Configuring Link Level Flow Control

- Link Level Flow Control, on page 1
- Guidelines and Limitations for Link Level Flow Control, on page 1
- Information About Link Level Flow Control, on page 2
- How to Configure Link Level Flow Control, on page 3
- Configuration Examples for Link Level Flow Control, on page 5

Link Level Flow Control

Link-level flow control is a congestion management technique that pauses data transmission until the congestion in the system is resolved. When a receiving device becomes congested, it communicates with the transmitter by sending a PAUSE frame. When the transmitting device receives a Pause frame it stops the transmission of any further data frames for a short period of time. The link-level flow control feature applies to all the traffic on the link. The transmit and receive directions are separately configurable. By default, link-level flow control is disabled for both directions.

Guidelines and Limitations for Link Level Flow Control

Link Level Flow Control (LLFC) has the following configuration guidelines and limitations:

- **show** commands with the **internal** keyword are not supported.
- Changing or configuring LLFC on FEX HIF or FEX HIF PO interfaces is not supported.
- LLFC is supported on Cisco Nexus 9500 platform switches with Network Forwarding Engine (NFE) (and Cisco Nexus 3164Q switch with NFE).
- The 100G Cisco Nexus 9408PC-CFP2 line card does not support LLFC.
- Ethernet interfaces do not auto detect the LLFC capability. LLFC must be configured explicitly.
- Enabling LLFC requires a part of the buffer to be reserved. This reservation reduces the available shared buffer space.
- Data Center Bridging Exchange Protocol (DCBX) is not supported.
- Configuration time quanta of the pause frames is not supported.
- On each Ethernet interface, the switch can enable either PFC or LLFC, but not both.

Note When both PFC and LLFC are enabled, LLFC is selected.

- Configuring LLFC on an interface causes the interface to flap which results in a momentary traffic loss.
- When a no-drop QoS group is configured, you must ensure that the packets received, on ports that do not have flow control send-on configured, are not classified to a no-drop QoS group.
- Do not enable Weighted Random Early Detection (WRED) on a no-drop class because it can cause an egress queue drop.
- We recommend the use of default buffer sizes for no-drop classes because if the buffer size is specified through the CLI, it allocates the same buffer size for all ports irrespective of the link speed, and MTU size.
- We recommend changing the LLFC configuration when there is no traffic, otherwise packets already in the MMU of the system may not get the expected treatment.
- LLFC and PFC are supported on Cisco Nexus 9300-X Cloud Scale platform switches and 9500 Series Cloud Scale modular switches.
- From Cisco NX-OS Release 10.4(1)F, LLFC is supported on Cisco Nexus C9348GC-FX3.
- From Cisco NX-OS Release 10.4(2)F, LLFC is supported on Cisco Nexus C93108TC-FX3 switch.
- From Cisco NX-OS Release 10.4(1)F, LLFC and LLFCWD features are not supported on Cisco Nexus C9348GC-FX3PH.

Information About Link Level Flow Control

Link Level Flow Control on Interfaces

When link level flow control is configured the system changes the interface state to Down if the specified interface is in UP state and then applies the flow control configuration. After the configuration is successfully applied to the interface, the system restores the interface to the UP state.

Link Level Flow Control on Ports

During a port shutdown event, the flow-control settings on an interface are retained, however no traffic is received or transmitted on the link. During a port startup event the flow-control settings are reinstated on to the hardware.

Mismatched Link Level Flow Control Configurations

The transmit and receive directions can be configured separately, and each device on the network can have a different Link Level Flow Control (LLFC) configuration. The following table describes how devices with mis-matched configurations interact.

Switch A	Switch B	Description
LLFC configured to receive and transmit PAUSE frames.	LLFC configured to receive PAUSE frames.	Switch A can transmit 802.3x PAUSE frames and honor 802.3x PAUSE frames. Switch B can only receive 802.3x PAUSE frames.
LLFC configured to receive and transmit PAUSE frames.	LLFC configured to transmit PAUSE frames.	Switch A can transmit 802.3x PAUSE frames and honor 802.3x PAUSE frames. Switch B can transmit 802.3x PAUSE frames but will drop all received PAUSE frames.

How to Configure Link Level Flow Control

Configuring Link Level Flow Control Receive

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet 1/1**
3. **flowcontrol receive on**
4. **exit**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**interface ethernet 1/1** **Example:** `Device(config)# interface ethernet 1/1`	Configures an interface type and enters interface configuration mode.
Step 3	**flowcontrol receive on** **Example:** `Device(config-if)# flowcontrol receive on`	Enables the interface to receive and process pause frames.

	Command or Action	Purpose
Step 4	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode.

Configuring Link Level Flow Control Transmit

To configure link-level flow control transmit on an interface, you enable flow control on the interface, configure a network-qos type QoS policy to enable a no-drop QoS group, and apply a qos type QoS policy to classify the traffic that requires no-drop behavior to the no-drop class.

You must ensure that bandwidth is allocated for the No-Drop QoS class using a queuing policy when you define a no-drop class. For more information, see the "Configuring Type Queuing Policies" section.

Note When a no-drop QoS Group is configured you must ensure that packets received on ports that do not have flow-control send-on configured, are not classified to a no-drop QoS group. This is required as any ingress port that does not have flow-control send-on configured, can not generate a link level pause frame and there is no way to request the transmitting device to stop the transmission. Therefore, if flow-control send-on is not configured on all the interfaces you should not use a system policy to classify the packets to the no-drop QoS group. Instead, you should apply an interface QoS policy to the interfaces that having flow-control send-on enabled.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet 1/1**
3. **flowcontrol send on**
4. **exit**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**interface ethernet 1/1** **Example:** `Device(config)# interface ethernet 1/1`	Configures an interface type and enters interface configuration mode.

	Command or Action	Purpose
Step 3	**flowcontrol send on** **Example:** `Device(config-if)# flowcontrol transmit on`	Enables the interface to send pause frames to remote devices.
Step 4	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.

Configuration Examples for Link Level Flow Control

Example: Configuring Link Level Flow Control Receive and Send

Configuring Link Level Flow Control Receive and Send

The following examples show how to configure Link Level Flow Control receive and send on the device.

- When only LLFC receive is enabled, no-drop class does not need to be configured on the system network-qos.

```
Device# configure terminal
Device(config)# interface ethernet 1/1
Device(config-if)# flowcontrol receive on
Device(config-if)# exit
```

- When both LLFC receive and send are enabled, no-drop class needs to be configured on the system network-qos. For information about configuring a no-drop class, refer to Configuring a No-Drop Policy.

  If PFC is configured on an interface, you do not need to enable LLFC transmission on the same interface.

```
Device# configure terminal
Device(config)# interface ethernet 1/1
Device(config-if)# flowcontrol receive on
Device(config-if)# flowcontrol send on
Device(config-if)# exit
```

- When only LLFC send is enabled, no-drop class needs to be configured on the system network-qos. For information about configuring a no-drop class, refer to Configuring a No-Drop Policy.

  If PFC is configured on an interface, you do not need to enable LLFC transmission on the same interface.

```
Device# configure terminal
Device(config)# interface ethernet 1/1
Device(config-if)# flowcontrol send on
Device(config-if)# exit
```