

# **Network Management Configuration**

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# Chapter 1 Network Management Configuration

## 1.1 SNMP Configuration

### 1.1.1 Overview

The SNMP system includes the following 3 parts:

- SNMP management server (NMS)
- SNMP agent (agent)
- MIB

SNMP is a protocol for the application layer. It provides the format for the packets which are transmitted between NMS and agent.

SNMP management server is a part of the network management system, such as CiscoWorks.

SNMP agent includes the MIB variable and the SNMP management server can be used to browse or change these variables' values. The management server can get the values from the agent or save these variables in the agent. The agent collects data from MIB. MIB is the database of equipment parameters and network data.

### 1. SNMP Notification

When a special event occurs, the system will send an inform to the SNMP management server. For example, when the agent system runs into an incorrect condition, it will send a message to the management server.

The SNMP notification can be sent as a trap or an inform request. Because the receiver receives a trap and does not send any response, the transmitter hence cannot confirm whether the trap is received. In this way, the trap is unreliable. Comparatively, the SNMP management server uses SNMP to respond PDU, which is acted as a response of this message. If the management server does not receive the inform request, it will not transmit a response. If the transmitter does not receive the response, it will transmit the inform request again. In this way, the inform has more chance to arrive the planned destination.

## 1.2 SNMP Tasks

- Configuring idle time value
- Configuring the time value of waiting for acknowledgement

- Configuring busy time value of remote end
- Configuring time value of Response
- Configuring the time of reject
- Configuring the redial times
- Configuring the size of window for resend
- Configuring the size of accumulated data packet
- Setting the acknowledgement time-delay
- Setting the maximum numbers of acknowledgement
- Showing LLC2 link information
- Debugging LLC2 link information

## 1.3 LLC2 Configuration Tast

### 1.3.1 Configuring Idle Time Value

The command is used for controlling the frequency of query at the idle time (no data exchanged)

The command “no” can be used for restoring to the default value.

Command	Purpose
<code>[no] llc2 idle-time [seconds]</code>	Used for controlling the frequency of query at the idle time (no data exchanged). seconds:The interval seconds of sending RR frame at the idle time. The maximum is 60 seconds, the minimum is 1 second, and the default is 10 seconds.

Configuration mode: Interface Configuration

#### Notes:

At idle time, no I (information) frame is exchanged and RR (receive ready) frame is sent to the remote end periodically to tell the remote end that the local end is ready to receive data. The relative small value should be set for ensuring the prompt advice to the remote end. If the value is set too small, too many RR frames is likely to be sent on the network.

Example: Setting RR frame sent every 12 seconds

```
int ethernet1/1
llc2 idle-time 12
```

### 1.3.2 Configuring the Time Value of Waiting for Acknowledgement

Command	Purpose
[no] llc2 t1-time [seconds]	Used for controlling the waiting time of expecting remote acknowledgement. The command "no" can be used for restoring to the default value. Seconds The seconds of waiting for remote acknowledgement. The maximum is 60 seconds, the minimum is 1 second and the default is 1 second.

Configuration mode: Interface configuration

#### Notes:

When the local end sends I frame, it will wait for remote acknowledgement. If no acknowledgement is received within a given time, the I-frame will be resent. The relative big value should be set on the network where the data is transmitted at a slow rate.

Example: Setting 12 seconds as the time value of waiting for acknowledgement.

```
int ethernet1/1
llc2 t1-time 12
```

### 1.3.3 Configuring Busy Time Value of Remote Terminal

Command	Purpose
[no] llc2 tbusy-time [seconds]	Used for controlling the waiting time when the remote end is busy. The command "no" can be used for restoring to the default value. Seconds The waiting seconds when the remote end is busy. The maximum is 60 seconds, the minimum is 1 second and the default is 10 seconds.

Configuration mode: Interface configuration

#### Notes:

a LLC2 connective end is able to inform the opposite end that local end is busy and prevent the opposite end from sending data to local end by sending a RNR (receive not ready) The relative big value can be set for averting the timeout.

Example: Setting 12 seconds as the busy time value of remote end.

```
int ethernet1/1
llc2 tbusy-time 12
```

### 1.3.4 Configuring Time Value of Response

The command is used for controlling the time of waiting for the response of remote end. The command "no" can be used for restoring to the default value.

Command	Purpose
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<b>[no] llc2 tpf-time</b> [seconds]	used for controlling the time of waiting for the response of remote end. The command “no” can be used for restoring to the default value. Seconds :The seconds of waiting for the response of remote end. The maximum is 60 seconds, the minimum is 1 second, and the default is 1 second.
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Configuration Mode: Interface Configuration

**Notes:**

A LLC2 connective end sometimes needs to know the status of opposite end. For this purpose, a command frame that requires a response from the opposite end needs to be sent. When the opposite end receives the command frame, it will reply a response frame. If the error occurs in the process, the send end will keep waiting. In order to avoid the situation, a clock needs to be enabled. When the arrival time is hit, the clock will think that the error occurs and it will send a separate command frame. The command is used for setting the time of waiting for the response of the opposite end to the command frame.

Example: Setting 12 seconds as the time of waiting for the response of the opposite end.

```
int ethernet1/1
llc2 tpf-time 12
```

### 1.3.5 Configuring the Time of Rejection

The command is

Command	Purpose
<b>[no] llc2 trej-time</b> [seconds]	Used for controlling the time of waiting for the response of remote end to the reject frame. The command “no” can be used for restoring to the default value. Seconds: The seconds of waiting when the remote end is busy. The maximum is 60 seconds, the minimum is 1 second and the default is 3 seconds.

Configuration mode: Interface configuration

**Notes:**

The data receive and send on the two ends of LLC2 link is carried out on the set sequence. When a LLC2 connective end receives I frame of opposite end whose sequence number is not the expected one, it will send a REJ (reject) frame and enable a clock. If no response is made at the arrival time, LLC2 link will be disconnected. The command is used for setting the time of waiting for the response of the opposite end to the REJ (reject) frame.

Example: Setting 12 seconds as the waiting time.

```
int ethernet1/1
llc2 trej-time 12
```

### 1.3.6 Configuring the Redial Times

The command is

Command	Purpose
<b>[no]llc2 n2 retry-count</b>	Used for controlling the times of re-sending the frame. The command "no" can be used for restoring to the default value. retry-count:The times of resending frame. The maximum is 255, the minimum is 1 and the default is 8.

Configuration mode: Interface configuration

**Notes:**

When one end of LLC2 sends the data to the opposite end, it will wait for the acknowledgement of the opposite end. If the opposite end does not send the acknowledgement within a given time, the local end will resend the data. But the time of resend shall be limited. When the value of resend times exceeds retry-count, LLC2 will be disconnected. The command is used for setting the times of retry-count.

Example: Setting the times of re-send as 12

```
int ethernet1/1
llc2 n2 12
```

### 1.3.7 Configuring the Size Of Window for Resending

The command is

Command	Purpose
<b>[no]llc2 local-window packet-count</b>	Used for controlling the maximum size of I frame send (namely the size of window for resend) when I frame is not confirmed. The command "no" can be used for restoring to the default value. packet-count:The maximum size of I frame send. The maximum is 127, the minimum is 1 and the default is 7.

Configuration mode: Interface configuration

**Notes:**

When one end of LLC2 link sends data to the opposite end, it can only send a certain amount of data before waiting for the acknowledgement of the opposite end. The command is used for setting the maximum value. When the set value is too big, it may lead to the loss of data because the opposite end is not able to receive all the data.

Example: Setting the size of send window as 12.

```
int ethernet1/1
llc2 local-window 12
```

### 1.3.8 Configuring the Size of Accumulated Data Packet

The command is

Command	Purpose
<b>[no] llc2 holdqueue [packet-count]</b>	Used for controlling the maximum local accumulated size of data packet when I frame (the remote end is busy) cannot be sent. The command "no" can be used for restoring to the default value. packet-count: The maximum size of data packets reserved by I frame when I frame is not confirmed.

Configuration mode: Interface configuration

#### Notes:

When the opposite end is busy, one end of LLC2 link is not able to send data (I frame). All the data shall be reserved before the busyness of the opposite end is cleared. But the reserved amount is limited. The command is used for setting the data amount to be reserved.

Example: Setting maximum data amount to be reserved as 120.

```
int ethernet1/1
llc2 holdqueue 120
```

### 1.3.9 Setting the Acknowledgement Time-Delay

When an I-frame (information frame) is received, an acknowledgement frame shall be sent immediately. In order to reduce the unnecessary acknowledgement, the acknowledgement can be delayed. If information frame is sent, an information frame will be sent as an acknowledgement instead of acknowledge frame. When the information frame sent by the opposite end exceeds the acknowledged maximum size, an acknowledge frame will be sent immediately rather than at the timeout. The command below can be used for setting the value.

Command	Purpose
<b>llc2 ack-delay-time</b> <i>seconds</i>	Setting the acknowledgement time-delay

### 1.3.10 Setting the Maximum Numbers of Acknowledgement

When the information frame sent by the opposite end exceeds the maximum number of acknowledgement in the process of acknowledging the time delay, the acknowledgement frame shall be sent immediately for clearing the network timeout perceived by the opposite end. The command below can be used for setting the value.

Command	Purpose
<b>llc2 ack-max</b> <i>number</i>	Setting the acknowledgement time-delay.

### 1.3.11 Showing LLC2 Link Information

Command	Purpose
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<b>show llc interface</b> [ <i>type number</i> ]	Used for showing the related information of LLC2 link connection.
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Configuration Mode: Interface, configuration and global

**Notes:**

Showing the related information of LLC2 link connection. Under interface mode, the command “show llc” is used for displaying LLC2 link information of the interface.

Example: Under interface mode, the command “show llc” is used for showing llc2 information on ethernet1/1.

```
int ethernet1/1
sho llc ethernet1/1
```

### 1.3.12 Debugging LLC2 Link Information

The command is

Command	Purpose
<b>debug llc2</b> [ <i>packet error state</i> ]	Used for opening LLC2 debug switch.

Configuration mode: Management Mode

**Notes:**

packet , Opening the debug switch of LLC2 link status information

Example, opening the debug switch of LLC2 link.

```
debug llc2 packet
debug llc2 state
debug llc2 error
```

## 1.4 Example of LLC2 Configuration

The number of LLC2 frame received before the response can be configured. For example, it is supposed that two information frames are received at the time 0 rather than at the maximum number 3, the responses of these frames are not sent. If the third frame that makes the router response is not received within 800 ms, the response will be transmitted as the time-delay timer is activated.

```
interface interface e1/1
llc2 ack-max 3
llc2 ack-delay-time 800
```

In this connection, as it is told that all the frames are received, the counter that calculates the maximum number of information frame is reset as 0.

### 1.4.1 Configuring SDLC as Two-Way and Concurrent Mode

SDLC two-way and concurrent mode allows master SDLC link station to use a full duplex serial circuit. When an outstanding polling occurs, the master SDLC link station is able to send the data to the slave station. The two-way and concurrent mode works only on the side of SDLC master station. In the slave link station, it response to the polling sent from the master station.

SDLC two-way and concurrent mode runs in the multi-branch link environment or point-to-point link environment.

In the multi-branch link environment, a two-way and concurrent master station is able to poll a slave station and receive the data from the slave station and send the data (information frame) to other slave stations.

In the point-to-point link environment, so long as no maximum limit on reaching the window, a two-way and concurrent master station is able to send the data (information frame) to the slave station even if there is an outstanding polling.

Any one of the commands can be used under interface configuration mode for activating the two-way and concurrent mode:

Command	Purpose
<b>sdhc simultaneous full-datamode</b>	Setting the send of data from master station to the polled slave station and receive of data from it.
<b>sdhc simultaneous half-datamode</b>	Shutting down the master station sending the data to the slave station.

### 1.4.2 Configuring SDLC Timer and Re-Sending Times

When SDLC workstation sends frame, it will wait for the response of receive end. The response indicates the frame has been received. The response time allowed by the router before re-sending frame can be amended. The times of re-sending the frame by the software can be set before terminating SDLC session process. Through controlling these values, by controlling these values, the network overhead can be reduced in continuing to detect the transmitted frame.

One or two commands below can be used under interface configuration mode for configuring SDLC timer and retransmission times:

Command	Purpose
<b>sdhc t1 milliseconds</b>	Controlling the total time of software of waiting for response.
<b>sdhc n2 retry-count</b>	Configuring the times of software of retrying a timeout operation.

### 1.4.3 Configuring the Number of SDLC Frame and Information Frame

The maximum length of input frame and the maximum number of the information frame (or the size of window) received before router sends response to the receive end can be configured. When the configured value is relative big, the network overhead can be reduced.

The command below can be used under interface configuration mode for configuring SDLC frame and number of information frame.

Command	Purpose
<b>sdlc n1</b> <i>bit-count</i>	Configuring the maximum length of input frame
<b>sdlc k</b> <i>window-size</i>	Configuring the size of local window of router
<b>sdlc poll-limit-value</b> <b>count</b>	Configuring the times of master station's polling to the slave station.

#### 1.4.4 Controlling the Size of Cache

The size of cache can be controlled. The cache is used for storing the data that is not decided to be sent to remote SDLC station. The command is especially useful in SDLC protocol convert equipment that implements the communication between SNA workstation whose link layer protocol is LLC2 in token-ring local area network (LAN) and SNA workstation whose link layer protocol is SDLC on serial link. The frame length and the size of window on the token-ring are usually much bigger than the acceptable ones on the serial link. What's more, the serial link is slower than token-ring.

In order to control the accumulation problem produced in the high-speed data transmission from token-ring to serial link, the command below can be used on the basis of each address under interface configuration mode:

Command	Purpose
<b>sdlc holdqueue address</b> <b>queue-size</b>	Setting the maximum quantity of the data packets stored in the sequence before transmission.

#### 1.4.5 Controlling the polling of slave station

The interval of router's polling to the slave station, the length of time of sending data from master station to slave station and how long the software polls a slave station before moving to the next station can be controlled.

The following points should be noted in using these commands:

Only when the slave station is polled by the master station, the data can be transmitted. When the polling terminates and the value of timer is too big, the response time of slave station will add. When the value of the timer is reduced too small, it will lead to the congestion of serial link and data flood due to the excessive and unnecessary polling frames sent from the slave station, which takes the extra CPU time for dealing with them.

The communication efficiency between master station and single slave station can be improved by increasing the limit value of polling, but it may delay the polling to other slave stations.

One or more commands below can be used under interface configuration mode for controlling the polling of slave station:

Command	Purpose
<b>sdlc poll-pause-timer</b> <i>milliseconds</i>	Configuring the waiting time interval of router's polling

	to two slave stations on some single serial port.
<b>sdhc poll-limit-value count</b>	Configuring the times of a master station's polling to slave station.

The "def" format of these commands can be used for restoring to the default polling value.

#### 1.4.6 Configuring SDLC Interface as Half-Duplex Mode

Under default state, SDLC interface runs under full duplex mode. The command below can be used under interface configuration mode for configuring SDLC interface as half-duplex mode.

Command	Purpose
<b>half-duplex</b>	Configuring SDLC interface as half-duplex mode.

#### 1.4.7 Configuring XID Value

XID value set in the router shall be consistent with the corresponding parameter set on token-ring host with which SDLC equipment will communicate and shall match with the corresponding system parameter in IDBLK and IDNUM defined in VTAM of token ring host.

##### Notes:

Configuring XID value will affect the attribute of the interface. If XID value is configured, it means that the equipment connected with the interface is Pu2.0. XID value can be configured after the port is shut down.

The command below can be used under interface configuration mode for configuring XID value.

Command	Purpose
<b>sdhc xid address xid</b>	Designating XID value related to SDLC station.

#### 1.4.8 Configuring the Maximum Value of SDLC Information Frame

Normally, the router and SDLC equipment that interacts with router protocol shall support the same and maximum length of SDLC information frame. The bigger the value is, the more efficient the link is used and the performance will be better.

After SDLC equipment is configured with the maximum possible information frame to be sent, the router shall be configured for supporting the same maximum length of information frame. The default value is 265 bytes. The maximum value supported by the software must be smaller than the maximum frame value of LLC2 defined at the time of configuring the maximum length of LLC2 information frame.

The command below can be used under interface configuration mode for configuring the maximum value of SDLC information frame:

Command	Purpose
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<b>sdhc sdhc-largest-frame</b> <i>address size</i>	Configuring the maximum length of information frame that can be sent or received by the designated SDLC station.
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#### 1.4.9 Monitoring SDLC Workstation

The command below can be used under management mode for monitoring the configuration of SDLC workstation and deciding which SDLC parameter needs to be adjusted.

Command	Purpose
<b>show interfaces</b>	Showing configuration information of SDLC workstation.