CHAPTER 19

Configuring TACACS+

This chapter describes how to configure the Terminal Access Controller Access Control System Plus (TACACS+) protocol on the Cisco Nexus 4001I and 4005I Switch Module for IBM BladeCenter.

This chapter includes the following sections:

Information About TACACS+

The TACACS+ security protocol provides centralized validation of users attempting to gain access to the switch. TACACS+ services are maintained in a database on a TACACS+ daemon typically running 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 switch are available.

TACACS+ provides for separate authentication, authorization, and accounting facilities. TACACS+ allows for a single access control server (the TACACS+ daemon) to provide each service (authentication, authorization, and accounting) independently. Each service is associated with 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. The switch provide centralized authentication using the TACACS+ protocol.

This section includes the following topics:

- TACACS+ Server Monitoring, page 19-3

TACACS+ Advantages

TACACS+ has the following advantages over RADIUS authentication:

- Provides independent AAA facilities. For example, the switch can authorize access without authenticating.
- Uses the TCP transport protocol to send data between the AAA client and server, making reliable transfers with a connection-oriented protocol.
- Encrypts the entire protocol payload between the switch and the AAA server to ensure higher data confidentiality. The RADIUS protocol only encrypts passwords.

User Login with TACACS+

When a user attempts a Password Authentication Protocol (PAP) login to a switch using TACACS+, the following actions occur:

1. When the switch establishes a connection, it contacts the TACACS+ daemon 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 completed by prompting for a username and password combination, but may include prompts for other items, such as the maiden name of the mother of a user.

2. The switch will receive one of the following responses from the TACACS+ daemon:
   - ACCEPT—User authentication succeeds and service begins. If the switch requires user authorization, authorization begins.
   - REJECT—User authentication failed. The TACACS+ daemon either denies further access to the user or prompts the user to retry the login sequence.
   - ERROR—An error occurred at some time during authentication dither at the daemon or in the network connection between the daemon and the switch. If the switch receives an ERROR response, the switch tries to use an alternative method for authenticating the user.

   The user also undergoes an additional authorization phase, if authorization has been enabled on the switch. Users must first successfully complete TACACS+ authentication before proceeding to TACACS+ authorization.
3. If TACACS+ authorization is required, the switch again contacts the TACACS+ daemon 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 (IPv4 or IPv6), access list, and user timeouts

Default TACACS+ Server Encryption Type and Preshared Key

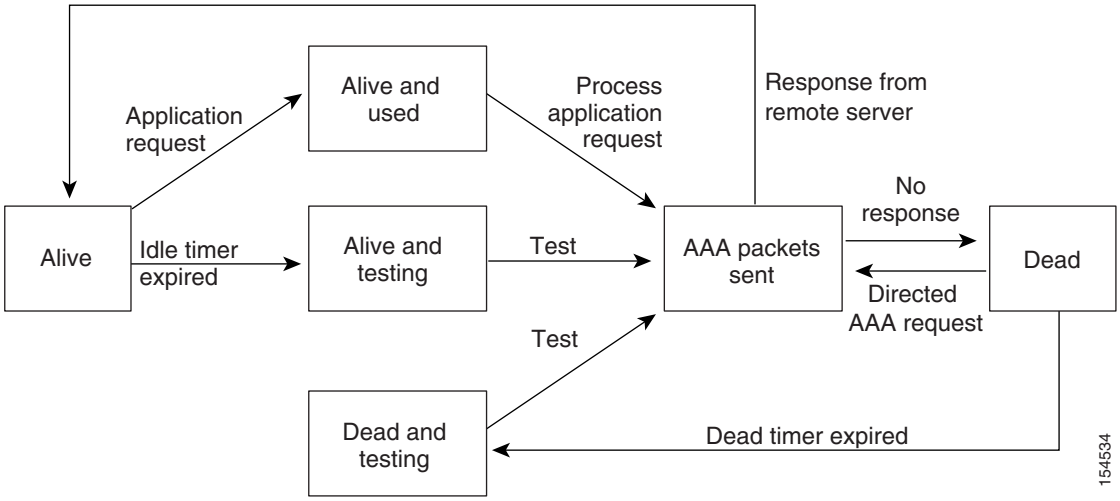
You must configure the TACACS+ preshared key to authenticate the switch to the TACACS+ server. A preshared key is a secret text string shared between the switch and the TACACS+ server host. The length of the key is restricted to 63 characters and can include any printable ASCII characters (white spaces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

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

TACACS+ Server Monitoring

An unresponsive TACACS+ server can delay the processing of AAA requests. A switch can periodically monitor an TACACS+ server to check whether it is responding (or alive) to save time in processing AAA requests. The switch marks unresponsive TACACS+ servers as dead and does not send AAA requests to any dead TACACS+ servers. A switch periodically monitors dead TACACS+ servers and brings them to the alive state once they are responding. This process verifies that a TACACS+ server is in a working state before real AAA requests are sent its way. Whenever an TACACS+ server changes to the dead or alive state, a Simple Network Management Protocol (SNMP) trap is generated and the switch displays an error message that a failure is taking place before it can impact performance. See Figure 19-1.

Figure 19-1 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.

Prerequisites for TACACS+

TACACS+ has the following prerequisites:

- Obtain the IPv4 or IPv6 addresses or hostnames for the TACACS+ servers.

- Obtain the preshared keys from the TACACS+ servers, if any.
- Ensure that the switch is configured as a TACACS+ client of the AAA servers.

Guidelines and Limitations

You can configure a maximum of 64 TACACS+ servers on the switch.

Configuring TACACS+

This section includes the following topics:

TACACS+ Server Configuration Process

To configure TACACS+ servers, perform the following steps:

Step 1 Enable TACACS+.

See the "Enabling TACACS+" section on page 19-5.

Step 2 Establish the TACACS+ server connections to the switch.

See the "Configuring TACACS+ Server Hosts" section on page 19-5.

Step 3 Configure the preshared secret keys for the TACACS+ servers.

See the "Configuring Global Preshared Keys" section on page 19-6 and the "Configuring TACACS+ Server Preshared Keys" section on page 19-7.

Step 4 If needed, configure TACACS+ server groups with subsets of the TACACS+ servers for AAA authentication methods.

See the "Configuring TACACS+ Server Groups" section on page 19-7 and Chapter 17, "Configuring AAA".

Step 5 If needed, configure any of the following optional parameters:

- Dead-time interval
- Allow TACACS+ server specification at login
- Timeout interval

  See the "Configuring the Global TACACS+ Timeout Interval" section on page 19-9.
- TCP port

  See the "Configuring TCP Ports" section on page 19-10.

Step 6 If needed, configure periodic TACACS+ server monitoring.

See the "Configuring Periodic TACACS+ Server Monitoring" section on page 19-11.

Enabling TACACS+

By default, the TACACS+ feature is disabled on the switch. To explicitly enable the TACACS+ feature to access the configuration and verification commands for authentication, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# feature tacacs+`	Enables TACACS+.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Configuring TACACS+ Server Hosts

To access a remote TACACS+ server, you must configure the IPv4 or IPv6 address or the hostname for the TACACS+ server on the switch. All TACACS+ server hosts are added to the default TACACS+ server group.You can configure up to 64 TACACS+ servers.

If a preshared key is not configured for a configured TACACS+ server, a warning message is issued if a global key is not configured. If a TACACS+ server key is not configured, the global key (if configured) is used for that server (see the "Configuring Global Preshared Keys" section on page 19-6 and the "Configuring TACACS+ Server Preshared Keys" section on page 19-7).

Before you configure TACACS+ server hosts, you should do the following:

- Enable TACACS+ (see the "Enabling TACACS+" section on page 19-5).
- Obtain the IPv4 or IPv6 addresses or the hostnames for the remote TACACS+ servers.

To configure TACACS+ server hosts, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server host {ipv4-address | ipv6-address|host-name}`	Specifies the IPv4 or IPv6 address or hostname for a TACACS+ server.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

You can delete a TACACS+ server host from a server group.

Configuring Global Preshared Keys

You can configure preshared keys at the global level for all servers used by the switch. A preshared key is a shared secret text string between the switch and the TACACS+ server hosts.

Before you configure preshared keys, you should do the following:

- Enable TACACS+ (see the "Enabling TACACS+" section on page 19-5).
- Obtain the preshared key values for the remote TACACS+ servers.

To configure global preshared keys, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server key [0|7] key-value`	Specifies a preshared key for all TACACS+ servers. You can specify a clear text (**0**) or encrypted (**7**) preshared key. The default format is clear text. The maximum length is 63 characters. By default, no preshared key is configured.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration. **Note** The preshared keys are saved in encrypted form in the running configuration. Use the **show running-config** command to display the encrypted preshared keys.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

The following example shows how to configure global preshared keys:

```
switch# configure terminal
switch(config)# tacacs-server key 0 QsEfThUkO
switch(config)# exit
```

```
switch# show tacacs-server
switch# copy running-config startup-config
```

Configuring TACACS+ Server Preshared Keys

You can configure preshared keys for a TACACS+ server. A preshared key is a shared secret text string between the switch and the TACACS+ server host.

To configure the TACACS+ preshared keys, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server host {ipv4-address|ipv6-address|host-name} key [0|7] key-value`	Specifies a preshared key for a specific TACACS+ server. You can specify a clear text (**0**) or encrypted (**7**) preshared key. The default format is clear text. The maximum length is 63 characters. This preshared key is used instead of the global preshared key.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration. **Note** The preshared keys are saved in encrypted form in the running configuration. Use the **show running-config** command to display the encrypted preshared keys.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

The following example shows how to configure the TACACS+ preshared keys:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.1.1 key 0 PlIjUhYg
switch(config)# exit
switch# show tacacs-server
switch# copy running-config startup-config
```

Configuring TACACS+ Server Groups

You can specify one or more remote AAA servers to authenticate users using server groups. All members of a group must belong to the TACACS+ protocol. The servers are tried in the same order in which you configure them.

You can configure these server groups at any time but they only take effect when you apply them to a AAA service. For information on AAA services, see Chapter 17, “Configuring AAA”.

To configure TACACS+ server groups, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# aaa group server tacacs+ group-name`	Creates a TACACS+ server group and enters the TACACS+ server group configuration mode for that group.
Step 3	`switch(config-tacacs+)# server {ipv4-address|ipv6-address|host-name}`	Configures the TACACS+ server as a member of the TACACS+ server group. **Tip** If the specified TACACS+ server is not found, configure it using the **tacacs-server host** command and retry this command.
Step 4	`switch(config-tacacs+)# deadtime minutes`	(Optional) Configures the monitoring dead time. 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.
Step 5	`switch(config-tacacs+)# exit`	Exits configuration mode.
Step 6	`switch(config)# show tacacs-server groups`	(Optional) Displays the TACACS+ server group configuration.
Step 7	`switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

The following example shows how to configure a TACACS+ server group:

```
switch# configure terminal
switch(config)# aaa group server tacacs+ TacServer
switch(config-tacacs+)# server 10.10.2.2
switch(config-tacacs+)# deadtime 30
switch(config-tacacs+)# exit
switch(config)# show tacacs-server groups
switch(config)# copy running-config startup-config
```

Specifying a TACACS+ Server at Login

You can configure the switch to allow the user to specify which TACACS+ server to send the authenticate request by enabling the directed-request option. By default, a switch forwards an authentication request based on the default AAA authentication method. If you enable this option, the user can log in as *username@hostname,* where *hostname* is the name of a configured RADIUS server.

Note User specified logins are only supported for Telnet sessions.

To specify a TACACS+ server at login, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server directed-request`	Allows users to specify a TACACS+ server to send the authentication request when logging in. The default is disabled.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server directed-request`	(Optional) Displays the TACACS+ directed request configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Configuring the Global TACACS+ Timeout Interval

You can set a global timeout interval that the switch waits for responses from all TACACS+ servers before declaring a timeout failure. The timeout interval determines how long the switch waits for responses from TACACS+ servers before declaring a timeout failure.

To specify a TACACS+ global timeout interval, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server timeout` *seconds*	Specifies the timeout interval for TACACS+ servers. The default timeout interval is 5 second and the range is from 1 to 60 seconds.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Configuring the Timeout Interval for a Server

You can set a timeout interval that the switch waits for responses from a TACACS+ server before declaring a timeout failure. The timeout interval determines how long the switch waits for responses from a TACACS+ server before declaring a timeout failure.

To configure the timeout interval for a server, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# 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 value. **Note** The timeout interval value specified for a TACACS+ server overrides the global timeout interval value specified for all TACACS+ servers.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Configuring TCP Ports

You can configure another TCP port for the TACACS+ servers if there are conflicts with another application. By default, switch uses port 49 for all TACACS+ requests.

To configure TCP ports, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# tacacs-server host {ipv4-address|ipv6-address|host-name} port tcp-port`	Specifies the UDP port to use for TACACS+ accounting messages.The default TCP port is 49. The range is from 1 to 65535.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

The following example shows how to configure TCP ports:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.1.1 port 2
switch(config)# exit
switch# show tacacs-server
switch# copy running-config startup-config
```

Configuring Periodic TACACS+ Server Monitoring

You can monitor the availability of TACACS+ servers. These parameters include the username and password to use for the server and an idle timer. The idle timer specifies the interval in which a TACACS+ server receives no requests before the switch sends out a test packet.You can configure this option to test servers periodically, or you can run a one-time only test.

Note To protect network security, we recommend that you use a username that is not the same as an existing username in the TACACS+ database.

The test idle timer specifies the interval in which a TACACS+ server receives no requests before the switch sends out a test packet.

Note The default idle timer value is 0 minutes. When the idle time interval is 0 minutes, periodic TACACS+ server monitoring is not performed.

To configure periodic TACACS+ server monitoring, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters 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]]}`	Specifies parameters for server monitoring. The default username is test and the default password is test. The default value for the idle timer is 0 minutes and the valid range is 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 number of minutes before the switch checks a TACACS+ server that was previously unresponsive. The default value is 0 minutes and the valid range is 0 to 1440 minutes.
Step 4	`switch(config)# exit`	Exits configuration mode.
Step 5	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 6	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

The following example shows how to configure periodic TACACS+ server monitoring:

```
switch# configure terminal
switch(config)# tacacs-server host 10.10.1.1 test username user1 password Ur2Gd2BH
idle-time 3
switch(config)# tacacs-server dead-time 5
switch(config)# exit
switch# show tacacs-server
switch# copy running-config startup-config
```

Configuring the Dead-Time Interval

You can configure the dead-time interval for all TACACS+ servers. The dead-time interval specifies the time that the switch waits, after declaring a TACACS+ server is dead, before sending out a test packet to determine if the server is now alive.

Note 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-timer per group (see the "Configuring TACACS+ Server Groups" section on page 19-7).

To configure the dead-time interval for all TACACS+ servers, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters 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 configuration mode.
Step 4	`switch# show tacacs-server`	(Optional) Displays the TACACS+ server configuration.
Step 5	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Manually Monitoring TACACS+ Servers or Groups

To manually issue a test message to a TACACS+ server or to a server group, perform this task:

	Command	Purpose
Step 1	`switch# test aaa server tacacs+ {ipv4-address|ipv6-address|host-name} [vrf vrf-name] username password`	Sends a test message to a TACACS+ server to confirm availability.
Step 2	`switch# test aaa group group-name username password`	Sends a test message to a TACACS+ server group to confirm availability.

The following example shows how to manually issue a test message:

```
switch# test aaa server tacacs+ 10.10.1.1 user1 Ur2Gd2BH
switch# test aaa group TacGroup user2 As3He3CI
```

Disabling TACACS+

You can disable TACACS+.

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

To disable TACACS+, perform this task:

	Command	Purpose
Step 1	`switch# configure terminal`	Enters configuration mode.
Step 2	`switch(config)# feature tacacs+`	Enables TACACS+.
Step 3	`switch(config)# exit`	Exits configuration mode.
Step 4	`switch# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Displaying TACACS+ Statistics

To display the statistics the switch maintains for TACACS+ activity, perform this task:

Command	Purpose
`switch# show tacacs-server statistics {hostname|ipv4-address|ipv6-address}`	Displays the TACACS+ statistics.

For detailed information about the fields in the output from this command, see the *Cisco Nexus 4000I and 4005I Switch Module for IBM BladeCenter NX-OS Command Reference*.

Verifying TACACS+ Configuration

To display TACACS+ configuration information, perform one of these tasks:

Command	Purpose
show running-config tacacs [**all**]	Displays the TACACS+ configuration in the running configuration.
show startup-config tacacs	Displays the TACACS+ configuration in the startup configuration.
show tacacs-server [*host-name* | *ipv4-address* | *ipv6-address*] [**directed-request** | **groups** | **sorted** | **statistics**]	Displays all configured TACACS+ server parameters.

Example TACACS+ Configuration

The following example shows how to configure TACACS+:

```
switch# configure terminal
switch(config)# feature tacacs+
switch(config)# tacacs-server key 7 "ToIkLhPpG"
switch(config)# tacacs-server host 10.10.2.2 key 7 "ShMoMhT1"
switch(config)# aaa group server tacacs+ TacServer
switch(config-tacacs+)# server 10.10.2.2
switch(config-tacacs+)# use-vrf management
```

Default Settings

Table 19-1 lists the default settings for TACACS+ parameters.

Table 19-1 Default TACACS+ Parameters

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