Configuring TACACS+

This chapter contains the following sections:

Information About TACACS+

The TACACS+ security protocol provides centralized validation of users who are attempting to gain access to a device. TACACS+ services are maintained in a database on a TACACS+ daemon that is running, typically, on a UNIX or Windows NT workstation. You must have access to and must configure a TACACS+ server before the configured TACACS+ features on your device are available.

TACACS+ provides for separate authentication, authorization, and accounting services. The TACACS+ daemon provides each service independently. Each service can be tied into its own database to take advantage of other services available on that server or on the network, depending on the capabilities of the daemon.

The TACACS+ client/server protocol uses TCP (TCP port 49) for transport requirements. Centralized authentication is provided using the TACACS+ protocol.

Note TACACS+ security protocol supports IPv4 and IPv6 addresses.

TACACS+ Operation for User Login

The following sequence of events take place when you attempt to log in to a TACACS+ server using the Password Authentication Protocol (PAP):

1. When a connection is established, the TACACS+ daemon is contacted to obtain the username and password.

Note TACACS+ allows an arbitrary conversation between the daemon and the user until the daemon receives enough information to authenticate the user. This action is usually done by prompting for a username and password combination, but might include prompts for additional information, such as your mother's maiden name.

2. The TACACS+ daemon provides one of the following responses:
    1. ACCEPT—User authentication succeeds and service begins. If user authorization is needed, authorization begins.
    2. REJECT—User authentication failed. The TACACS+ daemon either denies further access to the user or prompts the user to retry the login sequence.
    3. ERROR—An error occurred at some time during authentication either at the daemon or in the network connection. If an ERROR response is received, the device tries to use an alternative method for authenticating the user.

    If further authorization is required after authentication, the user also undergoes an additional authorization phase. Users must first successfully complete TACACS+ authentication before proceeding to TACACS+ authorization.
3. If TACACS+ authorization is required, the TACACS+ daemon is contacted and it returns an ACCEPT or REJECT authorization response. An ACCEPT response contains attributes that are used to direct the EXEC or NETWORK session for that user and determines the services that the user can access.

    Services include the following:
    - Telnet, rlogin, Point-to-Point Protocol (PPP), Serial Line Internet Protocol (SLIP), or EXEC services
    - Connection parameters, including the host or client IP address, access list, and user timeouts

Default TACACS+ Server Encryption Type and Preshared Key

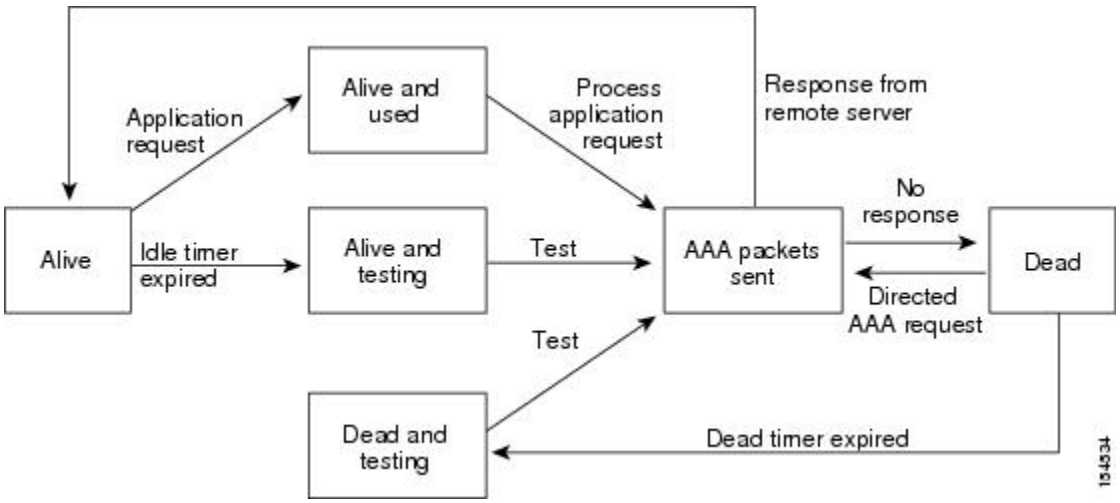
You must configure the TACACS+ preshared key to authenticate to the TACACS+ server. A preshared key is a secret text string shared between the device and the TACACS+ server host. The length of the key is restricted to 63 characters and can include any printable ASCII characters (white spaces are not allowed). You can configure a global preshared secret key for all TACACS+ server configurations.

You can override the global preshared key assignment by explicitly using the key option when configuring an individual TACACS+ server.

TACACS+ Server Monitoring

Unresponsive TACACS+ servers are marked as dead and are not sent AAA requests. Dead TACACS+ servers are periodically monitored and brought back alive once they respond. This process confirms that a TACACS+ server is in a working state before real AAA requests are sent its way. The following figure shows how a TACACS+ server state change generates a Simple Network Management Protocol (SNMP) trap and an error message showing the failure before it impacts performance.

Figure 1: TACACS+ Server States



Note The monitoring interval for alive servers and dead servers are different and can be configured by the user. The TACACS+ server monitoring is performed by sending a test authentication request to the TACACS+ server.

Vendor-Specific Attributes

The Internet Engineering Task Force (IETF) draft standard specifies a method for communicating vendor-specific attributes (VSAs) between the network access server and the TACACS+ server. The IETF uses attribute 26. VSAs allow vendors to support their own extended attributes that are not suitable for general use.

Cisco VSA Format

The Cisco TACACS+ implementation supports one vendor-specific option using the format recommended in the IETF specification. The Cisco vendor ID is 9, and the supported option is vendor type 1, which is named cisco-av-pair. The value is a string with the following format:

```
protocol : attribute separator value *
```

The protocol is a Cisco attribute for a particular type of authorization. The separator is = (equal sign) for mandatory attributes, and * (asterisk) indicates optional attributes.

When you use TACACS+ servers for authentication, the TACACS+ protocol directs the TACACS+ server to return user attributes, such as authorization information, with authentication results. This authorization information is specified through VSAs.

The following VSA protocol options are supported:

- Shell—Protocol used in access-accept packets to provide user profile information.
- Accounting—Protocol used in accounting-request packets. If a value contains any white spaces, you should enclose the value within double quotation marks.

The following attributes are other supported:

- roles—Lists all the roles to which the user belongs. The value consists of a string that lists the role names delimited by white space. This subattribute, which the TACACS+ server sends in the VSA portion of the Access-Accept frames, can only be used with the shell protocol value.
- accountinginfo—Stores accounting information in addition to the attributes covered by a standard TACACS+ accounting protocol. This attribute is sent only in the VSA portion of the Account-Request frames from the TACACS+ client on the switch. It can be used only with the accounting protocol data units (PDUs).

Prerequisites for TACACS+

- Obtain the IP addresses or hostnames for the TACACS+ servers.
- Obtain the preshared keys from the TACACS+ servers, if any.
- Ensure that the Cisco Nexus 1000V is configured as a TACACS+ client of the AAA servers.
- You have already configured AAA, including remote TACACS+ authentication.

Guidelines and Limitations for TACACS+

- You can configure a maximum of 64 TACACS+ servers.
- The logging level for TACACS + must be set to 5.
- We recommend that you configure the dead-time interval if more than six servers are configured in a group. If you must configure more than six servers, make sure to set the dead-time interval to a value greater than 0 and enable dead server monitoring by configuring the test username and test password.
- TACACS+ type-6 password encryption is applicable in the following order:
  1. feature configuration
  2. creating the master key
  3. configuration of the TACAC+ server key

Note You will not be able to achieve a proper TACAC+ type-6 password encryption if the above order is not followed.

Default Settings for TACACS+

Parameters	Default
TACACS+	Disabled

Parameters	Default
Dead timer interval	0 minutes
Timeout interval	5 seconds
Idle timer interval	0 minutes
Periodic server monitoring username	test
Periodic server monitoring password	test

Configuring TACACS+

The following flowchart guides you through the TACACS+ configuration process.

Note Be aware that the Cisco Nexus 1000V commands might differ from the Cisco IOS commands.

Figure 2: Configuring TACACS+ Flowchart

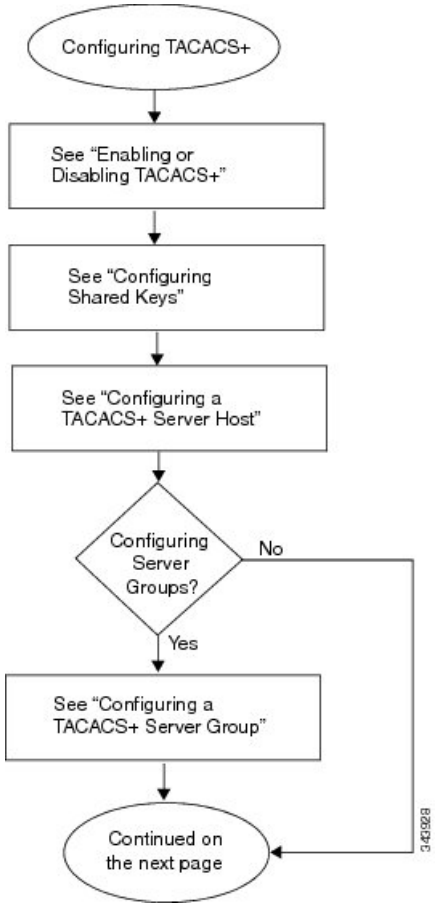


Figure 3: Configuring TACACS+ Flowchart (continued)

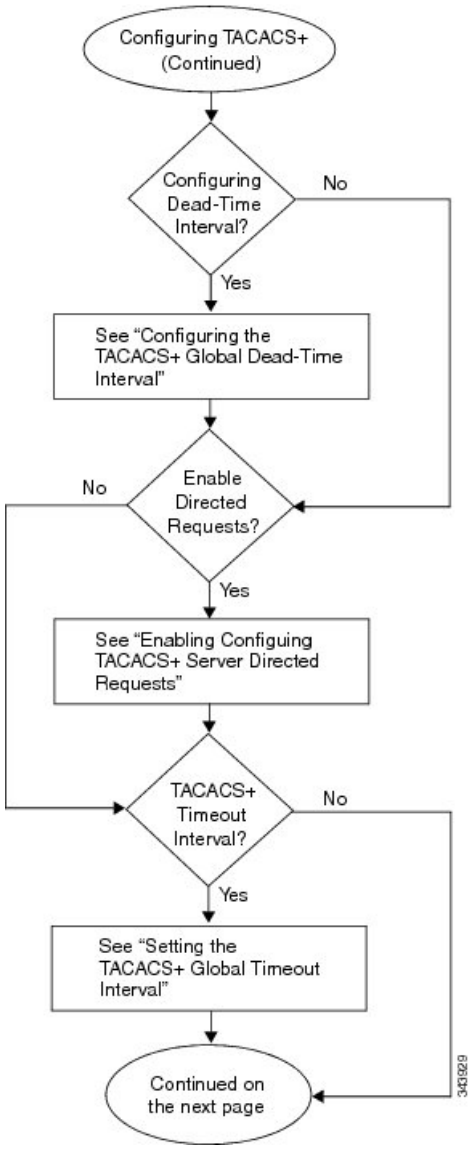
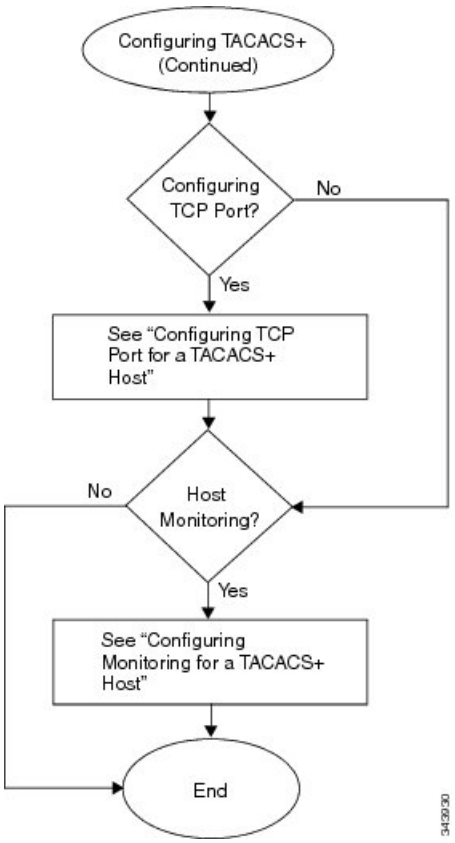


Figure 4: Configuring TACACS+ Flowchart (continued)



Enabling or Disabling TACACS+

By default, TACACS+ is disabled. You must explicitly enable the TACACS+ feature to access the configuration and verification commands that support TACACS+ authentication.

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Caution When you disable TACACS+, all related configurations are automatically discarded.

Before you begin

Log in to the CLI in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# [**no**] **tacacs+ enable**	Enables or disables TACACS+.
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.

	Command or Action	Purpose
Step 4	switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Example

This example shows how to enable TACACS+:

```
switch# configure terminal
switch(config)# tacacs+ enable
switch(config)# exit
switch# copy running-config startup-config
```

Configuring Shared Keys

By default, no global key is configured.

You can configure the following:

- The global key or a secret text string that is shared between the Cisco Nexus 1000V and all TACACS+ server hosts
- The key or secret text string that is shared between the Cisco Nexus 1000V and a single TACACS+ server host

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Know the key for the TACACS+ server host(s).

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode. Do one of the following: • To configure a global key for all TACACS+ server hosts, continue to the next step. • To configure a key for a single TACACS+ server host, go to Step 3.

	Command or Action	Purpose
Step 2	switch(config)# **tacacs-server key** [**0** | **7**] *global_key*	Designates the global key shared between the Cisco Nexus 1000V and the TACACS+ server hosts. • **0**—Specifies a clear text string (key) to follow. This is the default. • **7**—Specifies an encrypted string (key) to follow. • *global_key*— String of up to 63 characters. By default, no global key is configured. Go to Step 4.
Step 3	switch(config)# **tacacs-server host** { *ipv4-address* | *ipv6-address* | *host-name*} **key** [**0** | **7**] *shared_key*	Designates the key shared between the Cisco Nexus 1000V and this specific TACACS+ server host. **0**—Specifies a clear text string (key) to follow. This is the default. **7**—Specifies an encrypted string (key) to follow. *global key*—String of up to 63 characters. This shared key is used instead of the global shared key.
Step 4	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 5	(Optional) switch# **show tacacs-server**	Displays the TACACS+ server configuration. **Note** The global shared key is saved in encrypted form in the running configuration. To display the key, use the **show running-config** command.
Step 6	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Example

This example shows how to configure a shared key:

```
switch# configure terminal
switch(config)# tacacs-server key 0 QsEFtkI#
switch(config)# exit
switch# show tacacs-server
Global TACACS+ shared secret:********
```

```
timeout value:5
deadtime value:0
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
                available on port:49
switch# copy running-config startup-config
```

Configuring a TACACS+ Server Host

All TACACS+ server hosts are added to the default TACACS+ server group.

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Configure the shared key.
- Know the IP addresses or the hostnames for the remote TACACS+ server hosts.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server host** {*ipv4-address* | *ipv6-address* | *host-name*}	Configures the server IP address or hostname as a TACACS+ server host.
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 5	(Optional) switch(confgi)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to configure a TACACS+ server host using IPv4 address:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.2.2
switch(config)# exit
switch# show tacacs-server
timeout value:5
deadtime value:0
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
```

```
                available on port:49
switch# copy running-config startup-config
```

Configuring a TACACS+ Server Group

You can configure a TACACS+ server group whose member servers share authentication functions.

After you configure the TACACS+ server group, the server members are tried in the same order in which you configured them.

A TACACS+ server group can provide a failover if one server fails to respond. If the first server in the group fails, the next server in the group is tried until a server responds. Multiple server groups can provide failovers for each other in this same way.

Before you begin

- Log in to the CLI in EXEC mode.
- Know that all servers added to a TACACS+ server group use the TACACS+ protocol.
- Configure the preshared keys.
- Enable TACACS+ for authentication.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **aaa group server tacacs+** *group-name*	Creates a TACACS+ server group with the specified name and places you into the TACACS+ configuration mode for that group.
Step 3	switch(config-tacacs+)# **server** {*ipv4-address* | *ipv6-address* | *host-name*}	Configures the TACACS+ server hostname or IP address as a member of the TACACS+ server group. If the specified TACACS+ server is not found, configure it using the **tacacs-server host** command and retry this command.
Step 4	(Optional) switch(config-tacacs+)# **deadtime** *minutes*	Configures the monitoring dead time for this TACACS+ group. The default is 0 minutes. The range is from 0 through 1440. **Note** If the dead-time interval for a TACACS+ server group is greater than zero (0), that value takes precedence over the global dead-time value.

	Command or Action	Purpose
Step 5	(Optional) switch(config-tacacs+)# **use-vrf** *vrf-name*	Specifies the virtual routing and forwarding instance (VRF) to use to contact this server group
Step 6	(Optional) switch(config-tacacs+)# **source-interface** {*interface-type*} {*interface-number*}	Specifies a source interface to be used to reach the TACACS+ server. • **loopback**—Virtual interface number from 0 to 1023 • **mgmt**—Management interface 0 • **null**—Null interface 0 • **port-channel**—Port channel number from 1 to 4096
Step 7	(Optional) switch(config-tacacs+)# **show tacacs-server groups**	Displays the TACACS+ server group configuration
Step 8	(Optional) switch(config-tacacs+)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Example

This example shows how to configure a TACACS+ server group using IPv4 address:

```
switch# config terminal
switch(config)# aaa group server tacacs+ TacServer
switch(config-tacacs+)# server 10.10.2.2
switch(config-tacacs+)# deadtime 30
switch(config-tacacs+)# use-vrf management
switch(config-tacacs+)# source-interface mgmt0
switch(config-tacacs+)# show tacacs-server groups
total number of groups:1

following TACACS+ server groups are configured:
        group TacServer:
                server 10.10.2.2 on port 49
                deadtime is 30
                vrf is management
switch# copy running-config startup-config
```

Enabling TACACS+ Server-Directed Requests

You can designate which TACACS+ server to send an authentication request to. This process is called a directed request.

When directed requests are enabled, you can log in as username@vrfname:hostname, where *vrfname* is the VRF to use and hostname is the name of a configured TACACS+ server.

Note User-specified logins are supported only for Telnet sessions.

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server directed-request**	Enables use of directed requests for specifying the TACACS+ server to send an authentication request to when logging in. The default is disabled.
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server directed-request**	Displays the TACACS+ directed request configuration.
Step 5	switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to enable a TACACS+ server-directed request:

```
switch# config terminal
switch(config)# tacacs-server directed-request
switch(config)# exit
switch# show tacacs-server directed-request
enabled
switch# copy running-config startup-config
```

Setting the TACACS+ Global Timeout Interval

You can set the interval in seconds that the Cisco Nexus 1000V waits for a response from any TACACS+ server before declaring a timeout.

The timeout specified for an individual TACACS+ server overrides the global timeout interval. To set the timeout for an individual server.

Before you begin

- Log in to the CLI in EXEC mode.

- Enable TACACS+ for authentication.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server timeout** *seconds*	Specifies the interval in seconds that the Cisco Nexus 1000V waits for a response from a server. The default timeout interval is 5 seconds. The range is from 1 to 60 seconds.
Step 3	switch(confi)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 5	(Optional) switch(confi)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to set a TACACS+ timeout interval:

```
switch# configure terminal
switch(config)# tacacs-server timeout 10
switch(config)# exit

switch# n1000v# show tacacs-server
Global TACACS+ shared secret:********
timeout value:10
deadtime value:0
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
                available on port:49
switch# copy running-config startup-config
```

Setting a Timeout Interval for an Individual TACACS+ Host

You can set the interval in seconds that the Cisco Nexus 1000V waits for a response from a specific TACACS+ server before declaring a timeout. This setting is configured per TACACS+ host.

The timeout setting for an individual TACACS+ server overrides the global timeout interval.

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Configure the TACACS+ server.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server host** {*ipv4-address* | *ipv6-address* | *host-name*} **timeout** *seconds*	Specifies the timeout interval for a specific server. The default is the global timeout interval.
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 5	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to set a timeout interval for an individual TACACS+ host using IPv4 address:

```
switch# config terminal
switch(config)#  tacacs-server host 10.10.2.2 timeout 10
switch(config)# exit
switch# n1000v# show tacacs-server
Global TACACS+ shared secret:********
timeout value:10
deadtime value:0
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
                available on port:49
                timeout:10
switch# copy running-config startup-config
```

Configuring the TCP Port for a TACACS+ Host

You can configure a TCP port other than port 49 (the default for TACACS+ requests).

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Configure the TACACS+ server.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.

	Command or Action	Purpose
Step 2	switch(config)# **tacacs-server host** {*ipv4-address* | *ipv6-address* | *host-name*} **port** *tcp-port*	Specifies the TCP port to use. The port range is from 1 to 65535. The default is 49.
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 5	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to configure the TCP port for a TACACS+ host using IPv4 address:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.2.2 port 2
switch(config)# exit
switch# show tacacs-server
Global TACACS+ shared secret:********
timeout value:10
deadtime value:0
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
                available on port:2
                timeout:10
switch# copy running-config startup-config
```

Configuring Monitoring for a TACACS+ Host

You should know the following information:

- The idle timer specifies how long a TACACS+ server should remain idle (receiving no requests) before sending it a test packet.
- The default idle timer value is 0 minutes. When the idle time interval is 0 minutes, periodic TACACS+ server monitoring is not done.

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Configure the TACACS+ server.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server host** {*ipv4-address* | *ipv6-address* | *host-name* } **test** {**idle-time***minutes* |**password** *password* [**idle-time** *minutes*] | **username** *name* [**password** *password* [**idle-time***minutes*]] }	Configures server monitoring. The keywords and arguments are as follows: • **username**—Specifies that the default is test. **Note** To protect network security, we recommend that you assign a username that is not already in the TACACS+ database. • **password**—Specifies that the default is test. • **idle-time**—The default is 0 minutes. The valid range is from 0 to 1440 minutes **Note** For periodic TACACS+ server monitoring, the idle timer value must be greater than 0.
Step 3	switch(config)# **tacacs-server dead-time** *minutes*	Specifies the duration of time in minutes before checking a TACACS+ server that was previously unresponsive. The default value is 0 minutes and the valid range is from 0 to 1440 minutes.
Step 4	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 5	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 6	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to configure monitoring for a TACACS+ host using IPv4 address:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.2.2 test username pvk2 password a3z9yjqz7 idle-time
 3
switch(config)# tacacs-server dead-time 5
switch(config)# exit
switch# show tacacs-server
Global TACACS+ shared secret:********
timeout value:10
deadtime value:5
```

```
total number of servers:1

following TACACS+ servers are configured:
        10.10.2.2:
                available on port:2
                timeout:10
switch# copy running-config startup-config
```

Configuring the TACACS+ Global Dead-Time Interval

You can configure the interval to wait before sending a test packet to a previously unresponsive server.

When the dead-timer interval is 0 minutes, TACACS+ servers are not marked as dead even if they are not responding. You can configure the dead time per group.

Before you begin

- Log in to the CLI in EXEC mode.
- Enable TACACS+ for authentication.
- Configure the TACACS+ server.

Procedure

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **tacacs-server deadtime** *minutes*	Configures the global dead-time interval. The default value is 0 minutes. The range is from 1 to 1440 minutes
Step 3	switch(config)# **exit**	Exits global configuration mode and returns to EXEC mode.
Step 4	(Optional) switch(config)# **show tacacs-server**	Displays the TACACS+ server configuration.
Step 5	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration

Example

This example shows how to configure the TACACS+ global dead-time interval:

```
switch# configure terminal
switch(config)#  tacacs-server deadtime 5
switch(config)# exit
switch# show tacacs-server
Global TACACS+ shared secret:********
timeout value:10
deadtime value:5
total number of servers:1

following TACACS+ servers are configured:
```

```
        10.10.2.2:
                available on port:2
                timeout:10
switch# copy running-config startup-config
```

Displaying Statistics for a TACACS+ Host

Use the following command to display statistics for a TACACS+ host.

show tacacs-server statistics {*hostname* | *ipv4-address* | *ipv6-address*}

Configuration Example for TACACS+

This example shows a TACACS+ configuration:

```
switch# configure terminal
switch(config)# feature tacacs+
switch(config-tacacs+)# tacacs-server key 7 "ToIkLhPpG"
switch# (config-tacacs+)# tacacs-server host 10.10.2.2 key 7 "ShMoMhTl"
switch# (config-tacacs+)# aaa group server tacacs+ TacServer
    server 10.10.2.2
```

Feature History for TACACS+

This table only includes updates for those releases that have resulted in additions to the feature.

Feature Name	Releases	Feature Information
TACACS+	4.0(4)SV1(1)	This feature was introduced.