Preface

This configuration guide describes how to set up an IRF fabric of multiple H3C S5130-EI switches, including:
- Plan the switch roles in the IRF fabric.
- Connect the IRF links.
- Detect IRF splits and maintain the IRF fabric.

This preface includes the following topics about the documentation:
- Audience
- Conventions
- About the H3C S5130-EI documentation set
- Obtaining documentation
- Technical support
- Documentation feedback

Audience

This documentation is intended for:
- Network planners.
- Field technical support and servicing engineers.
- Network administrators working with the S5130-EI switch series.

Conventions

This section describes the conventions used in the documentation.

Command conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boldface</strong></td>
<td><strong>Bold</strong> text represents commands and keywords that you enter literally as shown.</td>
</tr>
<tr>
<td><em>Italic</em></td>
<td><em>Italic</em> text represents arguments that you replace with actual values.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Square brackets enclose syntax choices (keywords or arguments) that are optional.</td>
</tr>
<tr>
<td>{ x</td>
<td>y</td>
</tr>
<tr>
<td>[ x</td>
<td>y</td>
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<td>{ x</td>
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</tr>
<tr>
<td>[ x</td>
<td>y</td>
</tr>
</tbody>
</table>
### Convention Description

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;&lt;1-n&gt;</td>
<td>The argument or keyword and argument combination before the ampersand (&amp;) sign can be entered 1 to n times.</td>
</tr>
<tr>
<td>#</td>
<td>A line that starts with a pound (#) sign is comments.</td>
</tr>
</tbody>
</table>

### GUI conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldface</td>
<td>Window names, button names, field names, and menu items are in Boldface. For example, the <strong>New User</strong> window appears; click <strong>OK</strong>.</td>
</tr>
<tr>
<td>&gt;</td>
<td>Multi-level menus are separated by angle brackets. For example, <strong>File &gt; Create &gt; Folder</strong>.</td>
</tr>
</tbody>
</table>

### Symbols

<table>
<thead>
<tr>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Warning" /> <strong>WARNING</strong></td>
<td>An alert that calls attention to important information that if not understood or followed can result in personal injury.</td>
</tr>
<tr>
<td><img src="image" alt="Caution" /> <strong>CAUTION</strong></td>
<td>An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.</td>
</tr>
<tr>
<td><img src="image" alt="Important" /> <strong>IMPORTANT</strong></td>
<td>An alert that calls attention to essential information.</td>
</tr>
<tr>
<td><img src="image" alt="Note" /> <strong>NOTE</strong></td>
<td>An alert that contains additional or supplementary information.</td>
</tr>
<tr>
<td><img src="image" alt="Tip" /> <strong>TIP</strong></td>
<td>An alert that provides helpful information.</td>
</tr>
</tbody>
</table>

### Network topology icons

- ![Generic Network Device](image) Represents a generic network device, such as a router, switch, or firewall.
- ![Routing-Capable Device](image) Represents a routing-capable device, such as a router or Layer 3 switch.
- ![Generic Switch](image) Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
- ![Access Controller](image) Represents an access controller, a unified wired-WLAN module, or the access controller engine on a unified wired-WLAN switch.
- ![Access Point](image) Represents an access point.
- ![Mesh Access Point](image) Represents a mesh access point.
- ![Omnidirectional Signals](image) Represents omnidirectional signals.
- ![Directional Signals](image) Represents directional signals.
Port numbering in examples

The port numbers in this document are for illustration only and might be unavailable on your device.

About the H3C S5130-EI documentation set

The H3C S5130-EI documentation set includes the following categories of documents:

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<th>Category</th>
<th>Documents</th>
<th>Purposes</th>
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</thead>
<tbody>
<tr>
<td>Hardware specifications and installation</td>
<td>Compliance and safety manual CE DOC</td>
<td>Provides regulatory information and the safety instructions that must be followed during installation.</td>
</tr>
<tr>
<td></td>
<td>Installation quick start</td>
<td>Provides basic installation instructions.</td>
</tr>
<tr>
<td></td>
<td>Installation guide</td>
<td>Provides a complete guide to hardware installation and hardware specifications.</td>
</tr>
<tr>
<td></td>
<td>Power modules user manual</td>
<td>Describes the appearance, specifications, and installation and removal of hot-swappable power modules.</td>
</tr>
<tr>
<td></td>
<td>Pluggable transceiver modules installation guide</td>
<td>Guides you through installing SFP/SFP+ transceiver modules.</td>
</tr>
<tr>
<td></td>
<td>Pluggable modules manual</td>
<td>Describes the hot-swappable modules available for the H3C switches, their external views, and specifications.</td>
</tr>
<tr>
<td>Software configuration</td>
<td>Configuration guides</td>
<td>Describe software features and configuration procedures.</td>
</tr>
<tr>
<td></td>
<td>Command references</td>
<td>Provide a quick reference to all available commands.</td>
</tr>
<tr>
<td>Operations and maintenance</td>
<td>MIB Companion</td>
<td>Describes the MIBs for the software release.</td>
</tr>
<tr>
<td></td>
<td>Release notes</td>
<td>Provide information about the product release, including the version history, hardware and software compatibility matrix, version upgrade information, technical support information, and software upgrading.</td>
</tr>
</tbody>
</table>

Obtaining documentation

Access the most up-to-date H3C product documentation on the World Wide Web at [http://www.h3c.com](http://www.h3c.com).

Click the following links to obtain different categories of product documentation:
[Technical Documents]—Provides hardware installation, software upgrading, and software feature configuration and maintenance documentation.

[Products & Solutions]—Provides information about products and technologies, as well as solutions.

[Software Download]—Provides the documentation released with the software version.

Technical support

service@h3c.com

http://www.h3c.com

Documentation feedback

You can e-mail your comments about product documentation to info@h3c.com.

We appreciate your comments.
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IRF overview

H3C Intelligent Resilient Framework (IRF) technology creates a large IRF fabric from multiple devices to provide data center class availability and scalability. IRF virtualization technology offers processing power, interaction, unified management, and uninterrupted maintenance of multiple devices.

This book describes IRF concepts and guides you through the IRF setup procedure.

Hardware compatibility

An H3C S5130-EI switch can form an IRF fabric only with devices in the same series.

IRF benefits

IRF provides the following benefits:

- **Simplified topology and easy management**—An IRF fabric appears as one node and is accessible at a single IP address on the network. You can use this IP address to log in at any member device to manage all the members of the IRF fabric. In addition, you do not need to run the spanning tree feature among the IRF members.

- **1:N redundancy**—In an IRF fabric, one member acts as the master to manage and control the entire IRF fabric. All the other members process services while backing up the master. When the master fails, all the other member devices elect a new master from among them to take over without interrupting services.

- **IRF link aggregation**—You can assign several physical links between neighboring members to their IRF ports to create a load-balanced aggregate IRF connection with redundancy.

- **Multichassis link aggregation**—You can use the Ethernet link aggregation feature to aggregate the physical links between the IRF fabric and its upstream or downstream devices across the IRF members.

- **Network scalability and resiliency**—Processing capacity of an IRF fabric equals the total processing capacities of all the members. You can increase ports, network bandwidth, and processing capacity of an IRF fabric simply by adding member devices without changing the network topology.

Application scenario

Figure 1 shows an IRF fabric that has two devices, which appear as a single node to the upper-layer and lower-layer devices.
Basic concepts

This section describes the basic concepts you might encounter when you work with IRF.

IRF member roles

IRF uses two member roles: master and standby (called subordinate throughout the documentation).

When devices form an IRF fabric, they elect a master to manage and control the IRF fabric, and all the other devices back up the master. When the master device fails, the other devices elect a new master automatically. For more information about master election, see "Master election."

IRF member ID

An IRF fabric uses member IDs to uniquely identify and manage its members. This member ID information is included as the first part of interface numbers and file paths to uniquely identify interfaces and files in an IRF fabric. For more information about interface and file path naming, see "Interface naming conventions" and "File system naming conventions."

If two devices have the same IRF member ID, they cannot form an IRF fabric. If the IRF member ID of a device has been used in an IRF fabric, the device cannot join the fabric.

IRF port

An IRF port is a logical interface for the connection between IRF member devices. Every IRF-capable device supports two IRF ports. The IRF ports are named IRF-port n/1 and IRF-port n/2, where n is the member ID of the device. The two IRF ports are referred to as IRF-port 1 and IRF-port 2 in this book.
To use an IRF port, you must bind a minimum of one physical interface to it. The physical interfaces assigned to an IRF port form an aggregate IRF link automatically. An IRF port goes down only if all its IRF physical interfaces are down.

**IRF physical interface**

IRF physical interfaces connect IRF member devices and must be bound to an IRF port. They forward the IRF protocol packets between IRF member devices and the data packets that must travel across IRF member devices.

For more information about physical interfaces that can be used for IRF links, see “IRF physical interface requirements.”

**IRF domain ID**

One IRF fabric forms one IRF domain. IRF uses IRF domain IDs to uniquely identify IRF fabrics and prevent IRF fabrics from interfering with one another.

As shown in Figure 2, Device A and Device B form IRF fabric 1, and Device C and Device D form IRF fabric 2. Both fabrics use the LACP aggregate links between them for MAD. When a member device receives an extended LACPDU for MAD, it checks the domain ID to see whether the packet is from the local IRF fabric. Then, the device can handle the packet correctly.

*Figure 2 A network that contains two IRF domains*
IRF split

IRF split occurs when an IRF fabric breaks up into two or more IRF fabrics because of IRF link failures, as shown in Figure 3. The split IRF fabrics operate with the same IP address and cause routing and forwarding problems on the network. To quickly detect a multi-active collision, configure a minimum of one MAD mechanism (see “IRF multi-active detection”).

Figure 3 IRF split

IRF merge

IRF merge occurs when two split IRF fabrics reunite or when two independent IRF fabrics are united, as shown in Figure 4.

Figure 4 IRF merge

Member priority

Member priority determines the possibility of a member device to be elected the master. A member with higher priority is more likely to be elected the master.

The default member priority is 1. You can change the member priority of a device to affect the master election result.

Interface naming conventions

An interface is named in the chassis-number/slot-number/port-index format.

- **chassis-number**—IRF member ID of the switch. This argument defaults to 1. The IRF member ID always takes effect regardless of whether the switch is part of an IRF fabric.
- **slot-number**—Slot number of the front panel. This argument is fixed at 0.
- **port-index**—Index of the port on the device. Port index depends on the number of ports available on the device. To identify the index of a port, look at its port index mark on the chassis.

Look at the following examples:
• On the standalone switch Sysname, GigabitEthernet 1/0/1 represents the first port on the device. Set its link type to trunk, as follows:

```
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] port link-type trunk
```

• On the IRF fabric Master, GigabitEthernet 3/0/1 represents the first fixed port on member device 3. Set its link type to trunk, as follows:

```
<Master> system-view
[Master] interface gigabitethernet 3/0/1
[Master-GigabitEthernet3/0/1] port link-type trunk
```

### File system naming conventions

On a standalone device, you can use its storage device name to access its file system. For more information about storage device naming conventions, see *Fundamentals Configuration Guide*.

On an IRF fabric, you can use the storage device name to access the file system of the master. To access the file system of any other member device, use the name in the `slotmemberID#storage-device-name` format. For example:

To access the *test* folder under the root directory of the flash memory on the master device:

```
<Master> mkdir test
Creating directory flash:/test... Done.
<Master> dir
Directory of flash:
  0 -rw-  43548660 Jan 01 2011 08:21:29 system.ipe
  1 drw-  - Jan 01 2011 00:00:30 diagfile
  2 -rw-  567 Jan 02 2011 01:41:54 dsakey
  3 -rw-  735 Jan 02 2011 01:42:03 hostkey
  4 -rw-  36 Jan 01 2011 00:07:52 ifindex.dat
  5 -rw-  0 Jan 01 2011 00:53:09 lauth.dat
  6 drw-  - Jan 01 2011 06:33:55 log
  7 drw-  - Jan 02 2000 00:00:07 logfile
  8 -rw- 23724032 Jan 01 2011 00:49:47 switch-cmw710-system.bin
  9 drw-  - Jan 01 2000 00:00:07 seclog
 10 -rw-  591 Jan 02 2011 01:42:03 serverkey
 11 -rw-  4609 Jan 01 2011 00:07:53 startup.cfg
 12 -rw-  3626 Jan 01 2011 01:51:56 startup.cfg_bak
 13 -rw-  78833 Jan 01 2011 00:07:53 startup.mdb
 14 drw-  - Jan 01 2011 00:15:48 test
 25 drw-  - Jan 01 2011 04:16:53 versionInfo

524288 KB total (365292 KB free)
```

To create and access the *test* folder under the root directory of the flash memory on member device 3:

```
<Master> mkdir slot3#flash:/test
Creating directory slot3#flash:/test... Done.
<Master> cd slot3#flash:/test
<Master> pwd
slot3#flash:/test
```
Or:

```
<Master> cd slot3#flash:
<Master> mkdir test
Creating directory slot3#flash:/test... Done.
```

To copy the file `test.ipe` on the master to the root directory of the flash memory on member device 3:

```
# Display the current working path. In this example, the current working path is the root directory of the
# flash on member device 3.
<Master> pwd
slot3#flash:

# Change the current working path to the root directory of the flash memory on the master device.
<Master> cd flash:/
<Master> pwd
flash:

# Copy the file to member device 3.
<Master> copy test.ipe slot3#flash:/
Copy flash:/test.ipe to slot3#flash:/test.ipe?[Y/N]:y
Copying file flash:/test.ipe to slot3#flash:/test.ipe... Done.
```

### Configuration synchronization

IRF uses a strict running-configuration synchronization mechanism. In an IRF fabric, all devices obtain and run the running configuration of the master. Configuration changes are automatically propagated from the master to the remaining devices. The configuration files of these devices are retained, but the files do not take effect. The devices use their own startup configuration files only after they are removed from the IRF fabric.

For more information about configuration management, see *Fundamentals Configuration Guide*.

### Master election

Master election occurs each time the IRF fabric topology changes in the following situations:

- The IRF fabric is established.
- The master device fails or is removed.
- The IRF fabric splits.
- Independent IRF fabrics merge.

**NOTE:**

Master election does not occur when two split IRF fabrics merge.

Master election selects a master in descending order:

1. Current master, even if a new member has higher priority.
   - When an IRF fabric is being formed, all members consider themselves as the master. This rule is skipped.
2. Member with higher priority. If all members have the same priority, this rule is skipped.
3. Member with the longest system uptime.
Two members are considered to start up at the same time if the difference between their startup times is equal to or less than 10 minutes. For these members, the next tiebreaker applies.

4. Member with the lowest CPU MAC address.

For the setup of a new IRF fabric, the subordinate devices must reboot to complete the setup after the master election.

For an IRF merge, devices must reboot if they are in the IRF fabric that fails the master election.

**IRF multi-active detection**

An IRF link failure causes an IRF fabric to split in two IRF fabrics operating with the same Layer 3 settings, including the same IP address. To avoid IP address collision and network problems, IRF uses multi-active detection (MAD) mechanisms to detect the presence of multiple identical IRF fabrics, handle collisions, and recover from faults.

**Multi-active handling procedure**

The multi-active handling procedure includes detection, collision handling, and failure recovery.

**Detection**

The device’s MAD implementation detects active IRF fabrics with the same Layer 3 global configuration by extending the LACP, BFD, ARP, or IPv6 ND protocol.

These MAD mechanisms identify each IRF fabric with a domain ID and an active ID (the member ID of the master). If multiple active IDs are detected in a domain, MAD determines that an IRF collision or split has occurred.

You can use these mechanisms concurrently in an IRF fabric, depending on the network topology.

1 IMPORTANT:

LACP MAD handles collisions differently than BFD MAD, ARP MAD, and ND MAD. To avoid conflicts, do not enable LACP MAD together with any of those mechanisms in an IRF fabric. However, you can use BFD MAD, ARP MAD, and ND MAD together.

For a comparison of these MAD mechanisms, see "Configuring MAD."

**Collision handling**

When MAD detects a multi-active collision, it sets all IRF fabrics except one to the Recovery state. The fabric that is not placed in Recovery state can continue to forward traffic. The Recovery-state IRF fabrics are inactive and cannot forward traffic.

LACP MAD uses the following process to handle a multi-active collision:

1. Compares the number of members in each fabric.
2. Sets all fabrics to the Recovery state except the one that has the most members.
3. Compares the member IDs of the masters if all IRF fabrics have the same number of members.
4. Sets all fabrics to the Recovery state except the one that has the lowest numbered master.
5. Shuts down all physical network ports in the Recovery-state fabrics except for the following ports:
   - IRF physical interfaces.
   - Ports you have specified with the mad exclude interface command.
In contrast, BFD MAD, ARP MAD, and ND MAD do not compare the number of members in fabrics. These MAD mechanisms use the following process to hand a multi-active collision:

1. Compare the member IDs of the masters in the IRF fabrics.
2. Set all fabrics to the Recovery state except the one that has the lowest numbered master.
3. Take the same action on the network ports in Recovery-state fabrics as LACP MAD.

**Failure recovery**

To merge two split IRF fabrics, first repair the failed IRF link and remove the IRF link failure.

- If the IRF fabric in Recovery state fails before the failure is recovered, repair the failed IRF fabric and the failed IRF link.
- If the active IRF fabric fails before the failure is recovered, enable the inactive IRF fabric to take over the active IRF fabric. Then, recover the MAD failure.

**LACP MAD**

As shown in Figure 5, LACP MAD has the following requirements:

- Every IRF member must have a link with an intermediate device.
- All the links form a dynamic link aggregation group.
- The intermediate device must be a device that supports extended LACP for MAD.

The IRF member devices send extended LACPDU with TLVs that convey the domain ID and the active ID of the IRF fabric. The intermediate device transparently forwards the extended LACPDU received from one member device to all the other member devices.

- If the domain IDs and active IDs in the extended LACPDU sent by all the member devices are the same, the IRF fabric is integrated.
- If the extended LACPDU convey the same domain ID but different active IDs, a split has occurred. LACP MAD handles this situation as described in "Collision handling."
BFD MAD

BFD MAD can work with or without an intermediate device. Figure 6 shows a typical BFD MAD application scenario.

To use BFD MAD:

- Set up dedicated BFD MAD link between each pair of IRF members or between each IRF member and the intermediate device. Do not use the BFD MAD links for any other purposes.
- Assign the ports connected by BFD MAD links to the same VLAN.
- Create a VLAN interface for the VLAN, and assign a MAD IP address to each member on the VLAN interface.

The MAD addresses identify the member devices and must belong to the same subnet.

With BFD MAD, the master tries to establish BFD sessions with other member devices by using its MAD IP address as the source IP address:

- If the IRF fabric is integrated, only the MAD IP address of the master is effective. The master cannot establish a BFD session with any other member. If you execute the `display bfd session` command, the state of the BFD sessions is Down.
- When the IRF fabric splits, the IP addresses of the masters in the split IRF fabrics take effect. The masters can establish a BFD session. If you execute the `display bfd session` command, the state of the BFD session between the two devices is Up.
ARP MAD

ARP MAD detects multi-active collisions by using extended ARP packets that convey the IRF domain ID and the active ID.

You can set up ARP MAD links between neighbor IRF member devices, or between each IRF member device and an intermediate device (see Figure 7). If an intermediate device is used, you must also run the spanning tree feature between the IRF fabric and the intermediate device.
Each IRF member compares the domain ID and the active ID in incoming extended ARP packets with its domain ID and active ID:

- If the domain IDs are different, the extended ARP packet is from a different IRF fabric. The device does not continue to process the packet with the MAD mechanism.
- If the domain IDs are the same, the device compares the active IDs:
  - If the active IDs are different, the IRF fabric has split.
  - If the active IDs are the same, the IRF fabric is integrated.

**ND MAD**

ND MAD detects multi-active collisions by using the ND protocol's NS packets to transmit the IRF domain ID and the active ID.

You can set up ND MAD links between neighbor IRF member devices or between each IRF member device and an intermediate device (see Figure 8). If an intermediate device is used, you must also run the spanning tree protocol between the IRF fabric and the intermediate device.
Each IRF member device compares the domain ID and the active ID in incoming NS packets with its domain ID and active ID:

- If the domain IDs are different, the NS packet is from a different IRF fabric. The device does not continue to process the packet with the MAD mechanism.

- If the domain IDs are the same, the device compares the active IDs:
  - If the active IDs are different, the IRF fabric has split.
  - If the active IDs are the same, the IRF fabric is integrated.
Configuring IRF

To ensure a successful IRF setup, read the configuration restrictions and guidelines carefully before you connect and set up an IRF fabric.

General restrictions and configuration guidelines

Software requirements

All IRF member devices must run the same software image version. Make sure the software auto-update function is enabled on all member devices.

IRF physical interface requirements

Use SFP+ ports on the front panel for IRF connection.

Selecting transceiver modules and cables

When you select transceiver modules and cables, follow these restrictions and guidelines:

- Use Category 6A (or above) twisted-pair cables to connect 10-GE ports for a short-distance connection.
- Use SFP+ DAC cables to connect SFP+ ports for a short-distance connection.
- Use SFP+ transceiver modules and fibers to connect SFP+ ports for a long-distance connection.
- The transceiver modules at the two ends of an IRF link must be the same type.

For more information about the SFP+ ports, SFP+ DAC cables, and SFP+ transceiver modules, see the switch installation guide. For detailed information about the SFP+ transceiver modules, see H3C Low End Series Ethernet Switches Pluggable Modules Manual.

NOTE:
The SFP+ modules and SFP+ DAC cables available for the switch are subject to change over time. For the most up-to-date list of SFP+ modules and DAC cables, contact your H3C sales representative.

IRF physical interface location and binding restrictions

<table>
<thead>
<tr>
<th>Device model</th>
<th>Candidate IRF physical interfaces</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5130-28S-EI</td>
<td>The four SFP+ ports on the front panel.</td>
<td>No binding restrictions. You can bind the four ports as needed to any IRF ports.</td>
</tr>
<tr>
<td>S5130-28S-PWR-EI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5130-28S-HPWR-EI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5130-28F-EI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Device model | Candidate IRF physical interfaces | Requirements
---|---|---
- S5130-28TP-EI  
- S5130-28TP-PWR-EI | The two SFP+ ports and the two 10-GE ports on the front panel. | No binding restrictions. You can bind the four ports as needed to any IRF ports.

### Device model | Candidate IRF physical interfaces | Requirements
---|---|---
- S5130-52S-EI  
- S5130-52S-PWR-EI | The four SFP+ ports (in two groups) on the front panel:  
  - SFP+ ports 49 and 50 in one group.  
  - SFP+ ports 51 and 52 in the other group. | All physical interfaces of an IRF port must be in the same group.

### Device model | Candidate IRF physical interfaces | Requirements
---|---|---
- S5130-52TP-EI  
- S5130-52TP-PWR-EI | The two SFP+ ports and the two 10-GE ports on the front panel.  
  The ports are grouped: SFP+ ports in one group and the 10-GE ports in another group. | All physical interfaces of an IRF port must be in the same group.

#### Connecting IRF ports
When you connect two neighboring IRF members, connect the physical interfaces of IRF-port 1 on one member to the physical interfaces of IRF-port 2 on the other.

#### IRF link redundancy

<table>
<thead>
<tr>
<th>Switch model</th>
<th>Maximum number of physical interfaces/IRF port</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5130-28F-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-28S-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-28S-PWR-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-28S-HPWR-EI</td>
<td>4</td>
</tr>
<tr>
<td>S5130-28TP-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-28TP-PWR-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-52S-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-52S-PWR-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-52TP-EI</td>
<td></td>
</tr>
<tr>
<td>S5130-52TP-PWR-EI</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Multichassis link aggregation
For high availability, connect a downstream device to each IRF member device, and assign the links to one link aggregation group.
MAD and IRF domain restrictions

When you configure MAD, follow these restrictions and guidelines:

- If LACP MAD, ARP MAD, or ND MAD runs between two IRF fabrics, assign each fabric a unique IRF domain ID. (For BFD MAD, this task is optional.)
- An IRF fabric has only one IRF domain ID. You can change the IRF domain ID by using the following commands: `irf domain`, `mad enable`, `mad arp enable`, or `mad nd enable`. The IRF domain IDs configured by using these commands overwrite each other.
- LACP MAD handles collisions differently than BFD MAD, ARP MAD, and ND MAD. To avoid conflicts, do not enable LACP MAD together with any of those mechanisms in an IRF fabric. However, you can configure BFD MAD, ARP MAD, and ND MAD together in an IRF fabric for prompt IRF split detection.
- To prevent a port from being shut down when the IRF fabric transits to the Recovery state, use the `mad exclude interface` command. To bring up ports in a Recovery-state IRF fabric, use the `mad restore` command instead of the `undo shutdown` command. The `mad restore` command activates the Recovery-state IRF fabric.

Other configuration guidelines

- If a subordinate device uses the same next-startup configuration file name as the master device, the file might be overwritten depending on the configuration file management settings. To continue to use the configuration file after removing the device from the IRF fabric, back up the file before setting up the IRF fabric.
- Strictly follow the setup procedure described in "Setup and configuration task list" to plan the IRF fabric, identify IRF physical interfaces, connect IRF member devices, and configure basic settings.
- If two IRF fabrics have the same bridge MAC address, they cannot merge unless you change the bridge MAC address of one IRF fabric.
- Assign each member a unique IRF member ID to make sure they can merge. You must reboot the members to validate the IRF member ID settings.
- Assign the highest member priority to the device you want to use as the master.
- Save any configuration you have made to the startup configuration file before you reboot the IRF member devices.

Setup and configuration task list

H3C recommends the basic IRF setup procedure in Figure 9. Perform the tasks in this figure on each member device. After the IRF fabric is set up, you can access the IRF fabric to manage its member devices as if they were one device.
H3C recommends the following IRF fabric setup and configuration procedure:

<table>
<thead>
<tr>
<th>Tasks at a glance</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (Required.) Planning the IRF fabric setup</td>
<td>N/A</td>
</tr>
<tr>
<td>2. (Required.) Assigning a member ID to each IRF member device</td>
<td>Perform this task on each member device.</td>
</tr>
<tr>
<td>3. (Required.) Specifying a priority for each member device</td>
<td>Perform this task on each member device.</td>
</tr>
<tr>
<td>4. (Required.) Connecting IRF physical interfaces</td>
<td>N/A</td>
</tr>
<tr>
<td>5. (Required.) Binding physical interfaces to IRF ports</td>
<td>Perform this task on each member device. When you complete IRF port binding and activation on all IRF member devices, the IRF fabric is formed.</td>
</tr>
<tr>
<td>6. (Required.) Accessing the IRF fabric</td>
<td>When you log in to the IRF fabric, you are placed at the master’s CLI, where you complete subsequent IRF settings and configure other features for the member devices as if they were one device.</td>
</tr>
<tr>
<td>7. (Optional.) Configuring a member device description</td>
<td>N/A</td>
</tr>
<tr>
<td>8. (Optional.) Configuring IRF link load sharing mode:</td>
<td>N/A</td>
</tr>
<tr>
<td>o Configuring the global load sharing mode</td>
<td></td>
</tr>
<tr>
<td>o Configuring a port-specific load sharing mode</td>
<td></td>
</tr>
<tr>
<td>9. (Optional.) Configuring IRF bridge MAC persistence</td>
<td>N/A</td>
</tr>
<tr>
<td>10. (Optional.) Enabling software auto-update for software image synchronization</td>
<td>H3C recommends enabling software auto-update to ensure system software image synchronization.</td>
</tr>
<tr>
<td>11. (Optional.) Setting the IRF link down report delay</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Planning the IRF fabric setup

Consider the following items when you plan an IRF fabric:

- Hardware compatibility and restrictions.
- IRF fabric size.
- Master device.
- IRF physical interfaces.
- Member ID and priority assignment scheme.
- Fabric topology and cabling scheme.

For more information about hardware and cabling, see the switch installation guide.

### Assigning a member ID to each IRF member device

⚠️ **CAUTION:**

In an IRF fabric, changing IRF member IDs might cause undesirable configuration changes and even data loss. Before you do that, back up the configuration and make sure you fully understand the impact on your network. For example, all member devices in an IRF fabric are the same model. If you swapped the IDs of any two members, their interface settings would also be swapped.

By default, the IRF member ID is 1. To create an IRF fabric, you must assign a unique IRF member ID to each member device.

Perform this task before the IRF fabric is formed. To prevent any undesirable configuration change or data loss, avoid changing member IDs after the IRF fabric is formed.

The new member ID takes effect at a reboot. After the device reboots, the settings on all member ID-related physical resources (including common physical network ports) are removed, regardless of whether you have saved the configuration.

To assign a member ID to a device:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Assign a member ID to a member device.</td>
<td><strong>irf member</strong> member-id <strong>renumber</strong> new-memberid</td>
</tr>
</tbody>
</table>
### Specifying a priority for each member device

IRF member priority represents the possibility for a device to be elected the master in an IRF fabric. The higher the priority, the higher the possibility.

A change to member priority affects the election result at the next master election. However, it does not cause an immediate master re-election.

To specify a priority for a member device:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Specify a priority for the device.</td>
<td>irf member member-id priority priority</td>
</tr>
</tbody>
</table>

### Connecting IRF physical interfaces

When you connect two neighboring IRF members, connect the physical interfaces of IRF-port 1 on one member to the physical interfaces of IRF-port 2 on the other (see Figure 10).

For example, you have four chassis: A, B, C, and D. IRF-port 1 and IRF-port 2 are represented by A1 and A2 on chassis A, represented by B1 and B2 on chassis B, and so on. To connect the four chassis into a ring topology of A-B-C-D(A), the IRF link cabling scheme must be one of the following:

- A2-B1, B2-C1, C2-D1, and D2-A1.

**IMPORTANT:**

No intermediate devices are allowed between neighboring members.

![Figure 10 Connecting IRF physical interfaces](image-url)
Connect the devices into a daisy-chain topology or a ring topology. A ring topology is more reliable (see Figure 11). In ring topology, the failure of one IRF link does not cause the IRF fabric to split as in daisy-chain topology. Rather, the IRF fabric changes to a daisy-chain topology without interrupting network services.

**Figure 11 Daisy-chain topology vs. ring topology**

![Daisy-chain topology vs. ring topology](image)

**Binding physical interfaces to IRF ports**

When you bind physical interfaces to IRF ports, follow these guidelines:

- Follow the restrictions in "IRF physical interface requirements."
- You must always shut down a physical interface before binding it to an IRF port or removing the binding. Start the shutdown operation on the master, and then the member device that has the fewest number of hops from the master.

On a physical interface bound to an IRF port, you can execute only the following commands:

<table>
<thead>
<tr>
<th>Software version</th>
<th>Available commands</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 3106 and 3108P01</td>
<td>description</td>
<td>For more information about these commands, see Layer 2—LAN Switching Configuration Guide.</td>
</tr>
</tbody>
</table>
### Software version

<table>
<thead>
<tr>
<th>Available commands</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Basic Ethernet interface commands, including:</td>
<td>For more information about these commands, see Layer 2—LAN Switching Configuration Guide.</td>
</tr>
<tr>
<td>o description</td>
<td></td>
</tr>
<tr>
<td>o flow-interval</td>
<td></td>
</tr>
<tr>
<td>o shutdown</td>
<td></td>
</tr>
<tr>
<td>• LLDP commands, including:</td>
<td></td>
</tr>
<tr>
<td>o lldp admin-status</td>
<td></td>
</tr>
<tr>
<td>o lldp check-change-interval</td>
<td></td>
</tr>
<tr>
<td>o lldp enable</td>
<td></td>
</tr>
<tr>
<td>o lldp notification remote-change enable</td>
<td></td>
</tr>
<tr>
<td>o lldp tlv-enable</td>
<td></td>
</tr>
</tbody>
</table>

Release 3109P05 and later versions

---

### To bind physical interfaces to an IRF port:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Enter interface view or interface range view.</td>
<td>interface range { interface-type interface-number [ to interface-type interface-number ] } &amp;&lt;1-5&gt;</td>
</tr>
<tr>
<td>3.</td>
<td>Shut down the interface or the range of interfaces.</td>
<td>shutdown</td>
</tr>
<tr>
<td>4.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
<tr>
<td>5.</td>
<td>Enter IRF port view.</td>
<td>irf-port member-id/port-number</td>
</tr>
<tr>
<td>6.</td>
<td>Bind each physical interface to the IRF port.</td>
<td>port group interface interface-type interface-number</td>
</tr>
<tr>
<td>7.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
<tr>
<td>8.</td>
<td>Enter interface view or interface range view.</td>
<td>interface range { interface-type interface-number [ to interface-type interface-number ] } &amp;&lt;1-5&gt;</td>
</tr>
<tr>
<td>9.</td>
<td>Bring up the interface or the range of interfaces.</td>
<td>undo shutdown</td>
</tr>
<tr>
<td>10.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
</tbody>
</table>
### Accessing the IRF fabric

The IRF fabric appears as one device after it is formed. You configure and manage all IRF members at the CLI of the master. All settings you have made are propagated to the IRF members automatically.

The following methods are available for accessing an IRF fabric:

- **Local login**—Log in through the console port of any member device.
- **Remote login**—Log in at a Layer 3 interface on any member device by using methods including Telnet and SNMP.

When you log in to an IRF fabric, you are placed at the CLI of the master, regardless of at which member device you are logged in.

For more information, see login configuration in *Fundamentals Configuration Guide*.

### Configuring a member device description

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>system-view</td>
<td>N/A</td>
</tr>
<tr>
<td>2.</td>
<td>irf member member-id description text</td>
<td>By default, no member device description is configured.</td>
</tr>
</tbody>
</table>

### Configuring IRF link load sharing mode

On an IRF port, traffic is balanced across its physical links.

By default, traffic is distributed automatically based on packet types, including Layer 2, IPv4, and IPv6. You can configure the IRF port to distribute traffic based on certain criteria, including IP addresses, MAC...
addresses, and the combination of IP and MAC addresses. If the device does not support a criterion combination, the system displays an error message.

Configure the IRF link load sharing mode for IRF links in system view or IRF port view:

- In system view, the configuration is global and takes effect on all IRF ports.
- In IRF port view, the configuration is port specific and takes effect only on the specified IRF port.

An IRF port preferentially uses the port-specific load sharing mode. If no port-specific load sharing mode is available, the IRF port uses the global load sharing mode.

The IRF link load sharing mode takes effect on all types of packets, including unicast, multicast, and broadcast.

**NOTE:**

To distribute traffic based on TCP/UDP ports, use one of the following methods:

- Use the default setting for both global and port-specific IRF link load sharing modes.
- Set the IRF link load sharing mode to be based on source IP, destination IP, or their combination (`irf-port load-sharing mode { destination-ip | source-ip } *`), and set the global Ethernet link aggregation load sharing mode to be based on source service port, destination service port, or their combination (`link-aggregation global load-sharing mode { destination-port | source-port } *`). For more information about Ethernet link aggregation load sharing, see *Layer 2—LAN Switching Configuration Guide*.

### Configuring the global load sharing mode

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Configure the global IRF link load sharing mode.</td>
<td>`irf-port global load-sharing mode { destination-ip</td>
</tr>
</tbody>
</table>

### Configuring a port-specific load sharing mode

Before you configure a port-specific load sharing mode, make sure you have bound a minimum of one physical interface to the IRF port.

To configure a port-specific load sharing mode for an IRF port:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Enter IRF port view.</td>
<td><code>irf-port member-id/portnumber</code></td>
</tr>
</tbody>
</table>
3. Configure the port-specific load sharing mode.

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>irf-port load-sharing mode</code> { destination-ip</td>
<td>By default, packets are distributed automatically across IRF member</td>
</tr>
<tr>
<td></td>
<td></td>
<td>destination-mac</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IRF member links based on packet types. If you execute this command</td>
</tr>
<tr>
<td></td>
<td></td>
<td>multiple times, the most recent configuration takes effect.</td>
</tr>
</tbody>
</table>

### Configuring IRF bridge MAC persistence

By default, an IRF fabric uses the bridge MAC address of the master device as its bridge MAC address. Layer 2 protocols, such as LACP, use this bridge MAC address to identify the IRF fabric. On a switched LAN, the bridge MAC address must be unique.

To avoid duplicate bridge MAC addresses, an IRF fabric can change its bridge MAC address automatically after the address owner leaves. However, the change causes temporary traffic disruption.

Depending on the network condition, enable the IRF fabric to retain or change its bridge MAC address after the address owner leaves. Available options include:

- **`irf mac-address persistent timer`** — Bridge MAC address of the IRF fabric is retained for 6 minutes after the address owner leaves. If the address owner does not return before the timer expires, the IRF fabric uses the bridge MAC address of the current master as its bridge MAC address. This option avoids unnecessary bridge MAC address changes caused by device reboot, transient link failure, or purposeful link disconnection.

- **`irf mac-address persistent always`** — Bridge MAC address of the IRF fabric does not change after the address owner leaves.

**NOTE:**

IRF fabrics cannot merge if they have the same bridge MAC address. If you use the removed bridge MAC address owner as the master device in a new fabric, the bridge MAC of the new fabric is the same as the old fabric. For the two IRF fabrics to merge, you must change the bridge MAC address of the old IRF fabric.

- **`undo irf mac-address persistent`** — Bridge MAC address of the current master replaces the original bridge MAC address as soon as the owner of the original address leaves.

When you configure IRF bridge MAC persistence, follow these guidelines:

- If ARP MAD or ND MAD is used, configure the `undo irf mac-address persistent` command to enable immediate bridge MAC address change after the address owner leaves.

- Configure the `irf mac-address persistent always` command on the IRF fabric that meets the following requirements:
  - The IRF fabric uses a daisy-chain topology.
  - The IRF fabric has aggregate links with upstream or downstream devices.

  The persistence setting prevents transmission delay or packet loss after the address owner leaves.

To configure the IRF bridge MAC persistence setting:
<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
</tbody>
</table>
| 2.   | Configure IRF bridge MAC persistence. | • Retain the bridge MAC address even if the address owner has left the fabric: `irf mac-address persistent always`  
• Retain the bridge MAC address for 6 minutes after the address owner leaves the fabric: `irf mac-address persistent timer`  
• Change the bridge MAC address as soon as the address owner leaves the fabric: `undo irf mac-address persistent` | By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves.  
The command setting takes effect only after the address owner leaves the IRF fabric. Events such as active/standby or master/subordinate switchovers cannot trigger the command setting to take effect. |

Enabling software auto-update for software image synchronization

**IMPORTANT:**

To ensure a successful software auto-update in a multi-user environment, prevent the action of rebooting member devices during the auto-update process. You can configure the information center to output the software auto-update status to configuration terminals (see Network Management and Monitoring Configuration Guide).

The software auto-update function synchronizes the current software images of the master in an IRF fabric to all its members automatically.

To join an IRF fabric, a device must use the same software images as the master in the fabric.

When you add a device to the IRF fabric, software auto-update compares the startup software images of the device with the current software images of the IRF master. If the two sets of images are different, the device performs the following tasks automatically:

1. Downloads the current software images of the master.
2. Sets the downloaded images as main startup software images.
3. Reboots with the new software images to rejoin the IRF fabric.

If software auto-update is disabled, you must manually update the device with the software images of the master before adding the device to the IRF fabric.

Configuration prerequisites

Make sure the device you are adding to the IRF fabric has sufficient storage space for the new software images.

If sufficient storage space is not available, the device deletes the current software images automatically. If the reclaimed space is still insufficient, the device cannot complete the auto-update. You must reboot the device and access the Boot menu to delete files.
Configuration procedure

To enable an IRF fabric to synchronize software images of the master automatically to the devices you are adding to the IRF fabric:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Enable software auto-update.</td>
<td>irf auto-update enable</td>
</tr>
</tbody>
</table>

Setting the IRF link down report delay

To prevent frequent IRF splits and merges during link flapping, configure the IRF ports to delay reporting link down events. An IRF port works as follows:

- When the IRF link changes from up to down, the port does not immediately report the change to the IRF fabric. If the IRF link state is still down when the delay time is reached, the port reports the change to the IRF fabric.
- When the IRF link changes from down to up, the link layer immediately reports the event to the IRF fabric.

When you configure the IRF link down report delay, follow these restrictions and guidelines:

- Make sure the IRF link down report delay is shorter than the heartbeat timeout settings of upper-layer protocols (for example, CFD). The heartbeat timeout setting is the interval for a link to be determined as down by an upper-layer protocol. If the report delay is longer than the timeout setting of a protocol, unnecessary recalculation might occur.
- Set the delay to 0 seconds in the following situations:
  - The IRF fabric requires a fast master/subordinate or IRF link switchover.
  - The BFD or GR feature is used.
  - You want to shut down an IRF physical interface or reboot an IRF member device. (After you complete the operation, reconfigure the delay depending on the network condition.)

To set the IRF link down report delay:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Set the IRF link down report delay.</td>
<td>irf link-delay interval</td>
</tr>
</tbody>
</table>

Configuring MAD

The following MAD mechanisms are available for detecting multi-active collisions in different network scenarios:

- LACP MAD.
LACP MAD handles collisions differently than BFD MAD, ARP MAD, and ND MAD. To avoid conflicts, do not enable LACP MAD together with any of those mechanisms in an IRF fabric. However, you can use BFD MAD, ARP MAD, and ND MAD together.

Table 1 compares the MAD mechanisms and their application scenarios.

Table 1 Comparison of MAD mechanisms

<table>
<thead>
<tr>
<th>MAD mechanism</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Application scenario</th>
</tr>
</thead>
</table>
| LACP MAD      | - Detection speed is fast.  
- Does not require MAD-dedicated physical links or Layer 3 interfaces. | Requires an intermediate device that supports extended LACP for MAD. | Link aggregation is used between the IRF fabric and its upstream or downstream device.  
For information about LACP, see Layer 2—LAN Switching Configuration Guide. |
| BFD MAD       | - Detection speed is fast.  
- No intermediate device is required.  
- Intermediate device, if used, can come from any vendor. | - Requires MAD dedicated physical links and Layer 3 interfaces, which cannot be used for transmitting user traffic.  
- If no intermediate device is used, any two IRF members must have a BFD MAD link to each other.  
- If an intermediate device is used, every IRF member must have a BFD MAD link to the intermediate device. | - No special requirements for network scenarios.  
- If no intermediate device is used, this mechanism is only suitable for IRF fabrics that have a small number of members that are geographically close to one another.  
For information about BFD, see High Availability Configuration Guide. |
| ARP MAD       | - No intermediate device is required.  
- Intermediate device, if used, can come from any vendor.  
- Does not require MAD dedicated ports. | - Detection speed is slower than BFD MAD and LACP MAD.  
- The spanning tree feature must be enabled. | Spanning tree-enabled non-link aggregation IPv4 network scenario.  
For information about ARP, see Layer 3—IP Services Configuration Guide. |
| ND MAD        | - No intermediate device is required.  
- Intermediate device, if used, can come from any vendor.  
- Does not require MAD dedicated ports. | - Detection speed is slower than BFD MAD and LACP MAD.  
- The spanning tree feature must be enabled. | Spanning tree-enabled non-link aggregation IPv6 network scenario.  
For information about ND, see Layer 3—IP Services Configuration Guide. |
Configuring LACP MAD

When you use LACP MAD, follow these guidelines:

- The intermediate device must be a device that supports extended LACP for MAD.
- If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.
- Use dynamic link aggregation mode. MAD is LACP dependent. Even though LACP MAD can be configured on both static and dynamic aggregate interfaces, it takes effect only on dynamic aggregate interfaces.
- Configure link aggregation settings on the intermediate device.

To configure LACP MAD:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Assign a domain ID to the IRF fabric.</td>
<td>irf domain domain-id</td>
</tr>
<tr>
<td>3.</td>
<td>Create a Layer 2 aggregate interface and enter aggregate interface view.</td>
<td>interface bridge-aggregation interface-number</td>
</tr>
<tr>
<td>4.</td>
<td>Configure the aggregation group to operate in dynamic aggregation mode.</td>
<td>link-aggregation mode dynamic</td>
</tr>
<tr>
<td>5.</td>
<td>Enable LACP MAD.</td>
<td>mad enable</td>
</tr>
<tr>
<td>6.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
<tr>
<td>7.</td>
<td>Enter Ethernet interface view or interface range view.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enter interface range view:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interface range { interface-type interface-number</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interface-type interface-number }</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&amp;&lt;1-5&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enter Ethernet interface view:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interface interface-type interface-number</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Assign the Ethernet port or the range of Ethernet ports to the specified aggregation group.</td>
<td>port link-aggregation group number</td>
</tr>
</tbody>
</table>

Configuring BFD MAD

When you use BFD MAD, follow these guidelines:
Category | Restrictions and guidelines
---|---
BFD MAD VLAN | • Do not enable BFD MAD on VLAN-interface 1.
• If you are using an intermediate device, assign the ports of BFD MAD links to the BFD MAD VLAN on the device.
• Make sure the IRF fabrics on the network use different BFD MAD VLANs.
• For correct traffic forwarding, make sure the BFD MAD VLAN contains only ports on the BFD MAD links. Exclude a port from the BFD MAD VLAN if the port is not on the BFD MAD link. For example, if you have assigned the port to all VLANs by using the `port trunk permit vlan all` command, use the `undo port trunk permit` command to exclude the port from the BFD MAD VLAN.

BFD MAD VLAN and feature compatibility | Do not use the BFD MAD VLAN for any purpose other than configuring BFD MAD.
• Configure only the `mad bfd enable` and `mad ip address` commands on the VLAN interface used for BFD MAD. If you configure other features, both BFD MAD and other features on the interface might run incorrectly.
• Disable the spanning tree feature on all Layer 2 Ethernet ports in the BFD MAD VLAN. The MAD function is mutually exclusive with the spanning tree feature.

MAD IP address | • Use the `mad ip address` command instead of the `ip address` command to configure MAD IP addresses on the BFD MAD-enabled VLAN interface.
• Make sure all the MAD IP addresses on the BFD MAD-enabled VLAN interface are on the same subnet.

To configure BFD MAD:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td><code>system-view</code></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Assign a domain ID to the IRF fabric.</td>
<td>By default, the domain ID of an IRF fabric is 0.</td>
</tr>
<tr>
<td></td>
<td><code>irf domain domain-id</code></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Create a VLAN dedicated to BFD MAD.</td>
<td>The default VLAN on the device is VLAN 1.</td>
</tr>
<tr>
<td></td>
<td><code>vlan vlan-id</code></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Return to system view.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td><code>quit</code></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Enter interface range view or interface range view.</td>
<td>To assign a range of ports to the BFD MAD VLAN, enter interface range view.</td>
</tr>
<tr>
<td></td>
<td>• Enter interface range view: `interface range { interface-type interface-number [ to interface-type interface-number ]</td>
<td>&amp;&lt;1-5&gt; }`</td>
</tr>
<tr>
<td></td>
<td>• Enter interface view: <code>interface interface-type interface-number</code></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Command</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>6.</td>
<td>Assign the port to the VLAN as an access port: <strong>port access vlan vlan-id</strong></td>
<td>The link type of BFD MAD ports can be access, trunk, or hybrid. The default link type of a port is access.</td>
</tr>
<tr>
<td></td>
<td>Assign the port to the VLAN as a trunk port: <strong>port trunk permit vlan vlan-id</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assign the port to the VLAN as a hybrid port: **port hybrid vlan vlan-id (tagged</td>
<td>untagged)**</td>
</tr>
<tr>
<td>7.</td>
<td>Return to system view.</td>
<td><strong>quit</strong></td>
</tr>
<tr>
<td>8.</td>
<td>Enter VLAN interface view.</td>
<td><strong>interface vlan-interface</strong></td>
</tr>
<tr>
<td></td>
<td>vlan-interface-id</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Enable BFD MAD.</td>
<td><strong>mad bfd enable</strong></td>
</tr>
<tr>
<td>10.</td>
<td>Configure a MAD IP address for a member device on the VLAN interface.</td>
<td>**mad ip address ip-address (mask</td>
</tr>
</tbody>
</table>

### Configuring ARP MAD

When you use ARP MAD, follow these guidelines:
- Do not configure ARP MAD on VLAN-interface 1.
- Do not use the VLAN configured for ARP MAD for any other purpose.
- If an intermediate device is used, you can use common data links as ARP MAD links. If no intermediate device is used, set up dedicated ARP MAD links between IRF member devices.
- If an intermediate device is used, make sure the following requirements are met:
  - Run the spanning tree feature between the IRF fabric and the intermediate device.
  - Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves.
  - Create an ARP MAD VLAN and assign the ports on the ARP MAD links to the VLAN.
  - If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

To configure ARP MAD:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td><strong>system-view</strong></td>
</tr>
<tr>
<td>2.</td>
<td>Assign a domain ID to the IRF fabric.</td>
<td><strong>irf domain domain-id</strong></td>
</tr>
<tr>
<td>Step</td>
<td>Command</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>3.</td>
<td>Configure the IRF bridge MAC address to change as soon as the address owner leaves.</td>
<td>undo irf mac-address persistent  By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves.</td>
</tr>
<tr>
<td>4.</td>
<td>Create a VLAN dedicated to ARP MAD.</td>
<td>vlan vlan-id  The default VLAN on the device is VLAN 1.</td>
</tr>
<tr>
<td>5.</td>
<td>Return to system view.</td>
<td>quit  N/A</td>
</tr>
<tr>
<td>6.</td>
<td>Enter Ethernet interface view.</td>
<td>interface interface-type interface-number  N/A</td>
</tr>
<tr>
<td>7.</td>
<td>Assign the port to the ARP MAD VLAN.</td>
<td>- Assign the port to the VLAN as an access port: port access vlan vlan-id  - Assign the port to the VLAN as a trunk port: port trunk permit vlan vlan-id  - Assign the port to the VLAN as a hybrid port: port hybrid vlan vlan-id { tagged</td>
</tr>
<tr>
<td>8.</td>
<td>Return to system view.</td>
<td>quit  N/A</td>
</tr>
<tr>
<td>9.</td>
<td>Enter VLAN interface view.</td>
<td>interface vlan-interface vlan-interface-id  N/A</td>
</tr>
<tr>
<td>10.</td>
<td>Assign the interface an IP address.</td>
<td>ip address ip-address { mask</td>
</tr>
<tr>
<td>11.</td>
<td>Enable ARP MAD.</td>
<td>mad arp enable  By default, ARP MAD is disabled.</td>
</tr>
</tbody>
</table>

### Configuring ND MAD

When you use ND MAD, follow these guidelines:

- Do not configure ND MAD on VLAN-interface 1.
- Do not use the VLAN configured for ND MAD for any other purpose.
- If an intermediate device is used, you can use common data links as ND MAD links. If no intermediate device is used, set up dedicated ND MAD links between IRF member devices.
- If an intermediate device is used, make sure the following requirements are met:
  - Run the spanning tree feature between the IRF fabric and the intermediate device.
  - Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves.
  - Create an ND MAD VLAN and assign the ports on the ND MAD links to the VLAN.
  - If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

To configure ND MAD:
<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Assign a domain ID to the IRF fabric.</td>
<td>irf domain domain-id</td>
</tr>
<tr>
<td>3.</td>
<td>Configure the IRF bridge MAC address to change as soon as the address owner leaves.</td>
<td>undo irf mac-address persistent</td>
</tr>
<tr>
<td>4.</td>
<td>Create a VLAN dedicated to ND MAD.</td>
<td>vlan vlan-id</td>
</tr>
<tr>
<td>5.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
<tr>
<td>6.</td>
<td>Enter Ethernet interface view.</td>
<td>interface interface-type interface-number</td>
</tr>
<tr>
<td>7.</td>
<td>Assign the port to the ND MAD VLAN.</td>
<td>• Assign the port to the VLAN as an access port: port access vlan vlan-id&lt;br&gt;• Assign the port to the VLAN as a trunk port: port trunk permit vlan vlan-id&lt;br&gt;• Assign the port to the VLAN as a hybrid port: port hybrid vlan vlan-id { tagged</td>
</tr>
<tr>
<td>8.</td>
<td>Return to system view.</td>
<td>quit</td>
</tr>
<tr>
<td>9.</td>
<td>Enter VLAN interface view.</td>
<td>interface vlan-interface vlan-interface-id</td>
</tr>
<tr>
<td>10.</td>
<td>Assign the interface an IP address.</td>
<td>ipv6 address { ipv6-address/pre-length</td>
</tr>
<tr>
<td>11.</td>
<td>Enable ND MAD.</td>
<td>mad nd enable</td>
</tr>
</tbody>
</table>

Excluding a port from the shutdown action upon detection of multi-active collision

By default, all ports (except the console and IRF physical interfaces) shut down automatically when the IRF fabric transits to the Recovery state.

You can exclude a network port from the shutdown action for management or other special purposes. For example:

- Exclude a port from the shutdown action so you can Telnet to the port for managing the device.
- Exclude a VLAN interface and its Layer 2 ports from the shutdown action so you can log in through the VLAN interface.
**CAUTION:**

Do not exclude a VLAN interface and its Layer 2 ports from the shutdown action if the Layer 2 ports are distributed on multiple member devices. The exclusion introduces IP collision risks because the VLAN interface might be up on both active and inactive IRF fabrics.

To configure a port to not shut down when the IRF fabric transits to the Recovery state:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>2.</td>
<td>Configure a network port to not shut down when the IRF fabric transits to the Recovery state.</td>
<td><code>mad exclude interface interface-type interface-number</code></td>
</tr>
</tbody>
</table>

**Recovering an IRF fabric**

When the failed IRF link between two split IRF fabrics is recovered, all member devices in the inactive IRF fabric join the active IRF fabric as subordinate members automatically. The network ports that have been shut down by MAD restore their original physical state automatically, as shown in Figure 12.

**Figure 12 Recovering the IRF fabric**

![Figure 12 Recovering the IRF fabric](image)

If the active IRF fabric fails before the IRF link is recovered (see Figure 13), use the `mad restore` command on the inactive IRF fabric to recover the inactive IRF fabric. This command also brings up all physical ports that were shut down by MAD. After you repair the IRF link, the two parts merge into a unified IRF fabric.
To manually recover an inactive IRF fabric:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enter system view. <strong>system-view</strong></td>
</tr>
<tr>
<td>2.</td>
<td>Recover the inactive IRF fabric. <strong>mad restore</strong></td>
</tr>
</tbody>
</table>

After the IRF fabric is recovered, all ports that have been shut down by MAD come up automatically.

**Displaying and maintaining an IRF fabric**

Execute `display` commands in any view.

<table>
<thead>
<tr>
<th>Task</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display information about all IRF members.</td>
<td><code>display irf</code></td>
</tr>
<tr>
<td>Display the IRF fabric topology.</td>
<td><code>display irf topology</code></td>
</tr>
<tr>
<td>Display IRF link information.</td>
<td><code>display irf link</code></td>
</tr>
<tr>
<td>Task</td>
<td>Command</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Display IRF configuration.</td>
<td><code>display irf configuration</code></td>
</tr>
<tr>
<td>Display the load sharing mode for IRF links.</td>
<td><code>display irf-port load-sharing mode [ irf-port [ member-id/port-number ] ]</code></td>
</tr>
<tr>
<td>Display MAD configuration.</td>
<td><code>display mad [ verbose ]</code></td>
</tr>
</tbody>
</table>

**Configuration examples**

This section provides IRF configuration examples for IRF fabrics that use different MAD mechanisms.

**LACP MAD-enabled IRF configuration example**

**Network requirements**

As shown in Figure 14, set up a four-chassis IRF fabric at the access layer of the enterprise network. Configure LACP MAD on the multichassis aggregation to Device E, an H3C device that supports extended LACP.

**Figure 14 Network diagram**
**Configuration procedure**

1. **Configure Device A:**

   # Shut down the physical interfaces used for IRF connection. This example uses the SFP+ port group that contains Ten-GigabitEthernet 1/0/25 to Ten-GigabitEthernet 1/0/28 for IRF connection.

   ```
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit
   # Bind Ten-GigabitEthernet 1/0/25 and Ten-GigabitEthernet 1/0/26 to IRF-port 1/1.
   [Sysname] irf-port 1/1
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/25
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/26
   [Sysname-irf-port1/1] quit
   # Bind Ten-GigabitEthernet 1/0/27 and Ten-GigabitEthernet 1/0/28 to IRF-port 1/2.
   [Sysname] irf-port 1/2
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/27
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/28
   [Sysname-irf-port1/2] quit
   # Bring up the SFP+ ports and save the configuration.
   [Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
   [Sysname-if-range] undo shutdown
   [Sysname-if-range] quit
   [Sysname] save
   # Activate the IRF port configuration.
   [Sysname] irf-port-configuration active
   ```

2. **Configure Device B:**

   # Change the member ID of Device B to 2 and reboot the device to validate the change.

   ```
   <Sysname> system-view
   [Sysname] irf member 1 renumber 2
   Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
   [Sysname] quit
   <Sysname> reboot
   # Connect Device B to Device A as shown in Figure 14, and log in to Device B. This example uses the SFP+ group that contains Ten-GigabitEthernet 2/0/25 to Ten-GigabitEthernet 2/0/28 for IRF connection.

   # Shut down the physical interfaces.
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit
   # Bind Ten-GigabitEthernet 2/0/27 and Ten-GigabitEthernet 2/0/28 to IRF-port 2/1.
   [Sysname] irf-port 2/1
   [Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/27
   [Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/28
   [Sysname-irf-port2/1] quit
   ```
# Bind Ten-GigabitEthernet 2/0/25 and Ten-GigabitEthernet 2/0/26 to IRF-port 2/2.
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/25
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/26
[Sysname-irf-port2/2] quit

# Bring up the SFP+ ports and save the configuration.
[Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save

# Activate the IRF port configuration.
[Sysname] irf-port-configuration active

The two devices perform master election, and the one that has lost the election reboots to form an IRF fabric with the master.

3. Configure Device C:

# Change the member ID of Device C to 3 and reboot the device to validate the change.
<Sysname> system-view
[Sysname] irf member 1 renumber 3
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]: y
[Sysname] quit
<Sysname> reboot

# Connect Device C to Device A as shown in Figure 14, and log in to Device C. This example uses the SFP+ port group that contains Ten-GigabitEthernet 3/0/25 to Ten-GigabitEthernet 3/0/28 for IRF connection.

# Shut down the physical interfaces.
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit

[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/27
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/28
[Sysname-irf-port3/1] quit

[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/25
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/26
[Sysname-irf-port3/2] quit

# Bring up the SFP+ ports and save the configuration.
[Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save

# Activate the IRF port configuration.
[Sysname] irf-port-configuration active
Device C reboots to join the IRF fabric.

4. Configure Device D:

   # Change the member ID of Device D to 4 and reboot the device to validate the change.
   <Sysname> system-view
   [Sysname] irf member 1 renumber 4
   Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
   [Sysname] quit
   <Sysname> reboot

   # Connect Device D to Device B and Device C as shown in Figure 14, and log in to Device D. This example uses the SFP+ port group that contains Ten-GigabitEthernet 4/0/25 to Ten-GigabitEthernet 4/0/28 for IRF connection.

   # Shut down the physical interfaces.
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit

   # Bind Ten-GigabitEthernet 4/0/25 and Ten-GigabitEthernet 4/0/26 to IRF-port 4/1.
   [Sysname] irf-port 4/1
   [Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/25
   [Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/26
   [Sysname-irf-port4/1] quit

   # Bind Ten-GigabitEthernet 4/0/27 and Ten-GigabitEthernet 4/0/28 to IRF-port 4/2.
   [Sysname] irf-port 4/2
   [Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/27
   [Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/28
   [Sysname-irf-port4/2] quit

   # Bring up the SFP+ ports and save the configuration.
   [Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
   [Sysname-if-range] undo shutdown
   [Sysname-if-range] quit
   [Sysname] save

   # Activate the IRF port configuration.
   [Sysname] irf-port-configuration active

Device D reboots to join the IRF fabric. A four-chassis IRF fabric is formed.

5. Configure LACP MAD on the IRF fabric:

   # Set the domain ID of the IRF fabric to 1.
   <Sysname> system-view
   [Sysname] irf domain 1

   # Create a dynamic aggregate interface and enable LACP MAD.
   [Sysname] interface bridge-aggregation 2
   [Sysname-Bridge-Aggregation2] link-aggregation mode dynamic
   [Sysname-Bridge-Aggregation2] mad enable
   You need to assign a domain ID (range: 0-4294967295)
   [Current domain is: 1]:
   The assigned domain ID is: 1
   Info: MAD LACP only enable on dynamic aggregation interface.
6. Configure Device E as the intermediate device:

⚠️ **CAUTION:**

If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection. False detection causes IRF split.

# Create a dynamic aggregate interface.

```
<Sysname> system-view
<Sysname-Bridge-Aggregation2> interface bridge-aggregation 2
<Sysname-Bridge-Aggregation2> link-aggregation mode dynamic
<Sysname-Bridge-Aggregation2> quit
```

# Assign GigabitEthernet 1/0/1, GigabitEthernet 1/0/2, GigabitEthernet 1/0/3, and GigabitEthernet 1/0/4 to the aggregate interface.

```
<Sysname] interface gigabitethernet 1/0/1
<Sysname-GigabitEthernet1/0/1] port link-aggregation group 2
<Sysname-GigabitEthernet1/0/1] quit
<Sysname] interface gigabitethernet 1/0/2
<Sysname-GigabitEthernet1/0/2] port link-aggregation group 2
<Sysname-GigabitEthernet1/0/2] quit
<Sysname] interface gigabitethernet 1/0/3
<Sysname-GigabitEthernet1/0/3] port link-aggregation group 2
<Sysname-GigabitEthernet1/0/3] quit
<Sysname] interface gigabitethernet 1/0/4
<Sysname-GigabitEthernet1/0/4] port link-aggregation group 2
```
Disable the spanning tree feature on the ports used for BFD MAD, because the two features conflict with each other.

Figure 15 Network diagram

Configuration procedure

1. Configure Device A:
   
   # Shut down the physical interfaces used for IRF connection. This example uses the SFP+ port group that contains Ten-GigabitEthernet 1/0/25 to Ten-GigabitEthernet 1/0/28 for IRF connection.
   
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit

   # Bind Ten-GigabitEthernet 1/0/25 and Ten-GigabitEthernet 1/0/26 to IRF-port 1/1.
   
   [Sysname] irf-port 1/1
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/25
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/26
   [Sysname-irf-port1/1] quit

   # Bind Ten-GigabitEthernet 1/0/27 and Ten-GigabitEthernet 1/0/28 to IRF-port 1/2.
   
   [Sysname] irf-port 1/2
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/27
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/28
   [Sysname-irf-port1/2] quit
# Bring up the SFP+ ports and save the configuration.
[Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save

# Activate the IRF port configuration.
[Sysname] irf-port-configuration active

2. Configure Device B:

# Change the member ID of Device B to 2 and reboot the device to validate the change.
<Sysname> system-view
[Sysname] irf member 1 renumber 2
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
[Sysname] quit
<Sysname> reboot

# Connect Device B to Device A as shown in Figure 15, and log in to Device B. This example uses the SFP+ group that contains Ten-GigabitEthernet 2/0/25 to Ten-GigabitEthernet 2/0/28 for IRF connection.

# Shut down the physical interfaces.
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit

# Bind Ten-GigabitEthernet 2/0/27 and Ten-GigabitEthernet 2/0/28 to IRF-port 2/1.
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/27
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/28
[Sysname-irf-port2/1] quit

# Bind Ten-GigabitEthernet 2/0/25 and Ten-GigabitEthernet 2/0/26 to IRF-port 2/2.
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/25
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/26
[Sysname-irf-port2/2] quit

# Bring up the SFP+ ports and save the configuration.
[Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save

# Activate the IRF port configuration.
[Sysname] irf-port-configuration active

The two devices perform master election, and the one that has lost the election reboots to form an IRF fabric with the master.

3. Configure Device C:

# Change the member ID of Device C to 3 and reboot the device to validate the change.
<Sysname> system-view
[Sysname] irf member 1 renumber 3
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
Configure Device C:

1. Connect Device C to Device A as shown in Figure 15, and log in to Device C. This example uses the SFP+ port group that contains Ten-GigabitEthernet 3/0/25 to Ten-GigabitEthernet 3/0/28 for IRF connection.

   # Shut down the physical interfaces.
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit
   [Sysname] irf-port 3/1
   [Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/27
   [Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/28
   [Sysname-irf-port3/1] quit
   [Sysname] irf-port 3/2
   [Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/25
   [Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/26
   [Sysname-irf-port3/2] quit
   # Bring up the SFP+ ports and save the configuration.
   [Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
   [Sysname-if-range] undo shutdown
   [Sysname-if-range] quit
   [Sysname] save
   # Activate the IRF port configuration.
   [Sysname] irf-port-configuration active
   Device C reboots to join the IRF fabric.

2. Configure Device D:

   # Connect Device D to Device B and Device C as shown in Figure 15, and log in to Device D. This example uses the SFP+ port group that contains Ten-GigabitEthernet 4/0/25 to Ten-GigabitEthernet 4/0/28 for IRF connection.

   # Shut down the physical interfaces.
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit
   # Bind Ten-GigabitEthernet 4/0/25 and Ten-GigabitEthernet 4/0/26 to IRF-port 4/1.
   [Sysname] irf-port 4/1
   [Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/25

4. Device C reboots to join the IRF fabric.
5. Configure BFD MAD on the IRF fabric:

# Create VLAN 3, and add GigabitEthernet 1/0/1, GigabitEthernet 2/0/1, GigabitEthernet 3/0/1, and GigabitEthernet 4/0/1 to VLAN 3.
[Sysname] vlan 3
[Sysname-vlan3] port gigabitethernet 1/0/1 gigabitethernet 2/0/1 gigabitethernet 3/0/1 gigabitethernet 4/0/1
[Sysname-vlan3] quit

# Create VLAN-interface 3, and configure a MAD IP address for each member device on the VLAN interface.
[Sysname] interface vlan-interface 3
[Sysname-Vlan-interface3] mad bfd enable
[Sysname-Vlan-interface3] mad ip address 192.168.2.1 24 member 1
[Sysname-Vlan-interface3] mad ip address 192.168.2.2 24 member 2
[Sysname-Vlan-interface3] mad ip address 192.168.2.3 24 member 3
[Sysname-Vlan-interface3] mad ip address 192.168.2.4 24 member 4
[Sysname-Vlan-interface3] quit

# Disable the spanning tree feature on GigabitEthernet 1/0/1, GigabitEthernet 2/0/1, GigabitEthernet 3/0/1, and GigabitEthernet 4/0/1.
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] undo stp enable
[Sysname-GigabitEthernet1/0/1] quit
[Sysname] interface gigabitethernet 2/0/1
[Sysname-GigabitEthernet2/0/1] undo stp enable
[Sysname-GigabitEthernet2/0/1] quit
[Sysname] interface gigabitethernet 3/0/1
[Sysname-GigabitEthernet3/0/1] undo stp enable
[Sysname-GigabitEthernet3/0/1] quit
[Sysname] interface gigabitethernet 4/0/1
[Sysname-GigabitEthernet4/0/1] undo stp enable

6. Configure Device E as the intermediate device:
**CAUTION:**
If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection. False detection causes IRF split.

```bash
# Create VLAN 3, and assign GigabitEthernet 1/0/1, GigabitEthernet 1/0/2, GigabitEthernet 1/0/3, and GigabitEthernet 1/0/4 to VLAN 3 for forwarding BFD MAD packets.
<DeviceE> system-view
[DeviceE] vlan 3
[DeviceE-vlan3] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[DeviceE-vlan3] quit
```

### ARP MAD-enabled IRF configuration example

#### Network requirements
As shown in Figure 16, set up a four-chassis IRF fabric in the enterprise network. Configure ARP MAD in the IRF fabric and use the links connected to Device E for transmitting ARP MAD packets. To prevent loops, run the spanning tree feature between Device E and the IRF fabric.

#### Configuration procedure
1. Configure Device A:
# Shut down the physical interfaces used for IRF connection. This example uses the SFP+ port group that contains Ten-GigabitEthernet 1/0/25 to Ten-GigabitEthernet 1/0/28 for IRF connection.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

# Bind Ten-GigabitEthernet 1/0/25 and Ten-GigabitEthernet 1/0/26 to IRF-port 1/1.

```
[Sysname] irf-port 1/1
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/25
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/26
[Sysname-irf-port1/1] quit
```

# Bind Ten-GigabitEthernet 1/0/27 and Ten-GigabitEthernet 1/0/28 to IRF-port 1/2.

```
[Sysname] irf-port 1/2
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/27
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/28
[Sysname-irf-port1/2] quit
```

# Bring up the SFP+ ports and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save
```

# Activate the IRF port configuration.

```
[Sysname] irf-port-configuration active
```

2. Configure Device B:

# Change the member ID of Device B to 2 and reboot the device to validate the change.

```
<Sysname> system-view
[Sysname] irf member 1 renumber 2
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]: y
[Sysname] quit
<Sysname> reboot
```

# Connect Device B to Device A as shown in Figure 16, and log in to Device B. This example uses the SFP+ group that contains Ten-GigabitEthernet 2/0/25 to Ten-GigabitEthernet 2/0/28 for IRF connection.

# Shut down the physical interfaces.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

# Bind Ten-GigabitEthernet 2/0/27 and Ten-GigabitEthernet 2/0/28 to IRF-port 2/1.

```
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/27
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/28
[Sysname-irf-port2/1] quit
```

# Bind Ten-GigabitEthernet 2/0/25 and Ten-GigabitEthernet 2/0/26 to IRF-port 2/2.

```
[Sysname] irf-port 2/2
```
Configure Device C:

# Change the member ID of Device C to 3 and reboot the device to validate the change.
<Sysname> system-view
<Sysname> irf member 1 renumber 3
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
<Sysname> quit
<Sysname> reboot

# Connect Device C to Device A as shown in Figure 16, and log in to Device C. This example uses the SFP+ port group that contains Ten-GigabitEthernet 3/0/25 to Ten-GigabitEthernet 3/0/28 for IRF connection.

# Shut down the physical interfaces.
<Sysname> system-view
<Sysname> interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
<Sysname-if-range] shutdown
<Sysname-if-range] quit

<Sysname-if-port3/1] port group interface ten-gigabitethernet 3/0/27
<Sysname-if-port3/1] port group interface ten-gigabitethernet 3/0/28
<Sysname-if-port3/1] quit

<Sysname-if-port3/2] port group interface ten-gigabitethernet 3/0/25
<Sysname-if-port3/2] port group interface ten-gigabitethernet 3/0/26
<Sysname-if-port3/2] quit

# Bring up the SFP+ ports and save the configuration.
<Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
<Sysname-if-range] undo shutdown
<Sysname-if-range] quit
<Sysname] save

# Activate the IRF port configuration.
<Sysname] irf-port-configuration active

Device C reboots to join the IRF fabric.

Configure Device D:
# Change the member ID of Device D to 4 and reboot the device to validate the change.

```
<Sysname> system-view
[Sysname] irf member 1 renumber 4
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
[Sysname] quit
<Sysname> reboot
```

# Connect Device D to Device B and Device C as shown in Figure 16, and log in to Device D. This example uses the SFP+ port group that contains Ten-GigabitEthernet 4/0/25 to Ten-GigabitEthernet 4/0/28 for IRF connection.

# Shut down the physical interfaces.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

# Bind Ten-GigabitEthernet 4/0/25 and Ten-GigabitEthernet 4/0/26 to IRF-port 4/1.

```
[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/25
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/26
[Sysname-irf-port4/1] quit
```

# Bind Ten-GigabitEthernet 4/0/27 and Ten-GigabitEthernet 4/0/28 to IRF-port 4/2.

```
[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/27
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/28
[Sysname-irf-port4/2] quit
```

# Bring up the SFP+ ports and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save
```

# Activate the IRF port configuration.

```
[Sysname] irf-port-configuration active
```

Device D reboots to join the IRF fabric. A four-chassis IRF fabric is formed.

5. Configure ARP MAD on the IRF fabric:

# Enable the spanning tree feature globally on the IRF fabric to prevent loops.

```
<Sysname> system-view
[Sysname] stp global enable
```

# Configure the IRF fabric to change its bridge MAC address as soon as the address owner leaves.

```
[Sysname] undo irf mac-address persistent
```

# Set the domain ID of the IRF fabric to 1.

```
[Sysname] irf domain 1
```

# Create VLAN 3, and assign GigabitEthernet 1/0/2, GigabitEthernet 2/0/1, GigabitEthernet 3/0/2, and GigabitEthernet 4/0/1 to VLAN 3.

```
[Sysname] vlan 3
[Sysname-vlan3] port gigabitethernet 1/0/2 gigabitethernet 2/0/1 gigabitethernet 3/0/2 gigabitethernet 4/0/1
[Sysname-vlan3] quit
```
ND MAD-enabled IRF configuration example

Network requirements

As shown in Figure 17, set up a four-chassis IRF fabric in the IPv6 enterprise network. Configure ND MAD in the IRF fabric and use the links connected to Device E for transmitting ND MAD packets.

To prevent loops, run the spanning tree feature between Device E and the IRF fabric.
Figure 17 Network diagram

Configuration procedure

1. Configure Device A:

   # Shut down the physical interfaces used for IRF connection. This example uses the SFP+ port group that contains Ten-GigabitEthernet 1/0/25 to Ten-GigabitEthernet 1/0/28 for IRF connection.

   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit

   # Bind Ten-GigabitEthernet 1/0/25 and Ten-GigabitEthernet 1/0/26 to IRF-port 1/1.

   [Sysname] irf-port 1/1
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/25
   [Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/26
   [Sysname-irf-port1/1] quit

   # Bind Ten-GigabitEthernet 1/0/27 and Ten-GigabitEthernet 1/0/28 to IRF-port 1/2.

   [Sysname] irf-port 1/2
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/27
   [Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/28
   [Sysname-irf-port1/2] quit

   # Bring up the SFP+ ports and save the configuration.

   [Sysname] interface range ten-gigabitethernet 1/0/25 to ten-gigabitethernet 1/0/28
   [Sysname-if-range] undo shutdown
   [Sysname-if-range] quit
2. Configure Device B:
   # Change the member ID of Device B to 2 and reboot the device to validate the change.
   <Sysname> system-view
   [Sysname] irf member 1 renumber 2
   Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
   [Sysname] quit
   <Sysname> reboot
   # Connect Device B to Device A as shown in Figure 17, and log in to Device B. This example uses the SFP+ group that contains Ten-GigabitEthernet 2/0/25 to Ten-GigabitEthernet 2/0/28 for IRF connection.
   # Shut down the physical interfaces.
   <Sysname> system-view
   [Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
   [Sysname-if-range] shutdown
   [Sysname-if-range] quit
   # Bind Ten-GigabitEthernet 2/0/27 and Ten-GigabitEthernet 2/0/28 to IRF-port 2/1.
   [Sysname] irf-port 2/1
   [Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/27
   [Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/28
   [Sysname-irf-port2/1] quit
   # Bind Ten-GigabitEthernet 2/0/25 and Ten-GigabitEthernet 2/0/26 to IRF-port 2/2.
   [Sysname] irf-port 2/2
   [Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/25
   [Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/26
   [Sysname-irf-port2/2] quit
   # Bring up the SFP+ ports and save the configuration.
   [Sysname] interface range ten-gigabitethernet 2/0/25 to ten-gigabitethernet 2/0/28
   [Sysname-if-range] undo shutdown
   [Sysname-if-range] quit
   [Sysname] save
   # Activate the IRF port configuration.
   [Sysname] irf-port-configuration active
   The two devices perform master election, and the one that has lost the election reboots to form an IRF fabric with the master.

3. Configure Device C:
   # Change the member ID of Device C to 3 and reboot the device to validate the change.
   <Sysname> system-view
   [Sysname] irf member 1 renumber 3
   Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
   [Sysname] quit
   <Sysname> reboot
# Connect Device C to Device A as shown in Figure 17, and log in to Device C. This example uses the SFP+ port group that contains Ten-GigabitEthernet 3/0/25 to Ten-GigabitEthernet 3/0/28 for IRF connection.

# Shut down the physical interfaces.

```<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```


```[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/27
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/28
[Sysname-irf-port3/1] quit
```


```[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/25
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/26
[Sysname-irf-port3/2] quit
```

# Bring up the SFP+ ports and save the configuration.

```[Sysname] interface range ten-gigabitethernet 3/0/25 to ten-gigabitethernet 3/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save
```

# Activate the IRF port configuration.

```[Sysname] irf-port-configuration active
```

Device C reboots to join the IRF fabric.

4. **Configure Device D:**

# Change the member ID of Device D to 4 and reboot the device to validate the change.

```<Sysname> system-view
[Sysname] irf member 1 renumber 4
Renumbering the member ID may result in configuration change or loss. Continue? [Y/N]:y
[Sysname] quit
<Sysname> reboot
```

# Connect Device D to Device B and Device C as shown in Figure 17, and log in to Device D. This example uses the SFP+ port group that contains Ten-GigabitEthernet 4/0/25 to Ten-GigabitEthernet 4/0/28 for IRF connection.

# Shut down the physical interfaces.

```<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

# Bind Ten-GigabitEthernet 4/0/25 and Ten-GigabitEthernet 4/0/26 to IRF-port 4/1.

```[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/25
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/26
[Sysname-irf-port4/1] quit
```
# Bind Ten-GigabitEthernet 4/0/27 and Ten-GigabitEthernet 4/0/28 to IRF-port 4/2.

[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/27
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/28
[Sysname-irf-port4/2] quit

# Bring up the SFP+ ports and save the configuration.

[Sysname] interface range ten-gigabitethernet 4/0/25 to ten-gigabitethernet 4/0/28
[Sysname-if-range] undo shutdown
[Sysname-if-range] quit
[Sysname] save

# Activate the IRF port configuration.

[Sysname] irf-port-configuration active

Device D reboots to join the IRF fabric. A four-chassis IRF fabric is formed.

5. Configure ND MAD on the IRF fabric:

# Enable the spanning tree feature globally on the IRF fabric to prevent loops.

<Sysname> system-view
[Sysname] stp global enable

# Configure the IRF fabric to change its bridge MAC address as soon as the address owner leaves.

[Sysname] undo irf mac-address persistent

# Set the domain ID of the IRF fabric to 1.

[Sysname] irf domain 1

# Create VLAN 3, and add GigabitEthernet 1/0/2, GigabitEthernet 2/0/1, GigabitEthernet 3/0/2, and GigabitEthernet 4/0/1 to VLAN 3.

[Sysname] vlan 3
[Sysname-vlan3] port gigabitethernet 1/0/2 gigabitethernet 2/0/1 gigabitethernet 3/0/2 gigabitethernet 4/0/1
[Sysname-vlan3] quit

# Create VLAN-interface 3, assign it an IPv6 address, and enable ND MAD on the interface.

[Sysname] interface vlan-interface 3
[Sysname-Vlan-interface3] ipv6 address 2001::1 64
[Sysname-Vlan-interface3] mad nd enable

You need to assign a domain ID (range: 0-4294967295)

[Current domain is: 1]:
The assigned domain ID is: 1

6. Configure Device E as the intermediate device:

⚠️ CAUTION: ⚠️

If the intermediate device is also in an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection. False detection causes IRF split.

# Enable the spanning tree feature globally on Device E to prevent loops.

<DeviceE> system-view
[DeviceE] stp global enable

# Create VLAN 3, and add ports GigabitEthernet 1/0/1, GigabitEthernet 1/0/2, GigabitEthernet 1/0/3, and GigabitEthernet 1/0/4 to VLAN 3 for forwarding ND MAD packets.

[DeviceE] vlan 3
[DeviceE-vlan3] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[DeviceE-vlan3] quit
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