Data Security Solutions

Security Target

PrivacyDB V2.0

V1.10

OWL Systems Inc.

Jan 11, 2019

The Security Target related to the certified TOE. This Security Target is written in korean and translated from Korean into English.

Revision History

Ver	Date	Author	Revision
V1.0	Sep 15, 2017	Jun-ho You	Initial release
V1.1	Oct 10, 2017	Jeon-gyu Lee	Complement content revisions based on full document indexes
V1.2	Nov 24, 2017	Jun-ho You	Final document before primary consulting contract
V1.3	Aug 02, 2018	Jun-ho You	Complement modifications before certification review
V1.4	Sep 17, 2018	byung-seung Kang	Complement modifications after certification review
V1.5	Sep 28, 2018	byung-seung Kang	Complement modifications after certification review
V1.6	Oct 05, 2018	Jun-ho You	Complement modifications after certification review
V1.7	Nov 06, 2018	Jun-ho You	Complement modifications after certification review
V1.8	Nov 28, 2018	Jun-ho You	Complement modifications after certification review
V1.9	Dec 19, 2018	Jun-ho You	Reflects changes of identifiers by TOE components
V1.10	Jan 11, 2019	Jun-ho You	Modify Operational Environment of the TOE

< Table of Contents >

< List of Figures >

< List of Tables >

1 ST Introduction

This chapter introduces the Security Target (ST) of PrivacyDB V2.0 of OWL Systems Inc.

1.1 ST Reference

Classification	Description
Title	PrivacyDB V2.0 Security Target
Version	V1.10
Author	Jun-ho You of OWL Systems Inc.
Publication Date	January 11, 2019
Common Criteria	Common Criteria for Information Technology Security Evaluation
Common Criteria Version	V3.1 r5
Evaluation Assurance Level	EAL 1+ (ATE_FUN.1)
Keywords	DB encryption, Encryption

[Table-1] ST Reference

1.2 TOE Reference

The components of this TOE are divided into the following three S/W:

Classification		Identifier Information	Type	Distribution type
TOE Identification		PrivacyDB V2.0	-	CD 1
TOE Version		PrivacyDB V2.0.4.9	-	
TOE Component	KMS	Privacy-KMS ver 2.0.4.9	S/W	
	Console	Privacy-Console ver 2.0.2.17	S/W	
	EOC	Privacy-EOC ver 2.0.4.9	S/W	
Guidance		PrivacyDB V2.0 Preparative Procedures V1.8 PrivacyDB V2.0 User Operational Guidance V1.8	PDF	
Developers		Jun-ho, You, head of the OWL Systems Research Institute, 4 other developers		

[Table-2] TOE Reference

1.3 TOE Overview

PrivacyDB V2.0 (hereinafter referred to as the 'TOE') encrypts the database (hereinafter referred to as the 'DB') to prevent unauthorized exposure of the information you want to protect. Cryptographic keys are used to encrypt user data that is managed by the key management server and stored in the DB.
TOE's encryption target is a DB that is managed by the database management system (hereinafter 'DBMS') in the operating environment. This security target defines all data as user data before and after encryption is stored in the DB. Depending on the security policy of the organization that operates the TOE, some or all of the user's data can be encrypted.

1.3.1 TOE Type and Scope

The TOE is provided as software and shall provide the encryption/decryption function for the user data by each column. TOE is the product of DB encryption solution that divided into 'Plug-in' and 'API' depending on where user data is encrypted and decrypted, and supports both.
TOE consists of a management tool (hereinafter 'Console'), a key management server for cryptographic key and security policy management (hereinafter 'KMS'), an API and a Plug-in for encryption and decryption modules (hereinafter 'EOC').

1.3.2 TOE Usage and Major Security Features

TOE provides the ability to encrypt and decrypt in accordance with security policies set by authorized administrators to prevent unauthorized exposure to the information you want to protect.
The TOE is required to use a validated cryptographic module whose security and implementation conformance have been confirmed by the Korea Cryptographic Module Validation Program (KCMVP)
TOE provides various security features such as the security audit function that records and manages major auditable events; cryptographic support function such as cryptographic key management to encrypt the user and the TSF data, and cryptographic operation; user data protection function that encrypts the user data and protects the residual information; identification and authentication function such as verifying the identity of the authorized administrator, authentication failure handling, and mutual authentication among the TOE components; security management function for security functions, role definition, and configuration; TSF protection functions including protecting the TSF data transmitted among the TOE components, protecting the TSF data stored in the storage that is controlled by the TSF, and TSF self-test; and TOE access function to manage the access session of the authorized administrator.
The data encryption key (DEK) used to encrypt and decrypt user data is protected by encryption with the key encryption key (KEK). In addition, to protect stored TSF data and communication between TOE components. It shall be performed using the approved cryptographic algorithm of the validated cryptographic module of which safety and implementation suitabilities are validated using the Korea Cryptographic Module Validation Process (KCMVP).

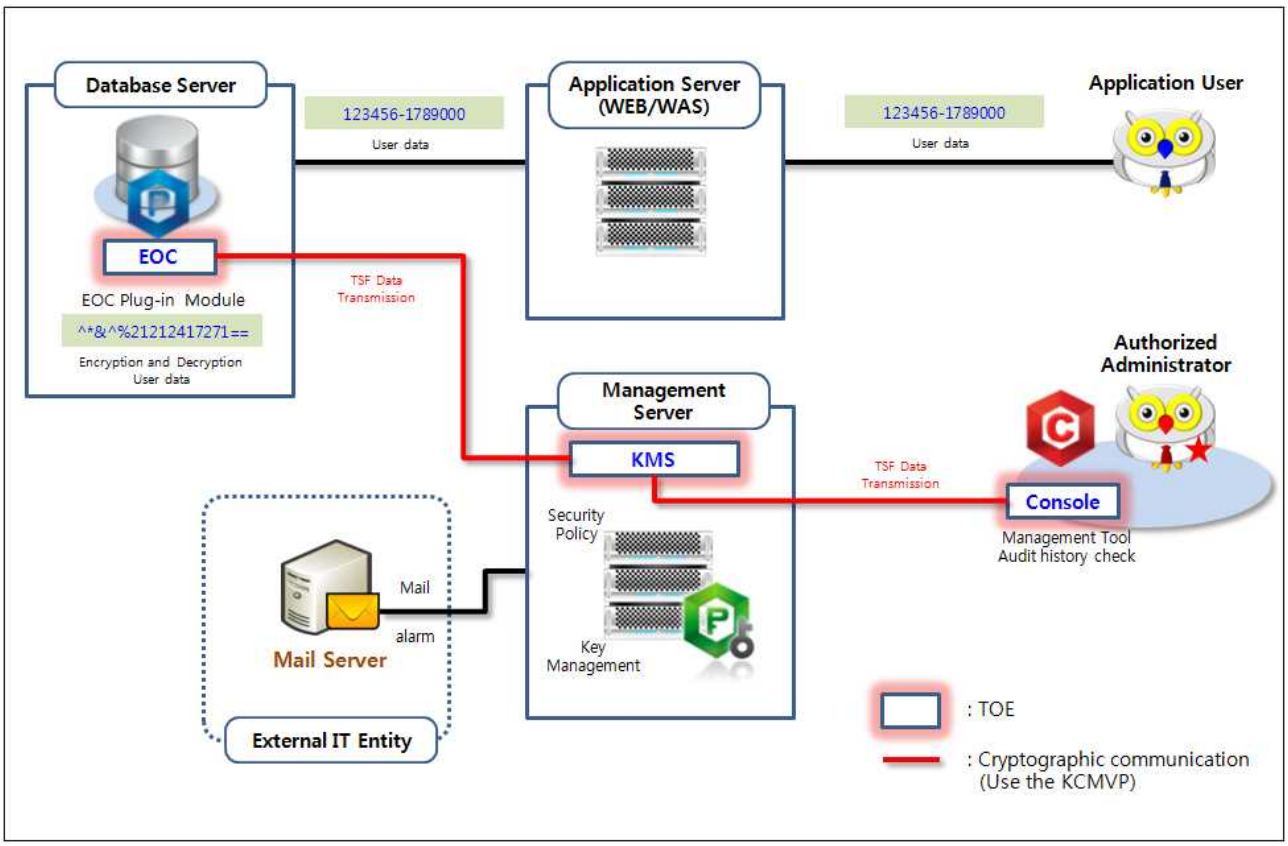
1.3.3 TOE Operational Environment

The operational environment of the TOE can be divided into 'plug-in' and 'API' as shown in the following figure.

The operational environment of the TOE includes a mail server for authorized administrator notifications in potential violation analysis and audit data loss.

[Figure-1], [Figure-2] is a general plug-in operating environment.

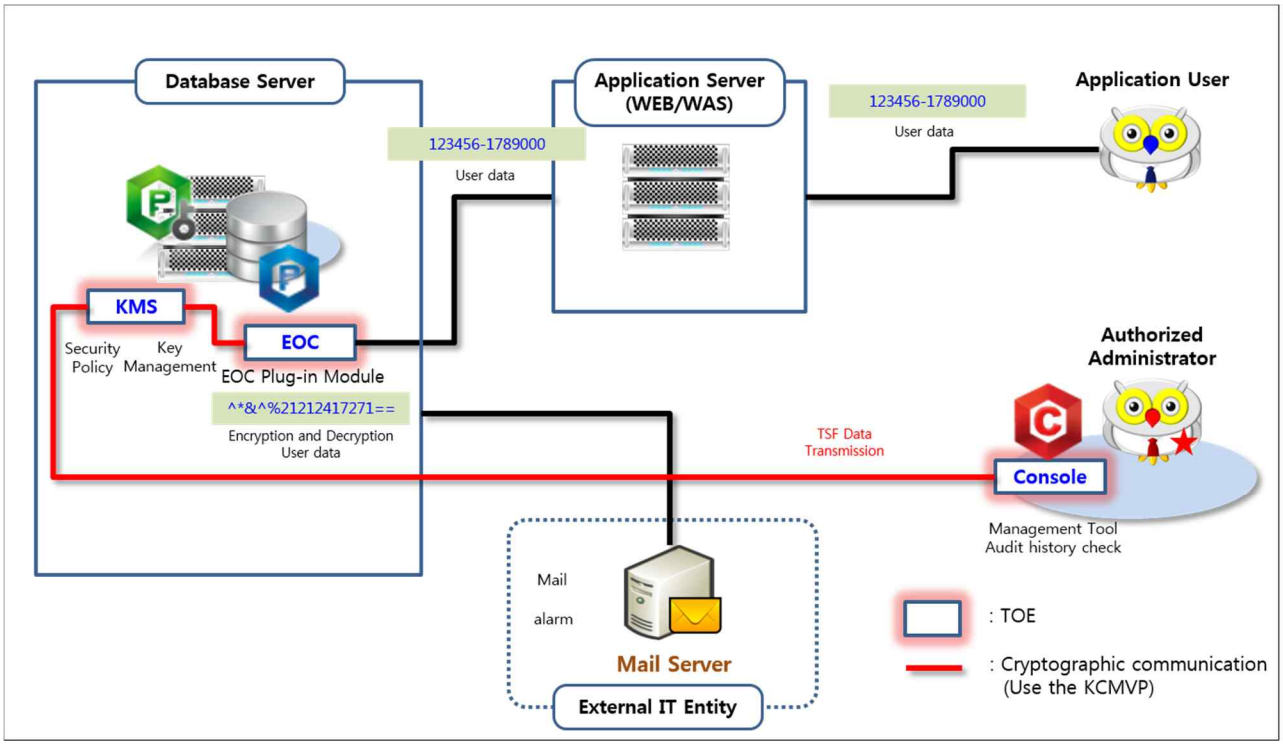
The EOC is installed within the Database Server where the protected DB resides and encrypts the user data received from the Application Server before storing it as DB in accordance with the security policy of an authorized administrator. EOC Performs the decryption of encrypted user data from the Database Server to the Application Server.



[Figure-1] Plug-in type operational environment (EOC, KMS separate type)

An authorized administrator accesses the KMS through the console to perform security management.

An KMS can be installed with an EOC on a Database Server or physically separate from an EOC.

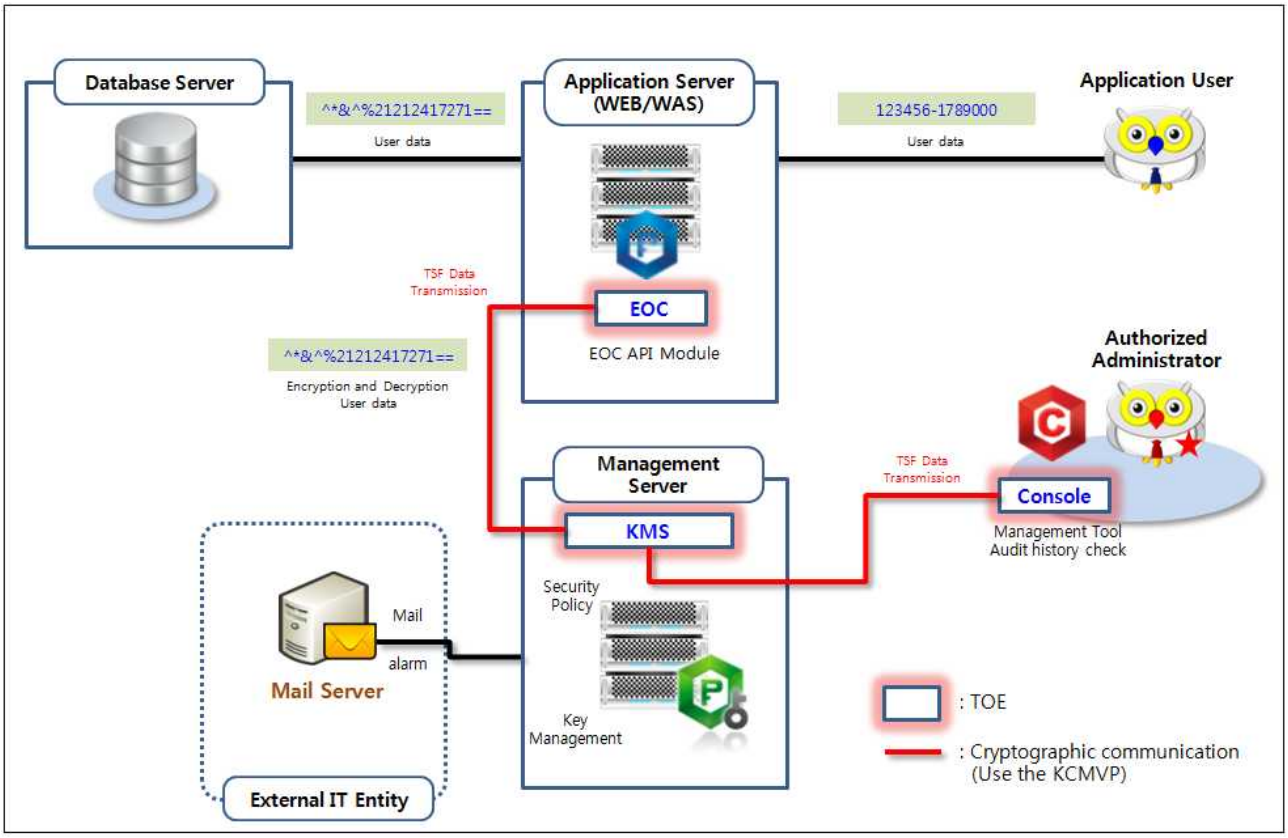


[Figure-2] Plug-in type operational environment (EOC, KMS integrated type)

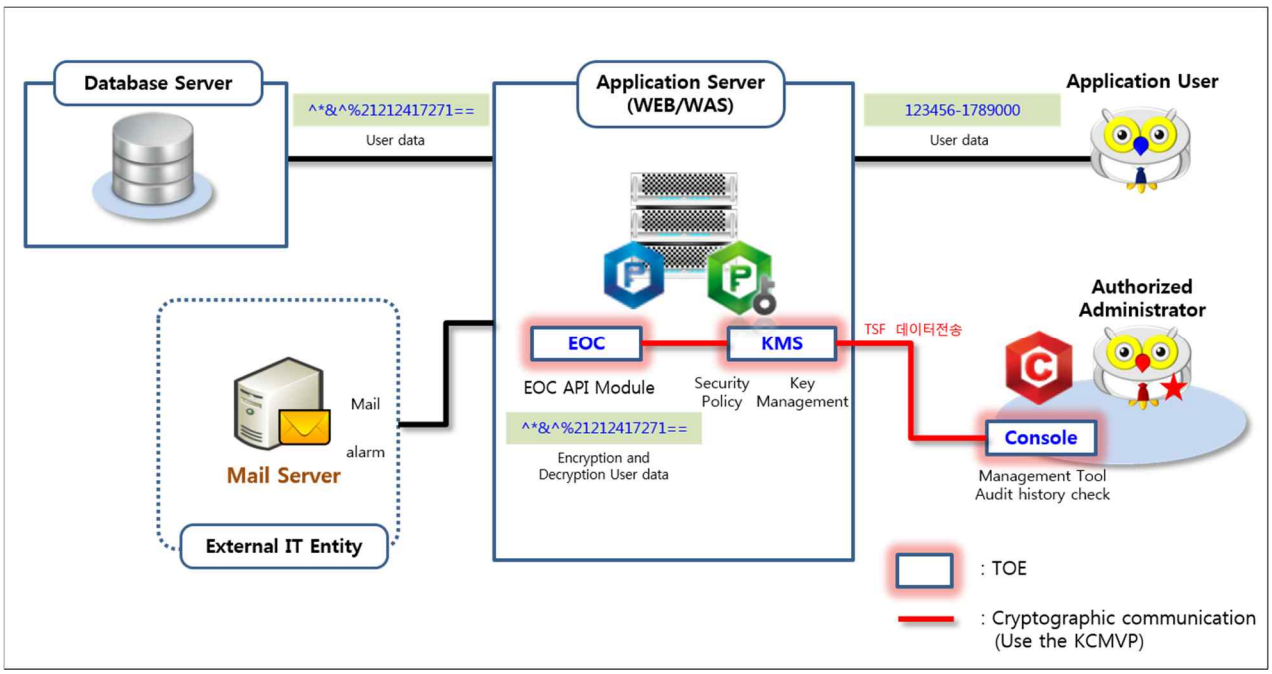
[Figure-3], [Figure-4] is an API-based operating environment. Applications that are installed in Application Server and provide application services are developed using the EOC to use the encryption and decryption function of the TOE.

The EOC is installed in Application Server and perform encryption and decryption of user data in accordance with the security policies of an authorized administrator. The user data entered by the application user is encrypted by the EOC installed on the Application Server and sent to the Database Server. Encrypted user data from the Database Server is decrypted by the EOC installed on the Application Server and sent to the application user.

An authorized administrator accesses the KMS to perform security management. The KMS can be installed with the EOC in an Application Server or physically separate from the EOC.



[Figure-3] API-type operational environment (EOC, KMS separate type)



[Figure-4] API-type operational environment (EOC, KMS Integrated type)

1.3.4 Non-TOE environment required by TOE

In addition, the external IT entities required for TOE operations are:

- SMTP Server used to send alert mail to administrators

The hardware required for the TOE to be installed is as follows.

TOE Component	Contents
KMS	CPU: Intel Dual core 2.4 GHz or higher Memory: 8GB Memory or higher HDD: Space required for TOE installation is 30G or higher NIC : 10/100/1000 Mb NIC * 1EA or higher
EOC	CPU: Intel Dual core 2.4 GHz or higher Memory: 8GB Memory or higher HDD: Space required for TOE installation is 30G or higher NIC : 10/100/1000 Mb NIC * 1EA or higher
Console	CPU: Intel Dual core 2.4 GHz or higher Memory: 8GB Memory or higher HDD: Space required for TOE installation is 30G or higher NIC : 10/100/1000 Mb NIC * 1EA or higher

[Table-3] Non-TOE Hardware required by the TOE

The 3rd Party software required for operation of the TOE is not included in the scope of the TOE, as follows:

TOE Component	Type	Contents	Notes
KMS	OS	CentOS 6.8 x86_64 (Kernel 2.6.32-504)	
	DBMS	PostgreSQL 9.5.13	Audit Storage
EOC	OS	CentOS 6.8 x86_64 (Kernel 2.6.32-504)	
	WAS	Apache-tomcat 7.0 (7.0.82), 64bit	API type
	DBMS	Oracle 11g (11.2.0.1.0) x64	Plug-in type
	JRE	jre 7u80 linux x64	Java
Console	OS	Windows 7 Professional (64 bit)	

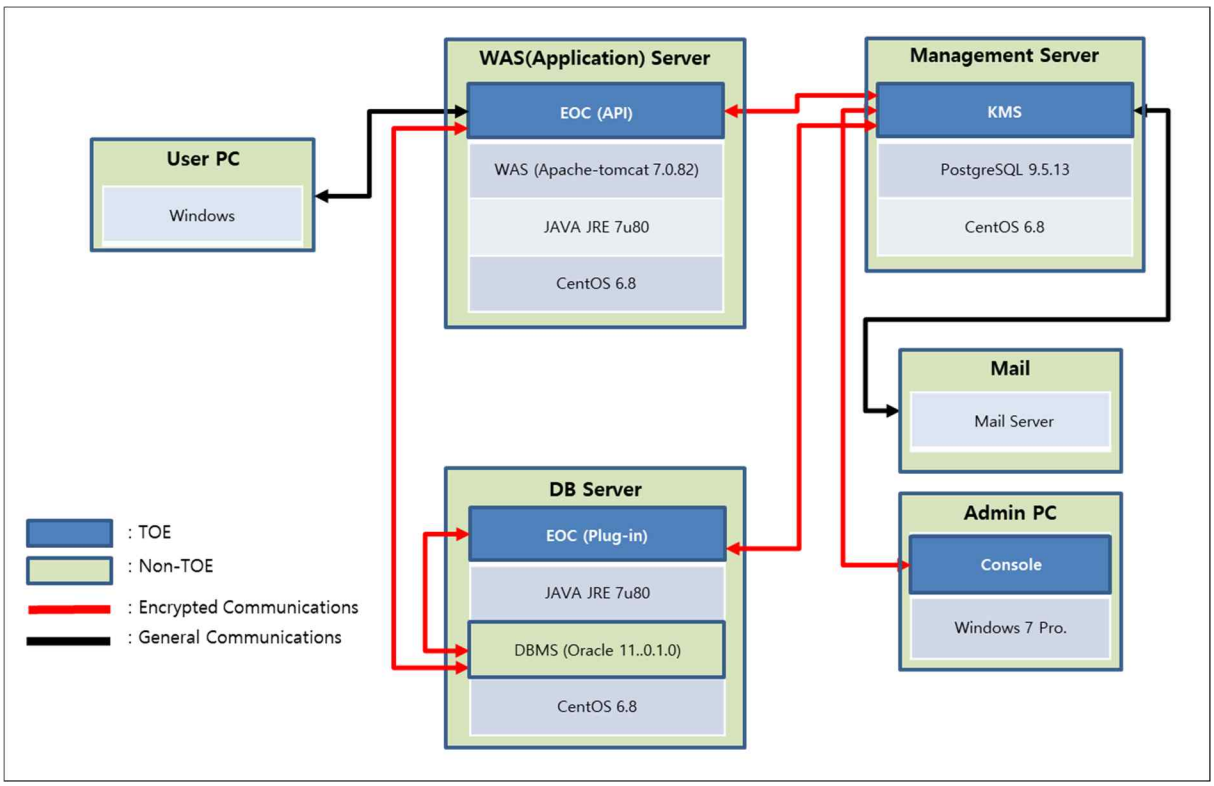
[Table-4] Non-TOE Software required by the TOE

1.4 TOE Description

This section describes the physical and logical ranges of the TOE.

1.4.1 Physical Scope of the TOE

The TOE consists of KMS, which is security policy establishment and management server, Console, which is an administrator tool, and EOC that encrypts and decrypts data in a DB or an application by receiving a DB cryptographic key and an encryption policy stored in KMS.
The EOC is installed on the WEB/WAS server for the API method and on the target DB server for the Plug-in method.



[Figure-5] Physical Scope of the TOE

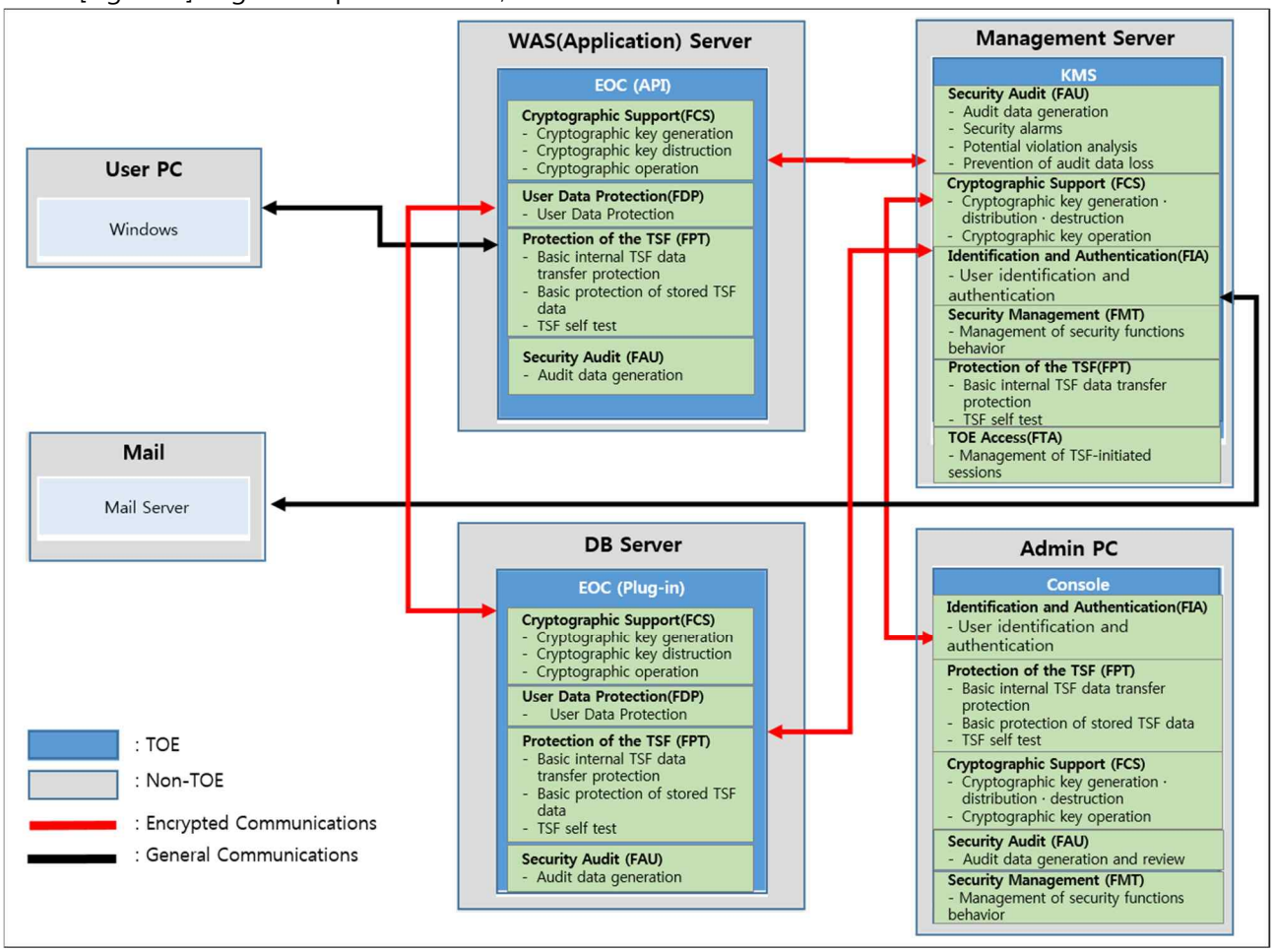
The TOE consists of KMS, EOC, Console and User Operational Guidance and Preparation Procedure.

Classification		Contents	Type	Distribution type
TOE Identification		PrivacyDB V2.0	-	
TOE Version		PrivacyDB V2.0.4.9	-	
TOE Component	KMS	Privacy-KMS ver 2.0.4.9 - PrivacyDB-KMS_linux_64bit_V2.0.4.9.tar	S/W	Distributed as a CD
	Console	Privacy-Console ver 2.0.2.17 - PrivacyDB-Console_x86_V2.0.2.17.zip	S/W	
	EOC	Privacy-EOC ver 2.0.4.9 - PrivacyDB-Eoc_linux_api_64bit_V2.0.4.9.tar - PrivacyDB-Eoc_linux_plugin_64bit_V2.0.4.9.tar	S/W	
Guidance		PrivacyDB V2.0 Preparative Procedures V1.8 - PrivacyDB V2.0 Preparative Procedures V1.8 PrivacyDB V2.0 User Operational Guidance V1.8 - PrivacyDB V2.0 User Operational Guidance V1.8	PDF	

[Table-5] Physical scope of the TOE

1.4.2 Logical Scope of the TOE

The logical scope of the TOE consists of security audits, cryptographic support, user data protection, identification and authentication, security management, protection of the TSF, and TOE access, as shown in the [Figure-6] Logical scope of the TOE, as follows.



[Figure-6] Logical Scope of the TOE

■ **Security Audit**

The security audit function consists of generating audit records, inquiring audit records, analyzing and responding to security violations, and protecting audit records. Audit records are generated for startup and shutdown of TOE and security-related configuration activities, and audit records generated are protected from unauthorized deletion. Only authorized administrators can view audit data and selectively check audit data. In addition, TOE analyzes potential violations, such as continuous failure of the administrator's certificate, and notifies the authorized administrator by email and generates audit records. In addition, if the audit storage space exceeds the threshold 90%, notify the authorized administrator by email and overwrite the oldest log first if the audit evidence is propagated.

■ **Cryptographic Support**

TOE supports cryptographic key management, cryptographic operation, and random bit generation. To

generate the encryption key, use the random number generator (HASH_DRBG 256) of the KCMVP (Key#Crypto v1.3) to generate the encryption key, to encrypt user data within the protected DBMS, use cryptographic algorithm (ARIA-128, 256, SEED-128, SHA-256, 384, 512) of the KCMVP. In addition, for protection of TSF data, it is operated using hash algorithm (SHA-256) and symmetric key encryption (ARIA, SEED). Cryptograchic key distribution of the EOC from KMS is safely distributed through public key encryption method (RSA-2048), and the cryptographic key is overwritten with "0" for destruction.

■ User data protection

To protect user data stored within the protected DBMS, encrypt and store the data using the KCMVP. The security policy established by the authorized administrator is to perform encryption and decryption through the block cipher algorithm (ARIA-128, 192, 256) and (SEED-128). in Addition, one-way encryption is supported through secure hash algorithm (SHA-256, 384, 512).

TOE provides users with column-by-column encryption and decryption of user data. In addition, when encrypting user data, do not generate identical cipher text for the same plain text. When a user's data is encrypted and the original data is reclaimed, a complete deletion is made to prevent all previous information on the resource from being available.

■ Identification and Authentication

TOE identifies and authenticates identification with managers' ID and PW based, controls KMS access through certificates, and permits access only to users with registered certificates. Prior to all actions for TOE security management, the administrator can access the management page through identification and authentication of ID and PW and certificate-based authentication, Lock the administrator account for a period of time when the critical value of the consecutive number of failures is reached. Feedback generated while performing administrator authentication is protected with '*' and does not provide a reason for the failure.

TOE carries out the verification of administrator authentication and whether the security criteria defined (length and combination rules) are met when creating and changing a password. It provides a function to verify that the only session ID is used to prevent reuse of administrator authentication data. Components of TOE, EOC, console, and KMS, provide two-way mutual authentication between components.

■ Security Management

Only authorized administrators can perform security management functions such as setting security functions, setting security policies, and generating encryption keys. Administrators must first authenticate through the Console, then must change the password for the administrator, and the administrator can perform security management only through the Console.

■ Protection of the TSF

TOE is encrypted through the symmetric key cryptographic algorithm (ARIA 128) of the KCMVP to protect against exposure and alteration of TSF data stored in storage controlled by TSF, in case of a password,

encrypt and store the password using the one-way encryption algorithm (SHA-256). To protect TSF data transmitted between TOE components (KMS, EOC, Console) encryption communication is carried out through symmetric key algorithm (ARIA-128) of the KCMVP.
TOE checks whether the main process of the TOE is working properly through self-test of the TSF. TOE performs self-test on the main process at startup or periodically during operation, TOE sends an alert email to the administrator if the integrity of the setup file and key processes is compromised at the time of TOE startup or after regular operation.

■ TOE Access

TOE allows a management connection session that attempted to access the terminal specified by the accessible IP, provides the ability to end a session if an authorized administrator has not been active for a period of time since logging in. TOE also maintains only one session to ensure that administrators of the same authority cannot log in twice.

1.5 Terms and Definitions

Terms used in this ST, which are the same as in the CC, must follow those in the CC.

Approved cryptographic algorithm
A cryptographic algorithm selected by Korea Cryptographic Module Validation Authority for block cipher, secure hash algorithm, message authentication code, random bit generation, key agreement, public key cipher, digital signatures cryptographic algorithms considering safety, reliability and interoperability

Application Server
The application server defined in this PP refers to the server that installs and operates the application, which is developed to provide a certain application service by the organization that operates the TOE. The pertinent application reads the user data from the DB, which is located in the database server, by the request of the application service user, or sends the user data to be stored in the DB to the database server.

Approved mode of operation
The mode of cryptographic module using approved cryptographic algorithm.

Assets
Entities that the owner of the TOE presumably places value upon

Assignment
The specification of an identified parameter in a component (of the CC) or requirement

Attack potential
Measure of the effort to be expended in attacking the TOE, expressed in terms of an attacker's expertise, resources and motivation

Authorized Administrator
Authorized user to securely operates and manages the TOE

Authentication Data
Information used to verify the claimed identity of a user

Authorized User
The TOE user who may, in accordance with the SFRs, perform an operation

Can/could
The ‘can’ or ‘could’ presented in Application notes indicates optional requirements applied to the TOE by

ST author's choice

column
A set of data values of a particular simple type, one for each row of the table in a relational database

Component
Smallest selectable set of elements on which requirements may be based

Critical Security Parameters(CSP)
Information related to security that can erode the security of the encryption module if exposed or changed (e.g., verification data such as secret key/private key, password, or Personal Identification Number).

Class
Set of CC families that share a common focus

Database(DB)
A set of data that is compiled according to a certain structure in order to receive, save, and provide data in response to the demand of multiple users to support multiple application duties at the same time. The database related to encryption by column, which is required by this ST, refers to the relational database.

Database Server
The database server defined in this PP refer to the server in which the DBMS managing the protected DB is installed in the organization that operates the TOE

Database Management System(DBMS)
A software system composed to configure and apply the database. The DBMS related to encryption by column, which is required by this ST, refers to the database management system based on the relational database model.

Data Encryption Key(DEK)
Key that encrypts and decrypts data.

DB encryption key
Key to encrypt and decrypt real table columns

Decryption
The act that restoring the ciphertext into the plaintext using the decryption key

Dependency

Relationship between components such that if a requirement based on the depending component is included in a PP, ST or package, a requirement based on the component that is depended upon must normally also be included in the PP, ST or package

Encryption
The act that converts the plaintext into the ciphertext using the encryption key

Element
Indivisible statement of a security need

External Entity
Human or IT entity possibly interacting with the TOE from outside of the TOE boundary

Evaluation Assurance Level(EAL)
Set of assurance requirements drawn from CC Part 3, representing a point on the CC predefined assurance scale, that form an assurance package

Family
Set of components that share a similar goal but differ in emphasis or rigor

Identity
Representation uniquely identifying entities (e.g. user, process or disk) within the context of the TOE

Iteration
Use of the same component to express two or more distinct requirements

Key Encryption Key (KEK)
Key that encrypts and decrypts another cryptographic key

Management access
The access to the TOE by using the HTTPS, SSH, TLS, etc to manage the TOE by administrator, remotely

Master encryption key
This is the key to encrypt master key

Master key
Key to encrypt the Encryption key when saving it to a file

Object

Passive entity in the TOE containing or receiving information and on which subjects perform operations

Operation(on a component of the CC)
Modification or repetition of a component. Allowed operations on components are assignment, iteration, refinement and selection.

Operation(on a subject)
Specific type of action performed by a subject on an object

Private Key
A cryptographic key which is used in an asymmetric cryptographic algorithm and is uniquely associated with an entity (the subject using the private key), not to be disclosed.

Protection Profile(PP)
Implementation-independent statement of security needs for a TOE type

Public Key
A cryptographic key which is used in an asymmetric cryptographic algorithm and is associated with an unique entity (the subject using the public key), it can be disclosed

Public Key (Asymmetric) Cryptographic Algorithm
A cryptographic algorithm that uses a pair of public and private keys

Random Bit Generator(RBG)
A device or algorithm that outputs a binary string that is statistically independent and is not biased. The RBG used for cryptographic application generally generates 0 and 1 bit string, and the string can be combined into a random bit block. The RBG is classified into the deterministic and non-deterministic type. The deterministic type RBG is composed of an algorithm that generates bit strings from the initial value called a "seed key," and the non-deterministic type RBG produces output that depends on the unpredictable physical source.

Recommend/be recommended
The 'recommend' or 'be recommended' presented in Application notes is not mandatorily recommended, but required to be applied for secure operations of the TOE

Refinement
Addition of details to a component

Role

Predefined set of rules establishing the allowed interactions between a user and the TOE

Security Function Policy (SFP)

A Set of rules that describes the specific security action performed by TSF (TOE security functionality) and describe them as SFR (security function requirement)

Secret Key

A cryptographic key which is used in a symmetric cryptographic algorithm and is uniquely associated with one or several entity, not to be disclosed

Security Target(ST)

Implementation-dependent statement of security needs for a specific identified TOE

Security attribute

The characteristics of the subject used to define the SFR, user (including the external IT product), object, information, session and/or resources. These values are used to perform the SFR

Selection

Specification of one or more items from a list in a component

Self-test

Pre-operational or conditional test executed by the cryptographic module

Session Key

Encryption key to encrypt and decrypt data in the communications section

Shall/must

The 'shall' or 'must' presented in Application notes indicates mandatory requirements applied to the TOE

Symmetric Cryptographic Technique

Encryption scheme that uses the same secret key in mode of encryption and decryption, also known as secret key cryptographic technique.

Subject

Active entity in the TOE that performs operations on objects

Target of Evaluation(TOE)

Set of software, firmware and/or hardware possibly accompanied by guidance

TLS(Transport Layer Security)

An SSL-based cryptographic authentication communication protocol between servers and clients, described in RFC 2246.

TOE Security Functionality(TSF)

Combined functionality of all hardware, software, and firmware of a TOE that must be relied upon for the correct enforcement of the SFRs

TSF Data

Data for the operation of the TOE upon which the enforcement of the SFR relies

User

Refer to "External entity"

User Data

Data for the user, that does not affect the operation of the TSF

1.6 Conventions

The notation, formatting and conventions used in this ST are consistent with the Common Criteria for Information Technology Security Evaluation.

The CC allows several operations to be performed for functional requirements: iteration, assignment, selection and refinement. Each operation is used in this ST.

Iteration

Iteration is used when a component is repeated with varying operations. The result of iteration is marked with an iteration number in parenthesis following the component identifier, i.e., denoted as (iteration No.).

Assignment

This is used to assign specific values to unspecified parameters (e.g., password length).
The result of assignment is indicated in square brackets like [assignment_value].

Selection

This is used to select one or more options provided by the CC in stating a requirement.
The result of selection is shown as *underlined and italicized*.

Refinement

This is used to add details and thus further restrict a requirement. The result of refinement is shown in **bold text.**

2 Conformance Claim

2.1 Conformance claim of CC, PP, Package

CC, PP and Package that are compliant with ST and TOE are as follows.

Classification	Conformance
Common Criteria	Common Criteria for Information Technology Security Evaluation, Version 3.1, Revision 5 - Common Criteria for Information Technology Security Evaluation. Part 1: Introduction and General Model, Version 3.1, Revision 5 (CCMB-2017-04-001, April, 2017) - Common Criteria for Information Technology Security Evaluation. Part 2: Security Functional Components, Version 3.1, Revision 5 (CCMB-2017-04-002, April, 2017) - Common Criteria for Information Technology Security Evaluation. Part 3: Security Assurance Components, Version 3.1, Revision 5 (CCMB-2017-04-003, April, 2017)
Conformance Claim Part 2 Security Functional Requirements	Extended: FCS_RBG.1, FIA_IMA.1, FDP_UDE.1, FMT_PWD.1, FPT_PST.1, FTA_SSL.5
Conformance Claim Part 3 Security Assurance Requirements	*Conformant*
Conformance Claim Package	Augmented: EAL1 *augmented* (ATE_FUN.1)
Protection Profile	Korean National PP for Database Encryption V1.0 (August, 2017)

[Table-6] CC Conformance Claim

2.2 Rationale for PP Conformance Claim

This ST complied with the same type of TOE and security requirements by strict compliance with the Korean National PP for Database Encryption V1.0

Classification	PP	ST	Rationale
Type of TOE	Database Encryption	Database Encryption	Same as PP
Security Function Requirement (SFR)	FAU_ARP.1	FAU_ARP.1	Same as PP
	FAU_GEN.1	FAU_GEN.1	Same as PP
	FAU_SAA.1	FAU_SAA.1	Same as PP
	FAU_SAR.1	FAU_SAR.1	Same as PP

	FAU_SAR.3	FAU_SAR.3	Same as PP
	FAU_SEL.1	FAU_SEL.1	Same as PP
	FAU_STG.3	FAU_STG.3	Same as PP
	FAU_STG.4	FAU_STG.4	Same as PP
	FCS_CKM.1(1)	FCS_CKM.1(1)	Same as PP
	FCS_CKM.1(2)	FCS_CKM.1(2)	Same as PP
	FCS_CKM.2	FCS_CKM.2	Same as PP
	FCS_CKM.4	FCS_CKM.4	Same as PP
	FCS_COP.1(1)	FCS_COP.1(1)	Same as PP
	FCS_COP.1(2)	FCS_COP.1(2)	Same as PP
	FCS_RBG.1(Extended)	FCS_RBG.1(Extended)	Same as PP
	FDP_UDE.1(Extended)	FDP_UDE.1(Extended)	Same as PP
	FDP_RIP.1	FDP_RIP.1	Same as PP
	FIA_AFL.1	FIA_AFL.1	Same as PP
	FIA_IMA.1(Extended)	FIA_IMA.1(Extended)	Same as PP
	FIA_SOS.1	FIA_SOS.1	Same as PP
	FIA_UAU.1	FIA_UAU.2	Limited than PP and requirements (Hierarchical relation)
	FIA_UAU.4	FIA_UAU.4	Same as PP
	FIA_UAU.7	FIA_UAU.7	Same as PP
	FIA_UID.1	FIA_UID.2	Limited than PP and requirements (Hierarchical relation)
	FMT_MOF.1	FMT_MOF.1	Same as PP
	FMT_MTD.1	FMT_MTD.1	Same as PP
	FMT_PWD.1(Extended)	FMT_PWD.1(Extended)	Same as PP
	FMT_SMF.1	FMT_SMF.1	Same as PP
	FMT_SMR.1	FMT_SMR.1	Same as PP
	FPT_ITT.1	FPT_ITT.1	Same as PP
	FPT_PST.1(Extended)	FPT_PST.1(Extended)	Same as PP
	FPT_TST.1	FPT_TST.1	Same as PP
	FTA_MCS.2	FTA_MCS.2	Same as PP
	FTA_SSL.5(Extended)	FTA_SSL.5(Extended)	Same as PP
	FTA_TSE.1	FTA_TSE.1	Same as PP
Security Assurance Requirement (SAR)	AGD_OPE.1	AGD_OPE.1	Same as PP
	AGD_PRE.1	AGD_PRE.1	Same as PP
	ALC_CMC.1	ALC_CMC.1	Same as PP
	ALC_CMS.1	ALC_CMS.1	Same as PP
	ASE_CCL.1	ASE_CCL.1	Same as PP

	ASE_ECD.1	ASE_ECD.1	Same as PP
	ASE_INT.1	ASE_INT.1	Same as PP
	ASE_OBJ.1	ASE_OBJ.1	Same as PP
	ASE_REQ.1	ASE_REQ.1	Same as PP
	ASE_TSS.1	ASE_TSS.1	Same as PP
	ATE_FUN.1	ATE_FUN.1	Same as PP
	ATE_IND.1	ATE_IND.1	Same as PP
	AVA_VAN.1	AVA_VAN.1	Same as PP

[Table-7] Rationale for PP Conformance Claim

3 Security objectives

3.1 Security objectives for the operational environment

The following are the security objectives handled by technical and procedural method supported from operational environment in order to provide the TOE security functionality accurately.

OE.PHYSICAL_CONTROL
The place where the TOE components are installed and operated shall be equipped with access control and protection facilities so that only authorized administrator can access.

OE.TRUSTED_ADMIN
An authorized administrator of the TOE shall be non-malicious intentions users, have appropriately trained for the TOE management functions and accurately fulfill the duties in accordance with administrator guidances.

OE.SECURE_DEVELOPMENT
The developer who uses the TOE to interoperate with the user identification and authentication function in the operational environment of the business system shall ensure that the security functions of the TOE are securely applied in accordance with the requirements of the manual provided with the TOE.

OE.LOG_BACKUP
The authorized administrator of the TOE shall periodically checks a spare space of audit data storage in case of the audit data loss, and carries out the audit data backup (external log server or separate storage device, etc.) to prevent audit data loss.

OE.OPERATION_SYSTEM_RE-INFORCEMENT
The authorized administrator of the TOE shall ensure the reliability and security of the operating system by performing the reinforcement on the latest vulnerabilities of the operating system in which the TOE is installed and operated.

OE.AUDIT_DATA_PROTECTION
Audit records with stored audit evidence, such as DBMS that interact with TOE, shall be protected from unauthorized deletion or modification.

OE.TIME_STAMP
The TOE shall accurately record security-relevant events by using reliable time stamps provided by the TOE operational environment.

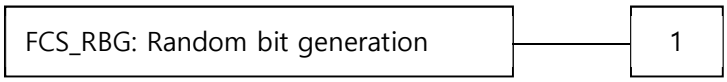
4 Extended Components Definition

4.1 Cryptographic support (FCS)

4.1.1. Random Bit Generation

Family Behavior
This family defines requirements for the TSF to provide the capability that generates random bits required for TOE cryptographic operation.

Component Leveling



FCS_RBG.1 random bit generation, requires TSF to provide the capability that generates random bits required for TOE cryptographic operation.

Management: FCS_RBG.1
There are no management activities foreseen.

Audit: FCS_RBG.1
There are no auditable events foreseen.

FCS_RBG.1 Random bit generation
Hierarchical to No other components
Dependencies No dependencies

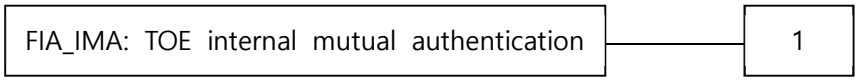
FCS_RBG.1.1 The TSF shall generate random bits required to generate an cryptographic key using the specified random bit generator that meets the following [assignment: *list of standards*].

.

4.2 Identification & authentication (FIA)

Family Behavior
This family defines requirements for providing mutual authentication between TOE components in the process of user identification and authentication.

Component Leveling



FIA_IMA.1 TOE Internal mutual authentication requires that the TSF provides mutual authentication function between TOE components in the process of user identification and authentication.

Management: FIA_IMA.1
There are no management activities foreseen.

Audit : FIA_IMA.1
The following actions are recommended to record if FAU_GEN Security audit data generation family is included in the PP/ST:

a) Minimal: Success and failure of mutual authentication
b) Minimal: Change of authentication protocol

FIA_IMA.1	TOE internal mutual authentication	
	Hierarchical to	No other components
	Dependencies	No dependencies

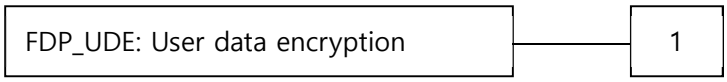
FIA_IMA.1.1 The TSF shall perform mutual authentication between [assignment: *different parts of TOE]* using the [assignment: authentication protocol] that meets the following: [assignment: *list of standards*].

4.3 User data protection (FDP)

4.3.1 User data encryption

Family Behavior
This family provides requirements to ensure confidentiality of user data.

Component Leveling



FDP_UDE.1 User Data Encryption(FDP) requires confidentiality of user data.

Management: FDP_UDE.1
The following actions could be considered for the management functions in FMT:
a) Management of user data encryption/decryption rules

Audit: FDP_UDE.1

The following actions are recommended to record if FAU_GEN Security audit data generation is included in the PP/ST:

a) Minimal : Success and failure of user data encryption/decryption

4.3.1.1 FDP_UDE.1 User data encryption

Hierarchical to No other components

Dependencies FCS_COP.1 Cryptographic operation

FDP_UDE.1.1 TSF shall provide TOE users with the ability to encrypt/decrypt user data according to [assignment: *the list of Encryption/decryption methods*] specified.

4.4 Security Management(FMT)

4.4.1 ID and Password

Family Behavior

This family defines the capability that is required to control ID and password management used in the TOE, and set or modify ID and/or password by authorized users.

Component Leveling

FMT_PWD ID and password	1

FMT_PWD.1 ID and password management, requires that the TSF provides the management function of ID and password.

Management: FMT_PWD.1

The following actions could be considered for the management functions in FMT:

a) Management of ID and password configuration rules

Audit : FMT_PWD.1

The following actions are recommended to record if FAU_GEN Security audit data generation is included in the PP/ST:

a) Minimal: All changes of the password

4.4.1.1 FMT_PWD.1 Management of ID and password

Hierarchical to No other components

Dependencies FMT_SMF.1 Specification of management functions

FMT_SMR.1 Security roles

FMT_PWD.1.1 The TSF shall restrict the ability to manage the password of [assignment: *list of functions*] to [assignment: *the authorized roles*].
1.[assignment *password combination rules and/or length*]
2.[assignment: *other management such as management of special characters unusable for password, etc.*]

FMT_PWD.1.2 The TSF shall restrict the ability to manage the ID of [assignment: *list of functions*] to [assignment: *the authorized identified roles*].
1.[assignment : *ID combination rules and/or length*]
2.[assignment : *other management such as management of special characters unusable for ID, etc.*]

FMT_PWD.1.3 The TSF shall provide the capability for [selection, choose one of: *setting ID and password when installing, setting password when installing, changing the ID and password when the authorized administrator accesses for the first time, changing the password when the authorized administrator accesses for the first time*].

4.5 Protection of the TSF(FPT)

4.5.1 Protection of stored TSF data

Family Behavior
This family defines rules to protect TSF data stored within containers controlled by the TSF from the unauthorized modification or disclosure.

Component Leveling

FPT_PST.1 Basic protection of stored TSF data, requires the protection of TSF data stored in containers controlled by the TSF.

Management: FPT_PST.1
There are no management activities foreseen.

Audit: FPT_PST.1
There are no auditable events foreseen.

FPT_PST.1 Basic protection of stored TSF data

Hierarchical to No other components

Dependencies No dependencies

FPT_PST.1.1 The TSF shall protect [assignment: *TSF data*] stored in containers controlled by the TSF from the unauthorized [selection: *disclosure, modification*].

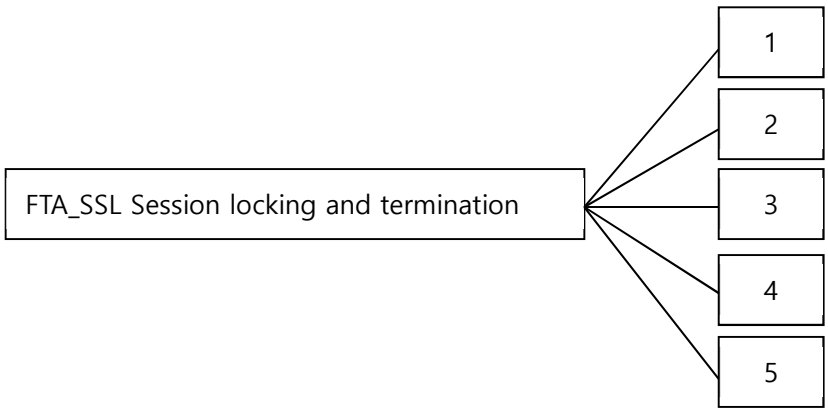
4.6 TOE Access(FTA)

4.6.1 Session Locking and Termination

Family Behavior

This family defines requirements for the TSF to provide the capability for TSF-initiated and user-initiated locking, unlocking, and termination of interactive sessions.

Component Leveling



FTA_SSL.5 The management of TSF-initiated sessions provides requirements that the TSF locks or terminates the session after a specified time interval of user inactivity.

Management : FTA_SSL.5

The following actions could be considered for the management functions in FMT:.

a) Specification of the time period of user inactivity that results in session locking or termination for each user.

b) Specification for the time interval of default user inactivity that is occurred the session locking and termination

Audit : FTA_SSL.5

The following actions are recommended to record if FAU_GEN Security audit data generation is included in the PP/ST:

a) Minimal: Locking or termination of interactive sessions

FTA_SSL.5 Management of TSF-initiated sessions

Hierarchical to No other components

Dependencies [FIA_UAU.1 Authentication or No dependencies]

FTA_SSL.5.1 The TSF shall [selection:

- *lock the session and re-authenticate the user before unlocking the session,*
- *terminate*]] an interactive session after a [assignment: *time interval of user inactivity*].

5 Security Requirements

The security requirements describe security functional requirements and assurance requirements that must be satisfied by the TOE that claims conformance to this ST.

5.1 Security Functional Requirements

The security function requirements defined in this ST are expressed by selecting the relevant security function components from CC Part 2 to satisfy the security objectives identified in Chapter 4.
The following [Table-8] provides a summary of the security function components used in this ST.

Security Functional Class	Security Functional Component	
Security Audit (FAU)	FAU_ARP.1	Security alarms
	FAU_GEN.1	Audit data generation
	FAU_SAA.1	Potential violation analysis
	FAU_SAR.1	Audit review
	FAU_SAR.3	Selectable audit review
	FAU_SEL.1	Selective audit
	FAU_STG.3	Action in case of possible audit data loss
	FAU_STG.4	Prevention of audit data loss
Cryptographic Support (FCS)	FCS_CKM.1(1)	Cryptographic key generation (User data encryption)
	FCS_CKM.1(2)	Cryptographic key generation (TSF data encryption)
	FCS_CKM.2	Cryptographic key distribution
	FCS_CKM.4	Cryptographic key destruction
	FCS_COP.1(1)	Cryptographic operation (User data encryption)
	FCS_COP.1(2)	Cryptographic operation(TSF data encryption)
	FCS_RBG.1(Extended)	Random bit generation
User Data Protection (FDP)	FDP_UDE.1(Extended)	User data encryption
	FDP_RIP.1	Protect the residual information Protection
Identification and Authentication (FIA)	FIA_AFL.1	Authentication failure handling
	FIA_IMA.1(Extended)	TOE internal mutual authentication
	FIA_SOS.1	Verification of secrets
	FIA_UAU.2	User authentication before any action (Administrator)
	FIA_UAU.4	Single-use authentication mechanism
	FIA_UAU.7	Protected authentication feedback

	FIA_UID.2	User identification before any action (Administrator)
Security Management (FMT)	FMT_MOF.1	Management of security functions behavior
	FMT_MTD.1	Management of TSF data
	FMT_PWD.1(Extended)	Management of ID and password
	FMT_SMF.1	Specification of management functions
	FMT_SMR.1	Security roles
Protection of the TSF (FPT)	FPT_ITT.1	Basic internal TSF data transfer protection
	FPT_PST.1(Extended)	Basic protection of stored TSF data
	FPT_TST.1	TSF testing
TOE Access (FTA)	FTA_MCS.2	Per user attribute limitation on multiple concurrent sessions
	FTA_SSL.5(Extended)	Management of TSF-initiated sessions
	FTA_TSE.1	TOE session establishment

[Table-8] Summary of Security Functional Components

5.1.1 Security Audit (FAU)

FAU_ARP.1 **Security alarms**

Hierarchical to: No other components

Dependencies: FAU_SAA.1 Potential violation analysis

FAU_ARP.1.1 The TSF shall take [an email notification to an authorized administrator] upon detection of a potential security violation.

FAU_GEN.1 **Audit data generation**

Hierarchical to: No other components

Dependencies: FPT_STM.1 Reliable time stamps

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

a) Start-up and shutdown of the audit functions.

b) All auditable events for the *not specified* level of audit, and

c) [Refer to "auditable event" in [Table-9] Auditable Event. [None]

Security Functional Component	Auditable Event	Additional Audit Record
FAU_ARP.1	Actions taken due to potential security violations	

FAU_SAA.1	Enabling and disabling of any of the analysis mechanisms, Automated responses performed by the tool	
FAU_STG.3	Actions taken due to exceeding of a threshold	
FAU_STG.4	Actions taken due to the audit storage failure	
FCS_CKM.1	Success and failure of the activity	
FCS_CKM.2	Success and failure of the activity (only applying to distribution of key related to user data encryption/decryption)	
FCS_CKM.4	Success and failure of the activity (only applying to destruction of key related to user data encryption/decryption)	
FCS_COP.1	Success and failure of cryptographic operation	
FDP_UDE.1	Success and failure of user data encryption/decryption	
FIA_AFL.1	The reaching of the threshold for the unsuccessful authentication attempts and the action taken, and the subsequent, if appropriate, restoration to the normal state	
FIA_IMA.1	Success and failure of mutual authentication Modify of authentication protocol	
FIA_UAU.2	All uses of authentication mechanisms	
FIA_UAU.4	Attempts to reuse authentication data	
FIA_UID.2	All use of the User Identification mechanism, including the user identity provided	
FMT_MOF.1	All modifications in the behavior of the functions in the TSF	
FMT_MTD.1	All modifications to the values of TSF data	Modified values of TSF data
FMT_PWD.1	All changes of the password	
FMT_SMF.1	Use of the management functions	
FMT_SMR.1	Modifications to the user group of rules divided	
FPT_TST.1	Execution of the TSF self tests and the results of the tests	Modified TSF data or execution code in case of integrity violation

FTA_MCS.2	Denial of a new session based on the limitation of multiple concurrent sessions	
FTA_SSL.5	Locking or termination of interactive session	

[Table-9] Audit event

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 of failure) of the event: and
b) For each audit event type, based on the auditable event definitions of the functional components include in the ST, [refer to "Additional Audit Record" in [Table-9] Auditable Event, (*None*)]

FAU_SAA.1 **Potential violation analysis**
Hierarchical to: No other components
Dependencies: FAU_GEN.1 Audit data generation

FAU_SAA.1.1 The TSF shall be able to apply a set of rules in monitoring the audited events and based upon these rules indicate a potential violation of the enforcement of the SFRs**.**

FAU_SAA.1.2 The TSF shall enforce the following rules for monitoring audited events:
a) Accumulation or combination of [
- Authentication failure audit event among auditable event in FIA_UAU.1
- Integrity violation event among auditable events in FPT_TST.1
- Failure of self test of the KCMVP , [None] known to indicate a potential security violation.

b) [None]

FAU_SAR.1 **Audit review**
Hierarchical to: No other components
Dependencies : FAU_GEN.1 Audit data generation

FAU_SAR.1.1 The TSF shall provide [authorized administrator] with the capability to read [all the audit data] from the audit records**.**

FAU_SAR.1.2 The TSF shall provide the audit records in a manner suitable for the **authorized administrator** to interpret the information.

FAU_SAR.3 **Selectable audit review**

Hierarchical to: No other components
Dependencies: FAU_SAR.1 Audit review

FAU_SAR.3.1 The TSF shall provide the capability to apply [the following methods of selection and/or ordering] of audit data based on [the following criteria with logical relations].

Audit Data Type	Selection Criteria (AND)	Allowable Ability
Administrator log	Date and time	Search, sort (according to the time of occurrence)
	Data type	
	Type of action	
	Result code	
	Result message	
	Security name	
System log	System name	
	System IP	
	Type of System	
	IP from which the log was sent	
Encryption log	Success	
	Failure	

[Table-10] Audit Data Type and Selection Criteria

FAU_SEL.1 **Selctive audit**
Hierarchical to: No other components
Dependencies: FAU_GEN.1 Audit data generation
FMT_MTD.1 TSF Management of TSF data

FAU_SEL.1.1 The TSF shall be able to select the set of events to be audited from the set of all auditable events based on the following attributes:
a) *Event type*
b) [None]

Application notes : This requirement is applied to the encryption / decryption success log and whether to include cipher text in the log.

FAU_STG.3 **Action in case of possible audit data loss**
Hierarchical to: No other components
Dependencies: FAU_STG.1 Protected audit trail storage

FAU_STG.3.1 The TSF shall [notification to the authorized administrator, [None]] if the audit trail

exceeds [the percentage of the spare space against the total capacity of the audit record (default value 90%)].

FAU_STG.4 Prevention of audit data loss

Hierarchical to: FAU_STG.3 Action in case of possible audit data loss

Dependencies: FAU_STG.1 Protected audit trail storage

FAU_STG.4.1 The TSF shall *overwrite oldest audit records* and [None] if the audit trail is full.

5.1.2 Cryptographic Support (FCS)

FCS_CKM.1(1) Cryptographic key generation (User Data Encryption)

Hierarchical to: No other components

Dependencies [FCS_CKM.2 Cryptographic key distribution or FCS_COP.1 Cryptographic operation]

FCS_CKM.4 Cryptographic key destruction

FCS_CKM.1.1 The TSF shall generate the specified cryptographic key generation algorithm [HASH_DRBG(SHA 256)] and the specified cryptographic key length [128, 192, 256 Bit] in accordance with the following [TTAK.KO-12.0190(2012)]

Application notes: Key generated from these requirements are used to encrypt and decrypt user data stored in the DB.

FCS_CKM.1(2) Cryptographic key generation (TSF data encryption)

Hierarchical to: No other components

Dependencies: [FCS_CKM.2 Cryptographic key distribution or FCS_COP.1 Cryptographic operation]

FCS_CKM.4 Cryptographic key destruction

FCS_CKM.1.1 The TSF shall generate the specified encryption key generation algorithm [key generation algorithm] and the cryptographic key length [cryptographic key length] in accordance with the following [Standard list].

Standard List	Key generation algorithm	Cryptographic key length	Encryption key usage
TTAK.KO-12.0190(2012)	HASH_DRBG (SHA 256)	128, 192, 256	Encryption and decryption of configuration

		256	Encryption and decryption of security policy file, transport data, and DB encryption key
ISO/IEC 18033-2(2006)	RSAES	2048	Session key distribution
PKCS#5 -RFC 2898	PBKDF2	256	Encryption and decryption Master key

[Table-11] TSF Data Encryption Key Generation Standards and Algorithms

FCS_CKM.2 Cryptographic key distribution

Hierarchical to: No other components

Dependencies: [FDP_ITC.1 Import of user data without security attributes, or
FDP_ITC.2 Import of user data without security attributes, or
FCS_CKM.1 Cryptographic key generation]
FCS_CKM.4 Cryptographic key destruction

FCS_CKM.2.1 The TSF shall distribute encryption keys in accordance with the stated cryptographic method [public key and symmetric key encryption methods] consistent with the following [None]

FCS_CKM.4 Cryptographic key destruction

Hierarchical to: No other components

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

FCS_CKM.4.1 The TSF shall destroy the encryption key in accordance with the stated cryptographic method ['0' Overwrite] that conforms to the following [None]:

Application notes: In this requirement, the master key and the DB encryption key that exist in file type are destroyed repeatedly 11 times.

FCS_COP.1(1) Cryptographic operation (User data encryption)

Hierarchical to: No other components

Dependencies: [FDP_ITC.1 Import of user data without security attributes, or
FDP_ITC.2 Import of user data with security attributes, or
FCS_CKM.1 Cryptographic key generation]
FCS_CKM.4 Cryptographic key destruction

FCS_COP.1.1 The following TSF shall perform [Operation list] according to the stated cryptographic

algorithm [Cryptographic Algorithm List] and the specified cryptographic key length [Cryptographic key length] in accordance with the following [Standard]:

Standards	Algorithms	Key length	Operation mode	Operation list
KS X 1213-1	ARIA	128, 192, 256	CBC, OFB, CFB, CTR,	Encrypt and decrypt user data stored in DB
TTAS.KO-12.0004/R1	SEED	128	CBC, OFB, CFB, CTR	Encrypt and decrypt user data stored in DB
ISO/IEC 10118-3	SHA256, SHA-384, SHA-512	None	None	Encrypt user data stored in DB

[Table-12] Cryptographic operation standards and algorithms

FCS_COP.1(2) Cryptographic operation (TSF data encryption)

Hierarchical to: No other components

Dependencies: [FDP_ITC.1 Import of user data without security attributes, or
FDP_ITC.2 Import of user data with security attributes, or
FCS_CKM.1 Cryptographic key generation
FCS_CKM.4 Cryptographic key destruction

FCS_COP.1.1 TSF shall perform [Operation List] according to the stated cryptographic algorithm [Cryptographic Algorithm] and the specified cryptographic key length [Encryption key length] that complies with the following [Standard]

Standard	Cryptographic Algorithm	Encryption key length	Operation mode	Operation List
KS X 1213-1	ARIA	128, 192, 256	CBC, OFB, CFB, CTR	Encryption and decryption of configuration
		256	CBC	Encryption and decryption of security policy file, transport data, and DB encryption key
TTAS.KO-12.0004/R1	SEED	128	CBC	Encryption and decryption of configuration
ISO/IEC 18033-2	RSAES	2048	None	Encryption key distribution
ISO/IEC 10118-3	SHA-256	None	None	Integrity verification, Encryption of authentication data

[Table-13] Cryptographic algorithm List

FCS_RBG.1 Random bit generation

Hierarchical to: No other components

Dependencies: No dependencies

FCS_RBG.1.1 The TSF shall generate random numbers using a specified random number generator conforming to the following [standard].

Standard	Algorithm	Random number lenght
TTAK.KO-12.0190	HASH-DRBG (SHA 256)	256

[Table-14] Standard random number generator algorithm

5.1.3 User data protection

FDP_UDE.1 User data protection

Hierarchical to: No other components

Dependencies: cryptographic operational.

FDP_UDE.1.1 TSF should provide TOE users with the ability to encrypt and decrypt user data according to the [Column-specific encryption method, [None]] stated.

FDP_RIP.1 Subset residual information protection

Hierarchical to: No other components

Dependencies: No dependencies

FDP_RIP.1.1 The TSF shall ensure that any previous information content of a resource is made unavailable upon the *allocation of the resource to, deallocation of the resource form* the following objects. [user data].

Application notes: Developers developing using API and Plug-in modules (EOC) should delete user data stored in memory so that it cannot be recovered..

5.1.4 Identification and authentication

FIA_AFL.1 **Authentication failure handling**

Hierarchical to : No other components

Dependencies : FIA_UAU.1 Timing of authentication

FIA_AFL.1.1 The TSF shall detect when [*5*] unsuccessful authentication attempts occur related to

[*Administrator Authentication Attempts*].

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been met, the TSF shall [lock the screen for 5 minutes and notify the administrator of mail].

FIA_IMA.1 **TOE Internal mutual authentication**
Hierarchical to: No other components
Dependencies: No dependencies

FIA_IMA.1.1 TSF shall perform mutual authentication using [Self-authentication protocol] in accordance with [None] between [Console and KMS, KMS and EOC].

FIA_SOS.1 **Verification of secrets**
Hierarchical to: No other components
Dependencies: No dependencies

FIA_SOS.1.1 The TSF shall provide a mechanism to verify that secrets meet [the following defined quality metric].
[Password combination rules]
- Digits : 9 ~ 40
- Three combinations of letters, special characters, and numbers
- Number(10) : 0~9,
- English capital letter(26) : A~Z,
- English small letter (26) : a~z,
- Special character(32) : `~!@#$%^&*()-_+=[]{}₩|;:'",.<>/?

FIA_UAU.2 **User authentication before any action (administrator)**
Hierarchical to: FIA_UAU.1
Dependencies: FIA_UID.1 Timing of identification

FIA_UAU.2.1 The TSF shall require the **administrator** to be successfully authenticated before allowing any other TSF-mediated actions on behalf of the **administrator.**

FIA_UAU.4 **Single-use authentication mechanisms**
Hierarchical to: No other components
Dependencies: No dependencies

FIA_UAU.4.1 The TSF shall prevent the reuse of authentication data related to [Administrator Authentication].

FIA_UAU.7 **Protected authentication feedback**

Hierarchical to: No other components

Dependencies: FIA_UAU.1 Timing of identification

FIA_UAU.7.1 The TSF shall provide only ['*', a message that cannot infer the reason for failure in the event of authentication failure] to the user while the authentication is in progress

FIA_UID.2 **User identification before any action**

Hierarchical to: FIA_UID.1

Dependencies: No dependencies

FIA_UID.2.1 Each **administrator** officer shall be identified successfully before allowing any other actions mediated by the TSF on behalf of the **administrator**.

5.1.5 Security Management

FMT_MOF.1 Management of security functions behaviour

Hierarchical to : No other components

Dependencies : FMT_SMF.1 Specification of management functions

FMT_SMR.1 Security roles

FMT_MOF.1.1 The TSF shall restrict the ability to *administrative actions of* the fuctions [Authorised Managers].

Administrator Type	Classification	Security Function	Ability			
			Determine the behavior	Not use	use	Modify the behavior
Authorized Administrator	Encryption key management	Generate encryption and decryption key	○	-	O	-
	Security management	Encryption target type	○	○	○	○
		Type of encryption algorithm	○	○	○	○
		User data integrity check feature	○	○	○	○
		Double encryption	○	○	○	-

		Encryption pattern	○	○	○	○
	Access control	User access right	○	○	○	○
	Environmental management	User access right (Permit and deny policy)	○	○	○	○
	Audit log	Selecting of audit targets (plain text, cipher text)	○	○	○	○
		Creating a success log	○	○	○	○

[Table-15] List of Security Functions Behavior of Administrator

FMT_MTD.1 **Management of TSF data**

Hierarchical to : No other components

Dependencies : FMT_SMF.1 Specification of management functions

FMT_SMR.1 Security roles

FMT_MTD.1.1 The TSF shall restrict the ability to *manage* [the following TSF data] to [Authorised Administrators].

Administrator Type	Classification	TSF Data	Ability				
			Modify Default	Query	Update	Create	Delete
Authorized Administrator	Key management	Encryption and Decryption of user data key management	-	-	○	○	○
		Master key management	-	-	○	○	○
	User management	DB user management	-	○	○	○	○
	Security management	User data security policy management	○	○	○	○	○
	Access Control	Access time management	○	○	○	○	○
		Manage access	○	○	○	○	○

		user					
		Access IP management	○	○	○	○	○
		Manage access program	○	○	○	○	○
	Audit log	Admin log	-	○	-	-	-
		System log	-	○	-	-	-
		Encryption log	-	○	-	-	-
	Certified information	Password log	-	○	○	○	-

[Table-16] List of TSF Data and Management Ability

FMT_PWD.1 Management of ID and password (extended)

Hierarchical to: No other components

Dependencies: FMT_SMF.1 Specification of management functions,
FMT_SMR.1 Security roles

FMT_PWD.1.1 The TSF shall restrict the ability to manage the password of [None].

1. [None]
2. [None]

FMT_PWD.1.2 The TSF shall restrict the ability to manage ID of [None].

1. [None]
2. [None]

FMT_PWD.1.3 The TSF shall provide the capability for *changing the ID and password when the authorized administrator accesses for the for the first time*.

FMT_SMF.1 Specification of management functions

Hierarchical to: No other components

Dependencies: No dependencies

FMT_SMF.1.1 The TSF shall be capable of performing the following management functions: [list of management functions to be provided by the TSF]

- Management functions of the TSF: Management functions specified in FMT_MOF.1
- Management of TSF data: Management functions specified in FMT_MTD.12
- Management of security role: Management functions specified in FMT_SMR.1

FMT_SMR.1 **Security roles**

Hierarchical: No other components

Dependencies: FIA_UID.1 Timing of identification

FMT_SMR.1.1 The TSF shall maintain the roles [Authentication Administrator]**.**

FMT_SMR.1.2 The TSF shall be able to associate users with **roles defined in FMT_SMR.1.1**

5.1.6 Protection of the TSF

FPT_ITT.1 Basic internal TSF data transfer protection

Hierarchical: No other components

Dependencies: No dependencies

FPT_ITT.1.1 The TSF shall protect TSF data from *disclosure, modification* when it is transmitted between separate parts of the TOE **through the encryption and message integrity verification**.

FPT_PST.1 Basic protection of stored TSF data (Extended)

Hierarchical to: No other components

Dependencies: No dependencies

FPT_PST.1.1 The TSF shall protect [the following TSF data] stored in the containers controlled by the TSF from unauthorized *disclosure, modification*.

[

・Administrator authentication data

・Database access account information

・Encryption key (master key, private key, symmetric key)

・TOE setting value (configuration, security policy settings, etc.)]

FPT_TST.1 **TSF testing**

Hierarchical to: No other components

Dependencies: No dependencies

FPT_TST.1.1 The TSF shall run a suite of self tests *during initial start-up, periodically during normal operation* to demonstrate the correct operation of *TSF.*

FPT_TST.1.2 The TSF shall provide the **authorized administrator** with the capability to verify the

integrity of *TSF data*

FPT_TST.1.3 The TSF shall provide the **authorized administrator** with the capability to verify the integrity of *TSF*

5.1.7 TOE Access

FTA_MCS.2 **Per user attribute limitation on multiple concurrent sessions**

Hierarchical to: FTA_MCS.1 Basic limitation on multiple concurrent sessions

Dependencies: FIA_UID.1 Timing of identification

FTA_MCS.2.1 The TSF has a list of management functions defined in [FMT_SMF.1.1:

a) Limit the maximum number of concurrent sessions to 1 for administrative access by the same administrator who have the authority to perform "management behavior" in FMT_MOF.1.1 and "management" in FMT_MTD.1.1.

b) 'Management behavior' in FMT_MOF.1.1 cannot be performed and 'manage' in FMT_MTD.1.1 maximum number of sessions for the same administrator with the right to perform query only { 0 }.

c) Limit the maximum number of concurrent sessions belonging to the same **Administrator** according to the [None] rule.

FTA_MCS.2.2 The TSF shall enforce a limit of [1] session per administrator by default.

FTA_SSL.5 **Management of TSF-initiated sessions**

Hierarchical to: No other components

Dependencies: FIA_UAU.1 Timing of authentication

FTA_SSL.5.1 The TSF shall *terminate* an interactive session[after 5 minutes of Administrator inactivity].

FTA_TSE.1 **TOE session establishment**

Hierarchical to: No other components

Dependencies: No dependencies

FTA_TSE.1.1 The TSF shall be able to deny the administrator's management access session establishment based on [assess IP, *whether or not management access session of the same account is activated*]

5.2 Assurance requirements

Security assurance requirements of this ST are composed of assurance components in Common Criteria

(CC V3.1) Part 3 and the evaluation assurance level is EAL1+.
The table below summarizes assurance components.

Assurance Class	Assurance Component	
Security Target evaluation	ASE_INT.1	ST introduction
	ASE_CCL.1	Conformance claims
	ASE_OBJ.1	Security objectives for the operational environment
	ASE_ECD.1	Extended components defination
	ASE_REQ.1	Stated security requirements
	ASE_TSS.1	TOE summary specification
Development	ADV_FSP.1	Basic functional specification
Guidance documents	AGD_OPE.1	Operational user guidance
	AGD_PRE.1	Preparative procedures
Life-cycle support	ALC_CMC.1	Labeling of the TOE
	ALC_CMS.1	TOE configuration management coverage
Tests	ATE_FUN.1	Functional testing
	ATE_IND.1	Independent testing: conformance
Vulnerability Assessment	AVA_VAN.1	Vulnerability survey

[Table-17] Assurance Component Summary

5.2.1 Security Target Evaluation

ASE_INT.1 **ST introduction**

Dependencies: No dependencies

Developer action elements

ASE_INT.1.1D The developer shall provide an ST introduction.

Content and presentation elements

ASE_INT.1.1C The ST introduction shall contain an ST reference, a TOE reference, a TOE overview and a TOE description.

ASE_INT.1.2C The ST reference shall uniquely identify the ST.

ASE_INT.1.3C The TOE reference shall uniquely identify the TOE.

ASE_INT.1.4C The TOE overview shall summaries the usage and major security features of the TOE.

ASE_INT.1.5C The TOE overview shall identify the TOE type.

ASE_INT.1.6C The TOE overview shall identify any non-TOE hardware/software/firmware required by the TOE.

ASE_INT.1.7C The TOE description shall describe the physical scope of the TOE.

ASE_INT.1.8C The TOE description shall describe the logical scope of the TOE.

Evaluator action elements

ASE_INT.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_INT.1.2E The evaluator shall confirm that the TOE reference, the TOE overview, and the TOE description are consistent with each other.

ASE_CCL.1 Conformance Claims

Dependencies: ASE_INT.1 ST introduction
ASE_ECD.1 Extended components definition
ASE_REQ.1 Stated security requirements

Developer action elements

ASE_CCL.1.1D The developer shall provide a conformance claim.

ASE_CCL.1.2D The developer shall provide a conformance claim rationale.

Content and presentation

ASE_CCL.1.1C The conformance claim shall contain a CC conformance claim that identifies the version of the CC to which the ST and the TOE claim conformance.

ASE_CCL.1.2C The CC conformance claim shall describe the conformance of the ST to CC part 2 as either CC Part 2 conformant or CC Part 2 extended.

ASE_CCL.1.3C The CC conformance claim shall describe the conformance of the ST to CC Part 3 as either CC Part 3 conformant or CC Part 3 extended.

ASE_CCL.1.4C The CC conformance claim shall be consistent with the extended components definition.

ASE_CCL.1.5C The conformance claim shall identify all PPs and security requirement packages to which the ST claims conformance.

ASE_CCL.1.6C The conformance claim shall describe any conformance of the ST to a package as either package-conformant or package-augmented.

ASE_CCL.1.7C The conformance claim rationale shall demonstrate that the TOE type is consistent with the TOE type in the PPs for which conformance is being claimed.

ASE_CCL.1.8C The conformance claim rationale shall demonstrate that the statement of the security problem definition is consistent with the statement of the security problem definition in the PPs for which conformance is being claimed.

ASE_CCL.1.9C The conformance claim rationale shall demonstrate that the statement of security objectives is consistent with the statement of security objectives in the PPs for which conformance is being claimed.

ASE_CCL.1.10C The conformance claim rationale shall demonstrate that the statement of security

requirements is consistent with the statement of security requirements in the PPs for which conformance is being claimed.

Evaluator action elements

ASE_CCL.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_OBJ.1 Security objectives for the operational environment
Dependencies: No dependencies

Developer action elements

ASE_OBJ.1.1D The developer shall provide a statement of security objectives.

Content and presentation elements

ASE_OBJ.1.1C The statement of security objectives shall describe the security objectives for the operational environment.

Evaluator action elements

ASE_OBJ.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_ECD.1 **Extended components definition**
Dependencies: No dependencies

Developer action elements

ASE_ECD.1.1D The developer shall provide a statement of security requirements.

ASE_ECD.1.2D The developer shall provide an extended components definition.

Content and presentation elements

ASE_ECD.1.1C The statement of security requirements shall identify all extended security requirements.

ASE_ECD.1.2C The extended components definition shall define an extended component for each extended security requirement.

ASE_ECD.1.3C The extended components definition shall describe how each extended component is related to the existing CC components, families, and classes.

ASE_ECD.1.4C The extended components definition shall use the existing CC components, families, classes, and methodology as a model for presentation.

ASE_ECD.1.5C The extended components shall consist of measurable and objective elements such that conformance or nonconformance to these elements can be demonstrated.

Evaluator action elements

ASE_ECD.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_ECD.1.2E The evaluator shall confirm that no extended component can be clearly expressed using existing components.

ASE_REQ.1 **Stated security requirements**

Dependencies: ASE_ECD.1 Extended components definition

Developer action elements

ASE_REQ.1.1D The developer shall provide a statement of security requirements.

ASE_REQ.2.2D The developer shall provide a security requirements rationale.

Content and presentation elements

ASE_REQ.1.1C The statement of security requirements shall describe the SFRs and the SARs.

ASE_REQ.1.2C All subjects, objects, operations, security attributes, external entities and other terms that are used in the SFRs and the SARs shall be defined.

ASE_REQ.1.3C The statement of security requirements shall identify all operations on the security requirements.

ASE_REQ.1.4C All operations shall be performed correctly.

ASE_REQ.1.5C Each dependency of the security requirements shall either be satisfied, or the security requirements rationale shall justify the dependency not being satisfied.

ASE_REQ.1.6C The statement of security requirements shall be internally consistent.

Evaluator action elements

ASE_REQ.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_TSS.1 **TOE summary specification**

Dependencies: ASE_INT.1 ST introduction
ASE_REQ.1 Stated security requirements
ADV_FSP.1 Basic functional specification

Developer action elements

ASE_TSS.1.1D The developer shall provide a TOE summary specification.

Content and presentation elements

ASE_TSS.1.1C The TOE summary specification shall describe how the TOE meets each SFR.

Evaluator action elements

ASE_TSS.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ASE_TSS.1.2E The evaluator shall confirm that the TOE summary specification is consistent with the TOE overview and the TOE description.

ADV_FSP.1 **Basic functional specification**

Dependencies: No dependencies

Developer action elements

ADV_FSP.1.1D The developer shall provide a functional specification.

ADV_FSP.1.2D The developer shall provide a tracing from the functional specification to the SFRs.

Content and presentation elements

ADV_FSP.1.1C The functional specification shall describe the purpose and method of use for each SFR-enforcing and SFR-supporting TSFI.

ADV_FSP.1.2C The functional specification shall identify all parameters associated with each SFR-enforcing and SFR-supporting TSFI.

ADV_FSP.1.3C The functional specification shall provide rationale for the implicit categorization of interface as SFR-non-interfering.

ADV_FSP.1.4C The tracing shall demonstrate that the SFRs trace to TSFIs in the functional specification.

Evaluator action elements

ADV_FSP.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADV_FSP.1.2E The evaluator shall determine that the functional specification is an accurate and complete instantiation of the SFRs.

5.2.2 Guidance Documents

AGD_OPE.1 Operational user guidance

Dependencies: ADV_FSP.1 Basic functional specification

Developer action elements

AGD_OPE.1.1D The developer shall provide operational user guidance.

Content and presentation elements

AGD_OPE.1.1C The operational user guidance shall describe, for each user role, the user-accessible functions and privilege that should be controlled in a secure processing environment,

including appropriate warnings.

AGD_OPE.1.2C The operational user guidance shall describe, for each user role, how to use the available interfaces provided by the TOE in a secure manner.

AGD_OPE.1.3C The operational user guidance shall describe, for each user role, the available functions and interfaces, in particular all security parameters under the control of the user, indicating secure values as appropriate.

AGD_OPE.1.4C The operational user guidance shall, for each user role, clearly present each type of security-relevant event relative to the user-accessible functions that need to be performed, including changing the security characteristics of entities under the control of the TSF.

AGD_OPE.1.5C The operational user guidance shall identify all possible modes of operation of the TOE (including operation following failure or operational error), their consequences and implications for maintaining secure operation.

AGD_OPE.1.6C The operational user guidance shall, for each user role, describe the security measures to be followed in order to fulfill the security objectives for the operational environment as described in the ST.

AGD_OPE.1.7C The operational user guidance shall be clear and reasonable.

Evaluator action elements

AGD_OPE.1.1E The operational user guidance shall be clear and reasonable.

AGD_PRE.1 Preparative procedures

Dependencies: No dependencies

Developer action elements

AGD_PRE.1.1D The developer shall provide the TOE including its preparative procedures.

Content and presentation elements

AGD_PRE.1.1C The preparative procedures shall describe all the steps necessary for secure acceptance of the delivered TOE in accordance with the developer's delivery procedures.

AGD_PRE.1.2C The preparative procedures shall describe all the steps necessary for secure installation of the TOE and for the secure preparation of the operational environment in accordance with the security objectives for the operational environment as described in the ST.

Evaluator action elements

AGD_PRE.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AGD_PRE.1.2E The evaluator shall apply the preparative procedures to confirm that the TOE can be prepared securely for operation.

5.2.3 Life-cycle Support

ALC_CMC.1 Labeling of the TOE

Dependencies: ALC_CMS.1 TOE CM coverage

Developer action elements

ALC_CMC.1.1D The developer shall provide the TOE and a reference for the TOE.

Content and presentation elements

ALC_CMS.1 TOE CM coverage

Dependencies: No dependencies

Developer action elements

ALC_CMS.1.1D The developer shall provide a configuration list for the TOE

Content and presentation elements

ALC_CMS.1.1C The configuration list shall include the followings: the TOE itself and the evaluation evidence required by the SARs.

ALC_CMS.1.2C The configuration list shall uniquely identify the configuration items.

Evaluator action elements

ALC_CMS.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

5.2.4 Tests

ATE_FUN.1 Functional testing

Dependencies: ATE_COV.1 Evidence of coverage

Developer action elements

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

ATE_FUN.1.2D The developer shall provide test documentation.

Content and presentation elements

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

ATE_FUN.1.2C The test plans shall identify the test to be performed and describe the scenarios for performing each test. These scenarios shall include any ordering dependencies on the

results of other tests.

ATE_FUN.1.3C The expected test results shall show the anticipated outputs from a successful execution of the tests**.**

ATE_FUN.1.4C The actual test results shall be consistent with the expected test results**.**

Evaluator action elements

ATE_FUN.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ATE_IND.1 Independent testing**:** sample

Dependencies: ADV_FSP.1 Basic functional specification
AGD_OPE.1 Operational user guidance
AGD_PRE.1 Preparative procedures

Developer action elements

ATE_IND.1.1D The developer shall provide the TOE for testing**.**

Content and presentation elements

ATE_IND.1.1C The TOE shall be suitable for testing**.**

Evaluator action elements

ATE_IND.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence**.**

ATE_IND.1.2E The evaluator shall test a subset of the TSF to confirm that the TSF operates as specified**.**

5.2.5 Vulnerability Assessment

AVA_VAN.1 Vulnerability survey

Dependencies: ADV_FSP.1 Basic functional specification
AGD_OPE.1 Operational user guidance
AGD_PRE.1 Preparative procedures

Developer action elements

AVA_VAN.1.1D The developer shall provide the TOE for testing.

Content and presentation elements

AVA_VAN.1.1C The TOE shall be suitable for testing

Evaluator action elements

AVA_VAN.1.1E The evaluator shall confirm that the information provided meets all requirements for

content and preparation of evidence

AVA_VAN.1.2E The evaluator shall perform a search of public domain sources to identify potential vulnerabilities in the TOE.

AVA_VAN.1.3E The evaluator shall conduct penetration testing, based on the identified potential vulnerabilities, to determine that the TOE is resistant to attacks performed by an attacker processing Basic attack potential.

5.3 Security Requirements Rationale

5.3.1 Dependency of the SFRs of the TOE

The [Table- 18] below shows dependencies of functional components.

NO.	SFR	Dependencies	Reference No.
1	FAU_ARP.1	FAU_SAA.1	3
2	FAU_GEN.1	FTP_STM.1	OE.TMIE_STAMP
3	FAU_SAA.1	FAU_GEN.1	2
4	FAU_SAR.1	FAU_GEN.1	2
5	FAU_SAR.3	FAU_SAR.1	4
6	FAU_SEL.1	FAU_GEN.1	
		FMT_MTD.1	
7	FAU_STG.3	FAU_STG.1	OE.AUDIT_DATA _PROTECTION
8	FAU_STG.4	FAU_STG.1	OE.AUDIT_DATA _PROTECTION
9	FCS_CKM.1(1)	[FCS_CKM.2 or FCS_COP.1]	11,13
		FCS_CKM.4	12
10	FCS.CKM.1(2)	[FCS_CKM.2 or FCS_COP.1]	11, 14
		FCS_CKM.4	12
11	FCS_CKM.2	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1]	9, 10
		FCS_CKM.4	12
12	FCS.CKM.4	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1]	9, 10
13	FCS_COP.1(1)	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1]	9, 12
		FCS_CKM.4	
14	FCS_COP.1(2)	FDP_ITC. or FDP_ITC.2 or FCS_CKM.1 FCS_CKM.4	10, 12
		FCS_CKM.4	
15	FCS_RBG.1(Extended)	-	-
16	FDP_UDE.1(Extended)	FCS_COP.1	13
17	FDP_RIP.1	-	-
18	FIA_AFL.1	FIA_UAU.1	FIA_UAU.2 21
19	FIA_IMA.1(Extended)	-	-

20	FIA_SOS.1	-	-
21	FIA_UAU.2	FIA_UID.1	FIA_UID.2 24
22	FIA_UAU.4	-	-
23	FIA_UAU.7	FIA_UAU.1	FIA_UAU.2 21
24	FIA_UID.2	-	-
25	FMT_MOF.1	FMT_SMF.1	28
		FMT_SMR.1	29
26	FMT_MTD.1	FMT_SMF.1	28
		FMT_SMR.1	29
27	FMT_PWD.1(Extended)	FMT_SMF.1	28
		FMT_SMR.1	29
28	FMT_SMF.1	-	-
29	FMT_SMR.1	FIA_UID.1	FIA_UID.2 24
30	FPT_ITT.1	-	-
31	FPT_PST.1(Extended)	-	-
32	FPT_TST.1	-	-
33	FTA_MCS.2	FIA_UID.1	FIA_UID.2 24
34	FTA_SSL.5(확장)	FIA_UAU.1	FIA_UAU.2 21
35	FTA_TSE.1	-	-

[Table-18] Dependencies of the SFRs of the TOE

FAU_GEN.1 has a dependency on FPT_STM.1. However, reliable time stamps provided by the security objective OE.TIME_STAMP for the operational environment of this ST are used, thereby satisfying the dependency.

FAU_STG.3 and FAU_STG.4 have a dependency on FAU_STG.1, which is satisfied by the operating environment of OE.DBMS.

FIA_AFL.1, FIA_UAU.7 and FTA_SSL.5 are dependent on FIA_UAU.1, which is satisfied by FIA_UAU.2 in its hierarchical relationship with FIA_UAU.1.

FIA_UAU.2, FMT_SMR.1, FTA_MCS.2 have dependencies on FIA_UID.1, which is satisfied by FIA_UID.2 in its hierarchical relationship with FIA_UID.1.

5.3.2 Dependency of SARs of the TOE

The dependency of each assurance package provided in Common Criteria for Information Technology Security Evaluation is already satisfied.

6 TOE Summary Specification

This chapter provides brief and clear description of how the SFRs are implemented in the TOE.

6.1 Security Audit (FAU)

6.1.1 Audit Data Generation and Collection

TOE generates audit data for each component (Console, EOC, KMS) and sends it to KMS. KMS collects audit data and stores it in DBMS. When saving KMS audit data, save the data in the DBMS audit data table for each record and the audit record includes the event period, event type, identity of the subject, and the event result.

The audit function operates when the KMS is run and is generated including start/end. In addition, the TOE can selectively generate audit data according to the type of event (Whether ciphertext is included, encryption / decryption success log) when generating audit data. The default value is to generate audit log for all audit data.

For specific types of audit data, refer to the [Table-9] Audit event.

SFR to be satisfied: FAU_GEN.1, FAU_SEL.1

6.1.2 Security alarms

TOE sends an alert mail to the administrator via registered mail if a log of the administrator continuous authentication failure, integrity violation event, and failure of self test of the KCMVP indicates a potential security violation.

SFR to be satisfied: FAU_ARP.1, FAU_SAA.1

6.1.3 Audit review

TOE stores audit data in a database format in DBMS and only authorized administrators can view audit data through Console. Audit data can be viewed in detail within the log through the security audit function of the Console, and authorized administrators can selectively check the accumulated audit data for each audit data type. The following table shows how to select/order audit data by type and condition.

Audit data type	Condition (AND)	To select or order
Administrator log	Date and time	Search, Sort (descending order)
	Data type	
	Action type	
	Result code	

	Result message	
	Security policy name	
System log	System name	
	System IP	
	System type	
	IP from which the log was sent	
Encryption log	Success	
	Failure	

[Table-19] Audit data search

SFR to be satisfied: FAU_SAR.1, FAU_SAR.3

6.1.4 Prevention of audit data loss

The TOE shall take the following actions if the audit data exceeds the storage limit.
a) In case the threshold pre-defined by the administrator is reached (default value: 90 percent), the administrator is notified via email.
b) In case the audit trail is full (default value: 100 percent), overwrite the oldest audit data to ensure that the latest audit data is generated. and the administrator is notified via email.

SFR to be satisfied: FAU_STG.3, FAU_STG.4

6.2 Cryptographic Support (FCS)

6.2.1 Cryptographic Key Generation

TOE generates random numbers from the random number generator (HASH_DRBG 256) via the Korea Cryptographic Module Validation Program (KCMVP) and optionally generates 128, 192, 256 bits depending on the length of the encryption key selected by the administrator. The KEK generation generates 256 bit keys through password-based encryption key guidance (PBKDF2) according to the PKCS#5 standard. TOE also generates a public key (2048 bit)/ private key pair via the Korea Cryptographic Module Validation Program (KCMVP).
The random number generator is TTAK.KO-12.0190 (2012) standard, public key/private key pairs conform to ISO/IEC 18033-2 (2006) standard. For key generation, use the following by KCMVP.

Classification	Description
Cryptographic module name	Key# Crypto v1.3
Developed company	Raonsecure Co., Ltd.
Validation No.	CM-110-2021.1

Module type	S/W(Library)
Validation Date	Jan 27, 2016
Effective Expiration Date	Jan 27, 2021

[Table-20] KCMVP

SFR to be satisfied: FCS_CKM.1(1), FCS_CKM.1(2), FCS_RBG.1(extended)

6.2.2 Cryptographic Key Distribution

TOE distributes session keys for protection of transmission data between TOE components. The distributed session keys perform data protection through ARIA-256. The distribution of session keys is safely distributed using the public key encryption algorithm (RSAES-2048) and the symmetric key encryption algorithm (ARIA-256).
Cryptographic keys used in EOC to encrypt and decrypt user data are safely distributed using the public key encryption algorithm (RSAES-2048) and the symmetric key encryption algorithm (ARIA-256) to send cryptographic keys stored in KMS to EOC.

SFR to be satisfied: FCS_CKM.2

6.2.3 Cryptographic Key Destruction

TOE safely destroys the encryption key at the end of the process or at the end of a session between components after using the encryption key. In addition, if an authorized administrator destroys the encryption key generated through the management of the encryption key in the console, the encryption key stored in the KMS is safely destroyed. Procedure for safely destroying the encryption key is as follows.
1) Overwrite the encryption key memory area to zero, then disable and destroy the memory.
2) The encryption key of the file type is '0' overwrites 11 times before releasing the buffer

SFR to be satisfied: FCS_CKM.4

6.2.4 Cryptographic Operation

When attempting to encrypt and decrypt user data stored within the DBMS to protect TOE, cryptographic operations are performed using KCMVP's ARIA-128, 1926, and SEED-128. It also provides user data encryption using one-way cryptographic algorithms such as SHA-256, 384, and 512. When encrypting stored TSF data and encrypting transmission data, encryption and decoding are performed using the ARIA-256 algorithm of KCMVP, TSF storage data encryption can be encrypted with ARIA-128, 192, 256 or SEED-128, depending on the administrator's choice. The SHA-256 algorithm also generates integrity data.
The following table provides a summary of the standards, algorithms, cryptographic keys, operating modes,

and computational lists used in cryptographic operations.

Division	Standard	Cryptographic algorithms	Encryption key length	Operational mode	Operation mode
Encrypt user data	KS X 1213-1	ARIA	128, 192, 256	CBC, OFB, CFB, CTR	DB Storage User Data Encryption Decryption
	TTAS.KO-12.0004/R1	SEED	128	CBC, OFB, CFB, CTR	
	ISO/IEC 10118-3	SHA-256, SHA-384, SHA-512	None	None	DB Storage User Data Encryption Decryption
Encrypt TSF data	KS X 1213-1	ARIA	128, 192, 256	CBC, OFB, CFB, CTR	Configuration Encryption Decryption
			256	CBC	Policy file, Transmission data, DB Encryption key Encryption Decryption
	TTAS.KO-12.0004/R1	SEED	128	CBC	Configuration Encryption Decryption
	ISO/IEC 18033-2	RSAES	2048	None	Encryption key distribution
	ISO/IEC 10118-3	SHA-256	None	None	Integrity verification, authentication data Encryption

[Table-21] TOE Cryptographic Operation

SFR to be satisfied: FCS_COP.1(1), FCS_COP.1(2)

6.3 User data protection (FDP)

6.3.1 Encrypt and decrypt user data

It provides column-by-column encryption and decryption of user data stored within the DBMS to protect TOE and performs encryption and decryption on web application servers or DBMS according to API and Plug-In methods. After TOE performs to encrypt and decrypt user data, it completely destroys the remaining information and files in memory as follows to protect the residual information for the original data.

The remaining information in the memory is overwritten with a '0' to be unpacked.

SFR to be satisfied: FDP_UDE.1, FDP_RIP.1

6.4 Identification and Authentication (FIA)

6.4.1 Administrator identification and authentication

TOE provides administrator ID and PW-based identification and authentication through the Console and further authentication through registered certificates.
If the administrator fails a continuous authentication failure (default value: five consecutive times) during authentication, the TOE will perform a (default value: five-minute) lock to prevent further authentication.
TOE processes a masking ('*') on secret information, such as passwords that are entered during administrator authentication, and blocks information that is exposed to the screen. A pop-up message generated in the event of a failed authentication does not provide an exact reason for the authentication failure so that passwords cannot be inferred.
Passwords required for administrator authentication must consist of at least 9 digits according to predefined combination rules and three combinations of alphabetic, numeric, and special characters for successful authentication. In addition, to prevent reuse of authentication data while the administrator is certified, the re-used data is verified and prevented using timestamps and random numbers.

SFR to be satisfied: FIA_AFL.1, FIA_SOS.1, FIA_UID.2, FIA_UAU.2, FIA_UAU.4, FIA_UAU.7

6.5 Security Management (FMT)

6.5.1 Management of Security Functions Behavior

The Console enables TOE to successfully authenticate based on ID and PW so that only logged in authorized administrators can perform security management functions. TOE provides security function management, TSF data management, ID and password management functions, and only authorized administrators play roles.

The security functions and administrative actions that an authorized administrator can manage are as follows:

Administrator Type	Classification	Security Function	Ability			
			Determine the behavior	Not use	use	Modify the behavior
Authorized Administrator	Encryption key management	Generate encryption and decryption key	○	-	O	-
	Security	Encryption target	○	○	○	○

	management	type				
		Type of encryption algorithm	○	○	○	○
		User data integrity check feature	○	○	○	○
		Double encryption	○	○	○	-
		Encryption pattern	○	○	○	○
	Access control	User access right	○	○	○	○
	Environmental management	User access right (Permit and deny policy)	○	○	○	○
	Audit log	Selecting of audit targets (cipher text)	○	○	○	○
		Creating a success log	○	○	○	○

[Table-22] List of Security Functions Behavior of Administrator

In addition, the types and management abilities of TSF data managed by an authorized administrator are as follows:

Administrator Type	**Classification**	**TSF Data**	**Ability**				
			Modify Default	**Query**	**Update**	**Create**	**Delete**
Authorized Administrator	Key management	Encryption and Decryption of user data key management	-	-	○	○	○
		Master key management	-	-	○	○	○
	User management	DB user management	-	○	○	○	○
	Security management	User data security policy management	○	○	○	○	○
	Access Control	Access time management	○	○	○	○	○

		Manage access user	○	○	○	○	○
		Access IP management	○	○	○	○	○
		Manage access program	○	○	○	○	○
	Audit log	Admin log	-	○	-	-	-
		System log	-	○	-	-	-
		Encryption log	-	○	-	-	-
	Certified information	Password log	-	○	○	○	-

[Table-23] List of TSF Data and Management Ability

The password is a combination of alphabetic, numeric, and special characters that will be set to a minimum length of 9 digits, forcing a popup reset if this rule is violated.

[Password combination rules]
- Digits: 9 or more digits ~ 40 or less
- Three combinations of English capital/small letters, special characters, and numbers.
- Number (10): 0~9,
- English capital (26): A~Z,
- English small (26): a~z,
- Special characters (32): `~!@#$%^&*()-_+=[]{}₩|;:'",.<>/?

SFR to be satisfied: FMT_MOF.1, FMT_SMF.1, FMT_SMR.1

6.6 Protection of the TSF

6.6.1 Basic Internal TSF Data Transfer Protection

TOE authenticates communication partners based on certificates between components KMS and Console. Between KMS and EOC, random numbers generated by EOC using the random bit generator are encrypted with the public key for KMS certificates, and KMS transmits the random numbers to decrypt to KMS using the private key. Mutual authentication between TOE components is performed by encrypting session keys generated by the server with the cryptographic algorithm ARIA-256 provided by the KCMVP using transmitted random numbers. In addition, protects data by encrypting data transmitted between components with encryption algorithm (ARIA-256) using received session keys

SFR to be satisfied: FIA_IMA.1(Extended), FPT_ITT.1

6.6.2 Basic Protection of Stored TSF data

Among stored TSF data, the DB encryption key is securely encrypted (ARIA-256) by the master key protected in the KMS. The master key is encrypted with ARIA-256 using a cryptographic key derived from the user password and is used to encrypt and store security policy files.
The administrator password is encrypted with SHA-256 and stored in the KMS, the encryption key and key security parameters loaded in memory do not exist in plain text in memory. At the time it is used for operation, it exists in memory as a plain text, and at the end of the operation it is safely destroyed and not in a plain text.

SFR to be satisfied: FPT_PST.1(extended)

6.6.3 TSF Self Tests and Integrity Tests

The TOE performs a self-test of the KCMVP when running, and a self-test of the main TOE process.
Perform a self-test if the process of the TOE is running normally at regular intervals (every 24 hours).
TOE also performs integrity verification function using hash algorithm (SHA-256) for binary files such as executable files and library files on a regular (24-hour cycle) basis.
For critical TSF data, such as configuration files and policy files, the integrity check function is performed periodically (24-hour cycles) at startup.

SFR to be satisfied: FPT_TST.1

6.7 TOE Access

6.7.1 Admin Session Management

TOE can perform security management functions only by an authorized and identified administrator through the Console. TOE's access limits the number of concurrent sessions to one authorized administrator based on the unique identification and certificate of the administrator PC where the console is installed.
If an authorized administrator logged in through the console does not have input for 5 minutes (default value), the session between KMS and the console ends and the administrator logout is performed automatically. TOE can be managed by one authorized administrator by default and is accessible only by the allowed access IP. TOE also blocks new access if an authorized administrator attempts to access it simultaneously.

SFR to be satisfied: FTA_MCS.2, FTA_SSL5(extended), FTA_TSE.1