

DIPLOMADO DE PROFUNDIZACION CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA – ECBTI
INGENIERIA DE TELECOMUNICACIONES
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DIPLOMADO DE OPCIÓN DE GRADO PRESENTADO PARA OPTAR EL TÍTULO DE
INGENIERO DE TELECOMUNICACIONES

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NOTA DE ACEPTACIÓN

Firma del presidente del Jurado

Firma del Jurado

Firma del Jurado

Santiago de Cali, 4 de mayo de 2023

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GLOSARIO

PC: Computador personal es un dispositivo electrónico que permite al usuario realizar una inmensa cantidad de tareas, por ejemplo, navegar por internet, crear y editar documentos, enviar correos, entre otros.

ROUTER: Dispositivo de red que se utiliza para conectar varias redes y dirigir el tráfico entre ellas, con el uso de tablas de direccionamiento IP, que permiten al dispositivo encontrar las mejores rutas para el envío de datos.

SWITCH: Dispositivo de red que se utiliza para conectar dispositivos en una red local (LAN) y dirigir el tráfico de red entre ellos, con el uso de tablas de direccionamiento MAC, que permiten al dispositivo determinar a qué dispositivo se realizara el envío de datos.

CISCO: Compañía de tecnología que ofrece una amplia variedad de soluciones de redes y comunicaciones, como hardware, software y servicios.

ENRUTAMIENTO ESTÁTICO: Método de enrutamiento en el que el administrador de la red configura manualmente las rutas en los Router con el fin de interconectar varios dispositivos, dicho enrutamiento permanece estático a menos que sea modificado manualmente.

IPV4: La cuarta versión del protocolo IP que se utiliza para enviar y recibir datos a través de internet, utiliza direcciones de 32 bits y puede admitir hasta 4.3 mil millones de direcciones únicas.

IPV6: La sexta versión del protocolo IP que se utiliza para enviar y recibir datos a través de internet, utiliza direcciones de 128 bits siendo la evolución del protocolo orientada a admitir una cantidad exponencialmente mayor de direcciones únicas.

VRF: Función de enrutamiento virtual utilizada para crear múltiples instancias de la tabla de enrutamiento del Router, cada instancia es independiente con respecto a otra y tiene múltiples funciones como por ejemplo seccionar redes virtualmente.

VLAN: Por sus siglas red de área local virtual, se utiliza para segmentar redes en múltiples redes lógicas, lo que permite que dispositivos en diferentes ubicaciones físicas se comuniquen como si estuvieran en la misma red física.

ENLACE TRONCAL: Enlace de red de alta velocidad que permite la conexión entre dispositivos, permitiendo también el enrutamiento de diferentes tráfico segmentados por VLAN por un único enlace.

ENLACE ACCESO: Enlace de red que comúnmente conecta un dispositivo final, como una computadora o impresora, a un Switch o Router.

ETHERCHANNEL: Tecnología de CISCO utilizada para combinar múltiples enlaces físicos entre dos dispositivos como un solo enlace lógico, con el objetivo de proporcionar mejoras de rendimiento y redundancia a prueba de fallos.

AAA: Sistema de autenticación, autorización y auditoría, se utiliza para controlar el acceso a la red como método de seguridad, y de seguimiento de la actividad de los usuarios en la red.

RESUMEN

El objetivo de la prueba de habilidades prácticas es evaluar las destrezas adquiridas en el proceso de formación de pregrado en CISCO CCNA y el diplomado de profundización en CISCO CCNP.

Se utilizará el software de simulación GNS3 para resolver un escenario empresarial que requiere la implementación de diferentes técnicas de enrutamiento, segmentación y redundancia, como ENRUTAMIENTO ESTÁTICO, VRF, VLAN y ETHERCHANNEL.

El objetivo es interconectar dos secciones de la red y garantizar la alta seguridad de la red con el uso de sistemas AAA para controlar el acceso a la red.

Esto garantizará la interconexión, redundancia, seguridad y privacidad de los datos de la red, que son objetivos indispensables para la implementación de infraestructuras de telecomunicaciones.

Palabras Clave: CISCO, CCNP, Conmutación, Enrutamiento, Redes, Electrónica.

ABSTRACT

The objective of the practical skills test is to evaluate the skills acquired in the CISCO CCNA undergraduate training process and the deepening CISCO CCNP diploma.

GNS3 simulation software will be used to solve a business scenario that requires the implementation of different routing, segmentation, and redundancy techniques such as STATIC ROUTING, VRF, VLAN and ETHERCHANNEL.

The goal is to interconnect two sections of the network and ensure high network security with the use of AAA systems to control network access.

This will guarantee the interconnection, redundancy, security, and privacy of network data, which are essential objectives for the implementation of telecommunications infrastructures.

Keywords: CISCO, CCNP, Routing, Swicthing, Networking, Electronics.

INTRODUCCIÓN

En la actualidad, las telecomunicaciones son fundamentales en el mundo empresarial, la conectividad y la disponibilidad de los sistemas de información son vitales para el correcto funcionamiento y desempeño de una organización, habiéndose creado industrias que dependen incluso completamente de un buen desempeño de una red y acceso a internet.

En esta prueba de habilidades se abordan temas de como configurar correctamente diferentes topologías y sistemas de red e interconexión, la cual será llevada a cabo en el software de simulación GNS3.

El escenario planeado solicita la configuración de una red multi-VRF donde la red admite dos grupos de usuarios “usuarios generales” y “usuarios especiales” los cuales tienen acceso a los equipos dentro de su propio segmento de red, pero no hacia el otro segmento.

Por lo cual se configurarán los diferentes dispositivos activos de la red para que sean capaces de brindar conectividad IPv4 e IPv6, utilizando conceptos de enrutamiento estático, VLAN.

La topología de red tendrá un segmento de red redundante con el fin de brindar fiabilidad y disponibilidad de la red.

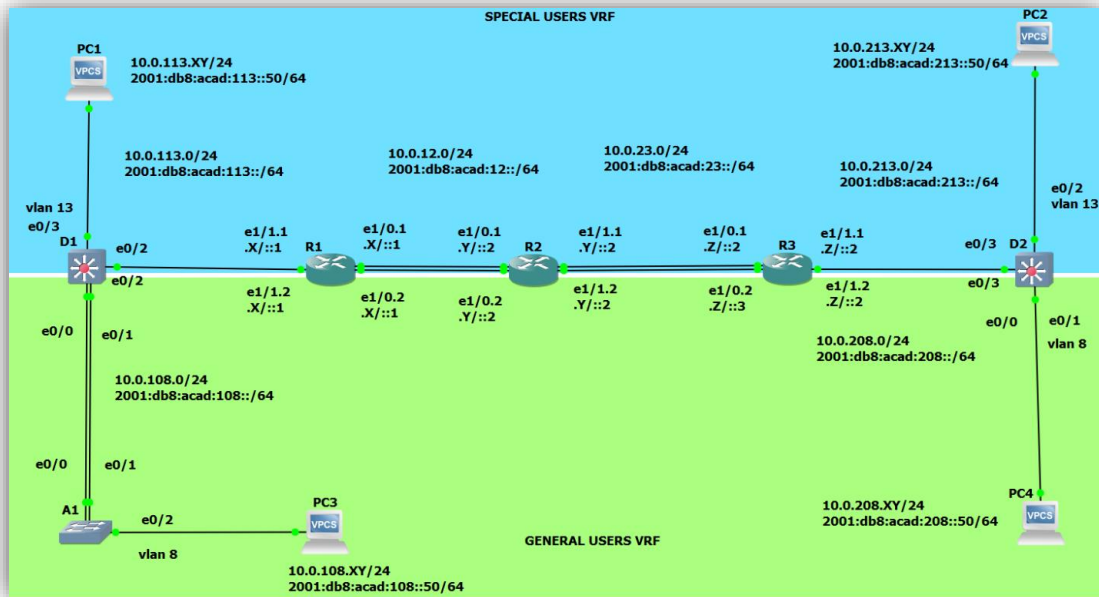
Todos los dispositivos activos de la red tendrán altos niveles de seguridad gracias a la implementación de sistemas autenticación para el acceso a dispositivos críticos de la red, basados en usuarios y contraseñas de inicio de sesión y habilitación de permisos especiales protegidos por contraseña.

Entregando como producto final una red segmentada para diferentes usos empresariales, redundante, fiable y segura.

ESCENARIO

El escenario propuesto con el fin de poner a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de administración de redes de telecomunicaciones, es el siguiente.

Figura 1 Escenario



Fuente: Guía de actividades

Prueba de habilidades en donde XYZ corresponden a los números 723, la construcción del escenario planteado estará compuesto por 3 enrutadores que tendrán las etiquetas R1, R2, R3, 3 switches que tendrán las etiquetas D1, D2, A1 y 4 computadores que tendrán las etiquetas PC1, PC2, PC3, PC4.

De acuerdo con Edgeworth, Garza Rios, Gooley y Hucaby (2020), en los dispositivos de interconexión CISCO se utilizan diversos protocolos y tecnologías para la gestión y administración de una red empresarial, por tanto, el escenario será desarrollado en base a ello.

La ejecución del escenario estará hecha por partes.

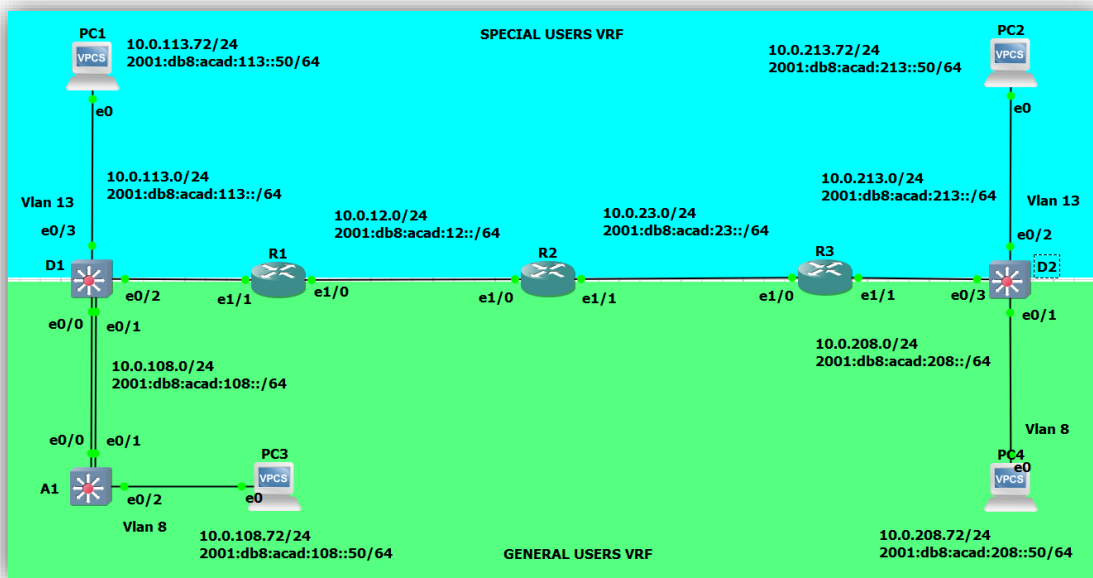
1 CONSTRUIR LA RED Y CONFIGURAR LOS AJUSTES BÁSICOS DEL DISPOSITIVO Y EL DIRECCIONAMIENTO DE LA INTERFAZ

Creación de la topología en el simulador GNS3, tabla de enrutamiento, configuraciones básicas para el direccionamiento de las interfaces.

1.1 CONEXIÓN DE DISPOSITIVOS SEGÚN DIAGRAMA DE TOPOLOGÍA

En base al escenario propuesto de evaluación de habilidades se realizan las conexiones pertinentes en el software de simulación GNS3 además de las notaciones para cada parte de la red con su respectivo identificador de interfaz.

Figura 2 Construcción de la red en GNS3



Fuente: Elaboración propia

1.2 CONFIGURACIONES BÁSICAS

Se realizan las configuraciones básicas de los dispositivos activos con el fin de prepararlos con las configuraciones generales que tendrán en común, como lo son el nombre del dispositivo, funcionalidades IPv6, búsqueda DNS, acceso por consola, notificaciones, VLAN ID, VLAN name, y guardar las configuraciones, conforme a los siguientes comandos.

Tabla 1 Configuraciones básicas

Command	Description
enable	Accede al modo privilegiado
configure terminal	Entra en el modo de configuración global
hostname *	Configura el nombre del dispositivo en donde * será la etiqueta del dispositivo
ipv6 unicast-routing	Activa IPv6 en el dispositivo
no ip domain lookup	Desactiva la búsqueda DNS
banner motd # *, ENCOR Skills Assessment, Scenario 2 #	Configura un banner en el dispositivo, en donde * será la etiqueta del dispositivo
line con 0	Accede a las opciones de configuración de la línea de consola
exec-timeout 0 0	Establece el tiempo de espera inactivo para la sesión
logging synchronous	Configura que mensajes se muestran en la terminal
Vlan *	En un switch entra en la configuración de la vlan seleccionada con el ID * que sea requerido
Name *	Configura el nombre de la vlan con el nombre * que sea requerido
exit	Da un paso atrás en el nivel de jerarquía de las configuraciones
copy running-config startup-config	Guarda la configuración actual a la memoria de inicio

Se accederá a cada dispositivo a través del software Solar-PuTTY para realizar las configuraciones básicas y guardarlos con sus respectivas etiquetas.

Scripts para los dispositivos

```
R1
enable
configure terminal
hostname R1
ipv6 unicast-routing
no ip domain lookup
banner motd # R1, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
end
copy running-config startup-config
```

```
R2
enable
configure terminal
hostname R2
ipv6 unicast-routing
no ip domain lookup
banner motd # R2, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
end
copy running-config startup-config
```

```
R3
enable
configure terminal
hostname R3
ipv6 unicast-routing
no ip domain lookup
banner motd # R3, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
end
copy running-config startup-config
```



```
D1
enable
configure terminal
hostname D1
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D1, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 8
name General-Users
exit
vlan 13
name Special-Users
end
copy running-config startup-config
```

```
D2
enable
configure terminal
hostname D2
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D2, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 8
name General-Users
exit
vlan 13
name Special-Users
end
copy running-config startup-config
```

```
A1
enable
configure terminal
hostname A1
ipv6 unicast-routing
no ip domain lookup
banner motd # A1, ENCOR Skills Assessment, Scenario 2 #
line con 0
exec-timeout 0 0
logging synchronous
exit
vlan 8
name General-Users
end
copy running-config startup-config
```

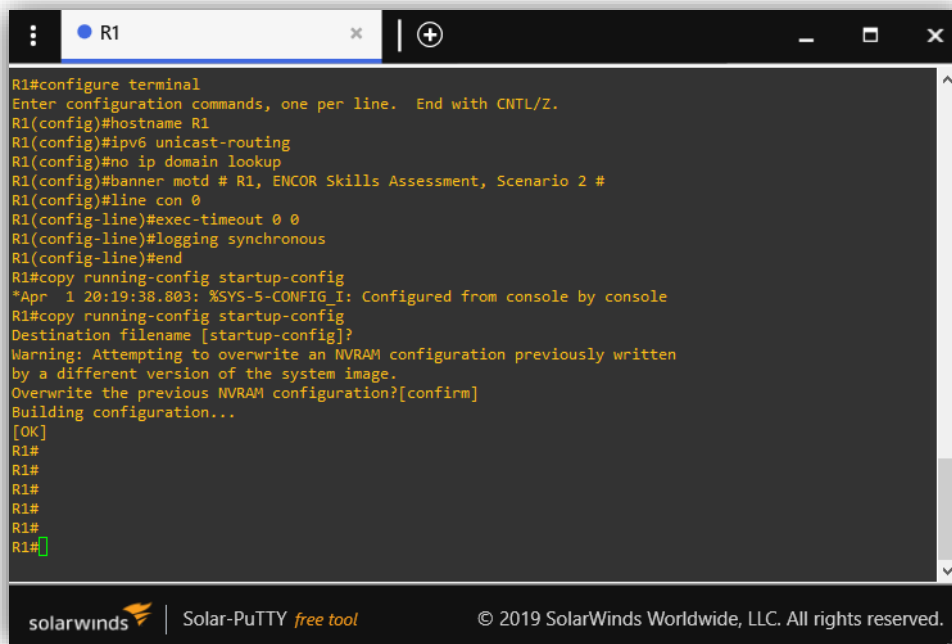
```
PC1
ip 10.0.113.72/24 10.0.113.7
ip 2001:db8:acad:113::50/64 2001:db8:acad:113::1
save
```

```
PC2
ip 10.0.213.72/24 10.0.213.3
ip 2001:db8:acad:213::50/64 2001:db8:acad:213::1
save
```

```
PC3
ip 10.0.108.72/24 10.0.108.7
ip 2001:db8:acad:108::50/64 2001:db8:acad:108::1
save
```

```
PC4
ip 10.0.208.72/24 10.0.208.3
ip 2001:db8:acad:208::50/64 2001:db8:acad:208::1
save
```

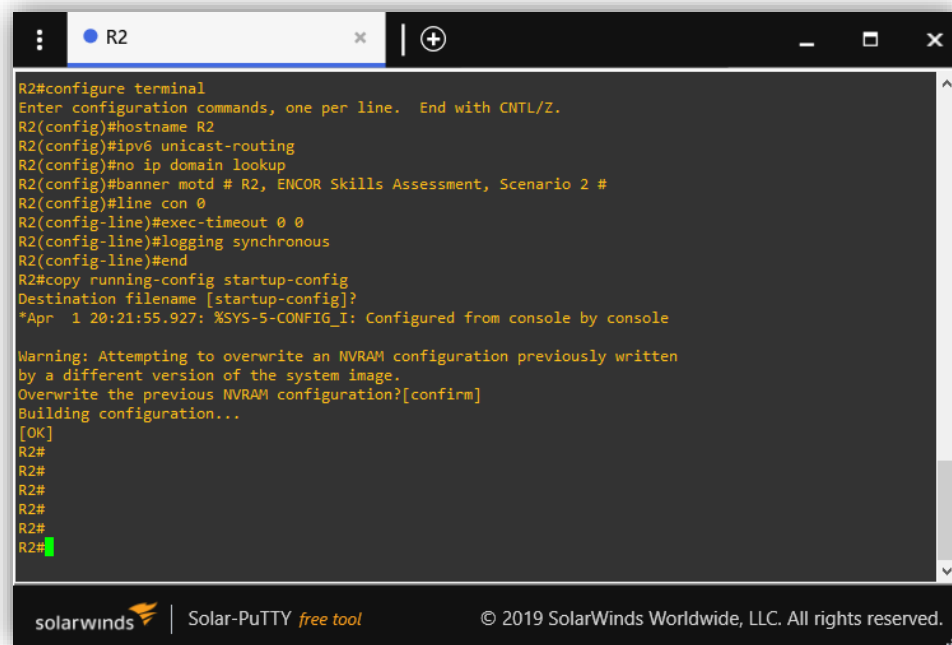
Figura 3 Configuraciones básicas y guardado R1



```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#ipv6 unicast-routing
R1(config)#no ip domain lookup
R1(config)#banner motd # R1, ENCOR Skills Assessment, Scenario 2 #
R1(config)#line con 0
R1(config-line)#exec-timeout 0 0
R1(config-line)#logging synchronous
R1(config-line)#end
R1#copy running-config startup-config
*Apr 1 20:19:38.803: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
R1#
R1#
R1#
R1#
R1#
```

Fuente: Elaboración propia

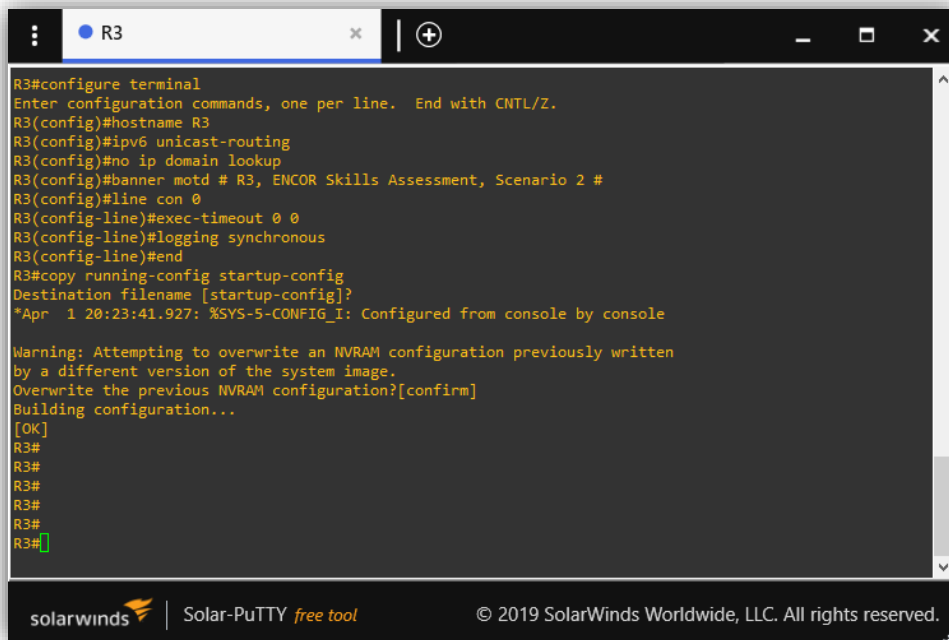
Figura 4 Configuraciones básicas y guardado R2



```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assessment, Scenario 2 #
R2(config)#line con 0
R2(config-line)#exec-timeout 0 0
R2(config-line)#logging synchronous
R2(config-line)#end
R2#copy running-config startup-config
Destination filename [startup-config]?
*Apr 1 20:21:55.927: %SYS-5-CONFIG_I: Configured from console by console
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
R2#
R2#
R2#
R2#
R2#
```

Fuente: Elaboración propia

Figura 5 Configuraciones básicas y guardado R3



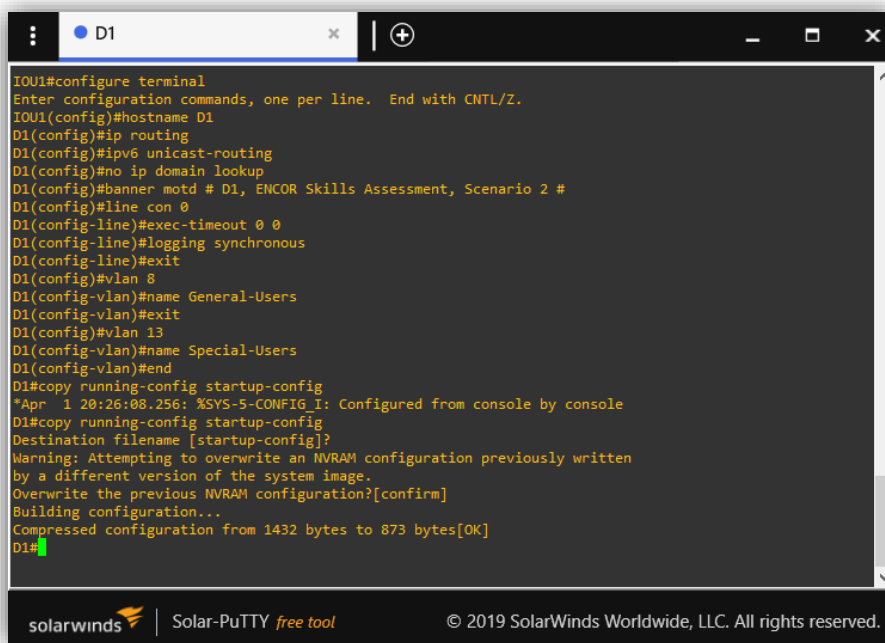
```
R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assessment, Scenario 2 #
R3(config)#line con 0
R3(config-line)#exec-timeout 0 0
R3(config-line)#logging synchronous
R3(config-line)#end
R3#copy running-config startup-config
Destination filename [startup-config]?
*Apr 1 20:23:41.927: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R3#
R3#
R3#
R3#
R3#
R3#
```

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Fuente: Elaboración propia

Figura 6 Configuraciones básicas y guardado D1

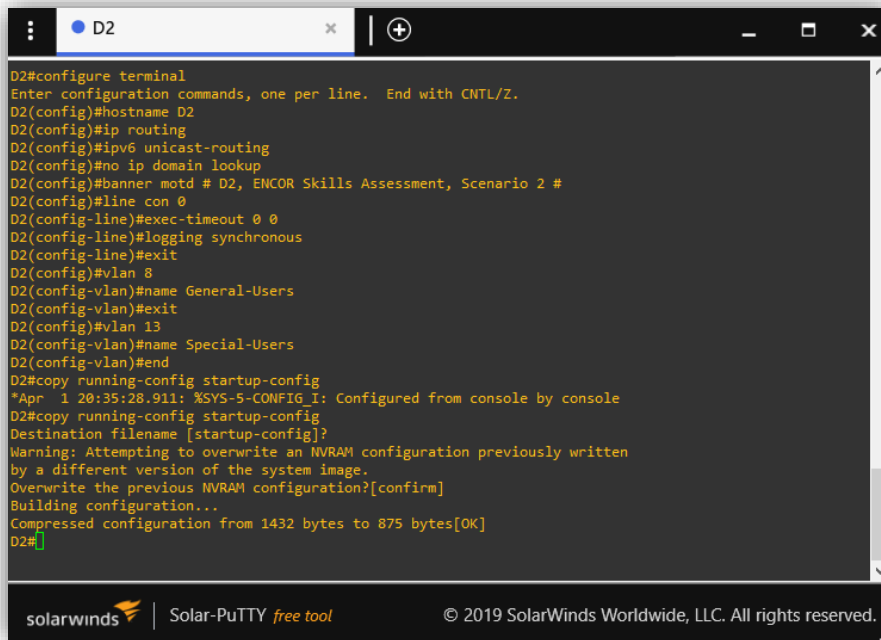


```
IOU1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
IOU1(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment, Scenario 2 #
D1(config)#line con 0
D1(config-line)#exec-timeout 0 0
D1(config-line)#logging synchronous
D1(config-line)#exit
D1(config)#vlan 8
D1(config-vlan)#name General-Users
D1(config-vlan)#exit
D1(config)#vlan 13
D1(config-vlan)#name Special-Users
D1(config-vlan)#end
D1#copy running-config startup-config
*Apr 1 20:26:08.256: %SYS-5-CONFIG_I: Configured from console by console
D1#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1432 bytes to 873 bytes[OK]
D1#
```

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Fuente: Elaboración propia

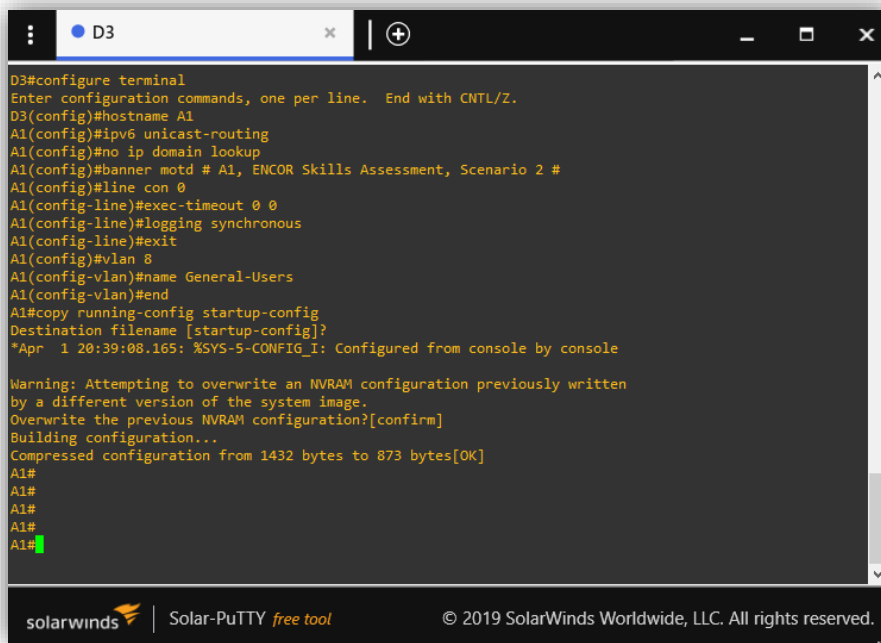
Figura 7 Configuraciones básicas y guardado D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#hostname D2
D2(config)#ip routing
D2(config)#ipv6 unicast-routing
D2(config)#no ip domain lookup
D2(config)#banner motd # D2, ENCOR Skills Assessment, Scenario 2 #
D2(config)#line con 0
D2(config-line)#exec-timeout 0 0
D2(config-line)#logging synchronous
D2(config-line)#exit
D2(config)#vlan 8
D2(config-vlan)#name General-Users
D2(config-vlan)#exit
D2(config)#vlan 13
D2(config-vlan)#name Special-Users
D2(config-vlan)#end
D2#copy running-config startup-config
*Apr 1 20:35:28.911: %SYS-5-CONFIG_I: Configured from console by console
D2#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1432 bytes to 875 bytes[OK]
D2#
```

Fuente: Elaboración propia

Figura 8 Configuraciones básicas y guardado D3



```
D3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D3(config)#hostname A1
A1(config)#ipv6 unicast-routing
A1(config)#no ip domain lookup
A1(config)#banner motd # A1, ENCOR Skills Assessment, Scenario 2 #
A1(config)#line con 0
A1(config-line)#exec-timeout 0 0
A1(config-line)#logging synchronous
A1(config-line)#exit
A1(config)#vlan 8
A1(config-vlan)#name General-Users
A1(config-vlan)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
*Apr 1 20:39:08.165: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1432 bytes to 873 bytes[OK]
A1#
A1#
A1#
A1#
A1#
```

Fuente: Elaboración propia

En base al escenario propuesto de evaluación de habilidades se realiza la tabla de direccionamiento, para garantizar la interconexión entre diferentes dispositivos activos de la red a través de sus interfaces.

Tabla 2 Tabla de direccionamiento

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local	Vlan
R1	E1/0.1	10.0.12.7/24	2001:db8:acad:12::1/64	fe80::1:1	13
	E1/0.2	10.0.12.7/24	2001:db8:acad:12::1/64	fe80::1:2	8
	E1/1.1	10.0.113.7/24	2001:db8:acad:113::1/64	fe80::1:3	13
	E1/1.2	10.0.108.7/24	2001:db8:acad:108::1/64	fe80::1:4	8
R2	E1/0.1	10.0.12.2/24	2001:db8:acad:12::2/64	fe80::2:1	13
	E1/0.2	10.0.12.2/24	2001:db8:acad:12::2/64	fe80::2:2	8
	E1/1.1	10.0.23.2/24	2001:db8:acad:23::2/64	fe80::2:3	13
	E1/1.2	10.0.23.2/24	2001:db8:acad:23::2/64	fe80::2:4	8
R3	E1/0.1	10.0.23.3/24	2001:db8:acad:23::3/64	fe80::3:1	13
	E1/0.2	10.0.23.3/24	2001:db8:acad:23::3/64	fe80::3:2	8
	E1/1.1	10.0.213.3/24	2001:db8:acad:213::1/64	fe80::3:3	13
	E1/1.2	10.0.208.3/24	2001:db8:acad:208::1/64	fe80::3:4	8
PC1	NIC	10.0.113.72/24	2001:db8:acad:113::50/64	EUI-64	13
PC2	NIC	10.0.213.72/24	2001:db8:acad:213::50/64	EUI-64	13
PC3	NIC	10.0.108.72/24	2001:db8:acad:108::50/64	EUI-64	8
PC4	NIC	10.0.208.72/24	2001:db8:acad:208::50/64	EUI-64	8

Fuente: Guía de actividades

Se configuran las direcciones IPv4 e IPv6 de los computadores de acuerdo con la tabla de direccionamiento.

Figura 9 Configuraciones IP y guardado PC1



```
PC1> ip 10.0.113.72/24 10.0.113.7
Checking for duplicate address...
PC1 : 10.0.113.72 255.255.255.0 gateway 10.0.113.7

PC1> ip 2001:db8:acad:113::50/64 2001:db8:acad:113::1
PC1 : 2001:db8:acad:113::50/64

PC1> save
Saving startup configuration to startup.vpc
. done

PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
```

Fuente: Elaboración propia

Figura 10 Configuraciones IP y guardado PC2



```
PC2> ip 10.0.213.72/24 10.0.213.3
Checking for duplicate address...
PC2 : 10.0.213.72 255.255.255.0 gateway 10.0.213.3

PC2> ip 2001:db8:acad:213::50/64 2001:db8:acad:213::1
PC1 : 2001:db8:acad:213::50/64

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

PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
PC2>
```

Fuente: Elaboración propia

Figura 11 Configuraciones IP y guardado PC3

```
PC3> ip 10.0.108.7/24 10.0.108.7
Checking for duplicate address...
PC3 : 10.0.108.7 255.255.255.0 gateway 10.0.108.7

PC3> ip 2001:db8:acad:108::50/64 2001:db8:acad:108::1
PC1 : 2001:db8:acad:108::50/64

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

PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
```

Fuente: Elaboración propia

Figura 12 Configuraciones IP y guardado PC4

```
PC4> ip 10.0.208.7/24 10.0.208.3
Checking for duplicate address...
PC4 : 10.0.208.7 255.255.255.0 gateway 10.0.208.3

PC4> ip 2001:db8:acad:208::50/64 2001:db8:acad:208::1
PC1 : 2001:db8:acad:208::50/64

PC4> save
Saving startup configuration to startup.vpc
. done

PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
PC4>
```

Fuente: Elaboración propia

2 CONFIGURAR VRF Y ENRUTAMIENTO ESTÁTICO

Configurar VRF-Lite en los tres enrutadores y las rutas estáticas adecuadas para admitir la accesibilidad de un extremo a otro además de las pruebas de conexión pertinentes desde R1 hasta R3 en cada VRF.

El proceso de configuración de los grupos VRF se hará por partes.

2.1 DEFINICIÓN DE GRUPOS VRF

Tabla 3 Tabla de tareas 2.1

Taks	Specification
En R1, R2 y R3, configure VRF-Lite VRFs como se muestra en el diagrama de topología.	Configure dos VRF: General-Users Special-Users Los VRF deben soportar IPv4 e IPv6.

Tabla 4 Configuración de instancias VRF

Command	Description
vrf definition *	Crea un grupo VRF con el nombre * que sea requerido
address-family ipv4	Habilita IPv4 al VRF
address-family ipv6	Habilita IPv6 al VRF

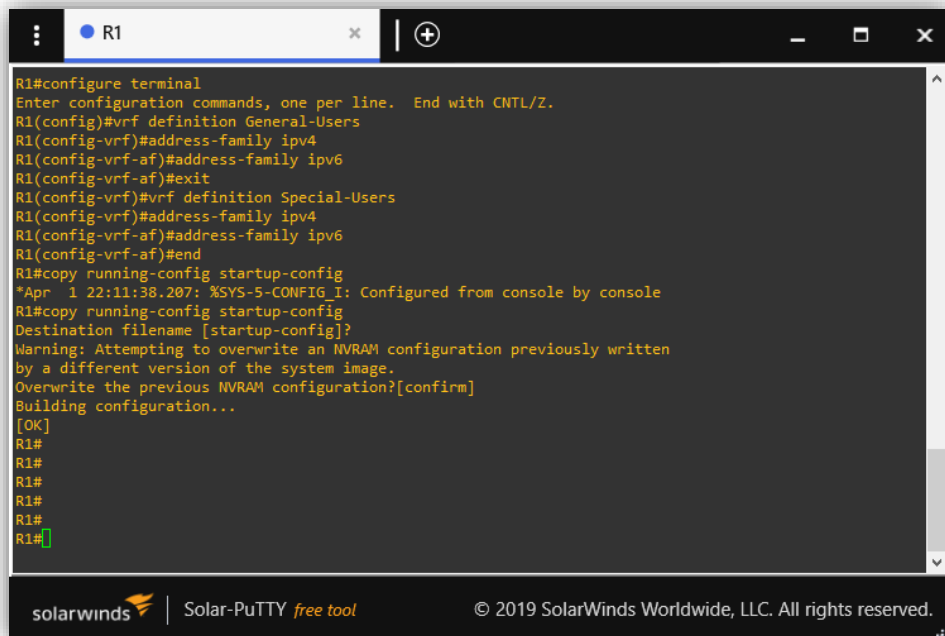
Se configuran 2 VRF-Lite con soporte para IPv4 e IPv6 con los nombres requeridos para los enrutadores R1, R2, R3.

Scripts para los dispositivos

R1, R2, R3

```
enable
configure terminal
vrf definition General-Users
address-family ipv4
address-family ipv6
exit
vrf definition Special-Users
address-family ipv4
address-family ipv6
end
copy running-config startup-config
```

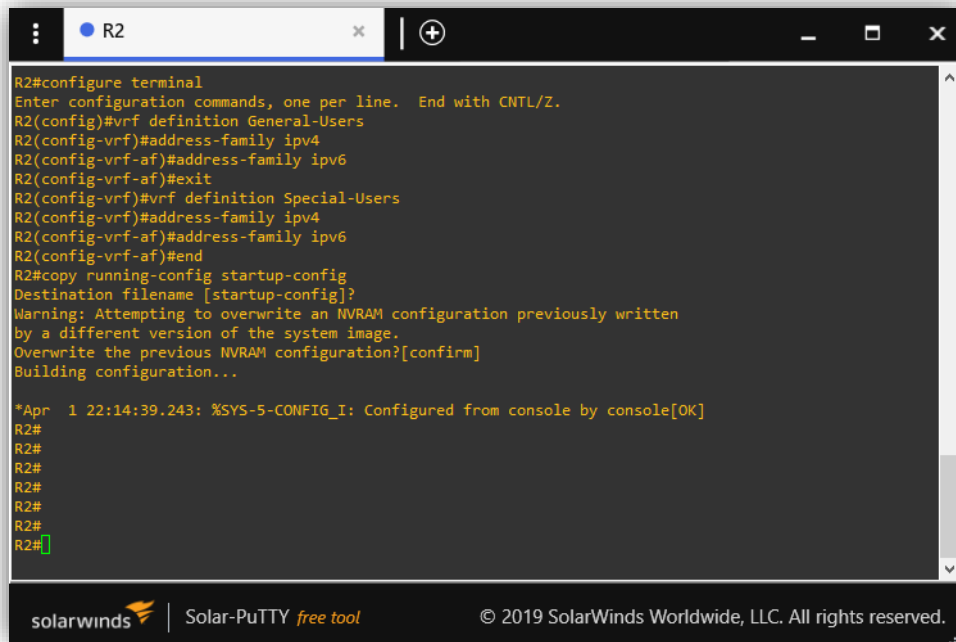
Figura 13 Configuración VRF con soporte IPv4 e IPv6 y guardado R1



```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#vrf definition General-Users
R1(config-vrf)#address-family ipv4
R1(config-vrf-af)#address-family ipv6
R1(config-vrf-af)#exit
R1(config-vrf)#vrf definition Special-Users
R1(config-vrf)#address-family ipv4
R1(config-vrf-af)#address-family ipv6
R1(config-vrf-af)#end
R1#copy running-config startup-config
*Apr  1 22:11:38.207: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
R1#
R1#
R1#
R1#
R1#
```

Fuente: Elaboración propia

Figura 14 Configuración VRF con soporte IPv4 e IPv6 y guardado R2

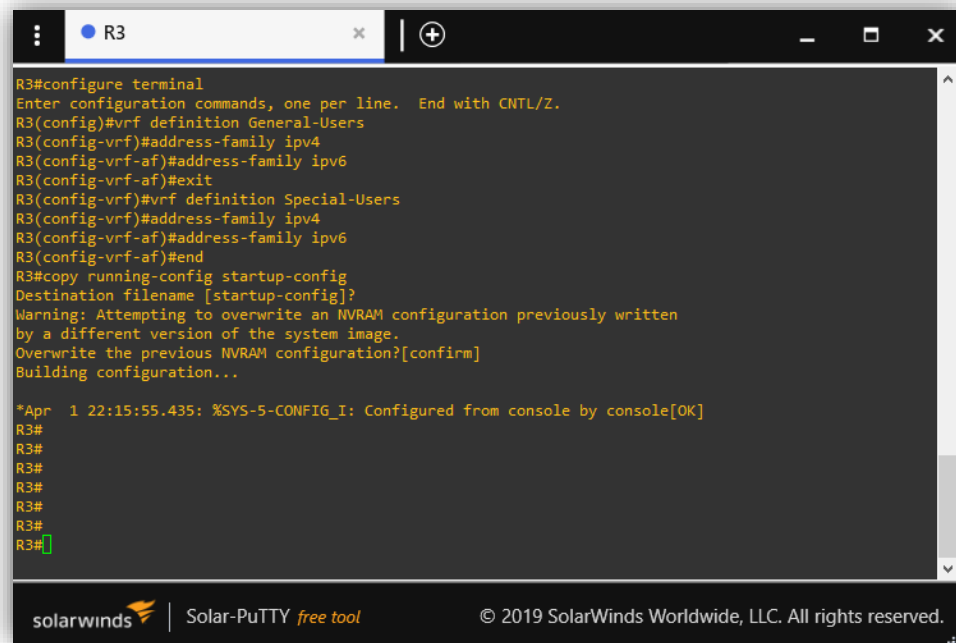


```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#vrf definition General-Users
R2(config-vrf)#address-family ipv4
R2(config-vrf-af)#address-family ipv6
R2(config-vrf-af)#exit
R2(config-vrf)#vrf definition Special-Users
R2(config-vrf)#address-family ipv4
R2(config-vrf-af)#address-family ipv6
R2(config-vrf-af)#end
R2#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...

*Apr  1 22:14:39.243: %SYS-5-CONFIG_I: Configured from console by console[OK]
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

Fuente: Elaboración propia

Figura 15 Configuración VRF con soporte IPv4 e IPv6 y guardado R3



```
R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#vrf definition General-Users
R3(config-vrf)#address-family ipv4
R3(config-vrf-af)#address-family ipv6
R3(config-vrf-af)#exit
R3(config-vrf)#vrf definition Special-Users
R3(config-vrf)#address-family ipv4
R3(config-vrf-af)#address-family ipv6
R3(config-vrf-af)#end
R3#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...

*Apr  1 22:15:55.435: %SYS-5-CONFIG_I: Configured from console by console[OK]
R3#
R3#
R3#
R3#
R3#
R3#
R3#
```

Fuente: Elaboración propia

2.2 CONFIGURACIÓN DE INTERFACES

Tabla 5 Tabla de tareas 2.2

Taks	Specification
En R1, R2 y R3, configure las interfaces IPv4 e IPv6 en cada VRF según lo detallado en la tabla de direcciones mencionada anteriormente.	<p>Todos los Routers utilizarán Router-On-A-Stick en sus interfaces e1/1.x para admitir la separación de los VRF.</p> <p>Subinterfaz 1: En el VRF Special Users Usar encapsulación dot1q Direcciones IPv4 e IPv6 GUA y link-local addresses Habilitar las interfaces</p> <p>Subinterfaz 2: En el VRF General Users Usar encapsulación dot1q Direcciones IPv4 e IPv6 GUA y link-local addresses Habilitar las interfaces</p>

Se configuran las interfaces y subinterfaces IPv4 e IPv6 para los enrutadores R1, R2, R3 en cada VRF.

Tabla 6 Configuración de interfaces y subinterfaces VRF

Command	Description
interface e1/0	Accede a la interfaz e1/0
no shutdown	Activa administrativamente la interfaz
interface e1/0.1	Accede a la subinterfaz e1/0.1
encapsulation dot1q 13	Permite el protocolo dot1q con el id 13, para vlan
vrf forwarding Special-Users	Habilita el envío para el vrf Special-Users
ip address 10.0.12.7 255.255.255.0	Configura la IPv4 de la interfaz o subinterfaz junto con su mascara de red
ipv6 address 2001:db8:acad:12::1/64	Configura la IPv6 y su mascara de red a la interfaz o subinterfaz
ipv6 address fe80::1:1 link-local	Configura la ip link-local IPv6 de la interfaz o subinterfaz

Scripts para los dispositivos

```
R1
enable
configure terminal
interface e1/0
no shutdown
exit
interface e1/1
no shutdown
exit
interface e1/0.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.12.7 255.255.255.0
ipv6 address 2001:db8:acad:12::1/64
ipv6 address fe80::1:1 link-local
no shutdown
exit
interface e1/0.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.12.7 255.255.255.0
ipv6 address 2001:db8:acad:12::1/64
ipv6 address fe80::1:2 link-local
no shutdown
exit
interface e1/1.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.113.7 255.255.255.0
ipv6 address 2001:db8:acad:113::1/64
ipv6 address fe80::1:3 link-local
no shutdown
exit
interface e1/1.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.108.7 255.255.255.0
ipv6 address 2001:db8:acad:108::1/64
ipv6 address fe80::1:4 link-local
no shutdown
end
copy running-config startup-config
```

```
R2
enable
configure terminal
interface e1/0
no shutdown
exit
interface e1/1
no shutdown
exit
interface e1/0.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.12.2 255.255.255.0
ipv6 address 2001:db8:acad:12::2/64
ipv6 address fe80::2:1 link-local
no shutdown
Exit
interface e1/0.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.12.2 255.255.255.0
ipv6 address 2001:db8:acad:12::2/64
ipv6 address fe80::2:2 link-local
no shutdown
exit
interface e1/1
no shutdown
interface e1/1.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.23.2 255.255.255.0
ipv6 address 2001:db8:acad:23::2/64
ipv6 address fe80::2:3 link-local
no shutdown
exit
interface e1/1.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.23.2 255.255.255.0
ipv6 address 2001:db8:acad:23::2/64
ipv6 address fe80::2:4 link-local
no shutdown
end
copy running-config startup-config
```

```
R3
enable
configure terminal
interface e1/0
no shutdown
exit
interface e1/1
no shutdown
exit
interface e1/0.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.23.3 255.255.255.0
ipv6 address 2001:db8:acad:23::3/64
ipv6 address fe80::3:1 link-local
no shutdown
exit
interface e1/0.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.23.3 255.255.255.0
ipv6 address 2001:db8:acad:23::3/64
ipv6 address fe80::3:2 link-local
no shutdown
exit
interface e1/1.1
encapsulation dot1q 13
vrf forwarding Special-Users
ip address 10.0.213.3 255.255.255.0
ipv6 address 2001:db8:acad:213::1/64
ipv6 address fe80::3:3 link-local
no shutdown
exit
interface e1/1.2
encapsulation dot1q 8
vrf forwarding General-Users
ip address 10.0.208.3 255.255.255.0
ipv6 address 2001:db8:acad:208::1/64
ipv6 address fe80::3:4 link-local
no shutdown
end
copy running-config startup-config
```

Figura 16 Configuración de las interfaces y subinterfaces VRF R1

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface e1/0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface e1/0.1
R1(config-subif)#encapsulation dot1q 13
R1(config-subif)#vrf forwarding Special-Users
R1(config-subif)#ip address 10.0.12.7 255.255.255.0
R1(config-subif)#ipv6 address 2001:db8:acad:12::1/64
R1(config-subif)#ipv6 address fe80::1:1 link-local
R1(config-subif)#no shutdown
R1(config-subif)#exit
R1(config)#interface e1/0.2
R1(config-subif)#encapsulation dot1q 8
R1(config-subif)#vrf forwarding General-Users
R1(config-subif)#ip address 10.0.12.7 255.255.255.0
R1(config-subif)#ipv6 address 2001:db8:acad:12::1/64
R1(config-subif)#ipv6 address fe80::1:2 link-local
R1(config-subif)#no shutdown
R1(config-subif)#exit
R1(config)#interface e1/1.1
R1(config-subif)#encapsulation dot1q 13
R1(config-subif)#vrf forwarding Special-Users
R1(config-subif)#ip address 10.0.113.7 255.255.255.0
R1(config-subif)#ipv6 address 2001:db8:acad:113::1/64
R1(config-subif)#ipv6 address fe80::1:3 link-local
R1(config-subif)#no shutdown
R1(config-subif)#exit
R1(config)#interface e1/1.2
R1(config-subif)#encapsulation dot1q 8
R1(config-subif)#vrf forwarding General-Users
R1(config-subif)#ip address 10.0.108.7 255.255.255.0
R1(config-subif)#ipv6 address 2001:db8:acad:108::1/64
R1(config-subif)#ipv6 address fe80::1:4 link-local
R1(config-subif)#no shutdown
R1(config-subif)#end
R1#copy running-config startup-config
*Apr 1 23:45:32.451: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Apr 1 23:45:32.455: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Apr 1 23:45:33.479: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
*Apr 1 23:45:33.483: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R1#copy running-config startup-config
*Apr 1 23:45:33.835: %SYS-5-CONFIG I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
*Apr 1 23:46:10.811: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duple
x), with D1 Ethernet0/2 (half duplex).
R1#
```

Fuente: Elaboración propia

Figura 17 Configuración de las interfaces y subinterfaces VRF R2

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface e1/0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface e1/1
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface e1/0.1
R2(config-subif)#encapsulation dot1q 13
R2(config-subif)#vrf forwarding Special-Users
R2(config-subif)#ip address 10.0.12.2 255.255.255.0
R2(config-subif)#ipv6 address 2001:db8:acad:12::2/64
R2(config-subif)#ipv6 address fe80::2:1 link-local
R2(config-subif)#no shutdown
R2(config-subif)#Exit
R2(config)#interface e1/0.2
R2(config-subif)#encapsulation dot1q 8
R2(config-subif)#vrf forwarding General-Users
R2(config-subif)#ip address 10.0.12.2 255.255.255.0
R2(config-subif)#ipv6 address 2001:db8:acad:12::2/64
R2(config-subif)#ipv6 address fe80::2:2 link-local
R2(config-subif)#no shutdown
R2(config-subif)#exit
R2(config)#interface e1/1
R2(config-if)#no shutdown
R2(config-if)#interface e1/1.1
R2(config-subif)#encapsulation dot1q 13
R2(config-subif)#vrf forwarding Special-Users
R2(config-subif)#ip address 10.0.23.2 255.255.255.0
R2(config-subif)#ipv6 address 2001:db8:acad:23::2/64
R2(config-subif)#ipv6 address fe80::2:3 link-local
R2(config-subif)#no shutdown
R2(config-subif)#exit
R2(config)#interface e1/1.2
R2(config-subif)#encapsulation dot1q 8
R2(config-subif)#vrf forwarding General-Users
R2(config-subif)#ip address 10.0.23.2 255.255.255.0
R2(config-subif)#ipv6 address 2001:db8:acad:23::2/64
R2(config-subif)#ipv6 address fe80::2:4 link-local
R2(config-subif)#no shutdown
R2(config-subif)#end
R2#copy running-config startup-config
*Apr  2 02:21:40.943: %SYS-5-CONFIG I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
```

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Fuente: Elaboración propia

Figura 18 Configuración de las interfaces y subinterfaces VRF R3

```
R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface e1/0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface e1/0.1
R3(config-subif)#encapsulation dot1q 13
R3(config-subif)#vrf forwarding Special-Users
R3(config-subif)#ip address 10.0.23.3 255.255.255.0
R3(config-subif)#ipv6 address 2001:db8:acad:23::3/64
R3(config-subif)#ipv6 address fe80::3:1 link-local
R3(config-subif)#no shutdown
R3(config-subif)#exit
R3(config)#interface e1/0.2
R3(config-subif)#encapsulation dot1q 8
R3(config-subif)#vrf forwarding General-Users
R3(config-subif)#ip address 10.0.23.3 255.255.255.0
R3(config-subif)#ipv6 address 2001:db8:acad:23::3/64
R3(config-subif)#ipv6 address fe80::3:2 link-local
R3(config-subif)#no shutdown
R3(config-subif)#exit
R3(config)#interface e1/1.1
R3(config-subif)#encapsulation dot1q 13
R3(config-subif)#vrf forwarding Special-Users
R3(config-subif)#ip address 10.0.213.3 255.255.255.0
R3(config-subif)#ipv6 address 2001:db8:acad:213::1/64
R3(config-subif)#ipv6 address fe80::3:3 link-local
R3(config-subif)#no shutdown
R3(config-subif)#exit
R3(config)#interface e1/1.2
R3(config-subif)#encapsulation dot1q 8
R3(config-subif)#vrf forwarding General-Users
R3(config-subif)#ip address 10.0.208.3 255.255.255.0
R3(config-subif)#ipv6 address 2001:db8:acad:208::1/64
R3(config-subif)#ipv6 address fe80::3:4 link-local
R3(config-subif)#no shutdown
R3(config-subif)#end
R3#copy running-config startup-config
*Apr 1 23:54:20.407: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Apr 1 23:54:20.487: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Apr 1 23:54:21.411: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
*Apr 1 23:54:21.491: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3#copy running-config startup-config
*Apr 1 23:54:21.739: %SYS-5-CONFIG I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R3#
R3#
*Apr 1 23:54:37.659: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D2 Ethernet0/3 (half duplex).
R3#
```

Fuente: Elaboración propia

2.3 CONFIGURACIÓN DE RUTAS ESTÁTICAS

Tabla 7 Tabla de tareas 2.3

Taks	Specification
En R1 y R3, configure rutas estáticas predeterminadas que apunten a R2.	Configurar las rutas estáticas VRF para IPv4 e IPv6 en ambas VRF.

Se configuran rutas estáticas en R1 y R3 apuntando hacia R2 para VRF con soporte para IPv4 e IPv6.

Tabla 8 Configuración rutas estáticas IPv4 y IPv6 VRF

Command	Description
ip route vrf Special-Users "red" "mascara" "destino"	Configura la ruta estática IPv4 para todas las redes del VRF Special-Users desde el origen hacia el destino
ip route vrf General-Users "red" "mascara" "destino"	Configura la ruta estática IPv4 para todas las redes del VRF General-Users desde el origen hacia el destino
ipv6 route vrf Special-Users "red y mascara IPv6" "destino IPv6"	Configura la ruta estática IPv6 para todas las redes del VRF Special-Users desde el origen hacia el destino
ipv6 route vrf General-Users "red y mascara IPv6" "destino IPv6"	Configura la ruta estática IPv6 para todas las redes del VRF General-Users desde el origen hacia el destino

En base a la sintaxis anterior de configuración de rutas estáticas, se configura el enrutamiento estático hacia las diferentes redes de cada subinterfaz.

Scripts para los dispositivos

```
R1
enable
configure terminal
ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.12.2
ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.12.2
ipv6 route vrf Special-Users ::/0 2001:db8:acad:12::2
ipv6 route vrf General-Users ::/0 2001:db8:acad:12::2
end
copy running-config startup-config
```

```
R2
enable
configure terminal
ip route vrf Special-Users 10.0.113.0 255.255.255.0 10.0.12.7
ip route vrf General-Users 10.0.108.0 255.255.255.0 10.0.12.7
ip route vrf Special-Users 10.0.213.0 255.255.255.0 10.0.23.3
ip route vrf General-Users 10.0.208.0 255.255.255.0 10.0.23.3
ipv6 route vrf Special-Users 2001:db8:acad:113::/64 2001:db8:acad:12::1
ipv6 route vrf General-Users 2001:db8:acad:108::/64 2001:db8:acad:12::1
ipv6 route vrf Special-Users 2001:db8:acad:213::/64 2001:db8:acad:23::3
ipv6 route vrf General-Users 2001:db8:acad:208::/64 2001:db8:acad:23::3
end
copy running-config startup-config
```

```
R3
enable
configure terminal
ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.23.2
ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.23.2
ipv6 route vrf Special-Users ::/0 2001:db8:acad:23::2
ipv6 route vrf General-Users ::/0 2001:db8:acad:23::2
end
copy running-config startup-config
```

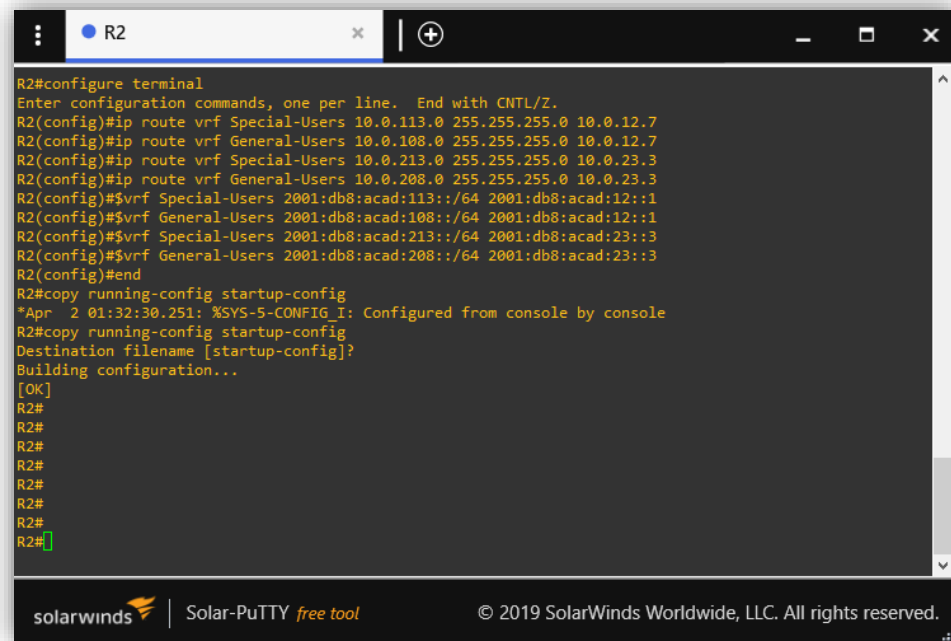
Figura 19 Configuración enrutamiento estático VRF IPv4 e IPv6 R1



```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.12.2
R1(config)#ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.12.2
R1(config)#ipv6 route vrf Special-Users ::/0 2001:db8:acad:12::2
R1(config)#ipv6 route vrf General-Users ::/0 2001:db8:acad:12::2
R1(config)#end
R1#copy running-config startup-config
*Apr 2 01:19:59.315: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

Fuente: Elaboración propia


Figura 20 Configuración enrutamiento estático VRF IPv4 e IPv6 R2



```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip route vrf Special-Users 10.0.113.0 255.255.255.0 10.0.12.7
R2(config)#ip route vrf General-Users 10.0.108.0 255.255.255.0 10.0.12.7
R2(config)#ip route vrf Special-Users 10.0.213.0 255.255.255.0 10.0.23.3
R2(config)#ip route vrf General-Users 10.0.208.0 255.255.255.0 10.0.23.3
R2(config)#vrf Special-Users 2001:db8:acad:113::/64 2001:db8:acad:12::1
R2(config)#vrf General-Users 2001:db8:acad:108::/64 2001:db8:acad:12::1
R2(config)#vrf Special-Users 2001:db8:acad:213::/64 2001:db8:acad:23::3
R2(config)#vrf General-Users 2001:db8:acad:208::/64 2001:db8:acad:23::3
R2(config)#end
R2#copy running-config startup-config
*Apr 2 01:32:30.251: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

Fuente: Elaboración propia

Figura 21 Configuración enrutamiento estático VRF IPv4 e IPv6 R3



```
R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.23.2
R3(config)#ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.23.2
R3(config)#ipv6 route vrf Special-Users ::/0 2001:db8:acad:23::2
R3(config)#ipv6 route vrf General-Users ::/0 2001:db8:acad:23::2
R3(config)#end
R3#copy running-config startup-config
*Apr  2 01:34:35.579: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
```

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Fuente: Elaboración propia

2.4 VERIFICACIÓN DE CONFIGURACIONES Y PRUEBAS DE CONECTIVIDAD

Tabla 9 Tabla de tareas 2.4

Taks	Specification
Verificar la conectividad en cada VRF.	Desde R1, verificar la conectividad hacia R3: ping vrf General-Users 10.0.208.9 ping vrf General-Users 2001:db8:acad:208::1 ping vrf Special-Users 10.0.213.9 ping vrf Special-Users 2001:db8:acad:213::1

Se verifica la configuración y se realizan pruebas de conectividad entre cada VRF para asegurar su correcto funcionamiento.

Scripts para los dispositivos

```
R1, R2, R3
show ip vrf brief
Show ip vrf interfaces
show ip interface brief
show run | inc route
show ip route vrf General-Users
show ip route vrf Special-Users
```

```
R1
ping vrf General-Users 10.0.208.9
ping vrf General-Users 2001:db8:acad:208::1
ping vrf Special-Users 10.0.213.9
ping vrf Special-Users 2001:db8:acad:213::1
```

Figura 22 Verificación de los grupos VRF R1

```
R1#show ip vrf brief
Name          Default RD      Interfaces
General-Users <not set>      Et1/0.2
               <not set>      Et1/1.2
Special-Users  <not set>      Et1/0.1
               <not set>      Et1/1.1

R1#Show ip vrf interfaces
Interface      IP-Address      VRF              Protocol
Et1/0.2        10.0.12.7       General-Users     up
Et1/1.2        10.0.108.7      General-Users     up
Et1/0.1        10.0.12.7       Special-Users     up
Et1/1.1        10.0.113.7      Special-Users     up
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

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Fuente: Elaboración propia

Figura 23 Verificación de los grupos VRF R2

```
R2#show ip vrf brief
Name          Default RD      Interfaces
General-Users <not set>      Et1/0.2
               <not set>      Et1/1.2
Special-Users  <not set>      Et1/0.1
               <not set>      Et1/1.1

R2#Show ip vrf interfaces
Interface      IP-Address      VRF              Protocol
Et1/0.2        10.0.12.2       General-Users     up
Et1/1.2        10.0.23.2       General-Users     up
Et1/0.1        10.0.12.2       Special-Users     up
Et1/1.1        10.0.23.2       Special-Users     up
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

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Fuente: Elaboración propia
Figura 24 Verificación de los grupos VRF R3


```
R3#show ip vrf brief
Name                Default RD          Interfaces
General-Users       <not set>          Et1/0.2
                    <not set>          Et1/1.2
Special-Users       <not set>          Et1/0.1
                    <not set>          Et1/1.1

R3#Show ip vrf interfaces
Interface            IP-Address          VRF                  Protocol
Et1/0.2              10.0.23.3           General-Users        up
Et1/1.2              10.0.208.3          General-Users        up
Et1/0.1              10.0.23.3           Special-Users        up
Et1/1.1              10.0.213.3          Special-Users        up
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
```

Fuente: Elaboración propia

Figura 25 Verificación interfaces IPv4 e IPv6 R1

```

R1#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
Ethernet0/0        unassigned      YES NVRAM   administratively down down
GigabitEthernet0/0 unassigned      YES NVRAM   administratively down down
Ethernet1/0         unassigned      YES NVRAM   up              up
Ethernet1/0.1      10.0.12.7       YES NVRAM   up              up
Ethernet1/0.2      10.0.12.7       YES NVRAM   up              up
Ethernet1/1         unassigned      YES NVRAM   up              up
Ethernet1/1.1      10.0.113.7      YES NVRAM   up              up
Ethernet1/1.2      10.0.108.7      YES NVRAM   up              up
Ethernet1/2         unassigned      YES NVRAM   administratively down down
Ethernet1/3         unassigned      YES NVRAM   administratively down down
R1#show run | inc route
ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.12.2
ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.12.2
ipv6 route vrf Special-Users ::/0 2001:DB8:ACAD:12::2
ipv6 route vrf General-Users ::/0 2001:DB8:ACAD:12::2
R1#show ip route vrf General-Users

Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 10.0.12.2 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 10.0.12.2
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.12.0/24 is directly connected, Ethernet1/0.2
L     10.0.12.7/32 is directly connected, Ethernet1/0.2
C     10.0.108.0/24 is directly connected, Ethernet1/1.2
L     10.0.108.7/32 is directly connected, Ethernet1/1.2
R1#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 10.0.12.2 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 10.0.12.2
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.12.0/24 is directly connected, Ethernet1/0.1
L     10.0.12.7/32 is directly connected, Ethernet1/0.1
C     10.0.113.0/24 is directly connected, Ethernet1/1.1
L     10.0.113.7/32 is directly connected, Ethernet1/1.1
R1#

```

Fuente: Elaboración propia

Figura 26 Verificación interfaces IPv4 e IPv6 R2

```

R2#show ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
Ethernet0/0        unassigned      YES NVRAM   administratively down down
GigabitEthernet0/0 unassigned      YES NVRAM   administratively down down
Ethernet1/0        unassigned      YES NVRAM   up           up
Ethernet1/0.1      10.0.12.2       YES NVRAM   up           up
Ethernet1/0.2      10.0.12.2       YES NVRAM   up           up
Ethernet1/1        unassigned      YES NVRAM   up           up
Ethernet1/1.1      10.0.23.2       YES NVRAM   up           up
Ethernet1/1.2      10.0.23.2       YES NVRAM   up           up
Ethernet1/2        unassigned      YES NVRAM   administratively down down
Ethernet1/3        unassigned      YES NVRAM   administratively down down
R2#show run | inc route
ip route vrf General-Users 10.0.108.0 255.255.255.0 10.0.12.7
ip route vrf General-Users 10.0.208.0 255.255.255.0 10.0.23.3
ip route vrf Special-Users 10.0.113.0 255.255.255.0 10.0.12.7
ip route vrf Special-Users 10.0.213.0 255.255.255.0 10.0.23.3
ipv6 route vrf General-Users 2001:DB8:ACAD:108::/64 2001:DB8:ACAD:12::1
ipv6 route vrf Special-Users 2001:DB8:ACAD:113::/64 2001:DB8:ACAD:12::1
ipv6 route vrf General-Users 2001:DB8:ACAD:208::/64 2001:DB8:ACAD:23::3
ipv6 route vrf Special-Users 2001:DB8:ACAD:213::/64 2001:DB8:ACAD:23::3
R2#show ip route vrf General-Users

Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.0.12.0/24 is directly connected, Ethernet1/0.2
L       10.0.12.2/32 is directly connected, Ethernet1/0.2
C       10.0.23.0/24 is directly connected, Ethernet1/1.2
L       10.0.23.2/32 is directly connected, Ethernet1/1.2
S       10.0.108.0/24 [1/0] via 10.0.12.7
S       10.0.208.0/24 [1/0] via 10.0.23.3
R2#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.0.12.0/24 is directly connected, Ethernet1/0.1
L       10.0.12.2/32 is directly connected, Ethernet1/0.1
C       10.0.23.0/24 is directly connected, Ethernet1/1.1
L       10.0.23.2/32 is directly connected, Ethernet1/1.1
S       10.0.113.0/24 [1/0] via 10.0.12.7
S       10.0.213.0/24 [1/0] via 10.0.23.3
R2#

```

Fuente: Elaboración propia

Figura 27 Verificación interfaces IPv4 e IPv6 R3

```

R3#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
Ethernet0/0        unassigned      YES NVRAM   administratively down down
GigabitEthernet0/0 unassigned      YES NVRAM   administratively down down
Ethernet1/0         unassigned      YES NVRAM   up              up
Ethernet1/0.1      10.0.23.3       YES NVRAM   up              up
Ethernet1/0.2      10.0.23.3       YES NVRAM   up              up
Ethernet1/1         unassigned      YES NVRAM   up              up
Ethernet1/1.1      10.0.213.3      YES NVRAM   up              up
Ethernet1/1.2      10.0.208.3      YES NVRAM   up              up
Ethernet1/2         unassigned      YES NVRAM   administratively down down
Ethernet1/3         unassigned      YES NVRAM   administratively down down
R3#show run | inc route
ip route vrf General-Users 0.0.0.0 0.0.0.0 10.0.23.2
ip route vrf Special-Users 0.0.0.0 0.0.0.0 10.0.23.2
ipv6 route vrf Special-Users ::/0 2001:DB8:ACAD:23::2
ipv6 route vrf General-Users ::/0 2001:DB8:ACAD:23::2
R3#show ip route vrf General-Users

Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is 10.0.23.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.23.2
     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.23.0/24 is directly connected, Ethernet1/0.2
L     10.0.23.3/32 is directly connected, Ethernet1/0.2
C     10.0.208.0/24 is directly connected, Ethernet1/1.2
L     10.0.208.3/32 is directly connected, Ethernet1/1.2
R3#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is 10.0.23.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.23.2
     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.23.0/24 is directly connected, Ethernet1/0.1
L     10.0.23.3/32 is directly connected, Ethernet1/0.1
C     10.0.213.0/24 is directly connected, Ethernet1/1.1
L     10.0.213.3/32 is directly connected, Ethernet1/1.1
R3#

```

Fuente: Elaboración propia

Figura 28 Verificación enrutamiento IPv4 e IPv6 R1

```
R1#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is 10.0.12.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.12.2
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.12.0/24 is directly connected, Ethernet1/0.1
L     10.0.12.7/32 is directly connected, Ethernet1/0.1
C     10.0.113.0/24 is directly connected, Ethernet1/1.1
L     10.0.113.7/32 is directly connected, Ethernet1/1.1
R1#show ip route vrf General-Users

Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is 10.0.12.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.12.2
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.12.0/24 is directly connected, Ethernet1/0.2
L     10.0.12.7/32 is directly connected, Ethernet1/0.2
C     10.0.108.0/24 is directly connected, Ethernet1/1.2
L     10.0.108.7/32 is directly connected, Ethernet1/1.2
R1#
*Apr  2 02:53:18.495: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D1 Ethernet0/2 (half duplex).
R1#
```

Fuente: Elaboración propia

Figura 29 Verificación enrutamiento IPv4 e IPv6 R2

```
R2#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.0.12.0/24 is directly connected, Ethernet1/0.1
L       10.0.12.2/32 is directly connected, Ethernet1/0.1
C       10.0.23.0/24 is directly connected, Ethernet1/1.1
L       10.0.23.2/32 is directly connected, Ethernet1/1.1
S       10.0.113.0/24 [1/0] via 10.0.12.7
S       10.0.213.0/24 [1/0] via 10.0.23.3
R2#show ip route vrf General-Users

Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2
        i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
        ia - IS-IS inter area, * - candidate default, U - per-user static route
        o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
        + - replicated route, % - next hop override

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.0.12.0/24 is directly connected, Ethernet1/0.2
L       10.0.12.2/32 is directly connected, Ethernet1/0.2
C       10.0.23.0/24 is directly connected, Ethernet1/1.2
L       10.0.23.2/32 is directly connected, Ethernet1/1.2
S       10.0.108.0/24 [1/0] via 10.0.12.7
S       10.0.208.0/24 [1/0] via 10.0.23.3
R2#
```

Fuente: Elaboración propia

Figura 30 Verificación enrutamiento IPv4 e IPv6 R3

```
R3#show ip route vrf Special-Users

Routing Table: Special-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 10.0.23.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.23.2
     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.23.0/24 is directly connected, Ethernet1/0.1
L     10.0.23.3/32 is directly connected, Ethernet1/0.1
C     10.0.213.0/24 is directly connected, Ethernet1/1.1
L     10.0.213.3/32 is directly connected, Ethernet1/1.1
R3#show ip route vrf Special-Users
*Apr  2 02:55:54.795: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D2 Ethernet0/3 (half duplex).
R3#show ip route vrf General-Users

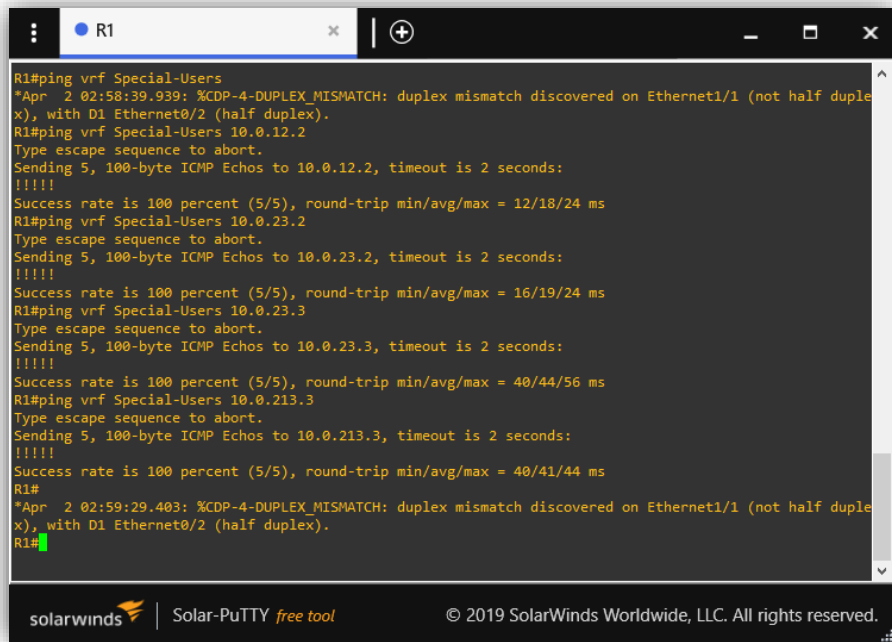
Routing Table: General-Users
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 10.0.23.2 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 10.0.23.2
     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C     10.0.23.0/24 is directly connected, Ethernet1/0.2
L     10.0.23.3/32 is directly connected, Ethernet1/0.2
C     10.0.208.0/24 is directly connected, Ethernet1/1.2
L     10.0.208.3/32 is directly connected, Ethernet1/1.2
R3#
```

Fuente: Elaboración propia

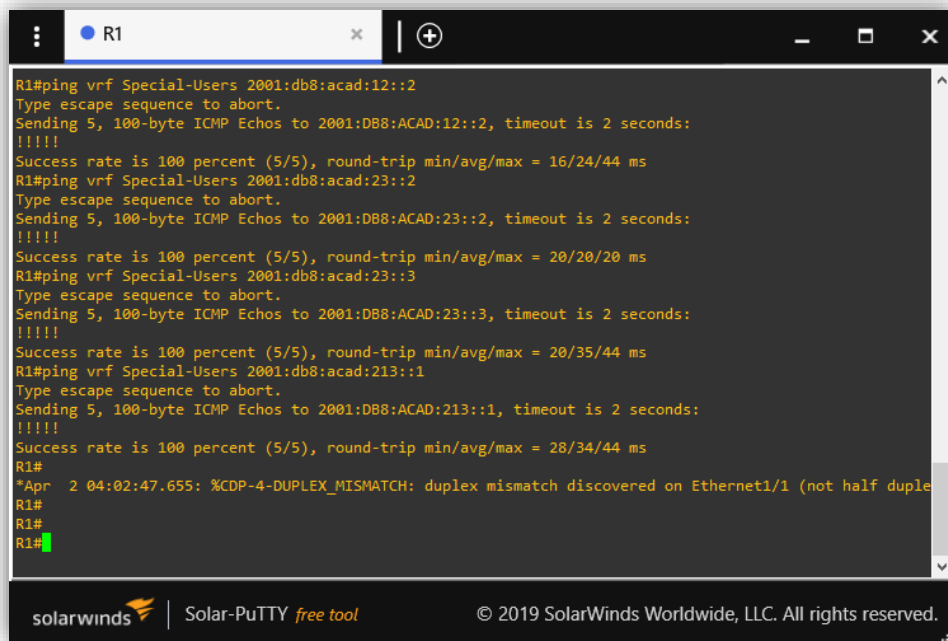
Figura 31 Verificación de conectividad IPv4 VRF Special-Users



```
R1#ping vrf Special-Users
*Apr 2 02:58:39.939: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D1 Ethernet0/2 (half duplex).
R1#ping vrf Special-Users 10.0.12.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.12.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/18/24 ms
R1#ping vrf Special-Users 10.0.23.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.23.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/19/24 ms
R1#ping vrf Special-Users 10.0.23.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.23.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/44/56 ms
R1#ping vrf Special-Users 10.0.213.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.213.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/41/44 ms
R1#
*Apr 2 02:59:29.403: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D1 Ethernet0/2 (half duplex).
R1#
```

Fuente: Elaboración propia

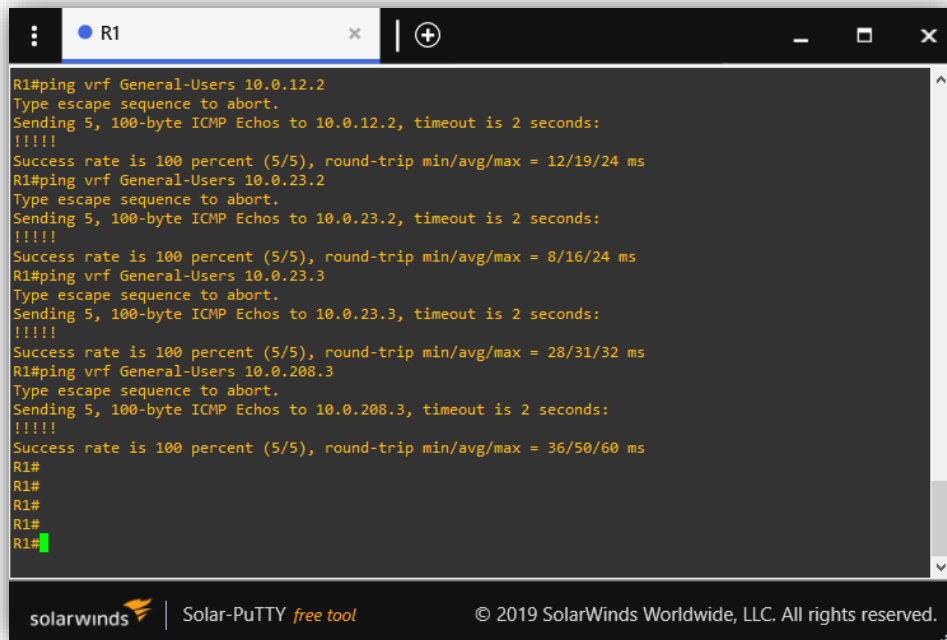
Figura 32 Verificación de conectividad IPv6 VRF Special-Users



```
R1#ping vrf Special-Users 2001:db8:acad:12::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:12::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/24/44 ms
R1#ping vrf Special-Users 2001:db8:acad:23::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:23::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
R1#ping vrf Special-Users 2001:db8:acad:23::3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:23::3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/35/44 ms
R1#ping vrf Special-Users 2001:db8:acad:213::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:213::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/34/44 ms
R1#
*Apr 2 04:02:47.655: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex)
R1#
R1#
R1#
```

Fuente: Elaboración propia

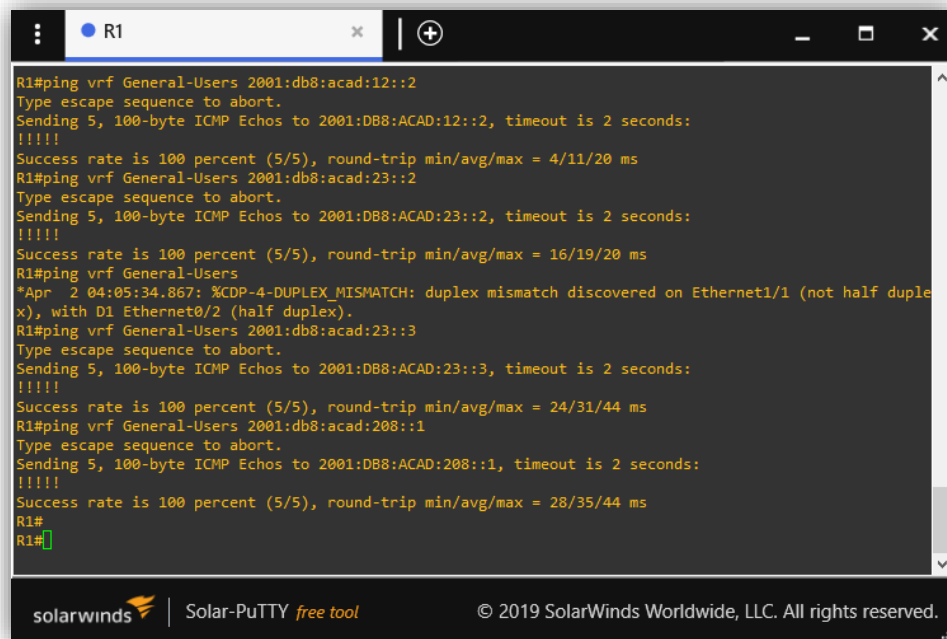
Figura 33 Verificación de conectividad IPv4 VRF General-Users



```
R1#ping vrf General-Users 10.0.12.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.12.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/19/24 ms
R1#ping vrf General-Users 10.0.23.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.23.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/24 ms
R1#ping vrf General-Users 10.0.23.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.23.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/31/32 ms
R1#ping vrf General-Users 10.0.208.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.208.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/50/60 ms
R1#
R1#
R1#
R1#
```

Fuente: Elaboración propia

Figura 34 Verificación de conectividad IPv6 VRF General-Users



```
R1#ping vrf General-Users 2001:db8:acad:12::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:12::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/11/20 ms
R1#ping vrf General-Users 2001:db8:acad:23::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:23::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/19/20 ms
R1#ping vrf General-Users
*Apr  2 04:05:34.867: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/1 (not half duplex), with D1 Ethernet0/2 (half duplex).
R1#ping vrf General-Users 2001:db8:acad:23::3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:23::3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/31/44 ms
R1#ping vrf General-Users 2001:db8:acad:208::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:208::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/35/44 ms
R1#
R1#
```

Fuente: Elaboración propia

3 CONFIGURAR CAPA 2

En esta parte, tendrá que configurar los Switches para soportar la conectividad con los dispositivos finales.

Las tareas de configuración son las siguientes.

3.1 DESHABILITAR TODAS LAS INTERFACES DE LOS SWITCHES

Tabla 10 Tabla de tareas 3.1

Task	Specification
En D1, D2, y A1, deshabilitar todas las interfaces	

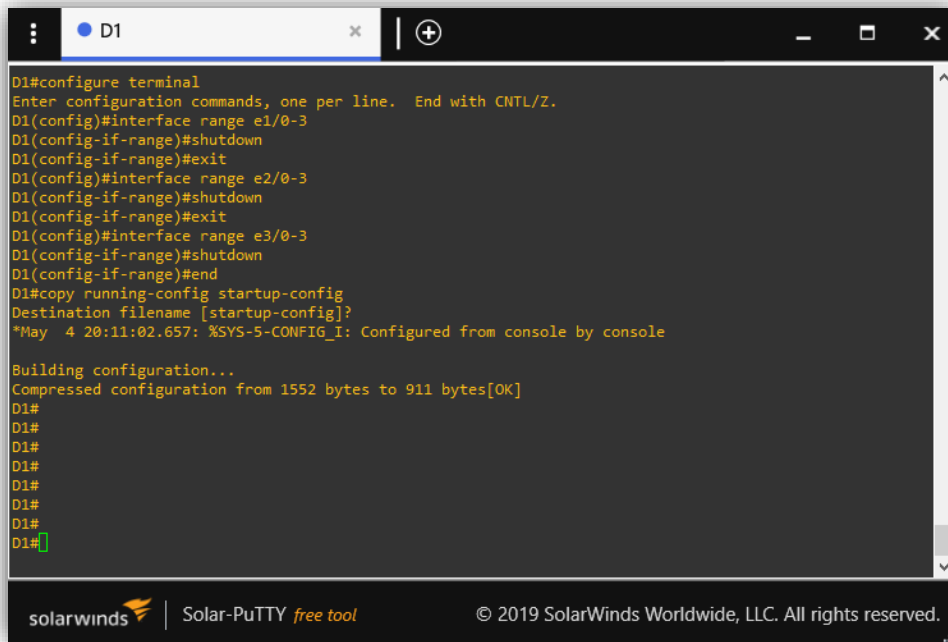
Tabla 11 Configuración para deshabilitar todas las interfaces en D1, D2 y A1

Command	Description
interface range "rango de interfaces"	Selecciona un rango de interfaces inicio-final, se pueden separar secciones utilizando comas
shutdown	Deshabilita una o varias interfaces seleccionadas previamente

Scripts para los dispositivos

```
D1, D2, A1
enable
configure terminal
interface range e1/0-3
shutdown
exit
interface range e2/0-3
shutdown
exit
interface range e3/0-3
shutdown
end
copy running-config startup-config
```

Figura 35 Configuración deshabilitar todas las interfaces D1

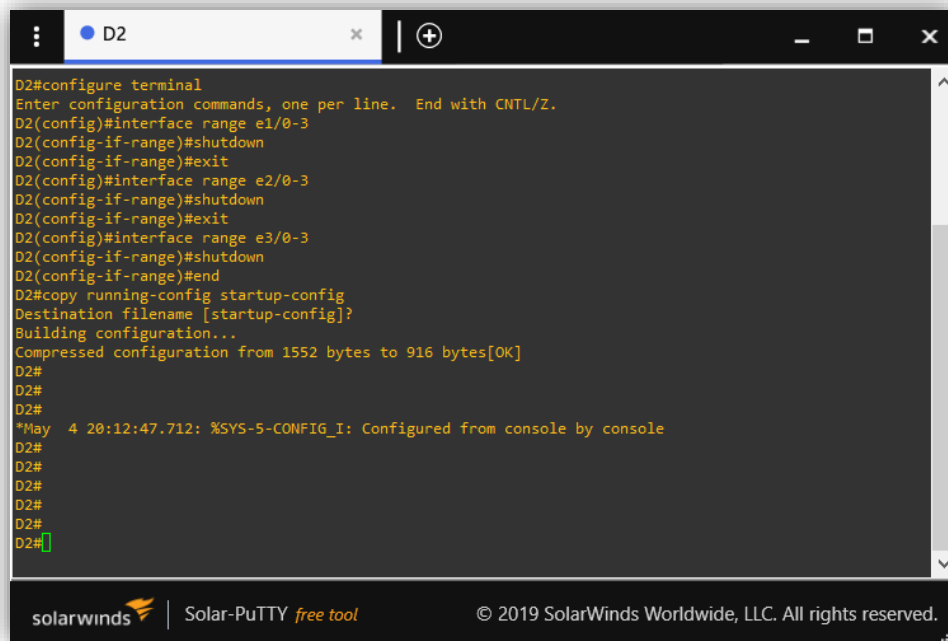


```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range e1/0-3
D1(config-if-range)#shutdown
D1(config-if-range)#exit
D1(config)#interface range e2/0-3
D1(config-if-range)#shutdown
D1(config-if-range)#exit
D1(config)#interface range e3/0-3
D1(config-if-range)#shutdown
D1(config-if-range)#end
D1#copy running-config startup-config
Destination filename [startup-config]?
*May  4 20:11:02.657: %SYS-5-CONFIG_I: Configured from console by console

Building configuration...
Compressed configuration from 1552 bytes to 911 bytes[OK]
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
```

Fuente: Elaboración propia

Figura 36 Configuración deshabilitar todas las interfaces D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface range e1/0-3
D2(config-if-range)#shutdown
D2(config-if-range)#exit
D2(config)#interface range e2/0-3
D2(config-if-range)#shutdown
D2(config-if-range)#exit
D2(config)#interface range e3/0-3
D2(config-if-range)#shutdown
D2(config-if-range)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1552 bytes to 916 bytes[OK]
D2#
D2#
D2#
*May  4 20:12:47.712: %SYS-5-CONFIG_I: Configured from console by console
D2#
D2#
D2#
D2#
D2#
```

Fuente: Elaboración propia

Figura 37 Configuración deshabilitar todas las interfaces A1

```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface range e1/0-3
A1(config-if-range)#shutdown
A1(config-if-range)#exit
A1(config)#interface range e2/0-3
A1(config-if-range)#shutdown
A1(config-if-range)#exit
A1(config)#interface range e3/0-3
A1(config-if-range)#shutdown
A1(config-if-range)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1552 bytes to 913 bytes[OK]
A1#
A1#
A1#
A1#
A1#
*May  4 20:14:01.128: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
A1#
```

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Fuente: Elaboración propia

3.2 CONFIGURACIÓN DE ENLACES TRONCALES

Tabla 12 Tabla de tareas 3.2

Task	Specification
En D1 y D2, configurar los enlaces troncales hacia R1 y R3	Configurar y habilitar el e0/# link como trunk link

Tabla 13 Configuración de enlaces troncales en D1 y D2

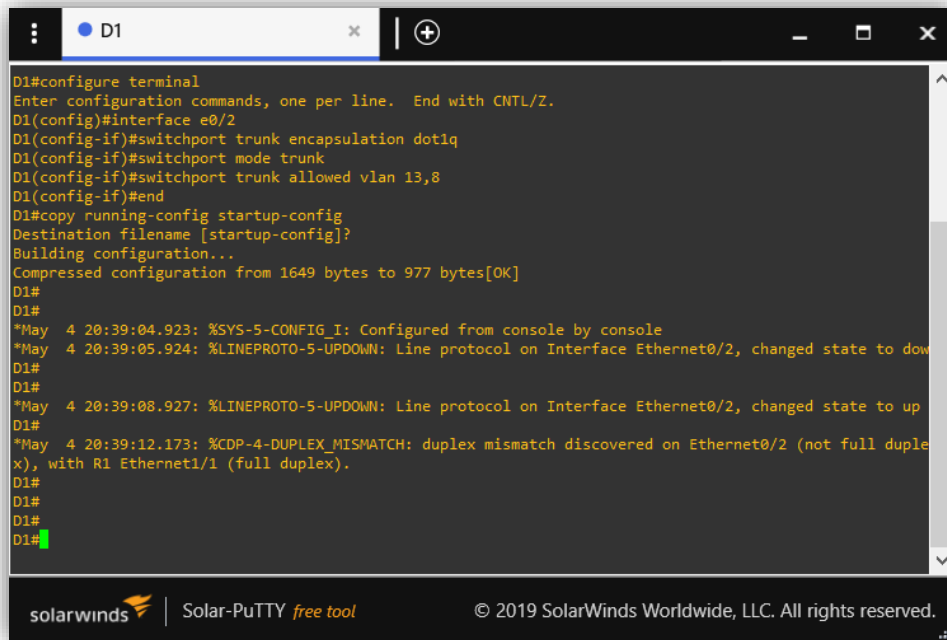
Command	Description
switchport trunk encapsulation dot1q	Habilita la encapsulación dot1q para la interfaz previamente seleccionada
switchport mode trunk	Habilita en modo troncal para la interfaz previamente seleccionada
switchport trunk allowed vlan 13,8	Configuración de vlan permitidas en el enlace troncal

Scripts para los dispositivos

```
D1
enable
configure terminal
interface e0/2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 13,8
end
copy running-config startup-config
```

```
D2
enable
configure terminal
interface e0/3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 13,8
end
copy running-config startup-config
```

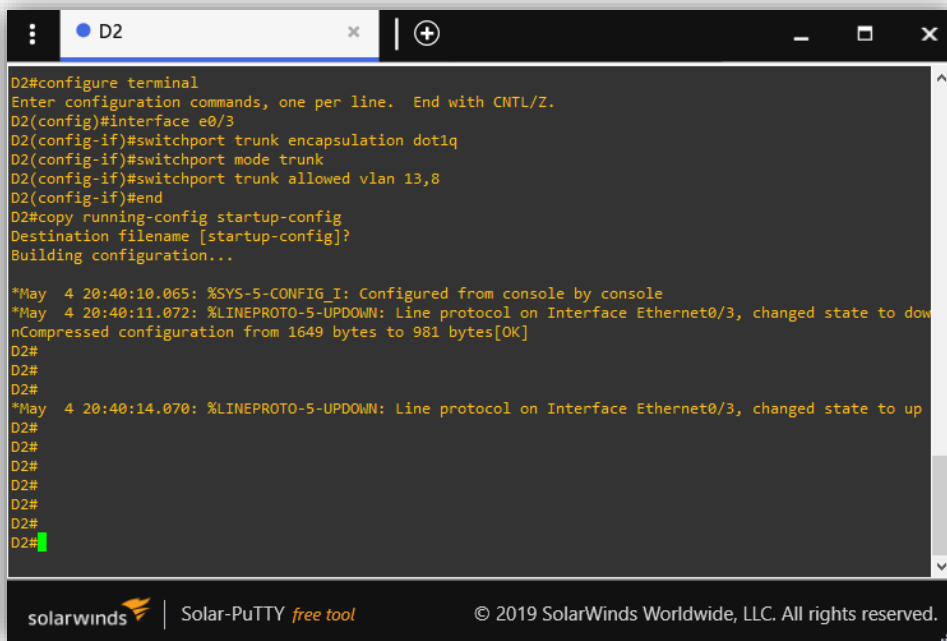
Figura 38 Configuración de enlaces troncales D1



```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface e0/2
D1(config-if)#switchport trunk encapsulation dot1q
D1(config-if)#switchport mode trunk
D1(config-if)#switchport trunk allowed vlan 13,8
D1(config-if)#end
D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1649 bytes to 977 bytes[OK]
D1#
D1#
*May  4 20:39:04.923: %SYS-5-CONFIG_I: Configured from console by console
*May  4 20:39:05.924: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/2, changed state to down
D1#
D1#
*May  4 20:39:08.927: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/2, changed state to up
D1#
*May  4 20:39:12.173: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet0/2 (not full duplex), with R1 Ethernet1/1 (full duplex).
D1#
D1#
D1#
D1#
```

Fuente: Elaboración propia

Figura 39 Configuración de enlaces troncales D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface e0/3
D2(config-if)#switchport trunk encapsulation dot1q
D2(config-if)#switchport mode trunk
D2(config-if)#switchport trunk allowed vlan 13,8
D2(config-if)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1649 bytes to 981 bytes[OK]
D2#
D2#
*May  4 20:40:10.065: %SYS-5-CONFIG_I: Configured from console by console
*May  4 20:40:11.072: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to down
D2#
D2#
*May  4 20:40:14.070: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to up
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

Fuente: Elaboración propia

3.3 CONFIGURACIÓN DE ETHERCHANNEL

Tabla 14 Tabla de tareas 3.3

Task	Specification
En D1 y A1, configurar EtherChannel	En D1, configurar y habilitar: <ul style="list-style-type: none">• Interface e0/0 and e0/1• Port Channel 1 using PAgP En A1, configurar y habilitar: <ul style="list-style-type: none">• Interface E0/0 and E0/1• Port Channel 1 using PAgP

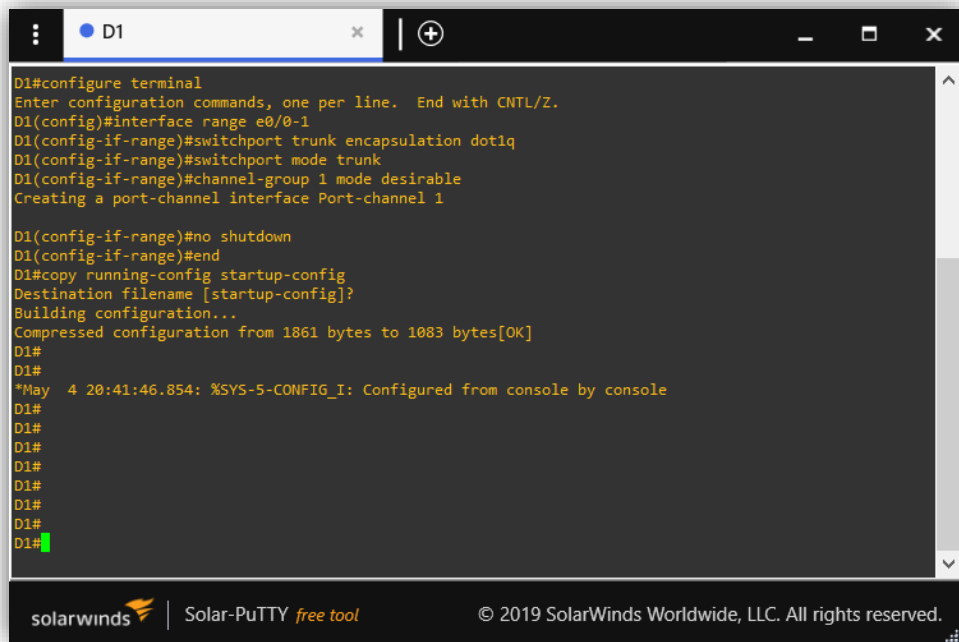
Tabla 15 Configuración de EtherChannel en D1 y A1

Command	Description
channel-group 1 mode desirable	Habilita Etherchannel con negociación automática con PAgP

Scripts para los dispositivos

```
D1, A1
enable
configure terminal
interface range e0/0-1
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 1 mode desirable
no shutdown
end
copy running-config startup-config
```

Figura 40 Configuración de EtherChannel D1

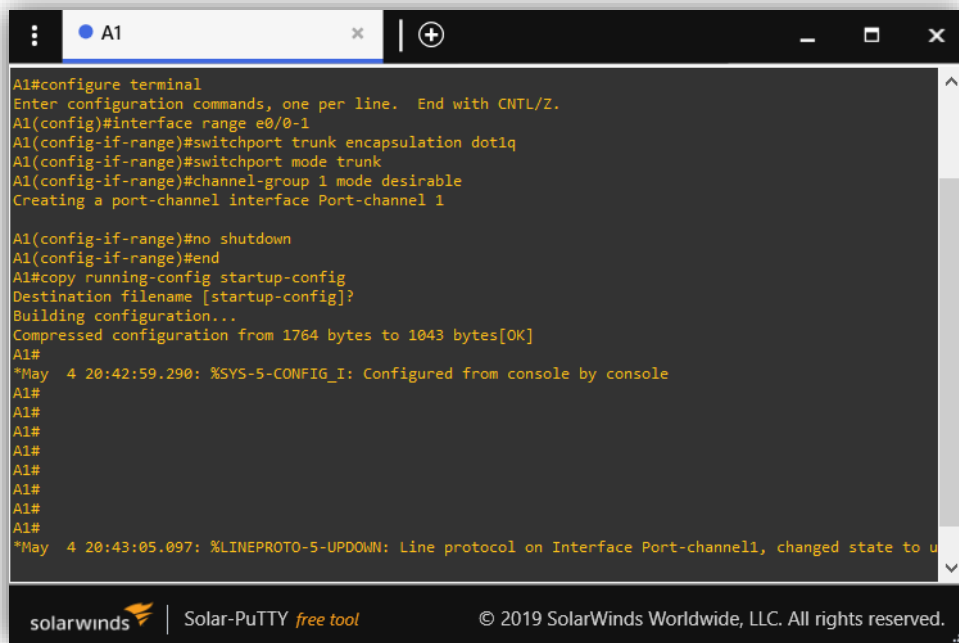


```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range e0/0-1
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

D1(config-if-range)#no shutdown
D1(config-if-range)#end
D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1861 bytes to 1083 bytes[OK]
D1#
D1#
*May  4 20:41:46.854: %SYS-5-CONFIG_I: Configured from console by console
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
```

Fuente: Elaboración propia

Figura 41 Configuración de EtherChannel A1



```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface range e0/0-1
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

A1(config-if-range)#no shutdown
A1(config-if-range)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1764 bytes to 1043 bytes[OK]
A1#
A1#
*May  4 20:42:59.290: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
*May  4 20:43:05.097: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to u
```

Fuente: Elaboración propia

3.4 CONFIGURAR ACCESS PORTS

Tabla 16 Tabla de tareas 3.4

Task	Specification
En D1, D2, y A1, configurar access ports para PC1, PC2, PC3, y PC4	Configurar y habilitar los Access ports como se indica: <ul style="list-style-type: none"> • En D1, configurar interface E0/3 modo access port en VLAN 13 y habilitar Portfast. • En D2, configurar interface E0/2 modo access port en VLAN 13 y habilitar Portfast. • En D2, configurar interface E0/1 modo access port en VLAN 8 y habilitar Portfast. • En A1, configurar interface E0/2 modo access port en VLAN 8 y habilitar Portfast.

Tabla 17 Configuración de access ports en D1, D2 y A1 para PC1, PC2, PC3, PC4

Command	Description
switchport mode access	Habilita el modo access al puerto seleccionado previamente
switchport access vlan "# id"	Habilita el acceso a una vlan en específico para el puerto seleccionado previamente
spanning-tree portfast	Habilita rapid spanning tree para el puerto seleccionado previamente

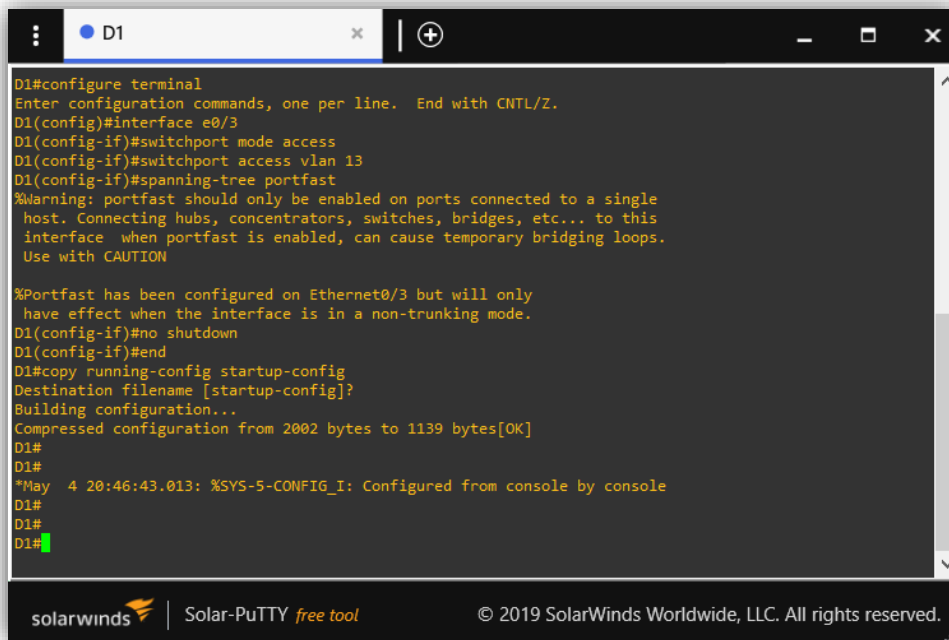
Scripts para los dispositivos

```
D1
enable
configure terminal
interface e0/3
switchport mode access
switchport access vlan 13
spanning-tree portfast
no shutdown
end
copy running-config startup-config
```

```
D2
enable
configure terminal
interface e0/2
switchport mode access
switchport access vlan 13
spanning-tree portfast
no shutdown
exit
interface e0/1
switchport mode access
switchport access vlan 8
spanning-tree portfast
no shutdown
end
copy running-config startup-config
```

```
A1
enable
configure terminal
interface e0/2
switchport mode access
switchport access vlan 8
spanning-tree portfast
no shutdown
end
copy running-config startup-config
```

Figura 42 Configuración access ports D1

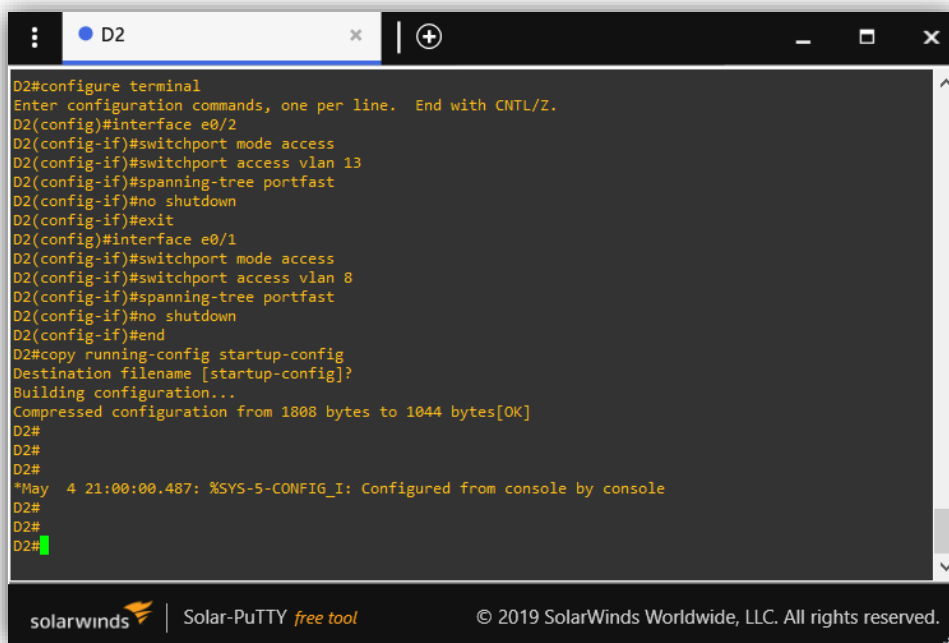


```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface e0/3
D1(config-if)#switchport mode access
D1(config-if)#switchport access vlan 13
D1(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. 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 Ethernet0/3 but will only
have effect when the interface is in a non-trunking mode.
D1(config-if)#no shutdown
D1(config-if)#end
D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2002 bytes to 1139 bytes[OK]
D1#
D1#
*May  4 20:46:43.013: %SYS-5-CONFIG_I: Configured from console by console
D1#
D1#
D1#
```

Fuente: Elaboración propia

Figura 43 Configuración access ports D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface e0/2
D2(config-if)#switchport mode access
D2(config-if)#switchport access vlan 13
D2(config-if)#spanning-tree portfast
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#interface e0/1
D2(config-if)#switchport mode access
D2(config-if)#switchport access vlan 8
D2(config-if)#spanning-tree portfast
D2(config-if)#no shutdown
D2(config-if)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1808 bytes to 1044 bytes[OK]
D2#
D2#
D2#
*May  4 21:00:00.487: %SYS-5-CONFIG_I: Configured from console by console
D2#
D2#
D2#
```

Fuente: Elaboración propia

Figura 44 Configuración access ports A1

```
A1
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface e0/2
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 8
% Access VLAN does not exist. Creating vlan 8
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 Ethernet0/2 but will only
  have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1904 bytes to 1102 bytes[OK]
A1#
A1#
*May  4 21:00:59.198: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
```

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Fuente: Elaboración propia

3.5 VERIFICACION DE CONFIGURACIONES Y CONECTIVIDAD DE PC A PC

Tabla 18 Tabla de tareas 3.5

Task	Specification
Verificar la conectividad PC a PC	Desde PC1, verificar la conectividad IPv4 e IPv6 hacia PC2. Desde PC3, verificar la conectividad IPv4 e IPv6 hacia PC4.

Se realizan pruebas de conectividad de PC a PC para asegurar su correcto funcionamiento.

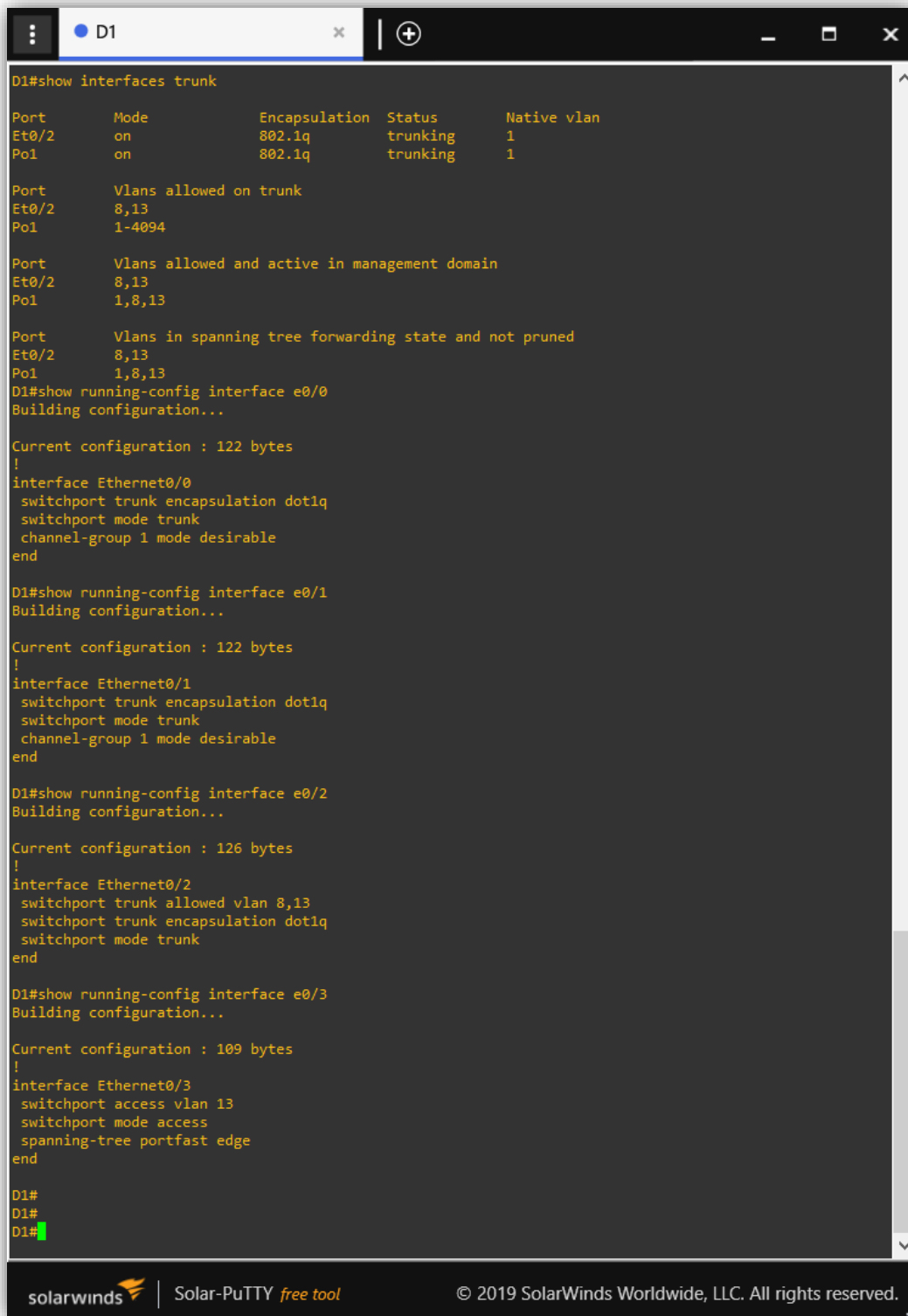
Scripts para los dispositivos

```
D1, D2, A1
show interfaces trunk
show running-config interface e0/0
show running-config interface e0/1
show running-config interface e0/2
show running-config interface e0/3
show etherchannel summary
```

```
PC1 a PC2
ping 10.0.213.72
ping 2001:db8:acad:213::50
```

```
PC3 a PC4
ping 10.0.208.72
ping 2001:db8:acad:208::50
```

Figura 45 Verificación de interfaces D1



```
D1#show interfaces trunk
Port      Mode      Encapsulation  Status      Native vlan
Et0/2     on        802.1q         trunking    1
Po1       on        802.1q         trunking    1

Port      Vlans allowed on trunk
Et0/2     8,13
Po1       1-4094

Port      Vlans allowed and active in management domain
Et0/2     8,13
Po1       1,8,13

Port      Vlans in spanning tree forwarding state and not pruned
Et0/2     8,13
Po1       1,8,13
D1#show running-config interface e0/0
Building configuration...

Current configuration : 122 bytes
!
interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode desirable
end

D1#show running-config interface e0/1
Building configuration...

Current configuration : 122 bytes
!
interface Ethernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode desirable
end

D1#show running-config interface e0/2
Building configuration...

Current configuration : 126 bytes
!
interface Ethernet0/2
 switchport trunk allowed vlan 8,13
 switchport trunk encapsulation dot1q
 switchport mode trunk
end

D1#show running-config interface e0/3
Building configuration...

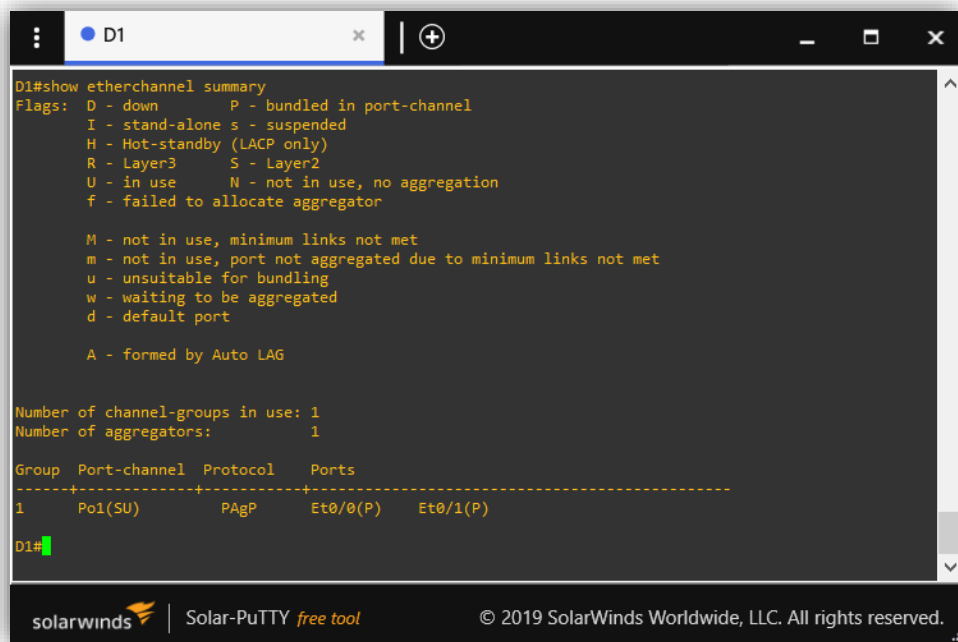
Current configuration : 109 bytes
!
interface Ethernet0/3
 switchport access vlan 13
 switchport mode access
 spanning-tree portfast edge
end

D1#
D1#
D1#
```

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Fuente: Elaboración propia

Figura 46 Verificación de EtherChannel D1



```
D1#show etherchannel summary
Flags:  D - down          P - bundled in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators:          1

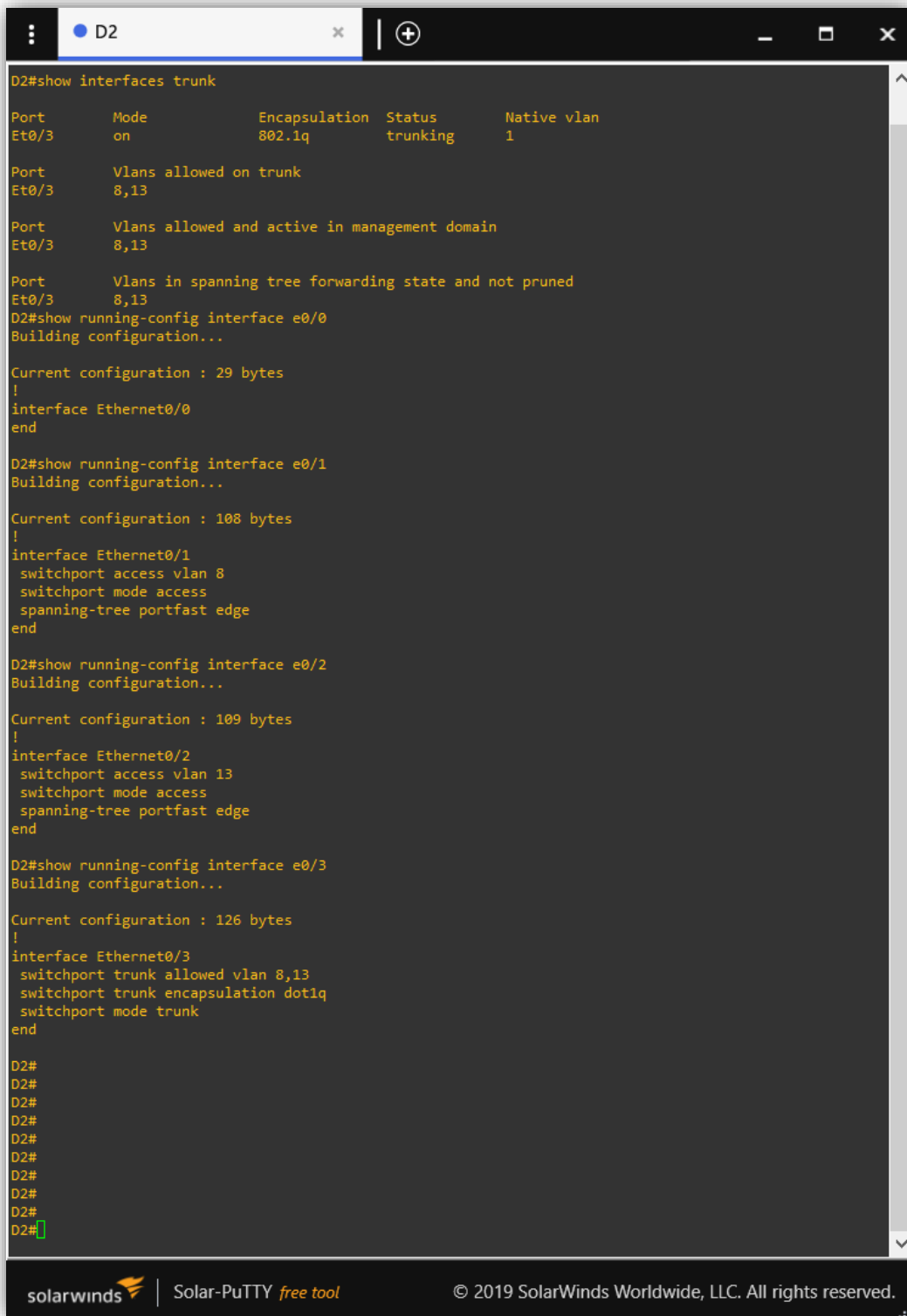
Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
1      Po1(SU)         PAgP        Et0/0(P)  Et0/1(P)

D1#
```

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Fuente: Elaboración propia

Figura 47 Verificación de interfaces D2



```
D2#show interfaces trunk
Port      Mode      Encapsulation  Status      Native vlan
Et0/3     on        802.1q         trunking    1

Port      Vlans allowed on trunk
Et0/3     8,13

Port      Vlans allowed and active in management domain
Et0/3     8,13

Port      Vlans in spanning tree forwarding state and not pruned
Et0/3     8,13
D2#show running-config interface e0/0
Building configuration...

Current configuration : 29 bytes
!
interface Ethernet0/0
end

D2#show running-config interface e0/1
Building configuration...

Current configuration : 108 bytes
!
interface Ethernet0/1
 switchport access vlan 8
 switchport mode access
 spanning-tree portfast edge
end

D2#show running-config interface e0/2
Building configuration...

Current configuration : 109 bytes
!
interface Ethernet0/2
 switchport access vlan 13
 switchport mode access
 spanning-tree portfast edge
end

D2#show running-config interface e0/3
Building configuration...

Current configuration : 126 bytes
!
interface Ethernet0/3
 switchport trunk allowed vlan 8,13
 switchport trunk encapsulation dot1q
 switchport mode trunk
end

D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

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Fuente:

Elaboración propia

Figura 48 Verificación de EtherChannel D2 no requiere

```
D2#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

       M - not in use, minimum links not met
       m - not in use, port not aggregated due to minimum links not met
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port

       A - formed by Auto LAG

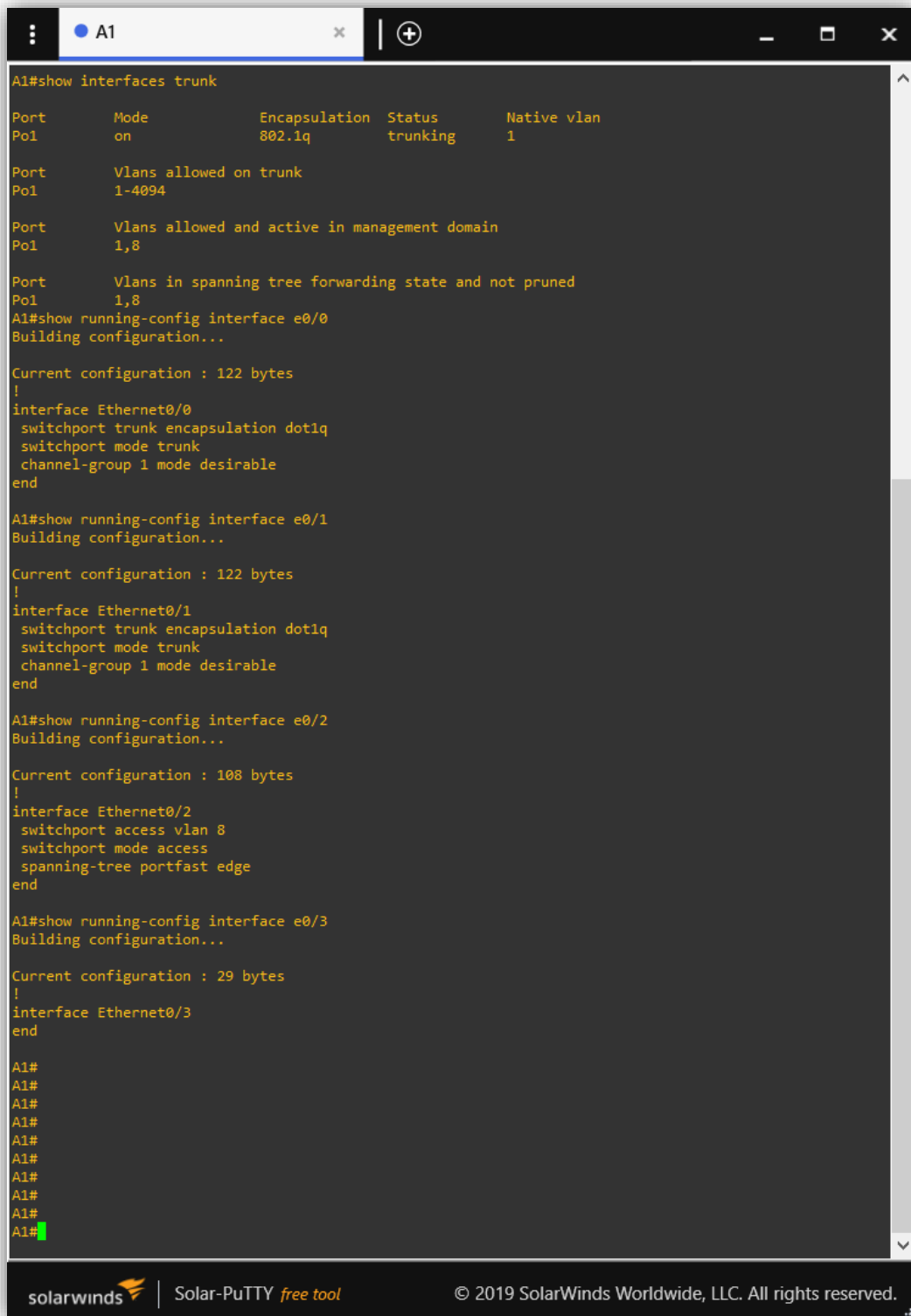
Number of channel-groups in use: 0
Number of aggregators:          0

Group  Port-channel  Protocol  Ports
-----+-----+-----+-----
D2#
D2#
```

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Fuente: Elaboración propia

Figura 49 Verificación de interfaces A1



```
A1#show interfaces trunk

Port      Mode           Encapsulation  Status        Native vlan
Po1       on             802.1q         trunking      1

Port      Vlans allowed on trunk
Po1       1-4094

Port      Vlans allowed and active in management domain
Po1       1,8

Port      Vlans in spanning tree forwarding state and not pruned
Po1       1,8
A1#show running-config interface e0/0
Building configuration...

Current configuration : 122 bytes
!
interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode desirable
end

A1#show running-config interface e0/1
Building configuration...

Current configuration : 122 bytes
!
interface Ethernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode desirable
end

A1#show running-config interface e0/2
Building configuration...

Current configuration : 108 bytes
!
interface Ethernet0/2
 switchport access vlan 8
 switchport mode access
 spanning-tree portfast edge
end

A1#show running-config interface e0/3
Building configuration...

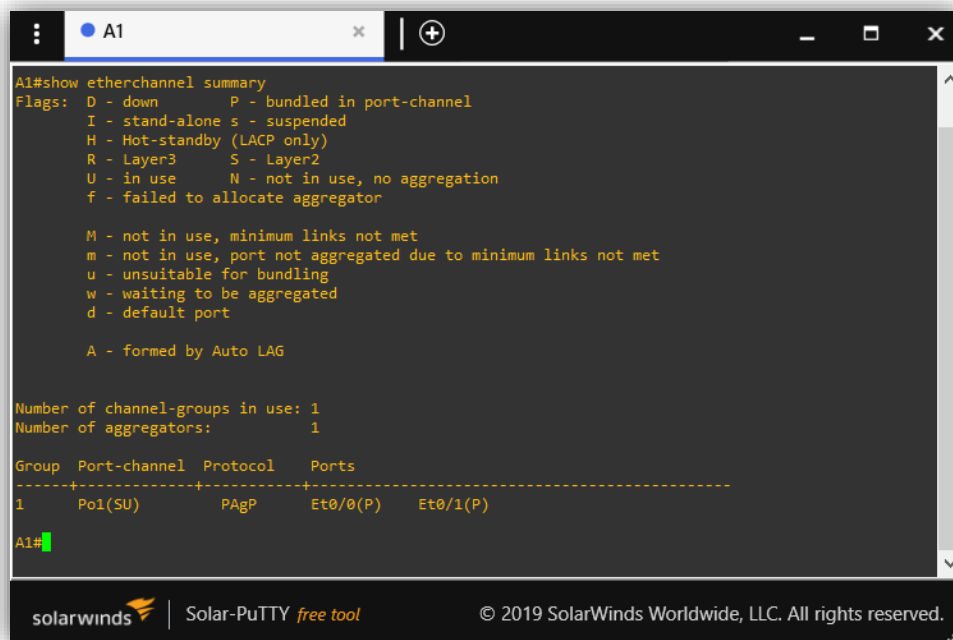
Current configuration : 29 bytes
!
interface Ethernet0/3
end

A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
```

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Fuente: Elaboración propia

Figura 50 Verificación de EtherChannel A1



```
A1#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

       M - not in use, minimum links not met
       m - not in use, port not aggregated due to minimum links not met
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port

       A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators:          1

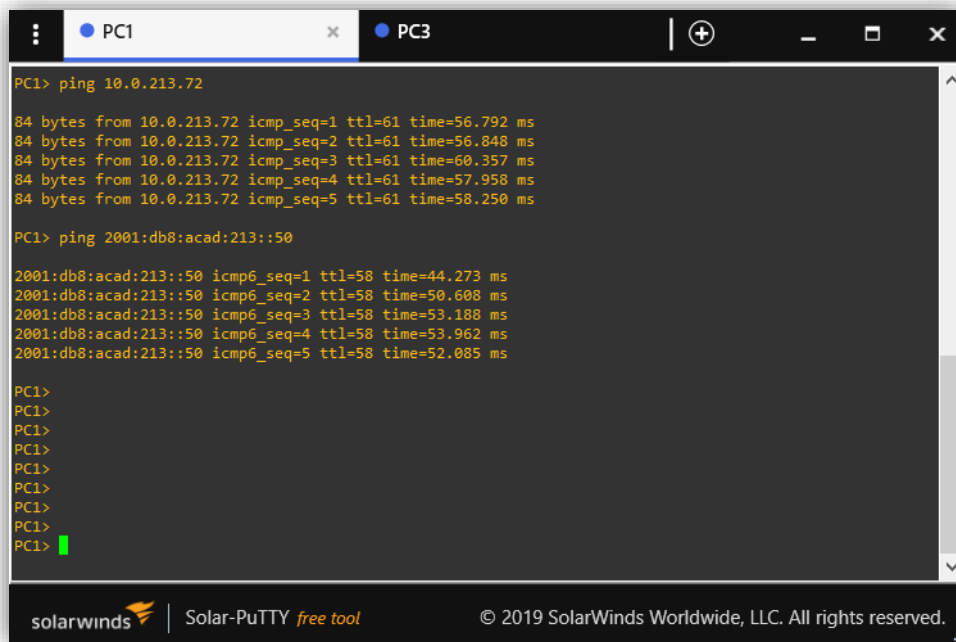
Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
1      Po1(SU)        PAgP        Et0/0(P)  Et0/1(P)

A1#
```

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Fuente: Elaboración propia

Figura 51 Verificación de conectividad PC1 a PC2 IPv4 e IPv6



```
PC1> ping 10.0.213.72

84 bytes from 10.0.213.72 icmp_seq=1 ttl=61 time=56.792 ms
84 bytes from 10.0.213.72 icmp_seq=2 ttl=61 time=56.848 ms
84 bytes from 10.0.213.72 icmp_seq=3 ttl=61 time=60.357 ms
84 bytes from 10.0.213.72 icmp_seq=4 ttl=61 time=57.958 ms
84 bytes from 10.0.213.72 icmp_seq=5 ttl=61 time=58.250 ms

PC1> ping 2001:db8:acad:213::50

2001:db8:acad:213::50 icmp6_seq=1 ttl=58 time=44.273 ms
2001:db8:acad:213::50 icmp6_seq=2 ttl=58 time=50.608 ms
2001:db8:acad:213::50 icmp6_seq=3 ttl=58 time=53.188 ms
2001:db8:acad:213::50 icmp6_seq=4 ttl=58 time=53.962 ms
2001:db8:acad:213::50 icmp6_seq=5 ttl=58 time=52.085 ms

PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
PC1>
```

Fuente: Elaboración propia

Figura 52 Verificación de conectividad PC3 a PC4 IPv4 e IPv6



```
PC3> ping 10.0.208.72

84 bytes from 10.0.208.72 icmp_seq=1 ttl=61 time=54.911 ms
84 bytes from 10.0.208.72 icmp_seq=2 ttl=61 time=55.888 ms
84 bytes from 10.0.208.72 icmp_seq=3 ttl=61 time=46.671 ms
84 bytes from 10.0.208.72 icmp_seq=4 ttl=61 time=59.787 ms
84 bytes from 10.0.208.72 icmp_seq=5 ttl=61 time=55.060 ms

PC3> ping 2001:db8:acad:208::50

2001:db8:acad:208::50 icmp6_seq=1 ttl=58 time=41.857 ms
2001:db8:acad:208::50 icmp6_seq=2 ttl=58 time=34.212 ms
2001:db8:acad:208::50 icmp6_seq=3 ttl=58 time=50.027 ms
2001:db8:acad:208::50 icmp6_seq=4 ttl=58 time=60.981 ms
2001:db8:acad:208::50 icmp6_seq=5 ttl=58 time=52.469 ms

PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
PC3>
```

Fuente: Elaboración propia

4 CONFIGURAR SEGURIDAD

Configuración de varios mecanismos de seguridad en los dispositivos de la topología. Las tareas de configuración son las siguientes:

4.1 CONFIGURACIÓN SEGURIDAD PRIVILEGIADA

Tabla 19 Tabla de tareas 4.1

Task	Specification
En todos los dispositivos Secure privileged EXE mode	Configurar enable secret como se indica a continuación: <ul style="list-style-type: none">• Algorithm type: SCRYPT• Password: nombreestudianteXYZ.

Tabla 20 Configuración privilegiada modo EXE para todos los dispositivos

Command	Description
enable algorithm-type scrypt secret brandodiaz723.	Configuración de contraseña cifrada con el algoritmo scrypt con la clave brandodiaz723 (Nota: para el firmware de los router c7200 no está disponible el algoritmo scrypt, configurar con enable secret)

Scripts para los dispositivos

```
R1, R2, R3
enable
configure terminal
enable secret brandodiaz723
end
copy running-config startup-config
```

```
D1, D2, A1
enable
configure terminal
enable algorithm-type scrypt secret brandodiaz723
end
copy running-config startup-config
```

Figura 53 Configuración privilegiada modo EXE R1

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#enable secret brandodiaz723
R1(config)#end
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

*May 4 22:08:53.747: %SYS-5-CONFIG_I: Configured from console by console[OK]
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

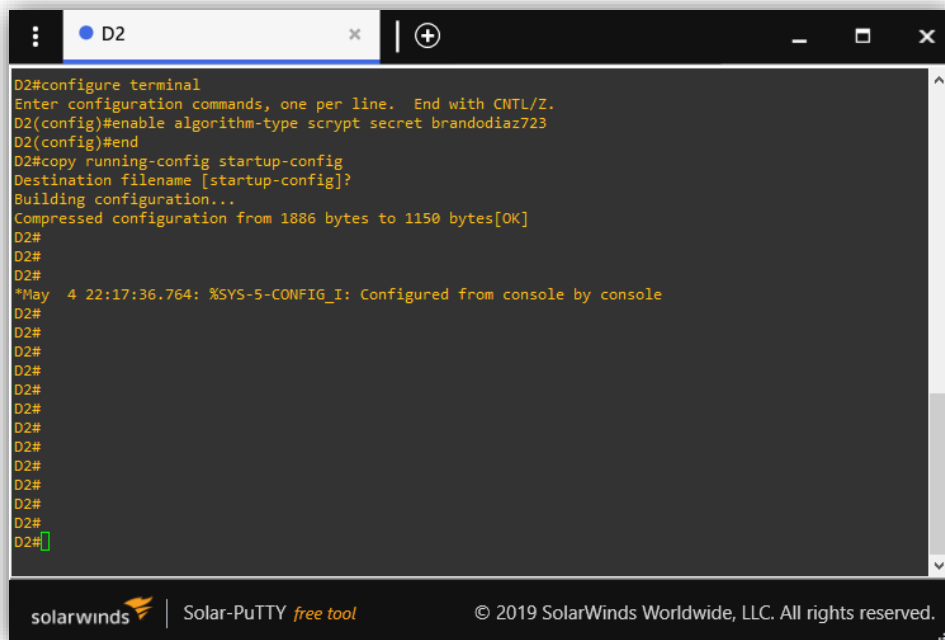
Fuente: Elaboración propia

Figura 54 Configuración privilegiada modo EXE R2

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#enable secret brandodiaz723
R2(config)#end
R2#copy running-config startup-config
Destination filename [startup-config]?
*May 4 22:13:07.995: %SYS-5-CONFIG_I: Configured from console
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

Fuente: Elaboración propia

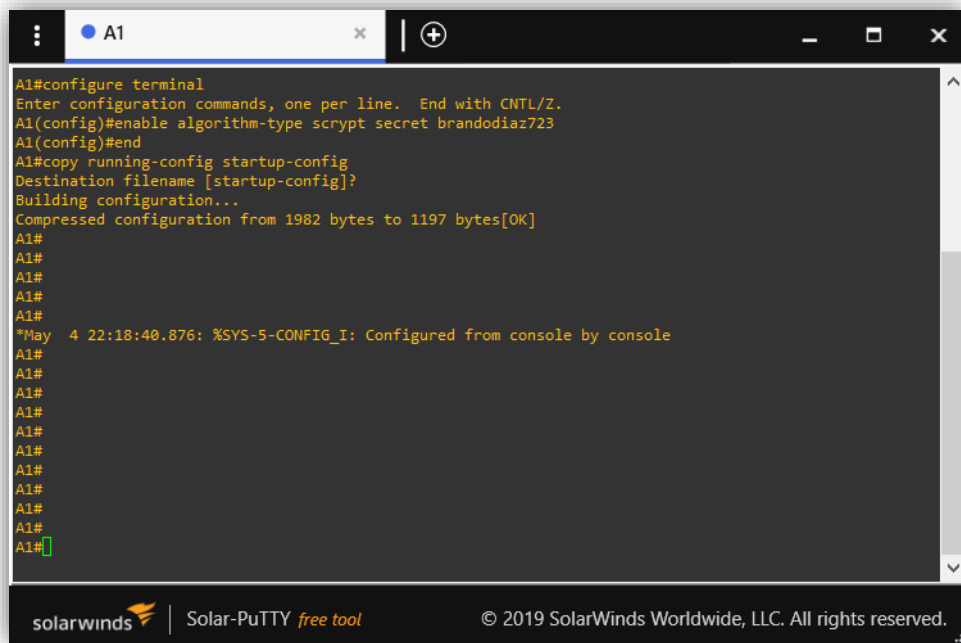
Figura 57 Configuración privilegiada modo EXE D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#enable algorithm-type scrypt secret brandodiaz723
D2(config)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1886 bytes to 1150 bytes[OK]
D2#
D2#
D2#
*May 4 22:17:36.764: %SYS-5-CONFIG_I: Configured from console by console
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

Fuente: Elaboración propia

Figura 58 Configuración privilegiada modo EXE A1



```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#enable algorithm-type scrypt secret brandodiaz723
A1(config)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1982 bytes to 1197 bytes[OK]
A1#
A1#
A1#
A1#
A1#
*May 4 22:18:40.876: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
```

Fuente: Elaboración propia

4.2 CREACIÓN DE CUENTA DE USUARIO LOCAL PARA TODOS LOS DISPOSITIVOS

Tabla 21 Tabla de tareas 4.2

Task	Specification
En todos los dispositivos Crear un local user account	Configurar un local user: <ul style="list-style-type: none">• Name: admin• Privilege level: 15• Algorithm type: SCRYPT• Password: nombrestudianteXYZ.

Tabla 22 Creación de cuenta de usuario local para todos los dispositivos

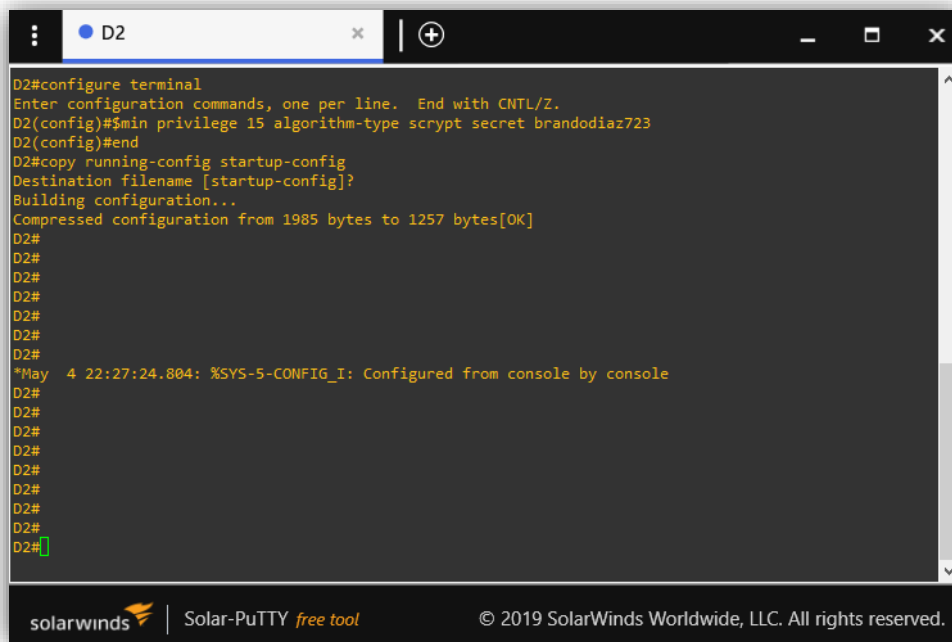
Command	Description
username "nombre" privilege 15 algorithm-type scrypt secret brandodiaz723	Creación de cuenta local con privilegio máximo y contraseña con algoritmo scrypt (Nota: para el firmware de los router c7200 no está disponible el algoritmo scrypt, configurar con enable secret)

Scripts para los dispositivos

```
R1, R2, R3
enable
configure terminal
username admin privilege 15 secret brandodiaz723
end
copy running-config startup-config
```

```
D1, D2, A1
enable
configure terminal
username admin privilege 15 algorithm-type scrypt secret brandodiaz723
end
copy running-config startup-config
```


Figura 63 Creación de cuenta de usuario local y clave D2

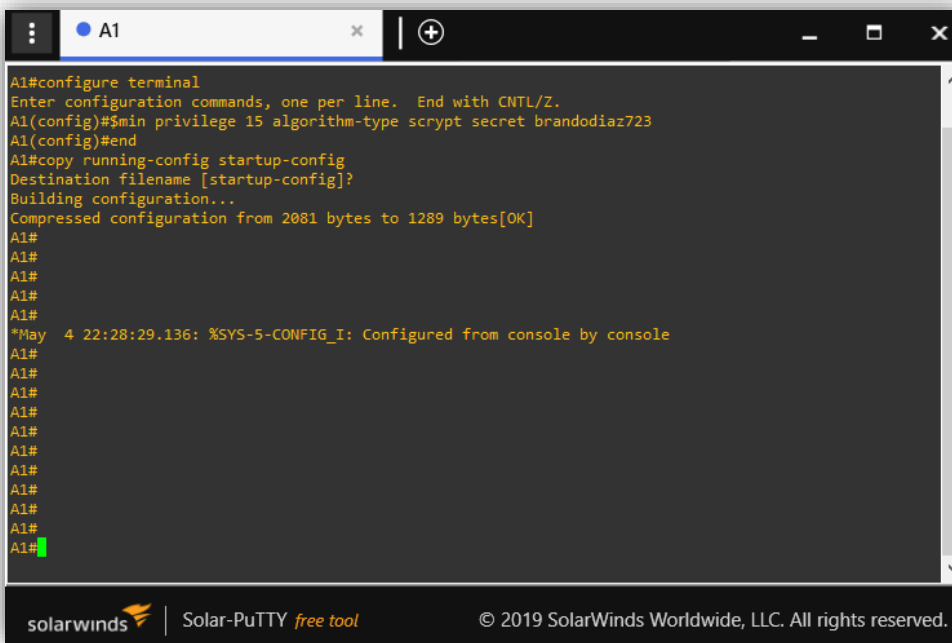


```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#$min privilege 15 algorithm-type scrypt secret brandodiaz723
D2(config)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1985 bytes to 1257 bytes[OK]
D2#
D2#
D2#
D2#
D2#
D2#
D2#
*May  4 22:27:24.804: %SYS-5-CONFIG_I: Configured from console by console
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

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Fuente: Elaboración propia

Figura 64 Creación de cuenta de usuario local y clave A1



```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#$min privilege 15 algorithm-type scrypt secret brandodiaz723
A1(config)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2081 bytes to 1289 bytes[OK]
A1#
A1#
A1#
A1#
A1#
A1#
A1#
*May  4 22:28:29.136: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
```

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Fuente: Elaboración propia

4.3 HABILITACIÓN DE AUTENTICACIÓN AAA Y VERIFICACION DE SEGURIDAD

Tabla 23 Tabla de tareas 4.3

Task	Specification
En todos los dispositivos Enable AAA Y Enable AAA authentication	Enable AAA authentication usando la base de datos local en todas las líneas

Tabla 24 Habilitar autenticación AAA para todos los dispositivos

Command	Description
aaa new-model	Habilita el modo de autenticación AAA
aaa authentication login default local	Habilita la autenticación utilizando la base de datos local

Scripts para los dispositivos

```
R1, R2, R3, D1, D2, A1
enable
configure terminal
aaa new-model
aaa authentication login default local
end
copy running-config startup-config
```

```
R1, R2, R3, D1, D2, A1
show running-config | include aaa|username
```

Figura 65 Habilidad de autenticación AAA local-database R1

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#aaa new-model
R1(config)#aaa authentication login default local
R1(config)#end
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

*May  4 22:29:56.339: %SYS-5-CONFIG_I: Configured from console by console[OK]
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

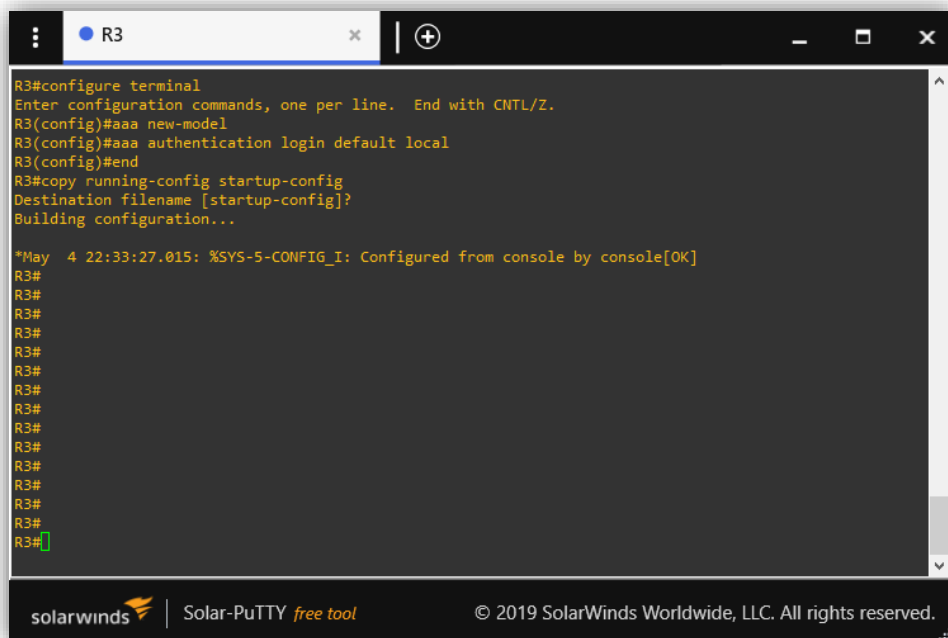
Fuente: Elaboración propia

Figura 66 Habilidad de autenticación AAA local-database R2

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#aaa new-model
R2(config)#aaa authentication login default local
R2(config)#end
R2#copy running-config startup-config
Destination filename [startup-config]?
*May  4 22:32:33.135: %SYS-5-CONFIG_I: Configured from console by console
Building configuration...
[OK]
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

Fuente: Elaboración propia

Figura 67 Habilitación de autenticación AAA local-database R3

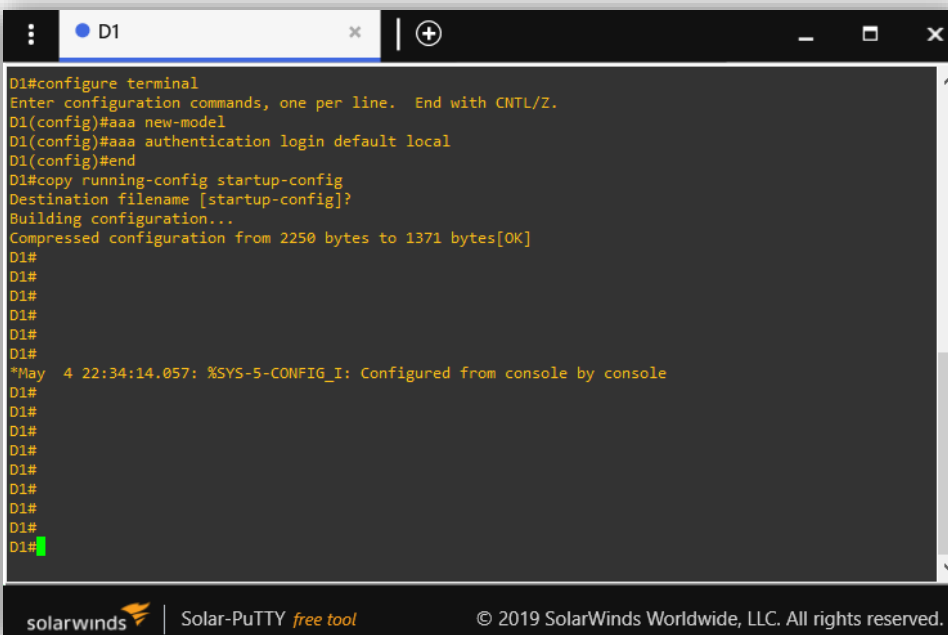


```
R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#aaa new-model
R3(config)#aaa authentication login default local
R3(config)#end
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

*May  4 22:33:27.015: %SYS-5-CONFIG_I: Configured from console by console[OK]
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
```

Fuente: Elaboración propia

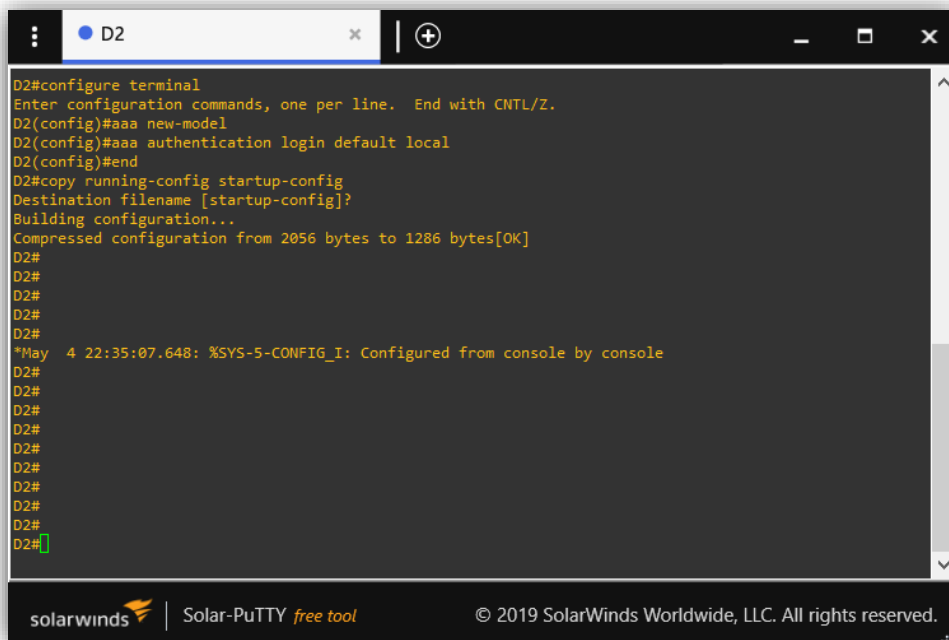
Figura 68 Habilitación de autenticación AAA local-database D1



```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#aaa new-model
D1(config)#aaa authentication login default local
D1(config)#end
D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2250 bytes to 1371 bytes[OK]
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
```

Fuente: Elaboración propia

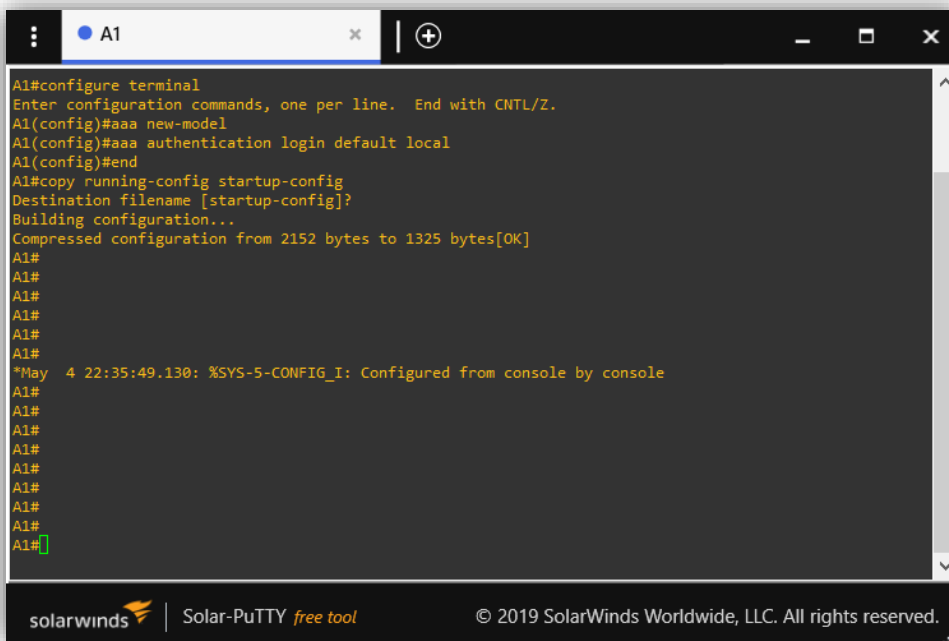
Figura 69 Habilitación de autenticación AAA local-database D2



```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#aaa new-model
D2(config)#aaa authentication login default local
D2(config)#end
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2056 bytes to 1286 bytes[OK]
D2#
D2#
D2#
D2#
*May  4 22:35:07.648: %SYS-5-CONFIG_I: Configured from console by console
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

Fuente: Elaboración propia

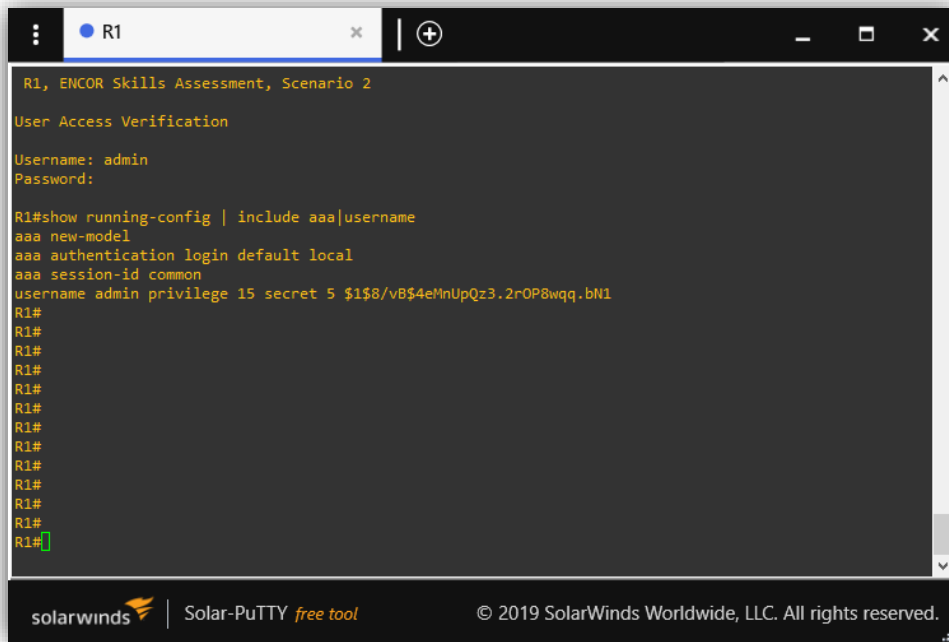
Figura 70 Habilitación de autenticación AAA local-database A1



```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#aaa new-model
A1(config)#aaa authentication login default local
A1(config)#end
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2152 bytes to 1325 bytes[OK]
A1#
A1#
A1#
A1#
A1#
*May  4 22:35:49.130: %SYS-5-CONFIG_I: Configured from console by console
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
```

Fuente: Elaboración propia

Figura 71 Verificación seguridad R1



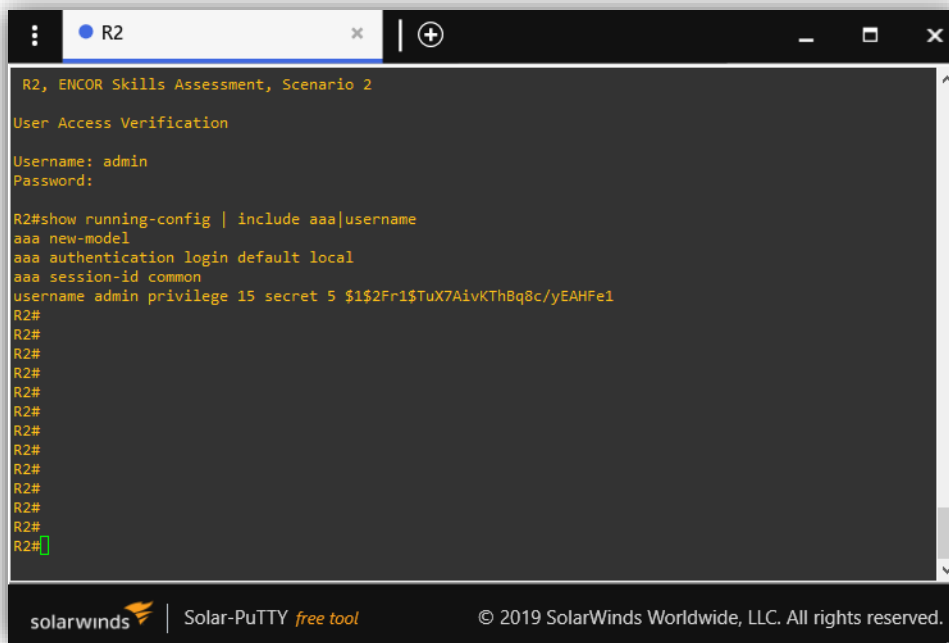
```
R1, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

R1#show running-config | include aaa|username
aaa new-model
aaa authentication login default local
aaa session-id common
username admin privilege 15 secret 5 $1$8/vB$4eMnUpQz3.2rOP8wqq.bn1
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

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Fuente: Elaboración propia

Figura 72 Verificación seguridad R2



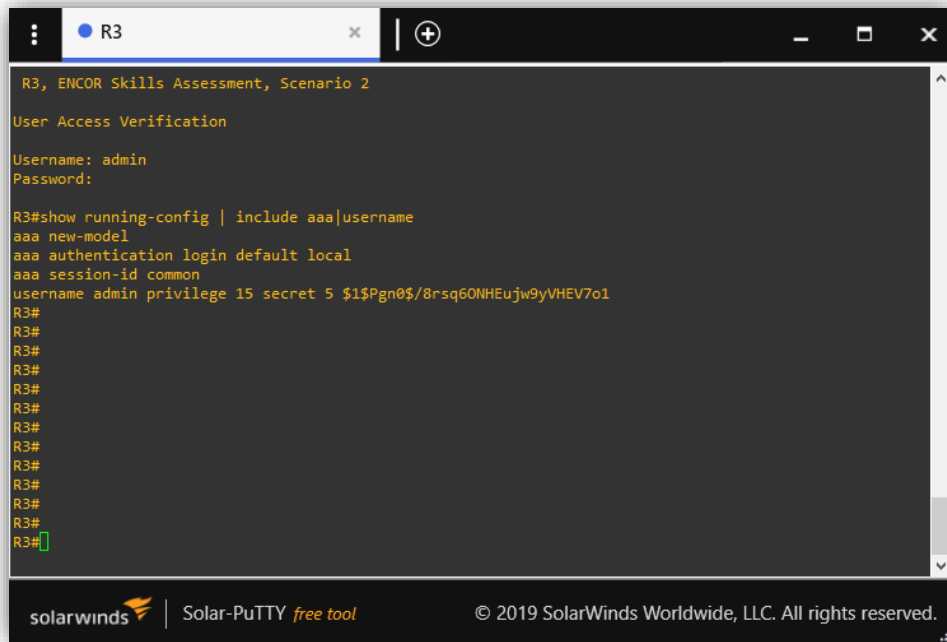
```
R2, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

R2#show running-config | include aaa|username
aaa new-model
aaa authentication login default local
aaa session-id common
username admin privilege 15 secret 5 $1$2Fr1$TuX7AivKThBq8c/yEAHFe1
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
R2#
```

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Fuente: Elaboración propia

Figura 73 Verificación seguridad R3

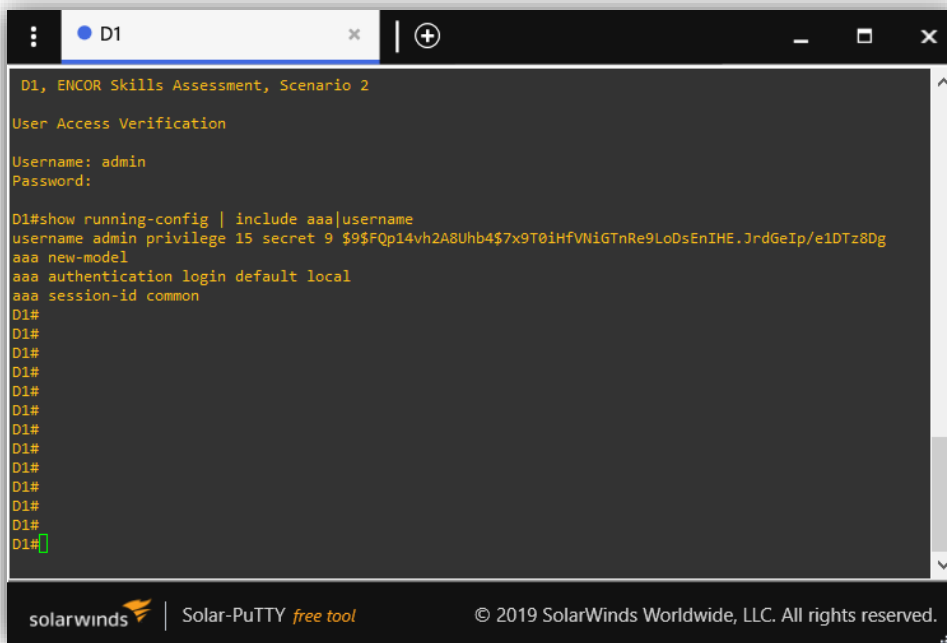


```
R3, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

R3#show running-config | include aaa|username
aaa new-model
aaa authentication login default local
aaa session-id common
username admin privilege 15 secret 5 $1$Pgn0$/8rsq60NHEujw9yVHEV7o1
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
R3#
```

Fuente: Elaboración propia

Figura 74 Verificación seguridad D1

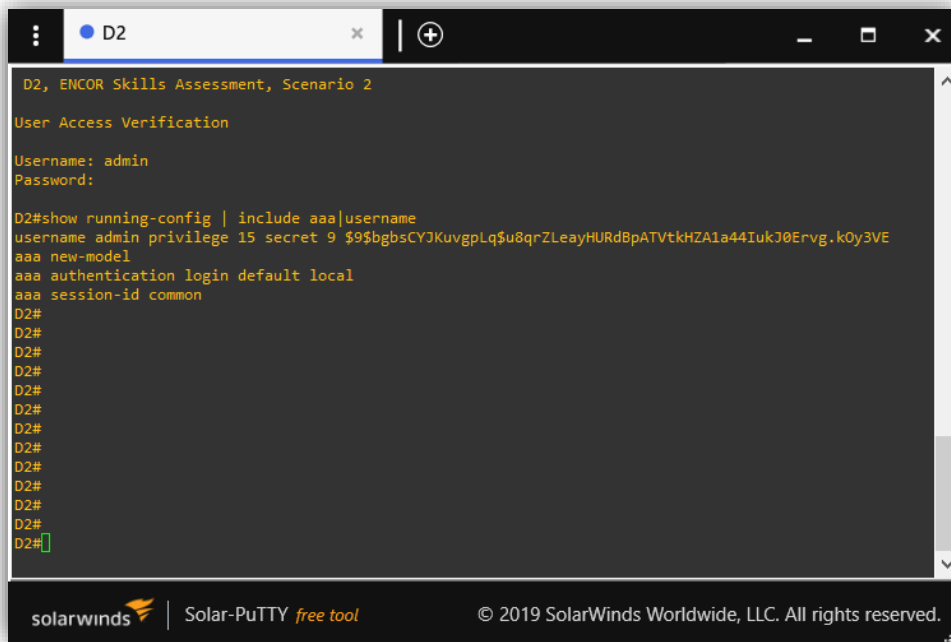


```
D1, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

D1#show running-config | include aaa|username
username admin privilege 15 secret 9 $9$FQp14vh2A8Uhb4$7x9T0iHfVNiGTnRe9LoDsEnIHE.JrdGeIp/e1DTz8Dg
aaa new-model
aaa authentication login default local
aaa session-id common
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
D1#
```

Fuente: Elaboración propia

Figura 75 Verificación seguridad D2

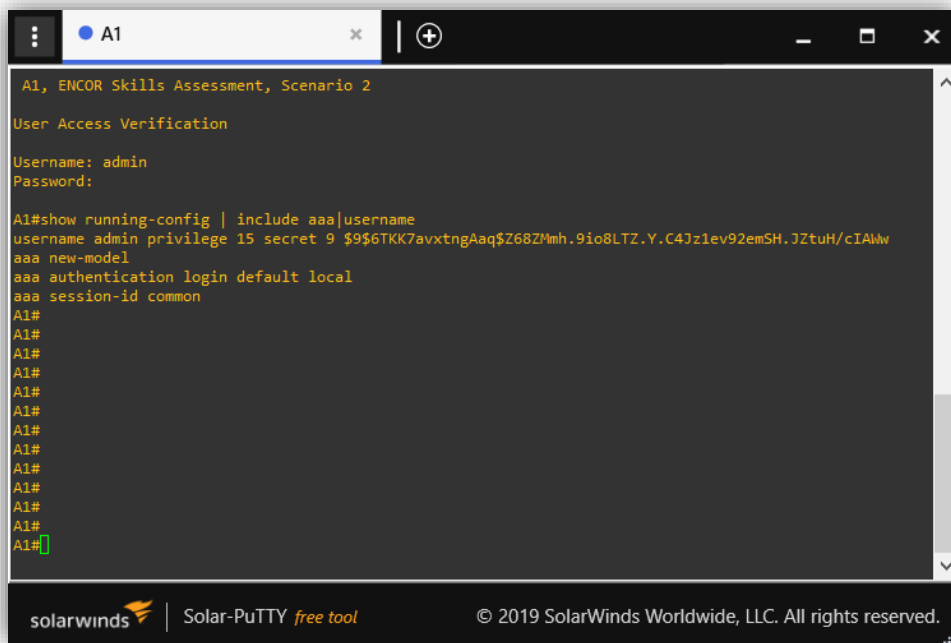


```
D2, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

D2#show running-config | include aaa|username
username admin privilege 15 secret 9 $9$bgb5CYJKuv9pLq$u8qrZLeayHURd8pATVtkHZA1a44IukJ0Erv9.k0y3VE
aaa new-model
aaa authentication login default local
aaa session-id common
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
D2#
```

Fuente: Elaboración propia

Figura 76 Verificación seguridad A1



```
A1, ENCOR Skills Assessment, Scenario 2
User Access Verification
Username: admin
Password:

A1#show running-config | include aaa|username
username admin privilege 15 secret 9 $9$6TKK7avxtngAaq$Z68ZMmh.9io8LTZ.Y.C4Jz1ev92emSH.JZtuH/cIAWw
aaa new-model
aaa authentication login default local
aaa session-id common
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
A1#
```

Fuente: Elaboración propia

CONCLUSIONES

Las configuraciones generales de los dispositivos permiten al administrador de la red tener un orden en la topología, conocer que medios de acceso a los dispositivos activos están permitidos, siendo este tipo de ajustes fáciles de replicar en múltiples dispositivos.

Con el uso de VRF, se logra una mayor eficiencia en el dispositivo, ya que en un único equipo se pueden crear múltiples instancias virtuales, disminuyendo los costos de hardware, interconexión e infraestructura.

La escalabilidad aumenta gracias a la creación de instancias virtuales, las cuales simplifican la expansión de la red.

La red es mucho más segura debido a la separación del tráfico, lograda por las distintas instancias virtuales, cada una con su propia tabla de enrutamiento y políticas de seguridad.

En las configuraciones de capa 2, redundancia y seguridad es indispensable como administrador de la red, evitar cualquier tipo de riesgo para la red, siendo este objetivo cumplido segmentando la red para usuarios especiales y finales en diferentes VLAN, también deshabilitando puertos de los dispositivos que no van a ser utilizados, configurando usuarios y contraseñas para el acceso a permisos privilegiados de configuración de los dispositivos, y preparando las conexiones de manera redundante, con el objetivo de dar fiabilidad, disponibilidad y seguridad.

BIBLIOGRAFÍA

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). IP Routing Essentials. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). Network Device Access Control and Infrastructure Security. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). Packet Forwarding. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). Secure Access Control. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). Spanning Tree Protocol. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). Virtualization. CCNP and CCIE Enterprise Core ENCORA 350-401.

Edgeworth, B., Garza Rios, B., Gooley, J., Hucaby, D. (2020). CISCO Press (Ed). VLAN Trunks and EtherChannel Bundles. CCNP and CCIE Enterprise Core ENCORA 350-401.