



FIPS 140-2 Non-Proprietary Security Policy

Symantec Messaging Gateway Cryptographic Module

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Abstract

This document provides a non-proprietary FIPS 140-2 Security Policy for Symantec Messaging Gateway Cryptographic Module.

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1 Introduction

1.1 About FIPS 140

Federal Information Processing Standards Publication 140-2 — Security Requirements for Cryptographic Modules specifies requirements for cryptographic modules to be deployed in a Sensitive but Unclassified environment. The National Institute of Standards and Technology (NIST) and Communications Security Establishment (CSE) Cryptographic Module Validation Program (CMVP) run the FIPS 140-2 program. The NVLAP accredits independent testing labs to perform FIPS 140 testing; the CMVP validates modules meeting FIPS 140-2 validation. *Validated* is the term given to a module that is documented and tested against the FIPS 140-2 criteria.

More information is available on the CMVP website at <http://csrc.nist.gov/groups/STM/cmvp/index.html>.

1.2 About this Document

This non-proprietary Cryptographic Module Security Policy for the Messaging Gateway Cryptographic Module from Symantec provides an overview of the product and a high-level description of how it meets the security requirements of FIPS 140-2. This document contains details on the module's cryptographic keys and critical security parameters. This Security Policy concludes with instructions and guidance on running the module in a FIPS 140-2 mode of operation.

Symantec Messaging Gateway Cryptographic Module may also be referred to as the “module” in this document.

1.3 External Resources

The Symantec website (www.symantec.com) contains information on Symantec services and products. The Cryptographic Module Validation Program website contains links to the FIPS 140-2 certificate and Symantec contact information.

1.4 Notices

This document may be freely reproduced and distributed in its entirety without modification.

1.5 Acronyms

The following table defines acronyms found in this document:

Acronym	Term
AES	Advanced Encryption Standard
ANSI	American National Standards Institute
API	Application Programming Interface
CMVP	Cryptographic Module Validation Program
CO	Crypto Officer
CSE	Communications Security Establishment
CSP	Critical Security Parameter
DES	Data Encryption Standard
DH	Diffie-Hellman
DRBG	Deterministic Random Bit Generator
DSA	Digital Signature Algorithm
EC	Elliptic Curve
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
FIPS	Federal Information Processing Standard
GPC	General Purpose Computer
GUI	Graphical User Interface
HMAC	(Keyed-) Hash Message Authentication Code
KAT	Known Answer Test
MAC	Message Authentication Code
MD	Message Digest
NIST	National Institute of Standards and Technology
OS	Operating System
PKCS	Public-Key Cryptography Standards
PSS	Probabilistic Signature Scheme
RNG	Random Number Generator
RSA	Rivest, Shamir, and Adleman
SHA	Secure Hash Algorithm
SHS	Secure Hash Standard
SSL	Secure Sockets Layer
Triple-DES	Triple Data Encryption Algorithm
TLS	Transport Layer Security
USB	Universal Serial Bus

Table 1 – Acronyms and Terms

2 Symantec Messaging Gateway Cryptographic Module

2.1 Cryptographic Module Specification

The Symantec Messaging Gateway Cryptographic Module provides cryptographic functions for the Messaging Gateway platforms software.

The module's logical cryptographic boundary is the shared library files and their integrity check HMAC files. The module is a multi-chip standalone embodiment installed on a General Purpose Device.

All operations of the module occur via calls from host applications and their respective internal daemons/processes. As such there are no untrusted services calling the services of the module.

2.1.1 Validation Level Detail

The following table lists the level of validation for each area in FIPS 140-2:

FIPS 140-2 Section Title	Validation Level
Cryptographic Module Specification	1
Cryptographic Module Ports and Interfaces	1
Roles, Services, and Authentication	1
Finite State Model	1
Physical Security	N/A
Operational Environment	1
Cryptographic Key Management	1
Electromagnetic Interference / Electromagnetic Compatibility	1
Self-Tests	1
Design Assurance	1
Mitigation of Other Attacks	N/A

Table 2 – Validation Level by FIPS 140-2 Section

2.1.2 Approved Cryptographic Algorithms

The module's cryptographic algorithm implementations have received the following certificate numbers from the Cryptographic Algorithm Validation Program:

CAVP Cert.	Algorithm	Standard	Mode/ Method	Key Lengths, Curves or Moduli	Use
#4124	AES	FIPS 197, SP 800-38A	ECB, CBC, CFB1, CFB8, OFB, CFB128, CTR	128, 192, 256	Data Encryption and Decryption
#4124	AES	SP 800-38B	CMAC	128, 192, 256	Generation and Verification
#4124	AES	SP 800-38C	CCM	128, 192, 256	Data Encryption and Decryption
#4124	AES	SP 800-38D	GCM, GMAC	128, 192, 256	Data Encryption and Decryption
#931	CVL Partial EC DH	SP 800-56A	ECC CDH KAS	All allowed curves	Shared Secret Computation
#1244	DRBG	SP 800-90A	Hash_DRBG	-	Deterministic Random Bit Generation
#1244	DRBG	SP 800-90A	HMAC_DRBG	-	Deterministic Random Bit Generation
#1244	DRBG	SP 800-90A	CTR_DRBG	-	Deterministic Random Bit Generation
#1117	DSA2	FIPS 186-4	PQG Gen, PQG Ver, Key Pair, Sig Gen, Sig Ver	1024 (for PQG Ver only), 2048, 3072	Digital Signature Generation and Verification
#939	ECDSA2	FIPS 186-4	Key Pair Generation Test, Public Key Validation Test, Signature Generation Test, Signature Verification Test	All allowed curves	Digital Signature Generation and Verification

CAVP Cert.	Algorithm	Standard	Mode/ Method	Key Lengths, Curves or Moduli	Use
#2695	HMAC	FIPS 198-1	HMAC-SHA-1	112	Message Authentication
#2695	HMAC	FIPS 198-1	HMAC-SHA-224, HMAC-SHA-256, HMAC-SHA-512	224, 256, 512	Message Authentication
#2238	RSA	FIPS 186-2	RSASSA-PSS Signature Verification	1024, 1536, 2048, 3072, 4096	Legacy use Digital Signature Verification
#2238	RSA	FIPS 186-4	ANSI X9.31 Signature Verification, RSASSA-PKCS#1-v1.5 Signature Verification	1024, 2048, and 3072	Digital Signature Verification
#2238	RSA2	FIPS 186-4	ANSI X9.31 Signature Generation, RSASSA-PKCS#1-v1.5 Signature Generation, RSASSA-PSS Signature Generation	2048, 3072, 4096	Digital Signature Generation and Verification
#3393	SHS	FIPS 180-4	SHA-1, SHA-224, SHA-256, SHA-384, SHA-512	-	Message Digest
#2255	Triple-DES	SP 800-67	TECB, TCBC, TCFB1, TCFB8, TCFB64, TOFB	3-Key	Data Encryption and Decryption
#2255	Triple-DES	SP 800-38B	CMAC	3-Key	Generation and Verification

Table 3 – FIPS-Approved Algorithm Certificates

2.1.3 Non-Approved Cryptographic Algorithms

The module supports the following non-FIPS 140-2 approved but allowed algorithms:

Algorithm	Caveat	Use
RSA Key Wrapping	Key wrapping; key establishment methodology provides between 112 and 256 bits of encryption strength	Key Establishment
EC Diffie-Hellman	Key agreement; key establishment methodology provides between 112 and 256 bits of encryption strength	Key Establishment
NDRNG	Produces output that is dependent on unpredictable physical sources that are outside human control	Seed Material

Table 4 – Non-Approved Cryptographic Algorithms

2.1.4 Non-Approved Mode of Operation

The module supports a non-approved mode of operation. The algorithms listed in this section are not to be used by the operator in the FIPS Approved mode of operation.

Algorithm	Use
AES-XTS	Non-compliant
CVL	ECC CDH KAS – non-compliant less than 112 bits of encryption strength
DSA (FIPS 186-2)	Key Generation and Signature Generation with SHA-1 and 1024 bit keys
RNG (ANS X9.31)	Random Number Generation
RSA	Key Wrapping – non-compliant less than 112 bits of encryption strength

Table 5 – Algorithms in the Non-Approved Mode of Operation

2.2 Module Interfaces

The figure below shows the module’s physical and logical block diagram:

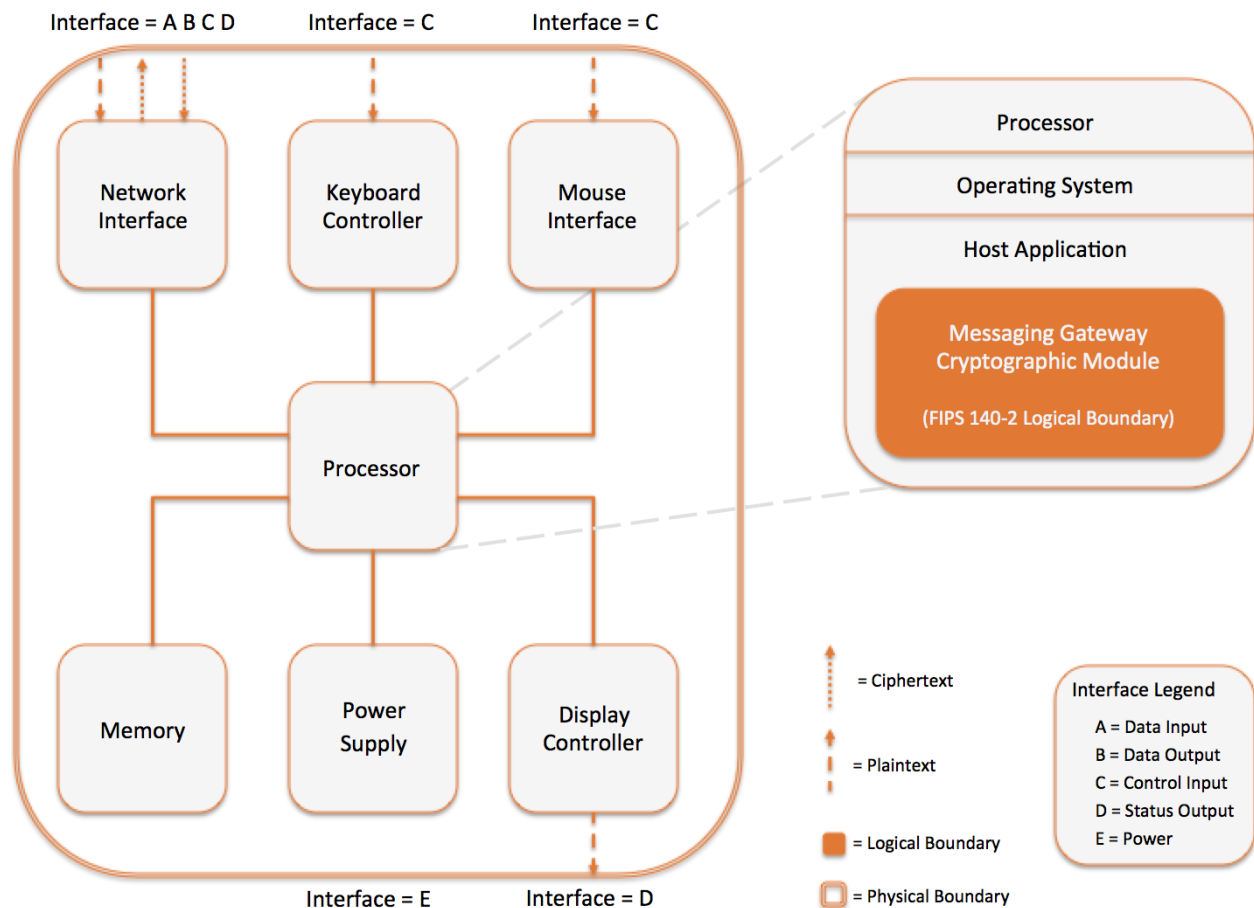


Figure 1 – Module Boundary and Interfaces Diagram

The interfaces (ports) for the physical boundary include the computer keyboard port, mouse port, network port, USB ports, display and power plug. When operational, the module does not transmit any information across these physical ports because it is a software cryptographic module. Therefore, the module’s interfaces are purely logical and are provided through the Application Programming Interface (API) that a calling daemon can operate. The logical interfaces expose services that applications directly call, and the API provides functions that may be called by a referencing application (see Section 2.3 – Roles, Services, and Authentication for the list of available functions). The module distinguishes between logical interfaces by logically separating the information according to the defined API.

The API provided by the module is mapped onto the FIPS 140- 2 logical interfaces: data input, data output, control input, and status output. Each of the FIPS 140- 2 logical interfaces relates to the module’s callable interface, as follows:

FIPS 140-2 Interface	Logical Interface	Module Physical Interface
Data Input	Input parameters of API function calls	Network Interface
Data Output	Output parameters of API function calls	Network Interface
Control Input	API function calls	Keyboard Interface, Mouse Interface
Status Output	For FIPS mode, function calls returning status information and return codes provided by API function calls.	Display Controller
Power	None	Power Supply

Table 6 – Logical Interface / Physical Interface Mapping

As shown in Figure 1 – Module Boundary and Interfaces Diagram and Table 7 – Module Services, Roles, and Descriptions, the output data path is provided by the data interfaces and is logically disconnected from processes performing key generation or zeroization. No key information will be output through the data output interface when the module zeroizes keys.

2.3 Roles, Services, and Authentication

The module supports a Crypto Officer and a User role. The module does not support a Maintenance role. The User and Crypto-Officer roles are implicitly assumed by the entity accessing services implemented by the Module.

2.3.1 Operator Services and Descriptions

The module supports services that are available to users in the various roles. All of the services are described in detail in the module’s user documentation. The following table shows the services available to the various roles and the access to cryptographic keys and CSPs resulting from services:

Service	Roles	CSP / Algorithm	Permission
Module initialization	Crypto Officer	None	No Access to Keys or CSPs
Symmetric encryption/decryption	User	AES Key, Triple-DES Key	User: read/write/execute
Digital signature ^{1*}	User	RSA Private Key, DSA Private Key, ECDSA Private Key	User: read/write/execute
Symmetric key generation	User	AES Key, Triple-DES Key	User: read/write/execute

¹ Note that per SP800-131A, issuing 1024-bit signatures with SHA-1 is disallowed as of the end of 2013.

* Indicates non-Approved services if non-Approved key sizes are utilized (<112 bits)

Service	Roles	CSP / Algorithm	Permission
Asymmetric key generation	User	RSA Private Key, DSA Private Key, ECDSA Private Key, EC DH Private Components	User: read/write/execute
Keyed Hash (HMAC)*	User	HMAC Key HMAC SHA-1, HMAC SHA- 224, HMAC SHA-256, HMAC SHA-512	User: read/write/execute
Message digest (SHS)	User	SHA-1, SHA-224, SHA-256, SHA-384, SHA-512	User: read/write/execute
Random number generation	User	DRBG Seed and Seed Key	User: read/write/execute
Show status	Crypto Officer User	None	No Access to Keys or CSPs
Self test	User	All CSPs	User: read/execute
Zeroize	Crypto Officer User	All CSPs	User and CO: delete

Table 7 – Module Services, Roles, and Descriptions

2.3.2 Operator Authentication

As required by FIPS 140-2, there are two roles (a Crypto Officer role and User role) in the module that operators may assume. As allowed by Level 1, the module does not support authentication to access services. As such, there are no applicable authentication policies. Access control policies are implicitly defined by the services available to the roles as specified in Table 7 – Module Services, Roles, and Descriptions.

2.4 Physical Security

This section of requirements does not apply to this module. The module is a software-only module and does not implement any physical security mechanisms.

2.5 Operational Environment

The module operates on a general purpose computer (GPC) running a general purpose operating system (GPOS). For FIPS purposes, the module is running on this operating system in single user mode and does not require any additional configuration to meet the FIPS requirements.

The module was tested on the following platforms:

- CentOS 6 running on a Dell PowerEdge R430 with Intel Xeon E5-2600

Compliance is maintained for other versions of the respective operating system family where the binary is unchanged. No claim can be made as to the correct operation of the module or the security strengths of the generated keys when ported to an operational environment which is not listed on the validation certificate.

The GPC(s) used during testing met Federal Communications Commission (FCC) FCC Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) requirements for business use as defined by 47 Code of Federal Regulations, Part 15, Subpart B. FIPS 140-2 validation compliance is maintained when the module is operated on other versions of the GPOS running in single user mode, assuming that the requirements outlined in NIST IG G.5 are met.

2.6 Cryptographic Key Management

The table below provides a complete list of Critical Security Parameters used within the module:

Keys and CSPs	Storage Locations	Storage Method	Input Method	Output Method	Zeroization	Access
AES Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
Triple-DES Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
RSA Public Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
RSA Private Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
DSA Public Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
DSA Private Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
HMAC Key	RAM	Plaintext	API call parameter	None	power cycle cleanse()	CO: D U: RWD
Integrity Key	Module Binary	Plaintext	None	None	None	CO: D U: RWD
EC DSA Private Key	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
EC DSA Public Key	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
EC DH Public Components	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
EC DH Private Components	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
CTR_DRBG V Value	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
CTR_DRBG Key	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
CTR_DRBG Entropy	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD

Keys and CSPs	Storage Locations	Storage Method	Input Method	Output Method	Zeroization	Access
Hash_DRBG V Value	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
Hash_DRBG C Value	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
Hash_DRBG Entropy	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
HMAC_DRBG Entropy	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
HMAC_DRBG V Value (Seed Length)	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
HMAC_DRBG Key	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD
HMAC_DRBG init_seed	RAM	Plaintext	None	None	power cycle cleanse()	CO: D U: RWD

R = Read W = Write D = Delete

Table 8 – Module Keys/CSPs

The application that uses the module is responsible for appropriate destruction and zeroization of the key material. The module provides functions for key allocation and destruction which overwrite the memory that is occupied by the key information with zeros before it is deallocated.

2.6.1 Random Number Generation

The module uses SP800-90A DRBGs for creation of asymmetric and symmetric keys.

The module accepts input from entropy sources external to the logical cryptographic boundary, but located within the operational environment inside the module’s physical boundary for use as seed material for the module’s Approved DRBGs. The calling application of the module shall use entropy sources that meet the security strength required for the random bit generation mechanism as shown in NIST Special Publication 800-90A Table 2 (Hash_DRBG, HMAC_DRBG) and Table 3 (CTR_DRBG).

The module performs continual tests on the random numbers it uses to ensure that the seed and seed key input to the Approved DRBGs do not have the same value. The module also performs continual tests on the output of the Approved DRBGs to ensure that consecutive random numbers do not repeat.

2.6.2 Key/Critical Security Parameter (CSP) Authorized Access and Use by Role and Service/Function

An authorized application as user (the User role) has access to all key data generated during the operation of the module.

2.6.3 Key/CSP Storage

Public and private keys are provided to the module by the calling process and are destroyed when released by the appropriate API function calls or during power cycle. The module does not perform persistent storage of keys.

2.6.4 Key/CSP Zeroization

The application is responsible for calling the appropriate destruction functions from the API. The destruction functions then overwrite the memory occupied by keys with zeros and deallocates the memory. This occurs during process termination / power cycle. Keys are immediately zeroized upon deallocation, which sufficiently protects the CSPs from compromise.

2.7 Self-Tests

FIPS 140-2 requires that the module perform self-tests to ensure the integrity of the module and the correctness of the cryptographic functionality at start up. In addition some functions require continuous verification of function, such as the random number generator. All of these tests are listed and described in this section. In the event of a self-test error, the module will log the error and will halt. The module must be initialized into memory to resume function.

The following sections discuss the module's self-tests in more detail.

2.7.1 Power-On Self-Tests

Power-on self-tests are executed automatically when the module is loaded into memory. The module verifies the integrity of the runtime executable using a HMAC-SHA256 digest computed at build time. If the fingerprints match, the power-up self-tests are then performed. If the power-up self-test is successful, a flag is set to place the module in FIPS mode.

Type	Detail
Software Integrity Check	<ul style="list-style-type: none"> HMAC-SHA256 on all module components
Known Answer Tests ²	<ul style="list-style-type: none"> AES separate encrypt and decrypt AES GCM separate encrypt and decrypt AES CCM separate encrypt and decrypt AES CMAC sign and verify Triple-DES CMAC sign and verify ECDH HMAC-SHA1 HMAC-SHA224 HMAC-SHA256 HMAC-SHA512 RSA sign and verify SHA-1 SHA-224 SHA-256 SHA-384 SHA-512 SP 800-90A DRBG (Hash_DRBG, HMAC_DRBG, CTR_DRBG) Triple-DES separate encrypt and decrypt (3-key) ECC CDH
Pair-wise Consistency Tests	<ul style="list-style-type: none"> DSA RSA ECDSA

Table 9 – Power-On Self-Tests

Input, output, and cryptographic functions cannot be performed while the Module is in a self-test or error state because the module is single-threaded and will not return to the calling application until the power-up self-tests are complete. If the power-up self-tests fail, subsequent calls to the module will also fail - thus no further cryptographic operations are possible.

² Note that all SHA-X KATs are tested as part of the respective HMAC SHA-X KAT. SHA-1 is also tested independently.

2.7.2 Conditional Self-Tests

The module implements the following conditional self-tests upon key generation, or random number generation (respectively):

TYPE	DETAIL
Pair-wise Consistency Tests	<ul style="list-style-type: none"> • DSA • RSA • ECDSA
Continuous RNG Tests	<ul style="list-style-type: none"> • Performed on all Approved DRBGs and the non-approved X9.31 RNG
DRBG Health Tests	<ul style="list-style-type: none"> • Health testing per SP 800-90A Section 11

Table 10 – Conditional Self-Tests

2.7.3 Cryptographic Function

The module verifies the integrity of the runtime executable using a HMAC-SHA256 digest which is computed at build time. If this computed HMAC-SHA256 digest matches the stored, known digest, then the power-up self-test (consisting of the algorithm-specific Pairwise Consistency and Known Answer tests) is performed. If any component of the power-up self-test fails, an internal global error flag is set to prevent subsequent invocation of any cryptographic function calls. Any such power-up self-test failure results in a transition to the error state that can only be recovered by reloading the module³. The power-up self-tests may be performed at any time by reloading the module.

No operator intervention is required during the running of the self-tests.

2.8 Mitigation of Other Attacks

The Module does not contain additional security mechanisms beyond the requirements for FIPS 140-2 Level 1 cryptographic modules.

³ The initialization function could be re-invoked but such re-invocation does not provide a means from recovering from an integrity test or known answer test failure

3 Guidance and Secure Operation

3.1 Crypto Officer Guidance

3.1.1 Software Installation

The module is provided directly to solution developers and is not available for direct download to the general public. The module and its host application are to be installed on an operating system specified in Section 2.5 or one where portability is maintained.

To enter the Approved Mode of Operation, the Crypto Officer must invoke the command “fipsmode on”, upon which the module will initiate a restart, effectively zeroizing keys and CSPs currently stored in memory that were intended for use in the Non-Approved Mode of Operation. While in the Approved Mode of Operation, the Crypto Officer can revert to the Non-Approved Mode of Operation by invoking the command “fipsmode off”, upon which the module will initiate a restart (zeroizing keys and CSPs that were intended for use in the Approved Mode).

3.1.2 Additional Rules of Operation

1. The writable memory areas of the module (data and stack segments) are accessible only by the application so that the operating system is in "single user" mode, i.e. only the application has access to that instance of the module.
2. The operating system is responsible for multitasking operations so that other processes cannot access the address space of the process containing the module.

3.2 User Guidance

3.2.1 General Guidance

The module is not distributed as a standalone library and is only used in conjunction with the solution.

The end user of the operating system is also responsible for zeroizing CSPs via wipe/secure delete procedures.

If the module power is lost and restored, the calling application shall reset the IV to the last value used.