Microsoft

Microsoft Windows XP

Operating System

Windows XP Enhanced DSS and Diffie-Hellman Cryptographic Provider (DSSENH)

Version 5.1.2600.5507

FIPS 140-2 Documentation: Security Policy

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Abstract

This document specifies the security policy for the Windows XP (SP3) Enhanced DSS and Diffie-Hellman Cryptographic Provider (DSSENH) as described in FIPS PUB 140-2.

CONTENTS

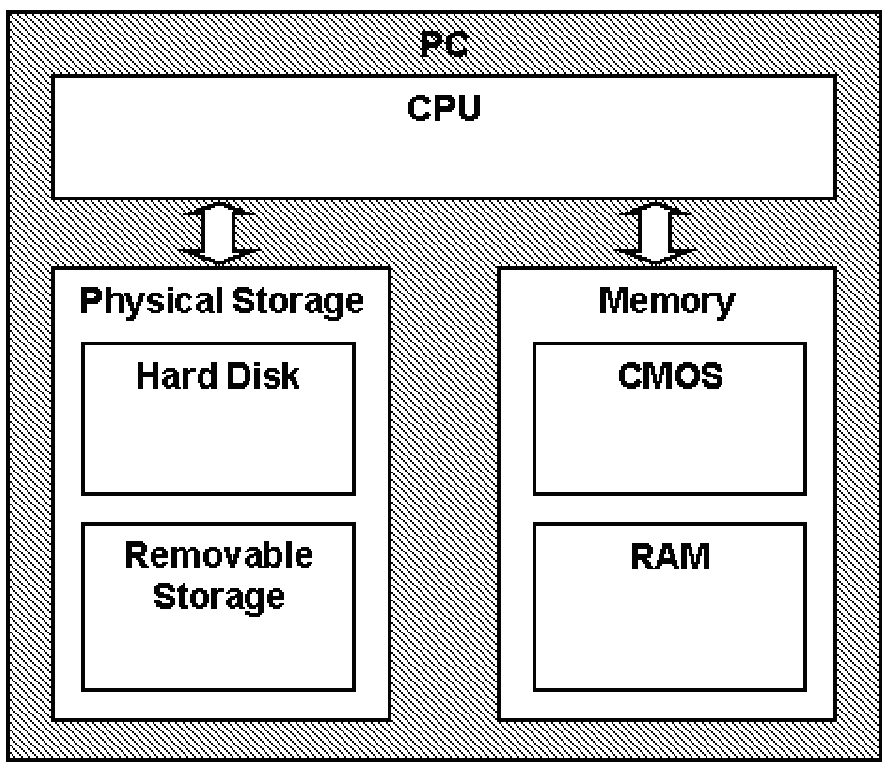
INTRODUCTION

Microsoft Corporation's Windows XP (SP3) Enhanced DSS and Diffie-Hellman Cryptographic Provider (DSSENH) is a FIPS 140-2 Level 1 compliant, general-purpose, software-based, cryptographic module. Like other cryptographic providers that ship with Microsoft Windows XP (SP3), DSSENH encapsulates several different cryptographic algorithms in an easy-to-use cryptographic module accessible via the Microsoft CryptoAPI. Software developers can dynamically link the Microsoft DSSENH module into their applications to provide FIPS 140-2 compliant cryptographic support.

Windows XP does not ship the previously FIPS 140-1 validated Microsoft Base DSS and Diffie-Hellman Cryptographic Provider (DSSBASE.DLL) anymore. There is no lost of functionality as the DSSENH functionality has always been a subset of the DSSBASE functionality.

Cryptographic Boundary

Windows XP Enhanced DSS and Diffie-Hellman Cryptographic Provider (DSSENH) (Software version 5.1.2600.5507), tested on an x86 processor, consists of a single dynamically-linked library (DLL) named DSSENH.DLL, which comprises the modules logical boundary. The cryptographic boundary for DSSENH is defined as the enclosure of the computer system on which the cryptographic module is to be executed. The physical configuration of the module, as defined in FIPS PUB 140-2, is Multi-Chip Standalone. It should be noted that the Data Protection API of Microsoft Windows XP is not part of the module and should be considered to be outside the boundary.



SECURITY POLICY

DSSENH operates under several rules that encapsulate its security policy.

- DSSENH is supported on Windows XP Service Pack 3
- DSSENH provides no user authentication. Roles are assumed implicitly.
- All services provided by DSSENH.DLL are available to the User and Crypto-officer roles.
- Keys created within DSSENH by one user are not accessible to any other user via DSSENH.
- DSSENH stores keys in the file system, but relies on Microsoft Windows XP for the encryption of the keys prior to storage.
- The following algorithms are Approved Security functions allowed in FIPS mode:
  - Tripe-DES (Cert #676), SHA-1 (Cert #784), RNG (Cert #448), and DSA (Cert #292). In addition the module supports the vendor-affirmed Triple-DES MAC, which is used only for the software integrity test.
- DSSENH also supports the non-approved Diffie-Hellman algorithm, which can be used in FIPS mode. Diffie-Hellman key agreement provides between 80 and 150 bits of encryption strength; non-compliant less than 80-bits of encryption strength.
- DSSENH supports the following non-FIPS approved algorithms: RC4, RC2, MD5[1], DES and DES40.
- DSSENH performs the following self-tests upon power up:
  - RC4 encrypt/decrypt
  - RC2 ECB encrypt/decrypt
  - DES ECB encrypt/decrypt
  - DES40 ECB encrypt/decrypt
  - Triple-DES 112 ECB encrypt/decrypt
  - Triple-DES ECB encrypt/decrypt
  - RC2 CBC encrypt/decrypt
  - DES CBC encrypt/decrypt
  - DES40 CBC encrypt/decrypt
  - Triple-DES 112 CBC encrypt/decrypt
  - Triple-DES CBC encrypt/decrypt
  - MD5 hash
  - SHA-1 hash
  - DSA pairwise consistency test
  - Diffie-Hellman pairwise consistency test
  - Software Integrity Test (Triple-DES MAC)
- DSSENH performs a pair-wise consistency test upon each invocation of DSA key generation as defined in FIPS PUB 140-2 and FIPS PUB 186-2.
- DSSENH performs a continuous random number generation test upon each random number generation (both approved and non-approved).
- Keys created using CryptDeriveKey can only be used as part of the TLS process using the derivation method outlined by the TLS protocol

[1] Applications may not use any of these non-FIPS algorithms if they need to be FIPS compliant. To operate the module in a FIPS compliant manner, applications must only use FIPS-approved algorithms.

SPECIFICATION OF ROLES

DSSENH module supports both a User and Cryptographic Officer roles (as defined in FIPS PUB 140-2). Both roles may access all services implemented in the cryptographic module.

When an application requests the crypto module to generate keys for a user, the keys are generated, used, and deleted as requested by applications. There are no implicit keys associated with a user, and each user may have numerous keys, both signature and key exchange, and these keys are separate from other users' keys.

Maintenance Roles

Maintenance roles are not supported by DSSENH.

Multiple Concurrent Operators

DSSENH is intended to run on Windows XP in Single User Mode. When run in this configuration, multiple concurrent operators are not supported.

Because the module is a DLL, each process requesting access is provided its own instance of the module. As such, each process has full access to all information and keys within the module. Note that no keys or other information are maintained upon detachment from the DLL, thus an instantiation of the module will only contain keys or information that the process has placed in the module.

Data Access

Because an operator is provided a separate instance of the module (a separate instantiation of the DLL), the operator has complete access to all of the security data items within the module.

SPECIFICATION OF SERVICES

The following list contains all services available to an operator. All services are accessible by the User and Crypto-officer roles.

Key Storage Services

The following functions provide interfaces to the cryptomodule's key container functions. Please see the Key Storage description under the Cryptographic Key Management section for more information.

CryptAcquireContext

The CryptAcquireContext function is used to acquire a programmatic context handle to a particular key container via a particular cryptographic service provider . This returned handle can then be used to make calls to the selected cryptographic service provider. Any subsequent calls to a cryptographic function need to reference the acquired context handle.

This function performs two operations. It first attempts to find a cryptographic service provider with the characteristics described in the *dwProvType* and *pszProvider* parameters. If the cryptographic service provider is found, the function attempts to find a key container matching the name specified by the *pszContainer* parameter.

With the appropriate setting of *dwFlags*, this function can also create and destroy key containers.

If *dwFlags* is set to CRYPT_NEWKEYSET, a new key container is created with the name specified by *pszContainer*. If *pszContainer* is NULL, a key container with the default name is created.

If *dwFlags* is set to CRYPT_DELETEKEYSET, The key container specified by pszContainer is deleted. If *pszContainer* is NULL, the key container with the default name is deleted. All key pairs in the key container are also destroyed and memory is zeroized.

When this flag is set, the value returned in *phProv* is undefined, and thus, the CryptReleaseContext function need not be called afterwards.

CryptGetProvParam

The CryptGetProvParam function retrieves data that governs the operations of the provider. This function may be used to enumerate key containers, enumerate supported algorithms, and generally determine capabilities of the cryptographic service provider.

CryptSetProvParam

The CryptSetProvParam function customizes various aspects of a provider's operations. This function is may be used to set a security descriptor on a key container.

CryptReleaseContext

The CryptReleaseContext function releases the handle referenced by the *hProv* parameter. After a provider handle has been released, it becomes invalid and cannot be used again. In addition, key and hash handles associated with that provider handle may not be used after CryptReleaseContext has been called.

Key Generation and Exchange Services

The following functions provide interfaces to the cryptomodule's key generation and exchange functions.

CryptDeriveKey

The CryptDeriveKey function creates cryptographic session keys derived from a hash value. This function guarantees that when the same cryptographic service provider and algorithms are used, the keys created from the same hash value are identical. The hash value is typically a cryptographic hash (SHA-1 must be used when operating in FIPS-mode) of a password or similar secret user data.

This function is the same as CryptGenKey, except that the generated session keys are created from the hash value instead of being random and CryptDeriveKey can only be used to create session keys. This function cannot be used to create public/private key pairs.

If keys are being derived from a CALG_SCHANNEL_MASTER_HASH, then the appropriate key derivation process is used to derive the key. In this case the process used is from the SSL 2.0, SSL 3.0, PCT or TLS[2] specification of deriving client and server side encryption and MAC keys. This function will cause the key block to be derived from the master secret and the requested key is then derived from the key block. Which process is used is determined by which protocol is associated with the hash object. For more information see the SSL 2.0, SSL 3.0, PCT and TLS specifications.

[2] Only keys derived for use as part of the TLS protocol using the TLS method for deriving encryption and MAC keys is allowed in FIPS mode.

CryptDestroyKey

The CryptDestroyKey function releases the handle referenced by the *hKey* parameter. After a key handle has been released, it becomes invalid and cannot be used again.

If the handle refers to a session key, or to a public key that has been imported into the cryptographic service provider through CryptImportKey, this function zeroizes the key in memory and frees the memory that the key occupied. The underlying public/private key pair (which resides outside the crypto module) is not destroyed by this function. Only the handle is destroyed.

CryptExportKey

The CryptExportKey function exports cryptographic keys from a cryptographic service provider in a secure manner for key archival purposes.

A handle to a private DSS/DH key to be exported may be passed to the function, and the function returns a key blob. This private key blob can be sent over a non-secure transport or stored in a non-secure storage location. The private key blob is useless until the intended recipient uses the CryptImportKey function on it to import the key into the recipient's cryptographic service provider. Key blobs are exported either in plaintext or encrypted with a symmetric key. If a symmetric key is used to encrypt the blob then a handle to the private DSS/DH key is passed in to the module and the symmetric key referenced by the handle is used to encrypt the blob. Any of the supported symmetric cryptographic algorithms may be used to encrypt the private key blob (DES, Triple-DES, DES40, RC4 or RC2[3]).

Public DSS/DH keys are also exported using this function. A handle to the DSS/DH public key is passed to the function and the public key is exported, always in plaintext as a blob. This blob may then be imported using the CryptImportKey function.

Symmetric keys may also be exported by wrapping the keys with another symmetric key. The wrapped key is then exported as a blob and may be imported using the CryptImportKey function.

CryptGenKey

The CryptGenKey function generates a random cryptographic key. A handle to the key is returned in *phKey*. This handle can then be used as needed with any CryptoAPI function requiring a key handle.

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[3] Note that DES, RC2 and RC4 may not be used while operating DSSENH in a FIPS compliant manner.

The calling application must specify the algorithm when calling this function. Because this algorithm type is kept bundled with the key, the application does not need to specify the algorithm later when the actual cryptographic operations are performed.

Generation of a DSS key for signatures requires the operator to complete several steps before a DSS key is generated. CryptGenKey is first called with CRYPT_PREGEN set in the dwFlags parameter. The operator then sets the P, Q, and G for the key generation via CryptSetKeyParam, once for each parameter. The operator calls CryptSetKeyParam with KP_X set as dwParam to complete the key generation.

Operators have two options while generating Diffie-Hellman keys for key exchange purposes — having CryptoAPI generate all new values for G, P, and X or by using existing values for G and P, and generating a new value for X. Generating completely new keys requires the operator to call CryptGenKey passing either CALG_DH_SF or CALG_DH_EPHEM in the Algid parameter. The key will be generated, using new, random values for G and P, a newly calculated value for X, and its handle will be returned in the phKey parameter. The process for generating keys using pre-defined G & P values is more involved. Refer to http://msdn2.microsoft.com/en-us/library/aa381969.aspx for detailed directions on key generation and the key establishment process.

CryptGenRandom

The CryptGenRandom function fills a buffer with random bytes. The random number generation algorithm is the SHS based RNG from FIPS 186 (FIPS186-2 Change Notice 1 random generator). During the function initialization, a seed, to which SHA-1 is applied to create the output random, is created based on the collection of all the data listed in the Miscellaneous section. CryptGenRandom accepts caller supplied data through its in/out pbBuffer parameter. This data is mixed with the seed

CryptGetKeyParam

The CryptGetKeyParam function retrieves data that governs the operations of a key.

CryptGetUserKey

The CryptGetUserKey function retrieves a handle of one of a user's public/private key pairs.

CryptImportKey

The CryptImportKey function transfers a cryptographic key from a key blob into a cryptographic service provider .

Private keys may be imported as blobs and the function will return a handle to the imported key.

Symmetric keys wrapped with other symmetric keys may also be imported using this function. The wrapped key blob is passed in along with a handle to a symmetric key, which the module is supposed to use to unwrap the blob. If the function is successful then a handle to the unwrapped symmetric key is returned.

To import a Diffie-Hellman (DH) key into the cryptographic service provider, call CryptImportKey, passing a pointer to the public key BLOB in the pbData parameter, the length of the BLOB in the dwDataLen parameter, and the handle to a DIFFIE-HELLMAN key in the hImpKey parameter. This call to CryptImportKey causes the calculation, (Y^X) mod P, to be performed thus creating the shared, secret key and completing the key exchange. This function call returns a handle to the new, secret, bulk-encryption key in the hKey parameter.

CryptSetKeyParam

The CryptSetKeyParam function customizes various aspects of a key's operations. This function is used to set session-specific values for symmetric keys.

CryptDuplicateKey

The CryptDuplicateKey function is used to duplicate, make a copy of, the state of a key and returns a handle to this new key. The CryptDestroyKey function must be used on both the handle to the original key and the newly duplicated key.

Data Encryption and Decryption Services

The following functions provide interfaces to the cryptomodule's data encryption and decryption functions.

CryptDecrypt

The CryptDecrypt function decrypts data previously encrypted using CryptEncrypt function.

CryptEncrypt

The CryptEncrypt function encrypts data. The algorithm used to encrypt the data is designated by the key held by the cryptographic service provider module and is referenced by the hKey parameter.

Hashing and Digital Signatures Services

The following functions provide interfaces to the cryptomodule's hashing and digital signature functions.

CryptCreateHash

The CryptCreateHash function initiates the hashing of a stream of data. It returns to the calling application a handle to a cryptographic service provider hash object. This handle is used in subsequent calls to CryptHashData and CryptHashSessionKey in order to hash streams of data and session keys. SHA-1 and MD5 are the cryptographic hashing algorithms supported. In addition, a MAC using a symmetric key is created with this call and may be used with any of the symmetric block ciphers support by the module (DES, Triple-DES, DES40, and RC2).

A CALG_SCHANNEL_MASTER_HASH may be created with this call. If this is the case then a handle to one of the following types of keys must be passed in the hKey parameter, CALG_SSL2_MASTER, CALG_SSL3_MASTER, CALG_PCT1_MASTER, or CALG_TLS1_MASTER. This function with CALG_SCHANNEL_MASTER_HASH in the ALGID parameter will cause the derivation of the master secret from the pre-master secret associated with the passed in key handle. This key derivation process is done in the method specified in the appropriate protocol specification, SSL 2.0, SSL 3.0, PCT 1.0, or TLS. The master secret is then associated with the resulting hash handle and session keys and MAC keys may be derived from this hash handle. The master secret may not be exported or imported from the module. The key data associated with the hash handle is zeroized when CryptDestroyHash is called.

CryptDestroyHash

The CryptDestroyHash function destroys the hash object referenced by the *hHash* parameter. After a hash object has been destroyed, it can no longer be used. When a hash object is destroyed, the crypto module zeroizes the memory within the module where the hash object was held. The memory is then freed.

If the hash handle references a CALG_SCHANNEL_MASTER_HASH key then when CryptDestroyHash is called the associated key material is zeroized also.

All hash objects should be destroyed with the CryptDestroyHash function when the application is finished with them.

CryptGetHashParam

The CryptGetHashParam function retrieves data that governs the operations of a hash object. The actual hash value can also be retrieved by using this function.

CryptHashData

The CryptHashData function adds data to a specified hash object. This function and CryptHashSessionKey can be called multiple times to compute the hash on long data streams or discontinuous data streams. Before calling this function, the CryptCreateHash function must be called to create a handle of a hash object.

CryptHashSessionKey

The CryptHashSessionKey function computes the cryptographic hash of a key object. This function can be called multiple times with the same hash handle to compute the hash of multiple keys. Calls to CryptHashSessionKey can be interspersed with calls to CryptHashData. Before calling this function, the CryptCreateHash function must be called to create the handle of a hash object.

CryptSetHashParam

The CryptSetHashParam function customizes the operations of a hash object.

CryptSignHash

The CryptSignHash function signs data. Because all signature algorithms are asymmetric and thus slow, the CryptoAPI does not allow data be signed directly. Instead, data is first hashed and CryptSignHash is used to sign the hash. The crypto module supports signing with DSS.

CryptVerifySignature

The CryptVerifySignature function verifies the signature of a hash object. Before calling this function, the CryptCreateHash function must be called to create the handle of a hash object. CryptHashData or CryptHashSessionKey is then used to add data or session keys to the hash object. The crypto module supports verifying DSS signatures.

After this function has been completed, only CryptDestroyHash can be called using the hHash handle.

CryptDuplicateHash

The CryptDuplicateHash function is used to duplicate, make a copy of, the state of a hash and returns a handle to this new hash. The CryptDestroyHash function must be used on both the handle to the original hash and the newly duplicated hash.

CRYPTOGRAPHIC KEY MANAGEMENT

The DSSENH crypto module manages keys in the following manner.

Cryptographic Keys, CSPs, and SRDIs

The DSSENH crypto module contains the following security relevant data items:

Security Relevant Data Item	SRDI Description
Software Integrity Key	TDES MAC Key for module integrity test
Symmetric encrypt/decrypt keys	Keys for TDES encryption/decryption.
DSA Public Keys	Keys for verifying DSA digital signatures.
DSA Private Keys	Keys for calculating DSA digital signatures.
DH Public and Private exponents	Public and private values used for Diffie-Hellman key establishment.
Triple-DES MAC keys	Keys used for Triple-DES MAC.

Access Control Policy

The DSSENH crypto module allows controlled access to the SRDIs contained within it. The following table defines the access that a service has to each. The permissions are categorized as a set of four separate permissions: read (r), write (w), execute (x), delete (d). If no permission is listed, the service has no access to the SRDI.

SRDI/Service Access Policy	Security Relevant Data Item	Software Integrity Key	Symmetric encrypt/decrypt keys	DSA Public Keys	DSA Private Keys	DH Public and Private exponents	Triple-DES MAC keys
Service							
Software Integrity Test		r/x					
Key Storage Services			r/x	r/x	r/x	r/x	r/x
Key Generation and Exchange Services			r/w/d	r/w/d	r/w/d	r/w/d	r/w/d
Data Encryption and Decryption Services			x				

Hashing and Digital Signature Services				x	x		

Key Material

DSSENH can create and use keys for the following algorithms: DSS, Diffie-Hellman, RC2, RC4, DES, DES40, and Triple-DES. Each time an application links with DSSENH, the DLL is instantiated and no keys exist within. The user application is responsible for importing keys into DSSENH or using DSSENH's functions to generate keys.

See MSDN Library\Platform SDK\Windows Base Services\Security\CryptoAPI 2.0\CryptoAPI Reference\CryptoAPI Structures\Cryptography Structures for more information about key formats and structures.
(MSDN Home > MSDN Library > Win32 and COM Development > Security > Cryptography > Cryptography Reference > General Cryptography Structures)

Key Generation

Random keys can be generated by calling the CryptGenKey() function. Keys can also be created from known values via the CryptDeriveKey() function. Keys are generated following the techniques given in FIPS PUB 186-2, Appendix 3, Random Number Generation.

See MSDN Library\Platform SDK\Windows Base Services\Security\CryptoAPI 2.0\CryptoAPI Reference\CryptoAPI Functions\Base Cryptography Functions\Key Generation and Exchange Functions for more information.
(MSDN Home > MSDN Library > Win32 and COM Development > Security > Cryptography > Cryptography Reference > Key Generation and Exchange Functions)

Key Entry and Output

Keys can be both exported and imported out of and into DSSENH via CryptExportKey() and CryptImportKey(). Exported private keys may be encrypted with a symmetric key passed into the CryptExportKey function. Any of the symmetric algorithms supported by the crypto module may be used to encrypt private keys for export (DES, Triple-DES, DES40, RC4 or RC2). When private keys are generated or imported from archival, they are covered/protected with the Microsoft Windows XP Data Protection API (DPAPI) and then outputted to the file system in the covered/protected form.

Symmetric key entry and output is done by exchanging keys using the recipient's asymmetric public key. Symmetric key entry and output may also be done by exporting a symmetric key wrapped with another symmetric key.

See MSDN Library\Platform SDK\Windows Base Services\Security\CryptoAPI 2.0\CryptoAPI Reference\CryptoAPI Functions\Base Cryptography Functions\Key Generation and Exchange Functions for more information. (MSDN Home > MSDN Library > Win32 and COM Development > Security > Cryptography > Cryptography Reference > Key Generation and Exchange Functions)

Key Storage

DSSENH does not provide persistent storage of keys. While, it is possible to store keys in the file system, this functionality is outside the scope of this validation. The task of protecting (or encrypting) the keys prior to storage in the file system is delegated to the Data Protection API (DPAPI) of Microsoft Windows XP. The DPAPI is a separate component of the operating system that is outside the boundaries of the crypto module but relies upon DSSENH for all cryptographic functionality. This section describes this functionality for information purposes only.

When a key container is deleted, the file is zeroized before being deleted. DSSENH offloads the key storage operations to the Microsoft Windows XP operating system, which is outside the cryptographic boundary. Because keys are not persistently stored inside the cryptographic module, private keys are instead encrypted by the Microsoft Data Protection API (DPAPI) service and stored in the Microsoft Windows XP file system. Keys are zeroized from memory after use. As an exception, the key used for power up self-testing is stored in the cryptographic module.

When an operator requests a keyed cryptographic operation from DSSENH, his/her keys are retrieved from the file system by DSSENH with the support of DPAPI.

The readers may refer to the technical paper "Windows Data Protection" (http://msdn.microsoft.com/library/en-us/dnsecure/html/windataprotection-dpapi.asp) for further detail of DPAPI.

Key Archival

DSSENH does not directly archive cryptographic keys. The operator may choose to export a cryptographic key labeled as exportable (cf. "Key Input and Output" above), but management of the secure archival of that key is the responsibility of the user.

Key Destruction

All keys (except the integrity test key) are destroyed and their memory location zeroized when the operator calls CryptDestroyKey on that key handle. Private keys that reside outside the cryptographic boundary (ones stored by the operating system in encrypted format in the Windows XP DPAPI system portion of the OS) are destroyed when the operator calls CryptAcquireContext with the CRYPT_DELETE_KEYSET flag.

The integrity test key of the module is stored within the module binary and can be zeroized by performing the deletion of the module.

SELF-TESTS

Power up

The following algorithm tests are initiated upon power-up:

- RC4 encrypt/decrypt KAT
- RC2 ECB encrypt/decrypt KAT
- DES ECB encrypt/decrypt KAT
- DES40 ECB encrypt/decrypt KAT
- Triple-DES ECB encrypt/decrypt KAT
- Triple-DES 112 ECB encrypt/decrypt KAT
- RC2 CBC encrypt/decrypt KAT
- DES CBC encrypt/decrypt KAT
- DES40 CBC encrypt/decrypt KAT
- Triple-DES CBC encrypt/decrypt KAT
- Triple-DES 112 CBC encrypt/decrypt KAT
- MD5 hash KAT
- SHA-1 hash KAT
- DSS pairwise consistency test
- Diffie-Hellman pairwise consistency test
- Software integrity test (Triple-DES MAC)
- FIPS186-2 Change Notice 1 random generator

Conditional

The following are initiated at key generation:

- DSS pairwise consistency test
- Diffie-Hellman pairwise consistency test
- Continuous random number generator test for approved and non-approved RNGs

MISCELLANEOUS

The following items address requirements not addressed above.

Cryptographic Bypass

Cryptographic bypass is not support in DSSENH.

Operator Authentication

DSSENH provides no authentication of operators. However, the Microsoft Windows XP operating system upon which it runs does provide authentication, but this is outside the scope of DSSENH's FIPS validation. The information about the authentication provided by Microsoft Windows XP is for informational purposes only. Microsoft Windows XP requires authentication from a trusted computer base (TCB[4]) before a user is able to access system services. Once a user is authenticated from the TCB, a process is created bearing the operator's security token. All subsequent processes and threads created by that operator are implicitly assigned the parent's (thus the operator's) security token. Every user that has been authenticated by Microsoft Windows XP is naturally assigned the operator role when he/she accesses DSSENH.

ModularExpOffload

The ModularExpOffload function offloads modular exponentiation from a cryptographic service provider to a hardware accelerator. The cryptographic service provider will check in the registry for the value HKLM\Software\Microsoft\Cryptography\ExpoOffload that can be the name of a DLL. The cryptographic service provider uses LoadLibrary to load that DLL and calls GetProcAddress to get the OffloadModExpo entry point in the DLL specified in the registry. The cryptographic service provider uses the entry point to perform all modular exponentiations for both public and private key operations. Two checks are made before a private key is offloaded. Note that to use DSSENH in a FIPS compliant manner, this function should only be used if the hardware accelerator is FIPS validated.

Operating System Security

The DSSENH crypto module is intended to run on Windows XP in Single User Mode.

[4] The TCB is the part of the operating system that is designed to meet the security functional requirements of the Controlled Access Protection Profile, which can be found at <http://www.radium.ncsc.mil/tpep/library/protection_profiles/index.html>. At this time, Windows XP has not been evaluated.

When an operating system process loads the crypto module into memory, the crypto module runs a RSA Signature on the crypto module's disk image of DSSENH.DLL, excluding the RSA signature, checksum, and export signature resources. This signature is compared to the value stored in the RSA signature resource. Initialization will only succeed if the two values are equal.

Each operating system process creates a unique instance of the crypto module that is wholly dedicated to that process. The crypto module is not shared between processes.

Each process requesting access is provided its own instance of the module. As such, each process has full access to all information and keys within the module. Note that no keys or other information are maintained upon detachment from the DLL, thus an instantiation of the module will only contain keys or information that the process has placed in the module.

Collection of Data to Create a Seed for Random Number

The DSSENH module uses a FIPS 186-2 Change Notice 1 approved PRNG to generate the random data required for symmetric & asymmetric key generation. The PRNG concatenates many different sources of information (detailed below) and the resulting byte stream is hashed with SHA-1 to produce a 20-byte seed value.

- User-supplied data
- The process ID of the current process requesting random data
- The thread ID of the current thread within the process requesting random data
- A 32bit tick count since the system boot
- The current local date and time
- The current system time of day information consisting of the boot time, current time, time zone bias, time zone ID, boot time bias, and sleep time bias
- The current hardware-platform-dependent high-resolution performance-counter value
- The information about the system's current usage of both physical and virtual memory, and page file
- The local disk information including the numbers of sectors per cluster, bytes per sector, free clusters, and clusters that are available to the user associated with the calling thread
- A hash of the environment block for the current process
- Some hardware CPU-specific cycle counters
- The system processor performance information consisting of Idle Process Time, Io Read Transfer Count, Io Write Transfer Count, Io Other Transfer Count, Io Read Operation Count, Io Write Operation Count, Io Other Operation Count, Available Pages, Committed Pages, Commit Limit, Peak

Commitment, Page Fault Count, Copy On Write Count, Transition Count, Cache Transition Count, Demand Zero Count, Page Read Count, Page Read Io Count, Cache Read Count, Cache Io Count, Dirty Pages Write Count, Dirty Write Io Count, Mapped Pages Write Count, Mapped Write Io Count, Paged Pool Pages, Non Paged Pool Pages, Paged Pool Allocated space, Paged Pool Free space, Non Paged Pool Allocated space, Non Paged Pool Free space, Free System page table entry, Resident System Code Page, Total System Driver Pages, Total System Code Pages, Non Paged Pool Look aside Hits, Paged Pool Lookaside Hits, Available Paged Pool Pages, Resident System Cache Page, Resident Paged Pool Page, Resident System Driver Page, Cache manager Fast Read with No Wait, Cache manager Fast Read with Wait, Cache manager Fast Read Resource Missed, Cache manager Fast Read Not Possible, Cache manager Fast Memory Descriptor List Read with No Wait, Cache manager Fast Memory Descriptor List Read with Wait, Cache manager Fast Memory Descriptor List Read Resource Missed, Cache manager Fast Memory Descriptor List Read Not Possible, Cache manager Map Data with No Wait, Cache manager Map Data with Wait, Cache manager Map Data with No Wait Miss, Cache manager Map Data Wait Miss, Cache manager Pin-Mapped Data Count, Cache manager Pin-Read with No Wait, Cache manager Pin Read with Wait, Cache manager Pin-Read with No Wait Miss, Cache manager Pin-Read Wait Miss, Cache manager Copy-Read with No Wait, Cache manager Copy-Read with Wait, Cache manager Copy-Read with No Wait Miss, Cache manager Copy-Read with Wait Miss, Cache manager Memory Descriptor List Read with No Wait, Cache manager Memory Descriptor List Read with Wait, Cache manager Memory Descriptor List Read with No Wait Miss, Cache manager Memory Descriptor List Read with Wait Miss, Cache manager Read Ahead IOs, Cache manager Lazy-Write IOs, Cache manager Lazy-Write Pages, Cache manager Data Flushes, Cache manager Data Pages, Context Switches, First Level Translation buffer Fills, Second Level Translation buffer Fills, and System Calls

- The system exception information consisting of Alignment Fix up Count, Exception Dispatch Count, Floating Emulation Count, and Byte Word Emulation Count
- The system lookaside information consisting of Current Depth, Maximum Depth, Total Allocates, Allocate Misses, Total Frees, Free Misses, Type, Tag, and Size
- The system interrupt information consisting of context switches, deferred procedure call count, deferred procedure call rate, time increment, deferred procedure call bypass count, and asynchronous procedure call bypass count
- The system process information consisting of Next Entry Offset, Number Of Threads, Create Time, User Time, Kernel Time, Image Name, Base Priority, Unique Process ID, Inherited from Unique Process ID, Handle Count, Session ID, Page Directory Base, Peak Virtual Size, Virtual Size,

Page Fault Count, Peak Working Set Size, Working Set Size, Quota Peak Paged Pool Usage, Quota Paged Pool Usage, Quota Peak Non Paged Pool Usage, Quota Non Paged Pool Usage, Page file Usage, Peak Page file Usage, Private Page Count, Read Operation Count, Write Operation Count, Other Operation Count, Read Transfer Count, Write Transfer Count, and Other Transfer Count

MORE INFORMATION

For the latest information on Windows XP, check out our World Wide Web site at http://www.microsoft.com/windows.