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# 1 Configuring Lines

## 1.1 Introduction

### 1.1.1 Overview

There are various types of terminal lines on network devices. You can group and manage terminal lines by types. Configurations of these terminal lines are called line configurations. On network devices, terminal lines are classified into multiple types such as CTY and virtual type terminal (VTY).

### 1.1.2 Principles

#### 1. Basic Concepts

- CTY

The CTY line is a line connected to the console port. Most network devices have one console port. You can access the local system through the console port.

- VTY

A VTY line is a virtual terminal line not connected to any hardware. It is used for telnet or Secure Shell (SSH) connection.

## 1.2 Configuration Task Summary

Line configuration includes the following tasks.

The following tasks are optional. Select them based on your requirements.

- [\(Optional\)Configuring the Number of VTY Terminals](#)
- [\(Optional\)Configuring Line Attributes](#)
- [\(Optional\)Configuring Terminal Attributes](#)

## 1.3 Configuring the Number of VTY Terminals

### 1.3.1 Overview

This section describes how to enter the line configuration mode to configure other functions.

### 1.3.2 Restrictions and Guidelines

- The **line vty** command allows you to enter the VTY line configuration mode and specify the number of VTY connections.
  - To reduce the number of available VTY connections, run the **no line vty line-number** command.
  - To configure the allowed maximum number of VTY connections, run the **line maximum-vty** command. If the allowed maximum number of VTY connections is set to **0**, all remote connections fail. If the allowed maximum number of VTY connections is set to a value less than the number of online remote connections,
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the configuration fails and a prompt appears.

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**Note**

- Remote connections include telnet, SSH, and session connections.
  - The allowed maximum number of VTY connections and the number of available VTY connections are separately managed. A remote connection is established successfully only when both conditions are met.
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### 1.3.3 Procedure

(1) Enter the privileged EXEC mode.

**enable**

(2) Enter the global configuration mode.

**configure terminal**

(3) Enter the line configuration mode.

**line { console | vty } first-line [ last-line ]**

(4) Configure the number of VTY lines. Perform either of the following operations:

- (Optional) Increase or decrease VTY connections.

**line vty line-number**

There are five VTY connections, numbered from 0 to 4 by default. You can increase the number of VTY connections to 36, with new ones numbered from 5 to 35.

VTY connections numbered from 0 to 4 are default connections of the system, which cannot be deleted. Only new connections can be deleted.

- (Optional) Configure the allowed maximum number of VTY connections.

**line maximum-vty max-number**

The allowed maximum number of VTY connections is **36** by default.

## 1.4 Configuring Line Attributes

### 1.4.1 Overview

This section describes how to configure line attributes in line configuration mode.

### 1.4.2 Restrictions and Guidelines

- When the absolute timeout time set for a line expires, the device immediately disconnects the line even if a user is operating the line terminal. Before the line is disconnected, the system displays the remaining time and a prompt, indicating that the terminal will exit.
  - After a user acts as a dumb terminal to connect to the device through an asynchronous serial port, the user remotely logs in to the specified host through telnet specified in the **autocommand** command or obtains the specified application-based terminal service by running the **autocommand** command.
  - The asynchronous hardware of the device generates seven data bits with parity check in flow communication mode. If parity is generated, specify seven data bits per character. If no parity is generated, specify eight data bits per character. Only early devices support five or six data bits, which are seldom used.
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- By running the **flowcontrol** command, you can specify the flow control mode to keep the Tx rate of one end the same as the Rx rate of the peer end. Since terminals cannot receive data while sending data, flow control can prevent data loss. When high-speed data processing devices communicate with low-speed data processing devices (for example, a printer communicates with a network port), you also need to enable flow control to prevent data loss. Orion\_B26Q general operating system (NOS) provides the following two flow control modes:
  - Software flow control, also called soft flow control, which uses control keys for control. The default stop and start characters for software flow control are **Ctrl+S** (XOFF, ASCII value 19) and **Ctrl+Q** (XON, ASCII value 17), respectively. You can run the **stop-character** and **start-character** commands to configure them.
  - Hardware flow control, also called hard flow control, which uses hardware for control.
- In telnet connection scenarios, you can run the **terminal-type** command to configure the type of terminals simulated on the terminal connected to a line as required. Upon telnet connection, one end negotiates with the other end about the terminal type based on its terminal type configuration (telnet negotiation ID: 0x18). For details, see RFC 854. You can run the **terminal-type vt100** command to restore the default terminal type.

### 1.4.3 Procedure

(1) Enter the privileged EXEC mode.

**enable**

(2) Enter the global configuration mode.

**configure terminal**

(3) Enter the line configuration mode.

**line { console | vty } first-line [ last-line ]**

(4) Configure line attributes. The following configurations are optional. Select them based on your requirements.

- Configure the absolute timeout time for a line.

**absolute-timeout absolute-timeout-time**

No absolute timeout time is configured for a line by default.

- Configure the baud rate for the current line terminal.

**speed baudrate**

The default baud rate is **9600**.

- Configure the character for activating a null terminal session.

**activation-character ascii-value**

The default character for activating a terminal session is the carriage return character (ASCII value 13).

- Enable automatic command execution.

**autocommand autocommand-command**

Automatic command execution is disabled by default.

- Configure the prompt for refusing line-based login.

**refuse-message [ c message c ]**

No prompt is configured for refusing line-based login by default.

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- Configure a privilege level for line-based login.

**privilege level** *privilege-level*

The default privilege level for line-based login is **1**.

- Enable logging on terminals.

**monitor**

Logging is disabled on terminals by default.

- Configure location description for a specific line.

**location** *location*

No location description is configured for a specific line by default.

- Configure the maximum number of lines that are displayed on a single screen for a specific line terminal.

**length** *screen-length*

The maximum number of lines that are displayed on a single screen is **24** by default.

- Configure the access to the CLI through a line.

**exce**

Accessing the CLI through lines is enabled by default.

- Configure the character for exiting a line.

**escape-character** *escape-value*

The default character for exiting a line is **Ctrl+Shift+6** (ASCII value 30).

- Configure the hotkey for disconnecting terminal connections.

**disconnect-character** *ascii-value*

The default hotkey for disconnecting terminal connections is **Ctrl+D** (ASCII value 4).

- Configure a role for a line.

**role** *role-name*

A role is configured for each line by default. The default role for serial ports, auxiliary ports, and extended serial ports is **network-admin**. The default role for other lines is **network-operator**.

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**⚠ Caution**

Each line is configured with 1 to 64 roles. The last role cannot be deleted. If it is deleted, a failure prompt is displayed.

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**(5)** Configure asynchronous line attributes. The following configurations are optional. Select them based on your requirements.

- Configure the number of data bits per character for asynchronous lines in flow communication mode.

**databits** *bit*

The default number of data bits per character for asynchronous lines in flow communication mode is **8**.

- Configure the CLI character encoding format for asynchronous lines.

**exec-character-bits** { **7** | **8** }

The system selects a full 8-bit ASCII character set as the CLI character set by default.

---

To enter Chinese characters or display Chinese characters, images, or other international characters in the CLI, run the **exec-character-bits 8** command.

- o Configure the flow control mode for asynchronous lines.

**flowcontrol { hardware | none | software }**

No flow control is configured for asynchronous lines by default.

- o Configure the parity bit for asynchronous lines.

**parity { even | none | odd }**

When using certain hardware (such as an asynchronous serial port and console port) for communication, you usually need to configure a parity bit.

- o Configure the start character for software flow control for asynchronous lines.

**start-character *ascii-value***

The default start character for software flow control for asynchronous lines is **Ctrl+Q** (ASCII value 17).

After software flow control is enabled for an asynchronous line, the start character indicates the start of data transmission.

- o Configure the stop character for software flow control for asynchronous lines.

**stop-character *ascii-value***

The default stop character for software flow control for asynchronous lines is **Ctrl+S** (ASCII value 19).

After software flow control is enabled for an asynchronous line, the stop character indicates the end of data transmission.

- o Configure the number of stop bits in each byte transmitted through asynchronous lines.

**stopbits { 1 | 2 }**

The default number of stop bits in each byte transmitted through asynchronous lines is **2**.

You should configure the stop bits for communication between an asynchronous line and the connected network device (such as a conventional numb terminal and modem).

- o Configure the type of terminals simulated by an asynchronous line terminal.

**terminal-type *terminal-type-string***

The default type of terminals simulated by a line is **vt100**.

- (6) (Optional) Configure an access control list (ACL) to control terminal login.

(IPv4 network)

**access-class { *acl-number* | *acl-name* } { in | out }**

(IPv6 network)

**ipv6 access-class { *acl-number* | *acl-name* } { in | out }**

No ACL is configured for controlling terminal login by default.

- (7) (Optional) Enable command accounting for a line.

**accounting commands { default | *list-name* }**

The command accounting function is disabled by default.

- (8) (Optional) Enable user access accounting for a line.
-

**accounting exec { default | list-name }**

The user access accounting function is disabled by default.

(9) (Optional) Enable EXEC authorization for a line.

**authorization exec { default | list-name }**

The EXEC authorization function is disabled by default.

## 1.5 Configuring Terminal Attributes

### 1.5.1 Overview

You can configure temporary terminal attributes in the CLI. These configurations are invalid after the connection is disconnected.

### 1.5.2 Procedure

(1) Enter the privileged EXEC mode.

**enable**

(2) Configure terminal attributes. The following configurations are optional. Select them based on your requirements.

- Configure the number of data bits per character for asynchronous lines in flow communication mode.

**terminal databits bit**

The default number of data bits per character for the current terminal in flow communication mode is **8**.

- Configure the character for exiting the current terminal.

**terminal escape-character escape-value**

The default character for exiting the current terminal is **Ctrl+Shift+6** (ASCII value 30).

- Configure the CLI character encoding format for the current terminal.

**terminal exec-character-bits { 7 | 8 }**

To enter Chinese characters or display Chinese characters, images, or other international characters in the CLI, run the **terminal exec-character-bits 8** command.

- Configure the flow control mode for the current terminal.

**terminal flowcontrol { hardware | none | software }**

No flow control is configured for asynchronous lines by default.

- Configure the start character for software flow control for the current terminal.

**terminal start-character ascii-value**

The default start character for software flow control for the current terminal is **Ctrl+Q** (ASCII value 17).

- Configure the stop character for software flow control for the current terminal.

**terminal stop-character ascii-value**

The default stop character for software flow control for the current terminal is **Ctrl+S** (ASCII value 19).

- Configure the number of stop bits in each byte transmitted through the current terminal.

**terminal stopbits { 1 | 2 }**

---

The default number of stop bits in each byte transmitted through the current terminal is **2**.

- o Configure the type of terminals simulated by the current terminal.

**terminal terminal-type** *terminal-type-string*

The default terminal type is **vt100**.

- o Configure the parity bit for the asynchronous line corresponding to the current terminal.

**terminal parity** { **even** | **none** | **odd** }

No parity bit is configured for the asynchronous line corresponding to the current terminal by default.

When using certain hardware (such as an asynchronous serial port and console port) for communication, you usually need to configure a parity bit.

- o Enable historical command recording for the current terminal and configure the allowed maximum number of recorded historical commands.

**terminal history** [ **size** *size* ]

The historical command recording function is enabled by default, and the default number of recorded historical commands is **10**.

- o Configure the maximum number of lines that are displayed on a single screen on the current terminal.

**terminal length** *screen-length*

The maximum number of lines that are displayed on a single screen is **24** by default.

- o Configure location description for the current terminal.

**terminal location** *location*

No location description is configured for the current terminal by default.

- o Configure the baud rate for the current terminal.

**terminal speed** *baudrate*

The default baud rate is **9600**.

- o Configure the maximum number of columns that are displayed in a single line on the current terminal, that is, the line width.

**terminal width** *screen-width*

The maximum number of columns that are displayed in a single line is **79** by default.

- (3) Enter the global configuration mode.

**configure terminal**

- (4) Enter the line configuration mode.

**line** { **console** | **vty** } *first-line* [ *last-line* ]

- (5) (Optional) Configure the login authentication timeout time for the current terminal.

**timeout login response** *response-timeout-time*

The default authentication timeout time for line-based login is **30** seconds.

- (6) (Optional) Configure communication protocols supported by the current terminal.

**transport input** { **all** | **ssh** | **telnet** | **none** }

All communication protocols are supported by default. That is, both SSH and telnet are supported.

---



(7) (Optional) Configure the prompt for terminal logout.

**vacant-message** [ *c message c* ]

No prompt is configured for terminal logout by default.

(8) (Optional) Configure the maximum number of columns that are displayed in a single line on the current terminal, that is, the line width.

**width** *screen-width*

The maximum number of columns that are displayed in a single line is **79** by default.

## 1.6 Monitoring

Run the **show** commands to check the running status of a configured function to verify the configuration effect.

Run the **clear** commands to clear information.

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### Caution

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

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Table 1-1 Monitoring

Command	Purpose
<b>clear line</b> { <b>console</b> <i>console-line-number</i>   <b>vty</b> <i>vty-line-number</i>   <i>line-number</i> }	Clears the connection status of a line.
<b>show line</b> { <b>console</b> <i>console-line-number</i>   <b>vty</b> <i>vty-line-number</i>   <i>line-number</i> }	Displays the line configurations.
<b>show history</b>	Displays historical command records of a line.
<b>show history</b>	Displays all historical command records.
<b>show privilege</b>	Display the privilege level of a line.
<b>show user</b> [ <i>all</i> ]	Displays login user information of a line.

## 1.7 Configuration Examples

### 1.7.1 Configuring Line Attributes

#### 1. Requirements

When users use VTY connections to remotely log in to the device through telnet, the network administrator can configure VTY line attributes based on the use and security requirements of the device. Configure an ACL to control terminal login, set the privilege level of VTY line users to **14**, and require users of VTY line-based login to enter a password. Set the absolute timeout time of VTY connections to 30 minutes.

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## 2. Topology

Figure 1-1 Configuring Line Attributes



## 3. Notes

- Set the maximum number of VTY line users to **6**.
- Configure an ACL to allow users of some IP addresses to access the device.
- Configure attributes of VTY line user.
- Configure the privilege level, login verification method, and verification password of VTY line users.

## 4. Procedure

Configure an ACL named **acl1** to control terminal login.

```
Device> enable
Device# configure terminal
Device(config)# ip access-list standard acl1
Device(config-std-nacl)# permit 192.168.1.0 0.0.0.255
Device(config-std-nacl)# exit
Device(config)# line v 0 6
Device(config-line)# access-class acl1 in
```

Set the maximum number of VTY line users to **6**.

```
Device(config)# line v 0 6
```

Set the baud rate to 115200 bps.

```
Device(config-line)# speed 115200
```

Set the number of data bits to **8**.

```
Device(config-line)# databits 8
```

Set the parity bit to **even**.

```
Device(config-line)# parity even
```

Set the number of stop bits to **1**.

```
Device(config-line)# stopbits 1
```

Set the absolute timeout time of VTY connections to 30 minutes.

```
Device(config-line)# absolute-timeout 30
```

Configure software flow control.

```
Device(config-line)# flowcontrol software
```

Set the maximum number of lines that are displayed on a single screen to **100**.

```
Device(config-line)# length 100
```

Set the maximum number of columns that are displayed in a line to **256**.

```
Device(config-line)# width 256
```

Enable historical command recording and set the number of recorded historical commands to **200**.

```
Device(config-line)# history size 200
```

Set the privilege level of line-based login to **14**.

```
Device(config-line)# privilege level 14
```

Configure the user verification method.

```
Device(config-line)# login local
```

```
Device(config-line)# exit
```

Configure a username.

```
Device(config)# username Device privilege 15 password test_1234
```

## 5. Verification

Users of the IP address 192.168.1.100 can log in to the device through tenet. Users beyond the IP addresses in the 192.168.1.0/24 network segment cannot log in to the device. Run the **show users** command to display users who log in to the device.

```
Device# show users
```

Line	User	Host(s)	Idle	Location
* 0 con 0	---	idle	00:00:00	---
1 vty 0	Device	idle	00:00:04	192.168.1.100

Run the **show line vty** command to display the line status of the console.

```
Device# show line vty 1
```

```
VTY      Type      speed  Overruns
  1      VTY      115200  0
Line 2, Location: "", Type: "vt100"
Length: 100 lines, Width: 256 columns
Special Chars: Escape Disconnect Activation
                ^^x      ^D      ^M
Timeouts:      Idle EXEC      Idle Session
                00:10:00      never
History is enabled, history size is 200.
Total input: 0 bytes
Total output: 0 bytes
Data overflow: 0 bytes
stop rx interrupt: 0 times
```

## 6. Configuration Files

Device configuration file

```
hostname Device
!
username Device privilege 15 password test_1234
!
```

```
line console 0
  exec-timeout 0 0
  speed 115200
line console 0
  exec-timeout 0 0
  speed 115200
line vty 0 6
  absolute-timeout 30
  access-class acl1 in
  privilege level 14
  login local
  password test_123
  flowcontrol software
  parity even
  stopbits 1
  width 256
  length 100
  monitor
  history size 200
  speed 115200
line vty 7 35
  access-class acl1 in
  login
!
end
```