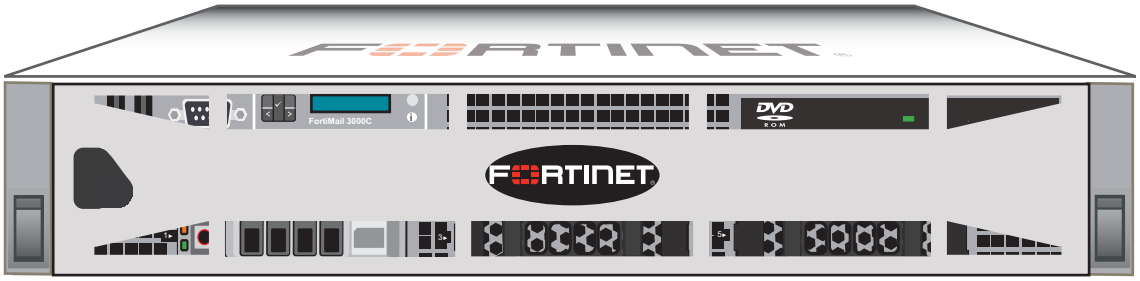
FIPS 140-2 Security Policy

FortiMail™ OS



FortiMail™ OS FIPS 140-2 Security Policy	
Document Version:	2.1
Publication Date:	March 28, 2012
Description:	Documents FIPS 140-2 Level 1 Security Policy issues, compliancy and requirements for FIPS compliant operation.
Firmware Version:	FortiMail 4.0, build0369,110615

FortiMail™ OS FIPS 140-2 Security Policy

28 March 2012

06-420-141252-201100318

for FortiMail 4.0 MR2

Trademarks

Contents

Overview

This document is a FIPS 140-2 Security Policy for Fortinet Incorporated's FortiMail™ OS firmware, which runs on the FortiMail family of security appliances. This policy describes how the FortiMail™ OS firmware (hereafter referred to as the 'module') meets the FIPS 140-2 security requirements and how to operate the module in a FIPS compliant manner. This policy was created as part of the Level 1 FIPS 140-2 validation of the module.

This document contains the following sections:

The Federal Information Processing Standards Publication 140-2 - *Security Requirements for Cryptographic Modules* (FIPS 140-2) details the United States Federal Government requirements for cryptographic modules. Detailed information about the FIPS 140-2 standard and validation program is available on the NIST (National Institute of Standards and Technology) website at http://csrc.nist.gov/groups/STM/cmvp/index.html.

References

This policy deals specifically with operation and implementation of the module in the technical terms of the FIPS 140-2 standard and the associated validation program. Other Fortinet product manuals, guides and technical notes can be found at the Fortinet technical documentation website at http://docs.forticare.com.

Additional information on the entire Fortinet product line can be obtained from the following sources:

- Find general product information in the product section of the Fortinet corporate website at http://www.fortinet.com/products.
- Find on-line product support for registered products in the technical support section of the Fortinet corporate website at http://www.fortinet.com/support
- Find contact information for technical or sales related questions in the contacts section of the Fortinet corporate website at http://www.fortinet.com/contact.
- Find security information and bulletins in the FortiGuard Center of the Fortinet corporate website at http://www.fortinet.com/FortiGuardCenter.

Introduction

The FortiMail family of message security appliances provide an effective barrier against the ever-rising volume of spam, maximum protection against sophisticated message-based attacks, and features designed to facilitate regulatory compliance. FortiMail™ OS offers both inbound and outbound scanning, advanced antispam and antivirus filtering capabilities, IP address black/white listing functionality, and extensive quarantine and

archiving capabilities. Three deployment modes offer maximum versatility: transparent mode for seamless integration into existing networks with no IP address changes, gateway mode as a proxy Mail Transfer Agent (MTA) for existing messaging gateways, or server mode to act as a mail server with functionality for small businesses (SMBs) and remote offices.

Note: The server mode of operation is not a FIPS approved mode of operation.

Security Level Summary

The module meets the overall requirements for a FIPS 140-2 Level 1 certification.

Table 1: Summary of FIPS security requirements and compliance levels

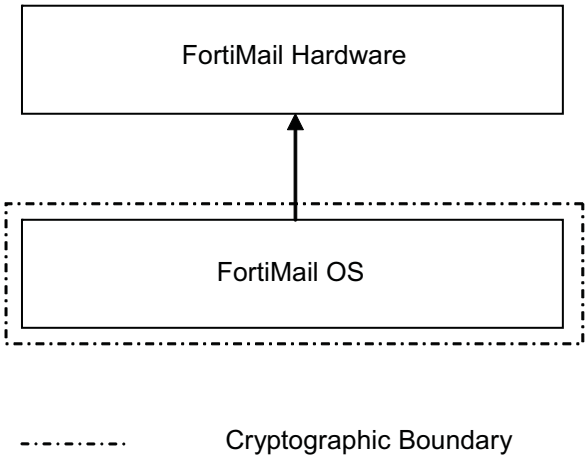
Security Requirement	Compliance Level
Cryptographic Module Specification	1
Cryptographic Module Ports and Interfaces	3
Roles, Services and Authentication	3
Finite State Model	1
Physical Security	1
Operational Environment	N/A
Cryptographic Key Management	1
EMI/EMC	1
Self-Tests	1
Design Assurance	3
Mitigation of Other Attacks	N/A

Module Description

The module is a firmware operating system that runs exclusively on the FortiMail line of appliances. The firmware versioning information, including build number and compile date, is FortiMail 4.0, build0369,110615. The firmware consists of multiple object files.

The FortiMail appliances are purpose built, PC based, multiple chip, standalone cryptographic modules consisting of production grade components contained in a physically protected enclosure.

Figure 1: FortiMail Cryptographic Boundary



For the purposes of FIPS 140-2 conformance testing, the module was tested on the following FortiMail appliances:

- FortiMail-3000C

The module can also be executed on any of the following FortiMail appliances and remain FIPS-compliant, however The CMVP makes no claim regarding the correct operation of the module when operating on these appliances:

- FortiMail-100
- FortiMail-100C
- FortiMail-400
- FortiMail-400B
- FortiMail-2000
- FortiMail-2000A
- FortiMail-2000B
- FortiMail-4000
- FortiMail-5001A

Module Interfaces

The module's physical and logical interfaces are described in Table 2.

Table 2: FortiMail™ OS logical interfaces and physical ports

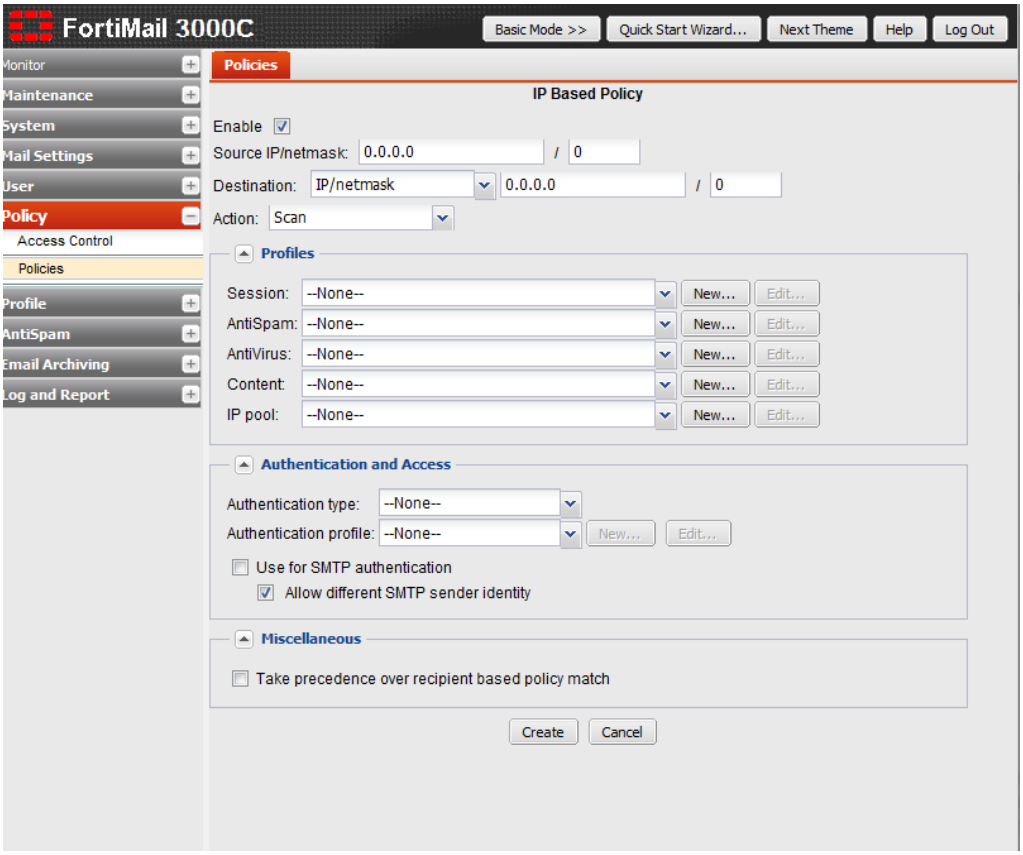
I/O	Logical Interface	Physical Ports
Data Input	API input parameters	Network interface
Data Output	API output parameters	Network interface
Control Input	API function calls	Network interface, serial interface
Status Output	API return values	Network interface, serial interface
Power Input	N/A	The power supply is the power interface

Web-Based Manager

The web-based manager provides GUI access to the module and is the primary tool for configuring the module. The manager requires a web browser on the management computer and an Ethernet connection between the FortiMail unit and the management computer.

A web browser that supports Transport Layer Security (TLS) 1.0 is required for remote access to the web-based manager when the module is operating in FIPS mode. HTTP access to the web-based manager is not allowed in FIPS mode and is disabled.

Figure 2: The FortiMail web-based manager



Command Line Interface

The Command Line Interface (CLI) is a full-featured, text based management tool for the module. The CLI provides access to all of the possible services and configuration options in the module. The CLI uses a console connection or a network (Ethernet) connection between the FortiMail unit and the management computer. The console connection is a direct serial connection. Terminal emulation software is required on the management computer using either method. For network access, a Telnet or SSH client that supports the SSH v2.0 protocol is required (SSH v1.0 is not supported in FIPS mode).

Roles, Services and Authentication

Roles

When configured in FIPS mode, the module provides the following roles:

- Crypto Officer
- User

The Crypto Officer role is initially assigned to the default ‘admin’ operator account. The Crypto Officer role has read-write access to all of the module’s administrative services. The initial Crypto Officer can create additional operator accounts. These additional accounts are assigned the Crypto Officer role and can be assigned a range of read/write or read only access permissions including the ability to create operator accounts.

The User role can make use of the encrypt/decrypt services, but cannot access the module for administrative purposes. The User role has access to the quarantine and email relay services as defined by a Crypto Officer.

The module does not provide a Maintenance role.

FIPS Approved Services

The following tables detail the types of FIPS approved services available to each role, the types of access for each role and the CSPs they affect.

The role names are abbreviated as follows:

Crypto Officer	CO
User	U

The access types are abbreviated as follows:

Read Access	R
Write Access	W
Execute Access	E

Table 3: Services available to Crypto Officers

Service	Access	Key/CSP
authenticate to module	WE	Operator Username, Operator Password
show system status	E	N/A
show FIPS mode enabled/disabled (console only)	E	N/A
enable FIPS mode of operation (console only)	WE	Configuration Integrity Key
execute factory reset (zeroize keys, disable FIPS mode)	WE	All keys stored in Flash RAM
execute FIPS on-demand self-tests (console only)	WE	N/A
add/delete operators and users	RWE	Operator Username, User Username
set/reset operator passwords	WE	Operator Password
modify user preferences	RWE	N/A

Table 3: Services available to Crypto Officers

Service	Access	Key/CSP
backup / restore configuration file	WE	Operator Password
read/set/delete/modify module configuration	RWE	N/A
enable/disable alternating bypass mode	RWE	N/A
execute firmware update	WE	Firmware Update Public Key
read log data (GUI only)	R	N/A
delete log data (GUI only)	WE	N/A
format log disk (CLI only)	WE	N/A

Table 4: Services available to Users

Service/CSP	Access	Key/CSP
authenticate to module	E	User Username, User Password
access to quarantined email	RE	SSL Server/Host Key, RNG keys, Diffie-Hellman Keys, SSL session keys
modify user preferences	E	N/A
encrypt/decrypt mail messages using SMTPS protocol	E	SSL Server/Host Key, RNG keys, Diffie-Hellman Keys, SSL session keys

Authentication

The module uses identity based authentiction. By default, operators and users authenticate with a username and password combination to access the module. Remote operator authentication is done over HTTPS (TLS) or SSH. Local operator authentication is done over the console connection. Remote user authentication is done over HTTPS (TLS). Password entry is obfuscated using asterisks.

Operator authentication over HTTPS/SSH and user authentication over HTTPS are subject to a limit of 3 failed authentication attempts in 1 minute. Operator authentication using the console is not subject to a failed authentication limit, but the number of authentication attempts per minute is limited by the bandwidth available over the serial connection.

Note that the user's username and password are not stored on the module. The module operates as a proxy for user authentication to a backend server (typically a mail server). User authentication is done over HTTPS, POP3S, or IMAPS. HTTPS, POP3S and IMAPS all use the underlying TLS protocol to protect user data between the client and the module and the module and the back end server during the authentication process.

The minimum password length is 8 characters when in FIPS-CC mode (maximum password length is 80 characters). Using a strong password policy, where operator and network user passwords are at least 8 characters in length and use a mix of alphanumeric (printable) characters from the ASCII character set (as explained in "FIPS 140-2 Compliant Operation" on page 10), the odds of guessing a password are 1 in $8!x26x10x32x94^5$.

The module can also be configured to use RSA certificates (1024bit or 2048bit) for operator authentication over HTTPS. Using RSA certificates, the odds of guessing the authentication key is 1 in 2^{1024} (based on a 1024bit RSA key size).

Physical Security

The physical security for the module is provided by the FortiMail hardware which uses production grade components.

Operational Environment

The module constitutes the entire firmware-based operating system for a FortiMAil appliance and can only be installed, and run on, a FortiMail appliance. The module provides a proprietary and non-modifiable operating system and does not provide a programming environment.

For the purposes of FIPS 140-2 conformance testing, the module was tested on the following FortiMail appliances:

- FortiMail-3000C

Cryptographic Key Management

Random Number Generation

The module uses a firmware-based deterministic random number generator that conforms to the FIPS 186-2 standard, Appendix 3.1, modified as per Change Notice 1.

Key Zeroization

Key zeroization is performed when resetting the module to the default configuration parameters using the CLI `execute factory reset` command or through the web-manager command equivalent. All keys except plaintext keys stored on the flash RAM are zeroized during a factory reset. The plaintext keys stored on the flash RAM are zeroized by formatting the flash RAM and then performing a firmware update. See Table 7 on page 9 for a complete list of keys and CSPs.

Algorithms

Table 5: FIPS Approved or Allowed Algorithms

Algorithm	NIST Certificate Number
RNG (ANSI X9.31 Appendix A)	860
Triple-DES	1049
AES	1604
SHA-1	1417
HMAC SHA-1	940
RSA PKCS1 (digital signature creation and verification)	786

Table 6: Non-FIPS Approved Algorithms

Algorithm
DES (disabled in FIPS mode)
MD5 (disabled in FIPS mode except for use in the TLS protocol)
HMAC MD5 (disabled in FIPS mode)
Diffie-Hellman (key agreement; key establishment methodology provides between 96 and 196 bits of encryption strength)
RSA (key wrapping; key establishment methodology provides 80 or 112 bits of encryption strength)
SHA-256 (non-compliant)
HMAC SHA-256 (non-compliant)

Note that algorithms may have deprecated encryption strengths, please see NIST SP 800-131A for details.

Cryptographic Keys and Critical Security Parameters

The following table lists all of the cryptographic keys and critical security parameters used by the module. The following definitions apply to the table:

Key or CSP The key or CSP description.

Storage Where and how the keys are stored

Usage How the keys are used

Table 7: Cryptographic Keys and Critical Security Parameters used in FIPS Mode

Key or CSP	Storage	Usage
Diffie-Hellman Key	SDRAM Plaintext	Key agreement and key establishment
RNG Seed (ANSI X9.31 Appendix A.2.4)	SDRAM Plain-text	Seed used for initializing the RNG
RNG AES Key (ANSI X9.31 Appendix A.2.4)	Flash RAM Plain-text	AES Seed key used with the RNG
Firmware Update Key	Flash RAM Plain-text	Verification of firmware integrity for download of new firmware versions using RSA public key
Firmware Integrity Key	Flash RAM Plain-text	Verification of firmware integrity during firmware integrity testing using RSA public key
HTTPS/TLS Server/Host Key	Flash RAM Plain-text	RSA private key used in the HTTPS/TLS protocols
HTTPS/TLS Session Authentication Key	SDRAM Plain-text	HMAC SHA-1 key used for HTTPS/TLS session authentication
HTTPS/TLS Session Encryption Key	SDRAM Plain-text	AES or Triple-DES key used for HTTPS/TLS session encryption
SSH Server/Host Key	Flash RAM Plain-text	RSA private key used in the SSH protocol
SSH Session Authentication Key	SDRAM Plain-text	HMAC SHA-1 key used for SSH session authentication
SSH Session Encryption Key	SDRAM Plain-text	AES or Triple-DES key used for SSH session encryption

Table 7: Cryptographic Keys and Critical Security Parameters used in FIPS Mode

Key or CSP	Storage	Usage
Configuration Integrity Hash	Flash RAM Plain-text	SHA-1 hash used for configuration and firmware integrity (bypass) tests
Operator Password	Flash RAM SHA-1 hash	Used during operator authentication
Operator Public Key	SDRAM RAM, Plain-text	RSA public key used for operator authentication
User Password	SDRAM Plain-text	Used during user authentication

Alternating Bypass Feature

The primary cryptographic function of the module is encrypting/decrypting email messages sent/received using SMTP over TLS (SMTPS). The module can also send/received plain-text email messages using SMTP. The module implements an alternating bypass feature based on the module's configuration and the direction of traffic. If the traffic is sent/received using SMTPS, the module is operating in a non-bypass state. If the traffic is sent/received using SMTP, the module is operating in a bypass state.

Incoming traffic is processed according to the protocol used and the domain configuration. An SMTPS message received by the module is decrypted before being processed. Once processed, if the specified domain is configured to use SMTPS, the message is encrypted before being sent to the mail server (non-bypass state). If the specified domain is configured to use SMTP, then the message is sent to the mail server in plain-text (bypass state).

Outgoing traffic is processed according to the message delivery configuration. If the destination domain is configured to use SMTPS, then the message is encrypted before it is sent (non-bypass state). If the destination domain is configured to use SMTP, then the message is sent in plain-text (bypass state).

Use of SMTPS for incoming traffic is enabled/disabled by checking/unchecking the "Use SMTPS" checkbox in the domain configuration.

Use of SMTPS for outgoing traffic is enabled/disabled by creating a delivery policy with valid TLS and encryption profiles.

Key Archiving

The module supports key archiving to a management computer or USB token as part of a module configuration file backup. Passwords and non-hard-coded keys are archived as part of the module configuration file. The configuration file is stored in plain text, but passwords and keys in the configuration file are AES encrypted (except for the operator passwords, which are stored as SHA1 hashes).

Mitigation of Other Attacks

The module does not mitigate against any other attacks.

FIPS 140-2 Compliant Operation

FIPS 140-2 compliant operation requires both that you use the module in its FIPS mode of operation and that you follow secure procedures for installation and operation of the FortiMail unit. You must ensure that:

- The FIPS mode of operation is enabled
- The FortiMail unit is installed in a secure physical location.
- Physical access to the FortiMail unit is restricted to authorized operators.
- Administrative passwords are at least 8 characters long.
- Administrative passwords are changed regularly.
- Administrator account passwords must have the following characteristics:
  - One (or more) of the characters should be capitalized
  - One (or more) of the characters should be numeric
  - One (or more) of the characters should be non alpha-numeric (e.g. punctuation mark)
- Administration of the module is permitted using only validated administrative methods. These are:
  - Console connection
  - Web-based manager via HTTPS (using TLS)
  - Command line interface (CLI) access via SSH
- Diffie-Hellman key sizes of less than 1536 bits (Group 5) are not used.

To remain FIPS 140-2 compliant, the module can only be configured to operate in either gateway or transparent mode.

Enabling FIPS Mode

To enable the FIPS 140-2 compliant mode of operation, the operator must execute the following command from the Local Console:

```
config system fips
  set status enable
```

The Operator is required to supply a password for the admin account which will be assigned to the Crypto Officer role.

The supplied password must be at least 8 characters long and correctly verified before the system will restart in FIPS compliant mode.

Upon restart, the module will execute self-tests to ensure the correct initialization of the module's cryptographic functions.

After restarting, the Crypto Officer can confirm that the module is running in FIPS compliant mode by executing the following command from the CLI:

```
get system status
```

If the module is running in FIPS compliant mode, the system status output will display the line:

```
FIPS status: enabled
```

Self-Tests

The module executes the following self-tests during startup and initialization:

- Firmware integrity test using RSA 1024-bit signature verification
- Configuration bypass test using SHA-1 hash (Configuration table integrity test)
- Triple-DES, CBC mode, encrypt/decrypt known answer test
- AES, CBC mode, encrypt/decrypt known answer test

- HMAC SHA-1 known answer test
- RSA signature generation/verification known answer test
- RNG known answer test

The results of the startup self-tests are displayed on the console during the startup process. The startup self-tests can also be initiated on demand using the CLI:

- to initiate all self-tests:

  ```
  execute fips kat all
  ```

- To initiate a specific self-test:

  ```
  execute fips kat <test>
  ```

The module executes the following conditional tests when the related service is invoked:

- Continuous RNG test
- RSA pairwise consistency test
- Configuration bypass test using SHA-1 hash (Configuration table integrity test)
- Firmware download integrity test using RSA signatures

If any of the self-tests or conditional tests fail, the module enters an error state as shown by the console output below:

```
Self-tests failed
Entering error mode...
The system is going down NOW !!
The system is halted.
```

All data output and cryptographic services are inhibited in the error state.

Non-FIPS Approved Services

The module also provides the following non-FIPS approved service:

- SHA-256 and HMAC SHA-256

If the above service is used, the module is not considered to be operating in the FIPS approved mode of operation.