

DIPLOMADO DE PROFUNDIZACION CISCO
INFORME PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD ESCUELA DE
CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA - ECBTI
INGENIERÍA ELECTRONICA
BOGOTÁ D.C.
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Diplomado de opción de grado presentado para optar el título de INGENIERO
ELECTRONICO

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2022

NOTA DE ACEPTACIÓN

Firma del presidente del Jurado

Firma del Jurado

Firma del Jurado

Bogotá D.C., 08 de noviembre de 2022.

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GLOSARIO

BGP (Border Gateway Protocol): utilizado para conectar distintos sistemas autónomos principalmente con el canal de internet.

DHCP: es un servidor que usa protocolo de red de tipo cliente/servidor en el que generalmente un servidor posee una lista de direcciones IP dinámicas y las va asignando a los clientes conforme éstas van quedando libres, sabiendo en todo momento quién ha estado en posesión de esa IP, cuánto tiempo la ha tenido y a quién se la ha asignado después.

ISP (Internet Service Provider): término que identifica las compañías que proveen acceso a internet.

OSPFv2: es la versión del protocolo OSPF que actualmente utilizamos en redes IPv4. En este caso, el formato del router ID coincide con el formato de las direcciones IP utilizadas en las interfaces por lo que es posible utilizar la dirección IP de una interfaz como router ID, de manera tal que no es obligatorio configurar un router-id y el sistema operativo puede tomar la dirección IP de una interfaz para ser utilizada en esta función.

ROOT BRIDGE: punto de referencia dentro de la red que puede soportar más conmutación, todos los switches deben estar conectados hacia él con el mejor coste.

SMART LAB: es un centro especializado en difusión de conocimiento, intercambio de experiencias y espacios compartidos de trabajo vinculado a las ciudades inteligentes, su objetivo es crear un entorno compartido que estimule el intercambio de ideas y la generación de proyectos innovadores.

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.

RESUMEN

El siguiente trabajo se desarrolló en el marco del diplomado de profundización Cisco CCNP, siendo este la opción de grado con el fin de culminar la carrera profesional de ingeniería electrónica. Por medio del presente, se busca implementar los conocimientos y habilidades adquiridas en la formación.

En la etapa inicial realizamos un montaje, mediante un simulador llamado "GNS3", una máquina virtual denominada "Virtual Box" y varios dispositivos utilizados en el software Cisco, lo anterior, con el fin de presentar un escenario donde debemos realizar distintas configuraciones para el funcionamiento de una red profesional.

Finalmente, demostramos nuestros conocimientos obtenidos para el manejo de las redes, configuración de distintos protocolos en especial de etapa 2 y 3, se establecen enrutamientos tanto en redes LAN como en sistemas autónomos y como resultado de las distintas configuraciones realizadas, se estructuran redes que se comunican entre sí a las cuales se incorporan políticas de seguridad, tal y como lo encontramos en una red empresarial en nuestra vida diaria.

PALABRAS CLAVE: CISCO, REDES, ELECTRÓNICA, LAN, WAN, PROTOCOLOS.

ABSTRACT

The following work was developed within the framework of the Cisco CCNP in-depth diploma, this being the degree option in order to complete the professional career in electronic engineering. Through this, it seeks to implement the knowledge and skills acquired in training.

In the initial stage we carried out an assembly, through a simulator called "GNS3", a virtual machine called "Virtual Box" and several devices used in the Cisco software, the above, in order to present a scenario where we must make different configurations for the operation of a professional network.

Finally, we demonstrate our knowledge obtained for network management, configuration of different protocols, especially stage 2 and 3, routing is established both in LAN networks and in autonomous systems and as a result of the different configurations carried out, networks will be structured communicate with each other to which security policies are incorporated, just as we find in a business network in our daily lives.

KEYWORDS: CISCO, NETWORKS, ELECTRONICS, LAN, WAN, PROTOCOLS.

INTRODUCCION

En el siguiente trabajo encontraremos el desarrollo de las pruebas de habilidades prácticas CCNP, donde por medio de una máquina virtual; para este caso Virtual Box y un software de simulador llamado “GNS3” realizaremos distintas configuraciones aplicadas al desarrollo de ambientes en redes empresariales.

Para el desarrollo de la actividad simularemos un escenario compuesto por 3 router, 2 switch y 4 PCS, en la primera parte vamos a estructurar redes conmutadas usando protocolo STP y la configuración de VLANs, esto nos ayudara a entender la composición de una infraestructura de red jerárquica.

En la segunda parte vamos a diseñar soluciones de red mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP en ambientes de red empresariales LAN y WAN.

Finalmente se configurarán los protocolos de enrutamiento en IPV4 e IPV6 para que sean convergentes, se configura la interfaz loopback 0 para los dos switches, también, se realizara la configuración versión 2 de HSRP para proporcionar redundancia para hosts en la red empresarial.

Figura 2. Simulación Escenario 1

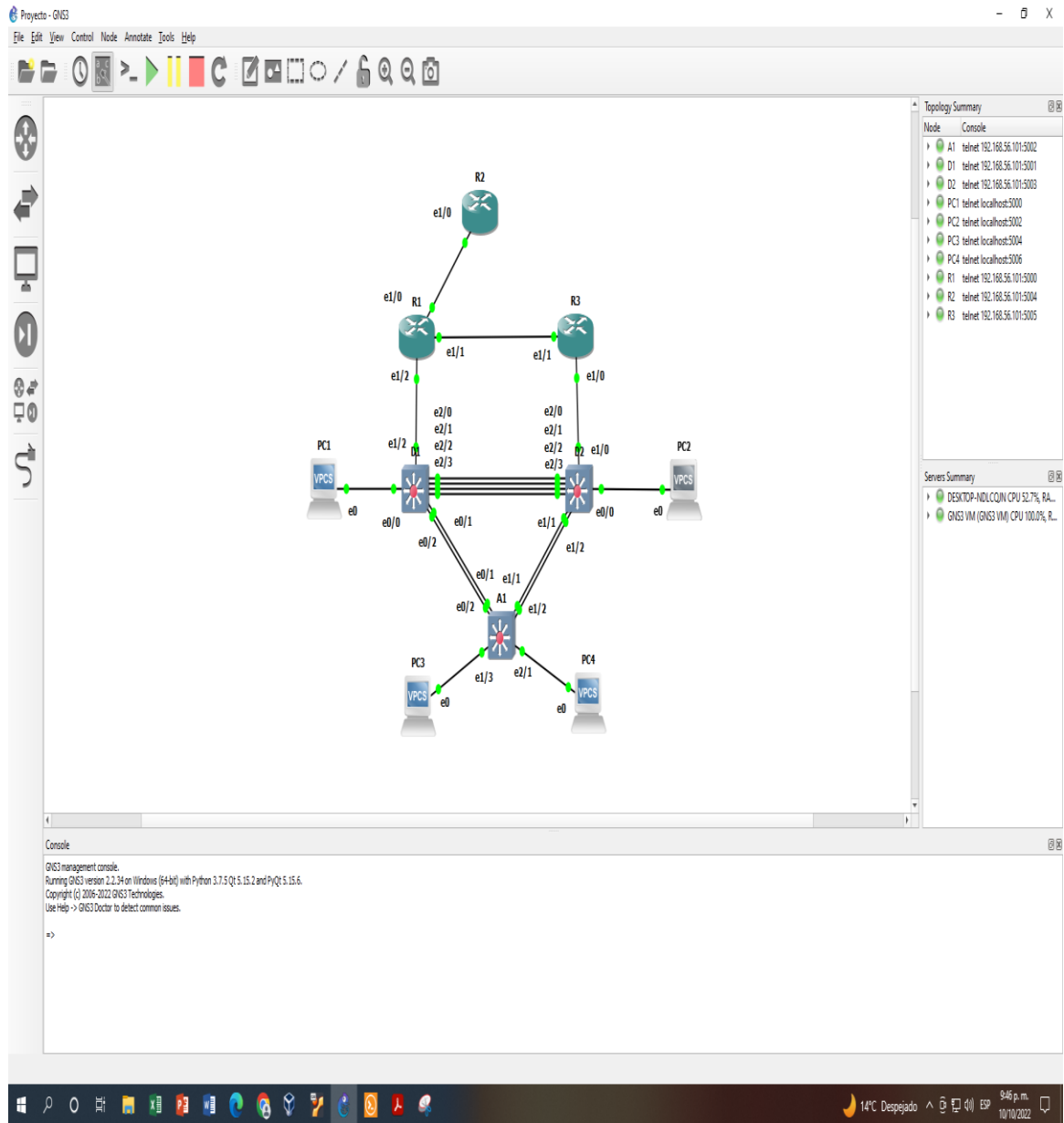


Tabla 1. Tabla de direccionamiento

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R1	E1/0	209.165.200.2 25/27	2001:db8:200::1/64	fe80::1:1
	E1/2	10.XY.10.1/24	2001:db8:100:1010:: 1/64	fe80::1:2
	E1/1	10. XY.13.1/24	2001:db8:100:1013:: 1/64	fe80::1:3
R2	E1/0	209.165.200.2 26/27	2001:db8:200::2/64	fe80::2:1
	Loopback0	2.2.2.2/32	2001:db8:2222::1/12 8	fe80::2:3
R3	E1/0	10. XY.11.1/24	2001:db8:100:1011:: 1/64	fe80::3:2
	E1/1	10. XY.13.3/24	2001:db8:100:1013:: 3/64	fe80::3:3
D1	E1/2	10. XY.10.2/24	2001:db8:100:1010:: 2/64	fe80::d1:1
	VLAN 100	10. XY.100.1/24	2001:db8:100:100::<1 /64	fe80::d1:2
	VLAN 101	10.XY.101.1/2 4	2001:db8:100:101::<1 /64	fe80::d1:3
	VLAN 102	10.XY.102.1/2 4	2001:db8:100:102::<1 /64	fe80::d1:4
D2	E1/0	10.XY.11.2/24	2001:db8:100:1011:: 2/64	fe80::d2:1
	VLAN 100	10.XY.100.2/2 4	2001:db8:100:100::<2 /64	fe80::d2:2
	VLAN 101	10.XY.101.2/2 4	2001:db8:100:101::<2 /64	fe80::d2:3
	VLAN 102	10.XY.102.2/2 4	2001:db8:100:102::<2 /64	fe80::d2:4

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
A1	VLAN 100	10.XY.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.XY.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	10.0.100.6/24	2001:db8:100:100::6/64	EUI-64

- 1.1. Parte 1: construir la red y configurar los ajustes básicos del dispositivo y el direccionamiento de la interfaz
En la Parte 1, configurará la topología de la red y configurará los ajustes básicos y el direccionamiento de la interfaz.
- 1.2. Paso 1: cablee la red como se muestra en la topología.
Conecte los dispositivos como se muestra en el diagrama de topología y cablee según sea necesario.
- 1.3. Paso 2: Configure los ajustes básicos para 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.

Router1

Configure terminal

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 10.99.10.1 255.255.255.0

ipv6 address fe80::1:2 link-local

ipv6 address 2001:db8:100:1010::1/64

no shutdown

exit

interface e1/1

ip address 10.99.13.1 255.255.255.0

ipv6 address fe80::1:3 link-local

ipv6 address 2001:db8:100:1013::1/64

no shutdown

exit
wr

Figura 3. Configuración Router 1



```
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:55:00.107: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:55:52.895: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:56:43.455: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:57:42.351: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:58:35.871: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 02:59:34.511: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 03:00:30.059: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
*Oct 11 03:01:22.655: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
met1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int e1/2
R1(config-if)#duplex full
*Oct 11 03:02:14.555: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet
/2 (half duplex).
R1(config-if)#duplex full
R1(config-if)#exit
R1(config)#exit
R1#
*Oct 11 03:02:26.727: XSYS-5-CONFIG_I: Configured from console by console
R1#
*Oct 11 03:03:13.535: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet
/2 (half duplex).
R1#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#ip v6 unicast-routing
R1(config)#no ip domain lookup
R1(config)#banner motd # R1, ENCOR Skills Assessment#
R1(config)#line con 0
R1(config-line)# exec-timeout 0 0
R1(config-line)# logging synchronous
R1(config-line)# exit
R1(config)#interface e1/0
R1(config-if)# ip address 209.165.200.225 255.255.255.224
R1(config-if)# ipv6 address fe80::1:1 link-local
R1(config-if)# ipv6 address 2001:db8:100::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#interface e1/2
R1(config-if)# ip address 10.99.10.1 255.255.255.0
R1(config-if)# ipv6 address fe80::1:2 link-local
R1(config-if)# ipv6 address 2001:db8:100:1010::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#interface e1/1
R1(config-if)# ip address 10.99.13.1 255.255.255.0
R1(config-if)# ipv6 address fe80::1:3 link-local
R1(config-if)# ipv6 address 2001:db8:100:1013::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#
*Oct 11 03:04:04.223: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet
/2 (half duplex).
R1(config)#
```


Router R3

Configure terminal

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 10.99.11.1 255.255.255.0

ipv6 address fe80::3:2 link-local

ipv6 address 2001:db8:100:1011::1/64

no shutdown

exit

interface e1/1

ip address 10.99.13.3 255.255.255.0

ipv6 address fe80::3:3 link-local

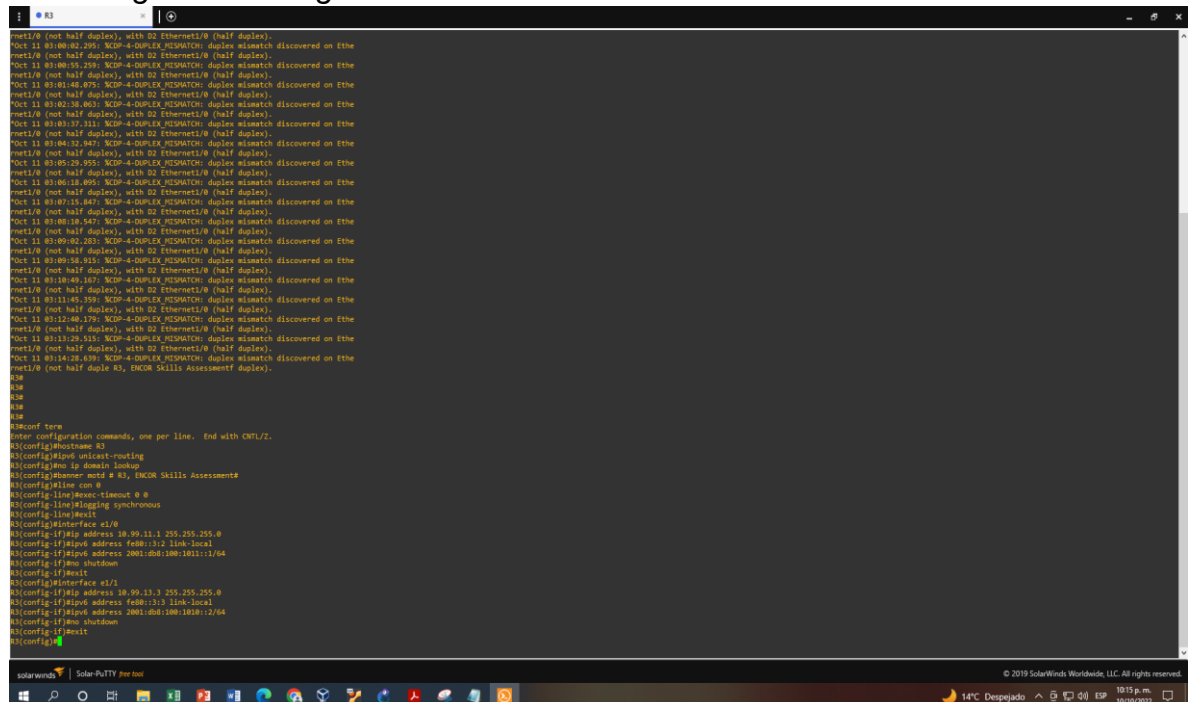
ipv6 address 2001:db8:100:1010::2/64

no shutdown

exit

wr

Figura 5. Configuración Router 3



```

R3
R3#
R3#
R3#
R3#
R3#conf tera
R3#Enter configuration commands, one per line. End with CTRL/Z.
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assessment#
R3(config)#line con 0
R3(config)#line#exec-timeout 0 0
R3(config)#logging synchronous
R3(config)#line#exit
R3(config)#interface e1/0
R3(config-if)#ip address 10.99.11.1 255.255.255.0
R3(config-if)#ipv6 address fe80::3:2 link-local
R3(config-if)#ipv6 address 2001:db8:100:1011::1/64
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ip address 10.99.13.3 255.255.255.0
R3(config-if)#ipv6 address fe80::3:3 link-local
R3(config-if)#ipv6 address 2001:db8:100:1010::2/64
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
```

Switch D1

```
Configure terminal
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 10.99.10.2 255.255.255.0
ipv6 address fe80::d1:1 link-local
ipv6 address 2001:db8:100:1010::2/64
no shutdown
exit
interface vlan 100
ip address 10.99.100.1 255.255.255.0
ipv6 address fe80::d1:2 link-local
ipv6 address 2001:db8:100:100::1/64
no shutdown
exit
interface vlan 101
ip address 10.99.101.1 255.255.255.0
ipv6 address fe80::d1:3 link-local
ipv6 address 2001:db8:100:101::1/64
no shutdown
```

```

exit
interface vlan 102
ip address 10.99.102.1 255.255.255.0
ipv6 address fe80::d1:4 link-local
ipv6 address 2001:db8:100:102::1/64
no shutdown
exit
ip dhcp excluded-address 10.99.101.1 10.0.101.109
ip dhcp excluded-address 10.99.101.141 10.0.101.254
ip dhcp excluded-address 10.99.102.1 10.0.102.109
ip dhcp excluded-address 10.99.102.141 10.0.102.254
ip dhcp pool VLAN-101
network 10.99.101.0 255.255.255.0
default-router 10.99.101.254
exit
ip dhcp pool VLAN-102
network 10.99.102.0 255.255.255.0
default-router 10.99.102.254
exit
interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
shutdown
exit
wr

```

Figura 6. Configuración Switch D1

```

D1(config)#shutdown D1
D1(config)#ip routing
D1(config)#ip unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment
D1(config)#line con 0
D1(config)#line con 0 timeout 0 0
D1(config)#line logging synchronous
D1(config)#line# exit
D1(config)#vlan 100
D1(config-vlan)# name Management
D1(config-vlan)# exit
D1(config)#vlan 101
D1(config-vlan)# name UserGroupA
D1(config-vlan)# exit
D1(config)#vlan 102
D1(config-vlan)# name UserGroupB
D1(config-vlan)# exit
D1(config)#vlan 999
D1(config-vlan)# name NATIVE
D1(config-vlan)# exit
D1(config)#interface e1/2
D1(config-if)# no switchport
D1(config-if)# ip address 10.99.102.2 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:1 link-local
D1(config-if)# ipv6 address 2001:db8:100:100::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 100
D1(config-if)# ip address 10.99.100.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:2 link-local
D1(config-if)# ipv6 address 2001:db8:100:100::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 101
D1(config-if)# ip address 10.99.101.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:3 link-local
D1(config-if)# ipv6 address 2001:db8:100:101::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 102
D1(config-if)# ip address 10.99.102.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:4 link-local
D1(config-if)# ipv6 address 2001:db8:100:102::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#ip dhcp excluded-address 10.99.101.1 10.0.101.109
D1(config)#ip dhcp excluded-address 10.99.101.141 10.0.101.254
D1(config)#ip dhcp excluded-address 10.99.102.1 10.0.102.109
D1(config)#ip dhcp excluded-address 10.99.102.141 10.0.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.99.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.99.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.99.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.99.102.254
D1(dhcp-config)# exit

```

Switch D2

```
Configure terminal
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 10.99.11.2 255.255.255.0
ipv6 address fe80::d1:1 link-local
ipv6 address 2001:db8:100:1011::2/64
no shutdown
exit
interface vlan 100
ip address 10.99.100.2 255.255.255.0
ipv6 address fe80::d2:2 link-local
ipv6 address 2001:db8:100:100::2/64
no shutdown
exit
interface vlan 101
ip address 10.99.101.2 255.255.255.0
ipv6 address fe80::d2:3 link-local
ipv6 address 2001:db8:100:101::2/64
no shutdown
```

```

exit
interface vlan 102
ip address 10.99.102.2 255.255.255.0
ipv6 address fe80::d2:4 link-local
ipv6 address 2001:db8:100:102::2/64
no shutdown
exit
ip dhcp excluded-address 10.99.101.1 10.0.101.209
ip dhcp excluded-address 10.99.101.241 10.0.101.254
ip dhcp excluded-address 10.99.102.1 10.0.102.209
ip dhcp excluded-address 10.99.102.241 10.0.102.254
ip dhcp pool VLAN-101
network 10.99.101.0 255.255.255.0
default-router 10.99.101.254
exit
ip dhcp pool VLAN-102
network 10.99.102.0 255.255.255.0
default-router 10.99.102.254
exit
interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
shutdown
exit
wr

```

Figura 7. Configuración Switch D2

```

Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#show run
D2(config)#ip routing
D2(config)#ip unicast-routing
D2(config)#no ip domain lookup
D2(config)#banner motd # D2, ENCOR Skills Assessment
D2(config)#line con 0
D2(config)#line exec-timeout 0 0
D2(config)#line logging synchronous
D2(config)#line# exit
D2(config)#vlan 100
D2(config-vlan)# name Management
D2(config-vlan)# exit
D2(config)#vlan 101
D2(config-vlan)# name UserGroupA
D2(config-vlan)# exit
D2(config)#vlan 102
D2(config-vlan)# name UserGroupB
D2(config-vlan)# exit
D2(config)#vlan 999
D2(config-vlan)# name NATIVE
D2(config-vlan)# exit
D2(config)#interface e1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.99.101.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d2:4 link-local
D2(config-if)# ipv6 address 2001:db8:100:101::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#interface vlan 100
D2(config-vlan)# ip address 10.99.100.2 255.255.255.0
D2(config-vlan)# ipv6 address fe80::d2:2 link-local
D2(config-vlan)# ipv6 address 2001:db8:100:100::2/64
D2(config-vlan)# no shutdown
D2(config-vlan)# exit
D2(config)#interface vlan 101
D2(config-vlan)# ip address 10.99.101.2 255.255.255.0
D2(config-vlan)# ipv6 address fe80::d2:1 link-local
D2(config-vlan)# ipv6 address 2001:db8:100:101::2/64
D2(config-vlan)# no shutdown
D2(config-vlan)# exit
D2(config)#interface vlan 102
D2(config-vlan)# ip address 10.99.102.2 255.255.255.0
D2(config-vlan)# ipv6 address fe80::d2:4 link-local
D2(config-vlan)# ipv6 address 2001:db8:100:102::2/64
D2(config-vlan)# no shutdown
D2(config-vlan)# exit
D2(config)#ip dhcp excluded-address 10.99.101.1 10.0.101.209
% [10.99.101.1, 10.0.101.209] is an illegal address range.
D2(config)#ip dhcp excluded-address 10.99.101.241 10.0.101.254
% [10.99.101.241, 10.0.101.254] is an illegal address range.
D2(config)#ip dhcp excluded-address 10.99.102.1 10.0.102.209
% [10.99.102.1, 10.0.102.209] is an illegal address range.
D2(config)#ip dhcp excluded-address 10.99.102.241 10.0.102.254
% [10.99.102.241, 10.0.102.254] is an illegal address range.
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.99.101.0 255.255.255.0
D2(dhcp-config)# default-router 10.99.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.99.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.99.102.254
D2(dhcp-config)# exit

```


Switch A1

```
Configure terminal
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 10.99.100.3 255.255.255.0
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
wr
```


Figura 9. Configuración IP PC4

```
PC4
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Dalling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (e1rnh@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

Checking for duplicate address...
PC1 : 10.99.100.6 255.255.255.0
PC1 : 2001:db8:100:100:2050:79ff:fe06:6003/64
PC4> show ip

NAME      : PC4[1]
IP/MASK   : 10.99.100.6/24
GATEWAY   : 255.255.255.0
DNS       :
MAC       : 00:150:79:166:168:03
LPORT    : 10000
MHOST:PORT : 127.0.0.1:10001
MTU       : 1500

PC4>
```

Figura 10. Configuración IP PC1

```
PC1
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Dalling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (e1rnh@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

Checking for duplicate address...
PC1 : 10.99.100.5 255.255.255.0
PC1 : 2001:db8:100:100:2050:79ff:fe06:6000/64
PC1> show ip

NAME      : PC1[1]
IP/MASK   : 10.99.100.5/24
GATEWAY   : 255.255.255.0
DNS       :
MAC       : 00:150:79:166:168:00
LPORT    : 10000
MHOST:PORT : 127.0.0.1:10007
MTU       : 1500

PC1>
```

2. Parte 2: 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:

Tabla 2. Tareas de configuración parte 2.

Task#	Task	Specification	Points
2.1	On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links	Enable 802.1Q trunk links between: <ul style="list-style-type: none"> • D1 and D2 • D1 and A1 • D2 and A1 	6
2.2	On all switches, change the native VLAN on trunk links.	Use VLAN 999 as the native VLAN.	6
2.3	On all switches, enable the Rapid Spanning-Tree Protocol.	Use Rapid Spanning Tree.	3
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.	Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.	2
2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: <ul style="list-style-type: none"> • D1 to D2 – Port channel 12 • D1 to A1 – Port channel 1 • D2 to A1 – Port channel 2 	3

Task#	Task	Specification	Points
2.6	On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.	Configure access ports with appropriate VLAN settings as shown in the topology diagram. Host ports should transition immediately to forwarding state.	4
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.	1
2.8	Verify local LAN connectivity.	PC1 should successfully ping: <ul style="list-style-type: none"> • D1: 10.99.100.1 • D2: 10.99.100.2 • PC4: 10.99.100.6 PC2 should successfully ping: <ul style="list-style-type: none"> • D1: 10.99.102.1 • D2: 10.99.102.2 PC3 should successfully ping: <ul style="list-style-type: none"> • D1: 10.99.101.1 • D2: 10.99.101.2 PC4 should successfully ping: <ul style="list-style-type: none"> • D1: 10.99.100.1 • D2: 10.99.100.2 • PC1: 10.99.100.5 	1

2.1. Enable 802.1Q trunk links between:

- D1 and D2
- D1 and A1
- D2 and A1

Switch D1

```
interface range e2/0-3
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
interface range e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
```

Switch D2

```
interface range e2/0-3
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
interface range e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
interface range e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
```

Switch A1

```
interface range e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
interface range e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
```

- 2.2. Use VLAN 999 as the native VLAN.

Switch D1

```
interface range e2/0-3
switchport trunk native vlan 999
```

```
interface range e0/1-2
switchport trunk native vlan 999
```

Switch D2

```
interface range e2/0-3
switchport trunk native vlan 999
```

```
interface range e0/1-2
switchport trunk native vlan 999
```

Switch A1

```
interface range e0/1-2
switchport trunk native vlan 999
```

```
interface range e1/1-2
switchport trunk native vlan 999
```

- 2.3. Use Rapid Spanning Tree.

```
Switch D1
spanning-tree mode rapid-pvst
```

```
Switch D2
spanning-tree mode rapid-pvst
```

```
Switch A1
spanning-tree mode rapid-pvst
```

- 2.4. Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.

Switch D1

```
spanning-tree vlan 100,102 root primary
spanning-tree vlan 101 root secondary
```

Switch D2

```
spanning-tree vlan 101 root primary
spanning-tree vlan 100,102 root secondary
```

- 2.5. Use the following channel numbers:

D1 to D2 – Port channel 12

D1 to A1 – Port channel 1

D2 to A1 – Port channel 2

Switch D1

```
interface range e2/0-3
channel-group 12 mode active
```

```
interface range e0/1-2
```

```
channel-group 1 mode active
```

Switch D2

```
interface range e2/0-3
channel-group 12 mode active
```

```
interface range e1/1-2
```

```
channel-group 2 mode active
```

Switch A1

```
interface range e0/1-2
```

```
channel-group 1 mode active
```

```
interface range e1/1-2
```

```
channel-group 2 mode active
```


- 2.6. Configure access ports with appropriate VLAN settings as shown in the topology diagram.

Host ports should transition immediately to forwarding state.

Switch D1

```
interface e0/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
```

Switch D2

```
interface e0/0
switchport mode access
switchport access vlan 102
spanning-tree portfast
```

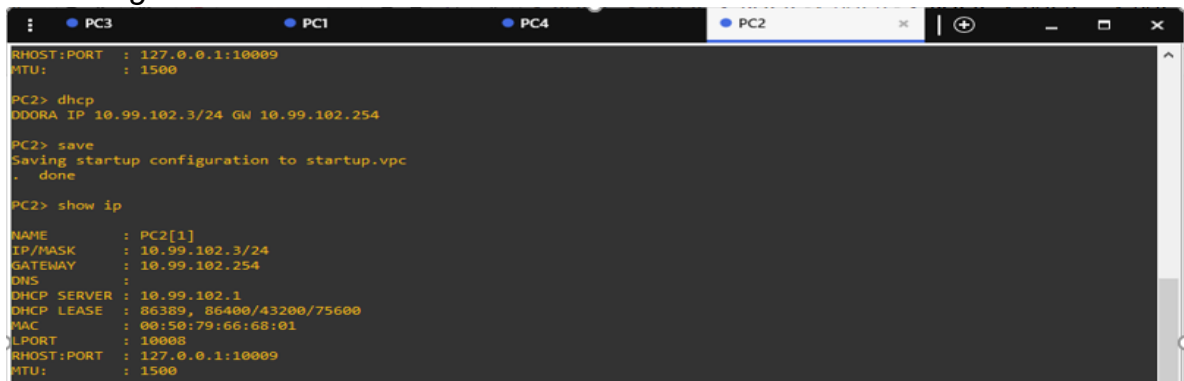
Switch A1

```
interface e1/3
switchport mode access
switchport access vlan 101
spanning-tree portfast
```

```
interface e2/1
switchport mode access
switchport access vlan 100
spanning-tree portfast
```

- 2.7. Verify IPv4 DHCP services.

Figura 11. DHCP en PC2



```
PC3 PC1 PC4 PC2
RHOST:PORT : 127.0.0.1:10009
MTU:       : 1500

PC2> dhcp
ODORA IP 10.99.102.3/24 GW 10.99.102.254

PC2> save
Saving startup configuration to startup.vpc
. done

PC2> show ip

NAME       : PC2[1]
IP/MASK    : 10.99.102.3/24
GATEWAY    : 10.99.102.254
DNS        :
DHCP SERVER : 10.99.102.1
DHCP LEASE : 86389, 86400/43200/75600
MAC        : 00:50:79:66:68:01
LPORT      : 10008
RHOST:PORT : 127.0.0.1:10009
MTU:       : 1500
```

Figura 12. DHCP en PC3

```
PC3> show ip
NAME       : PC3[1]
IP/MASK    : 0.0.0.0/0
GATEWAY    : 0.0.0.0
DNS        :
MAC        : 00:50:79:66:68:02
LPORT     : 10004
RHOST:PORT : 127.0.0.1:10005
MTU        : 1500

PC3> dhcp
DDORA IP 10.99.101.3/24 GW 10.99.101.254

PC3> save
Saving startup configuration to startup.vpc
. done
```

2.8. Verify local LAN connectivity.

PC1 should successfully ping:

- D1: 10.99.100.1
- D2: 10.99.100.2
- PC4: 10.99.100.6

Figura 13. Ping desde el PC1

```
Bad command: "mac 2001:db8:100:100::5". Use ? for help.

PC1> show ip
NAME       : PC1[1]
IP/MASK    : 10.99.100.5/24
GATEWAY    : 255.255.255.0
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 10006
RHOST:PORT : 127.0.0.1:10007
MTU        : 1500

PC1> ping 10.99.100.1
84 bytes from 10.99.100.1 icmp_seq=1 ttl=255 time=0.439 ms
84 bytes from 10.99.100.1 icmp_seq=2 ttl=255 time=0.786 ms
84 bytes from 10.99.100.1 icmp_seq=3 ttl=255 time=1.786 ms
84 bytes from 10.99.100.1 icmp_seq=4 ttl=255 time=0.844 ms
84 bytes from 10.99.100.1 icmp_seq=5 ttl=255 time=0.811 ms

PC1> ping 10.99.100.2
84 bytes from 10.99.100.2 icmp_seq=1 ttl=255 time=1.032 ms
84 bytes from 10.99.100.2 icmp_seq=2 ttl=255 time=1.355 ms
84 bytes from 10.99.100.2 icmp_seq=3 ttl=255 time=1.322 ms
84 bytes from 10.99.100.2 icmp_seq=4 ttl=255 time=1.207 ms
84 bytes from 10.99.100.2 icmp_seq=5 ttl=255 time=1.171 ms

PC1> ping 10.99.100.6
host (10.99.100.6) not reachable

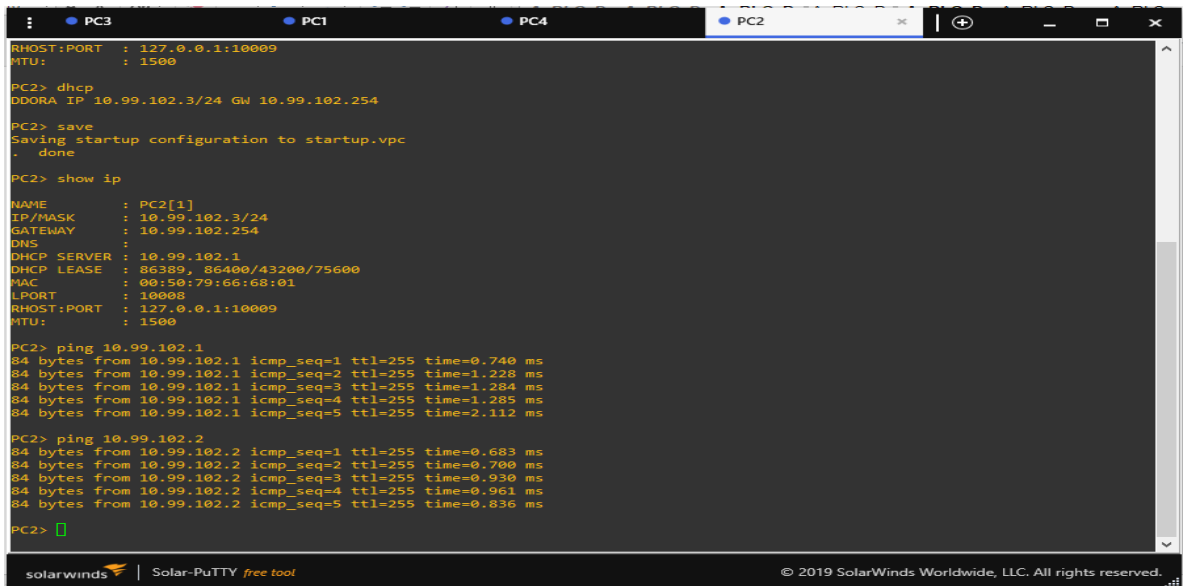
PC1> ping 10.99.100.6
84 bytes from 10.99.100.6 icmp_seq=1 ttl=64 time=3.499 ms
84 bytes from 10.99.100.6 icmp_seq=2 ttl=64 time=2.598 ms
84 bytes from 10.99.100.6 icmp_seq=3 ttl=64 time=2.318 ms
84 bytes from 10.99.100.6 icmp_seq=4 ttl=64 time=1.374 ms
84 bytes from 10.99.100.6 icmp_seq=5 ttl=64 time=4.589 ms

PC1> []
```

PC2 should successfully ping:

- D1: 10.99.102.1
- D2: 10.99.102.2

Figura 14. Ping desde PC2



```
PC3 PC1 PC4 PC2
RHOST:PORT : 127.0.0.1:10009
MTU: : 1500

PC2> dhcp
DDORA IP 10.99.102.3/24 GW 10.99.102.254

PC2> save
Saving startup configuration to startup.vpc
. done

PC2> show ip

NAME : PC2[1]
IP/MASK : 10.99.102.3/24
GATEWAY : 10.99.102.254
DNS :
DHCP SERVER : 10.99.102.1
DHCP LEASE : 86389, 86400/43200/75600
MAC : 00:50:79:66:68:01
LPORT : 10008
RHOST:PORT : 127.0.0.1:10009
MTU: : 1500

PC2> ping 10.99.102.1
84 bytes from 10.99.102.1 icmp_seq=1 ttl=255 time=0.740 ms
84 bytes from 10.99.102.1 icmp_seq=2 ttl=255 time=1.228 ms
84 bytes from 10.99.102.1 icmp_seq=3 ttl=255 time=1.284 ms
84 bytes from 10.99.102.1 icmp_seq=4 ttl=255 time=1.285 ms
84 bytes from 10.99.102.1 icmp_seq=5 ttl=255 time=2.112 ms

PC2> ping 10.99.102.2
84 bytes from 10.99.102.2 icmp_seq=1 ttl=255 time=0.683 ms
84 bytes from 10.99.102.2 icmp_seq=2 ttl=255 time=0.700 ms
84 bytes from 10.99.102.2 icmp_seq=3 ttl=255 time=0.930 ms
84 bytes from 10.99.102.2 icmp_seq=4 ttl=255 time=0.961 ms
84 bytes from 10.99.102.2 icmp_seq=5 ttl=255 time=0.836 ms


PC2> [ ]

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```

PC3 should successfully ping:

- D1: 10.99.101.1
- D2: 10.99.101.2

Figura 15. Ping desde PC3



```
PC3 PC1 PC4
10.99.101.1 icmp_seq=2 timeout
10.99.101.1 icmp_seq=3 timeout
10.99.101.1 icmp_seq=4 timeout
10.99.101.1 icmp_seq=5 timeout

PC3> show ip

NAME : PC3[1]
IP/MASK : 0.0.0.0/0
GATEWAY : 0.0.0.0
DNS :
MAC : 00:50:79:66:68:02
LPORT : 10004
RHOST:PORT : 127.0.0.1:10005
MTU: : 1500

PC3> dhcp
DDORA IP 10.99.101.3/24 GW 10.99.101.254

PC3> save
Saving startup configuration to startup.vpc
. done

PC3> ping 10.99.101.1
84 bytes from 10.99.101.1 icmp_seq=1 ttl=255 time=4.076 ms
84 bytes from 10.99.101.1 icmp_seq=2 ttl=255 time=1.020 ms
84 bytes from 10.99.101.1 icmp_seq=3 ttl=255 time=1.294 ms
84 bytes from 10.99.101.1 icmp_seq=4 ttl=255 time=1.197 ms
84 bytes from 10.99.101.1 icmp_seq=5 ttl=255 time=2.108 ms

PC3> ping 10.99.101.2
84 bytes from 10.99.101.2 icmp_seq=1 ttl=255 time=1.160 ms
84 bytes from 10.99.101.2 icmp_seq=2 ttl=255 time=2.290 ms
84 bytes from 10.99.101.2 icmp_seq=3 ttl=255 time=1.569 ms
84 bytes from 10.99.101.2 icmp_seq=4 ttl=255 time=1.361 ms
84 bytes from 10.99.101.2 icmp_seq=5 ttl=255 time=1.314 ms

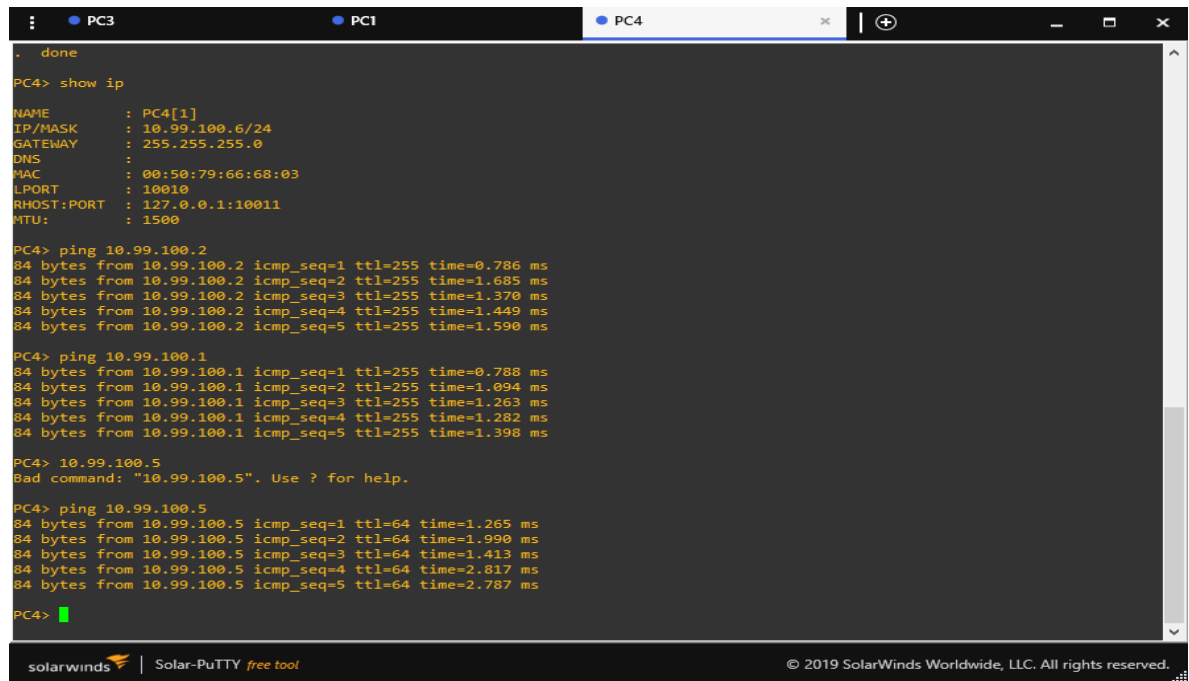
PC3> [ ]

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```

PC4 should successfully ping:

- D1: 10.99.100.1
- D2: 10.99.100.2
- PC1: 10.99.100.5

Figura 16. Ping desde PC4



```
. done
PC4> show ip
NAME       : PC4[1]
IP/MASK    : 10.99.100.6/24
GATEWAY    : 255.255.255.0
DNS        :
MAC        : 00:50:79:66:68:03
LPORT      : 10010
RHOST:PORT : 127.0.0.1:10011
MTU        : 1500

PC4> ping 10.99.100.2
84 bytes from 10.99.100.2 icmp_seq=1 ttl=255 time=0.786 ms
84 bytes from 10.99.100.2 icmp_seq=2 ttl=255 time=1.685 ms
84 bytes from 10.99.100.2 icmp_seq=3 ttl=255 time=1.370 ms
84 bytes from 10.99.100.2 icmp_seq=4 ttl=255 time=1.449 ms
84 bytes from 10.99.100.2 icmp_seq=5 ttl=255 time=1.590 ms

PC4> ping 10.99.100.1
84 bytes from 10.99.100.1 icmp_seq=1 ttl=255 time=0.788 ms
84 bytes from 10.99.100.1 icmp_seq=2 ttl=255 time=1.094 ms
84 bytes from 10.99.100.1 icmp_seq=3 ttl=255 time=1.263 ms
84 bytes from 10.99.100.1 icmp_seq=4 ttl=255 time=1.282 ms
84 bytes from 10.99.100.1 icmp_seq=5 ttl=255 time=1.398 ms

PC4> 10.99.100.5
Bad command: "10.99.100.5". Use ? for help.

PC4> ping 10.99.100.5
84 bytes from 10.99.100.5 icmp_seq=1 ttl=64 time=1.265 ms
84 bytes from 10.99.100.5 icmp_seq=2 ttl=64 time=1.990 ms
84 bytes from 10.99.100.5 icmp_seq=3 ttl=64 time=1.413 ms
84 bytes from 10.99.100.5 icmp_seq=4 ttl=64 time=2.817 ms
84 bytes from 10.99.100.5 icmp_seq=5 ttl=64 time=2.787 ms

PC4> █
```

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3. Evaluación de habilidades ENCOR (Escenario 2)

Parte 1: Configurar protocolos de enrutamiento

En esta parte, configurará los protocolos de enrutamiento IPv4 e IPv6. Al final de esta parte, la red debe estar completamente convergente. Los pings de IPv4 e IPv6 a la interfaz Loopback 0 desde D1 y D2 deberían ser exitosos.

Nota: Los pings de los hosts no tendrán éxito porque sus puertos de enlace predeterminadas apuntan a la dirección HSRP que se habilitará en la Parte 4. Sus tareas de configuración son las siguientes:

Tabla 3. Tareas de configuración parte 3

Task#	Task	Specification	Points
3.1	On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.	<p>Use OSPF Process ID 4 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • R1: 0.0.4.1 • R3: 0.0.4.3 • D1: 0.0.4.131 • D2: 0.0.4.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • 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. <p>Disable OSPFv2 advertisements on:</p> <ul style="list-style-type: none"> • 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.	<p>Use OSPF Process ID 6 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • 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. <p>Disable OSPFv3 advertisements on:</p> <ul style="list-style-type: none"> • 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.	<p>Configure two default static routes via interface Loopback 0:</p> <ul style="list-style-type: none"> • An IPv4 default static route. • An IPv6 default static route. <p>Configure R2 in BGP ASN 500 and use the router-id 2.2.2.2.</p> <p>Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300.</p> <p>In IPv4 address family, advertise:</p> <ul style="list-style-type: none"> • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). <p>In IPv6 address family, advertise:</p> <ul style="list-style-type: none"> • 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.	<p>Configure two static summary routes to interface Null 0:</p> <ul style="list-style-type: none"> • A summary IPv4 route for 10.XY.0.0/8. • A summary IPv6 route for 2001:db8:100::/48. <p>Configure R1 in BGP ASN 300 and use the router-id 1.1.1.1.</p> <p>Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500.</p> <p>In IPv4 address family:</p> <ul style="list-style-type: none"> • Disable the IPv6 neighbor relationship. • Enable the IPv4 neighbor relationship. • Advertise the 10.XY.0.0/8 network. <p>In IPv6 address family:</p> <ul style="list-style-type: none"> • Disable the IPv4 neighbor relationship. • Enable the IPv6 neighbor relationship. • Advertise the 2001:db8:100::/48 network. 	4

3.1. On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.

Configuración OSPFv2 con ID4

Router 1

```

conf t
router ospf 4
router-id 0.0.4.1
network 10.99.10.0 0.0.0.255 area 0

```



```
network 10.99.13.0 0.0.0.255 area 0
default-information originate
exit
```

Router 3

```
conf t
router ospf 4
router-id 0.0.4.3
network 10.99.11.0 0.0.0.255 area 0
network 10.99.13.0 0.0.0.255 area 0
exit
```

Switch D1

```
conf t
router ospf 4
router-id 0.0.4.131
network 10.99.100.0 0.0.0.255 area 0
network 10.99.101.0 0.0.0.255 area 0
network 10.99.102.0 0.0.0.255 area 0
network 10.99.10.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/2
exit
```

Switch D2

```
conf t
router ospf 4
router-id 0.0.4.132
network 10.99.100.0 0.0.0.255 area 0
network 10.99.101.0 0.0.0.255 area 0
network 10.99.102.0 0.0.0.255 area 0
network 10.99.11.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/0
exit
```

- 3.2. On the “Company Network” (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0.

Configuración OSPFv3 con ID6

Router 1

```
ipv6 router ospf 6
router-id 0.0.6.1
default-information originate
exit
interface e1/2
ipv6 ospf 6 area 0
exit
interface e1/1
ipv6 ospf 6 area 0
exit
```

Router 3

```
ipv6 router ospf 6
router-id 0.0.6.3
exit
interface e1/0
ipv6 ospf 6 area 0
exit
interface e1/1
ipv6 ospf 6 area 0
exit
end
```

Switch D1

```
ipv6 router ospf 6
router-id 0.0.6.131
passive-interface default
no passive-interface e1/2
exit
interface e1/2
ipv6 ospf 6 area 0
exit
```

```
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit
end
```

Switch D2

```
ipv6 router ospf 6
router-id 0.0.6.132
passive-interface default
no passive-interface e1/0
exit
interface e1/0
ipv6 ospf 6 area 0
exit
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit
```

3.3. On R2 in the “ISP Network”, configure MP-BGP.

Router 2

```
conf t
ip route 0.0.0.0 0.0.0.0 loopback 0
ipv6 route ::/0 loopback 0
router bgp 500
bgp router-id 2.2.2.2
neighbor 209.165.200.225 remote-as 300
```

```
neighbor 2001:db8:200::1 remote-as 300
address-family ipv4
neighbor 209.165.200.225 activate
no neighbor 2001:db8:200::1 activate
network 2.2.2.2 mask 255.255.255.255
network 0.0.0.0
exit-address-family
address-family ipv6
no neighbor 209.165.200.225 activate
neighbor 2001:db8:200::1 activate
network 2001:db8:2222::/128
network ::/0
exit-address-family
```

3.4. On R1 in the “ISP Network”, configure MP-BGP.

Router 1

```
ip route 10.99.0.0 255.0.0.0 null0
ipv6 route 2001:db8:100::/48 null0
router bgp 300
bgp router-id 1.1.1.1
neighbor 209.165.200.226 remote-as 500
neighbor 2001:db8:200::2 remote-as 500
address-family ipv4 unicast
neighbor 209.165.200.226 activate
no neighbor 2001:db8:200::2 activate
network 10.99.0.0 mask 255.0.0.0
exit-address-family
address-family ipv6 unicast
no neighbor 209.165.200.226 activate
neighbor 2001:db8:200::2 activate
network 2001:db8:100::/48
exit-address-family
```


Task#	Task	Specification	Points
4.1	On D1, create IP SLAs that test the reachability of R1 interface E1/2.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R1 E1/2 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>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.</p>	2
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R3 E1/0 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>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.</p>	2

4.3	On D1, configure HSRPv2.	<p>D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.100.254. • Set the group priority to 150. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.101.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.102.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. 	8
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Task#	Task	Specification	Points
		Configure IPv6 HSRP group 126 for VLAN 102: <ul style="list-style-type: none">• Assign the virtual IP address using ipv6 autoconfig.• Set the group priority to 150.• Enable preemption.• Track object 6 and decrement by 60.	

4.4	On D2, configure HSRPv2.	<p>D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.100.254. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.101.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.XY.102.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. 	
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Task#	Task	Specification	Points
		Configure IPv6 HSRP group 126 for VLAN 102: <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. 	

4.1. On D1, create IP SLAs that test the reachability of R1 interface E1/2.

Switch D1

```

conf t
ip sla 4
icmp-echo 10.99.10.1
frequency 5
exit
ip sla 6
icmp-echo 2001:db8:100:1010::1
frequency 5
exit
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now
track 4 ip sla 4
delay down 10 up 15
exit

```

4.2. On D2, create IP SLAs that test the reachability of R3 interface E1/0.

Switch D2

```

conf t
ip sla 4
icmp-echo 10.99.11.1
frequency 5
exit
ip sla 6
icmp-echo 2001:db8:100:1011::1
frequency 5
exit

```

```
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now
track 4 ip sla 4
delay down 10 up 15
exit
track 6 ip sla 6
delay down 10 up 15
exit
```

4.3. On D1, configure HSRPv2.

Switch D1

```
interface vlan 100
standby version 2
standby 104 ip 10.99.100.254
standby 104 priority 150
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 priority 150
standby 106 preempt
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.99.101.254
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.99.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
```

```
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60
exit
```

4.4. On D2, configure HSRPv2.

Switch D2

```
interface vlan 100
standby version 2
standby 104 ip 10.99.100.254
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 preempt
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.99.101.254
standby 114 priority 150
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 priority 150
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.99.102.254
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60
exit
```


Figura 24. Verificación Switch D1

```
show standby brief
|
P indicates configured to preempt.
Interface Grp Pri P State Active Standby Virtual IP
V1100 104 150 P Active local 10.99.100.2 10.99.100.254
V1100 106 150 P Active local FE80::02:2 FE80::573FF:FEA0:6A
V1101 114 100 P Standby 10.99.101.2 local 10.99.101.254
V1101 116 100 P Standby FE80::02:3 local FE80::573FF:FEA0:74
V1102 124 150 P Active local 10.99.102.2 10.99.102.254
V1102 126 150 P Active local FE80::02:4 FE80::573FF:FEA0:7E
D1#
```

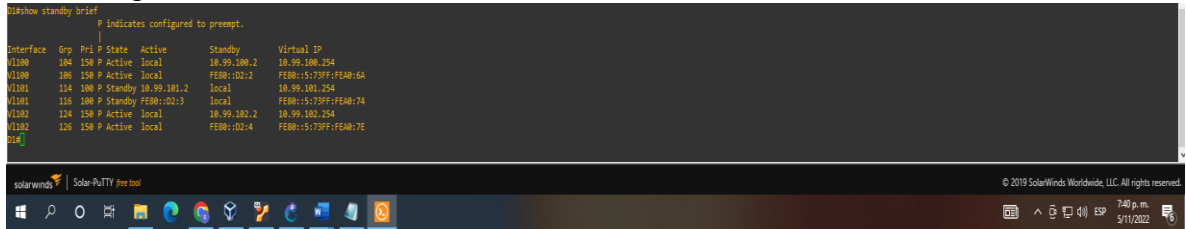


Figura 25. Verificación Switch D2

```
show standby brief
|
P indicates configured to preempt.
Interface Grp Pri P State Active Standby Virtual IP
V1100 104 100 P Standby 10.99.100.1 local 10.99.100.254
V1100 106 100 P Standby FE80::01:2 local FE80::573FF:FEA0:6A
V1101 114 150 P Active local 10.99.101.1 10.99.101.254
V1101 116 150 P Active local FE80::01:3 FE80::573FF:FEA0:74
V1102 124 100 P Standby 10.99.102.1 local 10.99.102.254
V1102 126 100 P Standby FE80::01:4 local FE80::573FF:FEA0:7E
D2#
```



CONCLUSIONES

En el desarrollo del trabajo podemos concluir que aprendimos a manejar un software especializado GNS3 apoyado con una máquina virtual llamada Virtual Box, y un software complementario llamada Putty para el desarrollo de la prueba de habilidades prácticas CCNP, donde se repasaron todos los conceptos aprendidos en los módulos enfocando todo a los diseños de las redes y realizamos configuraciones aplicadas al desarrollo de ambientes en redes empresariales.

En la primera parte estructuramos redes conmutadas usando protocolo STP y la configuración de VLANs, aprendiendo a realizar la composición de una infraestructura de red jerárquica. Cada capa en la jerarquía proporciona funciones específicas que definen su función dentro de la red general, esto ayuda a optimizar y seleccionar las características, el hardware y el software de red adecuados para llevar a cabo las funciones específicas de esa capa de red. Evidenciamos el funcionamiento de la red por medio del software GNS3.

En la segunda parte diseñamos soluciones de red mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP en ambientes de red empresariales LAN y WAN, se asignaron grupos, VLAN y se realizaron pines desde los PCS hacia diferentes dispositivos corroborando el funcionamiento y la conectividad de los dispositivos.

Aprendí a configurar los protocolos de enrutamiento en IPV4 e IPV6 para que sean convergentes, se realizaron configuraciones en la interfaz loopback 0 para los dos switches, también, se configuro la versión 2 de HSRP para proporcionar redundancia para hosts en la red empresarial, todo esto para entender las amenazas que afectan nuestras redes y la importancia de una buena estructura en la conexión de nuestros dispositivos complementado por unos protocolos de seguridad, de esta manera administramos mejor el manejo de la información a través, de estas redes sin correr el riesgo que llegue a personas no deseadas.

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