DIPLOMADO DE PROFUNDIZACIÓN CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CNNA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA - ECBTI
INGENIERIA DE SISTEMAS
ZIPAQUIRÁ
2020

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JHON FREDY MAHECHA ESPINOSA

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2020

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GLOSARIO

DIRECCION IP: El papel de la capa IP es averiguar cómo encaminar paquetes o datagramas a su destino final, lo que consigue mediante el protocolo IP. Para hacerlo posible, cada interfaz en la red necesita una dirección IP, que identifica tanto un ordenador concreto como la red a la que éste pertenece, ya que el sistema de direcciones IP es un sistema jerárquico.

DHCP: El protocolo de configuración dinámica de hosts (DHCP) es un estándar TCP/IP que utiliza un servidor central para gestionar direcciones IP y otros datos de configuración para toda una red. Un servidor DHCP responde a las peticiones de los clientes, asignándoles propiedades de forma dinámica.

INTERFAZ DE RED: Las interfaces de red se utilizan para conectar físicamente el router a las redes que el router va a interconectar. Es a través de estas interfaces que los paquetes de datos entran y salen del router. Habitualmente los routers tienen una interface de tipo LAN y una o más interfaces del tipo WAN. La cantidad y tipos de interfaces de red dependerán del modelo de router de que se trate.

ROUTER: Un router o encaminador es un dispositivo de red que permite la interconexión de redes al nivel de la capa de Red del Modelo de Referencia OSI. Desde el punto de vista funcional, un router puede concebirse como una computadora de propósito específico, en contraposición a una computadora personal a la que suele caracterizarse como de “propósito general”.

SSH: Secure Shell o SSH, es un protocolo (capa aplicación) de acceso y administración remota y que permite reemplazar estos protocolos deficientes añadiendo medios para encriptar la sesión de conexión y autenticar tanto al cliente como al servidor.

VLAN: Una Virtual Local Area Network (VLAN) o red de área local virtual es un grupo flexible de dispositivos que se encuentran en cualquier ubicación de una red de área local pero que se comunican como si estuvieran en el mismo segmento físico. Con las VLANs se puede segmentar la red sin restringirse a las ubicaciones o conexiones físicas.

RESUMEN

Basados en el aprendizaje mediante escenarios, se desarrolla la prueba de habilidades en la plataforma Cisco del módulo CCNA, teniendo en cuenta dos tipos de escenarios. El primero, consiste en la configuración de una red pequeña, que debe admitir la conectividad IPv4 e IPv6, con su respectivo enrutamiento entre VLAN, DHCP, Etherchannel y port-security, protocolos utilizados hoy en día. De igual manera, se realiza la verificación de la conectividad mediante el comando ping, teniendo en cuenta todos los equipos de la red. En el segundo escenario, se plantea otra red en la que se maneja conectividad IPv4 e IPv6, utilizando switches, routers y servidores, donde se implementaron los protocolos de routing dinámicos (OSPF) y protocolo de configuración de host dinámicos (DHCP.

ABSTRACT

Based on learning through stages, the skills assessment is developing on the Cisco platform of the CCNA module, considering two types of stage. The first one, consists of the configuration of a small network, which must support IPv4 and IPv6 connectivity, with their respective routing between VLAN, DHCP, Etherchannel and port-security, protocols that are using nowadays. Similarly, connectivity verification is carried out using the ping command, considering all the electronic devices on the network. In the second stage, another network is proposed in which IPv4 and IPv6 connectivity is handled, using switches, routers and servers, where dynamic routing protocol like open shortest path first (OSPF) and dynamic host configuration protocol (DHCP) were implemented.

INTRODUCCIÓN

Con el pasar del tiempo, así como el avance de la globalización del mundo, se evidencia un incremento sustancial en la necesidad de generar relaciones informáticas entre equipos situados en diferentes partes del planeta, es por ello, que el networking en tecnología ha tenido un auge importante en el desarrollo del ser humano, ya que mediante él, el intercambio de datos entre dos equipos de computo se realiza de manera acorde y seguro.

Por ende, en la ingeniería de sistemas ha generado un gran interés obtener certificaciones en diseño, configuración y mantenimiento de redes, que le permitan al profesional incursionar no solo en el campo laboral, sino generar soluciones a las diferentes necesidades de comunicación entre países.

Es por ello, que la empresa CISCO ha generado un programa educativo altamente práctico, que permite desarrollar habilidades en los estudiantes, con casos de estudio aplicados a la vida real, mediante el uso de herramientas de simulación. Se desarrollarán dos escenarios integrados a un contexto especifico, teniendo en cuenta la estrategia de aprendizaje basado en escenarios (ABE).

DESARROLLO ESCENARIO 1

I. ESCENARIO 1

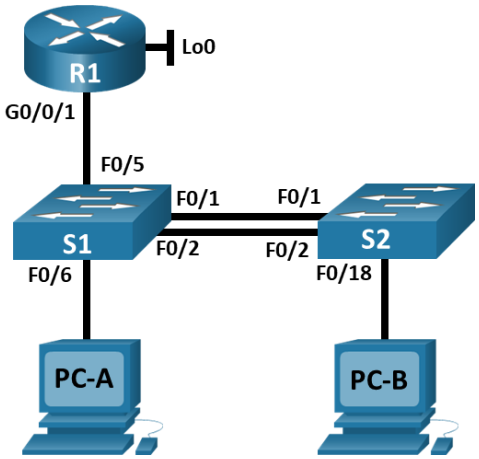

Figura 1. Escenario I

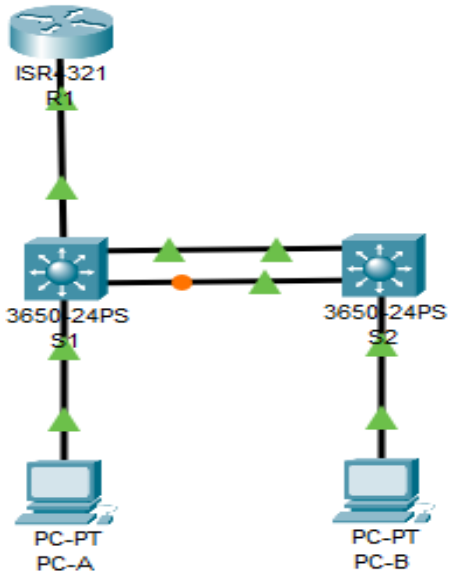

Figura 2. Simulación escenario I (Packet Tracer)

1. Inicializar, recargar y configurar aspectos básicos de los dispositivos

1.1. Inicializar y volver a cargar el router y el switch:

1.1.1. Se procede a borrar configuraciones iniciales de R1 y S1 y S2:

Se adjunta códigos de configuraciones en la consola cisco CLI

Router R1

Router>enable
Router#erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#reload
System configuration has been modified. Save? [yes/no]:no
Proceed with reload? [confirm]
Initializing Hardware ...

System integrity status: 00000610
Rom image verified correctly

System Bootstrap, Version 15.4(3r)S5, RELEASE SOFTWARE
Copyright (c) 1994-2015 by cisco Systems, Inc.

Current image running: Boot ROM0

Last reset cause: LocalSoft
Cisco ISR4321/K9 platform with 4194304 Kbytes of main memory

no valid BOOT image found
Final autoboot attempt from default boot device...
File size is 0x1d0580a0
Located isr4300-universalk9.03.16.05.S.155-3.S5-ext.SPA.bin
Image size 486899872 inode num 12, bks cnt 102567 blk size 8*512

```
##################################################################
##################################################################
######
Boot image size = 486899872 (0x1d0580a0) bytes

Package header rev 1 structure detected
Calculating SHA-1 hash...done
validate_package: SHA-1 hash:
calculated 83acd4f8:dc03c892:f243621c:06872286:6c9f0cf5
expected 83acd4f8:dc03c892:f243621c:06872286:6c9f0cf5

RSA Signed RELEASE Image Signature Verification Successful.
Package Load Test Latency : 6390 msec
Image validated
%IOSXEBOOT-4-BOOT_SRC: (rp/0): mounting /boot/super.iso to
/tmp/sw/isos

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cisco ISR4321/K9 (1RU) processor with 1687137K/6147K bytes of memory.
Processor board ID FLM2041W2HD
2 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
3223551K bytes of flash memory at bootflash:.

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Switch S1

```
Switch>enable
Switch#erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch#delete vlan.dat
Delete filename [vlan.dat]?
Delete flash:/vlan.dat? [confirm]
%Error deleting flash:/vlan.dat (No such file or directory)

Switch#reload
System configuration has been modified. Save? [yes/no]:
% Please answer 'yes' or 'no'.
System configuration has been modified. Save? [yes/no]:
% Please answer 'yes' or 'no'.
System configuration has been modified. Save? [yes/no]:no
Proceed with reload? [confirm]
Booting...
Interface GE 0 link down***ERROR: PHY link is down
Reading full image into memory
.....................................................done
Bundle Image
-----------------------------------
Kernel Address : 0x5342e350
Kernel Size : 0x418a9b / 4295323
Initramfs Address : 0x53846dec
Initramfs Size : 0xe780c3 / 15171779
Compression Format : .mzip

Bootable image at @ ram : 0x5342e350
Bootable image segment 0 address range[0x81100000, 0x82140000] is
in range[0x80180000, 0x90000000].
@@@
```

Launching Linux Kernel (flags = 0x5)

%IOSXEBOOT-7474e1d3392fed124a6b809c1b351b29-new_cksum: (rp/0): 4
%IOSXEBOOT - 7474e1d3392fed124a6b809c1b351b29 - saved_cksum: (rp / 0) : 4
% IOSXEBOOT - Sat - ### : (rp / 0) : Feb 4 22 : 18 : 09 Universal 2017
PLEASE DO NOT POWER CYCLE ### BOOT LOADER UPGRADING 4
% IOSXEBOOT - loader - boot: (rp / 0) : upgrade successful 4

Front - end Microcode IMG MGR : found 1 microcode images for 1 device.
Image for front - end 0 : / tmp / microcode_update / front_end / fe_type_8_1

Front - end Microcode IMG MGR : Preparing to program device microcode...
--More-- Front - end Microcode IMG MGR : Preparing to program device[0]...85504 bytes.
Front - end Microcode IMG MGR : Programming device 0...wRr0%.....10%.....20%.....30%.....40%.....50%.....60%.....70%.....80%.....90%.....!
Front - end Microcode IMG MGR : Microcode programming complete for device 0.
Front - end Microcode IMG MGR : Microcode programming complete in 43 seconds
1
Both links down, not waiting for other switches
Switch number is 1

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cisco WS-C3650-24PS (MIPS) processor (revision N0) with 865815K/6147K bytes of memory.
Processor board ID FDO2031E1Q6

2048K bytes of non - volatile configuration memory.
4194304K bytes of physical memory.
250456K bytes of Crash Files at crashinfo : .
1609272K bytes of Flash at flash : .
0K bytes of at webui : .

Base ethernet MAC Address : 00:90:0C:1B:5A:64
Motherboard assembly number : 73-15899-06
Motherboard serial number : FDO20311WHP
Model revision number : N0
Motherboard revision number : A0
Model number : WS-C3650-24PS
System serial number : FDO2031Q0TD

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]:
%LINK-5-CHANGED: Interface GigabitEthernet1/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet1/0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/6, changed state to up

% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Switch S2

Switch>enable

```
Switch#erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch#delete vlan.dat
Delete filename [vlan.dat]?
Delete flash:/vlan.dat? [confirm]
%Error deleting flash:/vlan.dat (No such file or directory)

Switch#reload
System configuration has been modified. Save? [yes/no]:si
% Please answer 'yes' or 'no'.
System configuration has been modified. Save? [yes/no]:yes
Building configuration...
[OK]
Proceed with reload? [confirm]
Booting...
Interface GE 0 link down***ERROR: PHY link is down
Reading full image into memory
.....done
Bundle Image
-------------------------------------
Kernel Address : 0x5342e350
Kernel Size : 0x418a9b / 4295323
Initramfs Address : 0x53846dec
Initramfs Size : 0xe780c3 / 15171779
Compression Format : .mzip

Bootable image at @ ram : 0x5342e350
Bootable image segment 0 address range[0x81100000, 0x82140000] is
in range[0x80180000, 0x90000000].
@@@
```

%IOSXEBOOT-7474e1d3392fed124a6b809c1b351b29-new_cksum: (rp/0): 4
%IOSXEBOOT - 7474e1d3392fed124a6b809c1b351b29 - saved_cksum: (rp / 0) : 4
% IOSXEBOOT - Sat - ### : (rp / 0) : Feb 4 22 : 18 : 09 Universal 2017
PLEASE DO NOT POWER CYCLE ### BOOT LOADER UPGRADING 4
% IOSXEBOOT - loader - boot: (rp / 0) : upgrade successful 4

Front - end Microcode IMG MGR : found 1 microcode images for 1 device.
Image for front - end 0 : / tmp / microcode_update / front_end / fe_type_8_1

Front - end Microcode IMG MGR : Preparing to program device microcode...
--More-- Front - end Microcode IMG MGR : Preparing to program device[0]...85504 bytes.
Front - end Microcode IMG MGR : Programming device 0...wRr0%.....10%.....20%.....30%.....40%.....50%.....60%.....70%.....80%.....90%.....!
Front - end Microcode IMG MGR : Microcode programming complete for device 0.
Front - end Microcode IMG MGR : Microcode programming complete in 43 seconds
1
Both links down, not waiting for other switches
Switch number is 1

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Processor board ID FDO2031E1Q6
2048K bytes of non - volatile configuration memory.
4194304K bytes of physical memory.

250456K bytes of Crash Files at crashinfo : .
1609272K bytes of Flash at flash : .
0K bytes of at webui : .

Base ethernet MAC Address : 00:07:EC:C0:3B:CD
Motherboard assembly number : 73-15899-06
Motherboard serial number : FDO20311WHP
Model revision number : N0
Motherboard revision number : A0
Model number : WS-C3650-24PS
System serial number : FDO2031Q0TD

Press RETURN to get started!

1.1.2. Recarga del switch, configuración de la plantilla SDM para admitir IPv6.

Switch S1

Switch>enable Ingreso a modo privilegiado
Switch#show sdm prefer Mostrar preferencias de SDM
The current template is "default" template.
The selected template optimizes the resources in
the switch to support this level of features for
0 routed interfaces and 1024 VLANs.

number of unicast mac addresses: 8K
number of IPv4 IGMP groups + multicast routes: 0.25K
number of IPv4 unicast routes: 0
number of IPv6 multicast groups: 0
number of directly-connected IPv6 addresses: 0
number of indirect IPv6 unicast routes: 0
number of IPv4 policy based routing aces: 0
number of IPv4/MAC qos aces: 0.125K
number of IPv4/MAC security aces: 0.375K
number of IPv6 policy based routing aces: 0
number of IPv6 qos aces: 0.02k
number of IPv6 security aces: 0.025K

Switch#reload Reinicio del Switch
Proceed with reload? [confirm]
Booting...

Interface GE 0 link down***ERROR: PHY link is down
Reading full image into memory
.....done
Bundle Image

Kernel Address : 0x5342e350
Kernel Size : 0x418a9b / 4295323
Initramfs Address : 0x53846dec
Initramfs Size : 0xe780c3 / 15171779
Compression Format : .mzip

Bootable image at @ ram : 0x5342e350
Bootable image segment 0 address range[0x81100000, 0x82140000] is in range[0x80180000, 0x90000000].
@@@

Front - end Microcode IMG MGR : Preparing to program device microcode...
--More-- Front - end Microcode IMG MGR : Preparing to program device[0]...85504 bytes.
Front - end Microcode IMG MGR : Programming device 0...wRr0%.....10%.....20%.....30%.....40%.....50%.....60%.....70%.....80%.....90%.....!
Front - end Microcode IMG MGR : Microcode programming complete for device 0.
Front - end Microcode IMG MGR : Microcode programming complete in 43 seconds
1
Both links down, not waiting for other switches
Switch number is 1

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cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

Cisco IOS Software [Denali], Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version 16.3.2, RELEASE SOFTWARE (fc4)
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FIPS: Flash Key Check : Begin
FIPS: Flash Key Check : End, Not Found, FIPS Mode Not Enabled

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If you require further assistance please contact us by sending email to export@cisco.com.

cisco WS-C3650-24PS (MIPS) processor (revision N0) with 865815K/6147K bytes of memory.
Processor board ID FDO2031E1Q6
2048K bytes of non - volatile configuration memory.
4194304K bytes of physical memory.
250456K bytes of Crash Files at crashinfo : .
1609272K bytes of Flash at flash : .
0K bytes of at webui : .

Base ethernet MAC Address : 00:90:0C:1B:5A:64
Motherboard assembly number : 73-15899-06
Motherboard serial number : FDO20311WHP

Model revision number : N0
Motherboard revision number : A0
Model number : WS-C3650-24PS
System serial number : FDO2031Q0TD

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]:
%LINK-5-CHANGED: Interface GigabitEthernet1/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet1/0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/6, changed state to up

% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Switch S2

Switch>enable Ingreso a modo privilegiado
Switch#show sdm prefer Mostrar preferencias de SDM
The current template is "default" template.
The selected template optimizes the resources in
the switch to support this level of features for
0 routed interfaces and 1024 VLANs.

number of unicast mac addresses: 8K
number of IPv4 IGMP groups + multicast routes: 0.25K
number of IPv4 unicast routes: 0
number of IPv6 multicast groups: 0
number of directly-connected IPv6 addresses: 0
number of indirect IPv6 unicast routes: 0
number of IPv4 policy based routing aces: 0
number of IPv4/MAC qos aces: 0.125K
number of IPv4/MAC security aces: 0.375K
number of IPv6 policy based routing aces: 0
number of IPv6 qos aces: 0.02k
number of IPv6 security aces: 0.025K

Switch#reload Reinicio del Switch
Proceed with reload? [confirm]
Booting...
Interface GE 0 link down***ERROR: PHY link is down
Reading full image into memory
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Bundle Image

Kernel Address : 0x5342e350
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Compression Format : .mzip

Bootable image at @ ram : 0x5342e350
Bootable image segment 0 address range[0x81100000, 0x82140000] is in range[0x80180000, 0x90000000].
@@@

%IOSXEBOOT-7474e1d3392fed124a6b809c1b351b29-new_cksum: (rp/0): 4
%IOSXEBOOT - 7474e1d3392fed124a6b809c1b351b29 - saved_cksum: (rp / 0) : 4
% IOSXEBOOT - Sat - ### : (rp / 0) : Feb 4 22 : 18 : 09 Universal 2017
PLEASE DO NOT POWER CYCLE ### BOOT LOADER UPGRADING 4
% IOSXEBOOT - loader - boot: (rp / 0) : upgrade successful 4

Front - end Microcode IMG MGR : found 1 microcode images for 1 device.
Image for front - end 0 : / tmp / microcode_update / front_end / fe_type_8_1

Front - end Microcode IMG MGR : Preparing to program device microcode...
--More-- Front - end Microcode IMG MGR : Preparing to program device[0]...85504 bytes.
Front - end Microcode IMG MGR : Programming device 0...wRr0%.....10%.....20%.....30%.....40%.....50%.....60%.....70%.....80%.....90%.....!
Front - end Microcode IMG MGR : Microcode programming complete for device 0.
Front - end Microcode IMG MGR : Microcode programming complete in 43 seconds
1
Both links down, not waiting for other switches
Switch number is 1

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cisco WS-C3650-24PS (MIPS) processor (revision N0) with 865815K/6147K bytes of memory.
Processor board ID FDO2031E1Q6
2048K bytes of non - volatile configuration memory.
4194304K bytes of physical memory.
250456K bytes of Crash Files at crashinfo : .
1609272K bytes of Flash at flash : .
0K bytes of at webui : .

Base ethernet MAC Address : 00:07:EC:C0:3B:CD
Motherboard assembly number : 73-15899-06
Motherboard serial number : FDO20311WHP
Model revision number : N0
Motherboard revision number : A0
Model number : WS-C3650-24PS
System serial number : FDO2031Q0TD

Press RETURN to get started!

1.2. Configuración de R1.

Se realizan las siguientes tareas

Tabla 1. Configuración de R1, aspectos básicos

Tarea	Especificación
Desactivar la búsqueda DNS	Router>enable Router#config terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#no ip domain lookup
Nombre del router	Router(config)#hostname R1
Nombre de dominio	R1(config)#ip domain-name ccna-lab.com

Tarea	Especificación
Contraseña cifrada para el modo EXEC privilegiado	R1(config-line)#password ciscoconpass
Contraseña de acceso a la consola	R1(config)#line console 0 R1(config-line)#password ciscoconpass R1(config-line)#login
Establecer la longitud mínima para las contraseñas	R1(config-line)#exit R1(config)#security password min-length 10
Crear un usuario administrativo en la base de datos local	R1(config)#username admin secret admin1pass
Configurar el inicio de sesión en las líneas VTY para que use la base de datos local	R1(config)#line vty 0 15 R1(config-line)#login local
Configurar VTY solo aceptando SSH	R1(config-line)#transport input ssh
Cifrar las contraseñas de texto no cifrado	R1(config-line)#exit R1(config)#service password-encryption
Configure un MOTD Banner	R1(config)#banner motd #Advertencia: Solo personal autorizado#
Habilitar el routing IPv6	R1(config)#ipv6 unicast-routing

Tarea	Especificación
Configurar interfaz G0/0/1 y subinterfaces	R1(config)#int g0/0/1.2 R1(config-subif)#encapsulation dot1q 2 R1(config-subif)#description bikes R1(config-subif)#ip address 10.19.8.1 255.255.255.192 R1(config-subif)#ipv6 address 2001:db8:acad:a::1/64 R1(config-subif)#ipv6 address fe80::1 link-local R1(config)#int g0/0/1.3 R1(config-subif)#description trikes R1(config-subif)#ip address 10.19.8.65 255.255.255.224 R1(config-subif)#ipv6 address 2001:db8:acad:b::1/64 R1(config-subif)#ipv6 address fe80::1 link-local R1(config-subif)#int g0/0/1.4 R1(config-subif)#encapsulation dot1q 4 R1(config-subif)#description management R1(config-subif)#ip address 10.19.8.97 255.255.255.248 R1(config-subif)#ipv6 address 2001:db8:acad:c::1/64 R1(config-subif)#ipv6 address fe80::1 link-local R1(config-subif)#int g0/0/1.6 R1(config-subif)#encapsulation dot1q 6 native R1(config-subif)#description native R1(config-subif)#exit R1(config)#int g0/0/1 R1(config-if)#no shutdown

Tarea	Especificación
Configure el Loopback0 interface	R1(config)#int loopback 0 R1(config-if)# %LINK-5-CHANGED: Interface Loopback0, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up R1(config-if)#ip address 209.165.201.1 255.255.255.224 R1(config-if)#ipv6 address 2001:db8:acad:209::1/64 R1(config-if)#ipv6 address fe80::1 link-local R1(config-if)#description Principal
Generar una clave de cifrado RSA	R1(config-if)#exit R1(config)#crypto key generate rsa The name for the keys will be: R1.ccna-lab.com Choose the size of the key modulus in the range of 360 to 2048 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes. How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable...[OK] R1(config)# *Mar 1 2:41:8.721: %SSH-5-ENABLED: SSH 1.99 has been enabled R1(config)#

1.3. Configuración de S1 y S2

Se realizan las siguientes configuraciones para S1.

Tabla 2. Configuración de S1, aspectos básicos

Tarea	Especificación
Desactivar la búsqueda DNS.	Switch>enable Switch#config terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#no ip domain lookup
Nombre del switch	Switch(config)#hostname S1
Nombre de dominio	S1(config)#ip domain-name ccna-lab.com
Contraseña cifrada para el modo EXEC privilegiado	S1(config)#enable secret ciscoenpass
Contraseña de acceso a la consola	S1(config)#line console 0 S1(config-line)#password ciscoconpass S1(config-line)#login
Crear un usuario administrativo en la base de datos local	S1(config-line)#exit S1(config)#username admin secret admin1pass
Configurar el inicio de sesión en las líneas VTY para que use la base de datos local	S1(config)#line vty 0 15 S1(config-line)#login local
Configurar las líneas VTY para que acepten únicamente las conexiones SSH	S1(config-line)#transport input ssh
Cifrar las contraseñas de texto no cifrado	S1(config-line)#exit S1(config)#service password-encryption

Tarea	Especificación
Configurar un MOTD Banner	S1(config)#banner motd #Advertencia: Solo personal autorizado#
Generar una clave de cifrado RSA	S1(config)#crypto key generate rsa The name for the keys will be: S1.ccna-lab.com Choose the size of the key modulus in the range of 360 to 2048 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes. How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable...[OK] S1(config)#
Configurar la interfaz de administración (SVI)	S1(config)#int vlan 4 S1(config-if)# S1(config-if)#ip address 10.19.8.98 255.255.255.248 S1(config-if)#ipv6 address 2001:db8:acad:c::98/64 S1(config-if)#ipv6 address fe80::1 link-local S1(config-if)#description management interface S1(config-if)#no shutdown
Configuración del gateway predeterminado	S1(config-if)#exit S1(config)#ip default-gateway 10.19.8.97 S1(config)#exit S1#

Se realizan las siguientes configuraciones para S2

Tabla 3. Configuración de S2, aspectos básicos

Tarea	Especificación
Desactivar la búsqueda DNS.	Switch>enable Switch#config terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#no ip domain lookup
Nombre del switch	Switch(config)#hostname S2
Nombre de dominio	S2(config)#ip domain-name ccna-lab.com
Contraseña cifrada para el modo EXEC privilegiado	S2(config)#enable secret ciscoenpass
Contraseña de acceso a la consola	S2(config)#line console 0 S2(config-line)#password ciscoconpass S2(config-line)#login
Crear un usuario administrativo en la base de datos local	S2(config-line)#exit S2(config)#username admin secret admin1pass
Configurar el inicio de sesión en las líneas VTY para que use la base de datos local	S2(config)#line vty 0 15 S2(config-line)#login local
Configurar las líneas VTY para que acepten únicamente las conexiones SSH	S2(config-line)#transport input ssh
Cifrar las contraseñas de texto no cifrado	S2(config-line)#exit S2(config)#service password-encryption
Configurar un MOTD Banner	S2(config)#banner motd #Advertencia: Solo personal autorizado#

Tarea	Especificación
Generar una clave de cifrado RSA	S2(config)#crypto key generate rsa The name for the keys will be: S2.ccna-lab.com Choose the size of the key modulus in the range of 360 to 2048 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes. How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable...[OK] S2(config)# *Mar 1 2:42:0.403: %SSH-5-ENABLED: SSH 1.99 has been enabled
Configurar la interfaz de administración (SVI)	S2(config)#int vlan 4 S2(config-if)#ip address 10.19.8.99 255.255.255.248 S2(config-if)#ipv6 address 2001:bd8:acad:c::1/64 S2(config-if)#ipv6 address fe80::1 link-local S2(config-if)#description management interface S2(config-if)#no shutdown
Configuración del gateway predeterminado	S2(config-if)#exit S2(config)#ip default-gateway 10.19.8.97 S2(config)#exit S2#

2. Configuración de la infraestructura de red (VLAN, Trunking, EtherChannel)

2.1. Configuración de S1

Tabla 4. Configuración S1, infraestructura de red

Tarea	Especificación
Crear VLAN	S1>enable S1#config terminal Enter configuration commands, one per line. End with CNTL/Z. S1(config)#vlan 2 S1(config-vlan)#name bikes S1(config-vlan)#vlan 3 S1(config-vlan)#name trikes S1(config-vlan)#vlan 4 S1(config-vlan)#name management S1(config-vlan)#vlan 5 S1(config-vlan)#name parking S1(config-vlan)#vlan 6 S1(config-vlan)#name native S1(config-vlan)#exit S1(config)#

Crear troncos 802.1Q que utilicen la VLAN 6 nativa	**Interface G1/0/5** S1>enable S1#config terminal Enter configuration commands, one per line. End with CNTL/Z. S1(config)#int g1/0/5 S1(config-if)#switchport trunk encapsulation dot1q S1(config-if)#switchport mode trunk S1(config-if)# %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/5, changed state to down %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/5, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan4, changed state to up S1(config-if)#switchport trunk native vlan 6 S1(config-if)# **Interfaces G1/0/1-2** S1>enable S1#config terminal Enter configuration commands, one per line. End with CNTL/Z. S1(config)#int range g1/0/1-2 S1(config-if-range)#shutdown S1(config-if-range)# %LINK-5-CHANGED: Interface GigabitEthernet1/0/1, changed state to administratively down

Tarea	Especificación
	%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to down %LINK-5-CHANGED: Interface GigabitEthernet1/0/2, changed state to administratively down %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to down S1(config-if-range)#switchport trunk encapsulation dot1q S1(config-if-range)#switchport mode trunk S1(config-if-range)#switchport trunk native vlan 6 S1(config-if-range)#
Crear un grupo de puertos EtherChannel de Capa 2 que use interfaces F0/1 y F0/2	S1(config-if-range)#channel-group 1 mode active S1(config-if-range)# Creating a port-channel interface Port-channel 1 %EC-5-CANNOT_BUNDLE2: Gig1/0/1 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/1 is 6, Po1 id 1) %EC-5-CANNOT_BUNDLE2: Gig1/0/2 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/2 is 6, Po1 id 1) S1(config-if-range)#int port-channel 1 S1(config-if)#switchport trunk encapsulation dot1q S1(config-if)#switchport mode trunk S1(config-if)#switchport trunk native vlan 6

Tarea	Especificación
Configurar el puerto de acceso de host para VLAN 2	S1(config-if)#int g1/0/6 S1(config-if)#switchport mode access S1(config-if)#switchport access vlan 2 S1(config-if)#
Configurar la seguridad del puerto en los puertos de acceso	S1(config-if)#switchport port-security S1(config-if)#switchport port-security maximum 3
Proteja todas las interfaces no utilizadas	S1(config-if)#switchport port-security S1(config-if)#switchport port-security maximum 3 S1(config-if)#int range g1/0/3-4 S1(config-if-range)#switchport mode access S1(config-if-range)#switchport access vlan 5 S1(config-if-range)#description not in use S1(config-if-range)#shutdown S1(config-if-range)#int range g1/0/7-24 S1(config-if-range)#switchport mode access S1(config-if-range)#switchport access vlan 5 S1(config-if-range)#description not in use S1(config-if-range)#shutdown S1(config-if-range)#int range g1/1/1-4 S1(config-if-range)#switchport mode access S1(config-if-range)#switchport access vlan 5 S1(config-if-range)#description not in use S1(config-if-range)#shutdown S1(config-if-range)#

2.2. Configuración de S2

Tabla 5. Configuración S2, infraestructura de red

Tarea	Especificación
Crear VLAN	S2>enable S2#config terminal Enter configuration commands, one per line. End with CNTL/Z. S2(config)#vlan 2 S2(config-vlan)#name bike S2(config-vlan)#vlan 3 S2(config-vlan)#name trikes S2(config-vlan)#vlan 4 S2(config-vlan)#name management S2(config-vlan)#vlan 5 S2(config-vlan)#name parking S2(config-vlan)#vlan 6 S2(config-vlan)#name native S2(config-vlan)#exit S2(config)#
Crear troncos 802.1Q que utilicen la VLAN 6 nativa	S2(config)#int range g1/0/1-2 S2(config-if-range)#shutdown %LINK-5-CHANGED: Interface GigabitEthernet1/0/1, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/2, changed state to administratively down S2(config-if-range)#switchport trunk encapsulatio dot1q S2(config-if-range)#switchport mode trunk S2(config-if-range)#switchport trunk native vlan 6

Tarea	Especificación
Crear un grupo de puertos EtherChannel de Capa 2 que use interfaces F0/1 y F0/2	S2(config-if-range)#channel-group 1 mode active S2(config-if-range)# Creating a port-channel interface Port-channel 1 %EC-5-CANNOT_BUNDLE2: Gig1/0/1 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/1 is 6, Po1 id 1) %EC-5-CANNOT_BUNDLE2: Gig1/0/2 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/2 is 6, Po1 id 1) S2(config-if-range)#int port-channel 1 S2(config-if)#switchport trunk encapsulation dot1q S2(config-if)#switchport mode trunk S2(config-if)#switchport trunk native vlan 6 S2(config-if)#

Tarea	Especificación
Configurar el puerto de acceso del host para la VLAN 3	S2(config-if-range)#channel-group 1 mode active S2(config-if-range)# Creating a port-channel interface Port-channel 1 %EC-5-CANNOT_BUNDLE2: Gig1/0/1 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/1 is 6, Po1 id 1) %EC-5-CANNOT_BUNDLE2: Gig1/0/2 is not compatible with Po1 and will be suspended (native vlan of Gig1/0/2 is 6, Po1 id 1) S2(config-if-range)#int port-channel 1 S2(config-if)#switchport trunk encapsulation dot1q S2(config-if)#switchport mode trunk S2(config-if)#switchport trunk native vlan 6
Configure port-security en los access ports	S2(config-if)#int g1/0/18 S2(config-if)#switchport mode access S2(config-if)#switchport access vlan 3 S2(config-if)#switchport port-security S2(config-if)#switchport port-security maximum 3

Asegure todas las interfaces no utilizadas.	S2(config-if)#int range g1/0/3-17 S2(config-if-range)#switchport mode access S2(config-if-range)#switchport access vlan 5 S2(config-if-range)#description mot in use S2(config-if-range)#shutdown %LINK-5-CHANGED: Interface GigabitEthernet1/0/3, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/4, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/5, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/7, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/8, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/9, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/10, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/11, changed state to administratively down

	%LINK-5-CHANGED: Interface GigabitEthernet1/0/12, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/13, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/14, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/15, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/16, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/17, changed state to administratively down S2(config-if-range)#int range g1/0/19-24 S2(config-if-range)#switchport mode access S2(config-if-range)#switchport access vlan 5 S2(config-if-range)#description mot in use S2(config-if-range)#shutdown %LINK-5-CHANGED: Interface GigabitEthernet1/0/19, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/20, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/21, changed state to administratively down

Tarea	Especificación
	%LINK-5-CHANGED: Interface GigabitEthernet1/0/22, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/23, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/0/24, changed state to administratively down S2(config-if-range)#int range g1/1/1-4 S2(config-if-range)#switchport mode access S2(config-if-range)#switchport access vlan 5 S2(config-if-range)#description mot in use S2(config-if-range)#shutdown %LINK-5-CHANGED: Interface GigabitEthernet1/1/1, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/1/2, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/1/3, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet1/1/4, changed state to administratively down S2(config-if-range)#

3. Configurar soporte de host

3.1. Configuración de R1

Tabla 6. Configuración R1, soporte de host

Tarea	Especificación
Configure Default Routing	R1>enable R1#config terminal Enter configuration commands, one per line. End with CNTL/Z. R1(config)#ip route 0.0.0.0 0.0.0.0 loopback 0 %Default route without gateway, if not a point-to-point interface, may impact performance R1(config)#ipv6 route ::/0 loopback 0
Configurar IPv4 DHCP para VLAN 2	R1>enable R1#config terminal Enter configuration commands, one per line. End with CNTL/Z. R1(config)#ip dhcp excluded-address 10.19.8.1 10.19.8.52 R1(config)#ip dhcp pool vlan2-bikes R1(dhcp-config)#network 10.19.8.0 255.255.255.192 R1(dhcp-config)#default-router 10.19.8.1 R1(dhcp-config)#domain-name ccna-a.net
Configurar DHCP IPv4 para VLAN 3	R1(dhcp-config)#exit R1(config)#ip dhcp excluded-address 10.19.8.65 10.19.8.84 R1(config)#ip dhcp pool vlan3-trikes R1(dhcp-config)#network 10.19.8.64 255.255.255.192 R1(dhcp-config)#network 10.19.8.64 255.255.255.224 R1(dhcp-config)#default-router 10.19.8.65 R1(dhcp-config)#domain-name ccna-b.net R1(dhcp-config)#exit R1(config)#

3.2. Configuración de los equipos (servidores) host PC-A y PC-B

Tabla 7. Configuración PC-A

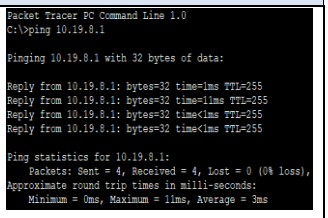
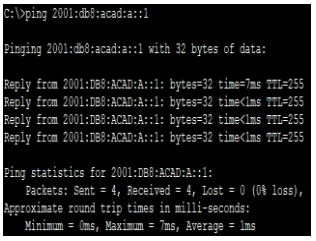
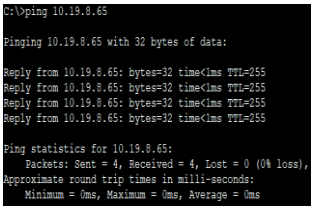
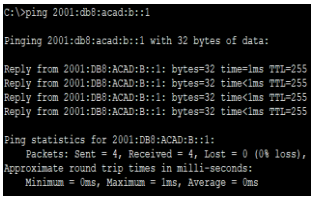
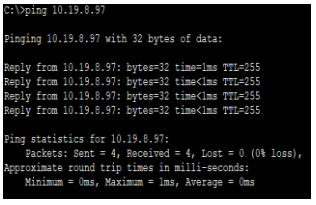
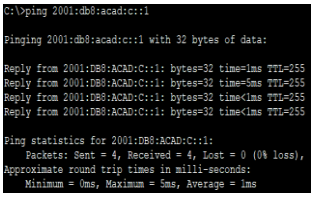
PC-A Network Configuration	
Descripción	PC-A
Dirección física	0001.42DC.26DC
Dirección IP	10.19.8.53
Máscara de subred	255.255.255.192
Gateway predeterminado	10.19.8.1
Gateway predeterminado IPv6	FE80::1

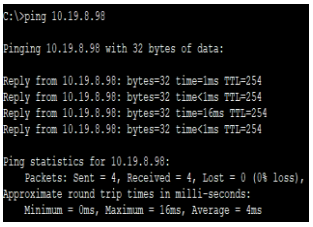
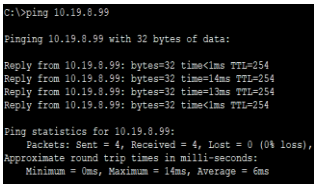
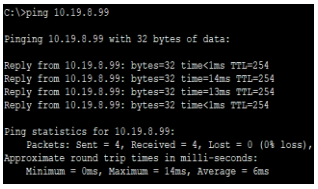
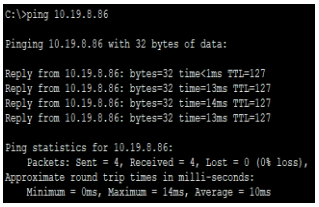
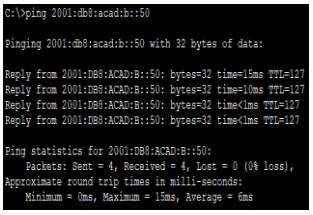
Tabla 8. Configuración PC-B

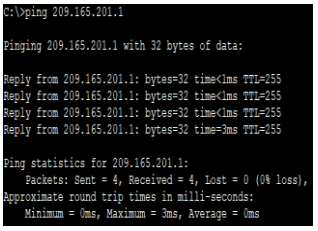
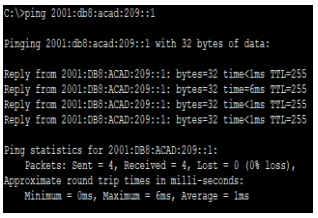
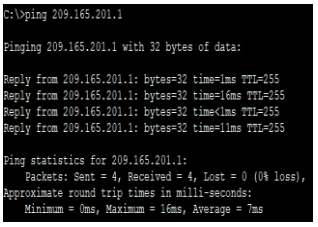
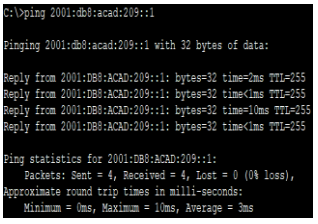
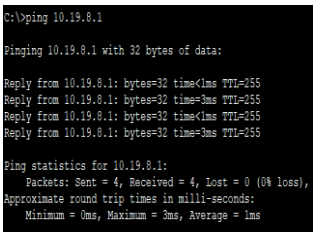
PC-B Network Configuration	
Descripción	PC-B
Dirección física	000A.F307.12AE
Dirección IP	10.19.8.85
Máscara de subred	255.255.255.224
Gateway predeterminado	10.19.8.65
Gateway predeterminado IPv6	FE80::1

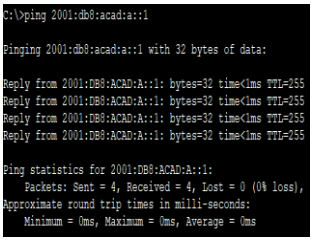
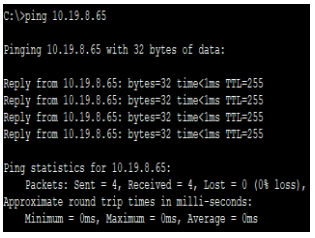
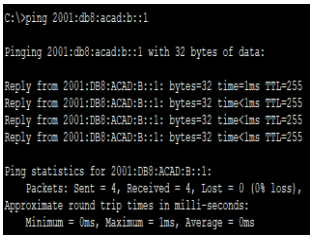
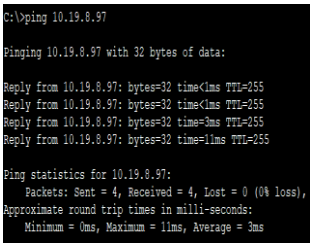
4. Probar y verificar la conectividad de extremo a extremo

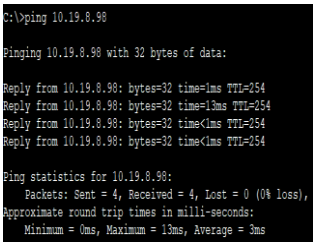
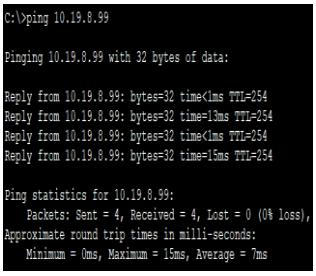
   Se comprueba la conectividad de los equipos realizando los respectivos pings entre cada uno de ellos, se utiliza la siguiente tabla para verificar la conectividad con cada dispositivo de red.

Desde	A	de Internet	Dirección IP	Resultados de ping
PC-A	R1, G0/0/1 .2	Dirección	10.19.8.1	
		IPv6	2001:db8:acad:a: :1	
	R1, G0/0/1 .3	Dirección	10.19.8.65	
		IPv6	2001:db8:acad:b: :1	
	R1, G0/0/1 .4	Dirección	10.19.8.97	
		IPv6	2001:db8:acad:c: :1	

Desde	A	de Internet	Dirección IP	Resultados de ping
	S1, VLAN 4	Dirección	10.19.8.98	
		IPv6	2001:db8:acad:c::98	
	S2, VLAN 4	Dirección	10.19.8.99	
		IPv6	2001:db8:acad:c::99	
	PC-B	Dirección	10.19.8.86	
		IPv6	2001:db8:acad:b::50	

Desde	A	de Internet	Dirección IP	Resultados de ping
	R1 Bucle 0	Dirección	209.165.201.1	
		IPv6	2001:db8:acad:209: :1	
PC-B	R1 Bucle 0	Dirección	209.165.201.1	
		IPv6	2001:db8:acad:209: :1	
	R1, G0/0/1.2	Dirección	10.19.8.1	

Desde	A	de Internet	Dirección IP	Resultados de ping
		IPv6	2001:db8:acad:a::1	
R1, G0/0/1.3		Dirección	10.19.8.65	
		IPv6	2001:db8:acad:b::1	
R1, G0/0/1.4		Dirección	10.19.8.97	
		IPv6	2001:db8:acad:c::1	

Desde	A	de Internet	Dirección IP	Resultados de ping
	S1, VLAN 4	Dirección	10.19.8.98	
		IPv6	2001:db8:acad:c::98	
	S2, VLAN 4	Dirección	10.19.8.99	
		IPv6	2001:db8:acad:c::99	

DESARROLLO ESCENARIO 2

II. ESCENARIO 2

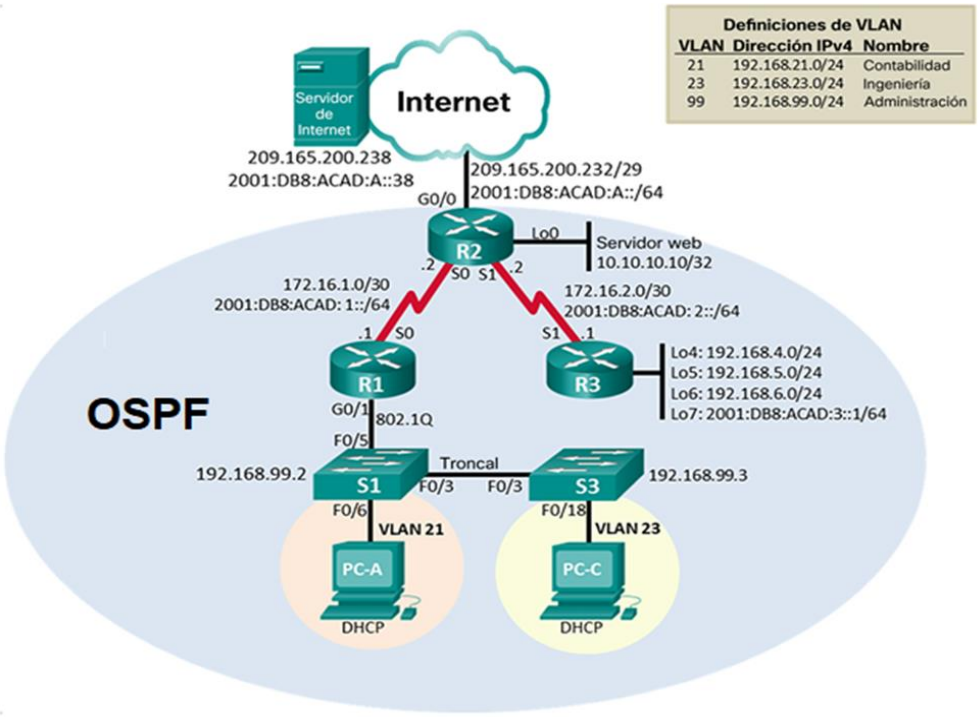


Figura 3. Escenario II

5. Inicializar dispositivos

5.1. Inicializar, recargar y configurar aspectos básicos del dispositivo.

Tabla 9. Inicializar, recargar y configurar aspectos básicos del dispositivo.

Tarea	Comando de IOS
Eliminar el archivo startup-config de todos los routers	**Router 1** Router>enable Router#erase startup-config Erasing the nvram filesystem will remove all configuration files! Continue? [confirm] [OK] Erase of nvram: complete %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram Router# **Router 2** Router>enable Router#erase startup-config Erasing the nvram filesystem will remove all configuration files! Continue? [confirm] [OK] Erase of nvram: complete %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram Router#

	Router 3 Router>enable Router#erase startup-config Erasing the nvram filesystem will remove all configuration files! Continue? [confirm] [OK] Erase of nvram: complete %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram Router#
Volver a cargar todos los routers	**Router 1** Router>enable Router#reload Proceed with reload? [confirm] System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1) Technical Support: http://www.cisco.com/techsupport Copyright (c) 2010 by cisco Systems, Inc. Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB CISCO1941/K9 platform with 524288 Kbytes of main memory Main memory is configured to 64/-1(On-board/DIMM0) bit mode with ECC disabled Readonly ROMMON initialized

	program load complete, entry point: 0x80803000, size: 0x1b340 program load complete, entry point: 0x80803000, size: 0x1b340 IOS Image Load Test _____ Digitally Signed Release Software program load complete, entry point: 0x81000000, size: 0x2bb1c58 Self decompressing the image : ## ## ## [OK] Smart Init is enabled smart init is sizing iomem TYPE MEMORY_REQ HWIC Slot 0 0x00200000 Onboard devices & buffer pools 0x01E8F000 ---------- TOTAL: 0x0268F000 Rounded IOMEM up to: 40Mb. Using 6 percent iomem. [40Mb/512Mb] Restricted Rights Legend Use, duplication, or disclosure by the Government is

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	2 Low-speed serial(sync/async) network interface(s) DRAM configuration is 64 bits wide with parity disabled. 255K bytes of non-volatile configuration memory. 249856K bytes of ATA System CompactFlash 0 (Read/Write) --- System Configuration Dialog --- Would you like to enter the initial configuration dialog? [yes/no]: **Router 2** Router#reload Proceed with reload? [confirm] System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1) Technical Support: http://www.cisco.com/techsupport Copyright (c) 2010 by cisco Systems, Inc. Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB CISCO1941/K9 platform with 524288 Kbytes of main memory

	Main memory is configured to 64/-1(On-board/DIMM0) bit mode with ECC disabled Readonly ROMMON initialized program load complete, entry point: 0x80803000, size: 0x1b340 program load complete, entry point: 0x80803000, size: 0x1b340 IOS Image Load Test _____ Digitally Signed Release Software program load complete, entry point: 0x81000000, size: 0x2bb1c58 Self decompressing the image : ## ## ## [OK] Smart Init is enabled smart init is sizing iomem TYPE MEMORY_REQ HWIC Slot 0 0x00200000 Onboard devices & buffer pools 0x01E8F000 ---------- TOTAL: 0x0268F000 Rounded IOMEM up to: 40Mb. Using 6 percent iomem. [40Mb/512Mb]

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	Cisco CISCO1941/K9 (revision 1.0) with 491520K/32768K bytes of memory. Processor board ID FTX152400KS 2 Gigabit Ethernet interfaces 2 Low-speed serial(sync/async) network interface(s) DRAM configuration is 64 bits wide with parity disabled. 255K bytes of non-volatile configuration memory. 249856K bytes of ATA System CompactFlash 0 (Read/Write) --- System Configuration Dialog --- Would you like to enter the initial configuration dialog? [yes/no]: **Router 3** Router>enable Router#reload Proceed with reload? [confirm] System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1) Technical Support: http://www.cisco.com/techsupport Copyright (c) 2010 by cisco Systems, Inc.

	Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB CISCO1941/K9 platform with 524288 Kbytes of main memory Main memory is configured to 64/-1(On-board/DIMM0) bit mode with ECC disabled Readonly ROMMON initialized program load complete, entry point: 0x80803000, size: 0x1b340 program load complete, entry point: 0x80803000, size: 0x1b340 IOS Image Load Test _____ Digitally Signed Release Software program load complete, entry point: 0x81000000, size: 0x2bb1c58 Self decompressing the image : ## ## ## [OK] Smart Init is enabled smart init is sizing iomem TYPE MEMORY_REQ HWIC Slot 0 0x00200000 Onboard devices & buffer pools 0x01E8F000

	---------- TOTAL: 0x0268F000 Rounded IOMEM up to: 40Mb. Using 6 percent iomem. [40Mb/512Mb] Restricted Rights Legend Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) of the Commercial Computer Software - Restricted Rights clause at FAR sec. 52.227-19 and subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS sec. 252.227-7013. cisco Systems, Inc. 170 West Tasman Drive San Jose, California 95134-1706 Cisco IOS Software, C1900 Software (C1900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport

	Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team Image text-base: 0x2100F918, data-base: 0x24729040 This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately. A summary of U.S. laws governing Cisco cryptographic products may be found at: http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

	If you require further assistance please contact us by sending email to export@cisco.com. Cisco CISCO1941/K9 (revision 1.0) with 491520K/32768K bytes of memory. Processor board ID FTX152400KS 2 Gigabit Ethernet interfaces 2 Low-speed serial(sync/async) network interface(s) DRAM configuration is 64 bits wide with parity disabled. 255K bytes of non-volatile configuration memory. 249856K bytes of ATA System CompactFlash 0 (Read/Write) --- System Configuration Dialog --- Would you like to enter the initial configuration dialog? [yes/no]:
Eliminar el archivo startup-config de todos los switches y eliminar la base de datos de VLAN anterior	**Switch 1** Switch>enable Switch#erase startup-config Erasing the nvram filesystem will remove all configuration files! Continue? [confirm] [OK]

	Erase of nvram: complete %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram Switch# Switch#delete vlan.dat Delete filename [vlan.dat]? Delete flash:/vlan.dat? [confirm] %Error deleting flash:/vlan.dat (No such file or directory) Switch# **Switch 3** Switch>enable Switch#erase startup-config Erasing the nvram filesystem will remove all configuration files! Continue? [confirm] [OK] Erase of nvram: complete %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram Switch# Switch#delete vlan.dat Delete filename [vlan.dat]? Delete flash:/vlan.dat? [confirm] %Error deleting flash:/vlan.dat (No such file or directory) Switch#

Volver a cargar ambos switches	**Switch 1** Switch>enable Switch#Reload Proceed with reload? [confirm] C2960 Boot Loader (C2960-HBOOT-M) Version 12.2(25r)FX, RELEASE SOFTWARE (fc4) Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory. 2960-24TT starting... Base ethernet MAC Address: 0007.ECD5.2762 Xmodem file system is available. Initializing Flash... flashfs[0]: 1 files, 0 directories flashfs[0]: 0 orphaned files, 0 orphaned directories flashfs[0]: Total bytes: 64016384 flashfs[0]: Bytes used: 4414921 flashfs[0]: Bytes available: 59601463 flashfs[0]: flashfs fsck took 1 seconds. ...done Initializing Flash. Boot Sector Filesystem (bs:) installed, fsid: 3 Parameter Block Filesystem (pb:) installed, fsid: 4

	Loading "flash:/c2960-lanbase-mz.122-25.FX.bin"... ## ## ## [OK] Restricted Rights Legend Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) of the Commercial Computer Software - Restricted Rights clause at FAR sec. 52.227-19 and subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS sec. 252.227-7013. cisco Systems, Inc. 170 West Tasman Drive San Jose, California 95134-1706

	Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team Image text-base: 0x80008098, data-base: 0x814129C4 Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory. 24 FastEthernet/IEEE 802.3 interface(s) 2 Gigabit Ethernet/IEEE 802.3 interface(s) 63488K bytes of flash-simulated non-volatile configuration memory. Base ethernet MAC Address : 0007.ECD5.2762 Motherboard assembly number : 73-9832-06 Power supply part number : 341-0097-02 Motherboard serial number : FOC103248MJ Power supply serial number : DCA102133JA Model revision number : B0 Motherboard revision number : C0

	Model number : WS-C2960-24TT System serial number : FOC1033Z1EY Top Assembly Part Number : 800-26671-02 Top Assembly Revision Number : B0 Version ID : V02 CLEI Code Number : COM3K00BRA Hardware Board Revision Number : 0x01 Switch Ports Model SW Version SW Image ------ ----- ----- ---------- ---------- * 1 26 WS-C2960-24TT 12.2 C2960-LANBASE-M Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team Press RETURN to get started! %LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up

	%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up %LINK-5-CHANGED: Interface FastEthernet0/6, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/6, changed state to up Switch> **Switch 3** Switch>enable Switch#Reload Proceed with reload? [confirm] C2960 Boot Loader (C2960-HBOOT-M) Version 12.2(25r)FX, RELEASE SOFTWARE (fc4) Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory. 2960-24TT starting... Base ethernet MAC Address: 0090.2BE7.AD0B Xmodem file system is available. Initializing Flash...

	flashfs[0]: 1 files, 0 directories flashfs[0]: 0 orphaned files, 0 orphaned directories flashfs[0]: Total bytes: 64016384 flashfs[0]: Bytes used: 4414921 flashfs[0]: Bytes available: 59601463 flashfs[0]: flashfs fsck took 1 seconds. ...done Initializing Flash. Boot Sector Filesystem (bs:) installed, fsid: 3 Parameter Block Filesystem (pb:) installed, fsid: 4 Loading "flash:/c2960-lanbase-mz.122-25.FX.bin"... ### ## [OK] Restricted Rights Legend Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) of the Commercial Computer Software - Restricted Rights clause at FAR sec. 52.227-19 and subparagraph

	(c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS sec. 252.227-7013. Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team Image text-base: 0x80008098, data-base: 0x814129C4 Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory. 24 FastEthernet/IEEE 802.3 interface(s) 2 Gigabit Ethernet/IEEE 802.3 interface(s) 63488K bytes of flash-simulated non-volatile configuration memory. Base ethernet MAC Address : 0090.2BE7.AD0B Motherboard assembly number : 73-9832-06 Power supply part number : 341-0097-02 Motherboard serial number : FOC103248MJ Power supply serial number : DCA102133JA

	Model revision number : B0 Motherboard revision number : C0 Model number : WS-C2960-24TT System serial number : FOC1033Z1EY Top Assembly Part Number : 800-26671-02 Top Assembly Revision Number : B0 Version ID : V02 CLEI Code Number : COM3K00BRA Hardware Board Revision Number : 0x01 Switch Ports Model SW Version SW Image ------ ----- ----- ---------- ---------- * 1 26 WS-C2960-24TT 12.2 C2960-LANBASE-M Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team Press RETURN to get started! %LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up

	%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up %LINK-5-CHANGED: Interface FastEthernet0/18, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/18, changed state to up Switch>
Verificar que la base de datos de VLAN no esté en la memoria flash en ambos switches	**Switch 1** Switch>enable Switch#dir flash Directory of flash:/ 1 -rw- 4414921 <no date> c2960-lanbase-mz.122-25.FX.bin 64016384 bytes total (59601463 bytes free) Switch# **Switch 3** Switch>enable Switch#dir flash Directory of flash:/

	1 -rw- 4414921 <no date> c2960-lanbase-mz.122-25.FX.bin 64016384 bytes total (59601463 bytes free) Switch#

6. Configurar los parámetros básicos del dispositivo.

6.1. Configurar la computadora del internet.

Tabla 10. Configurar la computadora del internet

Elemento o tarea de configuración	Especificación
Dirección IPv4	209.165.200.238
Máscara de subred para IPv4	255.255.255.248
Gateway predeterminado	209.165.200.233
Dirección IPv6/subred	2001:DB8:ACAD:A::38
Gateway predeterminado IPv6	2001:DB8:ACAD:2::1

6.2. Configuración del R1

Tabla 11. Configuración del R1

Elemento o tarea de configuración	Especificación
Desactivar la búsqueda DNS	Router>enable Router#config terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#no ip domain-lookup Router(config)#

Nombre del router	Router(config)#hostname R1 R1(config)#
Contraseña de exec privilegiado cifrada	R1(config)#enable secret class R1(config)#
Contraseña de acceso a la consola	R1(config)#line console 0 R1(config-line)#password cisco R1(config-line)#login
Contraseña de acceso Telnet	R1(config-line)#line vty 0 15 R1(config-line)#password cisco R1(config-line)#login R1(config-line)#exit
Cifrar las contraseñas de texto no cifrado	R1(config)#service password-encryption R1(config)#
Mensaje MOTD	R1(config)#banner motd "Advertencia: Solo personal autorizado" R1(config)#

Interfaz S0/0/0	Descripción de la interfaz R1(config)#int s0/0/0 R1(config-if)#description connection to R2 R1(config-if)# Configuración de IPv4. R1(config-if)#ip address 172.16.1.1 255.255.255.252 R1(config-if)# Configuración de IPv6 R1(config-if)#ipv6 address 2001:db8:acad:1::/64 R1(config-if)# Frecuencia de reloj en 128000 R1(config-if)#clock rate 128000 This command applies only to DCE interfaces R1(config-if)# Interface Activada R1(config-if)#no shut %LINK-5-CHANGED: Interface Serial0/0/0, changed state to down R1(config-if)#

Rutas predeterminadas	Ruta IPv4 Predeterminada R1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0 %Default route without gateway, if not a point-to-point interface, may impact performance R1(config)# Ruta IPv6 Predeterminada R1(config)#ipv6 route ::/0 s0/0/0 R1(config)#

6.3. Configuración del R2

Tabla 12. Configuración del R2

Elemento o tarea de configuración	**Especificación**
Desactivar la búsqueda DNS	Router>enable Router#config terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#no ip domain-lookup Router(config)#
Nombre del router	Router(config)#hostname R2 R2(config)#
Contraseña de exec privilegiado cifrada	R2(config)#enable secret class

Contraseña de acceso a la consola	R2(config)#line console 0 R2(config-line)#password cisco R2(config-line)#login
Contraseña de acceso Telnet	R2(config-line)#line vty 0 15 R2(config-line)#password cisco R2(config-line)#login R2(config-line)#exit R2(config)#
Cifrar las contraseñas de texto no cifrado	
Habilitar el servidor HTTP	R2(config)#ip http server ^ % Invalid input detected at '^' marker. R2(config)# Packet Tracer no soporta este comando por lo que hay que incorporar a la topología un servidor.
Mensaje MOTD	R2(config)#banner motd "Advertencia: Solo personal autorizado" R2(config)#

Interfaz S0/0/0	Descripción R2(config)#int s0/0/0 R2(config-if)#description connection to R1 Configuración IPv4 R2(config-if)#ip address 172.16.1.2 255.255.255.252 R2(config-if)# Configuración IPv6 R2(config-if)#ipv6 address 2001:db8:acad:1::/64 R2(config-if)# Interfaz Activada R2(config-if)#no shutdown R2(config-if)# %LINK-5-CHANGED: Interface Serial0/0/0, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up R2(config-if)#exit R2(config)#

Interfaz S0/0/1	Descripción R2(config)#int s0/0/1 R2(config-if)#description connection to R3 Configuración IPv4 R2(config-if)#ip address 172.16.2.1 255.255.0.0 R2(config-if)# Configuración IPv6 R2(config-if)#ipv6 address 2001:db8:acad:2::/64 R2(config-if)# Frecuencia del reloj R2(config-if)#clock rate 128000 R2(config-if)# Interfaz activada R2(config-if)#no shutdown %LINK-5-CHANGED: Interface Serial0/0/1, changed state to down R2(config-if)#

Interfaz G0/0 (simulación de Internet)	Descripción R2(config)#int g0/0 R2(config-if)#description connection to Internet Configuración IPv4 R2(config-if)#ip address 209.165.200.233 255.255.255.248 R2(config-if)# Configuración IPv6 R2(config-if)#ipv6 address 2001:db8:acad:a::/64 R2(config-if)# Interfaz activa R2(config-if)#no shutdown R2(config-if)# %LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up R2(config-if)#

Interfaz loopback 0 (servidor web simulado)	Descripción R2(config)#int lo0 R2(config-if)# %LINK-5-CHANGED: Interface Loopback0, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up R2(config-if)#description connection to servidor web R2(config-if)# Configuración IPv4 R2(config-if)#ip address 10.10.10.10 255.255.255.0 % 10.10.10.0 overlaps with GigabitEthernet0/1 R2(config-if)# Interfaz activada R2(config-if)#no shutdown R2(config-if)#

Ruta predeterminada	Ruta IPv4 predeterminada R2(config-if)#exit R2(config)#ip route 0.0.0.0 0.0.0.0 g0/0 %Default route without gateway, if not a point-to-point interface, may impact performance R2(config)# Ruta IPv6 predeterminada R2(config)#ipv6 route ::/0 g0/0 R2(config)#

6.4. Configuración del R3

Tabla 13. Configuración del R3

Elemento o tarea de configuración	**Especificación**
Desactivar la búsqueda DNS	Router>enable Router#config terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#no ip domain-lookup Router(config)#
Nombre del router	Router(config)#hostname R3 R3(config)#

Contraseña de exec privilegiado cifrada	R3(config)#enable secret class R3(config)#
Contraseña de acceso a la consola	R3(config)#line console 0 R3(config-line)#password cisco R3(config-line)#login R3(config-line)#
Contraseña de acceso Telnet	R3(config-line)#line vty 0 15 R3(config-line)#password cisco R3(config-line)#login R3(config-line)#
Cifrar las contraseñas de texto no cifrado	R3(config-line)#exit R3(config)#service password-encryption R3(config)#
Mensaje MOTD	Descripción R3(config)#banner motd "Advertencia: Solo personal autorizzado" R3(config)#

Interfaz S0/0/1	R3(config)#int s0/0/1 R3(config-if)#description connection to R2 R3(config-if)# Configuración IPv4 R3(config-if)#ip address 172.16.2.2 255.255.255.252 R3(config-if)# Configuración IPv6 R3(config-if)#ipv6 address 2001:db8:acad:2::/64 R3(config-if)# Interfaz activada R3(config-if)#no shutdown R3(config-if)# %LINK-5-CHANGED: Interface Serial0/0/1, changed state to up R3(config-if)#

Interfaz loopback 4	R3(config-if)#int lo4 R3(config-if)# %LINK-5-CHANGED: Interface Loopback4, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback4, changed state to up R3(config-if)#ip address 192.168.4.1 255.255.255.0 R3(config-if)#
Interfaz loopback 5	R3(config-if)#int lo5 R3(config-if)# %LINK-5-CHANGED: Interface Loopback5, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up R3(config-if)#ip addres 192.168.5.1 255.255.255.0 R3(config-if)#

Interfaz loopback 6	R3(config-if)#int lo6 R3(config-if)# %LINK-5-CHANGED: Interface Loopback6, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state to up R3(config-if)#ip address 192.168.6.1 255.255.255.0 R3(config-if)#
Interfaz loopback 7	R3(config-if)#int lo7 R3(config-if)# %LINK-5-CHANGED: Interface Loopback7, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback7, changed state to up R3(config-if)#ipv6 address 2001:db8:acad:3::/64 R3(config-if)#

Rutas predeterminadas	Ruta IPv4 predeterminada R3(config-if)# exit R3(config)#ip route 0.0.0.0 0.0.0.0 s0/0/1 %Default route without gateway, if not a point-to-point interface, may impact performance R3(config)# Ruta IPv6 predeterminada R3(config)#ipv6 route ::/0 s0/0/1 R3(config)#

6.5. Configuración del S1

Tabla 14. Configuración del S1

Elemento o tarea de configuración	**Especificación**
Desactivar la búsqueda DNS	Switch>enable Switch#config terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#no ip domain-lookup Switch(config)#
Nombre del switch	Switch(config)#hostname S1 S1(config)#
Contraseña de exec privilegiado cifrada	S1(config)#enable secret class S1(config)#

Contraseña de acceso a la consola	S1(config)#line console 0 S1(config-line)#password cisco S1(config-line)#login S1(config-line)#
Contraseña de acceso Telnet	S1(config-line)#line vty 0 15 S1(config-line)#password cisco S1(config-line)#login S1(config-line)#
Cifrar las contraseñas de texto no cifrado	S1(config-line)#exit S1(config)#service password-encryption S1(config)#
Mensaje MOTD	S1(config)#banner motd "Advertencia: Solo personal autorizado" S1(config)#

6.6. Configuración del S3

Tabla 15. Configuración del S3

Elemento o tarea de configuración	**Especificación**
Desactivar la búsqueda DNS	Switch>enable Switch#config terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#no ip domain-lookup Switch(config)#

Nombre del switch	Switch(config)#Hostname S3 S3(config)#
Contraseña de exec privilegiado cifrada	S3(config)#enable secret class S3(config)#
Contraseña de acceso a la consola	S3(config)#line console 0 S3(config-line)#password cisco S3(config-line)#login S3(config-line)#
Contraseña de acceso Telnet	S3(config-line)#line vty 0 15 S3(config-line)#password cisco S3(config-line)#
Cifrar las contraseñas de texto no cifrado	S3(config-line)#exit S3(config)#service password-encryption S3(config)#
Mensaje MOTD	S3(config)#banner motd "Advertencia: Solo personal autorizado" S3(config)#

6.7. Verificación de conectividad de la red

Usando el comando **Ping** probaremos la conectividad entre los dispositivos de la topología realizada.

Tabla 16. Verificación de conectividad de la red

Desde	A	Dirección IP	Resultados de ping
R1	R2, S0/0/0	172.16.1.2	R1#ping 172.16.1.2 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.1.2, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/10 ms
R2	R3, S0/0/1	172.16.2.2	R2#ping 172.16.2.2 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.2.2, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/5/15 ms
PC de Internet	Gateway predeterminado	209.165.200.233	C:\>ping 209.165.200.233 Pinging 209.165.200.233 with 32 bytes of data: Reply from 209.165.200.233: bytes=32 time<1ms TTL=255 Reply from 209.165.200.233: bytes=32 time<1ms TTL=255 Reply from 209.165.200.233: bytes=32 time<1ms TTL=255 Reply from 209.165.200.233: bytes=32 time<1ms TTL=255 Ping statistics for 209.165.200.233: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 0ms, Maximum = 0ms, Average = 0ms

7. Configuración de la seguridad del switch, las VLAN y el routing entre VLAN.

7.1. Configuración del S1

Tabla 17. Configuración del S1

Elemento o tarea de configuración	Especificación
Crear la base de datos de VLAN	Advertencia: Solo personal autorizado User Access Verification Password: S1>enable

	Password: S1#config terminal Enter configuration commands, one per line. End with CNTL/Z. S1(config)#vlan 21 S1(config-vlan)#name Contabilidad S1(config-vlan)#vlan 23 S1(config-vlan)#name Ingenieria S1(config-vlan)#vlan 99 S1(config-vlan)#name Administracion S1(config-vlan)#
Asignar la dirección IP de administración.	S1(config-vlan)#exit S1(config)#int vlan 99 S1(config-if)# %LINK-5-CHANGED: Interface Vlan99, changed state to up S1(config-if)#ip address 192.168.99.2 255.255.255.0 S1(config-if)#
Asignar el gateway predeterminado	S1(config-if)#ip default-gateway 192.168.99.1 S1(config)#
Forzar el enlace troncal en la interfaz F0/3	S1(config)#int f0/3 S1(config-if)#switchport mode trunk

	S1(config-if)# %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to down %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up S1(config-if)#switchport trunk native vlan 1 S1(config-if)#
Forzar el enlace troncal en la interfaz F0/5	S1(config-if)#int f0/5 S1(config-if)#switchport mode trunk S1(config-if)#switchport trunk native vlan 1 S1(config-if)#
Configurar el resto de los puertos como puertos de acceso	S1(config-if)#int range f0/1-2, f0/4, f0/7-2, g0/1-2

	S1(config-if-range)#switchport mode access S1(config-if-range)#
Asignar F0/6 a la VLAN 21	S1(config-if-range)#int f0/6 S1(config-if)#switchport mode access S1(config-if)#switchport access vlan 21 S1(config-if)#
Apagar todos los puertos sin usar	S1(config-if)#int range f0/1-2, f0/4, f0/7-2, g0/1-2 S1(config-if-range)#shutdown %LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

	%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down S1(config-if-range)#

7.2. Configuración del S3

Tabla 18. Configuración del S3

Elemento o tarea de configuración	**Especificación**
Crear la base de datos de VLAN	S3>enable Password: S3#config terminal Enter configuration commands, one per line. End with CNTL/Z. S3(config)#vlan 23 S3(config-vlan)#exit S3(config)#vlan 21 S3(config-vlan)#name Contabilidad S3(config-vlan)#vlan 23 S3(config-vlan)#name Ingenieria S3(config-vlan)#vlan 99 S3(config-vlan)#name Administracion S3(config-vlan)#

Asignar la dirección IP de administración	S3(config-vlan)#exit S3(config)# #int vlan 99 S3(config-if)# %LINK-5-CHANGED: Interface Vlan99, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up S3(config-if)#ip address 192.168.99.3 255.255.255.0 S3(config-if)#
Asignar el gateway predeterminado.	S3(config-if)#exit S3(config)#ip default-gateway 192.168.99.1 S3(config)#
Forzar el enlace troncal en la interfaz F0/3	S3(config)#int f0/3 S3(config-if)#switchport mode trunk S3(config-if)#switchport trunk native vlan 1 S3(config-if)#
Configurar el resto de los puertos como puertos de acceso	S3(config-if)#int range f0/1-2, f0/4-17, f0/19-24, g0/1-2 S3(config-if-range)#switchport mode access S3(config-if-range)#
Asignar F0/18 a la VLAN 23	S3(config-if-range)#int f0/18 S3(config-if)#switchport mode access S3(config-if)#switchport access vlan 23 S3(config-if)#

Apagar todos los puertos sin usar	S3(config-if)#int range f0/1-2, f0/4-17, f0/19-24, g0/1-2 S3(config-if-range)#shutdown %LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

	%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

	%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/20, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down

	%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down %LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down %LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down S3(config-if-range)#

7.3. Configuración del R1.

Tabla 19. Configuración del R1

Elemento o tarea de configuración	**Especificación**
Configurar la subinterfaz 802.1Q .21 en G0/1	R1>enable Password: R1#config terminal Enter configuration commands, one per line. End with CNTL/Z. R1(config)# int g0/1.21 R1(config-subif)#description LAN de contabilidad R1(config-subif)#encapsulation dot1q 31

	R1(config-subif)#ip address 192.168.21.1 255.255.255.0 R1(config-subif)# %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to down %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up R1(config-subif)#
Configurar la subinterfaz 802.1Q .23 en G0/1	R1(config-subif)#int g0/1.23 R1(config-subif)#description LAN de Ingenieria R1(config-subif)#encapsulation dot1q 23 R1(config-subif)#ip address 192.168.23.1 255.255.255.0 R1(config-subif)#
Configurar la subinterfaz 802.1Q .99 en G0/1	R1(config-subif)#int g0/1.99 R1(config-subif)#description LAN de Administracion R1(config-subif)#encapsulation dot1q 99 R1(config-subif)#ip address 192.168.99.1 255.255.255.0 R1(config-subif)#
Activar la interfaz G0/1	R1(config-subif)#int g0/1 R1(config-if)#no shutdown R1(config-if)# %LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up %LINK-5-CHANGED: Interface GigabitEthernet0/1.21, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.21, changed state to up

	%LINK-5-CHANGED: Interface GigabitEthernet0/1.23, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.23, changed state to up %LINK-5-CHANGED: Interface GigabitEthernet0/1.33, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.33, changed state to up %LINK-5-CHANGED: Interface GigabitEthernet0/1.99, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.99, changed state to up R1(config-if)#

7.4. Verificar la conectividad de la red.

Usando el comando ping se probará la conectividad entre los switch y el R1.

Tabla 20. Verificación conectividad de la red

Desde	A	Dirección IP	Resultados de ping
S1	R1, dirección VLAN 99	192.168.99.1	S1#ping 192.168.99.1 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 192.168.99.1, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

S3	R1, dirección VLAN 99	192.168.99.1	S3#ping 192.168.99.1 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 192.168.99.1, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
S1	R1, dirección VLAN 21	192.168.21.1	S1#ping 192.168.21.1 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 192.168.21.1, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
S3	R1, dirección VLAN 23	192.168.23.1	S3#ping 192.168.23.1 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 192.168.23.1, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/2 ms

8. Configuración del protocolo de routing dinámico OSPF

8.1. Configuración OSPF en el R1

Tabla 21. Configuración OSPF en el R1

Elemento o tarea de configuración	**Especificación**
Configurar OSPF ID	R1(config)#router ospf 1 R1(config-router)#
Anunciar las redes conectadas directamente	R1(config-router)#network 172.16.1.1 0.0.0.3 area 0 R1(config-router)#network 192.168.21.0 0.0.0.255 area 0

	R1(config-router)#network 192.168.23.0 0.0.0.255 area 0 R1(config-router)#network 192.168.99.0 0.0.0.255 area 0 R1(config-router)#
Establecer todas las interfaces LAN como pasivas	R1(config-router)#passive-interface g0/1.21 R1(config-router)#passive-interface g0/1.23 R1(config-router)#passive-interface g0/1.99 R1(config-router)#
Desactive la sumarización automática	R1(config-router)#no auto-summary R1(config-router)#

8.2. Configuración OSPF en el R2

Tabla 22. Configuración OSPF en el R2

Elemento o tarea de configuración	**Especificación**
Configurar OSPF área 0	R2(config)#router ospf 1 R2(config-router)#
Anunciar las redes conectadas directamente	R2(config-router)#network 172.16.1.2 0.0.0.3 area 0 R2(config-router)#network 172.16.2.1 0.0.0.3 area 0 R2(config-router)#network 10.10.10.10 0.0.0.255 area 0 R2(config-router)# **Nota:** Omitir la red G0/0.

Establecer la interfaz LAN (loopback) como pasivas	R2(config-router)#passive-interface g0/1 R2(config-router)#
Desactive la sumarización automática.	R2(config-router)#no auto-summary R2(config-router)#

8.3. Configurar OSPF en el router R3

Tabla 23. Configurar OSPF en R3

Elemento o tarea de configuración	**Especificación**
Configurar OSPF área 0	R3(config)#router ospf 1
Anunciar redes IPv4 conectadas directamente	R3(config-router)#network 172.16.2.2 0.0.0.3 area 0 R3(config-router)#
Establecer todas las interfaces de LAN IPv4 (Loopback) como pasivas	R3(config-router)#passive-interface loopback4 R3(config-router)#passive-interface loopback5 R3(config-router)#passive-interface loopback6 R3(config-router)#
Desactive la sumarización automática.	

8.4. Verificación de la información de OSPF

Tabla 24. Verificación de la información de OSPF

Pregunta	Respuesta
¿Con qué comando se muestran la ID del proceso OSPF, la ID del router, las redes de routing y las interfaces pasivas configuradas en un router?	**#Show ip ospf interface**
¿Qué comando muestra solo las rutas OSPF?	**#show ip route ospf**
¿Qué comando muestra la sección de OSPF de la configuración en ejecución?	**#show running-config**

9. Implementación DHCP y NAT para IPv4

9.1. Configuración del router R1 como servidor DHCP para las VLAN 21 y 23

Tabla 25. Configuración de R1 como servidor DHCP

Elemento o tarea de configuración	Especificación
Reservar las primeras 20 direcciones IP en la VLAN 21 para configuraciones estáticas	R1(config)#ip dhcp excluded-address 192.168.21.1 192.168.21.20 R1(config)#
Reservar las primeras 20 direcciones IP en la	R1(config)#ip dhcp excluded-address 192.168.23.1 192.168.23.20

VLAN 23 para configuraciones estáticas	R1(config)#
Crear un pool de DHCP para la VLAN 21.	R1(config)#ip dhcp pool acct R1(dhcp-config)#dns-server 10.10.10.10 R1(dhcp-config)#domain-name ccna-sa.com R1(dhcp-config)#default-router 198.168.21.1 R1(dhcp-config)#network 198.168.21.1 255.255.255.0 R1(dhcp-config)#
Crear un pool de DHCP para la VLAN 23	R1(config)#ip dhcp pool engnr R1(dhcp-config)#dns-server 10.10.10.10 R1(dhcp-config)#domain-name ccna-sa.com R1(dhcp-config)#default-router 198.168.23.1 R1(dhcp-config)#network 198.168.23.1 255.255.255.0 R1(dhcp-config)#

9.2. Configuración de la NAT estática y dinámica del R2.

Tabla 26. Configuración de la NAT estática y dinámica del R2

Elemento o tarea de configuración	**Especificación**
Crear una base de datos local con una cuenta de usuario	R2(config)#user webuser privilege 15 secret cisco12345 R2(config)#
Habilitar el servicio del servidor HTTP	R2(config)#ip http server ^ % Invalid input detected at '^' marker.

	R2(config)# Este router no soporta este comando, por lo que se usara un servidor WEB.
Configurar el servidor HTTP para utilizar la base de datos local para la autenticación	R2(config)#ip http authentication local ^ % Invalid input detected at '^' marker. R2(config)# Este router no soporta este comando, por lo que se usara un servidor WEB.
Crear una NAT estática al servidor web.	R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229 R2(config)#
Asignar la interfaz interna y externa para la NAT estática	R2(config)#int g0/0 R2(config-if)#ip nat outside R2(config-if)#int g0/1 R2(config-if)#ip nat inside R2(config-if)#
Configurar la NAT dinámica dentro de una ACL privada	R2(config)#access-list 1 permit 192.168.21.0 0.0.0.255 R2(config)#access-list 1 permit 192.168.23.0 0.0.0.255 R2(config)#access-list 1 permit 192.168.4.0 0.0.3.255 R2(config)#
Defina el pool de direcciones IP públicas utilizables.	R2(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask 255.255.255.248 R2(config)#

Definir la traducción de NAT dinámica	R2(config)#ip nat inside source list 1 pool INTERNET R2(config)#

9.3. Verificación del protocolo DHCP y NAT estático.

Tabla 27. Verificación del protocolo DHCP y NAT estático

Prueba	Resultados
Verificar que la PC-A haya adquirido información de IP del servidor de DHCP	
Verificar que la PC-C haya adquirido información de IP del servidor de DHCP	
Verificar que la PC-A pueda hacer ping a la PC-C **Nota:** Quizá sea necesario deshabilitar el firewall de la PC.	
Utilizar un navegador web en la computadora de Internet para acceder al servidor web (209.165.200.229) Iniciar sesión con el nombre de usuario **webuser** y la contraseña **cisco12345**	

10. Configuración de NTP.

Tabla 28. Configuración de NTP

Elemento o tarea de configuración	**Especificación**
Ajuste la fecha y hora en R2.	R2#clock set 09:00:00 march 5 2016 R2#
Configure R2 como un maestro NTP.	Nivel de estrato: **5**
Configurar R1 como un cliente NTP.	Servidor: **R2**
Configure R1 para actualizaciones de calendario periódicas con hora NTP.	
Verifique la configuración de NTP en R1.	

11. Configurar y verificar las listas de control de acceso (ACL).

11.1. Restringir a acceso a las líneas vty en el R2.

Tabla 29. Restringir a acceso a las líneas vty en el R2

Elemento o tarea de configuración	**Especificación**
Configurar una lista de acceso con nombre para permitir que solo R1 establezca una conexión Telnet con R2	R2(config)#ip access-list standard ADMIN-MGT R2(config-std-nacl)#permit host 172.16.1.1 R2(config-std-nacl)#

Aplicar la ACL con nombre a las líneas VTY	R2(config)#line vty 0 15 R2(config-line)#access-class ADMIN-MGT in R2(config-line)#
Verificar que la ACL funcione como se espera	R1#telnet 172.16.1.2 Trying 172.16.1.2 ...OpenAdvertencia: Solo personal autorizado User Access Verification Password: R2>enable Password: R2#

11.2. Introducir el comando CLI adecuado que se necesita para mostrar lo siguiente.

Tabla 30. Introducir el comando CLI adecuado

Descripción del comando	**Entrada del estudiante (comando)**
Mostrar las coincidencias recibidas por una lista de acceso desde la última vez que se restableció	R2#show access-list Standard IP access list 1 10 permit 192.168.21.0 0.0.0.255 20 permit 192.168.23.0 0.0.0.255 30 permit 192.168.4.0 0.0.3.255

	Standard IP access list ADMIN-MGT 10 permit host 172.16.1.1 (2 match(es)) R2#
Restablecer los contadores de una lista de acceso	R2#clear ip access-list counters ^ % Invalid input detected at '^' marker. R2# Packet Tracer no soporta este comando.
¿Qué comando se usa para mostrar qué ACL se aplica a una interfaz y la dirección en que se aplica?	R2#**show running-config** Building configuration... ! interface GigabitEthernet0/0 description connection to Internet ip address 209.165.200.233 255.255.255.248 ip access-group 101 out ip nat outside duplex auto speed auto ipv6 address 2001:DB8:ACAD:A::/64

¿Con qué comando se muestran las traducciones NAT?	**Nota:** Las traducciones para la PC-A y la PC-C se agregaron a la tabla cuando la computadora de Internet intentó hacer ping a esos equipos en el paso 2. Si hace ping a la computadora de Internet desde la PC-A o la PC-C, no se agregarán las traducciones a la tabla debido al modo de simulación de Internet en la red.
¿Qué comando se utiliza para eliminar las traducciones de NAT dinámicas?	R2#**show ip nat translations**

CONCLUSIONES

Al momento de realizar la respectiva verificación de la configuración de la red, se evidencia que al momento de ejecutar el comando ping entre los diferentes equipos, teniendo en cuenta las dos conectividades IPv4 e IPv6, estos son enviados con éxito.

Debido al uso de los diferentes protocolos de configuración de redes, se pudieron aplicar los comandos aprendidos anteriormente, mediante la ejecución de este ejercicio práctico.

Mediante la implementación de protocolos de seguridad se inhibe el ingreso a los equipos que puedan afectar la transferencia de datos e información entre los mismos.

Las configuraciones realizadas directamente en la interfaz de cada uno de los equipos fueron realizadas mediante la consola de un servidor, lo que permite aprender diferentes formas de configuración.

Se logran configurar equipos de red para conectividad IPv4 e IPv6, de igual manera protocolos seguridad aplicados al caso de estudio.

Se realiza la configuración como servidor DHCP para las VLAN requeridas en el ejercicio ejecutado.

Se consiguen aplicar las listas de acceso de control (ACL) en los diferentes equipos de la topología, teniendo accesos específicos a los diferentes servicios.

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