

FSOS

EFM Configuration

Contents

1. EFM Configuration.....	1
1.1 EFM Overview.....	1
1.1.1 EFM Main Function.....	1
1.1.2 EFM Protocol Packet.....	2
1.2 Configure EFM.....	2
1.2.1 EFM Basic Configuration.....	3
1.2.2 Configure EFM Timer Parameter.....	3
1.2.3 Configure the Remote Fault Detection Function.....	4
1.2.4 Configure the Link Monitoring Function.....	4
1.2.5 Enable Remote Loopback.....	5
1.2.6 Reject Remote Loopback Request From Remote Side.....	6
1.2.7 Enable the Remote MIB Variable Acquisition Function.....	6
1.2.8 Initiate the Remote MIB Variable Acquisition Request.....	6
1.2.9 EFM Display and Maintenance.....	7
1.3 Configuration Example.....	7

1. EFM Configuration

1.1 EFM Overview

EFM (Ethernet of First Mile), known as the first mile Ethernet, is defined by the IEEE 802.3ah standard for the management and maintenance of point-to-point Ethernet links between two devices.

1.1.1 EFM Main Function

EFM can effectively improve the management and maintenance of Ethernet capacity to ensure the stable operation of the network, its main functions include:

EFM Main Function

Function	Explanation
EFM auto-discovery function	<p>The EFM function is established on the basis of the EFM connection. The EFM connection establishment process is realized by the EFM automatic discovery function. Between the connected EFM entities, the information about the EFM configuration and the EFM capability supported by the local EFM are notified through the information OAMPDUs. After the EFM entity receives the configuration parameters of the opposite side, it determines whether to establish the EFM connection.</p> <p>There are two EFM modes: active mode and passive mode. An EFM connection can only be initiated by an EFM entity in active mode. An EFM entity in passive mode can only wait for a connection request from an opposite EFM entity. EFM connections can not be established between two EFM entities in passive mode.</p>
Remote fault indication function	<p>When the device detects an emergency link event, the faulty EFM entity reports the fault information (that is, the emergency link event type) to the remote EFM entity through the Flag field in the Information OAMPDU. In this manner, the administrator can dynamically learn the link status by observing the log information and process the corresponding errors in time.</p> <p>The emergency link event types include Link Fault, Dying Gasp, and Critical Event.</p>
Link monitoring function	<p>The link monitoring function is used to detect and discover the link layer faults in various environments. The EFM monitors the links by exchanging Event Notification OAMPDUs: When an EFM entity detects a general link event, it sends Event Notification OAMPDU for notification, administrators can monitor the status of the network dynamically by observing the log information.</p> <p>The general link event types include errored-symbol-period, errored-frame,</p>

	errored-frame-period and errored-frame-seconds.
Remote loopback	Remote loopback means that an EFM entity in active mode sends all the packets except the OAMPDUs to the remote side. After receiving the packet, the remote device does not forward the packet according to its destination address. Instead, it sends the packet back to the Local. The remote loopback function controls the remote side to perform the remote loopback function or cancel the remote loopback operation through the loopback control OAMPDU. This function can be used to detect the link quality and locate the link fault.
Remote MIB variable acquisition	The EFM entity can obtain the MIB variable value of the remote entity by exchanging the Variable Request / Response OAMPDU. The MIB variables contain all the performance parameters and error statistics on the Ethernet link. It provides the local EFM entity with a common detection mechanism for the performance and error of the remote entity.

Note:

The EFM-enabled port is called an EFM entity.

1.1.2 EFM Protocol Packet

EFM works at the data link layer, and its protocol packet is called OAMPDU (OAM Protocol Data Units). EFM reports the link status by periodically exchanging OAMPDUs between devices so that the network administrator can manage the network effectively.

EFM Protocol Packet Types and Effects

Packet type	Function
Information OAMPDU	It is used to send the status information of the EFM entity (including local information, remote information, and custom information) to the remote EFM entity to keep the EFM connection.
Event Notification OAMPDU	Generally, it is used for link monitoring and alarming of faults on the link connecting the local and remote EFM entities.
Loopback Control OAMPDU	It is mainly used for remote loopback control. It is used to control the EFM loopback status of a remote device. This packet contains information about enabling or disabling the loopback function. The remote loopback function is enabled or disabled based on this information. .
Variable Request/Response OAMPDU	It is used to obtain the MIB variable value of the remote device to monitor the remote status.

1.2 Configure EFM

1.2.1 EFM Basic Configuration

EFM works in active mode and passive mode. When EFM is enabled, the Ethernet port starts using the default working mode to establish EFM connections with its opposite ports.

EFM Basic Configuration

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	
Enter the port configuration mode	Interface ethernet <i>interface-num</i>	Required
Start EFM	efm	Required. By default, EFM is disabled
Close EFM	No efm	Port mode
Configure the EFM working mode	efm mode { passive active }	Optional By default, EFM works in active mode

1.2.2 Configure EFM Timer Parameter

After an EFM connection is established, EFM entities at both sides send information OAMPDUs at intervals of a certain interval to check whether the connection is normal. The interval is called handshake packet sending interval. If an EFM entity does not receive an Information OAMPDU from the remote EFM entity within the connection timeout period, the EFM connection is considered interrupted.

By adjusting the EFM handshake packet sending interval and connection timeout time, you can change the detection precision of the EFM connection. Configure the timeout time for responses of remote devices to OAMPDU request packets, if the response times out, the OAMPDU response packets received are discarded.

EFM Timer Parameter Configuration

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	-
Enter the port configuration mode	interface ethernet <i>interface-num</i>	If Switch products, only ethernet type port; if PON products, there are Ethernet and pon type port
Set the interval for sending EFM handshake packets	efm pdu-timeout time	Optional The default is 1s
Set the timeout time for EFM connections	efm link-timeout time	Optional The default is 5s
Set the response timeout time	efm remote-response-timeout time	Optional The default is 2s
Recovery Response Timeout Time	No efm remote-response-	Optional, restore the default

	timeout	
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Note:

After the EFM connection times out, the local EFM entity ages the connection with the opposite EFM entity and disables the EFM connection. Therefore, the connection timeout time must be greater than the handshake packet sending interval (recommended to be 3 times or more). Otherwise, the EFM connection will become unstable.

1.2.3 Configure the Remote Fault Detection Function

Configure the Remote Fault Detection Function

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	-
Enter the port configuration mode	interface ethernet <i>interface-num</i>	-
Enable the remote fault detection function	efm remote-failure { link-fault dying-gasp critical-event }	Optional By default, the remote fault detection function is enabled
Disable the remote fault detection function	no efm remote-failure { link-fault dying-gasp critical-event }	Optional

Note:

The remote fault detection function requires the device to support the single-link function to notify the emergency link event of the local to the remote. On the device that does not support the single-link function, after the local detects an emergency link event, it only reports the alarm to the local and can not notify the remote.

1.2.4 Configure the Link Monitoring Function

Configure the Link Monitoring Function

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	-
Enter the port configuration mode	interface ethernet <i>device/slot/port</i>	-
Enable the link monitoring function	efm link-monitor { errored-symbol-period errored-frame errored-frame-period errored-frame-seconds }y	Optional. By default, the link

		monitoring function is enabled
Disable the link monitoring function	no efm link-monitor { errored-symbol-period errored-frame errored-frame-period errored-frame-seconds }	optional
Configure the errored-symbol-period event detection interval	efm link-monitor errored-symbol-period window high <i>win-value1</i> low <i>win-value2</i>	optional
Configure the errored-symbol-period event detection threshold	efm link-monitor errored-symbol-period threshold high <i>th-value1</i> low <i>th-value2</i>	optional
Configure the errored-frame event detection interval	efm link-monitor errored-frame window <i>win-value</i>	optional
Configure the errored-frame event detection threshold	efm link-monitor errored-frame threshold <i>th-value</i>	optional
Configure the errored-frame-period event detection interval	efm link-monitor errored-frame-period window <i>win-value</i>	optional
Configure the errored-frame-period event detection threshold	efm link-monitor errored-frame-period threshold <i>th-value</i>	optional
Configure the errored-frame-seconds detection interval	efm link-monitor errored-frame-seconds window <i>win-value</i>	optional
Configure the errored-frame-seconds event detection threshold	efm link-monitor errored-frame-seconds threshold <i>th-value</i>	optional

Note:

The detection period and threshold of the errored-symbol-period event is a 64-bit integer value. The parameter values after high and low represent the upper 32 bits and the lower 32 bits of this value, respectively, i.e., the integer value = (high * (2 ^ 32)) + low.

1.2.5 Enable Remote Loopback

By default, the remote loopback function is disabled. You can enable remote loopback only on devices that support remote loopback.

Enable Remote Loopback

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	-
Enter the port	interface ethernet <i>interface-num</i>	optional

configuration mode		
Enable the remote loopback function	efm remote-loopback	optional
Disable the remote loopback function	no efm remote-loopback	optional

1.2.6 Reject Remote Loopback Request From Remote Side

To avoid the problem that normal services is affected by the remote loopback function, you can use the configuration to prevent the local port from being controlled by the Loopback Control OAMPDU from the opposite side, thus rejecting the EFM remote loopback request initiated by the opposite side.

Reject Remote Loopback Request From Remote Side

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	
Enter the port configuration mode	interface ethernet <i>interface-num</i>	
Reject remote loopback request from remote side	efm remote-loopback ignore	Optional By default, the remote loopback request from the remote side is denied
Process the remote loopback request from the remote side	efm remote-loopback process	optional

1.2.7 Enable the Remote MIB Variable Acquisition Function

Enable the Remote MIB Variable Acquisition Function

Operation	Command	Remarks
Enter the global configuration mode	configure terminal	-
Enter the port configuration mode	interface ethernet <i>interface-num</i>	optional
Enable the remote MIB variable acquisition function	efm variable-retrieval	Optional. By default, the remote MIB variable acquisition function is enabled

1.2.8 Initiate the Remote MIB Variable Acquisition Request

Initiate the Remote MIB Variable Acquisition Request

Operation	Command	Remarks
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Enter the global configuration mode	configure terminal	-
Enter the port configuration mode	interface ethernet <i>interface-num</i>	optional
Get the port MIB variable value of the remote device	show efm port <i>port-id-list</i> remote-mib { phyadminstate autonegadminstate }	optional
Get the global MIB variable value of the remote device	show efm remote-mib { fecability fecmode }	optional

Note:

Only when the EFM connection on the port is established, the EFM working mode is in active mode and the remote port supports the remote MIB variable acquisition function, in this case, the remote MIB variable acquisition request can be initiated on the port.

Currently, only the FEC capability, FEC mode, port enabled state, and port auto-negotiation enabled state can be queried. Other MIB variables can be supplemented according to requirements.

1.2.9 EFM Display and Maintenance

After completing the above configuration, you can use the following command to display the EFM configuration.

EFM Display and Maintenance

Operation	Command	Remarks
Display the running status of the EFM protocol	show efm status interface [<i>interface-name</i>]	Any mode is executable
Display EFM summary information	show efm summary	
Display EFM discovery information	show efm discovery interface [<i>interface-name</i>]	
Display EFM protocol packet statistics	show efm statistics interface [<i>interface-name</i>]	
Clear EFM protocol packet statistics	clear efm statistics interface [<i>interface-name</i>]	Global configuration mode

1.3 Configuration Example

```
Switch(config)#i e 0/0/2
Switch(config-if-ethernet-0/0/2)#efm // Start EFM
Switch(config-if-ethernet-0/0/2)#efm mode passive // Set the EFM working mode to passive
Switch(config-if-ethernet-0/0/2)#efm pdu-timeout 1 // Set the interval for sending EFM
```

```
handshake packets to 1s
Switch(config-if-ethernet-0/0/2)#efm link-timeout 5 // The connection timeout period is
5s
Switch(config-if-ethernet-0/0/2)#efm remote-response-timeout 2 // The response timeout
period is 2s
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-symbol-period // Enable
the link monitoring function
Switch (config-if-ethernet-0/0/2)#efm link-monitor errored-frame-period
Switch (config-if-ethernet-0/0/2)#efm link-monitor errored-frame-seconds
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-symbol-period window high 1 low
3 // Set the errored-symbol-period detection period to 1 to 3
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-symbol-period threshold high 1
low 3 // The detection threshold is from 1 to 3
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame window 20 // The
detection period of the errored-frame event is 20
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame threshold 2 // The
detection threshold is 2
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame-period window 2 //
The detection period of the errored-frame-period event is 2
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame-period threshold 2 //
The detection threshold is 2
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame-seconds window 200 //
Set the errored-frame-second event detection interval to 200
Switch(config-if-ethernet-0/0/2)#efm link-monitor errored-frame-seconds threshold 2
```