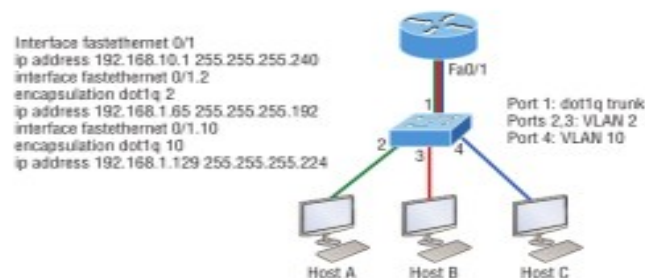


Computer Networks Week 7: Lab 11: Design of VLANs using GNS3

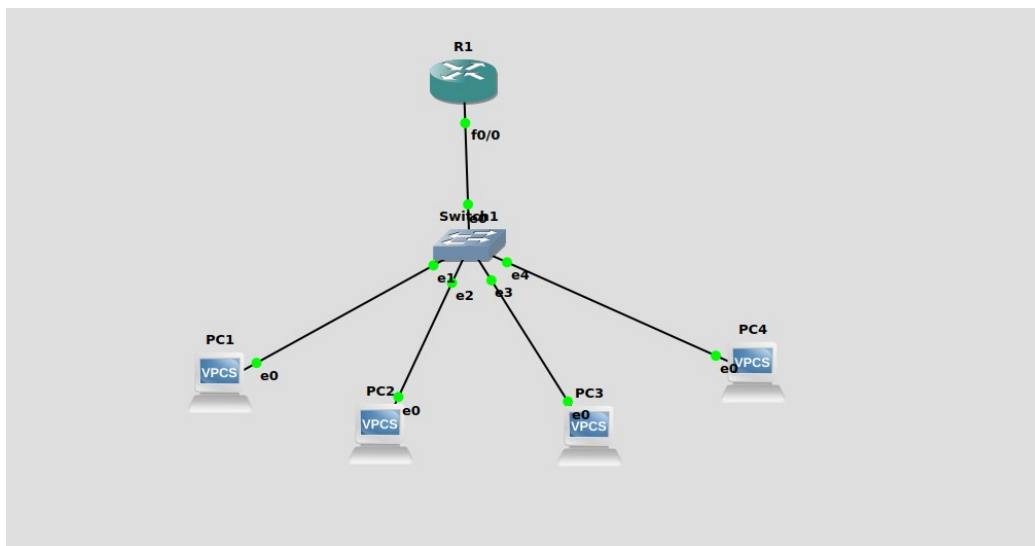
Lab Exercises:

Configure following inter-VLAN example in GNS3 and verify the working using wireshark tool.

1.



My network(i have used 4 Pcs and have kept 2 Pcs in each network):

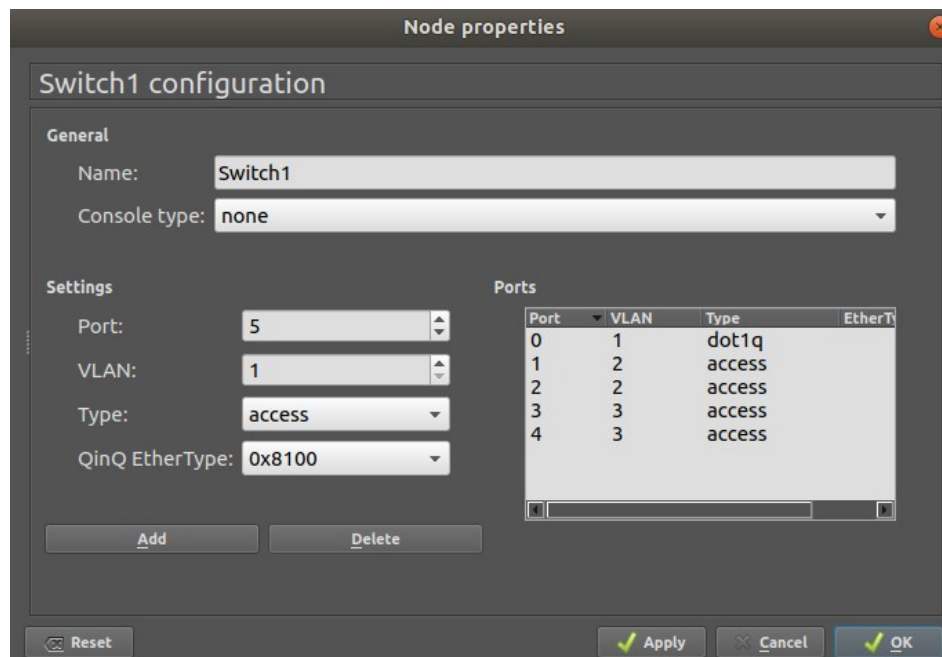


To accommodate the switch communicating between two VLANs, we need to configure the ports with which VLAN ID they will be serving and which protocol they will be following. We assign VLAN1 to the port which connects to the router (trunk) and configure it to dot1q protocol.

We create two more ports for VLAN2 for PC1 and PC2 and configure it to access. Similarly, two more for VLAN3 for PC3 and PC4, with access. A trunk is a connection which acts as two or more

separate connections via the same port. To accommodate for the router communicating between two VLANs, the trunk connection needs to have two separate IP-Addresses (one for each VLAN). The interface f0/0 of the router itself does not contain any of these IP-Addresses networks but their sub-interfaces do. By running the command encapsulation dot1q 2, we are configuring the router to use the IEEE 802.1q protocol for cross VLAN communication with the VLAN Id for this interface as 2.

The switch has been configured as follows:



Configuring the router R1 to have sub interfaces for accepting multiple VLAN packets on 1 interface itself.

```

R1
File Edit View Search Terminal Help
Cisco IOS Software, 7200 Software (C7200-JK9S-M), Version 12.4(13b), RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 25-Apr-07 03:18 by prod_rel_team
*Nov 29 05:53:50.839: %ENTITY_ALARM-6-INFO: ASSERT INFO Fa0/0 Physical Port Administrative State Down
*Nov 29 05:53:50.859: %ENTITY_ALARM-6-INFO: ASSERT INFO Se1/0 Physical Port Administrative State Down
*Nov 29 05:53:50.859: %ENTITY_ALARM-6-INFO: ASSERT INFO Se1/1 Physical Port Administrative State Down
*Nov 29 05:53:50.859: %ENTITY_ALARM-6-INFO: ASSERT INFO Se1/2 Physical Port Administrative State Down
*Nov 29 05:53:50.859: %ENTITY_ALARM-6-INFO: ASSERT INFO Se1/3 Physical Port Administrative State Down
*Nov 29 05:53:50.859: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a cold start
*Nov 29 05:53:51.151: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
*Nov 29 05:53:51.251: %LINK-5-CHANGED: Interface Serial1/0, changed state to administratively down
*Nov 29 05:53:51.295: %LINK-5-CHANGED: Interface Serial1/1, changed state to administratively down
*Nov 29 05:53:51.303: %LINK-5-CHANGED: Interface Serial1/2, changed state to administratively down
*Nov 29 05:53:51.303: %LINK-5-CHANGED: Interface Serial1/3, changed state to administratively down
*Nov 29 05:53:52.151: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down
*Nov 29 05:53:52.251: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to down
*Nov 29 05:53:52.295: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1, changed state to down
*Nov 29 05:53:52.303: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/2, changed state to down
*Nov 29 05:53:52.303: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/3, changed state to down
R1#
R1#
R1#enable
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
% Incomplete command.
R1(config-if)#ip address 192.168.10.1 255.255.255.240
R1(config-if)#no shut
R1(config-if)#
*Nov 29 05:55:50.223: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Nov 29 05:55:50.223: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 29 05:55:51.223: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#int f0/0.2
R1(config-subif)#encapsulation dot1q 2
R1(config-subif)#ip address 192.168.1.65 255.255.255.192
R1(config-subif)#no shut
R1(config-subif)#int f0/0.3
R1(config-subif)#encapsulation dot1q 3
R1(config-subif)#ip address 192.168.1.129 255.255.255.240
R1(config-subif)#no shut
R1(config-subif)#

```

Configuring PC1, PC2 and PC3, PC4 by giving the appropriate IP addresses and default gateways. PC1 and PC2 are in VLAN 2 whereas PC3 and PC4 is in VLAN 3.

PC1:

```
PC1
File Edit View Search Terminal Help
All rights reserved.

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.com.cn.

Press '?' to get help.

Executing the startup file

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

PC1> ping 192.168.1.65

84 bytes from 192.168.1.65 icmp_seq=1 ttl=255 time=40.652 ms
84 bytes from 192.168.1.65 icmp_seq=2 ttl=255 time=40.896 ms
84 bytes from 192.168.1.65 icmp_seq=3 ttl=255 time=10.069 ms
84 bytes from 192.168.1.65 icmp_seq=4 ttl=255 time=9.990 ms
84 bytes from 192.168.1.65 icmp_seq=5 ttl=255 time=9.467 ms

PC1>
```

PC2:

```
PC2
File Edit View Search Terminal Help
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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.com.cn.

Press '?' to get help.

Executing the startup file

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

PC2>
```

PC3:

```
PC3
File Edit View Search Terminal Help

Executing the startup file

PC3> ip 192.168.1.67/26 192.168.1.65
Checking for duplicate address...
PC3 : 192.168.1.67 255.255.255.192 gateway 192.168.1.65

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

PC3> show ip

NAME       : PC3[1]
IP/MASK    : 192.168.1.130/27
GATEWAY    : 192.168.1.129
DNS        :
MAC        : 00:50:79:66:68:02
LPORT      : 10016
RHOST:PORT : 127.0.0.1:10017
MTU        : 1500

PC3> 
```

PC4:

```
PC4
File Edit View Search Terminal Help

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

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 192.168.1.131/27 192.168.1.129
Checking for duplicate address...
PC4 : 192.168.1.131 255.255.255.224 gateway 192.168.1.129

PC4> 
```

Successfully pinging the default gateway for PC1(in above PC1 screenshot) and this one ping PC2 and PC3 from VLAN id 2 and 3 network respectively:

```
PC1
File Edit View Search Terminal Help

84 bytes from 192.168.1.65 icmp_seq=1 ttl=255 time=40.652 ms
84 bytes from 192.168.1.65 icmp_seq=2 ttl=255 time=40.896 ms
84 bytes from 192.168.1.65 icmp_seq=3 ttl=255 time=10.069 ms
84 bytes from 192.168.1.65 icmp_seq=4 ttl=255 time=9.990 ms
84 bytes from 192.168.1.65 icmp_seq=5 ttl=255 time=9.467 ms

PC1> ping 192.168.1.130

192.168.1.130 icmp_seq=1 timeout
84 bytes from 192.168.1.130 icmp_seq=2 ttl=63 time=19.644 ms
84 bytes from 192.168.1.130 icmp_seq=3 ttl=63 time=19.646 ms
84 bytes from 192.168.1.130 icmp_seq=4 ttl=63 time=19.626 ms
84 bytes from 192.168.1.130 icmp_seq=5 ttl=63 time=19.718 ms

PC1> ping 192.168.1.67

84 bytes from 192.168.1.67 icmp_seq=1 ttl=64 time=0.711 ms
84 bytes from 192.168.1.67 icmp_seq=2 ttl=64 time=0.912 ms
84 bytes from 192.168.1.67 icmp_seq=3 ttl=64 time=0.828 ms
84 bytes from 192.168.1.67 icmp_seq=4 ttl=64 time=0.950 ms
84 bytes from 192.168.1.67 icmp_seq=5 ttl=64 time=0.756 ms

PC1>
```

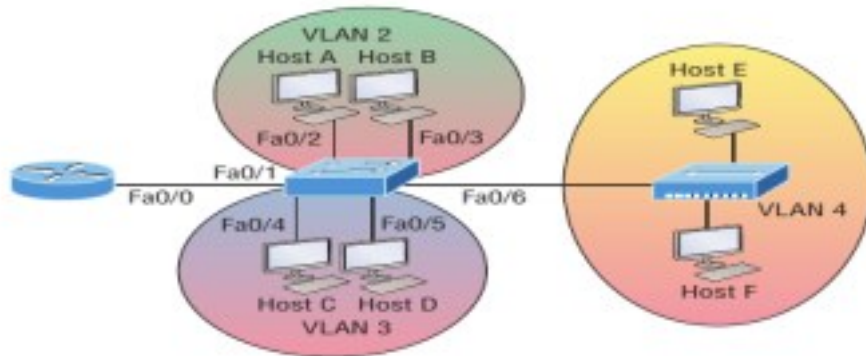
Wireshark capture of pinging PC3 from PC1 (in network 3 from network 2):

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request id=0x0774, seq=1/256, ttl=63 (reply in 4)
2	0.000578	Private_66:68:02	Broadcast	ARP	64	Who has 192.168.1.129? Tell 192.168.1.130 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
3	0.010294	ca:01:13:cb:00:00	Private_66:68:02	ARP	60	192.168.1.129 is at ca:01:13:cb:00:00
4	0.010493	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply id=0x0774, seq=1/256, ttl=64 (request in 1)
5	1.030859	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request id=0x0874, seq=2/512, ttl=63 (reply in 6)
6	1.031212	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply id=0x0874, seq=2/512, ttl=64 (request in 5)
7	2.051658	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request id=0x0974, seq=3/768, ttl=63 (reply in 8)
8	2.051926	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply id=0x0974, seq=3/768, ttl=64 (request in 7)
9	3.072778	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request id=0x0b74, seq=4/1024, ttl=63 (reply in 10)
10	3.073169	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply id=0x0b74, seq=4/1024, ttl=64 (request in 9)
11	4.093545	192.168.1.66	192.168.1.130	ICMP	98	Echo (ping) request id=0x0c74, seq=5/1280, ttl=63 (reply in 12)
12	4.093944	192.168.1.130	192.168.1.66	ICMP	98	Echo (ping) reply id=0x0c74, seq=5/1280, ttl=64 (request in 11)

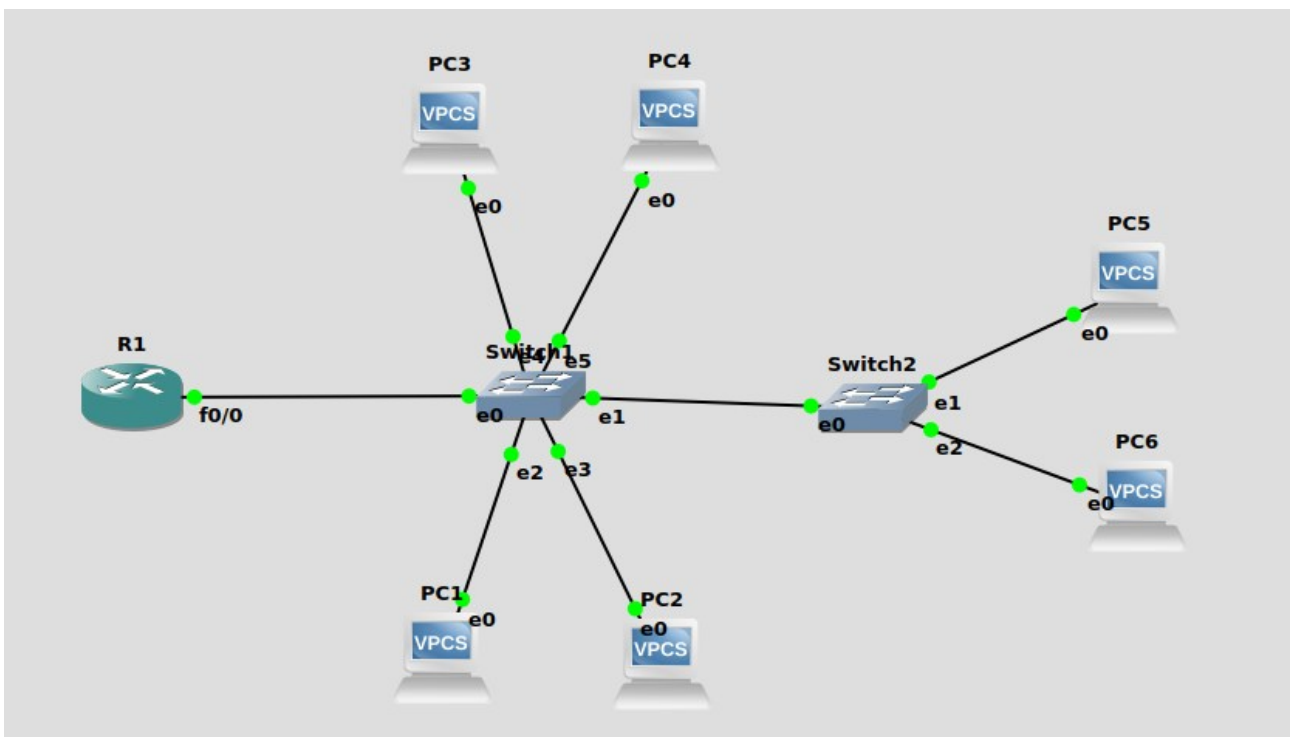
Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: ca:01:13:cb:00:00 (ca:01:13:cb:00:00), Dst: Private_66:68:02 (00:50:79:66:68:02)
Internet Protocol Version 4, Src: 192.168.1.66, Dst: 192.168.1.130
Internet Control Message Protocol

Ready to load or capture Packets: 12 - Displayed: 12 (100.0%) Profile: Default

2. Configure following inter-VLAN example in GNS3 and verify the working using wireshark tool.

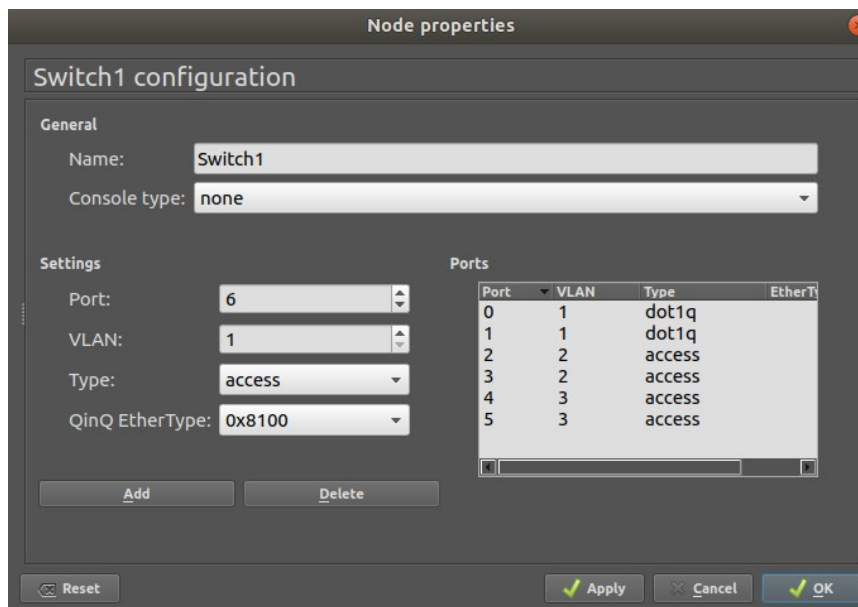


My network:



The switches have been configured as shown in the diagrams below:

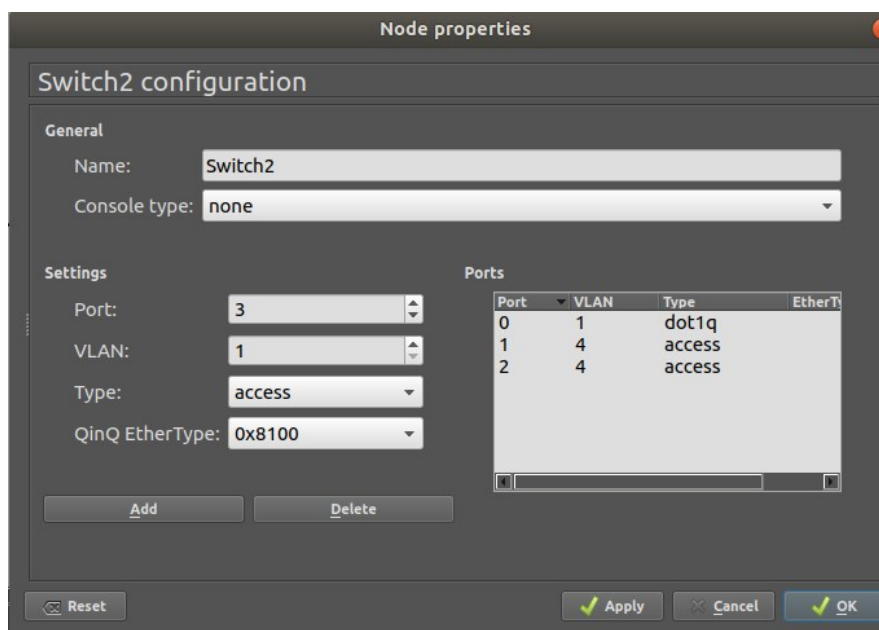
Switch 1:



The 'Node properties' dialog for 'Switch1 configuration' is shown. It has a 'General' section with 'Name' set to 'Switch1' and 'Console type' set to 'none'. The 'Settings' section has 'Port' set to 6, 'VLAN' set to 1, 'Type' set to 'access', and 'QinQ EtherType' set to '0x8100'. The 'Ports' table lists 6 ports with their respective VLANs and types.

Port	VLAN	Type	EtherT
0	1	dot1q	
1	1	dot1q	
2	2	access	
3	2	access	
4	3	access	
5	3	access	

Switch 2:



The 'Node properties' dialog for 'Switch2 configuration' is shown. It has a 'General' section with 'Name' set to 'Switch2' and 'Console type' set to 'none'. The 'Settings' section has 'Port' set to 3, 'VLAN' set to 1, 'Type' set to 'access', and 'QinQ EtherType' set to '0x8100'. The 'Ports' table lists 3 ports with their respective VLANs and types.

Port	VLAN	Type	EtherT
0	1	dot1q	
1	4	access	
2	4	access	

We make the connection from the first switch to the next switch a trunk.

Then we configure the router R1 as shown in the screenshot below:


```
R1
File Edit View Search Terminal Help
o down
*Nov 29 06:47:05.307: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/3, changed state t
o down
R1#enable
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
R1(config-if)#no shut
R1(config-if)#
*Nov 29 06:59:02.675: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Nov 29 06:59:02.675: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State
Down
*Nov 29 06:59:03.675: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed s
tate to up
R1(config-if)#int f0/0.2
R1(config-subif)#encapsulation dot1q 2
R1(config-subif)#ip address 192.168.1.65 255.255.255.192
R1(config-subif)#no shut
R1(config-subif)#int f0/0.3
R1(config-subif)#encapsulation dot1q 3
R1(config-subif)#ip address 192.168.1.129 255.255.255.224
R1(config-subif)#no shut
R1(config-subif)#int f0/0.4
R1(config-subif)#encapsulation dot1q 4
R1(config-subif)#ip address 192.168.1.193 255.255.255.240
R1(config-subif)#no shut
R1(config-subif)#
```

Here, there are 2 trunk ports present :

We connect the 2 switches using the port 1 in Switch1 and port 0 in Switch2.

This connection acts as the trunk line to allow Switch2's traffic to reach the router located on Switch1.

Next we configure the router's port f0/0 to be a trunk port for the 2 VLANs.

Then we configure all Pcs(1-6) with the given IP and masks as shown below:

```
PC1
File Edit View Search Terminal Help
Executing the startup file
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
PC1>

PC2
File Edit View Search Terminal Help
Executing the startup file
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
PC2>

PC3
File Edit View Search Terminal Help
Press '?' to get help.
Executing the startup file
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
PC3>

PC4
File Edit View Search Terminal Help
Press '?' to get help.
Executing the startup file
PC4> ip 192.168.1.131/27 192.168.1.129
Checking for duplicate address...
PC4 : 192.168.1.131 255.255.255.224 gateway 192.168.1.129
PC4>

PC5
File Edit View Search Terminal Help
Executing the startup file
PC5> ip 192.168.1.194/28 192.168.1.193
Checking for duplicate address...
PC5 : 192.168.1.194 255.255.255.240 gateway 192.168.1.193
PC5>

PC6
File Edit View Search Terminal Help
Executing the startup file
PC6> ip 192.168.1.195/28 192.168.1.193
Checking for duplicate address...
PC6 : 192.168.1.195 255.255.255.240 gateway 192.168.1.193
PC6>
```


Now, pinging the default gateway from PC1 successfully:

```
PC1
File Edit View Search Terminal Help
Executing the startup file

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

PC1> ping 192.168.1.65

84 bytes from 192.168.1.65 icmp_seq=1 ttl=255 time=29.500 ms
84 bytes from 192.168.1.65 icmp_seq=2 ttl=255 time=39.840 ms
84 bytes from 192.168.1.65 icmp_seq=3 ttl=255 time=10.036 ms
84 bytes from 192.168.1.65 icmp_seq=4 ttl=255 time=8.620 ms
84 bytes from 192.168.1.65 icmp_seq=5 ttl=255 time=9.322 ms

PC1> |
```

Pinging PC3 and PC4 in VLAN id 3 from PC1 in VLAN id2:

```
PC1> ping 192.168.1.130

192.168.1.130 icmp_seq=1 timeout
84 bytes from 192.168.1.130 icmp_seq=2 ttl=63 time=19.010 ms
84 bytes from 192.168.1.130 icmp_seq=3 ttl=63 time=19.659 ms
84 bytes from 192.168.1.130 icmp_seq=4 ttl=63 time=20.345 ms
84 bytes from 192.168.1.130 icmp_seq=5 ttl=63 time=19.630 ms

PC1> ping 192.168.1.131

192.168.1.131 icmp_seq=1 timeout
84 bytes from 192.168.1.131 icmp_seq=2 ttl=63 time=18.014 ms
84 bytes from 192.168.1.131 icmp_seq=3 ttl=63 time=19.598 ms
84 bytes from 192.168.1.131 icmp_seq=4 ttl=63 time=19.888 ms
84 bytes from 192.168.1.131 icmp_seq=5 ttl=63 time=19.320 ms

PC1> |
```

Pinging PC5 and PC6 in VLAN id 4 from PC1 in VLAN id2:

```
PC1> ping 192.168.1.194

192.168.1.194 icmp_seq=1 timeout
84 bytes from 192.168.1.194 icmp_seq=2 ttl=63 time=11.413 ms
84 bytes from 192.168.1.194 icmp_seq=3 ttl=63 time=19.114 ms
84 bytes from 192.168.1.194 icmp_seq=4 ttl=63 time=16.868 ms
84 bytes from 192.168.1.194 icmp_seq=5 ttl=63 time=18.846 ms

PC1> ping 192.168.1.195

192.168.1.195 icmp_seq=1 timeout
84 bytes from 192.168.1.195 icmp_seq=2 ttl=63 time=18.993 ms
84 bytes from 192.168.1.195 icmp_seq=3 ttl=63 time=19.469 ms
84 bytes from 192.168.1.195 icmp_seq=4 ttl=63 time=19.080 ms
84 bytes from 192.168.1.195 icmp_seq=5 ttl=63 time=19.163 ms

PC1> |
```

Pinging default gateway in PC6 in VLAN4 and then pinging PC1 in VLAN2:

```
PC6
File Edit View Search Terminal Help

PC6> ip 192.168.1.195/28 192.168.1.193
Checking for duplicate address...
PC6 : 192.168.1.195 255.255.255.240 gateway 192.168.1.193

PC6> ping 192.168.1.193

84 bytes from 192.168.1.193 icmp_seq=1 ttl=255 time=11.703 ms
84 bytes from 192.168.1.193 icmp_seq=2 ttl=255 time=9.437 ms
84 bytes from 192.168.1.193 icmp_seq=3 ttl=255 time=8.980 ms
84 bytes from 192.168.1.193 icmp_seq=4 ttl=255 time=9.104 ms
84 bytes from 192.168.1.193 icmp_seq=5 ttl=255 time=10.014 ms

PC6> ping 192.168.1.66

84 bytes from 192.168.1.66 icmp_seq=1 ttl=63 time=16.475 ms
84 bytes from 192.168.1.66 icmp_seq=2 ttl=63 time=19.731 ms
84 bytes from 192.168.1.66 icmp_seq=3 ttl=63 time=18.885 ms
84 bytes from 192.168.1.66 icmp_seq=4 ttl=63 time=19.580 ms
84 bytes from 192.168.1.66 icmp_seq=5 ttl=63 time=20.438 ms

PC6> 
```

Wireshark capture for ping from PC6(VLAN4) to PC1(VLAN2):

Capturing from Standard Input [Switch1 Ethernet2 to PC1 Ethernet0]

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.195	192.168.1.66	ICMP	98	Echo (ping) request id=0x6082, seq=1/256, ttl=63 (reply in 4)
2	0.000441	Private_66:68:02	Broadcast	ARP	64	Who has 192.168.1.65? Tell 192.168.1.66 [ETHERNET FRAME CHECK SEQUENCE INCORRECT]
3	0.010008	ca:01:1a:f9:00:00	Private_66:68:02	ARP	60	192.168.1.65 is at ca:01:1a:f9:00:00
4	0.011397	192.168.1.66	192.168.1.195	ICMP	98	Echo (ping) reply id=0x6082, seq=1/256, ttl=64 (request in 1)
5	1.029887	192.168.1.195	192.168.1.66	ICMP	98	Echo (ping) request id=0x6182, seq=2/512, ttl=63 (reply in 6)
6	1.030359	192.168.1.66	192.168.1.195	ICMP	98	Echo (ping) reply id=0x6182, seq=2/512, ttl=64 (request in 5)
7	2.049737	192.168.1.195	192.168.1.66	ICMP	98	Echo (ping) request id=0x6282, seq=3/768, ttl=63 (reply in 8)
8	2.049996	192.168.1.66	192.168.1.195	ICMP	98	Echo (ping) reply id=0x6282, seq=3/768, ttl=64 (request in 7)
9	3.069766	192.168.1.195	192.168.1.66	ICMP	98	Echo (ping) request id=0x6382, seq=4/1024, ttl=63 (reply in 10)
10	3.070235	192.168.1.66	192.168.1.195	ICMP	98	Echo (ping) reply id=0x6382, seq=4/1024, ttl=64 (request in 9)
11	4.089569	192.168.1.195	192.168.1.66	ICMP	98	Echo (ping) request id=0x6482, seq=5/1280, ttl=63 (reply in 12)
12	4.089917	192.168.1.66	192.168.1.195	ICMP	98	Echo (ping) reply id=0x6482, seq=5/1280, ttl=64 (request in 11)

Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0

Ethernet II, Src: ca:01:1a:f9:00:00 (ca:01:1a:f9:00:00), Dst: Private_66:68:02 (00:50:79:66:68:02)

Internet Protocol Version 4, Src: 192.168.1.195, Dst: 192.168.1.66

Internet Control Message Protocol

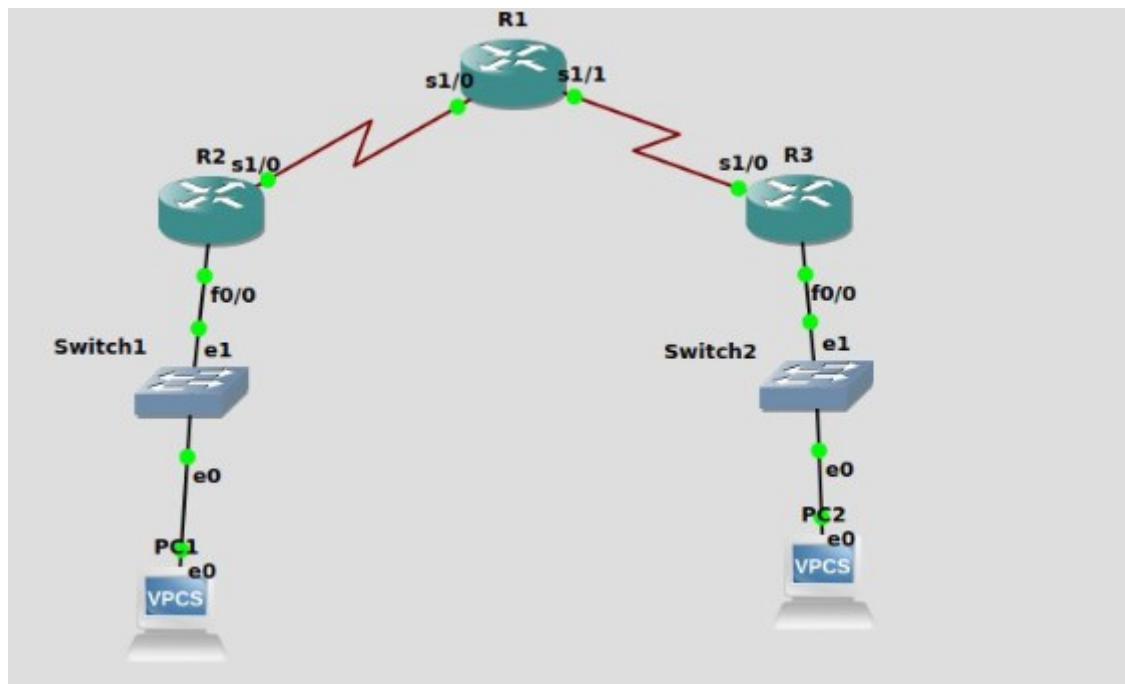
Ready to load or capture Packets: 12 - Displayed: 12 (100.0%) Profile: Default

THE END

Computer Networks Week 7: Lab 12: Study of dynamic routing protocols using GNS3

Lab Exercise:

The connection is as shown below:



Firstly i would be configuring the router R1:

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int s1/0
R1(config-if)#ip add 100.1.1.2 255.255.255.0
R1(config-if)#no shut
R1(config-if)#in
*Nov 29 06:35:53.227: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
R1(config-if)#int
*Nov 29 06:35:53.227: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Administrative State Down
R1(config-if)#int s1/
*Nov 29 06:35:54.231: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up
R1(config-if)#int s1/1
R1(config-if)#ip address
*Nov 29 06:36:15.219: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to down
R1(config-if)#ip address 20.1.1.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#e
*Nov 29 06:36:47.755: %LINK-3-UPDOWN: Interface Serial1/1, changed state to up
R1(config-if)#exit
*Nov 29 06:36:47.755: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/1 Physical Port Administrative State Down
*Nov 29 06:36:48.759: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1, changed state to up
R1(config-if)#exit
R1(config)#router rlp
R1(config-router)#version 2
R1(config-router)#network 20.1.1.0
R1(config-router)#network 100.1.1.0
*Nov 29 06:37:15.263: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1, changed state to down
R1(config-router)#network 100.1.1.0
R1(config-router)#
*Nov 29 06:42:25.203: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up
R1(config-router)#
*Nov 29 06:44:45.247: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1, changed state to up
R1(config-router)#
```

Then i would be configuring the second router as shown in the figure namely router R2:

```
R2(config)#int f0/0
R2(config-if)#ip address 172.16.2.1 255.255.0.0
R2(config-if)#no shut
R2(config-if)#
*Nov 29 06:36:31.119: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Nov 29 06:36:31.119: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 29 06:36:32.119: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#int s1/0
R2(config-if)#ip address 100.1.1.1 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
*Nov 29 06:39:23.219: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
R2(config-if)#exit
R2(config)#
*Nov 29 06:39:23.219: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Administrative State Down
R2(config)#router
*Nov 29 06:39:24.223: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 172.16.0.0
R2(config-router)#network 100.1.1.0
```

Then i would be configuring the third router as shown in the figure namely router R3:

```
R3#enable
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#int s1/0
R3(config-if)#ip address 20.1.1.2 255.255.255.0
R3(config-if)#no shut
R3(config-if)#
*Nov 29 06:38:14.067: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
R3(config-if)#
*Nov 29 06:38:14.067: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Administrative State Down
R3(config-if)#
*Nov 29 06:38:15.071: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up
R3(config-if)#int f0/0
R3(config-if)#ip address 10.2.2.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#
*Nov 29 06:39:09.423: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3(config)#
*Nov 29 06:39:09.423: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 29 06:39:10.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 10.2.2.0
R3(config-router)#network 20.1.1.0
R3(config-router)#
```

Then i would be assgining IP addresses and default gateways for PC1 and PC2:

PC1:

```
PC1> ip 172.16.2.10/16 172.16.2.1
Checking for duplicate address...
PC1 : 172.16.2.10 255.255.0.0 gateway 172.16.2.1
PC1> 
```

PC2:

```
PC2> ip 10.2.2.20/24 10.2.2.1
Checking for duplicate address...
PC2 : 10.2.2.20 255.255.255.0 gateway 10.2.2.1
PC2> 
```


Then i am pinging to the default gateway(172.16.2.1) and then to PC2(10.2.2.20) from PC1 as shown in the screenshot below:

```
PC1> ping 172.16.2.1

84 bytes from 172.16.2.1 icmp_seq=1 ttl=255 time=9.942 ms
84 bytes from 172.16.2.1 icmp_seq=2 ttl=255 time=10.457 ms
84 bytes from 172.16.2.1 icmp_seq=3 ttl=255 time=9.598 ms
84 bytes from 172.16.2.1 icmp_seq=4 ttl=255 time=9.825 ms
84 bytes from 172.16.2.1 icmp_seq=5 ttl=255 time=9.932 ms

PC1> ping 10.2.2.20

10.2.2.20 icmp_seq=1 timeout
84 bytes from 10.2.2.20 icmp_seq=2 ttl=61 time=36.098 ms
84 bytes from 10.2.2.20 icmp_seq=3 ttl=61 time=40.509 ms
84 bytes from 10.2.2.20 icmp_seq=4 ttl=61 time=40.544 ms
84 bytes from 10.2.2.20 icmp_seq=5 ttl=61 time=40.363 ms

PC1> 
```

Then when we run the “show ip route” command for Router 1, we see the neighbouring networks for router R1 that we have connected - 20.1.1.0 and 100.1.1.0 as shown below:

```
R1#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

    100.0.0.0/24 is subnetted, 1 subnets
C       100.1.1.0 is directly connected, Serial1/0
    20.0.0.0/24 is subnetted, 1 subnets
C       20.1.1.0 is directly connected, Serial1/1
R       172.16.0.0/16 [120/1] via 100.1.1.1, 00:00:15, Serial1/0
R       10.0.0.0/8 [120/1] via 20.1.1.2, 00:00:21, Serial1/1
```

Similarly, when we run the “show ip route” command for Router 2, we see the neighbouring networks for router R2 that we have connected - 172.16.0.0 and 100.1.1.0

```

R2#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

    100.0.0.0/24 is subnetted, 1 subnets
C       100.1.1.0 is directly connected, Serial1/0
R       20.0.0.0/8 [120/1] via 100.1.1.2, 00:00:27, Serial1/0
C       172.16.0.0/16 is directly connected, FastEthernet0/0
R       10.0.0.0/8 [120/1] via 100.1.1.2, 00:00:27, Serial1/0
R2#

```

And then when we run the “show ip route” command for Router 3, we see the neighbouring networks for router R3 that we have connected - 20.1.1.0 and 10.2.2.0 as shown below:

```

R3#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

R       100.0.0.0/8 [120/1] via 20.1.1.1, 00:00:18, Serial1/0
    20.0.0.0/24 is subnetted, 1 subnets
C       20.1.1.0 is directly connected, Serial1/0
R       172.16.0.0/16 [120/1] via 20.1.1.1, 00:00:18, Serial1/0
    10.0.0.0/24 is subnetted, 1 subnets
C       10.2.2.0 is directly connected, FastEthernet0/0
R3#

```

On executing the “show ip protocol” command for Router 1 we see that the routing protocol is “rip”:


```

R1#show ip protocol
Routing Protocol is "rip"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Sending updates every 30 seconds, next due in 25 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface          Send  Recv  Triggered RIP  Key-chain
    Serial1/0          2     2
    Serial1/1          2     2
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    20.0.0.0
    100.0.0.0
  Routing Information Sources:
    Gateway          Distance      Last Update
    20.1.1.2          120           00:00:22
    100.1.1.1         120           00:00:14
  Distance: (default is 120)

```

And finally, when we execute the “show ip rip database” command for Router 1 we see information about routes in the Routing Information Base as displayed in the screenshot below:

```

R1#show ip rip database
10.0.0.0/8      auto-summary
10.0.0.0/8
    [1] via 20.1.1.2, 00:00:17, Serial1/1
20.0.0.0/8      auto-summary
20.1.1.0/24     directly connected, Serial1/1
100.0.0.0/8     auto-summary
100.1.1.0/24    directly connected, Serial1/0
172.16.0.0/16   auto-summary
172.16.0.0/16
    [1] via 100.1.1.1, 00:00:26, Serial1/0
R1#

```

THE END