



# Provisioning Scripts

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- [Provisioning Scripts](#), page 1
- [Configuration Profile Formats](#), page 1
- [Open Profile \(XML\) Compression and Encryption](#), page 5
- [Apply a Profile to the IP Telephony Device](#), page 10
- [Provisioning Parameters](#), page 11
- [Data Types](#), page 16
- [Profile Updates and Firmware Upgrades](#), page 19

## Provisioning Scripts

The Cisco IP Phone accepts configuration in an XML format.

The examples in this document use configuration profiles with an XML format (XML) syntax. Sample profiles can be found in [Sample Configuration Profiles](#)

For detailed information about your Cisco IP Phone, refer to the administration guide for your particular device. Each guide describes the parameters that can be configured through the administration web server.

## Configuration Profile Formats

The configuration profile defines the parameter values for the Cisco IP Phone.

The configuration profile XM format uses standard XML authoring tools to compile the parameters and values.



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**Note**

Only UTF-8 charset is supported. If you modify the profile in an editor, do not change the encoding format; otherwise, the Cisco IP Phone cannot recognize the file.

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Each model of Cisco IP Phone has a different feature set and therefore, a different set of parameters.

### XML Format (XML) Profile

The Open format profile is a text file with XML-like syntax in a hierarchy of elements, with element attributes and values. This format lets you use standard tools to create the configuration file. A configuration file in this format can be sent from the provisioning server to the Cisco IP Phone during a resync operation. The file can be sent without compilation as a binary object.

The Cisco IP Phone can accept configuration formats that standard tools generate. This feature eases the development of back-end provisioning server software that generates configuration profiles from existing databases.

To protect confidential information in the configuration profile, the provisioning server delivers this type of file to the phone over a channel secured by TLS. Optionally, the file can be compressed by using the gzip deflate algorithm (RFC1951). The file can be encrypted with 256-bit AES symmetric key encryption.

### Example: Open Profile Format

```
<flat-profile>
<Resync_On_Reset> Yes </Resync_On_Reset>
<Resync_Periodic> 7200 </Resync_Periodic>
<Profile_Rule> tftp://prov.telco.com:6900/cisco/config/CP_x8xx_MPP.cfg</Profile_Rule>
</flat-profile>
```

The `<flat-profile>` element tag encloses all parameter elements that the Cisco IP Phone recognizes.

### Related Topics

[Open Profile \(XML\) Compression and Encryption, on page 5](#)

## Configuration File Components

A configuration file can include these components:

- Element tags
- Attributes
- Parameters
- Formatting features
- XML comments

### Element Tag Properties

- The XML provisioning format and the Web UI allow the configuration of the same settings. The XML tag name and the field names in the Web UI are similar but vary due to XML element name restrictions. For example, underscores ( `_` ) instead of " `"` .
- The Cisco IP Phone recognizes elements with proper parameter names that are encapsulated in the special `<flat-profile>` element.
- Element names are enclosed in angle brackets.
- Most element names are similar to the field names in the administration web pages for the device, with the following modifications:

- Element names may not include spaces or special characters. To derive the element name from the administration web field name, substitute an underscore for every space or the special characters [ ], ( ), or /.

**Example:** The <Resync\_On\_Reset> element represents the **Resync On Reset** field.

- Each element name must be unique. In the administration web pages, the same fields can appear on multiple web pages, such as the Line, User, and Extension pages. Append [n] to the element name to indicate the number that is shown in the page tab.

**Example:** The <Dial\_Plan\_1\_> element represents the **Dial Plan** for Line 1.

- Each opening element tag must have a matching closing element tag. For example:

```
<flat-profile>
<Resync_On_Reset> Yes
  </Resync_On_Reset>
<Resync_Periodic> 7200
  </Resync_Periodic>
<Profile_Rule>tftp://prov.telco.com: 6900/cisco/config/CP_x8xx_MPP.cfg
  </Profile_Rule>
</flat-profile>
```

- Element tags are case-sensitive.
- Empty element tags are allowed and will be interpreted as configuring the value to be empty. Enter the opening element tag without a corresponding element tag, and insert a space and a forward slash before the closing angle bracket (>). In this example, Profile Rule B is empty:

```
<Profile_Rule_B />
```

- Use an empty value to set the corresponding parameter to an empty string. Enter an opening and closing element without any value between them. In the following example, the GPP\_A parameter is set to an empty string.

```
<flat-profile>
<GPP_A>
  </GPP_A>
</flat-profile>
```

- Unrecognized element names are ignored.

## User Access Attribute

The user access (**ua**) attribute controls may be used to change access by the User account. If the **ua** attribute is not specified, the existing user access setting is retained. This attribute does not affect access by the Admin account.

The **ua** attribute, if present, must have one of the following values:

- na—No access
- ro—Read-only
- rw—Read and write

The following example illustrates the **ua** attribute:

```
<flat-profile>
  <SIP_TOS_DiffServ_Value_1_ ua="na"/>
```

```
<Dial_Plan_1_ ua="ro"/>
<Dial_Plan_2_ ua="rw"/>
</flat-profile>
```

Double quotes must enclose the value of the **ua** option.

## Access Control

If the <Phone-UI-User-Mode> parameter is enabled, the phone GUI honors the user access attribute of the relevant parameters when the GUI presents a menu item.

For menu entries that are associated with a single configuration parameter:

- Provisioning the parameter with “ua=na” (“ua” stands for “user access”) attribute makes the entry disappear.
- Provisioning the parameter with “ua=ro” attribute makes the entry read-only and non-editable.

For menu entries that are associated with multiple configuration parameters:

- Provisioning all concerned parameters with “ua=na” attribute makes the entries disappear.

## Parameter Properties

These properties apply to the parameters:

- Any parameters that no profile specifies are left unchanged in the Cisco IP Phone.
- Unrecognized parameters are ignored.
- If the Open format profile contains multiple occurrences of the same parameter tag, the last such occurrence overrides any earlier ones. To avoid inadvertent override of configuration values for a parameter, we recommend that each profile specify at most one instance of a parameter.
- The last profile processed takes precedence. If multiple profiles specify the same configuration parameter, the value of the latter profile takes precedence.

## Formatting

These properties apply to the formatting of the strings:

- Comments are allowed through standard XML syntax.
 

```
<!-- My comment is typed here -->
```
- Leading and trailing white space is allowed for readability but is removed from the parameter value.
- New lines within a value are converted to spaces.
- An XML header of the form <? ?> is allowed, but the Cisco IP Phone ignores it.
- To enter special characters, use basic XML character escapes, as shown in the following table.

Special Character	XML Escape Sequence
& (ampersand)	&amp;
< (less than)	&lt;

Special Character	XML Escape Sequence
> (greater than)	&gt;
' (apostrophe)	&apos;
" (double quote)	&quot;

In the following example, character escapes are entered to represent the greater than and less than symbols that are required in a dial plan rule. This example defines an information hotline dial plan that sets the <Dial\_Plan\_1\_> parameter (**Admin Login > advanced > Voice > Ext (n)**) equal to (S0 <:18005551212>).

```
<flat-profile>
<Dial_Plan_1_ >
  (S0 &lt;:18005551212&gt;);
</Dial_Plan_1_ >
</flat-profile>
```

- Numeric character escapes, using decimal and hexadecimal values (s.a. `&#40;`; and `&#x2e;`), are translated.

## Open Profile (XML) Compression and Encryption

The Open configuration profile can be compressed to reduce the network load on the provisioning server. The profile can also be encrypted to protect confidential information. Compression is not required, but it must precede encryption.

### Open Profile Compression

The supported compression method is the gzip deflate algorithm (RFC1951). The gzip utility and the compression library that implements the same algorithm (zlib) are available from Internet sites.

To identify compression, the Cisco IP Phone expects the compressed file to contain a gzip compatible header. Invocation of the gzip utility on the original Open profile generates the header. The Cisco IP Phone inspects the downloaded file header to determine the file format.

For example, if `profile.xml` is a valid profile, the file `profile.xml.gz` is also accepted. Either of the following commands can generate this profile type:

- `>gzip profile.xml`  
Replaces original file with compressed file.
- `>cat profile.xml | gzip > profile.xml.gz`  
Leaves original file in place, produces new compressed file.

A tutorial on compression is provided in the [Open Profile gzip Compression](#) section.

## Open Profile Encryption by Using AES

Symmetric key encryption can be used to encrypt an Open configuration profile, whether the file is compressed or not. The supported encryption algorithm is the American Encryption Standard (AES), using 256-bit keys, applied in cipher block chaining mode.



### Note

Compression must precede encryption for the Cisco IP Phone to recognize a compressed and encrypted Open format profile. The [Profile Encryption by Using OpenSSL](#) section provides a tutorial on encryption.

The OpenSSL encryption tool, available for download from various Internet sites, can perform the encryption. Support for 256-bit AES encryption may require recompilation of the tool to enable the AES code. The firmware has been tested against version openssl-0.9.7c.

For an encrypted file, the profile expects the file to have the same format as generated by the following command:

```
# example encryption key = SecretPhrase1234
openssl enc -e -aes-256-cbc -k SecretPhrase1234 -in profile.xml -out profile.cfg

# analogous invocation for a compressed xml file
openssl enc -e -aes-256-cbc -k SecretPhrase1234 -in profile.xml.gz -out profile.cfg
```

A lowercase `-k` precedes the secret key, which can be any plain text phrase, and which is used to generate a random 64-bit salt. With the secret specified by the `-k` argument, the encryption tool derives a random 128-bit initial vector and the actual 256-bit encryption key.

When this form of encryption is used on a configuration profile, the phone must be informed of the secret key value to decrypt the file. This value is specified as a qualifier in the profile URL. The syntax is as follows, using an explicit URL:

```
[--key "SecretPhrase1234"] http://prov.telco.com/path/profile.cfg
```

This value is programmed by using one of the `Profile_Rule` parameters. The key must be preprovisioned into the unit at an earlier time. Bootstrap of the secret key can be accomplished securely by using HTTPS.

Pre-encrypting configuration profiles offline, with symmetric key encryption, allows the use of HTTP for resyncing profiles. The provisioning server uses HTTPS to handle initial provisioning of the Cisco IP Phone after deployment. This feature reduces the load on the HTTPS server in large-scale deployments.

The final filename does not require a specific format, but a filename that ends with the `.cfg` extension normally indicates a configuration profile.

## Macro Expansion

Several provisioning parameters undergo macro expansion internally prior to being evaluated. This preevaluation step provides greater flexibility in controlling the Cisco IP Phone resync and upgrade activities.

These parameter groups undergo macro expansion before evaluation:

- Resync\_Trigger\_\*
- Profile\_Rule\*

- Log\_xxx\_Msg
- Upgrade\_Rule

Under certain conditions, some general-purpose parameters (GPP\_\*) also undergo macro expansion, as explicitly indicated in the [Optional Resync Arguments](#), on page 9 section.

During macro expansion, the contents of the named variables replace expressions of the form \$NAME and \$(NAME). These variables include general-purpose parameters, several product identifiers, certain event timers, and provisioning state values. For a complete list, see the [Macro Expansion Variables](#) section.

In the following example, the expression \$(MAU) is used to insert the MAC address 000E08012345.

The administrator enters: \$(MAU)config.cfg

The resulting macro expansion for a device with MAC address 000E08012345 is:  
000E08012345config.cfg

If a macro name is not recognized, it remains unexpanded. For example, the name STRANGE is not recognized as a valid macro name, while MAU is recognized as a valid macro name.

The administrator enters: \$STRANGE\$MAU.cfg

The resulting macro expansion for a device with MAC address 000E08012345 is:  
\$STRANGE000E08012345.cfg

Macro expansion is not applied recursively. For example, "\$MAU" expands into "\$MAU" (the \$\$ is expanded), and does not result in the MAC address.

The contents of the special purpose parameters, GPP\_SA through GPP\_SD, are mapped to the macro expressions \$\$SA through \$\$SD. These parameters are only macro expanded as the argument of the **--key**, **--uid**, and **--pwd** options in a resync URL.

## Conditional Expressions

Conditional expressions can trigger resync events and select from alternate URLs for resync and upgrade operations.

Conditional expressions consist of a list of comparisons, separated by the **and** operator. All comparisons must be satisfied for the condition to be true.

Each comparison can relate to one of the following three types of literals:

- Integer values
- Software or hardware version numbers
- Doubled-quoted strings

### Version Numbers

Multiplatform phones (MPP) phone formal release software version uses the format sip7832.v1-v2-v3MPP-BN (BN==Build Number) for the Cisco IP Conference Phone 7832. The comparing string must use the same format. Otherwise, a format parsing error results.

In the software version, v1-v2-v3-v4 can specify different digits and characters, but must start with a numeric digit. When comparing the software version, v1-v2-v3-v4 is compared in sequence, and the leftmost digits take precedence over the latter ones.

If v[x] includes only numeric digits, the digits are compared; if v[x] includes numeric digits + alpha characters, digits are compared first, then characters are compared in alphabetical order.

### Example of Valid Version Number

sip78yy.11-0-0MPP-BN

By contrast: 11.0.0 is an invalid format.

### Comparison

sip78xx.11-0-0MPP-BN < sip78xx.11-0-0MN-1MPP-BN

Quoted strings can be compared for equality or inequality. Integers and version numbers can also be compared arithmetically. The comparison operators can be expressed as symbols or as acronyms. Acronyms are convenient for expressing the condition in an Open format profile.

Operator	Alternate Syntax	Description	Applicable to Integer and Version Operands	Applicable to Quoted String Operands
=	eq	equal to	Yes	Yes
!=	ne	not equal to	Yes	Yes
<	lt	less than	Yes	No
<=	le	less than or equal to	Yes	No
>	gt	greater than	Yes	No
>=	ge	greater than or equal to	Yes	No
AND		and	Yes	Yes

It is important to enclose macro variables in double quotes where a string literal is expected. Do not do so where a number or version number is expected.

When used in the context of the Profile\_Rule\* and Upgrade\_Rule parameters, conditional expressions must be enclosed within the syntax "(expr)?" as in this upgrade rule example:

```
($SWVER ne sip78xx.11-0-0MPP)? http://ps.tell.com/sw/sip78xx.11-0-0MPP-BN (BN==Build Number).loads
```

Do not use the preceding syntax with parentheses to configure the Resync\_Trigger\_\* parameters.

## URL Syntax

Use Standard URL syntax to specify how to retrieve configuration files and firmware loads in Profile\_Rule\* and Upgrade\_Rule parameters, respectively. The syntax is as follows:

```
[ scheme:// ] [ server [:port]] filepath
```

Where `scheme` is one of these values:

- tftp
- http
- https

If `scheme` is omitted, `tftp` is assumed. The server can be a DNS-recognized hostname or a numeric IP address. The port is the destination UDP or TCP port number. The filepath must begin with the root directory (`/`); it must be an absolute path.

If `server` is missing, the `tftp` server specified through DHCP (option 66) is used.

If `port` is missing, the standard port for the specified scheme is used. (`tftp` uses UDP port 69, `http` uses TCP port 80, `https` uses TCP port 443.)

A filepath must be present. It need not necessarily refer to a static file, but can indicate dynamic content obtained through CGI.

Macro expansion applies within URLs. The following are examples of valid URLs:

```
/$MA.cfg
/cisco/sip78xx.11-0-0MPP-BN (BN==Build Number).loads
192.168.1.130/profiles/init.cfg
tftp://prov.call.com/cpe/cisco$MA.cfg
http://neptune.speak.net:8080/prov/$D/$E.cfg
https://secure.me.com/profile?Linksys
```

## Optional Resync Arguments

Optional arguments, `key`, `uid`, and `pwd` can precede the URLs entered in `Profile_Rule*` parameters, collectively enclosed by square brackets.

### key

The **key** option is used to specify an encryption key. Decryption of profiles that have been encrypted with an explicit key is required. The key itself is specified as a (possibly quoted) string following the term `--key`.

#### Usage Examples

```
[--key VerySecretValue]
[--key "my secret phrase"]
[--key a37d2fb9055c1d04883a0745eb0917a4]
```

The bracketed optional arguments are macro expanded. Special purpose parameters, `GPP_SA` through `GPP_SD`, are macro expanded into macro variables, `$SA` through `$SD`, only when they are used as key option arguments. See these examples:

```
[--key $SC]
[--key "$SD"]
```

In Open format profiles, the argument to `--key` must be the same as the argument to the `-k` option that is given to `openssl`.

## uid&pwd

The **uid** & **pwd** options can be used to specify userID and Password authentication for the specified URL. The bracketed optional arguments are macro expanded. Special purpose parameters, GPP\_SA through GPP\_SD, are macro expanded into macro variables, \$SA through \$SD, only when they are used as key option arguments. See these examples:

```
GPP_SA = MyUserID
GPP_SB = MySecretPassword
```

```
[--uid $SA -pwd $SB] https://provisioning_server_url/path_to_your_config/your_config.xml
```

would then expand to:

```
[--uid MyUserID -pwdMySecretPassword]
https://provisioning_server_url/path_to_your_config/your_config.xml
```

## Apply a Profile to the IP Telephony Device

After you create an XML configuration script, it must be passed to the Cisco IP Phone for application. To apply the configuration, you can either download the configuration file to the IP Phone from a TFTP, HTTP, or HTTPS server using a web browser or by using cURL command line utility.

### Download the Configuration File to the IP Phone from a TFTP Server

Complete these steps to download the configuration file to a TFTP server application on your PC.

#### Procedure

- 
- Step 1** Connect your PC to the phone LAN.
  - Step 2** Run a TFTP server application on the PC and ensure that the configuration file is available in the TFTP root directory.
  - Step 3** In a web browser, enter the Cisco IP Phone LAN IP address, the IP address of the computer, the filename, and the login credentials. Use this format:

```
http://<WAN_IP_Address>/admin/resync?tftp://<PC_IP_Address>/<file_name>&xuser=admin&xpassword=<password>
```

Example:

```
http://192.168.15.1/admin/resync?tftp://192.168.15.100/my_config.xml&xuser=admin&xpassword=admin
```

---

### Download the Configuration File to the IP Phone Using cURL

Complete these steps to download the configuration to the Cisco IP Phone by using cURL. This command-line tool is used to transfer data with a URL syntax. To download cURL, visit:

<https://curl.haxx.se/download.html>

## Procedure

- 
- Step 1** Connect your PC to the LAN port of the Cisco IP Phone.
- Step 2** Download the configuration file to the Cisco IP Phone by entering the following cURL command:
- ```
curl -d @my_config.xml  
"http://192.168.15.1/admin/config.xml&xuser=admin&xpassword=admin"
```
- 

# Provisioning Parameters

This section describes the provisioning parameters broadly organized according to function:

These provisioning parameter types exist:

- General Purpose
- Enables
- Triggers
- Configurable Schedules
- Profile Rules
- Upgrade Rule

## General Purpose Parameters

The general-purpose parameters GPP\_\* (**Admin Login > advanced > Voice > Provisioning**) are used as free string registers when configuring the Cisco IP Phone to interact with a particular provisioning server solution. The GPP\_\* parameters are empty by default. They can be configured to contain diverse values, including the following:

- Encryption keys
- URLs
- Multistage provisioning status information
- Post request templates
- Parameter name alias maps
- Partial string values, eventually combined into complete parameter values.

The GPP\_\* parameters are available for macro expansion within other provisioning parameters. For this purpose, single-letter uppercase macro names (A through P) suffice to identify the contents of GPP\_A through GPP\_P. Also, the two-letter uppercase macro names SA through SD identify GPP\_SA through GPP\_SD as a special case when used as arguments of the following URL options:

**key**, **uid**, and **pwd**

These parameters can be used as variables in provisioning and upgrade rules. They are referenced by prefixing the variable name with a '\$' character, such as \$GPP\_A.

## Using General Purpose Parameters

For example, if GPP\_A contains the string ABC, and GPP\_B contains 123, the expression \$A\$B macro expands into ABC123.

### Procedure

- 
- Step 1** On the Configuration Utility page, select **Admin Login** > **advanced** > **Voice** > **Provisioning**.
  - Step 2** Scroll to the **General Purpose Parameters** section.
  - Step 3** Enter valid values in the fields, GPP A through GPP P.
  - Step 4** Click **Submit All Changes**.
- 

## Enables

The Provision\_Enable and Upgrade\_Enable parameters control all profile resync and firmware upgrade operations. These parameters control resyncs and upgrades independently of each other. These parameters also control resync and upgrade URL commands that are issued through the administration web server. Both of these parameters are set to **Yes** by default.

The Resync\_From\_SIP parameter controls requests for resync operations. A SIP NOTIFY event is sent from the service provider proxy server to the Cisco IP Phone. If enabled, the proxy can request a resync. To do so, the proxy sends a SIP NOTIFY message that contains the Event: resync header to the device.

The device challenges the request with a 401 response (authorization refused for used credentials). The device expects an authenticated subsequent request before it honors the resync request from the proxy. The Event: reboot\_now and Event: restart\_now headers perform cold and warm restarts, respectively, which are also challenged.

The two remaining enables are Resync\_On\_Reset and Resync\_After\_Upgrade\_Attempt. These parameters determine whether the device performs a resync operation after power-up software reboots and after each upgrade attempt.

When Resync\_On\_Reset is enabled, the device introduces a random delay that follows the boot-up sequence before the reset is performed. The delay is a random time up to the value that the Resync\_Random\_Delay (in seconds) specifies. In a pool of phones that power up simultaneously, this delay spreads out the start times of the resync requests from each unit. This feature can be useful in a large residential deployment, in the case of a regional power failure.

## Triggers

The Cisco IP Phone allows you to resync at specific intervals or at a specific time.

## Resyncing at Specific Intervals

The Cisco IP Phone is designed to resync with the provisioning server periodically. The resync interval is configured in `Resync_Periodic` (seconds). If this value is left empty, the device does not resync periodically.

The resync typically takes place when the voice lines are idle. If a voice line is active when a resync is due, the Cisco IP Phone delays the resync procedure until the line becomes idle again. A resync can cause configuration parameter values to change.

A resync operation can fail because the Cisco IP Phone is unable to retrieve a profile from the server, the downloaded file is corrupt, or an internal error occurred. The device tries to resync again after a time that is specified in `Resync_Error_Retry_Delay` (seconds). If `Resync_Error_Retry_Delay` is set to 0, the device does not try to resync again after a failed resync attempt.

If an upgrade fails, a retry is performed after `Upgrade_Error_Retry_Delay` seconds.

Two configurable parameters are available to conditionally trigger a resync: `Resync_Trigger_1` and `Resync_Trigger_2`. Each parameter can be programmed with a conditional expression that undergoes macro expansion. When the resync interval expires (time for the next resync) the triggers, if set, will prevent resync unless one or more triggers evaluates to true.

The following example condition triggers a resync. In the example, the last phone upgrade attempt has elapsed more than 5 minutes (300 seconds), and at least 10 minutes (600 seconds) have elapsed since the last resync attempt.

```
$UPGTMR gt 300 and $PRVTMR ge 600
```

## Resync at a Specific Time

The `Resync_At` parameter allows the phone to resync at a specific time. This parameter uses the 24-hour format (hhmm) to specify the time.

The `Resync_At_Random_Delay` parameter allows the phone to resync at an unspecified delay in time. This parameter uses a positive integer format to specify the time.

Flooding the server with resync requests from multiple phones that are set to resync at the same time should be avoided. To do so, the phone triggers the resync up to 10 minutes after the specified time.

For example, if you set the resync time to 1000 (10 a.m.), the phone triggers the resync anytime between 10:00 a.m. and 10:10 a.m.

By default, this feature is disabled. If the `Resync_At` parameter is provisioned, the `Resync_Periodic` parameter is ignored.

## Configurable Schedules

You can configure schedules for periodic resyncs, and you can specify the retry intervals for resync and upgrade failures by using these provisioning parameters:

- `Resync_Periodic`
- `Resync_Error_Retry_Delay`
- `Upgrade_Error_Retry_Delay`

Each parameter accepts a single delay value (seconds). The new extended syntax allows for a comma-separated list of consecutive delay elements. The last element in the sequence is implicitly repeated forever. Here is an example:

```
Resync_Periodic=7200
Resync_Error_Retry_Delay=1800,3600,7200,14400
```

In the preceding example, the Cisco IP Phone periodically resyncs every 2 hours. If a resync failure occurs, the device retries at these intervals: 30 minutes, 1 hour, 2 hours, 4 hours. The device continues to try at 4-hour intervals until it resyncs successfully.

Optionally, you can use a plus sign to specify another numeric value that appends a random extra delay, as shown in this example:

```
Resync_Periodic=3600+600
Resync_Error_Retry_Delay=1800+300,3600+600,7200+900
```

In the preceding example, the device periodically resyncs every hour (plus an extra random delay of up to 10 minutes). In the case of a resync failure, the device retries at these intervals: 30 minutes (plus up to 5 minutes), 1 hour (plus up to 10 minutes), 2 hours (plus up to 15 minutes). The device continues to try at 2-hour intervals (plus up to 15 minutes) until it successfully resyncs.

Here is another example:

```
Upgrade_Error_Retry_Delay = 1800,3600,7200,14400+3600
```

In this example, if a remote upgrade attempt fails, the device retries the upgrade in 30 minutes, then again after one more hour, then in two hours. If the upgrade still fails, the device retries every four to five hours until the upgrade succeeds.

## Profile Rules

The Cisco IP Phone provides multiple remote configuration profile parameters (Profile\_Rule\*). Thus, each resync operation can retrieve multiple files that different servers manage.

In the simplest scenario, the device resyncs periodically to a single profile on a central server, which updates all pertinent internal parameters. Alternatively, the profile can be split between different files. One file is common for all the Cisco IP Phones in a deployment. A separate, unique file is provided for each account. Encryption keys and certificate information can be supplied by still another profile, stored on a separate server.

Whenever a resync operation is due, the Cisco IP Phone evaluates the four Profile\_Rule\* parameters in sequence:

- 1 Profile\_Rule
- 2 Profile\_Rule\_B
- 3 Profile\_Rule\_C
- 4 Profile\_Rule\_D

Each evaluation can result in a profile retrieval from a remote provisioning server, with a possible update of some number of internal parameters. If an evaluation fails, the resync sequence is interrupted, and is retried again from the beginning specified by the Resync\_Error\_Retry\_Delay parameter (seconds). If all evaluations succeed, the device waits for the second specified by the Resync\_Periodic parameter and then performs another resync.

The contents of each Profile\_Rule\* parameter consist of a set of alternatives. The alternatives are separated by the | (pipe) character. Each alternative consists of a conditional expression, an assignment expression, a profile URL, and any associated URL options. All these components are optional within each alternative. The following are the valid combinations, and the order in which they must appear, if present:

```
[ conditional-expr ] [ assignment-expr ] [[ options ] URL ]
```

Within each Profile\_Rule\* parameter, all alternatives except the last one must provide a conditional expression. This expression is evaluated and is processed as follows:

- 1 Conditions are evaluated from left to right, until one is found that evaluates as true (or until one alternative is found with no conditional expression).
- 2 Any accompanying assignment expression is evaluated, if present.
- 3 If a URL is specified as part of that alternative, an attempt is made to download the profile that is located at the specified URL. The system attempts to update the internal parameters accordingly.

If all alternatives have conditional expressions and none evaluates to true (or if the whole profile rule is empty), the entire Profile\_Rule\* parameter is skipped. The next profile rule parameter in the sequence is evaluated.

### Examples of Valid Programming for a Single Profile\_Rule\* Parameter

This example resyncs unconditionally to the profile at the specified URL, and performs an HTTP GET request to the remote provisioning server:

```
http://remote.server.com/cisco/$MA.cfg
```

In this example, the device resyncs to two different URLs, depending on the registration state of Line 1. In case of lost registration, the device performs an HTTP POST to a CGI script. The device sends the contents of the macro expanded GPP\_A, which may provide additional information on the device state:

```
($PRVTMR ge 600)? http://p.tel.com/has-reg.cfg  
| [--post a] http://p.tel.com/lost-reg?
```

In this example, the device resyncs to the same server. The device provides additional information if a certificate is not installed in the unit (for legacy pre-2.0 units):

```
($CCERT eq "Installed")? https://p.tel.com/config?  
| https://p.tel.com/config?cisco$MAU
```

In this example, Line 1 is disabled until GPP\_A is set equal to Provisioned through the first URL. Afterwards, it resyncs to the second URL:

```
($A ne "Provisioned")? (Line_Enable_1_ = "No");! https://p.tel.com/init-prov  
| https://p.tel.com/configs
```

In this example, the profile that the server returns is assumed to contain XML element tags. These tags must be remapped to proper parameter names by the aliases map stored in GPP\_B:

```
 [--alias b] https://p.tel.com/account/$PN$MA.xml
```

A resync is typically considered unsuccessful if a requested profile is not received from the server. The Resync\_Fails\_On\_FNF parameter can override this default behavior. If Resync\_Fails\_On\_FNF is set to No, the device accepts a file-not-found response from the server as a successful resync. The default value for Resync\_Fails\_On\_FNF is Yes.

## Upgrade Rule

Upgrade rule is to tell the device to activate to a new load and from where to get the load, if necessary. If the load is already on the device, it will not try to get the load. So, validity of the load location does not matter when the desired load is in the inactive partition.

The Upgrade\_Rule specifies a firmware load which, if different from the current load, will be downloaded and applied unless limited by a conditional expression or Upgrade\_Enable is set to **No**.

The Cisco IP Phone provides one configurable remote upgrade parameter, Upgrade\_Rule. This parameter accepts syntax similar to the profile rule parameters. URL options are not supported for upgrades, but conditional expressions and assignment expressions can be used. If conditional expressions are used, the parameter can be populated with multiple alternatives, separated by the | character. The syntax for each alternative is as follows:

```
[ conditional-expr ] [ assignment-expr ] URL
```

As in the case of Profile\_Rule\* parameters, the Upgrade\_Rule parameter evaluates each alternative until a conditional expression is satisfied or an alternative has no conditional expression. The accompanying assignment expression is evaluated, if specified. Then, an upgrade to the specified URL is attempted.

If the Upgrade\_Rule contains a URL without a conditional expression, the device upgrades to the firmware image that the URL specifies. After macro expansion and evaluation of the rule, the device does not reattempt to upgrade until the rule is modified or the effective combination of scheme + server + port + filepath is changed.

To attempt a firmware upgrade, the device disables audio at the start of the procedure and reboots at the end of the procedure. The device automatically begins an upgrade that is driven by the contents of Upgrade\_Rule only if all voice lines are currently inactive.

For example, for the Cisco IP Conference Phone 7832:

```
http://p.tel.com/firmware/sip7832.11-0-1MPP-BN (BN==Build Number).loads
```

In this example, the Upgrade\_Rule upgrades the firmware to the image that is stored at the indicated URL.

Here is another example for the Cisco IP Conference Phone 7832:

```
("$F" ne "beta-customer")? http://p.tel.com/firmware/sip7832.11-0-1MPP-BN (BN==Build
Number).loads
| http://p.tel.com/firmware/sip7832.11-0-1MPP-BN (BN==Build Number).loads
```

This example directs the unit to load one of two images, based on the contents of a general-purpose parameter, GPP\_F.

The device can enforce a downgrade limit regarding firmware revision number, which can be a useful customization option. If a valid firmware revision number is configured in the Downgrade\_Rev\_Limit parameter, the device rejects upgrade attempts for firmware versions earlier than the specified limit.

## Data Types

These data types are used with configuration profile parameters:

- {a,b,c,...}—A choice among a, b, c, ...

- Bool—Boolean value of either “yes” or “no.”
- CadScript—A miniscript that specifies the cadence parameters of a signal. Up to 127 characters.

Syntax:  $S_1[S_2]$ , where:

$S_i = D_i(\text{on}_{i,1}/\text{off}_{i,1}[\text{on}_{i,2}/\text{off}_{i,2}[\text{on}_{i,3}/\text{off}_{i,3}[\text{on}_{i,4}/\text{off}_{i,4}[\text{on}_{i,5}/\text{off}_{i,5}[\text{on}_{i,6}/\text{off}_{i,6}]]]]])$  and is known as a section.  $\text{on}_{i,j}$  and  $\text{off}_{i,j}$  are the on/off duration in seconds of a *segment*.  $i = 1$  or  $2$ , and  $j = 1$  to  $6$ .  $D_i$  is the total duration of the section in seconds. All durations can have up to three decimal places to provide 1 ms resolution. The wildcard character “\*” stands for infinite duration. The segments within a section are played in order and repeated until the total duration is played.

Example 1:

```
60(2/4)

Number of Cadence Sections = 1
Cadence Section 1: Section Length = 60 s
Number of Segments = 1
Segment 1: On=2s, Off=4s

Total Ring Length = 60s
```

Example 2—Distinctive ring (short,short,short,long):

```
60(.2/.2,.2/.2,.2/.2,1/4)

Number of Cadence Sections = 1
Cadence Section 1: Section Length = 60s
Number of Segments = 4
Segment 1: On=0.2s, Off=0.2s
Segment 2: On=0.2s, Off=0.2s
Segment 3: On=0.2s, Off=0.2s
Segment 4: On=1.0s, Off=4.0s

Total Ring Length = 60s
```

- DialPlanScript—Scripting syntax that is used to specify Line 1 and Line 2 dial plans.
- Float<n>—A floating point value with up to n decimal places.
- FQDN—Fully Qualified Domain Name. It can contain up to 63 characters. Examples are as follows:
  - sip.Cisco.com:5060 or 109.12.14.12:12345
  - sip.Cisco.com or 109.12.14.12
- FreqScript—A miniscript that specifies the frequency and level parameters of a tone. Contains up to 127 characters. Syntax:  $F_1@L_1[F_2@L_2[F_3@L_3[F_4@L_4[F_5@L_5[F_6@L_6]]]]]$ , where  $F_1$ – $F_6$  are frequency in Hz (unsigned integers only).  $L_1$ – $L_6$  are corresponding levels in dBm (with up to one decimal place). White spaces before and after the comma are allowed but not recommended.

Example 1—Call Waiting Tone:

```
440@-10

Number of Frequencies = 1
Frequency 1 = 440 Hz at -10 dBm
```

Example 2—Dial Tone:

```
350@-19,440@-19
```

```

Number of Frequencies = 2
Frequency 1 = 350 Hz at -19 dBm
Frequency 2 = 440 Hz at -19 dBm

```

- IP—Valid IPv4 Address in the form of x.x.x.x, where x is between 0 and 255. Example: 10.1.2.100.
- UserID—User ID as it appears in a URL; up to 63 characters.
- Phone—A phone number string, such as 14081234567, \*69, \*72, 345678; or a generic URL, such as, 1234@10.10.10.100:5068 or jsmith@Cisco.com. The string can contain up to 39 characters.
- PhTmpl—A phone number template. Each template may contain one or more patterns that are separated by a comma (.). White space at the beginning of each pattern is ignored. “?” and “\*” represent wildcard characters. To represent literally, use %xx. For example, %2a represents \*. The template can contain up to 39 characters. Examples: “1408\*, 1510\*”, “1408123????, 555?1.”.
- Port—TCP/UDP Port number (0-65535). It can be specified in decimal or hex format.
- ProvisioningRuleSyntax—Scripting syntax that is used to define configuration resync and firmware upgrade rules.
- PwrLevel—Power level expressed in dBm with one decimal place, such as -13.5 or 1.5 (dBm).
- RscTmpl—A template of SIP Response Status Code, such as “404, 5\*”, “61?”, “407, 408, 487, 481”. It can contain up to 39 characters.
- Sig<n>—Signed n-bit value. It can be specified in decimal or hex format. A “-” sign must precede negative values. A + sign before positive values is optional.
- Star Codes—Activation code for a supplementary service, such as \*69. The code can contain up to 7 characters.
- Str<n>—A generic string with up to n nonreserved characters.
- Time<n>—Time duration in seconds, with up to n decimal places. Extra specified decimal places are ignored.
- ToneScript—A miniscript that specifies the frequency, level, and cadence parameters of a call progress tone. Script may contain up to 127 characters. Syntax: FreqScript;Z<sub>1</sub>[;Z<sub>2</sub>]. The section Z<sub>1</sub> is similar to the S<sub>1</sub> section in a CadScript, except that each on/off segment is followed by a frequency components parameter: Z<sub>1</sub> = D<sub>1</sub>(on<sub>i,1</sub>/off<sub>i,1</sub>/f<sub>i,1</sub>[,on<sub>i,2</sub>/off<sub>i,2</sub>/f<sub>i,2</sub> [,on<sub>i,3</sub>/off<sub>i,3</sub>/f<sub>i,3</sub> [,on<sub>i,4</sub>/off<sub>i,4</sub>/f<sub>i,4</sub> [,on<sub>i,5</sub>/off<sub>i,5</sub>/f<sub>i,5</sub> [,on<sub>i,6</sub>/off<sub>i,6</sub>/f<sub>i,6</sub>]]]]]), where f<sub>i,j</sub> = n<sub>1</sub>[+n<sub>2</sub>]+n<sub>3</sub>[+n<sub>4</sub>]+n<sub>5</sub>[+n<sub>6</sub>]]]]]. 1 < n<sub>k</sub> < 6 specifies the frequency components in the FreqScript that are used in that segment. If more than one frequency component is used in a segment, the components are summed together.

Example 1—Dial tone:

```

350@-19,440@-19;10(* / 0 / 1 + 2)

Number of Frequencies = 2
Frequency 1 = 350 Hz at -19 dBm
Frequency 2 = 440 Hz at -19 dBm
Number of Cadence Sections = 1
Cadence Section 1: Section Length = 10 s
Number of Segments = 1
Segment 1: On=forever, with Frequencies 1 and 2

Total Tone Length = 10s

```

**Example 2—Stutter tone:**

```
350@-19,440@-19;2(.1/.1/1+2);10(*0/1+2)

Number of Frequencies = 2
Frequency 1 = 350 Hz at -19 dBm
Frequency 2 = 440 Hz at -19 dBm
Number of Cadence Sections = 2
Cadence Section 1: Section Length = 2s
Number of Segments = 1
Segment 1: On=0.1s, Off=0.1s with Frequencies 1 and 2
Cadence Section 2: Section Length = 10s
Number of Segments = 1
Segment 1: On=forever, with Frequencies 1 and 2

Total Tone Length = 12s
```

- **Uns<n>**—Unsigned n-bit value, where n = 8, 16, or 32. It can be specified in decimal or hex format, such as 12 or 0x18, as long as the value can fit into n bits.

**Note**

- **<Par Name>** represents a configuration parameter name. In a profile, the corresponding tag is formed by replacing the space with an underscore “\_”, such as **Par\_Name**.
- An empty default value field implies an empty string <“”>.
- The Cisco IP Phone continues to use the last configured values for tags that are not present in a given profile.
- Templates are compared in the order given. The first, *not the closest*, match is selected. The parameter name must match exactly.
- If more than one definition for a parameter is given in a profile, the last such definition in the file is the one that takes effect in the Cisco IP Phone.
- A parameter specification with an empty parameter value forces the parameter back to its default value. To specify an empty string instead, use the empty string “” as the parameter value.

## Profile Updates and Firmware Upgrades

The Cisco IP Phone supports secure remote provisioning (configuration) and firmware upgrades. An unprovisioned phone can receive an encrypted profile targeted for that device. The phone does not require an explicit key due to a secure first-time provisioning mechanism that uses SSL functionality.

User intervention is not required to either start or complete a profile update, or firmware upgrade, or if intermediate upgrades are required to reach a future upgrade state from an older release. A profile resync is only attempted when the Cisco IP phone is idle, because a resync can trigger a software reboot and disconnect a call.

General-purpose parameters manage the provisioning process. Each Cisco IP phone can be configured to periodically contact a normal provisioning server (NPS). Communication with the NPS does not require the use of a secure protocol because the updated profile is encrypted by a shared secret key. The NPS can be a standard TFTP, HTTP, or HTTPS server with client certificates.

The administrator can upgrade, reboot, restart, or resync Cisco IP phones by using the phone web user interface. The administrator can also perform these tasks by using a SIP notify message.

Configuration profiles are generated by using common, open-source tools that integrate with service provider provisioning systems.

#### Related Topics

[Allow and Configure Profile Updates, on page 20](#)

[Allow and Configure Firmware Upgrades, on page 20](#)

## Allow and Configure Profile Updates

Profile updates can be allowed at specified intervals. Updated profiles are sent from a server to the phone by using TFTP, HTTP, or HTTPS.

#### Procedure

---

- Step 1** On the Configuration Utility page, select **Admin Login > advanced > Voice > Provisioning**.
  - Step 2** In the **Configuration Profile** section, choose **Yes** from the **Provision Enable** drop-down list box.
  - Step 3** Enter the parameters.
  - Step 4** Click **Submit All Changes**.
- 

## Allow and Configure Firmware Upgrades

Firmware updates can be allowed at specified intervals. Updated firmware is sent from a server to the phone by using TFTP or HTTP. Security is less of an issue with a firmware upgrade, because firmware does not contain personal information.

#### Procedure

---

- Step 1** On the Configuration Utility page, select **Admin Login > advanced > Voice > Provisioning**.
  - Step 2** In the **Firmware Upgrade** section, choose **Yes** from the **Upgrade Enable** drop-down list box.
  - Step 3** Enter the parameters.
  - Step 4** Click **Submit All Changes**.
- 

## Upgrade Firmware by tftp/http/https

The phone supports single one image upgrade by tftp/http/https.

**Note**

A device (with new base and DCU) may not be downgraded to an earlier firmware release, such as 9.3(3). For details, refer to the hardware information and the firmware and hardware compatibility information in the current release note document that is, *Cisco IP Conference Phone 7832 Multiplatform Phones Release Notes*.

**Before You Begin**

The firmware load file must be downloaded to an accessible server.

**Procedure**

- 
- Step 1** Rename the image as follows:  
cp-x8xx-sip.aa-b-cMPP.cop to cp-x8xx-sip.aa-b-cMPP.tar.gz  
where:  
x8xx is 7832  
aa-b-c is the release number, such as 10-4-1
- Step 2** Use the tar `-xzvf` command to untar the tar ball.
- Step 3** Copy the folder to a tftp/http/https download directory.
- Step 4** On the Configuration Utility page, select **Admin Login** > **advanced** > **Voice** > **Provisioning**.
- Step 5** Find the load filename which ends in **.loads** and append it to the valid URL.
- Step 6** Click **Submit All Changes**.
- 

## Upgrade Firmware With a Browser Command

An upgrade command entered into the browser address bar can be used to upgrade firmware on a phone. The phone updates only when it is idle. The update is attempted automatically after the call is complete.

**Procedure**

To upgrade the Cisco IP Phone CP-78xx-3PCC with a URL in a web browser, enter this command:

```
http://<phone_ip>/admin/upgrade?<schema>://<serv_ip[:port]>/filepath
```

