Configuring UniDirectional Link Detection

Restrictions for Configuring UniDirectional Link Detection

The following are restrictions for configuring UniDirectional Link Detection (UDLD):

- A UDLD-capable port can't detect a unidirectional link if it's connected to a UDLD-incapable port of another device.
- When configuring the mode (normal or aggressive), make sure that the same mode is configured on both sides of the link.
- In the initial phase, the number of ports on which Fast UDLD can be enabled is limited to 32. If this number is reached, then Fast UDLD isn't enabled on additional ports and an error message is printed on the console:

```
UDLD: hundredGigE <> not enabled for fast hello, maximum number of fast hello ports (4)
 reached
```

- If you disable UDLD when Fast UDLD is configured, the entire UDLD configuration is removed.

Caution Loop guard works only on point-to-point links. We recommend that each end of the link has a directly connected device that is running STP.

Information About UniDirectional Link Detection

UniDirectional Link Detection (UDLD) is a Layer 2 protocol that enables devices that are connected through fiber-optic or twisted-pair Ethernet cables to monitor the physical configuration of the cables and detect when

a unidirectional link exists. All connected devices must support UDLD for the protocol to successfully identify and disable unidirectional links. When UDLD detects a unidirectional link, it disables the affected port and alerts you. Unidirectional links can cause a variety of problems, including spanning-tree topology loops.

Fast UniDirectional Link Detection

Fast UDLD supports timers in the few-hundred milliseconds range, which enables subsecond unidirectional link detection. With Fast UDLD, the time to detect a unidirectional link can vary from less than one second to a few seconds (the detection time also depends on how the timers are configured). Link status messages are exchanged every 200ms.

A transition from slow mode to fast mode occurs on the port when both sides of a link have Fast UDLD configured and have negotiated successfully to move into fast mode. A transition from fast mode to slow mode occurs when one of the Fast UDLD configured ports has its port-level Fast UDLD configuration removed.

Fast UDLD functionality has been made available on Catalyst 9500 Series Switches High Performance devices starting with the Cisco IOS XE Fuji 16.9.1release.

Modes of Operation

UDLD and Fast UDLD support two modes of operation: normal (the default) and aggressive. In normal mode, UDLD can detect unidirectional links due to misconnected ports on fiber-optic connections. In aggressive mode, UDLD can also detect unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and to misconnected ports on fiber-optic links.

In normal and aggressive modes, UDLD works with the Layer 1 mechanisms to learn the physical status of a link. At Layer 1, autonegotiation takes care of physical signaling and fault detection. UDLD performs tasks that autonegotiation cannot perform, such as detecting the identities of neighbors and shutting down misconnected ports. When you enable both autonegotiation and UDLD, the Layer 1 and Layer 2 detections work together to prevent physical and logical unidirectional connections and the malfunctioning of other protocols.

A unidirectional link occurs whenever traffic sent by a local device is received by its neighbor but traffic from the neighbor is not received by the local device.

Normal Mode

In normal mode, UDLD detects a unidirectional link when fiber strands in a fiber-optic port are misconnected and the Layer 1 mechanisms do not detect this misconnection. If the ports are connected correctly but the traffic is one way, UDLD does not detect the unidirectional link because the Layer 1 mechanism, which is supposed to detect this condition, does not do so. In this case, the logical link is considered undetermined, and UDLD does not disable the port.

When UDLD is in normal mode, if one of the fiber strands in a pair is disconnected, as long as autonegotiation is active, the link does not stay up because the Layer 1 mechanisms detects a physical problem with the link. In this case, UDLD does not take any action and the logical link is considered undetermined.

Aggressive Mode

In aggressive mode, UDLD detects a unidirectional link by using the previous detection methods. UDLD in aggressive mode can also detect a unidirectional link on a point-to-point link on which no failure between the two devices is allowed. It can also detect a unidirectional link when one of these problems exists:

- On fiber-optic or twisted-pair links, one of the ports cannot send or receive traffic.
- On fiber-optic or twisted-pair links, one of the ports is down while the other is up.
- One of the fiber strands in the cable is disconnected.

In these cases, UDLD disables the affected port.

In a point-to-point link, UDLD hello packets can be considered as a heart beat whose presence guarantees the health of the link. Conversely, the loss of the heart beat means that the link must be shut down if it is not possible to reestablish a bidirectional link.

If both fiber strands in a cable are working normally from a Layer 1 perspective, UDLD in aggressive mode detects whether those fiber strands are connected correctly and whether traffic is flowing bidirectionally between the correct neighbors. This check cannot be performed by autonegotiation because autonegotiation operates at Layer 1.

Methods to Detect Unidirectional Links

UDLD operates by using two methods:

- Neighbor database maintenance
- Event-driven detection and echoing

Neighbor Database Maintenance

UDLD learns about other UDLD-capable neighbors by periodically sending a hello packet (also called an advertisement or probe) on every active port to keep each device informed about its neighbors.

When the device receives a hello message, it caches the information until the age time (hold time or time-to-live) expires. If the device receives a new hello message before an older cache entry ages, the device replaces the older entry with the new one.

Whenever a port is disabled and UDLD is running, whenever UDLD is disabled on a port, or whenever the device is reset, UDLD clears all existing cache entries for the ports that are affected by the configuration change. UDLD sends at least one message to inform the neighbors to flush the part of their caches affected by the status change. The message is intended to keep the caches synchronized.

Note An interface does not support multiple UDLD neighbors. If an ingress UDLD protocol data unit (PDU) has multiple device IDs in echo type, length and value (TLV), the interface enters the error-disabled state.

Event-Driven Detection and Echoing

UDLD relies on echoing as its detection operation. Whenever a UDLD device learns about a new neighbor or receives a resynchronization request from an out-of-sync neighbor, it restarts the detection window on its side of the connection and sends echo messages in reply. Because this behavior is the same on all UDLD neighbors, the sender of the echoes expects to receive an echo in reply.

If the detection window ends and no valid reply message are received, the link might shut down, depending on the UDLD mode. When UDLD is in normal mode, the link might be considered undetermined and might

not be shut down. When UDLD is in aggressive mode, the link is considered unidirectional, and the port is disabled.

UniDirectional Link Detection Reset Options

If an interface becomes disabled by UDLD, you can use one of the following options to reset UDLD:

- The **udld reset** interface configuration command.
- The **shutdown** interface configuration command followed by the **no shutdown** interface configuration command restarts the disabled port.
- The **no udld** {**aggressive** | **enable**} global configuration command followed by the **udld** {**aggressive** | **enable**} global configuration command reenables the disabled ports.
- The **no udld port** interface configuration command followed by the **udld port** [**aggressive**] interface configuration command reenables the disabled fiber-optic port.
- The **errdisable recovery cause udld** global configuration command enables the timer to automatically recover from the UDLD error-disabled state, and the **errdisable recovery interval** *interval* global configuration command specifies the time to recover from the UDLD error-disabled state.

The **udld port disable** command disables UDLD on fiber-optic LAN ports.

Note This command is only supported on fiber-optic LAN ports.

Default UniDirectional Link Detection Configuration

Table 1: Default UDLD Configuration

Feature	Default Setting
UDLD global enable state	Globally disabled
UDLD per-port enable state for fiber-optic media	Disabled on all Ethernet fiber-optic ports
UDLD per-port enable state for twisted-pair (copper) media	Disabled on all Ethernet 10/100 and 1000BASE-TX p
UDLD aggressive mode	Disabled
Fast UDLD per-port enable state	Disabled on all ports

How to Configure UDLD

The following sections provide information about configuring UDLD:

Enabling UniDirectional Link Detection Globally

Follow these steps to enable UDLD in the aggressive or normal mode and to set the configurable message timer on all fiber-optic ports on the device.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**udld** {**aggressive** | **enable** | **message time** *message-timer-interval*} **Example:** `Device(config)# udld enable message time 10`	Specifies the UDLD mode of operation: • **aggressive**—Enables UDLD in aggressive mode on all fiber-optic ports. • **enable**—Enables UDLD in normal mode on all fiber-optic ports on the device. UDLD is disabled by default. An individual interface configuration overrides the setting of the **udld enable** global configuration command. • **message time** *message-timer-interval*—Configures the period of time between UDLD probe messages on ports that are in the advertisement phase and are detected to be bidirectional. The range is from 1 to 90 seconds; the default value is 15. **Note** This command affects fiber-optic ports only. Use the **udld** interface configuration command to enable UDLD on other port types. Use the **no** form of this command, to disable UDLD.
Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Enabling UniDirectional Link Detection on an Interface

Follow these steps either to enable UDLD in the aggressive or normal mode or to disable UDLD on a port.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-id* **Example:** `Device(config)# interface gigabitethernet 1/0/1`	Specifies the port to be enabled for UDLD, and enters interface configuration mode.
Step 4	**udld port** [**aggressive**] **Example:** `Device(config-if)# udld port aggressive`	UDLD is disabled by default. • **udld port**—Enables UDLD in normal mode on the specified port. • **udld port aggressive**—(Optional) Enables UDLD in aggressive mode on the specified port. **Note** Use the **no udld port** interface configuration command to disable UDLD on a specified fiber-optic port.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Enabling Fast UniDirectional Link Detection on an Interface

Follow these steps to enable Fast UDLD on a port.

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 2	**interface** *interface-id* **Example:** `Device(config)# interface gigabitethernet 1/0/1`	Specifies the port to be enabled for Fast UDLD, and enters interface configuration mode.
Step 3	**udld fast-hello** *message time interval* **Example:** `Device(config-if)# udld fast-hello 200`	Enables Fast UDLD on the specified port. • **message time** *message-timer-interval*—Configures the period of time between UDLD probe messages on ports that are in the advertisement phase and are detected to be bidirectional. **Note** Fast UDLD can be enabled only if UDLD is already enabled on the specified port.
Step 4	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Enabling Fast UniDirectional Link Detection Error Reporting

Follow these steps to enable Fast UDLD error reporting on the switch.

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**udld fast-hello error-reporting** **Example:** `Device(config)# udld fast-hello error-reporting`	Enables the display of console messages to report the error upon detection of a link failure. **Note** The detected unidirectional link will not be disabled if **udld fast-hello error-reporting** has been enabled.
Step 3	end **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Disabling UniDirectional Link Detection on Fiber-Optic LAN Interfaces

To disable UDLD on Fiber-optic LAN interfaces, perform this procedure:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/1/1`	Configures an interface and enters interface configuration mode.
Step 4	**udld port disable** **Example:** `Device(config-if)# udld port disable`	Disables UDLD on a fiber-optic LAN port. • The **udld port disable** command is only supported on fiber-optic LAN ports. • The **no udld port disable** command reverts to the **udld enable** global configuration command setting.
Step 5	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Monitoring and Maintaining UniDirectional Link Detection

Command	Purpose
show udld [*interface-id* | **neighbors**]	Displays the UDLD status for the specified port or for all ports.
show udld fast-hello [*interface-id*]	Displays fast-hello information for the specified port or for all ports.

Console Error Messages For Fast UniDirectional Link Detection

When a link failure is detected by fast UDLD, the unidirectional link is err-disabled by UDLD after displaying the following message on the console:

```
%UDLD-4-UDLD_PORT_DISABLED: UDLD disabled interface Hu1/0/10, unidirectional link detected
```

If the **udld fast-hello error-reporting** is configured, when fast UDLD detects a link failure, it prints the following console message instead of err-disabling the affected port:

```
%UDLD-SP-4-UDLD_PORT_FAILURE: UDLD failure reported per user request, interface HU1/0/10,
fast udld unidirectional link detected
```

The **udld reset** command can be used to clear the UDLD port state in both the cases.

Additional References for UniDirectional Link Detection

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the Layer 2/3 Commands section of the *Command Reference (Catalyst 9500 Series Switches)*

Feature History for UniDirectional Link Detection

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.5.1a	UniDirectional Link Detection (UDLD)	UDLD is a Layer 2 protocol that enables devices connected through fiber-optic or twisted-pair Ethernet cables to monitor the physical configuration of the cables and detect when a unidirectional link exists. Support for this feature was introduced only on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Fuji 16.8.1a	UniDirectional Link Detection (UDLD)	Support for this feature was introduced only on the C9500-32C, C9500-32QC, C9500-48Y4C, and C9500-24Y4C models of the Cisco Catalyst 9500 Series Switches.

Release	Feature	Feature Information
Cisco IOS XE Fuji 16.9.1	Fast UDLD	Enables subsecond UDLD. The UDLD protocol helps monitor a physical connection (such as monitoring wrong cabling) to detect unidirectional links to avoid spanning-tree topology loops or silent drop traffic. Support for this feature was introduced only on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.