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Cisco 2621 Security Policy

Software Unit Functional Specification

Project Headline

This document describes the rules for an IOS system using software-based IPSEC encryption when used in accordance with FIPS 140-1 level 2 requirements. Please see reference **[FIPS-140]** for a full list of the FIPS 140-1 requirements.

Department	Name	Acceptance Date
IOS Encryption	David Mcgrew, Manager	

Reviewers

Rev.	Date	Originator	Comment
A	9/25/98	Brian Weis	Initial Version
B	11/17/98	Brian Weis	Changed authentication method

Modification History

Definitions

This section defines words, acronyms, and actions which may not be readily understood.

IPSEC	A family of IETF protocols which provide network layer encryption.
IKE	A key management protocol used by IPSEC for authentication and secret key derivation.

1.0 Roles and Services

Role-based authentication is used by the IOS. Two roles are defined: a User role, and a Crypto-Officer role. There is no maintenance role. Services available for each role are listed. Please see **[UNIVERCD]** for a detailed configuration description.

1.1 User Role

A user enters the system by accessing the console port with a terminal program.

The IOS prompts the user for their password, entered in plaintext. If it matches the plaintext password stored in IOS memory the user is allowed entry to the IOS executive program. The non-cryptographic services available to the user role include:

- Obtain non-encryption router status (e.g., state of an interface, state of layer 2 protocols, version of IOS currently running)
- Connect to other network devices (e.g., outgoing telnet, PPP)
- Initiate diagnostic network services (e.g., ping, mtrace)
- Adjust the terminal session (e.g., lock the terminal, adjust flow control)
- Display a directory of files kept in flash memory
- Other non-cryptographic services such as ping, telnet, and etc. can be viewed in the console by typing “?” at the command prompt.

The following cryptographic services are available to the user

Table 1: Crypto User Encryption Services

Description of Service	Executive Command
Attempt to enter the crypto officer role	**Enable**

1.2 Crypto-Officer Role.

The Crypto-Officer role is entered from the User role by invoking the `enable` command and responding with an appropriate password. The enable password entered by the Crypto-Officer is compared to a password stored in the router memory. If two passwords match, the Crypto-Officer enters the Crypto-Officer role.

The non-cryptographic services available to the Crypto-Officer role include:

- Perform router configuration (e.g., defining IP addresses, enabling interfaces, enabling network services
- Reload and shut down the router
- Display full status of the router
- Shutdown and restart network services
- Display the router configuration stored in memory, and also the version saved in NVRAM which is used to initialize a router following a reboot.
- Other non-cryptographic services such as network configuration and routing configuration can be viewed in the console by typing “?” at the command prompt.

The following cryptographic services are available to the Crypto-Officer:

Crypto-Officer Cryptographic Services: Configuration

Description of Service	Configuration Command
Add/delete crypto users, and assign passwords to users	**line console 0 (to enable user role and password)** **password (enter password)** **login**
Create the crypto officer password	**Enable password**

Set IPSEC security association parameters	**Crypto ipsec security-association**
Set an IPSEC transform set	**Crypto ipsec transform-set**
Create access-lists to match encrypted traffic	**access-list <100-199>**
Define IPSEC policy and keys for a connection	**crypto map**
Set IPSEC policy on a network interface	**interface <interface name>** **crypto map**

Executive commands in the user role are also available in the Crypto-Officer role. The following commands are only available to the Crypto-Officer.

Crypto-Officer Cryptographic Services: Executive Commands

Description of Service	Executive Command
Show the current IPSEC security associations	**show crypto ipsec sa**
Show the current IPSEC security association lifetimes	**show crypto ipsec security- association-lifetime**
Show the current IPSEC transforms	**show crypto ipsec transform-set**
Show the number of encrypted and decrypted packets on a router	**show crypto engine connections active**
Clear an IPSEC security association	**clear crypto sa**
Execute encryption self tests	**Power regeneration or commnad “reload” for soft reboot**

2.0 Security Rules

2.1 System Requirements

The following requirement relate to how the IOS system must be configured.

1. The tamper-evident labels must be placed according to the “Tamper-Evident Label Placements” documentation prior to starting any of the services of the module. There are five tamper-evident labels that must be placed according to the documentation. If any of the labels were tampered, there will be clear tampered indication from the labels. The tamper-evident labels have to two layers. Upon tampering, the second layer will be peeled with the word “VOID” and stay on the module. This will clearly show tamper evidence.
2. The IOS version must be an image of at the following type: Cisco IOS Version 12.1(1)T.
3. The IOS version which is shipped with a router is the *only* allowable image. The loading of any other image is not allowed.
4. The value of the `config-register` which affects booting must be 0x0101 (the factory default). This setting disables “break” from the console to the ROM monitor, and specifies the first file in flash to be the boot IOS image.

5. The crypto-officer must be present when the system is initialized and perform the initial configuration. He must create at least one crypto-officer role, as well as define the enable password for the crypto-officer role.
6. The crypto-officer shall always assign passwords to users.
7. The crypto-officer shall only assign users to a privilege level 1 (the default)
8. The crypto-officer shall not assign a command to any privilege level other than its default.
9. The following network services affect the security data items and must not be configured: SNMP, NTP, TACACS+, RADIUS, Kerberos.
10. Using RSA will take the module out of FIPS mode under IKE.
11. All terminal services must be disabled, except for the console. The following configuration disables login services on the auxiliary console line.

    ```
    line aux 0
    no exec
    ```

    To disallow telnet and x.29 access to the router, the following configuration must be used:

    ```
    line vty 0 4
    transport input none
    ```

2.2 IPSEC Requirements and Cryptographic Algorithms

There are two types of key management method that are allowed in FIPS mode.

- IPSEC manually entered keys
- Internet Key Exchange with Pre-shared keys

Although the IOS implementation of IKE allows a number of algorithms, only the following transforms using FIPS approved algorithms are allowed in a FIPS140-1 configuration.

- ah-sha-hmac
- esp-des
- esp-sha-hmac
- esp-3des

Other non-FIPS approved algorithms include:

- RSA
- MD-4
- MD-5

3.0 Security Data Items

The following sections describe security relevant data items, and any restrictions on the user-configurable data items.

3.1 Passwords

The Crypto-Officer shall set user passwords to be at least 8 characters in length.

- User Passwords
- Enable Password

3.2 Keys

- IPSEC DES Session Keys

- IPSEC SHA HMAC keys
- IKE pre-shared Keys

The cryptographic keys are physically protected by the tamper evident labels. The cryptographic keys are also protected with passwords.

4.0 Tamper-evident Label Placements

It is the responsibility of the crypto-officer to place the tamper-evident labels. The crypto-officer must follow the direction described below to place the tamper-evident labels to be in FIPS mode.

Label 1 and 2: The tamper-evident label must be placed over the enclosure. It must be placed at the location shown in Figure 1. One half of the tamper-evident label must cover the enclosure and the other half must cover the router. Any attempt to remove the enclosure shall leave tamper evidence by the tamper-evident label.

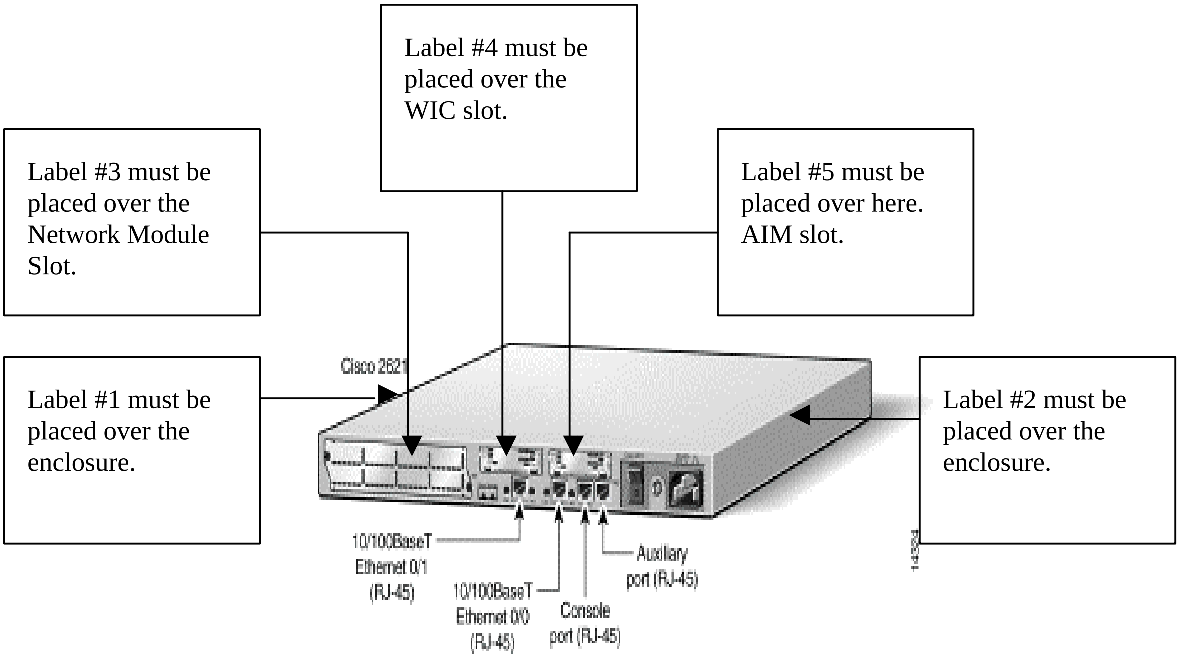
Label 3: The tamper-evident label must be placed so that the one half of the label must cover the enclosure and the other half must cover the Network Module slot. Any attempt to remove the Network Module slot shall leave tamper evidence by the tamper-evident label.

Label 4: The tamper-evident label must be placed so that the half of the label must cover the enclosure and the other half must cover the WAN interface card slot. Any attempt to remove the WAN interface card slot shall leave tamper evidence by the tamper-evident label.

Label 5: The tamper-evident label must be placed so that the half of the label must cover the enclosure and the other half must cover the WAN interface card slot. Any attempt to remove the WAN interface card slot shall leave tamper evidence by the tamper-evident label.

Note: The tamper-evident labels must be placed 24 hours minimum to be in FIPS mode.

Figure 1. Tamper-evident label placements



Label #4 must be placed over the WIC slot.

Label #3 must be placed over the Network Module Slot.

Label #5 must be placed over here. AIM slot.

Label #1 must be placed over the enclosure.

Label #2 must be placed over the enclosure.

Cisco 2621
10/100BaseT Ethernet 0/1 (RJ-45)
10/100BaseT Ethernet 0/0 (RJ-45)
Console port (RJ-45)
Auxiliary port (RJ-45)
14334

Reference Documents

[FIPS 140-1] FIPS PUB 140-1 FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION. Available online at http://csrc.nist.gov/cryptval/

[UNIVERCD] Cisco IOS documentation. Available online at `http://www.cisco.com/univercd/cc/td/doc/product/software/index.htm`