

Encrypted Preshared Key

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

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

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** 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** 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 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.

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-encryptioncommand 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

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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**key config-key password-encryption** [*text*] **Example:** `Router (config)# key config-key password-encryption`	Stores a type 6 encryption key in private NVRAM. • If you want to key in interactively (using the enter key) and an encrypted key already exists, you will be prompted for the following: Old key, New key, and Confirm key. • If you want to key in interactively but an encryption key is not present, you will be prompted for the following: New key and Confirm key.

	Command or Action	Purpose
		• If you want to remove the password that is already encrypted, you will see the following prompt: "WARNING: All type 6 encrypted keys will become unusable. Continue with master key deletion? [yes/no]:".
Step 4	**password encryption aes** **Example:** `Router (config)# password-encryption aes`	Enables the encrypted preshared key.

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**

SUMMARY STEPS

1. **enable**
2. **password logging**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**password logging** **Example:** `Router# password logging`	Provides a log of debugging output for a type 6 password operation.

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 keypas
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

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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Router# configure terminal`	
Step 3	**crypto isakmp key** *keystring* **address** *peer-address* **Example:** `Router (config)# crypto isakmp key cisco address 10.2.3.4`	Configures a preshared authentication key. • The *peer-address* argument specifies the IP address of the remote peer.
Step 4	**crypto isakmp key** *keystring* **hostname** *hostname* **Example:** `Router (config)# crypto isakmp key mykey hostname mydomain.com`	Configures a preshared authentication key. • The *hostname* argument specifies the fully qualified domain name (FQDN) of the peer.

Example

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

```
crypto isakmp key 6 _Hg[^^ECgLGGPF^RXTQfDDWQ][YAAB address 10.2.3.4
crypto isakmp key 6 `eR\eTRaKCUZPYYQfDgXRWi_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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router# enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto keyring** *keyring-name* **Example:** `Router (config)# crypto keyring mykeyring`	Defines a crypto keyring to be used during Internet Key Exchange (IKE) authentication and enters keyring configuration mode.
Step 4	**pre-shared-key address** *address* **key** *key* **Example:** `Router (config-keyring)# pre-shared-key address 10.2.3.5 key cisco`	Defines a preshared key to be used for IKE authentication. • The *address* argument specifies the IP address of the remote peer.
Step 5	**pre-shared-key hostname** *hostname* **key** *key* **Example:** `Router (config-keyring)# pre-shared-key hostname mydomain.com key cisco`	Defines a preshared key to be used for IKE authentication. • The *hostname* argument specifies the FQDN of the peer.

Example

The following s**how-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^RXTQfDcfZ]GPAAB
  pre-shared-key hostname mydomain.com key 6 aE_REHDcOfYCPF^RXTQfDJYVVNSAAB
```

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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto isakmp peer ip-address** *ip-address* **Example:** `Router (config)# crypto isakmp peer ip-address 10.2.3.4`	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.
Step 4	**set aggressive-mode client-endpoint** *client-endpoint* **Example:** `Router (config-isakmp-peer)# set aggressive-mode client-endpoint fqdn cisco.com`	Specifies the Tunnel-Client-Endpoint attribute within an ISAKMP peer configuration.
Step 5	**set aggressive-mode password** *password* **Example:** `Router (config-isakmp-peer)# set aggressive-mode password cisco`	Specifies the Tunnel-Password attribute within an ISAKMP peer configuration.

Example

The following s**how-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

Procedure

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

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 cZZgDZPOE\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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto ipsec client ezvpn** *name* **Example:** `Router (config)# crypto ipsec client ezvpn myclient`	Creates a Cisco Easy VPN remote configuration and enters Cisco Easy VPN remote configuration mode.
Step 4	**peer** *ipaddress* **Example:**	Sets the peer IP address for the VPN connection.

	Command or Action	Purpose
	`Router (config-isakmp-peer)# peer 10.2.3.4`	
Step 5	**mode client** **Example:** `Router (config-isakmp-ezpvy)# 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.
Step 6	**group** *group-name* **key** *group-key* **Example:** `Router (config-isakmp-ezvpn)# group mygroup key cisco`	Specifies the group name and key value for the VPN connection.
Step 7	**connect manual** **Example:** `Router (config-isakmp-ezvpn)# connect manual`	Specifies the manual setting for directing the Cisco Easy VPN remote client to wait for a command or application program interface (API) call before attempting to establish the Cisco Easy VPN remote connection.

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^RXTQfDFKEO\RAAB
 mode client
 peer 10.2.3.4
```

Configuration Examples for Encrypted Preshared Key

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#
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 CXWdhVTZYB_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 Already Exists Example

In the following configuration example, a key already exists:

```
Router (config)#
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** command and press the enter key to get into interactive mode.

```
Router (config)#
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)#

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)#
```

```
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

Related Topic	Document Title
Configuring passwords	*Cisco IOS Security Command Reference*

Standards

Standards	Title
None	--

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
None	--

Technical Assistance

Description	Link
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.	http://www.cisco.com/cisco/web/support/index.html