

System Configuration

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1 CONFIGURING COMMAND LINE INTERFACE

1.1 Overview

The command line interface (CLI) is a window used for text command interaction between users and network devices. You can enter commands in the CLI window to configure and manage network devices.

Protocols and Standards

N/A

1.2 Applications

| Application | Description |
|--|--|
| Configuring and Managing Network Devices Through CLI | You can enter commands in the CLI window to configure and manage network devices |

1.2.1 Configuring and Managing Network Devices Through CLI

Scenario

As shown in Figure 1-1, a user accesses network device A using a PC, and enter commands in the CLI window to configure and manage the network device.

Figure 1-1



| | |
|---------|---|
| Remarks | A is the network device to be managed. PC is a terminal. |
|---------|---|

Deployment

The user uses the Secure CRT installed on a PC to set up a connection with network device A, and opens the CLI window to enter configuration commands.

1.3 Features

Overview

| Feature | Description |
|--|--|
| Accessing CLI | You can log in to a network device for configuration and management. |
| Command Modes | The CLI provides several command modes. Commands that can be used vary according to command modes. |
| System Help | You can obtain the help information of the system during CLI configuration. |
| Abbreviated Commands | If the entered string is sufficient to identify a unique command, you do not need to enter the full string of the command. |
| No and Default Options of Commands | You can use the no option of a command to disable a function or perform the operation opposite to the command, or use the default option of the command to restore default settings. |
| Prompts Indicating Incorrect Commands | An error prompt will be displayed if an incorrect command is entered. |
| History Commands | You can use short-cut keys to display or call history commands. |
| Featured Editing | The system provides short-cut keys for editing commands. |
| Searching and Filtering of the Show Command Output | You can run the show command to search or filter specified commands. |
| Command Alias | You can configure alias of a command to replace the command. |

1.3.1 Accessing CLI

Before using the CLI, you need to connect a terminal or PC to a network device. You can use the CLI after starting the network device and finishing hardware and software initialization. When used for the first time, the network device can be connected only through the console port, which is called out band management. After performing relevant configuration, you can connect and manage the network device through Telnet.

1.3.2 Command Modes

Due to the large number of commands, these commands are classified by function to facilitate the use of commands. The CLI provides several commands modes, and all commands are registered in one or several command modes. You must first enter the command mode of a command before using this command. Different command modes are related with each other while distinguished from each other.

As soon as a new session is set up with the network device management interface, you enter User EXEC mode. In this mode, you can use only a small number of commands and the command functions are limited, such as the **show** commands. Execution results of commands in User EXEC mode are not saved.

To use more commands, you must first enter Privileged EXEC mode. Generally, you must enter a password to enter Privileged EXEC mode. In Privileged EXEC mode, you can use all commands registered in this command mode, and further enter global configuration mode.

Using commands of a certain configuration mode (such as global configuration mode and interface configuration mode) will affect configuration in use. If you save the configuration, these commands will be saved and executed next time the system is restarted. You must enter global configuration mode before entering another configuration mode, such as interface configuration mode.

The following table summarizes the command modes by assuming that the name of the network device is "QTECH".

| Command Mode | Access Method | Prompt | Exit or Entering Another Mode | About |
|---|---|--------|---|---|
| User EXEC (User EXEC mode) | Enter User EXEC mode by default when accessing a network device. | QTECH> | Run the exit command to exit User EXEC mode. Run the enable command to enter Privileged EXEC mode. | Use this command mode to conduct basic tests or display system information. |
| Privileged EXEC (Privileged EXEC mode) | In User EXEC mode, run the enable command to enter Privileged EXEC mode. | QTECH# | Run the disable command to return to User EXEC mode. Run the configure command to enter global configuration mode. | Use this command mode to check whether the configuration takes effect. This mode is password protected. |

| | | | | |
|---|---|----------------------------|---|---|
| <p>Global configuration (Global configuration mode)</p> | <p>In Privileged EXEC mode, run the configure command to enter global configuration mode.</p> | <p>QTECH(config)#</p> | <p>Run the exit or end command, or press Ctrl+C to return to Privileged EXEC mode.</p> <p>Run the interface command to enter interface configuration mode. When using the interface command, you must specify the interface.</p> <p>Run the vlan <i>vlan_id</i> command to enter VLAN configuration mode.</p> | <p>Using commands in this mode will affect the global parameters of the network device.</p> |
| <p>Interface configuration (Interface configuration mode)</p> | <p>In global configuration mode, run the interface command to enter interface configuration mode.</p> | <p>QTECH(config-if)#</p> | <p>Run the end command, or press Ctrl+C to return to Privileged EXEC mode. Run the exit command to return to global configuration mode. When using the interface command, you must specify the interface.</p> | <p>Use this configuration mode to configure various interfaces of the network device.</p> |
| <p>Config-vlan (VLAN configuration mode)</p> | <p>In global configuration mode, run the vlan <i>vlan_id</i> command to enter VLAN configuration mode.</p> | <p>QTECH(config-vlan)#</p> | <p>Run the end command, or press Ctrl+C to return to the Privileged EXEC mode.</p> <p>Run the exit command to return to global configuration mode.</p> | <p>Use this configuration mode to configure VLAN parameters.</p> |

1.3.3 System Help

When entering commands in the CLI window, you can obtain the help information using the following methods:

1. At the command prompt in any mode, enter a question mark (?) to list the commands supported by the current command mode and related command description.

For example

```
QTECH>?  
Exec commands:  
<1-99>  Session number to resume  
disable  Turn off privileged commands  
disconnect Disconnect an existing network connection  
enable   Turn on privileged commands  
exit     Exit from the EXEC  
help     Description of the interactive help system  
lock     Lock the terminal  
ping     Send echo messages  
show     Show running system information  
telnet   Open a telnet connection  
traceroute Trace route to destination
```

2. Enter a space and a question mark (?) after a keyword of a command to list the next keyword or variable associated with the keyword.

For example

```
QTECH(config)#interface ?  
Aggregateport  Aggregate port interface  
Dialer         Dialer interface  
GigabitEthernet Gigabit Ethernet interface  
Loopback      Loopback interface  
Multilink     Multilink-group interface  
Null          Null interface  
Tunnel        Tunnel interface  
Virtual-ppp   Virtual PPP interface  
Virtual-template Virtual Template interface  
Vlan          Vlan interface  
range         Interface range command
```

- i** If the keyword is followed by a parameter value, the value range and description of this parameter are displayed as follows:

```
QTECH(config)#interface vlan ?  
<1-4094> Vlan port number
```

3. Enter a question mark (?) after an incomplete string of a command keyword to list all command keywords starting with the string.

For example

```
QTECH#d?  
debug delete diagnostic dir disable disconnect
```

4. After an incomplete command keyword is entered, if the suffix of this keyword is unique, press the **Tab** key to display the complete keyword.

For example

```
QTECH# show conf<Tab>  
QTECH# show configuration
```

5. In any command mode, run the **help** command to obtain brief description about the help system.

For example

```
QTECH(config)#help  
Help may be requested at any point in a command by entering  
a question mark '?'. If nothing matches, the help list will  
be empty and you must backup until entering a '?' shows the  
available options.  
Two styles of help are provided:  
1. Full help is available when you are ready to enter a  
command argument (e.g. 'show ?') and describes each possible  
argument.  
2. Partial help is provided when an abbreviated argument is entered  
and you want to know what arguments match the input  
(e.g. 'show pr?'.)
```

1.3.4 Abbreviated Commands

If a command is long, you can enter a part of the command that is sufficient to identify the command keyword.

For example, to run the **interface** *gigabitEthernet 0/1* command in GigabitEthernet 0/1 interface configuration mode, enter the abbreviated command as follows:

```
QTECH(config)#int g0/1  
QTECH(config-if-GigabitEthernet 0/1)#
```

1.3.5 No and Default Options of Commands

Most commands have the **no** option. Generally, the **no** option is used to disable a feature or function, or perform the operation opposite to the command. For example, run the **no shutdown** command to perform the operation opposite to the **shutdown** command, that is, enabling the interface. The keyword without the **no** option is used to enable a disabled feature or a feature that is disabled by default.

Most configuration commands have the **default** option. The **default** option is used to restore default settings of the command. Default values of most commands are used to disable related functions. Therefore, the function of the **default** option is the same as that of the **no** option in most cases. For some commands, however, the default values are used to enable related functions. In this case, the function of the **default** option is opposite to that of the **no** option. At this time, the **default** option is used to enable the related function and set the variables to default values.

i For specific function of the **no** or **default** option of each command, see the command reference.

1.3.6 Prompts Indicating Incorrect Commands

When you enter an incorrect command, an error prompt is displayed.

The following table lists the common CLI error messages.

| Error Message | Meaning | How to Obtain Help |
|---|---|---|
| % Ambiguous command: "show c" | The characters entered are insufficient for identifying a unique command. | Re-enter the command, and enter a question mark after the word that is ambiguous. All the possible keywords will be displayed. |
| % Incomplete command. | The mandatory keyword or variable is not entered in the command. | Re-enter the command, and enter a space and a question mark. All the possible keywords or variables will be displayed. |
| % Invalid input detected at '^' marker. | An incorrect command is entered. The sign (^) indicates the position of the word that causes the error. | At the current command mode prompt, enter a question mark. All the command keywords allowed in this command mode will be displayed. |

1.3.7 History Commands

The system automatically saves commands that are entered recently. You can use short-cut keys to display or call history commands.

The methods are described in the following table.

| Operation | Result |
|------------------------|--|
| Ctrl+P or the UP key | Display the previous command in the history command list. Starting from the latest record, you can repeatedly perform this operation to query earlier records. |
| Ctrl+N or the DOWN key | After pressing Ctrl+N or the DOWN key, you can return to a command that is recently executed in the history command list. You can repeatedly perform this operation to query recently executed commands. |

 The standard terminals, such as the VT100 series, support the direction keys.

1.3.8 Featured Editing

When editing the command line, you can use the keys or short-cut keys listed in the following table:

| Function | Key or Short-Cut Key | Description |
|--|----------------------|---|
| Move the cursor on the editing line. | Left key or Ctrl+B | Move the cursor to the previous character. |
| | Right key or Ctrl+B | Move the cursor to the next character. |
| | Ctrl+A | Move the cursor to the head of the command line. |
| | Ctrl+E | Move the cursor to the end of the command line. |
| Delete an entered character. | Backspace key | Delete one character to the left of the cursor. |
| | Delete key | Delete one character to the right of the cursor. |
| Move the output by one line or one page. | Return key | When displaying contents, press the Return key to move the output one line upward and display the next line. This operation is performed when the output does not end yet. |
| | Space key | When displaying contents, press the Space key to page down and display the next page. This operation is performed when the output does not end yet. |

When the editing cursor is close to the right boundary, the entire command line will move to the left by 20 characters, and the hidden front part is replaced by the dollar (\$) signs. You can use the related keys or short-cut keys to move the cursor to the characters in the front or return to the head of the command line.

For example, the whole **access-list** may exceed the screen width. When the cursor is close to the end of the command line for the first time, the entire command line moves to the left by 20 characters, and the hidden front part is replaced by the dollar signs (\$). Each time the cursor is close to the right boundary, the entire command line moves to the left by 20 characters.

```
access-list 199 permit ip host 192.168.180.220 host
$ost 192.168.180.220 host 202.101.99.12
$0.220 host 202.101.99.12 time-range tr
```



Press **Ctrl+A** to return to the head of the command line. At this time, the hidden tail part of the command line is replaced by the dollar signs (\$).

```
access-list 199 permit ip host 192.168.180.220 host 202.101.99.$
```

1.3.9 Searching and Filtering of the Show Command Output

To search specified contents from the output of the **show** command, run the following command:

| Command | Description |
|---|---|
| show any-command begin regular-expression | Searches specified contents from the output of the show command. The first line containing the contents and all information that follows this line will be output. |

-  The **show** command can be executed in any mode.
-  Searched contents are case sensitive.

To filter specified contents from the output of the **show** command, run the following commands:

| Command | Description |
|---|--|
| show any-command exclude regular-expression | Filters the output of the show command. Except those containing the specified contents, all lines will be output. |
| show any-command include regular-expression | Filters the output of the show command. Only the lines containing the specified contents will be output. |

To search or filter the output of the **show** command, you must enter a vertical line (|). After the vertical line, select the searching or filtering rules and contents (character or string). Searched and filtered contents are case sensitive.

```
QTECH#show running-config | include interface
interface GigabitEthernet 0/0
interface GigabitEthernet 0/1
interface GigabitEthernet 0/2
interface GigabitEthernet 0/3
interface GigabitEthernet 0/4
interface GigabitEthernet 0/5
interface GigabitEthernet 0/6
interface GigabitEthernet 0/7
interface Mgmt 0
```

1.3.10 Command Alias

You can configure any word as the alias of a command to simplify the command input.

Configurations on Effect

1. Replace a command with a word.

For example, configure "mygateway" as the alias of the **ip route** *0.0.0.0 0.0.0.0 192.1.1.1* command. To run this command, you only need to enter "mygateway".

2. Replace the front part of a command with a word, and enter the later part.

For example, configure "ia" as the alias of the **ip address** command. To run this command, you need to enter "ia" and then the specified IP address and subnet mask.

Configurations on Steps

❖ Displaying Default Alias

In User EXEC or Privileged EXEC mode, default alias are available for some commands. You can run the **show aliases** command to display these default aliases.

```
QTECH(config)#show aliases
Exec mode alias:
h          help
p          ping
s          show
u          undebug
un        undebug
```

 These default aliases cannot be deleted.

❖ Configuring a Command Alias

| | |
|-----------------------|---|
| Command | <i>alias mode command-alias original-command</i> |
| Parameter Description | <i>mode</i> : indicates the command mode of the command represented by the alias. <i>command-alias</i> : indicates the command alias. <i>original-command</i> : indicates the command represented by the alias. |
| Command Mode | Global configuration mode |
| Usage Guide | In global configuration mode, run the alias ? command to list all command modes that can be configured with aliases. |

❖ Displaying Settings of Command Aliases

Run the **show aliases** command to display alias settings in the system.

Notes

- ❖ The command replaced by an alias must start from the first character of the command line.
- ❖ The command replaced by an alias must be complete.
- ❖ The entire alias must be entered when the alias is used; otherwise, the alias cannot be identified.

Configuration Example

❖ Defining an Alias to Replace the Entire Command

| | |
|----------------------------|---|
| Configuration Steps | In global configuration mode, configure the alias "ir" to represent the default route configuration command <code>ip route 0.0.0.0 0.0.0.0 192.168.1.1</code>. |
| | QTECH#configure terminal QTECH(config)#alias config ir ip route 0.0.0.0 0.0.0.0 192.168.1.1 |
| Verification | <ul style="list-style-type: none"> ❖ Run the show alias command to check whether the alias is configured successfully. <pre>QTECH(config)#show alias Exec mode alias: h help p ping s show u undebug un undebug</pre> |

| | |
|--|--|
| | <pre>Global configuration mode alias: ir ip route 0.0.0.0 0.0.0.0 192.168.1.1</pre> |
| | <p>❖ Use the configured alias to run the command, and run the show running-config command to check whether the alias is configured successfully.</p> |
| | <pre>QTECH(config)#ir QTECH(config)#show running-config Building configuration... ! alias config ir ip route 0.0.0.0 0.0.0.0 192.168.1.1 //Configuring an alias ... ip route 0.0.0.0 0.0.0.0 192.168.1.1 //Configuration result after the alias "ir" is entered !</pre> |

❖ Defining an Alias to Replace the Front Part of a Command

| | |
|----------------------------|--|
| Configuration Steps | In global configuration mode, configure the alias "ir" to represent the front part "ip route" of the default route configuration command. |
| | <pre>QTECH#configure terminal QTECH(config)#alias config ir ip route</pre> |
| Verification | <p>❖ Run the show alias command to check whether the alias is configured successfully.</p> <pre>QTECH(config)#show alias Exec mode alias: h help p ping s show u undebug un undebug Global configuration mode alias: ir ip route</pre> |
| | <p>❖ Enter the alias "ir" and then the later part of the command "0.0.0.0 0.0.0.0 192.168.1.1".</p> <p>❖ Run the show ap-config running command to check whether the configuration is successful.</p> |

```
QTECH(config)#ir 0.0.0.0 0.0.0.0 192.168.1.1
QTECH(config)#show running

Building configuration...
!
alias config ir ip route //Configuring an alias
!
ip route 0.0.0.0 0.0.0.0 192.168.1.1 //Configuration result after the alias "ir" and the
later part of the command are entered
!
```

System

Help

1. The system provides help information for command alias. An asterisk (*) will be displayed in front of an alias. The format is as follows:

```
*command-alias=original-command
```

For example, in Privileged EXEC mode, the default command alias "s" represents the **show** keyword. If you enter "s?", the keywords starting by "s" and alias information are displayed.

```
QTECH#s?
```

```
*s=show show start-chat start-terminal-service
```

2. If the command represented by an alias contains more than one word, the command is displayed in a pair of quotation marks.

For example, in Privileged EXEC mode, configure the alias "sv" to replace the **show version** command. If you enter "s?", the keywords starting by "s" and alias information are displayed.

```
QTECH#s?
```

```
*s=show *sv="show version" show start-chat
start-terminal-service
```

3. You can use the alias to obtain help information about the command represented by the alias.

For example, configure the alias "ia" to represent the **ip address** command in interface configuration mode. If you enter "ia?" in interface configuration mode, the help information on "ip address?" is displayed, and the alias is replaced by the command.

```
QTECH(config-if)#ia ?
```

```
A.B.C.D IP address
```

```
dhcp IP Address via DHCP
```

```
QTECH(config-if)#ip address
```

! If you enter a space in front of a command, the command represented by this alias will not be displayed.

2 CONFIGURING BASIC MANAGEMENT

2.1 Overview

This document is a getting started guide to network device management. It describes how to manage, monitor, and maintain network devices.

2.2 Applications

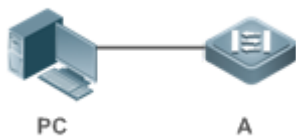
| Application | Description |
|---|---|
| Network Device Management | A user logs in to a network device from a terminal and runs commands on a command line interface (CLI) to manage device configurations. |

2.2.1 Network Device Management

[Scenario](#)

Network device management described in this document is performed through the CLI. A user logs in to Network Device A from a terminal and runs commands on the CLI to manage device configurations. See Figure 2-1.

Figure 2-1



2.3 Features

[Basic Concepts](#)

❖ TFTP

Trivial File Transfer Protocol (TFTP) is a TCP/IP protocol which allows a client to transfer a file to a server or get a file from a server.

❖ AAA

AAA is short for Authentication, Authorization and Accounting.

Authentication refers to the verification of user identities and the related network services.

Authorization refers to the granting of network services to users according to authentication results.

Accounting refers to the tracking of network service consumption by users. A billing system charges users based on consumption records.

AAA provides effective means of network management and security protection.

❖ RADIUS

Remote Authentication Dial In User Service (RADIUS) is the most widely used AAA protocol at present.

❖ Telnet

Telnet is a terminal emulation protocol in the TCP/IP protocol stack which provides access to a remote host through a virtual terminal connection. It is a standard protocol located at Layer 7 (application layer) of the Open System Interconnection (OSI) model and used on the internet for remote login. Telnet sets up a connection between the local PC and a remote host.

❖ System Information

System information includes the system description, power-on time, hardware and software versions, control-layer software version, and boot-layer software version.

❖ Hardware Information

Hardware information includes the physical device information as well as slot and module information. The device information includes the device description and slot quantity. The slot information includes the slot ID, module description (which is empty if a slot does not have a module), and actual and maximum number of physical ports.

Overview

| Feature | Description |
|--|--|
| User Access Control | Controls the terminal access to network devices on the internet based on passwords and privileges. |
| Login Authentication Control | Performs username-password authentication to grant access to network devices when AAA is enabled. (Authentication is performed by a dedicated server.) |

| | |
|---|---|
| Basic System Parameters | Refer to the parameters of a system, such as the clock, banner, and Console baud rate. |
| Displaying Configurations | Displays the system configurations, including the configurations that the system is currently running and the device configurations stored in the nonvolatile random access memory (NVRAM). |
| Telnet | Telnet is an application-layer protocol in the TCP/IP protocol stack. It provides the standard governing remote login and virtual terminal communication on the internet. |
| Restart | Introduces system restart. |

2.3.1 User Access Control

User access control refers to the control of terminal access to network devices on the internet based on passwords and privileges.

Working Principle

❖ Privilege Level

16 privilege levels are defined ranging from 0 to 15 for CLI on network devices to grant users access to different commands. Level 0 is the lowest level granting access to just a few commands, whereas level 15 is the highest level granting access to all commands. Levels 0 and 1 are common user levels without the device configuration permission (users are not allowed to enter global configuration mode by default). Levels 2–15 are privileged user levels with the device configuration permission.

❖ Password Classification

Passwords are classified into two types: password and security. The first type refers to simple encrypted passwords at level 15. The second type refers to secure encrypted passwords at levels 0–15. If a level is configured with both simple and secure encrypted passwords, the simple encrypted password will not take effect. If you configure a non-15 level simple encrypted password, a warning is displayed and the password is automatically converted into a secure encrypted password. If you configure the same simple encrypted password and secure encrypted password at level 15, a warning is displayed.

❖ Password Protection

Each privilege level on a network device has a password. An increase in privilege level requires the input of the target level password, whereas a reduction in privilege level does not require password input.

By default, only two privilege levels are password-protected, namely, level 1 (common user level) and level 15 (privileged user level). Sixteen privilege levels with password protection can be assigned to the commands in each mode to grant access to different commands.

If no password is configured for a privileged user level, access to this level does not require password input. It is recommended that a password be configured for security purposes.

❖ Command Authorization

Each command has its lowest execution level. A user with a privilege level lower than this level is not allowed to run the command. After the command is assigned a privilege level, users at this level and higher have access to the command.

Related Configuration

❖ Configuring a Simple Encrypted Password

Run the **enable password** command.

❖ Configuring a Secure Encrypted Password

Run the **enable secret** command.

A secure encrypted password is used to control the switching between user levels. It has the same function as a simple encrypted password but uses an enhanced password encryption algorithm. Therefore, secure encrypted passwords are recommended out of security consideration.

❖ Configuring Command Privilege Levels

Run the **privilege** command to assign a privilege level to a command.

A command at a lower level is accessible by more users than a command at a higher level.

❖ Raising/Lowering a User Privilege Level

Run the **enable** command or the **disable** command to raise or lower a user privilege level respectively.

After logging in to a network device, the user can change his/her level to obtain access to commands at different privilege levels.

To enable level increase logging, run the **login privilege log** command.

❖ Enabling Line Password Protection

Line password protection is required for remote login (such as login through Telnet).

Run the **password [0 | 7] line** command to configure a line password, and then run the **login** command to enable password protection.

By default, terminals do not support the **lock** command.

2.3.2 Login Authentication Control

In login authentication with AAA disabled, the password entered by a user is checked against the configured line password. If they are consistent, the user can access the network device. In local authentication, the username and password entered by a user are checked against those stored in the local user database. If they are matched, the user can access the network device with proper management permissions.

In AAA, the username and password entered by a user are authenticated by a server. If authentication is successful, the user can access the network device and enjoy certain management permissions.

For example, a RADIUS server can be used to authenticate usernames and passwords and control users' management permissions on network devices. Network devices no longer store users' passwords, but send encrypted user information to the RADIUS server, including usernames, passwords, shared passwords, and access policies. This provides a convenient way to manage and control user access and improve user information security.

Working Principle

❖ Line Password

If AAA is disabled, you can configure a line password used to verify user identities during login. After AAA is enabled, line password verification does not take effect.

❖ Local Authentication

If AAA is disabled, you can configure local authentication to verify user identities and control management permissions by using the local user database. After AAA is enabled, local authentication does not take effect.

❖ AAA

AAA provides three independent security functions, namely, Authentication, Authorization and Accounting. A server (or the local user database) is used to perform authentication based on the configured login authentication method list and control users' management permissions. For details about AAA, see *Configuring AAA*.

Related Configuration

❖ Configuring Local User Information

Run the **username** command to configure the account used for local identity authentication and authorization, including usernames, passwords, and optional authorization information.

❖ Configuring Local Authentication for Line-Based Login

Run the **login local** command (in the case that AAA is disabled).

Perform this configuration on every device.

❖ Configuring AAA Authentication for Line-Based Login

The default authentication method is used after AAA is enabled.

Run the **login authentication** command to configure a login authentication method list for a line.

Perform this configuration when the local AAA authentication is required.

❖ Configuring the Connection Timeout Time

The default connection timeout time is 10 minutes.

Run the **exec-timeout** command to change the default connection timeout time. An established connection will be closed if no output is detected during the timeout time.

Perform this configuration when you need to increase or reduce the connection timeout time.

❖ Configuring the Session Timeout Time

The default session timeout time is 0 minutes, indicating no timeout.

Run the **session-timeout** command to change the default session timeout time.

The session established to a remote host through a line will be disconnected if no output is detected during the timeout time. Then the remote host is restored to Idle. Perform this configuration when you need to increase or reduce the session timeout time.

❖ Locking a Session

By default, terminals do not support the **lock** command.

Run the **lockable** command to lock the terminals connected to the current line.

To lock a session, first enable terminal lock in line configuration mode, and then run the **lock** command in terminal EXEC mode to lock the terminal.

2.3.3 Basic System Parameters

❖ System Time

The network device system clock records the time of events on the device. For example, the time shown in system logs is obtained from the system clock. Time is recorded in the format of *year-month-day, hour:minute:second, day of the week*.

When you use a network device for the first time, set its system clock to the current date and time manually.

❖ Configuring a System Name and Command Prompt

You can configure a system name to identify a network device. The default system name is **QTECH**. A name with more than 32 characters will be truncated to keep only the first 32 characters. The command prompt keeps consistent with the system name.

❖ Banner

A banner is used to display login prompt information. There are two types of banner: Daily notification and login banner.

Daily notification is displayed on all terminals connected to network devices soon after login. Urgent messages (such as immediate system shutdown) can be delivered to users through daily notification.

A login banner appears after daily notification to display login information.

❖ Configuring the Console Baud Rate

You can manage network device through a Console port. The first configuration on the network device must be performed through the Console port. The serial port baud rate can be changed based on actual requirements. Note that the management terminal must have consistent baud rate setting with the device console.

❖ Configuring the Connection Timeout Time

The connection timeout time is used to control device connections (including established connections and sessions established to remote hosts). A connection will be closed when no input is detected during the timeout time.

Related Configuration

❖ Configuring the System Date and Clock

Run the **clock set** command to configure the system time of a network device manually. The device clock starts from the configured time and keeps running even when the device is powered off.

❖ Updating the Hardware Clock

If the hardware clock and software clock are not synchronized, run the **clock update-calendar** command to copy the date and time of the software clock to the hardware clock.

❖ Configuring a System Name

Run the **hostname** command to change the default system name.

The default host name is **QTECH**.

❖ Configuring a Command Prompt

Run the **prompt** command.

❖ Configuring Daily Notification

By default, no daily notification is configured.

Run the **banner motd** command to configure daily notification.

Daily notification is displayed on all terminals connected to network devices soon after login. Urgent messages (such as immediate system shutdown) can be delivered to users through daily notification.

❖ Configuring a Login Banner

By default, no login banner is configured.

Run the **banner login** command to configure a login banner to display login information.

❖ Configuring the Console Baud Rate

Run the **speed** command.

The default baud rate is 9,600 bps.

2.3.4 Displaying Configurations

Displays the system configurations, including the configurations that the system is currently running and the device configurations stored in the NVRAM.

Working Principle

❖ Running Configurations

Running configurations, namely, running-config, are the configurations that individual component modules run in real time. A request can be made to all running components to collect configurations, which will be orchestrated before being displayed to users. Only running components may provide real-time configurations, whereas unloaded components do not display configurations. In the case that the system is started, a component process is restarted, and a hot patch is executed, the configurations collected during this period may be inaccurate due to the component unstable state. For example, the configurations of a component may not be missing initially but can be displayed later.

❖ Startup Configurations

The configurations stored in the NVRAM, namely, startup-config, are the configurations executed during device startup. When the system is restarted, startup-config is loaded to become new running-config. To display permanent configurations, the system needs to read the **startup-config** file in the NVRAM.

 The startup-config file copied to the device only supports UTF-8 encoding without BOM.

Related Configuration

❖ Displaying Running Configurations

Run the **show running-config [interface *interface*]** command to display the configurations that the system is currently running or the configurations on an interface.

❖ Displaying Startup Configurations

Run the **show startup-config** command.

❖ Storing Startup Configurations

Run the **write** or **copy running-config startup-config** command to store the current running configurations as new startup configurations.

2.3.5 Telnet

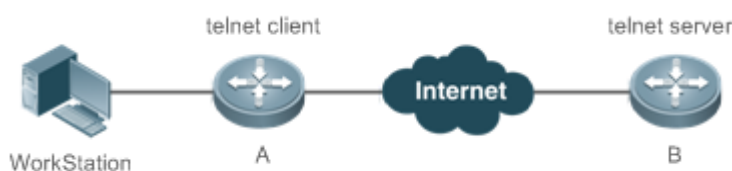
Working Principle

Telnet is an application-layer protocol in the TCP/IP protocol stack. It provides the standard governing remote login and virtual terminal communication on the internet.

The Telnet Client service allows a local or remote user who has logged in to a network device to use its Telnet Client program to access other remote system resources on the internet. In Figure 2-2, a user with a PC connects to Network Device A by using the terminal emulation or Telnet program and then logs in to Network Device B by using the **telnet** command to perform configuration management.

QTECH Telnet program supports the use of IPv4 and IPv6 addresses. A Telnet server accepts Telnet connection requests that carry IPv4 and IPv6 addresses. A Telnet client can send connection requests to hosts identified by IPv4 and IPv6 addresses.

Figure 2-2



Related Configuration

❖ Enabling the Telnet Client Service

Run the **telnet** command to log in to a remote device.

❖ Restoring a Telnet Client Session

Run the **<1-99>** command.

❖ Disconnecting a Suspended Telnet Client Session

Run the **disconnect** *session-id* command.

❖ Enabling the Telnet Server Service

Run the enable service telnet-server command.

Perform this configuration when you need to enable Telnet login.

2.3.6 Restart

The timed restart feature makes user operation easier in some scenarios (such as tests).

If you configure a time interval, the system will restart after the interval. The interval is in the format of *mmm* or *hhh:mm*, in the unit of minutes. You can specify the interval name to reflect the restart purpose.

If you define a future time, the system will restart when the time is reached.

- ❗ The clock feature must be supported by the system if you want to use the **at** option. It is recommended that you configure the system clock in advance. A new restart plan will overwrite the existing one. A restart plan will be invalid if the system is restarted before the plan takes effect.
- ❗ The span between the restart time and current time must not exceed 31 days, and the restart time must be later than the current system time. After you configure a restart plan, do not to change the system clock; otherwise, the plan may fail (for example, the system time is changed to a time after the restart time.)

Related Configuration

❖ Configuring Restart

Run the **reload** command to configure a restart policy.

Perform this configuration when you need to restart a device at a specific time.

2.4 Configuration

| | |
|--|--|
| | |
| Configuring Passwords and Privileges | (Optional) It is used to configure passwords and command privilege levels. |
| enable password | Configures a simple encrypted |

| | | |
|--|--|---|
| | | password. |
| | enable secret | Configures a secure encrypted password. |
| | enable | Raises a user privilege level. |
| | login privilege log | Outputs log information of user privilege level increase. |
| | disable | Lowers a user privilege level. |
| | privilege | Configures command privilege levels. |
| | password | Specifies a line password. |
| | login | Enables line password protection. |
| Configuring Login and Authentication | (Optional) It is used to configure different login modes and authentication methods. | |
| | username | Configures local user account information and optional authorization information. |
| | login local | Configures local authentication for line-based login. |
| | login authentication | Configures AAA authentication for line-based login. |
| | telnet | Enables the Telnet Client service. |
| | enable service telnet-server | Enables the Telnet Server service. |
| | exec-timeout | Configures the connection timeout time. |
| | session-timeout | Configures the session timeout time. |
| | lockable | Enables line-based terminal lock. |
| | lock | Locks a terminal connected to the current line. |
| Configuring Basic | (Optional) It is used to configure basic system parameters. | |

| | | |
|---|---|---------------------------------------|
| System Parameters | clock set | Configures the system date and clock. |
| | clock update-calendar | Updates the hardware clock. |
| | hostname | Configures a system name. |
| | prompt | Configures a command prompt. |
| | banner motd | Configures daily notification. |
| | bannerlogin | Configures a login banner. |
| | speed | Configures the Console baud rate. |
| Enabling and Disabling a Specific Service | (Optional) It is used to enable and disable a specific service. | |
| | enable service | Enables a service. |
| Configuring a Restart Policy | (Optional) It is used to configure a system restart policy. | |
| | reload | Restarts a device. |

2.4.1 Configuring Passwords and Privileges

Configuration

Effect

Configure passwords to control users' access to network devices.

Assign a privilege level to a command to grant the command access to only the users at or higher than the level.

Lower the command privilege level to grant more users access to the command.

Raise the command privilege level to limit the command access to a few users.

Notes

You can use the password configuration command with the **level** option to configure a password for a specific privilege level. After you specify the level and the password, the password works for the users who need to access this level.

By default, no password is configured for any level. The default level is 15.

If you configure a simple encrypted password with a non-15 level, a warning is displayed and the password is automatically converted into a secure encrypted password.

The system chooses the secure encrypted password over the simple encrypted password if both of them are configured.

Configuration Steps

❖ Configuring a Simple Encrypted Password

(Optional) Perform this configuration when you need to establish simple encrypted password verification when users switch between different privilege levels.

Run the **enable password** command to configure a simple encrypted password.

❖ Configuring a Secure Encrypted Password

(Optional) Perform this configuration when you need to establish secure encrypted password verification when users switch between different privilege levels.

Run the **enable secret** command to configure a secure encrypted password.

A secure encrypted password has the same function as a simple encrypted password but uses an enhanced password encryption algorithm. Therefore, secure encrypted passwords are recommended out of security consideration.

❖ Configuring Command Privilege Levels

Optional.

A command at a lower level is accessible by more users than a command at a higher level.

❖ Raising/Lowering a User Privilege Level

After logging in to a network device, the user can change his/her level to obtain access to commands at different privilege levels.

Run the **enable** command or the **disable** command to raise or lower a user privilege level respectively.

To enable level increase logging, run the **login privilege log** command.

❖ Enabling Line Password Protection

(Optional) Line password protection is required for remote login (such as login through Telnet).

Run the **password [0 | 7] line** command to configure a line password, and then run the **login** command to enable login authentication.

i If a line password is configured but login authentication is not configured, the system does not display password prompt.


Verification

Run the **show privilege** command to display the current user level.

Run the **show running-config** command to display the configuration.

Related Commands

❖ Configuring a Simple Encrypted Password

| | |
|-----------------------|--|
| Command | enable password [level <i>level</i>] { <i>password</i> [0 7] <i>encrypted-password</i> } |
| Parameter Description | <p><i>level</i>: Indicates a specific user level.</p> <p><i>password</i>: Indicates the password used to enter privileged EXEC mode.</p> <p>0: Indicates that the password is entered in plaintext.</p> <p>7: Indicates that the password is entered in cyphertext.</p> <p><i>encrypted-password</i>: Indicates the password text, which must contain case-sensitive English letters and digits.</p> <p> Leading spaces are allowed, but will be ignored. However, intermediate and trailing spaces are recognized.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | <p>Currently, simple encrypted passwords can be configured with only level 15 and take effect only when no secure encrypted password is configured.</p> <p>If you configure a simple encrypted password with a non-15 level, a warning is displayed and the password is automatically converted into a secure encrypted password.</p> <p>If the level 15 simple encrypted password and secure encrypted password are configured the same, a warning is displayed.</p> <p>If you specify an encryption type and enter a password in plaintext, you cannot re-enter privileged EXEC mode. An encrypted password cannot be retrieved once lost. You have to configure a new password.</p> |

❖ Configuring a Secure Encrypted Password


| | |
|----------------|--|
| Command | enable secret [level <i>level</i>] {<i>secret</i> [0 5] <i>encrypted-secret</i> } |
|----------------|--|

| | |
|-----------------------|--|
| Parameter Description | <p><i>level</i>: Indicates a specific user level.</p> <p><i>secret</i>: Indicates the password used to enter privileged EXEC mode.</p> <p>0 5: Indicates the password encryption type. 0 indicates no encryption, and 5 indicates secure encryption.</p> <p><i>encrypted-password</i>: Indicates the password text.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to configure passwords for different privilege levels. |

❖ Raising a User Privilege Level

| | |
|-----------------------|---|
| Command | enable [<i>privilege-level</i>] |
| Parameter Description | <i>privilege-level</i> : Indicates a specific privilege level. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | An increase in privilege level requires the input of the target level password. |

❖ Lowering a User Privilege Level

| | |
|-----------------------|--|
| Command | disable [<i>privilege-level</i>] |
| Parameter Description | <i>privilege-level</i> : Indicates a specific privilege level. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | <p>A reduction in privilege level does not require password input.</p> <p>Use this command to exit Privileged EXEC mode and return to user EXEC mode. If <i>privilege-level</i> is specified, the current privilege level is reduced to the specified level.</p> <p> <i>privilege-level</i> must be lower than the current level.</p> |

❖ Enabling Level Increase Logging

| | |
|-----------------------|---|
| Command | login privilege log |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to enable logging of privilege level increase. The configuration takes effect for all terminals. |

❖ Configuring Command Privilege Levels

| | |
|-----------------------|---|
| Command | privilege <i>mode</i> [all] { level <i>level</i> reset } <i>command-string</i> |
| Parameter Description | <p><i>mode</i>: Indicates the CLI mode of the command. For example, config indicates the global configuration mode, EXEC indicates the privileged command mode, and interface indicates the interface configuration mode.</p> <p>all: Changes the subcommand privilege levels of a specific command to the same level.</p> <p>level <i>level</i>: Indicates a privilege level, ranging from 0 to 15.</p> <p>reset: Restores the command privilege level to the default.</p> <p><i>command-string</i>: Indicates the command to be assigned a privilege level.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | To restore a command privilege level, run the no privilege <i>mode</i> [all] level <i>level</i> <i>command</i> command in global configuration mode. |

❖ Specifying a Line Password

| | |
|-----------------------|---|
| Command | password[0 7] <i>line</i> |
| Parameter Description | <p>0: Indicates to configure a password in plaintext.</p> <p>7: Indicates to configure a password in cyphertext.</p> <p><i>line</i>: Indicates the password string.</p> |
| Command Mode | Line configuration mode |

| | |
|-------------|-----|
| Usage Guide | N/A |
|-------------|-----|

❖ Enabling Line Password Protection

| | |
|-----------------------|-------------------------|
| Command | login |
| Parameter Description | N/A |
| Command Mode | Line configuration mode |
| Usage Guide | N/A |

Configuration

Example

❖ Configuring Command Authorization

| | |
|---------------------|--|
| Scenario | Assign privilege level 1 to the reload command and its subcommands and configure level 1 as the valid level (by configuring the test password). |
| Configuration Steps | ❖ Assign privilege level 1 to the reload command and its subcommands. |
| | <pre>QTECH# configure terminal QTECH(config)# privilege exec all level 1 reload QTECH(config)# enable secret level 1 0 test QTECH(config)# end</pre> |
| Verification | ❖ Check whether the reload command and its subcommands are accessible at level 1. |
| | <pre>QTECH# disable 1 QTECH> reload ? at reload at <cr></pre> |

2.4.2 Configuring Login and Authentication

Configuration

Effect

Establish line-based login identity authentication.

Run the **telnet** command on a network device to log in to a remote device.

Close an established connection if no output is detected during the timeout time.

Disconnect an established session connecting to a remote host and restore the host to Idle if no output is detected during the timeout time.

Lock a terminal to deny access. When a user enters any character on the locked terminal, the password prompt is displayed. The terminal will be automatically unlocked if the entered password is correct.

Configuration

Steps

❖ Configuring Local User Information

Mandatory.

Run the **username** command to configure the account used for local identity authentication and authorization, including usernames, passwords, and optional authorization information.

Perform this configuration on every device.

❖ Configuring Local Authentication for Line-Based Login

Mandatory.

Configure local authentication for line-based login in the case that AAA is disabled.

Perform this configuration on every device.

❖ Configuring AAA Authentication for Line-Based Login

(Optional) Perform this configuration to configure AAA authentication for line-based login.

Configure AAA authentication for line-based login in the case that AAA is enabled.

Perform this configuration on every device.

❖ Enabling the Telnet Client Service

Run the **telnet** command to log in to a remote device.

❖ Restoring a Telnet Client Connection

(Optional) Perform this configuration to restore the connection on a Telnet client.

❖ Closing a Suspended Telnet Client Connection

(Optional) Perform this configuration to close the suspended connection on a Telnet client.

❖ Enabling the Telnet Server Service

Optional.

Enable the Telnet Server service when you need to enable Telnet login.

❖ Configuring the Connection Timeout Time

Optional.

An established connection will be closed if no output is detected during the timeout time.

Perform this configuration when you need to increase or reduce the connection timeout time.

❖ Configuring the Session Timeout Time

Optional.

The session connecting to a remote host will be disconnected and the host be restored to Idle if no output is detected during the timeout time.

Perform this configuration when you need to increase or reduce the session timeout time.

Locking a Session

(Optional) Perform this configuration when you need to temporarily exit a session on a device.

To lock a session, first enable terminal lock in line configuration mode, and then run the **lock** command to lock the terminal.

Verification

Run the **show running-config** command to display the configuration.

In the case that AAA is disabled, after local user information and line-based local authentication are configured, check whether users are prompted for username and password input for access to the CLI.

In the case that AAA is enabled, after local user information and local AAA authentication are configured, check whether users are prompted for username and password input for access to the CLI.

Run the **show user** command to display the information about the users who have logged in to the CLI.

Telnet clients can connect to devices enabled with the Telnet Server service.

When a user presses **Enter** on a locked CLI, the user is prompted for password input. The session is unlocked only when the entered password is the same as the configured one.

Run the **show sessions** command to display every established Telnet client instance.

Related Commands

❖ Configuring Local User Information

| | |
|-----------------------|--|
| Command | username <i>name</i> [login mode { <i>aux</i> <i>console</i> <i>ssh</i> <i>telnet</i> }] [online amount <i>number</i>] [permission <i>oper-mode path</i>] [privilege <i>privilege-level</i>] [reject remote-login] [web-auth] [pwd-modify] [nopassword password [<i>0</i> <i>7</i>] <i>text-string</i>] |
| Parameter Description | <p><i>name</i>: Indicates a user name.</p> <p>login mode: Indicates the login mode.</p> <p>aux: Indicates the aux mode.</p> <p>console: Sets the login mode to Console.</p> <p>ssh: Sets the login mode to SSH.</p> <p>telnet: Sets the login mode to Telnet.</p> <p>online amount <i>number</i>: Indicates the maximum number of online accounts.</p> <p>permission <i>oper-mode path</i>: Configures the file operation permission. <i>op-mode</i> indicates the operation mode, and <i>path</i> indicates the directory or path of a specific file.</p> <p>privilege <i>privilege-level</i>: Indicates the account privilege level, ranging from 0 to 15.</p> <p>reject remote-login: Rejects remote login by using the account.</p> <p>web-auth: Allows only Web authentication for the account.</p> <p>pwd-modify: Allows the account owner to change the password. This option is available only when web-auth is configured.</p> <p>nopassword: Indicates that no password is configured for the account.</p> <p>password [<i>0</i> <i>7</i>] <i>text-string</i>: Indicates the password configured for the account. 0 indicates that the password is input in plaintext, and 7 indicates that the password is input in cyphertext. The default is plaintext.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | <p>Use this command to create a local user database to be used by authentication.</p> <p>If the value 7 is selected for the encryption type, the entered cyphertext string must consist of an even number of characters.</p> |

| | |
|--|---|
| | This setting is applicable to the scenario where encrypted passwords may be copied and pasted. In other cases, the value 7 is not selected. |
|--|---|

❖ Configuring Local Authentication for Line-Based Login

| | |
|-----------------------|--|
| Command | login local |
| Parameter Description | N/A |
| Command Mode | Line configuration mode |
| Usage Guide | Use this command to configure local authentication for line-based login in the case that AAA is disabled. Local user information is configured by using the username command. |

❖ Configuring AAA Authentication for Line-Based Login

| | |
|-----------------------|--|
| Command | login authentication { default list-name } |
| Parameter Description | default: Indicates the default authentication method list name. <i>list-name:</i> Indicates the optional method list name. |
| Command Mode | Line configuration mode |
| Usage Guide | Use this command to configure AAA authentication for line-based login in the case that AAA is enabled. The AAA authentication methods, including RADIUS authentication, local authentication, and no authentication, are used during the authentication process. |

❖ Enabling the Telnet Client Service

| | |
|-----------------------|---|
| Command | telnet [oob] host [port] [/source { ip A.B.C.D ipv6 X:X:X:X:X interface interface-name }] [/vrf vrf-name] [via mgmt-name] |
| Parameter Description | oob: Remotely connects to a Telnet server through out-of-band communication (by using a management port). This option is available only when the device has a management port. |

| | |
|--------------|--|
| | <p><i>host</i>: Indicates the IPv4 address, IPv6 address, or host name of the Telnet server.</p> <p><i>port</i>: Indicates the TCP port number of the Telnet server. The default value is 23.</p> <p>/source: Indicates the source IP address or source port used by a Telnet client.</p> <p>ip <i>A.B.C.D</i>: Indicates the source IPv4 address used by the Telnet client.</p> <p>ipv6 <i>X:X:X::X</i>: Indicates the source IPv6 address used by the Telnet client.</p> <p>interface <i>interface-name</i>: Indicates the source port used by the Telnet client.</p> <p>/vrf <i>vrf-name</i>: Indicates the name of the virtual routing and forwarding (VRF) table to be queried.</p> <p>via <i>mgmt-name</i>: Indicates the management port used by the Telnet client when the oob option is specified.</p> |
| Command Mode | Privileged EXEC mode |
| Usage Guide | A user can telnet to a remote device identified by an IPv4 host name, IPv6 host name, IPv4 address, or IPv6 address. |

❖ Restoring a Telnet Client Session

| | |
|-----------------------|--|
| Command | <1-99> |
| Parameter Description | N/A |
| Command Mode | User EXEC mode |
| Usage Guide | Use this command to restore a Telnet client session. A user can press the shortcut key Ctrl+Shift+6 X to temporarily exit the Telnet client session that is established using the telnet command, run the <1-99> command to restore the session, and run the show sessions command to display the session information. |

❖ Closing a Suspended Telnet Client Connection

| | |
|-----------------------|---|
| Command | disconnect <i>session-id</i> |
| Parameter Description | <i>session-id</i> : Indicates the suspended Telnet client session ID. |

| | |
|--------------|--|
| Command Mode | User EXEC mode |
| Usage Guide | Use this command to close a specific Telnet client session by entering the session ID. |

❖ Enabling the Telnet Server Service

| | |
|-----------------------|--|
| Command | enable service telnet-server |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to enable the Telnet Server service. The IPv4 and IPv6 services are also enabled after the command is executed. |

❖ Configuring the Connection Timeout Time

| | |
|-----------------------|--|
| Command | exec-timeout <i>minutes</i> [<i>seconds</i>] |
| Parameter Description | <i>minutes</i> : Indicates the connection timeout time in the unit of minutes. <i>seconds</i> : Indicates the connection timeout time in the unit of seconds. |
| Command Mode | Line configuration mode |
| Usage Guide | Use this command to configure the timeout time for the established connections on a line. A connection will be closed when no input is detected during the timeout time. To remove the connection timeout configuration, run the no exec-timeout command in line configuration mode. |

❖ Configuring the Session Timeout Time

| | |
|-----------------------|---|
| Command | session-timeout <i>minutes</i>[<i>output</i>] |
| Parameter Description | <i>minutes</i> : Indicates the session timeout time in the unit of minutes. output : Indicates whether to add data output as a timeout criterion. |

| | |
|--------------|---|
| Command Mode | Line configuration mode |
| Usage Guide | Use this command to configure the timeout time for the remote host sessions on a line. A session will be disconnected when no input is detected during the timeout time. To cancel the session timeout time, run the no session-timeout command in line configuration mode. |

❖ Enabling Line-Based Terminal Lock

| | |
|-----------------------|-------------------------|
| Command | lockable |
| Parameter Description | N/A |
| Command Mode | Line configuration mode |
| Usage Guide | N/A |

❖ Locking a Terminal Connected to the Current Line

| | |
|-----------------------|-------------------------|
| Command | lock |
| Parameter Description | N/A |
| Command Mode | Line configuration mode |
| Usage Guide | N/A |

Configuration**Example**

❖ Establishing a Telnet Session to a Remote Network Device

| | |
|-------------------------|---|
| Configurati on Steps | <ul style="list-style-type: none"> ❖ Establish a Telnet session to a remote network device with the IP address 192.168.65.119. ❖ Establish a Telnet session to a remote network device with the IPv6 address 2AAA:BBBB::CCCC. ❖ Run the telnet command in privileged EXEC mode |
| | <pre>QTECH# telnet 192.168.65.119 Trying 192.168.65.119 ... Open User Access Verification Password:</pre> |
| | <pre>QTECH# telnet 2AAA:BBBB::CCCC Trying 2AAA:BBBB::CCCC ... Open User Access Verification Password:</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Check whether the Telnet sessions are established to the remote network devices. |

❖ Configuring the Connection Timeout Time

| | |
|-------------------------|---|
| Configurati on Steps | <ul style="list-style-type: none"> ❖ Set the connection timeout time to 20 minutes. |
| | <pre>QTECH# configure terminal//Enter global configuration mode. QTECH# line vty 0 //Enter line configuration mode. QTECH(config-line)#exec-timeout 20 //Set the connection timeout time to 20 minutes.</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Check whether the connection between a terminal and the local device is closed when no input is detected during the timeout time. |

❖ Configuring the Session Timeout Time

| | |
|-------------------------|--|
| Configurati on Steps | <ul style="list-style-type: none"> ❖ Set the session timeout time to 20 minutes. |
| | <pre>QTECH# configure terminal//Enter global configuration mode. QTECH(config)# line vty 0 //Enter line configuration mode. QTECH(config-line)#session-timeout 20//Set the session timeout time to 20 minutes.</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Check whether the session between a terminal and the local device is disconnected when no input is detected during the timeout time. |

2.4.3 Configuring Basic System Parameters

Configuration

Effect

Configure basic system parameters.

Configuration

Steps

❖ Configuring the System Date and Clock

Mandatory.

Configure the system time of a network device manually. The device clock starts from the configured time and keeps running even when the device is powered off.

i The time configuration is applied only to the software clock if the network device does not provide a hardware clock. The configuration will be invalid when the device is powered off.

❖ Updating the Hardware Clock

Optional.

Perform this configuration when you need to copy the date and time of the software clock to the hardware clock so that the hardware clock is synchronized with the software clock.

❖ Configuring a System Name

(Optional) Perform this configuration to change the default system name.

❖ Configuring a Command Prompt

(Optional) Perform this configuration to change the default command prompt.

❖ Configuring Daily Notification

(Optional) Perform this configuration when you need to display important prompts or warnings to users.

You can configure notification in one or multiple lines, which will be displayed to users after login.

❖ Configuring a Login Banner

(Optional) Perform this configuration when you need to display important messages to users upon login or logout.

❖ Configuring the Console Baud Rate

(Optional) Perform this configuration to change the default Console baud rate.

Verification

Run the **show clock** command to display the system time.

Check whether a login banner is displayed after login.

Run the **show version** command to display the system information and version.

Related Commands

❖ Configuring the System Date and Clock

| Command | clock set <i>hh:mm:ss month day year</i> |
|-----------------------|--|
| Parameter Description | <p><i>hh:mm:ss</i>: Indicates the current time, in the format of <i>hour</i> (24-hour format):<i>minute:second</i>.</p> <p><i>day</i>: Indicates a day (1–31) of the month.</p> <p><i>month</i>: Indicates a month (from January to December) of the year.</p> <p><i>year</i>: Indicates a year, ranging from 1993 to 2035. Abbreviation is not supported.</p> |
| Command Mode | Privileged EXEC mode |
| Usage Guide | <p>Use this command to configure the system time.</p> <p>If the device does not provide a hardware clock, the time configuration will be invalid when the device is powered off.</p> |

❖ Updating the Hardware Clock

| Command | clock update-calendar |
|-----------------------|--|
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | After the configuration, the time of the software clock will overwrite that of the hardware clock. |

❖ Configuring a System Name

| Command | hostname <i>name</i> |
|-----------|--|
| Parameter | <i>name</i> : Indicates the system name, which must consist of printable characters and must |

| | |
|--------------|--|
| Description | not exceed 63 bytes. |
| Command Mode | Global configuration mode |
| Usage Guide | To restore the system name to the default, run the no hostname command in global configuration mode. |

❖ Configuring a Command Prompt

| | |
|-----------------------|--|
| Command | prompt <i>string</i> |
| Parameter Description | <i>string</i> : Indicates the command prompt name. A name with more than 32 characters will be truncated to keep only the first 32 characters. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | To restore the command prompt to the default settings, run the no prompt command in global configuration mode. |

❖ Configuring Daily Notification

| | |
|-----------------------|---|
| Command | banner motd <i>c message c</i> |
| Parameter Description | <i>c</i> : Indicates a delimiter, which can be any character, such as "&". |
| Command Mode | Global configuration mode |
| Usage Guide | A message must start and end with delimiter+carriage return respectively. Any characters following the ending delimiter will be dropped. Any letter contained in the message must not be used as the delimiter. The message must not exceed 2047 bytes. |

❖ Configuring a Login Banner

| | |
|-----------------------|--|
| Command | banner login <i>c message c</i> |
| Parameter Description | <i>c</i> : Indicates a delimiter, which can be any character, such as "&". |
| Command Mode | Global configuration mode |

| | |
|-------------|--|
| Mode | |
| Usage Guide | <p>A message must start and end with delimiter+carriage return respectively. Any characters following the ending delimiter will be dropped. Any letter contained in the message must not be used as the delimiter. The message must not exceed 2047 bytes.</p> <p>To remove the login banner configuration, run the no banner login command in global configuration mode.</p> |

❖ Configuring the Console Baud Rate

| | |
|-----------------------|--|
| Command | speed speed |
| Parameter Description | <i>speed</i> : Indicates the console baud rate, in the unit of bps. The serial port baud rate can be set to 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps, or 115,200 bps. The default is 9,600 bps. |
| Command Mode | Line configuration mode |
| Usage Guide | You can configure the asynchronous line baud rate based on requirements. The speed command is used to configure receive and transmit rates for the asynchronous line. |

Configuration Example

❖ Configuring the System Time

| | |
|---------------------|---|
| Configuration Steps | ❖ Change the system time to 2003-6-20, 10:10:12. |
| | QTECH# clock set 10:10:12 6 20 2003 //Configure the system time and date. |
| Verification | ❖ Run the show clock command in privileged EXEC mode to display the system time. |
| | QTECH# show clock //Confirm that the changed system time takes effect. clock: 2003-6-20 10:10:54 |

Configuring Daily Notification

| | |
|---------------------|--|
| Configuration Steps | ❖ Configure the daily notification message "Notice: system will shutdown on July 6th." with the pound key (#) as the delimiter. |
|---------------------|--|

| | |
|--------------|---|
| | <pre>QTECH(config)# banner motd #//Starting delimiter Enter TEXT message. End with the character '#'. Notice: system will shutdown on July 6th.# //Ending delimiter QTECH(config)#</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show running-config command to display the configuration. ❖ Connect to the local device through the Console, Telnet or SSH, and check whether daily notification is displayed before the CLI appears. |
| | <pre>C:\>telnet 192.168.65.236 Notice: system will shutdown on July 6th. Access for authorized users only. Please enter your password. User Access Verification Password:</pre> |

❖ Configuring a Login Banner

| | |
|---------------------|---|
| Configuration Steps | ❖ Configure the login banner message "Access for authorized users only. Please enter your password." with the pound key (#) as the delimiter. |
| | <pre>QTECH(config)# banner login #//Starting delimiter Enter TEXT message. End with the character '#'. Access for authorized users only. Please enter your password. # //Ending delimiter QTECH(config)#</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show running-config command to display the configuration. ❖ Connect to the local device through the Console, Telnet or SSH, and check whether the login banner is displayed before the CLI appears. |
| | <pre>C:\>telnet 192.168.65.236 Notice: system will shutdown on July 6th. Access for authorized users only. Please enter your password. User Access Verification Password:</pre> |

❖ Configuring the Serial Port Baud Rate

| | |
|---------------------|---|
| Configuration Steps | ❖ Set the serial port baud rate to 57,600 bps. |
| | <pre>QTECH# configure terminal //Enter global configuration mode. QTECH(config)# line console 0 //Enter console line configuration mode. QTECH(config-line)# speed 57600 //Set the console baud rate to 57,600 bps. QTECH(config-line)# end //Returns to privileged mode.</pre> |

| | |
|--------------|--|
| Verification | ❖ Run the show command to display the configuration. |
| | <pre> QTECH# show line console 0 //Displays the console configuration. CON Type speed Overruns * 0 CON 57600 0 Line 0, Location: "", Type: "vt100" Length: 25 lines, Width: 80 columns Special Chars: Escape Disconnect Activation ^^x none ^M Timeouts: Idle EXEC Idle Session never never History is enabled, history size is 10. Total input: 22 bytes Total output: 115 bytes Data overflow: 0 bytes stop rx interrupt: 0 times Modem: READY </pre> |

2.4.4 Enabling and Disabling a Specific Service

Configuration

Effect

Dynamically adjust system services when the system is running, and enable and disable specific services (SNMP Agent, SSH Server, and Telnet Server).

Configuration

Steps

- ❖ Enabling the SNMP Agent, SSH Server, and Telnet Server Services
(Optional) Perform this configuration when you need to use these services.

Verification

Run the **show running-config** command to display the configuration.

Run the **show services** command to display the service Enabled/Disable state.

Related

Commands

- ❖ Enabling the SSH Server, Telnet Server, and SNMP Agent Services

| | |
|---------|---|
| Command | enable service { ssh-server telnet-server snmp-agent } |
|---------|---|

| | |
|-----------------------|---|
| Parameter Description | <p>ssh-server: Enables or disables the SSH Server service. The IPv4 and IPv6 services are also enabled together with this service.</p> <p>telnet-server: Enables or disables the Telnet Server service. The IPv4 and IPv6 services are also enabled together with this service.</p> <p>snmp-agent: Enables or disables the SNMP Agent service. The IPv4 and IPv6 services are also enabled together with this service.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to enable and disable specific services. |

Configuration Example

❖ Enabling the SSH Server Service

| | |
|---------------------|--|
| Configuration Steps | ❖ Enable the SSH Server service. |
| | <pre>QTECH# configure terminal //Enter global configuration mode. QTECH(config)#enable service ssh-server //Enable the SSH Server service.</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show running-config command to display the configuration. ❖ Run the show ip ssh command to display the configuration and running state of the SSH Server service. |

2.4.5 Configuring a Restart Policy

Configuration Effect

Configure a restart policy to restart a device as scheduled.

Configuration Steps

❖ Configuring Direct Restart

Run the **reload** command in privileged EXEC mode to restart the system immediately.

❖ Configuring Timed Restart

```
reload at hh:mm:ss month day year [string]
```

If you configure a specific time, the system will restart at the time. The time must be a time in the future. The **month**, **day** and **year** parameters are optional. If they are not specified, the time of the system clock is used by default.

The clock feature must be supported by the system if you want to use the **at** option. It is recommended that you configure the system clock in advance. A new restart plan will overwrite the existing one. A restart plan will be invalid if the system is restarted before the plan takes effect.

The restart time must be later than the current system time. After you configure a restart plan, do not change the system clock; otherwise, the plan may fail (for example, the system time is changed to a time after the restart time.)

Related Commands

❖ Restarting a Device

| | |
|-----------------------|---|
| Command | reload [at { <i>hh</i> [:<i>mm</i> [:<i>ss</i>]] } [<i>month</i> [<i>day</i> [<i>year</i>]]]] |
| Parameter Description | <p>at <i>hh:mm:ss</i>: Indicates the time when the system will restart.</p> <p><i>month</i>: Indicates a month of the year, ranging from 1 to 12.</p> <p><i>day</i>: Indicates a date, ranging from 1 to 31.</p> <p><i>year</i>: Indicates a year, ranging from 1993 to 2035. Abbreviation is not supported.</p> |
| Command Mode | Privileged EXEC mode |
| Usage Guide | Use this command to enable a device to restart at a specific time. |

2.5 Monitoring

Displaying

| Description | Command |
|-------------|-----------------------------------|
| show clock | Displays the current system time. |

| | |
|--|--|
| <code>show line { console <i>line-num</i> vty <i>line-num</i> <i>line-num</i> }</code> | Displays line configurations. |
| <code>show reload</code> | Displays system restart settings. |
| <code>show running-config [interface <i>interface</i>]</code> | Displays the current running configurations of the device or the configurations on an interface. |
| <code>show startup-config</code> | Displays the device configurations stored in the NVRAM. |
| <code>show this</code> | Displays the current system configurations. |
| <code>show version [devices module slots]</code> | Displays system information. |
| <code>show sessions</code> | Displays the information of each established Telnet client instance. |

3 CONFIGURING LINES

3.1 Overview

There are various types of terminal lines on network devices. You can manage terminal lines in groups based on their types. Configurations on these terminal lines are called line configurations. On network devices, terminal lines are classified into multiple types such as CTY and VTY.

3.2 Applications

| Application | Description |
|--|---|
| Accessing a Device Through Console | Enter the command-line interface (CLI) of a network device through the Console. |
| Accessing a Device Through VTY | Enter the CLI of a network device through Telnet or SSH. |

3.2.1 Accessing a Device Through Console

Scenario

Figure 3-1



| | |
|---------------|---|
| Remark | A is a network device to be managed. |
| s | PC is a network management station. |

Deployment

The network management station connects to the Console port of a network device through a serial cable. Using the Console software (Hyper Terminal or other terminal simulation software) on the

network management station, you can access the Console of the network device and enter the CLI to configure and manage the network device.

3.2.2 Accessing a Device Through VTY

Scenario

Figure 3-2



| | |
|--------------------|---|
| Remark S | A is a network device to be managed. PC is a network management station. |
|--------------------|---|

Deployment

The network management station connects to a network device through the network. Using a VTY client (such as Putty) on the network management station, you can access the network device through Telnet or SSH and enter the CLI to configure and manage the network device.

3.3 Features

Basic Concepts

❖ CTY

The CTY line refers to the line connected to the Console port. Most network devices have a Console port. You can access the local system through the Console port.

❖ VTY

The VTY line is a virtual terminal line that does not correspond to any hardware. It is used for Telnet or SSH connection.

Overview

| Feature | Description |
|--------------------------------|---|
| Basic Features | Configures a terminal, displays and clears terminal connection information. |

3.3.1 Basic Features

Related Configuration

❖ Configuring Terminal Lines

Run the **line** command in global configuration mode to enter the configuration mode of a specified line.

Configure the line attributes.

❖ Clearing Terminal Connections

When a terminal connects to the network device, the corresponding terminal line is occupied. Run the **show user** command to display the connection status of these terminal lines. If you want to disconnect the terminal from the network device, run the **clear line** command to clear the terminal line. After the terminal lines are cleared, the related connections (such as Telnet and SSH) are interrupted, the CLI exits, and the terminal lines restore to the unoccupied status. Users can re-establish connections.

❖ Specifying the Number of VTY Terminals

Run the **line vty** command to enter the VTY line configuration mode and specify the number of VTY terminals.

By default, there are 5 VTY terminals, numbered from 0 to 4. You can increase the number of VTY terminals to 36, with new ones numbered from 5 to 35. Only new terminals can be removed.

3.4 Configuration

| Configuration | Description and Command |
|---------------|--|
| | (Mandatory) It is used to enter the line configuration mode. |
| | line [console vty] <i>first-line</i> [<i>last-line</i>] Enters the specified line configuration mode. |
| | line vty <i>line-number</i> Increases or reduces the number of available VTY lines. |

3.4.1 Entering Line Configuration Mode

Configuration

Effect

Enter line configuration mode to configure other functions.

Configuration

Steps

❖ Entering Line Configuration Mode

Mandatory.

Unless otherwise specified, enter line configuration mode on each device to configure line attributes.

❖ Increasing/Reducing the Number of VTY Lines

Optional.

Run the **(no) line vty** *line-number* command to increase or reduce the number of VTY lines.

Verification

Run the **show line** command to display line configuration.

Related

Commands

❖ Entering Line Configuration Mode

| Command | <code>line [aux console tty vty] first-line [last-line]</code> |
|-----------------------|--|
| Parameter Description | <p>console: Indicates the Console port.</p> <p>vty: Indicates a virtual terminal line, which supports Telnet or SSH.</p> <p><i>first-line:</i> Indicates the number of the first line.</p> <p><i>last-line:</i> Indicates the number of the last line.</p> |
| Command Mode | Global configuration mode |
| Usage Guide | N/A |

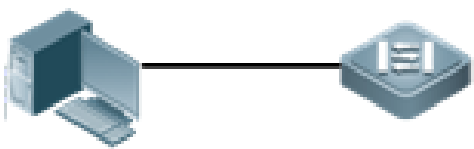
❖ Increasing/Reducing the Number of VTY Lines

| | |
|-----------------------|---|
| Command | line vty line-number |
| Parameter Description | line-number: Indicates the number of VTY lines. The value ranges from 0 to 35. |
| Command Mode | Global configuration mode |
| Usage Guide | Run the no line vty line-number command to reduce the number of available VTY lines. |

❖ Displaying Line Configuration

| | |
|-----------------------|--|
| Command | show line { console line-num vty line-num line-num } |
| Parameter Description | console: Indicates the Console port. vtty: Indicates a virtual terminal line, which supports Telnet or SSH. <i>line-num:</i> Indicates the line to be displayed. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

Configuration**Example**

| | |
|--------------------------------------|---|
| Scenario Figure 3-3 |  <p>The diagram illustrates a network connection between a PC and a device labeled 'A'. A horizontal line connects the two devices. The PC is represented by a blue icon of a computer tower and monitor, and 'A' is represented by a blue icon of a network switch or router.</p> |
|--------------------------------------|---|

| | |
|-------------------------|---|
| Configurati on Steps | <ul style="list-style-type: none"> ❖ Connect the PC to network device A through the Console line and enter the CLI on the PC. ❖ Run the show user command to display the connection status of the terminal line. ❖ Run the show line console 0 command to display the status of the Console line. ❖ Enter global configuration mode and run the line vty command to increase the number of VTY terminals to 36. |
| A | <pre> QTECH#show user Line User Host(s) Idle Location ----- * 0 con 0 --- idle 00:00:00 --- QTECH#show line console 0 CON Type speed Overruns * 0 CON 9600 0 Line 0, Location: "", Type: "vt100" Length: 24 lines, Width: 79 columns Special Chars: Escape Disconnect Activation ^^x ^D ^M Timeouts: Idle EXEC Idle Session 00:10:00 never History is enabled, history size is 10. Total input: 490 bytes Total output: 59366 bytes Data overflow: 0 bytes stop rx interrupt: 0 times QTECH#show line vty ? <0-5> Line number QTECH#configure terminal Enter configuration commands, one per line. End with CNTL/Z. QTECH(config)#line vty 35 QTECH(config-line)# *Oct 31 18:56:43: %SYS-5-CONFIG_I: Configured from console by console </pre> |
| Verification | <ul style="list-style-type: none"> ❖ After running the show line command, you can find that the number of terminals increases. ❖ Run the show running-config command to display the configuration. |
| A | <pre> QTECH#show line vty ? <0-35> Line number QTECH#show running-config </pre> |

```
Building configuration...
Current configuration : 761 bytes
version 11.0(1C2B1)(10/16/13 04:23:54 CST -ngcf78)
ip tcp not-send-rst
vlan 1
!
interface GigabitEthernet 0/0
!
interface GigabitEthernet 0/1
ip address 192.168.23.164 255.255.255.0
!
interface GigabitEthernet 0/2
!
interface GigabitEthernet 0/3
!
interface GigabitEthernet 0/4
!
interface GigabitEthernet 0/5
!
interface GigabitEthernet 0/6
!
interface GigabitEthernet 0/7
!
interface Mgmt 0
!
line con 0
line vty 0 35
login
!
end
```

3.5 Monitoring

Clearing

Running the **clear** commands may lose vital information and thus interrupt services.

| Description | Command |
|------------------------------------|--|
| Clears the line connection status. | clear line { console <i>line-num</i> vtty <i>line-num</i> <i>line-num</i> } |

Displaying

| Description | Command |
|---|--|
| Displays the line configuration. | show line { console <i>line-num</i> vty <i>line-num</i> <i>line-num</i> } |
| Displays historical records of a line. | show history |
| Displays the privilege level of a line. | show privilege |
| Displays users on a line. | show user [all] |

4 CONFIGURING TIME RANGE

4.1 Overview

Time Range is a time-based control service that provides some applications with time control. For example, you can configure a time range and associate it with an access control list (ACL) so that the ACL takes effect within certain time periods of a week.

4.2 Typical Application

| Typical Application | Scenario |
|--|---|
| Applying Time Range to an ACL Applying Time Range to an ACL | Apply a time range to an ACL module so that the time-based ACL takes effect |

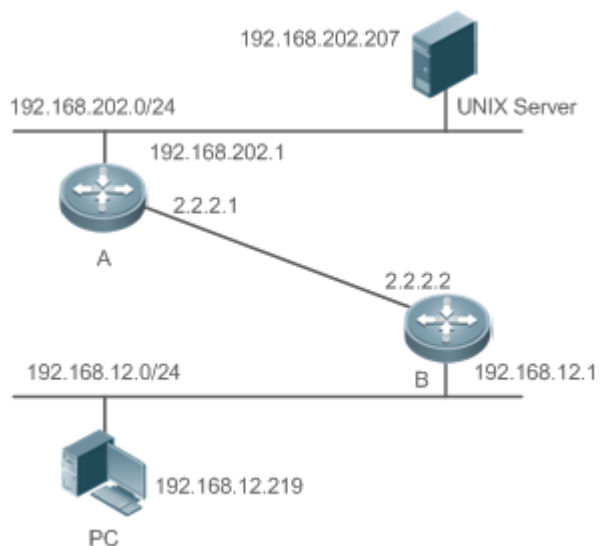
4.2.1 Applying Time Range to an ACL

Application

Scenario

An organization allows users to access the Telnet service on a remote Unix host during working hours only, as shown in Figure 4-1.

Figure 4-1



| | |
|-------------|--|
| Note | Configure an ACL on device B to implement the following security function: Hosts in network segment 192.168.12.0/24 can access the Telnet service on a remote Unix host during normal working hours only. |
|-------------|--|

Functional Deployment

On device B, apply an ACL to control Telnet service access of users in network segment 192.168.12.0/24. Associate the ACL with a time range, so that the users' access to the Unix host is allowed only during working hours.

4.3 Function Details

Basic Concepts

❖ Absolute Time Range

The absolute time range is a time period between a start time and an end time. For example, [12:00 January 1 2000, 12:00 January 1 2001] is a typical absolute time range. When an application based on a time range is associated with the time range, a certain function can be effective within this time range.

❖ Periodic Time

Periodic time refers to a periodical interval in the time range. For example, “from 8:00 every Monday to 17:00 every Friday” is a typical periodic time interval. When a time-based application is associated with the time range, a certain function can be effective periodically from every Monday to Friday.

Features

| Feature | Function |
|---|---|
| Using Absolute Time Range | Sets an absolute time range for a time-based application, so that a certain function takes effect within the absolute time range. |
| Using Periodic Time | Sets periodic time or a time-based application, so that a certain function takes effect within the periodic time. |

4.3.1 Using Absolute Time Range

Working Principle

When a time-based application enables a certain function, it determines whether current time is within the absolute time range. If yes, the function is effective or ineffective at the current time depending on specific configuration.

Related Configuration

❖ Configuring Time Range

No time range is configured by default.

Use the **time-range** *time-range-name* command to configure a time range.

❖ Configuring Absolute Time Range

The absolute time range is [00:00 January 1, 0, 23:59 December 31, 9999] by default.

Use the **absolute** { [start time date] | [end time date] } command to configure the absolute time range.

4.3.2 Using Periodic Time

Working Principle

When a time-based application enables a certain function, it determines whether current time is within the period time. If yes, the function is effective or ineffective at the current time depending on specific configuration.

Related Configuration

❖ Configuring Time Range

No time range is configured by default.

Use the **time-range** *time-range-name* command to configure a time range.

❖ Configure Periodic Time

No periodic time is configured by default.

Use the **periodic** *day-of-the-week time to [day-of-the-week] time* command to configure periodic time.

4.4 Configuration Details

| Configuration Item | Suggestions and Related Commands |
|--|--|
| Configuring Time Range | Mandatory configuration. Time range configuration is required so as to use the time range function. |
| | time-range <i>time-range-name</i> Configures a time range. |
| | Optional configuration. You can configure various parameters as necessary. |
| | absolute { [start <i>time date</i>] [end <i>time date</i>] } Configures an absolute time range. |
| | periodic <i>day-of-the-week time to [day-of-the-week] time</i> Configures periodic time. |

4.4.1 Configuring Time Range

Configuration Effect

Configure a time range, which may be an absolute time range or a periodic time interval, so that a time-range-based application can enable a certain function within the time range.

Configuration

Method

❖ Configuring Time Range

Mandatory configuration.

Perform the configuration on a device to which a time range applies.

❖ Configuring Absolute Time Range

Optional configuration.

❖ Configuring Periodic Time

Optional configuration.

Verification

Use the **show time-range** [*time-range-name*] command to check time range configuration information.

Related

Commands

❖ Configuring Time Range

| | |
|-----------------------|--|
| Command | time-range <i>time-range-name</i> |
| Parameter Description | <i>time-range-name</i> : name of the time range to be created. |
| Default | No time range is configured by default. |
| Command Mode | Global configuration mode |
| Usage Guide | Some applications (such as ACL) may run based on time. For example, an ACL can be effective within certain time ranges of a week. To this end, first you must configure a time range, then you can configure relevant time control in time range configuration mode. |

❖ Configuring Absolute Time Range

| | |
|----------------|---|
| Command | absolute { [<i>start time date</i>] [<i>end time date</i>] } |
|----------------|---|

| | |
|-----------------------|--|
| Parameter Description | start <i>time date</i> : start time of the range. end <i>time date</i> : end time of the range. |
| Default | No absolute time range is configured by default. |
| Command Mode | Time range configuration mode |
| Usage Guide | Use the absolute command to configure a time absolute time range between a start time and an end time to allow a certain function to take effect within the absolute time range. |

❖ Configuring Periodic Time

| | |
|-----------------------|---|
| Command | periodic <i>day-of-the-week time</i> to [<i>day-of-the-week</i>] <i>time</i> |
| Parameter Description | <i>day-of-the-week</i> : the week day when the periodic time starts or ends <i>time</i> : the exact time when the periodic time starts or ends |
| Default | No periodic time is configured by default. |
| Command Mode | Time range configuration mode |
| Usage Guide | Use the periodic command to configure a periodic time interval to allow a certain function to take effect within the periodic time. |

4.5 Monitoring and Maintaining Time Range

Displaying the Running Status

| Function | Command |
|------------------------------------|--|
| Displays time range configuration. | show time-range [<i>time-range-name</i>] |

5 CONFIGURING USB

5.1 Overview

Universal serial bus (USB) is an external bus standard. In this document, USB refers to a USB-compliant peripheral device, for example, a USB flash drive.

USB is a hot swappable device. You can use it to copy files (such as configuration and log files) from a communication device, or copy external data (such as system upgrade files) to the flash of the communication device.

Specific application scenarios of the USB are detailed in configuration guides of related functions. This document describes only how to identify, use, and remove the USB and view information about the USB.

5.2 Applications

| Application | Description |
|---|--|
| Using a USB Flash Drive to Upgrade a Device | Upgrade files are stored on a USB flash drive. After a device is powered on, the device detects the USB flash drive and runs the upgrade command to load the upgrade files. After loading is completed, the device is reset and runs the upgraded version. |

5.2.1 Using a USB Flash Drive to Upgrade a Device

Scenario

Upgrade files are stored on a USB flash drive. After a device is powered on, the device detects the USB flash drive and runs the upgrade command to load the upgrade files. After loading is completed, the device is reset and runs the upgraded version. An example of the upgrade command is as follows:

```
upgrade usb0:/s12k-ppc_11.0(1B2)_20131025_main_install.bin
```

If the file is valid and execution of this command succeeds, the device will be automatically reset and run the upgraded version.

Deployment

Use the prefix "usb0:/" to access USB 0. Run the **show usb** command to display information about the USB with the ID 0.

Run the **upgrade** command to perform upgrade.

5.3 Features

❖ Using the USB

Insert a USB into the USB slot. The system automatically searches for the USB. After the USB is located, the driver module automatically initializes the driver of the USB. After initialization, the system automatically loads the file system on the USB. Later, the system can read or write this USB.

If the system finds a USB and successfully loads the driver, the following information will be displayed:

```
*Jan 1 00:09:42: %USB-5-USB_DISK_FOUND: USB Disk <Mass Storage> has been inserted to USB
port 0!
*Jan 1 00:09:42: %USB-5-USB_DISK_PARTITION_MOUNT: Mount usb0(type:FAT32),size :
1050673152B(1002MB)
```

i "Mass Storage" indicates the name of the searched device, and "usb0:" indicates the first USB. "Size" indicates the size of the partition. For example, according to the preceding information displayed, the USB flash drive has a space of 1002 MB.

i "Size" indicates the size of the partition.

❖ Removing the USB

Use a command line interface (CLI) command to remove the USB first; otherwise, an error may occur if the system is currently using the USB.

If the USB is successfully removed, the following information will be displayed:

```
OK, now you can pull out the device 0.
```

You can remove the USB only after the preceding information is displayed.

5.4 Configuration

| Configuration | Description and Command |
|-----------------------------|-------------------------|
| Using a USB | Mandatory. |
| | N/A |

| | | |
|--------------------------------|---|----------------|
| Removing a USB | (Mandatory) It is used to remove a USB. | |
| | usb remove | Removes a USB. |

5.4.1 Using a USB

Configuration

Effect

After a USB is loaded, you can run the file system commands (such as **dir**, **copy**, and **del**) to perform operations on the USB.

Notes

The QTECH General Operating System (OS) is applicable only to devices (generally common USB flash drives) that support standard Small Computer System Interface (SCSI) commands. Other devices, such as the USB flash drive embedded in the USB network interface card (NIC) and USB flash drive with the virtual CD-ROM drive, cannot be used in the OS. Some devices are configured with the function of converting a USB port to the serial port.

The USB supports only the FAT file system. Other file systems on the USB must be formatted to the FAT file system on a PC before the USB can be used on a device.

The OS supports the hub. When a USB flash drive is inserted to a port on a hub, the access path becomes different. If the USB flash drive is inserted to a USB port on a device, the access path is **usbX:/**, where **X** indicates the device ID. You can run the **show usb** command to display this path. If the USB flash drive is inserted to a USB port through a hub, the access path is **usbX-Y:/**, where **X** indicates the device ID, and **Y** indicates the hub port ID. For example, **usb0-3:/** indicates port 3 on the hub that is connected to USB port 0 on the device.

Configuration

Steps

❖ Identifying a USB

A USB can be directly inserted to the USB slot without a CLI operation.

❖ Using a USB

Perform the following operations to copy files from a USB to the flash:

Run the **cd** command to enter the partition of the USB.

Run the **copy** command to copy files on the USB to the flash on the device.

Run the **dir** command to check whether the files are copied to the device.

i If the USB has multiple partitions, you can access only the first FAT partition on the device.

- i** The path of the USB does not contain any upper-level directory. After running the `cd usbX:\` command to access a USB, you can run the `cd flash:\` command to return to the flash file system.

Verification

Run the **show usb** command to display information about the USB inserted to the device.

Configuration

Example

❖ Using a USB Flash Drive

| Scenario | Standalone environment |
|---------------------|---|
| Configuration Steps | <ul style="list-style-type: none"> ❖ Insert the USB flash drive into the USB slot of the device. ❖ Run the show usb command on the device console. ❖ Copy the config.txt file from the USB flash drive to the flash on the device. |
| | <pre> QTECH#show usb Device: Mass Storage ID: 0 URL prefix: usb0 Disk Partitions: usb0(type:vfat) Size:15789711360B(15789.7MB) Available size:15789686784B(15789.6MB) QTECH# QTECH# QTECH#dir usb0:/ Directory of usb0:/ 1 -rwx 4 Tue Jan 1 00:00:00 1980 fac_test 2 -rwx 1 Mon Sep 30 13:15:48 2013 config.txt 2 files, 0 directories 15,789,711,360 bytes total (15,789,686,784 bytes free) QTECH# QTECH# QTECH#copy usb0:/config.txt flash:/ Copying: ! Accessing usb0:/config.txt finished, 1 bytes prepared Flushing data to flash:/config.txt... Flush data done QTECH# </pre> |

| | |
|--------------|--|
| | QTECH# |
| Verification | Check whether the config.txt file exists on the flash. |
| | <pre> QTECH# QTECH#dir flash:/ Directory of flash:/ 1 drw- 160 Wed Mar 31 08:40:01 2010 at 2 drwx 160 Thu Jan 1 00:00:11 1970 dm 3 drwx 160 Thu Jan 1 00:00:05 1970 rep 4 drwx 160 Mon Apr 26 03:42:00 2010 scc 5 drwx 160 Wed Mar 31 08:39:52 2010 ssh 6 drwx 224 Thu Jan 1 00:00:06 1970 var 7 d--- 288 Sat May 29 06:07:45 2010 web 8 drwx 160 Thu Jan 1 00:00:11 1970 addr 9 drwx 160 Sat May 29 06:07:44 2010 cwmp 10 drwx 784 Sat May 29 06:07:47 2010 sync 11 --w- 92 Tue Feb 2 01:06:55 2010 config_vsu.dat 12 -rw- 244 Sat Apr 3 04:56:52 2010 config.text 13 -rwx 1 Thu Jan 1 00:00:30 1970 .issu_state 14 -rw- 0 Tue Feb 2 01:07:03 2010 ss_ds_debug.txt 15 -rw- 8448 Thu Jan 1 00:01:41 1970 .shadow 16 -rwx 268 Thu Jan 1 00:01:41 1970 .pswdinfo 17 -rw- 4 Tue May 25 09:12:01 2010 reload 18 drwx 232 Wed Mar 31 08:40:00 2010 snpv4 19 drwx 6104 Sat May 29 06:10:45 2010 .config 20 ---- 1 Thu Jan 1 00:04:51 1970 config.txt 21 d--- 160 Thu Jan 1 00:00:12 1970 syslog 22 drwx 160 Tue May 25 03:05:01 2010 upgrade_ram 23 drwx 160 Tue Feb 2 01:06:54 2010 dm_vdu 24 -rwx 16 Thu Jan 1 00:01:41 1970 .username.data 9 files, 15 directories 5,095,424 bytes total (4,960,256 bytes free) QTECH# </pre> |

Common

Errors

Insert a USB flash drive that supports non-SCSI commands to the device.

The USB does not use the FAT file system, and cannot be identified by the system.

5.4.2 Removing a USB

Configuration

Effect

Remove the USB and ensure that the USB and the device are intact.

Notes

Run the **usb remove** command before removing the USB; otherwise, a system error occurs.

Configuration

Steps

- ❖ Running the Remove Command

Mandatory.

Run the **usb remove** command before removing the USB.

- ❖ Removing the USB

After the remove command is executed, remove the USB.

Verification

Run the **show usb** command to display information about the USB inserted to the device.

Related

Commands

- ❖ Removing a USB

| | |
|-----------------------|---|
| Command | usb remove <i>device-id</i> |
| Parameter Description | <i>device-id</i> : Indicates the ID of the USB port on the device. You can run the show usb command to display this ID. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | Before removing a USB, run the usb remove command; otherwise, an error occurs if the USB is in use. If the command is executed, related information will be displayed, and you can remove the USB. If the command execution fails, the USB is in use. In this case, do not remove the USB until it is not in use. |

Configuration

Example

❖ Removing a USB

| Scenario | Standalone environment |
|---------------------|--|
| Configuration Steps | <ul style="list-style-type: none"> ❖ Run the show usb command to display the ID of the USB. ❖ Run the usb remove command to remove the USB. |
| | <pre>QTECH#show usb Device: Mass Storage ID: 0 URL prefix: usb0 Disk Partitions: usb0(type:vfat) Size:15789711360B(15789.7MB) Available size:15789686784B(15789.6MB) QTECH# QTECH# QTECH#usb remove 0 OK, now you can pull out the device 0.</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show usb command again to check whether the USB is removed. If the device with ID 0 is not displayed in output of the show usb command, the USB is removed. |
| | <pre>QTECH#show usb QTECH#</pre> |

5.5 Monitoring

Displaying

| Description | Command |
|--|----------|
| Displays information about the inserted USB. | show usb |

6 CONFIGURING UFT

6.1 Overview

The unified forwarding table (UFT) enables the switch to dynamically allocate the hardware forwarding entries..

Protocols and Standards

N/A

6.2 Applications

| Typical Application | Scenario |
|--------------------------|--|
| Dynamic Entry Allocation | When a device operates in common routing mode, the MPLS label is not required for forwarding and the corresponding entry capacity is not used. If the entry capacity of the MPLS label can be used by other entries, such as ARP/ND entries, the device can learn more ARP/ND entries. |

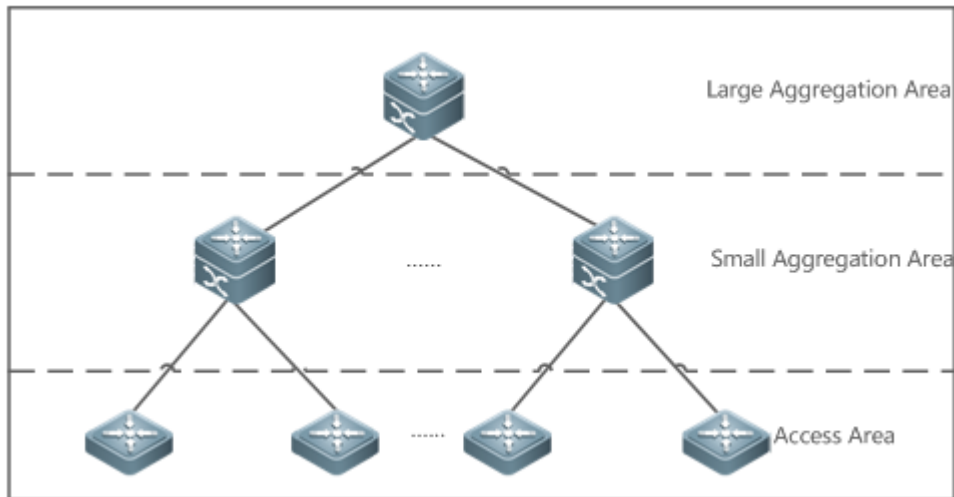
6.2.1 Dynamic Entry Allocation

Scenario

The following figure shows the simple and common topology of the campus network. The core device may be deployed in the small convergence area as a small convergence device. Layer 2 functions of the core device are mainly enabled. The core device can also be deployed in the large convergence area as a large convergence device. In this case, the core device works as a gateway. When the core device acts as a small convergence device, it requires a large enough size of the MAC address table.

Another application scenario of the core device is acting as a large convergence device, namely, a large gateway. Its access capability depends on the ARP and ND capacity, namely, the number of IPv4 and IPv6 terminals that can be accessed. Take the device installed with Windows7 operating system as an example. Such a device supports IPv4 and IPv6 dual-stack. When a terminal accesses the device, the terminal occupies one ARP entry and one ND entry. In this application scenario, a great number of ARP and ND entries are required.

Figure 6-1



Deployment

Enable the switch to operate in Bridge mode of UFT to increase the MAC address table capacity.
 Enable the switch to operate in Gateway mode of UFT to increase the ARP and ND entry capacity.

6.3 Features

Basic Concepts

N/A

Overview

| Feature | Function |
|------------------------------------|--|
| UFT operating mode | The UFT provides a mechanism for users to select an operating mode to meet the application scenario needs. |

6.3.1 UFT Operating Mode

Working Principle

The UFT provides a mechanism for users to select an operating mode to meet the application scenario needs.

The UFT supports up to eight operating modes. The selected operating mode can take effect after it is saved and the device is restarted.

❖ Default

By default, the UFT mode of the switch is Default. In Default mode, each hardware entry of the switch is applied to most of application scenarios.

❖ Bridge

The Bridge mode is the Layer 2 forwarding mode. It is applied to the application scenarios in which pure Layer 2 services dominate. In Bridge mode, ARP,ND and MPLS capacity is greatly reduced and most of capacity is allocated to the MAC address table.

❖ Gateway

The Gateway mode is classified into three modes: gateway mode, gateway-max mode, and gateway-ndmax mode.

Gateway mode is applied to the application scenarios in which Layer 3 services dominate. Gateway-max mode is applied to the application scenarios in which a large number of terminals are deployed. Gateway-ndmax mode is applied to the application scenarios in which a large number of IPv6 terminals are deployed.

❖ Route

The Route mode is the network routing mode. It is applied to the application scenarios in which a great amount of routing and forwarding dominate.

The Route mode is classified into route-v4max and route-v6max modes. In these two modes, the IPv6 and IPv6 network routing table capacity are respectively allocated to maximum extent.

❖ Alpm

The alpm mode is applied to the routing scenarios.

6.4 Configuration

| Configuration Item | Suggestions and Related Commands | |
|--------------------|---|--|
| Configuring UFT | Optional configuration. Switch over the current UFT operating mode of the switch. | |
| Operating Mode | switch-mode <i>mode_type slot slot_num</i> | Switches the UFT operating mode in VSU mode. |

6.4.1 Configuring UFT Operating Mode

Configuration

Effect

Configure the Bridge mode to increase the Layer 2 entry size. The Bridge mode is applied to the application scenarios in which Layer 2 services dominate.

Configure the Gateway mode to increase the ARP and ND table size. The Gateway mode is applied to the application scenarios in which Layer3 services dominate.

Configure the Route mode to increase the routing table size. The Route mode is applied to the application scenarios that require a great amount of routing and forwarding.

Notes

After configuration is complete, save it and restart the device to validate configuration.

Change the UFT mode and save the change. When the device is restarted for the first time after being upgraded, the UFT function may result in automatic restart of the line card once.

Configuration

Method

❖ Switching the UFT Operating Mode in Stand-Alone Mode

Mandatory configuration.

Use the **switch-mode mode_type slot slot_num** command to switch the UFT mode of the switch.

| | |
|-----------------------|--|
| Command Syntax | switch-mode mode_type slot slot_num |
| Parameter Description | <i>mode_type</i> : UFT operating mode. <i>slot_num</i> : indicates the corresponding line card installed in the chassis. |
| Defaults | Default mode |
| Command Mode | Global configuration mode |
| Usage Guide | In stand-alone mode, the line card can operate in the following modes: default : Default mode, which is applied to most of application scenarios. bridge : Bridge mode, which is applied to the application scenarios where pure Layer 2 |

services dominate.

gateway: Gateway mode, which is applied to the application scenario in which Layer 3 services dominate.

route-v4max: IPv4 routing mode, which is applied to the application scenarios that require a great number of IPv4 routes.


route-v6max: IPv6 routing mode, which is applied to the application scenarios that require a great number of IPv6 routes.

alpm: Alpm mode, which is applied to the routing scenarios.

❖ Switching the UFT Operating Mode in VSU Mode

Mandatory configuration.

Use the **switch-mode** *mode_type* **switch** *switch_num* **slot** *slot_num* command to switch the UFT mode of the switch.

| Command Syntax | switch-mode <i>mode_type</i> switch <i>switch_num</i> slot <i>slot_num</i> |
|-----------------------|--|
| Parameter Description | <p><i>mode_type</i>: UFT operating mode.</p> <p><i>switch_num</i>: In stand-alone mode, the switch keyword is invisible. In VSU mode, the switch keyword indicates the chassis or box device.</p> <p><i>slot_num</i>: indicates the line card installed in the chassis device.</p> |
| Defaults | Default mode |
| Command Mode | Global configuration mode |
| Usage Guide | <p> In VSU mode, the line card can operate in the following modes:</p> <p>default: Default mode, which is applied to most of application scenarios.</p> <p>bridge: Bridge mode, which is applied to the application scenarios where pure Layer 2 services dominate.</p> <p>gateway: Gateway mode, which is applied to the application scenarios in which Layer 3 services dominate.</p> <p>route-v4max: IPv4 routing mode, which is applied to the application scenarios that</p> |

require a great number of IPv4 routes.

route-v6max: IPv6 routing mode, which is applied to the application scenarios that require a great number of IPv6 routes.

alpm: Alpm mode, which is applied to the routing scenarios.

Verification

After the device is restarted, use the **show run** command to display the current line card status and check whether the configuration takes effect.

Use the **show switch-mode status** command to display the UFT mode status.

| | |
|-----------------------|---|
| Command Syntax | show switch-mode status |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode, global configuration mode, interface configuration mode |
| Usage Guide | N/A |
| Configuration Example | <pre>QTECH(config)#show switch-mode status Slot No Switch-Mode switch 1 slot 3 bridge</pre> |

Configuration Examples

❖ Switching UFT Operating Mode in Stand-Alone Mode

| | |
|----------------------|---|
| Network Environment | N/A |
| Configuration Method | Switch the UFT operating mode of the line card in slot3 of the switch to Bridge mode. |
| 1 | <pre>QTECH(config)#switch-mode bridge slot 3 Please save current config and restart your device! QTECH(config)#show run</pre> |

| | |
|--------------|--|
| | <pre>Building configuration... Current configuration : 1366 bytes version 11.0(1B2) ! cswmp ! sysmac 08c6.b334b5624 ! nfpp ! switch-mode bridge slot 3</pre> |
| Check Method | Use the show switch-mode status command to display configuration information. |
| | <pre>QTECH(config)#show switch-mode status Slot No Switch-Mode 3 bridge</pre> |

Common Errors

6.5 Monitoring

Clearing


N/A

Displaying the Running Status

| Function | Command |
|---|-------------------------|
| Displays UFT operating mode of the switch | show switch-mode status |

Displaying Debugging Information

The preceding monitoring and maintaining commands are also valid to the chassis devices and box devices, in stand-alone mode.

-
-  In stand-alone mode, the **switch** keyword is invisible. For the chassis device, **slot** keyword indicates a specified line card.
-

7 CONFIGURING ZAM

7.1 Overview

Manual deployment of all required devices for go-online on a network consumes a lot of labor and material resources, and has the following problems or defects:

Manual deployment of a massive number of devices for go-online on a network imposes a high technical requirement on deployment personnel. It requires a long period, resulting in high labor and material costs.

Manual deployment of a massive number of devices may cause fatigue, and consequently, may easily cause deployment inconsistency or errors, resulting in network malfunction.

Manual deployment does not support control and unified management, easily causing difference and inconsistency.

It is hard to track an event and network device deployment. The entire deployment process cannot be controlled and easily results in problems or missing.

It is hard to manage device go-online in a unified manner. Online statuses of devices cannot be tracked and thus administrators cannot learn about the online and running statuses of the devices on the network.

Device extensibility is poor. Automatic deployment of extensible devices and even the extensible network is not supported.

To address the preceding problems, QTECH launches the ZAM solution to enable zero configuration of network devices, support plug-and-play, and realize unified and automatic deployment. The ZAM solution imposes few technical requirement on deployment personnel and helps reduce workload and costs. It avoids inconsistent deployment, supports unified deployment and management, tracks online statuses of devices, and simplifies operation, maintenance, and deployment of a massive number of devices.

Protocols and Standards

RFC1541: DHCP standard

7.2 Application

| Application | Description |
|-------------|-------------|
|-------------|-------------|

[ZAM Automatic Deployment](#)

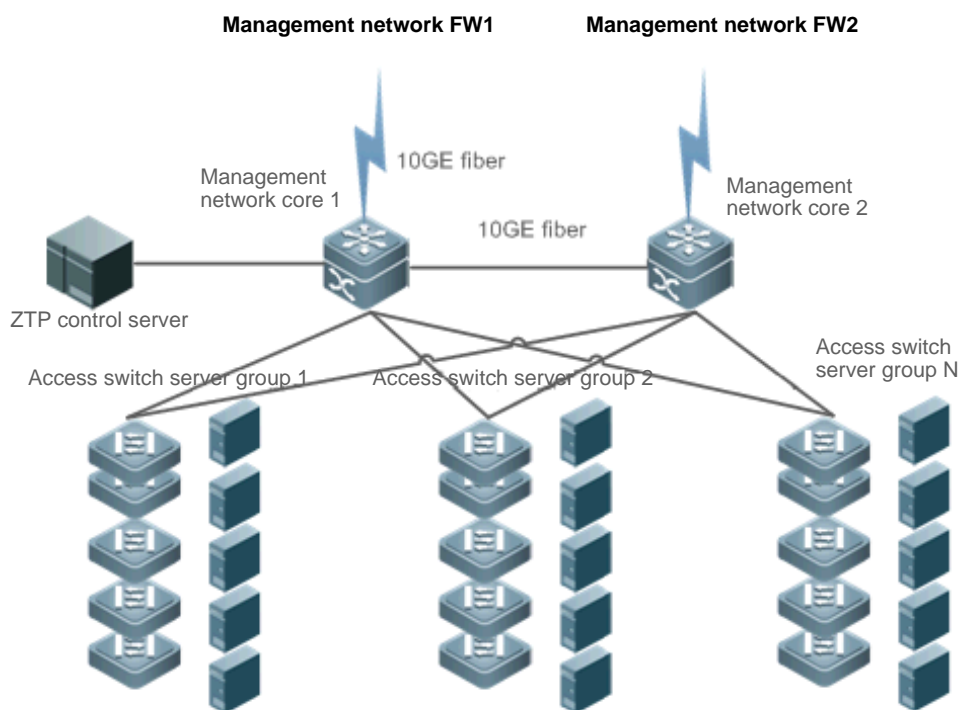
Implements unified management on device deployment for go-online.

7.2.1 ZAM Automatic Deployment

Scenario

Figure 7-1 shows the network topology for ZAM solution. On the basis of the original network, a ZAM control server is added. DHCP and TFTP services are deployed on the ZAM server for managing and controlling device deployment in a unified manner for go-online, thus realizing unified management of all the deployed devices.

Figure 7-1



Deployment

Deploy DHCP and TFTP services on the ZAM control server.

Enable ZAM for access switch server groups 1, 2...N.

7.3 Features

Basic Concepts

❖ ZAM

Zero Automatic Manage

❖ IDC

Internet Data Center

❖ DHCP

Dynamic Host Configuration Protocol

❖ TFTP

Trivial File Transfer Protocol

Feature

| Feature | Description |
|--|--|
| Device Go-online via ZAM | Uses the ZAM solution to enable zero configuration of network devices. |

7.3.1 Device Go-online via ZAM

The ZAM solution is implemented via three steps.

Step 1: A device without configurations accesses a network. The device applies for a fixed IP address from the ZAM control server via DHCP. The ZAM control server responds to the application by returning an IP address and the response also carries the TFTP server IP address and the configuration file name corresponding to the device. The device automatically applies the IP address, and resolves the TFTP server IP address and the configuration file name carried in the response.

Step 2: The device downloads the corresponding configuration file from the ZAM control server via TFTP (a TFTP server can be independently established).

Step 3: The device loads the configuration file.

The ZAM control server and device requiring go-online must meet the following requirements:

The ZAM control server must:

Be capable of identifying a device requiring go-online, IP address of a specific device, the TFTP server IP address, and configuration file name of this device saved on the TFTP server.

Be capable of allocating IP addresses to a device requiring go-online, that is, be capable of providing the DHCP service to pre-allocate an IP address, a TFTP server IP address, and a configuration file name, and enabling matching between the device and the preceding pre-allocated information.

Provide the TFTP function and support configuration file download and storage if the TFTP function is deployed on the ZAM control server (recommended).

The device requiring go-online must:

Be capable of automatically determining whether to go online via the ZAM solution after being powered on, that is, determining whether to go online without configuration via the ZAM solution.

Be capable of applying to the DHCP server for an IP address, and obtaining the TFTP server IP address and configures file name.

Be capable of downloading the specified configuration scripts from the TFTP server via TFTP.

Be capable of automatically loading the configuration script.

Provide a retry mechanism upon a ZAM deployment failure and provide a ZAM exit mechanism.

Working Principle

Device go-online via ZAM is divided into four stages:

❖ Initialization

At this stage, a device without configurations is powered on and accesses a network. After loading is completed, the device automatically pre-deploys the ZAM environment. The pre-deployment requirement is as follows:

Use the MGMT port for ZTP management and retain all default configurations without extra operation.

❖ DHCP

After the pre-deployment, the device obtains the ZAM management IP address, TFTP server IP address, configuration file name of the device via DHCP. Requirements are as follows:

On the MGMT port, enable DHCP.

Trigger DHCP to obtain the ZAM management IP address. Add request identifiers of Option 67 (boot file name) and Option 150 (TFTP server IP address) to the requested parameter list.

Resolve and deploy ZAM management IP address. Resolve Option 67 and Option 150 in the response.

❖ TFTP

Download the corresponding configuration script according to the configuration file name and TFTP server IP address obtained at the DHCP stage.

After the configuration script is downloaded successfully, execute the configuration script to download the corresponding configuration file or bin file from the TFTP server.

❖ Configuration loading

Load the configuration file or bin file obtained at the TFTP stage and restart the device.

Related Configuration


❖ Enabling ZAM

This function is enabled by default.

Run the ZAM command to enable or disable ZAM.

ZAM must be enabled on the device to implement automatic deployment via ZAM.

7.4 Configuration

| Configuration | Description and Command |
|--|---|
| Configuring Device Go-online via ZAM |  (Mandatory) It is used to enable ZAM. |
| | zam Enables ZAM. |

7.4.1 Configuring Device Go-online via ZAM

Configuration Effect

Configure device go-online via ZAM, so that a device without configurations enters the go-online process and implements automatic deployment.

Notes

Deploy a ZTP control server that supports device go-online via ZAM.

Configuration Steps

❖ Enabling ZAM

Mandatory.

Enable ZAM on each switch, unless otherwise specified.

Verification

Run the **show zam** command to check whether ZAM is enabled and to check configuration of the MGMT port.

Related Commands

❖ Enabling ZAM

| | |
|-----------------------|---------------------------|
| Command | zam |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Usage Guide | Configure ZAM. |

Configuration Example

i The following configuration example describes ZAM-related configuration only.

❖ Configuring Device Go-online via ZAM

| | |
|-----------------------|---|
| Scenario | |
| Configuration Steps | Configure device go-online via ZAM as follows: ❖ Enable ZAM. |
| Online device via ZAM | <pre>QTECH # configure terminal QTECH (config)# zam QTECH (config)# exit</pre> |
| Verification | ❖ Run the show zam command to display the current configuration and status of ZAM.. |
| QTECH | <pre>QTECH#show zam ZTP state : disable ZTP status : Now is idle ZTP manage interface: Mgmt 0 QTECH#</pre> |

Common Errors

The network connection between a device requiring go-online and the ZAM control server is abnormal.


The device requiring go-online is not in the zero-configuration state.

7.5 Monitoring

Displaying

| Description | Command |
|---|-----------------------|
| Displays the current configuration and status of ZAM. | <code>show zam</code> |

Debugging

 System resources are occupied when debugging information is output. Therefore, disable the debugging switch immediately after use.

| Description | Command |
|---------------------------------|------------------------|
| Debugs the ZAM framework event. | <code>debug zam</code> |

8 CONFIGURING MODULE HOT SWAPPING

8.1 Overview

Module Hot Swapping is a common maintenance function provided by chassis-based devices.

Module Hot Swapping automates the installation, uninstallation, reset, and information check of hot-swappable modules (management cards, line cards, cross-connect and synchronous timing boards [XCSs], and multi-service cards) after they are inserted into chassis-based devices.

8.2 Applications

| Application | Description |
|--|---|
| <u>Resetting Online Modules</u> | During routine maintenance, you can reset an abnormally running module to troubleshoot the fault. |
| <u>Clearing the Configuration of a Module</u> | During routine maintenance, you can replace the module in a slot with a different type of module. |
| <u>Clearing the Configuration of a Virtual Switch Unit (VSU) Member Device</u> | During routine maintenance, you can clear the configuration of all modules on a VSU member device and then reconfigure the modules. |
| <u>Deleting a MAC Address from the Configuration File</u> | During routine maintenance, you can delete the MAC addresses of VSU member devices to perform MAC address reelection. |
| <u>Modifying a MAC Address in the Configuration File</u> | When you replace a switch with a new one in gateway mode, you can configure the MAC address of the new switch to be the same as that of the replaced switch to retain the MAC address of the bound gateway on downstream devices. |

8.2.1 Resetting Online Modules

[Scenario](#)

During routine maintenance, you can reset an abnormally running module in a slot to troubleshoot the fault.

[Deployment](#)

Run the **reset module** command on the console to reset a module.

8.2.2 Clearing the Configuration of a Module

Scenario

During routine maintenance, you can replace the module in a slot on a chassis-based device with a different type of module without affecting other modules.

Deployment

Perform the following operations in sequence:

1. Remove the module from the target slot.
2. Run the **remove configuration module** command on the device to remove the module configuration.
3. Insert a new module into the slot.

8.2.3 Clearing the Configuration of a VSU Member Device

Scenario

In VSU mode, to meet service change requirements, you need to clear all configurations on a member device and reconfigure the device. You can run the **remove configuration device** command to clear configurations all at once, rather than clear the configuration of individual modules one by one on the member device.

Deployment

Perform the following operations in sequence:

1. Run the **remove configuration device** command on the target device.
2. Save the configuration.
3. Restart the VSU and check whether the configuration of the device is cleared.

8.2.4 Deleting the MAC Address from the Configuration File

Scenario

In general, the MAC address used by a system is written in the management card or the flash memory of the chassis. In VSU mode, to avoid service interruption due to the change of the MAC address, the system automatically saves the MAC address to the configuration file. After the system restarts, the valid MAC address (if any) in the configuration file is used in preference. The **no sysmac** command can be used to delete the MAC address from the configuration file. Then the MAC address written in the flash memory is used by default.

Deployment

Perform the following operations in sequence:

1. Run the **no sysmac** command on the target device to delete its MAC address.
2. Save the configuration.
3. Restart the VSU and check whether the MAC address of the device is reelected.

8.2.5 Modifying a MAC Address in the Configuration File

Scenario

In gateway mode (the **auth-mode gateway** command is configured), some peripheral devices are configured with the MAC address of the bound gateway. If the gateway is replaced, you can use the **sysmac** command to configure the MAC address of the new gateway to be the same as that of the replaced gateway to retain the MAC address of the bound gateway on downstream devices. The **sysmac** command is valid only in gateway mode.

Deployment

Perform the following operations in sequence:

1. Run the **sysmac** command in gateway mode on the target device.
2. Save the configuration.
3. Restart the device and check whether its MAC address is modified.


8.3 Features

Feature

| Feature | Description |
|--|--|
| Automatically Installing the Inserted Module | After a new module is inserted into a chassis-based device, the device's management software will automatically install the module driver. |
| Resetting Online Modules | Online modules can be reset. |

8.3.1 Automatically Installing the Inserted Module

You can hot-swap (insert and remove) a module on a device in running state without impact on other modules. After the module is inserted into a slot, the device's management software will automatically install the module driver. The configuration of the removed module is retained for subsequent configuration. If the removed module is inserted again, the module will be automatically started with its configuration effective.


-  The module mentioned here can be a management card, a line card, an XCS, or a multi-service card. A management card can only be inserted in a management card slot (M1 or M2). A line card or multi-service card can be inserted in a line card slot. An XCS can only be inserted in an XCS slot.

Working Principle

After a module is inserted, the device's management software will automatically install the module driver and save the module information (such as the quantity of ports on the module and port type) to the device, which will be used for subsequent configuration. After the module is removed, its information is not cleared by the management software. You can continue to configure the module information. When the module is inserted again, the management software assigns the user's module configuration to the module and make it take effect.

8.3.2 Resetting Online Modules


The management software of a device provides the online module reset feature for module software troubleshooting.

-  Resetting an online module may interrupt some services on the device.


Working Principle

After you run the **reset module** command, the device's management software uses a hardware or software interface of the device to restart the software on the target module and restores the hardware chip to the post-power-on state. The software failure of the module will be rectified after the module is reset.

8.4 Configuration

-  The module Hot Swapping feature is automatically implemented without manual configuration.

| Configuration | Description and Command |
|---------------|-------------------------|
|---------------|-------------------------|

| | | |
|--|--|--|
| Clearing Module and Device Configuration |  (Optional) It is used to clear configuration in global configuration mode. After you run the following commands, you need to save the command configuration so that it can take effect after system restart. | |
| | remove configuration module <i>[device-id/] slot-num</i> | Clears the configuration of a module. |
| | remove configuration device <i>device-id</i> | Clears the configuration of a VSU member device. |
| | no sysmac | Deletes a MAC address from the configuration file. |
| | sysmac | Modifies a MAC address in the configuration file. |

8.4.1 Clearing Module and Device Configuration

Configuration Effect

Clear the configuration of a module.

Clear the configuration of a VSU member device.


Delete a MAC address from the configuration file.

Configuration Steps

❖ Clearing the Configuration of a Module

(Optional) Perform this configuration when you need to remove a card from a slot on a device and delete related port configuration.

| | |
|------------------------------|---|
| Command | remove configuration module [device-id/]slot-num |
| Parameter Description | <i>device-id</i> : Indicates the ID of a chassis (in VSU mode, you must input the ID of the chassis housing the module to be removed. In stand-alone, the input is not required). <i>slot-num</i> : Indicates the number of the slot for the module. |
| Defaults | N/A |
| Command Mode | Global configuration mode |

| | |
|-------------|--|
| Usage Guide | Use this command to clear the configuration of a module (or a board not in position).  This command is forbidden for online cards to prevent the anti-loop configuration on online cards from being cleared causing network loops. |
|-------------|--|

❖ Clearing the Configuration of a VSU Member Device

(Optional) Perform this configuration when you need to clear the configuration of a VSU member device.

| | |
|-----------------------|---|
| Command | remove configuration device <i>device-id</i> |
| Parameter Description | <i>device-id</i> : Indicates the ID of a chassis. |
| Defaults | N/A |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to clear the configuration of a VSU member device. |

❖ Deleting a MAC Address from the Configuration File

(Optional) Perform this configuration when you need to change the MAC address of a system to the reelected MAC address.

In general, the MAC address used by a system is written in the management card or the flash memory of the chassis. In VSU mode, to avoid service interruption due to the change of the MAC address, the system automatically saves the MAC address to the configuration file. After the system restarts, the valid MAC address (if any) in the configuration file is used in preference.

| | |
|-----------------------|---------------------------|
| Command | no sysmac |
| Parameter Description | N/A |
| Defaults | N/A |
| Command Mode | Global configuration mode |

| | |
|-------------|--|
| Usage Guide | Use this command to delete a MAC address from the configuration file. Then the MAC address written in the flash memory is used by default. |
|-------------|--|

❖ Modifying a MAC Address in the Configuration File

(Optional) Perform this configuration when you need to modify the MAC address of a device.

In gateway mode (the **auth-mode gateway** command is configured), some peripheral devices are configured with the MAC address of the bound gateway. If the gateway is replaced, you can use the **sysmac** command to configure the MAC address of the new gateway to be the same as that of the replaced gateway to retain the MAC address of the bound gateway on downstream devices. The **sysmac** command is valid only in gateway mode.

| | |
|-----------------------|--|
| Command | sysmac <i>mac-address</i> |
| Parameter Description | <i>mac-address</i> : Indicates the new MAC address. |
| Defaults | N/A |
| Command Mode | Global configuration mode |
| Usage Guide | Use this command to configure the MAC address of a device. To make the MAC address take effect, save the configuration and restart the device. |

Verification

Run the **show version slot** command to display the installation information of a line card.

| | |
|-----------------------|--|
| Command | show version slots [<i>device-id</i> / <i>slot-num</i>] |
| Parameter Description | <i>device-id</i> : (Optional) Indicates the ID of a chassis (in VSU mode, when you input a slot number, you also need to input the ID of the chassis where the module is located). <i>slot-num</i> : (Optional) Indicates the number of a slot. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | Use this command to display the online state of a module. The Configured Module column shows the information of the installed module. After you run the remove configuration module command, the installation information of the removed module is deleted from this column. |

Configuration

Example

❖ Clearing the Configuration of an Offline Module

| | |
|---------------------|--|
| Scenario | ❖ To meet networking change requirements, the port configuration of the card in Slot 1 needs to be deleted to make the device's configuration file more concise. |
| Configuration Steps | ❖ Run the remove configuration module command to delete the card configuration. |
| | QTECH(config)# remove configuration module 1 |
| | ❖ Run the show version slots command to verify that the card configuration in Slot 1 is cleared. |

8.5 Monitoring

Clearing

⚠ Running the **reset module** command may interrupt services when the module is reset.

| Description | Command |
|-----------------|--|
| Resets a module | reset module <i>slot-num</i> reset module <i>device-id / slot-num</i> (in VSU mode) |

Displaying

| Description | Command |
|---|--|
| Displays the details of a module. | show version module detail [<i>slot-num</i>] show version module detail [<i>device-id/slot-num</i>] (in VSU mode) |
| Displays the online state of a module. | show version slots [<i>slot-num</i>] show version slots [<i>device-id/slot-num</i>] (in VSU mode) |
| Displays the current MAC address of a device. | show sysmac |

Displays system-level alarm information.

show alarm

9 CONFIGURING SUPERVISOR MODULE REDUNDANCY

9.1 Overview

Supervisor module redundancy is a mechanism that adopts real-time backup (also called hot backup) of the service running status of supervisor modules to improve the device availability.

In a network device with the control plane separated from the forwarding plane, the control plane runs on a supervisor module and the forwarding plane runs on cards. The control plane information of the master supervisor module is backed up to the slave supervisor module in real time during device running. When the master supervisor module is shut down as expected (for example, due to software upgrade) or unexpectedly (for example, due to software or hardware exception), the device can automatically and rapidly switch to the slave supervisor module without losing user configuration, thereby ensuring the normal operation of the network. The forwarding plane continues with packet forwarding during switching. The forwarding is not stopped and no topology fluctuation occurs during the restart of the control plane.

The supervisor module redundancy technology provides the following conveniences for network services:

1. Improving the network availability

The supervisor module redundancy technology sustains data forwarding and the status information about user sessions during switching.

2. Preventing neighbors from detecting link flaps

The forwarding plane is not restarted during switching. Therefore, neighbors cannot detect the status change of a link from Down to Up.

3. Preventing route flaps

The forwarding plane sustains forwarding communication during switching, and the control plane rapidly constructs a new forwarding table. The process of replacing the old forwarding table with the new one is unobvious, preventing route flaps.

4. Preventing loss of user sessions

Thanks to real-time status synchronization, user sessions that are created prior to switching are not lost.

9.2 Applications

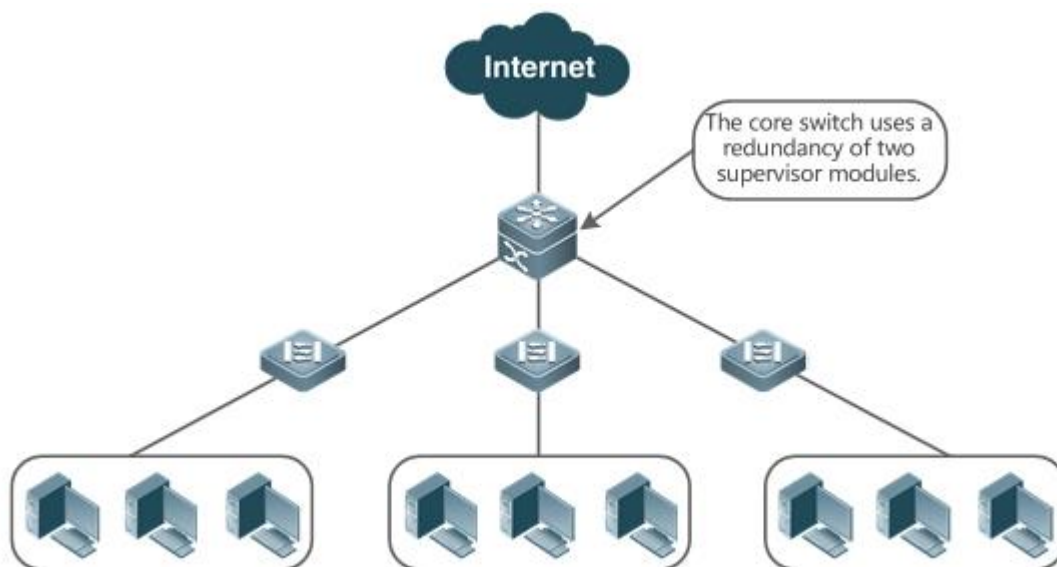
| Application | Description |
|--|---|
| Redundancy of Supervisor Modules | On a core switch where two supervisor modules are installed, the redundancy technology can improve the network stability and system availability. |

9.2.1 Redundancy of Supervisor Modules

Scenario

As shown in the following figure, in this network topology, if the core switch malfunctions, networks connected to the core switch break down. In order to improve the network stability, two supervisor modules need to be configured on the core switch to implement redundancy. The master supervisor module manages the entire system and the slave supervisor module backs up information about service running status of the master supervisor module in real time. When manual switching is performed or forcible switching is performed due to a failure occurring on the master supervisor module, the slave supervisor module immediately takes over functions of the master supervisor module. The forwarding plane can proceed with data forwarding and the system availability is enhanced.

Figure 9-1



Deployment

For chassis-type devices, the system is equipped with the master/slave backup mechanism. The system supports plug-and-play as long as master and slave supervisor modules conform to redundancy conditions.

For case-type devices, each device is equivalent to one supervisor module and one line card.

9.3 Features

Basic Concepts

❖ Master Supervisor Module, Slave Supervisor Module

On a device where two supervisor modules are installed, the system elects one supervisor module as active, which is called the master supervisor module. The other supervisor module functions as a backup supervisor module. When the master supervisor module malfunctions or actively requests switching, the backup supervisor module takes over the functions of the master supervisor module and becomes the new master supervisor module, which is called the slave supervisor module. In general, the slave supervisor module does not participate in switch management but monitors the running status of the master supervisor module.

❖ Prerequisites for Redundancy of Supervisor Modules

In a device system, the hardware and software of all supervisor modules must be compatible so that the redundancy of supervisor modules functions properly.

Batch synchronization is required between the master and slave supervisor modules during startup so that the two supervisor modules are in the same state. The redundancy of supervisor modules is ineffective prior to synchronization.

❖ Redundancy Status of Supervisor Modules

The master supervisor module experiences the following status changes during master/slave backup:

alone state: In this state, only one supervisor module is running in the system, or the master/slave switching is not complete, and redundancy is not established between the new master supervisor module and the new slave supervisor module.

batch state: In this state, redundancy is established between the master and slave supervisor modules and batch backup is being performed.

realtime state: The master supervisor module enters this state after the batch backup between the master and slave supervisor modules is complete. Real-time backup is performed between the master and slave supervisor modules, and manual switching can be performed only in this state.

Overview

| Feature | Description |
|---|--|
| Election of Master and Slave Supervisor Modules | The device can automatically select the master and slave supervisor modules based on the current status of the system. Manual selection is also supported. |
| Information Synchronization of Supervisor Modules | In the redundancy environment of supervisor modules, the master supervisor module synchronizes status information and configuration files to the slave supervisor module in real time. |

9.3.1 Election of Master and Slave Supervisor Modules

Working Principle

❖ Automatically Selecting Master and Slave Supervisor Modules for Chassis-type Devices

Users are allowed to insert or remove supervisor modules during device running. The device, based on the current condition of the system, automatically selects an engine for running, without affecting the normal data switching. The following cases may occur and the master supervisor module is selected accordingly:

If only one supervisor module is inserted during device startup, the device selects this supervisor module as the master supervisor module regardless of whether it is inserted into the M1 slot or M2 slot.

If two supervisor modules are inserted during device startup, by default, the supervisor module in the M1 slot is selected as the master supervisor module and the supervisor module in the M2 slot is selected as the slave supervisor module to serve as a backup, and relevant prompts are output.

If one supervisor module is inserted during device startup and another supervisor module is inserted during device running, the supervisor module that is inserted later is used as the slave supervisor module to serve as a backup regardless of whether it is inserted into the M1 slot or M2 slot, and relevant prompts are output.

Assume that two supervisor modules are inserted during device startup and one supervisor module is removed during device running (or one supervisor module malfunctions). If the removed supervisor module is the slave supervisor module prior to removal (or failure), only a prompt is displayed after removal (or malfunction), indicating that the slave supervisor module is removed (or fails to run). If the removed supervisor module is the master supervisor module prior to removal (or failure), the other supervisor module becomes the master supervisor module and relevant prompts are output.

❖ Manually Selecting the Master and Slave Supervisor Modules

Users can manually make configuration to select the master and slave supervisor modules, which are selected based on the environment as follows:

In standalone mode, users can manually perform master/slave switching. The supervisor modules take effect after reset.

Related Configuration

❖ Manually Performing Master/Slave Switching

By default, the device can automatically select the master supervisor module.

In both the standalone mode, users can run the **redundancy forceswitch** command to perform manual switching.

9.3.2 Information Synchronization of Supervisor Modules

Working Principle

Status synchronization

The master supervisor module synchronizes its running status to the slave supervisor module in real time so that the slave supervisor module can take over the functions of the master supervisor module at any time, without causing any perceivable changes.

Configuration synchronization

There are two system configuration files during device running: running-config and startup-config. running-config is a system configuration file dynamically generated during running and changes with the service configuration. startup-config is a system configuration file imported during device startup. You can run the **write** command to write running-config into startup-config or run the **copy** command to perform the copy operation.

For some functions that are not directly related to non-stop forwarding, the synchronization of system configuration files can ensure consistent user configuration during switching.

In the case of redundancy of dual supervisor modules, the master supervisor module periodically synchronizes the startup-config and running-config files to the slave supervisor module and all candidate supervisor modules. The configuration synchronization is also triggered in the following operations:

1. The running-config file is synchronized when the device switches from the global configuration mode to privileged EXEC mode.
2. The startup-config file is synchronized when the **write** or **copy** command is executed to save the configuration.

- Information configured over the Simple Network Management Protocol (SNMP) is not automatically synchronized and the synchronization of the running-config file needs to be triggered by running commands on the CLI.

Related Configuration

By default, the startup-config and running-config files are automatically synchronized once per hour. Run the **auto-sync time-period** command to adjust the interval for the master supervisor module to synchronize configuration files.

9.4 Configuration

| Configuration | Description and Command | |
|--|-------------------------|--|
| Configuring Manual Master/Slave Switching | Optional. | |
| | show redundancy states | Displays the hot backup status. |
| | redundancy forceswitch | Manually performs master/slave switching. |
| Configuring the Automatic Synchronization Interval | Optional. | |
| | redundancy | Enters the redundancy configuration mode. |
| | auto-sync time-period | Configures the automatic synchronization interval of configuration files in the case of redundancy of dual supervisor modules. |
| Resetting Supervisor Modules | Optional. | |
| | redundancy reload | Resets the slave supervisor module or resets both the master and slave supervisor modules at the same time. |

9.4.1 Configuring Manual Master/Slave Switching

Configuration Effect

The original master supervisor module is reset and the slave supervisor module becomes the new master supervisor module.

If there are more than two supervisor modules in the system, the original slave supervisor module becomes the master supervisor module, one supervisor module is elected out of candidate supervisor modules to serve as the new slave supervisor module, and the original master supervisor module becomes a candidate supervisor module after reset.

Notes

To ensure that data forwarding is not affected during switching, batch synchronization needs to be first performed between the master and slave supervisor modules so that the two supervisor modules are in the same state. That is, manual switching can be performed only when the redundancy of supervisor modules is in the real-time backup state. In addition, to ensure synchronization completeness of configuration files, service modules temporarily forbid manual master/slave switching during synchronization. Therefore, the following conditions need to be met simultaneously for manual switching:

Manual master/slave switching is performed on the master supervisor module and a slave supervisor module is available.

All virtual switching devices (VSDs) in the system are in the real-time hot backup state.

The hot-backup switching of all VSDs in the system is not temporarily forbidden by service modules.

If devices are virtualized as multiple VSDs, manual switching can be successfully performed only when the supervisor modules of all the VSDs are in the real-time backup state.

Configuration Steps

Optional.

Make the configuration on the master supervisor module.

Verification

Run the **show redundancy states** command to check whether the master and slave supervisor modules are switched.

Related Commands

❖ Checking the Hot Backup Status

| Command | show redundancy states |
|---------|------------------------|
|---------|------------------------|

| | |
|-----------------------|---|
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode or global configuration mode |
| Usage Guide | N/A |

❖ Manually Performing Master/Slave Switching

| | |
|-----------------------|-------------------------------|
| Command | redundancy forceswitch |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

Configuration

Example

❖ Manually Performing Master/Slave Switching

| | |
|----------------------------|---|
| Configuration Steps | In the VSD environment where the name of one VSD is staff, perform master/slave switching. |
| | <pre> QTECH> enable QTECH# show redundancy states Redundancy role: master Redundancy state: realtime Auto-sync time-period: 3600 s VSD staff redundancy state: realtime QTECH# redundancy forceswitch This operation will reload the master unit and force switchover to the slave unit. Are you sure to continue? [N/y] y </pre> |

| | |
|--------------|---|
| Verification | On the original slave supervisor module, run the show redundancy states command to check the redundancy status. |
| | <pre>QTECH# show redundancy states Redundancy role: master Redundancy state: realtime Auto-sync time-period: 3600 s VSD staff redundancy state: realtime</pre> |

9.4.2 Configuring the Automatic Synchronization Interval

Configuration

Effect

Change the automatic synchronization interval of the startup-config and running-config files. If the automatic synchronization interval is set to a smaller value, changed configuration is frequently synchronized to other supervisor modules, preventing the configuration loss incurred when services and data are forcibly switched to the slave supervisor module when the master supervisor module malfunctions.

Configuration

Steps

Optional. Make the configuration when the synchronization interval needs to be changed.

Make the configuration on the master supervisor module.

Verification

View the output syslogs to check whether timed synchronization is performed.

Related

Commands

Entering the Redundancy Configuration Mode

| | |
|-----------------------|---------------------------|
| Command | redundancy |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |

| | |
|-------------|-----|
| Usage Guide | N/A |
|-------------|-----|

Configuring the Automatic Synchronization Interval of Configuration Files

| | |
|-----------------------|--|
| Command | Auto-sync time-period <i>value</i> |
| Parameter Description | time-period <i>value</i> : Indicates the automatic synchronization interval, with the unit of seconds. The value ranges from 1 second to 1 month (2,678,400 seconds). |
| Command Mode | Redundancy configuration mode |
| Usage Guide | Configure the automatic synchronization interval of the startup-config and running-config files in the case of redundancy of dual supervisor modules. |

Configuration Example

Configuring the Automatic Synchronization Interval

| | |
|----------------------------|--|
| Configuration Steps | In redundancy configuration mode of the master supervisor module, configure the automatic synchronization interval to 60 seconds. |
| | <pre>QTECH(config)# redundancy QTECH(config-red)# auto-sync time-period 60 Redundancy auto-sync time-period: enabled (60 seconds). QTECH(config-red)# exit</pre> |
| Verification | Run the show redundancy states command to check the configuration. |
| | <pre>QTECH# show redundancy states Redundancy role: master Redundancy state: realtime Auto-sync time-period: 3600 s</pre> |

9.4.3 Resetting Supervisor Modules

Configuration Effect

Resetting only the slave supervisor module does not affect data forwarding, and the forwarding is not interrupted or user session information is not lost during reset of the slave supervisor module.

In standalone mode, running the **redundancy reload shelf** command will cause simultaneous reset of all supervisor modules and line cards in the chassis.

Notes

Configuration Steps

Optional. Perform the reset when the supervisor modules or device runs abnormally.

Related Commands

| | |
|-----------------------|--|
| Command | redundancy reload {peer shelf [switchid]} |
| Parameter Description | peer : Only resets the slave supervisor module. shelf [switchid] : Indicates that the master and slave supervisor modules are set in standalone mode. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | In standalone mode, the device reset command is redundancy reload shelf , that is, the entire device is reset. |

Configuration Example

9.5 Monitoring

Displaying

| Description | Command |
|--|------------------------|
| Displays the current redundancy status of dual supervisor modules. | show redundancy states |

10 CONFIGURING SYSLOG

10.1 Overview

Status changes (such as link up and down) or abnormal events may occur anytime. QTECH products provide the syslog mechanism to automatically generate messages (log packets) in fixed format upon status changes or occurrence of events. These messages are displayed on the related windows such as the Console or monitoring terminal, recorded on media such as the memory buffer or log files, or sent to a group of log servers on the network so that the administrator can analyze network performance and identify faults based on these log packets. Log packets can be added with the timestamps and sequence numbers and classified by severity level so that the administrator can conveniently read and manage log packets.

Protocols and Standards

RFC3164: The BSD syslog Protocol

10.2 Applications

| Application | Description |
|---|--------------------------------------|
| Sending Syslogs to the Console | Monitor syslogs through the Console. |
| Sending Syslogs to the Log Server | Monitor syslogs through the server. |

10.2.1 Sending Syslogs to the Console

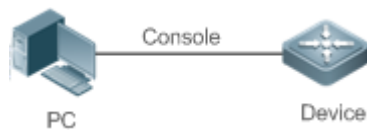
Scenario

Send syslogs to the Console to facilitate the administrator to monitor the performance of the system. The requirements are as follows:

1. Send logs of Level 6 or higher to the Console.
2. Send logs of only the ARP and IP modules to the Console.

Figure 10-1 shows the network topology.

Figure 10-1 Network topology



Deployment

Configure the device as follows:

1. Set the level of logs that can be sent to the Console to informational (Level 6).
2. Set the filtering direction of logs to terminal.
3. Set log filtering mode of logs to contains-only.
4. Set the filtering rule of logs to single-match. The module name contains only ARP or IP.

10.2.2 Sending Syslogs to the Log Server

Scenario

Send syslogs to the log server to facilitate the administrator to monitor the logs of devices on the server. The requirements are as follows:

1. Send syslogs to the log server 10.1.1.1.
2. Send logs of Level 7 or higher to the log server.
3. Send syslogs from the source interface Loopback 0 to the log server.

Figure 10-2 shows the network topology.

Figure 10-2 Network topology



Deployment

Configure the device as follows:

1. Set the IPv4 address of the server to 10.1.1.1.
2. Set the level of logs that can be sent to the log server to debugging (Level 7).
3. Set the source interface of logs sent to the log server to Loopback 0.

10.3 Features

Basic Concepts

❖ Classification of Syslogs

Syslogs can be classified into two types:

- Log type
- Debug type

❖ Levels of Syslogs

Eight severity levels of syslogs are defined in descending order, including emergency, alert, critical, error, warning, notification, informational, and debugging. These levels correspond to eight numerical values from 0 to 7. A smaller value indicates a higher level.

Only logs with a level equaling to or higher than the specified level can be output. For example, if the level of logs is set to informational (Level 6), logs of Level 6 or higher will be output.

The following table describes the log levels.

| Level | Numerical Value | Description |
|---------------|-----------------|---|
| emergencies | 0 | Indicates that the system cannot run normally. |
| alerts | 1 | Indicates that the measures must be taken immediately. |
| critical | 2 | Indicates a critical condition. |
| errors | 3 | Indicates an error. |
| warnings | 4 | Indicates a warning. |
| notifications | 5 | Indicates a notification message that requires attention. |
| informational | 6 | Indicates an informational message. |
| debugging | 7 | Indicates a debugging message. |

❖ Output Direction of Syslogs

Output directions of syslogs include Console, monitor, server, buffer, and file. The default level and type of logs vary with the output direction. You can customize filtering rules for different output directions.

The following table describes output directions of syslogs.

| Output Direction | Description | Default Output Level | Description |
|------------------|---------------------|-------------------------|--|
| Console | Console | Debugging (Level 7) | Logs and debugging information are output. |
| monitor | Monitoring terminal | Debugging (Level 7) | Logs and debugging information are output. |
| server | Log server | Informational (Level 6) | Logs and debugging information are output. |
| buffer | Log buffer | Debugging (Level 7) | Logs and debugging information are output. The log buffer is used to store syslogs. |
| file | Log file | Informational (Level 6) | Logs and debugging information are output. Logs in the log buffer are periodically written into files. |

❖ RFC3164 Log Format

Formats of syslogs may vary with the syslog output direction.

If the output direction is the Console, monitor, buffer, or file, the syslog format is as follows:

```
seq no: *timestamp: sysname %module-level-mnemonic: content
```

For example, if you exit configuration mode, the following log is displayed on the Console:

```
001233: *May 22 09:44:36: QTECH %SYS-5-CONFIG_I: Configured from console by console
```

If the output direction is the log server, the syslog format is as follows:

```
<priority>seq no: *timestamp: sysname %module-level-mnemonic: content
```

For example, if you exit configuration mode, the following log is displayed on the log server:

```
<189>001233: *May 22 09:44:36: QTECH %SYS-5-CONFIG_I: Configured from console by console
```

The following describes each field in the log in details:

1. Priority

This field is valid only when logs are sent to the log server.

The priority is calculated using the following formula: $\text{Facility} \times 8 + \text{Level}$. Level indicates the numerical code of the log level and Facility indicates the numerical code of the facility. The default facility value is local7 (23). The following table lists the value range of the facility.

| Numerical Code | Facility Keyword | Facility Description |
|----------------|------------------|--|
| 0 | kern | kernel messages |
| 1 | user | user-level messages |
| 2 | mail | mail system |
| 3 | daemon | system daemons |
| 4 | auth1 | security/authorization messages |
| 5 | syslog | messages generated internally by syslogs |
| 6 | lpr | line printer subsystem |
| 7 | news | network news subsystem |
| 8 | uucp | UUCP subsystem |
| 9 | clock1 | clock daemon |
| 10 | auth2 | security/authorization messages |
| 11 | ftp | FTP daemon |
| 12 | ntp | NTP subsystem |
| 13 | logaudit | log audit |
| 14 | logalert | log alert |

| | | |
|----|--------|----------------------|
| 15 | clock2 | clock daemon |
| 16 | local0 | local use 0 (local0) |
| 17 | local1 | local use 1 (local1) |
| 18 | local2 | local use 2 (local2) |
| 19 | local3 | local use 3 (local3) |
| 20 | local4 | local use 4 (local4) |
| 21 | local5 | local use 5 (local5) |
| 22 | local6 | local use 6 (local6) |
| 23 | local7 | local use 7 (local7) |

2. Sequence Number

The sequence number of a syslog is a 6-digit integer, and increases sequentially. By default, the sequence number is not displayed. You can run a command to display or hide this field.

3. Timestamp

The timestamp records the time when a syslog is generated so that you can display and check the system event conveniently. QTECH devices support two syslog timestamp formats: `datetime` and `uptime`.

- i** If the device does not have the real time clock (RTC), which is used to record the system absolute time, the device uses its startup time (uptime) as the syslog timestamp by default. If the device has the RTC, the device uses its absolute time (datetime) as the syslog timestamp by default.

The two timestamp formats are described as follows:

Datetime format

The datetime format is as follows:

```
Mmm dd yyyy hh:mm:ss.msec
```

The following table describes each parameter of the datetime.

| Timestamp Parameter | Parameter Name | Description |
|---------------------|----------------|---|
| Mmm | Month | Mmm refers to abbreviation of the current month. The 12 months in a year are written as Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, and Dec. |
| dd | Day | dd indicates the current date. |
| yyyy | Year | yyyy indicates the current year, and is not displayed by default. |
| hh | Hour | hh indicates the current hour. |
| mm | Minute | mm indicates the current minute. |
| ss | Second | ss indicates the current second. |
| msec | Millisecond | msec indicates the current millisecond. |

By default, the datetime timestamp displayed in the syslog does not contain the year and millisecond. You can run a command to display or hide the year and millisecond of the datetime timestamp.

Uptime format

The uptime format is as follows:

```
dd:hh:mm:ss
```

The timestamp string indicates the accumulated days, hours, minutes, and seconds since the system is started.

1. Sysname

This field indicates the name of the device that generates the log so that the log server can identify the host that sends the log. By default, this field is not displayed. You can run a command to display or hide this field.

2. Module

This field indicates the name of the module that generates the log. The module name is an upper-case string of 2 to 20 characters, which contain upper-case letters, digits, or underscores. The module field is mandatory in the log-type information, and optional in the debug-type information.

3. Level

Eight syslog levels from 0 to 7 are defined. The level of syslogs generated by each module is fixed and cannot be modified.

4. Mnemonic

This field indicates the brief information about the log. The mnemonic is an upper-case string of 4 to 32 characters, which may include upper-case letters, digits, or underscore. The mnemonic field is mandatory in the log-type information, and optional in the debug-type information.

5. Content

This field indicates the detailed content of the syslog.

Overview

| Feature | Description |
|-----------------------------------|---|
| Logging | Enable or disable the system logging functions. |
| Syslog Format | Configure the syslog format. |
| Logging Direction | Configure the parameters to send syslogs in different directions. |
| Syslog Filtering | Configure parameters of the syslog filtering function. |
| Featured Logging | Configure parameters of the featured logging function. |
| Syslog Monitoring | Configure parameters of the syslog monitoring function. |

10.3.1 Logging

Enable or disable the logging, log redirection, and log statistics functions.

[Related Configuration](#)

[Enable Logging](#)

By default, logging is enabled.

Run the **logging on** command to enable logging in global configuration mode. After logging is enabled, logs generated by the system are sent in various directions for the administrator to monitor the performance of the system.

Enabling Log Redirection

By default, log redirection is enabled on the Virtual Switching Unit (VSU).

Run the **logging rd on** command to enable log redirection in global configuration mode. After log redirection is enabled, logs generated by the standby device or standby supervisor module are redirected to the active device or active supervisor module on the VSU to facilitate the administrator to manage logs.

Enabling Log Statistics

By default, log statistics is disabled.

Run the **logging count** command to enable log statistics in global configuration mode. After log statistics is enabled, the system records the number of times a log is generated and the last time when the log is generated.

10.3.2 Syslog Format

Configure the syslog format, including the timestamp format, sysname, and sequence number.

Related Configuration

Configuring the Timestamp Format

By default, the syslog uses the datetime timestamp format, and the timestamp does not contain the year and millisecond.

Run the **service timestamps** command in global configuration mode to use the datetime timestamp format that contains the year and millisecond in the syslog, or change the datetime format to the uptime format.

Adding Sysname to the Syslog

By default, the syslog does not contain sysname.

Run the **service sysname** command in global configuration mode to add sysname to the syslog.

❖ Adding the Sequence Number to the Syslog

By default, the syslog does not contain the sequence number.

Run the **service sequence-numbers** command in global configuration mode to add the sequence number to the syslog.

❖ Enabling the Standard Log Format

By default, logs are displayed in the following format:

```
*timestamp: %module-level-mnemonic: content
```

Run the **service standard-syslog** command in global configuration mode to enable the standard log format and logs are displayed in the following format:

```
timestamp %module-level-mnemonic: content
```

Compared with the default log format, an asterisk (*) is missing in front of the timestamp, and a colon (:) is missing at the end of the timestamp in the standard log format.

❖ Enabling the Private Log Format

By default, logs are displayed in the following format:

```
*timestamp: %module-level-mnemonic: content
```

Run the **service private-syslog** command in global configuration mode to enable the private log format and logs are displayed in the following format:

```
timestamp module-level-mnemonic: content
```

Compared with the default log format, an asterisk (*) is missing in front of the timestamp, a colon (:) is missing at the end of the timestamp, and a percent sign (%) is missing at the end of the module name in the private log format.

10.3.3 Logging Direction

Configure parameters for sending syslogs in different directions, including the Console, monitor terminal, buffer, the log server, and log files.

[Related Configuration](#)

❖ Synchronizing User Input with Log Output

By default, this function is disabled.

Run the **logging synchronous** command in line configuration mode to synchronize user input with log output. After this function is enabled, user input will not be interrupted.

❖ Configuring the Log Rate Limit

By default, no log rate limit is configured.

Run the **logging rate-limit** { *number* | **all** *number* | **console** {*number* | **all** *number* } } [**except** [*severity*]] command in global configuration mode to configure the log rate limit.

❖ Configuring the Log Redirection Rate Limit

By default, a maximum of 200 logs are redirected from the standby device to the active device of VSU per second.

Run the **logging rd rate-limit** *number* [**except severity**] command in global configuration mode to configure the log redirection rate limit, that is, the maximum number of logs that are redirected from the standby device to the active device or from the standby supervisor module to the active supervisor module per second.

❖ Configuring the Level of Logs Sent to the Console

By default, the level of logs sent to the Console is debugging (Level 7).

Run the **logging console** [*level*] command in global configuration mode to configure the level of logs that can be sent to the Console.

❖ Sending Logs to the Monitor Terminal

By default, it is not allowed to send logs to the monitor terminal.

Run the **terminal monitor** command in the privileged EXEC mode to send logs to the monitor terminal.

❖ Configuring the Level of Logs Sent to the Monitor Terminal

By default, the level of logs sent to the monitor terminal is debugging (Level 7).

Run the **logging monitor** [*level*] command in global configuration mode to configure the level of logs that can be sent to the monitor terminal.

❖ Writing Logs into the Memory Buffer

By default, logs are written into the memory buffer, and the default level of logs is debugging (Level 7).

Run the **logging buffered** [*buffer-size*] [*level*] command in global configuration mode to configure parameters for writing logs into the memory buffer, including the buffer size and log level.

❖ Sending Logs to the Log Server

By default, logs are not sent to the log server.

Run the **logging server** [**oob**] { *ip-address* | **ipv6** *ipv6-address* } [**via** *mgmt-name*] [**udp-port** *port*] [**vrf** *vrf-name*] command in global configuration mode to send logs to a server specified by an IP address.

Run the **logging server** [**oob**] *hostname* [**via** *mgmt-name*] [**udp-port** *port*] [**vrf** *vrf-name*] command in global configuration mode to send logs to a server specified by a hostname.

❖ Configuring the Level of Logs Sent to the Log Server

By default, the level of logs sent to the log server is informational (Level 6).

Run the **logging trap** [*level*] command in global configuration mode to configure the level of logs that can be sent to the log server.

❖ Configuring the Facility Value of Logs Sent to the Log Server

Run the **logging facility** *facility-type* command in global configuration mode to configure the facility value of logs sent to the log server.

❖ Configuring the Source Address of Logs Sent to the Log Server

By default, the source address of logs sent to the log server is the IP address of the interface sending logs.

Run the **logging source** [**interface**] *interface-type interface-number* command to configure the source interface of logs. If this source interface is not configured, or the IP address is not configured for this source interface, the source address of logs is the IP address of the interface sending logs.

Run the **logging source** { **ip** *ip-address* | **ipv6** *ipv6-address* } command to configure the source IP address of logs. If this IP address is not configured on the device, the source address of logs is the IP address of the interface sending logs.

❖ Writing Logs into Log Files

By default, logs are not written into log files. After the function of writing logs into log files is enabled, the level of logs written into log files is informational (Level 6) by default.

Run the **logging file** {**flash:filename** | **usb0:filename** | **usb1:filename** } [*max-file-size*] [*level*] command in global configuration mode to configure parameters for writing logs into log files, including the type of device where the file is stored, file name, file size, and log level.

❖ Configuring the Number of Log Files

By default, the number of log files is 16.

Run the **logging file numbers** *numbers* command in global configuration mode to configure the number of log files.

❖ Configuring the Interval at Which Logs Are Written into Log Files

By default, logs are written into log files at the interval of 3600s (one hour).

Run the **logging flash interval** *seconds* command in global configuration mode to configure the interval at which logs are written into log files.

❖ Configuring the Storage Time of Log Files

By default, the storage time is not configured.

Run the **logging life-time level** *level days* command in global configuration mode to configure the storage time of logs. The administrator can specify different storage days for logs of different levels.

❖ Immediately Writing Logs in the Buffer into Log Files

By default, syslogs are stored in the syslog buffer and then written into log files periodically or when the buffer is full.

Run the **logging flash flush** command in global configuration mode to immediately write logs in the buffer into log files so that you can collect logs conveniently.

10.3.4 Syslog Filtering

By default, logs generated by the system are sent in all directions.

Working Principle

❖ Filtering Direction

Five log filtering directions are defined:

buffer: Filters out logs sent to the log buffer, that is, logs displayed by the **show logging** command.

file: Filters out logs written into log files.

server: Filters out logs sent to the log server.

terminal: Filters out logs sent to the Console and monitor terminal (including Telnet and SSH).

The four filtering directions can be used either in combinations to filter out logs sent in various directions, or separately to filter out logs sent in a single direction.

❖ Filtering Mode

Two filtering modes are available:

contains-only: Indicates that only logs that contain keywords specified in the filtering rules are output. You may be interested in only a specified type of logs. In this case, you can apply the contains-only mode on the device to display only logs that match filtering rules on the terminal, helping you check whether any event occurs.

filter-only: Indicates that logs that contain keywords specified in the filtering rules are filtered out and will not be output. If a module generates too many logs, spamming may occur on the terminal interface. If you do not care about this type of logs, you can apply the filter-only mode and configure related filtering rules to filter out logs that may cause spamming.

The two filtering modes are mutually exclusive, that is, you can configure only one filtering mode at a time.

❖ Filter Rule

Two filtering rules are available:

exact-match: If exact-match is selected, you must select all the three filtering options (module, level, and mnemonic). If you want to filter out a specified log, use the exact-match filtering rule.

single-match: If exact-match is selected, you only need to select one of the three filtering options (module, level, and mnemonic). If you want to filter out a specified type of logs, use the single-match filtering rule.

If the same module, level, or mnemonic is configured in both the single-match and exact-match rules, the single-match rule prevails over the exact-match rule.

Related Configuration

❖ Configuring the Log Filtering Direction

By default, the log filtering direction is all, that is, logs sent in all directions are filtered.

Run the **logging filter direction { all | buffer | file | server | terminal }** command in global configuration mode to configure the log filtering direction to filter out logs in the specified directions.

❖ Configuring the Log Filtering Mode

By default, the log filtering mode is filter-only.

Run the **logging filter type { contains-only | filter-only }** command in global configuration mode to configure the log filtering mode.

❖ Configuring the Log Filtering Rule

By default, no log filtering rule is configured on a device, that is, logs are not filtered out.

Run the **logging filter rule exact-match module *module-name* mnemonic *mnemonic-name* level *level*** command in global configuration mode to configure the exact-match rule.

Run the **logging filter rule single-match { level *level* | mnemonic *mnemonic-name* | module *module-name* }** command in global configuration mode to configure the single-match rule.

10.3.5 Syslog Monitoring

After syslog monitoring is enabled, the system monitors the access attempts of users and generates the related logs.

Working Principle

After logging of login/exit attempts is enabled, the system records the access attempts of users. The log contains user name and source address.

After logging of operations is enabled, the system records changes in device configurations, The log contains user name, source address, and operation.

Related Configuration

❖ Enabling Logging of Login or Exit Attempts

By default, a device does not generate logs when users access or exit the device.

Run the **logging userinfo** command in global configuration mode to enable logging of login/exit attempts. After this function is enabled, the device displays logs when users access the devices through Telnet, SSH, or HTTP so that the administrator can monitor the device connections.

❖ Enabling Logging of Operations

By default, a device does not generate logs when users modify device configurations.

Run the **logging userinfo command-log** command in global configuration mode to enable logging of operations. After this function is enabled, the system displays related logs to notify the administrator of configuration changes.

10.4 Configuration

| Configuration | Description and Command | |
|--|---|--|
| Configuring Syslog Format | (Optional) It is used to configure the syslog format. | |
| | service timestamps [<i>message-type</i> [uptime datetime [msec] [year]] | Configures the timestamp format of syslogs. |
| | service sysname | Adds the sysname to the syslog. |
| | service sequence-numbers | Adds the sequence number to the syslog. |
| | service standard-syslog | Enables the standard syslog format. |
| | service private-syslog | Enables the private syslog format. |
| Sending Syslogs to the Console | (Optional) It is used to configure parameters for sending syslogs to the Console. | |
| | logging on | Enables logging. |
| | logging count | Enables log statistics. |
| | logging console [<i>level</i>] | Configures the level of logs displayed on the Console. |

| | | |
|---|--|--|
| | logging rate-limit { <i>number</i> all <i>number</i> console { <i>number</i> all <i>number</i> } } [except [<i>severity</i>]] | Configures the log rate limit. |
| Sending Syslogs to the Monitor Terminal | (Optional) It is used to configure parameters for sending syslogs to the monitor terminal. | |
| | terminal monitor | Enables the monitor terminal to display logs. |
| | logging monitor [<i>level</i>] | Configures the level of logs displayed on the monitor terminal. |
| Writing Syslogs into the Memory Buffer | (Optional) It is used to configure parameters for writing syslogs into the memory buffer. | |
| | logging buffered [<i>buffer-size</i>] [<i>level</i>] | Configures parameters for writing syslogs into the memory buffer, including the buffer size and log level. |
| Sending Syslogs to the Log Server | (Optional) It is used to configure parameters for sending syslogs to the log server. | |
| | logging server [<i>oob</i>] { <i>ip-address</i> ipv6 <i>ipv6-address</i> } [via <i>mgmt-name</i>] [udp-port <i>port</i>] [vrf <i>vrf-name</i>] logging server [<i>oob</i>] <i>hostname</i> [via <i>mgmt-name</i>] [udp-port <i>port</i>] [vrf <i>vrf-name</i>] | Sends logs to a specified log server. |
| | logging trap [<i>level</i>] | Configures the level of logs sent to the log server. |
| | logging facility <i>facility-type</i> | Configures the facility value of logs sent to the log server. |
| | logging source [interface] <i>interface-type interface-number</i> | Configures the source interface of logs sent to the log server. |
| logging source { ip <i>ip-address</i> ipv6 <i>ipv6-address</i> } | Configures the source address of logs sent to the log server. | |

| | | |
|--|---|--|
| Writing Syslogs into Log Files | (Optional) It is used to configure parameters for writing syslog messages into a file. | |
| | logging file { flash:filename usb0:filename usb1:filename } [<i>max-file-size</i>] [<i>level</i>] | Configures parameters for writing syslog messages into a file, including the file storage type, file name, file size, and log level. |
| | logging file numbers <i>numbers</i> | Configures the number of files which logs are written into. The default value is 16. |
| | logging flash interval <i>seconds</i> | Configures the interval at which logs are written into log files. The default value is 3600. |
| | logging life-time level <i>level days</i> | Configures the storage time of log files. |
| Configuring Syslog Filtering | (Optional) It is used to enable the syslog filtering function. | |
| | logging filter direction { all buffer file server terminal } | Configures the log filtering direction. |
| | logging filter type { contains-only filter-only } | Configures the log filtering mode. |
| | logging filter rule exact-match module <i>module-name mnemonic mnemonic-name level level</i> | Configures the exact-match filtering rule. |
| | logging filter rule single-match { level <i>level</i> mnemonic <i>mnemonic-name</i> module <i>module-name</i> } | Configures the single-match filtering rule. |
| Configuring Syslog Redirection | (Optional) It is used to enable the log redirection function. | |
| | logging rd on | Enables the log redirection function. |
| | logging rd rate-limit <i>number</i> [except <i>severity</i>] | Configures the log redirection rate limit. |
| Configuring Syslog Monitoring | (Optional) It is used to configure parameters of the syslog monitoring function . | |

| | | |
|--|--|--|
| | logging userinfo | Enables logging of login/exit attempts. |
| | logging userinfo command-log | Enables logging of operations. |
| Synchronizing User Input with Log Output | (Optional) It is used to synchronize the user input with log output. | |
| | logging synchronous | Synchronizes user input with log output. |

10.4.1 Configuring Syslog Format

Configuration

Effect

Configure the format of syslogs.

Notes

❖ RFC3164 Log Format

If the device does not have the real time clock (RTC), which is used to record the system absolute time, the device uses its startup time (uptime) as the syslog timestamp by default. If the device has the RTC, the device uses its absolute time (datetime) as the syslog timestamp by default.

The log sequence number is a 6-digit integer. Each time a log is generated, the sequence number increases by one. Each time the sequence number increases from 000000 to 1,000,000, or reaches 2^{32} , the sequence number starts from 000000 again.

Configuration

Steps

❖ Configuring the Timestamp Format of Syslogs

(Optional) By default, the datetime timestamp format is used.

Unless otherwise specified, perform this configuration on the device to configure the timestamp format.

❖ Adding the Sysname to the Syslog

(Optional) By default, the syslog does not contain the sysname.

Unless otherwise specified, perform this configuration on the device to add the sysname to the syslog.

❖ Adding the Sequence Number to the Syslog

(Optional) By default, the syslog does not contain the sequence number.

Unless otherwise specified, perform this configuration on the device to add the sequence number to the syslog.

❖ Enabling the Standard Log Format

(Optional) By default, the default log format is used.

Unless otherwise specified, perform this configuration on the device to enable the standard log format.

❖ Enabling the Private Log Format

(Optional) By default, the default log format is used.

Unless otherwise specified, perform this configuration on the device to enable the private log format.

Verification

Generate a syslog, and check the log format.

Related

Commands

❖ Configuring the Timestamp Format of Syslogs

| Command | <code>service timestamps [message-type [uptime datetime [msec] [year]]]</code> |
|-----------------------|---|
| Parameter Description | <p><i>message-type</i>: Indicates the log type. There are two log types: log and debug.</p> <p>uptime: Indicates the device startup time in the format of dd:hh:mm:ss, for example, 07:00:10:41.</p> <p>datetime: Indicates the current device time in the format of MM DD hh:mm:ss, for example, Jul 27 16:53:07.</p> <p>msec: Indicates that the current device time contains millisecond.</p> <p>year: Indicates that the current device time contains year.</p> |
| Command Mode | Global configuration mode |
| Configuration Usage | Two syslog timestamp formats are available, namely, uptime and datetime. You can select a timestamp format as required. |

❖ Adding the Sysname to the Syslog

| Command | <code>service sysname</code> |
|---------|------------------------------|
|---------|------------------------------|

| | |
|-----------------------|--|
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | This command is used to add the sysname to the log to enable you to learn about the device that sends syslogs to the server. |

❖ Adding the Sequence Number to the Syslog

| | |
|-----------------------|---|
| Command | service sequence-numbers |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | This command is used to add the sequence number to the log. The sequence number starts from 1. After the sequence number is added, you can learn clearly whether any log is lost and the generation sequence of logs. |

❖ Enabling the Standard Syslog Format

| | |
|-----------------------|--|
| Command | service standard-syslog |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, logs are displayed in the following format (default format): *timestamp: %module-level-mnemonic: content If the standard syslog format is enabled, logs are displayed in the following format: |

| | |
|--|--|
| | <p>timestamp %module-level-mnemonic: content</p> <p>Compared with the default format, an asterisk (*) is missing in front of the timestamp, and a colon (:) is missing at the end of the timestamp in the standard log format.</p> |
|--|--|

❖ Enabling the Private Syslog Format

| | |
|------------------------------|--|
| Command | <code>service private-syslog</code> |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | <p>By default, logs are displayed in the following format (default format):</p> <p>*timestamp: %module-level-mnemonic: content</p> <p>If the private syslog format is enabled, logs are displayed in the following format:</p> <p>timestamp module-level-mnemonic: content</p> <p>Compared with the default format, an asterisk (*) is missing in front of the timestamp, a colon (:) is missing at the end of the timestamp, and a percent sign (%) is missing in front of the module name in the private log format.</p> |

Configuration

Example

❖ Enabling the RFC3164 Log Format

| | |
|----------------------------|--|
| Scenario | <p>It is required to configure the timestamp format as follows:</p> <ol style="list-style-type: none"> 1. Enable the RFC3164 format. 2. Change the timestamp format to datetime and add the millisecond and year to the timestamp. 3. Add the sysname to the log. 4. Add the sequence number to the log. |
| Configuration Steps | <ul style="list-style-type: none"> ▪ Configure the syslog format. |
| | <pre>QTECH# configure terminal QTECH(config)# service timestamps log datetime year msec QTECH(config)# service timestamps debug datetime year msec QTECH(config)# service sysname</pre> |

| | |
|--------------|--|
| | QTECH(config)# service sequence-numbers |
| Verification | <p>After the timestamp format is configured, verify that new syslogs are displayed in the RFC3164 format.</p> <ul style="list-style-type: none"> ▪ Run the show logging config command to display the configuration. ▪ Enter or exit global configuration mode to generate a new log, and check the format of the timestamp in the new log. |
| | <pre>QTECH(config)#exit 001302: *Jun 14 2013 19:01:40.293: QTECH %SYS-5-CONFIG_I: Configured from console by admin on console QTECH#show logging config Syslog logging: enabled Console logging: level informational, 1306 messages logged Monitor logging: level informational, 0 messages logged Buffer logging: level informational, 1306 messages logged File logging: level informational, 121 messages logged File name:syslog_test.txt, size 128 Kbytes, have written 5 files Standard format:false Timestamp debug messages: datetime Timestamp log messages: datetime Sequence-number log messages: enable Sysname log messages: enable Count log messages: enable Trap logging: level informational, 121 message lines logged,0 fail</pre> |

10.4.2 Sending Syslogs to the Console

Configuration

Effect

Send syslogs to the Console to facilitate the administrator to monitor the performance of the system.

Notes

If too many syslogs are generated, you can limit the log rate to reduce the number of logs displayed on the Console.

Configuration

Steps

- ❖ Enabling Logging

(Optional) By default, the logging function is enabled.

❖ Enabling Log Statistics

(Optional) By default, log statistics is disabled.

Unless otherwise specified, perform this configuration on the device to enable log statistics.

❖ Configuring the Level of Logs Displayed on the Console

(Optional) By default, the level of logs displayed on the Console is debugging (Level 7).

Unless otherwise specified, perform this configuration on the device to configure the level of logs displayed on the Console.

❖ Configuring the Log Rate Limit

(Optional) By default, the no rate limit is configured.

Unless otherwise specified, perform this configuration on the device to limit the log rate.

Verification

Run the **show logging config** command to display the level of logs displayed on the Console.

Related Commands

❖ Enabling Logging

| | |
|-----------------------|--|
| Command | logging on |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, logging is enabled. Do not disable logging in general cases. If too many syslogs are generated, you can configure log levels to reduce the number of logs. |

❖ Enabling Log Statistics

| | |
|----------------|----------------------|
| Command | logging count |
|----------------|----------------------|

| | |
|-----------------------|--|
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, log statistics is disabled. If log statistics is enabled, syslogs will be classified and counted. The system records the number of times a log is generated and the last time when the log is generated. |

❖ Configuring the Level of Logs Displayed on the Console

| | |
|-----------------------|--|
| Command | logging console [level] |
| Parameter Description | <i>level</i> : Indicates the log level. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, the level of logs displayed on the Console is debugging (Level 7). You can run the show logging config command in privileged EXEC mode to display the level of logs displayed on the Console. |

❖ Configuring the Log Rate Limit

| | |
|-----------------------|---|
| Command | logging rate-limit { number all number console {number all number } } [except [severity]] |
| Parameter Description | <i>number</i> : Indicates the maximum number of logs processed per second. The value ranges from 1 to 10,000. all : Indicates that rate limit is applied to all logs ranging from Level 0 to Level 7. console : Indicates the number of logs displayed on the Console per second. except severity : Rate limit is not applied to logs with a level equaling to or lower than the specified severity level. By default, the severity level is error (Level 3), that is, rate limit is not applied to logs of Level 3 or lower. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, no rate limit is configured. |

Configuration

Example

❖ Sending Syslogs to the Console

| | |
|---------------------|---|
| Scenario | It is required to configure the function of displaying syslogs on the Console as follows: <ol style="list-style-type: none"> 1. Enable log statistics. 2. Set the level of logs that can be displayed on the Console to informational (Level 6). 3. Set the log rate limit to 50. |
| Configuration Steps | ❖ Configure parameters for displaying syslogs on the Console. |
| | <pre>QTECH# configure terminal QTECH(config)# logging count QTECH(config)# logging console informational QTECH(config)# logging rate-limit console 50</pre> |
| Verification | ❖ Run the show logging config command to display the configuration. |
| | <pre>QTECH(config)#show logging config Syslog logging: enabled Console logging: level informational, 1303 messages logged Monitor logging: level debugging, 0 messages logged Buffer logging: level debugging, 1303 messages logged File logging: level informational, 118 messages logged File name:syslog_test.txt, size 128 Kbytes, have written 5 files Standard format:false Timestamp debug messages: datetime Timestamp log messages: datetime Sequence-number log messages: enable Sysname log messages: enable Count log messages: enable Trap logging: level informational, 118 message lines logged,0 fail</pre> |

10.4.3 Sending Syslogs to the Monitor Terminal

Configuration

Effect

Send syslogs to a remote monitor terminal to facilitate the administrator to monitor the performance of the system.

Notes

If too many syslogs are generated, you can limit the log rate to reduce the number of logs displayed on the monitor terminal.

By default, the current monitor terminal is not allowed to display logs after you access the device remotely. You need to manually run the **terminal monitor** command to allow the current monitor terminal to display logs.

Configuration Steps

❖ Allowing the Monitor Terminal to Display Logs

(Mandatory) By default, the monitor terminal is not allowed to display logs.

Unless otherwise specified, perform this operation on every monitor terminal connected to the device.

❖ Configuring the Level of Logs Displayed on the Monitor Terminal

(Optional) By default, the level of logs displayed on the monitor terminal is debugging (Level 7).

Unless otherwise specified, perform this configuration on the device to configure the level of logs displayed on the monitor terminal.

Verification

Run the **show logging config** command to display the level of logs displayed on the monitor terminal.

Related Commands

❖ Allowing the Monitor Terminal to Display Logs

| | |
|-----------------------|---|
| Command | terminal monitor |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Configuration Usage | By default, the current monitor terminal is not allowed to display logs after you access the device remotely. You need to manually run the terminal monitor command to allow the current monitor terminal to display logs. |

❖ Configuring the Level of Logs Displayed on the Monitor Terminal

| | |
|------------------------------|--|
| Command | logging monitor [level] |
| Parameter Description | <i>level</i> : Indicates the log level. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, the level of logs displayed on the monitor terminal is debugging (Level 7). You can run the show logging config command in privileged EXEC mode to display the level of logs displayed on the monitor terminal. |

Configuration

Example

❖ Sending Syslogs to the Monitor Terminal

| | |
|----------------------------|--|
| Scenario | It is required to configure the function of displaying syslogs on the monitor terminal as follows: <ol style="list-style-type: none"> 1. Display logs on the monitor terminal. 2. Set the level of logs that can be displayed on the monitor terminal to informational (Level 6). |
| Configuration Steps | ❖ Configure parameters for displaying syslogs on the monitor terminal. |
| | QTECH# configure terminal QTECH(config)# logging monitor informational QTECH(config)# line vty 0 4 QTECH(config-line)# monitor |
| Verification | ❖ Run the show logging config command to display the configuration. |
| | QTECH#show logging config Syslog logging: enabled Console logging: level informational, 1304 messages logged Monitor logging: level informational, 0 messages logged Buffer logging: level debugging, 1304 messages logged |

```
File logging: level informational, 119 messages logged
File name:syslog_test.txt, size 128 Kbytes, have written 5 files
Standard format:false
Timestamp debug messages: datetime
Timestamp log messages: datetime
Sequence-number log messages: enable
Sysname log messages: enable
Count log messages: enable
Trap logging: level informational, 119 message lines logged,0 fail
```

Common

Errors

To disable this function, run the **terminal no monitor** command, instead of the **no terminal monitor** command.

10.4.4 Writing Syslogs into the Memory Buffer

Configuration

Effect

Write syslogs into the memory buffer so that the administrator can view recent syslogs by running the **show logging** command.

Notes

If the buffer is full, old logs will be overwritten by new logs that are written into the memory buffer.

Configuration

Steps

❖ Writing Logs into the Memory Buffer

(Optional) By default, the system writes logs into the memory buffer, and the default level of logs is debugging (Level 7).

Unless otherwise specified, perform this configuration on the device to write logs into the memory buffer.

Verification

Run the **show logging config** command to display the level of logs written into the memory buffer.

Run the **show logging** command to display the level of logs written into the memory buffer.

Related Commands

❖ Writing Logs into the Memory Buffer

| | |
|------------------------------|---|
| Command | logging buffered [<i>buffer-size</i>] [<i>level</i>] |
| Parameter Description | <i>buffer-size</i> : Indicates the size of the memory buffer. <i>level</i> : Indicates the level of logs that can be written into the memory buffer. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, the level of logs written into the memory buffer is debugging (Level 7). Run the show logging command in privileged EXEC mode to display the level of logs written into the memory buffer and the buffer size. |

Configuration Example

❖ Writing Syslogs into the Memory Buffer

| | |
|----------------------------|--|
| Scenario | It is required to configure the function of writing syslog messages into the memory buffer as follows: <ol style="list-style-type: none"> 1. Set the log buffer size to 128 KB (131,072 bytes). 2. Set the information level of logs that can be written into the memory buffer to informational (Level 6). |
| Configuration Steps | ❖ Configure parameters for writing syslog messages into the memory buffer. |
| | QTECH# configure terminal QTECH(config)# logging buffered 131072 informational |
| Verification | ❖ Run the show logging config command to display the configuration and recent syslog messages. |
| | QTECH#show logging Syslog logging: enabled Console logging: level informational, 1306 messages logged Monitor logging: level informational, 0 messages logged |

```
Buffer logging: level informational, 1306 messages logged
File logging: level informational, 121 messages logged
File name:syslog_test.txt, size 128 Kbytes, have written 5 files
Standard format:false
Timestamp debug messages: datetime
Timestamp log messages: datetime
Sequence-number log messages: enable
Sysname log messages: enable
Count log messages: enable
Trap logging: level informational, 121 message lines logged,0 fail
Log Buffer (Total 131072 Bytes): have written 4200
001301: *Jun 14 2013 19:01:09.488: QTECH %SYS-5-CONFIG_I: Configured from
console by admin on console
001302: *Jun 14 2013 19:01:40.293: QTECH %SYS-5-CONFIG_I: Configured from
console by admin on console
//Logs displayed are subject to the actual output of the show logging command.
```

10.4.5 Sending Syslogs to the Log Server

Configuration

Effect

Send syslogs to the log server to facilitate the administrator to monitor logs on the server.

Notes

If the device has a MGMT interface and is connected to the log server through the MGMT interface, you must add the **oob** option (indicating that syslogs are sent to the log server through the MGMT interface) when configuring the **logging server** command.

To send logs to the log server, you must add the timestamp and sequence number to logs. Otherwise, the logs are not sent to the log server.

Configuration

Steps

❖ Sending Logs to a Specified Log Server

(Mandatory) By default, syslogs are not sent to any log server.

Unless otherwise specified, perform this configuration on every device.

❖ Configuring the Level of Logs Sent to the Log Server

(Optional) By default, the level of logs sent to the log server is informational (Level 6).

Unless otherwise specified, perform this configuration on the device to configure the level of logs sent to the log server.

❖ Configuring the Facility Value of Logs Sent to the Log Server

Unless otherwise specified, perform this configuration on the device to configure the facility value of logs sent to the log server.

❖ Configuring the Source Interface of Logs Sent to the Log Server

(Optional) By default, the source interface of logs sent to the log server is the interface sending the logs.

Unless otherwise specified, perform this configuration on the device to configure the source interface of logs sent to the log server.

❖ Configuring the Source Address of Logs Sent to the Log Server

(Optional) By default, the source address of logs sent to the log server is the IP address of the interface sending the logs.

Unless otherwise specified, perform this configuration on the device to configure the source address of logs sent to the log server.

Verification

Run the **show logging config** command to display the configurations related to the log server.

Related

Commands

❖ Sending Logs to a Specified Log Server

| | |
|-----------------------|--|
| Command | logging server [oob] { <i>ip-address</i> ipv6 <i>ipv6-address</i> } [<i>via mgmt-name</i>] [<i>udp-port port</i>] [<i>vrf vrf-name</i>] Or logging { <i>ip-address</i> ipv6 <i>ipv6-address</i> } [<i>udp-prot port</i>] [<i>vrf vrf-name</i>] logging server [oob] <i>hostname</i> [<i>via mgmt-name</i>] [<i>udp-prot port</i>] [<i>vrf vrf-name</i>] |
| Parameter Description | oob : Indicates that logs are sent to the log server through the MGMT interface. <i>hostname</i> : Specifies the hostname of the host that receives logs. <i>ip-address</i> : Specifies the IP address of the host that receives logs. ipv6 <i>ipv6-address</i> : Specifies the IPv6 address of the host that receives logs. via <i>mgmt-name</i> : Specifies the MGMT interface used by the log server when the oob option is included in the command. vrf <i>vrf-name</i> : Specifies the VPN routing and forwarding (VRF) instance connected to the log server. udp-port <i>port</i> : Specifies the port ID of the log server. The default port ID is 514. |
| Command Mode | Global configuration mode |

| | |
|-------------------------|--|
| Configurati on Usage | <p>This command is used to specify the address of the log server that receives logs. You can specify multiple log servers, and logs will be sent simultaneously to all these log servers.</p> <p>You can specify via only when oob is included in the command. In this case, vrf cannot be used.</p> <p>❗ When you configure the log server by specifying a hostname, the logging hostname command is not supported.</p> <p>You can configure up to five log servers on a QTECH product.</p> |
|-------------------------|--|

❖ Configuring the Level of Logs Sent to the Log Server

| | |
|--------------------------|--|
| Command | logging trap [<i>level</i>] |
| Parameter Description | <i>level</i> : Indicates the log level. |
| Command Mode | Global configuration mode |
| Configurati on Usage | By default, the level of logs sent to the log server is informational (Level 6). You can run the show logging config command in privileged EXEC mode to display the level of logs sent to the log server. |

❖ Configuring the Facility Value of Logs Sent to the Log Server

| | |
|--------------------------|--|
| Command | logging facility <i>facility-type</i> |
| Parameter Description | <i>facility-type</i> : Indicates the facility value of logs. |
| Command Mode | Global configuration mode |
| Configurati on Usage | N/A |

❖ Configuring the Source Interface of Logs Sent to the Log Server

| | |
|----------------|--|
| Command | logging source [<i>interface</i>] <i>interface-type interface-number</i> |
| Parameter | <i>interface-type</i> : Indicates the interface type. <i>interface-number</i> : Indicates the interface number. |

| | |
|---------------------|---|
| Description | |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, the source interface of logs sent to the log server is the interface sending the logs. To facilitate management, you can use this command to set the source interface of all logs to an interface so that the administrator can identify the device that sends the logs based on the unique address. |

❖ Configuring the Source Address of Logs Sent to the Log Server

| | |
|-----------------------|--|
| Command | <code>logging source { ip <i>ip-address</i> ipv6 <i>ipv6-address</i> }</code> |
| Parameter Description | ip <i>ip-address</i> : Specifies the source IPv4 address of logs sent to the IPv4 log server. ipv6 <i>ipv6-address</i> : Specifies the source IPv6 address of logs sent to the IPv6 log server. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, the source IP address of logs sent to the log server is the IP address of the interface sending the logs. To facilitate management, you can use this command to set the source IP address of all logs to the IP address of an interface so that the administrator can identify the device that sends the logs based on the unique address.. |

Configuration

Example

❖ Sending Syslogs to the Log Server

| | |
|---------------------|--|
| Scenario | It is required to configure the function of sending syslogs to the log server as follows: 1. Set the IPv4 address of the log server to 10.1.1.100. 2. Set the level of logs that can be sent to the log server to debugging (Level 7). 3. Set the source interface to Loopback 0. |
| Configuration Steps | ❖ Configure parameters for sending syslogs to the log server. |
| | QTECH# configure terminal QTECH(config)# logging server 10.1.1.100 QTECH(config)# logging trap debugging QTECH(config)# logging source interface Loopback 0 |

| | |
|--------------|---|
| Verification | ❖ Run the show logging config command to display the configuration. |
| | <pre>QTECH#show logging config Syslog logging: enabled Console logging: level informational, 1307 messages logged Monitor logging: level informational, 0 messages logged Buffer logging: level informational, 1307 messages logged File logging: level informational, 122 messages logged File name:syslog_test.txt, size 128 Kbytes, have written 5 files Standard format:false Timestamp debug messages: datetime Timestamp log messages: datetime Sequence-number log messages: enable Sysname log messages: enable Count log messages: enable Trap logging: level debugging, 122 message lines logged,0 fail logging to 10.1.1.100</pre> |

10.4.6 Writing Syslogs into Log Files

Configuration

Effect

Write syslogs into log files at the specified interval so that the administrator can view history logs anytime on the local device.

Notes

Syslogs are not immediately written into log files. They are first buffered in the memory buffer, and then written into log files either periodically (at the interval of one hour by default) or when the buffer is full.

Configuration

Steps

❖ Writing Logs into Log Files

(Mandatory) By default, syslogs are not written to any log file.

Unless otherwise specified, perform this configuration on every device.

❖ Configuring the Number of Log Files

(Optional) By default, syslogs are written to 16 log files.

Unless otherwise specified, perform this configuration on the device to configure the number of files which logs are written into.

❖ Configuring the Interval at Which Logs Are Written into Log Files

(Optional) By default, syslogs are written to log files every hour.

Unless otherwise specified, perform this configuration on the device to configure the interval at which logs are written into log files.

❖ Configuring the Storage Time of Log Files

(Optional) By default, no storage time is configured.

Unless otherwise specified, perform this configuration on the device to configure the storage time of log files.

❖ Immediately Writing Logs in the Buffer into Log Files

(Optional) By default, syslogs are stored in the buffer and then written into log files periodically or when the buffer is full.

Unless otherwise specified, perform this configuration to write logs in the buffer into log files immediately. This command takes effect only once after it is configured.

Verification

Run the **show logging config** command to display the configurations related to the log server.

Related Commands

❖ Writing Logs into Log Files

| Command | <code>logging file { flash:filename usb0:filename usb1:filename } [max-file-size] [level]</code> |
|-----------------------|---|
| Parameter Description | <p>flash: Indicates that log files will be stored on the extended Flash.</p> <p>usb0: Indicates that log files will be stored on USB 0. This option is supported only when the device has one USB port and a USB flash drive is inserted into the USB port.</p> <p>usb1: Indicates that log files will be stored on USB 1. This option is supported only when the device has two USB ports and USB flash drives are inserted into the USB ports.</p> <p><i>filename</i>: Indicates the log file name, which does not contain a file name extension. The file name extension is always txt.</p> <p><i>max-file-size</i>: Indicates the maximum size of a log file. The value ranges from 128 KB to 6 MB. The default value is 128 KB.</p> <p><i>level</i>: Indicates the level of logs that can be written into a log file.</p> |
| Command | Global configuration mode |

| | |
|---------------------|--|
| Mode | |
| Configuration Usage | <p>This command is used to create a log file with the specified file name on the specified file storage device. The file size increases with the amount of logs, but cannot exceed the configured maximum size. If not specified, the maximum size of a log file is 128 KB by default.</p> <p>After this command is configured, the system saves logs to log files. A log file name does not contain any file name extension. The file name extension is always txt, which cannot be changed.</p> <p>After this command is configured, logs will be written into log files every hour. If you run the logging file flash:syslog command, a total of 16 log files will be created, namely, syslog.txt, syslog_1.txt, syslog_2.txt, ..., syslog_14.txt, and syslog_15.txt. Logs are written into the 16 log files in sequence. For example, the system writes logs into syslog_1.txt after syslog.txt is full. When syslog_15.txt is full, logs are written into syslog.txt again,</p> |

❖ Configuring the Number of Log Files

| | |
|-----------------------|---|
| Command | logging file numbers <i>numbers</i> |
| Parameter Description | <i>numbers</i> : Indicates the number of log files. The value ranges from 2 to 32. |
| Command Mode | Global configuration mode |
| Configuration Usage | <p>This command is used to configure the number of log files.</p> <p>If the number of log files is modified, the system will not delete the log files that have been generated. Therefore, you need to manually delete the existing log files to save the space of the extended flash. (Before deleting existing log files, you can transfer these log files to an external server through TFTP.) For example, after the function of writing logs into log files is enabled, 16 log files will be created by default. If the device has generated 16 log files and you change the number of log files to 2, new logs will be written into syslog.txt and syslog_1.txt by turns. The existing log files from syslog_2.txt to syslog_15.txt will be preserved. You can manually delete these log files.</p> |

❖ Configuring the Interval at Which Logs Are Written into Log Files

| | |
|-----------------------|--|
| Command | logging flash interval <i>seconds</i> |
| Parameter Description | <i>seconds</i> : Indicates the interval at which logs are written into log files. The value ranges from 1s to 51,840s. |

| | |
|---------------------|--|
| Command Mode | Global configuration mode |
| Configuration Usage | This command is used to configure the interval at which logs are written into log files. The countdown starts after the command is configured. |

❖ Configuring the Storage Time of Log Files

| | |
|-----------------------|---|
| Command | logging life-time level <i>level</i> days |
| Parameter Description | <i>level</i> : Indicates the log level. <i>days</i> : Indicates the storage time of log files. The unit is day. The storage time is not less than seven days. |
| Command Mode | Global configuration mode |
| Configuration Usage | <p>After the log storage time is configured, the system writes logs of the same level that are generated in the same day into the same log file. The log file is named yyyy-mm-dd_filename_level.txt, where yyyy-mm-dd is the absolute time of the day when the logs are generated, filename is the log file named configured by the logging file flash command, and level is the log level.</p> <p>After you specify the storage time for logs of a certain level, the system deletes the logs after the storage time expires. Currently, the storage time ranges from 7days to 365 days.</p> <p>If the log storage time is not configured, logs are stored based on the file size to ensure compatibility with old configuration commands.</p> |

❖ Immediately Writing Logs in the Buffer into Log Files

| | |
|-----------------------|---|
| Command | logging flash flush |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | After this command is configured, syslog messages are stored in the buffer and then written into log files periodically or when the buffer is full. You can run this command to |

| | |
|--|---|
| | <p>immediately write logs into log files.</p> <p>The logging flash flush command takes effect once after it is configured. That is, after this command is configured, logs in the buffer are immediately written to log files.</p> |
|--|---|

Configuration

Example

❖ Writing Syslogs into Log Files

| | |
|---------------------|---|
| Scenario | <p>It is required to configure the function of writing syslog messages into log files as follows:</p> <ol style="list-style-type: none"> 1. Set the log file name to <code>syslog</code>. 2. Set the level of logs sent to the Console to debugging (Level 7). 3. Set the interval at which device logs are written into files to 10 minutes (600s). |
| Configuration Steps | <p>❖ Configure parameters for writing syslog messages into log files.</p> |
| | <pre>QTECH# configure terminal QTECH(config)# logging file flash:syslog debugging QTECH(config)# logging flash interval 600</pre> |
| Verification | <p>❖ Run the show logging config command to display the configuration.</p> |
| | <pre>QTECH(config)#show logging config Syslog logging: enabled Trap logging: level debugging, 122 message lines logged,0 fail logging to 10.1.1.100</pre> |

10.4.7 Configuring Syslog Filtering

Configuration

Effect

Filter out a specified type of syslog messages if the administrator does not want to display these syslog messages.

By default, logs generated by all modules are displayed on the Console or other terminals. You can configure log filtering rules to display only desired logs.

Notes

Two filtering modes are available: `contains-only` and `filter-only`. You can configure only one filtering mode at a time.

If the same module, level, or mnemonic is configured in both the single-match and exact-match rules, the single-match rule prevails over the exact-match rule.

Configuration

Steps

❖ Configuring the Log Filtering Direction

(Optional) By default, the filtering direction is all, that is, all logs are filtered out.

Unless otherwise specified, perform this configuration on the device to configure the log filtering direction.

❖ Configuring the Log Filtering Mode

(Optional) By default, the log filtering mode is filter-only.

Unless otherwise specified, perform this configuration on the device to configure the log filtering mode.

❖ Configuring the Log Filtering Rule

(Mandatory) By default, no filtering rule is configured.

Unless otherwise specified, perform this configuration on the device to configure the log filtering rule.

Verification

Run the **show running** command to display the configuration.

Related

Commands

❖ Configuring the Log Filtering Direction

| Command | <code>logging filter direction { all buffer file server terminal }</code> |
|-----------------------|---|
| Parameter Description | <p>all: Filters out all logs.</p> <p>buffer: Filters out logs sent to the log buffer, that is, the logs displayed by the show logging command.</p> <p>file: Filters out logs written into log files.</p> <p>server: Filters out logs sent to the log server.</p> <p>terminal: Filters out logs sent to the Console and VTY terminal (including Telnet and SSH).</p> |
| Command Mode | Global configuration mode |
| Configurati | The default filtering direction is all , that is, all logs are filtered out. |

| | |
|----------|---|
| on Usage | Run the default logging filter direction command to restore the default filtering direction. |
|----------|---|

❖ Configuring the Log Filtering Mode

| | |
|-----------------------|--|
| Command | logging filter type { contains-only filter-only } |
| Parameter Description | contains-only: Indicates that only logs that contain keywords specified in the filtering rules are displayed. filter-only: Indicates that logs that contain keywords specified in the filtering rules are filtered out and will not be displayed. |
| Command Mode | Global configuration mode |
| Configuration Usage | Log filtering modes include contains-only and filter-only. The default filtering mode is filter-only. |

❖ Configuring the Log Filtering Rule

| | |
|-----------------------|--|
| Command | logging filter rule { exact-match module <i>module-name</i> mnemonic <i>mnemonic-name</i> level <i>level</i> single-match { level <i>level</i> mnemonic <i>mnemonic-name</i> module <i>module-name</i> } } |
| Parameter Description | exact-match: If exact-match is selected, you must specify all three filtering options. single-match: If single-match is selected, you may specify only one of the three filtering options. module <i>module-name</i>: Indicates the module name. Logs of this module will be filtered out. mnemonic <i>mnemonic-name</i>: Indicates the mnemonic. Logs with this mnemonic will be filtered out. level <i>level</i>: Indicates the log level. Logs of this level will be filtered out. |
| Command Mode | Global configuration mode |
| Configuration Usage | Log filtering rules include exact-match and single-match. The no logging filter rule exact-match [module <i>module-name</i> mnemonic <i>mnemonic-name</i> level <i>level</i>] command is used to delete the exact-match filtering rules. You can delete all exact-match filtering rules at a time or one by one. The no logging filter rule single-match [level <i>level</i> mnemonic <i>mnemonic-name</i> module <i>module-name</i>] command is used to delete the single-match filtering rules. You can delete all single-match filtering rules at a time or one by one. |

Configuration Example

❖ Configuring Syslog Filtering

| | |
|---------------------|---|
| Scenario | It is required to configure the syslog filtering function as follows: <ol style="list-style-type: none"> 1. Set the filtering directions of logs to terminal and server. 2. Set the log filtering mode to filter-only. 3. Set the log filtering rule to single-match to filter out logs that contain the module name "SYS". |
| Configuration Steps | ❖ Configure the syslog filtering function. |
| | <pre>QTECH# configure terminal QTECH(config)# logging filter direction server QTECH(config)# logging filter direction terminal QTECH(config)# logging filter type filter-only QTECH(config)# logging filter rule single-match module SYS</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show running-config include logging command to display the configuration. ❖ Enter and exit global configuration mode, and verify that the system displays logs accordingly. |
| | <pre>QTECH#configure Enter configuration commands, one per line. End with CNTL/Z. QTECH(config)#exit QTECH# QTECH#show running-config include logging logging filter direction server logging filter direction terminal logging filter rule single-match module SYS</pre> |

10.4.8 Configuring Syslog Redirection

Configuration

Effect

On the VSU, logs on the secondary or standby device are displayed on its Console window, and redirected to the active device for display on the Console or VTY window, or stored in the memory buffer, extended flash, or syslog server.

On a box-type VSU, after the log redirection function is enabled, logs on the secondary or standby device will be redirected to the active device, and the role flag (*device ID) will be added to each log to indicate that the log is redirected. Assume that four devices form a VSU. The ID of the active device is 1, the ID of the secondary device is 2, and the IDs of two standby devices are 3 and 4. The role flag is not added to logs generated by the active device. The role flag (*2) is added to logs

redirected from the secondary device to the active device. The role flags (*3) and (*4) are added respectively to logs redirected from the two standby devices to the active device.

On a card-type VSU, after the log redirection function is enabled, logs on the secondary or standby supervisor module will be redirected to the active supervisor module, and the role flag "(device ID/supervisor module name)" will be added to each log to indicate that the log is redirected. If four supervisor modules form a VSU, the role flags are listed as follows: (*1/M1), (*1/M2), (*2/M1), and (*2/M2).

Notes

The syslog redirection function takes effect only on the VSU.

You can limit the rate of logs redirected to the active device to prevent generating a large amount of logs on the secondary or standby device.

Configuration Steps

❖ Enabling Log Redirection

(Optional) By default, log redirection is enabled on the VSU.

Unless otherwise specified, perform this configuration on the active device of VSU or active supervisor module.

❖ Configuring the Rate Limit

(Optional) By default, a maximum of 200 logs can be redirected from the standby device to the active device of VSU per second.

Unless otherwise specified, perform this configuration on the active device of VSU or active supervisor module.

Verification

Run the **show running** command to display the configuration.

Related Commands

❖ Enabling Log Redirection

| Command | logging rd on |
|-----------------------|---------------|
| Parameter Description | N/A |

| | |
|---------------------|--|
| Command Mode | Global configuration mode |
| Configuration Usage | By default, log redirection is enabled on the VSU. |

❖ Configuring the Rate Limit

| | |
|-----------------------|--|
| Command | logging rd rate-limit <i>number</i> [<i>except level</i>] |
| Parameter Description | rate-limit <i>number</i> : Indicates the maximum number of logs redirected per second. The value ranges from 1 to 10,000. except <i>level</i> : Rate limit is not applied to logs with a level equaling to or lower than the specified severity level. By default, the severity level is error (Level 3), that is, rate limit is not applied to logs of Level 3 or lower. |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, a maximum of 200 logs can be redirected from the standby device to the active device of VSU per second. |

Configuration**Example**

❖ Configuring Syslog Redirection

| | |
|---------------------|--|
| Scenario | It is required to configure the syslog redirection function on the VSU as follows: 1. Enable the log redirection function. 2. Set the maximum number of logs with a level higher than critical (Level 2) that can be redirected per second to 100. |
| Configuration Steps | ❖ Configure the syslog redirection function. |
| | QTECH# configure terminal QTECH(config)# logging rd on QTECH(config)# logging rd rate-limit 100 except critical |
| Verification | ❖ Run the show running-config include logging command to display the |

| | |
|--|--|
| | <p>configuration.</p> <ul style="list-style-type: none"> ❖ Generate a log on the standby device, and verify that the log is redirected to and displayed on the active device. |
| | <pre>QTECH#show running-config include logging logging rd rate-limit 100 except critical</pre> |

10.4.9 Configuring Syslog Monitoring

Configuration

Effect

Record login/exit attempts. After logging of login/exit attempts is enabled, the related logs are displayed on the device when users access the device through Telnet or SSH. This helps the administrator monitor the device connections.

Record modification of device configurations. After logging of operations is enabled, the related logs are displayed on the device when users modify the device configurations. This helps the administrator monitor the changes in device configurations.

Notes

If both the **logging userinfo** command and the **logging userinfo command-log** command are configured on the device, only the configuration result of the **logging userinfo command-log** command is displayed when you run the **show running-config** command.

Configuration

Steps

❖ Enabling Logging of Login/Exit Attempts

(Optional) By default, logging of login/exit attempts is disabled.

Unless otherwise specified, perform this configuration on every line of the device to enable logging of login/exit attempts.

❖ Enabling logging of Operations

(Optional) By default, logging of operations is disabled.

Unless otherwise specified, perform this configuration on every line of the device to enable logging of operations.

Verification

Run the **show running** command to display the configuration.

Related Commands

❖ Enabling Logging of Login/Exit Attempts

| | |
|-----------------------|---|
| Command | logging userinfo |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | By default, a device does not generate related logs when users log into or exit the device. |

❖ Enabling Logging of Operations

| | |
|-----------------------|---|
| Command | logging userinfo command-log |
| Parameter Description | N/A |
| Command Mode | Global configuration mode |
| Configuration Usage | The system generates related logs when users run configuration commands. By default, a device does not generate logs when users modify device configurations. |

Configuration Example

❖ Configuring Syslog Monitoring

| | |
|-----------------|--|
| Scenario | It is required to configure the syslog monitoring function as follows: 1. Enable logging of login/exit attempts. 2. Enable logging of operations. |
| Configuration | ❖ Configure the syslog monitoring function. |

| | |
|--------------|--|
| on Steps | |
| | <pre>QTECH# configure terminal QTECH(config)# logging userinfo QTECH(config)# logging userinfo command-log</pre> |
| Verification | <ul style="list-style-type: none"> ❖ Run the show running-config include logging command to display the configuration. ❖ Run a command in global configuration mode, and verify that the system generates a log. |
| | <pre>QTECH#configure terminal Enter configuration commands, one per line. End with CNTL/Z. QTECH(config)#interface gigabitEthernet 0/0 *Jun 16 15:03:43: %CLI-5-EXEC_CMD: Configured from console by admin command: interface GigabitEthernet 0/0 QTECH#show running-config include logging logging userinfo command-log</pre> |

10.4.10 Synchronizing User Input with Log Output

Configuration Effect

By default, the user input is not synchronized with the log output. After this function is enabled, the content input during log output is displayed after log output is completed, ensuring integrity and continuity of the input.

Notes

This command is executed in line configuration mode. You need to configure this command on every line as required.

Configuration Steps

❖ Synchronizing User Input with Log Output

(Optional) By default, the synchronization function is disabled.

Unless otherwise specified, perform this configuration on every line to synchronize user input with log output.

Verification

Run the **show running** command to display the configuration.

Related Commands

❖ Synchronizing User Input with Log Output

| | |
|-----------------------|--|
| Command | logging synchronous |
| Parameter Description | N/A |
| Command Mode | Line configuration mode |
| Configuration Usage | This command is used to synchronize the user input with log output to prevent interrupting the user input. |

Configuration Example

❖ Synchronizing User Input with Log Output

| | |
|---------------------|---|
| Scenario | It is required to synchronize the user input with log output as follows: 1. Enable the synchronization function. |
| Configuration Steps | ❖ Configure the synchronization function. |
| | <pre>QTECH# configure terminal QTECH(config)# line console 0 QTECH(config-line)# logging synchronous</pre> |
| Verification | ❖ Run the show running-config begin line command to display the configuration. |
| | <pre>QTECH#show running-config begin line line con 0 logging synchronous login local</pre> <p>As shown in the following output, when a user types in "vlan", the state of interface 0/1 changes and the related log is output. After log output is completed, the log module automatically displays the user input "vlan" so that the user can continue typing.</p> <pre>QTECH(config)#vlan *Aug 20 10:05:19: %LINK-5-CHANGED: Interface GigabitEthernet 0/1, changed state to up</pre> |

```
*Aug 20 10:05:19: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet 0/1, changed state to up
QTECH(config)#vlan
```

10.5 Monitoring

Clearing

Running the **clear** commands may lose vital information and thus interrupt services.

| Description | Command |
|-----------------------------------|----------------------|
| Clears logs in the memory buffer. | clear logging |

Displaying

| Description | Command |
|---|-----------------------------|
| Displays log statistics and logs in the memory buffer based on the timestamp from oldest to latest. | show logging |
| Displays log statistics and logs in the memory buffer based on the timestamp from latest to oldest. | show logging reverse |
| Displays syslog configurations and statistics. | show logging config |
| Displays log statistics of each module in the system. | show logging count |

11 CONFIGURING MONITOR

11.1 Overview

Intelligent monitoring is the intelligent hardware management of QTECH Network devices, including intelligent fan speed adjustment, and intelligent temperature monitoring. The intelligent monitoring performs the following tasks:

Automatic fan speed adjustment based on ambient temperature changes

Real-time temperature monitoring of boards to alert users

By default, the intelligent monitoring function is enabled after the device is powered on. It does not require any manual configuration.

Protocol Specification

N/A

11.2 Features

Basic Concepts

N/A

Features

| Feature | Function |
|--|---|
| Intelligent Speed Adjustment of Fans | The rotating speed of fans is automatically adjusted as the temperature changes to address the heat dissipation needs of the system. |
| Intelligent Temperature Monitoring | The system automatically monitors the temperature. When the temperature exceeds a certain threshold, the system automatically generates an alarm. |

[Power monitoring](#)

The system automatically monitors the power. When the power is insufficient or cannot be identified, the system automatically generates an alarm.

11.2.1 Intelligent Speed Adjustment of Fans

As the ambient temperature rises or drops, the fans automatically raise or reduce their rotating speed to dissipate heat and ensure that the noise is low.

[Working Principle](#)

The system automatically specifies default start rotating speed for the fans according to the current operating mode of the fans. As the ambient temperature rises or drops, the fans automatically raise or reduce their rotating speed to dissipate heat and ensure that the noise is low.

[Verification](#)

- ❖ Run the **show fan** command to display working status of all fans.
- ❖ Run the **show fan speed command** to display rotating speed.
- ❖ Run the **show fan attribute** command to display air flue type.

11.2.2 Intelligent Temperature Monitoring

The system automatically monitors the temperature. When the temperature changes, the system automatically notifies users.

[Working Principle](#)

The system monitors the temperature once per minute. When the temperature exceeds a certain threshold, the system takes a certain action. The temperature and action vary with different devices.

[Verification](#)

Run the **show temperature** command to display system temperature.

12 CONFIGURING PACKAGE MANAGEMENT

12.1 Overview

Package management (pkg_mgmt) is a package management and upgrade module. This module is responsible for installing, upgrading/degrading, querying and maintaining various components of the device, among which upgrade is the main function. Through upgrade, users can install new version of software that is more stable or powerful. Adopting a modular structure, the system not only supports overall upgrade and subsystem upgrade but also supports separate upgrade of a feature package.

✔ This document is for only version 11.0 and later, excluding those upgraded from earlier versions.

Protocols and Standards

N/A

12.2 Applications

| Application | Scenario |
|--|--|
| Upgrading/Degrading Subsystem | Upgrade subsystem firmware like boot, kernel, and rootfs on the device. |
| Upgrading/Degrading a Single Feature Package | Upgrade a single feature package on the device. |
| Installing a Hot Patch Package | Install a hot patch, and repair a certain part of the feature component. |
| Auto-Sync for Upgrade | Configure the auto sync policy, range and path. |

12.2.1 Upgrading/Degrading Subsystem

Scenario

After the upgrade of a subsystem firmware is complete, all system software on the device is updated, and the overall software is enhanced. Generally, the subsystem firmware of the box-type device is called main package.

The main features of this upgrade mode are as follows: All software on the device is updated after the upgrade is completed; all known software bugs are fixed. It takes a long time to finish upgrade.

Deployment

You can store the main package in the root directory of the TFTP server, download the package to the device, and then run an upgrade command to upgrade the package locally. You can also store the main package in a USB flash drive or SD card, connect the USB flash drive to the device, and then run an upgrade command to upgrade the package.

You must store the rack package in a USB flash drive before performing the upgrade because the rack package is too large to be stored in the memory space of the device.

12.2.2 Upgrading Subsystem by One-click

Scenario

Upgrade the firmware automatically without interrupting services on a dual-device VSU system. While either in VSU mode or in standalone mode, one single device will restart after this configuration, thus interrupting services.

Deployment

Upgrade or downgrade the subsystem.

12.2.3 Upgrading/Degrading a Single Feature Package

Scenario

Device software consists of several components, and each component is an independent feature module. After an independent feature package is upgraded, only the feature bug corresponding to this package is fixed. Besides, this feature is enhanced with the other features unchanged.

The features of this upgrade mode are as follows: Generally, a feature package is small and the upgrade speed is high. After the upgrade is completed, only the corresponding functional module is improved, and other functional modules remain unchanged.

Deployment

You can store this package in the root directory of the TFTP server, download the package to the local device, and then complete the upgrade. You can also store the package in a USB flash drive, connect the USB flash drive to the device, and then complete the upgrade.

12.2.4 Installing a Hot Patch Package

Scenario

To fix software bugs without restarting the device, you can install hot patch packages. Hot patch packages are only applicable to fixing a specific software version. Generally, hot patch packages are released to fix the software of a certain version only when the device cannot be started in the user's environment.

The most significant feature of hot patch upgrade is that all bugs can be fixed without device restart after the upgrade is completed.

Deployment

You can store this package in the root directory of the TFTP server, download the package to the local device, and then complete the upgrade. You can also store the package in a USB flash drive or SD card, connect the USB flash drive or SD card to the device, and then complete the upgrade.

12.2.5 Auto-Sync for Upgrade

Scenario

Auto-sync upgrade aims to ensure the coordination of multiple modules (line cards and chassis) within a system on a rack-type device or VSU. Specifically, the upgrade firmware is pushed to all target members automatically and the software version of new members is upgraded automatically based on the auto-sync policy.

Deployment

- ❖ Configure the policy for auto-sync upgrade.
- ❖ Configure the path of firmware for auto-sync upgrade.

12.3 Features

Basic

Concepts

- ❖ Subsystem

A subsystem exists on a device in the form of images. The subsystems of the OS include:

boot: After being powered on, the device loads and runs the boot subsystem first. This subsystem is responsible for initializing the device, and loading and running system images.

kernel: kernel is the OS core part of the system. This subsystem shields hardware composition of the system and provides applications with abstract running environment.

rootfs: rootfs is the collection of applications in the system.

❖ Main Package

Main package is often used to upgrade/degrade a subsystem of the box-type device. The main package is a combination package of the boot, kernel, and rootfs subsystems. The main package can be used for overall system upgrade/degradation.

❖ Feature Package of OS

The feature package of OS refers to a collection which enables a certain feature. When the device is delivered, all supported functions are contained in the rootfs subsystem. You can upgrade only a specific feature by upgrading a single feature package.

❖ Hot Patch Package

A hot patch package contains the hot patches of several features. You can upgrade a hot patch package to install patches for various features. New features are provided immediately without device restart after the upgrade.

i "Firmware" in this document refers to an installation file that contains a subsystem or feature module.

Overview

| Feature | Description |
|---|---|
| Upgrading/Degrading and Managing Subsystem Components | Upgrades/degrades a subsystem. |
| Upgrading/Degrading and Managing Functional Components | Upgrades/degrades a functional component. |
| Upgrading/Degrading and Managing Hot Patch Packages | Installs a hot patch package. |
| Auto-Sync for Upgrade | Ensures uniform upgrade upon member change. |

12.3.1 Upgrading/Degrading and Managing Subsystem Components

Subsystem upgrade/degradation aims to upgrade the software by replacing the subsystem components of the device with the subsystem components in the firmware. The subsystem component contains redundancy design. Subsystems of the device are not directly replaced with the subsystems in the package during upgrade/degradation in most cases. Instead, subsystems are added to the device and then activated during upgrade/degradation.

Working Principle

❖ Upgrade/Degradation

Various subsystems exist on the device in different forms. Therefore, upgrade/degradation varies with different subsystems.

boot: Generally, this subsystem exists on the norflash device in the form of images. Therefore, upgrading/degrading this subsystem is to write the image into the norflash device.

kernel: This subsystem exists in a specific partition in the form of files. Therefore, upgrading/degrading this subsystem is to write the file.

rootfs: Generally, this subsystem exists on the nandflash device in the form of images. Therefore, upgrading/degrading this subsystem is to write the image into the nandflash device.

❖ Management

Query the subsystem components that are available currently and then load subsystem components as required.

Each subsystem component contains redundancy design. During the upgrade/degradation:

boot: The boot subsystem always contains a master boot subsystem and a slave boot subsystem. Only the master boot subsystem is involved in the upgrade, and the slave boot subsystem serves as the redundancy backup all along.

kernel: as the kernel subsystem contains at least one redundancy backup. More redundancy backups are allowed if there is enough space.

rootfs: The rootfs subsystem always contains a redundancy backup.

The boot component is not included in the scope of subsystem management due to its particularity. During upgrade of the kernel or rootfs subsystem component, the upgrade/degradation module always records the subsystem component in use, the redundant subsystem component, and management information about various versions.

Relevant Configuration

❖ Upgrade

Store the upgrade file on the local device, and then run the **upgrade** command for upgrade.

12.3.2 Upgrading/Degrading and Managing Functional Components

Working Principle

In fact, upgrading a feature is replacing feature files on the device with the feature files in the package.

Managing feature components and hot patches is aimed at recording the information of feature components and hot patches by using a database. In fact, installing, displaying and uninstalling a component is the result of performing the Add, Query and Delete operation on the database.

After package upgrade, component upgrade cannot be performed.

Relevant Configuration

❖ Upgrade

Store the upgrade file on the local device, and then run the **upgrade** command for upgrade.

12.3.3 Upgrading/Degrading and Managing Hot Patch Packages

Working Principle

In fact, upgrading a feature component is replacing feature files on the device with the feature files in the package.

Upgrading hot patch packages is similar to upgrading features. The difference is that only files to be revised are replaced during hot patch package upgrade. In addition, after the files are replaced, the new files take effect automatically.

After package upgrade, component upgrade cannot be performed.

❖ Management

Similar to feature component management, hot patch management also includes the query, installation, and uninstallation operation, which is the result of adding, querying and deleting data respectively.

Hot patches and feature components are managed based on the same technology. The difference is that the hot patches involve three different states, that is, Not installed, Installed, and Activated. These states are described as follows:

The hot patch in Installed state only indicates that this hot patch exists on the device, but it has not taken effect yet.

Only the hot patch in Activated state is valid.

Relevant Configuration

❖ Upgrade

Store the upgrade file in the local file system, and then run the **upgrade** command for upgrade.

❖ Activating a Hot Patch

You can run the **patch active** command to activate a patch temporarily. The patch becomes invalid after device restart. To use this patch after device restart, you need to activate it again.

You can also run the **patch running** command to activate a patch already permanently. The patch is still valid after device start.

The patch not activated will never become valid.

❖ Deactivating a Hot Patch

To deactivate an activated patch, run the **patch deactivate** command.

❖ Uninstalling a Hot Patch

You can run the **patch delete** command to uninstall a hot patch.

12.3.4 Auto-Sync for Upgrade

Working Principle

Auto-sync upgrade aims to ensure the coordination of multiple modules (line cards and chassis) within a system. Specifically, the upgrade firmware is pushed to all target members automatically and the software version of new members is upgraded automatically based on the auto-sync policy.

There are three policies available.

None: No auto-sync upgrade.

Compatible: Performs auto-synchronization based on the sequential order of versions.

Coordinate: Synchronizes with the version based on the firmware stored on the supervisor module.

Auto-sync is performed in the following scenarios:

If no upgrade target is specified, the firmware is pushed to all matching members(including line cards and chassis) for auto-sync.

Every member is checked when the device is restarted and auto-sync is performed accordingly.

Every new member is checked when added into the system and auto-sync is performed accordingly.

Management

Auto-upgrade policy, range and path should be configured in advance.

Relevant


Configuration

Configuring Auto-Sync Policy

To perform upgrade as expected, check the configuration in advance, such as the path.

If some line cards are not checked for upgrade because the system is not configured with auto-sync policy . You can upgrade them manually.

12.4 Configuration

| Configuration | Description and Command |
|--|---|
| Upgrading/Degrading a Firmware |  The basic function of the configuration is installing and upgrading/degrading a subsystem firmware, feature package, and hot patch package. This command is valid on both the box-type device and rack-type device. |
| | upgrade <i>url</i> [patch-active patch-running] [<i>force</i>] <i>url</i> is a local path where the firmware is stored. This command is used to upgrade the firmware stored on the device. |
| | upgrade download tftp:/ <i>path</i> [patch-active patch-running] [<i>force</i>] [vrf <i>vrf-name</i>] <i>path</i> is the path of the firmware on the server. This command is used to download a firmware from the server and upgrade the package automatically. |
| | upgrade download oob_tftp:// <i>path</i> [patch-active patch-running] [<i>force</i>] <i>path</i> is the path of the firmware on the server. via mgmt number: If the transfer mode is <i>oob_tftp</i> and there are multiple MGMT ports, you can select a specific port. This command is used to download a firmware from the server and upgrade the package automatically. |

| | | |
|---|---|--|
| | patch active | Activates a patch temporarily. |
| | patch running | Activates a patch permanently, |
| Deactivating and Uninstalling a Hot Patch | ⚠ (Optional) Deactivates or uninstalls a hot patch. | |
| | upgrade deactivate | Deactivates an activated patch. |
| | patch delete | Uninstalls a hot patch. |
| Auto-Sync for Upgrade | ⚠ (Optional) Configures auto-sync policy. | |
| | upgrade auto-sync policy [compatible coordinate] | Configures the auto-sync policy. |
| | upgrade auto-sync range [chassis] | Configures the auto-sync range. |
| | upgrade auto-sync package url | Configures the auto-sync package path. |
| | upgrade auto-sync patch url | Configures the auto-sync patch path. |

12.4.1 Upgrading/Degrading a Firmware

Configuration

Effect

Available firmwares include the main package.

After the upgrade of the main package is complete, all system software on the line card is updated, and the overall software is enhanced.

After an independent feature package is upgraded, only the feature bug corresponding to this package is fixed. Besides, this feature is enhanced, with other features remain unchanged.

Upgrading hot patch packages is aimed at fixing software bugs without restarting the device. Hot patch packages are only applicable to fixing bugs for a specific version of software.

✔ Generally a main package is released to upgrade a box-type device.

Notes

N/A

Configuration Steps

❖ Upgrading the Main Package for a Single Device

Optional configuration. This configuration is required when all system software on the device needs to be upgraded.

Download the firmware to the local device and run the **upgrade** command.

✔ Generally a main package is pushed to upgrade a box-type device.

❖ Upgrading a Main Package on a VSU

- Optional configuration. This configuration is required when all system software on a VSU needs to be upgraded without service interruption.
- Download the firmware to the local device and run the **upgrade auto** command.
- If one-click upgrade times out, please reset the device manually.

✔ Generally a rack package is pushed to upgrade a rack-type device.

❖ Upgrading Each Feature Package

- Optional configuration. The configuration is used to fix bugs of a certain feature and enhance the function of this feature.

Download the firmware to the local device and run the **upgrade** command.

❖ Upgrading a Hot Patch Package

- Optional configuration. The configuration is used to fix software bugs without restarting the device.
- Download the firmware to the local device and run the **upgrade** command.

After being upgraded, the hot patch can be used after it is activated. The configuration in this step is mandatory. Two activation modes are available: Run the **patch active** command to activate a patch temporarily, or run the **patch running** command to activate a patch permanently.

⚠ Generally, the **patch running** command must be used to activate a patch permanently in the user scenario. The **patch active** command can be used to activate a patch only when a user intends to verify the patch.

Verification

After upgrading a subsystem component, you can run the **show upgrade history** command to check whether the upgrade is successful.

After upgrading a feature component, you can run the **show component** command to check whether the upgrade is successful.

After upgrading a hot patch package, you can run the **show patch** command to check whether the upgrade is successful.

Commands

❖ Upgrade

| | |
|-----------------------|--|
| Command | upgrade url [patch-active patch-running] [force] |
| Parameter Description | force: Indicates forced upgrade. patch-active: Activates a patch temporarily. patch-running: Activates a patch permanently. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

| | |
|-----------------------|--|
| Command | upgrade download tftp:/path [patch-active patch-running] [force] upgrade download oob_tftp:/path [patch-active patch-running] [force] |
| Parameter Description | <i>url</i> indicates the path of the firmware in the device file system. force: Indicates forced upgrade. patch-active: Activates a patch temporarily. patch-running: Activates a patch permanently. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Displaying the Firmware Stored on the Device

| | |
|-----------------------|--|
| Command | show upgrade file url |
| Parameter Description | <i>url</i> indicates the path of the firmware in the device file system. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Displaying the Device Upgrade Process

| | |
|-----------------------|----------------------------|
| Command | show upgrade status |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Displaying Upgrade History

| | |
|-----------------------|-----------------------------|
| Command | show upgrade history |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Displaying the Feature Components Already Installed

| | |
|-----------------------|--|
| Command | show component [slot { <i>num</i> M1 M2 all }] |
| Parameter Description | slot indicates that this command is executed on the device in the specified slot; <i>num</i> indicates the slot number of the specified line card; M1 and M2 indicate the supervisor modules; all indicates all devices. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Displaying the Patch Packages Already Installed

| | |
|----------------|---|
| Command | show patch [<i>package_name</i>] |
| Parameter | slot indicates that this command is executed on the device in the specified slot; <i>num</i> |

| | |
|--------------|--|
| Description | indicates the slot number of the specified line card; M1 and M2 indicate the supervisor modules; all indicates all devices. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | All parameters are applicable to only the rack-type device. |

❖ Activating the Patches Temporarily

| | |
|-----------------------|--|
| Command | patch active |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | This operation can be performed only on the device already installed with a patch. This command can be used to activate a patch temporarily, and the activated patch becomes invalid after device restart. |

❖ Activating the Patches Permanently

| | |
|-----------------------|--|
| Command | patch running |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | This operation can be performed only on the device already installed with a patch. This command can be used to activate a patch permanently. |

Configuration

Example

❖ Example of Upgrading a Subsystem Firmware on the Box-Type Device

| | |
|---------------------|--|
| Network Environment | <p>Before the upgrade, you must copy the firmware to the device. The upgrade module provides the following solutions.</p> <ul style="list-style-type: none"> ❖ Run some file system commands like <code>copy tftp</code> and <code>copy xmodem</code> to copy the firmware on the server to the device file system, and then run the <code>upgrade url</code> command to upgrade the firmware in the local file system. ❖ Run the <code>upgrade download tftp://path</code> command directly to upgrade the firmware file stored on the tftp server. ❖ Copy the firmware to a USB flash drive, insert the USB flash drive to the device, and then run the <code>upgrade url</code> command to upgrade the firmware in the USB flash drive or SD card. |
| Configuration Steps | <ul style="list-style-type: none"> ❖ Run the upgrade command. ❖ After upgrading the subsystem, restart the device. |
| Verification | <ul style="list-style-type: none"> ❖ Check the system version on the current device. If the version information changes, the upgrade is successful. |

❖ Example of Upgrading a Feature Package on the Box-Type Device

| | |
|---------------------|--|
| Network Environment | <p>Before the upgrade, you must copy the firmware to the device. The upgrade module provides the following solutions.</p> <p>Run some file system commands like <code>copy tftp</code> and <code>copy xmodem</code> to copy the firmware on the server to the device file system, and then run the <code>upgrade url</code> command to upgrade the firmware in the local file system.</p> <p>Run the <code>upgrade download tftp://path</code> command directly to upgrade the firmware file stored on the tftp server.</p> <p>Copy the firmware to a USB flash drive or SD card, connect the USB flash drive or SD card to the device, and then run the <code>upgrade url</code> command to upgrade the firmware in the USB flash drive or SD card.</p> |
| Configuration Steps | <p>Run the upgrade command.</p> <p>Check whether the device needs to be restarted based on the prompt displayed after the upgrade.</p> |
| | <pre> QTECH#upgrade sata0://bridge_eg1000m_2.3.1.1252ea-1.mips.rpm Upgrade processing is 10% Upgrade processing is 60% Upgrade processing is 90% Upgrade info [OK] </pre> |

| | |
|--------------|---|
| | <pre> bridge version[2.0.1.37cd5cda ->2.3.1.1252ea] [OK] Upgrade processing is 100% Reload system to take effect! Reload system?(Y/N)y Restarting system. </pre> |
| Verification | <p>Check the version of the feature component on the current device. If the version information changes, the upgrade is successful.</p> |
| | <pre> QTECH# show component Package :sysmonit Version:1.0.1.23cd34aa Build time: Wed Dec 7 00:58:56 2011 Size:12877 Install time :Wed Mar 5 14:23:12 2012 Description:this is a system monit package Required packages: None ----- package:bridge Version: 2.3.1.1252ea Build time: Wed Dec 7 00:54:56 2011 Size:26945 Install time : Wed Mar 19:23:15 2012 Description:this is a bridge package Required packages: None </pre> |

❖ Example of Upgrading a Main Package for a VSU

| | |
|---------------------|---|
| Network Environment | <p>Before the upgrade, you must copy the firmware to the device. The upgrade module provides the following solutions.</p> <p>Run some file system commands like <code>copy tftp</code> and <code>copy xmodem</code> to copy the firmware on the server to the device file system, and then run the <code>upgrade auto url</code> command to upgrade the firmware in the local file system.</p> <p>Copy the firmware to a USB flash drive or SD card, Insert the USB flash drive or SD card to the device, and then run the <code>upgrade auto url</code> command to upgrade the firmware in the USB flash drive or SD card.</p> |
| Configuration Steps | <p>Run the <code>upgrade auto</code> command.</p> <p>The VSU active and standby devices are restarted in sequence.</p> |
| | <pre> 2015-04-09_09-56-23 QTECH#upgrade auto usb0:QSW- </pre> |

```
6900_RGOS11.0(5)B1_install.bin
2015-04-09_09-56-24 QTECH#*Jan 1 00:23:40: %7:
2015-04-09_09-56-24 *Jan 1 00:23:40: %7: [Slot 1/0]:Upgrade processing is 10%
2015-04-09_09-56-26 QTECH#show upgrade status
2015-04-09_09-56-26 [Slot 1/0]
2015-04-09_09-56-26 dev_type: s6k
2015-04-09_09-56-26 status : upgrading
2015-04-09_09-56-26 [Slot 2/0]
2015-04-09_09-56-26 dev_type: s6k
2015-04-09_09-56-26 status : transmission
2015-04-09_09-58-20 *Jan 1 00:25:36: %7: [Slot 2/0]:Upgrade processing is 10%
2015-04-09_09-58-30 QTECH#show upgrade status
2015-04-09_09-58-30 [Slot 1/0]
2015-04-09_09-58-30 dev_type: s6k
2015-04-09_09-58-30 status : upgrading
2015-04-09_09-58-30 [Slot 2/0]
2015-04-09_09-58-30 dev_type: s6k
2015-04-09_09-58-30 status : upgrading
2015-04-09_09-58-39 *Jan 1 00:25:56: %7:
2015-04-09_09-58-39 *Jan 1 00:25:56: %7: [Slot 2/0]:Upgrade processing is 60%
2015-04-09_09-59-19 *Jan 1 00:26:35: %7:
2015-04-09_09-59-19 *Jan 1 00:26:35: %7: [Slot 2/0]:Upgrade processing is 90%
2015-04-09_09-59-19 *Jan 1 00:26:35: %7:
2015-04-09_09-59-19 *Jan 1 00:26:35: %7: [Slot 2/0]:
2015-04-09_09-59-19 *Jan 1 00:26:35: %7: Upgrade info [OK]
2015-04-09_09-59-19 *Jan 1 00:26:36: %7: Kernel version[2.6.32.6b311610a8eb91-
>2.6.32.6b31161115502c]
2015-04-09_09-59-19 *Jan 1 00:26:36: %7: Rootfs version[1.0.0.eb75cd01-
>1.0.0.3d978b6c]
2015-04-09_09-59-19 *Jan 1 00:26:36: %7:
2015-04-09_09-59-19 *Jan 1 00:26:36: %7: [Slot 2/0]:Reload system to take effect!
2015-04-09_09-59-21 *Jan 1 00:26:37: %7:
2015-04-09_09-59-21 *Jan 1 00:26:37: %7: [Slot 2/0]:Upgrade processing is 100%
2015-04-09_10-00-28 QTECH#show upgrade status
2015-04-09_10-00-28 [Slot 1/0]
2015-04-09_10-00-28 dev_type: s6k
2015-04-09_10-00-28 status : upgrading
2015-04-09_10-00-28 [Slot 2/0]
2015-04-09_10-00-28 dev_type: s6k
2015-04-09_10-00-28 status : success
2015-04-09_10-01-39 *Jan 1 00:28:56: %7:
2015-04-09_10-01-39 *Jan 1 00:28:56: %7: [Slot 1/0]:Upgrade processing is 60%
2015-04-09_10-02-17 *Jan 1 00:29:33: %7:
```


| | |
|---------------------|--|
| | <pre> 2015-04-09_10-02-17 *Jan 1 00:29:33: %7: [Slot 1/0]:Upgrade processing is 90% 2015-04-09_10-02-17 *Jan 1 00:29:33: %7: 2015-04-09_10-02-17 *Jan 1 00:29:33: %7: [Slot 1/0]: 2015-04-09_10-02-17 *Jan 1 00:29:34: %7: Upgrade info [OK] 2015-04-09_10-02-17 *Jan 1 00:29:34: %7: Kernel version[2.6.32.6b311610a8eb91- >2.6.32.6b31161115502c] 2015-04-09_10-02-17 *Jan 1 00:29:34: %7: Rootfs version[1.0.0.eb75cd01- >1.0.0.3d978b6c] 2015-04-09_10-02-17 *Jan 1 00:29:34: %7: 2015-04-09_10-02-18 *Jan 1 00:29:34: %7: [Slot 1/0]:Reload system to take effect! 2015-04-09_10-02-19 *Jan 1 00:29:35: %7: 2015-04-09_10-02-19 *Jan 1 00:29:35: %7: [Slot 1/0]:Upgrade processing is 100% 2015-04-09_10-02-19 *Jan 1 00:29:36: %7: %PKG_MGMT:auto-sync config synchronization, Please wait for a moment.... 2015-04-09_10-02-20 *Jan 1 00:29:36: %7: 2015-04-09_10-02-20 [1784.116069] rtc-pcf8563 6-0051: retrieved date/time is not valid. 2015-04-09_10-02-20 *Jan 1 00:29:36: %7: [Slot 2/0]:auto sync config: space not enough left 57229312, need 114597815 2015-04-09_10-02-20 *Jan 1 00:29:36: %7: 2015-04-09_10-02-20 *Jan 1 00:29:36: %7: [Slot 2/0]:auto sync package config err 2015-04-09_10-02-20 *Jan 1 00:29:37: %7: [Slot 1/0] 2015-04-09_10-02-21 *Jan 1 00:29:37: %7: device_name: s6k 2015-04-09_10-02-21 *Jan 1 00:29:37: %7: status: SUCCESS 2015-04-09_10-02-21 *Jan 1 00:29:37: %7: [Slot 2/0] 2015-04-09_10-02-21 *Jan 1 00:29:37: %7: device_name: s6k 2015-04-09_10-02-21 *Jan 1 00:29:37: %7: status: SUCCESS 2015-04-09_10-02-21 *Jan 1 00:29:38: %7: %Do with dtm callback.... 2015-04-09_10-02-21 *Jan 1 00:29:38: %VSU-5-DTM_AUTO_UPGRADE: Upgrading the system, wait a moment please. </pre> |
| <p>Verification</p> | <p>If the version information changes, the upgrade is successful.</p> |
| | <pre> QTECH-VSU#show version detail System description : QTECH Full 10G Routing Switch(QSW-6900) By QTECH System start time : 1970-02-07 00:33:24 System uptime : 0:00:47:28 System hardware version : 2.00 System software version : QSW-6900_OS 11.0(5)B1 System patch number : NA System software number : M01181304092015 System serial number : 1234942570019 System boot version : 1.2.9.f23dcbe(150317) </pre> |

```

System core version   : 2.6.32.6b31161115502c
Module information:
Slot 2/0 : QSW-6900
  Hardware version   : 2.00
  System start time  : 1970-02-07 00:33:24
  Boot version      : 1.2.9.f23dcbe(150317)
  Software version   : QSW-6900_OS 11.0(5)B1
  Software number    : M01181304092015
  Serial number     : 1234942570019
Slot 1/0 : QSW-6900
  Hardware version   : 2.00
  System start time  : 1970-02-07 00:33:47
  Boot version      : 1.2.9.f23dcbe(150317)
  Software version   : QSW-6900_OS 11.0(5)B1
  Software number    : M01181304092015
  Serial number     : 1234942570018
    
```

❖ Example of Installing a Patch Package on the Box-Type Device

| | |
|-----------------------------------|--|
| <p>Network Environment</p> | <p>Before the upgrade, you must copy the firmware to the device. The upgrade module provides the following solutions.</p> <ul style="list-style-type: none"> ❖ Run some file system commands like copy tftp and copy xmodem to copy the firmware on the server to the device file system, and then run the upgrade url command to upgrade the firmware in the local file system. ❖ Run the upgrade download tftp://path command directly to upgrade the firmware file stored on the tftp server. ❖ Copy the firmware to a USB flash drive, connect the USB flash drive to the device, and then run the upgrade url command to upgrade the firmware in the USB flash drive. |
| <p>Configuration Steps</p> | <ul style="list-style-type: none"> ❖ Run the upgrade command. ❖ Activate the hot patch. |
| | <pre> QTECH#upgrade download tftp://192.168.201.98/eg1000m_RGOS11.0(1C2)_20131008_patch.bin Accessing tftp://192.168.201.98/eg1000m_RGOS11.0(1C2)_20131008_patch.bin... !! !! !!!!!!!!!!!!!!!!!!!!!! Transmission finished, file length 9868 bytes. Upgrade processing is 10% Upgrade processing is 60% </pre> |

| | |
|---------------------|--|
| | <pre>Upgrade info [OK] patch_bridge version[1.0.0.1952] Upgrade processing is 90% Upgrade info [OK] patch_install version[1.0.0.192e35a] QTECH#patch running The patch on the system now is in running status</pre> |
| Verification | ❖ Check the hot patches installed on the current device. |
| | <pre>:patch package patch_install installed in the system, version:pa1 Package : patch_bridge Status: running Version: pa1 Build time: Mon May 13 09:03:07 2013 Size: 277 Install time: Tue May 21 03:07:17 2013 Description: a patch for bridge Required packages: None</pre> |

Common

Errors

If an error occurs during the upgrade, the upgrade module displays an error message. The following provides an example:

```
Upgrade info [ERR]
  Reason:creat config file err(217)
```

The following describes several types of common error messages:

Invalid firmware: The cause is that the firmware may be damaged or incorrect. It is recommended to obtain the firmware again and perform the upgrade operation.

Firmware not supported by the device: The cause is that you may use the firmware of other devices by mistake. It is recommended to obtain the firmware again, verify the package, and perform the upgrade operation.

Insufficient device space: It is recommended to check whether the device is supplied with a USB flash drive or SD card. Generally, this device has a USB flash drive.

12.4.2 Deactivating and Uninstalling a Hot Patch

Configuration

Effect

An activated hot patch is deactivated or uninstalled.

Notes

A hot patch that is not activated does not take effect; therefore, you cannot deactivate it.

Configuration

Steps

❖ Deactivating an Activated Patch

Optional configuration. To deactivate an activated patch, run the **patch deactivate** command.

❖ Uninstalling a Hot Patch

- Optional configuration. To uninstall a hot patch already installed, run the **patch delete** command.

Verification

You can run the **show patch** command to check whether a patch is activated or uninstalled.

Commands

❖ Deactivating an Activated Patch

| | |
|-----------------------|--|
| Command | patch deactivate |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |
| Usage Guide | You can perform this operation on only an activated patch. |

❖ Deleting a Hot Patch

| | |
|-----------------------|----------------------|
| Command | patch delete |
| Parameter Description | N/A |
| Command Mode | Privileged EXEC mode |

| | |
|-------------|---|
| Usage Guide | This command is used to remove the hot patch package from the device. |
|-------------|---|

Configuration Example

❖ Deactivating and Uninstalling a Patch on the Box Device

| | |
|----------------------------|---|
| Configuration Steps | <ul style="list-style-type: none"> ❖ Run the patch deactivation command. ❖ Run the patch deletion command. |
| | <pre>QTECH#patch deactivate Deactivate the patch package success QTECH# patch delete Clear the patch patch_bridge success Clear the patch success</pre> |
| Verification | ❖ Display patch status. |
| | <pre>QTECH#show patch No patch package installed in the system</pre> |

Common Errors

Run the **patch deactivate** command when the patch is not activated. It is recommended to check the patch status. You can run the **patch deactivate** command only when the patch is in the **status:running** state.

12.4.3 Auto-Sync for Upgrade

Configuration Effect

Auto-sync policy, range and path is configured.

Notes

N/A

Configuration Steps

❖ Configuring Auto-Sync Policy

Run the **upgrade auto-sync policy command** to configure the auto-sync policy. There are three modes available:

Compatible: Performs auto-synchronization based on the sequential order of versions.

Coordinate: Synchronizes with the version based on the firmware stored on the supervisor module.

❖ Configuring Auto-Sync Range

Run the **upgrade auto-sync range** command to configure the auto-sync range. There are two ranges available:

chassis: Performs auto-sync on a chassis.

vsd: Performs auto-sync in the VSU system.

❖ Configuring Auto-Sync Package Path

- **Every time the system is upgraded, the package path is recorded automatically for later auto-sync upgrade.** Alternatively, use the **upgrade auto-sync package** command to set a path.

Every time the system is upgraded, the patch path is recorded automatically for later auto-sync upgrade. Alternatively, use the **upgrade auto-sync patch** command to set a path.

Verification

Run the **upgrade auto-sync** command to check the configuration.

Commands

❖ Configuring Auto-Sync Policy

| command | upgrade auto-sync policy [compatible coordinate] |
|-----------------------|--|
| Parameter Description | compatible: Performs auto-synchronization based on the sequential order of versions. coordinate: Synchronizes with the version based on the firmware stored on the supervisor module. |
| Command Mode | Privileged EXEC mode |

| | |
|-------------|--------------------------------------|
| Usage Guide | It is recommended to set coordinate. |
|-------------|--------------------------------------|

❖ Configuring Auto-Sync Range

| | |
|-----------------------|--|
| command | upgrade auto-sync range [chassis] |
| Parameter Description | chassis: Performs auto-sync on a chassis. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | N/A |

❖ Configuring Auto-Sync Package Path

| | |
|-----------------------|---|
| command | upgrade auto-sync package <i>url</i> |
| Parameter Description | <i>url</i> indicates the path of the upgrade package in the device file system. |
| Command Mode | Privileged EXEC mode |
| Usage Guide | The path is not set generally. |

❖ Configuring Auto-Sync Patch Path

| | |
|-----------------------|---|
| command | upgrade auto-sync patch <i>url</i> |
| Parameter Description | <i>url</i> indicates the path of the patch in the device file system. |
| Command Mode | Privileged EXEC mode |

| | |
|-------------|--|
| Usage Guide | <p>The path is not set generally.</p> <p>✔ All parameters are applicable to only the rack-type device and VSU.</p> |
|-------------|--|

Configuration

Example

❖ Configuring Auto-Sync Policy

| | |
|----------------------------|---|
| Configuration Steps | Configure the auto-sync policy. |
| | <pre>QTECH# upgrade auto-sync policy coordinate Upgrade auto-sync policy is set as coordinate</pre> |
| Verification | Check the auto-sync policy. |
| | <pre>QTECH#show upgrade auto-sync auto-sync policy: coordinate auto-sync range: vsu auto-sync package: flash:/eg1000m_main_1.0.0.0f328e91.bin auto-sync patch : flash:sp1.bin</pre> |

❖ Configuring Auto-Sync Range

| | |
|----------------------------|---|
| Configuration Steps | Configure the auto-sync range. |
| | <pre>QTECH# upgrade auto-sync range vsu Upgrade auto-sync range is set as vsu.</pre> |
| Verification | Check the auto-sync range. |
| | <pre>QTECH#show upgrade auto-sync auto-sync policy: coordinate auto-sync range: vsu auto-sync package: flash:/eg1000m_main_1.0.0.0f328e91.bin auto-sync patch : flash:sp1.bin</pre> |

Common

Errors

url is not valid.

12.5 Monitoring

Clearing

| Function | Command |
|--|--------------|
| Deletes a hot patch package already installed. | patch delete |

Displaying

| Function | Command |
|--|--|
| Displays all components already installed on the current device and their information. | show component [slot { <i>num</i> M1 M2 all }] |
| Displays the information about the hot patch packages already installed on the device. | show patch [<i>patch_name</i>] |
| Displays the upgrade status of various line cards. | show upgrade status |
| Displays the upgrade history. | show upgrade history |

13 CONFIGURING PYTHON SHELL

13.1 Overview

Python is an object-oriented interpreted computer programming language. It is totally free software and its source code and interpreter named CPython comply with the GNU General Public License (GPL) protocol. The Python shell component can implement simple debugging and Python script execution via CLI commands. It mainly provides the following functions:

- ❖ In privileged EXEC mode, you can run a Python CLI command to access the Python console to conduct debugging.
- ❖ In privileged EXEC mode, you can add a file name to a Python CLI command and run the command to run the script in the **flash:** and **tmp:** directories of the device.
- ❖ The Python commands and scripts can be executed only on files in the **flash:** and **tmp:** directories due to permission control.
- ❖ Highly risky functions such as popen and system functions cannot be executed in Python scripts due to permission control.

13.2 Applications

| Application | Scenario |
|---|--|
| Debugging and Running a Python Script | Run the copy command to copy a local Python script to the device and then run a Python CLI command to run the Python script on the device. |

13.2.1 Python Script Execution Application Scenario

Scenario

To debug and run a Python script, do as follows:

- ❖ Compile a Python script (such as **test.py**) on the local PC and set up a Trivial File Transfer Protocol (TFTP) server.
- ❖ Run the **copy tftp://xxx.xxx.xxx.xxx/test.py flash:** command to copy the script to the device.
- ❖ In privileged EXEC mode, run the **python flash:test.py** command to run the Python script on the device.

Deployment

- ❖ The PC can be pinged from the device and the TFTP server is installed on the PC.

13.3 Features

13.3.1 Python Script Debugging

Python script debugging is to test or execute a script that is to be uploaded to the device. The debugging can be performed by accessing the Python console or copying the script to the device.

Working Principle

Open-source Python commands are actually executed regardless of which debugging method is used, and all debugging methods are consistent with those for open-source Python commands on other platforms. The Python shell component only redirects the input and output of open-source Python processes to the current STA.

Run the **python** *file_name args* command to debug and run the Python script.

13.3.2 Permission Control

Permission control means that Python CLI commands can be executed only on files in the **flash:** and **tmp:** directories, and the execution of `popen`, `system`, and other highly risky functions is prohibited inside scripts.

Working Principle

Permission control is to conduct control at the Python ingress. Permissions are controlled for Python scripts executed on the device, to control risks brought by Python script execution.

13.4 Monitoring

N/A