



Forcepoint NGFW Cryptographic Kernel Module

FIPS 140-2 Non-Proprietary Security Policy

Version 2.2

Last Update: 2017-10-20

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1. Introduction	4
1.1. Purpose of the Security Policy.....	4
1.2. Target Audience.....	4
2. Cryptographic Module Specification	5
2.1. Description of Module.....	5
2.2. Description of Approved Mode.....	7
2.3. Cryptographic Module Boundary.....	7
2.3.1. Software Block Diagram	7
2.3.2. Hardware Block Diagram	8
3. Cryptographic Module Ports and Interfaces	10
4. Roles, Services, and Authentication	11
4.1. Roles	11
4.2. Services	11
4.3. Operator Authentication	17
4.4. Mechanism and Strength of Authentication	17
5. Finite State Machine.....	18
6. Physical Security	19
7. Operational Environment	20
8. Cryptographic Key Management	21
8.1. Key Entry and Output	21
8.2. Key Storage.....	21
8.3. Zeroization Procedure.....	21
9. Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC).....	22
10. Self-Tests	23
10.1. Power-Up Tests	23
10.2. Integrity Check.....	23
11. Design Assurance.....	24
11.1. Configuration Management	24
11.2. Delivery and Operation.....	24
11.2.1. Downloading a FIPS 140-2-compatible engine version	24
11.3. Cryptographic Officer Guidance.....	24
11.3.1. Installation.....	24
11.3.1.1 Upgrading appliances to the FIPS 140-2-compatible engine version	24
11.3.1.2 Configuring the engine.....	25
11.3.1.3 Verifying activation of FIPS 140-2-compatible operating mode	25
11.3.1.4 Resetting the appliance to factory settings	26



11.3.1.5	Recovering from a FIPS 140-2 self-test failure	26
11.3.2.	Initialization	26
11.4.	User Guidance	27
11.4.1.	AES GCM	27
11.4.2.	Zeroization	27
12.	Mitigation of Other Attacks.....	28
13.	Glossary and Abbreviations.....	29
14.	References	30



1. Introduction

This document is a non-proprietary FIPS 140-2 Security Policy for the Forcepoint NGFW Cryptographic Kernel Module with the versions 2.0 and 2.0.1. An earlier version of this module has gone through FIPS 140-2 validation under certificate #1991. This document contains a specification of the rules under which the module must operate and describes how this module meets the requirements as specified in the Federal Information Processing Standards Publication (FIPS PUB) 140-2 for a Security Level 1 multi-chip standalone software module.

1.1. Purpose of the Security Policy

There are three major reasons that a security policy is required:

- For FIPS 140-2 validation,
- Allows individuals and organizations to determine whether the cryptographic module, as implemented, satisfies the stated security policy, and
- Describes the capabilities, protection, and access rights provided by the cryptographic module, allowing individuals and organizations to determine whether it will meet their security requirements.

1.2. Target Audience

This document is intended to be part of the package of documents that are submitted for FIPS 140-2 validation. It is intended for the following people:

- Developers working on the release
- FIPS 140-2 testing lab
- Cryptographic Module Validation Program (CMVP)
- Consumers



2. Cryptographic Module Specification

This document is the non-proprietary security policy for the Forcepoint NGFW Cryptographic Kernel Module, and was prepared as part of the requirements for conformance to FIPS 140-2, Level 1.

The following section describes the module and how it complies with the FIPS 140-2 standard in each of the required areas.

2.1. Description of Module

The Forcepoint NGFW Cryptographic Kernel Module is a multi-chip standalone, software-only module that provides general-purpose cryptographic algorithms for Forcepoint applications. The binary of the module and the integrity check file are `qcl_fips.ko` and `checksums.fips`. Assembly language optimizations are used in the cryptographic module implementation. The module contains the following cryptographic functionality:

- Cryptographic hash functions
- Message authentication code functions
- Symmetric key encryption and decryption

The following table shows the overview of the security level for each of the eleven sections of the validation.

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

Table 1: Security Levels

The module has been tested on the following platforms:

Module Version	Manufacturer	Model	O/S & Ver.	AES-NI
2.0	Forcepoint	MIL-320	Debian GNU/Linux 6.0-based distribution running on Intel Atom D (single-user mode)	Not Support



	Forcepoint	5206	Debian GNU/Linux 6.0-based distribution running on Intel Xeon E5 (single-user mode)	With AES-NI
	Forcepoint	3206	Debian GNU/Linux 6.0-based distribution running on Intel Xeon E5 (single-user mode)	With and Without AES-NI
	Forcepoint	3202	Debian GNU/Linux 6.0-based distribution running on Intel Xeon E5 (single-user mode)	With and Without AES-NI
	Forcepoint	1402	Debian GNU/Linux 6.0-based distribution running on Intel Xeon E5 (single-user mode)	With AES-NI
	Forcepoint	1065	Debian GNU/Linux 6.0-based distribution running on Intel Core i3 (single-user mode)	With AES-NI
	Forcepoint	1035	Debian GNU/Linux 6.0-based distribution running on Intel Celeron (single-user mode)	With AES-NI
2.0.1	Forcepoint	325-C2	Debian GNU/Linux 9.0-based distribution running on Intel Atom C (single-user mode)	With AES-NI
	Forcepoint	2105	Debian GNU/Linux 9.0-based distribution running on Intel Xeon D (single-user mode)	With AES-NI
	Forcepoint	3305	Debian GNU/Linux 9.0-based distribution running on Intel Xeon E5 (single-user mode)	With and Without AES-NI
	Forcepoint	6205	Debian GNU/Linux 9.0-based distribution running on Intel Xeon E5 (single-user mode)	With AES-NI

Table 2A: Tested Platforms

The following are the vendor affirmed platforms for the module version 2.0.1:

Manufacturer	Model	O/S & Ver.	AES-NI
Forcepoint	321-C2	Debian GNU/Linux 9.0-based distribution running on Intel Atom C (single-user mode)	With AES-NI
Forcepoint	2101	Debian GNU/Linux 9.0-based distribution running on Intel Xeon D (single-user mode)	With AES-NI



Forcepoint	3301	Debian GNU/Linux 9.0-based distribution running on Intel Xeon E5 (single-user mode)	With AES-NI
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Table 2B: Vendor Affirmed Platforms

Note: Per IG G.5, the CMVP makes no statement as to the correct operation of the module or the security strengths of the generated keys when the module is ported to the vendor affirmed platforms that are not listed on the validation certificate.

2.2. Description of Approved Mode

The cryptographic module supports only a FIPS 140-2 approved mode. The cryptographic module is initialized and set in the FIPS 140-2 approved mode when the kernel module is loaded.

The calling application can call the `ssh_crypto_get_certification_mode()` function to confirm the current mode of operation. It returns `SSH_CRYPTOCERTIFICATION_FIPS_140_2` to indicate that the module is indeed in the FIPS 140-2-approved mode.

The module supports the following approved functions:

- AES: ECB, CBC, OFB, CFB128 and GCM modes
- Triple-DES: ECB, CBC, OFB and CFB64 modes
- SHS: hashing
- HMAC: message integrity

2.3. Cryptographic Module Boundary

2.3.1. Software Block Diagram

The logical boundary of the module is the binary code of the Cryptographic Kernel Module itself, which is indicated by the “Cryptographic Boundary” rectangle as illustrated in the diagram below.

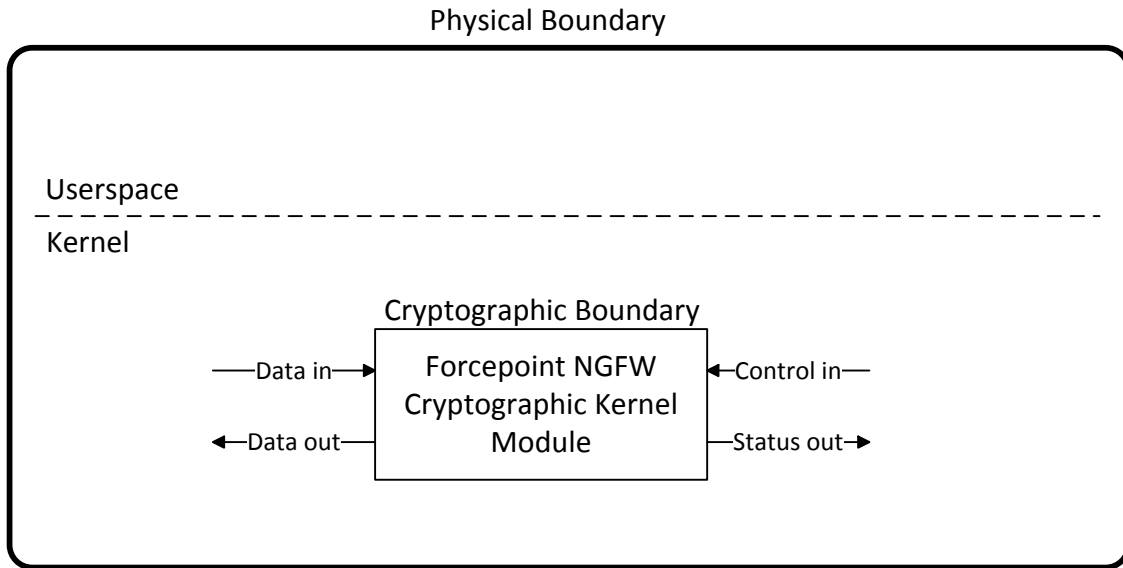
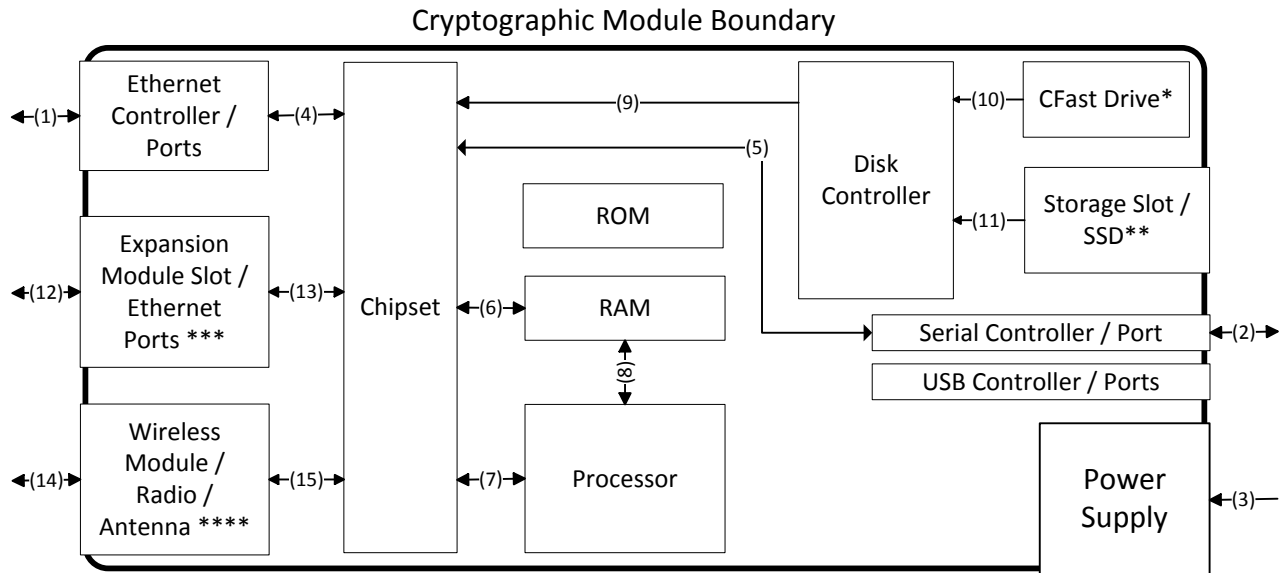


Figure 1: Software Block Diagram

2.3.2. Hardware Block Diagram

The physical boundary of the module is the enclosure of the appliance that the module is running on. The module was tested on seven separate appliances, all of which are general purpose computers. The hardware block diagram below depicts all test appliances and their internal components and ports (processor, SSD, USB, Ethernet, etc.).



1, 2, 4, 5, 6, 7, 8, 12, 13, 14 and 15: Data in, data out, control in, status out
3: Power in
9, 10 and 11: Control in

*) 321, 325, 2101, 2105, MIL-320, 1035, 1065

**) 3301, 3305, 6205, 1402, 3202, 3206, 5206

***) 325, 2101, 2105, 3301, 3305, 6205, 1035, 1065, 1402, 3202, 3206, 5206

****) 325, MIL-320

Figure 2: Hardware Block Diagram



3. Cryptographic Module Ports and Interfaces

FIPS Interface	Physical Ports	Logical Ports
Data Input	Ethernet ports, serial port, wireless radio	API input parameters
Data Output	Ethernet ports, serial port, wireless radio	API output parameters and return values
Control Input	Serial port, Ethernet ports, wireless radio	API functions, API input parameters
Status Output	Serial port, Ethernet ports, wireless radio	API return values, console, kernel ring buffer
Power Input	PC power supply port	N/A

Table 3: Ports and Interfaces



4. Roles, Services, and Authentication

4.1. Roles

The module implements both a User and a Cryptographic Officer (CO) role. The module does not allow concurrent operators.

The User role assumes to perform Approved algorithms operations. The CO role assumes to perform module installation and initialization.

The User and CO roles are implicitly assumed by the entity accessing services implemented by the module. No further authentication is required. The CO can initialize the module.

4.2. Services

Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
Symmetric Algorithms							
AES encryption and decryption	✓		128, 192, 256 bit keys	ECB, CBC, OFB, CFB128	Yes Certs #2914 , #2915 , #2916 , #2917 , #2918 , #2919 , #2920 , #2921 , #4587 , #4589 , #4650 , #4717	RWX	FIPS 197 ssh_cipher_allocate ssh_cipher_free ssh_cipher_get_block_length ssh_cipher_get_iv ssh_cipher_get_iv_length ssh_cipher_get_key_length ssh_cipher_get_max_key_length ssh_cipher_get_min_key_length ssh_cipher_get_supported ssh_cipher_has_fixed_key_length ssh_cipher_is_fips_approved ssh_cipher_name ssh_cipher_set_iv ssh_cipher_supported ssh_cipher_transform ssh_cipher_transfor



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
							m_remaining ssh_cipher_transform_with_iv ssh_cipher_get_block_len
AES-GCM authenticated encryption and decryption	✓		128, 192, 256 bit keys	GCM	Yes Certs #2914 , #2915 , #2916 , #2917 , #2918 , #2919 , #2920 , #2921 , #4587 , #4589 , #4650 , #4717	RWX	SP 800-38D ssh_cipher_allocate ssh_cipher_free ssh_cipher_get_block_length ssh_cipher_get_iv ssh_cipher_get_iv_length ssh_cipher_get_key_length ssh_cipher_get_max_key_length ssh_cipher_get_min_key_length ssh_cipher_get_supported ssh_cipher_has_fixed_key_length ssh_cipher_is_fips_approved ssh_cipher_name ssh_cipher_set_iv ssh_cipher_supported ssh_cipher_transform ssh_cipher_transform_remaining ssh_cipher_transform_with_iv ssh_cipher_get_block_len ssh_cipher_is_auth_cipher ssh_cipher_auth_re



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
							set ssh_cipher_auth_u pdate ssh_cipher_auth_fi nal ssh_cipher_auth_di gest_length ssh_cipher_is_auth ssh_cipher_generat e_iv_ctr ssh_cipher_auth_di gest_len



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
Triple-DES encryption and decryption	✓		168 bit keys	ECB, CBC, OFB, CFB64	Yes Certs #1729 , #1730 , #1731 , #1732 , #1733 , #1734 , #2440 , #2441 , #2473	RWX	SP 800-67 ssh_cipher_allocate ssh_cipher_free ssh_cipher_get_block_length ssh_cipher_get_iv ssh_cipher_get_iv_length ssh_cipher_get_key_length ssh_cipher_get_max_key_length ssh_cipher_get_min_key_length ssh_cipher_get_supported ssh_cipher_has_fixed_key_length ssh_cipher_is_fips_approved ssh_cipher_name ssh_cipher_set_iv ssh_cipher_supported ssh_cipher_transform ssh_cipher_transform_remaining ssh_cipher_transform_with_iv ssh_cipher_get_block_len
Hash Functions							
SHA-1 SHA-224 SHA-256 SHA-384 SHA-512	✓			N/A	Yes Certs #2452 , #2453 , #2454 , #2455 , #2456 , #2457 ,	RX	FIPS 180-4 ssh_hash_allocate ssh_hash_digest_length ssh_hash_final ssh_hash_free ssh_hash_get_supp



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
					#3762 , #3763 , #3809		orted ssh_hash_input_block_size ssh_hash_is_fips_approved ssh_hash_name ssh_hash_reset ssh_hash_supported ssh_hash_update
Message Authentication Codes (MACs)							
HMAC-SHA1 HMAC-SHA224 HMAC-SHA-256 HMAC-SHA-384 HMAC-SHA-512	✓		At least 112 bits HMAC key	N/A	Yes Certs #1843 , #1844 , #1845 , #1846 , #1847 , #1848 , #3036 , #3037 , #3078	RWX	FIPS 198-1 ssh_mac_allocate ssh_mac_final ssh_mac_free ssh_mac_get_block_length ssh_mac_get_max_key_length ssh_mac_get_min_key_length ssh_mac_get_supported ssh_mac_is_fips_approved ssh_mac_length ssh_mac_name ssh_mac_reset ssh_mac_supported ssh_mac_update
Management							



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
Installation		✓	N/A	N/A	N/A	N/A	Please refer to section 11.3 “Cryptographic Officer Guidance” for secure installation of the module.
Initialization		✓	N/A	N/A	N/A	RX	ssh_crypto_library_initialize sg_crypto_register_error_callback
Mode management		✓	N/A	N/A	N/A	RX	ssh_crypto_get_certification_mode ssh_crypto_set_certification_mode
Uninitialization		✓	N/A	N/A	N/A	RX	ssh_crypto_free ssh_crypto_library_uninitialize
External crypto registration		✓	N/A	N/A	N/A	RX	The external crypto registration is not supported on the tested Forcepoint platforms. The functions below return SG_CRYPTOREGISTER_NOT_SUPPORTED. sg_cipher_external_register sg_cipher_external_unregister sg_hash_external_register sg_hash_external_unregister sg_mac_external_register sg_mac_external_unregister sg_ciphermac_external_register



Service	Roles		CSP	Modes	FIPS Approved? Cert # (if applicable)	Access	Notes/API function
	User	CO					
							sg_ciphermac_external_unregister
Status							
Query status	✓	✓	N/A	N/A	N/A	RX	ssh_crypto_library_get_status ssh_crypto_library_get_version ssh_crypto_status_message
Self-tests							
Perform self-tests	✓	✓	N/A	N/A	N/A	RX	ssh_crypto_library_self_tests

Table 4: Services

Note – The 3305 and 6205 platforms share the same processor family and operating system. The CAVS certificates for 3305 will therefore apply to both 3305 and 6205 platforms.

4.3. Operator Authentication

There is no operator authentication; assumption of role is implicit by action.

4.4. Mechanism and Strength of Authentication

No authentication is required at Security Level 1; authentication is implicit by assumption of the role.



5. Finite State Machine

The following diagram represents the states and transitions of the cryptographic module.

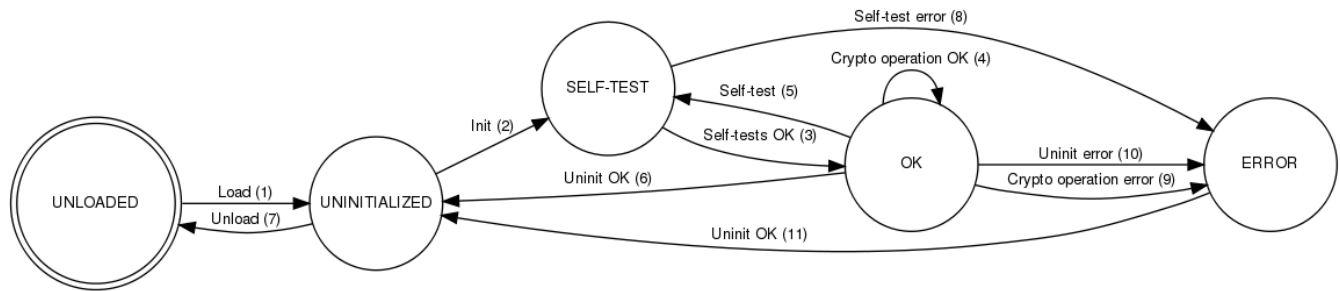


Figure 3: Cryptographic Module Finite State Machine

The state model contains the following states:

- **UNLOADED:** The start state of the cryptographic module is UNLOADED. The module is in this state until the shared library is loaded and linked to the application. Cryptographic operations are not available while in this state.
- **UNINITIALIZED:** The module is in the UNINITIALIZED state after it has been loaded but not yet initialized, or it has been successfully uninitialized. Cryptographic operations are not available while in this state.
- **SELF-TEST:** The module performs power-up self-tests during initialization or on-demand. Cryptographic operations are not available while in this state.
- **OK:** The cryptographic operations are available and are performed.
- **ERROR:** A self-test, a cryptographic operation or uninitialization has failed. An error indicator is output by the module.

The state transitions are as follows:

1. The loadable kernel module is loaded.
2. The cryptographic module is initialized using the `ssh_crypto_library_initialize` function. The function is called automatically when the cryptographic kernel module is loaded.
3. The self-tests succeed.
4. A cryptographic operation is performed successfully.
5. Self-tests are performed using the `ssh_crypto_library_self_tests` function.
6. The cryptographic module is uninitialized using the `ssh_crypto_library_uninitialize` function.
7. The shared library or the loadable kernel module is unloaded.
8. The self-tests fail.
9. A conditional test fails during a cryptographic operation.
10. The module uninitialization fails because cryptographic objects are still referenced.
11. Cryptographic objects are no longer in use and the module uninitialization succeeds. This transition also occurs automatically when the power-up self-tests fail during the module initialization.



6. Physical Security

The cryptographic module is tested on the Forcepoint MIL-320, 5206, 3206, 3202, 1402, 1065 and 1035 appliances that consist of production-grade components with standard passivation and a production-grade enclosure.



7. Operational Environment

This module will operate in a modifiable operational environment per the FIPS 140-2 definition. The module operates on the Forcepoint NGFW Debian GNU/Linux based hardened operating system that is set in the FIPS 140-2 compatible mode of operation. Login to the operating system is disabled and only the preinstalled Forcepoint application is running on the system. Therefore the operational environment is considered non-modifiable. The application that uses the cryptographic module is also the single user of the module.



8. Cryptographic Key Management

Keys are established externally. CSPs can be accessed only using the API. The operating system protects the memory and the address space of the process from unauthorized access.

Name	Auth Role	Generation	Size and Type	Output	Storage	Zeroization
AES symmetric keys	User	External, electronic entry	128-, 192-, 256-bit Symmetric key	N/A	Plaintext in memory	API call, power off
Triple-DES symmetric keys	User	External, electronic entry	168-bit Symmetric key	N/A	Plaintext in memory	API call, power off
HMAC key	User	External, electronic entry	At least 112 bits Symmetric key	N/A	Plaintext in memory	API call, power off
HMAC key for module integrity check	User, Crypto Officer	Manufacturer	128 bits HMAC-SHA-256 key	N/A	In module binary	Zeroization is not required per FIPS IG 7.4

Table 6: Key Management

8.1. Key Entry and Output

The cryptographic module supports electronic entry of symmetric keys and HMAC keys via API parameters. The application using the cryptographic module can pass secret keys to the module in plaintext within the physical boundary. The keys are associated with the calling application and are all ephemeral. Both User and Crypto Officer can enter, use and destroy symmetric keys. The module does not output any keys or CSPs.

8.2. Key Storage

The keys and CSPs are stored in plaintext in memory. The module does not provide persistent storage of keys.

8.3. Zeroization Procedure

The stored keys and CSPs are zeroized when the application calls the appropriate API function: `ssh_cipher_free` and `ssh_mac_free`. It is the calling application responsibility to call the zeroization API function to zeroize the keys and CSPs. Temporary key material is zeroized automatically by the module when no longer needed. All keys and CSPs can be zeroized by powering off the module and performing a system restore operation by the operational environment.



9. Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC)

All seven test platforms as shown in Table 2 are compliant to 47 CFR FCC Part 15, Subpart B, Class A (Business use).



10. Self-Tests

10.1. Power-Up Tests

The power-up self-tests are executed automatically when the cryptographic module is loaded. The kernel module initialization function returns 0 (SSH_CRYPTOK_OK) when the power-up self-tests have succeeded. If the power-up self-tests fail, the cryptographic module outputs an error indicator and enters an error state. The computer will need to be restarted in order for the cryptographic module to return to an operational state. No further operations are allowed when the module is in an error state.

Self-tests are performed on-demand when the user calls the `ssh_crypto_library_self_tests` function.

Cryptographic algorithm tests (Known Answer Tests):

- AES encryption and decryption tested separately
- Triple-DES encryption and decryption tested separately
- HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-512
- SHA-1, SHA-256, SHA-512

Cryptographic self-test error messages:

- Cipher algorithm test failed during self test.
- Mac algorithm test failed during self test.
- Hash algorithm test failed during self test.
- The checksum of the library is incorrect. Integrity has been compromised.

It is the application's responsibility to reboot the appliance to recover the module from the error state. The library will not cause the rebooting of the appliance.

10.2. Integrity Check

The cryptographic module uses the HMAC-SHA-256 message authentication code of the module binary for the integrity tests. The module reads the module binary file, computes the HMAC-SHA-256 MAC of the file content and compares it to the known correct MAC that is input to the module when it is loaded.



11. Design Assurance

11.1. Configuration Management

Git and SharePoint are used for configuration management of the cryptographic module.

11.2. Delivery and Operation

The cryptographic module is never released as source code. It is delivered as part of the Forcepoint NGFW software (formerly Stonesoft Security Engine). The FIPS-compatible Forcepoint NGFW software image is downloaded from the Forcepoint website. The Forcepoint NGFW software is also preinstalled on Forcepoint NGFW appliances (see *Table 2: Tested Platforms*). Product information for the appliances is available at the Forcepoint website:

<https://www.forcepoint.com/product/network-security/forcepoint-ngfw>

11.2.1. Downloading a FIPS 140-2-compatible engine version

A FIPS-compatible version of the Forcepoint NGFW software is downloaded as follows:

1. Go to the Forcepoint NGFW Downloads page at <https://support.forcepoint.com/Downloads>.
2. Enter the Proof-of-License (POL) or Proof-of-Serial (POS) code in the License Identification field and click **Submit**.
3. Click **Forcepoint NGFW downloads**. The Forcepoint NGFW Downloads page opens.
4. Download the .zip installation file.
5. Verify the SHA checksum. The correct checksum is shown on the download page.

11.3. Cryptographic Officer Guidance

11.3.1. Installation

The cryptographic module is delivered as part of the Forcepoint NGFW software. To run the cryptographic module on a Forcepoint NGFW appliance, the NGFW software is set to a FIPS-compatible operating mode.

11.3.1.1 Upgrading appliances to the FIPS 140-2-compatible engine version

Forcepoint NGFW appliances are delivered with the most recent engine software preinstalled. The engine software must be upgraded to the FIPS 140-2-compatible engine version before entering FIPS-compatible operating mode. This is necessary even if the same version was installed previously, because the file system checksum is stored during the upgrade process.

To upgrade to the FIPS 140-2-compatible engine version:

1. Save the FIPS 140-2-compatible engine upgrade zip file in the root directory of a USB memory stick. Note - The engine upgrade zip file must be in the root directory of the media.
2. Boot up the appliance. The Engine Configuration Wizard starts.
3. In the NGFW Initial Configuration Wizard, select Firewall/VPN for the role.
4. Select **Upgrade**. The Select Source Media dialog opens.
5. Select **USB Memory**. The upgrade starts.



6. Select **OK**. The engine reboots and the Engine Configuration Wizard starts with the engine image verification dialog shown. Select **Calculate**. The file system checksum is calculated and displayed below the checksum from the engine image zip file.
7. Verify that the calculated checksum is identical to the checksum from the zip file.
8. Select **OK**. The upgrade starts and the engine reboots.
9. Check the engine version to make sure that the certified version is loaded.
10. Select kernel in FIPS mode after reboot.

Continue as instructed in **Configuring the engine**, below.

11.3.1.2 Configuring the engine

To configure the engine:

1. Start the Engine Configuration Wizard as instructed in the **Configuring the Engine in the Engine Configuration Wizard** section of the *Forcepoint NGFW Installation Guide*.
2. Configure the Operating System settings as instructed in the **Configuring the Operating System Settings** section of the *Forcepoint NGFW Installation Guide*. Select **Restricted FIPS-compatible operating mode**. The SSH (Secure Shell) daemon and root password options are automatically disabled in the Engine Configuration Wizard.
3. Configure the network interfaces according to your environment as instructed in the **Configuring the Network Interfaces** section of the *Forcepoint NGFW Installation Guide*.
4. Contact the Management Server as instructed in the **Contacting the Management Server** section of the *Forcepoint NGFW Installation Guide*. Enter node IP address manually is selected by default and other IP address options are disabled when FIPS-compatible operating mode is enabled.

The engine restarts.

11.3.1.3 Verifying activation of FIPS 140-2-compatible operating mode

Restricted FIPS 140-2-compatible operating mode must be enabled during the initial configuration of the appliance. The following steps describe how to verify that FIPS 140-2-compatible operating mode has been activated.

To verify activation of FIPS 140-2-compatible operating mode:

1. Verify that the following messages are displayed on the console when the engine restarts:

```
FIPS: rootfs integrity check OK
```

(displayed after the root file system integrity test has been executed successfully)

```
FIPS power-up tests succeeded
```

(displayed after the FIPS 140-2 power-up tests have been executed successfully)

2. Continue as instructed in the **After Successful Management Server Contact** section of the *Forcepoint NGFW Installation Guide*.

Note - If the engine does not enter FIPS-compatible operating mode even though it is configured to do so, or if the power-up tests fail (a power-up test error message is displayed or the success message is not displayed), the appliance must be reset to factory settings and reinstalled as instructed in **Recovering from a FIPS 140-2 self-test failure**.



11.3.1.4 Resetting the appliance to factory settings

Resetting the appliance to factory settings is not part of the normal installation procedure. There is no need to reset the appliance to factory settings before starting to use it for the first time. These instructions can be used to reset the appliance to factory settings when necessary, such as when initial configuration has been completed without enabling the Restricted FIPS-compatible operating mode, during use, or when the appliance is being removed from use.

To reset the appliance to factory settings:

1. Reboot the appliance and select **System restore options** from the boot menu. Forcepoint NGFW System Restore starts.
2. Enter 2 for **Advanced data removal options**.
3. Enter one of the following options:
 - 1 for **1 pass overwrite**
 - 8 for a **Custom** number of overwrite passes

If you selected **Custom**, enter the number of overwrite passes. A larger number of overwrites is more secure, but it may take a considerable amount of time depending on the appliance storage capacity.

11.3.1.5 Recovering from a FIPS 140-2 self-test failure

If the FIPS 140-2 power-up self-tests fail, or the engine does not enter FIPS-compatible operating mode, the appliance must be reset to factory settings and reinstalled according to these instructions. Begin by Resetting the appliance to factory settings.

To recover from a FIPS 140-2 self-test failure:

1. Reset the appliance to factory settings as instructed in **Resetting the appliance to factory settings**.
2. Repeat the engine version upgrade as instructed in **Upgrading appliances to the FIPS 140-2-compatible engine version**.
3. Configure the firewall engine and enable FIPS-compatible operating mode as instructed in **Configuring the engine**.
4. Verify that FIPS-compatible operating mode is activated as instructed in **Verifying activation of FIPS 140-2-compatible operating mode**.

11.3.2 Initialization

The cryptographic module is initialized by loading the kernel module before any cryptographic functionality is available. The kernel module is loaded as follows:

```
# modprobe -f <module name> msg_digest=<hash value> file_path=<module path> \  
file_size=<module size>
```

<module name> is the name of the kernel module

<hash value> is the known SHA-256 hash value for the integrity check

<module path> is the pathname of the kernel module binary

<module size> is the size of the kernel module binary



The operation is performed automatically by the Forcepoint NGFW software.

11.4. User Guidance

11.4.1. AES GCM

If the module's power is lost and then restored, the key used for the AES GCM encryption/decryption shall be redistributed.

11.4.2. Zeroization

When a cryptographic key is no longer used, the key must be zeroized and freed using the `ssh_cipher_free` and `ssh_mac_free` functions for symmetric key encryption/decryption and message authentication keys, respectively.



12. Mitigation of Other Attacks

No other attacks are mitigated.



13. Glossary and Abbreviations

AES	Advanced Encryption Specification
API	Application Programming Interface
CAVP	Cryptographic Algorithm Validation Program
CBC	Cipher Block Chaining
CFB	Cipher Feedback
CMT	Cryptographic Module Testing
CMVP	Cryptographic Module Validation Program
CO	Cryptographic Officer
CSP	Critical Security Parameter
CTR	Counter
CVT	Component Verification Testing
DES	Data Encryption Standard
ECB	Electronic Codebook
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
FIPS	Federal Information Processing Standards
FSM	Finite State Model
GCM	Galois Counter Mode
HMAC	Hash Message Authentication Code
MAC	Message Authentication Code
NIST	National Institute of Science and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OFB	Output Feedback
O/S	Operating System
POL	Proof-of-License
POS	Proof-of-Serial
SHA	Secure Hash Algorithm
SHS	Secure Hash Standard
UI	User Interface



14. References

- [1] FIPS 140-2 Standard: <http://csrc.nist.gov/groups/STM/cmvp/standards.html>
- [2] FIPS 140-2 Implementation Guidance: <http://csrc.nist.gov/groups/STM/cmvp/standards.html>
- [3] FIPS 140-2 Derived Test Requirements: <http://csrc.nist.gov/groups/STM/cmvp/standards.html>
- [4] FIPS 197 Advanced Encryption Standard: <http://csrc.nist.gov/publications/PubsFIPS.html>
- [5] FIPS 180-4 Secure Hash Standard: <http://csrc.nist.gov/publications/fips/fips180-4/fips-180-4.pdf>
- [6] FIPS 198-1 The Keyed-Hash Message Authentication Code (HMAC):
<http://csrc.nist.gov/publications/PubsFIPS.html>
- [7] SP 800-67 Recommendation for the Triple Data Encryption Algorithm (TDEA) Block Cipher:
<http://csrc.nist.gov/publications/nistpubs/800-67-Rev1/SP-800-67-Rev1.pdf>
- [8] SP 800-38D Recommendation for Block Cipher Modes of Operation: Galois/Counter Mode (GCM) and GMAC: <http://csrc.nist.gov/publications/nistpubs/800-38D/SP-800-38D.pdf>