Configuring and Managing Zones

This chapter describes how to configure and manage zones.

This chapter contains the following sections:

- Information About Zones, on page 1

Information About Zones

Zoning enables you to set up access control between storage devices or user groups. If you have administrator privileges in your fabric, you can create zones to increase network security and to prevent data loss or corruption. Zoning is enforced by examining the source-destination ID field.

Note Cisco NX-OS Release 10.2(1)F supports basic, enhanced, and smart zoning. Advanced zoning capabilities specified in the FC-GS-4 and FC-SW-3 standards are supported. You can use either the existing basic zoning capabilities or the advanced, standards-compliant zoning capabilities.

Information About Zoning

Zoning Features

Zoning includes the following features:

- A zone consists of multiple zone members.
  - Members in a zone can access each other; members in different zones cannot access each other.
  - If zoning is not activated, all devices are members of the default zone.
  - If zoning is activated, any device that is not in an active zone (a zone that is part of an active zone set) is a member of the default zone.
  - Zones can vary in size.
  - Devices can belong to more than one zone.
  - A physical fabric can have a maximum of 16,000 members. This includes all VSANs in the fabric.

- A zone set consists of one or more zones.
  - A zone set can be activated or deactivated as a single entity across all switches in the fabric.
  - Only one zone set can be activated at any time in a VSAN.
  - A zone can be a member of more than one zone set.
  - A zone switch can have a maximum of 1000 zone sets.
- Zoning can be administered from any switch in the fabric.
  - When you activate a zone (from any switch), all switches in the fabric receive the active zone set. Additionally, full zone sets are distributed to all switches in the fabric, if this feature is enabled in the source switch in basic zoning mode and default in enhanced zoning mode.
  - If a new switch is added to an existing fabric, zone sets are acquired by the new switch.
- Zone changes can be configured nondisruptively.
  - New zones and zone sets can be activated without interrupting traffic on unaffected ports or devices.
- Zone membership can be specified using the following device alias members:
  - Port world wide name (pWWN)—Specifies the pWWN of an N port attached to the switch as a member of the zone.
  - Fabric pWWN—Specifies the WWN of the fabric port (switch port's WWN). This membership is also referred to as port-based zoning.
  - FC ID—Specifies the FC ID of an N port attached to the switch as a member of the zone.
  - Interface and switch WWN (sWWN)—Specifies the interface of a switch identified by the sWWN. This membership is also referred to as interface-based zoning.
  - Interface and domain ID—Specifies the interface of a switch identified by the domain ID.
  - Device Alias—Specifies a device alias name.
  - FC Alias—Specifies a FC alias name.

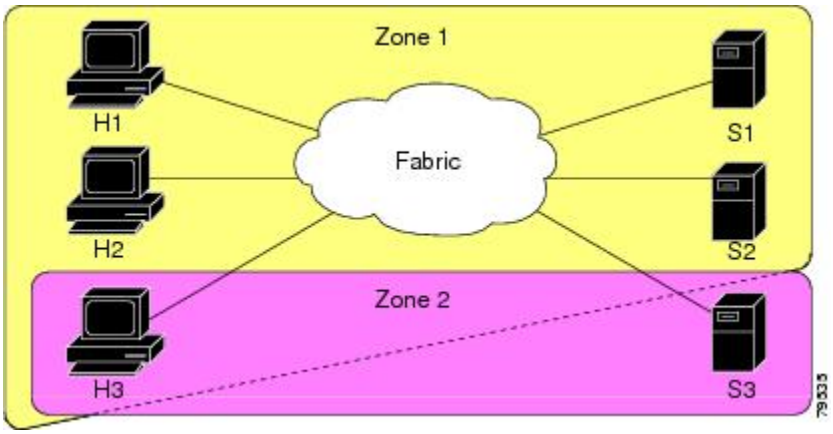
Note For N ports attached to the switch over a virtual Fibre Channel interface, you can specify zone membership using the device alias of the logged-in device, pWWN of the N port, the FC ID of the N port, or the fabric pWWN of the virtual Fibre Channel interface.

- Default zone membership includes all ports or WWNs that do not have a specific membership association. Access between default zone members is controlled by the default zone policy.
- You can configure up to 8000 zones per VSAN and a maximum of 8000 zones for all VSANs on the switch.
- The maximum of 4000 zone ACL entries are supported.
- If the number of zone ACL entries exceed 4000, the zone may transition to soft zoning mode.

Zoning Example

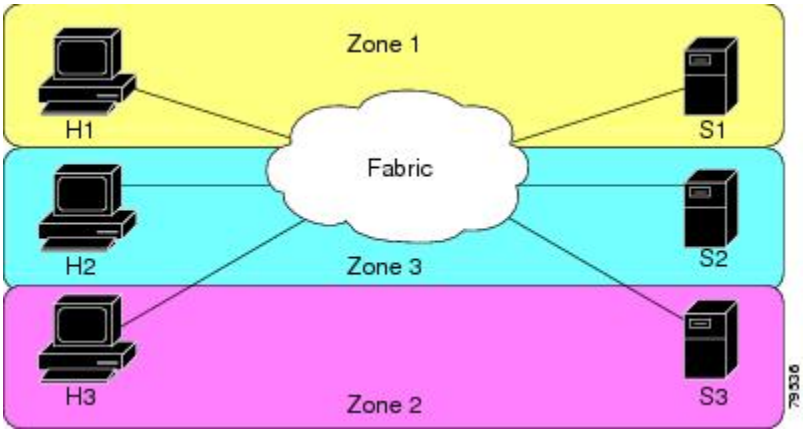
The following figure shows a zone set with two zones, zone 1 and zone 2, in a fabric. Zone 1 provides access from all three hosts (H1, H2, H3) to the data residing on storage systems S1 and S2. Zone 2 restricts the data on S3 to access only by H3. H3 resides in both zones.

Figure 1: Fabric with Two Zones



You can use other ways to partition this fabric into zones. The following figure shows another possibility. Assume that there is a need to isolate storage system S2 for the purpose of testing new software. To achieve this, zone 3 is configured, which contains only host H2 and storage S2. You can restrict access to only H2 and S2 in zone 3, and to H1 and S1 in zone 1.

Figure 2: Fabric with Three Zones



Zone Implementation

Cisco SAN switches automatically support the following basic zone features (no additional configuration is required):

- Zones are contained in a VSAN.
- Hard zoning cannot be manually disabled.
- Name server queries are soft-zoned.

- Only active zone sets are distributed.
- Unzoned devices cannot access each other.
- A zone or zone set with the same name can exist in each VSAN.
- Each VSAN has a full database and an active database.
- Active zone sets cannot be changed, without activating a full zone database.
- Active zone sets are preserved across switch reboots.
- Changes to the full database must be explicitly saved.
- Zone reactivation (a zone set is active and you activate another zone set) does not disrupt existing traffic.

If required, you can additionally configure the following zone features:

- Propagate full zone sets to all switches per VSAN.
- Change the default policy for unzoned members.
- Bring E ports out of isolation.

Active and Full Zone Sets

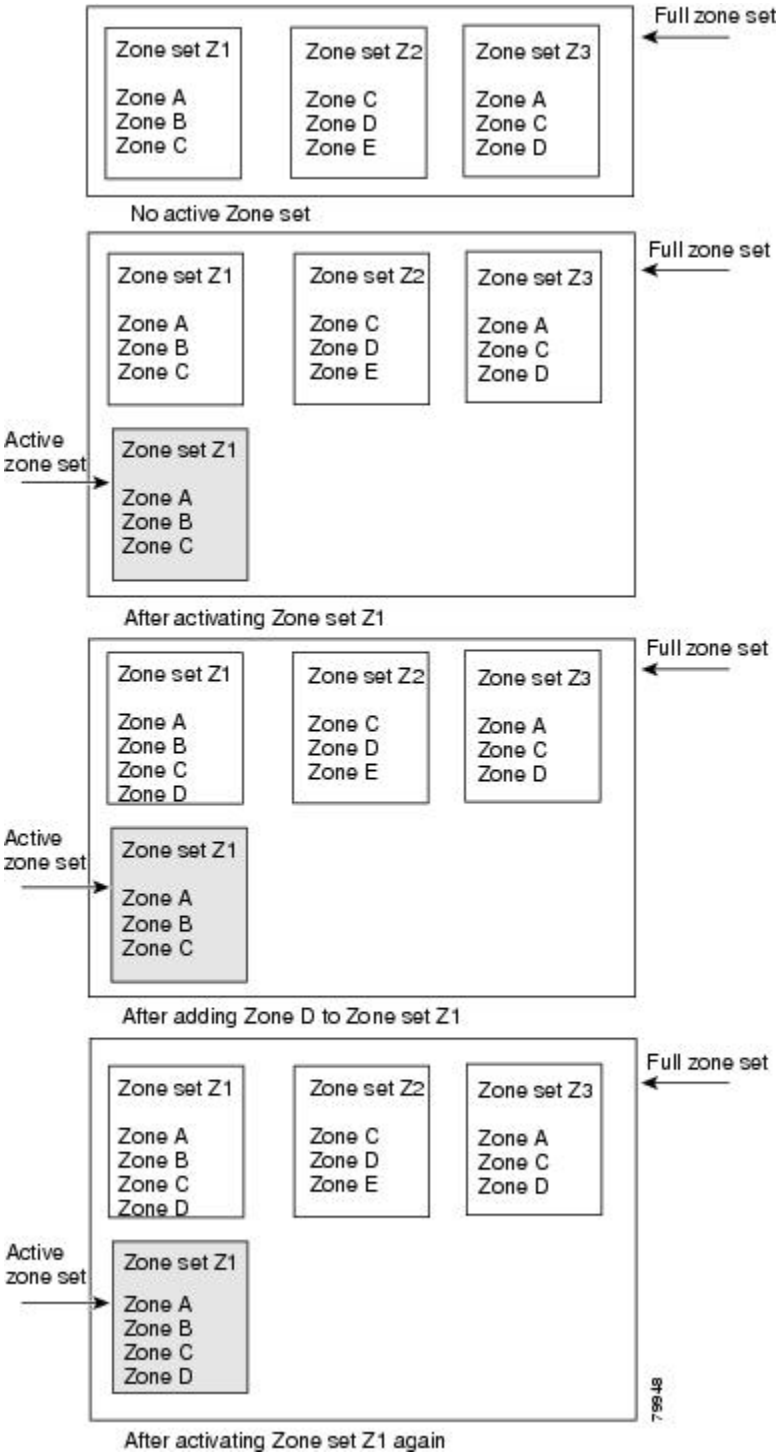
Before configuring a zone set, consider the following guidelines:

- Each VSAN can have multiple zone sets but only one zone set can be active at any given time.
- When you create a zone set, that zone set becomes a part of the full zone set.
- When you activate a zone set, a copy of the zone set from the full zone set is used to enforce zoning, and is called the active zone set. An active zone set cannot be modified. A zone that is part of an active zone set is called an active zone.
- The administrator can modify the full zone set even if a zone set with the same name is active. However, the modification will be enforced only upon reactivation.
- When the activation is done, the active zone set is automatically stored in persistent configuration. This enables the switch to preserve the active zone set information across switch resets.
- All other switches in the fabric receive the active zone set so they can enforce zoning in their respective switches.
- Hard and soft zoning are implemented using the active zone set. Modifications take effect during zone set activation.
- An FC ID or Nx port that is not part of the active zone set belongs to the default zone and the default zone information is not distributed to other switches.

Note If one zone set is active and you activate another zone set, the currently active zone set is automatically deactivated. You do not need to explicitly deactivate the currently active zone set before activating a new zone set.

The following figure shows a zone being added to an activated zone set.

Figure 3: Active and Full Zone Sets



Configuring a Zone

You can configure a zone and assign a zone name.

SUMMARY STEPS

1. **configure terminal**
2. **zone name** *zone-name* **vsan** *vsan-id*
3. **member** *type value*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone name** *zone-name* **vsan** *vsan-id* **Example:** `switch(config)# zone name test vsan 5`	Configures a zone in the specified VSAN. **Note** All alphanumeric characters or one of the following symbols ($, -, ^, _) are supported.
Step 3	**member** *type value* **Example:** `switch(config-zone)# member interface 4`	Configures a member for the specified zone based on the type (pWWN, fabric pWWN, FC ID, fcalias, device alias, domain ID, or interface) and value specified.

Configuration Examples

Tip Use the **show wwn switch** command to retrieve the sWWN. If you do not provide a sWWN, the software automatically uses the local sWWN.

The following examples show how to configure zone members:

```
switch(config)# zone name MyZone vsan 2
```

pWWN example:

```
switch(config-zone)# member pwwn 10:00:00:23:45:67:89:ab
```

Fabric pWWN example:

```
switch(config-zone)# member fwwn 10:01:10:01:10:ab:cd:ef
```

FC ID example:

```
switch(config-zone)# member fcid 0xce00d1
```

FC alias example:

```
switch(config-zone)# member fcalias Payroll
```

Device alias example:

```
switch(config-zone)# member device-alias finance
```

Domain ID example:

```
switch(config-zone)# member domain-id 2 portnumber 23
```

Show WWN example:

```
switch# show wwn switch
switch(config-zone)# member interface fc 2/1
switch(config-zone)# member interface fc 2/1 swwn 20:00:00:05:30:00:4a:de
switch(config-zone)# member interface fc 2/1 domain-id 25
```

Note The zone's default system settings such as **system default zone default-zone permit** and **system default zone distribute full** takes effect only on the newly created VSANs after you manually apply the settings. These settings may not be applied on VSAN 1 even though when they are set as part of FC setup script.

The following example shows how to configure different types of member alias:

```
switch(config)# fcalias name AliasSample vsan 3
```

pWWN example:

```
switch(config-fcalias)# member pwwn 10:00:00:23:45:67:89:ab
```

fWWN example:

```
switch(config-fcalias)# member fwwn 10:01:10:01:10:ab:cd:ef
```

FC ID example:

```
switch(config-fcalias)# member fcid 0x222222
```

Domain ID example:

```
switch(config-fcalias)# member domain-id 2 portnumber 23
```

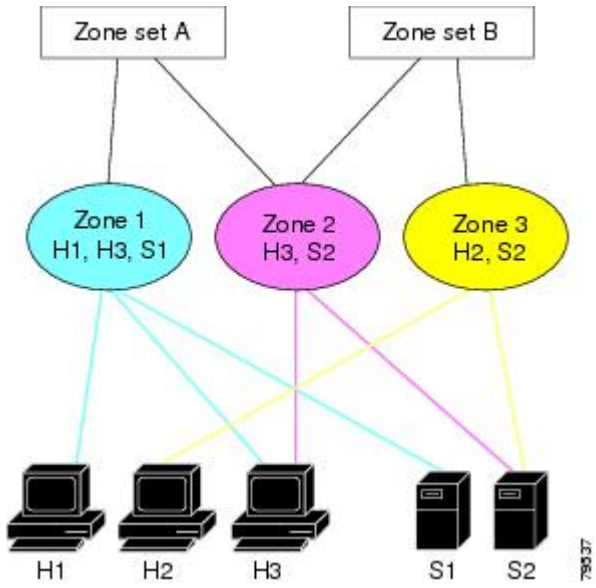
Device alias example:

```
switch(config-fcalias)# member device-alias devName
```

Zone Sets

In the following figure, two separate sets are created, each with its own membership hierarchy and zone members.

Figure 4: Hierarchy of Zone Sets, Zones, and Zone Members



Zones provide a method for specifying access control, while zone sets are a grouping of zones to enforce access control in the fabric. Either zone set A or zone set B can be activated (but not together).

Tip Zone sets are configured with the names of the member zones and the VSAN (if the zone set is in a configured VSAN).

Activating a Zone Set

You can activate or deactivate an existing zone set.

Changes to a zone set do not take effect in a full zone set until you activate it.

SUMMARY STEPS

1. **configure terminal**
2. **zoneset activate name** *zoneset-name* **vsan** *vsan-id*
3. **no zoneset activate name** *zoneset-name* **vsan** *vsan-id*

DETAILED STEPS

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	**zoneset activate name** *zoneset-name* **vsan** *vsan-id* **Example:** `switch(config)# zoneset activate name test vsan 34`	Activates the specified zone set.
Step 3	**no zoneset activate name** *zoneset-name* **vsan** *vsan-id* **Example:** `switch(config)# no zoneset activate name test vsan 30`	Deactivates the specified zone set.

Default Zone

Each member of a fabric (in effect a device attached to an Nx port) can belong to any zone. If a member is not part of any active zone, it is considered to be part of the default zone. Therefore, if no zone set is active in the fabric, all devices are considered to be in the default zone. Even though a member can belong to multiple zones, a member that is part of the default zone cannot be part of any other zone. The switch determines whether a port is a member of the default zone when the attached port comes up.

Note Unlike configured zones, default zone information is not distributed to the other switches in the fabric.

Traffic can either be permitted or denied among members of the default zone. This information is not distributed to all switches; it must be configured in each switch.

Note When the switch is initialized for the first time, no zones are configured and all members are considered to be part of the default zone. Members are not permitted to communicate with each other.

Configure the default zone policy on each switch in the fabric. If you change the default zone policy on one switch in a fabric, be sure to change it on all the other switches in the fabric.

Note The default settings for default zone configurations can be changed.

The default zone members are explicitly listed when the default policy is configured as permit or when a zone set is active. When the default policy is configured as deny, the members of this zone are not explicitly enumerated when you view the active zone set.

Configuring the Default Zone Access Permission

To permit or deny traffic to members in the default zone, perform this task:

SUMMARY STEPS

1. **configure terminal**
2. **zone default-zone permit vsan** *vsan-id*

3. **no zone default-zone permit vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone default-zone permit vsan** *vsan-id* **Example:** `switch(config)# zone default-zone permit vsan 13`	Permits traffic flow to default zone members.
Step 3	**no zone default-zone permit vsan** *vsan-id* **Example:** `switch(config)# no zone default-zone permit vsan 40`	Denies (default) traffic flow to default zone members.

FC Alias Creation

You can assign an alias name and configure an alias member using the following values:

- pWWN—The WWN of the N port is in hex format (for example, 10:00:00:23:45:67:89:ab).
- fWWN—The WWN of the fabric port name is in hex format (for example, 10:00:00:23:45:67:89:ab).
- FC ID—The N port ID is in 0xhhhhhh format (for example, 0xce00d1).
- Domain ID—The domain ID is an integer from 1 to 239. A mandatory port number of a non-Cisco switch is required to complete this membership configuration.
- Interface—Interface-based zoning is similar to port-based zoning because the switch interface is used to configure the zone. You can specify a switch interface as a zone member for both local and remote switches. To specify a remote switch, enter the remote switch WWN (sWWN) or the domain ID in the particular VSAN.
- Device Alias—Specifies a device alias name.

Tip The switch supports a maximum of 2048 aliases per VSAN.

Creating FC Aliases

You create an alias.

SUMMARY STEPS

1. **configure terminal**
2. **fcalias name** *alias-name* **vsan** *vsan-id*
3. **member** *type value*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**fcalias name** *alias-name* **vsan** *vsan-id* **Example:** `switch(config)# fcalias name testname vsan 50`	Configures an alias name. The alias name can be any case-sensitive, alphanumeric string up to 64 characters.
Step 3	**member** *type value* **Example:** `switch(config-fcalias)# member pwwn 20:00:20:94:00:00:00:01`	Configures a member for the specified fcalias based on the type (pWWN, fabric pWWN, FC ID, domain ID, or interface) and value specified. **Note** Multiple members can be specified on multiple lines.

Creating FC Aliases Example

Table 1: Type and Value Syntax for the member Command

Device alias	**member device-alias** *device-alias*
Domain ID	**member domain-id** *domain-id* **portnumber** *number*
FC ID	**member fcid** *fcid*
Fabric pWWN	**member fwwn** *fwwn-id*
Local sWWN interface	**member interface** *type slot*/*port*
Domain ID interface	**member interface** *type slot*/*port* **domain-id** domain-id
Remote sWWN interface	**member interface** *type slot*/*port* **swwn** *swwn-id*
pWWN	**member pwwn** *pwwn-id*

The following example shows how to configure different types of member alias:

```
switch(config)# fcalias name AliasSample vsan 3
```

pWWN example:

```
switch(config-fcalias)# member pwwn 10:00:00:23:45:67:89:ab
```

fWWN example:

```
switch(config-fcalias)# member fwwn 10:01:10:01:10:ab:cd:ef
```

FC ID example:

```
switch(config-fcalias)# member fcid 0x222222
```

Domain ID example:

```
switch(config-fcalias)# member domain-id 2 portnumber 23
switch(config-fcalias)# member interface fc 2/1
switch(config-fcalias)# member interface fc2/1 domain-id 25
```

Device alias example:

```
switch(config-fcalias)# member device-alias devName
```

Creating Zone Sets and Adding Member Zones

You can create a zone set to include several zones.

SUMMARY STEPS

1. **configure terminal**
2. **zone set name** *zoneset-name* **vsan** *vsan-id*
3. **member** *name*
4. **zone name** *zone-name*
5. **member fcid** *fcid*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone set name** *zoneset-name* **vsan** *vsan-id* **Example:** `switch(config)# zone set name new vsan 23`	Configures a zone set with the configured zoneset-name. **Tip** To activate a zone set, you must first create the zone and a zone set.
Step 3	**member** *name* **Example:** `switch(config-zoneset)# member new`	Adds a zone as a member of the previously specified zone set. **Tip**

	Command or Action	Purpose
		If the specified zone name was not previously configured, this command will return a "zone not present" error message:
Step 4	**zone name** *zone-name* **Example:** `switch(config-zoneset)# zone name trial`	Adds a zone to the specified zone set. **Tip** Execute this step only if you need to create a zone from a zone set prompt.
Step 5	**member fcid** *fcid* **Example:** `switch(config-zoneset-zone)# member fcid 0x222222`	Adds a new member to the new zone. **Tip** Execute this step only if you need to add a member to a zone from a zone set prompt.

Tip You do not have to copy the running configuration to the startup configuration to store the active zone set. However, you need to copy the running configuration to the startup configuration to explicitly store full zone sets.

Zone Enforcement

Zoning can be enforced in two ways: soft and hard. Each end device (N port) discovers other devices in the fabric by querying the name server. When a device logs in to the name server, the name server returns the list of other devices that can be accessed by the querying device. If an N port does not know about the FC IDs of other devices outside its zone, it cannot access those devices.

In soft zoning, zoning restrictions are applied only during interaction between the name server and the end device. If an end device somehow knows the FC ID of a device outside its zone, it can access that device.

Hard zoning is enforced by the hardware on each frame sent by an N port. As frames enter the switch, source-destination IDs are compared with permitted combinations to allow the frame at wire speed. Hard zoning is applied to all forms of zoning.

Note Hard zoning enforces zoning restrictions on every frame, and prevents unauthorized access.

Cisco SAN switches support both hard and soft zoning.

Zone Set Distribution

You can distribute full zone sets using one of two methods: one-time distribution using the **zoneset distribute vsan** command at the EXEC mode level or full zone set distribution using the **zoneset distribute full vsan** command at the configuration mode level. The following table lists the differences between the methods.

Table 2: Zone Set Distribution Differences

One-Time Distribution **zoneset distribute vsan Command (EXEC Mode)**	Full Zone Set Distribution **zoneset distribute full vsan Command (Configuration Mode)**
Distributes the full zone set immediately.	Does not distribute the full zone set immediately.
Does not distribute the full zone set information along with the active zone set during activation, deactivation, or merge process.	Remembers to distribute the full zone set information along with the active zone set during activation, deactivation, and merge processes.

Enabling Full Zone Set Distribution

All Cisco SAN switches distribute active zone sets when new E port links come up or when a new zone set is activated in a VSAN. The zone set distribution takes effect while sending merge requests to the adjacent switch or while activating a zone set.

You can enable full zone set and active zone set distribution to all switches on a per VSAN basis.

SUMMARY STEPS

1. **configure terminal**
2. **zoneset distribute full vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zoneset distribute full vsan** *vsan-id* **Example:** `switch(config)# zoneset distribute full vsan 12`	Enables sending a full zone set along with an active zone set.

Enabling a One-Time Distribution

You can perform a one-time distribution of inactive, unmodified zone sets throughout the fabric.

Use the **zoneset distribute vsan** *vsan-id* command in EXEC mode to perform this distribution.

```
switch# zoneset distribute vsan 2
Zoneset distribution initiated. check zone status
```

This command only distributes the full zone set information, as it does not save the information to the startup configuration. You must explicitly enter the **copy running-config startup-config** command to save the full zone set information to the startup configuration.

Note Only interop mode 3 is supported in Cisco Nexus 9000.

Use the **show zone status vsan** *vsan-id* command to check the status of the one-time zone set distribution request.

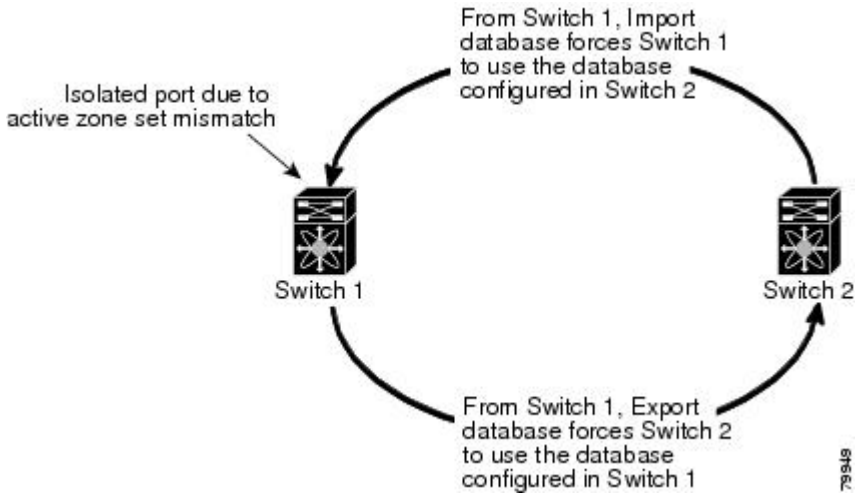
```
switch# show zone status vsan 3
VSAN: 3 default-zone: permit distribute: active only Interop: 100
    mode:basic merge-control:allow
    session:none
    hard-zoning:enabled
Default zone:
    qos:none broadcast:disabled ronly:disabled
Full Zoning Database :
    Zonesets:0  Zones:0 Aliases: 0
Active Zoning Database :
    Name: nozoneset  Zonesets:1  Zones:2
Status: Zoneset distribution completed at 04:01:06 Aug 28 2010
```

Recovering from Link Isolation

When two switches in a fabric are merged using a TE or E port, these TE and E ports may become isolated when the active zone set databases are different between the two switches or fabrics. When a TE port or an E port become isolated, you can recover that port from its isolated state using one of three options:

- Import the neighboring switch's active zone set database and replace the current active zone set (see the figure below).
- Export the current database to the neighboring switch.
- Manually resolve the conflict by editing the full zone set, activating the corrected zone set, and then bringing up the link.

Figure 5: Importing and Exporting the Database



Importing and Exporting Zone Sets

You can import or export the zone set information from or to an adjacent switch.

SUMMARY STEPS

1. **zoneset export vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**zoneset export vsan** *vsan-id* **Example:** `switch# zoneset export vsan 5`	Exports the zone set to the adjacent switch connected through the specified VSAN or range of VSANs.

Zone Set Duplication

You can make a copy and then edit it without altering the existing active zone set. You can copy an active zone set from the bootflash: directory, volatile: directory, or slot0 to one of the following areas:

- To the full zone set
- To a remote location (using FTP, SCP, SFTP, or TFTP)

The active zone set is not part of the full zone set. You cannot make changes to an existing zone set and activate it if the full zone set is lost or is not propagated.

Caution Copying an active zone set to a full zone set may overwrite a zone with the same name if it already exists in the full zone set database.

Copying Zone Sets

On Cisco SAN switches, you cannot edit an active zone set. However, you can copy an active zone set to create a new zone set that you can edit.

SUMMARY STEPS

1. **zone copy active-zoneset full-zoneset vsan** *vsan-id*
2. **zone copy vsan** *vsan-id* **active-zoneset scp://guest@myserver/tmp/active_zoneset.txt**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**zone copy active-zoneset full-zoneset vsan** *vsan-id* **Example:** `switch# zone copy active-zoneset full-zoneset vsan 301`	Makes a copy of the active zone set in the specified VSAN to the full zone set.
Step 2	**zone copy vsan** *vsan-id* **active-zoneset scp://guest@myserver/tmp/active_zoneset.txt** **Example:** `switch# zone copy vsan 55 active-zoneset scp://guest@myserver/tmp/active_zoneset.txt`	Copies the active zone in the specified VSAN to a remote location using SCP.

Renaming Zones, Zone Sets, and Aliases

You can rename a zone, zone set, fcalias, or zone-attribute-group.

SUMMARY STEPS

1. **configure terminal**
2. **zoneset rename** *oldname newname* **vsan** *vsan-id*
3. **zone rename** *oldname newname* **vsan** *vsan-id*
4. **fcalias rename** *oldname newname* **vsan** *vsan-id*
5. **zoneset activate name** *newname* **vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zoneset rename** *oldname newname* **vsan** *vsan-id* **Example:** `switch(config)# zoneset rename test myzoneset vsan 60`	Renames a zone set in the specified VSAN.
Step 3	**zone rename** *oldname newname* **vsan** *vsan-id* **Example:** `switch(config)# zone rename test myzone vsan 50`	Renames a zone in the specified VSAN.
Step 4	**fcalias rename** *oldname newname* **vsan** *vsan-id* **Example:** `switch(config)# fcalias rename test myfc vsan 200`	Renames a fcalias in the specified VSAN.
Step 5	**zoneset activate name** *newname* **vsan** *vsan-id* **Example:** `switch(config)# zoneset activate name myzone vsan 50`	Activates the zone set and updates the new zone name in the active zone set.

Cloning Zones, Zone Sets and FC Aliases

You can clone a zone, zone set and fcalias.

SUMMARY STEPS

1. **configure terminal**
2. **zoneset clone** *oldname newname* **vsan** *vsan-id*
3. **zone clone** *oldname newname* **vsan** *number*
4. **fcalias clone** *oldname newname* **vsan** *vsan-id*
5. **zoneset activate name** *newname* **vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zoneset clone** *oldname newname* **vsan** *vsan-id* **Example:** `switch(config)# zoneset clone test myzoneset2 vsan 2`	Clones a zone set in the specified VSAN.
Step 3	**zone clone** *oldname newname* **vsan** *number* **Example:** `switch(config)# zone clone test myzone3 vsan 3`	Clones a zone in the specified VSAN.
Step 4	**fcalias clone** *oldname newname* **vsan** *vsan-id* **Example:** `switch(config)# fcalias clone test myfcalias vsan 30`	Clones a fcalias in the specified VSAN.
Step 5	**zoneset activate name** *newname* **vsan** *vsan-id* **Example:** `switch(config)# zoneset activate name myzonetest1 vsan 3`	Activates the zone set and updates the new zone name in the active zone set.

Clearing the Zone Server Database

You can clear all configured information in the zone server database for the specified VSAN.

To clear the zone server database, use the following command:

```
switch# clear zone database vsan 2
```

Note After entering a **clear zone database** command, you must explicitly enter the **copy running-config startup-config** to ensure that the running configuration is used when the switch reboots.

Note Clearing a zone set only erases the full zone database, not the active zone database.

Verifying the Zone Configuration

You can view any zone information by using the **show** command. If you request information for a specific object (for example, a specific zone, zone set, VSAN, or alias, or keywords such as brief or active), only information for the specified object is displayed.

Command	Purpose
`show zone`	Displays zone information for all VSANs.
`show zone vsan` *`vsan-id`*	Displays zone information for a specific VSAN.
`show zoneset vsan` *`vsan-id`*	Displays the configured zone sets for a range of VSANs.
`show zone name` *`zone-name`*	Displays the members of a specific zone.
`show fcalias vsan` *`vsan-id`*	Displays the fcalias configuration.
`show zone member pwwn` *`pwwn-id`*	Displays all zones to which a member belongs.
`show zone statistics`	Displays the number of control frames exchanged with other switches.
`show zoneset active`	Displays the active zone set.
`show zone active`	Displays the active zones.
`show zone status`	Displays the zone status.

Enhanced Zoning

Enhanced Zoning

The zoning feature complies with the FC-GS-4 and FC-SW-3 standards. Both standards support the basic zoning functionalities explained in the previous section and the enhanced zoning functionalities described in this section.

Note In case the scale zone configuration replays with enhanced zone mode, you must manually clear the local zone database before applying the saved scale zone configuration to the running configuration.

Note Broadcast zoning is not supported on the Cisco Nexus 9000 Series switches.

The following table compares the differences between basic and enhanced zoning:

Table 3: Advantages of Enhanced Zoning

Basic Zoning	Enhanced Zoning	Enhanced Zoning Advantages
Administrators can make simultaneous configuration changes. Upon activation, one administrator can overwrite another administrator's changes.	Performs all configurations within a single configuration session. When you begin a session, the switch locks the entire fabric to implement the change.	One configuration session for the entire fabric to ensure consistency within the fabric.
If a zone is part of multiple zone sets, you create an instance of this zone in each zone set.	References to the zone are used by the zone sets as required once you define the zone.	Reduced payload size as the zone is referenced. The size is more significant with bigger databases.
The default zone policy is defined per switch. To ensure smooth fabric operation, all switches in the fabric must have the same default zone setting.	Enforces and exchanges the default zone setting throughout the fabric.	Fabric-wide policy enforcement reduces troubleshooting time.
To retrieve the results of the activation per switch basis, the managing switch provides a combined status about the activation. It does not identify the failure switch.	Retrieves the activation results and the nature of the problem from each remote switch.	Enhanced error reporting eases the troubleshooting process.
To distribute the zoning database, you must reactivate the same zone set. The reactivation may affect hardware changes for hard zoning on the local switch and on remote switches.	Implements changes to the zoning database and distributes it without reactivation.	Distribution of zone sets without activation avoids hardware changes for hard zoning in the switches.

Changing from Basic Zoning to Enhanced Zoning

You can change to the enhanced zoning mode from the basic mode.

Procedure

Step 1 Verify that all switches in the fabric can operate in the enhanced mode.

Step 2 If one or more switches cannot operate in the enhanced mode, then your request to move to enhanced mode is rejected.

Step 3 Set the operation mode to enhanced zoning mode.

Changing from Enhanced Zoning to Basic Zoning

Cisco Nexus 9000 switches allow you to change from enhanced zoning to basic zoning to enable you to downgrade and upgrade to other Cisco NX-OS releases.

Procedure

Step 1 Verify that the active and full zone set do not contain any configuration that is specific to the enhanced zoning mode.

Step 2 If such configurations exist, delete them before proceeding with this procedure. If you do not delete the existing configuration, the switch software automatically removes them.

Step 3 Set the operation mode to basic zoning mode.

Enabling Enhanced Zoning

You can enable enhanced zoning in a VSAN.

By default, the enhanced zoning feature is disabled in Cisco Nexus 9000 switches.

SUMMARY STEPS

1. **configure terminal**
2. **zone mode enhanced vsan** *vsan-id*
3. **no zone mode enhanced vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone mode enhanced vsan** *vsan-id* **Example:** `switch(config)# zone mode enhanced vsan 22`	Enables enhanced zoning in the specified VSAN.
Step 3	**no zone mode enhanced vsan** *vsan-id* **Example:** `switch(config)# no zone mode enhanced vsan 30`	Disables enhanced zoning in the specified VSAN.

Modifying the Zone Database

You can commit or discard changes to the zoning database in a VSAN.

Modifications to the zone database is done within a session. A session is created at the time of the first successful configuration command. On creation of a session, a copy of the zone database is created. Any changes done within the session are performed on this copy of the zoning database. These changes in the copy

zoning database are not applied to the effective zoning database until you commit the changes. Once you apply the changes, the session is closed.

If the fabric is locked by another user and for some reason the lock is not cleared, you can force the operation and close the session. You must have permission (role) to clear the lock in this switch and perform the operation on the switch from where the session was originally created.

SUMMARY STEPS

1. **configure terminal**
2. **zone commit vsan** *vsan-id*
3. switch(config)# **zone commit vsan** *vsan-id* **force**
4. switch(config)# **no zone commit vsan** *vsan-id*
5. **no zone commit vsan** *vsan-id* **force**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone commit vsan** *vsan-id* **Example:** `switch(config)# zone commit vsan 679`	Applies the changes to the enhanced zone database and closes the session.
Step 3	switch(config)# **zone commit vsan** *vsan-id* **force** **Example:** `switch(config)# zone commit vsan 34 force`	Forcefully applies the changes to the enhanced zone database and closes the session created by another user.
Step 4	switch(config)# **no zone commit vsan** *vsan-id* **Example:** `switch(config)# no zone commit vsan 22`	Discards the changes to the enhanced zone database and closes the session.
Step 5	**no zone commit vsan** *vsan-id* **force** **Example:** `switch(config)# no zone commit vsan 34 force`	Forcefully discards the changes to the enhanced zone database and closes the session created by another user.

Releasing Zone Database Locks

To release the session lock on the zoning database on the switches in a VSAN, use the **no zone commit vsan** command from the switch where the database was initially locked.

```
switch# configure terminal
switch(config)# no zone commit vsan 2
```

If session locks remain on remote switches after using the **no zone commit vsan** command, you can use the **clear zone lock vsan** command on the remote switches.

```
switch# clear zone lock vsan 2
```

Note We recommend using the **no zone commit vsan** command first to release the session lock in the fabric. If that fails, use the **clear zone lock vsan** command on the remote switches where the session is still locked.

Verifying Enhanced Zone Information

This example shows how to display the zone status for a specified VSAN:

```
switch# show zone status vsan 2
```

Merging the Database

The merge method depends on the fabric-wide merge control setting:

- Restrict—If the two databases are not identical, the ISLs between the switches are isolated.
- Allow—The two databases are merged using the merge rules specified in the following table.

Table 4: Database Zone Merge Status

Local Database	Adjacent Database	Merge Status	Results of the Merge
The databases contain zone sets with the same name. In the enhanced zoning mode, the active zone set does not have a name in interop mode 3. The zone set names are only present for full zone sets but are different zones, aliases, and attributes groups.		Successful.	ISLs are not isolated if the database mege is successful.
The databases contain a zone, FC alias, or zone attribute group object with same name1 but different members.		Failed.	The adjacent database information populates the local database. ISLs are isolated.
Empty.	Contains data.	Successful.	The merging of the local and adjacent databases.
Contains data.	Empty.	Successful.	The local database information populates the adjacent database.

The merge process operates as follows:

- The software compares the protocol versions. If the protocol versions differ, the ISL is isolated.
- If the protocol versions are the same, then the zone policies are compared. If the zone policies (includes **Default zoning**: *permit/deny*, **Smart-zoning**: *enable/disable* and **Merge policy** - *allow/restrict*) differ, the ISL is isolated.

- If the zone merge options are the same, the comparison is implemented based on the merge control setting.
  - If the setting is restrict, the active zone set and the full zone set should be identical. Otherwise, the link is isolated.
  - If the setting is allow, the merge rules are used to perform the merge.

Configuring Zone Merge Control Policies

You can configure merge control policies.

SUMMARY STEPS

1. **configure terminal**
2. **zone merge-control restrict vsan** *vsan-id*
3. **no zone merge-control restrict vsan** *vsan-id*
4. **zone commit vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone merge-control restrict vsan** *vsan-id* **Example:** `switch(config)# zone merge-control restrict vsan 24`	Configures a restricted merge control setting for this VSAN.
Step 3	**no zone merge-control restrict vsan** *vsan-id* **Example:** `switch(config)# no zone merge-control restrict vsan 33`	Defaults to using the allow merge control setting for this VSAN.
Step 4	**zone commit vsan** *vsan-id* **Example:** `switch(config)# zone commit vsan 20`	Commits the changes made to the specified VSAN.

Default Zone Policies

You can permit or deny traffic in the default zone.

SUMMARY STEPS

1. **configure terminal**
2. **zone default-zone permit vsan** *vsan-id*
3. **no zone default-zone permit vsan** *vsan-id*
4. **zone commit vsan** *vsan-id*

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**zone default-zone permit vsan** *vsan-id* **Example:** `switch(config)# zone default-zone permit vsan 12`	Permits traffic flow to default zone members.
Step 3	**no zone default-zone permit vsan** *vsan-id* **Example:** `switch(config)# no zone default-zone permit vsan 12`	Denies traffic flow to default zone members and reverts to factory default.
Step 4	**zone commit vsan** *vsan-id* **Example:** `switch(config)# zone commit vsan 340`	Commits the changes made to the specified VSAN.

Configuring System Default Zoning Settings

You can configure default settings for default zone policies and full zone distribution for new VSANs on the switch.

Note The zone's default system settings such as system default zone default-zone permit and system default zone distribute full takes effect only on the newly created VSANs after you manually apply the settings. These settings may not be applied on VSAN 1 even though when they are set as part of FC setup script.

You can configure zone settings using FC script also. For more information about configuring default zone settings using FC script, see: *Cisco Nexus 9000 Series NX-OS Fundamentals Configuration Guide*.

SUMMARY STEPS

1. **configure terminal**

2. **system default zone default-zone permit**
3. **no system default zone default-zone permit**
4. **system default zone distribute full**
5. **no system default zone distribute full**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**system default zone default-zone permit** **Example:** `switch(config)# system default zone default-zone permit`	Configures permit as the default zoning policy for new VSANs on the switch.
Step 3	**no system default zone default-zone permit** **Example:** `switch(config)# no system default zone default-zone permit`	Configures deny (default) as the default zoning policy for new VSANs on the switch.
Step 4	**system default zone distribute full** **Example:** `switch(config)# system default zone distribute full`	Enables full zone database distribution as the default for new VSANs on the switch.
Step 5	**no system default zone distribute full** **Example:** `switch(config)# no system default zone distribute full`	Disables (default) full zone database distribution as the default for new VSANs on the switch. Only the active zone database is distributed.

About Smart Zoning

Smart zoning implements hard zoning of large zones with fewer hardware resources than was previously required. The traditional zoning method allows each device in a zone to communicate with every other device in the zone. The administrator is required to manage the individual zones according to the zone configuration guidelines. Smart zoning eliminates the need to create a single initiator to single target zones. By analyzing device-type information in the FCNS, useful combinations can be implemented at the hardware level by the Cisco NX-OS software, and the combinations that are not used are ignored. For example, initiator-target pairs are configured, but not initiator-initiator. The device is treated as unknown if:

- The FC4 types are not registered on the device.
- During Zone Convert, the device is not logged into the fabric.

- The zone is created, however, initiator, target, or initiator and target is not specified.

The device type information of each device in a smart zone is automatically populated from the Fibre Channel Name Server (FCNS) database as host, target, or both. This information allows more efficient utilisation of switch hardware by identifying initiator-target pairs and configuring those only in hardware. In the event of a special situation, such as a disk controller that needs to communicate with another disk controller, smart zoning defaults can be overridden by the administrator to allow complete control.

Note

- Smart Zoning can be enabled at VSAN level but can also be disabled at zone level.
- Smart zoning is not supported on VSANs that have DMM, IOA, or SME applications enabled on them.

Smart Zoning Member Configuration

Table displays the supported smart zoning member configurations.

Table 5: Smart Zoning Configuration

Feature	Supported
PWWN	Yes
FCID	Yes
FCalias	Yes
Device-alias	Yes
Interface	No
IP address	No
Symbolic nodename	No
FWWN	No
Domain ID	No

Enabling Smart Zoning on a VSAN

To configure the **smart zoning** for a VSAN, follow these steps:

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config)# **zone smart-zoning enable vsan 1**

Enables smart zoning on a VSAN.

Step 3 switch(config)# no **zone smart-zoning enable vsan 1**

Disables smart zoning on a VSAN.

Setting Default Value for Smart Zoning

To set the default value, follow these steps:

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config)# system default zone smart-zone enable

Enables smart zoning on a VSAN that are created based on the specified default value.

Step 3 switch(config)# no system default zone smart-zone enable

Disables smart zoning on a VSAN.

Converting Zones Automatically to Smart Zoning

To fetch the device-type information from nameserver and to add that information to the member, follow the steps below: This can be performed at zone, zoneset, FCalias, and VSAN levels. After the zoneset is converted to smart zoning, you need to activate zoneset.

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config)# zone convert smart-zoning fcalias name <alias-name> vsan <vsan no>

Fetches the device type information from the nameserver for the fcalias members.

Note
When the zone convert command is run, the FC4-Type should be SCSI-FCP. The SCSI-FCP has bits which determines whether the device is an initiator or target. If initiator and target are both set, the device is treated as both.

Step 3 switch(config)# zone convert smart-zoning zone name <zone name> vsan <vsan no>

Fetches the device type information from the nameserver for the zone members.

Step 4 switch(config)# zone convert smart-zoning zoneset name <zoneset name> vsan <vsan no>

Fetches the device type information from the nameserver for all the zones and fcalias members in the specified zoneset.

Step 5 switch(config)# zone convert smart-zoning vsan <vsan no>

Fetches the device type information from the nameserver for all the zones and fcalias members for all the zonesets present in the VSAN.

Step 6 switch(config)# show zone smart-zoning auto-conv status vsan 1

Displays the previous auto-convert status for a VSAN.

Step 7 switch(config)# show zone smart-zoning auto-conv log errors

Displays the error-logs for smart-zoning auto-convert.

What to do next

Use the show fcns database command to check if the device is initiator, target or both:

```
switch# show fcns database
VSAN 1:
------------------------------------------------------------------------
FCID TYPE PWWN (VENDOR) FC4-TYPE:FEATURE
------------------------------------------------------------------------
0x9c0000 N 21:00:00:e0:8b:08:96:22 (Company 1) scsi-fcp:init
0x9c0100 N 10:00:00:05:30:00:59:1f (Company 2) ipfc
0x9c0200 N 21:00:00:e0:8b:07:91:36 (Company 3) scsi-fcp:init
0x9c03d6 NL 21:00:00:20:37:46:78:97 (Company 4) scsi-fcp:target
```

Configuring Device Types for Zone Members

To configure the device types for zone members, follow these steps:

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config-zoneset-zone)# **member device-alias** *name* **both**

Configures the device type for the device-alias member as both. For every supported member-type, init, target, and both are supported.

Step 3 switch(config-zoneset-zone)# **member pwwn** *number* **target**

Configures the device type for the pwwn member as target. For every supported member-type, init, target, and both are supported.

Step 4 switch(config-zoneset-zone)# **member fcid** *number*

Configures the device type for the FCID member. There is no specific device type that is configured. For every supported member-type, init, target, and both are supported.

Note

When there is no specific device type configured for a zone member, at the backend, zone entries that are generated are created as device type both.

Removing Smart Zoning Configuration

To remove the smart zoning configuration, follow these steps:

Procedure

Step 1 switch(config)# **clear zone smart-zoning fcalias name** *alias-name* **vsan** *number*

Removes the device type configuration for all the members of the specified fcalias.

Step 2 switch(config)# **clear zone smart-zoning zone name** *zone name* **vsan** *number*

Removes the device type configuration for all the members of the specified zone.

Step 3 switch(config)# **clear zone smart-zoning zoneset name** *zoneset name* **vsan** *number*

Removes the device type configuration for all the members of the zone and fcalias for the specified zoneset.

Step 4 switch(config)# **clear zone smart-zoning vsan** *number*

Removes the device type configuration for all the members of the zone and fcalias of all the specified zonesets in the VSAN.

Disabling Smart Zoning at Zone Level in the Basic Zoning Mode

To disable smart zoning at the zone level for a VSAN in basic zoning mode, follow these steps:

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config)# **zone name zone1 vsan 1**

Configures a zone name.

Step 3 switch(config-zone)# **attribute disable-smart-zoning**

Disables Smart Zoning for the selected zone.

Note
This command only disables the smart zoning for the selected zone and does not remove the device type configurations.

Disabling Smart Zoning at Zone Level for a VSAN in the Enhanced Zoning Mode

To disable smart zoning at the zone level for a VSAN in enhanced zoning mode, follow these steps:

Procedure

Step 1 switch# **configure terminal**

Enters configuration mode.

Step 2 switch(config)# **zone-attribute-group name disable-sz vsan 1**

Creates an enhanced zone session.

Step 3 switch(config-attribute-group)#**disable-smart-zoning**

Disables Smart Zoning for the selected zone.

Note
This command only disables the smart zoning for the selected zone and does not remove the device type configurations.

Step 4 switch(config-attribute-group)# **zone name prod vsan 1**

Configures a zone name.

Step 5 switch(config-zone)# **attribute-group disable-sz**

Configures to assign a group-attribute name for the selected zone.

Step 6 switch(config-zone)# **zone commit vsan 1**

Commits zoning changes to the selected VSAN.

Default Settings for Zones

The following table lists the default settings for basic zone parameters.

Table 6: Default Basic Zone Parameters

Parameters	Default
Default zone policy	Denied to all members.
Full zone set distribute	The full zone set(s) is not distributed.
Enhanced zoning	Disabled.