CWA 14167-2:

Cryptographic Module for CSP Signing Operations with Backup — Protection Profile

CMCSOB-PP

Version: 0.28

Tuesday, 27th October 2003

Prepared By: E-SIGN Workshop - Expert Group D2

Prepared For: CEN/ISSS

Note: **This Protection Profile (PP) has been prepared for the European Electronic Signature Standardisation Initiative EESSI by CEN/ISSS area D2 on trustworthy systems, sub-group D2 on cryptographic modules for certification service providers. In its present form it has been successfully evaluated and certified and it represents the final version approved by CEN/ISSS WS/E-Sign.**

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Foreword

This 'Cryptographic Module for CSP Signing Operations with Backup - Protection Profile' (CMCSOB-PP) is issued by the European Committee for Standardization, Information Society Standardization System (CEN/ISSS) Electronic Signatures (E-SIGN) workshop. The document represents the CEN/ISSS workshop agreement (CWA) on trustworthy systems area D2.

The document is for use by the European Commission in accordance with the procedure laid down in Article 9 of the Directive 1999/93/ec of the European parliament and of the council of 13 December 1999 on a Community framework for electronic signatures [1] as generally recognised standard for electronic-signature products in the Official Journal of the European Communities.

The document has been prepared as a Protection Profile (PP) following the rules and formats of ISO 15408, as known as the Common Criteria version 2.1 [2] [3] [4].

The set of algorithms for secure signature-creation devices and parameters for algorithms for secure signature-creation devices is given in a separate document [5].

This document has been originally prepared as a single Protection Profile and approved as CWA 14167-2:2002. Afterward, while reviewing this Protection Profile for the evaluation, in order to make it conformant to the Common Criteria 2.1, two Protection Profiles have been created for the same TOE, one including the mandatory function of key backup and the other excluding this function:

- Cryptographic Module for CSP Signing Operations with Backup - Protection Profile (CMCSOB-PP), version 0.28; CWA 14167-2:2004 (this document);
- Cryptographic Module for CSP Signing Operations - Protection Profile (CMCSO-PP), version 0.28; CWA 14167-4:2004.

The Protection Profile with the key backup function (CMCSOB-PP) keeps the original part number (Part 2). The PP without the key backup function (CMCSO-PP) gets a new part number (Part 4).

The two Protection Profiles (CMCSOB-PP and CMCSO-PP) v. 0.28 have been both successfully evaluated and certified.

This document is part of the CWA 14167 that consists of the following parts:

- Part 1: System Security Requirements;
- Part 2: Cryptographic Module for CSP Signing Operations with Backup – Protection Profile (CMCSOB-PP);
- Part 3: Cryptographic Module for CSP Key Generation Services – Protection Profile (CMCKG-PP);
- Part 4: Cryptographic Module for CSP Signing Operations – Protection Profile (CMCSO-PP).

The document containing the Protection Profile v. 0.28 successfully evaluated is dated 27 October 2003. That document has been updated as follows:

- modified the CEN document identifier as described above;
- removed the "draft" indication;
- updated the fields "General Status" and "Version Number" in the "1.1 Identification" section;
- modified this Foreword.

The outcome of these updates constitutes the document dated 12 January 2004 and ready for the CEN workshop voting.

After the approval by CEN workshop that document has been updated as follows:

- updated the last sentence included in the text box on the cover page;
- updated the CWA's definition in the "Terminology" section;
- modified this Foreword.

The outcome of these updates constitutes the present document, dated 02 March 2004 and ready for the official publication by CEN and DCSSI.

This version of this CWA 14167-2:2004 was published on 2004-04-29.

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Revision History

PRE-RELEASE HISTORY FOR EDITORIAL TRACKING ONLY, REPLACE FOR FINAL PP

v0.04	17.04.01	initial draft for Brussels kick-off meeting
v0.05	27.04.01	PP-skeleton resulting from kick-off meeting
v0.06	09.05.01	extension of skeleton
v0.07	11.05.01	inclusion of SFR and operations (pre-Munich meeting version)
v0.08	28.05.01	inclusion of Munich-meeting discussions (editing in parallel sections)
v0.09	03.06.01	combination of the sections to single document
v0.10	13.06.01	inclusion of the revised sections 2 and 3
v0.11	14.06.01	incorporated telephone conference results
v0.12	21.06.01	added SFR/SAR as generated/mapped via Sparta-tool data files version distributed for workshop comments at Sophia Antipolis meeting
v0.13	07.08.01	comments on v0.12 incorporate including Helmut's revisions
v0.14	13.08.01	revisions during Brussels D2 meeting
v0.15	20.08.01	incorporated comments and Brussels D2 meeting results "for public comments version" to be distributed
v0.16	27.08.01	Version distributed for public comments.
v.017	03.10.01	Version including changes according to comments and Milano meeting
v.018	08.11.01	minor editorial changes, "list of approved algorithms and parameters" defined under terminology
v.019	28.02.02	Changes according to the findings of CWA evaluator checks
v0.20	16.07.02	Crypto-user is replaced by Auditor in the application notes to the audit functions, rationale for O.Control_Service updated.
v0.21	31.01.03	Changes according to the findings of evaluation report
v0.22	25.02.03	Changes due to the comments of the expert group
v0.23	08.05.03	Backup support is mandatory in this version CMCSOB-PP
v0.25	03.06.03	Changes due to public comments in ESIGN workshop
v0.26	04.09.03	Changes due to the findings of evaluation report
v0.27	07.10.03	Editorial changes due to the evaluator's remarks
v0.28	27.10.03	Editorial changes due to the evaluator's remarks

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Conventions and Terminology

Conventions

The document follows the rules and conventions laid out in Common Criteria 2.1, part 1 [2], Annex B "Specification of Protection Profiles". Admissible cryptographic algorithms and parameters for algorithms are given in a separate document [5]. Therefore, the Protection Profile (PP) refers to [5].

Terminology

Administrator means a CSP user role that performs TOE initialisation or other TOE administrative functions. These tasks are mapped to the Crypto-officer role of the TOE.

Advanced electronic signature (defined in the Directive [1], article 2.2) means an electronic signature which meets the following requirements:

(a) it is uniquely linked to the signatory;
(b) it is capable of identifying the signatory;
(c) it is created using means that the signatory can maintain under his sole control, and
(d) it is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable.

Authentication data is information used to verify the claimed identity of a user.

Auditor means a user exporting the TOE audit data and reviewing the audit data with tools in the TOE environment.

Backup means export of the CSP-SCD, the TSF data and the system data (backup data) sufficient to recreate the state of the TOE at the time the backup was created. Note that backup is the only function which is allowed to export CSP-SCD and only if backup package is implemented.

CEN workshop agreement (CWA) is a consensus-based specification, drawn up in an open workshop environment of the European Committee for Standardization (CEN).

Certificate means an electronic attestation which links the SVD to a person and confirms the identity of that person. (defined in the Directive [1], article 2.9)

CSP signature creation data (CSP-SCD) means SCD which is used by the CSP, e.g. for the creation of advanced electronic signatures in qualified certificates or for signing certificate status information.

CSP signature verification data (CSP-SVD) means SVD which corresponds to the CSP-SCD and which is used to verify the advanced electronic signature in the qualified certificate or for signing certificate status information.

Certification-service-provider (CSP) means an entity or a legal or natural person who issues certificates or provides other services related to electronic signatures (defined in the Directive [1], article 2.11).

Data to be signed (DTBS) means the complete electronic data to be signed, such as QC content data or certificate status information.

Data to be signed representation (DTBS-representation) means the data sent to the TOE for signing and is

(a) a hash-value of the DTBS or
(b) an intermediate hash-value of a first part of the DTBS and a remaining part of the DTBS or
(c) the DTBS itself.

The client indicates to the TOE the case of DTBS-representation, unless implicitly indicated. The hash-value in case (a) or the intermediate hash-value in case (b) is calculated by the client. The final hash-value in case (b) or the hash-value in case (c) is calculated by the TOE.

Digital signature means data appended to, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to prove the source and integrity of the data unit and protect against forgery e.g. by the recipient. [ISO 7498-2]

Directive The Directive 1999/93/ec of the European parliament and of the council of 13 December 1999 on a Community framework for electronic signatures [1] is also referred to as the 'Directive' in the remainder of the PP.

Dual person control means a special form of access control of a task which requires two users with different identities to be authenticated and authorised to the defined roles at the time this task is to be performed.

Hardware security module (HSM) means the cryptographic module used to generate the advanced signature in qualified certificates and which represents the TOE.

List of approved algorithms and parameters means cryptographic algorithms and parameters published in [5] for electronic signatures, secure signature creation devices and trustworthy systems

Reference authentication data (RAD) means data persistently stored by the TOE for verification of the authentication attempt as authorised user.

Restore means import of the backup data to recreate the state of the TOE at the time the backup was created.

Qualified certificate (QC) means a certificate which meets the requirements laid down in Annex I of the Directive [1] and is provided by a CSP who fulfils the requirements laid down in Annex II of the Directive [1]. (defined in the Directive [1], article 2.10)

Secure signature-creation device (SSCD) means configured software or hardware which is used to implement the SCD and which meets the requirements laid down in Annex III of the Directive [1]. (SSCD is defined in the Directive [1], article 2.5 and 2.6).

Side-channel means illicit information flow in result of the physical behavior of the technical implementation of the TOE. Side-channels are but limited to interfaces not intended for data output like power consumption, timing of any signals and radiation. Side-channels might be enforced by influencing the TOE behavior from outside.

Signature-creation data (SCD) means unique data, such as codes or private cryptographic keys, which are used by the signatory to create an electronic signature. (defined in the Directive [1], article 2.4)

Signature-verification data (SVD) means data, such as codes or public cryptographic keys, which are used for the purpose of verifying an electronic signature. (defined in the Directive [1], article 2.7)

Split knowledge procedure for key import is a process by which a cryptographic key is split into multiple key components, individually sharing no knowledge of the original key, that can be subsequently input into, or output from, a cryptographic module by separate entities and combined to recreate the original cryptographic key.

SSCD provision service means a service that prepares and provides a SSCD to subscribers.

User means any entity (human user or external IT entity) outside the TOE that interacts with the TOE.

User data means data created by and for the user that does not affect the operation of the TSF.

Verification authentication data (VAD) means authentication data provided as input by knowledge or authentication data derived from user's biometric characteristics.

Document Organisation

Section 1 provides the introductory material for the Protection Profile.

Section 2 provides general purpose and TOE description.

Section 3 provides a discussion of the expected environment for the TOE. This section also defines the set of threats that are to be addressed by either the technical countermeasures implemented in the TOE hardware, the TOE software, or through the environmental controls.

Section 4 defines the security objectives for both the TOE and the TOE environment.

Section 5 contains the functional requirements and assurance requirements derived from the Common Criteria (CC), Part 2 [3] and Part 3 [4], that must be satisfied by the TOE.

Section 6 provides a rationale to explicitly demonstrate that the information technology security objectives satisfy the policies and threats. Arguments are provided for the coverage of each policy and threat. The section then explains how the set of requirements are complete relative to the objectives, and that each security objective is addressed by one or more component requirements. Arguments are provided for the coverage of each objective. Next section 6 provides a set of arguments that address dependency analysis, strength of function issues, and the internal consistency and mutual supportiveness of the protection profile requirements

A reference section is provided to identify background material.

An acronym list is provided to define frequently used acronyms.

1 Introduction

This section provides document management and overview information that is required to carry out protection profile registry. Therefore, section 1.1 “Identification” gives labelling and descriptive information necessary for registering the Protection Profile (PP). Section 1.2 “Protection Profile Overview” summarises the PP in narrative form. As such, the section gives an overview to the potential user to decide whether the PP is of interest. It is usable as stand-alone abstract in PP catalogues and registers.

1.1 Identification

Title:	Cryptographic Module for CSP Signing Operations with backup – Protection Profile
Authors:	Wolfgang Killmann, Helmut Kurth, Herbert Leitold, Hans Nilsson
Vetting Status:	
CC Version:	2.1 Final (including final interpretations)
General Status:	Evaluated and certified
Version Number:	0.28
Registration:	
Keywords:	cryptographic module, CSP signing device, qualified certificate signing, certificate status information signing

The following final interpretation of the CCIMB related to APE criteria in CC part 3 [4] and the CEM [8] were taken into account: 008, 013, 019, 043, 049, 051, 058, 064, 065, 084, 085, 098, 138.

1.2 Protection Profile Overview

The Directive 1999/93/ec of the European parliament and of the council of 13 December 1999 on a Community framework for electronic signatures [1], referred to as the ‘Directive’ in the remainder of the PP, states in Annex II that:

- *Certification-service-providers must:*
  - *(f) use trustworthy systems and products which are protected against modification and ensure the technical and cryptographic security of the process supported by them;*
  - *(g) take measures against forgery of certificates, and, in cases where the certification-service-provider generates signature-creation data, guarantee confidentiality during the process of generating such data;*

In the supporting ETSI Technical Specification "Policy Requirements for Certification Authorities (CA) [1] issuing Qualified Certificates" (ETSI TS 101 456) [6], it is stated that

- *The CA shall ensure that CA keys are generated in accordance with industry standards, and*

[1] **Note: In the remainder of this PP the term ‘Certificate Service Provider (CSP)’ is used instead of the commonly used term ‘Certification Authority (CA)’, as the former is employed by the Directive [1] this PP aims to support.**

- *The CA shall ensure that CA private keys remain confidential and maintain their integrity".*

This Protection Profile (PP) defines the security requirements of a Cryptographic Module (CM) used by CSP as part of its trustworthy system to provide signing services, such as Certificate Generation Service or Certificate Status Information Signing Services. The Cryptographic Module, which is the Target of Evaluation (TOE), is used for the creation of CSP key pairs, and their usage for the creation and verification of advanced electronic signatures in qualified certificates or certificate status information. The private keys are referred to in this PP as Certification Service Provider Signature-Creation Data (CSP-SCD). The public keys are referred as Certification Service Provider Signature-Verification Data (CSP-SVD).

The TOE may implement additional functions and security requirements, e.g. for the creation of Signature Creation Data (SCD) for loading into Secure Signature Creation Devices (SSCD) as part of a Subscriber Device Provision Service. However, these additional functions and security requirements are not subject of this Protection Profile.

This PP is Common Criteria Part 2 extended and Common Criteria Part 3 conformant. The assurance level for this PP is EAL4, augmented with ADV_IMP.2 (implementation of the TSF), AVA_CCA.1 (vulnerability assessment, covert channel analysis) and AVA_VLA.4 (vulnerability assessment, highly resistant). The minimum strength level for the TOE security functions is 'SOF high' (Strength of Functions High).

In Article 3.5, the Directive further states that

- *The Commission may, in accordance with the procedure laid down in Article 9, establish and publish reference numbers of generally recognised standards for electronic-signature products in the Official Journal of the European Communities. Member States shall presume that there is compliance with the requirements laid down in Annex II, point (f), and Annex III when an electronic signature product meets those standards."*

This Protection Profile is established by CEN/ISSS for use by the European Commission, with reference to Annex II (f), in accordance with this procedure.

2 TOE Description

The TOE is a Cryptographic Module (CM) used for the creation and usage of Certificate Service Provider Signature-Creation Data (CSP-SCD). The CM may optionally also perform hashing of the qualified certificate content.

The TOE is configured software and hardware that may be used to provide the following cryptographic functions:

- Generation of CSP-SCD
- Usage of the CSP-SCD to create advanced electronic signatures for qualified certificates based on either
    a) the hash value of the content of the qualified certificate, or
    b) the complete content of the qualified certificate, where the hashing is also performed in the CM (optional).

The Protection Profile's primary scope is for signing qualified certificates. Still components evaluated against this standard may be applied for other signature-creation tasks carried out by a certificate service provider (CSP) such as time-stamping, signing certificate revocation lists (CRLs) or issuing online certificate status protocol (OCSP) messages.

For the cryptographic functions, the TOE shall support the cryptographic algorithms specified in [5], or a subset thereof.

The TOE shall provide the following additional functions to protect these cryptographic functions:

- User authentication
- Access control for the creation and destruction of keys
- Access control for usage of keys to create certificate signatures
- Auditing of security-relevant changes to the TOE
- Self-test of the TOE

The TOE shall handle the following User Data:

- CSP Signature Creation Data (CSP-SCD): private key of CSP, created and stored internally in the TOE
- Data to be signed representation (DTBS-representation): The data to be signed by the TOE may e.g. be:
    - Certificate hash value: imported to the TOE
    - Certificate contents (optional, when hashing is performed in the TOE), data to be hashed and signed, imported to the TOE
    - other data to be signed by the TOE, such as CRL or the hash value of the CRL, or time-stamping content data
- Certificate signature: created signature, exported from the TOE.

The TOE supports backup and restore of CSP-SCD, other user data and TSF data to re-establish an operational state after failure. The TOE will protect the confidentiality of the backup data and detect loss of the integrity of the backup data while the IT-environment will ensure the availability of the backup data.

2.1 TOE Roles

The TOE shall as a minimum support the following user categories (roles):

- Crypto-officer (authorised to install, configure and maintain the TOE and to create, destruct, backup/restore data)
- Crypto-user (authorised to sign with existing CSP-SCDs)
- Auditor (authorised to read audit data generated by the TOE and exported for audit review in the TOE environment)

The TOE may support other roles or sub-roles in addition to the roles specified above. The roles may also be allowed to perform additional functions provided by the TOE as long as the separation between different roles is given.

The interface to the TOE may either be shared between the different user categories, or separated for certain functions, for example configuration and key backup/restore. Authentication of TOE users shall be identity-based.

Maintenance of the TOE as well as the management of the CSP-SCDs are highly critical operations that need to be related to the individual users that performed the operation. It is therefore required that for the roles System Auditor and Security officer of the CSP [7] the individual users have to be known by the TOE as Auditor and Crypto-officer and the TOE needs to perform identity based authentication for those roles. The Crypto-officer role is very powerful including user and key management. Therefore the Auditor role is implemented to watch on Crypto-officer's actions and to detect misuse of Crypto-officer's authorisation.

The TOE may manage two or more user identities for the role Crypto-user to allow dual person control for security critical actions like generation of CSP-SCD and CSP-SVD generation, backup and restore. The end-users may access to the TOE signing service through a client application in the TOE environment. The client application acts as agent for these end-users with an TOE user identity in the Crypto-user role.

2.2 TOE Usage

In most cases the TOE will be a separate component with its own hardware and software, communicating via a well-defined physical and logical interface with the client application in the IT environment. Examples of physical interfaces that may be used to connect the TOE to the client application are the PCI bus, the SCSI bus, USB or Firewire.

Logically the TOE is responsible for protecting the CSP-SCD against disclosure, compromise and unauthorised modification and for ensuring that the TOE services are only used in an authorised way.

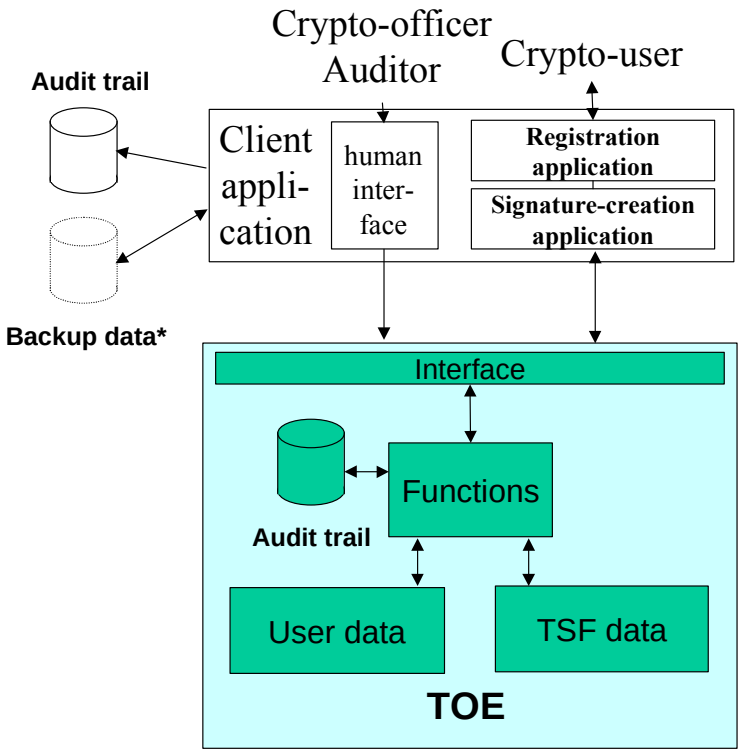


Figure 1: TOE general overview

As shown in figure 1, end-users will communicate with the client application, which in turn will call TOE services on behalf of the end-user. The client application provides the human interface for user identification and authentication. The client application is responsible for passing any user data in a correct way to the TOE. Different mechanisms may be used to protect the user data on its way from the originating user to the TOE, but all those mechanisms are not part of the TOE functionality and therefore not defined in this Protection Profile.

The TOE provides identification authentication, access control and audit for users of its services. The client application in the TOE environment may mediate the TOE signing function to its end-users. Therefore it is the responsibility of the client application to identify, authenticate and control access of its end-users gaining access to the TOE services provided for the Crypto-user role. The end-user authenticates themselves to the client application with his or her identity. The client application checks the authorisation of the end-user for the TOE signing service. If the end-user is allowed to use the signing function the client application will authenticate themselves for the Crypto-user role to the TOE and will map the identity of the end-user to the Crypto-user role. The client application performs identity-based auditing to support accountability for the cryptographic operations. While the TOE will only perform auditing for the client application the TOE environment audit might distinguish between the end-users of the client application.

The client application that communicates with the TOE may itself consist of different parts implemented on different systems. For example, a client application that initiates the generation of qualified certificate may consist of two parts:

1. A registration application, which initialises the information for the certificate.

2. A signature-creation application which may be

   a) a certification application, which verifies the integrity and authenticity of the request submitted by the registration application and then calls the TOE service to sign the certificate or

   b) other applications requesting the TOE to sign DTBS-representations, e.g. certificate status information. The application verifies integrity and authenticity of the signature request.

When exporting the CSP-SCD or TSF data the TOE ensures the confidentiality and integrity of the CSP-SCD and the TSF data by the backup and restore functions. The backup will export user data and TSF data (backup data) and the restore function will import the backup data for recreation the state of the TOE at the time the backup was created. The IT-environment provides means to support the backup and restore functions of the TOE by ensuring the availability of the backup data.

3 TOE Security Environment

3.1 Assets to protect

The primary assets that need to be protected by the TOE are the following:

TOE services

- **R.SERVICES**: integrity and availability of the TOE services as well as protection against misuse is required.

TOE internal data:

- **R. USER_DATA**: confidential user data (CSP-SCD, other user related secret keys (if any), etc.) and data to be signed with CSP-SCD which has to be protected in integrity.
- **R.USERMGMT_DATA**: non-confidential user / role related data (identifier, access control lists, role definitions, etc.). Those data has to be protected in integrity.
- **R. SYSTEM_DATA**: TSF data (especially VAD and RAD) and other system data not related to a user or role (system configuration data, audit data) which have to be protected in confidentiality, integrity and availability.
- **R.BACKUP**: backup data exported by the TOE to the TOE environment and restored in the TOE. This data needs to be protected in integrity and confidentiality by the TOE. Availability of this data has to be ensured in the TOE environment.

3.2 Assumptions

A.Audit_Support *CSP audit review*

The CSP reviews the audit trail generated and exported by the TOE. The client application receives and stores the audit trail of the TOE for review by the System auditor of the CSP according to the audit procedure of the CSP.

A.Correct_DTBS *Correct DTBS Content Data*

DTBS-representation submitted to the TOE is assumed to be correct. This requires that the DTBS (e.g. the certificate content data) has been initialised correctly and maintains this correctness until it is passed to the TOE. This requires the DTBS to be correctly defined during the registration process, be transferred with integrity protection between the systems involved in the process (e.g. registration and certificate generation), be processed in a correct way by the client application, being hashed correctly (in the case the hashing is done by the client application and not by the TOE) and passed correctly to the TOE.

The TOE environment will probably use its own mechanisms to ensure this correctness during processing and transmission. This will for example include mechanisms that can be used to verify the integrity and authenticity of user data when passed between different entities within the TOE environment. Specific instantiations of the TOE may have additional functions that can be used by the TOE environment to maintain the integrity of user data outside of the TOE, but those functions are not mandated by this Protection Profile

A.Data_Store *Storage and Handling of TOE data*

The TOE environment ensures the confidentiality, integrity and availability of their security relevant data for TOE initialisation, start-up and operation if stored or handled outside the TOE. The TOE environment ensures the availability of the backup data. Examples of these data are verification authentication data, cryptographic key material and documentation of TOE configuration data.

A.Human_Interface *Interface with Human Users*

The client application will provide an appropriate interface and communication path between human users and the TOE because the TOE does not have a human interface for authentication and management services. The TOE environment transmits identification, authentication and management data of TOE users correctly and in a confidential way to the TOE.

A.User_Authentication *Authentication of Users*

The client-application is assumed as user of the TOE in the Crypto-user role. Other users authorised for the TOE Crypto-user services may be not be known to the TOE itself. The TOE environment performs identification and authentication for theses individual users and allows successfully authenticated users to use the client application as their agent for the Crypto-user services.

Application note:

There are different users of the TOE services within a CSP environment. The TOE itself is only required to relate a request for a TOE service to a specific role and requires credentials to authenticate that the request was generated by a user having a specific role. In the following section we discuss the TOE role model and the users within the TOE environment.

In most cases the registration authority is separated from the certificate generation system. The registration authority system usually has its own protection features including the identification and authentication of individual users (“registration officers”) of the specific registration authority system.

Once the certificate request has been generated on the registration authority system it is submitted to the certificate generation system protected by a digital signature. This digital signature is used by the certificate generation system to verify that the request has been issued by a registration authority authorised to generate certification requests for this certificate generation system.

The registration authority may use its own internal user management and the individual users within the registration authorities may not be known to the certificate generation system and

therefore also not known to the TOE. The registration authority may use one specific RA private key to sign a certification request and may use its own internal audit procedures to relate a specific certification request to an individual user within the RA system.

Management of the individual users for the System Administrator and the Crypto Administrator role of the CSP [7] needs to be performed within the TOE as Crypto-officer. The System Auditor [7] will use the TOE Auditor role.

3.3 Threats to Security

T.Bad_SW Malicious Software during the Lifetime of the TOE

When the TOE provides the ability to load new software or software updates or modify software when it is in operation, this function can be misused to load malicious software by unauthorised persons.

T.CSP-SCD_Derive *Deriving All or Parts of the CSP-SCD*

The most valuable asset the TOE has to protect is the CSP-SCD. The ability to derive all or parts of the CSP-SCD in any way (including the legitimate use of the TOE services) presents a threat that needs to be countered by the TOE. This includes also any ability to derive all or part of the CSP-SCD using knowledge about the CSP-SCD generation and signing processes.

T.CSP-SCD_Disclose *Disclosing All or Part of the CSP-SCD*

Direct disclosure of the CSP-SCD or part of it presents a major threat to the TOE. This includes any way of disclosing all or part of the CSP-SCD over any physical or logical TOE interface.

T.CSP-SCD_Distortion *Distortion of the CSP-SCD*

When the CSP-SCD is distorted, DTBS signed with the distorted CSP-SCD (e.g. qualified certificates or CRLs) will be invalid. Although the use of a distorted CSP-SCD can be detected, the impacts for the organisation issuing the signed data using the CSP-SCD (e.g. qualified certificates) can be high. There is also the danger that by the use of a distorted CSP-SCD, parts of the original CSP-SCD can be derived.

T.Data_Manipul *Manipulating Data outside of the TOE*

User data that is transmitted to the TOE from the client application may be manipulated within the TOE environment before it is passed to the TOE. This may result in the effect that the TOE signs data without the approval of the user under whose control the data is submitted to the TOE. When performed within the client application such manipulations may not be detectable by the TOE itself and therefore this threat needs to be countered within the TOE environment.

Manipulation of data in the TOE environment within the session of a Crypto-officer may also result in a compromise of the security of the TOE. The backup of user data and TSF data might be lost.

T.Malfunction *Malfunction of TOE*

Internal malfunction of TOE functions may result in the modification of DTBS-representation, misuse of TOE services, disclosure or distortion of CSP-SCD or denial of service for authorised users. This includes the destruction of the TOE as well as hardware failures which prevent the TOE from performing its services. This includes also the destruction of the TOE by deliberate action or environmental failure. Technical failure may result in a insecure operational state violating the integrity and availability of the TOE services.

The correct operation of the TOE also depends on the correct operation of critical hardware components. A failure of such a critical hardware component could result in the disclosure or distortion of the CSP-SCD, the modification of DTBS-representation or the ability to misuse services of the TOE. Critical components might be:

- the central processing unit
- a coprocessor for accelerating cryptographic operations
- a physical random number generator
- storage devices used to store the CSP-SCD or the DTBS-representation
- physical I/O device drivers

T.Insecure_Init *Insecure Initialisation of the TOE*

Unauthorised CSP personnel or authorised CSP personnel without using adequate organisational controls may initialise the TOE with insecure system data, management data or user data.

An attacker may manipulate the backup data to initialise the TOE insecurely by the restore procedure.

T.Insecure_Oper *Insecure Operation of the TOE*

The TOE may be operated in an insecure way not detectable by the TOE itself. This includes the use and operation of the TOE within another environment than the intended one (e. g. the TOE may be connected to a hostile system).

T.Management *Misuse of Management*

CSP personnel may misuse the TOE services to forge user data as CSP-SCD, user management data, system data or TSF data.

T.Misuse_Sign *Misuse of signature-creation function*

An user of the client application or of the TOE misuses the TOE service for signature-creation to sign with the SCP-SCD forged qualified certificates or forged certificate status information.

T.Phys_Manipul *Physical Manipulation of the TOE*

An attacker may try to physically manipulate the TOE with the intent to derive all or part of the CSP-SCD, to manipulate the DTBS within the TOE or to misuse services of the TOE. The TOE may be physically attacked by even an authorised user of TOE services.

T.Signature_Forgery *Forgery of digital signature*

An attacker exploits weaknesses in the cryptography and/or key management in the TOE in order to forge a CSP digital signature in a way that is not detectable by the verifier of the signature.

3.4 Organisational Security Policies

P.Algorithms *Use of Approved Algorithms and Algorithm Parameter*

Only algorithms and algorithm parameter (e. g. key length) approved for being used for signature-creation by trustworthy systems shall be used to e.g. generate qualified certificates or to sign certificate status information. A list of approved algorithms and parameters is given in [5]. Where confidentiality protection is required such as for backup of CSP-SCD, only cryptographic strong algorithms and algorithm parameters shall be used.

4 Security Objectives

This section identifies and defines the security objectives for the TOE and its environment. Security objectives reflect the stated intent and counter the identified threats, as well as comply with the identified organisational security policies and assumptions.

4.1 Security Objectives for the TOE

O.Audit_CM *Generation and Export of Audit Data*

The TOE shall audit the following events:

- TOE initialisation
- TOE start-up
- Generation of CSP-SCD
- Destruction of CSP-SCD
- Unsuccessful authentication
- Modification of TOE management data
- Adding new users or roles
- Deleting users or roles
- Unsuccessful self test operations
- Execution of the TSF self tests during initial start-up, at the request of the authorised user, at the conditions installation and maintenance
- Reading and deleting audit trail records
- Generation and export of backup data
- Import of backup keys
- Restore of backup data
- Unsuccessful restore attempt

The audit data shall associate each auditable event with the identity of the user that caused the event. The integrity of the audit trail shall be ensured. The TOE shall export the audit data upon request the Auditor and the Crypto-officer. The TOE shall provide the management function for the audit to the Auditor only.

O.CSP-SCD_Secure *Secure CSP-SCD Generation and Management*

The confidentiality and integrity of the CSP-SCD shall be ensured during their whole life time. The TOE shall ensure cryptographic secure CSP-SCD generation, use and management. This includes protection against disclosing completely or partly the CSP-SCD through any physical or logical TOE interface. The TOE implements secure cryptographic algorithms and parameters for the generation of CSP-SCD/CSP-SVD pairs chosen from [5].

O.Check_Operation *Check for Correct Operation*

The TOE shall perform regular checks to verify that its components operate correctly. This includes integrity checks of TOE software, firmware, internal TSF data or user data during initial start-up, at the request of the authorised user, at the conditions installation and maintenance.

O.Control_Services *Management and Control of TOE Services*

The TOE shall restrict the access to its services, depending on the user role, to those services explicitly assigned to this role. Assignment of services to roles shall be either done by explicit action of a Crypto-officer or by default. Roles may also be predefined in the production or initialisation phase.

O.Detect_Attack *Detection of Physical Attacks*

The TOE shall detect attempts of physical tampering and securely destroy the CSP-SCD in this case.

O.Error_Secure *Secure State in Case an Error is detected*

The TOE shall enter a secure state whenever it detects a failure or an integrity error of software, firmware, internal TSF data or user data. The secure state shall prevent the loss of confidentiality of the CSP-SCD.

O.Protect_Exported_Data *Protection of Data Exported by the TOE*

The TOE shall apply integrity and confidentiality protection measures to all assets listed in the asset list requiring integrity or confidentiality protection when they are exported from the TOE e.g. for the purpose of backup and restore. Backup and restore shall be audited and the audit data shall associate these events with the identity of the users. The TOE implements secure cryptographic algorithms and parameters for the encryption and data integrity protection chosen from [5].

O.Sign_Secure *Secure advanced signature-creation*

The TOE creates signatures such as the advanced signature in qualified certificates that
- do not reveal the CSP-SCD and
- can not be forged without knowledge of the CSP-SCD.

The TOE implements secure cryptographic algorithms and parameters for the signing operation chosen from [5].

O.User_Authentication *Authentication of Users interacting with the TOE*

The TOE shall be able to identify and authenticate the users acting with a defined role, before allowing any access to TOE protected assets. Identification and authentication shall be user-based.

4.2 Security Objectives for the Environment

The following security objectives relate to the TOE environment. This includes the client application as well as the procedures for the secure operation of the TOE

O.ENV_Application *Security in the Client Application*

The applications which use the TOE shall perform the necessary security checks on the data passed to the TOE. The applications shall also perform the required user authentication and

access control functions that can not be performed within the TOE. Security controls in the TOE environment shall also prevent unauthorised manipulation of data submitted to the TOE.

O.ENV_Audit *Audit review*

The environment ensures the availability of the generated and exported by the TOE audit trails and provides a review of the audit trail recorded by the TOE.

O.ENV_Human_Interface *Reliable Human Interface*

If the client application provides a human interface and a communication path between human users and the TOE, the client application will ensure the confidentiality and integrity of the data transferred between the TOE and the human user.

O.ENV_Personnel *Reliable Personnel*

The personnel using the TOE services shall be aware of civil, financial and legal responsibilities, as well as the obligations they have to face, depending on their role. The personnel shall be trained on correct usage of the TOE.

O.ENV_Protect_Access *Prevention of Unauthorised Physical Access*

The TOE shall be protected by physical, logical and organisational protection measures, in order to prevent any TOE modification, as well as any protected assets disclosure. Those measures shall restrict the TOE usage to authorised persons only.

O.ENV_Recovery *Secure Recovery in Case of Major Failure*

Recovery plans and procedures shall exist that allow a secure and timely recovery in the case of a major problem with the TOE (i.e. if TOE is blocked in its secure state after a failure, service discontinuity or detected physical tampering). These procedures shall ensure that the confidentiality and integrity of TOE assets are maintained during recovery and that the recovery does not result in a situation that allows personnel to extend the TOE services they are allowed to use.

O.ENV_Secure_Init *Secure Initialisation Procedures*

Procedures and controls in the TOE environment shall be defined and applied that allow to securely set-up and initialise the TOE for the generation of signatures for qualified certificates or certificate status information. This includes the secure key generation / key import as well as the initial configuration of other TSF data like roles, users and user authentication information.

O.ENV_Secure_Oper *Secure Operating Procedures*

Procedures and controls in the TOE environment shall be defined that allow operating the TOE within a CA system in compliance with the requirements of the EU directive and the Policy for certification authorities issuing qualified certificates.

5 IT Security Requirements

This chapter gives the security functional requirements (SFR) and the security assurance requirements (SAR) for the TOE and the environment.

Security functional requirements components given in section 5.1 “TOE security functional requirements” are drawn from Common Criteria part 2 [3]. Some security functional requirements represent extensions to [3], with a reasoning given in section 6.5. Operations for assignment, selection and refinement have been made. Operations not performed in this PP are identified in order to enable instantiation of the PP to a Security Target (ST).

The TOE security assurance requirements statement given in section 5.2 “TOE Security Assurance Requirement” are drawn from the security assurance components from Common Criteria part 3 [4].

Section 5.3 identifies the IT security requirements that are to be met by the IT environment of the TOE.

The non-IT environment is described in section 5.4.

5.1 TOE Security Functional Requirements

Note that the national laws for electronic signatures may require to disable any backup function of the CSP-SCD if the CM is used by CSP under the national regulation. If enabling and disabling of the backup and restore functions shall be supported by the TOE the ST writer will include appropriate security functional requirements by means of the components FMT_MOF.1 and FMT_SMF.1.

According to CC part 1 the refinements provided in this section are operations of the security functional requirements and therefore are mandatory parts. The application notes are optional part of the PP and contain additional supporting information that is considered relevant or useful for the construction, evaluation, or use of the TOE but they are not mandatory to fit.

5.1.1 Security audit (FAU)

5.1.1.1 Audit data generation (FAU_GEN.1)

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

a) Start-up and shutdown of the audit functions;
b) All auditable events for the not specified level of audit; and
c) Initialisation of the TOE,
Start-up after power up,
Shutdown of the TOE,
Cryptographic key generation (FCS_CKM.1): CSP-SCD/CSP-SVD pair generation,
Cryptographic key distribution (FCS_CKM.2): entry of back-up key(s)

Cryptographic key destruction (FCS_CKM.4): CSP-SCD destruction, destruction of backup key(s)
Backup and recovery (FDP_BKP.1): Use of the backup function, Use of the recovery function, Unsuccessful recovery because of detection of modification of the backup data
Authentication failure handling (FIA_AFL.1): the reaching of the threshold for the unsuccessful authentication attempts and the actions,
Timing of authentication (FIA_UAU.1): all unsuccessful use of the authentication mechanism,
Management of security attributes (FMT_MSA.1) /(all instantiations): all modifications of the values of security attributes,
Static attribute initialisation (FMT_MSA.3): modifications of the default setting of permissive or restrictive rules, all modifications of the initial values of security attributes;
Management of TSF data (FMT_MTD.1/ACCESS_CONTROL): All modifications to the values of TSF data,
Management of TSF data (FMT_MTD.1/AUDIT: Export of audit data, Clear of audit data,
Abstract machine testing (FPT_AMT.1): Execution of the tests of the underlying machine and the results of the tests,
Failure with preservation of secure state (FPT_FLS.1): Failure detection of the TSF and secure state,
Inter-TSF detection of modification (FPT_ITI.1): The detection of modification of imported backuped TSF data
Notification of physical attack (FPT_PHP.2): Detection of intrusion,
TSF testing (FPT_TST.1): Execution of the TSF self tests during initial start-up, at the request of the authorised user, at the conditions installation and maintenance and the results of the tests, unsuccessful self test operations.

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

a) Date and time of the event, type of event, subject identity, and the outcome (success or failure) of the event; and
b) For each audit event type, based on the auditable event definitions of the functional components included in the PP/ST, identity of the user and sequence data

Refined by adding:
Date and time of the event may be given by the sequence data correlated to time of export the audit data to the TOE environment. The sequence data shall be a sequence number of the audit event data or time stamp.

Application note:
The audit data for the Crypto-user role can only identify the client application. Further refinement of audit data might be provided by audit functions in the TOE environment distinguishing between end-users using the services of the client application.

If time stamps are chosen as the sequence data the ST shall include security functional requirements for reliable time stamps (FPT_STM.1).

5.1.1.2 User identity association (FAU_GEN.2)

FAU_GEN.2.1 The TSF shall be able to associate each auditable event with the identity of the user that caused the event.

5.1.1.3 Guarantees of audit data availability (FAU_STG.2/TOE)

FAU_STG.2.1/TOE The TSF shall protect the stored audit records from unauthorised deletion.

FAU_STG.2.2/TOE The TSF shall be able to prevent modifications to the audit records.

FAU_STG.2.3/TOE The TSF shall ensure that [assignment: *metric for saving audit record*s] audit records will be maintained when the following conditions occur: audit storage exhaustion.

Application note:
The TSF may overwrite the audit trail data after reading (export) by the Auditor. The ST shall perform the assignment for the metric for saving audit records according the storage provided for audit events. This metric should implement security mechanisms to ensure availability of audit data in case of audit storage exhaustion because of limited storage of audit events. For example, if the storage is exhausted, the TOE would

(i) stop the normal operation,
(ii) inform the actual user about exhaustion of the audit event storage and
(iii) continue the normal operation only after export and deletion of audit data.

5.1.2 Cryptographic support (FCS)

5.1.2.1 Cryptographic key generation (FCS_CKM.1)

FCS_CKM.1.1 The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [assignment: *cryptographic key generation algorithm*] and specified cryptographic key sizes [assignment: *cryptographic key sizes*] that meet the following: [assignment: *list of standards*].

Refined by adding:
The standards for cryptographic key generation shall be assigned from the list of approved algorithms and parameters [5].

5.1.2.2 Cryptographic key distribution (FCS_CKM.2)

FCS_CKM.2.1 The TSF shall distribute cryptographic keys in accordance with a specified cryptographic key distribution method key entry that meets the following: [assignment: *list of standards*].

Refinement
All encrypted secret or private keys entered into the TOE shall be encrypted using a cryptographic algorithm from the list of approved algorithms and parameters [5]. The key entry shall be performed using either manual or electronic methods.
Secret and private keys established using manual methods shall be entered either

(1) in encrypted form or
(2) using split knowledge procedures.

Manually-entered keys shall be verified during entry into the TOE for accuracy.
Secret and private keys established using electronic methods shall be entered in encrypted form.
If split knowledge procedures are used:

(1) The TOE shall separately authenticate the crypto-officer entering each key component.
(2) At least two key components shall be required to reconstruct the original cryptographic key.

Application note:
Due to the SFR FPT_FLS.1 and FPT_PHP.3 with their refinements the TOE would not store permanently any private or secret key because this key will be erased after detection of failure or physical tampering. The TSF shall import all secret backup key(s) to restore the TOE to an operational status at a previous point in time. The import of encrypted keys requires a clear key to decrypt these keys in the TOE. Therefore FCS_CKM.2 ensures that the master key under which all other keys are encrypted for import into the TOE shall be imported by split knowledge procedures. Note that according to FDP_BKP.1.4 the CSP-SCD shall be exported for backup and imported for restore in encrypted form only.

5.1.2.3 Cryptographic key destruction (FCS_CKM.4)

FCS_CKM.4.1 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method [assignment: *cryptographic key destruction method*] that meets the following: [assignment: *list of standards*].

Application note:
The TSF will destroy the CSP-SCD and all other plaintext secret or private keys, if the TSF required by FPT_PHP.2 detects physical tampering.

5.1.2.4 Cryptographic operation (FCS_COP.1/SIGN)

FCS_COP.1.1/SIGN The TSF shall perform digital signature-creation in accordance with a specified cryptographic algorithm [assignment: *cryptographic algorithm*] and cryptographic key sizes [assignment: *cryptographic key sizes*] that meet the following: [assignment: *list of standards*].

Refined by adding:
The standards for digital signature-creation shall be assigned from the list of approved algorithms and parameters [5].

5.1.2.5 Cryptographic operation (FCS_COP.1/BACKUP_ENC)

FCS_COP.1.1/ BACKUP_ENC — The TSF shall perform encryption and decryption in accordance with a specified cryptographic algorithm [assignment: *cryptographic algorithm*] and cryptographic key sizes [assignment: *cryptographic key sizes*] that meet the following: [assignment: *list of standards*].

Refined by adding:
The standards for encryption and decryption shall be assigned from the list of approved algorithms and parameters [5].

Application note:
The TSF shall use a backup key.

5.1.2.6 Cryptographic operation (FCS_COP.1/BACKUP_INT)

FCS_COP.1.1/ BACKUP_INT — The TSF shall perform calculation and verification of cryptographic checksums in accordance with a specified cryptographic algorithm [assignment: *cryptographic algorithm*] and cryptographic key sizes [assignment: *cryptographic key sizes*] that meet the following: [assignment: *list of standards*].

Refined by adding:
The standards for calculation and verification of cryptographic checksums shall be assigned from the list of approved algorithms and parameters [5].

The cryptographic checksum for backup data shall use a backup key and shall be based on symmetric cryptographic algorithms (e.g. keyed hash) or asymmetric cryptographic algorithms (e.g. digital signatures).

5.1.2.7 Quality metrics for random numbers (FCS_RND.1)

FCS_RND.1.1 — The TSF shall provide a mechanism for generating random numbers that meet [assignment: *a defined quality metric*].

FCS_RND.1.2 — The TSF shall be able to enforce the use of TSF-generated random numbers for FCS_CKM.1.

Application Note:
The quality metric shall meet the requirements defined for SCD / SVD generation in the list of approved algorithms and parameters [5].

5.1.3 User data protection (FDP)

5.1.3.1 Subset access control (FDP_ACC.1/CRYPTO)

FDP_ACC.1.1/ CRYPTO — The TSF shall enforce the Crypto-SFP on User; CSP-SCD, CSP-SVD, DTBS representation; generate CSP-SCD/CSP-SVD pair (FCS_CKM.1), destruction of CSP-SCD and CSP-SVD (FCS_CKM.4); sign DTBS representation (FCS_COP.1/SIGN).

5.1.3.2 Subset access control (FDP_ACC.1/AUDIT)

FDP_ACC.1.1/ AUDIT — The TSF shall enforce the Audit-SFP on User; Audit data; export and delete.

5.1.3.3 Subset access control (FDP_ACC.1/BACKUP)

FDP_ACC.1.1/ BACKUP — The TSF shall enforce the Backup_SFP on User; CSP-SCD, backup key(s), backup data; backup (FDP_BKP.1), restore (FDP_BKP.1), backup key entry (FCS_CKM.2).

5.1.3.4 Security attribute based access control (FDP_ACF.1/CRYPTO)

FDP_ACF.1.1/ CRYPTO — The TSF shall enforce the Crypto-SFP to objects based on Identity and Role.

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

(1) User with security attribute Role Crypto-officer is allowed to generate (FCS_CKM.1) the objects CSP-SCD and CSP-SVD under dual person control.
(2) User with security attribute Role Crypto-officer is allowed to destruct (FCS_CKM.4) the objects CSP-SCD and CSP-SVD.
(3) User with security attribute Role Crypto-officer is allowed to export CSP-SVD.
(4) User with security attribute Role Crypto-user is allowed to create signature of the DTBS-representation with CSP-SCD (FCS_COP.1/SIGN).
(5) User with security attribute Role Crypto-user is allowed to export CSP-SVD.

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

FDP_ACF.1.4/ CRYPTO The TSF shall explicitly deny access of subjects to objects based on the following rules: User with security attribute Role Crypto-user is not allowed
(a) generate (FCS_CKM.1) the objects CSP-SCD and CSP-SVD,
(b) destruct (FCS_CKM.4) the objects CSP-SCD and CSP-SVD.

Application note:
The dual person control requires two users to be authenticated with different identities and with the same role Crypto-officer at the same time.

5.1.3.5 Security attribute based access control (FDP_ACF.1/AUDIT)

FDP_ACF.1.1/ AUDIT The TSF shall enforce the Audit-SFP to objects based on Role.

FDP_ACF.1.2/ AUDIT The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:
(1) Users with security attribute Role Auditor are allowed
(a) to export Audit data,
(b) to clear Audit data.
(2) Users with security attribute Role Crypto-officer are allowed to export Audit data

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

FDP_ACF.1.4/ AUDIT The TSF shall explicitly deny access of subjects to objects based on the following rules
(1) Users with security attribute Role Crypto-officer are not allowed to delete Audit data
(2) Users with security attribute Role Crypto-user are not allowed to export or to delete Audit data.

5.1.3.6 Security attribute based access control (FDP_ACF.1/BACKUP)

FDP_ACF.1.1/ BACKUP The TSF shall enforce the Backup SFP to objects based on Identity and Role.

FDP_ACF.1.2/ BACKUP The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: User with security attribute Role Crypto-officer is allowed under dual person control
(a) to backup CSP-SCD and CSP-SVD (FDP_BKP.1),
(b) to restore CSP-SCD and CSP-SVD (FDP_BKP.1),
(c) to enter backup keys (FCS_CKM.2)

FDP_ACF.1.3/ BACKUP The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: [assignment: *rules, based on security attributes that explicitly authorise access of subjects to objects*].

FDP_ACF.1.4/ BACKUP The TSF shall explicitly deny access of subjects to objects based on the User with security attribute Role Crypto-user is not allowed

(a) to backup CSP-SCD (FDP_BKP.1),
(b) to restore CSP-SCD (FDP_BKP.1),
(c) to enter a backup key (FCS_CKM.2).

Application note:
If the TSF implementing FDP_BKP.1 does not support separate backup for CSP-SCD and for other backup data the additional rules in FDP_ACF.1.3 may allow the Crypto-officer to backup and to restore all backup data.

5.1.3.7 Backup and recovery (FDP_BKP.1)

FDP_BKP.1.1 The TSF shall be capable of invoking the backup function on demand.

FDP_BKP.1.2 The data stored in the backup shall be sufficient to recreate the state of the TOE at the time the backup was created using only:

(1) a copy of the same version of the TOE as was used to create the backup data;
(2) a stored copy of the backup data;
(3) the cryptographic key(s) needed to decrypt the CSP-SCD and any other encrypted critical security parameters;
(4) the cryptographic key(s) needed to verify the cryptographic checksum of the backup data.

FDP_BKP.1.3 The TSF shall include a recovery function that is able to restore the state of the TOE from a backup.

FDP_BKP.1.4 The CSP-SCD, other critical security parameters and other confidential information shall be exported in encrypted form only.

FDP_BKP.1.5 The backup data shall be checked for modification through the use of cryptographic checksums. Modified backup data shall not be used for recovery.

5.1.3.8 Export of user data without security attributes (FDP_ETC.1)

FDP_ETC.1.1 The TSF shall enforce the Crypto-SFP when exporting user data, controlled under the SFP(s), outside of the TSC.

FDP_ETC.1.2 The TSF shall export the user data without the user data's associated security attributes.

5.1.3.9 Subset information flow control (FDP_IFC.1/BACKUP)

FDP_IFC.1.1/ BACKUP — The TSF shall enforce the Side-channel of backup-functions SFP on Anybody; Information about CSP-SCD; backup (FDP_BKP.1, FCS_COP.1/BACKUP_ENC, FCS_COP.1/BACKUP_INT), restore (FDP_BKP.1, FCS_COP.1/BACKUP_ENC, FCS_COP.1/BACKUP_INT), key entry (FCS_CKM.2).

5.1.3.10 Subset information flow control (FDP_IFC.1/CRYPTO)

FDP_IFC.1.1/ CRYPTO — The TSF shall enforce the Side-channels of Crypto-functions SFP on Anybody; Information about CSP-SCD; generation of CSP-SCD/SVD pair (FCS_CKM.1), destruction of CSP-SCD (FCS_CKM.4), signing DTBS-representation (FCS_COP.1/SIGN).

5.1.3.11 Partial elimination of illicit information flows (FDP_IFF.4/BACKUP)

FDP_IFF.4.1/ BACKUP — The TSF shall enforce the Side-channel of backup-functions SFP to limit the capacity of covert channels information flow of

(1) the backup function including encryption of the backup data (FDP_BKP.1),
(2) the backup key(s) entry (FCS_CKM.2),
(3) the encryption and decryption of the backup data (FCS_COP.1/BACKUP_ENC)

through physical behaviour of the TOE interfaces and emanation [assignment: *other relevant side-channels*] compromising information about the CSP-SCD to a [assignment: *maximum capacity*].

FDP_IFF.4.2/ BACKUP — The TSF shall prevent the following types of side-channels information flow within the backup data (FDP_BKP.1) about the CSP-SCD.

Application note:
The TOE shall prevent side-channel attacks against the CSP-SCD and other secret data where the attack is based on external observable physical phenomena of the TOE as mentioned in the application note to FDP_IFF.4/Crypto. The maximum capacity of the side channels shall be defined by the ST allowing the SCP to prevent any remaining side channels by appropriate security measures in the TOE environment.
The TOE shall prevent side-channel attacks against the CSP-SCD through the intended output data of the TOE e.g. the backup data encrypted with an initial vector containing information about the used backup key.

5.1.3.12 Partial elimination of illicit information flows (FDP_IFF.4/Crypto)

FDP_IFF.4.1/ CRYPTO — The TSF shall enforce the Side-channels of Crypto-functions SFP to limit the capacity of side-channels information flow of
(1) the CSP-SCD/SVD generation (FCS_CKM.1),
(2) the signature-creation (FCS_COP.1/SIGN),
through physical behaviour of the TOE interfaces and emanation [assignment: *other relevant side-channels*] compromising information about the CSP-SCD to a [assignment: *maximum capacity*].

FDP_IFF.4.2/ CRYPTO — The TSF shall prevent side-channels information flow within the data exported
(1) by the TSF CSP-SCD / SVD pair generation (FCS-CKM.1),
(2) by the TSF signature-creation function (FCS-COP.1/SIGN) about the CSP-SCD.

Application note:
The TSF requires the TOE to prevent side-channel attacks against the CSP-SCD and other secret data where the attack is based on external observable physical phenomena of the TOE. The set of measurable physical phenomena is influenced by the technology employed to implement the TOE. Examples of measurable phenomena are variations in the timing of transitions of internal states, the power consumption and the electromagnetic radiation. Such phenomena may be caused by normal internal operation of the TOE or may be forced by an attacker who varies the physical environment under which the TOE operates (e. g. power supply, temperature, radio emission or emission of light). Due to the heterogeneous nature of the technologies that may cause such emanations, evaluation is assumed against state-of-the-art attacks applicable to the technologies employed by the TOE. Examples of such attacks are, but are not limited to, evaluation of the TOE's electromagnetic radiation, simple power analysis (SPA), differential power analysis (DPA), timing attacks, etc. The maximum capacity of the side channels should be defined by the ST allowing the CSP to prevent any remaining side channels by appropriate security measures in the TOE environment.
The TSF requires the TOE to prevent side-channel attacks against the CSP-SCD through the intended output data of the TOE e.g. the random padding bits in the signature may contain information about the CSP-SCD if both are generated by the same pseudo-random number generator.

5.1.3.13 Subset residual information protection (FDP_RIP.1)

FDP_RIP.1.1 — The TSF shall ensure that any previous information content of a resource is made unavailable upon the de-allocation of the resource from the following objects: CSP-SCD and RAD.

5.1.3.14 Stored data integrity monitoring and action (FDP_SDI.2)

FDP_SDI.2.1 — The TSF shall monitor user data stored within the TSC for integrity errors on all objects, based on the following attributes: error detecting code.

FDP_SDI.2.2 — Upon detection of a data integrity error, the TSF shall enter the secure blocking state.

Refined by adding:
The TSF are not required to monitor the DTBS representation for integrity errors.

Application Note:
The integrity of the CSP-SCD may be checked with the CSP-SVD as error detecting code by verifying the created signature by signature verification.

5.1.4 Identification and authentication (FIA)

The Crypto-user role may be associated with only one user – the client application. The client application in the TOE environment may act as agent for more than one user demanding signing of DTBS by the HSM.

5.1.4.1 Authentication failure handling (FIA_AFL.1)

FIA_AFL.1.1 The TSF shall detect when [assignment: *number*] unsuccessful authentication attempts occur related to [assignment: *list of authentication events*].

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been met or surpassed, the TSF shall block the identity for authentication.

Application note:
The number of authentication failures handling shall be defined with respect to the high strength of the authentication function. If all identities are blocked by FIA_AFL.1 then the TOE is not operational.

5.1.4.2 User attribute definition (FIA_ATD.1)

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

5.1.4.3 Verification of secrets (FIA_SOS.1)

FIA_SOS.1.1 The TSF shall provide a mechanism to verify that secrets meet [assignment: *a defined quality metric*].

Application note:
The quality metric to be defined shall be defined with respect to the high strength of the authentication function and the authentication mechanism to be implemented in the TOE.

5.1.4.4 Timing of authentication (FIA_UAU.1)

FIA_UAU.1.1 The TSF shall allow start-up, self-test (FPT_TST.1), detection of the secure blocking state (FPT_FLS.1), detection of violation of physical integrity (FPT_PHP.2), identification (FIA_UID.1) on behalf of the user to be performed before the user is authenticated.

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

5.1.4.5 Timing of identification (FIA_UID.1)

FIA_UID.1.1 The TSF shall allow start-up, self-test (FPT_TST.1), detection of the secure blocking state (FPT_FLS.1), detection of violation of physical integrity (FPT_PHP.2) on behalf of the user to be performed before the user is identified.

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

5.1.5 Security management (FMT)

5.1.5.1 Management of security attributes (FMT_MSA.1/ROLE_CRYPTO)

FMT_MSA.1.1/ ROLE_CRYPTO The TSF shall enforce the Backup SFP and Crypto-SFP to restrict the ability to query, modify and delete [assignment: *other operations*] the security attributes Role Crypto-user and Role Crypto-officer to Crypto-officer.

5.1.5.2 Management of security attributes (FMT_MSA.1/ROLE_AUDIT)

FMT_MSA.1.1/ ROLE_AUDIT The TSF shall enforce the Audit-SFP to restrict the ability to query, modify and delete [assignment: *other operations*] the security attributes Role Auditor to Auditor.

5.1.5.3 Secure security attributes (FMT_MSA.2)

FMT_MSA.2.1 The TSF shall ensure that only secure values are accepted for security attributes.

5.1.5.4 Static attribute initialisation (FMT_MSA.3)

FMT_MSA.3.1 The TSF shall enforce the Audit-SFP, Backup SFP and Crypto-SFP, to provide restrictive default values for security attributes that are used to enforce the SFP.

FMT_MSA.3.2 The TSF shall allow the Auditor and Crypto-officer to specify alternative initial values to override the default values when an object or information is created.

5.1.5.5 Management of TSF data (FMT_MTD.1/ACCESS_CONTROL)

FMT_MTD.1.1/ ACCESS_CONTROL The TSF shall restrict the ability to query and modify the access control lists to Crypto-officer.

Application note:
The Crypto-officer is allowed to change the access control lists only within the limits of the defined roles.

5.1.5.6 Management of TSF data (FMT_MTD.1/USER_Crypto)

FMT_MTD.1.1/ USER_CRYPTO: The TSF shall restrict the ability to change default and delete the Identity and RAD for user with role attribute Crypto-officer and Crypto-user to Crypto-officer.

5.1.5.7 Management of TSF data (FMT_MTD.1/USER_AUDIT)

FMT_MTD.1.1/ USER_AUDIT: The TSF shall restrict the ability to change default and delete the Identity and RAD for user with role attribute Auditor to Auditor.

5.1.5.8 Management of TSF data (FMT_MTD.1/RAD)

FMT_MTD.1.1/ RAD: The TSF shall restrict the ability to modify the RAD to User for its own RAD.

5.1.5.9 Management of TSF data (FMT_MTD.1/AUDIT)

FMT_MTD.1.1/ AUDIT: The TSF shall restrict the ability to query the audit data of the TSF required by FAU_GEN.1 to Auditor.

5.1.5.10 Specification of Management Functions (FMT_SMF.1)

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

1. User management (FMT_MSA.1/ROLE_CRYPTO, FMT_MSA.1/ROLE_AUDIT, FMT_MTD.1/RAD, FMT_MTD.1/USER_CRYPTO and FMT_MTD.1/USER_AUDIT),
2. Management of audit data (FMT_MSA.3, FMT_MTD.1/AUDIT),
3. Management of TSF data (FMT_MTD.1/ACCESS_CONTROL).

5.1.5.11 Security roles (FMT_SMR.1)

FMT_SMR.1.1 The TSF shall maintain the roles Crypto-officer, Crypto-user and Auditor.

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

Application note:
The Crypto-user role may be associated with only one user – the client application. The client application in the TOE environment may act as agent for more than one user demanding singing of DTBS by the HSM.

5.1.6 Protection of the TOE Security Functions (FPT)

5.1.6.1 Abstract machine testing (FPT_AMT.1)

FPT_AMT.1.1 The TSF shall run a suite of tests at the request of an authorised user to demonstrate the correct operation of the security assumptions provided by the abstract machine that underlies the TSF.

Application note:
Even though this PP includes requirements to the hardware as physical protection the TOE might not include all hardware of the cryptographic module. The TSF shall perform testing to demonstrate the security assumptions made about the underlying abstract machine upon which the TSF relies. This “abstract” machine could be a hardware/firmware platform, or it could be some known and assessed hardware/software combination acting as a virtual machine. An example of a security assumption is memory management unit providing support for information flow control (as required by FDP_IFF.4) or access control (as required by FDP_ACF.1/AUDIT) in the TOE.

5.1.6.2 Failure with preservation of secure state (FPT_FLS.1)

FPT_FLS.1.1 The TSF shall preserve a secure state when the following types of failures occur: failures detected by the TSF FPT_AMT.1 and FPT_TST.1.

Refined by adding:

The TSF shall destroy the plaintext SCP-SCD and other confidential secret and private keys if failures occur.

5.1.6.3 Inter-TSF confidentiality during transmission (FPT_ITC.1)

FPT_ITC.1.1 The TSF shall protect all TSF data transmitted from the TSF to a remote trusted IT product from unauthorised disclosure during transmission.

Application note:
The SFR FPT_ITC.1 addresses the confidentiality protection of the TSF data if they are exported as part of the backup data.

5.1.6.4 Inter-TSF detection of modification (FPT_ITI.1)

FPT_ITI.1.1 The TSF shall provide the capability to detect modification of all TSF data during transmission between the TSF and a remote trusted IT product within the following metric: cryptographic checksum according to the list of approved algorithms and parameters.

FPT_ITI.1.2 The TSF shall provide the capability to verify the integrity of all TSF data transmitted between the TSF and a remote trusted IT product and perform alarm indication to the Crypto-officer if modifications are detected.

Application note:
The SFR FPT_ITI.1 addresses the integrity protection of the TSF data if they are imported as part of the backup data.

5.1.6.5 Notification of physical attack (FPT_PHP.2)

FPT_PHP.2.1 The TSF shall provide unambiguous detection of physical tampering that might compromise the TSF.

FPT_PHP.2.2 The TSF shall provide the capability to determine whether physical tampering with the TSF's devices or TSF's elements has occurred.

FPT_PHP.2.3 For TOE, the TSF shall monitor the devices and elements and notify local user when physical tampering with the TSF's devices or TSF's elements has occurred.

Refined by adding:

The TSF shall detect physical tampering performed by opening the device or removal of a cover.

Application Note:
The notification about detected physical attacks may be given e.g. through functional interfaces (stopping any other services but alarm signalisation), acoustic or optic signals. The TOE non-IT environment should ensure that notification about physical tampering attempts given by the TOE shall be noticed by the CSP security personnel.

5.1.6.6 Resistance to physical attack (FPT_PHP.3)

FPT_PHP.3.1 The TSF shall resist physical tampering by opening the device or removal of a cover to the components which
- generates CSP-SCD (FCS_CKM.1)
- creates the signature with CSP-SCD (FCS_COP.1)
- stores CSP-SCD
- stores other secret or private keys

by responding automatically such that the TSP is not violated.

Refined by adding:

The TSF shall resist the tampering by destruction of plaintext SCP-SCD and other confidential secret and private keys if physical tampering performed by opening the device or removal of a cover is detected.

Application Note:

The TOE shall protect the confidentiality of the SCP-CSD and other secret and private keys in case of physical maintenance or physical tampering. If the detection of opening the device or

removal of a cover might not be effective for the switched off device the TOE will destroy the CSP-SCD in case of loss of power. The TOE will invoke the TSF required by FCS_CKM.4 to destroy the SCP-SCD and all other plaintext secret and private keys. The destruction of the CSP-SCD will prevent the use of an attacked TOE for signing until restoring the operational state.

5.1.6.7 Manual recovery (FPT_RCV.1)

FPT_RCV.1.1 After a failure or service discontinuity, the TSF shall enter a maintenance mode where the ability to return the TOE to a secure state is provided.

5.1.6.8 TSF testing (FPT_TST.1)

FPT_TST.1.1 The TSF shall run a suite of self tests during initial start-up, at the request of the authorised user, at the conditions installation and maintenance to demonstrate the correct operation of the TSF.

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

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

Refined by adding:

The TSF shall perform self-tests

1. **Initialisation**
   Extended software/firmware integrity test

2. **Power-Up Tests**
   Software/firmware integrity test
   Internal TSF data integrity test.
   Cryptographic algorithm test.
   Random number generator tests
   Critical functions test.

3. **Conditional Tests**
   Pair-wise consistency test (for public and private keys).
   Manual key entry test (if manual key entry is implemented).
   Continuous random number generator test.

Application note:
The TSF performs self-tests according to FPT_TST.1 to ensure that the TOE is functioning properly. The extended software/firmware integrity test might verify error detecting codes, cryptographic checksums or digital signatures generated by the software/firmware developer or by other authorities. A digital signature might prove that the firmware or software is part of the evaluated product. The power-up software/firmware integrity test and internal TSF data integrity test may detect modification of these data if the device was switched off. The tests may be implemented by internally generated error detecting codes, cryptographic checksums or digital signatures. The cryptographic algorithm test may detect errors in hardware, firmware or

software implementing critical cryptographic mechanisms (see FCS_CKM.1, FCS_COP.1/SIGN). The test might be a known-answer-test (e.g. for encryption) or a pair-wise consistency test (e.g. verifying a generated signature before the signature is exported). Supplementary tests shall detect error of the random number generator used for the generation of CSP-SCD (see FCS_CKM.1 and FCS_RND.1), cryptographic keys or parameters. If any critical function is not covered by these tests the TSF should implement additional self-tests. The pair-wise consistency test for public and private keys may detect errors in the key generation process. Other consistency tests may check the correctness of the signing process and other cryptographic processes to prevent e.g. differential fault attacks. Manual key entry test may detect errors to prevent use of incorrect keys if manual key entry is implemented. Continuous random number generator test may detect failure in operation of the generator to prevent use of wrong random number.
The TOE shall verify the integrity and authenticity of the TSF executable code at installation, maintenance and initialisation to prevent malicious software running on the TOE.

5.1.7 Trusted path (FTP)

5.1.7.1 Trusted path (FTP_TRP.1/TOE)

FTP_TRP.1.1/TOE The TSF shall provide a communication path between itself and local users that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from modification or disclosure.

FTP_TRP.1.2/TOE The TSF shall permit local users to initiate communication via the trusted path.

FTP_TRP.1.3/TOE The TSF shall require the use of the trusted path for initial user authentication /FIA_UID.1, FIA_UAU.1) and TSF management (FMT_MSA.1/ROLE, FMT_MTD.1/USER_CRYPTO, FMT_MTD.1/USER_AUDIT, FMT_MTD.1/RAD, FMT_MSA.2, FMT_MSA.3, FMT_MTD.1/ACCESS, FMT_MTD.1/AUDIT, FMT_SMR.1).

5.2 TOE Security Assurance Requirements

Table 5.1 Assurance Requirements: EAL 4 augmented

Assurance Class	Assurance Components
ACM	ACM_AUT.1 ACM_CAP.4 ACM_SCP.2
ADO	ADO_DEL.2 ADO_IGS.1
ADV	ADV_FSP.2 ADV_HLD.2 ADV_IMP.2 ADV_LLD.1 ADV_RCR.1 ADV_SPM.1
AGD	AGD_ADM.1 AGD_USR.1
ALC	ALC_DVS.1 ALC_LCD.1 ALC_TAT.1
ATE	ATE_COV.2 ATE_DPT.1 ATE_FUN.1 ATE_IND.2

AVA	AVA_CCA.1 AVA_MSU.2 AVA_SOF.1 AVA_VLA.4

5.2.1 Configuration management (ACM)

5.2.1.1 Partial CM automation (ACM_AUT.1)

ACM_AUT.1.1D The developer shall use a CM system.

ACM_AUT.1.2D The developer shall provide a CM plan.

ACM_AUT.1.1C The CM system shall provide an automated means by which only authorised changes are made to the TOE implementation representation.

ACM_AUT.1.2C The CM system shall provide an automated means to support the generation of the TOE.

ACM_AUT.1.3C The CM plan shall describe the automated tools used in the CM system.

ACM_AUT.1.4C The CM plan shall describe how the automated tools are used in the CM system.

5.2.1.2 Generation support and acceptance procedures (ACM_CAP.4)

ACM_CAP.4.1D The developer shall provide a reference for the TOE.

ACM_CAP.4.2D The developer shall use a CM system.

ACM_CAP.4.3D The developer shall provide CM documentation.

ACM_CAP.4.1C The reference for the TOE shall be unique to each version of the TOE.

ACM_CAP.4.2C The TOE shall be labelled with its reference.

ACM_CAP.4.3C The CM documentation shall include a configuration list, a CM plan, and an acceptance plan.
The configuration list shall uniquely identify all configuration items that comprise the TOE.

ACM_CAP.4.4C The configuration list shall describe the configuration items that comprise the TOE.

ACM_CAP.4.5C The CM documentation shall describe the method used to uniquely identify the configuration items.

ACM_CAP.4.6C The CM system shall uniquely identify all configuration items.

ACM_CAP.4.7C The CM plan shall describe how the CM system is used.

ACM_CAP.4.8C The evidence shall demonstrate that the CM system is operating in accordance with the CM plan.

ACM_CAP.4.9C The CM documentation shall provide evidence that all configuration items have been and are being effectively maintained under the CM system.

ACM_CAP.4.10C The CM system shall provide measures such that only authorised changes are made to the configuration items.

ACM_CAP.4.11C The CM system shall support the generation of the TOE.

ACM_CAP.4.12C The acceptance plan shall describe the procedures used to accept modified or newly created configuration items as part of the TOE.

5.2.1.3 Problem tracking CM coverage (ACM_SCP.2)

ACM_SCP.2.1D The developer shall provide a list of configuration items for theTOE..

ACM_SCP.2.1C The list of configuration items shall include the following: implementation representation; security flaws; and the evaluation evidence required by the assurance components in the ST.

5.2.2 Delivery and operation (ADO)

5.2.2.1 Detection of modification (ADO_DEL.2)

ADO_DEL.2.1D The developer shall document procedures for delivery of the TOE or parts of it to the user.

ADO_DEL.2.2D The developer shall use the delivery procedures.

ADO_DEL.2.1C The delivery documentation shall describe all procedures that are necessary to maintain security when distributing versions of the TOE to a user's site.

ADO_DEL.2.2C The delivery documentation shall describe how the various procedures and technical measures provide for the detection of modifications, or any discrepancy between the developer's master copy and the version received at the user site.

ADO_DEL.2.3C The delivery documentation shall describe how the various procedures allow detection of attempts to masquerade as the developer, even in cases in which the developer has sent nothing to the user's site.

5.2.2.2 Installation, generation, and start-up procedures (ADO_IGS.1)

ADO_IGS.1.1D The developer shall document procedures necessary for the secure installation, generation, and start-up of the TOE.

ADO_IGS.1.1C The installation, generation and start-up documentation shall describe all

the steps necessary for secure installation, generation and start-up of the TOE.

5.2.3 Development (ADV)

5.2.3.1 Fully defined external interfaces (ADV_FSP.2)

ADV_FSP.2.1D The developer shall provide a functional specification.

ADV_FSP.2.1C The functional specification shall describe the TSF and its external interfaces using an informal style.

ADV_FSP.2.2C The functional specification shall be internally consistent.

ADV_FSP.2.3C The functional specification shall describe the purpose and method of use of all external TSF interfaces, providing complete details of all effects, exceptions and error messages.

ADV_FSP.2.4C The functional specification shall completely represent the TSF.

ADV_FSP.2.5C The functional specification shall include rationale that the TSF is completely represented.

5.2.3.2 Security enforcing high-level design (ADV_HLD.2)

ADV_HLD.2.1D The developer shall provide the high-level design of the TSF.

ADV_HLD.2.1C The presentation of the high-level design shall be informal.

ADV_HLD.2.2C The high-level design shall be internally consistent.

ADV_HLD.2.3C The high-level design shall describe the structure of the TSF in terms of subsystems.

ADV_HLD.2.4C The high-level design shall describe the security functionality provided by each subsystem of the TSF.

ADV_HLD.2.5C The high-level design shall identify any underlying hardware, firmware, and/or software required by the TSF with a presentation of the functions provided by the supporting protection mechanisms implemented in that hardware, firmware, or software.

ADV_HLD.2.6C The high-level design shall identify all interfaces to the subsystems of the TSF.

ADV_HLD.2.7C The high-level design shall identify which of the interfaces to the subsystems of the TSF are externally visible.

ADV_HLD.2.8C The high-level design shall describe the purpose and method of use of all interfaces to the subsystems of the TSF, providing details of effects,

exceptions and error messages, as appropriate.

ADV_HLD.2.9C The high-level design shall describe the separation of the TOE into TSP-enforcing and other subsystems.

5.2.3.3 Implementation of the TSF (ADV_IMP.2)

ADV_IMP.2.1D The developer shall provide the implementation representation for the entire TSF.

ADV_IMP.2.1C The implementation representation shall unambiguously define the TSF to a level of detail such that the TSF can be generated without further design decisions.

ADV_IMP.2.2C The implementation representation shall be internally consistent.

ADV_IMP.2.3C The implementation representation shall describe the relationships between all portions of the implementation.

5.2.3.4 Descriptive low-level design (ADV_LLD.1)

ADV_LLD.1.1D The developer shall provide the low-level design of the TSF.

ADV_LLD.1.1C The presentation of the low-level design shall be informal.

ADV_LLD.1.2C The low-level design shall be internally consistent.

ADV_LLD.1.3C The low-level design shall describe the TSF in terms of modules.

ADV_LLD.1.4C The low-level design shall describe the purpose of each module.

ADV_LLD.1.5C The low-level design shall define the interrelationships between the modules in terms of provided security functionality and dependencies on other modules.

ADV_LLD.1.6C The low-level design shall describe how each TSP-enforcing function is provided.

ADV_LLD.1.7C The low-level design shall identify all interfaces to the modules of the TSF.

ADV_LLD.1.8C The low-level design shall identify which of the interfaces to the modules of the TSF are externally visible.

ADV_LLD.1.9C The low-level design shall describe the purpose and method of use of all interfaces to the modules of the TSF, providing details of effects, exceptions and error messages, as appropriate.

ADV_LLD.1.10C The low-level design shall describe the separation of the TOE into TSP-enforcing and other modules.

5.2.3.5 Informal correspondence demonstration (ADV_RCR.1)

ADV_RCR.1.1D The developer shall provide an analysis of correspondence between all adjacent pairs of TSF representations that are provided.

ADV_RCR.1.1C For each adjacent pair of provided TSF representations, the analysis shall demonstrate that all relevant security functionality of the more abstract TSF representation is correctly and completely refined in the less abstract TSF representation.

5.2.3.6 Informal TOE security policy model (ADV_SPM.1)

ADV_SPM.1.1D The developer shall provide a TSP model.

ADV_SPM.1.2D The developer shall demonstrate correspondence between the functional specification and the TSP model.

ADV_SPM.1.1C The TSP model shall be informal.

ADV_SPM.1.2C The TSP model shall describe the rules and characteristics of all policies of the TSP that can be modeled.

ADV_SPM.1.3C The TSP model shall include a rationale that demonstrates that it is consistent and complete with respect to all policies of the TSP that can be modeled.

ADV_SPM.1.4C The demonstration of correspondence between the TSP model and the functional specification shall show that all of the security functions in the functional specification are consistent and complete with respect to the TSP model.

5.2.4 Guidance documents (AGD)

5.2.4.1 Administrator guidance (AGD_ADM.1)

AGD_ADM.1.1D The developer shall provide administrator guidance addressed to system administrative personnel.

AGD_ADM.1.1C The administrator guidance shall describe the administrative functions and interfaces available to the administrator of the TOE.

AGD_ADM.1.2C The administrator guidance shall describe how to administer the TOE in a secure manner.

AGD_ADM.1.3C The administrator guidance shall contain warnings about functions and privileges that should be controlled in a secure processing environment.

AGD_ADM.1.4C The administrator guidance shall describe all assumptions regarding user behaviour that are relevant to secure operation of the TOE.

AGD_ADM.1.5C The administrator guidance shall describe all security parameters under the control of the administrator, indicating secure values as appropriate.

AGD_ADM.1.6C The administrator guidance shall describe each type of security-relevant event relative to the administrative functions that need to be performed, including changing the security characteristics of entities under the control of the TSF.

AGD_ADM.1.7C The administrator guidance shall be consistent with all other documentation supplied for evaluation.

AGD_ADM.1.8C The administrator guidance shall describe all security requirements for the IT environment that are relevant to the administrator.

5.2.4.2 User guidance (AGD_USR.1)

AGD_USR.1.1D The developer shall provide user guidance.

AGD_USR.1.1C The user guidance shall describe the functions and interfaces available to the non-administrative users of the TOE.

AGD_USR.1.2C The user guidance shall describe the use of user-accessible security functions provided by the TOE.

AGD_USR.1.3C The user guidance shall contain warnings about user-accessible functions and privileges that should be controlled in a secure processing environment.

AGD_USR.1.4C The user guidance shall clearly present all user responsibilities necessary for secure operation of the TOE, including those related to assumptions regarding user behaviour found in the statement of TOE security environment.

AGD_USR.1.5C The user guidance shall be consistent with all other documentation supplied for evaluation.

AGD_USR.1.6C The user guidance shall describe all security requirements for the IT environment that are relevant to the user.

5.2.5 Life cycle support (ALC)

5.2.5.1 Identification of security measures (ALC_DVS.1)

ALC_DVS.1.1D The developer shall produce development security documentation.

ALC_DVS.1.1C The development security documentation shall describe all the physical, procedural, personnel, and other security measures that are necessary to protect the confidentiality and integrity of the TOE design and implementation in its development environment.

ALC_DVS.1.2C The development security documentation shall provide evidence that these security measures are followed during the development and maintenance of the TOE.

5.2.5.2 Developer defined life-cycle model (ALC_LCD.1)

ALC_LCD.1.1D The developer shall establish a life-cycle model to be used in the development and maintenance of the TOE.

ALC_LCD.1.2D The developer shall provide life-cycle definition documentation.

ALC_LCD.1.1C The life-cycle definition documentation shall describe the model used to develop and maintain the TOE.

ALC_LCD.1.2C The life-cycle model shall provide for the necessary control over the development and maintenance of the TOE.

5.2.5.3 Well-defined development tools (ALC_TAT.1)

ALC_TAT.1.1D The developer shall identify the development tools being used for the TOE.

ALC_TAT.1.2D The developer shall document the selected implementation-dependent options of the development tools.

ALC_TAT.1.1C All development tools used for implementation shall be well-defined.

ALC_TAT.1.2C The documentation of the development tools shall unambiguously define the meaning of all statements used in the implementation.

ALC_TAT.1.3C The documentation of the development tools shall unambiguously define the meaning of all implementation-dependent options.

5.2.6 Tests (ATE)

5.2.6.1 Analysis of coverage (ATE_COV.2)

ATE_COV.2.1D The developer shall provide an analysis of the test coverage.

ATE_COV.2.1C The analysis of the test coverage shall demonstrate the correspondence between the tests identified in the test documentation and the TSF as described in the functional specification.

ATE_COV.2.2C The analysis of the test coverage shall demonstrate that the correspondence between the TSF as described in the functional specification and the tests identified in the test documentation is complete.

5.2.6.2 Testing: high-level design (ATE_DPT.1)

ATE_DPT.1.1D The developer shall provide the analysis of the depth of testing.

ATE_DPT.1.1C The depth analysis shall demonstrate that the tests identified in the test documentation are sufficient to demonstrate that the TSF operates in accordance with its high-level design.

5.2.6.3 Functional testing (ATE_FUN.1)

ATE_FUN.1.1D The developer shall test the TSF and document the results.

ATE_FUN.1.2D The developer shall provide test documentation.

ATE_FUN.1.1C The test documentation shall consist of test plans, test procedure descriptions, expected test results and actual test results.

ATE_FUN.1.2C The test plans shall identify the security functions to be tested and describe the goal of the tests to be performed.

ATE_FUN.1.3C The test procedure descriptions shall identify the tests to be performed and describe the scenarios for testing each security function. These scenarios shall include any ordering dependencies on the results of other tests.

ATE_FUN.1.4C The expected test results shall show the anticipated outputs from a successful execution of the tests.

ATE_FUN.1.5C The test results from the developer execution of the tests shall demonstrate that each tested security function behaved as specified.

5.2.6.4 Independent testing - sample (ATE_IND.2)

ATE_IND.2.1D The developer shall provide the TOE for testing.

ATE_IND.2.1C The TOE shall be suitable for testing.

ATE_IND.2.2C The developer shall provide an equivalent set of resources to those that were used in the developer's functional testing of the TSF.

5.2.7 Vulnerability assessment (AVA)

5.2.7.1 Covert channel analysis (AVA_CCA.1)

AVA_CCA.1.1D The developer shall conduct a search for covert channels for each information flow control policy.

AVA_CCA.1.2D The developer shall provide covert channel analysis documentation.

AVA_CCA.1.1C The analysis documentation shall identify covert channels and estimate their capacity.

AVA_CCA.1.2C The analysis documentation shall describe the procedures used for

determining the existence of covert channels, and the information needed to carry out the covert channel analysis.

AVA_CCA.1.3C The analysis documentation shall describe all assumptions made during the covert channel analysis.

AVA_CCA.1.4C The analysis documentation shall describe the method used for estimating channel capacity, based on worst case scenarios.

AVA_CCA.1.5C The analysis documentation shall describe the worst case exploitation scenario for each identified covert channel.

5.2.7.2 Validation of analysis (AVA_MSU.2)

AVA_MSU.2.1D The developer shall provide guidance documentation.

AVA_MSU.2.2D The developer shall document an analysis of the guidance documentation.

AVA_MSU.2.1C The guidance documentation shall identify all possible modes of operation of the TOE (including operation following failure or operational error), their consequences and implications for maintaining secure operation.

AVA_MSU.2.2C The guidance documentation shall be complete, clear, consistent and reasonable.

AVA_MSU.2.3C The guidance documentation shall list all assumptions about the intended environment.

AVA_MSU.2.4C The guidance documentation shall list all requirements for external security measures (including external procedural, physical and personnel controls).

AVA_MSU.2.5C The analysis documentation shall demonstrate that the guidance documentation is complete.

5.2.7.3 Strength of TOE security function evaluation (AVA_SOF.1)

AVA_SOF.1.1D The developer shall perform a strength of TOE security function analysis for each mechanism identified in the ST as having a strength of TOE security function claim.

AVA_SOF.1.1C For each mechanism with a strength of TOE security function claim the strength of TOE security function analysis shall show that it meets or exceeds the minimum strength level defined in the PP/ST.

AVA_SOF.1.2C For each mechanism with a specific strength of TOE security function claim the strength of TOE security function analysis shall show that it meets or exceeds the specific strength of function metric defined in the PP/ST.

5.2.7.4 Highly resistant (AVA_VLA.4)

AVA_VLA.4.1D The developer shall perform a vulnerability analysis.

AVA_VLA.4.2D The developer shall provide vulnerability analysis documentation.

AVA_VLA.4.1C The vulnerability analysis documentation shall describe the analysis of the TOE deliverables performed to search for ways in which a user can violate the TSP.

AVA_VLA.4.2C The vulnerability analysis documentation shall describe the disposition of identified vulnerabilities.

AVA_VLA.4.3C The vulnerability analysis documentation shall show, for all identified vulnerabilities, that the vulnerability cannot be exploited in the intended environment for the TOE.

AVA_VLA.4.4C The vulnerability analysis documentation shall justify that the TOE, with the identified vulnerabilities, is resistant to obvious penetration attacks.

AVA_VLA.4.5C The vulnerability analysis documentation shall show that the search for vulnerabilities is systematic.

AVA_VLA.4.6C The vulnerability analysis documentation shall provide a justification that the analysis completely addresses the TOE deliverables.

5.3 Security Requirements for the IT Environment

5.3.1 Security audit (FAU)

5.3.1.1 Audit review (FAU_SAR.1)

FAU_SAR.1.1 The IT environment shall provide System auditor of the CSP with the capability to read all audit information produced by the TOE from the audit records.

FAU_SAR.1.2 The IT environment shall provide the audit records in a manner suitable for the user to interpret the information.

5.3.1.2 Protected audit trail storage (FAU_STG.1/ENVIRONMENT)

FAU_STG.1.1/ ENVIRONMENT The IT environment shall protect the stored audit records from unauthorised deletion.

FAU_STG.1.2/ ENVIRONMENT The IT environment shall be able to prevent modifications to the audit records.

Application note:
The SFR FAU_STG.1/ENVIRONMENT addresses the protection of the IT environment for the audit trail generated and exported by the TOE.

5.3.2 User data protection (FDP)

The client application shall provide the TOE signing function to its authorised end-user only and shall prevent unauthorised transmission and manipulation of DTBS representation to be signed by the TOE.

5.3.2.1 Subset access control (FDP_ACC.1/CLIENT)

FDP_ACC.1.1/ CLIENT	The IT environment shall enforce the Client application SFP on end-user, Cryptographic module signing function, use.

5.3.2.2 Security attribute based access control (FDP_ACF.1/CLIENT)

FDP_ACF.1.1/ CLIENT	The IT environment shall enforce the Client application SFP to objects based on authorisation for Cryptographic module signing function.
FDP_ACF.1.2/ CLIENT	The IT environment shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: authorised end-user is allowed to use Cryptographic module signing function.
FDP_ACF.1.3/ CLIENT	The IT environment shall explicitly authorise access of subjects to objects based on the following additional rules: none.
FDP_ACF.1.4/ CLIENT	The IT environment shall explicitly deny access of subjects to objects based on the rule: non-authorised end-user is not allowed to use Cryptographic module signing function.

Application Note:
The security attribute “authorisation for Cryptographic module signing function” is assigned to end-users of the client application with two possible values:

(a) authorised to use Cryptographic module signing function,
(b) not authorised to use Cryptographic module signing function.

5.3.2.3 Data exchange integrity (FDP_UIT.1)

FDP_UIT.1.1	The IT environment shall enforce the Client application SFP to be able to transmit user data in a manner protected from modification, deletion and insertion errors.

FDP_UIT.1.2 The IT environment shall be able to determine on receipt of user data, whether modification, deletion and insertion has occurred.

Application note:
The user data to be protected by the IT environment are data to be signed by the Cryptographic module.

5.3.3 Identification and authentication (FIA)

The client application shall identify and authenticate its end-user for use of the Cryptographic module services.

5.3.3.1 Timing of authentication (FIA_UAU.1/CLIENT)

FIA_UAU.1.1/ CLIENT The IT environment shall allow [assignment: *list of actions in the IT environment*] on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2/ CLIENT The IT environment shall require each user to be successfully authenticated before allowing any other actions on behalf of that user.

5.3.3.2 Timing of identification (FIA_UID.1/CLIENT)

FIA_UID.1.1/ CLIENT The IT environment shall allow [assignment: *list of actions in the IT environment*] on behalf of the user to be performed before the user is identified.

FIA_UID.1.2/ CLIENT The IT environment shall require each user to be successfully identified before allowing any other actions of the IT environment on behalf of that user.

5.3.4 Trusted path (FPT)

5.3.4.1 Trusted path (FTP_TRP.1/CLIENT)

FTP_TRP.1.1/ CLIENT The IT environment shall provide a communication path between itself and local users that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from modification or disclosure.

FTP_TRP.1.2/ CLIENT The IT environment shall permit local users to initiate communication via the trusted path.

FTP_TRP.1.3/ CLIENT	The IT environment shall require the use of the trusted path for communication with TOE for identification, authentication and management.

Application note:
The Cryptographic module does not have a human user interface for authentication and management. The client application will provide this interface and a trusted path for the communication between the user and the Cryptographic module. The client application shall support the trusted path as one for the communication entity.

5.3.5 Non-IT requirements

RE.ENV_Personnel *Personnel security measures*

The CSP shall define the obligations and the services of management and operation roles for the TOE. The CSP shall inform and train the personnel for their roles. The CSP shall inform the personnel using the TOE about their civil, financial and legal responsibilities.

RE.ENV_Protect_Access *Physical protection of the TOE*

The CSP shall establish physical and organisational security measures to protect the TOE against modification of TOE hardware, firmware and software. These measures shall restrict the access to the TOE and protected assets to authorised persons. If the TOE detects and notifies about physical tampering the local users shall inform the CSP security staff. The TOE shall not be used until the physical integrity of the TOE is established.

RE.ENV_Recovery *Recovery procedures for the TOE*

The CSP shall define and apply recovery plans and procedures which allow a secure and timely recovery of the TOE operational state. These procedures shall ensure at least

(1) secure initialisation of new TOE devices replacing other TOE devices,

(2) re-initialisation of TOE devices establishing the secure state by the TSF FPT_FLS.1 after detecting failures by the TSF FPT_AMT.1 and FPT_TST.1,

(3) integrity check of the TOE hardware, firmware and software and re-initialisation of TOE devices if the TOE indicates physical tampering by TSF FPT_PHP.2 and destroyed the plaintext SCP-SCD and other confidential secret and private keys by TSF FPT_PHP.3.

To support the TOE backup of the CSP-SCD, other user data and TSF data the CSP will ensure the availability of the backup data and the cryptographic quality, confidentiality and availability of the backup keys.

RE.ENV_Secure_Init *Secure initialisation of the TOE*

The CSP shall define and apply procedures and controls in the TOE environment which allow to securely set-up and initialise the TOE for the generation of CSP-SCD and signatures. This includes

(1) dual control for secure installation and initialisation of the TOE in the CSP,

(2) the CSP-SCD / CSP-SVD pair generation,

(3) the export of the CSP-SVD by the TOE and the securing the authenticity of the CSP-SVD,

(4) the secure initial configuration of the TSF data user's identity, roles and user authentication information.

RE.ENV_Secure_Oper *Secure operation of the TOE*

The CSP shall define and apply procedures and controls in the TOE environment which allow operating the TOE within a CA system in compliance with the requirements of the EU directive, the Qualified Certificates Policy for the issued certificates, the secure operation of the client application and the TOE guidance.

The TOE user shall ensure that notification about physical tampering attempts given by the TOE will be noticed by the CSP security personnel.

6 Rationale

6.1 Introduction

The TOE that has been defined covers cryptographic modules that implement—partly or completely—the functionality necessary for devices involved in generating the advanced electronic signatures of qualified certificates. The tables in sub-sections 6.2.1 “Security Objectives Coverage” and 6.3.1 “Security Requirement Coverage” provide the mapping of the security objectives and security requirements for these TOE types.

6.2 Security Objectives Rationale

6.2.1 Security Objectives Coverage

Table 6-1 Security Environment to Security Objectives Mapping

Policy/Threat/Assumptions	Objectives
Policies	
P.Algorithms	O.CSP-SCD_Secure, O.Sign_Secure, O.Protect_Exported_Data
Threats	
T.Bad_SW	O.Check_Operation, O.Control_Services
T.CSP-SCD_Derive	O.CSP-SCD_Secure, O.Sign_Secure, O.ENV_Protect_Access
T.CSP-SCD_Disclose	O.CSP-SCD_Secure, O.Check_Operation, O.Protect_Exported_Data, O.Sign_Secure, O.ENV_Protect_Access
T.CSP-SCD_Distortion	O.Check_Operation, O.Detect_Attack, O.Error_Secure, O.Protect_Exported_Data, O.ENV_Protect_Access
T.Data_Manipul	O.ENV_Application, O.ENV_Secure_Oper
T.Insecure_Init	O.Audit_CM, O.CSP-SCD_Secure, O.Control_Services, O.Protect_Exported_Data, O.ENV_Application, O.ENV_Personnel, O.ENV_Protect_Access, O.ENV_Recovery, O.ENV_Secure_Init
T.Insecure_Oper	O.ENV_Personnel, O.ENV_Protect_Access, O.ENV_Secure_Oper
T.Malfunction	O.Check_Operation, O.Error_Secure, O.ENV_Protect_Access, O.ENV_Recovery

T.Management	O.Audit_CM, O.Control_Services, O.Protect_Exported_Data, O.User_Authentication, O.ENV_Personnel, O.ENV_Protect_Access, O.ENV_Secure_Oper
T.Misuse_Sign	O.Audit_CM, O.Control_Services, O.User_Authentication, O.ENV_Application
T.Phys_Manipul	O.Check_Operation, O.Detect_Attack, O.Error_Secure, O.ENV_Protect_Access
T.Signature_Forgery	O.Sign_Secure
Assumptions	
A.Audit_Support	O.ENV_Audit, O.ENV_Personnel
A.Correct_DTBS	O.ENV_Application, O.ENV_Secure_Oper
A.Data_Store	O.ENV_Recovery, O.ENV_Secure_Init, O.ENV_Secure_Oper
A.Human_Interface	O.ENV_Application, O.ENV_Human_Interface
A.User_Authentication	O.ENV_Application, O.ENV_Human_Interface

Table 6-2 Tracing of Security Objectives to the TOE Security Environment

Objectives	Policy/Threat/Assumptions
Security Objectives for the TOE	
O.Audit_CM	T.Insecure_Init, T.Management, T.Misuse_Sign
O.CSP-SCD_Secure	P.Algorithms, T.Insecure_Init, T.CSP-SCD_Derive, T.CSP-SCD_Disclose
O.Check_Operation	T.Bad_SW, T.CSP-SCD_Disclose, T.CSP-SCD_Distortion, T.Malfunction, T.Phys_Manipul
O.Control_Services	T.Bad_SW, T.Insecure_Init, T.Management, T.Misuse_Sign
O.Detect_Attack	T.CSP-SCD_Distortion, T.Phys_Manipul
O.Error_Secure	T.CSP-SCD_Distortion, T.Malfunction, T.Phys_Manipul
O.Protect_Exported_Data	P.Algorithms, T.CSP-SCD_Disclose, T.CSP-SCD_Distortion, T.Insecure_Init, T.Management
O.Sign_Secure	P.Algorithms, T.CSP-SCD_Derive, T.CSP-SCD_Disclose, T.Signature_Forgery
O.User_Authentication	T.Management, T.Misuse_Sign
Security Objectives for the Environment	
O.ENV_Application	A.Correct_DTBS, A.Human_Interface, A.User_Authentication, T.Insecure_Init, T.Data_Manipul, T.Misuse_Sign
O.ENV_Audit	A.Audit_Support
O.ENV_Human_Interface	A.Human_Interface, A.User_Authentication
O.ENV_Personnel	A.Audit_Support, T.Insecure_Init, T.Insecure_Oper, T.Management
O.ENV_Protect_Access	T.Insecure_Init, T.Insecure_Oper, T.Malfunction, T.Management, T.Phys_Manipul T.CSP-SCD_Derive, T.CSP-SCD_Disclose, T.CSP-SCD_Distortion
O.ENV_Recovery	A.Data_Store, T.Insecure_Init, T.Malfunction
O.ENV_Secure_Init	A.Data_Store, T.Secure_Init
O.ENV_Secure_Oper	A.Correct_DTBS, A.Data_Store, T.Data_Manipul, T.Insecure_Oper, T.Management

6.2.2 Security Objectives Sufficiency

The overall objective of this Protection Profile is to provide a basis for cryptographic devices used within a CA environment to store and apply the private keys of a CA to sign certificates, certificate revocation lists, time stamp certificates or OCSP responses. Basic requirements for such a device are defined in the EU directive [1] as well as in the ETSI document on policy requirements for certification authorities issuing qualified certificates [6]. In addition the objectives of FIPS 140-2 for cryptographic modules have been taken into account.

In this chapter we will map the security objectives, threats and assumptions on the requirements stated in those documents to demonstrate compliance with the EU directive. In addition we will present the arguments for the consistency of the objectives, assumptions and threats defined.

6.2.2.1 Policies and Security Objective Sufficiency

P.Algorithms addresses the problem to use cryptographic algorithms and parameters that provide the required level of security against cryptographic attacks resulting in the ability to generate false signatures. These properties are addressed in the objectives O.CSP-SCD_Secure, O.Sign_Secure and O.Protect_Exported_Data.

6.2.2.2 Threats and Security Objective Sufficiency

T.Bad_SW deals with the threat of introducing potentially malicious or faulty code into the TOE after it has been checked and released for use. Not all CSP signing devices may provide a capability to modify the operational software in those stages of the life-cycle, but many CSP signing devices may provide the ability to install software updates. In this case O.Control_Services will ensure that only authorised users can perform such an update. O.Check_Operation detects unauthorised software changes by means of integrity checks of TOE software and firmware during initial start-up, at the request of the authorised user, at the conditions installation and maintenance.

T.CSP-SCD_Derive deals with the threat that the CSP-SCD can be derived from the reaction and responses of the CSP signing device. This includes any type of covert storage channel which can be used to extract information about the CSP-SCD as well as the problem of timing channels or other signals of the CSP signing device that may carry information about the CSP-SCD. Examples are power consumption or radiation.

O.CSP-SCD_Secure is responsible to ensure that no information about the CSP-SCD is directly transmitted to any entity outside the TOE. O.Sign_Secure ensures that the algorithms and the specific implementation will not reveal the CSP-SCD. Leakage of information via e. g. the power consumption or via radiation may require sufficient physical protection of the CSP signing device in its operational environment, which is addressed by O.ENV_Protect_Access.

T.CSP-SCD_Disclose deals with the threat of disclosing directly all or part of the CSP-SCD via the defined interfaces. This may happen either because a defined function allows the unencrypted export of CSP-SCD, the CSP-SCD is not protected sufficiently when exported because of the incorrect operation of an element of the TOE. Unencrypted export of the CSP-SCD is prohibited by O.CSP-SCD_Secure and O.Protect_Exported_Data, and the incorrect operation is addressed by O.Check_Operation. In addition O.Sign_Secure ensures that the CSP-SCD is not disclosed as part of the signed data exported to the user.

Physical, logical and organisational protection measures addressed by O.ENV_Protect_Access strengthen the prevention of CSP-SCD disclosure by tampering.

T.CSP-SCD_Distortion deals with the threat that the CSP-SCD gets corrupted either by a software or hardware malfunction or by a deliberate physical attack on the TOE. This threat is only relevant, if the TOE will use the distorted CSP-SCD. Therefore it has to be the objective to detect the distortion of the CSP-SCD, not only to prevent such a distortion.

O.Check_Operation will ensure that the TOE will check the CSP-SCD regularly. O.Error_Secure will prevent the TOE to use distorted CSP-SCD after it has detected the distortion and O.Detect_Attack will prohibit the use of a distorted CSP-SCD after a physical attack (of course in the case of a physical attack the TOE will itself destroy the CSP-SCD and enter a state where it can only be reused after a secure re-initialisation). O.Protect_Exported_Data addresses the integrity and confidentiality protection measures to CSP-SCD when they are exported from the TOE e.g. for the purpose of backup and restore.

Physical, logical and organisational protection measures addressed by O.ENV_Protect_Access strengthen the prevention of CSP-SCD distortion by tampering.

T.Data_Manipul deals with the threat that data to be signed is manipulated before it is submitted to the TOE. As a result the TOE may sign false certificates or certificate status information. This threat does not address manipulations the TOE is able to detect (e. g. data protected by secure checksums or digital signatures). Instead it addresses the threat of false data to be signed generated by those system components that are allowed to generate data to be signed. An example is a Registration Authority where an authorised operator has made a mistake in defining the certificate content data. Another example is a directory service generating wrong certificate status information which is then submitted to the TOE for signing. This threat has to address in the TOE environment by the objective O.ENV_Secure_Oper and O.ENV_Application.

T.Insecure_Init deals with the threat of a CSP signing device initiated in an insecure way. Each CSP signing device will need to be initialised correctly and in a secure way before it can be used within a CA environment for issuing and managing qualified certificates. Secure initialisation includes the secure generation or import of the CA keys as well as the secure setup of the CSP signing device TSF management data. This threat is countered by O.CSP-SCD_Secure with respect to the secure CSP-SCD generation and management, O.Control_Services with respect to the unauthorised use of services (also in the initialisation phase) as well as by objectives on the TOE environment O.ENV_Secure_Init and O.ENV_Recovery. In addition O.Audit_CM provides the ability to check if the initialisation process has been performed correctly.

Procedures within the TOE environment have to be in place that monitor the correct initialisation of the TOE before it is accepted to sign qualified certificates or certificate status information. To counter this threat, organisational controls addressed by O.ENV_Recovery shall be in place. O.ENV_Recovery covers the case where a CSP signing device has to be initialised to take over the task of another CSP signing device e. g. in the case this device works incorrectly.

In addition, applications running on systems within the TOE environment have to perform the necessary checks within the initialisation procedure e. g. if those applications generate data that is then downloaded to the TOE and used there as TSF data. O.ENV_Protect_Access addresses the aspect of physical access to an un-initialised TOE by unauthorised personnel,

O.ENV_Secure_Init addresses the organisational aspects while O.ENV_Application addresses the aspect of security checks and controls within the applications used in the TOE environment for the initialisation of the TOE. In addition, the personnel performing the initialisation actions must be aware of the implications of their activities and trained to perform their task correctly. This is covered by the objective O.ENV_Personnel.

A TOE may also be initialised to be copy of another TOE that became unusable e. g. because of a hardware failure. In this case the TOE needs to be initialised with TSF data that has been previously exported from the other TOE. O.Protect_Exported_Data addresses the issue that this data has been manipulated after it has been exported. This allows the new TOE to get securely initialised with the data of the old TOE.

T.Insecure_Oper deals with the threat that the TOE might be operated in an insecure way and where the TOE itself is not able to detect this. This includes the possibility to operate the TOE in a hostile system that simulates the intended system environment or a valid system environment is operated without in violation of the requirements stated in the EU directive, national laws or regulations. This threat is addressed by the objective O.ENV_Secure_Oper. Physical protection of the TOE, which is also necessary to operate the TOE securely, is addressed by O.ENV_Protect_Access. In addition all personnel performing operational activities with the TOE or within the TOE environment must be aware of their duties and responsibilities and must be trained to perform their actions in accordance with the defined procedures. This is addressed by the objective O.ENV_Personnel.

T. Malfunction deals with the threat that a failure may prohibit the TOE to operate correctly. Examples are faults within hardware components of the TOE, loss or corruption of programs and/or data within the TOE due to component failures or ageing, accidental or deliberate destruction of the TOE or its components As a result the DTBS-representation, the CSP-SCD or TSF management data may be corrupted or the result of TOE operations may be false. As a consequence CSP-SCD may be disclosed or distorted data may be signed by the TOE. This threat is countered by O.Check_Operation and O.Error_Secure (which ensures that the TOE will not continue to operate with the CSP-SCD when it has detected a malfunction). Due to the criticality of the TOE and the requirement for resistance to physical attacks, maintenance of the TOE is also critical and repairing the TOE might be impossible without deleting the CSP-SCD. Therefore the TOE should be protected as far as possible from defects caused by deliberate or accidental mishandling (this is covered by the objective O.ENV_Protect_Access). On the other hand, if a defect occurs procedures within the TOE environment have to exist that allow the organisation operating the TOE to recover in a secure way from this defect. This is covered by the objective O.ENV_Recovery.

This protection profile does not state specific details of the recovery procedure, because the requirements on this procedure depend on the overall requirements and architecture of the system where the TOE is used to sign qualified certificates or certificate status information.

T.Management deals with the threat of misuse TOE management functions during initialisation and operation. The only way the TOE can deal with this threat is by restricting the use of TOE management functions to users authorised to use those functions and by auditing the actions of those users. Therefore the threat is countered by O.Control_Services, which restricts the use of TOE management functions to authorised users, O.User_Authentication, which ensures that the invoking a management function has the authorisation and O.Audit_CM, which allows to trace the actions of those users. In addition the objective O.Protect_Exported_Data prohibits the

modification of data exported by the TOE when it is imported again (which otherwise could be used to manipulate TSF management data).

The TOE environment will limit the access to the TOE to authorised personnel only according to O.ENV_Protect_Access. Because of O.ENV_Personnel this personnel will be aware of their responsibility to manage the TOE securely as addressed by O.ENV_Secure_Oper.

T.Misuse_Sign deals with the threat of misuse of the TOE to create a forged signature. This could be achieved, if an unauthorised user could invoke the signature function. O.Control_Services counters this threat for the user known to the TOE. O.User_Authentication prevents the misuse by persons not authorised to use the TOE and O.Audit_CM allows checking, if an unauthorised user has attempted to get access to the TOE or if an authorised user has attempted to misuse the TOE by attempting to use functions he is not allowed to use. O.ENV_Application extents this protection to the end-users of the client application by their user authentication and access control.

T.Phys_Manipul deals with physical manipulation of the TOE. An attacker may try to get access to the CSP-SCD by trying to get physical access to the location where it is stored. O.Detect_Attack counters this threat as long as the TOE is directly able to detect that it is under attack. This includes manipulation by authorised users. O.Check_Operation counters the case where the TOE does not detect the physical manipulation directly but detects an error during operation that might have been caused by a physical attack. O.Error_Secure enforce a secure state of the TOE if such error is detected. Since it is obvious that the TOE is not able to withstand all kind of physical manipulation, O.ENV_Protect_Access shall prohibit (as far as possible) the likelihood that an attacker is able to perform any physical manipulation on the TOE.

T.Signature_Forgery deals with the threat that an attacker is able to generate a forged signature with the result that either a forged qualified signature or forged certificate status information is generated. While the threat of disclosing information about the CSP-SCD is covered elsewhere, this threat deals with the problem that it might be able for someone to forge a signature without knowledge of the CSP-SCD. O.Sign_Secure counters this threat by stating that it should not be possible to generate a valid signature without knowledge of the CSP-SCD.

6.2.2.3 Assumptions and Security Objective Sufficiency

A.Audit_Support is addressed by the objective O.ENV_Audit, which ensures that the audit trail (generated and exported by the TOE) is properly analysed. The personnel performing this analysis must be aware of their duties and responsibilities, which is addressed by the objective O.ENV_Personnel.

A.Correct_DTBS is addressed by the objective O_ENV_Application ensures that the applications that use the TOE will perform the required checks on the data they pass to the TOE. O.ENV_Secure_Oper ensures that the necessary operational procedures are in place for the organisation operating the TOE as part of their certification system. With the sum of these objectives the assumption is covered.

A.Data_Store is addressed by the objectives O.ENV_Secure_Init and O.ENV_Secure_Oper, which deals with the security of data necessary for secure initialisation and operation of the

TOE if they are stored in the TOE environment. In addition O.ENV_Recovery addresses the availability of data stored in the TOE environment.

A.Human_Interface is addressed by the objective O.ENV_Human_Interface and the objective O.ENV_Application. The client application will provide the human interface and protection of the authentication data provided by the users for the identification and authentication function of the TOE.

A.User_Authentication deals with the authentication function of the client application for its end-users gaining access to the TOE signing function. O.ENV_Application and O.ENV_Human_Interface address the TOE environment task to support the authentication of an individual end-user outside of the TOE (e. g. within the system of a registration authority).

Note in contrast to O.ENV_Application the objective O.User_Authentication addresses the direct authentication of the Crypto-officer and Auditor by the TOE as individual users.

6.3 Security Requirements Rationale

6.3.1 Security Requirement Coverage

Table 6-3 Functional and Assurance Requirement to Security Objective Mapping

Objectives	Requirements
Security Objectives for the TOE	
O.Audit_CM	FAU_GEN.1, FAU_GEN.2, FAU_STG.2/TOE, FDP_ACC.1/AUDIT, FDP_ACF.1/AUDIT, FMT_MTD.1/AUDIT, FMT_SMF.1, FPT_ITI.1
O.Protect_Exported_Data	FAU_GEN.1, FAU_GEN.2, FCS_CKM.2, FCS_COP.1/BACKUP_ENC, FCS_COP.1/BACKUP_INT, FDP_ACC.1/BACKUP, FDP_ACF.1/BACKUP, FDP_BKP.1, FDP_ETC.1, FDP_IFC.1/BACKUP, FDP_IFF.4/BACKUP, FMT_MSA.1/ROLE_CRYPTO, FMT_MSA.3, FPT_ITC.1, FPT_ITI.1, AVA_CCA.1
O.CSP-SCD_Secure	FCS_CKM.1, FCS_CKM.4, FCS_COP.1/SIGN, FCS_RND.1, FDP_ACC.1/CRYPTO, FDP_ACF.1/CRYPTO, FDP_BKP.1, FDP_IFC.1/CRYPTO, FDP_IFF.4/CRYPTO, FDP_RIP.1, FDP_SDI.2
O.Check_Operation	FAU_GEN.1, FPT_TST.1, FPT_AMT.1
O.Control_Services	FDP_ACC.1/AUDIT, FDP_ACC.1/BACKUP, FDP_ACC.1/CRYPTO, FDP_ACF.1/AUDIT, FDP_ACF.1/BACKUP, FDP_ACF.1/CRYPTO, FMT_MSA.1/ ROLE_CRYPTO, FMT_MSA.1/ROLE_AUDIT, FMT_MSA.2, FMT_MSA.3, FMT_MTD.1/AUDIT, FMT_MTD.1/ACCESS_CONTROL, FMT_SMF.1, FMT_SMR.1, FPT_TST.1, ACM_CAP.4, ADO_DEL.2, ADO_IGS.1, ALC_DVS.1, ALC_LCD.1
O.Detect_Attack	FPT_PHP.2, FPT_PHP.3
O.Error_Secure	FPT_AMT.1, FPT_FLS.1, FPT_RCV.1, FPT_TST.1
O.Sign_Secure	FCS_COP.1/SIGN, FDP_IFC.1/CRYPTO, FDP_IFF.4/CRYPTO, AVA_CCA.1, AVA_VLA.4
O.User_Authentication	FIA_AFL.1, FIA_ATD.1, FIA_SOS.1, FIA_UAU.1, FIA_UID.1, FMT_MTD.1/USER_CRYPTO, FMT_MTD.1/USER_AUDIT, FMT_MTD.1/RAD, FMT_SMF.1, FTP_TRP.1/TOE
Security Objectives for the Environment	
O.ENV_Application	FIA_UID.1/CLIENT, FIA_UAU.1/CLIENT, FDP_ACC.1/CLIENT, FDP_ACF.1/CLIENT, FDP_UIT.1
O.ENV_Audit	FAU_SAR.1, FAU_STG.1/ENVIRONMENT,

Objectives	Requirements
O.ENV_Human_Interface	FTP_TRP.1/CLIENT
O.ENV_Personnel	RE.ENV_Personnel
O.ENV_Protect_Access	RE.ENV_Protect_Access
O.ENV_Recovery	RE.ENV_Recovery
O.ENV_Secure_Init	RE.ENV_Secure_Init
O.ENV_Secure_Oper	RE.ENV_Secure_Oper
Security Assurance Requirements	
O.CSP-SCD_Secure	ADV_IMP.2, AVA_CCA.1, AVA_VLA.4
O.Protect_Exported_Data	ADV_IMP.2, AVA_CCA.1, AVA_VLA.4
O.Sign_Secure	AVA_CCA.1, AVA_VLA.4

6.3.2 Security Requirements Sufficiency

6.3.2.1 TOE Security Requirements Sufficiency

O.Audit_CM (Audit record generation and export) addresses the generation and protection of audit data by the TOE. The audit generation is implemented by the SFR FAU_GEN.1 and FAU_GEN.2 with the audit events matching the list in O.Audit_CM. Additional audit is implemented by the SFR FAU_GEN.1 and FAU_GEN.2. The TOE stores the audit data according to the SFR FAU_STG.2/TOE until the audit trail is exported upon request of the Auditor or Crypto-officer under control of the SFR FDP_ACC.1/AUDIT, FDP_ACF.1/AUDIT and FMT_MTD.1/AUDIT. FMT_SMF.1 and FMT_MTD.1/AUDIT require management function for the audit. These management functions are provided to the Auditor only. The integrity of the audit data will be ensured by the SFR FAU_STG.2/TOE inside the TOE.

O.SCP-SCD_Secure (secure CSP-SCD generation and management) addresses the confidentiality and integrity of the CSP-SCD which shall be ensured during their whole life time. The SFR ensure the cryptographic secure CSP-SCD generation by FCS_CKM.1 and FCS_RND.1 as well as operation by FCS_COP.1/SIGN according to the list of approved algorithms and parameters. The confidentiality and integrity of the CSP-SCD will be protected by SFR FDP_RIP.1 and FDP_SDI.2 while internal processing. The SFR FCS_CKM.4 requires secure key destruction to prevent any misuse of CSP-SCD after operational life time. The all CSP-SCD management and operation is under access control of the SFR FDP_ACC.1/CRYPTO and FDP_ACF.1/CRYPTO. The TOE shall protect CSP-SCD against side-channels by the SFR FDP_IFC.1/CRYPTO and FDP_IFF.4/CRYPTO. The SAR AVA_CCA.1 requires subject side-channels to the vulnerability analysis.

Note that the special protection of the CSP-SCD needed if the CSP-SCD is exported by backup function. This is addressed by O.Protect_Exported_Data and implemented by appropriate SFR. The SFR FDP_BKP.1 will protect the confidentiality if the CSP-SCD (or any other cryptographic key) is exported. The complex protection of the CSP-SCD as most valuable asset requires a

systematic and complete vulnerability analysis considering high attack potential by SAR AVA_VLA.4.

O.Check_Operation (check for correct operation) addresses regular checks to verify that its components operate correctly. This security objective is implemented in the TOE by the SFR for abstract machine testing FPT_AMT.1 and TSF testing FPT_TST.1. If these tests detect an error the TOE will transit into a secure state (see O.Error_secure) and prevent the normal operation. FAU_GEN.1 generates audit records about the test results of the SFR FPT-AMT.1 and FPT_TST.1 to inform the user (Auditor or Crypto-officer) about the performed self-tests and their results. The FPT_TST.1 includes checks of the executable code.

O.Control_Services (Management and control of TOE services) addresses the access control to TOE services and its management. The access control is implemented in the TOE by:

a) FDP_ACC.1/CRYPTO and FDP_ACF.1/CRYPTO for the cryptographic functions (Crypto-SFP),
b) FDP_ACC.1/AUDIT and FDP_ACF.1/AUDIT for the audit function (Audit-SFP),
c) FDP_ACC.1/BACKUP and FDP_ACF.1/BACKUP for the backup function (Backup-SFP

with the roles Auditor, Crypto-officer and Crypto-user as defined by the SFR FMT_SMR.1. The SFR FMT_MSA.1/ROLE_CRYPTO, FMT_MSA.1/ROLE_AUDIT, FMT_MSA.2, FMT_MSA.3, FMT_MTD.1/ACCESS_CONTROL, FMT_MTD.1/AUDIT and FMT_SMF.1 assign the management functions for the cryptographic to the Crypto-officer and audit functions to the Auditor. The SFR FMT_MSA.1/ROLE_CRYPTO extend the Crypto-officer's management functions to backup and restore. The SFR require the TSF to enforce the Audit-SFP, Backup-SFP and Crypto-SFP to provide restrictive default values for security attributes which may be changed by the Auditor and the Crypto-officer. Note that the user management is addressed by O.User_authentication. The assurance requirements in the development environment, especial ACM_CAP.4 (Generation support and acceptance procedures), ADO_DEL.2 (Detection of modification), ADO_IGS.1 (Installation, generation, and start-up procedures), ALC_DVS.1 (Identification of security measures) and ALC_LCD.1 (Developer defined life-cycle model), prevent that malicious code is installed or hardware is manipulated during the development, production or delivery of the TOE.

O.Detect_Attack (detection of physical attacks) addresses the detection of physical tampering attempts and the secure destruction of the CSP-SCD if such attempts are detected. The SFR FPT_PHP.2 implements notification of and FPT_PHP.3 resistance to physical attack. The refinements limit the tamper scenarios to opening the device or removal of a cover. This limitation is reasonable because RE.ENV_Protect_Access requires CSP security measures for physical protection of the TOE.

O.Error_secure (secure state in case of error) addresses a secure state and protection of CSP-SCD confidentiality whenever the TOE detects an error. The SFR FPT_AMT.1 and FPT_TST.1 require tests for error detection and the SFR FPT_FLS.1 requires preservation of a secure state when errors are detected. The TSF shall destroy the plaintext SCP-SCD and other confidential secret and private keys if failures occur. The SFR FPT_RCV.1 requires a maintenance mode where the ability to return the TOE to a secure state is provided. Note that the RE.ENV_Recovery describes the related security measures in the TOE environment.

O.Protect_Exported_Data (protection of data exported by the TOE) addresses the integrity and confidentiality protection measures to all assets listed in the asset list requiring integrity or confidentiality protection when they are exported from the TOE. The SFR FDP_ETC.1

implements the Crypto-SFP for all exported data. The TOE backup and restore functions requires the SFR FDP_BKP.1 the confidentiality and integrity protection of backup data. The backup and restore of CSP-SCD, other user data and TSF data is described in the SFR FDP_BKP.1. The confidentiality and integrity protection of the TSF data as part of the backup data is implemented by the SFR FPT_ITC.1 and SFR FPT_ITI.1 The FDP_BKP.1 needs the cryptographic functions implemented by the following SFR: (i) import the backup keys by FCS_CKM.2, (ii) encryption of backup data by FCS_COP.1/BACKUP_ENC, (iii) data integrity protection by FCS_COP.1/BACKUP_INT. The SFR FDP_BKP.1 requires encrypting the CSP-SCD and electronically exported keys if they are exported. The backup and restore TSF will be under access control required by the SFR FDP_ACF.1/BACKUP according to FDP_ACC.1/BACKUP. The SFR FMT_MSA.1/ROLE_BACKUP and FMT_MSA.3 extend the management functions of security attributes to the Backup SFP. The SFR FAU_GEN.1 and FAU_GEN.2 require audit data specific for the use of the backup and restore function associated with the identity of the users. Because FDP_BKP.1 handles and exports the CSP-SCD outside the TSC the TOE shall protect against side-channels to prevent any illicit information flow. The SFR FDP_IFC.1/BACKUP and FDP_IFF.4/BACKUP implements this protection and the SFR AVA_CCA.1 requires subject side-channels to the vulnerability analysis.

O.Sign_Secure (Secure advanced signature-creation) addresses the security of the signatures, i.e. the signature does not reveal the CSP-SCD and cannot be forged without knowledge of the CSP-SCD. The cryptographic security of signature is implemented by the SFR FCS_COP.1/SIGN with reference to the list of approved algorithms and parameters [5]. The SFR FDP_IFC.1/CRYPTO and FDP_IFF.4/CRYPTO requires TSF to prevent illicit information flow about the CSP-SCD through side-channels in the signatures. The SAR AVA_CCA.1 and AVA_VLA.4 requires covert-channel analysis and a systematic and complete vulnerability analysis considering high attack potential. That is because the signature-creation with CSP-SCD especially for certificates is the most important and critical service of the TOE.

O.User_authentication (authentication of users interacting with the TOE) addresses the identification and authentication the users before having any access to TOE protected assets. The SFR require timing identification by FIA_UID.1 and timing authentication by FIA_UAU.1. The following actions are allowed on behalf of the user to be performed before the user is identified respectively authenticated: start-up, identification (FIA_UID.1), self-test (FPT_TST.1), detection of the secure blocking state (FPT_FLS.1) and detection of violation of physical integrity (FPT_PHP.2). Therefore these actions support the TOE protection and do not allow any access to the TOE protected assets. The SFR FIA_ATD.1 defines the security attributes for identity based authentication. Note that the client application might be the only user in the Crypto-user role and may act as agent for several end-users in the TOE environment (see O.ENV_Application). The SFR FIA_SOS.1 ensures the verification of the quality of the secret used for authentication. The SFR FIA_AFL.1 protects the VAD against guessing. The SFR FMT_MTD.1/USER_CRYPTO, FMT_MTD.1/USER_AUDIT, FMT_MTD.1/RAD and FMT_SMF.1 provide management functions for identification.

6.3.2.2 TOE Environment Security Requirements Sufficiency

O.ENV_Application (Security in the Client Application) addresses the client application which acts as agent for the end-user gaining access to the TOE signing function provided and passes the DTBS representation to the TOE. The client application shall implement end-user identification and authentication required by the SFR FIA_UID.1/CLIENT and

FIA_UAU.1/CLIENT. It shall implement access control for the DTBS representation sent to the TOE for signing according to the SFR FDP_ACC.1/CLIENT and FDP_ACF.1/CLIENT. Security controls in the TOE environment shall also prevent unauthorised manipulation of data submitted to the TOE as required by SFR FDP_UIT.1.

O.ENV_Audit (Audit review) addresses the review of the audit trail recorded by the TOE. The audit review of TOE's audit data is implemented in the IT environment by the SFR FAU_SAR.1. Because the TOE implements access control on reading the TOE's audit trail only the SFR FAU_STG.1/ENVIRONMENT ensures the availability of the TOE audit trail and prevents the modification of the TOE audit trail outside the TOE.

O.ENV_Human_Interface (reliable human interface) addresses the confidentiality and integrity of the data transferred between the TOE and the human user if the client application provides a human interface and a communication path between human users and the TOE. In this case the client application will implement the trusted path according to SFR FTP_TRP.1/CLIENT for transmission of authentication and management data of the human user to the TOE.

O.ENV_Personnel (Reliable Personnel) addresses the awareness of civil, financial and legal responsibilities, as well as the obligations the CSP personnel have to face, depending on their role. The RE.ENV_Personnel implements the definition of the obligations, the services and the roles of the TOE users. The CSP shall inform about their civil, financial and legal responsibilities and train the personnel for their roles.

O.ENV_Protect_Access (Prevention of Unauthorised Physical Access) addresses the physical and logical protection of the TOE, the restriction the TOE usage and the limitation of the access to TOE assets to authorised persons only. The RE.ENV_Protect_Access requests the CSP to establish physical and organisational security measures against modification of TOE hardware, firmware and software. These measures shall restrict the access to the TOE and protected assets to authorised persons. Note that the TOE itself protects by FPT_PHP.2 and FPT_PHP.3 the confidentiality of the CSP-SCD against physical access because even the CSP personnel do not need to know the CSP-SCD in plaintext.

O.ENV_Recovery (Secure Recovery in Case of Major Failure) addresses the recovery plans and procedures for a secure and timely recovery in the case of a major problem with the TOE. The RE.ENV_Recovery implements such recovery plans and procedures using the TOE TSF according to FDP_BKP.1 and other SFR. It takes recovery in case of detected errors or physical tampering into account.

O.ENV_Secure_Init (Secure Initialisation Procedures) addresses secure set-up and initialisation the TOE for the CSP services. The RE.ENV_Secure_Init implements the definition and application of procedures and controls set-up the TOE for the secure generation of CSP-SCD and initialisation of the signature function.

O.ENV_Secure_Oper (Secure Operating Procedures) addresses the procedures and controls in the TOE environment to operate the TOE within a CA system in compliance with the requirements of the EU directive and the Policy for certification authorities issuing qualified certificates. The RE.ENV_Secure_Oper requires the implementation of such procedures and controls and the observance of the TOE guidance.

6.4 Dependency Rationale

6.4.1 Functional and Assurance Requirements Dependencies

Table 6.4 Functional and Assurance Requirements Dependencies

Requirement	CC-required Dependencies	Remark
Functional Requirements for the TOE		
FAU_GEN.1	FPT_STM.1	dependency is not satisfied by the PP (see justification in section 6.4.2)
FAU_GEN.2	FAU_GEN.1, FIA_UID.1	
FAU_STG.2/TOE	FAU_GEN.1, FAU_GEN.1	
FCS_CKM.1	FCS_COP.1/SIGN, FCS_CKM.4, FMT_MSA.2 FCS_CKM.2	
FCS_CKM.2	FCS_CKM.1, FCS_CKM.4, FMT_MSA.2	dependency on FCS_CKM.1 is not satisfied by the PP (see justification in section 6.4.2)
FCS_CKM.4	FCS_CKM.1, FMT_MSA.2	
FCS_COP.1/ BACKUP_ENC	FCS_CKM.1, FCS_CKM.4, FMT_MSA.2	dependency on FCS_CKM.1 is not satisfied by the PP (see justification in section 6.4.2)
FCS_COP.1/ BACKUP_INT	FCS_CKM.1, FCS_CKM.4, FMT_MSA.2	dependency on FCS_CKM.1 is not satisfied by the PP (see justification in section 6.4.2)
FCS_COP.1/SIGN	FCS_CKM.1, FCS_CKM.4, FMT_MSA.2	
FDP_ACC.1/BACKUP	FDP_ACF.1/BACKUP	
FDP_ACC.1/AUDIT	FDP_ACF.1/AUDIT	
FDP_ACC.1/CRYPTO	FDP_ACF.1/CRYPTO	
FDP_ACF.1/BACKUP	FDP_ACC.1/BACKUP, FMT_MSA.3	
FDP_ACF.1/AUDIT	FDP_ACC.1/AUDIT, FMT_MSA.3	

Requirement	CC-required Dependencies	Remark
FDP_ACF.1/CRYPTO	FDP_ACC.1/CRYPTO, FMT_MSA.3	
FDP_BKP.1	FCS_CKM.2, FCS_COP.1/BACKUP_ENC, FCS_COP.1/BACKUP_INT	
FDP_ETC.1	FDP_ACC.1/CRYPTO, FDP_ACC.1/BACKUP, FDP_ACC.1/AUDIT, FDP_IFC.1/CRYPTO, FDP_IFC.1/BACKUP	
FDP_IFC.1/BACKUP	FDP_IFF.1	dependency is not satisfied by the PP (see justification in section 6.4.2)
FDP_IFC.1/CRYPTO	FDP_IFF.1	dependency is not satisfied by the PP (see justification in section 6.4.2)
FDP_IFF.4/BACKUP	AVA_CCA.1, FDP_IFC.1/BACKUP	
FDP_IFF.4/CRYPTO	AVA_CCA.1, FDP_IFC.1/CRYPTO	
FIA_AFL.1	FIA_UAU.1	
FIA_UAU.1	FIA_UID.1	
FMT_MSA.1/ ROLE_CRYPTO	FDP_ACC.1/BACKUP, FDP_ACC.1/CRYPTO, FMT_SMF.1, FMT_SMR.1	
FMT_MSA.1/ ROLE_AUDIT	FDP_ACC.1/AUDIT, FMT_SMF.1, FMT_SMR.1	
FMT_MSA.2	ADV_SPM.1, FDP_ACC.1/AUDIT, FDP_ACC.1/BACKUP, FDP_ACC.1/CRYPTO, FMT_MSA.1/ROLE_AUDIT, FMT_MSA.1/ROLE_CRYPTO, FMT_SMR.1	
FMT_MSA.3	FMT_MSA.1/ROLE_AUDIT, FMT_MSA.1/ROLE_CRYPTO, FMT_SMR.1	
FMT_MTD.1/AUDIT	FMT_SMF.1, FMT_SMR.1	

Requirement	CC-required Dependencies	Remark
FMT_MTD.1/ ACCESS_CONTROL	FMT_SMF.1, FMT_SMR.1	
FMT_MTD.1/ USER_CRYPTO	FMT_SMF.1, FMT_SMR.1	
FMT_MTD.1/ USER_AUDIT	FMT_SMF.1, FMT_SMR.1	
FMT_MTD.1/RAD	FMT_SMF.1, FMT_SMR.1	
FMT_SMF.1	(no dependencies)	
FMT_SMR.1	FIA_UID.1	
FPT_FLS.1	ADV_SPM.1	
FPT_ITC.1	(no dependencies)	
FPT_ITI.1	(no dependencies)	
FPT_PHP.2	FMT_MOF.1	dependency is not satisfied by the PP (see justification in section 6.4.2)
FPT_RCV.1	FPT_TST.1, AGD_ADM.1, ADV_SPM.1	
FPT_TST.1	FPT_AMT.1	
FTP_TRP.1/TOE	(no dependencies)	
Assurance Requirements		
ACM_AUT.1	ACM_CAP.3	ACM_CAP.4 is hierarchical to ACM_CAP.3.
ACM_CAP.4	ALC_DVS.1	
ACM_SCP.2	ACM_CAP.3	ACM_CAP.4 is hierarchical to ACM_CAP.3
ADO_DEL.2	ACM_CAP.3	ACM_CAP.4 is hierarchical to ACM_CAP.3
ADO_IGS.1	AGD_ADM.1	
ADV_FSP.2	ADV_RCR.1	

Requirement	CC-required Dependencies	Remark
ADV_HLD.2	ADV_FSP.1, ADV_RCR.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
ADV_IMP.2	ADV_LLD.1, ADV_RCR.1, ALC_TAT.1	
ADV_LLD.1	ADV_HLD.2, ADV_RCR.1	
ADV_SPM.1	ADV_FSP.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
AGD_ADM.1	ADV_FSP.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
AGD_USR.1	ADV_FSP.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
ALC_TAT.1	ADV_IMP.1	ADV_IMP.2 is included and hierarchical to ADV_IMP.1
ATE_COV.2	ADV_FSP.1, ATE_FUN.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
ATE_DPT.1	ADV_HLD.1, ATE_FUN.1	ADV_HLD.2 is hierarchical to ADV_HLD.1
ATE_IND.2	ADV_FSP.1, AGD_ADM.1, AGD_USR.1, ATE_FUN.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
AVA_CCA.1	ADV_FSP.2, ADV_IMP.2, AGD_ADM.1, AGD_USR.1	
AVA_MSU.2	ADO_IGS.1, ADV_FSP.1, AGD_ADM.1, AGD_USR.1	ADV_FSP.2 is hierarchical to ADV_FSP.1
AVA_SOF.1	ADV_FSP.1, ADV_HLD.1	ADV_FSP.2 is hierarchical to ADV_FSP.1, ADV_HLD.2 is hierarchical to ADV_HLD.1
AVA_VLA.4	ADV_FSP.1, ADV_HLD.2, ADV_IMP.1, ADV_LLD.1, AGD_ADM.1, AGD_USR.1	ADV_FSP.2 is hierarchical to ADV_FSP.1, ADV_IMP.2 is included and hierarchical to ADV_IMP.1
Functional Requirements for the IT environment		

Requirement	CC-required Dependencies	Remark
FAU_SAR.1	FAU_GEN.1	The IT environment provides the audit trail generated by TOE (as required by FAU.GEN.1) to the System auditor of the CSP.
FAU_STG.1/ ENVIRONMENT	FAU_GEN.1	The IT environment protects the audit trail generated by TOE (as required by FAU.GEN.1).
FDP_ACC.1/CLIENT	FDP_AFC.1/CLIENT	
FDP_AFC.1/CLIENT	FDP_ACC.1/CLIENT	FMT_MSA.3 is not fulfilled, a rationale is given in section 6.4.2
FDP_UIT.1	FDP_ACC.1/CLIENT, FTP_TRP.1/CLIENT	
FIA_UAU.1/CLIENT	FIA_UID.1/CLIENT	
FIA_UID.1/CLIENT	(no dependencies)	
FTP_TRP.1/CLIENT	(no dependencies)	

6.4.2 Justification of Unsupported Dependencies

Component	Justification for not including	Remark
Security Functional Requirements for the TOE		
FAU_GEN.1	FPT_STM.1	FAU_GEN.1 uses sequence data, which may be a sequence number or reliable time stamp. If sequence number is used FPT_STM.1 is not needed. The application note directs the ST editor to include FPT_STM.1 if reliable time stamp is used by the TOE.

Component	Justification for not including	Remark
FCS_CKM.2	FCS_CKM.1	Key entry requires key components for split knowledge procedures not generated by the TOE. This key material will be provided by the TOE environment (as required by RE.ENV_Recovery).
FCS_COP.1/ BACKUP_ENC	FCS_CKM.1	The backup key material will be provided by the TOE environment (as required by RE.ENV_Recovery).
FCS_COP.1/ BACKUP_INT,	FCS_CKM.1	The backup key material will be provided by the TOE environment (as required by RE.ENV_Recovery).
FDP_IFC.1/BACKUP	FDP_IFF.1	FDP_IFC.1/Backup is defined for the CSP-SCD without reference to any security attribute.
FDP_IFC.1/CRYPTO	FDP_IFF.1	FDP_IFC.1/CRYPTO is defined for the CSP-SCD without reference to any security attribute.
FPT_PHP.2	FMT_MOF.1	FPT_PHP.2 informs the local user about detected tampering attempt. No management of security functions behaviour is needed.
Functional Requirements for the IT environment		
FDP_AFC.1/CLIENT	FMT_MSA.3	The cryptographic module does not need of specific requirements for management of security attributes of the client application. It is up to the CSP to define which kind of static attribute initialisation of the client application (either permissive or restrictive in nature) ensures that the default values of security attributes are appropriate.

6.5 Security Requirements Grounding in Objectives

Table 6-5 Requirements to Objectives Mapping

Requirement	Security Objectives
Security Requirements for the TOE	
ACM_AUT.1	EAL4
ACM_CAP.4	EAL4
ACM_SCP.2	EAL4
ADO_DEL.2	EAL4
ADO_IGS.1	EAL4
ADV_FSP.2	EAL4
ADV_HLD.2	EAL4
ADV_IMP.2	O.CSP-SCD_Secure, ADV_IMP.2 is hierarchical to ADV_IMP.1 required for EAL4
ADV_LLD.1	EAL4
ADV_RCR.1	EAL4
ADV_SPM.1	EAL4
AGD_ADM.1	EAL4
AGD_USR.1	EAL4
ALC_DVS.1	EAL4
ALC_LCD.1	EAL4
ALC_TAT.1	EAL4
ATE_COV.2	EAL4
ATE_DPT.1	EAL4
ATE_FUN.1	EAL4
ATE_IND.2	EAL4
AVA_CCA.1	O.Sign_Secure, O.Protect_Exported_Data, O.CSP-SCD_Secure

Requirement	Security Objectives
AVA_MSU.2	EAL4
AVA_SOF.1	EAL4
AVA_VLA.4	O.CSP-SCD_Secure, O.Protect_Exported_Data, O.Sign_Secure,
FAU_GEN.1	O.Audit_CM, O.Protect_Exported_Data, O.Check_Operation
FAU_GEN.2	O.Audit_CM, O.Protect_Exported_Data
FAU_STG.2/TOE	O.Audit_CM
FCS_CKM.1	O.CSP-SCD_Secure
FCS_CKM.2	O.Protect_Exported_Data
FCS_CKM.4	O.CSP-SCD_Secure
FCS_COP.1/ BACKUP_ENC	O.Protect_Exported_Data
FCS_COP.1/ BACKUP_INT	O.Protect_Exported_Data
FCS_COP.1/SIGN	O.Sign_Secure, O.CSP-SCD_Secure
FCS_RND.1	O.CSP-SCD_Secure
FDP_ACC.1/BACKUP	O.Protect_Exported_Data, O.Control_Services
FDP_ACC.1/AUDIT	O.Audit_CM, O.Control_Services
FDP_ACC.1/CRYPTO	O.CSP-SCD_Secure, O.Control_Services
FDP_ACF.1/BACKUP	O.Protect_Exported_Data, O.Control_Services
FDP_ACF.1/AUDIT	O.Control_Services, O.Audit_CM
FDP_ACF.1/CRYPTO	O.CSP-SCD_Secure, O.Control_Services
FDP_BKP.1	O.Protect_Exported_Data
FDP_ETC.1	O.Protect_Exported_Data
FDP_IFC.1/BACKUP	O.Protect_Exported_Data, O.CSP-SCD_Secure
FDP_IFC.1/CRYPTO	O.CSP-SCD_Secure, O.Sign_Secure

Requirement	Security Objectives
FDP_IFF.4/BACKUP	O.Protect_Exported_Data, O.CSP-SCD_Secure
FDP_IFF.4/CRYPTO	O.CSP-SCD_Secure, O.Sign_Secure
FDP_RIP.1	O.CSP-SCD_Secure
FDP_SDI.2	O.CSP-SCD_Secure
FIA_AFL.1	O.User_Authentication
FIA_ATD.1	O.User_Authentication
FIA_SOS.1	O.User_Authentication
FIA_UAU.1	O.User_Authentication
FIA_UID.1	O.User_Authentication
FMT_MTD.1/ USER_CRYPTO	O.User_Authentication
FMT_MTD.1/ USER_AUDIT	O.User_Authentication
FMT_MTD.1/RAD	O.User_Authentication
FMT_MSA.1/ ROLE_AUDIT	O.Control_Services
FMT_MSA.1/ ROLE_CRYPTO	O.Control_Services
FMT_MSA.2	O.Control_Services
FMT_MSA.3	O.Protect_Exported_Data, O.Control_Services
FMT_MTD.1/AUDIT	O.Audit_CM
FMT_MTD.1/ ACCESS_CONTROL	O.Control_Services
FMT_SMF.1	O.Audit_CM, O.Control_Services, O.User_Authentication
FMT_SMR.1	O.Control_Services
FPT_AMT.1	O.Check_Operation, O.Error_Secure

Requirement	Security Objectives
FPT_ITC.1	O.Protect_Exported_Data
FPT_ITI.1	O.Protect_Exported_Data
FPT_FLS.1	O.Error_Secure
FPT_PHP.2	O.Detect_Attack
FPT_PHP.3	O.Detect_Attack
FPT_RCV.1	O.Error_Secure
FPT_TST.1	O.Error_Secure, O.Check_Operation
FTP_TRP.1/TOE	O.User_Authentication
Security Objectives for the Environment	
FAU_SAR.1	O.ENV_Audit
FAU_STG.1/ ENVIRONMENT	O.ENV_Audit
FDP_ACC.1/ CLIENT	O.ENV_Application
FDP_ACF.1/ CLIENT	O.ENV_Application
FDP_UIT.1	O.ENV_Application
FIA_UAU.1	O.ENV_Application
FIA_UID.1	O.ENV_Application
FTP_TRP.1/CLIENT	O.ENV_Human_Interface

6.6 Rationale for Extensions

6.6.1 Rationale for Extension of Class FCS with Family FCS_RND

The TOE shall generate CSP-SCD with high cryptographic quality using random number generators. The family FCS_RNG.1 requires the ST editor to define the quality metric of the random numbers used by the TOE to generate the CSP-SCD. The component similar to FCS_RND.1 in CC part 2 is limited in their application to secrets used as authentication information.

FCS_RND generation of random numbers

Family behaviour

This family defines quality metrics for generating random numbers intended for cryptographic purposes.

Component levelling

FCS_RND.1 The generation of random numbers using TSFs requires the random numbers to meet the defined quality metrics.

Management: FCS_RND.1

No management functions are provided for.

Audit: FCS_RND.1

There are no events identified that should be auditable if FCS_RND generation of random numbers data generation is included in the PP/ST.

FCS_RND.1 Quality metrics for random numbers

Hierarchical to: no other components.

FCS_RND.1.1 The TSFs shall provide a mechanism for generating random numbers that meet [assignment: *a defined quality metric*].

FCS_RND.1.2 The TSFs shall be able to enforce the use of TSF-generated random numbers for [assignment: *list of TSF functions*].

Dependencies: FPT_TST.1 TSF testing.

6.6.2 Rationale for Extension of Class FDP with Family FDP_BKP

The HSM supports backup of CSP-SCD, other user data and TSF data to restore the operational state of the same HSM or for a new HSM in the event of a system failure or other serious error. The export, import and protection of the backup data are combined in a specific way. The HSM ensures the confidentiality of the backup data and detects loss of the integrity of the backup data. The availability of the backup data will be ensured by the TOE environment.

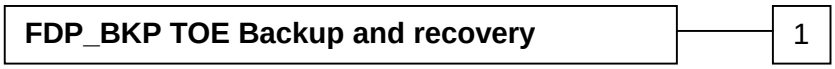
This component is necessary to specify a unique requirement of certificate issuing and management components that is not addressed by the Common Criteria. The specific requirements address the protection of CSP-SCD, other cryptographic keys and TSF data for backup and recovery.

Backup and recovery (FDP_BKP)

Family behaviour

This family defines export and import of the backup data. The TOE ensures the confidentiality of the backup data and detects loss of the integrity of the backup data. The availability of the backup data will be ensured by the TOE environment.

Component levelling:



FDP_BKP.1 Backup and recovery provides export, import and protection of the backup data.

Management: FDP_BKP.1

There are no management activities foreseen.

Audit: FDP_BKP.1

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

a) Use of the backup function,

b) Use of the recovery function,

c) Unsuccessful recovery because of detection of modification of the backup data.

FDP_BKP.1 Backup and recovery

Hierarchical to: No other components.

FDP_BKP.1.1 The TSF shall be capable of invoking the backup function on demand.

FDP_BKP.1.2 The data stored in the backup shall be sufficient to recreate the state of the TOE at the time the backup was created using only:
(1) a copy of the same version of the TOE as was used to create the backup data;
(2) a stored copy of the backup data;
(3) the cryptographic key(s) needed to decrypt the CSP-SCD and any other encrypted critical security parameters;
(4) the cryptographic key(s) needed to verify the cryptographic checksum of the backup data.

FDP_BKP.1.3 The TSF shall include a recovery function that is able to restore the state of the TOE from a backup.

FDP_BKP.1.4 The CSP-SCD, other critical security parameters and other confidential information shall be exported in encrypted form only.

FDP_BKP.1.5 The backup data shall be checked for modification through the use of cryptographic checksums. Modified backup data shall not be used for recovery.

Dependencies: [FCS_CKM.1 Cryptographic key generation
or
FCS_CKM.2 Cryptographic key distribution
or
FDP_ITC.1 Import of user data without security attributes]
FCS_COP.1 Cryptographic operation

6.7 Rationale for Assurance Level 4 Augmented

The assurance level for this protection profile is EAL4 augmented.EAL4 allows a developer to attain a reasonably high assurance level without the need for highly specialised processes and practices. It is considered to be the highest level that could be applied to an existing product line without undue expense and complexity. As such, EAL4 is appropriate for commercial products that can be applied to moderate to high security functions. The TOE described in this protection profile is just such a product. Augmentation results from the selection of:

ADV_IMP.2 Development - Implementation of the TSF
AVA_CCA.1 Vulnerability Assessment - Covert channel analysis
AVA_VLA.4 Vulnerability Assessment - Vulnerability Analysis – Highly resistant

The security objective O.CSP-SCD_Secure includes protection against disclosing completely or partly the CSP-SCD through any physical or logical TOE interface. This calls for security functional requirements as FDP_IFF.4/Crypto and security assurance requirements as AVA_CCA.1. ADV_IMP.2 is required to fulfil the dependencies for AVA_CCA.1.

The TOE generates, uses and manages the most sensitive data of the CSP – the CSP-SCD. Any loss of confidentiality or integrity of the CSP-SCD threaten the security of the certificates signed with this CSP-SCD and therefore the security of all signatures created with the SCD which correspond to the certificates. The cryptographic security of the CSP-SCD/CSP-SVD pair generation and the signing with the CSP-SCD can be ensured only by the TOE itself. The TOE shall be free of any covert channel which might compromise the CSP-SCD. The TOE environment shall support the TOE in CSP-SCD protection against physical and some other attacks but cannot make up for TOE security. The protection of the CSP-SCD shall be solely and in tabloid form provided by the CM as part of the trustworthy system. The complex protection of the CSP-SCD requires a systematic and complete vulnerability analysis by SAR AVA_VLA.4. The TOE protecting the CSP-SCD as most valuable asset shall be shown to be highly resistant to penetration attacks. Therefore the strength of function “high” for AVA_SOF.1 and AVA_VLA.4 is chosen.

References

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[3] Common Criteria for Information Technology Security Evaluation, Part 2: Security Functional Requirements; Version 2.1, August 1999

[4] Common Criteria for Information Technology Security Evaluation, Part 3: Security Assurance Requirements; Version 2.1, August 1999

[5] ETSI SR 002 176 - Electronic Signatures and Infrastructures (ESI); Algorithms and Parameters for Secure Electronic Signatures V1.1.1 (2003-03).

[6] European Telecommunications Standards Institute Technical Specification, *ETSI TS 101462 Policy requirements for certification authorities issuing qualified certificates,* V1.1.1, 2000

[7] CEN/ISSS WS/E-Sign; Area D1, CWA 14167-1: Security Requirements for Trustworthy Systems Managing Certificates for Electronic Signatures

[8] Common Methodology for Information Technology Security Evaluation CEM-99/045 Part 2: Evaluation Methodology, Version 1.0, August 1999

Appendix A - Acronyms

CC	Common Criteria
EAL	Evaluation Assurance Level
IT	Information Technology
PP	Protection Profile
SF	Security Function
SAR	Security assurance requirements
SFP	Security Function Policy
SFR	Security functional requirements
SOF	Strength of Function
ST	Security Target
TOE	Target of Evaluation
TSC	TSF Scope of Control
TSF	TOE Security Functions
TSFI	TSF Interface
TSP	TOE Security Policy