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(54) DISCOVERY AND DISTRIBUTION OF GAME SESSION INFORMATION

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Publication Classification

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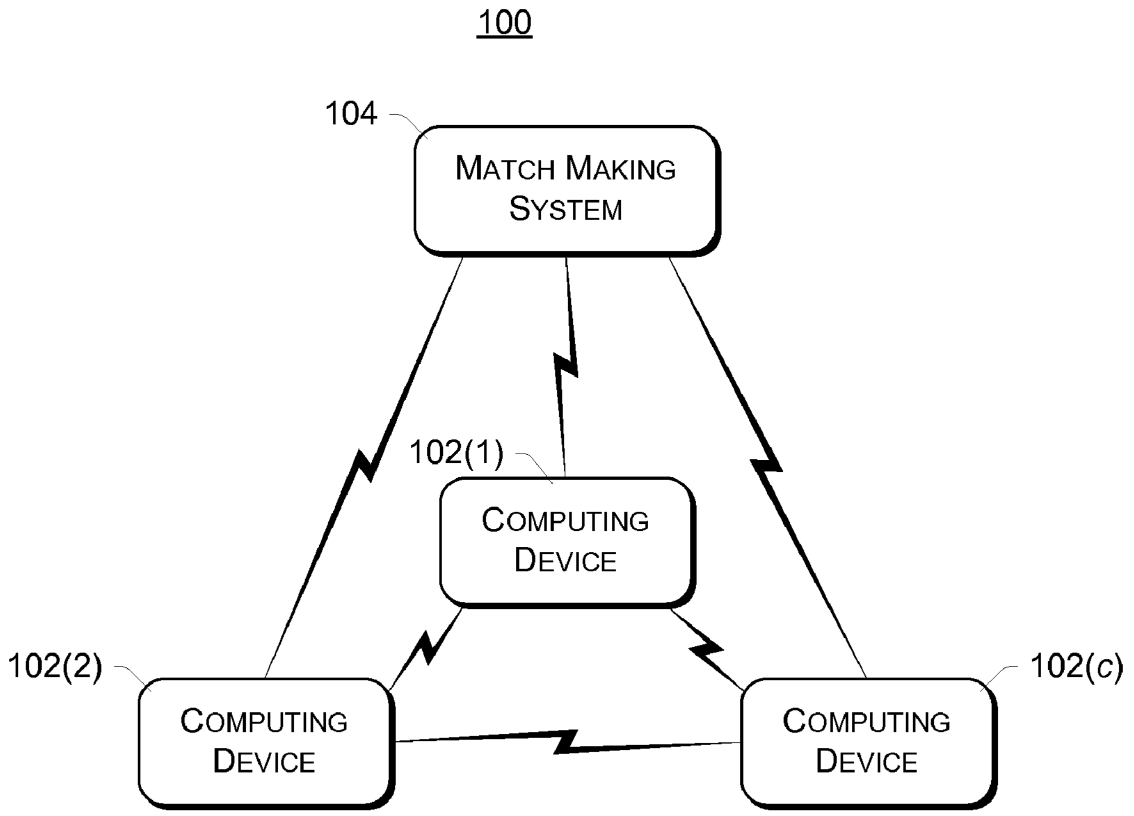
A63F 9/24 (2006.01)

(52) **U.S. Cl.** **463/29**; 463/42

(57) **ABSTRACT**

Discovery and distribution of game session security information includes receiving a request to generate a new game session from a computing device and maintaining a record of a game session identifier for the new game session and a game session key for the new game session, and making the new game session available for other computing devices to join. A request for information describing one or more of a plurality of game sessions may also be received and responded to with the information describing the one or more game sessions as well as a session key that can be used to communicate with at least one of the one or more other computing devices that are part of the game session.



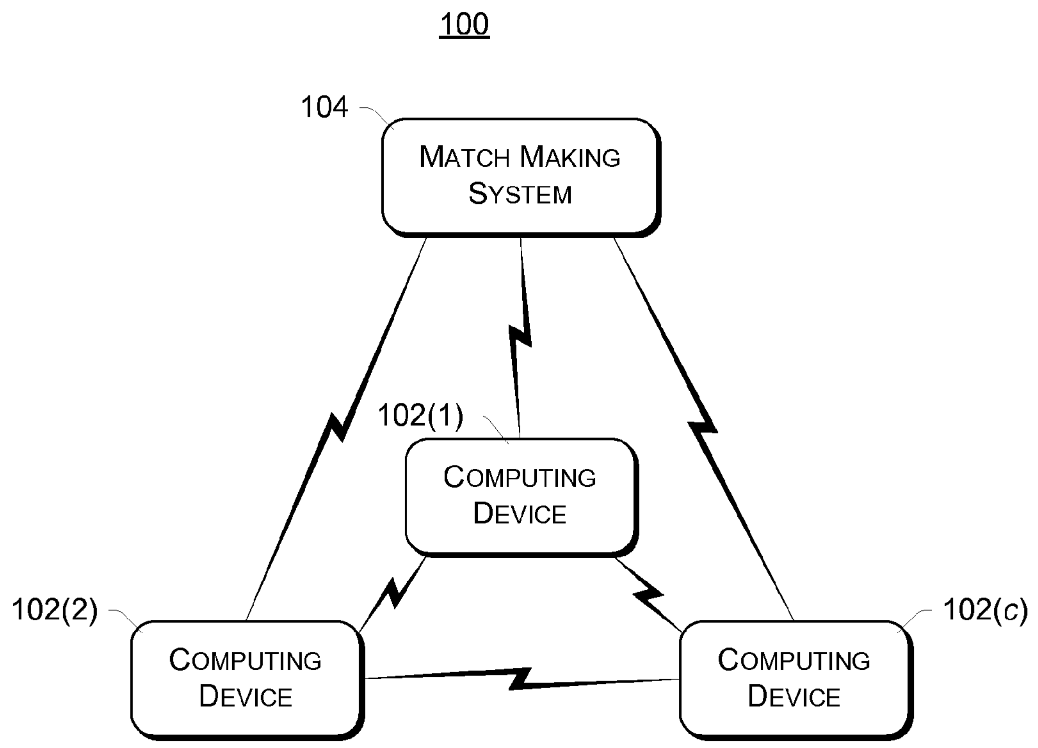

100
104
MATCH MAKING SYSTEM
102(1)
COMPUTING DEVICE
102(2)
COMPUTING DEVICE
102(c)
COMPUTING DEVICE

Fig. 1

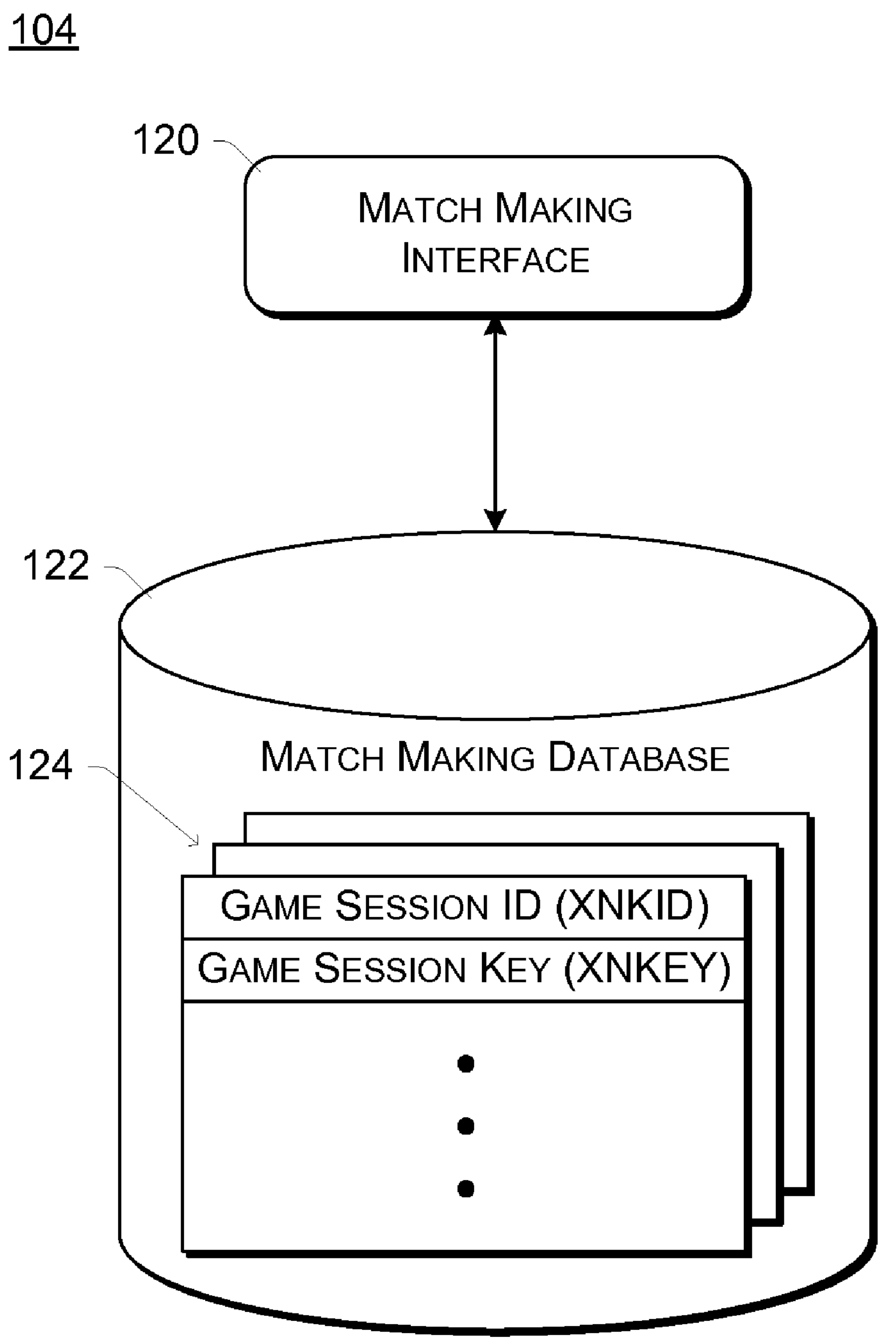

104
120
MATCH MAKING INTERFACE
122
124
MATCH MAKING DATABASE
GAME SESSION ID (XNKID)
GAME SESSION KEY (XNKEY)

Fig. 2

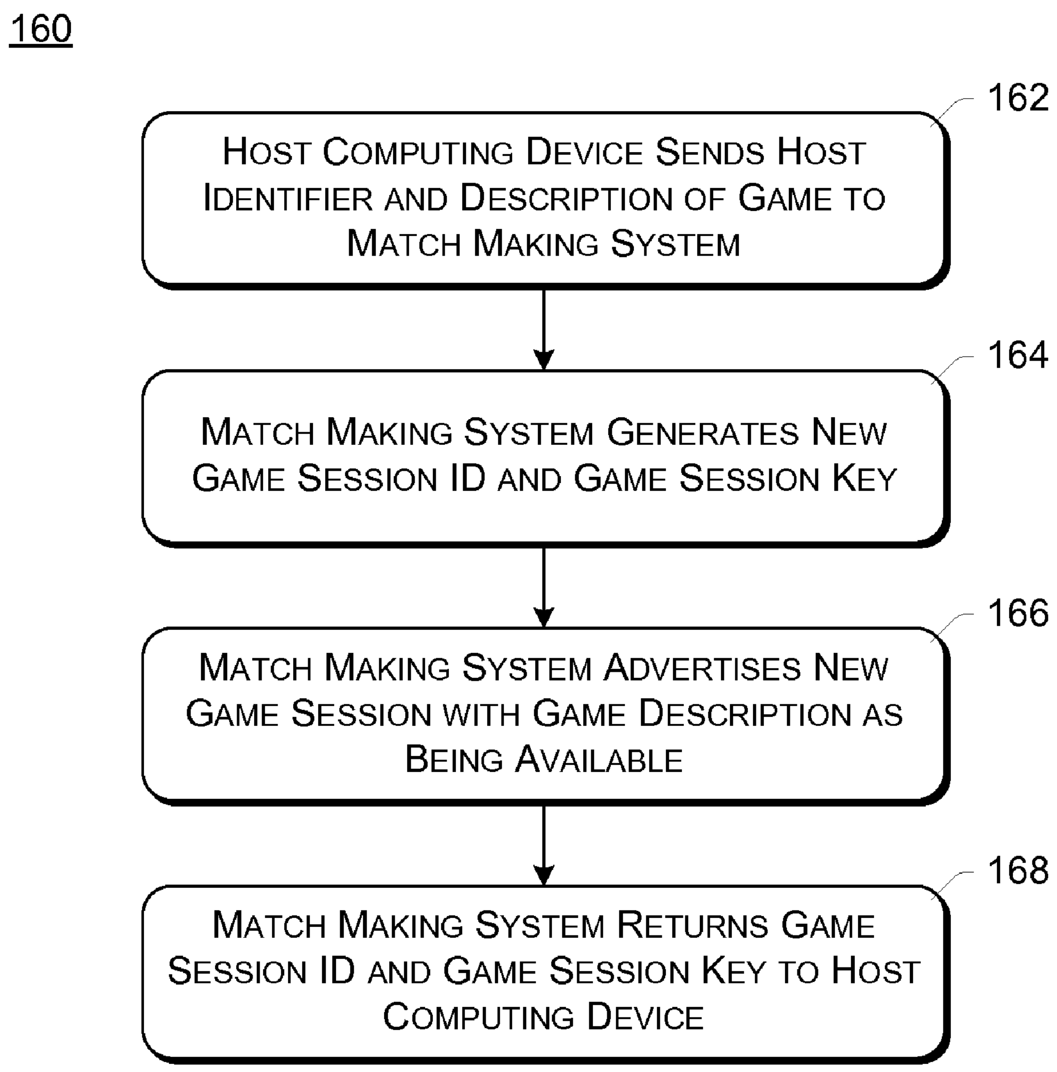

160
162
Host Computing Device Sends Host Identifier and Description of Game to Match Making System
164
Match Making System Generates New Game Session ID and Game Session Key
166
Match Making System Advertises New Game Session with Game Description as Being Available
168
Match Making System Returns Game Session ID and Game Session Key to Host Computing Device

Fig. 3

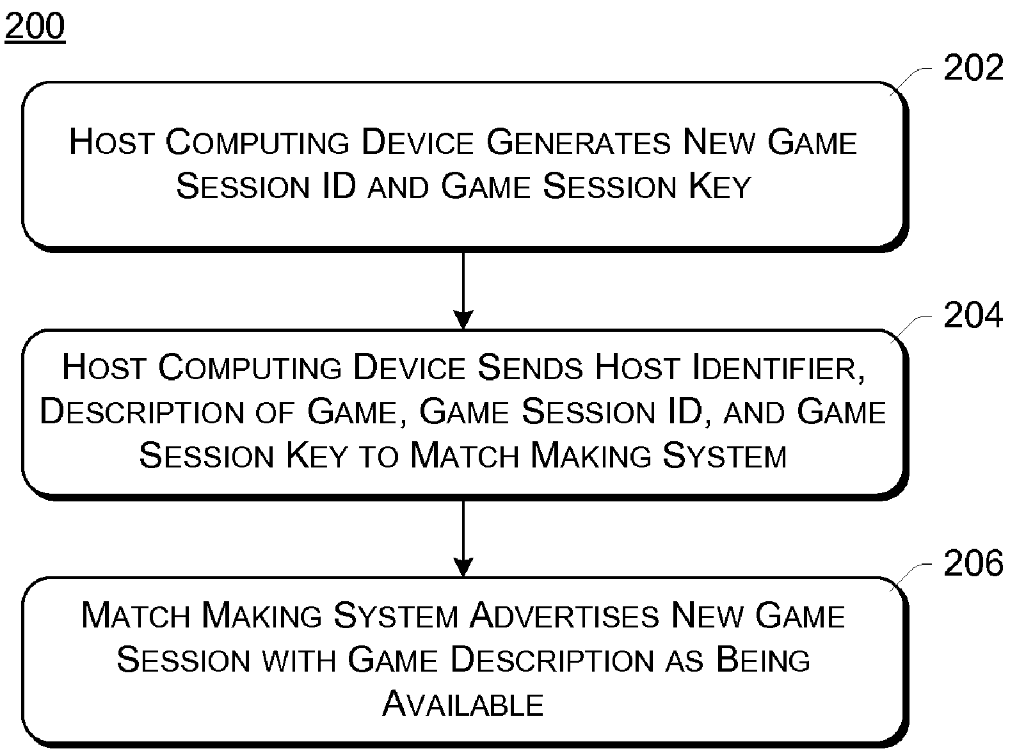

200
202
Host Computing Device Generates New Game Session ID and Game Session Key
204
Host Computing Device Sends Host Identifier, Description of Game, Game Session ID, and Game Session Key to Match Making System
206
Match Making System Advertises New Game Session with Game Description as Being Available

Fig. 4

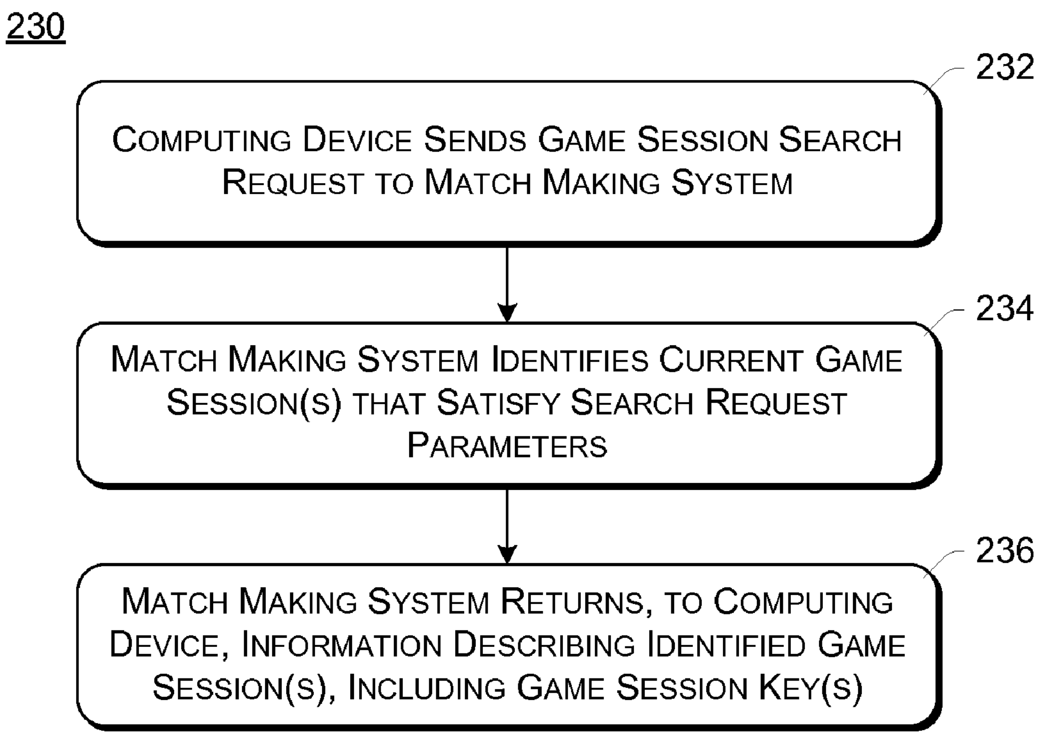

230
232
Computing Device Sends Game Session Search Request to Match Making System
234
Match Making System Identifies Current Game Session(s) that Satisfy Search Request Parameters
236
Match Making System Returns, to Computing Device, Information Describing Identified Game Session(s), Including Game Session Key(s)

Fig. 5

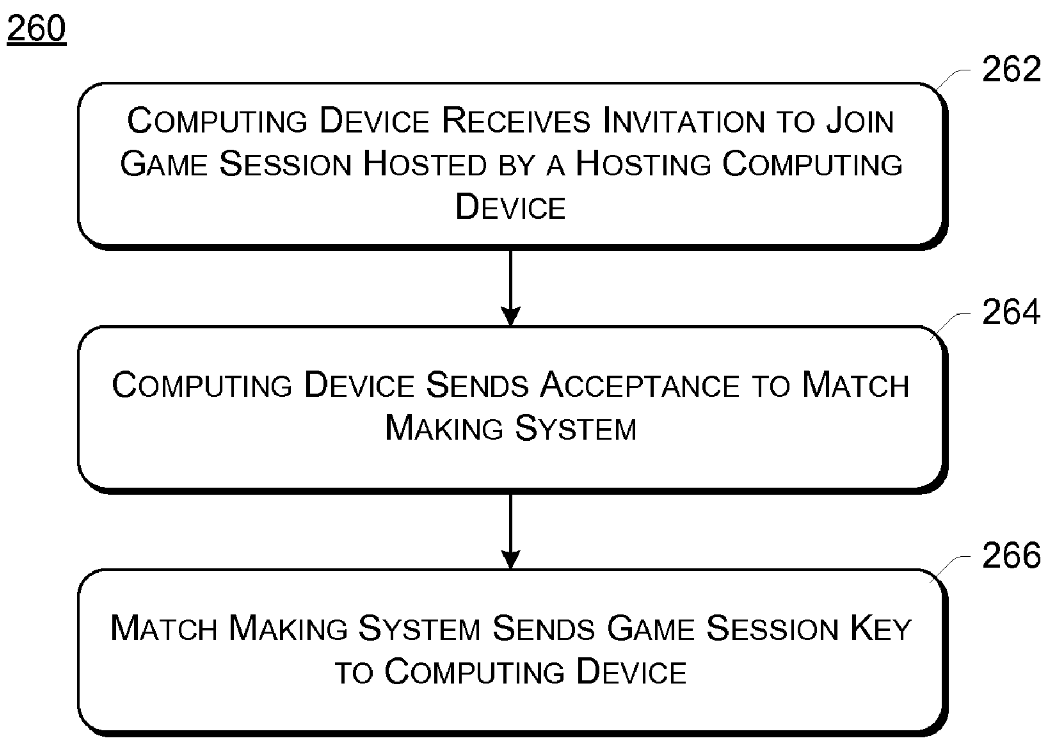

260
262
Computing Device Receives Invitation to Join Game Session Hosted by a Hosting Computing Device
264
Computing Device Sends Acceptance to Match Making System
266
Match Making System Sends Game Session Key to Computing Device

Fig. 6

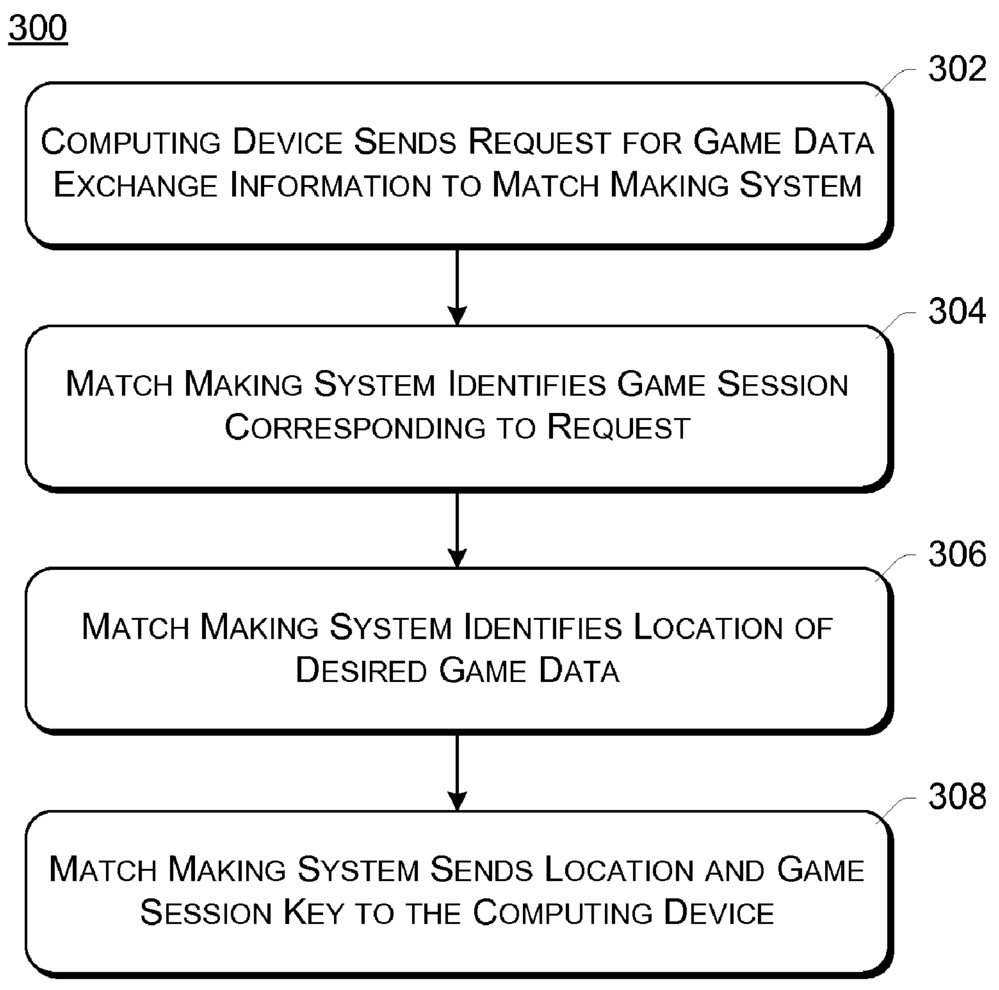

300
302
Computing Device Sends Request for Game Data Exchange Information to Match Making System
304
Match Making System Identifies Game Session Corresponding to Request
306
Match Making System Identifies Location of Desired Game Data
308
Match Making System Sends Location and Game Session Key to the Computing Device

Fig. 7

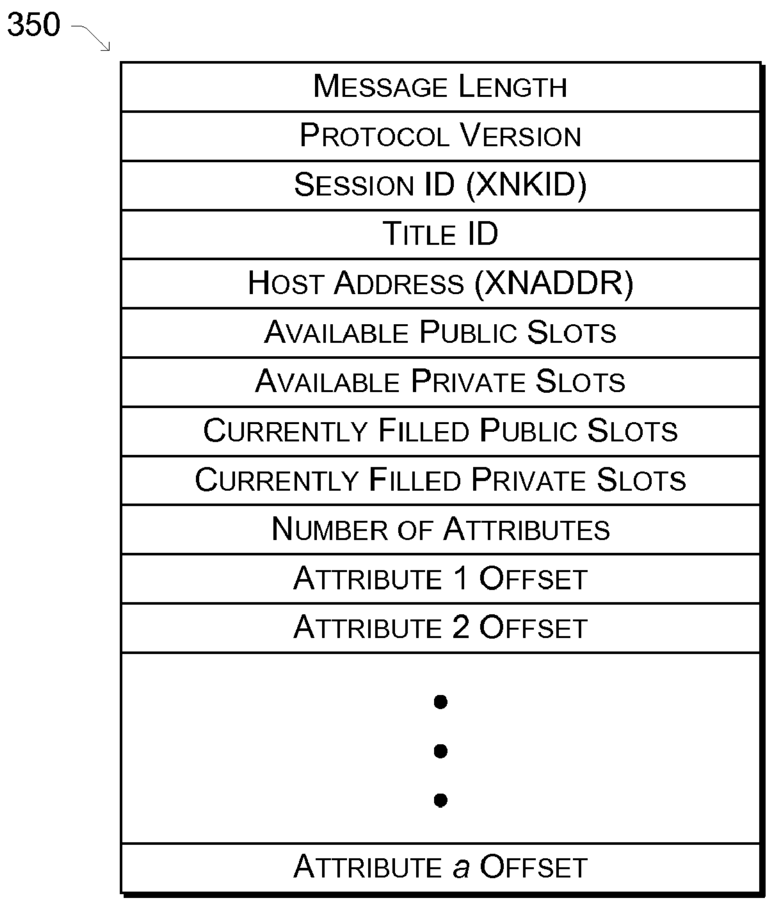

350
Message Length
Protocol Version
Session ID (XNKID)
Title ID
Host Address (XNADDR)
Available Public Slots
Available Private Slots
Currently Filled Public Slots
Currently Filled Private Slots
Number of Attributes
Attribute 1 Offset
Attribute 2 Offset
•
•
•
Attribute *a* Offset

Fig. 8

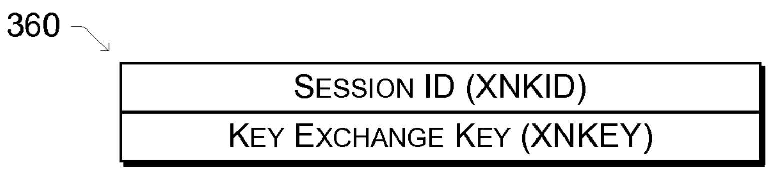

360
Session ID (XNKID)
Key Exchange Key (XNKEY)

Fig. 9

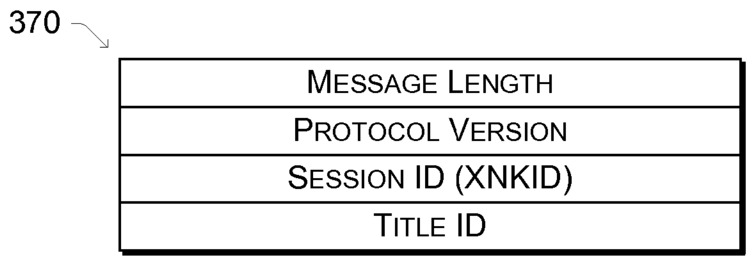

370
MESSAGE LENGTH
PROTOCOL VERSION
SESSION ID (XNKID)
TITLE ID

Fig. 10

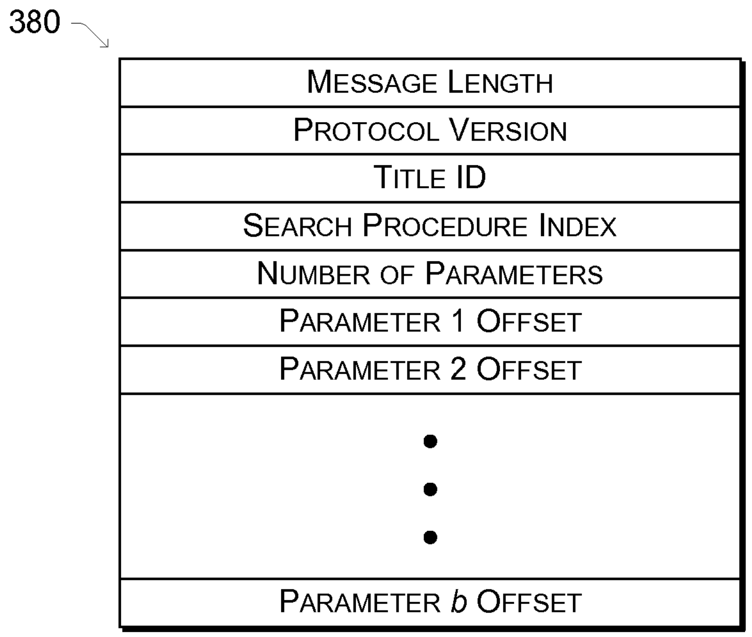

380
MESSAGE LENGTH
PROTOCOL VERSION
TITLE ID
SEARCH PROCEDURE INDEX
NUMBER OF PARAMETERS
PARAMETER 1 OFFSET
PARAMETER 2 OFFSET
PARAMETER *b* OFFSET

Fig. 11

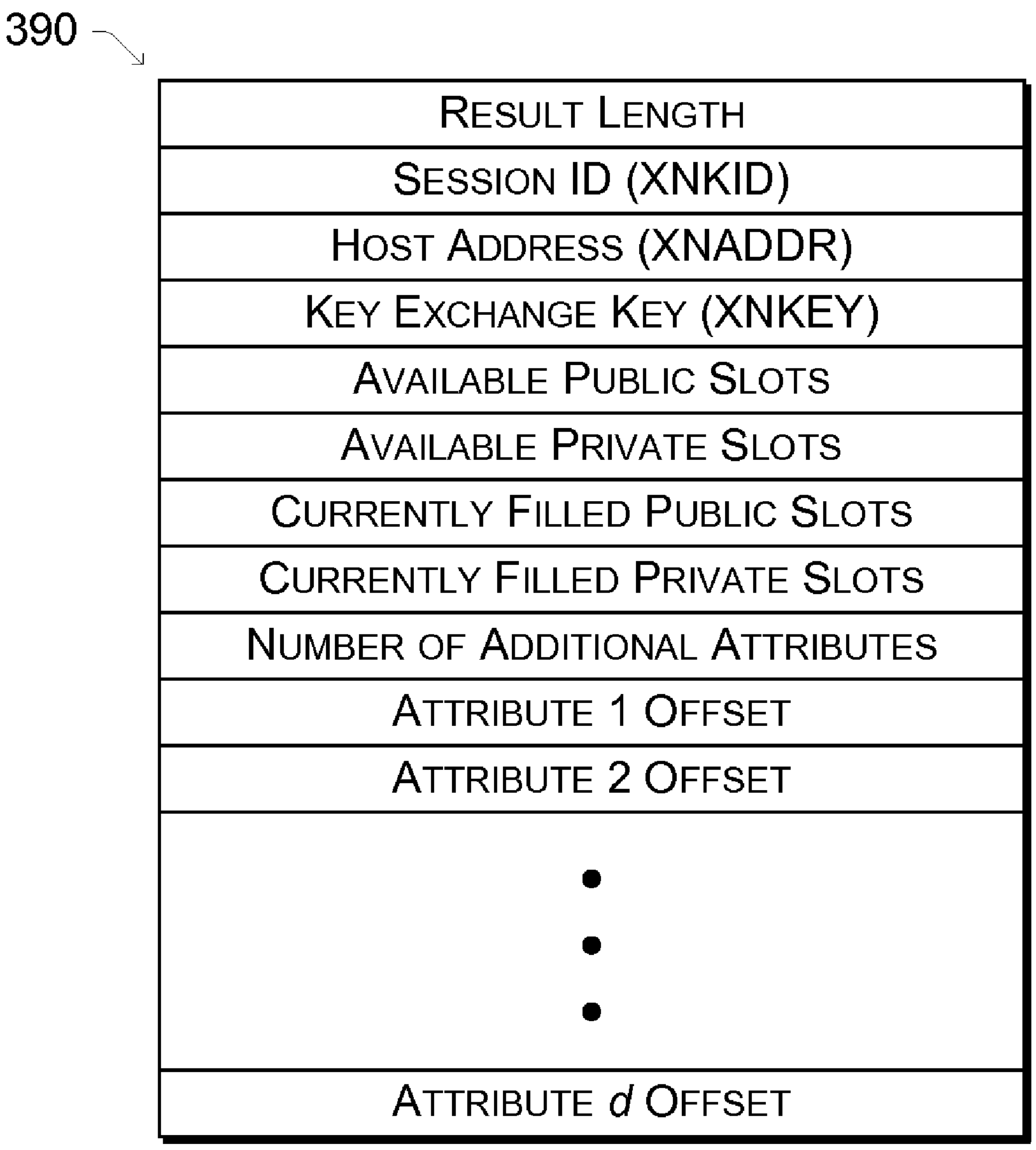

390
RESULT LENGTH
SESSION ID (XNKID)
HOST ADDRESS (XNADDR)
KEY EXCHANGE KEY (XNKEY)
AVAILABLE PUBLIC SLOTS
AVAILABLE PRIVATE SLOTS
CURRENTLY FILLED PUBLIC SLOTS
CURRENTLY FILLED PRIVATE SLOTS
NUMBER OF ADDITIONAL ATTRIBUTES
ATTRIBUTE 1 OFFSET
ATTRIBUTE 2 OFFSET
ATTRIBUTE *d* OFFSET

Fig. 12

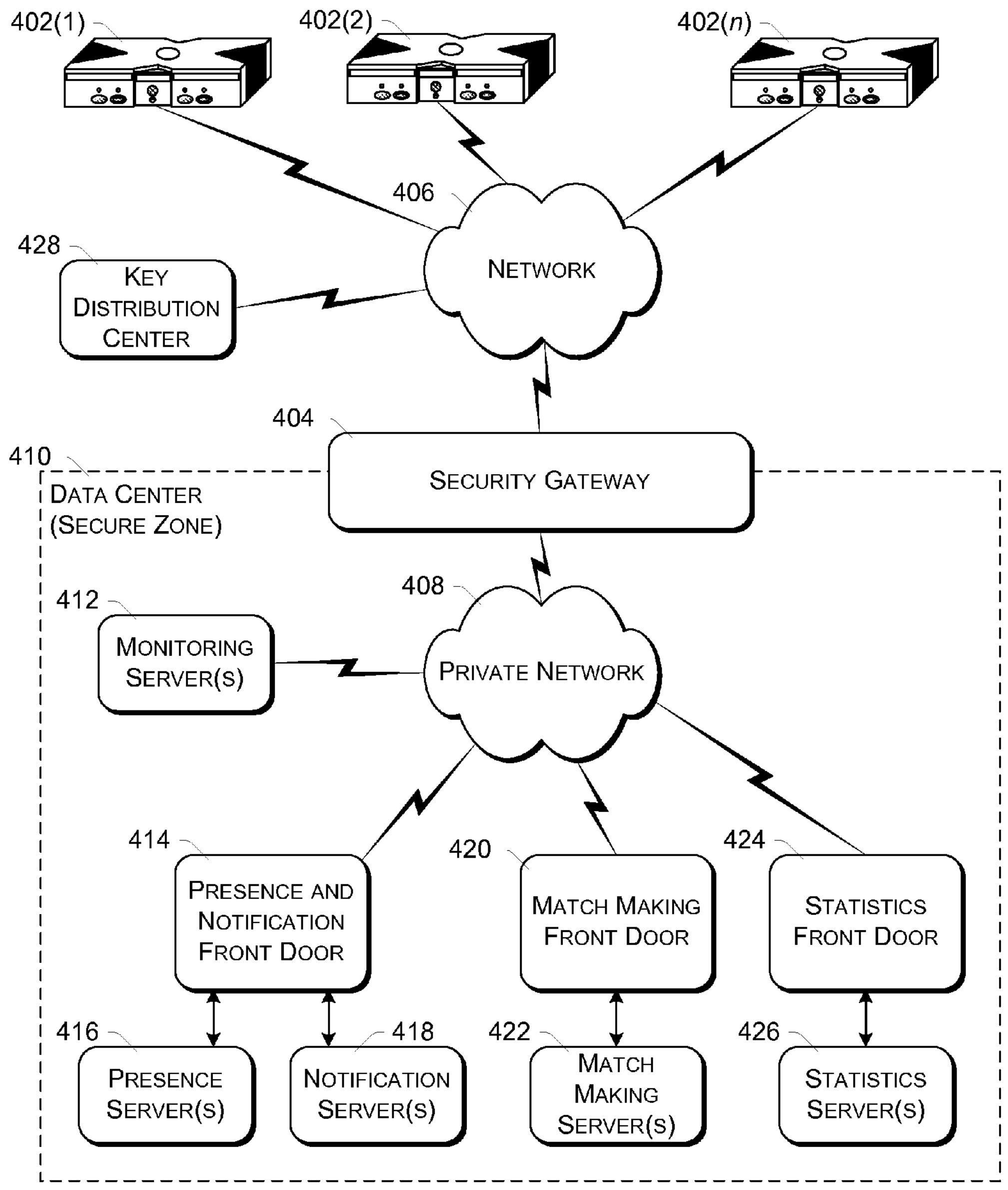

402(1)
402(2)
402(n)
406
Network
428
Key Distribution Center
404
Security Gateway
410
Data Center (Secure Zone)
408
Private Network
412
Monitoring Server(s)
414
Presence and Notification Front Door
420
Match Making Front Door
424
Statistics Front Door
416
Presence Server(s)
418
Notification Server(s)
422
Match Making Server(s)
426
Statistics Server(s)

Fig. 13

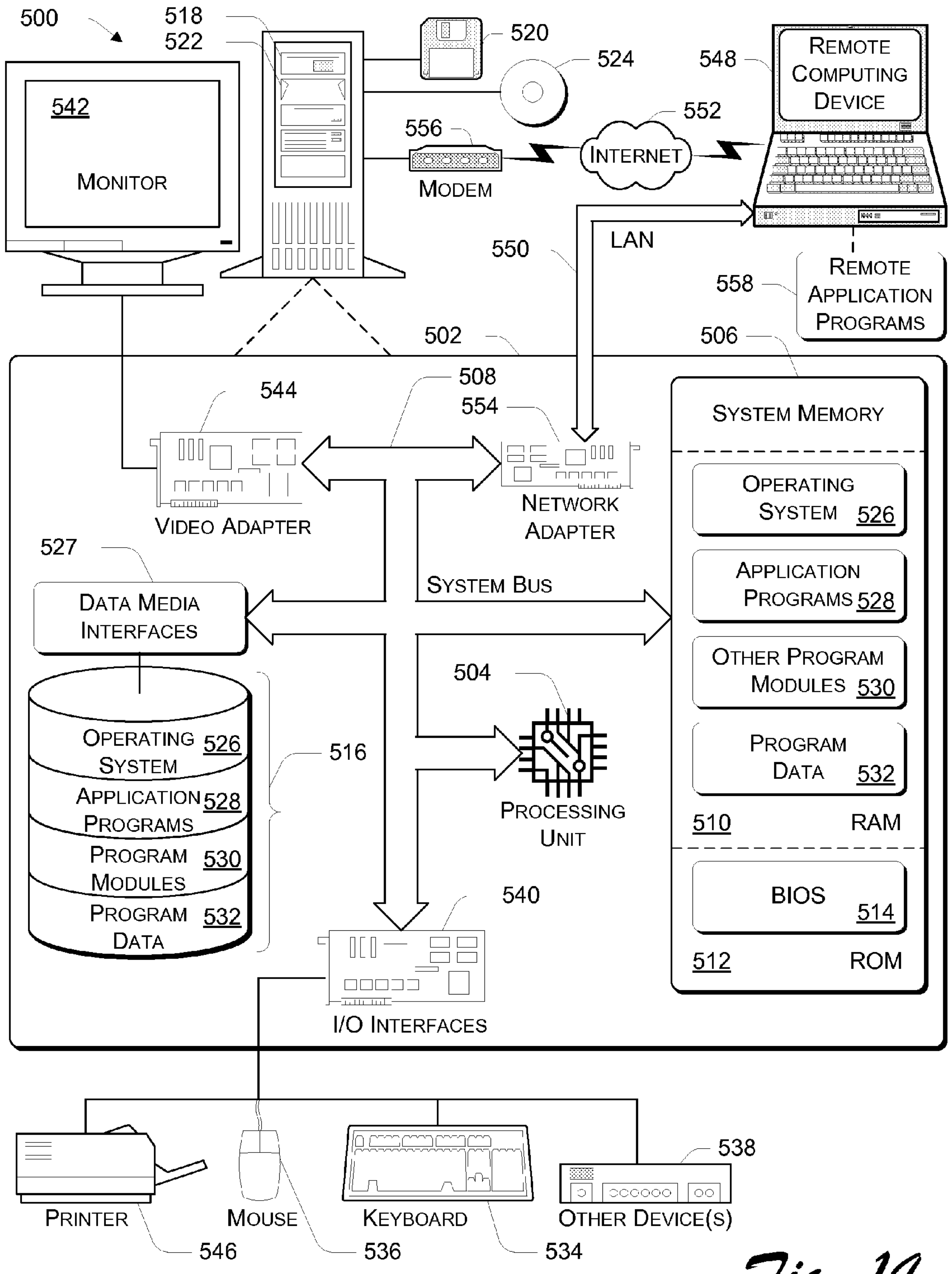

500
518
522
542
Monitor
520
524
548
Remote Computing Device
552
556
Internet
Modem
LAN
550
558
Remote Application Programs
502
506
544
508
554
System Memory
Video Adapter
Network Adapter
Operating System 526
527
Application Programs 528
System Bus
Data Media Interfaces
Other Program Modules 530
504
Operating System 526
Program Data 532
Application Programs 528
516
Processing Unit
510
RAM
Program Modules 530
540
BIOS 514
Program Data 532
512
ROM
I/O Interfaces
538
Printer
Mouse
Keyboard
Other Device(s)
546
536
534

Fig. 14

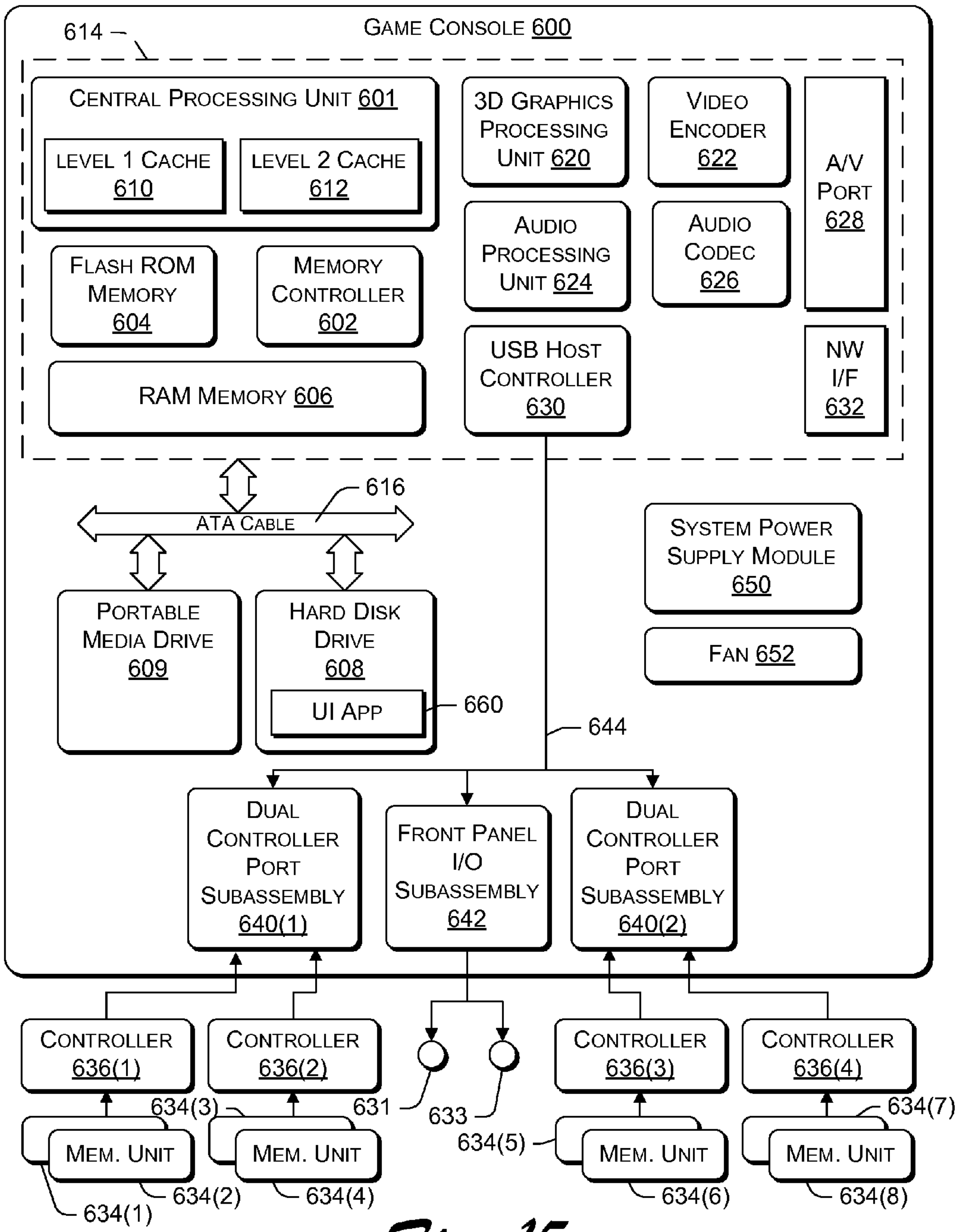

GAME CONSOLE 600
614
CENTRAL PROCESSING UNIT 601
LEVEL 1 CACHE 610
LEVEL 2 CACHE 612
3D GRAPHICS PROCESSING UNIT 620
VIDEO ENCODER 622
A/V PORT 628
AUDIO PROCESSING UNIT 624
AUDIO CODEC 626
FLASH ROM MEMORY 604
MEMORY CONTROLLER 602
RAM MEMORY 606
USB HOST CONTROLLER 630
NW I/F 632
616
ATA CABLE
SYSTEM POWER SUPPLY MODULE 650
FAN 652
PORTABLE MEDIA DRIVE 609
HARD DISK DRIVE 608
UI APP
660
644
DUAL CONTROLLER PORT SUBASSEMBLY 640(1)
FRONT PANEL I/O SUBASSEMBLY 642
DUAL CONTROLLER PORT SUBASSEMBLY 640(2)
CONTROLLER 636(1)
CONTROLLER 636(2)
CONTROLLER 636(3)
CONTROLLER 636(4)
634(3)
631
633
634(5)
634(7)
MEM. UNIT
MEM. UNIT
MEM. UNIT
MEM. UNIT
634(1)
634(2)
634(4)
634(6)
634(8)

Fig. 15

DISCOVERY AND DISTRIBUTION OF GAME SESSION INFORMATION

RELATED APPLICATIONS

[0001] This application is a continuation of and claims priority to U.S. patent application Ser. No. 10/184,225, filed Jun. 28, 2002, entitled "Discovery and Distribution of Game Session Information," which is hereby incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] This invention relates to game consoles, and particularly to discovery and distribution of game session information.

BACKGROUND

[0003] Traditionally, gaming systems with a dedicated console were standalone machines that accommodated a limited number of players (e.g., 2-4 players). Personal computer-based gaming grew in popularity in part due to the ability to play games online with many remote players over the Internet. Thus, one trend for dedicated gaming consoles is to provide capabilities to facilitate gaming over a network, such as Internet-based online gaming.

[0004] Network-based or online gaming can be implemented in a centralized-server approach or a peer-to-peer approach. In the centralized-server approach, gaming systems connect to one or more centralized servers and interact with one another via this centralized server(s). In the peer-to-peer approach, gaming systems connect to one another and interact with one another directly. However, even in the peer-to-peer approach, a centralized server(s) may be employed to assist in the communication.

[0005] One problem encountered in employing such a centralized server(s) is to protect network traffic between the gaming systems from tampering or observation by other devices on the network. Gamers are notorious for developing creative cheating mechanisms, making the network traffic a ripe target for such users. Unfortunately, previous console-based gaming systems typically did not provide for secure communications with one another.

[0006] The discovery and distribution of game session information described below solves these and other problems.

SUMMARY

[0007] Discovery and distribution of game session information is described herein.

[0008] According to one embodiment, a request to generate a new game session is received from a computing device. A record of a game session identifier for the new game session and a game session key for the new game session are maintained, and the new game session is made available for other computing devices to join.

[0009] According to another embodiment, a request is received from a computing device for information describing one or more of a plurality of game sessions that are being hosted by one or more other computing devices and that are currently available for play. The request is responded to with the information describing the one or more game sessions as well as a session key that can be used to communicate with at least one of the one or more other computing devices that are part of the game session.

[0010] According to yet another embodiment, an identifier of a location where game data is stored is received from a computing device. A record of the location and a game session key are maintained, and the game data location and game session key are made available to other computing devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The same numbers are used throughout the document to reference like components and/or features.

[0012] FIG. **1** is a block diagram of an exemplary environment in which the discovery and distribution of game session information can be used.

[0013] FIG. **2** is a block diagram illustrating an exemplary match making system in additional detail.

[0014] FIG. **3** is a flowchart illustrating an exemplary process for creating a new game session.

[0015] FIG. **4** is a flowchart illustrating another exemplary process for creating a new game session.

[0016] FIG. **5** is a flowchart illustrating an exemplary process for distributing information allowing a computing device to join a game session.

[0017] FIG. **6** is a flowchart illustrating an exemplary process for distributing information allowing a computing device to join a game session it has been invited to join.

[0018] FIG. **7** is a flowchart illustrating an exemplary process for facilitating information exchange among computing devices.

[0019] FIG. **8** illustrates an exemplary message structure for communicating a game session creation request.

[0020] FIG. **9** illustrates an exemplary message structure for communicating a response to a game session creation request.

[0021] FIG. **10** illustrates an exemplary message structure for communicating a request to delete a game session

[0022] FIG. **11** illustrates an exemplary message structure for communicating a game session search request.

[0023] FIG. **12** illustrates an exemplary message structure for communicating a response to a game session search request.

[0024] FIG. **13** is a block diagram of an exemplary online gaming environment.

[0025] FIG. **14** illustrates a general computer environment, which can be used to implement the techniques described herein

[0026] FIG. **15** shows functional components of a game console in more detail

DETAILED DESCRIPTION

[0027] The discussion herein assumes that the reader is familiar with basic cryptography principles, such as encryption, decryption, authentication, hashing, and digital signatures. For a basic introduction to cryptography, the reader is directed to a text written by Bruce Schneier and entitled, "Applied Cryptography: Protocols, Algorithms, and Source Code in C," published by John Wiley & Sons, copyright **1994** (second edition 1996), which is hereby incorporated by reference.

[0028] FIG. 1 is a block diagram of an exemplary environment **100** in which the discovery and distribution of game session information can be used. Multiple computing devices **102(1)**, . . . , **102(*c*)** are coupled to a match making system **104**. The coupling between devices **102** and system **104**, as well as between devices **102**, can be any of a variety of couplings allowing communication between system **104** and each of devices **102** and/or between devices **102**. In one implementation, the coupling includes the Internet, and may also optionally include one or more other networks (e.g., a local area network (LAN) or wide area network (WAN)). For example, each of computing devices **102** may be situated on a home-based LAN and each home-based LAN coupled to system **104** via the Internet. The couplings can be implemented using any of a variety of network types and technologies, including wire and/or wireless networks.

[0029] Computing devices **102** allow their respective users to play games with one another. Online gaming typically refers to two or more game consoles communicating with one another to allow the user(s) of the consoles to play games with one another. This communicating is typically performed over the Internet, but could alternatively be over other networks as well (in place of or in addition to the Internet).

[0030] Match making system **104** maintains information about multiple game sessions being hosted by the computing devices **102**, allowing players to search for game sessions, create new game sessions, join game sessions, quit game sessions, and obtain information used by the computing devices to communicate data to one another. The hosting device of a game session is the device responsible for initiating a game session, such as by having match making system **104** (or alternatively some other device) create a new game session. A game session refers to one instance of a game title including one or more players. When all players of the game session have ended the session (e.g., quit the game session, logged out of system **104**, powered-down their devices, etc.), then the game session ends. A game session can include multiple rounds of play, or alternatively a new game session may be created for each round of play. Information regarding multiple game sessions for each of multiple different game titles can be maintained by system **104** concurrently. Players can leave (quit) a game session and join a game session. Once the session reaches a particular point in the gameplay, the ability to join the session can be restricted, or alternatively players may be able to join and leave the game session at will during gameplay, so that the players at the end of the game session can be different than the players at the beginning of the game session. Restrictions on the ability to join and leave the game session can vary by game title, based on the desires of the game title designer.

[0031] When a player using a computing device joins a game session, that computing device is also referred to as joining the game session. The device being used by each player that is playing a game session is also referred to as a member of the game session.

[0032] Computing device **102** can be a dedicated game console, a game console incorporating additional functionality (e.g., digital video recording functionality so that it can operate as a digital VCR, channel tuning functionality so that it can tune and decode television signals (whether they be broadcast signals, cable signals, satellite signals, etc.), and so forth), a desktop PC, a workstation, a portable computer, a cellular telephone, an Internet appliance, a server computer, etc. Additionally, different types of devices **102** may use match making system **104** concurrently. For example, a user on a dedicated game console may join a game session and play against a user on a portable computer, or a user on a dedicated game console manufactured by one manufacturer may join a game session and play against a user on a dedicated game console manufactured by another manufacturer.

[0033] FIG. **2** is a block diagram illustrating an exemplary match making system **104** in additional detail. Match making system **104** includes a match making interface **120** and a match making database **122**. Match making interface **120** receives requests regarding creating, joining, quitting, searching, etc. game sessions. When such a request is received, match making interface **120** generates the appropriate commands to be issued to match making database **122** in order to carry out the request. Alternatively, match making interface **120** may simply forward the requests to match making database **122**.

[0034] Match making database **122** maintains multiple records **124** storing information regarding the various game sessions that are currently being managed by match making system **104**. The game sessions managed by match making system **104** are typically those game sessions that are created by match making system **104**. Some game sessions managed by match making system **104** may be open and thus additional players can join the sessions, while other game sessions may be closed and thus additional players cannot join the sessions. The records **124** can be maintained using any of a variety of data structures. In one exemplary implementation, the information regarding each game session is stored as an entry in one of one or more tables.

[0035] Match making system **104** is designed to facilitate establishing of game sessions between or among computing devices. In most of the discussions herein, match making system **104** is described as managing game sessions but not managing the transfer of data between or among the member devices of the game session. Rather, the computing devices transfer the data between or among themselves, or via another server device (not shown in FIG. **2**). Alternatively, some game data transfer may occur via match making system **104**.

[0036] A variety of different information can be maintained in records **124** for each game session. In one implementation, this information includes at least a game session ID (XNKID) and a game session key (XNKEY). The game session ID uniquely identifies a particular game session managed by match making system **104**. The game session key is a cryptographic key associated with the game session. This cryptographic key is made available to all of the members of the game session, and is used by the members of the game session to securely communicate data to one another. It should be noted that an additional key may be used by each of the computing devices to communicate securely with match making system **104**; however, this additional key(s) is different than the game session key illustrated in FIG. **2**.

[0037] The game session ID as well as the game session key can be generated by match making system **104** or the hosting computing device **102**. Alternatively, one of the game session ID and the game session key may be generated by match making system **104** and the other generated by the hosting computing device **102**.

[0038] Although a single database **122** is illustrated in FIG. **2**, it is to be appreciated that the records maintained by database **122** may be distributed across multiple server devices (referred to as partitioning). Partitioning can be performed in a variety of manners, and in one implementation is performed by using one or more fields in a given row of a table and applying an algorithm, such as a hash function, to the data in that field(s) in order to generate a partition number for a particular record. Different fields can be used, such as the game title identifier, game session ID, game session key, combinations thereof, and so forth. The partition number identifies the one of the multiple server devices on which the record is stored (or to be stored).

[0039] FIG. **3** is a flowchart illustrating an exemplary process **160** for creating a new game session. In process **160**, both of the game session ID and the game session key are generated by match making system **104**. Process **160** may be performed in software, firmware, hardware, or combinations thereof. Process **160** is discussed with additional reference to components of FIGS. **1** and **2**.

[0040] Initially, the host computing device sends an identifier of itself as well as a description of the game for which the new session is to be created to match making system **104** (act **162**). The host identifier includes, for example, a network address structure for the host computing device that can be communicated to other computing devices that join the game session in order to allow those computing devices to communicate with the host device. In one implementation this host identifier is a fully qualified address (XNADDR), which is discussed in more detail below.

[0041] The description of the game includes the title of the game as well as one or more attributes of the game. An attribute is a piece of data associated with a game session, or a player in a game session. The attributes of the game can vary by game based on the desires of the game title designer. For example, the attributes may indicate the skill level of the player that initiates creating the new session, the desired skill level of other players that may join the new session, the game location where the play will occur (for example, during the day, at night, at a particular stadium, in a particular city, on a particular track, weather conditions, etc.), objects to be used during play (for example, types of cars, types of airplanes or spaceships, etc.), characteristics of the various characters in the game (for example, special powers that are available, magical spells that are available, etc.), and so forth. Additionally, rather than including the game title, the game title may be inherent in the request (for example, a different request type may be used for each game title).

[0042] The host computing device **102** can identify its desire to create a new game session in a variety of different manners. In one implementation, a predefined session ID value is sent in act **162** to indicate to match making system **104** that a new game session is to be created (for example, a session ID value of zero). Alternatively, a special command may be defined for use by host computing device **102** to request creation of a new game session. In yet another alternative, the request may be inherent in some other command, or due to the result of another operation. For example, if a computing device requests to join a game session with a set of attributes for which no current game session satisfies, then match making system **104** may automatically create a new game session with that set of attributes.

[0043] Match making system **104** then generates a new game session ID and game session key (act **164**). The new game session ID can be generated in a variety of different manners. In one implementation, match making interface **120** generates a random number or pseudo random number to use as the game session ID (e.g., using the cryptographically strong random number generator in the Win32® application programming interface). In the event that the random number is the same as another game session ID currently being used by match making system **104**, then match making interface **120** generates a new random number to use as the game session ID (this generation of new random numbers continues until a random number is generated that is not the same as another game session ID currently being used by match making system **104**).

[0044] The new game session key generated in act **164** can also be generated in a variety of different manners. In one exemplary implementation, match making interface **120** generates a random number or pseudo random number to use as the game session key (e.g., using the cryptographically strong random number generator in the Win32® application programming interface). Alternatively, any of a variety of conventional cryptographic processes can be used to generate the game session key.

[0045] Match making system **104** then advertises the new game session, along with the game description, as being available (act **166**). In one implementation, this advertising comprises adding a record of the game session to its database and thus making the game session available for searching by other computing devices. Alternatively, this advertising may comprise pushing the game session to one or more computing devices. For example, a computing device may register search criteria (e.g., game sessions with a particular player, particular skill level, or other attributes) with match making interface **120**, requesting interface **120** to send a notification of any new game session that satisfies the search criteria to the computing device.

[0046] Match making system **104** returns the game session ID and the game session key to the host computing device (act **168**). By returning the game session ID and the session key to the host computing device, the host computing device can identify the newly created game session, such as when receiving subsequent communications regarding the game session from other members of the session. Alternatively, in situations where the computing device is permitted to host only a single game session at a time, the game session ID need not be returned to the host computing device and the host device can simply assume that any subsequent communications received regarding a hosted game session are for this newly created game session.

[0047] FIG. **4** is a flowchart illustrating another exemplary process **200** for creating a new game session. In process **200**, both of the game session ID and the game session key are generated by the host computing device **102**. Process **200** may be performed in software, firmware, hardware, or combinations thereof. Process **200** is discussed with additional reference to components of FIGS. **1** and **2**.

[0048] Initially, the host computing device **102** generates a new game session ID and a new game session key for a new game session (act **202**). The desire to create a new game session can be identified by the host computing device **102** in a variety of manners analogous to act **162** discussed above with reference to FIG. **3**. The new game session ID and new game session key can be generated in a variety of manners, analogous to act **164** discussed above with reference to FIG. **3**. The host computing device **102** then sends an identifier of the host computing device **102**, a description of the game for the new game session, as well as the game session ID and game session key generated in act **202**, to match making system **104** (act **204**). Match making system **104** receives this information from the host computing device **102** and advertises the new game session with the game description as being available (act **206**). This advertising can be performed in a variety of manners, analogous to act **166** discussed above with reference to FIG. **3**.

[0049] FIG. **5** is a flowchart illustrating an exemplary process **230** for distributing information allowing a computing device to join a game session. Process **230** may be performed in software, firmware, hardware, or combinations thereof. Process **160** is discussed with additional reference to components of FIGS. **1** and **2**.

[0050] A computing device desiring to join a game session sends a game session search request to match making system **104** (act **232**). In one implementation, this game session search request includes the desired game title as well as one or more additional search parameters. Alternatively, the desired game title need not be included (for example, in a situation where a player indicates that he or she simply wants to play any game). In another alternative, the one or more additional search parameters need not be included (for example, in a situation where a player indicates that he or she wants to play a particular game title without concern for any attributes of the game).

[0051] Match making system **104** receives the game session search request and identifies zero or more current game sessions that satisfy the search request parameters (act **234**) and that have open slots for players to fill. In one implementation, match making system **104** returns only game sessions having a number of open slots equal to or greater than the number of current players using the computing device. If greater than a threshold number of game sessions satisfy the search request parameters, then a subset of those game sessions are returned. Match making system **104** then returns, to the requesting computing device, information describing the identified game sessions (act **236**). This information includes the game session key for each of the identified game sessions, thereby allowing the computing device to communicate securely with the other computing device(s) in the game session. This information also includes the descriptive information provided by the host computing device when creating the game session (e.g., in act **162** of FIG. **3** or act **204** of FIG. **4**). Thus, the descriptive information returned can include additional attributes of the game beyond what were indicated in the search request parameters.

[0052] It should be noted that multiple acts may also be performed in place of act **236**. For example, rather than returning the game session keys for all of the identified game sessions, only the game identifiers and descriptive information may be returned to the computing device. A player at the computing device can select one of the identified game sessions, in response to which the computing device sends a request for the game session key for the selected game session to the match making system **104**. The match making system **104** then returns the requested game session key to the computing device.

[0053] Returning to FIG. **1**, a user of a computing device **102** may be able to invite a particular user of another computing device (e.g., a friend of the user's) to join a game session. Such an invitation may be sent via match making system **104**, or alternatively another system (e.g., such as a presence and notification system, discussed below with reference to FIG. **13**). An invitation to join a game session includes the game session ID for the session, allowing the invited user to search for and have identified the appropriate game session.

[0054] FIG. **6** is a flowchart illustrating an exemplary process **260** for distributing information allowing a computing device to join a game session it has been invited to join. Process **260** may be performed in software, firmware, hardware, or combinations thereof. Process **260** is discussed with additional reference to components of FIGS. **1** and **2**.

[0055] Initially, a computing device receives an invitation to join a game session hosted by a hosting computing device (act **262**). The computing device sends an acceptance of the invitation to the matchmaking system **104** (act **264**). The acceptance in act **264** may be a specific type of request, or alternatively may be a game search request with a single search parameter that is the game session ID of the game session the computing device was invited to join. The matchmaking system **104** responds by sending the game session key for that game session to the computing device (act **266**).

[0056] In one implementation, a host computing device is able to have a game session created that includes both public and private slots. As part of the creation process, the host computing device identifies to match making system **104** how many public slots are to be included for the game session and how many private slots are to be included for the game session. Each slot can be filled by a single player. Match making system **104** maintains a record of these different slots, and allows a public slot to be filled by searching (e.g., per process **230** of FIG. **5**) and allows a private slot to be filled by invitation (e.g., per process **260** of FIG. **6**). Thus, when the game session is created, the user can set aside particular slots in the game for his or her friends (whom he or she can subsequently invite), without fear of all the slots being filled by strangers. Match making system **104** may alternatively allow variations on these rules, such as allowing an invited user to fill a public slot if all of the private slots have been filled, allow a non-invited user to fill a private slot if the private slot has been empty for at least a threshold amount of time, and so forth.

[0057] In addition to maintaining a record of game sessions, match making system **104** (or alternatively another system operating in cooperation with system **104**), can maintain records of other information stored on the individual computing devices **102**. For example, certain games titles maintain information about the game play (e.g., various characteristics about the environment of the game, such as the number of fish or obstacles in particular parts of a lake, a number of extra computer-generated characters or animals that are part of a particular scene, weather patterns (e.g., how rough water is in a particular location), and so forth). The computing devices that are playing in this environment typically want to share this information for uniformity of game play amongst the various players, even though the players may not be playing against one another in a head-to-head environment.

[0058] Match making system **104** can facilitate the exchange of information for such game titles by maintaining a record of identifiers of the information to be shared as well as indications of where the information is stored (e.g., do all computing devices store the information, or do only selected ones of the computing devices (and if so, which computing devices store the information)). These identifiers can be stored, for example, as attributes of a game session. Thus, rather than performing a search request to obtain information describing game sessions that the user may join, a search request for this game data location(s) may be performed in response to a request from a computing device (which may or may not already be in the game session). The game session key can also be returned to the various computing devices playing the game, in order to allow the devices to exchange the game data directly in a secure manner if necessary. A computing device, having obtained a location(s) for game data from match making system **104**, can then access the location(s) (e.g., the computing devices at those locations) to obtain the data from the location. In one implementation, the location is a fully qualified address (XNADDR) of a computing device.

[0059] FIG. **7** is a flowchart illustrating an exemplary process **300** for facilitating information exchange among computing devices. Process **300** may be performed in software, firmware, hardware, or combinations thereof. Process **300** is discussed with additional reference to components of FIGS. **1** and **2**.

[0060] Initially, a computing device sends a request for game data exchange information to match making system **104** (act **302**). The request can identify a particular game session by its game session ID, for example. The match making session identifies the game session corresponding to the request (act **304**), and identifies the location of the desired game data (act **306**). The location of the desired game data can be, for example, a particular one or more of the computing devices in the game session. The match making system then sends the location and game session key to the computing device (act **308**), giving the computing device the information it can use to obtain the game data with the appropriate computing device via a secure connection. Alternatively, if the session key has already been communicated to the computing device, then the session key need not be sent in act **308**.

[0061] Returning to FIG. **2**, various attributes can be stored in records **124**, and used by match making system **104** in creating and searching game sessions. An attribute is a piece of data associated with a game session or a player in a game session. In one implementation, each attribute has an attribute value that is identified by an attribute ID. An example format of a 32-bit attribute ID is shown in Table I below. The attribute ID uniquely identifies the attribute within a game session, and different bit-ranges of the ID also describe the attribute. The description can specify what entity the attribute relates to, what kind of data is used to represent attribute values and what namespace the attribute is associated with.

[0062] In one implementation, an attribute can be associated with a global namespace or a title-specific namespace. Global attributes are those attributes predefined by the match making system, and have a common meaning across games. Title-specific attributes are defined by the game and only have meaning within that game. Thus, it is possible for two different game titles to use the same attribute ID to refer to two different and unrelated attributes. As these title-specific attributes are scoped by the title ID, the attributes are not confused with one another.

TABLE I

Field	Bit(s)	Description
Namespace	31	Indicates whether the attribute is title-specific (e.g., a value of 0) or global (e.g., a value of 1).
Reserved	28-30	Reserved for future use.
Attribute Type	24-27	Indicates the type of attribute (e.g., 0001 for user attribute and 0000 for game session attribute). Other values are reserved for future use.
Attribute Data Type	20-23	Indicates the type of data stored in the attribute value (e.g., 0000 for integer, 0001 for string, 0010 for binary, 1111 for null). Other values are reserved for future use.
Reserved	16-19	Reserved for future use.
Attribute Specifier	0-15	Unique identifier of the attribute within its namespace (title-defined for attributes in the title-specific namespace).

[0063] FIGS. **8-12** illustrate exemplary message formats for communicating requests and responses between a game console **102** of FIG. **1** and match making system **104**. Each message format includes multiple fields or portions that can include various data as discussed below.

[0064] FIG. **8** illustrates an exemplary message structure **350** for communicating, from game console **102** to match making system **104**, a game session creation request. The message link field contains the length of the message structure **350**. The protocol version field contains the protocol version of the match making protocol being used. The session ID field contains the game session ID of the corresponding game session. The title ID field contains an identifier of the game title of the corresponding game session.

[0065] The host address field contains an address structure of the host computing device. In one implementation, this address structure is referred to as a fully qualified address (XNADDR) for the host computing device. The fully qualified address of the host computing device includes sufficient information to allow other computing devices to access the host computing device even though the host computing device may be situated behind a network address translation (NAT) device, such as a network router.

[0066] The fully qualified address for a computing device includes: the Ethernet MAC address for the computing device; the local IP address of the computing device (this is the IP address that the computing device believes it has, and may be different than the IP address from which the match making system receives data packets from the computing device (e.g., due to a NAT device, such as a router, situated between the computing device and the match making system (or an intermediary acting on behalf of the match making system, such as security gateway **404** of FIG. **13**, discussed below)); the IP address and port from which the match making system (or intermediary) receives data packets from the computing device (this may be the same as the local IP address of the computing device, or alternatively different (e.g., the address of a NAT device)); a logical device number (an identifier assigned to the match making system (or intermediary) to uniquely identify the match making system (or intermediary) within a cluster of multiple match making systems (or intermediaries)); a Security Parameters Index (SPI) value (e.g., SPI_1 and/or SPI_2); and a computing device id. The contents of the fully qualified address can be determined based on information embedded in data packets received from the computing device as well as information received in establishing a secure connection between the computing device and the match making system (or intermediary).

[0067] The value SPI_1 refers to a value generated by the computing device that the device includes in the header of each data packet sent via a secure communications channel to the match making system (or intermediary). The first data packet sent by the game console to the match making system (or intermediary) to establish a secure communications channel includes an SPI_1 value of zero to indicate to match making system (or intermediary) that a new communications channel is to be established. Subsequent data packets include a non-zero value generated by the game console. Similarly, the match making system (or intermediary) generates a value SPI_2 that it includes in the header of each data packet sent via the secure communications channel to the game console. The SPI_1 value allows the game console to identify the secure communications channel between the game console and the match making system (or intermediary) as the particular channel to which the data packets sent by the game console correspond, and the SPI_2 value similarly allows the match making system (or intermediary) to identify the secure communications channel between the game console and the match making system (or intermediary) as the particular channel to which the data packets sent by the match making system (or intermediary) correspond. Each secure communications channel, even though between the same game console and match making system (or intermediary), typically has different SPI values.

[0068] The available public slots field specifies the number of searchable player slots available in this game. As players join or leave the game, the value in the available public slots field is updated accordingly. The available private slots field specifies the number of private player slots available in this game. As players join or leave the game, the value in the available private slots field is updated accordingly. A private player slot can be taken only by a player that has received an invitation to the game session.

[0069] The currently filled public slots field specifies the number of public slots that are currently filled by players. As players join or leave the game, the value in this currently filled public slots field is updated accordingly. The currently filled private slots field specifies the number of private slots that are currently filled by players. As players join or leave the game, the value in this currently filled private slots field is updated accordingly. The number of attributes field specifies the number of attributes associated with this game session. The attributes offset fields specify the offsets to the attributes associated with this game session. The attributes can be arranged in any order. Each attribute offset identifies (e.g., is a pointer to) a region of the message that includes the attribute ID and attribute value.

[0070] FIG. **9** illustrates an exemplary message structure **360** for communicating, from match making system **104** to game console **102**, a response to a game session creation request. The session ID field contains the game session ID assigned to this game session. The key exchange key field contains the game session key assigned to this game session.

[0071] FIG. **10** illustrates an exemplary message structure **370** for communicating, from game console **102** to match making system **104**, a request to delete a game session. The message link field contains the length of the message structure **370**. The protocol version field contains the protocol version of the match making protocol being used. The session ID field contains the game session ID of the corresponding game session. The title ID field contains an identifier of the game title of the corresponding game session.

[0072] FIG. **11** illustrates an exemplary message structure **380** for communicating, from game console **102** to match making system **104**, a game session search request. The message link field contains the length of the message structure **380**. The protocol version field contains the protocol version of the match making protocol being used. The title ID field contains an identifier of the game title of the corresponding game session. The search procedure index field specifies which stored procedure in the match making system is to be used to perform the search. Different search procedure indexes can be used to specify different types of searches to be performed, such as searching based on the game session ID (e.g., when responding to invitations to join games) or searches based on other parameters.

[0073] The number of parameters field specifies the number of parameters that are being sent with this game session search request. The parameters can be arranged in any order. Each parameter includes a data type indicator followed by the parameter data.

[0074] FIG. **12** illustrates an exemplary message structure **390** for communicating, from match making system **104** to game console **102**, a response to a game session search request. The result link field contains the total length of the search result message structure **390**, including any attributes. The session ID field contains the game session ID of the corresponding game session. The host address field contains an address structure of the host computing device. In one implementation, this address structure is referred to as a fully qualified address (XNADDR) for the host computing device.

[0075] The available public slots field specifies the number of searchable player slots available in this game. The available private slots field specifies the number of private player slots available in this game. The currently filled public slots field specifies the number of public slots that are currently filled by players. The currently filled private slots field specifies the number of private slots that are currently filled by players. The number of additional attributes field specifies the number of attributes associated with this game session. The attributes can be arranged in any order. Each attribute offset identifies (e.g., is a pointer to) a region of the message that includes the attribute ID and attribute value.

[0076] In one implementation, match making database **122** of FIG. **2** uses multiple tables to store the data for various game sessions. These tables and the data stored in each is discussed below in Tables II-X below. These tables include: a match sessions table (Table II) that includes a master list of all game sessions being managed by match making system **104**; a match attributes table (Table III) that includes a list of session attributes for all current game sessions being managed by match making system **104**; a match attribute information table (Table IV) that includes a list of valid, title-specific attributes used to monitor the number of title-specific attributes a given title is using (an attribute limit may optionally be imposed on titles, or fees charged based on number of attributes); a match titles table (Table V) that includes information about each game title certified to use match making system **104**; a match session security gateway lookup table (Table VI) that includes information that allows a reverse lookup from the security gateway address to the associated game session ID (security gateways are discussed in more detail below with reference to FIG. **13**); a match configuration table (Table VII) includes configuration information used by the match making database application; a match zones table (Table VIII) includes a complete list of network zones (e.g., a set of network zones established within a network in which match making system **104** of FIG. **1** is implemented, such as data center **410** of FIG. **13**); a match zone map (Table IX) includes definitions of which network address prefixes reside in which zones; and a match zone distances table (Table X) includes distances (e.g., network latencies) between pairs of zones.

TABLE II

Field	Description
i__session__id	Contains the game session ID that uniquely identifies the game session within the scope of the title ID.
i__title__id	Identifies the game title being played in this session.
b__host__address	Contains an XNADDR structure.
I__zone__id	Host Address mapped to a proximity zone.
b__key__exchange__key	Game session key - shared by all participants in the session. Can be used to secure communications among participants, or establish additional peer-to-peer keys among participants.
i__public__available	Number of public slots open for this session.
i__private__available	Number of private slots open for this session.
i__public__current	Current number of players occupying public slots.
i__private__current	Current number of players occupying private slots.
dt__session__expiration	Specifies the time when this session will be removed from the database, if it is not proactively removed by the host.
f__selection__probability	Contains a selection probability that is adjusted over time as this session is returned in search results. The probability also decays over time.
dt__change__probability	Contains the last time that the selection probability was updated.

TABLE III

Field	Description
i__attribute__id	Contains the attribute ID that uniquely identifies this attribute within the session.
i__title__id	Identifies the game title that the attribute (and the session) is associated with.
sv__value	Contains the attribute value.
bi__session__id	Contains the session ID that uniquely identifies the session that this attribute is associated with.
bi__user__puid	User ID (e.g., a Passport User ID (PUID) assigned by Microsoft ® Passport) of the player that this attribute is associated with. If this is a session attribute, then this column will contain zero.
i__user__flags	Guest account information related to bi__user__puid.

TABLE IV

Field	Description
i__title__id	Identifies the game title that defines this attribute.
i__attribute__id	Contains the attribute ID that uniquely identifies the attribute for the title.

TABLE V

Field	Description
i__title__id	Unique identifier for the title.
i__publisher__id	Unique identifier of the publisher of this title.
i__maximum__attributes	Maximum number of attributes that this title is allowed to define and store.
i__session__expiration	Specifies the expiration time for all sessions created for this title.
vc__db__list	Semi-colon separated list of db names.

TABLE VI

Field	Description
i__sg__ip	IP Address of the security gateway.
b__id	Remainder of SGADDR minus the SG IP address.
i__title__id	Title ID of the associated session.
bi__session__id	Session ID of the associated session.
vc__db__list	Semi-colon separated list of db names.

TABLE VII

Field	Description
vc__name	Name of the configuration item.
vc__value	Value of the configuration item.

TABLE VIII

Field	Description
i__zoneID	Unique identifier for the zone.

TABLE IX

Field	Description
i__prefix	Network address prefix.
ti__prefix__length	Number of bits in i__prefix that are significant.
i__zoneID	Zone that this prefix resides in.

TABLE X

Field	Description
i__zoneID1	Source zone ID.
i__zoneID2	Destination zone ID.
i__distance	The distance (network latency) between the two zones.

[0077] In one implementation, a set of application programming interfaces (APIs) are made available to the game titles to employ the match making functionality. These APIs are exposed to the game titles on the computing devices and allow game sessions to be created and searched. A set of game session host APIs to support hosting of game sessions includes:

[0078] XOnlineMatchSessionCreate

[0079] XOnlineMatchSessionUpdate

[0080] XOnlineMatchSessionDelete

[0081] XOnlineMatchGetSessionInfo

A set of game session client APIs to support searching game sessions includes:

[0082] XOnlineMatchSearch

[0083] XOnlineMatchSessionFindFromID

[0084] XOnlineMatchSearchGetResults

[0085] XOnlineMatchSearchParse

[0086] The game title on a computing device host of a game session first calls XOnlineMatchSessionCreate to create a new game session. The base session information and a structure containing any desired attributes are passed in. The API will format and send the game session request to the match making system. An online task handle is returned. After the session create task has completed, the caller can then use the task handle to retrieve the game session ID and game session key (key exchange key) using the XOnlineMatchGetSessionInfo API. If the session information or attributes change, XOnlineMatchSessionUpdate can be called to send the updates to the server. Again, a task handle is returned. XOnlineMatchSessionDelete is called when the host no longer wishes to advertise the game session on the server.

XOnlineMatchSessionCreate

[0087] This function initializes a hosted game session and returns an asynchronous task handle.

```
HRESULT XOnlineMatchSessionCreate(
    IN DWORD dwPublicCurrent,
    IN DWORD dwPublicAvailable,
    IN DWORD dwPrivateCurrent,
    IN DWORD dwPrivateAvailable,
    IN DWORD dwNumAttributes,
    IN PXONLINE_ATTRIBUTE pAttributes,
    IN HANDLE hWorkEvent,
    OUT PXONLINETASK_HANDLE phTask
    );
```

[0088] XOnlineMatchSessionCreate Parameters

[0089] dwPublicCurrent—The number of players in the session currently occupying public slots.

[0090] dwPublicAvailable—The number of available public slots.

[0091] dwPrivateCurrent—The number of players in the session currently occupying private slots.

[0092] dwPrivateAvailable—The number of available private slots.

[0093] dwNumAttributes—The number of attributes that will be advertised for this session. This number should take into account user-specific attributes that may be duplicated in the case that multiple users are sitting at the console.

[0094] pAttributes—An array of attribute structures describing the attributes of the session.

[0095] hWorkEvent—This is the handle to a caller-created event object. The caller can periodically check this event to determine if there is work to do. The caller can also pass in NULL if they plan on using a polling model.

[0096] phTask—On input this parameter should point to a valid task handle variable. On successful return, this variable will be filled in with a valid handle.

[0097] XOnlineMatchSessionCreate Return Value

[0098] S_OK—Game session was successfully created, handle is returned in phTask.

XOnlineMatchSessionUpdate

[0099] This function is used to change session information and attributes on the server after a session has already been created.

```
HRESULT XOnlineMatchSessionUpdate(
    IN XNKID SessionID,
    IN DWORD dwPublicCurrent,
    IN DWORD dwPublicAvailable,
    IN DWORD dwPrivateCurrent,
    IN DWORD dwPrivateAvailable,
    IN DWORD dwNumAttributes,
    IN PXONLINE_ATTRIBUTE pAttributes,
    IN HANDLE hWorkEvent,
    OUT PXONLINETASK_HANDLE phTask
    );
```

[0100] XOnlineMatchSessionUpdate Parameters

[0101] SessionID—Identifies the session that is being updated. This value can be retrieved from XOnlineMatchSessionGetInfo.

[0102] dwPublicAvailable—The number of available public slots.

[0103] dwPrivateCurrent—The number of players in the session currently occupying private slots.

[0104] dwPrivateAvailable—The number of available private slots.

[0105] dwNumAttributes—The number of attributes that will be advertised for this session. This number should take into account user-specific attributes that may be duplicated in the case that multiple users are sitting at the console.

[0106] pAttributes—An array of attribute structures describing the attributes of the session.

[0107] hWorkEvent—This is the handle to a caller-created event object. The caller can periodically check this event to determine if there is work to do. The caller can also pass in NULL if they plan on using a polling model.

[0108] phTask—On input this parameter should point to a valid task handle variable. On successful return, this variable will be filled in with a valid handle.

[0109] XOnlineMatchSessionUpdate Return Value

[0110] S_OK—The function was successful.

XOnlineMatchSessionDelete

[0111] This function is used to remove a session and all of its attributes from the server.

```
HRESULT XOnlineMatchSessionDelete(
    IN XNKID SessionID,
```

-continued

```
        IN HANDLE hWorkEvent,
        OUT PXONLINETASK_HANDLE phTask
        );
```

[0112] XOnlineMatchSessionDelete Parameters

[0113] SessionID—Identifies the session being deleted. This value is retrieved from XOnlineMatchSessionGetInfo after a session is created.

[0114] hWorkEvent—This is the handle to a caller-created event object. The caller can periodically check this event to determine if there is work to do. The caller can also pass in NULL if they plan on using a polling model.

[0115] phTask—On input this parameter should point to a valid task handle variable. On successful return, this variable will be filled in with a valid handle.

[0116] XOnlineMatchSessionDelete Return Value

[0117] S_OK—The function was successful.

XOnlineMatchGetSessionInfo

[0118] This function is used to retrieve the session information from a task handle after XOnlineMatchSessionCreate has successfully completed.

```
HRESULT XOnlineMatchGetSessionInfo(
    IN XONLINETASK_HANDLE hTask,
    OUT XNKID *pSessionID,
    OUT XNKEY *pKeyExchangeKey
    );
```

[0119] XOnlineMatchGetSessionInfo Parameters

[0120] hTask—Online task handle returned by XOnlineMatchSessionCreate.

[0121] pSessionID—Address of an XNKID variable that will receive the session ID.

[0122] pKeyExchangeKey—Address of an XNKEY variable that will receive the key exchange key.

[0123] XOnlineMatchGetSessionInfo Return Value

[0124] S_OK—The session ID and key were successfully returned.

[0125] To perform a game search, a game title calls XOnlineMatchSearch. The game title passes in the procedure index, the maximum number of search results it wishes to receive and any parameters to be passed to the search stored procedure on the database. The game also specifies the maximum buffer size that the search results can occupy. This buffer size is allocated internally by the API, and any search results that do not fit in this buffer will be dropped. The game title can optionally specify an event handle that will be signaled when there is any work to do.

[0126] XOnlineMatchSearch returns an online task handle. When the search task has indicated completion, the game can retrieve an array of search results by calling XOnlineMatchSearchGetResults with the task handle. The search results can be accessed individually at this point. Any extended attributes returned can be parsed using XOnlineMatchSearchParse. The game knows beforehand the order and types of the attributes returned. Each individual search result contains the XNADDR, XNKID and XNKEY used to connect to the game session host.

[0127] In the case where a specific game session ID is already known via some out-of-band mechanism such, the XOnlineMatchSessionFindFromID API can be used to retrieve a single session using the session ID. Once this task has completed, the caller uses XOnlineMatchSearchGetResults to retrieve the XNADDR, XNKID and XNKEY of the requested session.

XOnlineMatchSearch

[0128] This function creates a new game session search, sends it to the server and returns an asynchronous task handle for monitoring the progress of the request. This function allocates a buffer for the search results internally, using the size passed in by the caller.

```
HRESULT XOnlineMatchSearch(
    IN DWORD dwProcedureIndex,
    IN DWORD dwNumResults,
    IN DWORD dwNumAttributes,
    IN PXONLINE_ATTRIBUTE pAttributes,
    IN DWORD dwResultsLen,
    IN HANDLE hWorkEvent,
    OUT PXONLINETASK_HANDLE phTask
    );
```

[0129] XOnlineMatchSearch Parameters

[0130] dwProcedureIndex—Identifies the stored procedure for this title that will be run on the database to execute the search.

[0131] dwNumResults—Specifies that maximum number of search results that the game is interested in processing.

[0132] dwNumAttributes—The number of parameters that will be passed as part of this request, and ultimately passed to the stored procedure.

[0133] pAttributes—An array of parameter values.

[0134] dwResultsLen—This parameter specifies the amount of buffer space that this API will allocate to hold search results. These APIs will attempt to fill up the buffer space specified by this parameter.

[0135] hWorkEvent—This is a handle to a caller-created event object. This object becomes signaled when there is work to do. This parameter is optional and the caller may pass in NULL instead, indicating that the caller will poll.

[0136] phTask—Upon successful return, this parameter will point to a handle that uniquely identifies this search. This handle is used in subsequent API calls.

[0137] XOnlineMatchSearch Return Value

[0138] S_OK—Search was created successfully.

XOnlineMatchSessionFindFromID

[0139] This function retrieves information for a single, specified session. This function assumes that the session ID is retrieved via some out-of-band mechanism, such as invitations. This function is essentially a short-hand form of XOnlineMatchSearch, where the procedure index, parameters and maximum results are fixed. All of the events that occur under the covers for XOnlineMatchSearch, will also occur for this API. The returned task handle is used to allow the API to periodically perform its work. It is identical to the handle returned by XOnlineMatchSearch.

```
HRESULT XOnlineMatchSessionFindFromID(
    IN XNKID SessionID,
    IN HANDLE hWorkEvent,
    OUT PXONLINETASK_HANDLE phTask
    );
```

[0140] XOnlineMatchSessionFindFromID Parameters

[0141] SessionID—The XNKID of the session to get.

[0142] hWorkEvent—This is a handle to a caller-created event object. This object becomes signaled when there is work to do. This parameter is optional and the caller may pass in NULL instead, indicating that the caller will poll.

[0143] phTask—Upon successful return, this parameter will point to a handle that uniquely identifies this search. This handle is used in subsequent search API calls.

[0144] XOnlineMatchSessionFindFromID Return Value

[0145] S_OK—Search request was sent successfully.

XOnlineMatchSearchGetResults

[0146] This function is used to retrieve a set of search results for a specified search request. This function is called after the task handle obtained from a previous call to XOnlineMatchSearch indicates successful completion.

```
HRESULT XOnlineMatchSearchGetResults(
    IN XONLINETASK_HANDLE hTask,
    OUT PXMATCH_SEARCHRESULT **prgpSearchResults,
    OUT DWORD *pdwReturnedResults
    );
```

[0147] XOnlineMatchSearchGetResults Parameters

[0148] hTask—An online task handle returned from a previous call to XOnlineMatchSearch.

[0149] prgpSearchResults—Receives a pointer to an array of search result structures.

[0150] pdwReturnedResults—Receives the number of search result structures pointed to by prgpSearchResults.

[0151] XOnlineMatchSearchGetResults Return Value

[0152] S_OK—Search results were successfully returned.

XOnlineMatchSearchParse

[0153] This function is used to retrieve extended attributes from a particular search result. The caller must know the exact order and type of the extended attributes.

```
HRESULT XOnlineMatchSearchParse(
    IN PXMATCH_SEARCHRESULT pSearchResult,
    IN DWORD dwNumSessionAttributes,
    IN PXONLINE_ATTRIBUTE_SPEC pSessionAttributeSpec,
    OUT PVOID pQuerySession
    );
```

[0154] XOnlineMatchSearchParse Parameters

[0155] pSearchResult—Specifies the search result being parsed.

[0156] dwNumSessionAttributes—Specifies the number of extended attributes in the search result.

[0157] pSessionAttributeSpec—Identifies the types of each of the attributes.

[0158] pQuerySession—Buffer to contain the attributes.

[0159] FIG. **13** is a block diagram of an exemplary online gaming environment **400**. Multiple game consoles **402**(**1**), **402**(**2**), . . . , **402**(*n*) are coupled to a security gateway **404** via a network **406**. Network **406** represents any one or more of a variety of conventional data communications networks. Network **406** will typically include packet switched networks, but may also include circuit switched networks. Network **406** can include wire and/or wireless portions. In one exemplary implementation, network **406** includes the Internet and may optionally include one or more local area networks (LANs) and/or wide area networks (WANs). At least a part of network **406** is a public network, which refers to a network that is publicly-accessible. Virtually anyone can access the public network.

[0160] In some situations, network **406** includes a LAN (e.g., a home network), with a routing device situated between game console **402** and security gateway **404**. This routing device may perform network address translation (NAT), allowing the multiple devices on the LAN to share the same IP address on the Internet, and also operating as a firewall to protect the device(s) on the LAN from access by malicious or mischievous users via the Internet.

[0161] Security gateway **404** operates as a gateway between public network **406** and a private network **408**. Private network **408** can be any of a wide variety of conventional networks, such as a local area network. Private network **408**, as well as other devices discussed in more detail below, is within a data center **410** that operates as a secure zone. Data center **410** is made up of trusted devices communicating via trusted communications. Thus, encryption and authentication within secure zone **410** is not necessary. The private nature of network **408** refers to the restricted accessibility of network **408**—access to network **408** is restricted to only certain individuals (e.g., restricted by the owner or operator of data center **410**).

[0162] Security gateway **404** is a cluster of one or more security gateway computing devices. These security gateway computing devices collectively implement security gateway **404**. Security gateway **404** may optionally include one or more conventional load balancing devices that operate to direct requests to be handled by the security gateway computing devices to appropriate ones of those computing devices. This directing or load balancing is performed in a manner that attempts to balance the load on the various security gateway computing devices approximately equally (or alternatively in accordance with some other criteria).

[0163] Also within data center **410** are: one or more monitoring servers **412**; one or more presence and notification front doors **414**, one or more presence servers **416**, and one or more notification servers **418** (collectively implementing a presence and notification service); one or more match making front doors **420** (e.g., interfaces **120** of FIG. **2**) and one or more match making servers **422** (e.g., databases **122** of FIG. **2**) (collectively implementing a match making system); and one or more statistics front doors **424** and one or more statistics servers **426** (collectively implementing a statistics service). The servers **416**, **418**, **422**, and **426** provide services to game consoles **402**, and thus can be referred to as service devices. Other service devices may also be included in addition to, and/or in place of, one or more of the servers **416**, **418**, **422**, and **426**. Additionally, although only one data center is shown in FIG. **13**, alternatively multiple data centers may exist with which game consoles **402** can communicate. These data centers may operate independently or alternatively may operate collectively (e.g., to make one large data center available to game consoles **402**).

[0164] Game consoles **402** are situated remotely from data center **410**, and access data center **410** via network **406**. A game console **402** desiring to communicate with one or more devices in the data center establishes a secure communication channel between the console **402** and security gateway **404**. Game console **402** and security gateway **404** encrypt and authenticate data packets being passed back and forth, thereby allowing the data packets to be securely transmitted between them without being understood by any other device that may capture or copy the data packets without breaking the encryption. Each data packet communicated from game console **402** to security gateway **404**, or from security gateway **404** to game console **402** can have data embedded therein. This embedded data is referred to as the content or data content of the packet. Additional information may also be inherently included in the packet based on the packet type.

[0165] The secure communication channel between a console **402** and security gateway **404** is based on a security ticket. Console **402** authenticates itself and the current user(s) of console **402** to a key distribution center **428** and obtains, from key distribution center **428**, a security ticket. Console **402** then uses this security ticket to establish the secure communication channel with security gateway **404**. In establishing the secure communication channel with security gateway **404**, the game console **402** and security gateway **404** authenticate themselves to one another and establish a session security key that is known only to that particular game console **402** and the security gateway **404**. This session security key is used to encrypt data transferred between the game console **402** and the security gateway cluster **404**, so no other devices (including other game consoles **402**) can read the data. The session security key is also used to authenticate a data packet as being from the security gateway **404** or game console **402** that the data packet alleges to be from. Thus, using such session security keys, secure communication channels can be established between the security gateway **404** and the various game consoles **402**.

[0166] Once the secure communication channel is established between a game console **402** and the security gateway **404**, encrypted data packets can be securely transmitted between the two. When the game console **402** desires to send data to a particular service device in data center **410**, the game console **402** encrypts the data and sends it to security gateway **404** requesting that it be forwarded to the particular service device(s) targeted by the data packet. Security gateway **404** receives the data packet and, after authenticating and decrypting the data packet, encapsulates the data content of the packet into another message to be sent to the appropriate service via private network **408**. Security gateway **404** determines the appropriate service for the message based on the requested service(s) targeted by the data packet.

[0167] Although discussed herein as primarily communicating encrypted data packets between security gateway **404** and a game console **402**, alternatively some data packets may be partially encrypted (some portions of the data packets are encrypted while other portions are not encrypted). Which portions of the data packets are encrypted and which are not can vary based on the desires of the designers of data center **410** and/or game consoles **402**. For example, the designers may choose to allow voice data to be communicated among consoles **402** so that users of the consoles **402** can talk to one another—the designers may further choose to allow the voice data to be unencrypted while any other data in the packets is encrypted. Additionally, in another alternative, some data packets may have no portions that are encrypted (that is, the entire data packet is unencrypted). It should be noted that, even if a data packet is unencrypted or only partially encrypted, all of the data packet can still be authenticated.

[0168] Similarly, when a service device in data center **410** desires to communicate data to a game console **402**, the data center sends a message to security gateway **404**, via private network **408**, including the data content to be sent to the game console **402** as well as an indication of the particular game console **402** to which the data content is to be sent. Security gateway **404** embeds the data content into a data packet, and then encrypts the data packet so it can only be decrypted by the particular game console **402** and also authenticates the data packet as being from the security gateway **404**.

[0169] Each security gateway device in security gateway **404** is responsible for the secure communication channel with typically one or more game consoles **402**, and thus each security gateway device can be viewed as being responsible for managing or handling one or more game consoles. The various security gateway devices may be in communication with each other and communicate messages to one another. For example, a security gateway device that needs to send a data packet to a game console that it is not responsible for managing may send a message to all the other security gateway devices with the data to be sent to that game console. This message is received by the security gateway device that is responsible for managing that game console and sends the appropriate data to that game console. Alternatively, the security gateway devices may be aware of which game consoles are being handled by which security gateway devices—this may be explicit, such as each security gateway device maintaining a table of game consoles handled by the other security gateway devices, or alternatively implicit, such as determining which security gateway device is responsible for a particular game console based on an identifier of the game console.

[0170] Monitoring server(s) **412** operate to inform devices in data center **410** of an unavailable game console **402** or an unavailable security gateway device of security gateway **404**. Game consoles **402** can become unavailable for a variety of different reasons, such as a hardware or software failure, the console being powered-down without logging out of data center **410**, the network connection cable to console **402** being disconnected from console **402**, other network problems (e.g., the LAN that the console **402** is on malfunctioning), etc. Similarly, a security gateway device of security gateway **404** can become unavailable for a variety of different reasons, such as hardware or software failure, the device being powered-down, the network connection cable to the device being disconnected from the device, other network problems, etc.

[0171] Each of the security gateway devices in security gateway **404** is monitored by one or more monitoring servers **412**, which detect when one of the security gateway devices becomes unavailable. In the event a security gateway device becomes unavailable, monitoring server **412** sends a message to each of the other devices in data center **410** (servers, front doors, etc.) that the security gateway device is no longer available. Each of the other devices can operate based on this information as it sees fit (e.g., it may assume that particular game consoles being managed by the security gateway device are no longer in communication with data center **410** and perform various clean-up operations accordingly). Alternatively, only certain devices may receive such a message from the monitoring server **412** (e.g., only those devices that are concerned with whether security gateway devices are available).

[0172] Security gateway **404** monitors the individual game consoles **402** and detects when one of the game consoles **402** becomes unavailable. When security gateway **404** detects that a game console is no longer available, security gateway **404** sends a message to monitoring server **412** of the unavailable game console. In response, monitoring server **412** sends a message to each of the other devices in data center **410** (or alternatively only selected devices) that the game console is no longer available. Each of the other devices can then operate based on this information as it sees fit.

[0173] Presence server(s) **416** hold and process data concerning the status or presence of a given user logged in to data center **410** for online gaming. Notification server(s) **418** maintains multiple queues of outgoing messages destined for a player logged in to data center **410**. Presence and notification front door **414** is one or more server devices that operate as an intermediary between security gateway **404** and servers **416** and **418**. One or more load balancing devices (not shown) may be included in presence and notification front door **414** to balance the load among the multiple server devices operating as front door **414**. Security gateway **404** communicates messages for servers **416** and **418** to the front door **414**, and the front door **414** identifies which particular server **416** or particular server **418** the message is to be communicated to. By using front door **414**, the actual implementation of servers **416** and **418**, such as which servers are responsible for managing data regarding which users, is abstracted from security gateway **404**. Security gateway **404** can simply forward messages that target the presence and notification service to presence and notification front door **414** and rely on front door **414** to route the messages to the appropriate one of server(s) **416** and server(s) **418**.

[0174] Match making server(s) **422** hold and process data concerning the matching of online players to one another, as discussed above. Match front door **420** includes one or more server devices (and optionally a load balancing device(s)) and operates to abstract match server(s) **422** from security gateway **404** in a manner analogous to front door **414** abstracting server(s) **416** and server(s) **418**.

[0175] Statistics server(s) **426** hold and process data concerning various statistics for online games. The specific statistics used can vary based on the game designer's desires (e.g., the top ten scores or times, a world ranking for all online players of the game, a list of users who have found the most items or spent the most time playing, etc.). Statistics front door **424** includes one or more server devices (and optionally a load balancing device(s)) and operates to abstract statistics server(s) **426** from security gateway **404** in a manner analogous to front door **414** abstracting server(s) **416** and server(s) **418**.

[0176] Thus, it can be seen that security gateway **404** operates to shield devices in the secure zone of data center **410** from the untrusted, public network **406**. Communications within the secure zone of data center **410** need not be encrypted, as all devices within data center **410** are trusted. However, any information to be communicated from a device within data center **410** to a game console **402** passes through security gateway cluster **404**, where it is encrypted in such a manner that it can be decrypted by only the game console **402** targeted by the information.

[0177] FIG. **14** illustrates a general computer environment **500**, which can be used to implement the techniques described herein. The computer environment **500** is only one example of a computing environment and is not intended to suggest any limitation as to the scope of use or functionality of the computer and network architectures. Neither should the computer environment **500** be interpreted as having any dependency or requirement relating to any one or combination of components illustrated in the exemplary computer environment **500**.

[0178] Computer environment **500** includes a general-purpose computing device in the form of a computer **502**. Computer **502** can be, for example, a match making system **104** or computing device **102** of FIG. **1**, a match making interface **120** or match making database **122** of FIG. **2**, a server **412**, **416**, **418**, **422**, and/or **426** of FIG. **13**, or a front door **414**, **420**, or **424** of FIG. **13**. The components of computer **502** can include, but are not limited to, one or more processors or processing units **504** (optionally including a cryptographic processor or co-processor), a system memory **506**, and a system bus **508** that couples various system components including the processor **504** to the system memory **506**.

[0179] The system bus **508** represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. By way of example, such architectures can include an Industry Standard Architecture (ISA) bus, a Micro Channel Architecture (MCA) bus, an Enhanced ISA (EISA) bus, a Video Electronics Standards Association (VESA) local bus, and a Peripheral Component Interconnects (PCI) bus also known as a Mezzanine bus.

[0180] Computer **502** typically includes a variety of computer readable media. Such media can be any available media that is accessible by computer **502** and includes both volatile and non-volatile media, removable and non-removable media.

[0181] The system memory **506** includes computer readable media in the form of volatile memory, such as random access memory (RAM) **510**, and/or non-volatile memory, such as read only memory (ROM) **512**. A basic input/output system (BIOS) **514**, containing the basic routines that help to transfer information between elements within computer **502**, such as during start-up, is stored in ROM **512**. RAM **510** typically contains data and/or program modules that are immediately accessible to and/or presently operated on by the processing unit **504**.

[0182] Computer **502** may also include other removable/non-removable, volatile/non-volatile computer storage media. By way of example, FIG. **14** illustrates a hard disk drive **516** for reading from and writing to a non-removable, non-volatile magnetic media (not shown), a magnetic disk drive **518** for reading from and writing to a removable, non-volatile magnetic disk **520** (e.g., a "floppy disk"), and an optical disk drive **522** for reading from and/or writing to a removable, non-volatile optical disk **524** such as a CD-ROM, DVD-ROM, or other optical media. The hard disk drive **516**, magnetic disk drive **518**, and optical disk drive **522** are each connected to the system bus **508** by one or more data media interfaces **527**. Alternatively, the hard disk drive **516**, magnetic disk drive **518**, and optical disk drive **522** can be connected to the system bus **508** by one or more interfaces (not shown).

[0183] The disk drives and their associated computer-readable media provide non-volatile storage of computer readable instructions, data structures, program modules, and other data for computer **502**. Although the example illustrates a hard disk **516**, a removable magnetic disk **520**, and a removable optical disk **524**, it is to be appreciated that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes or other magnetic storage devices, flash memory cards, CD-ROM, digital versatile disks (DVD) or other optical storage, random access memories (RAM), read only memories (ROM), electrically erasable programmable read-only memory (EEPROM), and the like, can also be utilized to implement the exemplary computing system and environment.

[0184] Any number of program modules can be stored on the hard disk **516**, magnetic disk **520**, optical disk **524**, ROM **512**, and/or RAM **510**, including by way of example, an operating system **526**, one or more application programs **528**, other program modules **530**, and program data **532**. Each of such operating system **526**, one or more application programs **528**, other program modules **530**, and program data **532** (or some combination thereof) may implement all or part of the resident components that support the distributed file system.

[0185] A user can enter commands and information into computer **502** via input devices such as a keyboard **534** and a pointing device **536** (e.g., a "mouse"). Other input devices **538** (not shown specifically) may include a microphone, joystick, game pad, satellite dish, serial port, scanner, and/or the like. These and other input devices are connected to the processing unit **504** via input/output interfaces **540** that are coupled to the system bus **508**, but may be connected by other interface and bus structures, such as a parallel port, game port, or a universal serial bus (USB).

[0186] A monitor **542** or other type of display device can also be connected to the system bus **508** via an interface, such as a video adapter **544**. In addition to the monitor **542**, other output peripheral devices can include components such as speakers (not shown) and a printer **546** which can be connected to computer **502** via the input/output interfaces **540**.

[0187] Computer **502** can operate in a networked environment using logical connections to one or more remote computers, such as a remote computing device **548**. By way of example, the remote computing device **548** can be a personal computer, portable computer, a server, a router, a network computer, a peer device or other common network node, game console, and the like. The remote computing device **548** is illustrated as a portable computer that can include many or all of the elements and features described herein relative to computer **502**.

[0188] Logical connections between computer **502** and the remote computer **548** are depicted as a local area network (LAN) **550** and a general wide area network (WAN) **552**. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet.

[0189] When implemented in a LAN networking environment, the computer **502** is connected to a local network **550** via a network interface or adapter **554**. When implemented in a WAN networking environment, the computer **502** typically includes a modem **556** or other means for establishing communications over the wide network **552**. The modem **556**, which can be internal or external to computer **502**, can be connected to the system bus **508** via the input/output interfaces **540** or other appropriate mechanisms. It is to be appreciated that the illustrated network connections are exemplary and that other means of establishing communication link(s) between the computers **502** and **548** can be employed.

[0190] In a networked environment, such as that illustrated with computing environment **500**, program modules depicted relative to the computer **502**, or portions thereof, may be stored in a remote memory storage device. By way of example, remote application programs **558** reside on a memory device of remote computer **548**. For purposes of illustration, application programs and other executable program components such as the operating system are illustrated herein as discrete blocks, although it is recognized that such programs and components reside at various times in different storage components of the computing device **502**, and are executed by the data processor(s) of the computer.

[0191] Various modules and techniques may be described herein in the general context of computer-executable instructions, such as program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Typically, the functionality of the program modules may be combined or distributed as desired in various embodiments.

[0192] An implementation of these modules and techniques may be stored on or transmitted across some form of computer readable media. Computer readable media can be any available media that can be accessed by a computer. By way of example, and not limitation, computer readable media may comprise "computer storage media" and "communications media."

[0193] "Computer storage media" includes volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules, or other data. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by a computer.

[0194] "Communication media" typically embodies computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as carrier wave or other transport mechanism. Communication media also includes any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared, and other wireless media. Combinations of any of the above are also included within the scope of computer readable media.

[0195] FIG. **15** shows functional components of a game console **600** in more detail. Game console **600** can be used, for example, as a computing device **102** of FIG. **1**. Game console **600** has a central processing unit (CPU) **601** and a memory controller **602** that facilitates processor access to various types of memory, including a flash ROM (Read Only Memory) **604**, a RAM (Random Access Memory) **606**, a hard disk drive **608**, and a portable media drive **609**. CPU **601** is equipped with a level 1 cache **610** and a level 2 cache **612** to temporarily store data and hence reduce the number of memory access cycles, thereby improving processing speed and throughput.

[0196] CPU **601**, memory controller **602**, and various memory devices are interconnected via one or more buses, including serial and parallel buses, a memory bus, a peripheral bus, and a processor or local bus using any of a variety of bus architectures. By way of example, such architectures can include an Industry Standard Architecture (ISA) bus, a Micro Channel Architecture (MCA) bus, an Enhanced ISA (EISA) bus, a Video Electronics Standards Association (VESA) local bus, and a Peripheral Component Interconnects (PCI) bus also known as a Mezzanine bus.

[0197] As one suitable implementation, CPU **601**, memory controller **602**, ROM **604**, and RAM **606** are integrated onto a common module **614**. In this implementation, ROM **604** is configured as a flash ROM that is connected to the memory controller **602** via a PCI (Peripheral Component Interconnect) bus and a ROM bus (neither of which are shown). RAM **606** is configured as multiple DDR SDRAM (Double Data Rate Synchronous Dynamic RAM) that are independently controlled by the memory controller **602** via separate buses (not shown). The hard disk drive **608** and portable media drive **609** are connected to the memory controller via the PCI bus and an ATA (AT Attachment) bus **616**.

[0198] A 3D graphics processing unit **620** and a video encoder **622** form a video processing pipeline for high speed and high resolution graphics processing. Data is carried from the graphics processing unit **620** to the video encoder **622** via a digital video bus (not shown). An audio processing unit **224** and an audio codec (coder/decoder) **626** form a corresponding audio processing pipeline with high fidelity and stereo processing. Audio data is carried between the audio processing unit **624** and the audio codec **626** via a communication link (not shown). The video and audio processing pipelines output data to an A/V (audio/video) port **628** for transmission to the television or other display. In the illustrated implementation, the video and audio processing components **620**-**628** are mounted on the module **614**.

[0199] Also implemented on the module **614** are a USB host controller **630** and a network interface **632**. The USB host controller **630** is coupled to the CPU **601** and the memory controller **602** via a bus (e.g., PCI bus) and serves as host for the peripheral controllers **636(1)**-**636(4)**. The network interface **232** provides access to a network (e.g., Internet, home network, etc.) and may be any of a wide variety of various wire or wireless interface components including an Ethernet card, a modem, a Bluetooth module, a cable modem, and the like.

[0200] The game console **600** has two dual controller support subassemblies **640(1)** and **640(2)**, with each subassembly supporting two game controllers **636(1)**-**636(4)**. A front panel I/O subassembly **642** supports the functionality of a power button **631** and a media drive eject button **633**, as well as any LEDs (light emitting diodes) or other indicators exposed on the outer surface of the game console. The subassemblies **640(1)**, **640(2)**, and **642** are coupled to the module **614** via one or more cable assemblies **644**.

[0201] Eight memory units **634(1)**-**634(8)** are illustrated as being connectable to the four controllers **636(1)**-**636(4)**, i.e., two memory units for each controller. Each memory unit **634** offers additional storage on which games, game parameters, and other data may be stored. When inserted into a controller, the memory unit **634** can be accessed by the memory controller **602**.

[0202] A system power supply module **650** provides power to the components of the game console **600**. A fan **652** cools the circuitry within the game console **600**.

[0203] A console user interface (UI) application **660** is stored on the hard disk drive **608**. When the game console is powered on, various portions of the console application **660** are loaded into RAM **606** and/or caches **610**, **612** and executed on the CPU **601**. Console application **660** presents a graphical user interface that provides a consistent user experience when navigating to different media types available on the game console.

[0204] Game console **600** implements a cryptography engine to perform common cryptographic functions, such as encryption, decryption, authentication, digital signing, hashing, and the like. The cryptography engine may be implemented as part of the CPU **601**, or in software stored on the hard disk drive **608** that executes on the CPU, so that the CPU is configured to perform the cryptographic functions. Alternatively, a cryptographic processor or co-processor designed to perform the cryptographic functions may be included in game console **600**.

[0205] Game console **600** may be operated as a standalone system by simply connecting the system to a television or other display. In this standalone mode, game console **600** allows one or more players to play games, watch movies, or listen to music. However, with the integration of broadband connectivity made available through the network interface **632**, game console **600** may further be operated as a participant in online gaming, as discussed above.

[0206] Various processes are illustrated by way of flowcharts herein. It should be noted that the acts involved in these processes can be performed in the order shown in the flowcharts, or alternatively in different orders. For example, in FIG. **3**, the acts may be performed in the order shown, or alternatively in different orders (e.g., **168** may be performed prior to or concurrent with act **166**). By way of another example, in FIG. **4**, the acts may be performed in the order shown, or alternatively in different orders (e.g., act **206** may be performed prior to or concurrent with act **204**).

[0207] Although the description above uses language that is specific to structural features and/or methodological acts, it is to be understood that the invention defined in the appended claims is not limited to the specific features or acts described. Rather, the specific features and acts are disclosed as exemplary forms of implementing the invention.

We claim:

1. A method comprising:

receiving, from a computing device, a request for information including a parameter describing a game session including a skill level of the game session, the game session being hosted by one or more other computing devices and the game session being currently available for play; and

responding to the request with the information including a parameter describing the game session including the skill level of the game session and a game session key enabling secure communication for the computing device with at least one of the one or more other computing devices that are part of the game session.

2. A method as recited in claim **1**, wherein the computing device comprises a game console.

3. A method as recited in claim **1**, wherein the computing device and the at least one of the one or more other computing devices comprise different types of computing devices.

4. A method as recited in claim **1**, the parameter describing the game session including a game session ID.

5. A method as recited in claim **1**, wherein responding to the request comprises returning to the computing device information allowing the computing device to join the game session hosted by the one or more other hosting computing devices.

6. A method as recited in claim **1**, wherein the computing device and the one or more other hosting computing device are situated behind different network address translation (NAT) devices.

7. A computer-readable media having computer instructions encoded thereon, the computer readable instructions, upon execution by a processor, configuring the processor to perform the method of claim **1**.

8. A method comprising:

requesting information describing one or more of a plurality of game sessions;

receiving the information describing the one or more of the plurality of game sessions, the information including:

an identifier of a game being hosted at a computing device;

a fully qualified address of the computing device hosting the game;

one or more game session keys associated respectively with the one or more of the plurality of game sessions, wherein:

the one or more game session keys is for secure communication with the computing device hosting the game; and

the one or more game session keys facilitate another computing device playing the game hosted at the computing device without communication from the another computing device associated with the game being routed through a server device.

9. A method as recited in claim **8**, wherein the computing device comprises a game console.

10. A method as recited in claim **8**, wherein the another computing device comprises a game console.

11. A method as recited in claim **8**, wherein the one or more game session keys is created at the computing device.

12. A method as recited in claim **8**, the information further including a skill level of the game being hosted at the computing device.

13. A computer-readable media having computer instructions encoded thereon, the computer readable instructions, upon execution by a processor, configuring the processor to perform the method of claim **8**.

14. A computing device configured to perform the method of claim **8**.

15. A method comprising:

sending information describing a game session, the information comprising:

an identifier of a game being hosted at a computing device;

a fully qualified address of the computing device hosting the game;

a number of slots configured to be filled by other computing devices to join the game during the game session;

receiving a request from another computing device to join the game; and

utilizing a session key associated with the game session for game play, wherein the session key is for secure communication between the computing device hosting the game and the another computing device without the communication from the another computing device associated with the game being routed through a server device.

16. A method as recited in claim **15**, wherein the computing device hosting the game comprises a game console.

17. A method as recited in claim **8**, wherein the another computing device comprises a game console.

18. A method as recited in claim **8**, wherein the one or more game session keys is created at the computing device hosting the game.

19. A method as recited in claim **15**, the information further comprising a skill level of the game session.

20. A computer-readable media having computer instructions encoded thereon, the computer readable instructions, upon execution by a processor, configuring the processor to perform the method of claim **15**.

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