STANDARD SERIES

GLI-26:

Wireless Systems Standard

Version: 2.0

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ABOUT THIS STANDARD

This Standard has been produced by Gaming Laboratories International, LLC (GLI) for the purpose of providing independent certifications to suppliers based on the specifications and requirements set forth herein.

A supplier should submit equipment with a request that it be certified in accordance with this Standard. Upon certification, Gaming Laboratories International, LLC will provide a certificate of compliance, and if requested, an appropriate Gaming Labs Certified® mark evidencing the certification to this Standard.

GLI-26 Wireless Systems shall be viewed as a living document which is expected to change as technology and wireless network technology evolves. GLI-26 is not intended to replace or negate any current or future document in the GLI Standard Series. As just one example, the recommendations in GLI-26 are not intended to circumvent any specifications in GLI-21 Client Server Systems and/or GLI-27 Network Security Best Practices, should the network in question support client server and/or wired networking functionalities. Likewise, for other types of networks and the GLI standards document that specifically applies to those networks, the specific standard will take precedence.

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CHAPTER 1
1.0 STANDARD OVERVIEW

1.1   Introduction

1.1.1   General Statement. **Gaming Laboratories International, LLC (GLI)** has been testing gaming devices since 1989. Over the years, we have developed numerous standards for jurisdictions all over the world. In recent years, many jurisdictions have opted to ask for standards tests without creating their own standards documents. In addition, with technology changing almost monthly, new technology is not being incorporated quickly enough into existing standards due to the long process of administrative rulemaking. This document, *GLI Standard 26*, will set forth the technical Standards for Wireless Networks being utilized in a gaming environment.

1.1.2   Document History. We have listed below, and give credit to, agencies whose documents we reviewed prior to writing this Standard. It is the policy of **Gaming Laboratories International, LLC** to update this document as often as possible to reflect changes in technology, testing methods, or cheating methods. This document will be distributed without charge to all those who request it. It may be obtained by downloading it from our website at www.gaminglabs.com or by writing to us at:

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1.2   Acknowledgment of Other Standards Reviewed

1.2.1   General Statement. These Standards have been developed by reviewing and using

portions of the documents from various organizations as applicable. The following organizations are acknowledged for their contributions:

a)   Institute of Electrical and Electronic Engineers (IEEE).

b)   Wi-Fi Alliance Payment Card Industry Security Standard Council.

c)   National Institute of Standards and Technology.

d)   ARUBA Networks.

e)   NETGEAR.

f)   Cisco Systems, Inc.

g)   "IPsec Virtual Private Network Fundamentals" by James Henry Carmouche (ISBN: 1587052075).

h)   Nevada Gaming Commission and State Gaming Control Board.

1.3   Purpose of Technical Standards

1.3.1   *General Statement.*   The purpose of this technical standard is:

a)   To eliminate subjective criteria in analyzing and certifying Wireless Local Area Networks (WLAN);

b)   To only analyze those criteria that impacts the confidentiality, accountability and integrity of Wireless Local Area Networks.

c)   To create a standard that will ensure that the security of the WLAN and/or Wi-Fi Systems in a gaming environment is as closely equivalent to the security of a wired system as possible by establishing controls and guidelines for design, implementation, and use of wireless networks and devices.

d)   To distinguish between local public policy and laboratory criteria. At GLI, we believe that it is up to each local jurisdiction to setup their own public policy with respect to the wireless network.

e)   To recognize that non-gaming testing (such as Wi-Fi Certification and Electrical and Product Safety Testing) should not be incorporated into this standard but left to appropriate test laboratories that specialize in that type of testing.   Except where specifically identified in the standard, testing is not directed at health or safety matters. These matters are the responsibility of the manufacturer, purchaser, and operator of the

equipment.

f)   To construct a standard that can be easily changed or modified and allow for new technology to be introduced.

g)   To construct a standard that does not specify any particular technology, method, or algorithm. The intent is to allow a wide range of methods to be used to conform to the standards, while at the same time, to encourage new methods to be developed.

NOTE: Due to continuous changes and improvement in wireless and networking technologies, the information in this document is considered current only as of the publication date. Therefore, it is imperative for organizations to continually review and update internal control policies and procedures to ensure the wireless network is secure and threats and vulnerabilities are addressed accordingly. Similarly, the technology which is employed in WLANs shall be reviewed and updated accordingly to ensure the highest or most stringent available security features have been implemented. The requirements in this document have been developed based on a centralized WLAN model in an enterprise private network. In a centralized WLAN model, the security, authentication, and communication requirements are controlled and managed via a centralized management server or system in order to implement a more robust, secure and auditable network.

1.3.2   No Limitation of Technology. One should be cautioned that this document should not be read in such a way that limits the use of future technology. The document should not be interpreted that if the technology is not mentioned, then it is not allowed. Quite to the contrary, as new technology is developed, it will be reviewed and minimum standards for this new technology will be incorporated into this document.

1.4   Other Documents That May Apply

1.4.1   General Statement. This document is intended to be used as a supplementary standard that is applied in addition to the base GLI or jurisdictionally adopted standards for the product in test. This standard will detail the additional requirements that shall be met in order to operate any

device or system over a wireless network. Please refer to our website at http://www.gaminglabs.com for a complete list of GLI Standards.

1.4.2 ***Stakeholder's Minimum Internal Control Standards.*** The implementation of a Wireless Network and/or System is a complex task, and as such will require the development of internal process and procedures to ensure that the system is configured and operated with the level of security and control necessary. To that end, it is expected that the network operator/stakeholder will establish a set of Minimum Internal Control Specifications (MICS) to define the internal requirements for the creation, management, and handling of the wireless network as well as the requirements for internal control of any player/operator client software and hardware, and their associated accounts.

1.5   Phases of Testing

1.5.1 ***General Statement.*** Wireless System submissions to the Test Laboratory will be performed in two phases:
a)   Within the laboratory setting; and
b)   On-site following the initial installation of the system to ensure proper configuration of the security applications.

NOTE: In addition to the on-site testing of the wireless network/system, the test laboratory shall provide training on this new technology to the local regulators, recommended field auditing procedures, and assistance with the compilation of internal controls, if requested.

CHAPTER 2

2.0 WIRELESS DEVICE REQUIREMENTS

2.1   Wireless Devices

2.1.1   _General Statement._ Wireless Devices refer to any devices which communicate wirelessly over a local area network or have an impact on a wireless network. This includes, but is not limited to:

a)   A Wireless Access Point (WAP) is a device that allows wireless devices to connect to a wired network using a wireless transport (e.g. Wi-Fi).

b)   A Wireless Connectivity Device (WCD) is a device that provides the interface through which a wireless network can be accessed by other hardware within the gaming establishment (e.g. a wireless network adaptor on a PC).

c)   A Wireless Client Device is a device that converts communications from the Wireless System into a human interpretable form, and converts human decisions into communication format understood by the Wireless System.

NOTE: It is recommended that all Wireless Devices are Underwriter's Laboratory (or equivalent) approved for device safety, resistance to power surges, electrostatic discharge, magnetic interference, and extreme environmental conditions. The test laboratory shall NOT make any finding with regard to Safety and EMC testing as that is the responsibility of the manufacturer of the goods or those that purchase the goods. The test laboratory shall not test for, be liable for, nor make a finding relating to these matters.

2.1.2   _Configuration._ All Wireless Devices shall be configured as follows:

a)   All network management functions must:

      i.   Authenticate all users on the network; and

     ii.   Encrypt all network management communications.

b) All software that will be communicating over the wireless network shall implement user access control with strong authentication as defined in the stakeholder's MICS. Any administrative access shall require an additional level of control.

c) If any authentication credentials are hard coded on a component of the wireless network, they shall be encrypted.

d) Communication on the secure network shall only be possible between approved wireless components that have been registered and authenticated as valid on the network. No unauthorized communications to components and/or access points shall be allowed.

e) Any component that uses the wireless network to communicate shall meet all of the encryption and authentication requirements set forth within this standard.

2.2 Wireless Access Points (WAP)

2.2.1 <u>*General Statement.*</u> The Wireless Access Point (WAP) relays data between the wireless device(s) and the rest of the network. All devices that provide one or more WAPs shall:

a) Be installed in a secure, controlled, or inaccessible area to allow for the restriction of physical access to the device.

b) Be constructed in such a way as to be resistant to physical damage to the hardware or corruption of the contained firmware/software by normal usage.

c) Have all physical connection ports secured to prevent unauthorized access to the network via physically connecting to the Wireless Access Point. All unused ports/connections shall be physically blocked or software disabled.

d) Limit wireless network coverage to an approved area. (For example; Directional Antennae, Geofencing, etc.)

NOTE: It is recommended that all WAPs are certified by the <u>Wi-Fi Alliance ®</u>*. The test laboratory shall NOT make any finding with regard to Wi-Fi testing as that is the responsibility of the manufacturer of the goods or those that purchase the goods. The test laboratory shall not test for, be liable for, nor make a finding relating to these matters.*

2.2.2 <u>*Configuration.*</u> All WAP Devices shall be configured as follows:

a)   The default administration login and password shall be changed from the factory default to a secure value controlled according to the stakeholder's MICS.

b)   The default network password shall be changed from the factory default to a secure value controlled according to the stakeholder's MICS.

c)   The "Service Set Identifier (SSID)" for the device shall be configured as follows:

    i.   The value shall be changed from the factory default to a secure value.

    ii.   The SSID shall not contain any reference to the site name, manufacturer, or any other reference that could be easily discerned.

d)   Access to the administrative functions of the Wireless Access Point device shall be restricted to connections from the wired side of the network utilizing a secure protocol with a privileged user account defined by the stakeholder's MICS.

NOTE: Alternate network management methods and protocols will be examined on a case by case basis.

2.3   Wireless Connectivity Devices (WCD)

2.3.1   *General Statement.* All Wireless Connectivity Devices (WCDs) shall have the capability of being configured to meet the configuration requirements set forth in section 2.1.2 of this document.

NOTE: It is recommended that all WCDs are certified by the Wi-Fi Alliance ®. *The test laboratory shall NOT make any finding with regard to Wi-Fi testing as that is the responsibility of the manufacturer of the goods or those that purchase the goods. The test laboratory shall not test for, be liable for, nor make a finding relating to these matters.*

2.4   Wireless Client Devices

2.4.1   *General Statement.* A Wireless Client Device allows for the connection to, and interaction with a wireless system. All hardware devices that allow for the use of Wireless Client software shall be compatible with or incorporate a WCD.

2.4.2 <u>*Other Requirements.*</u> All proprietary hardware devices developed to support wireless gaming shall meet the applicable Jurisdictional standards for its intended use, as well as the requirements set forth in this document. In the absence of specific jurisdictional standards, GLI-11 should be used.

2.5   Wireless System Devices

2.5.1 <u>*General Statement.*</u> Any system components that utilize wireless communication to communicate with the gaming network shall meet the following requirements:

a)   Be compatible with or incorporate a WCD.

b)   Be located in a secure and controlled location within the gaming facility such that access to the system devices is limited to authorized personnel.

2.6   Other Wireless Devices

2.6.1 <u>*General Statement.*</u> Wireless peripherals including, but not limited to, keyboards, mice, presenters/pointers,headphones and mobile devices(e.g. patron phones or tablets used for non-gaming activity) shall be used in accordance with the following security controls:

a)   These devices shall not be used to communicate Sensitive Data (see section 4.2.2) unless they conform to all wireless communication security and encryption requirements outlined in this document.

b)   All operations of these components shall be used in accordance with the applicable requirements of this technical standard, and other applicable GLI Standards.

CHAPTER 3

3.0 SOFTWARE REQUIREMENTS FOR WIRELESS COMPONENTS

3.1 Wireless Devices – Software Requirements

3.1.1 _Identification._ All wireless device software shall contain sufficient information to identify the software and revision level of the information stored on the Wireless device, which may be displayed via a display screen.

NOTE: The process used in the identification of the software and revision level will be evaluated on a case-by-case basis.

3.1.2 _Independent Control Program Verification._ It must be possible to allow for an independent integrity check of the device's software from an outside source. This is required for all software that may affect the integrity of the system. This shall be accomplished by being authenticated by a third-party device, or by allowing for removal of the media such that it can be verified externally. Other methods shall be evaluated on a case-by-case basis. This integrity check will provide a means for field verification of the software to identify and validate the program. The test laboratory, prior to device approval, shall evaluate the integrity check method.

3.1.3 _Validation._ Software utilized in a wireless network shall have the ability to authenticate that all software being utilized is valid and upon failure of the authentication routines, cease all gaming operations, and display an error message until corrected. This authentication shall take place upon installation of the software, each time the software is loaded for use, upon the initiation of an active session, and upon request by an authorized user account defined in the stakeholder's MICS.

NOTE: Program verification mechanisms will be evaluated on a case-by-case basis and approved by the independent test laboratory based on industry-standard security practices.

3.2 Wireless Client – Software

3.2.1 _**General Statement.**_ Wireless Client software is any software downloaded to, or installed on a device which is used to interface with an associated system. Wireless Operator Client devices are for display and interface functions only. All credits, meters, critical data, and program logic shall be implemented and performed by the associated system. All Wireless Client software shall conform to the requirements listed in Section 3.1 of this document as well as those listed below.

3.2.2 _**Client-Server Interactions.**_ The following requirements apply to Wireless Client Software and the client-server interactions:

a)   The Wireless Client Software must not automatically alter any client-specified firewall rules to open ports that are blocked by either a hardware or software firewall.

b)   The Wireless Client Software must not access any ports (either automatically or by prompting the user to manually access) which are not necessary for the communication between the client and the server.

c)   If the Wireless Client software includes additional non-game or non-administrative related functionality, this additional functionality shall not alter the software's integrity in any way.

d)   The Wireless Client Software shall not possess the ability to override the volume settings of the Wireless Client Device.

e)   It is recommended that auto complete, password caching, or other methods that will fill in the password field are disabled for Wireless Client Software.

3.2.3 _**Limited Area of Operation.**_   Connection to, and use of a Wireless Network for gaming or administration purposes shall be limited to a specific location as defined in the stakeholder's MICS. Once the device is removed from the defined area, it shall immediately disable and cease all gaming or administration operations.

3.2.4 _**Compatibility Verification.**_   During any installation or initialization and prior to establishing a session, the Client Software used in conjunction with the System shall detect any incompatibilities or resource limitation with the device on which it is installed that would prevent proper operation of the Wireless Client software. If any incompatibilities or resource

limitations are detected the client and system shall

a)   Notify the user of any incompatibility and/or resource limitation preventing operation(e.g. software version, minimum specifications not met, etc..) ; and

b)   Prevent any gaming or administrative activity while the incompatibility or resource limitation exists.

3.2.5   *Content.*   Wireless Client Software shall not contain any functionality deemed to be malicious in nature by the regulatory body. This includes, but is not limited to, unauthorized file extractions/transfers, unauthorized player device modifications, unauthorized access to any device stored personal information(contacts, calendar, etc..), and malware.

3.2.6   *Cookies.* All application level cookies used shall contain no malicious code.

3.2.7   *Communications.*   Communications between the Wireless Client and associated system shall take place over a secure network connection that meets all of the requirements set forth in Chapter 4 (Wireless Network Security Requirements) of this standard.

3.2.8   *User Interface Requirements.* The user interface is defined as an application or program through which the operator views and/or interacts with the client software to communicate their actions to the associated system. The User Interface shall meet the following:

a)   Any resizing or overlay of the User Interface shall be mapped accurately to reflect the revised display, buttons, or touch/click points.

b)   The functions of all buttons, touch or click points represented on the user interface shall be clearly indicated within the area of the button, or touch/click point and/or within the help menu. There shall be no functionality available through any buttons or touch/click points that are hidden or undocumented on the client device.

c)   The display of the instructions and information shall be adapted to the user interface. For example, where the player client device uses technologies with a smaller display screen, it is permissible to present an abridged version of the game information accessible directly from within the game and make available the full/complete version of the game

information via another method, such as a secondary screen, help menu, or other interface that is easily identified on the visual game screen.

3.2.9   Simultaneous Inputs.   The program shall not be adversely affected by the simultaneous or sequential activation of the various inputs and outputs which might, whether intentionally or not, cause malfunctions or invalid results.

3.3   Wireless Operator Client – Software

3.3.1   General Statement.   Wireless Operator Client software is utilized by Gaming Venue personnel to perform administrative tasks within the property (e.g. Ticket Validation, Status monitoring, etc…). All Wireless Operator Client software shall conform to the requirements listed in Section 3.2 (Wireless Devices-Software Requirements) of this document as well as those listed below.

3.3.2   Required Functionality for Wireless Operator Client software.   In addition to the applicable jurisdictional requirements for the connected system, the Wireless Operator Client software shall meet the following:

a)   All available options presented in the Wireless Operator Client shall be tied to the account of the operator logged in. Only access available to the logged in account shall be available through the Wireless Operator Client.

b)   Wireless Operator Client devices shall not store sensitive data or system information.

NOTE: In the absence of specific jurisdictional rules, GLI-13 should be applied.

3.3.3   Operator Sessions.   An operator session is defined as a time frame during which an operator or other Gaming Venue personnel can utilize a Wireless Operator Client device to perform administrative functions on the gaming floor on a wireless device.

a)   A Wireless Operator session is initiated by the operator logging in to their controlled account using their secure username and password via either their own device, or a device provided by the property.

b)   An operator shall be provided with (or have created) an electronic identifier such as a digital certificate or an account description and a password that will be utilized to start a session.

c)   Operator account security shall be established according to the applicable jurisdictional system standards.

3.3.4   Operator Session Inactivity. The wireless operator client software shall employ a mechanism that detects session inactivity and terminates a session when applicable.

a)   If the Wireless Operator Client device does not receive input from the operator within 5 minutes, or other period of time as defined by the regulator, the session shall time out and require reactivation. Gaming Venue personnel can re-establish their session by re-establishing their login with the system. This process shall include, at a minimum, the manual entry of the operators secure password or other accepted methods.

b)   No further operator functionality is permitted until a new session is established.

3.4   Wireless Player Client – Software

3.4.1 General Statement. Wireless Player Client software is utilized by a player to take part in any gaming activity over a wireless network. All Wireless Player Client software shall conform to the requirements listed in Section 3.2 of this document as well as those listed below.

3.4.2   Required Functionality for Wireless Player Client software.   In addition to the applicable jurisdictional requirements for Server Based Gaming System Clients, the Wireless Player Client software shall meet the following:

a)   Wireless Player Client devices shall not contain any logic utilized to generate the result of any game. All critical functions including the generation of any game (and the return to the player) shall be generated by the Gaming System and be independent of the Wireless Player Client.

b)   Wireless Player Client devices shall not be capable of conducting gaming activity if

disconnected from the associated gaming server.

c)   Wireless Player Client devices shall not store sensitive data or system information.

d)   Wireless Player Client software shall not be able to transfer data to other Wireless Client software other than chat functions (e.g. text, voice, video, etc…) and approved files (e.g. user profile pictures, photos, etc…).

e)   Game outcome shall not be affected by the effective bandwidth, link utilization, bit error rate or other characteristic of the communications channel between the Gaming System and the Player Client.

NOTE: In the absence of specific jurisdictional rules, GLI-21 should be applied.

3.4.3   *Wireless Gaming Sessions.* A wireless gaming session is defined as a time frame during which a player can participate in gaming activity. A wireless gaming session can be established by one of the following methods, as allowed by the stakeholder:

a)   ***Gaming Venue Provided Device.*** The player may obtain a wireless client device from casino personnel after completing the necessary process defined within the stakeholder's MICS.

b)   ***Player Owned Device.*** The player may obtain/download an application or software package containing the wireless player client software, or access the client application via a browser interface.

    i.   The client software installation process shall include a validation process that requires system validation of the installation and links an end user connection to a specific account for the duration of the session.

    ii.   Where cookies are used, the player must be informed of their usage upon installation. When cookies are required for game play, game play cannot occur if the Wireless Player Client Device does not accept them.

3.4.4   *Player Session Management.* A player session is managed by one of the following methods, as allowed by the stakeholder:

a)   ***Established Player Account.*** The player shall log in to the gaming system using their established player account.

      i.   Player accounts shall conform to the stakeholder's MICS and the requirements defined in the jurisdiction's rules and regulations for player accounts. In absence of specific regulations, GLI-16 "Cashless Systems in Casinos" should be applied.

     ii.   The player may wager the credits that are currently present on their account during this gaming session. Credits can be added and redeemed from their personal account via the standard methods of deposits and withdrawals from a player account established by the stakeholders MICS.

b)   **_Guest Play._** The Gaming Venue personnel will initialize the client software on the device and establish a connection to the gaming system using a secure method.

      i.   Credits can be added to the wireless gaming session using methods defined in the stakeholder's MICS. These credits will be available for play using the client device. The player may increase their available credits via this same process.

     ii.   The player may redeem the credit balance on the wireless gaming session by returning to the origination point of the session or via Gaming Venue personnel, who will pay them the credit balance as per the standard methods of withdrawal established by the stakeholder's MICS.

NOTE: Alternate implementations of player session handling will be reviewed on a case by case basis.

3.4.5   **_Wireless Gaming Session Inactivity._** The wireless player client software shall employ a mechanism that detects session inactivity and terminates a wireless gaming session when applicable.

a)   If the Wireless Player Client device does not receive input from the player within 30 minutes, or other period of time as defined by the regulator, the wireless gaming session shall time out and require reactivation.

b)   If such a termination occurs, the Wireless Player Client device shall display to the player that the session has timed out and inform them of the steps needed to be taken to reestablish the gaming session.

      i.   For gaming sessions tied to player accounts, the player may establish a new session and resume play by re-establishing their login with the system. This

process shall include, at a minimum, the manual entry of the players secure password.

      ii.   For all other gaming sessions, the device must be returned to the origination point of the session or property representative for reactivation.

c)   No further game play is permitted until a new wireless gaming session is reestablished.

d)   Should a timeout due to user inactivity occur during a game cycle, the current game will be treated as an incomplete game and handled as per sections 3.5.3, 3.5.4, and 3.5.5 of this standard.

3.4.6   *Player Facing History.* A 'replay last game' facility must be provided, either as a re-enactment or by description. The replay must clearly indicate that it is a replay of the entire previous game cycle, and must provide the following information (at a minimum):

a)   The date and time the game started and/or ended;

b)   The display associated with the final outcome of the game, either graphically or via a clear text message;

c)   Total player cash / credits at start and/or end of play;

d)   Total amount bet ;

e)   Total cash / credits won for the prize (including Progressive Jackpots);

f)   The results of any player choices involved in the game outcome;

g)   Results of any intermediate game phases, such as gambles or feature games; and

h)   Amount of any promotional awards received (if applicable).

3.5   Wireless Gaming System - Software

3.5.1 *Required functionality.*

a)   The Wireless Gaming System shall meet all applicable jurisdictional requirements for Server Based Game Systems. In the absence of specific jurisdictional rules, GLI-21 shall be applied.

b)   The Wireless Gaming System shall incorporate a location tracking component that can track the locations of all wireless client devices logged on to the system and detect when

any devices have been transported out of the allowed area. When client devices are discovered to be out of the allowed area, the system shall disable any current gaming or operator sessions associated with those devices.

3.5.2 *Game Enable/Disable.* The following requirements apply to the disabling and re-enabling of gambling on the Wireless Gaming System:

a) The Wireless Gaming System must be able to disable or enable all gambling on command;

b) The Wireless Gaming System must be able to disable or enable individual games on command;

c) The Wireless Gaming System must be able to disable or enable individual gaming sessions on command; and

d) When any gambling is disabled or enabled on the Wireless Gaming System an entry must be made in an audit log that includes the reason for any disable or enable.

3.5.3 *Current Game.* When a game or gaming activity is disabled:

a) The game is not to be accessible to a player once the player's game has fully concluded.

b) The player should be permitted to conclude the game in play (i.e. bonus rounds, double up/gamble and other game features related to the initial game wager should be fully concluded).

c) If wagers have been placed on pending real-life events:

    i. The game screens must clearly define what happens to the wagers if the gaming activity is to remain disabled and the corresponding real-life event is completed, and the Wireless Gaming System must be capable of returning all bets to the players, or settling all bets, as appropriate.

    ii. The game screens must clearly define what happens to the wagers if the gaming activity is to re-enable before the corresponding real-life event is completed, and the Wireless Gaming System must be capable of returning all bets to the players, or leaving all bets active, as appropriate.

3.5.4 *Incomplete Games.* A game is incomplete when the game outcome remains unresolved

or the outcome cannot be properly seen by the player. Incomplete games may result from:

a) Loss of communications between the Wireless Player Client and the gaming system;

b) A system restart;

c) A Wireless Player Client restart or malfunction;

d) Abnormal termination of the Client Software; or

e) A game-disable command by the system during play.

3.5.5 *Completion of Incomplete Games.* The Wireless Gaming System may provide a mechanism for a player to complete an incomplete game. An incomplete game shall be resolved before a player is permitted to participate in another instance of the same game.

a) If the player has an incomplete game, the Wireless Gaming System is to present the incomplete game for completion upon reconnection or whenever a new player session is established.

    i. Where no player input is required to complete the game, the game shall display the final outcome as determined by the Wireless Gaming System and game rules, and the player`s account shall be updated accordingly.

    ii. For single-player, multi-stage games, where player input is required to complete the game, the game shall return the player to the game state immediately prior to the interruption and allow the player to complete the game; and

    (NOTE: The addition of an optional bonus or feature, such as double-up or gamble, would not make a game multi-stage.)

    iii. For multi-player games, the game shall display the final outcome as determined according to the game rules and/or terms and conditions, and the player`s account shall be updated accordingly.

b) Wagers associated with an incomplete game that can be continued shall be held by the Wireless Gaming System until the game completes. Player accounts shall reflect any funds held in incomplete games.

3.5.6 *Cancellation of Incomplete Games.* Wagers associated with an incomplete game that can be continued, but remaining undecided for a time period to be specified by the regulatory body

can be voided and the wagers forfeited or returned to the player provided that:

a)   The game rules and/or the terms and conditions shall clearly define how wagers will be handled when they remain undecided beyond the specified time period and the Wireless Gaming System shall be capable of returning or forfeiting the wagers, as appropriate.

b)   In the event that a game cannot be continued due to a Wireless Gaming System action, all wagers shall be returned to the players of that game.

3.5.7   _Shutdown and Recovery._   The Wireless Gaming System shall have the following shutdown and recovery capabilities:

a)   The Wireless Gaming System shall be able to perform a graceful shut down with no loss of data, and only allow automatic restart on power up after the following procedures have been performed as a minimum requirement:

   i.   Program resumption routine(s), including self tests, complete successfully;

   ii.   All critical control program components of the Wireless Gaming System have been authenticated using an approved method (ex. CRC, MD5, SHA-1, etc); and

   iii.   Communication with all components necessary for Wireless Gaming System operation have been established and similarly authenticated.

b)   The Wireless Gaming System shall be able to identify and properly handle the situation where master resets have occurred on other gaming components which affect game outcome, win amount or reporting.

c)   The Wireless Gaming System shall have the ability to restore the system from the last backup.

d)   The Wireless Gaming System shall be able to recover all critical information from the time of the last backup to the point in time at which the Wireless Gaming System failure or reset occurred.

3.5.8   _Malfunction._ The Wireless Gaming System shall:

a)   Not be affected by the malfunction of Wireless Player Client Devices other than to institute the incomplete games procedures in accordance with these requirements; and

b)   Include a mechanism to void bets and pays in the event of a malfunction of the Wireless

Gaming System itself if a full recovery is not possible.

3.5.9 ***Back-end History.*** For each individual game played, the following information, in addition to the above required elements within Section 3.4.6, is to be recorded, maintained and easily demonstrable per session by the Wireless Gaming System for a period as defined within the stakeholder's MICS:

a)   Unique player ID;

b)   Contributions to Progressive Jackpot pools (if applicable);

c)   Game status (in progress, complete, etc);

d)   The table number (if applicable) at which the game was played;

e)   The paytable used; and

f)   Game identifier and version.

3.6   Game Requirements

3.6.1 ***General Statement.*** All game software to be used in conjunction with the wireless gaming system shall meet the requirements outlined within each jurisdiction's applicable requirements for games, to ensure player fairness. In the absence of these jurisdictional specific requirements, the GLI-11 requirements should be used.

3.6.2 ***Peer to Peer (P2P).*** P2P game rooms are those environments which offer players the opportunity to gamble with and against each other. In these environments, the operator usually does not engage in the gambling event as a party (e.g. house banked gaming), but usually provides the gambling service or environment for use by its players, and takes a rake, fee, or percentage for the service. Systems that offer P2P games shall do the following, unless otherwise specified, in addition to the above applicable game rules:

a)   Provide a mechanism to reasonably detect and prevent player collusion, artificial player software, unfair advantages, and ability to influence the outcome of a game or tournament;

b)   Provide warnings about how bots can affect play, so that players can make an informed decision whether to participate and provide steps to report suspected player-bot usage;

c)   Prevent authorized players from occupying more than one seat at any individual table;

d)   Provide authorized players with the option to join a table where all authorized players have been selected at random;

e)   Inform authorized players of the length of time each player has been seated at a particular table;

f)   Clearly indicate to all authorized players at the table whether any players are playing with house money (shills) or are proposition players; and

g)   Must not employ artificial player software to act as an authorized player, except in free play or training modes.

3.6.3   _Computerized Players_. The following requirements apply to use of computerized players in free play or training modes:

a)   The software may employ the use of Artificial Intelligence (AI) in order to facilitate game play for demo, free games, or training modes.

b)   The use of AI software must be clearly explained in the help menus.

c)   All computerized players must be clearly marked at the tables so that players are aware of which players are not human.

3.6.4   _Contests/Tournaments_. An organized event that permits a player to either purchase or be awarded the opportunity to engage in competitive play against other players may be permitted providing the following rules are met.

a)   While enabled for tournament play, the tournament feature shall not accept real money from any source, nor pay out real money in any way, but shall utilize tournament specific credits, points or chips which shall have no cash value.

b)   Wireless gaming contest/tournament rules are available to a registered player on the client application through which the contest/tournament is being conducted. The rules must include at a minimum:

      i.   All conditions registered players must meet to qualify for entry into, and advancement through, the contest/tournament.

      ii.   Any conditions concerning late arrivals or complete tournament no-shows and how auto-blind posting and/or initial entry purchase is handled.

      iii.   Specific information pertaining to any single contest/tournament, including the amount of money placed in the prize pool.

      iv.   The distribution of funds based on specific outcomes.

      v.   The name of the organization (or persons) that conducted the contest/tournament on behalf of, or in conjunction with, the operator if applicable.

c)   The results of each contest/tournament, shall be made available on the wireless gaming client software for the participants to review. Subsequent to being posted, the results of each contest/tournament are available upon request from the gaming establishment. The recording includes the following:

      i.   Name of the event;

      ii.   Date(s) of event;

      iii.   Total number of entries;

      iv.   Amount of entry fees;

      v.   Total prize pool; and

      vi.   Amount paid for each winning category.

NOTE: For free contests/tournaments (i.e., registered player does not pay an entry fee), the information required by the above must be recorded except for the number of entries, amount of entry fees and total prize pool.

3.7 Random Number Generator (RNG) Requirements

3.7.1 ***General Statement.*** The random number generator to be used in conjunction with the wireless gaming system must be cryptographically strong at the time of submission and meet the randomness requirements established by the requested jurisdictional authority. In the absence of these jurisdictional specific requirements, the GLI-11 RNG requirements should be used.

3.8 Taxation

3.8.1 ***General Statement.*** The Wireless Gaming System must support a mechanism that is capable of identifying all wins that are subject to taxation and providing the necessary information in accordance with each jurisdiction's taxation requirements.

NOTE: Methods of jackpot and taxation handling will be examined on a case by case basis.

CHAPTER 4
4.0 WIRELESS NETWORK SECURITY REQUIREMENTS

4.1   Wireless Authentication and Encryption Requirements

4.1.1 ***General Statement.*** This section defines the encryption and authentication requirements for a wireless network being utilized to communicate gaming data. GLI requires the use of strong user authentication, authorization, and encryption.

a)   All WLAN solutions shall provide for multi-factor authentication at the network and device level.

NOTE: The test laboratory will consider secure encryption and authentication methodologies on a case by case basis.

b)   If the router supports WPA2 authentication, it shall be enabled as follows:

   i.   All Access Points shall be configured with Enterprise Mode enabled or with a strong pre-shared key.

   ii.   All Access points shall be IEEE 802.11 compliant.

c)   A password or other secure method as defined in the stakeholder's MICS shall be enabled for each client that connects to the network.

d)   A fallback method for failed wireless authentication (e.g., forgotten passwords) shall be at least as strong as the primary method. This fallback method shall be detailed in the stakeholder's minimum internal control standards.

e)   Advance Encryption Standards (AES) or equivalent with a minimum of 256 bit encryption shall be used to support integrity and confidentiality services.

f)   The Pairwise Master Key (PMK) utilized shall have a lifetime of 24 hours or less. Alternatively, it is acceptable for the PMK be changed during pre-scheduled maintenance downtime as described in an internal control document.

g)   The Group Master Key (GMK) utilized shall have a lifetime of 8 hours or less.

4.1.2 _**Wired Equivalent Privacy (WEP).**_ WEP shall not be used.

NOTE: If it is not possible for the manufacturer to implement WPA2 protocol, the laboratory will consider the implementation of WEP as a secure encryption and authentication on a case by case basis.

4.2   Wireless Communication Protocol

4.2.1 _**General.**_ Each wireless network reviewed by the independent test lab will be examined thoroughly to ensure that the proposed field configuration is secure. The independent test lab may provide additional security recommendations and provide on-site training to the network operator / stakeholder, if requested.

4.2.2 _**Sensitive Data.**_ Communication of sensitive data must be secure from eavesdropping, access, tampering, intrusion or unauthorized alteration. Sensitive data includes, but is not limited to:

a)   RNG seeds and outcomes;

b)   Encryption keys, where the implementation chosen requires transmission of keys;

c)   PINs/Passwords;

d)   Transfers of funds;

e)   Player tracking information;

f)   Download Packages; and

g)   Any information that affects game outcome.

4.2.3 _**Communication Protocol(s).**_   Each device shall be reviewed on a case-by-case basis by the network operators/stakeholders and the independent test lab.

   a) Each component of a wireless network that communicates gaming data shall utilize a communications protocol with encryption and authentication.

   b) Each component of a wireless network shall function in accordance with its implemented communications protocol.

   c) Devices using an unsecured communication transport (e.g. Bluetooth) may not be used

for any function that affects game play, player account management, or any other critical gaming function.

4.2.4 _Wireless Device Communication with Other Systems._ In the event that components of the wireless portion of the network are utilized in conjunction with other traditional wired systems; (i.e. On-Line Monitoring and Control Systems, Ticket Validation Systems, Progressive Systems, etc.), the communications between the wireless device and the traditional network shall meet the following:

a) All communications shall pass through at least one approved application-level firewall, and provide an alternate network path <u>unless</u> the alternate route conforms to the requirements of this document and has independent security (i.e. keys are not the same as other networks), and

b) All communications shall be performed utilizing the network authentication and security methods outlined in this standard.

4.2.5 _Wireless Network Software Security._ A wireless network shall:

a) Implement a security method that links the clients and/or devices to the server, such that the software may only be used by authorized clients and/or devices.

b) Implement a security scheme that utilizes metamorphic security keys. In general, if keys or seeds are used they shall not be hard coded, and shall change automatically, over time, as a function of the communication link. Each method shall be reviewed by the network operators/stakeholders and the independent test lab on a case-by-case basis.

c) Perform mutual authentication to ensure that clients only communicate with valid networks.

d) Validate clients and devices at pre-defined time intervals with at least one method of authentication as described above. This time interval shall be configurable based on network operators/stakeholders requirements.

e) Close active sessions if user authentication has exceeded the number of failed attempts. The number of failed attempts shall be configurable based on network operators/stakeholders requirements.

f)   Provide a printable report of failed network access attempts, including the:

    i.   time and date stamp,

    ii.   the device name, and

    iii.   the hardware identifier of all devices requesting access to the network.

4.2.6   _Wireless Network Authentication Methods._ Communications between devices on the wireless shall use protocols designed for securing, authenticating and encrypting wireless networks.   One of the following encrypted tunneling protocols shall be utilized to secure communication of all gaming related data over the wireless network:

a)   Protected Extensible Authentication Protocol (Protected EAP or PEAP),

b)   Extensible Authentication Protocol- Transport Layer Security (EAP-TLS),

c)   Extensible Authentication Protocol-Tunneled Transport Layer Security (EAP-TTLS),

d)   Virtual Private Network with L2TP/IPsec (VPN),

e)   Point to Point Tunneling Protocol (PPTP), or

f)   Secure Sockets Layer (SSL).

NOTE: These methods are authenticated against LDAP, RADIUS, Kerberos or Microsoft Active Directory servers, as well as local databases stored on the secure gateway controller. The implementation of any other methods will be reviewed on a case by case basis.

NOTE: Authentication schemes using Public Key Infrastructure shall require certificate validation. Ideally, in both directions (e.g. client certificates)

NOTE: Alternate authentication and encryption methods will be evaluated on a case by case basis.

4.2.7   _Component Failures._ The wireless network shall have sufficient redundancy and modularity to accommodate a component failure to prevent the interruption of the wireless operations.   There shall be redundant copies of each audit log and system database, where applicable, on the wireless server with open support for backups and restoration. This includes a wireless network that has support for failover redundancy. A backup scheme implementation shall occur in compliance with the Disaster Recovery Policy, although all methods will be reviewed on a case-by-case basis by the independent test lab.

_4.2.8_ _Recovery Requirements._ In the event of a catastrophic failure when the wireless network cannot be restarted in any other way, it shall be possible to reload the system from the last viable backup point and fully recover the contents of that backup. Backups shall consist of at least the following minimum information, as applicable:

a)   Significant events,

b)   Auditing information, and

c)   Specific site information such as unique configuration settings, security accounts, etc.

_4.2.9_ _User Authorization Requirements._ The Wireless System shall implement the following user authorization requirements:

a)   Wireless systems shall employ a secure and controlled mechanism that is capable of verifying that the wireless device is being operated by an authorized person.

b)   The mechanism shall be able to be initiated on demand and on a regular basis.

c)   Any authorization information communicated by the wireless device to the system for identification purposes must be obtained at the time of the request from the wireless system and not be stored on the wireless client device.

NOTE: Stationary devices that cannot be moved by the patron may be exempted from these requirements on a case by case basis.

_4.2.10_ _Connectivity._ The Wireless system shall provide methods to:

a)   Enroll and un-enroll system components;

b)   Enable and disable specific system components;

c)   Ensure that only enrolled and enabled system components participate in the wireless gaming system; and

d)   Ensure that the default condition for all components shall be un-enrolled and disabled.

CHAPTER 5

5.0 INFORMATION SYSTEM SECURITY (ISS) REQUIREMENTS

5.1 General Statement

5.1.1 **_General Statement._** To ensure players are not exposed to unnecessary security risks, these security requirements will apply to the following critical components of the Wireless System:

a) Wireless System components which record, store, process, share, transmit or retrieve sensitive player information, e.g. transaction details, authentication information, player account balances;

b) Wireless System components which generate, transmit, or process random numbers used to determine the outcome of games or virtual events;

c) Wireless System components which store results or the current state of a player's wager;

d) Points of entry to and exit from the above systems (other systems which are able to communicate directly with core critical systems); and

e) Wireless networks which transmit sensitive player information.

5.2 Information Security Policy

5.2.1 **_General Statement._** An information security policy document shall be in effect to describe the operator's approach to managing information security and its implementation. The information security policy shall:

a) Have a provision requiring review when changes occur to the Wireless System or the operator's processes which alter the risk profile of the Wireless System;

b) Be approved by management;

c) Be communicated to all employees and relevant external parties;

d) Undergo review at planned intervals; and

e)   Delineate the responsibilities of the operator's staff and the staff of any third parties for the operation, service and maintenance of the Wireless System and/or its components.

5.3   Administrative Controls

5.3.1   Human Resource Security. The security roles and responsibilities of employees should be defined and documented in accordance with the information security policy.

a)   All employees of the organization shall receive appropriate security awareness training and regular updates in organizational policies and procedures as needed for their job function.

b)   An access control policy shall be established, documented, and reviewed based on business and security requirements for physical and logical access to the Wireless System and / or its components.

c)   Employees shall only be provided with access to the services or facilities that they have been specifically authorized to use.

d)   Management shall review users' access rights at regular intervals using a formal process.

e)   The access rights of all employees to the Wireless System and / or its components shall be removed upon termination of their employment, contract or agreement, or adjusted upon change.

5.3.2   Third Party Services. The security roles and responsibilities of third party service providers should be defined and documented in accordance with the information security policy.

a)   Agreements with third party service providers involving accessing, processing, communicating or managing the Wireless System and / or its components, or adding products or services to the Wireless System and / or its components shall cover all relevant security requirements.

b)   The services, reports and records provided by the third party shall be monitored and reviewed by management at least once a year.

c)   Changes to the provision of services, including maintaining and improving existing information security policies, procedures and controls, shall be managed, taking account

of the criticality of business systems and processes involved and re-assessment of risks.

d)   The access rights of third party service providers to the Wireless System and / or its components shall be removed upon termination of their contract or agreement, or adjusted upon change.

5.3.3   *Asset Management.* All assets housing, processing or communicating controlled information, including those comprising the operating environment of the Wireless System and/or its components, should be accounted for and have a nominated owner in accordance with the information security policy.

a)   An inventory shall be drawn up and maintained of all assets holding controlled items.

b)   Assets shall be classified in terms of their criticality, sensitivity, and value.

c)   Each asset shall have a designated "owner" responsible for ensuring that information and assets are appropriately classified, and defining and periodically reviewing access restrictions and classifications.

d)   A policy shall be included on the acceptable use of assets associated with the Wireless System and its operating environment.

e)   A procedure shall exist for removing assets from service and adding new assets.

f)   De-commissioned equipment shall have storage media removed and disposed of securely using documented procedures.

g)   Removable storage media should be disposed of securely when no longer required, using documented procedures.

5.3.4   *Encryption Key Management.* The management of encryption keys shall follow defined processes in accordance with the information security policy.

a)   There shall be a documented process for obtaining or generating encryption keys.

b)   If encryption keys expire there shall be a documented process for managing the expiry of encryption keys.

c)   There shall be a documented process to revoke encryption keys.

d)   There shall be a documented process for securely changing the current encryption keyset.

e)   There shall be a documented process in place for the storage of any encryption keys.

f)　　There shall be a method to recover data encrypted with a revoked or expired encryption key for a defined period of time after the encryption key becomes invalid.

5.3.5　*Software Development Life Cycle.* The acquisition and development of new software shall follow defined processes in accordance with the information security policy.

a)　　The production environment shall be logically and physically separated from the development and test environments.

b)　　Development staff shall be precluded from having access to promote code changes into the production environment.

c)　　There shall be a documented method to verify that test software is not deployed to the production environment.

d)　　To prevent leakage of personally identifiable information, there shall be a documented method to ensure that raw production data is not used in testing.

e)　　All documentation relating to software and application development should be available and retained for the duration of its lifecycle.

5.3.6　*Change Control.* The implementation of changes to the hardware and software of the Wireless System shall be managed by the use of formal change control procedures in accordance with the information security policy.

a)　　Program change control procedures shall be adequate to ensure that only properly approved and tested versions of programs are implemented on the production wireless system. Production change controls shall include:

　　i.　　An appropriate software version control or mechanism for all software components;

　　ii.　　Details of the reason for the change;

　　iii.　　Details of the person making the change;

　　iv.　　Complete backups of previous versions of software;

　　v.　　A policy addressing emergency change procedures;

　　vi.　　 Procedures for testing and migration of changes;

　　vii.　　Segregation of duties between the developers, quality assurance team, the

migration team and users; and

viii. Procedures to ensure that technical and user documentation is updated as a result of a change.

b) All patches should be tested whenever possible on a wireless system configured identically to the target wireless system. Under circumstances where patch testing cannot be thoroughly conducted in time to meet the timelines for the severity level of the alert, then patch testing should be risk managed, either by isolating or removing the untested wireless system from the network or applying the patch and testing after the fact.

5.3.7 ___Incident Management.___ A process for reporting information security incidents and the Management response shall be documented in accordance with the information security policy.

a) The incident management process shall include a definition of what constitutes an information security incident.

b) The incident management process shall document how information security incidents are reported through appropriate management channels.

c) The incident management process shall address Management responsibilities and procedures to ensure a rapid, effective and orderly response to information security incidents, including:

i. Procedures to handle different types of information security incident;

ii. Procedures for the analysis and identification of the cause of the incident;

iii. Communication with those affected by the incident;

iv. Reporting of the incident to the appropriate authority;

v. Forensic evidence collection; and

vi. Controlled recovery from information security incidents.

5.3.8 ___Business Continuity and Disaster Recovery.___ A plan shall be in place to recover gaming operations in the event that the production gaming system is rendered inoperable.

a) The disaster recovery plan shall address the method of storing player account information and gaming data to minimize loss in the event the production gaming system is rendered inoperable. If asynchronous replication is used, the method for recovering data should be described or the potential loss of data should be documented.

b)   The disaster recovery plan shall delineate the circumstances under which it will be invoked.

c)   The disaster recovery plan shall address the establishment of a recovery site physically separated from the production site.

d)   The disaster recovery plan shall contain recovery guides detailing the technical steps required to re-establish gaming functionality at the recovery site.

e)   The business continuity plan shall address the processes required to resume administrative operations of gaming activities after the activation of the recovered platform for a range of scenarios appropriate for the operational context of the Wireless System.

5.4   Technical Controls

5.4.1   *Self Monitoring.*

a)   The Wireless System shall implement the self-monitoring of critical components (e.g. central hosts, network devices, firewalls, links to third parties, etc.).

b)   A critical component which fails self-monitoring tests shall be taken out of service immediately. The component shall not be returned to service until there is reasonable evidence that the fault has been rectified.

c)   The network should be redundant so that following b) above will not result in a denial of service condition

5.4.2   *Domain Name Service (DNS) Requirements.*

a)   The primary server used to resolve DNS queries used in association with the Wireless System shall be physically located in a secure data center.

b)   Logical and physical access to the primary DNS server shall be restricted to authorized personnel.

c)   Zone transfers to arbitrary hosts shall be disallowed.

5.4.3   *Monitoring.*

a)   The clocks of all components of the Wireless System shall be synchronized with an agreed accurate time source to ensure consistent logging. Time skew shall be checked periodically.

b)   Audit logs recording user activities, exceptions, and information security events shall be produced and kept for an appropriate period to assist in future investigations and access control monitoring.

c)   System Administrator and System Operator activities shall be logged.

d)   Logging facilities and log information shall be protected against tampering and unauthorized access.

e)   Any modification, attempted modification, read access or other change or access to any wireless system record, audit or log shall be detectable by the Wireless System. It shall be possible to see who has viewed or altered a log and when.

f)   Logs generated by monitoring activities shall be reviewed periodically using a documented process. A record of each review shall be maintained.

g)   Wireless System faults shall be logged, analyzed, and appropriate action taken.

h)   Network appliances with limited onboard storage shall disable all communication if the audit log becomes full or offload logs to a dedicated log server.

5.4.4   *Cryptographic Controls.* A policy on the use of cryptographic controls for protection of information should be developed and implemented.

a)   Any sensitive or personally identifiable information should be encrypted if it traverses a network with a lower level of trust.

b)   Data that is not required to be hidden but shall be authenticated shall use some form of message authentication technique.

c)   Authentication shall use a security certificate from an approved organization.

d)   The grade of encryption used should be appropriate to the sensitivity of the data.

e)   The use of encryption algorithms shall be reviewed periodically by qualified Management staff to verify that the current encryption algorithms are secure.

f)   Changes to encryption algorithms to correct weaknesses shall be implemented as soon as

practical. If no such changes are available, the algorithm shall be replaced.

g)   Encryption keys shall not be stored without being encrypted themselves through a different encryption method and/or by using a different encryption key.

5.4.5 **_Access Controls._** The allocation of access privileges shall be restricted and controlled based on business requirements and the principle of least privilege.

a)   A formal user registration and de-registration procedure shall be in place for granting and revoking access to all information systems and services.

b)   All users shall have a unique identifier (user ID) for their personal use only, and a suitable authentication technique shall be chosen to substantiate the claimed identity of a user.

c)   The use of generic accounts shall be limited, and where used the reasons for their use shall be formally documented.

d)   Password provision shall be controlled through a formal management process.

e)   Passwords shall meet business requirements for length, complexity and lifespan.

f)   Access to Wireless System applications and operating systems shall be controlled by a secure log-on procedure.

g)   Appropriate authentication methods, in addition to passwords, shall be used to control access by remote users.

h)   Any physical access to areas housing Wireless System components, and any logical access to the Wireless System applications or operating system shall be recorded.

i)   The use of automated equipment identification to authenticate connections from specific locations and equipment shall be formally documented and shall be included in the regular review of access rights by Management.

j)   Restrictions on connection times shall be used to provide additional security for high-risk applications.

k)   The use of utility programs that might be capable of overriding system and application controls shall be restricted and tightly controlled.

l)   A formal policy shall be in place, and appropriate security measures shall be adopted to protect against the risks of using mobile computing and communication facilities.

m)   Telecommuting into the wireless system shall not be permitted except under circumstances where the security of the endpoint can be guaranteed.

5.4.6   _Network Security Management._ Networks should be logically separated such that there should be no network traffic on a network link which cannot be serviced by hosts on that link.

a)   The failure of any single item should not result in a denial of service.

b)   An Intrusion Detection System / Intrusion Prevention System shall be installed on the network which can:

   i.   Listen to both internal and external communications;

   ii.   Detect or prevent Distributed Denial of Service (DDOS) attacks;

   iii.   Detect or prevent shellcode from traversing the network;

   iv.   Detect or prevent Address Resolution Protocol (ARP) spoofing;

   v.   Detect other Man-in-the-Middle indicators and sever communications immediately if detected;

   vi.   Scan the wireless network for any unauthorized or rogue wireless devices connected to any access point on the wireless network. This scan should be performed at least once per quarter or as defined within the stakeholder's MICS;

   vii.   Scan the wireless network for any rogue access points. This scan should be performed at least once per quarter or as defined within the stakeholder's MICS;

   viii.   Automatically disable any unauthorized or rogue wireless devices connected to the system;

   ix.   Maintain a history log of all wireless access for at least the previous 90 days or a period as defined within the stakeholder's MICS. This log should contain complete and comprehensive information about all wireless devices involved, and should be able to be reconciled with all other networking devices within the Gaming Venue or property;

c)   In virtualized environments, redundant server instances cannot run under the same hypervisor.

d)   Stateless protocols (e.g. UDP) should not be used for sensitive data without stateful transport.

NOTE: Although HTTP is technically stateless, if it runs on TCP which is stateful, this is allowed.

e)   All changes to network infrastructure (e.g. network device configuration) shall be logged.

f)   Virus scanners and/or detection programs should be installed on all pertinent information systems. These programs should be updated regularly to scan for new strains of viruses.

g)   Network security should be tested by a qualified and experienced individual on a regular basis.

h)   Testing should include testing of the external (public) interfaces and the internal network.

i)   Testing of each security domain on the internal network should be undertaken separately.

5.4.7   *Firewalls*.

a)   A firewall should be located at the boundary of any two dissimilar security domains.

b)   All connections to Wireless System hosts in the secure data center shall pass through at least one application-level firewall. This includes connections to and from any non-Wireless System hosts used by the operator.

c)   The firewall shall be a separate hardware device with the following characteristics:

    i.   Only firewall-related applications may reside on the firewall; and

    ii.   Only a limited number of accounts may be present on the firewall (e.g. system administrators only).

d)   The firewall shall reject all connections except those that have been specifically approved.

e)   The firewall shall reject all connections from destinations which cannot reside on the network from which the message originated (e.g. RFC1918 addresses on the public side of an internet firewall.)

f)   The firewall shall maintain an audit log of all changes to parameters which control the connections permitted through the firewall.

g)   The firewall shall maintain an audit log of all successful and unsuccessful connection attempts. Logs should be kept for 90 days and a sample reviewed monthly for unexpected traffic. It is recommended that the source and destination IP addresses be recorded for each instance.

h) The firewall shall disable all communication if the audit log becomes full.

i) The number of unsuccessful connection attempts threshold shall be a configurable parameter by the network operator / stakeholder; and may be utilized to deny further connection requests should the threshold be exceeded. Should this threshold be exceeded, the operators/stakeholders shall be notified.

5.4.8 _**Remote Access**_**.** Remote access is defined as any access from outside the system or system network including any access from other networks within the same establishment. Remote access shall only be allowed if authorized by the regulatory body and shall have the option to be disabled. Where allowed, remote access shall accept only the remote connections permissible by the firewall application and Wireless System settings. Remote access security will be reviewed on a case-by-case basis, in conjunction with the implementation of the current technology and approval from the local regulatory body. In addition, there shall be:

a) No unauthorized remote user administration functionality (adding users, changing permissions, etc.);

b) No unauthorized access to any database other than information retrieval using existing functions;

c) No unauthorized access to the operating system; and

d) The Wireless System shall maintain an activity log which updates automatically depicting all remote access information.

5.4.9 _**Backup**_**.** Backup copies of information and software shall be taken and tested regularly in accordance with the backup policy.

5.5 Physical and Environmental Controls

5.5.1 _**Secure Areas.**_ Wireless systems and the associated communications systems shall be located in facilities which provide physical protection against damage from fire, flood, hurricane, earthquake and other forms of natural or man-made disaster.

a) Security perimeters (barriers such as walls, card controlled entry gates or manned

reception desks) shall be used to protect areas which contain Wireless System components.

b)   Secure areas shall be protected by appropriate entry controls to ensure that access is restricted to only authorized personnel.

c)   All access shall be recorded in a secure log.

d)   Secure areas shall include an intrusion detection system, and attempts at unauthorized access shall be logged.

5.5.2   _Gaming Equipment Security._ Wireless System servers shall be located in a secure area which restricts unauthorized access.

5.5.3   _Supporting Utilities._

a)   All Wireless System components shall be provided with adequate primary power.

b)   All Wireless System components responsible for the logical operations or data storage of the system shall have uninterruptible power supply (UPS) equipment to support operations in the event of a power failure.

c)   There shall be adequate cooling and fire protection for the Wireless System components

d)   Power and telecommunications cabling carrying data or supporting information services shall be protected from interception or damage.

Glossary

Reference	Definition
Active Directory	Active Directory is an implementation of LDAP directory services by Microsoft for use in Windows environments
AES	Advance Encryption standards
CCMP	Counter Mode CBC MAC Protocol
Client Software	The software installed on a Wireless Client Device that facilitates communication between the Player or Operator Interface to the Wireless System. Examples of Client Software include proprietary download software packages, html, flash, etc.
Default accounts	User accounts with predefined access levels usually created by default at installation for operating systems, databases, and applications.
Digital Certificate	A set of data which can be used to verify the identity of an entity by reference to a trusted third party (the Certification Authority). Digital certificates are often used to authenticate messages for non-repudiation purposes. One of the attributes of a digital certificate is that it cannot be modified without compromising its internal consistency. X.509 certificates are an example of a digital certificate.
Domain Name Service	The globally distributed Internet database which (amongst other things) maps machine names to IP numbers and vice-versa.
EAP	Extensible Authentication Protocol
EAP-TLS	Extensible Authentication Protocol- Transport Layer Security
EAP-TTLS	Extensible Authentication Protocol- Tunneled Transport Layer Security
Effective Bandwidth	The amount of data that actually can be transferred across a network per unit of time. The effective bandwidth through the Internet is usually considerably lower than the bandwidth of any of the constituent links
FIPS	Federal information Processing Standard
Firewall	Network security barrier. A firewall is a device that guards the entrance to a private network and keeps out unauthorized or unwanted traffic.
Generic user accounts	User accounts that are shared by multiple users (using the same password) to gain access to any component of a gaming system: application, database, or operating system.
GMK	Group Master Key
HTTP	Hypertext Transport Protocol
IEEE	Institute of Electrical and Electronics Engineers
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
Link Utilization	The percentage time that a communications link is engaged in transmitting data.
MAC	Medium Access Control
PEAP	Protected Extensible Authentication Protocol
PMK	Pairwise Master Key
Protocol	Used to refer to the hardware interface, line discipline and message formats of the communications
PTK	Pairwise Transient Key
RADIUS	Remote Authentication Dial In User Service
Sensitive Data	Data which, if obtained by a third party, may be used to affect game outcome/s or player/s accounts.
Service accounts	Accounts on which automated system functions are dependent to execute. These accounts defined at the operating system level provide a certain level of access necessary for normal operation of applications and/or automated batch processes.
SNMP	Simple Network Management Protocol
SSID	Service Set Identifier, Network name
TKIP	Temporal key Integrity Protocol
Version Control	The method by which an evolving approved Wireless System is verified to be operating in an approved

	state.
VPN	Virtual Private Network
WAP	Wireless Access Point
WCD	Wireless Connectivity Devices
WEP	Wired Equivalent Privacy
Wi-Fi	Wireless Fidelity (WLAN)
Wireless Client Device	The device that converts communications from the Wireless System into a human interpretable form, and converts human decisions into communication format understood by the Wireless System. Examples of Wireless Client Devices include PDAs, mobile phones, tablets, etc.
WLAN	Wireless Local Area Network
WPA	Wi-Fi Protected Access
WPA2	Wi-Fi Protected Access 2

Example Wireless Network