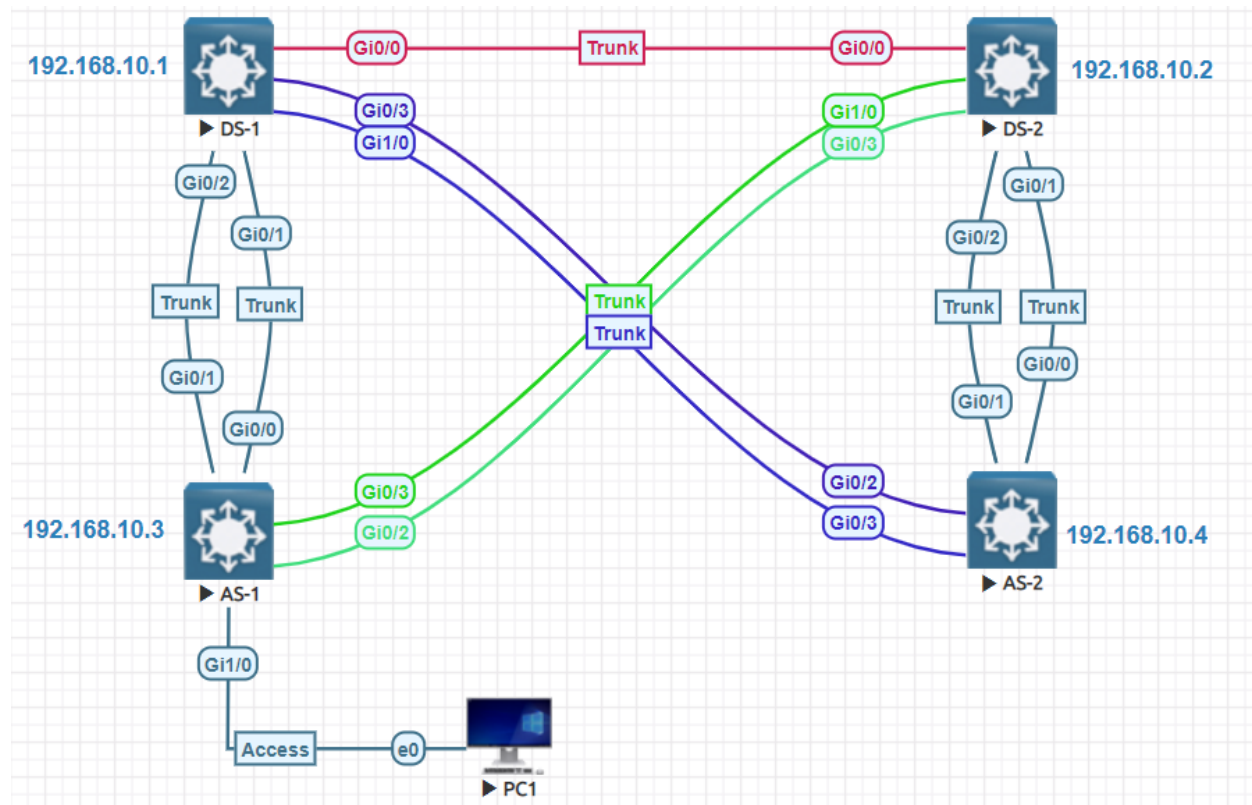


## MSTP Lab:



Switch Images	vios_l2-adventerprisek9-m.ssa.high_iron_20190423
Client PC	Linux-Slax-9.11.0 or VPCS
VLANs	VLAN1 and VLAN10
DS-1 VLAN 10 IP Address	192.168.10.1
DS-2 VLAN 10 IP Address	192.168.10.2
AS-1 VLAN 10 IP Address	192.168.10.3
AS-2 VLAN 10 IP Address	192.168.10.4
DS-1 Trunk Interfaces	G0/0, G0/1, G0/2, G0/3, G1/0
DS-2 Trunk Interfaces	G0/0, G0/1, G0/2, G0/3, G1/0
AS-1 Trunk Interfaces	G0/0, G0/1, G0/2, G0/3
AS-2 Trunk Interfaces	G0/0, G0/1, G0/2, G0/3
AS-1 Access Interface	G1/0
Spanning Tree Mode	MSTP
DS-1 Access Interface	G1/1
DS-2 Access Interface	G1/1
AS-1 Access Interface	G1/1
AS-2 Access Interface	G1/1

### DS-1 Basic Configuration

```
DS-1(config)#hostname DS-1
DS-1(config)#spanning-tree mode rapid-pvst
DS-1(config)#line con 0
DS-1(config-line)#exec-timeout 0 0
DS-1(config-line)#logging synchronous
DS-1(config-line)#exit
DS-1(config)#interface range g0/0-3, g1/0-3
DS-1(config-if-range)#shutdown
DS-1(config-if-range)#exit
```

### DS-1 Trunk Configuration

```
DS-1(config)#interface range g0/0-3, g1/0
DS-1(config-if-range)#switchport trunk encapsulation dot1q
DS-1(config-if-range)#switchport mode trunk
DS-1(config-if-range)#no shutdown
DS-1(config-if-range)#exit
```

### DS-1 VLAN Configuration

```
DS-1(config)#vlan 20
DS-1(config-vlan)#name G20
DS-1(config-vlan)#exit
DS-1(config)#vlan 30
DS-1(config-vlan)#name G30
DS-1(config-vlan)#
DS-1(config-vlan)#exit
DS-1(config)#vlan 40
DS-1(config-vlan)#name G40
DS-1(config-vlan)#exit
DS-1(config)#vlan 50
DS-1(config-vlan)#name G50
DS-1(config-vlan)#exit
```

### DS-1 Interfaces Configuration

```
DS-1(config)#interface g1/1
DS-1(config-if)#switchport access vlan 20
DS-1(config-if)#no shutdown
```

### DS-2 Basic Configuration

```
DS-2(config)#hostname DS-2
DS-2(config)#spanning-tree mode rapid-pvst
DS-2(config)#line con 0
DS-2(config-line)#exec-timeout 0 0
DS-2(config-line)#logging synchronous
DS-2(config-line)#exit
DS-2(config)#interface range g0/0-3, g1/0-3
DS-2(config-if-range)#shutdown
DS-2(config-if-range)#exit
```

### DS-2 Trunk Configuration

```
DS-2(config)#interface range g0/0-3, g1/0
DS-2(config-if-range)#switchport trunk encapsulation dot1q
DS-2(config-if-range)#switchport mode trunk
DS-2(config-if-range)#no shutdown
DS-2(config-if-range)#exit
```

### DS-2 VLAN Configuration

```
DS-2(config)#vlan 20
DS-2(config-vlan)#name G20
DS-2(config-vlan)#exit
DS-2(config)#vlan 30
DS-2(config-vlan)#name G30
DS-2(config-vlan)#exit
DS-2(config)#vlan 40
DS-2(config-vlan)#name G40
DS-2(config-vlan)#exit
DS-2(config)#vlan 50
DS-2(config-vlan)#name G50
DS-2(config-vlan)#exit
```

### DS-2 Interfaces Configuration

```
DS-2(config)#interface g1/1
DS-2(config-if)#switchport access vlan 20
DS-2(config-if)#no shutdown
```

### AS-1 Basic Configuration

```
AS-1(config)#hostname AS-1
AS-1(config)#spanning-tree mode rapid-pvst
AS-1(config)#line con 0
AS-1(config-line)#exec-timeout 0 0
AS-1(config-line)#logging synchronous
AS-1(config-line)#exit
AS-1(config)#interface range g0/0-3, g1/0-3
AS-1(config-if-range)#shutdown
AS-1(config-if-range)#exit
```

### AS-1 Trunk Configuration

```
AS-1(config)#interface range g0/0-3
AS-1(config-if-range)#switchport trunk encapsulation dot1q
AS-1(config-if-range)#switchport mode trunk
AS-1(config-if-range)#no shutdown
AS-1(config-if-range)#exit
```

### AS-1 VLAN Configuration

```
AS-1(config)#vlan 20
AS-1(config-vlan)#name G20
AS-1(config-vlan)#exit
AS-1(config)#vlan 30
AS-1(config-vlan)#name G30
AS-1(config-vlan)#exit
AS-1(config)#vlan 40
AS-1(config-vlan)#name G40
AS-1(config-vlan)#exit
AS-1(config)#vlan 50
AS-1(config-vlan)#name G50
AS-1(config-vlan)#exit
```

### AS-1 Interfaces Configuration

```
AS-1(config)#interface g1/1
AS-1(config-if)#switchport access vlan 20
AS-1(config-if)#no shutdown
```

### AS-2 Basic Configuration

```
AS-2(config)#hostname AS-2
AS-2(config)#spanning-tree mode rapid-pvst
AS-2(config)#line con 0
AS-2(config-line)#exec-timeout 0 0
AS-2(config-line)#logging synchronous
AS-2(config-line)#exit
AS-2(config)#interface range g0/0-3, g1/0-3
AS-2(config-if-range)#shutdown
AS-2(config-if-range)#exit
```

### AS-2 Trunk Configuration

```
AS-2(config)#interface range g0/0-3
AS-2(config-if-range)#switchport trunk encapsulation dot1q
AS-2(config-if-range)#switchport mode trunk
AS-2(config-if-range)#no shutdown
AS-2(config-if-range)#exit
```

### AS-2 VLAN Configuration

```
AS-2(config)#vlan 20
AS-2(config-vlan)#name G20
AS-2(config-vlan)#exit
AS-2(config)#vlan 30
AS-2(config-vlan)#name G30
AS-2(config-vlan)#exit
AS-2(config)#vlan 40
AS-2(config-vlan)#name G40
AS-2(config-vlan)#exit
AS-2(config)#vlan 50
AS-2(config-vlan)#name G50
AS-2(config-vlan)#exit
```

### AS-2 Interfaces Configuration

```
AS-2(config)#interface g1/1
AS-2(config-if)#switchport access vlan 20
AS-2(config-if)#no shutdown
```

## Implement MSTP DS-1, DS-2, AS-1 and AS-2

```
DS-1(config)#spanning-tree mode mst
```

```
DS-2(config)#spanning-tree mode mst
```

```
AS-1(config)#spanning-tree mode mst
```

```
AS-2(config)#spanning-tree mode mst
```

```
DS-1#show spanning-tree
```

```
MST0
```

```
Spanning tree enabled protocol mstp
```

```
Root ID    Priority    32768  
Address    500a.0001.0000
```

```
This bridge is the root
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID Priority    32768 (priority 32768 sys-id-ext 0)
```

```
Address    500a.0001.0000
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Desg	FWD	20000	128.1	P2p
Gi0/1	Desg	FWD	20000	128.2	P2p
Gi0/2	Desg	FWD	20000	128.3	P2p
Gi0/3	Desg	FWD	20000	128.4	P2p
Gi1/0	Desg	FWD	20000	128.5	P2p

```
DS-1#show spanning-tree mst
```

```
##### MST0    vlans mapped: 1-4094
```

```
Bridge        address 500a.0001.0000 priority    32768 (32768 sysid 0)
```

```
Root          this switch for the CIST
```

```
Operational   hello time 2 , forward delay 15, max age 20, txholdcount 6
```

```
Configured    hello time 2 , forward delay 15, max age 20, max hops 20
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Desg	FWD	20000	128.1	P2p
Gi0/1	Desg	FWD	20000	128.2	P2p
Gi0/2	Desg	FWD	20000	128.3	P2p
Gi0/3	Desg	FWD	20000	128.4	P2p
Gi1/0	Desg	FWD	20000	128.5	P2p

```
DS-1#show spanning-tree mst configuration
```

```
Name [ ]
```

```
Revision 0    Instances configured 1
```

```
Instance Vlan mapped
```

```
0 1-4094
```

```
DS-1#show spanning-tree mst configuration digest
Name      []
Revision  0      Instances configured 1
Digest    0xAC36177F50283CD4B83821D8AB26DE62
Pre-std Digest 0xBB3B6C15EF8D089BB55ED10D24DF44DE
```

```
DS-1#show spanning-tree summary
Switch is in mst mode (IEEE Standard)
Root bridge for: MST0
Extended system ID          is enabled
Portfast Default            is disabled
Portfast Edge BPDU Guard Default is disabled
Portfast Edge BPDU Filter Default is disabled
Loopguard Default          is disabled
PVST Simulation             is enabled
Bridge Assurance            is enabled
EtherChannel misconfig guard is enabled
Configured Pathcost method used is short (Operational value is long)
UplinkFast                  is disabled
BackboneFast                is disabled
```

Name	Blocking	Listening	Learning	Forwarding	STP Active
MST0	0	0	0	5	5
1 mst_	0	0	0	5	5

```
DS-2#show spanning-tree
```

```
MST0 ←
Spanning tree enabled protocol mstp
Root ID    Priority    32768
           Address    500a.0001.0000
           Cost      0
           Port      1 (GigabitEthernet0/0)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
           Address    500a.0002.0000
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Root	FWD	20000	128.1	P2p
Gi0/1	Desg	FWD	20000	128.2	P2p
Gi0/2	Desg	FWD	20000	128.3	P2p
Gi0/3	Desg	FWD	20000	128.4	P2p
Gi1/0	Desg	FWD	20000	128.5	P2p

```
DS-2#show spanning-tree root
```

MST Instance	Root ID	Root Cost	Hello Time	Max Age	Fwd Dly	Root Port
MST0	32768 500a.0001.0000	0	2	20	15	Gi0/0

### MSTP DS-1, DS-2, AS-1 and AS-2

```
DS-1(config)#spanning-tree mst configuration
DS-1(config-mst)#name test
DS-1(config-mst)#revision 1
DS-1(config-mst)#instance 1 vlan 20,30
DS-1(config-mst)#instance 2 vlan 40,50
DS-1(config-mst)#exit
DS-1(config)#exit
```

```
DS-2(config)#spanning-tree mst configuration
DS-2(config-mst)#name test
DS-2(config-mst)#revision 1
DS-2(config-mst)#instance 1 vlan 20,30
DS-2(config-mst)#instance 2 vlan 40,50
DS-2(config-mst)#exit
DS-2(config)#exit
```

```
AS-1(config)#spanning-tree mst configuration
AS-1(config-mst)#name test
AS-1(config-mst)#revision 1
AS-1(config-mst)#instance 1 vlan 20,30
AS-1(config-mst)#instance 2 vlan 40,50
AS-1(config-mst)#exit
AS-1(config)#exit
```

```
AS-2(config)#spanning-tree mst configuration
AS-2(config-mst)#name test
AS-2(config-mst)#revision 1
AS-2(config-mst)#instance 1 vlan 20,30
AS-2(config-mst)#instance 2 vlan 40,50
AS-2(config-mst)#exit
AS-2(config)#exit
```

```
DS-1#show spanning-tree mst configuration
```

```
Name [test]
```

```
Revision 1 Instances configured 3
```

```
Instance Vlans mapped
```

```
-----  
0 1-19,21-29,31-39,41-49,51-4094
```

```
1 20,30
```

```
2 40,50  
-----
```

DS-1#show spanning-tree bridge

MST Instance	Bridge ID	Hello Time	Max Age	Fwd Dly	Protocol
MST0	32768 (32768, 0) 500a.0001.0000	2	20	15	mstp
MST1	32769 (32768, 1) 500a.0001.0000	2	20	15	mstp
MST2	32770 (32768, 2) 500a.0001.0000	2	20	15	mstp

DS-1#show spanning-tree root

MST Instance	Root ID	Root Cost	Hello Time	Max Age	Fwd Dly	Root Port
MST0	32768 500a.0001.0000	0	2	20	15	
MST1	32769 500a.0001.0000	0	2	20	15	
MST2	32770 500a.0001.0000	0	2	20	15	

```
##### MST0 vlans mapped: 1-19,21-29,31-39,41-49,51-4094
Bridge address 500a.0001.0000 priority 32768 (32768 sysid 0)
Root this switch for the CIST
Operational hello time 2 , forward delay 15, max age 20, txholdcount 6
Configured hello time 2 , forward delay 15, max age 20, max hops 20
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Desg	FWD	20000	128.1	P2p
Gi0/1	Desg	FWD	20000	128.2	P2p
Gi0/2	Desg	FWD	20000	128.3	P2p
Gi0/3	Desg	FWD	20000	128.4	P2p
Gi1/0	Desg	FWD	20000	128.5	P2p

```
##### MST1 vlans mapped: 20,30
Bridge address 500a.0001.0000 priority 32769 (32768 sysid 1)
Root this switch for MST1
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Desg	FWD	20000	128.1	P2p
Gi0/1	Desg	FWD	20000	128.2	P2p
Gi0/2	Desg	FWD	20000	128.3	P2p
Gi0/3	Desg	FWD	20000	128.4	P2p
Gi1/0	Desg	FWD	20000	128.5	P2p

```
##### MST2 vlans mapped: 40,50
Bridge address 500a.0001.0000 priority 32770 (32768 sysid 2)
Root this switch for MST2
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
-----------	------	-----	------	----------	------

DS-2#show spanning-tree mst

```
##### MST0      vlans mapped: 1-19,21-29,31-39,41-49,51-4094
Bridge          address 500a.0002.0000 priority 32768 (32768 sysid 0)
Root            address 500a.0001.0000 priority 32768 (32768 sysid 0)
                  port    Gi0/0      path cost 0
Regional Root  address 500a.0001.0000 priority 32768 (32768 sysid 0)
                  internal cost 20000      rem hops 19
Operational     hello time 2 , forward delay 15, max age 20, txholdcount 6
Configured      hello time 2 , forward delay 15, max age 20, max hops 20
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Gi0/0	Root	FWD	20000	128.1		P2p
Gi0/1	Desg	BLK	20000	128.2		P2p Dispute
Gi0/2	Desg	BLK	20000	128.3		P2p Dispute
Gi0/3	Desg	BLK	20000	128.4		P2p
Gi1/0	Desg	BLK	20000	128.5		P2p

```
##### MST1      vlans mapped: 20,30
Bridge          address 500a.0002.0000 priority 32769 (32768 sysid 1)
Root            address 500a.0001.0000 priority 32769 (32768 sysid 1)
                  port    Gi0/0      cost      20000      rem hops 19
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Gi0/0	Root	FWD	20000	128.1		P2p
Gi0/1	Desg	BLK	20000	128.2		P2p Dispute
Gi0/2	Desg	BLK	20000	128.3		P2p Dispute
Gi0/3	Desg	BLK	20000	128.4		P2p
Gi1/0	Desg	BLK	20000	128.5		P2p

DS-1 MSTP Root Bridge
DS-1(config)#spanning-tree mst 1 root primary
DS-1(config)#spanning-tree mst 2 root secondary
DS-1 MSTP Root Bridge
DS-2(config)#spanning-tree mst 2 root primary
DS-2(config)#spanning-tree mst 1 root secondary

Verification
DS-1#show spanning-tree mst
DS-2#show spanning-tree mst
DS-1#show spanning-tree root
DS-2#show spanning-tree root
DS-1#show spanning-tree
DS-2#show spanning-tree