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# Configuring loop detection

## About loop detection

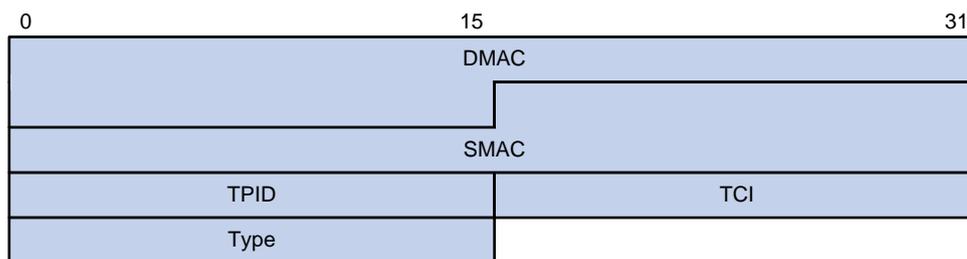
The loop detection mechanism performs periodic checking for Layer 2 loops. The mechanism immediately generates a log when a loop occurs so that you are promptly notified to adjust network connections and configurations. You can configure loop detection to shut down the looped port. Logs are maintained in the information center. For more information, see *Network Management and Monitoring Configuration Guide*.

## Loop detection mechanism

The device detects loops by sending detection frames and then checking whether these frames return to any port on the device. If they do, the device considers that the port is on a looped link.

Loop detection usually works within a VLAN. If a detection frame is returned with a different VLAN tag than it was sent out with, an inter-VLAN loop has occurred. To remove the loop, examine the QinQ or VLAN mapping configuration for incorrect settings. For more information about QinQ and VLAN mapping, see "Configuring QinQ" and "Configuring VLAN mapping."

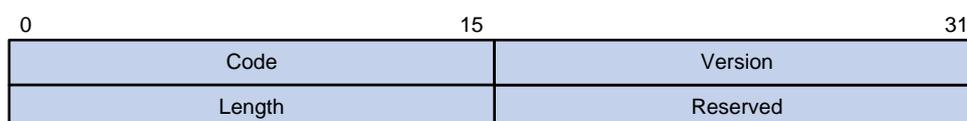
**Figure 1 Ethernet frame header for loop detection**



The Ethernet frame header of a loop detection packet contains the following fields:

- **DMAC**—Destination MAC address of the frame, which is the multicast MAC address 010f-e200-0007. When a loop detection-enabled device receives a frame with this destination MAC address, it performs the following operations:
  - Sends the frame to the CPU.
  - Floods the frame in the VLAN from which the frame was originally received.
- **SMAC**—Source MAC address of the frame, which is the bridge MAC address of the sending device.
- **TPID**—Type of the VLAN tag, with the value of 0x8100.
- **TCI**—Information of the VLAN tag, including the priority and VLAN ID.
- **Type**—Protocol type, with the value of 0x8918.

**Figure 2 Inner frame header for loop detection**



The inner frame header of a loop detection packet contains the following fields:

- **Code**—Protocol sub-type, which is 0x0001, indicating the loop detection protocol.

- **Version**—Protocol version, which is always 0x0000.
- **Length**—Length of the frame. The value includes the inner header, but excludes the Ethernet header.
- **Reserved**—This field is reserved.

Frames for loop detection are encapsulated as TLV triplets.

**Table 1 TLVs supported by loop detection**

TLV	Description	Remarks
End of PDU	End of a PDU.	Optional.
Device ID	Bridge MAC address of the sending device.	Required.
Port ID	ID of the PDU sending port.	Optional.
Port Name	Name of the PDU sending port.	Optional.
System Name	Device name.	Optional.
Chassis ID	Chassis ID of the sending port.	Optional.
Slot ID	Slot ID of the sending port.	Optional.
Sub Slot ID	Sub-slot ID of the sending port.	Optional.

## Loop detection interval

Loop detection is a continuous process as the network changes. Loop detection frames are sent at the loop detection interval to determine whether loops occur on ports and whether loops are removed.

## Loop protection actions

When the device detects a loop on a port, it generates a log but performs no action on the port by default. You can configure the device to take one of the following actions:

- **Block**—Disables the port from learning MAC addresses and blocks the port.
- **No-learning**—Disables the port from learning MAC addresses.
- **Shutdown**—Shuts down the port to disable it from receiving and sending any frames.

## Port status auto recovery

When the device configured with the block or no-learning loop action detects a loop on a port, it performs the action and waits three loop detection intervals. If the device does not receive a loop detection frame within three loop detection intervals, it performs the following operations:

- Automatically sets the port to the forwarding state.
- Notifies the user of the event.

When the device configured with the shutdown action detects a loop on a port, the following events occur:

1. The device automatically shuts down the port.

2. The device automatically sets the port to the forwarding state after the detection timer set by using the `shutdown-interval` command expires. For more information about the `shutdown-interval` command, see *Fundamentals Command Reference*.
3. The device shuts down the port again if a loop is still detected on the port when the detection timer expires.

This process is repeated until the loop is removed.

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**NOTE:**

Incorrect recovery can occur when loop detection frames are discarded to reduce the load. To avoid this, use the shutdown action, or manually remove the loop.

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## Loop detection tasks at a glance

To configure loop detection, perform the following tasks:

1. [Enabling loop detection](#)
  - o [Enabling loop detection globally](#)
  - o [Enabling loop detection on a port](#)
2. (Optional) [Setting the loop protection action](#)
  - o [Setting the global loop protection action](#)
  - o [Setting the loop protection action on an interface](#)
3. (Optional) [Setting the loop detection interval](#)

## Enabling loop detection

### Restrictions and guidelines for loop detection configuration

When you enable loop detection, follow these restrictions and guidelines:

- You can enable loop detection globally or on a per-port basis. When a port receives a detection frame in any VLAN, the loop protection action is triggered on that port, regardless of whether loop detection is enabled on it.
- When EVB is enabled on a Layer 2 Ethernet interface or Layer 2 aggregate interface, the loop detection feature does not take effect on the interface.
- As a best practice, do not enable loop detection on TRILL ports, because TRILL networks prevent loops from being generated. For information more about TRILL, see *TRILL Configuration Guide*.

### Enabling loop detection globally

1. Enter system view.  
`system-view`
2. Globally enable loop detection.  
`loopback-detection global enable vlan { vlan-id--list | all }`  
By default, loop detection is globally disabled.

## Enabling loop detection on a port

1. Enter system view.  
**system-view**
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, S-channel interface view, S-channel aggregate interface view, or S-channel bundle interface view.  
**interface** *interface-type* *interface-number*
3. Enable loop detection on the port.  
**loopback-detection enable** **vlan** { *vlan-id--list* | **all** }  
By default, loop detection is disabled on ports.

## Setting the loop protection action

### Restrictions and guidelines for loop protection action configuration

You can set the loop protection action globally or on a per-port basis. The global action applies to all ports. The per-port action applies to the individual ports. The per-port action takes precedence over the global action.

### Setting the global loop protection action

1. Enter system view.  
**system-view**
2. Set the global loop protection action.  
**loopback-detection global action shutdown**  
By default, the device generates a log but performs no action on the port on which a loop is detected.

### Setting the loop protection action on an interface

1. Enter system view.  
**system-view**
2. Enter interface view.  
**interface** *interface-type* *interface-number*
3. Set the loop protection action on the interface.  
**loopback-detection action** { **block** | **no-learning** | **shutdown** }  
By default, the device generates a log but performs no action on the port on which a loop is detected.  
Support for the keywords of this command varies by interface type. For more information, see *Layer 2—LAN Switching Command Reference*.

# Setting the loop detection interval

## About the loop detection interval

With loop detection enabled, the device sends loop detection frames at the loop detection interval. A shorter interval offers more sensitive detection but consumes more resources. Consider the system performance and loop detection speed when you set the loop detection interval.

## Procedure

1. Enter system view.  
`system-view`
2. Set the loop detection interval.  
`loopback-detection interval-time interval`  
The default setting is 30 seconds.

# Display and maintenance commands for loop detection

Execute `display` commands in any view.

Task	Command
Display the loop detection configuration and status.	<code>display loopback-detection</code>

# Loop detection configuration examples

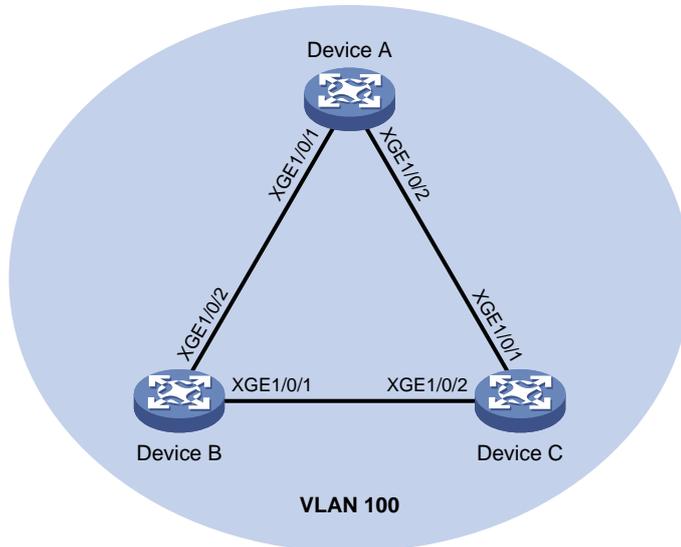
## Example: Configuring basic loop detection functions

### Network configuration

As shown in [Figure 3](#), configure loop detection on Device A to meet the following requirements:

- Device A generates a log as a notification.
- Device A automatically shuts down the port on which a loop is detected.

**Figure 3 Network diagram**



## Procedure

### 1. Configure Device A:

# Create VLAN 100, and globally enable loop detection for the VLAN.

```
<DeviceA> system-view
[DeviceA] vlan 100
[DeviceA-vlan100] quit
[DeviceA] loopback-detection global enable vlan 100
```

# Configure Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 as trunk ports, and assign them to VLAN 100.

```
[DeviceA] interface Ten-GigabitEthernet 1/0/1
[DeviceA-Ten-GigabitEthernet1/0/1] port link-type trunk
[DeviceA-Ten-GigabitEthernet1/0/1] port trunk permit vlan 100
[DeviceA-Ten-GigabitEthernet1/0/1] quit
[DeviceA] interface ten-gigabitethernet 1/0/2
[DeviceA-Ten-GigabitEthernet1/0/2] port link-type trunk
[DeviceA-Ten-GigabitEthernet1/0/2] port trunk permit vlan 100
[DeviceA-Ten-GigabitEthernet1/0/2] quit
```

# Set the global loop protection action to shutdown.

```
[DeviceA] loopback-detection global action shutdown
```

# Set the loop detection interval to 35 seconds.

```
[DeviceA] loopback-detection interval-time 35
```

### 2. Configure Device B:

# Create VLAN 100.

```
<DeviceB> system-view
[DeviceB] vlan 100
[DeviceB-vlan100] quit
```

# Configure Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 as trunk ports, and assign them to VLAN 100.

```
[DeviceB] interface ten-gigabitethernet 1/0/1
[DeviceB-Ten-GigabitEthernet1/0/1] port link-type trunk
```

```
[DeviceB-Ten-GigabitEthernet1/0/1] port trunk permit vlan 100
[DeviceB-Ten-GigabitEthernet1/0/1] quit
[DeviceB] interface ten-gigabitethernet 1/0/2
[DeviceB-Ten-GigabitEthernet1/0/2] port link-type trunk
[DeviceB-Ten-GigabitEthernet1/0/2] port trunk permit vlan 100
[DeviceB-Ten-GigabitEthernet1/0/2] quit
```

### 3. Configure Device C:

#### # Create VLAN 100.

```
<DeviceC> system-view
[DeviceC] vlan 100
[DeviceC-vlan100] quit
```

#### # Configure Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 as trunk ports, and assign them to VLAN 100.

```
[DeviceC] interface ten-gigabitethernet 1/0/1
[DeviceC-Ten-GigabitEthernet1/0/1] port link-type trunk
[DeviceC-Ten-GigabitEthernet1/0/1] port trunk permit vlan 100
[DeviceC-Ten-GigabitEthernet1/0/1] quit
[DeviceC] interface ten-gigabitethernet 1/0/2
[DeviceC-Ten-GigabitEthernet1/0/2] port link-type trunk
[DeviceC-Ten-GigabitEthernet1/0/2] port trunk permit vlan 100
[DeviceC-Ten-GigabitEthernet1/0/2] quit
```

## Verifying the configuration

#### # View the system logs on devices, for example, Device A.

```
[DeviceA]
%Feb 24 15:04:29:663 2013 DeviceA LPDT/4/LPDT_LOOPED: A loop was detected on
Ten-GigabitEthernet1/0/1.
%Feb 24 15:04:29:664 2013 DeviceA LPDT/4/LPDT_VLAN_LOOPED: A loop was detected on
Ten-GigabitEthernet1/0/1 in VLAN 100.
%Feb 24 15:04:29:667 2013 DeviceA LPDT/4/LPDT_LOOPED: A loop was detected on
Ten-GigabitEthernet1/0/2.
%Feb 24 15:04:29:668 2013 DeviceA LPDT/4/LPDT_VLAN_LOOPED: A loop was detected on
Ten-GigabitEthernet1/0/2 in VLAN 100.
%Feb 24 15:04:44:243 2013 DeviceA LPDT/5/LPDT_VLAN_RECOVERED: A loop was removed on
Ten-GigabitEthernet1/0/1 in VLAN 100.
%Feb 24 15:04:44:243 2013 DeviceA LPDT/5/LPDT_RECOVERED: All loops were removed on
Ten-GigabitEthernet1/0/1.
%Feb 24 15:04:44:248 2013 DeviceA LPDT/5/LPDT_VLAN_RECOVERED: A loop was removed on
Ten-GigabitEthernet1/0/2 in VLAN 100.
%Feb 24 15:04:44:248 2013 DeviceA LPDT/5/LPDT_RECOVERED: All loops were removed on
Ten-GigabitEthernet1/0/2.
```

The output shows the following information:

- Device A detected loops on Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 within a loop detection interval.
- Loops on Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 were removed.

#### # Use the **display loopback-detection** command to display the loop detection configuration and status on devices, for example, Device A.

```
[DeviceA] display loopback-detection
Loop detection is enabled.
```

Loop detection interval is 35 second(s).

Loop is detected on following interfaces:

Interface	Action mode	VLANs
Ten-GigabitEthernet1/0/1	Shutdown	100
Ten-GigabitEthernet1/0/2	Shutdown	100

The output shows that the device has removed the loops from Ten-GigabitEthernet 1/0/1 and Ten-GigabitEthernet 1/0/2 according to the shutdown action.

# Display the status of Ten-GigabitEthernet 1/0/1 on devices, for example, Device A.

```
[DeviceA] display interface ten-gigabitethernet 1/0/1
```

```
Ten-GigabitEthernet1/0/1 current state: DOWN (Loop detection down)
```

...

The output shows that Ten-GigabitEthernet 1/0/1 is already shut down by the loop detection module.

# Display the status of Ten-GigabitEthernet 1/0/2 on devices, for example, Device A.

```
[DeviceA] display interface ten-gigabitethernet 1/0/2
```

```
Ten-GigabitEthernet1/0/2 current state: DOWN (Loop detection down)
```

...

The output shows that Ten-GigabitEthernet 1/0/2 is already shut down by the loop detection module.