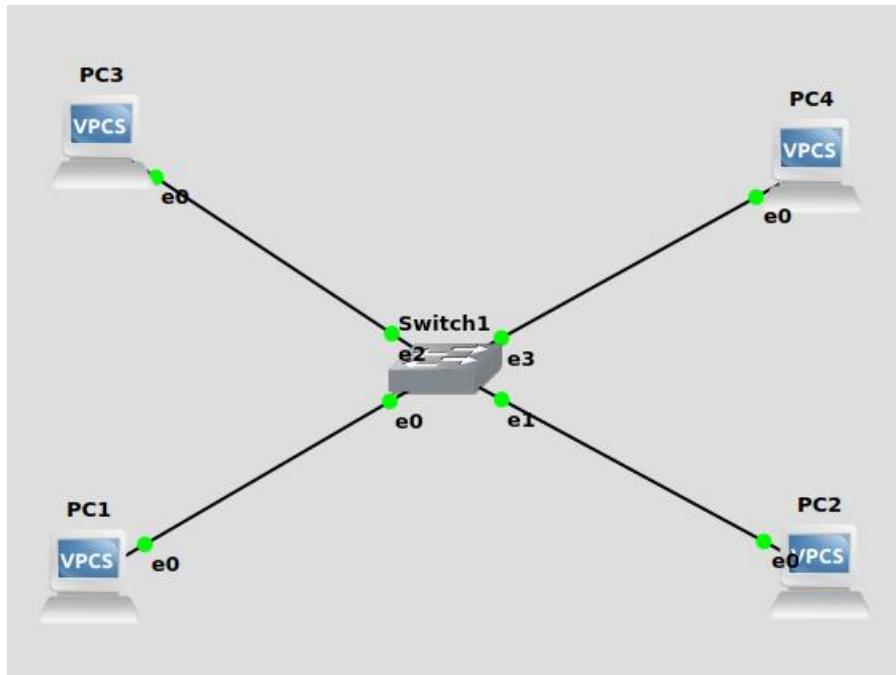


Fig: Switch

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

```

PC3 terminal output:
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

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Press '?' to get help.

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 terminal output:
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 192.168.1.1/24 192.168.1.254
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0 gateway 192.168.1.254
PC1>

PC2 terminal output:
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

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Executing the startup file

PC2> ip 192.168.1.2/24 192.168.1.254
Checking for duplicate address...
PC2 : 192.168.1.2 255.255.255.0 gateway 192.168.1.254
PC2>

PC4 terminal output:
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

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Executing the startup file

PC4> tp 19.
Invalid address

PC4> ip 192.168.1.4/24 192.168.1.254
Checking for duplicate address...
PC4 : 192.168.1.4 255.255.255.0 gateway 192.168.1.254
PC4>

```

Fig: IP address for all 4 PC's.

3. Right click on PC4 & give start capture.

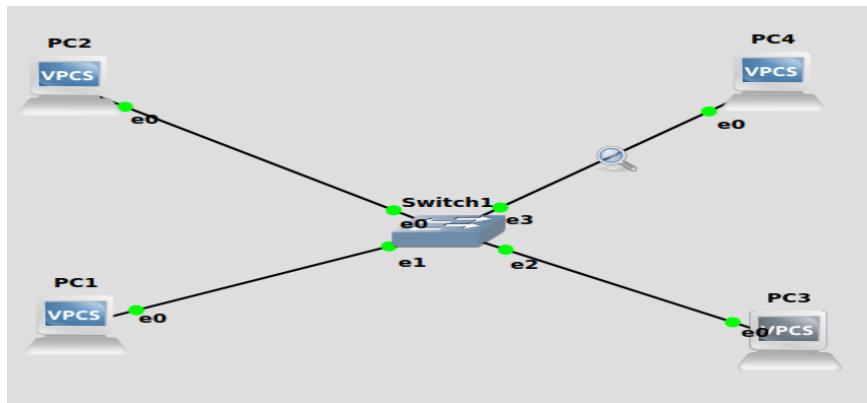


Fig: PC4 Start Capture Picture

- 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

```

PC1          PC2          PC3          PC4
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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=0.588 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

PC1>

```

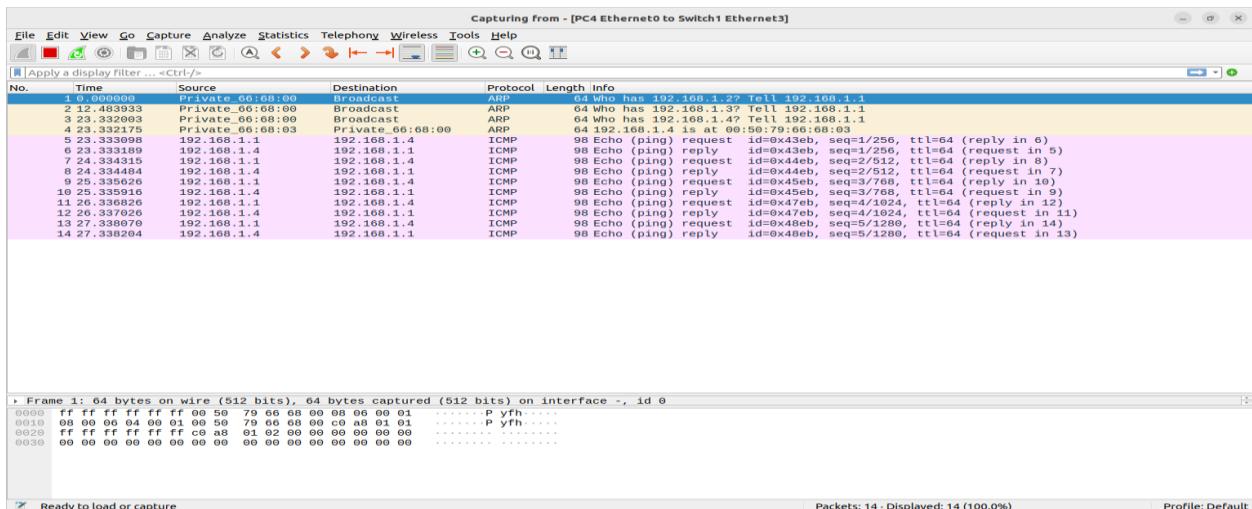


Fig: Wireshark Displaying the request reply through the connected VPCs and Captured PC.

HUB Configuration:-

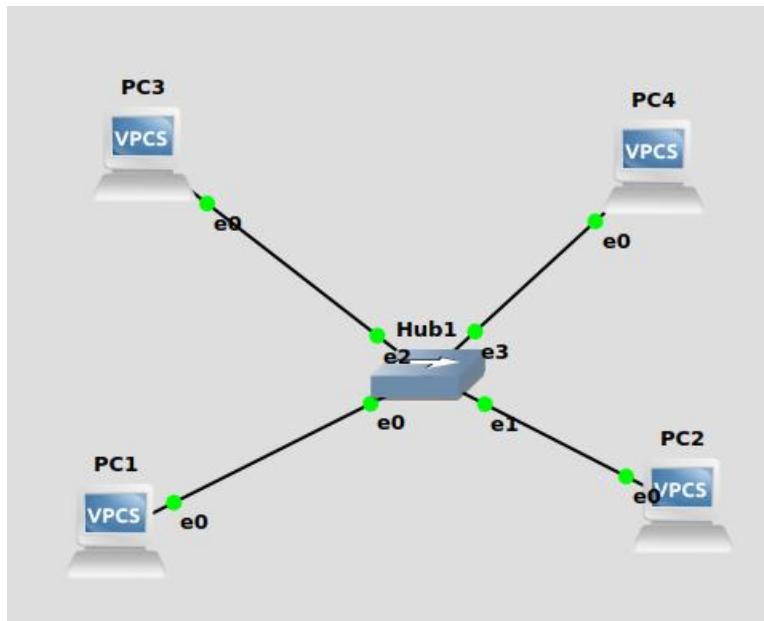


Fig: Hub

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

```

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

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Press '?' to get help.
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

PC1 x PC2 x PC3 x PC4 x
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 192.168.1.1/24 192.168.1.254
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0 gateway 192.168.1.254
  
```

```

PC2
Trying 127.0.0.1...
Connected to localhost.
Escape character is ']'.

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Press '?' to get help.

Executing the startup file

PC2> ip 192.168.1.2/24 192.168.1.254
Checking for duplicate address...
PC2 : 192.168.1.2 255.255.255.0 gateway 192.168.1.254
PC2>

PC4
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Press '?' to get help.

Executing the startup file

PC4> ip 19.
Invalid address

PC4> ip 192.168.1.4/24 192.168.1.254
Checking for duplicate address...
PC4 : 192.168.1.4 255.255.255.0 gateway 192.168.1.254
PC4>

```

Fig: setting IP address for all VPCs.

- Right click on PC4 and give Start Capture.

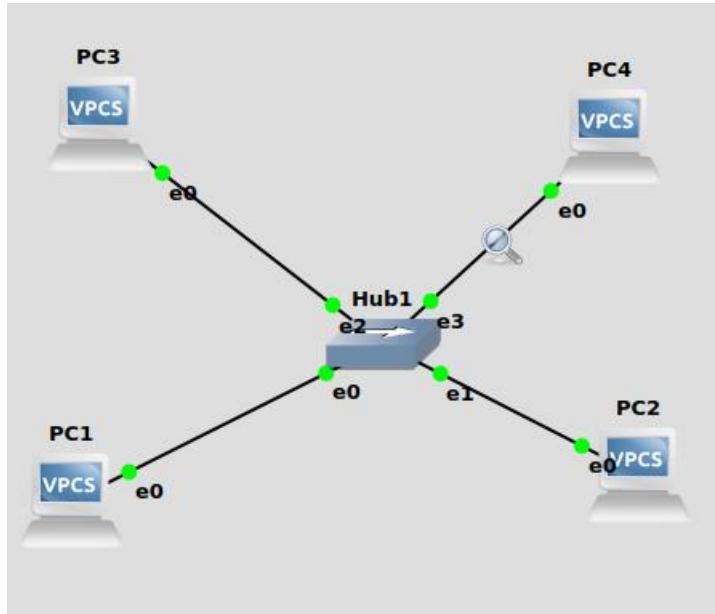


Fig: - PC4 Start Capture Picture

- Ping all the VPCs using ping command
- PC1>ping 192.168.1.2
- PC1>ping 192.168.1.3
- PC1>ping 192.168.1.4

Output:-

```

Trying 127.0.0.1...
Connected to localhost.
Escape character is '^A'.
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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

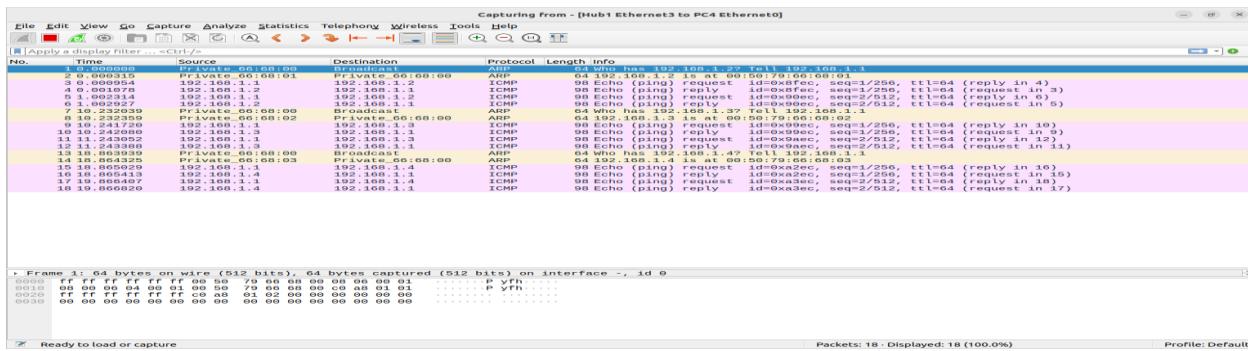
PC1> ping 192.168.1.2 -c 2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.298 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.026 ms

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>

```



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:-

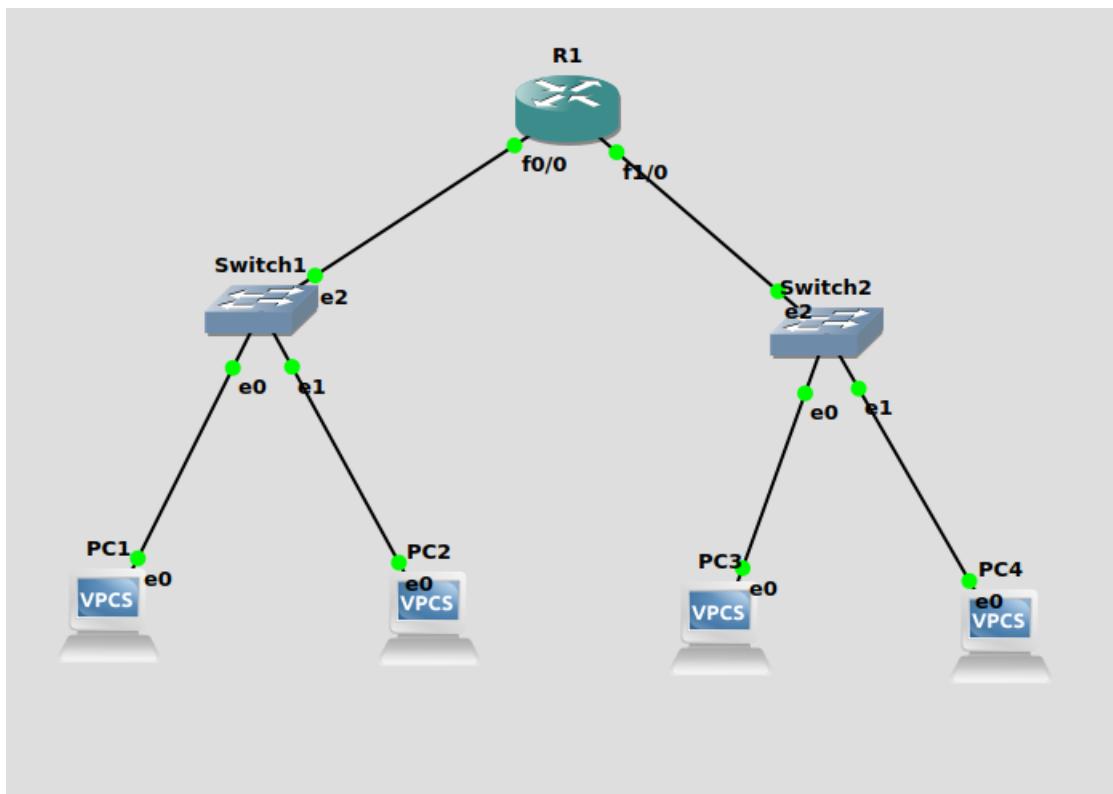


Fig:- Single Router Configuration

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

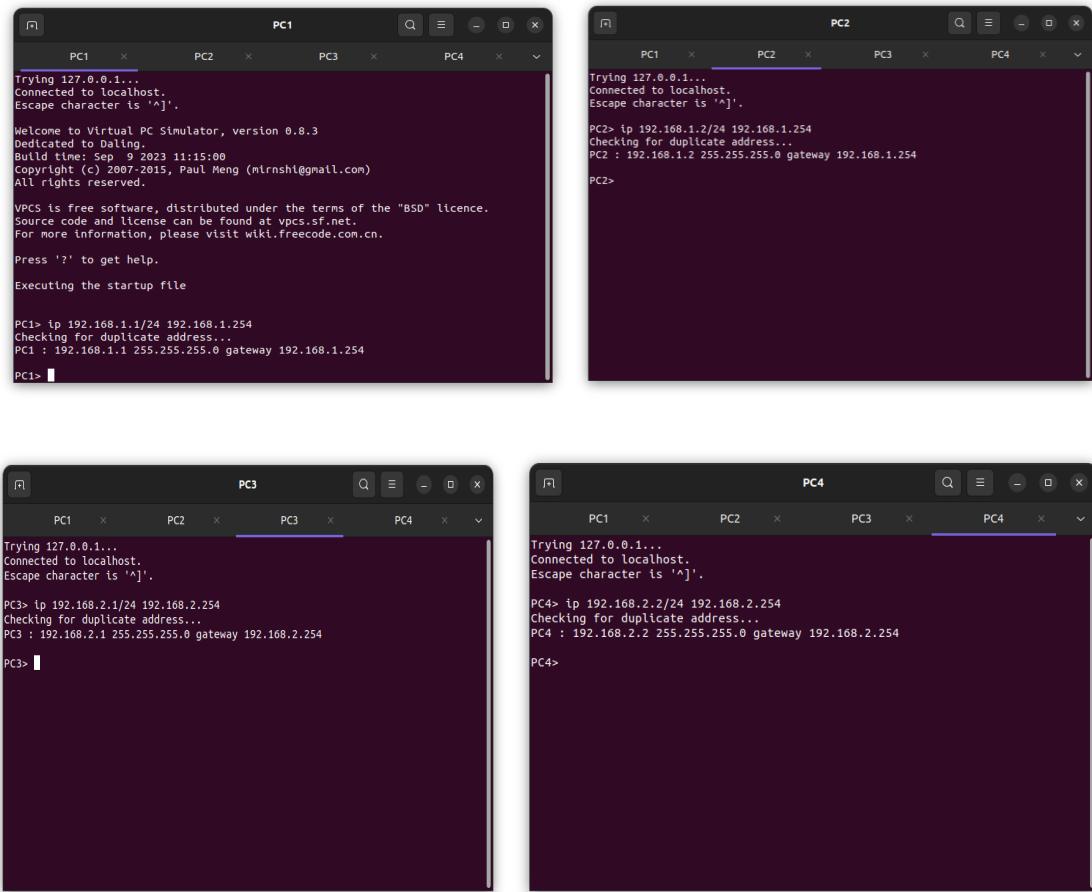


Fig:- Showing PC's IP address.

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

This terminal window is titled "PC1". It shows the startup message and the command "ping 19.168.2.1". The output indicates that the host at 192.168.1.254 is not reachable.

```

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Press '?' to get help.

Executing the startup file

PC1> ping 19.168.2.1
host (192.168.1.254) not reachable
PC1>

```

Fig: Ping PC1 to PC3.

Router Configuration:-

Router Configuration 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 192.168.2.254 255.255.255.0
R1 (config)#no shut
R1 (config)#exit
```

7. Ping PC1 to PC3.

PC1> ping 192.168.2.1

```
PC1
PC2
PC3
PC4
R1

Connected to localhost.
Escape character is '^]'.

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Press '?' to get help.

Executing the startup file

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

PC1> ping 19.168.2.1

host (19.168.1.254) not reachable

PC1> ping 19.168.2.1

*192.168.1.254 icmp_seq=1 ttl=255 time=9.853 ms (ICMP type=3, code=1, Destination host unreachable)
*192.168.1.254 icmp_seq=2 ttl=255 time=6.533 ms (ICMP type=3, code=1, Destination host unreachable)
*192.168.1.254 icmp_seq=3 ttl=255 time=7.355 ms (ICMP type=3, code=1, Destination host unreachable)
*192.168.1.254 icmp_seq=4 ttl=255 time=5.355 ms (ICMP type=3, code=1, Destination host unreachable)
*192.168.1.254 icmp_seq=5 ttl=255 time=4.737 ms (ICMP type=3, code=1, Destination host unreachable)

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=15.417 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=15.903 ms

PC1>
```

Fig: Data Packets transfer from PC1 to PC3.

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

Double Router Configuration:

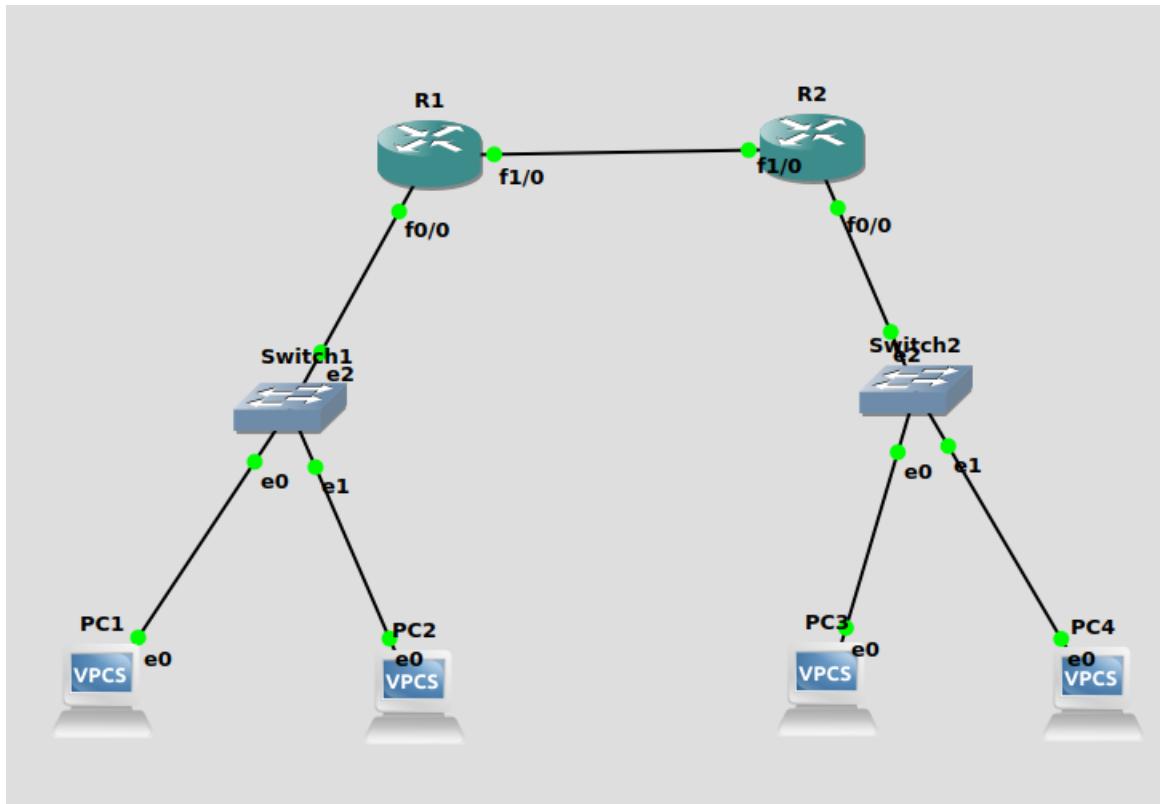


Fig: - Double Router Configuration

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

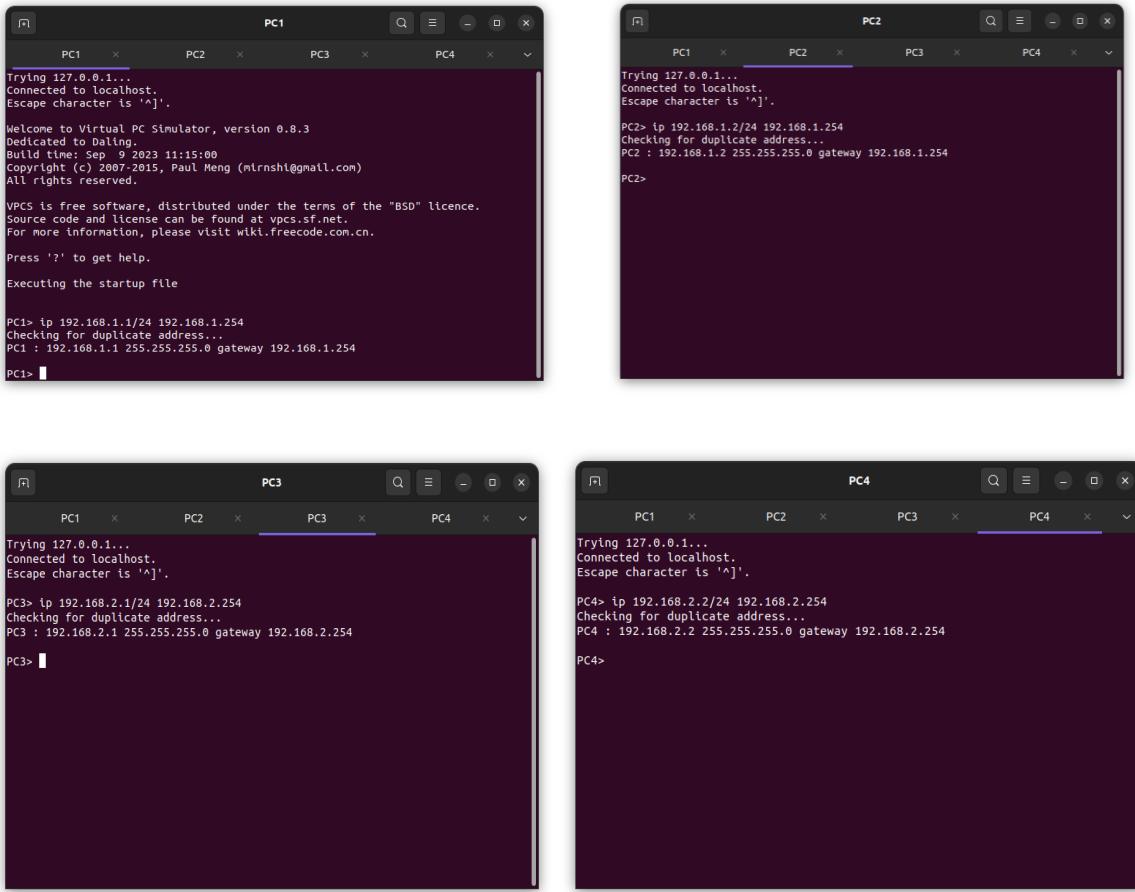


Fig:- Showing PC's IP address.

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.

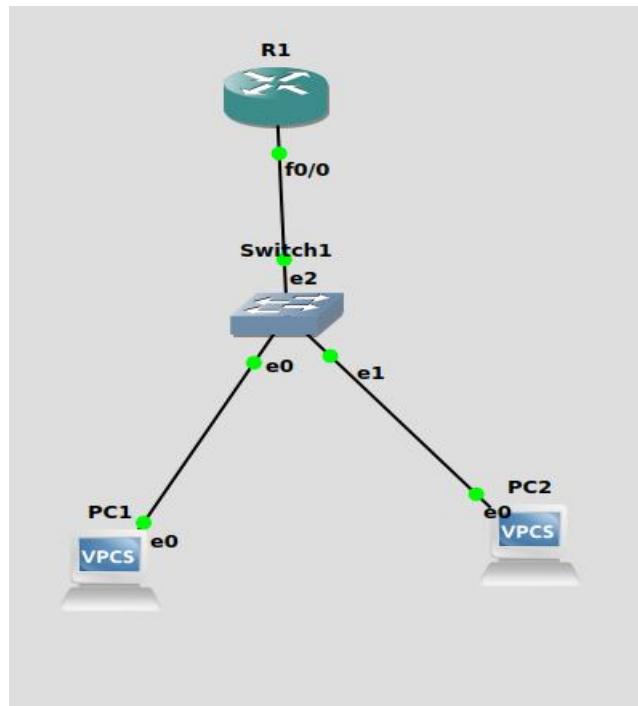


Fig:- Network Topology for DHCP Configuration

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
```

```
% 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 04:10:26.093: %IFMGR-7-NO_IFINDEX_FILE: Unable to open nvram:/ifIndex-table No such file or directory
*Mar 1 04:10:26.095: %DEC2110-1-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)S5, 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)#
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
building configuration...
[OK]
R1(config)#

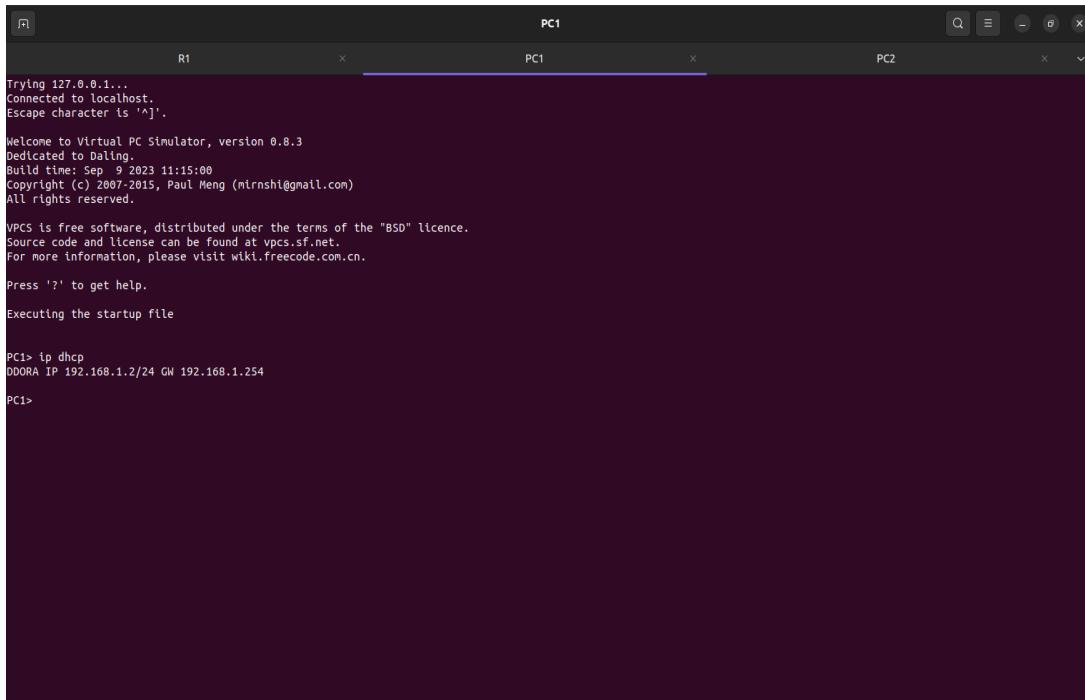
```

Fig: - Router Configuration

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

5. Click the VPCS.

PC1>ip dhcp



```
R1          PC1          PC2
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^']'.

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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

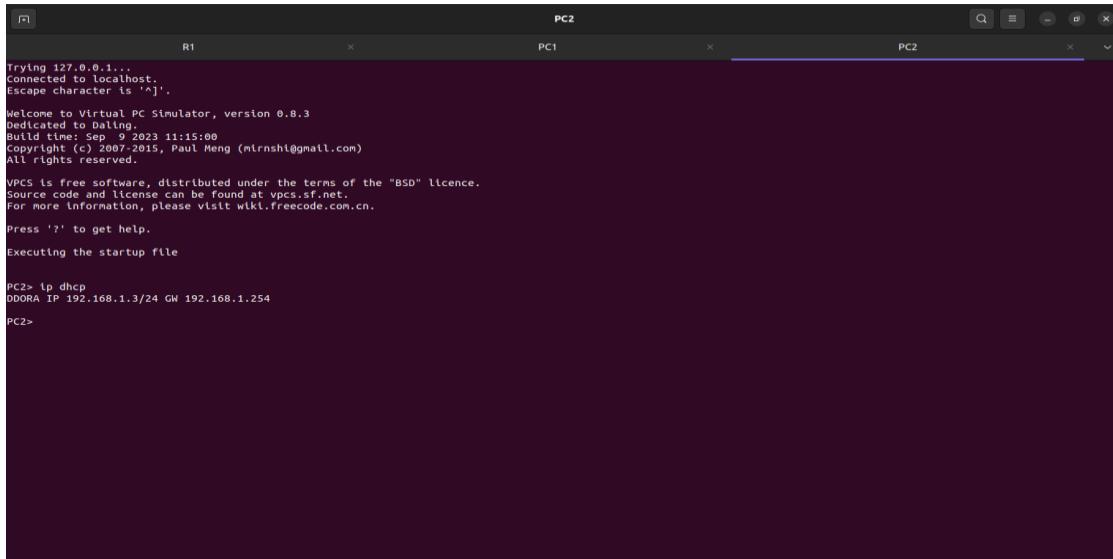
PC1> ip dhcp
DDORA IP 192.168.1.2/24 GW 192.168.1.254

PC1>
```

Fig:-Showing PC1 IP address.

DDOORA 192.168.1.2 192.168.1.254 is the output

PC2>ip dhcp



```
R1          PC1          PC2
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^']'.

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
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Press '?' to get help.

Executing the startup file

PC2> ip dhcp
DDORA IP 192.168.1.4/24 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

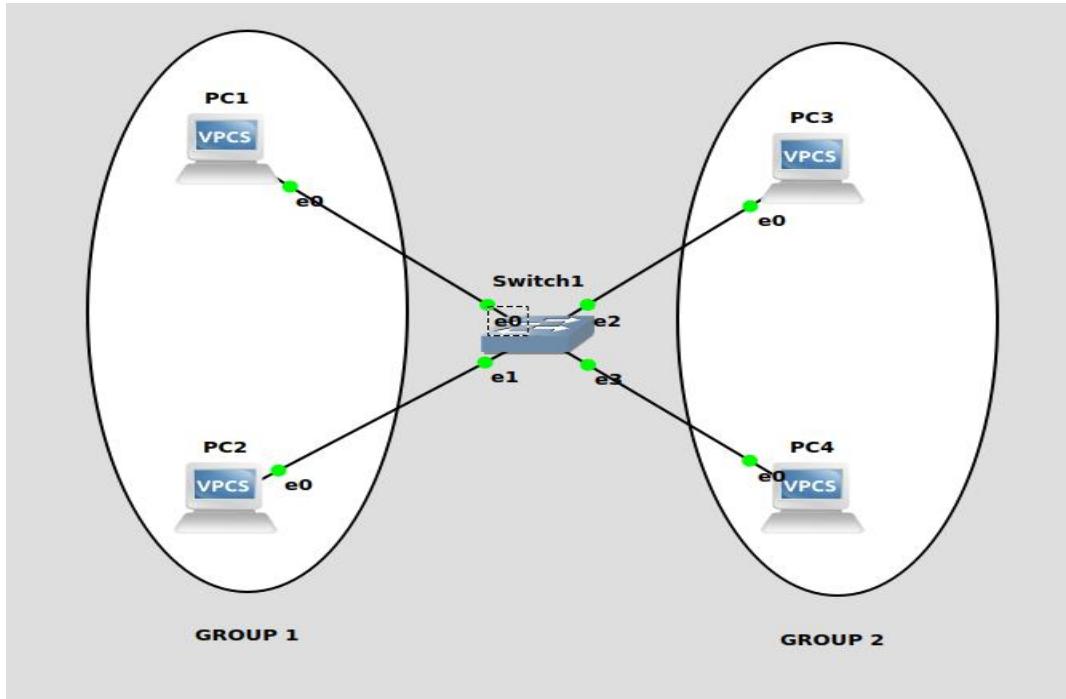


Fig: - VLANs Configuration

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 x PC2 x PC3 x PC4 x
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^['.
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to DaLing.
Build time: Sep 9 2023 11:15:00
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For more information, please visit wiki.freecode.com.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>
```

```
PC1 x PC2 x PC3 x PC4 x
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^['.
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to DaLing.
Build time: Sep 9 2023 11:15:00
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For more information, please visit wiki.freecode.com.cn.

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>
```

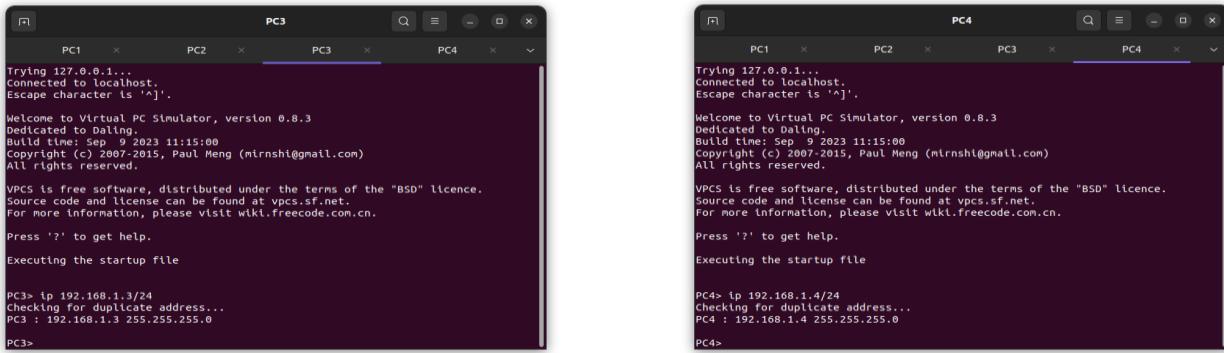


Fig:- IP address for all the PC'S.

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

PC1> ping 192.168.1.3

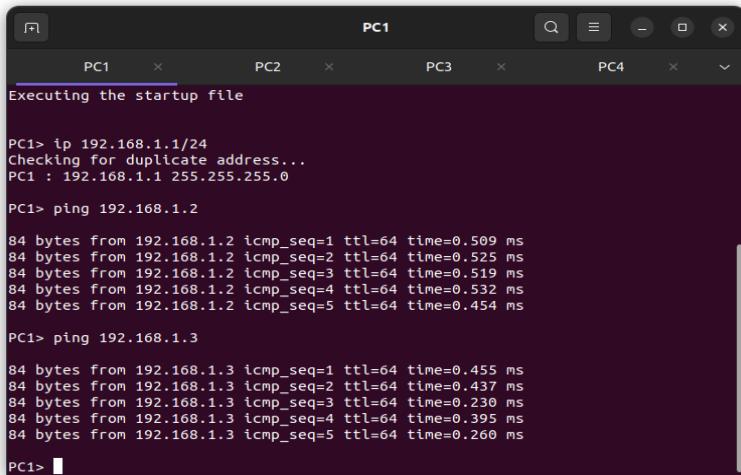


Fig: Ping PC1 to PC3

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

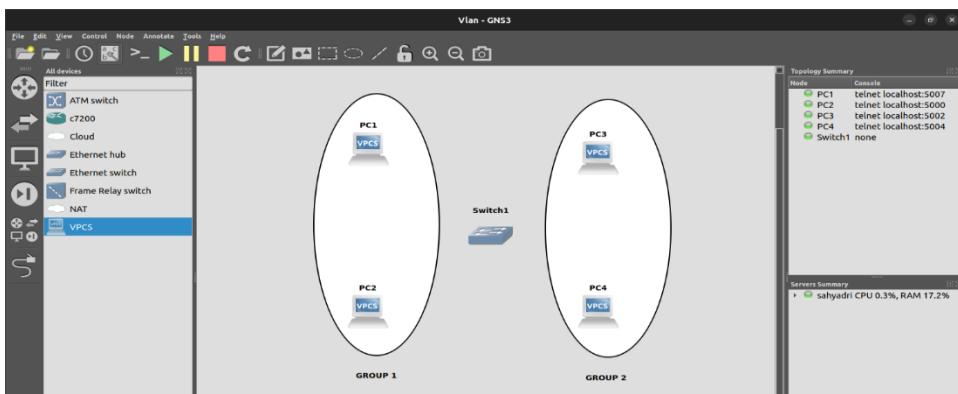
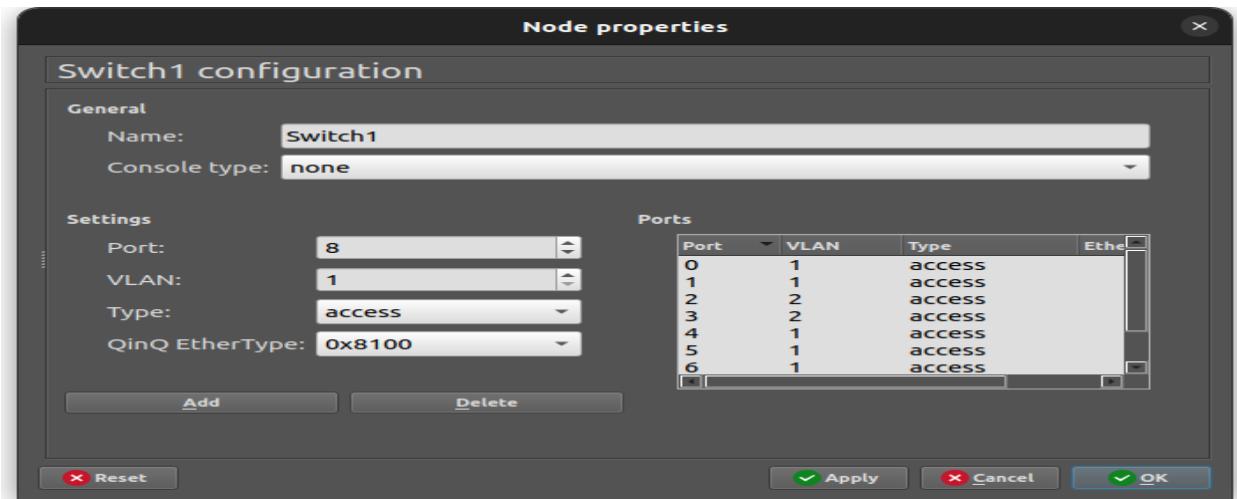


Fig: - deleting all the connections through the VPCS.

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
PC2
PC3
PC4

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For more information, please visit wktl.freecode.com.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
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.509 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.525 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.519 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.532 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=0.454 ms

PC1> ping 192.168.1.3
84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=0.455 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=0.437 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=0.458 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=0.395 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=0.260 ms

PC1> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.240 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.348 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.371 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.495 ms
84 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>

```