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Virtual Technologies Configuration Guide

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Configuring an IRF fabric

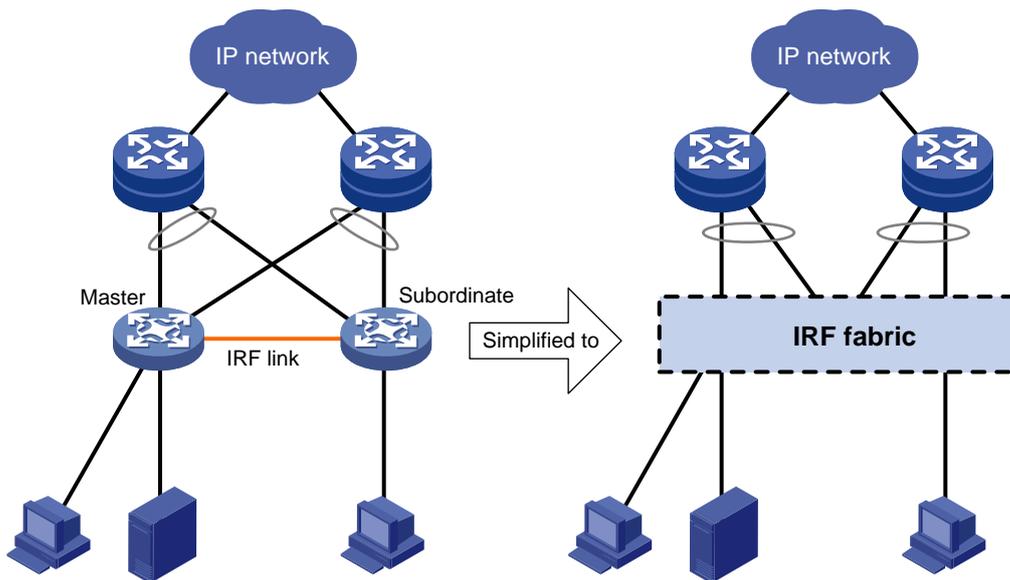
About IRF

The Intelligent Resilient Framework (IRF) technology virtualizes multiple physical devices at the same layer into one virtual fabric to provide data center class availability and scalability. IRF virtualization technology offers processing power, interaction, unified management, and uninterrupted maintenance of multiple devices.

IRF network model

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

Figure 1 IRF application scenario



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.

Basic concepts

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 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. 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. Two devices cannot form an IRF fabric if they use the same member ID. A device cannot join an IRF fabric if its member ID has been used in the fabric.

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.

IRF port

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

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 when all its IRF physical interfaces are down.

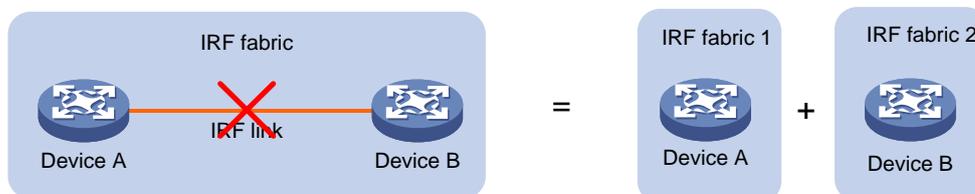
IRF physical interface

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

IRF split

IRF split occurs when an IRF fabric breaks up into multiple IRF fabrics because of IRF link failures, as shown in [Figure 2](#). 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 a minimum of one MAD mechanism (see "[Configuring MAD](#)").

Figure 2 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 3](#).

Figure 3 IRF merge



MAD

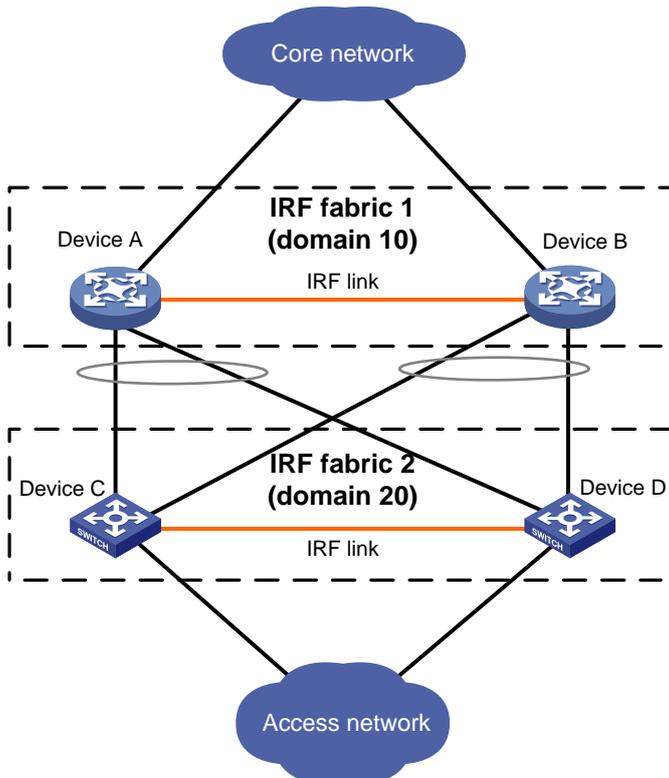
An IRF link failure causes an IRF fabric to split in two IRF fabrics operating with the same Layer 3 settings, including the same IP address. To avoid IP address collision and network problems, IRF uses multi-active detection (MAD) mechanisms to detect the presence of multiple identical IRF fabrics,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

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 determine whether the packet is from the local IRF fabric. Then, the member device can handle the packet correctly.

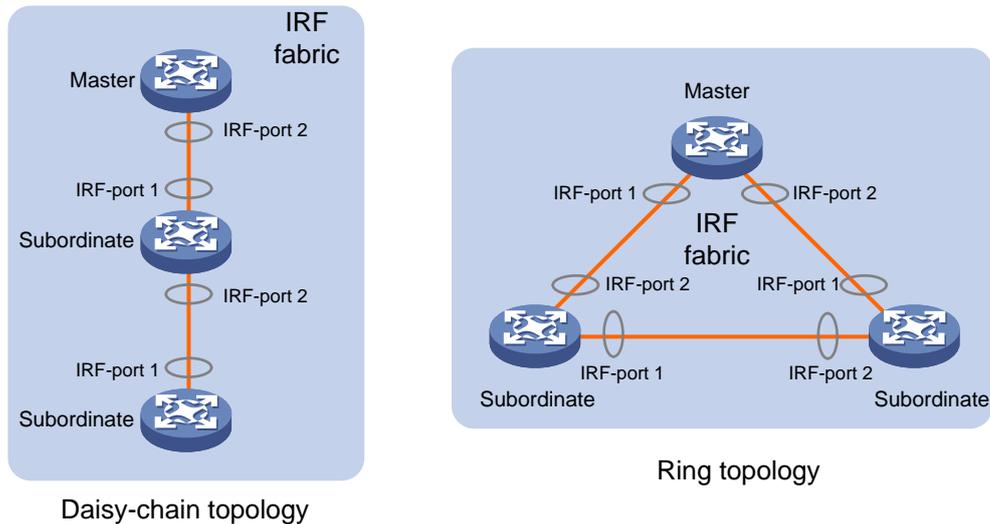
Figure 4 A network that contains two IRF domains



IRF network topology

An IRF fabric can use a daisy-chain or ring topology. As shown in [Figure 5](#), a ring topology is more reliable. 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 5 Daisy-chain topology vs. ring topology



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 split IRF fabrics merge. For information about the master device of the merged IRF fabric, see "[Failure recovery](#)."

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.
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.

Interface naming conventions

A physical interface is numbered in the *chassis-number/slot-number/interface-index* format.

- **chassis-number**—Member ID of the device. The default value for this argument is 1. Any change to the member ID takes effect after a reboot.
- **slot-number**—Slot number of the interface. The slot number is fixed at 0.
- **interface-index**—Interface index on the device. Interface index depends on the number of physical interfaces available on the device. To identify the index of a physical interface, examine its index mark on the chassis.

For example, GigabitEthernet 3/0/1 represents the first physical interface on member device 3. Set its link type to trunk, as follows:

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

File system naming conventions

On a single-chassis fabric, you can use its storage device name to access its file system.

On a multichassis 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 **slotmember-ID#storage-device-name** format.

For more information about storage device naming conventions, see *Fundamentals Configuration Guide*.

For example:

- To create and access the **test** folder under the root directory of the flash memory on the master switch:

```
<Master> mkdir test
Creating directory flash:/test... Done.
<Master> cd test
<Master> dir
Directory of flash:/test
The directory is empty.
```

```
251904 KB total (70964 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> dir
Directory of slot3#flash:/test
The directory is empty.
```

```
251904 KB total (70964 KB free)
```

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.

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.

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.

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

Multi-active handling procedure

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

Detection

IRF provides MAD mechanisms by extending LACP, BFD, ARP, and IPv6 ND to detect multi-active collisions. As a best practice, configure a minimum of one MAD mechanism on an IRF fabric. For more information about the MAD mechanisms and their application scenarios, see "[MAD mechanisms](#)."

For information about LACP, see Ethernet link aggregation in *Layer 2—LAN Switching Configuration Guide*. For information about BFD, see *High Availability Configuration Guide*. For information about ARP, see *Layer 3—IP Services Configuration Guide*. For information about ND, see IPv6 basics in *Layer 3—IP Services Configuration Guide*.

Collision handling

When detecting a multi-active collision, MAD disables all IRF fabrics except one from forwarding data traffic by placing them in Recovery state. The IRF fabrics placed in Recovery state are called inactive IRF fabrics. The IRF fabric that continues to forward traffic is called the active IRF fabric.

LACP MAD and BFD MAD use the following process to handle a multi-active collision:

1. Compare the number of members in each fabric.
2. Set all fabrics to the Recovery state except the one that has the most members.
3. Compare the member IDs of the masters if all IRF fabrics have the same number of members.
4. Set all fabrics to the Recovery state except the one that has the lowest numbered master.
5. Shut down all common network interfaces in the Recovery-state fabrics except for the following interfaces:
 - o Interfaces automatically excluded from being shut down by the system.
 - o Interfaces specified by using the `mad exclude interface` command.

ARP MAD and ND MAD use the following process to handle a multi-active collision:

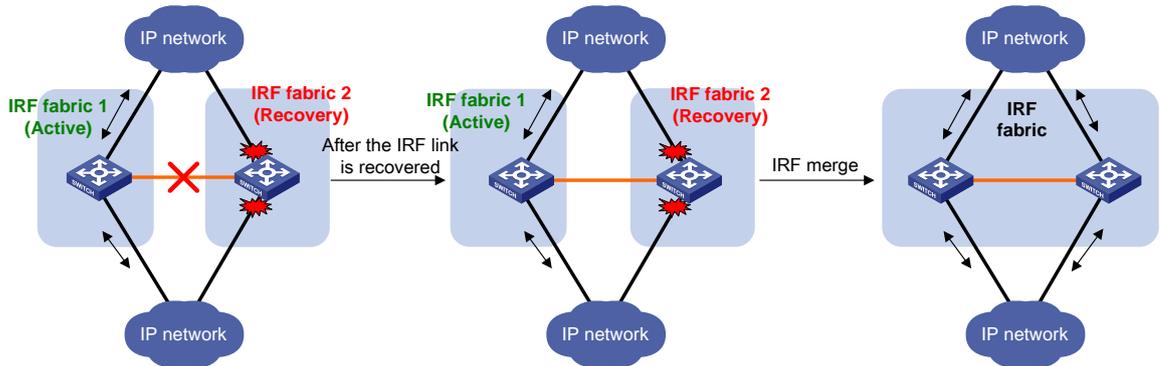
6. Compare the member IDs of the masters in the IRF fabrics.
7. Set all fabrics to the Recovery state except the one that has the lowest numbered master.
8. Take the same action as LACP MAD and BFD MAD on the network interfaces in Recovery-state fabrics.

Failure recovery

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

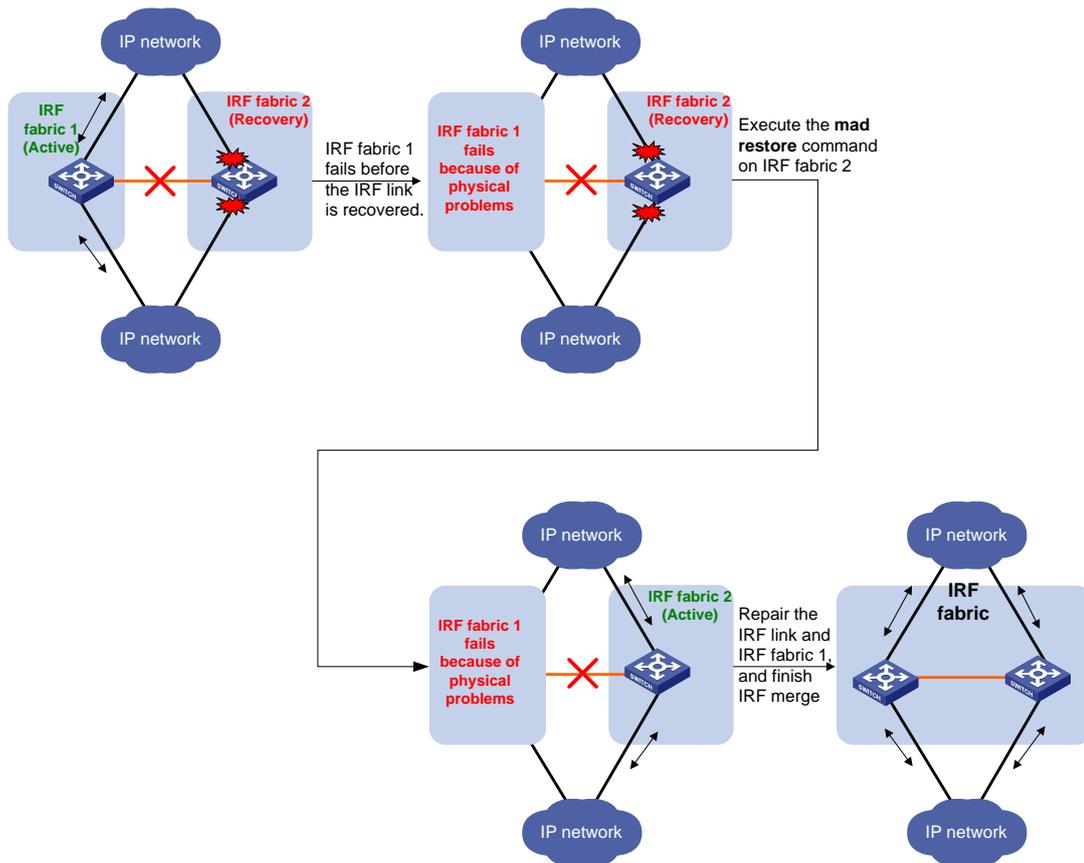
When the failed IRF link between two split IRF fabrics is recovered, all member devices in the inactive IRF fabric automatically reboot to join the active IRF fabric as subordinate members. The network interfaces that have been shut down by MAD automatically restore their original state, as shown in [Figure 6](#).

Figure 6 Recovering the IRF fabric



If the active IRF fabric fails before the IRF link is recovered (see [Figure 7](#)), use the `mad restore` command on the inactive IRF fabric to recover the inactive IRF fabric. This command brings up all network interfaces that were shut down by MAD. After the IRF link is repaired, merge the two parts into a unified IRF fabric.

Figure 7 Active IRF fabric fails before the IRF link is recovered



MAD mechanisms

IRF provides MAD mechanisms by extending LACP, BFD, ARP, and IPv6 ND.

Table 1 compares the MAD mechanisms and their application scenarios.

Table 1 Comparison of MAD mechanisms

MAD mechanism	Advantages	Disadvantages	Application scenarios
LACP MAD	<ul style="list-style-type: none"> Detection speed is fast. Runs on existing aggregate links without requiring 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.
BFD MAD	<ul style="list-style-type: none"> Detection speed is fast. 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.	<ul style="list-style-type: none"> No special requirements for network scenarios. If no intermediate device is used, this mechanism is only suitable for IRF fabrics that have only two members that are geographically close to one another.
ARP MAD	<ul style="list-style-type: none"> No intermediate device is required. Intermediate device, if used, can come from any vendor. Does not require MAD dedicated ports. 	<ul style="list-style-type: none"> Detection speed is slower than BFD MAD and LACP MAD. The spanning tree feature must be enabled if common Ethernet ports are used for ARP MAD links. 	Non-link aggregation IPv4 network scenarios. Spanning tree-enabled non-link aggregation IPv4 network scenarios if common Ethernet ports are used.
ND MAD	<ul style="list-style-type: none"> No intermediate device is required. Intermediate device, if used, can come from any vendor. Does not require MAD dedicated ports. 	<ul style="list-style-type: none"> Detection speed is slower than BFD MAD and LACP MAD. The spanning tree feature must be enabled if common Ethernet ports are used for ND MAD links. 	Non-link aggregation IPv6 network scenarios. Spanning tree-enabled non-link aggregation IPv6 network scenarios if common Ethernet ports are used.

LACP MAD

As shown in Figure 8, LACP MAD has the following requirements:

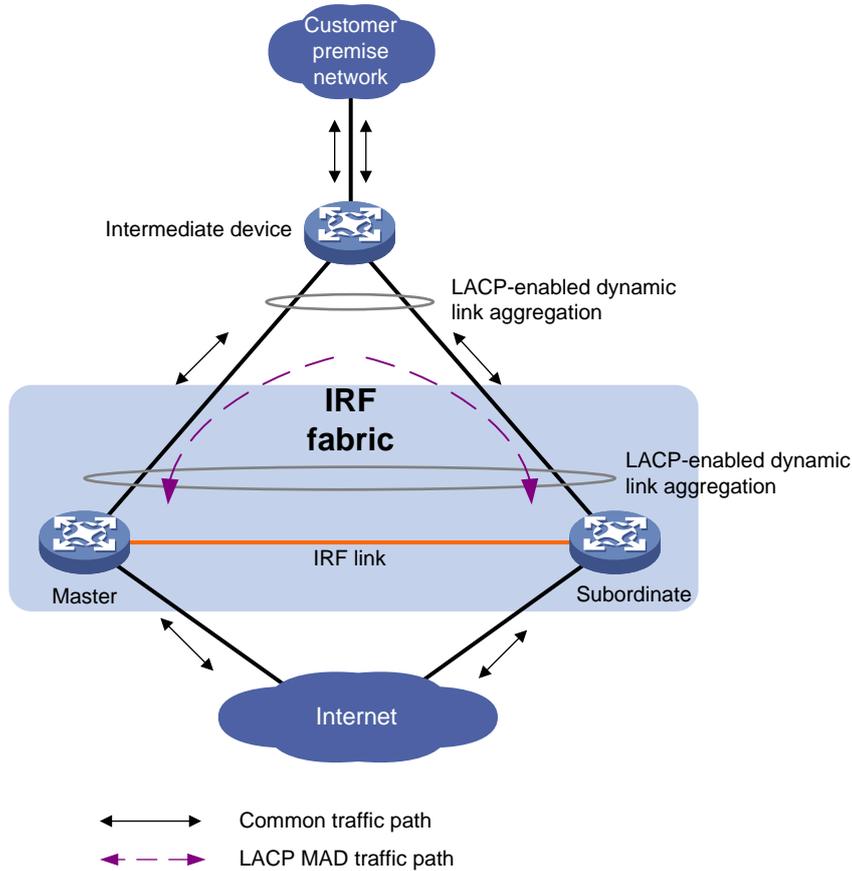
- Every IRF member must have a link with an intermediate device.
- All the links form a dynamic link aggregation group.
- The intermediate device must be a device that supports extended LACP for MAD.

The IRF member devices send extended LACPDUs that convey a domain ID and an active ID (the member ID of the master). The intermediate device transparently forwards the extended LACPDUs received from one member device to all the other member devices.

- If the domain IDs and active IDs 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."

Figure 8 LACP MAD scenario



BFD MAD

BFD MAD detects multi-active collisions by using BFD.

You can use common or management Ethernet ports for BFD MAD.

If management Ethernet ports are used, BFD MAD has the following requirements:

- An intermediate device is required and each IRF member device must have a BFD MAD link to the intermediate device.
- Each member device is assigned a MAD IP address on the master's management Ethernet port.

Follow these guidelines when you use management Ethernet ports for BFD MAD:

- As a best practice, use the management Ethernet ports for BFD MAD only if you will not access the device through the management Ethernet ports for out-of-band management.
- Establish direct BFD links between management ports only if the IRF fabric has only two member devices.
- If you directly connect the management ports on a two-member IRF fabric, you will be unable to access the device at the IP address of the management ports for out-of-band management. To access the device remotely, you must connect to the IP address of a common Layer 3 interface for in-band management.
- As a best practice, do not access the device at the IP address of the management ports after they are used for BFD MAD. Doing so might cause unexpected issues and interference with

BFD MAD. To access the device, connect to the IP address of a common Layer 3 interface for in-band management.

If common Ethernet ports are used, BFD MAD has the following requirements:

- If an intermediate device is used, each member device must have a BFD MAD link to the intermediate device. If no intermediate device is used, all member devices must have a BFD MAD link to each other. As a best practice, use an intermediate device to connect IRF member devices if the IRF fabric has more than two member devices. A full mesh of IRF members might cause broadcast loops.
- Ports on BFD MAD links are assigned to a VLAN used for BFD MAD. Each member device is assigned a MAD IP address on the VLAN interface.

The BFD MAD links and BFD MAD VLAN must be dedicated. Do not use BFD MAD links or BFD MAD VLAN 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 9 shows a typical BFD MAD scenario that uses an intermediate device. On the intermediate device, assign the ports on the BFD MAD links to the same VLAN.

Figure 10 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 9 BFD MAD scenario with an intermediate device

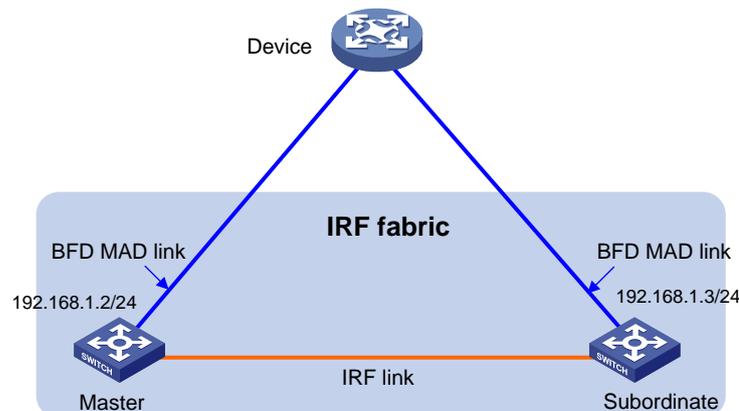
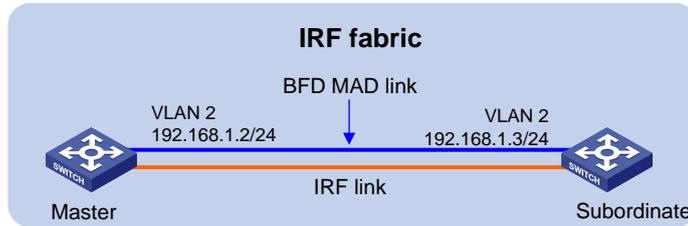


Figure 10 BFD MAD scenario without an intermediate device



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 use common or management Ethernet ports for ARP MAD.

If management Ethernet ports are used, ARP MAD must work with an intermediate device. Make sure the following requirements are met:

- Connect a management Ethernet port on each member device to the intermediate device.
- On the intermediate device, you must assign the ports used for ARP MAD to the same VLAN.

Follow these guidelines when you use management Ethernet ports for ARP MAD:

- As a best practice, use the management Ethernet ports for ARP MAD only if you will not access the device through the management Ethernet ports for out-of-band management.
- Establish direct ARP MAD links between management ports only if the IRF fabric has only two member devices.
- If you directly connect the management ports on a two-member IRF fabric, you will be unable to access the device at the IP address of the management ports for out-of-band management. To access the device remotely, you must connect to the IP address of a common Layer 3 interface for in-band management.
- As a best practice, do not access the device at the IP address of the management ports after they are used for ARP MAD. Doing so might cause unexpected issues and interference with ARP MAD. To access the device, connect to the IP address of a common Layer 3 interface for in-band management.

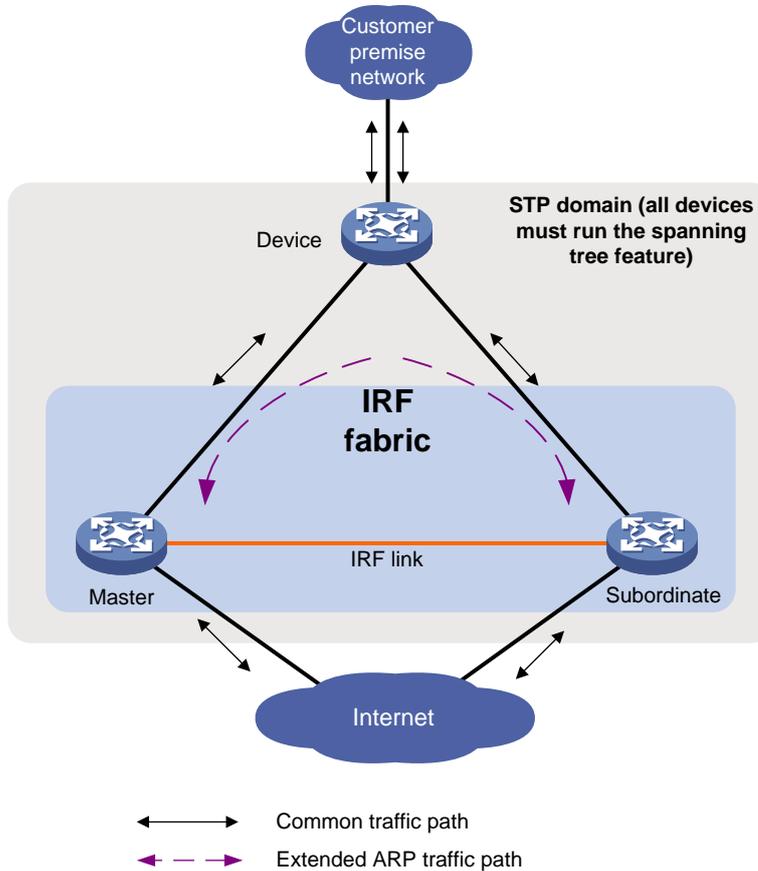
If common Ethernet ports are used, ARP MAD can work with or without an intermediate device. Make sure the following requirements are met:

- If an intermediate device is used, connect each IRF member device to the intermediate device, as shown in [Figure 11](#). Run the spanning tree feature between the IRF fabric and the intermediate device. In this situation, data links can be used.
- If no intermediate device is used, connect each IRF member device to all other member devices. In this situation, IRF links cannot be used for ARP MAD.

Each IRF member compares the domain ID and the active ID (the member ID of the master) 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.

Figure 11 ARP MAD scenario (common Ethernet ports)



ND MAD

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

You can use common or management Ethernet ports for ND MAD.

If management Ethernet ports are used, ND MAD must work with an intermediate device. Make sure the following requirements are met:

- Connect a management Ethernet port on each member device to the intermediate device.
- On the intermediate device, you must assign the ports used for ND MAD to the same VLAN.

Follow these guidelines when you use management Ethernet ports for ND MAD:

- As a best practice, use the management Ethernet ports for ND MAD only if you will not access the device through the management Ethernet ports for out-of-band management.
- Establish direct ND MAD links between management ports only if the IRF fabric has only two member devices.
- If you directly connect the management ports on a two-member IRF fabric, you will be unable to access the device at the IP address of the management ports for out-of-band management. To access the device remotely, you must connect to the IP address of a common Layer 3 interface for in-band management.
- As a best practice, do not access the device at the IP address of the management ports after they are used for ND MAD. Doing so might cause unexpected issues and interference with ND MAD. To access the device, connect to the IP address of a common Layer 3 interface for in-band management.

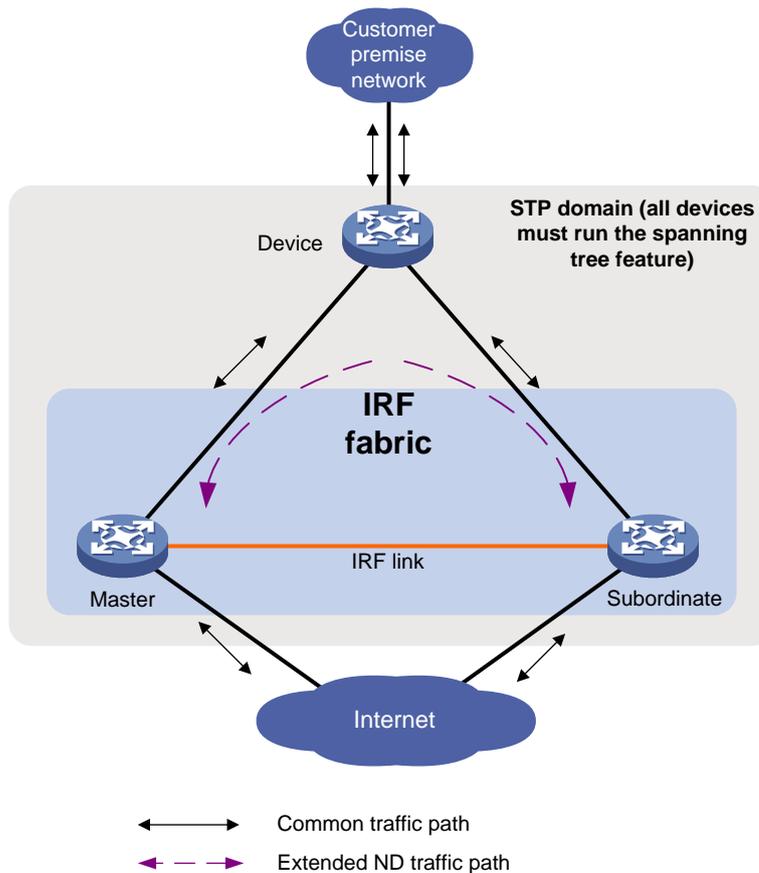
If common Ethernet ports are used, ND MAD can work with or without an intermediate device. Make sure the following requirements are met:

- If an intermediate device is used, connect each IRF member device to the intermediate device, as shown in [Figure 12](#). Run the spanning tree feature between the IRF fabric and the intermediate device. In this situation, data links can be used.
- If no intermediate device is used, connect each IRF member device to all other member devices. In this situation, IRF links cannot be used for ND MAD.

Each IRF member device compares the domain ID and the active ID (the member ID of the master) 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.

Figure 12 ND MAD scenario (common Ethernet ports)



Restrictions and guidelines: IRF configuration

Hardware compatibility with IRF

A switch of this series can form an IRF fabric only with devices in the same series.

Software requirements for IRF

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

Candidate IRF physical interfaces

You can use 10G or 1G Ethernet ports as IRF physical interfaces.

- The 10G or 1G Ethernet ports must operate at 10 Gbps or 1 Gbps, respectively, when they are used as IRF physical interfaces.
- The ports bound to an IRF port must belong to the same port group. However, ports in the same group can be bound to different IRF ports. To obtain port group information, execute the **debug port mapping** command in probe view and examine the value in the **Unit** field for each port. Ports in one port group have the same unit value.

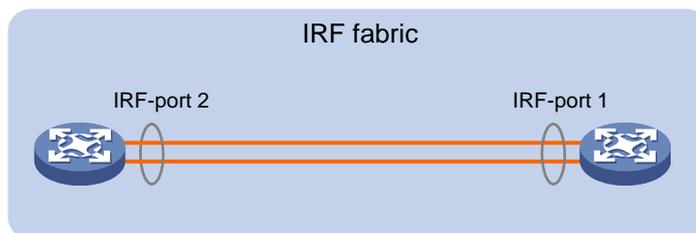
For more information about the ports that can be used as IRF physical interfaces, their port group information, and the available transceiver modules and cables, see IRF fabric setup in the switch installation guide.

IRF port connection

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.
- For high availability, bind multiple physical interfaces to an IRF port. You can bind a maximum of eight physical interfaces to an IRF port.

Figure 13 Connecting IRF physical interfaces



IRF physical interface configuration restrictions and guidelines

Command configuration restrictions

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

- Basic interface commands, including **shutdown** and **description**. For more information about these commands, see Ethernet interface commands in *Layer 2—LAN Switching Command Reference*.
- The **flow-interval** command, which sets the statistics polling interval on an interface. For more information about this command, see Ethernet interface commands in *Layer 2—LAN Switching Command Reference*.
- The **port link-flap protect enable** command, which enables link flapping protection on an interface. To prevent IRF link flapping from affecting system performance, link flapping

protection acts differently on IRF physical interfaces than on common network interfaces, as follows:

- Link flapping protection is enabled by default on IRF physical interfaces. This feature takes effect on an IRF physical interface as long as it is enabled on that interface, regardless of whether link flapping protection has been enabled globally.
- If the number of link flappings on an IRF physical interface crosses the link flapping threshold during a flapping detection interval, the system displays event messages. However, the system does not shut down that IRF physical interface as it would do with a common network interface.

For more information about this command, see Ethernet interface commands in *Layer 2—LAN Switching Command Reference*.

- The `mirroring-group reflector-port` command, which specifies the physical interface as a reflector port for remote mirroring. For more information about this command, see port mirroring in *Network Management and Monitoring Command Reference*.

! **IMPORTANT:**

Do not execute the `mirroring-group reflector-port` command on an IRF physical interface if that interface is the only member interface of an IRF port. Doing so will split the IRF fabric, because this command also removes the binding of the physical interface and IRF port.

Suppressing SNMP notifications of packet drops on IRF physical interfaces

Before an IRF member device forwards a packet, it examines its forwarding path in the IRF fabric for a loop. 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.

To suppress SNMP notifications of packet drops that do not require attention, do not monitor packet forwarding on the IRF physical interfaces.

Configuration rollback restrictions

The configuration rollback feature cannot roll back the following IRF settings:

- Member device description (set by using the `irf member description` command).
- Member device priority (set by using the `irf member priority` command).
- IRF physical interface and IRF port bindings (set by using the `port group interface` command).

For more information about the configuration rollback feature, see configuration file management in *Fundamentals Configuration Guide*.

IRF tasks at a glance

To configure IRF, perform the following tasks:

1. [Setting up an IRF fabric](#)
2. [Configuring MAD](#)

Configure a minimum of one MAD mechanism on an IRF fabric. For the MAD compatibility, see "[MAD mechanism compatibility](#)."

- [Configuring LACP MAD](#)
- [Configuring BFD MAD](#)
- [Configuring ARP MAD](#)
- [Configuring ND MAD](#)

- [Excluding interfaces from the shutdown action upon detection of multi-active collision](#)
This feature excludes an interface from the shutdown action for management or other special purposes when an IRF fabric transits to the Recovery state.
- [Recovering an IRF fabric](#)
- 3. (Optional.) [Optimizing IRF settings for an IRF fabric](#)
 - [Configuring a member device description](#)
 - [Configuring IRF bridge MAC address settings](#)
 - [Enabling software auto-update for software image synchronization](#)
This feature automatically synchronizes the current software images of the master to devices that are attempting to join the IRF fabric.
 - [Setting the IRF link status change report delay](#)

Planning the IRF fabric setup

Consider the following items when you plan an IRF fabric:

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

Setting up an IRF fabric

IRF setup tasks at a glance

To set up an IRF fabric, perform the following tasks:

1. Configure member IDs, priorities, and IRF physical interfaces separately.
 - a. [Assigning a member ID to each IRF member device](#)
 - b. (Optional.) [Specifying a priority for each member device](#)
 - c. [Binding physical interfaces to IRF ports](#)

Skip these tasks if you configure member IDs, priorities, domain ID, and IRF physical interfaces in bulk.
2. [Bulk-configuring basic IRF settings for a member device](#)
Skip this task if you configure member IDs, priorities, domain ID, and IRF physical interfaces separately.
3. [Connecting IRF physical interfaces](#)
4. [Accessing the IRF fabric](#)

Assigning a member ID to each IRF member device

Restrictions and guidelines

To create an IRF fabric, you must assign a unique IRF member ID to each member device.

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

In an IRF fabric, changing IRF member IDs might cause undesirable configuration changes and data loss. Before you do that, back up the configuration, and make sure you fully understand the impact on your network.

Procedure

1. Enter system view.

```
system-view
```

2. Assign a member ID to a member device.

```
irf member member-id renumber new-member-id
```

The default IRF member ID is 1.

3. (Optional.) Save the configuration.

```
save
```

If you have bound physical interfaces to IRF ports or assigned member priority, you must perform this step for these settings to take effect after the reboot.

4. Return to user view.

```
quit
```

5. Reboot the device.

```
reboot [ slot slot-number ] [ force ]
```

Specifying a priority for each member device

About specifying an IRF member priority

IRF member priority represents the possibility for a device to be elected the master in an IRF fabric. A larger priority value indicates a higher priority.

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

Procedure

1. Enter system view.

```
system-view
```

2. Specify a priority for the device.

```
irf member member-id priority priority
```

The default IRF member priority is 1.

Binding physical interfaces to IRF ports

Restrictions and guidelines

Select qualified physical interfaces as IRF physical interfaces as described in "[Candidate IRF physical interfaces](#)."

After binding physical interfaces to IRF ports for the first time, you must use the **irf-port-configuration active** command to activate the settings on the IRF ports.

The system activates the IRF port settings automatically only in the following situations:

- The configuration file that the device starts with contains IRF port bindings.
- You are adding physical interfaces to an IRF port (in UP state) after an IRF fabric is formed.

Procedure

1. Enter system view.
system-view
2. Enter interface view or interface range view.
 - o Enter interface view.
interface *interface-type interface-number*
 - o Enter interface range view. Choose one of the following commands:
interface range { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>
interface range name *name* [**interface** { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>]

To shut down a range of IRF physical interfaces, enter interface range view.
To shut down one IRF physical interface, enter its interface view.
3. Shut down the physical interfaces.
shutdown
By default, a physical interface is up.
4. Return to system view.
quit
5. Enter IRF port view.
irf-port *member-id/irf-port-number*
6. Bind each physical interface to the IRF port.
port group interface *interface-type interface-number*
By default, no physical interfaces are bound to an IRF port.
Repeat this step to assign multiple physical interfaces to the IRF port.
7. Return to system view.
quit
8. Enter interface view or interface range view.
 - o Enter interface view.
interface *interface-type interface-number*
 - o Enter interface range view. Choose one of the following commands:
interface range { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>
interface range name *name* [**interface** { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>]
9. Bring up the physical interfaces.
undo shutdown
10. Return to system view.
quit
11. Save the configuration.
save
Activating IRF port configurations 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 IRF port settings.
irf-port-configuration active

Bulk-configuring basic IRF settings for a member device

About easy IRF

Use the easy IRF feature to bulk-configure basic IRF settings for a member device, including the member ID, domain ID, priority, and IRF port bindings.

The easy IRF feature provides the following configuration methods:

- **Interactive method**—Enter the `easy-irf` command without parameters. The system will guide you to set the parameters step by step.
- **Non-interactive method**—Enter the `easy-irf` command with parameters.

As a best practice, use the interactive method if you are new to IRF.

Restrictions and guidelines

The member device reboots immediately after you specify a new member ID for it. Make sure you are aware of the impact on the network.

If you execute the `easy-irf` command multiple times, the following settings take effect:

- The most recent settings for the member ID, domain ID, and priority.
- IRF port bindings added through repeated executions of the command. To remove an IRF physical interface from an IRF port, you must use the `undo port group interface` command in IRF port view.

If you specify IRF physical interfaces by using the interactive method, you must also follow these restrictions and guidelines:

- Do not enter spaces between the interface type and interface number.
- Use a comma (,) to separate two physical interfaces. No spaces are allowed between interfaces.

Procedure

1. Enter system view.

```
system-view
```

2. Bulk-configure basic IRF settings for the device.

```
easy-irf [ member member-id [ renumber new-member-id ] domain domain-id  
[ priority priority ] [ irf-port1 interface-list1 ] [ irf-port2  
interface-list2 ] ]
```

Make sure the new member ID is unique in the IRF fabric to which the device will be added.

Connecting IRF physical interfaces

Follow the restrictions in "[IRF port connection](#)" to connect IRF physical interfaces as well as based on the topology and cabling scheme. The devices perform master election. The member devices that fail the master election automatically reboot to form an IRF fabric with the master device.

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 automatically propagated to the IRF members.

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 MAD

Restrictions and guidelines for MAD configuration

Hardware compatibility with MAD

Some switch models do not support configuring MAD on a management Ethernet port, because they do not have management Ethernet ports. For information about these models, see the switch installation guide.

MAD mechanism compatibility

As a best practice, configure a minimum of one MAD mechanism on an IRF fabric for prompt IRF split detection. Because MAD mechanisms use different collision handling processes, follow these restrictions and guidelines when you configure multiple MAD mechanisms on an IRF fabric:

- Do not configure LACP MAD together with ARP MAD or ND MAD.
- Do not configure BFD MAD together with ARP MAD or ND MAD.

Assigning IRF domain IDs

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.

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.)

Actions on interfaces shut down by MAD

To prevent a multi-active collision from causing network issues, avoid using the **undo shutdown** command to bring up the interfaces shut down by a MAD mechanism on a Recovery-state IRF fabric.

Configuring LACP MAD

1. Enter system view.
system-view
2. Assign a domain ID to the IRF fabric.
irf domain domain-id
The default IRF domain ID is 0.
3. Create a Layer 2 aggregate interface and enter its view.
interface bridge-aggregation interface-number
Perform this step also on the intermediate device.
4. Configure the aggregation group to operate in dynamic aggregation mode.
link-aggregation mode dynamic
By default, an aggregation group operates in static aggregation mode.
LACP MAD takes effect only on dynamic aggregate interfaces.
Perform this step also on the intermediate device.

5. Enable LACP MAD.

```
mad enable
```

By default, LACP MAD is disabled.

6. Return to system view.

```
quit
```

7. Enter Ethernet interface view or interface range view.

- o Enter Ethernet interface view.

```
interface interface-type interface-number
```

- o Enter interface range view. Choose one of the following commands:

```
interface range { interface-type interface-number [ to interface-type interface-number ] } &<1-24>
```

```
interface range name name [ interface { interface-type interface-number [ to interface-type interface-number ] } &<1-24> ]
```

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 group-id
```

Multichassis link aggregation is allowed.

Perform this step also on the intermediate device.

Configuring BFD MAD

Restrictions and guidelines for configuring BFD MAD

As a best practice, use the following procedure to set up BFD MAD:

1. Choose a BFD MAD link scheme as described in "BFD MAD."
2. Configure BFD MAD.
3. Connect the BFD MAD links.

When you configure BFD MAD on a VLAN interface, follow these restrictions and guidelines:

Category	Restrictions and guidelines
BFD MAD VLAN	<ul style="list-style-type: none"> • Do not enable BFD MAD on VLAN-interface 1. • If you are using an intermediate device, perform the following tasks: <ul style="list-style-type: none"> o On the IRF fabric and the intermediate device, create a VLAN for BFD MAD. o On the IRF fabric and the intermediate device, assign the ports of BFD MAD links to the BFD MAD VLAN. o On the IRF fabric, create a VLAN interface for the BFD MAD VLAN. • Make sure the IRF fabrics on the network use different BFD MAD VLANs. • Make sure the BFD MAD VLAN contains only ports on the BFD MAD links. Exclude a port from the BFD MAD VLAN if that port is not on a BFD MAD link. If you have assigned that port to all VLANs by using the port trunk permit vlan all command, use the undo port trunk permit command to exclude that port from the BFD MAD VLAN.
BFD MAD VLAN and feature compatibility	<p>Do not use the BFD MAD VLAN and its member ports for any purpose other than configuring BFD MAD.</p> <ul style="list-style-type: none"> • Use only the mad bfd enable and mad ip address commands on the BFD MAD-enabled VLAN interface. If you configure other

Category	Restrictions and guidelines
	<p>features, both BFD MAD and other features on the interface might run incorrectly.</p> <ul style="list-style-type: none"> • 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.
MAD IP address	<ul style="list-style-type: none"> • To avoid network issues, only use the mad ip address command to configure IP addresses on the BFD MAD-enabled VLAN interface. Do not configure an IP address by using 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.

When you configure BFD MAD on a management Ethernet port, follow these restrictions and guidelines:

Category	Restrictions and guidelines
Management Ethernet ports for BFD MAD	Connect a management Ethernet port on each IRF member device to the common Ethernet ports on the intermediate device.
BFD MAD VLAN	<ul style="list-style-type: none"> • 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. • Make sure the BFD MAD VLAN on the intermediate device contains only ports on the BFD MAD links.
MAD IP address	<ul style="list-style-type: none"> • Use the mad ip address command instead of the ip address command to configure MAD IP addresses on the BFD MAD-enabled management Ethernet ports. • Make sure all the MAD IP addresses are on the same subnet.

Configuring BFD MAD on a VLAN interface

1. Enter system view.
system-view
2. (Optional.) Assign a domain ID to the IRF fabric.
irf domain *domain-id*
By default, the domain ID of an IRF fabric is 0.
3. Create a VLAN dedicated to BFD MAD.
vlan *vlan-id*
By default, only VLAN 1 exists.
Do not enable BFD MAD on VLAN-interface 1.
Perform this step also on the intermediate device (if any).
4. Return to system view.
quit
5. Enter Ethernet interface view or interface range view.
 - Enter Ethernet interface view.
interface *interface-type interface-number*
 - Enter interface range view. Choose one of the following commands:
interface range { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>

```
interface range name name [ interface { interface-type  
interface-number [ to interface-type interface-number ] } &<1-24> ]
```

To assign a range of ports to the BFD MAD VLAN, enter interface range view.

To assign one port to the BFD MAD VLAN, enter Ethernet interface view.

6. Assign the port or the range of ports to the BFD MAD VLAN.

- o Assign the ports to the VLAN as access ports.

```
port access vlan vlan-id
```

- o Assign the ports to the VLAN as trunk ports.

```
port trunk permit vlan vlan-id
```

- o Assign the ports to the VLAN as hybrid ports.

```
port hybrid vlan vlan-id { tagged | untagged }
```

The link type of BFD MAD ports can be access, trunk, or hybrid.

The default link type of a port is access.

Perform this step also on the intermediate device (if any).

7. Return to system view.

```
quit
```

8. Enter VLAN interface view.

```
interface vlan-interface vlan-interface-id
```

9. Enable BFD MAD.

```
mad bfd enable
```

By default, BFD MAD is disabled.

10. Assign a MAD IP address to a member device on the VLAN interface.

```
mad ip address ip-address { mask | mask-length } member member-id
```

By default, no MAD IP addresses are configured on any VLAN interfaces.

Repeat this step to assign a MAD IP address to each member device on the VLAN interface.

Configuring BFD MAD on a management Ethernet port

1. Enter system view.

```
system-view
```

2. (Optional.) Assign a domain ID to the IRF fabric.

```
irf domain domain-id
```

By default, the domain ID of an IRF fabric is 0.

3. Enter management Ethernet interface view.

```
interface m-gigabitethernet interface-number
```

Of all management Ethernet ports on an IRF fabric, only the master's management Ethernet port is accessible.

4. Enable BFD MAD.

```
mad bfd enable
```

By default, BFD MAD is disabled.

5. Assign a MAD IP address to each member device.

```
mad ip address ip-address { mask | mask-length } member member-id
```

By default, no MAD IP addresses are configured.

Configuring ARP MAD

Restrictions and guidelines for configuring ARP MAD

As a best practice, use the following procedure to set up ARP MAD:

1. Choose an ARP MAD link scheme as described in "ARP MAD."
2. Configure ARP MAD.
3. Connect the ARP MAD links if you are not using existing data links as ARP MAD links.

When you configure ARP MAD on a VLAN interface, follow these restrictions and guidelines:

Category	Restrictions and guidelines
ARP MAD VLAN	<ul style="list-style-type: none"> • Do not enable ARP MAD on VLAN-interface 1. • If you are using an intermediate device, perform the following tasks: <ul style="list-style-type: none"> ○ On the IRF fabric and the intermediate device, create a VLAN for ARP MAD. ○ On the IRF fabric and the intermediate device, assign the ports of ARP MAD links to the ARP MAD VLAN. ○ On the IRF fabric, create a VLAN interface for the ARP MAD VLAN. • Do not use the ARP MAD VLAN for any other purposes.
ARP MAD and feature configuration	<p>If an intermediate device is used, make sure the following requirements are met:</p> <ul style="list-style-type: none"> • Run the spanning tree feature between the IRF fabric and the intermediate device to ensure that there is only one ARP MAD link in forwarding state. For more information about the spanning tree feature and its configuration, see <i>Layer 2—LAN Switching Configuration Guide</i>. • Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves. • If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

When you configure ARP MAD on a management Ethernet port, follow these restrictions and guidelines:

Category	Restrictions and guidelines
Management Ethernet ports for ARP MAD	Connect a management Ethernet port on each member device to the common Ethernet ports on the intermediate device.
ARP MAD VLAN	On the intermediate device, create a VLAN for ARP MAD, and assign the ports used for ARP MAD to the VLAN. On the IRF fabric, you do not need to assign the management Ethernet ports to the VLAN.
ARP MAD and feature configuration	<ul style="list-style-type: none"> • Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves. • If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

Configuring ARP MAD on a VLAN interface

1. Enter system view.


```
system-view
```
2. Assign a domain ID to the IRF fabric.


```
irf domain domain-id
```

The default IRF domain ID is 0.
3. Configure the IRF bridge MAC address to change as soon as the address owner leaves.

undo irf mac-address persistent

By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves.

4. Create a VLAN dedicated to ARP MAD.

```
vlan vlan-id
```

By default, only VLAN 1 exists.

Do not configure ARP MAD on VLAN-interface 1.

Perform this task also on the intermediate device (if any).

5. Return to system view.

```
quit
```

6. Enter Ethernet interface view or interface range view.

- o Enter Ethernet interface view.

```
interface interface-type interface-number
```

- o Enter interface range view. Choose one of the following commands:

```
interface range { interface-type interface-number [ to  
interface-type interface-number ] } &<1-24>
```

```
interface range name name [ interface { interface-type  
interface-number [ to interface-type interface-number ] } &<1-24> ]
```

To assign a range of ports to the ARP MAD VLAN, enter interface range view.

To assign one port to the ARP MAD VLAN, enter Ethernet interface view.

7. Assign the port or the range of ports to the ARP MAD VLAN.

- o Assign the ports to the VLAN as access ports.

```
port access vlan vlan-id
```

- o Assign the ports to the VLAN as trunk ports.

```
port trunk permit vlan vlan-id
```

- o Assign the ports to the VLAN as hybrid ports.

```
port hybrid vlan vlan-id { tagged | untagged }
```

The link type of ARP MAD ports can be access, trunk, or hybrid.

The default link type of a port is access.

Perform this task also on the intermediate device (if any).

8. Return to system view.

```
quit
```

9. Enter VLAN interface view.

```
interface vlan-interface vlan-interface-id
```

10. Assign the interface an IP address.

```
ip address ip-address { mask | mask-length }
```

By default, no IP addresses are assigned to any VLAN interfaces.

11. Enable ARP MAD.

```
mad arp enable
```

By default, ARP MAD is disabled.

Configuring ARP MAD on a management Ethernet port

1. Enter system view.

```
system-view
```

2. Assign a domain ID to the IRF fabric.

```
irf domain domain-id
```

The default IRF domain ID is 0.

3. Configure the IRF bridge MAC address to change as soon as the address owner leaves.

```
undo irf mac-address persistent
```

By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves.

4. Enter management Ethernet interface view.

```
interface m-gigabitethernet interface-number
```

Of all management Ethernet ports on an IRF fabric, only the master's management Ethernet port is accessible.

5. Assign an IP address to the management Ethernet port.

```
ip address ip-address { mask | mask-length }
```

By default, no IP addresses are configured.

6. Enable ARP MAD.

```
mad arp enable
```

By default, ARP MAD is disabled.

Configuring ND MAD

Restrictions and guidelines for configuring ND MAD

As a best practice, use the following procedure to set up ND MAD:

1. Choose an ND MAD link scheme as described in "[ND MAD](#)."
2. Configure ND MAD.
3. Connect the ND MAD links if you are not using existing data links as ND MAD links.

When you configure ND MAD on a VLAN interface, follow these restrictions and guidelines:

Category	Restrictions and guidelines
ND MAD VLAN	<ul style="list-style-type: none">• Do not enable ND MAD on VLAN-interface 1.• If you are using an intermediate device, perform the following tasks:<ul style="list-style-type: none">○ On the IRF fabric and the intermediate device, create a VLAN for ND MAD.○ On the IRF fabric and the intermediate device, assign the ports of ND MAD links to the ND MAD VLAN.○ On the IRF fabric, create a VLAN interface for the ND MAD VLAN.• Do not use the ND MAD VLAN for any other purposes.
ND MAD and feature configuration	<p>If an intermediate device is used, make sure the following requirements are met:</p> <ul style="list-style-type: none">• Run the spanning tree feature between the IRF fabric and the intermediate device to ensure that there is only one ND MAD link in forwarding state. For more information about the spanning tree feature and its configuration, see <i>Layer 2—LAN Switching Configuration Guide</i>.• Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves.• If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

When you configure ND MAD on a management Ethernet port, follow these restrictions and guidelines:

Category	Restrictions and guidelines
Management Ethernet ports for ND MAD	Connect a management Ethernet port on each member device to the common Ethernet ports on the intermediate device.
ND MAD VLAN	On the intermediate device, create a VLAN for ND MAD, and assign the ports used for ND MAD to the VLAN. On the IRF fabric, you do not need to assign the management Ethernet ports to the VLAN.
ND MAD and feature configuration	<ul style="list-style-type: none"> • Enable the IRF fabric to change its bridge MAC address as soon as the address owner leaves. • If the intermediate device is also an IRF fabric, assign the two IRF fabrics different domain IDs for correct split detection.

Configuring ND MAD on a VLAN interface

1. Enter system view.
system-view
2. Assign a domain ID to the IRF fabric.
irf domain *domain-id*
The default IRF domain ID is 0.
3. Configure the IRF bridge MAC address to change as soon as the address owner leaves.
undo irf mac-address persistent
By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves the fabric.
4. Create a VLAN dedicated to ND MAD.
vlan *vlan-id*
By default, only VLAN 1 exists.
Do not configure ND MAD on VLAN-interface 1.
Perform this task also on the intermediate device (if any).
5. Return to system view.
quit
6. Enter Ethernet interface view or interface range view.
 - o Enter Ethernet interface view.
interface *interface-type interface-number*
 - o Enter interface range view. Choose one of the following commands:
interface range { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>
interface range name *name* [**interface** { *interface-type interface-number* [**to** *interface-type interface-number*] } &<1-24>]

To assign a range of ports to the ND MAD VLAN, enter interface range view.
To assign one port to the ND MAD VLAN, enter Ethernet interface view.
7. Assign the port or the range of ports to the ND MAD VLAN.
 - o Assign the ports to the VLAN as access ports.
port access vlan *vlan-id*
 - o Assign the ports to the VLAN as trunk ports.
port trunk permit vlan *vlan-id*
 - o Assign the ports to the VLAN as hybrid ports.
port hybrid vlan *vlan-id* { **tagged** | **untagged** }

The link type of ND MAD ports can be access, trunk, or hybrid.

The default link type of a port is access.

Perform this task also on the intermediate device (if any).

8. Return to system view.

```
quit
```

9. Enter VLAN interface view.

```
interface vlan-interface interface-number
```

10. Assign the interface an IPv6 address.

```
ipv6 address { ipv6-address/prefix-length | ipv6-address  
prefix-length }
```

By default, no IPv6 addresses are assigned to a VLAN interface.

11. Enable ND MAD.

```
mad nd enable
```

By default, ND MAD is disabled.

Configuring ND MAD on a management Ethernet port

1. Enter system view.

```
system-view
```

2. Assign a domain ID to the IRF fabric.

```
irf domain domain-id
```

The default IRF domain ID is 0.

3. Configure the IRF bridge MAC address to change as soon as the address owner leaves.

```
undo irf mac-address persistent
```

By default, the IRF bridge MAC address remains unchanged for 6 minutes after the address owner leaves the fabric.

4. Enter management Ethernet interface view.

```
interface m-gigabitethernet interface-number
```

Of all management Ethernet ports on an IRF fabric, only the master's management Ethernet port is accessible.

5. Assign an IPv6 address to the management Ethernet port.

```
ipv6 address { ipv6-address/pre-length | ipv6 address pre-length }
```

By default, no IPv6 addresses are assigned to a management Ethernet port.

6. Enable ND MAD.

```
mad nd enable
```

By default, ND MAD is disabled.

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

About excluding interfaces from being shut down

When an IRF fabric transits to the Recovery state, the system automatically excludes the following network interfaces from being shut down:

- IRF physical interfaces.
- Interfaces used for BFD MAD.

- Member interfaces of an aggregate interface if the aggregate interface is excluded from being shut down.

You can exclude an interface 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.

Restrictions and guidelines

If the Layer 2 ports of a VLAN interface are distributed on multiple member devices, the exclusion operation might introduce IP collision risks. The VLAN interface might be up on both active and inactive IRF fabrics.

Procedure

1. Enter system view.
`system-view`
2. Configure an interface to not shut down when the IRF fabric transits to the Recovery state.
`mad exclude interface interface-type interface-number`

By default, all network interfaces on a Recovery-state IRF fabric are shut down, except for the network interfaces automatically excluded by the system.

Recovering an IRF fabric

About recovering an IRF fabric

If the active IRF fabric fails before the IRF link is recovered, perform this task on the inactive IRF fabric to recover the inactive IRF fabric for traffic forwarding. The manual recovery operation brings up all interfaces that were shut down by MAD on the inactive IRF fabric.

Procedure

1. Enter system view.
`system-view`
2. Recover the inactive IRF fabric.
`mad restore`

Optimizing IRF settings for an IRF fabric

Configuring a member device description

1. Enter system view.
`system-view`
2. Configure a description for a member device.
`irf member member-id description text`
By default, no member device description is configured.

Configuring IRF bridge MAC address settings

About IRF bridge MAC address configuration

The bridge MAC address of a system must be unique on a switched LAN. IRF bridge MAC address identifies an IRF fabric by Layer 2 protocols (for example, LACP) on a switched LAN.

By default, an IRF fabric uses the bridge MAC address of the master as the IRF bridge MAC address. After the master leaves, the IRF bridge MAC address persists for a period of time or permanently depending on the IRF bridge MAC persistence setting. When the IRF bridge MAC persistence timer expires, the IRF fabric uses the bridge MAC address of the current master as the IRF bridge MAC address.

If IRF fabric merge occurs, IRF determines the IRF bridge MAC address of the merged IRF fabric as follows:

1. When IRF fabrics merge, IRF ignores the IRF bridge MAC addresses and checks the bridge MAC address of each member device in the IRF fabrics. IRF merge fails if any two member devices have the same bridge MAC address.
2. After IRF fabrics merge, the merged IRF fabric uses the bridge MAC address of the merging IRF fabric that won the master election as the IRF bridge MAC address.

Restrictions and guidelines for IRF bridge MAC address configuration

CAUTION:

Bridge MAC address change will cause transient traffic disruption.

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

- If ARP MAD or ND MAD is used with the spanning tree feature, you must disable IRF bridge MAC persistence by using the `undo irf mac-address persistent` command.
- If the IRF fabric has multichassis aggregate links, do not use the `undo irf mac-address persistent` command. Use of this command might cause traffic disruption.

Configuring IRF bridge MAC persistence

1. Enter system view.
`system-view`
2. Configure IRF bridge MAC persistence.
 - Retain the bridge MAC address permanently 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 fabric.

The `irf mac-address persistent timer` command avoids unnecessary bridge MAC address changes caused by device reboot, transient link failure, or purposeful link disconnection.

Enabling software auto-update for software image synchronization

About IRF software auto-update

The software auto-update feature automatically synchronizes the current software images of the master to devices that are attempting to join the IRF fabric.

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 automatically performs the following operations:

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

You must manually update the new device with the software images running on the IRF fabric if software auto-update is disabled.

Restrictions and guidelines

To ensure a successful software auto-update in a multi-user environment, prevent anyone from rebooting 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*).

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 automatically deletes the current software images. If the reclaimed space is still insufficient, the device cannot complete the auto-update. You must reboot the device, and then access the BootWare menu to delete files.

Procedure

1. Enter system view.
`system-view`
2. Enable software auto-update.
`irf auto-update enable`
By default, software auto-update is enabled.

Setting the IRF link status change report delay

About IRF link status change report delay

To prevent frequent IRF splits and merges during link flapping, configure the IRF ports to delay reporting link status change events.

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

The device delays reporting link status change events of an IRF port, but it does not delay reporting link status change events of an IRF physical interface.

Restrictions and guidelines

Make sure the IRF link status change report delay is shorter than the heartbeat or hello timeout settings of upper-layer protocols (for example, CFD 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 RRPP, 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.)

Procedure

1. Enter system view.

```
system-view
```

2. Set the IRF link status change report delay.

```
irf link-delay interval
```

The default IRF link status change report delay is 4 seconds.

Display and maintenance commands for IRF

Execute **display** commands in any view.

Task	Command
Display information about all IRF members.	display irf
Display the IRF fabric topology.	display irf topology
Display IRF link information.	display irf link
Display IRF configuration.	display irf configuration
Display MAD configuration.	display mad [verbose]

IRF configuration examples

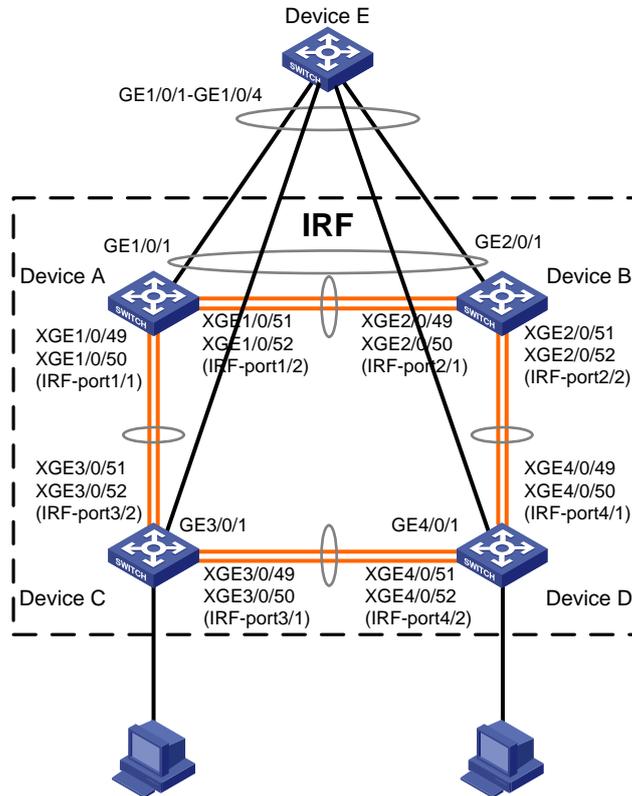
The IRF configuration examples show how to set up IRF fabrics that use different MAD mechanisms.

Example: Configuring an LACP MAD-enabled IRF fabric

Network configuration

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, which supports extended LACP.

Figure 14 Network diagram



Procedure

1. Configure Device A:

Shut down the physical interfaces used for IRF links. In this example, the physical interfaces are shut down in batch. For more information, see *Layer 2—LAN Switching Configuration Guide*.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 1/0/49 and Ten-GigabitEthernet 1/0/50 to IRF-port 1/1.

```
[Sysname] irf-port 1/1
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/49
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/50
[Sysname-irf-port1/1] quit
```

Bind Ten-GigabitEthernet 1/0/51 and Ten-GigabitEthernet 1/0/52 to IRF-port 1/2.

```
[Sysname] irf-port 1/2
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/51
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/52
[Sysname-irf-port1/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 2/0/49 and Ten-GigabitEthernet 2/0/50 to IRF-port 2/1.

```
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/49
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/50
[Sysname-irf-port2/1] quit
```

Bind Ten-GigabitEthernet 2/0/51 and Ten-GigabitEthernet 2/0/52 to IRF-port 2/2.

```
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/51
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/52
[Sysname-irf-port2/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[Sysname-if-range] shutdown
```

```

[Sysname-if-range] quit
# Bind Ten-GigabitEthernet 3/0/49 and Ten-GigabitEthernet 3/0/50 to IRF-port 3/1.
[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/49
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/50
[Sysname-irf-port3/1] quit
# Bind Ten-GigabitEthernet 3/0/51 and Ten-GigabitEthernet 3/0/52 to IRF-port 3/2.
[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/51
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/52
[Sysname-irf-port3/2] quit
# Bring up the physical interfaces and save the configuration.
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[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 have the change take effect.
<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.
(Details not shown.)
# Shut down the physical interfaces.
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
# Bind Ten-GigabitEthernet 4/0/49 and Ten-GigabitEthernet 4/0/50 to IRF-port 4/1.
[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/49
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/50
[Sysname-irf-port4/1] quit
# Bind Ten-GigabitEthernet 4/0/51 and Ten-GigabitEthernet 4/0/52 to IRF-port 4/2.
[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/51
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/52
[Sysname-irf-port4/2] quit
# Bring up the physical interfaces and save the configuration.
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[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 ID is: 1]:
The assigned domain ID is: 1
[Sysname-Bridge-Aggregation2] quit
# Assign GigabitEthernet 1/0/1, GigabitEthernet 2/0/1, GigabitEthernet 3/0/1, and
GigabitEthernet 4/0/1 to the aggregate interface.
[Sysname] interface range gigabitethernet 1/0/1 gigabitethernet 2/0/1
gigabitethernet 3/0/1 gigabitethernet 4/0/1
[Sysname-if-range] port link-aggregation group 2
[Sysname-if-range] quit
```

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] 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 range gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[Sysname-if-range] port link-aggregation group 2
[Sysname-if-range] quit
```

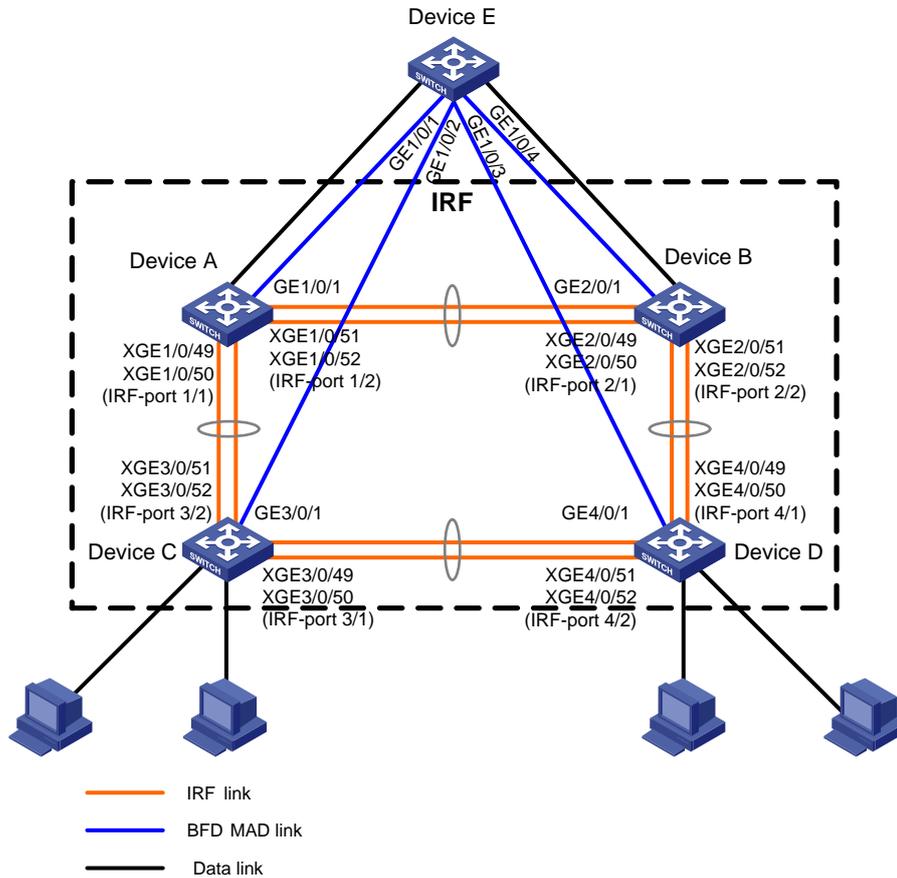
Example: Configuring a BFD MAD-enabled IRF fabric

Network configuration

As shown in [Figure 15](#), set up a four-chassis IRF fabric at the distribution layer of the enterprise network.

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

Figure 15 Network diagram



Procedure

1. Configure Device A:

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 1/0/49 and Ten-GigabitEthernet 1/0/50 to IRF-port 1/1.

```
[Sysname] irf-port 1/1
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/49
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/50
[Sysname-irf-port1/1] quit
```

Bind Ten-GigabitEthernet 1/0/51 and Ten-GigabitEthernet 1/0/52 to IRF-port 1/2.

```
[Sysname] irf-port 1/2
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/51
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/52
[Sysname-irf-port1/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 2/0/49 and Ten-GigabitEthernet 2/0/50 to IRF-port 2/1.

```
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/49
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/50
[Sysname-irf-port2/1] quit
```

Bind Ten-GigabitEthernet 2/0/51 and Ten-GigabitEthernet 2/0/52 to IRF-port 2/2.

```
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/51
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/52
[Sysname-irf-port2/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[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 have the change take effect.

```
<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 15](#), and log in to Device C. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
```

```
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 3/0/49 and Ten-GigabitEthernet 3/0/50 to IRF-port 3/1.

```
[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/49
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/50
[Sysname-irf-port3/1] quit
```

Bind Ten-GigabitEthernet 3/0/51 and Ten-GigabitEthernet 3/0/52 to IRF-port 3/2.

```
[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/51
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/52
[Sysname-irf-port3/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[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 have the change take effect.

```
<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 15](#), and log in to Device D. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 4/0/49 and Ten-GigabitEthernet 4/0/50 to IRF-port 4/1.

```
[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/49
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/50
[Sysname-irf-port4/1] quit
```

Bind Ten-GigabitEthernet 4/0/51 and Ten-GigabitEthernet 4/0/52 to IRF-port 4/2.

```
[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/51
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/52
[Sysname-irf-port4/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
```

```
[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 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 range gigabitethernet 1/0/1 gigabitethernet 2/0/1
gigabitethernet 3/0/1 gigabitethernet 4/0/1
```

```
[Sysname-if-range] undo stp enable
```

```
[Sysname-if-range] quit
```

6. Configure Device E as the intermediate device:

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
```

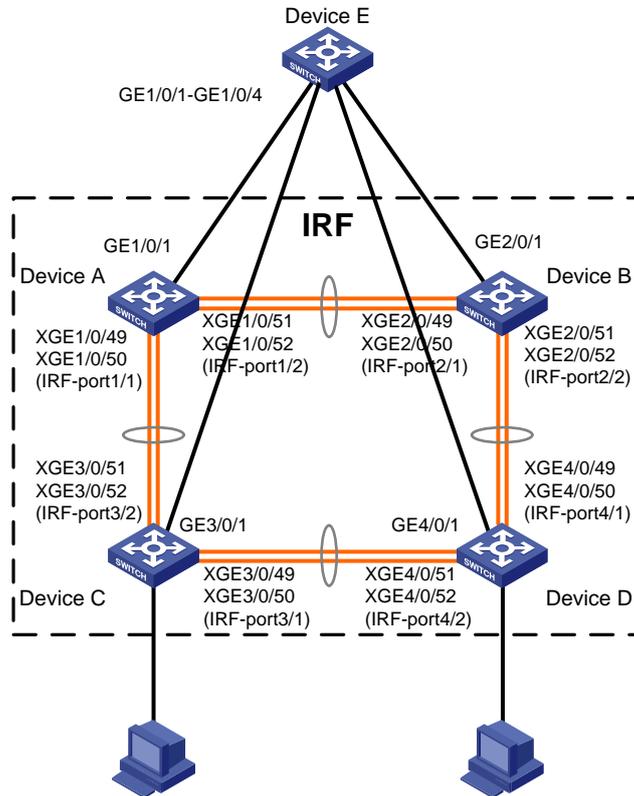
Example: Configuring an ARP MAD-enabled IRF fabric

Network configuration

As shown in [Figure 16](#), set up a four-chassis IRF fabric in the enterprise network.

- Configure ARP MAD on 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.

Figure 16 Network diagram



Procedure

1. Configure Device A:

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
```

```
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
```

```
[Sysname-if-range] shutdown
```

```
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 1/0/49 and Ten-GigabitEthernet 1/0/50 to IRF-port 1/1.

```
[Sysname] irf-port 1/1
```

```
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/49
```

```
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/50
```

```
[Sysname-irf-port1/1] quit
```

Bind Ten-GigabitEthernet 1/0/51 and Ten-GigabitEthernet 1/0/52 to IRF-port 1/2.

```
[Sysname] irf-port 1/2
```

```
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/51
```

```
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/52
```

```
[Sysname-irf-port1/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
```

```
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 2/0/49 and Ten-GigabitEthernet 2/0/50 to IRF-port 2/1.

```
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/49
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/50
[Sysname-irf-port2/1] quit
```

Bind Ten-GigabitEthernet 2/0/51 and Ten-GigabitEthernet 2/0/52 to IRF-port 2/2.

```
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/51
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/52
[Sysname-irf-port2/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 3/0/49 and Ten-GigabitEthernet 3/0/50 to IRF-port 3/1.

```

[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/49
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/50
[Sysname-irf-port3/1] quit
# Bind Ten-GigabitEthernet 3/0/51 and Ten-GigabitEthernet 3/0/52 to IRF-port 3/2.
[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/51
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/52
[Sysname-irf-port3/2] quit
# Bring up the physical interfaces and save the configuration.
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[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 have the change take effect.
<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.
(Details not shown.)
# Shut down the physical interfaces used for IRF links.
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
# Bind Ten-GigabitEthernet 4/0/49 and Ten-GigabitEthernet 4/0/50 to IRF-port 4/1.
[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/49
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/50
[Sysname-irf-port4/1] quit
# Bind Ten-GigabitEthernet 4/0/51 and Ten-GigabitEthernet 4/0/52 to IRF-port 4/2.
[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/51
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/52
[Sysname-irf-port4/2] quit
# Bring up the physical interfaces and save the configuration.
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[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. Map the ARP MAD VLAN to MSTI 1 in the MST region.

```
<Sysname> system-view
[Sysname] stp global enable
[Sysname] stp region-configuration
[Sysname-mst-region] region-name arpmad
[Sysname-mst-region] instance 1 vlan 3
[Sysname-mst-region] active region-configuration
[Sysname-mst-region] quit
```

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 1/0/1, 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, assign it an IP address, and enable ARP MAD on the interface.

```
[Sysname] interface vlan-interface 3
[Sysname-Vlan-interface3] ip address 192.168.2.1 24
[Sysname-Vlan-interface3] mad arp 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. Map the ARP MAD VLAN to MSTI 1 in the MST region.

```
<DeviceE> system-view
[DeviceE] stp global enable
[DeviceE] stp region-configuration
[DeviceE-mst-region] region-name arpmad
[DeviceE-mst-region] instance 1 vlan 3
[DeviceE-mst-region] active region-configuration
[DeviceE-mst-region] quit
```

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 ARP MAD packets.

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

```
[DeviceE-vlan3] quit
```

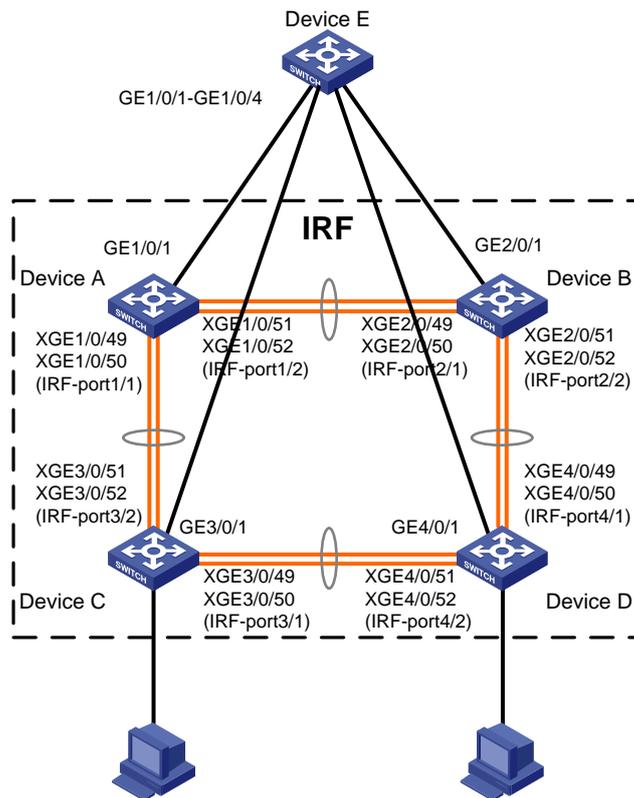
Example: Configuring an ND MAD-enabled IRF fabric

Network configuration

As shown in [Figure 17](#), set up a four-chassis IRF fabric in the IPv6 enterprise network.

- Configure ND MAD on 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



Procedure

1. Configure Device A:

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
```

```
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
```

```
[Sysname-if-range] shutdown
```

```
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 1/0/49 and Ten-GigabitEthernet 1/0/50 to IRF-port 1/1.

```
[Sysname] irf-port 1/1
```

```
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/49
```

```
[Sysname-irf-port1/1] port group interface ten-gigabitethernet 1/0/50
```

```
[Sysname-irf-port1/1] quit
```

Bind Ten-GigabitEthernet 1/0/51 and Ten-GigabitEthernet 1/0/52 to IRF-port 1/2.

```
[Sysname] irf-port 1/2
```

```
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/51
[Sysname-irf-port1/2] port group interface ten-gigabitethernet 1/0/52
[Sysname-irf-port1/2] quit
# Bring up the physical interfaces and save the configuration.
[Sysname] interface range ten-gigabitethernet 1/0/49 to ten-gigabitethernet 1/0/52
[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 have the change take effect.
<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. (Details not shown.)
```

```
# Shut down the physical interfaces used for IRF links.
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 2/0/49 and Ten-GigabitEthernet 2/0/50 to IRF-port 2/1.

```
[Sysname] irf-port 2/1
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/49
[Sysname-irf-port2/1] port group interface ten-gigabitethernet 2/0/50
[Sysname-irf-port2/1] quit
```

Bind Ten-GigabitEthernet 2/0/51 and Ten-GigabitEthernet 2/0/52 to IRF-port 2/2.

```
[Sysname] irf-port 2/2
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/51
[Sysname-irf-port2/2] port group interface ten-gigabitethernet 2/0/52
[Sysname-irf-port2/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 2/0/49 to ten-gigabitethernet 2/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 3/0/49 and Ten-GigabitEthernet 3/0/50 to IRF-port 3/1.

```
[Sysname] irf-port 3/1
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/49
[Sysname-irf-port3/1] port group interface ten-gigabitethernet 3/0/50
[Sysname-irf-port3/1] quit
```

Bind Ten-GigabitEthernet 3/0/51 and Ten-GigabitEthernet 3/0/52 to IRF-port 3/2.

```
[Sysname] irf-port 3/2
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/51
[Sysname-irf-port3/2] port group interface ten-gigabitethernet 3/0/52
[Sysname-irf-port3/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 3/0/49 to ten-gigabitethernet 3/0/52
[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 have the change take effect.

```
<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. (Details not shown.)

Shut down the physical interfaces used for IRF links.

```
<Sysname> system-view
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[Sysname-if-range] shutdown
[Sysname-if-range] quit
```

Bind Ten-GigabitEthernet 4/0/49 and Ten-GigabitEthernet 4/0/50 to IRF-port 4/1.

```
[Sysname] irf-port 4/1
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/49
[Sysname-irf-port4/1] port group interface ten-gigabitethernet 4/0/50
[Sysname-irf-port4/1] quit
```

Bind Ten-GigabitEthernet 4/0/51 and Ten-GigabitEthernet 4/0/52 to IRF-port 4/2.

```
[Sysname] irf-port 4/2
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/51
[Sysname-irf-port4/2] port group interface ten-gigabitethernet 4/0/52
[Sysname-irf-port4/2] quit
```

Bring up the physical interfaces and save the configuration.

```
[Sysname] interface range ten-gigabitethernet 4/0/49 to ten-gigabitethernet 4/0/52
[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. Map the ND MAD VLAN to MSTI 1 in the MST region.

```
<Sysname> system-view
[Sysname] stp global enable
[Sysname] stp region-configuration
[Sysname-mst-region] region-name ndmad
[Sysname-mst-region] instance 1 vlan 3
[Sysname-mst-region] active region-configuration
[Sysname-mst-region] quit
```

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 1/0/1, 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, 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. Map the ND MAD VLAN to MSTI 1 in the MST region.

```
<DeviceE> system-view
[DeviceE] stp global enable
[DeviceE] stp region-configuration
[DeviceE-mst-region] region-name ndmad
[DeviceE-mst-region] instance 1 vlan 3
[DeviceE-mst-region] active region-configuration
[DeviceE-mst-region] quit
# Create VLAN 3, and add GigabitEthernet 1/0/1, GigabitEthernet1/0/2, 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
```

Document conventions and icons

Conventions

This section describes the conventions used in the documentation.

Command conventions

Convention	Description
Boldface	Bold text represents commands and keywords that you enter literally as shown.
<i>Italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x y ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[x y ...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x y ... }*	Asterisk marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[x y ...]*	Asterisk marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

GUI conventions

Convention	Description
Boldface	Window names, button names, field names, and menu items are in Boldface. For example, the New User window opens; click OK .
>	Multi-level menus are separated by angle brackets. For example, File > Create > Folder .

Symbols

Convention	Description
 WARNING!	An alert that calls attention to important information that if not understood or followed can result in personal injury.
 CAUTION:	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.
 IMPORTANT:	An alert that calls attention to essential information.
NOTE:	An alert that contains additional or supplementary information.
 TIP:	An alert that provides helpful information.

Network topology icons

Convention	Description
	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	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.
	Represents an access controller, a unified wired-WLAN module, or the access controller engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a wireless terminator unit.
	Represents a wireless terminator.
	Represents a mesh access point.
	Represents omnidirectional signals.
	Represents directional signals.
	Represents a security product, such as a firewall, UTM, multiservice security gateway, or load balancing device.
	Represents a security module, such as a firewall, load balancing, NetStream, SSL VPN, IPS, or ACG module.

Examples provided in this document

Examples in this document might use devices that differ from your device in hardware model, configuration, or software version. It is normal that the port numbers, sample output, screenshots, and other information in the examples differ from what you have on your device.

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
www.hpe.com/assistance
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates, go to either of the following:
 - Hewlett Packard Enterprise Support Center **Get connected with updates** page:
www.hpe.com/support/e-updates
 - Software Depot website:
www.hpe.com/support/softwaredepot
- To view and update your entitlements, and to link your contracts, Care Packs, and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:
www.hpe.com/support/AccessToSupportMaterials

ⓘ **IMPORTANT:**

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Websites

Website	Link
Networking websites	
Hewlett Packard Enterprise Information Library for Networking	www.hpe.com/networking/resourcefinder
Hewlett Packard Enterprise Networking website	www.hpe.com/info/networking
Hewlett Packard Enterprise My Networking website	www.hpe.com/networking/support
Hewlett Packard Enterprise My Networking Portal	www.hpe.com/networking/mynetworking
Hewlett Packard Enterprise Networking Warranty	www.hpe.com/networking/warranty
General websites	
Hewlett Packard Enterprise Information Library	www.hpe.com/info/enterprise/docs
Hewlett Packard Enterprise Support Center	www.hpe.com/support/hpesc
Hewlett Packard Enterprise Support Services Central	ssc.hpe.com/portal/site/ssc/
Contact Hewlett Packard Enterprise Worldwide	www.hpe.com/assistance
Subscription Service/Support Alerts	www.hpe.com/support/e-updates
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