

EVALUACIÓN PRUEBA DE HABILIDADES PRACTICAS CCNA

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INGENIERÍA ELECTRONICA

SEVILLA, VALLE DEL CAUCA

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GLOSARIO

- HSRP: Protocolo de enrutamiento en espera del host. Asigne un enrutador en el grupo de espera a activo, otro al modo de espera y el otro a escuchar. En este caso, el enrutador está activo y dinámicamente tiene una IP virtual.
- ISP: Proveedor de servicios de Internet, término que identifica a una empresa que proporciona acceso a Internet.
- LACP: Protocolo de control de agregación de enlaces, una función de Capa 2 que combina los puertos físicos de una red en un puerto lógico de alta velocidad para crear redundancia.
- MP-BGP: Multiprotocolo-BGP. Permite que BGP transporte información de IPv6 y otros protocolos multired.
- OSPFv2: abrir primero la ruta más corta. Un protocolo de enrutamiento dinámico que detecta cambios de topología, fallas de enlace y converge rápidamente a nuevas topologías, especialmente para IPv4.
- OSPFv3: abrir primero la ruta más corta. Un protocolo de enrutamiento dinámico que detecta cambios de topología, fallas de enlace y converge rápidamente a nuevas topologías, especialmente para IPv6.
- Root Bridge: Un punto de referencia en la red que puede admitir más conmutadores. Todos los interruptores deben conectarse al menor costo.
- RSTP: el protocolo Rapid Spanning Tree se aplica en la capa 2 para reducir significativamente la convergencia de topología bajo ciertos cambios.
- VLAN: LAN virtual, un método utilizado para crear múltiples redes lógicas dentro de la misma red física.

RESUMEN

Este trabajo incluye un escenario para practicar los conocimientos adquiridos en el Diploma Avanzado CCNA de CISCO, ilustrado con la implementación de las configuraciones y el escenario proporcionados en el entorno virtual del Real Data Network Simulation Lab. Proporciona acceso al enrutamiento y conmutación entre dispositivos que intervienen en diferentes redes, lo que permite evaluar el nivel de conocimiento, habilidades, comprensión y configuración a nivel de red para el entorno de la solución. Investigadores y profesionales en el campo de la electrónica y las telecomunicaciones. Se explicará en detalle la solución del escenario propuesto, el código de configuración para cada dispositivo en la red y el proceso de solución de red de enrutamiento y segmento de red. Este escenario utiliza una variedad de protocolos de enrutamiento, incluidos OSPF y MP-BGP, redundancia de primer salto. La configuración se realiza a través de HRSP versión 2 Enviar, realizar la configuración del nivel de seguridad y las funciones de administración de la red, verificar la configuración del enrutador y del conmutador, verificar el ping, rastrear la ruta, la ruta de la red, mostrar la IP, etc. Pasar la prueba de conexión.

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

ABSTRACT

This work includes a scenario to practice the knowledge acquired in the CISCO CCNA Advanced Diploma, illustrated with the implementation of the configurations and the appropriate scenario in the virtual environment of the Real Data Network Simulation Lab. Access Provide routing and switching between devices involved in different networks, which allows to assess the level of knowledge, skills, understanding and configuration at the network level for the solution environment. Researchers and professionals in the field of electronics and telecommunications. The solution of the proposed scenario, the configuration code for each device in the network, and the network routing and network segment solution process will be explained in detail. This scenario uses a variety of routing protocols, including OSPF and MP-BGP, first hop redundancy. Configuration is via HRSP version 2 Send, perform security level configuration and network management functions, check router and switch settings, check ping, trace route, network path, show the IP, etc. Pass the connection test.

Keywords: CISCO, CCNA, Routing, Switching, Networking, Electronics.

INTRODUCCIÓN

Las redes de datos y las tecnologías de la comunicación contribuyen al desarrollo de la tecnología global al proporcionar un gran valor para conectar a las personas y resolver problemas a nivel local. Por lo tanto, se requiere conocimiento de la red de aplicaciones para coordinar los dispositivos, componentes y configuraciones requeridas para estas operaciones. Los componentes de dispositivos operativos, como enrutadores, conmutadores y dispositivos de usuario amplían el contenido de este documento para las VLAN, la administración de políticas de seguridad y los protocolos de enrutamiento dinámico.

Este trabajo se basa en una secuencia de comandos propuesta que conecta el enrutador de un ISP a la nube a través de una "red privada". Hay dos tipos de redes corporativas. Dos de las redes virtuales de la red, R1 y R3, utilizan un protocolo de enrutamiento dinámico que administra el enrutamiento de paquetes y tiene estado de enlace OSPF, el protocolo más utilizado por organizaciones e instituciones. Tengo un enrutador que hice. Medianas y grandes redes. Con una arquitectura en capas que facilita la escalabilidad, la seguridad y la gestión de enrutamiento, OSPF se ha establecido como la métrica a utilizar en función de la velocidad del enlace y tiene otras funciones que permiten la gestión del rendimiento. Además de la configuración básica del dispositivo de red para el enrutamiento, se realiza la configuración del canal Ethernet, la configuración de conmutador a conmutador y la configuración de la interfaz troncal, el protocolo RSPT está habilitado y los conmutadores L2 utilizan la versión 2 de HSRP para la redundancia de primer salto para proteger todos sus dispositivos. Este está protegido por políticas de seguridad y finalmente se realizan pruebas de conectividad entre los distintos actores de la topología para verificar su funcionamiento.

ESCENARIO 1

En este trabajo se va a construir una red, configurar los ajustes básicos de cada dispositivo y el direccionamiento de las interfaces.

Figura 1 Escenario 1

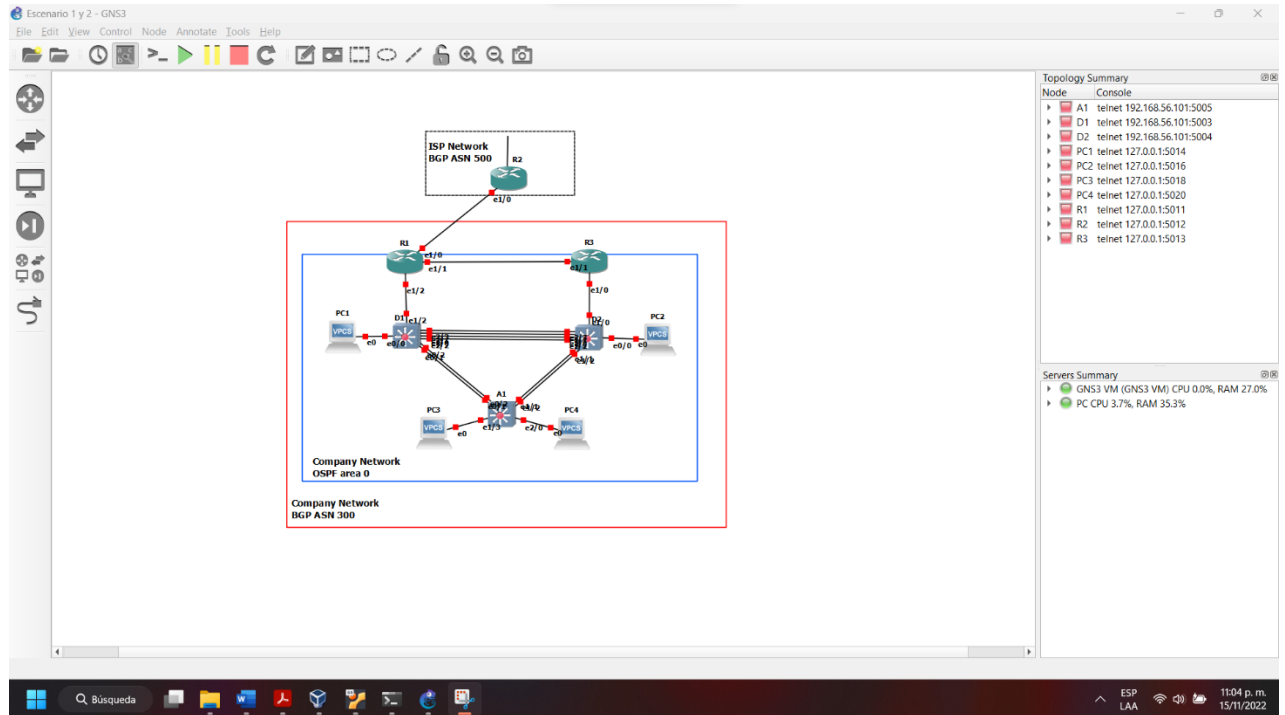


Tabla 1 Tabla de direccionamiento IP

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R1	E1/0	209.165.200.225/27	2001:db8:200::1/64	fe80::1:1
R1	E1/2	10.73.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
R1	E1/1	10.73.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1
R2	Loopback0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R3	E1/0	10.73.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
R3	E1/1	10.73.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.73.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
D1	VLAN 100	10.73.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
D1	VLAN 101	10.73.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
D1	VLAN 102	10.73.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.73.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
D2	VLAN 100	10.73.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
D2	VLAN 101	10.73.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
D2	VLAN 102	10.73.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.73.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.73.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.73.100.6/24	2001:db8:100:100::6/64	EUI-64

El primer paso diseñar la red de la figura 1 y luego hay que realizar las configuraciones básicas de la red con la tabla 1. En la tabla 2 se muestran los comandos para las configuraciones básicas de cada dispositivo.

Tabla 2 Configuraciones básicas

Routers	R1	
		<pre> config t hostname R1 ipv6 unicast-routing no ip domain-lookup banner motd # R1, ENCOR </pre>

		<pre> Skills Assessment# line con 0 exec-timeout 0 0 logging synchronous exit interface e1/0 ip address 209.165.200.225 255.255.255.224 ipv6 address fe80::1:1 link-local ipv6 address 2001:db8:200::1/64 no shutdown exit interface e1/2 ip address 10.73.10.1 255.255.255.0 ipv6 address fe80::1:2 link-local ipv6 address 2001:db8:100:1010::1/64 no shutdown exit interface e1/1 ip address 10.73.13.1 255.255.255.0 ipv6 address fe80::1:3 link-local ipv6 address </pre>
--	--	---

		<pre> 2001:db8:100:1013::1/64 no shutdown exit exit copy running-config startup- config </pre>
	R2	<pre> config t hostname R2 ipv6 unicast-routing no ip domain-lookup banner motd # R2, ENCOR Skills Assessment# line con 0 exec-timeout 0 0 logging synchronous exit interface e1/0 ip address 209.165.200.226 255.255.255.224 ipv6 address fe80::2:1 link-local ipv6 address 2001:db8:200::2/64 no shutdown exit interface Loopback 0 ip address 2.2.2.2 </pre>

		<pre> 255.255.255.255 ipv6 address fe80::2:3 link-local ipv6 address 2001:db8:2222::1/128 no shutdown exit exit copy running-config startup- config </pre>
	<p>R3</p>	<pre> config t hostname R3 ipv6 unicast-routing no ip domain-lookup banner motd # R3, ENCOR Skills Assessment# line con 0 exec-timeout 0 0 logging synchronous exit interface e1/0 ip address 10.73.11.1 255.255.255.0 ipv6 address fe80::3:2 link-local ipv6 address 2001:db8:100:1011::1/64 no shutdown </pre>

		<pre> exit interface e1/1 ip address 10.73.13.3 255.255.255.0 ipv6 address fe80::3:3 link-local ipv6 address 2001:db8:100:1010::2/64 no shutdown exit exit copy running-config startup- config </pre>
Switches	D1	<pre> config t hostname D1 ip routing ipv6 unicast-routing no ip domain lookup banner motd # D1, ENCOR Skills Assessment# line con 0 exec-timeout 0 0 logging synchronous exit vlan 100 name Management </pre>

		<pre>exit vlan 101 name UserGroupA exit vlan 102 name UserGroupB exit vlan 999 name NATIVE exit interface e1/2 no switchport ip address 10.73.10.2 255.255.255.0 ipv6 address fe80::d1:1 link- local ipv6 address 2001:db8:100:1010::2/64 no shutdown exit interface vlan 100 ip address 10.73.100.1 255.255.255.0 ipv6 address fe80::d1:2 link- local ipv6 address</pre>
--	--	---

		<pre> 2001:db8:100:100::1/64 no shutdown exit interface vlan 101 ip address 10.73.101.1 255.255.255.0 ipv6 address fe80::d1:3 link- local ipv6 address 2001:db8:100:101::1/64 no shutdown exit interface vlan 102 ip address 10.73.102.1 255.255.255.0 ipv6 address fe80::d1:4 link- local ipv6 address 2001:db8:100:102::1/64 no shutdown exit ip dhcp excluded-address 10.73.101.1 10.73.101.109 ip dhcp excluded-address 10.73.101.141 10.73.101.254 ip dhcp excluded-address 10.73.102.1 10.73.102.109 ip dhcp excluded-address </pre>
--	--	--

		<pre> 10.73.102.141 10.73.102.254 ip dhcp pool VLAN-101 network 10.73.101.0 255.255.255.0 default-router 10.73.101.254 exit ip dhcp pool VLAN-102 network 10.73.102.0 255.255.255.0 default-router 10.73.102.254 exit interface range e0/3,e1/0- 1,e1/3,e3/0-3 shutdown exit exit copy running-config startup- config </pre>
	D2	<pre> config t hostname D2 ip routing ipv6 unicast-routing no ip domain lookup banner motd # D2, ENCOR Skills Assessment# line con 0 </pre>

		<pre>exec-timeout 0 0 logging synchronous exit vlan 100 name Management exit vlan 101 name UserGroupA exit vlan 102 name UserGroupB exit vlan 999 name NATIVE exit interface e1/0 no switchport ip address 10.73.11.2 255.255.255.0 ipv6 address fe80::d2:1 link- local ipv6 address 2001:db8:100:1011::2/64 no shutdown exit</pre>
--	--	---

		<pre> interface vlan 100 ip address 10.73.100.2 255.255.255.0 ipv6 address fe80::d2:2 link- local ipv6 address 2001:db8:100:100::2/64 no shutdown exit interface vlan 101 ip address 10.73.101.2 255.255.255.0 ipv6 address fe80::d2:3 link- local ipv6 address 2001:db8:100:101::2/64 no shutdown exit interface vlan 102 ip address 10.73.102.2 255.255.255.0 ipv6 address fe80::d2:4 link- local ipv6 address 2001:db8:100:102::2/64 no shutdown exit ip dhcp excluded-address </pre>
--	--	--

		<pre> 10.73.101.1 10.73.101.209 ip dhcp excluded-address 10.73.101.241 10.73.101.254 ip dhcp excluded-address 10.73.102.1 10.73.102.209 ip dhcp excluded-address 10.73.102.241 10.73.102.254 ip dhcp pool VLAN-101 network 10.73.101.0 255.255.255.0 default-router 10.73.101.254 exit ip dhcp pool VLAN-102 network 10.73.102.0 255.255.255.0 default-router 10.73.102.254 exit interface range e0/1-3,e1/3,e3/0- 3 shutdown exit exit copy running-config startup- config </pre>
	A1	<pre> config t hostname A1 no ip domain lookup </pre>

		<pre>banner motd # A1, ENCOR Skills Assessment# line con 0 exec-timeout 0 0 logging synchronous exit vlan 100 name Management exit vlan 101 name UserGroupA exit vlan 102 name UserGroupB exit vlan 999 name NATIVE exit interface vlan 100 ip address 10.73.100.3 255.255.255.0 ipv6 address fe80::a1:1 link- local ipv6 address 2001:db8:100:100::3/64</pre>
--	--	--

		no shutdown exit interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3 shutdown exit exit copy running-config startup- config
--	--	--

El siguiente paso es realizar la configuración del direccionamiento de host del PC1 y PC4 con los comandos de la tabla 3.

Tabla 3 Direccionamiento de host en PC1 y PC4

PC1	ip 10.73.100.5/24 255.255.255.0 ip 2001:db8:100:100::5/64 save
PC4	ip 10.73.100.6/24 255.255.255.0 ip 2001:db8:100:100::6/64 save

Lo siguiente es configurar la capa 2 de la red y el soporte de Host, utilizando los comandos de la tabla 4.

Tabla 4 Comando configuración capa 2 de la red y soporte host

Switches	D1	Config t interface range e2/0-3, e0/1-
-----------------	-----------	---

		<pre> 2 switchport trunk encapsulation dot1q switchport mode trunk no shutdown exit interface range e2/0-3, e0/1- 2 switchport trunk native vlan 999 exit spanning-tree mode rapid- pvst spanning-tree vlan 100 root primary spanning-tree vlan 102 root primary spanning-tree vlan 101 root secondary interface range e2/0-3 channel-protocol lacp channel-group 12 mode active exit interface port-channel 12 switchport trunk encapsulation dot1q switchport mode trunk </pre>
--	--	--

		<pre> switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 exit interface range e0/1-2 channel-protocol lacp channel-group 1 mode active exit interface port-channel 1 switchport trunk encapsulation dot1q switchport mode trunk switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 exit interface e0/0 switchport mode access switchport access vlan 100 spanning-tree portfast no shutdown exit </pre>
	D2	<pre> config t interface range e2/0-3, e1/1- </pre>

		<pre> 2 switchport trunk encapsulation dot1q switchport mode trunk no shutdown exit interface range e2/0-3, e1/1- 2 switchport trunk native vlan 999 exit spanning-tree mode rapid- pvst spanning-tree vlan 101 root primary spanning-tree vlan 100 root secondary spanning-tree vlan 102 root secondary interface range e2/0-3 channel-protocol lacp channel-group 12 mode active exit interface port-channel 12 switchport trunk encapsulation dot1q switchport mode trunk </pre>
--	--	--

		<pre> switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 exit interface range e1/1-2 channel-protocol lacp channel-group 2 mode active exit interface port-channel 2 switchport trunk encapsulation dot1q switchport mode trunk switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 exit interface e0/0 switchport mode access switchport access vlan 102 spanning-tree portfast no shutdown exit </pre>
	A1	<pre> config t interface range e0/1-2, e1/1- </pre>

		<pre> 2 switchport trunk encapsulation dot1q switchport mode trunk no shutdown exit interface range e0/1-2, e1/1- 2 switchport trunk native vlan 999 exit spanning-tree mode rapid- pvst interface range e0/1-2 channel-protocol lacp channel-group 1 mode passive exit interface port-channel 1 switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 switchport mode trunk exit interface range e1/1-2 channel-protocol lacp </pre>
--	--	--

		<pre> channel-group 2 mode passive exit interface port-channel 2 switchport mode trunk switchport trunk native vlan 999 switchport trunk allowed vlan 100-102 exit interface e1/3 switchport mode access switchport access vlan 101 spanning-tree portfast no shutdown exit interface e2/0 switchport mode access switchport access vlan 100 spanning-tree portfast no shutdown exit </pre>
--	--	---

Luego se realizan las pruebas para verificar las configuraciones, en las figuras 2 – 13 se muestran cada una de las pruebas realizadas.

Figura 2 Figura 2 Verificar enlaces troncales en el Switch D1

```
Nov 18 04:59:54.364: %DUP-4-DUPLEX_MISMATCH: duplex mismatch discovered on ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show int trunk

Port      Mode      Encapsulation  Status      Native vlan
-----
Po1       on        802.1q         trunking    999
Po12      on        802.1q         trunking    999

Port      Vlans allowed on trunk
-----
Po1       100-102
Po12      100-102

Port      Vlans allowed and active in management domain
-----
Po1       100-102
Po12      100-102

Port      Vlans in spanning tree forwarding state and not pruned
-----
Po1       100-102
Po12      100-102
D1#
```

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Figura 3 Verificar enlaces troncales en el Switch D2.



```
Nov 16 04:36:59.559: M1NRPDIO-S-UPDOWN: Line protocol on Interface Port-chann
e112, changed state to up
D2#
*Nov 16 04:37:40.970: MHSRP-5-STATECHANGE: Vlan100 Grp 106 state Active -> Speak
D2#
*Nov 16 04:37:42.221: MHSRP-5-STATECHANGE: Vlan102 Grp 124 state Active -> Speak
*Nov 16 04:37:42.298: MHSRP-5-STATECHANGE: Vlan102 Grp 126 state Active -> Speak
*Nov 16 04:37:42.402: MHSRP-5-STATECHANGE: Vlan100 Grp 104 state Active -> Speak
D2#
*Nov 16 04:37:48.338: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:37:52.297: MHSRP-5-STATECHANGE: Vlan100 Grp 106 state Speak -> Standb
y
*Nov 16 04:37:53.117: MHSRP-5-STATECHANGE: Vlan102 Grp 124 state Speak -> Standb
y
*Nov 16 04:37:53.224: MHSRP-5-STATECHANGE: Vlan100 Grp 104 state Speak -> Standb
y
D2#
*Nov 16 04:37:53.703: MHSRP-5-STATECHANGE: Vlan102 Grp 126 state Speak -> Standb
y
D2#
*Nov 16 04:38:40.083: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:39:38.131: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:40:19.233: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#show int trunk

Port      Mode          Encapsulation  Status        Native vlan
-----
Po2       on            802.1q         trunking     999
Po12      on            802.1q         trunking     999

Port      Vlans allowed on trunk
-----
Po2       100-102
Po12      100-102

Port      Vlans allowed and active in management domain
-----
Po2       100-102
Po12      100-102

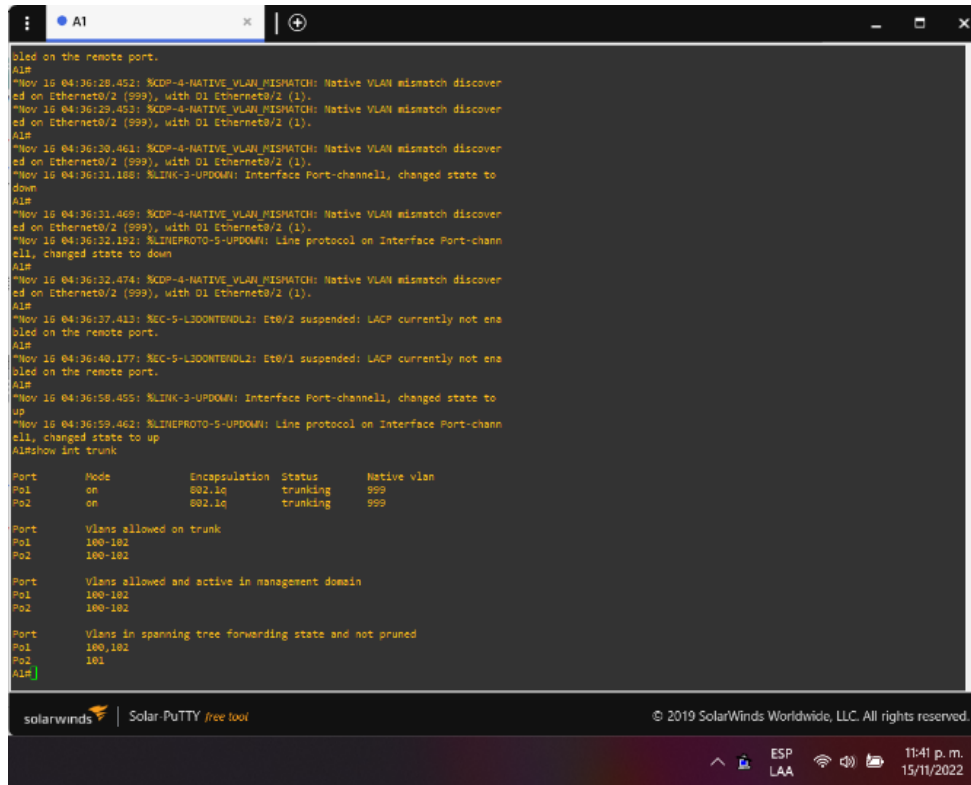
Port      Vlans in spanning tree forwarding state and not pruned
-----
Po2       100-102
Po12      100-102
D2#
```

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ESP LAA 11:40 p. m. 15/11/2022

Figura 4 Verificar enlaces troncales en el Switch A1.



```
bled on the remote port.
A1#
*Nov 16 04:36:28.452: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet0/2 (999), with D1 Ethernet0/2 (1).
*Nov 16 04:36:29.453: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet0/2 (999), with D1 Ethernet0/2 (1).
A1#
*Nov 16 04:36:30.461: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet0/2 (999), with D1 Ethernet0/2 (1).
*Nov 16 04:36:31.108: %LINK-3-UPDOWN: Interface Port-channel1, changed state to down
A1#
*Nov 16 04:36:31.469: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet0/2 (999), with D1 Ethernet0/2 (1).
*Nov 16 04:36:32.192: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to down
A1#
*Nov 16 04:36:32.474: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet0/2 (999), with D1 Ethernet0/2 (1).
A1#
*Nov 16 04:36:37.413: %EC-5-L3OINTERDL2: Et0/2 suspended: LACP currently not enabled on the remote port.
A1#
*Nov 16 04:36:40.177: %EC-5-L3OINTERDL2: Et0/1 suspended: LACP currently not enabled on the remote port.
A1#
*Nov 16 04:36:58.455: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up
*Nov 16 04:36:59.462: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up
A1#show int trunk
Port      Node      Encapsulation  Status      Native Vlan
-----
Po1       on        802.1q         trunking    999
Po2       on        802.1q         trunking    999

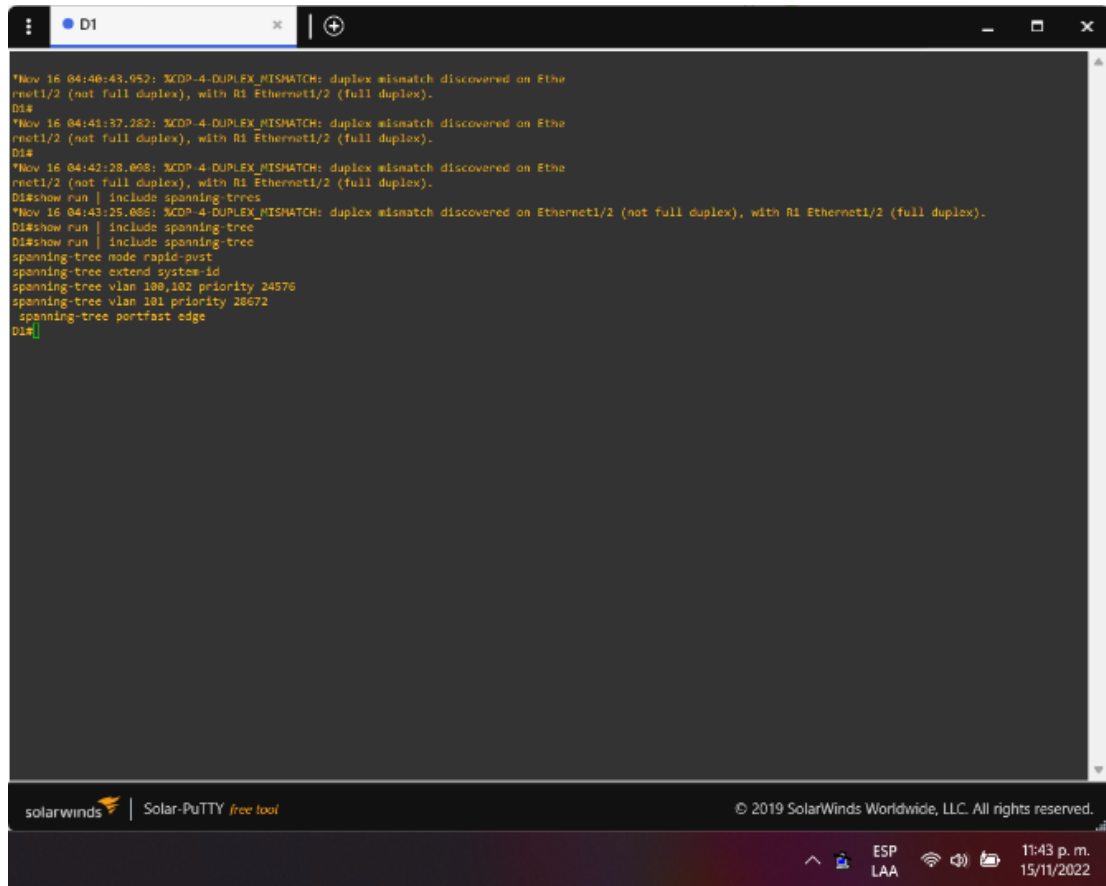
Port      Vlans allowed on trunk
-----
Po1       100-102
Po2       100-102

Port      Vlans allowed and active in management domain
-----
Po1       100-102
Po2       100-102

Port      Vlans in spanning tree forwarding state and not pruned
-----
Po1       100,102
Po2       101
A1#
```

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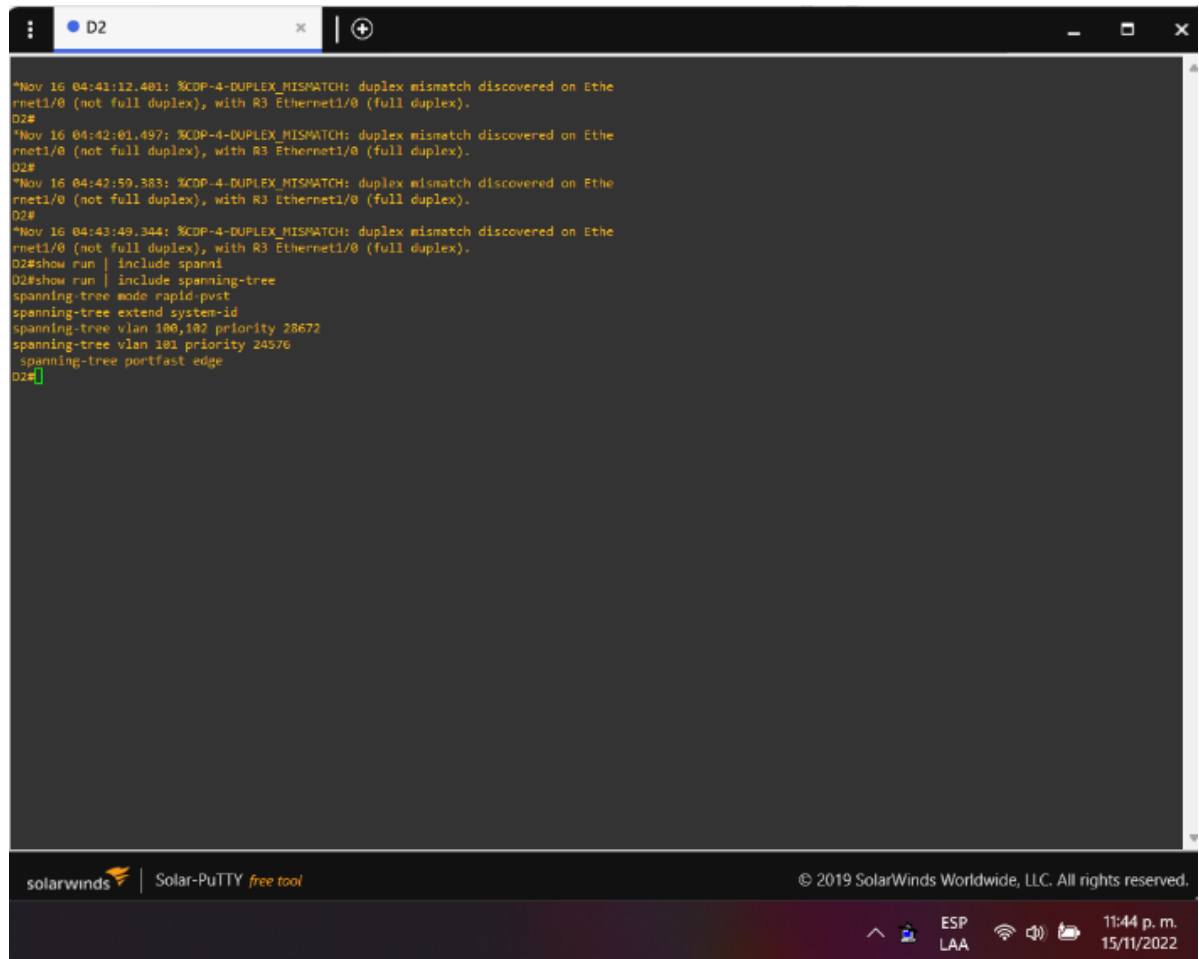
Figura 5 Verificar Spanning-tree en el Switch D1



```
Nov 16 04:40:43.952: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
Nov 16 04:41:37.282: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
Nov 16 04:42:28.008: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show run | include spanning-tree
Nov 16 04:43:25.086: MCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show run | include spanning-tree
D1#show run | include spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
spanning-tree vlan 100,102 priority 24576
spanning-tree vlan 101 priority 26072
spanning-tree portfast edge
D1#
```

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Figura 6 Verificar Spanning-tree en el Switch D2



```
D2
*Nov 16 04:41:12.481: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:42:01.497: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:42:59.383: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:43:49.344: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#show run | include spanni
D2#show run | include spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
spanning-tree vlan 100,102 priority 28672
spanning-tree vlan 101 priority 24576
spanning-tree portfast edge
D2#
```

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Figura 7 Verificar LACP en Switch D1

```

D1

*Nov 16 04:44:17.782: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 16 04:45:18.291: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 16 04:46:09.205: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 16 04:47:06.603: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 16 04:47:57.498: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show lacp neighbor
^
% Invalid input detected at '^' marker.

D1#show lacp neighbor
Flags: S - Device is requesting Slow LACPDUs
      F - Device is requesting fast LACPDUs
      A - Device is in Active mode      P - Device is in Passive mode

Channel group 1 neighbors
Partner's information:
Port      Flags  Priority  Dev ID      Age  Admin Oper  Port  Port
Et0/1     SP     32768    aabb.cc80.0300  7s  0x0  0x1  0x2  0x3C
Et0/2     SP     32768    aabb.cc80.0300  23s 0x0  0x1  0x3  0x3C

Channel group 12 neighbors
Partner's information:
Port      Flags  Priority  Dev ID      Age  Admin Oper  Port  Port
Et2/0     SA     32768    aabb.cc80.0400  23s 0x0  0x0  0x201 0x30
Et2/1     SA     32768    aabb.cc80.0400  7s  0x0  0x0  0x202 0x30
Et2/2     SA     32768    aabb.cc80.0400  4s  0x0  0x0  0x203 0x30
Et2/3     SA     32768    aabb.cc80.0400  9s  0x0  0x0  0x204 0x30
D1#
*Nov 16 04:48:45.587: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethern
et1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#

```

Figura 8 Verificar LACP en Switch D2

```
Nov 16 04:48:22.199: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
Nov 16 04:49:13.835: XCDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#show lacp neighbor
Flags: S - Device is requesting Slow LACPDUs
      F - Device is requesting Fast LACPDUs
      A - Device is in Active mode      P - Device is in Passive mode

Channel group 2 neighbors
Partner's information:
Port      Flags  LACP port
Priority  Dev ID  Age  Admin Oper  Port  Port
tt2/0    SA     32768 aabb.cc00.0200 18s 0x0 0xC 0x201 0x3D
tt2/1    SA     32768 aabb.cc00.0200 22s 0x0 0xC 0x202 0x3D
tt2/2    SA     32768 aabb.cc00.0200 16s 0x0 0xC 0x203 0x3D
tt2/3    SA     32768 aabb.cc00.0200 16s 0x0 0xC 0x204 0x3D
D2#
```

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Figura 9 Verificar LACP en Switch A1

```
A1#show lacp neighbor
Flags: S - Device is requesting Slow LACPDU
      F - Device is requesting Fast LACPDU
      A - Device is in Active mode      P - Device is in Passive mode

Channel group 1 neighbors
Partner's information:

```

Port	Flags	Priority	Dev ID	Age	Admin key	Oper Key	Port Number	Port State
Et0/1	SA	32768	ea0b.cc00.0200	23s	0x0	0x1	0x2	0x30
Et0/2	SA	32768	ea0b.cc00.0200	0s	0x0	0x1	0x3	0x30

```
Channel group 2 neighbors
Partner's information:

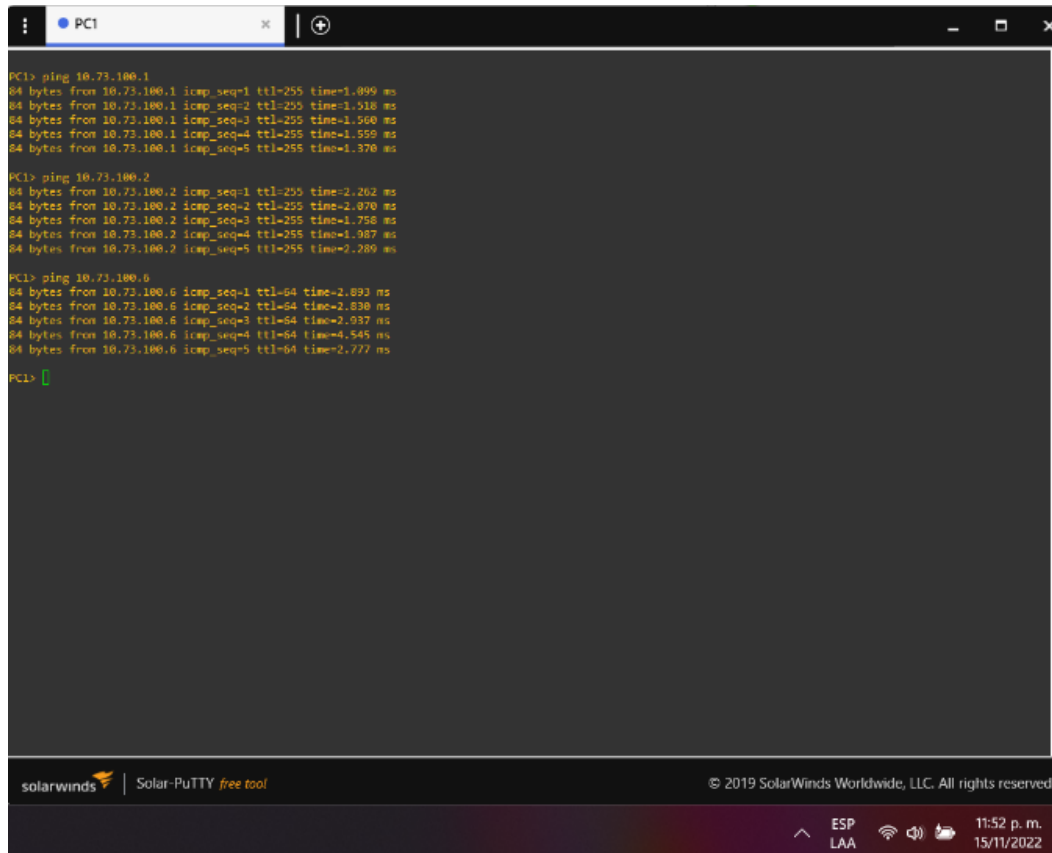
```

Port	Flags	Priority	Dev ID	Age	Admin key	Oper Key	Port Number	Port State
Et1/1	SA	32768	ea0b.cc00.0400	2s	0x0	0x2	0x102	0x30
Et1/2	SA	32768	ea0b.cc00.0400	2s	0x0	0x2	0x103	0x30

```
A1#
```

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Figura 10 Ping entre los dispositivos de la red local desde el PC1



```
PC1> ping 10.73.100.1
64 bytes from 10.73.100.1 icmp_seq=1 ttl=255 time=1.499 ms
64 bytes from 10.73.100.1 icmp_seq=2 ttl=255 time=1.516 ms
64 bytes from 10.73.100.1 icmp_seq=3 ttl=255 time=1.560 ms
64 bytes from 10.73.100.1 icmp_seq=4 ttl=255 time=1.559 ms
64 bytes from 10.73.100.1 icmp_seq=5 ttl=255 time=1.370 ms

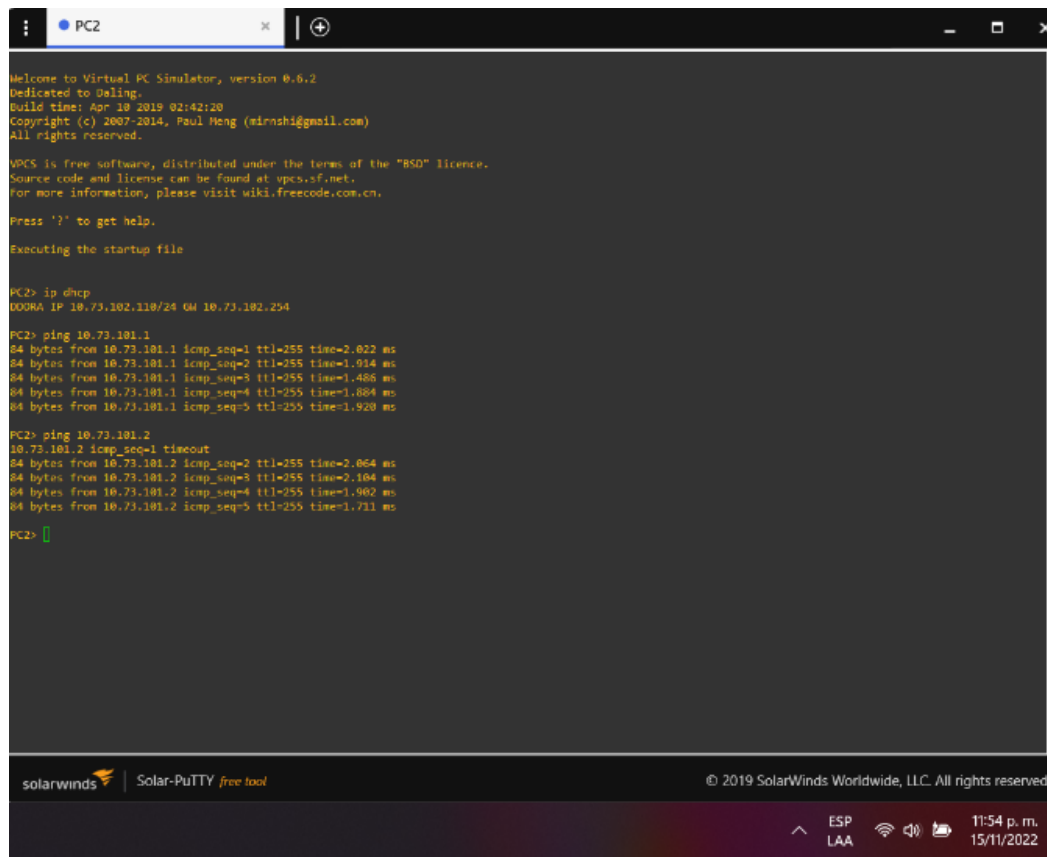
PC1> ping 10.73.100.2
64 bytes from 10.73.100.2 icmp_seq=1 ttl=255 time=2.262 ms
64 bytes from 10.73.100.2 icmp_seq=2 ttl=255 time=2.070 ms
64 bytes from 10.73.100.2 icmp_seq=3 ttl=255 time=1.758 ms
64 bytes from 10.73.100.2 icmp_seq=4 ttl=255 time=1.987 ms
64 bytes from 10.73.100.2 icmp_seq=5 ttl=255 time=2.280 ms

PC1> ping 10.73.100.6
64 bytes from 10.73.100.6 icmp_seq=1 ttl=64 time=2.893 ms
64 bytes from 10.73.100.6 icmp_seq=2 ttl=64 time=2.830 ms
64 bytes from 10.73.100.6 icmp_seq=3 ttl=64 time=2.937 ms
64 bytes from 10.73.100.6 icmp_seq=4 ttl=64 time=4.545 ms
64 bytes from 10.73.100.6 icmp_seq=5 ttl=64 time=2.777 ms

PC1> [
```

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Figura 11 IP del PC en DHCP y Ping entre los dispositivos de la red local desde PC2



```
PC2
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Galing.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Heng (slrnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC2> ip dhcp
DHCPA IP 10.73.102.110/24 GW 10.73.102.254

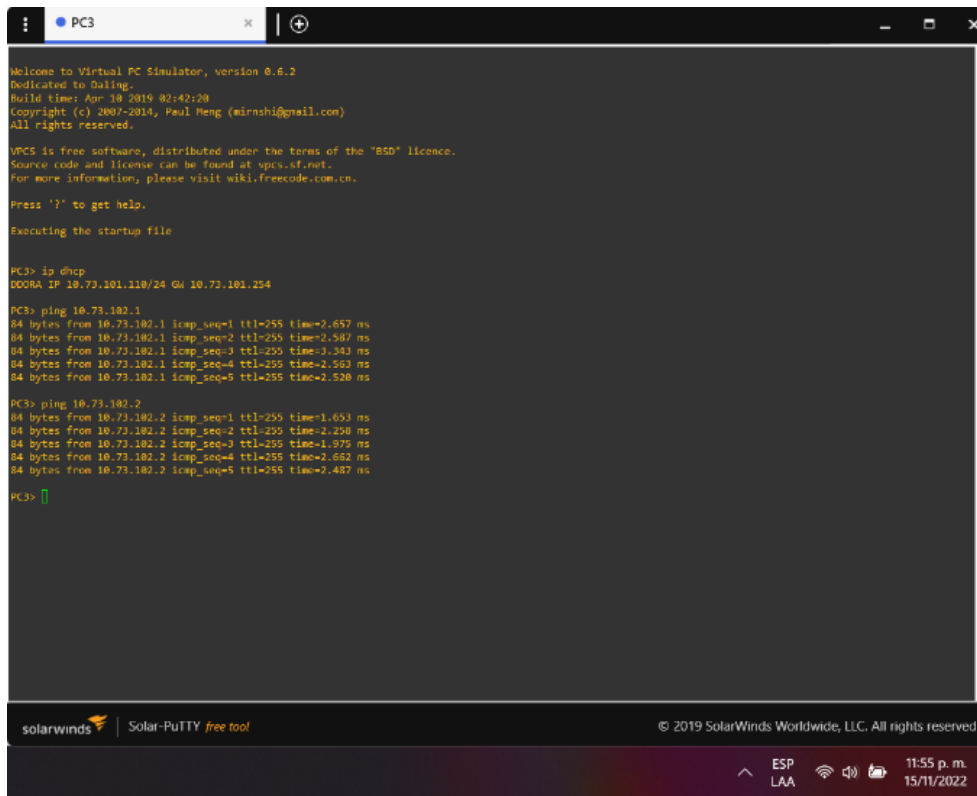
PC2> ping 10.73.101.1
64 bytes from 10.73.101.1 icmp_seq=1 ttl=255 time=2.022 ms
64 bytes from 10.73.101.1 icmp_seq=2 ttl=255 time=1.914 ms
64 bytes from 10.73.101.1 icmp_seq=3 ttl=255 time=1.485 ms
64 bytes from 10.73.101.1 icmp_seq=4 ttl=255 time=1.884 ms
64 bytes from 10.73.101.1 icmp_seq=5 ttl=255 time=1.920 ms

PC2> ping 10.73.101.2
10.73.101.2 icmp_seq=1 timeout
64 bytes from 10.73.101.2 icmp_seq=2 ttl=255 time=2.064 ms
64 bytes from 10.73.101.2 icmp_seq=3 ttl=255 time=2.104 ms
64 bytes from 10.73.101.2 icmp_seq=4 ttl=255 time=1.902 ms
64 bytes from 10.73.101.2 icmp_seq=5 ttl=255 time=1.711 ms

PC2> 
```

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Figura 12 IP del PC en DHCP y Ping entre los dispositivos de la red local desde PC3



```
PC3
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 18 2019 02:42:20
Copyright (c) 2007-2014, Paul Heng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.
Executing the startup file

PC3> ip dhcp
DHCPA IP 10.73.101.118/24 GW 10.73.101.254

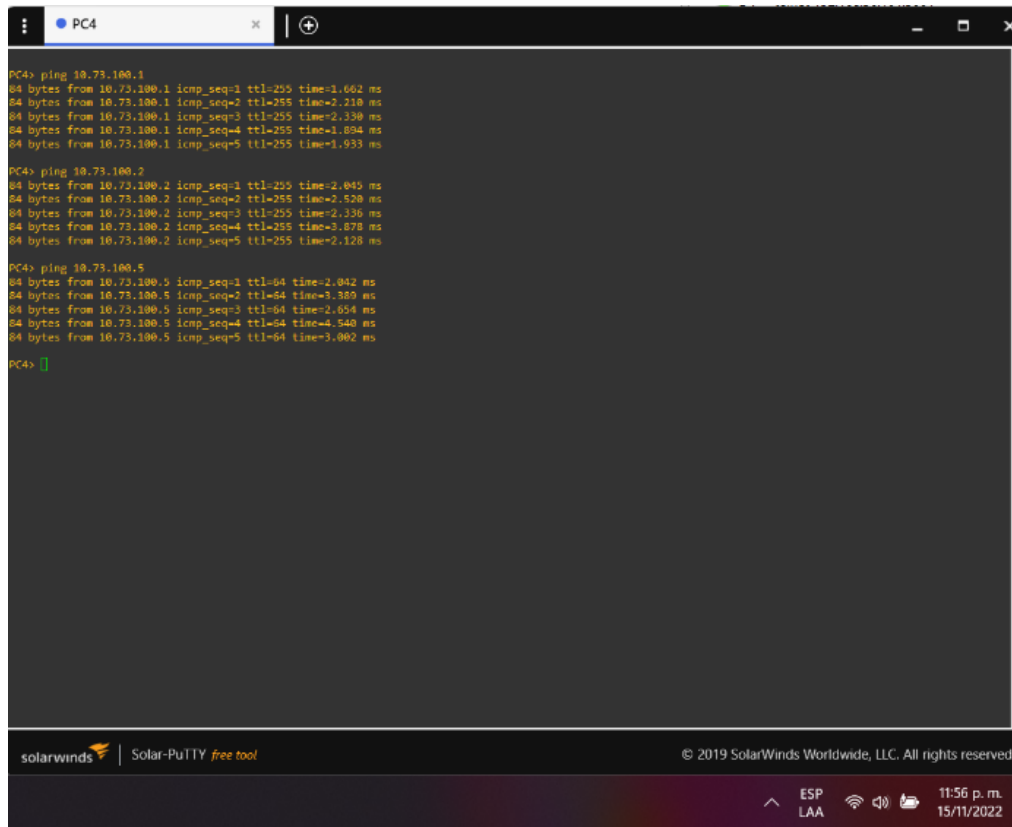
PC3> ping 10.73.102.1
84 bytes from 10.73.102.1 icmp_seq=1 ttl=255 time=2.657 ms
84 bytes from 10.73.102.1 icmp_seq=2 ttl=255 time=2.587 ms
84 bytes from 10.73.102.1 icmp_seq=3 ttl=255 time=3.343 ms
84 bytes from 10.73.102.1 icmp_seq=4 ttl=255 time=2.593 ms
84 bytes from 10.73.102.1 icmp_seq=5 ttl=255 time=2.520 ms

PC3> ping 10.73.102.2
84 bytes from 10.73.102.2 icmp_seq=1 ttl=255 time=1.653 ms
84 bytes from 10.73.102.2 icmp_seq=2 ttl=255 time=2.298 ms
84 bytes from 10.73.102.2 icmp_seq=3 ttl=255 time=1.979 ms
84 bytes from 10.73.102.2 icmp_seq=4 ttl=255 time=2.662 ms
84 bytes from 10.73.102.2 icmp_seq=5 ttl=255 time=2.487 ms

PC3> |
```

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Figura 13 Ping entre los dispositivos de la red local desde PC4



```
PC4> ping 10.73.100.1
64 bytes from 10.73.100.1 icmp_seq=1 ttl=255 time=1.662 ms
64 bytes from 10.73.100.1 icmp_seq=2 ttl=255 time=2.218 ms
64 bytes from 10.73.100.1 icmp_seq=3 ttl=255 time=2.338 ms
64 bytes from 10.73.100.1 icmp_seq=4 ttl=255 time=1.894 ms
64 bytes from 10.73.100.1 icmp_seq=5 ttl=255 time=1.933 ms

PC4> ping 10.73.100.2
64 bytes from 10.73.100.2 icmp_seq=1 ttl=255 time=2.045 ms
64 bytes from 10.73.100.2 icmp_seq=2 ttl=255 time=2.528 ms
64 bytes from 10.73.100.2 icmp_seq=3 ttl=255 time=2.336 ms
64 bytes from 10.73.100.2 icmp_seq=4 ttl=255 time=3.878 ms
64 bytes from 10.73.100.2 icmp_seq=5 ttl=255 time=2.128 ms

PC4> ping 10.73.100.5
64 bytes from 10.73.100.5 icmp_seq=1 ttl=64 time=2.042 ms
64 bytes from 10.73.100.5 icmp_seq=2 ttl=64 time=3.388 ms
64 bytes from 10.73.100.5 icmp_seq=3 ttl=64 time=2.654 ms
64 bytes from 10.73.100.5 icmp_seq=4 ttl=64 time=4.548 ms
64 bytes from 10.73.100.5 icmp_seq=5 ttl=64 time=3.062 ms

PC4> |
```

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ESCENARIO 2

En este escenario se continua con la configuración del escenario 1.

El primer paso es configurar los protocolos de enrutamiento, desde los dispositivos, en la tabla 5 se muestran los comandos para dicha configuración.

Tabla 5 Configuración protocolos de enrutamiento

Router	R1	Config t
		<pre>router ospf 4 router-id 0.0.4.1 network 10.73.10.0 0.0.0.255 area 0 network 10.73.13.0 0.0.0.255 area 0 default-information originate exit ipv6 router ospf 6 router-id 0.0.6.1 default-information originate exit interface e1/2 ipv6 ospf 6 area 0 exit interface e1/1 ipv6 ospf 6 area 0 exit ip route 10.0.0.0 255.0.0.0 null 0</pre>

		<pre> ipv6 route 2001:db8:100::/48 null 0 router bgp 300 bgp router-id 1.1.1.1 neighbor 209.165.200.226 remote-as 500 neighbor 2001:db8:200::2 remote-as 500 address-family ipv4 unicast neighbor 209.165.200.226 activate no neighbor 2001:db8:200::2 activate network 10.0.0.0 mask 255.0.0.0 exit-address-family address-family ipv6 unicast no neighbor 209.165.200.226 activate neighbor 2001:db8:200::2 activate network 2001:db8:100::/48 exit-address-family </pre>
	R2	<pre> Config t ip route 0.0.0.0 0.0.0.0 loopback 0 ipv6 route ::/0 loopback 0 router bgp 500 bgp router-id 2.2.2.2 neighbor 209.165.200.225 remote-as 300 neighbor 2001:db8:200::1 remote-as </pre>

		<pre> 300 address-family ipv4 neighbor 209.165.200.225 activate no neighbor 2001:db8:200::1 activate network 2.2.2.2 mask 255.255.255.255 network 0.0.0.0 exit-address-family address-family ipv6 no neighbor 209.165.200.225 activate neighbor 2001:db8:200::1 activate network 2001:db8:2222::1/128 network ::/0 exit-address-family </pre>
	R3	<pre> Config t router ospf 4 router-id 0.0.4.3 network 10.73.11.0 0.0.0.255 area 0 network 10.73.13.0 0.0.0.255 area 0 exit ipv6 router ospf 6 router-id 0.0.6.3 exit interface e1/0 ipv6 ospf 6 area 0 </pre>

		<pre> exit interface e1/1 ipv6 ospf 6 area 0 exit </pre>
Switch	D1	<pre> Config t router ospf 4 router-id 0.0.4.131 network 10.73.10.0 0.0.0.255 area 0 network 10.73.100.0 0.0.0.255 area 0 network 10.73.101.0 0.0.0.255 area 0 network 10.73.102.0 0.0.0.255 area 0 passive-interface default no passive-interface e1/2 exit ipv6 router ospf 6 router-id 0.0.6.131 passive-interface default no passive-interface e1/2 exit interface e1/2 ipv6 ospf 6 area 0 exit interface vlan 100 ipv6 ospf 6 area 0 </pre>

		<pre> exit interface vlan 101 ipv6 ospf 6 area 0 exit interface vlan 102 ipv6 ospf 6 area 0 exit </pre>
	D2	<pre> Config t router ospf 4 router-id 0.0.4.132 network 10.73.11.0 0.0.0.255 area 0 network 10.73.100.0 0.0.0.255 area 0 network 10.73.101.0 0.0.0.255 area 0 network 10.73.102.0 0.0.0.255 area 0 passive-interface default no passive-interface e1/0 exit ipv6 router ospf 6 router-id 0.0.6.132 passive-interface default no passive-interface e1/0 exit interface e1/0 ipv6 ospf 6 area 0 </pre>

		<pre>exit interface vlan 100 ipv6 ospf 6 area 0 exit interface vlan 101 ipv6 ospf 6 area 0 exit interface vlan 102 ipv6 ospf 6 area 0 exit</pre>
--	--	--

El siguiente paso es realizar la verificación de la tabla de enrutamiento IPv4 en los dispositivos configurados, con los comandos que se muestran en la figura 14 - 19.

Figura 14 Tabla de enrutamiento en R1

```
R1
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:52:11.131: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:53:05.615: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:54:03.363: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:54:55.031: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:55:53.527: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 15 23:56:50.487: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#show ip route
Codes: L - local, C - connected, S - static, R - RTP, H - 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 - OOR, P - periodic downloaded static route, H - NHRP, I - LISP
+ - replicated route, % - next hop override

Gateway of last resort is 209.165.200.226 to network 0.0.0.0

R* 0.0.0.0/0 [20/0] via 209.165.200.226, 00:31:08
   2.0.0.0/32 is subnetted, 1 subnets
   B   2.2.2.2 [20/0] via 209.165.200.226, 00:31:08
   10.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
   S   10.0.0.0/8 is directly connected, Null0
   C   10.73.10.0/24 is directly connected, Ethernet1/2
   L   10.73.10.1/32 is directly connected, Ethernet1/2
   O   10.73.11.0/24 [110/20] via 10.73.13.3, 00:31:15, Ethernet1/1
   C   10.73.13.0/24 is directly connected, Ethernet1/1
   L   10.73.13.1/32 is directly connected, Ethernet1/1
   O   10.73.100.0/24 [110/11] via 10.73.10.2, 00:20:14, Ethernet1/2
   O   10.73.101.0/24 [110/11] via 10.73.10.2, 00:20:14, Ethernet1/2
   O   10.73.102.0/24 [110/11] via 10.73.10.2, 00:20:14, Ethernet1/2
   209.165.200.0/24 is variably subnetted, 2 subnets, 2 masks
   C   209.165.200.224/27 is directly connected, Ethernet1/0
   L   209.165.200.225/32 is directly connected, Ethernet1/0
R1#
```

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Figura 15 Tabla de enrutamiento en R3

```
R3#
*Nov 15 23:51:16.955: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:52:13.215: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:53:10.435: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:54:08.115: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:55:00.043: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:55:54.843: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:56:53.675: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
*Nov 15 23:57:50.823: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth
er1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#show ip route
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, I - ISIS
       + - replicated route, % - next hop override

Gateway of last resort is 10.73.13.1 to network 0.0.0.0

O*E2 0.0.0.0/0 [110/1] via 10.73.13.1, 00:31:55, Ethernet1/1
    10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
    O   10.73.10.0/24 [110/20] via 10.73.13.1, 00:25:29, Ethernet1/1
    C   10.73.11.0/24 is directly connected, Ethernet1/0
    L   10.73.11.1/32 is directly connected, Ethernet1/0
    C   10.73.13.0/24 is directly connected, Ethernet1/1
    L   10.73.13.3/32 is directly connected, Ethernet1/1
    O   10.73.100.0/24 [110/11] via 10.73.11.2, 00:25:06, Ethernet1/0
    O   10.73.101.0/24 [110/11] via 10.73.11.2, 00:25:06, Ethernet1/0
    O   10.73.102.0/24 [110/11] via 10.73.11.2, 00:25:06, Ethernet1/0
R3#
R3#
```

Figura 16 Tabla de enrutamiento en D1

```
--More--
*Nov 16 04:53:25.526: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:54:28.427: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:55:13.282: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:56:01.848: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:56:52.439: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:57:45.992: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
*Nov 16 04:58:37.232: SCOP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
--More--
[0/0]  S0      32768  sabb.cc00.0400 15s 0x0 0xC 0x204 0x00
D1#show ip route
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, I - LISP
       a - application route
       r - replicated route, % - next hop override

Gateway of last resort is 10.73.10.1 to network 0.0.0.0

O*E2 0.0.0.0/0 [110/1] via 10.73.10.1, 00:21:44, Ethernet1/2
10.0.0.0/8 is variably subnetted, 10 subnets, 2 masks
C    10.73.10.0/24 is directly connected, Ethernet1/2
I    10.73.10.2/32 is directly connected, Ethernet1/2
O    10.73.11.0/24 [110/50] via 10.73.10.1, 00:21:44, Ethernet1/2
O    10.73.13.0/24 [110/20] via 10.73.10.1, 00:21:44, Ethernet1/2
C    10.73.100.0/24 is directly connected, Vlan100
L    10.73.100.1/32 is directly connected, Vlan100
C    10.73.101.0/24 is directly connected, Vlan101
L    10.73.101.1/32 is directly connected, Vlan101
C    10.73.101.1/32 is directly connected, Vlan101
C    10.73.102.0/24 is directly connected, Vlan102
L    10.73.102.1/32 is directly connected, Vlan102
D1#
```

Figura 17 Tabla de enrutamiento en D2

```
D2
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:53:30.132: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:54:24.508: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:55:11.707: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on the
rnet1/0 (not full duplex), with R1 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:56:08.751: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:56:58.758: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:57:48.858: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on the
rnet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#
*Nov 16 04:58:47.983: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on the
rnet1/0 (not full duplex), with R1 Ethernet1/0 (full duplex).
D2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, D - BGP
        B - 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 - 16MBP, 1 - 115P
        a - application route
        + - replicated route, X - next hop override

Gateway of last resort is 10.73.11.1 to network 0.0.0.0

O*E2 0.0.0.0/0 [110/1] via 10.73.11.1, 00:26:24, Ethernet1/0
    10.0.0.0/8 is variably subnetted, 10 subnets, 2 masks
O    10.73.10.0/24 [110/30] via 10.73.11.1, 00:26:24, Ethernet1/0
C    10.73.11.0/24 is directly connected, Ethernet1/0
L    10.73.11.1/32 is directly connected, Ethernet1/0
O    10.73.13.0/24 [110/20] via 10.73.11.1, 00:26:24, Ethernet1/0
C    10.73.100.0/24 is directly connected, Vlan100
L    10.73.100.2/32 is directly connected, Vlan100
C    10.73.101.0/24 is directly connected, Vlan101
L    10.73.101.2/32 is directly connected, Vlan101
C    10.73.102.0/24 is directly connected, Vlan102
L    10.73.102.2/32 is directly connected, Vlan102
D2#
```

Figura 18 Ping hacia Loopback 0 desde D1

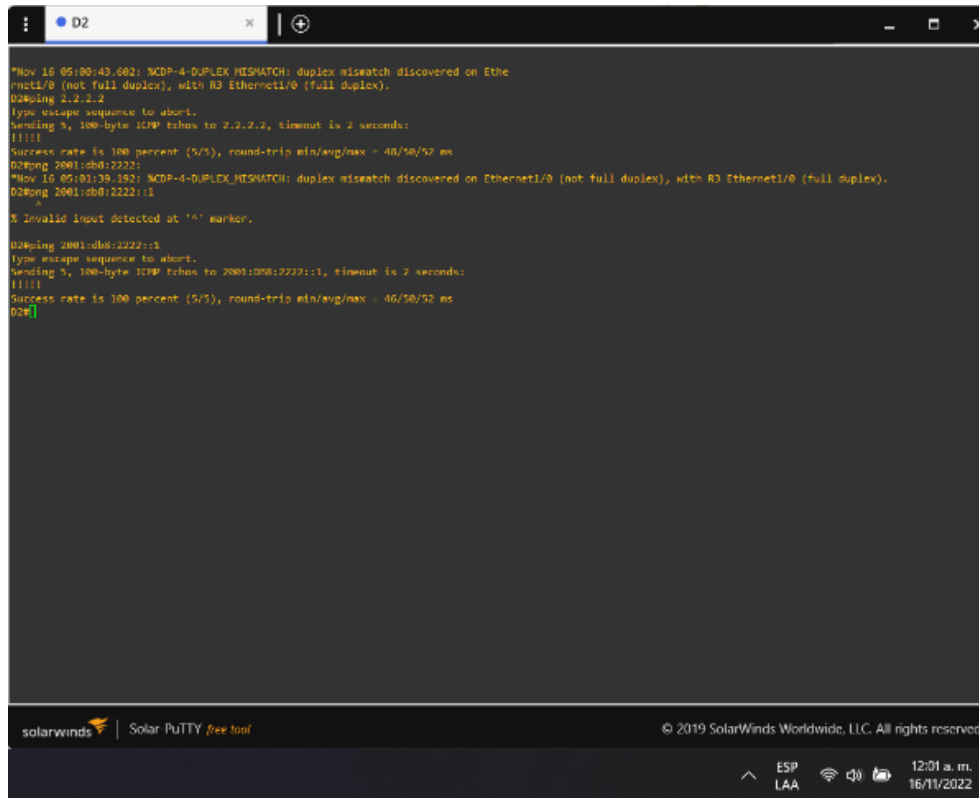


```
Nov 16 04:59:11.161: %CDP-4-DUPLICATION: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/30/52 ms
D1#ping
Nov 16 05:00:24.592: %CDP-4-DUPLICATION: duplex mismatch discovered on Ethern
et1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#ping 2001:db8:2222::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:2222::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 30/30/52 ms
D1#
```

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ESP 12:00 a. m.
LAA 16/11/2022

Figura 19 Ping hacia Loopback 0 desde D2



```
Nov 16 05:00:43.682: MDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Eth0/
rnt1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/50/52 ms
D2#ping 2001:db8:2222::1
Nov 16 05:01:39.192: MDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#ping 2001:db8:2222::1
^
% Invalid input detected at '^' marker.
D2#ping 2001:db8:2222::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:2222::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 46/50/52 ms
D2#
```

Luego hay que configurar la redundancia del primer salto. En la tabla 6 se muestran los comandos para dicha configuración.

Tabla 6 Configuración redundancia de primer salto

Switch	D1	<pre> config t ip sla 4 icmp-echo 10.73.10.1 frequency 5 exit ip sla 6 icmp-echo 2001:db8:100:1010::1 frequency 5 exit ip sla Schedule 4 life forever start-time now ip sla Schedule 6 life forever start-time now track 4 ip sla 4 delay up 10 down 15 exit track 6 ip sla 6 delay up 10 down 15 exit interface vlan 100 standby version 2 standby 104 ip 10.73.100.254 standby 104 priority 150 </pre>

		<pre>standby 104 preempt standby 104 track 4 decrement 60 standby 106 ipv6 autoconfig standby 106 priority 150 standby 106 preempt standby 106 track 6 decrement 60 exit interface vlan 101 standby version 2 standby 114 ip 10.73.101.254 standby 114 preempt standby 114 track 4 decrement 60 standby 116 ipv6 autoconfig standby 116 preempt standby 116 track 6 decrement 60 exit interface vlan 102 standby version 2 standby 124 ip 10.73.102.254 standby 124 priority 150 standby 124 preempt standby 124 track 4</pre>
--	--	---

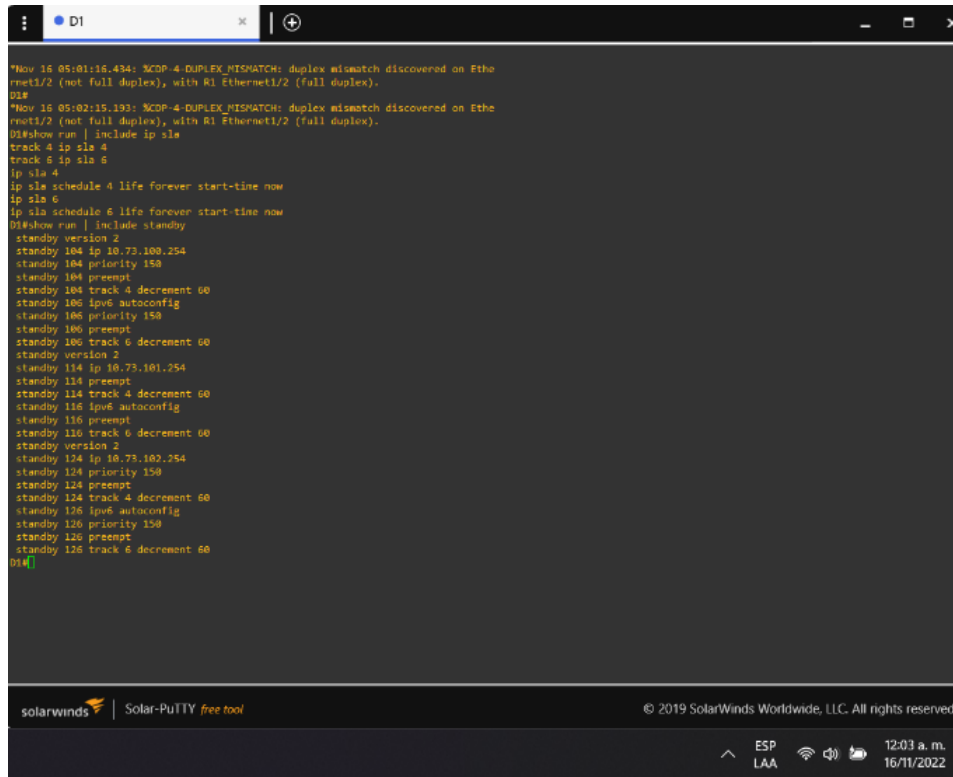
		<pre> decrement 60 standby 126 ipv6 autoconfig standby 126 priority 150 standby 126 preempt standby 126 track 6 decrement 60 exit end </pre>
	D2	<pre> Config t ip sla 4 icmp-echo 10.73.11.1 frequency 5 exit ip sla 6 icmp-echo 2001:db8:100:1011::1 frequency 5 exit ip sla schedule 4 life forever start-time now ip sla schedule 6 life forever start-time now track 4 ip sla 4 delay up 10 down 15 exit </pre>

		<pre>track 6 ip sla 6 delay up 10 down 15 exit interface vlan 100 standby version 2 standby 104 ip 10.73.100.254 standby 104 preempt standby 104 track 4 decrement 60 standby 106 ipv6 autoconfig standby 106 preempt standby 106 track 6 decrement 60 exit interface vlan 101 standby version 2 standby 114 ip 10.73.101.254 standby 114 priority 150 standby 114 preempt standby 114 track 4 decrement 60 standby 116 ipv6 autoconfig standby 116 priority 150 standby 116 preempt standby 116 track 6</pre>
--	--	--

		<pre>decrement 60 exit interface vlan 102 standby version 2 standby 124 ip 10.73.102.254 standby 124 preempt standby 124 track 4 decrement 60 standby 126 ipv6 autoconfig standby 126 preempt standby 126 track 6 decrement 60 exit end</pre>
--	--	---

Después se realiza la verificación de las configuraciones de las SLAs y del Standby en los Switch configurados usando los comandos que se muestran en las figuras 20 - 23.

Figura 20 SLAs y Standby en D1

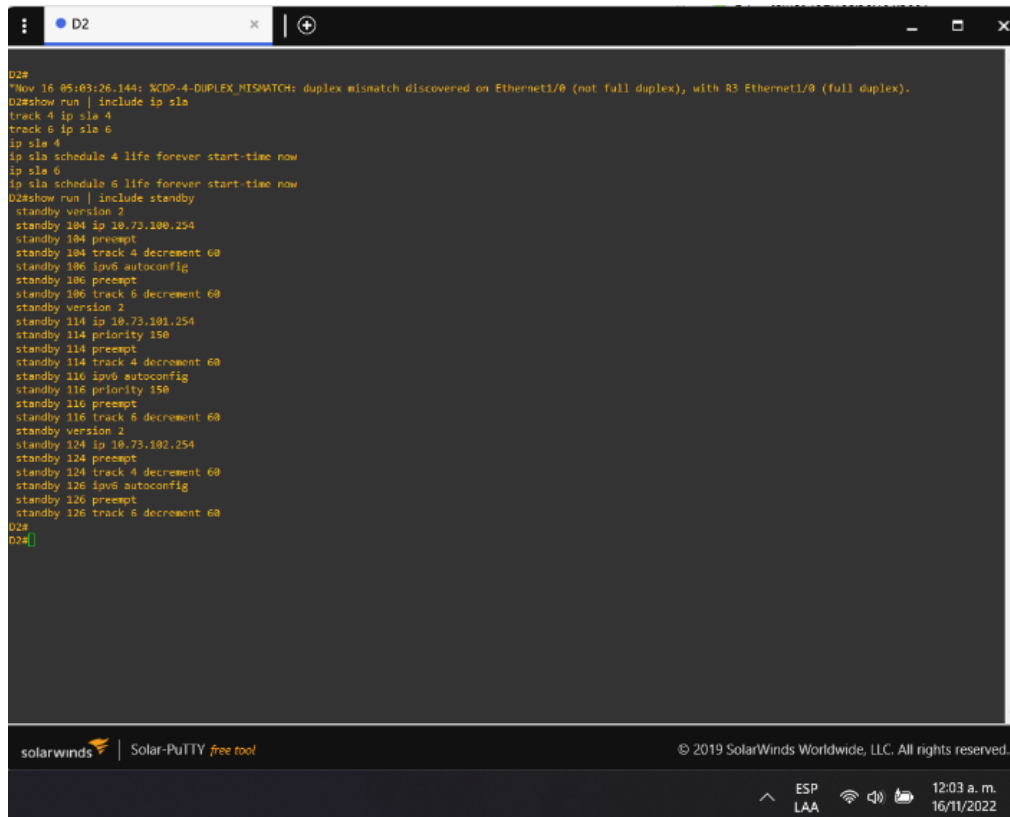


```
Nov 16 05:01:16.434: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
Nov 16 05:02:15.193: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethe
rnet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show run | include ip sla
track 4 ip sla 4
track 6 ip sla 6
ip sla 4
ip sla schedule 4 life forever start-time now
ip sla 6
ip sla schedule 6 life forever start-time now
D1#show run | include standby
standby version 2
standby 104 ip 10.73.100.254
standby 104 priority 150
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 priority 150
standby 106 preempt
standby 106 track 6 decrement 60
standby version 2
standby 114 ip 10.73.101.254
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 preempt
standby 116 track 6 decrement 60
standby version 2
standby 124 ip 10.73.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60
D1#
```

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Figura 21 SLAs y Standby en D2



```
D2#
*Nov 16 05:03:26.144: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not full duplex), with R3 Ethernet1/0 (full duplex).
D2#show run | include ip sla
track 4 ip sla 4
track 6 ip sla 6
ip sla 4
ip sla schedule 4 life forever start-time now
ip sla 6
ip sla schedule 6 life forever start-time now
D2#show run | include standby
standby version 2
standby 104 ip 10.73.100.254
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 preempt
standby 106 track 6 decrement 60
standby version 2
standby 114 ip 10.73.101.254
standby 114 priority 150
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 priority 150
standby 116 preempt
standby 116 track 6 decrement 60
standby version 2
standby 124 ip 10.73.102.254
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60
D2#
D2#
```

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CONCLUSIONES

En la configuración para las primeras fases del escenario incluye una configuración básica de enrutadores y conmutadores de capa 3 donde se utiliza la segmentación de red. Esto se hace para los protocolos de transporte IPv4 e IPv6. Se ha demostrado que los protocolos en la interfaz de loopback que usa R2 tienen errores al emular monitores de paquetes porque algunos comandos no son compatibles con la configuración del switch. Elegir la ruta de red más corta permite a los sistemas individuales transferir datos de control entre fragmentos cuando cambia la naturaleza de la conexión de red y redirigir los flujos al siguiente tramo. Ejecute escenarios utilizando un entorno virtualizado para definir, configurar y realizar pruebas y errores sobre el tamaño, la compatibilidad y el rendimiento de los dispositivos. Además, el acceso a segmentos de red conmutados, la configuración de VLAN y el cableado ayudan a administrar los dispositivos de red correctamente.

Se pueden definir conceptos de red de alto nivel para la configuración y gestión de la red. La administración de redes es una solución de conocimiento de dominio aplicado para diversas situaciones del mundo real en las que es necesario realizar tareas técnicas de comunicación.

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ANEXOS

Anexo A:

https://drive.google.com/file/d/1lybnR1EYsL8nzDJmHPn_9q_tFaz1YL5N/view