Fibre Channel Slow Drain Device Detection and Congestion Avoidance- An Overview

All data traffic between end devices in the SAN fabric is carried by Fibre Channel Class 3, and in some cases, Class 2 services, that use link-level, per-hop-based, and buffer-to-buffer flow control. These classes of service do not support end-to-end flow control. When slow devices are attached to the fabric, the end devices do not accept the frames at the configured or negotiated rate. The slow devices lead to an Inter-Switch Link (ISL) credit shortage in the traffic that is destined for these devices and they congest the links. The credit shortage affects the unrelated flows in the fabric that use the same ISL link even though destination devices do not experience a slow drain.

This feature provides various enhancements that enable you to detect slow drain devices are cause congestion in the network and also provide congestion avoidance.

The enhancements are mainly on the edge ports that connect to the slow drain devices to minimize the frames stuck condition in the edge ports due to slow drain devices that are causing an ISL blockage. To avoid or minimize the stuck condition, configure lesser frame timeout for the ports. You can use the no-credit timeout to drop all packets after the slow drain is detected using the configured thresholds. A smaller frame timeout value helps to alleviate the slow drain condition that affects the fabric by dropping the packets on the edge ports sooner than the time they actually get timed out (358 ms). This function frees the buffer space in ISL, which can be used by other unrelated flows that do not experience slow drain condition.

Note This feature supports edge ports that are connected to slow edge devices. Even though you can apply this feature to ISLs as well, we recommend that you apply this feature only for edge F ports and retain the default configuration for ISLs as E and TE ports. This feature is not supported on Generation 1 modules.

How to Configure a Stuck Frame Timeout Value

Configuring a Stuck Frame Timeout Value

The default stuck frame timeout value is 358 ms. The timeout value can be incremented in steps of 10. We recommend that you retain the default configuration for ISLs and configure a value that does not exceed 500 ms (100 to 200 ms) for fabric F ports.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **system timeout congestion-drop** *seconds* **mode E | F**	Specifies the stuck frame timeout value in milliseconds and the port mode for the switch.
Step 3	switch(config)# **system timeout congestion-drop default mode E | F**	Specifies the default stuck frame timeout port mode for the switch.

This example shows how to configure a stuck frame timeout value of 100 ms:

```
switch# configure terminal
switch(config)# system timeout congestion-drop 100 mode F
switch(config)# system timeout congestion-drop default mode F
```

How to Configure a No-Credit Timeut Value

Configuring a No-Credit Timeout Value

When the port does not have the credits for the configured period, you can enable a no-credit timeout on that port, which results in all frames that come to that port getting dropped in the egress. This action frees the buffer space in the ISL link, which helps to reduce the fabric slowdown and congestion on other unrelated flows that use the same link.

The dropped frames are the frames that have just entered the switch or have stayed in the switch for the configured timeout value. These drops are preemptive and clear the congestion completely.

The no-credit timeout feature is disabled by default. We recommend that you retain the default configuration for ISLs and configure a value that does not exceed 358 ms (200 to 300 ms) for fabric F ports.

You can disable this feature by entering the **no system timeout no-credit-drop mode F** command.

Note The no-credit timeout value and stuck frame timeout value are interlinked. The no-credit timeout value must always be greater than the stuck frame timeout value.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **system timeout no-credit-drop** *seconds* **mode F**	Specifies the no-credit timeout value and port mode for the switch. The *seconds* value is 500ms by default. This value can be incremented in steps of 100.
Step 3	switch(config)# **system timeout no-credit-drop default mode F**	Specifies the default no-credit timeout value port mode for the switch.

This example shows how to configure a no-credit timeout value:

```
switch# configure terminal
switch(config)# system timeout no-credit-drop 100 mode F
switch(config)# system timeout no-credit-drop default mode F
```

Displaying Credit Loss Counters

Use the following commands to display the credit loss counters per module per interface for the last specified minutes, hours, and days:

Command	Purpose
show process creditmon {**credit-loss-event-history** | **credit-loss-events** | **force-timeout-events** | **timeout-discards-events**}	Displays Onboard Failure Logging (OBFL) credit loss logs.

Displaying Credit Loss Events

Use one of the following commands to display the total number of credit loss events per interface with the latest three credit loss time stamps:

Command	Purpose
show process creditmon credit-loss-events [**module** *module number*]	Displays the credit loss event information for a module.
show process creditmon credit-loss-event-history [**module** *module number*]	Displays the credit loss event history information.

Displaying Timeout Drops

Use the following command to display the timeout drops per module per interface for the last specified minutes, hours, and days:

Command	Purpose
show logging onboard flow-control timeout-drops [**last** *mm* **minutes**] [**last** *hh* **hours**] [**last** *dd* **days**] [**module** *module number*]	Displays the Onboard Failure Logging (OBFL) timeout drops log.

Displaying the Average Credit Not Available Status

When the average credit nonavailable duration exceeds the set threshold, you can error-disable the port, send a trap with interface details, and generate a syslog with interface details. In addition, you can combine or more actions or turn on or off an action. The port monitor feature provides the command line interface to configure the thresholds and action. The threshold configuration can be a percentage of credit non-available duration in an interval.

The thresholds for the credit nonavailable duration can be 0 percent to 100 percent in multiples of 10, and the interval can be from 1 second to 1 hour. The default is 10 percent in 1 second and generates a syslog.

Use the following command to display the average credit-not-available status:

Command	Purpose
show system internal snmp credit-not-available {**module** | **module-id**}	Displays the port monitor credit-not-available counter logs.

How to Configure a Port Monitor

Port Monitoring

You can use port monitoring to monitor the performance of fabric devices and to detect slow drain devices. You can monitor counters and take the necessary action depending on whether the portguard is enabled or disabled. You can configure the thresholds for various counters and trigger an event when the values cross the threshold settings. Port monitoring provides a user interface that you can use to configure the thresholds and action. By default, portguard is disabled in the port monitoring policy.

Two default policies, default and default slowdrain, are created during snmpd initialization. The default slowdrain policy is activated when the switch comes online when no other policies are active at that time. The default slowdrain policy monitors only credit-loss-reco and tx-credit-not-available counters.

When you create a policy, it is created for both access and trunk links. The access link has a value of F and the trunk link has a value of E.

Enabling Port Monitor

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# [**no**] **port-monitor enable**	Enables (default) the port monitoring feature. The **no** version of this command disables the port monitoring feature.

Configuring a Port Monitor Policy

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **port-monitor name** *policyname*	Specifies the policy name and enters the port monitor policy configuration mode.
Step 3	switch(config-port-monitor)# **port-type all**	Applies the policy to all ports.
Step 4	switch(config-port-monitor)# **counter** {**invalid-crc** | **invalid-words** | **link-loss** | **protocol-error** |**rx-performance** | **signal-loss** | **sync-loss** | **tx-performance** | **credit-loss-reco** | **tx-credit-not-available** | **lr-rx** | **lr-tx** | **timeout-discards** | **tx-discards**} **poll-interval** *seconds* **absolute rising-threshold** *value1* **event** *event-id1* **falling-threshold** *value2* **event** *event-id2*	Specifies the poll interval in seconds, the thresholds in absolute numbers, and the event IDs of events to be triggered for the following reasons: • credit-loss-reco—Credit loss recovery • timeout-discards—Timeout discards
Step 5	switch(config-port-monitor)# **counter tx-credit-not-available poll-interval** *seconds* **delta rising-threshold** *percentage1* **event** *event-id1* **falling-threshold** *percentage2* **event** *event-id2*	Specifies the delta poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered for the following reasons: • **tx-credit-not-available**—Average credit non-available duration
Step 6	switch(config-port-monitor)# [**no**] **monitor counter** {**invalid-crc** | **invalid-words** | **link-loss** | **protocol-error** | **rx-performance** | **signal-loss** | **state-change** | **sync-loss** | **tx-performance** | **credit-loss-reco** | **tx-credit-not-available** | **lr-rx** | **lr-tx** | **timeout-discards** | **tx-discards**}	Turns on monitoring for the specified counter. The **no** form of this command turns off monitoring for the specified counter.

This example shows how to specify the poll interval and threshold for timeout discards:

```
switch# configure terminal
switch(config)# port-monitor cisco
switch(config-port-monitor)# counter timeout-discards
```

This example show how to specify the poll interval and threshold for link reset responses received by the FC port:

```
switch# configure terminal
switch(config)# port-monitor cisco
switch(config-port-monitor)# counter poll-interval 20 delta rising-threshold 10 event 4
falling-threshold 3 event 4
```

Activating a Port Monitor Policy

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **port-monitor activate** *policyname*	Activates the specified port monitor policy.
Step 3	switch(config)# **port-monitor activate**	(Optional) Activates the default port monitor policy.
Step 4	switch(config)# **no port-monitor activate** *policyname*	(Optional) Deactivates the specified port monitor policy.

This example shows how to activate a specific port monitor policy:

```
switch# configure terminal
switch(config)# port-monitor activate cisco
```

Displaying Port Monitor Policies

Use the following command to display port monitor policies:

Command	Purpose
switch# **show port-monitor** *policyname*	Displays details of the specified port monitor policy.

This example shows how to display a specific port monitor policy:

```
switch# show port-monitor cisco

Policy Name  : cisco

Admin status : Active

Oper status  : Active
```

```
Port type    : All Ports

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Counter                 Threshold  Interval Rising Threshold event Falling Threshold  event
 Portguard     In Use

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Timeout Discards         Delta      60       200              4     10                 4
   Not enabled   Yes

Credit Loss Reco         Delta      5        4                4     1                  4
   Not enabled   Yes

TX Credit Not Available  Delta      30       60               4     10                 4
   Not enabled   Yes

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```