



# Configuring AAA Rules for Network Access

This chapter describes how to enable AAA (pronounced “triple A”) for network access.

For information about AAA for management access, see the “[Configuring AAA for System Administrators](#)” section on page 96-18 in the general operations configuration guide.

This chapter includes the following sections:

- [AAA Performance](#), page 8-1
- [Licensing Requirements for AAA Rules](#), page 8-1
- [Guidelines and Limitations](#), page 8-2
- [Configuring Authentication for Network Access](#), page 8-2
- [Configuring Authorization for Network Access](#), page 8-12
- [Configuring Accounting for Network Access](#), page 8-17
- [Using MAC Addresses to Exempt Traffic from Authentication and Authorization](#), page 8-19
- [Feature History for AAA Rules](#), page 8-20

## AAA Performance

The ASA uses “cut-through proxy” to significantly improve performance compared to a traditional proxy server. The performance of a traditional proxy server suffers because it analyzes every packet at the application layer of the OSI model. The ASA cut-through proxy challenges a user initially at the application layer and then authenticates with standard AAA servers or the local database. After the ASA authenticates the user, it shifts the session flow, and all traffic flows directly and quickly between the source and destination while maintaining session state information.

## Licensing Requirements for AAA Rules

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

# Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

## Context Mode Guidelines

Supported in single and multiple context mode.

## Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

## IPv6 Guidelines

Supports IPv6.

## Additional Guidelines

In clustering, this feature is only supported on the master unit.

# Configuring Authentication for Network Access

This section includes the following topics:

- [Information About Authentication, page 8-2](#)
- [Configuring Network Access Authentication, page 8-6](#)
- [Enabling the Redirection Method of Authentication for HTTP and HTTPS, page 8-7](#)
- [Enabling Secure Authentication of Web Clients, page 8-8](#)
- [Authenticating Directly with the ASA, page 8-9](#)
- [Configuring the Authentication Proxy Limit, page 8-11](#)

## Information About Authentication

The ASA lets you configure network access authentication using AAA servers. This section includes the following topics:

- [One-Time Authentication, page 8-3](#)
- [Applications Required to Receive an Authentication Challenge, page 8-3](#)
- [ASA Authentication Prompts, page 8-3](#)
- [AAA Prompts and Identity Firewall, page 8-4](#)
- [AAA Rules as a Backup Authentication Method, page 8-5](#)
- [Static PAT and HTTP, page 8-5](#)

## One-Time Authentication

A user at a given IP address only needs to authenticate one time for all rules and types, until the authentication session expires. (See the Configuration > Firewall > Advanced > Global Timeouts pane for timeout values.) For example, if you configure the ASA to authenticate Telnet and FTP, and a user first successfully authenticates for Telnet, then as long as the authentication session exists, the user does not also have to authenticate for FTP.

## Applications Required to Receive an Authentication Challenge

Although you can configure the ASA to require authentication for network access to any protocol or service, users can authenticate directly with HTTP, HTTPS, Telnet, or FTP only. A user must first authenticate with one of these services before the ASA allows other traffic requiring authentication.

The authentication ports that the ASA supports for AAA are fixed as follows:

- Port 21 for FTP
- Port 23 for Telnet
- Port 80 for HTTP
- Port 443 for HTTPS

## ASA Authentication Prompts

For Telnet and FTP, the ASA generates an authentication prompt.

For HTTP, the ASA uses basic HTTP authentication by default, and provides an authentication prompt. You can optionally configure the ASA to redirect users to an internal web page where they can enter their username and password (configured in the Configuration > Firewall > AAA Rules > Advanced > AAA Rules Advanced Options dialog box; see the [“Enabling the Redirection Method of Authentication for HTTP and HTTPS” section on page 8-7](#)).

For HTTPS, the ASA generates a custom login screen. You can optionally configure the ASA to redirect users to an internal web page where they can enter their username and password (configured in the Configuration > Firewall > AAA Rules > Advanced > AAA Rules Advanced Options dialog box; see the [“Enabling the Redirection Method of Authentication for HTTP and HTTPS” section on page 8-7](#)).

Redirection is an improvement over the basic method because it provides an improved user experience during authentication, and an identical user experience for HTTP and HTTPS in both Easy VPN and firewall modes. It also supports authentication directly with the ASA.

You might want to continue to use basic HTTP authentication for the following reasons:

- You do not want the ASA to open listening ports.
- You use NAT on a router and you do not want to create a translation rule for the web page served by the ASA.
- Basic HTTP authentication might work better with your network.

For example non-browser applications, as when a URL is embedded in e-mail, might be more compatible with basic authentication.

After you authenticate correctly, the ASA redirects you to your original destination. If the destination server also has its own authentication, the user enters another username and password. If you use basic HTTP authentication and need to enter another username and password for the destination server, then you need to configure virtual HTTP (see the Configuration > Firewall > Advanced Options > Virtual Access pane).

**Note**

If you use HTTP authentication, by default the username and password are sent from the client to the ASA in clear text; in addition, the username and password are sent on to the destination web server as well. See the “[Enabling Secure Authentication of Web Clients](#)” section on page 8-8 for information to secure your credentials.

For FTP, a user has the option of entering the ASA username followed by an at sign (@) and then the FTP username (name1@name2). For the password, the user enters the ASA password followed by an at sign (@) and then the FTP password (password1@password2). For example, enter the following text:

```
name> name1@name2
password> password1@password2
```

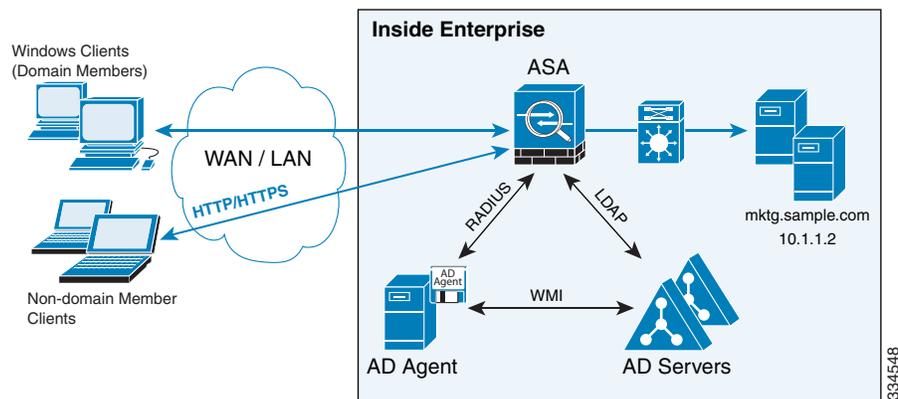
This feature is useful when you have cascaded firewalls that require multiple logins. You can separate several names and passwords by multiple at signs (@).

## AAA Prompts and Identity Firewall

In an enterprise, some users log into the network by using other authentication mechanisms, such as authenticating with a web portal (cut-through proxy). For example, users with a Mac and Linux client might log into a web portal (cut-through proxy). Therefore, you must configure the identity firewall to allow these types of authentication in connection with identity-based access policies.

Figure 8-1 shows a deployment to support a cut-through proxy authentication captive portal. Active Directory servers and the AD Agent are installed on the main site LAN. However, the identity firewall is configured to support authentication of clients that are not part of the Active Directory domain.

**Figure 8-1** Deployment Supporting Cut-through Proxy Authentication



The ASA designates users logging in through a web portal (cut-through proxy) as belonging to the Active Directory domain with which they authenticated.

The ASA reports users logging in through a web portal (cut-through proxy) to the AD Agent, which distributes the user information to all registered ASA devices. In this case, the identity firewall can associate the users with their Active Directory domain. Specifically, the user identity-IP address mappings of authenticated users are forwarded to all ASA contexts that contain the input interface where packets are received and authenticated.

Users can log in by using HTTP/HTTPS, FTP, Telnet, or SSH. When users log in with these authentication methods, the following guidelines apply:

- For HTTP/HTTPS traffic, an authentication window appears for unauthenticated users.

- For Telnet and FTP traffic, users must log in through the cut-through proxy server and again to the Telnet and FTP servers.
- A user can specify an Active Directory domain while providing login credentials (in the format, domain\username). The ASA automatically selects the associated AAA server group for the specified domain.
- If a user specifies an Active Directory domain while providing login credentials (in the format, domain\username), the ASA parses the domain and uses it to select an authentication server from the AAA servers that have been configured for the identity firewall. Only the username is passed to the AAA server.
- If the backslash (\) delimiter is not found in the login credentials, the ASA does not parse the domain and authentication is conducted with the AAA server that corresponds to the default domain configured for the identity firewall.
- If a default domain or a server group is not configured for that default domain, the ASA rejects the authentication.
- If the domain is not specified, the ASA selects the AAA server group for the default domain that is configured for the identity firewall.

## AAA Rules as a Backup Authentication Method

An authentication rule (also known as “cut-through proxy”) controls network access based on the user. Because this function is very similar to an access rule plus an identity firewall, AAA rules can now be used as a backup method of authentication if a user AD login expires or a valid user has not yet logged into AD. For example, for any user without a valid login, you can trigger a AAA rule. To ensure that the AAA rule is only triggered for users that do not have valid logins, you can specify special usernames in the extended ACL that are used for the access rule and for the AAA rule: None (users without a valid login) and Any (users with a valid login). In the access rule, configure your policy as usual for users and groups, but then include a rule that permits all None users before deny any any; you must permit these users so they can later trigger a AAA rule. Then, configure a AAA rule that does not match Any users (these users are not subject to the AAA rule, and were handled already by the access rule), but matches all None users only to trigger AAA authentication for these users. After the user has successfully logged in via cut-through proxy, the traffic will flow normally again.

## Static PAT and HTTP

For HTTP authentication, the ASA checks real ports when static PAT is configured. If it detects traffic destined for real port 80, regardless of the mapped port, the ASA intercepts the HTTP connection and enforces authentication.

For example, assume that outside TCP port 889 is translated to port 80 and that any relevant ACLs permit the traffic:

```
object network obj-192.168.123.10-01
  host 192.168.123.10
  nat (inside,outside) static 10.48.66.155 service tcp 80 889
```

Then when users try to access 10.48.66.155 on port 889, the ASA intercepts the traffic and enforces HTTP authentication. Users see the HTTP authentication page in their web browsers before the ASA allows HTTP connection to complete.

If the local port is different than port 80, as in the following example:

```
object network obj-192.168.123.10-02
  host 192.168.123.10
```

```
nat (inside,outside) static 10.48.66.155 service tcp 111 889
```

Then users do not see the authentication page. Instead, the ASA sends an error message to the web browser, indicating that the user must be authenticated before using the requested service.

When a mapped address is used for static PAT, it is automatically placed into the dynamic PAT pool.

For instance, this configuration,

```
object network my-ftp-server
  host <real-server>
  nat (inside,outside) static <mapped-server> ftp ftp
```

is equivalent to

```
object network my-ftp-server
  host <real-server>
  nat (inside,outside) static <mapped-server> ftp ftp
```

```
object network <internal>
  nat (inside,outside) dynamic <mapped-server>
```

The second line ensures that all PAT bindings are accounted for. This accounting is necessary to avoid connection failure from port collision.

As the the mapped address is placed under dynamic PAT, any additional service that is to be accessed through the mapped address, must also be explicitly configured.

For example, the following is the correct configuration for three services through address 192.150.49.10. Additionally, the SMTP and HTTP services also reside at a host with the same address as the mapped address, 192.150.49.10.

```
object network my-ftp-server
  host <real-server>
  nat (inside,outside) static <mapped-server> ftp ftp
```

```
object network my-ftp-server
  host "192.150.49.10"
  nat (inside,outside) static 192.150.49.10 smtp smtp
```

```
object network my-ftp-server
  host "192.150.49.10"
  nat (inside,outside) static 192.150.49.10 http http
```

## Configuring Network Access Authentication

To configure network access authentication, perform the following steps:

---

**Step 1** In the Configuration > Firewall > AAA Rules pane, choose **Add > Add Authentication Rule**.

The Add Authentication Rule dialog box appears.

**Step 2** In the Interface drop-down list, choose the interface for applying the rule.




---

**Tip** In the Action field, click one of the following, depending on the implementation:

---

- **Authenticate**
- **Do not Authenticate**

- Step 3** In the AAA Server Group drop-down list, choose a server group. To add a AAA server to the server group, click **Add Server**.
- If you chose LOCAL for the AAA server group, you can optionally add a new user by clicking **Add User**. See the “[Adding a User Account to the Local Database](#)” section on page 33-4 in the general operations configuration guide for more information.
- Step 4** In the Source field, add the source IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.
- Step 5** In the Destination field, enter the destination IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.
- Step 6** In the Service field, enter an IP service name or number for the destination service, or click the ellipsis (...) to choose a service.
- Step 7** (Optional) In the Description field, enter a description.
- Step 8** (Optional) Click **More Options** to do any of the following:
- To specify a source service for TCP or UDP, enter a TCP or UDP service in the Source Service field.
  - The destination service and source service must be the same. Copy and paste the destination Service field to the Source Service field.
  - To make the rule inactive, clear the **Enable Rule** check box.  
You may not want to remove a rule, but instead turn it off.
  - To set a time range for the rule, In the Time Range drop-down list, choose an existing time range. To add a new time range, click the ellipsis (...). For more information, see the “[Configuring Time Ranges](#)” section on page 20-26 in the general operations configuration guide.
- Step 9** Click **OK**.
- The Add Authentication Rule dialog box closes and the rule appears in the AAA Rules table.
- Step 10** Click **Apply**.
- The changes are saved to the running configuration.
- 

For more information about authentication, see the “[Information About Authentication](#)” section on page 8-2.

## Enabling the Redirection Method of Authentication for HTTP and HTTPS

This method of authentication enables HTTP(S) listening ports to authenticate network users. When you enable a listening port, the ASA serves an authentication page for direct connections and, by enabling redirection, for through traffic. This method also prevents the authentication credentials from continuing to the destination server. See the “[ASA Authentication Prompts](#)” section on page 8-3 for more information about the redirection method compared to the basic method.

To enable a AAA listener, perform the following steps:

- 
- Step 1** In the Configuration > Firewall > AAA Rules pane, click **Advanced**.
- The AAA Rules Advanced Options dialog box appears.
- Step 2** Under Interactive Authentication, click **Add**.
- The Add Interactive Authentication Entry dialog box appears.

**Step 3** For the Protocol, choose either **HTTP** or **HTTPS**. You can enable both by repeating this procedure and creating two separate rules.

**Step 4** In the Interface drop-down list, choose the interface on which you want to enable the listener.

**Step 5** In the Port drop-down list, choose the port or enter a number.

This is the port that the ASA listens on for direct or redirected traffic; the defaults are 80 (HTTP) and 443 (HTTPS). You can use any port number and retain the same functionality, but be sure your direct authentication users know the port number; redirected traffic is sent to the correct port number automatically, but direct authenticators must specify the port number manually.

**Step 6** (Optional) Check **Redirect network users for authentication request**.

This option redirects through traffic to an authentication web page served by the ASA. Without this option, only traffic directed to the ASA interface can access the authentication web pages.



**Note** If you enable the redirect option, you cannot also configure static PAT for the same interface where you translate the interface IP address and the same port that is used for the listener; NAT succeeds, but authentication fails.

**Step 7** Click **OK**, and then click **OK** again to close the AAA Rules Advanced Options dialog box.

**Step 8** Click **Apply**.

The changes are saved to the running configuration.

## Enabling Secure Authentication of Web Clients

If you use HTTP authentication, by default the username and password are sent from the client to the ASA in clear text; in addition, the username and password are sent to the destination web server as well.

The ASA provides the following methods for securing HTTP authentication:

- Enable the redirection method of authentication for HTTP—See the [“Enabling the Redirection Method of Authentication for HTTP and HTTPS”](#) section on page 8-7. This method prevents the authentication credentials from continuing to the destination server. See the [“ASA Authentication Prompts”](#) section on page 8-3 for more information about the redirection method compared to the basic method.
- Enable virtual HTTP— Virtual HTTP lets you authenticate separately with the ASA and with the HTTP server. Even if the HTTP server does not need a second authentication, this command achieves the effect of stripping the basic authentication credentials from the HTTP GET request. See the [“Authenticating HTTP\(S\) Connections with a Virtual Server”](#) section on page 8-9 for more information.
- Enable the exchange of usernames and passwords between a web client and the ASA with HTTPS—To enable the exchange of usernames and passwords between a web client and the ASA with HTTPS, perform the following steps:
  - a. In the Configuration > Firewall > AAA Rules pane, click **Advanced**. The AAA Rules Advanced Options dialog box appears.
  - b. Under Secure HTTP, click **Enable Secure HTTP**.
  - c. Click **OK**, and then click **OK** again to close the AAA Rules Advanced Options dialog box.
  - d. Click **Apply**.

This is the only method that protects credentials between the client and the ASA, as well as between the ASA and the destination server. You can use this method alone, or in conjunction with either of the other methods so you can maximize your security.

After enabling this feature, when a user requires authentication when using HTTP, the ASA redirects the HTTP user to an HTTPS prompt. After you authenticate correctly, the ASA redirects you to the original HTTP URL.

Secured, web-client authentication has the following limitations:

- A maximum of 64 concurrent HTTPS authentication sessions are allowed. If all 64 HTTPS authentication processes are running, a new connection requiring authentication will not succeed.
- When the uauth timeout is set to unlimited, HTTPS authentication might not work. If a browser initiates multiple TCP connections to load a web page after HTTPS authentication, the first connection is let through, but the subsequent connections trigger authentication. As a result, users are continuously presented with an authentication page, even if the correct username and password are entered each time. To work around this, set the uauth timeout to one second (see the Configuration > Firewall > Advanced > Global Timeouts pane). However, this workaround opens a 1-second window of opportunity that might allow unauthenticated users to go through the firewall if they are coming from the same source IP address.

Because HTTPS authentication occurs on the SSL port 443, users must not configure an access rule to block traffic from the HTTP client to the HTTP server on port 443. Furthermore, if static PAT is configured for web traffic on port 80, it must also be configured for the SSL port.

## Authenticating Directly with the ASA

If you do not want to allow HTTP, HTTPS, Telnet, or FTP through the ASA but want to authenticate other types of traffic, you can authenticate with the ASA directly using HTTP, HTTPS, or Telnet.

This section includes the following topics:

- [Authenticating HTTP\(S\) Connections with a Virtual Server, page 8-9](#)
- [Authenticating Telnet Connections with a Virtual Server, page 8-10](#)

## Authenticating HTTP(S) Connections with a Virtual Server

If you enabled the redirection method of HTTP and HTTPS authentication in the “[Configuring Network Access Authentication](#)” section on page 8-6, then you have also automatically enabled direct authentication.

When you use HTTP authentication on the ASA (see the “[Configuring Network Access Authentication](#)” section on page 8-6), the ASA uses basic HTTP authentication by default.

You can change the authentication method so that the ASA redirects HTTP connections to web pages generated by the ASA itself using the “[Enabling the Redirection Method of Authentication for HTTP and HTTPS](#)” section on page 8-7.

However, if you continue to use basic HTTP authentication, then you might need the virtual HTTP server when you have cascading HTTP authentications.

If the destination HTTP server requires authentication in addition to the ASA, then virtual HTTP lets you authenticate separately with the ASA (via a AAA server) and with the HTTP server. Without virtual HTTP, the same username and password that you used to authenticate with the ASA is sent to the HTTP

server; you are not prompted separately for the HTTP server username and password. Assuming the username and password are not the same for the AAA and HTTP servers, then the HTTP authentication fails.

This feature redirects all HTTP connections that require AAA authentication to the virtual HTTP server on the ASA. The ASA prompts for the AAA server username and password. After the AAA server authenticates the user, the ASA redirects the HTTP connection back to the original server, but it does not include the AAA server username and password. Because the username and password are not included in the HTTP packet, the HTTP server prompts the user separately for the HTTP server username and password.

For inbound users (from lower security to higher security), you must also include the virtual HTTP address as a destination interface in the access rule applied to the source interface. Moreover, you must add a static NAT rule for the virtual HTTP IP address, even if NAT is not required. An identity NAT rule is typically used (where you translate the address to itself).

For outbound users, there is an explicit permit for traffic, but if you apply an access rule to an inside interface, be sure to allow access to the virtual HTTP address. A static NAT rule is not required.

**Note**

Do not set the uauth timeout duration to 0 seconds when using virtual HTTP, because this setting prevents HTTP connections to the real web server. See the [“Configuring Global Timeouts” section on page 22-9](#).

You can authenticate directly with the ASA at the following URLs when you enable AAA for the interface:

```
http://interface_ip[:port]/netaccess/connstatus.html
https://interface_ip[:port]/netaccess/connstatus.html
```

To allow users to authenticate with the ASA virtual server separately from the HTTP server, perform the following steps:

- 
- Step 1** In the Configuration > Firewall > Advanced > Virtual Access > Virtual HTTP Server area, check the **Enable** check box.
  - Step 2** In the Virtual HTTP Server field, add the IP address of the virtual HTTP server.  
Make sure this address is an unused address that is routed to the ASA. For example, if you perform NAT for inside addresses accessing an outside server, and you want to provide outside access to the virtual HTTP server, you can use one of the global NAT addresses for the virtual HTTP server address.
  - Step 3** (Optional) If you are using text-based browsers, where redirection does not happen automatically, check the **Display redirection warning** check box. This enables an alert to notify users when the HTTP connection is being redirected.
  - Step 4** Click **Apply**.  
The virtual server is added and the changes are saved to the running configuration.
- 

## Authenticating Telnet Connections with a Virtual Server

Although you can configure network access authentication for any protocol or service (see the [“Configuring Network Access Authentication” section on page 8-6](#)), you can authenticate directly with HTTP, Telnet, or FTP only. A user must first authenticate with one of these services before other traffic

that requires authentication is allowed through. If you do not want to allow HTTP, Telnet, or FTP traffic through the ASA, but want to authenticate other types of traffic, you can configure virtual Telnet; the user Telnets to a given IP address configured on the ASA, and the ASA issues a Telnet prompt.

When an unauthenticated user connects to the virtual Telnet IP address, the user is challenged for a username and password, and then authenticated by the AAA server. After the user is authenticated, the message “Authentication Successful” appears. Then the user can successfully access other services that require authentication.

For inbound users (from lower security to higher security), you must also include the virtual Telnet address as a destination interface in the access rule applied to the source interface. In addition, you must add a static NAT rule for the virtual Telnet IP address, even if NAT is not required. An identity NAT rule is typically used (where you translate the address to itself).

For outbound users, there is an explicit permit for traffic, but if you apply an access rule to an inside interface, be sure to allow access to the virtual Telnet address. A static NAT rule is not required.

To log out from the ASA, reconnect to the virtual Telnet IP address; you are prompted to log out.

To enable direct authentication using Telnet, perform the following steps:

- 
- Step 1** In the Configuration > Firewall > Advanced > Virtual Access > Virtual Telnet Server area, check the **Enable** check box.
- Step 2** In the Virtual Telnet Server field, enter the IP address of the virtual Telnet server.
- Make sure that this address is an unused address that is routed to the ASA. For example, if you perform NAT for inside addresses accessing an outside server, and you want to provide outside access to the virtual HTTP server, you can use one of the global NAT addresses for the virtual HTTP server address.
- Step 3** Click **Apply**.
- The virtual server is added and the changes are saved to the running configuration.
- 

## Configuring the Authentication Proxy Limit

You can manually configure the uauth session limit by setting the maximum number of concurrent proxy connections allowed per user.

To set the proxy limit, perform the following steps:

- 
- Step 1** Choose **Configuration > Firewall > AAA Rules**, then click **Advanced**.
- The AAA Rules Advanced Options dialog box appears.
- Step 2** In the Proxy Limit area, check the **Enable Proxy Limit** check box.
- Step 3** In the Proxy Limit field, enter the number of concurrent proxy connections allowed per user, from 1 to 128.
- Step 4** Click **OK**, then click **Apply**.
- The changes are saved to the running configuration.
-

# Configuring Authorization for Network Access

After a user authenticates for a given connection, the ASA can use authorization to further control traffic from the user.

This section includes the following topics:

- [Configuring TACACS+ Authorization, page 8-12](#)
- [Configuring RADIUS Authorization, page 8-13](#)

## Configuring TACACS+ Authorization

You can configure the ASA to perform network access authorization with TACACS+. Authentication and authorization statements are independent; however, any unauthenticated traffic matched by an authorization rule will be denied. For authorization to succeed:

1. A user must first authenticate with the ASA.  
Because a user at a given IP address only needs to authenticate one time for all rules and types, if the authentication session has not expired, authorization can occur even if the traffic is not matched by an authentication rule.
2. After a user authenticates, the ASA checks the authorization rules for matching traffic.
3. If the traffic matches the authorization rule, the ASA sends the username to the TACACS+ server.
4. The TACACS+ server responds to the ASA with a permit or a deny for that traffic, based on the user profile.
5. The ASA enforces the authorization rule in the response.

See the documentation for your TACACS+ server for information about configuring network access authorizations for a user.

To configure TACACS+ authorization, perform the following steps:

- 
- Step 1** Enable authentication. For more information, see the [“Configuring Network Access Authentication” section on page 8-6](#). If you have already enabled authentication, continue to the next step.
  - Step 2** In the Configuration > Firewall > AAA Rules pane, choose **Add > Add Authorization Rule**.  
The Add Authorization Rule dialog box appears.
  - Step 3** In the Interface drop-down list, choose the interface for applying the rule.
  - Step 4** In the Action field, click one of the following, depending on the implementation:
    - **Authorize**
    - **Do not Authorize**
  - Step 5** In the AAA Server Group drop-down list, choose a server group. To add a AAA server to the server group, click **Add Server**.  
Only TACACS+ servers are supported.
  - Step 6** In the Source field, add the source IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.
  - Step 7** In the Destination field, enter the destination IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.

- Step 8** In the Service field, enter an IP service name or number for the destination service, or click the ellipsis (...) to choose a service.
- Step 9** (Optional) In the Description field, enter a description.
- Step 10** (Optional) Click **More Options** to do any of the following:
- To specify a source service for TCP or UDP, enter a TCP or UDP service in the Source Service field.
  - The destination service and source service must be the same. Copy and paste the Destination Service field content into the Source Service field.
  - To make the rule inactive, clear the **Enable Rule** check box.  
You may not want to remove a rule, but instead turn it off.
  - To set a time range for the rule, in the Time Range drop-down list, choose an existing time range. To add a new time range, click the ellipsis (...). For more information, see the [“Configuring Time Ranges” section on page 20-26](#) in the general operations configuration guide.
- Step 11** Click **OK**.  
The Add Authorization Rule dialog box closes, and the rule appears in the AAA Rules table.
- Step 12** Click **Apply**.  
The changes are saved to the running configuration.
- 

## Configuring RADIUS Authorization

When authentication succeeds, the RADIUS protocol returns user authorizations in the access-accept message sent by a RADIUS server. For more information about configuring authentication, see the [“Configuring Network Access Authentication” section on page 8-6](#).

When you configure the ASA to authenticate users for network access, you are also implicitly enabling RADIUS authorizations; therefore, this section contains no information about configuring RADIUS authorization on the ASA. It does provide information about how the ASA handles ACL information received from RADIUS servers.

You can configure a RADIUS server to download an ACL to the ASA or an ACL name at the time of authentication. The user is authorized to do only what is permitted in the user-specific ACL.



### Note

If you have enabled the Per User Override Setting (see the Configuration > Firewall > Access Rules > Advanced > Access Rules Advanced Options dialog box), be aware of the following effects of the per-user-override feature on authorization by user-specific ACLs:

- Without the per-user-override feature, traffic for a user session must be permitted by both the interface ACL and the user-specific ACL.
- With the per-user-override feature, the user-specific ACL determines what is permitted.

This section includes the following topics:

- [Configuring a RADIUS Server to Send Downloadable Access Control Lists, page 8-14](#)
- [Configuring a RADIUS Server to Download Per-User Access Control List Names, page 8-17](#)

## Configuring a RADIUS Server to Send Downloadable Access Control Lists

This section describes how to configure Cisco Secure ACS or a third-party RADIUS server and includes the following topics:

- [About the Downloadable ACL Feature and Cisco Secure ACS, page 8-14](#)
- [Configuring Cisco Secure ACS for Downloadable ACLs, page 8-15](#)
- [Configuring Any RADIUS Server for Downloadable ACLs, page 8-16](#)
- [Converting Wildcard Netmask Expressions in Downloadable ACLs, page 8-17](#)

### About the Downloadable ACL Feature and Cisco Secure ACS

Downloadable ACLs is the most scalable means of using Cisco Secure ACS to provide the appropriate ACLs for each user. It provides the following capabilities:

- Unlimited ACL size—Downloadable ACLs are sent using as many RADIUS packets as required to transport the full ACL from Cisco Secure ACS to the ASA.
- Simplified and centralized management of ACLs—Downloadable ACLs enable you to write a set of ACLs once and apply it to many user or group profiles and distribute it to many ASAs.

This approach is most useful when you have very large ACL sets that you want to apply to more than one Cisco Secure ACS user or group; however, its ability to simplify Cisco Secure ACS user and group management makes it useful for ACLs of any size.

The ASA receives downloadable ACLs from Cisco Secure ACS using the following process:

1. The ASA sends a RADIUS authentication request packet for the user session.
2. If Cisco Secure ACS successfully authenticates the user, Cisco Secure ACS returns a RADIUS access-accept message that includes the internal name of the applicable downloadable ACL. The Cisco IOS `cisco-av-pair` RADIUS VSA (vendor 9, attribute 1) includes the following attribute-value pair to identify the downloadable ACL set:

```
ACS: CiscoSecure-Defined-ACL=acl-set-name
```

where *acl-set-name* is the internal name of the downloadable ACL, which is a combination of the name assigned to the ACL by the Cisco Secure ACS administrator and the date and time that the ACL was last modified.

3. The ASA examines the name of the downloadable ACL and determines if it has previously received the named downloadable ACL.
  - If the ASA has previously received the named downloadable ACL, communication with Cisco Secure ACS is complete and the ASA applies the ACL to the user session. Because the name of the downloadable ACL includes the date and time that it was last modified, matching the name sent by Cisco Secure ACS to the name of an ACL previously downloaded means that the ASA has the most recent version of the downloadable ACL.
  - If the ASA has not previously received the named downloadable ACL, it may have an out-of-date version of the ACL or it may not have downloaded any version of the ACL. In either case, the ASA issues a RADIUS authentication request using the downloadable ACL name as the username in the RADIUS request and a null password attribute. In a `cisco-av-pair` RADIUS VSA, the request also includes the following attribute-value pairs:

```
AAA:service=ip-admission
AAA:event=acl-download
```

In addition, the ASA signs the request with the Message-Authenticator attribute (IETF RADIUS attribute 80).

4. After receipt of a RADIUS authentication request that has a username attribute that includes the name of a downloadable ACL, Cisco Secure ACS authenticates the request by checking the Message-Authenticator attribute. If the Message-Authenticator attribute is missing or incorrect, Cisco Secure ACS ignores the request. The presence of the Message-Authenticator attribute prevents malicious use of a downloadable ACL name to gain unauthorized network access. The Message-Authenticator attribute and its use are defined in RFC 2869, RADIUS Extensions, available at <http://www.ietf.org>.
5. If the ACL required is less than approximately 4 KB in length, Cisco Secure ACS responds with an access-accept message that includes the ACL. The largest ACL that can fit in a single access-accept message is slightly less than 4 KB, because part of the message must be other required attributes.

Cisco Secure ACS sends the downloadable ACL in a cisco-av-pair RADIUS VSA. The ACL is formatted as a series of attribute-value pairs that each include an ACE and are numbered serially:

```
ip:inacl#1=ACE-1
ip:inacl#2=ACE-2
.
.
ip:inacl#n=ACE-n

ip:inacl#1=permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
```

6. If the ACL required is more than approximately 4 KB in length, Cisco Secure ACS responds with an access-challenge message that includes a portion of the ACL, formatted as described previously, and a State attribute (IETF RADIUS attribute 24), which includes control data used by Cisco Secure ACS to track the progress of the download. Cisco Secure ACS fits as many complete attribute-value pairs into the cisco-av-pair RADIUS VSA as it can without exceeding the maximum RADIUS message size.

The ASA stores the portion of the ACL received and responds with another access-request message that includes the same attributes as the first request for the downloadable ACL, plus a copy of the State attribute received in the access-challenge message.

This process repeats until Cisco Secure ACS sends the last of the ACL in an access-accept message.

### Configuring Cisco Secure ACS for Downloadable ACLs

You can configure downloadable ACLs on Cisco Secure ACS as a shared profile component and then assign the ACL to a group or to an individual user.

The ACL definition consists of one or more ASA commands that are similar to the extended **access-list** command (see command reference), except without the following prefix:

```
access-list acl_name extended
```

The following example is a downloadable ACL definition on Cisco Secure ACS version 3.3:

```
+-----+
| Shared profile Components                               |
|                                                       |
|     Downloadable IP ACLs Content                     |
| Name:      acs_ten_acl                               |
|                                                       |
|     ACL Definitions                                  |
|                                                       |
| permit tcp any host 10.0.0.254                       |
| permit udp any host 10.0.0.254                       |
| permit icmp any host 10.0.0.254                     |
| permit tcp any host 10.0.0.253                       |
+-----+
```

```
| permit udp any host 10.0.0.253 |
| permit icmp any host 10.0.0.253 |
| permit tcp any host 10.0.0.252 |
| permit udp any host 10.0.0.252 |
| permit icmp any host 10.0.0.252 |
| permit ip any any |
+-----+-----+
```

For more information about creating downloadable ACLs and associating them with users, see the user guide for your version of Cisco Secure ACS.

On the ASA, the downloaded ACL has the following name:

```
#ACSACL#-ip-acl_name-number
```

The *acl\_name* argument is the name that is defined on Cisco Secure ACS (*acs\_ten\_acl* in the preceding example), and *number* is a unique version ID generated by Cisco Secure ACS.

The downloaded ACL on the ASA consists of the following lines:

```
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit ip any any
```

## Configuring Any RADIUS Server for Downloadable ACLs

You can configure any RADIUS server that supports Cisco IOS RADIUS VSAs to send user-specific ACLs to the ASA in a Cisco IOS RADIUS *cisco-av-pair* VSA (vendor 9, attribute 1).

In the *cisco-av-pair* VSA, configure one or more ACEs that are similar to the **access-list extended** command (see command reference), except that you replace the following command prefix:

```
access-list acl_name extended
```

with the following text:

```
ip:inacl#nnn=
```

The *nnn* argument is a number in the range from 0 to 999999999 that identifies the order of the command statement to be configured on the ASA. If this parameter is omitted, the sequence value is 0, and the order of the ACEs inside the *cisco-av-pair* RADIUS VSA is used.

The following example is an ACL definition as it should be configured for a *cisco-av-pair* VSA on a RADIUS server:

```
ip:inacl#1=permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
ip:inacl#99=deny tcp any any
ip:inacl#2=permit udp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
ip:inacl#100=deny udp any any
ip:inacl#3=permit icmp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
```

For information about making unique per user the ACLs that are sent in the *cisco-av-pair* attribute, see the documentation for your RADIUS server.

On the ASA, the downloaded ACL name has the following format:

```
AAA-user-username
```

The *username* argument is the name of the user that is being authenticated.

The downloaded ACL on the ASA consists of the following lines. Notice the order based on the numbers identified on the RADIUS server.

```
access-list AAA-user-bcham34-79AD4A08 permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list AAA-user-bcham34-79AD4A08 permit udp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list AAA-user-bcham34-79AD4A08 permit icmp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list AAA-user-bcham34-79AD4A08 deny tcp any any
access-list AAA-user-bcham34-79AD4A08 deny udp any any
```

Downloaded ACLs have two spaces between the word “access-list” and the name. These spaces serve to differentiate a downloaded ACL from a local ACL. In this example, “79AD4A08” is a hash value generated by the ASA to help determine when ACL definitions have changed on the RADIUS server.

### Converting Wildcard Netmask Expressions in Downloadable ACLs

If a RADIUS server provides downloadable ACLs to Cisco VPN 3000 series concentrators as well as to the ASA, you may need the ASA to convert wildcard netmask expressions to standard netmask expressions. This is because Cisco VPN 3000 series concentrators support wildcard netmask expressions, but the ASA only supports standard netmask expressions. Configuring the ASA to convert wildcard netmask expressions helps minimize the effects of these differences on how you configure downloadable ACLs on your RADIUS servers. Translation of wildcard netmask expressions means that downloadable ACLs written for Cisco VPN 3000 series concentrators can be used by the ASA without altering the configuration of the downloadable ACLs on the RADIUS server.

You configure ACL netmask conversion on a per-server basis when you add a server to a server group in the Configuration > Device Management > Users/AAA > AAA Server Groups > AAA Server Groups area.

### Configuring a RADIUS Server to Download Per-User Access Control List Names

To download a name for an ACL that you already created on the ASA from the RADIUS server when a user authenticates, configure the IETF RADIUS filter-id attribute (attribute number 11) as follows:

```
filter-id=acl_name
```



#### Note

In Cisco Secure ACS, the values for filter-id attributes are specified in boxes in the HTML interface, omitting **filter-id=** and entering only *acl\_name*.

For information about making the filter-id attribute value unique per user, see the documentation for your RADIUS server.

To create an ACL on the ASA, see [Chapter 21, “Using the ACL Manager,”](#) in the general operations configuration guide.

## Configuring Accounting for Network Access

The ASA can send accounting information to a RADIUS or TACACS+ server about any TCP or UDP traffic that passes through the ASA. If that traffic is also authenticated, then the AAA server can maintain accounting information by username. If the traffic is not authenticated, the AAA server can maintain

accounting information by IP address. Accounting information includes session start and stop times, username, the number of bytes that pass through the ASA for the session, the service used, and the duration of each session.

To configure accounting, perform the following steps:

- 
- Step 1** If you want the ASA to provide accounting data per user, you must enable authentication. For more information, see the [“Configuring Network Access Authentication” section on page 8-6](#). If you want the ASA to provide accounting data per IP address, enabling authentication is not necessary and you can continue to the next step.
- Step 2** In the Configuration > Firewall > AAA Rules pane, choose **Add > Add Accounting Rule**.  
The Add Accounting Rule dialog box appears.
- Step 3** In the Interface drop-down list, choose the interface for applying the rule.
- Step 4** In the Action field, click one of the following, depending on the implementation:
- **Account**
  - **Do not Account**
- Step 5** In the AAA Server Group drop-down list, choose a server group. To add a AAA server to the server group, click **Add Server**.
- Step 6** In the Source field, enter the source IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.
- Step 7** In the Destination field, enter the destination IP address, or click the ellipsis (...) to choose an IP address already defined in ASDM.
- Step 8** In the Service field, enter an IP service name or number for the destination service, or click the ellipsis (...) to choose a service.
- Step 9** (Optional) In the Description field, enter a description.
- Step 10** (Optional) Click **More Options** to do any of the following:
- To specify a source service for TCP or UDP, enter a TCP or UDP service in the Source Service field.
  - The destination service and source service must be the same. Copy and paste the Destination Service field content to the Source Service field.
  - To make the rule inactive, clear the **Enable Rule** check box.  
You may not want to remove a rule, but instead turn it off.
  - To set a time range for the rule, In the Time Range drop-down list, choose an existing time range. To add a new time range, click the ellipsis (...). For more information, see the [“Configuring Time Ranges” section on page 20-26](#) in the general operations configuration guide.
- Step 11** Click **OK**.  
The Add Accounting Rule dialog box closes and the rule appears in the AAA Rules table.
- Step 12** Click **Apply**.  
The changes are saved to the running configuration.
- 

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 connect through the ASA. (The Telnet server enforces authentication, too; the ASA prevents unauthorized users from attempting to access the server.)

## Using MAC Addresses to Exempt Traffic from Authentication and Authorization

The ASA can exempt from authentication and authorization any traffic from specific MAC addresses.

For example, if the ASA authenticates TCP traffic originating on a particular network but you want to allow unauthenticated TCP connections from a specific server, you would use a MAC exempt rule to exempt from authentication and authorization any traffic from the server specified by the rule. This feature is particularly useful to exempt devices such as IP phones that cannot respond to authentication prompts.

The order of entries matters, because the packet uses the first entry it matches, instead of a best match scenario. If you have a **permit** entry, and you want to deny an address that is allowed by the **permit** entry, be sure to enter the **deny** entry before the **permit** entry.

To use MAC addresses to exempt traffic from authentication and authorization, perform the following steps:

- 
- Step 1** In the Configuration > Firewall > AAA Rules pane, choose **Add > Add MAC Exempt Rule**.  
The Add MAC Exempt Rule dialog box appears.
- Step 2** In the Action drop-down list, click one of the following options, depending on the implementation:
- **MAC Exempt**
  - **No MAC Exempt**
- The MAC Exempt option allows traffic from the MAC address without having to authenticate or authorize. The No MAC Exempt option specifies a MAC address that is not exempt from authentication or authorization. You might need to add a **deny** entry if you permit a range of MAC addresses using a MAC address mask such as ffff.fff.0000, and you want to force a MAC address in that range to be authenticated and authorized.
- Step 3** In the MAC Address field, specify the source MAC address in 12-digit hexadecimal form; that is, nnnn.nnnn.nnnn.
- Step 4** In the MAC Mask field, specify the portion of the MAC address that should be used for matching. For example, ffff.fff.fff matches the MAC address exactly. ffff.fff.0000 matches only the first 8 digits.
- Step 5** Click **OK**.  
The Add MAC Exempt Rule dialog box closes and the rule appears in the AAA Rules table.
- Step 6** Click **Apply**.  
The changes are saved to the running configuration.
-

## Feature History for AAA Rules

Table 8-1 lists each feature change and the platform release in which it was implemented. ASDM is backwards-compatible with multiple platform releases, so the specific ASDM release in which support was added is not listed.

**Table 8-1** Feature History for AAA Rules

Feature Name	Platform Releases	Feature Information
AAA Rules	7.0(1)	AAA Rules describe how to enable AAA for network access.  We introduced the following screens: Configuration > Firewall > AAA Rules Configuration > Firewall > Advanced > Virtual Access.
Authentication using Cut-Through Proxy	9.0(1)	You can authenticate using AAA rules in conjunction with the Identity Firewall feature.