



Configuring and Managing VSANs

This chapter describes how to configure and manage VSANs.

This chapter includes the following sections:

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Configuring and Managing VSANs

You can achieve higher security and greater stability in Fibre Channel fabrics by using virtual SANs (VSANs). VSANs provide isolation among devices that are physically connected to the same fabric. With VSANs you can create multiple logical SANs over a common physical infrastructure. Each VSAN can contain up to 239 switches and has an independent address space that allows identical Fibre Channel IDs (FC IDs) to be used simultaneously in different VSANs.

Information About VSANs

A VSAN is a virtual storage area network (SAN). A SAN is a dedicated network that interconnects hosts and storage devices primarily to exchange SCSI traffic. In SANs you use the physical links to make these interconnections. A set of protocols run over the SAN to handle routing, naming, and zoning. You can design multiple SANs with different topologies.

You can achieve higher security and greater stability in Fibre Channel fabrics by using virtual SANs (VSANs). VSANs provide isolation among devices that are physically connected to the same fabric. With VSANs you can create multiple logical SANs over a common physical infrastructure. Each VSAN can contain up to 239 switches and has an independent address space that allows identical Fibre Channel IDs (FC IDs) to be used simultaneously in different VSANs.

VSAN Topologies

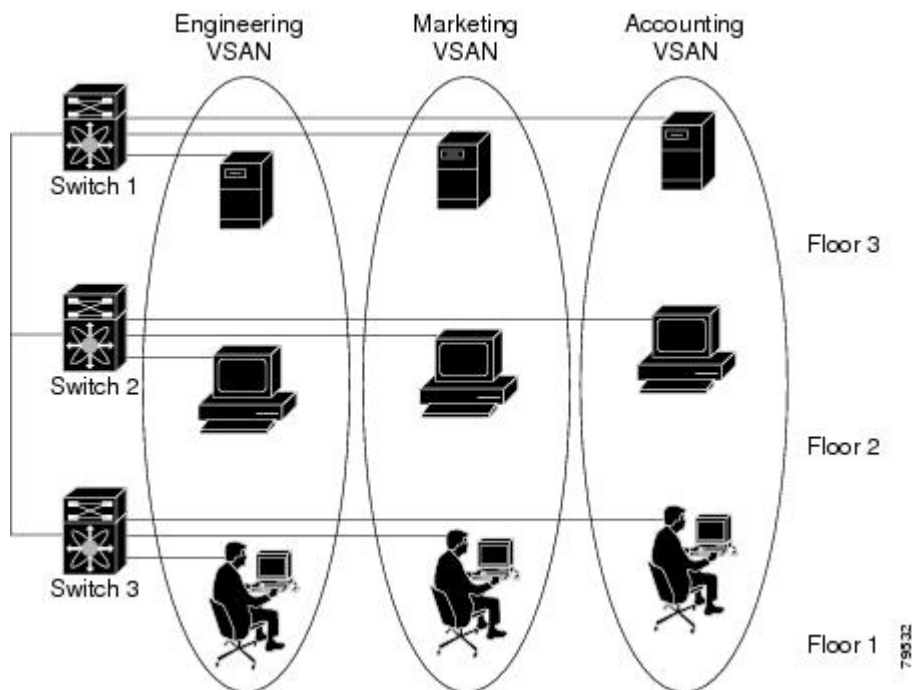
A VSAN has the following additional features:

- Multiple VSANs can share the same physical topology.
- The same Fibre Channel IDs (FC IDs) can be assigned to a host in another VSAN, which increases VSAN scalability.

- Every instance of a VSAN runs all required protocols such as FSPF, domain manager, and zoning.
- Fabric-related configurations in one VSAN do not affect the associated traffic in another VSAN.
- Events causing traffic disruptions in one VSAN are contained within that VSAN and are not propagated to other VSANs.

The following figure shows a fabric with three switches, one on each floor. The geographic location of the switches and the attached devices is independent of their segmentation into logical VSANs. No communication between VSANs is possible. Within each VSAN, all members can talk to one another.

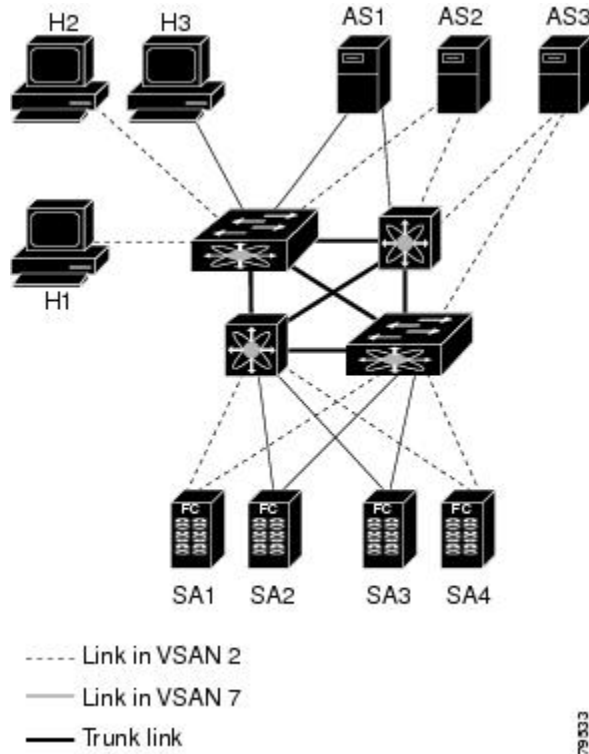
Figure 1: Logical VSAN Segmentation



The application servers or storage arrays can be connected to the switch using Fibre Channel or virtual Fibre Channel interfaces. A VSAN can include a mixture of Fibre Channel and virtual Fibre Channel interfaces.

The following figure shows a physical Fibre Channel switching infrastructure with two defined VSANs: VSAN 2 (dashed) and VSAN 7 (solid). VSAN 2 includes hosts H1 and H2, application servers AS2 and AS3, and storage arrays SA1 and SA4. VSAN 7 connects H3, AS1, SA2, and SA3.

Figure 2: Example of Two VSANs



The four switches in this network are interconnected by VSAN trunk links that carry both VSAN 2 and VSAN 7 traffic. You can configure a different inter-switch topology for each VSAN. In the preceding figure, the inter-switch topology is identical for VSAN 2 and VSAN 7.

Without VSANs, a network administrator would need separate switches and links for separate SANs. By enabling VSANs, the same switches and links might be shared by multiple VSANs. VSANs allow SANs to be built on port granularity instead of switch granularity. The preceding figure illustrates that a VSAN is a group of hosts or storage devices that communicate with each other using a virtual topology defined on the physical SAN.

The criteria for creating such groups differ based on the VSAN topology:

- VSANs can separate traffic based on the following requirements:
 - Different customers in storage provider data centers
 - Production or test in an enterprise network
 - Low and high security requirements
 - Backup traffic on separate VSANs
 - Replicating data from user traffic

- VSANs can meet the needs of a particular department or application.

VSAN Advantages

VSANs offer the following advantages:

- Traffic isolation—Traffic is contained within VSAN boundaries and devices reside only in one VSAN ensuring absolute separation between user groups, if desired.
- Scalability—VSANs are overlaid on top of a single physical fabric. The ability to create several logical VSAN layers increases the scalability of the SAN.
- Per VSAN fabric services—Replication of fabric services on a per VSAN basis provides increased scalability and availability.
- Redundancy—Several VSANs created on the same physical SAN ensure redundancy. If one VSAN fails, redundant protection (to another VSAN in the same physical SAN) is configured using a backup path between the host and the device.
- Ease of configuration—Users can be added, moved, or changed between VSANs without changing the physical structure of a SAN. Moving a device from one VSAN to another only requires configuration at the port level, not at a physical level.

Up to 256 VSANs can be configured in a switch. Of these, one is a default VSAN (VSAN 1), and another is an isolated VSAN (VSAN 4094). User-specified VSAN IDs range from 2 to 4093.

VSANs Versus Zones

Zones are always contained within a VSAN. You can define multiple zones in a VSAN.

Because two VSANs are equivalent to two unconnected SANs, zone A on VSAN 1 is different and separate from zone A in VSAN 2. The following table lists the differences between VSANs and zones.

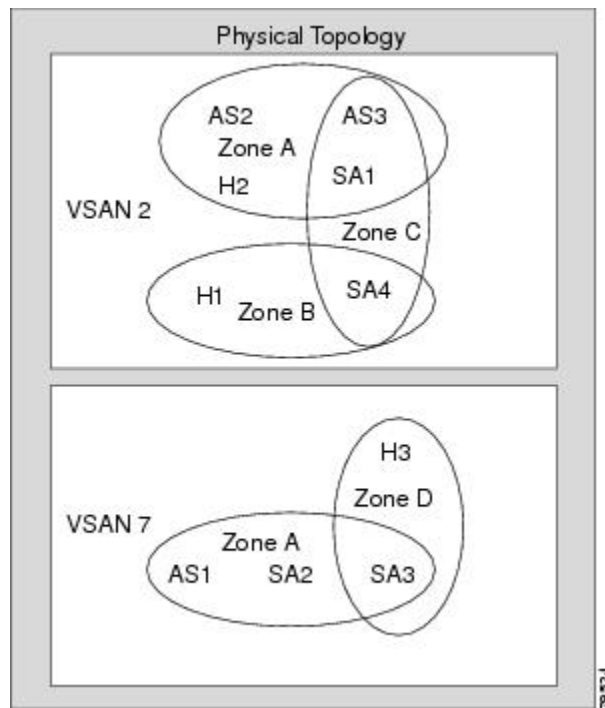
Table 1: VSAN and Zone Comparison

VSAN Characteristic	Zone Characteristic
VSANs equal SANs with routing, naming, and zoning protocols.	Routing, naming, and zoning protocols are not available on a per-zone basis.
VSANs limit unicast, multicast, and broadcast traffic.	Zones limit unicast traffic.
Membership is typically defined using the VSAN ID to F ports.	Membership is typically defined by the pWWN.
An HBA or a storage device can belong only to a single VSAN (the VSAN associated with the F port).	An HBA or storage device can belong to multiple zones.
VSANs enforce membership at each E port, source port, and destination port.	Zones enforce membership only at the source and destination ports.

VSAN Characteristic	Zone Characteristic
VSANs are defined for larger environments (storage service providers).	Zones are defined for a set of initiators and targets not visible outside the zone.
VSANs encompass the entire fabric.	Zones are configured at the fabric edge.

The following figure shows the possible relationships between VSANs and zones. In VSAN 2, three zones are defined: zone A, zone B, and zone C. Zone C overlaps both zone A and zone B as permitted by Fibre Channel standards. In VSAN 7, two zones are defined: zone A and zone D. No zone crosses the VSAN boundary. Zone A defined in VSAN 2 is different and separate from zone A defined in VSAN 7.

Figure 3: VSANS with Zoning



Guidelines and Limitations for VSANs

VSANs have the following configuration guidelines and limitations:

- VSAN ID—The VSAN ID identifies the VSAN as the default VSAN (VSAN 1), user-defined VSANs (VSAN 2 to 4093), and the isolated VSAN (VSAN 4094).
- State—The administrative state of a VSAN can be configured to an active (default) or suspended state. Once VSANs are created, they may exist in various conditions or states.
 - The active state of a VSAN indicates that the VSAN is configured and enabled. By enabling a VSAN, you activate the services for that VSAN.

- The suspended state of a VSAN indicates that the VSAN is configured but not enabled. If a port is configured in this VSAN, it is disabled. Use this state to deactivate a VSAN without losing the VSAN's configuration. All ports in a suspended VSAN are disabled. By suspending a VSAN, you can preconfigure all the VSAN parameters for the whole fabric and activate the VSAN immediately.
- VSAN name—This text string identifies the VSAN for management purposes. The name can be from 1 to 32 characters long and it must be unique across all VSANs. By default, the VSAN name is a concatenation of VSAN and a four-digit string representing the VSAN ID. For example, the default name for VSAN 3 is VSAN0003.



Note A VSAN name must be unique.

- Load-balancing attributes—These attributes indicate the use of the source-destination ID (src-dst-id) or the originator exchange OX ID (src-dst-ox-id, the default) for load-balancing path selection.
- A VSAN is in the operational state if the VSAN is active and at least one port is up. This state indicates that traffic can pass through this VSAN. This state cannot be configured.
- You can create only 14 VSANs in N5672UP-16G, including the default VSAN 1.
- For an NPV switch which is configured for trunking on any interface, or for a regular switch where the f port-channel-trunk command is issued to enable the Trunking F Port Channels feature, follow these configuration guidelines for reserved VSANs and isolated VSAN:
 - If the trunk mode is enabled for any of the interfaces, or if the NP port channel is up, the reserved VSANs range from 3840 to 4078, which are not available for user configuration.
 - The Exchange Virtual Fabric Protocol (EVFP) isolated VSAN is 4079, and it is not available for user configuration.

About VSAN Creation

A VSAN is in the operational state if the VSAN is active and at least one port is up. This state indicates that traffic can pass through this VSAN. This state cannot be configured.

Creating VSANs Statically

You cannot configure any application-specific parameters for a VSAN before creating the VSAN.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.

	Command or Action	Purpose
Step 2	vsan database Example: switch(config)# vsan database	Configures the database for a VSAN. Application specific VSAN parameters cannot be configured from this prompt.
Step 3	vsan vsan-id Example: switch(config-vsan-db)# vsan 360	Creates a VSAN with the specified ID if that VSAN does not exist already.
Step 4	vsan vsan-id name name Example: switch(config-vsan-db)# vsan 360 name test	Updates the VSAN with the assigned name.
Step 5	vsan vsan-id suspend Example: switch(config-vsan-db)# vsan 470 suspend	Suspends the selected VSAN.
Step 6	switch(config-vsan-db)# no vsan vsan-id suspend Example: switch(config-vsan-db)# no vsan 470 suspend	Negates the suspend command issued in the previous step.
Step 7	switch(config-vsan-db)# end Example: switch(config-vsan-db)# end	Returns you to EXEC mode.

Port VSAN Membership

Port VSAN membership on the switch is assigned on a port-by-port basis. By default each port belongs to the default VSAN. You can assign VSAN membership to ports using one of two methods:

- Statically—Assigning VSANs to ports.
- Dynamically—Assigning VSANs based on the device WWN. This method is referred to as dynamic port VSAN membership (DPVM). Cisco Nexus devices do not support DPVM.

VSAN trunking ports have an associated list of VSANs that are part of an allowed list.

Related Topics

[Assigning Static Port VSAN Membership](#), on page 8
[Configuring VSAN Trunking](#)

Assigning Static Port VSAN Membership

You can statically assign VSAN membership for an interface port.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	vsan database Example: switch(config)# vsan database switch(config-vsan-db)#	Configures the database for a VSAN.
Step 3	vsan vsan-id Example: switch(config-vsan-db)# vsan 50	Creates a VSAN with the specified ID if that VSAN does not exist already.
Step 4	switch(config-vsan-db)# vsan vsan-id interface {fc slot/port vfc vfc-id}	Assigns the membership of the specified interface to the VSAN. Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .
Step 5	switch(config-vsan-db)# vsan vsan-id {fc slot/port vfc vfc-id}	Updates the membership information of the interface to reflect the changed VSAN. Note To remove the VSAN membership of a FC or vFC interface, assign the VSAN membership of that interface to another VSAN. Cisco recommends that you assign it to VSAN 1. Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .

Displaying VSAN Static Membership

To display the VSAN static membership information, use the **show vsan membership** command.

The following example displays membership information for the specified VSAN:

```
switch # show vsan 1 membership
vsan 1 interfaces:
    fc2/1    fc2/2    fc2/3    fc2/4
    san-port-channel 3    vfc1/1
```




Note Interface information is not displayed if interfaces are not configured on this VSAN.

The following example displays membership information for all VSANs:

```
switch # show vsan membership
vsan 1 interfaces:
    fc2/1    fc2/2    fc2/3    fc2/4

    san-port-channel 3  vfc3/1
vsan 2 interfaces:
    fc2/3 vfc4/1
vsan 7 interfaces:
vsan 100 interfaces:
vsan 4094(isolated vsan) interfaces:
```

The following example displays static membership information for the specified interface:

```
switch # show vsan membership interface fc2/1
fc2/1
    vsan:1
    allowed list:1-4093
```

Default VSANs

The factory settings for Cisco SAN switches have only the default VSAN 1 enabled. We recommend that you do not use VSAN 1 as your production environment VSAN. If no VSANs are configured, all devices in the fabric are considered part of the default VSAN. By default, all ports are assigned to the default VSAN.



Note VSAN 1 cannot be deleted, but it can be suspended.

Up to 256 VSANs can be configured in a switch. Of these, one is a default VSAN (VSAN 1), and another is an isolated VSAN (VSAN 4094). User-specified VSAN IDs range from 2 to 4093.

Isolated VSANs

VSAN 4094 is an isolated VSAN. When a VSAN is deleted, all nontrunking ports are transferred to the isolated VSAN to avoid an implicit transfer of ports to the default VSAN or to another configured VSAN. This action ensures that all ports in the deleted VSAN become isolated (disabled).



Note When you configure a port in VSAN 4094 or move a port to VSAN 4094, that port is immediately isolated.



Caution Do not use an isolated VSAN to configure ports.



Note Up to 256 VSANs can be configured in a switch. Of these, one is a default VSAN (VSAN 1), and another is an isolated VSAN (VSAN 4094). User-specified VSAN IDs range from 2 to 4093.

Displaying Isolated VSAN Membership

The `show vsan 4094 membership` command displays all ports associated with the isolated VSAN.

Operational State of a VSAN

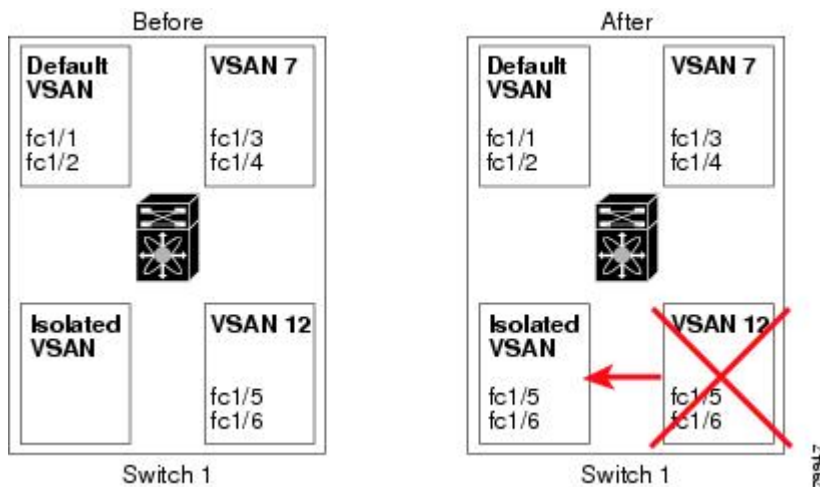
A VSAN is in the operational state if the VSAN is active and at least one port is up. This state indicates that traffic can pass through this VSAN. This state cannot be configured.

Static VSAN Deletion

When an active VSAN is deleted, all of its attributes are removed from the running configuration. VSAN-related information is maintained by the system software as follows:

- VSAN attributes and port membership details are maintained by the VSAN manager. This feature is affected when you delete a VSAN from the configuration. When a VSAN is deleted, all the ports in that VSAN are made inactive and the ports are moved to the isolated VSAN. If the same VSAN is recreated, the ports do not automatically get assigned to that VSAN. You must explicitly reconfigure the port VSAN membership (see the figure below).

Figure 4: VSAN Port Membership Details



- VSAN-based runtime (name server), zoning, and configuration (static routes) information is removed when the VSAN is deleted.
- Configured VSAN interface information is removed when the VSAN is deleted.



Note

The allowed VSAN list is not affected when a VSAN is deleted.

Any commands for a nonconfigured VSAN are rejected. For example, if VSAN 10 is not configured in the system, a command request to move a port to VSAN 10 is rejected.

Related Topics[Configuring VSAN Trunking](#)**Deleting Static VSANs**

You can delete a VSAN and its various attributes.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	vsan database Example: switch(config)# vsan database switch(config-vsan-db)#	Configures the VSAN database.
Step 3	vsan vsan-id Example: switch(config-vsan-db)# vsan 2	Places you in VSAN configuration mode.
Step 4	switch(config-vsan-db)# no vsan <i>vsan-id</i> Example: switch(config-vsan-db)# no vsan 5	Deletes VSAN 5 from the database and switch.
Step 5	switch(config-vsan-db)# end Example: switch(config-vsan-db)# end	Places you in EXEC mode.

About Load Balancing

Load-balancing attributes indicate the use of the source-destination ID (src-dst-id) or the originator exchange OX ID (src-dst-ox-id, the default) for load-balancing path selection.

Configuring Load Balancing

You can configure load balancing on an existing VSAN.

Load-balancing attributes indicate the use of the source-destination ID (src-dst-id) or the originator exchange OX ID (src-dst-ox-id, the default) for load-balancing path selection.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	vsan database Example: switch(config)# vsan database switch(config-vsan-db)#	Enters VSAN database configuration submenu.
Step 3	vsan vsan-id Example: switch(config-vsan-db)# vsan 15	Specifies an existing VSAN.
Step 4	vsan vsan-id loadbalancing src-dst-id Example: switch(config-vsan-db)# vsan 15 loadbalancing src-dst-id	Enables the load-balancing guarantee for the selected VSAN and directs the switch to use the source and destination ID for its path selection process.
Step 5	no vsan vsan-id loadbalancing src-dst-id Example: switch(config-vsan-db)# no vsan 15 loadbalancing src-dst-id	Negates the command entered in the previous step and reverts to the default values of the load-balancing parameters.
Step 6	vsan vsan-id loadbalancing src-dst-ox-id Example: switch(config-vsan-db)# vsan 15 loadbalancing src-dst-ox-id	Changes the path selection setting to use the source ID, the destination ID, and the OX ID (default).
Step 7	vsan vsan-id suspend Example: switch(config-vsan-db)# vsan 23 suspend	Suspends the selected VSAN.
Step 8	no vsan vsan-id suspend Example: switch(config-vsan-db)# no vsan 23 suspend	Negates the suspend command entered in the previous step.
Step 9	end Example: switch(config-vsan-db)# end	Returns you to EXEC mode.

Interop Mode

Interoperability enables the products of multiple vendors to connect with each other. Fibre Channel standards guide vendors to create common external Fibre Channel interfaces.

Related Topics

[Switch Interoperability](#)

Displaying the Static VSAN Configuration

The following example shows how to display information about a specific VSAN:

```
switch# show vsan 100
```

The following example shows how to display VSAN usage:

```
switch# show vsan usage
4 vsan configured
configured vsans:1-4
vsans available for configuration:5-4093
```

The following example shows how to display all VSANs:

```
switch# show vsan
```

Default Settings for VSANs

The following table lists the default settings for all configured VSANs.

Table 2: Default VSAN Parameters

Parameters	Default
Default VSAN	VSAN 1.
State	Active state.
Name	Concatenation of VSAN and a four-digit string representing the VSAN ID. For example, VSAN 3 is VSAN0003.
Load-balancing attribute	OX ID (src-dst-ox-id).

