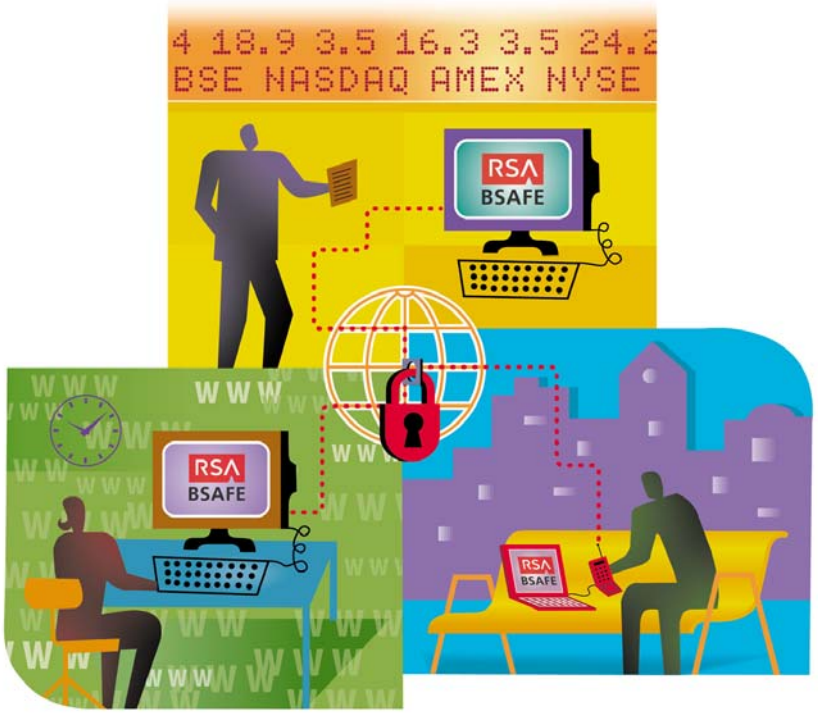
RSA BSAFE®

Crypto-C Micro Edition

Security Policy

Version 2.1.0.2 and 2.1.0.3
December 14, 2007

Strong encryption technology for software developers



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1. Introduction

This is a non-proprietary RSA Cryptographic Module security policy. This security policy describes how the RSA BSAFE Crypto-C Micro Edition (Crypto-C ME) module meets the security requirements of FIPS 140-2, and how to securely operate the module in a FIPS-compliant manner. This policy was prepared as part of the FIPS 140-2 Level 1 validation of the Crypto-C ME module.

FIPS 140-2 (Federal Information Processing Standards Publication 140-2 — *Security Requirements for Cryptographic Modules*) details the United States Government requirements for cryptographic modules. More information about the FIPS 140-2 standard and validation program is available on the NIST Web site at http://csrc.nist.gov/cryptval/.

1.1. References

This document deals only with operations and capabilities of the Crypto-C ME module in the technical terms of a FIPS 140-2 cryptographic module security policy. More information is available on the Crypto-C ME module and the entire RSA BSAFE product line from the following resources:

- The RSA Web site contains information on their full line of products and services at http://www.rsa.com/.
- The RSA BSAFE product overview is provided at http://www.rsa.com/node.asp?id=1204.
- For answers to technical or sales related questions please refer to http://www.rsasecurity.com./node.asp?id=1067.

1.2. Document Organization

This document explains the Crypto-C ME module FIPS 140-2 relevant features and functionality. This section, Introduction provides an overview and introduction to the Security Policy. Crypto-C ME Module on page 5 describes the Cryptographic Module and how it meets FIPS 140-2 requirements. Secure Operation of the Cryptographic Module on page 13 specifically addresses the required configuration for the FIPS mode of operation. Services on page 16 lists all of the functions by the Cryptographic Module. Acronyms/Definitions on page 20 lists the definitions for the acronyms used in this document.

2. Crypto-C ME Module

This section provides an overview of the Crypto-C ME Module. The following topics are discussed:

- Introduction
- Cryptographic Module
- Module Interfaces
- Roles and Services
- Cryptographic Key Management
- Cryptographic Algorithms
- Self-Test.

2.1. Introduction

The Crypto-C ME module is a software development toolkit that enables developers to incorporate cryptographic technologies into wireless applications, devices and systems. Wireless technology provides easy and fast delivery of information and services through digital devices such as mobile phones, pagers and handheld devices.

The features of the module include the ability to optimize code for different processors and specific speed or size requirements. Assembly-level optimizations on key processors mean Crypto-C ME algorithms can be used at increased speeds on many wireless platforms.

Also, the Crypto-C ME module has received FIPS 140-2 validation and offers a full set of cryptographic algorithms including public-key (asymmetric) algorithms, symmetric (secret key) block and stream ciphers, message digests, message authentication, and Pseudo Random Number Generator (PRNG) support. Developers can implement the full suite of algorithms through a single Application Programming Interface (API) or select a specific set of algorithms to reduce code size or meet performance requirements.

Note: When operating in a FIPS-approved manner, the set of algorithm implementations is not customizable).

2.2. Cryptographic Module

This Cryptographic Module is classified as a multi-chip standalone module for FIPS 140-2 purposes. As such, the module must be tested upon a particular operating system and computer platform. The cryptographic boundary thus includes the Cryptographic Module running on selected platforms running selected operating systems while configured in “single user” mode. The Cryptographic Module was validated as meeting all FIPS 140-2 Level 1 security requirements, including cryptographic key management and operating system requirements.

The Crypto-C ME module is packaged as a set of dynamically loaded modules or shared library files which contain the module’s entire executable code. Additionally, the Crypto-C ME toolkit relies on the physical security provided by the host PC in which it runs.

The RSA BSAFE Crypto-C ME toolkit (Version 2.1.0.2), 32-bit builds, was tested on the following platforms:

- SUSE Linux Enterprise Server 9.0 x86 (Intel Pentium 4)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Red Hat Enterprise Linux AS 4.0 x86 (Intel Celeron)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - Red Hat Enterprise Linux AS 3.0 x86 (32-bit)

- Sun Microsystems Solaris 10 (Sun OS 5.10) Sparc V8 (Sun UltraSparc IIIi)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - Sun Microsystems Solaris 9 (Sun OS 5.9) Sparc V8 (32-bit)
  - Sun Microsystems Solaris 8 (Sun OS 5.8) Sparc V8 (32-bit)

- Sun Microsystems Solaris 10 (Sun OS 5.10) Sparc V8+ (Sun UltraSparc IIIi)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - Sun Microsystems Solaris 9 (Sun OS 5.9) Sparc V8+ (32-bit)
  - Sun Microsystems Solaris 8 (Sun OS 5.8) Sparc V8+ (32-bit)

- Microsoft Windows Mobile 5.0 for ARM (Intel PXA270)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Microsoft Windows Mobile 5.0 for Pocket PC Phone Edition (TI OMAP 850)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Microsoft Windows Mobile 2003 for Pocket PC (Intel PXA 250)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Microsoft Windows Mobile 2003 for Smartphone (TI OMAP 1510)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Microsoft Windows 2003 Server, Service Pack 1 x86 (Intel Pentium 4) [also tested under version 2.1.0.3]
  Binary executable built with Microsoft Visual Studio 2005.
  Compliance is maintained on platforms for which the binary executable remains unchanged including (but not limited to):
  - Microsoft Windows 2000 Professional, Service Pack 4 (32-bit)
  - Microsoft Windows XP, Service Pack 1 (32-bit)
  - Microsoft Windows XP, Service Pack 2 (32-bit)

- Microsoft Windows 2003 Server, Service Pack 1 x86 (Intel Celeron)
  Binary executable built with Microsoft Visual Studio 6.
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - Microsoft Windows 2000 Professional, Service Pack 4 (32-bit)
  - Microsoft Windows XP, Service Pack 1 (32-bit)
  - Microsoft Windows XP, Service Pack 2 (32-bit)

- IBM AIX 5L v5.2 PowerPC (IBM POWER3)

Compliance is maintained on platforms for which the binary executable remains unchanged.

- IBM AIX 5L v5.3 PowerPC (IBM POWER5)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- HP-UX 11.23 ia64 (Intel Itanium 2)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - HP-UX 11.0 through 11.23 for Itanium 2 processors (32-bit)

- HP-UX 11.11 PA-RISC 2.0 (HP PA-8600)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - HP-UX 11.0 through 11.23 for PA-RISC 2.0 processors (32-bit)

- VxWorks 5.4 PowerPC PPC 604 (Motorola MPC 7455)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- VxWorks 5.5 PowerPC PPC 603 (Motorola MPC 8260)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- VxWorks 5.5 PowerPC PPC 604 (Motorola MPC 7455)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- VxWorks 6.0 PowerPC PPC 604 (Motorola MPC 7457)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

The RSA BSAFE Crypto-C ME toolkit (Version 2.1.0.2), 64-bit builds, was tested on the following platforms:

- SUSE Linux Enterprise Server 9.0 x86_64 (AMD Opteron)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Red Hat Enterprise Linux AS 4.0 x86_64 (Intel Pentium D)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Sun Microsystems Solaris 10 (Sun OS 5.10) Sparc V9 (Sun UltraSparc-IIe)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - Sun Microsystems Solaris 9 (Sun OS 5.9) Sparc V9 (64-bit)
  - Sun Microsystems Solaris 8 (Sun OS 5.8) Sparc V9 (64-bit)

- Sun Microsystems Solaris 10 (SunOS 5.10) x86_64 (AMD Opteron)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- Microsoft Windows 2003 Server, Service Pack 1 x86_64 (AMD Athlon64 X2 4000+)
  Binary executable built with Microsoft Visual Studio 2005.
  Compliance is maintained on platforms for which the binary executable remains unchanged including (but not limited to):
  - Microsoft Windows 2003 Server, Service Pack 1 (64-bit)

  - Microsoft Windows 2000 Professional, Service Pack 4 (64-bit)
  - Microsoft Windows 2000 Professional, Service Pack 4 (64-bit)

- Microsoft Windows 2003 Server, Service Pack 1 ia64 (Intel Itanium 2)
  Binary executable built with Microsoft Visual Studio 2005.
  Compliance is maintained on platforms for which the binary executable remains unchanged including (but not limited to):
  - Microsoft Windows 2000 Professional, Service Pack 4 (64-bit)

- IBM AIX 5L v5.2 PowerPC (IBM POWER3)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- IBM AIX 5L v5.3 PowerPC (IBM POWER5)
  Compliance is maintained on platforms for which the binary executable remains unchanged.

- HP-UX 11.23 ia64 (Intel Itanium 2)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - HP-UX 11.0 through 11.23 for Itanium 2 processors (64-bit)

- HP-UX 11.11 PA-RISC 2.0W (HP PA-8600)
  Compliance is maintained on platforms for which the binary executable remains unchanged, including (but not limited to):
  - HP-UX 11.0 through 11.23 for PA-RISC 2.0W processors (64-bit)

Refer to the NIST document, *Implementation Guidance for FIPS PUB 140-2 and the Cryptographic Module Validation Program*, for resolution on the issue of "Multi User" modes. This document is located at: http://csrc.nist.gov/cryptval/140-1/FIPS1402IG.pdf.

2.3. Module Interfaces

The Crypto-C ME module is evaluated as a multi-chip, standalone module. The Cryptographic Module's physical interfaces consist of the keyboard, mouse, monitor, CD-ROM drive, floppy drive, serial ports, USB ports, COM ports, and network adapter(s). However, the module sends/receives data entirely through the underlying logical interface, a C-language API documented in the *RSA BSAFE Crypto-C ME Developer's Guide*.

The module provides for control input through the API calls. Data input and output are provided in the variables passed with API calls, and Status Output is provided through the returns, exceptions, and error codes that are documented for each call.

2.4. Roles and Services

The Crypto-C ME module meets all FIPS 140-2 Level 1 requirements for Roles and Services, implementing both a User (User) role and Officer (CO) role. As allowed by FIPS 140-2, the Crypto-C ME module does not support user identification or authentication for these roles. Only one role may be active at a time and the Crypto-C ME module does not allow concurrent operators.

Table 1. Crypto-C ME Roles and Services

Role	Services
Officer	The Officer has access to a superset of the services that are available to the User. The Officer role may also invoke the full set of self tests inside the module.
User	The User may perform general security functions as described in the Crypto-C ME Developer's Guide. The User may also call specific FIPS 140 module functions as defined in Crypto-C ME Developer's Guide.

2.4.1. Officer Role

An operator assuming the Officer role can call any of the module's functions. The complete list of the functionality available to the Officer is outlined in Services on page 16.

2.4.2. User Role

An operator assuming the User role can utilize the entire Crypto-C ME API except for the `R_FIPS140_self_test_full()` method, which is reserved for the Officer. The Crypto-C ME API functions are documented in Services on page 16.

2.5. Cryptographic Key Management

2.5.1. Key Generation

The Crypto-C ME module supports generation of DSA, RSA, Diffie-Hellman (DH) and ECC public and private keys. Furthermore, the module employs a FIPS 186-2 compliant random number generator as well as a Dual Elliptic Curve Deterministic Random Bit Generator for generating asymmetric and symmetric keys used in algorithms such as AES, TDES, RSA, DSA, Diffie-Hellman or ECC.

2.5.2. Key Storage

The Crypto-C ME module does not provide long-term cryptographic key storage. If a User chooses to store keys, the User is responsible for storing keys exported from the module. The following table outlines how the module uses volatile (short term) memory to store cryptographic keys.

Note: The User & Officer roles have equal and complete access to all keys listed in the table below

Table 2. Crypto-C ME Key Storage

Item	Storage
AES keys	In volatile memory only (plaintext)
Triple DES keys	In volatile memory only (plaintext)
HMAC with SHA1 and SHA2 keys	In volatile memory only (plaintext)
Diffie-Hellman public key	In volatile memory only (plaintext)
Diffie-Hellman private key	In volatile memory only (plaintext)
ECC public key	In volatile memory only (plaintext)
ECC private key	In volatile memory only (plaintext)
RSA public key	In volatile memory only (plaintext)
RSA private key	In volatile memory only (plaintext)
DSA public key	In volatile memory only (plaintext)
DSA private key	In volatile memory only (plaintext)
PRNG seeds(FIPS 186-2 and ECDRBG)	In volatile memory only (plaintext)

2.5.3. Key Access

An authorized operator of the module has access to all key data created during the module's operation.

2.5.4. Key Protection/Zeroization

All key data resides in internally allocated data structures and can be output only using the module's defined API. The operating system protects memory and process space from unauthorized access. The operator should follow the steps outlined in the *RSA BSAFE Crypto-C ME Developer's Guide* to ensure sensitive data is protected by zeroizing the data from memory when it is no longer needed.

2.6. Cryptographic Algorithms

The Crypto-C ME module supports a wide variety of cryptographic algorithms. FIPS 140-2 requires that FIPS-approved algorithms be used whenever there is an applicable FIPS standard. The following table lists the FIPS approved algorithms supported by the module.

Table 3. Crypto-C ME FIPS-approved Algorithms

Algorithm	Validation Certificate
AES ECB, CBC, CFB (128), OFB (128), CTR – [128, 192, 256 bit key sizes]	Cert. 490 and 673
AES CCM	Cert. 490 and 673
3DES ECB, CBC, CFB (64bit) , and OFB (64 bit)	Cert. 501 and 618
Diffie-Hellman	Non-Approved (Allowed in FIPS mode)
DSA	Cert. 199 and 254
EC-Diffie-Hellman	Non-Approved (Allowed in FIPS mode)
EC-DSA, EC-DSA-SHA1	Cert. 47 and 74
FIPS 186-2 PRNG (Change Notice 1-with and without the mod q step)	Cert. 270 and 392
ANS X9.82 Dual EC Deterministic Random Number Generator (ECDRBG)	Vendor affirmed, SP 800-90
RSA X9.31, PKCS#1 V.1.5, PKCS#1 V.2.1 (SHA256 - PSS)	Cert. 203 and 314
RSA encrypt/decrypt	Non-Approved (Allowed in FIPS mode for key transport)
SHA-1	Cert. 560 and 706
SHA-224, 256, 384, 512	Cert. 560 and 706
HMAC-SHA1, SHA224, SHA256, SHA384, SHA512	Cert. 244 and 357

The following table lists the non-FIPS-approved algorithms supported by the module.

Table 4. Crypto-C ME Non-FIPS Approved Algorithms

Algorithm
DES
MD2
MD5
HMAC MD5
DES40
RC2
RC4
RC5
ECAES
RSA PKCS#1 V.2.0 (SHA256 - OAEP)

For more information on using the module in a FIPS compliant manner refer to Secure Operation of the Cryptographic Module on page 13.

2.7. Self-Test

The Crypto-C ME module performs a number of power-up and conditional self-tests to ensure proper operation.

2.7.1. Power-Up Self-Tests

The power-up self-tests implemented in the module are:

- AES Known Answer Tests (KATs)
- AES CCM Known Answer Tests (KATs)
- TDES KATs
- DES KATs
- SHA-1 KATs
- SHA-256 KATs
- SHA-384 KATs
- SHA-512 KATs
- HMAC SHA-1 KATs
- HMAC SHA-224 KATs
- HMAC SHA-256 KATs
- HMAC SHA-384 KATs
- HMAC SHA-512 KATs
- RSA Sign/verify test
- DSA Sign/verify test
- DH conditional test
- ECDSA Sign/verify test
- PRNG (FIPS 186-2 and ECDRBG) KATs
- Software integrity test.

Power-up self-tests are executed automatically when the module is loaded into memory.

2.7.2. Conditional Self-Tests

The Crypto-C ME module performs two conditional self-tests: a pair-wise consistency test each time the module generates a DSA, DH, RSA, or EC public/private key pair, and a continuous random number generator test each time the module produces random data per its FIPS 186-2 random number generator.

2.7.3. Critical Functions Test

When operating in `FIPS140_SSL_MODE`, a known answer test is performed for MD5 and HMAC-MD5.

When operating in `FIPS140_ECC_MODE`, a known answer test is performed for ECAES and ECDRBG.

When operating in `FIPS140_SSL_ECC_MODE`, a known answer test is performed for MD5, HMAC-MD5, ECAES and ECDRBG.

2.7.4. Mitigation of Other Attacks

RSA key operations implement blinding by default, providing a defense against timing attacks. Blinding is implemented through blinding modes, and the following options are available:

- Blinding mode off
- Blinding mode with no update, where the blinding value is constant for each operation
- Blinding mode with full update, where a new blinding value is used for each operation.

3. Secure Operation of the Cryptographic Module

This section provides an overview of how to securely operate the Crypto-C ME module in order to be in compliance with the FIPS 140-2 standards.

3.1. Approved DSA and RSA Modulus Sizes

In the FIPS approved mode, the DSA key-pair modulus sizes must be 1024 bits, and the RSA modulus size can range from 1024 to 4096 bits.

3.2. Modes of Operation

The following table lists and describes the module's six modes of operation.

Table 5. Crypto-C ME Modes of Operation

Cryptographic Module Mode	Description
`R_FIPS140_MODE_FIPS140` FIPS-approved	Provides the cryptographic algorithms listed in Table 3 Crypto-C ME FIPS-approved Algorithms above. The default random number generator is the FIPS 186-2 pseudo random number generator (PRNG). This is the default mode of the cryptographic module on start up.
`R_FIPS140_MODE_FIPS140_ECC` FIPS-approved	Provides the same algorithms as `R_FIPS140_MODE_FIPS140`, but the random number generator in this mode is the Dual Elliptic Curve (EC) Deterministic Random Bit Generator (DRBG) (ANSI X9.82 Part 3).

Cryptographic Module Mode	Description
R_FIPS140_MODE_FIPS140_SSL FIPS-approved if used with TLS protocol implementations	Provides the MD5 message digest in addition to the algorithms available in R_FIPS140_MODE_FIPS140. This mode can be used in the context of the key establishment phase in the TLSv1 and TLSv1.1 protocol (see Implementation Guidance for FIPS PUB 140-2 and the Cryptographic Module Validation Program, 7.1 Acceptable Key Establishment Protocols). The implementation guidance disallows the use of the SSLv2 and SSLv3 versions. Cipher suites that include non-FIPS approved algorithms are unavailable. This mode allows implementations of the TLS protocol to operate the Crypto-C ME toolkit in a FIPS 140-2 compliant manner with the FIPS 140-2 approved FIPS 186-2 PRNG as the default.
R_FIPS140_MODE_FIPS140_SSL_ECC FIPS-approved if used with TLS protocol implementations	Provides the same algorithms as R_FIPS140_MODE_FIPS140_SSL with the addition of Elliptic Curve Cryptography (ECC). In particular the random number generator in this mode is the Dual Elliptic Curve (EC) Deterministic Random Bit Generator (DRBG) (ANSI X9.82 Part 3). The same restrictions with respect to protocol versions and cipher suites as in R_FIPS140_MODE_FIPS140_SSL apply.
R_FIPS140_MODE_NON_FIPS140 Non-FIPS-approved	Allows users to operate the Crypto-C ME toolkit without any cryptographic algorithm restrictions.
R_FIPS140_MODE_DISABLED Non-FIPS-approved	Indicates that the FIPS 140 library is disabled. No future transition into other modes is permitted.

R_FIPS140_MODE_DISABLED indicates that the FIPS140 library is disabled, usually due to an internal or caller's usage error. The other modes vary in the set of algorithms available and which random number generator (FIPS 186-2 or ECDRBG) is the default.

Cryptographic keys must not be shared between R_FIPS140_MODE_FIPS140/R_FIPS140_MODE_FIPS140_SSL/R_FIPS140_MODE_FIPS140_ECC /R_FIPS140_MODE_FIPS140_SSL_ECC and R_FIPS140_MODE_DISABLED/R_FIPS140_MODE_NON_FIPS140.

3.3. Operating the Cryptographic Module

The Crypto-C ME module operates in `R_FIPS140_MODE_FIPS140` by default if the Crypto-C ME library is initialized with the `PRODUCT_DEFAULT_RESOURCE_LIST()`. The current mode of the cryptographic module can be determined with a call to `R_FIPS140_get_mode`(). The mode of the cryptographic module can be changed by using the function `R_FIPS140_set_mode`() with an information identifier from Table 5 Crypto-C ME Modes of Operation above.

After setting the cryptographic module into a FIPS Approved mode, the Cryptographic Module enforces that only the FIPS approved algorithms listed in Services on page 16 are available to operators. To disable FIPS mode, call `R_FIPS140_set_mode`() with the mode identifier `R_FIPS140_MODE_NON_FIPS140`.

The following Services are restricted to operation by the Officer:

- `R_FIPS140_self_tests_full()`

The user of the Cryptographic Module shall link with the static library for their platform which will load the cryptographic module's shared or dynamic link master and provider libraries at runtime. For additional details see the “FIPS 140-2 Library and Modes of Operation” section in the Crypto-C ME Developers Guide.

3.4. Startup Self Tests

The Crypto-C ME module offers the ability to configure when power up self tests are executed. To operate the Crypto-C ME module in a FIPS 140-2 compliant manner the default shipped configuration, which executes the self tests when the module is first loaded, must be used. For more information about this configuration setting, see the *Crypto-C ME Installation Guide*.

3.5. Random Number Generator

The Crypto-C ME module provides a FIPS 186-2 Pseudo Random Number Generator and uses this PRNG internally in all operations that require the generation of random numbers.

The module also implements an Elliptic Curve Deterministic Random Bit Generator (ECDRBG). Users can select the random number generator used by creating a Random Number Generator object and setting this object against the operation requiring random number generation (for example, key generation).

4. Services

The following table lists services provided by the Crypto-C ME module. For more information about the operation of each of these services, see the *RSA BSAFE Crypto-C ME Developer's Guide*.

Table 6. Crypto-C ME Services

Function	Function
BIO_append_filename	R_FIPS140_load_module
BIO_clear_flags	R_FIPS140_MODE_from_string
BIO_clear_retry_flags	R_FIPS140_MODE_to_string
BIO_copy_next_retry	R_FIPS140_new
BIO_debug_cb	R_FIPS140_RESULT_from_string
BIO_dump	R_FIPS140_RESULT_to_string
BIO_dump_format	R_FIPS140_ROLE_from_string
BIO_dup_chain	R_FIPS140_ROLE_to_string
BIO_f_buffer	R_FIPS140_self_tests_full
BIO_f_null	R_FIPS140_self_tests_short
BIO_find_type	R_FIPS140_set_info
BIO_flags_to_string	R_FIPS140_set_interface_version
BIO_flush	R_FIPS140_set_mode
BIO_free	R_FIPS140_set_role
BIO_free_all	R_FIPS140_STATE_from_string
BIO_get_cb	R_FIPS140_STATE_to_string
BIO_get_cb_arg	R_FIPS140_unload_module
BIO_get_close	R_FORMAT_from_string
BIO_get_flags	R_FORMAT_to_string
BIO_get_fp	R_free
BIO_get_retry_BIO	R_get_mem_functions
BIO_get_retry_flags	R_HW_CTX_build_device_handle_list
BIO_get_retry_reason	R_HW_CTX_free
BIO_gets	R_HW_CTX_get_device_handle_list
BIO_method_name	R_HW_CTX_get_device_handle_list_count
BIO_method_type	R_HW_CTX_get_device_handle_list_handle
BIO_new	R_HW_CTX_get_info
BIO_new_file	R_HW_CTX_iterate_devices
BIO_new_fp	R_HW_CTX_new
BIO_new_mem	R_HW_CTX_probe_devices
BIO_open_file	R_HW_CTX_set_info
BIO_pop	R_HW_DEV_get_device_driver_id
BIO_print_hex	R_HW_DEV_get_device_name
BIO_printf	R_HW_DEV_get_device_number
BIO_push	R_HW_DEV_get_info
BIO_puts	R_HW_DEV_is_equal
BIO_read	R_HW_DEV_set_info
BIO_read_filename	R_HW_DRIVER_free
BIO_reference_inc	R_HW_DRIVER_get_info
BIO_reset	R_HW_DRIVER_load_devices
BIO_retry_type	R_HW_DRIVER_new
BIO_rw_filename	R_HW_DRIVER_probe_devices
BIO_s_file	R_HW_DRIVER_set_info
BIO_s_mem	R_HW_OBJ_dup

BIO_s_null	R_HW_OBJ_free
BIO_seek	R_HW_OBJ_get_info
BIO_set_bio_cb	R_HW_OBJ_init
BIO_set_cb	R_HW_OBJ_new
BIO_set_cb_arg	R_HW_OBJ_set_info
BIO_set_close	R_HW_SEARCH_eof
BIO_set_flags	R_HW_SEARCH_free
BIO_set_fp	R_HW_SEARCH_get_locate_count
BIO_should_io_special	R_HW_SEARCH_locate
BIO_should_read	R_HW_SEARCH_new
BIO_should_retry	R_HW_SEARCH_next
BIO_should_write	R_HW_SEARCH_set_browse
BIO_tell	R_LIB_CTX_free
BIO_write	R_LIB_CTX_get_detail_string
BIO_write_filename	R_LIB_CTX_get_error_string
PRODUCT_DEFAULT_RESOURCE_LIST	R_LIB_CTX_get_function_string
PRODUCT_FIPS140_ECC_SWITCH_RESOURCE_LIST	R_LIB_CTX_get_info
PRODUCT_FIPS140_SSL_ECC_SWITCH_RESOURCE_LIST	R_LIB_CTX_get_reason_string
PRODUCT_FIPS140_SSL_SWITCH_RESOURCE_LIST	R_LIB_CTX_new
PRODUCT_FIPS140_SWITCH_RESOURCE_LIST	R_LIB_CTX_set_info
PRODUCT_LIBRARY_FREE	R_lock_ctrl
PRODUCT_LIBRARY_INFO	R_lock_get_cb
PRODUCT_LIBRARY_INFO_TYPE_FROM_STRING	R_lock_get_name
PRODUCT_LIBRARY_INFO_TYPE_TO_STRING	R_lock_num
PRODUCT_LIBRARY_NEW	R_lock_r
PRODUCT_LIBRARY_VERSION	R_lock_set_c
PRODUCT_NON_FIPS140_SWITCH_RESOURCE_LIST	R_lock_w
R_CR_asym_decrypt	R_locked_add
R_CR_asym_decrypt_init	R_locked_add_get_cb
R_CR_asym_encrypt	R_locked_add_set_cb
R_CR_asym_encrypt_init	R_lockid_new
R_CR_CTX_alg_supported	R_lockids_free
R_CR_CTX_free	R_malloc
R_CR_CTX_get_info	R_PKEY_cmp
R_CR_CTX_ids_from_sig_id	R_PKEY_CTX_free
R_CR_CTX_ids_to_sig_id	R_PKEY_CTX_get_info
R_CR_CTX_new	R_PKEY_CTX_get_LIB_CTX
R_CR_CTX_set_info	R_PKEY_CTX_new
R_CR_decrypt	R_PKEY_CTX_set_info
R_CR_decrypt_final	R_PKEY_decode_pkcs8
R_CR_decrypt_init	R_PKEY_delete_device
R_CR_decrypt_update	R_PKEY_encode_pkcs8
R_CR_DEFINE_CUSTOM_CIPHER_LIST	R_PKEY_FORMAT_from_string
R_CR_DEFINE_CUSTOM_METHOD_TABLE	R_PKEY_FORMAT_to_string
R_CR_derive_key	R_PKEY_free
R_CR_digest	R_PKEY_from_binary
R_CR_digest_final	R_PKEY_from_bio
R_CR_digest_init	R_PKEY_from_file
R_CR_digest_update	R_PKEY_from_public_key_binary
R_CR_dup	R_PKEY_get_handle
R_CR_encrypt	R_PKEY_get_info
R_CR_encrypt_final	R_PKEY_get_num_bits
R_CR_encrypt_init	R_PKEY_get_num_primes

R_CR_encrypt_update	R_PKEY_get_PKEY_CTX
R_CR_free	R_PKEY_get_private_handle
R_CR_generate_key	R_PKEY_get_public_handle
R_CR_generate_key_init	R_PKEY_get_purpose
R_CR_generate_parameter	R_PKEY_get_type
R_CR_generate_parameter_init	R_PKEY_iterate_fields
R_CR_get_crypto_provider_name	R_PKEY_METHOD_free
R_CR_get_default_imp_method	R_PKEY_METHOD_get_flag
R_CR_get_default_method	R_PKEY_METHOD_get_name
R_CR_get_default_signature_map	R_PKEY_METHOD_get_type
R_CR_get_detail	R_PKEY_new
R_CR_get_detail_string	R_PKEY_PASSWORD_TYPE_from_string
R_CR_get_detail_string_table	R_PKEY_PASSWORD_TYPE_to_string
R_CR_get_device_handle	R_PKEY_pk_method
R_CR_get_error	R_PKEY_print
R_CR_get_error_string	R_PKEY_public_cmp
R_CR_get_file	R_PKEY_public_to_bio
R_CR_get_function	R_PKEY_public_to_file
R_CR_get_function_string	R_PKEY_read_device
R_CR_get_function_string_table	R_PKEY_reference_inc
R_CR_get_info	R_PKEY_rsa_blinding_lib_start
R_CR_get_line	R_PKEY_rsa_no_blinding_lib_start
R_CR_get_reason	R_PKEY_set_handle
R_CR_get_reason_string	R_PKEY_set_info
R_CR_get_reason_string_table	R_PKEY_set_private_handle
R_CR_ID_from_string	R_PKEY_set_public_handle
R_CR_ID_sign_to_string	R_PKEY_set_purpose
R_CR_ID_to_string	R_PKEY_to_binary
R_CR_key_exchange_init	R_PKEY_to_bio
R_CR_key_exchange_phase_1	R_PKEY_to_file
R_CR_key_exchange_phase_2	R_PKEY_to_public_key_binary
R_CR_mac	R_PKEY_TYPE_from_string
R_CR_mac_final	R_PKEY_TYPE_to_string
R_CR_mac_init	R_PKEY_write_device
R_CR_mac_update	R_realloc
R_CR_new	R_remalloc
R_CR_random_bytes	R_RES_LIST_get_item
R_CR_random_seed	R_RES_LIST_get_resource
R_CR_RES_CRYPTO_CUSTOM_METHOD	R_RES_LIST_set_item
R_CR_set_info	R_RES_LIST_set_resource
R_CR_sign	R_set_mem_functions
R_CR_sign_final	R_SKEY_delete_device
R_CR_sign_init	R_SKEY_free
R_CR_sign_update	R_SKEY_get_handle
R_CR_SUB_from_string	R_SKEY_get_info
R_CR_SUB_to_string	R_SKEY_new
R_CR_TYPE_from_string	R_SKEY_read_device
R_CR_TYPE_to_string	R_SKEY_set_handle
R_CR_verify	R_SKEY_set_info
R_CR_verify_final	R_SKEY_write_device
R_CR_verify_init	R_thread_id
R_CR_verify_mac	R_thread_id_get_cb
R_CR_verify_mac_final	R_thread_id_set_cb

R_CR_verify_mac_init	R_TIME_cmp
R_CR_verify_mac_update	R_TIME_CTX_free
R_CR_verify_update	R_TIME_CTX_new
R_ERROR_EXIT_CODE	R_TIME_dup
R_FIPS140_free	R_TIME_export
R_FIPS140_get_default	R_TIME_free
R_FIPS140_get_failure_reason	R_TIME_get_time_mi_method
R_FIPS140_get_failure_reason_string	R_TIME_get_utc_time_method
R_FIPS140_get_info	R_TIME_import
R_FIPS140_get_interface_version	R_TIME_new
R_FIPS140_get_mode	R_TIME_offset
R_FIPS140_get_role	R_TIME_time
R_FIPS140_get_supported_interfaces	R_unlock_r
R_FIPS140_library_free	R_unlock_w
R_FIPS140_library_init	

5. Acronyms/Definitions

The following table gives an explanation of the terms and acronyms used throughout this document.

Term	Description
AES	Advanced Encryption Standard. A fast block cipher with a 128-bit block, and keys of lengths 128, 192 and 256 bits. This will replace DES as the US symmetric encryption standard.
API	Application Programming Interface
Attack	Either a successful or unsuccessful attempt at breaking part or all of a cryptosystem. Various attack types include an algebraic attack, birthday attack, brute force attack, chosen ciphertext attack, chosen plaintext attack, differential cryptanalysis, known plaintext attack, linear cryptanalysis, and middleperson attack.
DES	Data Encryption Standard. A symmetric encryption algorithm with a 56-bit key. See also Triple DES.
Diffie-Hellman	The Diffie-Hellman asymmetric key exchange algorithm. There are many variants, but typically two entities exchange some public information (for example, public keys or random values) and combines them with their own private keys to generate a shared session key. As private keys are not transmitted, eavesdroppers are not privy to all of the information that composes the session key.
DSA	Digital Signature Algorithm. An asymmetric algorithm for creating digital signatures.
EC	Elliptic Curve
ECC	Elliptic Curve Cryptography
Encryption	The transformation of plaintext into an apparently less readable form (called ciphertext) through a mathematical process. The ciphertext may be read by anyone who has the key that decrypts (undoes the encryption) the ciphertext.
FIPS	Federal Information Processing Standards
HMAC	Keyed-Hashing for Message Authentication Code
KAT	Known Answer Test
Key	A string of bits used in cryptography, allowing people to encrypt and decrypt data. Can be used to perform other mathematical operations as well. Given a cipher, a key determines the mapping of the plaintext to the ciphertext. Various types of keys include: distributed key, private key, public key, secret key, session key, shared key, subkey, symmetric key, and weak key.
NIST	National Institute of Standards and Technology. A division of the US Department of Commerce (formerly known as the NBS) which produces security and cryptography-related standards.
OS	Operating System
PC	Personal Computer
PDA	Personal Digital Assistant
PPC	PowerPC
privacy	The state or quality of being secluded from the view and/or presence of others.
private key	The secret key in public key cryptography. Primarily used for decryption but also used for encryption with digital signatures.
PRNG	Pseudo Random Number Generator
RC2	Block cipher developed by Ron Rivest as an alternative to the DES. It has a block size of 64 bits and a variable key size. It is a legacy cipher and RC5 should be used in preference.
RC4	Symmetric algorithm designed by Ron Rivest using variable length keys (usually 40 bit or 128 bit).
RC5	Block cipher designed by Ron Rivest. It is parameterizable in its word size, key length and number of rounds. Typical use involves a block size of 64 bits, a key size of 128 bits and either 16 or 20 iterations of its round function.
RNG	Random Number Generator
RSA	Public key (asymmetric) algorithm providing the ability to encrypt data and create and verify digital signatures. RSA stands for Rivest, Shamir, and Adleman, the developers of the RSA public key cryptosystem.
SHA	Secure Hash Algorithm. An algorithm which creates a unique hash value for each possible input. SHA takes an arbitrary input which is hashed into a 160-bit digest.
SHA-1	A revision to SHA to correct a weakness. It produces 160-bit digests. SHA-1 takes an arbitrary input which is hashed into a 20-byte digest.
SHA-2	The NIST-mandated successor to SHA-1, to complement the Advanced Encryption Standard. It is a family of hash algorithms (SHA-256, SHA-384 and SHA-512) which produce digests of 256, 384 and 512 bits respectively.
Triple DES	A variant of DES which uses three 56-bit keys.

6. Contacting RSA

The RSA Web site contains the latest news, security bulletins and information about coming events.

The RSA BSAFE Web site contains product information.

The RSA Laboratories Web site contains frequently asked questions.

6.1. Support and Service

If you have any questions or require additional information, see RSA Support or RSA SecurCare Online.

6.2. Feedback

We welcome your feedback on the documentation produced by RSA. Please e-mail us at userdocs@rsa.com.