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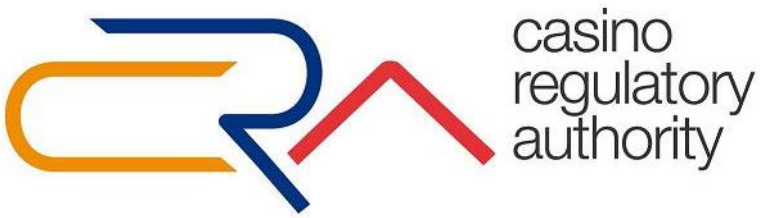

TECHNICAL STANDARDS

FOR

SLOT MANAGEMENT SYSTEM

(SINGAPORE)

Version 1.2

With effect from 6 March 2015

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Preface

The purpose of this document is to establish the system requirements for the design and operation of a Slot Management System (SMS) within the Singapore jurisdiction and to guide testing and certification bodies on the areas for technical compliance on the SMS.

A Slot Management System (SMS) is a game management system that continuously monitors each electronic gaming machine (EGM) via a defined communication protocol by a dedicated leased line, dial-up or other secure transmission method. The tasks of the SMS would include but not limited to providing logging, searching and reporting of significant game events, collection of meter data and reconciliation of meter data against hard and soft counts.

A Ticket In – Ticket Out (TITO) system refers to a vouchering system that interfaces with electronic gaming machines that are each equipped with a voucher printer (TITO EGMs). The TITO system validates a voucher dispensed by a TITO EGM when the voucher is redeemed by inserting into another TITO EGM or at a cage window or redemption kiosk.

A TITO system may be integrated into a SMS or exists as an entirely separate entity. SMS, as defined in this document will assume the inclusion of the TITO component.

The intent of this document is to ensure the SMS operates in a manner that is:-

a. Honest;
b. Secure;
c. Reliable; and
d. Auditable.

It is not the intent of this document to:-

a. Mandate a single solution or method to realise an objective;
b. Limit technology application to gaming equipment;
c. Limit creativity and variety of choice;
d. Limit any supplier or manufacturer of equipment;
e. Preclude research and development into new technologies equipment or innovative ideas.

As far as possible, this document specifies what the minimum technical requirements for SMS are instead of how the requirements should be met; nor try to mandate a particular solution or method as the means to realise the requirements.

The Casino Regulatory Authority of Singapore (CRA) is the regulatory authority that supervises and regulates the activities of casinos in Singapore. Casino operators are required to be licensed by law and their Slot Management Systems (SMS) shall comply with the technical requirements stated in this document as part of their licensing requirements.

Where applicable, the provisions in the Casino Control Act (Cap. 33A) and its subsidiary legislations shall take precedence over the technical standards.

This document would be reviewed on an ongoing basis to take into account the evolution of systems security and development of other casino related technologies that may require technical regulation.

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1. INTRODUCTION

1.1 Purpose

1.1.1 The purpose of this document is to:-

a. Create a set of technical standards that would ensure that the operation of the Slot Management System (SMS) in Casinos under Singapore's jurisdiction is secure, reliable and auditable;

b. Establish the minimum systems integrity standards for SMS;

c. Eliminate subjective criteria in analyzing and certifying SMS operation;

d. Construct a set of technical standards that is technology neutral wherever feasible; and

e. Construct a set of technical standards that does not specify or approve any particular method or algorithm. The intent being to allow a wide range of methods to be used to conform to the standards as long as the methods are secure, reliable and consistent with the technology best practices of the day.

1.2 Scope

1.2.1 The scope of this set of technical standards covers:-

a. The minimum technical standards required in the operation of the Slot Management System (SMS) so that security, reliability and integrity of the system are achieved;

b. The interfaces to the electronic gaming machines for the purpose of communicating mandatory security events, metering data, voucher records (TITO); and

c. The communication of events originated at the gaming device level to the SMS.

1.3 Terminology

1.3.1 The following terminology used in this document is to be interpreted as follows:-

a. Shall: The guideline defined is a mandatory requirement, and therefore must be complied with;

b. Should: The guideline defined is a recommended requirement. Non-compliance shall be documented and approved by the management. Where appropriate, compensating controls shall be implemented; and

c. May: The guideline defined is an optional requirement. The implementation of this guideline is determined by the operator's environmental requirements.

1.4 Definition of Terms

Authority/ The CRA	The Casino Regulatory Authority of Singapore
Baseline	A snapshot of an evolving system. The baseline defines a theoretical envelope around a system of which verification control can be maintained. For example, application files within a baseline would require approval prior to being modified and there must be a method that verifies that the baseline files have not been changed since the last approval.
Critical Data	Memory locations storing information including, but not limited to:- a. Security events that lead to automatic de-activation and require manual re-activation. These procedures may involve immediate approval for re-activation or the approval may be withheld until physical inspection is completed; b. Mandatory metering information; c. Current game information including interim win amounts, feature games details, etc; d. Any changeable Configuration Information; and e. Current credit amount
FEP	Front end processor which is a controller that collates all data collected from the gaming machines and relays them to the SMS database server.
Meter	A "meter" may be any of the following:- a. A hard meter. The meter can only be incremented. Meter incrementing can only be performed by the gaming equipment's computer. The meter is read by human inspection of the meter display; or b. A storage area within some form of computer memory (e.g. disk or RAM) into which the computer's software is programmed to store and update the current count of the metered quantity.
SMS	The Slot Management System in the casino operator's Gaming Network.
TITO	Ticket In – Ticket Out System which validates vouchers printed out by EGMs; the vouchers can either be redeemed for cash, or inserted for play into other EGMs that support this mechanism.
Voucher	A printed wagering instrument that has a fixed dollar wagering value that can only be used to acquire an equivalent value of credits or cash.

1.5 Testing

1.5.1 Testing of the SMS by Approved Test Service Providers (ATPSs) shall be aimed at determining compliance with the technical requirements provided in this document. Areas of non-compliance shall be reported in the test/certification report. Where, in the opinion of the ATSP, the technical requirements spelt out in this document are insufficient, inappropriate or not pertinent to the design and operation of the SMS, the ATSP shall seek direction and further clarification from the Authority before proceeding to testing/certification.

1.6 Consistency of Interpretation

1.6.1 The Casino Regulatory Authority (CRA) of Singapore recognises that the technical standards may be subject to different interpretations by systems vendors, casino operators and ATSPs. As such, any feedback where different interpretations may be applied to the technical standards provided in this document should be directed to the CRA for clarification when it arises.

2. EGM MONITORING AND CONTROL REQUIREMENTS

2.1 Configuration & Information Retrieval

2.1.1 A SMS shall provide a function for uniquely registering a new gaming machine and unique floor location for every gaming machine with no duplicate creation of the unique identifying field for the gaming machine and floor location field.

2.1.2 A SMS shall have the capability to report all information associated with every gaming machine. The SMS shall have a master "EGM file" which is a database of every gaming machine in operation, including at minimum the following information for each entry:-

a. Unique interface element/location identification number;

b. EGM identification number as assigned by the casino;

c. Denomination of the gaming machine;

d. Theoretical hold of the gaming machine;

e. Game details including control program(s) within gaming machine; and

f. Accounting meter and events details of the gaming machine.

2.1.3 If the SMS retrieves any of these parameters directly from the gaming machines, sufficient controls must be in place to ensure integrity of the information.

2.1.4 The SMS shall support the capability of issuing real time commands to the gaming machines for information retrieval purpose.

2.1.5 All information pertaining to jackpot/progressive winnings shall be relayed to SMS through the EGM. If the jackpot/progressive controller used is able to communicate with the SMS, configuration data of the jackpot/progressive shall also be captured by the SMS.

2.2 EGM Verification

2.2.1 Verification may be user initiated or triggered by specific event(s) on the gaming machines. To ensure complete coverage, verification should be performed after each of the following events:-

a. Gaming machine power up; and

b. Loading of the program files.

2.2.2 The SMS shall be notified (through an exception triggered by the gaming machine) in event that a signature verification check failure occurs on any gaming machine if the SMS provides the function for signature verification of the gaming machines.

2.2.3 When a signature check failure is detected, the failed gaming machine shall be excluded from performing any monetary transaction.

2.3 Metering

2.3.1 The SMS shall collect and individually report all the meters specified in Section 3.2 of the "Technical Standards for Electronic Gaming Machines".

2.3.2 At a minimum, the SMS shall collect and store all the meters from all the gaming machines at a period specified within the system.

2.3.3 Meters readings shall be stored and made retrievable from online, near-line or offline storage for a minimum period of five (5) years.

2.3.4 The SMS shall store sufficient metering information at any point of time in order to recover the last known valid meters under circumstances such as gaming machine RAM corruption.

2.3.5 The SMS shall be capable of storing meters of at least ten (10) decimal digits.

2.3.6 The SMS shall store history of all real-time meter changes. It must not be possible to alter the history of these changes made to the meters.

2.3.7 The SMS shall be capable of producing reports whose calculations are based on the absolute meter values obtained from the various gaming machines within the system rather than performing the calculations based on the incremental values. The SMS shall also be capable of producing reports that compare absolute game meters to daily totals of actual transactions.

2.3.8 It shall be possible, in conjunction with appropriate manual procedures, to calculate correct daily revenue when the following exceptional circumstances have occurred during the day:-

a. A RAM reset has occurred on a gaming machine;

b. A meter rollover has occurred on a gaming machine;

c. A gaming machine has been moved or retired;

d. Multiple configuration changes are made for a gaming machine within one (1) gaming day; and

e. A new gaming machine has been installed.

2.4 Functionality

2.4.1 A SMS shall include an application or facility that captures and processes every hand pay message from each gaming machine. Hand pay messages shall be created for single wins (jackpots), progressive jackpots and accumulated credit cash outs (cancelled credits) that result in hand pays.

2.4.2 A Fill is normally initiated from a hopper empty message. An allowable exception to fill initiation would be where the system provides preventive or maintenance fill functionality, in which the transaction may be initiated by system or an authorised user.

2.4.3 Once captured, there must be access controls to allow for authorisation, alteration, or deletion of any values prior to payment or execution.

3. TICKET IN - TICKET OUT (TITO) REQUIREMENTS

3.1 General

3.1.1 Ticket In – Ticket Out (TITO) function, if supportable by the SMS shall consist of a computerised voucher validation system. A gaming machine shall be equipped with a voucher reader and voucher printer, and has a communication connection to the validation system. The vouchers can either be redeemed for cash, or inserted for play into other gaming machines (redeemed as credits).

3.2 Voucher validation

3.2.1 Voucher redemption on a gaming machine for playing credits shall only be permissible when the gaming machine is linked to an approved validation system.

3.2.2 Validation approval shall only be coming from the voucher validation system.

3.2.3 Validation number to be printed on a voucher can either be generated by the validation system or gaming machine.

3.2.4 For system generated validation number, the algorithm or method used by the validation system to generate the voucher validation number shall guarantee uniqueness and non-repetition.

3.2.5 For gaming machine generated validation number, the validation system shall send a unique seed to the gaming machine upon enrolling the gaming machine as voucher printing capable. The algorithm or method used to determine the seed shall guarantee uniqueness and non-repetition.

3.2.6 The validation system shall only accept one (1) authorised voucher per valid validation number.

3.3 Voucher Issuance

3.3.1 The voucher validation system shall at minimum be able to communicate the following voucher data to the gaming machine to be printed on the voucher:-

a. Casino name;

b. Validation number or seed (for gaming machine to generate validation number); and

c. Number of days before voucher expires.

3.3.2 The validation system shall retrieve the voucher information correctly and store the voucher information into a database.

3.3.3 The voucher record on the host system shall contain at minimum the following information:-

a. Validation number;

b. Amount of voucher in dollars and cents;

c. Date and time of issuance (in 24-hour format);

d. Number of days before voucher expires;

e. Type of transaction or other methods of differentiating voucher types (assuming multiple voucher types are available);

f. Status of voucher (i.e. valid, unredeemed, pending, void, invalid, redemption in progress, redeemed, etc); and

g. Identification of where the voucher was issued from (i.e. gaming machine number, cashier/change booth identifier, etc).

3.4 Voucher Redemption

3.4.1 Voucher shall be redeemed at the gaming machines, cashier/change booths or other approved validation devices (kiosks, wireless handhelds, etc) provided they are enrolled for voucher validation with an approved validation system.

3.4.2 The validation system shall process voucher redemption correctly according to the secure communication protocol implemented.

3.4.3 The validation system shall update the voucher status on the database during each phase of the redemption process accordingly whenever the voucher status changes with minimally the following information:-

a. Date and time of status change;

b. Voucher status;

c. Voucher value; and

d. Machine number or source identification from where the voucher information came from.

3.4.4 All validation terminals for cashier/change booth operation shall be user and password controlled.

3.4.5 The validation system shall be able to identify and notify the cashier the following conditions:-

a. Voucher cannot be found on file (stale date, forgery, etc);

b. Voucher has already been paid; or

c. Amount of voucher differs from amount from file

4. SMS SYSTEM COMPONENT REQUIREMENTS

4.1 Interface

4.1.1 Each gaming machine interfaced with a SMS using an interface component shall have the interface component installed inside a secure area of the gaming machine and shall employ a secure communication method between the interface component and the SMS.

4.1.2 If not directly communicating gaming machine meters, the interface component must maintain separate electronic meters to preclude the loss of information from meter rollovers, or a means to identify multiple rollovers in the connected gaming machine.

4.1.3 If unable to communicate with the SMS, the interface component must be able to preserve all metering and exception information until at such time the information can be communicated to the SMS. Gaming machines operation may continue until the stage that critical data will be overwritten.

4.1.4 An interface component shall have a mechanism whereby an error will not cause the loss of stored accounting meter information.

4.1.5 Data recorded by electronic meters shall be preserved after a power loss to an interface component and shall be maintained for a period of at least twenty-four (24) hours.

4.1.6 Interface components shall allow for the configuration of a unique identification number, to be used in conjunction with the gaming machine file in the SMS. This identification number shall be used by the SMS to track all mandatory information of the associated gaming machine.

4.2 Front End Controller and Data Collector

4.2.1 For a SMS that may possess a Front End Processor (FEP) that gathers and relays all data from the connected Data Collectors to the associated database(s) and the Data Collectors, in turn, collect all data from connected gaming machines, the communication between components shall be adequately secure and conform to the communication protocol requirements stated in Section 6.2. If the FEP maintains buffered/logging information, then a secure mechanism shall be in place to prevent the loss of critical information contained herein.

4.3 Server

4.3.1 The SMS shall comprise of networked systems that direct overall operation and an associated database that stores all entered and collected information.

4.3.2 The SMS shall be designed so that no single failure of any system component will cause the cessation of system operation.

4.3.3 The SMS shall maintain an internal clock that accurately reflects the current time (in hours, minutes and seconds) and date that shall be used to provide for the following:-

a. Time stamping of significant events;

b. Reference clock for reporting; and

c. Time stamping of configuration changes.

4.3.4 The SMS shall be capable of maintaining and synchronizing the time for all connected gaming machines within accuracy of sixty (60) seconds so as to ensure that time stamping of all events and data is correct.

5. SMS SYSTEM REQUIREMENTS

5.1 System Integrity

5.1.1 SMS shall be designed and developed to provide assurance of data accuracy and integrity. There shall be:-

a. Input data validation controls to ensure that input data is correct and appropriate;

b. Processing controls to detect errors in the completeness and accuracy of the processing and update of system; and

c. Output data controls to ensure the accuracy of information being output or reported.

5.1.2 The integrity of the SMS software shall be maintained during live use.

5.1.3 Automated integrity checking mechanism may be implemented to ensure the integrity of the software (including the use of checksums).

5.1.4 The operational and system control of the SMS shall be administered in accordance with the relevant Internal Control procedures.

5.1.5 A SMS System Baseline shall be developed covering the core areas of the system (both hardware and software) and documented in the System Baseline Document. The System Baseline Document shall be filed with the Authority.

5.1.6 A method of hashing or check summing the system application executable files (or other suitable method) and selected command macros shall be required in order to verify the configuration of the system baseline.

5.1.7 There shall be adequate procedures in place to ensure that portions of the system outside the baseline envelope are checked regularly to ensure that unauthorised activities are not taking place on the system.

5.1.8 All software for all the components of the SMS shall be maintained under an appropriate software version control system or mechanism.

5.1.9 All changes to the SMS software shall be authorised before they are implemented.

5.2 Events

Event Search

5.2.1 The SMS shall provide an online search facility that enables comprehensive searching of the event log for the present and for the previous thirty (30) days of data. The search facility shall have the ability to perform a search based at least on the following:-

a. Date and Time range;

b. Unique interface element/EGM identification number; and

c. Event number/identifier.

5.2.2 Each event shall be stored in a database(s) which includes at minimum the following:-

a. Date and time which the event occurred;

b. Identity of the gaming machine that generated the event;

c. A unique number/code that defines the event; and

d. A brief text that describes the event.

5.2.3 The SMS shall be able to report all exception codes that are applicable to that gaming machine's hardware configuration. For critical events and faults that may indicate system security and integrity is jeopardised, the SMS shall generate and display such events as critical alerts in real-time.

Software Security Breach

5.2.4 In the event of the unauthorised access of the logic area containing software, the gaming machine shall raise a real-time priority exception to the SMS.

Gaming Machine Off-line

5.2.5 The SMS shall generate alerts for link down detection of any gaming machine with minimal delay. Such error condition shall be rectified within the time frame stipulated by the operator's Internal Control Procedure with no loss of data residing on the gaming machine (which shall be gathered by SMS upon resumption of connectivity or machine coming back online).

SMS Event Log

5.2.6 The SMS shall detect and prevent any unauthorised changing of the events log and/or game play transactions.

5.3 Reporting Requirements

General

5.3.1 Events and metering information are stored on the SMS in a database and accounting reports are subsequently generated by querying the stored information. Reports will be generated from time to time and on a schedule as requested by the Authority.

Accounting report

5.3.2 The SMS shall be able to create all the financial reconciliation and variance reports as well as all Internal Controls required reports as stipulated in the CRA "Casino Reporting Requirements for Operators" document.

5.4 Security

Physical Security

5.4.1 The SMS shall be hosted in a secure area where only authorised personnel may enter.

5.4.2 Physical access controls shall be in place to monitor the entry of personnel into the SMS hosting environment so as to prevent and detect unauthorised entry attempts.

5.4.3 Adequate environment controls shall be implemented to manage the risk against possible environmental exposure such as power failures, flooding and fires at the location where the SMS is hosted.

Device Security

5.4.4 The normal operation of any device that holds game or voucher information shall not have any options or method that might compromise the information.

5.4.5 Any device that holds information in its memory shall not allow the removal of its information unless it has first transferred that information to the database.

System Security

5.4.6 Adequate security controls over the SMS shall be in place to ensure continued system integrity and auditability.

5.4.7 Role Based Access Control which users are allowed access to only programs and menu items related to their job functions shall be supported.

5.4.8 A record of all privileges allocated to user accounts shall be maintained.

5.4.9 All passwords and PINs shall be encrypted in storage. There shall be a non-alterable audit trail of all user logon activities.

5.4.10 The SMS shall not permit alteration of any metering data, validation data (TITO) and event log information that was properly communicated from the gaming machines.

5.4.11 In the event financial data is changed, an automated audit log must be generated to at minimum capture the following:-

a. Data element & value before change;

b. Data element & value after change;

c. Time and date of change; and

d. User(id) that performs the change.

5.5 Data Retention

5.5.1 Game play statistics, machine events, configuration data (including configurable paytable information where applicable) are to be held for each individual gaming machine in the SMS.

5.5.2 The calculated player return statistics for each game shall be maintained by the SMS.

5.5.3 Accounting and security event data are to be held for each individual gaming machine.

5.5.4 All data (Section 5.5.1 – 5.5.3) shall be held and be able to be accessed or retrieved (from back-up) for a period of five (5) years.

5.6 Data Protection and Recovery

5.6.1 The SMS database shall be stored on redundant media so that no single failure of any portion of the system would cause the loss or corruption of data.

5.6.2 All received data must be stored on the databases before the monitoring system may purge data from the FEPs, the Data Collectors and the gaming machines.

5.6.3 In the event of a system failure, the database shall be reloaded from the last backup point and all data up to the minute of failure shall be fully recovered through roll forward of transaction logs.

6. NETWORK AND COMMUNICATION

6.1 Network

6.1.1 Individual network segments shall be isolated from each other and protected using firewalls that are able to log audit information to a central logging host.

6.2 Communication

6.2.1 Communication path between the gaming machines and SMS shall be implemented via proven reliable communication protocol and network architecture that is robust against potential attack.

6.2.2 The communication protocol between the gaming machines (interface cards) and SMS shall provide the following:-

a. All critical data communication shall be protocol based and incorporate an error detection and correction scheme to ensure an accuracy of ninety-nine percent (99%) or better of messages received;

b. The defined communication protocol shall be open standards based at the network layer and include the following:-

i) Error Control;

ii) Flow Control;

iii) Link Control (remote connection) and

c. All critical data communications associated with monetary player balances and affecting revenue shall be encrypted for secure communication purposes.

6.2.3 In event of communication breakdown between the gaming machine and SMS, the gaming machine shall:-

a. Not respond to the validation request and reject vouchers inserted;

b. Prevent further voucher issuance (for system generated validation numbers); or

c. Continue with the issuance of voucher (for gaming machine generated validation numbers) if mechanism is in place to guarantee that all buffered validation records be read by the SMS subsequently.