Lab 04

Phase 1: Enterprise Foundation

Lab 04: Enterprise VLAN & Trunk Operations

Lab type: Enterprise Foundation Build Lab
Difficulty: Intermediate
Estimated time: 120–150 minutes

Lab objective

You will deploy enterprise VLAN segmentation and configure 802.1Q trunk operations between multiple enterprise switches.

By the end of this lab, you will be able to:

- Create enterprise VLANs
- Assign access ports
- Configure and validate enterprise trunk links
- Verify VLAN propagation and Layer 2 forwarding behavior
- Troubleshoot VLAN inconsistencies
- Build a scalable enterprise Layer 2 foundation

Why this lab matters

Enterprise networks rely heavily on VLAN segmentation to:

- Isolate departments
- Reduce broadcast domains
- Improve security
- Simplify operations
- Support scalable enterprise architectures

Improper VLAN deployment can cause:

- Broadcast storms
- Traffic leaks
- Spanning-tree instability
- Management outages
- Large-scale Layer 2 failures

This lab introduces an operational workflow used in real enterprise campus switching environments.

Enterprise scenario

Your organization is expanding its enterprise campus infrastructure.

Management requires separate VLANs for:

- Sales
- Engineering
- Management services

You are assigned to:

- Deploy enterprise VLAN segmentation
- Configure trunk links between switches
- Validate VLAN communication
- Ensure enterprise Layer 2 operations function correctly before routing services are introduced

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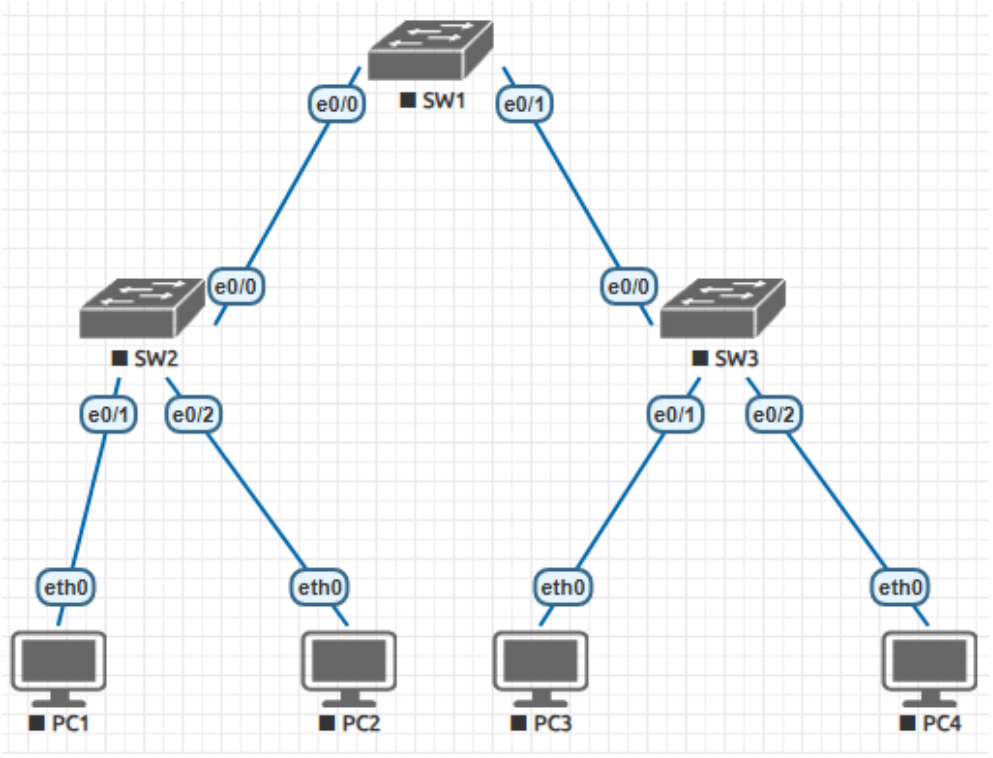
Topology

Topology for EVE-NG & GNS3



Connection table

Device	Interface	Connected To	Interface
SW1	Ethernet0/0	SW2	Ethernet0/0
SW1	Ethernet0/1	SW3	Ethernet0/0
SW2	Ethernet0/1	PC1	eth0
SW2	Ethernet0/2	PC2	eth0
SW3	Ethernet0/1	PC3	eth0
SW3	Ethernet0/2	PC4	eth0

Design & Standards

VLAN design table

VLAN ID	VLAN Name	Department
10	SALES	Sales
20	ENGINEERING	Engineering
99	MANAGEMENT	Native/Management

IP addressing table

Device	Interface	IP Address	VLAN
PC1	eth0	10.10.10.10/24	VLAN 10
PC2	eth0	10.20.20.10/24	VLAN 20
PC3	eth0	10.10.10.20/24	VLAN 10
PC4	eth0	10.20.20.20/24	VLAN 20

Enterprise naming standards

Device type	Naming convention
Distribution switch	SW1
Access switch	SW2
Access switch	SW3
Sales endpoint	PC1 / PC3
Engineering endpoint	PC2 / PC4

Required images

Device	Purpose
Cisco IOLL2	Enterprise Layer 2 switching
VPCS	Endpoint validation

Section A: Enterprise build scenario

Step 1: Deploy nodes in EVE-NG

Goal: Deploy the enterprise Layer 2 topology.

Add the following nodes

Node	Quantity
IOLL2 Switch	3
VPCS Host	4

Step 2: Connect the enterprise topology

Goal: Create all enterprise Layer 2 connections.

Use the Connection Table above.

Step 3: Configure VPCS hosts

PC1

```
ip 10.10.10.10/24
set pcname PC1
save
```

PC2

```
ip 10.20.20.10/24
set pcname PC2
save
```

PC3

```
ip 10.10.10.20/24
set pcname PC3
save
```

PC4

```
ip 10.20.20.20/24
set pcname PC4
save
```

Verification

```
show ip
```

```
PC4> show ip

NAME        : PC4[1]
IP/MASK     : 10.20.20.20/24
GATEWAY     : 0.0.0.0
DNS         :
MAC         : 00:50:79:66:68:04
LPORT       : 20000
RHOST:PORT  : 127.0.0.1:30000
MTU         : 1500
```

Expected result: All VPCS hosts should display correct IP addressing, proper subnet masks, and operational interfaces.

Step 4: Configure SW1 (distribution switch)

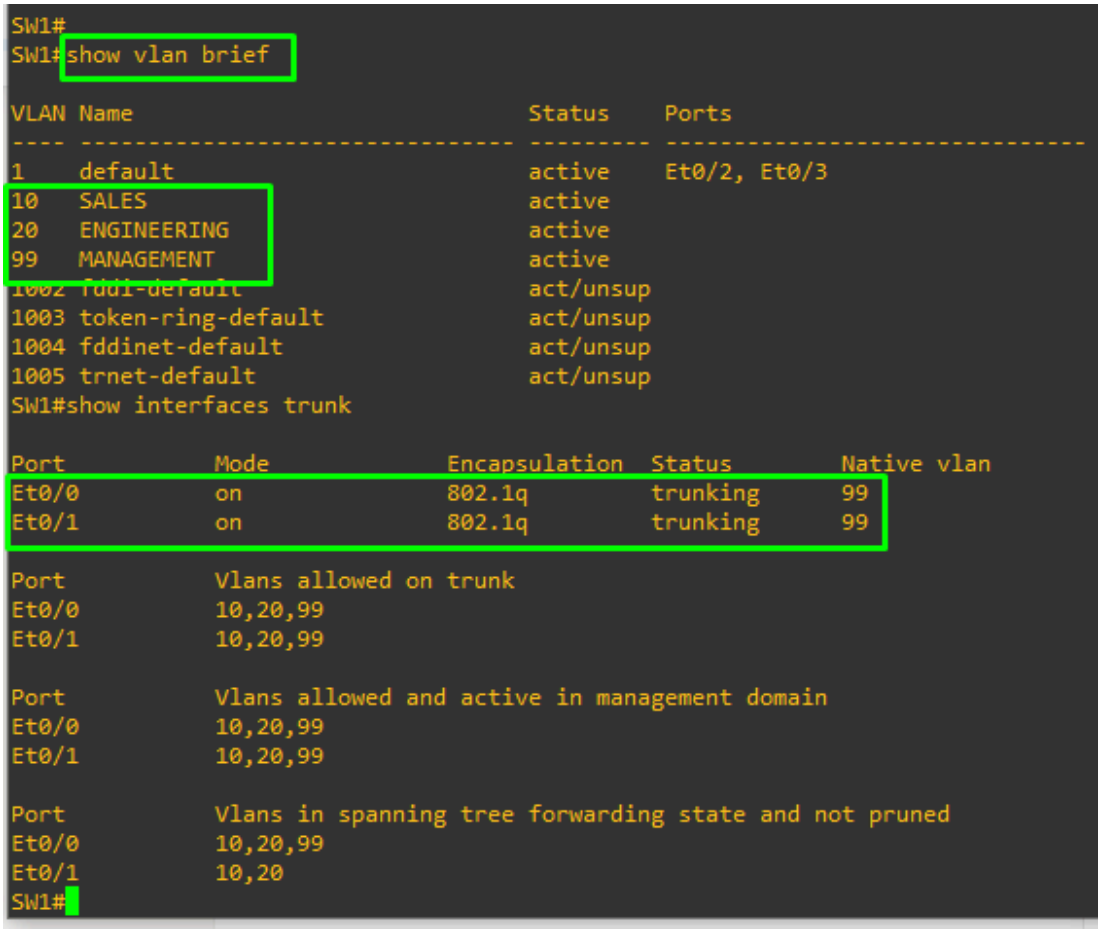
Goal: Configure enterprise VLAN database and trunk operations.

Commands

```
enable
conf t

hostname SW1

vlan 10
 name SALES

vlan 20
 name ENGINEERING

vlan 99
 name MANAGEMENT

interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport trunk native vlan 99
 switchport trunk allowed vlan 10,20,99
 no shutdown

interface Ethernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport trunk native vlan 99
 switchport trunk allowed vlan 10,20,99
 no shutdown

end
write memory
```

Verification

```
show vlan brief
show interfaces trunk
```



Expected result: VLANs 10, 20, and 99 active; trunk links operational; correct allowed VLAN lists.

Step 5: Configure SW2 (access switch)

Goal: Configure enterprise access switch operations.

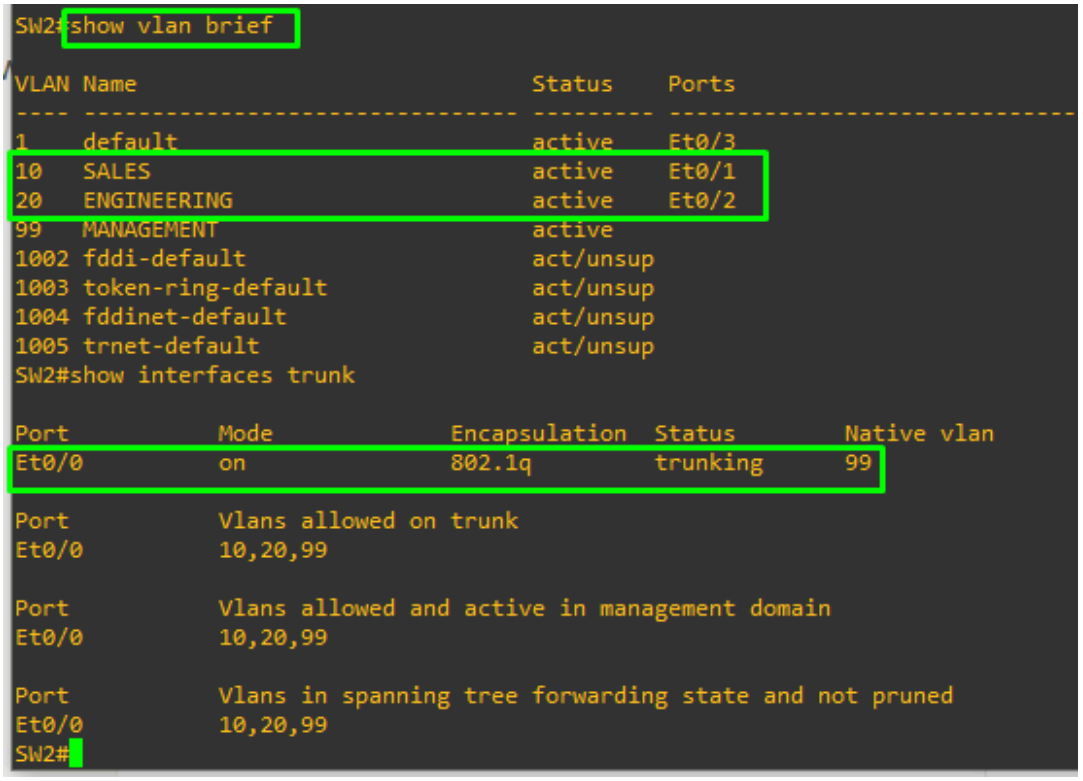
Commands

```
enable
conf t

hostname SW2
```

```
vlan 10
 name SALES

vlan 20
 name ENGINEERING

vlan 99
 name MANAGEMENT

interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport trunk native vlan 99
 switchport trunk allowed vlan 10,20,99
 no shutdown

interface Ethernet0/1
 switchport mode access
 switchport access vlan 10
 spanning-tree portfast
 no shutdown

interface Ethernet0/2
 switchport mode access
 switchport access vlan 20
 spanning-tree portfast
 no shutdown

end
write memory
```

Verification

```
show vlan brief
show interfaces trunk
```



Expected result: Access ports appear under correct VLANs; trunk link operational; VLAN database matches SW1.

Step 6: Configure SW3 (access switch)

Goal: Configure additional enterprise access switch operations.

Commands

```
enable
conf t

hostname SW3

vlan 10
 name SALES

vlan 20
 name ENGINEERING

vlan 99
 name MANAGEMENT

interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport trunk native vlan 99
```

```
 switchport trunk allowed vlan 10,20,99
 no shutdown

interface Ethernet0/1
 switchport mode access
 switchport access vlan 10
 spanning-tree portfast
 no shutdown

interface Ethernet0/2
 switchport mode access
 switchport access vlan 20
 spanning-tree portfast
 no shutdown

end
write memory
```

Verification

```
show vlan brief
show interfaces trunk
```

Expected result: Access ports operational; VLANs active; trunk link forwarding correctly.

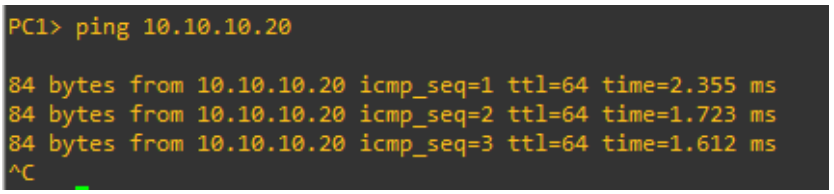
Step 7: Validate enterprise VLAN connectivity

Goal: Validate Layer 2 forwarding across enterprise VLANs.

From PC1 (VLAN 10)

```
ping 10.10.10.20
```

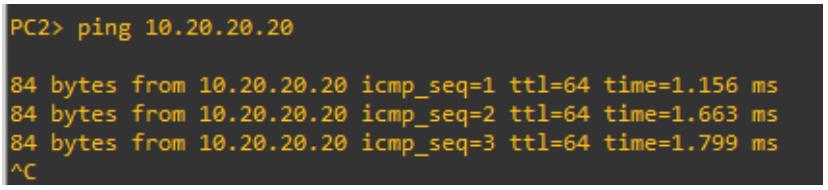
Expected result: PC3 responds successfully (both endpoints are in VLAN 10).



From PC2 (VLAN 20)

```
ping 10.20.20.20
```

Expected result: PC4 responds successfully (both endpoints are in VLAN 20).



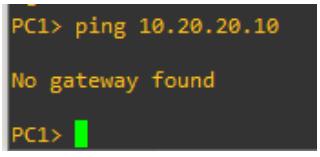
Step 8: Validate VLAN isolation

Goal: Validate enterprise traffic isolation (no inter-VLAN routing yet).

From PC1 (VLAN 10)

```
ping 10.20.20.10
```

Expected result: Ping fails because inter-VLAN routing has not been configured.

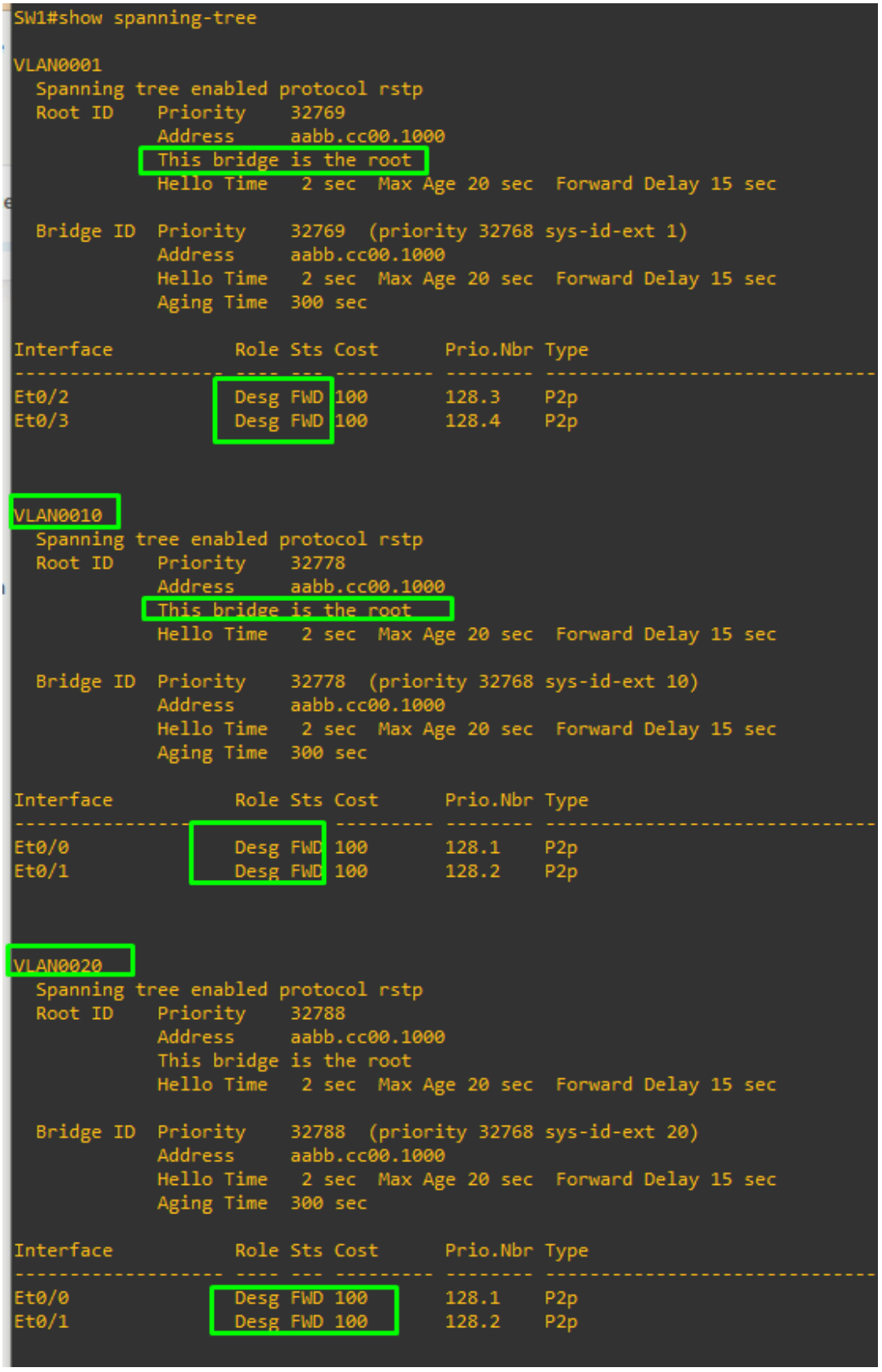


Step 9: Enterprise verification

SW1 verification

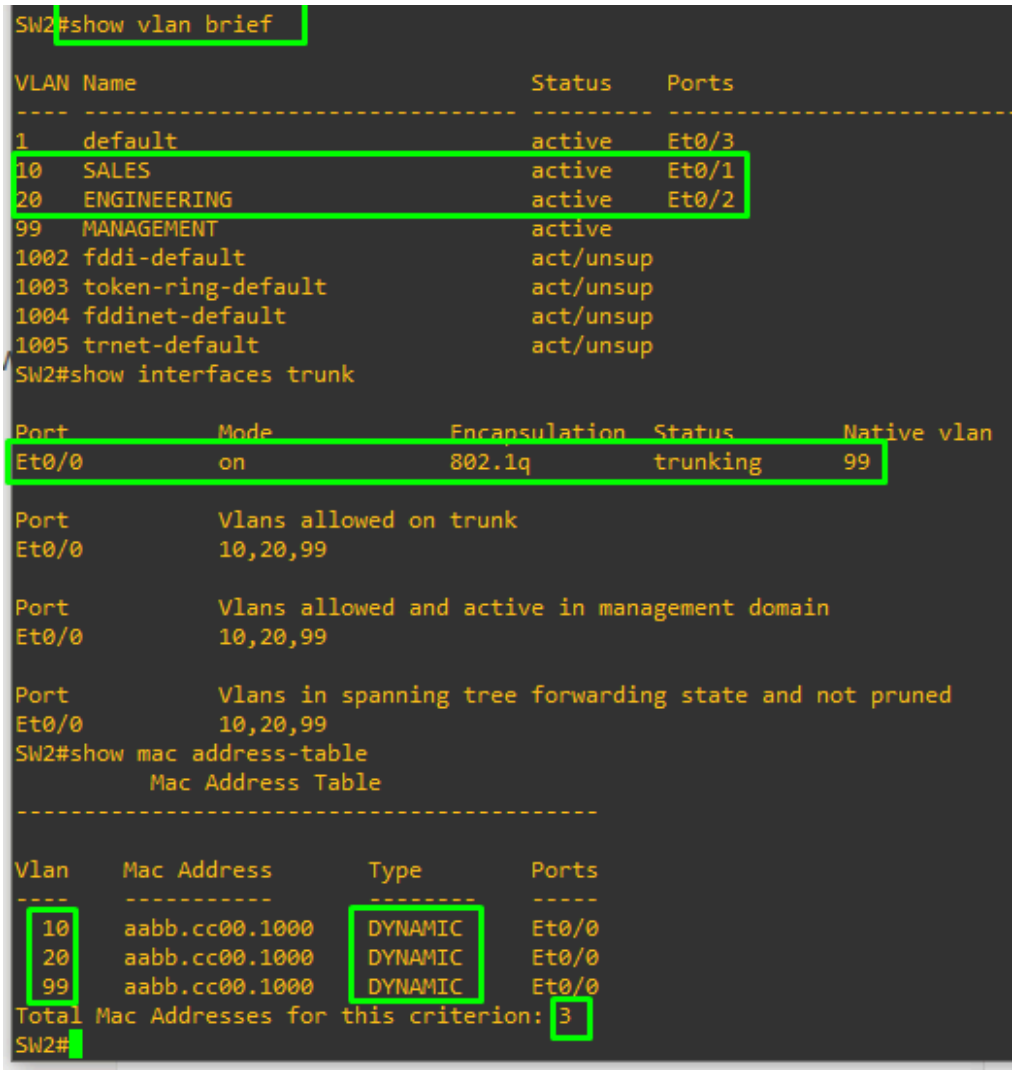
```
show vlan brief
show interfaces trunk
show spanning-tree
```

```
SW1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Et0/2, Et0/3
10   SALES                            active
20   ENGINEERING                      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
SW1#show interfaces trunk

Port          Mode             Encapsulation  Status        Native vlan
Et0/0         on               802.1q         trunking      99
Et0/1         on               802.1q         trunking      99

Port          Vlans allowed on trunk
Et0/0         10,20,99
Et0/1         10,20,99

Port          Vlans allowed and active in management domain
Et0/0         10,20,99
Et0/1         10,20,99

Port          Vlans in spanning tree forwarding state and not pruned
Et0/0         10,20,99
Et0/1         10,20,99
```



SW2 verification

```
show vlan brief
show interfaces trunk
show mac address-table
```



SW3 verification

```
show vlan brief
show interfaces trunk
show mac address-table
```

Common mistakes

Problem	Cause
VLAN traffic failure	Missing trunk configuration
Hosts unreachable	Wrong VLAN assignment
Native VLAN mismatch	Incorrect trunk native VLAN
VLAN missing	VLAN not created
MAC addresses not learned	Layer 2 connectivity issue

Engineering notes (build)

- VLANs reduce enterprise broadcast domains.
- Trunk links carry multiple VLANs simultaneously.
- Native VLAN consistency is critical for operational stability.
- Enterprise access ports should always use PortFast.
- Structured VLAN design improves scalability and security.

Step 10: Save configurations

SW1

```
write memory
```

SW2

```
write memory
```

SW3

```
write memory
```

Step 11: Backup enterprise VLAN documentation

Goal: Document enterprise VLAN assignments.

Suggested documentation

```
VLAN 10  -> SALES
VLAN 20  -> ENGINEERING
VLAN 99  -> MANAGEMENT

PC1 -> VLAN 10
PC2 -> VLAN 20
PC3 -> VLAN 10
PC4 -> VLAN 20
```

What you learned (build)

In this lab you learned:

- Enterprise VLAN deployment
- Trunk link configuration
- Access port assignment
- VLAN forwarding validation
- Layer 2 traffic isolation
- Enterprise switch verification
- VLAN operational troubleshooting workflows

Verification score

Task	Status
VLANs configured	☐
Trunks operational	☐
Access ports assigned	☐
VLAN propagation verified	☐
Connectivity validated	☐
Isolation validated	☐
Configurations saved	☐

Section B: Enterprise troubleshooting scenario

Incident scenario

Users report that devices in VLAN 20 cannot communicate across the enterprise network.

Your task:

- Investigate the issue
- Identify the root cause
- Restore enterprise VLAN communication

Step 1: Introduce failure

On SW3

```
enable
conf t

interface Ethernet0/0
 switchport trunk allowed vlan 10,99

end
```

Step 2: Verify failure symptoms

From PC2

```
ping 10.20.20.20
```

Expected result: Ping fails because VLAN 20 is no longer allowed across the trunk.

Step 3: Begin investigation

Verification commands

```
show interfaces trunk
```

Expected result: VLAN 20 is missing from the allowed VLAN list.

Root cause analysis

The enterprise trunk link was incorrectly filtering VLAN 20 traffic.

Without VLAN propagation:

- Endpoints lose connectivity
- Enterprise segmentation breaks
- Operational services fail

Step 4: Restore enterprise connectivity

Commands

```
enable
conf t

interface Ethernet0/0
 switchport trunk allowed vlan 10,20,99

end
```

Step 5: Validate recovery

From PC2

```
ping 10.20.20.20
```

Expected result: VLAN 20 communication is restored successfully.

Final enterprise validation

SW1

```
show interfaces trunk
```

SW2

```
show vlan brief
```

SW3

```
show interfaces trunk
```

Final engineering note

Enterprise Layer 2 troubleshooting should always follow a structured workflow:

1. Verify physical connectivity
2. Verify trunk state
3. Verify VLAN existence
4. Verify allowed VLAN lists
5. Verify access VLAN assignment
6. Restore VLAN propagation
7. Validate end-to-end recovery

End of Lab 04: Enterprise VLAN & Trunk Operations