Encrypted Preshared Key

The Encrypted Preshared Key feature allows you to securely store plain text passwords in type 6 (encrypted) format in NVRAM.

Feature History for Encrypted Preshared Key

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.3(2)T</td>
<td>This feature was introduced.</td>
</tr>
</tbody>
</table>

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://tools.cisco.com/ITDIT/CFN/jsp/index.jsp. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click Cancel at the login dialog box and follow the instructions that appear.

Contents

- Restrictions for Encrypted Preshared Key, page 1
- Information About Encrypted Preshared Key, page 2
- How to Configure an Encrypted Preshared Key, page 3
- Configuration Examples for Encrypted Preshared Key, page 11
- Where to Go Next, page 13
- Additional References, page 13

Restrictions for Encrypted Preshared Key

- Old ROM monitors (ROMMONs) and boot images cannot recognize the new type 6 passwords. Therefore, errors are expected if you boot from an old ROMMON.
- For Cisco 836 routers, please note that support for Advanced Encryption Standard (AES) is available only on IP plus images.
Information About Encrypted Preshared Key

- Using the Encrypted Preshared Key Feature to Securely Store Passwords, page 2
- How to Configure an Encrypted Preshared Key, page 3

Using the Encrypted Preshared Key Feature to Securely Store Passwords

Using the Encrypted Preshared Key feature, you can securely store plain text passwords in type 6 format in NVRAM using a command-line interface (CLI). Type 6 passwords are encrypted. Although the encrypted passwords can be seen or retrieved, it is difficult to decrypt them to find out the actual password. Use the `key config-key password-encryption` command with the `password encryption aes` command to configure and enable the password (symmetric cipher AES is used to encrypt the keys). The password (key) configured using the `config-key password-encryption` command is the master encryption key that is used to encrypt all other keys in the router.

If you configure the `password encryption aes` command without configuring the `key config-key password-encryption` command, the following message is printed at startup or during any nonvolatile generation (NVGEN) process, such as when the `show running-config` or `copy running-config startup-config` commands have been configured:

"Can not encrypt password. Please configure a configuration-key with ‘key config-key’"

Changing a Password

If the password (master key) is changed, or reencrypted, using the `key config-key password-encryption` command), the list registry passes the old key and the new key to the application modules that are using type 6 encryption.

Deleting a Password

If the master key that was configured using the `key config-key password-encryption` command is deleted from the system, a warning is printed (and a confirm prompt is issued) that states that all type 6 passwords will become useless. As a security measure, after the passwords have been encrypted, they will never be decrypted in the Cisco IOS software. However, passwords can be reencrypted as explained in the previous paragraph.

Caution

If the password configured using the `key config-key password-encryption` command is lost, it cannot be recovered. The password should be stored in a safe location.

Unconfiguring Password Encryption

If you later unconfigure password encryption using the `no password encryption aes` command, all existing type 6 passwords are left unchanged, and as long as the password (master key) that was configured using the `key config-key password-encryption` command exists, the type 6 passwords will be decrypted as and when required by the application.
Encrypted Preshared Key

Storing Passwords

Because no one can “read” the password (configured using the `key config-key password-encryption` command), there is no way that the password can be retrieved from the router. Existing management stations cannot “know” what it is unless the stations are enhanced to include this key somewhere, in which case the password needs to be stored securely within the management system. If configurations are stored using TFTP, the configurations are not standalone, meaning that they cannot be loaded onto a router. Before or after the configurations are loaded onto a router, the password must be manually added (using the `key config-key password-encryption` command). The password can be manually added to the stored configuration but is not recommended because adding the password manually allows anyone to decrypt all passwords in that configuration.

Configuring New or Unknown Passwords

If you enter or cut and paste cipher text that does not match the master key, or if there is no master key, the cipher text is accepted or saved, but an alert message is printed. The alert message is as follows:

"ciphertext>[for username bar]> is incompatible with the configured master key."

If a new master key is configured, all the plain keys are encrypted and made type 6 keys. The existing type 6 keys are not encrypted. The existing type 6 keys are left as is.

If the old master key is lost or unknown, you have the option of deleting the master key using the `no key config-key password-encryption` command. Deleting the master key using the `no key config-key password-encryption` command causes the existing encrypted passwords to remain encrypted in the router configuration. The passwords will not be decrypted.

Enabling the Encrypted Preshared Key

The `password encryption aes` command is used to enable the encrypted password.

How to Configure an Encrypted Preshared Key

- Configuring an Encrypted Preshared Key, page 4 (required)
- Monitoring Encrypted Preshared Keys, page 5 (optional)
- Configuring an ISAKMP Preshared Key, page 6 (optional)
- Configuring an ISAKMP Preshared Key in ISAKMP Keyrings, page 7 (optional)
- Configuring ISAKMP Aggressive Mode, page 8 (optional)
- Configuring a Unity Server Group Policy, page 9 (optional)
- Configuring an Easy VPN Client, page 10 (optional)
Configuring an Encrypted Preshared Key

To configure an encrypted preshared key, perform the following steps.

**SUMMARY STEPS**

1. ```enable```
2. ```configure terminal```
3. ```key config-key password-encryption [text]```  
4. ```password encryption aes```  

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** enable | Enables privileged EXEC mode.  
| **Example:** Router> enable |  
| **Step 2** configure terminal | Enters global configuration mode.  
| **Example:** Router# configure terminal |  
| **Step 3** key config-key password-encryption [text] | Stores a type 6 encryption key in private NVRAM.  
| **Example:** Router (config)# key config-key password-encryption |  
| **Step 4** password encryption aes | Enables the encrypted preshared key.  
| **Example:** Router (config)# password-encryption aes |  

**Troubleshooting Tips**

If you see the warning message “ciphertext >[for username bar] is incompatible with the configured master key,” you have entered or cut and pasted cipher text that does not match the master key or there is no master key. (The cipher text will be accepted or saved.) The warning message will allow you to locate the broken configuration line or lines.
Monitoring Encrypted Preshared Keys

To get logging output for encrypted preshared keys, perform the following steps.

1. enable
2. password logging

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
|        | enable            | Enables privileged EXEC mode.  
|        |                   | • Enter your password if prompted. |
| Example: | Router> enable | |
| Step 2 | password logging | Provides a log of debugging output for a type 6 password operation. |
| Example: | Router# password logging | |

Examples

The following password logging debug output shows that a new master key has been configured and that the keys have been encrypted with the new master key:

```
Router (config)# key config-key password-encrypt
New key:
Confirm key:
Router (config)#
01:40:57: TYPE6_PASS: New Master key configured, encrypting the keys with the new master key
```

```
Router (config)# key config-key password-encrypt
Old key:
New key:
Confirm key:
Router (config)#
01:42:11: TYPE6_PASS: Master key change heralded, re-encrypting the keys with the new master key
01:42:11: TYPE6_PASS: Mac verification successful
01:42:11: TYPE6_PASS: Mac verification successful
01:42:11: TYPE6_PASS: Mac verification successful
```

What To Do Next

You can perform any of the following procedures. Each procedure is independent of the others.

- Configuring an ISAKMP Preshared Key, page 6
- Configuring an ISAKMP Preshared Key in ISAKMP Keyrings, page 7
- Configuring ISAKMP Aggressive Mode, page 8
- Configuring a Unity Server Group Policy, page 9
- Configuring an Easy VPN Client, page 10
Configuring an ISAKMP Preshared Key

To configure an ISAKMP preshared key, perform the following procedure.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `crypto isakmp key keystring address peer-address`
4. `crypto isakmp key keystring hostname hostname`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Step 1** `enable` | Enables privileged EXEC mode.  
- Enter your password if prompted. |

**Example:**

```
Router# enable
```

| **Step 2** `configure terminal` | Enters global configuration mode. |

**Example:**

```
Router# configure terminal
```

| **Step 3** `crypto isakmp key keystring address peer-address` | Configures a preshared authentication key.  
- The `peer-address` argument specifies the IP address of the remote peer. |

**Example:**

```
Router (config)# crypto isakmp key cisco address 10.2.3.4
```

| **Step 4** `crypto isakmp key keystring hostname hostname` | Configures a preshared authentication key.  
- The `hostname` argument specifies the fully qualified domain name (FQDN) of the peer. |

**Example:**

```
Router (config)# crypto isakmp key mykey hostname mydomain.com
```

**Example**

The following sample output shows that an encrypted preshared key has been configured:

```
crypto isakmp key 6 _Hg[\'^ECgLGGFP^RXTQfDDWQ][YAAB address 10.2.3.4
crypto isakmp key 6 `eR\eTRaKCUZPYQfDgXRW\_AAB hostname mydomain.com
```
Configuring an ISAKMP Preshared Key in ISAKMP Keyrings

To configure an ISAKMP preshared key in ISAKMP keyrings, which are used in IPSec Virtual Route Forwarding (VRF) configurations, perform the following procedure.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `crypto keyring keyring-name`
4. `pre-shared-key address address key key`
5. `pre-shared-key hostname hostname key key`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> crypto keyring keyring-name</td>
<td>Defines a crypto keyring to be used during Internet Key Exchange (IKE) authentication and enters keyring configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config)# crypto keyring mykeyring</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> pre-shared-key address address key key</td>
<td>Defines a preshared key to be used for IKE authentication.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config-keyring)# pre-shared-key address 10.2.3.5 key cisco</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> pre-shared-key hostname hostname key key</td>
<td>Defines a preshared key to be used for IKE authentication.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config-keyring)# pre-shared-key hostname mydomain.com key cisco</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

The following `show-running-config` sample output shows that an encrypted preshared key in ISAKMP keyrings has been configured.

crypto keyring mykeyring
pre-shared-key address 10.2.3.5 key 6 `WHCJYR_Z\]GRPF^RXTQfDefZ\]GPAAB
pre-shared-key hostname mydomain.com key 6 aE_REHDCOFYCPF^RXTQfDJYVNSAAAB
Configuring ISAKMP Aggressive Mode

To configure ISAKMP aggressive mode, perform the following steps.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `crypto isakmp peer ip-address ip-address`
4. `set aggressive-mode client-endpoint client-endpoint`
5. `set aggressive-mode password password`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> <code>enable</code></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> <code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> <code>crypto isakmp peer ip-address ip-address</code></td>
<td>To enable an IP Security (IPSec) peer for IKE querying of authentication, authorization, and accounting (AAA) for tunnel attributes in aggressive mode and to enter ISAKMP peer configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config)# crypto isakmp peer ip-address 10.2.3.4</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> <code>set aggressive-mode client-endpoint client-endpoint</code></td>
<td>Specifies the Tunnel-Client-Endpoint attribute within an ISAKMP peer configuration.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config-isakmp-peer)# set aggressive-mode client-endpoint fqdn cisco.com</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> <code>set aggressive-mode password password</code></td>
<td>Specifies the Tunnel-Password attribute within an ISAKMP peer configuration.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router (config-isakmp-peer)# set aggressive-mode password cisco</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

The following `show-running-config` sample output shows that an encrypted preshared key in ISAKMP aggressive mode has been configured.

crypto isakmp peer address 10.2.3.4
set aggressive-mode password 6 ^aKPIQ_KJE_PPF^RXTQfDTIaLNeAAB
set aggressive-mode client-endpoint fqdn cisco.com
Configuring a Unity Server Group Policy

To configure a unity server group policy, perform the following steps.

**SUMMARY STEPS**

1. enable
2. configure terminal
3. crypto isakmp client configuration group group-name
4. pool name
5. domain name
6. key name

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Step 1** enable | Enables privileged EXEC mode.  
  - Enter your password if prompted. |
| Example: Router# enable | |
| **Step 2** configure terminal | Enters global configuration mode. |
| Example: Router# configure terminal | |
| **Step 3** crypto isakmp client configuration group group-name | Specifies the policy profile of the group that will be defined and enters ISAKMP group configuration mode. |
| Example: Router (config)# crypto isakmp client configuration group mygroup | |
| **Step 4** pool name | Defines a local pool address. |
| Example: Router (config-isakmp-group)# pool mypool | |
| **Step 5** domain name | Specifies the Domain Name Service (DNS) domain to which a group belongs. |
| Example: Router (config-isakmp-group)# domain cisco.com | |
| **Step 6** key name | Specifies the IKE preshared key for group policy attribute definition. |
| Example: Router (config-isakmp-group)# key cisco | |
Example

The following `show-running-config` sample output shows that an encrypted key has been configured for a unity server group policy:

```
crypto isakmp client configuration group mygroup
  key 6 c2ZqDZPOe\dDPF'RXTqfDTiALNeAAB
  domain cisco.com
  pool mypool
```

Configuring an Easy VPN Client

To configure an Easy VPN client, perform the following steps.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `crypto ipsec client ezvpn name`
4. `peer ipaddress`
5. `mode client`
6. `group group-name key group-key`
7. `connect manual`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Step 1**<br>`enable` | Enables privileged EXEC mode.  
  - Enter your password if prompted. |
| Example: `Router# enable` | |
| **Step 2**<br>`configure terminal` | Enters global configuration mode. |
| Example: `Router# configure terminal` | |
| **Step 3**<br>`crypto ipsec client ezvpn name` | Creates a Cisco Easy VPN remote configuration and enters Cisco Easy VPN remote configuration mode. |
| Example: `Router (config)# crypto ipsec client ezvpn myclient` | |
| **Step 4**<br>`peer ipaddress` | Sets the peer IP address for the VPN connection. |
| Example: `Router (config-isakmp-peer)# peer 10.2.3.4` | |
| **Step 5**<br>`mode client` | Automatically configures the router for Cisco Easy VPN Client mode operation, which uses Network Address Translation (NAT) or Peer Address Translation (PAT) address translations. |
| Example: `Router (config-isakmp-ezpvy)# mode client` | |
Example

The following `show-running-config` sample output shows that an Easy VPN client has been configured. The key has been encrypted.

```
crypto ipsec client ezvpn myclient
    connect manual
    group mygroup key 6 gdMI`S^^[GICPF`RXTQfdFfEO\RAAB
    mode client
    peer 10.2.3.4
```

Configuration Examples for Encrypted Preshared Key

This section provides the following configuration examples:

- Encrypted Preshared Key: Example, page 11
- No Previous Key Present: Example, page 12
- Key Already Exists: Example, page 12
- Key Already Exists But the User Wants to Key In Interactively: Example, page 12
- No Key Present But the User Wants to Key In Interactively: Example, page 12
- Removal of the Password Encryption: Example, page 12

Encrypted Preshared Key: Example

The following is an example of a configuration for which a type 6 preshared key has been encrypted. It includes the prompts and messages that a user might see.

```
Router (config)# crypto isakmp key cisco address 10.0.0.2
Router (config)# exit
Router# show running-config | include crypto isakmp key
    crypto isakmp key cisco address 10.0.0.2
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router (config)# password encryption aes
Router (config)# key config-key password-encrypt
New key:
Confirm key:
Router (config)#
```
01:46:40: TYPE6_PASS: New Master key configured, encrypting the keys with the new master key
Router (config)# exit
Router # show running-config | include crypto isakmp key
crypto isakmp key 6 CXWdhVT2YB_Vcd`cIHDOahiFTa address 10.0.0.2

**No Previous Key Present: Example**

In the following configuration example, no previous key is present:

Router (config)# key config-key password-encryption testkey 123

**Key Already Exists: Example**

In the following configuration example, a key already exists:

Router (config)# key config-key password-encryption testkey123
Old key:
Router (config)#

**Key Already Exists But the User Wants to Key In Interactively: Example**

In the following configuration example, the user wants to key in interactively, but a key already exists. The Old key, New key, and Confirm key prompts will show on your screen if you enter the key config-key password-encryption command and press the enter key to get into interactive mode.

Router (config)# key config-key password-encryption
Old key:
New key:
Confirm key:

**No Key Present But the User Wants to Key In Interactively: Example**

In the following example, the user wants to key in interactively, but no key is present. The New key and Confirm key prompts will show on your screen if you are in interactive mode.

Router (config)# key config-key password-encryption
New key:
Confirm key:

**Removal of the Password Encryption: Example**

In the following configuration example, the user wants to remove the encrypted password. The “WARNING: All type 6 encrypted keys will become unusable. Continue with master key deletion? [yes/no]:” prompt will show on your screen if you are in interactive mode.

Router (config)# no key config-key password-encryption

WARNING: All type 6 encrypted keys will become unusable. Continue with master key deletion? [yes/no]: y
Where to Go Next

Configure any other preshared keys.

Additional References

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuring passwords</td>
<td><em>Cisco IOS Security Command Reference</em></td>
</tr>
</tbody>
</table>

Standards

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>—</td>
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MIBs

<table>
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<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS software releases, and feature sets, use Cisco MIB Locator found at the following URL: <em><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></em></td>
</tr>
</tbody>
</table>

RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.</td>
<td><em><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></em></td>
</tr>
</tbody>
</table>