Indian Telecom Security Assurance Requirements (ITSAR)

भारतीय दूरसंचार सुरक्षा आश्वासन आवश्यकताएँ (भा.दू.सु.आ.आ.)

Smart Camera

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About NCCS

National Centre for Communication Security (NCCS), with headquarters at Bengaluru was set up in 2018 with the objective to establish and operationalize a framework of security testing and certification within the country. NCCS is mandated to prepare Telecom security requirements/standards called Indian Telecom Security Assurance Requirements (ITSAR) that address the country-specific security needs in the telecommunication landscape and notify the same.

Document History

S.no	Title	ITSAR No.	Version	Date of Release	Remark
1	Smart Camera	ITSAR3090622504	1.0.0	21.04.2025	First release

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A) Outline

The objective of this document is to present comprehensive, country-specific security requirements for the smart camera. A smart camera is a consumer Internet of Things (IoT) device that remotely captures multimedia (such as audio, video, image, etc.) and can perform intelligent analysis functions (such as movement detection) and share the information with the consumer (over mobile/web-based interface). The smart camera can be a part of a video surveillance system (VSS) that provides display and storage of the video captured by multiple remote smart cameras over a network for multiple security applications along with other functionalities such as remote control and alarm.

The specifications produced by various regional/ international standardization bodies/ organizations/associations like ISO, ETSI, NIST, IoTSF, Agelight, GSMA, ENISA, OWASP ISVS, and OWASP ASVS along with the country-specific security requirements from BIS, AIS are the basis for the baseline security requirements considered in this document. The BIS/ITU-T references made in this document imply that the respective clause has been adopted as it is or with certain modifications.

This document commences with a brief description of the smart camera architecture and its functionalities and then proceeds to address the common and specific security requirements of consumer smart cameras. The common security requirements cover the software part in general and the specific security requirements focus mainly on the communication part of the consumer smart cameras.

B) Scope

This document specifies the security requirements and gives recommendations for the consumer IoT (Internet of Things) smart camera installed for surveillance and monitoring applications.

C) Conventions

1. Must or shall or required denotes the absolute requirement of a particular clause of ITSAR.
2. Must not or shall not denote absolute prohibition of a particular clause of ITSAR.
3. Should or recommended denotes that the particular clause of ITSAR may be ignored under justifiable circumstances but after careful examination of its implications.
4. Should not or not Recommended denotes the opposite meaning of (3) above.

Chapter 1 – Overview

Introduction:

A smart camera is a popular alternative to the traditional digital camera that can extract specific information from the captured images or videos (Ref: ER TEC28822108). Smart cameras are widely used in a multitude of applications, including fingerprint readers, smart camera phones, human-computer interfaces, machine visions, and video surveillance. The smart cameras installed for surveillance in a home can be wired or wireless cameras. A user can access these cameras using a custom-built app on a mobile phone via two modes: connecting to the gateway via Wi-Fi or by connecting over the Internet and getting routed to the camera. The smart camera can process images and, in some cases, take action. For example, a camera deployed for home surveillance can trigger an alarm or send an email to a user when an entity is detected. Unlike traditional CCTV cameras that record continuously, smart cameras may record instances of activities when detecting any motion by in-built sensors.

Smart Camera Architecture:

The hardware architecture of a smart camera varies based on the application domain and constraints on size, cost, and power consumption. The basic architecture of a smart camera is shown in Figure 1. A smart camera captures images using image sensors and stores them in the memory module. Also, the communication interface handles the transportation of images to another device or part(s) of the video surveillance system (VSS). The processor of a smart camera controls the device's functionality and analyses the captured image to gather information.
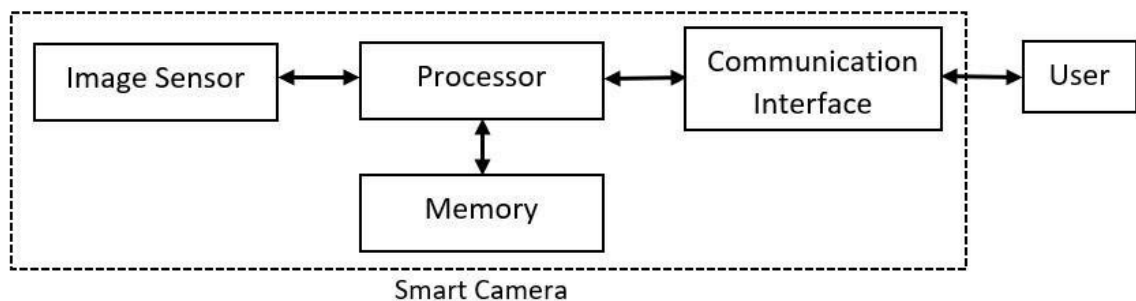
Figure 1. Smart Camera Architecture (adopted from [6])

VSS Architecture:

A VSS consists of a camera module, a gateway, and mobile devices. A camera collects video, audio, alarm signals, and other information, which can be conveyed to the gateway and transmitted, delivered, stored, or processed by the gateway. Gateway is the central controller responsible for configurations, access, authorization, maintenance, and update. It provides services to the user, such as watching videos, receiving alarms, and controlling camera functionality. Users and the camera can access the gateway with a fixed or mobile network. A typical architecture of VSS used indoors is shown in Figure 2. BIS IS 16910 (Part 1/Sec 1) identifies that a VSS for security applications has three functional blocks which portray the various parts and functions of the system. The three major functional parts are Video Environment, System Management, and System Security. System security includes system integrity and data integrity that protects the VSS from intentional and unintentional interference during normal operation. System integrity defines the physical security of all system components and control of physical and logical access to the VSS. Data integrity covers logical access to the data and prevention of loss or manipulation of the data.
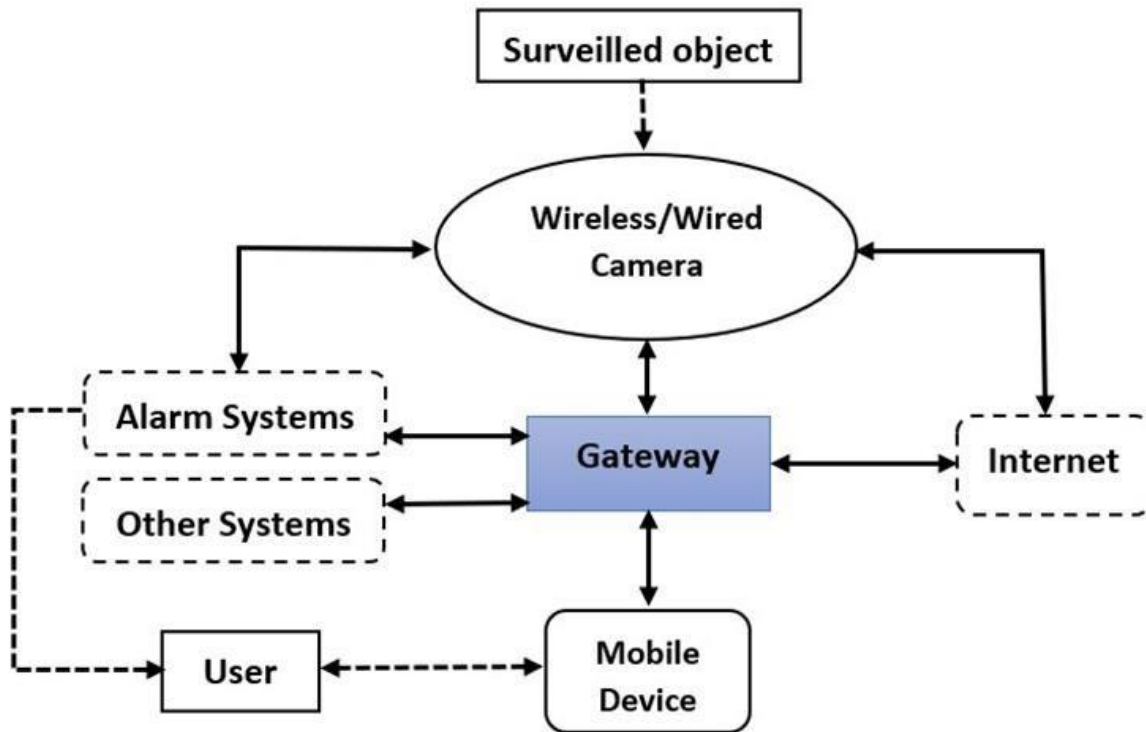
Figure 2. VSS Architecture (adopted from ITU-T F.743)

Smart Camera Security:

To provide sufficient security to the Smart Camera and the data, a coordinated effort from all stakeholders is essential. The scope of this document is limited to mandatory requirements and recommendations for the design and implementation of devices from Environmental

Class-I (residential/office environment) with all security grades and access levels. The smart camera pertaining to Class-I (BIS IS 16910 (Part 1/Sec 1)) provides monitoring functions and solutions for homes/offices with detection needs. Also, it supports several surveillance assistant functions such as remote viewing on multiple devices, two-way real-time audio, storage methods, and human detection to help users. Security for physical and hardware, firmware and operating system, Communication, operation and maintenance, application domain, and data protection are some of the baseline security requirements.

Keeping in view of the device functionality and capabilities and referring to various standards on IoT security, specifically ETSI EN 303 645 V2.1.1 (2020-06), ENISA Baseline security recommendations for IoT November 2017, IoT SF IoT Security Assurance Framework Release 3.0 Nov 2021 Security Assurance Framework, GSMA CLP suitable common security requirements for the smart camera are developed in this document. Also, specific security requirements are developed considering the industry specifications for the consumer smart camera.

Classification of IoT devices based on Security Features

Making the whole diversity of IoT-class applications adhere to a common security objective is a subjective endeavour. Even within vertical sectors such as consumer and enterprise, the security measures and strength of controls will vary depending on the actual use case. Though international standards exist for IoT security viz., ETSI 303 645, IoT SF security framework for IoT, there is no harmonization of these standards. In an endeavour to classify IoT devices based on Security features, TEC (Telecom Engineering Centre) has mapped the device classifications from various standard bodies in its technical report- "Security by Design for IoT Device Manufacturers".

In the above report, TEC has also proposed "*Classification for IoT devices in India".* This classification has IoT devices varying from Level-0 to Level-4 covering the CIA (Confidentiality, Integrity, and Availability) triad requirements along with authentication and authorization covering baseline security requirements and principles of security by design.

The proposed classification has Level-0 meeting no security requirements, Level-1 meeting the baseline requirements, Level-2 adhering to international cybersecurity standards for IoT, Level-3 meeting the principles of security by design and having no known software vulnerabilities and Level-4 device being resistant to cyber security attacks by undergoing penetration testing.

To develop Indian Telecom Security Assurance Requirements (ITSARs) for the gamut of Consumer IoT devices, National Centre for Communication Security (NCCS) adopts the cybersecurity device classification proposed in the "Security by Design for IoT Device Manufacturers" report of TEC.

The TEC report also explains the five levels of IoT devices as below.

Level 0: Such devices are very constrained devices with very low processing power, no data encryption and message encryption. Such type of devices may not enable a secure communication and should be allowed to work through such gateways which can add the required measure of security. Without the security augmentation by a Gateway, such type of devices should not be permitted for use in mission critical infrastructure. It is required that the Gateways used to connect such devices will follow the security assurance at Level 2 / Level 3.

Level-1: Devices of this level must use a protocol stack specifically designed for IoT devices with constraints, such as Constrained Application Protocol (CoAP). Device examples in this category can include environmental sensors. Devices in this category should meet the baseline requirements of ETSI EN 303 645 i.e. no default password, ensuring the availability of security updates and implementing means to manage vulnerability reporting.

Level-2: Security requirement of Level-1 and adherence to international standards (secure identity, software asset security etc.).

Level-3: Absence of Known Common Software Vulnerabilities. The devices must meet the Security assurance requirements of Level-2 and also the software used in the connected device must be evaluated by a test laboratory using automated binary analysers to ensure that there is no known critical software weakness, vulnerabilities or malware.

Level-4: The device should perform well against the penetration tests by approved third party test labs, and fulfil Level-3 requirements. The IoT device undergoes penetration testing by a test laboratory to provide a basic level of resistance against common cybersecurity attacks.

Proposal for Device Classification							
Security Features	Security Requirements	Level-0	Level-1	Level-2	Level-3	Level-4	
Confidentiality	Message Encryption	X	√	√	√	√	
	Attack Protection	X	X	√	√	√	
	Data Encryption	X	√	√	√	√	
	Tamper Resistance	X	X	√	√	√	
	Security Assessment Certificates	X	X	√	√	√	
	Device ID Management (Physical/ Logical)	√	√	√	√	√	
Integrity	Data Integrity	X	X	√	√	√	
	Platform Integrity	X	X	√	√	√	
	Secure Booting and Integrity Test / Self Test	X	X	X	√	√	
Availability	Logging	√	√	√	√	√	
	External Attack Prevention & Response	X	X	X	√	√	
	Secure Monitoring	X	X	X	√	√	
	Secure Firmware Update & Patch Update	X	√	√	√	√	
	Software Assets Protection & Response	X	X	√	√	√	
	Vulnerability Management & Response	X	√	√	√	√	
	Security Policy Update & Response	X	X	X	√	√	
Authentication/ Authorization	Biometrics	X	X	X	X	√	
	User Authentication	X	√	√	√	√	
	Data Authentication	X	X	√	√	√	
	Password Management	X	√	√	√	√	
	Access Control	√	√	√	√	√	
	Device ID Verification	X	X	√	√	√	
Security Assement and standard		Level-0	Level-1	Level-2	Level-3	Level-4	
Meet Baseline Security Requirement							
Adherence to cyber security based on International Standards							
Adherence to the principles of Security by Design, and absence of known common software vulnerabilities							
Resistance against common cyber-attack and undergo for penetration testing							

Proposed levels for IoT devices [Ref: Table 7 Proposed levels for IoT devices from "Security by Design for IoT Device Manufacturers" published by TEC]

Level '0' type of devices may not enable secure communication and they do not meet baseline security requirements. They can be allowed to work through only gateways which can add the required measure of security. For ITSAR purpose, the level '0' classification is not considered as these devices do not meet baseline security requirements and hence, it is not possible to carry out security certification at Level '0'.

Classification of Security Requirements:

In order to apply an appropriate level of security assurance to an IoT device, This ITSAR has four levels of security requirements classified based on the classification of IoT devices proposed in "Security by Design for IoT Device Manufacturers" report of TEC.
The security requirements to be met by the IoT device under each level are explained below.

Level 1: Baseline Security Requirements

The level 1 device shall meet the requirement of no default password, ensuring the availability of security updates and implementing means to manage vulnerability reporting. It also shall meet the basic security requirements such as message encryption, data encryption, device ID management (Physical/Logical), logging availability, secure firmware update and patch update, vulnerability management and response, user authentication, password management and access control mechanisms.

Level 2: Adherence to Cybersecurity based on International Standards

In addition to fulfilling Level 1 requirements, the level 2 device shall have integrated features to provide adherence to cybersecurity such as attack protection, tamper resistance, security assessment certificates, data integrity, platform integrity, software assets protection and response, data authentication and device ID verification.

Level 3: Adherence to the Principles of Security-by-Design, and Absence of Known Common Software Vulnerabilities

In addition to fulfilling Level 2 requirements, the level 3 device shall have adherence to the principles of Security-by Design and absence of known common software vulnerabilities by using features like secure booting and integrity test / self-test, external attack prevention and response, secure monitoring and secure policy update and response.

Level 4: Resistance against Common Cyber-Attacks and undergo for penetration testing

In addition to fulfilling Level 3 requirements, the level 4 device shall have resistance against common cyber-attacks, it undergoes penetration testing and incorporates the usage of biometric authentication.

Minimum level of Security Certification

For the Smart Camera, the ***minimum-security certification required shall be at least Level 3 and above.*** In other words, for smart cameras to get Security Certified as per this ITSAR, the minimum-security requirements to be met are Level 3 and above.

Chapter 2 – Common Security Requirements

Section1: Authentication

A. Level-1 Security requirements:

2.1.A.1 Default passwords and user names

Requirement:

a) The device shall enforce the factory-issued or OEM login accounts and factory-default usernames to be disabled, erased or renamed when installed or commissioned.

b) The device shall enforce all the factory default user login passwords altered when installed or commissioned. Weak, common, null, or blank passwords shall not be allowed.

[Ref: 1) ENISA Baseline security recommendations for IoT November 2017 GP-TM-22,
    2) IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.12 and 2.4.8.13]

2.1.A.2 Hardcoded authentication credentials

Requirement:

The manufacturer shall submit an undertaking that authentication credentials for users, devices, or services are not hardcoded in firmware or applications.

[Ref : OWASP ISVS 2.1.9]

2.1.A.3 Unique passwords

Requirement:

Where passwords are used and, in any state, all consumer IoT device passwords shall be unique per device or defined by the user. If password-less authentication is used, the same principles of uniqueness apply.

[Ref: 1) ETSI EN 303 645 V2.1.0 (2020-04) Provision 5.1-1, 2) IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.3]

2.1.A.4 Multiple user accounts

Requirement:

Multiple user accounts with varied levels of control shall be created.

[Ref: ETSI EN 303 645 V2.1.0 (2020-04) Note]

B. Level-2 Security Requirements:

2.1.B.1 Authentication credentials

Requirement:

Authentication credentials shall be salted, hashed, and/or encrypted. Authentication credentials, including but not limited to user passwords, shall be salted, and hashed. Applies to all stored credentials to help prevent unauthorized access and brute force attacks.

[Ref: ENISA Baseline security recommendations for IoT November 2017, GP-TM-24]

2.1.B.2 Username and password reset

Requirement:

Manufacturer shall provide generally accepted username and password reset mechanisms using multi-factor verification and authentication and shall provide notification of password and/or user ID reset or changes utilizing secure authentication and /or out-of-band notice(s).

[Ref: Agelight IoT Safety Architecture & Risk Toolkit v4.0 15 and 17]

2.1.B.3 Logical access

Requirement:

The device shall authenticate each user and device attempting to logically access it.

[Ref: NIST 8228 Expectation 10]

2.1.B.4 Pairing and connecting with other devices

Requirement:

Devices shall provide notice and/or request user confirmation when pairing, onboarding, and/or connecting with other devices, platforms, or services.

[Ref: Agelight IoT Safety Architecture & Risk Toolkit v4.0 19]

2.1.B.5 Provisioned credentials

Requirement:

Provisioned credentials such as username for device authentication shall be unique per device.

[Ref: OWASP ISVS 2.1.10]

2.1.B.6 Changing authentication value

Requirement:

Where a user can authenticate against a device, the device shall provide the user or an administrator with a simple mechanism to change the authentication value used.

[Ref: ETSI EN 303 645 V2.1.0 (2020-04) Provision 5.1-4]

2.1.B.7 New and common passwords

Requirement:

The device shall not allow new and common passwords containing the user account name with which the user account is associated.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.5]

2.1.B.8 Changing authentication password

Requirement:

User authentication password change mechanism shall ask for the user's current password.

[Ref: OWASP ISVS 2.1.6]

2.1.B.9 Display of user credentials

Requirement:

The device shall conceal password characters from display of user credentials on login interfaces when a user enters a password for a device. Device shall disable the use of default or hardcoded passwords.

[Ref: NIST 8228 Expectation 9, IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.15]

C. Level-3 Security Requirements:

2.1.C.1 Multi-factor authentication

Requirement:

Authentication mechanisms shall use strong passwords or personal identification numbers (PINs), and shall use two-factor authentication (2FA) or multi-factor authentication (MFA) like OTP-based, Biometrics, certificates etc.

[Ref: ENISA Baseline security recommendations for IoT November 2017 GP-TM-23]

2.1.C.2 Trusted Computing Base (TCB)

Requirement:

The device shall implement a trusted computing base. The manufacturer shall give an undertaking that the Trusted Computing Base has been implemented, and the identity is cryptographically authenticated using the TCB. The device shall utilize an API for the TCB.

[Ref. GSMA CLP.12 4.2]

2.1.C.3 Brute force Attacks

Requirement:

Brute force attacks shall be impeded by introducing escalating delays following failed user account login attempts, and/or a maximum permissible number of consecutive failed attempts within a certain time interval

[Ref: 1. IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.13.15, 2.4.8.7,
2. ENISA Baseline security recommendations for IoT November 2017 GP-TM-25 and ETSI EN 303 645 V2.1.0 (2020-04) Provision 5.1-5]

2.1.C.4 Locking of account

Requirement:

The client application shall be able to lock an account or to delay additional authentication attempts after a limited number of failed authentication attempts.

[Ref: ETSI EN 303 645 V2.1.0 (2020-04) Provision 5.1-5 Example 7]

D. Level-4 Security Requirements:

Nil

Section 2: Identity Management

A. Level-1 Security Requirements:

2.2.A.1 Physical and logical identifiers

Requirement:

The device shall be uniquely identified logically and physically, only authorized entities should have access to the physical identifier, which may or may not be the same as the logical identifier.

[Ref: NIST 8259A Device Identification]

B. Level-2 Security Requirements:

2.2.B.1 Hardcoded unique identity

Requirement:

Hard-coded unique identity per device shall be used in a device. It shall resist tampering by means such as physical, electrical or software. The unique ID may be as prescribed by National Trust Centre or MoRTH, Govt of India.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.4.2]

2.2.B.2 Root of Trust

Requirement:

Manufacturer shall submit an undertaking that Root of Trust-backed unique logical identity shall be used to identify them in logs of their physical chain of custody.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.4.12]

2.2.B.3 Consistent authentication security

Requirement:

The manufacturer shall give an undertaking that all authentication pathways and identity management APIs shall implement consistent authentication security control strength, such that there are no weaker alternatives per the risk of the application.

[Ref: OWASP ISVS 1.2.4]

C. Level-3 Security Requirement:

Nil

D. Level-4 Security Requirements:

Nil

Section 3: Authorization and access controls

A. Level-1 Security Requirements:

2.3.A.1 Common authorization framework

Requirement:

It shall be ensured that IoT system accounts across users, services and devices share a common authorization framework.

[Ref: OWASP ISVS 2.2.1]

2.3.A.2 Failure of access controls

Requirement:

The access controls shall fail securely, including when an exception occurs.

[Ref: OWASP ASVS 4.1.5]

2.3.A.3 Directory browsing

Requirement:

Directory browsing shall be disabled. Additionally, applications should not allow discovery or disclosure of file or directory metadata, such as Thumbs. db, .DS_Store, .git or .svn folders.

[Ref: OWASP ASVS 4.3.2]

2.3.A.4 Manipulation of user and data attributes

Requirement:

User and data attributes and policy information used by access controls shall not be manipulated by end users unless specifically authorized.

[Ref: OWASP ISVS 4.1.2]

2.3.A.5 Access control privileges

Requirement:

The access control privileges shall be defined, justified, and documented.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.10]

2.3.A.6 Protection against spoofing

Requirement:

The principle of least privilege shall be enforced by limiting applications and services that run as root or administrator. Users shall only be able to access functions, data files, URLs, controllers, services, and other resources, for which they possess specific authorization. This implies protection against spoofing and elevation of privilege.

[Ref: OWASP ASVS 4.1.3]

2.3.A.7 Access to sensitive information

Requirement:

The device shall support access control measures to the root/highest privilege account to restrict access to sensitive information or system processes.

[Ref: IoT SF IoT Security Assurance Framework Release 3.0 November 2021 2.4.8.9]

2.3.A.8 Controlled user account access

Requirement:

The device shall only allow controlled user account access; access using anonymous, or guest user accounts shall not be supported.

2.3.A.9 Access to debug capabilities

Requirement:

Authorized access to device debug capabilities shall be in place along with monitoring and logging such access.

[Ref: OWASP ISVS 2.2.4]

2.3.A.10   Recording of data

Requirement:

The device or service shall record audio/visual/or any other data in accordance with the authorization of the user only, no passive recording without explicit authorization shall be done.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.12.14]

2.3.A.11   Reset of authorized information

Requirement:

The device allows an authorized and complete factory reset of all the device's authorization information.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.16]

2.3.A.12   Access control during initial connection

Requirement:

The device shall maintain appropriate access control during initial connection (i.e., onboarding) and when reestablishing connectivity after disconnection or outage.

[Ref: NIST Whitepaper]

B. Level-2 Security Requirements:

Nil

C. Level-3 Security Requirements:

2.3.C.1 Trusted service layer

Requirement:

The device application shall enforce access control rules on a trusted service layer, especially if client-side access control is present and could be bypassed.

[Ref: OWASP ASVS 4.1.1]

2.3.C.2 Administration interfaces

Requirement:

The administration interfaces shall be accessible only by authorized operators. Mutual authentication over administration interfaces such as certificates shall be used.

[Ref: 1. IoT SF IoT Security Assurance Framework Release 3.0 November 2021 2.4.10.13] and 2. OWASP ISVS 4.3.1]

D. Level-4 Security Requirements:

Nil

Section 4: Securely storing sensitive information.

A. Level-1 Security Requirements:

Nil

B. Level-2 Security Requirements:

2.4.B.1 Sensitive security parameters

Requirement:

Sensitive security parameters in persistent storage shall be stored securely by the device.

[Ref: ETSI EN 303 645 V2.1.0 (2020-04) Provision 5.4-1]

2.4.B.2 Hardcoded security parameters

Requirement:

Security parameters and passwords shall not be hard coded into source code or stored in a local file.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.6.5]

2.4.B.3 Secure storing of passwords

Requirement:

The device shall securely store any passwords using secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)".

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.8.8]

2.4.B.4 Salting and hashing of passwords

Requirement:

Passwords shall be stored in a form that is resistant to offline attacks. Passwords shall be salted and hashed using an approved one-way key derivation or password hashing function. Key derivation and password hashing functions shall take a password, a salt, and a cost factor as inputs when generating a password hash. Salt shall be at least 32 bits in length and be chosen arbitrarily to minimize salt value collisions among stored hashes. For each credential, a unique salt value and the resulting hash shall be stored.

[Ref: OWASP ASVS 2.4.1 & OWASP ASVS 2.4.2]

2.4.B.5 bcrypt

Requirement:

If bcrypt is used, then the work factor shall be as large as the verification server performance will allow, with a minimum of 10.

[Ref: OWASP ASVS 2.4.4]

C. Level-3 Security Requirements:

2.4.C.1 Storing of sensitive data

Requirement:

OEM shall ensure that sensitive data, such as private keys and certificates, shall be stored securely by leveraging dedicated hardware security features.

[Ref: OWASP ISVS 5.1.4]

2.4.C.2 Personal Identifiable Information (PII)

Requirement:

Sensitive information, such as personal identifiable information (PII) and credentials shall be stored securely using secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)".

[Ref: OWASP ISVS 2.3.1]

2.4.C.3 PBKDF2

Requirement:

If PBKDF2 is used, then the iteration count shall be as large as verification server performance will allow, typically at least 100,000 iterations.

[Ref: OWASP ASVS 2.4.3]

2.4.C.4 Secret salt value

Requirement:

An additional iteration of a key derivation function shall be performed using a salt value that is secret and known only to the verifier. The secret salt value shall be stored separately from the hashed password.

[Ref: OWASP ASVS 2.4.5]

2.4.C.5 Tamper-resistant storage of sensitive data

Requirement:

UICC/ embedded UICC should be used for tamper-resistant storage of sensitive data for services, including security keys controlled by the service provider.
[Ref: GSMA CLP.14 5.1-1.4]

2.4.C.6 Trusted Computing Base (TCB)

Requirement:

If Trusted Computing Base has been implemented, the unique identifier shall be stored in the TCB's trust anchor.

[Ref: GSMA CLP.13 6.6]

2.4.C.7 Trust Anchor

Requirement:

Tamper resistant Trust Anchor shall be used.
Static key or personalize key shall be used with a trust anchor device specific.

[Ref: GSMA CLP.13 6.1.1, 6.1.1.1, 6.1.1.2 and 6.3]

D. Level-4 Security Requirements:

2.4.D.1 Cryptographic Root of Trust

Requirement:

Devices should be provisioned with a cryptographic root of trust that is hardware-based and immutable.

[Ref: OWASP ISVS 1.2.6]

Section 5: Data Protection

A. Level-1 Security Requirements:

2.5.A.1 Data in browser storage

Requirement:

Data stored in browser storage (such as local Storage, session Storage, Indexed DB, or cookies) shall not contain sensitive data.

[Ref: OWASP ASVS 8.2.2]

2.5.A.2 Clearance of authenticated data

Requirement:

Authenticated data shall be cleared from client storage, such as the browser DOM, after the client or session is terminated.

[Ref: OWASP ASVS 8.2.3]

2.5.A.3 Personally Identifiable Information collection

Requirement:

The manufacturer shall share what PI device collects. The device shall ensure that all PI is encrypted only accessible after successful authentication and authorization.

[Ref: ITU-T F.743, IoT SF IoT Security assurance framework Release 3.0 November 2021 4.12.2]

B. Level-2 Security Requirements:

2.5.B.1 Sensitive information in memory

Requirement:

Sensitive information contained in memory shall be overwritten as soon as it is no longer required to mitigate memory dumping attacks, using zeroes or random data.

[Ref: OWASP ASVS 8.3.6]

C. Level-3 Security Requirements:
Nil

D. Level-4 Security Requirements:
Nil

Section 6: Secure input and output handling
A. Level-1 Security Requirements:
Nil
B. Level-2 Security Requirements:

2.6.B.1 Validation of input data and transferred data

Requirement:

The device software shall validate data input via user interfaces or transferred via Application Programming Interfaces (APIs) or between networks in services and devices. All data being transferred over interfaces shall be validated by checking the data type, length, format, range, authenticity, origin, and frequency.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.13-1, IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.10.10]

2.6.B.2 Validation of inputs and outputs

Requirement:

a) All inputs and outputs shall be validated using, for example, an allow list (formerly 'whitelist') containing authorized origins of data and valid attributes of such data. Use "Fuzzing" tests to check for acceptable responses or output for both expected (valid) and unexpected (invalid) input stimuli.
b) All input (HTML form fields, REST requests, URL parameters, HTTP headers, cookies, batch files, RSS feeds, etc.) shall be validated using positive validation (allow lists).
c) Structured data shall be strongly typed and validated against a defined schema, including allowed characters, length, and pattern (e.g., credit card numbers, e-mail addresses, telephone numbers, or validating that two related fields are reasonable, such as checking that suburb and zip/postcode match).

[Ref: a) IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.10.12, 2.4.11.9 and 2.4.5.23
b) OWASP ISVS 5.1.3
c) OWASP ISVS 5.1.4

2.6.B.3 Validation checks

Requirement:

Validation checks shall be incorporated into applications to detect any corruption of information through processing errors or deliberate acts.

[Ref: ISO 27001 A.12.2.2]

2.6.B.4 Warning regarding potentially untrusted content

Requirement:

URL redirects and forwards shall only allow destinations that appear on an allow list or show a warning when redirecting to potentially untrusted content.

C. Level-3 Security Requirements:

2.6.C.1 HTTPS parameter pollution attacks

Requirement:

The application shall have defences against HTTPS parameter pollution attacks, particularly if the application framework makes no distinction about the source of request parameters (GET, POST, cookies, headers, or environment variables).

[Ref: OWASP ISVS 5.1.1]

2.6.C.2 Mass parameter assignment attacks

Requirement:

Mass parameter assignment attacks shall be protected by frameworks, or the application shall have countermeasures to protect against unsafe parameter assignment, such as marking fields private or similar.

[Ref: OWASP ISVS 5.1.2]

2.6.C.3 OS command injection

Requirement:

Embedded applications shall not be susceptible to OS command injection by performing input validation and escaping of parameters within firmware code, shell command wrappers, and scripts.

[Ref: OWASP ISVS 1.3.15]

D. Level-4 Security Requirements:

Nil

Section 7: Communicate Securely

A. Level-1 Security Requirements:

2.7.A.1 Cryptographic algorithms and primitives

Requirement:

Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall only be used. Such cryptographic algorithms and primitives shall be updateable.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.5-2, 5.5-3, and 5.5-1]

2.7.A.2 Internal or external traffic

Requirement:

Internal or external traffic must not expose the device credentials.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-40]

2.7.A.3 Enabling specific ports

Requirement:

Only specific ports that are necessary shall be enabled and all other ports shall be disabled.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-45]

2.7.A.4 Secure connection with remote servers

Requirement:

Where the application communicates with a device related remote server(s), or device, it shall be done over a secure connection.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.7.19 and 2.4.11.4]

2.7.A.5 Access via network interface

Requirement:

Access to device functionality via a network interface in the initialized state should only be possible after mutual authentication on that interface.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.5-4]

2.7.A.6 Configuration changes via network interface

Requirement:

Device functionality that allows security-relevant changes in configuration via a network interface shall be accessible only after mutual authentication. The exception is for network service protocols that are relied upon by the device and where the manufacturer cannot guarantee what configuration will be required for the device to operate. Protocols that are an exception include ARP, DHCP, DNS, ICMP, and NTP.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.5-5]

2.7.A.7 Web interfaces

Requirement:

The web interfaces shall fully encrypt the user session, from the device to the backend services, and that they are not susceptible to XSS, CSRF, SQL injection, etc.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-52]

2.7.A.8 Communication of sensitive data between device and associated services

Requirement:

The confidentiality of sensitive personal data communicated between the device and associated services shall be protected. Critical security parameters should be encrypted in transit. Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall only be used.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.8-2]

2.7.A.9 Communication of personal data between device and web interface

Requirement:

Any personal data communicated between the web interface/mobile app and the device shall be encrypted. Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall only be used.

[Ref: IoT SF IoT Security Assurance Framework Release 3.0 November 2021 2.4.10.19and 2.4.13.35]

2.7.A.10 Sensitive data through HTTP message

Requirement:

If HTTP is used, sensitive data shall not be sent to the server in the HTTP message body or headers, and that query string parameters from any HTTP verb shall not contain sensitive data.

[Ref: OWASP ASVS 8.3.1]

B. Level-2 Security Requirements:

2.7.B.1 Authentication of data received from other devices

Requirement:

The device shall not trust data received and shall always verify any interconnections. Discover, identify, and verify/authenticate the devices connected to the network before trust can be established, and preserve their integrity for reliable solutions and services.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-42]

2.7.B.2 Authentication of connections at all levels of protocols

Requirement:

The device shall make intentional connections, shall prevent unauthorized connections to it or other devices the device is connected to, at all levels of the protocols. Protocols to be used shall be latest and must be patched for all vulnerabilities.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-44]

C. Level-3 Security Requirements:

2.7.C.1 Cloud service

Requirement:

If run as a cloud service, TCP based communications (such as MQTT connections) shall be encrypted using Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" and authenticated using latest DTLS 1.2 and above standard and TLS 1.2 and above standard.

[Ref: GSMA CLP.14 5.1.1.4 and IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.13.23]

2.7.C.2 TLS

Requirement:

TLS 1.2 and above shall be used regardless of the sensitivity of the data being transmitted. Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall only be used.

[Ref: ENISA Baseline Security Recommendations for IoT November 2017 GP-TM-39]

2.7.C.3 Webserver devices

Requirement:

Where a device related to a webserver encrypts communications using TLS and requests a client certificate, the server(s) shall establish a connection if the client certificate and its chain of trust are valid.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.13.9]

2.7.C.4 Verification of X.509 certificate - TLS

Requirement:

If TLS 1.2 and above is used, then the device shall cryptographically verify the X.509 certificate.

[Ref: OWASP ISVS 4.1.3]

2.7.C.5 Certificate and keys - TLS

Requirement:

If TLS 1.2 and above is used, the device's TLS implementation shall use its own certificate store, pins to the endpoint's certificate or public key, and disallows connections to endpoints with different certificates or keys, even if signed by a trusted CA.

[Ref: OWASP ISVS 4.1.6]

2.7.C.6 Client server model

Requirement:

If client server model is used for communication, then device shall use up to date configurations to enable and set the preferred order of algorithms and ciphers used for communication, using TLS 1.2 or later.

[Ref: OWASP ASVS V9.1]

2.7.C.7 Replay attacks

Requirement:

Protection against replay attacks shall be built into the device.

[Ref: OWASP ISVS 4.1.1]

2.7.C.8 Security for email notifications

Requirement:

The device shall implement transport-level security as per Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" for email notifications to ensure the privacy of the communication while in transit.

[Ref: Agelight IoT Safety Architecture & Risk Toolkit v4.0 38]

D. Level-4 Security Requirements:
Nil

Section 8: Cryptography
A. Level-1 Security Requirements:
2.8.A.1 Cryptographic controls

Requirement:

Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" for the protection of information shall be used.

[Ref: ISO:27001 A.12.3.1]

2.8.A.2 Cryptographic keys

Requirement:

Cryptographic secrets and keys shall be unique per device.
All encryption keys that are unique to each device shall be either securely and truly randomly internally generated or securely programmed into each device in accordance with industry standard FIPS140-2 or equivalent. The manufacturer shall submit an undertaking in this regard.

[Ref: a) OWASP ISVS 2.4.1 and IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.14.9
b) OWASP ISVS 2.4.1]

2.8.A.3 Cryptographic key chain

Requirement:

The OEM shall submit an undertaking that the cryptographic key chain used for signing production software is different from that used for any other test, development or other software images or support requirement.

[Ref: IoT Security assurance framework Release 3.0 November 2021 2.4.9.8]

2.8.A.4 Secure sources of randomness

Requirement:

Secure sources of randomness shall be provided by the operating system and/or hardware for all security needs.

[Ref: OWASP ISVS 2.4.3]

B. Level-2 Security Requirements:

2.8.B.1 Confidentiality, authenticity, and/or integrity of data

Requirement:

Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall be used to protect the confidentiality, authenticity, and/or integrity of data and information (including control messages), in transit and in rest.

[Ref: ENISA Baseline security recommendations for IoT November 2017 GP-TM-34]

2.8.B.2 Secured sessions

Requirement:

Secure session shall be established after each disconnected session to prevent intentional and unintentional Denial of Service (DoS).

[Ref: GSMA CLP.13 9.1]

2.8.B.3 Storage of sensitive unencrypted parameters

Requirement:

The device shall store all sensitive unencrypted parameters (e.g., keys) in a secure, tamper resistant location.

[Ref: IoT Security assurance framework Release 3.0 November 2021 2.4.9.7]

2.8.B.4 Applications stored outside CPU's core EEPROM

Requirement:

All applications stored outside of a CPU's core EEPROM shall be cryptographically authenticated.

[Ref: GSMA CLP.13 6.11]

C. Level-3 Security Requirements:
Nil

D. Level-4 Security Requirements:
Nil

Section 9: Minimize Exposed Attack Surfaces

A. Level-1 Security Requirements:

2.9.A.1 Unused communication ports

Requirement:

All communications port(s) which are not used as part of the device's normal operation shall not be physically accessible and shall be disabled.

[Ref: IoT SF IoT Security Assurance Framework Release 3.0 November 2021 2.4.4.9]

B. Level-2 Security Requirements:

2.9.B.1 Physical decapsulation, side channel and glitching attacks

Requirement:

The devices shall have tamper resistant device casting and shall be provided protection against physical decapsulation, side channel and glitching attacks.

[Ref: OWASP ISVS 5.1.9 and GSMA CLP 7.3]

2.9.B.2 Debugging and Testing Technologies

Requirement:

Disable Debugging and Testing Technologies: The final Configuration of the device to be deployed shall never contain debugging, diagnostic, or testing interfaces that could be abused by an adversary. Such interfaces are:
   a   Command-line console interfaces
   b   Consoles with verbose debugging, diagnostic, or error messages
   c   Hardware debugging ports such as JTAG or SWD
   d   Network services used for debugging, diagnostics, or testing
   e   Administrative interfaces, such as SSH or Telnet

All such technologies should be disabled in the final configuration.

The manufacturer shall submit an undertaking that hardware has no undocumented debug features, such as special pin configurations that can enable or disable certain functionality.

[Ref: a) GSMA CLP.13 8.2

b) OWASP ISVS 5.1.7]

2.9.B.3 Unused network and logical interfaces

Requirement:

All unused network and logical interfaces shall be disabled, offering a configuration option that logically disables the interfaces.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.6-1 and NIST (8259) A]

2.9.B.4 Software services

Requirement:

The manufacturer shall only enable software services that are used or required for the intended use or operation of the device.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.6-5]

2.9.B.5 Debug interface

Requirement:

Debug interface shall communicate only with authorized and authenticated entities on the production devices. The functionality of any interface should be minimized to its essential task.

[Ref: IoT SF IoT Security Assurance Framework Release 3.0 November 2021 2.4.4.5]

C. Level-3 Security Requirements:
Nil

D. Level-4 Security Requirements:
Nil

Section 10: Vulnerability Management

A. Level-1 Security Requirements:

2.10.A.1 Vulnerability management related policies

Requirement

The manufacturer shall submit an undertaking that the following policies/processes are in place for

    a) receiving reports of vulnerabilities
    b) recording reported vulnerabilities
    c) responding to reported vulnerabilities, including the process of coordinating vulnerability response activities among component suppliers and third-party vendors.
    d) disclosing reported vulnerabilities.
    e) receiving notification from component suppliers and third-party vendors about any change in the status of their supplied components, such as the end of production, end of support, deprecated status (e.g., the device is no longer recommended for use), or known insecurities.
    f) interacting with both internal and third-party security researcher(s) on the devices or services.
    g) conflict resolution process for Vulnerability Disclosures
    h) Security advisory notification
    i) Retention of the key security design information and risk analysis over the whole lifecycle of the device or service.
    j) Informing users and relevant stakeholders when vulnerabilities affect devices through established communication channels (website, e-mail, security advisory pages, changelogs, etc.).

2.10.A.2   Vulnerability scanners

Requirement:

The device shall support the use of vulnerability scanners.

[Ref: NIST 8228 Expectation-7]

2.10.A.3   Third party and open-source software

Requirement:

The manufacturer shall verify the potential areas of risk that come with the use of third party and open-source software and take action to mitigate such risks.

[Ref: OWASP ISVS 1.2.2]

B. Level-2 Security Requirements:

2.10.B.1   Abnormal number of requests

Requirement:

The device application shall provide anomaly detection and alert on abnormal numbers of requests, such as by IP, user, total per hour or day, or whatever makes sense for the application.

[Ref: OWASP ASVS 8.1.4, GSMA CLP.13 6.13]

C. Level-3 Security Requirements:

2.10.C.1   Review of device OS/source code

Requirement:

a) OEM shall follow best security practices including secure coding for software development. Source code shall be made available either at Telecom Security Testing Laboratory (TSTL) premises or at the mutually agreed location for source code review by the designated TSTL. It may be supported by furnishing the Software Test Document (STD).
b) Also, OEM shall submit the undertaking as below:
   i   Industry standard best practices of secure coding have been followed during the entire software development life cycle of the device which includes OEM developed code, third party software and open-source code libraries used/embedded in the device.
   ii device software shall be free from Common Weakness Enumeration (CWE) top 25, Open Worldwide Application Security Project (OWASP) top 10 security vulnerabilities and OWASP top 10 API Security vulnerabilities as on the date of latest release of product or three months prior to the date of offer of product for testing, whichever is latest. For security weaknesses, vulnerabilities identified or discovered during the interim period, OEM shall give mitigation plan.
   iii The binaries for device and upgrades/updates thereafter generated from the source code are free from all known security vulnerabilities stated in (ii) above.

[Ref: : a) https://cwe.mitre.org/top25/archive/2022/2022_cwe_top25.html
        b) https://owasp.org/www-project-top-ten/
        c) https://owasp.org/www-project-api-security/]

D. Level-4 Security Requirements:

2.10.D.1   Penetration testing strategy

Requirement:

The device shall implement a complete persistent penetration testing strategy.

[Ref: GSMA CLP-13 7.11]

Section 11: Incident Management

A. Level-1 Security Requirements:
2.11.A.1 Operational and security events

Requirement:

The device shall log its operational and security events.

[Ref: NIST Expectation 15]

B. Level-2 Security Requirements:
2.11.B.1 Detection of potential incidents

Requirement:

The device shall facilitate the detection of potential incidents by internal or external controls, such as intrusion prevention systems, anti-malware utilities, and file integrity checking mechanisms.

[Ref: NIST Expectation 17]

C. Level-3 Security Requirements:
Nil

D. Level-4 Security Requirements:
Nil

Section 12: Keep Software Updated

A. Level-1 Security Requirements:
2.12.A.1 Remote update

Requirement:

Where remote update is supported, there shall be an established process/plan for validating and updating devices on an on-going or remedial basis.

2.12.A.2   Secure update

Requirement:

All software components in the devices shall be securely updateable.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.3-1]

2.12.A.3   Authenticate to update server

Requirement:

The device shall authenticate to the update server component prior to downloading the Update.

[Ref: OWASP ISVS 3.4.10]

2.12.A.4   Authenticity of the update

Requirement:

The update shall be applied right after the authenticity of the update is validated.

[Ref: OWASP ISVS 3.4.4]

2.12.A.5   Automatic updates and/or update notifications

Requirement:

If the device supports automatic updates and/or update notifications, these should be enabled in the initialized state and configurable so that the user can enable, disable, or postpone installation of security updates and/or update notifications.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.3-6]

2.12.A.6   Checking for security updates

Requirement:

The device should check after initialization, and then periodically, whether security updates are available. Security updates shall be timely, and the devices shall be updated automatically upon a pre-defined schedule.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.3-5]

2.12.A.7   Notification during software update

Requirement:

The device shall notify the user when the application of a software update will disrupt the basic functioning of the device along with the approximate expected duration of downtime.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.3-12]

2.12.A.8   Over-The-Air (OTA) update

Requirement:

The manufacturer shall ensure that the device software/firmware, its configuration, and its applications have the ability to update Over-The-Air (OTA), that the update server is secure, that the update file is transmitted via a secure connection. Secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)" shall only be used.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-18]

2.12.A.9   Failure of update

Requirement:

In the event of an update failure, the device shall revert to a backup image.

[Ref: OWASP ISVS 3.4.7]

B. Level-2 Security Requirements:

2.12.B.1   Authenticity and integrity of software updates

Requirement:

a) Software package integrity shall be validated during the software update stage.
b) The device shall support software package integrity validation via cryptographic means, e.g., digital signature using Secure cryptographic controls prescribed in Table 1 of the latest document "ITSAR for Cryptographic Controls" only. To this end, the device has a list of public keys or certificates of authorized software sources, and uses the keys to verify that the software update originated from only these sources.
c) Tampered software shall not be executed or installed if integrity check fails.

d) A security mechanism is required to guarantee that only authorized individuals can initiate and deploy a software update and modify the list mentioned in (b) above. Note: Code signing (valid and not time expired) is also allowed as an option in (b) above.

[Ref: TSDSI STD T1.3GPP 33.117 17.2.0 V1.2.0 Section 4.2.3.3.5]

2.12.B.2   Authenticity and integrity of firmware:

Requirement:

Firmware binary should be made available with the version matching one in the device as well as binary size & modification timestamp and/ or checksum should match for the binary provided and one installed on device.

[Ref: AIS-140 Amendment-2, Page 14, Point 6, Table -2 Clause No 8.5]

C. Level-3 Security Requirements:

2.12.C.1   Firmware-update through peer

Requirement:

If the network peer claims to offer a firmware-update service, the TCB shall authenticate the peer as being a part of the core IoT Service Provider network before accepting firmware updates from the peer.

[Ref: GSMA CLP.13 6.1]

D. Level-4 Security Requirements:

Nil

Section 13: Ensure Software Integrity

A. Level-1 Security Requirements:

2.13.A.1   Back doors

Requirement:

Manufacturer shall submit an undertaking that the application source code and third-party libraries
    i.   do not contain back doors, such as hard-coded or additional undocumented accounts or keys, code obfuscation, undocumented binary blobs, rootkits, or anti-

debugging, insecure debugging features, or otherwise out of date, insecure, or hidden functionality that could be used maliciously

ii. do not contain time bombs by searching for date and time related functions, malicious code, such as salami attacks, logic bypasses, logic bombs, Easter eggs, or any other potentially unwanted functionality.

[Ref: OWASP ASVS 10.2.3, 10.2.5 and 10.2.6]

2.13.A.2 User interface

Requirement:

The user interface shall be protected by an automatic session idle logout timeout function.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.6.15]

2.13.A.3 Removal of unnecessary packages

Requirement:

All unnecessary packages must be removed and/or disabled from the system. Additionally, all unused operating system services and unused networking ports must be disabled or blocked. Only secure maintenance access shall be permitted and all known insecure protocols shall be disabled.

B. Level-2 Security Requirements:

2.13.B.1 Persistent filesystem storage

Requirement:

Persistent filesystem storage volumes must be encrypted.

[Ref: OWASP ASVS 3.2.5]

C. Level-3 Security Requirements:

2.13.C.1 Secure boot mechanisms

Requirement:

The device shall verify its software using secure boot mechanisms.

[Ref: ETSI EN 303 645 V2.1.1 (2020-06) Provision 5.7-1

2.13.C.2 Unnecessary Services removal

Requirement:

The device shall only run protocol handlers and services which are needed for its operation, and which do not have any known security vulnerabilities. In particular, by default the following services shall be initially configured to be disabled on the device by the vendor except if services are needed during deployment. In that case those services shall be disabled according to vendor's instructions after deployment is done.

- File Transfer Protocol (FTP)
- Trivial File Transfer Protocol (TFTP)
- Telnet
- rlogin, Rate Control Protocol (RCP), Remote Shell Protocol (RSH)
- HTTP
- Simple Network Management Protocol (SNMP) v1 and v2
- SSHv1
- Transmission Control Protocol (TCP) / User Datagram Protocol (UDP) Small   Servers (Echo, Chargen, Discard and Daytime)
- Finger
- Bootstrap Protocol (BOOTP) server
- Discovery protocols (Cisco Discovery Protocol (CDP), Link Layer Discovery Protocol (LLDP))
- IP Identification Service (Identd)
- Packet Assembler/Disassembler (PAD)
- Maintenance Operations Protocol (MOP)

Any other protocols, services that are vulnerable are also to be permanently disabled.
Full documentation of required protocols and services (communication matrix) of the device and their purpose needs to be provided by the OEM as a prerequisite for the test case.
[Ref: TSDSI STD T1.3GPP 33.117-17.1.0 V.1.1.0. Section-4.3.2.1]

2.13.C.3   Controls against mobile code

Requirement:

Where the use of mobile code is authorized, the configuration shall ensure that the authorized mobile code operates according to a clearly defined security policy, and unauthorized mobile code shall be prevented from executing.

[Ref: ISO 27001 A.10.4.2]

D. Level-4 Security Requirements:
Nil

Section 14: Firmware and Bootloader Security

A. Level-1 Security Requirements:

2.14.A.1   Configuration of firmware

Requirement:

The devices released shall have firmware configured with secure defaults appropriate for a release build (as opposed to debug versions)

[Ref: OWASP ISVS 1.2.3]

2.14.A.2   Design of device firmware

Requirement:

Device firmware shall be designed to isolate privileged code and data from portions of the firmware that do not need access to them

[Ref: ENISA Baseline security recommendations for IoT November 2017 GP-TM-28]

B. Level-2 Security Requirements:
Nil

C. Level-3 Security Requirements:

2.14.C.1   Secure boot process

Requirement:

The secure boot process shall be enabled by default, and the device's processor system shall have an irrevocable hardware secure boot process.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.4.1, 2.4.4.4]

2.14.C.2   Authenticity of first stage boot loader

Requirement:

The authenticity of the first stage bootloader shall be verified by a trusted component of which the configuration in read-only memory (ROM) cannot be altered (e.g., CPU Based Secure Boot/Trusted Boot with a hardware root of trust).

[Ref: OWASP ISVS 3.1.4]

2.14.C.3   Default/standard boot loader

Requirement:

The default/standard bootloader shall not be used if it allows alternative images or firmware flashing.

[Ref: GSMA CLP.13 6.17]

2.14.C.4   Authenticity of boot loader stages

Requirement:

The authenticity of bootloader stages or application code shall get cryptographically verified before executing subsequent steps in the boot process.

[Ref: OWASP ISVS 3.1.5]

2.14.C.5   Executable image of first-stage boot loader

Requirement:

The first-stage bootloader executable image shall be locked in EEPROM and should only be updated through a secure process.

[Ref: GSMA CLP.13 6.17]

2.14.C.6   Sensitive information in boot loader stages

Requirement:

Bootloader stages shall not contain sensitive information (e.g., private keys or passwords logged to the console) as part of device start-up.

[Ref: OWASP ISVS 3.1.6]

2.14.C.7   Code loading of boot loader

Requirement:

The bootloader shall not allow code loaded from arbitrary locations, including both local storage (e.g., SD, USB, etc.) and network locations (e.g. NFS, TFTP, etc.).

[Ref: OWASP ISVS 3.1.1]

2.14.C.8 Communication interfaces

Requirement:

The communication interfaces such as USB, UART, and other variants shall be disabled or adequately protected during every stage of the device's boot process.

[Ref: OWASP ISVS 3.1.3]

D. Level-4 Security Requirements:

Nil

Section 15: Secured Execution Platform

A. Level-1 Security Requirements:

2.15.A.1 Non-volatile memory's contents

Requirement:

Where microcontroller/ microprocessor(s) reads the firmware from a separate non-volatile memory device, the non-volatile memory's contents shall be encrypted.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.4.13]

B. Level-2 Security Requirements:

2.15.B.1 Minimum Viable execution Platform

Requirement:

A device should support Minimum Viable execution Platform (Application Roll-Back).

[Ref: GSMA CLP.13 6.7]

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 16: Collection of Logs

A. Level-1 Security Requirements:

2.16.A.1   Security logs

Requirement:

The device shall generate logs of all the important events including the events with security implications, such as connection logs, access logs, successful and failed authentication attempts, access to debugging functionality etc.

[Ref: OWASP ISVS 1.4.1]

2.16.A.2   Contents of logs

Requirement:

The collected logs shall have the adequate granularity to enable actionable insights and alerts. Logs should include, at a minimum, the type of event, timestamp, source, outcome, and identification of involved actors.

[Ref: OWASP ISVS 1.4.2]

2.16.A.3   Device synchronization

Requirement:

The device shall be synchronized with a reliable time source to ensure the validity of log timestamps.

[Ref: OWASP ISVS 1.4.3]

2.16.A.4   Sensitive information in logs

Requirement:

Verify that collected logs do not include sensitive information, such as PII, credentials and cryptographic keys.

[Ref: OWASP ISVS 1.4.4]

2.16.A.5   Online collection of logs

Requirement:

Verify that collected logs can be securely exported or retrieved from the devices over an online collection, either periodically or on-demand.

[Ref: OWASP ISVS 1.4.5]

B. Level-2 Security Requirements:
Nil

C. Level-3 Security Requirements:
Nil

D. Level-4 Security Requirements:
Nil

Chapter 3 – Specific Security Requirements

Section 1: Bluetooth

A. Level-1 Security Requirements:

3.1.A.1 PIN/ Pass-key code

Requirement:

PIN or Pass-Key codes shall not be easily guessable (e.g., don't use 0000 or 1234).

[Ref: OWASP ISVS 4.3.2]

3.1.A.2 Encryption keys

Requirement:

Encryption keys shall be the maximum size the device supports, and this size is sufficient to adequately protect the information transmitted over the Bluetooth connection. The most secure Bluetooth pairing method available shall be used.

[Ref: OWASP ISVS 4.3.5]

3.1.A.3 Pairing methods

Requirement:

Out Of Band (OOB), Numeric Comparison, or Passkey Entry pairing methods shall be used depending on the communicating device's capabilities.

[Ref: OWASP ISVS 4.3.6]

3.1.A.4 Bluetooth Security Mode and Level

Requirement:

The strongest Bluetooth Security Mode and Level supported by the device shall be used. For Bluetooth 4, Security Mode 4, Level 4 shall be used. For Bluetooth 2.1 through 4.0 devices,

Security Mode 4, Level 3 shall be used, and for Bluetooth 2.0 and older devices Security Mode 3 is recommended.

[Ref: OWASP ISVS 4.3.7]

3.1.A.5 Encryption of Bluetooth connections

Requirement:

Bluetooth connections should be encrypted when transmitting user IDs, passwords, and other sensitive information.

[Ref: Agelight IoT Safety Architecture & Risk Toolkit v4.0 1]

B. Level-2 Security Requirements:

3.1.B.1 Pairing and discovery

Requirement:

Pairing and discovery on Bluetooth devices must be disabled by default and only enabled under the following circumstances like during device setup, initial configuration and when establishing authorized communication with another device etc.

[Ref: OWASP ISVS 4.3.1]

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 2: Zigbee

A. Level-1 Security Requirements:

3.2.A.1 Version

Requirement:

Zigbee version 3.0 and above shall be used

[Ref: OWASP ISVS 4.5.1]

3.2.A.2 Joining Zigbee network

Requirement:

The most secure way of joining the Zigbee network shall be used, depending on the selected security architecture. For example, for the Centralized architecture, use out-of-band install codes. For the Distributed one, use pre-configured link keys.

[Ref: OWASP ISVS 4.5.3]

3.2.A.3 Pre-configured global link key

Requirement:

The default pre-configured global link key (i.e., ZigbeeAlliance09) shall not be used to join the network, except if explicitly required for compatibility reasons and if associated risks have been considered.

[Ref: OWASP ISVS 4.5.4]

3.2.A.4 Activation of pairing mode

Requirement:

User interaction shall be required to activate pairing mode for both the joining nodes and the Zigbee Trust Center or router. Devices should automatically exit pairing mode after a pre-defined short amount of time, even if the pairing is unsuccessful.

[Ref: OWASP ISVS 4.5.5]

3.2.A.5   Network key generation

Requirement:

The network key shall be randomly generated (for example during the initial network setup).

[Ref: OWASP ISVS 4.5.6]

3.2.A.6   Network key regeneration

Requirement:

The network key shall be periodically regenerated.

B. Level-2 Security Requirements:

3.2.B.1 Validation of Paired Devices

Requirement:

Users shall obtain an overview of paired devices to validate that they are legitimate (for example, by comparing the MAC addresses of connected devices to the expected ones).

[Ref: OWASP ISVS 4.5.8]

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 3: Wi-Fi

A. Level-1 Security Requirements:

3.3.A.1 Disabling Wi-FI connectivity

Requirement:

Wi-Fi connectivity shall be disabled unless required as part of device functionality. Devices with no need for network connectivity or which support other types of network connectivity, such as Ethernet, shall have the Wi-Fi interface disabled.

[Ref: OWASP ISVS 4.4.2]

3.3.A.2 Protection of Wi-Fi communications

Requirement:

WPA2 or higher shall be used to protect Wi-Fi communications. In case WPA is used, it shall be encrypted with AES (CCMP mode).

[Ref: OWASP ISVS 4.4.3]

3.3.A.3 Use of Wi-Fi Protected Setup (WPS)

Requirement:

Wi-Fi Protected Setup (WPS) shall not use to establish Wi-Fi connections between devices.

[Ref: OWASP ISVS 4.4.4]

B. Level-2 Security Requirements:

3.3.B.1 SSIDs

Requirement:

The SSIDs should not be the default and should be hidden for all connected devices, reducing the attack surface of a brute-force attack.

[Ref: OWASP ISVS 4.4.1]

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 4: LTE

A. Level-1 Security Requirements:

3.4.A.1 Confidentiality on the Air Interface

Requirement:

LTE shall enable Confidentiality on the air interface.

[Ref: NIST SP 800-187 5.2]

3.4.A.2 Ciphering Indicator

Requirement:

LTE shall use the ciphering indicator

[Ref: NIST SP 800-187 5.3]

3.4.A.3 SIM/USIM/eSIM PIN Code

Requirement:

The device shall use SIM/USIM/eSIM PIN Code

[Ref: NIST SP 800-187 5.7]

3.4.A.4 Temporary Identities

Requirement:

LTE shall use Temporary Identities

[Ref: NIST SP 800-187 5.8]

B. Level-2 Security Requirements:

Nil

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 5: LoRaWAN

A. Level-1 Security Requirements:

3.5.A.1 Version

Requirement:

LoRaWAN version 1.1 or above shall be used.

[Ref: OWASP ISVS 4.6.1]

3.5.A.2 Root keys

Requirement:

Root keys shall be unique per device.

[Ref: OWASP ISVS 4.6.4]

B. Level-2 Security Requirements:

3.5.B.1 Replay attacks

Requirement:

Replay attacks shall not be possible using off-sequence frame counters. For example, in case end device counters are reset after a reboot, verify that old messages cannot be replayed to the gateway.

[Ref: OWASP ISVS 4.6.5]

C. Level-3 Security Requirements:

3.5.C.1 Communication with LoRaWAN gateway

Requirement:

All communication between the LoRaWAN gateway and the network, join and application servers shall occur over a secure channel (for example TLS or IPsec), guaranteeing at least the integrity and authenticity of the messages.

[Ref: OWASP ISVS 4.6.3]

D. Level-4 Security Requirements:

Nil

Section 6: Other Security Requirements

A. Level-1 Security Requirements:

3.6.A.1 Private Access Point Name

Requirement:

Private (secure) Access Point Name (APN) shall be used to connect cellular network.

B. Level-2 Security Requirements:

Nil

C. Level-3 Security Requirements:

Nil

D. Level-4 Security Requirements:

Nil

Section 7: Camera specific security Requirements

A. Level-1 Security Requirements:

3.7.A.1 Restoration on loss of power

Requirement:

Smart Camera shall remain operating and locally functional in the case of a loss of network access and should recover cleanly in the case of restoration of a loss of power.

[Ref: ETSI EN 303 645 V2.1.0 (2020-04) provisions 5.9-2]

3.7.A.2 Authentication Logs

Requirement:

Failed authentication attempts shall be logged.

[Ref: IoT SF IoT Security assurance framework Release 3.0 November 2021 2.4.7.5]

3.7.A.3 Secure Built in capabilities

Requirement:

The device shall have its own secure built-in patch, upgrade, and configuration management capabilities.

[Ref: NIST 8228 Expectation 6]

3.7.A.4 Revoke credentials of compromised/ decommissioned devices

Requirement:

Authentication schemes shall be designed to revoke credentials of compromised or decommissioned devices.

[Ref: OWASP ISVS 2.1.11]

3.7.A.5 Factory reset

Requirement:

The user shall have the ability to perform a factory reset, including the ability to delete all user data in the event of device transfer, rental, loss, or sale to a third party.

3.7.A.6 Restricted access to management Server

Requirement:

Access control shall ensure that only authorized users are allowed to access the management server according to their access privileges in the video surveillance system.

[Ref: T-REC-X.1453]

3.7.A.7 Personal data collection acknowledgement

Requirement:

The manufacturer shall submit an undertaking whether the device shares the recorded video and personal data or not.

3.7.A.8 Logged and audited parameters and events

Requirement:

The manufacturer shall share the details of list of parameters and events that are logged and audited.

[Ref: Security requirements for intelligent video cameras (ITU draft)]

B. Level-2 Security Requirements:

3.7.B.1 Device authentication

Requirement:

The device shall authenticate itself to connect to the VMs/cloud.

[Ref: T-REC-X.1453]

3.7.B.2 Sensitive data protection

Requirement:

Sensitive data and APIs shall be protected against Insecure Direct Object Reference (IDOR) attacks targeting creation, reading, updating and deletion of records, such as creating or updating someone else's record, viewing everyone's records, or deleting all records.

[Ref: OWASP ASVS 4.2.1]

3.7.B.3 Tamper detection alerts

Requirement:

The device shall support alarm generation, User-definable alerts, email alerts, and HTTP notifications for camera physical tampering detection.

[Ref: Security requirements for intelligent video cameras (ITU draft)]

3.7.B.4 Password Policy

Requirement:

An acceptable password shall have minimum of 12 characters from at least three different character groups-- upper case, lower case, digits, punctuation, etc., and the password shall be changed at least once in every 90 days. Device shall have password expiration detection.

[Ref: OWASP ISVS 2.1.5, Security requirements for intelligent video cameras (ITU draft)]

3.7.B.5 Data Authenticity and integrity

Requirement:

a) Guarantee data authenticity to enable reliable exchanges from data emission to data reception.
b) Data shall always be signed whenever and wherever it is captured and stored.
c) The device integrity shall ensure that the stored video data are original data without forgery.
d) The device integrity shall ensure that the video data transmitted from the camera are original data without forgery.

[Ref: ENISA BASELINE SECURITY RECOMMENDATIONS FOR IOT NOVEMBER 2017Baseline security recommendations GP-TM-41]

3.7.B.6 Use of dynamic Address Resolution Protocol

Requirement:

The device shall use dynamic Address Resolution Protocol (ARP) detection or transmission encryption to prevent attacker from using and analysing network traffic.

[Ref: Security requirements for intelligent video cameras (ITU draft)]

3.7.B.7 IP Filter support

Requirement:

The device should support IP Filter.

C. Level-3 Security Requirements:

3.7.C.1 End-to-end encryption

Requirement:

The device shall support end-to-end encrypted transmission to ensure that nobody is able to access the video data in the camera's real-time video stream. Encryption must be done securely using secure cryptographic controls prescribed in Table1 of the latest document "Cryptographic Controls for Indian Telecom Security Assurance Requirements (ITSAR)".

3.7.C.2 User authentication

Requirement:

User authentication shall use HTTPS, TLS1.2 or above.

[Ref: ISO 27001 A.11.4.2]

3.7.C.3 Network authentication

Requirement:

The device shall support 802.1x network authentication with EAP and TLS 1.2 or better.

3.7.C.4 Digest Authentication

Requirement:

The device should support Digest Authentication.

3.7.C.5 Certificates for Public Key Infrastructure

Requirement:

The device should use ITU X.509 certificates for Public Key Infrastructure (PKI).

3.7.C.6 Protocol hardening

Requirement:

The device shall support protocol hardening configuration.

[Ref: Security requirements for intelligent video cameras (ITU draft)]

3.7.C.7 Secure File Transfer

Requirement:

The device shall support SFTP.

3.7.C.8 Self-diagnosis

Requirement:

The device should have mechanisms for self-diagnosis and self-repair/healing to recover from failure, malfunction, or a compromised state.

[Ref: ENISA Baseline Security Recommendation for IoT November 2017 GP-TM-16]

3.7.C.9 Intrusion detection and prevention

Requirement:

The device should detect, identify, and prevent intrusion behaviours such as abnormal super accounts, system sensitive file tampering, process privilege escalation, etc. to ensure that system resources are protected from attacks that use an IP based network, allowing the video surveillance to operate normally.

[Ref: T-REC-X.1453]

D. Level-4 Security Requirements:

Nil

Definitions

1. **Attacker**: A hacker, threat agent, threat actor, fraudster, or other malicious threat to an IoT Service. This threat could come from individual criminals, organized crime, terrorism, hostile governments and their agencies, industrial espionage, hacking groups, political activists, 'hobbyist' hackers, and researchers, as well as unintentional security and privacy breaches.

2. **Authorized Individuals, services, and other IoT device components**: An entity (i.e., a person, device, service, network, domain, developer, or other party who might interact with an IoT device) that has implicitly or explicitly been granted approval to interact with a particular IoT device.

3. **Constrained device**: Device which has physical limitations in either the ability to process data, the ability to communicate data, the ability to store data or the ability to interact with the user, due to restrictions that arise from its intended use.

4. **Consumer**: Natural person who is acting for purposes that are outside her/his trade, business, craft, or profession.

5. **Consumer IoT device**: Network-connected (and network-connectable) device that has relationships to associated services and are used by the consumer typically in the home or as electronic wearables.

6. **Critical security parameter**: Security-related secret information whose disclosure or modification can compromise the security of a security module.

7. **Defined support period**: Minimum length of time, expressed as a period or by an end date, for which a manufacturer will provide security updates.

8. **Device manufacturer**: Entity that creates an assembled final consumer IoT device, which is likely to contain the devices and components of many other suppliers.

9. **Endpoint**: An IoT Endpoint is a physical computing device that performs a function or task as part of an Internet-connected device or service.

10. **Endpoint Ecosystem**: Any configuration of low-complexity devices, rich devices, and gateways that connect the physical world to the digital world in novel ways.

11. **Factory default**: State of the device after factory reset or after final production/ assembly.

12. **Initialization**: Process that activates the network connectivity of the device for operation and optionally sets authentication features for a user or for network access

13. **Initialized state**: state of the device after initialization.

14. **Internet of Things**: The Internet of Things describes the coordination of multiple machines, devices, and appliances connected to the Internet through multiple networks. These devices include everyday objects such as tablets and consumer,

electronics, and other machines such as vehicles, monitors, and sensors equipped with machine-to-machine (M2M) communications that allow them to send and receive data.

15. **IoT SAFE**: IoT SIM Applet for Secure End-2-End Communication.
16. **IoT Service**: Any computer program that leverages data from IoT devices to perform the service.
17. **IoT Service Ecosystem**: The set of services, platforms, protocols, and other technologies required to provide capabilities and collect data from Endpoints deployed in the field.
18. **IoT Service Provider**: Enterprises or organizations who are looking to develop new and innovative connected IoT devices and services.
19. **Logical interface**: software implementation that utilizes a network interface to communicate over the network via channels or ports.
20. **Manufacturer**: relevant economic operator in the supply chain (including the device manufacturer).
21. **Network Interface**: physical interface that can be used to access the functionality of consumer IoT via a network.
22. **Network Operator**: The operator and owner of the communication network that connects the IoT Endpoint Device to the IoT Service Ecosystem.
23. **Root of Trust**: A set of cryptographic policies and procedures that govern how identities, applications, and communications can and should be cryptographically secured.
24. **Owner**: User who owns or who purchased the device.
25. **Personal data**: Any information relating to an identified or identifiable natural person.
26. **Personally Identifiable Information (PII)**: Information that can be used to distinguish or trace an individual's identity, either alone or when combined with other information that is linked or linkable to a specific individual."
27. **Public security parameter**: Security related public information whose modification can compromise the security of a security module.
28. **Physical interface**: Physical port or air interface (such as radio, audio or optical) used to communicate with the device at the physical layer.
29. **Remotely accessible**: Intended to be accessible from outside the local network.
30. **Sensitive data**: data that may be used for authentication or may help to identify the user, such as user names, passwords, PINs, cryptographic keys, IMSIs, IMEIs, MSISDNs, or IP addresses of the device, as well as files of a system that are needed for the functionality such as firmware images, patches, drivers or kernel modules.
31. **Security module**: Set of hardware, software, and/or firmware that implements security functions.

32. **Security update**: Set of hardware, software, and/or firmware that implements security functions.
33. **Sensitive security parameters**: Critical security parameters and public security Parameters.
34. **Software service**: Software component of a device that is used to support functionality.
35. **Subscriber Identity Module**: The smart card used by a mobile network to authenticate devices for connection to the mobile network and access to network services.
36. **Telemetry**: Data from a device that can provide information to help the manufacturer identify issues or information related to device usage.
37. **Trust Anchor**: In cryptographic systems with a hierarchical structure, a trust anchor is an authoritative entity for which trust is assumed and not derived.
38. **Trusted Computing Base**: A Trusted Computing Base (TCB) is a conglomeration of algorithms, policies, and secrets within a device or service. The TCB acts as a module that allows the device or service to measure its own trustworthiness, gauge the authenticity of network peers, verify the integrity of messages sent and received to the device or service, and more. The TCB functions as the base security platform upon which security devices and services can be built. A TCB's components will change depending on the context (a hardware TCB for Endpoints or a software TCB for cloud services), but the abstract goals, services, procedures, and policies should be very similar.
39. **UICC**: A Secure Element Platform specified in ETSI TS 102 221 can support multiple standardized network or service authentication applications in cryptographically separated security domains. It may be embodied in embedded form factors specified in ETSI TS 102 671.
40. **Unique per device**: Unique for each individual device of a given device class or type.
41. **User**: natural person or organization
42. **Video surveillance system** [b-ITU-T H.626]: A telecommunication service focusing on video (including audio and image) application technology, which is used to remotely capture multimedia (such as audio, video, image, alarm signal, etc.) and present them to the end user in a user-friendly manner, based on a managed broadband network with ensured quality, security, and reliability.

Acronyms

2FA	-	Two Factor Authentication
3G	-	Third Generation
API	-	Application Program Interface
APN	-	Access Point Name
BT	-	Bluetooth
CLP	-	GSMA's Connected Living Programme
CPU	-	Central Processing Unit
DDoS	-	Distributed Denial of Service
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
ENISA	-	European Union Agency for Network and Information Security
ETSI	-	European Telecommunications Standards Institute
GSMA	-	GSM Association
HTTP	-	Hypertext Transfer Protocol.
I/O	-	Input-Output
IoT	-	Internet of Things
IoT SF	-	Internet of Things Security Foundation
IP	-	Internet Protocol
LAN	-	Local-area Network
LoRA	-	Long Range Radio
LPWAN	-	Low-Power Wide-Area Network
MFA	-	Multi Factor Authentication
MSISDN	-	Mobile Station International Subscriber Directory Number

NIST	-	National Institute of Standards and Technology
OEM	-	Original Equipment Manufacturer
OS	-	Operating System
OWASP	-	Open Web Application Security Project
PII	-	Personally identifiable information
PSK	-	Pre-Shared Key
RAM	-	Random Access Memory
RFID	-	Radio-frequency identification
ROM	-	Read Only Memory
SMS	-	Short Message Service
SSH	-	Secure Shell Protocol
SRAM	-	Static Random Access Memory
TCB	-	Trusted Computing Base
TLS	-	Transport Layer Security
UICC	-	Universal Integrated Circuit Card
Wi-Fi	-	Wireless Fidelity

List Of Submissions

List of undertakings to be furnished by OEM for Smart Camera security testing

1) Hardcoded authentication credentials (Against test case 2.1.A.2)
2) Trusted Computing Base (Against test case 2.1.C.2)
3) Root of Trust (Against test case 2.2.B.2)
4) Consistent authentication security (Against test case 2.2.B.3)
5) Cryptographic keys (Against test case 2.8.A.2)
6) Cryptographic key chain (Against test case 2.8.A.3)
7) Debugging and testing Technologies (Against test case 2.9.B.2)
8) Vulnerability management related policies (Against test case 2.10.A.1)
9) Review of device OS/ source code (Against test case 2.10.C.1)
10) Back doors (Against test case 2.13.A.3)
11) Personal data collection acknowledgement (Against test case 3.7.A.7)

References

1. TEC 31328:2023 Security by Design for IoT Device Manufacturers ISO 9001 :2015
2. TEC 31188:2022 Framework of National Trust Centre for M2M/ IoT Devices and Applications
3. TEC 31318:2021: TEC Code of Practice for Securing Consumer Internet of Things (IoT)
4. Essential Requirements for Smart Camera TEC28822108.
5. ITU-T F.743, IoT SF IoT Security assurance framework Release 3.0 November 2021
6. Mustafah, Y.M., Shan, T., Azman, A.W., Bigdeli, A. and Lovell, B.C., "Real-time face detection and tracking for high resolution smart camera system," In IEEE Conference of the Australian Pattern Recognition Society on Digital Image Computing Techniques and Applications (DICTA), pp. 387-393, 2007.
7. ENISA Baseline Security Recommendation for IoT November 2017
8. ETSI EN 303 645 V2.1.0 (2020-04) Cyber Security for Consumer IoT Baseline Requirements.
9. GSMA (CLP.11, CLP.12, CLP.13) IoT Security Guidelines
10. IoT SF IoT Security assurance framework Release 3.0 November 2021.
11. ISO/IEC 27001 Information Security Management Systems (ISMS)
12. NIST 8259A IoT device Cyber security capability core baseline
13. NIST 8228 Considerations for managing Internet of Things (IoT) Cybersecurity and Privacy Risks.
14. NIST Cybersecurity Whitepaper
15. AIS-140 Amendment-2
16. TSDSI STD T1.3GPP 33.117-17.1.0 V.1.1.0 Catalogue of general security assurance requirements