CHAPTER 1

Basic Inter-VSAN Routing Configuration

This chapter describes the Inter-VSAN Routing (IVR) feature and provides basic instructions on sharing resources across VSANs using IVR management interfaces. After setting up a basic IVR configuration, see *Chapter 2, "Advanced Inter-VSAN Routing Configuration."* if you need to set up an advanced IVR configuration.

This chapter includes the following sections on IVR basic configuration:

- About Inter-VSAN Routing, page 1-1
- Basic IVR Configuration, page 1-5
- IVR Virtual Domains, page 1-11
- IVR Zones and IVR Zone Sets, page 1-12
- IVR Logging, page 1-20
- Database Merge Guidelines, page 1-21
- Default Settings, page 1-23

About Inter-VSAN Routing

Virtual SANs (VSANs) improve storage area network (SAN) scalability, availability, and security by allowing multiple Fibre Channel SANs to share a common physical infrastructure of switches and ISLs. These benefits are derived from the separation of Fibre Channel services in each VSAN and the isolation of traffic between VSANs. Data traffic isolation between the VSANs also inherently prevents sharing of resources attached to a VSAN, such as robotic tape libraries. Using IVR, you can access resources across VSANs without compromising other VSAN benefits.

This section includes the following topics:

- IVR Features, page 1-2
- IVR Terminology, page 1-3
- IVR Configuration Limits, page 1-4
- Fibre Channel Header Modifications, page 1-4
- IVR Network Address Translation, page 1-4
- IVR VSAN Topology, page 1-5
- IVR Interoperability, page 1-5

IVR Features

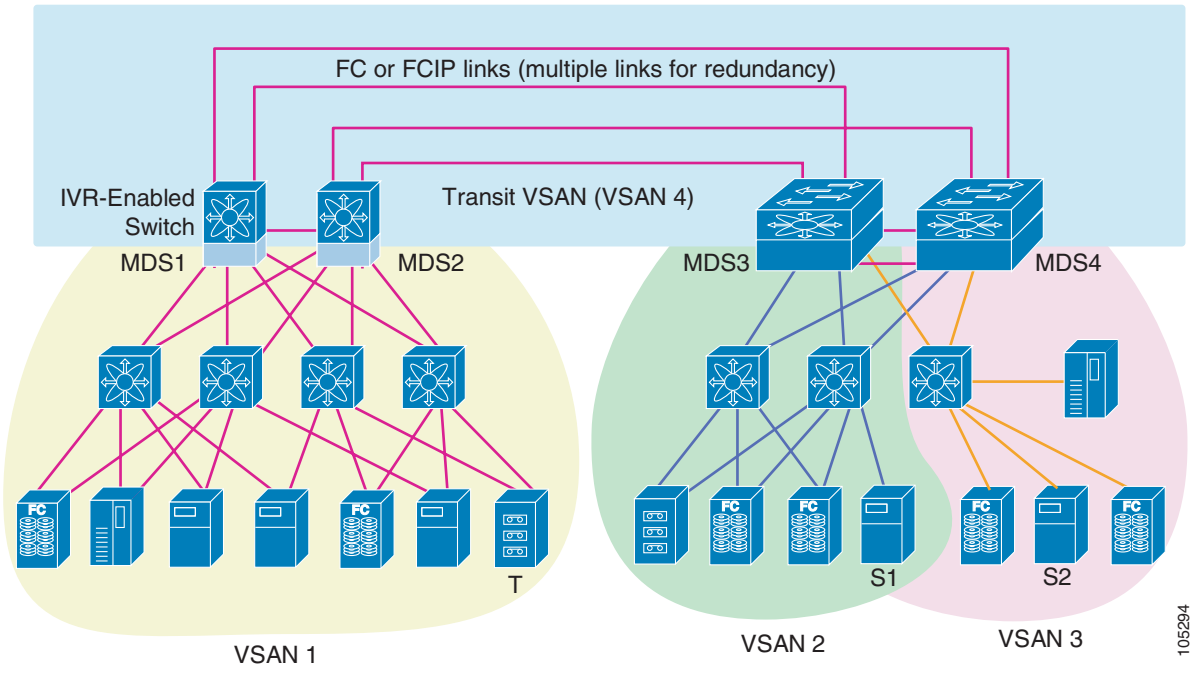
IVR supports the following features:

- Accesses resources across VSANs without compromising other VSAN benefits.
- Transports data traffic between specific initiators and targets on different VSANs without merging VSANs into a single logical fabric.
- IVR is not limited to VSANs present on a common switch. Routes that traverse one or more VSANs across multiple switches can be established, if necessary, to establish proper interconnections.
- Shares valuable resources (such as tape libraries) across VSANs without compromise. Fibre Channel traffic does not flow between VSANs, nor can initiators access any resource across VSANs other than the designated VSAN.
- Provides efficient business continuity or disaster recovery solutions when used in conjunction with FCIP (see Figure 1-1).
- Is in compliance with Fibre Channel standards.
- Incorporates third-party switches, however, IVR-enabled VSANs may need to be configured in one of the interop modes.

Note IVR is not supported on the Cisco MDS 9124 Fabric Switch, the Cisco MDS 9134 Fabric Switch, the Cisco Fabric Switch for HP c-Class BladeSystem, and the Cisco Fabric Switch for IBM BladeCenter.

Originator Exchange ID (OX ID) load balancing of IVR traffic from IVR- enabled switches is not supported on Generation 1 switching modules. OX ID-based load balancing of IVR traffic from a non-IVR MDS switch could work in some environments. Generation 2 switching modules support OX ID-based load balancing of IVR traffic from IVR-enabled switches.

Figure 1-1 Traffic Continuity Using IVR and FCIP



IVR Terminology

The following IVR-related terms are used in the IVR documentation:

- Native VSAN—The VSAN to which an end device logs on is the native VSAN for that end device.
- Current VSAN—The VSAN currently being configured for IVR.
- Inter-VSAN Routing zone (IVR zone)—A set of end devices that are allowed to communicate across VSANs within their interconnected SAN fabric. This definition is based on their port world wide names (pWWNs) and their native VSAN associations. Prior to Cisco SAN-OS Release 3.0(3), you can configure up to 2000 IVR zones and 10,000 IVR zone members on the switches in the network. As of Cisco SAN-OS Release 3.0(3), you can configure up to 8000 IVR zones and 20,000 IVR zone members on the switches in the network.
- Inter-VSAN routing zone sets (IVR zone sets)—One or more IVR zones make up an IVR zone set. You can configure up to 32 IVR zone sets on any switch in the Cisco MDS 9000 Family. Only one IVR zone set can be active at any time.
- IVR path—An IVR path is a set of switches and Inter-Switch Links (ISLs) through which a frame from an end device in one VSAN can reach another end device in some other VSAN. Multiple paths can exist between two such end devices.
- IVR-enabled switch—A switch on which the IVR feature is enabled.
- Edge VSAN—A VSAN that initiates (source edge-VSAN) or terminates (destination edge-VSAN) an IVR path. Edge VSANs may be adjacent to each other or they may be connected by one or more transit VSANs. In Figure 1-1, VSANs 1, 2, and 3 are edge VSANs.

  Note An edge VSAN for one IVR path can be a transit VSAN for another IVR path.

- Transit VSAN—A VSAN that exists along an IVR path from the source edge VSAN of that path to the destination edge VSAN of that path. In Figure 1-1, VSAN 4 is a transit VSAN.

  Note When the source and destination edge VSANs are adjacent to each other, then a transit VSAN is not required between them.

- Border switch—An IVR-enabled switch that is a member of two or more VSANs. Border switches, such as the IVR-enabled switch between VSAN 1 and VSAN 4 in Figure 1-1, span two or more different color-coded VSANs.
- Edge switch—A switch to which a member of an IVR zone has logged in to. Edge switches are unaware of the IVR configurations in the border switches. Edge switches do not need to be IVR-enabled.
- Autonomous Fabric Identifier (AFID)—Allows you to configure more than one VSAN in the network with the same VSAN ID and avoid downtime when configuring IVR between fabrics that contain VSANs with the same ID.
- Service group—Allows you to reduce the amount of IVR traffic to non-IVR-enabled VSANs by configuring one or more service groups that restrict the traffic to the IVR-enabled VSANs.

IVR Configuration Limits

Table 1-1 summarizes the configuration limits for IVR.

Table 1-1 IVR Configuration Limits

IVR Feature	Maximum Limit
IVR VSANs	128
IVR zone members	As of Cisco SAN-OS Release 3.0(3), 20,000 IVR zone members per physical fabric Prior to Cisco SAN-OS Release 3.0(3), 10,000 IVR zone members per physical fabric
IVR zones	As of Cisco SAN-OS Release 3.0(3), 8000 IVR zones per physical fabric Prior to Cisco SAN-OS Release 3.0(3), 2000 IVR zones per physical fabric
IVR zone sets	32 IVR zone sets per physical fabric.
IVR service groups	16 service groups per physical fabric.
IVR switches	25 (automatic topology) **Note** We recommend manual topology if you have more than 25 IVR switches.

Fibre Channel Header Modifications

IVR virtualizes the remote end devices in the native VSAN using a virtual domain. When IVR is configured to link end devices in two disparate VSANs, the IVR border switches are responsible for modifying the Fibre Channel headers for all communication between the end devices. The sections of the Fibre Channel frame headers that are modified include:

- VSAN number
- Source FCID
- Destination FCID

When a frame travels from the initiator to the target, the Fibre Channel frame header is modified such that the initiator VSAN number is changed to the target VSAN number. If IVR Network Address Translation (NAT) is enabled, then the source and destination FCIDs are also translated at the edge border switch. If IVR NAT is not enabled, then you must configure unique domain IDs for all switches involved in the IVR path.

IVR Network Address Translation

IVR Network Address Translation (NAT) can be enabled to allow non-unique domain IDs; however, without NAT, IVR requires unique domain IDs for all switches in the fabric. IVR NAT simplifies the deployment of IVR in an existing fabric where non-unique domain IDs might be present.

To use IVR NAT, it must be enabled on all IVR-enabled switches in the fabric. By default, IVR NAT and IVR configuration distribution are disabled on all switches in the Cisco MDS 9000 Family.

See the "About IVR NAT and Auto Topology" section on page 1-8 for information on IVR requirements and guidelines as well as configuration information.

IVR VSAN Topology

IVR uses a configured IVR VSAN topology to determine how to route traffic between the initiator and the target across the fabric.

Auto mode automatically builds the IVR VSAN topology and maintains the topology database when fabric reconfigurations occur. Auto mode distributes the IVR VSAN topology to IVR-enabled switches using CFS.

Using Auto mode, you no longer need to manually update the IVR VSAN topology when reconfigurations occur in your fabric. If a manually configured IVR topology database exists, Auto mode initially uses that topology information. This reduces disruption in the network by gradually migrating from the user-specified topology database to the automatically learned topology database. User configured topology entries that are not part of the network are aged out in about three minutes. New entries that are not part of the user-configured database are added as they are discovered in the network.

When auto IVR topology is enabled, it starts with the previously active manual IVR topology if it exists. Auto topology then begins the discovery process. It may discover new, alternate, or better paths. If the traffic is switched to an alternate or better path, there may be temporary traffic disruptions that are normally associated with switching paths.

Note IVR topology in Auto mode requires Cisco MDS SAN-OS Release 2.1(1a) or later and CFS must be enabled for IVR on all switches in the fabric.

IVR Interoperability

When using the IVR feature, all border switches in a fabric must be Cisco MDS switches. However, other switches in the fabric may be non-MDS switches. For example, end devices that are members of the active IVR zone set may be connected to non-MDS switches. Non-MDS switches may also be present in the transit VSAN(s) or in the edge VSANs if one of the interop modes is enabled.

For additional information on switch interoperability, refer to the *Cisco Data Center Interoperability Support Matrix*.

Basic IVR Configuration

This section describes how to configure IVR and contains the following sections:

- Configuring IVR and IVR Zones Using the IVR Zone Wizard, page 1-6
- About IVR NAT and Auto Topology, page 1-8
- IVR NAT Requirements and Guidelines, page 1-8
- Configuring IVR NAT and IVR Auto Topology, page 1-10

Configuring IVR and IVR Zones Using the IVR Zone Wizard

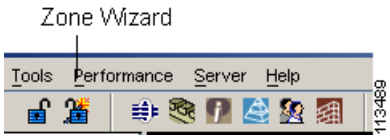
The IVR Zone Wizard simplifies the process of configuring IVR zones in a fabric. The IVR Zone Wizard checks the following conditions and identifies any related issues:

- Checks all switches in the fabric to identify the SAN-OS or NX-OS release that is running on the switch. If Cisco MDS SAN-OS Release 2.1(1a) or later is running on the switch, you can decide to migrate to IVR NAT with Auto topology.
- Checks all switches in the fabric to identify the SAN-OS or NX-OS release that is running on the switch. If Cisco MDS SAN-OS Release 2.1(1a) or later is running on the switch, you can decide to upgrade the necessary switches or to disable IVR NAT or Auto topology if they are enabled.

To configure IVR and IVR zones using the Fabric Manager IVR Zone Wizard, follow these steps:

Step 1 Click the **IVR Zone Wizard** icon in the Zone toolbar (see Figure 1-2).

Figure 1-2 IVR Zone Wizard Icon

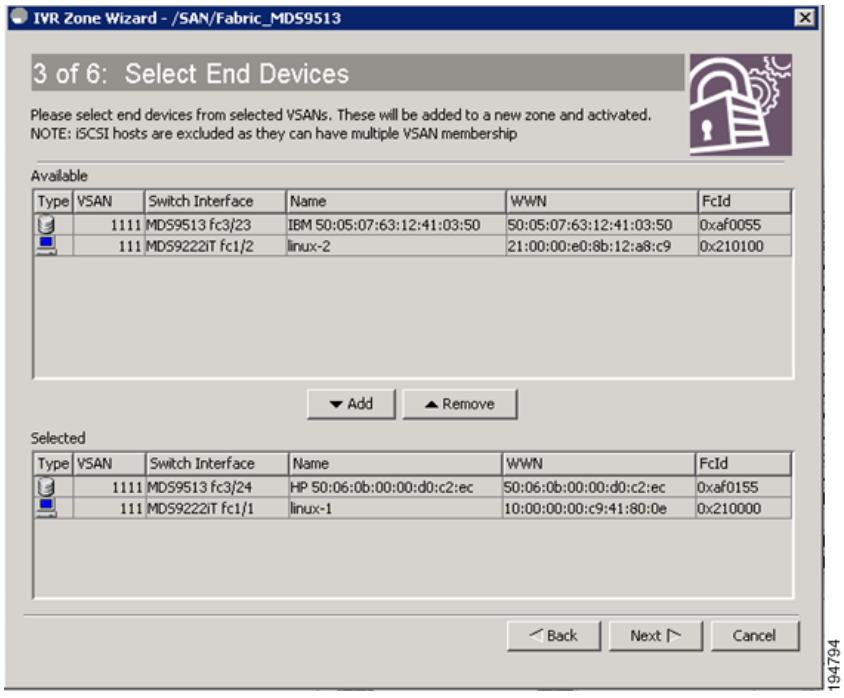


To migrate to IVR NAT mode click **Yes**, otherwise click **No**. You see the IVR Zone Wizard dialog box.

Step 2 Select the VSANs that will participate in IVR in the fabric. Click **Next**.

Figure 1-3 shows the Select End Devices dialog box.

Figure 1-3 Select End Devices Dialog Box



Step 3 Select the end devices that you want to connect using IVR.

Note If you are not using IVR NAT, Fabric Manager may display an error message if all the switches participating in IVR do not have unique domain IDs. You must reconfigure those switches before configuring IVR. See Step 6.

Step 4 If you enable IVR NAT, verify switches that Fabric Manager will enable with IVR NAT, CFS for IVR, and IVR topology in Auto mode.

Step 5 Enter the VSAN ID of the VSAN you want to use as the transit VSAN between the VSANs selected for the IVR zone. Click **Next**.

Step 6 Optionally, configure a unique AFID for switches in the fabric that have non-unique VSAN IDs in the Select AFID dialog box.

Step 7 If you did not enable IVR NAT, verify the transit VSAN or configure the transit VSAN if Fabric Manager cannot find an appropriate transit VSAN.

Step 8 Set the IVR zone and IVR zone set.

Step 9 Verify all steps that Fabric Manager will take to configure IVR in the fabric.

Step 10 Click **Finish** if you want to enable IVR NAT and IVR topology and to create the associated IVR zones and IVR zone set.

You see the **Save Configuration** dialog box. You can save the configuration of the master switch to be copied to other IVR-enabled switches.

Step 11 Click **Continue Activation,** or click **Cancel**.

Step 12 Click **Finish**.

Note IVR NAT and Auto topology can be configured independently if you configure these features outside the IVR Zone Wizard. See the "Basic IVR Configuration" section on page 1-5.

About IVR NAT and Auto Topology

Before configuring an IVR SAN fabric to use IVR NAT and Auto topology, consider the following:

- Configure IVR only in the relevant switches.
- Enable CFS for IVR on all switches in the fabric. You must first click the CFS tab in order for the other tabs on the dialog boxes to become available.
- Verify that all switches in the fabric are running Cisco MDS SAN-OS Release 2.1(1a) or later.
- Acquire a mandatory Enterprise License Package or SAN-EXTENSION license package if you have Cisco MDS SAN-OS Release2.1(1a) or later and one active IPS card for this feature. For information on licensing, refer to the *Cisco MDS 9000 Family NX-OS Licensing Guide*.

Note The IVR over FCIP feature is bundled with the Cisco MDS 9216i Switch and does not require the SAN extension over IP package for the fixed IP ports on the supervisor module.

Tip If you change any FSPF link cost, ensure that the FSPF path distance (that is, the sum of the link costs on the path) of any IVR path is less than 30,000.

Note IVR-enabled VSANs can be configured when the interop mode is enabled (any interop mode) or disabled (no interop mode).

IVR NAT Requirements and Guidelines

The requirements and guidelines for using IVR NAT are listed below:

- IVR NAT port login (PLOGI) requests that are received from hosts are delayed a few seconds to perform the rewrite on the FC ID address. If the host's PLOGI timeout value is set to a value less than five seconds, it may result in the PLOGI being unnecessarily aborted and the host being unable to access the target. We recommend that you configure the host bus adapter for a timeout of at least ten seconds (most HBAs default to a value of 10 or 20 seconds).
- IVR NAT requires Cisco MDS SAN-OS Release 2.1(1a) or later on all IVR switches in the fabric. If you have isolated switches with an earlier release that are configured in IVR topology, you must remove any isolated fabrics from monitoring by the Fabric Manager server and then re-open the fabric to use IVR NAT. See the *Cisco Fabric Manager Fundamentals Guide* for information on selecting a fabric to manage continuously.
- Load balancing of IVR NAT traffic across equal cost paths from an IVR-enabled switch is not supported. However, load balancing of IVR NAT traffic over PortChannel links is supported. The load balancing algorithm for IVR NAT traffic over port-channel with Generation 1 linecards is SRC/DST only. Generation 2 linecards support SRC/DST/OXID based load balancing of IVR NAT traffic across a port-channel.
- You cannot configure IVR NAT and preferred Fibre Channel routes on Generation 1 module interfaces.
- IVR NAT allows you to set up IVR in a fabric without needing unique domain IDs on every switch in the IVR path. IVR NAT virtualizes the switches in other VSANs by using local VSAN for the destination IDs in the Fibre Channel headers. In some Extended Link Service message types, the

destinations IDs are part of the payload. In these cases, IVR NAT replaces the actual destination ID with the virtualized destination ID. IVR NAT supports destination ID replacement in the Extended Link Service messages described in Table 1-2.

Table 1-2 Extended Link Service Messages Supported by IVR NAT

Extended Link Service Messages	Link Service Command (LS_COMMAND)	Mnemonic
Abort Exchange	0x06 00 00 00	ABTX
Discover Address	0x52 00 00 00	ADISC
Discover Address Accept	0x02 00 00 00	ADISC ACC
Fibre Channel Address Resolution Protocol Reply	0x55 00 00 00	FARP-REPLY
Fibre Channel Address Resolution Protocol Request	0x54 00 00 00	FARP-REQ
Logout	0x05 00 00 00	LOGO
Port Login	0x30 00 00 00	PLOGI
Read Exchange Concise	0x13 00 00 00	REC
Read Exchange Concise Accept	0x02 00 00 00	REC ACC
Read Exchange Status Block	0x08 00 00 00	RES
Read Exchange Status Block Accept	0x02 00 00 00	RES ACC
Read Link Error Status Block	0x0F 00 00 00	RLS
Read Sequence Status Block	0x09 00 00 00	RSS
Reinstate Recovery Qualifier	0x12 00 00 00	RRQ
Request Sequence Initiative	0x0A 00 00 00	RSI
Scan Remote Loop	0x7B 00 00 00	RSL
Third Party Process Logout	0x24 00 00 00	TPRLO
Third Party Process Logout Accept	0x02 00 00 00	TPRLO ACC

- If you have a message that is not recognized by IVR NAT and contains the destination ID in the payload, you cannot use IVR with NAT in your topology. You can still use IVR with unique domain IDs.

Transit VSAN Guidelines

Consider the following guidelines for transit VSANs:

- In addition to 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:

- Border switches require Cisco MDS SAN-OS Release 2.1(1a) 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 (optionally) be enabled on additional border switches to provide redundant paths between active IVR zone members.
- The VSAN topology configuration updates automatically when a border switch is added or removed.

Configuring IVR NAT and IVR Auto Topology

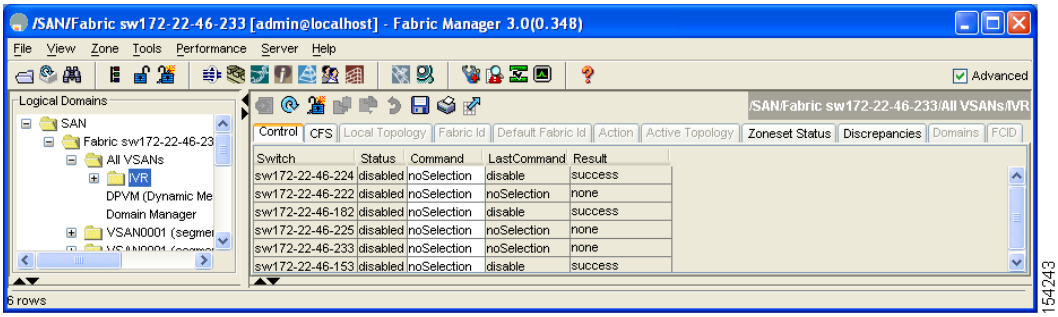
This section includes instructions on how to enable NAT and how to enable auto-discovery of IVR topologies.

To configure IVR in NAT mode and IVR topology in Auto mode using Fabric Manager, follow these steps:

Step 1 Expand **All VSANs** and then select **IVR** in the Logical Domains pane.

You see the inter-VSAN routing configuration in the Information pane shown in Figure 1-4.

Figure 1-4 IVR Routing Configuration Control Tab



Step 2 Select **enable** from the Admin column drop-down menu for the primary switch.

Step 3 Click the **Apply Changes** icon to distribute this change to all switches in the fabric.

Step 4 Click the **Action** tab.

Step 5 Check the **Enable IVR NAT** check box to enable IVR in NAT mode.

Step 6 Check the **Auto Discover Topology** check box to enable IVR topology in Auto mode.

Step 7 Click the **Apply Changes** icon to enable IVR on the switches.

IVR Virtual Domains

In a remote VSAN the IVR application does not automatically add the virtual domain to the assigned domains list. Some switches (for example, the Cisco SN5428 switch) do not query the remote name server until the remote domain appears in the assigned domains list in the fabric. In such cases, add the IVR virtual domains in a specific VSAN to the assigned domains list in that VSAN. When adding IVR domains, all IVR virtual domains that are currently present in the fabric (and any virtual domain that is created in the future) will appear in the assigned domains list for that VSAN.

Tip Be sure to add IVR virtual domains if Cisco SN5428 or MDS 9020 switches exist in the VSAN.

When you enable the IVR virtual domains, links may fail to come up due to overlapping virtual domain identifiers. If this occurs, temporarily withdraw the overlapping virtual domain from that VSAN.

Note Withdrawing an overlapping virtual domain from an IVR VSAN disrupts IVR traffic to and from that domain.

Tip Only add IVR domains in the edge VSANs and not in transit VSANs.

Manually Configuring IVR Virtual Domains

To manually configure an IVR virtual domain using Fabric Manager, follow these steps:

Step 1 Expand **All VSANs** and then select **IVR** in the Logical Domains pane.

You see the IVR configuration in the Information pane.

Figure 1-5 Domains Tab

Step 2 Click the **Domains** tab to display the existing IVR topology.

Step 3 Click the **Create Row** icon to create rows in the IVR topology (see Figure 1-5).

Step 4 Enter the Current Fabric, Current VSAN, Native Fabric, Native VSAN and Domain ID in the dialog box. These are the VSANs that will add the IVR virtual domains to the assigned domains list.

Step 5 Click **Create** to create this new row.

IVR Zones and IVR Zone Sets

This section describes configuring IVR zones and IVR zone sets and includes the following topics:

- About IVR Zones, page 1-12
- IVR Zone Limits and Image Downgrading Considerations, page 1-12
- Automatic IVR Zone Creation, page 1-13
- Configuring IVR Zones and IVR Zone Sets, page 1-14
- About Activating Zone Sets and Using the force Option, page 1-17
- Recovering an IVR Full Zone Database, page 1-19
- Recovering an IVR Full Topology, page 1-20

About IVR Zones

As part of the IVR configuration, you need to configure one or more IVR zones to enable cross-VSAN communication. To achieve this result, you must specify each IVR zone as a set of (pWWN, VSAN) entries. Like zones, several IVR zone sets can be configured to belong to an IVR zone. You can define several IVR zone sets and activate only one of the defined IVR zone sets.

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

Table 1-3 identifies the key differences between IVR zones and zones.

Table 1-3 Key Differences Between IVR Zones and Zones

IVR Zones	Zones
IVR zone membership is specified using the VSAN and pWWN combination.	Zone membership is specified using pWWN, fabric WWN, sWWN, or the AFID.
Default zone policy is always deny (not configurable).	Default zone policy is deny (configurable).

IVR Zone Limits and Image Downgrading Considerations

Table 1-4 identifies the IVR zone limits per physical fabric.

Table 1-4 IVR Zone Limits

Cisco Release	IVR Zone Limit	IVR Zone Member Limit	IVR Zone Set Limit
SAN-OS Release 3.0(3 or later	8000	20,000	32
SAN-OS Release 3.0(2b) or earlier	2000	10,000	32

Note A zone member is counted twice if it exists in two zones. See the "Database Merge Guidelines" section on page 1-21.

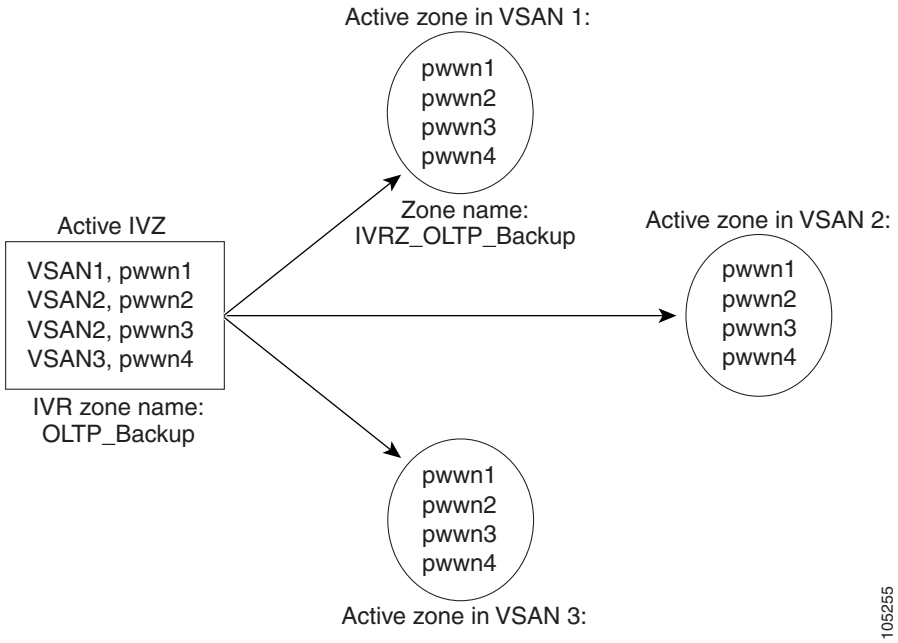
Caution If you want to downgrade to a release prior to Cisco SAN-OS Release 3.0(3), the number of IVR zones cannot exceed 2000 and the number of IVR zone members cannot exceed 10,000.

Automatic IVR Zone Creation

Figure 1-6 depicts an IVR zone consisting of four members. To allow pwwn1 to communicate with pwwn2, they must be in the same zone in VSAN 1, as well as in VSAN 2. If they are not in the same zone, then the hard-zoning ACL entries will prohibit pwwn1 from communicating with pwwn2.

A zone corresponding to each active IVR zone is automatically created in each edge VSAN specified in the active IVR zone. All pWWNs in the IVR zone are members of these zones in each VSAN.

Figure 1-6 Creating Zones Upon IVR Zone Activation



The zones are created automatically by the IVR process when an IVR zone set is activated. They are not stored in a full zone set database and are lost when the switch reboots or when a new zone set is activated. The IVR feature monitors these events and adds the zones corresponding to the active IVR zone set configuration when a new zone set is activated. Like zone sets, IVR zone sets are also activated nondisruptively.

Note If pwwn1 and pwwn2 are in an IVR zone in the current as well as the new IVR zone set, then activation of the new IVR zone set does not cause any traffic disruption between them.

IVR zone and IVR zone set names are restricted to 64 alphanumeric characters.

Caution Prior to Cisco SAN-OS Release 3.0(3), you can only configure a total of 2000 IVR zones and 32 IVR zone sets on the switches in the network. As of Cisco SAN-OS Release 3.0(3), you can only configure a total of 8000 IVR zones and 32 IVR zone sets on the switches in the network. See the "Database Merge Guidelines" section on page 1-21.

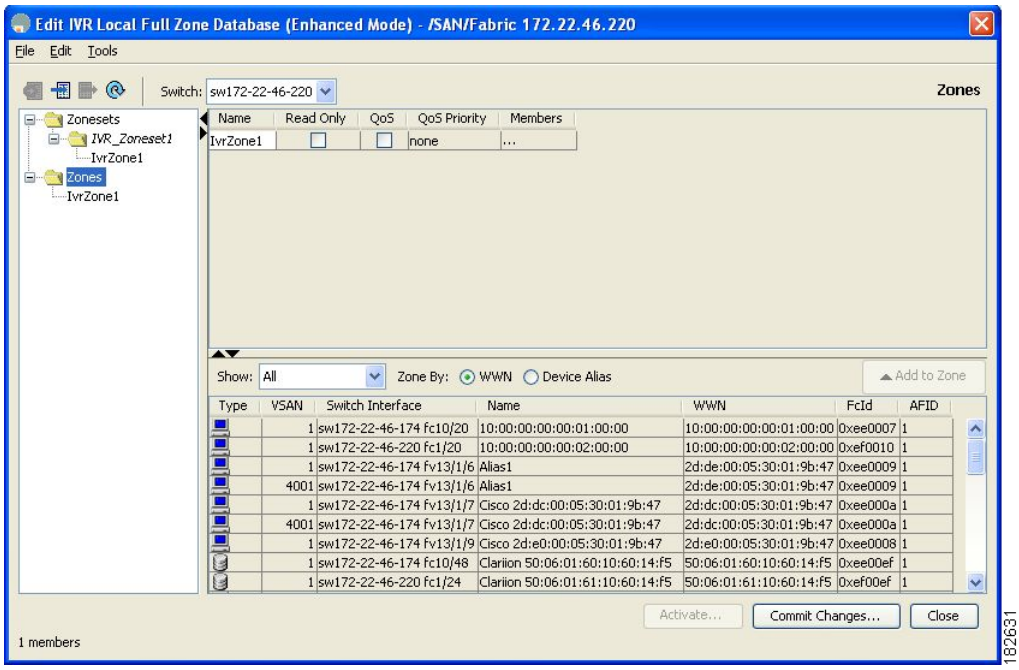
Configuring IVR Zones and IVR Zone Sets

To create IVR zones and IVR zone sets using Fabric Manager, follow these steps:

Step 1 Choose **Zone > IVR > Edit Local Full Zone Database**.

You see the Edit IVR Local Full Zone Database dialog box for the selected VSAN (see Figure 1-7).

Figure 1-7 Edit IVR Local Full Zone Database Dialog Box

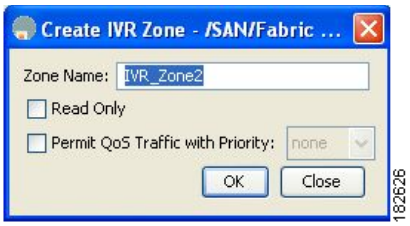


If you want to view zone membership information, right-click in the **Members** column, and then click **Show Details** for the current row or all rows from the pop-up menu.

Step 2 Click **Zones** in the left pane and click the **Insert** icon to create a zone.

You see the Create IVR Zone dialog box shown in Figure 1-8.

Figure 1-8 Create IVR Zone Dialog Box



Step 3 Enter an IVR zone name.

Step 4 Check one of the following check boxes:

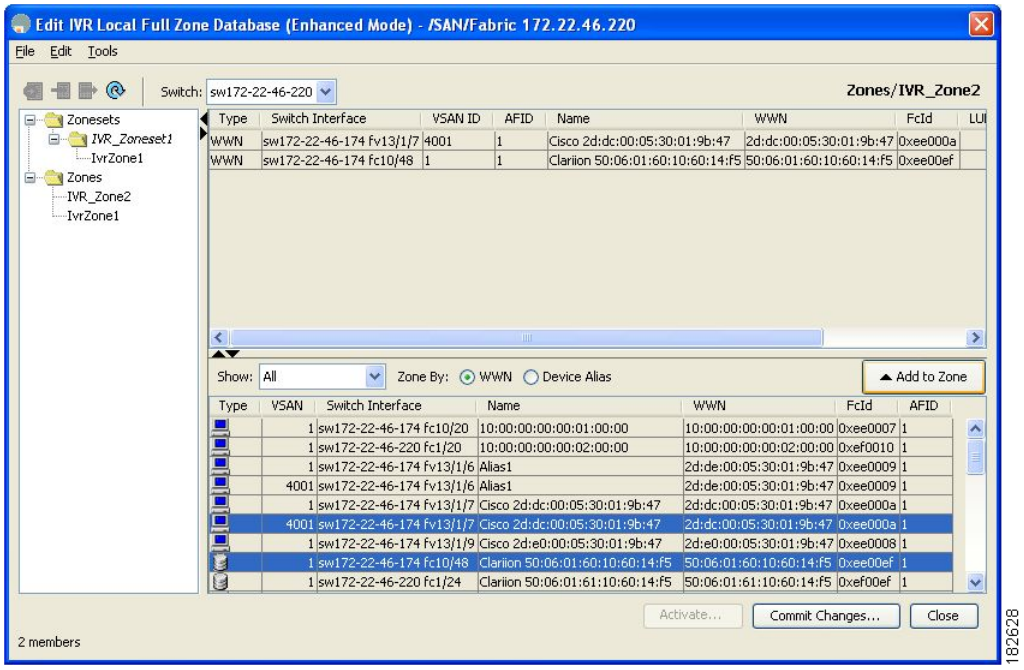
a. **Read Only**—The zone permits read and denies write.

b. **Permit QoS traffic with Priority**—You set the priority from the drop-down menu.

Step 5 Click **OK** to create the IVR zone.

Step 6 To add members to this zone, select the members you want to add from the Fabric pane (see Figure 1-9) and click **Add to Zone**.

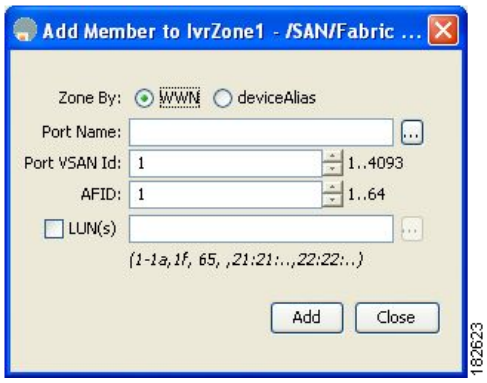
Figure 1-9 Edit IVR Local Full Zone Database Dialog Box



Step 7 Alternatively, click the zone where you want to add members and click the **Insert** icon.

You see the Add Member to Zone dialog box shown in Figure 1-10.

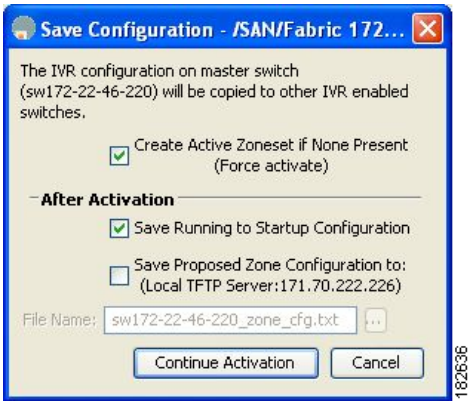
Figure 1-10 Add Member to IVR Zone Dialog Box



Step 8 If you added a zone set, select the new zone set and then click **Activate**.

You see the Save Configuration dialog box shown in Figure 1-11.

Figure 1-11 Save Configuration Dialog Box



Step 9 Check the **Save Running to Startup Configuration** check box to save all changes to the startup configuration.

Step 10 Click **Continue Activation** to activate the zone set.

Note Sometimes zone names beginning with prefix IVRZ and a zone set with name **nozoneset** appear in a logical view. The zones with prefix IVRZ are IVR zones that get appended to regular active zones. The prefix IVRZ is appended to active IVR zones by the system. Similarly the zone set with name **nozoneset** is an IVR active zone set created by the system if no active zone set is available for that VSAN and if the ivrZonesetActivateForce flag is enabled on the switch.

In the server.properties file, you can set the property zone.ignoreIVRZones to **true** or **false** to either hide or view IVR zones as part of regular active zones. For information on the server.properties file, refer to the *Cisco Fabric Manager Fundamentals Configuration Guide*.

Note Do not create a zone with prefix the IVRZ or a zone set with name no zoneset. These names are used by the system for identifying IVR zones.

Step 11 Select the new zone or zone set from the list in the Information pane and then click **Distribute**.

About Activating Zone Sets and Using the force Option

Once the zone sets have been created and populated, you must activate the zone set. When you activate an IVR zone set, IVR automatically adds an IVR zone to the regular active zone set of each edge VSAN. If a VSAN does not have an active zone set, IVR can only activate an IVR zone set using the force option, which causes IVR to create an active zone set called "nozoneset" and adds the IVR zone to that active zone set.

Caution If you deactivate the regular active zone set in a VSAN, the IVR zone set is also deactivated. This occurs because the IVR zone in the regular active zone set, and all IVR traffic to and from the switch, is stopped. To reactivate the IVR zone set, you must reactivate the regular zone set.

Note If IVR and iSLB are enabled in the same fabric, at least one switch in the fabric must have both features enabled. Any zoning-related configuration or activation operation (for normal zones, IVR zones, or iSLB zones) must be performed on this switch. Otherwise, traffic might be disrupted in the fabric.

You can also use the **force activate option** to activate IVR zone sets. Table 1-5 lists the various scenarios with and without the **force activate** option.

Table 1-5 IVR Scenarios With and Without the Force Activate Option

Case	Default Zone Policy	Active Zone Set before IVR Zone Activation	Force Activate Option Used?	IVR Zone Set Activation Status	Active IVR Zone Created?	Possible Traffic Disruption
1	Deny	No active zone set	No	Failure	No	No
2			Yes	Success	Yes	No
3[1]	Deny	Active zone set present	No/Yes	Success	Yes	No
4	Permit	No active zone set *or* Active zone set present	No	Failure	No	No
5			Yes	Success	Yes	Yes

1. We recommend that you use the Case 3 scenario.

Caution Using the **force activate option** of IVR zone set activation may cause traffic disruption, even for devices that are not involved in IVR. For example, if your configuration does not have any active zone sets and the default zone policy is permit, then an IVR zone set activation will fail. However, IVR zone set

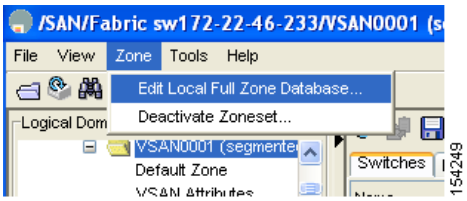
activation will be successful if the **force activate option** is used. Because zones are created in the edge VSANs corresponding to each IVR zone, traffic may be disrupted in edge VSANs where the default zone policy is permit.

Activating or Deactivating IVR Zone Sets

To activate or deactivate an existing IVR zone set using Fabric Manager, follow these steps:

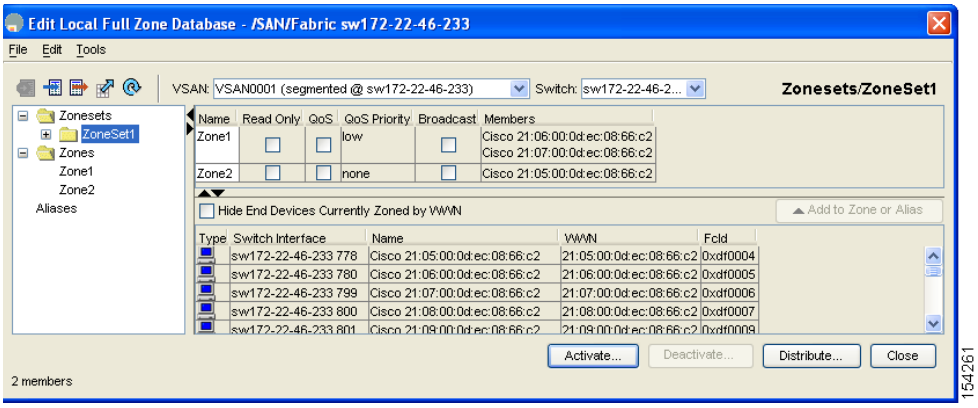
Step 1 Click **Zone** and then select **Edit Local Full Zone Database** as shown in Figure 1-12.

Figure 1-12 Zone Menu



You see the Edit Local Full Zone Database dialog box in Figure 1-13.

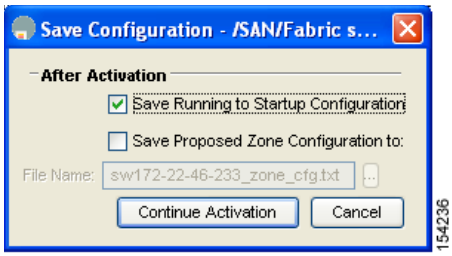
Figure 1-13 Edit Zone Database Dialog Box



Step 2 Select a **Zoneset** folder and then click **Activate** to activate the zone set (shown in Figure 1-13) or click **Deactivate** to deactivate an activated zone set.

You see the Save Configuration dialog box shown in Figure 1-14.

Figure 1-14 Save Configuration Options for a New Zone Set



Step 3 Optionally, check one of the **Save Running to Configuration** check boxes to save these changes to the startup configuration (see Figure 1-14).

Step 4 Click **Continue Activation** to activate the zone set (see Figure 1-14) or **Yes** if you are deactivating the zone set.

Note The active zone set in Edit Zone is shown in bold if any change has been made to the full zone set resulting in a difference between the active zone set and full zone set. Activating the zone set, unbolds it.

Recovering an IVR Full Zone Database

You can recover an IVR zone database by copying the IVR full zone database from another switch.

To recover an IVR zone database using Fabric Manager, follow these steps:

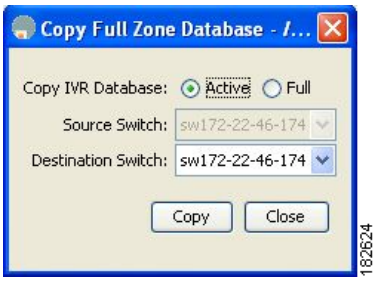
Step 1 Choose **Zone > IVR > Edit Local Full Zone Database**.

You see the Edit IVR Local Full Zone Database dialog box.

Step 2 Choose **Edit > Copy Full Zone Database**.

You see the Copy Full Zone Database dialog box shown in Figure 1-15.

Figure 1-15 Copy Full Zone Database Dialog Box



Step 3 Choose either **Active** or **Full**, depending on which type of IVR database you want to copy.

Step 4 Select the source switch from which to copy the information from the drop-down list.

Step 5 Select the destination switch from the drop-down list.

Step 6 Click **Copy** to copy the database.

Recovering an IVR Full Topology

You can recover a topology by copying from the active zone database or the full zone database.

To recover a zone topology using Fabric Manager, follow these steps:

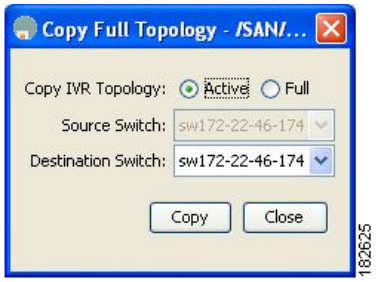
Step 1 Choose **Zone > IVR > Edit Local Full Zone Database**.

You see the Edit IVR Local Full Zone Database dialog box.

Step 2 Choose **Edit > Copy Full Topology**.

You see the Copy Full Topology dialog box shown in Figure 1-16.

Figure 1-16 Copy Full Topology Dialog Box



Step 3 Choose either **Active** or **Full**, depending on which type of IVR database you want to copy from.

Step 4 Select the source switch from which to copy the information from the drop-down list.

Step 5 Select the destination switch from the drop-down list.

Step 6 Click **Copy** to copy the topology.

IVR Logging

You can configure Telnet or SSH logging for the IVR feature. For example, if you configure the IVR logging level at level 4 (warning), then messages with a severity level of 4 or above are displayed. Use the instructions in this section to configure the logging levels:

- Configuring IVR Logging Severity Levels, page 1-20

Configuring IVR Logging Severity Levels

To configure the severity level for logging messages from the IVR feature using Fabric Manager, follow these steps:

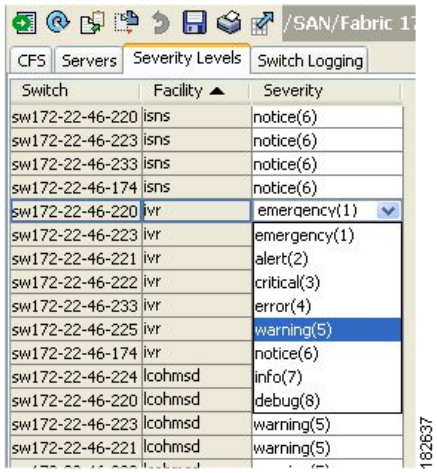
Step 1 Expand **Switches > Events** and then select **Syslog** from the Physical Attributes pane.

Step 2 Click the **Severity Levels** tab.

Step 3 Click the **Facility** column header to sort the table by facility name.

Step 4 Select the severity level at which the IVR logs system messages from the Severity drop-down menu (see Figure 1-17).

Figure 1-17 Syslog Severity Drop-Down Menu



Tip Setting the severity to **warning** means that all IVR messages at the warning level or above will be logged to Fabric Manager.

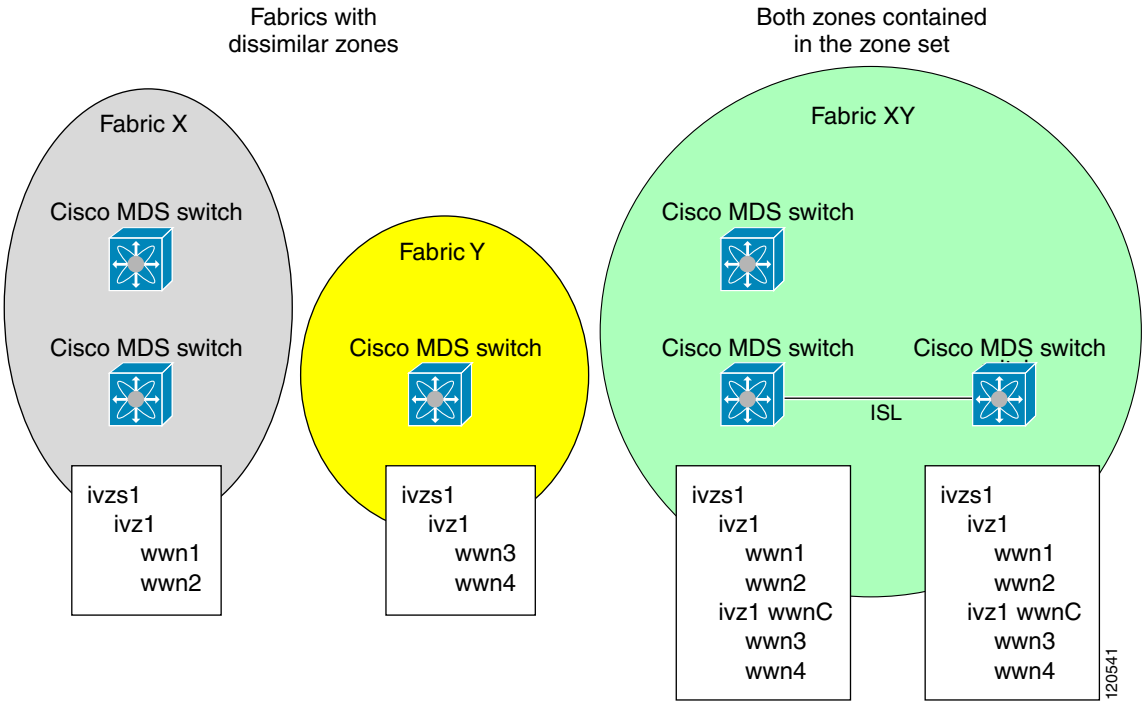
Step 5 Click the **Apply Changes** icon to save these changes locally.

Database Merge Guidelines

A database merge refers to a union of the configuration database and static (unlearned) entries in the active database. For information on CFS Merge Support, refer to the *Cisco MDS 9000 Family NX-OS System Management Configuration Guide* or *Cisco Fabric Manager System Management Configuration Guide*.

- Consider the following conditions when merging two IVR fabrics:
  - The IVR configurations are merged even if two fabrics contain different configurations.
  - If dissimilar zones exist in two merged fabrics, the zone from each fabric is cloned in the distributed zone set with appropriate names (see Figure 1-18).

Figure 1-18 Fabric Merge Consequences



- You can configure different IVR configurations in different Cisco MDS switches.
- To avoid traffic disruption, after the database merge is complete, the configuration is a union of the configurations that were present on the two switches involved in the merge.
  - The configurations are merged even if both fabrics have different configurations.
  - A union of zones and zone sets are used to get the merged zones and zone sets. If a dissimilar zone exists in two fabrics, the dissimilar zones are cloned into the zone set with appropriate names so both zones are present.
  - The merged topology contains a union of the topology entries for both fabrics.
  - The merge will fail if the merged database contains more topology entries than the allowed maximum.
  - The total number of VSANs across the two fabrics cannot exceed 128.

Note VSANs with the same VSAN ID but different AFIDs are counted as two separate VSANs.

  - The total number of IVR-enabled switches across the two fabrics cannot exceed 128.
  - The total number of zone members across the two fabrics cannot exceed 10,000. As of Cisco SAN-OS Release 3.0(3), the total number of zone members across the two fabrics cannot exceed 20,000. A zone member is counted twice if it exists in two zones.

Note If one or more of the fabric switches are running Cisco SAN-OS Release 3.0(3) or later, and the number of zone members exceeds 10,000, you must either reduce the number of zone members in the fabric or upgrade all switches in both fabrics to Cisco SAN-OS Release 3.0(3) or later.

- The total number of zones across the two fabrics cannot exceed 2000. As of Cisco SAN-OS Release 3.0(3), the total number of zones across the two fabrics cannot exceed 8000.

Note If only some of the switches in the fabrics are running Cisco SAN-OS Release 3.0(3) or later, and if the number of zones exceeds 2000, you must either reduce the number of zones in the fabric or upgrade all switches in both fabrics to Cisco SAN-OS Release 3.0(3) or later.

- The total number or zone sets across the two fabrics cannot exceed 32.

Table 1-6 describes the results of a CFS merge of two IVR-enabled fabrics under different conditions.

Table 1-6 Results of Merging Two IVR-Enabled Fabrics

IVR Fabric 1	IVR Fabric 2	After Merge
NAT enabled	NAT disabled	Merge succeeds and NAT enabled
Auto mode on	Auto mode off	Merge succeeds and Auto mode on
Conflicting AFID database		Merge fails
Conflicting IVR zone set database		Merge succeeds with new zones created to resolve conflicts
Combined configuration exceeds limits (such as maximum number of zones or VSANs)		Merge fails
Service group 1	Service group 2	Merge succeeds with service groups combined
User-configured VSAN topology configuration with conflicts		Merge fails
User-configured VSAN topology configuration without conflicts		Merge succeeds

Caution If you do not follow these conditions, the merge will fail. The next distribution will forcefully synchronize the databases and the activation states in the fabric.

Default Settings

Table 1-7 lists the default settings for IVR parameters.

Table 1-7 Default IVR Parameters

Parameters	Default
IVR feature	Disabled
IVR VSANs	Not added to virtual domains
IVR NAT	Disabled
QoS for IVR zones	Low
Configuration distribution	Disabled