



Configuring AAA Servers and the Local Database

This chapter describes support for AAA (pronounced “triple A”) and how to configure AAA servers and the local database.

This chapter contains the following sections:

- [AAA Overview, page 10-1](#)
- [AAA Server and Local Database Support, page 10-3](#)
- [Configuring the Local Database, page 10-9](#)
- [Identifying AAA Server Groups and Servers, page 10-11](#)

AAA Overview

AAA enables the security appliance to determine who the user is (authentication), what the user can do (authorization), and what the user did (accounting).

AAA provides an extra level of protection and control for user access than using ACLs alone. For example, you can create an ACL allowing all outside users to access Telnet on a server on the DMZ network. If you want only some users to access the server and you might not always know IP addresses of these users, you can enable AAA to allow only authenticated and/or authorized users to make it through the security appliance. (The Telnet server enforces authentication, too; the security appliance prevents unauthorized users from attempting to access the server.)

You can use authentication alone or with authorization and accounting. Authorization always requires a user to be authenticated first. You can use accounting alone, or with authentication and authorization.

This section includes the following topics:

- [About Authentication, page 10-2](#)
- [About Authorization, page 10-2](#)
- [About Accounting, page 10-2](#)

About Authentication

Authentication controls access by requiring valid user credentials, which are typically a username and password. You can configure the security appliance to authenticate the following items:

- All administrative connections to the security appliance including the following sessions:
 - Telnet
 - SSH
 - Serial console
 - ASDM (using HTTPS)
 - VPN management access
- The **enable** command
- Network access
- VPN access

About Authorization

Authorization controls access *per user* after users authenticate. You can configure the security appliance to authorize the following items:

- Management commands
- Network access
- VPN access

Authorization controls the services and commands available to each authenticated user. Were you not to enable authorization, authentication alone would provide the same access to services for all authenticated users.

If you need the control that authorization provides, you can configure a broad authentication rule, and then have a detailed authorization configuration. For example, you authenticate inside users who attempt to access any server on the outside network and then limit the outside servers that a particular user can access using authorization.

The security appliance caches the first 16 authorization requests per user, so if the user accesses the same services during the current authentication session, the security appliance does not resend the request to the authorization server.

About Accounting

Accounting tracks traffic that passes through the security appliance, enabling you to have a record of user activity. If you enable authentication for that traffic, you can account for traffic per user. If you do not authenticate the traffic, you can account for traffic per IP address. Accounting information includes when sessions start and stop, username, the number of bytes that pass through the security appliance for the session, the service used, and the duration of each session.

AAA Server and Local Database Support

The security appliance supports a variety of AAA server types and a local database that is stored on the security appliance. This section describes support for each AAA server type and the local database.

This section contains the following topics:

- [Summary of Support, page 10-3](#)
- [RADIUS Server Support, page 10-4](#)
- [TACACS+ Server Support, page 10-5](#)
- [SDI Server Support, page 10-6](#)
- [NT Server Support, page 10-7](#)
- [Kerberos Server Support, page 10-7](#)
- [LDAP Server Support, page 10-8](#)
- [Local Database Support, page 10-8](#)

Summary of Support

Table 10-1 summarizes the support for each AAA service by each AAA server type, including the local database. For more information about support for a specific AAA server type, refer to the topics following the table.

Table 10-1 Summary of AAA Support

AAA Service	Database Type						
	Local	RADIUS	TACACS+	SDI	NT	Kerberos	LDAP
Authentication of . . .							
VPN users	Yes	Yes	Yes	Yes	Yes	Yes	No
Firewall sessions	Yes	Yes	Yes	No	No	No	No
Administrators	Yes	Yes	Yes	No	No	No	No
Authorization of . . .							
VPN users	Yes	Yes	No	No	No	No	Yes
Firewall sessions	No	Yes*	Yes	No	No	No	No
Administrators	Yes**	No	Yes	No	No	No	No
Accounting of . . .							
VPN connections	No	Yes	Yes	No	No	No	No
Firewall sessions	No	Yes	Yes	No	No	No	No
Administrators	No	Yes	Yes	No	No	No	No

* For firewall sessions, RADIUS authorization is supported with user-specific ACLs only, which are received or specified in a RADIUS authentication response.

** Local command authorization is supported by privilege level only.

RADIUS Server Support

The security appliance supports RADIUS servers.

This section contains the following topics:

- [Authentication Methods, page 10-4](#)
- [Attribute Support, page 10-4](#)
- [RADIUS Functions, page 10-4](#)

Authentication Methods

The security appliance supports the following authentication methods with RADIUS:

- PAP
- CHAP
- MS-CHAPv1
- MS-CHAPv2 (including password aging), for IPSec users only

Attribute Support

The security appliance supports the following sets of RADIUS attributes:

- Authentication attributes defined in RFC 2138.
- Accounting attributes defined in RFC 2139.
- RADIUS attributes for tunneled protocol support, defined in RFC 2868.
- Cisco IOS VSAs, identified by RADIUS vendor ID 9.
- Cisco VPN-related VSAs, identified by RADIUS vendor ID 3076.
- Microsoft VSAs, defined in RFC 2548.

RADIUS Functions

The security appliance can use RADIUS servers for the functionality described in [Table 10-2](#).

Table 10-2 **RADIUS Functions**

Functions	Description
User authentication for CLI access	When a user attempts to access the security appliance with Telnet, SSH, HTTP, or a serial console connection and the traffic matches an authentication statement, the security appliance challenges the user for a username and password, sends these credentials to the RADIUS server, and grants or denies user CLI access based on the response from the server.
User authentication for the enable command	When a user attempts to access the enable command, the security appliance challenges the user for a password, sends to the RADIUS server the username and enable password, and grants or denies user access to enable mode based on the response from the server.
Accounting for CLI access	You can configure the security appliance to send accounting information to a RADIUS server about administrative sessions.

Table 10-2 *RADIUS Functions (continued)*

Functions	Description
User authentication for network access	When a user attempts to access networks through the security appliance and the traffic matches an authentication statement, the security appliance sends to the RADIUS server the user credentials (typically a username and password) and grants or denies user network access based on the response from the server.
User authorization for network access using dynamic ACLs per user	To implement dynamic ACLs, you must configure the RADIUS server to support it. When the user authenticates, the RADIUS server sends a downloadable ACL to the security appliance. Access to a given service is either permitted or denied by the ACL. The security appliance deletes the ACL when the authentication session expires.
User authorization for network access using a downloaded ACL name per user	To implement downloaded ACL names, you must configure the RADIUS server to support it. When the user authenticates, the RADIUS server sends a name of an ACL. If an ACL with the name specified exists on the security appliance, access to a given service is either permitted or denied by the ACL. You can specify the same ACL for multiple users.
VPN authentication	When a user attempts to establish VPN access and the applicable tunnel-group record specifies a RADIUS authentication server group, the security appliance sends to the RADIUS server the username and password, and then grants or denies user access based on the response from the server.
VPN authorization	When user authentication for VPN access has succeeded and the applicable tunnel-group record specifies a RADIUS authorization server group, the security appliance sends a request to the RADIUS authorization server and applies to the VPN session the authorizations received.
VPN accounting	When user authentication for VPN access has succeeded and the applicable tunnel-group record specifies a RADIUS accounting server group, the security appliance sends the RADIUS server group accounting data about the VPN session.
Accounting for network access per user or IP address	You can configure the security appliance to send accounting information to a RADIUS server about any traffic that passes through the security appliance.

TACACS+ Server Support

The security appliance can use TACACS+ servers for the functionality described in [Table 10-3](#). The security appliance supports TACACS+ authentication with ASCII, PAP, CHAP, and MS-CHAPv1.

Table 10-3 *TACACS+ Functions*

Functions	Description
User authentication for CLI access	When a user attempts to access the security appliance with Telnet, SSH, HTTP, or a serial console connection and the traffic matches an authentication statement, the security appliance challenges the user for a username and password, sends these credentials to the TACACS+ server, and grants or denies user CLI access based on the response from the server.
User authentication for the enable command	When a user attempts to access the enable command, the security appliance challenges the user for a password, sends to the TACACS+ server the username and enable password, and grants or denies user access to enable mode based on the response from the server.

Table 10-3 **TACACS+ Functions (continued)**

Functions	Description
Accounting for CLI access	You can configure the security appliance to send accounting information to a TACACS+ server about administrative sessions.
User authentication for network access	When a user attempts to access networks through the security appliance and the traffic matches an authentication statement, the security appliance sends to the TACACS+ server the user credentials (typically a username and password) and grants or denies user network access based on the response from the server.
User authorization for network access	When a user matches an authorization statement on the security appliance after authenticating, the security appliance consults the TACACS+ server for user access privileges.
VPN authentication	When a user attempts to establish VPN access and the applicable tunnel-group record specifies a TACACS+ authentication server group, the security appliance sends to the TACACS+ server the username and password, and then grants or denies user access based on the response from the server.
VPN accounting	When user authentication for VPN access has succeeded and the applicable tunnel-group record specifies a TACACS+ accounting server group, the security appliance sends the TACACS+ server group accounting data about the VPN session.
User authorization for management commands.	On the TACACS+ server, configure the commands that a user can use after authenticating for CLI access. Each command that a user enters at the CLI is checked by the TACACS+ server.
Accounting for network access per user or IP address	You can configure the security appliance to send accounting information to the TACACS+ server about any traffic that passes through the security appliance.

SDI Server Support

The security appliance can use RSA SecureID servers for VPN authentication. These servers are also known as SDI servers. When a user attempts to establish VPN access and the applicable tunnel-group record specifies a SDI authentication server group, the security appliance sends to the SDI server the username and one-time password and grants or denies user access based on the response from the server.

This section contains the following topics:

- [SDI Version Support, page 10-6](#)
- [Two-step Authentication Process, page 10-7](#)
- [SDI Primary and Replica Servers, page 10-7](#)

SDI Version Support

The security appliance offers the following SDI version support:

- **Versions prior to version 5.0**—SDI versions prior to 5.0 use the concept of an SDI master and an SDI slave server which share a single node secret file (SECURID).
- **Versions 5.0**—SDI version 5.0 uses the concepts of an SDI primary and SDI replica servers. Each primary and its replicas share a single node secret file. The node secret file has its name based on the hexadecimal value of the ACE/Server IP address with .sdi appended.

A version 5.0 SDI server that you configure on the security appliance can be either the primary or any one of the replicas. See the “[SDI Primary and Replica Servers](#)” section on page 10-7 for information about how the SDI agent selects servers to authenticate users.

Two-step Authentication Process

SDI version 5.0 uses a two-step process to prevent an intruder from capturing information from an RSA SecurID authentication request and using it to authenticate to another server. The Agent first sends a lock request to the SecurID server before sending the user authentication request. The server locks the username, preventing another (replica) server from accepting it. This means that the same user cannot authenticate to two security appliances using the same authentication servers simultaneously. After a successful username lock, the security appliance sends the passcode.

SDI Primary and Replica Servers

The security appliance obtains the server list when the first user authenticates to the configured server, which can be either a primary or a replica. The security appliance then assigns priorities to each of the servers on the list, and subsequent server selection derives at random from those assigned priorities. The highest priority servers have a higher likelihood of being selected.

NT Server Support

The security appliance supports VPN authentication with Microsoft Windows server operating systems that support NTLM version 1, which we collectively refer to as NT servers. When a user attempts to establish VPN access and the applicable tunnel-group record specifies a NT authentication server group, the security appliance uses NTLM version 1 to for user authentication with the Microsoft Windows domain server. The security appliance grants or denies user access based on the response from the domain server.

**Note**

NT servers have a maximum length of 14 characters for user passwords. Longer passwords are truncated. This is a limitation of NTLM version 1.

Kerberos Server Support

The security appliance can use Kerberos servers for VPN authentication. When a user attempts to establish VPN access through the security appliance, and the traffic matches an authentication statement, the security appliance consults the Kerberos server for user authentication and grants or denies user access based on the response from the server.

The security appliance supports 3DES, DES, and RC4 encryption types.

**Note**

The security appliance does not support changing user passwords during tunnel negotiation. To avoid this situation happening inadvertently, disable password expiration on the Kerberos/Active Directory server for users connecting to the security appliance.

LDAP Server Support

The security appliance can use LDAP servers for VPN authorization. When user authentication for VPN access has succeeded and the applicable tunnel-group record specifies an LDAP authorization server group, the security appliance queries the LDAP server and applies to the VPN session the authorizations it receives.

Local Database Support

The security appliance maintains a local database that you can populate with user profiles.

This section contains the following topics:

- [User Profiles, page 10-8](#)
- [Local Database Functions, page 10-8](#)
- [Fallback Support, page 10-9](#)

User Profiles

User profiles contain, at a minimum, a username. Typically, a password is assigned to each username, although passwords are optional.

The **username attributes** command enables you to enter the username mode. In this mode, you can add other information to a specific user profile. The information you can add includes VPN-related attributes, such as a VPN session timeout value.

Local Database Functions

The security appliance can use local database for the functionality described in [Table 10-4](#).

Table 10-4 Local Database Functions

Functions	Description
User authentication for CLI access	When a user attempts to access the security appliance with Telnet, SSH, HTTP, or a serial console connection and the traffic matches an authentication statement, the security appliance challenges the user for a username and password, checks these credentials against the local database, and grants or denies user CLI access based on the result.
User authentication for the enable or login command	When a user attempts to access the enable command, the security appliance challenges the user for a password, checks the username and password against the local database, and grants or denies user access to enable mode based on the result.
User authorization for management commands.	When a user authenticates with the enable command (or logs in with the login command), the security appliance places that user in the privilege level defined by the local database. You can configure each command to belong to privilege level between 0 and 15 on the security appliance.
User authentication for network access	When a user attempts to access networks through the security appliance and the traffic matches an authentication statement, the security appliance challenges the user for a username and password, checks these credentials against the local database, and grants or denies user network access based on the result.

Table 10-4 Local Database Functions (continued)

Functions	Description
VPN authentication	When a user attempts to establish VPN access and the traffic matches an authentication statement, the security appliance checks the username and password received against the local user database, and grants or denies VPN access based on the result.
VPN authorization	When user authentication for VPN access has succeeded, the security appliance applies to the VPN session the attributes from the local database that are associated with the username and the applicable group policy.

Fallback Support

With the exception of fallback for network access authentication, the local database can act as a fallback method for the functions in [Table 10-4](#). This behavior is designed to help you prevent accidental lockout from the security appliance.

For users who need fallback support, we recommend that their usernames and passwords in the local database match their usernames and passwords in the AAA servers. This provides transparent fallback support. Because the user cannot determine whether a AAA server or the local database is providing the service, using usernames and passwords on AAA servers that are different than the usernames and passwords in the local database means that the user cannot be certain which username and password should be given.

The local database supports the following fallback functions:

- **Console and enable password authentication**—When you use the **aaa authentication console** command, you can add the **LOCAL** keyword after the AAA server group tag. If the servers in the group all are unavailable, the security appliance uses the local database to authenticate administrative access. This can include enable password authentication, too.
- **Command authorization**—When you use the **aaa authorization command** command, you can add the **LOCAL** keyword after the AAA server group tag. If the TACACS+ servers in the group all are unavailable, the local database is used to authorize commands based on privilege levels.
- **VPN authentication and authorization**—VPN authentication and authorization are supported to enable remote access to the security appliance if AAA servers that normally support these VPN services are unavailable. The **authentication-server-group** command, available in tunnel-group general attributes mode, lets you specify the **LOCAL** keyword when you are configuring attributes of a tunnel group. When VPN client of an administrator specifies a tunnel group configured to fallback to the local database, the VPN tunnel can be established even if the AAA server group is unavailable, provided that the local database is configured with the necessary attributes.

Configuring the Local Database

This section describes how to manage users in the local database. You can use the local database for CLI access authentication, privileged mode authentication, command authorization, network access authentication, and VPN authentication and authorization. You cannot use the local database for network access authorization. The local database does not support accounting.

For multiple context mode, you can configure usernames in the system execution space to provide individual logins using the **login** command; however, you cannot configure any **aaa** commands in the system execution space.

**Caution**

If you add to the local database users who can gain access to the CLI but who should not be allowed to enter privileged mode, enable command authorization. (See the [“Configuring Local Command Authorization” section on page 31-7.](#)) Without command authorization, users can access privileged mode (and all commands) at the CLI using their own password if their privilege level is 2 or greater (2 is the default). Alternatively, you can use RADIUS or TACACS+ authentication so that the user will not be able to use the **login** command, or you can set all local users to level 1 so you can control who can use the system enable password to access privileged mode.

To define a user account in the local database, perform the following steps:

Step 1 Create the user account. To do so, enter the following command:

```
hostname/contexta(config)# username username {nopassword | password password} [encrypted]
[privilege level]
```

where the options are as follows:

- **username**—A string from 4 to 64 characters long.
- **password password**—A string from 3 to 16 characters long. In version 7.0(5), the password can be up to 32 characters long.
- **encrypted**—Indicates that the password specified is encrypted.
- **privilege level**—The privilege level that you want to assign to the new user account (from 0 to 15). The default is 2. This privilege level is used with command authorization.
- **no**password—Creates a user account with no password.

Step 2 To configure a local user account with VPN attributes, follow these steps:

a. Enter the following command:

```
hostname/contexta(config)# username username attributes
```

When you enter a **username attributes** command, you enter username mode. The commands available in this mode are as follows:

- **group-lock**
- **password-storage**
- **vpn-access-hours**
- **vpn-filter**
- **vpn-framed-ip-address**
- **vpn-group-policy**
- **vpn-idle-timeout**
- **vpn-session-timeout**
- **vpn-simultaneous-logins**
- **vpn-tunnel-protocol**
- **webvpn**

Use these commands as needed to configure the user profile. For more information about these commands, see the *Cisco Security Appliance Command Line Configuration Guide*.

- b. When you have finished configuring the user profiles, enter **exit** to return to config mode.

For example, the following command assigns a privilege level of 15 to the admin user account:

```
hostname/contexta(config)# username admin password passw0rd privilege 15
```

The following command creates a user account with no password:

```
hostname/contexta(config)# username bcham34 nopassword
```

The following commands create a user account with a password, enter username mode, and specify a few VPN attributes:

```
hostname/contexta(config)# username rwilliams password g0ge0us
hostname/contexta(config)# username rwilliams attributes
hostname/contexta(config-username)# vpn-tunnel-protocol IPSec
hostname/contexta(config-username)# vpn-simultaneous-logins 6
hostname/contexta(config-username)# exit
```

Identifying AAA Server Groups and Servers

If you want to use an external AAA server for authentication, authorization, or accounting, you must first create at least one AAA server group per AAA protocol and add one or more servers to each group. You identify AAA server groups by name. Each server group is specific to one type of server: Kerberos, LDAP, NT, RADIUS, SDI, or TACACS+.

The security appliance contacts the first server in the group. If that server is unavailable, the security appliance contacts the next server in the group, if configured. If all servers in the group are unavailable, the security appliance tries the local database if you configured it as a fallback method (management authentication and authorization only). If you do not have a fallback method, the security appliance continues to try the AAA servers.

To create a server group and add AAA servers to it, follow these steps:

Step 1 For each AAA server group you need to create, follow these steps:

- a. Identify the server group name and the protocol. To do so, enter the following command:

```
hostname/contexta(config)# aaa-server server_group protocol {kerberos | ldap | nt |
radius | sdi | tacacs+}
```

For example, to use RADIUS to authenticate network access and TACACS+ to authenticate CLI access, you need to create at least two server groups, one for RADIUS servers and one for TACACS+ servers.

You can have up to 15 single-mode server groups or 4 multi-mode server groups. Each server group can have up to 16 servers in single mode or up to 4 servers in multi-mode.

When you enter a **aaa-server protocol** command, you enter group mode.

- b. If you want to specify the maximum number of requests sent to a AAA server in the group before trying the next server, enter the following command:

```
hostname/contexta(config-aaa-server-group)# max-failed-attempts number
```

The *number* can be between 1 and 5. The default is 3.

If you configured a fallback method using the local database (for management access only; see the “Authenticating and Authorizing System Administrators” section on page 31-4 and the “Configuring TACACS+ Command Authorization” section on page 31-11 to configure the fallback mechanism), and all the servers in the group fail to respond, then the group is considered to be unresponsive, and the fallback method is tried. The server group remains marked as unresponsive for a period of 10 minutes (by default) so that additional AAA requests within that period do not attempt to contact the server group, and the fallback method is used immediately. To change the unresponsive period from the default, see the **reactivation-mode** command in the following step.

If you do not have a fallback method, the security appliance continues to retry the servers in the group.

- c. If you want to specify the method (reactivation policy) by which failed servers in a group are reactivated, use the **reactivation-mode** command. For more information about this command, see the *Cisco Security Appliance Command Reference*.
- d. If you want to indicate whether accounting messages are sent to a single server (single mode) or sent to all servers in the group (simultaneous mode), use the **accounting-mode** command. For more information about this command, see the *Cisco Security Appliance Command Reference*.
- e. When you have finished configuring the AAA server group, enter **exit**.

Step 2 For each AAA server on your network, follow these steps:

- a. Identify the server, including the AAA server group it belongs to. To do so, enter the following command:

```
hostname/contexta(config)# aaa-server server_group (interface_name) host server_ip
```

When you enter a **aaa-server host** command, you enter host mode.

- b. As needed, use host mode commands to further configure the AAA server.

The commands in host mode do not apply to all AAA server types. Table 10-5 lists the available commands, the server types they apply to, and whether a new AAA server definition has a default value for that command. Where a command is applicable to the server type you specified and no default value is provided (indicated by “—”), use the command to specify the value. For more information about these commands, see the *Cisco Security Appliance Command Reference*.

Table 10-5 Host Mode Commands, Server Types, and Defaults

Command	Applicable AAA Server Types	Default Value
accounting-port	RADIUS	1646
acl-netmask-convert	RADIUS	standard
authentication-port	RADIUS	1645
kerberos-realm	Kerberos	—
key	RADIUS	—
	TACACS+	—
ldap-base-dn	LDAP	—
ldap-login-dn	LDAP	—
ldap-login-password	LDAP	—
ldap-naming-attribute	LDAP	—
ldap-scope	LDAP	—
nt-auth-domain-controller	NT	—

Table 10-5 Host Mode Commands, Server Types, and Defaults (continued)

Command	Applicable AAA Server Types	Default Value
radius-common-pw	RADIUS	—
retry-interval	Kerberos	10 seconds
	RADIUS	10 seconds
sdi-pre-5-slave	SDI	—
sdi-version	SDI	sdi-5
server-port	Kerberos	88
	LDAP	389
	NT	139
	SDI	5500
	TACACS+	49
timeout	All	10 seconds

- c. When you have finished configuring the AAA server host, enter **exit**.

For example, to add one TACACS+ group with one primary and one backup server, one RADIUS group with a single server, and an NT domain server, enter the following commands:

```
hostname/contexta(config)# aaa-server AuthInbound protocol tacacs+
hostname/contexta(config-aaa-server-group)# max-failed-attempts 2
hostname/contexta(config-aaa-server-group)# reactivation-mode depletion deadtime 20
hostname/contexta(config-aaa-server-group)# exit
hostname/contexta(config)# aaa-server AuthInbound (inside) host 10.1.1.1
hostname/contexta(config-aaa-server-host)# key TACPlusUauthKey
hostname/contexta(config-aaa-server-host)# exit
hostname/contexta(config)# aaa-server AuthInbound (inside) host 10.1.1.2
hostname/contexta(config-aaa-server-host)# key TACPlusUauthKey2
hostname/contexta(config-aaa-server-host)# exit
hostname/contexta(config)# aaa-server AuthOutbound protocol radius
hostname/contexta(config-aaa-server-group)# exit
hostname/contexta(config)# aaa-server AuthOutbound (inside) host 10.1.1.3
hostname/contexta(config-aaa-server-host)# key RadUauthKey
hostname/contexta(config-aaa-server-host)# exit
hostname/contexta(config)# aaa-server NTAAuth protocol nt
hostname/contexta(config-aaa-server-group)# exit
hostname/contexta(config)# aaa-server NTAAuth (inside) host 10.1.1.4
hostname/contexta(config-aaa-server-host)# nt-auth-domain-controller primary1
hostname/contexta(config-aaa-server-host)# exit
```

