Transport Layer Security (TLS) Configuration Note

January 2012
Document # LTRT-31600
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Notice

This document describes configuration of Transport Layer Security (TLS) on AudioCodes Multi-Service Business Gateways.

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Date Published: January-19-2012

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Abbreviations and Terminology

Each abbreviation, unless widely used, is spelled out in full when first used.

Note: In this guide, device refers to AudioCodes’ Customer Premises Equipment (CPE).
## Related Documentation

<table>
<thead>
<tr>
<th>Document Name</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click the link ‘this presentation’</td>
<td></td>
</tr>
<tr>
<td>LTRT-52308 SIP CPE Product Reference Manual Ver. 6.4</td>
<td></td>
</tr>
</tbody>
</table>
1 Overview

AudioCodes devices support Transport Layer Security (TLS) protocol enabling client-server applications to communicate with one another secured against eavesdropping, tampering and message forgery. Applications include HTTPS, SIP, Automatic Update Facility and Telnet. The TLS feature supports 3 attributes:

Table 1-1: TSL Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES (Advanced Encryption Standard)</td>
<td>Uses a Key to encrypt plain text into cipher-text and the same Key to decrypt.</td>
</tr>
<tr>
<td>RSA</td>
<td>Enables an entity's identity to be authenticated before it is allowed to operate in your network.</td>
</tr>
<tr>
<td>SHA-1 (Secure Hash Algorithm -1)</td>
<td>Ensures integrity by sending a thumbprint from one entity to another.</td>
</tr>
</tbody>
</table>

1.1 AudioCodes Device Security Highlights

Security highlights are:

- Devices are shipped with a Self-Signed Certificate (RSA1024) which includes a Public Key and a Private Key burned in flash memory. TLS server mode requires it. TLS client mode does not require a certificate (default) unless the server requests two-way authentication.

- AudioCodes recommends that you install Certification Authority (CA) Signed device/client and root certificates on the device to join the device to Public Key Infrastructure (PKI).

Note:
- Joining an AudioCodes device to PKI is only possible if you have PKI.
- If you don’t, you won't have a CA from whom to obtain Authority-Signed Certificates.
- PKI vendors such as VeriSign and Microsoft sell CA entities/services. AudioCodes does not.

- Customers can join a device to PKI
  a. *without replacing* the Private Key (see Section 2.1 on page 9) (recommended)
  -OR-
  b. *by replacing* the Private Key (see Section 2.2 on page 11) (not recommended)

Note: For a recorded presentation on Certificates and PKI, go to AudioCodes web site page:


Click this presentation link.
Read these explanations of basic terms before proceeding:

**Table 1-2: Explanations of Basic Terms**

<table>
<thead>
<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKI</td>
<td>If you have Public Key Infrastructure you have a CA and each entity in your network can have two Authority-Signed Certificates installed on it: (1) a device certificate and (2) a trusted root certificate.</td>
</tr>
<tr>
<td>CA</td>
<td>Certification Authority whose server can be located externally (VeriSign, Microsoft, etc.) or internally (your IT department). The CA issues 2 Authority-Signed Certificates (1) a device certificate and (2) a trusted root certificate. These can be obtained from the CA and installed on the device.</td>
</tr>
<tr>
<td>Entity</td>
<td>An entity can be an AudioCodes device, a management station, a phone, etc., in the network.</td>
</tr>
<tr>
<td>Self-Signed Certificate</td>
<td>Burned in the flash memory of each shipped AudioCodes device. Includes a Public Key. Does not enable authentication.</td>
</tr>
<tr>
<td>Private Key</td>
<td>Burned in the flash memory of each shipped AudioCodes device. Decodes information encoded by the Public Key.</td>
</tr>
<tr>
<td>Public Key</td>
<td>Included in the Self-Signed Certificate and associated mathematically with the Private Key, it decodes information encoded by the Private Key.</td>
</tr>
<tr>
<td>Authority-Signed Certificate</td>
<td>Obtainable from a CA (VeriSign, Microsoft, etc.). The CA issues 2 Authority-Signed Certificates (1) a device certificate and (2) a trusted root certificate. Both must be installed on the device to join it to PKI.</td>
</tr>
</tbody>
</table>
2. Joining an AudioCodes Device to PKI

2.1 Installing Authority Signed Certificates on the Device

Note:
- The recommended method of joining a device to PKI is to install Certification Authority (CA) signed device/client and root certificates on the device, leaving the device's default Private Key installed.
- This method is secure because no private data is transmitted over the network and there's less room for errors.
- If, however, replacing the Private Key is unavoidable, see Section 2.2 on page 11.

Figure 2-1: Installing Certification Authority Signed Certificates on a Device

Explanation

1. In your browser, access the device's embedded Web server via the device's IP address and in the Web based management tool, generate a Certificate Signing Request (CSR).

2. Submit the CSR to your CA on the CA web site's certificates page.

3. From the CA web site's certificates page, download an Authority-Signed Device/Client Certificate file and an Authority-Signed Root Certificate file to your management station.

4. Save these on your management station and use the Web interface to upload them to the AudioCodes device.

Before joining the device to PKI, configure SIP, cipher-suites and NTP (see Section 3 on page 15).

➢ To join the device to PKI:

1. In your browser access the device’s embedded Web server via the device’s IP address and in the Web based management tool that opens, navigate to the WEB Security Settings page (Configuration tab > System > Management).

2. Make sure the 'Secured Web Connection' field is set to HTTP and HTTPS. This setting will enable you to access the device if the new certificate won't work.
3. Open the Certificates page (Configuration tab > System > Certificates) and scroll down to 'Certificates Signing Request'.

4. In the 'Subject Name (CN)' field, enter a unique DNS name for the device, for example, "dns_name.corp.customer.com".

5. Click the Create CSR button; the CSR text is generated and displayed on the page.

6. Copy the CSR text from ----BEGIN CERTIFICATE REQUEST to END CERTIFICATE REQUEST----, paste it into Notepad (for example) and save it as a .txt file on your PC.

7. Open your CA web site's certificates page, access the screen in which to request a device/client certificate and submit the CSR text that you saved previously, selecting Base 64 encoding option and the textual PEM format option.

8. Download and save the CA signed device/client certificate file on your PC as device.cer (for example). This step differs slightly from one CA web site to another. See an example under Appendix A on page 19.

9. Access the root certificate download page and save the file as root.cer on your PC. The procedure differs from one CA web site to another; see Section A on page 19 for an example.

10. In the Web interface's Certificates page, scroll to 'Upload certificate files from your computer'.

11. Click the Browse button under 'Send Device Certificate file from your computer to the device', navigate to the device.cer file, and click the Send File button; the CA-issued device/client certificate is installed on the device.

12. Click the Browse button under 'Send Trusted Root Certificate Store file from your computer to the device', navigate to the root.cer file, and click the Send File button; the CA root certificate is installed on the device.

13. Restart the device; the Web interface now uses the provided CA-issued certificates.
14. In the Web interface open the Certificates page and verify under 'Certificate information' that the status of the 'Private Key' parameter is 'OK', if it's not, consult your security administrator.

15. Open the WEB Security Settings page (Configuration tab > System > Management) and set the 'Secured Web Connection' field to HTTP Only.

![Figure 2-6: Secured Web Connection](image)

Note:

- The CA-issued root certificate can be replaced whenever necessary (for example, when it expires).
- It's possible to use the IP address of the device (e.g., 10.3.3.1) instead of a qualified DNS name in the Subject Name. This is not recommended since the IP address is subject to changes and may not uniquely identify the device.
- The CA-issued device certificate file can alternatively be loaded via the Automatic Update Facility using ini file parameter HTTPSCertFileName and the CA-issued root certificate using ini file parameter HTTPSRootFileName.

### 2.2 Replacing the Device's Private Key

AudioCodes devices are shipped with a Self-Signed Certificate that includes a Public Key and a Private Key burned in each device's flash memory.

Joining a device to PKI by replacing its Private Key is not recommended because the Private Key, by default installed on the shipped device, is secure, and replacing it is unnecessary.

However, replacing the Private Key may be unavoidable if you:

1. have PKI that doesn’t support CSR
2. have a central provisioning server on which to store all Private Keys
3. want to track the usage of Certificates / Private Keys
4. want to control Certificates / Private Keys replacements
5. are a government agency that wants to keep a copy of the device's Private Key on a third-party entity

Note:

- Each device's Private Key is unique so after an RMA, for example, you cannot use the previous Private Key, you must obtain a new one for the new device received after the RMA.
- Take precautions to load the Private Key over a physically secure connection such as a back-to-back Ethernet cable connected directly to the management station.
- The recommended method of joining PKI is to leave the Private Key installed, to request an Authority-Signed Certificate from your CA via a CSR, and to install the CA-issued files on the device (see Section 2.1 on page 9).
The procedure below describes how to join a device to PKI by replacing its Private Key (not recommended).

To replace a device’s Private Key:

1. In the Web interface, open the Certificates page (Configuration tab > System > Certificates), and in the ‘Subject Name (CN)’ field, enter the fully-qualified DNS name (FQDN) as the Certificate subject (e.g., dns_name.corp.customer.com).
2. Scroll down to 'Generate new private key and self-signed certificate':
   
   ![Figure 2-7: Generate New Private Key and Self-Signed Certificate](image)

   3. Make sure that no traffic is running on the device. Generating a new Self-Signed Certificate disrupts traffic and should be done during maintenance time.
4. From the 'Private Key Size' drop-down list, select 2048 if your device is version 6.4. If it's pre 6.4, leave the default 1024.
5. Click Generate Self-signed; wait until a message appears displaying the subject name of the new Self-Signed Certificate; you've successfully generated a new Self-Signed Certificate and changed the name of the default one (‘ACL_nnnnnnn’, where nnnnnnn is the device’s serial number).
6. Save the configuration and restart the device for the new Self-Signed Certificate to take effect.
7. Obtain from your security administrator a Private Key in either textual PEM (PKCS #7) or PFX (PKCS #12) format. The file may be encrypted with a short pass-phrase, which should be provided by your security administrator.
8. Open the Web Admin Tool and in the WEB Security Settings page (Configuration tab > System > Management), make sure the ‘Secured Web Connection’ field is set to HTTP and HTTPS.
   
   ![Figure 2-8: Secured Web Connection](image)

   With this configuration, you'll be able to access the device if the new Certificate doesn't work. If the Certificate does work, configure the field to HTTP Only after testing.
9. In the Web interface, open the Certificates page and scroll down to the 'Upload certificate files from your computer' group.
   
   ![Figure 2-9: Loading a Private Key to a Device](image)

   10. Enter the 'Private key pass-phrase' field (optional).
11. Click the Browse button corresponding to 'Send Private Key', navigate to the private key file, and click Send File.
12. If the security administrator provided you with a Device Certificate file, load it now using the 'Send Device Certificate' button (see Figure 4-8 below).
13. After the files successfully load to the device, save the configuration and restart the device; the Web interface uses the new configuration.

14. In the Web interface open the Certificates page again and verify under 'Certificate information' that the status of the 'Private Key' parameter is 'OK', if it's not, consult your security administrator.

15. Open the WEB Security Settings page (Configuration tab > System > Management) and set the 'Secured Web Connection' field to HTTP Only.

### 2.2.1 Configuring Network Time Protocol (NTP)

Without the correct date and time, Self-Signed Certificates cannot work. After receiving the AudioCodes device, you must configure it to use NTP to obtain the current date and time (since X.509 certificates have an expiration date and time).

- **To configure NTP:**

1. In the Web interface, open the Application Settings page (Configuration tab > System menu > Application Settings).

   ![Figure 2-10: Application Settings](image)

   **Table 2-1: NTP Settings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTP Server IP Address</td>
<td>Defines the IP address of the NTP server.</td>
</tr>
<tr>
<td>NTP UTC Offset</td>
<td>Defines the time offset in relation to the UTC. For example, if your region is 2 hours ahead of the UTC, enter &quot;2&quot;.</td>
</tr>
<tr>
<td>NTP Updated Interval</td>
<td>Defines the period after which the date and time of the device is updated.</td>
</tr>
</tbody>
</table>

2. Configure NTP Settings using Table 2-1 as a reference.

3. Configure daylight saving, if required, using Table 2-2 as a reference:

   **Table 2-2: Daylight Saving Time**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Light Saving Time</td>
<td>Enables daylight saving time.</td>
</tr>
<tr>
<td>Start Time and End Time</td>
<td>Defines the period for which daylight saving time is relevant.</td>
</tr>
<tr>
<td>Offset</td>
<td>Defines the offset in minutes to add to the time for daylight saving. For example, if your region has daylight saving of one hour, the time received from the NTP server is 11:00, and the UTC offset for your region is +2 (i.e., 13:00), you need to enter &quot;60&quot; to change the local time to 14:00.</td>
</tr>
</tbody>
</table>

4. In the Regional Settings page, verify that the device is set to the correct date and time (Configuration tab > System menu > Regional Settings). If the device is configured
to obtain the date and time from an SNTP (Simple Network Time Protocol Support) server, the fields on this page display the received date and time as read-only.

**Figure 2-11: Regional Settings**

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Day</th>
<th>Hour</th>
<th>Minutes</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>05</td>
<td>15</td>
<td>11</td>
<td>07</td>
<td>07</td>
</tr>
</tbody>
</table>
3 Securing SIP Application Signaling

AudioCodes devices feature TLS to protect Session Initiation Protocol (SIP) application signaling. TLS provides authentication and encryption of the SIP signaling associated with VoIP and other SIP-based applications.

3.1 Configuring SIP Transport Type (TLS) and SIP TLS Local Port

The procedure below shows you how to protect SIP application signaling, by configuring SIP Transport Type (as TLS) and configuring the SIP TLS Local Port.

➢ To configure SIP Transport Type and SIP TLS Local Port:
1. Open the SIP General Parameters page.

   ![Figure 3-1: SIP Transport Type and SIP TLS Local Port](image)

2. From the ‘SIP Transport Type’ drop-down list, select **TLS**. This field can also be set per destination in the Web interface’s:
   - Proxy Sets Table page (see Figure 3-2 below)
   - Tel to IP Routing page (see Figure 3-3 below)

   ![Figure 3-2: Proxy Sets Table](image)

   ![Figure 3-3: Tel to IP Routing](image)

3. In the SIP General Parameters page enter the SIP TLS Local Port and the SIP Destination Port.

4. From the ‘Enable SIPS’ drop-down list, select **Enable**; TLS will be used through the entire connection, over multiple hops, if **TLS** was selected as ‘SIP Transport Type’.
though if **UDP** was selected as ‘SIP Transport Type’, the connection will fail. If you leave ‘Enable SIPS’ at **Disable** (default), TLS will be used for the next network hop only.

### 3.2 Configuring Two-Way Client-Server Authentication

By default, servers using TLS provide one-way authentication; the client is certain that the identity of the server is authentic.

➤ **To configure two-way authentication:**

1. In the Web interface, open the General Security Settings page (**Configuration** tab > **VoIP** > select **Full** > **Security** > **General Security Settings**) and in the ‘TLS Mutual Authentication’ drop-down list under SIP TLS Settings, choose **Enable**.

   ![Figure 3-4: TLS Mutual Authentication](image)

   The ‘TLS Mutual Authentication’ field determines the device's behavior when acting as a server for TLS connections.

   **Table 3-1: TLS Mutual Authentication**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable (Default)</td>
<td>The device does not request the client certificate.</td>
</tr>
<tr>
<td>Enable</td>
<td>The device requires receipt and verification of the client certificate to establish the TLS connection</td>
</tr>
</tbody>
</table>

2. For this parameter to take effect, a device reset is required.

   Two-way client-server authentication can also be configured using the **SIPSRequireClientCertificate** ini file parameter.
4 Enabling Cipher-Suites

A cipher-suite is a predefined combination of algorithms that customers select to control the type of encryption performed.

Combinations are made up of a session key management algorithm used to exchange session keys (ADH, EDH, or RSA), an authentication algorithm used to verify the identity of the peer (RSA, DSA or none), a cipher algorithm used to encrypt data (RC4, AES, DES, 3DES, etc.), bit strength, i.e., key size used for encryption (56, 128, 256, etc.) and an integrity algorithm used to validate that the data is transmitted correctly (MD5 or SHA1).

Selection depends on the PKI vendor and the type of PKI installed by the customer. Each PKI allows a specific algorithms combination.

➢ To select a cipher-suite:

1. Set the HTTPSCipherString ini file parameter. To see all possible values, see http://www.openssl.org/docs/apps/ciphers.html. By default, it’s set to EXP, though if the 'Strong Encryption' Software Upgrade Key is enabled (depending on the customer’s order), the default is EXP:RC4 enabling RC4-128 bit.

   ![Note] If the 'Strong Encryption' Software Upgrade Key feature is disabled, TLS is limited to the EXP cipher-suite, i.e., the only ciphers available will be RC4 and DES, and the cipher bit strength will be limited to 56 bits.

2. For additional cipher-suites, set this parameter to ALL.
A  **Example of Joining a Device to PKI**

This example shows you how to request a certificate from the Microsoft CA entity and install it on the AudioCodes device.

Follow this procedure:

1. Configure the Gateway Name (see Step 1)
2. Generate a CSR (see Step 2)
3. Get a Microsoft CA Certificate and a Trusted Root Certificate (see Step 3 on page 20)
4. Load the Certificates to the Device (see Step 4 on page 23)

A.1 **Step 1: Configure the Gateway Name**

The procedure below describes how to configure the host name for the PSTN Gateway. This appears as the URI host name in the SIP From header in INVITE messages sent by the PSTN Gateway to the Mediation Server. This allows the Mediation Server to identify the PSTN Gateway (if required), when using certificates for TLS.

➢ To configure the SIP gateway name:

1. Open the Proxy & Registration page (Configuration tab > VoIP menu > SIP Definitions sub-menu > Proxy & Registration).

   ![Proxy & Registration Page]

2. In the 'Gateway Name' field, assign a unique FQDN name to the PSTN Gateway within the domain, for example,"gw.lync2010.com". This name is identical to the name that is configured in the Lync Topology Builder.

A.2 **Step 2: Generate a CSR**

The procedure below describes how to generate a CSR (Certificate Signing Request) by the PSTN Gateway. This CSR is later sent to Microsoft CA.

➢ To generate a CSR:

1. Open the Certificates Signing Request page (Configuration tab > System menu > Certificates).
2. In the ‘Subject Name’ field, enter the SIP URI host name that you configured for the PSTN Gateway.

3. Click **Create CSR**; a Certificate request is generated and displayed on the page.

4. Copy the certificate from the line “----BEGIN CERTIFICATE” to “END CERTIFICATE REQUEST----” to a text file such as Notepad and then save it to a folder on your PC with the file name certreq.txt.

### A.3 Step 3: Get a Microsoft CA Certificate and a Trusted Root Certificate

After generating the certreq.txt file, upload it to the Microsoft Certificate server and request a CA certificate and a trusted root certificate.

- **To obtain a Microsoft CA certificate and a trusted root certificate:**
  1. Open a Web browser and navigate to Microsoft Certificate Services at [http://<certificate server address>/certsrv](http://<certificate server address>/certsrv).

### Figure 4-3: Microsoft Certificate Services Web Page

2. Click the **Request a certificate** link.
3. Click the **advanced certificate request** link.

4. Click the **Submit a Certificate request by using base-64-encoded...** link.
5. Open the certreq.txt file that you created and saved previously and copy its contents into the Saved Request pane.

6. From the 'Certificate Template' drop-down list, select Web Server.

7. Click Submit.

8. Select the Base 64 encoding option.

9. Click the Download CA certificate link and save the file with the name gateway.cer on your PC.


11. Click the Download a CA certificate, certificate chain or CRL link.

12. Under Encoding method, select the Base 64 option.

13. Click the Download CA certificate link, and save the file with the name certroot.cer on your PC.
A.4 Step 4: Load the Two Certificates to the Device

After obtaining the CA and trusted root certificates from Microsoft, load these two certificates to the device.

➢ To load the 2 certificates to the device:

1. Open the Certificates page (Configuration tab > System menu > Certificates) and scroll to ‘Upload certificate files from your computer’.

   *Figure 4-8: Certificates Page*

   - [Figure showing the Certificates page with fields for uploading certificate files]

   2. Adjacent to the ‘Device Certificate’ field click Browse, select the gateway.cer file that you saved on your PC and click Send File.

   3. Adjacent to the ‘Trusted Root Certificate Store’ field click Browse, select the certroot.cer file that you saved on your PC and click Send File.

   4. On the toolbar, click Burn to save the certificates to the device; the device resets, saving the settings to flash memory.
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