CHAPTER 8

Configuring SSL

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This topic describes the steps required to configure your ACE (both the ACE module and the ACE appliance) as a virtual Secure Sockets Layer (SSL) server for SSL initiation or termination. The topics included in this section are:

SSL Overview

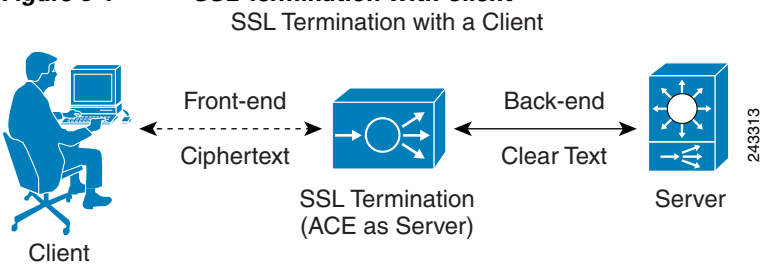
SSL is an application-level protocol that provides encryption technology for the Internet, ensuring secure transactions such as the transmission of credit card numbers for e-commerce Web sites. SSL initiation occurs when the ACE device (either an ACE module or an ACE appliance) acts as a client and initiates the SSL session between it and the SSL server. SSL termination occurs when the ACE, acting as an SSL server, terminates an SSL connection from a client and then establishes a TCP connection to an HTTP server.

SSL provides the secure transaction of data between a client and a server through a combination of privacy, authentication, and data integrity. SSL relies upon certificates and private-public key exchange pairs for this level of security.

Figure 8-1 shows the following network connections in which the ACE terminates the SSL connection with the client:

- Client to ACE—SSL connection between a client and the ACE acting as an SSL proxy server
- ACE to Server—TCP connection between the ACE and the HTTP server

Figure 8-1 SSL Termination with Client



The ACE uses parameter maps, SSL proxy services, and class maps to build the policy maps that determine the flow of information between the client, the ACE, and the server. SSL termination is a Layer 3 and Layer 4 application because it is based on the destination IP addresses of the inbound traffic flow from the client. For this type of application, you create a Layer 3 and Layer 4 policy map that the ACE applies to the inbound traffic.

If you need to delete any of the SSL objects (authorization groups, chain groups, parameter maps, keys, CRLs, or certificates), you must remove the dependency from within the proxy service first before removing the SSL object.

Before configuring the ACE for SSL, see SSL Configuration Prerequisites, page 8-2.

SSL Configuration Prerequisites

Before configuring your ACE for SSL operation, you must first ensure:

- Your ACE hardware is configured for server load balancing (SLB).

Note During the real server and server farm configuration process, when you associate a real server with a server farm, ensure that you assign an appropriate port number for the real server. The default behavior by the ACE is to automatically assign the same destination port that was used by the inbound connection to the outbound server connection if you do not specify a port.

- Your policy map is configured to define the SSL session parameters and client/server authentication tools, such as the certificate and RSA key pair.
- Your class map is associated with the policy map to define the virtual SSL server IP address that the destination IP address of the inbound traffic must match.
- You must import a digital certificate and its corresponding public and private key pair to the desired ACE context.
- At least one SSL certificate is available.
- If you do not have a certificate and corresponding key pair, you can generate an RSA key pair and a *certificate signing request* (CSR). Create a CSR when you need to apply for a certificate from a *certificate authority* (CA). The CA signs the CSR and returns the authorized digital certificate to you.

Note You cannot generate a CSR in Building Blocks (**Config > Global > All Building Blocks**); SSL CSR generation is available only in virtual context configuration.

Summary of SSL Configuration Steps

Table 8-1 describes the steps for using SSL keys and certificates.

Table 8-1 SSL Key and Certificate Procedure Overview

Task	Description
Create an SSL parameter map.	Create an SSL parameter map to specify the options that apply to SSL sessions such as the method to be used to close SSL connections, the cipher suite, and version of SSL or TSL. See Configuring SSL Parameter Maps, page 8-16.
Create an SSL key pair file.	Create an SSL RSA key pair file to generate a CSR, create a digital signature, and encrypt packet data during the SSL handshake with an SSL peer. See Generating SSL Key Pairs, page 8-11.
Configure CSR parameters.	Set CSR parameters to define the distinguished name attributes of a CSR. See Configuring SSL CSR Parameters, page 8-20.
Create a CSR.	Create a CSR to submit with the key pair file when you apply for an SSL certificate. See Generating CSRs, page 8-21.
Copy and paste the CSR into the Certificate Authority (CA) Web-based application or e-mail the CSR to the CA.	Using the SSL key pair and CSR, apply for an approved certificate from a Certificate Authority. Use the method specified by the CA for submitting your request.
Save the approved certificate from the CA in its received format on an FTP, SFTP, or TFTP server.	When you receive the approved certificate, save it in the format in which it was received on a network server accessible via FTP, SFTP, or TFTP.
Import the approved certificate and key pair into the desired virtual context.	Import the approved certificate and the associated SSL key pair into the appropriate context using ANM. See: • Importing SSL Certificates, page 8-6 • Importing SSL Key Pairs, page 8-9
Confirm that the public key in the key pair file matches the public key in the certificate file.	Examine the contents of the files to confirm that the key pair information is the same in both the key pair file and the certificate file.
Configure the virtual context for SSL.	See Configuring Traffic Policies, page 11-1.

Table 8-1 SSL Key and Certificate Procedure Overview (continued)

Task	Description
Configure authorization group.	Create a group of certificates that are trusted as certificate signers by creating an authentication group. See Configuring SSL Authentication Groups, page 8-24.
Configure CRL.	See Configuring CRLs for Client Authentication, page 8-26.

For more information about using SSL with ACE, see the *Cisco 4700 Series Application Control Engine Appliance SSL Configuration Guide* or *Cisco Application Control Engine Module SSL Configuration Guide*.

SSL Setup Sequence

The SSL setup sequence provides detailed instructions with illustrations for configuring SSL on ACE devices from ANM (Figure 8-2). The purpose of this option is to provide a visual guide for performing typical SSL operations, like SSL CSR generation, SSL proxy creation, and so on. This option does not replace any existing SSL functions or configuration screens already present in ANM. It is only intended as an additional guide for anyone unfamiliar or unclear with the SSL operations that need to be performed on the ACE device. From the SSL setup sequence, you are allowed to configure all SSL operations, without duplicating the edit/delete/table/view operations that the other SSL configuration screens provide.

The purpose of this option is to provide details about typical SSL flows and the operations involved in doing typical SSL operations, including the following:

- SSL Import/Create Keys
- SSL Import Certificates
- SSL CSR generation
- SSL proxy creation

For more information on SSL configuration features, see Summary of SSL Configuration Steps.

Figure 8-2 SSL Setup Sequence

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19

- Configuring SSL Proxy Service, page 8-22

Using SSL Certificates

Digital certificates and key pairs are a form of digital identification for user authentication. Certificate Authorities issue certificates that attest to the validity of the public keys they contain. A client or server certificate includes the following identification attributes:

- Name of the Certificate Authority and Certificate Authority digital signature
- Name of the client or server (the certificate subject) that the certificate authenticates
- Issuer
- Time stamps that indicate the certificate's start date
- Time stamps that indicate the certificate's expiration date
- CA certificate

A Certificate Authority has one or more signing certificates that it uses for creating SSL certificates and certificate revocation lists (CRL). Each signing certificate has a matching private key that is used to create the Certificate Authority signature. The Certificate Authority makes the signing certificates (with the public key embedded) available to the public, enabling anyone to access and use the signing certificates to verify that an SSL certificate or CRL was actually signed by a specific Certificate Authority.

Note The ACE supports the creation of a maximum of four CRLs for any context.

All certificates have an expiration date, usually one year after the certificate was issued. You can monitor certificate expiration status by going to **Monitor > Alarm Notifications > Threshold Groups**. ANM will issue a warning email daily before the certificate expiration date (See Configuring Alarm Notifications, page 14-27). You establish how many days before the expiration date that the warning email messages begin in the Threshold Groups settings page.

Step 1 Select **Monitor > Alarm Notifications > Threshold Groups**, then click **Add**.

ACE require certificates and corresponding key pairs for:

- SSL Termination—The ACE acts as an SSL proxy server and terminates the SSL session between it and the client. For SSL termination, you must obtain a server certificate and corresponding key pair.
- SSL Initiation—The ACE acts as a client and initiates the SSL session between it and the SSL server. For SSL initiation, you must obtain a client certificate and corresponding key pair.

Related Topics

- Configuring SSL, page 8-1
- Exporting SSL Certificates, page 8-13
- Importing SSL Certificates, page 8-6
- Using SSL Keys, page 8-8
- Importing SSL Key Pairs, page 8-9
- Configuring SSL CSR Parameters, page 8-20

- Generating CSRs, page 8-21

Importing SSL Certificates

Use this procedure to import SSL certificates.

Assumptions

- You have configured the ACE for server load balancing. (See Load Balancing Overview, page 4-1.)
- You have obtained an SSL certificate from a certificate authority (CA) and have placed it on a network server accessible by the ACE.

Note You cannot import SSL certificates in Building Blocks (**Config > Global > All Building Blocks**); SSL certificate imports are available only in virtual context configuration.

Procedure

Step 1 To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Certificates**.

The Certificates table appears, listing any valid SSL certificates.

Step 2 To import a single SSL certificate, click **Import**. The Import dialog box appears.

Step 3 Enter the applicable information in Table 8-2.

Table 8-2 SSL Certificate Management Import Attributes

Field	Description
Protocol	Specify the method to be used for accessing the network server: • FTP—Indicates that FTP is to be used to access the network server when importing the SSL certificate. • SFTP—Indicates that SFTP is to be used to access the network server when importing the SSL certificate. • TERMINAL—Indicates that you will import the file using cut and paste by pasting the certificate information to the terminal display. You can use the terminal method to display only PEM files, which are in ASCII format. • TFTP—Indicates that TFTP is to be used to access the network server when importing the SSL certificate.
IP Address	This field appears for FTP, TFTP, and SFTP. Enter the IP address of the remote server on which the SSL certificate file resides.
Remote File Name	This field appears for SSL certificate importing and FTP, TFTP, and SFTP. Enter the directory and filename of the single certificate file on the network server.
Local File Name	Enter the filename to be used for the SSL certificate file when it is imported to the ACE.

Table 8-2 SSL Certificate Management Import Attributes (continued)

Field	Description
User Name	This field appears for FTP and SFTP. Enter the name of the user account on the network server.
Password	This field appears for FTP and SFTP. Enter the password for the user account on the network server.
Confirm	This field appears for FTP and SFTP. Reenter the password.
Passphrase	This field appears for FTP, SFTP, and TERMINAL. Enter the passphrase that was created with the file. Without this phrase, you cannot use the file. Passphrases are used only with encrypted PEM and PKCS files.
Confirm	This field appears for FTP, SFTP, and TERMINAL. Reenter the passphrase.
Non-Exportable	The ability to export SSL certificates allows you to copy signed certificates to another server on your network so that you can then import them onto another ACE or Web server. Exporting is similar to copying in that the original files are not deleted. Check the check box to indicate that this certificate file cannot be exported from the ACE.
Import Text	This field appears for Terminal. Cut the certificate information from the remote server and paste it into this field.

Step 4 Click:

- **OK** to accept your entries and to return to the Certificates table. ANM updates the Certificates table with the newly installed certificate.
- **Cancel** to exit this procedure without saving your entries and to return to the Certificates table.

Related Topics

- Configuring SSL, page 8-1
- Using SSL Keys, page 8-8
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Using SSL Keys

The ACE and its peer use a public key cryptographic system named Rivest, Shamir, and Adelman Signatures (RSA) for authentication during the SSL handshake to establish an SSL session. The RSA system uses *key pairs* that consist of a public key and a corresponding private (secret) key. During the handshake, the RSA key pairs encrypt the session key that both devices will use to encrypt the data that follows the handshake.

Use this procedure to view options for working with SSL and SSL keys.

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Keys**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > Keys**.

The Keys table appears.

Step 2 Continue with one of the following options:

- Generate a key pair—See Generating SSL Key Pairs, page 8-11.
- Import a key pair—See Importing SSL Key Pairs, page 8-9.
- Export a key pair—See Exporting SSL Key Pairs, page 8-14.
- Generate a CSR—See Generating CSRs, page 8-21.

Related Topics

- Generating SSL Key Pairs, page 8-11
- Importing SSL Key Pairs, page 8-9
- Generating SSL Key Pairs, page 8-11

- Exporting SSL Key Pairs, page 8-14
- Configuring SSL, page 8-1

Importing SSL Key Pairs

Use this procedure to import an SSL key pair file.

Assumptions

- You have configured the ACE for server load balancing. (See Load Balancing Overview, page 4-1.)
- You have obtained an SSL key pair from a certificate authority (CA) and have placed the pair on a network server accessible by the ACE.

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Keys**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > Keys**.

The Keys table appears, listing existing SSL keys.

Step 2 To import a single SSL key pair, click **Import**. The Import dialog box appears.

Step 3 Enter the information in Table 8-3.

Table 8-3 SSL Key Pair Import Attributes

Field	Description
Protocol	Specify the method to be used for accessing the network server: • FTP—Indicates that FTP is to be used to access the network server when importing the SSL key pair file. • SFTP—Indicates that SFTP is to be used to access the network server when importing the SSL key pair file. • TERMINAL—Indicates that you will import the file using cut and paste by pasting the certificate and key pair information to the terminal display. You can use the terminal method to display only PEM files, which are in ASCII format. • TFTP—Indicates that TFTP is to be used to access the network server when importing the SSL key pair file.
IP Address	This field appears for FTP, TFTP, and SFTP. Enter the IP address of the remote server on which the SSL key pair file resides.
Remote File Name	This field appears for SSL key pair importing and FTP, TFTP, and SFTP. Enter the directory and filename of the key pair file on the network server.
Local File Name	Enter the filename to be used for the SSL key pair file when it is imported to the ACE.

Table 8-3 SSL Key Pair Import Attributes (continued)

Field	Description
User Name	This field appears for FTP and SFTP. Enter the name of the user account on the network server.
Password	This field appears for FTP and SFTP. Enter the password for the user account on the network server.
Confirm	This field appears for FTP, SFTP, and TERMINAL. Reenter the password.
Passphrase	This field appears for FTP, SFTP, and TERMINAL. Enter the passphrase that was created with the file. Without this phrase, you cannot use the file. Passphrases are used only with encrypted PEM and PKCS files.
Confirm	This field appears for FTP and SFTP. Reenter the passphrase.
Non-Exportable	The ability to export SSL key pair files allows you to copy key pair files to another server on your network so that you can then import them onto another ACE or Web server. Exporting is similar to copying in that the original files are not deleted. Check the check box to indicate that this key pair file cannot be exported from the ACE. Clear the check box to indicate that this key pair file can be exported from the ACE.
Import Text	This field appears for Terminal. Cut the key pair information from the remote server and paste it into this field.

Step 4 Click:

- **OK** to accept your entries and to return to the Keys table. ANM updates the Keys table with the imported key pair file information.
- **Cancel** to exit this procedure without saving your entries and to return to the Keys table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Generating SSL Key Pairs

If you do not have any matching key pairs, you can use ANM to generate a key pair.

Use this procedure to generate SSL RSA key pairs.

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Keys**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > Keys**.

The Keys table appears.

Step 2 Click **Add** to add a new key pair. The Keys configuration screen appears.

Note You cannot modify an existing entry in the Keys table. Instead, delete the existing entry, then add a new one.

Step 3 Enter the information in Table 8-4.

Table 8-4 Key Attributes

Field	Description
Name	Enter the name of the SSL key pair. Valid entries are alphanumeric strings up to 64 characters.
Size (Bits)	Select the key pair security strength. The number of bits in the key pair file defines the size of the RSA key pair used to secure Web transactions. Longer keys produce more secure implementations by increasing the strength of the RSA security policy. Options and their relative levels of security are: • 512—Least security • 768—Normal security • 1024—High security, level 1 • 1536—High security, level 2 • 2048—High security, level 3
Type	RSA is a public-key cryptographic system used for authentication.
Exportable Key	Check the check box to indicate that the key pair file can be exported. Clear the check box to indicate that the key pair file cannot be exported.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit this procedure without saving your entries and to return to the Keys table.
- **Next** to deploy your entries and to define another RSA key pair.

After generating an RSA key pair, you can:

- Create a CSR parameter set. The CSR parameter set defines the distinguished name attributes for the ACE to use during the CSR-generating process. For details on defining a CSR parameter set, see the Configuring SSL CSR Parameters, page 8-20.
- Generate a CSR for the RSA key pair file and transfer the CSR request to the certificate authority for signing. This provides an added layer of security because the RSA private key originates directly within the ACE and does not have to be transported externally. Each generated key pair must be accompanied by a corresponding certificate to work. For details on generating a CSR, see Generating CSRs, page 8-21.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Exporting SSL Certificates

The ability to export SSL certificates allows you copy signed certificates to another server on your network so that you can then import them onto another ACE or Web server. Exporting certificates is similar to copying in that the original certificates are not deleted.

Use this procedure to export SSL certificates from the ACE to a remote server.

Assumption

The SSL certificate can be exported. (See Importing SSL Certificates, page 8-6.)

Note You cannot export an SSL certificate in Building Blocks (**Config > Global > All Building Blocks**); SSL certificate export is available only in virtual context configuration.

Procedure

Step 1 To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Certificates**.

The Certificates table appears, listing any valid SSL certificates.

Step 2 Select the certificate you want to export, then click **Export**. The Export dialog box appears.

Step 3 Enter the information in Table 8-5.

Table 8-5 SSL Certificate Export Attributes

Field	Description
Protocol	Specify the method to be used for exporting the SSL certificate: • FTP—Indicates that FTP is to be used to access the network server when exporting the SSL certificate. • SFTP—Indicates that SFTP is to be used to access the network server when exporting the SSL certificate. • TERMINAL—Indicates that you will export the certificate using cut and paste by pasting the certificate and key pair information to the terminal display. You can use the terminal method to display only PEM files, which are in ASCII format. • TFTP—Indicates that TFTP is to be used to access the network server when exporting the SSL certificate.
IP Address	This field appears for FTP, TFTP, and SFTP. Enter the IP address of the remote server to which the SSL certificate file is to be exported.
Remote File Name	This field appears for FTP, TFTP, and SFTP. Enter the directory and filename to be used for the SSL certificate file on the remote network server.
User Name	This field appears for FTP and SFTP. Enter the name of the user account on the remote network server.

Table 8-5 SSL Certificate Export Attributes (continued)

Field	Description
Password	This field appears for FTP and SFTP. Enter the password for the user account on the remote network server.
Confirm	This field appears for FTP and SFTP. Reenter the password.

Step 4 Click:

- **OK** to export the certificate and to return to the Certificates table.
- **Cancel** to exit this procedure without exporting the certificate and to return to the Certificates table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Generating SSL Key Pairs, page 8-11
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Exporting SSL Key Pairs

The ability to export SSL key pairs allows you copy SSL key pair files to another server on your network so that you can then import them onto another ACE or Web server. Exporting key pair files is similar to copying in that the original key pairs are not deleted.

Use this procedure to export SSL key pairs from the ACE to a remote server.

Assumption

The SSL key pair can be exported (see Generating SSL Key Pairs, page 8-11).

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Keys**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > Keys**.

The Keys table appears.

Step 2 Select the key entry you want to export, then click **Export**. The Export dialog box appears.

Step 3 Enter the information in Table 8-6.

Table 8-6 SSL Key Export Attributes

Field	Description
Protocol	Specify the method to be used for exporting the SSL key pair: • FTP—Indicates that FTP is to be used to access the network server when exporting the SSL key pair. • SFTP—Indicates that SFTP is to be used to access the network server when exporting the SSL key pair. • TERMINAL—Indicates that you will export the key pair using cut and paste by pasting the key pair information to the terminal display. You can use the terminal method to display only PEM files, which are in ASCII format. • TFTP—Indicates that TFTP is to be used to access the network server when exporting the SSL key pair.
IP Address	This field appears for FTP, TFTP, and SFTP. Enter the IP address of the remote server to which the SSL key pair is to be exported.
Remote File Name	This field appears for FTP, TFTP, and SFTP. Enter the directory and filename to be used for the SSL key pair file on the remote network server.
User Name	This field appears for FTP and SFTP. Enter the name of the user account on the remote network server.
Password	This field appears for FTP and SFTP. Enter the password for the user account on the remote network server.
Confirm	This field appears for FTP and SFTP. Reenter the password.

Step 4 Click:

- **OK** to export the key pair and to return to the Keys table.
- **Cancel** to exit this procedure without exporting the key pair and to return to the Keys table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Generating SSL Key Pairs, page 8-11
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Configuring SSL Parameter Maps

An SSL parameter map defines the SSL session parameters that the ACE applies to an SSL proxy service. SSL parameter maps let you apply the same SSL session parameters to different proxy services.

Use this procedure to create SSL parameter maps.

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > Parameter Map**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > Parameter Map**.

The Parameter Map table appears.

Step 2 Click **Add** to add a new SSL parameter map, or choose an existing entry to modify, then click **Edit**. The Parameter Map configuration screen appears.

Step 3 Enter the information in Table 8-7.

Table 8-7 SSL Parameter Map Attributes

Field	Description
Name	Enter a unique name for the parameter map. Valid entries are alphanumeric strings with a maximum of 64 characters.
Queue Delay Timeout (Milliseconds)	Sets the amount of time (in milliseconds) to wait before emptying the queued data for encryption. If disabled (set to 0), the ACE module encrypts the data from the server as soon as it arrives and then sends the encrypted data to the client. **Note** The Queue Delay Timeout is only applied to data that the SSL module sends to the client. This avoids a potentially long delay in passing a small HTTP GET to the real server.
Session Cache Timeout (Milliseconds)	Allows the ACE module to reuse the master key on subsequent connections with the client, which can speed up the SSL negotiation process. Specifies a timeout value of an SSL session ID to remain valid before the ACE module requires the full SSL handshake to establish a new SSL session. Specifying 0 causes the ACE module to implement a least recently used (LRU) timeout policy. By disabling this option (with the **no** command), the full SSL handshake occurs for each new connection with the ACE module.
Reject Expired CRLs	Configures whether expired CRLs can be used. If checked, no expired CRLs are allowed.

Table 8-7 SSL Parameter Map Attributes (continued)

Field	Description
Close Protocol Behavior	Select the method to be used to close the SSL connection. The default is None; allowed options are None and Disabled. • Disabled—Indicates that the ACE is to send a close-notify alert message to the SSL peer; however, the SSL peer does not expect a close-notify alert before removing the session. Whether the SSL peer sends a close-notify alert message or not, the session information is preserved, allowing session resumption for future SSL connections. • None—Indicates that the ACE is not to send a close-notify alert message to the SSL peer, nor does the ACE expect a close-notify alert message from the peer. The ACE preserves the session information so that SSL resumption can be used for future SSL connections. **Note** Where ACE 1.0 is already configured with the Strict option, ANM interprets it as the option None. This is due to the change in ACE 1.0 configuration (which no longer allows the Strict option).
SSL Version	Enter the version of SSL be to used during SSL communications: • All—Indicates that the ACE is to use both SSL v3 and TLS v1 in its communications with peer ACE. • SSL3—Indicates that the ACE is to use only SSL v3 in its communications with peer ACE. • TLS1—Indicates that the ACE is to use only TLS v1 in its communications with peer ACE.
Ignore Authentication Failure	**Note** This is applicable to ACE 2.0 modules versions 3.0(0)A2(1.1) forward, and ACE 4710 devices running image A3(1.0). This feature is *not applicable* to ACE 2.0 modules 3.0(0)A2(1.0a)/ACE 4710 devices A1(7x) and earlier releases. If checked, this feature enables the ACE to ignore expired or invalid server certificates and to continue setting up the back-end connection in an SSL initiation configuration. This command allows the ACE to ignore the following nonfatal errors with respect to server certificates: • Certificate not yet valid • Certificate has expired • Unable to get issuer certificate • Certificate revoked

Step 4 In the Parameter Map Cipher table, click **Add** to add a cipher, or choose an existing cipher, then click **Edit**.

Step 5 Enter the information in Table 8-8.

Table 8-8 SSL Parameter Map Cipher Configuration Attributes

Field	Description
Cipher Name	Select the cipher you want to use. For more information on the SSL cipher suites that ACE supports, see *Cisco 4700 Series Application Control Engine Appliance SSL Configuration Guide* or *Cisco Application Control Engine Module SSL Configuration Guide*.
Cipher Priority	Enter the priority you want to assign to this cipher suite. The priority indicates the cipher's preference for use. Valid entries are integers from 1 to 10 with 1 indicating the least preferred and 10 indicating the most preferred. When determining which cipher suite to use, the ACE chooses the cipher suite with the highest priority.

Step 6 On the Parameter Map Cipher table, click:

- **Deploy Now** to deploy the Parameter Map Cipher on the ACE.
- **Cancel** to exit the procedure without saving your entries and to return to the Parameter Map Cipher table.
- **Next** to deploy your entries and to add another entry to the Parameter Map Cipher table.

Step 7 On the Parameter Map table, click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit the procedure without saving your entries and to return to the Parameter Map table.
- **Next** to deploy your entries and to add another entry to the Parameter Map table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Generating SSL Key Pairs, page 8-11
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20
- Configuring SSL Proxy Service, page 8-22

Configuring SSL Chain Group Parameters

A chain group specifies the *certificate chains* that the ACE sends to its peer during the handshake process. A certificate chain is a hierarchal list of certificates that includes the ACE's certificate, the root certificate authority certificate, and any intermediate certificate authority certificates. Using the information provided in a certificate chain, the certificate verifier searches for a trusted authority in the certificate hierarchal list up to and including the root certificate authority. If the verifier finds a trusted authority before reaching the root certificate authority certificate, it stops searching further.

Use this procedure to configure certificate chains for a virtual context.

Assumption

At least one SSL certificate is available.

Procedure

Step 1 Select **Config > Devices >** *context* **> SSL > Chain Group Parameters**. The Chain Group Parameters table appears.

Step 2 Click **Add** to add a new chain group, or choose an existing chain group, then click **Edit** to modify it. The Chain Group Parameters configuration screen appears.

Step 3 In the Name field, enter a unique name for the chain group. Valid entries are alphanumeric strings with a maximum of 64 characters.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE. The updated Chain Group Parameters screen appears along with the Chain Group Certificates table. Continue with Step 5.
- **Cancel** to exit the procedure without saving your entries and to return to the Chain Group Parameters table.
- **Next** to deploy your entries and to add another entry to the Chain Group Parameters table.

Step 5 In the Chain Group Certificates table, click **Add** to add an entry. The Chain Group Certificates configuration screen appears.

Note You cannot modify an existing entry in the Chain Group Certificates table. Instead, delete the entry, then add a new one.

Step 6 In the Certificate Name field, choose the certificate to add to this chain group.

Step 7 Click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit the procedure without saving your entries and to return to the Chain Group Certificates table.
- **Next** to deploy your entries and to add another certificate to this chain group table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6

Configuring SSL CSR Parameters

A *certificate signing request* (CSR) is a message you send to a certificate authority such as VeriSign and Thawte to apply for a digital identity certificate. The CSR contains information that identifies the SSL site, such as location and a serial number, and a public key that you choose. A corresponding private key is not included in the CSR, but is used to digitally sign the request. The CSR may be accompanied by other credentials or proofs of identity required by the certificate authority, and the certificate authority may contact the applicant for more information.

If the request is successful, the certificate authority returns a digitally signed (with the private key of the certificate authority) identity certificate.

CSR parameters define the *distinguished name* attributes the ACE applies to the CSR during the CSR-generating process. These attributes provide the certificate authority with the information it needs to authenticate your site. Defining a CSR parameter set lets you to generate multiple CSRs with the same distinguished name attributes.

Each context on the ACE can contain up to eight CSR parameter sets.

Use this procedure to define the distinguished name attributes for SSL CSRs.

Procedure

Step 1 Select the item to configure:

- To configure a virtual context, choose **Config > Devices >** *context* **> SSL > CSR Parameters**.
- To configure a building block, choose **Config > Global >** *building_block* **> SSL > CSR Parameters**.

The CSR Parameters table appears.

Step 2 Click **Add** to add new set of CSR attributes, or choose an existing entry to modify, then click **Edit**. The CSR Parameters configuration screen appears.

Step 3 Enter the information in Table 8-9.

Table 8-9 SSL CSR Parameter Attributes

Field	Description
Name	Enter a unique name for this parameter set. Valid entries are alphanumeric strings with a maximum of 64 characters.
Country	Enter the name of the country where the SSL site resides. Valid entries are 2 alphabetic characters representing the country, such as *US* for the United States. The International Organization for Standardization (ISO) maintains the complete list of valid country codes on its Web site (www.iso.org).
State	Enter the name of the state or province where the SSL site resides.

Table 8-9 SSL CSR Parameter Attributes (continued)

Field	Description
Locality	Enter the name of the city where the SSL site resides.
Common Name	Enter the name of the domain or host of the SSL site. Valid entries are strings with a maximum of 64 characters. Special characters are allowed.
Serial Number	Enter a serial number to assign to the certificate. Valid entries are alphanumeric strings with a maximum of 16 characters.
Organization Name	Enter the name of the organization to include in the certificate. Valid entries are alphanumeric strings with a maximum of 64 characters.
Email	Enter the site e-mail address. Valid entries are text strings, including alphanumeric and special characters (for example, @ symbol in email address) with a maximum of 40 characters.
Organization Unit	Enter the name of the organization to include in the certificate. Valid entries are alphanumeric strings with a maximum of 64 characters.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit this procedure without saving your entries and to return to the CSR Parameters table.
- **Next** to deploy your entries and to define another set of CSR attributes.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL Proxy Service, page 8-22

Generating CSRs

A *certificate signing request* (CSR) is a message you send to a certificate authority such as VeriSign and Thawte to apply for a digital identity certificate. Create a CSR when you need to apply for a certificate from a certificate authority. When the certificate authority approves a request, it signs the CSR and returns the authorized digital certificate to you. This certificate includes the private key of the certificate authority. When you receive the authorized certificate and key pair, you can import them for use (see Importing SSL Certificates, page 8-6 and Importing SSL Key Pairs, page 8-9).

Use this procedure to generate SSL CSRs.

Note You cannot generate a CSR in Building Blocks (**Config > Global > All Building Blocks**); SSL CSR generation is available only in virtual context configuration.

Assumption

You have configured SSL CSR parameters (see Configuring SSL CSR Parameters, page 8-20).

Procedure

Step 1 Select **Config > Devices >** *context* **> SSL > Keys**. The Keys table appears.

Step 2 Select a key in the table, and then click **Generate CSR**. The Generate a Certificate Signing Request dialog box appears.

Step 3 In the CSR Parameter field, choose the CSR parameter to be used.

Step 4 Click:

- **OK** to generate the CSR. The CSR appears in a popup window which you can now submit to a certificate authority for approval. Work with your certificate authority to determine the method of submission, such as e-mail or a Web-based application. Click **Close** to close the popup window and to return to the Keys table.
- **Cancel** to exit this procedure without generating the CSR and to return to the Keys table.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL Proxy Service, page 8-22

Configuring SSL Proxy Service

SSL proxy service defines the SSL parameter map, key pair, certificate, and chain group the ACE uses during SSL handshakes. By configuring an SSL proxy *server* service on the ACE, the ACE can act as an SSL server.

Use this procedure to define the attributes that the ACE is to use during SSL handshakes so that it can act as an SSL server.

Assumption

You have configured at least one SSL key pair, certificate, chain group, or parameter map to apply to this proxy service.

Procedure

Step 1 Select **Config > Devices >** *context* **> SSL > Proxy Service**. The Proxy Service table appears.

Step 2 Click **Add** to add a new proxy service, or choose an existing service, then click **Edit** to modify it. The Proxy Service configuration screen appears.

Step 3 Enter the information in Table 8-10.

Table 8-10 SSL Proxy Service Attributes

Field	Description
Proxy Service Name	Enter a unique name for this proxy service. Valid entries are alphanumeric strings with a maximum of 40 to 65 characters, depending on your module and hardware version.
Keys	Select the key pair that the ACE is to use during the SSL handshake for data encryption.
Certificates	Select the certificate that the ACE is to use during the SSL handshake to prove its identity.
Chain Groups	Select the chain group that the ACE is to use during the SSL handshake. To create a chain group, see Configuring SSL Chain Group Parameters, page 8-19.
Auth Groups	Select the authorization group name that the ACE is to use during the SSL handshake. To create an authorization group, see Configuring SSL Authentication Groups, page 8-24.
CRL Best-Effort	Displays only when Auth Groups is selected. Allows ANM to search client certificates for the service to determine if it contains a CRL in the extension. ANM then retrieves the value, if it exists.
CRL Name	Name of the CRL.
Parameter Maps	Select the SSL parameter map to associate with this SSL proxy server service.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit this procedure without saving your entries and to return to the Proxy Service table.
- **Next** to deploy your entries and to add another proxy service.
- **Delete** to remove this configuration on the ACE.

Note When an authorization group is deleted, the CRL Name object (if it exists) is deleted automatically.

Related Topics

- Configuring SSL, page 8-1
- Importing SSL Certificates, page 8-6
- Importing SSL Key Pairs, page 8-9
- Configuring SSL Parameter Maps, page 8-16
- Configuring SSL Chain Group Parameters, page 8-19
- Configuring SSL CSR Parameters, page 8-20

Enabling Client Authentication

During the flow of a normal SSL handshake, the SSL server sends its certificate to the client. Then the client verifies the identity of the server through the certificate. However, the client does not send any identification of its own to the server. When you enable the client authentication feature enabled on the ACE, it will require that the client send a certificate to the server. Then the server verifies the following information on the certificate:

- A recognized CA issued the certificate.
- The valid period of the certificate is still in effect.
- The certificate signature is valid and not tampered.
- The CA has not revoked the certificate.
- At least one SSL certificate is available.

Use the following procedures to enable or disable client authentication:

- Configuring SSL Proxy Service, page 8-22
- Configuring SSL Authentication Groups, page 8-24
- Configuring CRLs for Client Authentication, page 8-26

Configuring SSL Authentication Groups

On the ACE, you can implement a group of certificates that are trusted as certificate signers by creating an authentication group. After creating the authentication group and assigning its certificates, then you can assign the authentication group to a proxy service in an SSL termination configuration to enable client authentication. For information on client authentication, see Enabling Client Authentication, page 8-24.

For information on server authentication and assigning an authentication group, see Configuring SSL Proxy Service, page 8-22.

Use this procedure to specify the certificate authentication groups that the ACE uses during the SSL handshake and enable client authentication on this SSL-proxy service. The ACE includes the certificates configured in the group along with the certificate that you specified for the SSL proxy service.

Note You cannot create an authorization group in Building Blocks (**Config > Global > All Building Blocks**); You can only create SSL authentication groups while configuring virtual contexts in specific modules.

Assumptions

- At least one SSL certificate is available.
- Your ACE module supports authentication groups. See your *Supported Devices Table for the Cisco Application Networking Manager 2.1* for details on supported modules.

Procedure

Step 1 Select **Config > Devices >** *context* **> SSL > Auth Group Parameters**.

The Auth Group Parameters table appears.

Step 2 Click **Add** to add an authentication group, or choose an existing authorization group, then click **Edit** to modify it. The Auth Group Parameters configuration screen appears.

Step 3 In the Name field, enter a unique name for the authorization group. Valid entries are alphanumeric strings with a maximum of 64 characters.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE. The updated Auth Group Parameters screen appears along with the Auth Group Certificates table. Continue with Step 5.
- **Cancel** to exit the procedure without saving your entries and to return to the Auth Group Parameters table.
- **Next** to deploy your entries and to add another entry to the Auth Group Parameters table.

Step 5 In the Auth Group Certificate ield, click **Add** to add an entry. The Auth Group Certificates configuration screen appears.

Note You cannot modify an existing entry in the Auth Group Certificates table. Instead, delete the entry, then add a new one.

Step 6 In the Certificate Name field, choose the certificate to add to this authorization group.

Step 7 Click:

- **Deploy Now** to deploy this configuration on the ACE.
- **Cancel** to exit the procedure without saving your entries and to return to the Auth Group Parameters table.
- **Next** to deploy your entries and to add another entry to the Auth Group Parameters table.

Step 8 You can repeat the previous step to add more certificates to the authorization group or click **Deploy Now**.

Step 9 After you configure authorization group parameters, you can configure the SSL proxy service to use a CRL. See Configuring CRLs for Client Authentication, page 8-26.

Note When you enable client authentication, a significant performance decrease may occur. Additional latency may occur when you configure CRL retrieval.

Related Topics

- Configuring SSL Chain Group Parameters, page 8-19
- Configuring CRLs for Client Authentication, page 8-26

Configuring CRLs for Client Authentication

By default, ACE does not use certificate revocation lists (CRLs) during client authentication. You can configure the SSL proxy service to use a CRL by having the ACE scan each client certificate for the service to determine if it contains a CRL in the extension and then retrieve the value, if it exists. For more information about SSL termination on the ACE, see either the *Cisco Application Control Engine Module SSL Configuration Guide* or the *Cisco ACE 4700 Series Appliance SSL Configuration Guide*.

Note The ACE supports the creation of a maximum of four CRLs for any context.

Note When you enable client authentication, a significant performance decrease may occur. Additional latency may occur when you configure CRL retrieval.

Use this procedure to configure ACE to scan for CRLs and retrieve them.

Assumption

A CRL cannot be configured on an SSL proxy without first configuring an authorization group.

Procedure

Step 1 Select **Config > Devices >** *context* **> SSL > Certificate Revocation Lists (CRLs)**. The Certificate Revocation Lists (CRLs) table appears.

Step 2 Click **Add** to add a CRL or choose an existing CRL, then click **Edit** to modify it. The Certificate Revocation Lists (CRLs) screen appears.

Step 3 Enter the information in Table 8-11.

Table 8-11 SSL Certificate Revocation List

Field	Description
Name	Enter the CRL name. Valid entries are unquoted alphanumeric strings with a maximum of 64 characters.
URL	Enter the URL where the ACE retrieves the CRL. Valid entries are unquoted alphanumeric strings with a maximum of 255 characters. Only HTTP URLs are supported. ACE checks the URL and displays an error if it does not match.

Step 4 Click:

- **Deploy Now** to deploy this configuration on the ACE. The updated Certificate Revocation Lists (CRLs) table appears.
- **Cancel** to exit the procedure without saving your entries and to return to the Certificate Revocation Lists (CRLs) table.
- **Next** to deploy your entries and to add another entry to the Certificate Revocation Lists (CRLs) table.

Related Topics

- Configuring SSL Proxy Service, page 8-22
- Configuring SSL Authentication Groups, page 8-24