FIPS 140-2 Non-Proprietary Security Policy for the Cisco PIX 525/535 Security Appliance

Introduction

This is a non-proprietary Cryptographic Module Security Policy for the Cisco PIX 525 and PIX 535 security appliances, referred to in this document as PIX security appliances, devices, modules, or appliances. This security policy describes how the PIX security appliances meet the security requirements of FIPS 140-2 and how to run the devices in a FIPS 140-2 mode of operation.

This policy was prepared as part of the Level 1 FIPS 140-2 validation of the Cisco PIX 525 and PIX 535 security appliances.


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This document includes the following sections:

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Submission Package

This security policy document is part of a complete FIPS 140-2 Submission Package. In addition to this document, the complete FIPS 140-2 Submission Package contains:

- Vendor Evidence
- Finite State Machine
- Other supporting documentation as additional references

With the exception of this Non-Proprietary Security Policy, the FIPS 140-2 Validation Documentation is proprietary to Cisco Systems, Inc. and is releasable only under appropriate non-disclosure agreements. For access to these documents, please contact Cisco Systems, Inc. See “Obtaining Technical Assistance” section on page 21 for more information.

Overview

The Cisco PIX security appliances deliver robust user and application policy enforcement, multi-vector attack protection, and secure connectivity services in cost-effective, easy-to-deploy solutions. Cisco PIX security appliances provide comprehensive security, performance, and reliability for network environments of all sizes.

These PIX security appliances provide multiple integrated security and networking services, including:

- Application-aware firewall services
- Voice over IP (VoIP) and multimedia security
- Robust site-to-site and remote-access IPSec VPN connectivity
- Resiliency
- Intelligent networking services
- Flexible management solutions

The Cisco PIX 525 and PIX 535 security appliances are validated with the VPN Acceleration Card+ (VAC+), to provide hardware-accelerated IP Security (IPSec) VPN support for international cryptographic standards and scalable VPN tunnel aggregation in a solution that comes integrated with, or as an upgrade for, most Cisco PIX security appliances. Ranging from solutions for small to midsize businesses (SMBs) to large enterprises and service providers, the Cisco PIX security appliances offer...
integrated network security services and investment protection. The Cisco PIX VAC+ offloads VPN cryptographic functionality from the PIX device, enabling the Cisco PIX security appliances to deliver stateful inspection firewall services, advanced application and protocol inspection, inline intrusion protection, and robust multimedia and voice security services.

**PIX Security Appliance Validation Level**

Table 1 lists the level of validation for each area in the FIPS 140-2 security policy.

<table>
<thead>
<tr>
<th>No.</th>
<th>Area Title</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cryptographic Module Specification</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Cryptographic Module Ports and Interfaces</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Roles, Services, and Authentication</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Finite State Model</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Physical Security</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Operational Environment</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Cryptographic Key management</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Electromagnetic Interface/Electromagnetic Compatibility</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Self-Tests</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Design Assurance</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Mitigation of Other Attacks</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Physical Characteristics and Module Interfaces**

The design of the Cisco PIX 525 and PIX 535 security appliances supports a combination of 10/100 Fast Ethernet interfaces and Gigabit Ethernet interfaces, with a redundant power supply on PIX 535.

Each PIX security appliance is a multi-chip standalone device. The cryptographic boundary is defined as encompassing the “top,” “front,” “left,” “right,” and “bottom” surfaces of the case, as well as the “backplane” of the case not supporting a removable interface or service card, and the inverse of the three-dimensional space within the case that would otherwise be occupied by an installed service card. The cryptographic boundary includes the connection apparatus between the service card and the motherboard/daughterboard that hosts the service card, but the boundary does not include the service card itself (except when a VAC+ is inserted into an available PIX Circuit Board Interface). In other words, the cryptographic boundary encompasses all hardware components within the case of the device except any installed modular service card (except when a VAC+ is inserted into an available PIX Circuit Board Interface).

Each PIX security appliance provides a number of physical and logical interfaces to the device, and the physical interfaces provided by the device are mapped to four FIPS 140-2 defined logical interfaces: data input, data output, control input, and status output.
The logical interfaces and their mapping are described in Table 2 and in Table 3:

**Table 2  Cisco 525 Physical Interface/Logical Interface Mapping**

<table>
<thead>
<tr>
<th>Physical Interface</th>
<th>FIPS 140-2 Logical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100BaseTX Ethernet 0</td>
<td>Data Input Interface</td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 1</td>
<td>Data Output Interface</td>
</tr>
<tr>
<td>Circuit Board Interfaces 0-2</td>
<td>Control Input Interface</td>
</tr>
<tr>
<td>Console Port</td>
<td>Status Output Interface</td>
</tr>
<tr>
<td>Power Switch</td>
<td>Power Interface</td>
</tr>
<tr>
<td>Main Power Plug</td>
<td>Unused Interface</td>
</tr>
<tr>
<td>USB Port</td>
<td>Unused Interface</td>
</tr>
<tr>
<td>Serial Failover Interface</td>
<td>Unused Interface</td>
</tr>
</tbody>
</table>
Table 3  Cisco 535 Physical Interface/Logical Interface Mapping

<table>
<thead>
<tr>
<th>Physical Interface</th>
<th>FIPS 140-2 Logical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100BaseTX Ethernet 0</td>
<td>Data Input Interface</td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 1</td>
<td></td>
</tr>
<tr>
<td>Circuit Board Interfaces 0-8</td>
<td></td>
</tr>
<tr>
<td>Console Port</td>
<td></td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 0</td>
<td>Data Output Interface</td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 1</td>
<td></td>
</tr>
<tr>
<td>Circuit Board Interfaces 0-8</td>
<td></td>
</tr>
<tr>
<td>Console Port</td>
<td></td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 0</td>
<td>Control Input Interface</td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 1</td>
<td></td>
</tr>
<tr>
<td>Circuit Board Interfaces 0-8</td>
<td></td>
</tr>
<tr>
<td>Power Switch</td>
<td></td>
</tr>
<tr>
<td>Console Port</td>
<td></td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 0</td>
<td>Status Output Interface</td>
</tr>
<tr>
<td>10/100BaseTX Ethernet 0 100Mbps LED</td>
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<tr>
<td>10/100BaseTX Ethernet 0 ACT LED</td>
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<tr>
<td>10/100BaseTX Ethernet 0 LINK LED</td>
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<tr>
<td>10/100BaseTX Ethernet 1</td>
<td></td>
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<tr>
<td>10/100BaseTX Ethernet 1 100Mbps LED</td>
<td></td>
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<tr>
<td>10/100BaseTX Ethernet 1 ACT LED</td>
<td></td>
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<tr>
<td>10/100BaseTX Ethernet 1 LINK LED</td>
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<tr>
<td>Circuit Board Interfaces 0-8</td>
<td></td>
</tr>
<tr>
<td>Console Port</td>
<td></td>
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<tr>
<td>Power Plug(s)</td>
<td>Power Interface</td>
</tr>
<tr>
<td>USB Port</td>
<td></td>
</tr>
<tr>
<td>Serial Failover Interface</td>
<td>Unused Interface</td>
</tr>
</tbody>
</table>
Roles and Services

The device can be accessed in one of the following ways.

- Console Port
- Telnet over IPSec
- SSH
- ASDM via HTTPS/TLS

As required by FIPS 140-2, there are two main roles in the PIX security appliance that operators may assume: a crypto officer role and user role. The PIX security appliance supports role-based authentication, and the respective services for each role are described in the “Crypto Officer Services” section on page 6, and the “User Services” section on page 6.

Crypto Officer Services

The crypto officer role is responsible for the configuration and maintenance of the PIX security appliance and authenticates from the `enable` command (for local authentication) or the `login` command (for AAA authentication) from the user services. The crypto officer services consist of the following:

- **Configure the Device**—Define network interfaces and settings; set the protocols the PIX security appliance will support; enable interfaces and network services; set system date and time; load authentication information; and configure authentication servers, filters and access lists for interfaces and users, and privileges
- **Define Rules and Filters**—Create packet filters that are applied to user data streams on each interface. Each filter consists of a set of rules, which define a set of packets to permit or deny based on characteristics such as protocol ID, addresses, ports, TCP connection establishment, or packet direction.
- **View Status**—View the configuration, routing tables, active sessions, use gets to view SNMP MIB statistics, health, temperature, memory status, packet statistics, review accounting logs, and view physical interface status.
- **Manage the Device**—Log off users, shutdown or reload the PIX security appliance, view complete configurations, view full status, manage user rights, and restore configurations.
- **Set Encryption/Bypass**—Set up the configuration tables for IP tunneling, set keys and algorithms to be used for each IP range or allow plaintext packets to be sent from specified IP address.
- **Install Service Card**— Remove tamper-evident seals to install or replace service cards.

User Services

Basic encryption and decryption services are performed by the User role. A user enters the system by accessing the console port with a terminal program or via IPSec protected telnet or SSH session to a LAN port. The PIX security appliance will prompt the user for their password. If the password is correct, the user is allowed entry to the executive program. The services available to the user role consist of:

- **Status Functions**—Image version currently running, installed hardware components, and version of hardware installed
- **Network Functions**—Initiate diagnostic network services, such as ping
- **Directory Services**—Display directory of files kept in Flash memory
Critical Security Parameters

The services accessing the Critical Security Parameters (CSPs), the type of access and which role accesses the CSPs are listed in the Table 4.

Table 4  Role and Service Access to Security Relevant Data Items

<table>
<thead>
<tr>
<th>Role/Service</th>
<th>Critical Security Parameter</th>
<th>CSP1</th>
<th>CSP2</th>
<th>CSP3</th>
<th>CSP4</th>
<th>CSP5</th>
<th>CSP6</th>
<th>CSP7</th>
<th>CSP8</th>
<th>CSP9</th>
<th>CSP10</th>
<th>CSP11</th>
<th>CSP12</th>
<th>CSP13</th>
<th>CSP14</th>
<th>CSP15</th>
<th>CSP16</th>
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<tbody>
<tr>
<td>User role</td>
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<td>Crypto-Officer Role</td>
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<tr>
<td>Configure the Module</td>
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<tr>
<td>Define Rules and Filters</td>
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<td>Status Functions</td>
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<tr>
<td>Manage the Module</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Set Encryption/Bypass</td>
<td>r w d</td>
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<td></td>
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</tr>
<tr>
<td>Install Service Card</td>
<td>r w d</td>
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</tr>
</tbody>
</table>

\[ r = \text{read} \quad w = \text{write} \quad d = \text{delete} \]

Authentication Mechanisms

The PIX security appliance supports either a password or digital certificates for authenticating IPSec users. To log on to the PIX security appliance for management purposes, an operator must connect to it through one of the management interfaces (Console Port, SSH, Telnet, or ASDM) and provide a password.

Table 5 describes the estimated strength of the authentication mechanism.
Cryptographic Key Management

The PIX security appliances use a variety of critical security parameters during operation. Table 6 lists the critical security parameters used by the PIX security appliance.

<table>
<thead>
<tr>
<th>Authentication Type</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Username Password mechanism</td>
<td>Passwords must be a minimum of 6 characters (see the “Secure Operation” section on page 12). The probability of a false positive for a random password guess is less than 1 in 1,000,000. This is also valid for RADIUS or TACACS+ shared secret keys. The password can consist of alphanumeric values, a-zA-Z0-9, yielding 62 choices per character. The probability of a successful random attempt is 1/62^6, which is less than 1/1,000,000.</td>
</tr>
<tr>
<td>Certificate based authentication</td>
<td>The PIX security appliance supports a public key based authentication with 1024 and 2048 (for RSA) bit keys, and thus the probability of a false positive from a random correct guess is less than 1 in 1,000,000. A 1024-bit RSA key has at least 80-bits of equivalent strength. The probability of a successful random attempt is 1/2^80, is less than 1/1,000,000. A 2048-bit RSA key has at least 112-bits of equivalent strength. The probability of a successful random attempt is 1/2^112, is less than 1/1,000,000.</td>
</tr>
</tbody>
</table>
Table 6  Critical Security Parameters Used by the PIX Security Appliance

<table>
<thead>
<tr>
<th>#</th>
<th>Key/CSP Name</th>
<th>Generation/Algorithm</th>
<th>Description</th>
<th>Storage</th>
<th>Zeroization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RSA public/private keys</td>
<td>ANSI X9.31/RSA</td>
<td>Identity certificates for the PIX security appliance itself and also used in IPSec, TLS, and SSH negotiations. While the PIX security appliance supports 512, 768, 1024 and 2048 bit RSA key sizes; 512 and 768 bit RSA keys shall not be used in FIPS mode. 1536 bit keys are not supported.</td>
<td>Private Key—NVRAM (plain text) and RAM (plain text)</td>
<td>Private Key—crypto key zeroize, write to startup config, then reboot. Public Key—delete trustpoint from configuration, write to startup config, then reboot.</td>
</tr>
<tr>
<td>2</td>
<td>DSA public/private keys</td>
<td>ANSI X9.31/DSA</td>
<td>Identity certificates for the PIX security appliance itself and also used in IPSec negotiations. The PIX security appliance supports 512, 768, 1024 and 2048 bit key sizes.</td>
<td>Private Key—NVRAM (plain text) and RAM (plain text)</td>
<td>Private Key—crypto key zeroize, write to startup config, then reboot. Public Key—delete trustpoint from configuration, write to startup config, then reboot.</td>
</tr>
<tr>
<td>3</td>
<td>Diffie-Hellman Key Pairs</td>
<td>ANSI X9.31 / DH</td>
<td>Key agreement for IKE, TLS, and SSH sessions. DH groups 1 (768 bits of keying strength), 2 (1024 bits), 5 (1536 bits), and 7 (2048 bits) are supported.</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>4</td>
<td>Public keys</td>
<td>DSA / RSA</td>
<td>Public keys of peers</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>5</td>
<td>TLS Traffic Keys</td>
<td>Generated using the TLS protocol (X9.31PRNG + HMAC-SHA1 + HMAC-MD5 + either DH or RSA) Algorithm: Also Triple DES &amp; AES</td>
<td>Used in HTTPS connections</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>6</td>
<td>SSH Session Keys</td>
<td>ANSI X9.31 / Triple DES-AES</td>
<td>SSH keys</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>7</td>
<td>IPSec authentication keys</td>
<td>ANSI X9.31 / Triple DES-AES / DH</td>
<td>Exchanged using the IKE protocol and the public/private key pairs. These are Triple DES or AES keys.</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
</tbody>
</table>
## Cryptographic Key Management

### Table 6  Critical Security Parameters Used by the PIX Security Appliance (continued)

<table>
<thead>
<tr>
<th>#</th>
<th>Key/CSP Name</th>
<th>Generation/Algorithm</th>
<th>Description</th>
<th>Storage</th>
<th>Zeroization</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>IPSec traffic keys</td>
<td>ANSI X9.31 / Triple DES-AES / DH</td>
<td>Exchanged using the IKE protocol and the public/private key pairs. These are Triple DES or AES keys.</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>9</td>
<td>IKE preshared keys</td>
<td>Shared Secret</td>
<td>Entered by the crypto officer in plain text form and used for authentication during IKE</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Overwrite keys with new keys, or delete keys from the configuration via the <em>erase flash</em> command. Write to startup configuration, then reboot.</td>
</tr>
<tr>
<td>10</td>
<td>IKE Authentication key</td>
<td>Generated using IKE (X9.31+HMAC-SHA1+DH). Algorithms: Triple DES, AES, SHA-1</td>
<td>Used to encrypt and authenticate IKE negotiations</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>11</td>
<td>IKE Encryption Key</td>
<td>Generated using IKE (X9.31+HMAC-SHA1+DH). Algorithms: Triple DES, AES, SHA-1</td>
<td>Used to encrypt IKE negotiations</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the PIX security appliance.</td>
</tr>
<tr>
<td>12</td>
<td>RADIUS and TACACS+ shared secret keys</td>
<td>Shared Secret</td>
<td>Used for authenticating the RADIUS or TACACS+ server to the PIX security appliance and vice versa. Entered by the crypto officer in plain text form and stored in plain text form.</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Overwrite keys with new keys, or delete keys from the configuration via the <em>erase flash</em> command. Write to startup configuration, then reboot.</td>
</tr>
<tr>
<td>13</td>
<td>Usernames/Passwords</td>
<td>Secret</td>
<td>Critical security parameters used to authenticate the user/crypto officer login.</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Overwriting the passwords with new ones, write to startup config, then reboot.</td>
</tr>
<tr>
<td>14</td>
<td>Certificates of Certificate Authorities (CAs)</td>
<td>ANSI X9.31</td>
<td>This is a public key certificate, using signatures from a certificate authority (CA), to verify certificates issued by the CA. Install the CA certificate prior to installing subordinate certificates.</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Delete trustpoint from configuration via <em>erase flash</em> command, write to startup config, then reboot.</td>
</tr>
</tbody>
</table>
Self-Tests

The PIX security appliances include an array of self-tests that are run during startup and periodically during operations to prevent any secure data from being released and to ensure all components are functioning correctly.

Table 7 lists the PIX security appliance power-on self-tests.

Table 7 Security Appliance Power-On Self-Tests

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Tests Performed</th>
</tr>
</thead>
</table>
| PIX security appliance software | • Software/firmware test  
                            | • Bypass test  
                            | • DSA KAT (signature/verification)  
                            | • RSA KAT (signature/verification)  
                            | • RSA KAT (encrypt/decrypt)  
                            | • AES KAT  
                            | • Triple DES KAT  
                            | • SHA-1 KAT  
                            | • HMAC SHA-1 KAT  
                            | • PRNG KAT |
| VAC+ (Broadcom 5823)     | • DSA KAT (verification)  
                            | • RSA KAT (signature/verification)  
                            | • RSA KAT (encrypt/decrypt)  
                            | • AES KAT  
                            | • Triple DES KAT  
                            | • SHA-1 KAT  
                            | • HMAC SHA-1 KAT |

Table 6 Critical Security Parameters Used by the PIX Security Appliance (continued)

<table>
<thead>
<tr>
<th>#</th>
<th>Key/CSP Name</th>
<th>Generation/Algorithm</th>
<th>Description</th>
<th>Storage</th>
<th>Zeroization</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>PRNG Seed Key</td>
<td>Entropy</td>
<td>Seed key for X9.31 PRNG. Entropy is 192 bits (Triple-DES key length).</td>
<td>RAM (plain text)</td>
<td>Zeroized with generation of new seed.</td>
</tr>
<tr>
<td>16</td>
<td>Failover Key</td>
<td>Pre-shared secret</td>
<td>Used to encrypt and authenticate LAN-based failover.</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Overwrite keys with new keys, or delete keys from the configuration via the erase flash: command. Write to startup configuration, then reboot.</td>
</tr>
</tbody>
</table>
The PIX security appliances perform all power-on self-tests automatically at boot-up when FIPS mode is enabled. All power-on self-tests must be passed before a user/crypto officer can perform services. The power-on self-tests are performed after the cryptographic systems are initialized but prior to the initialization of the LANs; this prevents the device from passing any data during a power-on self-test failure. In the unlikely event that a power-on self-test fails, an error message is displayed on the console followed by a system reboot.

Table 8 lists the conditional self-tests that the PIX security appliance performs.

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Tests Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIX security appliance software</td>
<td>• Pairwise key consistency test for RSA</td>
</tr>
<tr>
<td></td>
<td>• Pairwise key consistency test for DSA</td>
</tr>
<tr>
<td></td>
<td>• Continuous Random Number Generator Test for all RNGs</td>
</tr>
<tr>
<td></td>
<td>• Conditional Bypass test</td>
</tr>
<tr>
<td>VAC+ (Broadcom 5823)</td>
<td>• Pairwise key consistency test for DSA</td>
</tr>
</tbody>
</table>

**Mitigation of Other Attacks**

The PIX security appliances do not claim to mitigate any attacks in a FIPS-approved mode of operation above and beyond the protection inherently provided by the PIX security appliance.

**Secure Operation**

The Cisco PIX 525 and PIX 535 security appliances meet FIPS 140-2 Level 1 requirements.

This section describes how to place and keep the PIX security appliance in a FIPS-approved mode of operation. Operating the PIX security appliance without maintaining the settings described in the “Crypto Officer Guidance – System Initialization” section on page 12 and “Crypto Officer Guidance – System Configuration” section on page 14 will remove the PIX security appliance from the FIPS-approved mode of operation.

The Crypto Officer must ensure that the PC that is used for the console connection is a stand-alone or a non-networked PC.

**Crypto Officer Guidance – System Initialization**

The PIX security appliances were validated with software version 7.0.4. This is the only allowable image for FIPS-approved mode of operation.

Initialize the system using the procedure below:

**Step 1**

Ensure the security context mode is set to single mode.

```
(config)#mode single
```

**Step 2**

Ensure the firewall mode is set to routed.
(config)#no firewall transparent

Step 3  Disable the console output of system crash information.

(config)#crashinfo console disable

Step 4  Enable “FIPS Mode” to allow the device to internally enforce FIPS-compliant behavior, such as running power-on self tests and bypass test.

(config)#fips enable

Step 5  Install Triple DES/AES licenses to require the device to use Triple DES and AES (for data traffic and SSH). (See http://www.cisco.com/en/US/products/hw/vpndevc/ps2030/products_data_sheet09186a00800b0d85.html for additional information on PIX licenses.)

Step 6  Disable password recovery.

(config)#no service password-recovery

Step 7  Set the configuration register to bypass ROMMON prompt at boot.

(config)#config-register 0x10011

Step 8  If failover is to be enabled, define the failover key to ensure encryption of the link to redundant devices prior to enabling failover.

(config)#failover key hex <key>

Note  Failover is not required for FIPS mode of operation. Only LAN-based failover is allowed for FIPS mode of operation; serial link failover is not allowed in FIPS mode of operation. Failover must not be configured over the lowest-numbered interface, such as Ethernet 0; ports Ethernet 1 or above should be used. If the lowest-numbered interface is already implemented as the failover interface, the crypto officer should take the following action:
- Before upgrading to V7.0.4, copy the configuration to a location off the device
- Use a text editor to modify the interface configuration
- Change the failover cables to the specified failover interface
- Upgrade to V7.0.4 and reload the modified configuration

Step 9  Enable AAA authorization for the console.

(config-terminal)#aaa authentication serial console LOCAL
(config-terminal)#username <name> password <password>

Step 10  Enable AAA authorization for SSH and Telnet.

(config-terminal)#aaa authentication ssh console LOCAL
(config-terminal)#aaa authentication telnet console LOCAL

Step 11  Enable AAA authorization for Enable mode.

(config-terminal)#aaa authentication enable console LOCAL

Step 12  Specify Privilege Level 15 for crypto officer and Privilege Level 1 for user and set up username/password for each role.

(config-terminal)#username <name> password <password> privilege 15
(config-terminal)#username <name> password <password> privilege 1

Step 13  Ensure passwords are at least 6 characters long. Replace all default passwords, such as enable and telnet with new passwords.
**Secure Operation**

**Step 14** Install one V AC+ in any available Circuit Board Interface of the PIX security appliance, if one is not already installed.

**Note** The crypto officer may install any service cards that only provide a physical interface, such as PIX-1FE, PIX-1GE-66, PIX-4FE-66. The PIX security appliances are validated only with the VPN Acceleration Card PLUS (V AC+) for cryptographic acceleration; the legacy V AC is not supported in FIPS approved mode of operation.

**Step 15** Apply tamper-evident labels as described in the “Applying Tamper-Evident Labels” section on page 16.

**Step 16** Reboot the PIX security appliance.

---

**Crypto Officer Guidance – System Configuration**

Configure the system using the following procedure:

**Step 1** Assign users a Privilege Level of 1.

**Step 2** Define RADIUS and TACACS+ shared secret keys that are at least 6 characters long and secure all traffic between the PIX security appliance and the RADIUS/TACACS+ server via IPSec tunnel.

**Note** Use only if RADIUS/TACACS+ is configured.

**Step 3** Configure the TLS protocol for key derivation using HTTPS to protect administrative functions. Due to known issues relating to the use of TLS with certain versions of the Java plugin, we recommend that the customer upgrade to JRE 1.5.0_05 or later. Use the following settings when launching ASDM in a TLS-only environment with JRE 1.5.0_05:

- Configure the device to allow only TLSv1 packets.
  
  
  (config)# ssl server-version tlsv1-only
  
- Uncheck SSL Version 2.0 in both the web browser and JRE security settings.
- Check TLS V1.0 in both the web browser and JRE security settings.

**Step 4** Configure the PIX security appliance to use SSHv2.

  (config)# ssh version 2

**Note** All operators must still authenticate after remote access is granted.

**Step 5** Configure the PIX security appliance to assure that any remote connections via Telnet are secured through IPSec.

**Step 6** Configure the PIX security appliance to assure that only FIPS-approved algorithms are used for IPSec tunnels.

**Step 7** Configure the PIX security appliance to assure that error messages can only be viewed by an authenticated crypto officer.

**Step 8** Configure SNMP to always use a secure IPSec tunnel.

**Step 9** Disable the TFTP server and disable the HTTP server from performing system management.
Step 10  Assure that installed digital certificates are signed using FIPS approved algorithms.
Step 11  Assure that 512-bit and 768-bit RSA keys are not used.
Step 12  Assure that the DSA algorithm uses at least a 512-bit modulus.

### Approved Cryptographic Algorithms

The PIX security appliances support many different cryptographic algorithms. However, only the following FIPS-approved algorithms may be used:

- AES encryption/decryption
- Triple DES encryption/decryption
- SHA-1 hashing
- SHA-1 HMAC for hashed message authentication
- RSA signing and verifying
- DSA signing and verifying
- X9.31 for RNG

In addition, the following algorithms are FIPS-allowed:

- RSA encryption/decryption (used only for key transport)
- TLS for Layer 7 security

**Note**

Pursuant to the DES Transition Plan and the approval of the Withdrawal of Federal Information Processing Standard (FIPS) 46-3, Data Encryption Standard (DES); FIPS 74, Guidelines for Implementing and Using the NBS Data Encryption Standard; and FIPS 81, DES Modes of Operation, the DES algorithm must not be used in FIPS-approved mode of operation.

Each cryptographic implementation in the PIX security appliance software release with on-board acceleration has achieved the certifications listed in Table 9.

**Table 9  Algorithm Certificates**

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>PIX Security Appliance Software</th>
<th>VPN Acceleration Card+</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES</td>
<td>320</td>
<td>209</td>
</tr>
<tr>
<td>Triple DES</td>
<td>384</td>
<td>298</td>
</tr>
<tr>
<td>SHA-1</td>
<td>393</td>
<td>285</td>
</tr>
<tr>
<td>HMAC SHA-1</td>
<td>124</td>
<td>15</td>
</tr>
<tr>
<td>RNG</td>
<td>143</td>
<td>Not supported</td>
</tr>
<tr>
<td>RSA</td>
<td>105</td>
<td>107</td>
</tr>
<tr>
<td>DSA</td>
<td>150</td>
<td>152</td>
</tr>
</tbody>
</table>
Non-FIPS Approved Algorithms

The PIX security appliances implement the following non-FIPS-approved cryptographic algorithms:

- DES
- SSL
- RC4
- MD5
- MD5 HMAC
- Diffie-Hellman (allowed for use in FIPS mode) (key agreement; key establishment methodology provides between 70 and 112 bits of encryption strength)
- RSA (allowed in FIPS mode for key transport) (key wrapping; key establishment methodology provides 80 or 112 bits of encryption strength)

Applying Tamper-Evident Labels

All Critical Security Parameters (CSPs) are stored and protected within the PIX security appliance tamper-evident enclosure. The administrator is responsible for properly placing all tamper-evident labels to comply with the FIPS 140-2 security policy. The security labels mandatory for FIPS 140-2 compliance are provided in FIPS Kit (CVPNPIXASAFIPS/KIT). These security labels are very fragile and cannot be removed without clear signs of damage to the labels.

The crypto officer should inspect the tamper-evident labels periodically to verify they are intact and the serial numbers on the applied tamper-evident labels match the records in the security log.

**Note**

The tamper-evident seals are produced from a special thin gauge vinyl with self-adhesive backing. Any attempt to open the PIX security appliance will damage the tamper-evident seals or the material of the PIX security appliance cover. Because the tamper-evident seals have non-repeated serial numbers, they may be inspected for damage and compared against the applied serial numbers to verify that the device has not been tampered with. Tamper-evident seals can also be inspected for signs of tampering, which include the following: curled corners, rips, and slices. The word Open may appear if the label was peeled back. Extra tamper-evident seals have been included in your FIPS kit to accommodate maintenance of your chassis.

Apply the serialized tamper-evident labels by performing the steps in either the “PIX 525” section on page 16 or the “PIX 535” section on page 17.

**PIX 525**

**Step 1** Turn off and unplug the system before cleaning the chassis and applying labels.

**Step 2** Clean the chassis of any grease, dirt, or oil before applying the labels. Alcohol-based cleaning pads are recommended for this purpose.
Step 3  Apply one label on the side of the PIX security appliance as shown in Figure 1. Apply a second label towards the back of the device and wrap it toward the back plate as shown in Figure 1. See the same label from a different angle in Figure 2.

Figure 1  Cisco PIX 525 Front Tamper-Evident Label Placement

Step 4  On the back of the device, apply a label to cover the power supply, as shown in Figure 2.

Step 5  Apply one label on the other side of the device as shown in Figure 2.

Figure 2  Cisco PIX 525 Back Tamper-Evident Label Placement

Step 6  Record the serial numbers of the labels applied to the system in a security log.

PIX 535

Step 1  Turn off and unplug the system before cleaning the chassis and applying labels.

Step 2  Clean the chassis of any grease, dirt, or oil before applying the labels. Alcohol-based cleaning pads are recommended for this purpose.

Step 3  Apply one label on the side of the device as shown in Figure 3, and a second label on the other side of the device as shown in Figure 4.
Step 4  On the back of the device, apply labels to cover the power supplies and the removable component tray as shown in Figure 4.

Figure 4  Cisco PIX 535 Back Tamper-Evident Label Placement

Step 5  Record the serial numbers of the labels applied to the system in a security log.

Related Documentation

This document deals only with operations and capabilities of the PIX security appliance in the technical terms of a FIPS 140-2 cryptographic device security policy.

More information is available on the PIX security appliance from the following sources:

- PIX security appliance (hardware):
- PIX security appliance software:
- PIX security appliance licenses:
- NIST Cryptographic Module Validation Program website contains contact information for answers to technical or sales-related questions for the PIX security appliance. (See http://csrc.nist.gov/cryptval/.)
Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:
http://www.cisco.com/techsupport
You can access the Cisco website at this URL:
http://www.cisco.com
You can access international Cisco websites at this URL:

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- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL:

http://www.cisco.com/go/psirt

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:


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Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you have identified a vulnerability in a Cisco product, contact PSIRT:

- For Emergencies only — security-alert@cisco.com  
  An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.
- For Nonemergencies — psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302  
- 1 408 525-6532

Tip  
We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.x through 9.x.
Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:


The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

## Obtaining Technical Assistance

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http://www.cisco.com/techsupport

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**Note**

Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the Tools & Resources link under Documentation & Tools. Choose Cisco Product Identification Tool from the Alphabetical Index drop-down list, or click the Cisco Product Identification Tool link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting `show` command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.
Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

- Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
- EMEA: +32 2 704 55 55
- USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is down, or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired, while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

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or view the digital edition at this URL:
http://ciscoiq.texterity.com/ciscoiq/sample/

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Definitions

AES—Advanced Encryption Standard
CMVP—Cryptographic Module Validation Program
CSP—Critical Security Parameter
DES—Data Encryption Standard
Definitions

DSA—Digital Signature Algorithm
FIPS—Federal Information Processing Standard
HMAC—Hashed Message Authentication Code
HTTP—Hyper Text Transfer Protocol
IKE—Internet Key Exchange
KAT—Known Answer Test
LED—Light Emitting Diode
MAC—Message Authentication Code
NIST—National Institute of Standards and Technology
NVLAP—National Voluntary Laboratory Accreditation Program
NVRAM—Non-volatile Random Access Memory
PRNG—Pseudo-Random Number Generator
RAM—Random Access Memory
RSA—Rivest Shamir and Adleman method for asymmetric encryption
Service Card—A service card may provide additional interfaces, feature acceleration or additional services. Service cards may take a Circuit Board form factor for PIX security appliances
SHA—Secure Hash Algorithm
SSL—Secure Sockets Layer
TLS—Transport Layer Security

Trustpoint—A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA. When certificates are exchanged, the PIX/ASA device follows the trustpoint path upwards until it reaches the root CA to validate the certificate. For more information: