The H3C S9800 documentation set includes 17 configuration guides. These guides describe the software features for the H3C S9800 Switch Series running Release 2135 and later, and guide you through the software configuration procedures. These guides also provide configuration examples to help you apply software features to different network scenarios.

The IRF Configuration Guide describes how to set up an IRF fabric of multiple 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:
- Audience
- Conventions
- 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 S9800 series

Conventions

This section describes the conventions used in this documentation set.

Command conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boldface</strong></td>
<td>Bold text represents commands and keywords that you enter literally as shown.</td>
</tr>
<tr>
<td><em>Italic</em></td>
<td>Italic 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>
</tr>
<tr>
<td>{ x</td>
<td>y</td>
</tr>
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### Convention Description

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ x</td>
<td>y</td>
</tr>
<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>
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</table>

### GUI conventions

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

<table>
<thead>
<tr>
<th>Convention</th>
<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

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Generic network device" /></td>
<td>Represents a generic network device, such as a router, switch, or firewall.</td>
</tr>
<tr>
<td><img src="image" alt="Routing-capable device" /></td>
<td>Represents a routing-capable device, such as a router or Layer 3 switch.</td>
</tr>
<tr>
<td><img src="image" alt="Generic switch" /></td>
<td>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.</td>
</tr>
<tr>
<td><img src="image" alt="Access controller" /></td>
<td>Represents an access controller, a unified wired-WLAN module, or the access controller engine on a unified wired-WLAN switch.</td>
</tr>
<tr>
<td><img src="image" alt="Access point" /></td>
<td>Represents an access point.</td>
</tr>
<tr>
<td><img src="image" alt="Mesh access point" /></td>
<td>Represents a mesh access point.</td>
</tr>
<tr>
<td><img src="image" alt="Omnidirectional signals" /></td>
<td>Represents omnidirectional signals.</td>
</tr>
<tr>
<td><img src="image" alt="Directional signals" /></td>
<td>Represents directional signals.</td>
</tr>
</tbody>
</table>
Port numbering in examples

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

Obtaining documentation

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

Click the following links to obtain different categories of product documentation:

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

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

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http://www.h3c.com

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We appreciate your comments.
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<td>Assigning an IRF domain ID to the IRF fabric</td>
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IRF overview

The 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 S9800 switch can form an IRF fabric only with devices of the same model.

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 works as the master to manage and control the entire IRF fabric. All 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.

- **Multiple-chassis 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.
Network topologies

The H3C S9800 IRF fabric only supports the daisy-chain topology. For information about connecting IRF member devices, see "Connecting IRF physical interfaces."

Basic concepts

This section uses Figure 2 and Figure 3 to describe the basic concepts that you might encounter when you work with IRF.
In this figure, Device A and Device B form a two-chassis IRF fabric. The fabric has two MPUs (one active and one standby), and two times the number of LPUs that a single device provides. The IRF fabric manages the physical and software resources of Device A and Device B in a centralized manner.
In this figure, Device A and Device B form a two-chassis IRF fabric. The fabric has four MPUs (one active and three standbys), and two times the number of LPUs that a single device provides. The IRF fabric manages the physical and software resources of Device A and Device B in a centralized manner.

Operating mode

The device operates in one of the following modes:

- **Standalone mode**—The device cannot form an IRF fabric with other devices.
- **IRF mode**—The device can form an IRF fabric with other devices.

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 the IRF fabric, and all other devices back up the master. When the master device fails, the other devices automatically elect a new master. 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. 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.

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 example, after you assign a device with member ID 2 to an IRF fabric, the name of interface FortyGigE 3/0/1 changes to FortyGigE 2/3/0/1. The file path changes from slot0#flash:/test.cfg to chassis2#slot0#flash:/test.cfg.

MPU roles

The S9804 switch uses one built-in MPU (slot 0) and the S9810 switch uses two removable switching fabric modules (slots 10 and 11) for switching and control.

Unless otherwise stated, the term “MPU” collectively refers to the switching fabric modules on the S9810 switch and the built-in MPU on the S9804 switch.

The following are MPU roles:

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master MPU</td>
<td>Active MPU of the master device. It is also called the global active MPU. You configure and manage the entire IRF fabric at the CLI of the global active MPU.</td>
</tr>
<tr>
<td>Active MPU</td>
<td>Active MPU on each member device. An active MPU performs the following operations:</td>
</tr>
<tr>
<td></td>
<td>• Manages the local device, including synchronizing configuration with the local standby MPU, processing protocol packets, and creating and maintaining route entries.</td>
</tr>
<tr>
<td></td>
<td>• Processes IRF-related events, such as master election and topology collection.</td>
</tr>
<tr>
<td>Standby MPU</td>
<td>For the master MPU, all other MPUs are standby MPUs, including active MPUs on subordinate devices. If a member device has two MPUs, the MPU backing up the local active MPU is the local standby MPU from the perspective of the member device.</td>
</tr>
</tbody>
</table>

IRF port

An IRF port is a logical interface that connects IRF member devices. Every IRF-capable device supports two IRF ports.

In standalone mode, the IRF ports are named IRF-port 1 and IRF-port 2.

In IRF mode, 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 automatically form an aggregate IRF link. An IRF port goes down only if all its IRF physical interfaces are down.

For two neighboring devices, their IRF physical links must be bound to IRF-port 1 on one device and to IRF-port 2 on the other.
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.

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 4, IRF fabric 1 contains Device A and Device B, and IRF fabric 2 contains Device C and Device D. 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 4 A network that contains two IRF domains

IRF split

IRF split occurs when an IRF fabric breaks up into multiple IRF fabrics because of IRF link failures, as shown in Figure 5. The split IRF fabrics operate with the same IP address. IRF split causes routing and forwarding problems on the network. To quickly detect a multi-active collision, configure one of the MAD mechanisms (see “IRF multi-active detection”).
IRF merge

IRF merge occurs when two split IRF fabrics reunite or when two independent IRF fabrics are united, as shown in Figure 6.

Figure 6 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.

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 member devices consider themselves as the master. This rule is skipped.
2. Member with higher priority.
3. Member with the longest system uptime.
Two members are considered to start up at the same time if their startup time difference is equal to or less than 10 minutes. For these members, the next tiebreaker applies.

4. Member with the lowest member ID.

For 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. The reboot can be performed automatically or manually (see “Enabling IRF auto-merge”).

After a master election, all subordinate devices reboot with the configuration on the master. The configuration files of the subordinate members are retained, but the files do not take effect in the IRF fabric. A subordinate member uses its own startup configuration file only after it is removed from the IRF fabric.

IRF connection error notification

The device generates error messages when its IRF physical interfaces are connected to non-IRF physical interfaces. The error messages use the form of “The port port can’t receive irf pkt and has been changed to inactive status, please check.” The port argument represents the interface name of an IRF physical interface that connects to a non-IRF physical interface.

The messages help you identify incorrect IRF connections to avoid issues including cross-chassis packet loss and IRF split.

The error messages might be falsely generated when the IRF fabric is unstable. For example, the messages might occur during an IRF setup, reboot, or IRF port binding modification process. If the IRF connections are correct, the messages will not occur after the IRF fabric completes the process.

Loop elimination mechanism

Loop control protocols such as the spanning tree feature cannot be configured on IRF physical interfaces. However, IRF has its own mechanism to eliminate loops. Before an IRF member device forwards a packet, it identifies whether loops exist on the forwarding path based on the source and destination physical interfaces and the IRF topology. If a loop exists, the device discards the packet on the source interface of the looped path. This loop elimination mechanism will drop a large number of broadcast packets on the IRF physical interfaces. When you use SNMP tools, do not monitor packet forwarding on the IRF physical interfaces to reduce SNMP notifications of packet drops.

IRF multi-active detection

An IRF link failure causes an IRF fabric to split in two IRF fabrics operating with the same Layer 3 configurations, 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 MAD implementation of this device detects active IRF fabrics with the same Layer 3 global configuration by extending the LACP or BFD 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.

**IMPORTANT:**

LACP MAD handles collisions differently than BFD MAD. To avoid conflicts, do not enable LACP MAD together with BFD MAD.

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

Collision handling

When MAD detects a multi-active collision, it allows one IRF fabric to forward traffic and sets all the other IRF fabrics to the Recovery state. 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. Allows the fabric that has the most members to forward traffic, and sets all other fabrics to the Recovery state.
3. Compares the member IDs of their masters if all IRF fabrics have the same number of members.
4. Allows the IRF fabric that has the lowest numbered master to forward traffic, and sets all other fabrics to the Recovery (inactive) state.
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 does not compare the number of members in fabrics. BFD MAD uses the following process to handle a multi-active collision:

1. Allows the IRF fabric that has the lowest numbered master to forward traffic.
2. Sets all other fabrics to the Recovery state.
3. Takes 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 7, 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 an H3C device that supports extended LACP for MAD. The IRF member devices send extended LACPDUs with a domain ID and an active ID. The intermediate device transparently forwards the extended LACPDUs received from one member device to all the other member devices.
• If the domain IDs and the active IDs in the extended LACPDUs sent by all the member devices are the same, the IRF fabric is integrated.
• If the extended LACPDUs convey the same domain ID but different active IDs, a split has occurred. LACP MAD handles this situation as described in "Collision handling."

**Figure 7 LACP MAD scenario**

---

**BFD MAD**

**IMPORTANT:**
BFD MAD is supported only on the default MDC.

In versions earlier than Release 2138P01, you can use only common Ethernet ports for BFD MAD links. In Release 2138P01 and later versions, you can use common or management Ethernet ports for BFD MAD links.

• If management Ethernet ports are used, BFD MAD has the following requirements:
  o Each IRF member device has a BFD MAD link to an intermediate device.
  o Each member device is assigned a MAD IP address on the master’s management Ethernet port.
• If common Ethernet ports are used, BFD MAD has the following requirements:
  o Each member device has a BFD MAD link to an intermediate device, or all member devices have a BFD MAD link to each other.
  o Each member device is assigned a MAD IP address on a VLAN interface.

The BFD MAD links must be dedicated. Do not use BFD MAD links for any other purposes.

**NOTE:**
• The MAD addresses identify the member devices and must belong to the same subnet.
• Of all management Ethernet ports on an IRF fabric, only the master’s management Ethernet port is accessible.

Figure 8 shows a typical BFD MAD scenario that uses an intermediate device. Figure 9 shows a typical BFD MAD scenario that does not use an intermediate device.

With BFD MAD, the master attempts 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 takes effect. 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**.

**Figure 8 BFD MAD scenario with intermediate device**

**Figure 9 BFD MAD scenario without intermediate device**
Configuring IRF

General restrictions and configuration guidelines

For a successful IRF setup, follow the restrictions and guidelines in this section and the setup procedure in "Setup and configuration task list."

Software requirements

All IRF member devices must run the same system software image version.

IRF size and member ID restrictions

To ensure a successful IRF setup, follow these IRF size and member ID restrictions:

- An H3C S9800 IRF fabric can have a maximum of two chassis.
- The member ID assigned to a member chassis must be 1 or 2.

MPU requirements

Each IRF member device must have a minimum of one MPU.

IRF physical interface restrictions

Use the following physical interfaces for IRF links:

- 10-GE ports.
- 40-GE ports.
- 100-GE ports.

Selecting transceiver modules and cables

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

- Use SFP+, QSFP+, or CXP transceiver modules and fibers for a long-distance connection.
- Use SFP+, QSFP+, or CXP DAC cables to connect 10-GE, 40-GE, or 100-GE ports for a short-distance connection.
- The transceiver modules at the two ends of an IRF link must be the same type. For more information about transceiver modules, see the device installation guide.

40-GE port restrictions

You can use a 40-GE QSFP+ port as an IRF physical interface, or use the `using tengige` command to split a QSFP+ port into four 10-GE breakout interfaces.

When you use the 10-GE breakout interfaces of a QSFP+ port for IRF links, follow these restrictions and guidelines:
• The 10-GE breakout interfaces of a 40-GE port are operating independently. You do not need to use all of them for IRF links.

• Port split and combination (the using fortygige command) require a card reboot. As a best practice to avoid topology change, complete these operations before you add the device to an IRF fabric. When you perform these operations in an IRF fabric, make sure you understand the impact on the IRF fabric topology. For more information about 40-GE port split and combination operations, see Layer 2—LAN Switching Configuration Guide.

Physical interface binding requirements

When you bind an IRF physical interface to an IRF port, follow these guidelines:

• In IRF mode, use the shutdown command to shut down the physical interface before you bind it to or remove it from the IRF port. Use the undo shutdown command to bring up the physical interface after a binding or binding removal operation.

• In standalone mode, the shutdown and undo shutdown operations are not required.

Connecting IRF ports

When you connect two neighboring IRF members, follow these restrictions and guidelines:

• You must connect the physical interfaces of IRF-port 1 on one member to the physical interfaces of IRF-port 2 on the other.

• Do not connect physical interfaces of both IRF ports on one member device to the physical interfaces of both IRF ports on the other device.

IRF link redundancy

When you configure an IRF fabric, follow these link redundancy guidelines:

• For link redundancy and load sharing, bind a maximum of eight physical interfaces to one IRF port.

• Physical interfaces bound to an IRF port can be located on different cards. As a best practice, use multicard IRF links to prevent a card removal from causing an IRF split.

Multichassis link aggregation

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

Feature compatibility and configuration restrictions

System operating mode

All member devices in the IRF fabric must work in the same system operating mode (set by using the system-working-mode command). For more information about the system operating mode, see Fundamentals Configuration Guide.

MDC

If the IRF fabric splits, do not change the MDC settings on any IRF member devices before they reunite. Except for the commands in Table 1, all IRF commands are available only on the default MDC.
### Table 1 IRF commands available on both default and non-default MDCs

<table>
<thead>
<tr>
<th>Command category</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display commands</td>
<td>display irf link</td>
</tr>
<tr>
<td></td>
<td>mad bfd enable</td>
</tr>
<tr>
<td></td>
<td>mad enable</td>
</tr>
<tr>
<td></td>
<td>mad exclude interface</td>
</tr>
<tr>
<td></td>
<td>mad ip address</td>
</tr>
</tbody>
</table>

For more information about MDCs, see *Fundamentals Configuration Guide*.

### MAD and IRF domain restrictions

When you configure MAD, follow these restrictions and guidelines:

- If LACP MAD or BFD MAD runs between two IRF fabrics, assign each fabric a unique IRF domain ID.
- An IRF fabric has only one IRF domain ID.
  - You can change the IRF domain ID by using the `irf domain` or `mad enable` command. The IRF domain IDs configured by using these commands overwrite each other.
  - In an MDC environment, if you change the IRF domain ID in one MDC, the IRF domain IDs in all other MDCs change automatically. The `irf domain` command is available only on the default MDC. The `mad enable` command is available on any MDCs.
- LACP MAD handles collisions differently than BFD MAD. To avoid conflicts, do not enable LACP MAD together with BFD MAD in an IRF fabric.
- 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.

### IRF merge restrictions

If the IRF fabric splits, do not change the IRF settings on any IRF member devices before they reunite.

### Configuration backup

As a best practice, back up the next-startup configuration file on a device before adding the device to an IRF fabric as a subordinate device.

A subordinate device’s next-startup configuration file might be overwritten if the master and the subordinate use the same file name for their next-startup configuration files. You can use the backup file to restore the original configuration after removing the subordinate from the IRF fabric.

### Setup and configuration task list

As a best practice, use 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.) Preconfiguring IRF member devices in standalone mode:</td>
<td>Perform this task on each member device before IRF mode is enabled.</td>
</tr>
<tr>
<td>- Assigning a member ID to each IRF member device</td>
<td></td>
</tr>
<tr>
<td>- Specifying a priority for each member device</td>
<td></td>
</tr>
<tr>
<td>- Binding physical interfaces to IRF ports</td>
<td></td>
</tr>
<tr>
<td>3. (Required.) Saving configuration to the next-startup configuration file</td>
<td>N/A</td>
</tr>
<tr>
<td>4. (Required.) Connecting IRF physical interfaces</td>
<td>Make sure the physical interfaces are interoperable.</td>
</tr>
<tr>
<td>5. (Required.) Setting the operating mode to IRF mode</td>
<td>N/A</td>
</tr>
<tr>
<td>6. (Required.) Accessing the IRF fabric</td>
<td>N/A</td>
</tr>
<tr>
<td>7. (Optional.) Configuring IRF member devices in IRF mode:</td>
<td>Adding physical interfaces to an IRF port is required if you did not preconfigure IRF port bindings.</td>
</tr>
<tr>
<td>- Assigning an IRF domain ID to the IRF fabric</td>
<td></td>
</tr>
<tr>
<td>- Changing the member ID of a device</td>
<td></td>
</tr>
<tr>
<td>- Changing the priority of a member device</td>
<td></td>
</tr>
<tr>
<td>- Adding physical interfaces to an IRF port</td>
<td></td>
</tr>
<tr>
<td>- Enabling IRF auto-merge</td>
<td></td>
</tr>
<tr>
<td>- Configuring a member device description</td>
<td></td>
</tr>
<tr>
<td>- Configuring the IRF bridge MAC address</td>
<td></td>
</tr>
<tr>
<td>- Configuring IRF bridge MAC persistence</td>
<td></td>
</tr>
<tr>
<td>- Enabling software auto-update for system software image synchronization</td>
<td></td>
</tr>
<tr>
<td>- Setting the IRF link down report delay</td>
<td></td>
</tr>
<tr>
<td>- Configuring MAD</td>
<td></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 installation guide for the device.

### Preconfiguring IRF member devices in standalone mode

Perform the preconfiguration tasks on every IRF member device. These settings take effect on each member device after their operating mode changes to IRF.
Assigning a member ID to each IRF member device

By default, a device operates in standalone mode without an IRF member ID. You must assign it a unique IRF member ID before changing its operating mode to IRF.

The member ID assigned to a device is saved in both active and standby MPUs of the device. The standby MPU might store a different member ID than the active MPU after an MPU replacement. For consistency, the system automatically updates the member ID in the active MPU to the standby MPU when the difference is detected.

To set a member ID for the device in standalone mode:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>display irf configuration</td>
<td>Check the MemberID field. If the device does not have an IRF member ID, the field displays two hyphens (-).</td>
</tr>
<tr>
<td>2.</td>
<td>system-view</td>
<td>N/A</td>
</tr>
<tr>
<td>3.</td>
<td>irf member member-id</td>
<td>By default, the device does not have an IRF member ID. The assigned member ID must be 1 or 2. If you use other member IDs, the IRF fabric cannot be set up.</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.

To specify a priority for the device in standalone mode:

<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 priority priority</td>
<td>The default IRF member priority is 1.</td>
</tr>
</tbody>
</table>

Binding physical interfaces to IRF ports

To establish an IRF connection between two devices, you must bind a minimum of one physical interface to IRF-port 1 on one device and to IRF-port 2 on the other. For link redundancy and load sharing, bind multiple physical interfaces to one IRF port.

Make sure the IRF physical interfaces are operating as Layer 2 interfaces. Layer 3 interfaces cannot be bound to IRF ports. To configure a physical interface as a Layer 2 interface, use the port link-mode bridge command. For more information about this command, see Layer 2—LAN Switching Configuration Guide.
In standalone mode, IRF port binding operations do not affect the current configuration of the interface. However, when the operating mode changes to IRF mode, the default configuration is restored on the IRF physical interface. You can only execute the following commands on the physical interface:

<table>
<thead>
<tr>
<th>Command category</th>
<th>Commands</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Ethernet interface commands</td>
<td>• description</td>
<td>See Layer 2—LAN Switching Configuration Guide.</td>
</tr>
<tr>
<td></td>
<td>• flow-interval</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• shutdown</td>
<td></td>
</tr>
<tr>
<td>LLDP commands</td>
<td>• lldp admin-status</td>
<td>See Layer 2—LAN Switching Configuration Guide.</td>
</tr>
<tr>
<td></td>
<td>• lldp check-change-interval</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• lldp enable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• lldp encapsulation snap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• lldp notification remote-change enable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• lldp tlv-enable</td>
<td></td>
</tr>
</tbody>
</table>

To bind physical interfaces to IRF ports:

<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 N/A</td>
</tr>
<tr>
<td>2.</td>
<td>Enter IRF port view.</td>
<td>irf-port port-number N/A</td>
</tr>
<tr>
<td>3.</td>
<td>Bind a physical interface to the IRF port.</td>
<td>port group [ mdc mdc-id ] interface interface-type interface-number [ mode enhanced ] N/A</td>
</tr>
</tbody>
</table>

By default, no physical interfaces are bound to any IRF port. Repeat this step to assign multiple physical interfaces to the IRF port. Each IRF port can have a maximum of eight physical interfaces. The number of IRF physical interfaces per chip cannot exceed four on a slot. To view the chip location of a port, execute the `debug port mapping` command in probe view and see the `Unit` column of the command output.

An IRF physical interface operates in enhanced mode after the IRF binding takes effect, regardless of whether you have specified the `mode enhanced` keywords.
Saving configuration to the next-startup configuration file

Save the running configuration before converting to the IRF mode. The mode change requires a reboot, which causes all unsaved settings to be lost.

Perform the following task in any view:

<table>
<thead>
<tr>
<th>Task</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save the running configuration to the next-startup configuration file.</td>
<td>`save [ safely ] [ backup</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).

When you connect transceiver modules, connect the transmit port of the transceiver module at one end to the receive port of the transceiver module at the other end.

**IMPORTANT:**

No intermediate devices are allowed between neighboring members.

Figure 10 Connecting IRF physical interfaces

Connect the devices into a daisy-chain topology.
Setting the operating mode to IRF mode

By default, the device operates in standalone mode. To assign the device to an IRF fabric, you must change its operating mode to IRF mode.

To set the operating mode of a device to IRF mode:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(Optional.) Verify that a unique IRF member ID has been assigned to the device.</td>
<td>display irf configuration</td>
</tr>
<tr>
<td>2.</td>
<td>Enter system view.</td>
<td>system-view</td>
</tr>
<tr>
<td>3.</td>
<td>Set the operating mode to IRF mode.</td>
<td>chassis convert mode irf</td>
</tr>
</tbody>
</table>

After you change the operating mode, the device automatically reboots for the change to take effect.

During the reboot, you may choose to have the system automatically convert the startup configuration file. Automatic configuration conversion prevents slot- or interface-related settings from becoming invalid. For example, the system can convert the `slot slot-number` parameter set in standalone mode to the `chassis chassis-number slot slot-number` parameter in IRF mode. The system can also add the chassis ID in an interface number.

To restore the standalone mode, use the `undo chassis convert mode` command.

**TIP:**
IRF generates packets on a device in IRF mode even if the device does not form an IRF fabric with any other devices. To conserve system resources, set a device to standalone mode after removing it from an IRF fabric.
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 global active MPU. All settings you made are automatically propagated to the IRF members. When you log in to an IRF fabric, you are placed at the CLI of the global active MPU, regardless of at which member device you are logged in.

The following methods are available for accessing an IRF fabric:
- **Local login**—Log in through the console port of a member device.
- **Remote login**—Log in at a Layer 3 Ethernet interface on any member device by using methods including Telnet and SNMP.

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

Configuring IRF member devices in IRF mode

After you access the global active MPU's CLI, you can perform the tasks in this section or configure features in all other configuration guides for the device.

Assigning an IRF domain ID to the IRF fabric

One IRF fabric forms one IRF domain. IRF domain IDs prevent IRF fabrics from interfering with one another.

To assign a domain ID to an IRF fabric:

<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 domain domain-id</td>
<td>By default, the domain ID of an IRF fabric is 0.</td>
</tr>
</tbody>
</table>

Changing the member ID of a device

⚠️ **CAUTION:**
- In IRF mode, an IRF member ID change can invalidate member ID-related settings and cause data loss. Make sure you fully understand its impact on your live network.
- If you are exchanging the member IDs of member devices, you must place the member devices in standalone mode before renumbering them for a successful IRF merge.

The new member ID takes effect at 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 change the member ID of 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>Change the member ID of a member device.</td>
<td>irf member member-id renumber new-member-id</td>
</tr>
<tr>
<td>3.</td>
<td>Save the running configuration.</td>
<td>save [ safely ] [ force ]</td>
</tr>
<tr>
<td>4.</td>
<td>Reboot the member device.</td>
<td>reboot chassis chassis-number</td>
</tr>
</tbody>
</table>

### Changing the priority of a member device

You can change the priority of a member device so it can be elected the master at the next master election.

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

To change the priority of 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 a member of an IRF fabric.</td>
<td>irf member member-id priority priority</td>
</tr>
</tbody>
</table>

### Adding physical interfaces to an IRF port

An IRF port can have a maximum of eight physical interfaces.

In IRF mode, you can add physical interfaces to an IRF port without traffic interruption on the IRF port.

When you perform this task, follow the IRF physical interface restrictions and configuration guidelines in the following sections:
- IRF physical interface restrictions.
- Binding physical interfaces to IRF ports.

To add physical interfaces to IRF ports:

<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>Step</td>
<td>Command</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>2.</td>
<td>Enter Ethernet interface view or interface range view.</td>
<td>To shut down a range of IRF physical interfaces, enter interface range view. To shut down one IRF physical interface, enter its interface view.</td>
</tr>
<tr>
<td></td>
<td>• Enter interface range view: interface range { interface-type interface-number [ to interface-type interface-number ] } &amp;&lt;1-24&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enter interface view: interface interface-type interface-number</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Shut down the physical interfaces.</td>
<td>CAUTION: If you have connected two peer IRF physical interfaces, shut down both interfaces before assigning them to their respective IRF ports. Failure to do so might cause IRF split. If the system does not allow you to shut down a physical interface, follow the system instruction to shut down its remote peer interface.</td>
</tr>
<tr>
<td>4.</td>
<td>Return to system view.</td>
<td>N/A</td>
</tr>
<tr>
<td>5.</td>
<td>Enter IRF port view.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>irf-port member-id/port-number</td>
<td>By default, no physical interfaces are bound to any IRF port. Repeat this step to assign multiple physical interfaces to the IRF port. Each IRF port can have a maximum of eight physical interfaces. The number of IRF physical interfaces per chip cannot exceed four on a slot. To view the chip location of a port, execute the debug port mapping command in probe view and see the Unit column of the command output. An IRF physical interface operates in enhanced mode after the IRF binding takes effect, regardless of whether you have specified the mode enhanced keywords.</td>
</tr>
<tr>
<td>6.</td>
<td>Bind each physical interface to the IRF port.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>port group [ mdc mdc-id ] interface interface-type interface-number [ mode enhanced ]</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Return to system view.</td>
<td>N/A</td>
</tr>
<tr>
<td>Step</td>
<td>Command</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>8.</td>
<td>Enter Ethernet interface view or interface range view.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
|      | - Enter interface range view:  
|      |  `interface range { interface-type interface-number [ to interface-type interface-number ] } &<1-24>` |        |
|      | - Enter interface view:  
|      |  `interface interface-type interface-number` |        |
| 9.   | Bring up the physical interfaces. | undo shutdown | N/A |
| 10.  | Return to system view. | quit | N/A |
| 11.  | Save the running configuration. | save | Activating IRF port settings causes IRF merge and reboot. To avoid data loss, save the running configuration to the startup configuration file before you perform the operation. |
| 12.  | Activate the configuration on the IRF port. | irf-port-configuration active | After this step is performed, the state of the IRF port changes to UP, the member devices elect a master, and the subordinate device reboots automatically. After the IRF fabric is formed, you can add additional physical interfaces to an IRF port (in UP state) without repeating this step. |

### Enabling IRF auto-merge

When two IRF fabrics merge, you must reboot the member devices in the IRF fabric that fails in the master election. The auto-merge feature enables the IRF fabric to automatically reboot all its member devices to complete the merge.

This feature works only when it is enabled on both IRF fabrics that are merging.

To enable IRF auto-merge:

<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 IRF auto-merge.</td>
<td>irf auto-merge enable</td>
</tr>
</tbody>
</table>

### 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>Enter system view.</td>
<td>system-view</td>
</tr>
</tbody>
</table>
## Configuring the IRF bridge MAC address

**IMPORTANT:**
- This feature is available in Release 2138P01 and later versions.
- Use this feature with caution. The bridge MAC address change causes transient traffic disruption.

Use this feature to configure the bridge MAC address of an IRF fabric. Layer 2 protocols, such as LACP, use the IRF bridge MAC address to identify an IRF fabric. On a switched LAN, the bridge MAC address must be unique.

When IRF fabrics merge, IRF ignores the configured IRF bridge MAC address and only checks the bridge MAC address of each member device in the IRF fabrics. IRF merge fails if any of the member devices have the same bridge MAC address.

After IRF fabrics merge, the merged IRF fabric uses the bridge MAC address of the merging IRF fabric whose master has the higher priority as the IRF bridge MAC address.

If an IRF fabric splits after you configure the IRF bridge MAC address, both the split IRF fabrics use the configured bridge MAC address as the IRF bridge MAC address.

To configure the IRF bridge MAC address:

<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 mac-address mac-address</td>
<td>By default, an IRF fabric uses the bridge MAC address of the master as the IRF bridge MAC address.</td>
</tr>
</tbody>
</table>

## Configuring IRF bridge MAC persistence

**IMPORTANT:**
- This feature does not take effect if the IRF bridge MAC address is configured by using the `irf mac-address` command.
- The IRF bridge MAC address change causes transient 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 always`—Bridge MAC address of the IRF fabric does not change after the address owner leaves.
- `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.
IRF fabrics cannot merge if they contain member devices that have the same bridge MAC address.

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>
<tr>
<td>2.</td>
<td>Configure IRF bridge MAC persistence.</td>
<td>• Retain the bridge MAC address permanently even if the address owner has left the fabric: <strong>irf mac-address persistent always</strong>&lt;br&gt;• Change the bridge MAC address as soon as the address owner leaves the fabric: <strong>undo irf mac-address persistent</strong>&lt;br&gt;By default, the IRF bridge MAC address is retained permanently even if the address owner has left the fabric.</td>
</tr>
</tbody>
</table>

Enabling software auto-update for system software image synchronization

**IMPORTANT:**

To ensure a successful software auto-update in a multi-user environment, prevent anyone from swapping or rebooting the MPUs or member devices during the auto-update process. To inform administrators of the auto-update status, configure the information center to output the status messages to configuration terminals (see Network Management and Monitoring Configuration Guide).

The software auto-update feature automatically propagates the software images of the global active MPU to all other MPUs in the IRF fabric.

To join an IRF fabric, an MPU must use the same software images as the global active MPU in the fabric.

When you add an MPU to the IRF fabric, software auto-update compares the startup software images of the MPU with the current software images of the IRF global active MPU. If the two sets of images are different, the MPU automatically performs the following operations:

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

You must manually update the new device or MPU with the software images running on the IRF fabric in the following situations:

- Software auto-update is disabled.
- Software auto-update fails to update software. This situation might occur if the IRF fabric cannot identify the software version used on the new device or MPU.

**NOTE:**

To synchronize software from the active MPU to the standby MPU in standalone mode, use the **undo version check ignore** and **version auto-update enable** commands. For more information about these commands, see Fundamentals Configuration Guide.
**Configuration prerequisites**

Make sure the MPU 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 MPU cannot complete the auto-update. You must reboot the MPU, and then access the BootWare menus to delete files.

**Configuration procedure**

To enable software auto-update:

<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 does not report a link down event to the IRF fabric immediately after its link changes from up to down. If the IRF link state is still down when the delay is reached, the port reports the change to the IRF fabric.

IRF ports do not delay link up events. They report the link up event immediately after the IRF link comes up.

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 or hello timeout settings of upper-layer protocols (for example, VRRP and OSPF). If the report delay is longer than the timeout setting of a protocol, unnecessary recalculations 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.

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.
- BFD MAD.

LACP MAD handles collisions differently than BFD MAD. To avoid conflicts, do not enable LACP MAD together with BFD MAD in an IRF fabric.

Table 2 provides a reference for you to make a MAD mechanism selection decision.

**Table 2 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 H3C device that supports extended LACPDUs 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](#). |

**Configuring LACP MAD**

When you use LACP MAD, follow these guidelines:

- The intermediate device must be an H3C device that support extended LACP for MAD.
- If the intermediate device is also an IRF fabric, you must 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 also 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>system-view</td>
<td>N/A</td>
</tr>
<tr>
<td>Step</td>
<td>Command</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>2.</td>
<td>(Optional.) Assign a domain ID to the IRF fabric.</td>
<td><code>irf domain domain-id</code></td>
</tr>
<tr>
<td>3.</td>
<td>Create a Layer 2 aggregate interface and enter aggregate interface view.</td>
<td><code>interface bridge-aggregation interface-number</code></td>
</tr>
<tr>
<td>4.</td>
<td>Configure the aggregation group to operate in dynamic aggregation mode.</td>
<td><code>link-aggregation mode dynamic</code></td>
</tr>
<tr>
<td>5.</td>
<td>Enable LACP MAD.</td>
<td><code>mad enable</code></td>
</tr>
<tr>
<td>6.</td>
<td>Return to system view.</td>
<td><code>quit</code></td>
</tr>
</tbody>
</table>
| 7.   | Enter Ethernet interface view or interface range view. | • Enter interface range view:  
  o Method 1:  
    `interface range { interface-type interface-number [ to interface-type interface-number ] } &<1-24>`  
  o Method 2:  
    `interface range name name [ interface { interface-type interface-number [ to interface-type interface-number ] } &<1-24> ]`  
  • Enter Ethernet interface view:  
    `interface interface-type interface-number` | To assign a range of ports to the aggregation group, enter interface range view.  
  To assign one port to the aggregation group, enter Ethernet interface view. |
| 8.   | Assign the Ethernet port or the range of Ethernet ports to the specified aggregation group. | `port link-aggregation group number` | Multichassis link aggregation is allowed. Perform this step also on the intermediate device. |

**Configuring BFD MAD that uses common Ethernet ports**

Configure BFD MAD on a VLAN interface if you use common Ethernet ports for BFD MAD.

When you configure BFD MAD settings, follow these restrictions and guidelines:
# Category Restrictions and guidelines

## BFD MAD VLAN
- Do not enable BFD MAD on VLAN-interface 1.
- If you are using an intermediate device, perform the following tasks on both the IRF fabric and intermediate device:
  - Create a VLAN and VLAN interface for BFD MAD.
  - Assign the ports of BFD MAD links to the BFD MAD VLAN.
- Make sure the IRF fabrics on the network use different BFD MAD VLANs.

## BFD MAD VLAN and feature compatibility
- Do not use the BFD MAD VLAN for any purpose other than configuring BFD MAD. Layer 2 or Layer 3 features, including ARP and LACP, cannot work on the BFD MAD-enabled VLAN interface or any port in the VLAN. If you configure any other feature on the VLAN, neither the configured feature nor the BFD MAD feature will work correctly.
- Disable the spanning tree feature on any Layer 2 Ethernet ports in the BFD MAD VLAN. The MAD feature is mutually exclusive with the spanning tree feature.

## IRF domain ID
- If the intermediate device is also an IRF fabric, you must assign the two IRF fabrics different domain IDs for correct split detection.

## MAD IP address
- To avoid problems, only use the `mad ip address` command to configure IP addresses on the BFD MAD-enabled VLAN interface. Do not configure an IP address with the `ip address` command or configure a VRRP virtual address on the BFD MAD-enabled VLAN interface.
- Make sure all the MAD IP addresses are on the same subnet.
- The MAD IP addresses must not be the same as any IP addresses assigned to interfaces or VRRP groups in the IRF fabric.

## To configure BFD MAD that uses common Ethernet ports:

<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>2.</td>
<td>(Optional.) 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>3.</td>
<td>Create a new VLAN dedicated to BFD MAD.</td>
<td>The default VLAN on the device is VLAN 1.</td>
</tr>
<tr>
<td>4.</td>
<td>Return to system view.</td>
<td>N/A</td>
</tr>
<tr>
<td>5.</td>
<td>Enter Ethernet interface 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:</td>
<td>To assign one port to the BFD MAD VLAN, enter Ethernet interface view.</td>
</tr>
<tr>
<td></td>
<td>- Method 1:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <code>interface range</code> { interface-type interface-number [ to interface-type interface-number ] } &amp;&lt;1-24&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Method 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <code>interface range name</code> name [ interface { interface-type interface-number [ to interface-type interface-number ] } &amp;&lt;1-24&gt; ]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enter Ethernet interface view:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <code>interface interface-type interface-number</code></td>
<td></td>
</tr>
</tbody>
</table>
### Configuring BFD MAD that uses management Ethernet ports

**IMPORTANT:**

This feature is available in Release 2138P01 and later versions.

When you configure BFD MAD that uses management Ethernet ports, follow these restrictions and guidelines:

<table>
<thead>
<tr>
<th>Category</th>
<th>Restrictions and guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports on the intermediate device for BFD MAD</td>
<td>Use common Ethernet ports on the intermediate device to connect the management Ethernet ports on the IRF fabric.</td>
</tr>
</tbody>
</table>
| BFD MAD VLAN                      | - On the intermediate device, create a VLAN for BFD MAD, and assign the ports used for BFD MAD to the VLAN. On the IRF fabric, you do not need to assign the management Ethernet ports to the VLAN.  
- Make sure the IRF fabrics on the network use different BFD MAD VLANs. |
| IRF domain ID                     | If the intermediate device is also an IRF fabric, you must assign the two IRF fabrics different domain IDs for correct split detection. |
### Category Restrictions and guidelines

#### MAD IP address
- To avoid problems, only use the `mad ip address` command to configure IP addresses on the BFD MAD-enabled management Ethernet port. Do not configure an IP address with the `ip address` command or configure a VRRP virtual address on the BFD MAD-enabled management Ethernet port.
- Make sure all the MAD IP addresses are on the same subnet.
- The MAD IP addresses must not be the same as any IP addresses assigned to interfaces or VRRP groups in the IRF fabric.

To configure BFD MAD that uses management Ethernet ports:

<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. (Optional.)</td>
<td>Assign a domain ID to the IRF fabric.</td>
<td><code>irf domain domain-id</code></td>
</tr>
<tr>
<td>3.</td>
<td>Enter management Ethernet interface view.</td>
<td><code>interface m-gigabitethernet interface-number</code></td>
</tr>
<tr>
<td>4.</td>
<td>Enable BFD MAD.</td>
<td><code>mad bfd enable</code></td>
</tr>
<tr>
<td>5.</td>
<td>Assign a MAD IP address to each member device.</td>
<td>`mad ip address ip-address [ mask</td>
</tr>
</tbody>
</table>

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

⚠️ **CAUTION:**

Excluding a VLAN interface and its Layer 2 ports from the shutdown action introduces IP collision risks because the VLAN interface might be active on both the active and inactive IRF fabrics.

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 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.

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 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

After the failed IRF link between two split IRF fabrics is recovered, log in to the Recovery-state IRF fabric, and use the `reboot` command to reboot all its members. If the `irf auto-merge enable` command has been configured, the inactive IRF member devices automatically reboot after the failed link is recovered. After these member devices join the active IRF fabric as subordinates, IRF merge is complete, as shown in Figure 12.

Figure 12 Recovering the IRF fabric

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. The command also brings up all physical interfaces that were shut down by MAD. After you repair the IRF link, the two parts merge into a unified IRF fabric.

Figure 13 Active IRF fabric fails before the IRF link is recovered
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.</td>
</tr>
<tr>
<td>2.</td>
<td>Recover the inactive IRF fabric.</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><strong>display irf</strong></td>
</tr>
<tr>
<td>Display the IRF fabric topology.</td>
<td><strong>display irf topology</strong></td>
</tr>
<tr>
<td>Display IRF link information.</td>
<td><strong>display irf link</strong></td>
</tr>
<tr>
<td>Display basic IRF settings.</td>
<td><strong>display irf configuration</strong></td>
</tr>
<tr>
<td>Display MAD configuration.</td>
<td><strong>display mad [ verbose ]</strong></td>
</tr>
</tbody>
</table>

Configuration examples

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

**LACP MAD-enabled IRF configuration example**

**Network requirements**

As shown in Figure 14, set up a two-chassis IRF fabric at the access layer of the enterprise network.

Configure LACP MAD on the multichassis aggregation to Device C, an H3C device that supports extended LACP.
Configuration procedure

1. **IMPORTANT:**
   Between two neighboring IRF members, IRF links must be bound to IRF-port 1 on one member and to IRF-port 2 on the other.

   ```
   1. Configure Device A:
      # Assign member ID 1 to Device A, and bind FortyGigE 1/0/2 to IRF-port 2.
      <Sysname> system-view
      [Sysname] irf member 1
      Info: Member ID change will take effect after the member reboots and operates in IRF mode.
      [Sysname] irf-port 2
      [Sysname-irf-port2] port group interface fortygige 1/0/2
      [Sysname-irf-port2] quit
      # Save the configuration.
      [Sysname] quit
      <Sysname> save
      # Enable IRF mode.
      <Sysname> system-view
      [Sysname] chassis convert mode irf
      The device will switch to IRF mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup. Continue? [Y/N]:y
      Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in IRF mode? [Y/N]:y
      Please wait...
      Saving the converted configuration file to the main board succeeded.
      Slot 1:
      Saving the converted configuration file succeeded.
      Now rebooting, please wait...
   ```
Device A reboots to form a single-chassis IRF fabric.

2. Configure Device B:

# Assign member ID 2 to Device B, and bind FortyGigE 1/0/1 to IRF-port 1.

```
<Sysname> system-view
[Sysname] irf member 2
Info: Member ID change will take effect after the member reboots and operates in IRF mode.
[Sysname] irf-port 1
[Sysname-irf-port1] port group interface fortygige 1/0/1
[Sysname-irf-port1] quit
```

# Save the configuration.

```
[Sysname] quit
<Sysname> save
```

# Connect the two devices as shown in Figure 14.

# Log in to Device B. (Details not shown.)

# Enable IRF mode.

```
<Sysname> system-view
[Sysname] chassis convert mode irf
The device will switch to IRF mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup.
Continue? [Y/N]:y
Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in IRF mode? [Y/N]:y
Please wait...
Saving the converted configuration file to the main board succeeded.
Slot 1:
Saving the converted configuration file succeeded.
Now rebooting, please wait...
```

Device B and Device A form a two-chassis IRF fabric after Device B reboots.

3. Configure LACP MAD:

# Assign domain ID 1 to the IRF fabric.

```
<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
MAD LACP only enable on dynamic aggregation interface.
[Sysname-Bridge-Aggregation2] quit
```

# Assign FortyGigE 1/1/0/1 and FortyGigE 2/1/0/2 to the aggregate interface.

```
[Sysname] interface fortygige 1/1/0/1
[Sysname-FortyGigE1/1/0/1] port link-aggregation group 2
[Sysname-FortyGigE1/1/0/1] quit
```
Configure Device C 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.

```plaintext
# Create a dynamic aggregate interface.
<Sysname> system-view
<Sysname> interface bridge-aggregation 2
<Sysname-Bridge-Aggregation2> link-aggregation mode dynamic
<Sysname-Bridge-Aggregation2> quit

# Assign FortyGigE 1/0/1 and FortyGigE 1/0/2 to the aggregate interface.
<Sysname> interface fortygige 1/0/1
<Sysname-FortyGigE1/0/1> port link-aggregation group 2
<Sysname-FortyGigE1/0/1> quit
<Sysname> interface fortygige 1/0/2
<Sysname-FortyGigE1/0/2> port link-aggregation group 2
<Sysname-FortyGigE1/0/2> quit
```

### BFD MAD-enabled IRF configuration example

#### Network requirements

As shown in Figure 15, set up an IRF fabric at the distribution layer of the network.

- Configure BFD MAD in the IRF fabric and set up BFD MAD links between the member devices.
- Disable the spanning tree feature on the ports used for BFD MAD, because the two features conflict with each other.
Configuration procedure

1. Configure IRF on Device A:

   # Assign member ID 1 to Device A.
   <Sysname> system-view
   [Sysname] irf member 1
   Info: Member ID change will take effect after the member reboots and operates in IRF mode.

   # Enable IRF mode.
   [Sysname] chassis convert mode irf
   The device will switch to IRF mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup.
   Continue? [Y/N]:y
   Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in IRF mode? [Y/N]:y
   Please wait...
   Saving the converted configuration file to the main board succeeded.
   Slot 1:
   Saving the converted configuration file succeeded.
   Now rebooting, please wait...

   Device A reboots to form a single-chassis IRF fabric.

   # Bind FortyGigE 1/1/0/2 to IRF-port 1/2.
   <Sysname> system-view
   [Sysname] interface fortygige 1/1/0/2
   [Sysname-FortyGigE1/1/0/2] shutdown
   [Sysname-FortyGigE1/1/0/2] quit
2. Configure IRF on Device B:

# Assign member ID 2 to Device B.
<Sysname> system-view
[Sysname] irf member 2
Info: Member ID change will take effect after the member reboots and operates in IRF mode.

# Enable IRF mode.
[Sysname] chassis convert mode irf
The device will switch to IRF mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup. Continue? [Y/N]:y

Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in IRF mode? [Y/N]:y
Please wait...
Saving the converted configuration file to the main board succeeded.
Slot 1:
Saving the converted configuration file succeeded.
Now rebooting, please wait...

Device B reboots to form a single-chassis IRF fabric.

# Bind FortyGigE 2/1/0/2 to IRF-port 2/1.
<Sysname> system-view
[Sysname] interface fortygige 2/1/0/2
[Sysname-FortyGigE2/1/0/2] shutdown
[Sysname-FortyGigE2/1/0/2] quit
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface fortygige 2/1/0/2
[Sysname-irf-port2/1] quit
[Sysname] interface fortygige 2/1/0/2
[Sysname-FortyGigE2/1/0/2] undo shutdown
[Sysname-FortyGigE2/1/0/2] quit

# Save the running configuration to startup configuration file.
[Sysname] quit
<Sysname> save

3. Activate the configuration on IRF ports:

# Connect Device B to Device A as shown in Figure 15.
# Log in to Device A. (Details not shown.)
# Activate IRF port configuration on Device A.
### Configuration example for restoring standalone mode

#### Network requirements

Break the IRF fabric in Figure 16, and change the operating mode of Device A and Device B from IRF to standalone.
## Configuration procedure

1. **Identify the master.**
   
   ```
   <IRF> display irf
   
   MemberID Slot Role Priority  CPU-Mac         Description
   *+1 0 Master 1       00e0-fc0a-15e0 DeviceA
   1  1 Standby 1       00e0-fc0f-8c02 DeviceA
   2  0 Standby 1       00e0-fc0f-15e1 DeviceB
   2  1 Standby 1       00e0-fc0f-15e2 DeviceB
   
   * indicates the device is the master.
   + indicates the device through which the user logs in.
   
   The Bridge MAC of the IRF is: 000f-e26a-58ed
   Auto upgrade        : no
   Mac persistent      : always
   Domain ID           : 0
   
   The output shows that Device A is the master.
   ```

2. **Examine the configuration for VLAN interfaces.**
   
   If a VLAN interface has member ports on different member devices, change the IP address for the
   interface on each device to be unique.

3. **Shut down IRF physical interfaces to disconnect all IRF links.** In this example, shut down FortyGigE
   1/1/0/2.
   
   ```
   <IRF> system-view
   [IRF] interface fortygige 1/1/0/2
   [IRF-FortyGigE1/1/0/2] shutdown
   [IRF-FortyGigE1/1/0/2] quit
   ```

4. **Save the configuration.**
   
   ```
   [IRF] save
   The current configuration will be written to the device. Are you sure? [Y/N]: y
   ```
Please input the file name (*.cfg) [flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]: y
Validating file. Please wait....................................
The current configuration is saved to the active main board successfully.
Configuration is saved to device successfully.

5. **Change the operating mode of Device A to standalone.**
   
   [IRF] undo chassis convert mode  
   The device will switch to stand-alone mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup. Continue? [Y/N]: y
   Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in stand-alone mode? [Y/N]: y
   Please wait.............
   Saving the converted configuration file to main board succeeded.
   Chassis 1 Slot 1:  
   Saving the converted configuration file succeeded.  
   Now rebooting, please wait...  
   Device A automatically reboots to complete the operating mode change.

6. **Log in to Device B and change its operating mode to standalone.**
   
   <IRF> system-view  
   [IRF] undo chassis convert mode  
   The device will switch to stand-alone mode and reboot. You are recommended to save the current running configuration and specify the configuration file for the next startup. Continue? [Y/N]: y
   Do you want to convert the content of the next startup configuration file flash:/startup.cfg to make it available in stand-alone mode? [Y/N]: y
   Please wait.............
   Saving the converted configuration file to main board succeeded.
   Chassis 2 Slot 1:  
   Saving the converted configuration file succeeded.  
   Now rebooting, please wait...  
   Device B automatically reboots to complete the operating mode change.
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