INFORME DE AVANCE PRUEBAS DE HABILIDADES PRACTICAS

OSWALDO ENRIQUE PERCIA BLANCO

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA -UNAD
ESCUELA DE CIENCIAS BASICAS, TECNOLOGÍA E INGENERÍA-ECBTI
INGENERIA ELECTRÓNICA
BARRANQUILLA
2022

INFORME DE AVANCE PRUEBAS DE HABILIDADES PRACTICAS

OSWALDO ENRIQUE PERCIA BLANCO

Diplomado de opción de grado presentado para optar el título
de ingeniería electrónica

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ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENERÍA- ECBTI
INGENERÍA ELECTRONICA
BARRANQUILLA
2022

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Atlántico, 19 de noviembre de 2022

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GLOSARIO

BGP: Es un protocolo escalable de Dynamic routing usado en la Internet por grupos de enrutadores para compartir información de enrutamiento. BGP usa parámetros de ruta o atributos para definir políticas de enrutamiento y crear un entorno de enrutamiento estable. Ese protocolo permite que divulgue más de un camino hacia y desde la Internet a su red y recursos, lo que le ofrece caminos redundantes y puede aumentar su tiempo de actividad.

ASN: Un sistema autónomo se define como “un grupo de redes IP que poseen una política de rutas propia e independiente”. Esta definición hace referencia a la característica fundamental de un Sistema Autónomo: realiza su propia gestión del tráfico que fluye entre él y los restantes Sistemas Autónomos que forman Internet.

HRSP: El Hot Standby Router Protocol es un protocolo propiedad de CISCO que permite el despliegue de enrutadores redundantes tolerantes de fallos en una red. Este protocolo evita la existencia de puntos de fallo únicos en la red mediante técnicas de redundancia y comprobación del estado de los routers.

VLAN: Es un método para crear redes lógicas independientes dentro de una misma red física. Varias VLAN pueden coexistir en un único conmutador físico o en una única red física.

PuTTY: Es un cliente SSH, Telnet, rlogin, y TCP raw con licencia libre. Disponible originalmente solo para Windows, ahora también está disponible en varias plataformas Unix, y se está desarrollando la versión para Mac OS clásico y Mac OS.

GNS3: Es un simulador gráfico de red lanzado en 2008, que te permite diseñar topologías de red complejas y poner en marcha simulaciones sobre ellos, permitiendo la combinación de dispositivos tanto reales como virtuales.

SWITCH: Trabaja esencialmente en la capa 2 de una red OSI, el enlace de datos, y utiliza direcciones MAC sin utilizar direcciones IP. Por su parte, el routers lo hace en la capa 3 y se encarga del enrutamiento utilizando direcciones IP.

RSTP: Es un protocolo de red de la segunda capa OSI, que gestiona enlaces redundantes. Especificado en IEEE 802.1w, es una evolución del Spanning tree Protocol, reemplazándolo en la edición 2004 del 802.1d.

LACP: Es un término que indica el establecimiento de una red de datos que describe cómo utilizar varios enlaces Ethernet full-dúplex en la comunicación entre dos equipos, repartiendo el tráfico entre ellos.

RESUMEN

Este documento está desarrollado en base a opción de grado de la facultad ingeniería electrónica, de la universidad abierta y a distancia.
Desarrollaremos las rutas del planteamiento para fortalecer habilidades y ejecutar las prácticas de habilidades CCNP, teniendo como escenario un protocolo de simulaciones que ejecutaremos gracias a las herramientas GNS3, donde plantearemos los montajes y la manipulación de las topologías utilizando el protocolo IOS de los dispositivos CISCO.

Los escenarios proponen, configurar un método de simulaciones de redes creando una topologia de enrutamientos, esto va orientado a la programación del sistema de dispositivos existente en las actividades; en el laboratorio del escenarios, adoptaremos un planteamiento básico de conmutación de redes de programación, teniendo como adaptadores programables, como son; swicht, routers y PC, estos dispositivos en interconexiones crean un sistema electrónico de comunicación, implementando un conjunto de funcionalidades mediante interfaces del programa, esto nos da una solución de respuestas logrando proporcionar acceso de verificación, con el objetivo de monitorear el estado de ejecución y configuración del sistema.

Palabra clave: CCNP, GNS3, CISCO, conmutación, swicht, routers, PC.

ABSTRACT

This document is developed based on the degree option of the electronic engineering faculty, of the open and distance university.
We will develop the routes of the approach to strengthen skills and execute the CCNP skills practices, taking as a scenario a simulation protocol that we will execute thanks to the GNS3 tools, where we will propose the assemblies and manipulation of the topologies using the IOS protocol of the CISCO devices.

The scenarios propose configuring a method of network simulations creating a routing topology, this is oriented to the programming of the existing device system in the activities; In the laboratory of the scenarios, we will adopt a basic exposition of commutation of programming networks, having as programmable adapters, as they are; switch, rosters and PC, these devices in interconnections create an electronic communication system, implementing a set of functionalities through program interfaces, this gives us a response solution, managing to provide verification access, with the objective of monitoring the execution status and system configuration.

Keyword: CCNP, GNS3, CISCO, commutation, swicht, routers, PC.

INTRODUCCION

En el presente trabajo, desarrollaremos la actividad correspondiente al Diplomando Cisco CCNP, donde ejecutaremos la prueba de habilidades correspondiente al paso de prácticas de habilidad final del lineamiento del curso, este lleva como nombre; ENCOR Skills assessment (Escenario 1 y 2). Este escenario consta de una topologia estructurada ya definida, permitiendo la comunicación de redes con los dispositivos a implementar, esta interacción de comunicación consta; routers, swicht y PC; iniciaremos el paso a paso con la configuración de los programas o herramienta para trabajar en GNS3, implementaremos la metodología para la conmutación y enlace de los programas y sus diferentes interacciones, debemos crear en GNS3 una la máquina virtual, donde con ayudas de otros programas lograremos la ejecución el diseño de nuestra actividad.

En el siguiente paso implementaremos las configuraciones de las direcciones IP en cada uno de los dispositivos IPv4 y IPv6, desarrollaremos el cronograma de la experiencia instalando cada dispositivo y conmutando sus conexiones, manejando los protocolos de las diferentes características de cada uno de ellos, teniendo los enlaces de VLAN, LACP; OSPF, LAN y cada uno de los enrutamientos de BGP, para así ejecutar la experiencia práctica de habilidades.

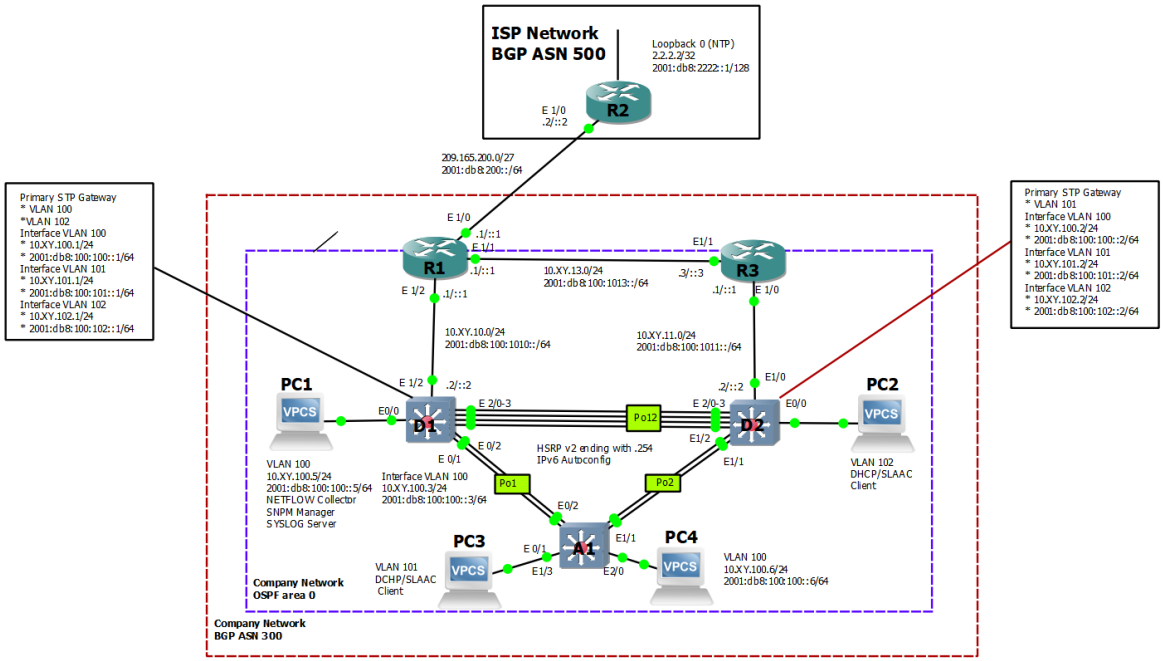
Por último, implementares las ejecución y verificación de los enlaces de cada uno de los dispositivos, donde nos muestra la respuesta en tiempo real, su funcionamiento y protocolo de respuesta del sistema de redes, esta experiencia corresponde a una serie de metodología interpuesta en toda la ejecución de la actividad de Cisco.

PARTE 1: ENCOR Skills assessment

(Escenario 1)

1.1. Topología

Figura 1. topologia



Fuente: Guía UNAD CCNP - Escenario 1 Prueba de habilidades

Tabla de direccionamiento

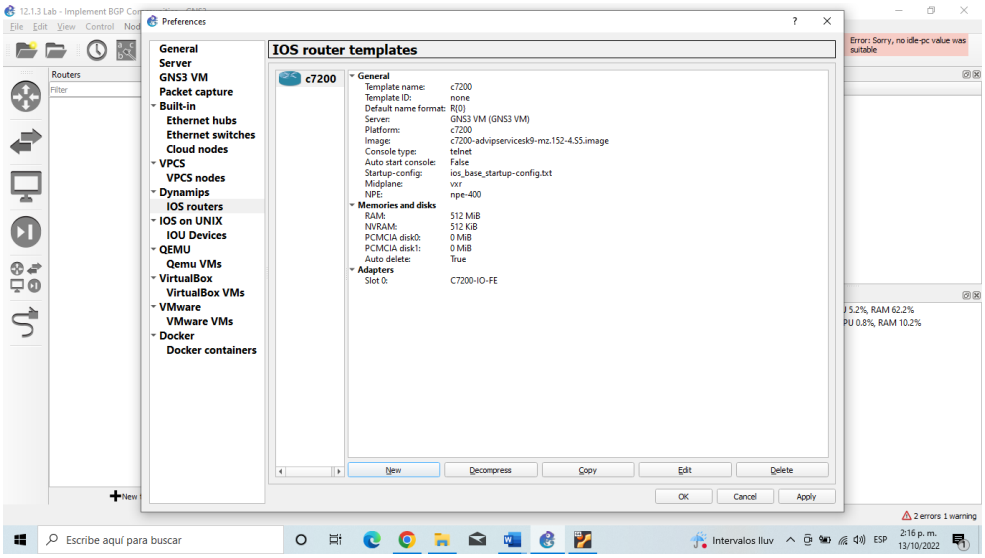
Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R1	E1/0	209.165.200.225/27	2001:db8:200::1/64	fe80::1:1
	E1/2	10.11.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10. 11.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1
	Loopback0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10. 11.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10. 11.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10. 11.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10. 11.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.11.101.1/24	2001:db8:100:101::1/64	fe80::d1:3

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
	VLAN 102	10.11.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.11.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.11.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.11.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.11.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.11.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.11.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.11.100.6/24	2001:db8:100:100::6/64	EUI-64

Recursos necesarios

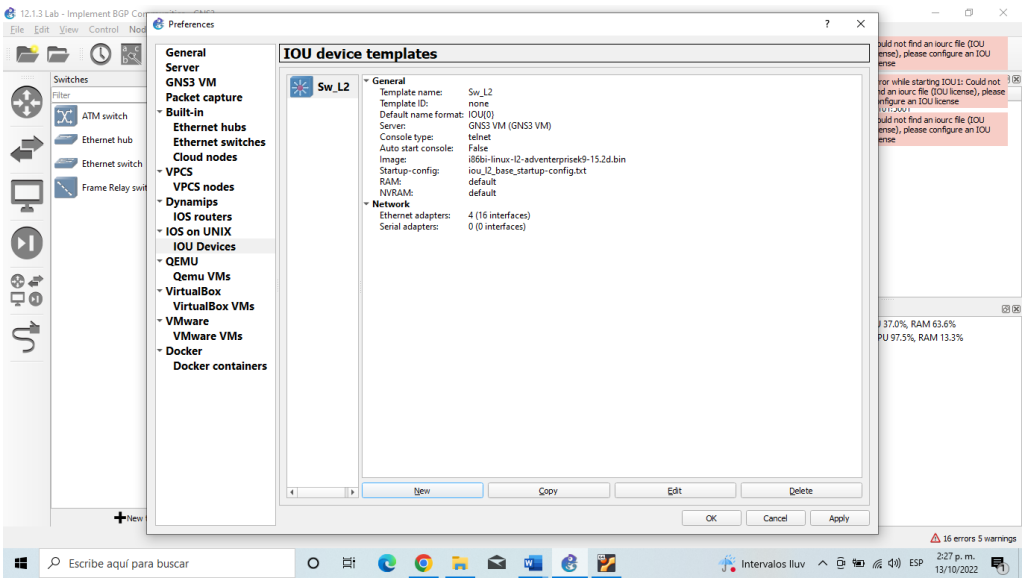
Routers (Cisco 7200). [Click on the download link of the images for GNS3.]

Figura 2. topologia del Router



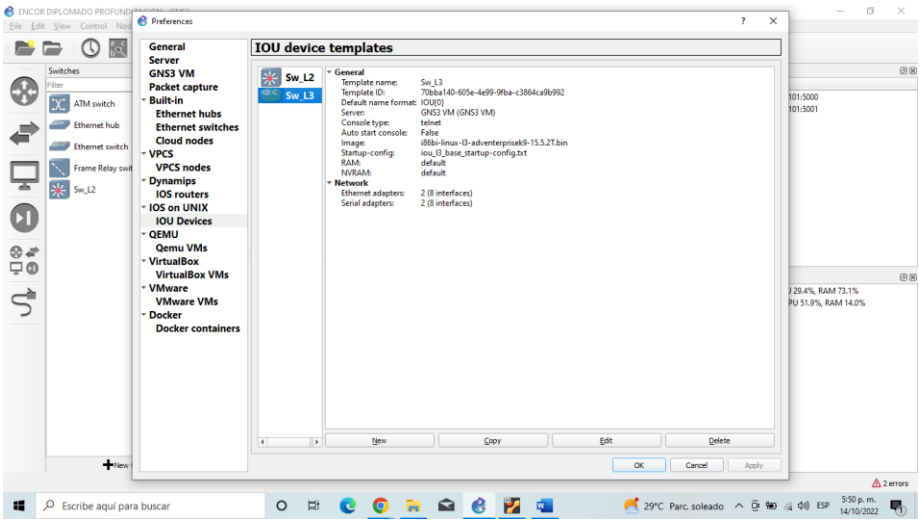
Switches (Cisco IOU L2). [Click on the download link of the images for GNS3.]

Figura 3. topologia del switch Sw_L2



Cisco IOU L3

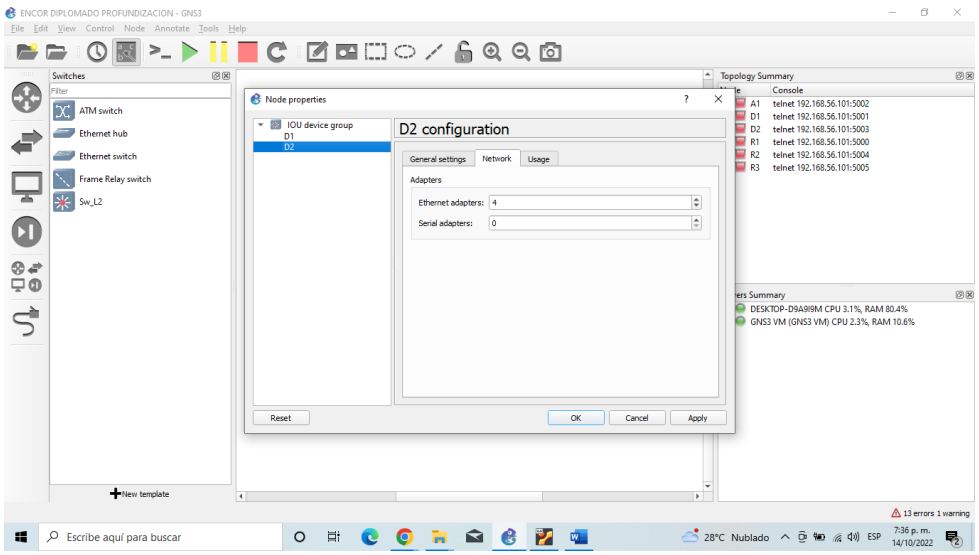
Figura 4. topologia del switch Sw_L3



4 PCs (Use the GNS3's VPCS)

After the configuration of devices in GNS3, the Slots of the network adapters of the SW must be configured as follows:

Figura 5. configuration switch D1



Configuración del programa putty

Figura 6. configuracion de licencia de los swicht

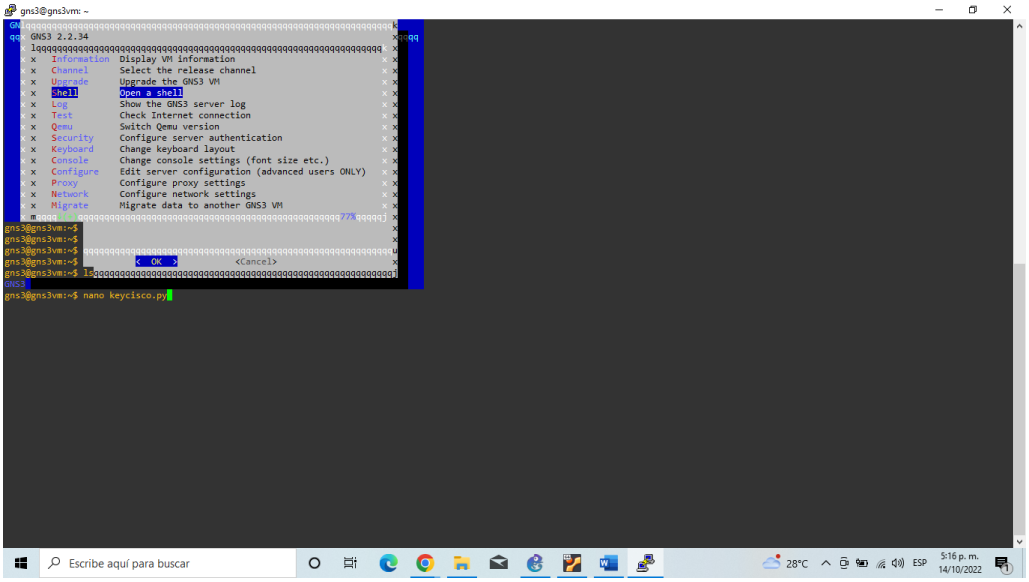


Figura 7. de configuracion de parametros Putty

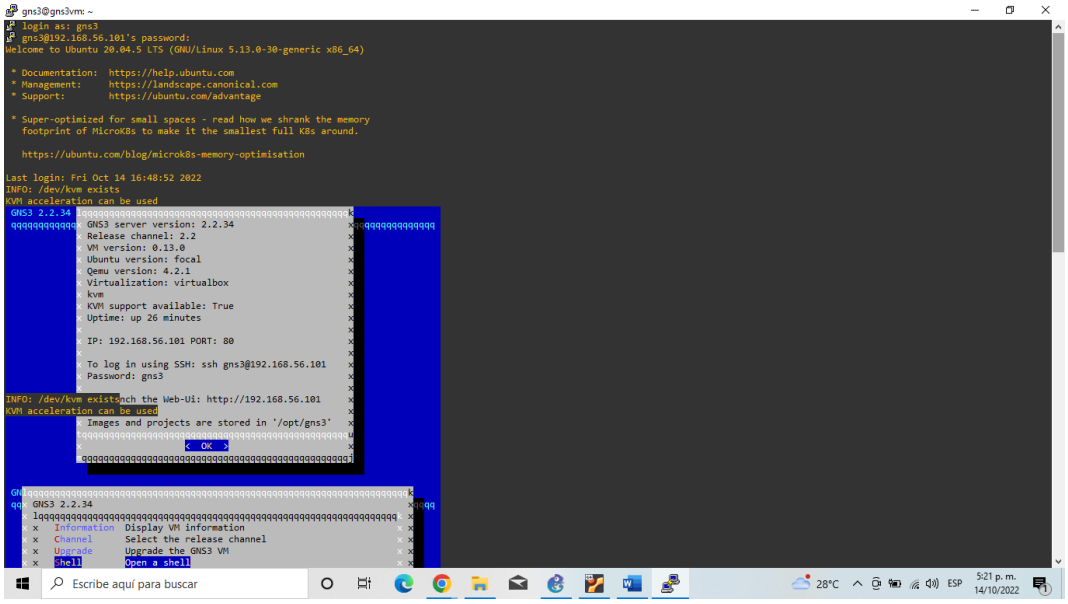
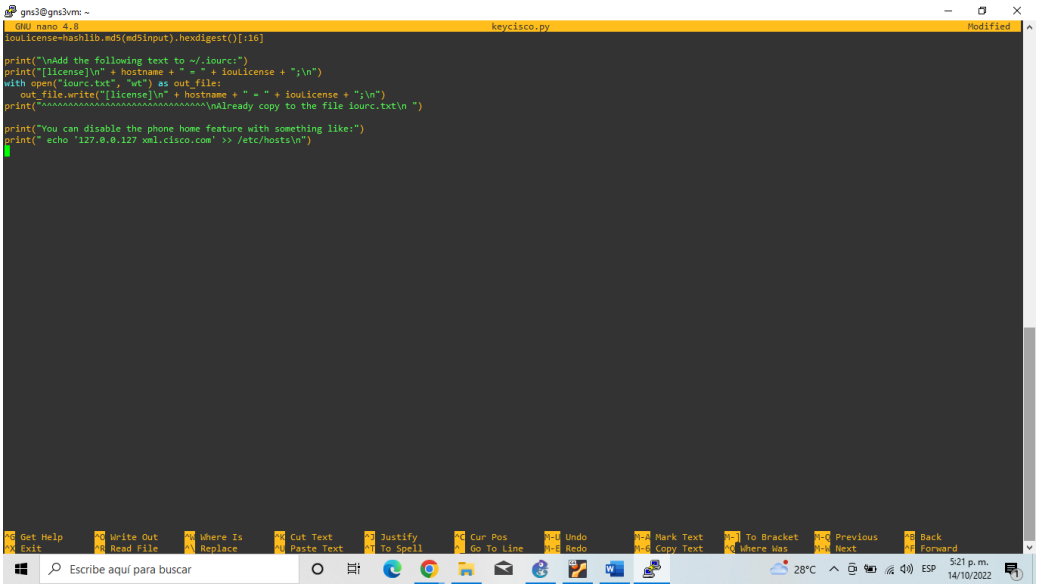


Figura 8. Configuracion de enlace de programacion Putty



Configuración de Reuters

Figura 9. configuracion Router c7200 R1

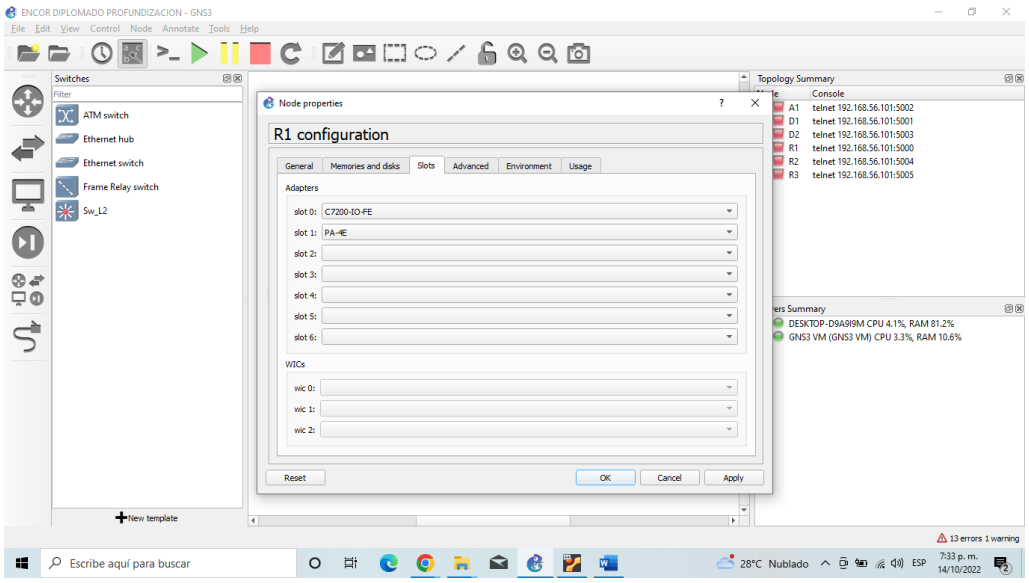


Figura 10. configuracion Router c7200 R2

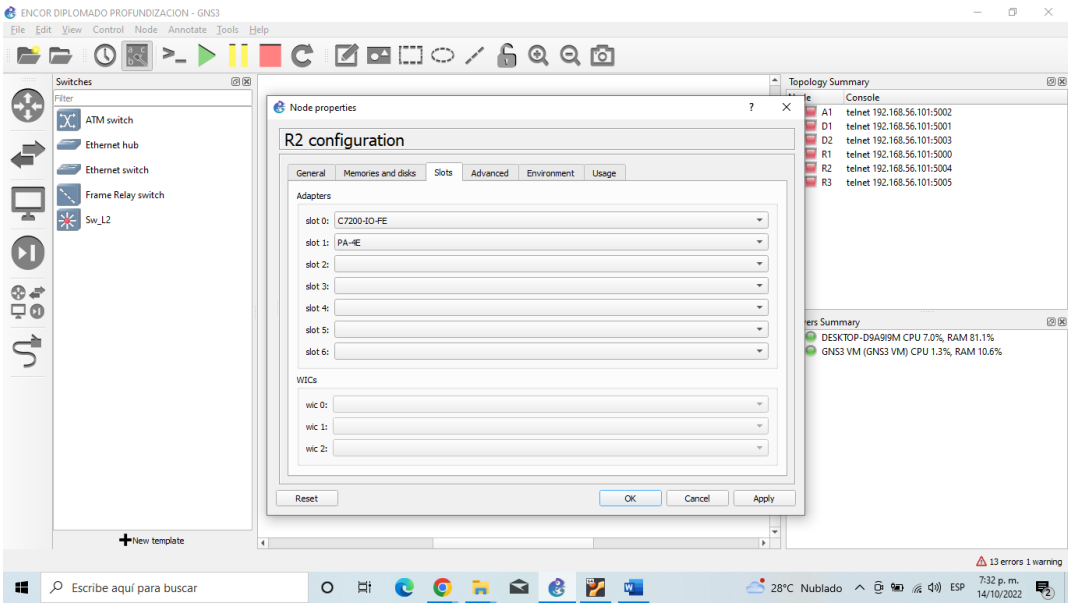
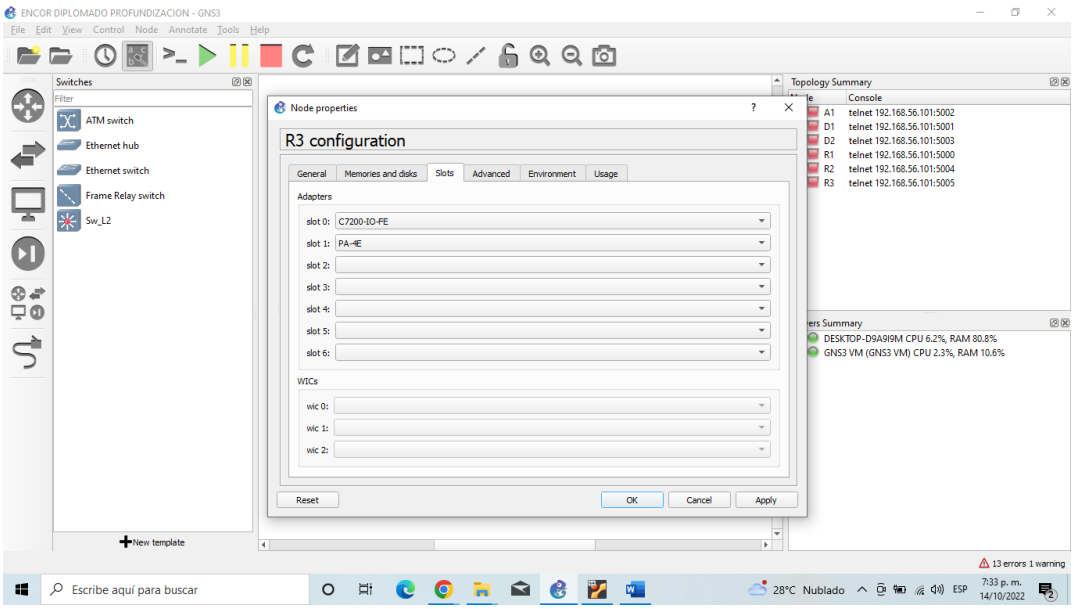


Figura 11. configuracion Router c7200 R3



1.2. Diseño de Topología programa GNS3

Figura 12. diseño de swicht y router

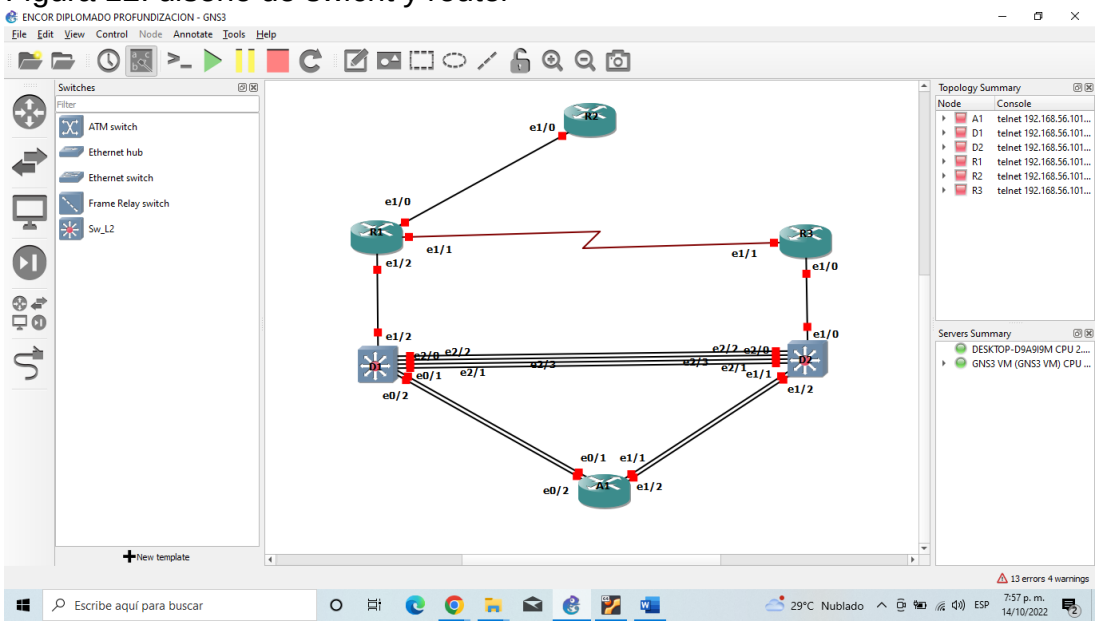
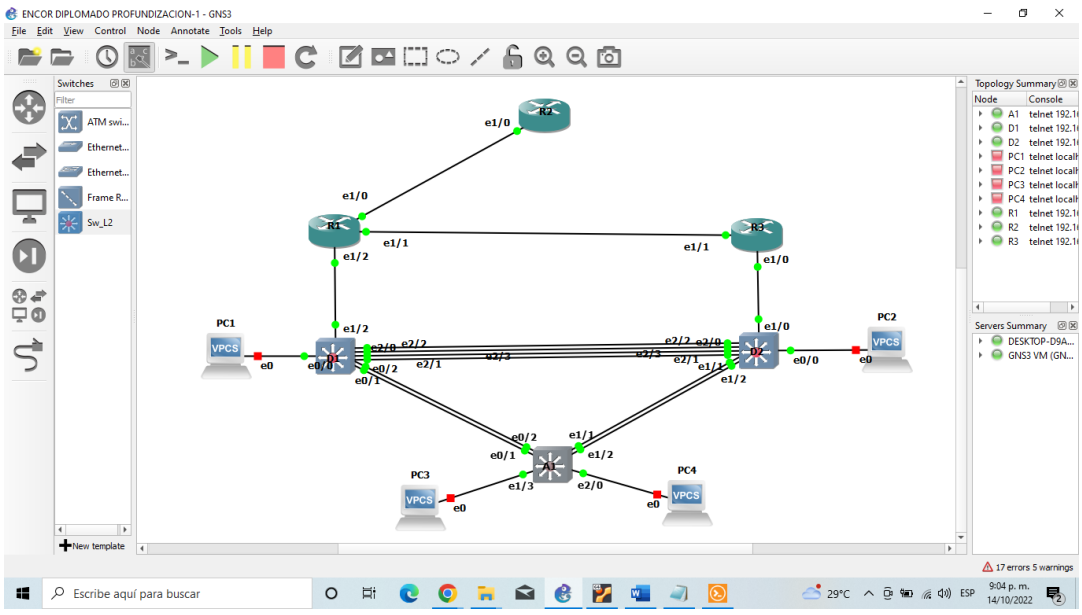


Figura 13. diseño de topologia completo.



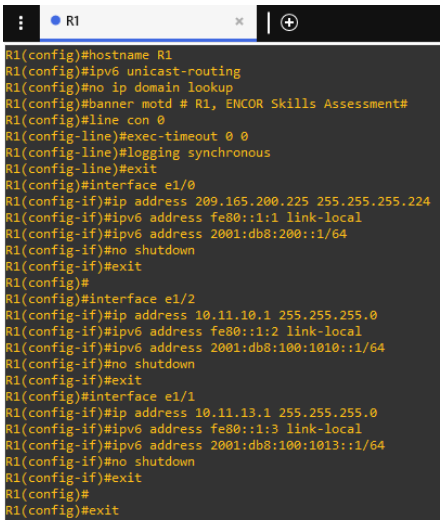
1.3. Configuraciones básicas de cada dispositivo

Consola en cada dispositivo, ingrese al modo de configuración global y aplique la configuración básica. Las configuraciones de inicio para cada dispositivo se proporcionan a continuación.

Router R1

```
hostname R1
ipv6 unicast-routing
no ip domain lookup
banner motd # R1, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
interface e1/0
ip address 209.165.200.225 255.255.255.224
ipv6 address fe80::1:1 link-local
ipv6 address 2001:db8:200::1/64
no shutdown
exit
interface e1/2
ip address 10.11.10.1 255.255.255.0
ipv6 address fe80::1:2 link-local
ipv6 address 2001:db8:100:1010::1/64
no shutdown
exit
interface e1/1
ip address 10.11.13.1 255.255.255.0
ipv6 address fe80::1:3 link-local
ipv6 address 2001:db8:100:1013::1/64
no shutdown
exit
```

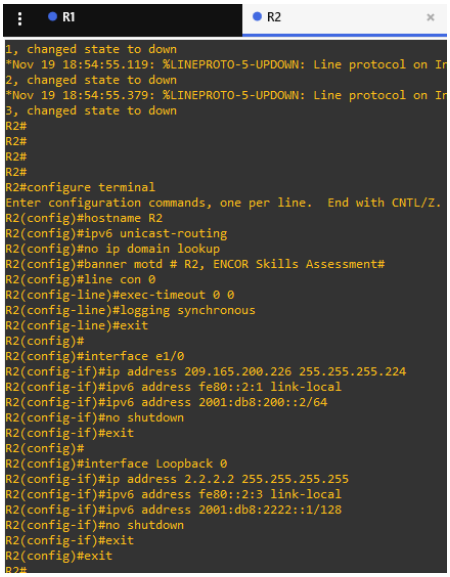
Figura 14. configuracion Router R1



Router R2

hostname R2
ipv6 unicast-routing
no ip domain lookup
banner motd # R2, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
interface e1/0
ip address 209.165.200.226 255.255.255.224
ipv6 address fe80::2:1 link-local
ipv6 address 2001:db8:200::2/64
no shutdown
exit
interface Loopback 0
ip address 2.2.2.2 255.255.255.255
ipv6 address fe80::2:3 link-local
ipv6 address 2001:db8:2222::1/128
no shutdown
exit

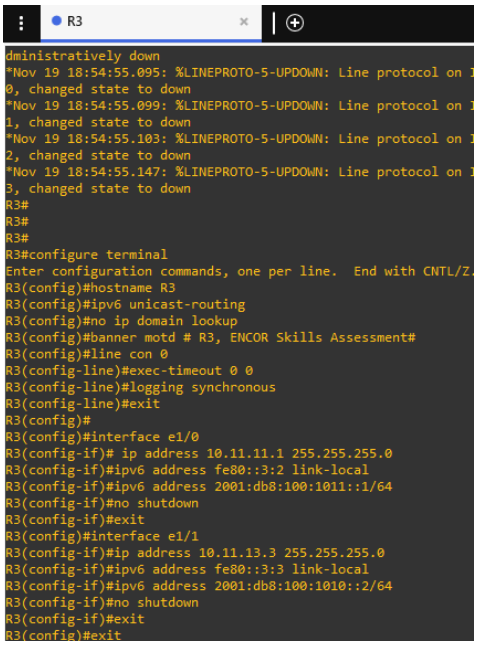
Figura 15. configuracion Router R2



Router R3

hostname R3
ipv6 unicast-routing
no ip domain lookup
banner motd # R3, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
interface e1/0
ip address 10.11.11.1 255.255.255.0
ipv6 address fe80::3:2 link-local
ipv6 address 2001:db8:100:1011::1/64
no shutdown
exit
interface e1/1
ip address 10.11.13.3 255.255.255.0
ipv6 address fe80::3:3 link-local
ipv6 address 2001:db8:100:1010::2/64
no shutdown
exit

Figura 16. configuracion Router R3



Switch D1

hostname D1
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D1, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 100
name Management
exit
vlan 101
name UserGroupA
exit
vlan 102
name UserGroupB
exit
vlan 999

```
name NATIVE
exit
interface e1/2
no switchport
ip address 10.11.10.2 255.255.255.0
ipv6 address fe80::d1:1 link-local
ipv6 address 2001:db8:100:1010::2/64
no shutdown
exit
interface vlan 100
ip address 10.11.100.1 255.255.255.0
ipv6 address fe80::d1:2 link-local
ipv6 address 2001:db8:100:100::1/64
no shutdown
exit
interface vlan 101
ip address 10.11.101.1 255.255.255.0
ipv6 address fe80::d1:3 link-local
ipv6 address 2001:db8:100:101::1/64
no shutdown
exit
interface vlan 102
ip address 10.11.102.1 255.255.255.0
ipv6 address fe80::d1:4 link-local
ipv6 address 2001:db8:100:102::1/64
no shutdown
exit
ip dhcp excluded-address 10.11.101.1 10.11.101.109
ip dhcp excluded-address 10.11.101.141 10.11.101.254
ip dhcp excluded-address 10.11.102.1 10.11.102.109
ip dhcp excluded-address 10.11.102.141 10.11.102.254
ip dhcp pool VLAN-101
network 10.11.101.0 255.255.255.0
default-router 10.11.101.254
exit
ip dhcp pool VLAN-102
```

network 10.11.102.0 255.255.255.0
default-router 10.11.102.254
exit
interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
shutdown
exit

Figura 17. configuracion Switch D1

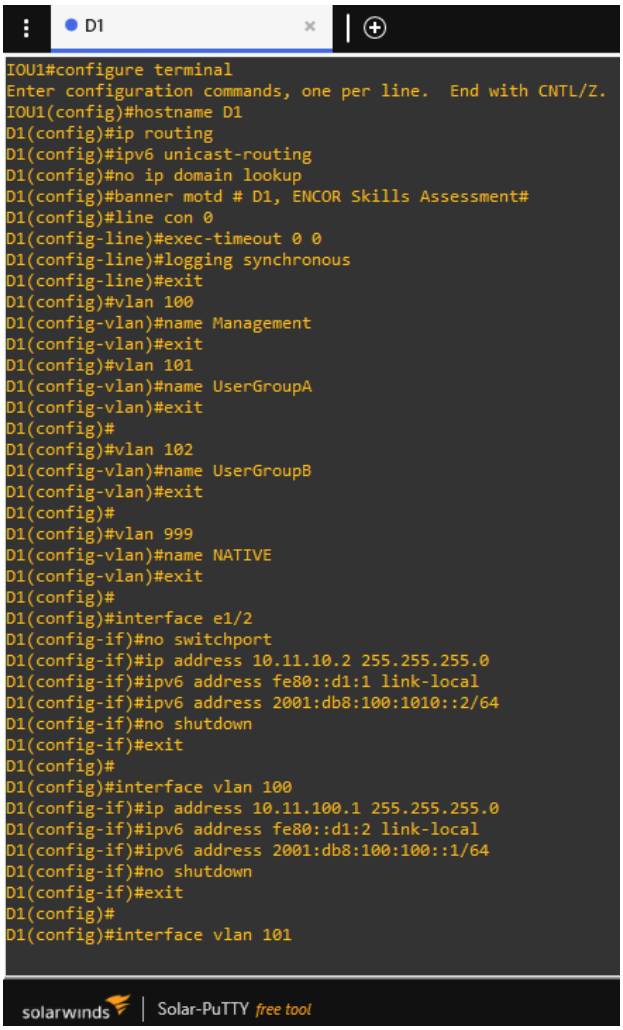
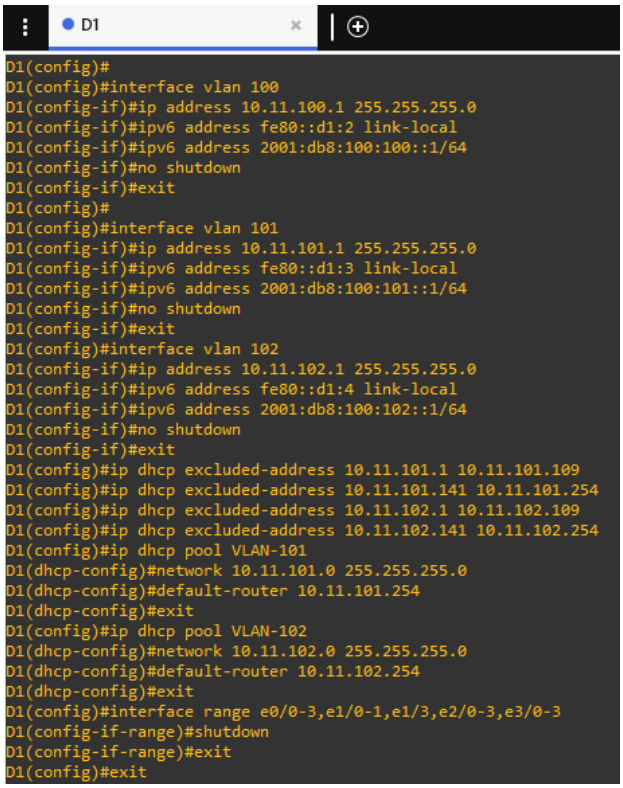


Figura 18. configuracion Switch D1



Switch D2

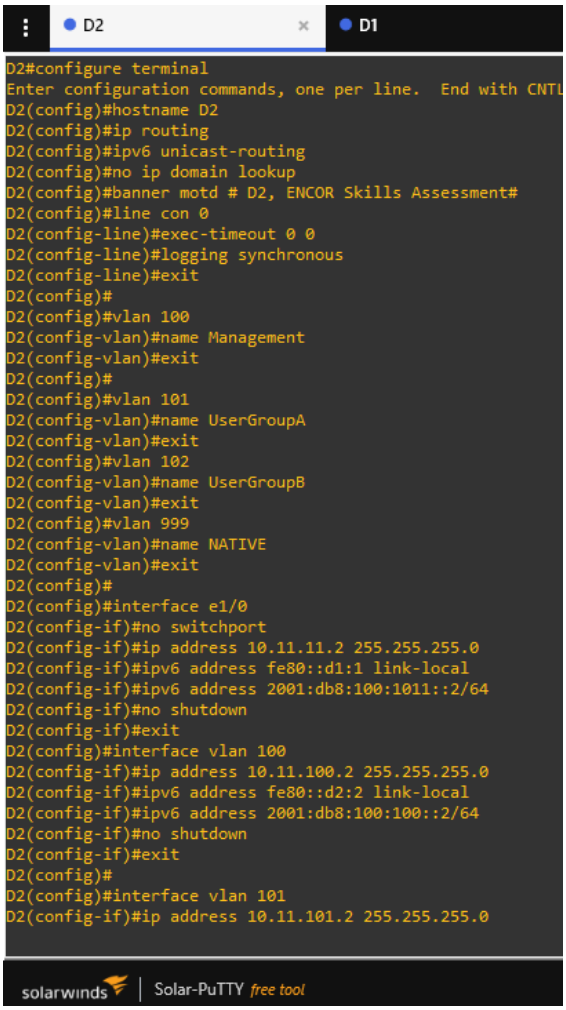
hostname D2
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D2, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 100
name Management
exit
vlan 101
name UserGroupA
exit
vlan 102

```
name UserGroupB
exit
vlan 999
name NATIVE
exit
interface e1/0
no switchport
ip address 10.11.11.2 255.255.255.0
ipv6 address fe80::d1:1 link-local
ipv6 address 2001:db8:100:1011::2/64
no shutdown
exit
interface vlan 100
ip address 10.11.100.2 255.255.255.0
ipv6 address fe80::d2:2 link-local
ipv6 address 2001:db8:100:100::2/64
no shutdown
exit
interface vlan 101
ip address 10.11.101.2 255.255.255.0
ipv6 address fe80::d2:3 link-local
ipv6 address 2001:db8:100:101::2/64
no shutdown
exit
interface vlan 102
ip address 10.11.102.2 255.255.255.0
ipv6 address fe80::d2:4 link-local
ipv6 address 2001:db8:100:102::2/64
no shutdown
exit

ip dhcp excluded-address 10.11.101.1 10.11.101.209
ip dhcp excluded-address 10.11.101.241 10.11.101.254
ip dhcp excluded-address 10.11.102.1 10.11.102.209
ip dhcp excluded-address 10.11.102.241 10.11.102.254
ip dhcp pool VLAN-101
```

network 10.11.101.0 255.255.255.0
default-router 11.0.101.254
exit
ip dhcp pool VLAN-102
network 10.11.102.0 255.255.255.0
default-router 10.11.102.254
exit
interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
shutdown
exit

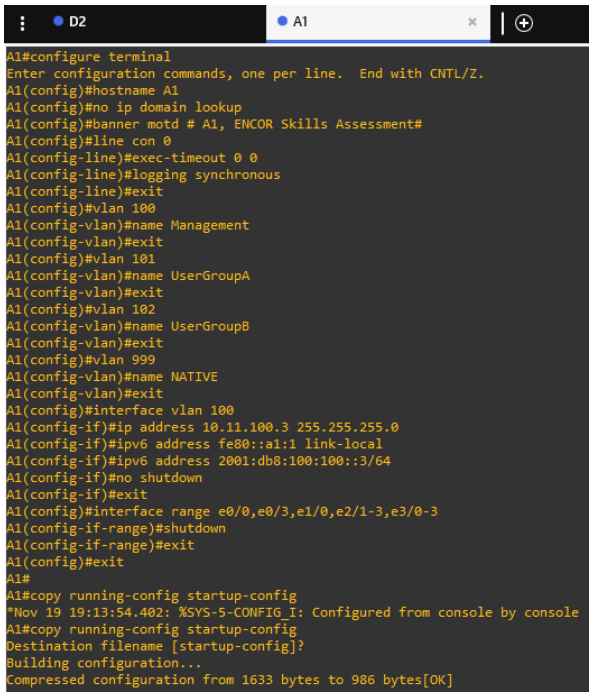
Figura 19. configuracion Switch D2



Switch A1

```
hostname A1
no ip domain lookup
banner motd # A1, ENCOR Skills Assessment#
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 100
name Management
exit
vlan 101
name UserGroupA
exit
vlan 102
name UserGroupB
exit
vlan 999
name NATIVE
exit
interface vlan 100
ip address 10.11.100.3 255.255.255.0
ipv6 address fe80::a1:1 link-local
ipv6 address 2001:db8:100:100::3/64
no shutdown
exit
interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
shutdown
exit
```

Figura 20. configuracion Switch A1



Guarde la configuración en ejecución en startup-config en todos los dispositivos.

Figura 21. configuracion startup-config R1

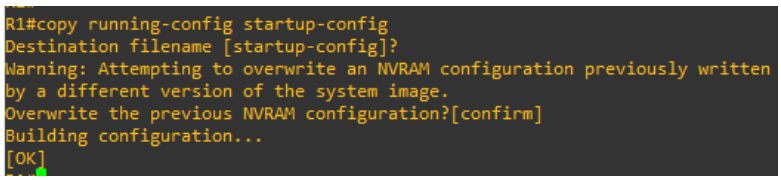


Figura 22.configuracion startup-config R2

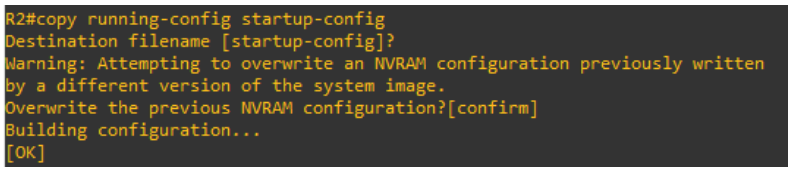


Figura 23. configuracion startup-config R3

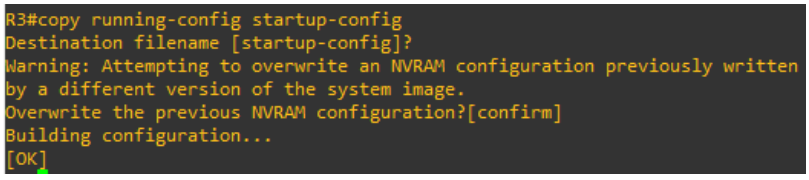


Figura 24. configuracion startup-config D1

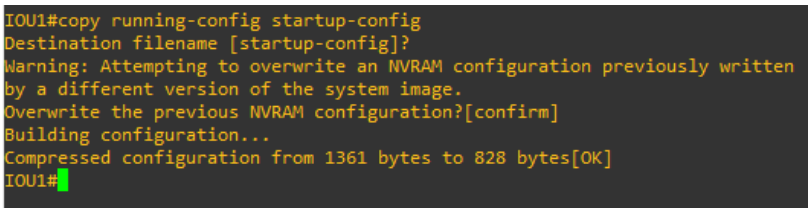


Figura 25. configuracion startup-config D2

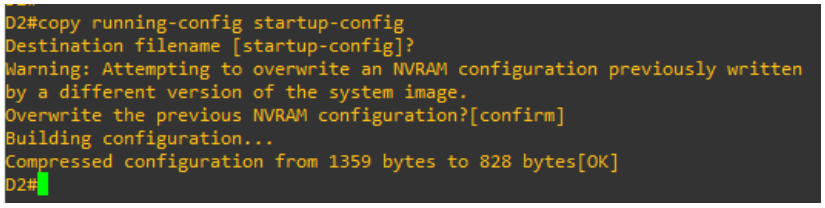
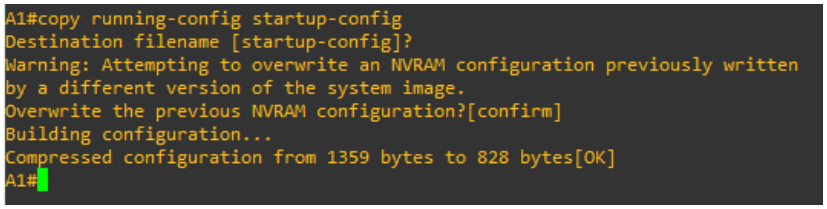


Figura 26. configuracion startup-config A1



Fuente: Aplicación GNS3(Autoría propia)

Para realizar el montaje del Escenario 1 fue necesario el uso de GNS3 y la máquinavirtual VM. En este caso se hizo uso de 3 Reuters Cisco 7200 (R1, R2 Y R3) estosconfigurados previamente todos con Ethernet Adaptes, 3 suiches Cisco IOU L2 (D1, D2 Y A1) y 4 VPCS (PC1, PC2, PC3 Y PC4).

Una vez ubicado los elementos a usar se hicieron las respectivas conexionesteniendo en cuenta la Figura 1

Configure el direccionamiento de host de PC 1 y PC 4 como se muestra en la tabla de direccionamiento. Asigne una dirección de puerta de enlace predeterminada de 10.11.100.254, que será la dirección IP virtual de HSRP utilizada en la Parte 4.

Figura 27. direccionamiento del host PC1

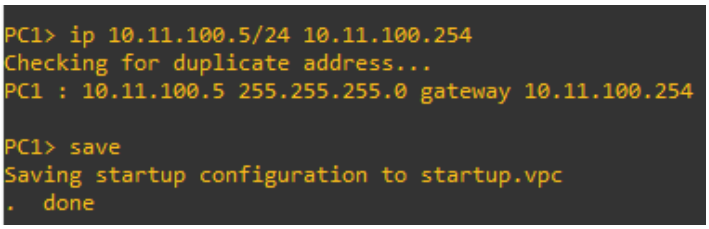
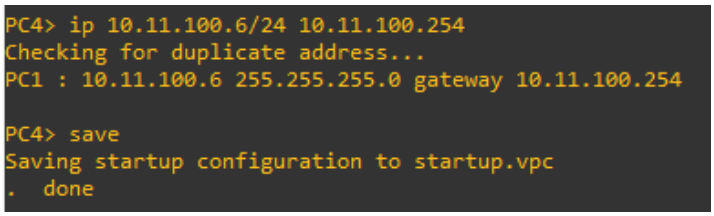


Figura 28. direccionamiento del host PC2



El protocolo de los switch LAN es distribuir las tramas por medios de las capa 2, estos dispositvos ejecutan un host local de la red de ethernet. Las direcciones MAC del host que se verifican en red son asignado en esa direccion Mac a su propio puerto de switch Ethernet.

Configurar la red de capa 2 y la compatibilidad con el host, en esta parte de la evaluación de habilidades, completará la configuración de la red de capa 2 y configurará el soporte de host básico. Al final de esta parte, todos los interruptores deberían poder comunicarse. PC2 y PC3 deben recibir direccionamiento de DHCP y SLAAC, Sus tareas de configuración son las siguientes:

2.1 On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links

Switch D1

configure terminal

interface range e2/0-3,e0/1-2

switchport trunk encapsulation dot1q

switchport mode trunk

no shutdown

exit

Figura 29. configuracion switch D1

```
D1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
D1(config)#interface range e2/0-3,e0/1-2
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
```

Switch D2

configure terminal

interface range e2/0-3,e1/1-2

switchport trunk encapsulation dot1q

switchport mode trunk

no shutdown

exit

Figura 30. configuracion switch D2

```
D2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
D2(config)#interface range e2/0-3,e1/1-2
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#exit
```

Switch A1

configure terminal

interface range e0/1-2,e1/1-2

switchport trunk encapsulation dot1q

switchport mode trunk

no shutdown

exit

Figura 31. configuracion switch A1

```
A1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
A1(config)#interface range e0/1-2,e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#exit
A1#
```

2.2 On all switches, change the native VLAN on trunk links.

Switch D1

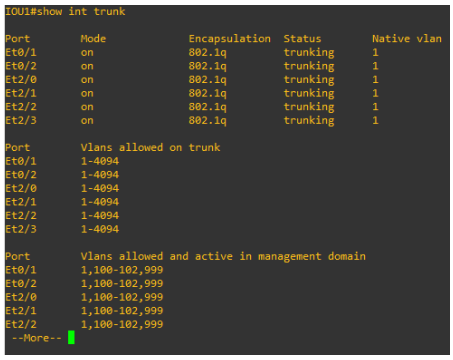
configure terminal

interface range e2/0-3,e0/1-2

switchport trunk native vlan 999

exit

Figura 32. configuracion VLAN switch D1



Switch D2

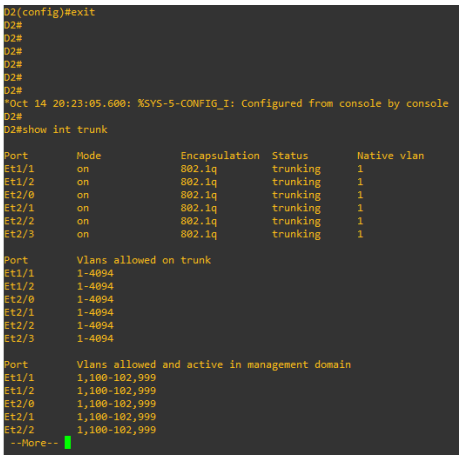
configure terminal

interface range e2/0-3,e1/1-2

switchport trunk native vlan 999

exit

Figura 33. configuracion VLAN switch D2



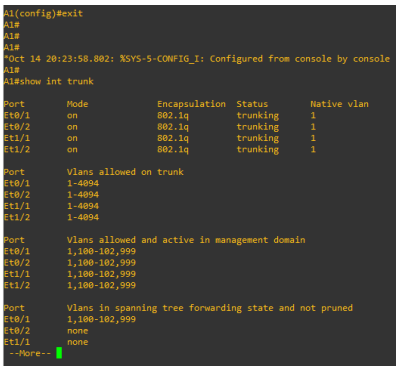
Switch A1

configure terminal

interface range e0/1-2,e1/1-2

switchport trunk native vlan 999 exit

Figura 34. configuracion VLAN switch A1



2.3 On all switches, enable the Rapid Spanning-Tree Protocol.

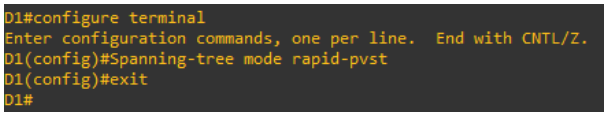
Switch D1

configure terminal

Spanning-tree mode rapid-pvst

Exit

Figura 35. configuracion Spanning-Tree Protocol switch D1



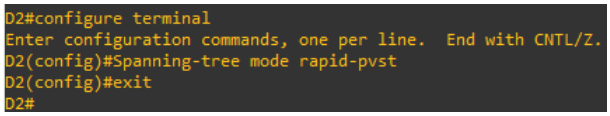
Switch D2

configure terminal

Spanning-tree mode rapid-pvst

Exit

Figura 36. configuracion Spanning-Tree Protocol switch D2



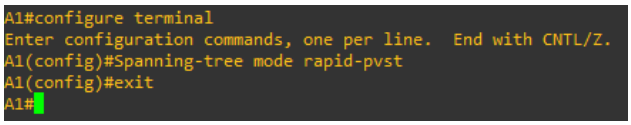
Switch A1

configure terminal

Spanning-tree mode rapid-pvst

Exit

Figura 37. configuracion Spanning-Tree Protocol switch A1



2.4 On D1 and D2, configure the appropriate RSTP root bridges based on the information in the topology diagram.

D1 and D2 must provide backup in case of root bridge failure.

Switch D1

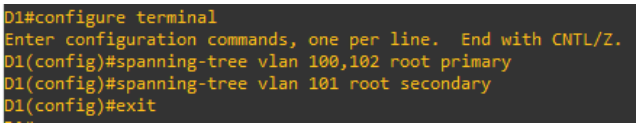
configure terminal

spanning-tree vlan 100,102 root primary

spanning-tree vlan 101 root secondary

exit

Figura 38. configuracion RSTP switch D1



Switch D2

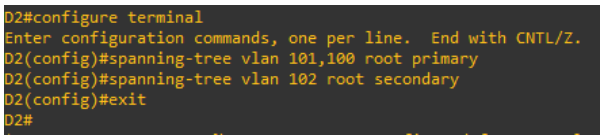
configure terminal

spanning-tree vlan 101,100 root primary

spanning-tree vlan 102 root secondary

exit

Figura 39. configuracion RSTP switch D2



2.5 On all switches, create LACP EtherChannels as shown in the topology diagram.

Switch D1

configure terminal

interface range e2/0-3

channel-protocol lacp

channel-group 12 mode active

no shutdown

exit

interfac port-channel 12

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

exit

interface range e0/1-2

channel-protocol lacp

channel-group 1 mode active

no shutdown

exit

interfac port-channel 1

switchport trunk encapsulation dot1q

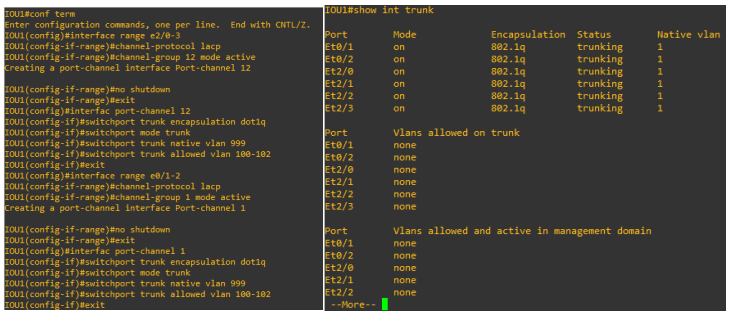
switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

exit

Figura 40. configuracion LACP switch D1



Switch D2

configure terminal

interface range e2/0-3

channel-protocol lacp

channel-group 12 mode active

no shutdown

exit

interfac port-channel 12

switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

exit

interface range e1/1-2

channel-protocol lacp

channel-group 2 mode active

no shutdown

exit

interfac port-channel 2

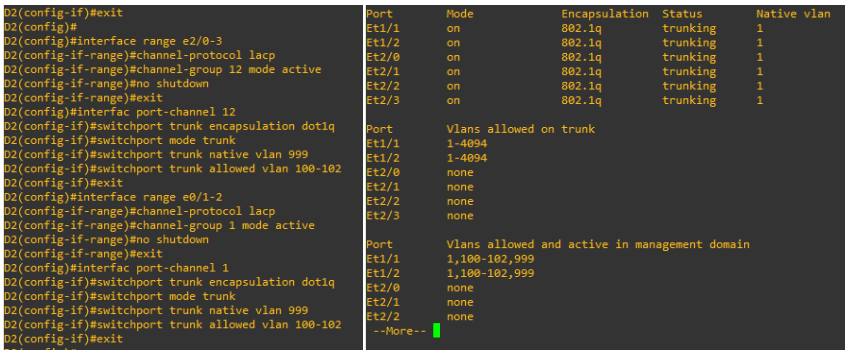
switchport trunk encapsulation dot1q

switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

Figura 41. configuracion LACP switch D2



Switch A1

configure terminal

interface range e0/1-2

channel-protocol lacp

channel-group 1 mode passive

no shutdown

exit

interfac port-channel 1

switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

exit

interface range e1/1-2

channel-protocol lacp

channel-group 2 mode passive

no shutdown

interfac port-channel 2

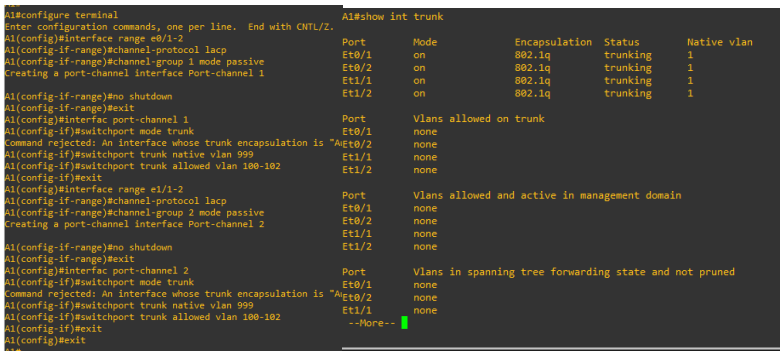
switchport mode trunk

switchport trunk native vlan 999

switchport trunk allowed vlan 100-102

exit

Figura 42. configuracion LACP switch A1



2.6 On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.

Switch D1

configure terminal

interface e0/0

switchport mode acces

switchport acces vlan 100

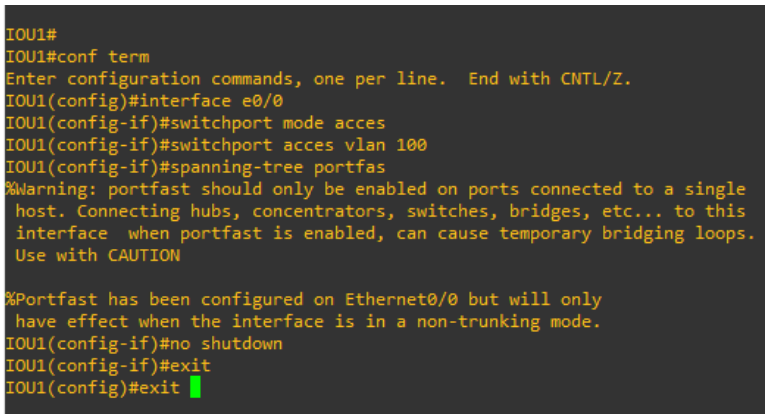
spanning-tree portfas

no shutdown

exit

exit

Figura 43. configuracion host ports connecting switch D1



Switch D2

configure terminal

interface e0/0

switchport mode acces

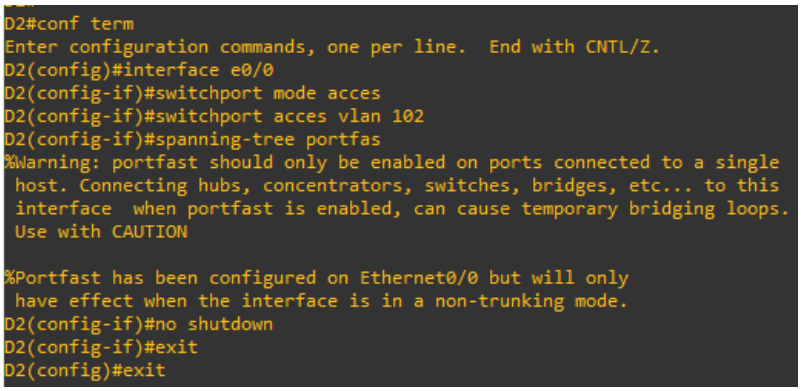
switchport acces vlan 102

spanning-tree portfast

no shutdown

exit

Figura 44. configuracion host ports connecting switch D2



Switch A1

configure terminal

interface e1/3

switchport mode acces

switchport acces vlan 101

spanning-tree portfast

no shutdown

exit

interface e2/0

switchport mode acces

switchport acces vlan 100

spanning-tree portfast

no shutdown

exit

Figura 45. configuracion host

```
A1#
A1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
A1(config)#interface e1/3
A1(config-if)#switchport mode acces
A1(config-if)#switchport acces vlan 101
A1(config-if)#spanning-tree portfas
%Warning: portfast should only be enabled on ports connected to a single
 host. Connecting hubs, concentrators, switches, bridges, etc... to this
 interface  when portfast is enabled, can cause temporary bridging loops.
 Use with CAUTION

%Portfast has been configured on Ethernet1/3 but will only
 have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#interface e2/0
A1(config-if)#switchport mode acces
A1(config-if)#switchport acces vlan 100
A1(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
 host. Connecting hubs, concentrators, switches, bridges, etc... to this
 interface  when portfast is enabled, can cause temporary bridging loops.
 Use with CAUTION

%Portfast has been configured on Ethernet2/0 but will only
 have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#exit
```

2.7 Verify IPv4 DHCP services.

PC2

IP 10.11.102.210/24

Figura 46. configuracion IPv4 DHCP PC2

```
PC1> ip 10.11.102.210/24
Checking for duplicate address...
PC1 : 10.11.102.210 255.255.255.0
```

PC3

IP dhcp

Figura 47. configuracion IP DHCP PC3

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the
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


PC3> ip dhcp
DDORA IP 10.11.101.110/24 GW 10.11.101.254
```

2.8 Verify local LAN connectivity.

Figura 48. configuracion LAN

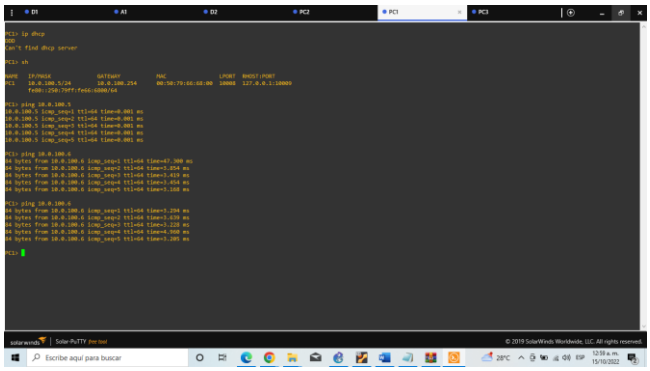


Figura 49. configuracion LAN

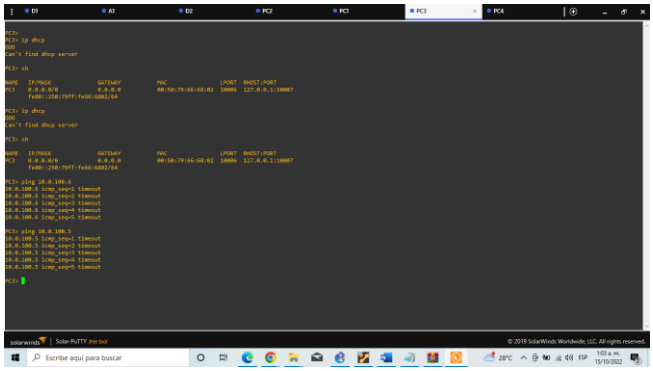
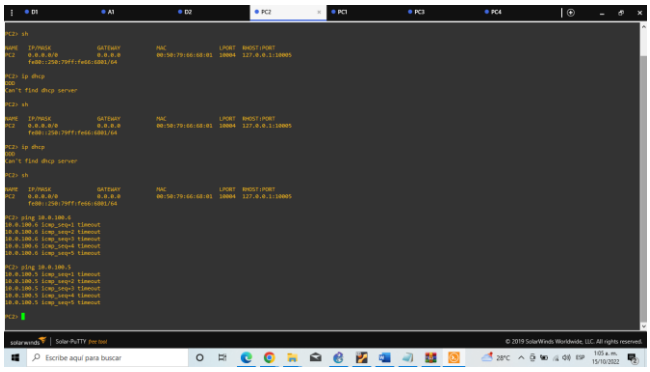


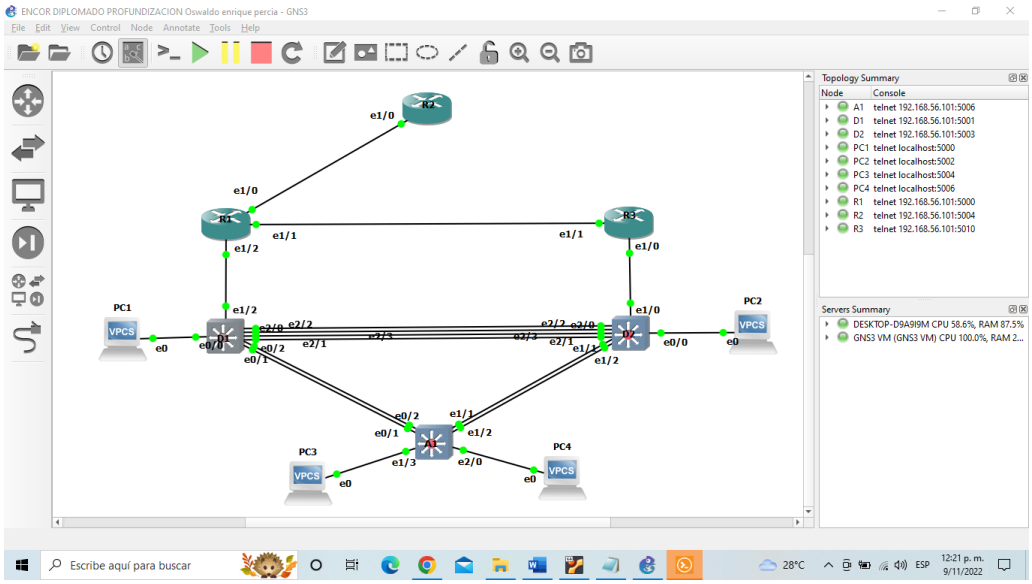
Figura 50. configuracion LAN



ENCOR Skills Assessment (scenario 2)

Continuación del escenario #1

Figura #51 topologia del escenario #2



Configure Routing Protocols

In this part, you will configure IPv4 and IPv6 routing protocols. At the end of this part, the network should be fully converged. IPv4 and IPv6 pings to the Loopback 0 interface from D1 and D2 should be successful.

Note: Pings from the hosts will not be successful because their default gateways are pointing to the HSRP address which will be enabled in Part 4.

Your configuration tasks are as follows:

Task#	Task	Specification	Points
3.1	On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.	Use OSPF Process ID **4** and assign the following router-IDs: • R1: 0.0.4.1 • R3: 0.0.4.3 • D1: 0.0.4.131 • D2: 0.0.4.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv2 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8

Task#	Task	Specification	Points
3.2	On the “Company Network” (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0.	Use OSPF Process ID **6** and assign the following router-IDs: • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv3 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8

Task#	Task	Specification	Points
3.3	On R2 in the “ISP Network”, configure MP-BGP.	Configure two default static routes via interface Loopback 0: • An IPv4 default static route. • An IPv6 default static route. Configure R2 in BGP ASN **500** and use the router-id 2.2.2.2. Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300. In IPv4 address family, advertise: • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). In IPv6 address family, advertise: • The Loopback 0 IPv4 network (/128). • The default route (::/0).	4

Task#	Task	Specification	Points
3.4	On R1 in the “ISP Network”, configure MP-BGP.	Configure two static summary routes to interface Null 0: • A summary IPv4 route for 10.11.0.0/8. • A summary IPv6 route for 2001:db8:100::/48. Configure R1 in BGP ASN **300** and use the router-id 1.1.1.1. Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500. In IPv4 address family: • Disable the IPv6 neighbor relationship. • Enable the IPv4 neighbor relationship. • Advertise the 10.11.0.0/8 network. In IPv6 address family: • Disable the IPv4 neighbor relationship. • Enable the IPv6 neighbor relationship. • Advertise the 2001:db8:100::/48 network.	4

3.1 En la "Red de la empresa" (es decir, R1, R3, D1 y D2), configure OSPFv2 de área única en el área 0.

Routers 1

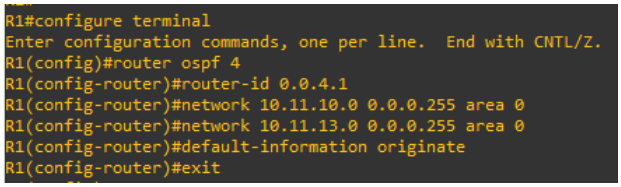
R1(config)#router ospf 4

R1(config-router)#router-id 0.0.4.1

R1(config-router)#network 10.11.10.0 0.0.0.255 area 0

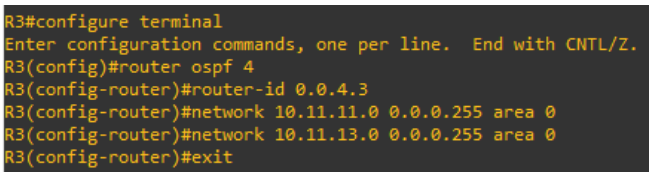
R1(config-router)#network 10.11.13.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit

Figura 52. configuracion OSPv2 Router R1



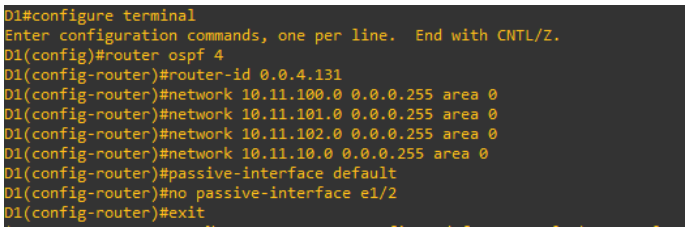
Routers 3
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3
R3(config-router)#network 10.11.11.0 0.0.0.255 area 0
R3(config-router)#network 10.11.13.0 0.0.0.255 area 0
R3(config-router)#exit

Figura 53. configuracion OSPv2 Router R2



Switch D1
D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.131
D1(config-router)#network 10.11.100.0 0.0.0.255 area 0
D1(config-router)#network 10.11.101.0 0.0.0.255 area 0
D1(config-router)#network 10.11.102.0 0.0.0.255 area 0
D1(config-router)#network 10.11.10.0 0.0.0.255 area 0
D1(config-router)#passive-interface default
D1(config-router)#no passive-interface e1/2
D1(config-router)#exit

Figura 54. configuracion OSPv2 Switch D1



Switch D2

D2(config)#router ospf 4

D2(config-router)#router-id 0.0.4.132

D2(config-router)#network 10.11.100.0 0.0.0.255 area 0

D2(config-router)#network 10.11.101.0 0.0.0.255 area 0

D2(config-router)#network 10.11.102.0 0.0.0.255 area 0

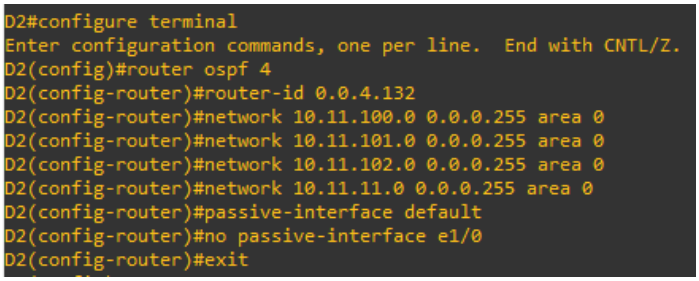
D2(config-router)#network 10.11.11.0 0.0.0.255 area 0

D2(config-router)#passive-interface default

D2(config-router)#no passive-interface e1/0

D2(config-router)#exit

Figura 55. configuracion OSPv2 Switch D2



3.2 En la "Red de la empresa" (es decir, R1, R3, D1 y D2), configure OSPFv3 clásico de área única en el área 0.

Routers 1

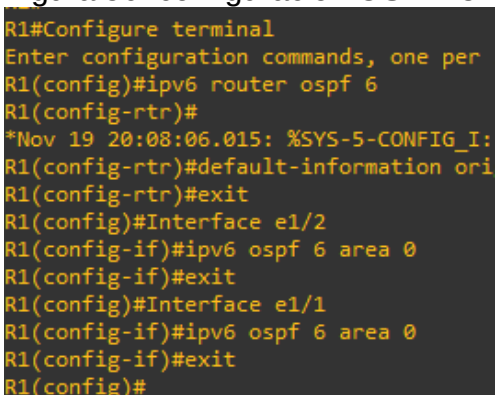
R1(config)#ipv6 router ospf 6

R1(config-rtr)#router-id 0.0.6.1

R1(config-rtr)#default-information originate

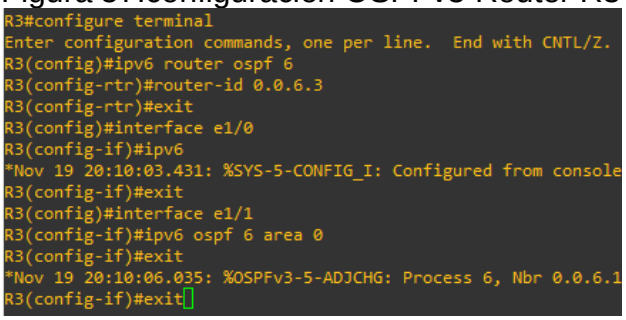
R1(config-rtr)#exit
R1(config)#interface e1/2
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit

Figura 56. configuracion OSPFv3 Router R1



Routers 3
R3(config)#ipv6 router ospf 6
R3(config-rtr)#router-id 0.0.6.3
R3(config-rtr)#exit
R3(config)#interface e1/0
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit

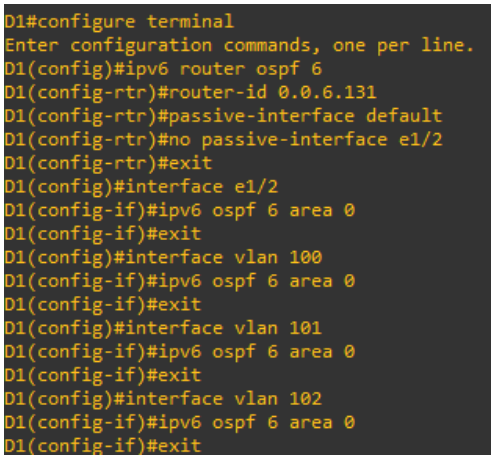
Figura 57.configuracion OSPFv3 Router R3



Switch D1

```
D1(config)#ipv6 router ospf 6
D1(config-rtr)#router-id 0.0.6.131
D1(config-rtr)#passive-interface default
D1(config-rtr)#no passive-interface e1/2
D1(config-rtr)#exit
D1(config)#interface e1/2
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
```

Figura 58. configuracion OSPFv3 switch D1



Switch D2

```
D2(config)#ipv6 router ospf 6
D2(config-rtr)#router-id 0.0.6.132
D2(config-rtr)#passive-interface default
```

D2(config-rtr)#no passive-interface e1/0
D2(config-rtr)#exit
D2(config)#interface e1/0
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit

Figura 59. configuracion OSPFv3 switch D2

```
D2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
D2(config)#ipv6 router ospf 6
D2(config-rtr)#router-id 0.0.6.132
D2(config-rtr)#passive-interface default
D2(config-rtr)#no passive-interface e1/0
D2(config-rtr)#exit
D2(config)#interface e1/0
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
```

3.3 En R2 en la "Red ISP", configure MP-BGP.

Routers 2
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300
R2(config-router)#address-family ipv4
R2(config-router)#neighbor 209.165.200.225 activate

R2(config-router)#no neighbor 2001:db8:200::1 activate
R2(config-router)#network 2.2.2.2 mask 255.255.255.255
R2(config-router)#network 0.0.0.0
R2(config-router)#exit-address-family
R2(config)#address-family ipv6
R2(config-router)#no neighbor 209.165.200.225 activate
R2(config-router)#neighbor 2001:db8:200::1 activate
R2(config-router)#network 2001:db8:2222::/128
R2(config-router)#network ::/0
R2(config-router)#exit-address-family

Figura 60. configuracion MP-BGP Router R*2*

```
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
%Default route without gateway, if not a point-to-point interface
R2(config)#ipv6 route ::/0 loopback 0
R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300
R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate
R2(config-router-af)#no neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)#network 0.0.0.0
R2(config-router-af)#exit-address-family
R2(config-router)#address-family ipv6
R2(config-router-af)#no neighbor 209.165.200.225 activate
R2(config-router-af)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family
R2(config-router)#exit
R2(config)#exit
```

3.4 En R1 en la "Red ISP", configure MP-BGP.

Routers 1
R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#router bgp 300
R1(config-router)#bgp router-id 1.1.1.1
R1(config-router)#neighbor 209.165.200.226 remote-as 500
R1(config-router)#%BGP-5-ADJCHANGE: neighbor 209.165.200.226 Up
R1(config-router)#neighbor 2001:db8:200::2 remote-as 500
R1(config-router)#address-family ipv4 unicast
R1(config-router)#neighbor 209.165.200.226 activate
R1(config-router)#no neighbor 2001:db8:200::2 activate

R1(config-router)#network 10.0.0.0 mask 255.0.0.0
R1(config-router)#exit-address-family
R1(config-router)#address-family ipv6 unicast
R1(config-router)#no neighbor 209.165.200.226 activate
R1(config-router)#neighbor 2001:db8:200::2 activate
R1(config-router)#network 2001:db8:100::/48
R1(config-router)#exit-address-family

Figura 61. configuracion MP-BGP Router R1

```
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#router bgp 300
R1(config-router)#bgp router-id 1.1.1.1
R1(config-router)#neighbor 209.165.200.226 remote-as 500
R1(config-router)#neighbor 2001:db8:200::2 remote-as 500
R1(config-router)#address-family ipv4 unicast
R1(config-router-af)#neighbor 209.165.200.226 activate
R1(config-router-af)#no neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 10.0.0.0 mask 255.0.0.0
R1(config-router-af)#exit-address-family
R1(config-router)#address-family ipv6 unicast
R1(config-router-af)#no neighbor 2009.165.200.226 activate
% Specify remote-as or peer-group commands first
R1(config-router-af)#neighbor 2001:db8:200::2 activate
R1(config-router-af)#neighbor 2001:db8:100::/48 activate
% Specify remote-as or peer-group commands first
R1(config-router-af)#exit-address-family
R1(config-router)#exit
```

3.5 verificación de ruta IPv4

Figura 62. configuracion IPv4 switch D1

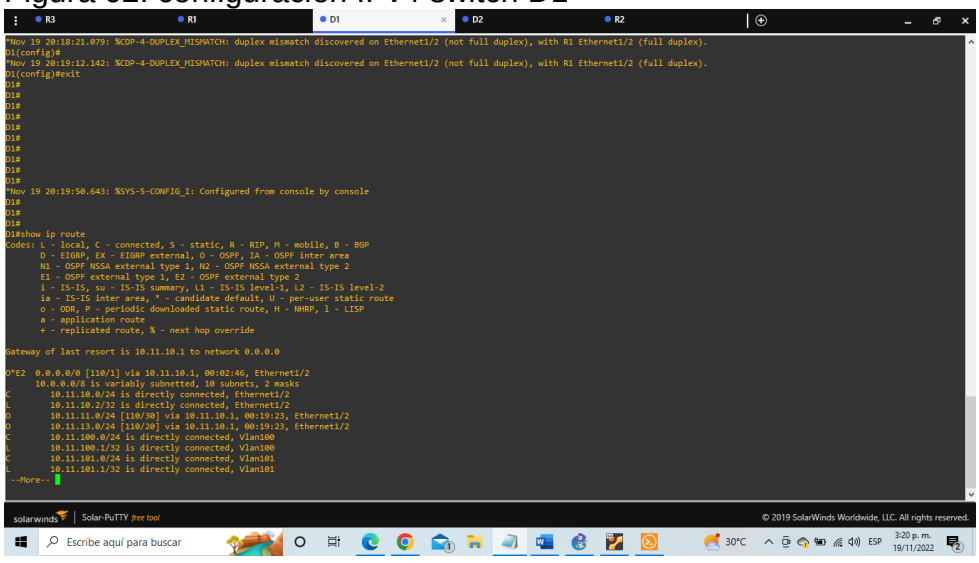


Figura 63. configuracion IPv4 Router R1

Figura 64. configuracion IPv4 switchD2

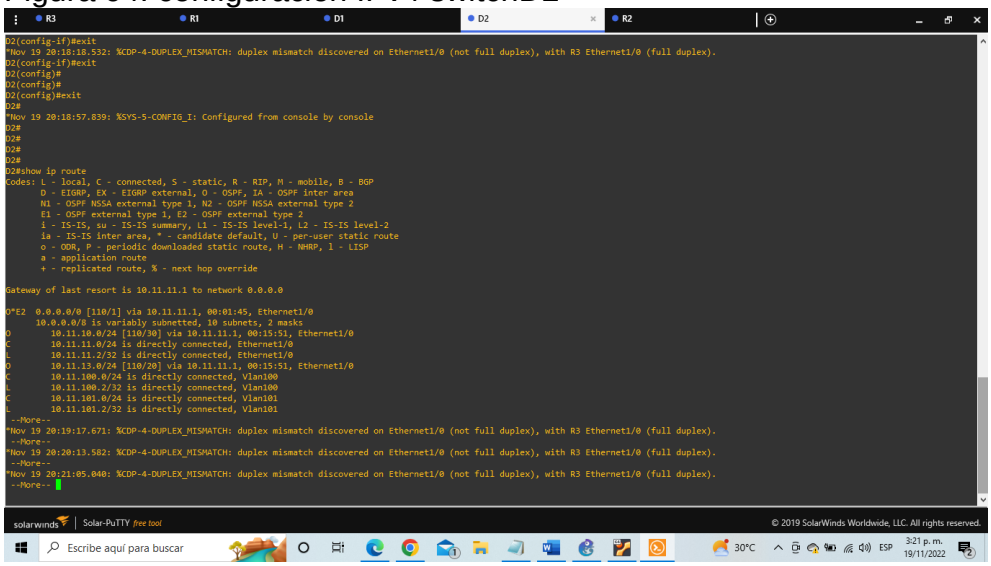
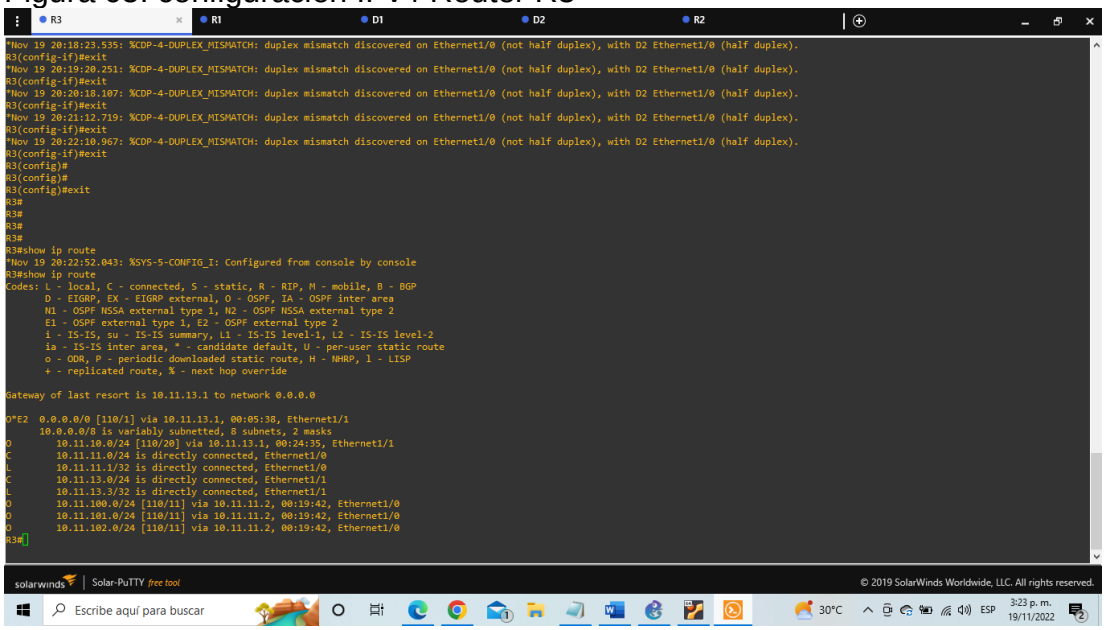


Figura 65. configuracion IPv4 Router R3



Ping de D1,D2 hacia loopback 0

Figura 66. configuracion loopback switch D1

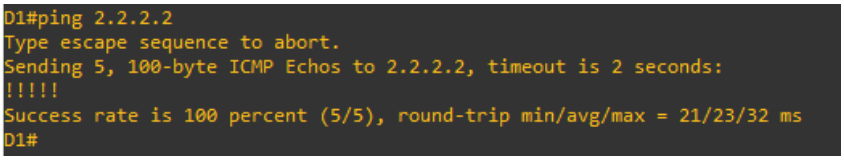
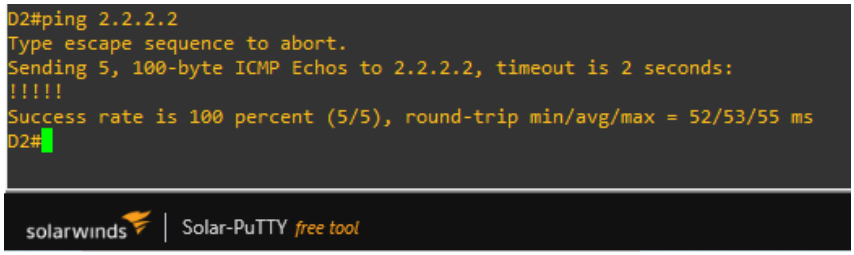


Figura 67. configuracion loopback switch D2



Configure First Hop Redundancy

In this part, you will configure HSRP version 2 to provide first-hop redundancy for hosts in the “Company Network”.

Your configuration tasks are as follows:

Task#	Task	Specification	Points
4.1	On D1, create IP SLAs that test the reachability of R1 interface E1/2.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R1 E1/2 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6. • Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.	2
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R3 E1/0 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6. • Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.	2

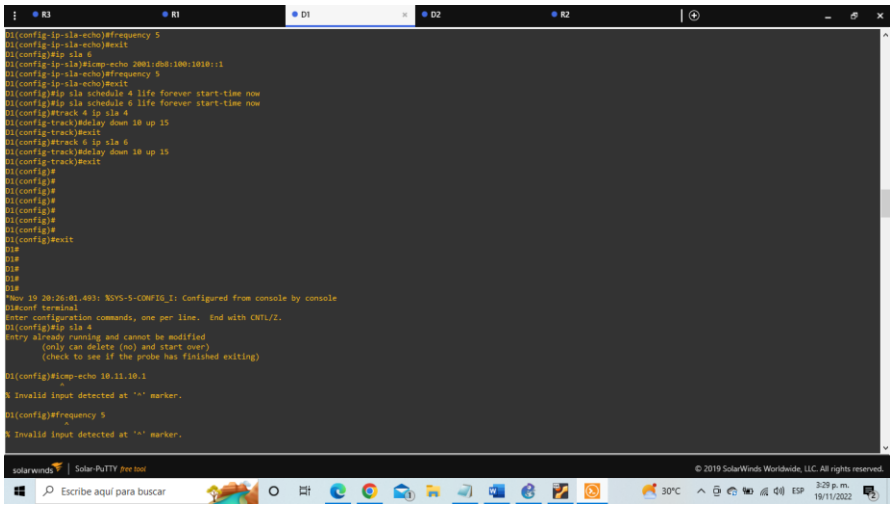
Task#	Task	Specification	Points
4.3	On D1, configure HSRPv2.	D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150. Configure HSRP version 2. Configure IPv4 HSRP group **104** for VLAN 100: • Assign the virtual IP address **10.11.100.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.11.101.254**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10.11.102.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60.	8

Task#	Task	Specification	Points
	On D2, configure HSRPv2.	D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150. Configure HSRP version 2. Configure IPv4 HSRP group **104** for VLAN 100: • Assign the virtual IP address **10.11.100.254**. • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.11.101.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10.11.102.254**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60.	

4.1. En D1, cree IP SLA que prueben la accesibilidad de la interfaz E1/2 de R1.

```
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.11.10.1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla 6
D1(config-ip-sla)#icmp-echo 2001:db8:100:1010::1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life-forever start-time now
D1(config)#track 4 ip sla 4
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#track 6 ip sla 6
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
```

Figura 68. configuracion IP SLA swicht D1



4.2 En D2, cree IP SLA que prueben la accesibilidad de la interfaz E1/0 de R3.

D2(config)#ip sla 4
D2(config-ip-sla)#icmp-echo 10.11.11.1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla 6
D2(config-ip-sla)#icmp-echo 2001:db8:100:1011::1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#track 4 ip sla 4
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#track 6 ip sla 6
D2(config-track)#delay down 10 up 15
D2(config-track)#exit

Figura 69. configuracion IP SLA swicht D2

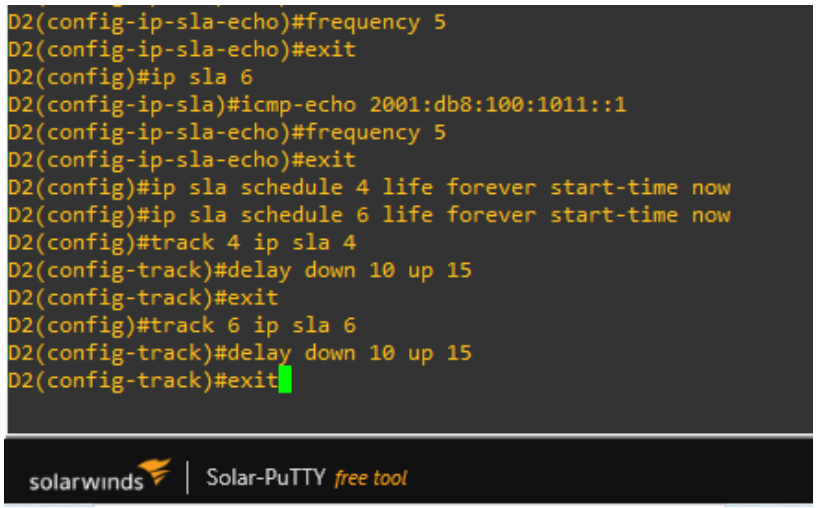


Figura 70. configuracion IP SLA swicht D

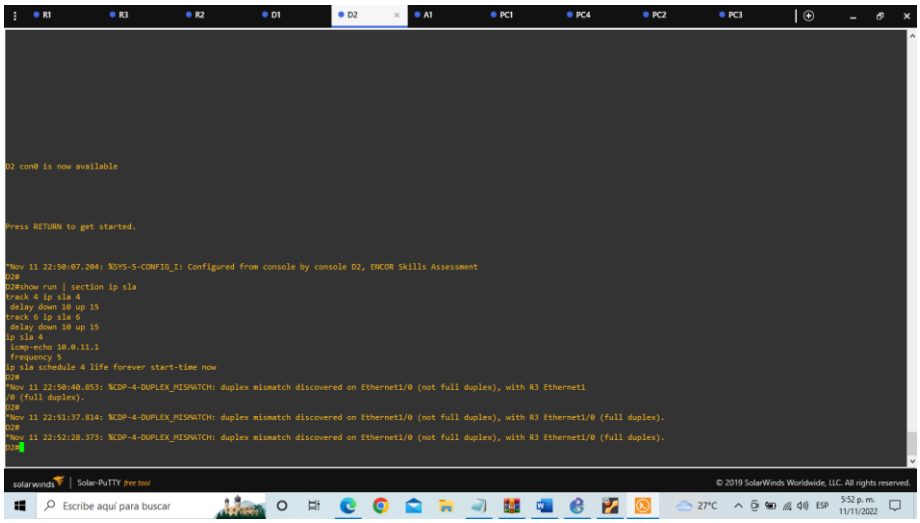
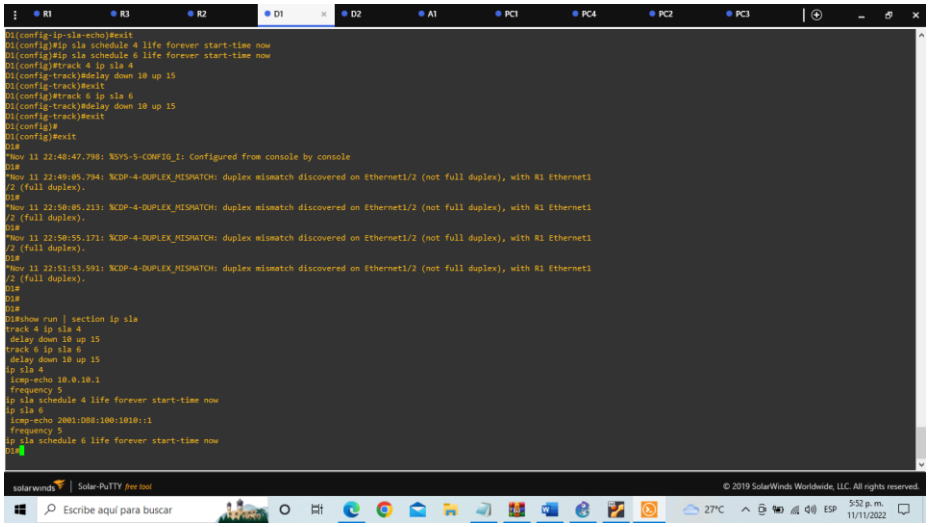


Figura 71. configuracion IP SLA swicht D1



4.3 En D1, configure HSRPv2.

D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 104 ip 10.0.100.254
D1(config-if)#standby 104 priority 150
D1(config-if)#standby 104 preempt

```
D1(config-if)#standby 104 track 4 decrement 60
D1(config-if)#standby 106 ipv6 autoconfig
D1(config-if)#standby 106 priority 150
D1(config-if)#standby 106 preempt
D1(config-if)#standby 106 track 6 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 114 ip 10.11.101.254
D1(config-if)#standby 114 preempt
D1(config-if)#standby 114 track 4 decrement 60
D1(config-if)#standby 116 ipv6 autoconfig
D1(config-if)#standby 116 preempt
D1(config-if)#standby 116 track 6 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#standby version 2
D1(config-if)#standby 124 ip 10.0.102.254
D1(config-if)#standby 124 priority 150
D1(config-if)#standby 124 preempt
D1(config-if)#standby 124 track 4 decrement 60
D1(config-if)#standby 126 ipv6 autoconfig
D1(config-if)#standby 126 priority 150
D1(config-if)#standby 126 priority 150
D1(config-if)#standby 126 preempt
D1(config-if)#standby 126 track 6 decrement 60
D1(config-if)#exit
D1(config)#end
```

Figura 72. configuracion HSRPv2 swicht D1

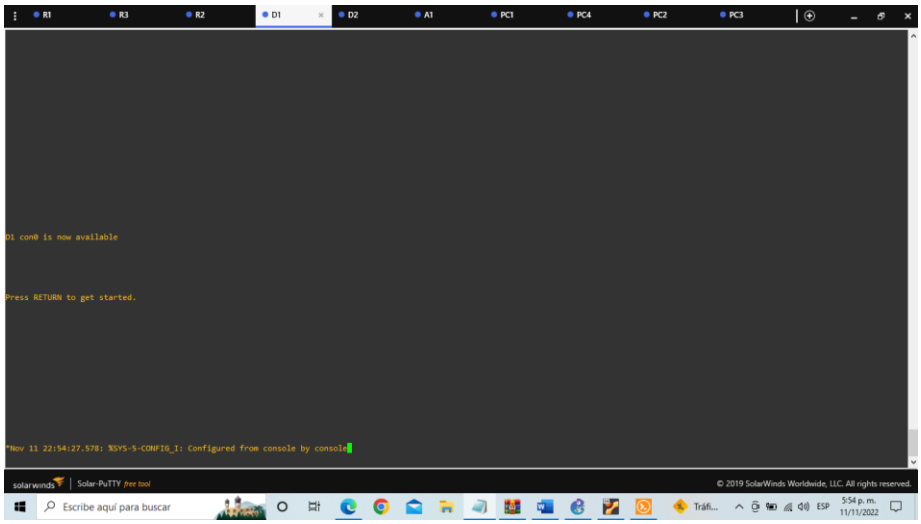
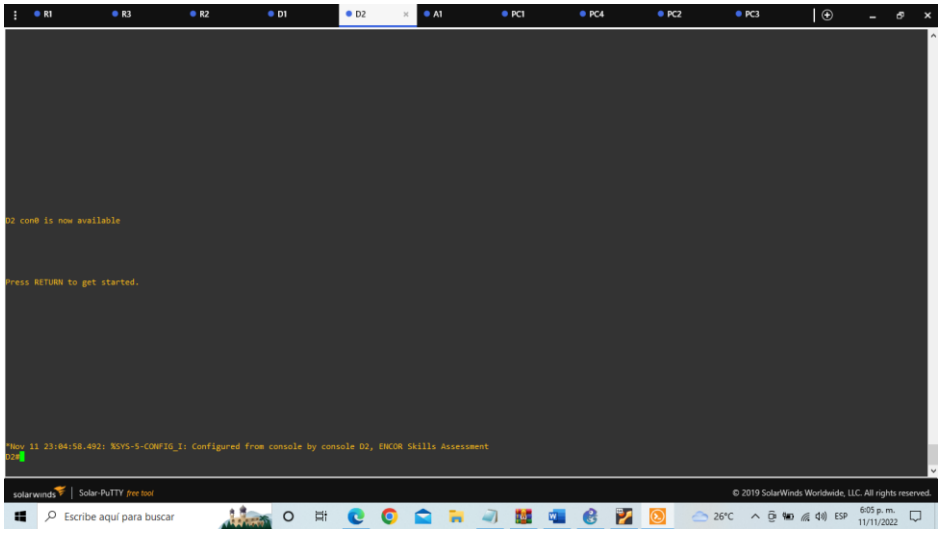


Figura 73. configuracion HSRPv2 swicht D2



CONCLUSIONES

Implementamos el escenario y protocolo propuesto en la topologia de la actividad de curso de profundización Cisco CCNP, utilizando las configuraciones LACP y el manejo teórico de la diferentes switch y sus características principales en la visión de instarla el diseño del que corresponde por capa 2 y 3. La plataforma Cisco es una estructura académica de redes, donde tiene como modelo las representaciones gráficas y programable de las configuración de los dispositivo de redes, teniendo como principal característica el estado de tiempo de ejecución de la topologia, enlazando y analizando los componentes de software y hardware.

En este orden de idea, implementamos una topologia escenario uno donde ejecutamos una tabla de direcciones para enlazar los diferentes dispositivos y realizar una conmutación con repuesta; BGP, ASN, HRSP, VLAN, IP SLA, HSRPv2, etc. De acuerdo a los pasos implementamos, los protocolos de enrutamiento se guardaron en cada uno de sus sistemas de programación interna con la configuración el modelo copy running-config startup-config, es la abreviatura de copy run start. Esto permite copiar la configuración activa del routers de la RAM a la NVRAM.

Ejecutamos y realizamos verificación de la configuración de red de capa 2 y la compatibilidad con el host, en esta parte de la evaluación de habilidades, completará la configuración de la red de capa 2 y configurará el soporte de host básico. Al final de esta parte, todos los interruptores deberían poder comunicarse. PC2 y PC3 deben recibir direccionamiento de DHCP y SLAAC, en el protocolo de la actividad nos muestra la implementación y la respuesta satisfactoria de cada ping y del diseño ejecutable final.

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