

Smart TV Security Solution V6.0  
for Samsung Knox  
Security Target Lite  
V1.1

SAMSUNG ELECTRONICS CO.,  
Ltd.

## Document History

VERSION	DESCRIPTION OF CHANGE	DATE
1.0	Sanitized version of the ST V1.0	2020. 11. 30
1.1	OpenSSL, SQLite Version update	2021. 11. 11

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# 1. Introduction of Security Target

## 1.1. Security Target Reference

This section provides information to refer to the Security Target (ST) as in the following Table. The ST is identified by the ST Title and the ST Version.

Security Target Lite Title	Smart TV Security Solution V6.0 for Samsung Knox Security Target Lite
Security Target Lite Version	V1.1
Publication Date	2021. 11. 11
Authors	SAMSUNG ELECTRONICS Co., Ltd.
CC Identification	Common Criteria for Information Technology Security (CC Version 3.1 Revision 5)
Evaluation Assurance Level	EAL1

## 1.2. TOE Reference

This section provides information to refer to the TOE as in the following Table. The TOE is identified by the TOE Title and the TOE Version.

TOE reference	Smart TV Security Solution V6.0 for Samsung Knox
TOE Version	V6.0
TOE Component	Samsung_Smart_TV_Security_Solution_SYSTEM_001_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_PLATFORM_001_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_PLATFORM_002_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_PLATFORM_003_V6

	.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_SERVICE_001_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_SERVICE_002_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_SERVICE_003_V6.0_Release_1-1-1.armv7l Samsung_Smart_TV_Security_Solution_SERVICE_004_V6.0_Release_1-1-1.armv7l
<b>Developer</b>	SAMSUNG ELECTRONICS CO., Ltd.

### 1.3. TOE Overview

Smart TV Security Solution V6.0 for Samsung Knox (hereinafter TOE) is a Smart TV Security Solution that provides security functions in the form of library by being embedded on Samsung Smart TV. Samsung Knox is a brand name given to a secure platform and security solutions that are equipped with the products released from Samsung Electronics.

The TOE provides functions for the secure operation of Samsung Smart TV with the system(kernel of Tizen OS) integrity verification, blocking the execution of unauthorized Web App, and blocking access to phishing sites. In addition, the TOE also provides encryption/decryption function for data used in Web App.

The TOE provides the security functions as follows:

- System Integrity Monitoring function: Integrity verification function for the kernel of Tizen OS
- Web App Protection function: Function to block the execution of unauthorized Web App in Smart TV
- Data Encryption/Decryption function: Function to encrypt and decrypt

data that developer designates for protection out of the data used in Web App

- Phishing Site Blocking function: Function to verify whether the site to access is a phishing site or not when Smart TV user accesses the site by using Web Browser (linked to Google Safe Browsing)

The TOE is delivered to the developers of Samsung Smart TV in the form of a library which is a kind of software, and is not in charge of all kinds of security functions provided in Samsung Smart TV. The TOE provides only the security function defined in the above.

The TOE is a library to provide the security for the firmware of Samsung Smart TV, and performs the role of being in charge of security function of Samsung Smart TV. The TOE allows a secure web surfing of a Samsung Smart TV user who accesses a web site using Web Browser by providing Phishing Site Blocking function. In addition, by blocking the execution of unauthorized Web App, the TOE prevents the execution of an unauthorized Web App from accessing the resource of Samsung Smart TV. Important data used in Web App are stored securely with encryption. With System Integrity Monitoring function, the verification on the integrity of the system(kernel of Tizen OS) is performed to guarantee secure operation of Samsung Smart TV. The update manager communicates with the update server to download the update file to the smart TV and performs integrity (digital signature) verification for the update file. TOE performs the update for the functions (integrity result report and phishing site DB list update) that are performed by communicating with the update server using the update file downloaded from the smart TV.

The TOE communicates with an external IT entity. Communication with



external IT entity can be done in the form of a wired communication using Ethernet and a wireless communication using Wi-Fi. Google Safe Browsing server and Update server are external IT entities which communicate with Phishing Site Blocking function. In a certain area, since Samsung Smart TV and update server are not interoperated, System Integrity Monitoring function does not report the result, and Phishing Site Blocking function is not operated. The communication with external IT entities uses a secure communication channel that supports confidentiality and integrity via OpenSSL provided in the operational environment. The developer can communicate with Samsung Smart TV using the serial port when developing applications for Smart TV using TOE. Serial port communication is not provided to Smart TV users who are not developers.

The TOE is a security solution that is in the form of library running in Samsung Smart TV and has the minimum hardware and the software requirements as in the following Table 1. Table 1 is classified as the TOE Operational Environment not included in the TOE scope.

**Table 1: Non-TOE Hardware/Software required by the TOE**

Category		Contents
H/W	CPU	ARM architecture (Cortex A53 Quad) or higher
	DDR Memory	1.0GB or higher
	Flash Memory	eMMC 4GB or higher
	Ethernet	1 x 10/100Mb RJ45
	Wi-Fi	802.11 a/b/g/n
	Serial Port	RS-232C
S/W	Web Brower	Tizen Browser 4.1.9200
	OpenSSL	V1.1.11

	SQLite	V3.33.0
	REE OS	Tizen 6.0
	TEE OS	TrustWare V3.1.0

External IT entities needed for the TOE operation are as follows. The TOE uses TLS V1.2 Protocol (OpenSSL 1.1.1l) provided in the operational environment when communicating with the external IT entity of below.

- Google Safe Browsing Server : A server provided by Google that informs whether a relevant URL is a phishing site or not.
- Update Server
  - receives the result detected by the system integrity monitoring function of Samsung smart TV and transmits the phishing site DB list to the smart TV.
  - transmits an online update file to Smart TV for functions which report the result and download the phishing site database

The architecture of Samsung Smart TV is basically composed based on the ARM TrustZone technology provided by ARM CPU. The execution environment of Samsung Smart TV is classified as Trusted Execution Environment(TEE) and Rich OS Application Environment. TEE functions based on TrustWare V3.1.0(Operating System developed by Samsung Electronics) and Rich OS Application Environment functions in Tizen 6.0 Operating System. Among the security functions of the TOE, System Integrity Monitoring function is executed in TEE and REE, Data Encryption/Decryption function is executed in REE or TEE according to the developer selection, whereas Web App Protection function and Phishing Site Blocking function are executed in REE.

## 1.4. TOE Description

### 1.4.1. Physical Scope of TOE

The TOE consists of software provided in the form of a library, and developer guidance. The TOE is delivered to the developers of Samsung Smart TV, and is operated in the form of a library for its operation after installation. The scope of the TOE includes only some of the library that is in charge of security function out of all the elements that compose the whole Samsung Smart TV. That is, the physical scope of TOE includes the library and the developer guidance of the API provided by the library. TOE is directly delivered to developers in a form of CD, including instruction.

TOE Components	Delivery Form	Note
Samsung_Smart_TV_Security_Solution_SYST EM_001_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_SYS TEM_001_V6.0_Release_1-1- 1.armv7l.rpm)	Software (CD)	System Integrity Monitoring
Samsung_Smart_TV_Security_Solution_PLA TFORM_001_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_PLA TFORM_001_V6.0_Release_1-1- 1.armv7l.rpm) Samsung_Smart_TV_Security_Solution_PLA TFORM_003_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_PLA TFORM_003_V6.0_Release_1-1- 1.armv7l.rpm)		Data Encryption/Decryption

<p>Samsung_Smart_TV_Security_Solution_PLA TFORM_002_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_PLA TFORM_002_V6.0_Release_1-1- 1.armv7l.rpm)</p>		<p>Web App Protection</p>
<p>Samsung_Smart_TV_Security_Solution_SERV ICE_001_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_SER VICE_001_V6.0_Release_1-1- 1.armv7l.rpm)</p>		<p>Phishing Site Blocking</p>
<p>Samsung_Smart_TV_Security_Solution_SERV ICE_002_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_SER VICE_002_V6.0_Release_1-1- 1.armv7l.rpm)</p> <p>Samsung_Smart_TV_Security_Solution_SERV ICE_003_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_SER VICE_003_V6.0_Release_1-1- 1.armv7l.rpm)</p> <p>Samsung_Smart_TV_Security_Solution_SERV ICE_004_V6.0_Release_1-1-1.armv7l (Samsung_Smart_TV_Security_Solution_SER VICE_004_V6.0_Release_1-1- 1.armv7l.rpm)</p>		<p>System Integrity Monitoring Phishing Site Blocking</p>
<p>Smart TV Security Solution V6.0 for Samsung Knox Developer Guide V1.1 (Smart TV Security Solution V6.0 for Samsung Knox Developer Guide V1.1.pdf)</p>	<p>Document File (CD)</p>	

TOE is delivered in the form of rpm package as above. As for its operation after installation, it is operated in the form of a library.

## 1.4.2. Logical Scope of TOE

Logical scope of the TOE includes all the aspects that are included in the physical scope of TOE. That is, all the functions provided by the library are included in the logical scope of TOE.

The logical scope of TOE will be explained by being classified according to security function provided by the TOE.

### **System Integrity Monitoring**

The TOE periodically performs the verification on the kernel integrity of Tizen OS while in normal operation through System Integrity Monitoring function so as to ensure safe operation of Samsung Smart TV.

System Integrity Monitoring function can be separated into three parts: the part that starts System Integrity Monitoring function on the application area of Tizen OS; the part that does system integrity monitoring on the dynamic kernel memory area, while operating on the kernel module area of Tizen OS, when TOE gets operated; the part that does the system integrity monitoring on the static area while operating on the application area of TrustWare.

The System Integrity Monitoring function that operates on application of Tizen OS starts the monitoring process after being installed in the application area of Tizen OS, and inserts the part that performs system integrity monitoring on the dynamic kernel memory area into kernel as a LKM(Loadable Kernel Module) so that the monitoring function can get operated on the kernel area of Tizen OS.

As mentioned earlier, the System Integrity Monitoring function that operates

on the kernel module area of Tizen OS performs a part of functions of TOE. Thus, this operates while being inserted as a LKM(Loadable Kernel Module) by the System Integrity Monitoring function that operates on the application of Tizen OS. When monitoring function starts, this performs system integrity monitoring for dynamic kernel memory area.

The System Integrity Monitoring function that operates in the application area of TrustWare detects whether there is any distortion or not by periodically comparing the memory value of the static kernel memory and the original value. This also receives the detected result from the System Integrity Monitoring function that operates on the kernel module area of Tizen OS, and saves the result along with the result detected in static kernel memory.

## **Web App Protection**

The TOE provides Web App Protection function in order to prevent execution of an unauthorized Web App in Samsung Smart TV. Samsung Smart TV can download and store only the Web App provided in App Store (hereinafter “App Contents Server”) provided by Samsung Electronics. When registering Web App in App Contents server, Samsung Electronics registered after encrypting the Web App, and Samsung Smart TV user can download the Web App from App Contents Server and store it on Samsung Smart TV. In order to execute the stored Web App, the decryption process is required. During the decryption process of the Web App, if the Web App is determined to be modified, the execution of the relevant Web App will be blocked. The TOE uses AES Algorithm (CTR mode) for decryption of Web App, and the 128-bit sizes of the cryptographic key.

## **Data Encryption/Decryption**

The TOE provides encryption/decryption function for important data used in Web App. The TOE uses AES algorithm (CBC mode) for encryption, and the 256-bit sizes of the cryptographic key. Data encryption and decryption can be performed in REE or TEE according to the developer selection. The cryptographic key is derived using PBKDF2 algorithm. The Cryptographic key exists on memory after being generated, and is destroyed after encryption/decryption operation is completed. The zeroization is used as the cryptographic key destruction method.

### **Phishing Site Blocking**

The TOE provides Phishing Site Blocking function in order to prevent private information from being exposed to any risks through the access to a harmful phishing site by Samsung Smart TV user. If Samsung Smart TV user accesses web sites using Web Browser(Tizen Browser), Phishing Site Blocking function checks the site based on the phishing site database stored in Smart TV. If the site is suspected for being a phishing site, Google Safe Browsing service is used to check whether the relevant site is a phishing site or not. If the relevant site is confirmed to be a phishing site, the information of such for the site being a phishing site is informed to the user. If the user selects to block the access to the site, the access to the phishing site is blocked to protect private information of the user. The TOE also provides Smart TV user the ability to either disable or enable the Phishing Site Blocking function. If a user disables to use the Phishing Site Blocking function, the Phishing Site Blocking function is not performed.

The list of Phishing Site on the database is updated periodically through Update Server.

- ※ When communicating with the TOE and Google Safe Browsing server, the transmitted data is protected by using TLS V1.2 (OpenSSL 1.1.1l) protocol provided by the operational environment.



## 1.5. Conventions

This section describes the conventions used to denote Common Criteria (CC) operations on security functional components and to distinguish text with special meaning. The notation, formatting, and conventions used in this ST are largely consistent with those used in the CC. Four presentation choices are discussed here.

### Refinement

The refinement operation is used to add detail to a requirement, and, thus, further restricts a requirement. Refinement of security requirements is denoted by **bold text**.

### Selection

The selection operation is used to select one or more options provided by the CC in stating a requirement. Selections are denoted by *underlined italicized text*.

### Assignment

The assignment operation is used to assign a specific value to an unspecified parameter such as the length of a password. Showing the value in square brackets [assignment\_value(s)] indicates an assignment.

### Iteration

Iterated functional components are given unique identifiers by appending to the component name, short name, and functional element name from the CC an iteration number inside parenthesis, for example, FIA\_AFL.1 (1) and FIA\_AFL.1 (2).

## 1.6. Terms and Definitions

### **Google Safe Browsing**

Google Safe Browsing is a service provided by Google offering URL list that contains phishing contents and open API that can use the list.

### **REE (Rich Execution Environment)**

This is a concept that is contradictory to TEE, and refers to execution environment provided by general operating environment such as Tizen and Android.

### **Samsung Knox**

Brand name given to a secure platform and security solutions that are equipped with the products released from Samsung Electronics.

### **Smart TV user**

Users installing and executing Web App in order to use various smart functions embedded on TV and using management function supported in TV.

### **TEE (Trusted Execution Environment)**

This refers to a execution environment providing the security of a quality higher than the execution environment provided in general operating environment. This defined the function of security hardware and software providing execution environment based on safe reliability of security related applications in devices such as smartphone, smart TV. Global Platform, which is a standard group, establishes the standard in the architecture of TEE and related API.

## **Tizen OS**

Tizen is based on the Linux kernel of Linux foundation, and is made based on HTML5 and C++. It is an open source operating system having the purpose of being included in mobile devices including smart phone, and electronic devices such as TV.

## **TrustWare**

This is an operating environment installed for the application of TEE (ARM TrustZone) technology, and TrustWare is the operating system developed by Samsung Electronics even from the kernel stage.

## **Update Server**

Server that performs the update on the database for the list of phishing site used in Phishing Site Blocking function

## **Web App**

Application for Tizen OS based on HTML5 which can be used by being downloaded on TV.

## 2. Conformance Claims

This chapter describes how the Security Target conforms to the Common Criteria, Protection Profile and Package.

### 2.1. Conformance to Common Criteria

This Security Target conforms to the following Common Criteria:

- **Common Criteria**

- Common Criteria for information Technology Security Evaluation, Part 1: Introduction and general model, Version 3.1 Revision 5, 2017. 4, CCMB-2017-04-001
- Common Criteria for Information Technology Security Evaluation, Part 2: SFR (Security Functional Requirement), Version 3.1 Revision 5, 2017. 4, CCMB-2017-04-002
- Common Criteria for Information Technology Security Evaluation, Part 3: SAR (Security Assurance Requirement), Version 3.1 Revision 5, 2017. 4, CCMB-2017-04-003

- **Common Criteria Conformance**

- Common Criteria for Information Technology Security Evaluation, Part 2 conformant
- Common Criteria for Information Technology Security Evaluation, Part 3 conformant

### 2.2. Conformance to Packages

This Security Target conforms to the following Protection Profile:

- Assurance Package: EAL1

## 2.3. Conformance to Protection Profiles

- There is no Protection Profile that this Security Target conforms.

### 3. Security Objectives

#### 3.1. Security Objectives for Operational Environment

This section describes the Security Objectives that must be fulfilled by technical and procedural measures in the operational environment of the TOE.

**Table 2: Security Objectives for the Operational Environment**

OE.Firmware Update	Smart TV user shall install immediately when an alert for firmware update pops up on TV so that the security functions can be maintained in a most up-to-date version.
OE.Secure Communication	Smart TV shall provide secure communication channel when the TOE communicates with Update Server and Google Safe Browsing server,
OE.Trusted Developer	The developer shall not have any malicious intention, should receive proper education for the use of the TOE and shall perform the obligation accurately.

## 4. Security Requirements

This chapter describes security functional requirements and security assurance requirements which should be satisfied in the TOE.

### 4.1. Security Functional Requirements

The security functional requirements defined in this Security Target are based on the functional requirements in Part 2 of the Common Criteria.

Table 3 summarizes the security functional requirements defined by this ST.

**Table 3: Security Functional Requirements**

Class	Component	
Cryptographic Support	FCS_CKM.1	Cryptographic key generation (Data Encryption/Decryption)
	FCS_CKM.4	Cryptographic key destruction (Data Encryption/Decryption)
	FCS_COP.1 (1)	Cryptographic operation (Data Encryption/Decryption)
	FCS_COP.1 (2)	Cryptographic operation (Web App Protection)
	FCS_COP.1 (3)	Cryptographic operation (System Integrity Monitoring)
	FCS_COP.1 (4)	Cryptographic operation (Phishing Site Blocking)
User Data Protection	FDP_DAU.1	Basic Data Authentication
	FDP_IFC.1	Subset information flow control
	FDP_IFF.1	Simple security attributes
Security Management	FMT_MOF.1	Management of security functions behaviour
	FMT_MSA.1	Management of security attributes
	FMT_MSA.3	Static attribute initialization
	FMT_SMF.1	Specification of management functions
	FMT_SMR.1	Security roles
Protection of the TSF	FPT_TEE.1	Testing of external entities

### 4.1.1. Cryptographic support (FCS)

#### FCS\_CKM.1 Cryptographic key generation (Data Encryption/Decryption)

Hierarchical to: No other components.

Dependencies: [FCS\_CKM.2 Cryptographic distribution or  
FCS\_COP.1 Cryptographic operation]

FCS\_CKM.4 Cryptographic key destruction

FCS\_CKM.1.1 The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm [Password Based Key Derivation Function(PBKDF2)] and specified cryptographic key sizes [256-bit] that meet the following: [RFC2898].

#### FCS\_CKM.4 Cryptographic key destruction (Data Encryption/Decryption)

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.4.1 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method [Zeroization] that meets the following: [None].

#### FCS\_COP.1(1) Cryptographic operation (Data Encryption/Decryption)

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 TSF shall perform [encryption and decryption on the important data used by Web App] in accordance with a specified cryptographic algorithm [Advanced Encryption Standard(AES–CBC)] and cryptographic key sizes [256–bit] that meet the following: [FIPS PUB 197].

※ Precautions for Application: Important data means data designated to be important as the developer of the Web App thought of as such among the data used by Web App.

#### **FCS\_COP.1(2) Cryptographic operation (Web App Protection)**

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 TSF shall perform [decryption of Web App] in accordance with a specified cryptographic algorithm [Advanced Encryption Standard(AES–CTR)] and cryptographic key sizes [128–bit] that meet the following: [FIPS PUB 197].

### **FCS\_COP.1(3) Cryptographic operation (System Integrity Monitoring)**

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 TSF shall perform [verification of kernel integrity] in accordance with a specified cryptographic algorithm [Secure Hash Algorithm(SHA)] and cryptographic key sizes [256-bit] that meet the following: [FIPS PUB 180-4].

### **FCS\_COP.1(4) Cryptographic operation (Phishing Site Blocking)**

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 TSF shall perform [Phishing Site Blocking function] in accordance with a specified cryptographic algorithm [Secure Hash Algorithm(SHA)] and cryptographic key sizes [256-bit] that meet the following: [FIPS PUB 180-4].

## **4.1.2. User data protection(FDP)**

## **FDP\_DAU.1 Basic Data Authentication**

Hierarchical to: No other components.

Dependencies: No dependencies.

FDP\_DAU.1.1 The TSF shall provide a capability to generate evidence that can be used as a guarantee of the validity of [Web App].

FDP\_DAU.1.2 The TSF shall provide [library for Web App Protection function] with the ability to verify evidence of the validity of the indicated information.

## **FDP\_IFC.1 Subset information flow control**

Hierarchical to: No other components.

Dependencies: FDP\_IFF.1 Simple security attributes

FDP\_IFC.1.1 The TSF shall enforce the [Phishing site blocking SFP] on [the below list of subjects, information, and operations that cause controlled information to flow to and from controlled subjects covered by the SFP].

- subject : Smart TV user
- information: URL
- operation: web site blocking

※ Precautions for Application: In a certain area, Samsung Smart TV and update server are not interoperated, the phishing site blocking function is not operated.

## **FDP\_IFF.1 Simple security attributes**

Hierarchical to: No other components.

Dependencies: FDP\_IFC.1 Subset information flow control  
FMT\_MSA.3 Static attribute initialisation

FDP\_IFF.1.1 The TSF shall enforce the [Phishing site blocking SFP] based

on the following types of subject and information security attributes: [the below list of subjects and information controlled under the indicated SFP, and for each, the security attributes].

- subject: Smart TV user
- information: URL
- subject security attribute: None
- information security attribute: destination URL

FDP\_IFF.1.2 The TSF shall permit an information flow between a controlled subject and controlled information via a controlled operation if the following rules hold: [If the destination URL included in the information security attribute is not included in the list of Phishing Sites].

※ Precautions for Application: For determination of a phishing site, two steps should be performed. The first step is to compare with the list of phishing site in the database, and if suspected for being a phishing site after the comparison, the second step of using Google Safe Browsing service should finally determine whether the site is a phishing site or not.

FDP\_IFF.1.3 The TSF shall enforce the [None].

FDP\_IFF.1.4 The TSF shall explicitly authorise an information flow based on the following rules: [If the destination URL included in the information security attribute is included in the list of phishing sites, but if the user decided to access the relevant URL].

FDP\_IFF.1.5 The TSF shall explicitly deny an information flow based on the following rules: [None].

### 4.1.3. Security management(FMT)

## FMT\_MOF.1 Management of security functions behaviour

Hierarchical to: No other components.

Dependencies: FMT\_SMR.1 Security roles

FMT\_SMF.1 Specification of Management Functions

FMT\_MOF.1.1 The TSF shall restrict the ability to disable, enable the behaviour of the functions [Phishing site blocking] to [Smart TV user].

## FMT\_MSA.1 Management of security attributes

Hierarchical to: No other components.

Dependencies: [FDP\_ACC.1 Subset access control, or

FDP\_IFC.1 Subset information flow control]

FMT\_SMR.1 Security roles

FMT\_SMF.1 Specification of Management Functions

FMT\_MSA.1.1 The TSF shall enforce the [Phishing site blocking SFP] to restrict the ability to [send] the security attributes [destination URL] to [Smart TV user].

## FMT\_MSA.3 Static attribute initialisation

Hierarchical to: No other components.

Dependencies: FMT\_MSA.1 Management of security attributes

FMT\_SMR.1 Security roles

FMT\_MSA.3.1 The TSF shall enforce the [Phishing site blocking SFP] to provide permissive default values for security attributes that are used to enforce the SFP.

FMT\_MSA.3.2 The TSF shall allow the [Smart TV user] to specify

alternative initial values to override the default values when an object or information is created.

#### **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: [Phishing site blocking].

#### **FMT\_SMR.1 Security roles**

Hierarchical to: No other components.

Dependencies: FIA\_UID.1 Timing of identification

FMT\_SMR.1.1 The TSF shall maintain the roles [Smart TV user].

FMT\_SMR.1.2 The TSF shall be able to associate users with roles.

### **4.1.4. Protection of the TSF (FPT)**

#### **FPT\_TEE.1 Testing of external entities**

Hierarchical to: No other components.

Dependencies: No dependencies.

FPT\_TEE.1.1 The TSF shall run a suite of tests periodically during normal operation to check the fulfillment of [kernel integrity for Tizen OS].

FPT\_TEE.1.2 If the test fails, the TSF shall [report when kernel integrity violation is detected].

## **4.2. Security Assurance Requirements**

Security assurance requirements (SAR) defined in this document consists of assurance component in Common Criteria for Information Technology Security Evaluation, Part 3. The Evaluation Assurance Levels (EALs) is EAL1. Table 4 shows the summary of assurance components.

**Table 4: Security Assurance Requirements**

Assurance Class	Assurance Component	
ASE: 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 definition
	ASE_REQ.1	Stated security requirements
	ASE_TSS.1	TOE summary specification
ADV: Development	ADV_FSP.1	Basic functional specification
AGD: Guidance documents	AGD_OPE.1	Operational user guidance
	AGD_PRE.1	Preparative procedures
ALC: Life-cycle support	ALC_CMC.1	Labelling of the TOE
	ALC_CMS.1	TOE CM coverage
ATE: Tests	ATE_IND.1	Independent testing – conformance
AVA: Vulnerability assessment	AVA_VAN.1	Vulnerability survey

#### 4.2.1. 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 identify the TOE.

ASE\_INT.1.4C The TOE overview shall summarise 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 elements:

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.1.2D 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.

### **4.2.2. Development**

#### **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 categorisation of interfaces 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.

### **4.2.3. 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 privileges 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 fulfil

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

### **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.

#### **4.2.4. Life-cycle support**

##### **ALC\_CMC.1 Labelling 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\_CMC.1.1C The TOE shall be labelled with its unique reference.

Evaluator action elements:

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

##### **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 following: 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.

## 4.2.5. Tests

### ATE\_IND.1 Independent testing – conformance

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.

## 4.2.6. 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 presentation 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 possessing Basic attack potential.

## 4.3. Dependency Rationale

### 4.3.1. SFR Dependencies

Table 5 shows the dependencies on the TOE Security Functional Components.

Table 5: Dependencies on the TOE Security Functional Components

No	TOE Security Functional Component	Claimed Dependencies	Note
1	FCS_CKM.1	FCS_COP.1, FCS_CKM.4	
2	FCS_CKM.4	FCS_CKM.1	
3	FCS_COP.1(1)	FCS_CKM.1, FCS_CKM.4	
4	FCS_COP.1(2)	–	
5	FCS_COP.1(3)	–	
6	FCS_COP.1(4)	–	
7	FDP_DAU.1	–	
8	FDP_IFC.1	FDP_IFF.1	
9	FDP_IFF.1	FDP_IFC.1, FMT_MSA.3	
10	FMT_MOF.1	FMT_SMF.1, FMT_SMR.1	
11	FMT_MSA.1	FDP_IFC.1, FMT_SMF.1, FMT_SMR.1	
12	FMT_MSA.3	FMT_MSA.1, FMT_SMR.1	
13	FMT_SMF.1		
14	FMT_SMR.1	FIA_UID.1	
15	FPT_TEE.1	–	

The dependency of some functional components is not satisfied, and the description for the justification of such is as follows.

FIA\_UID.1

- Smart TV embedded with security function of TOE is generally the possession of the individual of the Smart TV user, and all the rights

are given to individual users, and thus identification or authentication is not provided.

FCS\_CKM.1, FCS\_CKM.4 (Dependencies: FCS\_COP.1 (2)) :

- The cryptographic key used to decrypt the Web App in the Web App Protection function is provided in the Operational Environment, and thus does not have a process for generation and destruction of the cryptographic key.

FCS\_CKM.1, FCS\_CKM.4 (Dependencies: FCS\_COP.1 (3)) :

- System Integrity Monitoring function uses SHA–256 hash algorithm in order to verify the integrity of the kernel, and thus does not have a process for generation and destruction of the cryptographic key.

FCS\_CKM.1, FCS\_CKM.4 (Dependencies: FCS\_COP.1 (4)) :

- Phishing Site Blocking function uses SHA–256 hash algorithm in order to check whether the web site is a phishing site or not, and thus does not have a process for generation and destruction of the cryptographic key.

### 4.3.2. SAR Dependencies

The dependency of each assurance package (EAL1) provided by the CC is already satisfied.

## 5. TOE Summary Specification

### 5.1. System Integrity Monitoring

The TOE periodically performs the verification on the kernel integrity of Tizen OS while in normal operation through System Integrity Monitoring function so as to ensure safe operation of Samsung Smart TV.

System Integrity Monitoring function can be separated into three parts: the part that starts System Integrity Monitoring function on the application area of Tizen OS; the part that does system integrity monitoring on the dynamic kernel memory area, while operating on the kernel module area of Tizen OS, when TOE gets operated; the part that does the system integrity monitoring on the static area while operating on the application area of TrustWare.

The System Integrity Monitoring function that operates on application of Tizen OS starts the monitoring process after being installed in the application area of Tizen OS, and inserts the part that performs system integrity monitoring on the dynamic kernel memory area into kernel as a LKM(Loadable Kernel Module) so that the monitoring function can get operated on the kernel area of Tizen OS.

As mentioned earlier, the System Integrity Monitoring function that operates on the kernel module area of Tizen OS performs a part of functions of TOE. Thus, this operates while being inserted as a LKM(Loadable Kernel Module) by the System Integrity Monitoring function that operates on the application of Tizen OS. When monitoring function starts, this performs system integrity monitoring for dynamic kernel memory area. The scope of monitoring for the dynamic kernel memory area is the PageTable that does translating from the virtual address of memory to a physical address, LKM(Loadable Kernel

Module) that has kernel authority while operating as a part of kernel while being inserted to kernel, Netfilter that provides Hook function so that network related function can be performed as a handler, and protection on the Virtual File System which is an abstract hierarchy that enables access to many file systems in the same manner.

The System Integrity Monitoring function that operates in the application area of TrustWare detects whether there is any distortion or not by periodically comparing the memory value of the static kernel memory and the original value. This also receives the detected result from the System Integrity Monitoring function that operates on the kernel module area of Tizen OS, and saves the result along with the result detected in static kernel memory. The scope of monitoring for the static kernel memory area is the protection for the Read-Only which is the Read-Only data of kernel, for Text which is the kernel code, for Exception Vector Table which deals with interrupt or exception, and for Linux Security Module which is a Framework that provides Hook function so as to access to important internal kernel objects at all the points.

TOE provides an online update for function which reports the result. The update manager provided in the operational environment communicates with the update server to download the online update file to Smart TV and performs integrity verification for the online update file. TOE performs the update by installing the update file downloaded from Smart TV.

Relevant SFR : FPT\_TEE.1, FCS\_COP.1 (3)

## 5.2. Web App Protection

The TOE provides Web App Protection function in order to prevent execution

of an unauthorized Web App in Samsung Smart TV. Samsung Smart TV can download and store only the Web App provided in App Store (hereinafter “App Contents Server”) provided by Samsung Electronics. When registering Web App in App Contents server, Samsung Electronics registered after encrypting the Web App, and Samsung Smart TV user can download the Web App from App Contents Server and store it on Samsung Smart TV. In order to execute the stored Web App, the decryption process is required. During the decryption process of the Web App, if the Web App is determined to be modified, the execution of the relevant Web App will be blocked. The TOE uses AES Algorithm (CTR mode) for decryption of Web App, and the 128-bit sizes of the cryptographic key.

Relevant SFR : FDP\_DAU.1, FCS\_COP.1 (2)

### **5.3. Data Encryption/Decryption**

The TOE provides encryption/decryption function for important data used in Web App. The TOE uses AES algorithm (CBC mode) for encryption, and the 256-bit sizes of the cryptographic key. The cryptographic key is derived from hardware using PBKDF2 algorithm. Data encryption and decryption can be performed in REE OS or TEE OS according to the developer selection. The Cryptographic key exists on memory after being generated, and is destroyed after encryption/decryption operation is completed. The zeroization is used as the cryptographic key destruction method.

Data Encryption/Decryption function has the lifecycle of 1) Cryptographic key generation, 2) Encryption and Decryption operation, 3) Cryptographic key destruction.



Relevant SFR : FCS\_CKM.1, FCS\_CKM.4, FCS\_COP.1(1)

## 5.4. Phishing Site Blocking

The TOE provides Phishing Site Blocking function in order to prevent private information from being exposed to any risks through the access to a harmful phishing site by Samsung Smart TV user. If Samsung Smart TV user accesses web sites using Web Browser(Tizen Browser), Phishing Site Blocking function checks the site based on the phishing site database(SQLite) stored in Smart TV. If the site is suspected for being a phishing site, Google Safe Browsing service is used to check whether the relevant site is a phishing site or not. If the relevant site is confirmed to be a phishing site, the information of such for the site being a phishing site is informed to the user. If the user selects to block the access to the site, the access to the phishing site is blocked to protect private information of the user. The TOE also provides Smart TV user the ability to either disable or enable the Phishing Site Blocking function. If a user disables to use the Phishing Site Blocking function, the Phishing Site Blocking function is not performed. The list of Phishing Site on the database is updated periodically through Update Server.

TOE provides an online update for function which downloads the phishing site database. The update manager provided in the operational environment communicates with the update server to download the update file to Smart TV and performs integrity verification for the update file. TOE performs the update by installing the update file downloaded from Smart TV.

Relevant SFR : FDP\_IFC.1, FDP\_IFF.1, FMT\_MOF.1, FMT\_MSA.1, FMT\_MSA.3, FMT\_SMF.1, FMT\_SMR.1