

LDS V10 Applet in EAC with PACE Configuration

Public Security Target



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1 Introduction

This Security Target aims to satisfy the requirements of Common Criteria level EAL5+, augmented with AVA_VAN.5 and ALC_DVS.2 in defining the security enforcing functions of the Target Of Evaluation and describing the environment in which it operates.

The basis for this composite evaluation is the composite evaluation of open platform *COSMO V8.2* and configurable Java Card application, LDS V10.

The LDS V10 can have different configurations as described in Section 2.1. The present ST considers configuration 2 defined in Table 6 that supports the following features:

- EAC V2 with PACE-CAM/TA without CA
- AA
- CAM.
- DG3 and DG4 read protection by SM (AES/DES) after EAC

It is either activated in ROM during pre-personalization phase or loaded on the E2PROM of the platform at pre-personalization or personalization phase.

The LDS works on the ID-One Cosmo v8.2 Platform. The platform is covered by the Security Target [54].

1.1 Security target Reference

This Security target is identified as follows:

Title	LDS V10 Applet in EAC with PACE Configuration Public Security Target
ST Identification	FQR 550 0031 Ed 1
ST Version	V1
CC Version	3.1 Revision 5
Assurance Level	EAL5 augmented with ALC_DVS.2 and AVA_VAN.5
ITSEF	CEA-LETI
Certification Body	ANSSI
Compliant To Protection Profile	PP-EAC with PACE [49]

Table 1: ST Reference

1.2 TOE REFERENCE

TOE Commercial Name	LDS V10 in EAC with PACE configuration on ID-One Cosmo V8.2
Applet Code Version	06 70 01 2F
Guidance Documents	[60], [61], [55], [56], [57] and [58]
Platform Name	ID-One Cosmo v8.2 Platform
Platform Certificate	ANSSI-CC-2019/28
Communication Protocol	Contact, Contactless and Dual
IC Identifier	NXP Secure Smart Card Controller P6022Y VB
IC Certificate	BSI-DSZ-CC-1059

Table 2: TOE REFERENCES

1.3 TOE Identification

The aim of the paragraphs is to allow the user to identify uniquely the TOE.

The TOE is composed of application [LDS V10 in EAC with PACE configuration] and COSMO v8.2 Platform on the IC.

1.3.1 TOE Identification

This chapter presents the means to identify the evaluated application and the Platform.

The [LDS V10 Security Target EAC with PACE] installation command **shall** use the executable load File AID and module AID

Name	Value
Executable Load File (ELF) AID	A0000000770100000710000000000005
Executable Module AID	A0000000770100000710000100000005
Application AID	A00000024710FF

Table 3: AID LDS V10 Security Target EAC with PACE configuration

1.3.2 Platform Identification

In order to assure the authenticity of the card, the product identification shall be verified by analysing:

Platform Name	ID-One Cosmo v8.2 Platform
Mask / Hardware Identification	091121
Label GIT code	IDOne_Cosmo_V8.2_091121
IC reference version	NXP P60D145
IC configuration	NXP P6022Y VB
IC ST identification	NXP Secure Smart Card Controller P6022y VB Security Target Lite Rev. 2.1 — 6 April 2018 BSI-DSZ-CC-1059
IC EAL	EAL6 with augmentations: ALC_FLR.1 and ASE_TSS.2
IC certificate	BSI-DSZ-CC-1059
Date of IC certification	2018-05-18

Table 4: Platform Identification

The evaluated platform allows the loading of patch. The patch reference is specified in the platform ST for ID-One Cosmo v8.2 Platform and the associated platform certificate.

1.3.3 Configuration of the platform

In the present evaluation, the loading of application (Java Card Applets) on the platform at use phase is allowed. It can be forbidden if requested by the product issuer.

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1.5 Definitions

DES	Data Encryption Standard
DF	Dedicated File
DH	Diffie Hellman
EAL	Evaluation Assurance Level
EF	Elementary File
EEPROM	Electrically Erasable Programmable Read Only Memory
FID	File identifier
GP	Global Platform

Term	Definition
Document Security Object (SOD)	A RFC3369 CMS Signed Data Structure, signed by the Document Signer (DS). Carries the hash values of the LDS Data Groups. It is stored in the MRTD's chip. It may carry the Document Signer Certificate (CDS).
Eavesdropper	A threat agent with Enhanced-Basic attack potential reading the communication between the MRTD's chip and the inspection system to gain the data on the MRTD's chip.
Enrolment	The process of collecting biometric samples from a person and the subsequent preparation and storage of biometric reference templates representing that person's identity.
Extended Access Control (EAC)	Security mechanism identified in [48] by which means the MRTD's chip (i) verifies the authentication of the inspection systems authorized to read the optional biometric reference data, (ii) controls the access to the optional biometric reference data and (iii) protects the confidentiality and integrity of the optional biometric reference data during their transmission to the inspection system by secure messaging. The Personalization Agent may use the same mechanism to authenticate themselves with Personalization Agent Private Key and to get write and read access to the logical MRTD and TSF data.
Extended Inspection System (EIS)	A role of a terminal as part of an inspection system which is in addition to Basic Inspection System authorized by the issuing State or Organization to read the optional biometric reference data and supports the terminals part of the Extended Access Control Authentication Mechanism.
Forgery	Fraudulent alteration of any part of the genuine document, e.g. changes to the biographical data or the portrait.
Global Interoperability	The capability of inspection systems (either manual or automated) in different States throughout the world to exchange data, to process data received from systems in other States, and to utilize that data in inspection operations in their respective States. Global interoperability is a major objective of the standardized specifications for placement of both eye-readable and machine readable data in all MRTDs.
IC Dedicated Support Software	That part of the IC Dedicated Software (refer to above) which provides functions after TOE Delivery. The usage of parts of the IC Dedicated Software might be restricted to certain phases.
IC Dedicated Test Software	That part of the IC Dedicated Software (refer to above) which is used to test the TOE before TOE Delivery but which does not provide any functionality thereafter.
IC Identification Data	The IC manufacturer writes a unique IC identifier to the chip to control the IC as MRTD material during the IC manufacturing and the delivery process to the MRTD manufacturer (i.e MRTD packaging responsible).
Impostor	A person who applies for and obtains a document by assuming a false name and identity, or a person who alters his or her physical appearance to represent himself or herself as another person for the purpose of using that person's document.
Improperly document person	A person who travels, or attempts to travel with: (a) an expired travel document or an invalid visa; (b) a counterfeit, forged or altered travel document or visa; (c) someone else's travel document or visa; or (d) no travel document or visa, if required.
Initialisation	Process of writing Initialisation Data (see below) to the TOE.
Initialization Data	Any data defined by the TOE Manufacturer and injected into the non-volatile memory by the Integrated Circuits manufacturer (Phase 2). These data are for instance used for traceability and for IC identification as MRTD's material (IC identification data).

Term	Definition
Inspection	The act of a State examining an MRTD presented to it by a traveler (the MRTD holder) and verifying its authenticity.
Inspection System (IS)	A technical system used by the border control officer of the receiving State (i) examining an MRTD presented by the traveler and verifying its authenticity and (ii) verifying the traveler as MRTD holder.
Integrated Circuit (IC)	Electronic component(s) designed to perform processing and/or memory functions. The MRTD's chip is a integrated circuit.
Integrity	Ability to confirm the MRTD and its data elements on the MRTD's chip have not been altered from that created by the issuing State or Organization
Issuing Organization	Organization authorized to issue an official travel document (e.g. the United Nations Organization, issuer of the Laissez-passer).
Issuing State	The Country issuing the MRTD.
Logical Data Structure (LDS)	The collection of groupings of Data Elements stored in the optional capacity expansion technology. The capacity expansion technology used is the MRTD's chip.
Logical MRTD	Data of the MRTD holder stored according to the Logical Data Structure, as specified by ICAO on the contactless integrated circuit. It presents contactless readable data including (but not limited to) (1) personal data of the MRTD holder, (2) the digital Machine Readable Zone Data (digital MRZ data, EF.DG1), (3) the digitized portraits (EF.DG2), (4) the biometric reference data of finger(s) (EF.DG3) or iris image(s) (EF.DG4) or both and (5) the other data according to LDS (EF.DG5 to EF.DG16). (6) EF.COM and EF.SOD
Logical travel document	Data stored according to the Logical Data Structure as specified by ICAO in the contactless integrated circuit including (but not limited to) (1) data contained in the machine-readable zone (mandatory), (2) digitized photographic image (mandatory) and (3) fingerprint image(s) and/or iris image(s) (optional).
Machine Readable Travel Document (MRTD)	Official document issued by a State or Organization which is used by the holder for international travel (e.g. passport, visa, official document of identity) and which contains mandatory visual (eye readable) data and a separate mandatory data summary, intended for global use, reflecting essential data elements capable of being machine read.
Machine Readable Visa (MRV)	A visa or, where appropriate, an entry clearance (hereinafter collectively referred to as visas) conforming to the specifications contained herein, formulated to improve facilitation and enhance security for the visa holder. Contains mandatory visual (eye readable) data and a separate mandatory data summary capable of being machine read. The MRV is normally a label which is attached to a visa page in a passport.
Machine Readable Zone (MRZ)	Fixed dimensional area located on the front of the MRTD or MRP Data Page or, in the case of the TD1, the back of the MRTD, containing mandatory and optional data for machine reading using OCR methods.
Machine-verifiable biometrics feature	A unique physical personal identification feature (e.g. an iris pattern, fingerprint or facial characteristics) stored on a travel document in a form that can be read and verified by machine.
MRTD application	Non-executable data defining the functionality of the operating system on the IC as the MRTD's chip. It includes - the file structure implementing the LDS - the definition of the User Data, but does not include the User Data itself (i.e. content of EF.DG1 to EF.DG14, EF.DG 16, EF.COM and EF.SOD) and - the TSF Data including the definition the authentication data but except the authentication data itself.

2 Target of Evaluation

The product **LDS V10** is a multi-applicative Java Card product, embeddable in contact and/or contactless smart card integrated circuits of different form factors. The product can be configured to serve different use cases, during the **Pre-Personalization/Personalization phases** of the product [60].

The product supports the storage and retrieval of structured information compliant to the Logical Data Structure as specified in [44]. It also provides standard authentication protocols, Extended Access Control [49] PACE [50], Active Authentication.

It can host two types of applications as mentioned above, namely the **IDL** and **MRTD**. Moreover, further configuration may also be done to each type of application to serve use cases other than those behaviourally defined in the referenced normative documents.

This product is loaded on the platform, for details see ST [54].
The LDS V10 product architecture can be viewed as shown in the following figure:

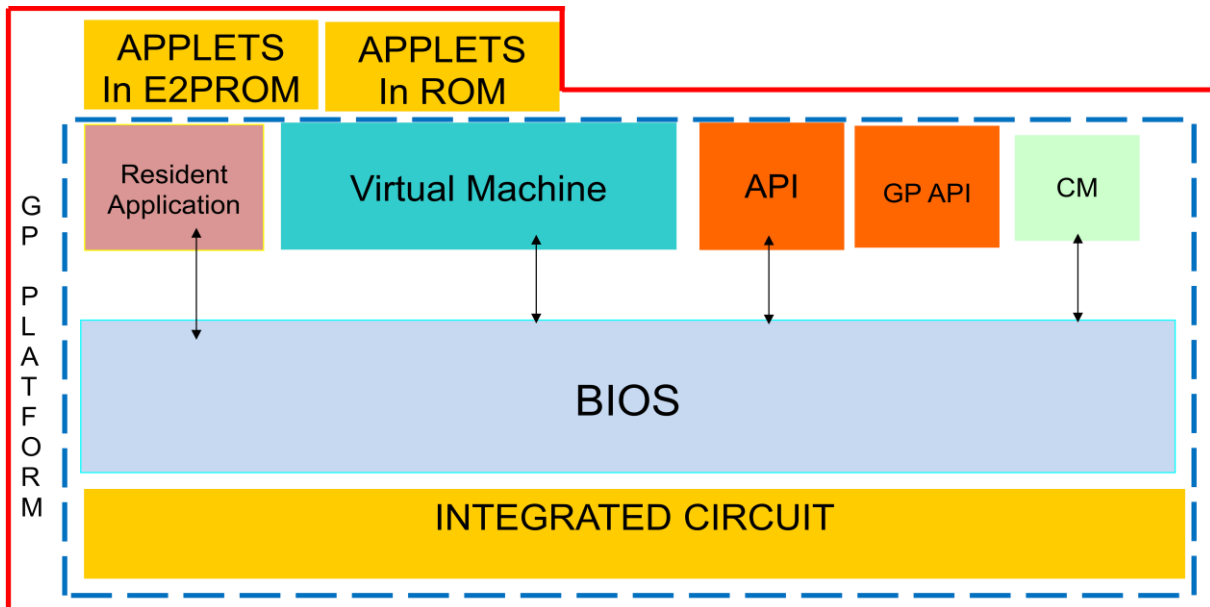


Figure1: TOE Limits

2.1 TOE Overview

The TOE described in this security target is the EAC with PACE, conformant to Configuration 2 (below). The product is composed of the functions: EAC, AA, CAM, PACE which are all presented in the chapter TOE architecture. Only some parts are in the scope of the evaluation of the present configuration.

Different configurations of the TOE are under evaluation. This ST considers only EAC and AA, CAM, PACE_CAM, BAC deactivation and Secure Messaging (DES + AES) on read DG3+DG4 after EAC.

Configuration	PP Conformity	Chip P60D145	Extensions
---------------	---------------	--------------	------------

1	PP 0068 (PACE)	X	AA CA CAM
2	PP0056v2 (EAC with PACE)	X	AA CAM PACE-CAM/TA without CA BAC de-activation SM (DES + AES) on read DG3+DG4 After EAC
3	PP 0055 (BAC)	X	AA + CA
4	PP0056v1 (EAC with BAC)	X	AA SM (DES + AES) on read DG3+DG4 after EAC

Table 6: 4 Configurations of the LDS application

The EAC with PACE TOE is instantiated during the application Pre-personalization with the creation of the MF / DF required for this configuration.

In the use phase of the product, and for interoperability purposes, the MRTD will most likely support BAC, PACE and EAC.

- If the terminal reads the content of the MRTD by performing BAC then EAC, the security of the MRTD will be covered by the security evaluation of the TOE described by the ST claiming compliance [54] and the TOE described by the ST claiming compliance to PP EAC assuming PACE is not supported (as not used for the inspection procedure).
- If the terminal reads the content of the MRTD by performing PACE then EAC, the security of the MRTD will be covered by the security evaluation of the TOE described by the ST claiming compliance to PP with PACE assuming BAC is not supported (as not used for the inspection procedure).

The TOE life cycle is described in § 3.
The TOE identification is described in § 1.3.1.

The TOE scope encompasses the following features:

- Active Authentication
- EAC Authentication
- PACE_CAM Authentication
- SM (DES + AES) on read DG3+DG4 after EAC
- BAC deactivation

Nevertheless, the TOE in the LDS application embeds other secure functionalities they are not in the scope of this evaluation and are in the scope of other evaluations.

2.1.1 Physical scope

The TOE is physically made up of several components hardware and software. Once constructed, the TOE is a bare microchip with its external interfaces for communication. The physical medium on which the microchip is mounted is not part of the target of evaluation because it does not alter nor modify any security functions of the TOE.

The TOE may be used on several physical medium within an inlay, or eCover; in a plastic card.

The physical form of the module is depicted in Figure below. The cryptographic boundary of the module is the surface and edges of the die and associated bond pads, shown as circles in the following figure.

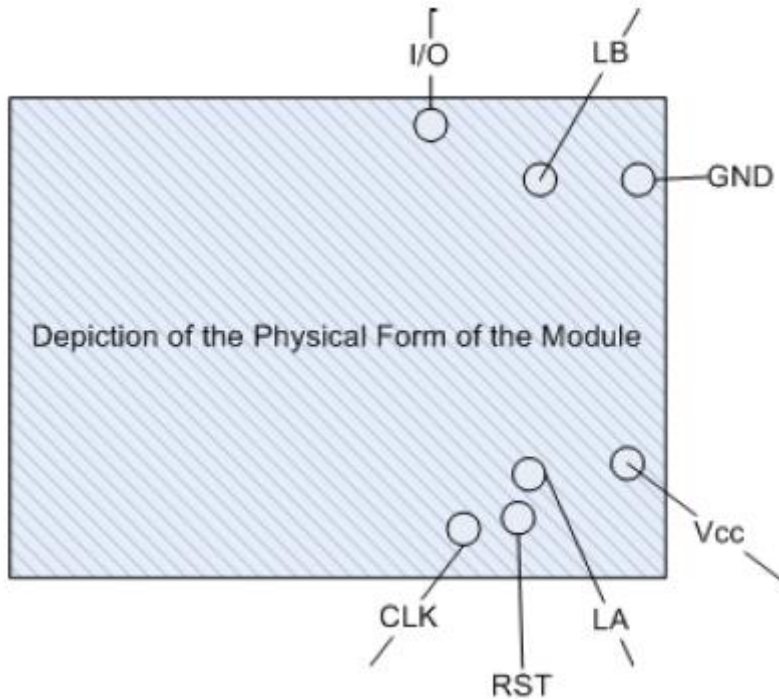


Figure 2: Physical Form

The contactless ports of the module require connection to an antenna. The module relies on [ISO7816] and [ISO14443] card readers and antenna connections as input/output devices.

Port	Description	Logical Interface Type
VCC, GND	ISO 7816: Supply voltage	Power (not available in contactless-only configurations)
RST	ISO 7816:Reset	Control in (not available in contactless-only configurations)
CLK	ISO 7816: Clock	Control in (not available in contactless-only configurations)
I/O	ISO 7816: Input/ Output	Control in, Data in, Data out, Status out (not available in contactless-only configurations)
LA, LB	ISO 14443: Antenna	Power, Control in, Data in, Data out, Status out (Not available in Contact-only configurations)

Table 7: Ports and Interfaces

2.1.2 Required non-TOE hardware/software/firmware

The TOE is an MRTD. It is an independent product and does not need any additional hardware/software/firmware to ensure its security.

In order to be powered up and to be able to communicate the TOE needs a card reader.

2.1.3 TOE Usage and major security features

State or organisation issues MRTDs to be used by the holder to prove his/her identity and claiming associated rights. For instance, it can be used to check identity at customs in an MRTD configuration, verifying authenticity of electronic visa stored on the card and correspondence with the holder.

In order to pass successfully the control, the holder presents its personal MRTD to the inspection system to first prove his/her identity. The inspection system is under control of an authorised agent and can be either a desktop device such as those present in airports or a portable device to be used on the field.

The MRTD in context of this security target contains:

- Visual (eye readable) biographical data and portrait of the holder printed in the booklet
- A separate data summary (MRZ or keydoc data) for visual and machine reading using OCR methods in the Machine Readable Zone (MRZ or keydoc area)
- And data elements stored on the TOE's chip for contact-less machine reading.

The authentication of the holder is based on:

- The possession of a valid MRTD personalized for a holder with the claimed identity as given on the biographical data page and
- The Biometric matching performed on the Inspection system using the reference data stored in the MRTD.

When holder has been authenticated the issuing State or Organization can perform extra authentications in order to gain rights required to grant access to some sensitive information such as "visa information".

The issuing State or Organization ensures the authenticity of the data of genuine MRTDs. The receiving State trusts a genuine MRTD of an issuing State or Organization.

The MRTD can be viewed as the combination:

A physical MRTD in form of paper or plastic with an embedded chip and possibly an antenna. It presents visual readable data including (but not limited to)

- personal data of the MRTD holder
- The biographical data on the biographical data page of the passport book
- The printed data in the Machine-Readable Zone (MRZ) or keydoc area that identifies the device
- The printed portrait

A logical MRTD as data of the MRTD holder stored according to the Logical Data Structure as specified by ICAO and extended in [44][45][46] on the contactless integrated circuit. It presents contact or contact-less readable data including (but not limited to)

- personal data of the MRTD holder
- The digital Machine Readable Zone Data (digital MRZ data or keydoc data, DG1)
- The digitized portraits
- The optional biometric reference data of finger(s) or iris image(s) or both
- The other data according to LDS (up to DG24)
- The Document security object

The issuing State or Organization implements security features of the MRTD to maintain the authenticity and integrity of the MRTD and its data. The MRTD as the physical device and the MRTD's chip is uniquely identified by the document number.

The physical MRTD is protected by physical security measures (e.g. watermark on paper, security printing), logical (e.g. authentication keys of the MRTD's chip) and organisational security measures (e.g. control of materials, personalization procedures). These security measures include the binding of the MRTD's chip to the physical support.

The logical MRTD is protected in authenticity and integrity by a digital signature created by the document signer acting for the issuing State or Organization and the security features of the MRTD's chip.

The ICAO defines the baseline security methods Passive Authentication and the optional advanced security methods Basic Access Control to the logical travel document, Active Authentication of the travel document's chip, Extended Access Control to and the Data Encryption of sensitive biometrics as optional security measure in the ICAO Doc 9303, and Password Authenticated Connection Establishment. The Passive Authentication Mechanism is performed completely and independently of the TOE by the TOE environment.

The Security Target addresses the protection of the logical travel document (i) in integrity by write-only-once access control and by physical means, and (ii) in confidentiality by the Extended Access Control Mechanism.

If BAC is supported by the TOE, the travel document has to be evaluated and certified separately. This is due to the fact that [47] does only consider extended basic attack potential to the Basic Access Control Mechanism (i.e. AVA_VAN.3).

The Active Authentication authenticates the contactless IC by signing a challenge sent by the IFD (inspection system) with a private key known only to the IC. For this purpose the contactless IC contains its own Active Authentication Key pair (KPrAA and KPuAA). A hash representation of Data Group 15 (Public Key (KPuAA) info) is stored in the Document Security Object (SOD) and therefore authenticated by the issuer's digital signature. The corresponding Private Key (KPrAA) is stored in the contactless IC's secure memory. By authenticating the visual MRZ (through the hashed MRZ in the Document Security Object (SOD)) in combination with the challenge response, using the eMRTD's Active Authentication Key Pair (KPrAA and KPuAA), the inspection system verifies that the Document Security Object (SOD) has been read from the genuine contactless IC, stored in the genuine eMRTD.

The confidentiality by Password Authenticated Connection Establishment (PACE) is a mandatory security feature of the TOE. The travel document shall strictly conform to the 'Common Criteria Protection Profile Machine Readable Travel Document using Standard Inspection Procedure with PACE considers high attack potential.

For the PACE protocol, the following steps shall be performed:

- (i) The travel document's chip encrypts a nonce with the shared password, derived from the MRZ resp. CAN data and transmits the encrypted nonce together with the domain parameters to the terminal.
- (ii) The terminal recovers the nonce using the shared password, by (physically) reading the MRZ resp. CAN data.
- (iii) The travel document's chip and terminal computer perform a Diffie-Hellmann key agreement together with the ephemeral domain parameters to create a shared secret. Both parties derive the session keys KMAC and KENC from the shared secret.
- (iv) Each party generates an authentication token, sends it to the other party and verifies the received token.

After successful key negotiation the terminal and the travel document's chip provide private communication (secure messaging).

The Security Target requires the TOE to implement the Extended Access Control. The Extended Access Control consists of two parts (i) the Chip Authentication Protocol Version 1 and (ii) the Terminal Authentication Protocol Version 1 (v.1). The Chip Authentication Protocol v.1 (i) authenticates the travel document's chip to the inspection system and (ii) establishes secure messaging which is used by Terminal Authentication v.1 to protect the confidentiality and integrity of the sensitive biometric reference data during their transmission from the TOE to the inspection system. Therefore Terminal Authentication v.1 can only be performed if Chip Authentication v.1 has been successfully executed. The Terminal Authentication Protocol v.1 consists of (i) the authentication of the inspection system as entity authorized by the receiving State or Organisation through the issuing State, and (ii) an access control by the TOE to allow reading the sensitive biometric reference data only to successfully authenticated authorized inspection systems. The issuing State or Organisation authorizes the receiving State by means of certification the authentication public keys of Document Verifiers who create Inspection System Certificates.

2.2 TOE Definition

The Target of Evaluation (TOE) is the contactless integrated circuit chip of machine readable travel documents (MRTD's chip) programmed according to the Logical Data Structure (LDS) and providing and provides standard authentication protocols, namely Basic Access Control, Extended Access Control, PACE and Active Authentication.

The product can be configured to serve different use cases, during the **Pre-Personalization/Personalization phases** of the product.

The TOE comprises at least:

- Circuitry of the MRTD's chip (the integrated circuit, IC)
- IC Dedicated Software with the parts IC Dedicated Test Software and IC Dedicated Support Software
- Cosmo V8.2 Platform
- API
- LDS V10 application
- Associated guidance documentation

The platform provides an operational environment for the application: all cryptographic algorithm implementations and associated self-tests, random number and key generation, card lifecycle management, and key storage and protection are provided by the platform. The code for this functionality is contained in the platform ROM. However, the factory configuration of the module constrains the module to the set of services provided by the platform's Card Manager (implementing a standard set of Global Platform services).

The applet may be used on a contact mode compliant to ISO/IEC 7816-3 specification or on contactless mode compliant to ISO/IEC 14443 specification.

2.3 TOE Architecture

The TOE is a smartcard, composed of IC, Java Card Platform and the LDS application. Other applications may reside in the TOE.

2.3.1 Integrated Circuit

The TOE is embedded on NXP chips; more information on the chips is given in the related Public Security Target identified in table 3 of chapter 1.3.2.

2.3.2 Java Card Platform

The Operating System is based on Java Card Technology and Global Platform technology. His main responsibilities are:

- providing interface between the Integrated Circuit and the applet
- providing to the applet, basic services to access to memories and all needed cryptographic operations
- ensuring global management of the card (loading, installation and deletion of applets) and monitor the security of the card (data integrity and physical attacks counter-measures). For details, see [54].

2.3.3 Application Functionalities

This application stores the personal information related to the cardholder of an MRTD or an IDL. It also allows governmental organizations to retrieve these pieces of data.

The applet supports the authentication mechanisms described in ICAO and EAC specifications and ISO/IEC 18013-3 ISO Compliant Driving License specification with a fully configurable access control management over the EFs (EFs).

The applet may be used on a contact mode (compliant to ISO/IEC 7816-3 specification) and/or contactless mode (compliant to ISO/IEC 14443 specification).

The compliancy of the applet to LDS, EAC, or IDL, is achieved provided a correct personalization is performed. The correct authentication mechanisms and access conditions over the EFs must be assigned.

In summary, the applet supports the following authentication mechanisms stated in the ICAO specifications (for MRTD) and the ISO Compliant Driving License standard (for IDL):

- Active Authentication (AA)
- Basic Access Control (BAC)
- Password Authenticated Connection Establishment (PACE)
- Extended Access Control (EAC)
- Chip Authentication Mapping (CAM)

All authentication mechanisms are listed in the following chapters, all are part of the product but only some are part of the present evaluation.

2.3.3.1 Active Authentication (AA)

Active Authentication is an authentication mechanism ensuring the chip is genuine. It uses a challenge-response protocol between the IS and the chip.

Active Authentication is realized with the INTERNAL AUTHENTICATE command.

The key and algorithms supported are the following:

RSA ISO/IEC 9796-2 with a key length of 1024 bits, 1536 bits or 2048 bits and hashing algorithm of SHA1 or SHA2.

ECDSA over prime field curves with hashing algorithm of SHA1 or SHA2 and the key sizes 192 to 512.

AES-256 using ISO/IEC 9797-1 M2 padding method.

TDES with double and triple length keys using ISO/IEC 9797-1 M2 padding method.

2.3.3.2 Basic Access Control (BAC)

The protocol for Basic Access Control is specified by ICAO [47]. Basic Access Control checks that the terminal has physical access to the MRTD's data page. This is enforced by requiring the terminal to derive an authentication key from the optically read MRZ of the MRTD. The protocol for Basic Access Control is based on ISO/IEC 11770-2 [41] key establishment mechanism 6. This protocol is also used to generate session keys that are used to protect the confidentiality (and integrity) of the transmitted data.

The Basic Access Control (BAC) is a security feature that is supported by the TOE. The inspection system

Reads the printed data in the MRZ (for MRTD), Authenticates itself as inspection system by means of keys derived from MRZ data. After successful 3DES based authentication, the TOE provides read access to data requiring BAC rights by means of a private communication (secure messaging) with the inspection system.

The purpose of this mechanism is to ensure that the holder gives access to the IS to the logical MRTD (data stored in the chip); It is achieved by a mutual authentication.

Once the mutual authentication is performed, a secure messaging is available to protect the communication between the chip and the IS.

This table lists the supported configurations for BAC protocol:

Configuration	Key Algo	Key Length	Hash Algo	MAC Algo
BAC	3DES 2Key	16-bytes	SHA-1	Retail MAC

Table 8: BAC Configuration

2.3.3.3 Terminal Authentication

The Terminal Authentication Protocol is a two move challenge-response protocol that provides explicit unilateral authentication of the terminal.

This protocol enables the MRTD chip to verify that the terminal is entitled to access sensitive data. As the terminal may access sensitive data afterwards, all further communication **MUST** be protected appropriately. Terminal Authentication therefore also authenticates an ephemeral public key chosen by the terminal that was used to set up Secure Messaging with Chip Authentication. The MRTD chip **MUST** bind the terminal's access rights to Secure Messaging established by the authenticated ephemeral public key of the terminal.

2.3.3.4 Chip Authentication

The Chip Authentication Protocol is an ephemeral-static Diffie-Hellman key agreement protocol that provides secure communication and unilateral authentication of the MRTD chip.

The protocol establishes Secure Messaging between an MRTD chip and a terminal based on a static key pair stored on the MRTD chip. Chip Authentication is an alternative to the optional ICAO Active Authentication, i.e. it enables the terminal to verify that the MRTD chip is genuine but has two advantages over the original protocol:

Challenge Semantics are prevented because the transcripts produced by this protocol are non-transferable.

Besides authentication of the MRTD chip this protocol also provides strong session keys.

The protocol in version 1 provides implicit authentication of both the MRTD chip itself and the stored data by performing Secure Messaging using the new session keys.

The protocol in Version 2 provides explicit authentication of the MRTD chip by verifying the authentication token and implicit authentication of the stored data by performing Secure Messaging using the new session keys.

2.3.3.5 Password Authenticated Connection Establishment (PACE)

PACE is an access control mechanism that is supplemental to BAC. It is a cryptographically stronger access control mechanism than BAC since it uses asymmetric cryptography compared to BAC's symmetric cryptography.

PACE is realized through 5 commands:

1. MSE SET – AT command
2. GENERAL AUTHENTICATE command – Encrypted Nonce
3. GENERAL AUTHENTICATE command – Map Nonce
4. GENERAL AUTHENTICATE command – Perform Key Agreement
5. GENERAL AUTHENTICATE command – Mutual Authentication

Once the mutual authentication is performed, a secure messaging is available to protect the communication between the chip and the IS.

This table lists the supported configurations for PACE protocol:

Configuration	Mapping	Key Algo	Key Length (in bytes)	Secure Messaging	Auth. Token	Hash Algo
PACE-ECDH-GM-3DES	Generic	3DES 2Key	16	CBC / Retail MAC	Retail MAC	SHA- 1
PACE-ECDH-GM-AES-128	Generic	AES	16	CBC / CMAC	CMAC	SHA- 1
PACE-ECDH-GM-AES-192	Generic	AES	24	CBC / CMAC	CMAC	SHA- 256
PACE-ECDH-GM-AES-256	Generic	AES	32	CBC / CMAC	CMAC	SHA- 256
PACE-ECDH-IM-3DES	Integrated	3DES 2Key	16	CBC / Retail MAC	Retail MAC	SHA- 1
PACE-ECDH-IM-AES-128	Integrated	AES	16	CBC / CMAC	CMAC	SHA- 1
PACE-ECDH-IM-AES-192	Integrated	AES	24	CBC / CMAC	CMAC	SHA- 256
PACE-ECDH-IM-AES-256	Integrated	AES	32	CBC / CMAC	CMAC	SHA- 256
PACE-ECDH-CAM-AES-128	Chip Authentication	AES	16	CBC / CMAC	CMAC	SHA- 1
PACE-ECDH-CAM-AES-192	Chip Authentication	AES	24	CBC / CMAC	CMAC	SHA- 256
PACE-ECDH-CAM-AES-256	Chip Authentication	AES	32	CBC / CMAC	CMAC	SHA- 256

Table 9: PACE Configuration

2.3.3.6 Extended Access Control (EAC)

EAC is an authentication protocol based on a PKI infrastructure. It further ensures that the IS is authorized to read and/or update data stored in the applet. This authentication mechanism generates a strong secure messaging session through the step of Chip Authentication.

This mechanism is realized by the following steps:

1. Chip Authentication (CA) Chip Authentication is achieved by using a MANAGE SECURITY ENVIRONMENT – SET – Key Agreement Template (MSE SET KAT) command or by using a MANAGE SECURITY ENVIRONMENT – SET – Authentication Template (MSE SET AT) command followed by GENERAL AUTHENTICATE command.

The Chip Authentication mechanism enables the authentication of the chip by using an authenticated DH scheme. It may be realized in two ways:

- Classical DH (DH El Gamal) with key length of 1024, 1536, or 2048 bits

- DH over Elliptic curves over prime fields (ECDH) with the key length supported by the underlying Java Card platform.

2. Certificate Chain Handling

The certificate chain is processed through a series of `MANAGE SECURITY ENVIRONMENT – SET – Digital Signature Template (MSE SET DST)` and `PERFORM SECURITY OPERATION – Verify Certificate (PSO VERIFY)` commands.

The chain is done to extract a key from the IS certificate, the key which will be used in the Terminal Authentication.

3. Terminal Authentication (TA)

Terminal Authentication is achieved by using an `EXTERNAL AUTHENTICATE` command.

The Terminal Authentication mechanism is an authentication of the IS based on a classical challenge/response scheme. The signature scheme may be: ECDSA SHA-1, ECDSA SHA-224, ECDSA SHA-256, ECDSA SHA-384, or ECDSA SHA-512 on elliptic curves over prime field with key length supported by the underlying Java Card platform RSA SHA-1, SHA-256, or SHA-512 (PKCS#1 v1.5 or PKCS#1 v2.1 - PSS) with a key length of 1024, 1536, and 2048 bits.

2.3.3.7 PACE-CAM

The Chip Authentication Mapping is a new mapping for PACE which extends the Generic Mapping that integrates Chip Authentication into the PACE protocol. This mapping combines PACE and Chip Authentication into one protocol PACE-CAM, which allows faster execution than the separate protocols (i.e. PACE + CA + TA).

PACE-CAM is realized the same way as § 2.3.3.6. The only difference is that the chip computes the Chip Authentication Data using the chip's static private key then sends this data to the terminal. The terminal verifies the authenticity of the chip using the recovered Chip Authentication Data.

2.3.3.8 Match On-Card (MOC) Verification

MOC verification may be used to grant some access rights to EFs.

This feature relies on the services provided by the CHV Server applet MOC verification is supported if the *CHV Configuration* is properly configured in the install parameter. Once the MOC verification is allowed the applet will permit the use of CHV-related commands that handles biometric and Global PIN credentials.

2.3.3.9 PIN

The product supports the management of card holder credentials such as Cardholder PIN and Global PIN which can be used to grant access rights to EFs or keys. The Cardholder PIN and Global PIN each have its PIN Unblocking Key (Cardholder PUK and Global PUK, respectively). These PINs and corresponding PUKs have to be initialized during personalization if they are used to protect access to EFs and keys.

2.3.3.10 BAC De-Activation

The TOE supports the automatic deactivation of BAC protocol at defined date.

Developer of sensitive applications*	COSMO V8.2 Security Recommendations [56]
Guidance for application developer*	COSMO V8.2 Reference Guide [58]
Guidance to Issuer of the platform that aims to load applications*	COSMO V8.1-N Application Loading Protection Guidance [55]

Table 10: TOE Guidance

3 TOE Life Cycle

3.1 TOE Life Cycle Overview

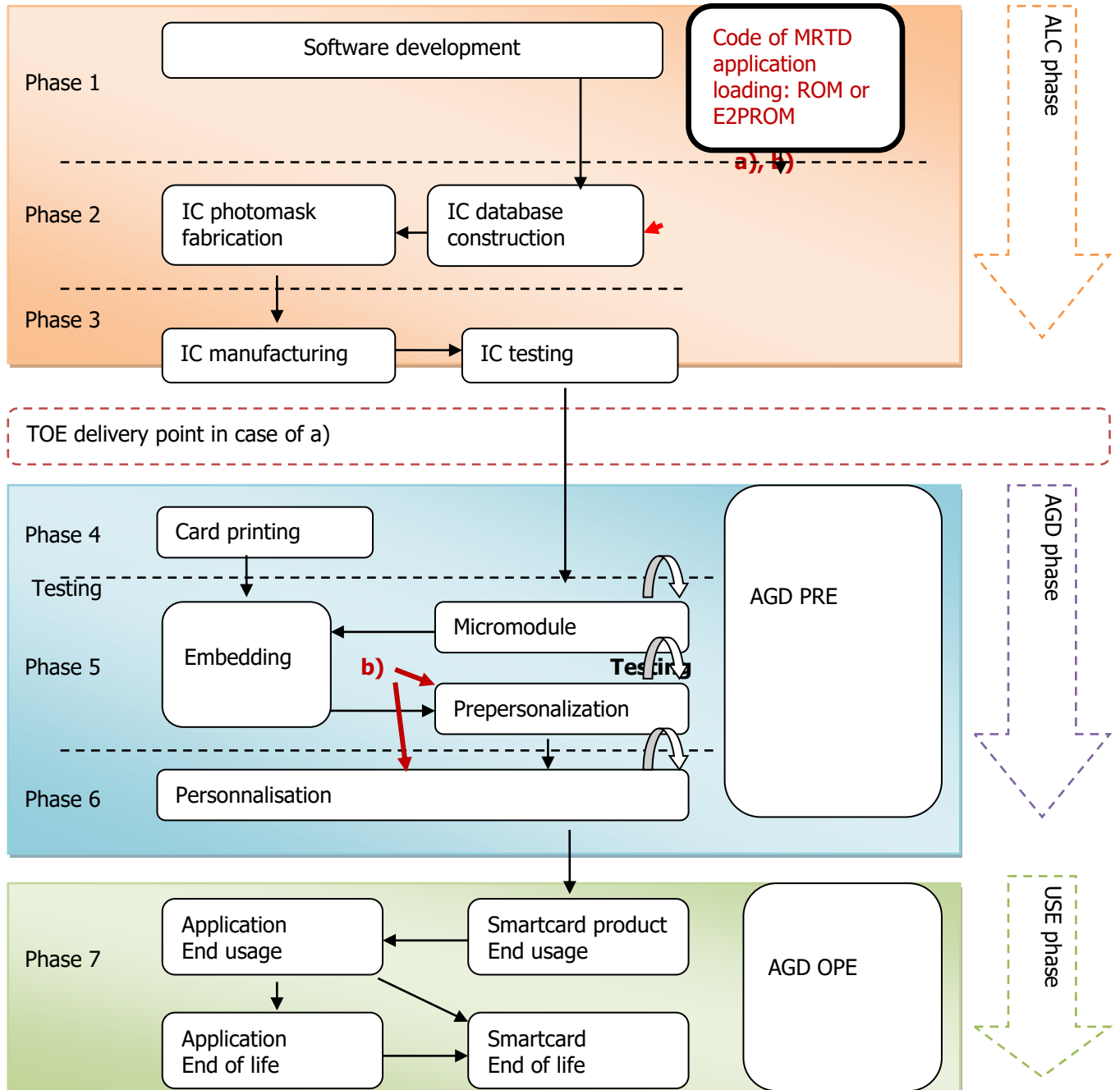


Figure 3: Smartcard product life-cycle for the TOE

The TOE life-cycle classically described in terms of four life-cycle phases is additionally subdivided into 7 steps.

The roles involved in the different steps are listed in the following table:

Roles	Subjects
IC manufacturer	NXP Semiconductors
TOE developer	IDEMIA
Manufacturer	NXP Semiconductors IDEMIA or another agent
Prepersonalizer	IDEMIA or another agent
Personalization Agent	IDEMIA or another agent

Table 11: Roles Identification on the life cycle.

3.2 TOE Life Cycle when the Application code is romed

The table below presents the subjects following TOE life cycle steps in accordance with the standard smart card life cycle, the Protection Profile lifecycle in phases, the TOE delivery point and the coverage in the case a):

Steps	Phase	Subject	Covered by
Step 1	Development	IDEMIA	ALC R&D sites
Step 2	Development	NXP Semiconductors	IC certification
Step 3	Manufacturing	NXP Semiconductors	IC certification
TOE delivery point			
Step 4	Manufacturing	MRD Manufacturer (Prepersonalizer)	AGD_PRE
Step 5	Manufacturing	MRD Manufacturer (Prepersonalizer)	AGD_PRE
Step 6	Personalization	Personalization Agent	AGD_PRE
Step 7	Operational Use	End user	AGD_OPE

Table 12: Subjects identification following life cycle steps
Details for each phase/step are presented in the following paragraphs.

3.3 Phase 1 “Development”

(Step1) The TOE is developed in phase 1. The IC developer develops the integrated circuit, the IC Dedicated Software and the guidance documentation associated with these TOE components.

The TOE includes the LDS V10 application and the Platform.
The LDS and Platform are both developed at IDEMIA R&D sites.
The sites are audited following MSSR last requirements.

(Step2) The TOE developer uses the guidance documentation for the integrated circuit and the guidance documentation for relevant parts of the IC Dedicated Software and develops the IC Embedded Software (operating system), the MRTD application and the guidance documentation associated with these TOE components.

The manufacturing documentation of the IC including the IC Dedicated Software and the Embedded Software in the non-volatile non-programmable memories is securely delivered to the IC manufacturer. The IC Embedded Software in the non-volatile programmable memories, the eMRTD application and the guidance documentation is securely delivered to the Manufacturer.

3.4 Phase 2 “Manufacturing”

(Step3) In a first step the TOE integrated circuit is produced containing the travel document’s chip Dedicated Software and the parts of the travel document’s chip Embedded Software in the non-volatile non-programmable memories (ROM). The IC manufacturer writes the IC Identification Data onto the chip to control the IC as travel document material during the IC manufacturing and the *delivery process to the Manufacturer. The IC is securely delivered from the IC manufacture to the Manufacturer.* If necessary the IC manufacturer adds the parts of the IC Embedded Software in the non-volatile programmable memories (for instance EEPROM). The IC manufacturer adds initialization data in EEPROM and keys (MSK, LSK).

The end of step 3 is the TOE delivery.

(Step4) The Manufacturer combines the IC with hardware for the contact based / contactless interface in the travel document unless the travel document consists of the card only.

(Step5) The Manufacturer (i) adds the IC Embedded Software (ii) creates the eMRTD application, and (iii) equips travel document’s chips with pre-personalization Data.

The pre-personalised travel document together with the IC Identifier is securely delivered from the Manufacturer to the Personalization Agent. The Manufacturer also provides the relevant parts of the guidance documentation to the Personalization Agent.

3.5 Phase 3 “Personalization of the travel document”

(Step6) The personalization of the travel document includes:
the survey of the travel document holder’s biographical data,
(ii) the enrolment of the travel document holder biometric reference data (i.e. the digitized portraits and the optional biometric reference data),
(iii) the personalization of the visual readable data onto the physical part of the travel document,
(iv) the writing of the TOE User Data and TSF Data into the logical travel document and
(v) configuration of the TSF if necessary.

The step (iv) is performed by the Personalization Agent and includes but is not limited to the creation of

(i) the digital MRZ data (EF.DG1),
(ii) the digitized portrait (EF.DG2), and
(iii) the Document security object. The signing of the Document security object by the Document signer finalizes the personalization of the genuine travel document for the travel document holder. The personalised travel document (together with appropriate guidance for TOE use if necessary) is handed over to the travel document holder for operational use.

3.5.1 Loading of application

The platform can host 2 kinds of applications: Evaluated sensitive applications and validated basic applications. Once the application is evaluated or validated, it is securely delivered to manufacturing site. This delivery ensures the integrity and confidentiality of the application code and data. Then applications code and data are securely stored.

The delivery, storage and loading of any application are covered by audited Organisational measures (ALC).

Applications can be loaded at pre issuance at step 5 or at step 6 or in post issuance.

3.5.2 Applet pre-personalisation (phase 6)

This phase is performed by the Personalisation Agent, which controls the TOE. During this phase, the Java Card applet is prepared as required by P.TOE_Construction.

All along this phase, the TOE is self-protected as it requires the authentication of the Personalisation Agent prior to any operation.

3.5.3 TOE personalisation (phase 6)

This phase is performed by the Personalisation Agent, which controls the TOE, which is in charge of the Java Card applet personalisation.

All along this phase, the TOE is self-protected as it requires the authentication of the Personalisation Agent prior to any operation.

This phase may not necessarily take place in a manufacturing site, but may be performed anywhere. The Personalisation Agent is responsible for ensuring a sufficient level of security during this phase. The Java Card applet is personalized according to guidance document [57].

At the end of phase 6, the TOE is constructed.

3.6 Phase 4 “Operational Use”

(Step7) The TOE is used as a travel document's chip by the traveller and the inspection systems in the “Operational Use” phase. The user data can be read according to the security policy of the issuing State or Organisation and can be used according to the security policy of the issuing State but they can never be modified.

Note that the personalization process and its environment may depend on specific security needs of an issuing State or Organisation. All production, generation and installation procedures after TOE delivery up to the “Operational Use” (phase 4) have to be considered in the product evaluation process under AGD assurance class. Therefore, the Security Target has to outline the split up of P.Manufact, P.Personalization and the related security objectives into aspects relevant before vs. after TOE delivery. Some production steps, e.g. Step 4 in Phase 2 may also take place in the Phase 3.

3.7 TOE Life Cycle when the Application code is loaded in E2prom

This chapter presents when the application is loaded in E2prom, case b.

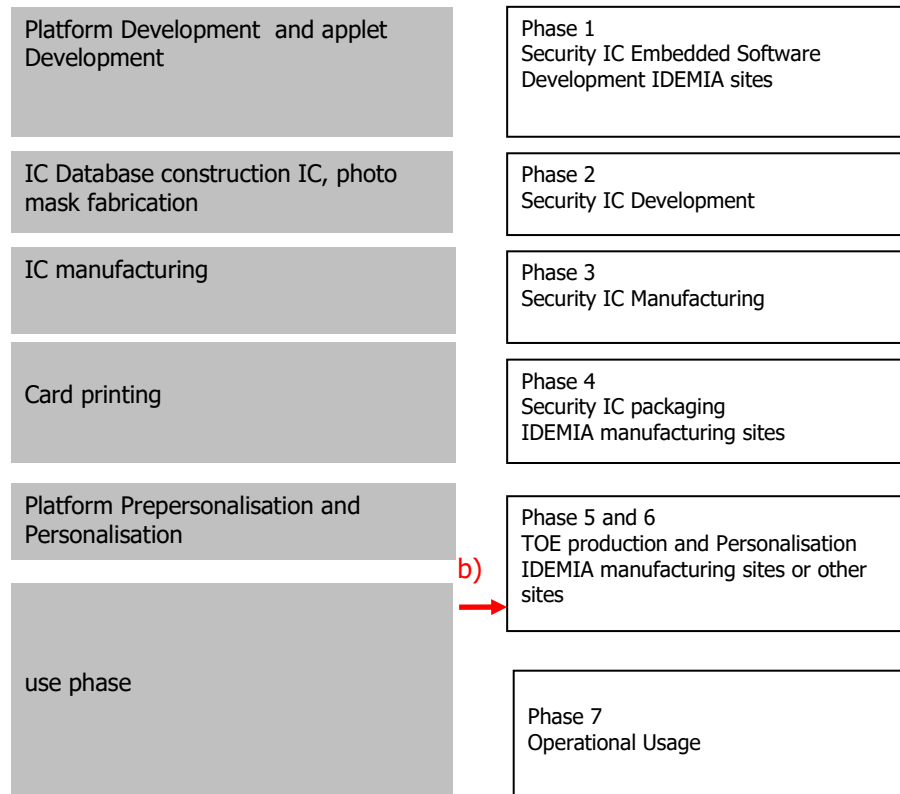


Figure 4: Smartcard product life-cycle for the TOE when the application is loaded in E2prom.

When the LDS application is loaded on the Platform at Phase 5; the entity responsible of the loading is the manufacturer:

- The Manufacturer (phase 5) loads the LDS application code (ii) creates the eMRTD application, and (iii) equips travel document's chips with pre-personalization Data.
- The pre-personalised travel document together with the IC Identifier is securely delivered from the Manufacturer to the Personalization Agent. The Manufacturer also provides the relevant parts of the guidance documentation to the Personalization Agent (AGD_PRE).

When the LDS application is loaded on the Platform at Phase 6; the entity responsible of the loading is the Personalization Agent:

- The Personalization Agent (phase 6) loads the LDS application code (ii) creates the eMRTD application, and (iii) equips travel document's chips with pre-personalization Data.
- The MRTD is also personalized, in this step, as defined in the chapter 3.5.3.
- The personalization phase can also occur in phase 7, by the Issuer.

When the LDS application is loaded on the Platform at Phase 7; the entity responsible of the loading is the issuer, the Prepersonalization and the personalisation of the MRTD is under the Issuer responsibility. All required information is securely given (application code and AGD_PRE and

AGD_OPE). The loading follows Platform requirements as defined in the COSMO V8.1-N Application Loading Protection Guidance [55].

Step	Possible operations	Required document form the platform	Required document form the application
Step 5	MRD Manufacturer (Prepersonalizer) Loading and Prepersonalization	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60]
Step 6	Loading and Prepersonalization and personalisation	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60]
Step 7	Loading and Prepersonalization and personalisation	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60] User Manual [61]

Table 13: Required inputs for each case

SFR from the PP	Dispatch in the ST
FCS_COP.1/SIG_VER	FCS_COP.1/TA_SIG_VER_ECC FCS_COP.1/TA_SIG_VER_RSA
FCS_COP.1/CA_MAC	FCS_COP.1/CA_MAC_SM_3DES FCS_COP.1/CA_MAC_SM_AES
FIA_UID.1/PACE	FIA_UID.1/PACE FIA_UID.1/CA
FIA_UAU.1/PACE	FIA_UAU.1/PACE FIA_UAU.1/EAC
FIA_UAU.4/PACE	FIA_UAU.4/PACE FIA_UAU.4/TA
FIA_UAU.5/PACE	FIA_UAU.5/PACE FIA_UAU.5/EAC FIA_UAU.5/CA_3DES FIA_UAU.5/CA_AES
FIA_UAU.6/EAC	FIA_UAU.6/EAC FIA_UAU.6/CA
FIA_API.1	FIA_API.1/CA
FDP_ACC.1/TRM	FDP_ACC.1/TRM
FDP_ACF.1/TRM	FDP_ACF.1/PACE_EAC
FMT_SMR.1/PACE	FMT_SMR.1/TA FMT_SMR.1/PACE
FMT_LIM.1	FMT_LIM.1/Global FMT_LIM.1/EAC
FMT_LIM.2	FMT_LIM.2/Global FMT_LIM.2/EAC
FMT_MTD.1/CVCA_INI	FMT_MTD.1/TA_CVCA_INI
FMT_MTD.1/CVCA_UPD	FMT_MTD.1/TA_CVCA_UPD
FMT_MTD.1/DATE	FMT_MTD.1/TA_DATE
FMT_MTD.1/CAPK	FMT_MTD.1/CA_KEY_WRITE
FMT_MTD.1/KEY_READ	FMT_MTD.1/CA_KEY_READ FMT_MTD.1/PACE_KEY_READ
FMT_MTD.3	FMT_MTD.3/EAC
FPT_EMS.1	FPT_EMS.1/Global FPT_EMS.1/CA FPT_EMS.1/PACE FPT_EMS.1/AA
SFR from the PP 0068 v2	
FAU_SAS.1	FAU_SAS.1
FCS_CKM.1/DH_PACE	FCS_CKM.1/ECDH_PACE_AES FCS_CKM.1/ECDH_PACE_3DES
FCS_CKM.4	FCS_CKM.4/Global
FCS_COP.1/PACE_ENC	FCS_COP.1/PACE_ENC_3DES FCS_COP.1/PACE_ENC_AES
FCS_COP.1/PACE_MAC	FCS_COP.1/PACE_MAC_AES FCS_COP.1/PACE_MAC_3DES
FCS_RND.1	FCS_RND.1/Global
FIA_AFL.1/PACE	FIA_AFL.1/PACE
FIA_UAU.6/PACE	FIA_UAU.6/PACE
FDP_RIP.1	FDP_RIP.1
FDP_UCT.1/TRM	FDP_UCT.1/TRM
FDP_UIT.1/TRM	FDP_UIT.1/TRM
FMT_SMF.1	FMT_SMF.1
FMT_MTD.1/INI_ENA	FMT_MTD.1/INI_ENA
FMT_MTD.1/INI_DIS	FMT_MTD.1/INI_DIS
FMT_MTD.1/PA	FMT_MTD.1/PA
FPT_TST.1	FPT_TST.1/Global FPT_TST.1/CA FPT_TST.1/TA FPT_TST.1/PACE
FPT_FLS.1	FPT_FLS.1/Global
FPT_PHP.3	FPT_PHP.3.1/Global
FPT_ITC.1/PACE	FPT_ITC.1/PACE

Table 15: PPs SFR

4.3.2 Overview of the SFR defined in this ST

Notation:

For optimisation and ease read, all the SFR presented in chapter Security Functional Requirements have extensions as presented here:

SFR (**/Global**) that are global to the product (shared between the various TOE)

SFR (**/AA**) that are dedicated for Active Authentication

SFR (**/CA**) that are dedicated for Chip Authentication

SFR (**/TA**) that are dedicated for Terminal Authentication

SFR (**/EAC**) that are dedicated for Extended Access Control

SFR (**/PACE**) that are dedicated for Password Authenticated Connection Establishment

SFR (**/PACE_CAM**) that are dedicated for Password Authenticated Connection Establishment with Chip Authentication Mapping

Additional SFRs:

SFR (**/SM_LVL**) Dedicated to SM level

SFR (**/BAC_EXP**) dedicated to BAC deactivation

SFR (**/UPD_FILE**) Dedicated to update some data.

4.3.3 Complete overview of the SFR

From the PP, the following table lists the SFR defined in the ST with the generic notation.

SFR from the PP
FCS_CKM.1/CA;FCS_COP.1/SHA; FCS_COP.1/CA_ENC; FCS_COP.1/SIG_VER; FCS_COP.1/CA_MAC; FIA_UID.1/PACE; FIA_UAU.1/PACE; FIA_UAU.4/PACE; FIA_UAU.5/PACE; FIA_UAU.6/EAC; FIA_API.1; FDP_ACC.1/TRM; FDP_ACF.1/TRM; FMT_SMR.1/PACE; FMT_LIM.1; FMT_LIM.2; FMT_MTD.1/CVCA_INI; FMT_MTD.1/CVCA_UPD; FMT_MTD.1/DATE; FMT_MTD.1/CAPK; FMT_MTD.1/KEY_READ; FMT_MTD.3; FPT_EMS.1

Table 16: SFR from the PP 0056 v2

SFR from the PP
FAU_SAS.1; FCS_CKM.1/DH_PACE ; FCS_CKM.4; FCS_COP.1/PACE_ENC ; FCS_COP.1/PACE_MAC; FCS_RND.1; FIA_AFL.1/PACE; FIA_UAU.6/PACE; FDP_RIP.1 ; FDP_UCT.1/TRM; FDP_UIT.1/TRM; FMT_SMF.1; FMT_MTD.1/INI_ENA; FMT_MTD.1/INI_DIS; FMT_MTD.1/PA; FPT_TST.1; FPT_FLS.1; FPT_PHP.3; FTP_ITC.1/PACE

Table 17: SFR driven from the PP 0068 v2 (required for the compliance to PP 0056 v2)

The following table presents the additional SFRs and express its functionality.

Section	Additional SFR
Active Authentication	FCS_COP.1/AA ; FDP_DAU.1/AA ; FDP_ITC.1/AA ; FMT_MTD.1/AA_KEY_READ ; FMT_MOF.1/AA ; FMT_MTD.1/AA_KEY_WRITE
PACE-CAM	FIA_UAU.1/PACE_CAM; FIA_UAU.4/PACE_CAM; FIA_UAU.5/PACE_CAM; FIA_UAU.6/PACE_CAM; FIA_UID.1/PACE_CAM; FMT_MTD.1/CA_KEY_WRITE

Section	Additional SFR
Additional fonctionnalité	FMT_MTD.1/SM_LVL, FDP_ACC.1/UPD_FILE, FDP_ACF.1/UPD_FILE, FMT_MTD.1/UPD_FILE, FMT_MOF.1/BAC_EXP, FMT_MTD.1/BAC_EXP, FMT_SMF.1/BAC_EXP

Table 18: additional SFR

The following table presents Global SFR overview:

Global SFR	Additional?	ST generic notation
FCS_CKM.4/Global	No	FCS_CKM.4
FCS_RND.1/Global	No	FCS_RND.1
FMT_LIM.1/Global	No	FMT_LIM.1
FMT_LIM.2/Global	No	FMT_LIM.2
FPT_EMS.1/Global	No	FPT_EMS.1
FPT_FLS.1/Global	No	FPT_FLS.1
FPT_TST.1/Global	No	FPT_TST.1
FPT_PHP.3/Global	No	FPT_PHP.3

Table 19: Global SFR overview

The following table presents the dedicated SFRs for Active Authentication (AA)

Active Auth. SFR	Additional?	ST generic notation
FCS_COP.1/AA_DSA FCS_COP.1/AA_ECDSA	Yes	FCS_COP.1/AA
FDP_DAU.1/AA	Yes	FDP_DAU.1/AA
FDP_ITC.1/AA	Yes	FDP_ITC.1/AA
FMT_MTD.1/AA_KEY_READ	Yes	FMT_MTD.1/AA_KEY_READ
FPT_EMS.1/AA	No	FPT_EMS.1
FMT_MOF.1/AA	Yes	FMT_MOF.1/AA
FMT_MTD.1/AA_KEY_WRITE	Yes	FMT_MTD.1/AA_KEY_WRITE

Table 20: Additional SFR for the Active Authentication

CA SFR overview

CA SFR	Additional?	ST generic notation
FIA_API.1/CA	No	FIA_API.1
FCS_CKM.1/CA_DH_SM_3DES FCS_CKM.1/CA_ECDH_SM_3DES FCS_CKM.1/CA_DH_SM_AES FCS_CKM.1/CA_ECDH_SM_AES	No	FCS_CKM.1
FCS_COP.1/CA_SHA_SM_3DES FCS_COP.1/CA_SHA_SM_AES	No	FCS_COP.1/SHA
FCS_COP.1/CA_SYM_SM_3DES FCS_COP.1/CA_SYM_SM_AES	No	FCS_COP.1/CA_ENC
FCS_COP.1/CA_MAC_SM_3DES FCS_COP.1/CA_MAC_SM_AES	No	FCS_COP.1/CA_MAC

FIA_UAU.5/CA_3DES FIA_UAU.5/CA_AES	No	FIA_UAU.5
FIA_UAU.6/CA	No	FIA_UAU.6
FPT_EMS.1/CA	No	FPT_EMS.1
FPT_TST.1/CA	No	FPT_TST.1
FMT_MTD.1/CA_KEY_WRITE	No	FMT_MTD.1/CAPK
FMT_MTD.1/CA_KEY_READ	No	FMT_MTD.1/KEY_READ

Table 21: CA SFR overview

TA SFR overview

TA SFR	Additional?	ST generic notation
FCS_COP.1/TA_SHA_ECC FCS_COP.1/TA_SHA_RSA	No	FCS_COP.1/SHA
FCS_COP.1/TA_SIG_VER_ECC FCS_COP.1/TA_SIG_VER_RSA	No	FCS_COP.1/SIG_VER
FIA_UAU.4/TA	No	FIA_UAU.4/PACE
FMT_MTD.1/TA_CVCA_UPD	No	FMT_MTD.1/CVCA_UPD
FMT_MTD.1/TA_CVCA_DATE	No	FMT_MTD.1/DATE
FPT_TST.1/TA	No	FPT_TST.1
FMT_SMR.1/TA	No	FMT_SMR.1/PACE
FMT_MTD.1/TA_CVCA_INI	No	FMT_MTD.1/CVCA_INI

Table 22: TA SFR overview

EAC SFR overview

EAC SFR	Additional?	ST generic notation
FMT_MTD.3/EAC	No	FMT_MTD.3/EAC
FIA_UAU.5/EAC	No	FIA_UAU.5/EAC
FMT_LIM.1/EAC	No	FMT_LIM.1/EAC
FMT_LIM.2/EAC	No	FMT_LIM.2/EAC
FIA_UID.1/EAC	No	FIA_UID.1/PACE
FIA_UAU.1/EAC	No	FIA_UAU.1/PACE

Table 23: EAC SFR overview

PACE SFR overview

PACE SFR	Additional ?	ST generic notation
FCS_CKM.1/ECDH_PACE_AES FCS_CKM.1/ECDH_PACE_AES	No	FCS_CKM.1/DH_PACE
FCS_COP.1/PACE_ENC_AES FCS_COP.1/PACE_ENC_3DES	No	FCS_COP.1/PACE_ENC
FCS_COP.1/PACE_MAC_AES FCS_COP.1/PACE_MAC_3DES	No	FCS_COP.1/PACE_MAC
FDP_ACC.1/TRM	No	FDP_ACC.1/TRM

4.3.4 Overview of the additional protocols

4.3.4.1 Active Authentication

The additional functionality of Active Authentication (AA) is based on the ICAO PKI V1.1 and the related on-card generation of RSA and ECC keys.

It implies the following addition to the standard PP:

Additional Objective: **§ 6.1.2 SO for AA**

Additional OE: **§ 6.2.3 OE for AA**

Additional Assumptions: **§ 5.4.3 for AA**

4.3.4.2 PACE CAM

The additional functionality of Password Authenticated Connection Establishment with Chip Authentication Mapping (PACE CAM) has been added to the TOE.

It possesses the same security requirements than the PACE functionality, that means that the same SPD applies to the PACE CAM.

Additional SFR has been defined for defining the PACE CAM security functional requirements.

4.3.4.3 Pre-personalization phase

The pre-personalization phase has been reinforced in this Security Target, with the following elements.

This functionality is usable in phase 5 and phase 6. Once the product is locked, stated as personalized, it is no more possible to perform this operation.

4.3.5 Rationale for the additions

In order to be compliant with the CEM, a rationale is given for the additional Objectives on the Environment, such as to demonstrate that they neither mitigates a threat nor fulfil an OSP.

4.3.5.1 OE for AA rationale

The objectives **OE.Exam_MRTD_AA**, **OE.Prot_Logical_MRTD_AA**, **OE.Activ_Auth_Verif** and **OE.Activ_Auth_Sign** define additional requirements on the operational environment for the Active Authentication Protocol which is not in the original scope of the [49]. This OE is only linked to threat and OSP for the Active Authentication and has no links with those of the PP.

4.3.5.2 Assumption for AA rationale

The **A.Insp_Sys_AA** is added, this assumption is only linked to Active Authentication mechanism as the Inspection System has to implement the mechanism and shall verify the authenticity of the MRTD's chip during inspection using the signature returned by the TOE during Active Authentication.

5 Security Problem Definition

5.1 Subjects

The Subjects are taken from the PP EAC with PACE, which requires to include also some Subjects described in the PP PACE.

5.1.1 PP EAC with PACE

Country Verifying Certification Authority (CVCA)

The Country Verifying Certification Authority (CVCA) enforces the privacy policy of the issuing State or Organization with respect to the protection of sensitive biometric reference data stored in the MRTD. The CVCA represents the country specific root of the PKI of Inspection Systems and creates the Document Verifier Certificates within this PKI. The updates of the public key of the CVCA are distributed in the form of Country Verifying CA Link-Certificates.

Document Verifier

The Document Verifier (DV) enforces the privacy policy of the receiving State with respect to the protection of sensitive biometric reference data to be handled by the Extended Inspection Systems. The Document Verifier manages the authorization of the Extended Inspection Systems for the sensitive data of the MRTD in the limits provided by the issuing States or Organizations in the form of the Document Verifier Certificates.

Terminal

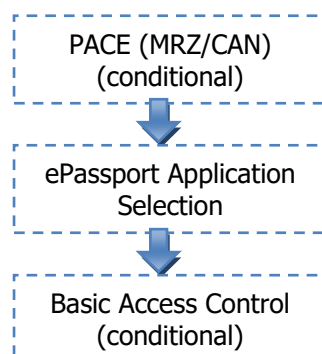
A terminal is any technical system communicating with the TOE either through the contact interface or through the contactless interface.

Inspection System (IS)

A technical system used by the border control officer of the receiving State (i) examining an MRTD presented by the traveller and verifying its authenticity and (ii) verifying the traveller as MRTD holder. The **Extended Inspection System** (EIS) performs the Advanced Inspection Procedure and therefore (i) contains a terminal for the communication with the travel document's chip, (ii) implements the terminals part of PACE and/or BAC; (iii) gets the authorization to read the logical travel document either under PACE or BAC by optical reading the travel document providing this information. (iv) implements the Terminal Authentication and Chip Authentication Protocols both according to [5] and (v) is authorized by the issuing State or Organisation through the Document Verifier of the receiving State to read the sensitive biometric reference data. Security attributes of the EIS are defined by means of the Inspection System Certificates. BAC may only be used if supported by the TOE. If both PACE and BAC are supported by the TOE and the BIS, PACE must be used.

Application note:

For definition of **Basic Inspection System** (BIS) resp. Basic Inspection System with PACE (BIS-PACE) see PACE PP.



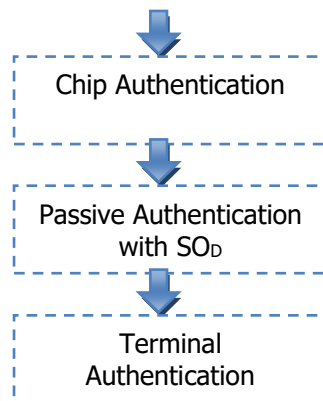


Figure 5: Advanced Inspection Procedure

Attacker

Additionally to the definition from PACE PP, chap 3.1 the definition of an attacker is refined as followed: A threat agent trying (i) to manipulate the logical travel document without authorization, (ii) to read sensitive biometric reference data (i.e. EF.DG3, EF.DG4), (iii) to forge a genuine travel document, or (iv) to trace a travel document.

Application Note:

An impostor is attacking the inspection system as TOE IT environment independent on using a genuine, counterfeit or forged travel document. Therefore the impostor may use results of successful attacks against the TOE but the attack itself is not relevant for the TOE.

5.1.2 PP PACE

Travel document holder (MRTD holder)

A person for whom the travel document Issuer has personalised the travel document. This entity is commensurate with 'MRTD Holder' in [47]. Please note that a travel document holder can also be an attacker.

Travel document presenter (Traveler)

A person presenting the travel document to a terminal and claiming the identity of the travel document holder. This external entity is commensurate with 'Traveller' in [47]. Please note that a travel document presenter can also be an attacker (s. below).

Terminal

A terminal is any technical system communicating with the TOE through the contactless/contact interface. The role 'Terminal' is the default role for any terminal being recognised by the TOE as not being PACE authenticated ('Terminal' is used by the travel document presenter). This entity is commensurate with 'Terminal' in [47].

Basic Inspection System with PACE (BIS-PACE)

A technical system being used by an inspecting authority and verifying the travel document presenter as the travel document holder (for ePassport: by comparing the real biometric data (face) of the travel document presenter with the stored biometric data (DG2) of the travel document holder). BIS-PACE implements the terminal's part of the PACE protocol and authenticates itself to the travel document using a shared password (PACE password) and supports Passive Authentication.

Document Signer (DS)

An organisation enforcing the policy of the CSCA and signing the Document Security Object stored on the travel document for passive authentication. A Document Signer is authorised by the national CSCA issuing the Document Signer Certificate (CDS), see [43]. This role is usually delegated to a Personalisation Agent.

Country Signing Certification Authority (CSCA)

An organisation enforcing the policy of the travel document Issuer with respect to confirming correctness of user and TSF data stored in the travel document. The CSCA represents the country specific root of the PKI for the travel document and creates the Document Signer Certificates within this PKI.

The CSCA also issues the self-signed CSCA Certificate (C_{CSCA}) having to be distributed by strictly secure diplomatic means, see [43].

Personalisation Agent

An organisation acting on behalf of the travel document Issuer to personalise the travel document for the travel document holder by some or all of the following activities:

- (i) Establishing the identity of the travel document holder for the biographic data in the travel document
- (ii) Enrolling the biometric reference data of the travel document holder
- (iii) Writing a subset of these data on the physical travel document (optical personalisation) and storing them in the travel document (electronic personalisation) for the travel document holder as defined in [43]
- (iv) Writing the document details data
- (v) Writing the initial TSF data
- (vi) Signing the Document Security Object defined in [43] (in the role of DS).

Please note that the role 'Personalisation Agent' may be distributed among several institutions according to the operational policy of the travel document Issuer.

This entity is commensurate with 'Personalisation agent' in [47].

Application Note

Personalization Agent is referred as the Personalizer in the Security Target

Manufacturer

Generic term for the IC Manufacturer producing integrated circuit and the travel document Manufacturer completing the IC to the travel document. The Manufacturer is the default user of the TOE during the manufacturing life cycle phase. The TOE itself does not distinguish between the IC Manufacturer and travel document Manufacturer using this role Manufacturer.

This entity is commensurate with 'Manufacturer' in [47].

Attacker

A threat agent (a person or a process acting on his behalf) trying to undermine the security policy defined by the current PP, especially to change properties of the assets having to be maintained. The attacker is assumed to possess an at most high attack potential.

Please note that the attacker might 'capture' any subject role recognised by the TOE.

This external entity is commensurate with 'Attacker' in [47].

5.2 Assets

5.2.1 User data

The assets to be protected by the TOE include the User Data on the travel document's chip, user data transferred between the TOE and the terminal, and travel document tracing data from the claimed PACE PP [50], chap 3.1.

Logical travel document sensitive User Data

Sensitive biometric reference data (EF.DG3, EF.DG4)

Authenticity of the travel document's chip

The authenticity of the travel document's chip personalised by the issuing State or Organisation for the travel document holder is used by the traveller to prove his possession of a genuine travel document.

Due to strict conformance to PACE PP, this ST also includes all assets listed in [50], chap 3.1, namely the primary assets user data stored on the TOE (object 1), user data transferred between the TOE and the terminal connected (object 2), travel document tracing data (object 3), and the secondary assets accessibility to the TOE functions and data only for authorised subjects (object 4) Genuineness of the TOE (object 5), TOE intrinsic secret cryptographic keys (object 6), TOE intrinsic non secret cryptographic material (object 7), and travel document communication establishment authorisation data (object 8).

They are refined here below for the present TOE.

User data stored on the TOE

All data (being not authentication data) stored in the context of the eMRTD application of the travel document as defined in [43] and being allowed to be read out solely by an authenticated terminal acting as Basic Inspection System with PACE (in the sense of [43]), i.e. for the current TOE:

User Data	Description
CPLC Data	Data uniquely identifying the chip. They are considered as user data as they enable to track the holder
Sensitive biometric reference data (EF.DG3, EF.DG4)	Contain the fingerprint and the iris picture
Chip Authentication Public Key and attributes in EF.DG14	Contain public data enabling to authenticate the chip thanks to a chip authentication
Active Authentication Public Key and attributes in EF.DG15	Contain public data enabling to authenticate the chip thanks to an active authentication

Table 27 User data stored on the TOE

Property to be maintained by the current security policy: Confidentiality, Integrity and Authenticity.

Though not each data element stored on the TOE represents a secret, the specification [53] anyway requires securing their confidentiality: only terminals authenticated according to [53] can get access to the user data stored. They have to be operated according to P.Terminal.

User data transferred between the TOE and the terminal connected

All data (being not authentication data) being transferred in the context of the eMRTD application of the travel document as defined in [47] between the TOE and an authenticated terminal acting as Basic Inspection System with PACE (in the sense of [43]).

User data can be received and sent (exchange <--> [receive, send]).

Property to be maintained by the current security policy: Confidentiality, Integrity and Authenticity.

Though not each data element being transferred represents a secret, the specification [53] anyway requires securing their confidentiality: the secure messaging in encrypt-then-authenticate mode is required for all messages according to [53].

Travel document tracing data

Technical information about the current and previous locations of the travel document gathered unnoticeable by the travel document holder recognising the TOE not knowing any PACE password. TOE tracing data can be provided / gathered.

Property to be maintained by the current security policy: Unavailability

Unavailability represents a prerequisite for anonymity of the travel document holder

5.2.2 TSF data

Accessibility to the TOE functions and data only for authorised subjects

Property of the TOE to restrict access to TSF and TSF-data stored in the TOE to authorised subjects only.

TSF data	Description
Personalisation Agent reference authentication Data	Private key enabling to authenticate the Personalisation agent (same as PACE ST)
Password Authenticated Connection Establishment (PACE) Key	Master keys used to established a trusted channel between the Basic Inspection Terminal and the travel document (same as PACE ST)
Session keys for the secure channel	Session keys used to protect the communication in confidentiality and in integrity

Table 28 Accessibility to the TOE functions and data only for authorised subjects

Property to be maintained by the current security policy: Availability.

Genuineness of the TOE

Property of the TOE is to be authentic in order to provide claimed security functionality in a proper way. The authenticity of the MRTD's chip personalised by the issuing State or Organization for the MRTD holder is used by the traveller to prove his possession of a genuine MRTD. This asset also covers "Authenticity of the MRTD's chip" in [47].

TSF data	Description
Chip Authentication private Key	Private key the chip uses to perform a chip authentication
Active Authentication private key	Private key the chip uses to perform an active authentication
Current Date	Current date of the travel document

Table 29: Genuineness of the TOE

Property to be maintained by the current security policy: Availability.

TOE internal secret cryptographic keys

Permanently or temporarily stored secret cryptographic material used by the TOE in order to enforce its security functionality.

TSF data	Description
Personalisation Agent reference authentication Data	Private key enabling to authenticate the Personalisation agent
Password Authenticated Connection Establishment (PACE) Key	Master keys used to established a trusted channel between the Basic Inspection Terminal and the travel document
Chip Authentication private Key	Private key the chip uses to perform a chip authentication
Active Authentication private key	Private key the chip uses to perform an active authentication

TSF data	Description
Session keys for the secure channel	Session keys used to protect the communication in confidentiality and in integrity
MSK	Manufacturer Secret Key used to perform the authentication of the personal agent in pre-personalisation phase

Table 30: TOE internal secret cryptographic keys

Property to be maintained by the current security policy: Confidentiality, Integrity.

TOE internal non-secret cryptographic material

Permanently or temporarily stored non-secret cryptographic (public) keys and other non-secret material (Document Security Object SOD containing digital signature) used by the TOE in order to enforce its security functionality.

TSF data	Description
Life Cycle State	Life Cycle state of the TOE
Public Key CVCA	Trust point of the travel document stored in persistent memory
CVCA Certificate	All the data related to the CVCA key (expiration date, name,..) stored in persistent memory
Current Date	Current date of the travel document

Table 31: TOE internal non-secret cryptographic material

Property to be maintained by the current security policy: Integrity, Authenticity.

Travel Document communication establishment authorisation data

Restricted-revealable authorization information for a human user being used for verification of the authorisation attempts as authorised user (PACE password). These data are stored in the TOE and are not to be send to it.

TSF data	Description
PACE password (MRZ or CAN)	Reference information being persistently stored in the TOE and allowing PACE authentication

Table 32: Travel Document communication establishment authorization data

Property to be maintained by the current security policy: Confidentiality, Integrity.

5.2.3 Threats

This section describes the threats to be averted by the TOE independently or in collaboration with its IT environment. These threats result from the TOE method of use in the operational environment and the assets stored in or protected by the TOE.

The TOE in collaboration with its IT environment shall avert the threats as specified below.

The threats are taken from the PP EAC with PACE, which requires to include also some threats described in the PP PACE.

5.2.3.1 PP EAC with PACE

T.Read_Sensitive_Data

Adverse action

An attacker tries to gain the sensitive biometric reference data through the communication interface of the Travel Document's chip. The attack T.Read_Sensitive_Data is similar to the threat T.Skimming (cf.) in respect of the attack path (communication interface) and the motivation (to get data stored on

the Travel Document's chip) but differs from those in the asset under the attack (sensitive biometric reference data vs. digital MRZ, digitized portrait and other data), the opportunity (i.e. knowing the PACE Password) and therefore the possible attack methods. Note, that the sensitive biometric reference data are stored only on the Travel Document's chip as private sensitive personal data whereas the MRZ data and the portrait are visually readable on the physical Travel Document as well.

Threat agent

Having high attack potential, knowing the PACE Password, being in possession of a legitimate Travel Document.

Asset

Confidentiality of logical Travel Document sensitive user data (i.e. biometric reference).

T.Counterfeit

Adverse action

An attacker with high attack potential produces an unauthorized copy or reproduction of a genuine MRTD's chip to be used as part of a counterfeit MRTD. This violates the authenticity of the MRTD's chip used for authentication of a traveller by possession of a MRTD.

The attacker may generate a new data set or extract completely or partially the data from a genuine MRTD's chip and copy them to another appropriate chip to imitate this genuine MRTD's chip.

Threat agent

Having high attack potential, being in possession of one or more legitimate MRTDs

Asset

Authenticity of user data stored on the TOE

5.2.3.2 PP PACE

T.Skimming

Adverse action

An attacker imitates an inspection system in order to get access to the user data stored on or transferred between the TOE and the inspecting authority connected via the contactless/contact interface of the TOE.

Threat agent

Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.

Asset

Confidentiality of logical travel document data

T.Eavesdropping

Adverse action

An attacker is listening to the communication between the travel document and the PACE authenticated BIS-PACE in order to gain the user data transferred between the TOE and the terminal connected.

Threat agent

Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.

Asset

Confidentiality of logical travel document data

T.Tracing**Adverse action**

An attacker tries to gather TOE tracing data (i.e. to trace the movement of the travel document) unambiguously identifying it remotely by establishing or listening to a communication via the contactless/contact interface of the TOE.

Threat agent

Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.

Asset

Privacy of the travel document holder

T.Abuse-Func**Adverse action**

An attacker may use functions of the TOE which shall not be used in TOE operational phase in order (i) to manipulate or to disclose the User Data stored in the TOE, (ii) to manipulate or to disclose the TSF-data stored in the TOE or (iii) to manipulate (bypass, deactivate or modify) soft-coded security functionality of the TOE. This threat addresses the misuse of the functions for the initialisation and personalisation in the operational phase after delivery to the travel document holder.

Threat agent

having high attack potential, being in possession of one or more legitimate travel documents

Asset

integrity and authenticity of the travel document, availability of the functionality of the travel document.

T.Information_Leakage**Adverse action**

An attacker may exploit information leaking from the TOE during its usage in order to disclose confidential *User Data* or/and *TSF-data stored on the travel document* or/and *exchanged between the TOE and the terminal connected*. The information leakage may be inherent in the normal operation or caused by the attacker.

Threat agent

having high attack potential.

Asset

confidentiality of User Data and TSF-data of the travel document.

Application note: Leakage may occur through emanations, variations in power consumption, I/O characteristics, clock frequency, or by changes in processing time requirements. This leakage may be interpreted as a covert channel transmission, but is more closely related to measurement of operating parameters which may be derived either from measurements of the contactless interface (emanation) or direct measurements (by contact to the chip still available even for a contactless chip) and can then be related to the specific operation being performed. Examples are Differential Electromagnetic Analysis (DEMA) and Differential Power Analysis (DPA). Moreover the attacker may try actively to enforce information leakage by fault injection (e.g. Differential Fault Analysis)..

T.Phys-Tamper**Adverse action**

An attacker may perform physical probing of the travel document in order (i) to disclose the TSF-data, or (ii) to disclose/reconstruct the TOE's Embedded Software. An attacker may physically modify the travel document in order to alter (I) its security functionality (hardware and software part, as well), (ii) the User Data or the TSF-data stored on the travel document.

Threat agent

having high attack potential, being in possession of one or more legitimate travel documents.

Asset

integrity and authenticity of the travel document, availability of the functionality of the travel document, confidentiality of User Data and TSF-data of the travel document.

Application note: Physical tampering may be focused directly on the disclosure or manipulation of the user data (e.g. authentication key of the travel document) or indirectly by preparation of the TOE to following attack methods by modification of security features (e.g. to enable information leakage through power analysis). Physical tampering requires a direct interaction with the travel document's internals. Techniques commonly employed in IC failure analysis and IC reverse engineering efforts may be used. Before that, hardware security mechanisms and layout characteristics need to be identified. Determination of software design including treatment of the user data and the TSF data may also be a pre-requisite. The modification may result in the deactivation of a security function, the biometric reference data for the inspection system) or the TSF data (e.g.

T.Forgery

Adverse action

An attacker fraudulently alters the *User Data* or/and *TSF-data stored on the travel document* or/and *exchanged between the TOE and the terminal connected* in order to outsmart the PACE authenticated BIS-PACE by means of changed travel document holder's related reference data (like biographic or biometric data). The attacker does it in such a way that the terminal connected perceives these modified data as authentic one.

Threat agent

having high attack potential.

Asset

integrity of the travel document.

T.Malfunction

Adverse action

An attacker may cause a malfunction the travel document's hardware and Embedded Software by applying environmental stress in order to (i) deactivate or modify security features or functionality of the TOE' hardware or to (ii) circumvent, deactivate or modify security functions of the TOE's Embedded Software. This may be achieved e.g. by operating the travel document outside the normal operating conditions, exploiting errors in the travel document's Embedded Software or misusing administrative functions. To exploit these vulnerabilities an attacker needs information about the functional operation.

Threat agent

having high attack potential, being in possession of one or more legitimate travel documents, having information about the functional operation.

Asset

integrity and authenticity of the travel document, availability of the functionality of the travel document, confidentiality of User Data and TSF-data of the travel document.

Application note: A malfunction of the TOE may also be caused using a direct interaction with elements on the chip surface. This is considered as being a manipulation (refer to the threat T.PhysTamper) assuming a detailed knowledge about TOE's internals.

5.2.3.3 Additional Threats

T. BAC_breaking "BAC protocol is broken"

Adverse action: An attacker manages to break the BAC protocol using cryptanalysis means and powerful computation capacity leading to threaten (1) the non traceability and (2) confidentiality of data.

The attacker is able to intercept and record a log of BAC transaction during inspection at a border control. Then using computation capacity, he is able to perform reverse engineering over the logs, to break the protocol within a few

minutes or less and get (1) the MRZ value, and (2) the log of plain text exchanged between the MRTD and the inspection system.

This leads the attacker to (1) get the holder information and use it, and (2) trace the holder in real time.

Threat agent: having high attack potential, being able to intercept transaction with MRTDs.

Asset: confidentiality of data read from the MRTD, traceability of the MRTD

T. Forgery_Supplemental_Data "Forgery of supplemental data stored in the TOE"

Adverse action: An attacker alters fraudulently the data stored in files other than EF.DG1 to EF.DG16, EF.COM and EF document security object. This may lead the extended inspection system (EIS) using these data to be deceived.

Threat agent: having high attack potential, being in possession of one or more legitimate MRTDs.

Asset: authenticity of data stored in files other than EF.DG1 to EF.DG16, EF.COM and EF document security object

5.3 Organisational Security Policies

The TOE shall comply with the following Organisational Security Policies (OSP) as security rules, procedures, practices, or guidelines imposed by an organisation upon its operations.

The OSP are taken from the PP EAC with PACE, which requires to include also some OSP described in the PP PACE.

5.3.1 PP EAC with PACE

P.Sensitive_Data

The biometric reference data of finger(s) (EF.DG3) and iris image(s) (EF.DG4) are sensitive private personal data of the MRTD holder. The sensitive biometric reference data can be used only by inspection systems which are authorized for this access at the time the MRTD is presented to the inspection system (Extended Inspection Systems). The issuing State or Organization authorizes the Document Verifiers of the receiving States to manage the authorization of inspection systems within the limits defined by the Document Verifier Certificate. The MRTD's chip shall protect the confidentiality and integrity of the sensitive private personal data even during transmission to the Extended Inspection System after Chip Authentication.

P.Personalization

The issuing State or Organization guarantees the correctness of the biographical data, the printed portrait and the digitized portrait, the biometric reference data and other data of the logical MRTD with respect to the MRTD holder. The personalization of the MRTD for the holder is performed by an agent authorized by the issuing State or Organization only.

5.3.2 PP PACE

P.Pre-Operational

1) The travel document Issuer issues the travel document and approves it using the terminals complying with all applicable laws and regulations.

- 2) The travel document Issuer guarantees correctness of the user data (amongst other of those, concerning the travel document holder) and of the TSF-data permanently stored in the TOE.
- 3) The travel document Issuer uses only such TOE's technical components (IC) which enable traceability of the travel documents in their manufacturing and issuing life cycle phases, i.e. before they are in the operational phase.
- 4) If the travel document Issuer authorises a Personalisation Agent to personalise the travel document for travel document holders, the travel document Issuer has to ensure that the Personalisation Agent acts in accordance with the travel document Issuer's policy.

P.Card_PKI

- 1) The travel document Issuer shall establish a public key infrastructure for the passive authentication, i.e. for digital signature creation and verification for the travel document. For this aim, he runs a Country Signing Certification Authority (CSCA). The travel document Issuer shall publish the CSCA Certificate (CCSCA)
- 2) The CSCA shall securely generate, store and use the CSCA key pair. The CSCA shall keep the CSCA Private Key secret and issue a self-signed CSCA Certificate (CCSCA) having to be made available to the travel document Issuer by strictly secure means, see [53]. The CSCA shall create the Document Signer Certificates for the Document Signer Public Keys (CDS) and make them available to the travel document Issue.
- 3) A Document Signer shall:
 - (i) Generate the Document Signer Key Pair
 - (ii) Hand over the Document Signer Public Key to the CSCA for certification
 - (iii) Keep the Document Signer Private Key secret
 - (iv) Securely use the Document Signer Private Key for signing the Document Security Objects of travel documents.

P.Trustworthy_PKI

The CSCA shall ensure that it issues its certificates exclusively to the rightful organisations (DS) and DSs shall ensure that they sign exclusively correct Document Security Objects to be stored on the travel document.

P.Manufact

The Initialization Data are written by the IC Manufacturer to identify the IC uniquely. The MRTD Manufacturer writes the Pre-personalization Data which contains at least the Personalization Agent Key.

P.Terminal

The Basic Inspection Systems with PACE (BIS-PACE) shall operate their terminals as follows:

- 1) The related terminals shall be used by terminal operators and by travel document holders
- 2) They shall implement the terminal parts of the PACE protocol [53], of the Passive Authentication [43] and use them in this order. The PACE terminal shall use randomly and (almost) uniformly selected nonces, if required by the protocols (for generating ephemeral keys for Diffie-Hellmann)
- 3) The related terminals need not to use any own credentials

4) They shall also store the Country Signing Public Key and the Document Signer Public Key (in form of *C_{CS}* and *C_{DS}*) in order to enable and to perform Passive Authentication (determination of the authenticity of data groups stored in the travel document, [43])

5) The related terminals and their environment shall ensure confidentiality and integrity of respective data handled by them (e.g. confidentiality of PACE passwords, integrity of PKI certificates, etc.), where it is necessary for a secure operation of the TOE

5.3.3 AA

P.Activ_Auth

The terminal implements the Active Authentication protocol as described in [43].

5.4 Assumptions

The assumptions describe the security aspects of the environment in which the TOE will be used or is intended to be used.

The Assumptions are taken from the PP EAC with PACE, which requires to include also some Assumptions described in the PP PACE.

5.4.1 PP EAC with PACE

A.Insp_Sys

The Extended Inspection System (EIS) for global interoperability:

- (i) Includes the Country Signing CA Public Key
- (ii) Implements the terminal part of PACE [53] and/or BAC [47]

BAC may only be used if supported by the TOE. If both PACE and BAC are supported by the TOE and the IS, PACE must be used. The EIS reads the logical travel document under PACE or BAC and performs the Chip Authentication v.1 to verify the logical travel document and establishes secure messaging. EIS supports the Terminal Authentication Protocol v.1 in order to ensure access control and is authorized by the issuing State or Organisation through the Document Verifier of the receiving State to read the sensitive biometric reference data.

A.Auth_PKI

The issuing and receiving States or Organisations establish a public key infrastructure for card verifiable certificates of the Extended Access Control. The Country Verifying Certification Authorities, the Document Verifier and Extended Inspection Systems hold authentication key pairs and certificates for their public keys encoding the access control rights. The Country Verifying Certification Authorities of the issuing States or Organisations are signing the certificates of the Document Verifier and the Document Verifiers are signing the certificates of the Extended Inspection Systems of the receiving States or Organisations. The issuing States or Organisations distribute the public keys of their Country Verifying Certification Authority to their travel document's chip.

5.4.2 PP PACE

A.Passive_Auth

The issuing and receiving States or Organisations establish a public key infrastructure for passive authentication i.e. digital signature creation and verification for the logical travel document. The issuing State or Organisation runs a Certification Authority (CA) which securely generates, stores and uses the Country Signing CA Key pair. The CA keeps the Country Signing CA Private Key secret and is recommended to distribute the Country Signing CA Public Key to ICAO, all receiving States maintaining its integrity.

The Document Signer

- (i) Generates the Document Signer Key Pair
- (ii) Hands over the Document Signer Public Key to the CA for certification
- (iii) Keeps the Document Signer Private Key secret
- (iv) Uses securely the Document Signer Private Key for signing the Document Security Objects of the travel documents.

The CA creates the Document Signer Certificates for the Document Signer Public Keys that are distributed to the receiving States and Organisations. It is assumed that the Personalisation Agent ensures that the Document Security Object contains only the hash values of genuine user data according to [43].

5.4.3 Assumptions for Active Authentication

A.Insp_Sys_AA

The Inspection System implements the Active Authentication Mechanism. The Inspection System verifies the authenticity of the MRTD's chip during inspection using the signature returned by the TOE during Active Authentication.

6 Security Objectives

This chapter describes the security objectives for the TOE and the security objectives for the TOE environment. The security objectives for the TOE environment are separated into security objectives for the development and production environment and security objectives for the operational environment.

6.1 Security Objectives for the TOE

This section describes the security objectives for the TOE addressing the aspects of identified threats to be countered by the TOE and organizational security policies to be met by the TOE.

The OT are taken from the PP EAC with PACE, which requires to include also some OT described in the PP PACE.

6.1.1 SO from PP EAC with PACE

OT.AC_Pers

The TOE must ensure that the logical MRTD data in EF.DG1 to EF.DG16, the Document security object according to LDS [43] and the TSF data can be written by authorized Personalization Agents only. The logical MRTD data in EF.DG1 to EF.DG16 and the TSF data may be written only during and cannot be changed after its personalization. The Document security object can be updated by authorized Personalization Agents if data in the data groups EF.DG 3 to EF.DG16 are added.

OT.Data_Int

The TOE must ensure integrity of the User Data and the TSF-data stored on it by protecting these data against unauthorised modification (physical manipulation and unauthorised modifying). The TOE must ensure integrity of the User Data and the TSF-data during their exchange between the TOE and the terminal connected (and represented by PACE authenticated BIS-PACE) after the PACE Authentication.

OT.Sens_Data_Conf

The TOE must ensure the confidentiality of the sensitive biometric reference data (EF.DG3 and EF.DG4) by granting read access only to authorized Extended Inspection Systems. The authorization of the inspection system is drawn from the Inspection System Certificate used for the successful authentication and shall be a non-strict subset of the authorization defined in the Document Verifier Certificate in the certificate chain to the Country Verifier Certification Authority of the issuing State or Organization. The TOE must ensure the confidentiality of the logical MRTD data during their transmission to the Extended Inspection System. The confidentiality of the sensitive biometric reference data shall be protected against attacks with high attack potential.

OT.Identification

The TOE must provide means to store IC Identification and Pre-Personalization Data in its nonvolatile memory. The IC Identification Data must provide a unique identification of the IC during Phase 2 "Manufacturing" and Phase 3 "Personalization of the MRTD". The storage of the Pre-Personalization data includes writing of the Personalization Agent Key(s). The storage of the Prepersonalization data includes writing of the Personalization Agent Key(s).

OT.CA_Proof

The TOE must support the General Inspection Systems to verify the identity and authenticity of the MRTD's chip as issued by the identified issuing State or Organization by means of the Chip Authentication. The authenticity proof provided by the MRTD's chip shall be protected against attacks with high attack potential.

OT.Prot_Abuse-Func

After delivery of the TOE to the MRTD Holder, the TOE must prevent the abuse of test and support functions that may be maliciously used to:

- (i) Disclose critical User Data
- (ii) Manipulate critical User Data of the IC Embedded Software
- (iii) Manipulate Soft-coded IC Embedded Software
- (iv) Bypass, deactivate, change or explore security features or functions of the TOE.

Details of the relevant attack scenarios depend, for instance, on the capabilities of the Test Features provided by the IC Dedicated Test Software which are not specified here.

OT.Prot_Inf_Leak

The TOE must provide protection against disclosure of confidential TSF data stored and/or processed in the MRTD's chip:

- By measurement and analysis of the shape and amplitude of signals or the time between events found by measuring signals on the electromagnetic field, power consumption, clock, or I/O lines and
- By forcing a malfunction of the TOE and/or
- By a physical manipulation of the TOE.

OT.Prot_Phys-Tamper

The TOE must provide protection of the confidentiality and integrity of the User Data, the TSF Data, and the MRTD's chip Embedded Software. This includes protection against attacks with enhanced-basic attack potential by means of

- Measuring through galvanic contacts which is direct physical probing on the chips surface except on pads being bonded (using standard tools for measuring voltage and current) or
- Measuring not using galvanic contacts but other types of physical interaction between charges (using tools used in solid-state physics research and IC failure analysis)
- Manipulation of the hardware and its security features, as well as
- Controlled manipulation of memory contents (User Data, TSF Data)

with a prior

- reverse-engineering to understand the design and its properties and functions.

OT.Prot_Malfunction

The TOE must ensure its correct operation. The TOE must prevent its operation outside the normal operating conditions where reliability and secure operation has not been proven or tested. This is to prevent errors. The environmental conditions may include external energy (esp. electromagnetic) fields, voltage (on any contacts), clock frequency, or temperature.

OT.Data_Auth (OT.Data_Authenticity)

The TOE must ensure authenticity of the User Data and the TSF-data stored on it by enabling verification of their authenticity at the terminal-side. The TOE must ensure authenticity of the User Data and the TSF-data during their exchange between the TOE and the terminal connected (and represented by PACE authenticated BIS-PACE) after the PACE Authentication. It shall happen by enabling such a verification at the terminal-side (at receiving by the terminal) and by an active verification by the TOE itself (at receiving by the TOE).

OT.Data_Conf (OT.Data_Confidentiality)

The TOE must ensure confidentiality of the User Data and the TSF-data by granting read access only to the PACE authenticated BIS-PACE connected. The TOE must ensure confidentiality of the User Data and the TSF-data during their exchange between the TOE and the terminal connected after the PACE Authentication.

OT.Tracing

The TOE must prevent gathering TOE tracing data by means of unambiguous identifying the travel document remotely through establishing or listening to a communication via the contactless/contact

interface of the TOE without knowledge of the correct values of shared passwords (PACE passwords) in advance.

6.1.2 SO for AA

OT.AA_Proof

The TOE must support the Inspection Systems to verify the identity and authenticity of MRTD's chip as issued by the identified issuing State or Organization by means of the Active Authentication as defined in [43]. The authenticity proof through AA provided by MRTD's chip shall be protected against attacks with high attack potential.

OT.Data_Int_AA

The TOE must ensure the integrity of the logical MRTD stored on the MRTD's chip against physical manipulation and unauthorized writing. The TOE must ensure the integrity of the logical MRTD data during their transmission to the General Inspection System after Active Authentication.

6.1.3 Additional SO

OT.Update_File "Modification of file in Operational Use Phase"

During Operational Use phase, the TOE must allow the modification of Updatable Data if the write access to these objects is fulfilled by the Terminal.

OT.AC_SM_Level "Access control to sensitive biometric reference data according to SM level"

During Operational Use phase, the TOE must allow read access to sensitive biometric data only if the Secure Messaging level reaches or exceeds the one specified in the biometric data Access Conditions data object.

OT.BAC_Expiration

During Operational Use phase, the TOE must disable the Basic Access Control protocol if the expiry date of this protocol is exceeded.

6.2 Security objectives for the Operational Environment

6.2.1 PP EAC with PACE

OE.Auth_Key_MRTD (OE.Auth_Key_Travel_Document)

The issuing State or Organization has to establish the necessary public key infrastructure in order to:

- (i) Generate the MRTD's Chip Authentication Key Pair
- (ii) Sign and store the Chip Authentication Public Key in the Chip Authentication Public Key data in EF.DG14
- (iii) Support inspection systems of receiving States or organizations to verify the authenticity of the MRTD's chip used for genuine MRTD by certification of the Chip Authentication Public Key by means of the Document Security Object.

OE.Authoriz_Sens_Data

The issuing State or Organization has to establish the necessary public key infrastructure in order to limit the access to sensitive biometric reference data of MRTD's holders to authorized receiving States or Organizations. The Country Verifying Certification Authority of the issuing State or Organization generates card verifiable Document Verifier Certificates for the authorized Document Verifier only.

OE.Exam_MRTD (OE.Exam_Travel_Document)

The inspection system of the receiving State or Organization must examine the MRTD presented by the traveler to verify its authenticity by means of the physical security measures and to detect any manipulation of the physical MRTD. The Basic Inspection System for global interoperability:

- (i) Includes the Country Signing CA Public Key and the Document Signer Public Key of each issuing State or Organization
- (ii) Implements the terminal part of the PACE [53] and/or the Basic Access Control [43].

Extended Inspection Systems perform additionally to these points the Chip Authentication Protocol to verify the Authenticity of the presented travel document's chip.

OE.Prot_Logical_MRTD (OE.Prot_Logical_Travel_Document)

The inspection system of the receiving State or Organization ensures the confidentiality and integrity of the data read from the logical MRTD. The inspection system will prevent eavesdropping to their communication with the TOE before secure messaging is successfully established based on the Chip Authentication Protocol .

OE.Ext_Insp_Systems

The Document Verifier of receiving States or Organizations authorizes Extended Inspection Systems by creation of Inspection System Certificates for access to sensitive biometric reference data of the logical MRTD. The Extended Inspection System authenticates themselves to the MRTD's chip for access to the sensitive biometric reference data with its private Terminal Authentication Key and its Inspection System Certificate.

6.2.2 PP PACE**OE.Legislative_Compliance**

The travel document Issuer must issue the travel document and approve it using the terminals complying with all applicable laws and regulations

OE.Pass_Auth_Sign (OE.Passive_Auth_Sign)

The travel document Issuer has to establish the necessary public key infrastructure as follows: the CSCA acting on behalf and according to the policy of the travel document Issuer must (i) generate a cryptographically secure CSCA Key Pair, (ii) ensure the secrecy of the CSCA Private Key and sign Document Signer Certificates in a secure operational environment, and (iii) publish the Certificate of the CSCA Public Key (CCSCA). Hereby authenticity and integrity of these certificates are being maintained.

A Document Signer acting in accordance with the CSCA policy must:

- (i) generate a cryptographically secure Document Signing Key Pair
- (ii) ensure the secrecy of the Document Signer Private Key
- (iii) hand over the Document Signer Public Key to the CSCA for certification
- (iv) sign Document Security Objects of genuine travel documents in a secure operational environment only. The digital signature in the Document Security Object relates to all hash values for each data group in use according to [43].

The Personalisation Agent has to ensure that the Document Security Object contains only the hash values of genuine user data according to [43]. The CSCA must issue its certificates exclusively to the rightful organisations (DS) and DSs must sign exclusively correct DocumentSecurity Objects to be stored on travel document.

OE.Personalization

The travel document Issuer must ensure that the Personalisation Agents acting on his behalf:

- (i) establish the correct identity of the travel document holder and create the biographical data for the travel document
- (ii) enrol the biometric reference data of the travel document holder

- (iii) write a subset of these data on the physical Passport (optical personalisation) and store them in the travel document (electronic personalisation) for the travel document holder as defined in [43]
- (iv) write the document details data
- (v) write the initial TSF data
- (vi) sign the Document Security Object defined in [43] (in the role of a DS).

OE.Terminal

The terminal operators must operate their terminals as follows:

- 1.) The related terminals (basic inspection systems, cf. above) are used by terminal operators and by travel document holders as defined in [43]
- 2.) The related terminals implement the terminal parts of the PACE protocol [53], of the Passive Authentication [53] (by verification of the signature of the Document Security Object) and use them in this order. The PACE terminal uses randomly and (almost) uniformly selected nonces, if required by the protocols (for generating ephemeral keys for Diffie-Hellmann)
- 3.) The related terminals need not to use any own credentials
- 4.) The related terminals securely store the Country Signing Public Key and the Document Signer Public Key (in form of CCSCA and CDS) in order to enable and to perform Passive Authentication of the travel document (determination of the authenticity of data groups stored in the travel document, [43])
- 5.) The related terminals and their environment must ensure confidentiality and integrity of respective data handled by them (e.g. confidentiality of the PACE passwords, integrity of PKI certificates, etc.), where it is necessary for a secure operation of the TOE according to the current ST

OE.Travel_Document_Holder

The travel document holder may reveal, if necessary, his or her verification values of the PACE password to an authorized person or device who definitely act according to respective regulations and are trustworthy.

6.2.3 OE for AA**OE.Exam_MRTD_AA**

Additionally to the OE.Exam_MRTD, the inspection systems perform the Active Authentication protocol to verify the Authenticity of the presented MRTD's chip.

OE.Prot_Logical_MRTD_AA

Additionally to the OE.Prot_Logical_MRTD, the inspection system prevents eavesdropping to their communication with the TOE before secure messaging is successfully established based on the Active Authentication Protocol.

OE.Activ_Auth_Verif

In addition to the verification by passive authentication, the inspection systems may use the verification by Active Authentication, which offers a stronger guaranty of the authenticity of the MRTD.

OE.Activ_Auth_Sign

The issuing State or Organization has to establish the necessary public key infrastructure in order to (i) generate the MRTD's Active Authentication Key Pair, (ii) ensure the secrecy of the MRTD's Active Authentication Private Key, sign and store the Active Authentication Public Key in the Active Authentication Public Key data in EF.DG15 and (iii) support inspection systems of receiving States or organizations to verify the authenticity of the MRTD's chip used for genuine MRTD by certification of the Active Authentication Public Key by means of the Document Security Object.

7 Extended requirements

7.1 Extended family FAU_SAS - Audit data storage

7.1.1 Extended components FAU_SAS.1

Description: see [47].

FAU_SAS.1 Audit storage

FAU_SAS.1.1 The TSF shall provide [assignment: authorized users] with the capability to store [assignment: list of audit information] in the audit records.

Dependencies: No dependencies.

Rationale: see [47]

7.2 Extended family FCS_RND - Generation of random numbers

7.2.1 Extended component FCS_RND.1

Description: see [47]

FCS_RND.1 Quality metric for random numbers

FCS_RND.1.1 The TSF shall provide a mechanism to generate random numbers that meet [assignment: a defined quality metric].

Dependencies: No dependencies.

Rationale: See [47]

7.3 Extended family FIA_API – Authentication proof of identity

7.3.1 Extended component FIA_API.1

Description: see [48]

FIA_API.1 Quality metric for random numbers

FIA_API.1.1 The TSF shall provide a [assignment: authentication mechanism] to prove the identity of the [assignment: authorized user or role].

Dependencies: No dependencies.

Rationale: See [48]

7.4 Extended family FMT_LIM - Limited capabilities and availability

7.4.1 Extended component FMT_LIM.1

Description: see [47]

FMT_LIM.1 Limited capabilities

FMT_LIM.1.1 The TSF shall be designed in a manner that limits their capabilities so that in conjunction with "Limited availability (FMT_LIM.2)" the following policy is enforced [assignment: Limited capability and availability policy].

Dependencies: (FMT_LIM.2)

Rationale: See [47]

7.4.2 Extended component FMT_LIM.2

Description: See [47]

FMT_LIM.2 Limited availability

FMT_LIM.2.1 The TSF shall be designed in a manner that limits their availability so that in conjunction with "Limited capabilities (FMT_LIM.1)" the following policy is enforced [assignment: Limited capability and availability policy].

Dependencies: (FMT_LIM.1)

Rationale: See [47]

7.5 Extended family FPT_EMS - TOE Emanation

7.5.1 Extended component FPT_EMS.1

Description: see [47]

FPT_EMS.1 TOE Emanation

FPT_EMS.1.1 The TOE shall not emit [assignment: types of emissions] in excess of [assignment: specified limits] enabling access to [assignment: list of types of TSF data] and [assignment: list of types of user data].

FPT_EMS.1.2 The TSF shall ensure [assignment: type of users] are unable to use the following interface [assignment: type of connection] to gain access to [assignment: list of types of TSF data] and [assignment: list of types of user data].

Dependencies: No dependencies.

Rationale: See [47]

8 Security Requirements

8.1 Security Functional Requirements

This chapter presents the Security Functional Requirements to take into account within the TOE configuration presented in this security target. It is composed of the following elements:

- **Global SFR** that are applicable to all the passports configuration
- **MP SFR** for covering the phase Manufacturing and Personalization described in the Passport Protection Profile.
- **Active Authentication SFR** that cover the Active Authentication Protocol
- **CA SFR** that cover the Chip Authentication Protocol
- **TA SFR** that cover the Terminal Authentication Protocol (note: Terminal Authentication Protocol is only available with the Extended Access Control)
- **EAC SFR** that cover the Extended Access Control (note: EAC protocol is a combination of TA and CA, this chapter only contains SFR that cannot be strictly applied to one or another)
- **PACE SFR** that cover the Password Authenticated Connection Establishment protocol
- **PACE CAM** that cover the Password Authenticated Connection Establishment with Chip Authentication Mapping protocol
- And **Additional SFRs** to cover additional functionalities of the TOE. See chapter 8.1.8.

8.1.1 Global SFR

This chapter covers the common SFR that are shared between the different parts of the embedded application on the product.

FCS_CKM.4/Global Cryptographic key destruction

FCS_CKM.4.1/Global The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method **zeroisation** that meets the following: **none**.

FCS_RND.1/Global Quality metric for random numbers

FCS_RND.1.1/Global The TSF shall provide a mechanism to generate random numbers that meet

1. **Deterministic Hybrid random number as defined in [54]**
2. **The requirement of FIPS SP800-90 [18] for random number generation.**

FMT_LIM.1/Global Limited capabilities

FMT_LIM.1.1/Global The TSF shall be designed in a manner that limits their capabilities so that in conjunction with "Limited availability (FMT_LIM.2)" the following policy is enforced:

Deploying Test Features after TOE Delivery does not allow:

1. **User Data to be manipulated and disclosed,**
2. **TSF data to be disclosed or manipulated,**

3. **Software to be reconstructed,**
4. **Substantial information about construction of TSF to be gathered which may enable other attacks and**
5. **Sensitive User Data (EF.DG3 and EF.DG4) to be disclosed.**

FMT_LIM.2/Global Limited availability

FMT_LIM.2.1/Global The TSF shall be designed in a manner that limits their availability so that in conjunction with "Limited capabilities (FMT_LIM.1)" the following policy is enforced:

Deploying Test Features after TOE Delivery does not allow

1. **User Data to be manipulated and disclosed,**
2. **TSF data to be disclosed or manipulated,**
3. **Software to be reconstructed,**
4. **Substantial information about construction of TSF to be gathered which may enable other attacks and**
5. **Sensitive User Data (EF.DG3 and EF.DG4) to be disclosed.**

FPT_EMS.1/Global TOE Emanation

FPT_EMS.1.1/Global The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to

1. **Chip Authentication Session Keys**
2. **PACE session Keys (PACE-K_{MAC}, PACE-K_{Enc}),**
3. **the ephemeral private key ephem SK_{PICC-PACE},**
4. **Personalization Agent Key(s),**
5. **Chip Authentication Private Key**

FPT_EMS.1.2/Global The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to

1. **Chip Authentication Session Keys**
2. **PACE session Keys (PACE-K_{MAC}, PACE-K_{Enc}),**
3. **the ephemeral private key ephem SK_{PICC-PACE},**
4. **Personalization Agent Key(s),**
5. **Chip Authentication Private Key**

FPT_FLS.1/Global Failure with preservation of secure state

FPT_FLS.1.1/Global The TSF shall preserve a secure state when the following types of failures occur:

1. Exposure to out-of-range operating conditions where therefore a malfunction could occur
2. Failure detected by TSF according to FPT_TST.1.

FPT_TST.1/Global TSF testing

FPT_TST.1.1/Global The TSF shall run a suite of self tests to demonstrate the correct operation of the TSF, at the conditions:

- At reset

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

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

FPT_PHP.3/Global Resistance to physical attack

FPT_PHP.3.1/Global The TSF shall resist **physical manipulation and physical probing** to the TSF by responding automatically such that the SFRs are always enforced.

8.1.2 Active Authentication SFR

FCS_COP.1/AA_DSA Cryptographic operation

FCS_COP.1.1/AA_DSA The TSF shall perform [**cryptographic operation**] in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**cryptographic key sizes**] that meet the following [**standard**]:

Operation	Algorithm	Key length (bits)	Standard
Digital Signature Creation	RSA signature (CRT) with SHA1, 224, 256, 384, 512	1024, 1536 and 2048.	[24]

FCS_COP.1/AA_ECDSA Cryptographic operation

FCS_COP.1.1/AA_ECDSA The TSF shall perform [**cryptographic operation**] in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**cryptographic key sizes**] that meet the following [**standard**]:

Operation	Algo	Key length (bits)	Standard
Digital Signature Creation	ECDSA with SHA1, 224, 256, 384, 512	192 to 512 over prime field curves	[24] [28][29][30]

FDP_DAU.1/AA Basic Data Authentication

FDP_DAU.1.1/AA The TSF shall provide a capability to generate evidence that can be used as a guarantee of the validity of **the TOE itself**.

FDP_DAU.1.2/AA The TSF shall provide **any users** with the ability to verify evidence of the validity of the indicated information.

Refinement:

Evidence generation and ability of verifying it constitute the Active Authentication protocol.

FDP_ITC.1/AA Import of user data without security attributes

FDP_ITC.1.1/AA The TSF shall enforce the **Active Authentication Access Control SFP** when importing user data, controlled under the SFP, from outside of the TOE.

FDP_ITC.1.2/AA The TSF shall ignore any security attributes associated with the user data when imported from outside the TOE.

FDP_ITC.1.3/AA The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: **none**.

FMT_MTD.1/AA_KEY_READ Management of TSF data

FMT_MTD.1.1/AA_KEY_READ The TSF shall restrict the ability to **read** the **AAK** to **none**.

FPT_EMS.1/AA TOE Emanation

FPT_EMS.1.1/AA The TOE shall not emit power variations, timing variations during command execution in excess of non useful information enabling access to

- 1. Active Authentication: Private Key (AAK)**

FPT_EMS.1.2/AA The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to

- 1. Active Authentication: Private Key (AAK)**

FMT_MOF.1/AA Management of security functions behaviour

FMT_MOF.1.1/AA The TSF shall restrict the ability to disable and enable the functions TSF Active Authentication to Personalization Agent.

FMT_MTD.1/AA_KEY_WRITE Management of TSF data

FMT_MTD.1.1/AA_KEY_WRITE The TSF shall restrict the ability to write the AAK to Personalization Agent.

8.1.3 Chip Authentication SFR

FIA_API.1/CA Authentication Proof of Identity

FIA_API.1.1/CA The TSF shall provide a **Chip Authentication protocol according to [45]** prove the identity of the **TOE**.

FCS_CKM.1/CA_DH_SM_3DES Cryptographic key generation

FCS_CKM.1.1/CA_DH_SM_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on the Key Diffie-Hellman key derivation protocol compliant to PKCS#3	112	[39]

FCS_CKM.1/CA_DH_SM_AES Cryptographic key generation

FCS_CKM.1.1/CA_DH_SM_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on the Key Diffie-Hellman key derivation protocol compliant to PKCS#3	128, 192, 256	[28][45]

FCS_CKM.1/CA_ECDH_SM_3DES Cryptographic key generation

FCS_CKM.1.1/CA_ECDH_SM_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on ECDH key derivation protocol compliant to ISO 15946	112	[39]

FCS_CKM.1/CA_ECDH_SM_AES Cryptographic key generation

FCS_CKM.1.1/CA_ECDH_SM_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on ECDH key derivation protocol compliant to ISO 15946	128, 192, 256	[39]

FCS_COP.1/CA_SYM_SM_3DES Cryptographic key generation

FCS_COP.1.1/CA_SYM_SM_3DES The TSF shall perform **SM encryption and decryption** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
3DES CBC mode	112	[45]

FCS_COP.1/CA_SYM_SM_AES Cryptographic key generation

FCS_COP.1.1/CA_SYM_SM_AES The TSF shall perform **SM encryption and decryption** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
AES	128, 192 and 256	[45]

FCS_COP.1/CA_MAC_SM_3DES Cryptographic key generation

FCS_COP.1.1/CA_MAC_SM_3DES The TSF shall perform **SM message authentication code** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
3DES Retail MAC	112	[45]

FCS_COP.1/CA_MAC_SM_AES Cryptographic key generation

FCS_COP.1.1/CA_MAC_SM_AES The TSF shall perform **SM message authentication code** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
AES CMAC	128, 192 and 256	[45]

FIA_UAU.1/EAC Timing of authentication

FIA_UAU.1.1/EAC The TSF shall allow:

1. **To establish the communication channel**
2. **To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS**
3. **To identify themselves by selection of the authentication key**
4. **To carry out the Chip Authentication Protocol**
5. **To carry out the Terminal Authentication Protocol**

on behalf of the user to be performed before the user is authenticated.

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

FIA_UAU.5/CA_3DES Multiple authentication mechanisms

FIA_UAU.5.1/CA_3DES The TSF shall provide

1. **Secure Messaging in MAC-ENC mode**

2. Symmetric Authentication Mechanism based on 3DES to support user authentication.

FIA_UAU.5.2/CA_3DES The TSF shall authenticate any user's claimed identity according to the

- 1. After run of the Chip Authentication Protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with key agreed with the terminal by means of the Chip Authentication Mechanism.**

FIA_UAU.5/CA_AES Multiple authentication mechanisms

FIA_UAU.5.1/CA_AES The TSF shall provide

- 1. Secure Messaging in MAC-ENC mode**
- 2. Symmetric Authentication Mechanism based on AES**

to support user authentication.

FIA_UAU.5.2/CA_AES The TSF shall authenticate any user's claimed identity according to the

- 1. After run of the Chip Authentication Protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with key agreed with the terminal by means of the Chip Authentication Mechanism.**

FIA_UAU.6/CA Re-authenticating

FIA_UAU.6.1/CA The TSF shall re-authenticate the user under the **conditions each command sent to the TOE after successful run of the CA shall be verified as being sent by the inspection system.**

FIA_UID.1/EAC Timing of identification

FIA_UID.1.1/EAC The TSF shall allow

- 1. To establish the communication channel**
- 2. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS**
- 3. To carry out the Chip Authentication Protocol**
- 4. To carry out the Terminal Authentication Protocol**

on behalf of the user to be performed before the user is identified.

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

FPT_EMS.1/CA TOE Emanation

FPT_EMS.1.1/CA The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to

- 1. Chip Authentication: Session Keys, Private Key (CAK)**

FPT_EMS.1.2/CA The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to

- 1. Active Authentication: Session Keys, Private Key (CAK)**

FPT_TST.1/CA TSF testing

FPT_TST.1.1/CA The TSF shall run a suite of self tests to demonstrate the correct operation of **the TSF, at the conditions:**

- **At reset**

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

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

FMT_MTD.1/CA_KEY_WRITE Management of TSF data

FMT_MTD.1.1/CA_KEY_WRITE The TSF shall restrict the ability to **write** the **CAK** to **Personalization Agent.**

FMT_MTD.1/CA_KEY_READ Management of TSF data

FMT_MTD.1.1/CA_KEY_READ The TSF shall restrict the ability to **read** the **CAK** to **none.**

8.1.4 Terminal Authentication SFR

FCS_COP.1/TA_SHA_RSA Cryptographic key generation

FCS_COP.1.1/TA_SHA_RSA The TSF shall perform **hashing** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
SHA1, SHA256 and SHA 512	None	[29]

FCS_COP.1/TA_SHA_SM_ECC Cryptographic key generation

FCS_COP.1.1/TA_SHA_SM_ECC The TSF shall perform **hashing** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
SHA1, SHA224, SHA256, SHA384 and SHA512	None	[29]

FCS_COP.1/TA_SIG_VER_RSA Cryptographic key generation

FCS_COP.1.1/TA_SIG_VER_RSA The TSF shall perform **digital signature verification** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
RSA coupled with SHA	From 1024 to 4096, with a step of 256	[45]

FCS_COP.1/TA_SIG_VER_ECC Cryptographic key generation

FCS_COP.1.1/TA_SIG_VER_ECC The TSF shall perform **digital signature verification** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
ECC coupled with SHA	From 192 to 521	[45]

FIA_UAU.4/TA Single-use authentication mechanisms

FIA_UAU.4.1/TA The TSF shall prevent reuse of authentication data related to

- 1. Terminal Authentication Protocol**

FMT_MTD.1/TA_CVCA_UPD Management of TSF data

FMT_MTD.1.1/TA_CVCA_UPD The TSF shall **restrict** the ability **to update** the

- 1. Country Verifying Certification Authority Public Key**
 - 2. Country Verifying Certification Authority Certificate**
- to **Country Verifying Certification Authority**.

FMT_MTD.1/TA_DATE Management of TSF data

FMT_MTD.1.1/TA_DATE The TSF shall **restrict** the ability **to modify** the **Current Date** to

- 1. Country Verifying Certification Authority**
- 2. Document Verifier**
- 3. Domestic Extended Inspection System**

FPT_TST.1/TA TSF testing

FPT_TST.1.1/TA The TSF shall run a suite of self tests to demonstrate the correct operation of **the TSF**, at the conditions:

- At reset**

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

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

FMT_SMR.1/TA Security roles

FMT_SMR.1.1/TA The TSF shall maintain the roles

- 1. Country Verifying Certification Authority**

2. Document Verifier
3. Domestic Extended Inspection System
4. Foreign Extended Inspection System

FMT_SMR.1.2/TA The TSF shall be able to associate users with roles.

FMT_MTD.1/TA_CVCA_INI Management of TSF data

FMT_MTD.1.1/TA_CVCA_INI The TSF shall **restrict** the ability **to write** the

1. Initial Country Verifying Certification Authority Public Key
2. Initial Country Verifying Certification Authority Certificate
3. Initial Current Date

to the Personalization Agent

8.1.5 Extended Access Control SFR

FMT_MTD.3/EAC Secure TSF data

FMT_MTD.3.1/EAC [Editorially Refined] The TSF shall ensure that only secure values of the **certificate chain** are accepted for **TSF data of the Terminal Authentication Protocol and the Access Control**.

Refinement:

The Certificate chain is valid if and only if:

1. The digital signature of the Inspection System Certificate can be verified as correct with the public key of the Document Verifier Certificate and the expiration date of the Inspection System Certificate is not before the Current Date of the TOE.
2. The digital signature of the Document Verifier Certificate can be verified as correct with the public key in the Certificate of the Country Verifying Certification Authority and the expiration date of the Document Verifier Certificate is not before the Current Date of the TOE.
3. The digital signature of the Certificate of the Country Verifying Certification Authority can be verified as correct with the public key of the Country Verifying Certification Authority known to the TOE and the expiration date of the Certificate of the Country Verifying Certification Authority is not before the Current Date of the TOE.

The Inspection System Public Key contained in the Inspection System Certificate in a valid certificate chain is a secure value for the authentication reference data of the Extended Inspection System.

The intersection of the Certificate Holder Authorizations contained in the certificates of a valid certificate chain is a secure value for Terminal Authorization of a successful authenticated Extended Inspection System.

FIA_UAU.5/EAC Multiple authentication mechanisms

FIA_UAU.5.1/EAC The TSF shall provide

1. Terminal Authentication Protocol
2. Secure messaging in MAC-ENC mode

to support user authentication.

FIA_UAU.5.2/EAC The TSF shall authenticate any user's claimed identity according to the

- 1. The TOE accepts the authentication attempt by means of the Terminal Authentication Protocol only if the terminal uses the public key presented during the Chip Authentication Protocol and the secure messaging established by the Chip Authentication Mechanism.**

FMT_LIM.1/EAC Limited capabilities

FMT_LIM.1.1/EAC The TSF shall be designed in a manner that limits their capabilities so that in conjunction with "Limited availability (FMT_LIM.2)" the following policy is enforced:

Deploying Test Features after TOE Delivery does not allow

- 1. Sensitive User Data (EF.DG3 and EF.DG4) to be disclosed (not available for BAC)**

FMT_LIM.2/EAC Limited availability

FMT_LIM.2.1/EAC The TSF shall be designed in a manner that limits their availability so that in conjunction with "Limited capabilities (FMT_LIM.1)" the following policy is enforced:

Deploying Test Features after TOE Delivery does not allow

- 1. User Data to be disclosed (DG3 and DG4) (not available for BAC)**

8.1.6 PACE SFRs

FCS_CKM.1/ECDH_PACE_3DES Cryptographic key generation

FCS_CKM.1.1/ECDH_PACE_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
ECDH key derivation protocol compliant to ISO 15946	3DES 2 keys	[43]

FCS_CKM.1/ECDH_PACE_AES Cryptographic key generation

FCS_CKM.1.1/ECDH_PACE_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [**cryptographic key generation algorithm**] and specified cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic key generation algorithm	Key length (bits)	Standards
ECDH key derivation protocol compliant to ISO 15946	128, 192 & 256	[43]

FCS_COP.1/PACE_ENC_AES Cryptographic key generation

FCS_COP.1.1/PACE_ENC_AES The TSF shall perform **Secure Messaging – encryption and decryption** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
AES in CBC mode	128, 192 and 256	[53]

FCS_COP.1/PACE_ENC_3DES Cryptographic key generation

FCS_COP.1.1/PACE_ENC_3DES The TSF shall perform **Secure Messaging – encryption and decryption** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
3DES in CBC mode	112	[53]

FCS_COP.1/PACE_MAC_AES Cryptographic key generation

FCS_COP.1.1/PACE_MAC_AES The TSF shall perform **Secure Messaging – Message Authentication Code** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
CMAC AES	128, 192 and 256	[53]

FCS_COP.1/PACE_MAC_3DES Cryptographic key generation

FCS_COP.1.1/PACE_MAC_3DES The TSF shall perform **Secure Messaging – Message Authentication Code** in accordance with a specified cryptographic algorithm [**cryptographic algorithm**] and cryptographic key sizes [**key length**] that meet the following [**standard**]:

Cryptographic algorithm	Key length (bits)	Standards
Retail MAC with 3DES	112	[53]

FDP_ACC.1/TRM Complete access control

FDP_ACC.1.1/TRM The TSF shall enforce the **Access Control SFP** on **terminals gaining access to the User Data and data stored in EF.SOD of the logical travel document and active Authentication private key of the logical MRTD.**

FDP_ACF.1/PACE_EAC Security attribute based access control

FDP_ACF.1.1/PACE_EAC The TSF shall enforce the **Access Control SFP** to objects based on the following

- 1. Subjects:**
 - a. Terminal**
 - b. BIS-PACE**
 - c. Extended Inspection System**
- 2. Objects:**

- a. Data in EF.DG1, EF.DG2 and EF.DG5 to EF.DG16, EF.SOD and EF.COM of the logical MRTD
 - b. Data in EF.DG3 of the logical MRTD
 - c. Data in EF.DG4 of the logical MRTD
 - d. All TOE intrinsic secret cryptographic keys stored in the travel document
3. Security attributes:
- a. PACE Authentication
 - b. Terminal Authentication
 - c. Authorization of the Terminal

FDP_ACF.1.2/PACE The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: **A BIS-PACE is allowed to read data objects from FDP.ACF.1.1/PACE according to [53] after a successful PACE authentication a required by FIA_UAU.1/PACE**

FDP_ACF.1.3/PACE The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: **none**.

FDP_ACF.1.4/PACE The TSF shall explicitly deny access of subjects to objects based on the following additional rules:

1. Any terminal being not authenticated as PACE authenticated BIS-PACE is not allowed to read, to write, to modify, to use any User Data stored on the travel document
2. Terminals not using secure messaging are not allowed to read, to write, to modify, to use any data stored on the travel document
3. Any terminal being not successfully authenticated as Extended Inspection System with the Read access to DG.3 (Fingerprint) granted by the relative certificate holder authorization encoding is not allowed to read the data objects 2b) of FDP_ACF.1.1/PACE
4. Any terminal being not successfully authenticated as Extended Inspection System with the Read access to DG.4 (Iris) granted by the relative certificate holder authorization encoding is not allowed to read the data objects 2c) of FDP_ACF.1.1/PACE
5. Nobody is allowed to read the data objects 2d) of FDP_ACF.1.1/PACE
6. Terminals authenticated as CVCA or as DV are not allowed to read data in the EF.DG3 and EF.DG4

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 **allocation of the resource to and deallocation of the resource from** the following objects:

1. **Session Keys (immediately after closing related communication session)**
2. **The ephemeral private key ephem-SKPICC- PACE (by having generated a DH shared secret)**

FDP_UCT.1/TRM Basic data exchange confidentiality - MRTD

FDP_UCT.1.1/TRM The TSF shall enforce the **Access Control SFP** to be able to **transmit and receive** user data in a manner protected from unauthorised disclosure.

FDP_UIT.1/TRM Data exchange integrity

FDP_UIT.1.1/TRM The TSF shall enforce the **Access Control SFP** to be able to **transmit and receive** user data in a manner protected from **modification, deletion, insertion and replay** errors

FDP_UIT.1.2/TRM The TSF shall be able to determine on receipt of user data, whether **modification, deletion, insertion and replay** has occurred

FIA_AFL.1/PACE Authentication failure handling

FIA_AFL.1.1/PACE The TSF shall detect when **10** unsuccessful authentication attempts occur related to **authentication attempts using the PACE password as shared password**

FIA_AFL.1.2/PACE [Editorially Refined] When the defined number of unsuccessful authentication attempts has been **met**, the TSF shall **wait for an increasing time between receiving of the terminal challenge and sending of the TSF response during the PACE authentication attempts**.

FIA_UAU.1/PACE Timing of authentication

FIA_UAU.1.1/PACE The TSF shall allow

- 1. To establish the communication channel**
- 2. Carrying out the PACE Protocol according to [53]**
- 3. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS**
- 4. To identify themselves by selection of the authentication key**

on behalf of the user to be performed before the user is authenticated.

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

FIA_UAU.4/PACE Single-use authentication mechanisms

FIA_UAU.4.1/PACE The TSF shall prevent reuse of authentication data related to

- 1. PACE Protocol according to [53].**

FIA_UAU.5/PACE Multiple authentication mechanisms

FIA_UAU.5.1/PACE The TSF shall provide

- 1. PACE Protocol according to [53]**
- 2. Passive Authentication according to [43]**
- 3. Secure messaging in MAC-ENC mode according to [53]**

to support user authentication.

FIA_UAU.5.2/PACE The TSF shall authenticate any user's claimed identity according to the following rules:

- 1. Having successfully run the PACE protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with the key agreed with the terminal by means of the PACE protocol**

FIA_UAU.6/EAC Re-authenticating – Re-authenticating of Terminal by the TOE

The TSF shall re-authenticate the user under the conditions **each command sent to the TOE after successful run of the Chip Authentication Protocol Version 1 shall be verified as being sent by the Inspection System.**

Application note 29: The Password Authenticated Connection Establishment and the Chip Authentication Protocol specified in [43] include secure messaging for all commands exchanged after successful authentication of the Inspection System. The TOE checks by secure messaging in MAC_ENC mode each command based on a corresponding MAC algorithm whether it was sent by the successfully authenticated terminal (see FCS_COP.1/CA_MAC for further details). The TOE does not execute any command with incorrect message authentication code. Therefore the TOE re-authenticates the user for each received command and accepts only those commands received from the previously authenticated user.

FIA_UAU.6/PACE Re-authenticating

FIA_UAU.6.1/PACE The TSF shall re-authenticate the user under the conditions **each command sent to the TOE after successful run of the PACE protocol shall be verified as being sent by the PACE terminal**

FIA_UID.1/PACE Timing of identification

FIA_UID.1.1/PACE The TSF shall allow

- 1. To establish the communication channel**
- 2. Carrying out the PACE Protocol according to [53]**
- 3. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS**

on behalf of the user to be performed before the user is identified.

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

FMT_MTD.1/PACE_KEY_READ Management of TSF data

FMT_MTD.1.1/PACE_KEY_READ The TSF shall restrict the ability to **read** the

- 1. PACE passwords**
- to **none**.

FMT_SMF.1 Specification of Management Functions

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

- 1. Initialization**
- 2. Pre-personalization**
- 3. Personalization**
- 4. Configuration**

FMT_SMR.1/PACE Security roles

FMT_SMR.1.1/PACE The TSF shall maintain the roles

1. **Terminal**
2. **PACE authenticated BIS-PACE**

FMT_SMR.1.2/PACE The TSF shall be able to associate users with roles.

FPT_EMS.1/PACE TOE Emanation

FPT_EMS.1.1/PACE The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to

1. **PACE: Session Keys (PACE-KMAC, PACE-KENC), Ephemeral Private Key ephem SKPICC-PACE**

FPT_EMS.1.2/PACE The TSF shall ensure **any users** are unable to use the following interface **smart card circuit contacts** to gain access to

1. **PACE: Session Keys (PACE-KMAC, PACE-KENC), Ephemeral Private Key ephem SKPICC-PACE**

FTP_ITC.1/PACE Inter-TSF trusted channel

FTP_ITC.1.1/PACE 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/PACE The TSF shall permit another trusted IT product to initiate communication via the trusted channel.

FTP_ITC.1.3/PACE The TSF shall **enforce** communication via the trusted channel for **any data exchange between the TOE and the Terminal**

FPT_TST.1/PACE TSF testing

FPT_TST.1.1/PACE The TSF shall run a suite of self tests to demonstrate the correct operation of self tests **at the conditions:**

- **At reset**

to demonstrate the correct operation of the **TSF**

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

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

FMT_MTD.1/INI_ENA Management of TSF data

FMT_MTD.1.1/INI_ENA The TSF shall restrict the ability to write the **Initialization Data and Prepersonalization Data** to the **Pre-personalizer**.

FMT_MTD.1/INI_DIS Management of TSF data

FMT_MTD.1.1/INI_DIS The TSF shall restrict the ability to disable read access for users to the **Initialization Data** to the **Personalization Agent**.

FMT_MTD.1/PA Management of TSF data

FMT_MTD.1.1/PA The TSF shall restrict the ability to **write** the **Document Security Objects (SOD)** to **Personalization Agent**.

FAU_SAS.1 Audit storage

FAU_SAS.1.1 The TSF shall provide **the Manufacturer** with the capability to store **the IC Identification Data** in the audit records.

8.1.7 PACE CAM SFR**FIA_UAU.1/PACE_CAM Timing of authentication**

FIA_UAU.1.1/PACE_CAM The TSF shall allow
1. Carrying out the PACE Protocol according to [53]
on behalf of the user to be performed before the user is authenticated.

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

FIA_UAU.4/PACE_CAM Single-use authentication mechanisms

FIA_UAU.4.1/PACE_CAM The TSF shall prevent reuse of authentication data related to
Additionally to FIA_UAU.4/PACE
1. PACE CAM Protocol according to [53]

FIA_UAU.5/PACE_CAM Multiple authentication mechanisms

FIA_UAU.5.1/PACE_CAM The TSF shall provide
1. PACE CAM Protocol according to [53]
to support user authentication.

FIA_UAU.5.2/PACE_CAM The TSF shall authenticate any user's claimed identity according to the **following rules:**
The same rules from FIA_UAU.5.2/PACE applies, with the PACE_CAM protocol

FIA_UAU.6/PACE_CAM Re-authenticating

FIA_UAU.6.1/PACE_CAM The TSF shall re-authenticate the user under the conditions **each command sent to the TOE after successful run of the PACE CAM protocol shall be verified as being sent by the PACE terminal**

FIA_UID.1/PACE_CAM Timing of identification

FIA_UID.1.1/PACE_CAM The TSF shall allow **additionally to FIA_UID.1/PACE:**

1. Carrying out the PACE CAM Protocol according to [53]
on behalf of the user to be performed before the user is identified.

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

FMT_MTD.1/PACE_CAM_KEY_READ Management of TSF data

FMT_MTD.1.1/PACE_CAM_KEY_READ The TSF shall restrict the ability to **read** the

1. PACE CAM Private Key
to **none**.

FMT_MTD.1/PACE_CAM_KEY_WRITE Management of TSF data

FMT_MTD.1.1/PACE_CAM_KEY_WRITE The TSF shall restrict the ability to **write** the **PACE CAM private key** to **Personalization Agent**

8.1.8 Additional SFRs

FDP_ACC.1/UPD_FILE "Subset access control"

FDP_ACC.1.1/UPD_FILE

The TSF shall enforce **the UPD_FILE Access Control SFP on terminals gaining write, read and modification access to data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD.**

FDP_ACF.1/UPD_FILE "Basic Security attribute based access control"

FDP_ACF.1.1/UPD_FILE The TSF shall enforce **the UPD_FILE Access Control SFP to objects based on the following:**

- 1. Subjects:**
 - a. Personalization Agent,**
 - b. Extended Inspection System,**
 - c. Terminal,**
- 2. Objects:**
 - a. data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD**
- 3. Security attributes**
 - a. authentication status of terminals,**

The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:

- 1. the Personalization Agent is allowed to write, read and modify the data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD,**
- 2. the successfully authenticated Extended Inspection System with the name corresponding to the one (or beginning of the one) set**

following **FMT_MTD.1.1/UPD_FILE** is allowed to modify the data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD.

FDP_ACF.1.2/UPD_FILE The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:

1. the Personalization Agent is allowed to write, read and modify the data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD,
2. the successfully authenticated Extended Inspection System with the name corresponding to the one (or beginning of the one) set following **FMT_MTD.1.1/UPD_FILE** is allowed to modify the data in the file(s) other than EF.COM, EF.SOD, and EF.DG1 to EF.DG16 of the logical MRTD.

FDP_ACF.1.3/UPD_FILE The TSF shall explicitly authorise access of subjects to objects base on the following additional rules: none.

FMT_MTD.1/UPD_FILE Management of TSF data”.

FMT_MTD.1.1/UPD_FILE The TSF shall restrict the ability to **set the name (or beginning of the name) of the terminal allowed to modify files in phase 7, and identifiers of these files (different from EF.COM, EF.SOD, EF.DG1 to EF.DG16) to the Personalization Agent.**

Application note: Name of the terminal is the Card Holder Reference (CHR) of the EIS.
Beginning of the name is a string of the left most significant bytes of the CHR of the EIS.

FMT_MTD.1/SM_LVL Management of TSF data”.

FMT_MTD.1.1/SM_LVL The TSF shall restrict the ability to **set the minimum Secure Messaging level required to access DG 3 and DG 4 to the Personalization Agent.**

Application Note: Possible secure messaging levels are: DES, AES 128, AES 192 or AES 256.

FMT_MOF.1/BAC_EXP “Management of functions in TSF

FMT_MOF.1.1/BAC_EXP:The TSF shall restrict the ability to **enable** the functions: **Deactivation of the BAC protocol to Country Verifying Certification Authority and Domestic document Verifier once the current date has reached or passed the value set by FMT_MTD.1/BAC_EXP.**

Application Note: The BAC is automatically deactivated by the TOE once the authenticated subject (Country Verifying Certification Authority or domestic Document Verifier) has updated the current date of the TOE with a date that reaches or passes the reference date configured by **FMT_MTD.1/BAC_EXP.**

FMT_MTD.1/BAC_EXP “Management of TSF data

FMT_MTD.1.1/BAC_EXP The TSF shall restrict the ability **to set the BAC expiry date to the Personalization Agent.**

Application note: By default, BAC expiration feature is not activated

FMT_SMF.1/BAC_EXP *Specification of Management Functions*

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

Basic Access Control expiration data

8.2 Security Assurance Requirements

The security assurance requirement level is EAL5+ augmented with ALC_DVS.2, AVA_VAN.5.

8.2.1 Rationale for augmentation

8.2.1.1 ALC_DVS.2 Sufficiency of security measures

The selection of the component ALC_DVS.2 provides a higher assurance of the security of the MRTD's development and manufacturing especially for the secure handling of the MRTD's material.

Development security is concerned with physical, procedural, personnel and other technical measures that may be used in the development environment to protect the TOE. This assurance component is a higher hierarchical component to EAL5 (only ALC_DVS.1). Due to the nature of the TOE, there is a need for any justification of the sufficiency of these procedures to protect the confidentiality and integrity of the TOE.

The component ALC_DVS.2 augmented to EAL5 has no dependencies to other security requirements.

8.2.1.2 AVA_VAN.5 Advanced methodical vulnerability analysis

Due to the definition of the TOE, it must be shown to be highly resistant to penetration attacks. This assurance requirement is achieved by the AVA_VAN.5 component.

Advanced methodical vulnerability analysis is based on highly detailed technical information. The attacker is assumed to be thoroughly familiar with the specific implementation of the TOE. The attacker is presumed to have a high level of technical sophistication. AVA_VAN.5 has dependencies with ADV_ARC.1 "Security architecture description", ADV_FSP.4 "Complete functional specification", ADV_IMP.1 "Implementation representation of the TSF", ADV_TDS.3 "Basic modular design", AGD_PRE.1 "Preparative procedures" and AGD_OPE.1 "Operational user Guidance" and ATE_DPT.1 "Testing: basic design".

All these dependencies are satisfied by EAL5.

9 TOE Summary Specification

9.1 TOE Summary Specification

Access Control in reading

This function controls access to read functions and enforces the security policy for data retrieval. Prior to any data retrieval, it authenticates the actor trying to access the data, and checks the access conditions are fulfilled as well as the life cycle state.

It ensures that at any time, the following keys are never readable:

- PACE keys
- Chip Authentication keys
- PACE CAM keys
- Active Authentication private key
- Personalization Agent keys
- MSK
- CVCA keys

It controls access to the CPLC data as well:

It ensures the CPLC data can be read during the personalization phase

It ensures it cannot be readable in free mode at the end of the personalization step.

Regarding the file structure:

In the operational use:

- The terminal can read user data (except DG3 & DG4), the Document Security Object, EF.CVA, EF.COM only after PACE authentication and through a valid secure channel.
- When the EAC was successfully performed, the terminal can only read the DG3 & DG4 provided the access rights are sufficient through a valid secure channel.

In the personalization phase:

- The Personalization Agent can read all the data stored in the TOE after it is authenticated by the TOE (using its authentication keys).

It ensures as well that no other part of the memory can be accessed at anytime

Access Control in writing

This function controls access to write functions (in EEPROM) and enforces the security policy for data writing. Prior to any data update, it authenticates the actor, and checks the access conditions are fulfilled as well as the life cycle state.

It ensures as well the CPLC data cannot be written anymore once the TOE is personalized.

Regarding the file structure:

In the operational use:

It is not possible to create any files (system or data files). Furthermore, it is not possible to update any system files. However the application data is still accessed internally by the application for its own needs.

The root CVCA key files and temporary key files are updated internally by the application according to the authentication mechanism described in [45].

In the personalization phase

The Personalization Agent can create and write through a valid secure channel all the data files it needs after it is authenticated by the TOE (using its authentication keys).

Active Authentication

This security functionality ensures the Active Authentication is performed as described in [45]. (if it is activated by the personaliser).

EAC mechanism

This security functionality ensures the EAC is correctly performed. In particular:

- It handles the certificate verification
- The management of the current date (update and control towards the expiration date of the incoming certificate)
- The signature verification (in the certificate or in the challenge/response mechanism)

It can only be performed once the TOE is personalized with the chip authentication keys & Root CVCA key(s) the Personalization Agent loaded during the personalization phase. Furthermore, this security functionalities ensure that the authentication is performed as described in [45].

This security functionality ensures the session keys for secure messaging are destroyed at each successful Chip Authentication step.

The TOE handles an error counter; after several failures in attempting to strongly authenticate the GIS (the error limit is reached). The TOE also implements countermeasures to protect the TOE; it takes more and more time for the TOE to reply to subsequent wrong GIS authentication attempts.

PACE mechanism

This security functionality ensures the PACE is correctly performed. It can only be performed once the TOE is personalized with the PACE password. Furthermore, this security functionalities ensures the correct calculation of the PACE session keys.

PACE_CAM mechanism

This security functionality ensures the PACE_CAM is correctly performed. It can only be performed once the TOE is personalized with:

- the chip authentication mapping (CAM) keys the Personalization Agent loaded during the personalization phase
- the PACE password.

Furthermore, this security functionality ensures the correct calculation of the PACE_CAM session keys.

Personalization

This security functionality ensures the TOE, when delivered to the Personalization Agent, demands an authentication prior to any data exchange. This authentication is based on a symmetric Authentication mechanism based on a Triple DES or AES algorithm. This TSF can use a Secure Messaging described in the TSF Secure Messaging.

This function allow to configure SM level for biometrical data access and the BAC deactivation mechanism

Physical protection

This security functionality protects the TOE against physical attacks.

Prepersonalization

This security functionality ensures the TOE, when delivered to the Prepersonalization Agent, demands an authentication prior to any data exchange. This authentication is based on a symmetric Authentication mechanism based on a Triple DES or AES algorithm. This function is in charge of pre-initializing the product. This TSF can use a Secure Messaging described in the TSF Secure Messaging.

Safe state management

This security functionalities ensures that the TOE gets back to a secure state when

- an integrity error is detected by F.SELFTESTS
- a tearing occurs (during a copy of data in EEPROM)

This security functionality ensures that such a case occurs, the TOE is either switched in the state "kill card" or becomes mute.

Secure Messaging

This security functionality ensures the confidentiality, authenticity & integrity of the communication between the TOE and the IFD.

After a successful EAC authentication, a secure channel is established based on Triple DES algorithm, and after a successful Chip Authentication, a secure channel is established based on Triple DES/AES algorithms.

This security functionality ensures:

No commands were inserted, modified nor deleted within the data flow

The data exchanged remain confidential

The issuer of the incoming commands and the destination of the outgoing data is the one that was authenticated (through PACE or EAC).

If an error occurs in the secure messaging layer, the session keys are destroyed.

This Secure Messaging can be combined with the Active Authentication.

This TSF can provide a GP Secure Messaging (SCP02 or SCP03) for the Prepersonalization or Personalization.

Self tests

The TOE performs self tests to verify the integrity on the TSF data:

- At reset

9.2 Link between the SFR and the TSF

The following chapters present the rationales between security objective and security requirements. For ease reading some requirements are merged.

All the SFRs provide equivalent service at personalisation phase: cryptographic authentication of the personalisation. The differences are related to algorithms used for the authentication.

	FCS_CKM.1/CA	FCS_COP.1/SHA	FCS_COP.1/CA_ENC	FCS_COP.1/SIG_VER	FCS_COP.1/CA_MAC	FIA_UJD.1/PACE	FIA_UAU.1/PACE	FIA_UAU.4/PACE	FIA_UAU.5/PACE	FIA_UAU.6/EAC	FIA_API.1	FDP_ACC.1/TRM	FDP_ACF.1/TRM	FDP_UCT.1/TRM	FDP_UIT.1/TRM	FMT_SMR.1/PACE	FMT_LIM.1	FMT_LIM.2	FMT_MTD.1/CVCA_INI	FMT_MTD.1/CVCA_UPD	FMT_MTD.1/DATE	MT_MTD.1/CAPK	FMT_MTD.1/KEY_READ	FMT_MTD.3	FPT_EMS.1
Access Control in reading			X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	
Access Control in writing																			X	X	X	X			
Active Authentication		X																							
EAC mechanism	X	X	X	X	X	X	X			X	X		X	X						X	X			X	X
PACE mechanism						X	X	X	X				X												
PACE_CAM mechanism																									
Personalization		X																							X
Physical protection																	X	X							
Prepersonalization		X				X																			X
Safe state management																X	X	X							
Secure Messaging	X	X			X	X	X	X	X				X												
Self tests																									

Table 33: Link between SFR from the PP0056v2 and TSF

FAU_SAS.1	FCS_CKM.1/DH_PACE	FCS_CKM.4	FCS_COP.1/PACE_ENC	FCS_COP.1/PACE_MAC	FCS_RND.1	FIA_AFL.1/PACE	FIA_UAU.6/PACE	FDP_RIP.1	FDP_UCT.1/TRM	FDP_UIT.1/TRM	FMT_SMF.1	FMT_MTD.1/INI_ENA	FMT_MTD.1/INI_DIS	FMT_MTD.1/PA	FPT_FLS.1	FPT_IPT.1	FPT_PHP.3	FPT_ITC.1/PACE

Access Control in reading				X	X		X	X		X	X			X					X
Access Control in writing										X	X	X	X		X				
Active Authentication						X													
EAC mechanism			X			X													
PACE mechanism		X		X	X		X	X											X
PACE_CAM mechanism																			
Personalization						X						X	X						
Physical protection	X																		X
Prepersonalization						X						X	X						
Safe state management	X											X				X			
Secure Messaging		X	X	X	X	X			X										X
Self tests						X										X			

Table 34: Link between SFR from the PP0068v2 and TSF

	FCS_COP.1/AA	FDP_DAU.1/AA	FDP_ITC.1/AA	FMT_MDF.1/AA	FMT_MTD.1/AA_KEY_WRITE	FMT_MTD.1/AA_KEY_READ
Access Control in reading						
Access Control in writing			X			
Active Authentication	X	X	X	X	X	X
EAC mechanism						
PACE mechanism						
PACE_CAM mechanism						
Personalization						
Physical protection						

Prepersonalization						
Safe state management						
Secure Messaging						
Self tests						

Table 35: Link between SFR for AA and TSF

	FIA_UAU.1/PACE_CAM	FIA_UAU.4/PACE_CAM	FIA_UAU.5/PACE_CAM	FIA_UAU.6/PACE_CAM	FIA_UID.1/PACE_CAM	FMT_MTD.1/PACE_CAM_KEY_READ	FMT_MTD.1/PACE_CAM_KEY_WRITE
Access Control in reading	X	X	X	X	X	X	
Access Control in writing							X
Active Authentication							
EAC mechanism							
PACE mechanism							
PACE_CAM mechanism	X	X	X	X	X	X	X
Personalization							
Physical protection							
Prepersonalization					X		
Safe state management							
Secure Messaging	X	X	X		X		

Self tests							
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Table 36: Link between Additional SFR for PACE_CAM and TSF

	FMT_MOF.1/BAC_EXP	FMT_SMF.1/BAC_EXP	FMT_MTD.1/BAC_EXP	FDP_ACC.1.1/UPD_FILE	FDP_ACE.1.1/UPD_FILE	FMT_MTD.1.1/UPD_FILE	FMT_MTD.1.1/SM_LVL
Access Control in reading			X	X	X	X	X
Access Control in writing			X	X	X	X	X
Active Authentication							
EAC mechanism				X	X		
PACE mechanism							
PACE_CAM mechanism							
Personalization	X	X	X	X	X	X	X
Physical protection							
Prepersonalization				X	X	X	
Safe state management							
Secure Messaging							
Self tests							

Table 37: Link between Additional SFRs and TSF

10 TOE Rationales Security Objectives rationale

10.1 Threats and Security Objectives

T.Read_Sensitive_Data

The threat T.Read_Sensitive_Data "Read the sensitive biometric reference data" is countered by the TOE-objective **OT.Sens_Data_Conf** "Confidentiality of sensitive biometric reference data" requiring that read access to EF.DG3 and EF.DG4 (containing the sensitive biometric reference data) is only granted to authorized inspection systems. Furthermore it is required that the transmission of these data ensures the data's confidentiality. The authorization bases on Document Verifier certificates issued by the issuing State or Organization as required by **OE.Authoriz_Sens_Data** "Authorization for use of sensitive biometric reference data". The Document Verifier of the receiving State has to authorize Extended Inspection Systems by creating appropriate Inspection System certificates for access to the sensitive biometric reference data as demanded by **OE.Ext_Insp_Systems** "Authorization of Extended Inspection Systems".

This threat is also covered by

OT.AC_SM_Level "Access control to sensitive biometric reference data according to SM level" that enhances this protection by allowing the issuing State or Organization to require the usage of a secure messaging with a minimum security level for accessing the sensitive biometric reference data. The strength of the secure messaging is tightly bound to the underlying block Cipher involved (DES, AES-128/192/256). This objective allows an issuing State or Organization to set a secure messaging level it considers as sufficient to ensure a long term confidentiality of the sensitive biometric data of its citizen when being read.

T.Counterfeit

The threat T.Counterfeit "MRTD's chip" addresses the attack of unauthorized copy or reproduction of the genuine MRTD chip. This attack is thwarted by chip and identification and authenticity proof required by **OT.Chip_Auth_Proof** "Proof of MRTD' chip authentication" using a authentication key pair to be generated by the issuing State or Organization. The Public Chip Authentication Key has to be written into EF.DG14 and signed by means of Documents Security Objects as demanded by **OE.Auth_Key_MRTD** "MRTD Authentication Key". According to **OE.Exam_MRTD** "Examination of the MRTD passport book" the General Inspection system has to perform the Chip Authentication Protocol to verify the authenticity of the MRTD's chip.

This attack is also thwarted by Active Authentication proving the authenticity of the chip as required by **OT.AA_Proof** and **OT.Data_Int_AA** using a authentication key pair to be generated by the issuing State or Organization. The Public active Authentication Key has to be written into EF.DG15 and signed by means of Documents Security Objects. **OE.Activ_Auth_Verif** covers also this threat enabling the possibility of performing an Active Authentication which reinforce the security associated to the communication.

T.Skimming

This threat addresses accessing the User Data (stored on the TOE or transferred between the TOE and the terminal) using the TOE's contactless/contact interface. This threat is countered by the security objectives **OT.Data_Int**, **OT.Data_Auth** and **OT.Data_Conf** through the PACE authentication. The objective **OE.Travel_Document_Holder** ensures that a PACE session can only be established either by the travel document holder itself or by an authorised person or device, and, hence, cannot be captured by an attacker.

T.Eavesdropping

This threat addresses listening to the communication between the TOE and a rightful terminal in order to gain the User Data transferred there. This threat is countered by the security objective **OT.Data_Conf** through a trusted channel based on the PACE authentication.

T.Tracing

This threat addresses gathering TOE tracing data identifying it remotely by establishing or listening to a communication via the contactless/contact interface of the TOE, whereby the attacker does not a priori know the correct values of the PACE password. This threat is directly countered by security objectives **OT.Tracing** (no gathering TOE tracing data) and **OE.Travel_Document_Holder** (the attacker does not a priori know the correct values of the shared passwords)

T.Abuse-Func

The threat T.Abuse-Func "Abuse of Functionality" addresses attacks using the MRTD's chip as production material for the MRTD and misuse of the functions for personalization in the operational state after delivery to MRTD holder to disclose or to manipulate the logical MRTD. This threat is countered by **OT.Prot_Abuse-Func** "Protection against Abuse of Functionality". Additionally this objective is supported by the security objective for the TOE environment: **OE.Personalization** "Personalization of logical MRTD" ensuring that the TOE security functions for the initialization and the personalization are disabled and the security functions for the operational state after delivery to MRTD holder are enabled according to the intended use of the TOE

T.Information_Leakage

The threat T.Information_Leakage "Information Leakage from MRTD's chip" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective **OT.Prot_Inf_Leak**

T.Phys-Tamper

The threat T.Phys-Tamper "Physical Tampering" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective **OT.Prot_Phys-Tamper** "Protection against Physical Tampering".

T.Forgery

The threat T.Forgery "Forgery of data on MRTD's chip" addresses the fraudulent alteration of the complete stored logical MRTD or any part of it. The security objective **OT.AC_Pers** "Access Control for Personalization of logical MRTD" requires the TOE to limit the write access for the logical MRTD to the trustworthy Personalization Agent (cf. **OE.Personalization**). The TOE will protect the integrity of the stored logical MRTD according the security objective **OT.Data_Int** "Integrity of personal data" and **OT.Data_Auth** respectively. The objectives **OT.Prot_Phys-Tamper** "Protection against Physical Tampering" and **OT.Prot_Abuse-Func** contribute to protecting integrity of the User Data or/and TSF-data stored on the TOE.

A terminal operator operating his terminals according to **OE.Terminal** and performing the Passive Authentication using the Document Security Object as aimed by **OE.Passive_Auth_Sign** will be able to effectively verify integrity and authenticity of the data received from the TOE.

Additionally, the examination of the presented eMRTD book according to **OE.Exam_MRTD** "Examination of the physical part of the travel document" and **OE.Exam_MRTD_AA** shall ensure its authenticity by means of the physical security measures and detect any manipulation of the physical part of the travel document.

T.Malfunction

The threat T.Malfunction "Malfunction due to Environmental Stress" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective **OT.Prot_Malfunction** "Protection against Malfunctions".

The threat **T.Forgery_Supplemental_Data** addresses the fraudulent alteration of updatable data. The TOE protects the update of these data thanks to **OT.Update_File** "*Modification of file in Operational Use Phase*" that ensures inspection system are authenticated and data to be updated are sent through a secure channel ensuring integrity, authenticity and confidentiality.

T.BAC_breaking

The threat **Additional Threats**

T. *BAC_breaking* "*BAC protocol is broken*"

addresses the attack aiming at breaking the BAC protocol. The protection of the TOE against this threat is addressed by security objective **OT.BAC_Expiration** which is directly related to it. It prevents an attacker to perform offline dictionary attacks on transaction log, in order to preserve confidentiality of data and avoid citizen traceability.

10.2 Organisational Security Policies

P.Sensitive_Data

The OSP P.Sensitive_Data "Privacy of sensitive biometric reference data" is fulfilled by the TOE-objective **OT.Sens_Data_Conf** "Confidentiality of sensitive biometric reference data" requiring that read access to EF.DG3 and EF.DG4 (containing the sensitive biometric reference data) is only granted to authorized inspection systems. Furthermore it is required that the transmission of these data ensures the data's confidentiality. The authorization bases on Document Verifier certificates issued by the issuing State or Organization as required by **OE.Authoriz_Sens_Data** "Authorization for use of sensitive biometric reference data". The Document Verifier of the receiving State has to authorize Extended Inspection Systems by creating appropriate Inspection System certificates for access to the sensitive biometric reference data as demanded by **OE.Ext_Insp_Systems** "Authorization of Extended Inspection Systems".

This policy is also covered by **OT.AC_SM_Level** "Access control to sensitive biometric reference data according to SM level" that enhances this protection by allowing the issuing State or Organization to require the usage of a secure messaging with a minimum security level for accessing the sensitive biometric reference data. The strength of the secure messaging is tightly bound to the underlying block Cipher involved (DES, AES-128/192/256). This objective allows an issuing State or Organization to set a secure messaging level it considers as sufficient to ensure a long term confidentiality of the sensitive biometric data of its citizen when being read.

P.Personalization

The OSP P.Personalization "Personalization of the MRTD by issuing State or Organization only" addresses the:

- (i) Enrolment of the logical MRTD by the Personalization Agent as described in the security objective for the TOE environment **OE.Personalization** "Personalization of logical MRTD"
- (ii) Access control for the user data and TSF data as described by the security objective **OT.AC_Pers** "Access Control for Personalization of logical MRTD".

Note that the manufacturer equips the TOE with the Personalization Agent Key(s) according to **OT.Identification** "Identification and Authentication of the TOE". The security objective **OT.AC_Pers** limits the management of TSF data and management of TSF to the Personalization Agent.

P.Pre-operational

This OSP is enforced by the following security objectives:

- **OT.Identification** is affine to the OSP's property 'traceability before the operational phase'

- **OT.AC_Pers** and **OE.Personalisation** together enforce the OSP's properties 'correctness of the User and the TSF data stored' and 'authorisation of Personalisation Agents'
- **OE.Legislative_Compliance** is affine to the OSP's property 'compliance with laws and regulations'.

P.Card_PKI

This OSP is enforced by establishing the issuing PKI branch as aimed by the objectives **OE.Passive_Auth_Sign** (for the Document Security Object).

P.Trustworthy_PKI

This OSP is enforced by **OE.Passive_Auth_Sign** (for CSCA, issuing PKI branch).

P.Manufact

The OSP P.Manufact "Manufacturing of the MRTD's chip" requires a unique identification of the IC by means of the Initialization Data and the writing of the Pre-personalization Data as being fulfilled by **OT.Identification**.

P.Terminal

This OSP is countered by the security objective **OE.Exam_MRTD** which enforces the terminals to perform the terminal part of the PACE protocol. **P.Terminal** is obviously enforced by the objective **OE.Terminal**, whereby the one-to-one mapping between the related properties is applicable.

P.Activ_Auth

The OSP P.Activ_Auth requires the implementation of the Active Authentication protocol as enforced by **OT.AA_Proof**.

10.3 Assumptions

A.Insp_Sys

The examination of the MRTD passport book addressed by the assumption A.Insp_Sys "Inspection Systems for global interoperability" is covered by the security objectives for the TOE environment **OE.Exam_MRTD** "Examination of the MRTD passport book" which requires the inspection system to examine physically the MRTD, the Basic Access Control and the General Inspection System and Extended Inspection Systems to implement and to perform the Chip Authentication Protocol to verify the authenticity of the presented MRTD's chip. The security objectives for the TOE environment **OE.Prot_Logical_MRTD** "Protection of data from the logical MRTD" require the Inspection System to protect the logical MRTD during the transmission and the internal handling.

A.Auth_PKI

The assumption is covered by the security objective for the TOE environment **OE.Authoriz_Sens_Data** "Authorization for use of sensitive biometric reference data" required the CVCA to limit the read access to sensitive biometrics by issuing Document Verifier certificates for authorized receiving States or Organisations only. The Document Verifier of the receiving State is required by **OE.Ext_Insp_Systems** "Authorization of Extended Inspection Systems" to authorize Extended Inspection Systems by creating Inspection System Certificates. Therefore, the receiving issuing State or Organization has to establish the necessary public key infrastructure.

A.Passive_Auth

This assumption is directly addressed by **OE.Passive_Auth_Sign** requiring the travel document issuer to establish a PKI for Passive Authentication, generating Document Signing private keys only for rightful organisations and requiring the Document Signer to sign exclusively correct Document Security Objects to be stored on travel document. It therefore covers the necessary procedures for the Country Signing CA Key Pair and the Document Signer Key Pairs. The implementation of the signature verification procedures is covered by **OE.Exam_MRTD** "Examination of the physical part of the travel document". The threat is also covered by **OE.Activ_Auth_Sign** covering the necessary procedures for the Active Authentication key pair establishment.

A.Insp_Sys_AA

The examination of the MRTD passport book addressed by the assumption A.Insp_Sys_AA "Inspection Systems for global interoperability" is covered by the security objectives for the TOE environment

OE.Exam_MRTD_AA "Examination of the MRTD passport book". The security objectives for the TOE environment **OE.Prot_Logical_MRTD_AA** "Protection of data from the logical MRTD" will require the Basic Inspection System to implement the Active Authentication Protocol and to protect the logical MRTD data during the transmission and the internal handling.

10.4 SPD and Security Objectives

Threats	Security Objectives
T.Read_Sensitive_Data	OT.Sens_Data_Conf, OE.Authoriz_Sens_Data, OE.Ext_Insp_Systems, OT.AC_SM_level
T.Forgery	OT.AC_Pers, OE.Personalization, OT.Data_Int, OT.Data_Auth, OT.Prot_Phys-Tamper, OT.Prot_Abuse-Func, OE.Terminal, OE.Pass_Auth_Sign, OE.Exam_MRTD, OE.Exam_MRTD_AA
T.Skimming	OT.Data_Int, OT.Data_Auth, OT.Data_Conf, OT.MRTD_Holder
T.Eavesdropping	OT.Data_Conf
T.Tracing	OT.Data_Int, OE.Travel_Document_Holder
T.Counterfeit	OT.Chip_Auth_Proof, OE.Auth_Key_MRTD, OE.Exam_MRTD, OT_AA_Proof, OT.Data_Int_AA, OE.Activ_Auth_Verif
T.Abuse-Func	OT.Prot_Abuse-Func, OE.Personalization
T.Information_Leakage	OT.Prot_Inf_Leak
T.Phys-Tamper	OT.Prot_Phys-Tamper
T.Malfunction	OT.Prot_Malfunction
T.Forgery_Supplemental_Data	OT.Update_File
T.BAC_breaking	OT.BAC_Expiration

Table 38: Threats and Security Objectives – coverage

The rational between the threats and the security objectives is presented in chapter 10.5.

OSP	Security Objectives
P.Sensitive_Data	OT.Sens_Data_Conf, OE.Authoriz_Sens_Data, OE.Ext_Insp_Systems, OT.AC_SM_Level
P.Personalization	OE.Personalization, OT.AC_Pers, OT.Identification
P.Pre_operational	OT.Identification, OT.AC_Pers, OE.Personalization, OE.Legislative_Compliance
P.Card_PKI	OE.Passive_Auth_Sign
P.Trustworthy_PKI	OE.Passive_Auth_Sign
P.Manufact	OT.Identification
P.Terminal	OE.Exam_MRTD, OE.Terminal
P.Activ_Auth	OT_AA_Proof

Table 39: OSPs and Security Objectives – Coverage

Assumptions	OE
A.Insp_Sys	OE.Exam_MRTD, OE.Prot_Logical_MRTD
A.Auth_PKI	OE.Authoriz_Sens_Data, OE.Ext_Insp_Systems
A.Passive_Auth	OE.Passive_Auth_Sign, OE.Exam_MRTD
A.Insp_Sys_AA	OE.Exam_MRTD_AA, OE.Prot_Logical_MRTD_AA

Table 40: Assumptions and OE – Coverage

10.5 Security requirements and security objectives

The following chapters present the rationales between security objective and security requirements. For ease reading some requirements are merged.

All the SFRs provide equivalent service at personalisation phase: cryptographic authentication of the personalisation. The differences are related to algorithms used for the authentication.

10.5.1 Rationale Security requirements and security objectives

OT.Sens_Data_Conf

The security objective OT.Sens_Data_Conf "Confidentiality of sensitive biometric reference data" is enforced by the Access Control SFP defined in **FDP_ACC.1/TRM** and **FDP_ACF.1/TRM** allowing the data of EF.DG3 and EF.DG4 only to be read by successfully authenticated Extended Inspection System being authorized by a valid verifiable certificate according **FCS_COP.1/SIG_VER**.

The SFR **FIA_UID.1/PACE**, **FIA_UAU.1/PACE**, **FIA_UID.1/PACE_CAM** and **FIA_UAU.1/PACE_CAM** require the identification and authentication of the inspection systems. The SFR **FIA_UAU.5/PACE** requires the successful Chip Authentication (CA) before any authentication attempt as Extended Inspection System. During the protected communication following the CA the reuse of authentication data is prevented by **FIA_UAU.4/PACE** and **FIA_UAU.4/PACE_CAM**. The SFR **FIA_UAU.6/EAC** and **FDP_UCT.1/TRM** requires the confidentiality protection of the transmitted data after chip authentication by means of secure messaging implemented by the cryptographic functions according to **FCS_RND.1** (for the generation of the terminal authentication challenge), **FCS_CKM.1/CA** (for the generation of shared secret), **FCS_COP.1/SHA** (for the derivation of the new session keys), and **FCS_COP.1/CA_ENC** and **FCS_COP.1/CA_MAC** for the ENC_MAC_Mode secure messaging. The session keys are destroyed according to **FCS_CKM.4** after use. The SFR **FMT_MTD.1/CAPK** and **FMT_MTD.1/KEY_READ** requires that the Chip Authentication Key cannot be written unauthorized or read afterwards. The SFR **FMT_MTD.1/PACE_CAM_KEY_WRITE** and **FMT_MTD.1/PACE_CAM_KEY_READ** requires that the CAM Key cannot be written unauthorized or read afterwards.

To allow a verification of the certificate chain as in **FMT_MTD.3** the CVCA's public key and certificate as well as the current date are written or update by authorized identified role as of **FMT_MTD.1/CVCA_INI**, **FMT_MTD.1/CVCA_UPD** and **FMT_MTD.1/DATE**.

OT.Chip_Auth_Proof

The security objective OT.Chip_Auth_Proof "Proof of MRTD's chip authenticity" is ensured by the Chip Authentication Protocol provided by **FIA_API.1** proving the identity of the TOE. The Chip Authentication Protocol defined by **FCS_CKM.1/CA** is performed using a TOE internally stored confidential private key as required by **FMT_MTD.1/CAPK**, **FMT_MTD.1/KEY_READ**, **FMT_MTD.1/PACE_CAM_KEY_WRITE** and **FMT_MTD.1/PACE_CAM_KEY_READ**. The Chip Authentication Protocol [R4] requires additional TSF according to **FCS_CKM.1/CA** (for the derivation of the session keys), **FCS_COP.1/CA_ENC** and **FCS_COP.1/CA_MAC** (for the ENC_MAC_Mode secure messaging). The SFRs **FMT_SMF.1** and **FMT_SMR.1/PACE** support the functions and roles related.

OT.Data_Int

"Integrity of personal data" requires the TOE to protect the integrity of the logical travel document stored on the travel document's chip against physical manipulation and unauthorized writing. Physical manipulation is addressed by **FPT_PHP.3**. Logical manipulation of stored user data is addressed by (**FDP_ACC.1/TRM**, **FDP_ACF.1/TRM**): only the Personalisation Agent is allowed to write the data in EF.DG1 to EF.DG16 of the logical travel document (**FDP_ACF.1.2/TRM**, rule 1) and terminals are not allowed to modify any of the data in EF.DG1 to EF.DG16 of the logical travel document (cf. **FDP_ACF.1.4/TRM**). **FMT_MTD.1/PA** requires that SOD containing signature over the User Data

stored on the TOE and used for the Passive Authentication is allowed to be written by the Personalisation Agent only and, hence, is to be considered as trustworthy. **FCS_CKM.4** represents some required specific properties of the protocols used. The SFR **FMT_SMR.1/PACE** lists the roles and the SFR **FMT_SMF.1** lists the TSF management functions.

Unauthorised modifying of the exchanged data is addressed, in the first line, by **FTP_ITC.1/PACE** using **FCS_COP.1/PACE_MAC**. For PACE secured data exchange, a prerequisite for establishing this trusted channel is a successful PACE Authentication (**FIA_UID.1/PACE**, **FIA_UAU.1/PACE**, (**FIA_UID.1/PACE_CAM**, **FIA_UAU.1/PACE_CAM**) using **FCS_CKM.1/DH_PACE** and possessing the special properties **FIA_UAU.5/PACE**, **FIA_UAU.6/PACE**, **FIA_UAU.5/PACE_CAM**, **FIA_UAU.6/PACE_CAM** resp. **FIA_UAU.6/EAC**. The trusted channel is established using PACE, Chip Authentication, and Terminal Authentication. **FDP_RIP.1** requires erasing the values of session keys (here: for K_{MAC}).

The TOE supports the inspection system detect any modification of the transmitted logical travel document data after Chip Authentication . The SFR **FIA_UAU.6/EAC** and **FDP_UIT.1/TRM** requires the integrity protection of the transmitted data after Chip Authentication by means of secure messaging implemented by the cryptographic functions according to **FCS_CKM.1/CA** (for the generation of shared secret and for the derivation of the new session keys), and **FCS_COP.1/CA_ENC**, **FCS_COP.1/CA_MAC** for the ENC_MAC_Mode secure messaging. The session keys are destroyed according to **FCS_CKM.4** after use.

The SFR **FMT_MTD.1/CAPK** and **FMT_MTD.1/KEY_READ** requires that the Chip Authentication Key cannot be written unauthorized or read afterwards. The SFR **FMT_MTD.1/PACE_CAM_KEY_WRITE** and **FMT_MTD.1/PACE_CAM_KEY_READ** requires that the CAM Key cannot be written unauthorized or read afterwards. The SFR **FCS_RND.1** represents a general support for cryptographic operations needed.

OT.Data_Auth

This objectif aims ensuring authenticity of the User- and TSF data (after the PACE Authentication) by enabling its verification at the terminal-side and by an active verification by the TOE itself. This objective is mainly achieved by **FTP_ITC.1/PACE** using **FCS_COP.1/PACE_MAC**. A prerequisite for establishing this trusted channel is a successful PACE or Chip and Terminal Authentication (**FIA_UID.1/PACE**, **FIA_UAU.1/PACE**, **FIA_UID.1/PACE_CAM**, **FIA_UAU.1/PACE_CAM**) using **FCS_CKM.1/DH_PACE** resp. **FCS_CKM.1/CA** and possessing the special properties **FIA_UAU.5/PACE**, **FIA_UAU.6/PACE**, **FIA_UAU.5/PACE_CAM**, **FIA_UAU.6/PACE_CAM** resp. **FIA_UAU.6/EAC**. **FDP_RIP.1** requires erasing the values of session keys (here: for K_{MAC}). **FIA_UAU.4/PACE**, **FIA_UAU.5/PACE**, **FIA_UAU.4/PACE_CAM**, **FIA_UAU.5/PACE_CAM** and **FCS_CKM.4** represent some required specific properties of the protocols used. The SFR **FMT_MTD.1/KEY_READ** restricts the access to the PACE passwords and the Chip Authentication Private Key. The SFR **FMT_MTD.1/PACE_CAM_KEY_READ** restricts the access to the CAM Private Key. **FMT_MTD.1/PA** requires that SOD containing signature over the User Data stored on the TOE and used for the Passive Authentication is allowed to be written by the Personalisation Agent only and, hence, is to be considered as trustworthy. The SFR **FCS_RND.1** represents a general support for cryptographic operations needed. The SFRs **FMT_SMF.1** and **FMT_SMR.1/PACE** support the functions and roles related.

OT.Data_Conf

This objectif aims that the TOE always ensures confidentiality of the User- and TSF-data stored and, after the PACE Authentication resp. Chip Authentication, of these data exchanged. This objective for the data stored is mainly achieved by (**FDP_ACC.1/TRM**, **FDP_ACF.1/TRM**). **FIA_UAU.4/PACE**, **FIA_UAU.5/PACE**, **FIA_UAU.4/PACE_CAM**, **FIA_UAU.5/PACE_CAM** and **FCS_CKM.4** represent some required specific properties of the protocols used. This objective for the data exchanged is mainly achieved by **FDP_UCT.1/TRM**, **FDP_UIT.1/TRM** and **FTP_ITC.1/PACE** using **FCS_COP.1/PACE_ENC** resp. **FCS_COP.1/CA_ENC**. A prerequisite for establishing this trusted channel is a successful PACE or Chip and Terminal Authentication (**FIA_UID.1/PACE**,

FIA_UAU.1/PACE, FIA_UID.1/PACE_CAM, FIA_UAU.1/PACE_CAM) using **FCS_CKM.1/DH_PACE** resp. **FCS_CKM.1/CA** and possessing the special properties **FIA_UAU.5/PACE, FIA_UAU.6/PACE, FIA_UAU.5/PACE_CAM, FIA_UAU.6/PACE_CAM** resp. **FIA_UAU.6/EAC. FDP_RIP.1** requires erasing the values of session keys (here: for Kenc). The SFR **FMT_MTD.1./KEY_READ** restricts the access to the PACE passwords and the Chip Authentication Private Key. The SFR **FMT_MTD.1/PACE_CAM_KEY_READ** restricts the access to the CAM Private Key. **FMT_MTD.1/PA** requires that SOD containing signature over the User Data stored on the TOE and used for the Passive Authentication is allowed to be written by the Personalisation Agent only and, hence, is to be considered trustworthy. The SFR **FCS_RND.1** represents the general support for cryptographic operations needed. The SFRs **FMT_SMF.1** and **FMT_SMR.1/PACE** support the functions and roles related.

OT.Tracing

This objective aims that the TOE prevents gathering TOE tracing data by means of unambiguous identifying the travel document remotely through establishing or listening to a communication via the contactless interface of the TOE without a priori knowledge of the correct values of shared passwords (CAN, MRZ). This objective is achieved as follows:

- (i) While establishing PACE communication with CAN or MRZ (non-blocking authorisation data) – by **FIA_AFL.1/PACE**
- (ii) For listening to PACE communication (is of importance for the current PP, since SOD is card-individual) – **FTP_ITC.1/PACE**

OT.Prot_Abuse-Func

The security objective OT.Prot_Abuse-Func "Protection against Abuse of Functionality" is ensured by **FMT_LIM.1** and **FMT_LIM.2** which prevent misuse of test functionality of the TOE or other features which may not be used after TOE Delivery.

OT.Prot_Inf_Leak

The security objective OT.Prot_Inf_Leak "Protection against Information Leakage" requires the TOE to protect confidential TSF data stored and/or processed in the MRTD's chip against disclosure by:

- Measurement and analysis of the shape and amplitude of signals or the time between events found by measuring signals on the electromagnetic field, power consumption, clock, or I/O lines, which is addressed by **FPT_EMS.1**
- Forcing a malfunction of the TOE, which is addressed by **FPT_FLS.1** and **FPT_TST.1**
- Physical manipulation of the TOE, which is addressed by **FPT_PHP.3**.

OT.Prot_Phys-Tamper

The security objective OT.Prot_Phys-Tamper "Protection against Physical Tampering" is covered by **FPT_PHP.3**.

OT.Identification

The security objective OT.Identification "Identification and Authentication of the TOE" addresses the storage of the IC Identification Data uniquely identifying the MRTD's chip in its non-volatile memory. This will be ensured by TSF according to SFR **FAU_SAS.1**.

The SFR **FMT_MTD.1/INI_ENA** allows only the Manufacturer to write Initialization Data and Pre-personalization Data (including the Personalization Agent key). The SFR **FMT_MTD.1/INI_DIS** allows the Personalization Agent to disable Initialization Data if their usage in the phase 4 "Operational Use" violates the security objective OT.Identification.

The SFRs **FMT_SMF.1** and **FMT_SMR.1/PACE** support the functions and roles related.

OT.AC_Pers

"Access Control for Personalisation of logical travel document" addresses the access control of the writing the logical travel document. The justification for the SFRs **FAU_SAS.1**, **FMT_MTD.1/INI_ENA** and **FMT_MTD.1/INI_DIS** arises from the justification for OT.Identification above with respect to the Pre-personalisation Data. The write access to the logical travel document data are defined by the SFR **FIA_UID.1/PACE**, **FIA_UAU.1/PACE**, **FIA_UID.1/PACE_CAM**, **FIA_UAU.1/PACE_CAM**, **FDP_ACC.1/TRM** and **FDP_ACF.1/TRM** in the same way: only the successfully authenticated Personalisation Agent is allowed to write the data of the groups EF.DG1 to EF.DG16 of the logical travel document only once. **FMT_MTD.1/PA** covers the related property of OT.AC_Pers (writing SOD and, in generally, personalisation data). The SFR **FMT_SMR.1/PACE** lists the roles (including Personalisation Agent) and the SFR **FMT_SMF.1** lists the TSF management functions (including Personalisation). The SFRs **FPT_EMS.1** restricts the access to the Personalisation Agent Keys and the Chip Authentication Private Key.

The authentication of the terminal as Personalisation Agent shall be performed by TSF according to SFR **FIA_UAU.4/PACE**, **FIA_UAU.5/PACE**, **FIA_UAU.4/PACE_CAM** and **FIA_UAU.5/PACE_CAM**. If the Personalisation Terminal want to authenticate itself to the TOE by means of the Terminal Authentication Protocol (after Chip Authentication) with the Personalisation Agent Keys the TOE will use TSF according to the **FCS_RND.1** (for the generation of the challenge), **FCS_CKM.1/CA** (for the derivation of the new session keys after Chip Authentication), and **FCS_COP.1/CA_ENC** and **FCS_COP.1/CA_MAC** (for the ENC_MAC_Mode secure messaging), **FCS_COP.1/SIG_VER** (as part of the Terminal Authentication Protocol) and **FIA_UAU.6/EAC** (for the re-authentication). If the Personalisation Terminal wants to authenticate itself to the TOE by means of the Authentication Mechanism with Personalisation Agent Key the TOE will use TSF according to the **FCS_RND.1** (for the generation of the challenge) and **FCS_COP.1/CA_ENC** (to verify the authentication attempt). The session keys are destroyed according to **FCS_CKM.4** after use.

OT.Prot_Malfunction

The security objective OT.Prot_Malfunction "Protection against Malfunctions" is covered by:

- **FPT_TST.1** which requires self tests to demonstrate the correct operation and tests of authorized users to verify the integrity of TSF data and TSF code
- **FPT_FLS.1** which requires a secure state in case of detected failure or operating conditions possibly causing a malfunction.

OT.AA_Proof

The security objective OT.AA_Proof is ensured by the Active Authentication Protocol activated by **FMT_MOF.1/AA** and provided by **FDP_DAU.1/AA** proving the identity and authenticity of the TOE. The Active Authentication relies on **FCS_COP.1/AA** and **FCS_RND.1**. It is performed using a TOE internally stored confidential private key as required by **FMT_MTD.1/KEY_WRITE_AA** and **FMT_MTD.1/KEY_READ_AA**.

OT.Data_Int_AA

The security objective OT.AA_Proof is ensured by the Active Authentication Protocol activated by **FMT_MOF.1/AA** and provided by **FDP_DAU.1/AA** and **FDP_ITC.1/AA** proving the identity and authenticity of the TOE.

OT.Update_File

The security objective **OT.Update_File** "Modification of file in Operational Use Phase" addresses the modification of Updatable Data as defined in **FDP_ACC.1/UPD_FILE**. The SFR **FDP_ACF.1/UPD_FILE** clarifies what can be done by which subject: after a correct authentication the Personalization Agent is allowed to write, read and modify these Updatable Data during Pre-Personalisation and Personalisation phases. Any Terminal is not allowed to modify them during Operational phase. Only a successfully authenticated Extended Inspection System is allowed to modify Updatable Data, only if with the name corresponding to the one (or beginning of the one) set

following **FMT_MTD.1/UPD_FILE** by the Personalization Agent during Pre-Personalisation and Personalisation phases.

OT.BAC_Expiration

The security objective **OT.BAC_Expiration** "Automatic deactivation of BAC protocol" is ensured by the SFR **FMT_SMF.1/BAC_EXP** and detailed in **FMT_MOF.1/BAC_EXP** regarding mechanism activation and **FMT_MTD.1/BAC_EXP** regarding mechanism configuration.

OT.AC_SM_Level

The security objective **OT.AC_SM_Level** "Access control to sensitive biometric reference data according to SM level" is covered by **FMT_MTD.1/SM_LVL**.

10.5.2 Matrix Security requirements and security objectives

SO	SFR
OT.Sens_Data_Conf	FDP_ACC.1/TRM, FDP_ACF.1/TRM, FCS_COP.1/SIG_VER, FIA_UID.1/PACE, FIA_UAU.1/PACE, FIA_UAU.5/PACE, FIA_UAU.4/PACE, FIA_UID.1/PACE_CAM, FIA_UAU.1/PACE_CAM, FIA_UAU.5/PACE_CAM, FIA_UAU.4/PACE_CAM, FIA_UAU.6/EAC, FDP_UCT.1/TRM, FCS_CKM.1/CA, FCS_COP.1/SHA, FCS_COP.1/CA_ENC, FCS_COP.1/CA_MAC, FCS_CKM.4, FMT_MTD.1/CAPK, FMT_MTD.1/KEY_READ, FMT_MTD.3, FMT_MTD.1/CVCA_INI, FMT_MTD.1/CVCA_UPD, FMT_MTD.1/DATE, FMT_SMF.1, FMT_SMR.1/PACE, FMT_MTD.1/PACE_CAM_KEY_WRITE, FMT_MTD.1/PACE_CAM_KEY_READ
OT.Chip_Auth_Proof	FIA_API.1, FCS_CKM.1/CA, FMT_MTD.1/CAPK, FMT_MTD.1/KEY_READ, FCS_COP.1/SHA, FCS_COP.1/CA_ENC, FCS_COP.1/CA_MAC, FMT_MTD.1/PACE_CAM_KEY_WRITE, FMT_MTD.1/PACE_CAM_KEY_READ
OT.Data_Int	FPT_PHP.3, FDP_ACC.1/TRM, FDP_ACF.1/TRM, FMT_MTD.1/PA, FIA_UID.1/PACE, FIA_UAU.1/PACE, FIA_UAU.4/PACE, FIA_UAU.5/PACE, FIA_UID.1/PACE_CAM, FIA_UAU.1/PACE_CAM, FIA_UAU.4/PACE_CAM, FIA_UAU.5/PACE_CAM, FCS_CKM.4, FMT_SMR.1/PACE, FMT_SMF.1, FCS_COP.1/PACE_MAC, FCS_CKM.1/DH_PACE, FIA_UAU.6/PACE, FIA_UAU.6/PACE_CAM, FIA_UAU.6/EAC, FDP_RIP.1, FDP_UIT.1/TRM, FCS_CKM.1/CA, FCS_COP.1/CA_ENC, FCS_COP.1/CA_MAC, FMT_MTD.1/CAPK, FMT_MTD.1/KEY_READ, FCS_RND.1, FMT_MTD.1/PACE_CAM_KEY_WRITE, FMT_MTD.1/PACE_CAM_KEY_READ
OT.Data_Auth	FPT_ITC.1/PACE, FCS_COP.1/PACE_MAC, FCS_CKM.1/DH_PACE, FCS_CKM.1/CA, FIA_UAU.5/PACE, FIA_UAU.6/PACE, FIA_UAU.5/PACE_CAM, FIA_UAU.6/PACE_CAM, FIA_UAU.6/EAC, FDP_RIP.1, FIA_UAU.4/PACE, FCS_CKM.4, FMT_MTD.1/KEY_READ, FMT_MTD.1/PA, FCS_RND.1, FMT_SMR.1/PACE, FMT_SMF.1, FMT_MTD.1/PACE_CAM_KEY_READ
OT.Data_Conf	FDP_ACC.1/TRM, FDP_ACF.1/TRM, FIA_UAU.4/PACE, FIA_UAU.5/PACE, FIA_UAU.4/PACE_CAM, FIA_UAU.5/PACE_CAM, FCS_CKM.4, FDP_UCT.1/TRM, FDP_UIT.1/TRM, FPT_ITC.1/PACE, FCS_COP.1/PACE_ENC, FCS_COP.1/CA_ENC, FIA_UID.1/PACE, FIA_UAU.1/PACE, FIA_UID.1/PACE_CAM, FIA_UAU.1/PACE_CAM, FCS_CKM.1/DH_PACE, FCS_CKM.1/CA, FIA_UAU.6/PACE, FIA_UAU.6/PACE_CAM, FIA_UAU.6/EAC, FDP_RIP.1, FMT_MTD.1/KEY_READ, FMT_MTD.1/PA, FCS_RND.1, FMT_SMF.1, FMT_SMR.1/PACE, FMT_MTD.1/PACE_CAM_KEY_READ
OT.Tracing	FIA_AFL.1/PACE, FPT_ITC.1/PACE
OT.Prot_Abuse-Func	FMT_LIM.1, FMT_LIM.2
OT.Prot_Inf_Leak	FPT_EMS.1, FPT_FLS.1, FPT_TST.1, FPT_PHP.3
OT.Prot_Phys-Tamper	FPT_PHP.3
OT.Identification	FAU_SAS.1, FMT_MTD.1/INI_ENA, FMT_MTD.1/INI_DIS

SO	SFR
OT.AC_Pers	FAU_SAS.1, FMT_MTD.1/INI_ENA, FMT_MTD.1/INI_DIS, FIA_UID.1/PACE, FIA_UAU.1/PACE, FIA_UID.1/PACE_CAM, FIA_UAU.1/PACE_CAM, FDP_ACC.1/TRM, FDP_ACF.1/TRM, FMT_MTD.1/PA, FMT_SMR.1/PACE, FMT_SMF.1, FPT_EMS.1, FIA_UAU.4/PACE, FIA_UAU.5/PACE, FIA_UAU.4/PACE_CAM, FIA_UAU.5/PACE_CAM, FCS_RND.1, FCS_CKM.1/CA, FCS_COP.1/CA_ENC, FCS_COP.1/CA_MAC, FCS_COP.1/SIG_VER, FIA_UAU.6/EAC, FCS_RND.1, FCS_CKM.4
OT.Prot_Malfunction	FPT_TST.1, FPT_FLS.1
OT.AA_Proof	FMT_MOF.1/AA, FDP_DAU.1/AA, FCS_COP.1/AA, FCS_RND.1, FMT_MTD.1/KEY_WRITE_AA, FMT_MTD.1/KEY_READ_AA, FDP_ITC.1/AA
OT.Data_Int_AA	FMT_MOF.1/AA, FDP_DAU.1/AA, FDP_ITC.1/AA
OT.Update_File	FDP_ACC.1/UPD_FILE FDP_ACF.1/UPD_FILE FMT_MTD.1/UPD_FILE
OT.AC_SM_Level	FMT_MTD.1/SM_LVL.
OT.BAC_Expiration	FMT_SMF.1/BAC_EXP, FMT_MOF.1/BAC_EXP, FMT_MTD.1/BAC_EXP

Table 41: Security Requirements and Security Objectives Matrix

10.5.3 Dependencies justification SFRs

Requirements	CC Dependencies	Satisfied Dependencies
PP 0056 v2		
FCS_CKM.1/CA	(FCS_CKM.2 or FCS_COP.1) and (FCS_CKM.4)	FCS_COP.1/CA_MAC, FCS_COP.1/CA_ENC, FCS_COP.1/SHA, FCS_CKM.4*
FCS_COP.1/SHA	(FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1) and (FCS_CKM.4)	FCS_CKM.1/CA, FCS_CKM.4*
FCS_COP.1/CA_ENC	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FCS_CKM.1/CA, FCS_CKM.4*
FCS_COP.1/SIG_VER	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FCS_CKM.1/CA, FCS_CKM.4*
FCS_COP.1/CA_MAC	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FCS_CKM.1/CA, FCS_CKM.4*
FIA_UID.1/PACE	No dependencies	
FIA_UAU.1/PACE	(FIA_UID.1)	FIA_UID.1/PACE
FIA_UAU.4/PACE	No dependencies	
FIA_UAU.5/PACE	No dependencies	
FIA_UAU.6/EAC	No dependencies	
FIA_API.1	No dependencies	
FDP_ACC.1/TRM	(FDP_ACF.1)	FDP_ACF.1/TRM
FDP_ACF.1/TRM	(FDP_ACC.1) and (FMT_MSA.3)	FDP_ACC.1/TRM, see justification
FMT_SMR.1/PACE	(FIA_UID.1)	FIA_UID.1/PACE
FMT_LIM.1	(FMT_LIM.2)	FMT_LIM.2
FMT_LIM.2	(FMT_LIM.1)	FMT_LIM.1
FMT_MTD.1/CVCA_INI	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE

Requirements	CC Dependencies	Satisfied Dependencies
FMT_MTD.1/CVCA_UPD	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/DATE	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/CAPK	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/KEY_READ	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.3	FMT_MTD.1	FMT_MTD.1/CVCA_INI FMT_MTD.1/CVCA_UPD
FPT_EMS.1	No dependencies	
FAU_SAS.1	No dependencies	
FCS_CKM.1/DH_PACE	(FCS_CKM.2 or FCS_COP.1) and (FCS_CKM.4)	FCS_CKM.4, FCS_COP.1/PACE_ENC, FCS_COP.1/PACE_MAC
FCS_CKM.4	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2)	FCS_CKM.1/
FCS_COP.1/PACE_ENC	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FCS_CKM.1/DH_PACE, FCS_CKM.4
FCS_COP.1/PACE_MAC	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FCS_CKM.1/DH_PACE, FCS_CKM.4
FCS_RND.1	No dependencies	
FIA_AFL.1/PACE	(FIA_UAU.1)	FIA_UAU.1/PACE
FIA_UAU.6/PACE	No dependencies	
FDP_RIP.1	No dependencies	
FDP_UCT.1/TRM	(FDP_ACC.1 or FDP_IFC.1) and (FDP_ITC.1 or FDP_TRP.1)	FDP_ACC.1/TRM, see justification
FDP_UIT.1/TRM	(FDP_ACC.1 or FDP_IFC.1) and (FDP_ITC.1 or FDP_TRP.1)	FDP_ACC.1/TRM, see justification
FMT_SMF.1	No dependencies	
FMT_MTD.1/INI_ENA	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/INI_DIS	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/PA	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FPT_TST.1	No dependencies	
FPT_FLS.1	No dependencies	
FPT_PHP.3	No dependencies	
FDP_ITC.1/PACE	No dependencies	
FCS_COP.1/AA	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	FDP_ITC.1/AA
FDP_DAU.1/AA	No dependencies	
FDP_ITC.1/AA	(FDP_ACC.1 or FDP_IFC.1) and (FMT_MSA.3)	FDP_ACC.1/TRM, see justification

Requirements	CC Dependencies	Satisfied Dependencies
FMT_MOF.1/AA	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/AA_KEY_WRITE	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/AA_KEY_READ	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
PACE CAM		
FIA_UAU.1/PACE_CAM	(FIA_UID.1)	FIA_UID.1/PACE_CAM
FIA_UAU.4/PACE_CAM	No dependencies	
FIA_UAU.5/PACE_CAM	No dependencies	
FIA_UAU.6/PACE_CAM	No dependencies	
FIA_UID.1/PACE_CAM	No dependencies	
FMT_MTD.1/PACE_CAM_KEY_READ	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/PACE_CAM_KEY_Write	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
Additions		
FDP_ACC.1/UPD_FILE	(FDP_ACF.1)	FDP_ACF.1/UPD_FILE
FDP_ACF.1/UPD_FILE	(FDP_ACC.1) and (FMT_MSA.3)	FDP_ACC.1/UPD_FILE, see justification
FMT_MTD.1/UPD_FILE	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MTD.1/SM_LVL	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMF.1, FMT_SMR.1/PACE
FMT_MOF.1/BAC_EXP	(FMT_SMF.1) and (FMT_SMR.1)	FMT_SMR.1/PACE, FMT_SMF.1
FMT_MTD.1/BAC_EXP	FMT_SMF.1 and FMT_SMR.1	FMT_SMF.1, FMT_SMR.1/PACE
FMT_SMF.1/BAC_EXP	No dependencies	

Table 42: SFRs dependencies

*: The FCS_CKM.4 is the one from PP 0068 v2, and as the SFRs of the PP are considered in the scope of this ST, this SFR is fulfilled.

10.5.4 Rationale for the exclusion of dependencies

The table shows the dependencies of each SFR, the missed one are written in the table with **bold character** and justifications for missing ones are in the following paragraph:

The dependency FMT_MSA.3 of FDP_ACF.1/TRM and FDP_ITC.1/AA is unsupported. The access control TSF according to FDP_ACF.1 uses security attributes which are defined during the personalization and are fixed over the whole life time of the TOE. No management of these security attribute (i.e. SFR FMT_MSA.1 and FMT_MSA.3) is necessary here.

The dependency FTP_ITC.1 or FTP_TRP.1 of FDP_UCT.1/TRM and FDP_UIT.1/TRM is unsupported. The SFR FDP_UCT.1/TRM and FDP_UIT.1/TRM require the use of secure messaging between the MRTD and the BIS. There is no need for SFR FTP_ITC.1, e.g. to require this communication channel to be logically distinct from other communication channels since there is only one channel. Since the TOE does not provide a direct human interface a trusted path as required by FTP_TRP.1 is not applicable here.

The dependency FCS_CKM.4 of FCS_COP.1/AA is unsupported. Since the key is permanently stored within the TOE there is no need for FCS_CKM.4, too. Nevertheless the key is define

The dependency FMT_MSA.3 of FDP_ACF.1/UPD_FILE is not required. The access control TSF according to **FDP_ACF.1/UPD_FILE** uses security attributes which are defined during the personalisation and are fixed over the whole life time of the TOE. No management of these security attribute (i.e. SFR FMT_MSA.1 and FMT_MSA.3) is necessary here.

10.5.5 SARs dependencies

Reqs	CC Dependencies	Satisfied Dependencies
ADV_ARC.1	(ADV_FSP.1) and (ADV_TDS.1)	ADV_FSP.5, ADV_TDS.4
ADV_FSP.5	(ADV_IMP.1) and (ADV_TDS.1)	ADV_IMP.1, ADV_TDS.4
ADV_IMP.1	(ADV_TDS.3) and (ALC_TAT.1)	ADV_TDS.4, ALC_TAT.2
ADV_INT.2	(ADV_IMP.1) and (ADV_TDS.3) and (ALC_TAT.1)	ADV_IMP.1, ADV_TDS.4, ALC_TAT.2
ADV_TDS.4	(ADV_FSP.5)	ADV_FSP.5
AGD_OPE.1	(ADV_FSP.1)	ADV_FSP.5
AGD_PRE.1	No dependencies	
ALC_CMC.4	(ALC_CMS.1) and (ALC_DVS.1) and (ALC_LCD.1)	ALC_CMS.5, ALC_DVS.2, ALC_LCD.1
ALC_CMS.5	No dependencies	
ALC_DEL.1	No dependencies	
ALC_DVS.2	No dependencies	
ALC_LCD.1	No dependencies	
ALC_TAT.2	(ADV_IMP.1)	ADV_IMP.1
ASE_CCL.1	(ASE_ECD.1) and (ASE_INT.1) and (ASE_REQ.1)	ASE_ECD.1, ASE_INT.1, ASE_REQ.2
ASE_ECD.1	No dependencies	
ASE_INT.1	No dependencies	
ASE_OBJ.2	(ASE_SPD.1)	ASE_SPD.1
ASE_REQ.2	(ASE_ECD.1) and (ASE_OBJ.2)	ASE_ECD.1, ASE_OBJ.2
ASE_SPD.1	No dependencies	
ASE_TSS.1	(ADV_FSP.1) and (ASE_INT.1) and (ASE_REQ.1)	ADV_FSP.5, ASE_INT.1, ASE_REQ.2
ATE_COV.2	(ADV_FSP.2) and (ATE_FUN.1)	ADV_FSP.5, ATE_FUN.1
ATE_DPT.3	(ADV_ARC.1) and (ADV_TDS.4) and (ATE_FUN.1)	ADV_ARC.1, ADV_TDS.4, ATE_FUN.1
ATE_FUN.1	(ATE_COV.1)	ATE_COV.2
ATE_IND.2	(ADV_FSP.2) and (AGD_OPE.1) and (AGD_PRE.1) and (ATE_COV.1) and (ATE_FUN.1)	ADV_FSP.5, AGD_OPE.1, AGD_PRE.1, ATE_COV.2, ATE_FUN.1
AVA_VAN.5	(ADV_ARC.1) and (ADV_FSP.4) and (ADV_IMP.1) and (ADV_TDS.3) and (AGD_OPE.1) and (AGD_PRE.1) and (ATE_DPT.1)	ADV_ARC.1, ADV_FSP.5, ADV_IMP.1, ADV_TDS.4, AGD_OPE.1, AGD_PRE.1, ATE_DPT.3

Table 44: SARs dependencies