



# Advanced Networking II Case Study

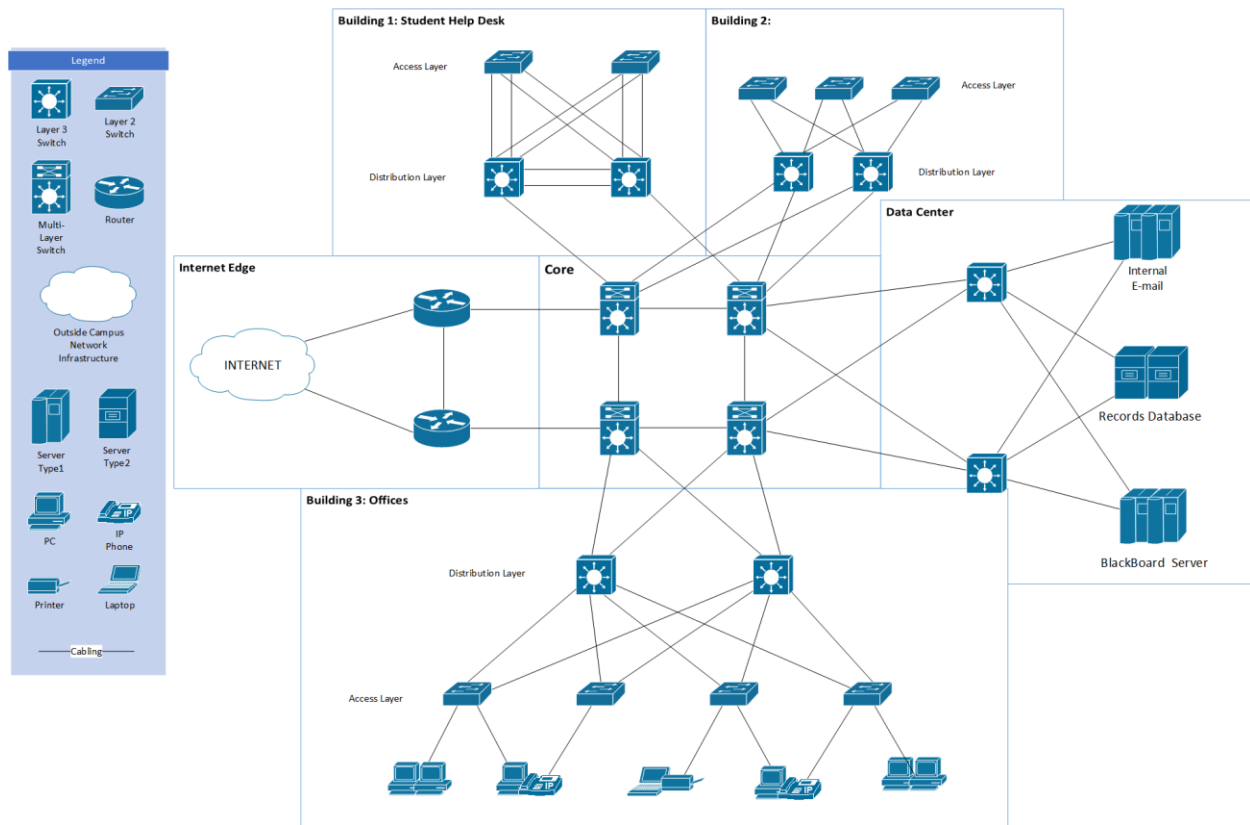
By: Manny Mand & Odafe Omole

# Table of Contents

---

Table of Contents	2
Topology Diagrams	3
Abstract	4
Configuration	5
Additional Deliverables	30
References	33
Final Show Run	34

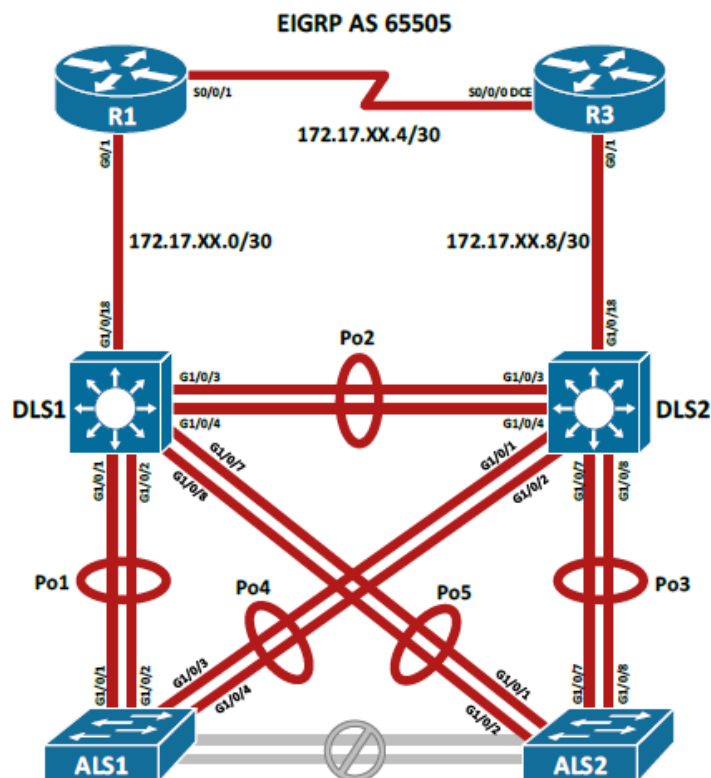
# Topology Diagrams



## Abstract

### INFR 2421U – Advanced Networking II Case Study - Winter 2017

<u>VLANs</u>		
<b>ALS1:</b>		
Name	VLAN	Ports
L1 Helpdesk	10	10-12
L2 Helpdesk	20	13-16
Supervisors	30	17-18
VOICE	40	19-24
Management	99	none
<b>ALS2</b>		
Name	VLAN	Ports
Sales	15	10-12
Business	25	13-16
Accounting	35	17-18
VOICE	40	19-24
Management	99	none
<b>IP Addresses: 10.XX.VLAN.0 /24</b>		



XX Represents the Group ID assigned in Blackboard.

Image above taken from 2016-2017 CCNP Switch Case Study Document [5]

Students partaking in the Advance Networking II course are being assessed based on their cumulative knowledge gained throughout the course. Assuming the role of contracted Network Administrator, they are given a portion of the enterprise network, (UOIT Student Help Desk Switch Network) and task with the overall implementation of the switched network above onto the equipment in lab. Once the Switch Network is in an operational form, they can begin the overall design of the rest of the enterprise network. Requirements for the enterprise network include; three campus modules (help desk switch network included), a core, a data center and an internet edge. Based on best practice learn throughout the course students are required to justify where certain feature should be applied and why. On completion of the case study students will have gain the necessary knowledge used by actual Network Engineers to plan design and implement configurations and feature on a on a production environment.

## Configuration

- 1) Disable the links between the access layer switches

```

ALS1(config)#do sh ip int br
Interface                               IP-Address      OK? Method Status        Protocol
Vlan1                                   unassigned      YES unset  up             down
FastEthernet0                           unassigned      YES unset  up             up
GigabitEthernet1/0/1                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/2                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/3                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/4                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/5                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/6                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/7                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/8                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/9                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/10                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/11                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/12                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/13                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/14                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/15                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/16                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/17                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/18                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/19                   unassigned      YES unset  administratively down down

```

```

ALS2(config)#do sh ip int br
Interface                               IP-Address      OK? Method Status        Protocol
Vlan1                                   unassigned      YES unset  up             down
FastEthernet0                           unassigned      YES unset  up             up
GigabitEthernet1/0/1                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/2                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/3                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/4                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/5                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/6                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/7                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/8                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/9                    unassigned      YES unset  administratively down down
GigabitEthernet1/0/10                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/11                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/12                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/13                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/14                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/15                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/16                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/17                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/18                   unassigned      YES unset  administratively down down
GigabitEthernet1/0/19                   unassigned      YES unset  administratively down down

```

### Commands Used

ALS1

int ran g1/0/7-8

shut

ALS2

int ran g1/0/3-4

shut

- 2) Place all switches in the VTP domain UOIT and set all switches to VTP mode transparent

```
DLS1(config)#do sh vtp status
VTP Version capable      : 1 to 3
VTP version running      : 1
VTP Domain Name          : UOIT
VTP Pruning Mode         : Disabled
VTP Traps Generation     : Disabled
Device ID                : 80e0.1d04.3280
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

Feature VLAN:
-----
VTP Operating Mode       : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 5
Configuration Revision   : 0
MD5 digest               : 0xB7 0x2B 0xB0 0xA9 0x31 0x2C 0x25 0x35
                          : 0x4F 0x51 0x95 0xC8 0x26 0x67 0xD4 0x8E
DLS1(config)#

DLS2(config)#do sh vtp status
VTP Version capable      : 1 to 3
VTP version running      : 1
VTP Domain Name          : UOIT
VTP Pruning Mode         : Disabled
VTP Traps Generation     : Disabled
Device ID                : d8b1.9004.0080
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

Feature VLAN:
-----
VTP Operating Mode       : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 5
Configuration Revision   : 0
MD5 digest               : 0xB7 0x2B 0xB0 0xA9 0x31 0x2C 0x25 0x35
                          : 0x4F 0x51 0x95 0xC8 0x26 0x67 0xD4 0x8E
DLS2(config)#

ALS1(config)#do sh vtp status
VTP Version capable      : 1 to 3
VTP version running      : 1
VTP Domain Name          : UOIT
VTP Pruning Mode         : Disabled
VTP Traps Generation     : Disabled
Device ID                : 84b5.177b.0980
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

Feature VLAN:
-----
VTP Operating Mode       : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 5
Configuration Revision   : 0
MD5 digest               : 0xB7 0x2B 0xB0 0xA9 0x31 0x2C 0x25 0x35
                          : 0x4F 0x51 0x95 0xC8 0x26 0x67 0xD4 0x8E
ALS1(config)#
```

```

ALS2(config)#do sh vtp status
VTP Version capable      : 1 to 3
VTP version running      : 1
VTP Domain Name          : UOIT
VTP Pruning Mode         : Disabled
VTP Traps Generation     : Disabled
Device ID                : 84b5.17aa.8580
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

Feature VLAN:
-----
VTP Operating Mode       : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 5
Configuration Revision    : 0
MD5 digest                : 0xB7 0x2B 0xB0 0xA9 0x31 0x2C 0x25 0x35
                          : 0x4F 0x51 0x95 0xC8 0x26 0x67 0xD4 0x8E
ALS2(config)#

```

### Commands Used

vtp domain UOIT

vtp mode transparent

### 3) Configure all switches for Rapid PVST+.

```

DLS1(config)#spanning-tree mode rapid-pvst
DLS1(config)#do sh run | begin spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
hw-switch switch 1 logging onboard message level 3
!
redundancy
mode sso
!
!

```

```

DLS2(config)#spanning-tree mode rapid-pvst
DLS2(config)#do sh run | begin spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
hw-switch switch 1 logging onboard message level 3
!
redundancy
mode sso
!
!

```

```

ALS1(config)#spanning-tree mode rapid-pvst
ALS1(config)#do sh run | begin spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
!
!
!

```

### Commands Used

spanning-tree mode rapid-pvst

- 4) Configure all inter-switch links statically as 802.1q trunk links. Enable LACP EtherChannels along links between the Access layer and the Distribution layer switches and enable PAgP EtherChannel between the two distribution layer switches

```
DLS1(config)#do sh int trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/1	on	802.1q	trunking	1
Gi1/0/2	on	802.1q	trunking	1
Gi1/0/3	on	802.1q	trunking	1
Gi1/0/4	on	802.1q	trunking	1
Gi1/0/7	on	802.1q	trunking	1
Gi1/0/8	on	802.1q	trunking	1

```
DLS2(config)#do sh int trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/1	on	802.1q	trunking	1
Gi1/0/2	on	802.1q	trunking	1
Gi1/0/3	on	802.1q	trunking	1
Gi1/0/4	on	802.1q	trunking	1
Gi1/0/7	on	802.1q	trunking	1
Gi1/0/8	on	802.1q	trunking	1

```
ALS1(config)#do sh int trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/1	on	802.1q	trunking	1
Gi1/0/2	on	802.1q	trunking	1
Gi1/0/3	on	802.1q	trunking	1
Gi1/0/4	on	802.1q	trunking	1

```
ALS2(config)#do sh int trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/1	on	802.1q	trunking	1
Gi1/0/2	on	802.1q	trunking	1
Gi1/0/7	on	802.1q	trunking	1
Gi1/0/8	on	802.1q	trunking	1



```

ALS1(config)#do sh etherchannel summary
Flags:  D - down          P - bundled 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

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

```

```

Number of channel-groups in use: 2
Number of aggregators:          2

```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/1(P) Gi1/0/2(P)
4	Po4(SU)	LACP	Gi1/0/3(P) Gi1/0/4(P)

```

ALS2(config)#do sh etherchannel summary
Flags:  D - down          P - bundled 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

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

```

```

Number of channel-groups in use: 2
Number of aggregators:          2

```

Group	Port-channel	Protocol	Ports
3	Po3(SU)	LACP	Gi1/0/7(P) Gi1/0/8(P)
5	Po5(SU)	LACP	Gi1/0/1(P) Gi1/0/2(P)

```

DLS1(config)#do sh etherchannel summary
Flags:  D - down          P - bundled 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

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

```

```

A - formed by Auto LAG

```

```

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

```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/1(P) Gi1/0/2(P)
2	Po2(SU)	PAgP	Gi1/0/3(P) Gi1/0/4(P)
5	Po5(SU)	LACP	Gi1/0/7(P) Gi1/0/8(P)

```

DLS2(config)#do sh etherchannel summary
Flags:  D - down          P - bundled 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

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG

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

Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
2      Po2 (SU)       PAgP        Gi1/0/3 (P) Gi1/0/4 (P)
3      Po3 (SU)       LACP        Gi1/0/7 (P) Gi1/0/8 (P)
4      Po4 (SU)       LACP        Gi1/0/1 (P) Gi1/0/2 (P)

```

### Commands used to set links as 802.1q trunk links

#### DLS1

Interface range G1/0/1-4, g1/0/7-8

Switchport mode trunk

no shut

#### DLS2

Interface range G1/0/1-4, g1/0/7-8

Switchport mode trunk

no shut

#### ALS1

Interface range G1/0/1-4

Switchport mode trunk

no shut

#### ALS2

Interface range G1/0/1-2, G1/0/7-8

Switchport mode trunk

no shut

### Commands Used For LACP

#### DLS1

interface range G1/0/1-2

shutdown

channel-group 1 mode active

no shutdown

```
exit
interface range G1/0/7-8
shutdown
channel-group 5 mode active
no shutdown
```

```
exit
```

#### DLS2

```
interface range G1/0/1-2
shutdown
channel-group 4 mode active
no shutdown
```

```
exit
```

```
interface range G1/0/7-8
shutdown
channel-group 3 mode active
no shutdown
```

```
exit
```

#### ALS1

```
interface range G1/0/1-2
shutdown
channel-group 1 mode active
no shutdown
```

```
exit
```

```
interface range G1/0/3-4
shutdown
channel-group 4 mode active
no shutdown
```

```
exit
```

#### ALS2

```
interface range G1/0/1-2
shutdown
channel-group 5 mode active
no shutdown
```

```
exit
```

```
interface range G1/0/7-8
shutdown
channel-group 3 mode active
```

no shutdown

exit

### Commands Used For PAgP

#### DLS1

interface range G1/0/3-4

shutdown

channel-group 2 mode desirable

no shut

#### DLS2

interface range G1/0/3-4

shutdown

channel-group 2 mode desirable

no shut

- 5) Create VLANs 40 and 99 on all switches. Configure DLS1 and DLS2 SVIs and assign addresses in the appropriate subnet.

```
DLS1(config)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/5, Gi1/0/6, Gi1/0/9 Gi1/0/10, Gi1/0/11, Gi1/0/12 Gi1/0/13, Gi1/0/14, Gi1/0/15 Gi1/0/16, Gi1/0/17, Gi1/0/18 Gi1/0/19, Gi1/0/20, Gi1/0/21 Gi1/0/22, Gi1/0/23, Gi1/0/24 Gi1/1/1, Gi1/1/2, Gi1/1/3 Gi1/1/4
40	Shared	active	
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
DLS1(config)#
```

```
DLS2(config)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/5, Gi1/0/6, Gi1/0/9 Gi1/0/10, Gi1/0/11, Gi1/0/12 Gi1/0/13, Gi1/0/14, Gi1/0/15 Gi1/0/16, Gi1/0/17, Gi1/0/18 Gi1/0/19, Gi1/0/20, Gi1/0/21 Gi1/0/22, Gi1/0/23, Gi1/0/24 Gi1/1/1, Gi1/1/2, Gi1/1/3 Gi1/1/4
40	Shared	active	
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
DLS2(config)#
```

```
ALS1(config)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/5, Gi1/0/6, Gi1/0/7 Gi1/0/8, Gi1/0/9, Gi1/0/10 Gi1/0/11, Gi1/0/12, Gi1/0/13 Gi1/0/14, Gi1/0/15, Gi1/0/16 Gi1/0/17, Gi1/0/18, Gi1/0/19 Gi1/0/20, Gi1/0/21, Gi1/0/22 Gi1/0/23, Gi1/0/24, Gi1/0/25 Gi1/0/26, Gi1/0/27, Gi1/0/28
40	Shared	active	
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
ALS1(config)#
```

```
ALS2(config)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/3, Gi1/0/4, Gi1/0/5 Gi1/0/6, Gi1/0/9, Gi1/0/10 Gi1/0/11, Gi1/0/12, Gi1/0/13 Gi1/0/14, Gi1/0/15, Gi1/0/16 Gi1/0/17, Gi1/0/18, Gi1/0/19 Gi1/0/20, Gi1/0/21, Gi1/0/22 Gi1/0/23, Gi1/0/24, Gi1/0/25 Gi1/0/26, Gi1/0/27, Gi1/0/28
40	Shared	active	
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
ALS2(config)#
```

```
DLS1(config)#do sh ip int br
Interface                IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
Vlan1                    unassigned      YES unset  administratively down  down
Vlan40                   10.27.40.1      YES manual  up          up
Vlan99                   10.27.99.1      YES manual  up          up
GigabitEthernet1/0/1     unassigned      YES unset  up          up
GigabitEthernet1/0/2     unassigned      YES unset  up          up
GigabitEthernet1/0/3     unassigned      YES unset  up          up
```

```
DLS2(config)#do sh ip int br
Interface                IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
Vlan1                    unassigned      YES unset  administratively down  down
Vlan40                   10.27.40.2      YES manual  up          up
Vlan99                   10.27.99.2      YES manual  up          up
GigabitEthernet1/0/1     unassigned      YES unset  up          up
GigabitEthernet1/0/2     unassigned      YES unset  up          up
GigabitEthernet1/0/3     unassigned      YES unset  up          up
GigabitEthernet1/0/4     unassigned      YES unset  up          up
```

### Commands Used

#### ALS1

```
vlan 40
name Voice
exit
vlan 99
name Managment
exit
```

#### ALS2

```
vlan 40
name Voice
exit
vlan 99
name Managment
exit
```

#### DLS1

```
vlan 40
name Voice
exit
vlan 99
name Management
exit
int vlan 40
```

```
ip address 10.27.40.1 255.255.255.0
```

```
exit
```

```
int vlan 99
```

```
ip address 10.27.99.1 255.255.255.0
```

```
exit
```

### DLS2

```
vlan 40
```

```
name Voice
```

```
exit
```

```
vlan 99
```

```
name Managment
```

```
exit
```

```
int vlan 40
```

```
ip address 10.27.40.2 255.255.255.0
```

```
exit
```

```
int vlan 99
```

```
ip address 10.27.99.2 255.255.255.0
```

```
exit
```

- 6) Configure DLS1 and DLS2 to use HSRP for VLANS 40 and 99. Make DLS1 the primary gateway for VLAN 40 and DLS2 the primary gateway for VLAN. Enable preemption on both switches.

```
DLS1(config)#do sh stand br
                        P indicates configured to preempt.
                        |
Interface    Grp  Pri P State   Active        Standby        Virtual IP
Vl40         40   120 P Active   local         10.27.40.2    10.27.40.5
Vl99         99   100 P Standby  10.27.99.2    local         10.27.99.5
```

```
DLS2#sh stand br
                        P indicates configured to preempt.
                        |
Interface    Grp  Pri P State   Active        Standby        Virtual IP
Vl40         40   100 P Standby  10.27.40.1    local         10.27.40.5
Vl99         99   120 P Active   local         10.27.99.1    10.27.99.5
```

```

DLS1(config)#do sh standby
Vlan40 - Group 40
  State is Active
    2 state changes, last state change 00:10:30
  Virtual IP address is 10.27.40.5
  Active virtual MAC address is 0000.0c07.ac28 (MAC In Use)
    Local virtual MAC address is 0000.0c07.ac28 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.840 secs
  Preemption enabled
  Active router is local
  Standby router is 10.27.40.2, priority 100 (expires in 9.792 sec)
  Priority 120 (configured 120)
  Group name is "hsrp-Vl40-40" (default)
Vlan99 - Group 99
  State is Standby
    4 state changes, last state change 00:07:52
  Virtual IP address is 10.27.99.5
  Active virtual MAC address is 0000.0c07.ac63 (MAC Not In Use)
    Local virtual MAC address is 0000.0c07.ac63 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.024 secs
  Preemption enabled
  Active router is 10.27.99.2, priority 120 (expires in 9.872 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Vl99-99" (default)

```

```

DLS2(config)#do sh standby
Vlan40 - Group 40
  State is Standby
    1 state change, last state change 00:00:22
  Virtual IP address is 10.27.40.5
  Active virtual MAC address is 0000.0c07.ac28 (MAC Not In Use)
    Local virtual MAC address is 0000.0c07.ac28 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.984 secs
  Preemption enabled
  Active router is 10.27.40.1, priority 120 (expires in 10.976 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Vl40-40" (default)
Vlan99 - Group 99
  State is Active
    1 state change, last state change 00:00:42
  Virtual IP address is 10.27.99.5
  Active virtual MAC address is 0000.0c07.ac63 (MAC In Use)
    Local virtual MAC address is 0000.0c07.ac63 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.496 secs
  Preemption enabled
  Active router is local
  Standby router is 10.27.99.1, priority 100 (expires in 10.080 sec)
  Priority 120 (configured 120)
  Group name is "hsrp-Vl99-99" (default)

```



## Commands Used

### DLS1

```
ip routing
int vlan 40
standby 40 ip 10.27.40.5
standby 40 priority 120
standby 40 preempt
exit
int vlan 99
standby 99 ip 10.27.99.5
standby 99 preempt
exit
```

### DLS2

```
ip routing
int vlan 40
standby 40 ip 10.27.40.5
standby 40 preempt
exit
int vlan 99
standby 99 ip 10.27.99.5
standby 99 priority 120
standby 99 preempt
exit
```

- 7) Using the table provided, assign the switch ports as access ports

```
ALS1(config-if-range)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/5, Gi1/0/6, Gi1/0/7 Gi1/0/8, Gi1/0/9, Gi1/0/25 Gi1/0/26, Gi1/0/27, Gi1/0/28
10	L1_Helpdesk	active	Gi1/0/10, Gi1/0/11, Gi1/0/12
20	L2_Helpdesk	active	Gi1/0/13, Gi1/0/14, Gi1/0/15 Gi1/0/16
30	Supervisors	active	Gi1/0/17, Gi1/0/18
40	Voice	active	Gi1/0/19, Gi1/0/20, Gi1/0/21 Gi1/0/22, Gi1/0/23, Gi1/0/24
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
ALS2(config)#do sh vlan br
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/3, Gi1/0/4, Gi1/0/5 Gi1/0/6, Gi1/0/9, Gi1/0/25 Gi1/0/26, Gi1/0/27, Gi1/0/28
15	Sales	active	Gi1/0/10, Gi1/0/11, Gi1/0/12
25	Business	active	Gi1/0/13, Gi1/0/14, Gi1/0/15 Gi1/0/16
35	Accounting	active	Gi1/0/17, Gi1/0/18
40	Voice	active	Gi1/0/19, Gi1/0/20, Gi1/0/21 Gi1/0/22, Gi1/0/23, Gi1/0/24
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

### Commands Used

#### ALS1

```
int range g1/0/10-12
switchport mode access
switchport access vlan 10
no shut
int range g1/0/13-16
switchport mode access
switchport access vlan 20
no shut
int range g1/0/17-18
switchport mode access
switchport access vlan 30
no shut
int range g1/0/19-24
switchport mode access
switchport access vlan 40
no shut
```

#### ALS2

```
int range g1/0/10-12
switchport mode access
switchport access vlan 15
no shut
int range g1/0/13-16
```

```

switchport mode access
switchport access vlan 25
no shut
int range g1/0/17-18
switchport mode access
switchport access vlan 35
no shut
int range g1/0/19-24
switchport mode access
switchport access vlan 40
no shut

```

- 8) Enable PortFast and BPDU guard on all access ports. Shutdown any unused ports at the Distribution layer

```

ALS1(config)#do sh spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: VLAN0010, VLAN0020, VLAN0030
EtherChannel misconfig guard is enabled
Extended system ID      is enabled
Portfast Default        is enabled
PortFast BPDU Guard Default is enabled
Portfast BPDU Filter Default is disabled
Loopguard Default       is disabled
UplinkFast              is disabled
BackboneFast            is disabled
Configured Pathcost method used is short

```

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN0001	0	0	0	2	2
VLAN0010	0	0	0	2	2
VLAN0020	0	0	0	2	2
VLAN0030	0	0	0	2	2
VLAN0040	0	0	0	2	2
VLAN0099	0	0	0	2	2
6 vlans	0	0	0	12	12

```

ALS1(config)#

```

```

ALS2(config)#do sh spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: VLAN0015, VLAN0025, VLAN0035
EtherChannel misconfig guard is enabled
Extended system ID is enabled
Portfast Default is enabled
PortFast BPDU Guard Default is enabled
Portfast BPDU Filter Default is disabled
Loopguard Default is disabled
UplinkFast is disabled
BackboneFast is disabled
Configured Pathcost method used is short

```

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN0001	0	0	0	2	2
VLAN0015	0	0	0	2	2
VLAN0025	0	0	0	2	2
VLAN0035	0	0	0	2	2
VLAN0040	0	0	0	2	2
VLAN0099	0	0	0	2	2
6 vlans	0	0	0	12	12

```

DLS1(config)#int range g1/0/5-6, g1/0/9-17, g1/0/19-24

```

```

DLS1(config-if-range)#shut

```

```

DLS1(config-if-range)#exit

```

```

DLS1(config)#do sh ip int br

```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down
Vlan40	10.27.40.1	YES	manual	up	up
Vlan99	10.27.99.1	YES	manual	up	up
GigabitEthernet1/0/1	unassigned	YES	unset	up	up
GigabitEthernet1/0/2	unassigned	YES	unset	up	up
GigabitEthernet1/0/3	unassigned	YES	unset	up	up
GigabitEthernet1/0/4	unassigned	YES	unset	up	up
GigabitEthernet1/0/5	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/6	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/7	unassigned	YES	unset	up	up
GigabitEthernet1/0/8	unassigned	YES	unset	up	up
GigabitEthernet1/0/9	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/10	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/11	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/12	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/13	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/14	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/15	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/16	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/17	unassigned	YES	unset	administratively down	down

```

DLS2(config)#int range g1/0/5-6, g1/0/9-17, g1/0/19-24
DLS2(config-if-range)#shutdown
DLS2(config-if-range)#exit
DLS2(config)#do sh ip int br

```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down
Vlan40	10.27.40.2	YES	manual	up	up
Vlan99	10.27.99.2	YES	manual	up	up
GigabitEthernet1/0/1	unassigned	YES	unset	up	up
GigabitEthernet1/0/2	unassigned	YES	unset	up	up
GigabitEthernet1/0/3	unassigned	YES	unset	up	up
GigabitEthernet1/0/4	unassigned	YES	unset	up	up
GigabitEthernet1/0/5	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/6	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/7	unassigned	YES	unset	up	up
GigabitEthernet1/0/8	unassigned	YES	unset	up	up
GigabitEthernet1/0/9	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/10	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/11	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/12	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/13	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/14	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/15	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/16	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/17	unassigned	YES	unset	administratively down	down

### Commands Used

#### DLS 1 & DLS 2

int range g1/0/5-6, g1/0/9-17, g1/0/19-24

shutdown

#### ALS 1 & ALS 2

spanning-tree portfast default

spanning-tree portfast bpduguard default

- 9) Configure ALS1 and ALS2 G1/0/19 through G1/0/24 for use with Cisco IP phones with a voice VLAN of 40.

```

ALS1#sh run | begin interface GigabitEthernet1/0/19
interface GigabitEthernet1/0/19
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/20
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/21
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/22
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/23
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/24
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!

ALS2(config)#do sh run | begin interface GigabitEthernet1/0/19
interface GigabitEthernet1/0/19
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/20
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/21
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/22
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/23
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
interface GigabitEthernet1/0/24
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!

```

### Commands Used

int range g1/0/19-24

switchport voice vlan 40

- 10) Configure ALS2 G1/0/17 and G1/0/18 for port security. Allow only up to three MAC addresses to be learned on each port and then drop any traffic from other MAC addresses and set the violate mode to protect.

```
ALS2(config)#do sh port-security int g1/0/17
Port Security           : Enabled
Port Status             : Secure-down
Violation Mode          : Protect
Aging Time              : 0 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 3
Total MAC Addresses     : 0
Configured MAC Addresses : 0
Sticky MAC Addresses    : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0

ALS2(config)#do sh port-security int g1/0/18
Port Security           : Enabled
Port Status             : Secure-down
Violation Mode          : Protect
Aging Time              : 0 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 3
Total MAC Addresses     : 0
Configured MAC Addresses : 0
Sticky MAC Addresses    : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0
```

### Commands Used

int range g1/0/17-18

switchport port-security

switchport port-security maximum 3

switchport port-security violation protect

- 11) Configure ALS1 G1/0/17 and G1/0/18 to only allow the MAC addresses of the two supervisor laptops (aka the two-team members completing this case study). Assign only one MAC address per port and shutdown if a violation occurs.

```

ALS1(config)#do sh port-security int g1/0/17
Port Security           : Enabled
Port Status             : Secure-down
Violation Mode          : Shutdown
Aging Time              : 0 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 1
Total MAC Addresses     : 1
Configured MAC Addresses : 1
Sticky MAC Addresses    : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0

```

```

ALS1(config)#do sh port-security int g1/0/18
Port Security           : Enabled
Port Status             : Secure-down
Violation Mode          : Shutdown
Aging Time              : 0 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 1
Total MAC Addresses     : 1
Configured MAC Addresses : 1
Sticky MAC Addresses    : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0

```

```

ALS1(config)#int g1/0/17
ALS1(config-if)#switchport port-security
ALS1(config-if)#switchport port-security mac-address 5C-E0-C5-27-D7-2E
ALS1(config-if)#switchport port-security violation shutdown
ALS1(config-if)#exit
ALS1(config-if)#exit
ALS1(config)#int g1/0/18
ALS1(config-if)#switchport port-security
ALS1(config-if)#switchport port-security mac-address 28-F1-0E-21-70-66
ALS1(config-if)#switchport port-security violation shutdown
ALS1(config-if)#exit

```

### Commands Used

int g1/0/17

switchport port-security

switchport port-security mac-address 5C-E0-C5-27-D7-2E

switchport port-security violation shutdown



```

exit
int g1/0/18
switchport port-security
switchport port-security mac-address 28-F1-0E-21-70-66
switchport port-security violation shutdown
exit

```

- 12) Create a routed port on DLS1 and DLS2 at Port G1/0/18 that leads to R1 and R3. Use the addressing scheme shown.

```

DLS1(config)#ip routing
DLS1(config)#int g1/0/18
DLS1(config-if)#no switchport
DLS1(config-if)#ip addr 172.17.27.1 255.255.255.252
DLS1(config-if)#no shut
DLS1(config-if)#end
DLS1#
*Mar 24 01:52:10.190: %SYS-5-CONFIG_I: Configured from console by console
DLS1#sh run | begin interface GigabitEthernet1/0/18
interface GigabitEthernet1/0/18
  no switchport
  ip address 172.17.27.1 255.255.255.252
.

DLS2(config)#ip routing
DLS2(config)#int g1/0/18
DLS2(config-if)#no switchport
DLS2(config-if)#ip addr 172.17.27.9 255.255.255.252
DLS2(config-if)#no shut
DLS2(config-if)#end
DLS2#
*Mar 24 01:55:51.315: %SYS-5-CONFIG_I: Configured from console by console
DLS2#
*Mar 24 01:55:51.661: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/18, changed state to down
DLS2#sh run | begin interface GigabitEthernet1/0/18
interface GigabitEthernet1/0/18
  no switchport
  ip address 172.17.27.9 255.255.255.252
.

```

### Commands Used

#### DLS1

```

ip routing
int g1/0/18
no switchport
ip address 172.17.27.1 255.255.255.252
no shut

```

#### DLS2

```

ip routing
int g1/0/18
no switchport

```

```
ip address 172.17.27.9 255.255.255.252
no shut
```

- 13) Set remaining configurations on the serial interfaces for the routers, enable EIGRP routing on DLS1, DLS2, R1 and R3 and advertise all connected networks.

```
R1(config)#int g0/1
R1(config-if)#ip address 172.17.27.2 255.255.255.252
R1(config-if)#no shut
R1(config-if)#int s0/0/1
R1(config-if)#ip address 172.17.27.5 255.255.255.252
R1(config-if)#no shut
R1(config-if)#router eigrp 65505
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 172.17.27.0 255.255.255.252
R1(config-router)#network 172.17.27.4 255.255.255.252
R1(config-router)#
*Mar 24 01:54:22.804: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to down
*Mar 24 01:54:22.872: %LINK-3-UPDOWN: Interface Serial0/0/1, changed state to down
*Mar 24 01:54:26.340: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
*Mar 24 01:54:27.340: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
R1(config-router)#
--More--
R3(config)#int s0/0/0
R3(config-if)#clock rate 64000
R3(config-if)#ip address 172.17.27.6 255.255.255.252
R3(config-if)#no shut
R3(config-if)#int g0/1
R3(config-if)#ip address 172.17.27.10 255.255.255.252
R3(config-if)#no shut
R3(config-if)#router eigrp 65505
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 172.17.27.4 255.255.255.252
R3(config-router)#network 172.17.27.8 255.255.255.252
R3(config-router)#
*Mar 24 01:56:27.764: %LINK-3-UPDOWN: Interface Serial0/0/0, changed state to up
*Mar 24 01:56:27.828: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to down
*Mar 24 01:56:28.764: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
*Mar 24 01:56:30.924: %DUAL-5-NBRCHANGE: EIGRP-IPv4 65505: Neighbor 172.17.27.5 (Serial0/0/0) is up: new adjacency
*Mar 24 01:56:31.648: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
*Mar 24 01:56:32.648: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
R3(config-router)#
DLS1(config)#router eigrp 65505
DLS1(config-router)#router-id 4.4.4.4
DLS1(config-router)#network 172.17.27.0 255.255.255.252
DLS1(config-router)#
*Mar 24 02:00:31.212: %DUAL-5-NBRCHANGE: EIGRP-IPv4 65505: Neighbor 172.17.27.2 (GigabitEthernet1/0/18) is up: new adjacency
DLS2(config)#router eigrp 65505
DLS2(config-router)#router-id 2.2.2.2
DLS2(config-router)#network 172.17.27.8 255.255.255.252
DLS2(config-router)#
*Mar 24 02:03:21.816: %DUAL-5-NBRCHANGE: EIGRP-IPv4 65505: Neighbor 172.17.27.10 (GigabitEthernet1/0/18) is up: new adjacency
```

## Commands Used

### R1

```
int g0/1
ip address 172.17.27.2 255.255.255.252
no shut
int s0/0/1
ip address 172.17.27.5 255.255.255.252
```

```

no shut
router eigrp 65505
router-id 1.1.1.1
network 172.17.27.0 255.255.255.252
network 172.17.27.4 255.255.255.252
R3
int s0/0/0
clock rate 64000
ip address 172.17.27.6 255.255.255.252
no shut
int g0/1
ip address 172.17.27.10 255.255.255.252
no shut

```

#### DLS1

```

router eigrp 65505
router-id 4.4.4.4
network 172.17.27.0 255.255.255.252

```

#### DLS2

```

router eigrp 65505
router-id 2.2.2.2
network 172.17.27.9 255.255.255.252

```

- 14) Implement one additional upgrade that you have learned in this course. Suggestions include monitoring (IP SLAs), private VLANs, L3 EtherChannel, etc

```

DLS1(config)#do sh ip sla config 1
IP SLAs Infrastructure Engine-III
Entry number: 1
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: icmp-echo
Target address/Source address: 10.27.10.5/0.0.0.0
Type Of Service parameter: 0x0
Request size (ARR data portion): 28
Verify data: No

```

```
DLS2(config)#do sh ip sla config 1
IP SLAs Infrastructure Engine-III
Entry number: 1
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: icmp-echo
Target address/Source address: 10.27.15.5/0.0.0.0
Type Of Service parameter: 0x0
Request size (ARR data portion): 28
Verify data: No
```

```
DLS1(config)#do sh ip sla config 2
IP SLAs Infrastructure Engine-III
Entry number: 2
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: udp-jitter
Target address/Source address: 10.27.40.6/0.0.0.0
Target port/Source port: 5000/0
Type Of Service parameter: 0x0
Request size (ARR data portion): 32
Packet Interval (milliseconds)/Number of packets: 20/10
Verify data: No
```

```
DLS2(config)#do sh ip sla config 2
IP SLAs Infrastructure Engine-III
Entry number: 2
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: udp-jitter
Target address/Source address: 10.27.40.7/0.0.0.0
Target port/Source port: 5000/0
Type Of Service parameter: 0x0
Request size (ARR data portion): 32
Packet Interval (milliseconds)/Number of packets: 20/
Verify data: No
```

### Commands Used

#### ALS1

ip sla responder

ip sla responder udp-echo ipaddr 10.27.99.1 port 5000

#### ALS2

ip sla responder

ip sla responder udp-echo ipaddr 10.27.99.2 port 5000

DLS1

```
ip sla 1
icmp-echo 10.27.10.5
exit
ip sla 2
udp-jitter 10.27.40.6 5000
exit
ip sla schedule 1 life forever start-time now
ip sla schedule 2 life forever start-time now
```

DLS2

```
ip sla 1
icmp-echo 10.27.15.5
exit
ip sla 2
udp-jitter 10.27.40.7 5000
exit
ip sla schedule 1 life forever start-time now
ip sla schedule 2 life forever start-time now
```

## Additional Deliverables

1. A ping issued from any host in any VLAN will reach the routers (doesn't matter which router).

### Addresses

Address	Netmask	Gateway
10.27.99.101	24	10.27.99.2

This was the IPv4 setting configured on the host

Address: 10.27.99.101

Netmask: 255.255.255.0

Gateway: 10.27.99.2

```
[Odafe0@UoitHost ~] $ ping 172.17.27.10
PING 172.17.27.10 (172.17.27.10) 56(84) bytes of data.
64 bytes from 172.17.27.10: icmp_seq=1 ttl=254 time=1.03 ms
64 bytes from 172.17.27.10: icmp_seq=2 ttl=254 time=1.06 ms
64 bytes from 172.17.27.10: icmp_seq=3 ttl=254 time=1.02 ms
64 bytes from 172.17.27.10: icmp_seq=4 ttl=254 time=0.938 ms
64 bytes from 172.17.27.10: icmp_seq=5 ttl=254 time=0.966 ms
64 bytes from 172.17.27.10: icmp_seq=6 ttl=254 time=1.05 ms
64 bytes from 172.17.27.10: icmp_seq=7 ttl=254 time=0.942 ms
^Z
```

This is the ping issued to the g0/1 interface on R3

### Command Used

Ping 172.17.27.10

2. A trace issued from any host in any VLAN will reach the routers (doesn't matter which router) using the active HSRP active router.

```
[Odafe0@UoitHost ~] $ traceroute 172.17.27.5
traceroute to 172.17.27.5 (172.17.27.5), 30 hops max, 60 byte packets
 1 gateway (10.27.99.2) 3.801 ms 3.760 ms 3.879 ms
 2 172.17.27.10 (172.17.27.10) 1.071 ms 1.118 ms 1.100 ms
 3 172.17.27.5 (172.17.27.5) 9.816 ms * *
```

A traceroute was issued to the address 172.17.27.5; the first hop it goes out to is 10.27.99.2. The next hop for that address is 172.17.27.10 from the next hop is its destination of 172.17.27.5

### Command Used

traceroute 172.17.27.5

3. When the active HSRP router fails, the passive router will switchover. Further, when the

active HSRP router comes back up, preemption takes place and the desired active router regains the active role.

```
DLS2(config)#int rang g1/0/1-4,g1/0/7-8
DLS2(config-if-range)#shut
DLS2(config-if-range)#
*Mar 24 23:16:05.260: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel4, changed state to down
*Mar 24 23:16:05.270: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel2, changed state to down
*Mar 24 23:16:05.278: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel3, changed state to down
*Mar 24 23:16:06.250: %LINK-5-CHANGED: Interface GigabitEthernet1/0/1, changed state to administratively down
*Mar 24 23:16:06.250: %LINK-5-CHANGED: Interface GigabitEthernet1/0/2, changed state to administratively down
*Mar 24 23:16:06.259: %LINK-3-UPDOWN: Interface Port-channel4, changed state to down
*Mar 24 23:16:06.260: %LINK-5-CHANGED: Interface GigabitEthernet1/0/3, changed state to administratively down
*Mar 24 23:16:06.270: %LINK-5-CHANGED: Interface GigabitEthernet1/0/4, changed state to administratively down
*Mar 24 23:16:06.271: %LINK-3-UPDOWN: Interface Vlan40, changed state to down
*Mar 24 23:16:06.271: %LINK-3-UPDOWN: Interface Vlan99, changed state to down
*Mar 24 23:16:06.272: %LINK-3-UPDOWN: Interface Port-channel2, changed state to down
*Mar 24 23:16:06.278: %DUAL-5-NBRCHANGE: EIGRP-IPv4 65505: Neighbor 10.27.99.1 (Vlan99) is down: interface down
*Mar 24 23:16:06.282: %LINK-5-CHANGED: Interface GigabitEthernet1/0/7, changed state to administratively down
*Mar 24 23:16:06.282: %LINK-5-CHANGED: Interface GigabitEthernet1/0/8, changed state to administratively down
*Mar 24 23:16:06.290: %LINK-3-UPDOWN: Interface Port-channel3, changed state to down
*Mar 24 23:16:07.249: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to down
*Mar 24 23:16:07.249: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to down
*Mar 24 23:16:07.259: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/3, changed state to down
*Mar 24 23:16:07.270: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/4, changed state to down
*Mar 24 23:16:07.270: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan40, changed state to down
*Mar 24 23:16:07.271: %HSRP-5-STATECHANGE: Vlan40 Grp 40 state Standby -> Init
*Mar 24 23:16:07.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to down
*Mar 24 23:16:07.271: %HSRP-5-STATECHANGE: Vlan99 Grp 99 state Active -> Init
*Mar 24 23:16:07.281: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/7, changed state to down
*Mar 24 23:16:07.282: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/8, changed state to down
DLS2(config-if-range)#exit
```

We shut down all the ports going toward the active router for vlan 99 which in this case is DLS2

```
DLS1(config)#do sh stand br
P indicates configured to preempt.
|
Interface    Grp   Pri P State   Active      Standby      Virtual IP
Vl40         40    120 P Active  local       unknown     10.27.40.5
Vl99         99    100 P Active  local       unknown     10.27.99.5
DLS1(config)#
```

As shown above as a result of DLS2 not being accessible, DLS1 becomes the active router for vlan 99

```

DLS2(config)#int rang g1/0/1-4,g1/0/7-8
DLS2(config-if-range)#no shut
DLS2(config-if-range)#
*Mar 24 23:20:12.051: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1, changed state to down
*Mar 24 23:20:12.051: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/2, changed state to down
*Mar 24 23:20:12.051: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/3, changed state to down
*Mar 24 23:20:12.051: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/4, changed state to down
*Mar 24 23:20:12.060: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/7, changed state to down
*Mar 24 23:20:12.061: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/8, changed state to down
*Mar 24 23:20:14.990: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/3, changed state to up
*Mar 24 23:20:15.143: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/4, changed state to up
*Mar 24 23:20:18.900: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/3, changed state to up
*Mar 24 23:20:18.999: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/4, changed state to up
*Mar 24 23:20:19.050: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/2, changed state to up
*Mar 24 23:20:19.231: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1, changed state to up
*Mar 24 23:20:19.890: %LINK-3-UPDOWN: Interface Port-channel2, changed state to up
*Mar 24 23:20:19.912: %LINK-3-UPDOWN: Interface Vlan40, changed state to up
*Mar 24 23:20:19.913: %LINK-3-UPDOWN: Interface Vlan99, changed state to up
*Mar 24 23:20:20.199: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/7, changed state to up
*Mar 24 23:20:20.382: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/8, changed state to up
*Mar 24 23:20:20.889: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel2, changed state to up
*Mar 24 23:20:20.912: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan40, changed state to up
*Mar 24 23:20:20.912: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up
*Mar 24 23:20:21.530: %DUAL-5-NBRCHANGE: EIGRP-IPv4 65505: Neighbor 10.27.99.1 (Vlan99) is up: new adjacency
*Mar 24 23:20:22.842: %HSRP-5-STATECHANGE: Vlan99 Grp 99 state Listen -> Active
*Mar 24 23:20:24.490: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/7, changed state to up
*Mar 24 23:20:24.928: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to up
*Mar 24 23:20:25.309: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/2, changed state to up
*Mar 24 23:20:25.489: %LINK-3-UPDOWN: Interface Port-channel3, changed state to up
*Mar 24 23:20:25.929: %LINK-3-UPDOWN: Interface Port-channel4, changed state to up
*Mar 24 23:20:26.368: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/8, changed state to up
*Mar 24 23:20:26.490: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel3, changed state to up
*Mar 24 23:20:26.929: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel4, changed state to up

```

To force preemption, we make DLS2 accessible again by re-enabling all the trunk ports

```

DLS2(config-if-range)#do sh stand br
P indicates configured to preempt.
|
Interface    Grp   Pri P State   Active      Standby      Virtual IP
Vl40         40    100 P Standby 10.27.40.1   local        10.27.40.5
Vl99         99    120 P Active  local       10.27.99.1   10.27.99.5

```

We check DLS2 again, preemption goes to work, and DLS2 resumes its role as the active router for vlan 99

4. Port security violations will act as anticipated. i.e. The supervisor ports will shut down when a violation occurs and the accounting ports will transition to protect mode.

```

ALS1(config)#
Mar 24 18:27:09.235: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/17, changed state to up
Mar 24 18:27:10.238: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/17, changed state to up
Mar 24 18:27:13.422: %PM-4-ERR_DISABLE: psecure-violation error detected on Gi1/0/17, putting Gi1/0/17 in err-disable state
Mar 24 18:27:13.426: %PORT_SECURITY-2-PSECURE_VIOLATION: Security violation occurred, caused by MAC address 28f1.0e21.7066 on port GigabitEthernet1/0/17.
Mar 24 18:27:14.425: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/17, changed state to down
Mar 24 18:27:15.425: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/17, changed state to down

```

For this Odafe plugged his laptop into g1/0/17, as a result the port shutdown because his MAC address was not the MAC address configure to use this port



## References

---

- [1] Cisco, "Enterprise Campus 3.0 Architecture," Cisco Systems, Inc, San Jose, 2008.
- [2] S. Herbet , "3 Reasons You Should Be Using Rapid Spanning Tree (802.1w)," Slaptijack Network-Systems-Coding, 2013. [Online]. Available: <https://slapjack.com/networking/3-reasons-you-should-be-using-rapid-spanning-tree-8021w/>. [Accessed 2017].
- [3] J. Lowe, "Chapter 4: Spanning Tree in Depth - Part 1," University of Ontario Institute of Technology, Oshawa, 2017.
- [4] J. Lowe, "Chapter 6: First-Hop Redundancy - Part 1," University of Ontario Institute of Technology, Oshawa, 2017.
- [5] J. Lowe, "INFR 2421U – Advanced Networking II Case Study," University of Ontario Institute of Technology, Oshawa, 2017.
- [6] J. Lowe, "Chapter 4: Spanning Tree in Depth - Part 2," University of Ontario Institute of Technology, Oshawa, 2017.
- [7] J. Lowe , "Chapter 6: First-Hop Redundancy - Part 2," Univeristy of Ontario Institute of Technology, Oshawa, 2017
- [8] T. Support, I. Routing, T. Alerts and T. TechNotes, "Enhanced Interior Gateway Routing Protocol", Cisco, 2017. [Online]. Available: <http://www.cisco.com/c/en/us/support/docs/ip/enhanced-interior-gateway-routing-protocol-eigrp/16406-eigrp-toc.html>. [Accessed: 27- Mar- 2017].
- [9] S. Convery, "Hacking Layer 2: Fun with Ethernet Switches", *Blackhat*. [Online]. Available: <https://www.blackhat.com/presentations/bh-usa-02/bh-us-02-convery-switches.pdf>. [Accessed: 26- Mar- 2017].

## Final Show Run

---

### R1

---

```
hostname R1
!
!
interface GigabitEthernet0/1
 ip address 172.17.27.2 255.255.255.252
 no shut
!
!
interface Serial0/0/1
 ip address 172.17.27.5 255.255.255.252
 no shut
!
!
router eigrp 65505
 network 172.17.27.0 0.0.0.3
 network 172.17.27.4 0.0.0.3
 eigrp router-id 1.1.1.1
!
!
End
```

### R3

---

```
hostname R3
!
!
interface GigabitEthernet0/1
 ip address 172.17.27.10 255.255.255.252
 no shut
!
!
interface Serial0/0/0
 ip address 172.17.27.6 255.255.255.252
```

```
no shut
clock rate 64000
!
!
router eigrp 65505
 network 172.17.27.4 0.0.0.3
 network 172.17.27.8 0.0.0.3
 eigrp router-id 3.3.3.3
!
!
End
```

## DLS1

---

```
hostname DLS1
!
!
ip routing
!
no ip domain-lookup
ip domain-name CCNP.NET
!
!
vtp domain UOIT
vtp mode transparent
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
!
vlan 40
 name Voice
!
vlan 99
 name Management
!
```

```
!  
interface Port-channel1  
  switchport mode trunk  
!  
interface Port-channel2  
  switchport mode trunk  
!  
interface Port-channel5  
  switchport mode trunk  
!  
!  
interface GigabitEthernet1/0/1  
  switchport mode trunk  
  channel-group 1 mode active  
!  
interface GigabitEthernet1/0/2  
  switchport mode trunk  
  channel-group 1 mode active  
!  
interface GigabitEthernet1/0/3  
  switchport mode trunk  
  channel-group 2 mode desirable  
!  
interface GigabitEthernet1/0/4  
  switchport mode trunk  
  channel-group 2 mode desirable  
!  
!  
interface GigabitEthernet1/0/7  
  switchport mode trunk  
  channel-group 5 mode active  
!  
interface GigabitEthernet1/0/8  
  switchport mode trunk  
  channel-group 5 mode active  
!  
!
```

```
interface GigabitEthernet1/0/18
no switchport
ip address 172.17.27.1 255.255.255.252
!
!
interface Vlan40
ip address 10.27.40.1 255.255.255.0
standby 40 ip 10.27.40.5
standby 40 priority 120
standby 40 preempt
!
interface Vlan99
ip address 10.27.99.1 255.255.255.0
standby 99 ip 10.27.99.5
standby 99 preempt
!
!
router eigrp 65505
network 172.17.27.0 0.0.0.3
eigrp router-id 4.4.4.4
!
!
ip sla 1
icmp-echo 10.27.10.5
ip sla schedule 1 life forever start-time now
ip sla 2
udp-jitter 10.27.40.6 5000
ip sla schedule 2 life forever start-time now
!
!
end
```

**DLS2**

---

```
hostname DLS2
!
!
ip routing
!
no ip domain-lookup
ip domain-name CCNP.NET
!
!
vtp domain UOIT
vtp mode transparent
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
!
vlan 40
 name Voice
!
vlan 99
 name Management
!
!
interface Port-channel2
 switchport mode trunk
!
interface Port-channel3
 switchport mode trunk
!
interface Port-channel4
 switchport mode trunk
!
!
interface GigabitEthernet1/0/1
```

```
switchport mode trunk
channel-group 4 mode active
!
interface GigabitEthernet1/0/2
switchport mode trunk
channel-group 4 mode active
!
interface GigabitEthernet1/0/3
switchport mode trunk
channel-group 2 mode desirable
!
interface GigabitEthernet1/0/4
switchport mode trunk
channel-group 2 mode desirable
!
!
interface GigabitEthernet1/0/7
switchport mode trunk
channel-group 3 mode active
!
interface GigabitEthernet1/0/8
switchport mode trunk
channel-group 3 mode active
!
!
interface GigabitEthernet1/0/18
no switchport
ip address 172.17.27.9 255.255.255.252
!
!
interface Vlan40
ip address 10.27.40.2 255.255.255.0
standby 40 ip 10.27.40.5
standby 40 preempt
!
interface Vlan99
ip address 10.27.99.2 255.255.255.0
```

```
standby 99 ip 10.27.99.5
standby 99 priority 120
standby 99 preempt
!
!
router eigrp 65505
network 172.17.27.8 0.0.0.3
eigrp router-id 2.2.2.2
!
!
ip sla 1
icmp-echo 10.27.15.5
ip sla schedule 1 life forever start-time now
ip sla 2
udp-jitter 10.27.40.7 5000
ip sla schedule 2 life forever start-time now
!
!
End
```

### **ALS1**

---

```
hostname ALS1
!
!
no ip domain-lookup
ip domain-name CCNP.NET
vtp domain UOIT
vtp mode transparent
!
!
spanning-tree mode rapid-pvst
spanning-tree portfast default
spanning-tree portfast bpduguard default
spanning-tree extend system-id
!
!
vlan 10
```



```
name L1_Helpdesk
!
vlan 20
name L2_Helpdesk
!
vlan 30
name Supervisors
!
vlan 40
name Voice
!
vlan 99
name Management
!
!
interface Port-channel1
switchport mode trunk
!
interface Port-channel4
switchport mode trunk
!
!
interface GigabitEthernet1/0/1
switchport mode trunk
channel-group 1 mode active
!
interface GigabitEthernet1/0/2
switchport mode trunk
channel-group 1 mode active
!
interface GigabitEthernet1/0/3
switchport mode trunk
channel-group 4 mode active
!
interface GigabitEthernet1/0/4
switchport mode trunk
channel-group 4 mode active
```

```
!  
!  
interface GigabitEthernet1/0/10  
  switchport access vlan 10  
  switchport mode access  
!  
interface GigabitEthernet1/0/11  
  switchport access vlan 10  
  switchport mode access  
!  
interface GigabitEthernet1/0/12  
  switchport access vlan 10  
  switchport mode access  
!  
interface GigabitEthernet1/0/13  
  switchport access vlan 20  
  switchport mode access  
!  
interface GigabitEthernet1/0/14  
  switchport access vlan 20  
  switchport mode access  
!  
interface GigabitEthernet1/0/15  
  switchport access vlan 20  
  switchport mode access  
!  
interface GigabitEthernet1/0/16  
  switchport access vlan 20  
  switchport mode access  
!  
interface GigabitEthernet1/0/17  
  switchport access vlan 30  
  switchport mode access  
  switchport port-security  
  switchport port-security mac-address 5ce0.c527.d72e  
  switchport port-security violation shutdown  
!
```

```
interface GigabitEthernet1/0/18
switchport access vlan 30
switchport mode access
switchport port-security
switchport port-security mac-address 28f1.0e21.7066
switchport port-security violation shutdown
```

!

```
interface GigabitEthernet1/0/19
switchport access vlan 40
switchport mode access
switchport voice vlan 40
spanning-tree portfast
```

!

```
interface GigabitEthernet1/0/20
switchport access vlan 40
switchport mode access
switchport voice vlan 40
spanning-tree portfast
```

!

```
interface GigabitEthernet1/0/21
switchport access vlan 40
switchport mode access
switchport voice vlan 40
spanning-tree portfast
```

!

```
interface GigabitEthernet1/0/22
switchport access vlan 40
switchport mode access
switchport voice vlan 40
spanning-tree portfast
```

!

```
interface GigabitEthernet1/0/23
switchport access vlan 40
switchport mode access
switchport voice vlan 40
spanning-tree portfast
```

!

```
interface GigabitEthernet1/0/24
  switchport access vlan 40
  switchport mode access
  switchport voice vlan 40
  spanning-tree portfast
!
!
ip sla responder
ip sla responder udp-echo ipaddress 10.27.99.1 port 5000
!
!
End
ALS2
```

---

```
hostname ALS2
!
!
no ip domain-lookup
ip domain-name CCNP.NET
vtp domain UOIT
vtp mode transparent
!
!
spanning-tree mode rapid-pvst
spanning-tree portfast default
spanning-tree portfast bpduguard default
spanning-tree extend system-id
!
!
vlan 15
  name Sales
!
vlan 25
  name Business
!
vlan 35
  name Accounting
```

```
!  
vlan 40  
  name Voice  
!  
vlan 99  
  name Management  
!  
!  
interface Port-channel3  
  switchport mode trunk  
!  
interface Port-channel5  
  switchport mode trunk  
!  
!  
interface GigabitEthernet1/0/1  
  switchport mode trunk  
  channel-group 5 mode active  
!  
interface GigabitEthernet1/0/2  
  switchport mode trunk  
  channel-group 5 mode active  
!  
!  
interface GigabitEthernet1/0/7  
  switchport mode trunk  
  channel-group 3 mode active  
!  
interface GigabitEthernet1/0/8  
  switchport mode trunk  
  channel-group 3 mode active  
!  
!  
interface GigabitEthernet1/0/10  
  switchport access vlan 15  
  switchport mode access  
!
```

```
interface GigabitEthernet1/0/11
  switchport access vlan 15
  switchport mode access
!
interface GigabitEthernet1/0/12
  switchport access vlan 15
  switchport mode access
!
interface GigabitEthernet1/0/13
  switchport access vlan 25
  switchport mode access
!
interface GigabitEthernet1/0/14
  switchport access vlan 25
  switchport mode access
!
interface GigabitEthernet1/0/15
  switchport access vlan 25
  switchport mode access
!
interface GigabitEthernet1/0/16
  switchport access vlan 25
  switchport mode access
!
interface GigabitEthernet1/0/17
  switchport access vlan 35
  switchport mode access
  switchport port-security maximum 3
  switchport port-security
  switchport port-security violation protect
!
interface GigabitEthernet1/0/18
  switchport access vlan 35
  switchport mode access
  switchport port-security maximum 3
  switchport port-security
  switchport port-security violation protect
```

```
!  
interface GigabitEthernet1/0/19  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!  
interface GigabitEthernet1/0/20  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!  
interface GigabitEthernet1/0/21  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!  
interface GigabitEthernet1/0/22  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!  
interface GigabitEthernet1/0/23  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!  
interface GigabitEthernet1/0/24  
  switchport access vlan 40  
  switchport mode access  
  switchport voice vlan 40  
  spanning-tree portfast  
!
```

```
!  
ip sla responder  
ip sla responder udp-echo ipaddress 10.27.99.2 port 5000  
!  
!  
end
```