

Curso de Profundización cisco CCNP
Evaluación de Prueba de
Habilidades Prácticas

Entregado por:
Dairo Mauricio Suarez Perdomo

Grupo: 02

Tutor
Gerardo Granados Acuña

Escuela de Ciencias Básicas Tecnología e Ingeniería
Programa de Ingeniería Electrónica
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Introducción

En el presente trabajo se desarrolla la fase final del curso de diplomado en CCNP para la implementación de las temáticas de las cuatro unidades vistas en una prueba de habilidades prácticas. Ya que es de gran importancia en el mundo moderno manejar sistemas de redes y conexión de la red IPv6 para brindar mayor seguridad al cliente, aquí se pone en práctica la configuración de switches y routers que permiten una comunicación local en su respectiva área.

Evaluación – Prueba de habilidades prácticas CCNP

Descripción general de la prueba de habilidades

La evaluación denominada “Prueba de habilidades prácticas”, forma parte de las actividades evaluativas del Diplomado de Profundización CCNP, la cual busca identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del diplomado y a través de la cual se pondrá a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

Para esta actividad, el estudiante dispone de cerca de dos semanas para realizar las tareas asignadas en cada uno de los escenarios propuestos, acompañado de los respectivos procesos de documentación de la solución, correspondientes al registro de la configuración de cada uno de los dispositivos, la descripción detallada del paso a paso de cada una de las etapas realizadas durante su desarrollo, el registro de los procesos de verificación de conectividad mediante el uso de comandos ping, traceroute, show ip route, entre otros.

Teniendo en cuenta que la Prueba de habilidades está conformada por dos escenarios, el estudiante deberá realizar el proceso de configuración de un escenario en el **Laboratorio SmartLab** y el otro mediante el uso de **herramientas de Simulación (Puede ser Packet Tracer o GNS3)**. El estudiante es libre de escoger bajo qué mediación tecnológica resolverá cada escenario.

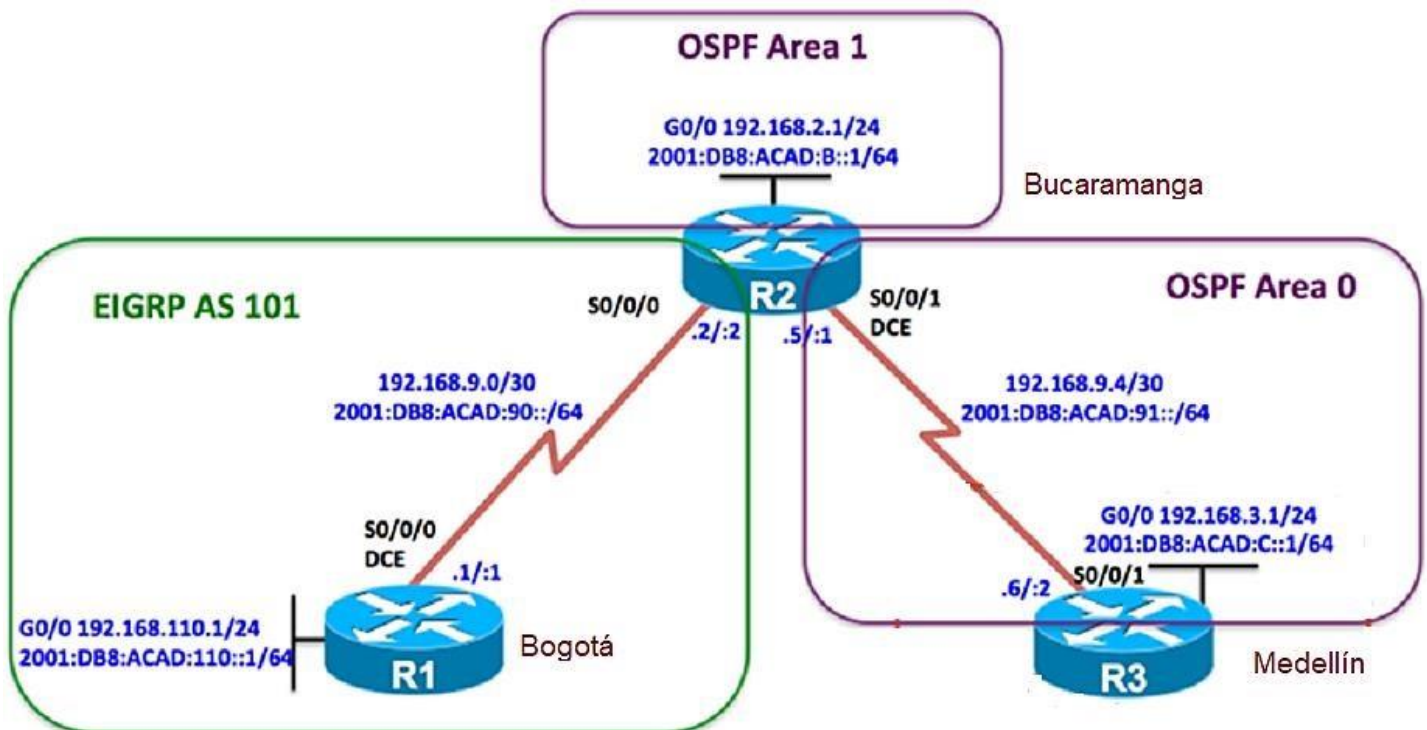
Finalmente, el informe deberá cumplir con las normas ICONTEC para la presentación de trabajos escritos, teniendo en cuenta que este documento deberá ser entregado al final del curso en el Repositorio Institucional, acorde con los lineamientos institucionales para grado. Proceso que les será socializado al finalizar el curso.

Es muy importante mencionar que esta actividad es de carácter **INDIVIDUAL**. El informe deberá estar acompañado de las respectivas evidencias de configuración de los dispositivos, las cuales generarán veracidad al trabajo realizado.

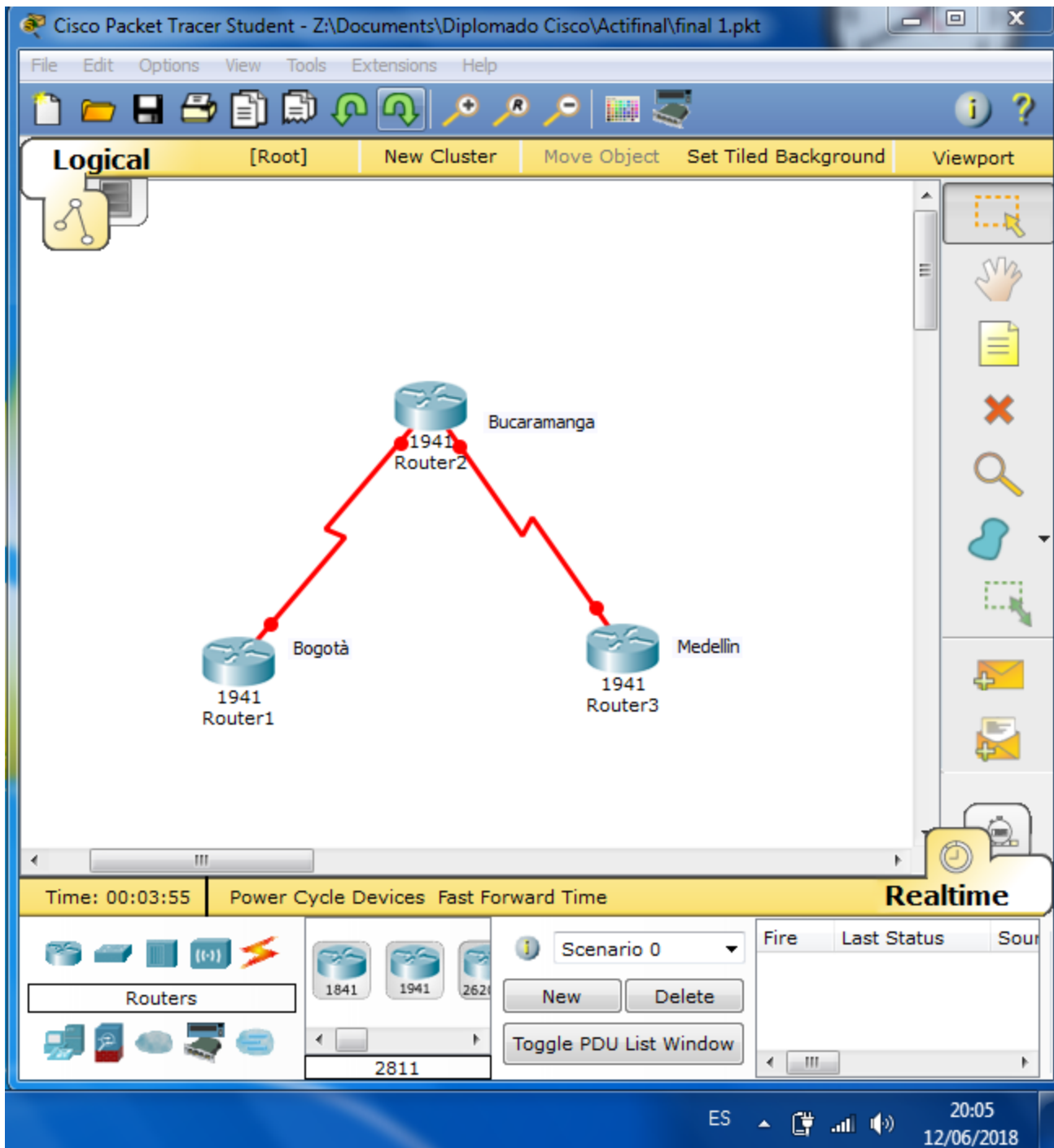
Descripción de escenarios propuestos para la prueba de habilidades

Escenario 1: Una empresa de confecciones posee tres sucursales distribuidas en las ciudades de Bogotá, Medellín y Bucaramanga, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

Topología de red



Configurar la topología de red, de acuerdo con las siguientes especificaciones.



Parte 1: Configuración del escenario propuesto

1. Configurar las interfaces con las direcciones IPv4 e IPv6 que se muestran en la topología de red.

Router1

Physical Config CLI

IOS Command Line Interface

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#
R1(config)#line con 0
R1(config-line)#logging synchronous
R1(config-line)#exec-timeout 0 0
R1(config-line)#interface GigabitEthernet0/0
R1(config-if)#ip address 192.168.110.1 255.255.255.0
R1(config-if)#ipv6 address FE80::1 link-local
R1(config-if)#ipv6 address 2001:DB8:ACAD:110::1/64
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

R1(config-if)#exit
R1(config)#interface Serial0/0/0
R1(config-if)#ip address 192.168.9.1 255.255.255.252
R1(config-if)#ipv6 address FE80::1 link-local
R1(config-if)#ipv6 address 2001:DB8:ACAD:90::1/64
R1(config-if)#clock rate 64000
This command applies only to DCE interfaces
R1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)#
```

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ES 12:24 13/06/2018

Cisco Packet Tracer Student - Z:\Documents\Diplomado Cisco\Activfinal\final 1.pkt

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

194 Router2

Bucaramanga

Bogotá

Medellin

Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
GigabitEthernet0/0	Up	--	192.168.110.1/24	2001:DB8:ACAD:110::1/64	0060.4717.2A01
GigabitEthernet0/1	Down	--	<not set>	<not set>	0060.4717.2A02
Serial0/0/0	Up	--	192.168.9.1/30	2001:DB8:ACAD:90::1/64	<not set>
Serial0/0/1	Down	--	<not set>	<not set>	<not set>
FastEthernet0/1/0	Down	1	--	<not set>	0000.0C6B.BE01
FastEthernet0/1/1	Down	1	--	<not set>	0000.0C6B.BE02
FastEthernet0/1/2	Down	1	--	<not set>	0000.0C6B.BE03
FastEthernet0/1/3	Down	1	--	<not set>	0000.0C6B.BE04
Vlan1	Down	1	<not set>	<not set>	0001.4208.05D2

Time: 02:57:43 Power

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet

Connections

New Delete

Serial DCE

Toggle PDU List Window

Router2

Physical Config CLI

IOS Command Line Interface

```
Router>EN
Router#CONF T
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#no ip domain-lookup
R2(config)#line con 0
R2(config-line)#logging synchronous
R2(config-line)#exec-timeout 0 0
R2(config-line)#EXIT
R2(config)#interface GigabitEthernet0/0
R2(config-if)#ip address 192.168.3.1 255.255.255.0
R2(config-if)#ip address 192.168.2.1 255.255.255.0
R2(config-if)#ipv6 address FE80::2 link-local
R2(config-if)#ipv6 address 2001:DB8:ACAD:b::1/64
R2(config-if)#no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to
up

R2(config-if)#exit
R2(config)#interface Serial0/0/0
R2(config-if)#ip address 192.168.9.2 255.255.255.252
R2(config-if)#ipv6 address FE80::2 link-local
R2(config-if)#ipv6 address 2001:DB8:ACAD:90::2/64
R2(config-if)#no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to
up
```

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```

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

R2(config-if)#exit
R2(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0,
changed state to up

R2(config)#interface Serial0/0/1
R2(config-if)#ip address 192.168.9.5 255.255.255.252
R2(config-if)#ipv6 address FE80::2 link-local
R2(config-if)#ipv6 address 2001:DB8:CAFE:4::1/64
R2(config-if)#
R2(config-if)#
R2(config-if)#ipv6 address 2001:DB8:acad:91::1/64
R2(config-if)#clock rate 64000
R2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
R2(config-if)#

```

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Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
GigabitEthernet0/0	Up	--	192.168.2.1/24	2001:DB8:ACAD:B::1/64	0001.97DC.1901
GigabitEthernet0/1	Down	--	<not set>	<not set>	0001.97DC.1902
Serial0/0/0	Up	--	192.168.9.2/30	2001:DB8:ACAD:90::2/64	<not set>
Serial0/0/1	Up	--	192.168.9.5/30	2001:DB8:ACAD:91::1/64	<not set>
				2001:DB8:CAFE:4::1/64	
FastEthernet0/1/0	Down	1	--	<not set>	00D0.D883.C901
FastEthernet0/1/1	Down	1	--	<not set>	00D0.D883.C902
FastEthernet0/1/2	Down	1	--	<not set>	00D0.D883.C903
FastEthernet0/1/3	Down	1	--	<not set>	00D0.D883.C904
Vlan1	Down	1	<not set>	<not set>	000C.8596.8808

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet



Router3

Physical Config CLI

IOS Command Line Interface

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#Hostname R
R(config)#Hostname R3
R3(config)#no ip domain-lookup
R3(config)#line con 0
R3(config-line)#logging synchronous
R3(config-line)#exec-timeout 0 0
R3(config-line)#interface GigabitEthernet0/0
R3(config-if)#ip address 192.168.3.1 255.255.255.0
R3(config-if)#ipv6 address FE80::3 link-local
R3(config-if)#ipv6 address 2001:DB8:ACAD:C::1/64
R3(config-if)#no shutdown

R3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to
up

R3(config-if)#exit
R3(config)#interface Serial10/0/1
R3(config-if)#ip address 192.168.9.6 255.255.255.252
R3(config-if)#ipv6 address FE80::3 link-local
R3(config-if)#ipv6 address 2001:DB8:ACAD:91::2/64
R3(config-if)#no shutdown

R3(config-if)#
%LINK-5-CHANGED: Interface Serial10/0/1, changed state to up

R3(config-if)#exit
```

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13/06/2018

```
R3(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1,
changed state to up

R3(config)#clock rate 64000
      ^
% Invalid input detected at '^' marker.

R3(config)#interface Serial0/0/1
R3(config-if)#clock rate 64000
This command applies only to DCE interfaces
R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1,
changed state to down

R3(config-if)#|
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

R3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1,
changed state to up

R3(config-if)#clock rate 64000
This command applies only to DCE interfaces
R3(config-if)#
```

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12:51
13/06/2018

PRUEBA DE HABILIDADES CCNP - Word

ARCHIVO INICIO INSERTAR DISEÑO DISEÑO DE PÁGINA REFERENCIAS CORRESPONDENCIA REVISAR VISTA NITRO PRO

Cisco Packet Tracer Student - Z:\Documents\Diplomado Cisco\Actifinal\final 1.pkt

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
GigabitEthernet0/0	Up	--	192.168.3.1/24	2001:DB8:ACAD:C::1/64	00E0.F9D1.5E01
GigabitEthernet0/1	Down	--	<not set>	<not set>	00E0.F9D1.5E02
Serial0/0/0	Down	--	<not set>	<not set>	<not set>
Serial0/0/1	Up	--	192.168.9.6/30	2001:DB8:ACAD:91::2/64	<not set>
FastEthernet0/1/0	Down	1	--	<not set>	00E0.F792.3301
FastEthernet0/1/1	Down	1	--	<not set>	00E0.F792.3302
FastEthernet0/1/2	Down	1	--	<not set>	00E0.F792.3303
FastEthernet0/1/3	Down	1	--	<not set>	00E0.F792.3304
Vlan1	Down	1	<not set>	<not set>	0090.21E0.6E19

Hostname: R3

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet

Realtime

Fire Last Status Source Destination

Connections

Serial DCE

Toggle PDU List Window

PÁGINA 9 DE 15 1557 PALABRAS ESPAÑOL

ES 12:52 13/06/2018

- Ajustar el ancho de banda a 128 kbps sobre cada uno de los enlaces seriales ubicados en R1, R2, y R3 y ajustar la velocidad de reloj de las conexiones de DCE según sea apropiado.

Router1

Physical Config CLI

GLOBAL

ROUTING

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

Serial0/0/0

Serial0/0/1

FastEthernet0/1/0

FastEthernet0/1/1

FastEthernet0/1/2

FastEthernet0/1/3

Serial0/0/0

Port Status On

Duplex Full Duplex

Clock Rate 128000

IP Configuration

IP Address 192.168.9.1

Subnet Mask 255.255.255.252

Tx Ring Limit 10

Equivalent IOS Commands

```
R1(config)#interface GigabitEthernet0/0
R1(config-if)#
R1(config-if)#exit
R1(config)#interface GigabitEthernet0/1
R1(config-if)#
R1(config-if)#exit
R1(config)#interface Serial0/0/0
R1(config-if)#clock rate 128000
R1(config-if)#
```

ES 14:21
13/06/2018

Router2

Physical Config CLI

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

SWITCHING

- VLAN Database

INTERFACE

- GigabitEthernet0/0
- GigabitEthernet0/1
- Serial0/0/0
- Serial0/0/1
- FastEthernet0/1/0
- FastEthernet0/1/1
- FastEthernet0/1/2

Serial0/0/0

Port Status On

Duplex Full Duplex

Clock Rate 128000

IP Configuration

IP Address 192.168.9.2

Subnet Mask 255.255.255.252

Tx Ring Limit 10

Equivalent IOS Commands

```
R2>enable
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface Serial0/0/0
R2(config-if)#clock rate 128000
This command applies only to DCE interfaces
R2(config-if)#
```

ES 14:22 13/06/2018

The screenshot shows the configuration window for Router2, specifically for the Serial0/0/1 interface. The interface is configured with the following settings:

- Port Status: On
- Duplex: Full Duplex
- Clock Rate: 128000
- IP Configuration:
 - IP Address: 192.168.9.5
 - Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

The CLI tab is active, showing the equivalent IOS commands for configuration:

```
R2 (config)#interface Serial0/0/0
R2 (config-if)#clock rate 128000
This command applies only to DCE interfaces
R2 (config-if)#
R2 (config-if)#exit
R2 (config)#interface Serial0/0/1
R2 (config-if)#clock rate 128000
R2 (config-if)#
```

3. En R2 y R3 configurar las familias de direcciones OSPFv3 para IPv4 e IPv6. Utilice el identificador de enrutamiento 2.2.2.2 en R2 y 3.3.3.3 en R3 para ambas familias de direcciones.
4. En R2, configurar la interfaz F0/0 en el área 1 de OSPF y la conexión serial entre R2 y R3 en OSPF área 0.

```
R2(config-if)#ipv6 router ospf 1
R2(config-rtr)#router-id 2.2.2.2
R2(config-rtr)#area 0 stub no-summary
OSPF: Backbone can not be configured as stub area
R2(config-rtr)#
```

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5. En R3, configurar la interfaz F0/0 y la conexión serial entre R2 y R3 en OSPF área 0.

```
R3(config-if)#
R3(config-if)#exit
R3(config)#interface FastEthernet0/1/0
R3(config-if)#ipv6 unicast-routing
R3(config)#ipv6 cef
%Must enable IPv4 CEF first
R3(config)#ipv6 router ospf 1
R3(config-rtr)# router-id 3.3.3.3
R3(config-rtr)#area 0 stub
OSPF: Backbone can not be configured as stub area
R3(config-rtr)#
```

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6. Configurar el área 1 como un área totalmente Stubby.

```
R3(config-rtr)#Area 1 nssa no-summary
R3(config-rtr)#
```

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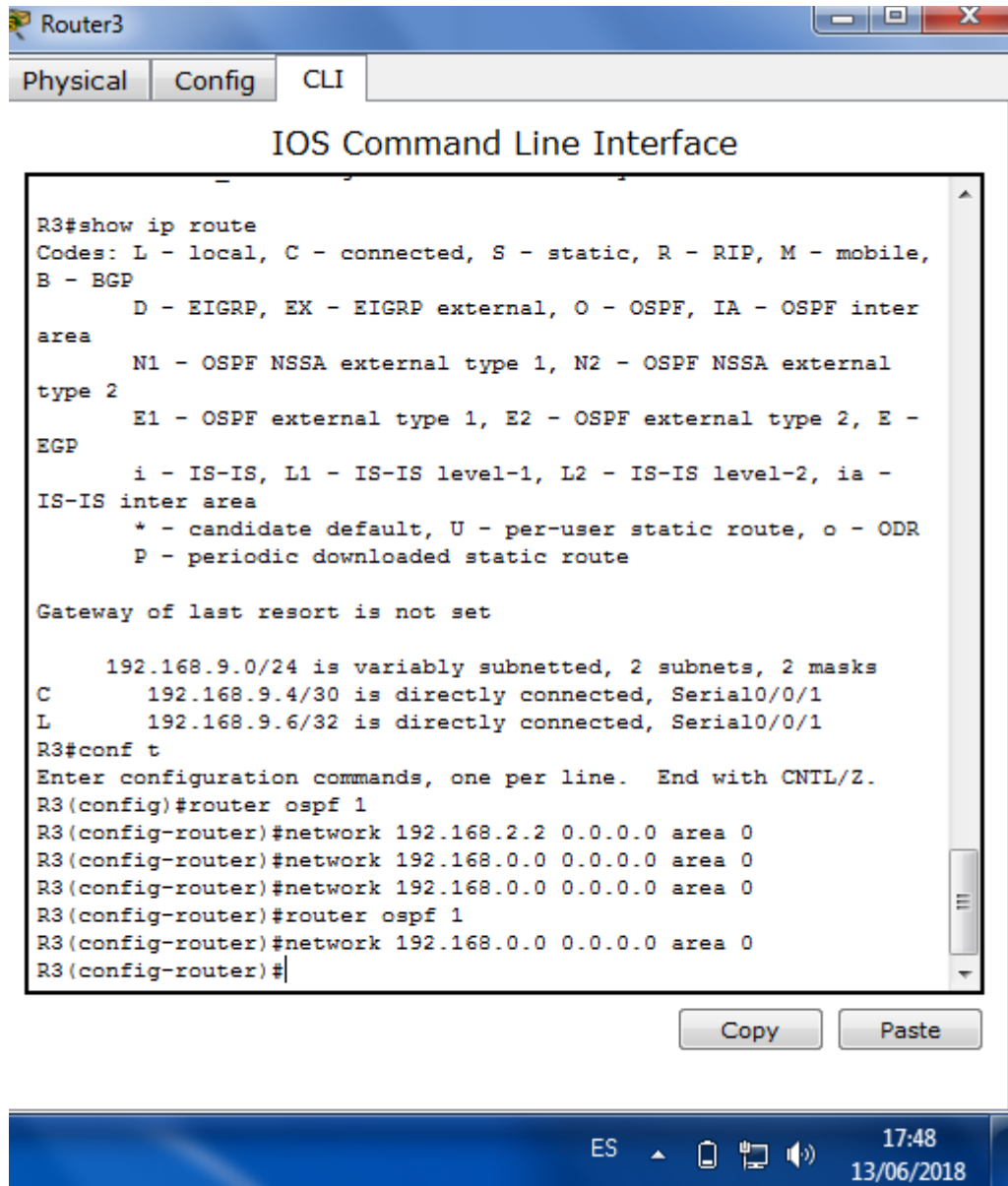
ES 15:29 13/06/2018

```
R2(config-rtr)#Area 1 nssa no-summary
R2(config-rtr)#
```

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ES 15:31 13/06/2018

7. Propagar rutas por defecto de IPv4 y IPv6 en R3 al interior del dominio OSPFv3. **Nota: Es importante tener en cuenta que una ruta por defecto es diferente a la definición de rutas estáticas.**



```
Router3
Physical Config CLI
IOS Command Line Interface

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, E -
EGP
      i - IS-IS, 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

Gateway of last resort is not set

      192.168.9.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.9.4/30 is directly connected, Serial0/0/1
L       192.168.9.6/32 is directly connected, Serial0/0/1
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 192.168.2.2 0.0.0.0 area 0
R3(config-router)#network 192.168.0.0 0.0.0.0 area 0
R3(config-router)#network 192.168.0.0 0.0.0.0 area 0
R3(config-router)#router ospf 1
R3(config-router)#network 192.168.0.0 0.0.0.0 area 0
R3(config-router)#
```

Copy Paste

ES 17:48 13/06/2018

The screenshot shows a terminal window titled "Router2" with tabs for "Physical", "Config", and "CLI". The main area is titled "IOS Command Line Interface" and contains the following text:

```
R2(config-if)#
R2(config-if)#exit
R2(config)#interface FastEthernet0/1/0
R2(config-if)#
R2(config-if)#exit
R2(config)#interface FastEthernet0/1/0
R2(config-if)# ipv6 ospf 1 area 0
R2(config-if)#
% Invalid input detected at '^' marker.

R2(config-if)#ipv6 router ospf 1
R2(config-rtr)#router-id 2.2.2.2
R2(config-rtr)#area 0 stub no-summary
OSPF: Backbone can not be configured as stub area
R2(config-rtr)#Area 1 nssa no-summary
R2(config-rtr)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to down

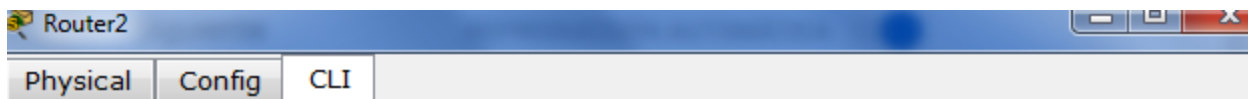
R2(config-rtr)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

R2(config-rtr)#exit
R2(config)#router ospf 1
R2(config-router)#network 192.168.2.2 0.0.0.0 area 0
R2(config-router)#network 192.168.0.0 0.0.0.0 area 1
R2(config-router)#
```

At the bottom of the terminal window, there are "Copy" and "Paste" buttons. The system tray at the bottom right shows the time "17:48" and date "13/06/2018".

8. Realizar la configuración del protocolo EIGRP para IPv4 como IPv6. Configurar la interfaz F0/0 de R1 y la conexión entre R1 y R2 para EIGRP con el sistema autónomo 101. Asegúrese de que el resumen automático está desactivado.



IOS Command Line Interface

```
R2(config-if)#exit
R2(config)#ipv6 unicast-routing
R2(config)#ipv6 router eigrp 1
R2(config-rtr)#no shutdown
R2(config-rtr)#eigrp router-id 2.2.2.2
R2(config-rtr)#exit
R2(config)#int g0/0
R2(config-if)#ipv6 eigrp
% Incomplete command.
R2(config-if)#ipv6 eigrp 1
R2(config-if)#
R2(config-if)#exit
R2(config)#interface Serial0/0/0
R2(config-if)#ipv6 eigrp 1
R2(config-if)#
%DUAL-5-NBRCHANGE: IPv6-EIGRP 1: Neighbor FE80::1 (Serial0/0/0) is up: new adjacency

R2(config-if)#
R2(config-if)#exit
R2(config)#interface Serial0/0/0
R2(config-if)#
R2(config-if)#exit
R2(config)#interface Serial0/0/1
R2(config-if)#ipv6 eigrp 1
R2(config-if)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

Copy Paste



```
R2#show ipv6 eigrp neighbor
IPv6-EIGRP neighbors for process 1
H  Address                Interface      Hold  Uptime   SRTT  RTO  Q  Seq
   (sec)                  (ms)          Cnt  Num
0  Link-local address:    Se0/0/0       12   00:01:31  40    1000 0  5
   FE80::1
```

Copy Paste



9. Configurar las interfaces pasivas para EIGRP según sea apropiado.

```
R1(config-router)#passive-interface serial 0/0/1
R1(config-router)#
R1(config-router)#exit
R1(config)#interface Serial0/0/1
R1(config-if)#exit
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#
R1#
```

Copy

Paste

ES 9:57
14/06/2018

```
R1#
R1#debug eigrp packet
EIGRP Packets debugging is on
      (UPDATE, REQUEST, QUERY, REPLY, HELLO, ACK )
R1#
EIGRP: Received HELLO on Serial0/0/0 nbr FE80::2
      AS 1, Flags 0x0, Seq 6/0 idbQ 0/0
R1#
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A
      AS 1, Flags 0x0, Seq 6/0 idbQ 0/0 iidbQ un/rely 0/0
R1#
```

Copy

Paste

ES 9:58
14/06/2018

10. En R2, configurar la redistribución mutua entre OSPF y EIGRP para IPv4 e IPv6. Asignar métricas apropiadas cuando sea necesario.

```
R2(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0/1
R2(config)#
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A
      AS 1, Flags 0x0, Seq 11/0 idbQ 0/0 iidbQ un/rely 0/0
R2(config)#
```

Copy

Paste

ES 11:28
14/06/2018

```
R2(config-router)#redistribute static
% Only classful networks will be redistributed
R2(config-router)#
```

```
R2(config-router)#redistribute static
% Only classful networks will be redistributed
R2(config-router)#
```

Copy

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```
R3(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0/1
%Default route without gateway, if not a point-to-point interface, may impact
performance
R3(config)#
```

Copy

Paste

```
R3(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0/1
%Default route without gateway, if not a point-to-point interface, may impact
performance
R3(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0/0
R3(config)#ip route 0.0.0.0 0.0.0.0 serial 0/1/0
%Invalid interface type and number
R3(config)#router ospf 1
R3(config-router)#redistribute static
% Only classful networks will be redistributed
R3(config-router)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#wr
Building configuration...
[OK]
R3#
```

Copy

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```
R1(config-router)#redistribute static
R1(config-router)#
```

Copy

Paste

ES 11:53 14/06/2018

The image displays a network diagram and a Realtime monitoring interface. The network diagram shows three 1941 routers connected in a triangle: Router1 (Bogotá) at the bottom left, Router2 (Bucaramanga) at the top, and Router3 (Medellin) at the bottom right. Red lines represent the connections between them. The Realtime interface below the diagram shows a yellow bar with 'Cycle Devices' and 'Fast Forward Time' on the left, and 'Realtime' on the right. Below this bar, there is a list of devices (1841, 1941, 2620XM, 2621XM) and a 'Scenario 0' dropdown menu. A 'Toggle PDU List Window' button is also visible. The PDU List Window shows a table of fire events:

Fire	Last Status	Source	Destination
	Successful	Router1	Router2

The bottom of the interface shows a blue taskbar with 'ES', signal strength, and the time '14:11' and date '14/06/2018'.

11. En R2, de la hacer publicidad de ruta 192.168.3.0/24 a R1 mediante una lista de distribución y ACL.

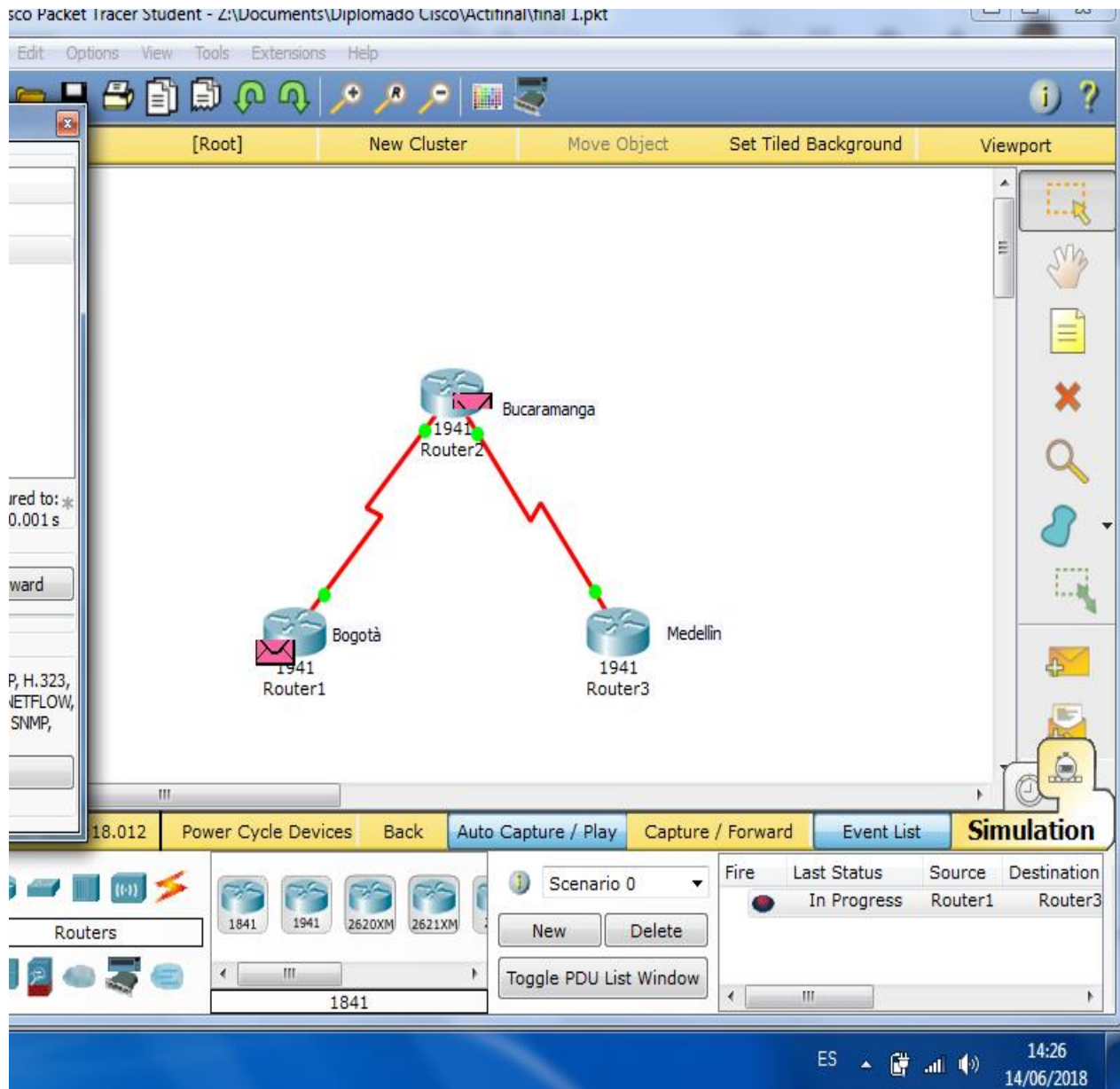
The screenshot shows a Cisco Router CLI window titled "Router1" with tabs for "Physical", "Config", and "CLI". The main window displays the "IOS Command Line Interface" with the following text:

```
R1(config-router)#  
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0 iibQ un/rely 0/0  
  
R1(config-router)#  
EIGRP: Received HELLO on Serial0/0/0 nbr FE80::2  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0  
  
R1(config-router)#  
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0 iibQ un/rely 0/0  
  
R1(config-router)#  
EIGRP: Received HELLO on Serial0/0/0 nbr FE80::2  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0  
  
R1(config-router)#  
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0 iibQ un/rely 0/0  
  
R1(config-router)#  
EIGRP: Received HELLO on Serial0/0/0 nbr FE80::2  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0  
  
R1(config-router)#  
EIGRP: Sending HELLO on Serial0/0/0 nbr FF02::A  
AS 1, Flags 0x0, Seq 11/0 idbQ 0/0 iibQ un/rely 0/0  
  
R1(config-router)#
```

At the bottom of the window, there are "Copy" and "Paste" buttons. The system tray at the bottom right shows the time "14:22" and date "14/06/2018".

Parte 2: Verificar conectividad de red y control de la trayectoria.

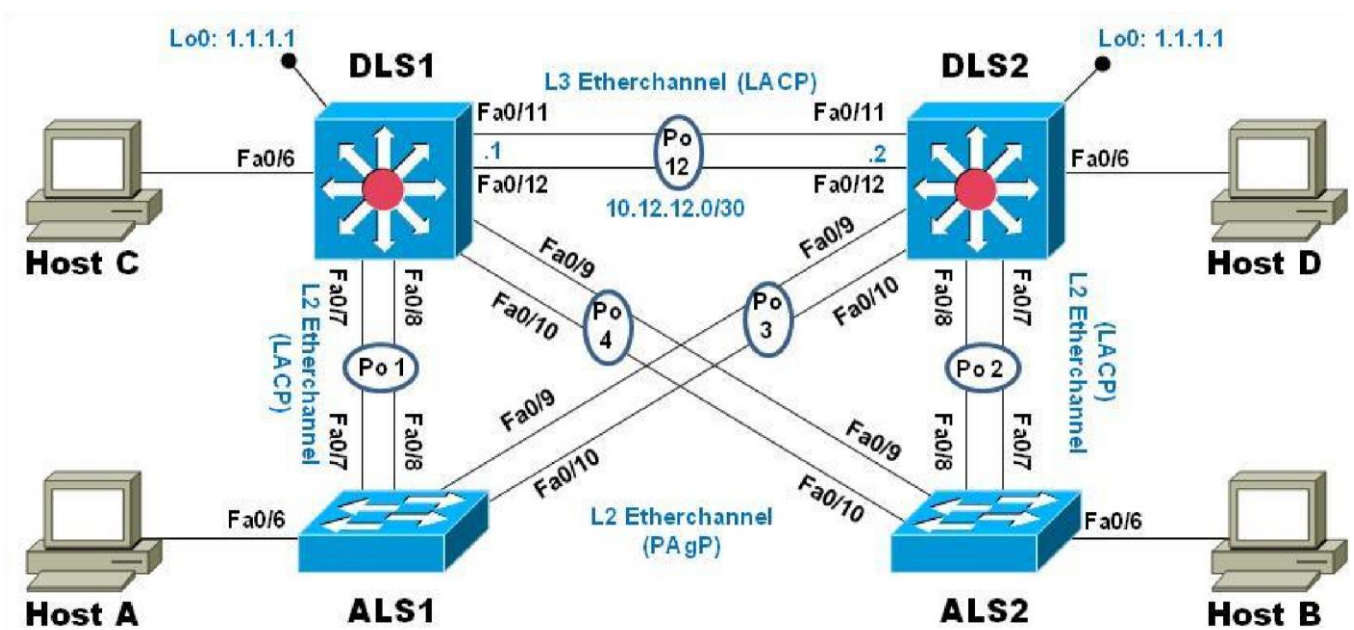
- Registrar las tablas de enrutamiento en cada uno de los routers, acorde con los parámetros de configuración establecidos en el escenario propuesto.
- Verificar comunicación entre routers mediante el comando ping y traceroute
- Verificar que las rutas filtradas no están presentes en las tablas de enrutamiento de los routers correctas.



Nota: Puede ser que Una o más direcciones no serán accesibles desde todos los routers después de la configuración final debido a la utilización de listas de distribución para filtrar rutas y el uso de IPv4 e IPv6 en la misma red.

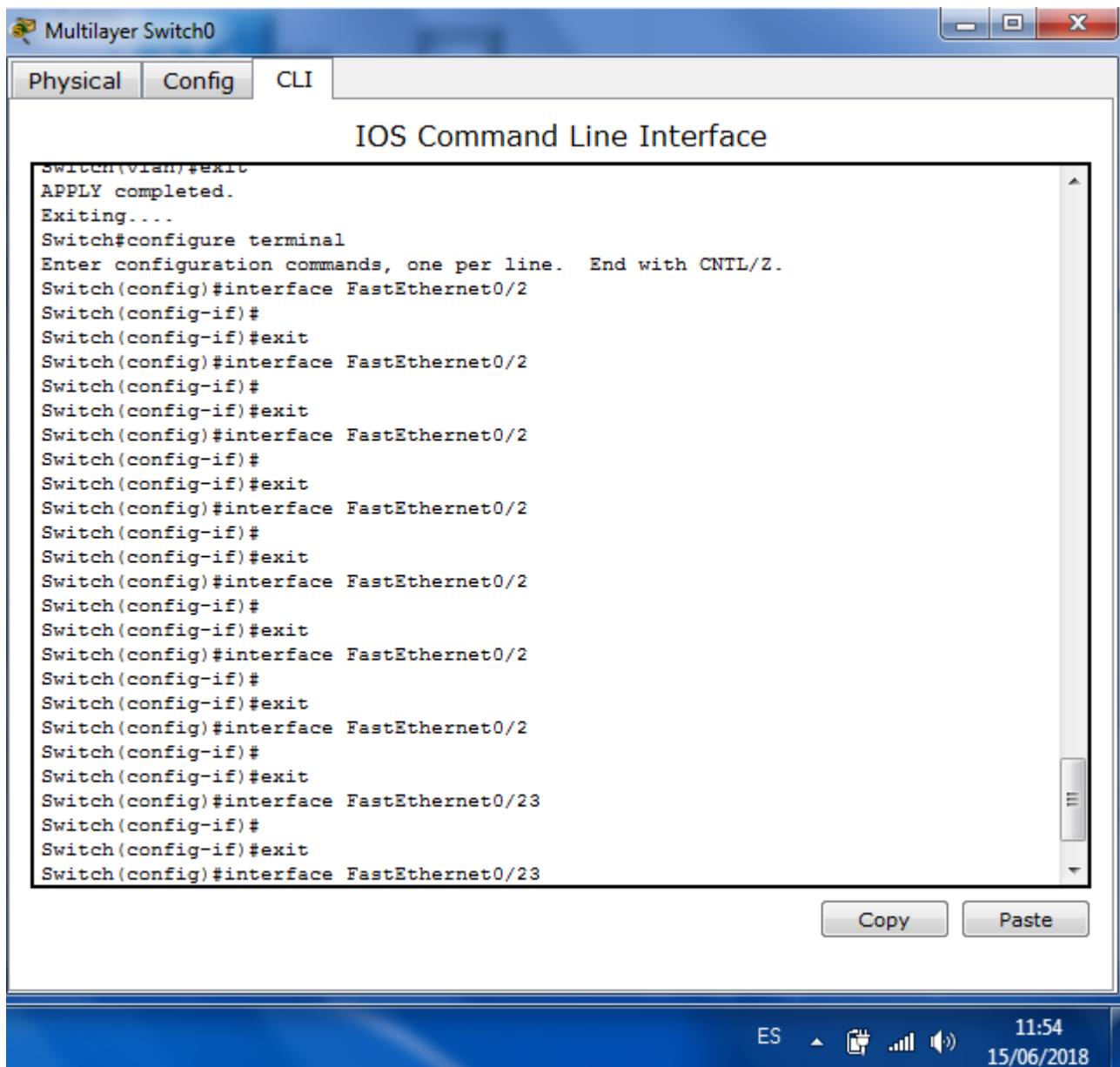
Escenario 2: Una empresa de comunicaciones presenta una estructura Core acorde a la topología de red, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, etherchannels, VLANs y demás aspectos que forman parte del escenario propuesto.

Topología de red



Parte 1: Configurar la red de acuerdo con las especificaciones.

- a. Apagar todas las interfaces en cada switch.



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch(config)#interface FastEthernet0/24
Switch(config-if)#shutdown

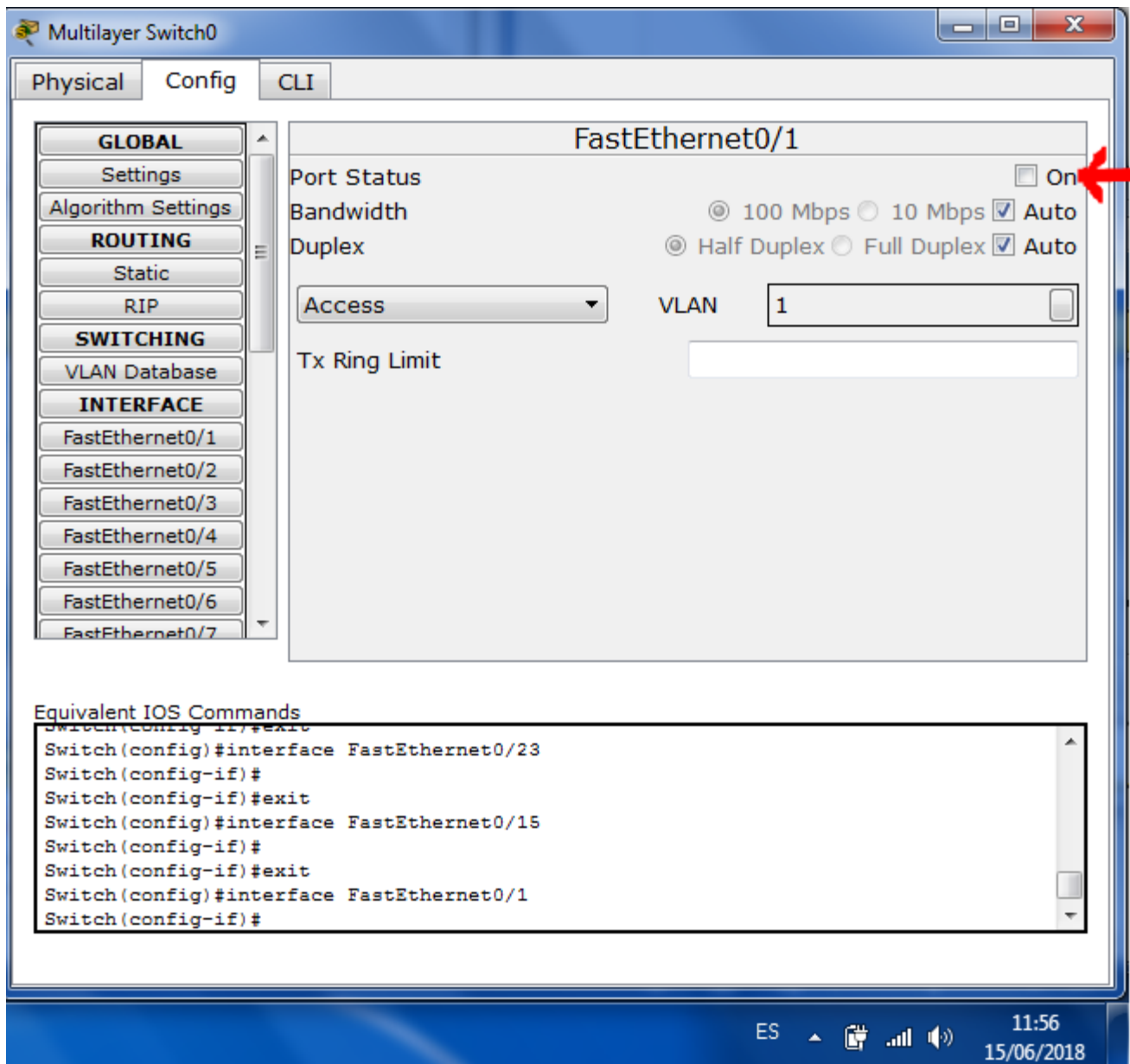
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively
down
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/24
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/24
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet0/1
Switch(config-if)#shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively
down
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet0/1
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet0/2
Switch(config-if)#shutdown

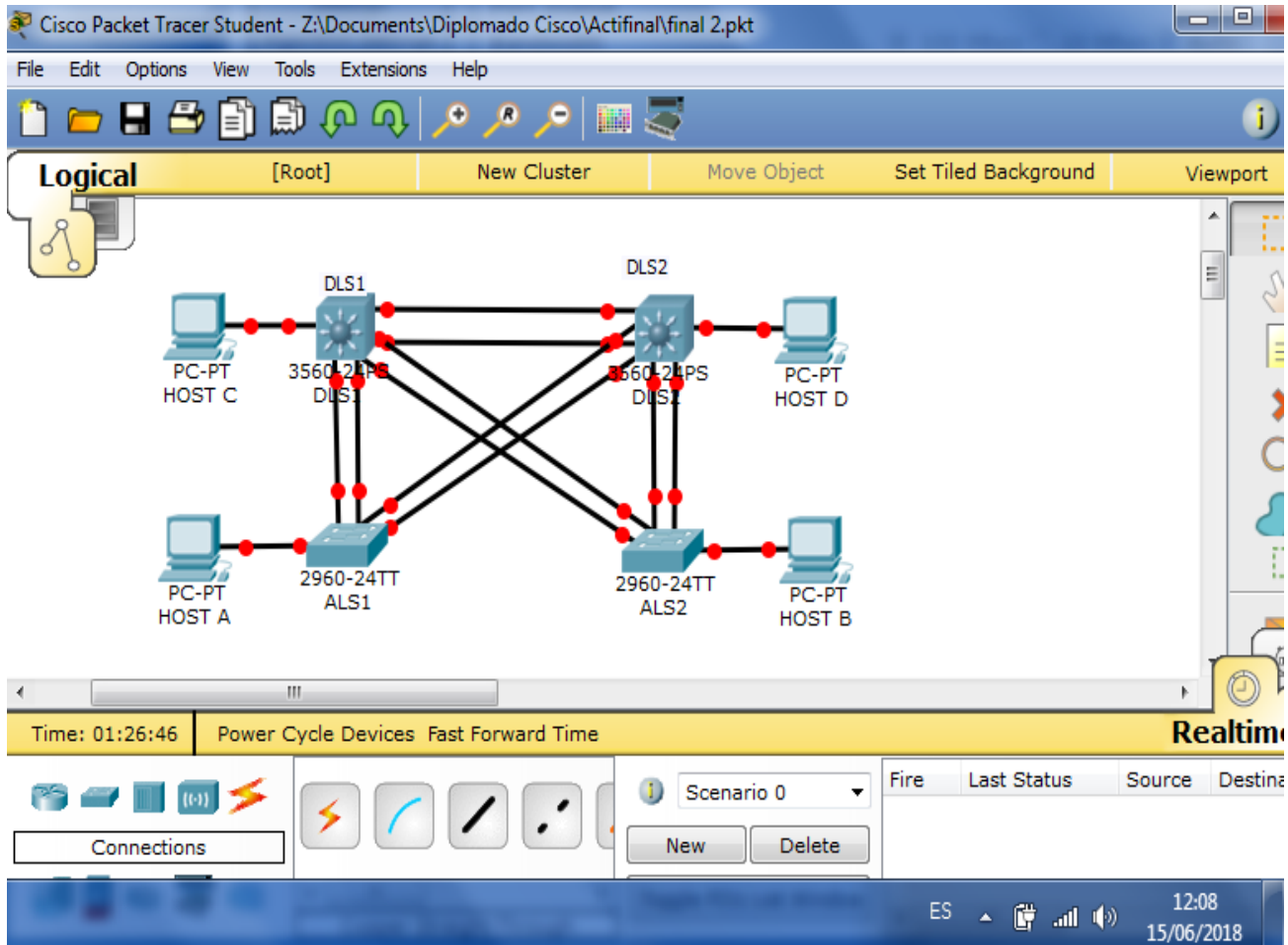
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively
down
Switch(config-if)#
```

Copy Paste

ES 11:55 15/06/2018



b. Asignar un nombre a cada switch acorde al escenario establecido.



c. Configurar los puertos troncales y Port-channels tal como se muestra en el diagrama.

- 1) La conexión entre DLS1 y DLS2 será un EtherChannel capa-3 utilizando LACP. Para DLS1 se utilizará la dirección IP 10.12.12.1/30 y para DLS2 utilizará 10.12.12.2/30.

```
DLS1>en
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#interface range gigabitethernet 0/1-2
DLS1(config-if-range)#switchport mode access
DLS1(config-if-range)#switchport access vlan 5
DLS1(config-if-range)#switchport access vlan 1
DLS1(config-if-range)#exit
DLS1(config)#
DLS1(config)#interface port-channel 3
DLS1(config-if)#no switchport
DLS1(config-if)#ip address 10.12.12.1 255.255.255.252
DLS1(config-if)#end
DLS1#
%SYS-5-CONFIG_I: Configured from console by console
DLS1#
```

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname DLS2
DLS2(config)#interface port-channel 3
DLS2(config-if)#no switchport
DLS2(config-if)#ip address 10.12.12.2 255.255.255.252
DLS2(config-if)#end
DLS2#
%SYS-5-CONFIG_I: Configured from console by console
```

2) Los Port-channels en las interfaces Fa0/7 y Fa0/8 utilizarán LACP.

The screenshot shows a Cisco IOS CLI window titled "DLS1" with tabs for "Physical", "Config", and "CLI". The main area displays the following text:

```
DLS1>en
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#int range fast 0/7
DLS1(config-if-range)#no switchport mode access
DLS1(config-if-range)#switchport mode trunk
Command rejected: An interface whose trunk encapsulation is
"Auto" can not be configured to "trunk" mode.
DLS1(config-if-range)#
DLS1(config-if-range)#exit
DLS1(config)#interface FastEthernet0/7
DLS1(config-if)#
DLS1(config-if)#switchport trunk encapsulation dot1q
DLS1(config-if)#switchport mode trunk
DLS1(config-if)#
DLS1(config-if)#exit
DLS1(config)#interface FastEthernet0/7
DLS1(config-if)#switchport trunk native vlan 800
DLS1(config-if)#channel-group 2 mode active
DLS1(config-if)#
Creating a port-channel interface Port-channel 2
```

Below the text area are "Copy" and "Paste" buttons. The bottom of the window shows a taskbar with the text "ES", signal strength icons, and the time "8:37" and date "16/06/2018".

```
-----  
DLS1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
DLS1(config)#interface FastEthernet0/8  
DLS1(config-if)#  
DLS1(config-if)#exit  
DLS1(config)#interface FastEthernet0/7  
DLS1(config-if)#  
DLS1(config-if)#exit  
DLS1(config)#interface FastEthernet0/8  
DLS1(config-if)#  
DLS1(config-if)#switchport trunk encapsulation dot1q  
DLS1(config-if)#switchport mode trunk  
DLS1(config-if)#no switchport mode access  
DLS1(config-if)#switchport mode trunk  
DLS1(config-if)#switchport trunk native vlan 800  
DLS1(config-if)#channel-group 2 mode active  
DLS1(config-if)#end  
DLS1#  
%SYS-5-CONFIG_I: Configured from console by console|
```

Copy

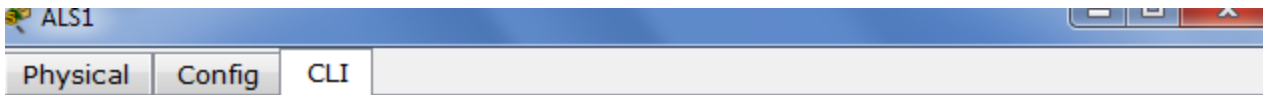
Paste

100 %

ES

8:37

16/06/2018



IOS Command Line Interface

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname ALS1
ALS1(config)#
ALS1(config)#interface FastEthernet0/7
ALS1(config-if)#
ALS1(config-if)#switchport mode trunk
ALS1(config-if)#SWITCHPORT mode access
ALS1(config-if)#switchport mode trunk
ALS1(config-if)#switchport trunk native vlan 800
ALS1(config-if)#channel-group 2 mode pasive
ALS1(config-if)#channel-group 2 mode pasive
^
% Invalid input detected at '^' marker.

ALS1(config-if)#channel-group 2 mode pasive
ALS1(config-if)#channel-group 2 mode pasive
^
% Invalid input detected at '^' marker.

ALS1(config-if)#channel-group 2 mode active
ALS1(config-if)#
Creating a port-channel interface Port-channel 2

ALS1(config-if)#end
ALS1#
%SYS-5-CONFIG_I: Configured from console by console

ALS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ALS1(config)#
```

Copy Paste



```
ALS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ALS1(config)#
ALS1(config)#interface FastEthernet0/8
ALS1(config-if)#no switchport mode access
ALS1(config-if)#switchport mode trunk
ALS1(config-if)#switchport trunk native vlan 800
ALS1(config-if)#channel-group 2 mode active
ALS1(config-if)#end
ALS1#
%SYS-5-CONFIG_I: Configured from console by console

ALS1#
```

Copy Paste



Cisco Packet Tracer Student - Z:\Documents\Diplomado Cisco\Activfinal\final 2.pkt

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

PC-PT HOST C
3560-24PS DLS1
3560-24PS DLS2
PC-PT HOST D
2960-24TT ALS1
2960-24TT ALS2
PC-PT HOST A
PC-PT HOST B

Time: 00:22:16 Power Cycle Devices Fast Forward Time Realtime

Routers

Scenario 0

Fire	Last Status	Source	Destination
------	-------------	--------	-------------

Toggle PDU List Window

ES 8:48 16/06/2018

DLS2

Physical Config CLI

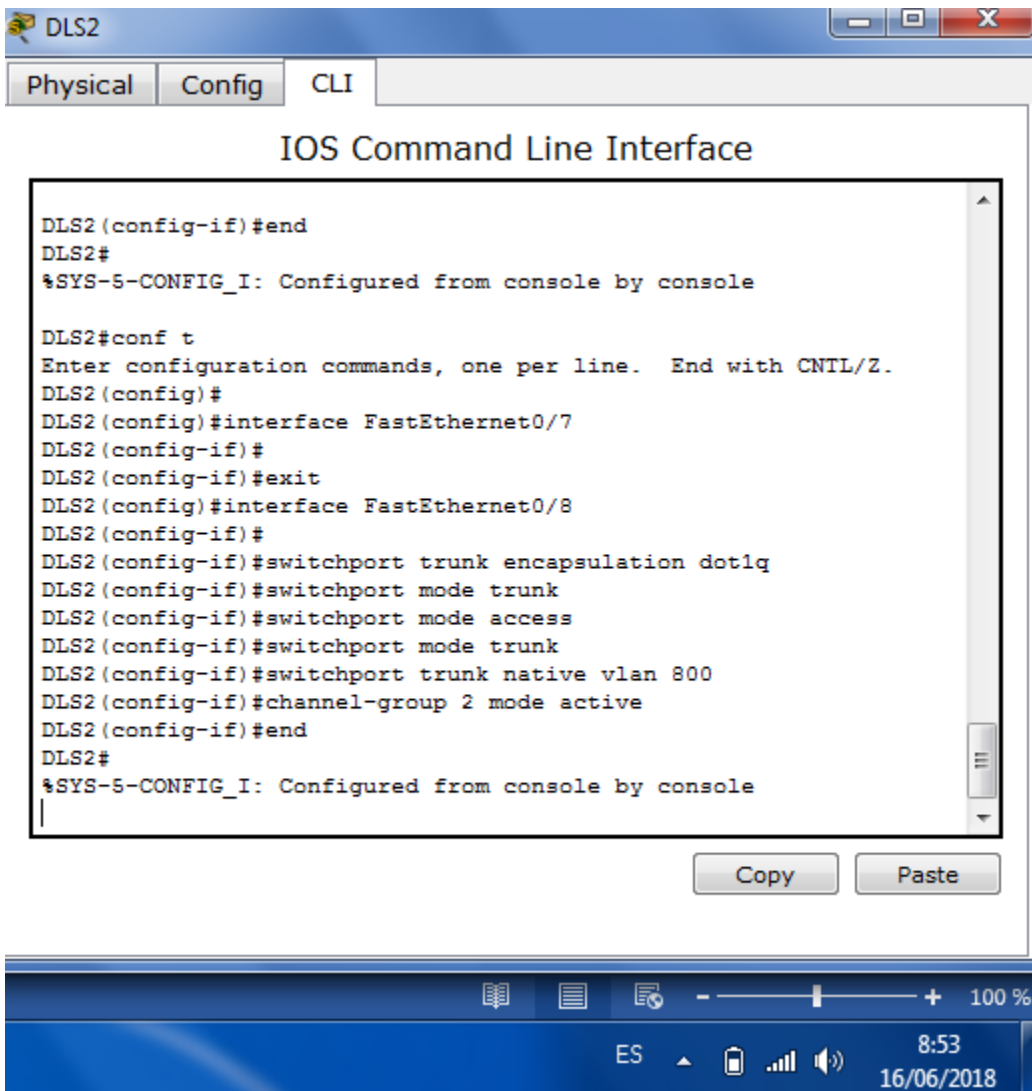
IOS Command Line Interface

```
Press RETURN to get started!

DLS2>en
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#
DLS2(config)#interface FastEthernet0/7
DLS2(config-if)#
DLS2(config-if)#switchport trunk encapsulation dot1q
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#switchport mode access
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#switchport trunk native vlan 800
DLS2(config-if)#channel-group 2 mode active
DLS2(config-if)#
Creating a port-channel interface Port-channel 2

DLS2(config-if)#end
DLS2#
```

ES 8:52 16/06/2018



ALS2

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname ALS2
ALS2(config)#
ALS2(config)#interface FastEthernet0/7
ALS2(config-if)#
ALS2(config-if)#switchport mode trunk
ALS2(config-if)#switchport mode ACCESS
ALS2(config-if)#switchport mode trunk
ALS2(config-if)#switchport trunk native vlan 800
ALS2(config-if)#channel-group 2 mode active
ALS2(config-if)#
Creating a port-channel interface Port-channel 2

ALS2(config-if)#end
ALS2#
%SYS-5-CONFIG_I: Configured from console by console
```

ES 8:57 16/06/2018

```
ALS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ALS2(config)#
ALS2(config)#interface FastEthernet0/7
ALS2(config-if)#
ALS2(config-if)#exit
ALS2(config)#interface FastEthernet0/8
ALS2(config-if)#
ALS2(config-if)#switchport mode trunk
ALS2(config-if)#switchport mode access
ALS2(config-if)#switchport trunk native vlan 800
ALS2(config-if)#channel-group 2 mode active
ALS2(config-if)#end
ALS2#
%SYS-5-CONFIG_I: Configured from console by console

ALS2#
```

Copy Paste

ES 8:57 16/06/2018

DLS1

Physical Config CLI

IOS Command Line Interface

```
DLS1>en
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#
DLS1(config)#interface FastEthernet0/9
DLS1(config-if)#
DLS1(config-if)#switchport trunk encapsulation dot1q
DLS1(config-if)#switchport mode trunk
DLS1(config-if)#
DLS1(config-if)#switchport mode access
DLS1(config-if)#end
DLS1#
%SYS-5-CONFIG_I: Configured from console by console
```

Copy Paste

ES 10:04 16/06/2018

```
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#
DLS1(config)#interface FastEthernet0/10
DLS1(config-if)#
DLS1(config-if)#exit
DLS1(config)#interface FastEthernet0/10
DLS1(config-if)#switchport mode access
DLS1(config-if)#switchport access vlan 5
DLS1(config-if)#switchport access vlan 800
DLS1(config-if)#channel-group 3 mode desirable
Command rejected (Port-channel): Either port is L2 and port-
channel is L3, or vice-versa
DLS1(config-if)#end
DLS1#
%SYS-5-CONFIG_I: Configured from console by console
```

Copy Paste

ES 10:04 16/06/2018

```
ALS2(config-if)#switchport mode access
ALS2(config-if)#switchport access vlan 800
% Access VLAN does not exist. Creating vlan 800
ALS2(config-if)#switchport access vlan 800
ALS2(config-if)#channel-group 3 mode desirable
ALS2(config-if)#
Creating a port-channel interface Port-channel 3

ALS2(config-if)#end
ALS2#
%SYS-5-CONFIG_I: Configured from console by console

ALS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ALS2(config)#
ALS2(config)#interface FastEthernet0/9
ALS2(config-if)#
ALS2(config-if)#exit
ALS2(config)#interface FastEthernet0/10
ALS2(config-if)#switchport mode access
ALS2(config-if)#switchport access vlan 800
ALS2(config-if)#channel-group 3 mode desirable
ALS2(config-if)#end
ALS2#
%SYS-5-CONFIG_I: Configured from console by console

ALS2#|
```

Copy

Paste

ES



10:09

16/06/2018

DLS2

Physical Config CLI

IOS Command Line Interface

```
DLS2>EN
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#
DLS2(config)#interface FastEthernet0/9
DLS2(config-if)#switchport mode access
DLS2(config-if)#switchport access vlan 800
% Access VLAN does not exist. Creating vlan 800
DLS2(config-if)#channel-group 3 mode desirable
Command rejected (Port-channel): Either port is L2 and port-
channel is L3, or vice-versa
DLS2(config-if)#end
DLS2#
%SYS-5-CONFIG_I: Configured from console by console

DLS2#
DLS2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#interface FastEthernet0/9
DLS2(config-if)#
DLS2(config-if)#
DLS2(config-if)#switchport access vlan 1
DLS2(config-if)#end
DLS2#
%SYS-5-CONFIG_I: Configured from console by console

DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#
DLS2(config)#interface FastEthernet0/10
DLS2(config-if)#switchport mode access
DLS2(config-if)#switchport access vlan 1
DLS2(config-if)#channel-group 3 mode desirable
Command rejected (Port-channel): Either port is L2 and port-
channel is L3, or vice-versa
DLS2(config-if)#end
DLS2#
```

Copy Paste

ES 10:22 16/06/2018

The image shows a screenshot of a Cisco IOS Command Line Interface (CLI) window titled "ALS1". The window has three tabs: "Physical", "Config", and "CLI", with "CLI" being the active tab. The main content area displays the following text:

```
ALS1>en
ALS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ALS1(config)#
ALS1(config)#interface FastEthernet0/9
ALS1(config-if)#
ALS1(config-if)#exit
ALS1(config)#interface FastEthernet0/10
ALS1(config-if)#channel-group 3 mode desirable
ALS1(config-if)#end
ALS1#
%SYS-5-CONFIG_I: Configured from console by console
ALS1#
```

Below the text area are "Copy" and "Paste" buttons. At the bottom of the window, there is a taskbar with icons for a book, a list, a refresh, and a volume icon, along with a zoom level of "100%". The system tray at the very bottom shows the text "ES", a battery icon, a signal strength icon, a speaker icon, the time "11:05", and the date "16/06/2018".

4) Todos los puertos troncales serán asignados a la VLAN 800 como la VLAN nativa.

```
DLS1(config)#
DLS1(config)#interface GigabitEthernet0/1
DLS1(config-if)#switchport trunk native vlan 800
DLS1(config-if)#
DLS1(config-if)#exit
DLS1(config)#interface GigabitEthernet0/1
DLS1(config-if)#
DLS1(config-if)#exit
DLS1(config)#interface GigabitEthernet0/2
DLS1(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/8 (800).

DLS1(config-if)#switchport trunk native vlan
% Incomplete command.
DLS1(config-if)#switchport trunk native vlan 800
DLS1(config-if)#
```

Copy Paste



- d. Configurar DLS1, ALS1, y ALS2 para utilizar VTP versión 3
1) Utilizar el nombre de dominio UNAD con la contraseña cisco123
2) Configurar DLS1 como servidor principal para las VLAN.
2) Configurar ALS1 y ALS2 como clientes VTP.

```
DLS1>EN
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#ip domain-name UNAD
DLS1(config)#enable secret cisco123
DLS1(config)#
```

Copy Paste



```

DLS2>en
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#ip domain-name UNAD
DLS2(config)#enable secret cisco123
DLS2(config)#

```

Copy Paste

ES 19:45 17/06/2018

DLS1

Physical Config CLI

GLOBAL
ROUTING
SWITCHING
VLAN Database
INTERFACE

VLAN Configuration

VLAN Number

VLAN Name

Add Remove

VLAN No	VLAN Name
1	default
5	VLAN0005
12	EJECUTIVO
101	VOZ
111	VIDEONET
123	MANTENIMIENTO
234	HUESPED

Equivalent IOS Commands

```

DLS1>enable
Password:
DLS1#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

```

e. Configurar en el servidor principal las siguientes VLAN:

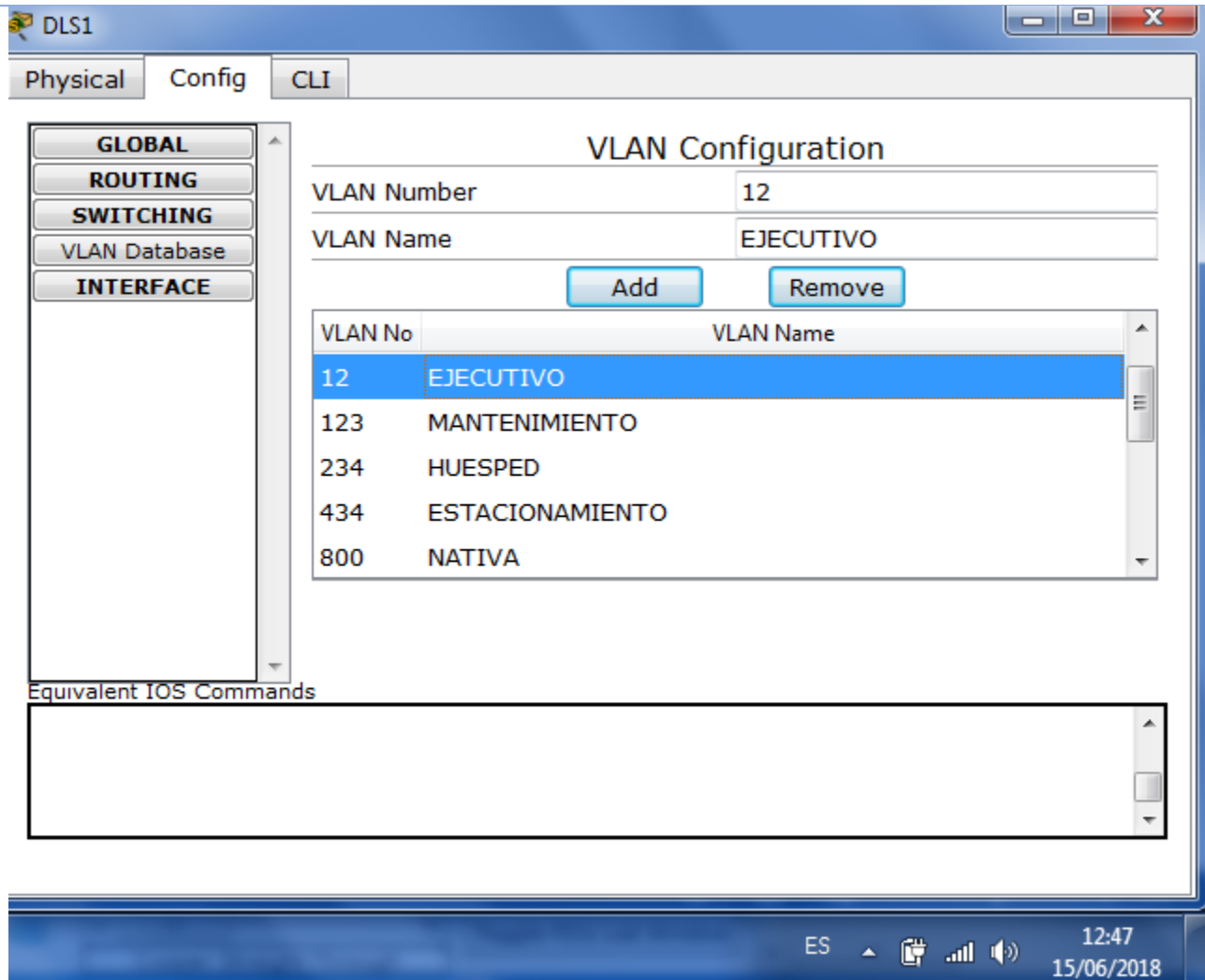
Número de VLAN

Nombre de VLAN

Número de VLAN

Nombre de VLAN

800	NATIVA	434	ESTACIONAMIENTO
12	EJECUTIVOS	123	MANTENIMIENTO
234	HUESPEDES	1010	VOZ
1111	VIDEONET	3456	ADMINISTRACIÓN



f. En DLS1, suspender la VLAN 434.

VLAN Configuration

VLAN Number: 434
VLAN Name: ESTACIONAMIENTO

VLAN No	VLAN Name
111	VIDEONET
123	MANTENIMIENTO
234	HUESPED
434	ESTACIONAMIENTO
800	NATIVA
1002	fddi-default
1003	token-ring-default

Equivalent IOS Commands

```
DLS1>enable
Password:
DLS1#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.
DLS1(vlan)#
```

- g. Configurar DLS2 en modo VTP transparente VTP utilizando VTP versión 2, y configurar en DLS2 las mismas VLAN que en DLS1.

```
DLS2>show vtp status
VTP Version           : 2
Configuration Revision : 4
Maximum VLANs supported locally : 1005
Number of existing VLANs : 6
VTP Operating Mode    : Server
VTP Domain Name      :
VTP Pruning Mode     : Disabled
VTP V2 Mode          : Disabled
VTP Traps Generation : Disabled
MD5 digest           : 0xE9 0xBD 0x20 0x52 0x2D 0x50 0x72 0x5E
Configuration last modified by 0.0.0.0 at 3-1-93 02:58:20
Local updater ID is 0.0.0.0 (no valid interface found)
DLS2>
DLS2>en
Password:
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#vtp mode transparent
Setting device to VTP TRANSPARENT mode.
DLS2(config)#
```

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17/06/2018

DLS2

Physical Config CLI

IOS Command Line Interface

```
DLS2#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

DLS2(vlan)#
%SYS-5-CONFIG_I: Configured from console by console
vlan 12 name EJECUTIVOS
VLAN 12 modified:
  Name: EJECUTIVOS
DLS2(vlan)#vlan 234 name HUESPEDES
VLAN 234 modified:
  Name: HUESPEDES
DLS2(vlan)#vlan 111 name VIDEONET
VLAN 111 modified:
  Name: VIDEONET
DLS2(vlan)#vlan 434 name ESTACIONAMIENTO
VLAN 434 modified:
  Name: ESTACIONAMIENTO
DLS2(vlan)#vlan 123 name MANTENIMIENTO
VLAN 123 modified:
  Name: MANTENIMIENTO
DLS2(vlan)#vlan 101 name VOZ
VLAN 101 modified:
  Name: VOZ
DLS2(vlan)#vlan 345 name ADMINISTRACIN
VLAN 345 modified:
  Name: ADMINISTRACIN
DLS2(vlan)#vlan 345 name ADMINISTRACION
```

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h. Suspender VLAN 434 en DLS2.

```
DLS2(vlan)#
DLS2(vlan)#no vlan 434
Deleting VLAN 434...
DLS2(vlan)#
```

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i. En DLS2, crear VLAN 567 con el nombre de CONTABILIDAD. La VLAN de CONTABILIDAD no podrá estar disponible en cualquier otro Switch de la red.

The screenshot shows the configuration interface for a device named DLS2. The 'CLI' tab is active, displaying the 'VLAN Configuration' section. On the left, there is a navigation menu with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. The 'VLAN Configuration' section includes fields for 'VLAN Number' (567) and 'VLAN Name' (CONTABILIDAD), with 'Add' and 'Remove' buttons. Below this is a table of existing VLANs:

VLAN No	VLAN Name
1	default
12	EJECUTIVOS
101	VOZ
111	VIDEONET
123	MANTENIMIENTO
234	HUESPEDES
345	ADMINISTRACION

Below the table, the 'Equivalent IOS Commands' section shows the following commands:

```
DLS2 (vlan) #
DLS2 (vlan) #no vlan 434
Deleting VLAN 434...
DLS2 (vlan) #
DLS2 (vlan) #vlan 567 name CONTABILIDAD
VLAN 567 modified:
  Name: CONTABILIDAD
DLS2 (vlan) #
```

A red arrow points to the 'Name: CONTABILIDAD' line in the command output.

- j. Configurar DLS1 como Spanning tree root para las VLAN 1, 12, 434, 800, 1010, 1111 y 3456 y como raíz secundaria para las VLAN 123 y 234.

```
DLS1(vlan)#exit
APPLY completed.
Exiting....
DLS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#spanning-tree vlan 1 root primary
DLS1(config)#spanning-tree vlan 12 root primary
DLS1(config)#spanning-tree vlan 434 root primary
DLS1(config)#spanning-tree vlan 800 root primary
DLS1(config)#spanning-tree vlan 101 root primary
DLS1(config)#spanning-tree vlan 111 root primary
DLS1(config)#spanning-tree vlan 345 root primary
DLS1(config)#spanning-tree vlan 123 root secondary
DLS1(config)#spanning-tree vlan 234 root secondary
DLS1(config)#
```

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18/06/2018

- k. Configurar DLS2 como Spanning tree root para las VLAN 123 y 234 y como una raíz secundaria para las VLAN 12, 434, 800, 1010, 1111 y 3456.

```
DLS2>en
Password:
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#spanning-tree vlan 123 root primary
DLS2(config)#spanning-tree vlan 234 root primary
DLS2(config)#spanning-tree vlan 12 root secondary
DLS2(config)#spanning-tree vlan 434 root secondary
DLS2(config)#spanning-tree vlan 800 root secondary
DLS2(config)#spanning-tree vlan 101 root secondary
DLS2(config)#spanning-tree vlan 111 root secondary
DLS2(config)#spanning-tree vlan 345 root secondary
DLS2(config)#
```

Copy

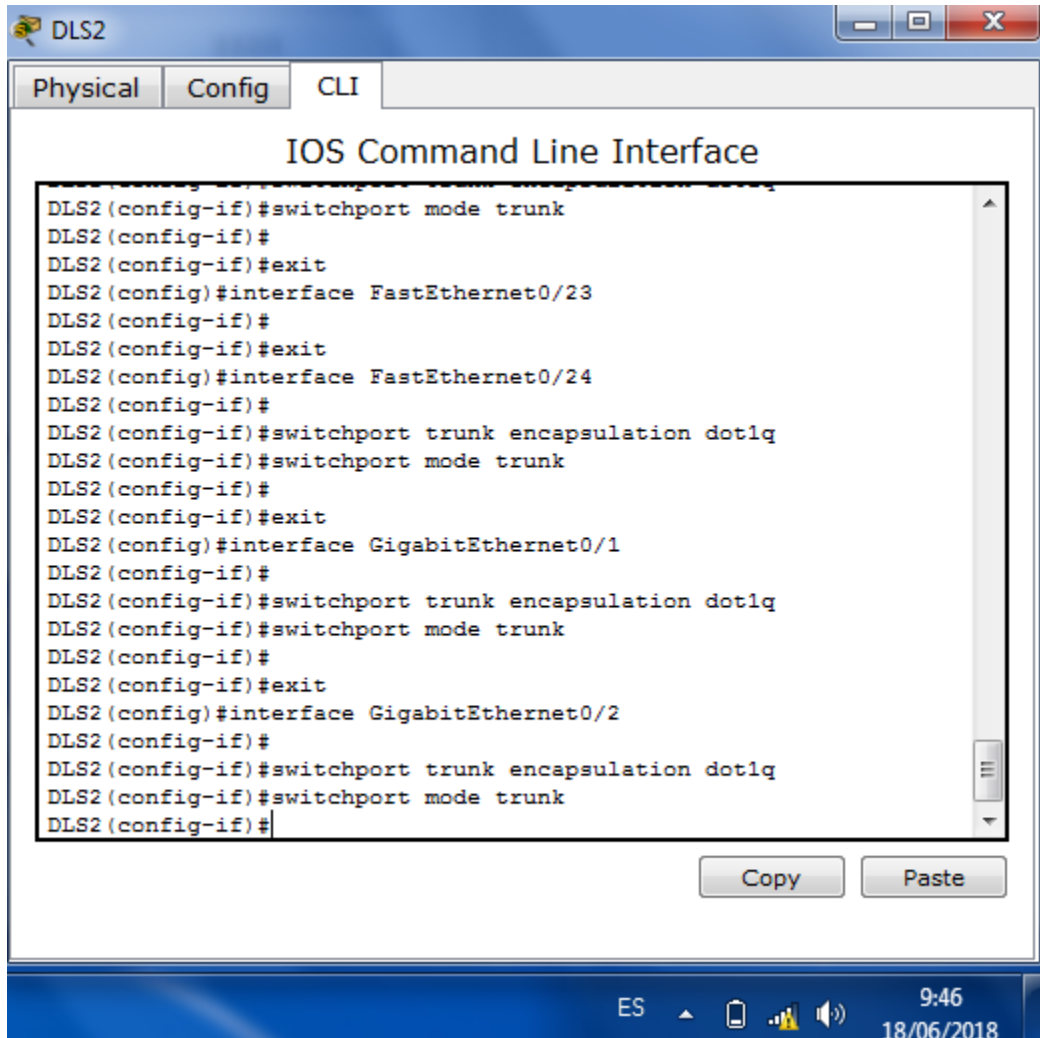
Paste

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18/06/2018

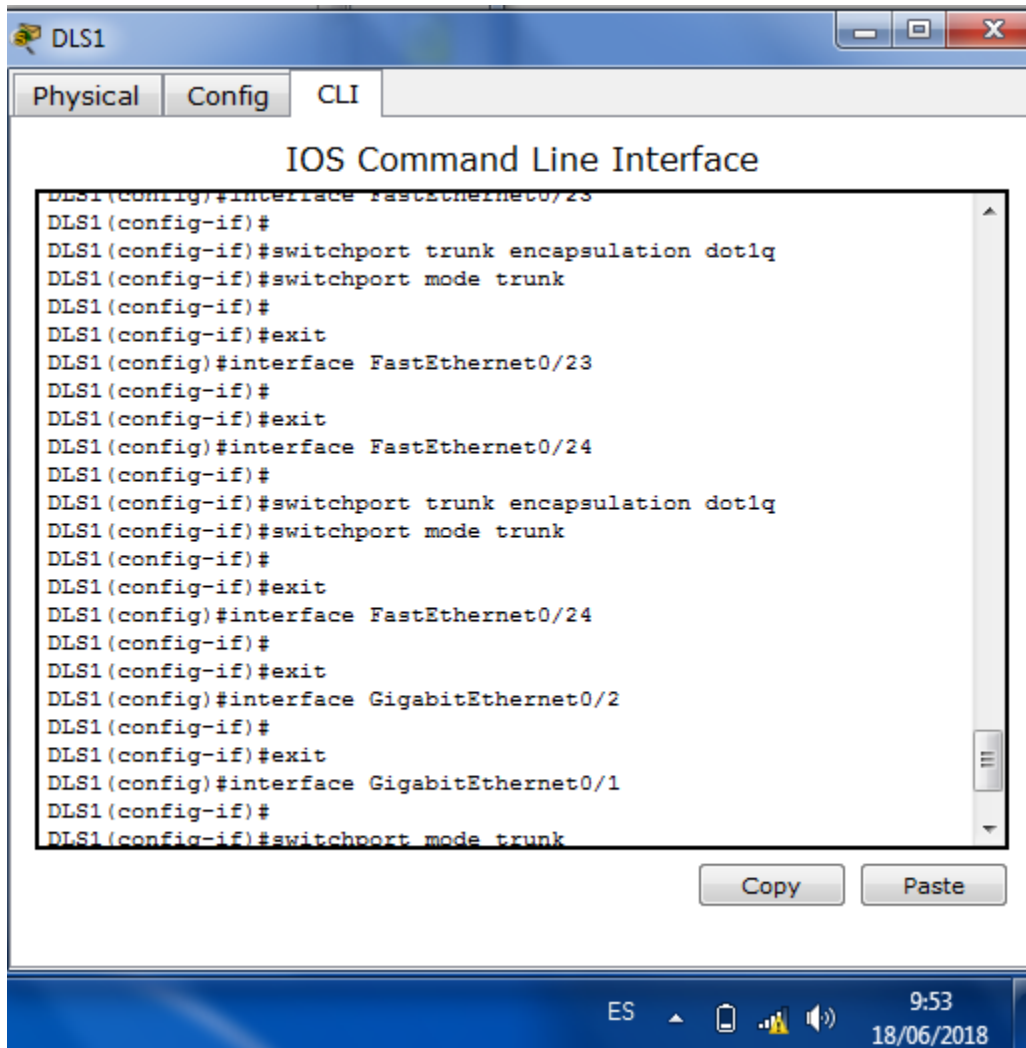
1. Configurar todos los puertos como troncales de tal forma que solamente las VLAN que se han creado se les permitirá circular a través de éstos puertos.



```
DLS2
Physical Config CLI
IOS Command Line Interface
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface FastEthernet0/23
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface FastEthernet0/24
DLS2(config-if)#
DLS2(config-if)#switchport trunk encapsulation dot1q
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface GigabitEthernet0/1
DLS2(config-if)#
DLS2(config-if)#switchport trunk encapsulation dot1q
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface GigabitEthernet0/2
DLS2(config-if)#
DLS2(config-if)#switchport trunk encapsulation dot1q
DLS2(config-if)#switchport mode trunk
DLS2(config-if)#
```

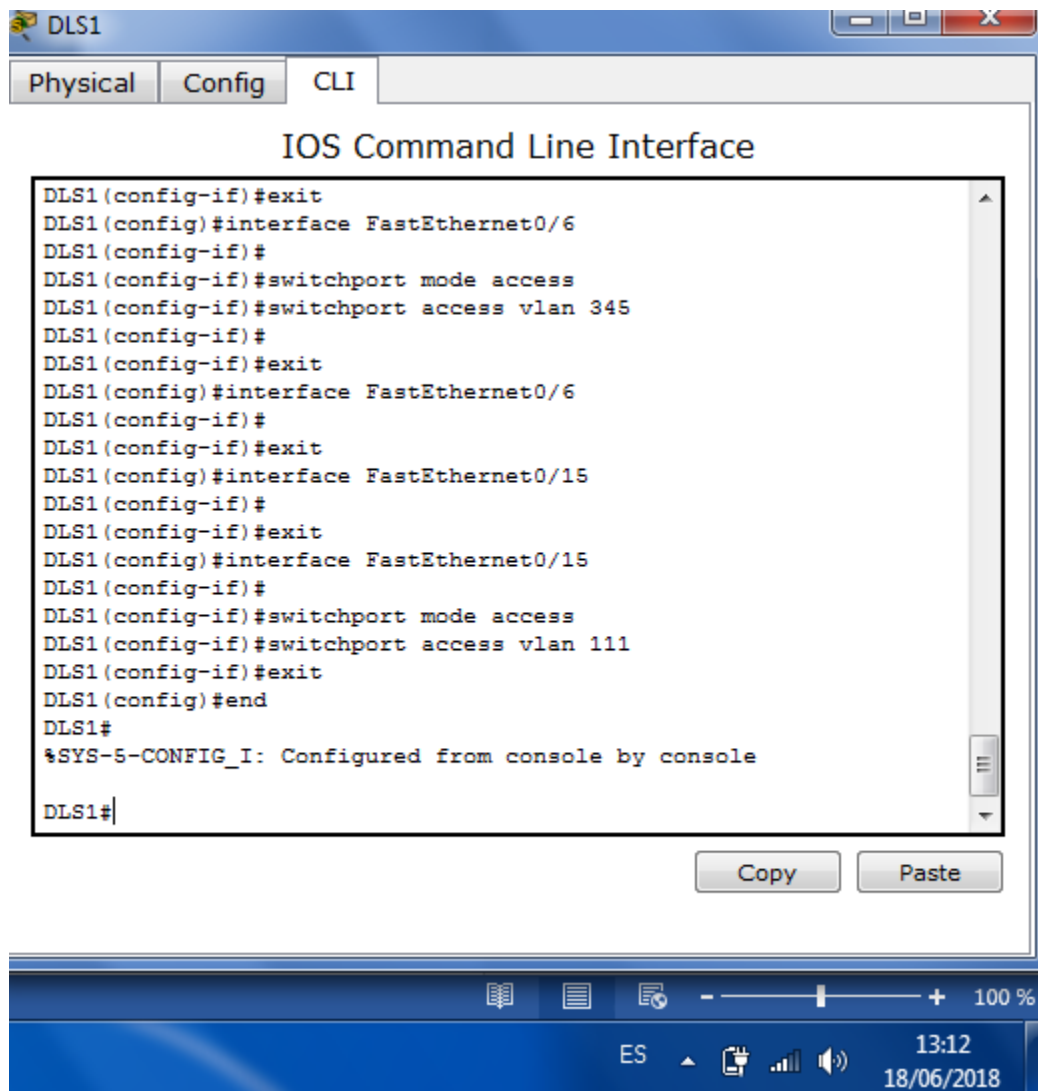
Copy Paste

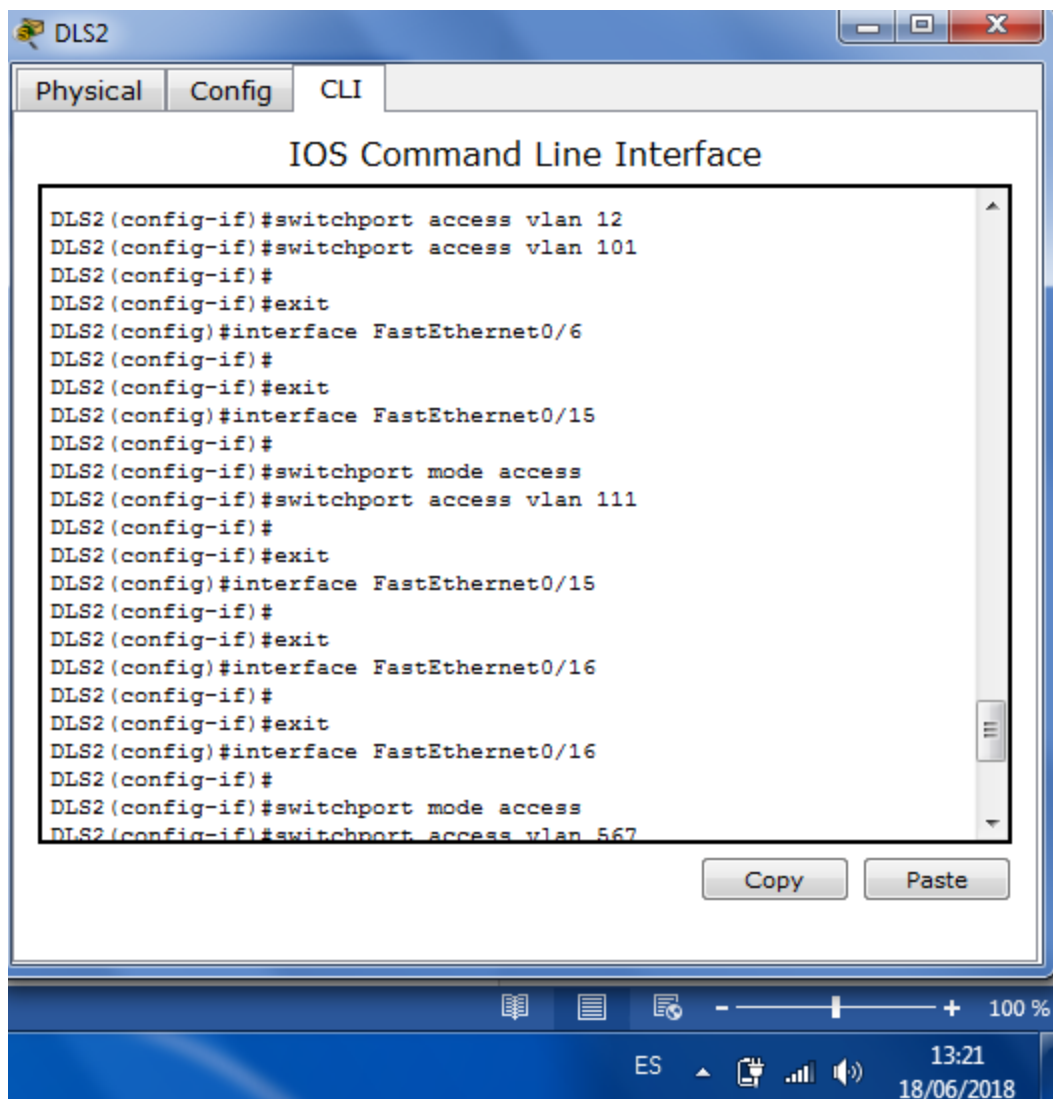
ES 9:46 18/06/2018



m. Configurar las siguientes interfaces como puertos de acceso, asignados a las VLAN de la siguiente manera:

Interfaz	DLS1	DLS2	ALS1	ALS2
Interfaz Fa0/6	3456	12, 1010	123, 1010	234
Interfaz Fa0/15	1111	1111	1111	1111
Interfaces F0 /16-18		567		





```
DLS2(config-if)#switchport access vlan 567
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface FastEthernet0/16
DLS2(config-if)#
DLS2(config-if)#exit
DLS2(config)#interface FastEthernet0/18
DLS2(config-if)#
DLS2(config-if)#switchport mode access
DLS2(config-if)#switchport access vlan 567
DLS2(config-if)#end
DLS2#
%SYS-5-CONFIG_I: Configured from console by console
DLS2#
```

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100 %

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18/06/2018

ALS1

Physical Config CLI

IOS Command Line Interface

```
ALS1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ALS1(config)#interface FastEthernet0/6
ALS1(config-if)#
ALS1(config-if)#exit
ALS1(config)#interface FastEthernet0/6
ALS1(config-if)#
ALS1(config-if)#switchport mode access
ALS1(config-if)#switchport access VLAN 123
ALS1(config-if)#switchport access VLAN 101
ALS1(config-if)#switchport access VLAN 123
ALS1(config-if)#
ALS1(config-if)#exit
ALS1(config)#interface FastEthernet0/6
ALS1(config-if)#
ALS1(config-if)#exit
ALS1(config)#interface FastEthernet0/15
ALS1(config-if)#switchport access VLAN 111
ALS1(config-if)#end
ALS1#
%SYS-5-CONFIG_I: Configured from console by console

ALS1#
```

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100 %

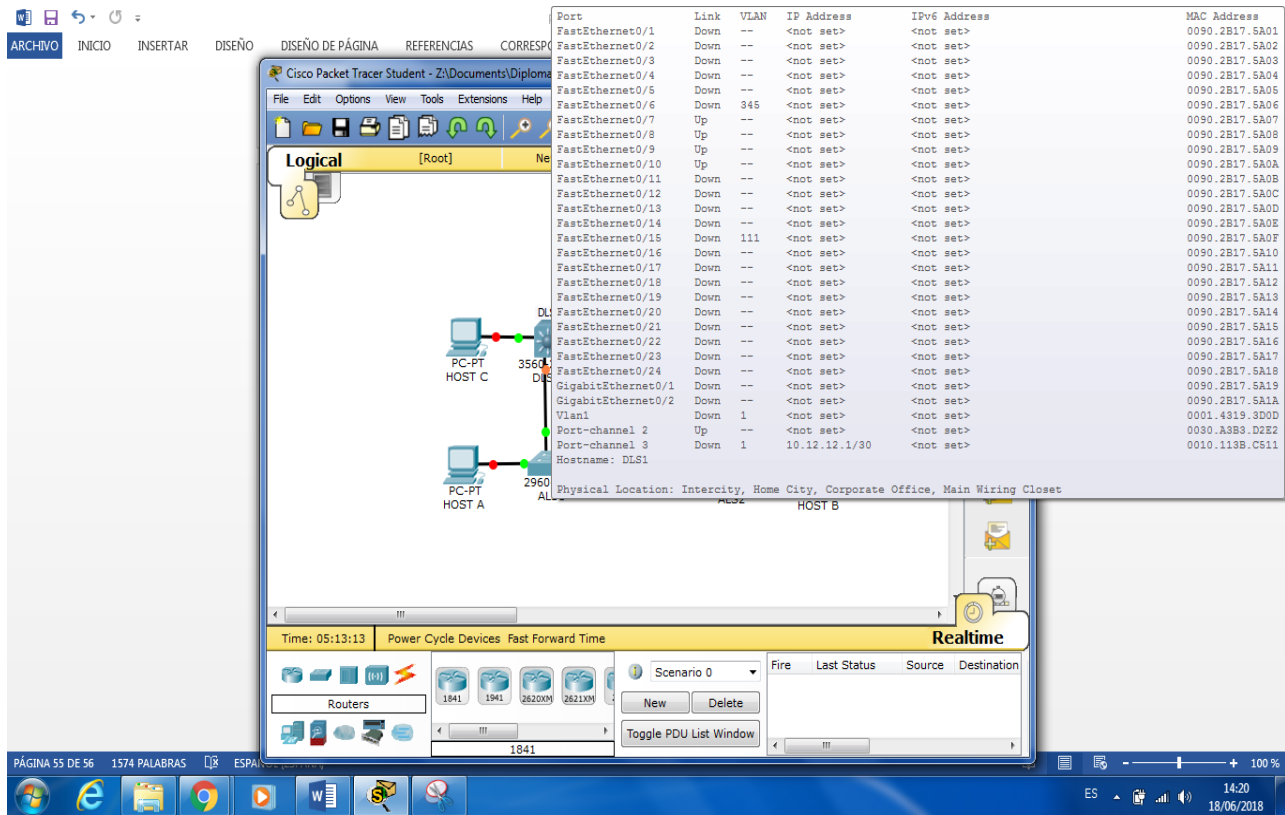
ES 13:39 18/06/2018

```
ALS2(config)#interface FastEthernet0/6
ALS2(config-if)#
ALS2(config-if)#switchport mode access
ALS2(config-if)#switchport access VLAN
ALS2(config-if)#switchport access VLAN 234
ALS2(config-if)#
ALS2(config-if)#exit
ALS2(config)#interface FastEthernet0/6
ALS2(config-if)#
ALS2(config-if)#exit
ALS2(config)#interface FastEthernet0/15
ALS2(config-if)#
ALS2(config-if)#switchport mode access
ALS2(config-if)#switchport access vlan 111
ALS2(config-if)#
```

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14:12 18/06/2018

n. Todas las interfaces que no sean utilizadas o asignadas a alguna VLAN deberán ser apagadas.



o. Configurar SVI en DLS1 y DLS2 como soporte de todas las VLAN y de enrutamiento entre las VLAN. Utilice la siguiente tabla para las asignaciones de subred:

VLAN	Nombre de VLAN	subred	VLAN	Nombre de VLAN	subred
12	EJECUTIVOS	10.0.12.0/24	123	MANTENIMIENTO	10.0.123.0/24
234	HUESPEDES	10.0.234.0/24	1010	VOZ	10.10.10.0/24
1111	VIDEONET	10.11.11.0/24	3456	ADMINISTRACIÓN	10.34.56.0/24

DLS1

Physical Config CLI

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface Vlan234, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan234, changed
state to up

DLS1(config-if)#no shutdown
DLS1(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/8 (800).

DLS1(config-if)#ip address 10.0.234.1 255.255.255.0
DLS1(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/8 (800).

DLS1(config-if)#exit
DLS1(config)#ip routing
DLS1(config)#interface vlan 111
DLS1(config-if)#
%LINK-5-CHANGED: Interface Vlan111, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan111, changed
state to up

DLS1(config-if)#no shutdown
DLS1(config-if)#ip address
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS1 FastEthernet0/8 (800).
DLS1(config-if)#ip address 10.11.11.1 255.255.255.0
DLS1(config-if)#exit
DLS1(config)#ip routing
DLS1(config)#
```

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ES 15:49 18/06/2018

The screenshot shows a network switch CLI window titled "DLS2" with tabs for "Physical", "Config", and "CLI". The main content area is titled "IOS Command Line Interface" and displays the following text:

```
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/8 (800).

DLS2(config)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/8 (800).

DLS2(config)#interface vlan 234
DLS2(config-if)#
%LINK-5-CHANGED: Interface Vlan234, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan234, changed state to up

DLS2(config-if)#no shutdown
DLS2(config-if)#ip address 10.0.234.1 255.255.255.0
DLS2(config-if)#exit
DLS2(config)#ip ro
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2 (1), with ALS2 FastEthernet0/8 (800).
DLS2(config)#ip routing
```

At the bottom right of the CLI window, there are "Copy" and "Paste" buttons. The Windows taskbar at the bottom shows the time as 16:01 on 18/06/2018.

- DLS1 siempre utilizará la dirección .252 y DLS2 siempre utilizará la dirección .253 para las direcciones IPv4.
 - La VLAN 567 en DLS2 no podrá ser soportada para enrutamiento.
- p. Configurar una interfaz Loopback 0 en DLS1 y DLS2. Esta interfaz será configurada con la dirección IP 1.1.1.1/32 en ambos Switch.

```
DLS2>en
Password:
Password:
DLS2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DLS2(config)#interface loopback 0

DLS2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed
state to up

DLS2(config-if)#ip address 1.
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
Port-channel 2 (1), with ALS2 FastEthernet0/8 (800).
DLS2(config-if)#ip address 1.1.1.1 255.255.255.255
DLS2(config-if)#exit
DLS2(config)#
```

- q. Configurar HSRP con interfaz tracking para las VLAN 12, 123, 234, 1010, y 1111
 - 1) Utilizar HSRP versión 2
 - 2) Crear dos grupos HSRP, alineando VLAN 12, 1010, 1111, y 3456 para el primer grupo y las VLAN 123 y 234 para el segundo grupo.
 - 3) DLS1 será el Switch principal de las VLAN 12, 1010, 1111, y 3456 y DLS2 será el Switch principal para las VLAN 123 y 234.
 - 4) Utilizar la dirección virtual .254 como la dirección de Standby de todas las VLAN
- r. Configurar DLS1 como un servidor DHCP para las VLAN 12, 123 y 234
 - 1) Excluir las direcciones desde .251 hasta .254 en cada subred
 - 2) Establecer el servidor DNS a 1.1.1.1 para los tres Pool.
 - 3) Establecer como default-router las direcciones virtuales HSRP para cada VLAN
- s. Obtener direcciones IPv4 en los host A, B, y D a través de la configuración por DHCP que fue realizada.

```
DLS1#
DLS1#
DLS1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)#interface GigabitEthernet0/1
DLS1(config-if)#no ip address
DLS1(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS1 FastEthernet0/8 (800).
DLS1(config-if)#standby 100 ipv6 autoconfig
% Group configured for different address family
DLS1(config-if)#standby 100 timers msec 50 msec 200
^
% Invalid input detected at '^' marker.

DLS1(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS1 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS1 FastEthernet0/8 (800)
```

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14:49

28/06/2018

The screenshot shows a network switch CLI interface with the following content:

```
Physical Config CLI
IOS Command Line Interface
(1), with ALS2 FastEthernet0/7 (800).
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).
DLS2(config-if)#standby 100 ipv6 autoconfig
% IPv6 is not enabled on GigabitEthernet0/1
DLS2(config-if)#standby 100 ipv6 autoconfig
% IPv6 is not enabled on GigabitEthernet0/1
DLS2(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).
DLS2(config-if)#standby 100
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).
DLS2(config-if)#standby 100 priority 110
DLS2(config-if)#standby 100 preempt
DLS2(config-if)#ipv6 address 2001:DB8:5::2
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).
DLS2(config-if)#ipv6 address 2001:DB8:5::2/64
DLS2(config-if)#
```

Buttons: Copy Paste

ES 15:02 28/06/2018

Part 2: conectividad de red de prueba y las opciones configuradas.

- a. Verificar la existencia de las VLAN correctas en todos los switches y la asignación de puertos troncales y de acceso

Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
FastEthernet0/1	Down	--	<not set>	<not set>	0090.2B17.5A01
FastEthernet0/2	Down	--	<not set>	<not set>	0090.2B17.5A02
FastEthernet0/3	Down	--	<not set>	<not set>	0090.2B17.5A03
FastEthernet0/4	Down	--	<not set>	<not set>	0090.2B17.5A04
FastEthernet0/5	Down	--	<not set>	<not set>	0090.2B17.5A05
FastEthernet0/6	Up	345	<not set>	<not set>	0090.2B17.5A06
FastEthernet0/7	Up	--	<not set>	<not set>	0090.2B17.5A07
FastEthernet0/8	Up	--	<not set>	<not set>	0090.2B17.5A08
FastEthernet0/9	Up	--	<not set>	<not set>	0090.2B17.5A09
FastEthernet0/10	Up	--	<not set>	<not set>	0090.2B17.5A0A
FastEthernet0/11	Down	--	<not set>	<not set>	0090.2B17.5A0B
FastEthernet0/12	Down	--	<not set>	<not set>	0090.2B17.5A0C
FastEthernet0/13	Down	--	<not set>	<not set>	0090.2B17.5A0D
FastEthernet0/14	Down	--	<not set>	<not set>	0090.2B17.5A0E
FastEthernet0/15	Down	111	<not set>	<not set>	0090.2B17.5A0F
FastEthernet0/16	Down	--	<not set>	<not set>	0090.2B17.5A10
FastEthernet0/17	Down	--	<not set>	<not set>	0090.2B17.5A11
FastEthernet0/18	Down	--	<not set>	<not set>	0090.2B17.5A12
FastEthernet0/19	Down	--	<not set>	<not set>	0090.2B17.5A13
FastEthernet0/20	Down	--	<not set>	<not set>	0090.2B17.5A14
FastEthernet0/21	Down	--	<not set>	<not set>	0090.2B17.5A15
FastEthernet0/22	Down	--	<not set>	<not set>	0090.2B17.5A16
FastEthernet0/23	Down	--	<not set>	<not set>	0090.2B17.5A17
FastEthernet0/24	Down	--	<not set>	<not set>	0090.2B17.5A18
GigabitEthernet0/1	Down	--	<not set>	2001:DB8:5::1/64	0090.2B17.5A19
GigabitEthernet0/2	Down	--	<not set>	<not set>	0090.2B17.5A1A
Loopback0	Up	--	1.1.1.1/32	<not set>	00D0.FFA4.D541
Vlan1	Down	1	<not set>	<not set>	0001.4319.3D0D
Vlan12	Up	12	10.0.12.1/24	<not set>	0001.4319.3D0D
Vlan111	Up	111	10.11.11.1/24	<not set>	0001.4319.3D0D
Vlan234	Up	234	10.0.234.1/24	<not set>	0001.4319.3D0D
Port-channel 2	Up	--	<not set>	<not set>	0005.5E5A.3B3E
Port-channel 3	Down	1	10.12.12.1/30	<not set>	0003.244A.9226

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet

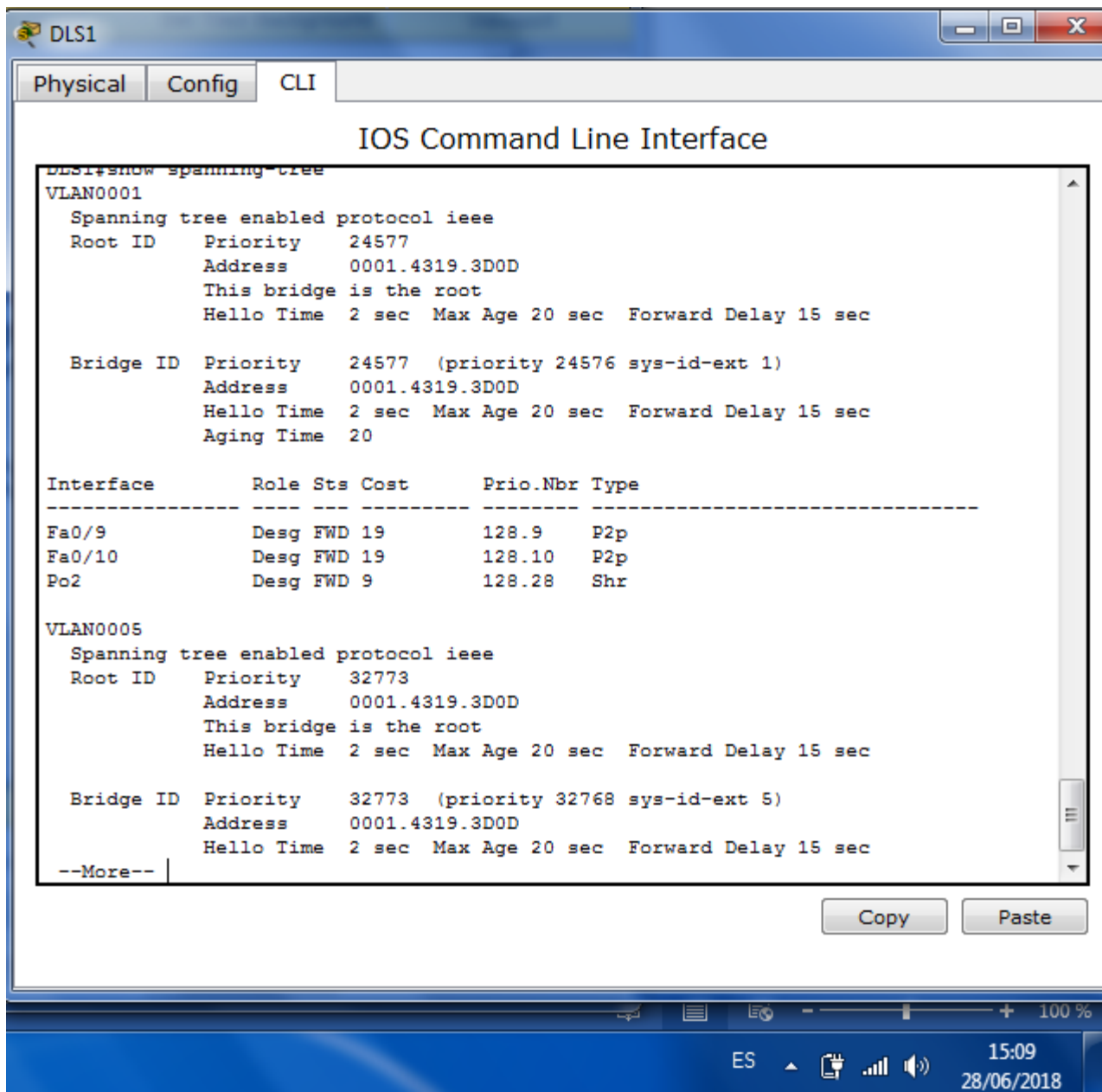
Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
FastEthernet0/1	Down	--	<not set>	<not set>	0050.0F95.8401
FastEthernet0/2	Down	--	<not set>	<not set>	0050.0F95.8402
FastEthernet0/3	Down	--	<not set>	<not set>	0050.0F95.8403
FastEthernet0/4	Down	--	<not set>	<not set>	0050.0F95.8404
FastEthernet0/5	Down	--	<not set>	<not set>	0050.0F95.8405
FastEthernet0/6	Up	101	<not set>	<not set>	0050.0F95.8406
FastEthernet0/7	Up	--	<not set>	<not set>	0050.0F95.8407
FastEthernet0/8	Up	--	<not set>	<not set>	0050.0F95.8408
FastEthernet0/9	Down	--	<not set>	<not set>	0050.0F95.8409
FastEthernet0/10	Down	--	<not set>	<not set>	0050.0F95.840A
FastEthernet0/11	Down	--	<not set>	<not set>	0050.0F95.840B
FastEthernet0/12	Down	--	<not set>	<not set>	0050.0F95.840C
FastEthernet0/13	Down	--	<not set>	<not set>	0050.0F95.840D
FastEthernet0/14	Down	--	<not set>	<not set>	0050.0F95.840E
FastEthernet0/15	Down	111	<not set>	<not set>	0050.0F95.840F
FastEthernet0/16	Down	567	<not set>	<not set>	0050.0F95.8410
FastEthernet0/17	Down	--	<not set>	<not set>	0050.0F95.8411
FastEthernet0/18	Down	567	<not set>	<not set>	0050.0F95.8412
FastEthernet0/19	Down	--	<not set>	<not set>	0050.0F95.8413
FastEthernet0/20	Down	--	<not set>	<not set>	0050.0F95.8414
FastEthernet0/21	Down	--	<not set>	<not set>	0050.0F95.8415
FastEthernet0/22	Down	--	<not set>	<not set>	0050.0F95.8416
FastEthernet0/23	Down	--	<not set>	<not set>	0050.0F95.8417
FastEthernet0/24	Down	--	<not set>	<not set>	0050.0F95.8418
GigabitEthernet0/1	Down	--	<not set>	2001:DB8:5::2/64	0050.0F95.8419
GigabitEthernet0/2	Down	--	<not set>	<not set>	0050.0F95.841A
Loopback0	Up	--	1.1.1.1/32	<not set>	0060.5C26.8746
Vlan1	Down	1	<not set>	<not set>	0000.0C99.680D
Vlan12	Up	12	10.0.12.1/24	<not set>	0000.0C99.680D
Vlan111	Up	111	10.11.11.1/24	<not set>	0000.0C99.680D
Vlan234	Up	234	10.0.234.1/24	<not set>	0000.0C99.680D
Port-channel 2	Up	--	<not set>	<not set>	0002.16D5.B52A
Port-channel 3	Down	1	10.12.12.2/30	<not set>	00E0.F9E9.17C9

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet

b. Verificar que el EtherChannel entre DLS1 y ALS1 está configurado correctamente

Port	Link	VLAN	IP Address	MAC Address
FastEthernet0/1	Down	--	--	0060.5C69.4E01
FastEthernet0/2	Down	--	--	0060.5C69.4E02
FastEthernet0/3	Down	--	--	0060.5C69.4E03
FastEthernet0/4	Down	--	--	0060.5C69.4E04
FastEthernet0/5	Down	--	--	0060.5C69.4E05
FastEthernet0/6	Down	123	--	0060.5C69.4E06
FastEthernet0/7	Up	--	--	0060.5C69.4E07
FastEthernet0/8	Up	--	--	0060.5C69.4E08
FastEthernet0/9	Up	--	--	0060.5C69.4E09
FastEthernet0/10	Down	--	--	0060.5C69.4E0A
FastEthernet0/11	Down	--	--	0060.5C69.4E0B
FastEthernet0/12	Down	--	--	0060.5C69.4E0C
FastEthernet0/13	Down	--	--	0060.5C69.4E0D
FastEthernet0/14	Down	--	--	0060.5C69.4E0E
FastEthernet0/15	Down	--	--	0060.5C69.4E0F
FastEthernet0/16	Down	--	--	0060.5C69.4E10
FastEthernet0/17	Down	--	--	0060.5C69.4E11
FastEthernet0/18	Down	--	--	0060.5C69.4E12
FastEthernet0/19	Down	--	--	0060.5C69.4E13
FastEthernet0/20	Down	--	--	0060.5C69.4E14
FastEthernet0/21	Down	--	--	0060.5C69.4E15
FastEthernet0/22	Down	--	--	0060.5C69.4E16
FastEthernet0/23	Down	--	--	0060.5C69.4E17
FastEthernet0/24	Down	--	--	0060.5C69.4E18
GigabitEthernet0/1	Down	--	--	0060.5C69.4E19
GigabitEthernet0/2	Down	1	--	0060.5C69.4E1A
Vlan1	Down	1	<not set>	00D0.580E.84C6
Port-channel 2	Up	--	<not set>	0011.C833.D964
Port-channel 3	Down	1	<not set>	00E0.F922.C761

c. Verificar la configuración de Spanning tree entre DLS1 o DLS2 para cada VLAN.



d. Verificar configuraciones HSRP mediante comandos Show

```
DLS2>en
Password:
DLS2#show standby
DLS2#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/7 (800).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Port-channel 2
(1), with ALS2 FastEthernet0/8 (800).

DLS2#
```

Copy

Paste

ES



16:23
28/06/2018

Conclusiones

- El desarrollo del trabajo requirió una investigación extensa y un esfuerzo mayor, debido a que aquí se acentúan todas las temáticas que se vieron durante el curso.
- Cisco Packet tracer es una herramienta de simulación muy completa, ya que permite llevar a cabo el desarrollo de cualquier sistema de red.
- En este nivel de programación de redes, ha requerido un excelente manejo del inglés como idioma para el desarrollo del estudio y el trabajo.

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