

# **Protection Profile for Mobile Device Management**



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**National Information Assurance Partnership**

## Revision History

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Version	Date	Comment
1.0	2013-10-21	Initial Release
1.1	2014-02-07	Typographical changes and clarifications to front-matter
2.0	2014-12-31	Separation of MDM Agent SFRs Updated cryptography, protocol, X.509 requirements. Updated management functions to match MDFPPv2.0. Included SSH as a remote administration protocol. Removed IPsec as protocol to communicate to MDM Agent. Added X509 enrollment objective requirement. Added Optional Mobile Application Store requirements.
3.0	2016-11-21	Updates to align with Technical Decisions Added requirements to support BYOD use case Removed IPsec and SSH requirements, which are now contained in EPs
4.0	2018-09-24	Updates to align with Technical Decisions Removed platform dependency Removed TLS SFRs and utilize the TLS Functional Package Allowed for a distributed TOE

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# 1 Introduction

## 1.1 Overview

Mobile device management (MDM) products allow enterprises to apply security policies to mobile devices, such as smartphones and tablets. The purpose of these policies is to establish a security posture adequate to permit mobile devices to process enterprise data and connect to enterprise network resources.

This document provides a baseline set of Security Functional Requirements (SFRs) for an MDM system, which is the Target of Evaluation (TOE). The MDM System is only one component of an enterprise deployment of mobile devices. Other components, such as the mobile device platforms, which enforce the security policies and network access control servers are out of scope.

## 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.
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.
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 Protection Profiles.
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.
TOE Security Functionality	The security functionality of the product under evaluation.

**TOE Summary** A description of how a TOE satisfies the SFRs in an ST.  
**Specification**  
**(TSS)**

**Target of Evaluation** (TOE) The product under evaluation.

### 1.2.2 Technical Terms

API Application Programming Interface (API)	A specification of routines, data structures, object classes, and variables that allows an application to make use of services provided by another software component, such as a library. APIs are often provided for a set of libraries included with the platform.
Administrator	The person who is responsible for management activities, including setting the policy that is applied by the enterprise on the mobile device.
Critical Security Parameter (CSP)	Security-related information whose disclosure or modification can compromise the security of a cryptographic module and/or authentication system.
Data	Program or application or data files that are stored or transmitted by a server or MD.
Data Encryption Key (DEK)	A key used to encrypt data-at-rest.
Developer Modes	States in which additional services are available to a user in order to provide enhanced system access for debugging of software.
Enrolled State	The state in which a mobile device is managed by a policy from an MDM.
Enrollment over Secure Transport (EST)	Cryptographic protocol that describes an X.509 certificate management protocol targeting public key infrastructure (PKI) clients that need to acquire client certificates and associated certificate authority (CA) certificates.
Enterprise Applications	Applications that are provided and managed by the enterprise as opposed to a public application store.
Enterprise Data	Any data residing in enterprise servers or temporarily stored on mobile devices to which the mobile device user is allowed access according to the security policy defined by the enterprise and implemented by the administrator.
Key Encryption Key (KEK)	A key that is used to encrypt other keys, such as (DEKs) or storage repositories that contain keys.
Locked State	Mobile device state where the device is powered on but most functionality is unavailable for use without authentication.
Mobile Device (MD)	A device which is composed of a hardware platform and its system software. The device typically provides wireless connectivity and may include software for functions like secure messaging, email, web, VPN connection, and VoIP (Voice over IP), for access to the protected enterprise network, enterprise data and applications, and for communicating to other MDs.
Mobile Device Management (MDM)	Products that allow enterprises to apply security policies to MDs. This system consists of two primary components: the MDM Server and the MDM Agent.
Mobile Device User	The person who uses and is held responsible for an MD.
Operating System (OS)	Software which runs at the highest privilege level and can directly control hardware resources. Modern mobile devices typically have at least two primary operating systems: one which runs on the cellular baseband processor and one which runs on the application processor. The platform of the application processor handles most user interaction and provides the execution environment for apps. The platform of the cellular baseband processor handles communications with the cellular network and may control other

peripherals. The term OS, without context, may be assumed to refer to the platform of the application processor.

Powered-Off State	Mobile device shutdown state.
Protected Data	All non-TSF data on the mobile device, including user or enterprise data. Protected data is encrypted while the mobile device is in the powered-off state. This includes keys in software-based storage. May overlap with sensitive data.
Root Encryption Key (REK)	A key tied to a particular device that is used to encrypt all other keys for that device.
Sensitive Data	Data that is encrypted by the mobile device. May include all user or enterprise data or may be data for specific applications such as emails, messaging, documents, calendar items, or contacts. May be protected while the mobile device is in the locked state. Must include at minimum some keys in software-based key storage.
Trust Anchor Database	A list of trusted root Certificate Authority certificates.
Unenrolled State	Mobile device state when it is not managed by an MDM.
Unlocked State	Mobile device state where it is powered on and its functionality is available for use.

## 1.3 Compliant Targets of Evaluation

The Mobile Device Management (MDM) system consists of two primary components: the MDM Server software and the MDM Agent. Optionally, the MDM system may consist of a separate Mobile Application Store (MAS) server.

### 1.3.1 TOE Boundary

The MDM system operational environment consists of the mobile device on which the MDM Agent resides, the platform on which the MDM Server runs, and an untrusted wireless network over which they communicate, as pictured below.



**Figure 1: MDM System Operating Environment**

The **MDM Server** is software (an application, service, etc.) on a general-purpose platform, a network device, or cloud architecture executing in a trusted network environment. The MDM Server provides administration of the mobile device policies and reporting on mobile device behavior. The MDM Server is responsible for managing device enrollment, configuring and sending policies to the MDM Agents, collecting reports on device status, and sending commands to the Agents. The MDM Server may be standalone or distributed, where a distributed TOE is one that requires multiple distinct components to operate as a logical whole in order to fulfill the requirements of this PP (a more extensive description of distributed MDMs is given in section 3).

The **MDM Agent** establishes a secure connection back to the MDM Server controlled by an enterprise administrator and configures the mobile device per the administrator's policies. The MDM Agent is addressed in the PP-Module for MDM Agents. If the MDM Agent is installed on a mobile device as an application developed by the MDM developer, the PP-Module extends this PP and is included in the TOE. In this case, the TOE security functionality specified in this PP must be addressed by the MDM Agent in addition to the MDM Server. Otherwise, the MDM Agent is provided by the mobile device vendor and is out of scope of this PP; however, MDMs are required to indicate the mobile platforms supported by the MDM Server and must be tested against the native MDM agent of those platforms.

The **Mobile Application Store (MAS)** hosts applications for the enterprise, authenticates Agents, and securely transmits applications to enrolled mobile devices. The MAS functionality can be included as part of the MDM Server Software or can be logically distinct. If the MAS functionality is on a physically separate server, then the TOE is distributed with the MDM Server and MAS Server being separate components.

## 1.4 Use Cases

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This PP defines four use cases:

### [USE CASE 1] Enterprise-owned device for general-purpose enterprise use

An enterprise-owned device for general-purpose business use is commonly called Corporately Owned, Personally Enabled (COPE). This use case entails a significant degree of enterprise control over configuration and software inventory. Enterprise administrators use an MDM product to establish policies on the mobile devices prior to user issuance. Users may use internet connectivity to browse the web, access corporate mail, or run enterprise applications, but this connectivity may be under significant control of the enterprise. The user may also be expected to store data and use applications for personal, non-enterprise use. The enterprise administrator uses the MDM product to deploy security policies and query mobile device status. The MDM may issue commands for remediation actions.

### [USE CASE 2] Enterprise-owned device for specialized, high-security use

An enterprise-owned device with intentionally limited network connectivity, tightly controlled configuration, and limited software inventory is appropriate for specialized, high-security use cases. As in the previous use case, the MDM product is used to establish such policies on mobile devices prior to issuance to users. The device may not be permitted connectivity to any external peripherals. It may only be able to communicate via its Wi-Fi or cellular radios with the enterprise-run network, which may not even permit connectivity to the internet. Use of the device may require compliance with usage policies that are more restrictive than those in any general-purpose use case, yet may mitigate risks to highly sensitive information. Based upon the operation environment and the acceptable risk level of the enterprise, those security functional requirements outlined in Section 5 of this PP along with the selections in the Use Case 2 template defined in Appendix G are sufficient for the high-security use case.

### [USE CASE 3] Personally-owned device for personal and enterprise use

A personally owned device which is used for both personal activities and enterprise data is commonly called Bring Your Own Device (BYOD). The device may be provisioned for access to enterprise resources after significant personal usage has occurred. Unlike in the enterprise-owned cases, the enterprise is limited in what security policies it can enforce because the user purchased the device primarily for personal use and is unlikely to accept policies that limit the functionality of the device.

However, because the enterprise allows the user full (or nearly full) access to the enterprise network, the enterprise will require certain security policies, for example a password or screen lock policy and health reporting, such as the integrity of the mobile device system software, before allowing access. The administrator of the MDM can establish remediation actions, such as wipe of the enterprise data, for non-compliant devices. These controls could potentially be enforced by a separation mechanism built-in to the device itself to distinguish between enterprise and personal activities, or by a third-party application that provides access to enterprise resources and leverages security capabilities provided by the mobile device. Based upon the operational environment and the acceptable risk level of the enterprise, those security functional requirements outlined in Section 5 of this PP along with the selections in the Use Case 3 template defined in Appendix G are sufficient for the secure implementation of this BYOD use case.

### [USE CASE 4] Personally owned device for personal and limited enterprise use

A personally owned device may also be given access to limited enterprise services such as enterprise email. The enterprise may not need to enforce any security policies on this device because the user does not have full access to the enterprise or enterprise data. However, the enterprise may want secure email and web browsing with assurance that the services being provided to those clients by the mobile device are not compromised. Based upon the operational environment and the acceptable risk level of the enterprise, those security functional requirements outlined in Section 5 of this PP are sufficient for the secure implementation of this BYOD use case.

## 2 Conformance Claims

A Security Target (ST) must claim exact conformance to this PP, as defined in the CC and CEM addenda for Exact Conformance, Selection-Based SFRs, and Optional SFRs (dated May 2017).

This PP is conformant to Parts 2 (extended) and 3 (conformant) of Common Criteria Version 3.1, Release 5.

This PP does not claim conformance to any PP.

This PP is TLS Package Version 1.1 Conformant.

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

- PP-Module for MDM Agent, Version 1.0
- PP-Module for VPN Client, Version 2.1
- Protection Profile for Mobile Device Fundamentals, Version 3.1
- Protection Profile for Application Software, Version 1.3

# 3 Introduction to Distributed TOEs

This PP includes support for distributed MDM TOEs. MDMs can sometimes be composed of multiple components operating as a logical whole. Frequently we see this architecture when dealing with products hosted in the cloud and offered as Software as a Service. There are a number of different architectures; but fundamentally, they are variations of the following model where the SFRs of this PP can only be fulfilled if the components are deployed and operate together. To be considered a distributed TOE, a minimum of two interconnected components are required.

## 3.1 Registration of Distributed TOE Components

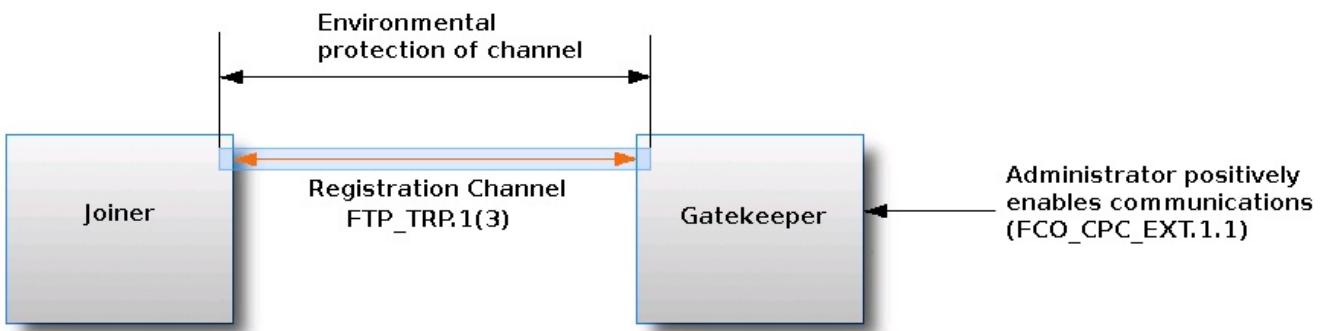
When dealing with a distributed TOE, a number of separate components need to be brought together in the operational environment in order to create the TOE. This requires that trusted communications channels are set up between certain pairs of components (it is assumed that all components need to communicate with at least one other component, but not that all components need to communicate with all other components). The underlying model for creation of the TOE is to have a "registration process" in which components "join" the TOE. The registration process starts with two components, one of which (the "joiner") is about to join an existing TOE by registering with the other (the "gatekeeper"). The two components will use one or more specified authentication and communication channel options so that the components authenticate each other and protect any sensitive data that is transmitted during the registration process (e.g. a key might be sent by a gatekeeper to the joiner as a result of the registration). The following figures illustrate the three supported registration models. [Figure 2](#) illustrates a distributed TOE registration approach which uses an instance of [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) to protect the registration exchange.



- 1) Registration may be performed over any untrusted network
- 2) Registration performed over IPsec, TLS, SSH, or HTTPS channel
- 3) Choose FPT\_ITT.1(1) if certificate revocation checking is not performed
- 4) Choose FPT\_ITT.1(2) if registration is between the TSF and an MDM agent that is included in the TOE
- 5) Choose FTP\_ITC.1 if certificate revocation checking is performed
- 6) Registration channel may be re-used for internal TSF communications

**Figure 2: Distributed TOE registration using channel satisfying [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1/INTER\\_XFER\\_IT](#)**

The second approach ([Figure 3](#)) uses an alternative registration channel and supports use cases where the channel relies on environmental security constraints to provide the necessary protection of the registration exchange.



- 1) Registration channel must be authenticated, provide integrity protection and optionally confidentiality
- 2) Registration channel relies on environmental constraints for some aspects of its protection, or to increase strength of protection, e.g. direct physical connection between Joiner and Gatekeeper (FTP\_TRP.1(3))
- 3) Registration channel must not be re-used and must be replaced after registration is complete with an internal TSF channel that satisfies either FPT\_ITT.1(1)/FPT\_ITT.1(2) or FTP\_ITC.1

**Figure 3: Distributed TOE registration using channel satisfying [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#)**

The final approach (Figure 4) supports use cases where registration is performed manually through direct configuration of both the Joiner and Gatekeeper devices. Once configured, the two components establish an internal TSF channel that satisfies [FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1/INTER\\_XFER\\_IT](#).



- 1) Joiner and Gatekeeper are manually pre-configured with information necessary to build inter-TOE communications channel
- 2) Once configured, Joiner and Gatekeeper establish internal TSF channel that satisfies either FPT\_ITT.1(1)/FPT\_ITT.1(2) or FTP\_ITC.1

**Figure 4: Distributed TOE registration without a registration channel**

In each case, during the registration process, the administrator must positively enable the joining components before it can act as part of the TSF. Figure 5 illustrates the approaches that this enablement step may take;



**Figure 5: Joiner enablement options for Distributed TOE's**

Note that in the case where no registration channel is required, that is the joiner and gatekeeper are directly configured (Figure 4), enablement is implied as part of this direct configuration process.

After registration the components will communicate between themselves using a normal SSH/TLS/DTLS/IPsec/HTTPS channel (which is specified in an ST as an instance of [FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) in terms of [Section 6 Security Requirements](#) and [Table optional](#)). This channel for intercomponent communications is specified at the top level with the new (extended) SFR [FCO\\_CPC\\_EXT.1](#) and is in addition to the other communication channels required for communication with entities outside the TOE (which are specified in an ST as instances of [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) and [FTP\\_TRP.1/TRUSTPATH\\_Rem\\_ADMIN](#)).

### 3.2 Allocation of Requirements in Distributed TOEs

For a distributed TOE, the security functional requirements in this PP need to be met by the TOE as a whole, but not all SFRs will necessarily be implemented by all components. The following categories are defined in order to specify when each SFR must be implemented by a component:

- **All Components ("All")** - All components that comprise the distributed TOE must independently satisfy the requirement.
- **At least one Component ("One")** - This requirement must be fulfilled by at least one component within the distributed TOE.
- **Feature Dependent ("Feature Dependent")** - These requirements will only be fulfilled where the feature is implemented by the distributed TOE component (note that the requirement to meet the PP as a whole requires that at least one component implements these requirements if they are specified in [Section 6 Security Requirements](#)).

[Table 1](#) specifies how each of the SFRs in this PP must be met, using the categories above.

**Table 1: Security Functional Requirements for Distributed TOEs**

Requirement	Description	Distributed TOE SFR Allocation
<a href="#">FAU_ALT_EXT.1</a>	Server Alerts	One
<a href="#">FAU_CRP_EXT.1</a>	Support for Compliance Reporting of Mobile Device Configuration	One
<a href="#">FAU_GEN.1/AUDITGEN</a>	Audit Data Generation	All
<a href="#">FAU_GEN.1/MAS_SERVER</a>	Audit Data Generation	Feature Dependent
<a href="#">FAU_NET_EXT.1</a>	Network Reachability Review	One
<a href="#">FAU_SAR.1</a>	Audit Review	Feature Dependent
<a href="#">FAU_SEL.1</a>	Security Audit Event Selection	One
<a href="#">FAU_STG_EXT.1</a>	External Trail Storage	All

FAU_STG_EXT.2	Audit Event Storage	Feature Dependent
FCO_CPC_EXT.1	Communication Partner Control	All
FCS_CKM.1	Cryptographic Key Generation	Feature Dependent
FCS_CKM.2	Cryptographic Key Establishment	All
FCS_CKM_EXT.4	Cryptographic Key Destruction	All
FCS_COP.1.1/CONF_ALG	Cryptographic Operation (Confidentiality Algorithms)	All
FCS_COP.1.1/HASH_ALG	Cryptographic Operation (Hashing Algorithms)	All
FCS_COP.1.1/SIGN_ALG	Cryptographic Operation (Signature Algorithms)	All
FCS_COP.1.1/KEY_HASH	Cryptographic Operation (Keyed-Hash Message Authentication)	All
FCS_HTTPS_EXT.1	HTTPS Protocol	Feature Dependent
FCS_IV_EXT.1	Initialization Vector Generation	Feature Dependent
FCS_RBG_EXT.1	Random Bit Generation	All
FCS_STG_EXT.1	Cryptographic Key Storage	All
FCS_STG_EXT.2	Encrypted Cryptographic Key Storage	Feature Dependent
FIA_ENR_EXT.1	Enrollment of Mobile Device into Management	One
FIA_UAU.1	Timing of Authentication	One
FIA_UAU_EXT.4/REUSE	User Authentication	One
FIA_UAU_EXT.4/REUSE_ENROLL	User Authentication	One
FIA_X509_EXT.1/CERTVAL_MAN	X.509 Certification Validation	Feature Dependent
FIA_X509_EXT.1/CERTVAL_SEL	X.509 Certification Validation	Feature Dependent
FIA_X509_EXT.2	X.509 Certificate Authentication	Feature Dependent
FIA_X509_EXT.3	X.509 Enrollment	Feature Dependent
FIA_X509_EXT.4	Alternate X.509 Enrollment	Feature Dependent
FIA_X509_EXT.5	X.509 Unique Certificate	One
FMT_MOF.1/FUNCBE	Management of functions behaviour	Feature Dependent
FMT_MOF.1/MANAGEMENT_ENROLL	Management of functions behaviour (Enrollment)	Feature Dependent
FMT_MOF.1/MANAGEMENT_MAS	Management of Functions in (MAS Server Downloads)	Feature Dependent
FMT_POL_EXT.1	Trusted Policy Update	One
FMT_SAE_EXT.1	Security Attribute Expiration	One
FMT_SMF.1/SERVER_CONF_AGENT	Specification of Management Functions (Server configuration of Agent)	One
FMT_SMF.1/SERVER_CONF_SERVER	Specification of Management Functions (Server configuration of Server)	Feature Dependent
FMT_SMF.1/MAS	Specification of Management Functions (MAS Server)	Feature Dependent
FMT_SMR.1/SECMAN_ROLES	Security Management Roles	One
FMT_SMR.1/SECMAN_ROLES_MAS	Security Management Roles	Feature Dependent
FPT_API_EXT.1	Use of Supported Services and API's	All
FPT_ITT.1/INTER_XFER	Internal TOE TSF Data Transfer	Feature Dependent

FPT_ITT.1/INTER_XFER_AGENT	Internal TOE TSF Data Transfer (To MDM Agent)	Feature Dependent
FPT_LIB_EXT.1	Use of Third Party Libraries	All
FPT_TST_EXT.1	Functionality Testing	All (except for MDM Agent components)
FPT_TUD_EXT.1	Trusted Update	All
FTA_TAB.1	Default TOE Access Banners	One
FTP_ITC.1/INTER_XFER_IT	Inter-TSF Trusted Channel (Authorized IT Entities)	One
FTP_ITC.1/INTER_TSF_XFER_AGENT	Inter-TSF Trusted Channel (MDM Agent)	One
FTP_ITC_EXT.1	Trusted Channel	One
FTP_TRP.1/TRUSTPATH_Rem_ADMIN	Trusted Path for Remote Administration	Feature Dependent
FTP_TRP.1/TRUSTPATH_ENROLL	Trusted Path for Enrollment	Feature Dependent
FTP_TRP.1/TRUSTPATH_JOIN	Trusted Path for Joining	Feature Dependent

Only those SFRs included in the ST are required to be audited. The ST for a distributed TOE must include a mapping of SFRs to each of the components of the TOE. (Note that this deliverable is examined as part of the [ASE\\_TSS.1](#) and [AVA\\_VAN.1](#) Evaluation Activities.) The ST for a distributed TOE may also introduce a "minimum configuration" and identify components that may have instances added to an operational configuration without affecting the validity of the CC certification. Appendix E describes Evaluation Activities relating to these equivalency aspects of a distributed TOE (and hence what is expected in the ST).

### 3.3 Security Audit for Distributed TOEs

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For distributed TOEs the handling of audit information might be more complicated than for TOEs consisting only of one component. There are a few basic requirements to be fulfilled:

- Every component must be able to generate audit information.
- Every component must be able to buffer audit information and forward it to another TOE component and optionally store audit information locally.
- For the overall TOE it must be possible to send out audit information to an external audit server.

In general, every component must be able to generate its own audit information. It would be possible that every component also stores its own audit information locally as well as every component could be able to send out audit data to an external audit server. It would also be sufficient that every component would be able to generate its own audit data and buffer it locally before the information is sent out to one or more other TOE components for local storage and/or transmission to an external audit server. For the transfer of audit records between TOE components the secure connection via [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) must be used.

Such a solution would still be suitable to fulfil the requirement that all audit-related SFRs have to be fulfilled by all TOE components, although formally not every component would support local storage or transfer to an external audit server itself.

Regarding the establishment of inter-TOE communication, error conditions as well as successful connection/teardown events should be captured by both ends of the connection.

All TOE components shall be able to generate its own audit data according to [FAU\\_GEN.1](#) for all SFRs that it implements. For distributed TOEs, a mapping shall be provided to show which auditable events according to [FAU\\_GEN.1](#) are covered by which components (also giving a justification that the records generated by each component cover all the SFRs that it implements). The overall TOE has to provide audit information about all events defined for [FAU\\_GEN.1](#). As a result, at least one TOE component has to be assigned to every auditable event defined for [FAU\\_GEN.1](#). The part of the mapping related to [Table atref-mandatory](#) shall be consistent with the mapping of SFRs to TOE components for [ASE\\_TSS.1](#) in the sense that all components defined as generating audit information for a particular SFR should also contribute to that SFR in the mapping for [ASE\\_TSS.1](#). This applies not only to audit events defined for mandatory SFRs but also to all audit events for optional, selection-based, and objective SFRs as defined in [Table optional](#), [Table sel-based](#), and [Table objective](#).

If one or more of the optional audit components [FAU\\_STG\\_EXT.1](#) or [FAU\\_STG\\_EXT.2](#) are selected in the ST derived from this PP, then the SFR mapping for [ASE\\_TSS.1](#) must include a specific identification of the TOE components to which they apply.

# 4 Security Problem Description

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## 4.1 Threats

### T.MALICIOUS\_APPS

Malicious or flawed application threats exist because apps loaded onto a mobile device may include malicious or exploitable code. An administrator of the MDM or mobile device user may inadvertently import malicious code, or an attacker may insert malicious code into the TOE, resulting in the compromise of TOE or TOE data.

### T.NETWORK\_ATTACK

An attacker may masquerade as an MDM Server and attempt to compromise the integrity of the mobile device by sending malicious management commands.

### T.NETWORK\_EAVESDROP

An attacker is positioned on a communications channel or elsewhere on the network infrastructure. Attackers may monitor and gain access to data exchanged between the MDM Server and other endpoints.

### T.PHYSICAL\_ACCESS

The mobile device may be lost or stolen, and an unauthorized individual may attempt to access user data. Although these attacks are primarily directed against the mobile device platform, the TOE configures features, which address these threats.

## 4.2 Assumptions

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### A.COMPONENTS\_RUNNING

This assumption applies to distributed TOEs only. For distributed TOEs it is assumed that the availability of all TOE components is checked as appropriate to reduce the risk of an undetected attack on (or failure of) one or more TOE components. It is also assumed that in addition to the availability of all components it is also checked as appropriate that the audit functionality is running properly on all TOE components.

### A.CONNECTIVITY

The TOE relies on network connectivity to carry out its management activities. The TOE will robustly handle instances when connectivity is unavailable or unreliable.

### A.MDM\_SERVER\_PLATFORM

The MDM Server relies upon a trustworthy platform and local network from which it provides administrative capabilities.

The MDM Server relies on this platform to provide a range of security-related services including reliable timestamps, user and group account management, logon and logout services via a local or network directory service, remote access control, and audit log management services to include offloading of audit logs to other servers. The platform is expected to be configured specifically to provide MDM services, employing features such as a host-based firewall, which limits its network role to providing MDM functionality.

### A.PROPER\_ADMIN

One or more competent, trusted personnel who are not careless, willfully negligent, or hostile, are assigned and authorized as the TOE Administrators, and do so using and abiding by guidance documentation.

### A.PROPER\_USER

Mobile device users are not willfully negligent or hostile, and use the device within compliance of a reasonable Enterprise security policy.

## 4.3 Organizational Security Policies

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### P.ACOUNTABILITY

Personnel operating the TOE shall be accountable for their actions within the TOE.

### P.ADMIN

The configuration of the mobile device security functions must adhere to the Enterprise security policy.

### P.DEVICE\_ENROLL

A mobile device must be enrolled for a specific user by the administrator of the MDM prior to being used in the Enterprise network by the user.

### P.NOTIFY

The mobile user must immediately notify the administrator if a mobile device is lost or stolen so that the administrator may apply remediation actions via the MDM system.

# 5 Security Objectives

## 5.1 Security Objectives for the TOE

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### O.ACCOUNTABILITY

The TOE must provide logging facilities which record management actions undertaken by its administrators.

### O.APPLY\_POLICY

The TOE must facilitate configuration and enforcement of enterprise security policies on mobile devices via interaction with the mobile OS and the MDM Server. This includes the initial enrollment of the device into management through its entire lifecycle, including policy updates and its possible unenrollment from management services.

### O.DATA\_PROTECTION\_TRANSIT

Data exchanged between the MDM Server and the MDM Agent must be protected from being monitored, accessed, or altered.

### O.INTEGRITY

The TOE will provide the capability to perform self tests to ensure the integrity of critical functionality, software, firmware, and data has been maintained. The TOE will also provide a means to verify the integrity of downloaded updates.

### O.MANAGEMENT

The TOE provides access controls around its management functionality.

### O.QUALITY

To ensure quality of implementation, conformant TOEs leverage services and APIs provided by the runtime environment rather than implementing their own versions of these services and APIs. This is especially important for cryptographic services and other complex operations such as file and media parsing. Leveraging this platform behavior relies upon using only documented and supported APIs.

## 5.2 Security Objectives for the Operational Environment

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### OE.COMPONENTS\_RUNNING

For distributed TOEs the administrator ensures that the availability of every TOE component is checked as appropriate to reduce the risk of an undetected attack on (or failure of) one or more TOE components. The administrator also ensures that it is checked as appropriate for every TOE component that the audit functionality is running properly.

### OE.PROPER\_ADMIN

TOE Administrators are trusted to follow and apply all administrator guidance in a trusted manner.

### OE.PROPER\_USER

Users of the mobile device are trained to securely use the mobile device and apply all guidance in a trusted manner.

### OE.IT\_ENTERPRISE

The enterprise IT infrastructure provides security for a network that is available to the TOE and mobile devices that prevents unauthorized access.

### OE.TIMESTAMP

Reliable timestamp is provided by the operational environment for the TOE.

### OE.WIRELESS\_NETWORK

A wireless network will be available to the mobile devices.

## 5.3 Security Objectives Rationale

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This section describes how the assumptions, threats, and organization security policies map to the security objectives.

**Table 2: Security Objectives Rationale**

Threat, Assumption, or OSP	Security Objectives	Rationale
T.MALICIOUS_APPS	O.APPLY_POLICY	The threat T.MALICIOUS_APPS is countered by O.APPLY_POLICY as this provides the capability to limit the ability to install applications on the MD.
	O.INTEGRITY	The threat T.MALICIOUS_APPS is countered by O.INTEGRITY as this provides the capability to perform self-tests to ensure the integrity of critical

		functionality, software/firmware and data has been maintained.
T.NETWORK_ATTACK	O.DATA_PROTECTION_TRANSIT	The threat T.NETWORK_ATTACK is countered by O.DATA_PROTECTION_TRANSIT as this provides authentication of the endpoints of a trusted communication path.
T.NETWORK_EAVESDROP	O.DATA_PROTECTION_TRANSIT	The threat T.NETWORK_EAVESDROP is countered by O.DATA_PROTECTION_TRANSIT as this provides the capability to communicate using one (or more) standard protocols as a means to maintain the confidentiality of data that are transmitted outside and within the TOE.
	O.QUALITY	The threat T.NETWORK_EAVESDROP is countered by O.QUALITY as this provides the capability to invoke platform resources to ensure quality of implementation.
T.PHYSICAL_ACCESS	O.APPLY_POLICY	The threat T.PHYSICAL_ACCESS is countered by O.APPLY_POLICY as this provides the capability to configure and apply security policies to ensure the Mobile Device can protect user and enterprise data that it may store or process.
A.COMPONENTS_RUNNING	OE.COMPONENTS_RUNNING	The operational environment objective OE.COMPONENTS_RUNNING is realized through A.COMPONENTS_RUNNING.
A.CONNECTIVITY	OE.WIRELESS_NETWORK	The operational environment objective OE.WIRELESS_NETWORK is realized through A.CONNECTIVITY.
A.MDM_SERVER_PLATFORM	OE.TIMESTAMP	The operational environment objective OE.TIMESTAMP is realized through A.MDM_SERVER_PLATFORM.
A.PROPER_ADMIN	OE.PROPER_ADMIN	The operational environment objective OE.PROPER_ADMIN is realized through A.PROPER_ADMIN.
A.PROPER_USER	OE.PROPER_USER	The operational environment objective OE.PROPER_USER is realized through A.PROPER_USER.
P.ACOUNTABILITY	O.ACOUNTABILITY	The organizational security policy O.ACOUNTABILITY is realized through P.ACOUNTABILITY.
P.ADMIN	OE.PROPER_ADMIN	The organizational security policy P.ADMIN is realized through OE.PROPER_ADMIN.
P.DEVICE_ENROLL	OE.IT_ENTERPRISE	The organizational security policy P.DEVICE_ENROLL is realized through OE.IT_ENTERPRISE.
P.NOTIFY	OE.PROPER_USER	The organizational security policy P.NOTIFY is realized through OE.PROPER_USER.

# 6 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 (including replacing an assignment with a more restrictive selection) 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."

The SFRs included in this section are derived from Part 2 of the Common Criteria for Information Technology Security Evaluation, Version 3.1, Revision 5, with additional extended functional components.

For a distributed TOE, the ST author should reference [Table 1](#) for guidance on how each SFR should be met. The table details whether SFRs should be met by all TOE components, by at least one TOE component or whether they are dependent upon the feature being implemented by the TOE component. The ST for a distributed TOE must include a mapping of SFRs to each of the components of the TOE. (Note that this deliverable is examined as part of the [ASE\\_TSS.1](#) and [AVA\\_VAN.1](#) Evaluation Activities.) **Test Environment for Evaluation Activities**

As described in the evaluation activities below, the ST for an MDM system is required to list all the supported MDM Agents and MD platforms with which an MDM Server operates. The identified evaluation activities for testing that includes the use of an Agent should be completed for each MDM Agent and platform listed in the ST.

The evaluator's activities for testing that include use of an Agent will ensure that the Server interacts appropriately with the Agent (i.e. sends a policy update to the Agent), but will not ensure that the Agent handles the received data correctly (i.e. appropriately applies the policy to the device), as that is accounted for in the Evaluation Activities in the Mobile Device Fundamentals PP or the PP-Module for Mobile Device Management Agents.

## 6.1 Security Functional Requirements

### 6.1.1 Auditable Events for Mandatory SFRs

**Table 3: Audit Events for Mandatory Requirements**

Requirement	Auditable Events	Additional Audit Record Contents
FAU_ALT_EXT.1	Type of alert	Identity of Mobile Device that sent alert.
FAU_GEN.1/AUDITGEN	No events specified	
FAU_NET_EXT.1	No events specified	
FAU_STG_EXT.1	No events specified	
FCS_CKM.1	<b>[selection: Failure of key generation activity for authentication keys, None]</b>	
FCS_CKM.2	No events specified	
FCS_CKM_EXT.4	No events specified	
FCS_COP.1/CONF_ALG	No events specified	
FCS_COP.1/HASH_ALG	No events specified	
FCS_COP.1/SIGN_ALG	No events specified	
FCS_COP.1/KEY_HASH	No events specified	
FCS_RBG_EXT.1	Failure of the randomization process	
FCS_STG_EXT.1	No events specified	

<a href="#">FIA_ENR_EXT.1</a>	Failure of MD user authentication	Presented username
<a href="#">FIA_UAU.1</a>	No events specified	
<a href="#">FIA_X509_EXT.1/CERTVAL_MAN</a>	Failure to validate X.509 certificate	Reason for failure
<a href="#">FIA_X509_EXT.2</a>	Failure to establish connection to determine revocation status.	
<a href="#">FIA_X509_EXT.5</a>	No events specified	
<a href="#">FMT_MOF.1/FUNCBE</a>	Issuance of command to perform function	Command sent and identity of MDM Agent recipient(s)
<a href="#">FMT_MOF.1/FUNCBE</a>	Change of policy settings	Policy changed and value or full policy
<a href="#">FMT_MOF.1/MANAGEMENT_ENROLL</a>	Enrollment by a user	Identity of user
<a href="#">FMT_POL_EXT.1</a>	No events specified	
<a href="#">FMT_SMF.1/SERVER_CONF_AGENT</a>	No events specified	
<a href="#">FMT_SMF.1/SERVER_CONF_SERVER</a>	Success or failure of function	
<a href="#">FMT_SMR.1/SECMAN_ROLES</a>	No events specified	
<a href="#">FPT_API_EXT.1</a>	No events specified	
<a href="#">FPT_LIB_EXT.1</a>	No events specified	
<a href="#">FPT_TST_EXT.1</a>	Initiation of self-test	
<a href="#">FPT_TST_EXT.1</a>	Failure of self-test	Algorithm that caused failure
<a href="#">FPT_TST_EXT.1</a>	Detected integrity violation	The TSF code file that caused the integrity violation
<a href="#">FPT_TUD_EXT.1</a>	Success or failure of signature verification	
<a href="#">FTP_ITC_EXT.1</a>	No events specified	
<a href="#">FTP_ITC.1/INTER_XFER_IT</a>	Initiation and termination of the trusted channel	Trusted channel protocol Non-TOE endpoint of connection
<a href="#">FTP_TRP.1/TRUSTPATH_Rem_ADMIN</a>	Initiation and termination of the trusted channel	Trusted channel protocol Identity of administrator
<a href="#">FTP_TRP.1/TRUSTPATH_ENROLL</a>	Initiation and termination of the trusted channel	Trusted channel protocol

## 6.1.2 Security Audit (FAU)

### FAU\_ALT\_EXT.1 Server Alerts

#### FAU\_ALT\_EXT.1.1

The TSF shall alert the administrators in the event of any of the following:

- a. Change in enrollment status
- b. Failure to apply policies to a mobile device
- c. [selection: **assignment**: Other events], no other events]

**Application Note:** An alert can be defined as any form of providing straightaway notice to the administrator. An alert is different from an audit record, however the fact that an alert was sent should be audited per FAU\_GEN.1. Email, pop-up notifications, or other methods are acceptable forms of alerts.

The MDM Agent is required to report to the MDM Server on successful application of policies on a managed mobile device, and failures can be inferred from the absence of such alerts. This requirement is intended to ensure that the MDM Server notifies administrators when policies are not properly installed. Failure to properly install policy updates does not affect the enrollment status of

the mobile device.

## Evaluation Activities ▼

### [FAU\\_ALT\\_EXT.1:](#)

#### **TSS**

The evaluator shall examine the TSS and verify that it describes how the alert system is implemented. The evaluator shall also verify that a description of each assigned event is provided in the TSS.

#### **Guidance**

The evaluator shall examine the guidance document and verify that it describes how the alerts can be configured, if configurable.

#### **Tests**

For each MDM Agent/platform listed as supported in the ST:

- **Test 1:** The evaluator shall enroll a device and ensure that the MDM server alerts the administrator of the change in enrollment status. The evaluator shall unenroll (retire) a device and ensure that the MDM server alerts the administrator of the change in enrollment status.
- **Test 2:** The evaluator shall configure policies, which the MDM agent should not be able to apply. These policies shall include:
  - a setting which is configurable on the MDM Server interface but not supported by the platform on which the MDM Agent runs, if any such settings exist
  - a valid configuration setting with an invalid parameter, which may require manual modification of the policy prior to transmission to the device

The evaluator shall deploy such policies and verify that the MDM server alerts the administrator about the failed application of the policy.

- **Test 3:** (Conditional) The evaluator shall trigger each of the events listed and ensure that the MDM Server alerts the administrator.

## **FAU\_CRP\_EXT.1 Support for Compliance Reporting of Mobile Device Configuration**

**This is an objective component.**

### FAU\_CRP\_EXT.1.1

The TSF shall provide [**selection**: an interface that provides responses to queries about the configuration of enrolled devices, an interface that permits the export of data about the configuration of enrolled devices] to authorized entities over a channel that meets the secure channel requirements in [FTP\\_ITC.1/INTER\\_XFER\\_IT](#). The provided information for each enrolled mobile device includes:

- a. The current version of the MD firmware/software
- b. The current version of the hardware model of the device
- c. The current version of installed mobile applications
- d. List of MD configuration policies that are in place on the device (as defined in [FMT\\_SMF.1.1/SERVER\\_CONF\\_AGENT](#))
- e. [**selection**: **[assignment**: list of other available information about enrolled devices], no other information]

**Application Note:** The intent of this requirement is that the MDM Server be able to provide compliance information about enrolled mobile devices for use by other enterprise security infrastructure systems. There are active standards efforts underway by the Internet Engineering Task Force (IETF) Security Automation and Continuous Monitoring (SACM) Working Group and others to define protocols and standards to assess and report upon endpoint device posture. We expect that this requirement will evolve in future versions of this Protection Profile as standards efforts mature.

## Evaluation Activities ▼

### [FAU\\_CRP\\_EXT.1:](#)

#### **Guidance**

The evaluator shall check to ensure that the operational guidance contains instructions on how to access the MDM Server's compliance reporting interface.

#### **Tests**

- **Test 1:** Using the operational guidance, the evaluator shall demonstrate the ability to access the compliance reporting interface from an authorized entity and successfully obtain information about enrolled devices.

- **Test 2:** The evaluator shall attempt to access the compliance reporting interface from an unauthorized entity and demonstrate that the attempt is denied.

## **FAU\_GEN.1/AUDITGEN Audit Data Generation**

### **FAU\_GEN.1.1/AUDITGEN**

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to generate an audit record of the following auditable events:

- a. Start up and shut down of the MDM System
- b. All administrative actions
- c. [selection: Commands issued to the MDM Agent, none]
- d. Specifically defined auditable events listed in [Table atref-mandatory](#)
- e. [selection:
  - **Auditable events defined in Table atref-optional-depfor Strictly Optional SFRs,**
  - **Auditable events defined in Table atref-objective-depfor Objective SFRs,**
  - **Auditable events defined in Table atref-sel-based-depfor Selection-Based SFRs,**
  - **Auditable events defined in the audit table for the TLS Functional Package (see [Table4](#)),**
  - **no other auditable events**
- f. [selection: [assignment: other events], no other events].

]

**Application Note:** This requirement outlines the events for which an audit record must be generated by either the MDM System or the MDM Server platform. Each of these audit records may be written by the MDM System or may be dispatched to the operating system on which it runs. It is acceptable to select both "invoke platform-provided functionality" and "implement functionality." It should be specified which auditable events are completed by the MDM System and which are completed by the MDM platform.

The ST author can include other auditable events in the assignment; they are not limited to the list presented. All audits must contain at least the information mentioned in [FAU\\_GEN.1.2/AUDITGEN](#), but may contain more information which can be assigned.

For distributed TOEs each component must generate an audit record for each of the SFRs that it implements. If more than one TOE component is involved when an audit event is triggered, the event has to be audited on each component (e.g. rejection of a connection by one component while attempting to establish a secure communication channel between two components should result in an audit event being generated by both components). This is not limited to error cases but also includes events about successful actions like successful build up/tear down of a secure communication channel between TOE components.

Item a above requires the auditing of the start-up and shutdown of the given component of the MDM System. If the TOE is distributed, this applies to all components. If the TOE is not distributed then MDM System is equivalent to MDM Server.

Item b above requires all administrative actions to be auditable. Administrative actions refer to any management functions specified by [FMT\\_MOF.1/FUNCBE](#). Thus no additional specification for the auditability of these actions is specified in [Table atref-mandatory](#) aside from those that require additional record content. If the TOE is distributed and the given component does not deal with setting the policy applied to the MDM Agent, it is acceptable to not have any administrative actions to audit.

Item c includes those commands, which may be performed automatically based on triggers or on a schedule. If the TOE component, if distributed, interacts directly with the MDM Agent, then "Commands issued to an MDM Agent" must be selected. If the TOE component, if distributed, does not interact directly with the MDM Agent, then it is acceptable to select "none".

Depending on the specific requirements selected by the ST author from Security Functional Requirements, Optional Requirements, Selection-Based Requirements, and Objective Requirements, the ST author should include the appropriate auditable event from [Table atref-mandatory](#) in the ST for the requirements selected.

**Table4: Auditable Events for Functional Packages**

<b>Requirement</b>	<b>Auditable Events</b>	<b>Additional Audit Record Contents</b>
FCS_TLSC_EXT.1	Failure to establish a TLS session.	Reason for failure.
FCS_TLSC_EXT.1	Failure to verify presented identifier.	Presented identifier and reference identifier.
FCS_TLSS_EXT.1	Failure to establish a TLS session.	Reason for failure.
FCS_DTLSC_EXT.1	Failure of the certificate validity check.	Issuer Name and Subject Name of certificate.
FCS_DTLSS_EXT.1	Failure of the certificate validity check.	Issuer Name and Subject Name of certificate.

**FAU\_GEN.1.2/AUDITGEN**

The TSF shall record within each TSF audit record at least the following information:

- date and time of the event
- type of event
- subject identity
- (if relevant) the outcome (success or failure) of the event
- additional information in [Table atref-mandatory](#)
- **[selection]**
  - **Additional information defined in [Table atref-optional-depfor Strictly Optional SFRs](#),**
  - **Additional information defined in [Table atref-objective-depfor Objective SFRs](#),**
  - **Additional information defined in [Table atref-sel-based-depfor Selection-Based SFRs](#),**
  - **Additional information defined in the audit table for the TLS Functional Package (see [Table4](#)),**
  - **no other auditable events**
- **[assignment: other audit relevant information].**

**Application Note:** This requirement outlines the information to be included in audit records. All audits must contain at least the information mentioned in [FAU\\_GEN.1.2/AUDITGEN](#), but may contain more information which can be assigned. The ST author must identify in the TSS which information of the audit record that is performed by the TSF and that which is performed by the TOE platform.

**Evaluation Activities** ▼**[FAU\\_GEN.1/AUDITGEN](#):****TSS**

*The evaluator shall check the TSS and ensure that it lists all of the auditable events. The evaluator shall check to make sure that every audit event type mandated by the PP is described in the TSS. The evaluator shall verify that for every audit event described in the TSS, the description indicates where the audit event is generated (TSF, TOE platform).*

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

**Guidance**

*The evaluator shall check the administrative guide and ensure that it lists all of the auditable events. The evaluator shall check to make sure that every audit event type mandated by the PP is described.*

*The evaluator shall also make a determination of the administrative actions that are relevant in the context of this PP including those listed in the Management section. The evaluator shall examine the administrative guide and make a determination of which administrative commands are related to the configuration (including enabling or disabling) of the mechanisms*

implemented in the TOE that are necessary to enforce the requirements specified in the PP. The evaluator shall document the methodology or approach taken while determining which actions in the administrative guide are security relevant with respect to this PP. The evaluator may perform this activity as part of the activities associated with ensuring the AGD\_OPE guidance satisfies the requirements.

### Tests

The evaluator shall test the TOEs ability to correctly generate audit records by having the TOE generate audit records for the events listed in the provided table and administrative actions. This should include all instances of an event. The evaluator shall test that audit records are generated for the establishment and termination of a channel for each of the cryptographic protocols contained in the ST. For administrative actions, the evaluator shall test that each action determined by the evaluator above to be security relevant in the context of this PP is auditable.

Note that the testing here can be accomplished in conjunction with the testing of the security mechanisms directly. For example, testing performed to ensure that the administrative guidance provided is correct verifies that [AGD\\_OPE.1](#) is satisfied and should address the invocation of the administrative actions that are needed to verify the audit records are generated as expected.

### TSS

The evaluator shall check the TSS and ensure that it provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field.

### Guidance

The evaluator shall check the administrative guide and ensure that it provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field. The evaluator shall check to make sure that the description of the fields contains the information required in [FAU\\_GEN.1.2/AUDITGEN](#).

### Tests

When verifying the test results from [FAU\\_GEN.1.1/AUDITGEN](#), the evaluator shall ensure the audit records generated during testing match the format specified in the administrative guide, and that the fields in each audit record have the proper entries.

Note that the testing here can be accomplished in conjunction with the testing of the security mechanisms directly. For example, testing performed to ensure that the administrative guidance provided is correct verifies that [AGD\\_OPE.1](#) is satisfied and should address the invocation of the administrative actions that are needed to verify the audit records are generated as expected.

The Auditable Events table includes optional, selection-based and objective requirements. The auditing of these requirements are only required if the requirement is included in the ST.

## FAU\_GEN.1/MAS\_SERVER Audit Generation (MAS Server)

**This is a selection-based component. Its inclusion depends upon selection from .**

### FAU\_GEN.1.1/MAS\_SERVER

**Refinement:** The MAS Server shall be able to generate an audit record of the following auditable events:

- a. Failure to push a new application on a managed mobile device
- b. Failure to update an existing application on a managed mobile device.

**Application Note:** The MDM Agent is required to report to the MAS Server on successful receipt of an application or update on a managed mobile device, and failures can be inferred from the absence of such alerts.

### FAU\_GEN.1.2/MAS\_SERVER

**Refinement:** The [selection: *MAS Server, MAS Server platform*] shall record within each TSF audit record at least the following information:

- date and time of the event
- type of event
- mobile device identity
- [assignment: *other audit relevant information*]

**Application Note:** All audits must contain at least the information mentioned in [FAU\\_GEN.1.2/MAS\\_SERVER](#), but may contain more information which can be assigned. The ST author must identify in the TSS which information of the audit record that is performed by the TSF and that which is performed by the TOE platform.

## Evaluation Activities ▼

## [FAU\\_GEN.1/MAS\\_SERVER:](#)

### **TSS**

*The evaluator shall check the TSS and ensure that it provides a format for audit records.*

### **Guidance**

*The evaluator shall check the administrative guide and ensure that it provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field.*

### **Tests**

*The evaluator shall verify that when an application or update push fails, that the audit records generated match the format specified in the guidance and that the fields in each audit record have the proper entries.*

### **TSS**

*The evaluator shall check the TSS and ensure that it provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field.*

### **Guidance**

*The evaluator shall check the administrative guide and ensure that it provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field. The evaluator shall check to make sure that the description of the fields contains the information required in [FAU\\_STG\\_EXT.2.1](#).*

### **Tests**

*When verifying the test results from [FMT\\_MOF.1.1/FUNCBE](#), the evaluator shall ensure the audit records generated during testing match the format specified in the administrative guide, and that the fields in each audit record have the proper entries.*

*Note that the testing here can be accomplished in conjunction with the testing of the security mechanisms directly. For example, testing performed to ensure that the administrative guidance provided is correct verifies that [AGD\\_OPE.1](#) is satisfied and should address the invocation of the administrative actions that are needed to verify the audit records are generated as expected.*

## **FAU\_NET\_EXT.1 Network Reachability Review**

### **FAU\_NET\_EXT.1.1**

The TSF shall provide authorized administrators with the capability to read the network connectivity status of an enrolled agent.

**Application Note:** The MDM Server establishes the network connectivity status of enrolled agents using periodic reachability event alerts from the agents according to FAU\_ALT\_EXT.2.1 in the MDM Agent PP-Module. This status may be determined by sending an update request from the MDM Server which the Agent is required to respond to or by using scheduled periodic notifications of connectivity initiated by the MDM Agent.

### **Evaluation Activities** ▼

#### [FAU\\_NET\\_EXT.1:](#)

##### **TSS**

*The evaluator ensures that the TSS describes how reachability events are implemented, for each supported mobile platform. The evaluator verifies that this description clearly indicates who (MDM Agent or MDM Server) initiates reachability events.*

##### **Guidance**

*The evaluator shall verify that the guidance instructs administrators on the method of determining the network connectivity status of an enrolled agent.*

##### **Tests**

*For each MDM Agent/platform listed as supported in the ST:*

*The evaluator shall configure the MDM Agent/platform to perform a network reachability test, both with and without such connectivity and shall ensure that by following the guidance, the evaluator can determine results that reflect both.*

## **FAU\_SAR.1 Audit Review**

***This is an optional component. However, applied modules or packages might redefine it as mandatory.***

### **FAU\_SAR.1.1**

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to provide [Authorized Administrators] with the capability to read [all audit data] from the audit records.

#### FAU\_SAR.1.2

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to provide the audit records in a manner suitable for the Authorized Administrators to interpret the information.

**Application Note:** The intent of this requirement is to ensure that the administrator can view and interpret the audit records and to prevent unauthorized users from accessing the logs.

### Evaluation Activities ▼

#### FAU\_SAR.1:

##### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### Guidance

The evaluator shall check the AGD guidance and ensure that it describes how the administrator accesses the audit data and describes the format of the audit record.

##### Tests

The evaluator shall attempt to view the audit record as the authorized administrator and verify that the action succeeds. The evaluator shall ensure the audit records generated during testing match the format specified in the administrative guide.

### FAU\_SEL.1 Security Audit Event Selection

**This is an optional component. However, applied modules or packages might redefine it as mandatory.**

#### FAU\_SEL.1.1

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to select the set of events to be audited from the set of all auditable events based on the following attributes:

- a. event type
- b. success of auditable security events
- c. failure of auditable security events
- d. [assignment: other attributes]

**Application Note:** The intent of this requirement is to identify all criteria that can be selected to trigger an audit event. The ST author must select whether the TSF or the platform maintains the audit record. For the ST author, the assignment is used to list any additional criteria or "none".

### Evaluation Activities ▼

#### FAU\_SEL.1:

##### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### Guidance

The evaluator shall review the administrative guidance to ensure that the guidance itemizes all event types, as well as describes all attributes that are to be selectable in accordance with the requirement, to include those attributes listed in the assignment. The administrative guidance shall also contain instructions on how to set the pre-selection as well as explain the syntax (if

present) for multi-value pre-selection. The administrative guidance shall also identify those audit records that are always recorded, regardless of the selection criteria currently being enforced.

### Tests

The evaluator shall also perform the following tests:

- **Test 1:** For each attribute listed in the requirement, the evaluator shall devise a test to show that selecting the attribute causes only audit events with that attribute (or those that are always recorded, as identified in the administrative guidance) to be recorded.
- **Test 2:** [conditional] If the TSF supports specification of more complex audit pre-selection criteria (e.g., multiple attributes, logical expressions using attributes) then the evaluator shall devise tests showing that this capability is correctly implemented. The evaluator shall also, in the test plan, provide a short narrative justifying the set of tests as representative and sufficient to exercise the capability.

## FAU\_STG\_EXT.1 External Trail Storage

### FAU\_STG\_EXT.1.1

The TSF shall be able to use a trusted channel per [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) to transmit audit data to an external IT entity and [**selection: store audit data locally, no other method**].

**Application Note:** The TOE must be capable of transmitting audit data to an external entity using a trusted channel as specified in [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) and optionally can store audit data locally. If "store audit data locally" is selected, then [FAU\\_STG\\_EXT.2.1](#) must be included in the ST.

This requirement only applies to audit data maintained by the TSF, not audit data that is maintained by the platform. Audit data may include the audit records received from the Agent, in addition to the audit records generated by the MDM Server.

The TOE may rely on a non-TOE audit server for storage and review of audit records. Although the TOE generates audit records and receives audit records from managed mobile devices, the storage of these audit records and the ability to allow the administrator to review these audit records is provided by the operational environment. The TSF may rely on the underlying operating system for this functionality.

Although the audit server is outside of the TOE, the MDM Server should still be able to support mutual authentication. There are no requirements levied on the audit server, but the client (MDM Server) should be able to support TLS client certificate authentication. This way if the non-TOE audit server does support verifying client certs, the MDM Server is in a position to make use of that.

For distributed TOEs each component must be able to export audit data across a protected channel external (FTP\_ITC.1) or intercomponent ([FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1](#)) as appropriate. At least one component of the TOE must be able to export audit records via [FTP\\_ITC.1/INTER\\_XFER\\_IT](#) such that all TOE audit records can be exported to an external IT entity.

### Evaluation Activities ▾

#### [FAU\\_STG\\_EXT.1:](#)

##### **TSS**

The evaluator shall examine the TSS to ensure it describes the means by which the audit data are transferred to the external audit server, and how the trusted channel is provided.

##### **Guidance**

The evaluator shall also examine the operational guidance to determine that it describes the relationship between the local audit data and the audit data that are sent to the audit log server. For example, when an audit event is generated, is it simultaneously sent to the external server and the local store, or is the local store used as a buffer and "cleared" periodically by sending the data to the audit server.

The evaluator shall also examine the operational guidance to ensure it describes how to establish the trusted channel to the audit server, as well as describe any requirements on the audit server (particular audit server protocol, version of the protocol required, etc.), as well as configuration of the TOE needed to communicate with the audit server.

##### **Tests**

Testing of the trusted channel mechanism will be performed as specified in the associated

*evaluation activities for the particular trusted channel mechanism.*

*The evaluator shall perform the following test for this requirement:*

- **Test 1:** *The evaluator shall establish a session between the TOE and the audit server according to the configuration guidance provided. The evaluator shall then examine the traffic that passes between the audit server and the TOE during several activities of the evaluator's choice designed to generate audit data to be transferred to the audit server. The evaluator shall observe that these data are not able to be viewed in the clear during this transfer, and that they are successfully received by the audit server. The evaluator shall record the particular software (name, version) used on the audit server during testing.*

## **FAU\_STG\_EXT.2 Audit Event Storage**

***This is a selection-based component. Its inclusion depends upon selection from .***

### **FAU\_STG\_EXT.2.1**

The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to protect the stored audit records in the audit trail from unauthorized modification.

**Application Note:** If "store audit data locally" is selected in [FAU\\_STG\\_EXT.1.1](#), this SFR shall be included in the ST.

The purpose of this requirement is to ensure that audit records are stored securely. The ST author is responsible for selecting whether audit records are maintained when audit storage or failure occurs. The ST author must choose a means by which audit records are saved and select the events during which the records will be saved. The TSF may rely on the underlying operating system for this functionality, and the first selection should be made appropriately.

### **Evaluation Activities ▾**

#### **[FAU\\_STG\\_EXT.2:](#)**

##### **TSS**

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how the audit record protection functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

*If "implement functionality" is selected, the evaluator shall ensure that the TSS describes how the audit records are protected from unauthorized modification or deletion. The evaluator shall ensure that the TOE uses audit trail specific protection mechanisms.*

##### **Tests**

*The evaluator shall perform the following tests:*

- **Test 1:** *The evaluator shall access the audit trail as an unauthorized user and attempt to modify and delete the audit records. The evaluator shall verify that these attempts fail.*
- **Test 2:** *The evaluator shall access the audit trail as an authorized user and attempt to modify and delete the audit records. The evaluator shall verify that these attempts succeed. The evaluator shall verify that only the records intended for modification and deletion are modified and deleted.*

## **6.1.3 Communication (FCO)**

### **FCO\_CPC\_EXT.1 Component Registration Channel Definition**

***This is an objective component.***

### **FCO\_CPC\_EXT.1.1**

The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to require an Administrator to enable communications between any pair of TOE components before such communication can take place.

### **FCO\_CPC\_EXT.1.2**

The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to implement a registration process in which components establish and use a communications channel that uses [**selection**:

- *A channel that meets the secure channel requirements in [**selection**:*

- A channel that meets the secure registration channel requirements in [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#),
- No channel

] for at least TSF data.

#### FCO\_CPC\_EXT.1.3

The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to enable an administrator to disable communications between any pair of TOE components.

**Application Note:** This SFR is only applicable if the TOE is distributed and therefore has multiple components that need to communicate via an internal TSF channel. When creating the TSF from the initial pair of components, either of these components may be identified as the TSF for the purposes of satisfying the meaning of "TSF" in this SFR.

The intention of this requirement is to ensure that there is a registration process that includes a positive enablement step by an administrator before components joining a distributed TOE can communicate with the other components of the TOE and before the new component can act as part of the TSF. The registration process may itself involve communication with the joining component: many implementations use a bespoke process for this, and the security requirements for the "registration communication" are then defined in [FCO\\_CPC\\_EXT.1.2](#). Use of this "registration communication" channel is not deemed inconsistent with the requirement of [FCO\\_CPC\\_EXT.1.1](#) (i.e. the registration channel can be used before the enablement step, but only in order to complete the registration process).

The channel selection (for the registration channel) in [FCO\\_CPC\\_EXT.1.2](#) is essentially a choice between the use of a normal secure channel that is equivalent to a channel used to communicate with external IT entities ([FTP\\_ITC.1](#)) or existing TOE components ([FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#)), or else a separate type of channel that is specific to registration ([FTP\\_TRP.1/TRUSTPATH\\_JOIN](#)). If the TOE does not require a communications channel for registration (e.g. because the registration is achieved entirely by configuration actions by an administrator at each of the components) then the main selection in [FCO\\_CPC\\_EXT.1.2](#) is completed with the "No channel" option.

If the ST author selects the [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) channel type in the main selection in [FCO\\_CPC\\_EXT.1.2](#) then the TSS identifies the relevant SFR iteration that specifies the channel used. If the ST author selects the [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) channel type, then the TSS (possibly with support from the operational guidance) describes details of the channel and the mechanisms that it uses (and describes how the registration process ensures that the channel can only be used by the intended joiner and gatekeeper). Note that the [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) channel type may require support from security measures in the operational environment (see the definition of [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) for details).

If the ST author selects the [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) channel type in the main selection in [FCO\\_CPC\\_EXT.1.2](#) then the ST identifies the registration channel as a separate iteration of [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) and gives the iteration identifier (e.g. "FPT\_ITT.1/Join") in an ST Application Note for [FCO\\_CPC\\_EXT.1](#).

Note that the channel that is set up and used for registration may be adopted as a continuing internal communication channel (i.e. between different TOE components) provided that the channel meets the requirements of [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#). Otherwise the registration channel is closed after use and a separate channel is used for the internal communications.

Specific requirements for Preparative Procedures relating to [FCO\\_CPC\\_EXT.1](#) are defined in the Evaluation Activities.

#### Evaluation Activities ▼

##### [FCO\\_CPC\\_EXT.1](#):

##### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to

verify that it describes (for each supported platform) how the audit record protection functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how the audit record protection functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how the audit record protection functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

### Guidance

The evaluator shall examine the guidance documentation to confirm that it contains instructions for enabling and disabling communications with any individual component of a distributed TOE. The evaluator shall confirm that the method of disabling is such that all other components can be prevented from communicating with the component that is being removed from the TOE (preventing the remaining components from either attempting to initiate communications to the disabled component, or from responding to communications from the disabled component).

### Tests

- **Test 1:** The evaluator shall confirm that an IT entity that is not currently a member of the distributed TOE cannot communicate with any component of the TOE until the non-member entity is enabled by an administrator for each of the non-equivalent TOE components that it is required to communicate with (non-equivalent TOE components are as defined in the minimum configuration for the distributed TOE)
- **Test 2:** The evaluator shall confirm that after enablement, an IT entity can communicate only with the components that it has been enabled for. This includes testing that the enabled communication is successful for the enabled component pair, and that communication remains unsuccessful with any other component for which communication has not been explicitly enabled.

Some TOEs may set up the registration channel before the enablement step is carried out, but in such a case the channel must not allow communications until after the enablement step has been completed.

- **Test 3:** The evaluator shall separately disable each TOE component in turn and ensure that the other TOE components cannot then communicate with the disabled component, whether by attempting to initiate communications with the disabled component or by responding to communication attempts from the disabled component.

## 6.1.4 Cryptographic Support (FCS)

### FCS\_CKM.1 Cryptographic Key Generation

#### FCS\_CKM.1.1

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to generate **asymmetric** cryptographic keys in accordance with a specified cryptographic key generation algorithm [selection:

- RSA schemes using cryptographic key sizes of 2048-bit or greater that meets FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.3,
- ECC schemes using "NIST curves" P-384 and [selection: P-256, P-521, no other curves] that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.4 ,
- FFC schemes using cryptographic key sizes of 2048-bit or greater that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.1 ,
- FFC schemes using Diffie-Hellman group 14 that meet the following: RFC3526, Section 3,
- FFC schemes using "safe-prime" groups that meet the following: 'NIST Special Publication 800-56A Revision 3, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography"', and [selection: RFC 3526, RFC 7919]

].

**Application Note:** The ST author must select all key generation schemes used for key establishment and MDM authentication. When key generation is used for

key establishment, the schemes in [FCS\\_CKM.2.1](#) and selected cryptographic protocols must match the selection. When key generation is used for MDM authentication, the public key is expected to be associated with an X.509v3 certificate.

If the TOE only acts as a receiver in the RSA key establishment scheme, the TOE does not need to implement RSA key generation.

In a distributed TOE, if the TOE component acts as a receiver in the key establishment scheme, the TOE does not need to implement key generation.

## Evaluation Activities ▼

### [FCS\\_CKM.1](#):

#### TSS

##### **If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key generation functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **If "implement functionality" is selected**

: The evaluator shall ensure that the TSS identifies the key sizes supported by the TOE. If the ST specifies more than one scheme, the evaluator shall examine the TSS to verify that it identifies the usage for each scheme.

#### Guidance

The evaluator shall verify that the AGD guidance instructs the administrator how to configure the TOE to use the selected key generation schemes and key sizes for all uses defined in this PP.

#### Tests

##### **Key Generation for FIPS PUB 186-4 RSA Schemes**

The evaluator shall verify the implementation of RSA Key Generation by the TOE using the Key Generation test. This test verifies the ability of the TSF to correctly produce values for the key components including the public verification exponent  $e$ , the private prime factors  $p$  and  $q$ , the public modulus  $n$  and the calculation of the private signature exponent  $d$ .

Key Pair generation specifies 5 ways (or methods) to generate the primes  $p$  and  $q$ . These include:

1. Random Primes:
  - a. Provable primes
  - b. Probable primes
2. Primes with Conditions:
  - a. Primes  $p_1, p_2, q_1, q_2, p$  and  $q$  shall all be provable primes
  - b. Primes  $p_1, p_2, q_1$ , and  $q_2$  shall be provable primes and  $p$  and  $q$  shall be probable primes
  - c. Primes  $p_1, p_2, q_1, q_2, p$  and  $q$  shall all be probable primes

To test the key generation method for the Random Provable primes method and for all the Primes with Conditions methods, the evaluator must seed the TSF key generation routine with sufficient data to deterministically generate the RSA key pair. This includes the random seed(s), the public exponent of the RSA key, and the desired key length. For each key length supported, the evaluator shall have the TSF generate 25 key pairs. The evaluator shall verify the correctness of the TSF's implementation by comparing values generated by the TSF with those generated from a known good implementation.

If possible, the Random Probable primes method should also be verified against a known good implementation as described above. Otherwise, the evaluator shall have the TSF generate 10 keys pairs for each supported key length  $nlen$  and verify:

- $n = p * q$ ,
- $p$  and  $q$  are probably prime according to Miller-Rabin tests,
- $GCD(p-1, e) = 1$ ,
- $GCD(q-1, e) = 1$ ,
- $2^{16} \leq e \leq 2^{256}$  and  $e$  is an odd integer,
- $|p-q| > 2^{(nlen/2 - 100)}$ ,
- $p \geq \text{sqrt}(2) * (2^{(nlen/2 - 1)})$ ,
- $q \geq \text{sqrt}(2) * (2^{(nlen/2 - 1)})$ ,
- $2^{(nlen/2)} < d < LCM(p-1, q-1)$ ,

- $e^*d = 1 \bmod LCM(p-1, q-1)$ .

## **Key Generation for Elliptic Curve Cryptography (ECC)**

### **FIPS 186-4 ECC Key Generation Test**

For each supported NIST curve, i.e., P-256, P-384 and P-521, the evaluator shall require the implementation under test (IUT) to generate 10 private/public key pairs. The private key shall be generated using an approved random bit generator (RBG). To determine correctness, the evaluator shall submit the generated key pairs to the public key verification (PKV) function of a known good implementation.

### **FIPS 186-4 Public Key Verification (PKV) Test**

For each supported NIST curve, i.e., P-256, P-384 and P-521, the evaluator shall generate 10 private/public key pairs using the key generation function of a known good implementation and modify five of the public key values so that they are incorrect, leaving five values unchanged (i.e., correct). The evaluator shall obtain in response a set of 10 PASS/FAIL values.

## **Key Generation for Finite-Field Cryptography (FFC)**

The evaluator shall verify the implementation of the Parameters Generation and the Key Generation for FFC by the TOE using the Parameter Generation and Key Generation test. This test verifies the ability of the TSF to correctly produce values for the field prime  $p$ , the cryptographic prime  $q$  (dividing  $p-1$ ), the cryptographic group generator  $g$ , and the calculation of the private key  $x$  and public key  $y$ .

The Parameter generation specifies two ways (or methods) to generate the cryptographic prime  $q$  and the field prime  $p$ :

Cryptographic and Field Primes:

- Primes  $q$  and  $p$  shall both be provable primes
- Primes  $q$  and field prime  $p$  shall both be probable primes and two ways to generate the cryptographic group generator  $g$ :

Cryptographic Group Generator:

- Generator  $g$  constructed through a verifiable process
- Generator  $g$  constructed through an unverifiable process.

The Key generation specifies two ways to generate the private key  $x$ :

Private Key:

- $\text{len}(q)$  bit output of RBG where  $1 \leq x \leq q-1$
- $\text{len}(q) + 64$  bit output of RBG, followed by a mod  $q-1$  operation where  $1 \leq x \leq q-1$ .

The security strength of the RBG must be at least that of the security offered by the FFC parameter set.

To test the cryptographic and field prime generation method for the provable primes method and/or the group generator  $g$  for a verifiable process, the evaluator must seed the TSF parameter generation routine with sufficient data to deterministically generate the parameter set.

For each key length supported, the evaluator shall have the TSF generate 25 parameter sets and key pairs. The evaluator shall verify the correctness of the TSF's implementation by comparing values generated by the TSF with those generated from a known good implementation. Verification must also confirm

- $g \neq 0, 1$
- $q$  divides  $p-1$
- $g^q \bmod p = 1$
- $g^x \bmod p = y$

for each FFC parameter set and key pair.

### **Diffie-Hellman Group 14 and FFC Schemes using "safe-prime" groups**

Testing for FFC Schemes using Diffie-Hellman group 14 and/or "safe-prime" groups is done as part of testing in [FCS\\_CKM.2.1](#).

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform cryptographic key establishment in accordance with a specified cryptographic key establishment method: [selection]:

- RSA-based key establishment schemes that meet the following: RSAES-PKCS1-v1\_5 as specified in Section 7.2 of RFC 8017, "Public-Key Cryptography Standards (PKCS) #1:RSA Cryptography Specifications Version 2.1",
- Elliptic curve-based key establishment schemes that meets the following: NIST Special Publication 800-56A, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography",
- Finite field-based key establishment schemes that meets the following: NIST Special Publication 800-56A, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography",
- Key establishment schemes using Diffie-Hellman group 14 that meets the following: RFC 3526, Section 3,
- FFC schemes using "safe-prime" groups that meet the following: 'NIST Special Publication 800-56A Revision 3, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography"', and [selection: RFC 3526, RFC 7919]

].

**Application Note:** The ST author must select all key establishment schemes used for the selected cryptographic protocols.

The elliptic curves used for the key establishment scheme must correlate with the curves specified in [FCS\\_CKM.1.1](#).

The domain parameters used for the finite field-based key establishment scheme are specified by the key generation according to [FCS\\_CKM.1.1](#).

## Evaluation Activities ▾

### [FCS\\_CKM.2](#):

#### If "invoke platform-provided functionality" is selected:

##### TSS

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key establishment functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### If "implement functionality" is selected:

The evaluator shall ensure that the supported key establishment schemes correspond to the key generation schemes identified in [FCS\\_CKM.1.1](#). If the ST specifies more than one scheme, the evaluator shall examine the TSS to verify that it identifies the usage for each scheme.

The evaluator shall ensure that the TSS describes how the TOE handles decryption errors. In accordance with NIST Special Publication 800-56B, the TOE must not reveal the particular error that occurred, either through the contents of any outputted or logged error message or through timing variations. If KTS-OAEP is supported, the evaluator shall create separate contrived ciphertext values that trigger each of the three decryption error checks described in NIST Special Publication 800-56B section 7.2.2.3, ensure that each decryption attempt results in an error, and ensure that any outputted or logged error message is identical for each. If KTS-KEM-KWS is supported, the evaluator shall create separate contrived ciphertext values that trigger each of the three decryption error checks described in NIST Special Publication 800-56B section 7.2.3.3, ensure that each decryption attempt results in an error, and ensure that any outputted or logged error message is identical for each.

If Diffie-Hellman group 14 is selected from [FCS\\_CKM.2.1](#), the TSS shall describe how the implementation meets RFC 3526 Section 3.

##### Guidance

The evaluator shall verify that the AGD guidance instructs the administrator how to configure the TOE to use the selected key establishment scheme(s).

##### Tests

The evaluator shall verify the implementation of the key establishment schemes supported by the TOE using the applicable tests below.

The evaluator shall verify a TOEs implementation of SP800-56A key agreement schemes using the following Function and Validity tests. These validation tests for each key agreement scheme verify that a TOE has implemented the components of the key agreement scheme according to the specifications in the recommendation. These components include the calculation of the primitives (the shared secret value Z) and the calculation of the derived keying material (DKM) via the Key Derivation Function (KDF). If key confirmation is supported, the evaluator shall also verify that the components of key confirmation have been implemented correctly, using the test procedures described below. This includes the parsing of the DKM, the generation of MACdata and the calculation of MACtag.

#### Function Test

The Function test verifies the ability of the TOE to implement the key agreement schemes correctly. To conduct this test the evaluator shall generate or obtain test vectors from a known good implementation of the TOE supported schemes. For each supported key agreement scheme-key agreement role combination, KDF type, and, if supported, key confirmation role- key confirmation type combination, the tester shall generate 10 sets of test vectors. The data set consists of one set of domain parameter values (FFC) or the NIST approved curve (ECC) per 10 sets of public keys. These keys are static, ephemeral or both depending on the scheme being tested.

The evaluator shall obtain the DKM, the corresponding TOEs public keys (static and/or ephemeral), the MAC tag(s), and any inputs used in the KDF, such as the Other Information field OI and TOE ID fields.

If the TOE does not use a KDF defined in SP 800-56A, the evaluator shall obtain only the public keys and the hashed value of the shared secret.

The evaluator shall verify the correctness of the TSF's implementation of a given scheme by using a known good implementation to calculate the shared secret value, derive the keying material DKM, and compare hashes or MAC tags generated from these values.

If key confirmation is supported, the TSF shall perform the above for each implemented approved MAC algorithm.

#### Validity Test

The Validity test verifies the ability of the TOE to recognize another party's valid and invalid key agreement results with or without key confirmation. To conduct this test, the evaluator shall obtain a list of the supporting cryptographic functions included in the SP800-56A key agreement implementation to determine which errors the TOE should be able to recognize. The evaluator generates a set of 24 (FFC) or 30 (ECC) test vectors consisting of data sets including domain parameter values or NIST approved curves, the evaluator's public keys, the TOEs public/private key pairs, MACTag, and any inputs used in the KDF, such as the other info and TOE ID fields.

The evaluator shall inject an error in some of the test vectors to test that the TOE recognizes invalid key agreement results caused by the following fields being incorrect: the shared secret value Z, the DKM, the other information field OI, the data to be MACed, or the generated MACTag. If the TOE contains the full or partial (only ECC) public key validation, the evaluator will also individually inject errors in both parties' static public keys, both parties' ephemeral public keys and the TOEs static private key to assure the TOE detects errors in the public key validation function and/or the partial key validation function (in ECC only). At least two of the test vectors shall remain unmodified and therefore should result in valid key agreement results (they should pass).

The TOE shall use these modified test vectors to emulate the key agreement scheme using the corresponding parameters. The evaluator shall compare the TOEs results with the results using a known good implementation verifying that the TOE detects these errors.

#### **RSA-based key establishment**

The evaluator shall verify the correctness of the TSF's implementation of RSAES-PKCS1-v1\_5 by using a known good implementation for each protocol selected in [FTP\\_TRP.1/TRUSTPATH\\_Rem\\_Admin](#), [FTP\\_TRP.1/TRUSTPATH\\_Enroll](#), [FTP\\_TRP.1/TRUSTPATH\\_Join](#), [FTP\\_ITC.1/INTER\\_XFER\\_IT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#), [FPT\\_ITT.1/INTER\\_XFER](#), and [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) that uses RSAES-PKCS1-v1\_5.

#### **Diffie-Hellman Group 14**

The evaluator shall verify the correctness of the TSF's implementation of Diffie-Hellman group 14 by using a known good implementation for each protocol selected in [FTP\\_TRP.1/TRUSTPATH\\_Rem\\_Admin](#), [FTP\\_TRP.1/TRUSTPATH\\_Enroll](#), [FTP\\_TRP.1/TRUSTPATH\\_Join](#), [FTP\\_ITC.1/INTER\\_XFER\\_IT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#), [FPT\\_ITT.1/INTER\\_XFER](#), and

### FFC Schemes using "safe-prime" groups

The evaluator shall verify the correctness of the TSF's implementation of "safe-prime" groups by using a known good implementation for each protocol selected in [FTP\\_TRP.1/TRUSTPATH\\_Rem\\_ADMIN](#), [FTP\\_TRP.1/TRUSTPATH\\_ENROLL](#), [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#), [FTP\\_ITC.1/INTER\\_XFER\\_IT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#), [FPT\\_ITT.1/INTER\\_XFER](#), and [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) that uses "safe-prime" groups. This test must be performed for each "safe-prime" group that each protocol uses.

## FCS\_CKM\_EXT.4 Cryptographic Key Destruction

### FCS\_CKM\_EXT.4.1

The TSF shall destroy plaintext keying material and critical security parameters by [selection]:

- invoking platform-provided functionality with the following rules:
  - For volatile memory, the destruction shall be executed by [selection]:
    - a single direct overwrite consisting of [selection: a pseudo-random pattern using the TSF/Platform RBG (as specified in [FCS\\_RBG\\_EXT.1](#)), zeroes, ones, a new value of a key, [assignment: some 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 that consists of 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]] direct overwrite consisting of [selection: a pseudo-random pattern using the TSF/Platform RBG (as specified in [FCS\\_RBG\\_EXT.1](#)), zeroes, ones, a new value of a key, [assignment: some value that does not contain any CSP]],
    - instructs the underlying platform to destroy the abstraction that represents the key
- implementing key destruction in accordance with the following rules:
  - For volatile memory, the destruction shall be executed by a single direct overwrite [selection: consisting of a pseudo-random pattern using the TSF/Platform RBG (as specified in [FCS\\_RBG\\_EXT.1](#)), consisting of zeroes]
  - For non-volatile EEPROM, the destruction shall be executed by a single direct overwrite consisting of a pseudo-random pattern using the TSF/Platform RBG (as specified in [FCS\\_RBG\\_EXT.1](#)), followed by a read-verify.
  - For non-volatile flash memory, that is not wear-leveled, the destruction shall be executed [selection: by a single direct overwrite consisting of zeros followed by a read-verify, by a block erase that erases the reference to memory that stores data as well as the data itself]
  - For non-volatile flash memory, that is wear-leveled, the destruction shall be executed [selection: by a single direct overwrite consisting of zeros, by a block erase]
  - For non-volatile memory other than EEPROM and flash, the destruction shall be executed by a single direct overwrite with a random pattern that is changed before each write

].

**Application Note:** The ST author should select "invoking platform-provided functionality" if the MDM Server performs no operations using plaintext secret, private cryptographic keys, and CSPs.

Any security related information (such as keys, authentication data, and passwords) must be zeroized when no longer in use to prevent the disclosure or modification of security critical data.

The zeroization indicated above applies to each intermediate storage area for plaintext key and Cryptographic Service Provider (CSP) (i.e., any storage, such as memory buffers, that is included in the path of such data) upon the transfer of the key/CSP to another location.

Since the TOE does not include the host IT environment, the extent of this capability is necessarily somewhat limited. For the purposes of this requirement, it is sufficient for the TOE to invoke the correct underlying functions of the host to perform the zeroization--it does not imply that the TOE has to include a kernel-mode memory driver to ensure the data are zeroized. It is assumed that the host platform appropriately performs zeroization of key material in its internal processes.

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.

#### FCS\_CKM\_EXT.4.2

The TSF shall destroy all plaintext keying material and critical security parameters (CSPs) when no longer needed.

**Application Note:** Key destruction procedures are performed in accordance with [FCS\\_CKM\\_EXT.4.1](#). Even if "invoking platform-provided functionality" is selected in [FCS\\_CKM\\_EXT.4.1](#), the TSF must determine when the plaintext keying material and CSP are no longer needed and thus should be destroyed. The TSF must "release" the key material and CSP when no longer needed, regardless if the TSF or TOE platform destroys the key material and CSPs.

For the purposes of this requirement, plaintext keying material refers to authentication data, authorization data, secret/private symmetric keys, data used to derive keys, etc.

### Evaluation Activities ▼

#### [FCS\\_CKM\\_EXT.4:](#)

##### **TSS**

*If "invoking platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key destruction functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

*Evaluation Activity Note:*

*The evaluation activity used is dependent on the selection made in [FCS\\_CKM\\_EXT.4.1](#).*

##### **TSS**

*The evaluator shall check to ensure the TSS lists each type of plaintext key material and CSP (authentication data, authorization data, secret/private symmetric keys, data used to derive keys, etc.) and its origin and storage location.*

*The evaluator shall verify that the TSS describes when each type of key material and CSP is no longer needed.*

#### **If "invoke platform-provided functionality" is selected:**

*The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key releasing functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

#### **If "implement functionality" is selected:**

*The evaluator shall also verify that, for each type, the type of clearing procedure that is performed is listed. If different types of memory are used to store the materials to be protected, the evaluator shall check to ensure that the TSS describes the clearing procedure in terms of the memory in which the data are stored (for example, "secret keys stored on flash are cleared by overwriting once with zeros, while secret keys stored on the internal persistent storage device are cleared by overwriting one time with a random pattern that is changed before each write"). For block erases, the evaluator shall also ensure that the block erase command used is listed and shall verify that the command used also addresses any copies of the plaintext key material that may be created in order to optimize the use of flash memory.*

#### **Tests**

*For each software and firmware key clearing situation the evaluator shall repeat the following*

tests. Note that at this time hardware-bound keys are explicitly excluded from testing.

- **Test 1:** The evaluator shall utilize appropriate combinations of specialized operational environment and development tools (debuggers, simulators, etc.) for the TOE and instrumented TOE builds to test that keys are cleared correctly, including all intermediate copies of the key that may have been created internally by the TOE during normal cryptographic processing with that key.

Cryptographic TOE implementations in software shall be loaded and exercised under a debugger to perform such tests. The evaluator shall perform the following test for each key subject to clearing, including intermediate copies of keys that are persisted encrypted by the TOE:

1. Load the instrumented TOE build in a debugger.
2. Record the value of the key in the TOE subject to clearing.
3. Cause the TOE to perform a normal cryptographic processing with the key from #1.
4. Cause the TOE to clear the key.
5. Cause the TOE to stop the execution but not exit.
6. Cause the TOE to dump the entire memory footprint of the TOE into a binary file.
7. Search the content of the binary file created in #4 for instances of the known key value from #1.

The test succeeds if no copies of the key from #1 are found in step #7 above and fails otherwise. The evaluator shall perform this test on all keys, including those persisted in encrypted form, to ensure intermediate copies are cleared.

- **Test 2:** In cases where the TOE is implemented in firmware and operates in a limited operating environment that does not allow the use of debuggers, the evaluator shall utilize a simulator for the TOE on a general purpose operating system. The evaluator shall provide a rationale explaining the instrumentation of the simulated test environment and justifying the obtained test results.

## FCS\_COP.1/CONF\_ALG Cryptographic Operation (Confidentiality Algorithms)

### FCS\_COP.1.1/CONF\_ALG

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform encryption/decryption in accordance with a specified cryptographic algorithm: [selection:

- AES-CBC (as defined in FIPS PUB 197, and NIST SP 800-38A) mode,
- AES-GCM (as defined in NIST SP 800-38D),
- AES Key Wrap (KW) (as defined in NIST SP 800-38F),
- AES Key Wrap with Padding (KWP) (as defined in NIST SP 800-38F),
- AES-CCM (as defined in NIST SP 800-38C)

] and cryptographic key sizes [selection: 128-bit, 256-bit]

**Application Note:** For the second selection of FCS\_COP.1.1/CONF\_ALG , the ST author should choose the mode or modes in which AES operates in the trusted channel protocols. For the third selection, the ST author should choose the key sizes that are supported by this functionality.

## Evaluation Activities ▼

### FCS\_COP.1/CONF\_ALG: TSS

#### If "invoke platform-provided functionality" is selected:

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the encryption/decryption functionality is invoked for each mode and key size selected in the MDM Server's ST (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### Tests

#### If "implement functionality" is selected:

##### AES-CBC Tests

- **Test 1:** AES-CBC Known Answer Tests

There are four Known Answer Tests (KATs), described below. In all KATs, the plaintext, ciphertext, and IV values shall be 128-bit blocks. The results from each test may either be obtained by the evaluator directly or by supplying the inputs to the implementer and receiving the results in response. To determine correctness, the evaluator shall compare the resulting values to those obtained by submitting the same inputs to a known good implementation.

- **Test 1.1:** KAT-1. To test the encrypt functionality of AES-CBC, the evaluator shall supply a set of 10 plaintext values and obtain the ciphertext value that results from AES-CBC encryption of the given plaintext using a key value of all zeros and an IV of all zeros. Five plaintext values shall be encrypted with a 128-bit all-zeros key, and the other five shall be encrypted with a 256-bit all-zeros key.

To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using 10 ciphertext values as input and AES-CBC decryption.

- **Test 1.2:** KAT-2. To test the encrypt functionality of AES-CBC, the evaluator shall supply a set of 10 key values and obtain the ciphertext value that results from AES-CBC encryption of an all-zeros plaintext using the given key value and an IV of all zeros. Five of the keys shall be 128-bit keys, and the other five shall be 256-bit keys.

To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using an all-zero ciphertext value as input and AES-CBC decryption.

- **Test 1.3:** KAT-3. To test the encrypt functionality of AES-CBC, the evaluator shall supply the two sets of key values described below and obtain the ciphertext value that results from AES encryption of an all-zeros plaintext using the given key value and an IV of all zeros. The first set of keys shall have 128 128-bit keys, and the second set shall have 256 256-bit keys. Key  $i$  in each set shall have the leftmost  $i$  bits be ones and the rightmost  $N-i$  bits be zeros, for  $i$  in  $[1, N]$ .

To test the decrypt functionality of AES-CBC, the evaluator shall supply the two sets of key and ciphertext value pairs described below and obtain the plaintext value that results from AES-CBC decryption of the given ciphertext using the given key and an IV of all zeros. The first set of key/ciphertext pairs shall have 128 128-bit key/ciphertext pairs, and the second set of key/ciphertext pairs shall have 256 256-bit key/ciphertext pairs. Key  $i$  in each set shall have the leftmost  $i$  bits be ones and the rightmost  $N-i$  bits be zeros, for  $i$  in  $[1, N]$ . The ciphertext value in each pair shall be the value that results in an all-zeros plaintext when decrypted with its corresponding key.

- **Test 1.4:** KAT-4. To test the encrypt functionality of AES-CBC, the evaluator shall supply the set of 128 plaintext values described below and obtain the two ciphertext values that result from AES-CBC encryption of the given plaintext using a 128-bit key value of all zeros with an IV of all zeros and using a 256-bit key value of all zeros with an IV of all zeros, respectively. Plaintext value  $i$  in each set shall have the leftmost  $i$  bits be ones and the rightmost  $128-i$  bits be zeros, for  $i$  in  $[1, 128]$ .

To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using ciphertext values of the same form as the plaintext in the encrypt test as input and AES-CBC decryption.

- **Test 2: AES-CBC Multi-Block Message Test**

The evaluator shall test the encrypt functionality by encrypting an  $i$ -block message where  $1 < i \leq 10$ . The evaluator shall choose a key, an IV and plaintext message of length  $i$  blocks and encrypt the message, using the mode to be tested, with the chosen key and IV. The ciphertext shall be compared to the result of encrypting the same plaintext message with the same key and IV using a known good implementation.

The evaluator shall also test the decrypt functionality for each mode by decrypting an  $i$ -block message where  $1 < i \leq 10$ . The evaluator shall choose a key, an IV and a ciphertext message of length  $i$  blocks and decrypt the message, using the mode to be tested, with the chosen key and IV. The plaintext shall be compared to the result of decrypting the same ciphertext message with the same key and IV using a known good implementation.

- **Test 3: AES-CBC Monte Carlo Tests**

The evaluator shall test the encrypt functionality using a set of 200 plaintext, IV, and key 3-tuples. 100 of these shall use 128 bit keys, and 100 shall use 256 bit keys. The plaintext and IV values shall be 128-bit blocks. For each 3-tuple, 1000 iterations shall be run as follows:

```
# Input: PT, IV, Key
for i = 1 to 1000:
    if i == 1:
        CT[1] = AES-CBC-Encrypt(Key, IV, PT)
        PT = IV
    else:
```

$CT[i] = AES\text{-}CBC\text{-}Encrypt(Key, PT)$   
 $PT = CT[i-1]$

The ciphertext computed in the 1000th iteration (i.e.,  $CT[1000]$ ) is the result for that trial. This result shall be compared to the result of running 1000 iterations with the same values using a known good implementation.

The evaluator shall test the decrypt functionality using the same test as for encrypt, exchanging  $CT$  and  $PT$  and replacing  $AES\text{-}CBC\text{-}Encrypt$  with  $AES\text{-}CBC\text{-}Decrypt$ .

### **AES-GCM Test**

- **Test 1:** The evaluator shall test the authenticated encrypt functionality of AES-GCM for each combination of the following input parameter lengths:

- 128 bit and 256 bit keys
- Two plaintext lengths. One of the plaintext lengths shall be a non-zero integer multiple of 128 bits, if supported. The other plaintext length shall not be an integer multiple of 128 bits, if supported.
- Three AAD lengths. One AAD length shall be 0, if supported. One AAD length shall be a non-zero integer multiple of 128 bits, if supported. One AAD length shall not be an integer multiple of 128 bits, if supported.
- Two IV lengths. If 96 bit IV is supported, 96 bits shall be one of the two IV lengths tested.

The evaluator shall test the encrypt functionality using a set of 10 key, plaintext, AAD, and IV tuples for each combination of parameter lengths above and obtain the ciphertext value and tag that results from AES-GCM authenticated encrypt. Each supported tag length shall be tested at least once per set of 10. The IV value may be supplied by the evaluator or the implementation being tested, as long as it is known.

The evaluator shall test the decrypt functionality using a set of 10 key, ciphertext, tag, AAD, and IV 5-tuples for each combination of parameter lengths above and obtain a Pass/Fail result on authentication and the decrypted plaintext if Pass. The set shall include five tuples that Pass and five that Fail.

The results from each test may either be obtained by the evaluator directly or by supplying the inputs to the implementer and receiving the results in response. To determine correctness, the evaluator shall compare the resulting values to those obtained by submitting the same inputs to a known good implementation.

### **AES-CCM Tests**

- **Test 1:** The evaluator shall test the generation-encryption and decryption-verification functionality of AES-CCM for the following input parameter and tag lengths:

- 128 bit and 256 bit keys
- Two payload lengths. One payload length shall be the shortest supported payload length, greater than or equal to zero bytes. The other payload length shall be the longest supported payload length, less than or equal to 32 bytes (256 bits).
- Two or three associated data lengths. One associated data length shall be 0, if supported. One associated data length shall be the shortest supported payload length, greater than or equal to zero bytes. One associated data length shall be the longest supported payload length, less than or equal to 32 bytes (256 bits). If the implementation supports an associated data length of 216 bytes, an associated data length of 216 bytes shall be tested.
- Nonce lengths. All supported nonce lengths between 7 and 13 bytes, inclusive, shall be tested.
- Tag lengths. All supported tag lengths of 4, 6, 8, 10, 12, 14 and 16 bytes shall be tested.

To test the generation-encryption functionality of AES-CCM, the evaluator shall perform the following four tests:

- **Test 1.1:** For EACH supported key and associated data length and ANY supported payload, nonce and tag length, the evaluator shall supply one key value, one nonce value and 10 pairs of associated data and payload values and obtain the resulting ciphertext.
- **Test 1.2:** For EACH supported key and payload length and ANY supported associated data, nonce and tag length, the evaluator shall supply one key value, one nonce value and 10 pairs of associated data and payload values and obtain the resulting ciphertext.
- **Test 1.3:** For EACH supported key and nonce length and ANY supported associated data, payload and tag length, the evaluator shall supply one key value and 10 associated data, payload and nonce value 3-tuples and obtain the resulting ciphertext.
- **Test 1.4:** For EACH supported key and tag length and ANY supported associated data, payload and nonce length, the evaluator shall supply one key value, one nonce

*value and 10 pairs of associated data and payload values and obtain the resulting ciphertext.*

*To determine correctness in each of the above tests, the evaluator shall compare the ciphertext with the result of generation-encryption of the same inputs with a known good implementation.*

*To test the decryption-verification functionality of AES-CCM, for EACH combination of supported associated data length, payload length, nonce length and tag length, the evaluator shall supply a key value and 15 nonce, associated data and ciphertext 3-tuples and obtain either a FAIL result or a PASS result with the decrypted payload. The evaluator shall supply 10 tuples that should FAIL and 5 that should PASS per set of 15.*

#### **AES Key Wrap (AES-KW) and Key Wrap with Padding (AES-KWP) Test**

- **Test 1:** The evaluator shall test the authenticated encryption functionality of AES-KW for EACH combination of the following input parameter lengths:

- 128 and 256 bit key encryption keys (KEKs)
- Three plaintext lengths. One of the plaintext lengths shall be two semi-blocks (128 bits). One of the plaintext lengths shall be three semi-blocks (192 bits). The third data unit length shall be the longest supported plaintext length less than or equal to 64 semi-blocks (4096 bits).

*using a set of 100 key and plaintext pairs and obtain the ciphertext that results from AES-KW authenticated-encryption. To determine correctness, the evaluator shall use the AES-KW authenticated-encryption function of a known good implementation.*

*The evaluator shall test the authenticated-decryption functionality of AES-KW using the same test as for authenticated-encryption, replacing plaintext values with ciphertext values and AES-KW authenticated-encryption with AES-KW authenticated-decryption.*

*The evaluator shall test the authenticated-encryption functionality of AES-KWP using the same test as for AES-KW authenticated-encryption with the following change in the three plaintext lengths:*

- One plaintext length shall be one octet.
- One plaintext length shall be 20 octets (160-bits).
- One plaintext length shall be the longest supported plaintext length less than or equal to 512 octets (4096-bits).

*The evaluator shall test the authenticated-decryption functionality of AES-KWP using the same test as for AES-KWP authenticated-encryption, replacing plaintext values with ciphertext values and AES-KWP authenticated-encryption with AES-KWP authenticated-decryption.*

### **FCS\_COP.1/HASH\_ALG Cryptographic Operation (Hashing Algorithms)**

#### **FCS\_COP.1.1/HASH\_ALG**

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform cryptographic hashing in accordance with a specified cryptographic algorithm [selection: SHA-256, SHA-384, SHA-512] and message digest sizes [selection: 256, 384, 512] bits that meet the following: FIPS Pub 180-4.

**Application Note:** The intent of this requirement is to specify the hashing function for trusted channel protocols. The hash selection must support the message digest size selection. The hash selection should be consistent with the overall strength of the algorithm used (for example, SHA-256 for 128-bit keys).

### **Evaluation Activities ▼**

#### **FCS\_COP.1/HASH\_ALG:**

**If "invoke platform-provided functionality" is selected:**

##### **TSS**

*The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the hash functionality is invoked for each digest size selected in the MDM Server's ST (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

**If "implement functionality" is selected:**

*The evaluator shall check that the association of the hash function with other TSF cryptographic*

functions (for example, the digital signature verification function) is documented in the TSS. The evaluator checks the AGD documents to determine that any configuration that is required to be done to configure the functionality for the required hash sizes is present. The TSF hashing functions can be implemented in one of two modes. The first mode is the byte-oriented mode. In this mode the TSF only hashes messages that are an integral number of bytes in length; i.e., the length (in bits) of the message to be hashed is divisible by 8. The second mode is the bit-oriented mode. In this mode the TSF hashes messages of arbitrary length. As there are different tests for each mode, an indication is given in the following sections for the bit-oriented vs. the byte-oriented testmacs.

### Tests

The evaluator shall perform all of the following tests for each hash algorithm implemented by the TSF and used to satisfy the requirements of this PP.

#### **Short Messages Test Bit-oriented Mode**

- **Test 1:** The evaluators devise an input set consisting of  $m+1$  messages, where  $m$  is the block length of the hash algorithm. The length of the messages range sequentially from 0 to  $m$  bits. The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

#### **Short Messages Test Byte-oriented Mode**

- **Test 1:** The evaluators devise an input set consisting of  $m/8+1$  messages, where  $m$  is the block length of the hash algorithm. The length of the messages range sequentially from 0 to  $m/8$  bytes, with each message being an integral number of bytes. The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

#### **Selected Long Messages Test Bit-oriented Mode**

- **Test 1:** The evaluators devise an input set consisting of  $m$  messages, where  $m$  is the block length of the hash algorithm. The length of the  $i$ th message is  $512 + 99*i$ , where  $1 \leq i \leq m$ . The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

#### **Selected Long Messages Test Byte-oriented Mode**

- **Test 1:** The evaluators devise an input set consisting of  $m/8$  messages, where  $m$  is the block length of the hash algorithm. The length of the  $i$ th message is  $512 + 8*99*i$ , where  $1 \leq i \leq m/8$ . The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

#### **Pseudorandomly Generated Messages Test**

- **Test 1:** This test is for byte-oriented implementations only. The evaluators randomly generate a seed that is  $n$  bits long, where  $n$  is the length of the message digest produced by the hash function to be tested. The evaluators then formulate a set of 100 messages and associated digests by following the algorithm provided in Figure 1 of [SHAVS]. The evaluators then ensure that the correct result is produced when the messages are provided to the TSF.

### **FCS\_COP.1/SIGN\_ALG Cryptographic Operation (Signature Algorithms)**

#### FCS\_COP.1.1/SIGN\_ALG

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform cryptographic signature services (generation and verification) in accordance with a specified cryptographic algorithm [selection:

- RSA schemes using cryptographic key sizes of 2048-bit or greater that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Section 4,
- ECDSA schemes using "NIST curves" P-384 and [selection: P-256, P-521, no other curves] that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Section 5

]

**Application Note:** The ST Author should choose the algorithm implemented to

perform digital signatures. The MDM Server must perform digital signatures in accordance with the trusted channel protocols. The MDM Server is required to validate any signed policies and policy updates sent by the MDM Server.

## Evaluation Activities ▼

### [FCS\\_COP.1/SIGN\\_ALG:](#)

#### **If "invoke platform-provided functionality" is selected:**

##### **TSS**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the digital signature functionality is invoked for each operation they are used for in the MDM Server (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **Tests**

#### **If "implement functionality" is selected:**

##### **ECDSA Algorithm Tests**

- **Test 1:** ECDSA FIPS 186-4 Signature Generation Test

For each supported NIST curve (i.e., P-256, P-384 and P-521) and SHA function pair, the evaluator shall generate 10 1024-bit long messages and obtain for each message a public key and the resulting signature values R and S. To determine correctness, the evaluator shall use the signature verification function of a known good implementation.

- **Test 2:** ECDSA FIPS 186-4 Signature Verification Test

For each supported NIST curve (i.e., P-256, P-384 and P-521) and SHA function pair, the evaluator shall generate a set of 10 1024-bit message, public key and signature tuples and modify one of the values (message, public key or signature) in five of the 10 tuples. The evaluator shall obtain in response a set of 10 PASS/FAIL values.

##### **RSA Signature Algorithm Tests**

- **Test 1:** Signature Generation Test

The evaluator shall verify the implementation of RSA Signature Generation by the TOE using the Signature Generation Test. To conduct this test the evaluator must generate or obtain 10 messages from a trusted reference implementation for each modulus size/SHA combination supported by the TSF. The evaluator shall have the TOE use their private key and modulus value to sign these messages.

The evaluator shall verify the correctness of the TSF's signature using a known good implementation and the associated public keys to verify the signatures.

- **Test 2:** Signature Verification Test

The evaluator shall perform the Signature Verification test to verify the ability of the TOE to recognize another party's valid and invalid signatures. The evaluator shall inject errors into the test vectors produced during the Signature Verification Test by introducing errors in some of the public keys e, messages, IR format, and/or signatures. The TOE attempts to verify the signatures and returns success or failure.

The evaluator shall use these test vectors to emulate the signature verification test using the corresponding parameters and verify that the TOE detects these errors.

## **FCS\_COP.1/KEY\_HASH Cryptographic Operation (Keyed-Hash Message Authentication)**

### [FCS\\_COP.1.1/KEY\\_HASH](#)

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform keyed-hash message authentication in accordance with a specified cryptographic algorithm HMAC-[selection: SHA-256, SHA-384, SHA-512], key sizes [assignment: key size (in bits) used in HMAC], and message digest sizes [selection: 256, 384, 512] bits that meet the following: FIPS Pub 198-1, "The Keyed-Hash Message Authentication Code, and

**Application Note:** The intent of this requirement is to specify the keyed-hash message authentication function used when used for key establishment purposes for the various cryptographic protocols used by the TOE (e.g., trusted channel). The hash selection must support the message digest size selection. The hash selection should be consistent with the overall strength of the algorithm used for FCS\_COP.1/SIGN\_ALG.

## Evaluation Activities ▼

### [FCS\\_COP.1/KEY\\_HASH:](#)

#### **TSS**

##### **If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the keyed-hash functionality is invoked for each mode and key size selected in the MDM Server's ST (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **If "implement functionality" is selected:**

The evaluator shall examine the TSS to ensure that it specifies the following values used by the HMAC function: key length, hash function used, block size, and output MAC length used.

#### **Tests**

For each of the supported parameter sets, the evaluator shall compose 15 sets of test data. Each set shall consist of a key and message data. The evaluator shall have the TSF generate HMAC tags for these sets of test data. The resulting MAC tags shall be compared to the result of generating HMAC tags with the same key and IV using a known good implementation.

## FCS\_HTTPS\_EXT.1 HTTPS Protocol

**This is a selection-based component. Its inclusion depends upon selection from .**

### FCS\_HTTPS\_EXT.1.1

The TSF shall implement the HTTPS protocol that complies with RFC 2818.

### FCS\_HTTPS\_EXT.1.2

The TSF shall implement HTTPS using TLS in accordance with the Package for Transport Layer Security .

**Application Note:** The TLS Functional Package must be included in the ST, with the following selections made:

- FCS\_TLS\_EXT.1:
  - TLS must be selected
  - either client or server is selected as appropriate
- FCS\_TLSC\_EXT.1.1 or FCS\_TLSS\_EXT.1.1 (as appropriate):
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in FCS\_COP.1.

Validity is determined by the certificate path, the expiration date, and the revocation status in accordance with RFC 5280.

## Evaluation Activities ▼

### [FCS\\_HTTPS\\_EXT.1:](#)

#### **Tests**

- **Test 1:** The evaluator shall attempt to establish an HTTPS connection with a web server, observe the traffic with a packet analyzer, and verify that the connection succeeds and that the traffic is identified as TLS or HTTPS.

Other tests are performed in conjunction with the TLS evaluation activities.

## FCS\_IV\_EXT.1 Initialization Vector Generation

**This is a selection-based component. Its inclusion depends upon selection from .**

FCS\_IV\_EXT.1.1

The TSF shall [**selection**: invoke platform-provided functionality, implement functionality] to generate IVs in accordance with [Table 5](#).

**Application Note:** This requirement must be included in the ST if the selection in [FCS\\_STG\\_EXT.1](#) indicates that the TSF is protecting private keys and persistent secrets with encryption rather than the platform-provided key storage.

[Table 5](#) lists the requirements for composition of IVs according to the corresponding NIST Special Publications for each cipher mode. The composition of IVs generated for encryption according to a cryptographic protocol is addressed by the protocol. Thus, this requirement addresses only IVs generated for key storage encryption.

**Table 5: References and IV Requirements for NIST-approved Cipher Modes**

Cipher Mode	Reference	IV Requirement
Electronic Codebook (ECB)	SP800-38A	No IV
Counter (CTR)	SP800-38A	"Initial Counter" shall be non-repeating. No counter value shall be repeated across multiple messages with the same secret key.
Cipher Block Chaining (CBC)	SP800-38A	IVs shall be unpredictable. Repeating IVs leak information about whether the first one or more blocks are shared between two messages, so IVs should be non-repeating in such situations.
Output Feedback (OFB)	SP800-38A	IVs shall be non-repeating and shall not be generated by invoking the cipher on another IV.
Cipher Feedback (CFB)	SP800-38A	IVs should be non-repeating as repeating IVs leak information about the first plaintext block and about common shared prefixes in messages.
XEX (XOR Encrypt XOR)	SP800-38E	No IV. Tweak values shall be non-negative integers, assigned consecutively, and starting at an arbitrary non-negative integer.
Tweakable Block Cipher with Ciphertext Stealing (XTS)	SP800-38E	No IV. Nonces shall be non-repeating.
Cipher-based Message Authentication Code (CMAC)	SP800-38B	No IV
Key Wrap and Key Wrap with Padding	SP800-38F	No IV
Counter with CBC-Message Authentication Code (CCM)	SP800-38C	No IV. Nonces shall be non-repeating.
Galois Counter Mode (GCM)	SP800-38D	IV shall be non-repeating. The number of invocations of GCM shall not exceed $2^{32}$ for a given secret key unless an implementation only uses 96-bit IVs (default length).

**Evaluation Activities** ▼

[FCS\\_IV\\_EXT.1](#):

**If "invoke platform-provided functionality" is selected:**

**TSS**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the IV generation is invoked for each mode selected in the MDM Server's ST (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

**If "implement functionality" is selected:**

The evaluator shall examine the TSS to ensure that it details the encryption of user credentials, persistent secrets, and private keys and the generation of the IVs used for that encryption.

**Tests**

The evaluator shall ensure that the generation of IVs for each key encrypted by the same KEK meets [Table 5](#).

## FCS\_RBG\_EXT.1 Extended: Random Bit Generation

### FCS\_RBG\_EXT.1.1

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to perform all deterministic random bit generation services in accordance with NIST Special Publication 800-90A using [selection: Hash\_DRBG (any), HMAC\_DRBG (any), CTR\_DRBG (AES)].

**Application Note:** The ST author should select whether the server provides its own DRBG or uses the platforms. SP 800-90A contains three different methods of generating random numbers; each of these, in turn, depends on underlying cryptographic primitives (hash functions/ciphers). The ST author will select the function used, and include the specific underlying cryptographic primitives used in the requirement or in the TSS. While any of the identified hash functions (SHA-224, SHA-256, SHA-384, SHA-512) are allowed for Hash\_DRBG or HMAC\_DRBG, only AES-based implementations for CTR\_DRBG are allowed.

### FCS\_RBG\_EXT.1.2

The deterministic RBG shall be seeded by an entropy source that accumulates entropy from [selection: a software-based noise source, a platform-based RBG, a hardware-based noise source, no other sources] with a minimum of [selection: 128 bits, 256 bits] of entropy at least equal to the greatest security strength (according to NIST SP 800-57) of the keys and hashes that it will generate.

**Application Note:** For the first selection in this requirement, the ST author selects 'software-based noise source' if any additional noise sources are used as input to the application's DRBG. Note that the application must use the platform's DRBG to seed its DRBG.

In the second selection in this requirement, the ST author selects the appropriate number of bits of entropy that corresponds to the greatest security strength of the algorithms included in the ST. Security strength is defined in Tables 2 and 3 of NIST SP 800-57A. For example, if the implementation includes 2048-bit RSA (security strength of 112 bits), AES 128 (security strength 128 bits), and HMAC-SHA-256 (security strength 256 bits), then the ST author would select 256 bits.

## Evaluation Activities ▼

### [FCS\\_RBG\\_EXT.1:](#)

**TSS**

**If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the RBG functionality is invoked for each operation they are used for in the MDM Server (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

**Tests**

**If "implement functionality" is selected:**

The evaluator shall perform the following tests.

The evaluator shall perform 15 trials for the RNG implementation. If the RNG is configurable, the evaluator shall perform 15 trials for each configuration. The evaluator shall also confirm that

*the operational guidance contains appropriate instructions for configuring the RNG functionality.*

*If the RNG has prediction resistance enabled, each trial consists of (1) instantiate DRBG, (2) generate the first block of random bits, (3) generate a second block of random bits, and (4) uninstantiate. The evaluator verifies that the second block of random bits is the expected value. The evaluator shall generate eight input values for each trial. The first is a count (0 - 14). The next three are entropy input, nonce, and personalization string for the instantiate operation. The next two are additional input and entropy input for the first call to generate. The final two are additional input and entropy input for the second call to generate. These values are randomly generated. "generate one block of random bits" means to generate random bits with number of returned bits equal to the Output Block Length (as defined in NIST SP 800-90A).*

*If the RNG does not have prediction resistance, each trial consists of (1) instantiate DRBG, (2) generate the first block of random bits (3) reseed, (4) generate a second block of random bits, and (5) uninstantiate. The evaluator verifies that the second block of random bits is the expected value. The evaluator shall generate eight input values for each trial. The first is a count (0 - 14). The next three are entropy input, nonce, and personalization string for the instantiate operation. The fifth value is additional input to the first call to generate. The sixth and seventh are additional input and entropy input to the call to reseed. The final value is additional input to the second generate call.*

*The following paragraphs contain more information on some of the input values to be generated/selected by the evaluator.*

*Entropy input: the length of the entropy input value must equal the seed length.*

*Nonce: If a nonce is supported (CTR\_DRBG with no Derivation Function does not use a nonce), the nonce bit length is one-half the seed length.*

*Personalization string: The length of the personalization string must be less than or equal to seed length. If the implementation only supports one personalization string length, then the same length can be used for both values. If more than one string length is support, the evaluator shall use personalization strings of two different lengths. If the implementation does not use a personalization string, no value needs to be supplied.*

*Additional input: the additional input bit lengths have the same defaults and restrictions as the personalization string lengths.*

### **TSS**

*Documentation shall be produced-and the evaluator shall perform the activities-in accordance with Appendix D: Entropy Documentation and Assessment and the "Clarification to the Entropy Documentation and Assessment Annex."*

*In the future, specific statistical testing (in line with NIST SP 800-90B) will be required to verify the entropy estimates.*

## **FCS\_STG\_EXT.1 Cryptographic Key Storage**

### **FCS\_STG\_EXT.1.1**

The TSF shall utilize [**selection: platform-provided key storage, encryption as specified in FCS\_STG\_EXT.2**] for all persistent secrets and private keys.

**Application Note:** This requirement ensures that persistent secrets (credentials, secret keys) and private keys are stored securely when not in use. If some secrets/keys are manipulated by the TOE and others are manipulated by the platform, then both of the selections can be specified by the ST author and the ST author must identify in the TSS those keys which are manipulated by the TOE and those by the platform.

If "encryption as specified in [FCS\\_STG\\_EXT.2](#)" is selected then [FCS\\_STG\\_EXT.2](#) and [FCS\\_IV\\_EXT.1](#) must be included in the ST.

If the TSF is an application, and not a dedicated server, then it should store its private keys in the platform-provided key storage.

The ST author is responsible for selecting the manner in which the keys are stored and where they are stored in the selections above.

## **Evaluation Activities ▾**

### [FCS\\_STG\\_EXT.1:](#)

#### **TSS**

*Regardless of whether this requirement is met by the TSF or the TOE platform, the evaluator will check the TSS to ensure that it lists each persistent secret (credential, secret key) and private key needed to meet the requirements in the ST. For each of these items, the evaluator will confirm that the TSS lists for what purpose it is used, and how it is stored. The evaluator then performs the following actions.*

*Persistent secrets and private keys manipulated by the TOE platform:*

*The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key storage functionality is invoked for each persistent secret and private key described in the TSS (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

*Persistent secrets and private keys manipulated by the TSF:*

*The evaluator reviews the TSS to determine that it makes a case that, for each item listed as being manipulated by the TOE, it is not written unencrypted to persistent memory, and that the item is stored by the platform.*

## **FCS\_STG\_EXT.2 Encrypted Cryptographic Key Storage**

***This is a selection-based component. Its inclusion depends upon selection from .***

### **FCS\_STG\_EXT.2.1**

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to encrypt all keys using AES in the [selection: Key Wrap (KW) mode, Key Wrap with Padding (KWP) mode, GCM, CCM, CBC mode].

**Application Note:** This requirement states that keys used by the TSF shall not be kept in plaintext. The intent of this requirement is to ensure that the private keys, credentials, and persistent secrets cannot be accessed in the TOE in an unencrypted state, allowing an attacker to access keys without having to exhaust the AES key space.

This requirement must be including in the ST if the selection in [FCS\\_STG\\_EXT.1](#) indicates that the TSF is protecting private keys and persistent secrets with encryption rather than the platform-provided key storage.

## **Evaluation Activities ▼**

### [\*\*FCS\\_STG\\_EXT.2:\*\*](#)

#### **TSS**

*The evaluator shall examine the TSS to ensure it describes in detail how user credentials, persistent secret and private keys are stored and encrypted. The evaluator shall review the TSS to determine that it makes a case that key material is not written unencrypted to persistent memory and that it identifies the mode of encryption.*

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how the key encryption functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

## **6.1.5 Identification and Authentication (FIA)**

### **FIA\_ENR\_EXT.1 Enrollment of Mobile Device into Management**

#### **FIA\_ENR\_EXT.1.1**

The TSF shall authenticate the remote users over a trusted channel during the enrollment of a mobile device.

**Application Note:** The MDM Server may use its own directory or a directory server to perform the authentication decision for users performing the remote enrollment of a mobile device.

#### **FIA\_ENR\_EXT.1.2**

The TSF shall limit the user's enrollment of devices to devices specified by [selection: IMEI, [assignment: a unique device ID]] and [selection: specific

*device models, a number of devices, specific time period, [assignment: other features], no other features].*

**Application Note:** This requirement is designed to permit the enterprise to restrict users' enrollment of devices. A unique device ID is required to limit the user's enrollment. The unique device ID can be the IMEI or an ID specific to a particular platform.

## Evaluation Activities ▼

### FIA\_ENR\_EXT.1:

#### TSS

*The evaluator shall examine the TSS and verify that it describes the process of enrollment for each MDM Agent/platform listed as supported in the ST. This description shall include the trusted path used for enrollment ([FTP\\_TRP.1/TRUSTPATH\\_ENROLL](#)), the method of user authentication (username/password, token, etc.), the method of authentication decision (local or remote authentication services), and the actions performed on the MDM Server upon successful authentication.*

#### Tests

- **Test 1:** The evaluator shall attempt to enroll a device without providing correct credentials. The evaluator shall verify that the device is not enrolled and that the described enrollment actions are not taken.
- **Test 2:** The evaluator shall attempt to enroll the device providing correct credentials. The evaluator shall verify that the device is enrolled and that the described enrollment actions are taken.

#### TSS

*The evaluator shall examine the TSS and verify that it implements a policy to limit the user's enrollment of devices.*

#### Guidance

*The evaluator shall ensure that the administrative guidance describes the method(s) of restricting user enrollment and that it instructs the administrator how to configure the restrictions.*

#### Tests

*For each type of policy selected, the evaluator shall perform the following:*

- **Test 1:** The evaluator shall attempt to configure the MDM Server according to the administrative guidance in order to prevent enrollment. The evaluator shall verify that the user cannot enroll a device outside of the configured limitation. (For example, the evaluator may try to enroll a disallowed device, or may try to enroll additional devices beyond the number allowed.)

## FIA\_UAU.1 Timing of Authentication

### FIA\_UAU.1.1

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to allow [assignment: list of TSF mediated actions] on behalf of the user to be performed before the user is authenticated with the Server.

### FIA\_UAU.1.2

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] that requires each user to be successfully authenticated with the Server before allowing any other TSF-mediated actions on behalf of that user.

**Application Note:** This requirement ensures that any user attempting to access the TSF must be authenticated. These users may be administrators attempting to administer the TOE or ordinary users attempting to enroll for management by the MDM system. The ST author is responsible for assigning the list of actions that can take place before this authentication. The TSF or TOE platform may utilize enterprise authentication to meet this requirement.

For distributed TOEs at least one TOE component has to support the authentication of administrators but not necessarily all TOE components. In case not all TOE components support authentication for administrators the TSS must describe how administrators are authenticated and identified.

## Evaluation Activities ▼

### [\*\*FIA\\_UAU.1:\*\*](#)

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **Tests**

The evaluator shall perform the following tests:

- **Test 1:** The evaluator shall attempt to perform the prohibited actions before authentication. The evaluator shall verify the actions cannot be performed.
- **Test 2:** The evaluator shall attempt to perform the prohibited actions after authentication. The evaluator shall verify the actions can be performed.

## **FIA\_UAU\_EXT.4/REUSE User Authentication (Re-Use Prevention)**

**This is an objective component.**

### **FIA\_UAU\_EXT.4.1/REUSE**

The TSF shall prevent reuse of enrollment authentication data related to [assignment: identified authentication mechanism(s)].

**Application Note:** This requirement references the authentication mechanism(s) used to authenticate the user for enrollment in [FIA\\_ENR\\_EXT.1.1](#). If a username and password is used to authenticate the user for enrollment, the password must not be reused. Thus if the user has two devices enrolled in management or needs to re-enroll the same device (i.e., after a device wipe), the password must be different for each enrollment. Additionally, if two different users are enrolling the password must be different for each user.

## **Evaluation Activities ▼**

### [\*\*FIA\\_UAU\\_EXT.4/REUSE:\*\*](#)

#### **TSS**

The evaluator shall verify that the TSS contains a description of the process of enrollment for each MDM Agent/platform listed as supported in the ST. This description shall include the method of user authentication (username/password, token, etc.) and how reuse of the authentication data is prevented.

#### **Tests**

- **Test 1:** The evaluator shall enroll a device providing correct credentials. The evaluator shall attempt to enroll a second device using the same credentials used to enroll the first device. The evaluator shall verify that the second device could not enroll.

## **FIA\_UAU\_EXT.4/REUSE\_ENROLL User Authentication (Re-Use Prevention for Device Enrollment)**

**This is an objective component.**

### **FIA\_UAU\_EXT.4.1/REUSE\_ENROLL**

The TSF shall prevent reuse of [selection: IMEI, [assignment: a unique device ID]] related to limiting the user's enrollment of devices.

**Application Note:** The MDM server must not allow two devices to be enrolled using the same unique identifier. The unique identifier is specified in [FIA\\_ENR\\_EXT.1.2](#).

[FIA\\_UAU\\_EXT.4.1/REUSE\\_ENROLL](#) can only be included in the ST if "devices specified by IMEI" or "device specified by [assignment: a unique device ID] is selected in [FIA\\_ENR\\_EXT.1.2](#). The same selection must be completed for this requirement.

**FIA\_UAU\_EXT.4/REUSE\_ENROLL:****TSS**

The evaluator shall verify that the TSS contains a description of the policy to limit the user's enrollment of devices.

**Guidance**

The evaluator shall ensure that the administrative guidance describes the method(s) of restricting user enrollment and that it instructs the administrator how to configure the restrictions.

**Tests**

- **Test 1:** The evaluator shall configure the MDM Server to restrict user's enrollment to a specific unique device ID and enroll a device with that device ID. The evaluator shall attempt to enroll a second device with the same unique device ID. (The evaluator may need to wipe the device without network connectivity, so the device is un-enrolled but the MDM server considers the device still enrolled.) The evaluator shall verify that the second enrollment using the same unique device ID fails.

**FIA\_X509\_EXT.1/CERTVAL\_MAN X.509 Certificate Validation****FIA\_X509\_EXT.1.1/CERTVAL\_MAN**

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to validate certificates in accordance with the following rules:

- RFC 5280 certificate validation and certificate path validation.
- The certificate path must terminate with a trusted CA certificate.
- The TSF shall validate a certificate path by ensuring the presence of the basicConstraints extension and that the CA flag is set to TRUE for all CA certificates.
- The TSF shall validate the revocation status of the certificate using [**selection: the Online Certificate Status Protocol (OCSP) as specified in RFC 2560, a Certificate Revocation List (CRL) as specified in RFC 5280 Section 6.3, a Certificate Revocation List (CRL) as specified in RFC 5759 Section 5**].
- The TSF shall validate the extendedKeyUsage field according to the following rules:
  - Certificates used for trusted updates and executable code integrity verification shall have the Code Signing purpose (id-kp 3 with OID 1.3.6.1.5.5.7.3.3) in the extendedKeyUsage field.
  - Server certificates presented for TLS shall have the Server Authentication purpose (id-kp-1 with OID 1.3.6.1.5.5.7.3.1) in the extendedKeyUsage field.
  - Client certificates presented for TLS shall have the Client Authentication purpose (id-kp-2 with OID 1.3.6.1.5.5.7.3.2) in the extendedKeyUsage field.
  - CSP certificates presented for OCSP responses shall have the OCSP Signing purpose (id- kp 9 with OID 1.3.6.1.5.5.7.3.9) in the extendedKeyUsage field.
  - Server certificates presented for EST shall have the CMC Registration Authority (RA) purpose (id-kp-cmcRA with OID 1.3.6.1.5.5.7.3.28) in the extendedKeyUsage field.

**Application Note:** [FIA\\_X509\\_EXT.1.1/CERTVAL\\_MAN](#) lists the rules for validating certificates. The ST author must select whether revocation status is verified using OCSP or CRLs. [FIA\\_X509\\_EXT.2](#) requires that certificates are used for trusted channels; this use requires that the *extendedKeyUsage* rules are verified. Certificates may optionally be used for code signing and policy signing and, if implemented, must be validated to contain the corresponding *extendedKeyUsage*.

Regardless of the selection of implement functionality or invoke platform-provided functionality, the validation is expected to end in a trusted root CA certificate in a root store managed by the platform.

**FIA\_X509\_EXT.1.2/CERTVAL\_MAN**

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to treat a certificate as a CA certificate only if the basicConstraints extension is present and the CA flag is set to TRUE.

**Application Note:** This requirement applies to certificates that are used and processed by the TOE or platform and restricts the certificates that may be

added as trusted CA certificates.

## Evaluation Activities ▼

### [\*\*FIA\\_X509\\_EXT.1/CERTVAL\\_MAN:\*\*](#) **TSS**

#### **If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the certificate validation functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **If "implement functionality" is selected:**

The evaluator shall ensure the TSS describes where the check of validity of the certificates takes place. The evaluator ensures the TSS also provides a description of the certificate path validation algorithm.

#### **Tests**

The tests described must be performed in conjunction with the other certificate services evaluation activities, including each of the functions in [\*\*FIA\\_X509\\_EXT.2.1\*\*](#). The tests for the extendedKeyUsage rules are performed in conjunction with the uses that require those rules. The evaluator shall create a chain of at least three certificates: the node certificate to be tested, an Intermediate CA, and the self-signed Root CA.

- **Test 1:** The evaluator shall load a certificate or certificates as trusted CAs needed to validate the certificate to be used in the function, and demonstrate that the function succeeds. The evaluator shall then delete one of the certificates, and show that the function fails.
- **Test 2:** The evaluator shall demonstrate that validating an expired certificate results in the function failing.
- **Test 3:** The evaluator shall test that the TOE can properly handle revoked certificates--conditional on whether CRL or OCSP is selected; if both are selected, then a test shall be performed for each method. The evaluator shall test revocation of the node certificate and revocation of the intermediate CA certificate (i.e. the intermediate CA certificate should be revoked by the root CA). The evaluator shall ensure that a valid certificate is used, and that the validation function succeeds. The evaluator then attempts the test with a certificate that has been revoked (for each method chosen in the selection) to ensure when the certificate is no longer valid that the validation function fails.
- **Test 4:** [Conditional] If OCSP is selected, the evaluator shall configure the OCSP server or use a man-in-the-middle tool to present a certificate that does not have the OCSP signing purpose and verify that validation of the OCSP response fails. If CRL is selected and the CA contains a Key Usage extension, the evaluator shall configure the CA to sign a CRL with a certificate that does not have the cRLsign key usage bit set, and verify that validation of the CRL fails. If the CA is a root CA with no Key Usage extension, this test is not performed.
- **Test 5:** The evaluator shall modify any byte in the first eight bytes of the certificate and demonstrate that the certificate fails to validate. (The certificate will fail to parse correctly.)
- **Test 6:** The evaluator shall modify any byte in the last byte of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)
- **Test 7:** The evaluator shall modify any byte in the public key of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)

#### **TSS**

#### **If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **Tests**

#### **If "implement functionality" is selected:**

The tests described must be performed in conjunction with the other certificate services evaluation activities, including the functions in [\*\*FIA\\_X509\\_EXT.2.1\*\*](#). The evaluator shall create a chain of at least four certificates: the node certificate to be tested, two Intermediate CAs, and the self-signed Root CA.

- **Test 1:** The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOEs certificate does not contain the basicConstraints extension. The validation of the certificate path fails.
- **Test 2:** The evaluator shall construct a certificate path, such that the certificate of the CA

issuing the TOEs certificate has the cA flag in the basicConstraints extension not set. The validation of the certificate path fails.

- **Test 3:** The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOEs certificate has the cA flag in the basicConstraints extension set to TRUE. The validation of the certificate path succeeds.

## FIA\_X509\_EXT.1/CERTVAL\_SEL X.509 Certificate Validation

**This is a selection-based component. Its inclusion depends upon selection from .**

### FIA\_X509\_EXT.1.1/CERTVAL\_SEL

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to validate certificates in accordance with the following rules:

- RFC 5280 certificate validation and certificate path validation.
- The certificate path must terminate with a trusted CA certificate.
- The TSF shall validate a certificate path by ensuring the presence of the basicConstraints extension and that the CA flag is set to TRUE for all CA certificates.
- The TSF shall validate the revocation status of the certificate using [selection: the Online Certificate Status Protocol (OCSP) as specified in RFC 2560, a Certificate Revocation List (CRL) as specified in RFC 5280 Section 6.3, a Certificate Revocation List (CRL) as specified in RFC 5759 Section 5, no revocation method].
- The TSF shall validate the extendedKeyUsage field according to the following rules:
  - Certificates used for trusted updates and executable code integrity verification shall have the Code Signing purpose (id-kp 3 with OID 1.3.6.1.5.5.7.3.3) in the extendedKeyUsage field.
  - Server certificates presented for TLS shall have the Server Authentication purpose (id-kp-1 with OID 1.3.6.1.5.5.7.3.1) in the extendedKeyUsage field.
  - Client certificates presented for TLS shall have the Client Authentication purpose (id-kp-2 with OID 1.3.6.1.5.5.7.3.2) in the extendedKeyUsage field.
  - CSP certificates presented for OCSP responses shall have the OCSP Signing purpose (id- kp 9 with OID 1.3.6.1.5.5.7.3.9) in the extendedKeyUsage field.
  - Server certificates presented for EST shall have the CMC Registration Authority (RA) purpose (id-kp-cmcRA with OID 1.3.6.1.5.5.7.3.28) in the extendedKeyUsage field.

**Application Note:** FIA\_X509\_EXT.1.1/CERTVAL\_SEL should be chosen if the TOE is distributed and the protocol(s) selected in FPT\_ITT.1/INTER\_XFER utilize X.509 certificates for peer authentication. In this case, the use of revocation list checking is optional as there are additional requirements surrounding the enabling and disabling of the ITT channel as defined in FCO\_CPC\_EXT.1. If revocation checking is not supported, the ST author should select no revocation method. However, if certificate revocation checking is supported, the ST author selects whether this is performed using OCSP or CRLs.

The TSS must describe when revocation checking is performed. It is expected that revocation checking is performed when a certificate is used in an authentication step. It is not sufficient to verify the status of a X.509 certificate only when it is loaded onto the device.

This SFR lists the rules for validating certificates. The ST author must select whether revocation status is verified using OCSP or CRLs. FIA\_X509\_EXT.2 requires that certificates are used for trusted channels; this use requires that the *extendedKeyUsage* rules are verified. Certificates may optionally be used for code signing and policy signing and, if implemented, must be validated to contain the corresponding *extendedKeyUsage*.

Regardless of the selection of implement functionality or invoke platform-provided functionality, the validation is expected to end in a trusted root CA certificate in a root store managed by the platform.

### FIA\_X509\_EXT.1.2/CERTVAL\_SEL

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to treat a certificate as a CA certificate only if the basicConstraints extension is present and the CA flag is set to TRUE.

**Application Note:** This requirement applies to certificates that are used and

processed by the TOE or platform and restricts the certificates that may be added as trusted CA certificates.

## Evaluation Activities ▼

### [FIA\\_X509\\_EXT.1/CERTVAL\\_SEL:](#)

#### **If "invoke platform-provided functionality" is selected:**

##### **TSS**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how the certificate validation functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **If "implement functionality" is selected:**

The evaluator shall ensure the TSS describes where the check of validity of the certificates takes place. The evaluator ensures the TSS also provides a description of the certificate path validation algorithm.

##### **Tests**

The tests described must be performed in conjunction with the other certificate services evaluation activities, including each of the functions in [FIA\\_X509\\_EXT.2.1](#). The tests for the extendedKeyUsage rules are performed in conjunction with the uses that require those rules. The evaluator shall create a chain of at least four certificates: the node certificate to be tested, two Intermediate CAs, and the self-signed Root CA.

- **Test 1:** The evaluator shall load a certificate or certificates as trusted CAs needed to validate the certificate to be used in the function, and demonstrate that the function succeeds. The evaluator shall then delete one of the certificates, and show that the function fails.
- **Test 2:** The evaluator shall demonstrate that validating an expired certificate results in the function failing.
- **Test 3:** The evaluator shall test that the TOE can properly handle revoked certificates--conditional on whether CRL or OCSP is selected; if both are selected, then a test shall be performed for each method. The evaluator shall test revocation of the node certificate and revocation of the intermediate CA certificate (i.e. the intermediate CA certificate should be revoked by the root CA). The evaluator shall ensure that a valid certificate is used, and that the validation function succeeds. The evaluator then attempts the test with a certificate that has been revoked (for each method chosen in the selection) to ensure when the certificate is no longer valid that the validation function fails.
- **Test 4:** If OCSP is selected, the evaluator shall configure the OCSP server or use a man-in-the-middle tool to present a certificate that does not have the OCSP signing purpose and verify that validation of the OCSP response fails. If CRL is selected and the CA contains a Key Usage extension, the evaluator shall configure the CA to sign a CRL with a certificate that does not have the cRLsign key usage bit set, and verify that validation of the CRL fails. If the CA is a root CA with no Key Usage extension, this test is not performed.
- **Test 5:** The evaluator shall modify any byte in the first eight bytes of the certificate and demonstrate that the certificate fails to validate. (The certificate will fail to parse correctly.)
- **Test 6:** The evaluator shall modify any byte in the last byte of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)
- **Test 7:** The evaluator shall modify any byte in the public key of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)

##### **TSS**

#### **If "invoke platform-provided functionality" is selected:**

The evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **Tests**

#### **If "implement functionality" is selected:**

The tests described must be performed in conjunction with the other certificate services evaluation activities, including the functions in [FIA\\_X509\\_EXT.2.1](#). The evaluator shall create a chain of at least four certificates: the node certificate to be tested, two Intermediate CAs, and the self-signed Root CA.

- **Test 1:** The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOEs certificate does not contain the basicConstraints extension. The validation

of the certificate path fails.

- **Test 2:** The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOEs certificate has the cA flag in the basicConstraints extension not set. The validation of the certificate path fails.
- **Test 3:** The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOEs certificate has the cA flag in the basicConstraints extension set to TRUE. The validation of the certificate path succeeds.

## FIA\_X509\_EXT.2 X.509 Certificate Authentication

### FIA\_X509\_EXT.2.1

The TSF shall [selection]:

- invoke platform-provided functionality to use X.509v3 certificates as defined by RFC 5280 to support authentication for [selection: IPsec, HTTPS, TLS, DTLS, SSH, no protocols], and [selection:
  - code signing for system software updates,
  - code signing for integrity verification,
  - policy signing,
  - [assignment: other uses],
  - no additional uses]
  - implement functionality to use X.509v3 certificates as defined by RFC 5280 to support authentication for [selection:
    - IPsec as defined in the PP-Module for VPN Client,
    - HTTPS in accordance with FCS\_HTTPS\_EXT.1,
    - TLS as defined in the Package for Transport Layer Security,
    - DTLS as defined in the Package for Transport Layer Security,
    - SSH as defined in the Extended Package for Secure Shell,
    - no protocols]
    - and [selection:
      - code signing for system software updates,
      - code signing for integrity verification,
      - policy signing,
      - [assignment: other uses],
      - no additional uses]

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**Application Note:** The ST author's selection(s) must match the selection of [FTP\\_TRP.1/TRUSTPATH\\_ENROLL](#), [FTP\\_ITC.1/INTER\\_XFER\\_IT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#), [FPT\\_ITT.1/INTER\\_XFER](#), and [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#). Certificates may optionally be used for trusted updates of system software ([FPT\\_TUD\\_EXT.1.3](#)) and software integrity verification ([FPT\\_TST\\_EXT.1.2](#)). If some authentication services are provided by the TOE and others by the platform, the ST author must clearly identify which services are provided by the TOE and which by the platform.

If code signing for integrity verification is selected, the MDM vendor is not expected to digitally sign DLL's from other vendors that have been incorporated into their product.

### FIA\_X509\_EXT.2.2

When the [selection: TSF, TOE platform] cannot establish a connection to determine the validity of a certificate, the TSF shall [selection: invoke platform-provided functionality, implement functionality] to [selection: allow the administrator to choose whether to accept the certificate in these cases, accept the certificate, not accept the certificate].

**Application Note:** Often a connection must be established to perform a verification of the revocation status of a certificate - either to download a CRL or to perform OCSP. The selection is used to describe the behavior in the event that such a connection cannot be established (for example, due to a network error). If the TOE has determined the certificate is valid according to all other rules in [FIA\\_X509\\_EXT.1/CERTVAL\\_MAN](#), the behavior indicated in the second selection must determine the validity. The TOE must not accept the certificate if it fails any of the other validation rules in [FIA\\_X509\\_EXT.1/CERTVAL\\_MAN](#). If the administrator-configured option is selected by the ST Author, the ST Author must also select function d in [FMT\\_SMF.1/SERVER\\_CONF\\_SERVER](#).

If the TOE is distributed and [FIA\\_X509\\_EXT.1/CERTVAL\\_SEL](#) is selected, then certificate revocation checking is optional. This is due to additional authorization

actions being performed in the enabling and disabling of the intra-TOE trusted channel as defined in [FCO\\_CPC\\_EXT.1](#). In this case, a connection is not required to determine certificate validity and this SFR is trivially satisfied.

## Evaluation Activities ▼

### [FIA\\_X509\\_EXT.2:](#)

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **TSS**

The evaluator shall check the TSS to ensure that it describes how the TOE chooses which certificates to use, and any necessary instructions in the administrative guidance for configuring the operating environment so that the TOE can use the certificates.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

If "implement functionality" is selected, the evaluator shall examine the TSS to confirm that it describes the behavior of the TOE when a connection cannot be established during the validity check of a certificate used in establishing a trusted channel. The evaluator shall verify that any distinctions between trusted channels are described.

#### **Guidance**

If the requirement that the administrator is able to specify the default action is selected, then the evaluator shall ensure that the operational guidance contains instructions on how this configuration action is performed.

#### **Tests**

The evaluator shall perform the following test for each trusted channel:

- **Test 1:** The evaluator shall demonstrate use of a valid certificate requiring certificate validation checking to be performed in at least some part by communicating with a non-TOE IT entity. The evaluator shall then manipulate the environment so that the TOE is unable to verify the validity of the certificate, and observe that the action selected in [FIA\\_X509\\_EXT.2.2](#) is performed. If the selected action is administrator-configurable, then the evaluator shall follow the operational guidance to determine that all supported administrator-configurable options behave in their documented manner.

## [FIA\\_X509\\_EXT.3 X.509 Enrollment](#)

**This is an objective component.**

### FIA\_X509\_EXT.3.1

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to generate a Certificate Request Message as specified by RFC 2986 and be able to provide the following information in the request: public key and [**selection: device-specific information, Common Name, Organization, Organizational Unit, Country**].

**Application Note:** The public key is the public key portion of the public-private key pair generated by the TOE as specified in [FCS\\_CKM.1.1](#).

As Enrollment over Secure Transport (EST) is a new standard that has not yet been widely adopted, this requirement is included as an interim objective requirement in order to allow developers to distinguish those products which have to have the ability to generate Certificate Request Messages but do not yet implement EST.

### FIA\_X509\_EXT.3.2

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to validate the chain of certificates from the Root CA upon receiving the CA Certificate Response.

## Evaluation Activities ▼

### **FIA\_X509\_EXT.3:**

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **TSS**

If the ST author selects "device-specific information", the evaluator shall verify that the TSS contains a description of the device-specific fields used in certificate requests.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **Guidance**

The evaluator shall check to ensure that the operational guidance contains instructions on requesting certificates from a CA, including generation of a Certificate Request Message. If the ST author selects "Common Name", "Organization", "Organizational Unit", or "Country", the evaluator shall ensure that this guidance includes instructions for establishing these fields before creating the certificate request message.

#### **Tests**

- **Test 1:** The evaluator shall use the operational guidance to cause the TOE to generate a certificate request message. The evaluator shall capture the generated message and ensure that it conforms to the format specified. The evaluator shall confirm that the certificate request provides the public key and other required information, including any necessary user-input information.
- **Test 2:** The evaluator shall demonstrate that validating a certificate response message without a valid certification path results in the function failing. The evaluator shall then load a certificate or certificates as trusted CAs needed to validate the certificate response message, and demonstrate that the function succeeds. The evaluator shall then delete one of the certificates, and show that the function fails.

### **FIA\_X509\_EXT.4 Alternate X.509 Enrollment**

**This is an objective component.**

#### **FIA\_X509\_EXT.4.1**

The TSF shall use the Enrollment over Secure Transport (EST) protocol as specified in RFC 7030 to request certificate enrollment using the simple enrollment method described in RFC 7030 Section 4.2.

#### **FIA\_X509\_EXT.4.2**

The TSF shall be capable of authenticating EST requests using an existing certificate and corresponding private key as specified by RFC 7030 Section 3.3.2.

#### **FIA\_X509\_EXT.4.3**

The TSF shall be capable of authenticating EST requests using HTTP Basic Authentication with a username and password as specified by RFC 7030 Section 3.2.3.

#### **FIA\_X509\_EXT.4.4**

The TSF shall perform authentication of the EST server using an Explicit Trust Anchor following the rules described in RFC 7030, section 3.6.1.

**Application Note:** EST also uses HTTPS as specified in [FCS\\_HTTPS\\_EXT.1](#) to establish a secure connection to an EST server, and thus, the ST author must also include [FCS\\_HTTPS\\_EXT.1](#) in the main body of the ST. The separate Trust Anchor Database dedicated to EST operations is described as Explicit Trust Anchors in RFC 7030.

#### **FIA\_X509\_EXT.4.5**

The TSF shall be capable of requesting server-provided private keys as specified in RFC 7030 Section 4.4.

#### **FIA\_X509\_EXT.4.6**

The TSF shall be capable of updating its EST-specific Trust Anchor Database using the "Root CA Key Update" process described in RFC 7030 Section 4.1.3.

#### **FIA\_X509\_EXT.4.7**

The TSF shall generate a Certificate Request Message for EST as specified in RFC 2986 and be able to provide the following information in the request: public key and [selection]:

- device-specific information,
- Common Name, Organization, Organizational Unit, and Country

1.

#### FIA\_X509\_EXT.4.8

The TSF shall validate the chain of certificates from the Root CA certificate in the Trust Anchor Database to the EST Server CA certificate upon receiving a CA Certificates Response.

**Application Note:** The public key referenced in [FIA\\_X509\\_EXT.4.7](#) is the public key portion of the public-private key pair generated by the TOE as specified in [FCS\\_CKM.1](#).

### Evaluation Activities ▼

#### [FIA\\_X509\\_EXT.4:](#)

##### **Guidance**

*The evaluator shall check to ensure that the operational guidance contains instructions on requesting certificates from an EST server, including generating a Certificate Request Message.*

##### **Tests**

*The evaluator shall also perform the following tests. Other tests are performed in conjunction with the TLS evaluation activities.*

- **Test 1:** The evaluator shall use the operational guidance to cause the TOE to request certificate enrollment from an EST server using the simple enrollment method described in RFC 7030 Section 4.2, authenticating the certificate request to the server using an existing certificate and private key as described by RFC 7030 Section 3.3.2. The evaluator shall confirm that the resulting certificate is successfully obtained and installed in the TOE key store.
- **Test 2:** The evaluator shall use the operational guidance to cause the TOE to request certificate enrollment from an EST server using the simple enrollment method described in RFC 7030 Section 4.2, authenticating the certificate request to the server using a username and password as described by RFC 7030 Section 3.2.3. The evaluator shall confirm that the resulting certificate is successfully obtained and installed in the TOE key store.
- **Test 3:** The evaluator shall modify the EST server to return a certificate containing a different public key than the key included in the TOEs certificate request. The evaluator shall use the operational guidance to cause the TOE to request certificate enrollment from an EST server. The evaluator shall confirm that the TOE does not accept the resulting certificate since the public key in the issued certificate does not match the public key in the certificate request.
- **Test 4:** The evaluator shall configure the EST server or use a man-in-the-middle tool to present a server certificate to the TOE that is present in the TOE general Trust Anchor Database but not its EST-specific Trust Anchor Database. The evaluator shall cause the TOE to request certificate enrollment from the EST server. The evaluator shall verify that the request is not successful.
- **Test 5:** The evaluator shall configure the EST server or use a man-in-the-middle tool to present an invalid certificate. The evaluator shall cause the TOE to request certificate enrollment from the EST server. The evaluator shall verify that the request is not successful. The evaluator shall configure the EST server or use a man-in-the-middle tool to present a certificate that does not have the CMC RA purpose and verify that requests to the EST server fail. The tester shall repeat the test using a valid certificate and a certificate that contains the CMC RA purpose and verify that the certificate enrollment requests succeed.
- **Test 6:** The evaluator shall use a packet sniffing tool between the TOE and an EST server. The evaluator shall turn on the sniffing tool and cause the TOE to request certificate enrollment from an EST server. The evaluator shall verify that the EST protocol interaction occurs over a Transport Layer Security (TLS) protected connection. The evaluator is not expected to decrypt the connection but rather observe that the packets conform to the TLS protocol format.
- **Test 7:** The evaluator shall use the operational guidance to cause the TOE to request a server-provided private key and certificate from an EST server. The evaluator shall confirm that the resulting private key and certificate are successfully obtained and installed in the TOE key store.
- **Test 8:** The evaluator shall modify the EST server to, in response to a server-provided private key and certificate request, return a private key that does not correspond with the public key in the returned certificate. The evaluator shall use the operational guidance to cause the TOE to request a server-provided private key and certificate. The evaluator shall confirm that the TOE does not accept the resulting private key and certificate since the private key and public key do not correspond.
- **Test 9:** The evaluator shall configure the EST server to provide a "Root CA Key Update" as

described in RFC 7030 Section 4.1.3. The evaluator shall cause the TOE to request CA certificates from the EST server and shall confirm that the EST-specific Trust Anchor Database is updated with the new trust anchor.

- **Test 10:** The evaluator shall configure the EST server to provide a "Root CA Key Update" as described in RFC 7030 Section 4.1.3, but shall modify part of the NewWithOld certificate's generated signature. The evaluator shall cause the TOE to request CA certificates from the EST server and shall confirm that the EST-specific Trust Anchor Database is not updated with the new trust anchor since the signature did not verify.
- **Test 11:** The evaluator shall use the operational guidance to cause the TOE to generate a certificate request message. The evaluator shall capture the generated message and ensure that it conforms with the format specified by RFC 2986. The evaluator shall confirm that the certificate request provides the public key and other required information, including any necessary user-input information.

## FIA\_X509\_EXT.5 X.509 Unique Certificate

### FIA\_X509\_EXT.5.1

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to require a unique certificate for each client device.

**Application Note:** Each client device will have a unique X.509v3 certificate for use by the MDM Agent; the certificate is not to be reused among clients. This requirement is to ensure that the MDM Server either provides a unique certificate or verifies that each client certificate is unique.

## Evaluation Activities ▼

### *FIA\_X509\_EXT.5:*

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

If "implement functionality" is selected then the evaluator shall examine the TSS to verify that it describes the methods to ensure that each client utilizes a unique certificate.

#### **Tests**

For each MDM Agent/platform listed as supported in the ST:

The evaluator shall utilize appropriate combinations of specialized operational environment and development tools (debuggers, simulators, etc.) for the TOE and instrumented TOE builds as needed to perform this test.

One of the following tests must be performed depending on whether the MDM agent allows for the loading of certificates.

- **Test 1: [conditional]** If the MDM agent allows for the loading of certificates:  
The evaluator shall initiate communications between the MDM Server and a client device over a trusted channel established using the device's unique certificate, verifying that a successful communication channel was established. The evaluator shall then attempt to initiate communications between the MDM Server and a second client device over a trusted channel established using the unique certificate from the first device, verifying that the MDM Server rejects this attempt at communication.
- **Test 2: [conditional]** If the MDM agent does not allow for the loading of certificates:  
The evaluator shall concurrently enroll 10 devices and ensure that the client certificate for each is unique, per the methods described in the TSS.

## 6.1.6 Security Management (FMT)

### FMT\_MOF.1/FUNCBE Management of Functions Behavior

#### FMT\_MOF.1.1/FUNCBE

**Refinement:** The TSF shall restrict the ability to perform the functions

- listed in [FMT\\_SMF.1/SERVER\\_CONF\\_AGENT](#)
- enable, disable, and modify policies listed in [FMT\\_SMF.1/SERVER\\_CONF\\_AGENT](#)
- listed in [FMT\\_SMF.1/SERVER\\_CONF\\_SERVER](#)
- [**selection: enable, disable and modify policies listed in FMT\_SMF.1/MAS, no other functions**]

to [authorized administrators].

**Application Note:** This requirement outlines the functions that administrators will have the power to enable, disable, modify, and monitor functions and policies listed in [FMT\\_SMF.1/SERVER\\_CONF\\_AGENT](#). It also includes functions necessary to maintain and configure the MDM Server itself.

"Enable, disable and modify policies listed in [FMT\\_SMF.1/MAS](#)" must be selected if the TOE includes MAS functionality and [FMT\\_SMF.1/MAS](#), [FAU\\_GEN.1/MAS\\_SERVER](#), [FMT\\_MOF.1/MANAGEMENT\\_MAS](#), [FMT\\_SMR.1/SECMAN\\_ROLES\\_MAS](#) must be included in the ST.

## Evaluation Activities ▼

### [FMT\\_MOF.1/FUNCBE](#):

#### TSS

*The evaluator shall examine the TSS and user documents to ensure that they describe what security management functions are restricted to the administrator and what actions can be taken for each management function. The evaluator shall verify that the security management functions are restricted to authorized administrators and the administrator is only able to take the actions as described in the user documents.*

#### Tests

- **Test 1:** The evaluator shall attempt to access the functions and policies in [FMT\\_SMF.1/SERVER\\_CONF\\_AGENT](#) as an unauthorized user and verify that the attempt fails.
- **Test 2:** [conditional] The evaluator shall attempt to access the functions and policies in [FMT\\_SMF.1/MAS](#) as an unauthorized user and verify that the attempt fails.

## **FMT\_MOF.1/MANAGEMENT\_ENROLL Management of Functions Behavior (Enrollment)**

### FMT\_MOF.1.1/MANAGEMENT\_ENROLL

**Refinement:** The **MDM Server** shall restrict the ability to *[initiate the enrollment process]* to *[authorized administrators and MD users]*.

**Application Note:** This requirement outlines the enrollment functions that both administrators and MD users may perform. The enrollment actions are identified in the TSS as a part of [FIA\\_ENR\\_EXT.1](#).

The authorized administrator does not remotely initiate enrollment of the mobile devices that are in the possession of users but may enroll mobile devices when they are in the possession of the administrator, for example, before distributing the mobile devices to the users.

## Evaluation Activities ▼

### [FMT\\_MOF.1/MANAGEMENT\\_ENROLL](#):

#### TSS

*The evaluator shall examine the TSS and verify that it describes how unauthorized users are prevented from enrolling in the MDM services.*

#### Tests

*The test of this function is performed in conjunction with [FIA\\_ENR\\_EXT.1](#).*

## **FMT\_MOF.1/MANAGEMENT\_MAS Management of Functions in (MAS Server Downloads)**

***This is a selection-based component. Its inclusion depends upon selection from .***

### FMT\_MOF.1.1/MANAGEMENT\_MAS

**Refinement:** The MAS Server shall restrict the ability to download applications, allowing only enrolled mobile devices that are compliant with MDM policies and assigned to a user in the application access group to perform this function.

## Evaluation Activities ▼

### [FMT\\_MOF.1/MANAGEMENT\\_MAS](#):

#### TSS

*The evaluator shall examine the TSS to determine that all methods of initiating an application download or update push are specified.*

**Guidance**

The evaluator shall confirm that the operational guidance contains how to initiate an application download or update push.

**Tests**

The evaluator shall ensure that the MAS Server verifies that the mobile device is enrolled in the MDM Server and is in a compliant state. The evaluator shall verify that an application cannot be downloaded from the MAS Server prior to enrolling the device with the MDM. The evaluator shall partially enroll the mobile device, so the device is connected to the MDM Server, but is not compliant and verify that applications cannot be downloaded.

**FMT\_POL\_EXT.1 Trusted Policy Update****FMT\_POL\_EXT.1.1**

The TSF shall provide digitally signed policies and policy updates to the MDM Agent.

**Application Note:** The intent of this requirement is to cryptographically tie the policies to the enterprise that mandated the policy, not to protect the policies in transit (as they are already protected by [FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) or [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#)). This is especially critical for users who connect to multiple enterprises.

**Evaluation Activities ▼****[FMT\\_POL\\_EXT.1](#):****TSS**

Policies must be digitally signed by the enterprise using the algorithms in [FCS\\_COP.1/SIGN\\_ALG](#). The evaluator shall ensure that the TSS describes how policies are digitally signed by the TSF.

**Guidance**

If applicable, the evaluator shall verify that the AGD guidance instructs administrators on configuring the Enterprise certificate to be used for signing policies or signing the policies before applying them.

**Tests**

The evaluator shall perform a policy update in accordance with [FMT\\_SMF.1/SERVER\\_CONF\\_AGENT](#). The evaluator shall examine the policy either at the MDM Server, in transmission, or at the MDM agent, and verify the TSF signs the update and provides it to the MDM Agent.

**FMT\_SAE\_EXT.1 Security Attribute Expiration**

**This is an objective component.**

**FMT\_SAE\_EXT.1.1**

The TSF shall be capable to specify a configurable expiration time for enrollment authentication data.

**FMT\_SAE\_EXT.1.2**

The TSF shall be able to deny enrollment after the expiration time for the enrollment authentication data has passed.

**Application Note:** This requirement references the user authenticator used for device enrollment in management in [FIA\\_ENR\\_EXT.1.1](#). The user authenticator must only be valid for a configurable time limit. If the authenticator is expired, even if entered correctly, enrollment must not occur.

The length of the time the authenticator is valid for is configured per function c.5 in [FMT\\_SMF.1/SERVER\\_CONF\\_SERVER](#). If [FMT\\_SAE\\_EXT.1](#) is included in the ST, then function g must be selected in [FMT\\_SMF.1/SERVER\\_CONF\\_SERVER](#).

**Evaluation Activities ▼****[FMT\\_SAE\\_EXT.1](#):****TSS**

The evaluator shall verify that the TSS contains a description of the process of enrollment for each MDM Agent/platform listed as supported in the ST. This description shall the method of

*user authentication (username/password, token, etc.).*

#### **Guidance**

*The evaluator shall check to ensure that the operational guidance contains instructions to configure the expiration time for each method of user authentication listed in the TSS.*

#### **Tests**

- **Test 1:** The evaluator shall configure the MDM Server according to the administrative guidance to set an expiration time for the enrollment authentication data. For each method of user authentication listed in the TSS, the evaluator shall attempt to enroll using authentication data that has expired. The evaluator shall verify that enrollment was unsuccessful.

### **FMT\_SMF.1/SERVER\_CONF\_AGENT Specification of Management Functions (Server configuration of Agent)**

#### **FMT\_SMF.1.1/SERVER\_CONF\_AGENT**

**Refinement:** The **MDM Server** shall be capable of **communicating the following commands to the MDM Agent:**

1. transition to the locked state (MDF Function 6)
2. full wipe of protected data (MDF Function 7)
3. unenroll from management
4. install policies
5. query connectivity status
6. query the current version of the MD firmware/software
7. query the current version of the hardware model of the device
8. query the current version of installed mobile applications
9. import X.509v3 certificates into the Trust Anchor Database (MDF Function 11)
10. install applications (MDF Function 16)
11. update system software (MDF Function 15)
12. remove applications (MDF Function 14)

**and the following commands to the MDM Agent:**

**[selection:**

- 13. remove Enterprise applications (MDF Function 17),
- 14. wipe Enterprise data (MDF Function 28),
- 15. remove imported X.509v3 certificates and **[selection:**
  - no other X.509v3 certificates,
  - **[assignment:** list of other categories of X.509v3 certificates]**] in the Trust Anchor Database (MDF Function 12),**
- 16. alert the user,
- 17. import keys/secrets into the secure key storage (MDF Function 9),
- 18. destroy imported keys/secrets and **[selection:**
  - no other keys/secrets,
  - **[assignment:** list of other categories of keys/secrets]**] in the secure key storage (MDF Function 10),**
- 19. read audit logs kept by the MD (MDF Function 32),
- 20. retrieve MD-software integrity verification values (MDF Function 38),
- 21. approve exceptions for sharing data between **[selection:**
  - application processes,
  - group of application processes**] (MDF Function 42),**
- 22. place applications into application process groups based on **[assignment:** application characteristics] (MDF Function 43),
- 23. revoke Biometric template,
- 24. **[assignment:** list of other management functions to be provided by the MD],
- no other management functions

**] and the following MD configuration policies:**

25. password policy:
  - a. minimum password length
  - b. minimum password complexity
  - c. maximum password lifetime (MDF Function 1)
26. session locking policy:
  - a. screen-lock enabled/disabled
  - b. screen lock timeout
  - c. number of authentication failures (MDF Function 2)
27. wireless networks (SSIDs) to which the MD may connect (MDF Function 2)

28. security policy for each wireless network:

a. [selection]:

- specify the CA(s) from which the MD will accept WLAN authentication server certificate(s),
- specify the FQDN(s) of acceptable WLAN authentication server certificate(s)

]

b. ability to specify security type

c. ability to specify authentication protocol

d. specify the client credentials to be used for authentication

e. [assignment: any additional WLAN management functions] (WLAN Client PP-Module Function 1)

29. application installation policy by [selection]:

- specifying authorized application repository(s),
- specifying a set of allowed applications and versions (an application whitelist),
- denying application installation

], (MDF Function 8)

30. enable/disable policy for [assignment: list of audio or visual collection devices] across device, [selection]:

- on a per-app basis,
- on a per-group of applications processes basis,
- no other method

], (MDF Function 5)

**and the following MD configuration policies:**

[selection]:

- 31. enable/disable policy for the VPN protection across MD, [selection]:

- on a per-app basis,
- on a per-group of application processes basis,
- no other method

](MDF Function 3),

- 32. enable/disable policy for [assignment: list of radios], (MDF Function 4),

- 33. enable/disable policy for data signaling over [assignment: list of externally accessible hardware ports], (MDF Function 24),

- 34. enable/disable policy for [assignment: list of protocols where the device acts as a server], (MDF Function 25),

- 35. enable/disable policy for developer modes, (MDF Function 26),

- 36. enable policy for data-at-rest protection, (MDF Function 20),

- 37. enable policy for removable media's data-at-rest protection, (MDF Function 21),

- 38. enable/disable policy for local authentication bypass, (MDF Function 27),

- 39. the Bluetooth trusted channel policy:

- a. enable/disable the Discoverable mode (for BR/EDR)

- b. change the Bluetooth device name, [selection]:

- allow/disallow additional wireless technologies to be used with Bluetooth ,

- disable/enable Advertising (for LE),

- disable/enable the Connection mode,

- disable/enable the Bluetooth services and/or profiles available on the device ,

- specify minimum level of security for each pairing,

- configure allowable methods of Out of Band pairing,

- no other Bluetooth configuration

](MDF Function 18)

- 40. enable/disable policy for display notification in the locked state of [selection]:

- email notifications,

- calendar appointments,

- contact associated with phone call notification,

- text message notification,

- other application-based notifications,

- none

](MDF Function 19)

- 41. policy for establishing a trusted channel or disallowing

- establishment if the MD cannot establish a connection to determine the validity of a certificate, (MDF Function 30),*
- 42. enable/disable policy for the cellular protocols used to connect to cellular network base stations, (MDF Function 31),
  - 43. policy for import and removal by applications of X.509v3 certificates in the Trust Anchor Database, (MDF Function 29),
  - 44. [selection:
    - certificate,
    - public-key
] used to validate digital signature on applications, (MDF Function 33),
  - 45. policy for exceptions for shared use of keys/secrets by multiple applications, (MDF Function 34),
  - 46. policy for exceptions for destruction of keys/secrets by applications that did not import the key/secret, (MDF Function 35),
  - 47. the unlock banner policy, (MDF Function 36),
  - 48. configure the auditable items (MDF Function 37),
  - 49. enable/disable [selection:
    - USB mass storage mode,
    - USB data transfer without user authentication,
    - USB data transfer without authentication of the connection system
](MDF Function 39) ,
- 50. enable/disable backup of [selection:
    - all applications,
    - selected applications,
    - selected groups of applications,
    - configuration data
] to [selection: locally connected system, remote system] (MDF Function 40),
  - 51. enable/disable [selection:
    - Hotspot functionality authenticated by [selection: pre-shared key, passcode, no authentication],
    - USB tethering authenticated by [selection: pre-shared key, passcode, no authentication]
](MDF Function 41) ,
  - 52. enable/disable location services:
    - [selection:
      - across device,
      - on a per-app basis,
      - on a per-group of application processes basis,
      - no other method
](MDF Function 22) ,
    - 53. enable/disable policy for user unenrollment,
    - 54. enable/disable policy for the Always-On VPN protection across device (MDF Function 45),
    - 55. enable/disable policy for use of Biometric Authentication Factor (MDF Function 23),
    - 56. Connectivity timeout policy: [selection:
      - allowed [selection: number of missed reachability events, length of time without server connectivity],
      - when server connectivity timeout is exceeded agent shall [selection: disable user password, wipe device] and [selection: [assignment: other action], none]
],
    - 57. enable/disable multi-user modes,
    - 58. enable/disable automatic updates of system software,
    - 59. enable/disable removable media,
    - 60. [assignment: list of other policies to be provided by the MD], no other policies].

]

**Application Note:** This requirement captures all the configuration functionality the TSF provides the administrator to configure the MDM Agent. This requirement is broken into two configurable areas: MDM Agent commands and MDM Agent policies. The ST author can add more commands and configuration policies by completing the appropriate assignment statements.

The ST author must not claim any functionality not provided by the Mobile Device. All selections and assignments performed by the ST author in this requirement should match the selections and assignments of the validated Mobile Device ST.

## Function-specific Application Notes:

Function-specific application notes reference Mobile Device Fundamentals (MDF) PP v3.1.

Function 12 may be satisfied for the BYOD use case by application blacklisting and/or disabling. In the case of BYOD, an enterprise may not want to remove "personal" applications, thus for that use case disabling the application rather than removing it would allow the user to not lose any information they might have in the application.

Function 16 provides the MDM server to display an alert to the user of the mobile device.

The audit records read according to Function 19 are to be transmitted to an external audit server according to FAU\_STG\_EXT.1. The MDM Server is not expected to retain those logs.

Function 34 provides the ability to enable/disable policy for the list of protocols where the device acts as a server, such as a mobile hotspot.

Function 56 corresponds to FPT\_NET\_EXT.1.1 in Agent. If the MDM Agent has not had a successful reachability event with the MDM Server in the amount of time specified in 'a', then the agent must perform the action selected in 'b'. It is feasible, but not required, that if multiple actions are selected in 'b', each action could be associated with a different timeout in 'a'. If function 56 is included in the ST, than FPT\_NET\_EXT.1.1 must be included in the Agent ST.

## Evaluation Activities ▼

### FMT\_SMF.1/SERVER\_CONF\_AGENT:

#### TSS

*The evaluator shall examine the TSS to ensure that it describes each management function listed. The evaluator shall examine the TSS to verify that any differences between management functions and policies for each supported MDM Agent/platform are listed. The evaluator shall also examine the ST of the claimed Mobile Device to verify that the selections and assignments in the functions and policies in the TSS do not exceed the capabilities of the supported MD.*

*The evaluator shall examine the TSS to ensure that it identifies the management functions implemented for each supported MDM Agent/platform, which are likely to be subsets of all of the management functions available to the administrator on the MDM Server.*

#### Tests

*For each MDM Agent/platform listed as supported in the ST:*

- **Test 1:** *The evaluator shall verify the ability to command each MDM Agent functional capability and configure each MDM Agent policy listed above.*

## FMT\_SMF.1/SERVER\_CONF\_SERVER Specification of Management Functions (Server Configuration of Server)

### FMT\_SMF.1.1/SERVER\_CONF\_SERVER

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

- a. choose X.509v3 certificates for MDM Server use
- b. configure the **[selection]**:
  - devices specified by **[selection]: IMEI, [assignment]: a unique device ID]**,
  - specific device models,
  - a number of devices,
  - specific time period
- c. **[selection]**:
  1. allow the administrator to choose whether to accept the certificate when connection cannot be made to establish validity,
  2. configure the TOE unlock banner,
  3. configure periodicity of the following commands to the agent:  
**[assignment]: list of commands],**
  4. configure the privacy-sensitive information that will and will not be collected from particular mobile devices,

5. configure the length of time the enrollment authenticator is valid,
6. configure the interaction between TOE components,
7. configure the cryptographic functionality,
8. [assignment: other management functions],
9. no other management functions]

**Application Note:** This requirement captures all the configuration functionality in the MDM Server to configure the underlying MDM Server. The ST author can add more commands and configuration policies by completing the assignment statement.

Function a can be met by relying on the platform to configure the certificates used by the MDM server, however, the MDM Server must allow the administrator to choose which certificate is used for a specific functionality. The selection in b corresponds to the selection in [FIA\\_ENR\\_EXT.1.2](#). The selection in c.1 includes a function that corresponds to the selection in [FIA\\_X509\\_EXT.2.2](#). Function c.3 allows the administrator to configure periodicity of assigned commands, for example "read audit logs kept by the Mobile Device". In this way the administrator can configure the MDM system to retrieve audit logs from the Mobile Device on a periodic, such as daily, basis in order to ensure freshness of log data and to minimize loss of audit logs. Function c.4 allows the administrator to configure the privacy-sensitive information that will and will not be collected from particular mobile devices to handle BYOD environments where some information may not be appropriate to collect. Privacy sensitive information may include items such as device physical location and lists of installed personal applications, and would vary depending on the particular capabilities of the TOE and MDM agent. The TOE should provide the capability to group enrolled devices into categories such as enterprise-owned and personal-owned and define the information that will be collected from devices in each category. Function c.5 corresponds to configuring the length of time the user authenticator for enrollment is valid in [FMT\\_SAE\\_EXT.1](#). This function must be included in the ST if and only if [FMT\\_SAE\\_EXT.1](#) is included in the ST.

For distributed TOEs the interaction between TOE components will be configurable (see [FCO\\_CPC\\_EXT.1](#)). Therefore, the ST author includes the selection "Ability to configure the interaction between TOE components" for distributed TOEs. A simple example would be the change of communication protocol according to [FPT\\_ITT.1/INTER\\_XFER](#). Another example would be changing the management of a TOE component from direct remote administration to remote administration through another TOE component. A more complex use case would be if the realization of an SFR is achieved through two or more TOE components and the responsibilities between the two or more components could be modified.

For distributed TOEs that implement a registration channel (as described in [FCO\\_CPC\\_EXT.1.2](#)), the ST author uses the selection "configure the cryptographic functionality" in this SFR, and its corresponding mapping in the TSS, to describe the configuration of any cryptographic aspects of the registration channel that can be modified by the operational environment in order to improve the channel security.

## Evaluation Activities ▼

### [FMT\\_SMF.1/SERVER\\_CONF\\_SERVER:](#)

#### **TSS**

*The evaluator shall examine the TSS to ensure that it describes each management function listed. For function c.4, the evaluator shall examine the TSS to ensure that it describes the privacy-sensitive information that the TOE has the capability to collect from enrolled mobile devices.*

#### **Guidance**

*The evaluator shall verify the AGD guidance includes detailed instructions of what options are available and how to configure each management functional capability listed.*

#### **Tests**

*The tests of functions b, c.1, c.2, and c.5 are performed in conjunction with the use of the function. Test 3 also covers function c.4. The evaluator shall perform the following test:*

- **Test 1:** The evaluator shall configure the TSF authentication certificate(s) and verify that the correct certificate is used in established trusted connections ([FPT\\_ITT.1/INTER\\_XFER](#), [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#), [FTP\\_ITC.1/INTER\\_XFER\\_IT](#), and [FTP\\_TRP.1/TRUSTPATH\\_ENROLL](#)).
- **Test 2:** (conditional) The evaluator shall configure the periodicity for the assigned list of commands to the agent for several configured time periods and shall verify that the MDM Server performs the commands schedule.

- **Test 3:** (conditional) The evaluator shall design and perform tests to demonstrate that the assigned function may be configured and that the intended behavior of the function is enacted by the MDM Server.

## FMT\_SMF.1/MAS Specification of Management Functions (MAS Server)

**This is a selection-based component. Its inclusion depends upon selection from .**

### FMT\_SMF.1.1/MAS

**Refinement:** The MAS Server shall be capable of performing the following management functions:

- Configure application access groups
- Download applications
- [selection: **assignment:** other MAS management functions], no other functions]

**Application Note:** This requirement captures all the configuration functionality in the MAS Server to configure the underlying MAS Server. The ST author can add more commands and configuration policies by completing the assignment statement.

The MAS Server must be able to create groups to configure which applications a user can access based on which group they are in. If the MAS Server uses the groups defined by the MDM, then it must communicate with the MDM Server (if separate server) to determine which applications the user can access.

### Evaluation Activities ▼

#### FMT\_SMF.1/MAS:

##### TSS

*The evaluator shall examine the TSS to ensure that it describes each management function listed.*

*The evaluator shall examine the TSS to determine if the MAS Server creates its own groups or relies on the groups specified by the MDM Server.*

##### Guidance

*The evaluator shall confirm that the operational guidance contains how to create and define user groups and how to specify which applications are accessible by which group.*

*The evaluator shall verify the AGD guidance includes detailed instructions of what options are available and how to configure each management functional capability listed.*

##### Tests

*The evaluator shall ensure that the MAS client can only access the applications specified for the group they are enrolled in. The evaluator shall create a user group, making sure that the MAS client user is excluded from the group. Verify that an application accessible to that group cannot be accessed. The evaluator shall include the MAS client user in the group and assure that the application can be accessed.*

## FMT\_SMR.1/SECMAN\_ROLES Security Management Roles

### FMT\_SMR.1.1/SECMAN\_ROLES

**Refinement:** The TSF shall maintain the roles administrator, MD user, and [selection: **assignment:** additional authorized identified roles], no additional roles].

### FMT\_SMR.1.2/SECMAN\_ROLES

The TSF shall be able to associate users with roles.

**Application Note:** It is envisioned that the MDM Server will be configured and maintained by different user roles. The assignment is used by the ST author to list the roles that are supported. At a minimum, one administrative role must be supported. If no additional roles are supported, then "no additional roles" is selected. The MD user role is used for enrollment of mobile devices to the MDM according to [FIA\\_ENR\\_EXT.1](#).

For distributed TOEs, not every TOE component is required to implement its own user management to fulfill this SFR. At least one component has to support authentication and identification of users according to [FIA\\_UAU.1](#). For the other

TOE components authentication can be realized through the use of a trusted channel (either according to [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER / FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#)) from a component that supports the authentication of users according to [FIA\\_UAU.1](#). The identification of users according to [FIA\\_UAU.1.2](#) and the association of users with roles according to [FMT\\_SMR.1.2/SECMAN\\_ROLES](#) is done through the components that support the authentication of users according to [FIA\\_UAU.1](#).

## Evaluation Activities ▼

### [FMT\\_SMR.1/SECMAN\\_ROLES](#):

#### **TSS**

*The evaluator shall examine the TSS to verify that it describes the administrator role and the powers granted to and limitations of the role.*

#### **Guidance**

*The evaluator shall review the operational guidance to ensure that it contains instructions for administering the TOE and which interfaces are supported.*

#### **Tests**

*In the course of performing the testing activities for the evaluation, the evaluator shall use all supported interfaces, although it is not necessary to repeat each test involving an administrative action with each interface. The evaluator shall ensure, however, that each supported method of administering the TOE that conforms to the requirements of this PP be tested; for instance, if the TOE can be administered through a local hardware interface or HTTPS then both methods of administration must be exercised during the evaluation team's test activities.*

## **FMT\_SMR.1/SECMAN\_ROLES\_MAS Security Management Roles (MAS Server)**

***This is a selection-based component. Its inclusion depends upon selection from .***

### FMT\_SMR.1.1/SECMAN\_ROLES\_MAS

**Refinement:** The TSF shall additionally maintain the roles enrolled mobile devices, application access groups, and [**assignment**: *additional authorized identified roles*].

### FMT\_SMR.1.2/SECMAN\_ROLES\_MAS

**Refinement:** The MAS Server shall be able to associate users with roles.

**Application Note:** It is envisioned that the MAS Server will be configured and maintained by different user roles. The assignment is used by the ST author to list the roles that are supported. At a minimum, one administrative role must be supported. If no additional roles are supported, then "no additional roles" is stated. The MD user role is used for enrollment of mobile devices to the MAS according to [FIA\\_ENR\\_EXT.1](#).

## Evaluation Activities ▼

### [FMT\\_SMR.1/SECMAN\\_ROLES\\_MAS](#):

#### **TSS**

*The evaluator shall examine the TSS to verify that it describes the administrator role and the powers granted to and limitations of the role.*

#### **Guidance**

*The evaluator shall review the operational guidance to ensure that it contains instructions for administering the TOE and which interfaces are supported.*

#### **Tests**

*In the course of performing the testing activities for the evaluation, the evaluator shall use all supported interfaces, although it is not necessary to repeat each test involving an administrative action with each interface. The evaluator shall ensure, however, that each supported method of administering the TOE that conforms to the requirements of this PP be tested; for instance, if the TOE can be administered through a local hardware interface or HTTPS then both methods of administration must be exercised during the evaluation team's test activities.*

## **6.1.7 Protection of the TSF (FPT)**

### **FPT\_API\_EXT.1 Use of Supported Services and APIs**

#### FPT\_API\_EXT.1.1

The TSF shall use only documented platform APIs.

**Application Note:** This requirement applies to the APIs used when "invoke platform provided functionality" is selected in an SFR. The definition of *documented* may vary depending upon whether the MDM software is provided by a third party (who relies upon documented platform APIs) or by a platform vendor who may be able to guarantee support for platform APIs.

## Evaluation Activities ▼

### [FPT\\_API\\_EXT.1:](#)

#### **TSS**

*The evaluator shall verify that the TSS lists the platform APIs used by the MDM software. The evaluator shall then compare the list with the supported APIs (available through e.g. developer accounts, platform developer groups) and ensure that all APIs listed in the TSS are supported.*

## FPT\_LIB\_EXT.1 Use of Third Party Libraries

### FPT\_LIB\_EXT.1.1

The MDM software shall be packaged with only [**assignment**: *list of third-party libraries*].

**Application Note:** This requirement applies to libraries used when "implement functionality" is selected in an SFR. The intention of this requirement is for the evaluator to document which software libraries the MDM software is including in case vulnerabilities are later discovered with those libraries.

## Evaluation Activities ▼

### [FPT\\_LIB\\_EXT.1:](#)

#### **TSS**

*The evaluator shall verify that the TSS lists the libraries used by the MDM software. The evaluator shall verify that libraries found to be packaged with or employed by the MDM software are limited to those in the assignment.*

## FPT\_ITT.1/INTER\_XFER Internal TOE TSF Data Transfer

***This is a selection-based component. Its inclusion depends upon selection from .***

### FPT\_ITT.1.1/INTER\_XFER

**Refinement:** The TSF shall [**selection**:

- invoke platform-provided functionality to use [**selection**:
  - IPsec,
  - mutually authenticated TLS,
  - mutually authenticated DTLS,
  - HTTPS,
  - SSH],
- implement functionality using [**selection**:
  - IPsec as defined in the PP-Module for VPN Client,
  - mutually authenticated TLS as defined in the Package for Transport Layer Security,
  - mutually authenticated DTLS as defined in the Package for Transport Layer Security,
  - HTTPS in accordance with [FCS\\_HTTPS\\_EXT.1](#),
  - SSH as defined in the Extended Package for Secure Shell]

]

] to protect all data from [disclosure and modification] when it is transferred between separate parts of the TOE.

**Application Note:** This requirement ensures all communications between components of a distributed TOE are protected through the use of an encrypted communications channel. The data passed in this trusted communication channel are encrypted as defined in the protocol chosen in the second selection.

The trusted channel uses secure protocols that preserve the confidentiality and integrity of MDM communications. The ST author chooses the mechanism or mechanisms supported by the TOE. To support mutual authentication [FIA\\_X509\\_EXT.1/CERTVAL\\_SEL](#) should be included in the ST. This channel may also be used as the registration channel for the registration process, as

described in section 3.1 and [FCO\\_CPC\\_EXT.1.2](#).

If "IPsec as defined in the PP-Module for VPN Client" is selected, the TSF must claim conformance to a PP-Configuration that includes the VPN Client PP-Module.

If the ST author selects "SSH as defined in the Extended Package for Secure Shell", the TSF must be validated against the EP for Secure Shell with the MDM PP. It should be noted that due to constraints imposed by this PP that sha1 cannot be used.

If the ST author selects "mutually authenticated TLS as defined in the Package for Transport Layer Security" or "mutually authenticated DTLS as defined in the Package for Transport Layer Security", the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - either TLS or DTLS is selected depending on the selection made in
  - either client or server is selected as appropriate
- FCS\_TLSC\_EXT.1.1 or FCS\_TLSS\_EXT.1.1 (as appropriate):
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in FCS\_COP.1.
  - mutual authentication must be selected

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

## Evaluation Activities ▼

### [FPT\\_ITT.1/INTER\\_XFER:](#)

#### **TSS**

*The evaluator shall examine the TSS to determine that the methods and protocols used to protect distributed TOE components are described. The evaluator shall also confirm that all protocols listed in the TSS in support of TOE administration are consistent with those specified in the requirement, and are included in the requirements in the ST.*

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

#### **Guidance**

*The evaluator shall confirm that the operational guidance contains instructions for establishing the communication paths for each supported method.*

#### **Tests**

- **Test 1:** *The evaluator shall ensure that communications using each specified (in the operational guidance) communication method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.*
- **Test 2:** *The evaluator shall ensure, for each method of communication, the channel data is not sent in plaintext.*

*Further evaluation activities are associated with the specific protocols.*

## FPT\_ITT.1/INTER\_XFER\_AGENT Internal TOE TSF Data Transfer (MDM Agent)

***This is a selection-based component. Its inclusion depends upon selection from .***

### FPT\_ITT.1.1/INTER\_XFER\_AGENT

**Refinement:** The TSF shall [selection]:

- invoke platform-provided functionality to use [selection]:
  - mutually authenticated TLS,
  - mutually authenticated DTLS,
  - HTTPS
- J,
  - implement functionality using [selection]:
    - mutually authenticated TLS as defined in the Package for Transport Layer Security,
    - mutually authenticated DTLS as defined in the Package for Transport Layer Security,

- *HTTPS in accordance with FCS\_HTTPS\_EXT.1*

]

] to protect all data from [disclosure and modification] when it is transferred between the TSF and MDM Agent.

**Application Note:** This requirement ensures all communications between the TSF and MDM Agent are protected through the use of an encrypted communications channel. The data passed in this trusted communication channel are encrypted as defined in the protocol chosen in the second selection.

The trusted channel uses secure protocols that preserve the confidentiality and integrity of MDM communications. The ST author chooses the mechanism or mechanisms supported by the TOE. To support mutual authentication [FIA\\_X509\\_EXT.1/CERTVAL\\_MAN](#) should be included in the ST. This channel may also be used as the registration channel for the registration process, as described in section 3.1 and [FCO\\_CPC\\_EXT.1.2](#).

If the ST author selects "mutually authenticated TLS as defined in the Package for Transport Layer Security" or "mutually authenticated DTLS as defined in the Package for Transport Layer Security", the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - either TLS or DTLS is selected depending on the selection made in [FPT\\_ITT.1.1\(2\)](#)
  - either client or server is selected as appropriate
- FCS\_TLSC\_EXT.1.1 or FCS\_TLSS\_EXT.1.1 (as appropriate):
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in [FCS\\_COP.1](#).
  - mutual authentication must be selected

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

## Evaluation Activities ▼

### [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#):

#### **TSS**

*The evaluator shall examine the TSS to determine that the methods and protocols used to protect distributed TOE components are described. The evaluator shall also confirm that all protocols listed in the TSS in support of TOE administration are consistent with those specified in the requirement, and are included in the requirements in the ST.*

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

#### **Guidance**

*The evaluator shall confirm that the operational guidance contains instructions for establishing the communication paths for each supported method.*

#### **Tests**

- **Test 1:** *The evaluator shall ensure that communications using each specified (in the operational guidance) communication method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.*
- **Test 2:** *The evaluator shall ensure, for each method of communication, the channel data is not sent in plaintext.*

*Further evaluation activities are associated with the specific protocols.*

## **FPT\_TST\_EXT.1 Functionality Testing**

### FPT\_TST\_EXT.1.1

The TSF shall run a suite of self tests during initial start-up (power on) to demonstrate correct operation of the TSF.

### FPT\_TST\_EXT.1.2

The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to provide the capability to verify the integrity of stored TSF executable code when it is loaded for execution through the use of the [**selection: TSF, TOE platform**]-provided cryptographic services.

**Application Note:** While the TOE is typically a software package running in the IT Environment, it is still capable of performing the self-test activities required above. It should be understood, however, that there is a significant dependency on the host environment in assessing the assurance provided by the tests mentioned above (meaning that if the host environment is compromised, the self-tests will not be meaningful).

For distributed TOEs all TOE components (except the MDM Agent components) have to perform self-tests. This does not necessarily mean that each TOE component has to carry out the same self-tests: the ST describes the applicability of the selection (i.e. when self-tests are run) and the final assignment (i.e. which self-tests are carried out) to each TOE component.

## Evaluation Activities ▾

### FPT\_TST\_EXT.1:

#### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

If "implement functionality" is selected, the evaluator shall examine the TSS to ensure that it details the self-tests that are run by the TSF on start-up; this description should include an outline of what the tests are actually doing (e.g., rather than saying "memory is tested", a description similar to "memory is tested by writing a value to each memory location and reading it back to ensure it is identical to what was written" shall be used). The evaluator shall ensure that the TSS makes an argument that the tests are sufficient to demonstrate that the TSF is operating correctly.

The evaluator shall examine the TSS to ensure that it describes how to verify the integrity of stored TSF executable code when it is loaded for execution. The evaluator shall ensure that the TSS makes an argument that the tests are sufficient to demonstrate that the integrity of stored TSF executable code has not been compromised. The evaluator also ensures that the TSS (or the operational guidance) describes the actions that take place for successful (e.g. hash verified) and unsuccessful e.g., hash not verified) cases.

#### Tests

The evaluator shall perform the following tests:

- **Test 1:** The evaluator performs the integrity check on a known good TSF executable and verifies that the check is successful.
- **Test 2:** The evaluator modifies the TSF executable, performs the integrity check on the modified TSF executable and verifies that the check fails.

## FPT\_TUD\_EXT.1 Trusted Update

### FPT\_TUD\_EXT.1.1

The TSF shall provide Authorized Administrators the ability to query the current version of the software.

**Application Note:** For a distributed TOE, the method of determining the installed versions on each component of the TOE is described in the operational guidance. In the requirement, "software" refers to the component of the distributed TOE to which the requirement is being applied.

### FPT\_TUD\_EXT.1.2

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to provide Authorized Administrators the ability to initiate updates to TSF software.

### FPT\_TUD\_EXT.1.3

The TSF shall [selection: invoke platform-provided functionality, implement functionality] to provide a means to verify software updates to the TSF using a digital signature mechanism prior to installing those updates.

**Application Note:** The software on the TSF will occasionally need to be updated. This requirement is intended to ensure that the TSF only installs updates provided by the vendor, as updates provided by another source may contain malicious code. If the server is not an appliance, the update will be verified by the platform on which the server software runs. If the server is an appliance, the update must be verified by the TSF software or hardware.

For distributed TOEs all TOE components must support Trusted Update. The

verification of the signature or hash on the update must either be done by each TOE component itself (signature verification) or for each TOE component (hash verification).

Updating a distributed TOE might lead to the situation where different TOE components are running different software versions. Depending on the differences between the different software versions the impact of a mixture of different software versions might be no problem at all or critical to the proper functioning of the TOE. The TSS must detail the mechanisms that support the continuous proper functioning of the TOE during trusted update of distributed TOEs.

## Evaluation Activities ▼

### FPT\_TUD\_EXT.1:

#### Guidance

*The evaluator shall ensure that the administrator guidance includes instructions for determining the current version of the TOE.*

#### Tests

*The evaluator shall query the TSF for the current version of the software according to the AGD guidance and shall verify that the current version matches that of the documented and installed version.*

#### TSS

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

#### TSS

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

*If "implement functionality" is selected, the evaluator shall examine the TSS and verify that it describes the standards by which the updates are digitally signed and how the signature verification process is implemented.*

#### Guidance

*The evaluator shall examine the AGD guidance to verify that it describes how to query the current version of the TSF software, how to initiate updates and how to check the integrity of updates prior to installation.*

#### Tests

*The evaluator shall perform the following tests:*

- **Test 1:** The evaluator shall attempt to initiate an update digitally signed by the vendor and verify that the update is successfully installed.
- **Test 2:** The evaluator shall attempt to install an update not digitally signed by the vendor and verify that either the signature can be checked (allowing the update to be aborted) or the update is not installed.

## 6.1.8 TOE Access (FTA)

### FTA\_TAB.1 Default TOE Access Banners

**This is an optional component. However, applied modules or packages might redefine it as mandatory.**

#### FTA\_TAB.1.1

**Refinement:** Before establishing a user session, the TSF shall [selection: invoke platform-provided functionality, implement functionality] to display an Administrator-specified advisory notice and consent warning message regarding use of the TOE.

**Application Note:** This requirement is to ensure that an advisory notice and/or consent banner is presented to the user on start-up or unlock of the TSF.

## Evaluation Activities ▼

**FTA\_TAB.1:**

**TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

If "implement functionality" is selected, the TSS shall describe when the banner is displayed.

**Guidance**

The evaluator follows the operational guidance to configure a notice and consent warning message.

**Tests**

The evaluator shall also perform the following test: The evaluator shall start up or unlock the TSF. The evaluator shall verify that the notice and consent warning message is displayed in each instance described in the TSS.

## 6.1.9 Trusted Path/Channels (FTP)

### FTP\_ITC\_EXT.1 Trusted Channel

#### FTP\_ITC\_EXT.1.1

The TSF shall provide a communication channel between itself and [selection]:

- an MDM Agent that is internal to the TOE,
- an MDM Agent that is external to the TOE,
- other components comprising the distributed TOE

] that is logically distinct from other communication channels, as specified in [selection: [FPT\\_ITT.1/INTER\\_XFER](#)"/>, [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#)].

**Application Note:** This SFR describes the communication channels between the MDM Server and an Agent that may or may not be in the TOE, and optionally separate components comprising a distributed TOE, to determine which selection-based SFRs will need to be included in the ST.

If the TOE includes an MDM Agent, then the communication channel between the Agent and TSF is internal to the TOE and thus "an MDM Agent that is internal to the TOE" must be selected in the first selection. Additionally [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) must be selected in the second selection and [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#) must be included in the ST.

If the TOE interoperates with an evaluated MDM Agent built into a mobile device (i.e., the TOE does not include an MDM Agent), the communication channel between the Agent and TSF is external to the TOE and thus "an MDM Agent that is external to the TOE" must be selected in the first selection. Additionally [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#) must be selected in the second selection and [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#) must be included in the ST.

If "other components comprising the distributed TOE" is selected in the first selection then [FPT\\_ITT.1/INTER\\_XFER](#) must be selected in the second selection. [FPT\\_ITT.1/INTER\\_XFER](#) must be included in the ST for all internal channels used to transfer TSF data between TOE components other than an MDM Agent.

### Evaluation Activities ▾

**FTP\_ITC\_EXT.1:**

**TSS**

The evaluator shall ensure that the TSS contains whether the MDM Server communication channel is internal or external to the TOE.

**Tests**

This testing can be completed in conjunction with the testing for [FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#), [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT](#) or [FTP\\_ITC.1\(3\)](#).

### FTP\_ITC.1/INTER\_XFER\_IT Inter-TSF Trusted Channel (Authorized IT Entities)

#### FTP\_ITC.1.1/INTER\_XFER\_IT

**Refinement:** The TSF shall [selection]:

- invoke platform-provided functionality to use [selection]:

- IPsec,
  - SSH,
  - mutually authenticated TLS,
  - mutually authenticated DTLS,
  - HTTPS
- ],
- implement functionality using [**selection**]:
    - IPsec as defined in the PP-Module for VPN Client,
    - SSH as defined in the Extended Package for Secure Shell,
    - mutually authenticated TLS as defined in the Package for Transport Layer Security,
    - mutually authenticated DTLS as defined in the Package for Transport Layer Security,
    - HTTPS in accordance with [FCS HTTPS EXT.1](#)
- ]

] to provide a trusted communication channel between itself and authorized IT entities supporting the following capabilities: audit server, [**selection**: *authentication server, [assignment: other capabilities]*] that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification and disclosure.

**Application Note:** The intent of the mandatory portion of the above requirement is to use the cryptographic protocols identified in the requirement to establish and maintain a trusted channel with authorized IT entities that the TOE interacts with to perform its functions.

Protection (by one of the listed protocols) is required at least for communications with the server that collects the audit information. If it communicates with an authentication server (e.g., RADIUS), then the ST author chooses "authentication server" in [FTP\\_ITC.1.1/INTER\\_XFER\\_IT](#) and this connection must be protected by one of the listed protocols. If other authorized IT entities (e.g., NTP server) are protected, the ST author makes the appropriate assignments (for those entities) and selections (for the protocols that are used to protect those connections).

To summarize, the connection to an external audit collection server is required to be protected by one of the listed protocols. If an external authentication server is supported, then it is required to protect that connection with one of the listed protocols. For any other external server, external communications are not required to be protected, but if protection is claimed, then it must be protected with one of the identified protocols.

For communications with any authorized IT entities outside of the TOE, the MDM Server should still be able to support mutual authentication. There are no requirements levied on the external entities, but the MDM Server should be able to support mutual authentication. This way if the non-TOE authorized entity does support mutual authentication, the MDM Server is in a position to make use of that.

The trusted channel uses IPsec, TLS, DTLS, or HTTPS as the protocol that preserves the confidentiality and integrity of MDM communications. The ST author chooses the mechanism or mechanisms supported by the TOE.

If "IPsec as defined in the PP-Module for VPN Client" is selected, the TSF must claim conformance to a PP-Configuration that includes the VPN Client PP-Module.

If the ST author selects "SSH as defined in the Extended Package for Secure Shell", the TSF must be validated against the EP for Secure Shell with the MDM PP. It should be noted that due to constraints imposed by this PP that sha1 cannot be used.

If the ST author selects "mutually authenticated TLS as defined in the Package for Transport Layer Security" or "mutually authenticated DTLS as defined in the Package for Transport Layer Security", the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - either TLS or DTLS is selected depending on the selection made in [FTP\\_ITC.1.1/INTER\\_XFER\\_IT](#)
  - either client or server is selected as appropriate
- FCS\_TLSC\_EXT.1.1 or FCS\_TLSS\_EXT.1.1 (as appropriate):
  - The cipher suites selected must correspond with the algorithms and

- hash functions allowed in FCS\_COP.1.
- mutual authentication must be selected
- FCS\_DTLS\_C\_EXT.1.1 or FCS\_DTLSS\_EXT.1.1 (as appropriate):
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in FCS\_COP.1.
  - mutual authentication must be selected

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

The requirement implies that not only are communications protected when they are initially established, but also on resumption after an outage. It may be the case that some part of the TOE setup involves manually setting up tunnels to protect other communication, and if after an outage the TOE attempts to re-establish the communication automatically with (the necessary) manual intervention, there may be a window created where an attacker might be able to gain critical information or compromise a connection.

#### [FTP\\_ITC.1.2/INTER\\_XFER\\_IT](#)

**Refinement:** The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to permit the MDM Server or other authorized IT entities to initiate communication via the trusted channel.

#### [FTP\\_ITC.1.3/INTER\\_XFER\\_IT](#)

**Refinement:** The TSF shall [**selection**: *invoke platform-provided functionality, implement functionality*] to initiate communication via the trusted channel for [**assignment**: *list of services for which the TSF is able to initiate communications*].

**Application Note:** While there are no requirements on the party initiating the communication, the ST author lists in the assignment for [FTP\\_ITC.1.3/INTER\\_XFER\\_IT](#) the services for which the TOE can initiate the communication with the authorized IT entity.

### Evaluation Activities ▾

#### [FTP\\_ITC.1/INTER\\_XFER\\_IT](#):

##### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **TSS**

The evaluator shall examine the TSS to determine that the methods of communication with authorized IT entities are indicated, along with how those communications are protected.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **Guidance**

The evaluator shall confirm that the operational guidance contains instructions for configuring the communication channel between the MDM Server and authorized IT entities for each supported method.

##### **Tests**

- Test 1:** The evaluators shall ensure that communications using each specified (in the operational guidance) communication method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.
- Test 2:** The evaluator shall ensure, for each method of communication, the channel data is not sent in plaintext.
- Test 3:** The evaluator shall ensure, for each communication channel with the MDM Server, that a protocol analyzer identifies the traffic as the protocol under testing.

Further evaluation activities are associated with the specific protocols.

## **FTP\_ITC.1/INTER\_TSF\_XFER\_AGENT Inter-TSF Trusted Channel (MDM Agent)**

**This is a selection-based component. Its inclusion depends upon selection from .**

FTP\_ITC.1.1/INTER\_TSF\_XFER\_AGENT

**Refinement:** The TSF shall [selection]:

- invoke platform-provided functionality to use [selection]:
  - mutually authenticated TLS,
  - mutually authenticated DTLS,
  - HTTPS
- implement functionality using [selection]:
  - mutually authenticated TLS as defined in the Package for Transport Layer Security,
  - mutually authenticated DTLS as defined in the Package for Transport Layer Security,
  - HTTPS in accordance with [FCS\\_HTTPS\\_EXT.1](#)

] ,

] to provide a trusted communication channel between itself (as a server) and the MDM Agent that is logically distinct from other communication channels, provides assured identification of its end points, protects channel data from disclosure, and detects modification of the channel data.

**Application Note:** The intent of the mandatory portion of the above requirement is to use the cryptographic protocols identified in the requirement to establish and maintain a trusted channel between the TOE and the MDM Agent. If the TOE includes a separate MAS Server, this requirement also addresses the communication between the MAS Server and the MDM Agent. Only TLS, DTLS, or HTTPS are used in this trusted channel.

This requirement is to ensure that the transmission of any audit logs, mobile device information data (software version, hardware model, and application versions), and configuration data collected by the MDM Agent and sent from the MDM Agent to the MDM Server, when commanded, or at configurable intervals, is properly protected. This trusted channel also protects any commands and policies sent by the MDM Server to the MDM Agent. Either the MDM Agent or the MDM Server is able to initiate the connection.

For TLS connections between the MDM Server and Agent, the MDM Server is the Server side of the TLS connection, therefore it is appropriate to include the selection-based FCS\_TLSS SFRs in the ST, not FCS\_TLSC SFRs. With respect to mutual authentication, in cases where the Agent is outside of the TOE, it should be verified that the server can support mutual authentication, meaning that the server includes support for client-side certificates for TLS mutual authentication post-enrollment. However, the client side is not evaluated since the agent is not in the TOE.

This trusted channel protects the connection between an enrolled MDM Agent and the MDM Server. [FTP\\_TRP.1/TRUSTPATH\\_ENROLL](#) provides a trusted channel to protect the connection between an unenrolled MDM Agent and the MDM Server during the enrollment operation.

The trusted channel uses TLS, DTLS, or HTTPS as the protocol that preserves the confidentiality and integrity of MDM communications. The ST author chooses the mechanism or mechanisms supported by the TOE.

If the ST author selects "mutually authenticated TLS as defined in the Package for Transport Layer Security" or "mutually authenticated DTLS as defined in the Package for Transport Layer Security", the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - either TLS or DTLS is selected depending on the selection made in [FTP\\_ITC.1.1/INTER\\_TSF\\_XFER\\_AGENT](#)
  - server must be selected
- FCS\_TLSS\_EXT.1.1:
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in FCS\_COP.1.

- mutual authentication must be selected

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

The requirement implies that not only are communications protected when they are initially established, but also on resumption after an outage. It may be the case that some part of the TOE setup involves manually setting up tunnels to protect other communication, and if after an outage the TOE attempts to re-establish the communication automatically with (the necessary) manual intervention, there may be a window created where an attacker might be able to gain critical information or compromise a connection.

#### [FTP\\_ITC.1.2/INTER\\_TSF\\_XFER\\_AGENT](#)

**Refinement:** The TSF shall [selection: *invoke platform-provided functionality, implement functionality*] to permit the TSF and MDM Agent to initiate communication via the trusted channel.

#### [FTP\\_ITC.1.3/INTER\\_TSF\\_XFER\\_AGENT](#)

**Refinement:** The TSF shall [selection: *invoke platform-provided functionality, implement functionality*] to initiate communication via the trusted channel for all communication between the TSF and the MDM Agent

### Evaluation Activities ▼

#### [FTP\\_ITC.1/INTER\\_TSF\\_XFER\\_AGENT:](#)

##### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **TSS**

The evaluator shall examine the TSS to determine that the methods of Agent-Server communication are indicated, along with how those communications are protected. The evaluator shall also confirm that all protocols listed in the TSS in support of remote TOE administration are consistent with those specified in the requirement, and are included in the requirements in the ST.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

##### **Guidance**

The evaluator shall confirm that the operational guidance contains instructions for configuring the communication channel between the MDM Agent and the MDM Server for each supported method.

##### **Tests**

- **Test 1:** The evaluators shall ensure that communications using each specified (in the operational guidance) Agent-Server communication method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.
- **Test 2:** The evaluator shall ensure, for each method of Agent-Server communication, the channel data is not sent in plaintext.
- **Test 3:** The evaluator shall ensure, for each communication channel with the MDM Server, that a protocol analyzer identifies the traffic as the protocol under testing.

Further evaluation activities are associated with the specific protocols.

#### [FTP\\_TRP.1/TRUSTPATH\\_Rem\\_ADMIN Trusted Path \(for Remote Administration\)](#)

##### [FTP\\_TRP.1.1/TRUSTPATH\\_Rem\\_ADMIN](#)

**Refinement:** The TSF shall [selection:

- invoke platform-provided functionality to use [selection:
  - IPsec,

- *TLS*,
  - *HTTPS*,
  - *SSH*
- J,
- *implement functionality using [selection]:*
    - *IPsec as defined in the PP-Module for VPN Client*,
    - *TLS as defined in the Package for Transport Layer Security*,
    - *HTTPS in accordance with FCS\_HTTPS\_EXT.1*,
    - *SSH as defined in the Extended Package for Secure Shell*
- J

] to provide a trusted communication path between itself as a [**selection: server, peer**] and remote administrators that is logically distinct from other communication paths and provides assured identification of its endpoints and protection of the communicated data from [modification, disclosure].

#### FTP\_TRP.1.2/TRUSTPATH\_Rem\_ADMIN

**Refinement:** The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to permit remote administrators to initiate communication via the trusted path.

#### FTP\_TRP.1.3/TRUSTPATH\_Rem\_ADMIN

**Refinement:** The TSF shall [**selection: invoke platform-provided functionality, implement functionality**] to require the use of the trusted path for [all remote administration actions].

**Application Note:** This requirement ensures that authorized remote administrators initiate all communication with the TOE via a trusted path, and that all communications with the TOE by remote administrators is performed over this path. The data passed in this trusted communication channel are encrypted as defined in the protocol chosen in the first selection. The ST author chooses the mechanism or mechanisms supported by the TOE.

If "IPsec as defined in the PP-Module for VPN Client" is selected, the TSF must claim conformance to a PP-Configuration that includes the VPN Client PP-Module.

If the ST author selects "SSH as defined in the Extended Package for Secure Shell", the TSF must be validated against the EP for Secure Shell with the MDM PP. It should be noted that due to constraints imposed by this PP that sha1 cannot be used.

If the ST author selects "TLS as defined in the Package for Transport Layer Security" the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - TLS shall be selected
  - server shall be selected
- FCS\_TLSS\_EXT.1.1:
  - The cipher suites selected must correspond with the algorithms and hash functions allowed in FCS\_COP.1.

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

## Evaluation Activities ▼

### FTP\_TRP.1/TRUSTPATH\_Rem\_ADMIN:

#### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### TSS

The evaluator shall examine the TSS to determine that the methods of remote TOE

*administration are indicated, along with how those communications are protected. The evaluator shall also confirm that all protocols listed in the TSS in support of TOE administration are consistent with those specified in the requirement, and are included in the requirements in the ST.*

*If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).*

### **Guidance**

*The evaluator shall confirm that the operational guidance contains instructions for establishing the remote administrative sessions for each supported method.*

### **Tests**

*The evaluator shall also perform the following tests:*

- **Test 1:** *The evaluators shall ensure that communications using each specified (in the operational guidance) remote administration method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.*
- **Test 2:** *For each method of remote administration supported, the evaluator shall follow the operational guidance to ensure that there is no available interface that can be used by a remote user to establish remote administrative sessions without invoking the trusted path.*
- **Test 3:** *The evaluator shall ensure, for each method of remote administration, the channel data is not sent in plaintext.*

*Further evaluation activities are associated with the specific protocols.*

## **FTP\_TRP.1/TRUSTPATH\_ENROLL Trusted Path (for Enrollment)**

### **FTP\_TRP.1.1/TRUSTPATH\_ENROLL**

**Refinement:** The TSF shall [selection:

- invoke platform-provided functionality to use [selection:
  - TLS,
  - HTTPS],
- implement functionality using [selection:
  - TLS as defined in the Package for Transport Layer Security,
  - HTTPS in accordance with [FCS\\_HTTPS\\_EXT.1](#)]

] to provide a trusted communication path between itself (as a server) and MD users that is logically distinct from other communication paths and provides assured identification of its endpoints and protection of the communicated data from disclosure and detection of modification of the communicated data from [modification, disclosure].

### **FTP\_TRP.1.2/TRUSTPATH\_ENROLL**

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to permit MD users to initiate communication via the trusted path.

### **FTP\_TRP.1.3/TRUSTPATH\_ENROLL**

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to require the use of the trusted path for [all MD user actions].

**Application Note:** This requirement ensures that authorized MD users initiate all communication with the TOE via a trusted path, and that all communications with the TOE by MD users is performed over this path. The purpose of this connection is for enrollment by the MD user. The data passed in this trusted communication channel are encrypted as defined in the protocol chosen in the first selection. The ST author chooses the mechanism or mechanisms supported by the TOE.

If the ST author selects "TLS as defined in the Package for Transport Layer Security" the TSF must be validated against requirements from the Package for Transport Layer Security, with the following selections made:

- FCS\_TLS\_EXT.1:
  - TLS must be selected
  - server must be selected
- FCS\_TLSS\_EXT.1.1:
  - The cipher suites selected must correspond with the algorithms and

hash functions allowed in FCS\_COP.1.

Protocol, RBG, Certificate validation, algorithm, and similar services may be met with platform provided services.

## Evaluation Activities ▼

### FTP\_TRP.1/TRUSTPATH\_ENROLL:

#### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### TSS

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### TSS

The evaluator shall examine the TSS to determine that the methods of remote enrollment are indicated, along with how those communications are protected. The evaluator shall also confirm that all protocols listed in the TSS in support of enrollment are consistent with those specified in the requirement, and are included in the requirements in the ST.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### Guidance

The evaluator shall confirm that the operational guidance contains instructions for establishing the enrollment sessions for each supported method.

#### Tests

For each MDM Agent/platform listed as supported in the ST:

- **Test 1:** The evaluators shall ensure that communications using each specified (in the operational guidance) enrollment method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.
- **Test 2:** For each method of enrollment supported, the evaluator shall follow the operational guidance to ensure that there is no available interface that can be used by a remote user to establish enrollment sessions without invoking the trusted path.
- **Test 3:** The evaluator shall ensure, for each method enrollment, the channel data is not sent in plaintext.

Further evaluation activities are associated with the specific protocols.

### FTP\_TRP.1/TRUSTPATH\_JOIN Trusted Path (for Joining)

**This is an objective component.**

#### FTP\_TRP.1.1/TRUSTPATH\_JOIN

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to provide a communication path between itself and a joining component that is logically distinct from other communication paths and provides assured identification of [selection: the TSF endpoint, both joining component and TSF endpoint] and protection of the communicated data from modification and [selection: disclosure, none].

#### FTP\_TRP.1.2/TRUSTPATH\_JOIN

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to permit [selection: the TSF, the joining component] to initiate communication via the trusted path.

#### FTP\_TRP.1.3/TRUSTPATH\_JOIN

**Refinement:** The TSF shall [selection: invoke platform-provided functionality, implement functionality] to require the use of the trusted path for [joining components to the TSF under environmental constraints identified in [assignment: reference to operational guidance]].

**Application Note:** This SFR implements one of the types of channel identified in the main selection for [FCO\\_CPC\\_EXT.1.2](#). The "joining component" in [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) is the IT entity that is attempting to join the distributed TOE by using the registration process.

The effect of this SFR is to require the ability for components to communicate in a secure manner while the distributed TSF is being created (or when adding components to an existing distributed TSF). When creating the TSF from the initial pair of components, either of these components may be identified as the TSF for the purposes of satisfying the meaning of "TSF" in this SFR.

The selection at the end of [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) recognises that in some cases confidentiality (i.e. protection of the data from disclosure) may not be provided by the channel. The ST author distinguishes in the TSS whether in this case the TOE relies on the environment to provide confidentiality (as part of the constraints referenced in [FTP\\_TRP.1.3/TRUSTPATH\\_JOIN](#)) or whether the registration data exchanged does not require confidentiality (in which case this assertion must be justified). If "none" is selected, then this word may be omitted in the ST to improve readability.

The assignment in [FTP\\_TRP.1.3/TRUSTPATH\\_JOIN](#) ensures that the ST highlights any specific details needed to protect the registration environment. Note that when the ST uses [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) for the registration channel then this channel cannot be reused as the normal inter-component communication channel (the latter channel must meet [FTP\\_ITC.1](#) or [FPT\\_ITT.1/INTER\\_XFER](#) / [FPT\\_ITT.1/INTER\\_XFER\\_AGENT](#)). Specific requirements for Preparative Procedures relating to [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#) are defined in the Evaluation Activities.

## Evaluation Activities ▾

### [FTP\\_TRP.1/TRUSTPATH\\_JOIN](#):

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **TSS**

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **TSS**

The evaluator shall examine the TSS to determine that the methods of joining TOE components are indicated, along with how those communications are protected. The evaluator shall also confirm that all protocols listed in the TSS in support of joining are consistent with those specified in the requirement, and are included in the requirements in the ST.

If "invoke platform-provided functionality" is selected, the evaluator shall examine the TSS to verify that it describes (for each supported platform) how this functionality is invoked (it should be noted that this may be through a mechanism that is not implemented by the MDM Server; nonetheless, that mechanism will be identified in the TSS as part of this evaluation activity).

#### **Guidance**

The evaluator shall confirm that the operational guidance contains instructions for joining TOE components for each supported method.

#### **Tests**

The evaluator shall also perform the following tests:

- **Test 1:** The evaluator shall ensure that the communications path for joining components to the TSF is tested for each distinct (nonequivalent) component type, setting up the connections as described in the guidance documentation and ensuring that communication is successful. In particular the evaluator shall confirm that requirements on environment protection for the registration process are consistent with observations made on the test configuration (for example, a requirement to isolate the components from the Internet during registration might be inconsistent with the need for a component to contact a license server). If no requirements on the registration environment are identified as necessary to protect confidentiality, then the evaluator shall confirm that the key used for registration can be configured (following the instructions in the guidance documentation) to be at least the same length as the key used for the internal TSF channel that is being enabled. The evaluator shall confirm that the key used for the channel is unique to the pair

of components (this is done by identifying the relevant key during the registration test: it is not necessary to examine the key value).

- **Test 2:** The evaluator shall follow the guidance documentation to ensure that in fact the communication channel can be enabled by an administrator for all the TOE components identified in the guidance documentation as capable of initiation.
- **Test 3:** The evaluator shall ensure that if the guidance documentation states that the channel data is encrypted then the data observed on the channel is not plaintext.
- **Test 4:** The evaluator shall ensure that, for each different pair of nonequivalent component types that can use the registration channel, the connection is physically interrupted during a joining attempt. The evaluator shall ensure that when physical connectivity is restored, communications are appropriately protected.

Further evaluation activities are associated with the specific protocols.

### 6.1.10 TOE Security Functional Requirements Rationale

The following rationale provides justification for each security objective for the TOE, showing that the SFRs are suitable to meet and achieve the security objectives:

**Table 6: SFR Rationale**

OBJECTIVE	ADDRESSED BY	RATIONALE
O.ACOUNTABILITY	FAU_ALT_EXT.1	The PP includes FAU_ALT_EXT.1 to define the ability of the TSF to generate alerts when certain actions occur.
	FAU_GEN.1/AUDITGEN	The PP includes FAU_GEN.1/AUDITGEN to require the TSF to generate audit records of security-relevant events, including management actions.
	FAU_GEN.1/MAS_SERVER (sel-based)	The PP includes FAU_GEN.1/MAS_SERVER to require the TSF to generate records of MAS Server functionality if the TSF supports this capability.
	FAU_NET_EXT.1	The PP includes FAU_NET_EXT.1 to require the TSF to record the connectivity status of enrolled agents.
	FAU_SAR.1 (optional)	The PP includes FAU_SAR.1 to optionally require the TSF to provide a method to review stored audit data.
	FAU_SEL.1 (optional)	The PP includes FAU_SEL.1 to optionally require the TSF to define the actions that are accounted for.
	FAU_STG_EXT.1	The PP includes FAU_STG_EXT.1 for the TSF to securely transmit its audit data to an external entity.
	FAU_STG_EXT.2 (sel-based)	The PP includes FAU_STG_EXT.2 to require the TSF to protect stored audit records from unauthorized modification if these records are stored locally.
O.APPLY_POLICY	FAU_CRP_EXT.1 (objective)	The PP includes FAU_CRP_EXT.1 to optionally require the TSF to collect information about the configuration of enrolled devices.
	FIA_ENR_EXT.1	The PP includes FIA_ENR_EXT.1 for the TSF to perform the initial enrollment of devices into management, including applying restrictions on what devices can be enrolled.
	FMT_MOF.1/FUNCBE	The PP includes FMT_MOF.1/FUNCBE to define the supported TSF management functions, including those used to enable, disable, and

		apply policies to enrolled devices.
	FMT_MOF.1/MANAGEMENT_ENROLL	The PP includes <a href="#">FMT_MOF.1/MANAGEMENT_ENROLL</a> for the TSF to restrict the enrollment process to authorized administrators and mobile device users.
	FMT_MOF.1/MANAGEMENT_MAS	The PP includes <a href="#">FMT_MOF.1/MANAGEMENT_MAS</a> to enforce restrictions on access to the MAS Server from enrolled devices based on applied policies.
	FMT_SAE_EXT.1 (objective)	The PP includes <a href="#">FMT_SAE_EXT.1</a> for the TSF to enforce restriction on agent enrollment by limiting the length of time that enrollment authentication data is valid.
	FMT_SMF.1/SERVER_CONF_AGENT (sel-based)	The PP includes <a href="#">FMT_SMF.1/SERVER_CONF_AGENT</a> to specify that the TSF is capable of sending configuration information and enterprise security policies to an MDM Agent.
	FMT_SMR.1/SERVER_CONF_SERVER (sel-based)	The PP includes <a href="#">FMT_SMR.1/SERVER_CONF_SERVER</a> to define roles on the MAS Server, if this capability is supported, that are used to determine the extent to which enrolled devices can access data on the MAS Server.
	FMT_SMF.1/MAS (sel-based)	The PP includes <a href="#">FMT_SMF.1/MAS</a> to specify that the TSF is capable of configuring the MAS Server to enforce restrictions on enrolled devices attempting to access it.
	FIA_UAU_EXT.4/1 (objective)	The PP includes <a href="#">FIA_UAU_EXT.4/1</a> to optionally require the TSF to limit enrollment through the prevention of reuse of enrollment authentication data.
	FIA_UAU_EXT.4/2 (objective)	The PP includes <a href="#">FIA_UAU_EXT.4/2</a> to provide access controls to prevent the reuse of enrollment data related to device enrollment. The TSF shall prevent two devices to be enrolled using the same unique identifier.
	FMT_SAE_EXT.1 (objective)	The PP includes <a href="#">FMT_SAE_EXT.1</a> for the TSF to enforce restriction on agent enrollment by limiting the length of time that enrollment authentication data is valid.
O.DATA_PROTECTION_TRANSIT	FAU_CRP_EXT.1 (objective)	The PP includes <a href="#">FAU_CRP_EXT.1</a> to require certain data to be collected from remote agents using a secure channel.
	FAU_STG_EXT.1	The PP includes <a href="#">FAU_STG_EXT.1</a> which requires the TSF to use a trusted channel for the external transmission of audit data.
	FCO_CPC_EXT.1 (objective)	The PP includes <a href="#">FCO_CPC_EXT.1</a> to define secure connectivity between different TOE components, including security of data in transit.
	FCS_CKM_EXT.4	The PP includes <a href="#">FCS_CKM_EXT.4</a> to ensure that the TSF destroys plaintext

	keying material and critical security parameters when no longer needed in support of securing data in transit.
FCS_CKM.1	The PP includes <a href="#">FCS_CKM.1</a> to define whether the TSF or the platform generates asymmetric keys that are used in support of securing data in transit.
FCS_CKM.2	The PP includes <a href="#">FCS_CKM.2</a> to define whether the TSF or the platform performs key establishment in support of securing data in transit.
FCS_COP.1/CONF_ALG	The PP includes <a href="#">FCS_COP.1/CONF_ALG</a> to define the symmetric AES encryption algorithms used in support of securing data in transit.
FCS_COP.1/HASH_ALG	The PP includes <a href="#">FCS_COP.1/HASH_ALG</a> to define the hash algorithms used in support of securing data in transit.
FCS_COP.1/SIGN_ALG	The PP includes <a href="#">FCS_COP.1/SIGN_ALG</a> to define the digital signature algorithms used in support of securing data in transit.
FCS_COP.1/KEY_HASH	The PP includes <a href="#">FCS_COP.1/KEY_HASH</a> to define the HMAC algorithms used in support of securing data in transit.
FCS_HTTPS_EXT.1 (sel-based)	The PP includes <a href="#">FCS_HTTPS_EXT.1</a> to define the TOE's support for the HTTPS trusted communications protocol.
FCS_IV_EXT.1 (sel-based)	The PP includes <a href="#">FCS_IV_EXT.1</a> to define the initialization vector generation to ensure secure implementation of cryptography used to secure data in transit.
FCS_RBG_EXT.1	The PP includes <a href="#">FCS_RBG_EXT.1</a> to define whether random bit generation services are implemented by the TSF or the platform. The TOE may rely on the use of a random bit generator to create keys that are subsequently used in support of securing data in transit.
FCS_STG_EXT.1	The PP includes <a href="#">FCS_STG_EXT.1</a> to define whether the TSF or the Operational Environment protects key data that may be used in support of securing data in transit.
FCS_STG_EXT.2 (sel-based)	The PP includes <a href="#">FCS_STG_EXT.2</a> to define the method the TSF uses to protect stored key data that may be used in support of securing data in transit.
FIA_ENR_EXT.1	The PP includes <a href="#">FIA_ENR_EXT.1</a> which requires the TSF to use a trusted channel for the agent enrollment process.
FIA_X509_EXT.1/CERTVAL_MAN	The PP includes <a href="#">FIA_X509_EXT.1/CERTVAL_MAN</a> to define validation rules for X.509 certificates that may be used in support of securing data in transit.

<a href="#">FIA_X509_EXT.1/CERTVAL_SEL</a> (sel-based)	The PP includes <a href="#">FIA_X509_EXT.1/CERTVAL_SEL</a> to define validation rules for X.509 certificates that may be used in support of securing data in transit in the specific case where the TOE is distributed across multiple remote nodes.
<a href="#">FIA_X509_EXT.2</a>	The PP includes <a href="#">FIA_X509_EXT.2</a> to define the TOE functions that support the use of X.509 certificates. This includes protection of data in transit.
<a href="#">FIA_X509_EXT.3</a> (objective)	The PP includes <a href="#">FIA_X509_EXT.3</a> to define X.509 enrollment activities using PKCS#10 to allow the TOE to obtain a signed certificate for use when establishing trusted communications.
<a href="#">FIA_X509_EXT.4</a> (objective)	The PP includes <a href="#">FIA_X509_EXT.3</a> to define X.509 enrollment activities using EST to allow the TOE to obtain a signed certificate for use when establishing trusted communications.
<a href="#">FIA_X509_EXT.5</a>	The PP includes <a href="#">FIA_X509_EXT.5</a> to require the TSF to enforce uniqueness for client certificates that are used in support of securing data in transit.
<a href="#">FPT_ITT.1/INTER_XFER</a> (sel-based)	The PP includes <a href="#">FPT_ITT.1/INTER_XFER</a> to define how data is secured in transit between TOE components if the MDM server itself is distributed.
<a href="#">FPT_ITT.1/INTER_XFER_AGENT</a> (sel-based)	The PP includes <a href="#">FPT_ITT.1/INTER_XFER_AGENT</a> to define how data is secured in transit between the MDM server and MDM agent if both are part of the TOE.
<a href="#">FTP_ITC_EXT.1</a>	The PP includes <a href="#">FTP_ITC_EXT.1</a> to define the trusted channels used by the TOE where security of data in transit is enforced.
<a href="#">FTP_ITC.1/INTER_XFER_IT</a>	The PP includes <a href="#">FTP_ITC.1/INTER_XFER_IT</a> to define a trusted communication channel between itself and trusted external servers.
<a href="#">FTP_ITC.1/INTER_TSF_XFER_AGENT</a>	The PP includes <a href="#">FTP_ITC.1/INTER_TSF_XFER_AGENT</a> to define a trusted communication channel between itself and an MDM agent if the MDM agent is not part of the TOE.
<a href="#">FTP_TRP.1/TRUSTPATH_Rem_Admin</a>	The PP includes <a href="#">FTP_TRP.1/TRUSTPATH_Rem_Admin</a> to define requirements for securing data in transit for administrative communications.
<a href="#">FTP_TRP.1/TRUSTPATH_Enroll</a>	The PP includes <a href="#">FTP_TRP.1/TRUSTPATH_Enroll</a> to define requirements for securing data in transit for agent enrollment.
<a href="#">FTP_TRP.1/TRUSTPATH_Join</a>	The PP includes <a href="#">FTP_TRP.1/TRUSTPATH_Join</a> to define requirements for securing data in transit between TOE components

		when establishing initial connectivity if the MDM server itself is distributed and a separate registration channel is used.
O.INTEGRITY	FCS_COP.1/HASH_ALG	The PP includes <a href="#">FCS_COP.1/HASH_ALG</a> to require the TSF to include a mechanism to cryptographically assert and verify the integrity of data using a hash algorithm.
	FCS_COP.1/SIG_ALG	The PP includes FCS_COP.1(3) to require the TSF to include a mechanism to cryptographically assert and verify the integrity of data using a digital signature.
	FIA_X509_EXT.2	The PP includes <a href="#">FIA_X509_EXT.2</a> to define the TOE functions that support the use of X.509 certificates. This includes code signing for system software updates, integrity verification, and policy signing.
	FMT_POL_EXT.1	The PP includes <a href="#">FMT_POL_EXT.1</a> to ensure the integrity of the policies and policy updates to the MDM Agent are digitally signed to protect their integrity.
	FCO_CPC_EXT.1	The PP includes <a href="#">FCO_CPC_EXT.1</a> to define secure connectivity between different TOE components, including security of data in transit.
	FPT_TST_EXT.1	The PP includes <a href="#">FPT_TST_EXT.1</a> to require The TSF to run a suite of self tests to ensure the correct operation of the TSF and the integrity of stored TSF executable code.
	FPT_TUD_EXT.1	The PP includes <a href="#">FPT_TUD_EXT.1</a> to define requirements for trusted update of TSF executable code, including that the integrity of this update data can be verified.
O.MANAGEMENT	FAU_CRP_EXT.1 (objective)	The PP includes <a href="#">FAU_CRP_EXT.1</a> to require certain data to be collected from remote agents using a secure channel.
	FAU_SAR.1 (optional)	The PP includes <a href="#">FAU_SAR.1</a> to optionally require the TSF to implement management functionality to review audit data that is restricted to authorized users.
	FAU_SEL.1 (optional)	The PP includes <a href="#">FAU_SEL.1</a> to optionally require the TSF to implement management functionality for configuring the events that are audited.
	FIA_ENR_EXT.1	The PP includes <a href="#">FIA_ENR_EXT.1</a> which requires the TSF to use a trusted channel for the agent enrollment process.
	FIA_UAU.1	The PP includes <a href="#">FIA_UAU.1</a> to require the TSF to enforce access control on its management interface by requiring user authentication.
	FIA_UAU_EXT.4/REUSE (objective)	The PP includes <a href="#">FIA_UAU_EXT.4/REUSE</a> to optionally

		require the TSF to limit enrollment through the prevention of reuse of enrollment authentication data.
FIA_UAU_EXT.4/2 (objective)		The PP includes FIA_UAU_EXT.4(2) to provide access controls to prevent the reuse of enrollment data related to device enrollment. The TSF shall prevent two devices to be enrolled using the same unique identifier.
FMT_MOF.1/FUNCBE		The PP includes FMT_MOF.1/FUNCBE for the TSF to restrict the functions to enable, disable, modify, and monitor functions and policies to authorized administrators.
FMT_MOF.1/MANAGEMENT_ENROLL		The PP includes FMT_MOF.1/MANAGEMENT_ENROLL to restrict the enrollment process to authorized administrators and mobile device users.
FMT_MOF.1/MANAGEMENT_MAS		The PP includes FMT_MOF.1/MANAGEMENT_MAS to enforce restrictions on access to the MAS Server from enrolled devices based on applied policies.
FMT_POL_EXT.1		The PP includes FMT_POL_EXT.1 to ensure the integrity of the policies and policy updates to the MDM Agent are digitally signed to protect their integrity.
FMT_SMF.1/SERVER_CONF_AGENT		The PP includes FMT_SMF.1/SERVER_CONF_AGENT to define the security-relevant management functions that the MDM server is capable of communicating to the MDM Agent.
FMT_SMF.1/SERVER_CONF_SERVER		The PP includes FMT_SMF.1/SERVER_CONF_SERVER to define the security-relevant management functions that the MDM server has for its own configuration.
FMT_SMF.1/MAS		The PP includes FMT_SMF.1/MAS to define the MAS Server management functionality if this capability is supported.
FMT_SMR.1/SECMAN_ROLES		The PP includes FMT_SMR.1/SECMAN_ROLES to define the security management roles that are used as the basis for access control enforcement.
FMT_SMR.1/SECMAN_ROLES_MAS (sel-based)		The PP includes FMT_SMR.1/SECMAN_ROLES_MAS to define the management roles that apply to the MAS Server if this capability is supported.
FTA_TAB.1 (optional)		The PP includes FTA_TAB.1 to display an Administrator-specified advisory notice and consent warning message regarding use of the TOE.
O.QUALITY	FPT_API_EXT.1	The PP includes FPT_API_EXT.1 to enforce quality of implementation by ensuring that the MDM software uses only documented platform APIs to support its security functionality.
	FPT_LIB_EXT.1	The PP includes FPT_LIB_EXT.1 to

enforce quality of implementation by ensuring that the MDM software does not include any unnecessary or unexpected third-party libraries which could present a privacy threat or vulnerability.

## 6.2 Security Assurance Requirements

The Security Objectives for the TOE in [Section 6 Security Requirements](#) were constructed to address threats identified in [Section 4.1 Threats](#). The Security Functional Requirements (SFRs) in [Section 6 Security Requirements](#) are a formal instantiation of the Security Objectives. The PP identifies the Security Assurance Requirements (SARs) to frame the extent to which the evaluator assesses the documentation applicable for the evaluation and performs independent testing.

This section lists the set of SARs from CC part 3 that are required in evaluations against this PP. Individual Evaluation Activities (AAs) to be performed are specified both in [Section 6 Security Requirements](#) as well as in this section.

The general model for evaluation of TOEs against STs written to conform to this PP is as follows:

After the ST has been approved for evaluation, the ITSEF will obtain the TOE, supporting environmental IT, and the administrative/user guides for the TOE. The ITSEF is expected to perform actions mandated by the Common Evaluation Methodology (CEM) for the ASE and ALC SARs. The ITSEF also performs the Evaluation Activities contained within [Section 6 Security Requirements](#), which are intended to be an interpretation of the other CEM assurance requirements as they apply to the specific technology instantiated in the TOE. The Evaluation Activities that are captured in [Section 6 Security Requirements](#) also provide clarification as to what the developer needs to provide to demonstrate the TOE is compliant with the PP.

The TOE security assurance requirements are identified in [Table 7](#).

**Table 7:Security Assurance Requirements**

Assurance Class	Assurance Components
Security Target (ASE)	ST introduction (ASE_INT.1) Conformance claims (ASE_CCL.1) Security objectives for the operational environment (ASE_OBJ.1) Extended components definition (ASE_ECD.1) Stated security requirements (ASE_REQ.1) TOE summary specification ( <a href="#">ASE_TSS.1</a> )
Development (ADV)	Basic functional specification ( <a href="#">ADV_FSP.1</a> )
Guidance documents (AGD)	Operational user guidance ( <a href="#">AGD_OPE.1</a> ) Preparative procedures ( <a href="#">AGD_PRE.1</a> )
Life cycle support (ALC)	Labeling of the TOE ( <a href="#">ALC_CMC.1</a> ) TOE CM coverage ( <a href="#">ALC_CMS.1</a> )
Tests (ATE)	Independent testing - sample ( <a href="#">ATE_IND.1</a> )
Vulnerability assessment (AVA)	Vulnerability survey ( <a href="#">AVA_VAN.1</a> )

### 6.2.1 Class ASE: Security Target

The ST is evaluated as per ASE activities defined in the CEM. In addition, there may be Evaluation Activities specified within [Section 6 Security Requirements](#) and relevant appendices that call for necessary descriptions to be included in the TSS that are specific to the TOE technology type.

#### **ASE\_TSS.1 TOE summary specification**

##### **Developer action elements:**

##### **Content and presentation elements:**

###### **ASE\_TSS.1.C**

The TOE summary specification shall describe how the TOE meets each SFR.

##### **Evaluator action elements:**

#### **Evaluation Activities** ▾

## 6.2.2 Class ADV: Development

The design information about the TOE is contained in the guidance documentation available to the end user as well as the TSS portion of the ST, and any additional information required by this PP that is not to be made public (e.g., Entropy Essay).

### ADV\_FSP.1 Basic Functional Specification (ADV\_FSP.1)

The functional specification describes the Target Security Functions Interfaces (TSFIs). It is not necessary to have a formal or complete specification of these interfaces. Additionally, because TOEs conforming to this PP will necessarily have interfaces to the Operational Environment that are not directly invokable by TOE users, there is little point specifying that such interfaces be described in and of themselves since only indirect testing of such interfaces may be possible. For this PP, the activities for this family should focus on understanding the interfaces presented in the TSS in response to the functional requirements and the interfaces presented in the AGD documentation. No additional "functional specification" documentation is necessary to satisfy the evaluation activities specified.

The interfaces that need to be evaluated are characterized through the information needed to perform the evaluation activities listed, rather than as an independent, abstract list.

#### Developer action elements:

ADV\_FSP.1.1D

The developer shall provide a functional specification.

ADV\_FSP.1.2D

The developer shall provide a tracing from the functional specification to the SFRs.

**Application Note:** As indicated in the introduction to this section, the functional specification is comprised of the information contained in the AGD\_OPE and AGD\_PRE documentation. The developer may reference a website accessible to application developers and the evaluator. The evaluation activities in the functional requirements point to evidence that should exist in the documentation and TSS section; since these are directly associated with the SFRs, the tracing in element [ADV\\_FSP.1.2D](#) is implicitly already done and no additional documentation is necessary.

#### Content and presentation elements:

ADV\_FSP.1.3C

The functional specification shall describe the purpose and method of use for each SFR-enforcing and SFR-supporting TSFI.

ADV\_FSP.1.4C

The functional specification shall identify all parameters associated with each SFR-enforcing and SFR-supporting TSFI.

ADV\_FSP.1.5C

The functional specification shall provide rationale for the implicit categorization of interfaces as SFR-non-interfering.

ADV\_FSP.1.6C

The tracing shall demonstrate that the SFRs trace to TSFIs in the functional specification.

#### Evaluator action elements:

ADV\_FSP.1.7E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADV\_FSP.1.8E

The evaluator shall determine that the functional specification is an accurate and complete instantiation of the SFRs.

#### Evaluation Activities ▼

##### [ADV\\_FSP.1](#):

*There are no specific evaluation activities associated with these SARs, except ensuring the information is provided. The functional specification documentation is provided to support the evaluation activities described in Section 5 and the relevant appendices, and other activities described for AGD, ATE, and AVA SARs. The requirements on the content of the functional specification information is implicitly assessed by virtue of the other evaluation activities being performed; if the evaluator is unable to perform an activity because there is insufficient interface information, then an adequate functional specification has not been provided.*

### **6.2.3 Class AGD: Guidance Documentation**

The guidance documents will be provided with the ST. Guidance must include a description of how the IT personnel verifies that the Operational Environment can fulfill its role for the security functionality. The documentation should be in an informal style and readable by the IT personnel.

Guidance must be provided for every operational environment that the product supports as claimed in the ST. This guidance includes:

- instructions to successfully install the TSF in that environment
- instructions to manage the security of the TSF as a product and as a component of the larger operational environment
- instructions to provide a protected administrative capability

Guidance pertaining to particular security functionality must also be provided; requirements on such guidance are contained in the evaluation activities specified with each requirement.

#### **AGD\_OPE.1 Operational User Guidance (AGD\_OPE.1)**

##### **Developer action elements:**

AGD\_OPE.1.1D

The developer shall provide operational user guidance.

**Application Note:** The operational user guidance does not have to be contained in a single document. Guidance to users, administrators and application developers can be spread among documents or web pages. Where appropriate, the guidance documentation is expressed in the eXtensible Configuration Checklist Description Format (XCCDF) to support security automation.

Rather than repeat information here, the developer should review the evaluation activities for this component to ascertain the specifics of the guidance that the evaluator will be checking for. This will provide the necessary information for the preparation of acceptable guidance.

##### **Content and presentation elements:**

AGD\_OPE.1.2C

The operational user guidance shall describe, for each user role, the user-accessible functions and privileges that should be controlled in a secure processing environment, including appropriate warnings.

**Application Note:** User and administrator are to be considered in the definition of user role.

AGD\_OPE.1.3C

The operational user guidance shall describe, for each user role, how to use the available interfaces provided by the TOE in a secure manner.

AGD\_OPE.1.4C

The operational user guidance shall describe, for each user role, the available functions and interfaces, in particular all security parameters under the control of the user, indicating secure values as appropriate.

AGD\_OPE.1.5C

The operational user guidance shall, for each user role, clearly present each type of security-relevant event relative to the user-accessible functions that need to be performed, including changing the security characteristics of entities under the control of the TSF.

AGD\_OPE.1.6C

The operational user guidance shall identify all possible modes of operation of the TOE (including operation following failure or operational error), their consequences, and implications for maintaining secure operation.

AGD\_OPE.1.7C

The operational user guidance shall, for each user role, describe the security measures to be followed in order to fulfill the security objectives for the operational environment as described in the ST.

AGD\_OPE.1.8C

The operational user guidance shall be clear and reasonable.

##### **Evaluator action elements:**

AGD\_OPE.1.9E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

## Evaluation Activities ▼

### **AGD\_OPE.1:**

*Some of the contents of the operational guidance will be verified by the evaluation activities in Sections 4.2, 4.3, and 4.4 and evaluation of the TOE according to the CEM. The following additional information is also required.*

*If cryptographic functions are provided by the TOE, the operational guidance shall contain instructions for configuring the cryptographic engine associated with the evaluated configuration of the TOE. It shall provide a warning to the administrator that use of other cryptographic engines was not evaluated nor tested during the CC evaluation of the TOE.*

*The documentation must describe the process for verifying updates to the TOE by verifying a digital signature - this may be done by the TOE or the underlying platform. The evaluator shall verify that this process includes the following steps:*

*Instructions for obtaining the update itself. This should include instructions for making the update accessible to the TOE (e.g., placement in a specific directory).*

*Instructions for initiating the update process, as well as discerning whether the process was successful or unsuccessful. This includes generation of the hash/digital signature.*

*The TOE will likely contain security functionality that does not fall in the scope of evaluation under this PP. The operational guidance shall make it clear to an administrator which security functionality is covered by the evaluation activities.*

## 6.2.4 Preparative Procedures (AGD\_PRE.1)

### **AGD\_PRE.1 Preparative Procedures (AGD\_PRE.1)**

#### **Developer action elements:**

##### AGD\_PRE.1.1D

The developer shall provide the TOE, including its preparative procedures.

**Application Note:** As with the operational guidance, the developer should look to the evaluation activities to determine the required content with respect to preparative procedures.

#### **Content and presentation elements:**

##### AGD\_PRE.1.2C

The preparative procedures shall describe all the steps necessary for secure acceptance of the delivered TOE in accordance with the developer's delivery procedures.

##### AGD\_PRE.1.3C

The preparative procedures shall describe all the steps necessary for secure installation of the TOE and for the secure preparation of the operational environment in accordance with the security objectives for the operational environment as described in the ST.

**Application Note:** It is recognised that the application of these requirements will vary depending on aspects such as whether the TOE is delivered in an operational state, or whether it has to be installed at the TOE owner's site, etc.

It might also be the case that no installation is necessary, for example as a Software as a Service implementation in a Cloud environment. In this case it may be inappropriate to require and analyse installation procedures and thus this requirement is implicitly satisfied.

#### **Evaluator action elements:**

##### AGD\_PRE.1.4E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

##### AGD\_PRE.1.5E

The evaluator shall apply the preparative procedures to confirm that the TOE can be prepared securely for operation.

## Evaluation Activities ▼

***AGD\_PRE.1:***

*As indicated in the introduction above, there are significant expectations with respect to the documentation, especially when configuring the operational environment to support TOE functional requirements. The evaluator shall check to ensure that the guidance provided for the TOE adequately addresses all platforms claimed for the TOE in the ST.*

## 6.2.5 Class ALC: Life-cycle Support

At the assurance level provided for TOEs conformant to this PP, life-cycle support is limited to end-user visible aspects of the life-cycle, rather than an examination of the TOE vendor's development and configuration management process. This is not meant to diminish the critical role that a developer's practices play in contributing to the overall trustworthiness of a product; rather, it's a reflection on the information to be made available for evaluation at this assurance level.

### **ALC\_CMC.1 Labeling of the TOE( ALC\_CMC.1)**

This component is targeted at identifying the TOE such that it can be distinguished from other products or versions from the same vendor and can be easily specified when being procured by an end user.

#### **Developer action elements:**

ALC\_CMC.1.1D

The developer shall provide the TOE and a reference for the TOE.

#### **Content and presentation elements:**

ALC\_CMC.1.2C

The TOE shall be labeled with its unique reference.

#### **Evaluator action elements:**

ALC\_CMC.1.3E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

## Evaluation Activities ▼

***ALC\_CMC.1:***

*The evaluator shall check the ST to ensure that it contains an identifier (such as a product name/version number) that specifically identifies the version that meets the requirements of the ST. Further, the evaluator shall check the AGD guidance and TOE samples received for testing to ensure that the version number is consistent with that in the ST. If the vendor maintains a website advertising the TOE, the evaluator shall examine the information on the website to ensure that the information in the ST is sufficient to distinguish the product.*

## 6.2.6 TOE CM Coverage (ALC\_CMS.1)

### **ALC\_CMS.1 TOE CM Coverage (ALC\_CMS.1)**

Given the scope of the TOE and its associated evaluation evidence requirements, this component's evaluation activities are covered by the evaluation activities listed for [ALC\\_CMC.1](#).

#### **Developer action elements:**

ALC\_CMS.1.1D

The developer shall provide a configuration list for the TOE.

#### **Content and presentation elements:**

ALC\_CMS.1.2C

The configuration list shall include the following: the TOE itself; and the evaluation evidence required by the SARs.

ALC\_CMS.1.3C

The configuration list shall uniquely identify the configuration items.

#### **Evaluator action elements:**

ALC\_CMS.1.4E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

**Application Note:** In cases where the MDM software is Software as a Service, running in a cloud environment where they have little to no control of the

operating system and underlying hardware, the evaluated configuration is considered a snapshot of the MDM software with the OS and/or VM versions used at the time of testing.

## Evaluation Activities ▼

### **ALC\_CMS.1:**

*The "evaluation evidence required by the SARs" in this PP is limited to the information in the ST coupled with the guidance provided to administrators and users under the AGD requirements. By ensuring that the TOE is specifically identified and that this identification is consistent in the ST and in the AGD guidance (as done in the evaluation activity for ALC\_CMC.1), the evaluator implicitly confirms the information required by this component.*

*Life-cycle support is targeted aspects of the developer's life-cycle and instructions to providers of applications for the developer's devices, rather than an in-depth examination of the TSF manufacturer's development and configuration management process. This is not meant to diminish the critical role that a developer's practices play in contributing to the overall trustworthiness of a product; rather, it's a reflection on the information to be made available for evaluation.*

*The evaluator shall ensure that the TSF is uniquely identified (with respect to other products from the TSF vendor), and that documentation provided by the developer in association with the requirements in the ST is associated with the TSF using this unique identification.*

## 6.2.7 Class ATE: Tests

Testing is specified for functional aspects of the system as well as aspects that take advantage of design or implementation weaknesses. The former is done through the ATE\_IND family, while the latter is through the AVA\_VAN family. At the assurance level specified in this PP, testing is based on advertised functionality and interfaces with dependency on the availability of design information. One of the primary outputs of the evaluation process is the test report as specified in the following requirements.

Since many of the APIs are not exposed at the user interface (e.g., touch screen), the ability to stimulate the necessary interfaces requires a developer's test environment. This test environment will allow the evaluator, for example, to access APIs and view file system information that is not available on consumer mobile devices.

### **ATE\_IND.1 Independent Testing - Conformance (ATE\_IND.1)**

Testing is performed to confirm the functionality described in the TSS as well as the administrative (including configuration and operational) documentation provided. The focus of the testing is to confirm that the requirements specified in Sections 5.3, and 5.4 are being met, although some additional testing is specified for SARs in Section 6. The Evaluation Activities identify the additional testing activities associated with these components. The evaluator produces a test report documenting the plan for and results of testing, as well as coverage arguments focused on the platform/TOE combinations that are claiming conformance to this PP.

#### **Developer action elements:**

##### ATE\_IND.1.1D

The developer shall provide the TOE for testing.

#### **Content and presentation elements:**

##### ATE\_IND.1.2C

The TOE shall be suitable for testing.

#### **Evaluator action elements:**

##### ATE\_IND.1.3E

The evaluator *shall confirm* that the information provided meets all requirements for content and presentation of evidence.

##### ATE\_IND.1.4E

The evaluator shall test a subset of the TSF to confirm that the TSF operates as specified.

## Evaluation Activities ▼

### **ATE\_IND.1:**

*The evaluator shall prepare a test plan and report documenting the testing aspects of the system. The test plan covers all of the testing actions contained in the CEM and the body of this PP's Evaluation Activities. While it is not necessary to have one test case per test listed in an evaluation activity, the evaluator must document in the test plan that each applicable testing*

*requirement in the ST is covered.*

*The test plan identifies the platforms to be tested, and for those platforms not included in the test plan but included in the ST, the test plan provides a justification for not testing the platforms. This justification must address the differences between the tested platforms and the untested platforms, and make an argument that the differences do not affect the testing to be performed. It is not sufficient to merely assert that the differences have no effect; rationale must be provided. If all platforms claimed in the ST are tested, then no rationale is necessary.*

*The test plan describes the composition of each platform to be tested, and any setup that is necessary beyond what is contained in the part of a test or as a standard pre-test condition. This may include special test drivers or tools. For each driver or tool, an argument (not just an assertion) should be provided that the driver or tool will not adversely affect the performance of the functionality by the TOE and its platform. This also includes the configuration of the cryptographic engine to be used. The cryptographic algorithms implemented by this engine are those specified by this PP and used by the cryptographic protocols being evaluated (IPsec, TLS/HTTPS, SSH).*

*The test plan identifies high-level test objectives as well as the test procedures to be followed to achieve those objectives. These procedures include expected results. The test report (which could just be an annotated version of the test plan) details the activities that took place when the test procedures were executed, and includes the actual results of the tests. This shall be a cumulative account, so if there was a test run that resulted in a failure; a fix installed; and then a successful re-run of the test, the report would show a "fail" and "pass" result (and the supporting details), and not just the "pass" result.*

## **6.2.8 Class AVA: Vulnerability Analysis**

For the first generation of this protection profile, the evaluation lab is expected to survey open sources to discover what vulnerabilities have been discovered in these types of products. In most cases, these vulnerabilities will require sophistication beyond that of a basic attacker. Until penetration tools are created and uniformly distributed to the evaluation labs, the evaluator will not be expected to test for these vulnerabilities in the TOE. The labs will be expected to comment on the likelihood of these vulnerabilities given the documentation provided by the vendor. This information will be used in the development of penetration testing tools and for the development of future protection profiles.

### **AVA\_VAN.1 Vulnerability Survey (AVA\_VAN.1)**

#### **Developer action elements:**

AVA\_VAN.1.1D

The developer shall provide the TOE for testing.

#### **Content and presentation elements:**

AVA\_VAN.1.2C

The TOE shall be suitable for testing.

#### **Evaluator action elements:**

AVA\_VAN.1.3E

The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AVA\_VAN.1.4E

The evaluator shall perform a search of public domain sources to identify potential vulnerabilities in the TOE.

AVA\_VAN.1.5E

The evaluator shall conduct penetration testing, based on the identified potential vulnerabilities, to determine that the TOE is resistant to attacks performed by an attacker possessing Basic attack potential.

## **Evaluation Activities ▼**

### **AVA\_VAN.1:**

*As with ATE\_IND, the evaluator shall generate a report to document their findings with respect to this requirement. This report could physically be part of the overall test report mentioned in ATE\_IND, or a separate document. The evaluator performs a search of public information to determine the vulnerabilities that have been found in network infrastructure devices and the implemented communication protocols in general, as well as those that pertain to the particular TOE. The evaluator documents the sources consulted and the vulnerabilities found in the report. For each vulnerability found, the evaluator either provides a rationale with respect to its non-applicability, or the evaluator formulates a test (using the guidelines provided in ATE\_IND) to*

*confirm the vulnerability, if suitable. Suitability is determined by assessing the attack vector needed to take advantage of the vulnerability. If exploiting the vulnerability requires expert skills and an electron microscope, for instance, then a test would not be suitable and an appropriate justification would be formulated.*

# **Appendix A - Implementation-Dependent Requirements**

Implementation-Dependent Requirements are dependent on the TOE implementing a particular function. If the TOE fulfills any of these requirements, the vendor must either add the related SFR or disable the functionality for the evaluated configuration.

# **Appendix B - Entropy Documentation and Assessment**

This appendix describes the required supplementary information for each entropy source used by the TOE.

The documentation of the entropy source(s) should be detailed enough that, after reading, the evaluator will thoroughly understand the entropy source and why it can be relied upon to provide sufficient entropy. This documentation should include multiple detailed sections: design description, entropy justification, operating conditions, and health testing. This documentation is not required to be part of the TSS.

## **B.1 Design Description**

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Documentation shall include the design of each entropy source as a whole, including the interaction of all entropy source components. Any information that can be shared regarding the design should also be included for any third-party entropy sources that are included in the product.

The documentation will describe the operation of the entropy source to include, how entropy is produced, and how unprocessed (raw) data can be obtained from within the entropy source for testing purposes. The documentation should walk through the entropy source design indicating where the entropy comes from, where the entropy output is passed next, any post-processing of the raw outputs (hash, XOR, etc.), if/where it is stored, and finally, how it is output from the entropy source. Any conditions placed on the process (e.g., blocking) should also be described in the entropy source design. Diagrams and examples are encouraged.

This design must also include a description of the content of the security boundary of the entropy source and a description of how the security boundary ensures that an adversary outside the boundary cannot affect the entropy rate.

If implemented, the design description shall include a description of how third-party applications can add entropy to the RBG. A description of any RBG state saving between power-off and power-on shall be included.

## **B.2 Entropy Justification**

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There should be a technical argument for where the unpredictability in the source comes from and why there is confidence in the entropy source delivering sufficient entropy for the uses made of the RBG output (by this particular TOE). This argument will include a description of the expected min-entropy rate (i.e. the minimum entropy (in bits) per bit or byte of source data) and explain that sufficient entropy is going into the TOE randomizer seeding process. This discussion will be part of a justification for why the entropy source can be relied upon to produce bits with entropy.

The amount of information necessary to justify the expected min-entropy rate depends on the type of entropy source included in the product.

For developer provided entropy sources, in order to justify the min-entropy rate, it is expected that a large number of raw source bits will be collected, statistical tests will be performed, and the min-entropy rate determined from the statistical tests. While no particular statistical tests are required at this time, it is expected that some testing is necessary in order to determine the amount of min-entropy in each output.

For third party provided entropy sources, in which the TOE vendor has limited access to the design and raw entropy data of the source, the documentation will indicate an estimate of the amount of min-entropy obtained from this third-party source. It is acceptable for the vendor to "assume" an amount of min-entropy, however, this assumption must be clearly stated in the documentation provided. In particular, the min-entropy estimate must be specified and the assumption included in the ST.

Regardless of type of entropy source, the justification will also include how the DRBG is initialized with the entropy stated in the ST, for example by verifying that the min-entropy rate is multiplied by the amount of source data used to seed the DRBG or that the rate of entropy expected based on the amount of source data is explicitly stated and compared to the statistical rate. If the amount of source data used to seed the DRBG is not clear or the calculated rate is not explicitly related to the seed, the documentation will not be considered complete.

The entropy justification shall not include any data added from any third-party application or from any state saving between restarts.

## **B.3 Operating Conditions**

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The entropy rate may be affected by conditions outside the control of the entropy source itself. For example,

voltage, frequency, temperature, and elapsed time after power-on are just a few of the factors that may affect the operation of the entropy source. As such, documentation will also include the range of operating conditions under which the entropy source is expected to generate random data. Similarly, documentation shall describe the conditions under which the entropy source is no longer guaranteed to provide sufficient entropy. Methods used to detect failure or degradation of the source shall be included.

## **B.4 Health Testing**

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More specifically, all entropy source health tests and their rationale will be documented. This will include a description of the health tests, the rate and conditions under which each health test is performed (e.g., at startup, continuously, or on-demand), the expected results for each health test, TOE behavior upon entropy source failure, and rationale indicating why each test is believed to be appropriate for detecting one or more failures in the entropy source.

# **Appendix C - Evaluating Additional Components for a Distributed TOE**

In the case of a distributed TOE the ST will identify an evaluated configuration that consists of a number of separate components chosen by the ST author, which collectively satisfy the requirements of the PP. This evaluated configuration need not be the minimum set of components that could possibly meet the PP (e.g. if the TOE is intended for large enterprise deployments then the evaluated configuration might include some redundancy in components in order to support expected connectivity and loads), but because this is the main configuration referred to in the ST and the evaluation, it is treated in this section as the minimum configuration of interest and is referred to here as the 'minimum configuration' as well as the 'evaluated configuration'.

In addition to the minimum configuration above, the ST may also identify (at the author's discretion, and subject to verification as described in this section) which TOE components can have instances added to an operational configuration without affecting the validity of the CC certification. The ST description may include constraints on how such components are added, including required and/or prohibited configurations of the components.

Extra instances of a TOE component must have the same hardware and software as the original component included in the evaluated configuration.

## **C.1 Evaluator Actions for Assessing the ST**

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### **TSS**

The evaluator shall examine the TSS to identify any extra instances of TOE components allowed in the ST and shall examine the description of how the additional components maintain the SFRs to confirm that it is consistent with the role that the component plays in the evaluated configuration. For example: the secure channels used by the extra component for intra-TOE communications (FPT\_ITT) and external communications (FTP\_ITC) must be consistent, the audit information generated by the extra component must be maintained, and the management of the extra component must be consistent with that used for the original instance of the component in the minimum configuration.

## **C.2 Evaluator Actions for Assessing the Guidance Documentation**

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### **Guidance**

w The evaluator shall examine the description of the extra instances of TOE components in the guidance documentation to confirm that they are consistent with those identified as allowed in the ST. This includes confirmation that the result of applying the guidance documentation to configure the extra component will leave the TOE in a state such that the claims for SFR support in each component are as described in the ST and therefore that all SFRs continue to be met when the extra components are present.

The evaluator shall examine the secure communications described for the extra components to confirm that they are the same as described for the components in the minimum configuration (additional connections between allowed extra components and the components in the minimum configuration are allowed of course).

## **C.3 Evaluator Actions for Testing the TOE**

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### **Tests**

The evaluator tests the TOE in the minimum configuration as defined in the ST (and the guidance documentation).

If the description of the use of extra components in the ST and guidance documentation identifies any difference in the SFRs allocated to a component, or the scope of the SFRs involved (e.g. if different selections apply to different instances of the component) then the evaluator tests these additional SFR cases that were not included in the minimum configuration.

In addition, the evaluator tests the following aspects for each extra component that is identified as allowed in the distributed TOE:

- Communications: the evaluator follows the guidance documentation to confirm, by testing, that any additional connections introduced with the extra component and not present in the minimum configuration are consistent with the requirements stated in the ST ( e.g. with regard to protocols and ciphersuites used). An example of such an additional connection would be if a single instance of the component is present in the minimum configuration and adding a duplicate component then introduces

an extra communication between the two instances. Another example might be if the use of the additional components necessitated the use of a connection to an external authentication server instead of using locally stored credentials.

- Audit: the evaluator confirms that the audit records from different instances of a component can be distinguished so that it is clear which instance generated the record.
- Management: if the extra component manages other components in the distributed TOE then the evaluator shall follow the guidance documentation to confirm that management via the extra component uses the same roles and role holders for administrators as for the component in the minimum configuration.

# Appendix D - MDM Software Equivalency Guidelines

## D.1 Introduction

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The purpose of equivalence in PP-based evaluations is to find a balance between evaluation rigor and commercial practicability, to ensure that evaluations meet customer expectations while recognizing that there is little to be gained from requiring that every variation in a product or platform be fully tested. If a product is found to be compliant with a PP on one platform, then all equivalent products on equivalent platforms are also considered to be compliant with the PP.

A Vendor can make a claim of equivalence if the Vendor believes that a particular instance of their Product implements PP-specified security functionality in a way equivalent to the implementation of the same functionality on another instance of their Product on which the functionality was tested. The Product instances can differ in version number or feature level (model), or the instances may run on different platforms. Equivalency can be used to reduce the testing required across claimed evaluated configurations. It can also be used during Assurance Maintenance to reduce testing needed to add more evaluated configurations to a certification.

These equivalency guidelines do not replace Assurance Maintenance requirements or NIAP Policy #5 requirements for CAVP certificates. Nor may equivalency be used to leverage evaluations with expired certifications.

These Equivalency Guidelines represent a shift from complete testing of all product instances to more of a risk-based approach. Rather than require that every combination of product and platform be tested, these guidelines support an approach that recognizes that products are being used in a variety of environments, and often in cloud environments over where the vendor (and sometimes the customer) have little or no control over the underlying hardware. Developers should be responsible for the security functionality of their applications on the platforms they are developed for, whether that is an operating system, a virtual machine, or a software-based execution environment such as a container. But those platforms may themselves run within other environments, virtual machines or operating systems, that completely abstract away the underlying hardware from the application. The developer should not be held accountable for security functionality that is implemented by platform layers that are abstracted away. The implication is that not all security functionality will necessarily be tested for all platform layers down to the hardware for all evaluated configurations, especially for applications developed for software-based execution environments such as containers. For these cases, the balancing of evaluation rigor and commercial practicability tips in favor of practicability. Note that this does not affect the requirement that at least one product instance be fully tested on at least one platform with cryptography mapped to a CAVP certificate.

Equivalency has two aspects:

1. **Product Equivalence:** Products may be considered equivalent if there are no differences between Product Models and Product Versions with respect to PP-specified security functionality.
2. **Platform Equivalence:** Platforms may be considered equivalent if there are no significant differences in the services they provide to the Product, or in the way the platforms provide those services, with respect to PP-specified security functionality.

The equivalency determination is made in accordance with these guidelines by the Validator and Scheme using information provided by the Evaluator/Vendor.

## D.2 Approach to Equivalency Analysis

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There are two scenarios for performing equivalency analysis. One is when a product has been certified and the vendor wants to show that a later product should be considered certified due to equivalence with the earlier product. The other is when multiple product variants are going through evaluation together and the vendor would like to reduce the amount of testing that must be done. The basic rules for determining equivalence are the same in both cases. But there is one additional consideration that applies to equivalence with previously certified products. That is, the product with which equivalence is being claimed must have a valid certification in accordance with scheme rules and the Assurance Maintenance process must be followed. If a product's certification has expired, then equivalence cannot be claimed with that product.

When performing equivalency analysis, the Evaluator/Vendor should first use the factors and guidelines for Product Model equivalence to determine the set of Product Models to be evaluated. In general, Product Models that do not differ in PP-specified security functionality are considered equivalent for purposes of evaluation against the SWApp PP.

If multiple revision levels of Product Models are to be evaluated, or to determine whether a revision of an evaluated product needs re-evaluation, the Evaluator/Vendor and Validator should use the factors and guidelines for Product Version equivalence to analyze whether Product Versions are equivalent.

Having determined the set of Product Models and Versions to be evaluated, the next step is to determine the

set of Platforms that the Products must be tested on.

Each non-equivalent Product for which compliance is claimed must be fully tested on each non-equivalent platform for which compliance is claimed. For non-equivalent Products on equivalent platforms, only the differences that affect PP-specified security functionality must be tested for each product.

#### **"Differences in PP-Specified Security Functionality" Defined**

If PP-specified security functionality is implemented by the TOE, then differences in the actual implementation between versions or product models break equivalence for that feature. Likewise, if the TOE implements the functionality in one version or model and the functionality is implemented by the platform in another version or model, then equivalence is broken. If the functionality is implemented by the platform in multiple models or versions on equivalent platforms, then the functionality is considered different if the product invokes the platform differently to perform the function.

### **D.3 Specific Guidance for Determining Product Model Equivalence**

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Product Model equivalence attempts to determine whether different feature levels of the same product across a product line are equivalent for purposes of PP testing. For example, if a product has a "basic" edition and an "enterprise" edition, is it necessary to test both models? Or does testing one model provide sufficient assurance that both models are compliant?

Product models are considered equivalent if there are no differences that affect PP-specified security functionality, as indicated in [Table 8](#).

**Table 8: Determining Product Model Equivalence**

<b>Factor</b>	<b>Same/Different</b>	<b>Guidance</b>
PP-Specified Functionality	Same	If the differences between Models affect only non-PP-specified functionality, then the Models are equivalent.
	Different	If PP-specified security functionality is affected by the differences between Models, then the Models are not equivalent and must be tested separately. It is necessary only to test the functionality affected by the software differences. If only differences are tested, then the differences must be enumerated, and for each difference the Vendor must provide an explanation of why each difference does or does not affect PP-specified functionality. If the Product Models are separately tested fully, then there is no need to document the differences.

### **D.4 Specific Guidance for Determining Product Version Equivalence**

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In cases of version equivalence, differences are expressed in terms of changes implemented in revisions of an evaluated Product. In general, versions are equivalent if the changes have no effect on any security-relevant claims about the TOE or assurance evidence. Non-security-relevant changes to TOE functionality or the addition of non-security-relevant functionality does not affect equivalence.

**Table 9: Factors for Determining Product Version Equivalence**

<b>Factor</b>	<b>Same/Different</b>	<b>Guidance</b>
Product Models	Different	Versions of different Product Models are not equivalent unless the Models are equivalent as defined in subsection 3.
PP-Specified Functionality	Same	If the differences affect only non-PP-specified functionality, then the Versions are equivalent.
	Different	If PP-specified security functionality is affected by the differences, then the Versions are not considered equivalent and must be tested separately. It is necessary only to test the functionality affected by the changes. If only the differences are tested, then for each difference the Vendor must provide an explanation of why the difference does or does not affect PP-specified functionality. If the Product Versions are separately tested fully, then there is no need to document the differences.

### **D.5 Specific Guidance for Determining Platform Equivalence**

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Platform equivalence is used to determine the platforms that equivalent versions of a Product must be tested on. Platform equivalence analysis done for one MDM cannot be applied to another MDM. Platform equivalence is not general, it is with respect to a particular MDM.

Product Equivalency analysis must already have been done and Products have been determined to be equivalent.

The platform can be hardware or virtual hardware, an operating system or similar entity, or a software execution environment such as a container. For purposes of determining equivalence for MDMs, we address each type of platform separately. In general, platform equivalence is based on differences in the interfaces between the TOE and Platform that are relevant to the implementation of PP-specified security functionality.

### D.5.1 Platform Equivalence, Hardware/Virtual Hardware Platforms

If an MDM runs directly on hardware without an operating system, or directly on virtualized hardware without an operating system, then platform equivalence is based on processor architecture and instruction sets. In the case of virtualized hardware, it is the virtualized processor and architecture that are presented to the MDM that matters, not the physical hardware.

Platforms with different processor architectures and instruction sets are not equivalent. This is not likely to be an issue for equivalency analysis for MDMs since there is likely to be a different version of the MDM for different hardware environments. Equivalency analysis becomes important when comparing processors with the same architecture. Processors with the same architecture that have instruction sets that are subsets or supersets of each other are not disqualified from being equivalent for purposes of an MDM evaluation. If the MDM takes the same code paths when executing PP-specified security functionality on different processors of the same family, then the processors can be considered equivalent with respect to that MDM. For example, if an MDM follows one code path on platforms that support the AES-NI instruction and another on platforms that do not, then those two platforms are not equivalent with respect to that MDM functionality. But if the MDM follows the same code path whether or not the platform supports AES-NI, then the platforms are equivalent with respect to that functionality.

The platforms are equivalent with respect to the MDM if the platforms are equivalent with respect to all PP-specified security functionality.

**Table 10: Factors for Determining Hardware/Virtual Hardware Platform Equivalence**

Factor	Same/Different/None	Guidance
Platform Architectures	Different	Platforms that present different processor architectures and instruction sets to the MDM are not equivalent.
PP-Specified Functionality	Same	For platforms with the same processor architecture, the platforms are equivalent with respect to the MDM if execution of all PP-specified security functionality follows the same code path on both platforms.

### D.5.2 Platform Equivalence, OS Platforms

For MDMs that are built for and run on operating systems, platform equivalence is determined by the interfaces between the MDM and the operating system that are relevant to PP-specified security functionality. Generally, these are the processor interface, device interfaces, and OS APIs. The following factors applied in order:

**Table 11: Factors for Determining OS/VS Platform Equivalence**

Factor	Same/Different/None	Guidance
Platform Architectures	Different	Platforms that run on different processor architectures and instruction sets are not equivalent.
Platform Vendors	Different	Platforms from different vendors are not equivalent.
Platform Versions	Different	Platforms from the same vendor with different major version numbers are not equivalent.
Platform Interfaces	Different	Platforms from the same vendor and major version are not equivalent if there are differences in device interfaces and OS APIs that are relevant to the way the platform provides PP-specified security functionality to the MDM.
Platform Interfaces	Same	Platforms from the same vendor and major version are equivalent if there are no differences in device interfaces and OS APIs that

		are relevant to the way the platform provides PP-specified security functionality to the MDM, or if the Platform does not provide such functionality to the MDM.
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### D.5.3 Software-based Execution Environment Platform Equivalence

If an MDM is built for and runs in a non-OS software-based execution environment, such as a Container or Java Runtime, then the below criteria must be used to determine platform equivalence. The key point is that the underlying hardware (virtual or physical) and OS is not relevant to platform equivalence. This allows MDMs to be tested and run on software-based execution environments on any hardware, as in cloud deployments.

**Table 12: Factors for Software-based Execution Environment Platform Equivalence**

Factor	Same/Different/None	Guidance
Platform Type/Vendor	Different	Software-based execution environments that are substantially different or come from different vendors are not equivalent. For example, a java virtual machine is not the same as a container. A Docker container is not the same as a CoreOS container.
Platform Versions	Different	Execution environments that are otherwise equivalent are not equivalent if they have different major version numbers.
PP-Specified Security Functionality	Same	All other things being equal, execution environments are equivalent if there is no significant difference in the interfaces through which the environments provide PP-specified security functionality to MDMs.

## D.6 Level of Specificity for Tested Configurations and Claimed Equivalent Configurations

In order to make equivalency determinations, the vendor and evaluator must agree on the equivalency claims. They must then provide the scheme with sufficient information about the TOE instances and platforms that were evaluated, and the TOE instances and platforms that are claimed to be equivalent.

The ST must describe all configurations evaluated down to processor manufacturer, model number, and microarchitecture version.

The information regarding claimed equivalent configurations depends on the platform that the MDM was developed for and runs on.

### Bare-Metal MDMs

For MDM Servers that run without an operating system on bare-metal or virtual bare-metal, the claimed configuration must describe the platform down to the specific processor manufacturer, model number, and microarchitecture version. The Vendor must describe the differences in the TOE with respect to PP-specified security functionality and how the TOE functions differently to leverage platform differences (e.g., instruction set extensions) in the tested configuration versus the claimed equivalent configuration.

### Traditional MDMs

For MDMs that run with an operating system as their immediate platform, the claimed configuration must describe the platform down to the specific operating system version. If the platform is a virtualization system, then the claimed configuration must describe the platform down to the specific virtualization system version. The Vendor must describe the differences in the TOE with respect to PP-specified security functionality and how the TOE functions differently to leverage platform differences in the tested configuration versus the claimed equivalent configuration. Relevant platform differences could include instruction sets, device interfaces, and OS APIs invoked by the TOE to implement PP-specified security functionality.

### Software-Based Execution Environments

For MDMs that run in a software-based execution environment such as a Java virtual machine or a Container, then the claimed configuration must describe the platform down to the specific version of the software execution environment. The Vendor must describe the differences in the TOE with respect to PP-specified security functionality and how the TOE functions differently to leverage platform differences in the tested configuration versus the claimed equivalent configuration.

# Appendix E - Implicitly Satisfied Requirements

This appendix lists requirements that should be considered satisfied by products successfully evaluated against this Protection Profile. However, these requirements are not featured explicitly as SFRs and should not be included in the ST. They are not included as standalone SFRs because it would increase the time, cost, and complexity of evaluation. This approach is permitted by [CC] Part 1, **8.2 Dependencies between components**.

This information benefits systems engineering activities which call for inclusion of particular security controls. Evaluation against the Protection Profile provides evidence that these controls are present and have been evaluated.

This appendix lists requirements that should be considered satisfied by products successfully evaluated against this PP-Module. However, these requirements are not featured explicitly as SFRs and should not be included in the ST. They are not included as standalone SFRs because it would increase the time, cost, and complexity of evaluation. This approach is permitted by [CC] Part 1, 8.2 Dependencies between components.

This information benefits systems engineering activities which call for inclusion of particular security controls. Evaluation against the PP-Module provides evidence that these controls are present and have been evaluated.

**Table 13: Implicitly Satisfied Requirements**

Requirement	Rationale for Satisfaction
FMT_MTD.1 - Management of TSF Data	<p><a href="#">FAU_SEL.1</a> has a dependency on FMT_MTD.1 because the configuration settings that determine what events are audited is considered to be TSF data. While <a href="#">FAU_SEL.1</a> determines the extent to which the TOE's audit function is configured, it relies on FMT_MTD.1 to determine the administrative roles that are permitted to manipulate this data.</p> <p>The PP allows <a href="#">FAU_SEL.1</a> to be implemented either by the TSF or by the TOE platform because the TOE may rely on the audit functionality provided by the OS it runs on. If this is configured entirely through the platform, the administrator does not necessarily need to be authenticated by the TOE to do this. Therefore, requiring FMT_MTD.1 does not make sense in this situation. If this is configured through the TOE, it can be implied from a review of FMT_SMR.1(1) that the 'MD user' role cannot perform this function as they lack the authority to manage the TSF. It is therefore understood that this function can be performed by the 'administrator' role or potentially by one or more roles specified by the ST author if the selection to specify additional roles is chosen. An additional SFR that explicitly identifies the roles permitted to manage this function is redundant in this context.</p>
FPT STM.1 - Reliable time stamps	<p>The PP's iterations of FAU_GEN.1 as well as its cryptographic functionality have a dependency on FPT_STM.1 because audit records require accurate timestamps as well as some cryptographic operations, such as determining if a presented X.509 certificate is expired. The TOE is installed on a general-purpose computer or specialized network device that is assumed to have the ability to provide certain functions to the TOE as specified in <a href="#">A.MDM_SERVER_PLATFORM</a>. This assumption explicitly lists 'reliable timestamps' as a function that the TSF is expected to have available to it.</p>

# Appendix F - Use Case Templates

The following use case templates list those selections, assignments, and objective requirements that best support the use cases identified by this Protection Profile. Note that the templates assume that all SFRs listed in Section 5 are included in the ST, not just those listed in the templates. These templates and deviations from the template should be identified in the Security Target to assist customers with making risk-based purchasing decisions. Products that do not meet these templates are not precluded from use in the scenarios identified by this Protection Profile. Where selections for a particular requirement are not identified in a use case template, all available selections are equally applicable to the use case.

## F.1 Enterprise-owned device for general-purpose enterprise use

Requirement	Action
FMT_SMF.1/SERVER_CONF_AGENT Function 32	Include in ST and assign GPS.
FMT_SMF.1/SERVER_CONF_AGENT Function 34	Include in ST. Assign personal hotspot connections (if feature exists).
FMT_SMF.1/SERVER_CONF_AGENT Function 47	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 49	Include in ST and select "a. USB mass storage mode".
FMT_SMF.1/SERVER_CONF_AGENT Function 51	Include in ST. Select both options.

## F.2 Enterprise-owned device for specialized, high-security use

Requirement	Action
FMT_SMF.1/SERVER_CONF_AGENT Function 15	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 16	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 31	Include in ST and select "no other method".
FMT_SMF.1/SERVER_CONF_AGENT Function 32	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 33	Include in ST. Assign at least USB.
FMT_SMF.1/SERVER_CONF_AGENT Function 34	Include in ST. Assign all protocols where the TSF acts as a server.
FMT_SMF.1/SERVER_CONF_AGENT Function 36	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 37	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 40	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 42	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 47	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 52	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT Function 54	Include in ST.
FMT_SMF.1/SERVER_CONF_AGENT	Include in ST.

#### Function c

FMT_SMF.1/SERVER_CONF_AGENT Function d	Include in ST.
FCS_CKM.1.1	Select RSA with key size of 3072 or select ECC schemes.
FCS_CKM.2.1	Select "RSA schemes" or select "ECC schemes".
FCS_COP.1.1/COMF_ALG	Select 256 bits
FCS_COP.1.1/HASH_ALG	Select SHA-384
FCS_COP.1.1/SIGN_ALG	Select RSA with key size of 3072 or select ECC schemes.
FIA_X509_EXT.2.2	Select either "allow the administrator to choose..." or "not accept the certificate".
FCS_TLSC_EXT.1.1 (from TLS Package)	If included in ST, select "TLS 1.2".
FCS_TLSC_EXT.2.1 (from TLS Package)	If included in ST, select "secp384r1".

### **F.3 Personally owned device for personal and enterprise use**

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Requirement	Action
FMT_SMF.1/SERVER_CONF_AGENT Function 13	Include in ST
FMT_SMF.1/SERVER_CONF_AGENT Function 14	Include in ST
FMT_SMF.1/SERVER_CONF_AGENT Function 21	Include in ST
FMT_SMF.1/SERVER_CONF_AGENT Function 22	Include in ST
FMT_SMF.1/SERVER_CONF_AGENT Function 30	Select "on a per-app basis" and/or "on a per-group of application processes basis"
FMT_SMF.1/SERVER_CONF_AGENT Function 31	If included in ST, select "on a per-app basis" and/or "on a per-group of application processes basis"
FMT_SMF.1/SERVER_CONF_AGENT Function 48	Include in ST
FMT_SMF.1/SERVER_CONF_AGENT Function 52	If included in ST, select "on a per-app basis" and/or "on a per-group of application processes basis"
FMT_SMF.1/SERVER_CONF_SERVER Function f	Include in the ST

### **F.4 Personally owned device for personal and limited enterprise use**

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At this time no requirements are recommended for this use case.

# Appendix G - References

ext-comp-def

## Identifier Title

[CC]	Common Criteria for Information Technology Security Evaluation - <ul style="list-style-type: none"><li>• <a href="#">Part 1: Introduction and General Model</a>, CCMB-2017-04-001, Version 3.1, Revision 5, April 2017.</li><li>• <a href="#">Part 2: Security Functional Components</a>, CCMB-2017-04-002, Version 3.1, Revision 5, April 2017.</li><li>• <a href="#">Part 3: Security Assurance Components</a>, CCMB-2017-04-003, Version 3.1, Revision 5, April 2017.</li></ul>
[CEM]	<a href="#">Common Evaluation Methodology for Information Technology Security - Evaluation Methodology</a> , CCMB-2012-09-004, Version 3.1, Revision 4, September 2012.
[CSA]	<a href="#">Computer Security Act of 1987</a> , H.R. 145, June 11, 1987.
[OMB]	<a href="#">Reporting Incidents Involving Personally Identifiable Information and Incorporating the Cost for Security in Agency Information Technology Investments</a> , OMB M-06-19, July 12, 2006.
[MDF PP]	<a href="#">Protection Profile for Mobile Device Fundamentals, Version 3.0, June 2016</a>
[MDM Agent PP]	<a href="#">Protection Profile for Mobile Device Management, Version 3.0, October 2016</a>

## Appendix H - Acronyms

Acronym	Meaning
API	API Application Programming Interface
Base-PP	Base Protection Profile
CC	Common Criteria
CEM	Common Evaluation Methodology
CSP	Critical Security Parameter
DEK	Data Encryption Key
EST	Enrollment over Secure Transport
KEK	Key Encryption Key
MD	Mobile Device
MDM	Mobile Device Management
OE	Operational Environment
OS	Operating System
PP	Protection Profile
PP-Configuration	Protection Profile Configuration
PP-Module	Protection Profile Module
REK	Root Encryption Key
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