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LOTTERY TRANSACTION PROCESSING SYSTEM

Abstract

A lottery transaction processing method is provided and includes receiving a lottery play request by a lottery play generation processor. The method further includes generating play information including a unique play serial number, and a play random number key, by the play generation processor, generating a play digital signature as a function of the play information and the play random number key by the play generation processor, transmitting the play information and the play digital signature, but not the play random number key, over a network to a gaming system server for storage by the gaming system server, and issuing a lottery play record including the play information and the play random number key by the play generation processor.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a Continuation patent application of U.S. patent application Ser. No. 17/887,603, filed Aug. 15, 2022, which is a U.S. Divisional patent application of U.S. patent application Ser. No. 16/362,927, filed Mar. 25, 2019, issued as U.S. Pat. No. 11,430,294, issued on Aug. 30, 2022, both of which are herein incorporated by reference in their entireties.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to lottery game transaction processing systems and methods.

BACKGROUND OF THE DISCLOSURE

[0003] Lottery systems provide the public with the chance to win prizes through the purchase of lottery tickets. Tickets can be won after a specified event such as a drawing, for example. Commonly, customers purchase their tickets at dedicated point-of-sale terminals located at retail stores or similar establishments. A point-of-sale terminal communicates with a central lottery server to exchange information associated with a given lottery transaction. For each transaction, the customers can select their own numbers or have a machine randomly select numbers for them. In any event, the point-of-sale terminal transmits the selected numbers to the central lottery server to be stored and receives directions to print the associated lottery ticket locally. The printed lottery ticket contains the selected numbers and a serial number that is unique to the ticket for validation and redemption purposes. At some point-of-sale terminals, an encrypted control number generated based a random number key is also printed on the ticket.

[0004] Currently, only the serial number printed on the ticket is typically checked for the validity of the ticket prior to redemption. The encrypted control number is sometimes manually checked on a standalone computer for higher tier payouts. There remains a need to develop faster and more efficient lottery transaction processing systems that can improve the validation and redemption process.

SUMMARY OF THE DISCLOSURE

[0005] In one embodiment of the present disclosure, a lottery transaction processing method is provided and includes receiving a lottery play request by a lottery play generation processor. The method further includes generating play information including a unique play serial number, and a play random number key, by the play generation processor, generating a play digital signature as a function of the play information and the play random number key by the play generation processor, transmitting the play information and the play digital signature, but not the play random number key, over a network to a gaming system server for storage by the gaming system server, and issuing a lottery play record including the play information and the play random number key by the play generation processor.

[0006] In one example, wherein issuing the lottery play record includes one or both of printing a lottery ticket and transmitting an electronic lottery ticket record.

[0007] In another example, wherein the method further includes receiving an authorization to issue the lottery play record at the lottery play generation processor from the gaming system server, and issuing the lottery play record includes issuing the lottery play record in response to the receipt of the authorization.

[0008] In yet another example, the method further includes receiving and storing the play information and play digital signature by the gaming system server. In a variation, the method

further includes transmitting the play information and play digital signature over a network to a lottery internal control system for storage by the lottery internal control system. In another variation, the method further includes receiving and storing the play information and play digital signature by the lottery internal control system.

[0009] In still another example, the method further includes receiving a redemption serial number and a redemption random number key from a lottery play record to be validated by a lottery redemption processor, and transmitting the redemption serial number and redemption random number key over a network to the gaming system server.

[0010] In yet still another example, the method further includes receiving by the gaming system server over a network a redemption serial number of a lottery play record to be validated, retrieving the play information and the play digital signature associated with the received redemption serial number from storage by the gaming system server, generating a validation digital signature as a function of the play information retrieved from storage by the gaming system server and a redemption random number key of the lottery play record to be validated, and comparing the validation digital signature to the play digital signature retrieved from storage by the gaming system server to validate authenticity of the lottery play record being validated, wherein if the validation digital signature matches the play digital signature, the redemption random number key matches the play random number key and the play record being validated is authentic, and wherein if the validation digital signature does not match the play digital signature, the redemption random number key does not match the play random number key and the play record being validated is not authentic.

[0011] In a variation, the method further includes receiving by the gaming system server of the network the redemption random number key, generating the validation digital signature includes generating the validation digital signature by the gaming system server, and comparing the validation digital signature to the play digital signature includes comparing the validation digital signature to the play digital signature by the gaming system server. In another variation, the method further includes transmitting the play information and play digital signature over a network from the gaming system server to a lottery internal control system for storage by the lottery internal control system, transmitting the redemption serial number and the redemption random number key of the lottery play record to be validated from the gaming system server to the lottery internal control system if the authenticity of the lottery play record is validated by the gaming system server, retrieving the play information and play digital signature associated with the redemption serial number from storage by the lottery internal control system, generating a presentment digital signature as a function of the play information retrieved from storage by the lottery internal control system and the redemption random number key by the lottery internal control system, comparing the presentment digital signature to the play digital signature retrieved from storage by the lottery internal control system to validate presentment of the lottery play record being validated, wherein if the presentment digital signature matches the play digital signature the lottery play record being validated was presented for payment.

[0012] In yet another variation, the method further includes transmitting the retrieved play information and play digital signature over a network to a lottery play redemption processor, generating the validation digital signature includes generating the validation digital signature by the lottery play redemption processor, and comparing the validation digital signature to the play digital signature includes comparing the validation digital signature to the play digital signature by the lottery play redemption processor.

[0013] In still another variation, the method further includes transmitting the play information and play digital signature over a network from the gaming system server to a lottery internal control system for storage by the lottery internal control system, transmitting the redemption serial number and redemption random number key of the lotter play record over a network from the lottery play redemption processor to the gaming system server if the authenticity of the lottery play record is

validated by the lottery play redemption processor, transmitting the redemption serial number and the redemption random number key of the lottery play record from the gaming system server to the lottery internal control system, retrieving the play information and play digital signature associated with the redemption serial number from storage by the lottery internal control system, generating a presentment digital signature as a function of the play information retrieved from storage by the lottery internal control system and the redemption random number key by the lottery internal control system, and comparing the presentment digital signature to the play digital signature retrieved from storage by the lottery internal control system to validate presentment of the lottery play record being validated, wherein if the presentment digital signature matches the play digital signature the lottery play record being validated was presented for payment.

[0014] In yet still another variation, the method further includes transmitting the play information and play digital signature over a network from the gaming system server to a lottery internal control system for storage by the lottery internal control system, transmitting the redemption serial number and the redemption random number key of the lottery play record to be validated from the gaming system server to the lottery internal control system if the authenticity of the lottery play record is validated, retrieving the play information and play digital signature associated with the redemption serial number from storage by the lottery internal control system, generating a presentment digital signature as a function of the play information retrieved from storage by the lottery internal control system and the redemption random number key by the lottery internal control system, and comparing the presentment digital signature to the play digital signature retrieved from storage by the lottery internal control system to validate presentment of the lottery play record being validated, wherein if the presentment digital signature matches the play digital signature the lottery play record being validated was presented for payment.

[0015] In another embodiment of the present disclosure, a lottery transaction processing method is provided and includes receiving a redemption serial number of a lottery play record to be validated over a network using a gaming system server. The method further includes retrieving play information and play digital signature associated with the received redemption serial number from storage by the gaming system server, generating a validation digital signature as a function of the play information retrieved from the storage by the gaming system server and a redemption random number key of the lottery play record to be validated, comparing the validation digital signature to the play digital signature retrieved from the storage by the gaming system server to validate authenticity of the lottery play record being validated, and determining, by the gaming system server, the authenticity of the lottery play record based on a match between the validation digital signature and the play digital signature.

[0016] In one example, the method further includes receiving by the gaming system server of the network the redemption random number key, generating the validation digital signature includes generating the validation digital signature by the gaming system server, and comparing the validation digital signature to the play digital signature includes comparing the validation digital signature to the play digital signature by the gaming system server.

[0017] In another example, the method further includes at least one of: transmitting the play information and play digital signature over a network from the gaming system server to a lottery internal control system for storage by the lottery internal control system, and transmitting the play information and play digital signature over a network from the gaming system server to a lottery play redemption processor for storage by the lottery play redemption processor.

[0018] In yet another example, the method further includes transmitting the redemption serial number and the redemption random number key of the lottery play record to be validated from the gaming system server to the lottery internal control system if the authenticity of the lottery play record is validated by the gaming system server.

[0019] In yet another embodiment of the present disclosure, a lottery transaction processing method is provided and includes receiving a redemption serial number and a redemption random number

key of a lottery play record to be validated. The method further includes retrieving play information and play digital signature associated with the redemption serial number from storage by the lottery internal control system, generating a presentment digital signature as a function of the play information retrieved from the storage by the lottery internal control system and the redemption random number key by the lottery internal control system, comparing the presentment digital signature to the play digital signature retrieved from storage by the lottery internal control system to validate presentment of the lottery play record being validated, and determining, by the lottery internal control system, authenticity of the presentment of the lottery play record based on a match between the presentment digital signature and the play digital signature.

[0020] In one example, the method further includes receiving the play information and play digital signature over a network from a gaming system server for storage by the lottery internal control system, and receiving the redemption serial number and the redemption random number key of the lottery play record to be validated from the gaming system server by the lottery internal control system if the authenticity of the lottery play record is validated.

[0021] In another example, the method further includes determining whether the lottery play record being validated was presented for payment if the presentment digital signature matches the play digital signature.

[0022] While multiple embodiments are disclosed, still other embodiments of the present invention will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative embodiments of the invention. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not restrictive.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The variations will be more readily understood in view of the following description when accompanied by the below figures and wherein like reference numerals represent like elements, wherein:

[0024] FIG. **1** is a schematic diagram of a lottery transaction processing system in accordance with embodiments of the present disclosure;

[0025] FIG. **2** is a schematic diagram of a play generation unit of the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure;

[0026] FIG. **3** is a schematic diagram of a play redemption unit of the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure;

[0027] FIG. **4** is a schematic diagram of a gaming system server of the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure;

[0028] FIG. **5** is a schematic diagram of a lottery internal control system of the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure;

[0029] FIG. **6** is a flow chart of a first validation process method using the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure; and

[0030] FIG. **7** is a flow chart of a second validation process method using the lottery transaction processing system of FIG. **1** in accordance with embodiments of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0031] Preferred embodiments of the present disclosure are described below by way of example only, with reference to the accompanying drawings. Further, the following description is merely exemplary in nature and is in no way intended to limit the disclosure, its application, or uses. As used herein, the term “module” or “unit” may refer to, be part of, or include an Application Specific Integrated Circuit (ASIC), an electronic circuit, a processor or microprocessor (shared, dedicated, or group) and/or memory (shared, dedicated, or group) that executes one or more software or

firmware programs, a combinational logic circuit, and/or other suitable components that provide the described functionality. Thus, while this disclosure includes particular examples and arrangements of the modules, the scope of the present system should not be so limited since other modifications will become apparent to the skilled practitioner.

[0032] Referring now to FIG. **1**, a lottery transaction processing system **10** provides, in real time, an efficient way to issue, validate, and redeem lottery tickets. The lottery transaction processing system **10** includes a terminal **12** communicably connected to a gaming system (GS) server such as **28**A, **28**B, **28**C (also designated **28** for any one of GS servers) via a network **24**. The terminal **12** issues lottery tickets to users and redeems lottery tickets presented by users for payout. For example, terminals such as **12** can be installed as a point-of-sale terminal at retail stores.

[0033] The GS servers **28**A-**28**C are commonly provided by a different lottery operating jurisdiction (e.g., individual state lottery systems) to manage lottery games played in the jurisdiction by authorizing the issuance of lottery tickets and performing the validation and redemption of the lottery tickets. In one embodiment, the GS server **28**A is associated with the state lottery system of a first jurisdiction (e.g., Illinois), the GS server **28**B is associated with the state lottery system of a second jurisdiction (e.g., Michigan), and the GS server **28**C is associated with the state lottery system of a third jurisdiction (e.g., Ohio). In some embodiments, each jurisdiction can have one or more GS servers **28**. Each of the GS servers **28**A, **28**B, **28**C is connected to a respective lottery internal control system (ICS) **30**A, **30**B, **30**C (also designated **30** for any one of ICSs) via a respective network **32**A, **32**B, **32**C. The ICSs **30**A-**30**C provide support services to audit lottery ticket transactions including monitoring, logging, verifying, and balancing the transactions in real, or near-real time. In another example, each ICS **30**A, **30**B, **30**C performs the validation and redemption of the lottery tickets in conjunction with a corresponding GS server **28**A, **28**B, **28**C. While only three GS servers and ICSs are shown in FIG. **1**, any number of GS servers and/or ICSs may be contemplated in other embodiments.

[0034] When a user, in a given jurisdiction, decides to play the lottery, the user proceeds to purchase a lottery ticket. In one embodiment, the user can purchase the lottery ticket using the terminal **12**, which is configured to communicate with a GS server **28** of the given jurisdiction's lottery system (e.g., GS server **28**A) to process the transaction. The terminal **12** includes a play control unit **14** configured to control at least a portion of the lottery ticket transaction.

[0035] In another embodiment, the user can purchase the lottery ticket using a mobile device **26** (e.g., a smartphone) or any other computing device (e.g., a laptop, a desktop, a tablet, a smartwatch, etc.). In this scenario, the functionality of the play control unit **14** is provided by the GS server **28**A. For example, the GS server **28**A includes a web server **29**A hosting a website that can be accessed by the mobile device **26** using, for example, a uniform resource locator (URL). The web server **29**A is configured to receive and process lottery ticket transaction requests from the mobile device **26** via the network **24**. Accordingly, the web server **29**A can be used for the electronic issuance of the lottery ticket to the mobile device **26**. The web server **29**A can be implemented as part of the GS server **28**A or can be implemented in dedicated hardware coupled to the GS server **28**A via local networks. In general, each of the GS servers **28**A, **28**B, **28**C can have a respective web server **29**A, **29**B, **29**C (also designated **29** for any one of web servers) as shown in FIG. **1**.

[0036] Any suitable communication network is contemplated for the network **24** as well as the networks **32**A-**32**C. For example, the terminal **12** and/or the mobile device **26** can be communicably connected to a GS server **28** via the Internet **24**. As another example, the GS servers **28**A-**28**C can be communicably connected to the ICSs **30**A-**30**C via LANs **32**A-**32**C. Other similar communication networks known in the art are also contemplated.

[0037] To issue the lottery ticket, a lottery play request is received. In one example, the lottery play request is received at the terminal **12** from the user. As such, the play control unit **14** includes a play generation unit **16**, which is a lottery play generation processor configured to receive the lottery play request and issue the lottery ticket. Interactions between the terminal **12** and the user is

managed by a human machine interface (HMI), such as a keyboard, a touch sensitive pad or screen, a mouse, a trackball, a voice recognition system, and the like. In another example, the lottery play request is received at the web server **29**A from the mobile device **26** via the network **24**.

[0038] The play generation unit **16** is configured to generate play information P including a unique play serial number N, and a play random number key K. In one embodiment, the play information P includes the unique play serial number N and other play data such as draw numbers selected by the user, draw numbers selected by the play generation unit **16** (e.g., if the user does not request specific draw numbers), a draw date, and the like. The play random number key K can be generated using conventional or otherwise known random number generation methods.

[0039] The play generation unit **16** is configured to generate a play digital signature S as a function of the play information P and the play random number key K. In one example, the play generation unit **16** uses a hash-based message authentication code (HMAC) method to generate the play digital signature S based on the play information P and the play random number key K. Other suitable cryptographic methods, such as tag authentication techniques, are also contemplated.

[0040] The play generation unit **16** is configured to transmit the play information P and the play digital signature S, but not the play random number key K, via the network **24**, to a corresponding GS server **28** for storage. The corresponding GS server **28** in turn transmits the play information P and the play digital signature S to an ICS **30** associated with the corresponding GS server **28** for further storage.

[0041] When the corresponding GS server **28** authorizes the issuance of the lottery ticket, the play generation unit **16** issues a lottery play record that includes the play information P and the play random number key K. The play information P including the unique play serial number N, and the play random number key K can be shown on the lottery play record as text and/or as a barcode. Issuing the lottery play record includes printing a physical lottery ticket and/or transmitting an electronic lottery ticket. When using the terminal **12**, the play generation unit **16** causes a printer **20** to print a physical copy of the lottery play record. On the other hand, when using the mobile device **26**, the web server **29** causes an electronic copy of the lottery play record to be transmitted to the mobile device **26**.

[0042] To redeem the lottery ticket, lottery redemption information is received. As such, the control unit **14** includes a play redemption unit **18**, which is a lottery redemption processor configured to receive the lottery redemption information. At the time of redemption, the lottery play record, either in the form of a physical lottery ticket or an electronic lottery ticket stored in a device such as the mobile device **26**, is presented by the user and scanned using a scanner **22** to read information on the lottery play record. For example, the scanner **22** can read a barcode on the lottery play record.

[0043] In one embodiment, the play redemption unit **18** is configured to receive a redemption serial number N′ and a redemption random number key K′ (e.g., contained in a barcode) of the presented lottery play record to be validated by the lottery redemption unit **18**. For validation purposes, the lottery redemption unit **18** transmits the redemption serial number N′ and the redemption random number key K′ via the network **24** to the corresponding GS server **28**. In another embodiment, the play redemption unit **18** is configured to receive only the redemption serial number N′ from the presented lottery play record to be validated by the lottery redemption unit **18**. In this case, the lottery redemption unit **18** transmits only the redemption serial number N′ via the network **24** to the corresponding GS server **28** for validation purposes.

[0044] Referring now to FIG. **2**, an exemplary configuration of the play generation unit **16** is shown. The play generation unit **16** includes an interface unit **100**, a generation unit **102**, a transmission unit **104**, an authorization unit **106**, an alert unit **108**, a storing unit **110**, and a print unit **112**. Although these sub-units **100**-**112** are illustrated as children modules subordinate of the parent unit **16**, each sub-unit can be operated as a separate unit from the parent unit **16**, and other suitable combinations of sub-units are contemplated to suit different applications. One or more

modules or units can be selectively bundled as a key software model running on the processor having software as a service (SaaS) features.
[0045] Relevant information can be stored in a database **114** (e.g., as a non-transitory data storage device and/or a machine-readable data storage medium carrying computer-executable instructions) for retrieval by the play generation unit **16** and its children units or modules.
[0046] The interface unit **100** is configured to provide an interface between the play generation unit **16**, the database **114**, and the network **24**. The interface unit **100** controls operation of, for example, the network **24**, the printer **20**, the scanner **22**, and other related system devices, services, and applications. The other devices, services, and applications may include, but are not limited to, one or more software or hardware components, etc., related to the terminal **12**. The interface unit **100** also receives data or information from a corresponding GS server **28**, which are communicated to the respective modules, such as the play generation unit **16** and its children units.
[0047] The generation unit **102** is configured to receive the lottery play request. The generation unit **102** is configured to generate the play information P including the unique play serial number N, and the play random number key K. The generation unit **102** is also configured to generate the play digital signature S as a function of the play information P and the play random number key K.
[0048] The transmission unit **104** is configured to transmit data or information relevant to the lottery play request to other units **100**, **106**, **108**, **110**, and facilitate the delivery of the data or information to the corresponding GS server **28** via the network **24**. For example, using the interface unit **100**, the transmission unit **104** transmits the play information P and the play digital signature S (except the play random number key K) via the network **24** to the corresponding GS server **28** for storage.
[0049] The authorization unit **106** is configured to receive an authorization from the corresponding GS server **28** to issue the lottery play record. In response to receiving the authorization, the print unit **112** issues the lottery play record including the play information P and the play random number key K. In one embodiment, the issuance of the lottery play record includes one or both of printing a physical lottery ticket record and transmitting an electronic lottery ticket record to another device via the network **24**.
[0050] The alert unit **108** is configured to inform the user or other systems of any detected errors during operation. One or more warning messages are sent by the alert unit **108** to a mobile device (e.g., mobile device **26**) or any computing device to alert the user. It is also contemplated that when one or more errors are detected, the alert unit **108** displays or prints relevant data or information such as a timestamp or a location of the terminal **12**.
[0051] The storing unit **110** is configured to store relevant information related to the lottery play request in the database **114**. In one embodiment, the storing unit **110** receives the play information P and the play digital signature S from the transmission unit **104**, which were generated by the generation unit **102**, and stores them (i.e., P, S) in the database **114** using the interface unit **100**. In one embodiment, the database **114** is part of the terminal **12**. In another embodiment, the database **114** is part of the corresponding GS server **28**. For example, the corresponding GS server **28** receives the play information P and the play digital signature S from the play generation unit **16** and stores them in the database **114**.
[0052] Further, the corresponding GS server **28** is configured to transmit the play information P and the play digital signature S via the network **32** to an ICS **30** associated with the corresponding GS server **28** for further storage. As is the case with the GS server **28**, the ICS **30** receives the play information P and the play digital signature S (but not the random number key K) and stores them in a database **114** of the ICS **30** (which can be a different database than the database of the corresponding GS server **28**). As such, the database **114** can be located independently or separately in any of the terminal **12**, the GS server **28**, and the ICS **30**. In another example, the database **114** can a central storage shared by any of the terminal **12**, the GS server **28**, and the ICS **30**. In various embodiments, the database **114** includes aggregated information including timestamps, location

data, and analysis data about errors, users, issuance, and redemption events for purposes of algorithm research and development.

[0053] Referring now to FIG. **3**, an exemplary configuration of the play redemption unit **18** is shown. The play redemption unit **18** includes an interface unit **200**, a receiving unit **202**, a transmission unit **204**, a validation unit **206**, an alert unit **208**, a storing unit **210**, and a scan unit **212**. Although these sub-units **200**-**212** are illustrated as children modules subordinate of the parent unit **18**, each sub-unit can be operated as a separate unit from the parent unit **18**, and other suitable combinations of sub-units are contemplated to suit different applications.

[0054] The interface unit **200** operates similarly with the interface unit **100**. During redemption, the scan unit **212** scans the lottery play record presented by the user using the scanner **22** to read information on the lottery play record. In one embodiment, the receiving unit **202** is configured to receive the redemption serial number N′ and the redemption random number key K′ contained in a barcode of the presented lottery play record.

[0055] The validation unit **206** is configured to perform a validation process of the presented lottery play record. Accordingly, the validation unit **206** instructs the transmission unit **204** to transmit the redemption serial number N′ and the redemption random number key K′ via the network **24** to the corresponding GS server **28**. In another embodiment, the receiving unit **202** is configured to receive only the redemption serial number N′ from the presented lottery play record. In this case, the validation unit **206** instructs the transmission unit **204** to transmit only the redemption serial number N′ via the network **24** to the corresponding GS server **28** for validation.

[0056] The alert unit **208** is configured to inform the user or other systems of any detected errors during the validation process. The storing unit **210** is configured to store relevant information related to the validation process in a database **214**, which can be the same as the database **114** in FIG. **2** or can be a different database that operates similarly to the database **114**.

[0057] Referring now to FIG. **4**, an exemplary configuration of a GS server **28** is shown. The GS server **28** includes an interface unit **300**, a retrieving unit **302**, a transmission unit **304**, a confirmation unit **306**, an alert unit **308**, a storing unit **310**, and a web server unit **312**. Although these sub-units **300**-**312** are illustrated as children modules subordinate of the parent unit **28**, each sub-unit can be operated as a separate unit from the parent unit **28**, and other suitable combinations of sub-units are contemplated to suit different applications.

[0058] The interface unit **300** operates similarly with the interface units **100** and **200**. During the validation process, the retrieving unit **302** is configured to receive, via the network **24**, the redemption serial number N′ of the lottery ticket (or both the redemption serial number N′ and the redemption random number key K′) from the play redemption unit **18**. The retrieving unit **302** retrieves the play information P and the play digital signature S associated with the received redemption serial number N′ (or both the received redemption serial number N and the redemption random number key K′) from the database **114**.

[0059] The transmission unit **304** is configured to transmit data or information relevant to the lottery play record to other units **300**, **306**, **308**, **310**, **312** and facilitate the delivery of the data or information to/from the GS server **28** via the network **24** and/or to/from an ICS **30** via the network **32**.

[0060] The confirmation unit **306** is configured to generate a validation digital signature S′ as a function of the play information P retrieved from a database **314** and the redemption random number key K′ of the lottery play record to be validated. The database **314** can be the same as the database **114** in FIG. **2** or can be a different database that operates similarly to the database **114**. The confirmation unit **306** is configured to compare the validation digital signature S′ to the play digital signature S to validate the authenticity of the lottery play record being validated. If the validation digital signature S′ matches the play digital signature S, then the redemption random number key K′ matches the play random number key K. This means that the lottery play record being validated is authentic. However, if the validation digital signature S′ does not match the play

digital signature S, then the redemption random number key K′ does not match the play random number key K. In this case, the lottery play record being validated is not authentic. If the lottery play record is determined to be not authentic, the confirmation unit **306** generates an error message (e.g., “please visit lottery office for payment”) to send to the play redemption unit **18** to notify the user.

[0061] The alert unit **308** is configured to inform the user or other systems of any detected errors during the validation process (e.g., if the lottery play record was determined to be not authentic). The storing unit **310** is configured to store relevant information related to the validation process in the database **314**.

[0062] In embodiments where the user purchases a lottery ticket using the mobile device **26**, some functionalities of the play generation unit **16** (e.g., functionality of the generation unit **102**) are provided by the GS server **28** in the web server unit **312**. As such, the web server unit **312** is configured to receive the lottery play request from the mobile device **26**, and generate the play information P and the play random number key K. The web server unit **312** is further configured to generate the play digital signature S as a function of the play information P and the play random number key K. The web server unit **312** also authorizes the issuance of the lottery play record to the mobile device **26**.

[0063] Referring now to FIG. **5**, an exemplary configuration of an ICS **30** is shown. The ICS **30** includes an interface unit **400**, a retrieving unit **402**, a transmission unit **404**, a presentment confirmation unit **406**, an alert unit **408**, and a storing unit **410**. Although these sub-units **400**-**410** are illustrated as children modules subordinate of the parent unit **30**, each sub-unit can be operated as a separate unit from the parent unit **30**, and other suitable combinations of sub-units are contemplated to suit different applications.

[0064] The interface unit **400** operates similarly with the interface units **100**, **200** and **300**. During the validation process, the retrieving unit **402** is configured to receive via the network **32** the play information P and the play digital signature S transmitted from the GS server **28**, using the transmission unit **404**. The retrieving unit **402** can store the received play information P and play digital signature S in a database **414**, which can be the same as the database **114** in FIG. **2** or can be a different database that operates similarly to the database **114**.

[0065] The transmission unit **404** is configured to transmit data or information relevant to the lottery play record to other units **400**, **406**, **408**, **410** and facilitate the delivery of the data or information to/from the GS server **28** via the network **32**. For example, the transmission unit **304** of the GS server **28** transmits the play information P and the play digital signature S via the network **32** to the ICS **30** for storage in the database **414**. When the confirmation unit **306** of the GS server **28** determines that the validation digital signature S′ and the play digital signature S are identical, the transmission unit **304** transmits the redemption serial number N′ and the redemption random number key K′ of the lottery play record to the ICS **30**. The retrieving unit **402** retrieves the play information P and the play digital signature S associated with the redemption serial number N′ from the database **414** using the transmission unit **404**.

[0066] The presentment confirmation unit **406** is configured to generate a presentment digital signature S″ as a function of the play information P retrieved from the database **414** by the ICS **30** and the redemption random number key K′. The presentment confirmation unit **406** is configured to compare the presentment digital signature S″ to the play digital signature S retrieved from the database **414** to validate presentment of the lottery play record being validated. If the presentment digital signature S″ matches the play digital signature S, the lottery play record being validated can be paid out to the user. However, if the presentment digital signature S″ does not match the play digital signature S, the lottery play record being validated may not be paid out to the user.

[0067] The alert unit **408** is configured to inform the user or other systems of any detected errors during the validation process (e.g., if the payout cannot be made). The storing unit **410** is configured to store relevant information related to the validation process in the database **414**.

[0068] Referring now to FIG. **6**, an exemplary first validation process method using the lottery transaction processing system **10** is shown. Although the following steps are primarily described with respect to the embodiments of FIGS. **1**-**5**, it should be understood that the steps within the method may be modified and executed in a different order or sequence without altering the principles of the present disclosure.

[0069] The method begins at step **500**. In step **502**, the scan unit **212** of the play redemption unit **18** reads a barcode on a lottery play record presented by a user for redemption. For example, the barcode includes the redemption serial number N′ and the redemption random number key K′ of the lottery play record to be validated.

[0070] In step **504**, the validation unit **206** instructs the transmission unit **204** to transmit the redemption serial number N′ and the redemption random number key K′ via the network **24** to a corresponding GS server **28**. In step **506**, the retrieving unit **302** of the corresponding GS server **28** retrieves the play information P and the play digital signature S from the database **314** using the redemption serial number N′. In step **508**, the confirmation unit **306** of the corresponding GS server **28** generates the validation digital signature S′ as a function of the retrieved play information P and the redemption random number key K′. For example, the validation digital signature S′ can be calculated using the HM AC method based on the play information P and the redemption random number key K′.

[0071] In step **510**, the confirmation unit **306** of the corresponding GS server **28** compares the validation digital signature S′ to the play digital signature S to validate the authenticity of the lottery play record being validated. If the validation digital signature S′ matches the play digital signature S, the method proceeds to step **512**. Otherwise, the method returns to step **502**. In step **512**, the transmission unit **304** of the corresponding GS server **28** transmits the redemption serial number N′ and the redemption random number key K′ of the lottery play record to an ICS **30** associated with the corresponding GS server **28**.

[0072] In step **514**, the retrieving unit **402** of the ICS **30** retrieves the play information P and the play digital signature S in the database **414** using the redemption serial number N′. In step **516**, the presentment confirmation unit **406** of the ICS **30** generates the presentment digital signature S″ as a function of the play information P retrieved from the database **114** and the redemption random number key K′. In step **518**, the presentment confirmation unit **406** compares the presentment digital signature S″ to the play digital signature S retrieved from the database **414** to validate presentment of the lottery play record being validated. If the presentment digital signature S″ matches the play digital signature S, the method proceeds to step **520**. Otherwise, the method returns to step **502**.

[0073] In step **520**, the presentment confirmation unit **406** of the ICS **30** authorizes payment remittance and transmits payment remittance information, such as a payment amount and a payment date, to the confirmation unit **306** of the corresponding GS server **28**. In step **522**, the confirmation unit **306** of the corresponding GS server **28** transmits any applicable informational messages related to the validation process to the print unit **112** of the play generation unit **16** via the network **24**. The print unit **112** displays or prints the informational messages on the printer **20**. The method ends at step **524** which may include a return to step **502**. Any of steps **502**-**522** can be repeated as desired.

[0074] Referring now to FIG. **7**, an exemplary second validation process method using the lottery transaction processing system **10** is shown. Although the following steps are primarily described with respect to the embodiments of FIGS. **1**-**5**, it should be understood that the steps within the method may be modified and executed in a different order or sequence without altering the principles of the present disclosure.

[0075] The method begins at step **600**. In step **602**, the scan unit **212** of the play redemption unit **18** reads a barcode on a lottery play record presented by a user for redemption. For example, the barcode includes the redemption serial number N′ and the redemption random number key K′ of

the lottery play record to be validated.
[0076] In step **604**, the validation unit **206** instructs the transmission unit **204** to transmit the redemption serial number N′ only via the network **24** to a corresponding GS server **28**. In step **606**, the retrieving unit **302** of the corresponding GS server **28** retrieves the play information P and the play digital signature S from the database **314** using the redemption serial number N′. In step **608**, the transmission unit **304** of the corresponding GS server **28** transmits the retrieved play information P and play digital signature S to the play redemption unit **18**.
[0077] In step **610**, the receiving unit **202** of the play redemption unit **18** receives the play information P and play digital signature S from the corresponding GS server **28**. The validation unit **206** of the play redemption unit **18** then generates the validation digital signature S′ as a function of the received play information P and the redemption random number key K′. For example, the validation digital signature S′ can be calculated using the HMAC method based on the play information P and the redemption random number key K′.
[0078] In step **612**, the validation unit **206** of the play redemption unit **18** compares the validation digital signature S′ to the play digital signature S to validate the authenticity of the lottery play record being validated. If the validation digital signature S′ matches the play digital signature S, the method proceeds to step **614**. Otherwise, the method returns to step **602**. In step **614**, the transmission unit **204** of the play redemption unit **18** transmits the redemption serial number N′ and the redemption random number key K′ of the lottery play record to the corresponding GS server **28**. In step **616**, the retrieving unit **302** of the corresponding GS server **28** receives the redemption serial number N′ and the redemption random number key K′ from the play redemption unit **18** via the network **24**, and transmits the redemption serial number N′ and the redemption random number key K′ to an ICS **30** associated with the corresponding GS server **28** via the network **32**.
[0079] In step **618**, the retrieving unit **402** of the ICS **30** retrieves the play information P and the play digital signature S in the database **414** using the redemption serial number N′. In step **620**, the presentment confirmation unit **406** of the ICS **30** generates the presentment digital signature S″ as a function of the play information P retrieved from the database **414** and the redemption random number key K′. In step **622**, the presentment confirmation unit **406** compares the presentment digital signature S″ to the play digital signature S retrieved from the database **414** to validate presentment of the lottery ticket being validated. If the presentment digital signature S″ matches the play digital signature S, the method proceeds to step **624**. Otherwise, the method returns to step **602**.
[0080] In step **624**, the presentment confirmation unit **406** of the ICS **30** authorizes payment remittance and transmits payment remittance information, such as a payment amount and a payment date, to the confirmation unit **306** of the corresponding GS server **28**. In step **626**, the confirmation unit **306** of the corresponding GS server **28** transmits any applicable informational messages related to the validation process to the print unit **112** of the play generation unit **16** via the network **24**. The print unit **112** displays or prints the informational messages on the printer **20**. The method ends at step **628** which may include a return to step **602**. Any of steps **602-626** can be repeated as desired.
[0081] Embodiments of the present disclosure are described above by way of example only, with reference to the accompanying drawings. Further, the description is merely exemplary in nature and is in no way intended to limit the disclosure, its application, or uses. As used herein, the algorithms described above may refer to, be part of, or include an Application Specific Integrated Circuit (ASIC), an electronic circuit, a processor or microprocessor (shared, dedicated, or group) and/or memory (shared, dedicated, or group) that executes one or more software or firmware programs, a combinational logic circuit, and/or other suitable components that provide the described functionality. Thus, while this disclosure includes particular examples and arrangements of the units of the apparatus, the scope of the present disclosure should not be so limited since other modifications will become apparent to the skilled practitioner.

[0082] The above detailed description and the examples described therein have been presented for the purposes of illustration and description only and not for limitation. For example, the operations described can be done in any suitable manner. The methods can be performed in any suitable order while still providing the described operation and results. It is therefore contemplated that the present embodiments cover any and all modifications, variations, or equivalents that fall within the scope of the basic underlying principles disclosed above and claimed herein. Furthermore, while the above description describes hardware in the form of a processor executing code, hardware in the form of a state machine, or dedicated logic capable of producing the same effect, other structures are also contemplated. It is therefore contemplated that the present disclosure covers any and all modifications, variations or equivalents that fall within the spirit and scope of the basic underlying principles disclosed above and claimed herein.

Claims

1. A lottery transaction processing method, comprising: receiving a lottery play request by a lottery play generation processor; generating play information including a unique play serial number, and a play random number key, by the play generation processor; generating a play digital signature as a function of the play information and the play random number key by the play generation processor; transmitting the play information and the play digital signature, but not the play random number key, over a network to a gaming system server for storage by the gaming system server; and issuing a lottery play record including the play information and the play random number key by the play generation processor.