



LexmarkTM

**Lexmark CS622, CS921, CS923, MS622, MS822,
and MS826
Single Function Printers Security Target**

Version 1.9

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DOCUMENT INTRODUCTION

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ACRONYMS LIST

- AD..... Active Directory**
- AES..... Advanced Encryption Standard**
- BSD..... Berkeley Software Distribution**
- CAC..... Common Access Card**
- CBC..... Cipher Block Chaining**
- CC..... Common Criteria**
- CM..... Configuration Management**
- EAL..... Evaluation Assurance Level**
- ESP..... Encapsulating Security Payload**
- FTP..... File Transfer Protocol**
- GSSAPI..... Generic Security Services Application Program Interface**
- GUI..... Graphical User Interface**
- HTTP..... HyperText Transfer Protocol**
- I&A..... Identification & Authentication**
- IPP..... Internet Printing Protocol**
- IPSec..... Internet Protocol Security**
- IPv4..... Internet Protocol version 4**
- IPv6..... Internet Protocol version 6**
- ISO..... International Standards Orgaization**
- IT..... Information Technology**
- KDC..... Key Distribution Center**
- KDF..... Key Derivation Function**
- LAN..... Local Area Network**
- LDAP..... Lightweight Directory Access Protocol**
- MB..... MegaByte**
- SFP..... Single Function Printer**
- NTP..... Network Time Protocol**
- NVRAM..... Non-Volatile Random Access Memory**
- OSP..... Organizational Security Policy**
- PIV..... Personal Identity Verification**
- PJL..... Printer Job Language**
- PP..... Protection Profile**
- RAM..... Random Access Memory**
- RFC..... Request For Comments**
- SASL..... Simple Authentication and Security Layer**
- SFP..... Security Function Policy**

SFR	Security Functional Requirement
SHA	Secure Hash Algorithm
SNMP	Simple Network Management Protocol
ST	Security Target
TFTP	Trivial File Transfer Protocol
TOE	Target of Evaluation
TRNG	True Random Number Generator
TSF	TOE Security Function
UI	User Interface
URL	Uniform Resource Locator
USB	Universal Serial Bus

1. Security Target Introduction

This Security Target (ST) describes the objectives, requirements and rationale for the Lexmark CS622, CS921, CS923, MS622, MS822, and MS826 Single Function Printers. The language used in this Security Target is consistent with the *Common Criteria for Information Technology Security Evaluation, Version 3.1 Revision 5*. As such, the spelling of terms is presented using the internationally accepted English.

1.1 Security Target Reference

Lexmark CS622, CS921, CS923, MS622, MS822, and MS826 Single Function Printers Security Target, Version 1.9, November 8, 2018.

1.2 TOE Reference

Lexmark Firmware versions:

- CSTMH.052.025: CS921, CS923
- CSTZJ.052.025: CS622
- MSTGM.052.025: MS622
- MSTGW.052.025: MS822, MS826

1.3 Evaluation Assurance Level

Assurance claims conform to EAL3 (Evaluation Assurance Level 3) augmented with ALC_FLR.3 from the *Common Criteria for Information Technology Security Evaluation, Version 3.1 Revision 5*.

1.4 Keywords

Hardcopy, Paper, Document, Printer, Residual data, Temporary data, Network interface, Single Function Device, SFP

1.5 TOE Overview

1.5.1 Usage and Major Security Features

The SFPs are single functional printer systems with networked capabilities. Their capabilities extend to servicing print jobs through the network. The SFPs feature an integrated touch-sensitive operator panel.

The major security features of the TOE are:

1. All Users are identified and authenticated as well as authorized before being granted permission to perform any restricted TOE functions.
2. Administrators authorize Users to use the functions of the TOE.
3. User Document Data are protected from unauthorized disclosure or alteration.
4. User Function Data are protected from unauthorized alteration.
5. TSF Data, of which unauthorized disclosure threatens operational security, are protected from unauthorized disclosure.
6. TSF Data, of which unauthorized alteration threatens operational security, are protected from unauthorized alteration.

7. Document processing and security-relevant system events are recorded, and such records are protected from disclosure or alteration by anyone except for authorized personnel.

1.5.2 TOE type

The firmware of a Single Function Device

1.5.3 Required Non-TOE Hardware/Software/Firmware

The TOE is the firmware of an SFP. The SFP hardware must be one of the models supported for the firmware versions specified for the TOE.

The optional Lexmark Secure Element (Part Number 57X0185) must be installed in the SFP. The Secure Element incorporates an Infineon Smart Card IC M9900 (Release A22, Infineon Part Number SLE97CSFX1M00PE). The M9900 provides a True Random Number Generator (TRNG) used by the TOE for seeding of the random number generator in the TOE, and has successfully completed a [Common Criteria EAL5+ evaluation](#) which included the TRNG functionality. The associated Security Target is in strict conformance to the [Security IC Platform Protection Profile, Version 1.0, and dated 15.06.2007](#). The Secure Element also incorporates firmware enabling communication between the SFP firmware and the M9900.

To be fully operational, any combination of the following items may be connected to the SFP:

1. A LAN for network connectivity. The TOE supports IPv4 and IPv6.
2. IT systems that submit print jobs to the SFP via the network using standard print protocols.
3. An IT system acting as the remote syslog recipient of audit event records sent from the TOE.
4. LDAP server to support Identification and Authentication (I&A). This component is optional depending on the type(s) of I&A mechanisms used.
5. Card reader and cards to support Smart Card authentication using Common Access Card (CAC), Personal Identity Verification (PIV) cards or Secret Internet Protocol Router Network (SIPRNet) cards. This component is optional depending on the type(s) of I&A mechanisms used. The supported card readers are:
 - a. Identiv uTrust 2700 F Contact Smart Card Reader & Identiv uTrust 2700 R Contact Smart Card Reader
 - b. Omnikey 3121 SmartCard Reader,
 - c. Any other Omnikey SmartCard Readers that share the same USB Vendor IDs and Product IDs with the Omnikey 3121 (example Omnikey 3021),
 - d. SCM SCR 331,
 - e. SCM SCR 3310v2.

1.6 TOE Description

The TOE provides a printing function, defined as producing a hardcopy document from its electronic form

All of the SFP models referenced in the evaluation are complete SFPs in a single unit.

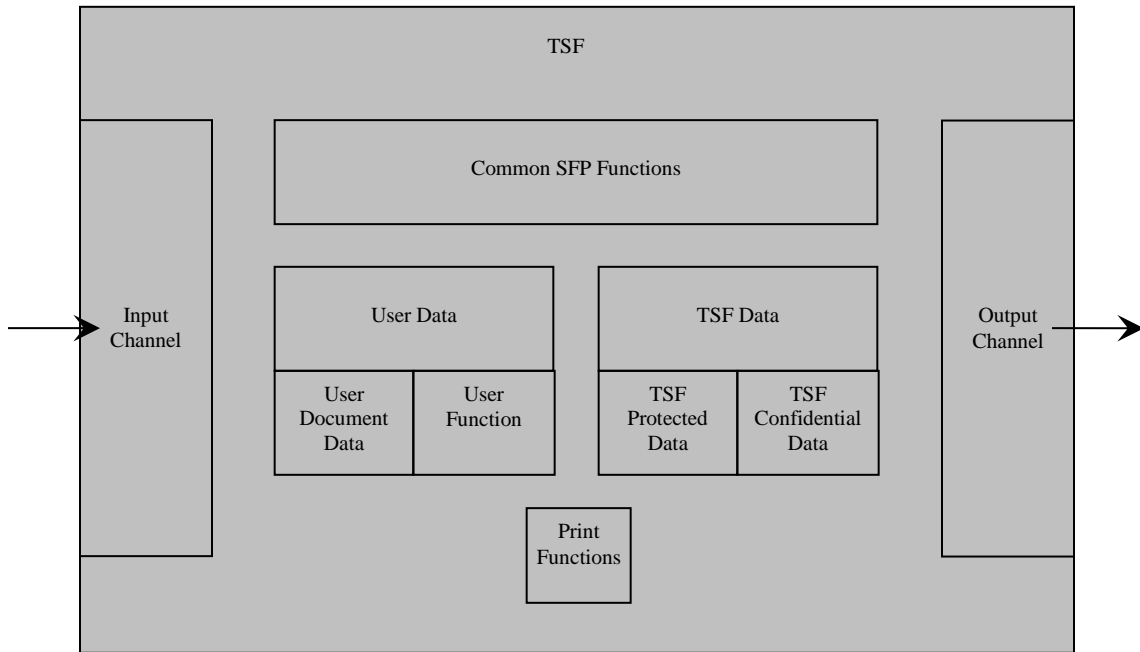
All of the firmware versions included in this evaluation provide the same security functionality. Their differences are in the processors, which accommodate different printing speeds and support for color operations. The following tables summarize the technical characteristics of the SFP models.

Table 1 - Technical Characteristics of the SFP Models

Model	Processor	Word Size	Color/Mono	Pages Per Minute
CS622	Marvell 88PA6220 (Gem)	64-bit	Color	40
CS921	Marvell 88PA6270 (G2)	32-bit	Color	35
CS923	Marvell 88PA6270 (G2)	32-bit	Color	55
MS622	Marvell 88PA6220 (Gem)	32-bit	Mono	50
MS822	Marvell 88PA6220 (Gem)	64-bit	Mono	55
MS826	Marvell 88PA6220 (Gem)	64-bit	Mono	70

The Target of Evaluation (TOE) is described using the standard Common Criteria terminology of Users, Objects, Operations, and Interfaces. Two additional terms are introduced: Channel describes both data interfaces and hardcopy document input/output mechanisms, and TOE Owner is a person or organizational entity responsible for protecting TOE assets and establishing related security policies. In this document, the terms User and Subject are used interchangeably.

Figure 1 - TOE Model



The following prefixes are used to indicate different entity types:

Table 2 - Notational prefix conventions

Prefix	Type of entity
U.	User
D.	Data
F.	Function
T.	Threat
P.	Policy
A.	Assumption
O.	Objective
OE.	Environmental objective
+	Security Attribute

1.6.1 Users

Users are entities that are external to the TOE and which interact with the TOE. There may be two types of Users: Normal and Administrator.

Table 3 - Users

Designation	Definition
U.USER	Any authorized User.
U.NORMAL	A User who is authorized to perform User Document Data processing functions of the TOE. In the remainder of this document, the term “Normal User” is used interchangeably with U.NORMAL. The TOE provides user-level permissions to access specific document processing functions (e.g. print). When it is necessary to distinguish the specific permission, that information is supplied. Otherwise the generic terms identified above are used.
U.ADMINISTRATOR	A User who has been specifically granted the authority to manage some portion or all of the TOE and whose actions may affect the TOE security policy (TSP). In the remainder of this document, the terms “Administrator” and “Authorized Administrator” are used interchangeably with U.ADMINISTRATOR. The TOE provides user-level permissions to access specific management functions. When it is necessary to distinguish the specific permission, that information is supplied. Otherwise the generic terms identified above are used.

1.6.2 Objects (Assets)

Objects are passive entities in the TOE, that contain or receive information, and upon which Subjects perform Operations. Objects are equivalent to TOE Assets. There are three categories of Objects: User Data, TSF Data, and Functions.

1.6.2.1 User Data

User Data are data created by and for Users and do not affect the operation of the TOE Security Functionality (TSF). This type of data is composed of two types of objects: User Document Data, and User Function Data.

Table 4 - User Data

Designation	Definition
D.DOC	User Document Data consists of the information contained in a user’s document. This includes the original document itself in either hardcopy or electronic form, image data, or residually-stored data created by the hardcopy device while processing an original document and printed hardcopy output. For this TOE, D.DOC includes: 1. User data contained in jobs submitted from the network for printing
D.FUNC	User Function Data are the information about a user’s document or job to be processed by the TOE. For this TOE, D.FUNC includes: 1. Job information for network print jobs

1.6.2.2 TSF Data

TSF Data are data created by and for the TOE and that might affect the operation of the TOE. This type of data is composed of two types of objects: TSF Protected Data and TSF Confidential Data.

Table 5 - TSF Data

Designation	Definition
D.PROT	TSF Protected Data are assets for which alteration by a User who is neither an Administrator nor the owner of the data would have an effect on the operational security of the TOE, but for which disclosure is acceptable.
D.CONF	TSF Confidential Data are assets for which either disclosure or alteration by a User who is neither an Administrator nor the owner of the data would have an effect on the operational security of the TOE.

1.6.2.3 Functions

Functions perform processing, storage, and transmission of data that may be present in the TOE. These functions are described in the following table.

Table 6 - Functions

Designation	Definition
F.PRT	Printing: a function in which electronic document input is converted to physical document output

1.6.3 Operations

Operations are a specific type of action performed by a Subject on an Object. Five types of operations are addressed: those that result in disclosure of information (Read), those that result in alteration of information (Create, Modify, Delete), and those that invoke a function (Execute).

1.6.4 Channels

Channels are the mechanisms through which data can be transferred into and out of the TOE.

Private Medium Interface: mechanism for exchanging information that use (1) wired electronic methods over a communications medium which, in conventional practice, is not accessed by multiple simultaneous Users; or, (2) Operator Panel and displays that are part of the TOE. It is an input-output channel. The touch panel is a private medium interface.

Shared-medium Interface: mechanism for exchanging information that use wired network electronic methods over a communications medium which, in conventional practice, is or can be simultaneously accessed by multiple Users. It is an input-output channel. The standard network interface is a shared-medium interface.

Hardcopy Output Handler: mechanism for transferring User Document Data out of the TOE in hardcopy form. It is an output channel. The printer is a hardcopy output handler.

1.7 Physical Boundary

The physical boundary of the TOE is the firmware executing on the Main Processor Board of the SFP. The hardware of the SFP is excluded from the TOE boundary.

The physical scope of the TOE also includes the following guidance documentation:

1. *Lexmark Common Criteria Installation Supplement and Administrator Guide*
2. *Lexmark Embedded Web Server Administrator's Guide*
3. *Lexmark CS620 Series User's Guide*
4. *Lexmark CS920, CS921, CS922, CS923, CS924, CS927 User's Guide*
5. *Lexmark MS620 Series User's Guide*
6. *Lexmark MS820 Series User's Guide*

1.8 Logical Boundary

The TOE supports the security functions documented in the following sections.

1.8.1 Audit Generation

The TOE generates audit event records for security-relevant events and transmits them to a remote IT system using the syslog protocol.

1.8.2 Identification and Authentication

When a touch panel or web session is initiated, the user is implicitly assumed to be the Guest (default) user. Per the evaluated configuration, the permissions for this user must be configured such that no access to TSF data or functions is allowed other than print job submission (job submission is authorized regardless of what user is logged in). Therefore, the user must successfully log in as a different user before any TSF data or functions other than print job submission may be accessed.

The TOE supports I&A with a per-user selection of Username/Password Accounts (processed by the TOE) or integration with an external LDAP server (in the operational environment). Smart Card authentication may also be specified for users of the touch panel.

1.8.3 Access Control

Access controls configured for functions and menu access are enforced by the TOE.

1.8.4 Management

Through web browser and touch panel sessions, authorized administrators may configure access controls and perform other TOE management functions.

1.8.5 D.DOC Wiping

In the evaluated configuration, the TOE automatically overwrites RAM used to store user data as soon as the buffer is released.

1.8.6 Secure Communication

The TOE protects the confidentiality and integrity of all information exchanged over the attached network by using IPSec with ESP for all network communication. Cryptographic keys may be generated by the TOE or pre-shared keys may be entered by the administrator.

1.8.7 Self Test

During initial start-up, the TOE performs self tests on its cryptographic components and the integrity of the configuration data.

1.9 TOE Data

1.9.1 TSF Data

Table 7 - TSF Data

Item	Description	D.CONF	D.PROT
Account Status	Login status information is associated with all accounts used to authenticate internally against a Username/Password. For each Username/Password account, the TOE tracks the number of login failures, time of the earliest login failure, and lock status.	X	
Active Directory Configuration	Configuration information used to join an Active Directory Domain. Once joined, machine credentials are generated and the LDAP+GSSAPI Login Method parameters for communication with the Domain Controller are automatically populated.	X	
Date and Time Parameters	Controls whether the time is tracked internally or from a remote NTP server. If an NTP server is used, it specifies the parameters for communication with the server. Internal and external time sources represent two distinct modes of TOE operation.		X
Enable Audit	Determines if the device records events in the secure audit log and (if enabled) in the remote syslog.		X
Enable HTTP Server	Enables HTTP(S) server on the TOE.		X
Enable Remote Syslog	Determines if the device transmits logged events to a remote server.		X
Groups	The set of Groups may be used to configure permissions for users. Each Group has a configured set of permissions. Users may belong to any number of Groups, and any User's permissions are the union of the permissions for each Group it is a member of.	X	
Held Print Job Expiration Timer	Specifies the amount of time a received print job is saved for a user to release before it is automatically deleted.		X

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Item	Description	D.CONF	D.PROT
IPSec Settings	The configuration parameters for IPSec that require IPSec with ESP for all network communication (IPv4 and/or IPv6) with certificate validation or pre-shared keys.		X
Job Waiting	Specifies whether a print job may be placed in the Held Jobs queue if the required resources (e.g. paper type) are not currently available, enabling subsequent print jobs to be processed immediately		X
Kerberos Setup	Defines the KDC Address, KDC Port, and Realm for communication with the KDC. KDC communication is required if the TOE is using the LDAP+GSSAPI mechanism.	X	
LDAP Certificate Required	Specifies whether a valid certificate is required to be sent by an LDAP server. Yes specifies that the server certificate is requested; if no certificate is provided or if a bad certificate is provided, the session is terminated immediately. No indicates that a certificate is not required; if a certificate is supplied and it is invalid, the session is terminated immediately.		X
LDAP+GSSAPI – SFP Credentials	Specifies the Username and password to be used when performing LDAP queries.	X	
LDAP+GSSAPI Configuration	Specifies the configuration options for communicating and exchanging information with an LDAP server using GSSAPI.	X	
LES Applications	Specifies whether enhanced service Java applications may be executed on the TOE. This parameter must be set to “Enable” during installation and is not accessible to administrators during operation.		X
Login Restrictions	Determines how many failed authentications are allowed within the “Failure time frame” value before the offending Username/Password account is prevented from logging in for the duration of the “Lockout time” value. The “Web Login Timeout” determines how long the web sessions can remain idle before the user is logged off automatically.	X	
Network Port	Defines the parameters required for the TOE to communicate via the standard network port		X
Permissions	Permissions specify the access to menus or functions. Permissions are separately configurable for the default Guest account (Public) and for each defined Group. Users other than Guest inherit the union of permissions for all Groups that they are a member of.	X	
Remote Syslog Parameters	Defines the communication to the remote syslog system	X	
Security Reset Jumper	Specifies the behavior of the TOE when a position change of the Security Rest Jumper is detected. No Effect indicates the jumper should be ignored. “Enable Guest Access” changes the permissions for the Guest account to provide access to all functions and menus.		X
Smart Card Authentication Client Configuration	Specifies parameters for validating the certificate from the card and retrieving information from Active Directory.	X	

Item	Description	D.CONF	D.PROT
USB Buffer	Disables all activity via the USB device ports (with the exception of a Smart Card reader if Smart Card usage is configured).		X
Username/Password Accounts	Specify a list of accounts that are internally validated by username and password. For each account, a list of Group memberships are configured.	X	
Visible Home Screen Icons	Specifies what icons should be displayed on the touch panel home screen.		X

1.9.2 Authentication Data

All the items described in the following table are D.CONF.

Table 8 - Authentication Data

Item	Description
Username/Password Account Usernames and Passwords	The username and password for each defined Username/Password account are used with Username/Password Account authentication performed internally by the TOE.

1.9.3 Security Attributes

All the items described in the following table are D.CONF.

Table 9 - Security Attributes

Item	Description
Permissions	The permissions for the user session, determined from the union of permissions from all the group memberships associated with the account
Username	The username specified during a successful I&A interaction.

1.9.4 User Data

All the items described in the following table have both a D.DOC and D.FUNC component.

Table 10 - User Data

Item	Description
Held Jobs	Data received via the network interface that is destined for the printer and held until released at the touch panel by the submitter.
Network Print Job	Data received via the network interface and destined for the printer. All network print jobs are held until released.

1.10 Evaluated Configuration

The following configuration options apply to the evaluated configuration of the TOE:

1. The B/W Print and Color Print permissions must be configured for the Public permissions, which apply to all users including the Guest user. These permissions authorize the SFP to accept print jobs from remote IT systems. No other permissions may be configured for the Public permissions.
2. No optional network interfaces are installed on the SFPs.
3. No optional parallel or serial interfaces are installed on the SFPs. These are for legacy connections to specific IT systems only.
4. All USB ports on the SFPs that perform document processing functions are disabled via configuration. In the operational environments in which the Common Criteria evaluated configuration is of interest, the users typically require that all USB ports are disabled. If Smart Card authentication is used, a card reader is physically connected to a specific USB port during TOE installation; in the evaluated configuration this USB port is limited in functionality to acting as the interface to the card reader. A reader is shipped with the SFP. If Smart Card authentication is not used, the card reader may be left unconnected.
5. Operational management functions are performed via browser sessions to the embedded web server or via the management menus available through the touch panel.
6. Access controls are configured for all TSF data so that only authorized administrators are permitted to manage those parameters.
7. All network communication is required to use IPsec with ESP to protect the confidentiality and integrity of the information exchanged, including management sessions that exchange D.CONF and D.PROT. Certificates presented by remote IT systems are validated.
8. Because all network traffic is required to use IPsec with ESP, syslog records sent to a remote IT system also are protected by IPsec with ESP. This is beyond IEEE Std. 2600.1™-2009 requirements for transmission of audit records.
9. I&A may use Username/Password Accounts and/or the LDAP+GSSAPI login method on a per-user basis. Smart Card authentication may be used for touch panel users. No other I&A mechanisms are included in the evaluation because they provide significantly lower strength than the supported mechanisms.
10. LDAP+GSSAPI and Smart Card authentication require integration with an external LDAP server such as Active Directory. This communication uses default certificates stored in NVRAM; the LDAP server must provide a valid certificate to the TOE. Binds to LDAP servers for LDAP+GSSAPI use device credentials (not anonymous bind) so that the information retrieved from Active Directory can be restricted to a specific SFP. Binds to LDAP servers for Smart Card authentication use user credentials from the card (not anonymous bind) so that the information retrieved from Active Directory can be restricted to a specific user.
11. Audit event records are transmitted to a remote IT system as they are generated using the syslog protocol.
12. The severity level of audit events to log must be set to 5 (Notice).

13. No Java applications are required to be installed on the TOE. These applications are referred to as eSF applications in end user documentation. The following eSF applications may be installed by an administrator during TOE installation if smart-card support is desired: "Smart Card Authentication", "Smart Card Authentication Client", "Display Customization", "Secure Email", "Secure Held Jobs", "PIV Smart Card Driver", "CAC Smart Card Driver", and "SIPRNet Smart Card Driver".
14. The following eSF applications may be installed by an administrator during TOE installation and must be enabled if smart card authentication is used: "Smart Card Authentication", "Smart Card Authentication Client", "PIV Smart Card Driver (if PIV cards are used)", "CAC Smart Card Driver (if CAC cards are used)", and "SIPRNet Smart Card Driver (if SIPRNet cards are used)".
15. All other eSF applications installed by Lexmark before the TOE is shipped must be disabled.
16. No option card for downloadable emulators is installed in the TOE.
17. NPAP, PJP and Postscript have the ability to modify system settings. The capabilities specific to modifying system settings via these protocols are disabled.
18. All administrators must be authorized for print functions.
19. All network print jobs are held until released via the touch panel. Every network print job must include a PJP SET USERNAME statement to identify the userid of the owner of the print job. Held print jobs may only be released by an authenticated user with the same userid as specified in the print job.
20. Administrators are directed (through operational guidance) to specify passwords adhering to the following composition rules for Username/Password Accounts:
 - A minimum of 8 characters
 - At least one lower case letter, one upper case letter, and one non-alphabetic character
 - No dictionary words or permutations of the user name
21. Simple Network Management Protocol (SNMP) support is disabled.
22. Internet Printing Protocol (IPP) support is disabled.
23. All unnecessary network ports are disabled.
24. The supported Diffie-Hellman groups for IKE are Group 14 (2048) and Group 24 (2048 w/ 256-bit POS).

The print function may be disabled or restricted, indicating that the functionality is included in the evaluation and may be disabled or restricted to an authorized set of users at the discretion of an administrator.

2. Conformance Claims

2.1 Common Criteria Conformance

Common Criteria version: Version 3.1 Revision 5

Common Criteria conformance: Part 2 extended and Part 3 conformant

2.2 Protection Profile Conformance

PP Identification: 2600.1, Protection Profile for Hardcopy Devices, Operational Environment A, version 1.0, dated January 2009

PP Conformance: “2600.1-PP, Protection Profile for Hardcopy Devices, Operational Environment A,” “2600.1-PRT, SFR Package for Hardcopy Device Print Functions, Operational Environment A,” and “2600.1-SMI, SFR Package for Hardcopy Device Shared-medium Interface Functions, Operational Environment A”

This Security Target claims demonstrable conformance to the Security Problem Definition (APE_SPD), Security Objectives (APE_OBJ), Extended Components Definitions (APE_ECD), and the Common Security Functional Requirements (APE_REQ) of the referenced PP.

This TOE performs the functions F.PRT and F.SMI as defined in the referenced PP and claims demonstrable conformance to the augmented SFR packages defined for each of these functions.

Rationale for PP conformance is provided in chapter 8.

2.3 Security Requirement Package Conformance

Security assurance requirement package conformance: EAL3 augmented by ALC_FLR.3

Security functional requirement package conformance: The SFR packages itemized below from the referenced PP with augmentations.

1. Common Security Functional Requirements
2. 2600.1-PRT, SFR Package for Hardcopy Device Print Functions, Operational Environment A
3. 2600.1-SMI, SFR Package for Hardcopy Device Shared-medium Interface Functions, Operational Environment A

3. Security Problem Definition

3.1 Introduction

This chapter defines the nature and scope of the security needs to be addressed by the TOE. Specifically this chapter identifies:

- A) assumptions about the environment,
- B) threats to the assets and
- C) organisational security policies.

This chapter identifies assumptions as *A.assumption*, threats as *T.threat* and policies as *P.policy*.

This chapter addresses threats posed by four categories of threat agents:

- Persons who are not permitted to use the TOE who may attempt to use the TOE.
- Persons who are authorized to use the TOE who may attempt to use TOE functions for which they are not authorized.
- Persons who are authorized to use the TOE who may attempt to access data in ways for which they are not authorized.
- Persons who unintentionally cause a software malfunction that may expose the TOE to unanticipated threats.

The threats and policies defined in this chapter address the threats posed by these threat agents.

3.2 Assumptions

The specific conditions listed in the following subsections are assumed to exist in the TOE environment. These assumptions include both practical realities in the development of the TOE security requirements and the essential environmental conditions on the use of the TOE.

Table 11 - Assumptions

A.Type	Description
A.ACCESS.MANAGED	The TOE is located in a restricted or monitored environment that provides protection from unmanaged access to the physical components and data interfaces of the TOE.
A.ADMIN.TRAINING	Administrators are aware of the security policies and procedures of their organization, are trained and competent to follow the manufacturer's guidance and documentation, and correctly configure and operate the TOE in accordance with those policies and procedures.
A.ADMIN.TRUST	Administrators do not use their privileged access rights for malicious purposes.
A.IPSEC	IPSec with ESP is used between the TOE and all remote IT systems with which it communicates over the network using IPv4 and/or IPv6.
A.USER.TRAINING	TOE Users are aware of the security policies and procedures of their organization, and are trained and competent to follow those policies and procedures.
A.VIPER	The Lexmark Secure Element provides entropy of adequate quality for secure operation of the TOE's DRBG.

3.3 Threats

The threats identified in the following subsections are addressed by the TOE and the Operational Environment.

Table 12 - Threats

T.Type	TOE Threats
T.CONF.ALT	TSF Confidential Data may be altered by unauthorized persons
T.CONF.DIS	TSF Confidential Data may be disclosed to unauthorized persons
T.DOC.ALT	User Document Data may be altered by unauthorized persons
T.DOC.DIS	User Document Data may be disclosed to unauthorized persons
T.FUNC.ALT	User Function Data may be altered by unauthorized persons
T.PROT.ALT	TSF Protected Data may be altered by unauthorized persons

3.4 Organisational Security Policies

This section describes the Organizational Security Policies (OSPs) that apply to the TOE. OSPs are used to provide a basis for security objectives that are commonly desired by TOE Owners in this operational environment but for which it is not practical to universally define the assets being protected or the threats to those assets.

Table 13 - Organizational Security Policies for the TOE

Name	Definition
P.AUDIT.LOGGING	To preserve operational accountability and security, records that provide an audit trail of TOE use and security-relevant events will be created, maintained, and protected from unauthorized disclosure or alteration, and will be reviewed by authorized personnel
P.INTERFACE.MANAGEMENT	To prevent unauthorized use of the external interfaces of the TOE, operation of those interfaces will be controlled by the TOE and its IT environment.
P.SOFTWARE.VERIFICATION	To detect corruption of the executable code in the TSF, procedures will exist to self-verify executable code in the TSF.
P.USER.AUTHORIZATION	To preserve operational accountability and security, Users will be authorized to use the TOE only as permitted by the TOE Owner

4. Security Objectives

This section identifies the security objectives of the TOE and the TOE's Operational Environment. The security objectives identify the responsibilities of the TOE and the TOE's Operational Environment in meeting the security needs. Objectives of the TOE are identified as *O.objective*. Objectives that apply to the operational environment are designated as *OE.objective*.

4.1 Security Objectives for the TOE

The TOE must satisfy the following objectives.

Table 14 - Security Objectives for the TOE

O.Type	Security Objective
O.AUDIT.LOGGED	The TOE shall create and maintain a log of TOE use and security-relevant events and prevent its unauthorized disclosure or alteration.
O.CONF.NO_ALT	The TOE shall protect TSF Confidential Data from unauthorized alteration.
O.CONF.NO_DIS	The TOE shall protect TSF Confidential Data from unauthorized disclosure.
O.DOC.NO_ALT	The TOE shall protect User Document Data from unauthorized alteration.
O.DOC.NO_DIS	The TOE shall protect User Document Data from unauthorized disclosure.
O.FUNC.NO_ALT	The TOE shall protect User Function Data from unauthorized alteration.
O.INTERFACE.MANAGED	The TOE shall manage the operation of external interfaces in accordance with security policies.
O.I&A	The TOE shall provide functionality to identify and authenticate users whose accounts are defined internal to the TOE.
O.MANAGE	The TOE will provide all the functions and facilities necessary to support the administrators in their management of the security of the TOE, and restrict these functions and facilities from unauthorized use.
O.PROT.NO_ALT	The TOE shall protect TSF Protected Data from unauthorized alteration.
O.SOFTWARE.VERIFIED	The TOE shall provide procedures to self-verify executable code in the TSF.
O.TIME_STAMP	The TOE will provide reliable time stamps for accountability purposes when internal clocks are configured by an administrator.
O.USER.AUTHORIZED	The TOE shall require identification and authentication of Users, and shall ensure that Users are authorized in accordance with security policies before allowing them to use the TOE.

4.2 Security Objectives for the Operational Environment

The TOE's operational environment must satisfy the following objectives.

Table 15 - Security Objectives of the Operational Environment

OE.Type	Operational Environment Security Objective
OE.ADMIN.TRAINED	The TOE Owner shall ensure that TOE Administrators are aware of the security policies and procedures of their organization; have the training, competence, and time to follow the manufacturer's guidance and documentation; and correctly configure and operate the TOE in accordance with those policies and procedures.
OE.ADMIN.TRUSTED	The TOE Owner shall establish trust that TOE Administrators will not use their privileged access rights for malicious purposes.
OE.AUDIT.REVIEWED	The TOE Owner shall ensure that audit logs are reviewed at appropriate intervals for security violations or unusual patterns of activity.

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OE.Type	Operational Environment Security Objective
OE.AUDIT_ACCESS.AUTHORIZED	If audit records generated by the TOE are exported from the TOE to another trusted IT product, the TOE Owner shall ensure that those records can be accessed in order to detect potential security violations, and only by authorized persons.
OE.AUDIT_STORAGE.PROTECTED	If audit records are exported from the TOE to another trusted IT product, the TOE Owner shall ensure that those records are protected from unauthorized access, deletion and modifications.
OE.I&A	The operational environment shall provide functionality to identify and authenticate users whose accounts are defined external to the TOE.
OE.INTERFACE.MANAGED	The IT environment shall provide protection from unmanaged access to TOE external interfaces.
OE.IPSEC	All remote IT system with which the TOE communicates over the network using IPv4 and/or IPv6 shall support IPsec with ESP.
OE.PHYSICAL.MANAGED	The TOE shall be placed in a secure or monitored area that provides protection from unmanaged physical access to the TOE.
OE.TIME_STAMP	The Operational Environment will provide reliable time stamps for accountability purposes when NTP is configured by an administrator.
OE.USER.AUTHORIZED	The TOE Owner shall grant permission to Users to be authorized to use the TOE according to the security policies and procedures of their organization.
OE.USER.TRAINED	The TOE Owner shall ensure that Users are aware of the security policies and procedures of their organization and have the training and competence to follow those policies and procedures.
OE.VIPER	The Lexmark Secure Element provides entropy of adequate quality for secure operation of the TOE's DRBG.

5. Extended Components Definition

5.1 Extended Security Functional Components

No extended security functional requirements are defined.

5.2 Extended Security Assurance Components

No extended security assurance requirements are defined.

6. Security Requirements

This section contains the functional requirements that are provided by the TOE.

The CC defines operations on security requirements. The font conventions listed below state the conventions used in this ST to identify the operations.

Assignment: indicated in italics

Selection: indicated in underlined text

Assignments within selections: indicated in italics and underlined text

SFR operation completed or partially completed in the PP: Bold

Refinement: indicated with bold text

Iterations of security functional requirements may be included. If so, iterations are specified at the component level and all elements of the component are repeated. Iterations are identified by letters in parentheses following the component or element (e.g., FAU_ARP.1(A)).

6.1 TOE Security Functional Requirements

The functional requirements are described in detail in the following subsections. Additionally, these requirements are derived verbatim from Part 2 of the *Common Criteria for Information Technology Security Evaluation* with the exception of completed operations.

6.1.1 Security Audit (FAU)

6.1.1.1 FAU_GEN.1 Audit Data Generation

FAU_GEN.1.1 The TSF shall be able to generate an audit record of the following auditable events:

- a) Start-up and shutdown of the audit functions;
- b) All auditable events for the not specified level of audit; and
- c) **All Auditable Events as each is defined for its Audit Level (if one is specified) for the Relevant SFR in Table 16; the additional auditable events specified in Table 16.**

FAU_GEN.1.2 The TSF shall record within each audit record at least the following information:

- a) Date and time of the event, type of event, subject identity, and the outcome (success or failure) of the event; and
- b) For each audit event type, based on the auditable event definitions of the functional components included in the PP/ST, **for each Relevant SFR listed in Table 16: (1) information as defined by its Audit Level (if one is specified), and (2) all Additional Information (if any is required; the internal event number, ISO 8601 time of the event occurrence, severity, and process.**

Table 16 - Audit data requirements

Auditable event	Relevant SFR	Audit level	Additional Information
SECURE AUDIT TURNED ON/OFF	FAU_GEN.1	n/a	Setting (ON or OFF)

Auditable event	Relevant SFR	Audit level	Additional Information
Job Started (Network print job with PJI SET USERNAME statement)	FDP_ACF.1	Not specified	Userid specified in the PJI SET USERNAME statement, Job identifier
Job Started (Network print job without PJI SET USERNAME statement)	FDP_ACF.1	Not specified	Userid displayed as “Unknown”, Job identifier
Job Completed	FDP_ACF.1	Not specified	Job identifier
Job Canceled (By user or via release expiration period)	FDP_ACF.1	Not specified	Job identifier
Authentication Failure	FIA_UAU.1, FIA_UID.1	Basic	Login mechanism, attempted user identity
Successful Authentication	FIA_UAU.1, FIA_UID.1	Basic	Login mechanism
Setting change	FMT_MTD.1	Basic	Parameter identifier and old and new values
Use of the management functions	FMT_SMF.1	Minimum	None
Modifications to the group of users that are part of a role	FMT_SMR.1	Minimum	None
Time changed	FPT_STM.1	Minimum	None
User logged out due to timeout	FTA_SSL.3	Minimum	None
Failure of the trusted channel	FTP_ITC.1	Minimum	None

Application Note: The audit for “Use of the management functions” is addressed by the “Setting change” audits. It is included in the audit table above for conformance with the P2600 PP.

Application Note: The audit for “Modifications to the group of users that are part of a role” is addressed by the “Setting change” audits. It is included in the audit table above for conformance with the P2600 PP.

6.1.1.2 FAU_GEN.2 User Identity Association

FAU_GEN.2.1 For audit events resulting from actions of identified users, the TSF shall be able to associate each auditable event with the identity of the user that caused the event.

6.1.2 Cryptographic Support (FCS)

6.1.2.1 FCS_CKM.1 Cryptographic Key Generation

FCS_CKM.1.1 The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm *RSA key generation* and specified cryptographic key sizes *2048 bits* that meet the following: *SP 800-56B*.

Application Note: The asymmetric keys are used in the self-signed X.509 cert that can be used for IKE/IPsec exchanges. The keys used to protect IPsec ESP traffic are determined using DH key agreement during SA establishment.

6.1.2.2 FCS_CKM.4 Cryptographic Key Destruction

FCS_CKM.4.1 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method *zeroization* that meets the following: *FIPS 140-2*.

6.1.2.3 FCS_COP.1 Cryptographic Operation

FCS_COP.1.1 The TSF shall perform *the operations listed in the table below* in accordance with a specified cryptographic algorithm *multiple algorithms described below* and cryptographic key sizes *as described below* that meet the following: *multiple standards as described below*.

Table 17 - Cryptographic Operations

Algorithm	Operations	Key/Hash Size in Bits	Standards
AES (CBC mode) (CAVP cert. 5891/5931 (G2-32bit) and 5894/5934 (Gem-64bit) and 5892/5932 (Gem-32bit))	Encryption, decryption	128, 256	FIPS 197 SP800-38A ISO/IEC 18033-3 ISO/IEC 10116
SHA (CAVP cert. 4642/4686 (G2-32bit) and 4645/4689 (Gem-64bit) and 4643/4687 (Gem-32bit))	Hashing	160, 256, 384	FIPS 180-4
HMAC (CAVP cert. 3866/3909 (G2-32bit) and 3869/3912 (Gem-64bit) and 3867/3910 (Gem-32bit))	Secure hash	160, 256, 384	FIPS 198-1 FIPS 180-4
RSA (CAVP cert. 3112 (G2-32bit) and 3115 (Gem-64bit) and 3113 (Gem-32bit))	Digital signatures	2048	FIPS 186-4
Diffie-Hellman (CAVP cert. 2159 (G2-32bit) and 2165 (Gem-64bit) and 2161 (Gem-32bit))	IKE KDF	Group 14 (2048), Group 24 (2048 w/ 256-bit POS)	SP800-135
DRBG (CTR_DRBG (AES)) (CAVP cert. 2484 (G2-32bit) and 2487 (Gem-64bit) and 2485 (Gem-32bit))	Random number generation	256	SP 800-90A

Application Note: IKE/IPsec use all of the above algorithms. IKE exchanges using the X.509 cert or PSK determine the key/hash sizes and key (via DH) used for IPsec ESP protection of the traffic.

6.1.3 User Data Protection (FDP)

6.1.3.1 FDP_ACC.1 Subset Access Control

FDP_ACC.1.1(A) The TSF shall enforce the *Common Access Control SFP* on

1. *Subjects: Users (U.USER)*
2. *Objects: Network Print Job*
3. *Operations: Create, View, Modify, Release, Delete*

Application Note: "Release" refers to releasing held jobs to be printed (at which time they can be read). "View" refers the ability to see that the job exists (D.FUNC), not to view the user data inside the job. No functionality exists to view the user data inside a job other than printing the document. "Modify" refers to the ability to change job parameters (e.g. number of copies).

FDP_ACC.1.1(B) The TSF shall enforce the *TOE Function Access Control SFP* on

1. *Subjects: Users (U.USER)*
2. *Objects: TOE Functions - F.PRT, F.SMI*
3. *Operations: Invoke*

6.1.3.2 FDP_ACF.1 Security Attribute Based Access Control

FDP_ACF.1.1(A) The TSF shall enforce the *Common Access Control SFP* to objects based on the following:

1. *Subjects: Users (U.USER) – Username, Group memberships*
2. *Objects: Network Print Job - owner*

FDP_ACF.1.2(A) The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: *the rules specified in the following table.*

Table 18 - Common Access Control SFP Rules

Operation Object	Create	View	Modify	Release	Delete
Network Print Job	Allowed if the submitted job includes a userid in a SET USERNAME PJL statement and the user is permitted to access the Held Jobs Access function. Note that all incoming network print jobs are held in the evaluated configuration. The job owner is the userid specified in the PJL SET USERNAME statement.	Allowed for jobs owned by the user if the user is permitted to access the Held Jobs Access function	n/a	Allowed for jobs owned by the user if the user is permitted to access the Held Jobs Access function	Allowed for jobs owned by the user if the user is permitted to access the Held Jobs Access function

FDP_ACF.1.3(A) The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: *no rules that explicitly authorise access.*

FDP_ACF.1.4(A) The TSF shall explicitly deny access of subjects to objects based on the following rules: *no rules that explicitly deny access.*

FDP_ACF.1.1(B) The TSF shall enforce the *TOE Function Access Control SFP* to objects based on the following:

1. *Subjects: Users (U.USER) – Group memberships*
2. *Objects: TOE Functions (F.PRT, F.SMI) - None*

FDP_ACF.1.2(B) The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: **the user is explicitly authorized by U.ADMINISTRATOR to use a function.**

FDP_ACF.1.3(B) The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: *no rules that explicitly authorise access.*

FDP_ACF.1.4(B) The TSF shall explicitly deny access of subjects to objects based on the following rules: *if a listed access control is “Disabled” access is denied.*

6.1.3.3 FDP_RIP.1 Subset Residual Information Protection

FDP_RIP.1.1 The TSF shall ensure that any previous information content of a resource is made unavailable upon the deallocation of the resource from the following objects: **D.DOC.**

6.1.4 Identification and Authentication (FIA)

6.1.4.1 FIA_AFL.1 Authentication Failure Handling

FIA_AFL.1.1 The TSF shall detect when an administrator configurable positive integer within the range of 1 to 10 unsuccessful authentication attempts occur related to *accounts within the administratively configured failure time frame.*

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been met, the TSF shall *disable the account for the administratively configured lockout time.*

6.1.4.2 FIA_ATD.1 User Attribute Definition

FIA_ATD.1.1 The TSF shall maintain the following list of security attributes belonging to individual users:

1. *Username*
2. *Password*
3. *Associated groups*
4. *User permissions, as specified by associated groups*
5. *Number of consecutive authentication failures*
6. *Time of the earliest authentication failure (since the last successful login if any have occurred)*
7. *Account lock status*

6.1.4.3 FIA_UAU.1 Timing of Authentication

FIA_UAU.1.1 The TSF shall allow *submission of network print jobs and usage of the touch panel and browser sessions to view SFP status* on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2 The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

Application Note: The TOE only performs the authentication for users using Username/Password Accounts. When I&A uses LDAP+GSSAPI or Smart Card, authentication is under the control of the LDAP server (and the Smart Card) in the operational environment. For all mechanisms, the TOE restricts access to other functionality until authentication is successful.

6.1.4.4 FIA_UAU.7 Protected Authentication Feedback

FIA_UAU.7.1 The TSF shall provide only *asterisks (“*”) or dots (“•”)* to the user while the authentication is in progress.

6.1.4.5 FIA_UID.1 Timing of Identification

FIA_UID.1.1 The TSF shall allow *usage of the touch panel and browser sessions to view SFP status* on behalf of the user to be performed before the user is identified.

FIA_UID.1.2 The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

Application Note: The TOE only performs the identification for users using Username/Password Accounts. When I&A uses LDAP+GSSAPI or Smart Card, identification is under the control of the LDAP server (and the Smart Card) in the operational environment. For all mechanisms, the TOE restricts access to other functionality until identification is successful.

6.1.4.6 FIA_USB.1 User-Subject Binding

FIA_USB.1.1 The TSF shall associate the following user security attributes with subjects acting on behalf of that user:

1. *Username*
2. *Password*
3. *Associated groups (for Username/Password Accounts only)*
4. *User permissions*

FIA_USB.1.2 The TSF shall enforce the following rules on the initial association of user security attributes with subjects acting on the behalf of users:

1. *The username and password are the values supplied by the user.*
2. *The associated groups are the values configured for the user account.*
3. *User permissions are determined by combining the configured permissions for each associated group.*

FIA_USB.1.3 The TSF shall enforce the following rules governing changes to the user security attributes associated with subjects acting on the behalf of users: *the security attributes do not change during a session.*

6.1.5 Security Management (FMT)

6.1.5.1 FMT_MSA.1 Management of Security Attributes

FMT_MSA.1.1 The TSF shall enforce the *Common Access Control SFP and TOE Function Access Control SFP* to restrict the ability to query, modify, delete, create the security attributes *Username, associated groups and user permissions to administrators authorized for access to the Security Menu.*

6.1.5.2 FMT_MSA.3 Static Attribute Initialisation

FMT_MSA.3.1 The TSF shall enforce the *Common Access Control SFP and TOE Function Access Control SFP* to provide restrictive default values for security attributes that are used to enforce the SFP.

FMT_MSA.3.2 The TSF shall allow the *no role* to specify alternative initial values to override the default values when an object or information is created.

6.1.5.3 FMT_MTD.1 Management of TSF Data

FMT_MTD.1.1 The TSF shall restrict the ability to *query, modify, delete, create* the *data identified in the following table* to **the authorized identified roles except U.NORMAL**.

Application Note: The user permission for each TSF data item to determine “authorized identified roles” is identified in the following table.

Table 19 - TSF Data

Item	Authorization Menu Item	Operations
Active Directory Configuration	Security Menu	Create
Date and Time Parameters	Device Menu	Query, Modify
Enable Audit	Security Menu	Query, Modify
Enable HTTP Server	Network/Ports Menu	Query, Modify
Enable Remote Syslog	Security Menu	Query, Modify
Groups	Security Menu	Query, Modify, Delete, Create
Held Print Job Expiration Timer	Security Menu	Query, Modify
IPSec Settings	Network/Ports Menu	Query, Modify
Job Waiting	Device Menu	Query, Modify
Kerberos Setup	Security Menu	Query, Modify
LDAP Certificate Verification	Security Menu	Query, Modify
LDAP+GSSAPI – SFP Credentials	Security Menu	Query, Modify
LDAP+GSSAPI Configuration	Security Menu	Query, Modify, Delete, Create
Login Restrictions	Security Menu	Query, Modify
Network Port	Network/Ports Menu	Query, Modify
Permissions	Security Menu	Query, Modify
Remote Syslog Parameters	Security Menu	Query, Modify
Security Reset Jumper	Security Menu	Query, Modify
Smart Card Authentication Client Configuration	Security Menu	Query, Modify
USB Buffer	Network/Ports Menu	Query, Modify
Username/Password Accounts	Security Menu	Query, Modify, Delete, Create

Item	Authorization Menu Item	Operations
Visible Home Screen Icons	Device Menu	Query, Modify

6.1.5.4 FMT_SMF.1 Specification of Management Functions

FMT_SMF.1.1 The TSF shall be capable of performing the following management functions:

1. *User management*
2. *Access control management*
3. *Time management*

6.1.5.5 FMT_SMR.1 Security Roles

FMT_SMR.1.1 The TSF shall maintain the roles *defined by the security-relevant permissions in the following table that can be configured in an operational TOE for users via group memberships.*

Table 20 - FMT_SMR.1 Detail

Item	Description	Administrators Only?
Device Menu	Controls access to the Device Menu	Yes
Function Configuration Menus	Controls access to the Print menu	Yes
Network/Ports Menu	Controls access to the Network/ Ports Menu	Yes
Reports Menu	Controls access to the Reports Menu via the Administration Menus. This includes information about user jobs, which can't be disclosed to non-administrators.	Yes
Held Jobs Access	In the evaluated configuration, controls which users are permitted to access the Held Jobs menu.	No
Security Menu	Controls access to the Security Menu	Yes

Application Note: If any permission identified as “Administrators Only” in the table above is associated with a user account, then that user account is implicitly an Administrator (U.ADMINISTRATOR). If no permission identified as “Administrators Only” in the table above is associated with a user account but any permission not identified as “Administrator Only” is, then that user account is implicitly a Normal User (U.NORMAL). The role “Guest” applies to a defined user that has no permissions identified in the table above.

FMT_SMR.1.2 The TSF shall be able to associate users with roles, **except for the role “Nobody” to which no user shall be associated.**

Refinement Rationale: The SFR is reproduced with the refinement included in the P2600 Protection Profile. In this TOE, the Guest user corresponds to the role Nobody. Since the evaluated configuration requires that no permissions are allocated to the Guest account, users must login before gaining access to any TSF data or functions.

6.1.6 Protection of the TSF (FPT)

6.1.6.1 FPT_STM.1 Reliable Time Stamps

FPT_STM.1.1 The TSF shall be able to provide reliable time-stamps.

Application Note: This SFR only applies when the TOE is configured to use internal timestamps. If the TOE is configured to obtain timestamps from an external NTP server, this functionality is provided by that external NTP server in the operational environment.

6.1.6.2 FPT_TST.1 TSF Testing

FPT_TST.1.1 The TSF shall run a suite of self tests during initial start-up to demonstrate the correct operation of the cryptographic components of the TSF.

FPT_TST.1.2 The TSF shall provide authorised users with the capability to verify the integrity of the configuration data.

FPT_TST.1.3 The TSF shall provide authorised users with the capability to verify the integrity of **stored TSF executable code**.

6.1.7 TOE Access (FTA)

6.1.7.1 FTA_SSL.3 TSF-Initiated Termination

FTA_SSL.3.1 The TSF shall terminate an interactive session after a *period of time configured by an authorized administrator for touch panel and web browser sessions*.

6.1.8 Trusted Path/Channels (FTP)

6.1.8.1 FTP_ITC.1 Inter-TSF Trusted Channel

FTP_ITC.1.1 The TSF shall provide a communication channel between itself and another trusted IT product that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.

FTP_ITC.1.2 The TSF shall permit **the TSF, another trusted IT product** to initiate communication via the trusted channel.

FTP_ITC.1.3 The TSF shall initiate communication via the trusted channel for **communication of D.DOC, D.FUNC, D.PROT, and D.CONF over any Shared-medium Interface**.

Application Note: For this TOE, the network interface is the only shared-medium interface. The TSF requires all IP datagrams entering or leaving the box to use IPSec with ESP (other than the ISAKMP/IKE datagrams used to set up the security associations). If an incoming IP datagram does not satisfy this rule, the TSF attempts to establish a security association with the remote IT system that originated the datagram.

6.2 TOE Security Assurance Requirements

The TOE meets the assurance requirements for EAL3 augmented by ALC_FLR.3. These requirements are summarized in the following table.

Table 21 - EAL3+ Assurance Requirements

Assurance Class	Component ID	Component Title
Development	ADV_ARC.1	Security architecture description
	ADV_FSP.3	Functional specification with complete summary
	ADV_TDS.2	Architectural design
Guidance Documents	AGD_OPE.1	Operational user guidance
	AGD_PRE.1	Preparative procedures
Life-Cycle Support	ALC_CMC.3	Authorisation controls

Assurance Class	Component ID	Component Title
	ALC_CMS.3	Implementation representation CM coverage
	ALC_DEL.1	Delivery procedures
	ALC_DVS.1	Identification of security measures
	ALC_FLR.3	Systematic flaw remediation
	ALC_LCD.1	Developer defined life-cycle model
Tests	ATE_COV.2	Analysis of coverage
	ATE_DPT.1	Testing: basic design
	ATE_FUN.1	Functional testing
	ATE_IND.2	Independent testing - sample
Vulnerability Assessment	AVA_VAN.2	Vulnerability analysis

6.3 CC Component Hierarchies and Dependencies

This section of the ST demonstrates that the identified SFRs include the appropriate hierarchy and dependencies. The following table lists the TOE SFRs and the SFRs each are hierarchical to, dependent upon and any necessary rationale.

Table 22 - TOE SFR Dependency Rationale

SFR	Hierarchical To	Dependency	Rationale
FAU_GEN.1	No other components.	FPT_STM.1	Satisfied
FAU_GEN.2	No other components.	FAU_GEN.1, FIA_UID.1	Satisfied Satisfied
FCS_CKM.1	No other components.	[FCS_CKM.2 or FCS_COP.1], FCS_CKM.4	Satisfied Satisfied
FCS_CKM.4	No other components.	[FDP_ITC.1 or FDP_ITC.2, or FCS_CKM.1]	Satisfied
FCS_COP.1	No other components.	[FDP_ITC.1 or FDP_ITC.2, or FCS_CKM.1], FCS_CKM.4	Satisfied Satisfied
FDP_ACC.1	No other components.	FDP_ACF.1	Satisfied
FDP_ACF.1	No other components.	FDP_ACC.1, FMT_MSA.3	Satisfied Satisfied
FDP_RIP.1	No other components.	None	n/a
FIA_AFL.1	No other components.	FIA_UAU.1	Satisfied
FIA_ATD.1	No other components.	None	n/a
FIA_UAU.1	No other components.	FIA_UID.1	Satisfied
FIA_UAU.7	No other components.	FIA_UAU.1	Satisfied
FIA_UID.1	No other components.	None	n/a
FIA_USB.1	No other components.	FIA_ATD.1	Satisfied
FMT_MSA.1	No other components.	[FDP_ACC.1 or FDP_IFC.1], FMT_SMF.1 FMT_SMR.1	Satisfied Satisfied Satisfied

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SFR	Hierarchical To	Dependency	Rationale
FMT_MSA.3	No other components.	FMT_MSA.1, FMT_SMR.1	Satisfied Satisfied
FMT_MTD.1	No other components.	FMT_SMF.1, FMT_SMR.1	Satisfied Satisfied
FMT_SMF.1	No other components.	None	n/a
FMT_SMR.1	No other components.	FIA_UID.1	Satisfied
FPT_STM.1	No other components.	None	n/a
FPT_TST.1	No other components.	None	n/a
FTA_SSL.3	No other components.	None	n/a
FTP_ITC.1	No other components.	None	n/a

7. TOE Summary Specification

7.1 Security Functions

7.1.1 Audit Generation

The TOE generates audit event records for security-relevant events. A severity level is associated with each type of auditable event; only events at or below the severity level configured by an administrator are generated.

Each record format follows the syslog format defined in the Berkeley Software Distribution (BSD) Syslog Protocol (RFC 3164). The TOE supplies the PRI, HEADER, MSG/TAG, and MSG/CONTENT fields for all messages. The CONTENT portion may contain the following fields (in order, separated by commas):

- Event Number
- ISO 8601 time ([YYYY-MM-DD]T[hh:mm:ss])
- Severity
- Process (same as TAG)
- Remote IPv4 address
- Remote IPv6 address
- Remote Hostname
- Remote Port
- Local Port
- Authentication/Authorization method
- Username
- Setting ID
- Setting's old and new values
- Event name
- Event data

The time field is supplied by the TOE if internal time is configured by an administrator or by an NTP server if external time is configured.

Fields in the CONTENT section that are not relevant for specific events are blank. The remote IPv4 address, remote IPv6 address, remote hostname, remote port, and local port fields are always blank for events resulting from actions at the SFP (e.g. usage of the touch panel). The events that cause audit records to be generated are specified in section 6.1.1.1 .

As audit event records are generated, they are forwarded to the remote syslog IT system configured by an administrator.

7.1.2 Identification and Authentication

Users are required to successfully complete the I&A process before they are permitted to access any restricted data or functionality. The set of restricted user functionality is under the control of the administrators, with the exception of submission of network print jobs which is always allowed.

A new session is established for the touch panel when the system boots and for web sessions when the connection is established. All sessions are initially bound to the Guest (default) user. In the evaluated configuration, the Guest user has no access to restricted functions or data.

Users must log in as a different user in order to gain access to TOE functionality. Multiple login mechanisms are supported in the evaluated configuration: Smart Card authentication, Username/Password Accounts and LDAP+GSSAPI.

For Smart Card authentication, no functions at the touch panel are allowed until I&A successfully completes. The touch panel displays a message directing the user to insert a card into the attached reader. Once a card is inserted, the user is prompted for a PIN. When the PIN is entered, only asterisks (“*”) or dots (“•”) are displayed. Once the PIN is collected (indicated by the user touching the Next button), the TOE passes the PIN to the card for validation. If it is not valid, a message is displayed on the touch panel and the user is asked to re-enter the PIN. After the card-configured number of consecutive invalid PINs, the card will lock itself until unlocked by a card administrator.

Upon successful card validation, the TOE forwards the certificate from the card to the configured Kerberos Key Distribution Center (Windows Domain Controller) for validation. If the certificate validation is not successful, an error message is displayed on the touch panel until the current card is removed from the reader. If the certificate validation is successful, the TOE binds the username, account name, and email address (all obtained from the LDAP server to the user session for future use. The group memberships for the user are also retrieved from the LDAP server and, for each group that matches a configured group in the TOE, the permissions for the group are merged to determine the overall permissions for the user session. An audit record for the successful authentication is generated.

For Username/Password Accounts and LDAP+GSSAPI, the TOE collects a username and password via the touch panel or via the browser session. When the password is entered, only asterisks (“*”) are displayed. Once the username and password are collected, the next step in the process depends on the I&A mechanism being used.

For Username/Password Accounts, the TOE performs the validation of the username and password against the set of configured Username/Password Accounts. If the validation fails because of an invalid password (for a valid username), the count of failed authentication attempts is incremented for that account. If the threshold for failed attempts within a time period is reached, then the account is marked as being locked for the configured amount of time to mitigate against brute force password attacks. This information is tracked in memory and is not maintained across a restart of the TOE.

For LDAP+GSSAPI, the TOE forwards the username and password to the configured LDAP server for validation (using the configured machine credentials) and waits for the response. If no response is received, the validation is considered to have failed.

In the case of failed validations, an error message is displayed via the touch panel or browser session, and then the display returns to the previous screen for further user action. An audit record for the failed authentication attempt is generated.

If validation is successful, the TOE binds the username, password, account name, and email address to the user session for future use. An audit record for the successful authentication is generated.

Permissions for the user session are determined from group memberships. For Username/Password accounts, the permissions for each group that the user is a member of (as specified in the account configuration) are combined. For Smart Cards and LDAP+GSSAPI, a list of group memberships are retrieved from the LDAP server. For each of those groups that match a group configured in the TOE, the permissions are combined.

The user session is considered to be active until the user explicitly logs off, removes the card or the administrator-configured inactivity timer for sessions expires. If the inactivity timer expires, an audit record is generated.

7.1.2.1 Active Directory

If Active Directory parameters are supplied and Join is selected, the parameter values are used to join the Active Directory Domain. If successful, machine credentials are generated and the LDAP+GSSAPI configuration parameters are automatically updated with the Domain and machine information.

Once the Domain has been joined, subsequent I&A attempts may use the LDAP+GSSAPI configuration to validate user credentials using the newly-created machine credentials as described above. The credentials specified for Active Directory by an authorized administrator are not saved.

7.1.3 Access Control

Access control validates the user access request against the user’s permissions configured by administrators. Users of the TOE, whether accessing the TOE via the touch panel or web interface, are considered to be in one or more of the following categories:

- Authorized Users – permitted to perform one or more of the SFP user functions defined in section 1.6.2.3
- Authorized Administrators – permitted to access administrative functionality for control and monitoring of the SFP operation
- Any Users – the Guest account as well as Authorized Users and Authorized Administrators

Permissions may be configured for the following items:

Table 23 - Access Control Items

Item	Description	Comment
Apps Configuration	Controls access to the configuration of any installed applications	Permission may only be granted to authorized administrators in the evaluated configuration.

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Item	Description	Comment
B/W Print	Controls the ability to print black and white jobs.	Permission may only be granted to authorized users in the evaluated configuration
Cancel Jobs at the device	Controls access to the functionality to cancel jobs via the touch panel.	Permission may only be granted to authorized users in the evaluated configuration
Change Language from Home Screen	Controls access to the Change Language button on the Home screen (when displayed); this button is NOT displayed by default but a user can activate it via the “General Settings Menu”	Permission may be granted to any users, including Guest
Color Dropout	Controls a user’s ability to activate the Color Dropout functionality as part of a job; if protected and the user fails to authenticate, then the device DOES NOT use the color dropout functionality in the job	Permission may only be granted to authorized users in the evaluated configuration
Color Print	Controls the ability to print color jobs.	Permission may only be granted to authorized users in the evaluated configuration
Device Menu	Controls access to the Device administrative menu	Permission may only be granted to authorized administrators in the evaluated configuration
Firmware Updates	Controls a user’s ability to update the device’s firmware code via the network	Permission may only be granted to authorized administrators in the evaluated configuration
Flash Drive Color Printing	Controls whether USB interfaces may be used for color print operations	Permission must not be specified for any user
Flash Drive Print	Controls whether USB interfaces may be used for black and white print operations	Permission must not be specified for any user
Flash Drive Scan	Controls whether USB interfaces may be used for scan operations	Permission must not be specified for any user
Function Configuration Menus	Controls access to the configuration menus for the print function.	Permission may only be granted to authorized administrators in the evaluated configuration
Held Jobs Access	Controls access to the Held jobs menu if the “Secure Held Print Jobs” eSF application is not installed	Permission may only be granted to authorized users in the evaluated configuration
Import/Export Settings	Controls the ability to import and export configuration files	Permission may only be granted to authorized administrators in the evaluated configuration
Internet Printing Protocol (IPP)	Controls access to print job submission via IPP	Permission must not be specified for any user
Manage Bookmarks	Controls access to the Delete Bookmark, Create Bookmark, and Create Folder buttons from both the bookmark list screen and from the individual bookmark screen	Permission must not be specified for any user
Manage Shortcuts	Controls access to the Manage Shortcuts Menu	Permission must not be specified for any user
Network/Ports Menu	Controls access to the Network/ Ports Menu	Permission may only be granted to authorized administrators in the evaluated configuration

Item	Description	Comment
New Apps	Controls access to configuration parameters for apps subsequently added to the device.	Permission may only be granted to authorized administrators in the evaluated configuration
Option Card Menu	Controls a user’s ability to access the “Option Card Menu” that displays menu nodes associated with installed DLEs	Permission may only be granted to authorized administrators in the evaluated configuration
Out of Service Erase	Controls the ability to wipe information in the SFP when it is being taken out of service.	Permission may only be granted to authorized administrators in the evaluated configuration
Paper Menu	Controls access to the Paper Menu	Permission may be granted to any users, including Guest
Remote Management	Controls whether or not management functions may be invoked from remote IT systems	Permission must not be specified for any user
Reports Menu	Controls access to the Reports Menu. This includes information about user jobs, which can’t be disclosed to non-administrators.	Permission may only be granted to authorized administrators in the evaluated configuration
Security Menus	Controls access to the Security Menu	Permission may only be granted to authorized administrators in the evaluated configuration
Supplies Menus	Controls access to the Security Menu	Permission may only be granted to authorized administrators in the evaluated configuration

Authorization is restricted by not associating a permission with a group.

When the permission is a menu, access is also restricted to all submenus (a menu that is normally reached by navigating through the listed item). This is necessary for instances where a shortcut could bypass the listed menu. If a shortcut is used to access a sub-menu, the access control check for the applicable menu item is still performed (as if normal menu traversal was being performed).

When a function is restricted, the access control function determines if the user has permission to access the function. Normally the icons for the functions the user is not permitted to access are not displayed in the GUI.

The following table summarizes the access controls and configuration parameters used by the TOE to control user access to the SFP functions provided by the TOE. Additional details for each function are provided in subsequent sections.

Table 24 - TOE Function Access Control SFP Rules

Object	Access Control Rules	Configuration Parameter Rules
F.PRT	Network print jobs can always be submitted. The job is held until released by a user who is authorized for the Held Jobs Access function and has the same userid as was specified in the SET USERNAME PJL statement. Network print jobs without a PJL SET USERNAME statement are	Allowed

Object	Access Control Rules	Configuration Parameter Rules
	automatically deleted after the expiry period for held jobs.	
F.SMI	Print jobs received via the network interface may not be transmitted back out the network interface. Input via the touch panel is not transmitted out the network interface (other than audit records transmitted to the configured Syslog server).	n/a

7.1.3.1 Printing

Submission of print jobs from users on the network is always permitted. Jobs that do not contain a PJI SET USERNAME statement are discarded after the configured held jobs expiry period. Submitted jobs are always held on the TOE until released or deleted by a user authorized for the appropriate access control and whose userid matches the username specified when the job was submitted. Users are able to display the queue of their pending print jobs. If a held job is not released within the configured expiration time, the job is automatically deleted.

7.1.3.2 Postscript Access Control

In the evaluated configuration, the setdevparams, setsysparams and setuserparams Postscript operators are made non-operational so that the Postscript DataStream can not modify configuration settings in the TOE.

7.1.4 Management

The TOE provides the ability for authorized administrators to manage TSF data from remote IT systems via a browser session or locally via the touch panel. Authorization is granular, enabling different administrators to be granted access to different TSF data. When an administrator modifies TSF data, an audit record is generated.

7.1.5 D.DOC Wiping

The TOE overwrites RAM with a fixed pattern upon deallocation of any buffer used to hold user data.

7.1.6 Secure Communications

During TOE installation, a 2048-bit self-signed certificate for the device is generated in accordance with NIST SP 800-56B (“Recommendation for Pair-Wise Key Establishment Schemes Using Integer Factorization Cryptography” for RSA- based key establishment schemes). An RBG function conforming to NIST SP 800-90A using CTR_DRBG(AES) is used to generate the asymmetric key pair. Entropy is provided by the Secure Element that is part of the operational environment.

IPSec with ESP is required for all network datagram exchanges with remote IT systems. IPSec provide confidentiality, integrity and authentication of the endpoints. Supported encryption options for ESP are AES-CBC-128 and AES-CBC-256. SHA-1, SHA-256 and SHA-384 are supported for HMACs.

ISAKMP and IKE v1 or v2 are used to establish the Security Association (SA) and session keys for the IPsec exchanges. Diffie-Hellman is used for IKE Key Derivation Function as specified in RFC2409, using Oakley Groups 14 or 24. This session key is stored in RAM. During the ISAKMP exchange, the TOE requires the remote IT system to provide a certificate and the RSA signature for it is validated, or text-based Pre-Shared Keys (PSKs) may be configured by administrators and validated between endpoints. PSKs configured in the system are conditioned using SHA-1, SHA-256 or SHA-384. The key size specified in the SA exchange may be 128 or 256 bits, the encryption algorithm is AES-CBC, and the Hash Authentication Algorithm is SHA-1, SHA-256 or SHA-384.

If an incoming IP datagram does not use IPsec with ESP, the datagram is discarded.

Since all incoming traffic must use IPsec, this mechanism also provides reliability for external time sources if they are configured to be used.

If external accounts are defined, LDAP+GSSAPI is used for the exchanges with the LDAP server. Kerberos v5 with AES encryption is supported for exchanges with the LDAP server.

All session keys are stored in dynamic RAM. The TOE zeroizes the session keys by overwriting once with zeros when the sessions are terminated.

7.1.7 Self Test

During initial start-up, the TOE performs self tests on the cryptographic components. The integrity of the configuration data is also verified. The integrity of the stored TSF executable code is verified by calculating a hash of the executable code and comparing it to a saved value.

If any problems are detected with the hardware or stored TSF executable code, an appropriate error message is posted on the touch screen and operation is suspended. If a problem is detected with the integrity of the configuration data, the data is reset to the factory default, an audit log record is generated, an appropriate error message is posted on the touch screen, and further operation is suspended. In this case, a system restart will result in the system being operational with the factory default settings for the data.

7.1.8 Deviations From Allowed Cryptographic Standards

The following deviations from the Allowed Cryptographic Standards in *188 Scheme Crypto Policy* are noted:

1. Hashing: SHA-1 is supported for backward compatibility with remote systems and for conditioning of PSKs.
2. HMAC: 160 bit keys with SHA-1 is supported for backward compatibility with remote systems.

7.1.9 Cryptographic Functionality Provided by the Operational Environment

The Secure Element incorporates an Infineon Smart Card IC M9900. The M9900 provides a True Random Number Generator (TRNG) used by the TOE for seeding of the random number generator in the TOE.

TOE firmware executing on the Main Processor Board of the SFP accesses a socket at "/var/run/egd-pool" to obtain entropy bits. When the available data in this pool drops below 64 bytes, the TOE sends the Random Number Generate (CMD ID = 0x0001) command to the Secure Element.

The command is processed by the Lexmark firmware executing on the Secure Element. When a Random Number Generate command is received, the firmware uses the Infineon function call IFX_ReadTrng to obtain more entropy data from the physical random number generator of the M9900. The entropy data is returned to the Main Processor Board by the Lexmark firmware and is then added to the data available from /var/run/egd-pool.

The average Shannon entropy per internal random bit of the TRNG exceeds 0.997.

8. Protection Profile Claims

This chapter provides detailed information in reference to the Protection Profile conformance identification that appears in Chapter 2.

8.1 TOE Type Consistency

Both the PP and the TOE describe Hard Copy Devices.

8.2 Security Problem Definition Consistency

This ST claims demonstrable conformance to the referenced PP.

All of the assumptions, threats, and organizational security policies of the PP are included in the ST. One additional assumption (A.IPSEC) is included in the ST, resulting in the ST being more restrictive than the PP.

8.3 Security Objectives Consistency

This ST claims demonstrable conformance to the referenced PP.

All of the security objectives for the TOE and the operational environment (IT and non-IT) of the PP are included in the ST. The following additional security objectives are included in the ST:

1. O.I&A
2. O.MANAGE
3. O.TIME_STAMP
4. OE.I&A
5. OE.IPSEC
6. OE.TIME_STAMP
7. OE.VIPER

Therefore, the ST is more restrictive than the PP.

8.4 Security Functional Requirements Consistency

This ST claims demonstrable conformance to the referenced PP.

All of the SFRs from the claimed SFR packages are included in the ST with any fully or partially completed operations from the PP. Any remaining operations have been completed. The following notes apply to conformance of the SFRs in the ST.

1. The auditable events listed in the table with FAU_GEN.1 have been enumerated to match the specific events generated by the TOE. All of the events required by the PP are represented along with additional events.
2. SFRs from the FCS class have been added to the ST to address cryptographic functionality for IPsec, which are additions to the security functionality required by the PP.
3. FDP_ACC.1(a) and FDP_ACF.1(a) have been integrated with the individual instances of FDP_ACC.1 and FDP_ACF.1 from the applicable SFR packages of the PP into a single

instance of FDP_ACC.1 and FDP_ACF.1 (still named Common Access Control SFP) that addresses all of the access control policies.

4. FIA_AFL.1 has been added to the ST to address to address authentication failure handling per application note 36 in the PP.
5. FIA_UAU.7 has been added to the ST to address to address protected authentication feedback per application note 36 in the PP.
6. FMT_MSA.1(a) and FMT_MSA.1(b) from the PP were combined into a single instance of FMT_MSA.1 since all the completed operations were identical.
7. FMT_MSA.3(a) and FMT_MSA.3(b) from the PP were combined into a single instance of FMT_MSA.3 since all the completed operations were identical.
8. FMT_MTD.1(a) and FMT_MTD.1(b) from the PP were combined into a single instance of FMT_MTD.1. Users (U.NORMAL) do not have any access to TSF data, and it was necessary to provide permission-level granularity of the administrator role for various TSF data access. Given these conditions, it was simpler to combine the instances of FMT_MTD.1 in the ST. In addition, Create was added as an operation in order to distinguish between creation and modification of entities.
9. For FMT_SMR.1, the TOE provides greater granularity of roles (based on individual permissions) than is required by the PP. The permission-based description has been provided in the ST, and an application note with the SFR defines the relationship between those permissions and the roles defined by the PP.
10. The instance of the FAU_GEN.1 in the SMI package has been integrated with the instance of FAU_GEN.1 in the common requirements.

8.5 Security Assurance Requirements Consistency

The ST assurance claims are identical to the assurance claims of the PP.

9. Rationale

This chapter provides the rationale for the selection of the IT security requirements, objectives, assumptions and threats. It shows that the IT security requirements are suitable to meet the security objectives, Security Requirements, and TOE security functional.

9.1 Rationale for IT Security Objectives

This section of the ST demonstrates that the identified security objectives are covering all aspects of the security needs. This includes showing that each threat, policy and assumption is addressed by a security objective.

The following table identifies for each threat, policy and assumption, the security objective(s) that address it.

Table 25 - Threats, Policies and Assumptions to Security Objectives Mapping

	O.AUDIT.LOGGED	O.CONF.NO_ALT	O.CONF.NO_DIS	O.DOC.NO_ALT	O.DOC.NO_DIS	O.FUNC.NO_ALT	O.INTERFACE.MANAGED	O.I&A	O.MANAGE	O.PROT.NO_ALT	O.SOFTWARE.VERIFIED	O.TIME_STAMP	O.USER.AUTHORIZED	OE.ADMIN.TRAINED	OE.ADMIN.TRUSTED	OE.AUDIT.REVIEWED	OE.AUDIT_ACCESS.AUTHORIZED	OE.AUDIT_STORAGE.PROTECTED	OE.I&A	OE.IPSEC	OE.INTERFACE.MANAGED	OE.PHYSICAL.MANAGED	OE.TIME_STAMP	OE.USER.AUTHORIZED	OE.USER.TRAINED	OE.VIPER
A.ACCESS.MANAGED																						X				
A.ADMIN.TRAINING														X												
A.ADMIN.TRUST															X											
A.IPSEC																				X						
A.USER.TRAINING																									X	
A.VIPER																										X
T.CONF.ALT		X						X					X						X					X		
T.CONF.DIS			X					X					X						X					X		
T.DOC.ALT				X				X					X						X					X		
T.DOC.DIS					X			X					X						X					X		
T.FUNC.ALT						X		X					X						X					X		
T.PROT.ALT								X		X			X						X					X		
P.AUDIT.LOGGING	X											X				X	X	X					X			
P.INTERFACE.MANAGEMENT							X														X					
P.SOFTWARE.VERIFICATION											X															
P.USER.AUTHORIZATION								X	X				X						X					X		

9.1.1 Rationale Showing Threats to Security Objectives

The following table describes the rationale for the threat to security objectives mapping.

Table 26 - Threats to Security Objectives Rationale

T.TYPE	Security Objectives Rationale
T.CONF.ALT	O.CONF.NO_ALT – The objective addresses the threat by requiring the TOE to protect against unauthorized alteration of TSF Confidential Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.
T.CONF.DIS	O.CONF.NO_DIS - The objective addresses the threat by requiring the TOE to protect against unauthorized disclosure of TSF Confidential Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.
T.DOC.ALT	O.DOC.NO_ALT - The objective addresses the threat by requiring the TOE to protect against unauthorized alteration of User Document Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.
T.DOC.DIS	O.DOC.NO_DIS - The objective addresses the threat by requiring the TOE to protect against unauthorized disclosure of User Document Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.
T.FUNC.ALT	O.FUNC.NO_ALT - The objective addresses the threat by requiring the TOE to protect against unauthorized alteration of User Function Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.
T.PROT.ALT	O.PROT.NO_ALT - The objective addresses the threat by requiring the TOE to protect against unauthorized alteration of TSF Protected Data. O.I&A and OE.I&A – The objectives help address the threat by requiring I&A mechanisms so that appropriate authorizations may be associated with users. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the threat by requiring authorizations to be specified for users.

9.1.2 Rationale Showing Policies to Security Objectives

The following table describes the rationale for the policy to security objectives mapping.

Table 27 - Policies to Security Objectives Rationale

P.TYPE	Security Objectives Rationale
P.AUDIT.LOGGING	O.AUDIT.LOGGED – The objective addresses the first part of the policy by requiring the TOE to generate audit records for TOE usage and security-relevant events, and to protect these records while they are inside the TSC. O.TIME_STAMP – The objective supports the policy by requiring the TOE to provide time stamps for the audit records when time is being tracked internally. OE.AUDIT.REVIEWED – The objective addresses the audit review portion of the policy by requiring timely review of the generated audit records. OE.AUDIT_ACCESS.AUTHORIZED – The objective supports the policy by requiring the operational environment to make the audit records available to authorized personnel only. OE.AUDIT_STORAGE.PROTECTED - The objective supports the policy by requiring the operational environment to protect the stored audit records from unauthorized access. OE.TIME_STAMP - The objective supports the policy by requiring the TOE to provide time stamps for the audit records when time is being supplied externally.
P.INTERFACE.MANAGEMENT	O.INTERFACE.MANAGED – The objective addresses the policy by requiring the TOE to enforce access to and usage of the TOE interfaces within the TSC. OE.INTERFACE.MANAGED – The objective addresses the policy by requiring the operational environment to control access to the TOE interfaces within the operational environment.
P.SOFTWARE.VERIFICATION	O.SOFTWARE.VERIFIED – The objective restates the policy.
P.USER.AUTHORIZATION	O.I&A and OE.I&A – The objectives help address the policy by requiring I&A mechanisms so that user authorizations may be restricted for users. O.MANAGE – The objective addresses the policy by requiring the TOE to provide management functions to administrators for configuration of user authorizations. O.USER.AUTHORIZED and OE.USER.AUTHORIZED – The objectives help address the policy by requiring authorizations to be specified for users.

9.1.3 Rationale Showing Assumptions to Environment Security Objectives

The following table describes the rationale for the assumption to security objectives mapping.

Table 28 - Assumptions to Security Objectives Rationale

A.TYPE	Security Objectives Rationale
A.ACCESS.MANAGED	OE.PHYSICAL.MANAGED – The objective addresses the assumption by requiring the TOE to be located in an area that restricts physical access.
A.ADMIN.TRAINING	OE.ADMIN.TRAINED – The objective restates the assumption.
A.ADMIN.TRUST	OE.ADMIN.TRUSTED – The objective addresses the assumption by requiring trust to be established in the administrators.
A.IPSEC	OE.IPSEC – All network systems with which the TOE communicates are required to support IPsec with ESP.
A.USER.TRAINING	OE.USER.TRAINED – The objective restates the assumption.
A.VIPER	OE.VIPER – The objective restates the assumption.

9.2 Security Requirements Rationale

9.2.1 Rationale for Security Functional Requirements of the TOE Objectives

This section provides rationale for the Security Functional Requirements demonstrating that the SFRs are suitable to address the security objectives.

The following table identifies for each TOE security objective, the SFR(s) that address it.

Table 29 - SFRs to Security Objectives Mapping

	O.AUDIT.LOGGED	O.CONF.NO_ALT	O.CONF.NO_DIS	O.DOC.NO_ALT	O.DOC.NO_DIS	O.FUNC.NO_ALT	O.INTERFACE.MANAGED	O.I&A	O.MANAGE	O.PROT.NO_ALT	O.SOFTWARE.VERIFIED	O.TIME_STAMP	O.USER.AUTHORIZED
FAU_GEN.1	X												
FAU_GEN.2	X												
FCS_CKM.1		X	X	X	X	X				X			
FCS_CKM.4		X	X	X	X	X				X			
FCS_COP.1		X	X	X	X	X				X			
FDP_ACC.1(A)				X	X	X							X
FDP_ACC.1(B)				X	X								X
FDP_ACF.1(A)				X	X	X							X
FDP_ACF.1(B)				X	X								X
FDP_RIP.1					X								
FIA_AFL.1								X					
FIA_ATD.1								X					X
FIA_UAU.1							X	X					X
FIA_UAU.7								X					
FIA_UID.1	X	X	X	X	X	X	X	X		X			X
FIA_USB.1								X					X
FMT_MSA.1				X	X	X			X				X
FMT_MSA.3				X	X	X			X				X
FMT_MTD.1		X	X						X	X			
FMT_SMF.1		X	X	X	X	X			X	X			
FMT_SMR.1		X	X	X	X	X			X	X			X
FPT_STM.1	X											X	
FPT_TST.1											X		
FTA_SSL.3							X		X				X
FTP_ITC.1		X	X	X	X	X				X			

The following table provides the detail of TOE security objective(s).

Table 30 - Security Objectives to SFR Rationale

Security Objective	SFR and Rationale
O.AUDIT.LOGGED	<p>FAU_GEN.1 addresses the objective by requiring the TOE to generate audit records for TOE usage and security relevant events.</p> <p>FAU_GEN.2 helps address the objective by requiring the audit records to include information associating a user with each event (if applicable).</p> <p>FIA_UID.1 supports audit policies by associating user identity with events.</p> <p>FPT_STM.1 supports audit policies by requiring time stamps associated with events.</p>
O.CONF.NO_ALT	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect management interactions during network transmission.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MTD.1 specifies the rules for altering TSF Confidential Data.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of management traffic across the network.</p>
O.CONF.NO_DIS	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect management interactions during network transmission.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MTD.1 specifies the rules for displaying TSF Confidential Data.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of management traffic across the network.</p>
O.DOC.NO_ALT	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect the document data while transferred across the network.</p> <p>FDP_ACC.1(A) and FDP_ACC.1(B) specify the subjects, objects and operations that are controlled regarding User Document Data that must be protected for unauthorized alteration.</p> <p>FDP_ACF.1(A) and FDP_ACF.1(B) specify the security attributes and rules used to determine whether access is permitted.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MSA.1 and FMT_MSA.3 support the access control function by enforcing control of security attributes and their defaults.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of D.DOC across the network.</p>
O.DOC.NO_DIS	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect the document data while transferred across the network.</p>

Security Objective	SFR and Rationale
	<p>FDP_ACC.1(A) and FDP_ACC.1(B) specify the subjects, objects and operations that are controlled regarding User Document Data that must be protected for unauthorized disclosure.</p> <p>FDP_ACF.1(A) and FDP_ACF.1(B) specify the security attributes and rules used to determine whether access is permitted.</p> <p>FDP_RIP.1 supports the objective by requiring the TOE to make unavailable any user document data when the RAM buffer holding the data is released.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MSA.1 and FMT_MSA.3 support the access control function by enforcing control of security attributes and their defaults.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of D.DOC across the network.</p>
O.FUNC.NO_ALT	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect the function data while transferred across the network.</p> <p>FDP_ACC.1(A) specifies the subjects, objects and operations that are controlled regarding functions.</p> <p>FDP_ACF.1(A) specifies the security attributes and rules used to determine whether access is permitted.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MSA.1 and FMT_MSA.3 support the access control function by enforcing control of security attributes and their defaults.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of D.FUNC across the network.</p>
O.INTERFACE.MANAGED	<p>FIA_UAU.1 enforces management of external interfaces by requiring user authentication.</p> <p>FIA_UID.1 enforces management of external interfaces by requiring user identification.</p> <p>FTA_SSL.3 enforces management of external interfaces by terminating inactive sessions.</p>
O.I&A	<p>FIA_AFL.1 supports the objective by requiring the TOE to lock accounts that experience an excessive number of failed authentication attempts, thereby providing protection from brute force password attacks.</p> <p>FIA_ATD.1 specifies the attributes associated with users, including information about failed authentication attempts.</p> <p>FIA_UAU.1 requires the TOE to provide I&A using Username/Password Accounts.</p> <p>FIA_UAU.7 protects the confidentiality of passwords by specifying that only asterisks are echoed during password entry.</p> <p>FIA_UID.1 requires the TOE to provide I&A using Username/Password Accounts.</p> <p>FIA_USB.1 specifies the attributes bound to a session upon successful completion of the I&A process.</p>

Security Objective	SFR and Rationale
O.MANAGE	<p>FMT_MSA.1 specifies the rules for management of the security attributes used in the access control decisions for user data.</p> <p>FMT_MSA.3 requires the TOE to impose restrictive default values for security attributes in all cases.</p> <p>FMT_MTD.1 specifies the rules for management of TSF data.</p> <p>FMT_SMF.1 specifies the management functions that the TOE provides and controls access to.</p> <p>FMT_SMR.1 specifies the roles (via user permissions) supported by the TOE.</p> <p>FTA_SSL.3 requires the TOE to automatically terminate idle sessions to mitigate against users taking advantage of existing sessions to gain unauthorized access.</p>
O.PROT.NO_ALT	<p>FCS_CKM.1, FCS_CKM.4 and FCS_COP.1 support the objective by requiring the TOE to provide key management and cryptographic functions to protect the management data while transferred across the network.</p> <p>FIA_UID.1 supports access control and security roles by requiring user identification.</p> <p>FMT_MTD.1 specifies the rules for displaying TSF Confidential Data.</p> <p>FMT_SMF.1 supports control of security attributes by requiring functions to control attributes.</p> <p>FMT_SMR.1 supports control of security attributes by requiring security roles.</p> <p>FTP_ITC.1 addresses the objective by requiring the TOE to provide trusted channels for the exchange of management traffic across the network.</p>
O.SOFTWARE.VERIFIED	<p>FPT_TST.1 addresses the objective by requiring the TOE to validate the TSF data for configuration data.</p>
O.TIME_STAMP	<p>FPT_STM.1 requires the TOE to provide a reliable time source when time is configured to be supplied internally.</p>
O.USER.AUTHORIZED	<p>FIA_ATD.1 supports authorization by associating security attributes with users.</p> <p>FIA_UID.1 and FIA_UAU.1 requires the TOE to successfully complete the I&A process before allowing users to perform anything other than the specified functions.</p> <p>FIA_USB.1 specifies the attributes bound to a sessions (and used in access control decisions) upon successful I&A.</p> <p>The security policies defined in FDP_ACC.1(A), FDP_ACC.1(B), FDP_ACF.1(A), FDP_ACF.1(B), FMT_MSA.1 and FMT_MSA.3 are required to be enforced by the TOE based on the security attributes bound to the subject (acting on behalf of the authenticated user).</p> <p>FMT_SMR.1 supports authorization by requiring security roles.</p> <p>FTA_SSL.3 enforces authorization by terminating inactive sessions.</p>

9.2.2 Security Assurance Requirements Rationale

The TOE stresses assurance through vendor actions that are within the bounds of current best commercial practice. The TOE provides, primarily via review of vendor-supplied evidence, independent confirmation that these actions have been competently performed.

The general level of assurance for the TOE is:

- A) Consistent with current best commercial practice for IT development and provides a product that is competitive against non-evaluated products with respect to functionality, performance, cost, and time-to-market.

- B) The TOE assurance also meets current constraints on widespread acceptance, by expressing its claims against EAL3 augmented with ALC_FLR.3 from part 3 of the Common Criteria.

9.3 TOE Summary Specification Rationale

This section demonstrates that the TOE’s Security Functions completely and accurately meet the TOE SFRs.

The following tables provide a mapping between the TOE’s Security Functions and the SFRs and the rationale.

Table 31 - SFRs to TOE Security Functions Mapping

	Audit Generation	I&A	Access Control	Management	D.DOC Wiping	Secure Communication	Self Test
FAU_GEN.1	X						
FAU_GEN.2	X						
FCS_CKM.1						X	
FCS_CKM.4						X	
FCS_COP.1					X	X	
FDP_ACC.1(A)			X				
FDP_ACC.1(B)			X				
FDP_ACF.1(A)			X				
FDP_ACF.1(B)			X				
FDP_RIP.1					X		
FIA_AFL.1		X					
FIA_ATD.1		X					
FIA_UAU.1		X					
FIA_UAU.7		X					
FIA_UID.1		X					
FIA_USB.1		X					
FMT_MSA.1			X	X			
FMT_MSA.3				X			
FMT_MTD.1			X	X			
FMT_SMF.1				X			
FMT_SMR.1				X			
FPT_STM.1	X						
FPT_TST.1							X
FTA_SSL.3		X					
FTP_ITC.1						X	

Table 32 - SFR to SF Rationale

SFR	SF and Rationale
FAU_GEN.1	Audit Generation addresses the SFR by specifying the audit event records that are generated and the content of the records.

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SFR	SF and Rationale
FAU_GEN.2	Audit Generation addresses the SFR by specifying that the associated Username (if applicable) is included in audit event records.
FCS_CKM.1	Secure Communications requires generation of a certificate with an RSA public-private key pair.
FCS_CKM.4	Secure Communication requires zeroization of the session keys obtained by DH IKE Key Derivation Function to be zeroized when the sessions terminate.
FCS_COP.1	Secure Communication requires the TOE to support TDES and AES for encryption, SHA for HMAC, RSA signatures, Diffie Hellman for IKE Key Derivation Function, and a deterministic random bit generator.
FDP_ACC.1(A)	Access Control specifies the access controls placed on the user operations (objects) performed by users to access user data in the TSC.
FDP_ACC.1(B)	Access Control specifies the access controls placed on the user operations (objects) performed by users to access user data in the TSC.
FDP_ACF.1(A)	Access Control specifies the access controls placed on the user operations (objects) performed by users to access user data in the TSC.
FDP_ACF.1(B)	Access Control specifies the access controls placed on the user operations (objects) performed by users to access user data in the TSC.
FDP_RIP.1	D.DOC Wiping requires the TOE to overwrite RAM buffers upon their release that contain user data from incoming print jobs.
FIA_AFL.1	Identification and Authentication requires the TOE to track failed login attempts for all authentication mechanisms. The limit on failed attempts that triggers an account lock is specified via the Login Restrictions TSF data.
FIA_ATD.1	Identification and Authentication requires the TOE to maintain the Username, Password, and Associated Groups security attributes for Username/Password Accounts; and the failed authentication security attributes for all users.
FIA_UAU.1	Identification and Authentication requires the TOE to prevent access to restricted functions before the I&A process is successfully completed. Printing is never a restricted function. The TOE is solely responsible for I&A for Username/Password Accounts.
FIA_UAU.7	Identification and Authentication requires the TOE to echo asterisks or dots when a password is being entered for the I&A process for all mechanisms.
FIA_UID.1	Identification and Authentication requires the TOE to prevent access to restricted functions before the I&A process is successfully completed. Printing is never a restricted function. The TOE is solely responsible for I&A for Username/Password Accounts.
FIA_USB.1	Identification and Authentication requires the TOE to bind the Username and Password supplied during I&A with the subject upon successful I&A. The TOE also binds the permissions based on the permissions of associated groups.
FMT_MSA.1	Management requires the TOE to provide the management capabilities for Usernames and Group memberships to the administrators that satisfy the access controls associated with the menus that control access to the data items. Access Control specifies that access be restricted and states the required configuration in the evaluated configuration.
FMT_MSA.3	Management requires the TOE to initially associate no group memberships with Username/Password Accounts.

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SFR	SF and Rationale
FMT_MTD.1	Management requires the TOE to provide the management capabilities specified in the table to the administrators that satisfy the access controls associated with the menus that control access to the data items. Access Control specifies that access be restricted and states the required configuration in the evaluated configuration.
FMT_SMF.1	Management requires the TOE to provide capabilities to manage the specified functions.
FMT_SMR.1	Management requires the TOE to maintain the specified roles via association of user permissions with users. Administrators are any users authorized access to restricted functionality, while normal users are all the other defined users.
FPT_STM.1	Audit Generation requires the TOE to provide time stamps for audit records when the TOE is configured for internal time.
FPT_TST.1	Self Test requires the TOE to perform tests on the cryptographic components, validates the configuration data, and validates the integrity of the executable code on each power up and reset.
FTA_SSL.3	Identification and Authentication states that sessions are automatically terminated by the TOE when the Home menu is not accessed within the configured timeout period.
FTP_ITC.1	Secure Communication requires the TOE to use a trusted channel for network communication with all remote IT systems.