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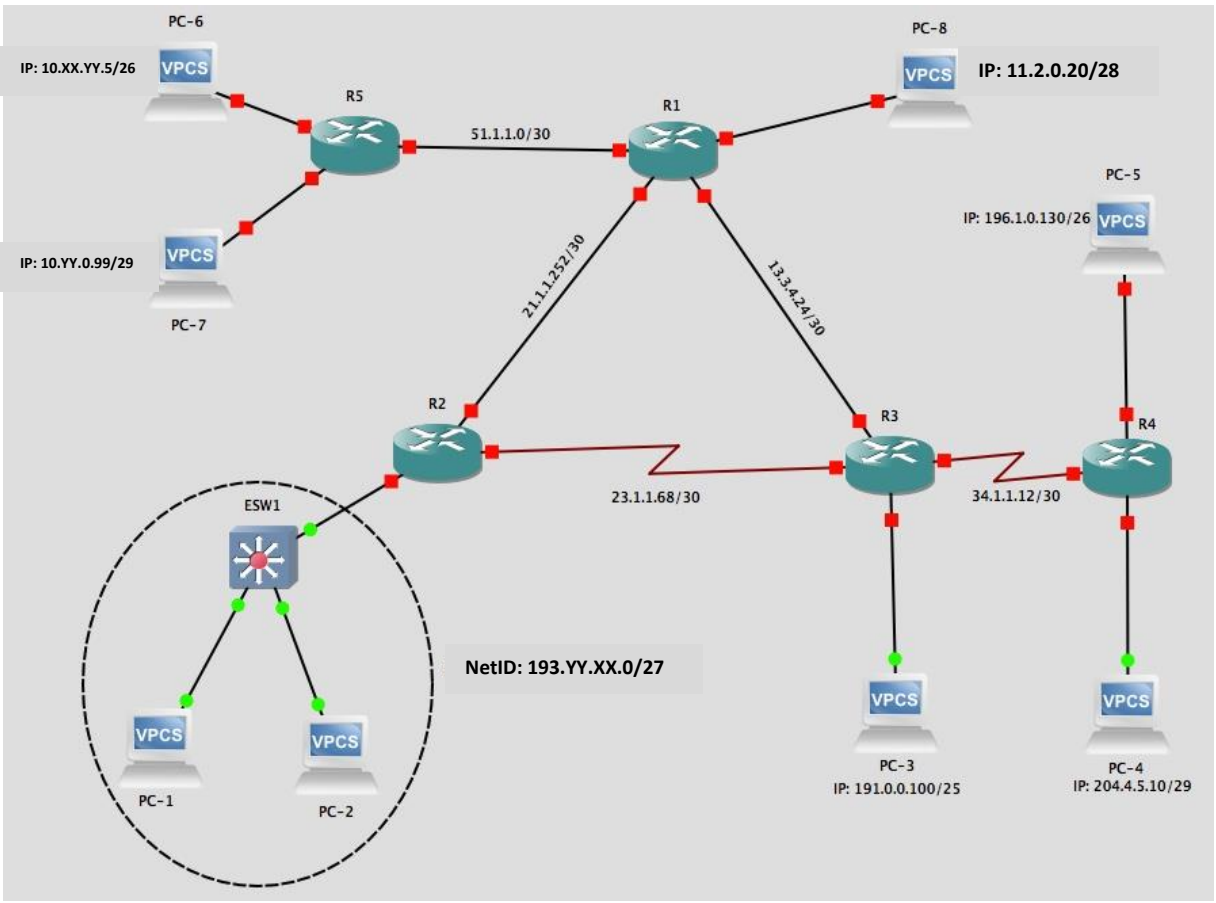
Netlab 4: Routing Topology in GNS3

Purpose: In this Lab exercise, you will build a more advanced network topology in GNS3. This exercise will help you to understand the principles of routing with the use of GNS3.

Procedure

You will continue using the ***IOS reference sheet*** for the commands required to configure the topology.
Launch GNS3 from the shortcut on your desktop. Create a new project, name the project "Lab4_yourname". Once the program is running, you can start building the topology portrayed below.



The routers in this topology are NetLab routers, the switches are the NetLab Ethernet Switches (ESWs). You might need to add more interfaces to the routers. Notice that in the topology there are Ethernet (straight line links) and serial T1 connections (lightning-bolt looking line links).

Once everything is connected, fill the following table with the needed information to configure your devices.

Id: 017618768 **CECS 303 NETWORKS AND NETWORK SECURITY**
xx = 68
yy = 87

Router	Name of Interface	IP Address with CIDR mask
R1 2	f2/0	11.2.0.17/28
R1 2	g0/0	51.1.1.2/30
R1 2	g1/0	21.1.1.253/30
R1 2	g3/0	13.3.4.25/30
Router	**Name of Interface**	**IP Address with CIDR mask**
R2 3	g1/0	21.1.1.254/30
R2 3	f2/0	193.87.68.1/27
R2 3	p4/0	23.1.1.69/30
Router	**Name of Interface**	**IP Address with CIDR mask**
R3 4	g0/0	13.3.4.26/30
R3	p4/0	23.1.1.70/30
R3	f2/0	191.0.0.1/25
R3	p5/0	34.1.1.13/30
Router	**Name of Interface**	**IP Address with CIDR mask**
R4 5	f2/0	196.1.0.129/26
R4	p3/0	34.1.1.14/30
R4	f2/1	204.4.5.9/29
Router	**Name of Interface**	**IP Address with CIDR mask**
R5 1	f2/1	10.68.87.1/26
R5	f2/0	10.87.0.97/29
R5	g0/0	51.1.1.1/30

Q.- How many broadcasts domains or networks do you have in the topology? 7_____

Complete the info in the following table with the IP addresses you planned to assign to the VPCs:

VPC	IP Address with mask in CIDR format	Gateway IP Address
1	193.87.68.2/27	193.87.68.1/27
2	193.87.68.3/27	193.87.68.1/27
3	10.68.87.5/26	10.68.87.1/26
4	10.87.0.99/29	10.87.0.97/29
5	11.2.0.20/28	11.2.0.17/28
6	196.1.0.130/26	196.1.0.129/26
7	204.4.5.10/29	204.4.5.9/29
8	191.0.0.100/25	191.0.0.1/25

Now let's configure the router's interfaces and VPC with the IPs in your tables (use the IOS reference sheet)

Try to ping between the VPCs in different broadcast domains. Does the ping work? NO

If your answer is NO, you need to implement a routing technique to make all the VPCs talk to each other. Use the commands from the *Cisco IOS Reference Sheet* to setup static IP routes

Router	Network ID with Mask	Next-Hop
	This table information is showed in the IpRoutingTables.rtf document	

Procedure - Part 2

Similar to the work in previous Labs, you will deploy a DHCP server for this lab. This time, it will be one single DHCP server for the entire topology. Router R1 will play the role of this global DHCP server. You need an IP helper-address (see your *Cisco IOS Reference Sheet)* to convert from broadcast to unicast the DHCP messages. This "helper" has to be implemented since routers cannot forward broadcast messages between subnets.

Network ID	Mask	Helper IP	Gateway	Excluded IPs
NetID: 193.87.68.0/27	255.255.255.224	1.1.1.1	193.87.68.1/27	193.87.68.1/27
191.0.0.0/25	255.255.255.128	1.1.1.1	191.0.0.1/25	191.0.0.1/25
204.4.5.8/29	255.255.255.248	1.1.1.1	204.4.5.9/29	204.4.5.9/29
196.1.0.128/26	255.255.255.192	1.1.1.1	196.1.0.129/26	196.1.0.129/26
11.2.0.16/28	255.255.255.240	1.1.1.1	11.2.0.17/28	11.2.0.17/28
10.68.86.1/26	255.255.255.192	1.1.1.1	10.68.87.1/26	10.68.87.1/26
10.87.0.96/29	255.255.255.248	1.1.1.1	10.87.0.97/29	10.87.0.97/29

Start a Wireshark packet capture in one of the point-to-point interfaces of router R1.

Q.- What type of DHCP messages do you see?

Boot Request

```
Dynamic Host Configuration Protocol (Discover)
    Message type: Boot Request (1)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 1
    Transaction ID: 0xee23c06b
    Seconds elapsed: 0
```

Q.- What is the source and destination IP addresses in one of the incoming messages?

dhcp

No.	Time	Source	Destination	Protocol	Length	Info
21	76.448498	10.68.87.1	1.1.1.1	DHCP	406	
23	77.453210	10.68.87.1	1.1.1.1	DHCP	406	
26	78.502059	51.1.1.2	10.68.87.1	DHCP	342	
28	80.476824	10.68.87.1	1.1.1.1	DHCP	406	

Q.- Are you able to execute inter-networks pings?

Yes, I was able to exceute inter-network pings

icmp

	Time	Source	Destination	Protocol	Length	Info
22	76.478991	51.1.1.2	10.68.87.2	ICMP	70	
24	77.966556	51.1.1.2	10.68.87.2	ICMP	70	
77	278.921981	51.1.1.2	10.87.0.98	ICMP	70	
80	280.351016	51.1.1.2	10.87.0.98	ICMP	70	
109	386.907892	10.68.87.2	193.87.68.12	ICMP	98	
110	388.928539	10.68.87.2	193.87.68.12	ICMP	98	

Procedure - Part 3

Now, you will add dynamic routing. Your instructor will provide guidance about what your routing protocol options you have.

Q.- Which dynamic routing protocol are you going to implement?

I am implementing OSPF

Q.- What is the optimal route to send messages from PC4 to PC1?

P4, R4,R3,R1,R2,P1

Q.- What is the optimal route to send messages from PC5 to PC6?

PC5, R4, R3, R1, R5, PC6

Q.- Compare the content of your dynamic forwarding table with the table you build for static routing. Describe and explaing you findings: