LAB GUIDE

MVRP Fundamentals

a Hewlett Packard Enterprise company

IMPORTANT! THIS GUIDE ASSUMES THAT THE AOS-CX OVA HAS BEEN INSTALLED AND WORKS IN GNS3 OR EVE-NG. PLEASE REFER TO GNS3/EVE-NG INITIAL SETUP LABS IF REQUIRED.

https://www.eve-ng.net/index.php/documentation/howtos/howto-add-aruba-cx-switch/

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Lab Objective

At the end of this lab you will be able to implement the basic configuration of MVRP (Multiple VLAN Registration Protocol) and show how MVRP propagates local VLAN information to other Aruba CX switches.

The use case for MVRP is to simplify VLAN configuration and deployment in Layer 2 networks. MVRP provides a mechanism of dynamically propagating VLAN information from a source switch to other switches in the Layer 2 LAN.

For further details on MVRP please refer to the latest Aruba documentation located on https://asp.arubanetworks.com/

Lab Overview

This lab set up is as shown in Figure 1 and Figure 2. This will allow you to observe the propagation of dynamic VLANs

This lab is split into two parts:

Part I we will show MVRP in a simple scenario

Part II we see MVRP in an MSTP environment and how it works in conjunction with MSTP, as well as coexistence with static vlans

Note: MVRP is not supported with RPVST.

Lab Network Layout

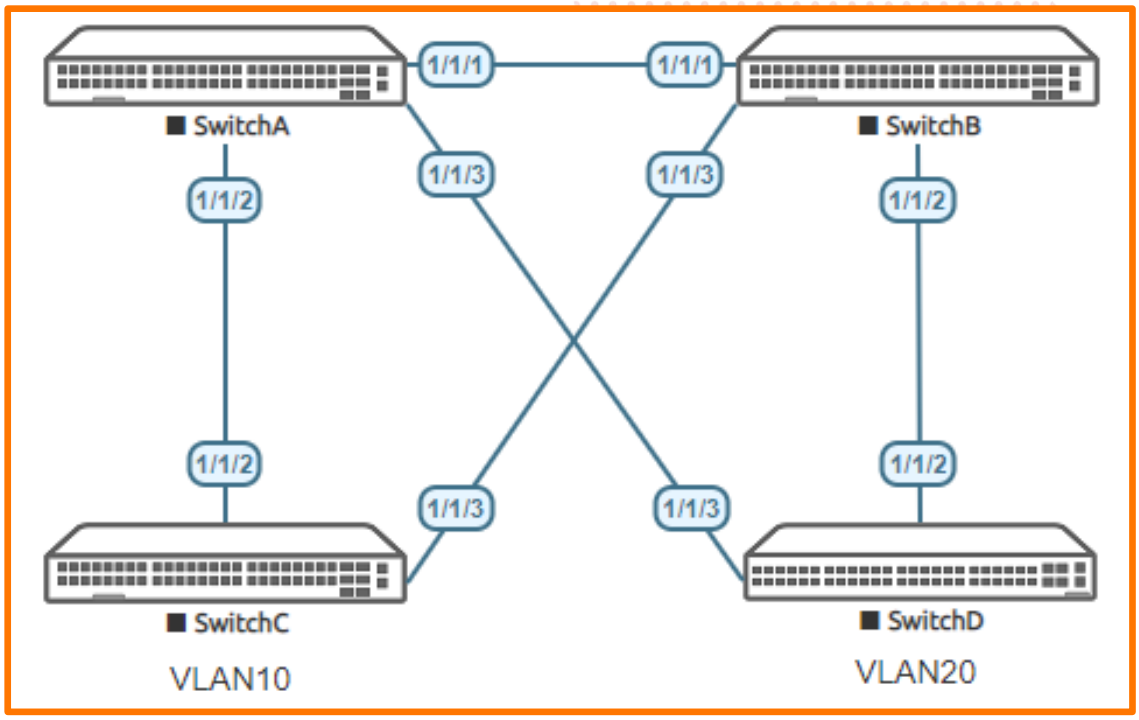

Figure 1. Part I Lab topology Only Use Switch A, C and D

Part I Lab Tasks

Task 1 - Lab setup

For this lab refer to Figure 1 for topology Part I only uses **Switch A**, **Switch C** and **Switch D**

- Open each switch console and log in with user “admin” and no password
- Change all hostnames as shown in the topology:

```
configure
hostname <device host name>
```

- On **Switch A, C and D** bring up required ports:

```
int 1/1/2-1/1/3
  no routing
  no shutdown
```

use `“exit”` to go back a level

- Validate LLDP neighbors appear as expected on each switch. Here we show SwitchA output only.

```
show lldp neighbor-info
```

If all switches have been configured as shown in

Figure 1 you should see Switch C and D through Switch A as shown below using LLDP.

Switch A

```
SwitchA# show lldp neighbor-info

LLDP Neighbor Information
=========================

Total Neighbor Entries          : 2
Total Neighbor Entries Deleted  : 0
Total Neighbor Entries Dropped  : 0
Total Neighbor Entries Aged-Out : 0

LOCAL-PORT  CHASSIS-ID         PORT-ID          PORT-DESC              TTL      SYS-NAME
-------------------------------------------------------------------------------------
1/1/2       08:00:09:83:49:9f  1/1/2            1/1/2                  120      SwitchC
1/1/3       08:00:09:a8:f7:52  1/1/3            1/1/3                  120      SwitchD
```

Task 2 - Configure MVRP and Native VLAN on Switch A and C

- On Switch A enable MVRP globally with native VLAN on trunks
- On Switch C enable MVRP globally with native VLAN and define a VLAN 10

Switch A

```
int 1/1/2-1/1/3
vlan trunk native 1
mvrp
vlan trunk native 1
exit
mvrp
```

Switch C

```
int 1/1/2
vlan trunk native 1
mvrp
exit
vlan 10
exit
mvrp
```

- Now observe the state on Switch A

```
SwitchA# show vlan

-------------------------------------------------------------------------------------------------------
VLAN  Name                                Status  Reason              Type      Interfaces
-------------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                      up      ok                  default   1/1/2-1/1/3
10    VLAN10                              up      ok                  dynamic   1/1/2
```

Above it can be seen VLAN 10 is dynamically present on Switch C

```
SwitchA# show mvrp config

Configuration and Status - MVRP

Global MVRP status : Enabled

Port       Status    Registration Join   Leave    LeaveAll Periodic
                     Type         Timer  Timer    Timer    Timer
---------- --------  --------     -----  -------  -------  --------
     1/1/2  Enabled    normal        20      300     1000       100
     1/1/3  Enabled    normal        20      300     1000       100
```

Above it is seen that MVRP is enabled on Switch A with default timers

```
SwitchA# show mvrp state

Configuration and Status - MVRP state

Port        VLAN Registrar Applicant Forbid
                 State     State     Mode
----------  ---- --------- --------- ---------
1/1/2       1    IN        QA        No
1/1/2       10   IN        VO        No
1/1/3       1    MT        AA        No
1/1/3       10   MT        AA        No
```

- On Switch A we see the MVRP register and applicant state. Interface 1/1/2 is `IN` (Registered) and 1/1/3 is `MT` (empty-Unregistered)
- Applicant states on 1/1/2 for VLAN 1 is `QA`(Quite Active), VLAN 10 is `VO` (Very Anxious Observer)
- Register and Applicant states on 1/1/3 are `MT` and `AA` (Anxious Active)

Note: Register and Applicant states are as defined in IEEE Std 802.1Q 2011.

The MVRP “applicant state” can vary as this is continuously checked/refreshed and may be slightly different from the outputs shown above.

Task 3 - Configure MVRP and Native VLAN on Switch D

- On Switch D enable MVRP globally with native VLAN and define a VLAN 20

```
SwitchD(config)#
int 1/1/3
vlan trunk native 1
mvrp
exit
vlan 20
exit
mvrp
```

SwitchD# show vlan

```
---------------------------------------------------------------------------------------------------
VLAN  Name                            Status  Reason              Type      Interfaces
---------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                  up      ok                  default   1/1/2-1/1/3
10    VLAN10                          up      ok                  dynamic   1/1/3
20    VLAN20                          up      ok                  static    1/1/2-1/1/3
```

In the above output the Dynamic VLAN 10 present on Switch D

On Switch A below both Dynamic VLAN 10 and 20 are observed

SwitchA# show vlan

```
---------------------------------------------------------------------------------------------------
VLAN  Name                            Status  Reason              Type      Interfaces
---------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                  up      ok                  default   1/1/2-1/1/3
10    VLAN10                          up      ok                  dynamic   1/1/2
20    VLAN20                          up      ok                  dynamic   1/1/3
```

On Switch C below the Dynamic VLAN 20 is present, that was defined in Switch D

SwitchC#show vlan

```
---------------------------------------------------------------------------------------------------
VLAN  Name                            Status  Reason              Type      Interfaces
---------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                  up      ok                  default   1/1/2-1/1/3
10    VLAN10                          up      ok                  static    1/1/2
20    VLAN20                          up      ok                  dynamic   1/1/2
```

Part I of lab is now completed

Part II Lab Tasks

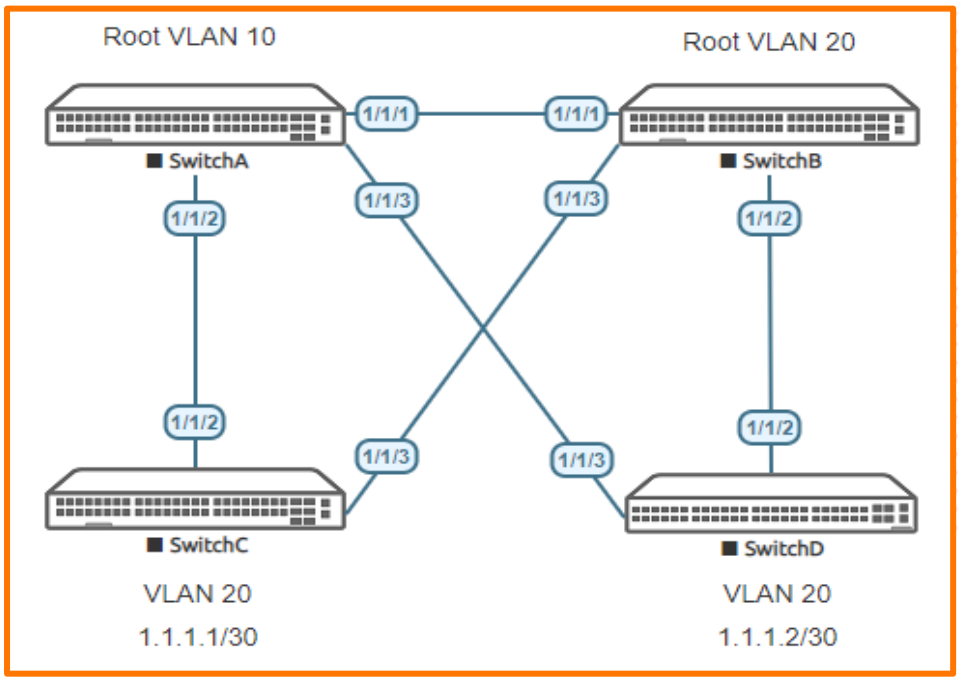

Figure 2 Part II Lab topology

In Part II we configure MVRP deployment in two MSTI

The assumption is made Part I has already been completed. This is a prerequisite for Part II .

MSTI is set up as detailed below

- VLAN 10 assigned to MSTI 1
- VLAN 20 assigned to MSTI 2

All other VLANs assigned to the default MSTI 0 make C Root, not shown in *Figure 3*

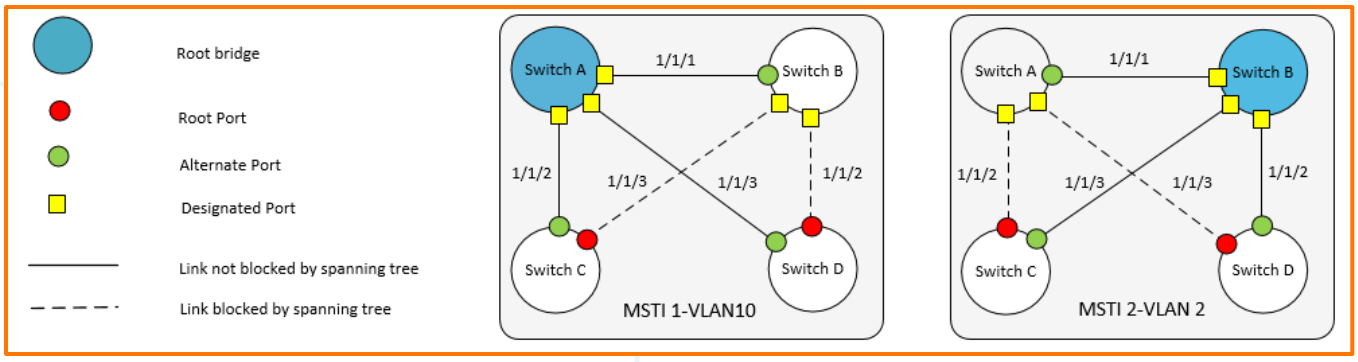

Figure 3 MSTI Topology

Task 4 – Part II Lab setup

First clear some of the VLAN Configurations, and enable all the relevant ports, as well as add Switch D as shown in

Figure 2

A prerequisite to follow Part II lab steps below, the assumption is Part I lab has been completed already.

- On **Switch B** add a hostname and bring up required ports:

```
configure
hostname <device host name>

int 1/1/1-1/1/3
  no routing
  no shutdown
```

use "exit" to go back a level

- On **Switch A** bring up required ports:

```
int 1/1/1
no routing
  no shutdown
```

use "exit" to go back a level

- On **Switch C** bring up required ports and remove the VLAN 10

```
int 1/1/3
no routing
  no shutdown
```

use "exit" to go back a level

```
no vlan 10
```

- On **Switch D** bring up required ports and remove the VLAN 20

```
int 1/1/2
no routing
  no shutdown
```

use "exit" to go back a level

```
no vlan 20
```

- Validate LLDP neighbors appear as expected on each Switch A and B as shown below

```
SwitchA# show lldp neighbor-info

LLDP Neighbor Information
=========================

Total Neighbor Entries          : 3
Total Neighbor Entries Deleted  : 0
Total Neighbor Entries Dropped  : 0
Total Neighbor Entries Aged-Out : 0

LOCAL-PORT  CHASSIS-ID         PORT-ID          PORT-DESC               TTL      SYS-NAME
-------------------------------------------------------------------------------------
1/1/1       08:00:09:6b:63:2b  1/1/1            1/1/1                   120      SwitchB
1/1/2       08:00:09:a7:87:32  1/1/2            1/1/2                   120      SwitchC
1/1/3       08:00:09:b2:17:10  1/1/3            1/1/3                   120      SwitchD
```

```
SwitchB# show lldp neighbor-info

LLDP Neighbor Information
=========================

Total Neighbor Entries          : 3
Total Neighbor Entries Deleted  : 0
Total Neighbor Entries Dropped  : 0
Total Neighbor Entries Aged-Out : 0

LOCAL-PORT  CHASSIS-ID         PORT-ID          PORT-DESC                TTL      SYS-NAME
-------------------------------------------------------------------------------------------
1/1/1       08:00:09:fd:8c:a2  1/1/1            1/1/1                    120      SwitchA
1/1/2       08:00:09:b2:17:10  1/1/2            1/1/2                    120      SwitchD
1/1/3       08:00:09:a7:87:32  1/1/3            1/1/3                    120      SwitchC
```

Task 5 - Configure MVRP and STP

- On Switch A add VLAN 10, Configure STP making Switch A Root for instance 1 VLAN 10,and Secondary Root for Instance 2 ,VLAN 20 and a add trunk to interface 1/1/1 with MVRP

```
SwitchA(config)#
vlan 10
Do you wish to convert it to static VLAN (y/n)?
y
exit
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
spanning-tree instance 1 priority 0
spanning-tree instance 2 priority 1
int 1/1/1
vlan trunk native 1
mvrp
exit
```

- On Switch B add VLAN 20 ,Configure STP making Switch B Root for Instance 2, VLAN 20, and Secondary Root for Instance 1, VLAN 10, and add trunk to all interfaces with MVRP

```
SwitchB(config)#
vlan 20
exit
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
spanning-tree instance 2 priority 0
spanning-tree instance 1 priority 1
interface 1/1/1-1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    mvrp
exit
mvrp
```

- On Switch C ,remove VLAN 10, add STP making C Root for other VLANS , and add a trunk to interface 1/1/3 with MVRP
- We also statically add VLAN 20 overriding dynamic allocation for this VLAN (Enables to observe differences in MVRP outputs later)

```
SwitchC(config)#
no vlan 10
vlan 20
exit
spanning-tree
spanning-tree priority 0
spanning-tree config-name sp1
```

```
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
interface 1/1/3
    vlan trunk native 1
    mvrp
```

- On Switch D Configure STP and add trunk to interfaces 1/1/2 with MVRP

```
SwitchD(config)#
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
interface 1/1/2
    vlan trunk native 1
    mvrp
```

Task 6 – Check configurations and output

- Check the STP topology from Switch D
  - It can be seen from the output below that :
  - MST1 mapped to VLAN 10 with Root port on interface 1/1/3
  - MST2 mapped to VLAN 20 with Root port on interface 1/1/2

```
SwitchD# show spanning-tree mst 1


#### MST1
Vlans mapped:  10
Bridge         Address:08:00:09:ee:11:82    Priority:32768
Root           Address:08:00:09:8a:14:fa    Priority:0
               Port:1/1/3, Cost:20000, Rem Hops:19

Port           Role           State      Cost    Priority   Type            BPDU-Tx    BPDU-Rx    TCN-Tx     TCN-Rx
-------------- -------------- ---------- ------- ---------- --------------- ---------- ---------- ---------- --------
1/1/2          Alternate      Blocking   20000   128        P2P             9          3767       4          5
1/1/3          Root           Forwarding 20000   128        P2P             10         3765       1          4

Topology change flag          : True
Number of topology changes    : 3
Last topology change occurred : 7526 seconds ago

SwitchD# show spanning-tree mst 2


#### MST2
Vlans mapped:  20
Bridge         Address:08:00:09:ee:11:82    Priority:32768
Root           Address:08:00:09:12:8e:9e    Priority:0
               Port:1/1/2, Cost:20000, Rem Hops:19

Port           Role           State      Cost    Priority   Type            BPDU-Tx    BPDU-Rx    TCN-Tx     TCN-Rx
-------------- -------------- ---------- ------- ---------- --------------- ---------- ---------- ---------- --------
1/1/2          Root           Forwarding 20000   128        P2P             9          3770       4          5
1/1/3          Alternate      Blocking   20000   128        P2P             10         3767       1          4

Topology change flag          : True
Number of topology changes    : 1
Last topology change occurred : 7531 seconds ago
```

- It can be seen below that both VLAN 10 and 20 are dynamically learned on Switch D aligned to STP interfaces as expected

```
SwitchD# show vlan

-------------------------------------------------------------------------------------------------------
VLAN  Name                                Status  Reason               Type      Interfaces
-------------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                      up      ok                   default   1/1/2-1/1/3
10    VLAN10                              up      ok                   dynamic   1/1/3
20    VLAN20                              up      ok                   dynamic   1/1/2
SwitchD#
```

- Now check the MVRP state

```
SwitchD#show mvrp state
```

```
Configuration and Status - MVRP state
Port        VLAN Registrar Applicant Forbid
                 State     State     Mode
----------  ---- --------- --------- ---------
1/1/2       1    IN        QA        No
1/1/2       10   MT        VP        No
1/1/2       20   IN        VO        No
1/1/3       1    MT        AA        No
1/1/3       10   IN        VO        No
1/1/3       20   MT        QA        No
```

- It can be observed above Switch D has `IN` Register for VLAN 10 on interface 1/1/3 and for VLAN 20 on interface 1/1/2. This follows the STP topology, and applicant states is in `VO` (Very Anxious Observer)

- Now observe the VLANs and MVRP State and VLANS on Switch C

SwitchC#show vlan

```
---------------------------------------------------------------------------------------------------
VLAN  Name                                Status  Reason              Type      Interfaces
---------------------------------------------------------------------------------------------------
1     DEFAULT_VLAN_1                      up      ok                  default   1/1/2-1/1/3
10    VLAN10                              up      ok                  dynamic   1/1/2
20    VLAN20                              up      ok                  static    1/1/2-1/1/3
```

- It can be seen we now only have a single dynamic VLAN 10 as we statically defined VLAN 20 on Switch C earlier

- Below it is seen the Register `IN` for both VLAN 10 and 20 in the MVRP State. However VLAN 20 is in `QA` (Quietly Active) State. As VLAN 20 was locally defined is on Switch C we only see VLAN 10 as Dynamically learned

SwitchC#show mvrp state

```
Configuration and Status - MVRP state
Port        VLAN Registrar Applicant Forbid
                 State     State     Mode
----------  ---- --------- --------- ---------
1/1/2       1    IN        QA        No
1/1/2       10   IN        VO        No
1/1/2       20   MT        QA        No
1/1/3       1    IN        QA        No
1/1/3       10   MT        AA        No
1/1/3       20   IN        QA        No
```

NOTE: The MVRP "applicant state" can vary as this is continuously checked/refreshed and may be slightly different from the outputs shown above

Task 6 – Basic connectivity test

Note: When VLANs are added to SVI or access ports, dynamic VLANs cannot co-exists on the local switch.

- Now we will observe some basic Layer 3 connectivity from Switch D to Switch C on Vlan 20
- Add VLAN interface 20 to Switch C with an IPV4 address

SwitchC#

```
configure
int vlan 20
ip address 1.1.1.1/30
```

on Switch D add VLAN interface 20, and then add an IPV4 address

SwitchD#

```
configure
interface vlan 20
Ignoring the operation on dynamic VLAN(s) 20.
```

- You will see the above message, you cannot add a VLAN interface or an access port VLAN to a dynamic defined VLAN, MVRP is only supported on trunk ports on Aruba CX.

- To use a dynamic VLAN locally you need to convert it to a static VLAN

- When you convert a Dynamic VLAN to a static VLAN you will be asked if you wish to do this.

```
SwitchD#
configure
vlan 20
VLAN 20 is a Dynamic VLAN.
Do you wish to convert it to static VLAN (y/n)? y
Exit
interface vlan 20
ip address 1.1.1.2/30
```

- It should now be possible to ping between SVI interfaces on VLAN 20 which will traverse the Core

```
SwitchD#
ping 1.1.1.1
PING 1.1.1.1 (1.1.1.1) 100(128) bytes of data.
108 bytes from 1.1.1.1: icmp_seq=1 ttl=64 time=56.6 ms
108 bytes from 1.1.1.1: icmp_seq=2 ttl=64 time=11.0 ms
108 bytes from 1.1.1.1: icmp_seq=3 ttl=64 time=14.3 ms
108 bytes from 1.1.1.1: icmp_seq=4 ttl=64 time=16.6 ms
108 bytes from 1.1.1.1: icmp_seq=5 ttl=64 time=9.87 ms
```

Part II of lab is now completed

Appendix – Complete Configurations

- If you face issues during your lab, you can verify your configs with the configs listed in this section
- If configs are the same, try powering off/powering on the switches to reboot them

Part I Configurations

Switch A

```
hostname SwitchA
mvrp
!
ssh server vrf mgmt
vlan 1
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
!
https-server vrf mgmt
```

Switch C

```
hostname SwitchC
mvrp
!
ssh server vrf mgmt
vlan 1,10
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
!
https-server vrf mgmt
```

Switch D

```
hostname SwitchD
led locator on
mvrp
!
ssh server vrf mgmt
vlan 1,20
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
!
https-server vrf mgmt
```

Part II Configurations

Switch A

```
hostname SwitchA
mvrp
!
!
ssh server vrf mgmt
vlan 1,10
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 1 priority 0
spanning-tree instance 2 vlan 20
spanning-tree instance 2 priority 1
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
!
https-server vrf mgmt
```

Switch B

```
hostname SwitchB
mvrp
!
!
ssh server vrf mgmt
vlan 1,20
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 1 priority 1
spanning-tree instance 2 vlan 20
spanning-tree instance 2 priority 0
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
```

```
    mvrp
!
https-server vrf mgmt
```

Switch C

```
hostname SwitchC
mvrp
!
!
ssh server vrf mgmt
vlan 1,20
spanning-tree
spanning-tree priority 0
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
!
https-server vrf mgmt
```

Switch D

```
hostname SwitchD
mvrp
!
!
ssh server vrf mgmt
vlan 1
spanning-tree
spanning-tree config-name sp1
spanning-tree config-revision 1
spanning-tree instance 1 vlan 10
spanning-tree instance 2 vlan 20
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/2
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/3
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    mvrp
interface 1/1/9
    no routing
    vlan access 1
!
!
https-server vrf mgmt
```

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