

PP-Module for Email Clients



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National Information Assurance Partnership

Revision History

Version	Date	Comment
v 1.0	2014-04-01	Release - Email Client Protection Profile
v 2.0	2015-06-18	Update as Extended Package of the Protection Profile for Application Software
v 2.0	2015-06-18	Application Software Module for Email Clients

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1 Introduction

1.1 Overview

Email clients are user applications that provide functionality to send, receive, access and manage email. The complexity of email content and email clients has grown over time. Modern email clients can render HTML as well as plaintext, and may include functionality to display common attachment formats, such as Adobe PDF and Microsoft Word documents. Some email clients allow their functionality to be modified by users through the addition of add-ons. Protocols have also been defined for communicating between email clients and servers. Some clients support multiple protocols for doing the same task, allowing them to be configured according to email server specifications.

The complexity and rich feature set of modern email clients make them a target for attackers, introducing security concerns. This document is intended to facilitate the improvement of email client security by requiring use of operating system security services, cryptographic standards, and environmental mitigations. Additionally, the requirements in this document define acceptable behavior for email clients regardless of the security features provided by the operating system.

This Module along with the Protection Profile for Application Software ([AppPP]) provide a baseline set of Security Functional Requirements (SFRs) for email clients running on any operating system regardless of the composition of the underlying platform.

The terms email client and TOE are interchangeable in this document.

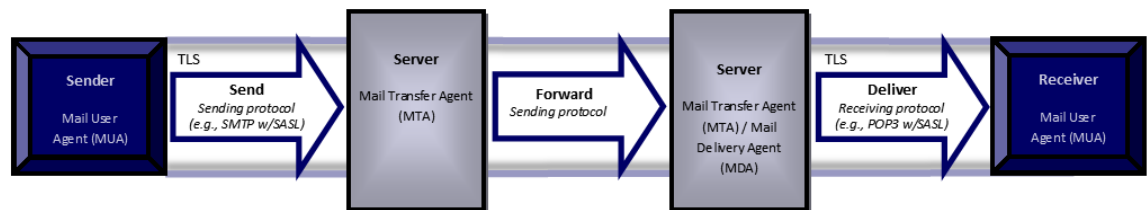


Figure 1: Sending and Delivering Email over TLS

1.2 Terms

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

1.2.1 Common Criteria Terms

Common Criteria (CC)	Common Criteria for Information Technology Security Evaluation.
Base Protection Profile (Base-PP)	Protection Profile used to build a PP-Configuration.
Protection Profile (PP)	An implementation-independent set of security requirements for a category of products.
Protection Profile Configuration (PP-Configuration)	Protection Profile composed of Base Protection Profiles and Protection Profile Module.
Protection Profile Module (PP-Module)	An implementation-independent statement of security needs for a TOE type complementary to one or more Base Protection Profiles.
Security Target (ST)	A set of implementation-dependent security requirements for a specific product.
Target of Evaluation (TOE)	The product under evaluation. In this case, application software and its supporting documentation.
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 a ST.
Security Functional Requirement (SFR)	A requirement for security enforcement by the TOE.
Security Assurance Requirement (SAR)	A requirement to assure the security of the TOE.

1.2.2 Technical Terms

ActiveSync	Microsoft protocol for synchronizing messaging and calendar data between mobile clients and email servers.
Add-on	Capabilities or functionality added to an application including plug-ins, extensions or other controls.
Email Client	Application used to send, receive, access and manage email provided by an email server. The terms email client and TOE are interchangeable in this document.
IMAP	Internet Message Access Protocol - Protocol for an email client to retrieve email from an email server over TCP/IP; IMAP4 defined in RFC 3501.
MAPI	Messaging Application Programming Interface - open specification used by email clients such as Microsoft Outlook and Thunderbird; defined in [MS-OXCMAPHTTP].
POP	Post Office Protocol - Protocol for an email client to retrieve email from an email server over TCP/IP; POP3 defined in RFC 1939.
RPC	Remote Procedure Call - Protocol used by Microsoft Exchange to send/receive MAPI commands; defined in MS-OXCRPC.
S/MIME	Secure/Multipurpose Internet Mail Extensions - S/MIME is used to sign and/or encrypt messages at the request of the user upon sending email and to verify digital signature on a signed message upon receipt.
SMTP	Simple Mail Transfer Protocol - Protocol for an email client to send email to an email server over TCP/IP; SMTP

1.3 Compliant Targets of Evaluation

The Target of Evaluation (TOE) in this PP-Module is an email client application running on a desktop or mobile operating system.

This PP-Module describes the extended security functionality of email clients in terms of [\[CC\]](#). As an extension of the ApSo PP, it is expected that the content of this PP-Module will be appropriately combined with the ApSo PP to include selection-based requirements in accordance with the selections and/or assignments made, and any optional and/or objective components to include the following components at minimum:

- FCS_CKM.1(1)
- FCS_CKM_EXT.1
- FCS_CKM.2
- FCS_COP.1(1)
- FCS_COP.1(2)
- FCS_COP.1(3)
- FCS_COP.1(4)
- FCS_TLSC_EXT.1
- FIA_X509_EXT.1
- FIA_X509_EXT.2

An ST must identify the applicable version of the ApSo PP and this PP-Module in its conformance claims.

1.4 Use Cases

Email clients perform tasks associated primarily with the following use case.

[USE CASE 1] Sending, receiving, accessing, managing and displaying email

Email clients are used for sending, receiving, viewing, accessing, managing email in coordination with a mail server. Email clients can render HTML as well as plaintext, and can display common attachment formats.

2 Conformance Claims

Conformance Statement

The Protection Profile for Application Software ([AppPP]) defines the baseline Security Functional Requirements (SFRs) and Security Assurance Requirements (SARs) for application software products. This PP-Module serves to extend the ApSo PP baseline with additional SFRs and associated Evaluation Activities specific to an email client. Evaluation Activities are the actions that the evaluator performs in order to determine an email client's compliance to the SFRs.

This PP-Module conforms to Common Criteria [] for Information Technology Security Evaluation, Version 3.1, Revision 4. It is CC Part 2 extended and CC Part 3 conformant. In order to be conformant to this PP-Module, the ST must include all components in this PP-Module and the associated ApSo PP that are:

- unconditional (which are always required)
- selection-based (which are required when certain selections are chosen in the unconditional requirements)

and may include optional and/or objective components that are desirable but not required for conformance.

In accordance with CC Part 1, dependencies are not included when they are addressed by other SFRs. The evaluation activities provide adequate proof that any dependencies are also satisfied.

3 Security Problem Description

The security problem is described in terms of the threats that the email client is expected to address, assumptions about the operational environment, and any organizational security policies that it is expected to enforce.

This Extended Package does not repeat the threats, assumptions, and organizational security policies identified in the ApSo PP, though they all apply given the conformance and hence dependence of this PP-Module on it. Together the threats, assumptions and organizational security policies of the ApSo PP and those defined in this PP-Module describe those addressed by an email client as the Target of Evaluation.

Notably, email clients are particularly at risk from the Network Attack threat identified in the ApSo PP. Attackers can send malicious email messages directly to users, and the email client will render or otherwise process this untrusted content.

3.1 Threats

The following threat is specific to email clients, and represents an addition to those identified in the Base PP.

T.FLAWED_ADDON

Email client functionality can be extended with integration of third-party utilities and tools. This expanded set of capabilities is made possible via the use of add-ons. The tight integration between the basic email client code and the new capabilities that add-ons provide increases the risk that malefactors could inject serious flaws into the email client application, either maliciously by an attacker, or accidentally by a developer. These flaws enable undesirable behaviors including, but not limited to, allowing unauthorized access to sensitive information in the email client, unauthorized access to the device's file system, or even privilege escalation that enables unauthorized access to other applications or the operating system.

4 Security Objectives

This Extended Package adds SFRs to objectives identified in the ApSo PP and describes an additional objective specific to this .

4.1 Security Objectives for the TOE

O.MANAGEMENT

QQQQ

Addressed by: [FDP_NOT_EXT.1](#), [FDP_NOT_EXT.2](#), [FMT_MOF_EXT.1](#)

O.PROTECTED_STORAGE

QQQQ

Addressed by: [FCS_CKM_EXT.3](#), [FCS_CKM_EXT.4](#), [FCS_CKM_EXT.5](#), [FCS_COP_EXT.2](#), [FCS_IVG_EXT.1](#), [FCS_KYC_EXT.1](#), [FCS_NOG_EXT.1](#), [FCS_SAG_EXT.1](#), [FCS_SMC_EXT.1](#)

O.PROTECTED_COMMS

QQQQ

Addressed by: [FCS_SMIME_EXT.1](#), [FDP_SMIME_EXT.1](#), [FIA_SASL_EXT.1](#), [FIA_X509_EXT.3](#), [FTP_ITC_EXT.1](#)

O.ADDON_INTEGRITY

To address issues associated with malicious or flawed plug-ins or extensions, conformant email clients implement mechanisms to ensure their integrity. This includes verification at installation time and update.

Addressed by: [FPT_AON_EXT.1](#), [FPT_AON_EXT.2](#)

4.2 Security Objectives for the Operational Environment

Some text concerning security objectives. And this is some text about this.

4.3 Security Objectives Rationale

5 Security Requirements

This chapter describes the security requirements which have to be fulfilled by the TOE. Those requirements comprise functional components from Part 2 and assurance components from Part 3 of [CC]. The following notations are used:

- **Refinement** operation (denoted by **bold text**): is used to add details to a requirement, 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: are identified with a number inside parentheses (e.g. "(1)")

5.1 ApSo PP Security Functional Requirements Direction

In a PP-Configuration the includes Application Software PP, the TOE is expected to rely on some of the security functions implemented by the application as a whole and evaluated against the Base-PP. The following sections 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 5.4.

5.1.1 Unmodified SFRs

The SFRs listed in this section are defined in the PP and are relevant to the secure operation of the TOE. When testing the TOE, it is necessary to ensure these SFRs are tested specifically in conjunction with the Email Client portion of the TOE. The ST author may complete all selections and assignments in these SFRs without any additional restrictions.

- FCS_RBG_EXT.1
- FCS_RBG_EXT.2
- FCS_CKM_EXT.1
- FCS_CKM.1(1)
- FCS_CKM.1(2)
- FCS_CKM.2
- FCS_COP.1(1)
- FCS_COP.1(2)
- FCS_COP.1(3)
- FCS_COP.1(4)
- FCS_STO_EXT.1
- FCS_TLSC_EXT.1
- FCS_TLSC_EXT.2
- FCS_TLSC_EXT.3
- FCS_TLSC_EXT.4
- FCS_TLSS_EXT.1
- FCS_DTLS_EXT.1
- FCS_HTTPS_EXT.1
- FDP_DEC_EXT.1
- FDP_NET_EXT.1
- FDP_DAR_EXT.1
- FIA_X509_EXT.1
- FIA_X509_EXT.2
- FMT_MEC_EXT.1
- FMT_CFG_EXT.1
- FMT_SMF.1
- FPR_ANO_EXT.1
- FPT_API_EXT.1
- FPT_API_EXT.2
- FPT_AEX_EXT.1
- FPT_TUD_EXT.1
- FPT_TUD_EXT.2
- FPT_LIB_EXT.1
- FPT_IDV_EXT.1
- FTP_DIT_EXT.1

5.1.2 Modified SFRs

The SFRs listed in this section are defined in the Application Software Protection Profile and relevant to the secure operation of the TOE.

5.1.3 Additional SFRs

This section defines additional SFRs that must be added to the TOE boundary in order to implement the functionality in any PP-Configuration where the Application Software Protection Profile is claimed as the Base-PP.

5.1.3.1 Cryptographic Support (FCS)

FCS_SMIME_EXT.1 Secure/Multipurpose Internet Mail Extensions (S/MIME)

- FCS_SMIME_EXT.1.1 The email client shall implement both a sending and receiving S/MIME v3.2 Agent as defined in RFC 5751, using CMS as defined in RFCs 5652, 5754, and 3565.

Application Note: The RFCs allow for an agent to be either sending or receiving, or to include both capabilities. The intent of this requirement is to ensure that the email client is capable of both sending and receiving S/MIME v3.2 messages.

- FCS_SMIME_EXT.1.2 The email client shall transmit the ContentEncryptionAlgorithmIdentifier for AES-128 CBC and AES-256 CBC as part of the S/MIME protocol.

Application Note: AES was added to CMS as defined in RFC 3565.

- FCS_SMIME_EXT.1.3 The email client shall present the digestAlgorithm field with the following Message Digest Algorithm identifiers [**selection:** *id-sha256, id-sha384, id-sha512*] and no others as part of the S/MIME protocol.

- FCS_SMIME_EXT.1.4 The email client shall present the AlgorithmIdentifier field with the following sha256withRSAEncryption and [**selection:**

- *sha384WithRSAEncryption,*
- *sha512WithRSAEncryption,*
- *ecdsa-with-SHA256,*
- *ecdsa-with-sha384,*
- *ecdsa-with-sha512*

] and no other algorithms as part of the S/MIME protocol.

Application Note: RFC 5751 mandates that receiving and sending agents support RSA with SHA256. The algorithms to be tested in the evaluated configuration are limited to the algorithms specified in the [FCS_SMIME_EXT.1.4](#) selection. Any other algorithms implemented that do not comply with these requirements should not be included in an evaluated email client.

- FCS_SMIME_EXT.1.5 The email client shall support use of different private keys (and associated certificates) for signature and for encryption as part of the S/MIME protocol.
- FCS_SMIME_EXT.1.6 The email client shall only accept a signature from a certificate with the digitalSignature bit set as part of the S/MIME protocol.

Application Note: It is acceptable to assume that the digitalSignature bit is set in cases where there is no keyUsage extension.

- FCS_SMIME_EXT.1.7 The email client shall implement mechanisms to retrieve certificates and certificate revocation information **[selection: for each signed/encrypted message sent/received , [assignment: frequency]]** as part of the S/MIME protocol.

Application Note: In accordance with FIA_X509_EXT.1.1 [\[AppPP\]](#), certificate revocation may use Certificate Revocation List (CRL) or Online Certificate Status Protocol (OCSP). The email client can define how this mechanism behaves, including whether it utilizes the underlying OS, but it is required that a mechanism exist such that revocation status is supported and so that certificates can be retrieved for sending/receiving messages. Frequency is configurable in [FMT_MOF_EXT.1.1](#). In this requirement, frequency can be interpreted as a one-time function with local storage, as a regularly scheduled retrieval, or as a mechanism that requires manual intervention. If the retrieval mechanism is periodic in nature, then the ST author will need to include an iteration of FCS for storage of revocation information; storage of certificates is covered in FCS_CKM. The import of certificates and certificate chains is not included in this requirement, but is covered in FIA_X509 and FMT_MOF.

FCS_CKM_EXT.3 Protection of Key and Key Material

- FCS_CKM_EXT.3.1 The email client shall **[selection:**
- not store keys in non-volatile memory,
 - only store keys in non-volatile memory when wrapped as specified in [FCS_COP_EXT.2](#) unless the key meets any one of following criteria: **[selection:**
 - 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 the other half of the key split is either **[selection: wrapped as specified in [FCS_COP_EXT.2](#) , 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_EXT.2](#) that is already wrapped as specified in [FCS_COP_EXT.2](#) ,
 - The plaintext key is the public portion of the key pair

]

].

Application Note: 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 email client or operational environment, the only methods that allow it to play a security relevant role is if it is a key split or providing additional layers of wrapping or encryption on keys that have already been protected.

FCS_CKM_EXT.4 Cryptographic Key Destruction

- FCS_CKM_EXT.4.1 The email client shall **[selection:**
- invoke platform-provided key destruction,
 - implement key destruction using **[selection:**
 - For volatile memory, the erasure shall be executed by a single direct overwrite **[selection:**
 - consisting of a pseudo-random pattern using the email client's RBG,
 - consisting of a pseudo-random pattern using the host platform's RBG,
 - consisting of zeroes
 -]. ,
 - For non-volatile storage, the erasure shall be executed by **[selection:**
 - single,
 - three or more times
 -]
 - overwrite of key data storage location consisting of **[selection:**
 - a pseudo random pattern using the email client's RBG (as specified in [FCS_RBG_EXT.1](#) [\[AppPP\]](#),
 - a pseudo-random pattern using the host platform's,
 - a static pattern
 -]

]

] that meet the following: **[selection:**

- NIST SP800-88,
- no standard

] for destroying all keying material and cryptographic security parameters when no longer needed.

Application Note: For the purposes of this requirement, keying material refers to authentication data, passwords, symmetric keys, data used to derive keys, etc. The destruction indicated above applies to each intermediate storage area for key/cryptographic critical security parameters (i.e., any storage, such as memory buffers, that is included in the path of such data) upon the transfer of the key/cryptographic critical security parameter to another memory location.

FCS_KYC_EXT.1 Key Chaining

- FCS_KYC_EXT.1.1 The email client shall maintain a key chain of: **[selection:**
- one,
 - a key stored in platform key storage
 - intermediate keys originating from: **[selection:**

- a password as specified in [FCS_CKM_EXT.5.1](#),
- one or more other authorization factor(s),
- credentials stored in platform key storage

]

] to the data encryption/decryption key(s) 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,
- implement key wrapping as specified in [FCS_COP_EXT.2](#),
- implement key combining as specified in [FCS_SMC_EXT.1](#)

] while maintaining an effective strength of [selection:

- 128 bits,
- 256 bits

]

Application Note: Key Chaining is the method of using multiple layers of encryption keys to ultimately secure the data encryption key. The number of intermediate keys will vary. This applies to all keys that contribute to the ultimate wrapping or derivation of the data encryption key; including those in protected areas. This requirement also describes how keys are stored.

5.1.3.2 User Data Protection (FDP)

FDP_NOT_EXT.1 Notification of S/MIME Status

FDP_NOT_EXT.1.1 The email client shall display a notification of the S/MIME status of received emails upon viewing.

Application Note: S/MIME status is whether the email has been signed or encrypted and whether the signature verifies and the associated certificate validates. This notification must at least display when the email content is viewed. Many implementations also display the S/MIME status of each email when all emails are viewed as a list.

FDP_SMIME_EXT.1 S/MIME

FDP_SMIME_EXT.1.1 The email client shall use S/MIME to sign, verify, encrypt, and decrypt mail.

Application Note: Note that this requirement does not mandate that S/MIME be used for all incoming/outgoing messages, or that the email client automatically encrypt and/or sign/verify all sent or received messages. This requirement only specifies that the mechanism for digital signature and encryption must be S/MIME.

5.1.3.3 Identification and Authentication (FIA)

FIA_X509_EXT.3 X509 Authentication and Encryption

FIA_X509_EXT.3.1 The email client shall use X.509v3 certificates as defined by RFC 5280 to support encryption and authentication for S/MIME.

FIA_X509_EXT.3.2 The email client shall prevent the establishment of a trusted communication channel when the peer certificate is deemed invalid.

Application Note: Trusted communication channels include any of TLS performed by the email client. Validity is determined by the certificate path, the expiration date, and the revocation status in accordance with RFC 5280.

FIA_X509_EXT.3.3 The email client shall prevent the installation of code if the code signing certificate is deemed invalid.

FIA_X509_EXT.3.4 The email client shall prevent the encryption of email if the email protection certificate is deemed invalid.

FIA_X509_EXT.3.5 The email client shall prevent the signing of email if the email protection certificate is deemed invalid.

5.1.3.4 Security Management (FMT)

FMT_MOF_EXT.1 Management of Functions Behavior

FMT_MOF_EXT.1.1 The email client shall be capable of performing the following management functions, controlled by the user or administrator as shown:

- X: Mandatory
- O: Optional

Management Function	Administrator	User
Enable/disable downloading embedded objects globally and by [selection: domain, sender, no other method]	O	O
Enable/disable plaintext only mode globally and by [selection: domain, sender, no other method]	O	O
Enable/disable rendering and execution of attachments globally and by [selection: domain, sender, no other method]	O	O
Enable/disable email notifications	O	O
Configure a certificate repository for encryption	O	O
Configure whether to establish a trusted channel or disallow establishment if the email client cannot establish a connection to determine the validity of a certificate	O	O
Configure message sending/receiving to only use cryptographic algorithms defined in FCS_SMIME_EXT.1	O	O
Configure CRL retrieval frequency	O	O
Enable/disable support for add-ons	O	O
Change password/passphrase authentication credential	O	O
Disable key recovery functionality	O	O

Configure cryptographic functionality	O	O
[assignment: Other management functions]	O	O

Application Note: For these management functions, the term "Administrator" refers to the administrator of a non-mobile device or the device owner of a mobile device. The Administrator is responsible for management activities, including setting the policy that is applied by the enterprise on the email client. The Administrator could be acting remotely and could be the MTA administrator acting through a centralized management console or dashboard. Applications used to configure enterprise policy should have their own identification and authorization and additional security requirements to ensure that the remote administration is trusted.

The intent of this requirement is to allow the Administrator to configure the email client with a policy that may not be over-ridden by the user. If the Administrator has not set a policy for a particular function, the user may still perform that function. Enforcement of the policy is done by the email client itself, or the email client and the email client platform in coordination with each other.

The function to configure whether to establish a trusted channel corresponds to the functionality described in FIA_X509_EXT.2.2 ([AppPP]). The Administrator has the option of accepting or rejecting all certificates that cannot be validated, accepting a given certificate that cannot be validated, or not accepting a given certificate that cannot be validated. Depending on the choice that the Administrator has made in FIA_X509_EXT.2.2 ([AppPP]), the trusted connection will either be allowed for all certificates that cannot be validated, disallowed for all certificates that cannot be validated, allowed for a given certificate that cannot be validated, or disallowed for a given certificate that cannot be validated.

If password or passphrase authorization factors are implemented by the email client, then the appropriate "change" selection must be included.

If the email client provides configurability of the cryptographic functions (for example, key size), even if the configuration is the form of parameters that may be passed to cryptographic functionality implement on the email client platform, then "configure cryptographic functionality" will be included, and the specifics of the functionality offered can either be written in this requirement as bullet points, or included in the TSS.

If the email client does include a key recovery function, the email client must provide the capability for the user to turn this functionality off so that no recovery key is generated and no keys are permitted to be exported.

5.1.3.5 Protection of the TSF (FPT)

FPT_AON_EXT.1 Support for Only Trusted Add-ons

FPT_AON_EXT.1.1 The email client shall include the capability to load [selection: *trusted add-ons, no add-ons*].

Application Note: FPT_AON_EXT.2 depends upon the selection made here. If the email client does not include support for installing only trusted add-ons, this requirement can be met by demonstrating the ability to disable all support for add-ons as specified in FMT_MOF_EXT.1. Cryptographic verification (i.e., trust) of add-ons is tested in FPT_AON_EXT.2.1

5.1.3.6 Trusted Path/Channels (FTP)

FTP_ITC_EXT.1 Inter-TSF Trusted Channel

FTP_ITC_EXT.1.1 The email client shall initiate or receive communication via the trusted channel.

FTP_ITC_EXT.1.2 The email client shall communicate via the trusted channel for [selection:

- IMAP,
- SMTP,
- POP,
- MAPI Extensions for HTTP,
- MAPI/RPC,
- ActiveSync,
- [assignment: other protocol (reference RFC or specification)]

].

Application Note: FIA_SASL_EXT.1 depends upon the selection(s) made here. For example, if POP is chosen, then FIA_SASL_EXT.1.2 shall be included in the ST. Selections must include at least one sending and one receiving protocol. If the assignment is used, the ST author must also include a reference for the protocol (e.g., an RFC number).

FCS_CKM_EXT.5 Cryptographic Key Derivation (Password/Passphrase Conditioning)

FCS_CKM_EXT.5.1 A password/passphrase used to generate a password authorization factor shall enable up to [assignment: *positive integer of 64 or more*] characters in the set of [selection:

- upper case characters,
- lower case characters,
- numbers,
- special characters: !, @, #, \$, %, ^, &, *, (,)
- [assignment: other supported special characters]

] and shall perform [Password-based Key Derivation Functions] in accordance with a specified cryptographic algorithm [selection:

- HMAC-SHA-256,
- HMAC-SHA-384,
- HMAC-SHA-512

] with [assignment: *positive integer of 4096 or more*] iterations, and output cryptographic key sizes of [selection:

- 128 bits,
- 256 bits

] that meet NIST SP 800-132.

Application Note: The password/passphrase is represented on the host machine as a sequence of characters whose encoding depends on the email client and the underlying OS. This sequence must be conditioned into a string of bits that is to be used as a key of equivalent size to the rest of the key chain.

This password/passphrase must be conditioned into a string of bits that forms the submask to be used as input into a key. Conditioning can be performed using one of the identified hash functions or the process described in NIST SP 800-132; the method used is selected by the ST Author. SP 800-132 requires the use of a pseudo-random function (PRF) consisting of HMAC with an approved hash function. The ST author selects the hash function used, also includes the appropriate requirements for HMAC and the 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.

There are two aspects of this component that require evaluation: passwords/passphrases of the length specified in the requirement (at least 64 characters) are supported, and that the characters that are input are subject to the selected conditioning function. These activities are separately addressed in the tests below.

FCS_SAG_EXT.1 Cryptographic Salt Generation

FCS_SAG_EXT.1.1 The email client shall only use salts that are generated by a [selection:

- *RNG as specified in FCS_RBG_EXT.1,*
- *RNG provided by the host platform*

]

Application Note: The salt must be random.

FCS_NOG_EXT.1 Cryptographic Nonce Generation

FCS_NOG_EXT.1.1 The email client shall only use unique nonces with a minimum size of [64] bits.

Application Note: Nonces must be unique.

FCS_IVG_EXT.1 Initialization Vector Generation

FCS_IVG_EXT.1.1 The email client shall create IVs in the following manner: [selection:

- *CBC: IVs shall be non-repeating,*
- *CCM: IV shall be non-repeating,*
- *XTS: No IV. Tweak values shall be non-negative integers, assigned consecutively, and starting at an arbitrary non-negative integer,*
- *GCM: IV shall be non-repeating. The number of invocations of GCM shall not exceed 2^{32} for a given secret key.*

]

Application Note: FCS_IVG_EXT.1.1 specifies how the IV should be handled for each encryption mode. CBC, XTS, and GCM are allowed for AES encryption of the data. AES-CCM is an allowed mode for Key Wrapping.

FDP_NOT_EXT.2 Notification of URI

FDP_NOT_EXT.2.1 The email client shall display the full Uniform Resource Identifier (URI) of any embedded links.

Application Note: Embedded links are HTML URI objects which may have a tag (such as a word, phrase, icon, or picture) that obfuscates the URI of the link. The intent of this requirement is to de-obfuscate the link. The URI may be displayed as a "mouse-over" event or may be rendered next to the tag.

FDP_PST_EXT.1 Storage of Persistent Information

FDP_PST_EXT.1.1 The email client shall be capable of operating without storing persistent information to the client platform with the following exceptions: [selection: *credential information, administrator provided configuration information, certificate revocation information, no exceptions*].

Application Note: Any data that persists after the email client closes, including temporary files, is considered to be persistent data. Satisfying this requirement would require the use of a protocol such as IMAP or MAPI. It is not compatible with POP.

FDP_REN_EXT.1 Rendering of Message Content

FDP_REN_EXT.1.1 The email client shall have a plaintext-only mode which disables the rendering and execution of [selection:

- *HTML,*
- *JavaScript,*
- *[assignment: other embedded content types],*
- *no embedded content types*

].

Application Note: Plaintext only mode prevents the automatic downloading, rendering and execution of images, external resources and embedded objects such as HTML or JavaScript objects. FMT_MOF_EXT.1.1 addresses configuration of this mode. The ST author must identify all content types supported by the email client through selections and/or assignments. If the email client only supports plaintext only mode, no embedded content types should be selected.

FPT_AON_EXT.2 Trusted Installation and Update for Add-ons

FPT_AON_EXT.2.1 The email client shall [selection: *provide the ability, leverage the platform*] to provide a means to cryptographically verify add-ons using a digital signature mechanism and [selection: *published hash, no other functions*] prior to installation and update.

FPT_AON_EXT.2.2 The email client shall [selection: *provide the ability, leverage the platform*] to query the current version of the add-on.

FPT_AON_EXT.2.3 The email client shall prevent the automatic installation of add-ons.

FIA_SASL_EXT.1 Simple Authentication and Security Layer (SASL)

FIA_SASL_EXT.1.1 The email client shall implement support for Simple Authentication and Security Layer (SASL) that complies with RFC 4422.

Application Note: SASL is needed if the email implements SMTP to send messages. Clients that do not use SMTP (e.g., ActiveSync or MAPI) would not need to implement support for SASL.

FIA_SASL_EXT.1.2 The email client shall support the POP3 CAPA and AUTH extensions for the SASL mechanism.

FIA_SASL_EXT.1.3 The email client shall support the IMAP CAPABILITY and AUTHENTICATE extensions for the SASL mechanism.

FIA_SASL_EXT.1.4

The email client shall support the SMTP AUTH extension for the SASL mechanism.

Application Note: In order for an email client to support PKI X.509 Certificates for POP3, IMAP and SMTP as required in this document, the client must support the Simple Authentication and Security Layer (SASL) authentication method as described in RFC 4422, the AUTH and CAPA extensions for POP3, as described in RFC 5034, the AUTHENTICATION and CAPABILITY extensions for IMAP, as described in RFC 4959 and the AUTH extension for SMTP, as described in RFC 4954.

FCS_SMC_EXT.1 Key Combining

FCS_SMC_EXT.1.1

The email client shall combine submasks using the following method [**selection:**

- *exclusive OR (XOR)*,
- *SHA-256*,
- *SHA-512*

] to generate another key.

Application Note: This requirement specifies the way that a product may combine the various submasks by using either an XOR or an approved SHA-hash.

FCS_COP_EXT.2 Key Wrapping

FCS_COP_EXT.2.1

The email client shall [**selection:**

- *use platform-provided functionality to perform Key Wrapping*
- *implement functionality to perform Key Wrapping*

] in accordance with a specified cryptographic algorithm **selection:**

- *AES Key Wrap*,
- *AES Key Wrap with Padding*,
- *RSA using the KTS-OAEP-basic scheme*,
- *RSA using the KTS-OAEP-receiver-confirmation scheme*,
- *ECC CDH*

] and the cryptographic key size **selection:**

- *128 bits (AES)*,
- *256 bits (AES)*,
- *2048 (RSA)*,
- *4096 (RSA)*,
- *256-bit prime*,
- *modulus (ECC CDH)*,
- *384-bit prime modulus (ECC CDH)*

] that meet the following: **selection:**

- *"NIST SP 800-38F" for Key Wrap (section 6.2) and Key Wrap with Padding (section 6.3)*,
- *"NIST SP 800-56B" for RSA using the KTS-OAEP-basic (section 9.2.3) and KTS-OAEP-receiver-confirmation (section 9.2.4) scheme, "NIST SP 800-56A rev 2" for ECC CDH (sections 5.6.1.2 and 6.2.2.2)*

].

Application Note: In the first selection, the ST author chooses the entity that performs the decryption/encryption. In the second selection, the ST author chooses the method used for encryption:

- Using one of the two AES-based Key Wrap methods specified in NIST SP 800-38F;
- Using one of the two the KTS-OAEP schemes for RSA as described in NIST SP 800-56B (KTSOAEP-basic described in section 9.2.3
- Using ECC CDH as described in NIST SP 800-56A section 6.2.2.2.

The third selection should be made to reflect the key size. 2048/4096 is used for the RSA-based schemes, while the size of the prime modulus is used for ECC-based schemes. Support for 256-bit AES key sizes will be required for products entering evaluation after Quarter 3, 2015. Based on the method(s) selected, the last selection should be used to select the appropriate reference(s).

5.2 TOE Security Functional Requirements

This module does not define any mandatory SFRs.

6 Consistency Rationale

6.1 Application Software Protection Profile

6.1.1 Consistency of TOE Type

If this PP-Module is used to extend the ApSo PP, the TOE type for the overall TOE is still an Software-based Application. The TOE boundary is simply extended to include the Email Client functionality that is built into the Application so that additional security functionality is claimed within the scope of the TOE.

6.1.2 Consistency of Security Problem Definition

The threats defined by this PP-Module (see section 3.1) supplement those defined in the ApSo PP as follows:

PP-Module Threat	Consistency Rationale
T.FLAWED_ADDON	The threat of a user installing a flawed add on is consistent with .

6.1.3 Consistency of Objectives

The objectives for the TOEs are consistent with the ApSo PP based on the following rationale:

PP-Module Threat	Consistency Rationale
O.MANAGEMENT	This objective is consistent with ApSo.
O.PROTECTED_STORAGE	This objective is consistent with ApSo..
O.PROTECTED_COMMS	This objective is consistent ApSo..
O.ADDON_INTEGRITY	This objective is consistent ApSo.

This PP-Module does not define any objectives for the TOE's operational environment.

6.1.4 Consistency of Requirements

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

PP-Module Requirement	Consistency Rationale
Modified SFRs	
This PP-Module does not modify any requirements when the ApSo PP is the base.	
Additional SFRs	
FCS_SMIME_EXT.1	This SFR defines how email messages are formatted when sent and received by the client. It does not impact the ApSo PP functionality.
FCS_CKM_EXT.3	This SFR defines how keys and key material are saved by the email client. It does not impact the ApSo PP functionality.
FCS_CKM_EXT.4	This SFR defines how email messages are formated when sent and received by the client. It does not impact the ApSo PP functionality.
FCS_KYC_EXT.1	This SFR defines how email clients maintain key chains. It does not impact the ApSo PP functionality.
FDP_NOT_EXT.1	This SFR defines the behavior an email client exhibits when a message is received. It does not impact the ApSo PP functionality.
FDP_SMIME_EXT.1	This SFR defines the format an email client shall use as output for cryptographic operations. It does not impact the ApSo PP functionality.
FIA_X509_EXT.3	This SFR defines the format an email client shall use for certificates to perform encryption and authentication. It does not impact the ApSo PP functionality.
FMT_MOF_EXT.1	This SFR defines a specific set of management functions for an email client. It does not impact the ApSo PP functionality.
FPT_AON_EXT.1	This SFR defines what types of plugins an email client may use. It does not impact the ApSo PP functionality.
FTP_ITC_EXT.1	This SFR defines which channels for an email client must be considered trusted. It does not impact the ApSo PP functionality.
Mandatory SFRs	
This PP-Module does not define any mandatory requirements.	
Optional SFRs	
FCS_CKM_EXT.5	
FCS_SAG_EXT.1	This SFR defines how clients generate salts for cryptographic operations. It does not impact functionality described by the ApSo PP.
FCS_NOG_EXT.1	This SFR defines how clients generate nonces for cryptographic operations. It does not impact functionality described by the ApSo PP.
FCS_IVG_EXT.1	This SFR defines how clients generate IVs for cryptographic operations. It does not impact functionality described by the ApSo PP.
FDP_NOT_EXT.2	This SFR defines how clients display URIs in embedded links It does not impact functionality described by the ApSo PP.
FDP_PST_EXT.1	This SFR defines how clients display URIs in embedded links It does not impact functionality described by the ApSo PP.
FDP_REN_EXT.1	This SFR defines functionality to display message content. It does not impact functionality described

by the ApSo PP.

Selection-based SFRs

FPT_AON_EXT.2	This SFR defines how email clients to verify Add-Ons. It does not impact functionality described by the ApSo PP.
FIA_SASL_EXT.1	This SFR defines an alternate method of transmitting messages. It does not impact functionality described by the ApSo PP.
FCS_SMC_EXT.1	This SFR defines how clients combine keys. It does not impact functionality described by the ApSo PP.
FCS_COP_EXT.2	This SFR defines how clients wrap keys. It does not impact functionality described by the ApSo PP.

Objective SFRs

This PP-Module does not define any objective requirements.

Appendix A - Optional SFRs

As indicated in the introduction to this PP-Module, the baseline requirements (those that must be performed by the TOE or its underlying platform) are contained in the body of this PP-Module. Additionally, there are three other types of requirements specified in Appendices A, B, and C. The first type (in this Appendix) are requirements that can be included in the ST, but do not have to be in order for a TOE to claim conformance to this PP-Module. The second type (in Appendix B) are requirements based on selections in the body of the PP-Module: if certain selections are made, then additional requirements in that appendix will need to be included. The third type (in Appendix C) are components that are not required in order to conform to this PP-Module, but will be included in the baseline requirements in future versions of this PP-Module, so adoption by VPN Client vendors is encouraged. Note that the ST author is responsible for ensuring that requirements that may be associated with those in Appendix A, Appendix B, and/or Appendix C but are not listed (e.g., FMT-type requirements) are also included in the ST.

FCS_CKM_EXT.5 Cryptographic Key Derivation (Password/Passphrase Conditioning)

FCS_CKM_EXT.5.1 A password/passphrase used to generate a password authorization factor shall enable up to [assignment: *positive integer of 64 or more*] characters in the set of [selection:

- *upper case characters,*
- *lower case characters,*
- *numbers,*
- *special characters: !, @, #, \$, %, ^, &, *, (,)*
- [assignment: *other supported special characters*]

] and shall perform [Password-based Key Derivation Functions] in accordance with a specified cryptographic algorithm [selection:

- *HMAC-SHA-256,*
- *HMAC-SHA-384,*
- *HMAC-SHA-512*

] with [assignment: *positive integer of 4096 or more*] iterations, and output cryptographic key sizes of [selection:

- *128 bits,*
- *256 bits*

] that meet NIST SP 800-132.

Application Note: The password/passphrase is represented on the host machine as a sequence of characters whose encoding depends on the email client and the underlying OS. This sequence must be conditioned into a string of bits that is to be used as a key of equivalent size to the rest of the key chain.

This password/passphrase must be conditioned into a string of bits that forms the submask to be used as input into a key. Conditioning can be performed using one of the identified hash functions or the process described in NIST SP 800-132; the method used is selected by the ST Author. SP 800-132 requires the use of a pseudo-random function (PRF) consisting of HMAC with an approved hash function. The ST author selects the hash function used, also includes the appropriate requirements for HMAC and the 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.

There are two aspects of this component that require evaluation: passwords/passphrases of the length specified in the requirement (at least 64 characters) are supported, and that the characters that are input are subject to the selected conditioning function. These activities are separately addressed in the tests below.

FCS_SAG_EXT.1 Cryptographic Salt Generation

FCS_SAG_EXT.1.1 The email client shall only use salts that are generated by a [selection:

- *RNG as specified in FCS_RBG_EXT.1,*
- *RNG provided by the host platform*

]

Application Note: The salt must be random.

FCS_NOG_EXT.1 Cryptographic Nonce Generation

FCS_NOG_EXT.1.1 The email client shall only use unique nonces with a minimum size of [64] bits.

Application Note: Nonces must be unique.

FCS_IVG_EXT.1 Initialization Vector Generation

FCS_IVG_EXT.1.1 The email client shall create IVs in the following manner: [selection:

- *CBC: IVs shall be non-repeating,*
- *CCM: IV shall be non-repeating,*
- *XTS: No IV. Tweak values shall be non-negative integers, assigned consecutively, and starting at an arbitrary non-negative integer,*
- *GCM: IV shall be non-repeating. The number of invocations of GCM shall not exceed 2^{32} for a given secret key.*

]

Application Note: FCS_IVG_EXT.1.1 specifies how the IV should be handled for each encryption mode. CBC, XTS, and GCM are allowed for AES encryption of the data. AES-CCM is an allowed mode for Key Wrapping.

FDP_NOT_EXT.2 Notification of URI

FDP_NOT_EXT.2.1 The email client shall display the full Uniform Resource Identifier (URI) of any embedded links.

Application Note: Embedded links are HTML URI objects which may have a tag (such as a word, phrase, icon, or picture) that obfuscates the URI of the link. The intent of this requirement is to de-obfuscate the link. The URI may be displayed as a "mouse-over" event or may be rendered next to the tag.

FDP_PST_EXT.1 Storage of Persistent Information

FDP_PST_EXT.1.1 The email client shall be capable of operating without storing persistent information to the client platform with the following exceptions: [selection: *credential information, administrator*

provided configuration information, certificate revocation information, no exceptions].

Application Note: Any data that persists after the email client closes, including temporary files, is considered to be persistent data. Satisfying this requirement would require the use of a protocol such as IMAP or MAPI. It is not compatible with POP.

FDP_REN_EXT.1 Rendering of Message Content

FDP_REN_EXT.1.1 The email client shall have a plaintext-only mode which disables the rendering and execution of **[selection:**

- *HTML,*
- *JavaScript,*
- **[assignment:** *other embedded content types*],
- *no embedded content types*

].

Application Note: Plaintext only mode prevents the automatic downloading, rendering and execution of images, external resources and embedded objects such as HTML or JavaScript objects. [FMT_MOF_EXT.1.1](#) addresses configuration of this mode. The ST author must identify all content types supported by the email client through selections and/or assignments. If the email client only supports plaintext only mode, no embedded content types should be selected.

Appendix B - Selection-based SFRs

As indicated in the introduction to this PP-Module, the baseline requirements (those that must be performed by the TOE or its underlying platform) are contained in the body of this PP-Module. There are additional requirements based on selections in the body of the PP-Module: if certain selections are made, then additional requirements below will need to be included.

FPT_AON_EXT.2 Trusted Installation and Update for Add-ons

- FPT_AON_EXT.2.1 The email client shall [selection: *provide the ability, leverage the platform*] to provide a means to cryptographically verify add-ons using a digital signature mechanism and [selection: *published hash, no other functions*] prior to installation and update.
- FPT_AON_EXT.2.2 The email client shall [selection: *provide the ability, leverage the platform*] to query the current version of the add-on.
- FPT_AON_EXT.2.3 The email client shall prevent the automatic installation of add-ons.

FIA_SASL_EXT.1 Simple Authentication and Security Layer (SASL)

- FIA_SASL_EXT.1.1 The email client shall implement support for Simple Authentication and Security Layer (SASL) that complies with RFC 4422.

Application Note: SASL is needed if the email implements SMTP to send messages. Clients that do not use SMTP (e.g., ActiveSync or MAPI) would not need to implement support for SASL.

- FIA_SASL_EXT.1.2 The email client shall support the POP3 CAPA and AUTH extensions for the SASL mechanism.
- FIA_SASL_EXT.1.3 The email client shall support the IMAP CAPABILITY and AUTHENTICATE extensions for the SASL mechanism.
- FIA_SASL_EXT.1.4 The email client shall support the SMTP AUTH extension for the SASL mechanism.

Application Note: In order for an email client to support PKI X.509 Certificates for POP3, IMAP and SMTP as required in this document, the client must support the Simple Authentication and Security Layer (SASL) authentication method as described in RFC 4422, the AUTH and CAPA extensions for POP3, as described in RFC 5034, the AUTHENTICATION and CAPABILITY extensions for IMAP, as described in RFC 4959 and the AUTH extension for SMTP, as described in RFC 4954.

FCS_SMC_EXT.1 Key Combining

- FCS_SMC_EXT.1.1 The email client shall combine submasks using the following method [selection:
 - *exclusive OR (XOR)*,
 - *SHA-256*,
 - *SHA-512*] to generate another key.

Application Note: This requirement specifies the way that a product may combine the various submasks by using either an XOR or an approved SHA-hash.

FCS_COP_EXT.2 Key Wrapping

- FCS_COP_EXT.2.1 The email client shall [selection:
 - *use platform-provided functionality to perform Key Wrapping*
 - *implement functionality to perform Key Wrapping*] in accordance with a specified cryptographic algorithm [selection:
 - *AES Key Wrap*,
 - *AES Key Wrap with Padding*,
 - *RSA using the KTS-OAEP-basic scheme*,
 - *RSA using the KTS-OAEP-receiver-confirmation scheme*,
 - *ECC CDH*] and the cryptographic key size [selection:
 - *128 bits (AES)*,
 - *256 bits (AES)*,
 - *2048 (RSA)*,
 - *4096 (RSA)*,
 - *256-bit prime*,
 - *modulus (ECC CDH)*,
 - *384-bit prime modulus (ECC CDH)*] that meet the following: [selection:
 - *"NIST SP 800-38F" for Key Wrap (section 6.2) and Key Wrap with Padding (section 6.3)*,
 - *"NIST SP 800-56B" for RSA using the KTS-OAEP-basic (section 9.2.3) and KTS-OAEP-receiver-confirmation (section 9.2.4) scheme, "NIST SP 800-56A rev 2" for ECC CDH (sections 5.6.1.2 and 6.2.2.2)*].

Application Note: In the first selection, the ST author chooses the entity that performs the decryption/encryption. In the second selection, the ST author chooses the method used for encryption:

- Using one of the two AES-based Key Wrap methods specified in NIST SP 800-38F;
- Using one of the two the KTS-OAEP schemes for RSA as described in NIST SP 800-56B (KTSOAEP-basic described in section 9.2.3
- Using ECC CDH as described in NIST SP 800-56A section 6.2.2.2.

The third selection should be made to reflect the key size. 2048/4096 is used for the RSA-based schemes, while the size of the prime modulus is used for ECC-based schemes. Support for 256-bit AES key sizes will be required for products entering evaluation after Quarter 3, 2015. Based on the method(s) selected, the last selection should be used to select the appropriate reference(s).

Appendix C - Objective SFRs

This section is reserved for requirements that are not currently prescribed by this PP-Module but are expected to be included in future versions of the PP-Module. Vendors planning on having evaluations performed against future products are encouraged to plan for these objective requirements to be met.

This module does not define any objective SFRs.

Appendix D - Bibliography

Identifier	Title
[CC]	Common Criteria for Information Technology Security Evaluation - <ul style="list-style-type: none">• Part 1: Introduction and General Model, CCMB-2017-04-001, Version 3.1, Revision 5, April 2017.• Part 2: Security Functional Components, CCMB-2017-04-002, Version 3.1, Revision 5, April 2017.• Part 3: Security Assurance Components, CCMB-2017-04-003, Version 3.1, Revision 5, April 2017.
[AppPP]	Protection Profile for Application Software
[MS-OXCMAPHTTP]	Messaging Application Programming Interface (MAPI) Extensions for HTTP

Appendix E - Acronyms

Acronym	Meaning
AES	Advanced Encryption Standard
CBC	Cipher Block Chaining
CMS	Cryptographic Message Syntax
CRL	Certificate Revocation List
CSP	Critical Security Parameter
DRBG	Deterministic Random Bit Generator
ECDSA	Elliptic Curve Digital Signature Algorithm
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure
IETF	Internet Engineering Task Force
IV	Initialization Vector
MTA	Mail Transfer Agent
NIST	National Institute of Standards and Technology
PBKDF	Password-Based Key Derivation Function
PDF	Portable Document Format
RBG	Random Bit Generator
RFC	Request for Comment (IETF)
RSA	Rivest Shamir Adelman
TLS	Transport Layer Security