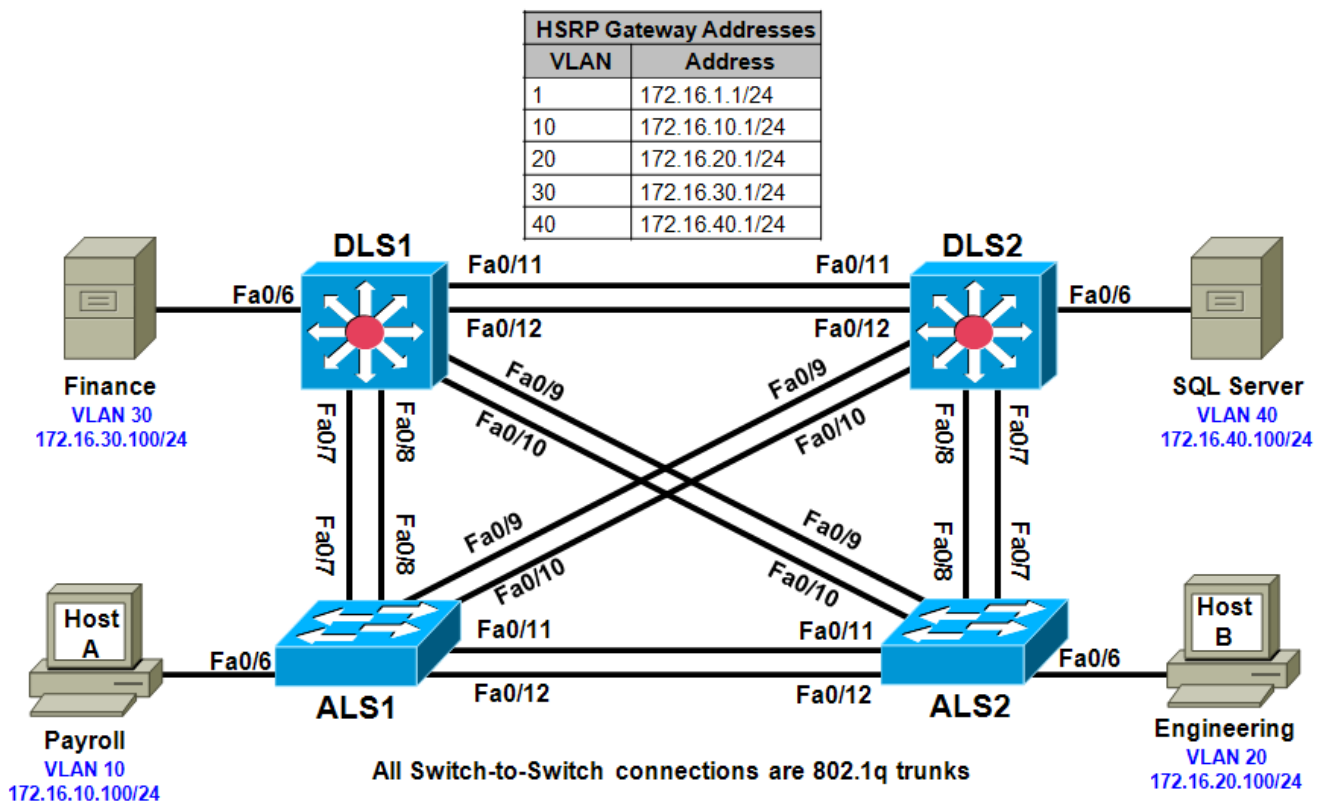


Chapter 5 Lab 5-1, Hot Standby Router Protocol

Topology



Objective

- Configure inter-VLAN routing with HSRP to provide redundant, fault-tolerant routing to the internal network.

Background

Hot Standby Router Protocol (HSRP) is a Cisco-proprietary redundancy protocol for establishing a fault-tolerant default gateway. It is described in RFC 2281. HSRP provides a transparent failover mechanism to the end stations on the network. This provides users at the access layer with uninterrupted service to the network if the primary gateway becomes inaccessible. The Virtual Router Redundancy Protocol (VRRP) is a standards-based alternative to HSRP and is defined in RFC 3768. The two technologies are similar but not compatible. This lab focuses on HSRP.

Note: This lab uses Cisco WS-C2960-24TT-L switches with the Cisco IOS image c2960-lanbasek9-mz.122-46.SE.bin, and Catalyst 3560-24PS with the Cisco IOS image c3560-advipservicesk9-mz.122-46.SE.bin. You can use other switches (such as 2950 or 3550) and Cisco IOS Software versions if they have comparable capabilities and features. Depending on the switch model and Cisco IOS Software version, the commands available and output produced might vary from what is shown in this lab.

Required Resources

- 2 switches (Cisco 2960 with the Cisco IOS Release 12.2(46)SE C2960-LANBASEK9-M image or comparable)
- 2 switches (Cisco 3560 with the Cisco IOS Release 12.2(46)SE C3560-ADVIPSERVICESK9-mz image or comparable)
- Ethernet and console cables

Step 1: Prepare the switches for the lab.

Erase the startup config, delete the vlan.dat file, and reload the switches. Refer to Lab 1-1, "Clearing a Switch" and Lab 1-2, "Clearing a Switch Connected to a Larger Network" to prepare the switches for this lab. Cable the equipment as shown.

Step 2: Configure the host IP settings.

Configure each host with the IP address, subnet mask, and default gateway shown in the topology.

Step 3: Configure basic switch parameters.

- a. Configure management IP addresses in VLAN 1, and the hostname, password, and Telnet access on all four switches.

```
Switch(config)# hostname ALS1
ALS1(config)# enable secret cisco
ALS1(config)# line vty 0 15
ALS1(config-line)# password cisco
ALS1(config-line)# login
ALS1(config-line)# exit
ALS1(config)# interface vlan 1
ALS1(config-if)# ip address 172.16.1.101 255.255.255.0
ALS1(config-if)# no shutdown
```

```
Switch(config)# hostname ALS2
ALS2(config)# enable secret cisco
ALS2(config)# line vty 0 15
ALS2(config-line)# password cisco
ALS2(config-line)# login
ALS2(config-line)# exit
ALS2(config)# interface vlan 1
ALS2(config-if)# ip address 172.16.1.102 255.255.255.0
ALS2(config-if)# no shutdown
```

```
Switch(config)# hostname DLS1
DLS1(config)# enable secret cisco
DLS1(config)# line vty 0 15
DLS1(config-line)# password cisco
DLS1(config-line)# login
DLS1(config-line)# exit
DLS1(config)# interface vlan 1
DLS1(config-if)# ip address 172.16.1.3 255.255.255.0
DLS1(config-if)# no shutdown
```

```
Switch(config)# hostname DLS2
DLS2(config)# enable secret cisco
DLS2(config)# line vty 0 15
DLS2(config-line)# password cisco
```

```
DLS2(config-line)# login
DLS2(config-line)# exit
DLS2(config)# interface vlan 1
DLS2(config-if)# ip address 172.16.1.4 255.255.255.0
DLS2(config-if)# no shutdown
```

- b. Configure default gateways on the access layer switches ALS1 and ALS2. The distribution layer switches will not use a default gateway because they act as Layer 3 devices. The access layer switches act as Layer 2 devices and need a default gateway to send management VLAN traffic off of the local subnet for the management VLAN.

```
ALS1(config)# ip default-gateway 172.16.1.1
```

```
ALS2(config)# ip default-gateway 172.16.1.1
```

Step 4: Configure trunks and EtherChannels between switches.

EtherChannel is used for the trunks because it allows you to utilize both Fast Ethernet interfaces that are available between each device, thereby doubling the bandwidth.

Note: It is good practice to shut down the interfaces on both sides of the link before a port channel is created and then reenabling them after the port channel is configured.

- a. Configure trunks and EtherChannels from DLS1 and DLS2 to the other three switches according to the diagram. The **switchport trunk encapsulation {isl | dot1q}** command is used because these switches also support ISL encapsulation.

```
DLS1(config)# interface range fastEthernet 0/7 - 8
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
DLS1(config-if-range)# channel-group 1 mode desirable
```

Creating a port-channel interface Port-channel 1

```
DLS1(config-if-range)# interface range fastEthernet 0/9 - 10
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
DLS1(config-if-range)# channel-group 2 mode desirable
```

Creating a port-channel interface Port-channel 2

```
DLS1(config-if-range)# interface range fastEthernet 0/11 - 12
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
DLS1(config-if-range)# channel-group 3 mode desirable
```

Creating a port-channel interface Port-channel 3

```
DLS2(config)# interface range fastEthernet 0/7 - 8
DLS2(config-if-range)# switchport trunk encapsulation dot1q
DLS2(config-if-range)# switchport mode trunk
DLS2(config-if-range)# channel-group 1 mode desirable
```

Creating a port-channel interface Port-channel 1

```
DLS2(config-if-range)# interface range fastEthernet 0/9 - 10
DLS2(config-if-range)# switchport trunk encapsulation dot1q
DLS2(config-if-range)# switchport mode trunk
DLS2(config-if-range)# channel-group 2 mode desirable
```

Creating a port-channel interface Port-channel 2

```
DLS2(config-if-range)# interface range fastEthernet 0/11 - 12
DLS2(config-if-range)# switchport trunk encapsulation dot1q
DLS2(config-if-range)# switchport mode trunk
DLS2(config-if-range)# channel-group 3 mode desirable
```

Creating a port-channel interface Port-channel 3

- b. Configure the trunks and EtherChannel from ALS1 and ALS2 to the other switches. Notice that no encapsulation type is needed because the 2960 supports only 802.1q trunks.

```
ALS1(config)# interface range fastEthernet 0/7 - 8
ALS1(config-if-range)# switchport mode trunk
ALS1(config-if-range)# channel-group 1 mode desirable
```

Creating a port-channel interface Port-channel 1

```
ALS1(config-if-range)# interface range fastEthernet 0/9 - 10
ALS1(config-if-range)# switchport mode trunk
ALS1(config-if-range)# channel-group 2 mode desirable
```

Creating a port-channel interface Port-channel 2

```
ALS1(config-if-range)# interface range fastEthernet 0/11 - 12
ALS1(config-if-range)# switchport mode trunk
ALS1(config-if-range)# channel-group 3 mode desirable
```

Creating a port-channel interface Port-channel 3

```
ALS2(config)# interface range fastEthernet 0/7 - 8
ALS2(config-if-range)# switchport mode trunk
ALS2(config-if-range)# channel-group 1 mode desirable
```

Creating a port-channel interface Port-channel 1

```
ALS2(config-if-range)# interface range fastEthernet 0/9 - 10
ALS2(config-if-range)# switchport mode trunk
ALS2(config-if-range)# channel-group 2 mode desirable
```

Creating a port-channel interface Port-channel 2

```
ALS2(config-if-range)# interface range fastEthernet 0/11 - 12
ALS2(config-if-range)# switchport mode trunk
ALS2(config-if-range)# channel-group 3 mode desirable
```

Creating a port-channel interface Port-channel 3

- c. Verify trunking between DLS1, ALS1, and ALS2 using the **show interface trunk** command on all switches.

```
DLS1# show interface trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	1
Po2	on	802.1q	trunking	1
Po3	on	802.1q	trunking	1

```
Port      Vlans allowed on trunk
Po1       1-4094
Po2       1-4094
Po3       1-4094
```

```
Port      Vlans allowed and active in management domain
Po1       1
Po2       1
Po3       1
```

```
Port      Vlans in spanning tree forwarding state and not pruned
Po1       1
Po2       1
Po3       1
```

- d. Issue the **show etherchannel summary** command on each switch to verify the EtherChannels. In the following sample output from ALS1, notice the three EtherChannels on the access and distribution layer switches.

```
ALS1# show etherchannel summary
```

```
Flags:  D - down          P - in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port
```

```
Number of channel-groups in use: 3
Number of aggregators:          3
```

Group	Port-channel	Protocol	Ports
-------	--------------	----------	-------

1	Po1(SU)	PAgP	Fa0/7(P) Fa0/8(P)
2	Po2(SU)	PAgP	Fa0/9(P) Fa0/10(P)
3	Po3(SU)	PAgP	Fa0/11(P) Fa0/12(P)

Which EtherChannel negotiation protocol is in use here?

PAgP (Port Aggregation Protocol)

Step 5: Configure VTP on ALS1 and ALS2.

- a. Change the VTP mode of ALS1 and ALS2 to client.

```
ALS1(config)# vtp mode client
Setting device to VTP CLIENT mode.
```

```
ALS2(config)# vtp mode client
Setting device to VTP CLIENT mode.
```

- b. Verify the VTP changes with the **show vtp status** command.

```
ALS1# show vtp status
VTP Version                : running VTP1 (VTP2 capable)
Configuration Revision      : 0
Maximum VLANs supported locally : 255
Number of existing VLANs    : 5
```

```
VTP Operating Mode           : Client
VTP Domain Name             :
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0xC8 0xAB 0x3C 0x3B 0xAB 0xDD 0x34 0xCF
Configuration last modified by 0.0.0.0 at 3-1-93 15:47:34
```

How many VLANs can be supported locally on the 2960 switch?

con el comando `show vtp status`, se indica que el "Maximum VLANs supported locally" es de 255

Step 6: Configure VTP on DLS1.

- a. Create the VTP domain on VTP server DLS1 and create VLANs 10, 20, 30, and 40 for the domain.

```
DLS1(config)# vtp domain SWPOD
DLS1(config)# vtp version 2

DLS1(config)# vlan 10
DLS1(config-vlan)# name Finance
DLS1(config-vlan)# vlan 20
DLS1(config-vlan)# name Engineering
DLS1(config-vlan)# vlan 30
DLS1(config-vlan)# name Server-Farm1
DLS1(config-vlan)# vlan 40
DLS1(config-vlan)# name Server-Farm2
```

- b. Verify VTP information throughout the domain using the `show vlan` and `show vtp status` commands.

How many existing VLANs are in the VTP domain?

hay un total de 9 vlans existentes

Step 7: Configure access ports.

- a. Configure the host ports of all four switches. The following commands configure the switch port mode as access, place the port in the proper VLANs, and turn on spanning-tree PortFast for the ports.

```
DLS1(config)# interface fastEthernet 0/6
DLS1(config-if)# switchport mode access
DLS1(config-if)# switchport access vlan 30
DLS1(config-if)# spanning-tree portfast

DLS2(config)# interface fastEthernet 0/6
DLS2(config-if)# switchport mode access
DLS2(config-if)# switchport access vlan 40
DLS2(config-if)# spanning-tree portfast

ALS1(config)# interface fastEthernet 0/6
ALS1(config-if)# switchport mode access
ALS1(config-if)# switchport access vlan 10
ALS1(config-if)# spanning-tree portfast

ALS2(config)# interface fastEthernet 0/6
ALS2(config-if)# switchport mode access
ALS2(config-if)# switchport access vlan 20
ALS2(config-if)# spanning-tree portfast
```

- b. Ping from the host on VLAN 10 to the host on VLAN 40. The ping should fail.

Are these results expected at this point? Why?

Sí, los resultados son esperados en este punto. El ping debería fallar entre un host en VLAN 10 y otro en VLAN 40 debido a que estas VLANs son redes separadas y segregadas entre sí. A menos que se configure un dispositivo de capa 3 (como un router o un switch multicapa)

Note: The **switchport host** command can be used to configure individual access ports. This command automatically activates access mode, PortFast, and removes all associations of the physical switch port with the port-channel interfaces (if there are any).

Step 8: Configure HSRP interfaces and enable routing.

HSRP provides redundancy in the network. The VLANs can be load-balanced by using the **standby group priority priority** command. The **ip routing** command is used on DLS1 and DLS2 to activate routing capabilities on these Layer 3 switches.

Each route processor can route between the various SVIs configured on its switch. In addition to the real IP address assigned to each distribution switch SVI, assign a third IP address in each subnet to be used as a virtual gateway address. HSRP negotiates and determines which switch accepts information forwarded to the virtual gateway IP address.

The **standby** command configures the IP address of the virtual gateway, sets the priority for each VLAN, and configures the router for preempt. Preemption allows the router with the higher priority to become the active router after a network failure has been resolved.

In the following configurations, the priority for VLANs 1, 10, and 20 is 150 on DLS1, making it the active router for those VLANs. VLANs 30 and 40 have a priority of 100 on DLS1, making DLS1 the standby router for these VLANs. DLS2 is configured to be the active router for VLANs 30 and 40 with a priority of 150, and the standby router for VLANs 1, 10, and 20 with a priority of 100.

```
DLS1(config)# ip routing

DLS1(config)# interface vlan 1
DLS1(config-if)# standby 1 ip 172.16.1.1
DLS1(config-if)# standby 1 preempt
DLS1(config-if)# standby 1 priority 150
DLS1(config-if)# exit

DLS1(config)# interface vlan 10
DLS1(config-if)# ip address 172.16.10.3 255.255.255.0
DLS1(config-if)# standby 1 ip 172.16.10.1
DLS1(config-if)# standby 1 preempt
DLS1(config-if)# standby 1 priority 150
DLS1(config-if)# exit

DLS1(config)# interface vlan 20
DLS1(config-if)# ip address 172.16.20.3 255.255.255.0
DLS1(config-if)# standby 1 ip 172.16.20.1
DLS1(config-if)# standby 1 preempt
DLS1(config-if)# standby 1 priority 150
DLS1(config-if)# exit

DLS1(config)# interface vlan 30
DLS1(config-if)# ip address 172.16.30.3 255.255.255.0
DLS1(config-if)# standby 1 ip 172.16.30.1
```

```
DLS1(config-if)# standby 1 preempt
DLS1(config-if)# standby 1 priority 100
DLS1(config-if)# exit

DLS1(config)# interface vlan 40
DLS1(config-if)# ip address 172.16.40.3 255.255.255.0
DLS1(config-if)# standby 1 ip 172.16.40.1
DLS1(config-if)# standby 1 preempt
DLS1(config-if)# standby 1 priority 100

DLS2(config)# ip routing

DLS2(config)# interface vlan 1
DLS2(config-if)# standby 1 ip 172.16.1.1
DLS2(config-if)# standby 1 preempt
DLS2(config-if)# standby 1 priority 100
DLS2(config-if)# exit

DLS2(config)# interface vlan 10
DLS2(config-if)# ip address 172.16.10.4 255.255.255.0
DLS2(config-if)# standby 1 ip 172.16.10.1
DLS2(config-if)# standby 1 preempt
DLS2(config-if)# standby 1 priority 100
DLS2(config-if)# exit

DLS2(config)# interface vlan 20
DLS2(config-if)# ip address 172.16.20.4 255.255.255.0
DLS2(config-if)# standby 1 ip 172.16.20.1
DLS2(config-if)# standby 1 preempt
DLS2(config-if)# standby 1 priority 100
DLS2(config-if)# exit

DLS2(config)# interface vlan 30
DLS2(config-if)# ip address 172.16.30.4 255.255.255.0
DLS2(config-if)# standby 1 ip 172.16.30.1
DLS2(config-if)# standby 1 preempt
DLS2(config-if)# standby 1 priority 150
DLS2(config-if)# exit

DLS2(config)# interface vlan 40
DLS2(config-if)# ip address 172.16.40.4 255.255.255.0
DLS2(config-if)# standby 1 ip 172.16.40.1
DLS2(config-if)# standby 1 preempt
DLS2(config-if)# standby 1 priority 150
```

Step 9: Verify the HSRP configuration.

- a. Issue the **show standby** command on both DLS1 and DLS2.

```
DLS1# show standby
Vlan1 - Group 1
  State is Active
    5 state changes, last state change 00:02:48
  Virtual IP address is 172.16.1.1
  Active virtual MAC address is 0000.0c07.ac01
  Local virtual MAC address is 0000.0c07.ac01 (v1 default)
  Hello time 3 sec, hold time 10 sec
```



```
Next hello sent in 2.228 secs
Preemption enabled
Active router is local
Standby router is 172.16.1.4, priority 100 (expires in 7.207 sec)
Priority 150 (configured 150)
IP redundancy name is "hsrp-Vl1-1" (default)
Vlan10 - Group 1
State is Active
5 state changes, last state change 00:02:50
Virtual IP address is 172.16.10.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.113 secs
Preemption enabled
Active router is local
Standby router is 172.16.10.4, priority 100 (expires in 9.807 sec)
Priority 150 (configured 150)
IP redundancy name is "hsrp-Vl10-1" (default)
Vlan20 - Group 1
State is Active
5 state changes, last state change 00:02:55
Virtual IP address is 172.16.20.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.884 secs
Preemption enabled
Active router is local
Standby router is 172.16.20.4, priority 100 (expires in 9.220 sec)
Priority 150 (configured 150)
IP redundancy name is "hsrp-Vl20-1" (default)
Vlan30 - Group 1
State is Standby
4 state changes, last state change 00:02:45
Virtual IP address is 172.16.30.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.413 secs
Preemption enabled
Active router is 172.16.30.4, priority 150 (expires in 8.415 sec)
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Vl30-1" (default)
Vlan40 - Group 1
State is Standby
4 state changes, last state change 00:02:51
Virtual IP address is 172.16.40.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.826 secs
Preemption enabled
Active router is 172.16.40.4, priority 150 (expires in 7.828 sec)
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Vl40-1" (default)
```

DLS2# **show standby**

Vlan1 - Group 1

State is Standby

3 state changes, last state change 00:02:33
Virtual IP address is 172.16.1.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.950 secs
Preemption enabled
Active router is 172.16.1.3, priority 150 (expires in 8.960 sec)
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Vl1-1" (default)

Vlan10 - Group 1

State is Standby

3 state changes, last state change 00:02:34
Virtual IP address is 172.16.10.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.759 secs
Preemption enabled
Active router is 172.16.10.3, priority 150 (expires in 7.844 sec)
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Vl10-1" (default)

Vlan20 - Group 1

State is Standby

3 state changes, last state change 00:02:42
Virtual IP address is 172.16.20.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.790 secs
Preemption enabled
Active router is 172.16.20.3, priority 150 (expires in 8.289 sec)
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Vl20-1" (default)

Vlan30 - Group 1

State is Active

2 state changes, last state change 00:02:52
Virtual IP address is 172.16.30.1
Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.549 secs
Preemption enabled
Active router is local
Standby router is 172.16.30.3, priority 100 (expires in 9.538 sec)
Priority 150 (configured 150)
IP redundancy name is "hsrp-Vl30-1" (default)

Vlan40 - Group 1

State is Active

2 state changes, last state change 00:02:58
Virtual IP address is 172.16.40.1

```

Active virtual MAC address is 0000.0c07.ac01
Local virtual MAC address is 0000.0c07.ac01 (v1 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 0.962 secs
Preemption enabled
Active router is local
Standby router is 172.16.40.3, priority 100 (expires in 8.960 sec)
Priority 150 (configured 150)
IP redundancy name is "hsrp-Vl40-1" (default)

```

- b. Issue the **show standby brief** command on both DLS1 and DLS2.

```

DLS1# show standby brief
                P indicates configured to preempt.
                |
Interface  Grp  Pri P State  Active          Standby          Virtual IP
Vl1        1    150 P Active local         172.16.1.4       172.16.1.1
Vl10       1    150 P Active local         172.16.10.4      172.16.10.1
Vl20       1    150 P Active local         172.16.20.4      172.16.20.1
Vl30       1    100 P Standby 172.16.30.4     local            172.16.30.1
Vl40       1    100 P Standby 172.16.40.4     local            172.16.40.1

```

```

DLS2# show standby brief
                P indicates configured to preempt.
                |
Interface  Grp  Pri P State  Active          Standby          Virtual IP
Vl1        1    100 P Standby 172.16.1.3      local            172.16.1.1
Vl10       1    100 P Standby 172.16.10.3     local            172.16.10.1
Vl20       1    100 P Standby 172.16.20.3     local            172.16.20.1
Vl30       1    150 P Active local           172.16.30.3     172.16.30.1
Vl40       1    150 P Active local           172.16.40.3     172.16.40.1

```

Which router is the active router for VLANs 1, 10, and 20? Which is the active router for 30 and 40?

VLANs 1, 10 y 20: El router activo es DLS1 , VLANs 30 y 40: El router activo es DLS2.

What is the default hello time for each VLAN? What is the default hold time?

Hello time 3 sec, hold time 10 sec

How is the active HSRP router selected?

El router HSRP activo se selecciona basado en la prioridad configurada; el router con la mayor prioridad se convierte en el activo. Si las prioridades son iguales, el router con la dirección IP más alta asume el rol activo. La prelación, si está habilitada, permite que un router de mayor prioridad tome el control incluso después del proceso inicial.

- c. Use the **show ip route** command to verify routing on both DLS1 and DLS2.

```

DLS1# show ip route
Codes: 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, 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

```

Gateway of last resort is not set

```

172.16.0.0/24 is subnetted, 5 subnets
C      172.16.40.0 is directly connected, Vlan40

```

```
C      172.16.30.0 is directly connected, Vlan30
C      172.16.20.0 is directly connected, Vlan20
C      172.16.10.0 is directly connected, Vlan10
C      172.16.1.0 is directly connected, Vlan1
```

Step 10: Verify connectivity between VLANs.

Verify connectivity between VLANs using the **ping** command from the SQL Server (VLAN 40) to the other hosts and servers on the network.

The following is from the SQL Server (VLAN 40) to the Engineering host (VLAN 20):

```
C:\> ping 172.16.20.100

Pinging 172.16.20.100 with 32 bytes of data:

Reply from 172.16.20.100: bytes=32 time=2ms TTL=255
Reply from 172.16.20.100: bytes=32 time=2ms TTL=255
Reply from 172.16.20.100: bytes=32 time=2ms TTL=255
Reply from 172.16.20.100: bytes=32 time=2ms TTL=255

Ping statistics for 172.16.20.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

Step 11: Verify HSRP functionally.

- a. Verify HSRP by disconnecting the trunks to DLS2. You can simulate this using the **shutdown** command on those interfaces.

```
DLS2(config)# interface range fastEthernet 0/7 - 12
DLS2(config-if-range)# shutdown
```

Output to the console should reflect DLS1 becoming the active router for VLANs 30 and 40.

```
1w3d: %HSRP-6-STATECHANGE: Vlan30 Grp 1 state Standby -> Active
1w3d: %HSRP-6-STATECHANGE: Vlan40 Grp 1 state Standby -> Active
```

- b. Verify that DLS1 is acting as the backup default gateway for VLANs 30 and 40 using the **show standby brief** command. DLS1 is now the active HSRP router for all VLANs and the standby router is unknown.

```
DLS1# show standby brief
                P indicates configured to preempt.
                |
Interface      Grp   Pri P State   Active        Standby        Virtual IP
Vl1            1    150 P Active  local         unknown        172.16.1.1
Vl10           1    150 P Active  local         unknown        172.16.10.1
Vl20           1    150 P Active  local         unknown        172.16.20.1
Vl30           1    100 P Active  local         unknown        172.16.30.1
Vl40           1    100 P Active  local         unknown        172.16.40.1
```

- c. Repeat this process by bringing up the DLS2 trunks and shutting down the DLS1 interfaces. Use the **show standby brief** command to see the results.

Note: If both DLS1 and DLS2 have links to the Internet, failure of either switch will cause HSRP to redirect packets to the other switch. The functioning switch will take over as the default gateway to provide virtually uninterrupted connectivity for hosts at the access layer.