**3-Tier Campus LAN Architecture with VLANs**

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# Abstract

Diagram

Description automatically generated

This Packet Tracer project was designed to demonstrate the creation of different broadcast domains across multiple access layer switches in a 3-tier campus LAN architecture. Each VLAN was assigned a separate subnet. Each end host was configured with it’s respective IP address and a corresponding default gateway for it’s VLAN. Access layer switch ACC-SW1 was configured as the VTP server and the VLANs created forwarded to the other access layer switches configured as VTP clients (ACC-SW2, ACC-SW3, ACC-SW4), all in the same domain. The respective end host access ports were added to their respective VLANs. Next Inter-VLAN routing was configured on the layer 3 distribution switches, DIS-DW1 & DIS-SW2. FHRP was enabled on the distribution layer using HSRP in an Active/Active configuration with the interfaces for VLAN 30 and VLAN 31. The dual uplinks between the layer 3 switches were configured as port channels using the EtherChannel link aggregation protocol PAgP. OSPF was enabled on all active interfaces on all the Layer 3 devices to populate the routing tables with the optimal routes. Finally, layer 2 port security was enabled on the end host access ports create a sticky mapping between access ports and the end host MAC addresses, with a default errdisable response if users tried to add there own devices to the network.

# Introduction

Two VLANs will be created. One for the Computer Science department and the other for the Engineering department. Each department will have 4 PCs and 1 printer. Each VLAN will be on a different subnet, with Inter-VLAN routing enabled. Core/Distribution uplinks will be aggregated using the Port Aggregation Protocol (PAgP). Core/Distribution routing will be enabled with the OSPF routing protocol. Redundancy across a pair of distribution switches will be enforced using a Active/Active HSRP configuration. Each access and trunk port on the access layer switches in use will be secured at layer 2 using Port-Security.

# Method and Equipment

## Summary of Router and Switch connections

|  |  |  |
| --- | --- | --- |
| Device list 1 | Connections | Device list 2 |
| Routers -R1, R2 | Straight-through Ethernet, point-point | Layer 3 Core Switches – C-SW1, C-SW2 |
| Layer 3 Core Switches – C-SW1, C-SW2 | Cross-over Ethernet, full mesh | Layer 3 Distribution Switches – DIS-SW1, DIS-SW2 |
| Layer 3 Distribution Switches – DIS-SW1, DIS-SW2 | Cross-over Ethernet, partial mesh | Layer 2 Access Switches – ACC-SW1, ACC-SW2, ACC-SW3, ACC-SW4 |

Table : Router and Switch Connections

## Hostname configuration

### R1

Router>en

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname R1

R1(config)#exit

R1#

%SYS-5-CONFIG\_I: Configured from console by console

R1#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### R2

Router>en

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname R2

R2(config)#exit

R2#

%SYS-5-CONFIG\_I: Configured from console by console

R2#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### C-SW1

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname C-SW1

C-SW1(config)#exit

C-SW1#

%SYS-5-CONFIG\_I: Configured from console by console

C-SW1#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### C-SW2

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname C-SW2

C-SW2(config)#exit

C-SW2#

%SYS-5-CONFIG\_I: Configured from console by console

C-SW2#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### DIS-SW1

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname DIS-SW1

DIS-SW1(config)#exit

DIS-SW1#

%SYS-5-CONFIG\_I: Configured from console by console

DIS-SW1#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### DIS-SW2

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname DIS-SW2

DIS-SW2(config)#exit

DIS-SW2#

%SYS-5-CONFIG\_I: Configured from console by console

DIS-SW2#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### ACC-SW1

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname ACC-SW1

ACC-SW1(config)#exit

ACC-SW1#

%SYS-5-CONFIG\_I: Configured from console by console

ACC-SW1#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### ACC-SW2

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname ACC-SW2

ACC-SW2(config)#exit

ACC-SW2#

%SYS-5-CONFIG\_I: Configured from console by console

ACC-SW2#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### ACC-SW3

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname ACC-SW3

ACC-SW3(config)#exit

ACC-SW3#

%SYS-5-CONFIG\_I: Configured from console by console

ACC-SW3#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

### ACC-SW4

Switch>en

Switch#config t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#hostname ACC-SW4

ACC-SW4(config)#exit

ACC-SW4#

%SYS-5-CONFIG\_I: Configured from console by console

ACC-SW4#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

## Router IP address configuration

### R1

R1#config t

Enter configuration commands, one per line. End with CNTL/Z.

R1(config)#int g0/0

R1(config-if)#ip address 172.17.0.1 255.255.255.252

R1(config-if)#no shutdown

### R2

R2#config t

Enter configuration commands, one per line. End with CNTL/Z.

R2(config)#int g0/0

R2(config-if)#ip address 172.18.0.1 255.255.255.252

R2(config-if)#no shutdown

### C-SW1

C-SW1(config)#int range g1/0/1-24

C-SW1(config-if-range)#shutdown

C-SW1(config-if-range)#int range g1/1/1-4

C-SW1(config-if-range)#shutdown

C-SW1(config-if-range)#exit

C-SW1(config)#int g1/0/1

C-SW1(config-if)#no switchport

C-SW1(config-if)#ip address 172.17.0.2 255.255.255.252

C-SW1(config-if)#no shutdown

### C-SW2

C-SW2(config)#int range g1/0/1-24

C-SW2(config-if-range)#shutdown

C-SW2(config-if-range)#int range g1/1/1-4

C-SW2(config-if-range)#shutdown

C-SW2(config-if-range)#exit

C-SW2(config)#int g1/0/1

C-SW2(config-if)#no switchport

C-SW2(config-if)#ip address 172.18.0.2 255.255.255.252

C-SW2(config-if)#no shutdown

## Trunk Configuration

### DIS-SW1

DIS-SW1#config t

DIS-SW1(config)#int g1/0/3

DIS-SW1(config-if)#switchport mode trunk

DIS-SW1(config-if)#no shutdown

DIS-SW1(config-if)#exit

DIS-SW1(config)#int range g1/0/4-6

DIS-SW1(config-if-range)#switchport mode trunk

DIS-SW1(config-if-range)#no shutdown

### DIS-SW2

DIS-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW2(config)#int range g1/0/3-6

DIS-SW2(config-if-range)#switchport mode trunk

DIS-SW2(config-if-range)#no shutdown

### ACC-SW1

ACC-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW1(config)#int range f0/1-24

ACC-SW1(config-if-range)#shutdown

ACC-SW1(config-if-range)#exit

ACC-SW1(config)#int range g0/1-2

ACC-SW1(config-if-range)#switchport mode trunk

### ACC-SW2

ACC-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW2(config)#int range f0/1-24

ACC-SW2(config-if-range)#shutdown

ACC-SW2(config-if-range)#exit

ACC-SW2(config)#int range g0/1-2

ACC-SW2(config-if-range)#switchport mode trunk

### ACC-SW3

ACC-SW3#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW3(config)#int range f0/1-24

ACC-SW3(config-if-range)#shutdown

ACC-SW3(config-if-range)#exit

ACC-SW3(config)#int range g0/1-2

ACC-SW3(config-if-range)#switchport mode trunk

### ACC-SW4

ACC-SW4#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW4(config)#int range f0/1-24

ACC-SW4(config-if-range)#shutdown

ACC-SW4(config-if-range)#exit

ACC-SW4(config)#int range g0/1-2

ACC-SW4(config-if-range)#switchport mode trunk

## VLAN Configuration

### ACC-SW1

ACC-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW1(config)#vtp domain Quogem

Changing VTP domain name from NULL to Quogem

ACC-SW1(config)#vtp mode server

Device mode already VTP SERVER.

ACC-SW1(config)#vlan 30

ACC-SW1(config-vlan)#name Eng

ACC-SW1(config-vlan)#exit

ACC-SW1(config)#vlan 31

ACC-SW1(config-vlan)#name CompSci

ACC-SW1(config-vlan)#exit

ACC-SW1(config)#int f0/1

ACC-SW1(config-if)#switchport mode access

ACC-SW1(config-if)#switchport access vlan 30

ACC-SW1(config-if)#no shutdown

ACC-SW1(config)#int f0/4

ACC-SW1(config-if)#switchport mode access

ACC-SW1(config-if)#switchport access vlan 31

ACC-SW1(config-if)#no shutdown

ACC-SW1(config)#int f0/2

ACC-SW1(config-if)#switchport mode access

ACC-SW1(config-if)#switchport access vlan 30

ACC-SW1(config-if)#no shutdown

### ACC-SW2

ACC-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW2(config)#vtp mode client

ACC-SW2(config)#int f0/1

ACC-SW2(config-if)#switchport mode access

ACC-SW2(config-if)#switchport access vlan 30

ACC-SW2(config-if)#no shutdown

ACC-SW2(config-if)#int f0/4

ACC-SW2(config-if)#switchport mode access

ACC-SW2(config-if)#switchport access vlan 30

ACC-SW2(config-if)#no shutdown

### ACC-SW3

ACC-SW3#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW3(config)#vtp mode client

ACC-SW3(config)#int f0/1

ACC-SW3(config-if)#switchport mode access

ACC-SW3(config-if)#switchport access vlan 31

ACC-SW3(config-if)#no shutdown

ACC-SW3(config-if)#int f0/4

ACC-SW3(config-if)#switchport mode access

ACC-SW3(config-if)#switchport access vlan 30

ACC-SW3(config-if)#no shutdown

### ACC-SW4

ACC-SW4#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW4(config)#vtp mode client

Setting device to VTP CLIENT mode.

ACC-SW4(config)#int f0/1

ACC-SW4(config-if)#switchport mode access

ACC-SW4(config-if)#switchport access vlan 31

ACC-SW4(config-if)#no shutdown

ACC-SW4(config-if)#int f0/4

ACC-SW4(config-if)#switchport mode access

ACC-SW4(config-if)#switchport access vlan 31

ACC-SW4(config-if)#no shutdown

ACC-SW4(config)#int f0/5

ACC-SW4(config-if)#switchport mode access

ACC-SW4(config-if)#switchport access vlan 31

ACC-SW4(config-if)#no shutdown

### DIS-SW1

DIS-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW1(config)#vtp mode transparent

### DIS-SW2

DIS-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW2(config)#vtp mode transparent

## Inter-VLAN Routing & HSRP Active/Active Configuration

### DIS-SW1

DIS-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW1(config)#ip routing

DIS-SW1(config)#int vlan 30

DIS-SW1(config-if)#ip address 172.30.0.9 255.255.0.0

DIS-SW1(config-if)#no shutdown

DIS-SW1(config-if)#

%LINK-5-CHANGED: Interface Vlan30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan30, changed state to up

DIS-SW1(config-if)#standby 30 ip 172.30.0.1

DIS-SW1(config-if)#standby 30 priority 110

%HSRP-6-STATECHANGE: Vlan30 Grp 30 state Speak -> Standby

%HSRP-6-STATECHANGE: Vlan30 Grp 30 state Standby -> Active

DIS-SW1(config-if)#standby 30 preempt

DIS-SW1(config-if)#int vlan 31

DIS-SW1(config-if)#ip address 172.31.0.9 255.255.0.0

DIS-SW1(config-if)#no shutdown

DIS-SW1(config-if)#

%LINK-5-CHANGED: Interface Vlan31, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan31, changed state to up

DIS-SW1(config-if)#standby 31 ip 172.31.0.1

DIS-SW1(config-if)#standby 31 priority 90

%HSRP-6-STATECHANGE: Vlan31 Grp 31 state Speak -> Standby

%HSRP-6-STATECHANGE: Vlan31 Grp 31 state Standby -> Active

### DIS-SW2

DIS-SW2(config)#ip routing

DIS-SW2(config-if)#interface Vlan30

DIS-SW2(config-if)# ip address 172.30.0.8 255.255.0.0

DIS-SW2(config-if)#no shutdown

DIS-SW2(config-if)# standby 30 ip 172.30.0.1

DIS-SW2(config-if)# standby 30 priority 90

%LINK-5-CHANGED: Interface Vlan30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan30, changed state to up

DIS-SW2(config-if)#

%HSRP-6-STATECHANGE: Vlan30 Grp 30 state Speak -> Standby

DIS-SW2(config-if)#interface Vlan31

DIS-SW2(config-if)# ip address 172.31.0.8 255.255.0.0

DIS-SW2(config-if)#no shutdown

DIS-SW2(config-if)# standby 31 ip 172.31.0.1

DIS-SW2(config-if)# standby 31 priority 110

DIS-SW2(config-if)# standby 31 preempt

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan31, changed state to up

%HSRP-6-STATECHANGE: Vlan31 Grp 31 state Standby -> Active

## EtherChannel Configuration

### C-SW1

C-SW1(config)#ip routing

C-SW1(config)#int range g1/0/2-3

C-SW1(config-if-range)#channel-group 1 mode desirable

C-SW1(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 1

C-SW1(config-if-range)#int port-channel 1

C-SW1(config-if)#no switchport

C-SW1(config-if)#ip address 172.16.0.5 255.255.255.252

C-SW1(config-if)#no shutdown

C-SW1(config)#int range g1/0/4-5

C-SW1(config-if-range)#channel-group 3 mode desirable

C-SW1(config-if-range)#no shutdown

Creating a port-channel interface Port-channel 3

C-SW1(config-if-range)#int po3

C-SW1(config-if)#no switchport

C-SW1(config-if)#ip address 172.16.0.21 255.255.255.252

C-SW1(config-if)#no shutdown

C-SW1(config)#int range g1/0/6-7

C-SW1(config-if-range)#channel-group 2 mode desirable

C-SW1(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 2

C-SW1(config-if-range)#int po2

C-SW1(config-if)#no switchport

C-SW1(config-if)#ip address 172.16.0.1 255.255.255.252

C-SW1(config-if)#no shutdown

### C-SW2

C-SW2(config)#ip routing

C-SW2(config)#int range g1/0/2-3

C-SW2(config-if-range)#channel-group 3 mode desirable

C-SW2(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 3

C-SW2(config-if-range)#int port-channel 3

C-SW2(config-if)#no switchport

C-SW2(config-if)#ip address 172.16.0.17 255.255.255.252

C-SW2(config-if)#no shutdown

C-SW2(config)#int range g1/0/4-5

C-SW2(config-if-range)#channel-group 1 mode desirable

C-SW2(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 1

C-SW2(config-if-range)#int po1

C-SW2(config-if)#no switchport

C-SW2(config-if)#ip address 172.16.0.13 255.255.255.252

C-SW2(config-if)#no shutdown

C-SW2(config)#int range g1/0/6-7

C-SW2(config-if-range)#channel-group 2 mode desirable

C-SW2(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 2

C-SW2(config-if-range)#int po2

C-SW2(config-if)#no switchport

C-SW2(config-if)#ip address 172.16.0.2 255.255.255.252

C-SW2(config-if)#no shutdown

### DIS-SW1

DIS-SW1(config)#int range g1/0/1-24

DIS-SW1(config-if-range)#shutdown

DIS-SW1(config-if-range)#int range g1/1/1-4

DIS-SW1(config-if-range)#shutdown

DIS-SW1(config)#int range g1/0/1-2

DIS-SW1(config-if-range)#channel-group 1 mode desirable

DIS-SW1(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 1

DIS-SW1(config-if-range)#int port-channel 1

DIS-SW1(config-if)#no switchport

DIS-SW1(config-if)#ip address 172.16.0.6 255.255.255.252

DIS-SW1(config-if)#no shutdown

DIS-SW1(config)#int range g1/0/7-8

DIS-SW1(config-if-range)#channel-group 2 mode desirable

DIS-SW1(config-if-range)#int port-channel 2

DIS-SW1(config-if)#no switchport

DIS-SW1(config-if)#ip address 172.16.0.9 255.255.255.252

DIS-SW1(config-if)#no shutdown

DIS-SW1(config)#int range g1/0/9-10

DIS-SW1(config-if-range)#channel-group 3 mode desirable

DIS-SW1(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 3

DIS-SW1(config-if-range)#int po3

DIS-SW1(config-if)#no switchport

DIS-SW1(config-if)#ip address 172.16.0.18 255.255.255.252

DIS-SW1(config-if)#no shutdown

### DIS-SW2

DIS-SW2(config)#int range g1/0/1-24

DIS-SW2(config-if-range)#shutdown

DIS-SW2(config-if-range)#int range g1/1/1-4

DIS-SW2(config-if-range)#shutdown

DIS-SW2(config)#int range g1/0/1-2

DIS-SW2(config-if-range)#no shutdown

DIS-SW2(config-if-range)#channel-group 2 mode desirable

DIS-SW2(config-if-range)#

Creating a port-channel interface Port-channel 2

DIS-SW2(config-if-range)#int port-channel 2

DIS-SW2(config-if)#no switchport

DIS-SW2(config-if)#ip address 172.16.0.10 255.255.255.252

DIS-SW2(config-if)#no shutdown

DIS-SW2(config)#int range g1/0/7-8

DIS-SW2(config-if-range)#channel-group 1 mode desirable

DIS-SW2(config-if-range)# no shutdown

Creating a port-channel interface Port-channel 1

DIS-SW2(config-if-range)#int po1

DIS-SW2(config-if)#no switchport

DIS-SW2(config-if)#ip address 172.16.0.14 255.255.255.252

DIS-SW2(config-if)#no shutdown

DIS-SW2(config)#int range g1/0/9-10

DIS-SW2(config-if-range)#channel-group 3 mode desirable

DIS-SW2(config-if-range)# no shutdown

DIS-SW2(config-if-range)#int po3

DIS-SW2(config-if)#no switchport

DIS-SW2(config-if)#ip address 172.16.0.22 255.255.255.252

DIS-SW2(config-if)#no shutdown

## OSPF Configuration

### C-SW1

C-SW1(config)#router ospf 1

C-SW1(config-router)#network 172.16.0.0 0.0.255.255 area 0

C-SW1(config-router)#network 172.17.0.0 0.0.255.255 area 0

### C-SW2

C-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

C-SW2(config)#router ospf 1

C-SW2(config-router)#network 172.16.0.0 0.0.255.255 area 0

C-SW2(config-router)#network 172.18.0.0 0.0.255.255 area 0

### DIS-SW1

DIS-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW1(config)#router ospf 1

DIS-SW1(config-router)#network 172.0.0.0 0.255.255.255 area 0

### DIS-SW2

DIS-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

DIS-SW2(config)#router ospf 1

DIS-SW2(config-router)#network 172.0.0.0 0.255.255.255 area 0

## Access Port Security Configuration

### ACC-SW1

ACC-SW1>en

ACC-SW1#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW1(config)#int range fa0/1-2

ACC-SW1(config-if-range)#switchport port-security

ACC-SW1(config-if-range)#switchport port-security mac-address sticky

ACC-SW1(config-if-range)#exit

ACC-SW1(config)#int fa0/4

ACC-SW1(config-if)#switchport port-security

ACC-SW1(config-if)#switchport port-security mac-address sticky

### ACC-SW2

ACC-SW2>en

ACC-SW2#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW2(config)#int fa0/1

ACC-SW2(config-if)#switchport port-security

ACC-SW2(config-if)#switchport port-security mac-address sticky

ACC-SW2(config-if)#exit

ACC-SW2(config)#int fa0/4

ACC-SW2(config-if)#switchport port-security

### ACC-SW2(config-if)#switchport port-security mac-address sticky

### ACC-SW3

ACC-SW3>en

ACC-SW3#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW3(config)#int fa0/1

ACC-SW3(config-if)#switchport port-security

ACC-SW3(config-if)#switchport port-security mac-address sticky

ACC-SW3(config-if)#exit

ACC-SW3(config)#int fa0/4

ACC-SW3(config-if)#switchport port-security

ACC-SW3(config-if)#switchport port-security mac-address sticky

### ACC-SW4

ACC-SW4>en

ACC-SW4#config t

Enter configuration commands, one per line. End with CNTL/Z.

ACC-SW4(config)#int range fa0/4-5

ACC-SW4(config-if-range)#switchport port-security

ACC-SW4(config-if-range)#switchport port-security mac-address sticky

ACC-SW4(config-if-range)#exit

ACC-SW4(config)#int fa0/1

ACC-SW4(config-if)#switchport port-security

ACC-SW4(config-if)#switchport port-security mac-address sticky

# Verification & Discussion

## VLAN Configuration

Text

Description automatically generated

Figure - VTP Status of the VTP server

Access switch, ACC-SW1, is configured as the VTP server with domain name “Quogem”.

Text

Description automatically generated

Figure - VLAN database summary on the VTP server

The VLANs Eng and CompSci were created on the VTP server and are being to forwarded to the VTP clients (ACC-SW2, ACC-SW3, ACC-SW4) as seen below:

Text

Description automatically generated with low confidence

Figure -VLAN database summary on the VTP client, ACC-SW2

Text

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Figure -VLAN database summary on the VTP client, ACC-SW3

Table

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Figure -VLAN database summary on VTP client, ACC-SW4

## Inter-VLAN Routing & HSRP Active/Active Configuration

Text

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Figure -HSRP status on DIS-SW1

On Distribution switch, DIS-SW1, Interface VLAN30 with group number 30 is set as the active default gateway for VLAN 30 with virtual IP address 172.30.0.1. While Interface VLAN31 with group number 31 is set as the standby gateway for VLAN 31 with virtual IP address 172.31.0.1.

Text

Description automatically generated

Figure -HSRP status on DIS-SW2

On Distribution switch, DIS-SW2, Interface VLAN30 with group number 30 is set as the standby default gateway for VLAN 30 with virtual IP address 172.30.0.1. While Interface VLAN31 with group number 31 is set as the active default gateway for VLAN 31 with virtual IP address 172.31.0.1.

The underlying IP addresses on the respective VLAN interfaces on DIS-SW1 & DIS-SW2 are:

Table -Summary of HSRP status, IP and virtual MAC addresses

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | VLANs | Real Static IP | Virtual IP (HSRP) | Virtual MAC Addr. | HSRP Status |
| DIS-SW1 | VLAN 30 | 172.30.0.9 | 172.30.0.1 | 0000.0C07.AC1E | Active |
|  | VLAN 31 | 172.31.0.9 | 172.31.0.1 | 0000.0C07.AC1F | Standby |
| DIS-SW2 | VLAN 30 | 172.30.0.8 | 172.30.0.1 | 0000.0C07.AC1E | Standby |
|  | VLAN 31 | 172.31.0.8 | 172.31.0.1 | 0000.0C07.AC1F | Active |

## IP Routing Configuration

Text

Description automatically generated

Figure -Demonstration of Eng-PC1 pinging CompSci-PC4

Eng-PC1 at IP address 172.30.0.11 in VLAN 30 can ping CompSci-PC4 in VLAN 31 at IP address 172.31.0.14. Two-way communication between VLAN 30 & 31 is now enabled due to the configuration of inter-VLAN routing on the pair of distribution switches.

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Description automatically generated

Figure - Eng-PC1 now has the virtual IP and MAC address of the default gateway for VLAN 30 in it’s ARP cache

Eng-PC1 now has the Virtual IP and Mac address in it’s ARP cache, for the Virtual interface created by HSRP configured on the pair of distribution switches.

Text

Description automatically generated

Figure -Trace route to the WAN edge router with IP 172.17.0.1

After running the trace route command (tracert), we see that two way communication is now enabled between Eng-PC1 in VLAN 30 and the Active default gateway interface for VLAN 30, the uplink IP for the Core switch C-SW1 (172.16.0.5), and the WAN edge router gateway on router, R1 via 172.17.0.1. Wan edge connectivity is also achieved for CompSci-PC4 in VLAN 31 as seen below:

Text

Description automatically generated

Figure -Trace route to the WAN edge router with IP 172.18.0.1

CompSci-PC4 in VLAN 31 now has two-way communication with the Active default gateway interface for VLAN 31, the uplink IP for the core switch C-SW2 (172.16.0.13), and the WAN edge router gateway on router, R2 via 172.18.0.1.