

# Advanced Inter-VSAN Routing Configuration

This chapter provides advanced configuration information and instructions. Before setting up advanced IVR configurations, see Basic Inter-VSAN Routing Configuration includes basic configuration instructions and descriptions of IVR features, limits, and terminology.


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# Advanced IVR Configuration Task List

To configure an advanced IVR topology in a SAN fabric, follow these steps:

**Procedure**

**Step 1** See IVR Network Address Translation and IVR NAT Requirements and Guidelines.

Determine whether or not to use IVR Network Address Translation (NAT).

**Step 2** See Domain ID Guidelines, on page 7.

If you do not plan to use IVR NAT, verify that unique domain IDs are configured in all switches and VSANs participating in IVR.

**Step 3** See Enabling IVR.

Enable IVR in the border switches.

**Step 4** See IVR Service Groups, on page 2.

Configure the service group as required.

**Step 5** See Distributing the IVR Configuration Using CFS.

Configure the IVR distribution as required.

**Step 6** Configure the IVR topology, either manually or automatically.

See Manually Configuring and Activating an IVR Topology, on page 8 and Advanced IVR Configuration, on page 2.

**Step 7** See Advanced IVR Zones and IVR Zone Sets, on page 17.

Create and activate IVR zone sets in *all* of the IVR-enabled border switches, either manually or using fabric distribution.

**Step 8** See Verifying the IVR Topology, on page 13.

Verify the IVR configuration.

# Advanced IVR Configuration

This section includes instructions on advanced IVR configurations. It includes the following topics:

## IVR Service Groups

In a complex network topology, you might only have a few IVR-enabled VSANs. To reduce the amount of traffic to non-IVR-enabled VSANs, you can configure service groups that restrict the traffic to the IVR-enabled VSANs. A maximum of 16 IVR service groups are allowed in a network. When a new IVR-enabled switch is added to the network, you must update the service groups to include the new VSANs.

### Service Group Guidelines

When configuring IVR service groups, consider these guidelines:

- If you use service groups with IVR auto topology mode, you should enable IVR and configure your service groups first, then distribute them with CFS before setting the IVR auto topology mode.
- The CFS distribution is restricted within the service group only when the IVR VSAN topology is in IVR auto topology mode. See IVR VSAN Topology .
- You can configure as many as 16 service groups in a network.
- When a new IVR-enabled switch is added to the network, you must update the service group to include the new VSANs.
- The same VSAN and AFID combination cannot be a member of more than one service group, otherwise, a CFS merge will fail.
- The total number of AFID and VSAN combinations in all the service groups combined cannot exceed 128. The maximum number of AFID and VSAN combinations in a single service group is 128.
- The IVR service group configuration is distributed in all IVR-enabled switches. IVR data traffic between two end devices belonging to a service group stays within that service group. For example, two members (for example, pWWN 1 and pWWN 2) cannot communicate if they belong to the same IVR zone and they belong to different service groups.
- During a CFS merge, service groups with the same name would be merged, as long as there are no conflicts with other service groups.
- If the total number of service groups exceeds 16 during a CFS merge, the CFS merge fails.

- CFS distributes service group configuration information to all reachable SANs. If you do not enable CFS distribution, you must ensure that the service group configuration is the same on all IVR-enabled switches in all VSANs.
- IVR end devices belonging to an IVR service group are not exported to any AFID or VSAN outside of its service group.
- When at least one service group is defined and an IVR zone member does not belong to the service group, that IVR zone member is not able to communicate with any other device.
- The default service group ID is zero (0).

## Default Service Group

All AFID and VSAN combinations that are part of an IVR VSAN topology but are not part of any user-defined service group are members of the default service group. The identifier of the default service group is 0.

By default, IVR communication is permitted between members of the default service group. You can change the default policy to deny. To change the default policy, see Configuring IVR Service Groups, on page 3. The default policy is not part of ASCII configuration.

## Service Group Activation

A configured service group must be activated. Like zone set activation or VSAN topology activation, the activation of a configured service group replaces the currently active service group, if any, with the configured one. There is only one configured service group database and one active service group database. Each of these databases can have up to 16 service groups.

## Configuring IVR Service Groups

To configure an IVR service group, follow these steps:

### Procedure

**Step 1** Enters configuration mode.

switch# **config t**

**Step 2** Configures the IVR service group called IVR-SG1 and enters IVR server group configuration mode.

switch(config)# **ivr service-group name IVR-SG1**

**Step 3** Deletes the IVR service group.

switch(config)# **no ivr service-group name IVR-SG1**

**Step 4** Configures AFID 10 for VSANs 1, 2, and 6 through 10.

switch(config-ivr-sg)# **autonomous-fabric-id 10 vsan-ranges 1,2,6-10**

**Step 5** Configures AFID 11 for VSAN 1.

switch(config-ivr-sg)# **autonomous-fabric-id 11 vsan-ranges 1**

**Step 6** Configures AFID 12 for VSANs 3 through 5.

switch(config-ivr-sg)# **autonomous-fabric-id 12 vsan-ranges 3-5**

**Step 7** Removes the association between AFID 12 and VSANs 3 through 5.

switch(config-ivr-sg)# **no autonomous-fabric-id 12 vsan-ranges 3-5**

**Step 8** Returns to configuration mode.

switch(config-ivr-sg)# **exit**

**Step 9** Configures the IVR service group called IVR-SG2 and enters IVR server group configuration mode.

switch(config)# **ivr service-group name IVR-SG2**

**Step 10** Configures AFID 20 for VSANs 3 through 5.

switch(config-ivr-sg)# **autonomous-fabric-id 20 vsan-ranges 3-5**

**Step 11** Returns to configuration mode.

switch(config-ivr-sg)# **exit**

**Step 12** Activates the service group configuration and sets the communication policy between switches in the default service group as allow (default).

switch(config)# **ivr service-group activate**

**Step 13** Activates the service group configuration and sets the communication policy between switches in the default service group to deny.

switch(config)# **ivr service-group activate default-sg-deny**

**Note**
To change the communication policy back to allow, you must issue the **ivr service-group activate** command again.

**Step 14** Deactivates (default) the service group configuration.

switch(config)# **no ivr service-group activate**

**Step 15** Activates the VSAN topology.

switch(config)# **ivr vsan-topology activate**

**Step 16** Enables CFS distribution for the IVR configuration.

switch(config)# **ivr distribute**

**Step 17** Commits the IVR configuration to the fabric.

switch(config)# **ivr commit**

## Copying the Active IVR Service Group Database

You can modify the configured IVR service group database; however, you cannot modify the active IVR service group database. To copy the active IVR service group database to the manually configured service group database, use the following command in EXEC mode:

```
switch# ivr copy active-service-group user-configured-service-group
```

## Clearing IVR Service Group Database

You can clear all entries in the IVR service group database by using the **clear ivr service-group databas**e command in EXEC mode. This command only clears the configured database, not the active database.

```
switch# clear ivr service-group database
```

## Verifying IVR Service Group Configuration

Use the **show ivr service-group active** command to view the active IVR service group database.

```
switch# show ivr service-group active
IVR ACTIVE Service Group
====================================
SG-ID  SG-NAME    AFID  VSANS
--------------------------------------------------------------------------------
 1     IVR-SG1      10  1-2,6-10
 1     IVR-SG1      11  1
 2     IVR-SG2      20  3-5
Total:   3 entries in active service group table
```

Use the **show ivr service-group configured** command to view the configured IVR service group database.

```
switch# show ivr service-group configured
IVR CONFIGURED Service Group
====================================
SG-ID  SG-NAME    AFID  VSANS
--------------------------------------------------------------------------------
 1     IVR-SG1      10  1-2,6-10
 1     IVR-SG1      11  1
 2     IVR-SG2      20  3-5
Total:   3 entries in configured service group table
```

# Autonomous Fabric IDs

The autonomous fabric ID (AFID) distinguishes segmented VSANS (for example, two VSANs that are logically and physically separate but have the same VSAN number). Cisco MDS NX-OS Release 4.2(1) supports AFIDs 1 through 64. AFIDs are used in conjunction with IVR auto topology mode to allow segmented VSANs in the IVR VSAN topology database.

## Autonomous Fabric ID Guidelines

You can configure AFIDs individually for VSANs, or you can set the default AFIDs for all VSANs on a switch. If you configure an individual AFID for a subset of the VSANs on a switch that has a default AFID, that subset uses the configured AFID while all other VSANs on that switch use the default AFID.

You can only use an AFID configuration when the VSAN topology is in IVR auto topology mode. In IVR manual topology mode, the AFIDs are specified in the VSAN topology configuration itself and a separate AFID configuration is not needed.



**Note** Two VSANs with the same VSAN number but different AFIDs are counted as two VSANs out of the total 128 VSANs allowed in the fabric.

When devices attached to multiple switches belong to one VSAN, they cannot communicate with each other by configuring the regular zone set because the AFIDs are different. You can consider that the different AFIDs are different fabrics; therefore, the three switches represent three separate fabrics.

If we specify the IVR VSAN topology as shown in the following example, IVR will set up the connection between the devices across the switches even though they have the same VSAN.

#### IVR VSAN Topology with the Same VSAN

```
switch# show ivr vsan-topology
AFID  SWITCH WWN                Active   Cfg.    VSANS
--------------------------------------------------------
   1  20:00:00:0d:ec:27:6b:c0     yes     yes       1
   2  20:00:00:0d:ec:27:6c:00     yes     yes       1
   3  20:00:00:0d:ec:27:6c:40     yes     yes       1
Total:   3 entries in active and configured IVR VSAN-Topology
```

## Configuring Default AFIDs

To configure the default AFID, follow these steps:

#### Procedure

**Step 1** Enters configuration mode.

switch# **config terminal**

**Step 2** Enters AFID database configuration submode.

switch(config)# **autonomous-fabric-id** database

**Step 3** Configures the default AFID for all VSANs not explicitly associated with an AFID. The valid range for the default AFID is 1 to 64.

switch(config-afid-db)# **switch-wwn 20:00:00:0c:91:90:3e:80 default-autonomous-fabric-id 5**

**Step 4** Reverts to the default value (1) for the default AFID.

switch(config-afid-db)# **no switch-wwn 20:00:00:0c:91:90:3e:80 default-autonomous-fabric-id 5**

## Configuring Individual AFIDs

To configure individual AFIDs, follow these steps:

#### Procedure

**Step 1** Enters configuration mode.

switch# **config t**

**Step 2** Enters AFID database configuration submode.

switch(config)# **autonomous-fabric-id** database

**Step 3** Configures an AFID and VSAN range for a switch. The valid range for AFIDs is 1 to 64.

switch(config-afid-db)# **switch-wwn 20:00:00:0c:91:90:3e:80 autonomous-fabric-id 10 vsan-ranges 1,2,5-8**

**Step 4** Deletes VSAN 2 from AFID 10.

switch(config-afid-db)# **no switch-wwn 20:00:00:0c:91:90:3e:80 autonomous-fabric-id 10 vsan-ranges 2**

## Verifying the AFID Database Configuration

To view the contents of the AFID database, use the **show autonomous-fabric-id database** command.

```
switch# show autonomous-fabric-id database
SWITCH WWN                    Default-AFID
------------------------------------------------------------
20:00:00:0c:91:90:3e:80          5
Total:   1 entry in default AFID table
SWITCH WWN                    AFID      VSANS
------------------------------------------------------------
20:00:00:0c:91:90:3e:80          10    1,2,5-8
Total:   1 entry in AFID table
```

# IVR Auto Topology Guidelines

Before configuring an IVR SAN fabric without IVR in NAT mode or IVR auto topology mode, consider the following general guidelines:

- Acquire a mandatory Enterprise License Package or SAN-EXTENSION license package and one active IPS card for this feature.
- If you change an FSPF link cost, ensure that the FSPF path distance (the sum of the link costs on the path) of any IVR path is less than 30,000.
- IVR-enabled VSANs can be configured when an interop mode is enabled or disabled.

# Domain ID Guidelines

Before configuring domain IDs, consider the following guidelines:

- Configure unique domain IDs across all VSANs and switches participating in IVR operations if you are not using IVR NAT. The following switches participate in IVR operations:
  - All edge switches in the edge VSANs (source and destination)
  - All switches in transit VSANs
- Minimize the number of switches that require a domain ID assignment. This ensures minimum traffic disruption.
- Minimize the coordination between interconnected VSANs when configuring the SAN for the first time as well as when you add each new switch.

You can configure domain IDs using one of two options:

- Configure the allowed-domains list so that the domains in different VSANs are non-overlapping on all participating switches and VSANs.
- Configure static, non-overlapping domains for each participating switch and VSAN.



**Note** In a configuration involving IVR without NAT, if one VSAN in the IVR topology is configured with static domain IDs, then the other VSANs (edge or transit) in the topology must be configured with static domain IDs.

## Transit VSAN Guidelines

Before configuring transit VSANS, consider the following guidelines:

- Besides defining the IVR zone membership, you can choose to specify a set of transit VSANs to provide connectivity between two edge VSANs:
  - If two edge VSANs in an IVR zone overlap, then a transit VSAN is not required (though, not prohibited) to provide connectivity.
  - If two edge VSANs in an IVR zone do not overlap, you may need one or more transit VSANs to provide connectivity. Two edge VSANs in an IVR zone will not overlap if IVR is not enabled on a switch that is a member of both the source and destination edge VSANs.
- Traffic between the edge VSANs only traverses through the shortest IVR path.
- Transit VSAN information is common to all IVR zone sets. Sometimes, a transit VSAN can also act as an edge VSAN in another IVR zone.

## Border Switch Guidelines

Before configuring border switches, consider the following guidelines:

- Configure IVR only in the relevant border switches.
- Border switches require Cisco MDS SAN-OS Release 1.3(1) or later.
- A border switch must be a member of two or more VSANs.
- A border switch that facilitates IVR communications must be IVR enabled.
- IVR can also be enabled on additional border switches to provide redundant paths between active IVR zone members.
- The VSAN topology configuration must be updated before a border switch is added or removed.

# Manually Configuring and Activating an IVR Topology

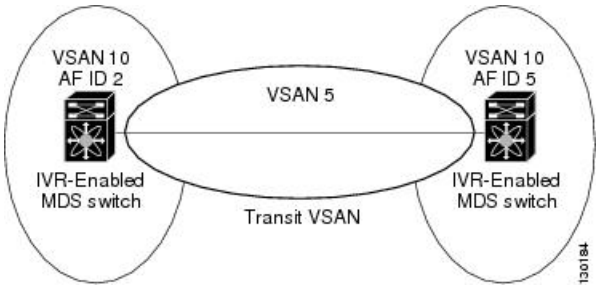
You must create the IVR topology on every IVR-enabled switch in the fabric if you have not enabled IVR auto topology mode. To use IVR manual topology mode, follow the instructions in this section.

## Manual Configuration Guidelines

Consider the following guidelines when using IVR manual topology mode:

- You can configure a maximum of 128 IVR-enabled switches and 128 distinct VSANs in an IVR topology (see Figure 1: Example: IVR Topology with Non-Unique VSAN IDs Using AFIDs, on page 9).
- You will need to specify the IVR topology using the following information:
  - The switch WWNs of the IVR-enabled switches.
  - A minimum of two VSANs to which the IVR-enabled switch belongs.
  - The AFID, which distinguishes two VSANs that are logically and physically separate, but have the same VSAN number. You can specify up to 64 AFIDs.

***Figure 1: Example: IVR Topology with Non-Unique VSAN IDs Using AFIDs***




- If two VSANs in an IVR topology have the same VSAN ID and different AFIDs, they count as two VSANs for the 128-VSAN limit for IVR.
- The use of a single AFID does not allow for segmented VSANs in an inter-VSAN routing topology.

# Manually Configuring an IVR Topology

**Note** Use the sh**ow wwn switch** command to obtain the switch WWNs of the IVR-enabled switches.

To manually configure an IVR topology using Cisco NX-OS, follow these steps:

### Procedure

**Step 1** Enters configuration mode.

switch# **config t**

**Step 2** Enters the VSAN topology database configuration mode for the IVR feature.

switch(config)# **ivr vsan-topology database**.

**Step 3** Configures VSANs 1, 2, and 6 to participate in IVR for this switch.

switch(config-ivr-topology-db)# **autonomous-fabric-id 1 switch 20:00:00:05:30:01:1b:b8 vsan-ranges 1-2,6**.

**Step 4** Configures VSANs 1, 2 and 3 to participate in IVR for this switch.

switch(config-ivr-topology-db)# **autonomous-fabric-id 1 switch 20:00:00:05:30:01:1b:c2 vsan-ranges 1-3**.

**Step 5** Removes VSANs 1 and 2 from IVR for this switch.

switch(config-ivr-topology-db)# **no autonomous-fabric-id 1 switch 20:00:00:05:30:01:1b:c2 vsan-ranges 1-2**.

**Step 6** Returns to EXEC mode.

switch(config-ivr-topology-db)# **end**

### What to do next

View the IVR topology using the **show ivr vsan-topology** command. In the following example output, VSAN 2 is the transit VSAN between VSANs 1, 5, and 6.

```
switch# show ivr vsan-topology
AFID  SWITCH WWN                Active   Cfg. VSANS
------------------------------------------------------------
   1  20:00:00:05:30:01:1b:c2 *   no      yes  1-2
   1  20:02:00:44:22:00:4a:05     no      yes  1-2,6
   1  20:02:00:44:22:00:4a:07     no      yes  2-5
Total:   3 entries in active and configured IVR VSAN-Topology

Current Status: Inter-VSAN topology is INACTIVE
```

Repeat this configuration on all IVR-enabled switches or distribute the IVR configuration using CFS. See Distributing the IVR Configuration Using CFS.

**Tip** Transit VSANs are deduced based on your configuration. The IVR feature does not have an explicit transit-VSAN configuration.

# Activating a Manually Configured IVR Topology

After manually configuring the IVR topology, you must activate it.

**Caution** Active IVR topologies cannot be deactivated. You can only switch to IVR auto topology mode.

To activate a manually configured IVR topology, follow these steps:

### Procedure

**Step 1** Enters configuration mode.

switch# **config terminal**

**Step 2** Activates the manually configured IVR topology.

switch(config)# **ivr vsan-topology activate**

## Viewing an Active IVR Topology

View the active IVR topology using the **show ivr vsan-topology** command.

```
switch# show ivr vsan-topology
AFID  SWITCH WWN                 Active   Cfg. VSANS
------------------------------------------------------------
   1  20:00:00:05:30:01:1b:c2 *   yes     yes  1-2
   1  20:02:00:44:22:00:4a:05     yes     yes  1-2,6
   1  20:02:00:44:22:00:4a:07     yes     yes  2-5
Total:   3 entries in active and configured IVR VSAN-Topology
Current Status: Inter-VSAN topology is ACTIVE
Last activation time: Mon Mar 24 07:19:53 2009
```

**Note** The asterisk (*) indicates the local switch.

# Working with Existing IVR Topologies

This section includes advanced IVR configurations for existing IVR topologies:

## Adding an IVR-Enabled Switch to an Existing IVR Topology

Before adding an IVR-enabled switch to an existing fabric, you must add an entry to the IVR topology for the new switch and activate the new IVR topology.

To add the IVR-enabled switch to an existing IVR topology, follow these steps:

### Procedure

**Step 1** Enters configuration mode.

switch# **config terminal**

**Step 2** Enters IVR VSAN topology database configuration submode.

mds(config)# ivr vsan-topology database

**Step 3** Adds the new IVR-enabled switch to the topology.

mds(config-ivr-topology-db)# **autonomous-fabric-id 1 switch-wwn 20:00:00:05:40:01:1b:c2 vsan-ranges 1,4**

**Step 4** Returns to configuration mode.

switch(config-ivr-topology-db)# **exit**

**Step 5** Activates the IVR VSAN topology.

switch(config)# ivr vsan-topology activate

**Step 6** Commits the IVR configuration change to the fabric.

switch(config)# **ivr commit**

**Step 7** Returns to EXEC mode.

switch(config)# **exit**

**Step 8** Saves the running configuration.

switch# **copy running-config startup-config**

### What to do next

After adding the switch to the IVR topology, enable IVR and CFS on the new switch (see Enabling IVR and Distributing the IVR Configuration Using CFS).

# Adding VSANs to an Existing IVR Topology

To add VSANs to an existing IVR topology you need to specify all VSANs in the command syntax. First IVR Configuration with VSANs 1101-1102 and 2101-2102, on page 12 shows an IVR configuration with VSANs 1101-1102 and VSANs 2101-2102. Adding VSANs 1103 and 2103 to the IVR Configuration, on page 12 shows the addition of VSANs 1103 and 2103 to the IVR topology.

### First IVR Configuration with VSANs 1101-1102 and 2101-2102

```
switch(config)# ivr enable
switch(config)# ivr distribute
switch(config)# ivr vsan-topology database
switch(config-ivr-topology-db)# autonomous-fabric-id    1 switch-wwn 20:00:00:0d:ec:4a:5e:00
 vsan-ranges 1101-1102,1199,3100,3150
switch(config-ivr-topology-db)# autonomous-fabric-id    1 switch-wwn 20:00:00:0d:ec:4a:5f:00
 vsan-ranges 2101-2102,2199,3100,3150
switch(config)# ivr vsan-topology activate
```

### Adding VSANs 1103 and 2103 to the IVR Configuration

```
switch(config)# ivr enable
switch(config)# ivr distribute
switch(config)# ivr vsan-topology database
switch(config-ivr-topology-db)# autonomous-fabric-id    1 switch-wwn 20:00:00:0d:ec:4a:5e:00
 vsan-ranges 1101-1103,1199,3100,3150
switch(config-ivr-topology-db)# autonomous-fabric-id    1 switch-wwn 20:00:00:0d:ec:4a:5f:00
 vsan-ranges 2101-2103,2199,3100,3150
switch(config)# ivr vsan-topology activate
```

# Copying the Active IVR Topology

You can edit a manually configured IVR topology; however, you cannot edit an active IVR topology. To copy the active IVR topology database to the manually configure topology, issue the **ivr copy active-topology user-configured-topology** command in EXEC mode:

```
switch# ivr copy active-topology user-configured-topology
```

# Clearing a Manually Configured IVR Topology Database

To clear a manually configured IVR topology database, follow these steps:

**Procedure**

**Step 1** Enters configuration mode.

switch# **config terminal**

**Step 2** Clears the previously created IVR topology.

switch(config)# no **ivr vsan-topology database**

# Verifying the IVR Topology

To verify the IVR topology, issue the **show ivr vsan-topology** command.

### Displays the Configured IVR VSAN Topology

```
switch# show ivr vsan-topology
AFID    SWITCH WWN                Active   Cfg. VSANS
-----------------------------------------------------------
   1    20:00:00:05:30:01:1b:c2 *   yes     yes  1-2
   1    20:02:00:44:22:00:4a:05     yes     yes  1-2,6
   1    20:02:00:44:22:00:4a:07     yes     yes  2-5
Total:   5 entries in active and configured IVR VSAN-Topology
Current Status: Inter-VSAN topology is ACTIVE
Last activation time: Sat Mar 22 21:46:15 1980
```

**Note** The asterisk (*) indicates the local switch.

### Displays the Active IVR VSAN Topology

```
switch# show ivr vsan-topology active
AFID   SWITCH WWN                Active   Cfg. VSANS
-----------------------------------------------------------
    1  20:00:00:05:30:01:1b:c2 *   yes     yes  1-2
    1  20:02:00:44:22:00:4a:05     yes     yes  1-2,6
    1  20:02:00:44:22:00:4a:07     yes     yes  2-5
Total:   5 entries in active IVR VSAN-Topology
Current Status: Inter-VSAN topology is ACTIVE
Last activation time: Sat Mar 22 21:46:15
```

**Displays the Configured IVR VSAN Topology**

```
switch# show ivr vsan-topology configured
AFID  SWITCH WWN                 Active   Cfg. VSANS
------------------------------------------------------------
    1  20:00:00:05:30:01:1b:c2 *   yes     yes  1-2
    1  20:02:00:44:22:00:4a:05     yes     yes  1-2,6
    1  20:02:00:44:22:00:4a:07     yes     yes  2-5
Total:   5 entries in configured IVR VSAN-Topology
```

# Migrating from IVR Auto Topology Mode to IVR Manual Topology Mode

If you want to migrate from IVR auto topology mode to IVR manual topology mode, copy the active IVR VSAN topology database to the user-configured IVR VSAN topology database before switching modes.

To migrate from IVR auto topology mode to IVR manual topology mode, follow these steps:

**Procedure**

**Step 1** Copies the automatic IVR topology database to the user-configured IVR topology.

switch# **ivr copy auto-topology user-configured-topology**

**Step 2** Enters configuration mode.

switch# **config t**

**Step 3** Disables IVR auto topology mode for the IVR topology database and enables IVR manual topology mode.

switch(config)# **ivr vsan-topology activate**

# Persistent FC IDs for IVR

This section includes the following information:

# FC ID Features and Benefits

FC ID persistence improves IVR management by providing the following features:

- Allows you to control and assign a specific virtual domain to use in a native VSAN.
- Allows you to control and assign a specific virtual FC ID for a device.

The benefits of persistent FC IDs for IVR are as follows:

- Host devices always see the same FC ID for targets.
- FC IDs help you plan your SAN layout better by assigning virtual domains for IVR to use.
- FC IDs can make SAN monitoring and management easier. When you see the same domain or FC ID consistently assigned, you can readily determine the native VSAN or device to which it refers.

# FC ID Guidelines

Before configuring persistent FC IDs, consider the following:

- You can configure two types of database entries for persistent IVR FC IDs:
  - Virtual domain entries—Contain the virtual domain that should be used to represent a native VSAN in a specific VSAN (current VSAN). Virtual domain entries contain the following information:

Native AFID

Native VSAN

Current AFID

Current VSAN

Virtual domain to be used for the native AFID and VSAN in current AFID and VSAN

- • Virtual FC ID entries—Contain the virtual FC ID that should be used to represent a device in a specific VSAN (current VSAN). Virtual FC ID entries contain the following information:

Port WWN

Current AFID

Current VSAN

Virtual FC ID to be used to represent a device for the given pWWN in the current AFID and VSAN

- If you use persistent FC IDs for IVR, we recommend that you use them for all the devices in the IVR zone set. We do not recommend using persistent FC IDs for some of the IVR devices while using automatic allocation for other devices.
- IVR NAT must be enabled to use IVR persistent FC IDs.
- In an IVR NAT configuration, if one VSAN in the IVR topology is configured with static domain IDs, then the IVR domains that can be exported to that VSAN must also be assigned static domains.

# Configuring Persistent FC IDs for IVR

To configure persistent FC IDs for IVR, follow these steps:

**Procedure**

**Step 1** Enters configuration mode.

switch# **config t**

**Step 2** Enters IVR fcdomain database configuration submode for current AFID 21 and VSAN 22

switch(config)# **ivr fcdomain database autonomous-fabric-num 21 vsan 22**.

**Step 3** Deletes all the database entries, including all the corresponding persistent FC ID entries, for current AFID 21 and VSAN 22

switch(config)# **no ivr fcdomain database autonomous-fabric-num 21 vsan 22**.

**Step 4** Adds or replaces a database entry for native AFID 20, native VSAN 11, and domain 12, and enters IVR fcdomain FC ID configuration submode. Domains of all the corresponding persistent FC ID entries, if any, are also changed to 12.

switch(config-fcdomain)# **native-autonomous-fabric-num 20 native-vsan 11 domain 12**

**Step 5** Deletes the virtual domain entry native AFID 20 and native VSAN 11, and all corresponding FC ID entries

switch(config-fcdomain)# **no native-autonomous-fabric-num 20 native-vsan 11**.

**Step 6** Adds or replaces a database entry for mapping the pWWN to the FC ID.

switch(config-fcdomain-fcid)# **pwwn 11:22:33:44:55:66:77:88 fcid 0x114466**

**Step 7** Deletes the database entries for the pWWN

switch(config-fcdomain-fcid)# **no pwwn 11:22:33:44:55:66:77:88**.

**Step 8** Adds a database entry for mapping the device alias to the FC ID.

switch(config-fcdomain-fcid)# **device-alias SampleName fcid 0x123456**

**Step 9** Deletes the database entries for the device alias.

switch(config-fcdomain-fcid)# **no device-alias SampleName**

# Verifying the Persistent FC ID Configuration

Verify the persistent FC ID configuration using the **show ivr fcdomain database** command.

### Displays All IVR fcdomain Database Entries

```
switch# show ivr fcdomain database
-------------------------------------------------
  AFID  Vsan  Native-AFID  Native-Vsan  Virtual-domain
-------------------------------------------------
    1     2        10          11         0xc(12)
   21    22        20          11         0xc(12)
Number of Virtual-domain entries: 2
-------------------------------------------------
  AFID  Vsan          Pwwn           Virtual-fcid
-------------------------------------------------
   21    22  11:22:33:44:55:66:77:88  0x114466
   21    22  21:22:33:44:55:66:77:88  0x0c4466
   21    22  21:22:33:44:55:66:78:88  0x0c4466
Number of Virtual-fcid entries: 3
```

### Displays the IVR fcdomain Database Entries for a Specific AFID and VSAN

```
switch# show ivr fcdomain database autonomous-fabric-num 21 vsan 22
-------------------------------------------------
  AFID  Vsan  Native-AFID  Native-Vsan  Virtual-domain
-------------------------------------------------
   21    22        20          11         0xc(12)
Number of Virtual-domain entries: 1
```

```
-------------------------------------------------
  AFID  Vsan          Pwwn           Virtual-fcid
-------------------------------------------------
   21    22  11:22:33:44:55:66:77:88  0x114466
   21    22  21:22:33:44:55:66:77:88  0x0c4466
   21    22  21:22:33:44:55:66:78:88  0x0c4466
Number of Virtual-fcid entries: 3
```

# Advanced IVR Zones and IVR Zone Sets

This section describes advanced configuration information for IVR zones and IVR zone sets. For basic information on configuring IVR zones and zone sets, see IVR Zones and IVR Zone Sets.

As part of the IVR configuration, you need to configure one or more IVR zone to enable cross-VSAN communication. To achieve this, you must specify each IVR zone as a set of (pWWN, VSAN) entries. Different IVR zone sets can contain the same IVR zone, because IVR zones can be members of one or more IVR zone sets.

**Note** The same IVR zone set must be activated on all of the IVR-enabled switches.

**Caution** Prior to Cisco SAN-OS Release 3.0(3) you can only configure a total of 10,000 zone members on all switches in a network. As of Cisco SAN-OS Release 3.0(3) you can only configure a total of 20,000 zone members on all switches in a network. A zone member is counted twice if it exists in two zones. See Database Merge Guidelines .

# IVR Zone Configuration Guidelines

When interop mode is enabled, consider the following IVR configuration guidelines:

- When a member's native VSAN is in interop mode (for example, when the interop mode is 2, 3, or 4), then ReadOnly, the QoS attribute, and LUN zoning are not permitted.
- When a member's VSAN is already in interop mode and an attempt is made to configure ReadOnly, the QoS attribute, or LUN zoning, a warning message is displayed to indicate that the configuration is not permitted.
- When you configure ReadOnly, the QoS attribute, or LUN zoning first, and then change the member's VSAN interop mode, a warning message is displayed to indicate the configuration is not permitted. You are then prompted to change the configuration.

The following example shows samples of the warning messages that are displayed when configuration changes are made that affect ReadOnly, the QoS attribute, and LUN zoning.

### IVR Zone Configuration Warning Messages

```
switch(config)# vsan database
switch(config-vsan-db)# vsan 2
```

```
switch(config-vsan-db)# vsan 2 interop 2
switch(config-vsan-db)# exit
switch(config)# ivr zoneset name ivr_zs1 switch(config-ivr-zoneset)# zone name ivr_z1
 switch(config-ivr-zoneset-zone)# member pwwn 21:00:00:14:c3:3d:45:22 lun 0x32 vsan 2 VSAN
 is in interop mode, and LUN zoning cannot be set.
switch(config)# ivr zoneset name ivr_zs1 switch(config-ivr-zoneset)# zone name ivr_z1
 switch(config-ivr-zoneset-zone)# member pwwn 21:00:00:14:c3:3d:45:22 vsan 2
 switch(config-ivr-zoneset-zone)# attribute read-only VSAN is in interop mode and zone
member has been configured, zone cannot be set to READ-ONLY.
switch(config-ivr-zoneset-zone)# attribute qos priority medium VSAN is in interop mode and
 zone member has been configured, QoS cannot be assigned to zone.
```

# Configuring LUNs in IVR Zoning

LUN zoning can be used between members of active IVR zones.You can configure the service by creating and activating LUN zones between the desired IVR zone members in all relevant edge VSANs using the zoning interface or you can use LUN zoning directly supported by IVR. For more details on the advantages of LUN zoning, refer to the Cisco MDS 9000 Series *NX-OS Fabric Configuration Guide* or the *Cisco Fabric Manager Fabric Configuration Guide* .

To configure LUNs in IVR zoning, follow these steps:

### Procedure

**Step 1** Enters configuration mode

switch# **config t**.

**Step 2** Configures an IVR zone called IvrLunZone

switch(config)# **ivr zone name IvrLunZone**

**Step 3** Configures an IVR zone member based on the specified pWWN and LUN value

switch(config-ivr-zone)# **member pwwn 10:00:00:23:45:67:89:ab lun 0x64 vsan 10**

**Note**
The CLI interprets the LUN identifier value as a hexadecimal value whether or not the **0x** prefix is included.

**Step 4** Configures an IVR zone member based on the specified pWWN, LUN value, and AFID.

switch(config-ivr-zone)# **member pwwn 10:00:00:23:45:67:89:ab lun 0x64 vsan 10 autonomous-fabric-id 20**

**Step 5** Removes an IVR zone member.

switch(config-ivr-zone)# **no member pwwn 20:81:00:0c:85:90:3e:80 lun 0x32 vsan 13 autonomous-fabric-id 10**

### What to do next

**Note** You can configure LUN zoning in an IVR zone set setup.

# Configuring the QoS Attribute

To configure the QoS attribute for an IVR zone, follow these steps:

### SUMMARY STEPS

1. Enters configuration mode.
2. Configures an IVR zone called IvrZone.
3. Configures the QoS for IVR zone traffic to medium
4. Reverts to the default QoS setting. The default is low.

### DETAILED STEPS

**Procedure**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | Enters configuration mode. | switch# **config t** |
| **Step 2** | Configures an IVR zone called IvrZone. | switch(config)# **ivr zone name IvrZone** |
| **Step 3** | Configures the QoS for IVR zone traffic to medium | switch(config-ivr-zone)# **attribute qos priority medium**. |
| **Step 4** | Reverts to the default QoS setting. The default is low. | switch(config-ivr-zone)# **no attribute qos priority medium** |

**What to do next**

**Note** If other QoS attributes are configured, the highest setting takes priority.

# Verifying the QoS Attribute For an IVR Zone

Use the **show ivr zone** command to verify the QoS attribute for an IVR zone.

```
switch(config)# show ivr zone
zone name IvrZone
    attribute qos priority medium
```

# Renaming IVR Zones and IVR Zone Sets

To rename an IVR zone, use the **ivr zone rename** command in EXEC mode.

```
switch# ivr zone rename ivrzone1 ivrzone2
```

To rename an IVR zone set, use the **ivr zoneset rename** command in EXEC mode.

```
switch# ivr zoneset rename ivrzone1 ivrzone2
```

# Clearing the Configured IVR Zone Database

Clearing a zone set erases the configured zone database, not the active zone database.

To clear the configured IVR zone database, use the **clear ivr zone database** command.

**Procedure**

**Step 1** Clears all configured IVR zone information.

switch# **clear ivr zone database**

**Step 2** Ensures that the running configuration is used when you restart the switch.

switch# **copy running-config startup-config**

# Configuring IVR Using Read-Only Zoning

Read-only zoning (with or without LUNs) can be used between members of active IVR zones. To configure this service, you must create and activate read-only zones between the desired IVR zone members in all relevant edge VSANs using the zoning interface.

**Note** Read-only zoning cannot be configured in an IVR zone set setup.

# Enabling Advanced Fabric Services on IVR Flows

Advanced fabric services (such as SME and IOA) use fabric-wide FC-Redirect infrastructure to redirect the traffic flows. These services can now be enabled on IVR flows using an internal feature, Abstract ACL Manager (AAM).

# Configuration Guidelines and Restrictions

The following prerequisites must be considered before enabling AAM for IVR:

- CFS distribution must be enabled for IVR.
- AAM is supported only in IVR-NAT mode.
- The switches where the fabric services (such as SME and IOA) are enabled must be running the AAM supported NX-OS release 5.0(1) or later.
- FC-Redirect can be running in version 1 or version 2 mode.
- AAM support for IVR must be enabled before enabling IVR support for FCR.
- LUN zoning is not supported when AAM is enabled for IVR.

- IVR merge is supported only when both the fabrics have AAM enabled or both the fabrics have AAM disabled. The IVR merge will fail if one of the fabric has AAM enabled and the other fabric has AAM disabled.
- You must delete all the advanced fabric service (SME and IOA) configurations for IVR devices and then disable IVR support for FCR before disabling AAM support for IVR.
- Before downgrading to an earlier release to MDS NX-OS Release 5.0(1), you must delete all the advanced fabric service (SME and IOA) configurations for IVR devices, disable IVR support for FCR, and then disable AAM support for IVR.

# Enabling AAM Support for IVR

To enable AAM for IVR, follow these steps:

### Procedure

**Step 1** Enters the configuration mode.

switch# **config t**

**Step 2** Enables IVR.

switch(config)# **feature ivr**

**Step 3** Enables CFS distribution for IVR.

switch(config)# **ivr distribute**

**Step 4** Enables NAT mode for IVR.

switch(config)# **ivr nat**

**Step 5** Commits IVR configuration changes.

switch(config)# **ivr commit**

**Step 6** Enables AAM for IVR.

switch(config)# **ivr aam register**

**Step 7** Commits IVR configuration changes.

switch(config)# **ivr commit**

### What to do next

You can use the **show ivr aam** command to verify if AAM support is enabled for IVR.

```
switch(config)# show ivr aam
AAM mode status
--------------------------
AAM is enabled
```

# Enabling IVR Support for FCR

To enable IVR support for FCR, follow these steps:

### Procedure

**Step 1** Enters the configuration mode.

switch# **config t**

**Step 2** Enables IVR support for FCR.

switch(config)# **fc-redirect ivr-support enable**

### What to do next

You can use the **show fc-redirect config** command to verify if AAM support is enabled for FCR.

```
switch(config)# show fc-redirect config
switch(config)#
switch(config)#
switch(config)#
```

# Disabling AAM Support for IVR

To disable AAM support for IVR, follow these steps:

### Procedure

**Step 1** Enters the configuration mode.

switch# **config t**

**Step 2** Checks for the existence of advanced fabric service configurations for IVR devices

switch(config)# **ivr aam pre-deregister-check**.

**Step 3** Displays the status of the advanced fabric service configurations for IVR devices

switch(config)# **show ivr aam pre-deregister-check**.

**Step 4** Delete all the advanced fabric service (SME and IOA) configurations for IVR devices

Refer to the Cisco MDS 9000 Series SME and IOA Configuration Guides..

**Step 5** Disables IVR support for FCR.

switch(config)# **no fc-redirect ivr-support enable**

**Step 6** Disables AAM support for IVR.

switch(config)# **no ivr aam register**.

**Step 7** Commits IVR configuration changes.

switch(config)# **ivr commit**

### What to do next

You must use the **ivr aam pre-deregister-check** command to see if there is any SME or IOA configuration for IVR devices, before disabling AAM support for IVR.

```
switch(config)# show ivr aam pre-deregister-check
AAM pre-deregister check status
--------------------------
Run the "ivr aam pre-deregister-check" command first to check whether an ivr aam deregister
 can be done.
switch(config)# ivr aam pre-deregister-check
switch(config)# show ivr aam pre-deregister-check
AAM pre-deregister check status
--------------------------
FAILURE
There are merged entries or AAM has not been enabled with the following switches:
  switch swwn 20:00:00:05:30:00:15:de
User has two options:
 1. User can go ahead to issue ivr commit, but the above switches in the fabric may fail
to deregister.
 2. User may also run "ivr abort", then resolve above switches and re-issue the ivr aam
deregister.
Warning: IVR AAM pre-deregister-check status may not be up-to-date. Please issue the command
 "ivr aam pre-deregister-check" to get updated status.
switch(config)# ivr aam pre-deregister-check
switch(config)# show ivr aam pre-deregister-check
AAM pre-deregister check status
--------------------------
SUCCESS
Warning: IVR AAM pre-deregister-check status may not be up-to-date. Please issue the command
 "ivr aam pre-deregister-check" to get updated status.
```