Security Accreditation Scheme - Consolidated Security Guidelines

Version 2.0

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This is a Non-binding Permanent Reference Document of the GSMA

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1 Introduction

1.1 Overview

The GSMA operates Security Accreditation Schemes (SAS) for a number of sensitive processes (SPs). To fulfil the requirements of the relevant Security Accreditation Schemes, participants are required to follow the corresponding Standard, including achieving compliance with the relevant security requirements.

To ensure common standards across the schemes the GSMA publishes the Consolidated Security Requirements (CSR) document [5]. The document sets out statements of requirement that are relevant to SAS participants.

These requirements are, in turn, supported by this Consolidated Security Guidelines (CSG) document which provides practical guidance to SAS participants to help them design, implement and operate security controls that meet the CSR.

The guide is intended to help suppliers understand how to interpret and apply the GSMA SAS standard operationally. The guide should be read and used in conjunction with the SAS Consolidated Security Requirements (CSR) document and relevant scheme Standard and Methodology and is not intended to replace or supersede these documents.

1.2 Audits

The SAS audit itself will remain the basis on which compliance with the SAS standard is assessed. Certification by the GSMA will be based on the auditors' assessment and recommendation.

The auditors will consider the quality and effectiveness of the implemented solutions and security management system to ensure that:

- They are integrated into the normal operations of the business
- They make appropriate consideration of security risks at the site
- They are sustainable
- Evidence exists of their ongoing successful application
- They comply with the basic principles of the standard
- The quality of the solution is consistent with that judged acceptable at other, similar, sites.

Where the auditors are not satisfied that sufficient evidence exists that the solutions in place satisfy the above criteria, certification may not be recommended, even where solutions are based on the guidelines in this document.

It is difficult for the auditors to assess processes or controls that are newly introduced due to the lack of evidence. When scheduling certification audits sites are strongly recommended to ensure that evidence exists of 4-6 weeks of continuous operation of the controls to be audited. Where changes are minor, the audit may consider evidence of previous versions of the process or control in addition to that in place at the time of the audit. In some cases shorter periods of evidence may be acceptable.

Alternative solutions to those provided in this guidelines document may also be acceptable to the auditors if they do satisfy the above criteria.

1.3 Using this document

This document is intended to provide guidelines to support the requirements for all SPs within the scope of the different SAS schemes.

Many of the requirements described in the CSR are common across all schemes, however some requirements are specific to individual SPs. The SPs for which each requirement and guideline apply are indicated in this document as described in 2.2.

The SAS Standard document relevant to the participants activities and certification will clearly define which of the SPs are, or may, be applicable.

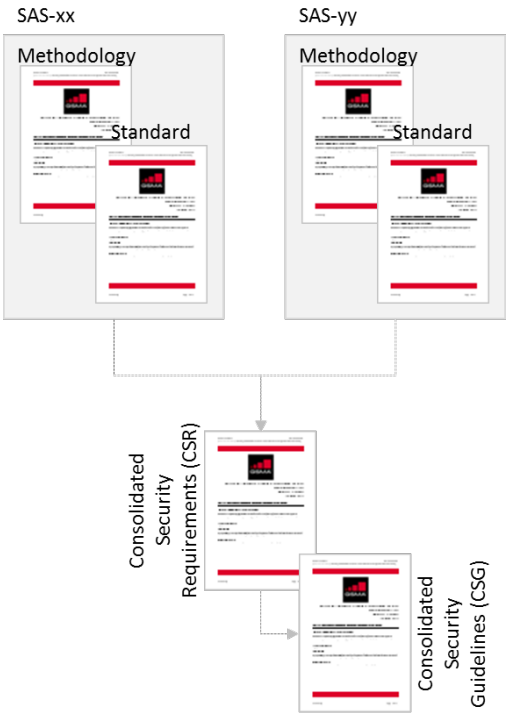
SAS participants are responsible for ensuring that they have determined which of the SPs and requirements are relevant to them. In the event of any query, participants should contact sas@gsma.com.

1.4 Intended audience

- Security professionals and others within organisations seeking to obtain or maintain accreditation under the GSM Association Security Accreditation Scheme
- Security professionals and others within organisations seeking to procure products or services within the scope of the GSM Association Security Accreditation Scheme
- SAS Certification Body members
- SAS auditors

1.5 Related documents

This document is part of the Security Accreditation Scheme documentation published by the GSM Association. Documentation is structured as follows:



Each SAS scheme comprises a **Methodology** and **Standard** relevant to Sensitive Processes (SPs) that should be protected**.**

The **Methodology** describes the purpose of the scheme and how it is administered.

The **Standard** describes the security objectives related to the relevant SPs.

The **Consolidated Security Requirements (CSR)** describe all of the security requirements that may apply to SPs in the different SAS schemes.

The **Consolidated Security Guidelines (CSG)** provide examples of how the security requirements may be achieved.

Figure 1 - SAS Documentation Structure

The accreditation schemes and documents are designed such that multiple schemes will utilise the same Consolidated Requirements and Guidelines.

References to the Standard and Methodology documents for each SAS scheme can be found in section 1.8.

1.6 Definitions

Term	Description
Actor	Person who is involved in, or can affect, the Sensitive Process
Audit Team	Two auditors, one each from different auditing companies, jointly carrying out the audit on behalf of the GSMA.
Auditee	The site that is the subject of the audit
Business Continuity	Capability of the operator of a SP to continue to operate the SP at predefined levels (as determined by customer requirements) following a failure incident.
Duplicate	Two or more assets of the same nature showing a set of information that should be individual according to the correct process
Employee	An individual who works part-time or full-time under a contract of employment, whether oral or written, express or implied, and has recognized rights and duties. Also called worker.
Environment	Environment of use of the sensitive process limited to the security aspects
eUICC	A UICC which is not easily accessible or replaceable, is not intended to be removed or replaced in a device, and enables the secure changing of profiles. Note: The term originates from "embedded UICC".

Term	Description
eUICC Management	A set of functions related to the registration of an eUICC to a SM-SR and the change of SM-SR for an eUICC.
Key	Any logical key (e.g. cryptographic key or certificate)
Physical key	Any key and/or combination used for opening a physical lock (e.g. a door, vault, safe or secure cabinet)
Platform Management	A set of functions related to the transport, enabling, disabling and deletion of a Profile on an eUICC.
Profile	Combination of a file structure, data and applications to be provisioned onto, or present on, an eUICC and which allows, when enabled, the access to a specific mobile network infrastructure.
Profile Management	A set of functions related to the downloading, installation and content update of a Profile in a dedicated eUICC.
Reject	Finished or partially finished product containing sensitive information which has been ejected from the process.
Restricted area	An area, which may or not be a sub-area of an HSA, in which physical access is limited and enforced by access control devices where sensitive systems or components of the SP are installed.
Sensitive Process	The security evaluation field, covering the processes and the assets within those processes. For the purposes of SAS, SPs can include activities related to UICC production, subscription management and certificate management.
Universal Integrated Circuit Card	A smart card that conform to the specification written and maintained by the ETSI Smart Card Platform.

1.7 Abbreviations

Term	Description
BCP	Business Continuity Plan
CA	Certificate Authority
CM	Certificate Management
CSR	Consolidated Security Requirements
CSG	Consolidated Security Guidelines
eUICC	Embedded UICC (as defined above)
EUM	Embedded UICC Manufacturer
FIPS	Federal Information Processing Standard
FS.nn	Prefix identifier for official documents belonging to GSMA Fraud and Security Group
GSMA	GSM Association
HSA	High Security Area
HSM	Hardware Security Module
IT	Information Technology
MNO	Mobile Network Operator
PKI	Public Key Infrastructure

Term	Description
SAS	Security Accreditation Scheme
SAS-SM	Security Accreditation Scheme for Subscription Management Roles
SAS-UP	Security Accreditation Scheme for UICC Production
SGP.nn	Prefix identifier for official documents belonging to GSMA SIM Group
SLA	Service Level Agreement
SM-DP	Subscription Manager – Data Preparation
SM-DP+	Subscription Manager – Data Preparation (Enhanced compared to the SM-DP in SGP.02 [7])
SM-DS	Subscription Manager – Discovery Service
SM-SR	Subscription Manager – Secure Routing
SP	Sensitive Process
UICC	Universal Integrated Circuit Card (e.g. a SIM card)

1.8 References

Ref	Doc Number	Title
[1]	PRD FS.04	GSMA SAS Standard for UICC Production, latest version available at www.gsma.com/sas
[2]	PRD FS.05	GSMA SAS Methodology for UICC Production, latest version available at www.gsma.com/sas
[3]	PRD FS.08	GSMA SAS Standard for Subscription Manager Roles, latest version available at www.gsma.com/sas
[4]	PRD FS.09	GSMA SAS Methodology for Subscription Manager Roles, latest version available at www.gsma.com/sas
[5]	PRD FS.17	GSMA SAS Consolidated Security Requirements, latest version available at www.gsma.com/sas
[6]	PRD SGP.01	Embedded SIM Remote Provisioning Architecture
[7]	PRD SGP.02	Remote Provisioning Architecture for Embedded UICC Technical Specification
[8]	PRD SGP.21	Remote SIM Provisioning Architecture
[9]	PRD SGP.22	Remote SIM Provisioning Technical Specification
[10]	RFC 2119	“Key words for use in RFCs to Indicate Requirement Levels”, S. Bradner, March 1997. Available at http://www.ietf.org/rfc/rfc2119.txt

1.9 Conventions

The key words “must”, “must not”, “required”, “shall”, “shall not”, “should”, “should not”, recommended”, “may”, and “optional” in this document are to be interpreted as described in RFC2119 [10].”

2 Security Guidelines

2.1 Application of requirements/guidelines

The applicability of requirements to different activities is indicated through the following scope symbols:

All	Applies to all participants, regardless of activity
UP	Applies to participants conducting UICC production
SM	Applies to participants conducting Subscription Management activities
CM	Applies to participants conducting Certificate Management activities

In all cases the scope symbols apply:

- to the statement against which they are marked
- to all subsequent statements of the same numbering depth where no different scope has been indicated

All statements of lower depth in the numbering scheme inherit the scope from the parent, unless an alternative scope is indicated.

2.2 Guidelines

Statements from CSR			Guidelines	
1 Policy, strategy and documentation				
All	The security policy and strategy provides the business and its employees with a direction and framework to support and guide security decisions within the company and at the location where the SP takes place.			
	1.1	Policy		
	1.1.1	A clear direction shall be set and supported by a documented security policy which defines the security objectives and the rules and procedures relating to the security of the SP, sensitive information and asset management.		A documented security policy should exist, either as a stand-alone document, or as part of a security manual. The policy should be a statement of overall security principles and management intent. The security policy document should be endorsed by senior management at the site. The policy should be supported by appropriate documentation – either as individual policies, or as part of an overall security manual.
	1.1.2	Employees shall understand and have access to the policy and its application should be checked periodically.		Objectives and rules should be available to employees. A mechanism should exist for ensuring that important changes to security rules and documents can be communicated effectively to all affected employees.
	1.2	Strategy		
	1.2.1	A coherent security strategy must be defined based on a clear understanding of the risks. The strategy shall use periodic risk assessment as the basis for defining, implementing and updating the site security system. The strategy shall be reviewed regularly to ensure that it reflects the		There should be evidence of a coherent security strategy based on a clear understanding of the risks, based on risk assessment, and design of the security management system to address them appropriately. There should be evidence of regular formal security risk assessments taking place. Results of risk assessment should be used to drive revisions to the security strategy and security management system. The risk assessment methodology should demonstrate clear structures for:

Statements from CSR			Guidelines	
		changing security environment through ongoing re-assessment of risks.		• Risk identification • Assessment/evaluation of the identified risks. The SAS Standards set out one sample framework for risk identification. Many formal methodologies exist for risk assessment, although most will involve evaluation of likelihood and impact (possibly in conjunction with other factors) on defined scales. Such scales should be clearly defined to ensure that they are applied in a consistent and repeatable way, e.g. by quantitative definition. Whilst the same risk assessment methodology can often be applied to different types of risk it is normally beneficial for a security risk assessment to be undertaken separately from other risk assessments (e.g. business continuity) to ensure correct focus on the relevant assets and threats.
	1.3	Business Continuity Planning		
	1.3.1	Business continuity measures must be in place:		The business continuity plan (BCP) should be developed as a working business document (rather than one developed specifically for SAS compliance). The BCP should reflect the availability requirements of the SP and any specific customer service level agreements (SLAs) in place. SAS compliance will require specific issues to be addressed, including: • Definition of incidents that critically affect the SP based on a business continuity risk assessment and impact analysis • Processes for management of scenarios that affect the SP • Mechanisms and processes in place to ensure continuity of operations • Management of customer contact and customer data • Maintenance of the integrity of the security system and production processes. All personnel with BCP responsibilities should receive formal training. The BCP should be subject to periodic testing (e.g. once per year). Scenario-based testing will normally be appropriate for most periodic tests.

Statements from CSR			Guidelines	
				For the purpose of SAS a scenario-based test would typically comprise a simulation of a BCP incident: • A sample scenario is defined that could or would lead to a business continuity incident. • Key personnel are presented with the scenario • The BCP team execute the BCP as a simulated desktop-based exercise. Each member of the team role-plays their individual actions and interactions. • Interfaces to external stakeholders (customers, suppliers, corporate teams) may be tested from time to time as appropriate, but will normally be simulated. • At the end of each test a review will allow improvements to the plan and to team training to be identified. Scenarios should be selected that exercise all elements of the BCP for response and recovery. Scenarios should be varied for each test to ensure appropriate coverage of all elements of the BCP.
	(i)	to ensure an appropriate level of availability		Availability requirements will vary dependant on the SP, its implementation and the relationship with other entities (e.g. customers). Auditees will always be required to make clear the level of availability that is required for the relevant SPs and the relationships with other entities (e.g. by contract).
				Where high availability is required then appropriate controls should be in place, to consider where applicable: • Continuous, uninterrupted access to electric power • Control of temperature and relative humidity within a defined operating range • Live switchover to an alternative / backup site where necessary.

Statements from CSR			Guidelines	
			CM	Facilities should be sufficient to: • Lock out input, finish any pending actions, and record the state of the equipment automatically before a shutdown. • Provide sufficient continued operation for repositories (containing Certificate Authority (CA) Certificates and Certificate revocation status) in the absence of commercial power, to maintain the required level of availability.
			UP	There is no specific requirement within SAS-UP for a backup site, however sites with no backup agreement should ensure that this is contractually acceptable to customers.
	(ii)	to enable response and recovery in the event of a disaster.		
	1.4	Internal audit and control		
	1.4.1	The overall security management system shall be subject to a rigorous programme of internal monitoring, audit and maintenance to ensure its continued correct operation.		A programme of internal checks and audits should be defined that demonstrates appropriate consideration of: • The frequency of checks required for each area addressed by the internal audit mechanism • The structure of the audits themselves, including clear guidance on what should be checked and how The recording / documentation and follow-up process for audits undertaken. The auditors will expect to see evidence that processes and systems are working correctly, and that internal checks have been carried out according to the schedule. There should be appropriate coverage of all aspects of the system; the audit programme should be defined around the need to provide appropriate coverage, rather than the availability of audit resource. The programme should normally consider controls at a number of different levels:

Statements from CSR			Guidelines	
				• Operational controls and checks should be conducted regularly as part of the normal function of each area, or as an integrated part of business processes. Such checks may be conducted by operational or supervisory personnel within the area, or as an independent control by an auditor or audit group from another business area. • Independent checks, should be conducted periodically to validate the effectiveness of the operational controls. Checks should be conducted by an auditor or audit group independent of operational or supervisory personnel from the area concerned. o Records of operational controls should be checked to ensure their completeness. o Independent validations of their effectiveness should also be carried out. • Reviews of the whole audit system should be conducted periodically to ensure the completeness and appropriateness of its coverage • Additional levels may be required in some areas dependant on the scale of the operation. • Care should be taken to ensure that a rigid or prescriptive audit system does not prevent identification of new or emerging issues. Auditors should have received appropriate training in the structure and content of internal audits.

Statements from CSR			Guidelines	
2 Organisation and responsibility				
All	A defined organisation shall be responsible for ownership and operation of the security management system.			
	2.1	Organisation		
	2.1.1	To successfully manage security, a defined organisation structure shall be established with appropriate allocation of security responsibilities.		The security organisation should be clearly defined and documented as part of the security management system.
	2.1.2	The management structure shall maintain and control security through a cross-functional team that co-ordinates identification, collation, and resolution, of security issues, independent of the business structure.		A cross-functional forum for discussion, escalation and resolution of security issues and solutions should exist and meet regularly (at least once per quarter). The forum should include senior management representatives. Evidence should exist of forum meetings taking place.
	2.2	Responsibility		
	2.2.1	A security manager shall be appointed with overall responsibility for the issues relating to security in the SP.		Security responsibilities of the security manager should be clearly defined. Although it may not always be appropriate to have a dedicated / full-time security manager role, auditees should be able to demonstrate that sufficient time is available for security management activities.
	2.2.2	Clear responsibility for all aspects of security, whether operational, supervisory or strategic, must be defined within the business as part of the overall security organization.		Responsibilities should be clearly documented and well understood within the business. Where security management roles are defined separately (e.g. physical and IT security), suppliers should be able to demonstrate an overall co-ordinated / integrated approach to security management with responsibilities clearly defined.
	2.2.3	Asset protection procedures and responsibilities shall be documented throughout the SP.		Employees should be made responsible and accountable for sensitive assets (both physical and information) within their care throughout the sensitive process.

Statements from CSR			Guidelines	
				Responsibility should be clearly defined, even where assets are in intermediate / temporary storage between sensitive process stages, such that a clear 'owner' can always be identified. Control of access to assets should reflect the assigned responsibility (such as key management, customer interface, IT administration). Procedures for documenting handover of assets should be clearly defined. Asset protection mechanisms applicable at each processing stage should be documented as part of the production process and supporting documentation. Protection mechanisms should be clearly understood by the employees affected.
	2.2.4	Clear security rules shall govern the manner in which employees engaged in such activities shall operate within the SP. Relevant guidelines should be in place and communicated to all relevant staff.		
	2.3	Incident response and reporting		
	2.3.1	An incident response mechanism shall be maintained that includes a process for the investigation and mitigation of:	All	An escalation process / mechanism should be in place where security breaches are identified. When any security breach is identified, an incident management process should be activated including impact analysis, setup of remediation plan and notification to any external third parties possibly impacted. All such security breaches should be tracked and reported.
			CM	The incident response mechanism should require the public key infrastructure (PKI) Policy Authority to be promptly notified of any incidents that may have affected the integrity and trust of the PKI.

Statements from CSR			Guidelines	
	(i)	accidental or deliberate breach of internal regulations and procedures		
	(ii)	suspected or detected compromise of systems, or receipt of notification of system vulnerabilities		
	(iii)	physical or logical penetration of the site		
	(iv)	denial of service attacks on components (where applicable)		
	2.4	Contracts and liabilities		
	2.4.1	In terms of contractual liability, responsibility for loss shall be documented. Appropriate controls and insurance shall be in place.		Contracts with customers and suppliers should clearly define responsibility and liability for loss. Where contracts with customers are not standardised (i.e. different contracts may be agreed with different customers) mechanisms should exist to ensure that all contracts are in line with an overall framework for liability and loss. Evidence should exist that the supplier is able to cover its liabilities for loss of physical assets or data, and for consequential loss where defined within contracts. Normally it will be expected that insurance will be in place to cover such losses.

Statements from CSR			Guidelines	
3 Information				
All	The management of sensitive information, including its storage, archiving, destruction and transmission, can vary depending on the classification of the asset involved.			
	3.1	Classification		
	3.1.1	A clear structure for classification of information and other assets shall be in place with accompanying guidelines to ensure that assets are appropriately classified and treated throughout their lifecycle.		An information and asset classification structure should be documented that is consistent with, or exceeds, those set out within the relevant SAS standard. The classification structure should not exist in isolation. Evidence should exist that the classification structure: • Links to a set of asset protection requirements / standards • Maps onto business processes to identify where sensitive assets are handled, and the asset protection standards are applied • Specifies the treatment during the entire lifecycle (that is, creation, processing, storage, transmission and disposal) The auditors will expect to see evidence of the classification structure being applied throughout the operation during the audit.
	3.2	Data and media handling		
	3.2.1	Access to sensitive information and assets must always be governed by an overall ‘need to know’ principle.		Individual physical and logical access rights should be formally documented. The ‘need to know’ principle should be used to ensure that an individual is granted no more than sufficient access to perform his or her job.
	3.2.2	Guidelines shall be in place governing the handling of data and other media, including a clear desk policy. Guidelines should describe the end-to-end ‘lifecycle management’ for sensitive assets, considering creation, classification, processing, storage, transmission and disposal.		A clear desk policy should be defined that considers both electronic and physical information assets. Guidelines should be in place to assist employees in understanding the asset classification scheme, and defining the treatment of assets throughout their lifecycle.

Statements from CSR			Guidelines	
				Specific controls should be in place for the secure handling of all media at end-of-life. Procedures should be in place for: • the disposal of sensitive information to prevent its unauthorised use, access, or disclosure. • the treatment of sensitive data in electronic form stored on old or faulty equipment.

Statements from CSR			Guidelines	
4 Personnel security				
All	A number of security requirements shall pertain to all personnel working within the SP and those with trusted positions.			General requirements should be applied to all personnel working inside the site where SPs are conducted. Trusted positions include all employees (both permanent and temporary), contractors, and consultants that have access to or control:
			All	• Sensitive information or assets
			CM	• Those authentication or cryptographic operations relevant to the SP at the site that may materially affect the following functions (typically applicable only to CAs): o The acceptance, rejection, or other processing of Certificate Applications, revocation requests, or renewal requests, or enrolment information o The issuance, or revocation of Certificates, including (in the case of Processing Centres) personnel having access to restricted portions of its repository o The handling of Subscriber information or requests
	4.1	Security in job description		
	4.1.1	Security responsibilities shall be clearly defined in job descriptions.		All individuals having: • access to sensitive assets • a specific security role or security responsibilities should have a job description in which security tasks are clearly defined. For all other individuals a general security declaration should be defined.
	4.2	Recruitment screening		

Statements from CSR			Guidelines	
	4.2.1	An applicant, and employee, screening policy shall be in place where local laws allow		All employees should be subject to a screening process that should include: • Formal interview • Validation of education and employment history. Clear policies should be defined for the periods of employment history that should be validated. Where local laws allow, screening should also include: • Criminal background checks • Credit checks. Where permitted, re-checking of criminal background and credit checks should be carried out on a regular basis (e.g. every year / 2 years). All checks should be documented to ensure that there is an auditable record of what checks were carried out, when and by whom.
	4.3	Acceptance of security rules		
	4.3.1	All recruits shall sign a confidentiality agreement.		All employees should sign a confidentiality agreement as part of, or in parallel with, their contract of employment. Temporary employees, contractors and visitors should sign confidentiality agreements.
	4.3.2	Employees shall read the security policy and record their understanding of the contents and the conditions they impose.		All employees should sign to indicate their understanding and accepting of the security policy as part of, or in parallel with, their contract of employment. Employees should be reminded of their acceptance of the security policy on a regular basis. Employees may be requested to re-confirm their acceptance of the policy on a regular basis; this may be done as part of the refresher training programme (see 4.3.3).
	4.3.3	Adequate training in relevant aspects of the security management system shall be provided on an ongoing basis.		All new employees should be provided with induction training covering basic security principles applicable throughout the site. Employees should receive refresher training in security principles on a regular basis (e.g. annually).

Statements from CSR			Guidelines	
				Employees may be asked to re-confirm their understanding and acceptance of security policy as part of refresher training. Mechanisms should be in place to ensure that all employees receive security training; auditable records should exist of training taking place, and those employees trained. Specific, focused, security training should be conducted for employees with specific security responsibilities.
	4.4	Incident response and reporting		
	4.4.1	Reporting procedures shall be in place where a breach of the security policy has been revealed.		Mechanisms should be in place for employees to make confidential reports of security incidents or suspicions. Follow-up and escalation mechanisms should exist for incidents reported.
	4.4.2	A clear disciplinary procedure shall be in place in the event that a staff member breaches the security policy.		
	4.5	Contract termination		
	4.5.1	Clear exit procedures shall be in place and observed with the departure of each Employee.		Exit checklists should be in place to ensure that company property has been retrieved and all privileges (e.g. physical and logical access) have been revoked. Procedures should exist to escort employees from the premises where appropriate. Employees should be reminded of their obligations under the confidentiality agreement prior to leaving the company.

Statements from CSR			Guidelines	
5 Physical Security				
All		Physical security controls are required at all sites where SPs are carried out, to consider the location and protection of the sensitive assets (both physical and information) wherever they are stored or processed. Buildings in which sensitive assets are processed or stored shall be of appropriate construction; robust and resistant to outside attack. Sensitive assets must be controlled within high security and restricted areas by using recognised security control devices, staff access procedures and audit control logs.		
	5.1	Security plan		
		Layers of physical security control shall be used to protect the SP according to a clearly defined and understood strategy. The strategy shall apply controls relevant to the assets and risks identified through risk assessment.		Security risk assessments should be conducted / updated on a regular basis (e.g. annually). Risk assessment findings should be used to drive continuous improvement and modification of controls.
	5.1.1	The strategy shall be encapsulated in a security plan that:		
	(i)	defines a clear site perimeter / boundary		The site boundary / perimeter is considered to be the point at which physical security controls - considering physical protection and access control - begin. Sites will vary in their definition of the boundary / perimeter. The boundary / perimeter from a physical security perspective will not always be the same as the boundary of the site itself (for example, where there is no boundary fence). In all cases sites will be expected to have considered, and defined, the site boundary and its role within the overall protection strategy for the site.
	(ii)	defines one or more levels of secure area within the boundary of the site perimeter		It is expected that all sensitive assets will be wholly contained within a high security area (HSA) from the time of receipt of raw materials through to despatch.

Statements from CSR			Guidelines	
				HSAs should be clearly defined and documented to include: • The perimeter of the HSA • The protection measures used to secure the HSA. Suppliers may choose to define several levels of HSA, to reflect the sensitivity of assets contained.
	(iii)	maps the creation, storage and processing of sensitive assets to the secure areas		The lifecycle of sensitive assets should be mapped against the HSAs defined.
	(iv)	defines physical security protection standards for each level of secure area		The expected, or required, physical protection standard for each level of HSA should be defined, to consider those elements defined in 5.2.1. Where multiple levels of HSA are defined, protection standards should be defined for each.
	5.2	Physical protection		
	5.2.1	The protection standards defined in the security plan shall be appropriately deployed throughout the site, to include:		
	(i)	physical protection of the building and secure areas capable of resisting attack for an appropriate period		Sites should make use of visible security mechanisms to act as a deterrent, which may include: • Fences at the site boundary • Perimeter lighting • CCTV • Access control • Guard presence / site monitoring.
	(ii)	deterrent to attack or unauthorized entry		Response and escalation times for secure areas should be defined. Requirements for attack times for secure areas should be set accordingly. Physical protection of secure areas should achieve, or exceed, stated attack times by ensuring that: • Walls should be of strong construction

Statements from CSR			Guidelines	
				• Points of access (windows and doors) to HSAs should be minimised • Doors and windows giving direct access into secure areas from outside (e.g. emergency exit doors) should be physically hardened to increase attack time. Suppliers should pay particular attention to the design of hinges and locking mechanisms used on access points to secure areas from outside: Multi-point locking mechanisms (including emergency doors) should be used. Removal or cutting of hinges should not allow doors to be opened.
	(iii)	mechanisms for early detection of attempted attack against, or unauthorized entry into, the secure areas at vulnerable points		When considering attack and response times, a response will be triggered only when an attack is identified. Sites should identify vulnerable points for access to secure areas (doors and windows; walls of weak construction; roof accesses). Detection mechanisms should be in place to identify attacks against these areas when they are taking place, rather than when they are successful. Mechanisms may include: • Movement detection sensors (microwave or infra-red) • Barrier systems (microwave or infra-red) • Seismic and vibration sensors • CCTV movement detection (based on automated image analysis).
	(iv)	control of access through normal entry / exit points into the building and SP to prevent unauthorized access		Automated access control systems should be in use.
	(v)	effective controls to manage security during times of emergency egress from the secure area and building		It is accepted that the priority during emergency evacuation of buildings is to ensure the safety of people. However, emergency evacuations often introduce vulnerabilities in site security, and may be exploited by attackers. Mechanisms should be in place to protect sensitive assets during such evacuations. Evacuation procedures should consider: • Responsibility for ensuring high security areas are cleared of all personnel during evacuation • Attempts to restrict unauthorised re-entry to buildings and high security areas, including:

Statements from CSR			Guidelines	
				o Monitoring of emergency exit doors by nominated personnel o Use of self-closers on emergency exit doors. Procedures for addressing weaknesses in physical protection introduced as a result of emergency incidents (e.g. damaged security systems or physical controls). Mechanisms to ensure that all assets are accounted for prior to production re-commencing.
	(vi)	mechanisms for identifying attempted, or successful, unauthorized access to, or within the site		Intrusion detection (alarm) systems should be in use. The alarm system should make appropriate use of detection technologies to protect the secure areas, configured as one or more detection zones within the alarm system. Mechanisms should be in place to ensure that alarm zones are armed in accordance with a defined policy. Consideration should be given to automatic arming of alarm zones covering sensitive areas (e.g. data processing rooms, production server rooms, areas used to store or process class 1 assets) when they are not occupied. Alarms should be recorded to a system-generated log. Controls should be in place to enforce the integrity of the log. Actions taken in response to each alarm should be recorded as part of the response process. Independent checks should be carried out to validate that reasons are recorded for all alarms.
	(vii)	mechanisms for monitoring and providing auditability of, authorised and unauthorised activities within the SP		CCTV systems should be in use. CCTV images should be recorded and retained for a minimum of: • 90 days where this is legally permissible • The maximum period legally permitted where this is less than 90 days. o Sites may be asked to provide evidence of legal restrictions It is acceptable for image capture and recording to be event-driven. Images should be recorded with sufficient frequency to provide good auditability of activities. As a guide:

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				• Cameras providing general coverage of movement of larger assets (e.g. packaged, sealed boxes), or of personnel movement, should typically exceed 3fps • Cameras providing detailed coverage of sensitive processes involving handling of individual UICCs should typically exceed 6fps • Some applications may demand higher frame rates, particularly where cameras are an integral part of the control systems used for counting product. Appropriate illumination should be provided for external CCTV cameras. Stored / archived CCTV images should be retrievable for specified dates / times / locations. Physical and logical controls should be in place to preserve the integrity of the CCTV recordings arising from: • Unauthorised manipulation of / interference with the recorder hardware • Unauthorised access to suppress, delete or overwrite video files. Where digital CCTV systems are in use, mechanisms should be in place to ensure sufficient storage space is available. Compression settings for images should be chosen carefully to ensure that image quality is not adversely affected. Positions of fixed cameras should be clearly defined. Reference images should be available for security / control room personnel to enable positions and live images to be validated. CCTV systems should be checked regularly to identify problems with cameras, images or system equipment, including: • Quality of live images, considering clarity, focus, exposure / light balance • Quality of recorded images, considering clarity, compression, actual frame rate, continuity and retention period • Correct framing of images (using reference pictures) Procedures for maintenance (including regular cleaning of camera housings) should be in place.

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	5.2.2	Controls deployed shall be clearly documented and up-to-date.		Physical security controls should be clearly documented and available to relevant site personnel. All changes to physical security controls should be documented.
	5.3	Access control		
	5.3.1	Clear entry procedures and policies shall exist which cater for the rights of Employees, visitors and deliveries to enter the SP. These considerations shall include the use of identity cards, procedures governing the movement of visitors within the SP, delivery/dispatch checking procedures and record maintenance.		An access control policy should be in place, enforced by an access control system. The policy should define authorities for access to secure areas by employees, visitors, contractors and security personnel. All employees should be issued with ID cards. Configuration of access rights should be under strict control. All changes to access rights should be auditable and accountable to the operator making the change, and awarded on a strict need to access basis. Specific controls should be in place to prevent employees from accessing secure areas in excess of their own privileges resulting from: • Ability to change or re-assign access rights in the access control system • Access to highly privileged access rights or cards intended for employees, visitors or emergency access. Where highly-privileged access cards are handled by, or accessible to, employees additional controls should be in place to prevent unauthorised use. Visitors to secure areas should be authorised by an appropriate authority according to a defined procedure. All visitors requiring access to secure areas should be registered in the access control system. Movement of materials to/from the HSA(s) should be controlled. Transfer of materials should be controlled using an intermediate / buffer zone or materials trap, e.g. within the delivery bay area. In production environments, vehicle movements should be logged and drivers positively identified before being admitted to delivery bays. Separation should be enforced between personnel inside secure areas and delivery drivers / vehicles. All pPhysical keys managed as part of the site's security management system should be catalogued. Issue of keys to employees should be tracked according to

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				an auditable system. Keys to secure areas should be under strict control and subject to regular audit.
	5.3.2	Access to each secure area shall be controlled on a 'need to be there' basis. Appropriate procedures shall be in place to control, authorise, and monitor access to each secure area and within secure areas.		All access to secure areas should be strictly controlled and auditable using the access control system. One-by-one mechanisms should be in use to strictly control access to HSAs. Anti-passback controls should be in place for access to, and within the HSA. All employees, visitors and contractors to the secure areas should be uniquely identifiable to the access control system. Access to sensitive locations within the high security areas should make use of two-factor authentication (e.g. ID card + PIN), or dual control (e.g. 2 people must be present within the area). Sensitive locations may include: • Secure storage (vault areas) • Data processing rooms • Key ceremony rooms • Server rooms Movements into, and out of, the secure areas, and between defined zones within the secure areas should be tracked by the access control system. Attempts to enter access control zones should be logged by the access control system and reviewed; repeated attempts to exceed access privileges should be followed-up with employees. Access to secure production areas where class 1 and class 2 assets are created, stored and processed should be enforced on a one-by-one basis. Access to secure areas where class 1 and class 2 assets are created, stored and processed should be on a strict 'need to be there' basis, covering employees, contractors and visitors to the site. To enforce a 'need to be there' principle, consideration should be given to separation of secure areas where class 1 and class 2 assets are processed.
	5.4	Security staff		

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	5.4.1	Security staff are commonly employed by suppliers. Where this is the case the duties shall be clearly documented and the necessary tools and training shall be supplied.		Security staff should have received specific training in their roles and responsibilities and operational procedures. Security staff should have an understanding of the operations of the site and the sensitive assets handled. Operational security procedures should be clearly documented, and available to security staff within the control room. Security staff should be familiar with the security systems provided (access control, alarm system, CCTV system). The auditors expect that security staff will demonstrate a basic competence in their operation during the audit.
	5.5	Internal audit and control		
	5.5.1	Physical security controls shall be subject to a rigorous programme of internal monitoring, audit and maintenance to ensure their continued correct operation.		A programme of internal audits/controls should be defined that demonstrates appropriate consideration of: • The frequency of checks required for each area addressed by the internal audit/control mechanism • The structure of the audits/controls themselves, including clear guidance on what should be checked and how • The recording / documentation and follow-up process for audits/controls undertaken. The auditors will expect to see evidence that processes and systems are working correctly, and that internal audits/controls have been carried out according to the schedule. There should be appropriate coverage of all aspects of the system; the audit/control programme should be defined around the need to provide appropriate coverage, rather than the availability of resource. In particular, there should be evidence that the internal audit system has been designed to validate all of the physical security controls in place, including regular testing of systems. Auditors should have received appropriate training in the structure and content of internal audits/controls.

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6 Certificate and key management				
All	Technical and procedural controls shall be applied to cryptographic keys and certificates related to the SP at the site. Applicable requirements will vary according to the level of SP. Specific requirements applying to Root CA(s) are highlighted where applicable.			
	6.1	Classification		
	6.1.1	Keys and certificates shall be classified as sensitive information. Logical, physical, personnel and procedural controls shall be applied to ensure that appropriate levels of confidentiality, integrity and availability are applied.		Systems used for processing and storage of keys and certificates should be configured, managed and operated in-line with the relevant requirements for infrastructure security from the CSR and CSG. Specifically, systems should be: • managed consistent with the requirements in section 10 • operated in an environment consistent with the requirements of section 5 • operated by personnel subject to the controls described in section 4
	6.2	Roles and responsibilities		
	6.2.1	Responsibilities and procedures for the management of certificates and cryptographic shall be clearly defined.		A key manager should be assigned to manage the overall responsibility of the cryptographic systems and key management. A back-up key manager should also be appointed. Key management activities should be conducted using fully authorized and trained personnel. All personnel should be formally designated and have formally accepted their duties and their responsibility. Re-vetting of members of the key management should be reviewed periodically. Temporary staff should not be involved in key management activities.

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	6.2.2	Auditable dual-control shall be applied to sensitive steps of key management.		All key management activities that take place at the site and are relevant to the SP, except component loading/extraction, should be conducted under dual control. These activities may include some or all of:
			All	• The administration of key management systems and mechanisms: o set up o configuration o maintenance o management of user's profiles o operations on cryptograms o key files back-up and restore.
			CM	and the following activities typically applicable only to the CA itself: o validation of information in Certificate Applications o acceptance, rejection, or other processing of Certificate Applications, revocation requests, key recovery requests or renewal requests, or enrolment information o issuance, or revocation of Certificates, including personnel having access to restricted portions of the repository; o handling of subscriber information or requests o generation, issuing or destruction of a CA Certificate o and the following activities typically applicable only to a sub CA: o loading or removal of a CA to/from a production environment.
	6.3	Cryptographic key specification		
	6.3.1	Technical specifications for cryptographic keys and certificates shall be selected that are: • compliant with relevant or applicable standards		The CSR/CSG do not describe technical specifications for cryptographic keys and certificates. Requirements will vary dependant on the value of the assets to be protected, the environment(s) in which they are used and the expected lifespan. Advances in computing power and developments in cryptanalysis

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		or • of an appropriate level to the asset(s) protected, based on risk and lifespan.		techniques will drive changes/obsolescence of acceptable algorithms and key lengths over time. Where technical standards or requirements are laid down for keys/certificates (e.g. as part of contractual agreements for participation within an ecosystem) then auditees will be expected to demonstrate that implementations are compliant with the relevant specifications. For example: • The secure channel key length and algorithm used on the ES5 interface (SM-SR - eUICC) shall comply with section 2.3.3 of SGP.02 [7]. • The secure channel configuration, key length and algorithm to be used on the ES8 interface (SM-DP - eUICC) shall comply with section 2.5 of SGP.02 [7]. • The key length and algorithm to be used for remote secure communication involving an SM-DP+ shall comply with section 2.6.5 of SGP.22 [9]. Where no specific technical standards are laid down, then auditees will be expected to demonstrate application of appropriate best-practice in selecting cryptographic algorithms and key lengths.
	6.4	Cryptographic key management		
	6.4.1	Cryptographic keys, certificates and activation data shall be generated, exchanged, stored, backed-up and destroyed securely.		Keys should be only used for the purpose intended. Key management should be governed by the following two major principles: • Knowledge is always split (not accessible by one person alone) • Process activities are conducted under dual control. A key should only be in clear-text form when residing within the HSM. Outside of the HSM, keys may only exist in the form of a cryptogram, or split into a minimum of 2 components. Where keys are split into components, the individual components should be under the sole control of the relevant and designated custodian only. Principles should apply during the whole life cycle. Test Keys and Live keys should never be found on the same operational system. Prototypes are understood to be “test” keys, though “pilot” keys are deemed “live” keys associated to production.

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				Key management activities should be operated in a separate area within the HSA where access to the area is logged via the Access Control system and equipped with intrusion detection and CCTV. Key lifecycle Generation • Entities responsible for the generation of key pairs should ensure that key pairs are generated: o By an appropriate mechanism (e.g. during a formal key ceremony) o In an environment with appropriate protection Exchange and storage • Key component and related sensitive data should be stored securely under the control of the respective owning custodian. • During key transport, the key received from a 3rd party should be conveyed either as a cryptogram or in minimum 2 components exchanged between authorized custodians and exchanged using tamper evident serialised envelope. o Key components should not be opened or accessed outside of the secure environment where the key ceremony takes place. • Keys should be loaded under appropriate control (e.g. during a formal key ceremony) • After successful loading of a key, the key components should be destroyed. • Controls should be in place for the exchange of public keys to ensure trust by the recipient. o Specific formal methods for exchange and validation should be used for public keys submitted for signing to a certificate authority. Backup • Where key backups are generated, these should be performed under dual control.

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				• The security level of the backup should equal at a minimum that of the key being backed up. • CA private signature keys should not be archived or escrowed. Destruction • Appropriate mechanisms should be used for the destruction of keys and key components to prevent their theft, disclosure or unauthorized use. Where relevant to the SP, activation data used to unlock private keys should: • Have an appropriate level of strength for the keys or data to be protected. • Be appropriately protected throughout its lifecycle to prevent loss, theft, modification, disclosure or unauthorized use. • Be updated as appropriate. Auditees should be capable of demonstrating a key ceremony (for example during a dummy/simulated ceremony) which shows that: • at no times are keys or components disclosed to an unauthorised person. • audit log reports are correctly established and maintained. • the dual control and required restraints during the ceremony are effective.
	6.4.2	The cryptographic key management process shall be documented and cover the full lifecycle of keys & certificates.		This documentation should specify the actors (key custodians), the involved keys, the entire lifecycle management (generation, distribution, loading, storage, usage, backup/recovery, destruction, audit trail) and incident management (compromise).
CM SM	6.4.3	The cryptographic computation for certificate generation (derivations, random generations) and storage of keys involved in the protection of the sensitive data (i.e. Class 1 data) shall rely on hardware security modules (HSM) that are FIPS 140-2 level 3 certified.		Cryptographic keys related to IT protocols between servers (e.g. between SM-DP and SM-SR) are out of the scope of SAS-SM. The service provider should provide a copy of the FIPS certification proving the identification of the hardware board and associated firmware of the cryptographic device used. Equipment should be subject to a documented commissioning and/or decommissioning process.

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				Customization of cryptographic devices is acceptable as long as native functions (key generation, key diversification, random number generator, algorithmic computation) are not altered. HSMs used for CM (e.g. EUM) or SM (e.g. SM-DP+) functions should be dedicated to that sole purpose. Any activity on the HSMs should be logged. The integrity of audit trail logs should be ensured. This requirement is mandatory for participants conducting EUM, SM-DR, SM-DP and SM-DP+ activities. It is not mandatory for participants conducting SM-DS activity. It is not mandatory for the private keys used in TLS session between server (e.g. SM-DP+ or SM-DS) and LPA as defined in SGP.22 [9].
	6.5	Auditability and accountability		
	6.5.1	Key management activities shall be controlled by an audit trail that provides a complete record of, and individual accountability for, all actions.		All key management processes should be documented in an audit trail which: • gives evidence as to all operations, key usage, equipment and roles involved in the process • is clearly documented (who, when, what, why) for the full life cycle of keys and systems deployed All activities related to keys/key management should be logged. Integrity of the audit trails should be ensured and protected against manipulation.
CM SM	6.6	GSMA Public Key Infrastructure (PKI) Certificates		
	6.6.1	Supplier certificates used as part of any GSMA PKI shall be signed by a CA authorized by and acting on behalf of the GSMA		The auditee should verify that the CA is authorised and acting on behalf of the GSMA and that certificate issuance is done in accordance with the official GSMA procedure. Only duly authorized staff of the supplier can request services from the CA.

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7 Sensitive Process data management				
UP SM	The site shall be responsible for lifecycle management of Class 1 data used within the SP. Information and IT security controls must be appropriately applied to all aspects of lifecycle management to ensure that data is adequately protected. The overall principle shall be that all data is appropriately protected from the point of receipt through storage, internal transfer, processing and through to secure deletion of the data.			
	7.1	Data transfer		
	7.1.1	Sites shall take responsibility to ensure that electronic data transfer between themselves and other third parties is appropriately secured.		A document should identify the relevant data transfer and its associated protection. Appropriate electronic data transfer mechanisms should be agreed with customers including encryption of sensitive data. Suppliers should demonstrate that they have worked to ensure data transfer mechanisms are appropriate to the sensitivity of the data concerned. Where customers demand insecure data transfer mechanisms, suppliers should formally notify (in writing) the customer of the unsuitability of the data transfer mechanism.
			SM	Encryption of sensitive data should be compliant with SGP.02 [7] or SGP.22 [9] when applicable or agreed with external third parties when not applicable.
	7.2	Sensitive data access, storage and retention		
	7.2.1	Sites shall prevent direct access to sensitive process data where it is stored and processed.		Sensitive data should normally be encrypted at all stages of storage, processing and transmission, except where decrypted data is specifically required to complete the processing stage (e.g. personalisation).
	(i)	User access to sensitive data shall be possible only where absolutely necessary. All access must		

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		be auditable to identify the date, time, activity and person responsible.		Appropriate data encryption technologies should be used to protect sensitive data. Keys should be managed securely. Please refer to the “General Consideration on Algorithm and Key Length” section in SGP.02 [7] to protect sensitive production data. Sensitive data should be deleted after use. Decrypted data should always be deleted using a secure wipe mechanism. Suppliers should be aware of the potential vulnerabilities arising from temporary files and memory paging when evaluating the risks around sensitive data processing. Appropriate controls should be in place to minimise such risks. Data generation and processing mechanisms that require manual intervention / processing of un-encrypted data files should be avoided wherever possible. Automated systems that encrypt data on-the-fly during processing are always preferred. Where manual access to sensitive data is possible or required it must always be auditable. Control of the audit trail must be independent of personnel with access to data.
	(ii)	System and database administrators may have privileged access to sensitive data. Administrator access to data must be strictly controlled and managed. Administrative access to data shall only take place where explicitly authorized and shall always be irreversibly logged.		
	7.2.2	Data shall be stored protected appropriate to its classification.		
	7.2.3	Data retention policies shall be defined, monitored and enforced.		
UP	7.3	Data generation		
	7.3.1	As part of the personalisation process secret data may be generated and personalized into the UICC. Where such generation takes place:		Guidelines in section 7.3 apply to those sites requiring generation of data for UICC personalisation to be within the scope of the SAS-UP certificate. “Local site” refers to the site participating in the SAS-UP scheme and being audited by the SAS-UP auditors.
	(i)	The quality of the number generator in use shall be subject to appropriate testing on a periodic basis. Evidence of testing, and successful results, shall be available.		Random numbers generated as part of data processing for GSM production should be produced by a source whose quality has been: • Certified to a recognised international standard. Evidence of certification should be available during the audit. Or • Subjected to a series of recognised tests of randomness with results that indicate that an acceptable level of randomness has been achieved.

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				Evidence of the testing process and evaluation of results should be available during the audit. Mechanisms should be in place to ensure that randomness is maintained (periodic re-testing, or re-seeding of PRNG may be appropriate). Evidence should always be available at the local site, even where the random source is part of a 'black box' personalisation solution (i.e. there is no detailed understanding of its inner workings by local personnel).
	(ii)	Clear, auditable, controls shall be in place surrounding the use of the number generator to ensure that data is taken from the appropriate source.		An auditable mechanism should be in place to ensure that the correct random source is used for generation of data. Appropriate mechanisms may include independent, auditable validation at time of development of data generation applications or configuration profiles. Where applications or configurations are developed by an off-site team the local site should still take responsibility to ensure that: • Validation has been carried out Validation may be carried out: o on-site by the local team as part of the process to receive the new application/configuration and install it into the production environment. o OR o off-site as part of the development process, provided that the evidence of independent, auditable validation is available to the local site for review as part of the process to receive the new application/configuration and install it into the production environment. • Evidence exists of the validation being carried out. Where data generation applications or configuration profiles are used, integrity controls should be considered to ensure that: • the correct application / profile is used for data generation / processing • the application / profile cannot be changed from that approved / validated. Controls may include:

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				o Restricted logical access to locations that applications / profiles are stored. o Encryption / encoding of applications or profiles to limit the ability of operational personnel to modify the applications / profiles. o Checksum / hashing mechanisms that seek to validate integrity at run-time.
UP SM	7.4	Auditability and accountability		
	7.4.1	The sensitive process shall be controlled by an audit trail that provides a complete record of, and individual accountability for the lifecycle of information assets to ensure that:		A complete, automated audit trail should be in place for all data processing and manipulation activities. The audit trail should record: • the identity of the user carrying out the action / processing stage • the date and time of the action • the nature of the action • the success / failure of the action (including attempts to exceed privileges). Where data processing activities are normally handled by a set of dedicated applications, parallel audit trails should exist for any attempted / successful manipulation of data outside of these applications (e.g. using operating system or generic database tools) The integrity of the audit trail should be preserved. The audit trail should be subject to regular review to identify irregular or unauthorised activity. Role separation should ensure that the audit trail cannot be modified / deleted by members of the data processing team. Based on the asset lists, a log should exist for the entire lifecycle of the asset. A log should exist for the entire user access lifecycle.
	(i)	all assets created, processed and deleted are completely accounted for		
	(ii)	access to sensitive data is auditable		
	(iii)	responsible individuals are traceable and can be held accountable		

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	7.4.2	The audit trail shall be protected in terms of integrity and the retention period must be defined. The audit trail shall not contain sensitive data.		Audit trails should not be modified via technical or procedural processes. Retention period guidelines shall be defined. The retention period is expected to be in accordance with the customer SLA (maximum or minimum).
	7.4.3	Auditable dual-control and 4-eyes principle shall be applied to sensitive steps of data processing.		Sensitive data processing steps will include any action that introduces a risk of unauthorised or duplicate production, and may include: • Manual generation or manipulation of production data • Changes to the status of production data (e.g. resetting UICCs already produced).
UP	7.4.4	For UICC production the audit trail shall include:		Management of the UICC audit trails should be consistent with the controls in sections 7.4.1-3.
	(i)	data generation and processing		
	(ii)	personalisation		
	(iii)	re-personalisation		
	(iv)	access to sensitive data		
	(v)	Production of customer output files		
	7.5	Duplicate production		
	7.5.1	Controls shall be in place to prevent duplicate production.		Prevention of duplicate production is a fundamental principle of SAS. Systems for data processing and production must be designed to prevent opportunities for duplicate production from occurring except where: • These have been explicitly requested and authorised by the customer MNO • The creation of the duplicate does not violate the relevant technical standards or undermine the integrity of the ecosystem.

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				Where production systems are reliant on file-based mechanisms, multiple levels of control should be in place to restrict access to data files. Experience shows that single levels of control (e.g. third-party software limiting access to operating-system tools) are vulnerable; weaknesses can often be introduced. Where production systems are reliant on centralised or database-driven mechanisms, access to manipulate the database / system status should be strictly controlled and fully auditable. Where mechanisms exist for exchange of data between different production sites additional controls should be in place to ensure that duplicate production across sites is prevented.
UP SM	7.6	Data integrity		
	7.6.1	Controls shall be in place to ensure that the same, authorized, data from the correct source is used for the sensitive process and supplied to the customer.		Control of authentication should be done between actors as per the functional specifications (for example, the certificate chain in the reference document SGP.02 [7]) when applicable. When not applicable, there should be a specific authentication mechanism with the third party (for example, specific communication link or specific data transfer process) equivalent to the above document.-
	7.7	Internal audit and control		
	7.7.1	Sensitive data controls shall be subject to a rigorous programme of internal monitoring, audit and maintenance to ensure their continued correct operation.		A programme of internal audits/controls should be defined that demonstrates appropriate consideration of: • The frequency of checks required for each area addressed by the internal audit/control mechanism • The structure of the audits/controls themselves, including clear guidance on what should be checked and how • The recording / documentation and follow-up process for audits/controls undertaken.

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				The auditors will expect to see evidence that processes and systems are working correctly, and that internal audits/controls have been carried out according to the schedule. There should be appropriate coverage of all aspects of the system; the audit/control programme should be defined around the need to provide appropriate coverage, rather than the availability of audit resource. Auditors should have received appropriate training in the structure and content of internal audits/controls.

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8 SM-DP, SM-SR, SM-DP+ and SM-DS Service Management				
SM	8.1	SM-DP, SM-SR, SM-DP+ and SM-SR Service		
	8.1.1	Systems used for the remote provisioning, management of eUICCs and management of Profiles shall support the secure interfaces as defined in SGP.01 [6], SGP.02 [7], SGP.21 [8] and/or SGP.22 [9] as applicable.		The objective is not to demonstrate that the system is compliant with the functional specifications but to show the existence of the different secure interfaces
	8.1.2	Exchange of data within the SM-DP, SM-SR, SM-DP+ or the SM-DS IT system shall be secured to the level required by its asset classification.		Refer to SGP.02 [7] or SGP.22 [9] to identify sensitive data exchanges.
	8.1.3	The SM-DP, SM-SR, SM-DP+ and SM-DS must prevent cross-contamination of assets between different customers.		Prevention should be ensured by use of key segregation (SM-SR, SM-DP, SM-DP+), access rights allocation (SM-DS).
	8.1.4	Multi-tenant SM-DP, SM-SR, SM-DP+ and SM-DS solutions on the same physical hardware shall ensure customer data is logically segregated between different customers.		Logically segregated means the same hardware, the same instance but different access rights.
	8.2	Remote Entity Authentication		
	8.2.1	All authorized entities in the SM-DP, SM-SR, SM-DP+ and SM-DS processes shall be authenticated by appropriate authentication protocols for example, SM-SR, SM-DP, SM-DP+, SM-DS, MNO.		Control of authentication should be done between actors as per the functional specifications (for example, the certificate chain in the reference document SGP.02 [7] or SGP.22 [9]) when applicable. When not applicable, there must be an equivalent specific authentication mechanism with the third party (for example, specific communication link or specific data transfer process)

	8.3	Audit trails		
	8.3.1	The SP shall be logged in an audit trail that provides a complete record of, and individual accountability for:		
	(i)	Profile Management, Platform Management, IT system and eUICC Management procedures, events management, and communication with other entities through the secure interfaces.		The minimum information related to the application (Profile Management, Platform Management, and eUICC Management) which should be logged are: • Initiator of the request (if applicable) • ID of the request (if applicable) • Type of the request (if applicable) • Timestamp of the request (if applicable) • Timestamp for the completion (if applicable) • Profile identifier (if applicable) • eUICC ID (if applicable) • MNO_ID (if applicable) • SM-SR ID (if applicable) • SM-DP ID (if applicable) • SM-DP+ ID (if applicable) The minimum information related to the IT system which should be logged are: • Users login (successful/unsuccessful) • Resource access • Activity description
	(ii)	Access to sensitive data		The minimum information related to the access to sensitive data which should be logged are: • Users login (successful/unsuccessful) • Reason for accessing sensitive data • List of sensitive data accessed • Timestamp of the log in and log out

	8.3.2	The audit trail shall be managed in accordance with the requirements of 7.4.		

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9 Logistics and production management				
UP	UICC production processes shall be subject to appropriate controls that ensure integrity of, and accountability for, all sensitive assets and prevent duplicate production.			
	9.1	Order management		
	9.1.1	The ordering format shall be agreed between operator and supplier and rules to preserve the integrity of the ordering process shall be in place.		
	9.2	Raw materials		
	9.2.1	Raw materials classified as lower than class 2 (plastic sheets, GSM generic components, blank mailers, etc.) are not considered to be security sensitive. However, appropriate controls shall be established for stock movements. The availability of these assets must be ensured.		Low sensitivity assets for GSM production should be subject to basic stock controls and reconciliation. Complete accountability for individual assets is not expected.
	9.2.2	Raw materials classified as class 2 (e.g. non-personalised devices) are considered to be security sensitive. Controls shall be established that:		Asset control mechanisms should be applied to class 2 assets. Where class 2 assets are stored and/or processed in separate environments to class 1 assets (with physical separation and independent access control – e.g. separate workshops) different control mechanisms may be applied. Where assets of different classes are processed in unified physical environments appropriate controls should be applied to ensure that the expected level of control for the highest level of assets is maintained and that the risks of uncontrolled assets and cross-contamination are managed appropriately.

				Auditees are encouraged to seek specific guidance on the acceptability of controls for unified environments in advance of their first audit via the GSMA and/or audit team.
	(i)	account for stock movement		
	(ii)	prevent unauthorized access		
	(iii)	preserve the integrity of batches		
	(iv)	prevent availability of class 2 assets within the production environment undermining the quantity control and reconciliation mechanism for class 1 assets.		
	9.3	Control, audit and monitoring		
	9.3.1	The production process shall be controlled by an audit trail that:		
	(i)	ensures that the quantities of class 1 assets created, processed, rejected and destroyed are completely accounted for		The audit trail should record quantities of class 1 and class 2 assets by type (e.g. card bodies, modules) and status (e.g. good, surplus, rejected) at each processing stage. It is accepted that the quantity of modules is difficult to control. Suppliers should, however, track quantities of modules used / remaining for each module reel. It is acceptable to use the manufacturer's reported quantity of 'good' modules on each reel as a starting point for the module tracking process. Modules that cannot be used, or are wasted, in setting up equipment should be classed and treated as rejects and recorded in the audit trail. Card bodies can be controlled effectively. Quantities of card bodies entering embedding should be subject to 100% control. Quantities of card bodies throughout processing of class 1 and class 2 assets should be subject to 100% control.
	(ii)	ensures that the responsible individuals are traceable and can be held accountable		Accountability for class 1 and class 2 assets should always be in place. Responsibility for assets should be documented within the audit trail.

				Assets should be subject to a formal, auditable, handover where responsibility changes. Quantities of assets should be subject to 100% control as part of the handover process.
	(iii)	demands escalation where discrepancies or other security incidents are identified.		An escalation process / mechanism should be in place where discrepancies are identified. It is expected that all such discrepancies are tracked and reported. Where discrepancies cannot be resolved, a risk assessment should be carried out and appropriate action taken. A register of unresolved incidents/discrepancies should be maintained.
	9.3.2	The stock of all Class 1 assets must be subject to end-to-end reconciliation in order that every element can be accounted for.		The audit trail described in section 9.3.1 should be independently reviewed at the end of production to carry out a reconciliation of all assets. Interim reconciliations within the production process are strongly recommended to aid identification and resolution or discrepancies. Any discrepancies should be documented and escalated. Where class 1 assets are temporarily held within production areas between production stages, they should be appropriately stored to preserve their integrity. Locked cages, trolleys, or storage cupboards are sufficient, provided that keys are controlled. Responsibility and accountability for assets should be identified. Appropriate re-counting of assets should take place prior to sensitive production stages (e.g. personalisation). Asset control mechanisms should ensure that all elements of each asset are accounted for. Where assets incorporate removable or re-pluggable elements (e.g. plug-ins) these should be verified as part of the asset at each stage. Missing elements should be identified and treated as incidents.
	9.3.3	Auditable dual-control and 4-eyes principle shall be applied to sensitive steps of the production process, including:		
	(i)	control of the quantity of assets entering the personalisation process		Quantities of assets entering personalisation should be counted under dual control (either two separate 100% counts by two different individuals, or a single count under 4-eyes principle).
	(ii)	authorization of re-personalisation for rejected UICCs		Authorisation of re-personalisation should take place under auditable 4-eyes principle. Prior to re-personalisation, rejects should be electrically disabled and

				physically marked to indicate their rejected status. Disablement should take place under 4-eyes principle.
	(iii)	control of the quantity of assets packaged for dispatch to customers		During production assets should be controlled 100% on a one-by-one basis. At the point of initial packaging, control will normally change from one-by-one to box-by-box control. At the point of packaging: Assets should be subject to a final count / control. For cards, the count may be undertaken using a card counter. For cards packaged with card carriers, or other fulfilment mechanisms, the count may be undertaken by machine counter, weight check or other counting device. Auditees will be expected to show that the counting mechanism used is accurate. The counted assets should be packed and sealed using a tamper-evident seal immediately following the final count / control. The final count / control should be under clear CCTV coverage Assets must be under clear, continuous CCTV coverage from the point of counting to the point the box being sealed. Appropriate CCTV coverage is best achieved using an overhead camera covering the counting / packing workstation. Where possible, auditees should increase the integrity of the control process by implementing automated audit trails of the assets counted. Counting and sealing of boxes under 4-eyes principle is also accepted. Good CCTV coverage is still required to provide auditability of the application of 4-eyes principle. Where fulfilment results in the UICC being wholly contained within other packaging (e.g. an envelope or box), mechanisms should be in place to validate that each package contains a UICC prior to the final count / control taking place.
	(iv)	destruction of rejected assets		Destruction of rejected assets should take place under 4-eyes principle.
	9.3.4	Application of 4-eyes principle shall be auditable through production records and CCTV.		Time and date of each control, and identities of employees responsible, should be documented within the audit trail. Recording of time and date will enable CCTV records to be identified and checked.

	9.3.5	Regular audits shall be undertaken to ensure the integrity of production controls and the audit trail.		Audit trails within production must be subject to regular internal control to ensure that processes are being followed. Discrepancies should be investigated and appropriate follow-up actions taken.
	9.3.6	Suppliers must demonstrate an ability to prevent unauthorised duplication within the production process during personalisation and re-personalisation.		Appropriate controls must be in place around the availability of data for personalisation, as described in section 7.2. Availability of embedded card bodies should be under appropriate control at point of issue. Reconciliation of production should ensure that all assets are accounted for. Authorisation of re-personalisation should require rejected UICCs to be disabled under 4-eyes principle (as described in section 9.3.3) prior to re-personalisation taking place.
	9.3.7	Suppliers must demonstrate an ability to preserve the integrity of batches within the production environment to prevent:		Within the production environment it is normal for different batches to be processed at the same time. This may include batches in 'live' production and batches being held between processing stages. The 'production environment' to which these controls apply will always include the physical environment in which personalisation takes place. Other activities included within the same physical environment should be subject to appropriate controls to prevent the asset control and reconciliation mechanism being undermined by uncontrolled assets and/or cross contamination of products and/or batches. These activities may include personalisation of other products (e.g. payment cards) or less sensitive processes (e.g. card body manufacturing, embedding). Activities taking place in other physical environments (e.g. physically separate workshops under separate access control with different operational personnel) could be carried out with different asset controls appropriate to their sensitivity.
	(i)	cross-contamination of assets between batches		Auditees should demonstrate that appropriate controls are in place to prevent accidental or deliberate cross-contamination of assets from different batches. Typically controls would include use of one or more of the following: • locked trolleys or cabinets for temporary storage of materials in process or between processing stages • sealing of individual boxes of assets.

				Such controls help to restrict unauthorised access and preserve the integrity of counts, and may also provide evidence of any unauthorised access / tampering.
	(ii)	uncontrolled assets in the production environment undermining the integrity of the asset control mechanism.		Asset control mechanisms often rely on counting systems / technologies that do not individually identify each asset. For example, card counters typically count a quantity of cards by identifying the edge of each card in a stack. Any uncontrolled assets within the production environment could, intentionally or accidentally, undermine the integrity of counts and controls if they are mixed with assets in the production process. To help manage this risk all assets entering the production environment should be controlled. Quantities should be checked before new assets are transferred into the production environment.
	9.4	Destruction		
	9.4.1	Rejected sensitive assets must always be destroyed according to a secure procedure and logs retained.		Destruction should take place regularly to avoid large stocks of rejected assets being accumulated (e.g. daily or weekly), and to simplify reconciliation. Destruction of class 1 and class 2 assets should take place locally, on-site under most circumstances. Rejected card / module assets should always be destroyed on-site. Assets for destruction should be reconciled against records of assets rejected immediately prior to destruction taking place. Reconciliation should take place under 4-eyes principle (4EP). Reconciliation may be based on: • Counting of individual assets immediately prior to destruction • Packs of assets counted at the point of rejection under 4EP and sealed using a tamper evident mechanism. The integrity of the tamper evident seal must be checked immediately prior to destruction, and the number and identity of sealed packs verified The destruction process for class 1 and class 2 assets should always be controlled under 4EP. Control may be achieved by: Either: • Both parties responsible for destruction witnessing all of the assets entering the body of the destruction device to a point from which they cannot normally be retrieved intact.

				Or: • Both parties witnessing the entry of all of the assets into a feeder for the destruction device, access to which is completely and solely under the control of the two parties taking responsibility for the destruction. The feeder may be locked and sealed and left unsupervised during the destruction process provided that: o The feeder can only be re-opened by the two designated parties. o The feeder can only be re-opened in the presence of both designated parties simultaneously. o A means is in place for the two designated parties to confirm that the locking mechanism has not been opened. • Locking of the feeder may be achieved by restricting access to the device itself, or to a self-contained area where the feeder device is located. In either case: • The complete destruction process should be auditable using the CCTV system. There should be complete continuity of coverage between reconciliation and destruction; this is best achieved by performing reconciliation within the destruction area. • Processes should be in place to ensure that all materials entering the shredding/destruction process have been destroyed. Destruction equipment should be inspected under 4EP at the end of each destruction to ensure that all materials have been destroyed. For 4EP to be effective, the two employees performing reconciliation and destruction should be from separate business areas. Wherever possible, the combination of employees carrying out destruction should be varied. The date, start time, end time and identities of the 2 employees carrying out reconciliation and destruction should always be recorded against an inventory of those items destroyed. Output from the shredding / destruction process should ensure that the active area of the device is reduced to half its original size in at least one dimension. For 2FF and 3FF plug-ins this is typically 3-4mm. For 4FF micro-SIMs this is

				typically 2-3mm. Measurements for embedded devices will be significantly smaller and require specialist destruction equipment. Output from the shredding / destruction process should be periodically checked to ensure that the mechanism in use is effective.
	9.5	Storage		
	9.5.1	Personalised product shall be stored securely prior to dispatch to preserve the integrity of the batches. Where personalised product is stored for extended periods additional controls shall be in place.		Following final control and sealing of finished boxes, goods should be packaged ready for despatch. It is sufficient for packaged goods to be held in secure production or despatch areas prior to despatch, provided that they are: • visible on CCTV • dispatched within 48hrs. If goods are to be dispatched more than 48hrs after packaging, they should be stored in a physically separate area under separate access control. CCTV coverage should be provided.
	9.6	Packaging and delivery		
	9.6.1	Packaging of goods shall be fit for the intended purpose and strong enough to protect them during shipment. Appropriate measures shall be in place to ascertain whether or not goods have been tampered with.		Appropriate packaging should provide protection against damage or unauthorised tampering. All transfers of finished or part-finished product, including intra- and inter- site transfers, should be included.
	9.6.2	Secure delivery procedures shall be agreed between the customer and the supplier which shall include agreed delivery addresses and the method of delivery.		-
	9.6.3	Collection and delivery notes must be positively identified. Goods shall only be handed over following the production of the appropriate authority documents. A receipt should be obtained.		-

	9.7	Internal audit and control		
	9.7.1	Production security controls shall be subject to a rigorous programme of internal monitoring, audit and maintenance to ensure their continued correct operation.		A programme of internal audits/controls should be defined that demonstrates appropriate consideration of: • The frequency of checks required for each area addressed by the internal audit/control mechanism • The structure of the audits/controls themselves, including clear guidance on what should be checked and how • The recording / documentation and follow-up process for audits/controls undertaken. The auditors will expect to see evidence that processes and systems are working correctly, and that internal audits/controls have been carried out according to the schedule. There should be appropriate coverage of all aspects of the system; the audit/control programme should be defined around the need to provide appropriate coverage, rather than the availability of resource. In particular, there should be evidence that the internal audit/control system has been designed to validate correct operation of the security controls in each part of the production process. Appropriate coverage should be provided of different shifts, products and fulfilment activities. Auditors should have received appropriate training in the structure and content of internal audits/controls.

Statements from CSR			Guidelines	
10 Computer and network management				
All		The secure operation of computer and network facilities is paramount to the security of data. In particular, the processing, storage and transfer of Class 1 information, which if compromised, could have serious consequences, must be considered. Operation of computer systems and networks must ensure that comprehensive mechanisms are in place to preserve the confidentiality, integrity and availability of data.		Requirements should be applied to all networks that support functions relevant to the scope of certification. IP networks and their associated systems used for physical security (e.g. CCTV, access control, alarm systems) should be treated as IT networks and be subject to appropriate IT security controls.
	10.1	Policy		
	10.1.1	A documented IT security policy shall exist which shall be well understood by employees.		An IT security policy should be defined and available to all employees as part of the site security documentation.
	10.2	Segregation of roles and responsibilities		
	10.2.1	Roles and responsibilities for administration of computer systems shall be clearly defined. Administration of systems storing or processing sensitive data shall not normally be carried out by users with regular operational responsibilities in these areas. Roles for review of audit logs for sensitive systems should be separated from privileged users (e.g. administrators).		Roles and responsibilities for administration of computer systems should be clearly defined. Users whose function it is to handle and process production data should not have the capability to administer the production systems. Where exceptions are necessary to the segregation of security-related and operational duties, additional controls should be in place.
	10.3	Access control		
	10.3.1	Physical access to sensitive computer facilities shall be controlled.		Servers and sensitive computer facilities (e.g. data processing) should be located in restricted areas within one or more HSAs.

Statements from CSR			Guidelines	
				Access to such rooms should be restricted on a need-to-be-there basis. Access should be auditable. Sensitive computer facilities should be protected by the site alarm system when not in use.
	10.3.2	An access control policy shall be in place and procedures shall govern the granting of access rights with a limit placed on the use of special privilege users. Logical access to IT services shall be via a secure logon procedure.		A process should be in place for requests for access to computer systems. The process should be auditable and include an authorisation mechanism. The process should cover creation, modification and deletion of access rights. The authorisation process should apply to all access, including the creation of administrator and 'machine' accounts. Access should not be provided without the appropriate authorisation process having been completed. Details of authorised users and user accounts should be maintained in a consolidated list, independent of the systems themselves, as a reference. Processes should be in place to reconcile the reference list against the systems periodically.
	10.3.3	Passwords shall be used and managed effectively.		A clear password policy should be defined and enforced for all users of all systems and applications. The password policy should normally include: • Length • Complexity • Regular change • Control of re-use of earlier passwords. Where systems are not capable of enforcing the policy, additional procedural controls should be used to ensure the policy is applied. Where split passwords are used to attempt to enforce dual control: • The scope of the dual control should be clearly defined to determine whether this is only applicable to the logon itself, or for the entire session resulting from the logon. • Additional mechanisms should be in place to make sure that dual control is effective, including:

Statements from CSR			Guidelines	
				o Application of password policy over each component of the password. o Independent audit of account activity to ensure that logon has taken place under dual control; for example, by use of CCTV to confirm that logons (and, where appropriate, the resulting sessions) recorded in the system audit trail were carried out with the correct individuals present.
	10.3.4	Strong authentication shall be deployed where remote access is granted.		Remote access to networks where sensitive data is transmitted, stored or processed is not normally expected at certified sites, except for access to data transfer platforms (e.g. secure file transfer servers) on dedicated networks (e.g. customer data transfer DMZ) provided solely for the purpose of exchange of data with customers. Where remote access is provided to other networks this should be limited to internal support from known and trusted personnel within specialist or dedicated teams for remote support or maintenance of key systems (e.g. dedicated firewall management or production platform teams). Remote access mechanisms should employ enhanced authentication mechanisms (e.g. two-factor authentication), whenever remote access is granted: • across networks of lower security level than that being connected to • from off-site locations
	10.4	Network security		
	10.4.1	Systems and data networks used for the processing and storage of sensitive data shall be housed in an appropriate environment and logically or physically separated from insecure networks.		Network configuration should be clearly documented. Secure networks should be defined and separated according to function/use. All processing of customer data should take place on secure networks. Secure networks should be dedicated networks that are physically or logically separated from insecure networks (which would typically include those used for general business administration purposes such as office networks, HR, accounting etc.). Where multiple networks are defined, the relative security levels of the networks should be documented as part of the network security strategy.

Statements from CSR			Guidelines	
				Where secure networks are logically separated, the secure network should be protected using one or more firewalls.
	10.4.2	Data transfer between secure and insecure networks must be strictly controlled according to a documented policy defined on a principle of minimum access.		There should be no direct connections made between the secure network and systems on uncontrolled, untrusted or third-party networks, even where these connections are made through the firewall(s). Systems used for data exchange between the secure network and uncontrolled, third-party, networks (e.g. customers), should be positioned on de-militarized zones (DMZs). It is not, generally, possible to certify network security where secure networks are directly connected to other networks (e.g. other sites within a group of companies), even where VPN tunnels are in use. Sites with such configurations should seek advice from the GSM Association prior to audit to agree an approach. Controls should be in place to prevent creation of unauthorised connections to secure networks, including implementation of port-level security. Where virtual server environments are in use physical server platforms should not be used to support virtual servers on networks of different security level.
	10.4.3	The system shall be implemented using appropriately configured and managed firewalls incorporating appropriate intrusion detection systems.		The configuration of firewalls and change process must be documented with the validation of the request prior to the effective change and the control after the implementation. • Firewalls should be managed from the protected (i.e. secure) network. • Firewalls should be configured to provide the minimum access required only, restricted by address and port. Connections across the firewall should be originated from the secure network. • Services used for permitted connections should be selected to minimise the risks to the integrity of: o Sensitive data o Secure clients o Secure networks.

Statements from CSR			Guidelines	
				• A business-level firewall policy document should be defined, documenting access to be provided by the firewall and the business-level requirement for it. All changes to the policy should be subject to authorisation. Authorisation should be independent of the firewall and network administrators. • Firewalls should be configured in accordance with the firewall policy and subject to periodic review. • It should not be possible for unauthorised changes to be made to firewall configuration (even by authorised personnel). Appropriate preventative controls could include: o All changes to firewall configuration being possible only under dual control. o Automated mechanisms being in place that provide real-time notification to independent personnel of any change to firewall configuration. • Firewalls should be configured to log key events; logs should be reviewed regularly (e.g. weekly). It should be demonstrated that intrusion detection systems are implemented and alerts are treated, including an escalation process.
	10.4.4	Controls shall be in place to proactively identify security weaknesses and vulnerabilities and ensure that these are addressed in appropriate timescales		Programmes of penetration testing should be in place to proactively identify potential weaknesses and vulnerabilities. Penetration tests should consider: • networks and identified hosts that are intentionally exposed to networks and clients of lower security level (e.g. data transfer networks) validating that other networks and hosts are not exposed. Penetration tests should normally be conducted at least 1-2 times per year or when significant changes are made to network or security configuration (e.g. creation of new data transfer networks, migration of firewalls to new platforms)
	10.4.5	Systems providing on-line, real-time services shall be protected by mechanisms that ensure		

Statements from CSR			Guidelines	
		appropriate levels of availability (e.g. by protecting against denial-of-service attacks).		
	10.5	Systems security		
	10.5.1	Systems configuration and maintenance		
	(i)	Security requirements of systems shall be identified at the outset of their procurement and these factors shall be taken into account when sourcing them.		An up to date inventory list of the IT systems should be available including their configurations.
	(ii)	System components and software shall be protected from known vulnerabilities by having the latest vendor-supplied security patches installed.		The entire IT system environment should be maintained with the latest vendor-supplied security patches as and when they become available. Whilst immediate application of patches may not always be possible, they should be applied within reasonable timescales. Out-of-support environments should not normally be in use. Migration strategies should be in place where environments are approaching end-of-life or end-of-support by the vendor.
	(iii)	System components configuration shall be hardened in accordance with industry best practice		A hardening policy should be defined and applied to systems or components based on risk. • Security devices (e.g. firewalls) should always be hardened. • Sensitive systems (systems in networks where sensitive data is stored, processed or transmitted) should be hardened, particularly where commodity OSs are used (e.g. Windows, Linux). • Exposed systems (e.g. customer data transfer servers) should be considered as sensitive. Auditees should be able to demonstrate how the policy has been applied, to systems or components. A range of recognised international standards, recommendations and guidance for OS and system hardening are available and should be considered by sites, including:

Statements from CSR			Guidelines	
				• Centre for Internet Security (CIS) Benchmarks https://benchmarks.cisecurity.org/downloads/benchmarks/ • US National Security Agency (NSA) Security Configuration Guides https://www.iad.gov/iad/library/ia-guidance/security-configuration/ • SANS Institute Checklists and Guides https://www.sans.org/score/checklists (Links correct at March 2017)
	(iv)	Change control processes and procedures for all changes to system components shall be in place.		Any change to IT systems shall be subject to a documented change management process with a formal validation process.
	(v)	Processes shall be in place to identify security vulnerabilities and ensure the associated risks are mitigated.		A programme of regular vulnerability scanning should be in place to consider: • All systems on the secure network(s) • All systems on networks used for customer data transfer • Scans should be completed: • After each major change • Monthly for internal 'secure' networks • Monthly for externally-facing networks used for customer data transfer. Sites should monitor vendor and industry sources for announcements of vulnerabilities and patches. Local policies should be in place that define target timescales for implementation of patches based on the level of risk. The level of risk may be determined based on: • the severity of the vulnerability • the context of the system where the vulnerability exists Critical vulnerabilities should always be prioritised for implementation. Critical vulnerabilities in externally facing system components should always be remediated as an immediate priority (e.g. within 7 days). Critical vulnerabilities in system components within secure networks should be remediated as high priority (e.g. within 30 days).

Statements from CSR			Guidelines	
	(vi)	Comprehensive measures for prevention and detection of malware and viruses shall be deployed across all vulnerable systems.		The malware control strategy should always emphasise prevention of infection as the primary control. Detection mechanisms should be used as a final line of defence in the event that prevention measures fail. Response mechanisms should be in place where possible infections occur. The prevention strategy should consider general best practice through a combination of: • Regular application of security patches and updates • Appropriate network segmentation and separation • Restrictions on the use of uncontrolled external media • Definition of a malware perimeter for the site. All incoming data (including application software) crossing the perimeter should be explicitly checked, including: o Email o Direct data transfer (e.g. FTP) o Physical media (e.g. CD/DVD-ROM, external USB storage device, USB memory key). Detection mechanisms (e.g. anti-virus software) should be: • installed on all vulnerable systems • updated regularly with virus definitions • subject to regular checks to identify systems that have not been updated. Where systems cannot support anti-virus software, controls should be in place to ensure viruses cannot be introduced. Such controls should include: • scanning of data and applications software prior to introduction to the system. • isolation of network segments containing such systems. Where possible infections are detected mechanisms should be in place to ensure that these are reported and escalated quickly. Clear response procedures should be in place. Possible infections in systems and networks used for the processing of sensitive data should always be treated

Statements from CSR			Guidelines	
				as security incidents. Root-cause of infections should always be identified and the anti-virus strategy reviewed and updated as appropriate.
	(vii)	Unattended terminals shall timeout to prevent unauthorised use and appropriate time limits should be in place.		Configuration of timeouts should be controlled by the administrator; users should be prevented from changing timeout settings.
	(viii)	Decertification/decommissioning of assets (such as IT systems) used as part of the SP shall be documented and performed in a secure manner.		The requirements of section 9.4 should be applied to network devices (routers, firewalls etc.)
	10.5.2	System back-up		
	(i)	Back-up copies of critical business data shall be taken regularly. Back-ups shall be stored appropriately to ensure confidentiality and availability.		A programme of regular back-ups should be defined. Back-up frequency and retention period should be defined based on the importance of the data contained Sensitive data should be appropriately protected in accordance with the site's security classification and data handling guidelines. Such controls should normally include encryption of data and physical security of storage media. Storage media used for back-ups should be selected, implemented, managed and maintained to ensure adequate protection from: • Environmental threats (e.g. fire, flood, temperature extremes, electrical and electro-magnetic effects) • Accidental or deliberate corruption • Unauthorised access Typically, media should be stored separately from the systems themselves. Back-ups retained on-site should be stored away from server rooms in a data / media fire safe. Off-site storage of one generation of back-ups should be considered. Procedures for restoration of data from back-up should be checked periodically (typically once or twice per year). Procedures should be in place to ensure that production status can be reinstated to the correct point when/if such data is restored from back-up.

Statements from CSR			Guidelines	
	10.6	Audit and monitoring		
	10.6.1	Audit trails of security events shall be maintained and procedures established for monitoring use.		Systems and applications on the secure network should implement logging of security relevant events including: • Logon attempts (successful and unsuccessful) • Logoff • Password changes • Attempts to exceed permissions • Changes to audit logs. Audit logs should be reviewed regularly (e.g. weekly) to identify suspicious behaviour. Specific applications on the secure networks (e.g. data processing, personalisation) should be implement full logging of all events relevant to the sensitive process, as described in section 7.4.1.
	10.7	External facilities management		
	10.7.1	If any sub-contracted external facilities or management services are used, appropriate security controls shall be in place. Such facilities and services shall be subject to the requirements stated in this document.		Where operations are outsourced, auditees should demonstrate that appropriate controls are in place to enforce the IT security policy. Auditees should take responsibility for auditing and controlling external facilities management partners.
	10.8	Internal audit and control		
	10.8.1	IT security controls shall be subject to a rigorous programme of internal monitoring, audit and maintenance to ensure their continued correct operation.		A programme of internal audits/controls should be defined that demonstrates appropriate consideration of: • The frequency of checks required for each area addressed by the internal audit/control mechanism • The structure of the audits/controls themselves, including clear guidance on what should be checked and how

Statements from CSR			Guidelines	
				• The recording / documentation and follow-up process for audits/controls undertaken and actions identified. The auditors will expect to see evidence that processes and systems are working correctly, and that internal audits/controls have been carried out according to the schedule. There should be appropriate coverage of all aspects of the system; the audit/control programme should be defined around the need to provide appropriate coverage, rather than the availability of resource. In particular, there should be evidence that the internal audit/control system has been designed to consider the different IT systems in use and the sensitivity of the data stored or processed. All IT systems should be audited against application of the IT security policy. Auditors should have received appropriate training in the structure and content of internal audits/controls.
SM	10.9	Software Development		
	10.9.1	The software development processes for the SM-DP, SM-SR, SM-DP+ or SM-DS shall follow industry best practices for development of secure systems.		The software development processes should be resistant against the top 10 security flaws described by the OWASP (www.owasp.org). The software development processes should follow the standard of the industry, for example, W3C standard. (The World Wide Web Consortium (W3C) is an international community that develops open standards to ensure the long-term growth of the Web)

Annex A Document Management

A.1 Document History

Version	Date	Brief Description of Change	Editor / Company
1.0	26 Jul 2016	Created based on SAS-UP Guidelines document v5.0. Added Certificate Management requirements and PKI Certificate Policy security requirements.	James Messham, FML
2.0	31 Mar 2017	Incorporated SAS-SM requirements, including SM-DP+ and SM-DS.	RSPSAS subgroup

A.2 Other Information

Type	Description
Document Owner	GSMA Fraud and Security Group
Editor / Company	David Maxwell, GSMA

It is our intention to provide a quality product for your use. If you find any errors or omissions, please contact us with your comments. You may notify us at sas@gsma.com.

Your comments or suggestions & questions are always welcome.