FIPS 140-2 Non-Proprietary Security Policy for the Cisco ASA 5505 and 5550 Security Appliances

Introduction

This is a non-proprietary Cryptographic Module Security Policy for Cisco ASA 5505 and ASA 5550 security appliances. This policy describes how the Cisco ASA 5505 and 5550 security appliances meet the requirements of FIPS 140-2. This document also includes instructions for configuring the security appliances in FIPS 140-2 mode.

This policy was prepared as part of the Level 2 FIPS 140-2 validation for the Cisco ASA 5505 and 5550 security appliances.


Note

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This document includes the following sections:

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- Roles and Services, page 7
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- Cryptographic Key Management, page 9
- Self-Tests, page 11
FIPS 140-2 Submission Package

The security policy document is one document in a complete FIPS 140-2 Submission Package. In addition to this document, the complete 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 22 for more information.

Overview

The Cisco ASA 5505 and 5550 security appliances leverage Cisco's expertise in security and VPN solutions, and integrates the latest technologies from Cisco PIX 500 series security appliances, Cisco IPS 4200 Series Intrusion Prevention Systems, and Cisco VPN 3000 series concentrators.

Among their capabilities, Cisco ASA 5505 and 5550 security appliances offer the use of Online Certificate Status Protocol (OCSP). This provides an alternative to a Certificate Revocation List for obtaining the revocation status of X.509 digital certificates. Rather than requiring a client to download a complete and often large certificate revocation list, OCSP localizes the certificate status on a Validation Authority, which it queries for the status of a specific certificate. Use of OCSP for VPN tunnel establishment has been reviewed and approved for FIPS mode operation.

ASA 5505

The Cisco ASA 5505 Adaptive Security Appliance is a next-generation, full-featured security appliance for small business, branch office, and enterprise teleworker environments. The Cisco 5505 delivers high-performance firewall, IPSec and SSL VPN, and rich networking services in a modular, "plug-and-play" appliance. Using the integrated Web-based Cisco Adaptive Security Device Manager,
the Cisco ASA 5505 can be rapidly deployed and easily managed, enabling businesses to minimize operations costs. The Cisco ASA 5505 features a flexible 8-port 10/100 Fast Ethernet switch, whose ports can be dynamically grouped to create up to three separate VLANs for home, business, and Internet traffic for improved network segmentation and security. The Cisco ASA 5505 provides two Power over Ethernet (PoE) ports, enabling simplified deployment of Cisco IP phones with zero-touch secure voice over IP (VoIP) capabilities, and deployment of external wireless access points for extended network mobility. The Cisco ASA 5505 also provides significant expandability and investment protection through its modular design, similar to the rest of the Cisco ASA 5500 Series, offering both an external expansion slot and multiple USB ports that enable the addition of services in the future.

ASA 5550

The ASA 5550 security appliance provides multiple integrated security and networking services, including:

• Advanced application-aware firewall services
• Market-leading Voice over IP (VoIP) and multimedia security
• Robust site-to-site and remote-access IPSec VPN connectivity
• Award-winning resiliency
• Intelligent networking services
• Flexible management solutions

The ASA 5550 security appliance is a high-performance, multifunction security appliance delivering converged firewall, IPS, network anti-virus and VPN services. As a key component of the Cisco Self-Defending Network, it provides proactive threat mitigation that stops attacks before they spread through the network, controls network activity and application traffic, and delivers flexible VPN connectivity while remaining cost-effective and easy-to-manage.

In a single platform, the ASA 5550 security appliance offers the following:

• Market-proven firewall and VPN capabilities
• Adaptive identification and mitigation services architecture providing granular policy control and future services extensibility
• Reduced deployment, operating costs, and complexity

Security Appliance Validation Level

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

<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>2</td>
</tr>
<tr>
<td>2</td>
<td>Cryptographic Module Ports and Interfaces</td>
<td>2</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>2</td>
</tr>
<tr>
<td>5</td>
<td>Physical Security</td>
<td>2</td>
</tr>
</tbody>
</table>
Physical Characteristics and Security Appliance Interfaces

ASA 5505

The ASA 5505 security appliance delivers enterprise-class security for small business and large enterprise networks in a modular, purpose-built appliance. The ASA 5505 security appliance’s compact design includes eight Fast Ethernet interfaces for businesses requiring a cost-effective security solution.

Each Cisco ASA 5505 is a multi-chip standalone device, and the cryptographic boundary is defined as encompassing the “top,” “front,” “left,” “right,” and “bottom” surfaces of the case; all portions of the “backplane” of the case which are not designed to accommodate a removable interface or Security Service Card (SSC); and the inverse of the three-dimensional space within the case that would be occupied by an installed SSC. The cryptographic boundary includes the connection apparatus between the SSC and the motherboard/daughterboard that hosts the SSC, but the boundary does not include the SSC itself. In other words, the cryptographic boundary encompasses all hardware components within the case of the device except any installed SSC.

Each security appliance provides a number of physical and logical interfaces to the device, and the physical interfaces provided by the security appliances 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 for the ASA 5505 security appliance are described in Table 2:

<table>
<thead>
<tr>
<th>Physical Interface</th>
<th>FIPS 140-2 Logical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Ethernet 0-7</td>
<td>Data Input Interface</td>
</tr>
<tr>
<td>Fast Ethernet 0-7</td>
<td>Data Output Interface</td>
</tr>
<tr>
<td>Fast Ethernet 0-7</td>
<td>Control Input Interface</td>
</tr>
<tr>
<td>Power Switch</td>
<td></td>
</tr>
<tr>
<td>Reset Switch</td>
<td></td>
</tr>
<tr>
<td>Com 1 (Console Port)</td>
<td></td>
</tr>
</tbody>
</table>
ASA 5550

The ASA 5550 security appliance delivers enterprise-class security for small business and large enterprise networks in a modular, purpose-built appliance. The ASA 5550 security appliance’s versatile one-rack unit (1RU) design includes two 4GE card interfaces, supporting eight 10/100/1000 Gigabit Ethernet interfaces and one 10/100 Fast Ethernet Management interface, making it an excellent choice for businesses requiring a cost-effective, resilient security solution with demilitarized zone (DMZ) support.

Each ASA 5550 security appliance is a multi-chip standalone device with a fixed configuration, and the cryptographic boundary is defined as encompassing the entire chassis.

Each security appliance provides a number of physical and logical interfaces to the device, and the physical interfaces provided by the security appliances 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 for the ASA 5550 security appliance are described in Table 3:

Table 3  Cisco ASA 5550 Physical Interface/Logical Interface Mapping

<table>
<thead>
<tr>
<th>Physical Interface</th>
<th>FIPS 140-2 Logical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>GigabitEthernet0/0-3</td>
<td>Data Input Interface</td>
</tr>
<tr>
<td>GigabitEthernet1/0-3</td>
<td></td>
</tr>
<tr>
<td>MGMT Port</td>
<td></td>
</tr>
<tr>
<td>Compact Flash Type 1</td>
<td></td>
</tr>
<tr>
<td>Com 1 (Console Port)</td>
<td></td>
</tr>
<tr>
<td>GigabitEthernet0/0-3</td>
<td>Data Output Interface</td>
</tr>
<tr>
<td>GigabitEthernet1/0-3</td>
<td></td>
</tr>
<tr>
<td>MGMT Port</td>
<td></td>
</tr>
<tr>
<td>Compact Flash Type 1</td>
<td></td>
</tr>
<tr>
<td>Com 1 (Console Port)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3  
Cisco ASA 5550 Physical Interface/Logical Interface Mapping (continued)

<table>
<thead>
<tr>
<th>Physical Interface</th>
<th>FIPS 140-2 Logical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>GigabitEthernet0/0-3</td>
<td>Control Input Interface</td>
</tr>
<tr>
<td>GigabitEthernet1/0-3</td>
<td></td>
</tr>
<tr>
<td>MGMT Port</td>
<td></td>
</tr>
<tr>
<td>Power Switch</td>
<td></td>
</tr>
<tr>
<td>Reset Switch</td>
<td></td>
</tr>
<tr>
<td>Com 1 (Console Port)</td>
<td></td>
</tr>
<tr>
<td>GigabitEthernet0/0-3</td>
<td>Status Output Interface</td>
</tr>
<tr>
<td>GigabitEthernet1/0-3</td>
<td></td>
</tr>
<tr>
<td>MGMT Port</td>
<td></td>
</tr>
<tr>
<td>Ethernet LEDs</td>
<td></td>
</tr>
<tr>
<td>Power LED</td>
<td></td>
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<tr>
<td>Status LED</td>
<td></td>
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<tr>
<td>VPN LED</td>
<td></td>
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<tr>
<td>Active LED</td>
<td></td>
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<tr>
<td>CF Active LED</td>
<td></td>
</tr>
<tr>
<td>Com 1 (Console Port)</td>
<td></td>
</tr>
<tr>
<td>Power Plug</td>
<td>Power Interface</td>
</tr>
<tr>
<td>USB Port</td>
<td></td>
</tr>
<tr>
<td>Com 2 (Aux Port) (^1)</td>
<td>Unused Interface</td>
</tr>
<tr>
<td>Serial Failover Interface</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Physical interface not functional
Roles and Services

The security appliances 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 security appliances that operators may assume: a Crypto Officer role and User role. The security appliances support role-based authentication, and the respective services for each role are described in the “Crypto Officer Services” section on page 7, and the “User Services” section on page 7.

Crypto Officer Services

The Crypto Officer role is responsible for the configuration and maintenance of the security appliances 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 Security Appliance**: Define network interfaces and settings; set the protocols the security appliances 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 SNMP queries to view SNMP MIB statistics, health, temperature, memory status, packet statistics, review accounting logs, and view physical interface status.

- **Manage the Security Appliance**: Log off users, shut down or reload the security appliances, 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 plain text packets to be sent from specified IP address.

- **Install Service Card**: Remove tamper evident seals to install or replace any applicable service cards.

- **Run Self-Tests**: Execute Known Answer Tests for each FIPS approved algorithm.

User Services

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 security appliances 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 the following:

- **Status Functions**: Image version currently running, installed hardware components, and version of hardware installed.

- **Network Functions**: Initiate diagnostic network services, such as ping.
**Authentication Mechanisms**

- **Directory Services**: Display directory of files kept in flash memory
- **Run Self-Tests**: Execute Known Answer Tests for each FIPS approved algorithm.

**Critical Security Parameters**

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

**Table 4  Cisco ASA 5505 and 5550 Adaptive Security Appliance Validation Level by Section**

<table>
<thead>
<tr>
<th>CSP/Role/Service Access Policy</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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role/Service</strong></td>
<td></td>
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<tr>
<td><strong>User Role</strong></td>
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<tr>
<td>Status Functions</td>
<td>r</td>
<td>r</td>
<td>r</td>
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<td>r</td>
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<tr>
<td>Network Functions</td>
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<tr>
<td>Directory Services</td>
<td>r</td>
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</tr>
<tr>
<td><strong>Crypto-Officer Role</strong></td>
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</tr>
<tr>
<td>Configure the Module</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
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<td>rwd</td>
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<td>rwd</td>
</tr>
<tr>
<td>Define Roles and Filters</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
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<td>rwd</td>
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<td>rwd</td>
</tr>
<tr>
<td>Status Functions</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
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<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
</tr>
<tr>
<td>Manage the Module</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
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<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
</tr>
<tr>
<td>Set Encryption/Bypass</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
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<td>rwd</td>
<td>rwd</td>
<td>rwd</td>
</tr>
<tr>
<td>Install Service Card</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Authentication Mechanisms**

The security appliances support either a password or digital certificates for authenticating IPSec users. To log on to the 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 appliance uses a variety of Critical Security Parameters during operation.

Table 6 lists the cryptographic keys used by the Cisco ASA 5505 and 5550 security appliances.

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### Table 5 Estimated Strength of Authentication Mechanism

<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 Secure Operation section of this document). The password can consist of alphanumeric values (a-z, A-Z, 0-9) yielding 62 choices per character. The probability of a successful random attempt is 1/62^6, which is less than 1/1,000,000. This is also valid for RADIUS or TACACS+ shared secret keys.</td>
</tr>
<tr>
<td>Certificate based authentication</td>
<td>The security appliances support a public key based authentication with 1024 or 2048 (for RSA) bit keys. A 1024-bit RSA key has at least 80-bits of equivalent strength. The probability of a successful random attempt is 1/2^80, which 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, which is less than 1/1,000,000.</td>
</tr>
</tbody>
</table>

---

### Table 6 Cryptographic Keys Used by the ASA 5505 and 5550 Adaptive Security Appliances

<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 security appliance itself and also used in IPSec, TLS, and SSH negotiations. The security appliances support 512, 768, 1024 and 2048 bit key sizes (512- and 768-bit key lengths are not to be used in FIPS mode).</td>
<td>Private Key - NVRAM (plain text) and RAM (plain text)</td>
<td>Private Key - crypto key zeroize, write to startup config, then reboot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Public Key - NVRAM (plain text) and RAM (plain text)</td>
<td>Public Key - delete trustpoint from configuration, write to startup config, then reboot.</td>
</tr>
<tr>
<td>2</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>Deleting keys from the configuration via erase flash: command (or replacing), write to startup config, then reboot</td>
</tr>
</tbody>
</table>
### Table 6: Cryptographic Keys Used by the ASA 5505 and 5550 Adaptive Security Appliances (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>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 security appliances</td>
</tr>
<tr>
<td>4</td>
<td>Public keys</td>
<td>RSA</td>
<td>Public keys of peers</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the security appliances</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); Algorithms: Triple-DES &amp; AES</td>
<td>Used in HTTPS connections</td>
<td>RAM (plain text)</td>
<td>Resetting or rebooting the security appliances</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 security appliances</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 security appliances</td>
</tr>
<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 security appliances</td>
</tr>
<tr>
<td>9</td>
<td>IKE pre-shared 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>Deleting keys from the configuration via erase flash: command (or replacing), write to startup config, 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 security appliances</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 security appliances</td>
</tr>
</tbody>
</table>
Table 6  Cryptographic Keys Used by the ASA 5505 and 5550 Adaptive Security Appliances (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>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 security appliances 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>Deleting keys from the configuration via <code>erase flash</code>: command (or replacing), write to startup config, 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>Public Key Certificates of Certificate Authorities (CAs)</td>
<td>ANSI X9.31</td>
<td>Necessary to verify certificates issued by the CA. Install the CA's certificate prior to installing subordinate certificates.</td>
<td>NVRAM (plain text) and RAM (plain text)</td>
<td>Delete trustpoint from configuration via <code>erase flash</code>: command, write to startup config, then reboot.</td>
</tr>
<tr>
<td>15</td>
<td>PRNG Seed Key</td>
<td>Entropy (192 bits - Triple-DES length)</td>
<td>Seed key for X9.31 PRNG</td>
<td>RAM (plain text)</td>
<td>Zeroized with generation of new seed</td>
</tr>
</tbody>
</table>

Self-Tests

The 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 ASA 5505 and 5550 adaptive security appliances 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>
| Security Appliance Software | • Software/firmware Test  
|                           | • Bypass Test  
|                           | • RSA KAT (signature/verification)  
|                           | • RSA KAT (encrypt/decrypt)  
|                           | • AES KAT  
|                           | • Triple-DES KAT  
|                           | • SHA-1 KAT  
|                           | • HMAC SHA-1 KAT  
|                           | • PRNG KAT  |
Mitigation of Other Attacks

The security appliances perform all power-on self-tests automatically at boot 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 LAN’s interfaces; this prevents the security appliances 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 security appliance reboot.

Table 8 lists the conditional self-tests that the ASA 5505 and 5550 adaptive security appliance perform.

Table 8  ASA 5505 and 5550 Adaptive Security Appliance Conditional Self-Tests

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Tests Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Appliance Software</td>
<td>• Pairwise consistency test for RSA</td>
</tr>
<tr>
<td></td>
<td>• Continuous Random Number Generator Test for the FIPS-approved RNG and non-approved RNGs</td>
</tr>
<tr>
<td></td>
<td>• Conditional Bypass test</td>
</tr>
<tr>
<td>ASA On-board (Cavium Nitrox Lite)</td>
<td>• Pairwise consistency test for RSA</td>
</tr>
<tr>
<td></td>
<td>• Continuous Random Number Generator Test for the FIPS-approved RNG</td>
</tr>
</tbody>
</table>

Secure Operation

The 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 ASA security appliance.

The Cisco ASA 5505 and 5550 security appliances meet FIPS 140-2 Level 2 requirements. This section describes how to place and keep the security appliances in a FIPS-approved mode of operation. Operating the security appliances without maintaining the following settings will remove the security appliances from the FIPS-approved mode of operation.

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

The Cisco ASA 5505 and 5550 security appliances were validated with adaptive security appliance software version 7.2.2.18 (file name: asa722-18-k8.bin), 7.2.4.18 (file name: asa724-18-k8.bin), and 7.2.4.30 (file name: asa724-30-k8.bin). These are the only allowable images for FIPS-approved mode of operation.

The Crypto Officer must configure and enforce the following initialization steps:

---

**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, using the following command:
```
(config)# crashinfo console disable
```

**Step 4**
Install Triple-DES/AES licenses to require the security appliances to use Triple-DES and AES (for data traffic and SSH).

**Step 5**
Enable “FIPS Mode” to allow the security appliances to internally enforce FIPS-compliant behavior, such as run power-on self-tests and bypass test, using the following command:
```
(config)# fips enable
```

**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**
Define the failover key to ensure encryption of the link to redundant security appliances prior to enabling failover.
```
(config)# failover key hex <key>
```

**Note**
Failover is not required for FIPS mode of operation. If failover is to be enabled, then the configuration in **Step 8** should be followed. Also, only LAN-based failover is allowed for FIPS mode of operation; serial link failover is not allowed in FIPS mode of operation.

**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
```

---
Secure Operation

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.

Step 14 All default passwords, such as enable and telnet, should be replaced with new passwords.

Step 15 Apply tamper evident labels as described in the “Tamper Evidence” section on page 16.

Step 16 Reboot the security appliances.

Crypto Officer Guidance – System Configuration

To operate in FIPS mode, the Crypto Officer must perform the following steps:

---

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 traffic between the security appliances and the RADIUS/TACACS+ server via IPSec tunnel.

Note Perform this step only if RADIUS/TACACS+ is configured, otherwise proceed to Step 3.

Step 3 Configure the TLS protocol when 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 you upgrade to JRE 1.5.0_05 or later.

The following configuration settings are known to work when launching ASDM in a TLS-only environment with JRE 1.5.0_05:

a. Configure the device to allow only TLSv1 packets using the following command:

    (config)# ssl server-version tlsv1-only
    (config)# ssl client-version tlsv1-only

b. Uncheck SSL Version 2.0 in both the web browser and JRE security settings.

c. Check TLS V1.0 in both the web browser and JRE security settings.

Step 4 Configure the security appliances to use SSHv2. Note that all operators must still authenticate after remote access is granted.

    (config)# ssh version 2

Step 5 Configure the security appliances such that any remote connections via Telnet are secured through IPSec.

Step 6 Configure the security appliances such that only FIPS-approved algorithms are used for IPSec tunnels.

Step 7 Configure the security appliances such 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.

Step 10 Disable HTTP for performing system management in FIPS mode of operation. HTTPS with TLS should always be used for Web-based management.
Step 11  Ensure that installed digital certificates are signed using FIPS approved algorithms.

Step 12  Ensure that the 512-bit and 768-bit RSA keys are not used.

Approved Cryptographic Algorithms

The Cisco ASA 5505 and 5550 security appliances support many different cryptographic algorithms; however, only the following FIPS approved algorithms may be used while in the FIPS mode of operation:

- AES encryption/decryption
- Triple-DES encryption/decryption
- SHA-1 hashing
- SHA-1 HMAC for hashed message authentication
- RSA 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 should not be used in FIPS approved mode of operation. The DES algorithm must not be used when the Triple-DES/AES licenses are installed.

Each ASA 5505 security appliance has achieved the certifications listed in Table 9.

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Adaptive Security Appliance Firmware</th>
<th>ASA On-board Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.2.2.18</td>
<td>7.2.4.18 and 7.2.4.30</td>
</tr>
<tr>
<td>AES</td>
<td>536</td>
<td>1010</td>
</tr>
<tr>
<td>Triple-DES</td>
<td>538</td>
<td>779</td>
</tr>
<tr>
<td>SHA-1</td>
<td>606</td>
<td>968</td>
</tr>
<tr>
<td>SHA-1 HMAC</td>
<td>283</td>
<td>567</td>
</tr>
<tr>
<td>RNG</td>
<td>309</td>
<td>570</td>
</tr>
<tr>
<td>RSA</td>
<td>242</td>
<td>485</td>
</tr>
</tbody>
</table>

Each ASA 5550 security appliance has achieved the certifications listed in Table 10.
Non-FIPS Approved Algorithms

The 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)

Tamper Evidence

All Critical Security Parameters are stored and protected within each appliance’s tamper evident enclosure. The administrator is responsible for properly placing all tamper evident labels. The security labels recommended for FIPS 140-2 compliance are provided in the FIPS Kit (Cisco-FIPS-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.

ASA 5505

Apply the serialized tamper evident label as follows (see Figure 1):

---

Table 10   **ASA 5550 Algorithm Certificates**

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Adaptive Security Appliance Firmware</th>
<th>ASA On-board Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>AES</td>
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<td>RNG</td>
<td>309</td>
<td>570</td>
</tr>
<tr>
<td>RSA</td>
<td>242</td>
<td>485</td>
</tr>
</tbody>
</table>
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 tamper evident labels. Alcohol-based cleaning pads are recommended for this purpose.

Step 3  On the back of the module, apply a label to cover the security appliances’s SSC slots and top of the case.

Note  The Cisco ASA 5505 must be installed in an opacity shield/ventilation enclosure to obstruct viewing of internal components through the side air-ventilation holes of the chassis case. The user must install the ASA 5505 in the rack-mount enclosure to meet FIPS opacity requirements, but not necessarily install the mounted device in a rack. Refer to the Cisco ASA 5500 Series Hardware Maintenance Guide, Chapter 2, for specific rack installation instructions.

Step 4  Apply a tamper evidence label across one of the screws on the bottom of the ASA 5505 rack-mount enclosure (see Figure 2).
Step 5  Record the serial numbers of the label applied to the system in a security log.

The tamper evident seals are produced from a special thin gauge vinyl with self-adhesive backing. Any attempt to open the device will damage the tamper evident seals or the material of the security appliances 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 security appliances 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.
ASA 5550

Apply the serialized tamper evident labels as follows (see Figure 3):

Figure 3  Cisco ASA 5550 Security Appliance Tamper Evident Label Placement

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 tamper evident labels. Alcohol-based cleaning pads are recommended for this purpose.
Step 3  Apply a label to cover the security appliance’s bottom/side portions of the case.
Step 4  On the back of the security appliance, apply one label to cover the CompactFlash slot and two labels to cover the Multiple Service Function slot.
Step 5  Record the serial numbers of the labels applied to the system in a security log.

The tamper evident seals are produced from a special thin gauge vinyl with self-adhesive backing. Any attempt to open the device will damage the tamper evident seals or the material of the 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 security appliance 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.

Related Documentation

This document deals only with operations and capabilities of the security appliances in the technical terms of a FIPS 140-2 cryptographic device security policy. More information is available on the security appliances from the sources listed in this section and from the following source:

- The NIST Cryptographic Module Validation Program website (http://csrc.nist.gov/cryptval/) contains contact information for answers to technical or sales-related questions for the security appliances.

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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The Product Documentation DVD is a comprehensive library of technical product documentation on portable media. The DVD enables you to access multiple versions of hardware and software installation, configuration, and command guides for Cisco products and to view technical documentation in HTML. With the DVD, you have access to the same documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .pdf versions of the documentation available.

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170 West Tasman Drive
San Jose, CA 95134-9883
We appreciate your comments.

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

A current list of security advisories and notices for Cisco products is available at this URL:
http://www.cisco.com/go/psirt

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

Reporting Security Problems in Cisco Products

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 might have identified a vulnerability in a Cisco product, contact PSIRT:
- Emergencies—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.
- Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:
- 1 877 228-7302
- 1 408 525-6532

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.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.

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Cisco Technical Support & Documentation Website

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http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:


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)—Your 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 operation 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 your network is impaired, but 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.

**Obtaining Additional Publications and Information**

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

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  http://www.ciscopress.com
- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:
  http://www.cisco.com/packet
• *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

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

or view the digital edition at this URL:

http://ciscoiq.texterity.com/ciscoiq/sample/

• *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

http://www.cisco.com/ipj

• Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:


• Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

http://www.cisco.com/discuss/networking

• World-class networking training is available from Cisco. You can view current offerings at this URL:


### Definition List

- AES—Advanced Encryption Standard
- ASA—Adaptive Security Appliance
- CMVP—Cryptographic Module Validation Program
- CSP—Critical Security Parameter
- DES—Data Encryption Standard
- FIPS—Federal Information Processing Standard
- HMAC—Hash Message Authentication Code
- HTTP—Hyper Text Transfer Protocol
- KAT—Known Answer Test
- LED—Light Emitting Diode
- MAC—Message Authentication Code
- NIST—National Institute of Standards and Technology
- NVRAM—Non-Volatile Random Access Memory
- OSCP—Online Certificate Status Protocol
- RAM—Random Access Memory
RNG—Random Number Generator
RSA—Rivest Shamir and Adleman method for asymmetric encryption
SCEP—Simple Certificate Enrollment Protocol
Security appliance—A security appliance may provide additional interfaces, feature acceleration or additional services. Security appliance may take a Circuit Board form factor SSM (for ASA appliance)
SHA—Secure Hash Algorithm
SSC—Security Services Card
SSL—Secure Sockets Layer
SSM—Security Services Module
Triple-DES—Triple Data Encryption Standard
TLS—Transport Layer Security
Trustpoint—Represents a Certification Authority (CA) identity and possibly a device identity, based on a certificate issued by the CA. When certificates are exchanged, the ASA device follows the trustpoint path upwards until it reaches the root CA to validate the certificate.