PP-Module for File Encryption Enterprise Management

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National Information Assurance Partnership

Revision History

Version	Date	Comment
1.0	2019-07-30	Initial Release
2.0	2025-09-29	Update to CC:2022

Contents

1 Introduction

1.1 Overview

The scope of the File Encryption Enterprise Management PP-Module is to describe the security functionality of a file encryption enterprise management product in terms of [CC] and to define functional and assurance requirements for such products. This PP-Module is intended for use with the following Base-PP

- Application Software Protection Profile, Version 2.0

This Base-PP is valid because a file encryption enterprise management product is a 3rd party application. The use case for a product conforming to the FE module is to protect data at rest on a device that is lost or stolen while powered off without any prior access by an adversary. The use case where an adversary obtains a device that is in a powered state and is able to make modifications to the environment or the TOE itself (e.g., evil maid attacks) is not addressed by that module. The module does contain protections to mitigate the potential for attack with a powered on device, but they are not sufficient to protect data from a skilled adversary with physical access.

While that use case is still true for the Enterprise Management PP-Module, this PP-module also expands the use case to include protecting the communications between the Enterprise Management Server and the client device through the use of a trusted channel. It also expands the use case to include the optional abilities of the EM to interact with clients (with proper authorization), to direct it to perform sanitation of keys and material on the device, to manage and store parts of the key chain required for decryption on the client, or to issue a recovery credential to reset the authentication factor if it has been lost.

The TOE and Its Supporting Environment:
The environment in which the EM functions is expected to exist is on a back end server, not on the endpoint system. It is expected to have secure access to a management system (e.g. Active Directory) and access to a means of storing key material when not in use. The EM shall not have the ability to access the secured stored key material without verification of access authority by the LDAP.

The Operating System environment may make a full range of services available to the Enterprise Management PP-Module, including hardware drivers, cryptographic libraries, and perhaps other services external to the TOE. The EM TOE may include or leverage features and functions within the operational environment.

1.2 Terms

The following sections list Common Criteria and technology terms used in this document.

1.2.1 Common Criteria Terms

Assurance	Grounds for confidence that a TOE meets the SFRs [CC].
Base Protection Profile (Base-PP)	Protection Profile used as a basis to build a PP-Configuration.

Collaborative Protection Profile (cPP)	A Protection Profile developed by international technical communities and approved by multiple schemes.
Common Criteria (CC)	Common Criteria for Information Technology Security Evaluation (International Standard ISO/IEC 15408).
Common Criteria Testing Laboratory	Within the context of the Common Criteria Evaluation and Validation Scheme (CCEVS), an IT security evaluation facility accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and approved by the NIAP Validation Body to conduct Common Criteria-based evaluations.
Common Evaluation Methodology (CEM)	Common Evaluation Methodology for Information Technology Security Evaluation.
Distributed TOE	A TOE composed of multiple components operating as a logical whole.
Extended Package (EP)	A deprecated document form for collecting SFRs that implement a particular protocol, technology, or functionality. See Functional Packages.
Functional Package (FP)	A document that collects SFRs for a particular protocol, technology, or functionality.
Operational Environment (OE)	Hardware and software that are outside the TOE boundary that support the TOE functionality and security policy.
Protection Profile (PP)	An implementation-independent set of security requirements for a category of products.
Protection Profile Configuration (PP-Configuration)	A comprehensive set of security requirements for a product type that consists of at least one Base-PP and at least one PP-Module.
Protection Profile Module (PP-Module)	An implementation-independent statement of security needs for a TOE type complementary to one or more Base-PPs.
Security Assurance Requirement (SAR)	A requirement to assure the security of the TOE.
Security Functional Requirement (SFR)	A requirement for security enforcement by the TOE.
Security Target (ST)	A set of implementation-dependent security requirements for a specific product.
Target of Evaluation (TOE)	The product under evaluation.
TOE Security Functionality (TSF)	The security functionality of the product under evaluation.
TOE Summary Specification (TSS)	A description of how a TOE satisfies the SFRs in an ST.

1.2.2 Technical Terms

Authorization factor (AF)	A value that a user knows, has, or is (e.g. password, token, etc.) submitted to the TOE to establish that the user is in the community authorized to access the requested material.
Entropy Source	This cryptographic function provides a seed for a random bit generator by accumulating the outputs from one or more noise sources. The functionality includes a measure of the minimum work required to guess a given output and tests to ensure that the noise sources are operating properly.
File Encryption Key (FEK)	The key that is used by the encryption algorithm to encrypt the selected user data on the host machine.
File/Set of files	The user data that is selected to be encrypted, which can include individual file encryption (with a FEK per file) or a set of files encrypted with a single FEK.
Key Chaining	The method of using multiple layers of encryption keys to protect data. A top layer key encrypts a lower layer key which encrypts the data; this method can have any number of layers.
Key Encryption Key (KEK)	The key that is used to encrypt another key.
Key Release Key	A key used to release another key from storage, it is not used for the direct derivation or decryption of another key.
Key Sanitization	A method of sanitizing encrypted data by securely overwriting the key, as described in the key destruction requirement, that was encrypting the data.
Keying Escrow	The process of exporting a key to an alternate location.
Keying Material	Key material is commonly known as critical security parameter (CSP) data, and also includes authorization data, nonces, and metadata.
Noise Source	The component of an RBG that contains the non-deterministic, entropy-producing activity.
Non-Volatile Memory	A type of computer memory that will retain information without power.
Powered-Off State	The device has been shut down.
Protected Data	This refers to all files designated by the user for encryption.
Random Bit Generator (RBG)	A cryptographic function composed of an entropy source and DRBG that is invoked for random bits needed to produce keying material.
Recovery Value	A secondary credential that can be used to validate a user in the event the primary one is lost.
Registration	The initial process of associating and endpoint and/or user with the server.
Submask	A submask is a bit string that can be generated and stored in a number of ways
System Identity	A composition of a series of identifiers that may vary, but aim to identity and associate with a specific system

1.3 Compliant Targets of Evaluation

The target of evaluation for this PP-Module is the Enterprise Management (EM) function of a FE solution. The following section provides an overview of the security functionality of this PP-module.

1.3.1 TOE Boundary

The application, which consists of the software provided by its vendor, is installed onto the platform(s) it operates on. It executes on the platform, which may be an operating system, hardware environment, a software based execution environment, or some combination of these. Those platforms may themselves run within other environments, such as virtual machines or operating systems, that completely abstract away the underlying hardware from the application. The TOE is not accountable for security functionality that is implemented by platform layers that are abstracted away. Some evaluation activities are specific to the particular platform on which the application runs, in order to provide precision and repeatability. The only platforms currently recognized by [AppPP] and this module are those specified in SFR Evaluation Activities. To test on a platform for which there are no EAs, a Vendor should contact NIAP with recommended EAs. NIAP will determine if the proposed platform is appropriate for the PP and accept, reject, or develop EAs as necessary in coordination with the technical community.

The TOE includes any software in the application installation package, even those pieces that may extend or modify the functionality of the underlying platform, such as kernel drivers. BIOS and other firmware, the operating system kernel, and other systems software (and drivers) provided as part of the platform are outside the scope of this document.

1.4 Use Cases

[USE CASE 1] Enterprise Management

The use case for this PP-Module is protecting the communications between the Enterprise Management Server and the client device through the use of a trusted channel. Including the optional abilities of the EM to interact with clients (with proper authorization), to direct it to perform sanitation of keys and material on the device, to manage and store parts of the key chain required for decryption on the client, or to issue a recovery credential to reset the authentication factor if it has been lost.

2 Conformance Claims

Conformance Statement

An ST must claim exact conformance to this PP-Module.

The evaluation methods used for evaluating the TOE are a combination of the workunits defined in [CEM] as well as the Evaluation Activities for ensuring that individual SFRs and SARs have a sufficient level of supporting evidence in the Security Target and guidance documentation and have been sufficiently tested by the laboratory as part of completing ATE_IND.1. Any functional packages this PP claims similarly contain their own Evaluation Activities that are used in this same manner.

CC Conformance Claims

This PP-Module is conformant to Part 2 (extended) and Part 3 (extended) of Common Criteria CC:2022, Revision 1.

PP Claim

This PP-Module does not claim conformance to any Protection Profile.

The following PPs and PP-Modules are allowed to be specified in a PP-Configuration with this PP-Module:

- PP-Module for VPN Clients, Version 3.0
- PP-Module for File Encryption, Version 2.0

Package Claim

- This PP-Module is Functional Package for SSH Version 2.0 conformant.
- This PP-Module is Functional Package for TLS Version 2.1 conformant.
- This PP-Module is Functional Package for X.509 Version 1.0 conformant.
- This PP-Module does not conform to any assurance packages.

The functional packages to which the PP conforms may include SFRs that are not mandatory to claim for the sake of conformance. An ST that claims one or more of these functional packages may include any non-mandatory SFRs that are appropriate to claim based on the capabilities of the TSF and on any triggers for their inclusion based inherently on the SFR selections made.

3 Security Problem Definition

The primary asset that is being protected is the sensitive user data stored on a system. The threat model thus focuses on a host machine that has been compromised by an unauthorized user. This section addresses threats to the TOE only.

3.1 Threats

T.KEYING_MATERIAL_COMPROMISE_SERVER

Possession of any of the keys, authorization factors, submasks, and random numbers or any other values that contribute to the creation of keys or authorization factors could allow an unauthorized user to defeat the encryption. This PP-Module considers possession of key material of equal importance to the data itself. Threat agents may look for key material in unencrypted storage on the Management Server and in external databases in the operating environment (OE), e.g. SQL database.

T.MAN_IN_THE_MIDDLE

An attacker listening on the communication between the Management Server and the Client(s) to obtain the user's credential, keys, or recovery material.

T.UNAUTHORIZED_ADMINISTRATOR_ACCESS

An attacker masquerading as an administrator to the Management Server to gain access to TOE management functionality to gain unauthorized access to protected data or prevent legitimate users from gaining authorized access.

T.UNAUTHORIZED_DATA_ACCESS_ENDPOINT

An attacker accessing the data on the encrypted file(s) by getting access to a protected file(s), attaching it to a host system controlled by the attacker and using the key material, or optionally a recovery credential to access the data. The PP-Module for File Encryption addresses the primary threat of unauthorized disclosure of recovery material.

T.UNAUTHORIZED_DATA_ACCESS_SERVER

An attacker accessing the Management Server and generating a recovery key chain for an endpoint. The File Encryption PP-Module addresses the primary threat of unauthorized disclosure of data protected on the endpoint; this adds the Management Server to the scope of the threat.

T.UNTRUSTED_COMMUNICATION_CHANNELS

An attacker targeting the Management Server using insecure tunneling protocols or the presence of an unencrypted path to disclose keys, key material, or recovery material transferred between the endpoint and the Management Server.

3.2 Assumptions

These assumptions are made on the Operational Environment (OE) in order to be able to ensure that the security functionality specified in the PP-Module can be provided by the TOE. If the TOE is placed in an OE that does not meet these assumptions, the TOE may no longer be able to provide all of its security functionality.

A.ENVIRONMENTAL_STORAGE

Any key storage mechanism provided by the Operational Environment is able to provide the same level of security as a TOE-internal storage mechanism that is conformant to this PP-Configuration.

A.PHYSICAL_SERVER

The platform on which the Management Server resides is physically protected in its Operational Environment and not subject to physical attacks that compromise the security and/or interfere with the platform's correct operation.

A.SECURED_CONFIGURATION

The Management Server and the remote endpoints are installed and configured in accordance with their evaluated configuration.

A.SECURED_ENVIRONMENT

Any environmental components required to support the functionality of the Management Server (e.g. underlying operating system, firewall, database) are installed and configured in accordance with its proper configuration.

3.3 Organizational Security Policies

An organization deploying the TOE is expected to satisfy the organizational security policy listed below in addition to all organizational security policies defined by the claimed Base-PP.

This document does not define any additional OSPs.

4 Security Objectives

The Security Problem described in Section 3 will be addressed by a combination of cryptographic capabilities. Compliant TOEs will provide security functionality that addresses threats to the TOE and enforces policies that are imposed by law and regulation. The following subsections provide a description of the security objectives required to meet the threats/policies previously discussed. The description of these security objectives are in addition to that described in the [AppPP].

Note: in each subsection below particular security objectives are identified (highlighted by O.) and they are matched with the associated security functional requirements (SFRs) that provide the mechanisms to satisfy the objectives.

The Security Objectives are the requirements for the Target of Evaluation (TOE) and for the Operational Environment derived from the threats in Section 3.

4.1 Security Objectives for the Operational Environment

OE.ENVIRONMENTAL_STORAGE

If the TOE relies on the Operational Environment for key storage, the storage mechanism will provide at least the same level of security as a TOE-internal storage mechanism as defined by FPT_KYP_EXT.1.

OE.PHYSICAL_SERVER

The Operating environment will provide a cryptographic function capability that is commensurate with the requirements and capabilities of the TOE as defined in FCS_KYC_EXT.1.

OE.SECURED_CONFIGURATION

The Management Server and remote endpoints are configured in accordance with its associated operational guidance so that the level of security that is provided by the TOE is consistent with its evaluated configuration.

OE.SECURED_ENVIRONMENT

The components of the Management Server’s underlying platform are configured in accordance with their associated operational guidance so that the TOE is deployed in an environment that is consistent with its evaluated configuration.

4.2 Security Objectives Rationale

This section describes how the assumptions and organizational security policies map to operational environment security objectives.

Table 1: Security Objectives Rationale

Assumption or OSP	Security Objectives	Rationale
A.ENVIRONMENTAL_STORAGE	OE.ENVIRONMENTAL_STORAGE	The operational environment objective OE.ENVIRONMENTAL_STORAGE is realized through A.ENVIRONMENTAL_STORAGE.

A.PHYSICAL_SERVER	OE.PHYSICAL_SERVER	The operational environment objective OE.PHYSICAL_SERVER is realized through A.PHYSICAL_SERVER.
A.SECURED_ CONFIGURATION	OE.SECURED_ CONFIGURATION	The operational environment objective OE.SECURED_CONFIGURATION is realized through A.SECURED_CONFIGURATION.
A.SECURED_ ENVIRONMENT	OE.SECURED_ ENVIRONMENT	The operational environment objective OE.SECURED_ENVIRONMENT is realized through A.SECURED_ENVIRONMENT.

5 Security Requirements

This chapter describes the security requirements which have to be fulfilled by the product under evaluation. Those requirements comprise functional components from Part 2 and assurance components from Part 3 of [CC]. The following conventions are used for the completion of operations:

- **Refinement** operation (denoted by **bold text** or ~~strikethrough text~~): Is used to add details to a requirement or to remove part of the requirement that is made irrelevant through the completion of another operation, and thus further restricts a requirement.
- **Selection** (denoted by *italicized text*): Is used to select one or more options provided by the [CC] in stating a requirement.
- **Assignment** operation (denoted by *italicized text*): Is used to assign a specific value to an unspecified parameter, such as the length of a password. Showing the value in square brackets indicates assignment.
- **Iteration** operation: Is indicated by appending the SFR name with a slash and unique identifier suggesting the purpose of the operation, e.g. "/EXAMPLE1."

5.1 Protection Profile for Application Software Security Functional Requirements Direction

The TOE is expected to rely on some of the security functions implemented by the application as a whole and evaluated against [AppPP]. The following section describe any modifications that the ST author must make to the SFRs defined in the Base-PP in addition to what is mandated by section 5.2.

5.1.1 Modified SFRs

The SFRs listed in this section are defined in the App PP and relevant to the secure operation of the TOE.

5.1.1.1 Trusted Path/Channel (FTP)

FTP_DIT_EXT.1: Protection of Data in Transit

This SFR is modified from its definition in the Base-PP by removing the first selection (where the application does not transmit any data or sensitive data). By definition, a TOE that conforms to this PP-Module must have the ability to transmit sensitive data to another trusted IT product.

The text of the requirement is replaced with:

The application shall [**selection:**

- *encrypt all transmitted [**selection, choose one of:** sensitive data, data] with [**selection:***
  - *HTTPS as a client in accordance with FCS_HTTPS_EXT.1*
  - *HTTPS as a server in accordance with FCS_HTTPS_EXT.1*
  - *TLS as a server as defined in Functional Package for TLS and also supports functionality for [**selection:** mutual authentication, none]*
  - *TLS as a client as defined in Functional Package for TLS*
  - *DTLS as a server as defined in Functional Package for TLS and also supports functionality for [**selection:** mutual authentication,none]*

- *DTLS as a client as defined in Functional Package for TLS*
- *SSH as defined in the Functional Package for Secure Shell*
- *IPsec as defined in the VPN Client PP-Module, version 3.0*

*] for [**assignment:** function(s)] using certificates as defined in the Functional Package for X.509*

- *invoke platform-provided functionality to encrypt all transmitted sensitive data with [**selection:** HTTPS, TLS, DTLS, SSH, IPsec] for [**assignment:** function(s)] using certificates as defined in the Functional Package for X.509*
- *invoke platform-provided functionality to encrypt all transmitted data with [**selection:** HTTPS, TLS, DTLS, SSH, IPsec] for [**assignment:** function(s)] using certificates as defined in the Functional Package for X.509*

] between itself and another trusted IT product.

5.2 TOE Security Functional Requirements

The following section describes the SFRs that must be satisfied by any TOE that claims conformance to this PP-Module. These SFRs must be claimed regardless of which PP-Configuration is used to define the TOE.

5.2.1 Cryptographic Support (FCS)

FCS_CKM.6 Cryptographic Key Destruction

FCS_CKM.6.1

The TSF shall destroy [*all keys and key material*] when *no longer needed*.

Application Note: Keys, including intermediate keys and key material that are no longer needed are destroyed by using an approved method, FCS_CKM.6.2. Examples of keys are intermediate keys, submasks. There may be instances where keys or key material that are contained in persistent storage are no longer needed and require destruction. Base on their implementation, vendors will explain when certain keys are no longer needed. There are multiple situations in which key material is no longer necessary, for example, a wrapped key may need to be destroyed when a password is changed. However, there are instances when keys are allowed to remain in memory, for example, a device identification key. If a PIN was used for a smart card and managed by the TOE, ensuring that the PIN was properly destroyed must be addressed.

FCS_CKM.6.2

The TSF shall destroy cryptographic keys and keying material specified by FCS_CKM.6.1 in accordance with a specified cryptographic key destruction method [*[**selection**:*

- *For volatile memory, the destruction shall be executed by a [**selection**:*
  - *single overwrite consisting of [**selection**: a pseudo-random pattern using the TSF's RBG, zeroes, ones, new value of a key, [**assignment**: any value that does not contain any CSP]]*
  - *removal of power to the memory*
  - *destruction of reference to the key directly followed by a request for garbage collection*

]

- *For non-volatile memory, the destruction shall be executed by [**selection**:*
  - *destruction of all KEKs protecting the target key, where none of the KEKs protecting the target key are derived*
  - *the invocation of an interface provided by the underlying platform that [**selection**:*
    - *logically addresses the storage location of the key and performs a [**selection**: single, [**assignment**: ST author defined multi-pass]] overwrite consisting of [**selection**: a pseudo-random pattern using the TSF's RBG, zeroes, ones, new value of a key, [**assignment**: any value that does not contain any CSP]]*
    - *instructs the underlying platform to destroy the abstraction that represents the key*

  ]

]

]] that meets the following: [*no standard*].

Application Note: The interface referenced in the requirement could take different forms, the most likely of which is an application programming interface to an OS kernel. There may be various levels of abstraction visible. For instance, in a given implementation that overwrites a key stored in non-volatile memory, the application may have access to the file system details and may be able to logically address specific memory locations. In another implementation that instructs the underlying platform to destroy the representation of a key stored in non-volatile memory, the application may simply have a handle to a resource and can only ask the platform to delete the resource, as may be the case with a platforms secure key store. The latter implementation should only be used for the most restricted access. The level of detail to which the TOE has access will be reflected in the TSS section of the ST. Several selections allow assignment of a 'value that does not contain any CSP'. This means that the TOE uses some other specified data not drawn from a source that may contain key material or reveal information about key material, and not being any of the particular values listed as other selection options. The point of the phrase 'does not contain any CSP' is to ensure that the overwritten data is carefully selected, and not taken from a general 'pool' that might contain current or residual data that itself requires confidentiality protection.

For the selection "destruction of all KEKs protecting target key, where none of the KEKs protecting the target key are derived", a key can be considered destroyed by destroying the key that protects the key. If a key is wrapped or encrypted it is not necessary to "overwrite" that key, overwriting the key that is used to wrap or encrypt the key used to encrypt/decrypt data, using the appropriate method for the memory type involved, will suffice. For example, if a product uses a Key Encryption Key (KEK) to encrypt a File Encryption Key (FEK), destroying the KEK using one of the methods in FCS_CKM.6 is sufficient, since the FEK would no longer be usable (of course, presumes the FEK is still encrypted and the KEK cannot be recovered or re-derived).

FCS_KYC_EXT.1 Key Chaining and Key Storage

FCS_KYC_EXT.1.1

The TSF shall maintain a key chain of [*intermediate keys*] originating from [*one or more initial [**selection**: submask(s), recovery value(s)]]* to [*the final value returned to the endpoint*] using the following method(s): [**selection**:

- *utilization of the platform key storage*

- *utilization of platform key storage that performs key wrap with a TSF provided key*
- *implementation of key establishment as specified in FCS_CKM.2 (from the Base-PP)*
- *implementation of key derivation as specified in FCS_KDF_EXT.1*
- *implementation of key wrapping as specified in FCS_COP.1/KW*
- *implementation of key encryption as specified in FCS_COP.1/KE*
- *implementation of key combining as specified in FCS_SMC_EXT.1*
- *implementation of key transport as specified in FCS_COP.1/KT*

] while maintaining an effective strength of commensurate with the strength of the FEK and [**selection**:

- *no supplemental key chains*
- *other supplemental key chains that protect a key or keys in the primary key chain using the following method(s): [**selection**:*
  - *utilization of the platform key storage*
  - *utilization of platform key storage that performs key wrap with a TSF provided key*
  - *implementation of key establishment as specified in FCS_CKM.2 (from the Base-PP)*
  - *implementation of key encryption as specified in FCS_COP.1/KE*
  - *implementation of key transport as specified in FCS_COP.1/KT*
  - *implementation of key wrapping as specified in FCS_COP.1/KW*
  - *implementation of key derivation as specified in FCS_KDF_EXT.1*
  - *implementation of key combining as specified in FCS_SMC_EXT.1*

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Application Note: Key Chaining is the method of using multiple layers of encryption keys to ultimately secure the a final key. The number of intermediate keys will vary. The ST Author should clearly indicate which portions of the key chain are created and maintained by the enterprise server and which are created and maintained by the endpoint. This requirement is in addition to the same requirement in the PP-Module for File Encryption, it covers a different section of the keychain, if both modules are included both requirements must be included.

FCS_VAL_EXT.1/Admin Validation (Server Administrator)

FCS_VAL_EXT.1.1/Admin

The TSF shall perform validation of the [*admin*] by [**selection**:

- *receiving assertion of the subject's validity from [**assignment**: Operational Environment component responsible for authentication]*
- *validating the [**selection**: submask, intermediate key] using the following methods: [**selection**:*
  - *key wrap as specified in FCS_COP.1/KW*
  - *hash the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1/**Hash (from [AppPP])** and compare it to a stored hash*
  - *decrypt a known value using the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1/SKC **(from [AppPP])** and compare it against a stored known value*

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FCS_VAL_EXT.1.2/Admin

The TSF shall require validation of the [*admin*] prior to [*permitting the actions described in FMT_MTD.1.1 and FMT_SMF.1.1/FEEM*].

Application Note: This PP-Module performs validation of any administrator credential on the management server, as described in FIA_AUT_EXT.1.1, used to log in to the EM in accordance with this SFR.

FCS_VAL_EXT.1/User Validation (User)

FCS_VAL_EXT.1.1/User

The TSF shall perform validation of the [*user*] by [**selection**:

- *receiving assertion of the subject's validity from [**assignment**: Operational Environment component responsible for authentication]*
- *validating the [**selection**: submask, intermediate key] using the following methods: [**selection**:*
  - *key wrap as specified in FCS_COP.1/KW*
  - *hash the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1/Hash **(from [AppPP])** and compare it to a stored hash*
  - *decrypt a known value using the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1/SKC **(from [AppPP])** and compare it against a stored known value*

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FCS_VAL_EXT.1.2/User

The TSF shall require validation of the [*user*] prior to [*transmitting submasks, FEKs, or keys to decrypt FEKs to the endpoint*].

Application Note: This references the validation of an endpoint user to the server. These activities are performed by the server.

FCS_VAL_EXT.2/User Validation Remediation (User)

FCS_VAL_EXT.2.1/User

The TSF shall [**selection**:

- *institute a delay such that only [**assignment**: **ST author specified number or configurable range of**] validation attempts can be made within a 24 hour period*
- *block validation after [**assignment**: **ST author specified number or configurable range of**] consecutive failed validation attempts*
- *[terminate the session] upon [**assignment**: **ST author specified number or configurable range of**] consecutive failed validation attempts*
- *[[**selection**: direct the endpoint to perform key sanitization, perform key sanitization] of FEK(s) or an intermediate key] upon [**assignment**: **ST specified number or configurable range of**] consecutive failed validation attempts*

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5.2.2 Identification and Authentication (FIA)

FIA_AUT_EXT.1 Subject Authorization

FIA_AUT_EXT.1.1

The TSF shall [**selection**: *receive assertion of the user's validity from: [**assignment**: Operational Environment component responsible for user authentication], provide authorization*] based on [**selection**:

- *a password authorization factor conditioned as defined in FCS_CKM_EXT.6*
- *an external smart card factor that is at least the same bit-length as the FEK(s), and is protecting a submask that is [**selection**: generated by the TOE (using the RBG as specified in FCS_RBG_EXT.1 **(from [AppPP])**), generated by the platform] protected using asymmetric keys as defined in FCS_CKM.1.1/AK (from [AppPP]) with user presence proved by presentation of the smart card and [**selection**: no PIN, an OE defined PIN, a configurable PIN]*
- *an external USB token factor that is at least the same security strength as the FEK(s), and is providing a submask generated by the [**selection**: TOE, using the RBG as specified in FCS_RBG_EXT.1 **(from [AppPP])**, platform]*

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Application Note: This applies to the authorization of administrators on the enterprise server.

FCS_RBG_EXT.1 is in the Application Software Protection Profile.

This requirement specifies what authorization factors the TOE accepts from the user. A password entered by the user is one authorization factor that the TOE must be able to condition, as specified in FCS_CKM_EXT.6. Another option is a smart card authorization factor, with the differentiating feature being how the value is generated – either by the TOE's RBG or by the platform. An external USB token may also be used, with the submask value generated either by the TOE's RBG or by the platform.

The TOE may accept any number of authorization factors, and these are categorized as "submasks". The ST author selects the authorization factors they support, and there may be multiple methods for a selection.

Use of multiple authorization factors is preferable; if more than one authorization factor is used, the submasks produced must be combined using FCS_SMC_EXT.1.

FIA_REC_EXT.1 Recovery Support

FIA_REC_EXT.1.1

The TSF shall [**selection**: *provide the ability to enable and disable the use of recovery credentials*, *not support recovery*].

FIA_REC_EXT.1.2

The TSF shall support the following recovery mechanisms [**selection**: *Challenge Response Recovery as defined in FIA_CHR_EXT.1*, *None*].

Application Note: This requirement defines the recovery options supported between the endpoint(s) and the enterprise server. This does not prevent the OE from providing recovery if the OE is managing the authentication of the users.

FIA_UAU.1 Timing of Authentication

FIA_UAU.1.1

The TSF shall allow [**assignment**: *list of TSF-mediated actions*] on behalf of the **administrator** to be performed before the administrator is authenticated.

FIA_UAU.1.2

The TSF shall require each **administrator** to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that **administrator**.

Application Note: This requirement defines the timing of administrator capabilities on the enterprise server.

FIA_UID.1 Timing of Identification

FIA_UID.1.1

The TSF shall allow [**assignment**: *list of TSF-mediated actions*] on behalf of the administrator to be performed before the **administrator** is identified.

FIA_UID.1.2

The TSF shall require each **administrator** to be successfully identified before allowing any other TSF-mediated actions on behalf of that **administrator**.

Application Note: This requirement defines the timing of administrator capabilities on the enterprise server.

5.2.3 Security Management (FMT)

FMT_MOF.1 Management of Security Functions Behaviour

FMT_MOF.1.1

The TSF shall restrict the ability to [**selection**: *determine the behavior of, disable, enable, modify the behavior of*] the functions **[selection: *encryption algorithms used, key sizes used*]** to [**selection**: *no users, [administrators]*].

Application Note: The intent of this SFR is to define a mechanism to distinguish administrators (who have the ability to configure the TSF and its data) from users (individuals in the enterprise who have FEs on their systems).

The TSF does not need to provide roles that are explicitly called ‘administrator’ or ‘user’; the ST must logically define the administrator as a combination of one or more roles that are provided by the TOE. A user as defined by this PP-Module may be either a user that is specifically assigned an unprivileged role by the TSF or it may be characterized by an individual that lacks an administrator account on the TOE

The TSF may optionally provide the ability to rely on an external authentication mechanism to identify users in the case of a user requesting distribution of a recovery credential. In this situation, the TOE’s reliance on the Operational Environment is functionally equivalent to the TSF maintaining the user role as defined by FMT_SMR.2.1.

FMT_MTD.1 Management of TSF Data

FMT_MTD.1.1

The TSF shall restrict the ability to [**selection**: *change default, query, modify, delete, clear, [**assignment**: other operations]*] the [*encryption keys and intermediate values*]

to [*administrators*] **at the following times: [selection:** ***never, during initial provisioning, during recovery*****]** .

Application Note: These restrictions apply to modifications on the enterprise server.

FMT_SMF.1/FEEM Specification of Management Functions (Management Server)

FMT_SMF.1.1/FEEM

The TSF shall be capable of performing the following management functions: **[selection:**

- ***register new user***
- ***revoke registration of user***
- ***initiate key generation***
- ***initiate keying escrow***
- ***initiate key zeroization***
- ***initiate key recovery***
- ***set encryption policy (supported algorithms and key sizes)***
- ***change administrator passwords***
- ***change user passwords***
- ***change recovery credentials***
- ***define administrators of the TOE***
- ***enable/disable use of recovery credential***
- ***configure number of failed authentication attempts before issuing a key destruction of the FEK(s)***
- ***configure the number of authentication attempts that can be made within a 24 hour period***
- ***configure the number of failed authentication attempts required to begin blocking subsequent attempts***
- ***ability to enable or disable one or more of the following functions: [selection: configure cryptographic functionality, change authentication factors, perform a cryptographic erase of the data by the destruction of FEKs or KEKs protecting the FEKs, configure the number of failed validation attempts required to trigger corrective behavior, configure the corrective behavior to issue in the event of an excessive number of failed validation attempts, [assignment: other management functions provided by the TSF]]***

] .

Application Note: This SFR refers specifically to the management functions that can be performed by the Management Server. Functions that are performed by the rest of the TOE are addressed by the FMT_SMF.1/FEEM SFR in the File Encryption PP-Module. The final two assignments provide the ST author the ability to indicate when the PP-Module for File Encryption functionality (such as configuration of power saving states) can be configured by the Management Server.

The TSF's ability to initiate key generation, escrow, zeroization, and/or recovery may be accomplished either by the TOE performing those functions or by the TOE issuing a request to a remote client to perform the functions. The ST author must indicate which case is provided by the TSF. If the TOE performs any of the cryptographic functions that are selected as being initiated in this SFR, the ST author must include the equivalent FCS SFRs from the File Encryption PP-Module as part of the TOE, specifically indicating that these functions are provided by the Management Server component of the TOE.

If the TSF supports the use of a recovery credential, the ST author must include the ‘enable/disable use of recovery credential’ selection.

FMT_SMR.2 Restrictions on Security Roles

FMT_SMR.2.1

The TSF shall maintain the roles [*administrator, user*].

FMT_SMR.2.2

The TSF shall be able to associate users with roles.

FMT_SMR.2.3

The TSF shall ensure that the conditions**[selection:** ***the administrator role shall be able to administer the Management Server locally, the administrator role shall be able to administer the Management Server remotely as specified in FTP_TRP.1, the administrator role shall be able to administer the endpoint(s) locally, the administrator role shall be able to administer the endpoint(s) remotely*****]** are satisfied.

Application Note: The intent of this SFR is to define a mechanism to distinguish administrators (who have the ability to configure the TSF and its data) from users (individuals in the enterprise who have FEs on their systems).

The TSF does not need to provide roles that are explicitly called ‘administrator’ or ‘user’; the ST must logically define the administrator as a combination of one or more roles that are provided by the TOE. A user as defined by this PP-Module may be either a user that is specifically assigned an unprivileged role by the TSF or it may be characterized by an individual that lacks an administrator account on the TOE.

The TSF may optionally provide the ability to rely on an external authentication mechanism to identify users in the case of a user requesting distribution of a recovery credential. In this situation, the TOE’s reliance on the Operational Environment is functionally equivalent to the TSF maintaining the user role as defined by FMT_SMR.2.1.

5.2.4 Protection of the TSF (FPT)

FPT_ITT.1 Basic Internal TSF Data Transfer Protection

FPT_ITT.1.1

The TSF shall protect TSF data from [*disclosure, modification*] when it is transmitted between separate parts of the TOE through the use of **[selection:** ***IPsec as defined in the PP-Module for VPN Client, HTTPS in accordance with FCS_HTTPS_EXT.1 (from [AppPP]), TLS as defined in the Functional Package for Transport Layer Security (TLS), version 2.1, SSH as defined in the Functional Package for Secure Shell (SSH), version 2.0*****]** .

Application Note: This SFR is intended to define protected communications between the Management Server and the endpoints.

FPT_KYP_EXT.1 Protection of Keys and Key Material

FPT_KYP_EXT.1.1

The TSF shall store keys in non-volatile memory only when [**selection**:

- *wrapped, as specified in FCS_COP.1/KW*
- *encrypted, as specified in FCS_COP.1/SKC (from [AppPP])*
- *the plaintext key is stored in the underlying platform's keystore as specified by FCS_STO_EXT.1* ***(from [AppPP])***
- *the plaintext key is stored in a SQL database in the Operational Environment*
- *the plaintext key is not part of the key chain as specified in FCS_KYC_EXT.1.*
- *the plaintext key will no longer provide access to the encrypted data after initial provisioning*
- *the plaintext key is a key split that is combined as specified in FCS_SMC_EXT.1 and another contribution to the split is [**selection**: wrapped as specified in FCS_COP.1/KW, derived and not stored in non-volatile memory]*
- *the plaintext key is stored on an external storage device for use as an authorization factor.*
- *the plaintext key is used to wrap a key as specified in FCS_COP.1/KW that is already wrapped as specified in FCS_COP.1/KW*

].

Application Note: This details the key storage requirements for the enterprise server. The plaintext key storage in non-volatile memory is allowed for several reasons. If the keys exist within protected memory that is not user accessible on the TOE or OE, the only methods that allow it to play a security relevant role for protecting the FEK is if it is a key split or providing additional layers of wrapping or encryption on keys that have already been protected.

FPT_KYP_EXT.2 Attribution of Key and Key Material

FPT_KYP_EXT.2.1

The TSF shall maintain an association between stored endpoint keys and user identity, [**selection**: *remote endpoints*, *recovery credential*, *system identity*, *no other subjects*].

Application Note: The intent of this SFR is that at minimum, keys are associated with the users for which it was explicitly created by the TSF. If the TOE has the ability to maintain an association to keys for a user, this SFR is intended to require an association between the key chain and a user through the user account name(s) that are authorized to use it.

Likewise, if the TOE supports the use of a recovery credential, this SFR is intended to require an association between user and the recovery credential used to recover that data.

FPT_KYP_EXT.2.2

The TSF shall provide the ability to register users by exchange of [**assignment**: *mutually identifying information that allows for an association to be made*].

Application Note: The ST author will complete the assignment with information on the method used by the Management Server portion of the TOE to establish the association with the endpoint portion of the TOE described in FPT_KYP_EXT.2.1.

FPT_KYP_EXT.2.3

The TSF shall provide the ability to revoke the registration of users by [**assignment**: *method of removing and/or exchanging information that prevents further communications between the TOE and the endpoint*].

FPT_KYP_EXT.2.4

The TSF shall transmit any secure or private cryptographic information that is transferred between the TOE and a user's endpoint in order to establish or disestablish an association using a communications channel with a security strength at least as great as the strength of the information being transmitted.

Application Note: The channel used to transmit this data is defined in FPT_ITT.1.

5.3 TOE Security Functional Requirements Rationale

The following rationale provides justification for each SFR for the TOE, showing that the SFRs are suitable to address the specified threats:

Table 2: SFR Rationale

Threat	Addressed by	Rationale
T.KEYING_MATERIAL_COMPROMISE_SERVER	FCS_CKM_EXT.1 (from Base-PP)	Mitigates the threat by ensuring that a key generation mechanism exists for the TOE to use.
	FCS_CKM.1/SK (from Base-PP)	Mitigates the threat by securely generating symmetric encryption keys.
	FCS_CKM.2 (from Base-PP)	Mitigates the threat by securely establishing cryptographic keys between entities.
	FCS_CKM.6	Mitigates the threat by securely destroying keys and key material when no longer needed.
	FCS_COP.1/KT (selection-based)	Mitigates the threat by securely transmitting keys using a cryptographic algorithm.
	FCS_COP.1/KW (selection-based)	Mitigates the threat by securely wrapping cryptographic keys using a cryptographic algorithm.
	FCS_KDF_EXT.1 (selection-based)	Mitigates the threat by securely deriving cryptographic keys.
	FCS_KYC_EXT.1	Mitigates the threat by securely storing keys & key chain material.
	FCS_SMC_EXT.1 (selection-based)	Mitigates the threat by securely generating intermediate keys by combining submasks.
	FIA_AUT_EXT.1	Mitigates the threat by authorizing a user based on a secure credential.
	FMT_MOF.1	Mitigates the threat by restricting the ability to manage encryption parameters to administrators.
	FMT_SMF.1/FEEM	Mitigates the threat by restricting the ability to manage the Management Server to

		administrators.
	FPT_ITT.1	Mitigates the threat by protecting data transmitted within different parts of the TOE.
	FPT_KYP_EXT.1	Mitigates the threat by limiting the situations in which plaintext keys may be stored, and storing the keys protected in all other situations.
	FTP_DIT_EXT.1 (modified from Base-PP)	Mitigates the threat by encrypting data transmitted to an external entity.
T.MAN_IN_THE_MIDDLE	FCS_CKM_EXT.1 (from Base-PP)	Mitigates the threat by ensuring that a key generation mechanism exists for the TOE to use.
	FCS_CKM_EXT.6 (selection-based)	Mitigates the threat by conditioning passwords or other credentials to an unreadable form.
	FCS_COP.1/SigGen (from Base-PP)	Mitigates the threat by cryptographically signing communications between servers and clients.
	FCS_COP.1/SKC (from Base-PP)	Mitigates the threat by utilizing symmetric encryption in communications between servers and clients.
	FCS_RBG_EXT.1 (from Base-PP)	Mitigates the threat by using a secure RBG to support secure communication.
	FPT_ITT.1	Mitigates the threat by encrypting data transmitted between different parts of the TOE.
	FTP_DIT_EXT.1 (modified from Base-PP)	Mitigates the threat by encrypting sensitive or all data transmitted to an external entity.
	FTP_TRP.1 (selection-based)	Mitigates the threat by protecting communication with an appropriate secure protocol.
T.UNAUTHORIZED_ ADMINISTRATOR_ ACCESS	FCS_VAL_EXT.1/Admin	Mitigates the threat by validating the administrator before allowing any administrative actions.
	FCS_VAL_EXT.2/Admin (selection-based)	Mitigates the threat by preventing excessive unsuccessful validation attempts.
	FIA_UAU.1	Mitigates the threat by limiting the administrative actions that can be taken before the authentication process must succeed.
	FIA_UID.1	Mitigates the threat by limiting the administrative actions that can be taken before

		the identification process must succeed.
T.UNAUTHORIZED_ DATA_ACCESS_ ENDPOINT	FPT_KYP_EXT.2	Mitigates the threat by associating keys to user identities and providing a method for revocation of the association.
T.UNAUTHORIZED_ DATA_ACCESS_SERVER	FCS_COP.1/SKC (from Base-PP)	Mitigates the threat by identifying users with a securely-encrypted value.
	FCS_VAL_EXT.1/User	Mitigates the threat by validating the user before decryption of any data or key.
	FCS_VAL_EXT.2/User	Mitigates the threat by preventing excessive unsuccessful validation attempts.
	FIA_CHR_EXT.1 (selection-based)	Mitigates the threat by providing a limited-time and limited-scope challenge-response recovery credential.
	FIA_REC_EXT.1	Mitigates the threat by providing a secure recovery mechanism.
	FIA_UAU.1	Mitigates the threat by limiting the administrative actions that can be taken before the authentication process must succeed.
	FIA_UID.1	Mitigates the threat by limiting the administrative actions that can be taken before the identification process must succeed.
	FMT_MTD.1	Mitigates the threat by restricting the times at which certain cryptographic parameters can be modified on the server.
	FMT_SMR.2	Mitigates the threat by maintaining separate security roles for administrators and users.

6 Consistency Rationale

6.1 Protection Profile for Application Software

6.1.1 Consistency of TOE Type

When this PP-Module is used to extend the App PP, the TOE type for the overall TOE is still a software application. The TOE boundary is simply extended to include the enterprise management functionality for software file encryption that the application performs.

6.1.2 Consistency of Security Problem Definition

Table 3: Consistency of Security Problem Definition (App PP base)

PP-Module Threat, Assumption, OSP	Consistency Rationale
T.KEYING_MATERIAL_COMPROMISE_SERVER	This threat is a specific example of T.PHYSICAL_ACCESS defined in the Base-PP. Specifically, this PP-Module defines a method of maliciously gaining access to sensitive data at rest that is particular to the technology type of this PP-Module.
T.MAN_IN_THE_MIDDLE	This threat is a specific example of T.NETWORK_EAVESDROP defined in the Base-PP. Specifically, the attacker performs network eavesdropping to gain access to key data in transit between TOE components.
T.UNAUTHORIZED_ADMINISTRATOR_ACCESS	This threat is a variation on T.LOCAL_ATTACK defined in the Base-PP. The Base-PP does not define access-controlled management functions so this PP-Module goes beyond it by specifying misuse of the management interface as a threat to the TSF.
T.UNAUTHORIZED_DATA_ACCESS_ENDPOINT	This threat is a variation on T.PHYSICAL_ACCESS defined in the Base-PP. In this case, the "sensitive data at rest" is the data that the TOE is intended to protect.
T.UNAUTHORIZED_DATA_ACCESS_SERVER	This threat is a variation on T.PHYSICAL_ACCESS defined in the Base-PP. In this case, the "sensitive data at rest" is the data that the TOE is intended to protect.
T.UNTRUSTED_COMMUNICATION_CHANNELS	This threat is a variation on T.NETWORK_ATTACK and T.NETWORK_EAVESDROP defined in the Base-PP. The threat of untrusted communication channels allows for exploitation of the TSF in different ways, depending on how the lack of trust is manifested.
A.ENVIRONMENTAL_STORAGE	

A.PHYSICAL_SERVER
A.SECURED_CONFIGURATION
A.SECURED_ENVIRONMENT

6.1.3 Consistency of OE Objectives

Table 4: Consistency of OE Objectives (App PP base)

PP-Module OE Objective	Consistency Rationale
OE.ENVIRONMENTAL_STORAGE	This objective is consistent with the Base-PP because the Base-PP allows for the TOE to use platform-provided key storage.
OE.PHYSICAL_SERVER	This objective is consistent with the Base-PP because it is an extension of the Base-PP's OE.PLATFORM objective that is specific to this technology type. It is also consistent because the Base-PP permits the TSF to use platform-provided cryptography.
OE.SECURED_CONFIGURATION	This objective is consistent with the Base-PP because it expects the TOE's operational guidance to be responsibly followed in the same manner as OE.PROPER_ADMIN in the Base-PP.
OE.SECURED_ENVIRONMENT	This objective is consistent with the Base-PP because it is an extension of the Base-PP's OE.PLATFORM objective that is specific to this technology type.

6.1.4 Consistency of Requirements

This PP-Module identifies several SFRs from the App PP that are needed to support File Encryption Enterprise Management functionality. This is considered to be consistent because the functionality provided by the App PP is being used for its intended purpose. The PP-Module also identifies a number of modified SFRs from the App PP that are used entirely to provide functionality for File Encryption Enterprise Management. The rationale for why this does not conflict with the claims defined by the App PP are as follows:

Table 5: Consistency of Requirements (App PP base)

PP-Module Requirement	Consistency Rationale
Modified SFRs	
FTP_DIT_EXT.1	This SFR is defined in the Base-PP. This PP-Module modifies it by removing the option not to transmit sensitive data because this particular TOE type will always have that capability. It is still consistent with the Base-PP because all selections that the ST author is permitted to make are available options in the Base-PP version of the SFR.
Additional SFRs	
This PP-Module does not add any requirements when the App PP is the base.	
Mandatory SFRs	

FCS_CKM.6	This SFR requires destruction of cryptographic keys when they are no longer needed. The Base-PP does not mandate key destruction but it also does not prohibit it.
FCS_KYC_EXT.1	The Base-PP defines how stored keys are protected. This SFR extends that functionality by defining the logical hierarchy of how keys are logically protected by other keys or other secret data.
FCS_VAL_EXT.1/Admin	This SFR goes beyond the functionality defined by the Base-PP by defining a method by which the TSF can validate the correctness of data input to it.
FCS_VAL_EXT.1/User	This SFR goes beyond the functionality defined by the Base-PP by defining a method by which the TSF can validate the correctness of data input to it.
FCS_VAL_EXT.2/User	This SFR goes beyond the functionality defined by the Base-PP by defining a method by which the TSF can take security-relevant action if some data input to it is invalid.
FIA_AUT_EXT.1	This SFR defines how administrator requests to access protected data are authorized. It uses FCS_RBG_EXT.1 from the Base-PP in a manner consistent with its definition, but otherwise does not relate to functionality defined by the Base-PP.
FIA_REC_EXT.1	This SFR defines the TOE's potential support for recovery credentials. This functionality does not relate to any behavior defined in the Base-PP.
FIA_UAU.1	This SFR requires administrators to be authenticated prior to accessing management functionality. The Base-PP does not mandate identification and authentication measures for a management interface but it also does not prohibit them.
FIA_UID.1	This SFR requires administrators to be identified prior to accessing management functionality. The Base-PP does not mandate identification and authentication measures for a management interface but it also does not prohibit them.
FMT_MOF.1	This SFR defines access restrictions for TOE management functions. This is not defined in the Base-PP but there is nothing in the Base-PP that prohibits it.
FMT_MTD.1	This SFR defines access restrictions for management of TSF data. This is not defined in the Base-PP but there is nothing in the Base-PP that prohibits it.
FMT_SMF.1/FEEM	This SFR defines management functions for the TOE for functionality specific to this PP-Module. These functions are defined in addition to what the Base-PP defines for its own operation.
FMT_SMR.2	This SFR defines administrative roles, which are used by other SFRs to derive privileges to interact with the TOE's management functionality. This is not defined in the Base-PP but there is nothing in the Base-PP that prohibits it.
FPT_ITT.1	This SFR uses a subset of the protocols defined in the Base-PP for secure communications. This PP-Module extends the functionality by explicitly defining a communications channel where both endpoints are TOE components.
FPT_KYP_EXT.1	The Base-PP defines an SFR for secure storage of sensitive data. This SFR expands on that definition by describing the supported logical methods for storage of key data.

FPT_KYP_EXT.2	This SFR relates to key attribution such that stored keys can be associated with the users that 'own' them. This does not relate to functionality that is defined in the Base-PP so it does not interfere with the implementation of any Base-PP SFRs.

Optional SFRs

This PP-Module does not define any Optional requirements.

Objective SFRs

This PP-Module does not define any Objective requirements.

Implementation-dependent SFRs

This PP-Module does not define any Implementation-dependent requirements.

Selection-based SFRs

FCS_CKM_EXT.6	This SFR defines a key derivation method based on passphrase conditioning. It uses the FCS_RBG_EXT.1 SFR from the Base-PP in its intended manner but otherwise does not relate to the Base-PP's functionality.
FCS_COP.1/KT	This SFR defines key transport functionality that is outside the scope of the original cryptographic operations defined in the Base-PP.
FCS_COP.1/KW	This SFR defines usage of AES functionality not defined by the Base-PP. However, this functionality is only used in certain situations that are specific to this PP-Module and do not affect the ability of any Base-PP SFRs to be enforced.
FCS_KDF_EXT.1	This SFR defines key transport functionality. It uses random bit generation and keyed-hash message authentication functionality from the Base-PP as they are intended but is otherwise outside the scope of the original cryptographic operations defined in the Base-PP.
FCS_SMC_EXT.1	This SFR relates to submask combining as a method of generating intermediate keys. Key hierarchy functionality is outside the scope of the Base-PP.
FCS_VAL_EXT.2/Admin	This SFR goes beyond the functionality defined by the Base-PP by defining a method by which the TSF can take security-relevant action if some data input to it is invalid.
FIA_CHR_EXT.1	This SFR defines the TOE's implementation of recovery credentials. This functionality does not relate to any behavior defined in the Base-PP.
FTP_TRP.1	This SFR uses a subset of the protocols defined in the Base-PP for secure communications. This PP-Module extends the functionality by explicitly defining a communications path between a remote administrator and the TOE.

Appendix A - Optional SFRs

A.1 Strictly Optional Requirements

This PP-Module does not define any Strictly Optional SFRs or SARs.

A.2 Objective Requirements

This PP-Module does not define any Objective SFRs.

A.3 Implementation-dependent Requirements

This PP-Module does not define any Implementation-dependent SFRs.

Appendix B - Selection-based Requirements

B.1 Cryptographic Support (FCS)

FCS_CKM_EXT.6 Cryptographic Password/Passphrase Conditioning

The inclusion of this selection-based component depends upon selection in FIA_AUT_EXT.1.1.

FCS_CKM_EXT.6.1

The TSF shall support a password/passphrase of up to [**assignment**: *maximum password size, positive integer of 64 or more*] characters used to generate a password authorization factor.

FCS_CKM_EXT.6.2

The TSF shall allow passwords to be composed of any combination of upper case characters, lower case characters, numbers, and the following special characters: “!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, and “)”, and [**selection**: *[**assignment**: other supported special characters], no other characters*].

FCS_CKM_EXT.6.3

The TSF shall perform Password-based Key Derivation Functions in accordance with a specified cryptographic algorithm HMAC- [**selection**: *SHA-384*, *SHA-512*], with [**assignment**: *positive integer of 4096 or more*] iterations, and output cryptographic key sizes [*256*] bits that meet the following: [*NIST SP 800-132*].

FCS_CKM_EXT.6.4

The TSF shall not accept passwords less than [**selection**: *a value settable by the administrator*, *[**assignment**: minimum password length accepted by the TOE, must be >= 1]*] and greater than the maximum password length defined in FCS_CKM_EXT.6.1.

FCS_CKM_EXT.6.5

The TSF shall generate all salts using an RBG that meets FCS_RBG_EXT.1 **(from [AppPP])** and with entropy corresponding to the security strength selected for PBKDF in FCS_CKM_EXT.6.3.

Application Note: This applies to passwords on the enterprise server.
The password/passphrase is represented on the host machine as a sequence of characters whose encoding depends on the TOE and the underlying OS. This sequence must be conditioned into a string of bits that is to be used as a KEK that is the same size as the FEK.

For FCS_CKM_EXT.6.1, the ST author assigns the maximum size of the password/passphrase it supports; it must support at least 64 characters.

For FCS_CKM_EXT.6.2, the ST author assigns any other supported characters; if there are no other supported characters, they should select “no other characters”.

For FCS_CKM_EXT.6.3, the ST author selects the parameters based on the PBKDF used by the TSF. The key cryptographic key sizes in FCS_CKM_EXT.6.3 are made to correspond to the KEK key sizes selected in FCS_KYC_EXT.1.

The password/passphrase must be conditioned into a string of bits that forms the submask to be used as input into the KEK. Conditioning is performed using one of the identified hash functions in accordance with the process described in NIST SP 800-132. SP 800-132 requires the use of a pseudo-random function (PRF) consisting of HMAC with an approved hash function.

Appendix A of SP 800-132 recommends setting the iteration count in order to increase the computation needed to derive a key from a password and, therefore, increase the workload of performing a password recovery attack. However, for this PP-Module, a minimum iteration count of 4096 is required in order to ensure that twelve bits of security is added to the password/passphrase value. A significantly higher value is recommended to ensure optimal security.

For FCS_CKM_EXT.6.4 If the minimum password length is settable, then ST author chooses “a value settable by the administrator for this component for FMT_SMF.1.1/FEEM. If the minimum length is not settable, the ST author fills in the assignment with the minimum length the password must be (zero-length passwords are not allowed for compliant TOEs).

This requirement is selection dependent on FIA_AUT_EXT.1.1.

FCS_COP.1/KT Cryptographic operation (Key Transport)

The inclusion of this selection-based component depends upon selection in FCS_KYC_EXT.1.1.

FCS_COP.1.1/KT

The TSF shall perform [*key transport*] in accordance with a specified cryptographic algorithm [**selection**:

- *CNSA 2.0 Compliant Algorithms:*
  - *[Hybrid Key-Transport Method] that meets the following: [Section 9.3 of NIST SP 800-56B, Revision 2]* ***using a key establishment algorithm [ML-KEM] as specified in FCS_CKM.2 (from the Base-PP) and a key wrapping algorithm as specified in FCS_COP.1/KW***
- *CNSA 1.0 Compliant Algorithms:*
  - *[KTS-OAEP] using cryptographic algorithm [RSA] with cryptographic key sizes [**selection**: 3072, 4096] bits that meet the following: [NIST SP 800-56B, Revision 2]*

].

Application Note: This requirement is used in the body of the ST if the ST author chooses to use key transport in the key chaining approach that is specified in FCS_KYC_EXT.1.

When describing the hybrid key-transport methods, Section 9.3 of NIST SP 800-56B only mentions using the key establishment schemes contained in SP800-56B to establish a shared symmetric key encryption key (KEK) for the transport; however any approved symmetric key establishment method could easily be substituted. This PP-Module allows the use of ML-KEM key establishment schemes with the hybrid

key-transport methods described in SP800-56B to provide a CNSA2-compliant key-transport method.

Future versions of this PP-Module may support the use of a key-encapsulation mechanism (KEM) for key transport as defined in NIST SP 800-227 (in draft as of the publication of this PP-Module), sections 5.1 and 6.2.1.

FCS_COP.1/KW Cryptographic operation (Key Wrapping)

The inclusion of this selection-based component depends upon selection in FCS_KYC_EXT.1.1, FCS_VAL_EXT.1.1/Admin, FCS_VAL_EXT.1.1/User.

FCS_COP.1.1/KW

The TSF shall ~~perform~~ [*[**selection**: use platform-provided functionality to perform Key Wrapping, implement functionality to perform Key Wrapping]]* in accordance with a specified cryptographic algorithm [*AES*] in the following mode *[**selection**:*

- *Key Wrap*
- *Key Wrap with Padding*
- *GCM mode*
- *CCM mode*

]] and cryptographic key sizes [*256 bits (AES)*] that meet the following: [*[**selection**:*

- *"NIST SP 800-38C"*
- *"NIST SP 800-38D"*
- *"NIST SP 800-38F"*
- *"NIST SP 800-38A"*

]].

Application Note: This applies to any key wrapping occurring on the enterprise server. This requirement is used in the body of the ST if the ST author chooses to use key wrapping in the key chaining approach that is specified in FCS_KYC_EXT.1, key wrap in the admin validation approach that is specified in FCS_VAL_EXT.1.1/Admin, or key wrap in the user validation approach that is specified in FCS_VAL_EXT.1.1/User.

FCS_KDF_EXT.1 Cryptographic Key Derivation Function

The inclusion of this selection-based component depends upon selection in FCS_KYC_EXT.1.1.

FCS_KDF_EXT.1.1

The TSF shall accept [**selection**: *a submask generated by an RBG as specified in FCS_RBG_EXT.1 **(from [AppPP])**, a conditioned password, an imported submask*] to derive an intermediate key, as defined in [**selection**:

- *NIST SP 800-108 [**selection**: KDF in Counter Mode, KDF in Feedback Mode, KDF in Double-Pipeline Iteration Mode]*
- *NIST SP 800-132*

] using the keyed-hash functions specified in FCS_COP.1/**KeyedHash (from [AppPP])**, such that the output is at least of equivalent security strength (in number of bits) to the [FEK(s)] .

Application Note: This requirement is used in the body of the ST if the ST author chooses to use key derivation in the key chaining approach that is specified in FCS_KYC_EXT.1. This applies to any key derivation occurring on the enterprise server. This requirement establishes acceptable methods for generating a new random key or an existing submask to create a new key along the key chain.

FCS_SMC_EXT.1 Submask Combining

The inclusion of this selection-based component depends upon selection in FCS_KYC_EXT.1.1.

FCS_SMC_EXT.1.1

The TSF shall combine submasks using the following method: [***[selection**: exclusive OR (XOR), SHA-384, SHA-512, HMAC-SHA-384, HMAC-SHA-512]*] to generate an intermediate key .

Application Note: This requirement is used in the body of the ST if the ST author chooses to use key combining in the key chaining approach that is specified in FCS_KYC_EXT.1. This applies to any submask combining occurring on the enterprise server. This requirement specifies the way that a product may combine the various submasks by using either an XOR or an approved SHA-hash.

FCS_VAL_EXT.2/Admin Validation Remediation (Server Administrator)

The inclusion of this selection-based component depends upon selection in FIA_AUT_EXT.1.1.

FCS_VAL_EXT.2.1/Admin

The TSF shall [**selection**:

- *institute a delay such that only [**assignment**: ST author specified number or configurable range of attempts] validation attempts can be made within a 24 hour period*
- *block validation after [**assignment**: ST author specified number or configurable range of attempts] of consecutive failed validation attempts*

].

Application Note: This requirement must be claimed by the TOE if the ST author chooses "provide user authorization" in FIA_AUT_EXT.1.1.

B.2 Identification and Authentication (FIA)

FIA_CHR_EXT.1 Challenge/Response Recovery Credential

The inclusion of this selection-based component depends upon selection in FIA_REC_EXT.1.2.

FIA_CHR_EXT.1.1

The TSF shall generate a response only if it is able to access recovery information for [**selection**: *the user requesting the recovery, the user requesting recovery and the device for which the recovery was requested*].

Application Note: This requires that the TSF has the ability to attribute key chain information to the appropriate user(s).

FIA_CHR_EXT.1.2

The response shall work only for the user to whom it was generated.

Application Note: This mechanism is intended to provide a recovery method for a user who has forgotten their authentication factor and is unable to access their encrypted data on a system that is fully functional.

FIA_CHR_EXT.1.3

The response shall be used only during the same session in which the request was generated.

Application Note: The intent of this requirement is to limit the attack surface of the recovery credential mechanism by preventing the use of the credential following a reboot of the device.

FIA_CHR_EXT.1.4

The TSF shall generate an ephemeral response that has at least as many potential values as a corresponding password or PIN.

FIA_CHR_EXT.1.5

The TSF shall allow a maximum of [**assignment**: *integer value*] response entry attempts per boot cycle.

FIA_CHR_EXT.1.6

The TSF shall perform remediation as defined in FCS_VAL_EXT.2/User for failed challenge recovery attempts.

B.3 Trusted Path/Channels (FTP)

FTP_TRP.1 Trusted Path

The inclusion of this selection-based component depends upon selection in FMT_SMR.2.3.

FTP_TRP.1.1

The TSF shall **be capable of using [selection:** ***IPsec as defined in the PP-Module for VPN Client, HTTPS in accordance with FCS_HTTPS_EXT.1 (from [AppPP]), TLS as defined in the Functional Package for Transport Layer Security (TLS), version 2.1, SSH as defined in the Functional Package for Secure Shell (SSH), version 2.0*** **] to** provide a communication path between itself and **authorized remote administrators** that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from [*modification, disclosure*].

FTP_TRP.1.2

The TSF shall permit **remote administrators** to initiate communication via the trusted path.

FTP_TRP.1.3

The TSF shall require the use of the trusted path for [*initial* ***administrator*** *authentication, [all remote administration actions]*].

Application Note: This SFR is intended to define protected communications between the Management Server and remote administrators.

Appendix C - Extended Component Definitions

This appendix contains the definitions for all extended requirements specified in the PP-Module.

C.1 Extended Components Table

All extended components specified in the PP-Module are listed in this table:

Table 6: Extended Component Definitions

Functional Class	Functional Components
Cryptographic Support (FCS)	FCS_CKM_EXT Cryptographic Key Management FCS_KDF_EXT Cryptographic Key Derivation Function FCS_KYC_EXT Key Chaining and Key Storage FCS_SMC_EXT Submask Combining FCS_VAL_EXT Validation
Identification and Authentication (FIA)	FIA_AUT_EXT Authorization FIA_CHR_EXT Challenge/Response Recovery Credential FIA_REC_EXT Recovery Support
Protection of the TSF (FPT)	FPT_KYP_EXT Protection of Key and Key Material

C.2 Extended Component Definitions

C.2.1 Cryptographic Support (FCS)

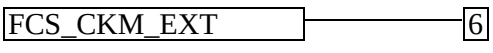
This PP-Module defines the following extended components as part of the FCS class originally defined by CC Part 2:

C.2.1.1 FCS_CKM_EXT Cryptographic Key Management

Family Behavior

Components in this family define requirements for key management activities that are beyond the scope of what is defined in the FCS_CKM family in CC Part 2.

Component Leveling



FCS_CKM_EXT.6, Cryptographic Password/Passphrase Conditioning, requires the TSF to implement password/passphrase conditioning using a specified algorithm and with specific constraints on the password/passphrase composition.

Management: FCS_CKM_EXT.6

There are no specific management functions identified.

Audit: FCS_CKM_EXT.6

There are no auditable events foreseen.

FCS_CKM_EXT.6 Cryptographic Password/Passphrase Conditioning

Hierarchical to:	No other components.
Dependencies to:	FCS_COP.1 Cryptographic Operation FCS_RBG_EXT.1 Random Bit Generation

FCS_CKM_EXT.6.1

The TSF shall support a password/passphrase of up to [**assignment**: *maximum password size, positive integer of 64 or more*] characters used to generate a password authorization factor.

FCS_CKM_EXT.6.2

The TSF shall allow passwords to be composed of any combination of upper case characters, lower case characters, numbers, and the following special characters: “!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, and “)”, and [**selection**: *[**assignment**: other supported special characters], no other characters*].

FCS_CKM_EXT.6.3

The TSF shall perform Password-based Key Derivation Functions in accordance with a specified cryptographic algorithm HMAC-[**selection**: *SHA-384*, *SHA-512*], with [**selection**: *[**assignment**: positive integer of 4096 or more] iterations*, *value supported by the platform, greater than 1000*], and output cryptographic key sizes [**assignment**: *output key size*] that meet the following: [**assignment**: *applicable standard*].

FCS_CKM_EXT.6.4

The TSF shall not accept passwords less than [**selection**: *a value settable by the administrator*, *[**assignment**: minimum password length accepted by the TOE, must be >= 1]*] and greater than the maximum password length defined in FCS_CKM_EXT.6.1.

FCS_CKM_EXT.6.5

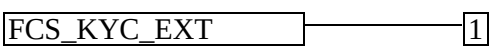
The TSF shall generate all salts using an RBG that meets FCS_RBG_EXT.1 and with entropy corresponding to the security strength selected for PBKDF in FCS_CKM_EXT.6.3.

C.2.1.2 FCS_KYC_EXT Key Chaining and Key Storage

Family Behavior

Components in this family define requirements for the secure storage of keys through the use of a logical key chain.

Component Leveling



FCS_KYC_EXT.1, Key Chaining and Key Storage, requires the TSF to specify how it implements key chaining.

Management: FCS_KYC_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of the cryptographic functionality.

Audit: FCS_KYC_EXT.1

There are no auditable events foreseen.

FCS_KYC_EXT.1 Key Chaining and Key Storage

Hierarchical to:	No other components.
Dependencies to:	FCS_COP.1 Cryptographic Operation FCS_KDF_EXT.1 Cryptographic Key Derivation Function FCS_SMC_EXT.1 Submask Combining

FCS_KYC_EXT.1.1

The TSF shall maintain a key chain of: [**selection**:

- *a conditioned password as the [**assignment**: key type]*
- *[**assignment**: key type] originating from [**assignment**: origin of key] to [**assignment**: end point of key chain] using the following method(s): [**assignment**: list of supported key protection methods] while maintaining an effective strength of commensurate with the strength of the FEK*

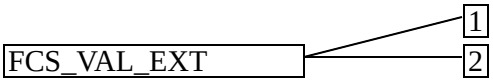
] and [**selection**: *no supplemental key chains, other supplemental key chains that protect a key or keys in the primary key chain using the following method(s): [**assignment**: list of supported key protection methods]*].

C.2.1.3 FCS_VAL_EXT Validation

Family Behavior

Components in this family define requirements for validation of data supplied to the TOE and any consequences resulting from failed validation attempts.

Component Leveling



FCS_VAL_EXT.1, Validation, requires the TSF to specify what data is being validated and how the validation is performed.

FCS_VAL_EXT.2, Validation Remediation, requires the TSF to specify what the TOE's response is in the event of a data validation failure.

Management: FCS_VAL_EXT.1

There are no specific management functions identified.

Audit: FCS_VAL_EXT.1

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Minimal: Change to configuration of validation function behavior.

FCS_VAL_EXT.1 Validation

Hierarchical to: No other components.

Dependencies to: FCS_COP.1 Cryptographic Operation

FCS_VAL_EXT.1.1

The TSF shall perform validation of the [**assignment**: *subject requiring validation*] by [**selection**:

- *receiving assertion of the subject's validity from [**assignment**: Operational Environment component responsible for authentication]*
- *validating the [**selection**: submask, intermediate key] using the following methods: [**selection**:*
  - *key wrap as specified in FCS_COP.1*
  - *hash the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1 and compare it to a stored hash*
  - *decrypt a known value using the [**selection**: submask, intermediate key, FEK] as specified in FCS_COP.1 and compare it against a stored known value*

  ]

].

FCS_VAL_EXT.1.2

The TSF shall require validation of the [**assignment**: *subject requiring validation*] prior to [**assignment**: *action requiring validation*].

Management: FCS_VAL_EXT.2

The following actions could be considered for the management functions in FMT:

- Configuration of the number of failed validation attempts required to trigger corrective behavior.
- Configuration of the corrective behavior to issue in the event of an excessive number of failed validation attempts.

Audit: FCS_VAL_EXT.2

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Minimal: Triggering of excessive validation failure response behavior.

FCS_VAL_EXT.2 Validation Remediation

Hierarchical to: No other components.

Dependencies to: FCS_VAL_EXT.1 Validation

FCS_VAL_EXT.2.1

The TSF shall [**selection**:

- *institute a delay such that only [**assignment**: specified number of] validation attempts can be made within a 24 hour period*
- *block validation after [**assignment**: specified number of] consecutive failed validation attempts*
- *[**assignment**: remediation action] upon [**assignment**: specified number of] consecutive failed validation attempts*

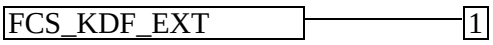
].

C.2.1.4 FCS_KDF_EXT Cryptographic Key Derivation Function

Family Behavior

Components in this family define requirements for the implementation of cryptographic key derivation functions

Component Leveling



FCS_KDF_EXT.1, Cryptographic Key Derivation Function, requires the TSF to specify how it performs key derivation.

Management: FCS_KDF_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of the cryptographic functionality.

Audit: FCS_KDF_EXT.1

There are no auditable events foreseen.

FCS_KDF_EXT.1 Cryptographic Key Derivation Function

Hierarchical to:	No other components.
Dependencies to:	FCS_COP.1 Cryptographic Operation FCS_RBG_EXT.1 Random Bit Generation

FCS_KDF_EXT.1.1

The TSF shall accept [**selection**: *a submask generated by an RBG as specified in FCS_RBG_EXT.1, a conditioned password, an imported submask*] to derive an intermediate key, as defined in [**selection**:

- *NIST SP 800-108 [**selection**: KDF in Counter Mode, KDF in Feedback Mode, KDF in Double-Pipeline Iteration Mode]*
- *NIST SP 800-132*

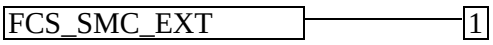
] using the keyed-hash functions specified in FCS_COP.1, such that the output is at least of equivalent security strength (in number of bits) to the [**assignment**: *key that is being derived*].

C.2.1.5 FCS_SMC_EXT Submask Combining

Family Behavior

Components in this family define requirements for generation of intermediate keys via submask combining.

Component Leveling



FCS_SMC_EXT.1, Submask Combining, requires the TSF to implement submask combining in a specific manner to support the generation of intermediate keys.

Management: FCS_SMC_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of the cryptographic functionality.

Audit: FCS_SMC_EXT.1

There are no auditable events foreseen.

FCS_SMC_EXT.1 Submask Combining

Hierarchical to: No other components.

Dependencies to: FCS_COP.1 Cryptographic Operation

FCS_SMC_EXT.1.1

The TSF shall combine submasks using the following method: [**assignment**: *submask combination method*] to generate an intermediate key.

C.2.2 Identification and Authentication (FIA)

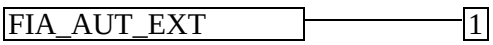
This PP-Module defines the following extended components as part of the FIA class originally defined by CC Part 2:

C.2.2.1 FIA_AUT_EXT Authorization

Family Behavior

Components in this family define requirements for how subject authorization is performed. Where FIA_UAU in CC Part 2 defines circumstances where authentication is required, this family describes the specific computational methods used to determine whether a subject's presented authentication data is valid.

Component Leveling



FIA_AUT_EXT.1, Subject Authorization, specifies the manner in which the TSF performs user authorization.

Management: FIA_AUT_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of authentication factors.

Audit: FIA_AUT_EXT.1

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Minimal: Failure of authorization function.
- Basic: All use of authorization function.

FIA_AUT_EXT.1 Subject Authorization

Hierarchical to: No other components.

Dependencies to: FCS_CKM_EXT.6 Cryptographic Password/Passphrase Conditioning
FCS_RBG_EXT.1 Random Bit Generation

FIA_AUT_EXT.1.1

The TSF shall [**selection**: *receive assertion of the user's validity from: [**assignment**: Operational Environment component responsible for user authentication], provide authorization*] based on [**selection**:

- *a password authorization factor conditioned as defined in FCS_CKM_EXT.6*
- *an external smart card factor that is at least the same bit-length as the FEK(s), and is protecting a submask that is [**selection**: generated by the TOE (using the RBG as specified in FCS_RBG_EXT.1), generated by the platform] protected using asymmetric keys as defined in FCS_CKM.1.1/AK (from [AppPP]) with user presence proved by presentation of the smart card and [**selection**: no PIN, an OE defined PIN, a configurable PIN]*
- *an external USB token factor that is at least the same security strength as the FEK(s), and is providing a submask generated by the [**selection**: TOE, using the RBG as specified in FCS_RBG_EXT.1, platform]*

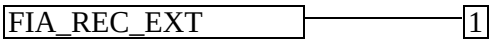
].

C.2.2.2 FIA_REC_EXT Recovery Support

Family Behavior

Components in this family define the TOE's support for recovery credentials as an alternate method for user authorization.

Component Leveling



FIA_REC_EXT.1, Recovery Support, requires the TSF to specify the supported recovery method and to include a means to enable/disable any supported recovery method.

Management: FIA_REC_EXT.1

The following actions could be considered for the management functions in FMT:

- Ability to enable/disable the user of recovery credentials.
- Ability to change recovery credential values.

Audit: FIA_REC_EXT.1

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Minimal: Configuration of recovery methods.

FIA_REC_EXT.1 Recovery Support

Hierarchical to: No other components.

Dependencies to: No dependencies.

FIA_REC_EXT.1.1

The TSF shall [**selection**: *provide the ability to enable and disable the use of recovery credentials*, *not support recovery*].

FIA_REC_EXT.1.2

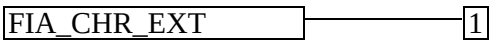
The TSF shall support the following recovery mechanisms [**selection**: *Challenge Response Recovery as defined in FIA_CHR_EXT.1*, *None*].

C.2.2.3 FIA_CHR_EXT Challenge/Response Recovery Credential

Family Behavior

Components in this family define requirements for the use of challenge/response as a recovery method.

Component Leveling



FIA_CHR_EXT.1, Challenge/Response Recovery Credential, requires the TSF to implement a challenge/response method to generate recovery credentials for an authorized user.

Management: FIA_CHR_EXT.1

The following actions could be considered for the management functions in FMT:

- Ability to enable/disable the user of recovery credentials.
- Ability to change recovery credential values.

Audit: FIA_CHR_EXT.1

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Minimal: Failure of recovery attempt.
- Basic: All recovery attempts.

FIA_CHR_EXT.1 Challenge/Response Recovery Credential

Hierarchical to: No other components.

Dependencies to: FCS_VAL_EXT.1 Validation
FIA_REC_EXT.1 Recovery Support

FIA_CHR_EXT.1.1

The TSF shall generate a response only if it is able to access recovery information for [**selection**: *the user requesting the recovery*, *the user requesting recovery and the device for which the recovery was requested*].

FIA_CHR_EXT.1.2

The response shall work only for the user to whom it was generated.

FIA_CHR_EXT.1.3

The response shall be used only during the same session in which the request was generated.

FIA_CHR_EXT.1.4

The TSF shall generate an ephemeral response that has at least as many potential values as a corresponding password or PIN.

FIA_CHR_EXT.1.5

The TSF shall allow a maximum of [**assignment**: *integer value*] response entry attempts per boot cycle.

FIA_CHR_EXT.1.6

The TSF shall perform remediation as defined in FCS_VAL_EXT.2 for failed challenge recovery attempts.

C.2.3 Protection of the TSF (FPT)

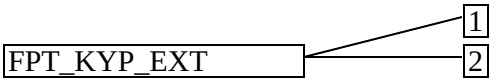
This PP-Module defines the following extended components as part of the FPT class originally defined by CC Part 2:

C.2.3.1 FPT_KYP_EXT Protection of Key and Key Material

Family Behavior

Components in this family define requirements for secure storage of keys.

Component Leveling



FPT_KYP_EXT.1, Protection of Keys and Key Material , requires the TSF to protect stored key data in a specified manner.

FPT_KYP_EXT.2, Attribution of Key and Key Material, requires the TSF to protect stored key data in a specified manner.

Management: FPT_KYP_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of the cryptographic functionality.

Audit: FPT_KYP_EXT.1

There are no auditable events foreseen.

FPT_KYP_EXT.1 Protection of Keys and Key Material

Hierarchical to: No other components.

Dependencies to: FCS_COP.1 Cryptographic Operation
FCS_KDF_EXT.1 Cryptographic Key Derivation Function
FCS_KYC_EXT.1 Key Chaining and Key Storage
FCS_SMC_EXT.1 Submask Combining
FCS_STO_EXT.1 Storage of Credentials

FPT_KYP_EXT.1.1

The TSF shall store keys in non-volatile memory only when [**selection**:

- *wrapped, as specified in FCS_COP.1*
- *encrypted, as specified in FCS_COP.1*
- *the plaintext key is stored in the underlying platform's keystore as specified by FCS_STO_EXT.1*
- *the plaintext key is stored in a SQL database in the Operational Environment*
- *the plaintext key is not part of the key chain as specified in FCS_KYC_EXT.1.*
- *the plaintext key will no longer provide access to the encrypted data after initial provisioning*
- *the plaintext key is a key split that is combined as specified in FCS_SMC_EXT.1 and another contribution to the split is [**selection**: wrapped as specified in FCS_COP.1, derived and not stored in non-volatile memory]*
- *the plaintext key is stored on an external storage device for use as an authorization factor.*
- *the plaintext key is used to wrap a key as specified in FCS_COP.1 that is already wrapped as specified in FCS_COP.1*

].

Management: FPT_KYP_EXT.2

The following actions could be considered for the management functions in FMT:

- Registration of users.
- Revocation of user registration.

Audit: FPT_KYP_EXT.2

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Basic: Creation and revocation of user registration.

FPT_KYP_EXT.2 Attribution of Key and Key Material

Hierarchical to: No other components.

Dependencies to: FPT_ITT.1 Basic Internal TSF Data Transfer Protection

FPT_KYP_EXT.2.1

The TSF shall maintain an association between stored endpoint keys and user identity, [**selection**: *remote endpoints*, *recovery credential*, *system identity*, *no other subjects*].

FPT_KYP_EXT.2.2

The TSF shall provide the ability to register users by exchange of [**assignment**: *mutually identifying information that allows for an association to be made*].

FPT_KYP_EXT.2.3

The TSF shall provide the ability to revoke the registration of users by [**assignment**: *method of removing and/or exchanging information that prevents further communications between the TOE and the endpoint*].

FPT_KYP_EXT.2.4

The TSF shall transmit any secure or private cryptographic information that is transferred between the TOE and a user's endpoint in order to establish or disestablish an association using a communications channel with a security strength at least as great as the strength of the information being transmitted.

Appendix D - Key Management Description

This appendix should be combined with the appendix in the PP-Module for File Encryption if it is also being evaluated. The documentation of the product's encryption key management should be detailed enough that, after reading, the evaluator will thoroughly understand the product's key management and how it meets the requirements to ensure the keys are adequately protected. This documentation should include an essay and diagram(s). This documentation is not required to be part of the TSS - it can be submitted as a separate document and marked as developer proprietary.

Essay:

The essay will provide the following information for all keys in the key chain:

The purpose of the key
If the key is stored in non-volatile memory
How and when the key is protected
How and when the key is derived
The strength of the key
When or if the key would be no longer needed, along with a justification
How and when a key may be transmitted

The essay will also describe the following topics:

A description of all authorization factors that are supported by the product and how each factor is handled, including any conditioning and combining performed.
If validation is implemented, the process for validation shall be described, noting what value is used for validation and the process used to perform the validation. It shall describe how this process ensures no keys in the key chain are weakened or exposed by this process.
The authorization process that leads to the recovery or access by an end user or administrator. This section shall detail the key chain used by the product. It shall describe which keys are used in the protection of the FEK(s) or KEK(s) and how they meet the encryption or derivation requirements, including the direct chain from the initial authorization to the FEK(s) or KEK(s). It shall also include any values that add into that key chain or interact with the key chain and the protections that ensure those values do not weaken or expose the overall strength of the key chain.
The diagram and essay will clearly illustrate the key hierarchy to ensure that at no point the chain could be broken without a cryptographic exhaust or all of the initial authorization values and the effective strength of the FEK(s) is maintained throughout the key chain.
A description of the data encryption engine, its components, and details about its implementation (e.g. initialization of the product, drivers, libraries (if applicable), logical interfaces for encryption/decryption, and how resources to be encrypted are identified. The description should also include the data flow from the device's host interface to the device's persistent media storing the data or transmission to and endpoint, information on those conditions in which the data bypasses the data encryption engine. The description should be detailed enough to verify all platforms ensure that when the user enables encryption, the product encrypts all selected resources.
The process for destroying keys when they are no longer needed by describing the storage location of all keys and the protection of all keys stored in non-volatile memory.

Diagram:

The diagram will include all keys from the initial authorization factor(s) to the FEK(s) and any keys or values that contribute into the chain. It must list the cryptographic strength of each key and indicate how each key along the chain is protected with either options from key chaining requirement. The diagram should indicate the input used to derive or decrypt each key in the chain.
A functional (block) diagram showing the main components (such as memories and processors) the initial steps needed for the activities the TOE performs to ensure it encrypts the targeted resources when a user or administrator first provisions the product.

Appendix E - Acronyms

Table 7: Acronyms

Acronym	Meaning
AF	Authorization factor
Base-PP	Base Protection Profile
CC	Common Criteria
CEM	Common Evaluation Methodology
cPP	Collaborative Protection Profile
EP	Extended Package
FEK	File Encryption Key
FP	Functional Package
KEK	Key Encryption Key
OE	Operational Environment
PP	Protection Profile
PP-Configuration	Protection Profile Configuration
PP-Module	Protection Profile Module
RBG	Random Bit Generator
SAR	Security Assurance Requirement
SFR	Security Functional Requirement
ST	Security Target
TOE	Target of Evaluation
TSF	TOE Security Functionality
TSFI	TSF Interface
TSS	TOE Summary Specification

Appendix F - Bibliography

Table 8: Bibliography

Identifier	Title
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