



Cryptomathic Signer SAM v6.0 for Utimaco Cryptoserver CP5 v5.1.0.0 Security Target

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Terms

administrator The Signer SAM term for a privileged user.

assertion A statement providing evidence that an external Identity Provider (IdP) has authenticated the signer user. In the scope of this ST, the assertion is an OAuth2 authorization token.

authorization token An OAuth2 authorization token providing strong evidence that the signer user is authenticated and has consented to the signing operation.

CA Certification Authority.

client An OAuth 2.0 client as defined in [RFC6749].

CM Cryptographic module. Resides within the HSM.

cryptographic module Cryptographic Module certified according to [CEN EN 419 221-5]. Utimaco CryptoServer Se-Series Gen2 CP5, version 5.1.0.0.

DTBS/R Data To Be Signed Representation. A hash value of the document to be signed.

HSM Hardware Security Module.

IdP Identity Provider.

LOA level of authentication.

privileged user The users who administrate the TOE and the signer users. This is the Common Criteria term for administrator users.

QSCD Qualified Electronic Signature (or Electronic Seal) Creation Device as defined in [eIDAS].

RA Registration Authority.

SAD Signature Activation Data. In the context of this security target, the SAD is an OAuth2 authorization token.

SAM Signature Activation Module.

SAP Signature Activation Protocol. Protocol use to perform the signature operation.

SCA Signature Creation Application. Application responsible for creating the document to be signed.

security officer privileged user with the “security officer” role. Security officers can administrate the TOE and other privileged users.

SIC Signer Interaction Component. In the context of this security target, the SIC is the browser/user agent of the signer user.

signer user End user who can sign documents.

signing key A cryptographic key used for signing under the sole control of a signer.

signing key certificate X.509 certificate issued by a CA to the holder of the signing key.

signing key identifier Unique identifier of a signing key.

SSA Server Signing Application [CEN EN 419 241-1].

SVD Signature Validation Data. The public part of a signing key.

TLS Transport Layer Security.

TSP Trusted Service Provider.

TW4S Trustworthy system supporting server signing [CEN EN 419 241-1].

user manager privileged user with the “user manager” role. User managers can administrate signer users and signing keys.

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1 Introduction

This Security Target describes the security of a software component being part of the Cryptomathic Signer product. The TOE of this ST is composite; the Signature Activation Module (SAM) loaded as a local application onto an Hardware Security Module (HSM) of type Utimaco CryptoServer Se-Series Gen2 CP5, version 5.1.0.0, see [UT_ST]. The document covers a specification of the security objectives and a description of the security functional requirements of the SAM. The specifications are consistent with the Common Criteria for Information Technology Security Evaluation, Version 3.1 release 5, parts 1, 2, and 3.

This section provides document management and overview information required for a security target. Section 1.1 “Security Target Reference” gives labelling and descriptive information necessary for registering the security target. Section 1.2 “TOE Reference” gives labelling and descriptive information for the TOE. Section 1.3 “TOE Overview” summarizes the TOE in a narrative form. Section 1.4 “TOE Description” contains a description of the TOE including the major security features and operating environment.

1.1 Security Target Reference

Cryptomathic Signer SAM v6.0 for Utimaco Cryptoserver CP5 v5.1.0.0 Security Target, revision 8e3009d265b4f4bcc0de66e47bb06fde30148664, by Cryptomathic Certification Team, February 23, 2024. CC version 3.1 release 5, see [CC1], [CC2], and [CC3].

1.2 TOE Reference

TOE Reference Cryptomathic Signer SAM v6.0 for Utimaco Cryptoserver CP5 v5.1.0.0.

TOE Composition Composition of the Cryptomathic Signer SAM v6.0 loaded onto the Utimaco Cryptoserver CP5 v5.1.0.0.

Assurance Level EAL4 augmented with AVA_VAN.5.

1.3 TOE Overview

1.3.1 Purpose and Usage

Cryptomathic Signer is a trustworthy system that offers remote digital signatures as a service. It ensures that the signing key(s) of a signer user are only used under the sole control of the signer user for the intended purpose.

The TOE provides a remote service from which the signer user can obtain digital signatures. The functionality and security features of the TOE are centered around protecting this operation, the signer users, and the keys used for the signature generation.

1.3.2 Security Features

The system uses a Cryptographic Module (CM) to generate signing keys and create digital signature values. The Cryptographic Module is an HSM providing the needed cryptographic functionality. The TOE is the composition of a software component, the SAM, loaded onto the HSM and it provides the necessary functionality for protecting the attributes of the signer user needed to generate a secure digital signature.

To provide a secure signature service for the signer users, the TOE is able to authenticate the signer users and associate them with signing keys. These signing keys are protected such that no one but the legitimate signer user can gain control over them. The TOE also provides the means for communication between the signer user and TOE which is protected from modification and disclosure.

Privileged users are employed for providing the functionality to administrate the signer users and the security configuration of the system. To ensure the secure administration of the TOE, the TOE is also able to authenticate the privileged users and provide access only to operations that they are authorized to perform.

Privileged users are divided by a role to indicate which tasks they can perform:

Security officer Management of TOE and privileged users.

User manager Management of signer users and signing keys.

Other roles can be configured to divide administrative responsibilities eg. for auditing the system.

1.3.3 TOE Type

The TOE is the composition of a software component, the SAM, deployed within the tamper protected part of the Cryptographic Module. Together the SAM and Cryptographic Module are a QSCD.

The TOE implements the Signature Activation Protocol (SAP). The TOE uses the Signature Activation Data (SAD) from the signer user to activate the corresponding signing key for use in a Cryptographic Module.

1.3.4 Usage and Major Security Features of the TOE

The major usage and security features of the TOE are:

- TOE initialization
 - The TOE provides a command for initialization and creation of initial privileged users.
- Operator management
 - Security officers can create other privileged users.
- System management
 - Security officers can handle system configuration.
- Signer user management
 - User managers can create signer users.
 - User managers can generate signing keys and Signature Validation Data (SVD) using a Cryptographic Module and assign the signing key identifier and SVD to a signer user.
- Signature operation
 - Signer users can supply a document to be signed.
 - The link between signer authentication, DTBS/R and signing key identifier is handled by the Signature Activation Data (SAD). This SAD is securely exchanged with the TOE using the Signature Activation Protocol (SAP). Within the TOE the following actions are performed:
 - * The TOE verifies the integrity of the SAD.
 - * The TOE verifies that the SAD binds together the signer user authentication, DTBS/R(s) and signing key identifier.
 - * The TOE verifies the level of authentication of the signer user.
 - * The TOE verifies that the signing key belongs to the signer user.
 - * If required, the TOE verifies that a certificate has been assigned to the SVD to ensure that the signing key has been certified.
 - * The TOE uses authorisation data to activate the signing key within the Cryptographic Module.
 - * The TOE uses the Cryptographic Module to create signatures.
- An audit trail is produced of all security relevant events within the TOE. Management access to audit trail is outside the scope of the TOE.

The TOE handles data assets as specified in 3.1.

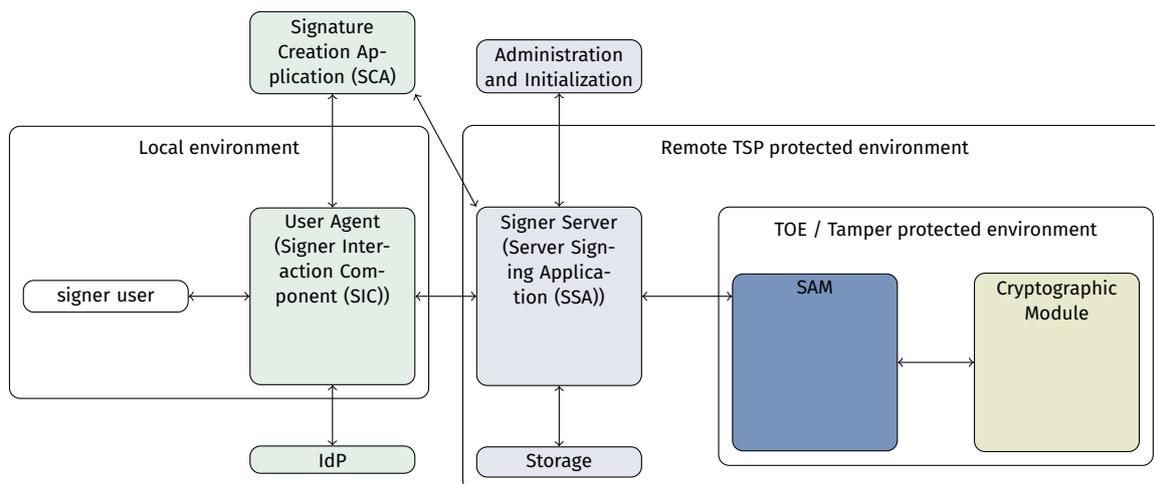


Figure 1: TOE Overview

1.3.5 TOE Life Cycle

The TOE life cycle consists of successive phase for development, production, preparation and operational use.

Development: The TOE developer develops the TOE application and its guidance documentation using any appropriate guidance documentation for components working with the TOE, including the Cryptographic Module.

Delivery: The TOE is securely delivered from the TOE developer to the TSP.

Installation and configuration: The TSP installs and configures the TOE with the appropriate configuration and initialization data. Initialization allows creating the initial security officers.

Operational phase: In operation, the TOE can be used by privileged users to create privileged users and signer users. Privileged users can maintain the TOE configuration. Privileged users may generate signing keys for a signer user. Signer users can supply the data to be signed to the TOE, and authorize a signature creation.

The TOE end of life is out of the scope of this document.

1.3.6 Environment of the TOE

The TOE consisting of the SAM and Cryptographic Module certified against [CEN EN 419 221-5] are required to obtain a QSCD. Figure 1 gives an overview of the environment in which the TOE is placed. The CM functionality is provided by the HSM including signing key generation and signature operations. The TOE is the SAM software component placed within the HSM. The remaining blue components are parts of the Cryptomathic Signer system. The green components are external components needed for the user to interact with the system.

The system relies on these services (external components in the Figure 1):

- Signer users must be identified and registered. It involves establishment of an authentication mechanism for a signer user. This is provided by the IdP as seen on the Figure 1.
- The Signature Creation Application (SCA) is responsible for creating the signed document using the signature values provided by the TOE.

Server Side Environment

To set up the system, the Signer Server (SSA) must be installed as described in the provided documentation and connected to the TOE in the HSM to perform any operations. External storage must be available for offloading data.

The TOE must be initialized before any other usage of the system is allowed. The initialization results in at least two operational security officers. Initialization and administration of the system can be done by privileged users through the initialization and administration components (administration APIs) provided with the system, see Figure 1.

Privileged users need a key pair for authentication purposes. The private key must be stored in a secure way and the privileged user authenticates himself to gain access to the private key. The private key is used for signing administrative commands and thus, the TOE holds the public key to be able to verify these signatures. Signature verification indirectly authenticates the privileged user. In this document, privileged user authentication or privileged user authentication means that the privileged users have gained access to their private key and the TOE has validated their signature on a command.

Administration of the system is done by the security officers. The Administration Client provided for administration purposes works through the Administration API.

Signer users can be created and maintained by user managers. The Administration SDK is provided to the user managers for the purpose of signer user creation and maintenance. The SSA must provide the functionality to delete a signing key if the public key certificate is expired or revoked.

Authentication Environment

The signer user authentication is conducted according to [CEN EN 419 241-1] SCAL.2 for qualified signatures. The TOE delegates the authentication to a trusted external authentication service or IdP for strong authentication of the signer users. The IdP verifies the authentication factor(s) of the signer user and issues an authorization token (the SAD) which provides strong evidence that the signer user has been authenticated. The TOE verifies the authorization token.

Since the signer user authentication is not performed directly by the TOE, it has to assume (on the environment) that authentication has taken place and rely on validation of the authorization token. In this document, signer user authentication means that the TOE has validated an authorization token issued by the IdP that authenticated the signer user.

Client Side Environment

The signer user uses the SIC in a local environment and interacts with the SSA in the remote environment to utilize the SSAs signing service. The signature operation is performed using a SAP. In the SAP, the SAD is generated by the IdP using the SIC under control of the signer user. The SAD binds together three elements: signer user authentication with the signing key and the data to be signed (DTBS/R(s)).

To ensure the signer users have sole control of their signing keys, the signature operation needs to be authorized. This is carried out by the TOE, which can handle one endpoint of SAP, verify SAD and activate the signing key within a Cryptographic Module. The Cryptographic Module and the SAM are located within a tamper protected environment. SAD verification means that the TOE checks the binding between the three SAD elements.

The signer user uses the SIC to communicate with the SSA and the IdP. The SSA forwards the communication from the SIC to the QSCD. Inside the QSCD the TOE receives the messages and optionally communicates with the SSA to obtain relevant data. When the TOE has verified the SAD, it can authorize the activation of the signing key within the CM and produce a digital signature value. The value is returned to the SSA and may be further delivered to the SCA or SIC. The TOE generates audit records and relies on the SSA to store these records.

1.3.7 Available non-TOE Hardware/Software/Firmware

The TOE needs, at least, the following hardware/software/firmware to operate:

- A Signature Creation Application (SCA) that manages the document to be signed and transfers that to the SSA, either directly or through the SIC.
- An SSA component which in this solution is the Cryptomathic Signer Server. This component forwards communication between the SIC or administration APIs and the SAM in the QSCD.
- An external storage to persist data.
- A SIC used locally by the signer to communicate with the remote systems.

- A Cryptographic Module certified against [CEN EN 419 221-5], which supports the operation of the TOE and performs cryptographic operations.¹
- Secure storage for privileged users to store their authentication data.

These components are delivered with the Cryptomathic Signer Solution to provide the major non-TOE parts and the guidance to set up the TOE environment:

- The SSA: Cryptomathic Signer Server.
- Initialization and Administration tools:
 - Cryptomathic Signer Administration Client.
 - Cryptomathic Signer Initialization Tool.
 - Cryptomathic Signer Admin SDK.
- From the Cryptomathic Signer General Documentation package:
 - Cryptomathic Signer Installation, Configuration, and Maintenance
 - Cryptomathic Signer Administrators' Manual

The components listed above must be from Cryptomathic Signer 6.0 or later to be compatible with the TOE.

1.4 TOE Description

Cryptomathic Signer enables authenticated users to create digital signatures. Thanks to secure protocols, the protection of a tamper evident environment, and the strict administration procedures enforced by the Trusted Service Providers operating the service, it is possible to provide an electronic signature service to key owners.

Cryptomathic Signer offers remote signing using an HSM containing the Cryptographic Module and which, when operated according to guidelines, provides a tamper protected environment. The TOE is the composition of software component (SAM) loaded as a local application onto the protected environment of the HSM. It is created to be responsible for all logic performed and for making the final access decisions about whether to allow the usage of a given signing key.

1.4.1 Physical Scope

The TOE is the composition of the SAM software component which is loaded onto an HSM which is tamper protected. The HSM is installed with firmware which comprises the Cryptographic Module functionality.

The SAM and relevant documentation is retrieved through a download area requiring customer credentials.

The SAM is the following component delivered as an MCT file signed by Utimaco:

Cryptomathic Signer SAM v6.0 to be loaded onto an HSM from the Utimaco CryptoServer Se-Series Gen2 CP5, v5.1.0.0.

The Utimaco HSM can be one of the following:

- CryptoServer CP5 Se12 5.1.0.0
- CryptoServer CP5 Se52 5.1.0.0
- CryptoServer CP5 Se500 5.1.0.0
- CryptoServer CP5 Se1500 5.1.0.0.

Together the SAM and HSM comprise the TOE.

The following guidance components are needed for CC compliant TOE setup:

- Guidance for implementing Server Signing Applications with Cryptomathic Signer SAM in compliance with eIDAS, revision 8e3009d265b4f4bcc0de66e47bb06fde30148664 (PDF file).
- Cryptomathic Signer SAM API 6.0, revision 15ea87c30176b9ef9b06c08cf96c6377534028e6 (Archive with HTML files).
- Cryptomathic HSM Setup and Maintenance with SCE. Utimaco CryptoServer CP5 v.1.7 (PDF file).

¹Striked since the CM is part of the composite TOE and thus cannot be defined as a non-TOE component.

1.4.2 Logical Scope

When installed and configured, the TOE provides a system for creating digital signatures. This section describes the logical entities needed in the system along with the initialization, administration and general usage of the system.

Secure initialization

When the system is installed, it is in an uninitialized state and no operations but the initialization can be performed before the system has been initialized. The initialization operation is a single call to the SAM setting the TSF data in a consistent state and prevents that partial initialization can be used to replace parts of the system. During the initialization operation, two to four initial security officers are created representing the initial privileged users of the TOE. It is important to note that all initial security officers must be present during initialization in order to ensure dual control. The initialization can only be executed once and will result in an operational system with initial privileged users and an initial configuration. In the initial configuration of the TOE the only operation allowed is to define roles and permissions. Two of the initial security officers must update the role permissions to allow further operations on the TOE.

Privileged users

Privileged users are the users who administrate the TOE and users. Roles are used to define the types of privileged users in the system. As a minimum, the roles security officer and user manager are defined. When initializing the system, two to four initial security officers are created. Security officers are responsible for the creation of other privileged users and for TOE maintenance and configuration. User managers are responsible for enrolling signer users who are the end users of the system and for the maintenance of these signer users and creation of signing keys for the signer users.

Following initialization two of the created initial privileged users must supply a role configuration defining these roles. It is possible to define supplemental roles by adding these to the configuration.

Secure TOE Maintenance

After initialization, the only operation permitted in the TOE is the definition of roles and permissions by at least two security officers. Before the TOE is useful, the initial security officers must update the roles and permissions. In particular, the security officers must define the user manager role, and must ensure that TOE maintenance operations are only allowed by security officers. The security officers can define additional roles in the system, and can grant access to certain operations for users of certain roles.

Only security officers can modify the TSF configuration. TSF configuration consists of: role and permission definition, creation and maintenance of system keys, creation and maintenance of policies.

1.4.2.1 Administrator protocol and tools

Administration of the TOE is done through the administrator protocol. All administrator commands are authenticated by signing with the private keys of privileged users. When an administration command arrives it is processed by the TOE. The TOE checks that the privileged user signatures on the incoming command are legal signatures and that the privileged users are allowed to execute the command. If all this is satisfied, the command is handled and the result is created. All administration commands are audit logged.

Privileged users are authenticated using key pairs. The private keys must be securely stored by the privileged users and the server stores the public key in a secure way.

Administrator Protocol and Tools

Administration of the TOE is done by privileged users through the administrator protocol. All privileged user commands are authenticated using key pairs.

Communication over the administrator protocol is done through a secure channel to the SSA.

Administration tools are provided, the Administration Client and the Administration SDK, both connecting to the server through the administrator protocol.

The Administration Client is a dedicated application providing a GUI for security officers for carrying out system administration and security operations. The operations that can be carried out by the security officers include:

- System administration and configuration.
- Decide which privileged user commands are enabled and which of them requires dual control.
- Decide on policies for signer user key creation and activation.
- Creation of new privileged users; Security officers and user managers.

The Administration SDK is used by the user manager for operations regarding users, e.g. enrolment and user management. The Administration SDK verifies that the SSA it connects to is trusted using a certificate generated by the SSA and it signs commands with the key belonging to the privileged user that wants to connect to the SSA. The Administration SDK can only be used by the user managers who can use it to create and manage signer users. The operations that can be carried out include:

- Create signer users.
- Create keys for signer users.
- Maintain the keys of signer users. Each key is normally associated with a certificate and it is important that the key is renewed when the certificate expires.

Administration of the TOE must follow the guidelines in the guidance documentation provided with the product.

Logging and auditing

The TOE provides logs intended for security audit. Two types of events are logged and can be audited; security events and user events.

The security events logged comprises all changes to the system that may impact the overall system security. The log contains all changes to the system that have been invoked through the Administration Client. These log events contains the security critical operations of the TOE, and therefore it is the most protected log events. Each entry is protected in integrity to prevent changes.

The user events logged are operations that are related to specific users, and thus it allows for auditing a specific user. The log contains operations done using the Administration SDK and SIC including policy assignment, key generation, state change and signing.

Signer Users; creation and signing key assignment

Signer users are created by privileged users with the user manager role. On creation, a signer user is linked to an IdP. All requests from the signer user must be authorized through the linked IdP.

A privileged user with the role user manager can request that the TOE creates a signing key for the user based on a key creation policy. Signing keys are always generated by the Cryptographic Module and access to the key is controlled by the TOE. User data and signing keys are stored confidentially and integrity protected in an external storage.

Signing key activation

The approach of the TOE is to centralize the storage and management of private signing keys at highly secure environments to keep them logically and physically protected.

To activate a signing key in the TOE, the signer user first authenticates with a trusted IdP. In the authorized session with the IdP, the signer user then consents to the signing operation. Following authentication and consent, the IdP issues an authorization token (i.e. the SAD) which contains details about the authentication as well as the consent from the user. Before the signing key is activated in the TOE, the TOE validates the IdP authorization token to ensure that the signer user is authenticated and consents to the signing operation. The TOE also validates that the signer user identified in the authorization token is the owner of the signing key.

The authorization token is signed by the IdP, and the TOE validates the signature, so no-one else than a trusted IdP can create an authorization token that can be used to activate the signing key. The authorization token binds together the signer user authentication and Data To Be Signed Representation (DTBS/R), so no-one can change the link between a signer user and DTBS/R. The IdP will only create an authorization token linked to a signer user after the signer user has

successfully been authenticated with the IdP, so only authenticated users can obtain a valid authorization token. The IdP will only create an authorization token linked to a DTBS/R after the authenticated signer user has given consent to signing the DTBS/R, so no-one else than the signer user can cause the creation of a authorization token which can be used to activate the signing key for signing of a specific DTBS/R. Together, these steps ensure that the signer users have sole control over their signing keys.

2 Conformance Claims

2.1 CC Conformance Claim

This security target is conformant to Common Criteria version 3.1 revision 5.

More precisely, this security target is:

- CC Part 1 [CC1],
- CC Part 2 extended [CC2],
- CC Part 3 conformant [CC3].

The assurance requirement of this security target is **EAL4 augmented**. Augmentation results from the selection of:

- AVA_VAN.5 Advanced methodical vulnerability analysis

2.2 PP Conformance Claim

This security target is conforming to the following protection profile:

- Trustworthy Systems Supporting Server Signing Part 2: Protection Profile for QSCD for Server Signing [CEN EN 419 241-2]

3 Security Problem Definition

3.1 Assets

The TOE has the following assets, which are to be protected in integrity and confidentiality as described below. The TOE must ensure that whenever an asset is persisted outside the TOE, the TOE has performed the necessary cryptographic operations to enforce confidentiality and detect if an asset has been modified. Access control to TOE assets outside the TOE are to be enforced by the environment.

R.Signing_Key_Id The signing key is the private key of an asymmetric key pair used to create a digital signature under the signer's sole control. The signing key can only be used by the Cryptographic Module. The TOE uses the asset R.Signing_Key_Id, which identifies a signing key in the Cryptographic Module. The binding of the R.Signing_Key_Id with R.Signer shall be protected in integrity.

Application Note 1 (PP)

The integrity and confidentiality of the signing key and the link between the R.Signing_Key_Id and the signing key is the responsibility of the Cryptographic Module. The TOE shall ensure that only the signer can use the signing key under his sole control.

Application Note 2 (ST)

In the context of this ST, R.Signing_Key_Id is non-reversibly derived from the signing key by the TOE.

R.Authorisation_Data is data used by the TOE to activate a signing key in the Cryptographic Module. The signing key is identified by R.Signing_Key_Id. It shall be protected in integrity and confidentiality.

Application Note 3 (PP)

The R.Authorisation_Data is used by the Cryptographic Module to activate a signing key. The data may be an asset of the TOE or derived by the TOE from the SAD. In both cases, the TOE must verify the SAD before the R.Authorisation_Data is used to activate the signing key in the Cryptographic Module.

If the TOE derives the R.Authorisation_Data from SAD then this data may not be held by the TOE.

Application Note 4 (ST)

In the context of this ST, R.Authorisation_Data is the signing key encrypted by the TOE.

R.SVD signature verification data is the public part, associated with the signing key, to perform digital signature verification. The R.SVD shall be protected in integrity.

The TOE uses a Cryptographic Module for signing key pair generation. As part of the signing key pair generation, Cryptographic Module provides the TOE with R.Signing_Key_Id and R.SVD. The TOE provides the R.SVD to the SSA for further handling for the key pair to be certified.

R.DTBS/R set of data which is transmitted to the TOE for digital signature creation on behalf of the signer. The DTBS/R(s) is transmitted to the TOE. The R.DTBS/R shall be protected in integrity. The transmission of the DTBS/R(s) to the TOE shall require the sending party — Signer or privileged-user² — to be authenticated.

Application Note 5 (PP)

The confidentiality of the R.DTBS/R is not required by Regulation (EU) No 910/2014[eIDAS].

R.SAD Signature Activation Data is a set of data involved in the Signature Activation Protocol, which activates the signature creation data to create a digital signature under the signer's sole control. The R.SAD must combine:

- The signer's strong authentication as specified in [CEN EN 419 241-1].

²Functionality for transmission of the DTBS/R(s) to the TOE is available to the signer user only.

- If a particular key is not implied (e.g. a default or one-time key) a unique reference to R.Signing_Key_Id.
- A given R.DTBS/R.

The R.SAD shall be protected in integrity and confidentiality.

Application Note 6 (ST)

In the context of this ST, R.SAD is the OAuth2 authorization token issued by the IdP. Confidentiality is protected by the OAuth2 protocol using TLS (see [RFC6749]).

Application Note 7 (PP)

The R.SAD may include some or all authentication factors or evidence from other systems that some or all authentication factors have been verified.

Application Note 8 (PP)

The unique reference to R.Signing_Key_Id in the R.SAD could be a certificate, a key identifier or derived information obtained from the signer's authentication.

Some solutions may use one-time signing keys, which are generated, certified and used within a limited signing session. The derived information from the signer's authentication may be used to provide session separation if a signer has multiple simultaneous signing sessions with the TOE, or to derive an R.Signing_Key_Id if the key is a one-time key. At the end of the session, the signing key is reliably deactivated.

For solutions that only handle one signing key for each signer, the reference to the R.Signing_Key_Id may also be implied and omitted from the SAD.

The ST writer shall describe what R.Signing_Key_Id is for a specific TOE.

R.Signature is the result of the signature operation and is a digital signature value. R.Signature is created on the R.DTBS/R using R.Signing_Key_Id by the Cryptographic Module under the signer's control as part of the SAP. The R.Signature shall be protected in integrity. The R.Signature can be verified outside TOE using R.SVD.

R.Audit is audit records containing logs of events requiring to be audited. The logs are produced by the TOE and stored externally. The R.Audit shall be protected in integrity.

R.Signer is a TOE subject containing the set of data that uniquely identifies the signer within the TOE. The R.Signer shall be protected in integrity and confidentiality.

Application Note 9 (PP)

It is only within the TOE the R.Signer needs to be unique. It is not the responsibility of the TOE to establish a connection between the R.Signer and the signer's identity. The signer is said to own the R.Signer object which uniquely identifies him within the TOE.

Application Note 10 (PP)

The R.Signer can include references to zero, one or several R.Signing_Key_Ids and R.SVDs.

R.Reference_Signer_Authentication_Data is the set of data used by TOE to authenticate the signer. It contains all the data (e.g. OTP device serial number, phone numbers, protocol settings etc.) and keys (e.g. device keys, verification keys etc.) used by the TOE to authenticate the signer. This may include an SVD or certificate to verify an assertion provided as a result of delegated authentication.

The R.Reference_Signer_Authentication_Data shall be protected in integrity and confidentiality.

Application Note 11 (PP)

The R.Reference_Signer_Authentication_Data is used by the TOE to authenticate the signer, and the R.Authorisation_Data is used by the TOE to activate a signing key in the Cryptographic Module.

Application Note 12 (PP)

If the R.Reference_Signer_Authentication_Data does not require encrypted data then the confidentiality requirement is

considered fulfilled. The ST writer shall describe which part of the R.Reference_Signer_Authentication_Data shall be protected in confidentiality.

Application Note 13 (ST)

In this ST, the R.Reference_Signer_Authentication_Data is the public key used to validate an authorization token (i.e. assertion) signed by the IdP as well as the “subject” string used by the IdP to identify the signer user. None of these parts require confidentiality.

Application Note 14 (ST)

When used as a security attribute of a signer user, R.Reference_Signer_Authentication_Data is the link from the signer user to the IdP. The actual key and “subject” string are security attributes of the IdP.

R.TSF_DATA is the set of TOE configuration data used to operate the TOE. It shall be protected in integrity.

Application Note 15 (PP)

The TOE configuration data could include cryptographic algorithm, key length, flows for SAP etc.

R.Privileged_User is a TOE subject containing the set of data that uniquely identifies a privileged user within the TOE. It shall be protected in integrity.

R.Reference_Privileged_User_Authentication_Data is the set of data used by the TOE to authenticate the privileged user. It shall be protected in integrity and confidentiality.

R.Random is random secrets, e.g. keys, used by the TOE to operate and communicate with external parties. It shall be protected in integrity and confidentiality.

3.2 Subjects

This following list of subjects interact with the TOE.

- Signer, which is the natural or legal person who uses the TOE through the SAP where he provides the SAD and can sign DTBS/R(s) using his signing key in the Cryptographic Module.
- Privileged user, which performs the administrative functions of the TOE and is able to provide a DTBS/R(s) to the TOE as part of the signature operation³.

Application Note 16 (PP)

The creation of signers, management of reference signer authentication data and signing key generation is expected to be carried out together with a Registration Authority (RA) providing a registration service using the SSA, as specified in e.g. [ETSI EN 319 411-1].

3.3 Threats

The following threats are defined for the TOE. An attacker described in each of the threats is a subject that is not authorised for the relevant operation, but may present himself as an unknown user or as one of the other defined subjects.

3.3.1 Enrolment

The threats during enrolment are:

T.ENROLMENT_SIGNER_IMPERSONATION

An attacker impersonates signer during enrolment. As examples, it could be:

³Functionality for transmission of the DTBS/R(s) to the TOE is available to the signer user only.

- by transferring wrong R.Signer to TOE from RA.
- by transferring wrong R.Reference_Signer_Authentication_Data to TOE from RA.

The assets R.Signer and R.Reference_Signer_Authentication_Data are threatened.

Such impersonation may allow a potential incorrect signer authentication leading to unauthorised signature operation on behalf of signer.

T.ENROLMENT_SIGNER_AUTHENTICATION_DATA_DISCLOSED

An attacker is able to obtain whole or part of R.Reference_Signer_Authentication_Data during enrolment. This can be during generation, storage or transfer to the TOE or transfer between signer and TOE. As examples it could be:

- by reading the data.
- by changing the data, e.g. to a known value.

The asset R.Reference_Signer_Authentication_Data is threatened.

Such data disclosure may allow a potential incorrect signer authentication leading to unauthorised signature operation on behalf of signer.

The threats on enrolment are threats on the environment in case external authentication is supported by the TOE.

T.SVD_FORGERY

An attacker modifies the R.SVD during transmission to the RA or CA. This results in loss of R.SVD integrity in the binding of R.SVD to signing key and to R.Signer.

The asset R.SVD is threatened.

If the CA relies on the generation of the key pair controlled by the TOE as specified in [ETSI EN 319 411-1] clause 6.3.3 d) then an attacker can forge signatures masquerading as the signer.

Application Note 17 (PP)

There should be a secure transport of R.SVD from TOE to RA or CA. The SAM is expected to produce a CSR.

If the registration services of the TSP issuing the certificate requires a “proof of possession or control of the private key” associated with the SVD, as specified in [ETSI EN 319 411-1] clause 6.3.1 a), this threat can be countered without any specific measures within the TOE.

3.3.2 Signer Management

T.ADMIN_IMPERSONATION

Attacker impersonates a privileged user and updates R.Reference_Signer_Authentication_Data, R.Signing_Key_Id or R.SVD.

The assets R.Reference_Signer_Authentication_Data, R.SVD and R.Signing_Key_Id are threatened.

Such data modification may allow a potential incorrect signer authentication leading to unauthorised signature operation on behalf of signer.

T.MAINTENANCE_AUTHENTICATION_DISCLOSE

Attacker discloses or changes (e.g. to a known value) R.Reference_Signer_Authentication_Data during update and is able to create a signature.

The assets R.Reference_Signer_Authentication_Data and R.Signing_Key_Id are threatened.

Such data disclosure may allow a potential incorrect signer authentication leading to unauthorised signature operation on behalf of signer.

3.3.3 Usage

This section describes threats for signature operation including authentication.

T.AUTHENTICATION_SIGNER_IMPERSONATION

An attacker impersonates signer using forged R.Reference_Signer_Authentication_Data and transmits it to the TOE during SAP and uses it to sign the same or modified DTBS/R(s).

The assets R.Reference_Signer_Authentication_Data, R.SAD and R.Signing_Key_Id are threatened.

T.SIGNER_AUTHENTICATION_DATA_MODIFIED

An attacker is able to modify R.Reference_Signer_Authentication_Data inside the TOE or during maintenance.

The asset R.Reference_Signer_Authentication_Data is threatened.

Such data modification may allow a potential incorrect signer authentication leading to unauthorised signature operation on behalf of signer.

T.SAP_BYPASS

An attacker bypasses one or more steps in the SAP and is able to create a signature without the signer having authorised the operation.

The asset R.SAD is threatened.

T.SAP_REPLAY

An attacker replays one or more steps of SAP and is able to create a signature without the signer having authorised the operation.

The asset R.SAD is threatened.

T.SAD_FORGERY

An attacker forges or manipulates R.SAD during transfer in SAP and is able to create a signature without the signer having authorised the operation.

The asset R.SAD is threatened.

T.SIGNATURE_REQUEST_DISCLOSURE

An attacker obtains knowledge of R.DTBS/R or R.SAD during transfer to TOE.

The assets R.DTBS/R and R.SAD are threatened.

T.DTBSR_FORGERY

An attacker modifies R.DTBS/R during transfer to TOE and is able to create a signature on this modified R.DTBS/R without the signer having authorised the operation on this DTBS/R.

The asset R.DTBS/R is threatened.

T.SIGNATURE_FORGERY

An attacker modifies R.Signature during or after creation or during transfer outside the TOE.

The asset R.Signature is threatened.

Application Note 18 (PP)

The modification of a signature can be detected by the SSA or any relying party by validation of the signature.

3.3.4 System

T.PRIVILEGED_USER_INSERTION

An attacker is able to create R.Privileged_User including R.Reference_Privileged_User_Authentication_Data and is able to log on to the TOE as a privileged user.

The assets R.Privileged_User and R.Reference_Privileged_User_Authentication_Data are threatened.

T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MODIFICATION

An attacker modifies R.Reference_Privileged_User_Authentication_Data and is able to log on to the TOE as the privileged user.

The asset R.Reference_Privileged_User_Authentication_Data is threatened.

T.AUTHORISATION_DATA_UPDATE

Attacker impersonates privileged user and updates R.Authorisation_Data and may be able to activate a signing key.

The assets R.Authorisation_Data and R.Signing_Key_Id are threatened.

Application Note 19 (PP)

In some applications, it may be sufficient for an attacker with access to R.Authorisation_Data and R.Signing_Key_Id to activate the signing key within the Cryptographic Module. Since the R.Signing_Key_Id is only to be protected in integrity and not in confidentiality, access to R.Authorisation_Data should only be allowed for authorized operators.

T.AUTHORISATION_DATA_DISCLOSE

Attacker discloses R.Authorisation_Data during update and is able to activate a signing key.

The assets R.Authorisation_Data and R.Signing_Key_Id are threatened.

T.CONTEXT_ALTERATION

An attacker modifies system configuration R.TSF_DATA to perform an unauthorized operation.

The assets R.Signing_Key_Id, R.SVD, R.SAD, R.Reference_Signer_Authentication_Data and R.TSF_DATA are threatened.

T.AUDIT_ALTERATION

An attacker modifies system audit and is able hide trace of TOE modification or usage.

The assets R.SVD, R.SAD, R.Signer, R.Reference_Signer_Authentication_Data, R.DTBS/R, R.Signature, R.AUDIT and R.TSF_DATA are threatened.

T.RANDOM

An attacker is able to guess system secrets R.RANDOM and able to create or modify TOE objects or participate in communication with external systems.

3.4 Relation between Threads and Assets

This following table provides an overview of the relationships between asset, associated security properties and threats. For details consult the individual threats in the previous sections.

Asset	Security Dimensions	Threats
R.Signing_Key_Id	Integrity	T.ADMIN_IMPERSONATION T.MAINTENANCE_AUTHENTICATION_DISCLOSE T.AUTHENTICATION_SIGNER_IMPERSONATION T.CONTEXT_ALTERATION
R.Authorisation_Data	Integrity Confidentiality	T.AUTHORISATION_DATA_UPDATE T.AUTHORISATION_DATA_UPDATE T.AUTHORISATION_DATA_DISCLOSE
R.SVD	Integrity	T.SVD_FORGERY T.ADMIN_IMPERSONATION T.CONTEXT_ALTERATION T.AUDIT_ALTERATION
R.DTBS/R	Integrity	T.SIGNATURE_REQUEST_DISCLOSE

Asset	Security Dimensions	Threats
	Confidentiality	T.DTBSR_FORGERY T.SIGNATURE_REQUEST_DISCLOSE T.DTBSR_FORGERY
	Origin authentication	T.DTBSR_FORGERY
R.SAD	Integrity	T.AUTHENTICATION_SIGNER_IMPERSONATION T.CONTEXT_ALTERATION T.AUDIT_ALTERATION T.SAP_BYPASS T.SAP_REPLAY T.SAD_FORGERY
	Confidentiality	T.AUTHENTICATION_SIGNER_IMPERSONATION T.DTBSR_FORGERY T.CONTEXT_ALTERATION
R.Signature	Integrity	T.SIGNATURE_FORGERY
R.Audit	Integrity	T.AUDIT_ALTERATION
R.Signer	Integrity	T.ENROLMENT_SIGNER_IMPERSONATION
R.Reference_Signer_Authentication_Data	Integrity	T.ENROLMENT_SIGNER_IMPERSONATION
	Confidentiality	T.ENROLMENT_SIGNER_AUTHENTICATION_DATA_DISCLOSED T.SIGNER_AUTEHNTICATION_DATA_MODIFIED T.ADMIN_IMPERSONATION T.MAINTENANCE_AUTHENTICATION_DISCLOSE T.AUTHENTICATION_SIGNER_IMPERSONATION T.CONTEXT_ALTERATION T.AUDIT_ALTERATION T.ENROLMENT_SIGNER_IMPERSONATION T.ENROLMENT_SIGNER_AUTHENTICATION_DATA_DISCLOSED T.SIGNER_AUTEHNTICATION_DATA_MODIFIED T.ADMIN_IMPERSONATION T.MAINTENANCE_AUTHENTICATION_DISCLOSE T.AUTHENTICATION_SIGNER_IMPERSONATION T.CONTEXT_ALTERATION
R.Privileged_User	Integrity	T.PRIVILEGED_USER_INSERTION T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MODIFICATION
R.Reference_Privileged_User_Authentication_Data	Integrity	T.PRIVILEGED_USER_INSERTION
	Confidentiality	T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MODIFICATION T.PRIVILEGED_USER_INSERTION T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MODIFICATION
R.RANDOM	Integrity Confidentiality	T.RANDOM T.RANDOM
R.TSF_DATA	Integrity	T.CONTEXT_ALTERATION T.AUDIT_ALTERATION

Table 1: Relation between Threads and Assets

3.5 Organizational Security Policies

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

OSP.RANDOM

The TOE is required to generate random numbers that meet a specified quality metric. These random numbers shall be suitable for use as keys, authentication/authorization data, or seed data for another random number generator that is used for these purposes.

OSP.CRYPTO

The TOE shall only use algorithm, algorithm parameters and key lengths endorsed by recognized authorities as appropriate by TSPs. This includes generation of random numbers, signing key pairs and signatures as well as the integrity and confidentiality of TOE assets.

Application Note 20 (PP)

For cryptographic algorithms within the European Union this is as indicated in [eIDAS] and an exemplary list of algorithms and parameters is given in [ETSI TS 119 312] or [SOGIS].

The following additional organizational security policy is added in this ST:

OSP.LOA

The TOE shall be able to restrict the signing operation to signer users that have been authenticated by an IdP at a specified level of assurance.

OSP.SIGNING_KEY_CERTIFIED

The TOE shall be able to restrict the signing operation to R.Signing_Key_Id where there exists a certificate issued for that signing key, which has not expired.

3.6 Assumptions

A.PRIVILEGED_USER

It is assumed that all personnel administering the TOE are trusted, competent and possesses the resources and skills required for his tasks and is trained to conduct the activities he is responsible for.

A.SIGNER_ENROLMENT

The signer shall be enrolled and certificates managed in conformance with the regulations given in [eIDAS]. Guidance for how to implement an enrolment and certificate management system in conformance with [eIDAS] are given in e.g. [ETSI EN 319 411-1] or for qualified certificate in e.g. [ETSI EN 319 411-2].

A.SIGNER_AUTHENTICATION_DATA_PROTECTION

It is assumed that the signer will not disclose his authentication factors.

A.SIGNER_DEVICE

It is assumed that the device and SIC used by signer to interact with the SSA and the TOE is under the signer's control for the signature operation, i.e. protected against malicious code.

A.CA

It is assumed that the qualified TSP that issues qualified certificates is compliant with the relevant requirements for qualified TSP's as defined in [eIDAS].

A.ACCESS_PROTECTED

It is assumed that the TOE operates in a protected environment that limits physical access to the TOE to authorized privileged users. The TOE software and hardware environment (including client applications) is installed and maintained by privileged users in a secure state that mitigates against the specific risks applicable to the deployment environment.

It is assumed that any audit generated by the TOE are only handled by authorized personal in a physical secured environment. The personal that carries these activities should act under established practices.

It is assumed that where copies of data protected by the TOE are managed outside of the TOE, client applications and other entities must provide appropriate protection for that data to a level required by the application context and the risks in the deployment environment.

Application Note 21 (ST)

The TOE stores all assets outside the TOE, protected in integrity and, when needed, confidentiality. Each operation of the TOE accepts assets relevant to the operation and validates the integrity of those assets.

A.AUTH_DATA

It is assumed that the SAP is designed in such a way that the activation of the signing key is under sole control of the signer with a high level of confidence. If SAD is received by the TOE, it must be assumed that the SAD was submitted under the full control of the signer by means that are in possession of the signer.

A.TSP_AUDITED

It is assumed that the TSP deploying the SSA and TOE is a qualified TSP according to article 3 (20) of Regulation (EU) No 910/2014[eIDAS] and audited to be compliant with the requirements for TSP's given by [eIDAS].

A.SEC_REQ

It is assumed that the TSP establishes an operating environment according to the security requirements for SCAL.2 defined in [CEN EN 419 241-1].

3.6.1 Additional Assumptions

The following assumptions are added in this ST.

A.TOE_CONFIGURATION

It is assumed that the security officers configure this TOE in accordance with requirements in [CEN EN 419 241-1]. In particular:

- The security officers must ensure that the following roles are always defined: security officer and user manager.
- The security officers must define role permissions so that only security officers are authorized to perform the following operations: privileged user creation and TOE maintenance.
- The security officers must ensure that maintenance of privileged users require dual control.
- The security officers must define role permissions so that only user managers are authorized to perform the following operations: signer creation, signer maintenance, and signer key pair generation.

Application Note 22 (ST)

This security target expands on the definition of privileged user from the protection profile by splitting privileged users into at least two roles: security officer and user manager. The extended definition imposes additional security on the system by requiring separation of duty on privileged user. The TOE configuration allows the definition of additional roles besides security officer and user manager. To ensure secure configuration of these roles, the assumption A.TOE_CONFIGURATION is necessary.

A.PRIVILEGED_USER_AUTHENTICATION_DATA_PROTECTION

It is assumed that the privileged user protects his authentication data.

Application Note 23 (ST)

privileged users authenticate using a private key. It is necessary to protect these private keys in order to prevent unauthorized access to the TOE.

4 Security Objectives

This section identifies and defines the security objectives for the TOE and its operational environment.

These security objectives reflect the stated intent, counter the identified threats, and take into account the assumptions.

4.1 Security Objectives for the TOE

The following security objectives describe security functions to be provided by the TOE.

4.1.1 Enrolment

OT.SIGNER_PROTECTION

The TOE shall ensure that data associated to R.Signer are protected in integrity and if needed in confidentiality.

OT.REFERENCE_SIGNER_AUTHENTICATION_DATA

The TOE shall be able to securely handle signature authentication data, R.Reference_Signer_Authentication_Data, as part of R.Signer.

OT.SIGNER_KEY_PAIR_GENERATION

The TOE shall be able to securely use the Cryptographic Module to generate signer signing key pairs and assign R.Signing_Key_Id and R.SVD to R.Signer.

OT.SVD

The TOE shall ensure that the R.SVD linked to R.Signer is not modified before it is certified.

4.1.2 User Management

OT.PRIVILEGED_USER_MANAGEMENT

The TOE shall ensure that any modification to R.Privileged_User and R.Reference_Privileged_User_Authentication_Data are performed under control of a privileged user.

OT.PRIVILEGED_USER_AUTHENTICATION

The TOE shall ensure that an administrator with a privileged user is authenticated before any action on the TOE is performed.

Application Note 24 (PP)

The exception to this objective is when the initial (set of) privileged users are created as part of system initialisation.

OT.PRIVILEGED_USER_PROTECTION

The TOE shall ensure that data associated to R.Privileged_User are protected in integrity and if needed in confidentiality.

OT.SIGNER_MANAGEMENT

The TOE shall ensure that any modification to R.Signer, R.Reference_Signer_Authentication_Data, R.Signing_Key_Id and R.SVD are performed under control of the Signer or privileged user.

4.1.3 Usage

OT.SAD_VERIFICATION

The TOE shall verify the SAD. That is, it shall check there is a link between the SAD elements and ensure the signer is strongly authenticated.

Application Note 25 (PP)

Requirements for authentication are described in [CEN EN 419 241-1] SRA_SAP1.1.

OT.SAP

The TOE shall implement the server-side endpoint of a Signature Activation Protocol (SAP), which provides the following:

- Signer authentication.
- Integrity of the transmitted SAD.
- Confidentiality of at least the elements of the SAD which contains sensitive information.
- Protection against replay, bypass of one or more steps and forgery.

Application Note 26 (PP)

The signer authentication is assumed to be conducted according to [CEN EN 419 241-1] SCAL.2 for qualified signatures. This means signer authentication can be carried out in one of the following ways:

- Directly by the SAM. In this case the SAM verifies the signer's authentication factor(s).
- Indirectly by the SAM. In the case, an external authentication service as part of the TW4S or a delegated party that verifies the signer's authentication factor(s) and issues an assertion that the signer has been authenticated. The SAM shall verify the assertion.
- A combination of the two directly or indirectly schemes.

OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION

The TOE shall ensure signature authentication data is protected against attacks when transmitted to the TOE which would compromise its use for authentication.

OT.DTBSR_INTEGRITY

The TOE shall ensure that the R.DTBS/R is protected in integrity when transmitted to the TOE.

OT.SIGNATURE_INTEGRITY

The TOE shall ensure that a signature can't be modified inside the TOE.

OT.CRYPTO

The TOE shall only use algorithm, algorithm parameters and key lengths endorsed by recognized authorities. This includes generation of random numbers, signing key pairs and signatures as well as the integrity and confidentiality of TOE assets.

OT.SIGNING_KEY_CERTIFICATE_REFERENCE

The TOE shall ensure, based on a policy, that

- There exists a unique identifier for the signing key certificate.
- The certificate has not expired.

Application Note 27 (ST)

The unique identifier is to be based on the X.509 signing key certificate—A SHA-256 thumbprint of the certificate is a suitable choice— such that it can be verified that the certificate existed at the time of signing. The expiration date should reflect the expiration date of the certificate.

4.1.4 System**OT.RANDOM**

Random numbers generated used by the TOE for use as keys, in protocols or seed data for another random number generator that is used for these purposes shall meet a defined quality metric in order to ensure that random numbers are not predictable and have sufficient entropy.

OT.SYSTEM_PROTECTION

The TOE shall ensure that modification of R.TSF_DATA is authorized by privileged user and that unauthorized modification can be detected.

OT.AUDIT_PROTECTION

The TOE shall ensure that modifications to R.AUDIT can be detected.

4.2 Security Objectives for the Operational Environment

OE.SVD_AUTHENTICITY

The operational environment shall ensure the SVD integrity during transmit outside the TOE to the CA.

OE.CA_REQUEST_CERTIFICATE

The operational environment shall ensure that the qualified TSP that issues qualified certificates is compliant with the relevant requirements for qualified TSP's as defined in [eIDAS].

The operational environment shall use a process for requesting a certificate, including SVD and signer information, and CA signature in a way, which demonstrates the signer is in control of the signing key associated with the SVD presented for certification. The integrity of the request shall be protected.

OE.CERTIFICATE_VERIFICATION

The operational environment shall verify that the certificate for the R.SVD contains the R.SVD.

OE.SIGNER_AUTHENTICATION_DATA

The signer's management of authentication factors data outside the TOE shall be carried out in a secure manner.

OE.DELEGATED_AUTHENTICATION

If the TOE has support for and is configured to use delegated authentication then the TSP deploying the SSA and TOE shall ensure that all requirements in [CEN EN 419 241-1] SRA_SAP.1.1 are met.

In addition, the TSP shall ensure that:

- The delegated party fulfils all the relevant requirements of this standard and the requirements for registration according to the Regulation (EU) No 910/2014 [eIDAS], or
- The authentication process delegated to the external party uses an electronic identification means issued under a notified scheme that is included in the list published by the Commission pursuant to Article 9 of the Regulation (EU) No 910/2014[eIDAS].

If the signer is only authenticated using a delegated party, the TSP shall ensure that the secret key material used to authenticate the delegated party to the TOE shall reside in a certified cryptographic module consistent with the requirement as defined in [CEN EN 419 241-1] SRG_KM.1.1.

The audit of the qualified TSP according to [CEN EN 419 241-1] shall provide evidence that any delegated party meets requirements from [CEN EN 419 241-1] SRA_SAP.1.1 and optionally SRG_KM.1.1 in case the signer is only authenticated using a delegated party.

OE.DEVICE

The device, computer/tablet/smart phone containing the SIC and which is used by the signer to interact with the TOE shall be protected against malicious code. It shall participate using SIC as local part of the SAP and may calculate SAD as described in [CEN EN 419 241-1]. It may be used to view the document to be signed.

OE.ENV

The TSP deploying the SSA and TOE shall be a qualified TSP according to article 3 (20) of Regulation (EU) No 910/2014 [eIDAS] and audited to be compliant with the requirements for TSP's given by [eIDAS]. The audit of the qualified TSP shall cover the security objectives for the operational environment specified in this clause.

The TOE shall operate in a protected environment that limits physical access to the TOE to authorized privileged users. The TOE software and hardware environment (including client applications) shall be installed and maintained by administrators in a secure state that mitigates against the specific risks applicable to the deployment environment, including (where applicable):

- Protection against loss or theft of the TOE or any of its externally stored assets.
- Inspections to deter and detect tampering (including attempts to access side-channels, or to access connections between physically separate parts of the TOE, or parts of the hardware appliance).
- Protection against the possibility of attacks based on emanations from the TOE (e.g. electromagnetic emanations) according to risks assessed for the operating environment.
- Protection against unauthorised software and configuration changes on the TOE and the hardware appliance.
- Protection to an equivalent level of all instances of the TOE holding the same assets (e.g. where a key is present as a backup in more than one instance of the TOE).

OE.CRYPTOMODULE_CERTIFIED

If the TOE is implemented as a local application within the same physical boundary as the Cryptographic Module defined in [CEN EN 419 221-5] then the TOE relies on the Cryptographic Module for providing a tamper protected environment and for cryptographic functionality and random number generation.

If the TOE is implemented within a separate physical boundary then the TOE relies on the Cryptographic Module for cryptographic functionality and random number generation. The physical boundary shall physically protect the TOE conformant to FPT_PHP.1 and FPT_PHP.3 in [CEN EN 419 221-5].

Application Note 28 (PP)

In the case that the ST is conformant to this PP and to [CEN EN 419 221-5] as written in the PP Claim section, the certification of the ST covers this requirement for the Operational Environment.

Application Note 29 (ST)

The TOE is the composition of SAM and CM located within the physical boundaries of the CM. The ST is conformant to the PP [CEN EN 419 241-2], and the CM is conformant to [CEN EN 419 221-5]. In consequence, the certification of the ST covers this requirement for the Operational Environment.

OE.TW4S_CONFORMANT

The TOE shall be operated by a qualified TSP in an operating environment conformant with [CEN EN 419 241-1].

4.2.1 Additional Security Objectives for the Operational Environment

This ST adds the following security objectives for the operational environment.

OE.PRIVILEGED_USER_AUTHENTICATION_DATA

The management of authentication data of privileged users outside the TOE shall be carried out in a secure manner.

Application Note 30 (ST)

Only the privileged users can protect their authentication data as assumed by A.PRIVILEGED_USER_AUTHENTICATION_DATA_PROTECTION. This application note ensures that privileged users are given proper guidance.

OE.OAUTH2

The IdP must implement the OAuth 2.0 Authorization Framework [RFC6749]. The IdP must use Transport Layer Security (TLS) for all communication related to authentication and authorization. The IdP and OAuth 2.0 clients must live up to the OAuth 2.0 best practices as described in [RFC8725] and the “none” algorithm must not be used. Furthermore, the IdP shall issue authorization tokens which are:

- JWT as defined in [RFC9068]. The JWT should contain the “acr” field when required by OSP.LOA. The validity duration of the JWT, as expressed by the “exp” field, must be determined by a risk assessment in order to prevent replay.
- Rich authorization details as defined in [RFC9396].
- With authorization detail of type “credential” as defined in [CSC] (Signer SAM will ignore any scope claim).

Application Note 31 (ST)

OE.DELEGATED_AUTHENTICATION allows the TOE to delegate authentication. Cryptomathic Signer SAM relies on delegated authentication. OE.OAUTH2 lists objectives for the environment that are specific to the protocol used for delegated authentication.

OE.AUTH_FAILURES

If the number of unsuccessful authentication attempts from the same user reaches the maximum number of allowed attempts, the IdP shall prevent further user authentication attempts within a certain time frame or until an administrative role unblocks the user.

Application Note 32 (ST)

Since authentication is delegated, the TOE cannot block users after failed authentication attempts. This application note ensures that the delegated party handles failed authentication attempts in accordance with [CEN EN 419 241-1].

OE.REPLAY_DETECTION

The replay of assertions must be detected by the SSA and rejected within the validity period of an assertion.

Application Note 33 (ST)

Cryptomathic Signer SAM detects replay by validating timestamps. This objective ensures even better replay prevention.

OE.SIGNER_KEY_PAIR_DELETION

The SSA shall be able to delete signing keys.

Application Note 34 (ST)

The TOE relies on the SSA to store signing keys in external storage. Even if signing keys are deleted from the TOE, they may still remain in the external storage. To ensure that signing keys are deleted, the SSA must guarantee that signing keys are removed from storage.

OE.MINIMAL_ROLE_DEFINITION

The security officers must ensure that the following roles are always defined: security officer and user manager. The security officers must define role permissions so that only security officers are authorized to perform the following operations: creation and maintenance of privileged users, and TOE maintenance. Furthermore, maintenance of privileged users must require dual control. The security officers must define role permissions so that only user managers are authorized to perform the following operations: signer creation, signer maintenance, and signer key pair generation.

Application Note 35 (ST)

This security target has augmented the protection profile with the assumption A.TOE_CONFIGURATION. The objective OE.MINIMAL_ROLE_DEFINITION covers that assumption.

4.2.2 Security Problem Definition and Security Objectives

The following tables map security objectives with the security problem definition.

	OT.SIGNER_PROTECTION	OT.REFERENCE_SIGNER_AUTHENTICATION_DATA	OT.SIGNER_KEY_PAIR_GENERATION	OT.SVD	OT.PRIVILEGED_USER_MANAGEMENT	OT.PRIVILEGED_USER_AUTHENTICATION	OT.PRIVILEGED_USER_PROTECTION	OT.SIGNER_MANAGEMENT	OT.SAD_VERIFICATION	OT.SAP	OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION	OT.DTBSR_INTEGRITY	OT.SIGNATURE_INTEGRITY	OT.CRYPTO	OT.RANDOM	OT.SYSTEM_PROTECTION	OT.AUDIT_PROTECTION	[OT.SIGNING_KEY_CERTIFICATE_REFERENCE]	OE.SVD_AUTHENTICITY	OE.CA_REQUEST_CERTIFICATE	OE.CERTIFICATE_VERIFICATION	[OE.SIGNER_KEY_PAIR_DELETION]	OE.SIGNER_AUTHENTICATION_DATA	[OE.PRIVILEGED_USER_AUTHENTICATION_DATA]	OE.DELEGATED_AUTHENTICATION	OE.DEVICE	OE.ENV	OE.CRYPTOMODULE_CERTIFIED	OE.TWAS_CONFORMANT	[OE.OAUTH2]	[OE.AUTH_FAILURES]	[OE.REPLAY_DETECTION]	[OE.MINIMAL_ROLE_DEFINITION]				
T.ENROLMENT_SIGNER_IMPERSONATION	X	X	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	.	.	.	X	.	.	.	.	.
T.ENROLMENT_SIGNER_AUTHENTICATION_DATA_DISCLOSED	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	X	.	.	.	.	.	.	.	.
T.SVD_FORGERY	.	.	X	X	.	.	.	.	.	.	.	.	X	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.ADMIN_IMPERSONATION	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	.	.	.	.	.	.	.	.	.	.
T.MAINTENANCE_AUTHENTICATION_DISCLOSE	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.AUTHENTICATION_SIGNER_IMPERSONATION	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	.	[X]	[X]	.	.	.	.	.
T.SIGNER_AUTHENTICATION_DATA_MODIFIED	.	X	.	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.SAP_BYPASS	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	[X]	.	.	.	.	.	.
T.SAP_REPLAY	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	[X]	.	[X]	.	.	.	.	.
T.SAD_FORGERY	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	X	.	[X]	.	.	.	.	.	.	.	.
T.SIGNATURE_REQUEST_DISCLOSURE	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	.	.	.	.
T.DTBSR_FORGERY	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.
T.SIGNATURE_FORGERY	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.PRIVILEGED_USER_INSERTION	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MOD.	.	.	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	.	.	.	.	.	.	.	.	.	.	.
T.AUTHORISATION_DATA_UPDATE	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.AUTHORISATION_DATA_DISCLOSE	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.CONTEXT_ALTERATION	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.AUDIT_ALTERATION	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
T.RANDOM	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ΘSP:TSP_AUDITED ⁴	*	.	.	
OSP.RANDOM	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
OSP.CRYPTO	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
[OSP.LOA]	[X]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	[X]	.	.	
[OSP.SIGNING_KEY_CERTIFIED]	[X]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
A.PRIVILEGED_USER
A.SIGNER_ENROLMENT	X
A.SIGNER_AUTHENTICATION_DATA_PROTECTION	X
[A.PRIVILEGED_USER_AUTHENTICATION_DATA_PROTECTION]	[X]
A.SIGNATURE_REQUEST_DISCLOSURE ⁵	X	.	.	.	.	.	.	.	.	.	.
A.SIGNER_DEVICE	X	.	.	.	.	.	.	.	.	.	.
A.CA
A.ACCESS_PROTECTED	X
A.AUTH_DATA	X
A.TSP_AUDITED	X
A.SEC_REQ	X
[A.TOE_CONFIGURATION]	[X]	

Table 2: Coverage of threats, organizational security policies, and assumptions by objectives for the TOE and the environment.

⁴This organizational security policy is listed in the mapping table in [CEN EN 419 221-5], however, it is never defined. We strike the assumption in this table.

⁵This assumption is listed in the mapping table in [CEN EN 419 221-5], however, it is never defined. We strike the assumption in this table.

4.2.3 Rationale for the Security Objectives

This section provides a rationale objectives covers each threat, organizational security policy and assumption.

Threats and objectives

T.ENROLMENT_SIGNER_IMPERSONATION is covered by

- OT.SIGNER_PROTECTION** requiring R.Signer to be protected in integrity and for sensitive parts in confidentiality.
- OT.SIGNER_MANAGEMENT** requiring the signer to be securely created.
- OE.SIGNER_KEY_PAIR_DELETION** requiring the SSA to be able to delete signing keys.
- OT.REFERENCE_SIGNER_AUTHENTICATION_DATA** requiring the TOE to be able to assign signer authentication data to the signer.
- OE.TW4S_CONFORMANT** as that requires signer enrolment to be handled in accordance with [Assurance] for level at least substantial.

T.ENROLMENT_SIGNER_AUTHENTICATION_DATA_DISCLOSED is covered by

- OT.REFERENCE_SIGNER_AUTHENTICATION_DATA** requiring that authentication data be securely handled.
- OT.SIGNER_PROTECTION** requiring that the attributes, including signer authentication data, be protected in integrity and if needed in confidentiality.
- OE.SIGNER_AUTHENTICATION_DATA** requiring the signer to keep his authentication data secret.
- OE.DEVICE** requiring the device used by the signer not to disclose authentication data.

T.SVD_FORGERY is covered by

- OT.SIGNER_KEY_PAIR_GENERATION** requiring a Cryptographic Module to generate signer key pair.
- OT.SVD** requiring the SVD to be protected while inside the TOE.
- OT.CRYPTO** requiring the usage of endorsed algorithms.
- OE.SVD_AUTHENTICITY** requiring the environment to protect the SVD during transmit from the TOE to the CA.
- OE.CA_REQUEST_CERTIFICATE** requiring the certification request to be protected in integrity.

T.ADMIN_IMPERSONATION is covered by

- OT.SIGNER_MANAGEMENT** and **OT.PRIVILEGED_USER_AUTHENTICATION** requiring any changes to the signer representation and attributes are carried out in an authorized manner.
- OE.SIGNER_KEY_PAIR_DELETION** requiring the SSA to be able to delete signing keys.

T.MAINTENANCE_AUTHENTICATION_DISCLOSE is covered by

- OT.REFERENCE_SIGNER_AUTHENTICATION_DATA** requiring that authentication data be securely handled.

T.AUTHENTICATION_SIGNER_IMPERSONATION is covered by

- OT.SAD_VERIFICATION** requiring that the TOE checks the SAD received in the SAP.
- OE.DELEGATED_AUTHENTICATION** and **OE.OAUTH2** requiring that the IdP handles authentication according to specified requirements.
- OE.AUTH_FAILURES** requiring the IdP to detect and respond to authentication failures.

T.SIGNER_AUTHENTICATION_DATA_MODIFIED is covered by

- OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION** requiring the SAD transported protected in the SAP.
- OT.REFERENCE_SIGNER_AUTHENTICATION_DATA** requiring that authentication data be securely handled.
- OT.SAP** requiring the integrity of the SAD is protected during transmit in the SAP.

T.SAP_BYPASS is covered by

OT.SAP requiring that all steps, including SAD verification, of the SAP must completed.

OE.AUTH2 requiring the IdP to follow the OAuth2 authentication protocol.

OE.DEVICE requiring the SIC to participate the in SAP.

T.SAP_REPLAY is covered by

OT.SAP requiring that the Signature Activation Protocol must be able to resist whole or part of it being replayed.

OE.OAUTH2 requiring that the authorization token contains expiration time as required by [RFC9068].

OE.OAUTH2 requiring the use of TLS for all communications related to authentication and authorization.

OE.REPLAY_DETECTION requiring that the SSA rejects assertion replays.

OE.DEVICE requiring the SIC to participate the in SAP.

T.SIGNATURE_REQUEST_DISCLOSURE is covered by

OT.SAP requiring the protocol to be able to transmit data securely.

OE.AUTH2 requiring that the IdP uses secure communication.

T.SAD_FORGERY is covered by

OT.SAP requiring the TOE to be able to detect if the SAD has been modified during transmit to the TOE.

OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION requiring signature authentication data to be protected during transmit to the TOE.

OE.SIGNER_AUTHENTICATION_DATA requiring the signer to protect his authentication data.

OE.DEVICE requiring the device used by the signer to participate correctly in the SAP, in particular the device shall not disclose authentication data.

OE.AUTH2 requiring hat the IdP signs the SAD.

T.DTBSR_FORGERY is covered by

OT.DTBSR_INTEGRITY requiring the R.DTBS/R to be protected in integrity during transmit to the TOE.

OE.AUTH2 requiring that the authorization token is signed as required by [RFC9068].

OE.DEVICE requiring the SIC to participate the in SAP.

T.SIGNATURE_FORGERY is covered by

OT.SIGNATURE_INTEGRITY requiring that the signature is protected in integrity inside the TOE.

OT.CRYPTO requiring the usage of endorsed algorithms.

T.PRIVILEGED_USER_INSERTION is covered by

OT.PRIVILEGED_USER_MANAGEMENT requiring only privileged user can create new R.Privileged_User

OT.PRIVILEGED_USER_AUTHENTICATION that requires a privileged user to be authenticated.

T.REFERENCE_PRIVILEGED_USER_AUTHENTICATION_DATA_MODIFICATION is covered by

OT.PRIVILEGED_USER_MANAGEMENT requiring only privileged user can modify R.Privileged_User

OT.PRIVILEGED_USER_AUTHENTICATION that requires a privileged user to be authenticated

OE.PRIVILEGED_USER_AUTHENTICATION_DATA requiring the privileged user to protect his authentication data..

OT.PRIVILEGED_USER_PROTECTION requiring the privileged user to be protected in integrity.

T.AUTHORISATION_DATA_UPDATE is covered by

OT.SYSTEM_PROTECTION requiring any unauthorized modification to TOE configuration to be detectable.

T.AUTHORISATION_DATA_DISCLOSE is covered by

OT.SYSTEM_PROTECTION requiring any unauthorized modification to TOE configuration to be detectable.

T.CONTEXT_ALTERATION is covered by

OT.SYSTEM_PROTECTION requiring any unauthorized modification to TOE configuration to be detectable.

T.AUDIT_ALTERATION is covered by

OT.AUDIT_PROTECTION requiring any audit modification can be detected.

T.RANDOM is covered by

OT.RANDOM requiring that random numbers are not predictable and have sufficient entropy.

Organizational security policies and objectives

OSP.RANDOM is covered by

OT.RANDOM requiring that random numbers are not predictable and have sufficient entropy.

OSP.CRYPTO is covered by

OT.CRYPTO requiring the usage of endorsed algorithms

OE.CRYPTOMODULE_CERTIFIED requiring a Cryptographic Module to provide a tamper-protected environment and for cryptographic functionality and random number generation.

OSP.LOA is covered by

OE.OAUTH2 requiring the IdP to indicate authentication level

OT.SAD_VALIDATION requiring the TOE to validate the level of authentication in the SAD against the level of authentication (LOA) policy.

OSP.SIGNING_KEY_CERTIFIED is covered by

OT.SIGNING_KEY_CERTIFICATE_REFERENCE requiring the TOE to check that there exists an identifier for the signing key certificate and that the expiration date has not been exceeded.

Assumptions and objectives

A.PRIVILEGED_USER is covered by

OE.TW4S_CONFORMANT requiring the TOE's administrator to be trained.

A.SIGNER_ENROLMENT is covered by

OE.ENV requiring the TSP to be audited.

A.SIGNER_AUTHENTICATION_DATA_PROTECTION is covered by

OE.SIGNER_AUTHENTICATION_DATA requiring the signer to protect his authentication data.

A.PRIVILEGED_USER_AUTHENTICATION_DATA_PROTECTION is covered by

OE.PRIVILEGED_USER_AUTHENTICATION_DATA requiring the privileged user to protect his authorization data.

A.SIGNER_DEVICE is covered by

OE.DEVICE requiring the signer's device to be protected against malicious code.

A.CA is covered by

OE.CA_REQUEST_CERTIFICATE requiring that the CA will issue certificates containing the SVD.

A.ACCESS_PROTECTED is covered by

OE.ENV requiring the TOE be operated in an environment with physical access controls.

A.AUTH_DATA is covered by

OE.DEVICE requiring the device to participate correctly in the SAP.

A.TSP_AUDITED is covered by

OE.ENV requiring that the TOE is operated by a qualified TSP.

A.SEC_REQ is covered by

OE.TW4S_CONFORMANT requiring the system where the TOE operates is compliant with [CEN EN 419 241-1].

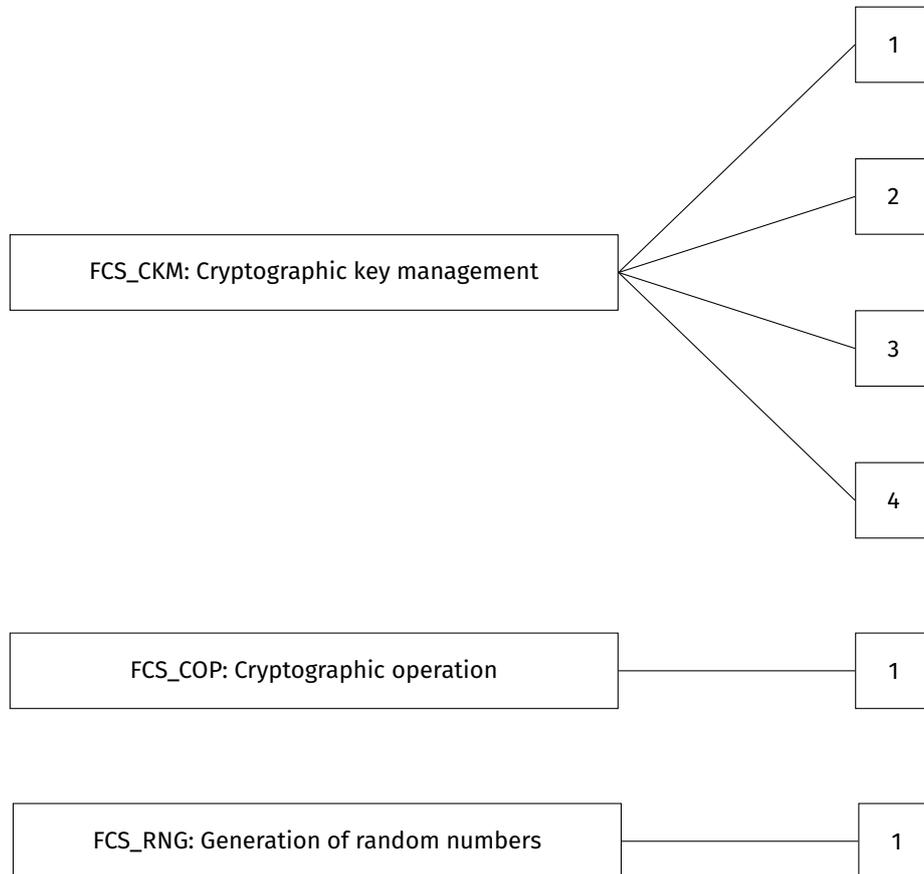
A.TOE_CONFIGURATION is covered by

OE.MINIMAL_ROLE_DEFINITION requiring that the security officers configures roles as required.

5 Extended Components Definition

5.1 Class FCS: Cryptographic Support

The Class FCS: Cryptographic Support as defined in [CC2] is extended with a new family: Generation of Random Numbers (FCS_RNG). The family is concerned with generation of random numbers. The following picture illustrates the decomposition of the Class FCS: Cryptographic Support with the added family FCS_RNG:



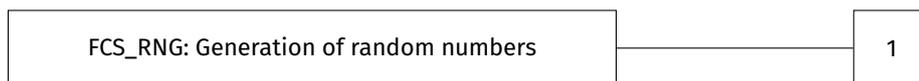
5.1.1 Generation of Random Numbers (FCS_RNG)

This family describes the functional requirements for random number generation used for cryptographic purposes.

Family behavior:

This family defines quality requirements for the generation of random numbers, which are intended to be use for cryptographic purposes.

Component levelling:



Management: FCS_RNG.1

There are no foreseen management activities.

Audit: FCS_RNG.1

There are no actions defined to be auditable.

FCS_RNG.1	Generation of random numbers
-----------	------------------------------

Hierarchical to: No other components.

Dependencies: No dependencies.

FCS_RNG.1.1 The TSF shall provide a [selection: physical, non-physical true, deterministic, hybrid physical, hybrid deterministic] random number generator that implements: [assignment: list of security capabilities].

FCS_RNG.1.2 The TSF shall provide [selection: bits, octets of bits, numbers [assignment: format of the numbers]] that meet [assignment: a defined quality metric].

Application Note 36 (PP)

A physical random number generator (RNG) produces the random number by a noise source based on physical random processes. A non-physical true RNG uses a noise source based on non-physical random processes like human interaction (key strokes, mouse movement). A deterministic RNG uses a random seed to produce a pseudorandom output. A hybrid RNG combines the principles of physical and deterministic RNGs where a hybrid physical RNG produces at least the amount of entropy the RNG output may contain and the internal state of a hybrid deterministic RNG output contains fresh entropy but less than the output of RNG may contain.

6 Security Requirements

6.1 Typographical Conventions

The following conventions are used in the definitions of the SFRs:

- Refinements are always updates of the text for the SFR. The added words are in **bold text** and removed words are ~~crossed out~~.
- Selections made in this ST are written in *italics*, and the original text is indicated in a footnote.
- Assignments made in this ST are written in *italics*, and the original text is indicated in a footnote.
- Iterations are denoted by a slash “/” and the iteration indicator after the component identifier.

6.2 Subjects, Objects and Operations

This section describes the subjects, object and operations supported by the TOE.

Subject	Description
R.Signer	Represents within the TOE the end user that wants to create a digital signature.
R.Privileged_User	Represents within the TOE a privileged user that can administer the TOE and a few operations relevant for R.Signer.

Table 3

Object	Description
R.Reference_Privileged_User- _Authentication_Data	Data used by the TOE to authenticate a Privileged_User.
R.Reference_Signer_Authenti- cation_Data	Data used by the TOE to authenticate a Signer.
R.SVD	The public part of a R.Signer signature key pair.
R.Signing_Key_Id	An identifier representing the private part of a R.Signer signature key pair.
R.DTBS/R	Data to be signed representation.
R.Authorisation_Data	Data used by the Cryptographic Module to activate the private part of a R.Signer signature key pair.
R.Signature	The result of a signature operation.
R.TSF_DATA	TOE Configuration Data

Table 4

Subject	Operation	Object	Description
R.Privileged_User	Create_New_Privileged- _User	R.Privileged_User R.Reference_Privile- ged_User_Authenti- cation_Data	A new privileged user can be created which covers the object representing the new privileged user as well as the object used to authenticate the newly created privileged user.
R.Privileged_User	Create_New_Signer	R.Signer R.Reference_Signer_Au- thentication_Data	A new signer can be created which covers the object representing the new signer as well as the object used to authenticate the newly created signer.
R.Privileged_User R.Signer	Generate_Signer_Key_Pair	R.Signer R.SVD R.Signing_Key_Id	A key pair can be generated and assigned to a signer.
R.Privileged_User R.Signer	Signer_Maintenance	R.Signer R.SVD R.Signing_Key_Id	A key pair can be deleted from a signer.
R.Privileged_User	Supply_DTBS/R	R.Signer R.DTBS/R	Data to be signed by a signer can be supplied by a privileged user.
R.Signer	Signing	R.Authorisation_Data R.Signer R.Signing_Key_Id R.DTBS/R R.Signature	A signer can sign data to be signed resulting in a signature.
R.Privileged_User	TOE_Maintenance	R.TSF_DATA	The TOE configuration can be maintained by a privileged user.

6.3 SFRs Overview

This section gives an overview of how the SFRs are related to handle TOE usage scenarios and Signer object.

Signer object

- FIA_ATD.1 and FIA_USB.1 requires that the R.Signer object is maintained by the TOE.
- FDP_IFC.2/Signer describes requirements for importing the R.Signer object.
- FDP_ETC.2/Signer describes requirements for exporting the R.Signer object.
- FDP_UIT.1 requires the R.Signer object to be protected in integrity when imported and exported.
- FPT_TDC.1 requires the TOE to be able to interpret R.Signer object related data when shared with the SSA.
- FMT_MSA.1, FMT_MSA.2 and FMT_MSA.3 describes rules for creation, maintaining and usage of the R.Signer object as well as requirements to its values.

Authentication

- FIA_AFL.1 limits the amount of authentication attempts.
- FDP_UCT.1 ensure that access control and information flow data are transmitted in a confidential way.
- FIA_UID.2 and FIA_UAU.1 requires that each user is identified and authenticated before any action on behalf of the user can take place.
- FIA_UAU.5/Signer and FIA_UAU.5/Privileged User describe the list of authentication mechanism.

Create Signer

- FDP_ACC.1/Signer Creation using FDP_ACF.1/Signer Creation describes access control requirements for creating an R.Signer object. FIA_USB.1 defines authorisation rules for creating new R.Signer objects.

Signer Key Pair Generation

- FDP_ACC.1/Signer Key Pair Generation using FDP_ACF.1/Signer Key Pair Generation describes access control requirements for signing key pair generation.
- FCS_CKM.1 describes rules for how signing key pair are generated.

Signer Key Pair Deletion

- FDP_ACC.1/Signer Key Pair Deletion using FDP_ACF.1/Signer Key Pair Deletion describes access control requirements for signing key pair deletion.
- FCS_CKM.4 requires keys to be securely destroyed.

Signer Maintenance

- FDP_ACC.1/Signer Maintenance using FDP_ACF.1/Signer Maintenance describes access control requirements for updating the R.Reference_Signer_Authentication_Data maintaining of a R.Signer object.

Supply DTBS/R

- FDP_ACC.1/Supply DTBS/R using FDP_ACF.1/Supply DTBS/R describes access control requirements for a privileged user to supply a DTBS/R(s).

Signing

- FDP_IFF.1/Signer and FDP_IFC.1/Signer describing requirements on preconditions for a signature operation can be carried out.
- FDP_UIT.1 requires the R.SAD object to be protected from modification and replay.

- FDP_ACC.1/Signing using FDP_ACF.1/Signing describes access control requirements for signing.
- FCS_COP.1 requires the TOE to perform cryptographic operation conformant with an ST specified list of algorithms.

Privileged user object

- FIA_ATD.1 and FIA_USB.1 requires that the R.Privileged User object is maintained by the TOE.
- ~~FDP_ITC.2/Privileged User describes requirements for importing the R.Privileged User object.~~
- ~~FDP_ETC.2/Privileged User describes requirements for exporting the R.Privileged User object.~~
- FDP_UIT.1 requires the R.Privileged User object to be protected in integrity when imported and exported.
- FPT_TDC.1 requires the TOE to be able to interpret R.Privileged User object when shared with a trusted IT product the SSA.
- FMT_MSA.1, FMT_MSA.2, FMT_MSA.3 describes rules for creation, maintaining and usage of the R.Privileged User object as well as requirements to its values.

Privileged User Creation

- FDP_ACC.1/Privileged User Creation using FDP_ACF.1/Privileged User Creation describes access control requirements for creating an R.Privileged User object.
- FIA_USB.1 defines authorisation rules for creating new R.Privileged User objects.

TOE Maintenance

- FDP_ACC.1/TOE Maintenance using FDP_ACF.1/TOE Maintenance.
- FMT_SMF.1 and FMT_SMF.2 requires the TOE to be able to carry out management functions and maintain users and roles.

Audit

- FAU_GEN.1 and FAU_GEN.2 describes what shall be audited.

Validate Audit

- FDP_ACF.1/Audit using FDP_ACC.1/Audit describes access control requirements for validating the audit log.

Communication

- FPT_ITC.2 requires that all communication to the TOE comes from the SSA.
- FTP_TRP.1/SSA and FTP_TRP.1/SIC requires that either the privileged user or the Signer initiates the communication.

6.4 Security Functional Requirements

The individual security functional requirements are specified in the sections below.

6.4.1 Security Audit (FAU)

FAU_GEN.1	Audit Generation
FAU_GEN.1.1	The TSF shall be able to generate an audit record of the following auditable events: <ol style="list-style-type: none"> Start-up and shutdown of the audit functions; All auditable events for the [selection: <i>minimum</i>⁶] level of audit; and

⁶[selection: minimum, basic, detailed, not specified]

- c) Privileged User management;
- d) Privileged User authentication;
- e) Signer management;
- f) Signer authentication;
- g) Signing key generation;
- h) Signing key destruction;
- i) Signing key activation and usage including the hash of the DTBS/R(s) and R.Signature;
- j) Change of TOE configuration;
- k) [assignment: *None*⁷].

Application Note 37 (PP)

Management of R.Privileged_User and R.Signer objects shall include all events, which creates, modifies or deletes the R.Signer or R.Privileged_User objects.

Signer authentication shall include failed verification of an assertion provided by a delegated party.

TOE configuration shall include all events, which creates, modifies and deletes the configuration object.

Application Note 38 (PP)

Generation of a certification request is usage of the signing key and mandates an audit trail.

Application Note 39 (ST)

The audit log entries for the signing operation contain the DTBS/R.

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 (if applicable), 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, [assignment: *Type of action performed (success or failure), identity of the role which performs the operation.* [assignment: *none*⁸]]

Application Note 40 (PP)

Audit trail shall not include any data which allow to retrieve sensitive data like R.SAD, R.Reference_Signer_Authentication_Data and R.Authorisation_Data.

FAU_GEN.2 User identity association

FAU_GEN.2.1

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

6.4.2 Cryptographic Support (FCS)

FCS_CKM.1 Cryptographic key generate

FCS_CKM.1.1

The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [assignment: *key generation algorithms listed in Table 5⁹*] and specified cryptographic key sizes [assignment: *key sizes listed in Table 5¹⁰*] that meet the following: [assignment: *standards listed in Table 5¹¹*].

⁷[assignment: assignment: other specifically defined auditable events]

⁸[assignment: other audit relevant information]

⁹[assignment: cryptographic key generation algorithm]

¹⁰[assignment: cryptographic key sizes]

¹¹[assignment: list of standards]

Key Type	Key Generation Algorithm	Key Size/Curve	Standard
AES	AES key generation	256	[FIPS 197], chapters 3.1 and 6
RSA	RSA key pair generation with pre-defined or given public exponent	2048, 3072, or 4096	[SOGIS], section 4.1
ECC	ECDSA key pair generation with given elliptic curve domain parameters	P-256, P-384, or P-521	[FIPS 186-4], chapter 6
ECC	ECDSA key pair generation with given elliptic curve domain parameters	brainpoolP256r1, brainpoolP320r1, brainpoolP384r1, brainpoolP512r1, brainpoolP256t1, brainpoolP320t1, brainpoolP384t1, or brainpoolP512t1	[ECCBP], chapter 10

Table 5: Key Generation Algorithms

Application Note 41 (PP)

The TOE is expected to use a Cryptographic Module certified in conformance with [CEN EN 419 221-5], see also OE.CRYPTO-MODULE_CERTIFIED for key generation. Although the TSF may not generate keys itself, this SFR expresses the requirement for the TSF to invoke the Cryptographic Module with the appropriate parameters whenever key generation is required.

Guidance on cryptographic algorithms can be found in [ETSI TS 119 312] and [SOGIS].

Application Note 42 (PP)

The ST is expected to use cryptographic keys for different purposes, e.g. application, infrastructure, session etc. The ST writer should include an iteration of this SFR for every key type (e.g. RSA and AES) it generates itself.

FCS_CKM.4	Cryptographic key destruction
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FCS_CKM.4.1 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method [assignment: *zeroization*¹²] that meets the following: [assignment: *None*¹³].

Application Note 43 (PP)

The TOE is expected to use a Cryptographic Module certified in conformance with [CEN EN 419 221-5] for key destruction.

Application Note 44 (ST)

All cryptographic keys are destroyed by this process. The ST writer should include an iteration of this SFR for purposes of keys that it destructs itself.

FCS_COP.1	Cryptographic operation
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FCS_COP.1.1 The TSF shall perform [assignment: *Operations listed in Table 6*¹⁴] in accordance with a specified cryptographic algorithm [assignment: *Algorithms listed in Table 6*¹⁵] and cryptographic key sizes [assignment: *Key sizes listed in Table 6*¹⁶] that meet the following: [assignment: *Standards listed in Table 6*¹⁷].

¹²[assignment: cryptographic key destruction method]

¹³[assignment: list of standards]

¹⁴[assignment: list of cryptographic operations]

¹⁵[assignment: cryptographic algorithm]

¹⁶[assignment: cryptographic key sizes]

¹⁷[assignment: list of standards]

Application Note 45 (ST)

The TOE uses the Cryptographic Module certified in conformance with [CEN EN 419 221-5] for the cryptographic operations listed in Table 6. The TOE is expected to use a Cryptographic Module certified in conformance with [CEN EN 419 221-5] for cryptographic operations.

Application Note 46 (PP)

The relevant authorities and endorsements for completion of the SFRs are determined by the context of the client applications that use the TOE. For digital signatures within the European Union, this is as indicated in Regulation (EU) No 910/2014 [eIDAS] and a list of approved signature and seal formats are given in [formats].

The next SFR is relevant when the TOE is deployed in an appliance distinct from the Cryptographic Module.

FCS_RNG.1	Generation of random numbers
FCS_RNG.1.1	The TSF shall provide a [selection: <i>hybrid deterministic</i> ¹⁸] random number generator that implements: [assignment: <i>list of security capabilities as required by FCS_RNG.1.1 of [UT_ST]</i> ¹⁹].
FCS_RNG.1.2	The TSF shall provide [selection: <i>octets of bits</i> ²⁰] that meet [assignment: <i>the quality metric required by FCS_RNG.1.2 of [UT_ST]</i> ²¹].

Application Note 47 (PP)

For more information on the selections and assignments, see the SFR definition in Section 5.1.1.

Application Note 48 (PP)

The SFR FCS_RNG.1 only apply, if the TOE is not implemented as a local application within the same physical boundary as the Cryptographic Module – otherwise, the SFRs defined in [CEN EN 419 221-5] already provide requirements on generation of random numbers. This should be stated in the Security Target.

Application Note 49 (ST)

Since the SAM is implemented as a local application within the same physical boundary as the Cryptographic Module, FCS_RNG.1 in [UT_ST] provides the requirements for FCS_RNG.1.

6.4.3 User Data Protection (FDP)

Application Note 50 (ST)

Table 7 shows which roles are authorized to perform certain operations. Security Officer and User Manager are sub-roles of privileged user (See FMT_SMR.2).

FDP_ACC.1/Privileged User Creation	Subset access control
FDP_ACC.1.1/Privileged User Creation	The TSF shall enforce the Privileged User Creation SFP on: <i>Subjects: privileged user</i> <i>Objects: New security attributes for the Privileged User to be created.</i> <i>Operations: Create_New_Privileged_User:</i> <i>The TOE creates R.Privileged_User and R.Reference_Privileged_User_Authentication_Data with information transmitted by privileged user.</i>

Application Note 51 (ST)

At TOE initialization, 2–4 privileged users, with the Security Officer role, are created.

FDP_ACF.1/Privileged User Creation	Security attribute based access control
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¹⁸[selection: physical, non-physical true, deterministic, hybrid physical, hybrid deterministic]

¹⁹[assignment: list of security capabilities]

²⁰[selection: bits, octets of bits, numbers [assignment: format of the numbers]]

²¹[assignment: a defined quality metric]

Operation	Key Type	Key Size/Curve	Algorithm	Standard
Signature validation	RSA	2048, 3072, or 4096	RSASSA-PKCS1-v1.5, RSASSA-PSS	[PKCS#1], Chapters 8.1.2 and 8.2.2
Signature validation	ECC	P-256, P-384, P-521, brainpoolP256r1, brainpoolP320r1, brainpoolP384r1, brainpoolP512r1, brainpoolP256t1, brainpoolP320t1, brainpoolP384t1, brainpoolP512t1	ECDSA	[ANSI-X9.62]
Signature generation	RSA	2048, 3072, or 4096	RSASSA-PKCS1-v1.5, RSASSA-PSS	[PKCS#1], Chapters 8.1.1 and 8.2.1
Signature generation	ECC	P-256, P-384, P-521, brainpoolP256r1, brainpoolP320r1, brainpoolP384r1, brainpoolP512r1, brainpoolP256t1, brainpoolP320t1, brainpoolP384t1, brainpoolP512t1	ECDSA	[ANSI-X9.62]
Confidentiality and integrity for key wrapping	AES	256	AES-CBC- PKCS5padding	[NIST SP 800-38A], Chapter 6.2
Integrity protection	AES	256	HMAC	[FIPS 198] and [RFC2104]
Integrity and confidentiality protection	AES	256	AES-GCM	[NIST SP 800-38D]
Key derivation	AES	256	KDF in Feedback Mode with HMAC	[NIST SP 800-108], Chapter 5.2
Cryptographic hash / digest calculation	N/A	N/A	SHA256, SHA384, SHA512	[FIPS 180-4] chapter 6
			SHA3-256, SHA3-384, SHA3-512	[FIPS 202]

Table 6: Cryptographic Operations

Role	Authorized operations
Security Officer	Privileged User Creation TOE Maintenance
User Manager	Signer Creation Signer Key Pair Generation Signer Maintenance
Signer	Signing

Table 7: User Authorization Table

FDP_ACF.1.1/Privileged User Creation The TSF shall enforce the Privileged User Creation SFP to objects based on the following:

1. *whether the subject is a **security officer** ~~privileged user~~ authorized to create a new privileged user.*

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

1. *Only a **security officer** ~~privileged user~~ who has been authorised for creation of new users can carry out the Create_New_Privileged_User operation.*

FDP_ACF.1.3/Privileged User Creation The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: *None*.

FDP_ACF.1.4/Privileged User Creation The TSF shall explicitly deny access of subjects to objects based on the following additional rule: *None*.

FDP_ACC.1/Signer Creation	Subset access control
---------------------------	-----------------------

FDP_ACC.1.1/Signer Creation The TSF shall enforce the Signer Creation SFP on:
Subjects: privileged user
Objects: R.Signer and R.Reference_Signer_Authentication_Data
Operations: Create_New_Signer
The TOE creates R.Signer and R.Reference_Signer_Authentication_Data with information transmitted by privileged user.

FDP_ACF.1/Signer Creation	Security attribute based access control
---------------------------	---

FDP_ACF.1.1/Signer Creation The TSF shall enforce the Signer Creation SFP to objects based on the following:

1. *whether the subject is a **user manager** ~~privileged user~~ authorized to create a new Signer.*

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

1. *Only a **user manager** ~~privileged user~~ who has been authorised for creation of new users can carry out the Create_New_Signer operation.*

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

FDP_ACF.1.4/Signer Creation The TSF shall explicitly deny access of subjects to objects based on the following additional rule: *None*.

FDP_ACC.1/Signer Maintenance	Subset access control
------------------------------	-----------------------

FDP_ACC.1.1/Signer Maintenance The TSF shall enforce the *Signer Maintenance SFP*²² on:
Subjects: user manager privileged-user and Signer
Objects: The security attributes R.Reference_Signer_Authentication_Data of R.Signer
Operations: Signer_Maintenance:
*The user manager privileged-user or Signer instructs the TOE to update R.Reference_Signer_Authentication_Data of R.Signer*²³.

FDP_ACF.1/Signer Maintenance	Security attribute based access control
------------------------------	---

FDP_ACF.1.1/Signer Maintenance The TSF shall enforce the *Signer Maintenance SFP*²⁴ to objects based on the following:
 1. *Whether the subject is a user manager privileged-user or Signer authorised to maintain the Signer security attributes*²⁵.

FDP_ACF.1.2/Signer Maintenance The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:
 1. *Only a user manager privileged-user or Signer who has been authorised to maintain a Signer can carry out the Signer_Maintenance operation*²⁶.

FDP_ACF.1.3/Signer Maintenance The TSF shall explicitly authorise access of subjects to objects based on the following additional rules:
 1. *The Signer must be the owner of the R.Signer object to be maintained*²⁷.

FDP_ACF.1.4/Signer Maintenance The TSF shall explicitly deny access of subjects to objects based on the following additional rules:
 1. *If the Signer does not own the R.Signer object, it can't be maintained*²⁸.

Application Note 52 (ST)

Only privileged users with the role Security Manager can maintain R.Reference_Signer_Authentication_Data.

FDP_ACC.1/Signer Key Pair Generation	Subset access control
--------------------------------------	-----------------------

FDP_ACC.1.1/Signer Key Pair Generation The TSF shall enforce the *Signer Key Pair Generation SFP*:
Subjects: Privileged User and Signer.
Objects: The security attributes R.SVD and R.Signing_Key_Id as part of R.Signer.
Operations: Generate_Signer_Key_Pair:
The TOE requests the Cryptographic Module to generate a signing key pair R.Signing_Key_Id and R.SVD and assign them to the R.Signer.

Application Note 53 (ST)

R.Authorisation_Data is created by the Cryptographic Module together with R.Signing_Key_Id and R.SVD, and is kept by the TOE.

Application Note 54 (ST)

Signing keys can be used by several Cryptographic Modules, as long as they have been initialized with identical TSF data. Integrity of the key and linking to R.Signer is governed by FPT_TDC and confidentiality by FDP_UCT.

²²[assignment: access control SFP]

²³[assignment: list of subjects, objects, and operations among subjects and objects covered by the SFP]

²⁴[assignment: access control SFP]

²⁵[assignment: list of subjects and objects controlled under the indicated SFP, and for each, the SFP-relevant security attributes, or named groups of SFP-relevant security attributes]

²⁶[assignment: rules governing access among controlled subjects and controlled objects using controlled operations on controlled objects]

²⁷[assignment: rules, based on security attributes, that explicitly authorise access of subjects to objects]

²⁸[assignment: rules, based on security attributes, that explicitly deny access of subjects to objects]

Application Note 55 (ST)

Signing keys are generated on-demand for a specific user, and so a signing key is always assigned to a Signer.

Application Note 56 (PP)

The environment shall ensure, if needed, any transformation of R.SVD to a certification request and transport to CA.

FDP_ACF.1/Signer Key Pair Generation	Security attribute based access control
FDP_ACF.1.1/Signer Key Pair Generation	The TSF shall enforce the <i>Signer Key Pair Generation SFP</i> to objects based on the following: <ol style="list-style-type: none">1. <i>Whether the subject is a user manager privileged user or Signer authorised to generate a key pair.</i>
FDP_ACF.1.2/Signer Key Pair Generation	The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: <ol style="list-style-type: none">1. <i>Only a user manager privileged user or Signer who has been authorised to generate the key pair can carry out the <i>Generate_Signer_Key_Pair</i> operation.</i>
FDP_ACF.1.3/Signer Key Pair Generation	The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: <ol style="list-style-type: none">1. <i>The Signer must be the owner of the R.Signer object where the key pair is to be generated.</i>
FDP_ACF.1.4/Signer Key Pair Generation	The TSF shall explicitly deny access of subjects to objects based on the following additional rules: <ol style="list-style-type: none">1. <i>If the Signer does not own the R.Signer object, key pair shall not be generated.</i>

Application Note 57 (ST)

The TOE does not provide pre-generated keys.

Application Note 58 (PP)

Owning a R.Signer object is described in FIA_UAU.5/Signer.

FDP_ACC.1/Signer Key Pair Deletion	Subset access control
FDP_ACC.1.1/Signer Key Pair Deletion	The TSF shall enforce the <i>Signer Key Pair Deletion SFP</i> ²⁹ on: <i>Subjects: Privileged User and Signer</i> <i>Objects: The security attributes R.Signing_Key_Id and R.SVD of R.Signer</i> <i>Operations: Signer_Key_Pair_Deletion:</i> <i>The privileged user or Signer instructs the TOE to delete the R.Signing_Key_Id and R.SVD from R.Signer</i> ³⁰ .

Application Note 59 (PP)

Deletion of R.Signing_Key_Id may also require that the signing key is deleted by the Cryptographic Module.

This SFR is limited to covering deletion of the R.Signing_Key_Id and R.SVD of R.Signer performed using one of the interfaces provided by the TOE and where authorisation to perform operations is managed by TOE.

Application Note 60 (ST)

Application Note 59 implies that the requirement only applies if the delete operation is performed by the TOE. The TOE does not provide any interface for deleting R.Signing_Key_Id and R.SVD of R.Signer, and thus the requirement is not applicable. However, the SSA is responsible for deletion of signing keys as described in OE.SIGNER_KEY_PAIR_DELETION.

FDP_ACF.1/Signer Key Pair Deletion	Security attribute based access control
------------------------------------	---

²⁹[assignment: access control SFP]

³⁰[assignment: list of subjects, objects, and operations among subjects and objects covered by the SFP]

FDP_ACF.1.1/Signer Key Pair Deletion	The TSF shall enforce the <i>Signer Key Pair Deletion SFP</i> ³¹ to objects based on the following: 1. <i>Whether the subject is a privileged user or Signer authorised to delete the Signer security attributes</i> ³² .
FDP_ACF.1.2/Signer Key Pair Deletion	The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: 1. <i>Only a privileged user or Signer who has been authorised to delete a key pair can carry out the Signer_Key_Pair_Deletion operation</i> ³³ .
FDP_ACF.1.3/Signer Key Pair Deletion	The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: 1. <i>The Signer must be the owner of the R.Signer object containing the key pair to be deleted</i> ³⁴ .
FDP_ACF.1.4/Signer Key Pair Deletion	The TSF shall explicitly deny access of subjects to objects based on the following additional rules: 1. <i>If the Signer does not own the R.Signer object, the key pair can't be deleted</i> ³⁵ .

The PP allows privileged users to supply DTBS/R on behalf of the Signer, as expressed by the following SFR. The TOE only allows the DTBS/R(s) to be supplied to the TOE by the Signer as part of the Signature Activation Protocol, which is covered by the FDP_ACC.1/Signing.

FDP_ACC.1/Supply DTBS/R	Subset access control
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FDP_ACC.1.1/Supply DTBS/R	The TSF shall enforce the <i>Supply DTBS/R SFP</i> on: <i>Subjects: Privileged User</i> <i>Objects: The security attributes R.DTBS/R of R.Signer.</i> <i>Operations: Supply_DTBS/R:</i> <i>The Privileged User instructs the TOE to link the supplied DTBS/R(s) to the next signature operation for R.Signer.</i>
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Application Note 61 (ST)

The TOE does not provide facilities for privileged users to supply the DTBS/R(s), so the relevant part of the SFR is trivially satisfied.

FDP_ACF.1/Supply DTBS/R	Security attribute based access control
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FDP_ACF.1.1/Supply DTBS/R	The TSF shall enforce the <i>Supply DTBS/R SFP</i> to objects based on the following: 1. <i>Whether the subject is a privileged user authorised to supply a DTBS/R(s).</i>
FDP_ACF.1.2/Supply DTBS/R	The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: 1. <i>Only a privileged user who has been authorised to supply a DTBS/R(s) can carry out the Supply_DTBS/R operation.</i>
FDP_ACF.1.3/Supply DTBS/R	The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: <i>None.</i>

³¹[assignment: access control SFP]

³²[assignment: list of subjects and objects controlled under the indicated SFP, and for each, the SFP-relevant security attributes, or named groups of SFP-relevant security attributes]

³³[assignment: rules governing access among controlled subjects and controlled objects using controlled operations on controlled objects]

³⁴[assignment: rules, based on security attributes, that explicitly authorise access of subjects to objects]

³⁵[assignment: rules, based on security attributes, that explicitly deny access of subjects to objects]

FDP_ACF.1.4/Supply DTBS/R	The TSF shall explicitly deny access of subjects to objects based on the following additional rules: <i>None</i> .
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Application Note 62 (ST)

The TOE does not provide facilities for privileged users to supply the DTBS/R(s), so the relevant part of the SFR is trivially satisfied.

FDP_ACC.1/Signing	Subset access control
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FDP_ACC.1.1/Signing	<p>The TSF shall enforce the <i>Signing SFP</i> on:</p> <p><i>Subjects: Signer</i></p> <p><i>Objects: R.Authorisation_Data, security attributes [R.Reference_Signer_Authentication_Data], R.Signing_Key_Id and R.DTBS/R of R.Signer and R.Signature.</i></p> <p><i>Operations: Signing:</i></p> <p><i>The Signer instructs the TOE to perform a signature operation containing the following steps:</i></p> <ul style="list-style-type: none"> • <i>The TOE establishes R.Authorisation_Data for the R.Signing_Key_Id.</i> • <i>The TOE uses the R.Autorisation_Data and R.Signing_Key_Id to activate a signing key in the Cryptographic Module and signs the R.DTBS/R resulting in R.Signature.</i> • <i>The TOE deactivates the signing key when the signature operation is completed.</i>
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Application Note 63 (ST)

R.Authorisation_Data contains the CM signing key token and R.Signing_Key_Id protected in both integrity and confidentiality. The TSF activates the signing key by decrypting R.Authorisation_Data and loading the CM signing key token into the CM. The TSF will only decrypt R.Authorisation_Data when provided as part of the Signing operation together with the same R.Signing_Key_Id as is contained in R.Authorisation_Data, and when the integrity of R.Authorisation_Data is verified.

Application Note 64 (ST)

The Signer provides R.DTBS/R(s) as part of the Signing operation.

Application Note 65 (PP)

Signing key deactivating means that the signer shall authorise any subsequent use of it.

FDP_ACF.1/Signing	Security attribute based access control
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FDP_ACF.1.1/Signing	<p>The TSF shall enforce the <i>Signing SFP</i> to objects based on the following:</p> <ol style="list-style-type: none"> 1. <i>Whether the subject is a Signer authorised to create a signature.</i>
FDP_ACF.1.2/Signing	<p>The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:</p> <ol style="list-style-type: none"> 1. <i>The R.SAD is verified in integrity.</i> 2. <i>The R.SAD is verified that it binds together the Signer authentication, a set of R.DTBS/R and R.Signing_Key_Id.</i> 3. <i>The R.DTBS/R used for signature operations is bound to the R.SAD.</i> 4. <i>The Signer identified in the SAD is authenticated according to the rules specified in FIA_UAU.5/Signer.</i> 5. <i>Only an R.Signing_Key_Id as bound in the SAD, and which is part of the R.Signer security attributes, can be used to create a signature.</i> 6. <i>[R.Signing_Key_Id fulfills the requirements of OSP.SIGNING_KEY_CERTIFIED.]</i> 7. <i>[R.Signing_Key_Id is linked to R.Authorisation_Data.]</i> 8. <i>[The Signer authentication linked to R.SAD is as required by OSP.LOA.]</i>

FDP_ACF.1.3/Signing The TSF shall explicitly authorise access of subjects to objects based on the following additional rules:

1. *The Signer must be the owner of the R.Signer object used to generate the signature.*

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

1. *If the Signer does not own the R.Signer object, it can't be used to create a signature.*

Application Note 66 (PP)

In FDP_ACF.1.2/Signing the R.Signing_Key_Id can be implied if the signing uses a one-time keys or a signing key is known to be the default.

If the TOE uses configuration data, then the following SFR is used to maintain it.

FDP_ACC.1/TOE Maintenance	Subset access control
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FDP_ACC.1.1/TOE Maintenance The TSF shall enforce the *TOE Maintenance SFP* on:
Subjects: Privileged User
Objects: R.TSF_DATA.
Operations: TOE_Maintenance:
The privileged user transmits information to the TOE to manage R.TSF_DATA.

FDP_ACF.1/TOE Maintenance	Security attribute based access control
---------------------------	---

FDP_ACF.1.1/TOE Maintenance The TSF shall enforce the *TOE Maintenance SFP* to objects based on the following:

1. *Whether the subject is a **security officer privileged-user** authorised to maintain the TOE configuration data.*

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

1. *Only a **security officer privileged-user** who has been authorised to maintain the TOE can carry out the TOE_Maintenance operation.*

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

FDP_ACF.1.4/TOE Maintenance The TSF shall explicitly deny access of subjects to objects based on the following additional rules: *None.*

The TOE can store data in an external repository to meet requirements on e.g. capacity and redundancy.

FDP_ETC.2/Signer	Export of user data with security attributes
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FDP_ETC.2.1/Signer The TSF shall enforce the *Signer-Creation-SFP, Signer-Key-Pair-Generation-SFP, Signer-Key-Pair-Deletion-SFP, Signer-Maintenance-SFP, Supply-DTBS/R-SFP and Signing-SFP* when exporting user data, controlled under the SFP(s), outside of the TSF.

FDP_ETC.2.2/Signer The TSF shall export the user data with the user data's associated security attributes.

FDP_ETC.2.3/Signer The TSF shall ensure that the security attributes, when exported outside the TSF, are unambiguously associated with the exported user data.

FDP_ETC.2.4/Signer The TSF shall enforce the following rules when user data is exported from the TSF: *None.*

Application Note 67 (ST)

The TOE does not support export of user data.

FDP_IFC.1/Signer	Subset information flow control
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FDP_IFC.1.1/Signer The TSF shall enforce the *Signer Flow SFP* on privileged user and Signer accessing Signer security attributes for all operations.

FDP_IFF.1/Signer Simple security attributes

FDP_IFF.1.1/Signer The TSF shall enforce the *Signer Flow SFP* based on the following types of subject and information security attributes: **user manager** ~~privileged user~~ and Signer accessing the Signer security attributes.

FDP_IFF.1.2/Signer The TSF shall permit an information flow between a controlled subject and controlled information via a controlled operation if the following rules hold: *The TOE shall be initialized with FDP_ACC.1/TOE Maintenance.*
To allow a Signer to sign, the Signer shall be created in the TOE by FDP_ACC.1/Signer Creation followed by FDP_ACC.1/Signer key Pair Generation.
After Signer is created the following operations can be done: FDP_ACC.1/Signer Key Pair Generation, FDP_ACC.1/Signer Key Pair Deletion, FDP_ACC.1/Supply DTBS/R, FDP_ACC.1/Signer Maintenance and FDP_ACC.1/Signing.

FDP_IFF.1.3/Signer The TSF shall enforce the: *None.*

FDP_IFF.1.4/Signer The TSF shall explicitly authorise an information flow based on the following rules: *None.*

FDP_IFF.1.5/Signer The TSF shall explicitly deny an information flow based on the following rules: *None.*

FDP_ETC.2/Privileged User Export of user data with security attributes

FDP_ETC.2.1/Privileged User The TSF shall enforce the *Privileged User Creation SFP* when exporting user data, controlled under the SFP(s), outside of the TSF.

FDP_ETC.2.2/Privileged User The TSF shall export the user data with the user data's associated security attributes.

FDP_ETC.2.3/Privileged User The TSF shall ensure that the security attributes, when exported outside the TSF, are unambiguously associated with the exported user data.

FDP_ETC.2.4/Privileged User The TSF shall enforce the following rules when user data is exported from the TSF: *None.*

Application Note 68 (ST)

The TOE does not support export of user data.

FDP_IFC.1/Privileged User Subset information flow control

FDP_IFC.1.1/Privileged User The TSF shall enforce the *Privileged User Flow SFP* on Privileged User accessing Privileged User security attributes for all operations.

FDP_IFF.1/Privileged User Simple security attributes

FDP_IFF.1.1/Privileged User The TSF shall enforce the *Privileged User Flow SFP* based on the following types of subject and information security attributes: **security officer** ~~privileged user~~ accessing the Privileged User security attributes.

FDP_IFF.1.2/Privileged User The TSF shall permit an information flow between a controlled subject and controlled information via a controlled operation if the following rules hold: *The TOE shall be initialized with FDP_ACC.1/TOE Maintenance.*

FDP_IFF.1.3/Privileged User The TSF shall enforce the: *None.*

FDP_IFF.1.4/Privileged User The TSF shall explicitly authorise an information flow based on the following rules: *None.*

FDP_IFT.1.5/Privileged User The TSF shall explicitly deny an information flow based on the following rules: *None*.

FDP_ITC.2/Signer	Import of user data with security attributes
FDP_ITC.2.1/Signer	The TSF shall enforce the <i>Signer Creation SFP, Signer Key Pair Generation SFP, Signer Key Pair Deletion, Signer Maintenance SFP, Supply DTBS/R SFP and Signing SFP</i> when importing user data, controlled under the SFP, from outside of the TOE.
FDP_ITC.2.2/Signer	The TSF shall use the security attributes associated with the imported user data.
FDP_ITC.2.3/Signer	The TSF shall ensure that the protocol used provides for the unambiguous association between the security attributes and the user data received.
FDP_ITC.2.4/Signer	The TSF shall ensure that interpretation of the security attributes of the imported user data is as intended by the source of the user data.
FDP_ITC.2.5/Signer	The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: <i>None</i> .

Application Note 69 (ST)

The TOE does not support import of user data.

FDP_ITC.2/Privileged User	Import of user data with security attributes
FDP_ITC.2.1/Privileged User	The TSF shall enforce the <i>Privileged User Creation SFP</i> when importing user data, controlled under the SFP, from outside of the TOE.
FDP_ITC.2.2/Privileged User	The TSF shall use the security attributes associated with the imported user data.
FDP_ITC.2.3/Privileged User	The TSF shall ensure that the protocol used provides for the unambiguous association between the security attributes and the user data received.
FDP_ITC.2.4/Privileged User	The TSF shall ensure that interpretation of the security attributes of the imported user data is as intended by the source of the user data.
FDP_ITC.2.5/Privileged User	The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: <i>None</i> .

Application Note 70 (ST)

The TOE does not support import of user data.

FDP_UCT.1	Basic data exchange confidentiality
FDP_UCT.1.1	The TSF shall enforce the <i>Signer Flow SFP and Privileged User Flow SFP</i> ³⁶ to transmit and receive ³⁷ user data in a manner protected from unauthorised disclosure.

FDP_UIT.1	Data exchange integrity
FDP_UIT.1.1	The TSF shall enforce the <i>Signer Flow SFP and Privileged User Flow SFP</i> ³⁸ to transmit and receive ³⁹ user data in a manner protected from <i>modification and insertion</i> ⁴⁰ errors for R.Signer and R.Privileged User, and for R.SAD also ⁴¹ from <i>modification and replay</i> ⁴² errors.

³⁶[assignment: access control SFP(s) and/or information flow control SFP(s)]

³⁷[assignment: transmit, receive]

³⁸[assignment: access control SFP(s) and/or information flow control SFP(s)]

³⁹[assignment: transmit, receive]

⁴⁰[assignment: modification, deletion, insertion, replay]

⁴¹The TSF shall enforce the [assignment: access control SFP(s) and/or information flow control SFP(s)] to [selection: transmit, receive] user data in a manner protected from [selection: modification, deletion, insertion, replay] errors.

⁴²[assignment: modification, deletion, insertion, replay]

FDP_UIT.1.2 The TSF shall be able to determine on receipt of user data, whether *modification, deletion and insertion*⁴³ **for R.Signer and R.Privileged_User, and for R.SAD**⁴⁴ whether *modification and replay*⁴⁵ has occurred.

Application Note 71 (PP)

Insertion of objects would mean that authorised creation of Signer and privileged user could be possible.

6.4.4 Identification and Authentication (FIA)

FIA_AFL.1 Authentication failure handling

FIA_AFL.1.1 The TSF shall detect when [~~selection: [assignment: positive integer number], a TOE Maintenance configurable positive integer within [assignment: range of acceptable values]] unsuccessful authentication attempts occur related to privileged user and Signer authentication.~~

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts have been met, the TSF shall suspend the privileged user and when it is a Signer suspend the usage of R.Signing_Key_Id.

Application Note 72 (PP)

The SFR only applies when the TOE uses any direct authentication.

Application Note 73 (ST)

Signer users authentication is delegated to an IdP. It is the responsibility of the IdP to detect failed authentication and suspend signer users (see OE.AUTH_FAILURES). Privileged users are authenticated when gaining access to their private key. Since the TOE does not support direct authentication, this requirement is not relevant.

FIA_ATD.1 User attribute definition

FIA_ATD.1.1 The TSF shall maintain the following list of security attributes belonging to individual users: *the security attribute as defined in FIA_USB.1.*

FIA_UAU.1 Timing of authentication

FIA_UAU.1.1 The TSF shall allow [assignment: *no action*⁴⁶] on behalf of the user to be performed before the user is authenticated.

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

Application Note 74 (ST)

The TOE only supports indirect authentication. The TOE considers a user to be authenticated when an authorization token has been validated.

FIA_UAU.5/Signer Multiple authentication mechanisms

FIA_UAU.5.1/Signer The TSF shall provide [selection: *authorization token validation*⁴⁷] to support Signer authentication.

FIA_UAU.5.2/Signer The TSF shall authenticate any Signer's claimed identity according to: [selection:

⁴³[assignment: modification, deletion, insertion, replay]

⁴⁴The TSF shall be able to determine on receipt of user data, whether [selection: modification, deletion, insertion, replay] has occurred.

⁴⁵[assignment: modification, deletion, insertion, replay]

⁴⁶[assignment: list of TSF mediated actions]

⁴⁷[selection: [assignment: list of direct authentication mechanisms conformant to [CEN EN 419 241-1] SRA_SAP.1.1, [assignment: list of delegated authentication mechanisms conformant to [CEN EN 419 241-1] SRA_SAP.1.1]]

- validation that authorization token is signed by IdP public key specified in *R.Reference_Signer_Authentication_Data*
- validation that “subject” in the authorization token identifies the signer user as specified in *R.Reference_Signer_Authentication_Data*.
- validation that “acr” in the authorization token identifies the LOA required by the policy (OSP.LOA).

^{48]}

Application Note 75 (PP)

This SFR only applies to signer authentication for maintaining signer (FDP_ACC.1/Signer Maintenance, [and] FDP_ACC.1/Signer Key Pair Generation and FDP_ACC.1/Signer Key Pair Deletion) and for signing (FDP_ACC.1/Signing).

Successful authentication gives Signer access to the relevant R.Signer object as the owner.

FIA_UAU.5/Privileged User	Multiple authentication mechanisms
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FIA_UAU.5.1/Privileged User	The TSF shall provide [assignment: <i>signature validation</i> ^{49]} to support privileged user authentication.
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FIA_UAU.5.2/Privileged User	The TSF shall authenticate any user’s claimed identity according to the [assignment: <i>Verification of signatures on communication with privileged user</i> ^{50]} .
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FIA_UID.2	User identification before any action
-----------	---------------------------------------

FIA_UID.2.1	The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.
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FIA_USB.1	User-subject binding
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FIA_USB.1.1	The TSF shall associate the following user security attributes with subjects acting on the behalf of that user:
-------------	---

1. *R.Reference_Signer_Authentication_Data*
2. *R.Signing_Key_Id*
3. *R.SVD*
4. *R.Signer*
5. [assignment: *none*^{51]}

to *Signer*

1. *R.Reference_Privileged_User_Authentication_Data*
2. [assignment: *role*^{52]}

to *Privileged User*.

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

1. *Whether the subject is a Privileged User authorized to create a new Signer.*
2. *Whether the subject is a Privileged User authorized to create a new privileged user.*

^{48]}[selection: selection: [assignment: the rules describing how delegated authentication is verified by the TSF], [assignment: the rules describing how direct authentication mechanisms provide authentication]]

^{49]}[assignment: list of authentication mechanisms]

^{50]}[assignment: rules describing how the multiple authentication mechanisms provide authentication]

^{51]}[assignment: list of user security attributes]

^{52]}[assignment: list of user security attributes]

3. [assignment: None⁵³].

FIA_USB.1.3

The TSF shall enforce the following rules governing changes to the user security attributes associated with subjects acting on the behalf of users:

1. Whether the subject is a Privileged User authorized to modify an R.Signer object.
2. Whether the subject is a Signer authorized to modify his own R.Signer object.
3. [assignment: None⁵⁴].

Application Note 76 (PP)

In FIA_USB.1.2 several attributes including R.Signing_Key_ID, R.SVD and R.DTBS/R may initially be empty.

Application Note 77 (ST)

R.Authorisation_Data is not a security attribute of the Signer.

Application Note 78 (ST)

R.DTBS/R is not a Signer attribute.

6.4.5 Security Management (FMT)

FMT_MSA.1/Signer	Management of security attributes
FMT_MSA.1.1/Signer	<p>The TSF shall enforce the</p> <ol style="list-style-type: none"> 1. Signer Creation SFP to restrict the ability to create the security attributes listed in FIA_USB.1 for Signer to authorized User Managers privileged-user. 2. Generate Signer Key Pair SFP to restrict the ability to generate the security attributes R.SVD and R.Signing_Key_Id to authorized User Managers privileged-user and Signer. 3. Signer Key Pair Deletion SFP⁵⁵ to restrict the ability to destruct⁵⁶ the security attribute R.SVD and R.Signing_Key_Id as part of R.Signer⁵⁷ to authorised Signer⁵⁸ 4. Supply DTBS/R SFP to restrict the ability to create the security attribute R.DTBS/R as part of R.Signer to authorized User Managers privileged-user. 5. Signing SFP to restrict the ability to create the security attribute R.DTBS/R as part of R.Signer to authorized Signer. 6. Signing SFP to restrict the ability to query the security attributes as listed in FIA_USB.1 to authorized Signer. 7. Signer Maintenance SFP to restrict the ability to change the security attributes R.Reference_Signer_Authentication_Data as part of R.Signer to authorized User Managers privileged-user and Signer.
FMT_MSA.1/Privileged User	Management of security attributes
FMT_MSA.1.1/Privileged User	<p>The TSF shall enforce the</p> <ol style="list-style-type: none"> 1. Privileged User Creation SFP to restrict the ability to create and query the security attributes listed in FIA_USB.1 for privileged user to authorised Security Officer privileged-user.

FMT_MSA.2 Secure security attributes

⁵³[assignment: rules for the initial association of attributes]
⁵⁴[assignment: rules for the changing of attributes]
⁵⁵[assignment: access control SFP(s), information flow control SFP(s)]
⁵⁶[assignment: change_default, query, modify, delete, [assignment: other operations]]
⁵⁷[assignment: list of security attributes]
⁵⁸[assignment: the authorised identified roles]

FMT_MSA.2.1 The TSF shall ensure that only secure values are accepted for *all security attributes listed in FIA_USB.1*.

FMT_MSA.3/Signer Static attribute initialization

FMT_MSA.3.1/Signer The TSF shall enforce the *Signer Creation SFP* to provide *restrictive* default values for security attributes that are used to enforce the SFP.

FMT_MSA.3.2/Signer The TSF shall allow the **User Managers** *privileged-user* to specify alternative initial values to override the default values when an object or information is created.

FMT_MSA.3/Privileged User Static attribute initialization

FMT_MSA.3.1/Privileged User The TSF shall enforce the *Privileged User Creation SFP* to provide *restrictive* default values for security attributes that are used to enforce the SFP.

FMT_MSA.3.2/Privileged User The TSF shall allow the **Security Officer** *privileged-user* to specify alternative initial values to override the default values when an object or information is created.

FMT_MTD.1 Management of TSF data

FMT_MTD.1.1 The TSF shall restrict the ability to

1. *Modify* the *R.TSF_DATA* data to **Security Officer** *privileged-user*.

Application Note 79 (PP)

The TSF data includes configuration of administrator roles.

FMT_SMF.1 Specification of Management Functions

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

1. *Signer management*,
2. *Privileged user management*,
3. *Configuration management*,
4. *[assignment: None⁵⁹]*.

FMT_SMR.2 Restrictions on security roles

FMT_SMR.2.1 The TSF shall maintain the roles: *Signer and Privileged User*, *[assignment: Security Officer and User Manager⁶⁰]*.

FMT_SMR.2.2 The TSF shall be able to associate users with roles.

FMT_SMR.2.3 The TSF shall ensure that the conditions *Signer can't be a privileged user* are satisfied.

Application Note 80 (ST)

A user having any of the roles “Security Officer” or “User Manager” automatically has the role privileged user (See Application Note 50 for a list of authorized operations).

⁵⁹[assignment: additional list of management functions to be provided by the TSF]

⁶⁰[assignment: other authorized identified roles]

6.4.6 Protection of the TSF (FPT)

FPT_PHP.1	Passive
FPT_PHP.1.1	The TSF shall provide unambiguous detection of physical tampering that might compromise the TSF.
FPT_PHP.1.2	The TSF shall provide the capability to determine whether physical tampering with the TSF's devices or TSF's elements has occurred.

Application Note 81 (PP)

Passive detection of a physical attack is typically achieved by using physical seals and an appropriate physical design of the TOE that allows the TOE administrator to verify the physical integrity of the TOE as part of a routine inspection procedure.

Because of the requirement for a physically secure environment with regular inspections (cf. OE.ENV), the level of protection (and hence resistance to attack potential) that is required by the implementation of FPT_PHP.1 for this TOE is equivalent to the physical security mechanisms for tamper detection and response required by section 7.7.2 Physical security general requirements and section 7.7.3 Physical security requirements for each physical security embodiment in [ISO/IEC 19790] for Security Level 3.

FPT_PHP.3	Resistance
FPT_PHP.3.1	The TSF shall resist [assignment: <i>physical manipulation</i> ⁶¹] to the [assignment: <i>Cryptographic Module</i> ⁶²] by responding automatically such that the SFRs are always enforced.

Application Note 82 (ST)

The TOE is implemented as a local application within the same physical boundary as the Cryptographic Module defined in [CEN EN 419 221-5], and so the SFRs FTP_PHP* rely on the similar SFRs described in the ST for the Cryptographic Module.

Application Note 83 (PP)

This SFR is linked to the requirements for passive detection of physical attacks in FPT_PHP.1, and should identify the relevant responses of the TOE involved in meeting the key zeroisation requirements of [ISO/IEC 19790] Security Level 3. As in the case of FPT_PHP.1, because of the requirement for a physically secure environment with regular inspections (cf. OE.ENV), the level of protection (and hence resistance to attack potential) that is required by the implementation of FPT_PHP.3 for this TOE is equivalent to the level of assessment for this aspect of tamper detection and response required for section 7.7.2 Physical security general requirements and section 7.7.3 Physical security requirements by each physical security embodiment in [ISO/IEC 19790] for Security Level 3.

FPT_RPL.1	Replay detection
FPT_RPL.1.1	The TSF shall detect replay for the following entities: <i>R.SAD</i> .
FPT_RPL.1.2	The TSF shall perform <i>reject the signature operation</i> when replay is detected.

Application Note 84 (ST)

Replays of the R.SAD will be detected and signature operations rejected by validating that the expiration time of the authorization token use has not been exceeded.

FPT_STM.1	Reliable time stamps
FPT_STM.1.1	The TSF shall be able to provide reliable time stamps.

Application Note 85 (PP)

The TOE may receive a reliable time source from its environment.

⁶¹[assignment: physical tampering scenarios]

⁶²[assignment: list of TSF devices/elements]

Application Note 86 (ST)

The TOE relies on the Cryptographic Module defined in [CEN EN 419 221-5] for reliable timestamps, and so the SFR FPT_STM.1 described in the ST for the Cryptographic Module applies.

FPT_TDC.1	Inter-TSF basic TSF data consistency
FPT_TDC.1.1	<p>The TSF shall provide the capability to consistently interpret</p> <ol style="list-style-type: none">1. <i>R.Signer</i>,2. <i>R.Reference_Signer_Authentication_Data</i>,3. <i>R.SAD</i>,4. <i>R.DTBS/R</i>,5. <i>R.SVD</i>,6. <i>R.Privileged_User</i>,7. <i>R.Reference_Privileged_User_Authentication_Data</i>,8. <i>R.TSF_DATA</i> <p>when shared between the TSF and another trusted IT product.</p>
FPT_TDC.1.2	<p>The TSF shall use <i>data integrity either on data or on communication channel</i> when interpreting the TSF data from another trusted IT product.</p>

Application Note 87 (PP)

The SFR is used to handle the situation where the whole or part of the above data are stored outside the TOE.

FPT_TDC.1/Audit	Inter-TSF basic TSF data consistency
FPT_TDC.1.1/Audit	<p>The TSF shall provide the capability to consistently interpret [assignment: <i>R.Audit</i>⁶³] when shared between the TSF and another trusted IT product.</p>
FPT_TDC.1.2/Audit	<p>The TSF shall use [assignment: <i>data integrity on data</i>⁶⁴] when interpreting the TSF data from another trusted IT product.</p>

6.4.7 Trusted Paths/Channels (FTP)

FTP_TRP.1/SSA	Inter-TSF Trusted path
FTP_TRP.1.1/SSA	<p>The TSF shall provide a communication path between itself and <i>privileged user through SSA</i> 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.</p>
FTP_TRP.1.2/SSA	<p>The TSF shall permit <i>privileged user through SSA</i> to initiate communication via the trusted path.</p>
FTP_TRP.1.3/SSA	<p>The TSF shall require the use of the trusted path for</p> <ol style="list-style-type: none">1. <i>FDP_ACC.1.1/Privileged User Creation</i>,2. <i>FDP_ACC.1/Signer Creation</i>,3. <i>FDP_ACC.1/Signer Maintenance</i>,4. <i>FDP_ACC.1/Signer Key Pair Generation</i>,5. <i>FDP_ACC.1/Signer Key Pair Deletion</i>,

⁶³[assignment: list of TSF data types]

⁶⁴[assignment: list of interpretation rules to be applied by the TSF]

6. *FDP_ACC.1/Supply-DTBS/R*,
7. *FDP_ACC.1/TOE Maintenance*,
8. *[assignment: none⁶⁵]*.

Application Note 88 (PP)

Since it is not all data transmitted to the TOE that needs to be protected in confidentiality, FTP_TRP1/SSA only requires protection from modification.

FTP_TRP1/SIC	Inter-TSF Trusted path
FTP_TRP1.1/SIC	The TSF shall provide a communication path between itself and <i>Remote Signer through the SIC</i> users that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from <i>modification</i> .
FTP_TRP1.2/SIC	The TSF shall permit <i>Remote Signer through SIC</i> to initiate communication via the trusted path.
FTP_TRP1.3/SIC	The TSF shall require the use of the trusted path for <ol style="list-style-type: none"> 1. <i>FDP_ACC.1/Signer Maintenance</i>, 2. <i>FDP_ACC.1/Signer Key Pair Generation</i>, 3. <i>FDP_ACC.1/Signer Key Pair Deletion</i>, 4. <i>FDP_ACC.1/Signing</i>, 5. <i>[assignment: none⁶⁶]</i>.

Application Note 89 (PP)

Since it is not all data transmitted to the TOE that needs to be protected in confidentiality, FTP_TRP1.1/SIC only requires protection from modification. All data transferred from the Signer to the TOE is protected in confidentiality to protect sensitive data.

The TOE is not expected to verify the SIC as a communication end point and it may rely on the signer authentication.

FTP_ITC.1/CM	Inter-TSF trusted channel
FTP_ITC.1.1/CM	The TSF shall provide a communication path between itself and a <i>Cryptographic Module certified according to [CEN EN 419 221-5]</i> that is logically distinct from other communication paths and provides assured authentication of its end points and protection of the communicated data from <i>modification or disclosure</i> .
FTP_ITC.1.2/CM	The TSF shall permit the TSF and a cryptographic module certified according to [CEN EN 419 221-5] to initiate communication via the trusted channel.
FTP_ITC.1.3/CM	The TSF shall initiate communication via the trusted channel for <i>[assignment: signature validation, signature generation, integrity protection, encryption, decryption, random number generation, cryptographic key generation⁶⁷]</i> .

Application Note 90 (ST)

Since the TOE and the Cryptographic Module are located within the same hardware appliance the trusted channel is mapped in the Security Target to the physical configuration, and no additional authentication or cryptographic protection are required (because of the physical security assumed in the appliance environment).

⁶⁵[assignment: other services for which trusted path is required]

⁶⁶[assignment: other services for which trusted path is required]

⁶⁷[assignment: list of functions for which a trusted channel is required]

6.5 Security Assurance Requirements

The security assurance requirement level is EAL4 augmented with AVA_VAN.5. The assurance components are identified in the table below with the augmented item in bold.

Since the TOE is operated in a physically protected environment as described in OE.ENV an evaluation against this PP will probably not include physical attacks.

Assurance Class	Assurance Components
Development (ADV)	Security architecture description (ADV_ARC.1) Complete functional specification (ADV_FSP.4) Implementation representation of the TSF (ADV_IMP.1) Basic modular design (ADV_TDS.3)
Guidance documents (AGD)	Operational user guidance (AGD_OPE.1) Preparative procedures (AGD_PRE.1)
Life-cycle support (ALC)	Production support, acceptance procedures and automation (ALC_CMC.4) Problem tracking CM coverage (ALC_CMS.4) Delivery procedures (ALC_DEL.1) Identification of security measures (ALC_DVS.1) Developer defined life-cycle model (ALC_LCD.1) Well-defined development tools (ALC_TAT.1)
Security Target evaluation (ASE)	Conformance claims (ASE_CCL.1) Extended components definition (ASE_ECD.1) ST introduction (ASE_INT.1) Security objectives (ASE_OBJ.2) Derived security requirements (ASE_REQ.2) Security problem definition (ASE_SPD.1) TOE summary specification (ASE_TSS.1)
Tests (ATE)	Analysis of coverage (ATE_COV.2) Testing: basic design (ATE_DPT.1) Functional testing (ATE_FUN.1) Independent testing – sample (ATE_IND.2)
Vulnerability assessment (AVA)	Advanced methodical vulnerability analysis (AVA_VAN.5)

Table 8: Assurance Components

7 TOE Summary Specification

The TOE employs a variety of security functionality (TSF) to satisfy the SFRs in order to provide creation of digital signatures. This chapter summarizes the security capabilities of the TOE to clarify the solutions implemented to ensure that the SFRs are satisfied.

Each of the following sections describe the security functionality related to one of the SFR classes identified in Section 6.

7.1 Security Audit (FAU)

The security functionality described below satisfies FAU_GEN.1 and FAU_GEN.2.

Audit logging is implemented in the TOE, and it recognizes and creates records for all security relevant events and user specific events. The security relevant events are all changes to the system that may impact the overall system security and contains all operations invoked through the Administration Client using the administrator protocol. The user specific events are all operations related to specific users. This allows auditing events pertaining to a given user account. This contains operations done in the Administration SDK and the SIC. Events logged include usage of the signing key of a signer user and the generation of certification requests instigated by a given privileged user with the user manager role.

Each log entry contains basic information about the event that occurred such as description and time stamp. For relevant events the log entry also includes the DTBS/R. For failure events, the failure is indicated in the log entry. The log entries never contain data that can be used for retrieving sensitive data like R.SAD, R.Authentication_Data, or R.Authorisation_Data.

The identity of the relevant user is included in the log entries when applicable. For privileged users the command signature is verified to determine the relevant user. For signer users each operation is authorized by an authorization token which includes the identity of the user. Each log entry can subsequently be associated to the user (R.Signer or R.Privileged_User) who caused the event except for logs of system events not instigated by a user.

The resulting audit records are stored securely in the external storage and are protected from modification. The audit records for TOE management events are also protected against deletion.

7.2 Cryptographic Support (FCS)

The security functionality described below satisfies FCS_CKM.1 and FCS_CKM.4 regarding cryptographic keys, and FCS_COP.1 regarding cryptographic operation.

7.2.1 Cryptographic Keys

The generation of signing keys is handled by the Cryptographic Module. Key generation is invoked with appropriate parameters such as key type and size. The usage of a Cryptographic Module certified in conformance with [CEN EN 419 221-5] ensures the quality of the generated keys. Cryptographic keys are destroyed by zeroisation when they are no longer in use.

7.2.2 Cryptographic Operation

Digital signatures can be generated using a signing key. The signer user can choose between the approved variations of hash functions and encodings as defined in FCS_COP.1.

7.3 User Data Protection (FDP)

The protection of user data is the most comprehensive part of the security functionality of the TOE. Multiple entities must be protected for the two kinds of users in the system; Signer users and privileged users. Data must be protected through the entire lifecycle from creation over e.g. maintenance, usage, and renewal to the possible destruction if the data is no longer used. The sections below describe the security functionality implemented to ensure the protection of user data.

7.3.1 Access Control

Access control is vital to the prevention of unauthorized use of the system and unauthorized access to and modification of the data in the system. The security functionality described in this section satisfies the SFRs regarding access control; FDP_ACC.1 and FDP_ACF.1.

Creation of Privileged Users

Privileged users can only be created at initialization of the TOE and later by other privileged users who have been authorized to do so, i.e. the security officers. Roles and privileges are applied to privileged users to enforce what each user is authorized to do, including the creation of new privileged users.

Privileged users are divided by their responsibilities by assigning them one of two roles; Security Officer and User Manager. The initial privileged users created when initializing the TOE are all security officers. The Security Officers and no other privileged users are authorized to create other privileged users.

To create a new privileged user, the command used for creating users must be signed by one or more security officers to be accepted by the TOE.

For all new privileged users including those created at initialization, the owner is required to be physically present at creation of the user in Signer to ensure secrecy of credentials.

Creation of Signer Users

Signer users can only be created by privileged users who are authorized to do so by assigned role; the User manager role. No other privileged users are authorized to create signer users. To create a new signer user, the User manager must be authenticated through the administrator protocol (using the Administration SDK), and it is verified that he is authorized to create signer users. The User manager initiates the user creation and the authentication data of the new user is created and stored securely.

Signer User Maintenance

The maintenance of a signer user is carried out by user managers. Only authenticated user managers are authorized to perform signer user maintenance tasks.

Signing key generation is carried out by user managers. Only authenticated user managers are authorized to create signing keys. Key pairs are created by the Cryptographic Module. During creation, the signing key is linked to the signer user who will hereafter be the owner of the key.

The signature verification data consisting of the public key is transformed into a certificate request. The certification is done by a trusted external CA and the resulting certificate is bound to the R.Signer representation and to the signing key.

Multiple Cryptographic Modules can be used for key generation. This does not pose a problem since the user data, the authorization data, and the binding of data to user is offloaded from the TOE and securely stored externally. Access to the private signing key is only granted to the signer user owning the key. No other signer user or privileged user can access the private signing key.

Signing

The DTBS/R is always supplied to the TOE by the signer user as part of the SAP prior to the signature operation. The DTBS/R can cover multiple documents to be signed and all signing happens in a single TOE invocation with an authorization token that provides evidence of authentication of the signer user.

The TSF verifies the R.SAD as part of the Signature Activation Protocol. The TSF checks that the SAD elements are linked and ensures that the signer user is strongly authenticated. The TOE then establishes the authorization data needed for the signature operation.

Optionally it is verified that the signing key is linked to a signing key certificate and that it has not expired.

The signer user is strongly authenticated, and it is verified that the signer user is authorized to create signatures. No one but the owner of the signer user can achieve access to the signing key for creating signatures on behalf of the signer user.

TOE Maintenance

The maintenance of the TOE is handled by privileged users with the security officer role. The security officers can manage roles, privileges and configuration of the TOE. Security officers are the only users with privilege to maintain the TOE.

The security officers must be authenticated before maintaining the TOE configuration. The TOE verifies that he is authorized to do maintenance before allowing any maintenance operations. No other users are allowed to use the maintenance functionality.

7.3.2 Information Flow

This section describes security functionality pertaining to flow of information including external storage of user data. This section also describes the security attributes of the signer users and privileged users which are subject to the described data flow. This security functionality satisfies the following SFRs: FDP_IFC.1 and FDP_IFF.1.

The security functionality enforcing confidentiality and integrity during data exchange is also described in this section. The functionality described satisfies FDP_UCT.1 and FDP_UIT.1.

Signer Data Exchange

The TOE stores data in an external repository to meet requirements on capacity and redundancy. The signer user data and associated security attributes are always stored together and associated unambiguously to each other. The data is securely exchanged with the external storage.

The information flow is secure as long as the system is properly initialized and signer users created properly. The TOE prevents flow of sensitive information when the system has not been initialized.

When the system is initialized and the initial Security officers are created, these can create other types of privileged users, e.g. User managers. A User manager can securely create a representation of a signer user. The attributes associated with the representation are protected in integrity and when needed also in confidentiality, e.g. the signing key. The TOE supports secure handling of sensitive data included in the signer representation R.Signer.

When a signer user has been created as described above, the TOE can securely use the Cryptographic Module to generate signing key pairs. The TOE can assign R.Signing_Key_Id and R.SVD to the signer representation R.Signer and it protects the R.SVD against modification before it is certified. The signer user can only perform signature operations if created and assigned a signing key as described above.

When the TOE receives the R.Signer representation from the external storage the integrity of the data is verified. The unambiguous association between user data and security attributes are upheld for the signer user data and the confidentiality of the data is also secured. The interpretation of the data is as intended, also after external storage.

Privileged User Data Exchange

When placing data of privileged users in external storage, it is integrity protected. Privileged user data is always stored with the associated security attributes. The externally stored privileged user data and security attributes are always unambiguously associated to each other.

The information flow is secure as long as the system is initialized and privileged users created according to the documentation. The TOE prevents flow of sensitive privileged user information when the system is not correctly initialized or the privileged user has not been authenticated.

When the system is initialized and the initial privileged users are created, it is possible to securely create additional privileged users with the desired roles and privileges. Privileged users of the type security officer may then access the security attributes of other privileged users. All privileged users may access their own security attributes.

When the TOE receives privileged user data from external storage, the integrity of the data is verified, before it can be used. The unambiguous association between privileged user data and security attributes are upheld for the privileged user data and the confidentiality of the data is also secured. The interpretation of the data is as intended, also after external storage.

Data Transfer Protection

The signer user's private signing key is confidentially stored externally. The private key is never exchanged besides this. All data in the SAP is transmitted over TLS allowing the signer user to transmit and receive data in a manner protected

from unauthorized disclosure. The TOE verifies the integrity of incoming data to protect against any form of modification.

The access control and information flow control are enforced to be able to transmit and receive user data in a manner protected from modification and insertion for all security attributes for R.Signer and R.Privileged_User, and from modification and replay for R.SAD.

It can be determined on receipt of user data whether modification, deletion, and insertion occurred for all security attributes as defined in R.Signer and R.Privileged_User, and for R.SAD for modification and insertion.

As a measure for replay prevention the R.SAD contains an expiration time. Expired assertions will not be accepted by the TOE. As an additional protection against replay of the R.SAD the SSA keeps a ledger of R.SAD send to the TOE and will reject all requests attempting to replay such R.SAD objects. The use of TLS adds additional replay prevention.

7.4 Identification and Authentication (FIA)

The security functionality described in this section pertains to the identification and authentication of signer users and privileged users in the TOE. First, the signer user security attributes and the binding of these to the signer users and privileged users is described. This covers how the SFRs FIA_ATD.1 and FIA_USB.1 are satisfied. Then authentication is described in detail, covering the security functionality satisfying the SFRs FIA_UAU.1, FIA_UID.2, and FIA_UAU.5.

7.4.1 Security Attributes

Users of the TOE are all associated with relevant security attributes. The TOE maintains security attributes belonging to individual users depending on user type, i.e. whether the user is a signer user or a privileged user. The following security attributes are maintained for each user:

- Signer user: R.Reference_Signer_Authentication_Data, R.Signing_Key_Id, R.SVD, R.Signer
- Privileged user: R.Reference_Privileged_User_Authentication_Data, Role

When users are created the TOE enforces that the creating privileged user is authorized to create a new user, i.e. has the role needed for user creation; Security officer for privileged user creation and User manager for signer user creation.

Some user security attributes (including R.Signing_Key_ID and R.SVD) may initially be empty. R.DTBS/R is not a signer user security attribute, but is supplied by the signer user prior to signature operations.

Users modifying the security attributes of a signer user must be authorized to do so. Privileged users must be assigned the appropriate privileges to be allowed to maintain the security attributes of a signer user.

7.4.2 Authentication

To perform TOE operations, users must be unambiguously identified and authenticated which associates the users with their own and no other security attributes including the privileges determining their authority to interact with the TOE. Identification and authentication mechanisms are separate for privileged users and signer users.

Privileged users must be successfully authenticated before they are allowed to do operations such as creating or managing signer users. The privileged user initiates communication by sending commands signed with a private key which must be stored securely. Each command the TOE receives is verified to ensure that it contains a valid signature from the privileged user(s) issuing the command.

Signer users must be successfully identified and authenticated with a trusted IdP. The IdP issues an authorization token which provides strong evidence of the authentication of the signer user. The TOE validates the authorization token before any operation is performed on behalf of a signer user.

When the signer user initiates the signing command, the TOE validates the SAD before passing the R.DTBS/R and the R.Authorisation_Data i.e. the private signing key of the authenticated signer user to the Cryptographic Module for signing. This ensures that identification and authentication of the signer users is done before signing and that the signer users are unambiguously associated with their private signing key.

Since authentication is delegated to external IdP(s), the responsibility of detection of multiple failed authentication attempts is also deferred to the IdP(s). If the validation of an authorization token fails, it will be audit logged.

7.5 Security Management (FMT)

The management of the security of the TOE is described in this section and includes the separation of privileged users and their ability to manage the security of the system if authorized to. The SFRs covered in this section are FMT_MSA.1, FMT_MSA.2, FMT_MSA.3, FMT_MTD.1, and FMT_SMF.1.

The security protocols of the TOE restricts the creation and management of signer users and privileged users to privileged users who have been assigned the appropriate privileges. The security protocols also restrict the management of system security attributes and data to privileged users of the security officer role. Only secure values are accepted for all security attributes.

Privileged users and signer users are created separately and as different entity types in the system and the type of user is maintained at all times. This implies that any user is either a privileged user or a signer user and thus a signer user never can be a privileged user. Once a user is created as either a signer user or a privileged user, the user type cannot be changed.

The creation and management of signer user security attributes are restricted to privileged users who have been assigned the user manager role. Creation of security attributes, assignment of privileges for being assigned a signing key, generation of R.SVD and R.Signing_Key_Id, and destruction of attributes is only allowed for privileged users who have been authorized to do so. Other management and use of security attributes is restricted to the owner of the R.Signer user. Restricted operations only allowed by the owner includes the ability to query the security attributes and to supply the R.DTBS/R. When signer users are created, restrictive default values are provided for security attributes when relevant.

When the TOE is initialized, two to four initial privileged users with the security officer role are created. Hereafter the ability to create privileged user and to query the security attributes of a privileged user is restricted to privileged users who have been assigned the security officer role. After creation of a privileged user, the security attributes have been assigned to the user. The security attribute representing the role of a privileged user is chosen on user creation and cannot be modified in the user lifetime. The public key for authentication is also assigned at creation.

The ability to modify security data including configuration of privileged user roles is restricted to Security officers. Through the Administration Client and the Administration SDK, management of signer users, management of privileged users, and configuration management can be performed.

Every command to change the system configuration must be signed by either one Security officer, or by two Security officers where dual control is required. When the command arrives at the TOE it is validated against the current privileged user role configuration and it is verified that the signature(s) on the command are valid. If the command is verified and the signing user(s) are authorized to complete the command, the command is handled and the result created. All verification, command handling, and result creation is performed in a single operation inside the TOE to prevent unauthorized access. All system changes are audit logged and thus the state of the TOE can be seen as a series of signed transformations, using audit logged commands, from the initial state to the current state.

7.6 Protection of the TSF (FPT)

The security functionality of the TOE is protected in various ways which will be described in this section. The section describes how the SFRs FPT_RPL.1 and FPT_TDC.1 are satisfied.

The TOE and the Cryptographic Module reside within the same physical boundary, and are placed within the tamper-protected environment of the HSM. The capability to determine whether tampering has occurred is provided by this environment. If tampering is detected, the Cryptographic Module will cease to function and thus no security operations through the TOE can be performed.

When security functions data is stored outside the TOE, it is integrity protected and the TOE has the capability to consistently interpret security essential data when the data returns to the TOE. Appropriate configuration is essential for protecting the security of the system and only security officers role can configure the TOE.

As described in Section 7.3 user data and security attributes are stored securely outside the TOE. The R.SAD is protected from replay by the use of a short expiration time. Execution of a signature operation is rejected when R.SAD expiration is detected. R.SAD expiration detection is logged for auditing purposes.

7.7 Trusted Paths/Channels (FTP)

This section pertains to the means of providing trusted communication between the users and the TSF, and between TSFs, and it describes how SFRs FTP_ITC.1 and FTP_TRP.1 are satisfied.

For the privileged user, trusted communication paths are provided between the Administration Client and the TOE and between the Administration SDK and the TOE through the SSA. Each path is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from modification by means of signed commands. The data communicated over the trusted path is integrity protected and for security relevant data also protected in confidentiality.

Privileged users are permitted to initiate communication via the above-mentioned trusted paths. The trusted paths must be used whenever a privileged user uses the Administration Client or Administration SDK for creating other privileged users, creating and maintaining signer users, generating signing key pairs, and performing TOE maintenance. The TOE rejects communication which is not transmitted via the trusted path.

For the signer user a trusted path is provided between the SIC and the TOE through the SSA. The connection from the signer user to the TOE is only used for the signature operation. The signer user authenticates to the IdP over a TLS connection. The authenticated TLS connection is then used to establish R.SAD with the consent of the signer user. The R.SAD is protected in integrity by the IdP signing the R.SAD. The R.SAD is then transmitted from the IdP to the SSA through the SIC. While being transmitted, the R.SAD is protected in confidentiality by using TLS. Finally, the SSA transfers the R.SAD to the TOE.

The SAM and the Cryptographic Module comprising the TOE are located within the physical boundary of the same hardware appliance and thus the communicated data is protected from modification and disclosure and no authorization is required.

The SAM will always initiate the communication since the Cryptographic Module does not have any knowledge of the functionality of the SAM. The SAM sends a request and awaits the response for all uses of the Cryptographic Module.

8 Rationale

8.1 Security Requirements Rationale

8.1.1 Security Requirements Coverage

The following table is used to demonstrate that every SFR is used to cover an objective and that every objective is covered by an SFR. The table is not complete in the sense that all possible crosses are created.

	OT.SIGNER_PROTECTION	OT.REFERENCE_SIGNER_AUTHENTICATION_DATA	OT.SIGNER_KEY_PAIR_GENERATION	OT.SVD	OT.PRIVILEGED_USER_MANAGEMENT	OT.PRIVILEGED_USER_AUTHENTICATION	OT.PRIVILEGED_USER_PROTECTION	OT.SIGNER_MANAGEMENT	OT.SYSTEM_PROTECTION	OT.AUDIT_PROTECTION	OT.SAD_VERIFICATION	OT.SAP	OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION	OT.DTBSR_INTEGRITY	OT.SIGNATURE_INTEGRITY	OT.CRYPTO	OT.RANDOM	[OT.SIGNING_KEY_CERTIFICATE_REFERENCE]
Security Audit																		
FAU_GEN.1	X	.	.	.	.	.	.	.	.
FAU_GEN.2	X	.	.	.	.	.	.	.	.
Cryptographic Support																		
FCS_CKM.1/RSA	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
FCS_CKM.4	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FCS_COP.1	.	.	X	.	.	.	.	.	.	.	.	.	.	.	X	X	.	.
FCS_RNG.1	X	.
User Data Protection																		
FDP_ACC.1/Privileged User Creation	X	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACF.1/Privileged User Creation	X	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACC.1/Signer Creation	.	X	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.
FDP_ACF.1/Signer Creation	.	X	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.
FDP_ACC.1/Signer Maintenance	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACF.1/Signer Maintenance	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACC.1/Signer Key Pair Generation	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACF.1/Signer Key Pair Generation	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ACC.1/Signer Key Pair Deletion	✘
FDP_ACF.1/Signer Key Pair Deletion	✘
FDP_ACC.1/Supply DTBS/R	✘
FDP_ACF.1/Supply DTBS/R	✘
FDP_ACC.1/Signing	X	.	.	.	X	.	.	.
FDP_ACF.1/Signing	X	.	.	.	X	.	.	[X]
FDP_ACC.1/TOE Maintenance	X	.	.	.	.	.	.	.	.	.
FDP_ACF.1/TOE Maintenance	X	.	.	.	.	.	.	.	.	.
FDP_ETC.2/Signer	✘
FDP_IFC.1/Signer	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_IFF.1/Signer	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_ETC.2/Privileged User	✘	.	✘
FDP_IFC.1/Privileged User	X	.	X	.	.	.	.	.	.	.	.	.	.	.
FDP_IFF.1/privileged User	X	.	X	.	.	.	.	.	.	.	.	.	.	.
FDP_ITC.2/Signer	✘
FDP_ITC.2/Privileged User	✘	.	✘
FDP_UCT.1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FDP_UIT.1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

	OT.SIGNER_PROTECTION	OT.REFERENCE_SIGNER_AUTHENTICATION_DATA	OT.SIGNER_KEY_PAIR_GENERATION	OT.SVD	OT.PRIVILEGED_USER_MANAGEMENT	OT.PRIVILEGED_USER_AUTHENTICATION	OT.PRIVILEGED_USER_PROTECTION	OT.SIGNER_MANAGEMENT	OT.SYSTEM_PROTECTION	OT.AUDIT_PROTECTION	OT.SAD_VERIFICATION	OT.SAP	OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION	OT.DTBSR_INTEGRITY	OT.SIGNATURE_INTEGRITY	OT.CRYPTO	OT.RANDOM	[OT.SIGNING_KEY_CERTIFICATE_REFERENCE]
Identification and Authentication																		
FIA_AFL.1	*	*
FIA_ATD.1	X	.	.	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.
FIA_UAU.1	X	.	.	.	.	X	.	.	.	.	.	.	.
FIA_UAU.5/Signer	X	.	.	.	.	.	.	.
FIA_UAU.5/Privileged User	X	.	.	.	.	.	.	.	.	.	.	.	.
FIA_UID.2	X	.	X	X	.	.	.	.	.	.	.	.	.	.
FIA_USB.1	X	.	X	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.
Security Management																		
FMT_MSA.1/Signer	X	.	.	.	.	.	.	.	.	.	.
FMT_MSA.1/Privileged User	X	.	.	X	.	.	.	.	.	.	.	.	.	.
FMT_MSA.2	X	.	.	X	.	.	.	.	.	.	.	.	.	.
FMT_MSA.3/Signer	X	.	.	.	.	.	.	.	.	.	.
FMT_MSA.3/Privileged User	X	.	.	.	.	.	.	.	.	.	.	.	.	.
FMT_MTD.1	X	X	.	.	.	.	.	.	.	.	.
FMT_SMF.1	X	.	.	.	.	.	.	.	.	.
FMT_SMR.2	X	.	.	.	.	.	.	.	.	.
Protection of the TSF																		
FPT_PHP.1	X	.	.	.	.	.	.	.	.	.
FPT_PHP.3	X	.	.	.	.	.	.	.	.	.
FPT_RPL.1	X	.	.	.	.	.	.
FPT_STM.1	X	.	.	.	.	.	.	.	.
FPT_TDC.1	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
FPT_TDC.1/Audit	X	.	.	.	.	.	.	.	.
Trusted Path/Channels																		
FTP_TRP.1/SSA	X	.	.	.	.	X	.	.	.	.
FTP_TRP.1/SIC	X	X	X	.	.	.	.
FTP_ITC.1/CM	.	.	X	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.

Table 9: Security Requirements and Objectives Coverage

OT.SIGNER_PROTECTION is handled by requirements for management, access control, protection, and exchange of R.Signer in a secure way. (FDP_IFC.1/Signer, FDP_IFF.1/Signer, FDP_UCT.1, FDP_UIT.1 and FPT_TDC.1). The actual description of the data is described in FIA_ATD.1 and FIA_USB.1. –OT.SIGNER_PROTECTION is handled by requirements export and import of R.Signer in a secure way. (FDP_ETC.2/Signer, FDP_IFC.1/Signer, FDP_IFF.1/Signer, FDP_ITC.2/Signer, FDP_UCT.1, FDP_UIT.1 and FPT_TDC.1). The actual description of the data is described in FIA_ATD.1 and FIA_USB.1.–

OT.REFERENCE_SIGNER_AUTHENTICATION_DATA is handled by FDP_ACC.1/Signer Creation, FDP_ACF.1/Signer Creation, FDP_ACC.1/Signer Maintenance and FDP_ACF.1/Signer Maintenance which describes access control for creating and updating R.Signer and R.Reference_Signer_Authentication_Data.

OT.SIGNER_KEY_PAIR_GENERATION is handled by the requirements for key generation and cryptographic algorithms in FCS_CKM.1 and FCS_COP.1. FCS_RNG.1 provides a random source for key generation. FCS_CKM.4 describes the requirements for key destruction. FDP_ACC.1/Signer Key Pair Generation and FDP_ACF.1/Signer Key Pair Generation describes access

control for creating a key pair. FIA_USB.1 describes that R.Signing_Key_Id is associated with Signer. FTP_ITC.1/CM can be used to communicate securely with a Cryptographic Module.

OT.SVD is handled by the requirements in FDP_ACC.1/Signer Key Pair Generation and FDP_ACF.1/Signer Key Pair Generation.

OT.PRIVILEGED_USER_MANAGEMENT is handled by requirements for access control in FDP_ACC.1/Privileged User Creation and FDP_ACF.1/Privileged User Creation. ~~OT.PRIVILEGED_USER_MANAGEMENT is handled by requirements for export and import of R.Privileged_User in a secure way (FDP_ETC.2/Privileged User, FDP_IFC.1/Privileged User, FDP_IFF.1/Privileged User, FDP_ITC.2/Privileged User and FPT_TDC.1).~~ The actual description of the data is described in FIA_ATD.1 and FIA_USB.1. Authentication of privileged users is handled by FIA_UID.2, FMT_MSA.1/Privileged User, FMT_MSA.2, and FMT_MSA.3/Privileged User. FDP_ACC.1/Privileged User Creation and FDP_ACF.1/Privileged User Creation describes access controls for creating privileged users.

OT.PRIVILEGED_USER_AUTHENTICATION is handled by FIA_AFL.4, FIA_UAU.1 and FIA_UAU.5/Privileged User.

OT.PRIVILEGED_USER_PROTECTION is handled by requirements for management, access control, protection, and exchange of R.Privileged User in a secure way (FDP_IFC.1/Privileged User, FDP_IFF.1/Privileged User, and FPT_TDC.1). ~~OT.PRIVILEGED_USER_PROTECTION is handled by requirements for export and import of R.Privileged_User in a secure way (FDP_ETC.2/Privileged User, FDP_IFC.1/Privileged User, FDP_IFF.1/Privileged User, FDP_ITC.2/Privileged User and FPT_TDC.1).~~ The actual description of the data is described in FIA_ATD.1 and FIA_USB.1. FIA_UID.2 ensures that privileged users are authenticated they can carry out any operation.

OT.SIGNER_MANAGEMENT is handled by the requirements for access control in FDP_ACC.1/Signer Creation, FDP_ACF.1/Signer Creation, FDP_ACC.1/Signer Maintenance and FDP_ACF.1/Signer Maintenance. Authentication of Signers and privileged users are handled by FIA_UID.2, FMT_MSA.1/Signer, FMT_MSA.1/Privileged User, FMT_MSA.2, FMT_MSA.3/Signer and FMT_MSA.3/Privileged User.

OT.SYSTEM_PROTECTION is handled by FMT_MTD.1, FMT_SMF.1 and FMT_SMR.2. FDP_ACC.1/TOE Maintenance and FDP_ACF.1/TOE Maintenance describes access control rules for managing TSF data. FPT_PHP.1 and FPT_PHP.3 describes requirements for TSF protection. [The physical protection is provided by a CM conformant with [CEN EN 419 221-5]]. FTP_TRP.1/SSA describes that only a privileged user can maintain the TOE.

OT.AUDIT_PROTECTION is handled by the requirements for audit record generation FAU_GEN.1 and FAU_GEN.2 using reliable time stamps in FPT_STM.1.

OT.SAD_VERIFICATION is handled by FIA_AFL.4, FIA_UAU.1 and FIA_UAU.5/Signer. FDP_ACC.1/Signing and FDP_ACF.1/Signing describes access control rules for the signature operation and well as for SAP verification.

OT.SAP is covered by the requirements FTP_TRP.1/SIC and FPT_RPL.1 the protocol between the SIC and TSF.

OT.SIGNATURE_AUTHENTICATION_DATA_PROTECTION is covered by FTP_TRP.1/SIC, which describes the requirements for data transmitted to the TOE, is protected in integrity.

OT.DTBSR_INTEGRITY is covered by FTP_TRP.1/SSA and FTP_TRP.1/SIC requiring data transmission to be protected in integrity.

OT.SIGNATURE_INTEGRITY is handled by FCS_COP.1, which describes requirements on the algorithms. FTP_ITC.1/CM may be used to transmit data securely between the TOE and the Cryptographic Module. Access control for the signature operation is ensured by FDP_ACC.1/Signing and FDP_ACF.1/Signing.

OT.CRYPTO is covered by FCS_CKM.1 and FCS_COP.1, which describes requirements for key generation and algorithms.

OT.RANDOM is handled by FCS_RNG.1, which describes requirement on the random number generation.

[OT.RANDOM is handled by the Cryptographic Module (CM). The TOE is implemented as a local application inside the same physical boundaries as the CM and thus fulfills the same requirements for random number generation as the CM as defined in [UT_ST].]

[OT.SIGNING_KEY_CERTIFICATE_REFERENCE is covered by FDP_ACF.1/Signing, which, based on OSP.SIGNING_KEY_CERTIFIED, requires the existence of a unique identifier for the signing key certificate and that the expiration date has not exceeded.]

8.2 SFR Dependencies

The dependencies between SFRs are addressed as shown in

Requirement	Dependencies	Fulfilled by
FAU_GEN.1	FPT_STM.1	FPT_STM.1

Requirement	Dependencies	Fulfilled by
FAU_GEN.2	FAU_GEN.1 FIA_UID.1	FAU_GEN.1 FIA_UID.2
FCS_CKM.1	[FCS_CKM.2 or FCS_COP.1] FCS_CKM.4	FCS_COP.1 and FCS_CKM.4
FCS_CKM.4	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1]	FCS_CKM.1
FCS_COP.1	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1] FCS_CKM.4	FCS_CKM.1
FCS_RNG.1	None	No dependencies
FDP_ACC.1/Privileged User Creation	FDP_ACF.1	FDP_ACF.1/Privileged User Creation
FDP_ACC.1/Signer Creation	FDP_ACF.1	FDP_ACF.1/Signer Creation
FDP_ACC.1/Signer Maintenance	FDP_ACF.1	FDP_ACF.1/Signer Maintenance
FDP_ACC.1/Signer Key Pair Generation	FDP_ACF.1	FDP_ACF.1/Signer Key Pair Generation
FDP_ACC.1/Signer Key Pair Deletion	FDP_ACF.1	FDP_ACF.1/Signer Key Pair Deletion
FDP_ACC.1/Supply DTBS/R	FDP_ACF.1	FDP_ACF.1/Supply DTBS/R
FDP_ACC.1/Signing	FDP_ACF.1	FDP_ACF.1/Signing
FDP_ACC.1/TOE Maintenance	FDP_ACF.1	FDP_ACF.1/TOE Maintenance
FDP_ACF.1/Privileged User Creation	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Privileged User Creation FMT_MSA.3/Privileged User
FDP_ACF.1/Signer Creation	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Signer Creation FMT_MSA.3/Signer
FDP_ACF.1/Signer Maintenance	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Signer Maintenance FMT_MSA.3/Signer
FDP_ACF.1/Signer Key Pair Generation	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Signer Key Pair Generation FMT_MSA.3/Signer
FDP_ACF.1/Signer Key Pair Deletion	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Signer Key Pair Deletion FMT_MSA.3/Signer
FDP_ACF.1/Supply DTBS/R	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Supply DTBS/R FMT_MSA.3/Signer
FDP_ACF.1/Signing	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/Signing FMT_MSA.3/Signer
FDP_ACF.1/TOE Maintenance	FDP_ACC.1 FMT_MSA.3	FDP_ACC.1/TOE Maintenance FMT_MSA.3/Privileged User
FDP_ETC.2/Signer	[FDP_ACC.1 or FDP_IFC.1]	FDP_IFC.1/Signer
FDP_ETC.2/Privileged User	[FDP_ACC.1 or FDP_IFC.1]	FDP_IFC.1/Privileged User
FDP_IFC.1/Signer	FDP_IFF.1	FDP_IFF.1/Signer
FDP_IFF.1/Signer	FDP_IFC.1 FMT_MSA.3	FDP_IFC.1/Signer FMT_MSA.3/Signer
FDP_IFC.1/Privileged User	FDP_IFF.1	FDP_IFF.1/Privileged User
FDP_IFF.1/Privileged User	FDP_IFC.1 FMT_MSA.3	FDP_IFC.1/Privileged User FMT_MSA.3/Privileged User

Requirement	Dependencies	Fulfilled by
FDP_ITC.2/Signer	{FDP_ACC.1 or FDP_IFC.1} {FTP_ITC.1 or FTP_TRP.1} FTP_TDC.1	FDP_IFC.1/Signer FTP_TRP.1/SSA and FTP_TRP.1/SIC FPT_TDC.1
FDP_ITC.2/Privileged User	{FDP_ACC.1 or FDP_IFC.1} {FTP_ITC.1 or FTP_TRP.1} FTP_TDC.1	FDP_IFC.1/Privileged User FTP_TRP.1/SSA FPT_TDC.1
FDP_UCT.1	[FTP_ITC.1 or FTP_TRP.1] [FDP_ACC.1 or FDP_IFC.1]	FTP_TRP.1/SSA and FTP_TRP.1/SIC FDP_IFC.1/Signer FDP_IFC.1/Privileged User
FDP_UIT.1	[FDP_ACC.1 or FDP_IFC.1] [FTP_ITC.1 or FTP_TRP.1]	FDP_IFC.1/Signer FDP_IFC.1/Privileged User FTP_TRP.1/SSA and FTP_TRP.1/SIC
FIA_AFL.1	FIA_UAU.1	FIA_UAU.1
FIA_ATD.1	None	No Dependencies
FIA_UAU.1	FIA_UID.1	FIA_UID.2
FIA_UAU.5/Signer	None	No Dependencies
FIA_UAU.5/Privileged User	None	
FIA_UID.2	None	
FIA_USB.1	FIA_ATD.1	FIA_ATD.1
FMT_MSA.1/Signer	[FDP_ACC.1 or FDP_IFC.1] FMT_SMR.1 FMT_SMF.1	FDP_IFC.1/Signer FMT_SMR.2 FMT_SMF.1
FMT_MSA.1/Privileged User	[FDP_ACC.1 or FDP_IFC.1] FMT_SMR.1 FMT_SMF.1	FDP_IFC.1/Privileged User FMT_SMR.2 FMT_SMF.1
FMT_MSA.2	[FDP_ACC.1 or FDP_IFC.1] FMT_MSA.1 FMT_SMR.1	FDP_IFC.1/Signer FDP_IFC.1/Privileged User FMT_MSA.1/Signer FMT_MSA.1/Privileged User FMT_SMR.2
FMT_MSA.3/Signer	FMT_MSA.1 FMT_SMR.1	FMT_MSA.1/Signer FMT_SMR.2
FMT_MSA.3/Privileged User	FMT_MSA.1 FMT_SMR.1	FMT_MSA.1/Privileged FMT_SMR.2
FMT_MTD.1	FMT_SMR.1 FMT_SMF.1	FMT_SMR.2 FMT_SMF.1
FMT_SMF.1	None	No Dependencies
FMT_SMR.2	FIA_UID.1	FIA_UID.2
FPT_RPL.1	None	No Dependencies
FPT_TDC.1	None	No Dependencies
FTP_TRP.1/SSA	None	No Dependencies
FTP_TRP.1/SIC	None	No Dependencies

Requirement	Dependencies	Fulfilled by
FTP_ITC.1/CM	None	No Dependencies

Table 10: SFR Dependencies

8.2.1 Rationales for SARs

EAL4 permits a developer to gain maximum assurance from positive security engineering based on good commercial development practices which, through rigorous, do not require substantial specialist knowledge, skills, and other resources. EAL4 is the highest level at which it is likely to be economically feasible to retrofit to an existing product line.

As the TOE manages signature creation data generation and authorizes its use it manage security attributes which can only be ensured by the TOE. While the TOE is assumed to be in a physically protected environment, it is still subject to logical remote attacks and should be evaluated to deal with High attack potential. EAL4 is therefore augmented with AVA_VAN.5.

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