



IVR NAT and Auto Topology

- [Information About IVR Auto Topology, page 1](#)
- [Default Settings, page 2](#)
- [Licensing Requirements, page 2](#)
- [Guidelines and Limitations for IVR NAT and Autotopology, page 3](#)
- [Configuring IVR NAT and Autotopology, page 4](#)
- [Verifying IVR Configuration, page 6](#)
- [Example: IVR Auto Topology, page 7](#)
- [Feature History, page 11](#)

Information About IVR Auto Topology

IVR uses a configured IVR VSAN topology to determine how to route traffic between the initiator and the target across the fabric. IVR auto topology mode automatically builds the IVR VSAN topology and maintains the topology database when fabric reconfiguration occur. IVR auto topology mode also distributes the IVR VSAN topology to IVR-enabled switches using CFS.

Using IVR auto topology mode, you do not need to manually update the IVR VSAN topology when reconfiguration occur in your fabric. If an IVR manual topology database exists, IVR auto topology mode initially uses that topology information. The automatic update 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 IVR auto topology mode is enabled, it starts with the previously active IVR manual topology if it exists, and then the discovery process begins. New, alternate, or better paths may be discovered. If the traffic is switched to an alternate or better path, there may be temporary traffic disruptions that are normally associated with switching paths.

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

- Configure IVR only in the relevant switches.
- Enable CFS for IVR on all switches in the fabric.

**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 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, you must enable it on all IVR-enabled switches in the fabric.

Default Settings

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

Licensing Requirements

Product	License
Cisco Nexus 7000 Series.	IVR requires the FCoE license for each F-series module. FCoE enabled in a storage VDC does not require the Advanced Services License. IVR also requires the Storage Enterprise License. For a complete explanation of the Cisco NX-OS licensing scheme and how to obtain and apply licenses, see the <i>Cisco NX-OS Licensing Guide</i>.

Guidelines and Limitations for IVR NAT and Autotopology

- 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).
- Load balancing of IVR NAT traffic across equal cost paths from an IVR-enabled switch is not supported.
- 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 destination IDs are included in the packet data. 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.
- If you have a message that is not recognized by IVR NAT and contains the destination ID in the packet data, you cannot use IVR with NAT in your topology. You can still use IVR with unique domain IDs.

The following table lists the 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

Extended Link Service Messages	Link Service Command (LS_COMMAND)	Mnemonic
Third Party Process Logout	0x24 00 00 00	TPRLO
Third Party Process Logout Accept	0x02 00 00 00	TPRLO ACC

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

- 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 Autotopology

Enabling IVR NAT

Before You Begin

- Ensure you have enabled the IVR feature and IVR distribution.

SUMMARY STEPS

1. **configure terminal**
2. **ivr nat**
3. (Optional) **show ivr**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	ivr nat Example: switch(config)# ivr nat	Enables IVR NAT.
Step 3	show ivr Example: switch(config)# show ivr	(Optional) Displays information about IVR.
Step 4	copy running-config startup-config Example: switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

Enabling IVR Auto Topology

Before You Begin

- Ensure you have enabled the IVR feature and IVR distribution.

SUMMARY STEPS

1. **configure terminal**
2. **ivr vsan-topology auto**
3. (Optional) **show ivr vsan topology**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
Step 2	ivr vsan-topology auto Example: <pre>switch(config)# ivr vsan-topology auto</pre>	Enables IVR auto topology mode.
Step 3	show ivr vsan topology Example: <pre>switch(config)# show ivr vsan topology</pre>	(Optional) Displays the automatically discovered IVR topology and the topology mode.
Step 4	copy running-config startup-config Example: <pre>switch(config)# copy running-config startup-config</pre>	(Optional) Copies the running configuration to the startup configuration.

Verifying IVR Configuration

To display the IVR configuration, perform one of the following tasks:

Command	Purpose
show ivr	Displays the status for the IVR configuration.
show ivr diagnostics	Displays information about IVR diagnostics.
show ivr merge status	Displays information the last IVR merge event.
show ivr pending	Displays information about the IVR pending database.
show ivr pending-diff	Displays the differences between the pending database and the config database.
show ivr vsan-topology [active configured]	Displays the IVR VSAN topology.

Command	Purpose
show ivr session status	Displays information about IVR CFS session.
show ivr virtual-domains	Displays information about IVR virtual domains for all local VSANs.
show ivr zone	Displays information about IVR zones.
show ivr zoneset	Displays information about IVR zone sets.
show ivr service-group active	Displays information about the active service group.
show ivr service-group configured	Displays information about the configured service group.
show autonomous-fabric-id database	Displays information about the AFIDs.
show ivr virtual-fcdomain-add-status	Displays the status of the IVR virtual domain configuration.

Related Topics

[Information about IVR Zones and Zonesets](#)

[Configuring IVR Zones](#)

[Configuring IVR Zone Sets](#)

Example: IVR Auto Topology

Step 1 Enable IVR on every border switch in the fabric.

Example:

```
switch# config t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# feature ivr
switch(config)# exit
switch#
```

Step 2 Verify that IVR is enabled on every IVR-enabled switch.

Example:

```
switch# show ivr
Inter-VSAN Routing is enabled
```

Example: IVR Auto Topology

```

Inter-VSAN enabled switches
-----
No IVR-enabled VSAN is active. Check VSAN-Topology configuration.

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

Inter-VSAN zoneset status
-----
      name           :
      state          : idle
      last activate time :

Fabric distribution status
-----
fabric distribution disabled
Last Action           : None
Last Action Result    : None
Last Action Failure Reason : None

Inter-VSAN NAT mode status
-----
FCID-NAT is disabled

License status
-----
IVR is running based on the following license(s)
ENTERPRISE_PKG

```

Step 3 Enable CFS distribution on every IVR-enabled switch in the fabric.

Example:

```

switch# config t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# ivr distribution

```

Step 4 Enable IVR auto topology mode.

Example:

```

switch(config)# ivr vsan-topology auto
fabric is locked for configuration. Please commit after configuration is
done.

```

Step 5 Commit the change to the fabric.

Example:

```

switch(config)# ivr commit
switch(config)# exit
switch#

```

Step 6 Verify the status of the commit request.

Example:

```

switch# show ivr session status
Last Action           : Commit
Last Action Result    : Success
Last Action Failure Reason : None

```

Step 7 Verify the active IVR auto topology.

Example:

```
switch# show ivr vsan-topology active
```

AFID	SWITCH	WWN	Active	Cfg.	VSANS
1	20:00:00:0d:ec:08:6e:40	*	yes	no	1,336-338
1	20:00:00:0d:ec:0c:99:40		yes	no	336,339

Step 8

Configure IVR zone set and zones.

Example:

```
switch(config)# ivr zoneset name tape_server1_server2

switch(config-ivr-zoneset)# zone name tape_server1
switch(config-ivr-zoneset-zone)# member pwwn 10:02:50:45:32:20:7a:52 vsan 1
switch(config-ivr-zoneset-zone)# member pwwn 10:02:66:45:00:20:89:04 vsan 2
switch(config-ivr-zoneset-zone)# exit

switch(config-ivr-zoneset)# zone name tape_server2
switch(config-ivr-zoneset-zone)# member pwwn 10:02:50:45:32:20:7a:52 vsan 1
switch(config-ivr-zoneset-zone)# member pwwn 10:00:ad:51:78:33:f9:86 vsan 3
switch(config-ivr-zoneset-zone)# exit
```

Two zones are required:

- One zone has tape T (pwwn 10:02:50:45:32:20:7a:52) and server S1 (pwwn 10:02:66:45:00:20:89:04).
- Another zone has tape T and server S2 (pwwn 10:00:ad:51:78:33:f9:86).

Tip Instead of creating two IVR zones, you can also create one IVR zone with the tape and both servers.

Step 9

View the IVR zone configuration to confirm that the IVR zone set and IVR zones are properly configured.

Example:

```
switch(config)# show ivr zoneset
zoneset name tape_server1_server2
  zone name tape_server1
    pwwn 10:02:50:45:32:20:7a:52 vsan 1
    pwwn 10:02:66:45:00:20:89:04 vsan 2

  zone name tape_server2
    pwwn 10:02:50:45:32:20:7a:52 vsan 1
    pwwn 10:00:ad:51:78:33:f9:86 vsan 3
```

Step 10

View the zone set prior to IVR zone set activation. Prior to activating the IVR zone set, view the active zone set. Repeat this step for VSANs 2 and 3.

Example:

```
switch(config)# show zoneset active vsan 1
zoneset name finance_dept vsan 1
  zone name accounts_database vsan 1
    pwwn 10:00:23:11:ed:f6:23:12
    pwwn 10:00:56:43:11:56:fe:ee

  zone name $default_zone$ vsan 1
```

Step 11

Activate the configured IVR zone set.

Example:

```
switch(config)# ivr zoneset activate name tape_server1_server2
zoneset activation initiated. check inter-VSAN zoneset status
switch(config)# exit
switch#
```

Step 12 Verify the IVR zone set activation.

Example:

```
switch# show ivr zoneset active
zoneset name tape_server1_server2
  zone name tape_server1
    pwnn 10:02:50:45:32:20:7a:52 vsan 1
    pwnn 10:02:66:45:00:20:89:04 vsan 2

  zone name tape_server2
    pwnn 10:02:50:45:32:20:7a:52 vsan 1
    pwnn 10:00:ad:51:78:33:f9:86 vsan 3
```

Step 13 Verify the zone set updates. Upon successful IVR zone set activation, verify that appropriate zones are added to the active zone set. Repeat this step for VSANs 2 and 3.

Example:

```
switch# show zoneset active vsan 1
zoneset name finance_dept vsan 1
  zone name accounts_database vsan 1
    pwnn 10:00:23:11:ed:f6:23:12
    pwnn 10:00:56:43:11:56:fe:ee

  zone name IVRZ_tape_server1 vsan 1
    pwnn 10:02:66:45:00:20:89:04
    pwnn 10:02:50:45:32:20:7a:52

  zone name IVRZ_tape_server2 vsan 1
    pwnn 10:02:50:45:32:20:7a:52
    pwnn 10:00:ad:51:78:33:f9:86

  zone name $default_zone$ vsan 1

switch# show ivr zoneset status
Zoneset Status

-----
name           : tape_server1_server2
state          : activation success
last activate time : Tue May 20 23:23:01 1980
force option    : on

status per vsan:

-----
vsan   status
-----
1      active
```

Feature History

Table 1: Feature History IVR

Feature Name	Releases	Feature Information
IVR	5.2(1)	This feature was introduced.

