



- (51) International Patent Classification:
G07C 9/00 (2006.01)
- (21) International Application Number:
PCT/IB2015/001926
- (22) International Filing Date:
9 September 2015 (09.09.2015)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
62/048,702 10 September 2014 (10.09.2014) US
- (71) Applicant: ASSA ABLOY AB [SE/SE]; Klarabergs-
viadukten 90, S-111 63 Stockholm (SE).
- (72) Inventor: AASE, Halvor; Avangen Terrasse 314, N-1536
Moss (NO).
- (74) Agent: ELLSWORTH, Matthew, R.; Sheridan Ross
P.C., 1560 Broadway, Suite 1200, Denver, CO 80202
(US).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: FIRST ENTRY NOTIFICATION

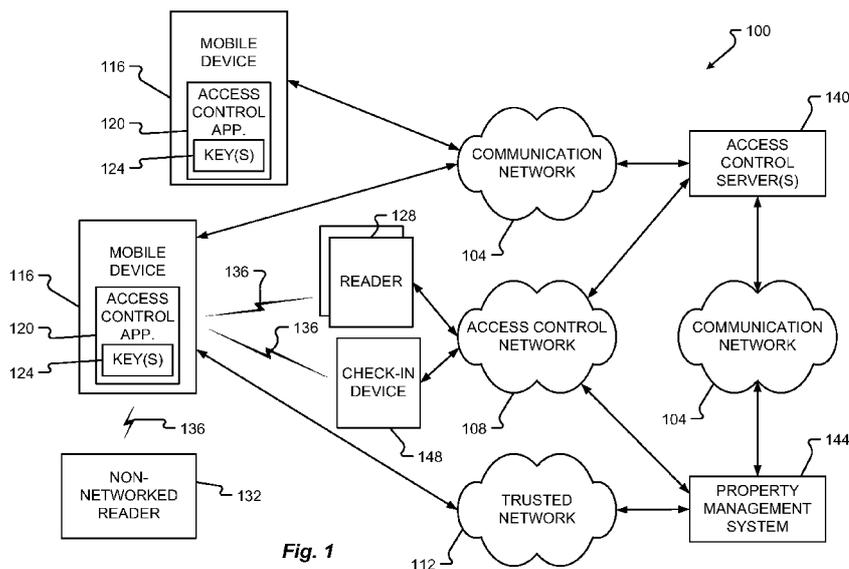


Fig. 1

(57) Abstract: An access control system is disclosed in which a user or guest's first entry or usage of an electronic key is reported. Reporting of the first entry or usage may include information particular to the initial transaction and may be delivered by a path that is substantially the same, but reversed, from an original key delivery path. In this way, non-networked or 'offline' locks/readers can report first entry or usage of an electronic key.

WO 2016/038457 A1

FIRST ENTRY NOTIFICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Patent Application No. 62/048,702, filed on September 10, 2014, the entire contents of which are hereby incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure is generally directed to access control systems and methods of operating the same.

BACKGROUND

[0003] A smart card, chip card, or integrated circuit card (ICC) is any pocket-sized card with embedded integrated circuits. Smart cards are traditionally made of plastic. One common use for smart cards is in the security of hotels and the like.

[0004] Hotels and other multi-room facilities often employ property management systems that are separate from the access control systems used to physical secure the rooms in the facility. For example, hotels traditionally use their property management systems to manage and allocate guests rooms and to track transactions such as guest purchases at restaurants, valet, mini-bar, and other in-room purchases. A new guest account is usually created in the property management system per room during guest check-in with the hotel front desk.

SUMMARY

[0005] In environments where a guest is able to bypass the front desk check-in process, the hotel faces new challenges. One of these challenges is associated with completing the guest check-in procedures in the property management system even though the guest never arrives at the front desk to check-in. It is desirable to enable guests to bypass the front desk to make the guest experience better and less administratively-burdensome. However, without having the guest arrive at the front desk, there needs to be a way to communicate the guest's check-in back to the property management system from the access control system, even though the two systems are separate and discrete systems.

[0006] It is, therefore, one aspect of the present disclosure to allow an access control system to detect, record, and automatically distribute information regarding the first time a given electronic key arrives at or gains access through a given 'offline lock'. Previously,

automatic distribution of such information has been possible for ‘online locks’ but not for ‘offline locks’.

[0007] An ‘online lock’ is a lock with inbuilt networking capability, which allows it to automatically report events back to the access control system. Typical events might be key usage, door opened, etc. Typical networks used might be wired or wireless Ethernet, Radio Frequency networks etc.

[0008] In contrast, an ‘offline lock’ is a lock with no such network capability, hence no previous means of automatic lock event reporting back to the access control system.

[0009] In some embodiments, an access control system is proposed that includes the following components:

- a1) access code / credential generation: generates electronic keys that can be stored on a phone (or other mobile device) and then used at locks;
- a2) secure distribution of the electronic keys to the targeted phones/devices;
- a3) software on the phones/devices to store the electronic keys and send them to the locks, typically using Radio Frequency (RF) communication;
- a4) offline lock electronics and firmware to receive the electronic keys from the phone/device decipher them and decide whether to grant access.

[0010] In some embodiments, electronic keys can be distributed to mobile devices via an electronic key delivery path. As a non-limiting example, an electronic key is generated in response to a request from an external system (e.g., a property management system). The key is securely distributed to the software application on the phone/mobile device of the intended recipient. This distribution uses standard networks and protocols available to the device, such as Wifi or cellular data, depending upon encryption requirements, customer preferences, and the like. When the phone/mobile device is presented to a lock within the access control system, the key is transmitted via RF, Bluetooth, infrared, or some other contactless delivery mechanism to the lock electronics where access control logic on the lock (e.g., firmware) examines the key and determines whether to grant access or not.

[0011] In some embodiments, the lock is offline, which means that the lock cannot, by itself, report resulting information to other parts of the access control system via a shared network. In the proposed system, a reverse path to the key delivery path is used to propagate information back from the lock and through the access control system. Rather than use dedicated networks that would be available to an ‘online lock’, the networks

available on the phone/mobile device are used. This enables more 'offline locks' to be used in an access control system, which greatly reduces the overall costs associated with implementing such a system (e.g., because dedicated wiring or networking components are not required to support the reporting mechanisms).

[0012] With respect to a return path, when the phone/mobile device is presented to the lock, information from the lock is transmitted via RF, Bluetooth, infrared, or some other contactless delivery mechanism from the lock electronics and firmware to the software application on the phone/mobile device. The information contained in this communication may include, without limitation, the current time (e.g., corresponding to a transaction time), the identity of the lock, the result (access granted or not) of the access control decision, and whether this is the first time the key has been used at that lock or whether it is the first time the key has ever been used with any lock. The software application then uses available networks and/or protocols of the phone/mobile device to transmit this information back to the originating part of the access control system. Upon receiving the information from the phone/mobile device, the originating part of the access control system can register that the key has arrived at its destination and has been used.

Additionally, the arrival / first entry information can be transmitted back to other external systems (e.g., a property management system) from various points in the access control system.

[0013] Although examples of the present disclosure will be primarily discussed in connection with access control systems of a hotel or similar type of multi-room facility, it should be appreciated that embodiments of the present disclosure are not so limited. As some non-limiting examples, embodiments of the present disclosure could be used in the following types of access control systems: hotel (has a guest arrived at their room); residential (has a workman arrived at a house); office (has a staff member arrived to start work), etc.

[0014] In a specific example of a hotel implementing embodiments of the present disclosure, the following steps may occur: (1) The hotel operator organizes for the property management system at a hotel to request generation of a room access key for a guest; (2) an electronic key is generated and is sent to the access control system application on that guest's phone/mobile device; (3) the guest arrives at the hotel and presents the phone to unlock the appropriate lock; (4) information (e.g., Room identifier/Success/First Use/etc.) is sent back to the phone application; (5) the phone

application sends the above information back to the originating part of the access control system; and then (6) the information is also distributed back to the hotel operator. Once received by the hotel operator, the information may be stored in the property management system database potentially along with other information (e.g., which network carried the electronic key and access information during (5) to/from the mobile device). It should be appreciated that, in some embodiments, some of the above-listed steps may be performed concurrently/simultaneously rather than sequentially. As a non-limiting example, steps (4), (5), and/or (6) may occur during the same transaction as used for (3) in which the guest presents their phone to the appropriate lock, thereby obviating the need for the guest to present their phone to the lock multiple times.

[0015] The present invention will be further understood from the drawings and the following detailed description. Although this description sets forth specific details, it is understood that certain embodiments of the invention may be practiced without these specific details. It is also understood that in some instances, well-known circuits, components and techniques have not been shown in detail in order to avoid obscuring the understanding of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The present disclosure is described in conjunction with the appended figures:

[0017] Fig. 1 is a block diagram depicting a communication system in accordance with embodiments of the present disclosure;

[0018] Fig. 2 is a block diagram depicting components of a mobile device in accordance with at least some embodiments of the present disclosure;

[0019] Fig. 3 is a block diagram depicting components of a lock/reader in accordance with at least some embodiments of the present disclosure;

[0020] Fig. 4 is a flow diagram depicting a method of generating and delivering keys to a mobile device in accordance with embodiments of the present disclosure;

[0021] Fig. 5 is a flow diagram depicting a method of reporting first interaction data in accordance with embodiments of the present disclosure;

[0022] Fig. 6 is a flow diagram depicting a method of distributing first interaction data in accordance with embodiments of the present disclosure;

[0023] Fig. 7 is a flow diagram depicting steps for using a key delivery path and a reverse of the key delivery path in accordance with embodiments of the present disclosure;

[0024] Fig. 8 is a flow diagram depicting a method of performing check-in processes in response to receiving an indication of first entry at a property management system in accordance with embodiments of the present disclosure; and

[0025] Fig. 9 is a flow diagram depicting a method of producing a direct-to-room check-in report in accordance with embodiments of the present disclosure.

DETAILED DESCRIPTION

[0026] The ensuing description provides embodiments only, and is not intended to limit the scope, applicability or configuration of the claims. Rather, the ensuing description will provide those skilled in the art with an enabling description for implementing the described embodiments. It being understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the appended claims.

[0027] The following description will provide various embodiments or characteristics of a system, which may include an access control system that facilitates interactions between multiple components. While embodiments of the present disclosure are discussed in connection with an access control system interacting with a property management system of a hotel or the like, it should be appreciated that embodiments of the present disclosure are not so limited.

[0028] With reference now to Figs. 1-9, various details and features related to an access control system and methods of operating the same will be described in accordance with at least some embodiments of the present disclosure. With initial reference to Fig. 1, a communication system 100 will be described in accordance with at least some embodiments of the present disclosure. The system 100 is shown to include one or multiple communication networks 104, an access control network 108, and an optional trusted network 112. Although depicted as two separate and distinct networks, it should be appreciated that the communication networks 104 may be implemented as a single network. Likewise, although network 104 and trusted network 112 are depicted as separate networks, it should be appreciated that the networks may be combined or one network (e.g., the trusted network 112) may be overlaid on top of the communication network 104, via communication tunneling (e.g., a Virtual Private Network (VPN), Wide

Area Network (WAN), or the like). Thus, the communication network 104 may include a trusted network 112 overlaid thereon without departing from the scope of the present disclosure.

[0029] The access control network 108 may provide connectivity between one or more access control servers 140 and a plurality of readers 128, check-in devices 148, and other components of an access control system. Thus, the access control network 108 may enable the administration and implementation of a Physical Access Control System (PACS) or the like. The access control network 108 may use any type of known communication protocol to carry information between components connected thereto. Non-limiting examples of the protocols or networks that may be used within access control network 108 include RS-232, RS-485, Wiegand, Ethernet, Power over Ethernet (PoE), ZigBee, Wi-Fi (e.g., IEEE 802.11, variants thereof, or extensions thereto), an Internet Protocol (IP) network, or any other type of wired or wireless protocol.

[0030] The communication network 104 may correspond to a private, semi-private, or public communication network used to carry information between compatible communication devices. In some embodiments, the communication network 104 may correspond to an untrusted or unsecured communication network. Non-limiting examples of a communication network 104 include a telephone network, a cellular network, an IMS network, a Wide Area Network (e.g., the Internet), a Local Area Network, an IP network, an SNMP network, or any other known type of network architecture. One or more of email messages, SMS messages, MMS messages, SNMP messages, messages transmitted using HTTP or SHTTP or variants thereof, messages exchanged using FTP, messages exchanged using RTP or UDP, or the like can be used to carry information between an access control server 140 and a mobile device 116. In some embodiments, Voice over IP (VoIP) or the like can also be used to carry information between the access control server 140 and mobile device 116.

[0031] The reader 128 may correspond to any type of interaction device or set of interaction devices that limit or control access to one or more protected assets. The reader 128, in some embodiments, may be configured to exchange communications directly with a mobile device 116 via a communications channel 136. The communications channel 136 may be a contactless communications channel in some embodiments. The communications channel 136 may alternatively or additionally be a contact-based communications channel. In some embodiments, electromagnetic radiation in the form of

Radio Frequency (RF) waves may be used to carry information on the communications channel 136. Alternatively or additionally, the communications channel 136 may utilize light, magnetic, acoustic, or any other medium to carry information between the reader 128 and mobile device 116. The communication channel 136 may also be characterized by the communication protocol used to exchange information. In some embodiments, signal modulation (e.g., Amplitude Modulation, Frequency Modulation, Phase Modulation, combinations thereof, variants thereof, or the like) is used to communicate data between the reader 128 and mobile device 116. Some non-limiting examples of the protocol(s) that are used on the communication channel 136 include protocols defined in ISO 14443, ISO 15693, ISO 18092, FeliCa, Near Field Communications (NFC), Bluetooth, Wi-Fi (e.g., 802.11N, variants thereof, or extensions thereto), ZigBee, GSM, combinations thereof, etc. It should further be appreciated that depending upon the capabilities of the mobile device 116 and reader 128, it may be possible to establish multiple communication channels 136 between the devices. For instance, the reader 128 and mobile device 116 may establish a first communication channel using a first protocol (e.g., Bluetooth or Bluetooth Low Energy (BLE)) as well as a second communication channel using a second protocol (e.g., NFC, infrared, or the like). It should be appreciated that the communication channel 136 may correspond to a proximity-based communication channel that can only be created when the mobile device 116 and reader 128 are within a predetermined distance of one another (e.g., less than 0.5 meters for NFC, less than 50 meters for BLE, or less than 200 meters for Wi-Fi). The communication channel 136 may be further characterized by the authentication protocol used by the devices (e.g., reader 128 and mobile device 116) to authenticate with one another. Examples of authentication protocols that may be used on the communication channel 136 include SEOS and FIDO.

[0032] Although the term “reader” is used herein to refer to a device or collection of devices used to control access to a protected asset (e.g., a physical asset such as a door to a room, a safe, etc.), it should be appreciated that the term “reader”, “lock”, and the like may be used interchangeably. For instance, a networked reader 128 as shown in Fig. 1 may also be referred to as an ‘online lock’. Similarly, as will be discussed in further detail herein, a non-network reader 132 may be referred to synonymously as an ‘offline lock’. In other words, the use of the term “lock”, “reader”, and other similar terms may be used to describe an electromechanical device or collection of devices that are used to protect and secure an asset, such as a physical asset. Furthermore, the reader or lock as discussed

herein may be used to protect and secure logical assets, such as bank accounts, computer network resources, and the like.

[0033] In addition to the traditional reader 128 that is depicted as being connected to an access control network 108, the communication system 100 also includes one or more non-networked readers 132 or ‘offline locks’. The non-networked readers 132 may differ from the readers 128 in that the non-networked readers 132 may not be natively or persistently connected to the access control network 108, which subsequently limits the non-networked reader’s 132 ability to communicate with access control servers 140 or other devices on an ad-hoc basis. Accordingly, embodiments of the present disclosure suggest utilizing the communication channel 136 to facilitate communication of information from the non-networked reader 132 to the mobile device 116 and eventually back to the access control servers 140 and other devices. Thus, the components of the non-networked reader 132 may be similar or identical to those of the reader 128 except that a communication interface with the access control network 108 may be lacking from the non-networked reader 132 or such an interface may be disabled/not be utilized.

[0034] The mobile device 116 may correspond to any type of electronic device and, as the name suggests, the electronic device may be portable in nature. As some examples, the mobile device 116 may correspond to a cellular phone or smartphone carried by a user. Other examples of a mobile device 116 include, without limitation, wearable devices (e.g., glasses, watches, shoes, clothes, jewelry, wristbands, stickers, etc.). The mobile device 116, as shown in Fig. 1, may be provided with an access control application 120 that stores one or a plurality of keys 124. The key(s) 124 may be communicated to a reader 128, 132 in connection with a holder of the mobile device 116 attempting to gain access to an asset protected by the reader 128, 132. As an example, the mobile device 116 may be presented to the reader 128, 132 by a user or holder of the mobile device 116.

[0035] In some embodiments, the key(s) 124 may be delivered to the mobile device 116 from the access control server 140 via the communication network 104. In other embodiments, the key(s) 124 may be delivered to the mobile device 116 via a check-in device 148, which receives the keys from the access control server(s) 140 over the access control network 108. Additional details of the first key delivery mechanism are described in U.S. Patent No. 8,074,271 to Davis et al. and U.S. Patent No. 7,706,778 to Lowe, both of which are hereby incorporated herein by reference in their entirety. Additional details of the second key delivery mechanism (e.g., use of the check-in device 148) are described

in U.S. Patent No. 8,730,004 to Elfstrom et al., the entire contents of which are hereby incorporated herein by reference. The access control modules described in the '004 patent may have similar characteristics to the readers 128, 132 described herein. Further still, the networking and communication behaviors of the readers 128 may be similar to the parent and child devices described in U.S. Patent No. 8,102,799 to Alexander et al., the entire contents of which are hereby incorporated herein by reference.

[0036] If NFC is being used for the communication channel 136, then the reader 128, 132 and mobile device 116 may have their interfaces/antennas inductively coupled to one another at which point the reader and/or mobile device 116 will authenticate or mutually authenticate with one another. Following authentication, the reader 128, 132 may request a key 124 or multiple keys from the mobile device 116 or the mobile device 116 may offer a key 124 or multiple keys to the reader 128, 132. Upon receiving the key(s) 124 from the mobile device 116, the reader 128, 132 may analyze the key(s) 124 and determine if the key(s) 124 are valid and, if so, allow the holder/user of the mobile device 116 access to the asset protected by the reader 128, 132. It should be appreciated that the mobile device 116 may alternatively or additionally be configured to analyze information received from the reader 128, 132 in connection with making an access control decision and/or in connection with making a decision whether or not to provide key(s) 124 to the reader 128, 132.

[0037] If BLE or some other non-inductive protocol (e.g., Wi-Fi) is being used for the communication channel 136, then the reader 128, 132 and mobile device 116 may perform a discovery routine prior to pairing with one another or otherwise connecting to establish the communication channel 136. After the channel 136 is established, however, the reader 128, 132 and mobile device 116 may then authenticate one another and exchange relevant information, such as the key(s) 124, to enable an access control decision to be made. If a positive access control decision is made (e.g., it is determined that the key(s) 124 are valid and the mobile device 116 is allowed to access the asset protected by the reader 128, 132), then the reader 128, 132 may initiate one or more actions to enable the holder/user of the mobile device 116 to access the asset protected by the reader 128, 132.

[0038] As will be discussed in further detail herein, the reporting of information from a networked reader 128 to the access control server 140 and/or to a property management system 144 is relatively straight forward. For instance, when a user presents a mobile device 116 to a reader 128, information regarding such an exchanged may be provided from the reader 128 to an access control server 140 or property management system 144

via the access control network 108. On the other hand, a non-networked reader 132 does not have the native capability to report the same type of information directly to the access control servers 140 or property management system 144. Accordingly, it may be desirable for the non-networked reader 132 to leverage the communication channel 136 as a mechanism for communicating the information regarding a first interaction (or first key usage or some other transactional information) back to an access control server 140 or property management system 144. Furthermore, once the mobile device 116 (or more specifically the access control application 120 running on the mobile device 116) is in possession of the interaction data from the non-networked reader 132, the mobile device 116 may decide whether to report the information to the access control servers 140 via the communication network 104 or whether the trusted network 112 can and should be utilized to report the information directly to the property management system 144. As a non-limiting example, the non-networked reader 132 may dictate to the mobile device 116 that the trusted network 112 is to be used to convey the interaction data back to the property management system 114, since the trusted network 112 may be under control of the entity administering the property management system 144 (e.g., the hotel operator). In some embodiments, interaction data may be reported simultaneously by a mobile device 116 to both the access control server(s) 140 and the property management systems via both the communication network 104 and the trusted network 112 (via two reporting messages).

[0039] With reference now to Fig. 2, additional details of a mobile device 116 will be described in accordance with at least some embodiments of the present disclosure. The mobile device 116 is shown to include computer memory 204 that stores one or more Operating Systems (O/S) 208 and keys 212, among other items. The mobile device 116 is also shown to include a processor 216, one or more drivers 220, a user interface 224, a reader interface 228, a network interface 232, and a power module 236. Suitable examples of a mobile device 116 include, without limitation, smart phones, PDAs, laptops, PCs, tablets, net books, wearable devices, and the like.

[0040] The memory 204 may correspond to any type of non-transitory computer-readable medium. In some embodiments, the memory 204 may comprise volatile or non-volatile memory and a controller for the same. Non-limiting examples of memory 204 that may be utilized in the mobile device 116 include RAM, ROM, buffer memory, flash memory, solid-state memory, or variants thereof.

[0041] The O/S 208 may correspond to one or multiple operating systems. The nature of the O/S 208 may depend upon the hardware of the mobile device 116 and the form factor of the mobile device 116. The O/S 208 may be viewed as an application stored in memory 204 that is processor-executable. The O/S 208 is a particular type of general-purpose application that enables other applications stored in memory 204 (e.g., a browser, an email application, an SMS application, etc.) to leverage the various hardware components and driver(s) 220 of the mobile device 116. In some embodiments, the O/S 208 may comprise one or more APIs that facilitate an application's interaction with certain hardware components of the mobile device 116. Furthermore, the O/S 208 may provide a mechanism for viewing and accessing the various applications stored in memory 208 and other data stored in memory 208.

[0042] The keys 212 may be similar or identical to the keys 124 depicted in Fig. 1. In some embodiments, the key(s) 212 may be stored in the same physical memory 204 as the O/S 208. In other embodiments, the key(s) 212 may be stored in physical computer memory that is separate from the computer memory used to store the O/S 208 and other applications. Even more specifically, the key(s) 212 may be kept in secure or encrypted computer memory, thereby preventing the keys contained therein from being obtained or manipulated by unauthorized parties. Access to the key(s) 212 may be predicated upon certain events and/or user inputs. For instance, a user may be required to input a valid password or PIN at the user interface 224 for the key(s) 212 to be distributed to a reader 128, 132, for example.

[0043] The processor 216 may correspond to one or many microprocessors that are contained within the housing of the mobile device 116 with the memory 204. In some embodiments, the processor 216 incorporates the functions of the mobile device's 116 Central Processing Unit (CPU) on a single Integrated Circuit (IC) or a few IC chips. The processor 216 may be a multipurpose, programmable device that accepts digital data as input, processes the digital data according to instructions stored in its internal memory, and provides results as output. The processor 216 may implement sequential digital logic as it has internal memory. As with most known microprocessors, the processor 216 may operate on numbers and symbols represented in the binary numeral system.

[0044] The driver(s) 220 may correspond to hardware, software, and/or controllers that provide specific instructions to hardware components of the mobile device 116, thereby facilitating their operation. For instance, the user interface 224, reader interface 228, and

network interface 232, may each have a dedicated driver 220 that provides appropriate control signals to effect their operation. The driver(s) 220 may also comprise the software or logic circuits that ensure the various hardware components are controlled appropriately and in accordance with desired protocols. For instance, the driver 220 of the reader interface 228 may be adapted to ensure that the reader interface 228 follows the appropriate proximity-based protocols (e.g., BLE, NFC, Infrared, Ultrasonic, IEEE 802.11N, etc.) such that the reader interface 228 can exchange communications.

Likewise, the driver 220 of the network interface 232 may be adapted to ensure that the network interface 232 follows the appropriate network communication protocols (e.g., TCP/IP (at one or more layers in the OSI model), UDP, RTP, GSM, LTE, Wi-Fi, etc.) such that the network interface 232 can exchange communications via the communication network 104, the trusted network 112, or the like. As can be appreciated, the driver(s) 220 may also be configured to control wired hardware components (e.g., a USB driver, an Ethernet driver, etc.).

[0045] As mentioned above, the user interface 224 may comprise one or more user input devices and/or one or more user output devices. Examples of suitable user input devices that may be included in the user interface 224 include, without limitation, buttons, keyboards, mouse, pen, camera, microphone, etc. Examples of suitable user output devices that may be included in the user interface 224 include, without limitation, display screens, lights, speakers, etc. It should be appreciated that the user interface 224 may also include a combined user input and user output device, such as a touch-sensitive display or the like.

[0046] The reader interface 228 may correspond to the hardware that facilitates communications between the mobile device 116 and a reader 128, 132. The reader interface 228 may include a Bluetooth interface (e.g., antenna and associated circuitry), a Wi-Fi/802.11N interface (e.g., an antenna and associated circuitry), an NFC interface (e.g., an antenna and associated circuitry), an Infrared interface (e.g., LED, photodiode, and associated circuitry), and/or an Ultrasonic interface (e.g., speaker, microphone, and associated circuitry). In some embodiments, the reader interface 228 is specifically provided to facilitate proximity-based communications over a communication channel 136 or multiple communication channels 136.

[0047] The network interface 232 may comprise hardware that facilitates communications with other communication devices over the communication network 104

or trusted network 112. As mentioned above, the network interface 232 may include an Ethernet port, a Wi-Fi card, a Network Interface Card (NIC), a cellular interface (e.g., antenna, filters, and associated circuitry), or the like. The network interface 232 may be configured to facilitate a connection between the mobile device 116 and the communication network 104, 112 and may further be configured to encode and decode communications (e.g., packets) according to a protocol utilized by the communication network 104, 112.

[0048] The power module 236 may include a built-in power supply (e.g., battery) and/or a power converter that facilitates the conversion of externally-supplied AC power into DC power that is used to power the various components of the mobile device 116. In some embodiments, the power module 236 may also include some implementation of surge protection circuitry to protect the components of the mobile device 116 from power surges.

[0049] With reference now to Fig. 3, additional details of a non-networked reader 132 will be described in accordance with at least some embodiments of the present disclosure. The non-networked reader 132 is depicted in Fig. 3, but it should be appreciated that similar components may be included in a networked reader 128. The difference between the networked reader 128 and non-networked reader 132 may correspond to the fact that the networked reader 128 has a network interface that connects the reader 128 to the access control network 108, either via a wired or wireless communication channel. The non-networked reader 132, however, is devoid of a network interface or such an interface is deactivated or unused by the non-networked reader 132. In some embodiments, a reader having intermittent, but non-continuous, communication capability with a network may be considered a non-networked reader 132. Thus, any reader without the ability to communicate via a communication network on-demand may be considered a non-networked reader 132.

[0050] The reader 132 is shown to include computer memory 304 that stores access control logic 308, a usage log 312, and first-use information 316, among other items. The reader 132 is also shown to include a processor 320, one or more drivers 324, a user interface 324, a credential interface 332, and a power module 336.

[0051] In some embodiments, the access control logic 308 is implemented as firmware, although it may also be possible to implement the access control logic 308 as software or in an Application Specific Integrated Circuit (ASIC). In some embodiments, the usage log

312 may contain information regarding interactions between the reader 132 and credentials, such as mobile devices 116 and traditional access control cards or key fobs, which may be referred to as credential-type devices. The type of information that may be stored in the usage log 312 includes dates and times of interactions with credential-type devices, whether any such interactions corresponded to a first or subsequent interaction with that particular device, which key(s) were used during the interaction, the results of the access control decision made by the access control logic 308, etc. In addition to the usage log 312, the memory 304 may also contain first-use information that is specific to instances of a key's first use and/or instances of a first interaction between a particular credential-type device and the reader 132.

[0052] In some embodiments, a key 124, 212 may be updated after it has been used for a first time, thereby enabling all subsequent readers to know that it is not receiving a key 124, 212 as a first instance of that key's use in the access control system. As an example, a key 124, 212 may be updated with a flag or marker after it has first been delivered to a reader 128, 132. All subsequent transmissions or uses of that key 124, 212 will include the updated flag or marker indicating that the key is no longer being used for the first time. Therefore, when a reader 128, 132 receives a key 124, 212 and that key is not marked as being used previously, then the reader 128, 132 will know that it is receiving the key 124, 212 during its first use. This information may be stored in the first-use information 316 along with a time of the transaction, an identity of the mobile device 116, an identity of the reader 128, 132, and whether access was granted or denied. The first-use information 316 and/or information from the usage log 312 may subsequently be transmitted by the reader 132 back to the mobile device 116 via the communication channel 136 for subsequent delivery to the access control server(s) 140 and/or property management system 144.

[0053] The processor 320 of the reader 132 may be similar in nature to the processor of a mobile device 116. In some embodiments, the processing capabilities of the processor 320 may be limited as compared to the processing capabilities of the processor 216. As an example, the processor 320 may comprise an IC chip or multiple IC chips configured to execute the firmware or instructions stored in memory 304.

[0054] Likewise, the driver(s) 324 may comprise software, firmware, or embedded hardware that facilitates operations of components of the reader 132. For instance, the user interface 328 may have a dedicated driver 324. The credential interface 332 may also

have a dedicated driver 324. Other components of the reader 132 may also have their own drivers 324.

[0055] The user interface 328 may correspond to a user input and/or user output device. In a reader 132 the user interface 328 is traditionally a relatively simple device, though simplicity is not a requirement. For instance, the user interface 328 may comprise a simple visual display (e.g., light, LED, 8-segment display, etc.) or a more elaborate visual display (e.g., LCD screen). A user input portion of the user interface 328 may comprise a PIN pad, fingerprint sensor, retina scanner, or the like. The user interface 328 may also facilitate audible interactions with the reader 132. For instance, the user interface 328 may comprise a buzzer, speaker, microphone, photodetector, proximity detector, etc. Alternatively or additionally, the user interface 328 may comprise a combined user input and user output device, such as a touch-sensitive display with configurable buttons.

[0056] The credential interface 332 may comprise the hardware, circuits, or the like that facilitate the establishment of the communication channel 136. As some non-limiting examples, the credential interface 332 may comprise an antenna, tuning circuitry, a BLE antenna, a Wi-Fi antenna, a magstripe reader, a photodetector, an infrared emitter, a microphone, a speaker, and the like.

[0057] The power module 336 may correspond to a dedicated power source and/or a power converter that facilitates the conversion of externally-supplied AC power into DC power that is used to power the various components of the reader 132. In some embodiments, the power module 336 may also include some implementation of surge protection circuitry to protect the components of the reader 132 from power surges.

[0058] With reference now to Fig. 4, a method of delivering a key 124, 212 to a mobile device 116 will be described in accordance with at least some embodiments of the present disclosure. The method begins when a request for an electronic key or set of electronic keys is received at the property management system 144 (step 404). The request may be received in response to a guest confirming a desire to stay at a hotel, in response to a guest confirming a desire to enter a house, in response to an office guest confirming their meeting at an office, or the like. The request for a key may then be forwarded from the property management system 144 to an access control server 140. Upon receiving the request for the electronic key from the property management system 144, the access control server(s) 140 will determine whether the request is a valid and actionable request (e.g., whether the request came from a trusted source, in a trusted format, and should result

in the creation of an electronic key). The authentication between the access control server(s) 140 and property management system 144 may be completed using any type of authentication protocol.

[0059] If the authentication is successful, then the access control server(s) 140 will determine attributes for the electronic key (step 408). These attributes may include a property or site code to be assigned to the electronic key, an encryption for the electronic key, a duration of validity for the electronic (which may be indefinite or finite), and other attributes that will belong to the key. Based on the attributes, the access control server(s) 140 will generate the electronic key(s) (step 412) and then determine one or more targets for the keys (step 416). The targets for the key(s) may include one or more mobile devices 116 that were identified in the request for the key in step 404. Alternatively or additionally, the target for the key(s) may include credentials other than a mobile device 116, such as a traditional smart card, key fob, or the like.

[0060] After the target for the electronic key has been determined, the access control server(s) 140 determine whether or not it is time to distribute the key (step 420). The timing of distribution may be based on an amount of time prior to a guest's anticipated arrival or check-in. Alternatively or additionally, the timing of distribution may be event-based or triggered by a sequence of events. Of course, the distribution may be both time-based and event-based. As an example of a time-based distribution, the electronic key may not be distributed to the target device until a predetermined amount of time prior to a guest's anticipated check-in to a hotel. As another example of a time-based distribution, the electronic key may not be distributed to the target device until a predetermined amount of time prior to a scheduled meeting. As an example of an event-based distribution, the electronic key may not be distributed until the guest is within a predetermined distance or proximity of a hotel, house, or office building. Another example of an event-based distribution would be to wait until a mobile device 116 is connected to a predetermined communication network 104 or trusted network 112. An example of a combined time-based and event-based distribution would be to limit distribution of a key until a predetermined amount of time prior to a guest's anticipated check-in and until the guest's mobile device 116 has connected to a trusted network 112 of the property where the guest is checking-in.

[0061] If the query of step 420 is answered negatively, then the access control server(s) 140 will continue monitoring events, time, and other triggers to determine an appropriate

delivery time (step 424). If the query of step 420 is answered affirmatively, an appropriate distribution protocol and channel are determined for the distribution then the electronic key(s) (step 428). For example, it may be determined that a cellular network and cellular communication protocol can be used to deliver the keys to the mobile device 116 over the communication network 104. As another example, it may be determined that a more secure delivery channel is required, in which case the trusted network 112 may be required for delivery of the key.

[0062] After the appropriate channel and protocol have been determined, the electronic key(s) are transmitted to their target via the determined channel and protocol (step 432). The delivery of the key(s) may employ traditional protocols such as HTTP/HTTPS, SNMP, FTP, SMS messages, MMS messages, RTP, UDP, etc. or non-traditional/proprietary protocols. In some embodiments, the path used to deliver the key to the target may be referred to as a key delivery path and may follow a specific set of nodes when traveling across the communication network 104 or trusted network 112.

[0063] With reference now to Fig. 5, a method of reporting first interaction data will be described in accordance with embodiments of the present disclosure. The method begins when a mobile device 116 is presented to a reader 128, 132 (step 504). This may involve bringing the mobile device 116 within a communication range of the reader 128, 132, pairing the mobile device 116 with the reader 128, 132, or the like. Once the devices are within a communication range of one another, an initial authentication may be performed (step 508). The authentication may be mutual or one way, depending upon preferences and administrative settings at the reader 128, 132 and/or mobile device 116. If the authentication is unsuccessful (step 512), then the method will either end or allow a retry of the authentication (step 516).

[0064] If the authentication is successful (step 512), then the two devices can continue by exchanging access control information (step 520). In this step, the mobile device 116 may convey one or more electronic keys to the reader 128, 132 via the communication channel 136 established between the two devices. The reader 128, 132 may also provide identification information and/or keys to the mobile device 116 during this step. Any other type of information used in connection with making an access control decision can be exchanged between the two devices (in either direction) via the communication channel 136.

[0065] Based on the information exchanged in step 520, the reader 128, 132 and/or mobile device 116 can make a determination as to whether or not the holder of the mobile device 116 is allowed to access an asset protected by the reader 128, 132 (step 524). If this query is answered negatively, then the reader 128, 132 may update its usage log 312 (step 528). The reader 128, 132 may then end the exchange or allow a retry (step 516).

[0066] If the query of step 524 is answered positively, then the reader 128, 132 will determine if this is the first interaction that the mobile device 116 has had with the access control system (e.g., determine whether this corresponds to a first-entry event) (step 532). This determination may correspond to determining whether the interaction between the specific mobile device 116 and reader 128, 132 is a first interaction in general. This determination may also involve determining if the key used by the mobile device corresponds to a first use instance of that key, either globally (e.g., among all readers in the access control system) or locally (e.g., specific to the current reader 128, 132). As discussed above, the reader 128, 132 may analyze properties of the key to determine if the key has been previously used or not, for example by analyzing the key for some indication of first use (or an indication of subsequent use via the marking of a use flag in the key). Analysis of the key as opposed to the mobile device 116 may be useful, especially for situations of frequent visitors to a property. For example, a guest may stay with a specific hotel a number of times over the course of a year, but the guest's mobile device 116 will use a different key for each such stay. If the mobile device 116 itself were analyzed for a first interaction, then all subsequent stays during the year would not be registered as a check-in event. On the other hand, if the keys used for a specific stay are analyzed, then a proper check-in can be determined for each stay instance.

[0067] It should also be appreciated that the analysis of step 532 may be performed in step 528 when the mobile device 116 is denied access. The illustration of step 532 as coming from only a positive access control decision is for ease of understanding and simplicity and should not be construed as limiting embodiments of the present disclosure.

[0068] If the interaction corresponds to a first interaction (or a first use of the key by the mobile device 116), then the reader 128, 132 may generate a bundle of first interaction data and attempt to report the first interaction data back to the access control server(s) 140 and/or property management system 144. If the reader is a networked reader 128, then the first interaction data can be simply transmitted via the access control network 108 to the access control servers 140 and/or property management system 144. On the other hand, if

the reader corresponds to a non-networked reader 132, then the reader 132 will provide the first interaction data back to the mobile device 116 (step 536). In some embodiments, the first interaction data is provided back to the mobile device 116 over the same communication channel 136 used to exchange access control information. If the determination at step 532 is made quickly enough, the non-networked reader 132 may even be able to provide the first interaction data back to the mobile device 136 during the same instance of presentation used to communicate the access control information. In other words, a user may not need to present the mobile device 116 to the reader 132 twice to facilitate the communications of step 520 and 536. Instead, the first interaction data may be efficiently transmitted back to the mobile device 116 while the mobile device 116 is being held in front of the reader 132 and waiting for an access control decision.

[0069] Non-limiting examples of the types of information that can be provided in the first interaction data include an identity or identification number of the reader 132, an identifier of the key or guest, a time of the transaction, a day of the transaction, whether the access control decision was positive or negative, current temperature, reader 132 status information (e.g., low battery), etc.

[0070] Thereafter, the reader 128, 132 grants the mobile device 116 and the holder thereof access to the asset protected by the reader 128, 132 (step 540).

[0071] With reference now to Fig. 6, a method of distributing first interaction data will be described in accordance with embodiments of the present disclosure. The method begins when a mobile device 116 receives first interaction data from a reader 132 (step 604). The first interaction data may be received via the communication channel 136 used during authentication and/or during the exchange of access control information.

[0072] When the mobile device 116 receives the first interaction data, the mobile device 116 then determines a recipient address for the first interaction data (step 608). This information may be contained within the first interaction data, it may be provided as separate instructions to the mobile device 116 from the reader 132, or the mobile device 116 may comprise the intelligence to make such a determination (as it may be included as part of the access control logic 308). The mobile device 116 may also make a determination as to which communication channel or pathway should be used to deliver the first interaction data to the recipient address (step 612). In some embodiments, the mobile device 116 may determine that the first interaction data is to travel a reverse path of the key delivery path. In other words, the mobile device 116 may simply send the first

interaction data back to the same entity from which it received its electronic keys and the mobile device 116 may utilize the same communication channel/network for sending the first interaction data. In other embodiments, an administrator of the access control system may dictate that the first interaction data is to be delivered directly to the property management system 144 and this information may be delivered via a trusted network 112 delivery path instead of traveling a reversal of the key delivery path.

[0073] Once the recipient address and appropriate communication channel are determined, the mobile device 116 generates an appropriate message or set of messages to include the first interaction data (step 616). The mobile device 116 then sends the message(s) to the determined recipient address (step 620).

[0074] With reference now to Fig. 7, additional details of the communication paths that can be used to deliver electronic keys and first interaction data will be described in accordance with at least some embodiments of the present disclosure. The process depicted in Fig. 7 begins when the property management system 144 transmits an electronic key request to the access control server(s) 140 (step S701). The access control server(s) 140, in response to receiving the request, transmit one or more electronic keys to a target mobile device 116 (step S702). In some embodiments, the delivery of the electronic keys in step S702 utilizes the communication network and may involve the use of multiple network types (e.g., Internet and cellular communication network). Accordingly, the path traveled by the message(s) carrying the electronic keys may traverse multiple network boundaries and multiple network border elements.

[0075] The mobile device 116 then receives the electronic keys and stores the keys in its access control application 120 or memory 204. The mobile device 116 retains the keys until it is presented to a non-networked reader 132 (or networked reader 128), at which point communications can begin and an authentication may occur between the two devices (step S703). If a trusted relationship can be established, then the communication channel 136 may be used to deliver the electronic key to the non-networked reader 132 (step S704). The non-networked reader 132 may then make an access control decision based, at least in part, on the contents of the electronic key. The non-networked reader 132 may also determine that its receipt of the electronic key from the mobile device 116 corresponds to a first use of the electronic key, in which case the non-networked reader 132 may generate and deliver first interaction data back to the mobile device 116, again via the communication channel 136 (step S705). In some embodiments, the steps S703,

S704, and S705 may be performed during a single presentation of the mobile device 116 to the reader 132. Of course, the steps may not be performed precisely simultaneously, but to a user holding the mobile device 116, the steps may be performed during an amount of time that is perceived by the user to be simultaneous. In other embodiments, the step S705 may occur after the mobile device 116 is first presented to the reader 132 and the reader 132 may prompt the holder of the mobile device 116 to re-present the mobile device 116 back to the reader 132 so that a check-in process can be completed and the reader 132 can deliver first interaction data back to the mobile device 116.

[0076] The mobile device 116 then provides an indication to the access control server(s) 140 of the results of the access control decision implemented at the reader 132 (step S706). Furthermore, the mobile device 116 may deliver the first interaction data back to the access control server(s) 140 during step S706. The access control server(s) 140 can then provide the first interaction data to the property management system 144 (step S707). Alternatively or additionally, the mobile device 116 may deliver the first interaction data directly to the property management system 144 (step S708). As can be appreciated, the key delivery path and the first interaction data delivery path may substantially match one another, but in a reversed order. In other embodiments, the utilization of the communication channel 136 may correspond to the only commonality between the key delivery path and the first interaction data delivery path.

[0077] With reference now to Fig. 8, a method of performing check-in processes in response to receiving an indication of first entry at a property management system 144 will be described in accordance with embodiments of the present disclosure. The method begins when an indication of a guest's first entry is received at the property management system 144 (step 804). The indication may be received in response to the property management system receiving first interaction data from either the access control server(s) 140 or from a mobile device 116. The first interaction data may indicate that a particular guest (or key associated with a guest) has arrived at a particular reader 128, 132 and that the reader 128, 132 has completed a first instance of an interaction with the guest's mobile device 116 for this particular stay.

[0078] Upon receiving the indication of first entry, the property management system initiates a guest check-in process where a new user account is created for that user, where the account is specific to this particular guest's stay and the room assigned to the guest (step 808). If the guest has a frequent guest account, then the newly-generated account

may be associated with the frequent guest account in a customer relationship management database. In some embodiments, at least some information from the first interaction data is used to populate the newly-generated account (step 812). For example, if the first interaction data includes an identifier of the reader 128, 132 with which the mobile device 116 first interacted and that reader 128, 132 corresponds to a room that is assigned or may be assigned to the guest (e.g., a vacant room), then the reader identifier contained in the first interaction data may be included in the newly-generated account to identify the room that has been assigned to the guest. As another example, if the guest first presented the mobile device 116 to a reader associated with a Point of Service (PoS) machine, then an identifier of the reader as well as transaction data for the guest may be incorporated into the newly-generated account.

[0079] The method continues with the property management system 144 determining if a passport is required for the guest's stay (step 816). If this query is answered negatively, then the method continues by finalizing other check-in items for that user's account (e.g., ensuring that a credit card is on file for the guest, lining up an itinerary for the guest, etc.).

[0080] However, if the query of step 816 is answered positively, then the guest may be asked to provide additional information to confirm their identity and that they are holding a valid passport (step 820). In some embodiments, the guest may be able to enter their passport information via the reader and/or mobile device 116. In some embodiments, the guest may provide a picture of their passport and transmit that picture to the property management system 144. In some embodiments, a customer service representative from the hotel may be dispatched to meet with the guest at their known location (e.g., toward the reader where the first interaction occurred) to verify the passport information.

[0081] After the passport analysis is finalized (step 824), the method can continue to step 828 where other check-in items for the guest are finalized.

[0082] With reference now to Fig. 9, a method of producing a direct-to-room check-in report will be described in accordance with embodiments of the present disclosure. The method begins by determining that a remote hotel check-in has been requested (step 904). This request may be specifically provided during a guest's purchase of their room. Alternatively, the option may be provided to the user after the purchase has been completed and the user may accept or deny the option.

[0083] When the property management system 144 determines that the guest desires remote check-in, thereby allowing them to bypass the front desk, the property

management system 144 allocates a room for the guest prior to check-in or anticipated arrival (step 908). The allocated room may correspond to a specific room or a set of rooms that are available to the guest for selection by the guest. The identification of the room allocated to the guest may be communicated to the guest via a message transmitted to the guest's mobile device 116.

[0084] The property management system 144 then creates a guest account prior to the guest arrival (step 912). The method then waits until the guest's first entry or arrival is detected (steps 916 and 920). Once the guest's arrival is detected, the first interaction data associated with this first arrival is sent from the reader 128, 132 to the property management system 144 (step 924). The property management system 144 then produces a direct-to-room check-in report at the hotel front desk as if a normal check-in has just occurred (step 928).

[0085] It is noted that the embodiments were described as a process which is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged without departing from the scope of the present disclosure. A process is terminated when its operations are completed, but could have additional steps not included in the figure.

[0086] While illustrative embodiments of the disclosure have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed, and that the appended claims are intended to be construed to include such variations, except as limited by the prior art.

What is claimed is:

1. A method of administering an access control system for a multi-room property having a plurality of locks, at least one of which is an offline lock and has no direct wired connectivity to an access control system backend, the method comprising:

determining that a guest has remotely checked-in to the multi-room property;

assigning a room from the multi-room property to the guest;

determining a lock that is used to secure the room;

generating an electronic key that contains information enabling access to the determined lock;

transmitting the electronic key to a mobile device of the guest, wherein the electronic key is transmitted to the mobile device via a wireless communications network;

determining that the mobile device has been presented to the lock for the first time;

analyzing the electronic key and the information contained therein at the electronic lock;

determining to grant the guest access to the room based on the analysis of the electronic key and the information contained therein; and

transmitting information from the lock to the mobile device in response to determining to grant the guest access to the room, wherein the information is only transmitted to the mobile device the first time that the mobile device is presented to the lock and the guest is granted access to the room, and wherein the information transmitted from the lock to the mobile device includes a room identifier, success information, and/or a first use indication.

2. The method of claim 1, wherein the electronic key is provided to the lock via an NFC coupling and wherein the information transmitted from the lock to the mobile device is also provided during the same NFC coupling, thereby obviating the need for multiple connections between the mobile device and the lock.

3. The method of claim 1, wherein the electronic key is provided to the lock via a Bluetooth connection and wherein the information transmitted from the lock to the mobile device is also provided during the same Bluetooth connection, thereby obviating the need for multiple connections between the mobile device and the lock.

4. The method of claim 1, wherein the information transmitted from the lock to the mobile device is subsequently transmitted to a Property Management System (PMS) and is stored in a database thereof.

5. The method of claim 1, wherein the information regarding first use of the mobile device with the lock is deleted from memory of the lock following transmission from the lock to the mobile device.

6. A method of communicating information about a guest's remote check-in with a non-networked reader, the method comprising:

using a credential interface of the non-networked reader to establish a communication channel with a mobile device;

receiving an electronic key from the mobile device over the communication channel;

determining that the receiving the electronic key corresponds to a first instance of the electronic key having been used by the mobile device;

in response to determining that the receiving the electronic key corresponds to a first instance of the electronic key having been used by the mobile device, generating first interaction data; and

transmitting the first interaction data to the mobile device via the communication channel.

7. The method of claim 6, wherein the first interaction data comprises an identifier of the non-networked reader.

8. The method of claim 7, wherein the first interaction data further comprises a time associated with receiving the electronic key at the reader.

9. The method of claim 8, wherein the first interaction data further comprises results of an access control decision made at the non-networked reader in response to analyzing the electronic key.

10. The method of claim 6, further comprising:

analyzing the electronic key with access control logic stored in memory of the reader; and

making an access control decision for the mobile device based on the analysis of the electronic key.

11. The method of claim 10, wherein results of the access control decision are included in the first interaction data.

12. The method of claim 6, wherein determining that the receiving the electronic key corresponds to a first instance of the electronic key having been used by the mobile device comprises analyzing contents of the electronic key for an indication of whether the

electronic key has been presented to any other reader prior to being presented to the non-networked reader.

13. The method of claim 6, wherein determining that the receiving the electronic key corresponds to a first instance of the electronic key having been used by the mobile device comprises analyzing a usage log in the non-networked reader to determine that the electronic key has not been presented to the non-networked reader.

14. The method of claim 6, wherein the first interaction data is transmitted to the mobile device immediately after determining that the receiving the electronic key corresponds to a first instance of the electronic key having been used by the mobile device.

15. The method of claim 14, wherein the first interaction data is transmitted via the communication channel during a same presentation of the mobile device to the non-networked reader that resulted in delivery of the electronic key.

16. The method of claim 6, wherein the communication channel corresponds to a Radio Frequency (RF) channel.

17. The method of claim 16, wherein Near Field Communications (NFC) and/or Bluetooth is used by the mobile device and non-networked reader to exchange information via the communication channel.

18. A non-networked reader, comprising:

a processor;

memory including access control logic and first interaction data, wherein the first interaction data comprises information that describes a first instance of an electronic key being used by a mobile device in an attempt to gain access to an asset in an access control system; and

a credential interface that enables the non-networked reader to communicate the first interaction data to a mobile device.

19. The non-networked reader of claim 18, wherein the first interaction data further includes a recipient address that is used by the mobile device to deliver the first interaction data to a property management system on behalf of the non-networked reader.

20. The non-networked reader of claim 18, wherein the first interaction data comprises an identifier of the non-networked reader, a time associated with the non-networked reader receiving the electronic key, and results of an access control decision made at the non-networked reader in response to analyzing the electronic key.

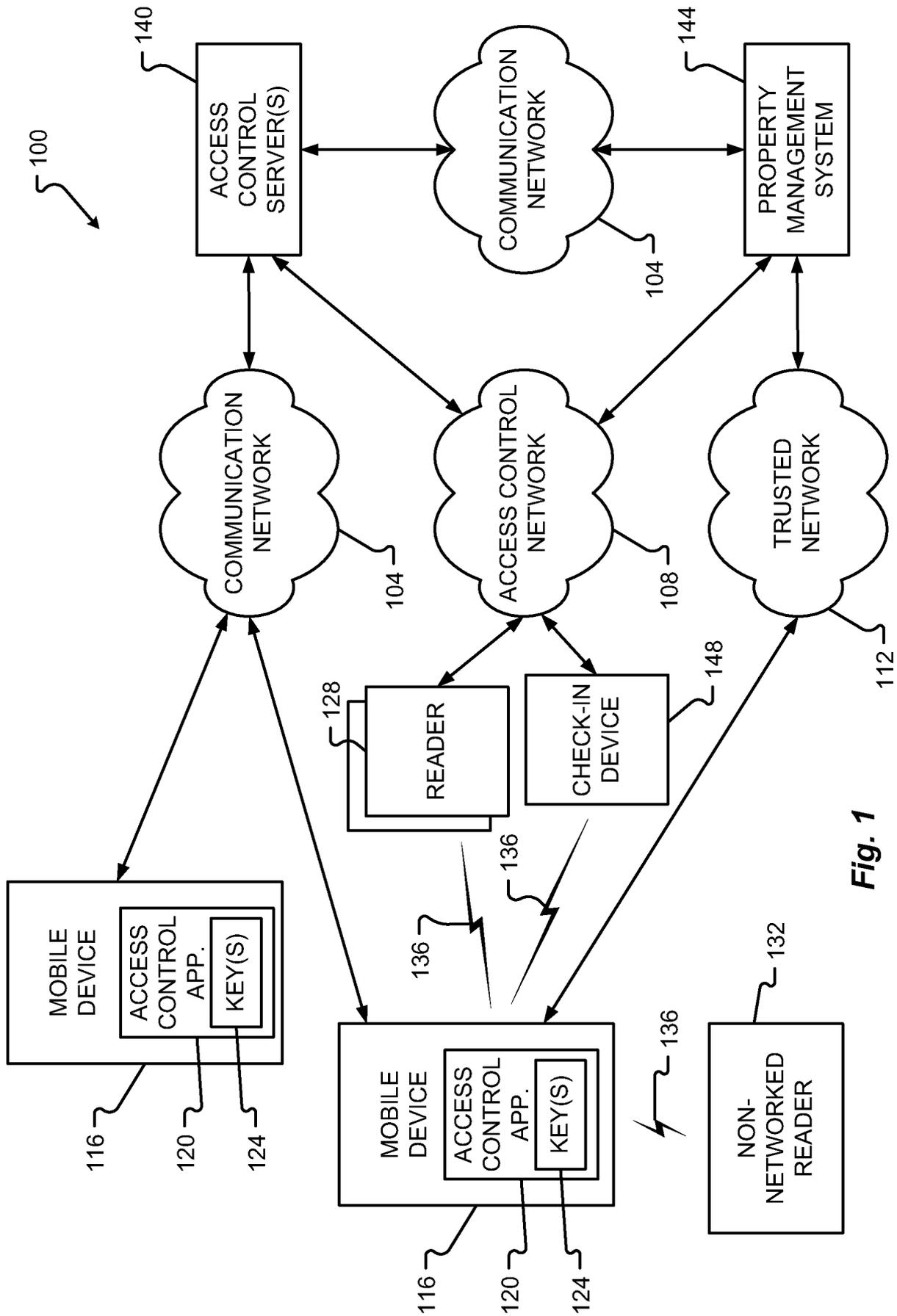


Fig. 1

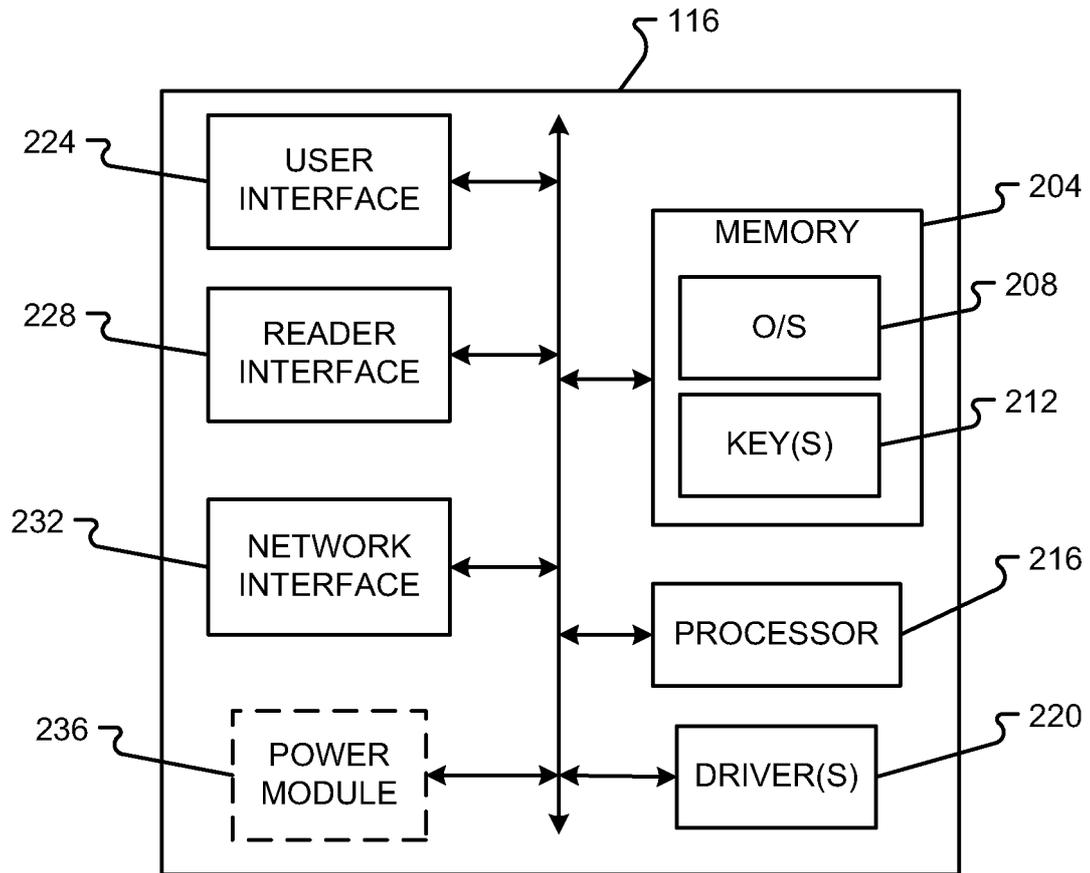


Fig. 2

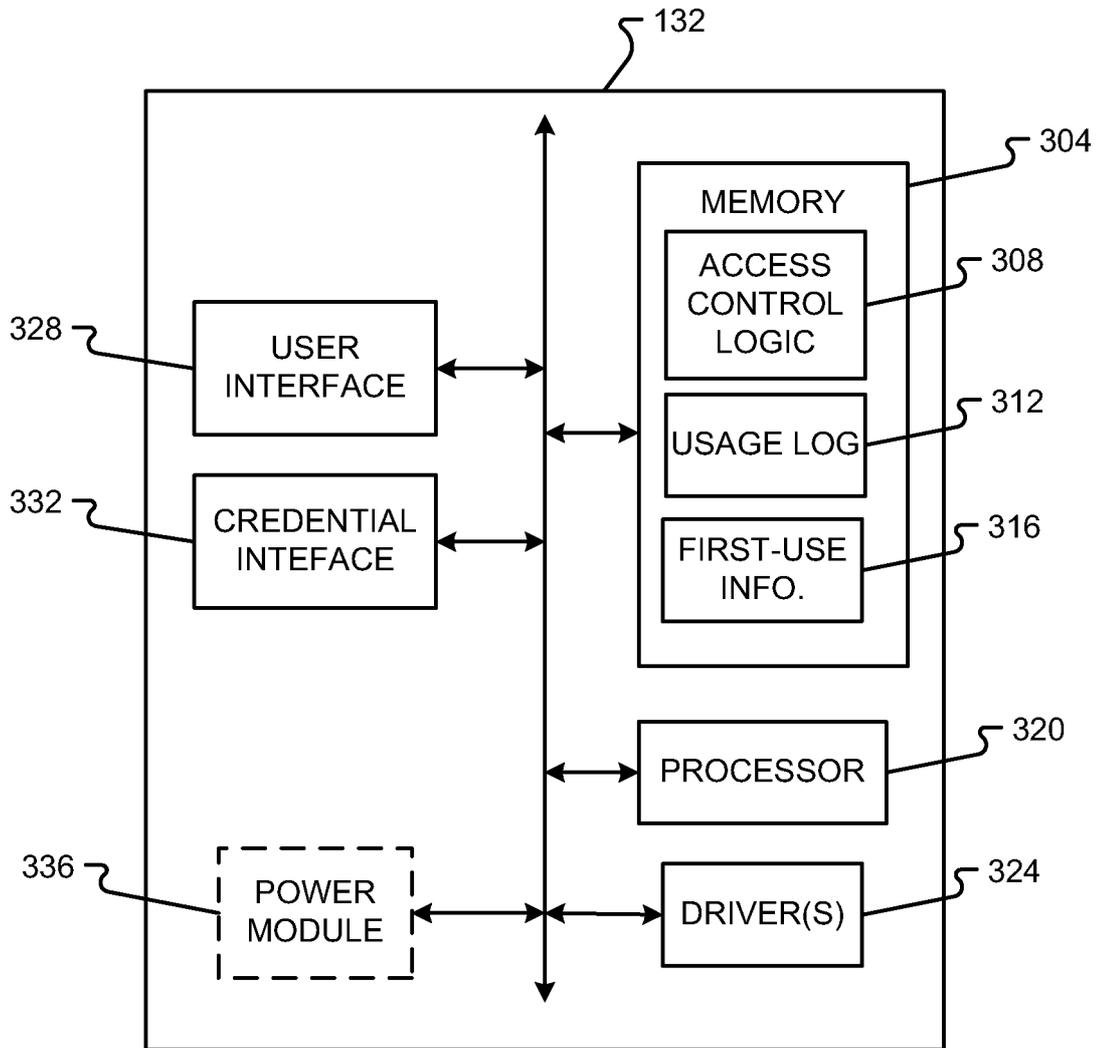


Fig. 3

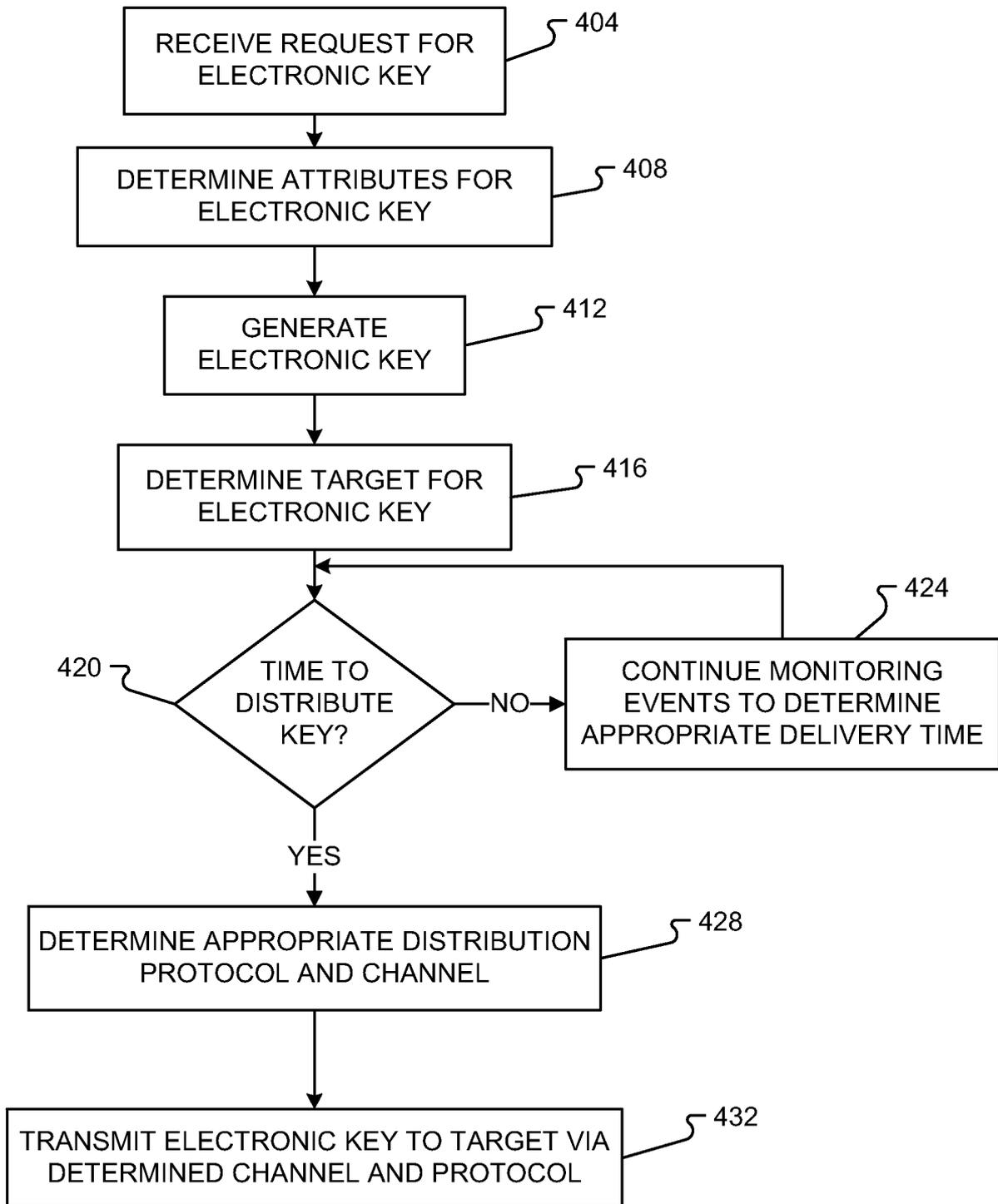


Fig. 4

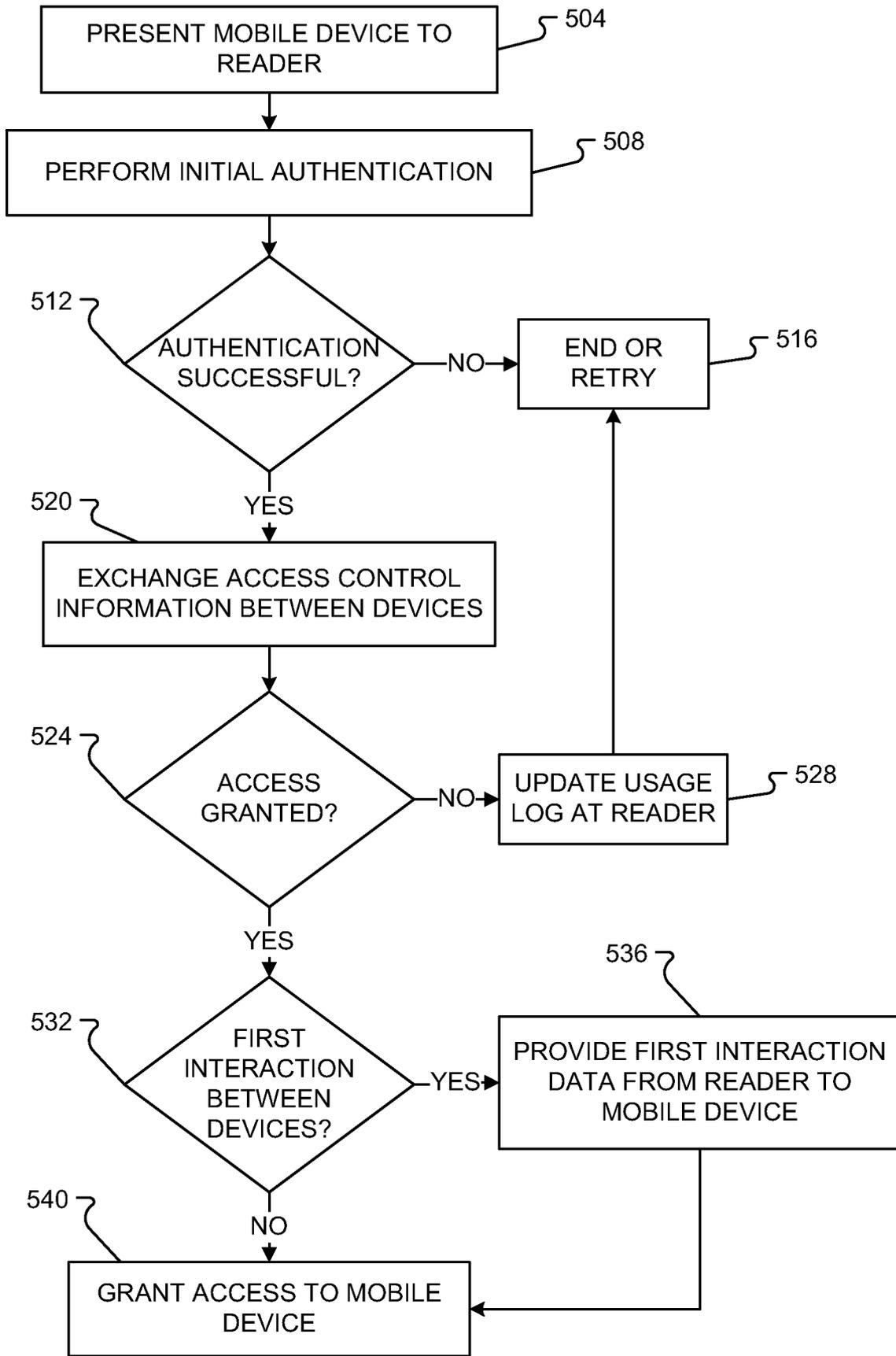
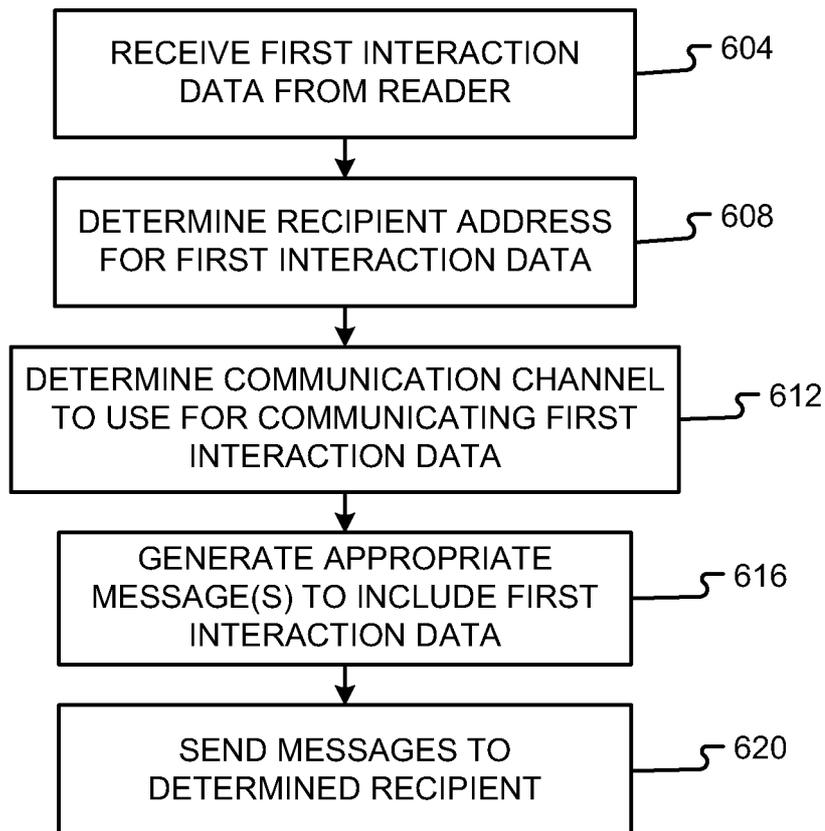


Fig. 5

**Fig. 6**

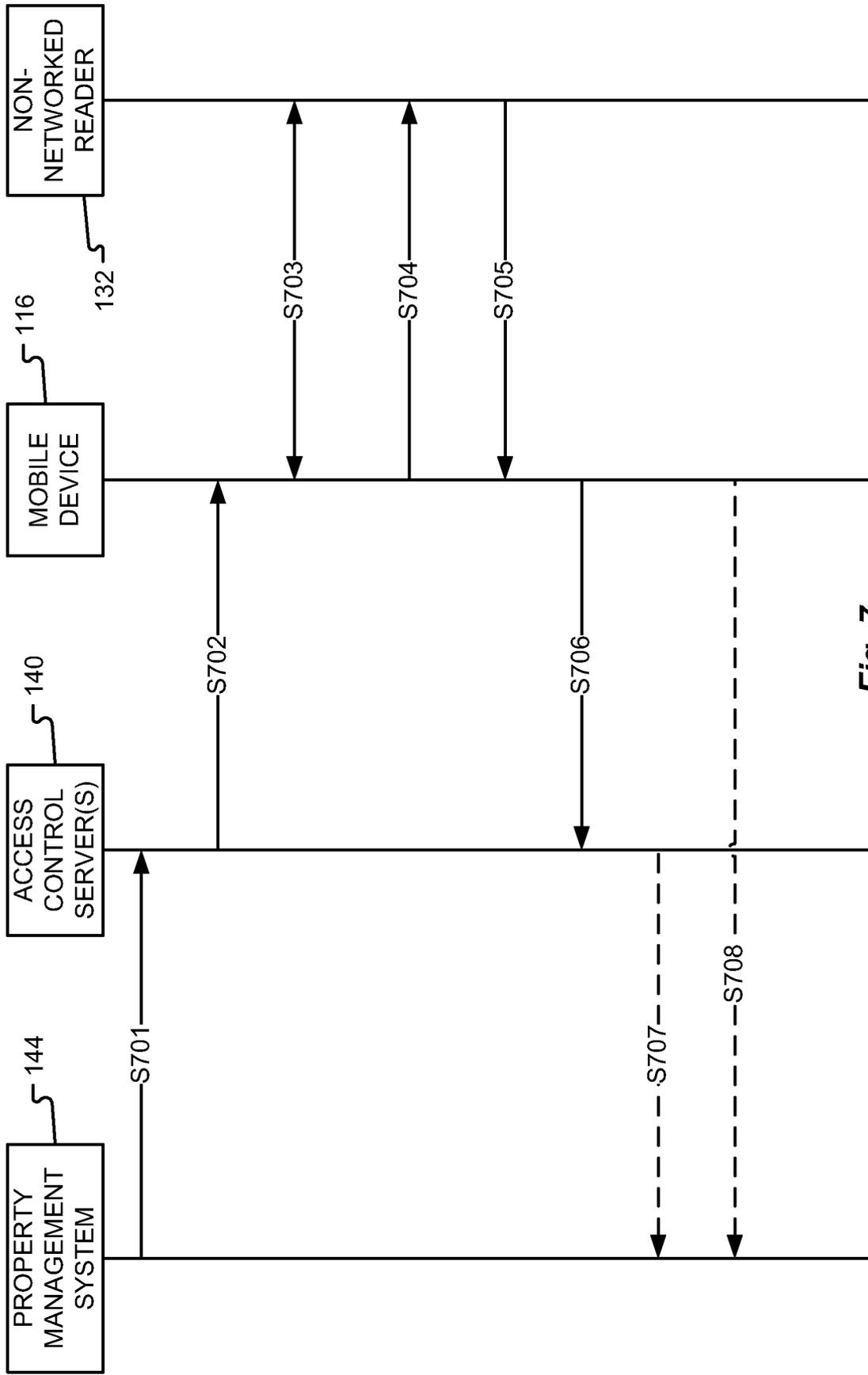


Fig. 7

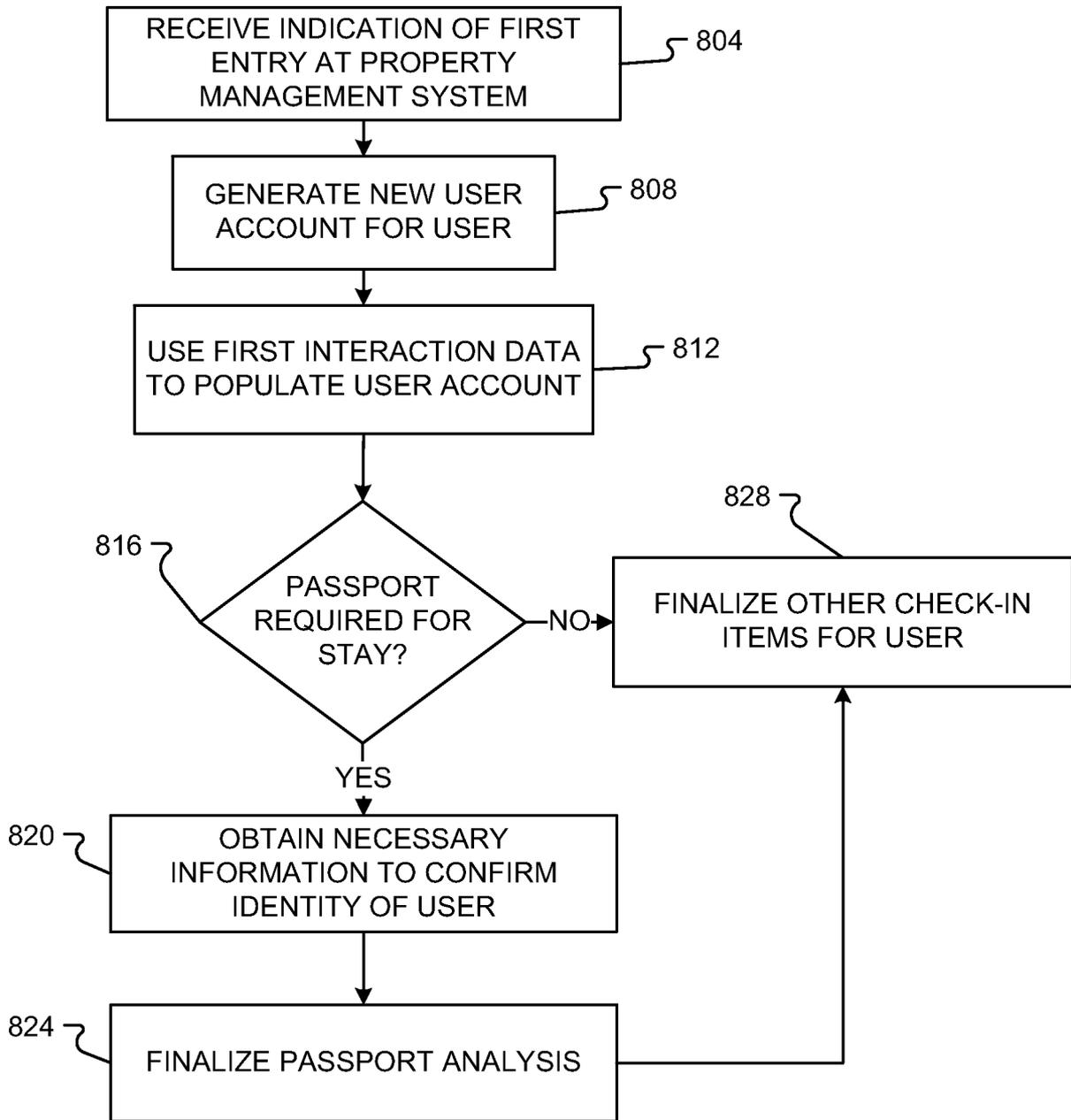


Fig. 8

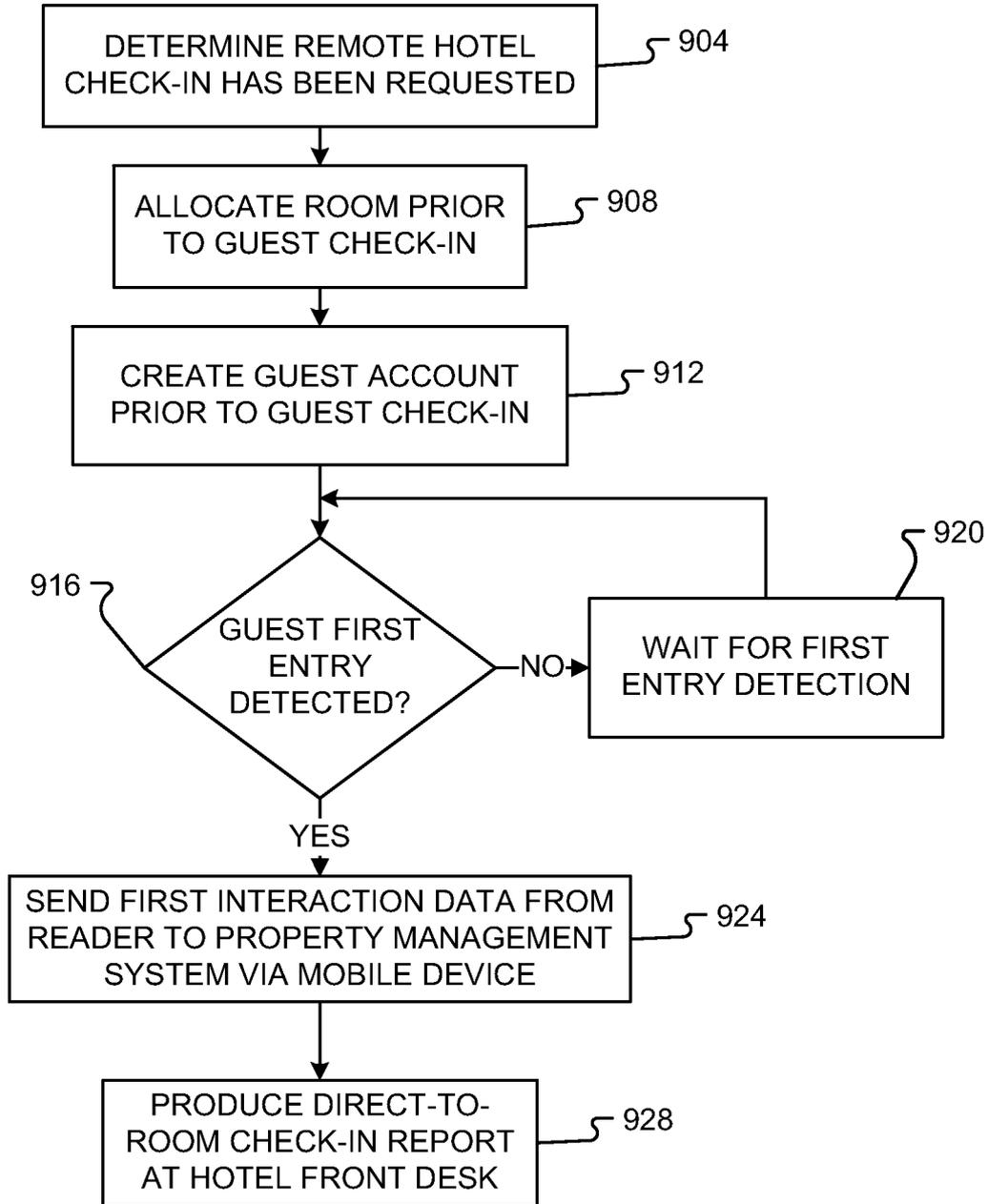


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No PCT/IB2015/001926

A. CLASSIFICATION OF SUBJECT MATTER

INV. G07C9/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07C G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>EP 2 736 021 A2 (ASSA ABLOY AB [SE]) 28 May 2014 (2014-05-28) figures 1,2,6,7,9 paragraph [0002] paragraph [0019] - paragraph [0020] paragraph [0028] - paragraph [0033] paragraph [0054] - paragraph [0062] paragraph [0067] - paragraph [0068] paragraph [0072] - paragraph [0073] ----- -/--</p>	1-20

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

25 January 2016

Date of mailing of the international search report

04/02/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Ngandu, William

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/001926

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 2014/007870 A1 (FINGI INC [US]; ROBFOGEL JACOB MORRIS [US]; VAN DEN IJSSEL ROBINUS [US] 9 January 2014 (2014-01-09) figure 2 paragraph [0001] - paragraph [0003] paragraph [0007] paragraph [0010] paragraph [0015] - paragraph [0016] paragraph [0044] - paragraph [0045] paragraph [0050] paragraph [0056] paragraph [0060] paragraph [0066] - paragraph [0067] -----</p>	1-20
A	<p>EP 2 701 124 A1 (BEKEY AS [DK]) 26 February 2014 (2014-02-26) figures 1,3 paragraph [0044] paragraph [0046] paragraph [0051] - paragraph [0053] paragraph [0072] - paragraph [0082] -----</p>	1-20
A	<p>EP 2 355 050 A2 (ASSA ABLOY HOSPITALITY INC [US]) 10 August 2011 (2011-08-10) figure 1 paragraph [0001] paragraph [0004] - paragraph [0005] paragraph [0016] paragraph [0018] - paragraph [0021] paragraph [0030] paragraph [0032] -----</p>	1-20
A	<p>GB 2 010 375 A (KADEX INC) 27 June 1979 (1979-06-27) figure 1 page 1, line 1 - line 7 page 2, line 19 - line 29 page 2, line 49 - line 74 -----</p>	1-20
A	<p>WO 97/45614 A1 (MA BUNN SIENG [FR]; FABRIKANT LUC [FR]) 4 December 1997 (1997-12-04) page 1, line 1 - line 3 page 1, line 27 - line 29 page 2, line 1 - line 5 page 2, line 24 - line 38 page 3, line 21 - line 28 -----</p>	1-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2015/001926

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-20

first entry notification method and system

1.1. claims: 1-5

administering of an access control system for a multi-room property

1.2. claims: 6-20

communication between a non-networked reader and a mobile device

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2015/001926

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 2736021	A2	28-05-2014	CN 103839313 A EP 2736021 A2 US 2014145823 A1	04-06-2014 28-05-2014 29-05-2014

WO 2014007870	A1	09-01-2014	US 2015170448 A1 WO 2014007870 A1	18-06-2015 09-01-2014

EP 2701124	A1	26-02-2014	EP 2701124 A1 US 2015221152 A1 WO 2014029774 A1	26-02-2014 06-08-2015 27-02-2014

EP 2355050	A2	10-08-2011	EP 2355050 A2 US 2011187493 A1 US 2014247111 A1	10-08-2011 04-08-2011 04-09-2014

GB 2010375	A	27-06-1979	FR 2408023 A1 GB 2010375 A	01-06-1979 27-06-1979

WO 9745614	A1	04-12-1997	FR 2749036 A1 WO 9745614 A1	28-11-1997 04-12-1997



(12)发明专利申请

(10)申请公布号 CN 107077763 A

(43)申请公布日 2017.08.18

(21)申请号 201580060815.1

(22)申请日 2015.09.09

(30)优先权数据

62/048,702 2014.09.10 US

(85)PCT国际申请进入国家阶段日

2017.05.09

(86)PCT国际申请的申请数据

PCT/IB2015/001926 2015.09.09

(87)PCT国际申请的公布数据

W02016/038457 EN 2016.03.17

(71)申请人 亚萨合莱有限公司

地址 瑞典斯德哥尔摩

(72)发明人 哈尔沃·奥瑟

(74)专利代理机构 北京康信知识产权代理有限公司 11240

代理人 梁丽超 田喜庆

(51)Int.Cl.

G07C 9/00(2006.01)

G06Q 10/02(2012.01)

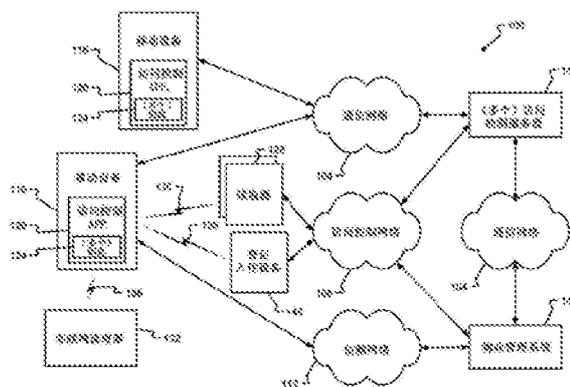
权利要求书2页 说明书13页 附图9页

(54)发明名称

首次进入通知

(57)摘要

公开了一种访问控制系统,其中,报告用户或客人的首次进入或电子钥匙的使用。首次进入或使用的报告可包括特定于初始交易的信息,并且可通过与原先的钥匙递送路径基本相同但是反向的路径来递送。这样,非联网或‘离线’锁/读取器可报告电子钥匙的首次进入或使用。



1. 一种管理用于具有多个锁的多房间房产的访问控制系统的方法,多个锁中的至少一个锁是离线锁并且没有到访问控制系统后端的直接有线连接,所述方法包括:

确定客人已远程地办理对所述多房间房产的登记入住;

从所述多房间房产中向所述客人分配房间;

确定用来锁牢所述房间的锁;

生成包含支持对所确定的锁访问的信息的电子钥匙;

将所述电子钥匙发送至所述客人的移动设备,其中,所述电子钥匙经由无线通信网络被发送至所述移动设备;

确定所述移动设备首次被呈现给所述锁;

在电子的所述锁处分析所述电子钥匙以及所述电子钥匙内包含的所述信息;

基于对所述电子钥匙以及所述电子钥匙内包含的所述信息的分析,确定授权所述客人访问所述房间;以及

响应于确定授权所述客人访问所述房间,将信息从所述锁发送至所述移动设备,其中,仅所述移动设备首次被呈现给所述锁并且所述客人被授权访问所述房间时将所述信息发送至所述移动设备,并且其中,从所述锁向所述移动设备发送的所述信息包括房间标识符、成功信息和/或首次使用指示。

2. 根据权利要求1所述的方法,其中,所述电子钥匙经由NFC耦合被提供给所述锁,并且其中,在同一NFC耦合期间也提供从所述锁向所述移动设备发送的所述信息,从而免除所述移动设备与所述锁之间多次连接的需要。

3. 根据权利要求1所述的方法,其中,所述电子钥匙经由蓝牙连接被提供给所述锁,并且其中,在同一蓝牙连接期间,也提供从所述锁向所述移动设备发送的所述信息,从而免除所述移动设备与所述锁之间多次连接的需要。

4. 根据权利要求1所述的方法,其中,从所述锁向所述移动设备发送的所述信息随后被发送至物业管理系统(PMS)并且被存储在所述物业管理系统的数据库中。

5. 根据权利要求1所述的方法,其中,关于所述移动设备与所述锁一起首次使用的所述信息在从所述锁发送到所述移动设备之后从所述锁的存储器中删除。

6. 一种与非联网读取器进行传送关于客人的远程登记入住的信息的方法,所述方法包括:

使用所述非联网读取器的证书接口与移动设备建立通信信道;

经由所述通信信道从所述移动设备接收电子钥匙;

确定所接收的所述电子钥匙对应于由所述移动设备使用的所述电子钥匙的首次事例;

响应于确定所接收的所述电子钥匙对应于由所述移动设备使用的所述电子钥匙的首次事例,生成首次交互数据;以及

经由所述通信信道将所述首次交互数据发送至所述移动设备。

7. 根据权利要求6所述的方法,其中,所述首次交互数据包括所述非联网读取器的标识符。

8. 根据权利要求7所述的方法,其中,所述首次交互数据进一步包括与在所述读取器接收所述电子钥匙相关联的时间。

9. 根据权利要求8所述的方法,其中,所述首次交互数据进一步包括响应于分析所述电

子钥匙而在所述非联网读取器处做出的访问控制决定的结果。

10. 根据权利要求6所述的方法,进一步包括:

利用所述读取器的存储器中存储的访问控制逻辑分析所述电子钥匙;以及
基于所述电子钥匙的所述分析对所述移动设备做出访问控制决定。

11. 根据权利要求10所述的方法,其中,所述访问控制决定的结果被包括在所述首次交互数据内。

12. 根据权利要求6所述的方法,其中,确定所接收的所述电子钥匙对应于由所述移动设备使用的所述电子钥匙的首次事例包括:针对所述电子钥匙在被呈现给所述非联网读取器之前是否已呈现给任何其他读取器的指示来分析所述电子钥匙的内容。

13. 根据权利要求6所述的方法,其中,确定所接收的所述电子钥匙对应于由所述移动设备使用的所述电子钥匙的首次事例包括:分析所述非联网读取器内的使用记录以确定所述电子钥匙尚未呈现给所述非联网读取器。

14. 根据权利要求6所述的方法,其中,在确定所接收的所述电子钥匙对应于由所述移动设备使用的所述电子钥匙的首次事例后,立即将所述首次交互数据发送给所述移动设备。

15. 根据权利要求14所述的方法,其中,在产生所述电子钥匙的递送的所述移动设备对所述非联网读取器的同一呈现期间,经由所述通信信道发送所述首次交互数据。

16. 根据权利要求6所述的方法,其中,所述通信信道对应于射频(RF)信道。

17. 根据权利要求16所述的方法,其中,近场通信(NFC)和/或蓝牙被所述移动设备和所述非联网读取器用来经由所述通信信道交换信息。

18. 一种非联网读取器,包括:

处理器;

存储器,包括访问控制逻辑和首次交互数据,其中,所述首次交互数据包括记载电子钥匙被移动设备用于尝试进入访问控制系统中的资产的首个事例;以及

证书接口,支持所述非联网读取器将所述首次交互数据传送至移动设备。

19. 根据权利要求18所述的非联网读取器,其中,所述首次交互数据进一步包括由代表所述非联网读取器的所述移动设备用来将所述首次交互数据递送至物业管理系统的收件人地址。

20. 根据权利要求18所述的非联网读取器,其中,所述首次交互数据包括所述非联网读取器的标识符、与所述非联网读取器接收所述电子钥匙相关联的时间以及响应于分析所述电子钥匙而在所述非联网读取器处做出的访问控制决定的结果。

首次进入通知

[0001] 相关申请的交叉引用

[0002] 本申请要求于2014年9月10日提交的美国临时专利申请No. 62/048702的权益, 兹将其全部内容以引证的方式合并于本文中。

技术领域

[0003] 本公开一般涉及访问控制系统以及操作访问控制系统的方法。

背景技术

[0004] 智能卡、芯片卡或集成电路卡 (ICC) 为具有嵌入式集成电路的任何袖珍卡。智能卡通常由塑料制成。智能卡的一个常见用途是用于酒店等的安全。

[0005] 酒店和其他多房间设施常使用与用于物理保护设施内的房间的访问控制系统相分离的物业管理系统。例如, 酒店传统上使用它们的物业管理系统来管理和分发客房并追踪交易, 诸如客人在餐厅、服务员、迷你酒吧的消费和其他室内消费。在客人在酒店前台登记入住期间, 通常每间客房都在物业管理系统创建新的客人账户。

发明内容

[0006] 在客人能够绕过前台登记入住手续的环境中, 酒店面临新的挑战。这些挑战中的其中一个与在物业管理系统里完成客人登记入住手续有关, 虽然客人从未来到前台办理登记入住。人们期望能让客人绕过前台以使客人体验行政上更好和更少的负担。然而, 不使客人到达前台的情况下, 需要一种方式将客人的入住从访问控制系统传回物业管理系统, 虽然这两种系统为单独和分立的系统。

[0007] 因此, 本公开的一个方面允许访问控制系统检测、记录和自动分发关于给定电子钥匙第一次到达或进入给定的‘离线锁’的信息。以前, 这种信息的自动分发对于‘在线锁’已是可能的, 但是对于‘离线锁’是不可能的。

[0008] ‘在线锁’是具有内置网络能力的锁, 该网络能力使锁能够自动向访问控制系统回报事件。典型事件可以是钥匙使用、门打开等等。使用的典型网络可以是有线或无线以太网、射频网络等等。

[0009] 相反地, ‘离线锁’是不具有这种网络能力的锁, 因此, 没有先前向访问控制系统自动回报锁事件的装置。

[0010] 在一些实施方式中, 提出的访问控制系统包括下面的组件:

[0011] a1) 访问码/证书的生成: 生成能够被存储在电话(或其他移动设备)的并且然后在锁处使用的电子钥匙;

[0012] a2) 电子钥匙到目标电话/设备的安全分发;

[0013] a3) 电话/设备上用来存储电子钥匙并且通常使用射频 (RF) 通信将电子钥匙发送给锁的软件;

[0014] a4) 从电话/设备接收电子钥匙、解密电子钥匙并且决定是否授权访问的离线锁电

子产品和固件。

[0015] 在一些实施方式中,电子钥匙可经由电子钥匙递送路径分发给移动设备。作为非限制性实例,电子钥匙是响应外部系统(例如,物业管理系统)的请求而产生的。钥匙安全地分发到预期接收者的电话/移动设备上的软件应用上。依据加密要求、顾客偏好等等,这种分发使用设备可用的标准网络和协议,比如,Wifi或蜂窝数据。当电话/移动设备被呈现给访问控制系统内的锁时,钥匙经由RF、蓝牙、红外线或一些其他的非接触式递送机制被发送到电子锁产品,在电子锁产品内,锁(例如,固件)上的访问控制逻辑检查钥匙且确定是否授权访问。

[0016] 在一些实施方式中,锁是离线的,这就意味着锁本身不能经由共享网络向访问控制系统报告所产生的信息。在所提议的系统中,与钥匙递送路径反向的路径用来将信息从锁传回并且到访问控制系统。不是使用‘在线锁’可用的专用网络,而是使用了电话/移动设备可用的网络。这支持更多的‘离线锁’被用在访问控制系统中,这样大大降低了与实施一系统相关的总成本(例如,因为不需要专用配线或联网组件来支持报告机构)。

[0017] 关于返回路径,当电话/移动设备呈现给锁时,来自锁的信息经由RF、蓝牙、红外线或一些其他非接触式递送机制从电子锁产品和固件被发送到电话/移动设备的软件应用。包含在该通信内的信息可包括但不限于:当前时间(例如,对应于交易时间)、锁的身份、访问控制决定的结果(是否授权访问)以及该钥匙是否首次在该锁上使用或该钥匙是否首次同任一把锁一起使用。软件应用然后使用电话/移动设备的可用网络和/或协议将该信息发送回访问控制系统的发起部。一旦从电话/移动设备接收到该信息,访问控制系统的发起部可登记该钥匙已达成目的地且已被使用。另外,到达/首次进入(first entry)信息可从访问控制系统的各个点发送回其他外部系统(例如,物业管理系统)。

[0018] 虽然本公开的实例将主要结合酒店或类似类型的多房间设施的访问控制系统来讨论,但应理解的是,本公开的实施方式并不限制于此。作为一些非限制实例,本公开的实施方式可被用在访问控制系统的以下类型:酒店(有客人达到其房间);住宅(有工人到达家);办公室(有职员达到开始工作)等等。

[0019] 在本公开的酒店实施的实施方式的具体实例中,可出现下面这些步骤:(1)酒店操作员在酒店安排物业管理系统请求为客人生成房间访问钥匙;(2)生成电子钥匙,并发送电子钥匙到该客人的电话/移动设备上的访问控制系统应用上;(3)客人到达酒店,呈现电话机以打开合适的锁;(4)将信息(例如,房间标识符/成功/首次使用/等等)发送回电话应用;(5)电话应用将上述信息发送回访问控制系统的发起部;然后,(6)信息还分发返回给酒店操作员。一旦酒店操作员接收到信息,该信息可潜在地与其他信息(例如,步骤(5)期间哪个网络携带电子钥匙和访问信息往来于移动设备)一起存储在物业管理系统数据库内。应理解,在一些实施方式中,上面所列的步骤中的某些可并行/同时执行而非顺次执行。作为非限制实例,步骤(4)、(5)和/或(6)可在同一交易中发生,如在步骤(3)中客人将电话机呈现给合适的锁时所使用的一样,因此,免除了客人多次向锁呈现电话机的需要。

[0020] 可从附图和下面的详细描述中进一步理解本发明。尽管本描述记载了特定细节,但应理解,本发明的某些实施方式可在没有这些特定细节的情况下实施。也应理解的是,在一些实例中,众所周知的电路、组件和技术未详细示出,以避免使对本发明的理解晦涩。

附图说明

- [0021] 结合附图来描述本公开：
- [0022] 图1为描绘根据本公开的实施方式的通信系统的方框图；
- [0023] 图2为描绘根据本公开的至少一些实施方式的移动设备的组件的方框图；
- [0024] 图3为描绘根据本公开的至少一些实施方式的锁/读取器的组件的方框图；
- [0025] 图4为描绘根据本公开的实施方式的生成和传送钥匙到移动设备的方法的流程图；
- [0026] 图5为描绘根据本公开的实施方式的报告首次交互数据的方法的流程图；
- [0027] 图6为描绘根据本公开的实施方式的分发首次交互数据的方法的流程图；
- [0028] 图7为描绘根据本公开的实施方式的使用钥匙递送路径和钥匙递送路径的反向路径的步骤的流程图；
- [0029] 图8为描绘根据本公开的实施方式的响应于在物业管理系统接收到首次进入的指示执行登记入住处理的方法的流程图；以及
- [0030] 图9为描绘根据本公开的实施方式的生成直接去房间登记入住报告的方法的流程图。

具体实施方式

[0031] 随后的描述仅提供实施方式，而不是旨在限制权利要求的范围、适用性和构造。相反，随后的描述将为本领域的技术人员提供实施所描述的实施方式的启用描述。应当理解，在不脱离所附权利要求书的精神和范围的情况下，可以对元件的功能和布置进行各种改变。

[0032] 下面的描述将提供系统的各种实施方式或特性，所述系统可包括促进多个组件之间交互的访问控制系统。虽然结合与酒店等的物业管理系统交互的访问控制系统讨论了本公开的实施方式，但应理解本公开的实施方式并不限于此。

[0033] 现在参考图1-9，将根据本公开的至少一些实施方式描述与访问控制系统和操作访问控制系统的方法相关的各种细节和特征。首先参考图1，将根据本公开的至少一些实施方式描述通信系统100。系统100示出为包括一个或多个通信网络104、访问控制网络108和可选择的信赖网络112。虽然被描述为两个分离且不同的网络，但是应理解，通信网络104可作为单一的网络实施。同样地，尽管网络104和信赖网络112被描述为分离的网络，但应该理解，网络可被组合成一个网络（例如，信赖网络112）可通过通信隧道（例如，虚拟专用网（VPN）、广域网（WAN）等等）叠加在通信网络104的顶部。因此，在不偏离本公开的范围的情况下，通信网络104可包括叠加在其上的信赖网络112。

[0034] 访问控制网络108可提供一个或多个访问控制服务器140与多个读取器128、登记入住设备148以及访问控制系统的其他组件之间的连接。因此，访问控制网络108可支持物理访问控制系统（PACS）等的管理和实施。访问控制网络108可使用任何类型的已知通信协议来携带在连接到访问控制网络的组件之间的信息。可在访问控制网络108内使用的该协议或网络的非限制实例包括RS-232、RS-485、韦根协议、以太网、以太网供电（PoE）、ZigBee、Wi-Fi（例如，IEEE 802.11，IEEE 802.11的变体或IEEE 802.11的拓展）、互联网协议（IP）网

络或任何其他类型的有线或无线协议。

[0035] 通信网络104可对应用于在兼容的通信设备之间携带信息的私人的、半私人的或公共通信网络。在一些实施方式中,通信网络104可对应不可信或不安全的通信网络。通信网络104的非限制实例包括电话网络、蜂窝网络、IMS网络、广域网(例如,因特网)、局域网、IP网、SNMP网或任何其他已知类型的网络构架。电子邮件消息、SMS消息、MMS消息、SNMP消息、使用HTTP或SHTTP传输的消息或使用HTTP或SHTTP传输的消息的变体、使用FTP交换的消息、使用RTP或UDP交换的消息等等中的一个或多个可被用来在访问控制服务器140和移动设备116之间携带信息。在一些实施方式中,也可使用基于IP的语音(VoIP)等等在访问控制服务器140和移动设备116之间携带信息。

[0036] 读取器128可对应于任何类型的交互设备或者限制或控制对一个或多个受保护的资产进行访问的交互设备的集合。在一些实施方式中,读取器128可被配置为经由通信信道136与移动设备116直接交换通信。通信信道136在某些实施方式中可以是非接触式通信信道。可选择地或另外地,通信信道136可以是基于接触的通信信道。在一些实施方式中,射频(RF)波形式的电磁辐射可用于在通信信道136上携带信息。可选择地或另外地,通信信道136可利用光、磁、声音或任何其他媒介来在读取器128和移动设备116之间携带信息。通信信道136也可被表征为被用来交换信息的通信协议。在一些实施方式中,信号调制(例如,振幅调制、频率调制、相位调制及其组合和其变体等等)被用来在读取器128和移动设备116之间传送数据。通信信道136上使用的(多个)协议的一些非限制实例包括ISO14443、ISO15693、ISO18092、FeliCa、近场通信(NFC)、蓝牙、Wi-Fi(例如,802.11N,及其变体或对其的扩展)、ZigBee、GSM、及它们的组合等等中限定的协议。应进一步理解,依据移动设备116和读取器128的能力,在设备之间能够建立多个通信信道136。例如,读取器128和移动设备116可使用第一协议(例如,蓝牙或低功耗蓝牙(BLE))建立第一通信信道以及利用第二协议(例如NFC、红外线等等)建立第二通信信道。应理解,通信信道136可对应于只有当移动设备116和读取器128在彼此预定距离内(例如,对于NFC来说距离小于0.5米,对于BLE来说距离小于50米或者对于Wi-Fi来说距离小于200米)才能创建的基于相近度的通信信道。通信信道136可进一步表征为由设备(例如,读取器128和移动设备116)用来彼此认证的认证协议。通信信道136上可使用的认证协议的实例包括SEOS和FIDO。

[0037] 尽管文中使用了术语“读取器”来指用于控制对受保护资产(例如,诸如房间的门、保险箱等的物理资产)的访问的设备或设备集合,但应理解,术语“读取器”、“锁”等等可交替使用。例如,图1所示的联网读取器128也可称为‘在线锁’。同理,作为在文中进一步讨论的,非联网读取器132可同义地称为‘离线锁’。换句话说,术语“锁”、“读取器”以及其他类似术语的使用可用于描述电机械设备或用于保护和保障诸如物理资产的资产的设备集合。此外,文中所讨论的读取器或锁可用来保护和确保逻辑资产安全,比如,银行账户、电脑网络资源等等。

[0038] 除了描述为被连接到访问控制网络108的传统读取器128之外,通信系统100还包括一个或多个非联网读取器132或‘离线锁’。非联网读取器132与读取器128的不同可在于:非联网读取器132可以不用原生地或永久地连接到访问控制网络108,这限制非联网读取器132与访问控制服务器140或基于特设的其他设备通信的能力。因此,本公开的实施方式暗示使用通信信道136来促进从非联网读取器132到移动设备116的信息通信,且最终将信息

返回到访问控制服务器140和其他设备。因此,除了非联网读取器132缺少与访问控制网络108通信的通信接口或这种接口会被禁用或不用外,非联网读取器132的组件可类似于读取器128的组件或与读取器128的组件相同。

[0039] 移动设备116可对应于任何类型的电子设备,并且如名字所暗示的,电子设备在本质上是便携的。作为一些实例,移动设备116可对应于用户携带的蜂窝电话或智能电话。移动设备116的其他实例包括但不限于可穿戴设备(例如,眼镜、手表、鞋、衣服、珠宝、手带、贴纸型等等)。如图1所示,移动设备116可设有访问控制应用120,访问控制应用120存储一个或多个钥匙124。(多个)钥匙132可被传送到与尝试进入读取器128,132所保护的资产的移动设备116的持有者有关的读取器128,132上。例如,移动设备116的用户或持有者可将移动设备116呈现给读取器128,132。

[0040] 在一些实施方式中,(多个)钥匙124可经由通信网络104从访问控制服务器140分发给移动设备116。在其他实施方式中,(多个)钥匙124可经由登记入住设备148传送给移动设备116,登记入住设备148经由访问控制网络108从(多个)访问控制服务器140接收钥匙。在Davis等人的美国专利No.8074271和Lowe的美国专利No.7706778中描述了第一钥匙递送机制的额外细节,这两个专利在此都以引用的方式全部结合于本文中。在Elfstrom等人的美国专利No.8730004中描述了第二钥匙递送机制(例如,登记入住设备148的使用)的额外细节,该专利的全部内容在此以引用的方式结合于本文中。004专利描述的访问控制模块可具有类似于在文中描述的读取器128和132的特点。更进一步地,读取器128的联网和通信行为可类似于Alexander等人在美国专利No.8102799中描述的母子设备,该专利的全部内容在此以引用的方式全部结合于本文中。

[0041] 如果NFC被用于通信信道136,那么读取器128,132与移动设备116可使其接口/天线在读取器和/或移动设备116将彼此认证或相互彼此认证的点彼此感应耦合。紧接着认证,读取器128,132可从移动设备116请求钥匙124或多个钥匙或移动设备116可向读取器128,132提供钥匙124或多个钥匙。一旦从移动设备116接收到(多个)钥匙124,读取器128,132可分析(多个)钥匙124且确定(多个)钥匙124是否有效,并且如果有效,允许移动设备116的持有人/用户访问读取器128,132保护的资产。应理解,移动设备116可交替或另外被配置为分析从读取器128,132接收到的与做出访问控制的决定有关和/或与决定是否向读取器128,132提供(多个)钥匙124有关的信息。

[0042] 如果BLE或其他的一些非感应协议(例如Wi-Fi)被用于通信信道136,那么,读取器128,132与移动设备116可在彼此配对或以其他方式连接之前执行发现例程以建立通信信道136。然而,建立信道136后,读取器128,132与移动设备116则可彼此认证并且交换例如(多个)钥匙124的相关信息,以使得访问控制决定被做出。如果做出积极的访问控制决定(例如,确定(多个)钥匙124是有效的且允许移动设备116访问读取器128,132保护的资产),那么,读取器128,132可发起一个或多个动作使得移动设备116的持有者或用户访问读取器128,132保护的资产。

[0043] 如在文中将进一步讨论的,从联网读取器128到访问控制服务器140和/或到物业管理系统144的信息的报告是相对直截了当的。例如,当用户将移动设备116呈现给读取器128时,关于交换的信息可从读取器128经由访问控制网络108提供给访问控制服务器140或物业管理系统144。另一方面,非联网读取器132不具有直接向访问控制服务器140或物业管

理系统144报告相同类型的信息的能力。因此,人们期望非联网读取器132利用通信信道136作为用于将关于第一交互(或首次钥匙使用或其他一些交易信息)的信息传回访问控制服务器140或物业管理系统144的机构。此外,一旦移动设备116(或更具体地,移动设备116上运行的访问控制应用120)拥有来自非联网读取器132的交互数据,移动设备116可决定是否经由通信网络104向访问控制服务器140报告该信息或决定是否可以且应该利用信赖网络112直接向物业管理系统144报告该信息。作为非限制实例,非联网读取器132可向移动设备116指示:信赖网络112将被用来向物业管理系统144回传交互数据,这是因为信赖网络112可在管理物业管理系统144的实体(例如,酒店操作员)的控制下。在一些实施方式中,移动设备116可经由通信网络104和信赖网络112(经由两条报告消息)同时向(多个)访问控制服务器140和物业管理系统报告交互数据。

[0044] 现在参考图2,将根据本公开的至少一些实施方式描述移动设备116的额外细节。在其他项目中,移动设备116被示出为包括存储一个或多个操作系统(O/S) 208和钥匙212的计算机存储器204。移动设备116还示出为包括处理器216、一个或多个驱动器220、用户接口224、读取器接口228、网络接口232和电力模块236。移动设备116的合适实例包括但不限于智能电话、PDA、笔记本电脑、个人电脑、平板电脑、上网本、可穿戴设备等等。

[0045] 存储器204可对应于任何类型的非暂时性计算机可读媒介。在一些实施方式中,存储器204可包括易失性存储器或非易失性存储器以及针对它们的控制器。移动设备116中可使用的存储器204的非限制性实例包括RAM、ROM、缓存存储器、快闪存储器、固态存储器或其变体。

[0046] O/S 208可对应于一个或多个操作系统。O/S 208的性质可取决于移动设备116的硬件和移动设备116的构成因素。O/S 208可视为存储在存储器204内的处理器可执行的应用。O/S 208是特殊类型的通用应用,其使得存储在存储器204内的其他应用(例如,浏览器、电子邮件应用、SMS应用等等)利用移动设备116的各种硬件组件和(多个)驱动器220。在一些实施方式中,O/S 208可包括促进应用与移动设备116的某些硬件组件的交互的一个或多个API。此外,O/S 208可提供查看和访问存储在存储器208内的各种应用和存储在208内的其他数据的机构。

[0047] 钥匙212可类似于图1中描述的钥匙124或与图1中描述的钥匙124相同。在一些实施方式中,(多个)钥匙212可与O/S 208存储在相同的物理存储器204内。在其他实施方式中,(多个)钥匙212可存储在与用于存储O/S 208和其他应用的计算机存储器分离的物理计算机存储器内。甚至更具体地,(多个)钥匙212可保存在安全或加密的计算机存储器内,从而防止包含在其内的钥匙被未经授权方获得或操纵。根据某些事件发生和/或用户输入,可预测对钥匙的访问。例如,在(多个)钥匙212要被分发给读取器128,132时,用户可被要求在用户接口224输入有效密码或PIN。

[0048] 处理器216可对应于包含在具有存储器204的移动设备116的壳体内一个或多个微处理器。在一些实施方式中,处理器216在单个集成电路(IC)或几个IC芯片上合并移动设备116的中央处理器(CPU)的功能。处理器216可以是多用途的可编程设备,其接收数字数据作为输入,根据存储在其内部存储器内的指令处理数字数据且提供结果作为输出。处理器216可因其具有内部存储器而实施顺序数字逻辑。正如众所周知的微处理器,处理器206可对以二进制数制表示的数字和符号进行运算。

[0049] (多个)驱动器220可对应于向移动设备116的硬件组件提供具体指令的硬件、软件和/或控制器,从而促进它们的操作。例如,用户接口224、读取器接口228和网络接口232可各自具有提供合适的控制信号影响其操作的专用驱动器220。(多个)驱动器220也可包括根据期望的协议适当控制各种硬件组件的软件或逻辑电路。例如,读取器接口228的驱动器220可适合确保读取器接口228遵从合适的基于相近度的协议(例如,BLE、NFC、红外线、超声波、IEEE802.11N等等)使得读取器接口228可交换通信。同样地,网络接口232的驱动器220可适合确保网络接口232遵循合适的网络通信协议(例如(在ISI模型的一层或多层的)TCP/IP、UDP、RTP、GSM、LTE、Wi-Fi等等)使得网络接口232能经由通信网络104、信赖网络112等等交换通信。正如能被领会的一样,(多个)驱动器220也可被配置为控制有线硬件组件(例如,USB驱动器、以太网驱动器等)。

[0050] 如上所提及的,用户接口224可包括一个或多个用户输入设备和/或一个或多个用户输出设备。在用户接口224内可包括的合适的用户输入设备的实例包括但不限于按钮、键盘、鼠标、笔、相机、麦克风等等。可包括在用户接口224内的合适的用户输出设备的实例包括但不限于显示屏、灯、扬声器等等。应理解,用户接口224也可包括组合的用户输入和用户输出设备,比如,触敏显示器等等。

[0051] 读取器接口228可对应于促进移动设备116和读取器128,132之间通信的硬件。读取器接口228可包括蓝牙接口(例如,天线和相关电路)、Wi-Fi/802.11N接口(例如,天线和相关电路)、NFC接口(例如,天线和相关电路)、红外线接口(例如,LED、光电二极管和相关电路)和/或超声接口(例如,扬声器、麦克风和相关电路)。在一些实施方式中,读取器接口228具体设置为促进经由通信信道136或多个通信信道136进行基于相近度的通信。

[0052] 网络接口232可包括促进与其他通信设备通过通信网络104或信赖网络112进行通信的硬件。如上所述,网络接口232可包括以太网端口、Wi-Fi卡、网络接口卡(NIC)、蜂窝接口(例如,天线、滤波器和相关电路)等等。网络接口232可被配置为促进移动设备116和通信网络104,112之间的连接且还可被配置为根据通信网络104,112使用的协议编码和解码通信(例如,数据包)。

[0053] 电力模块236可包括内置电源(例如,电池)和/或电力转换器,电力转换器促进外部提供的交流电转换为用于向移动设备116的各种组件供电的直流电。在一些实施方式中,电力模块236也可包括浪涌保护电路的一些实施以保护移动设备116的组件免于电涌。

[0054] 现在参考图3,将根据本公开的至少一些实施方式描述非联网读取器132的额外细节。非联网读取器132在图3中描述,但应理解,类似的组件可包括在联网读取器128内。联网读取器128和非联网读取器132的区别可对应于下面这个事实:联网读取器128具有将读取器128经由有线或无线通信信道连接到访问控制网络108的网络接口。然而,非联网读取器132缺乏网络接口或这种接口被非联网读取器132去激活或者不可用。在一些实施方式中,与网络之间具有间歇但非连续的通信能力的读取器可被认为是非联网读取器132。因此,没有按需经由通信网络进行通信的能力的任何读取器可被认为是非联网读取器132。

[0055] 除了其他项外,读取器132示出为包括存储访问控制逻辑308、使用记录312和首次使用信息316的计算机存储器304。移动设备132还示出为包括处理器320、一个或多个驱动器324、用户接口224、证书接口332和电力模块336。

[0056] 在一些实施方式中,访问控制逻辑308实施为固件,虽然作为软件或在专用集成电

路(ASIC)中实施访问控制逻辑308也是可能的。在一些实施方式中,使用记录312可包含关于读取器132和证书之间的交互的信息,如移动设备116和传统的访问控制卡或钥匙链之间,可被称为证书类设备。可存储在使用记录312内的信息的类型包括与证书类设备交互的日期和时间、这种交互是否与特定设备的首次或随后的交互相对应、交互期间使用的哪把钥匙、访问控制逻辑308做出的访问控制决定的结果等等。除了使用记录312之外,存储器304也可包含针对钥匙首次使用实例和/或特定证书类设备与读取器132之间首次交互的事例的首次使用信息。

[0057] 在一些实施方式中,钥匙124,212可在其被首次使用后更新,从而让后续所有的读取器知道其不是作为该钥匙在访问控制系统中使用的第一件事例来接收钥匙124,212。例如,钥匙124,212在首次传输到读取器128,132后,可用旗标或标识更新钥匙124,212。该钥匙124,212所用的随后传输或使用包括表示钥匙不再是首次使用的更新旗标或标识。因此,当读取器128,132接收到钥匙124,212且该钥匙未被标记为先前使用过,那么,读取器128,132将知道在其首次使用期间接收钥匙124,212。这条信息可同交易时间、移动设备116的身份、读取器128,132的身份以及是否同意或拒绝访问一起保存在首次使用信息316内。首次使用信息316和/或来自使用记录312的信息可随后由读取器132经由通信信道136传回移动设备116,随后传输到(多个)访问控制服务器140和/或物业管理系统144。

[0058] 读取器132的处理器320本质上类似于移动设备116的处理器。在一些实施方式中,相较于处理器216的处理能力,处理器320的处理能力可以是有限的。举个例子,处理器320可包括IC芯片或多个IC芯片,IC芯片或多个IC芯片被配置为执行硬件或存储在存储器304内的指令。

[0059] 同样地,(多个)驱动器324可包括促进读取器132的组件的操作的软件、固件或嵌入式硬件。例如,用户接口328可具有专用驱动器324。证书接口332也可具有专用驱动器324。读取器132的其他组件也可有其自己的驱动器324。

[0060] 用户接口328可对应用户输入和/或用户输出设备。在读取器132内,用户接口328传统上为相对简单的设备,但简单不是一种要求。例如,用户接口328可包括简单的视觉显示器(例如,光、LED、八段显示器等等)或更精密的视觉显示器(例如,LCD屏)。用户接口328的用户输入部可包括PIN板、指纹传感器、视网膜扫描仪等等。用户接口328也可有助于与读取器132的听觉交互。例如,用户接口328可包括蜂鸣器、扬声器、麦克风、光电检测器、相近度检测器等等。作为选择或另外地,用户接口328可包括组合的用户输入和用户输出设备,例如,具有可配置按钮的触敏显示器。

[0061] 证书接口332可包括促进通信信道136的建立的硬件、电路等。作为一些非限制性实例,证书接口332可包括天线、调谐电路、BLE天线、Wi-Fi天线、磁条读取器、光电检测器、红外线发射器、麦克风、扬声器等等。

[0062] 电力模块336可对应于专用电源和/或电力转换器,电力转换器促进外部提供的交流电转换为用于向移动设备132的各种组件供电的直流电。在一些实施方式中,电力模块336也可包括浪涌保护电路的一些实施以保护移动设备132的组件免于电涌。

[0063] 现在参考图4,将根据本公开的至少一些实施方式描述向移动设备116传输钥匙124,212的一种方法。当在物业管理系统144处接收到对电子钥匙或一套电子钥匙的请求时,该方法开始(步骤404)。可响应于客人确认希望留宿酒店、响应于客人确认希望进入房

间、响应于办公室客人确认在办公室会面等等,接收该请求。然后,对钥匙的请求可从物业管理系统144转发给访问控制服务器140。一旦从物业管理系统144接收到对电子钥匙的请求,(多个)访问控制服务器140确定该请求是否有效且可行的请求(例如,该请求是否来自于信赖源,为信赖格式且应导致生成电子钥匙)。(多个)访问控制服务器140和物业管理系统144之间的认证可使用任何类型的认证协议来完成。

[0064] 如果认证成功,那么(多个)访问控制服务器140确定电子钥匙的属性(步骤408)。这些属性可包括将分配给电子钥匙的性质或站点代码、电子钥匙的加密、电子钥匙的有效时间(可能是不确定的或确定的)、以及将属于钥匙的其他属性。基于这些属性,(多个)访问控制服务器140将生成(多个)电子钥匙(步骤412),然后确定钥匙的一个或多个目标(步骤416)。(多个)钥匙的目标可包括在步骤404中对钥匙的请求中识别的一个或多个移动设备116。作为选择或另外地,(多个)钥匙的目标可包括除了移动设备116之外的证书(credential),例如,传统的智能卡、钥匙链等等。

[0065] 确定钥匙的目标后,(多个)访问控制服务器140确定是否到时间分发钥匙(步骤420)。分发时间可基于客人预期的到达或登记入住之前的时间量。作为选择或另外地,分发时间可以是基于事件的或由一系列事件触发的。当然,分发可既是基于时间的也是基于事件的。作为基于时间的分发的实例,可不向目标设备分发电子钥匙,直到达到客人预期登记入住酒店之前的预定的时间量。作为基于时间的分发的另一实例,可不向目标设备分发电子钥匙,直到达到预定会面之前的预定的时间量。作为基于事件的分发的实例,可不分发电子钥匙,直到客人在酒店、房间或办公楼预定的距离或附近范围内。基于事件的分发的另一实例是直到移动设备116连接到预定通信网络104或信赖网络112之前,一直等。基于时间和基于事件组合的分发的实例是限制钥匙的分发,直到达到客人预期登记入住之前的预定时间量且直到客人的移动设备116已连接到客人登记入住的物业的信赖网络112。

[0066] 如果步骤420的询问得到否定回复,那么,(多个)访问控制服务器140继续监测事件、时间和其他触发以确定合适的传送时间(步骤424)。如果步骤420的询问得到肯定回复,为(多个)电子钥匙的分发确定合适的分发协议和信道(步骤428)。例如,可确定能使用蜂窝网络和蜂窝通信协议在通信网络104上向移动设备116传输钥匙。作为另一实例,可以确定需要更安全的传输信道,在这种情况下,可要求信赖网络112用于传输钥匙。

[0067] 已确定合适的信道和协议后,经由确定出的信道和协议向其目标传输(多个)电子钥匙。(多个)钥匙的传送可使用传统协议,比如,HTTP/HTTPS、SNMP、FTP、SMS消息、MMS消息、RTP、UDP等或非传统/专有协议。在一些实施方式中,用于向目标传输钥匙的路径可称为钥匙递送路径且当跨通信网络104或信赖网络112传播时可遵循特定的节点组。

[0068] 现在参考图5,将根据本公开的实施方式描述报告首次交互数据的方法。当移动设备116呈现给读取器128,132时该方法开始(步骤504)。这可包括将移动设备116带到读取器128,132的通信范围内,将移动设备116与读取器128,132配对等等。一旦这些设备在彼此的通信范围内,可进行初始认证(步骤508)。依据在读取器128,132和/或移动设备116处的用户选择和管理设定,可以双向或单向地认证。如果认证失败(步骤512),则该方法将结束或者将允许认证的重试(步骤516)。

[0069] 如果认证成功(步骤512),则两设备可通过交换访问控制信息而继续(步骤520)。在该步骤中,移动设备116可经由两设备之间建立的通信信道136向读取器128,132传送一

个或多个电子钥匙。在该步骤中,读取器128,132也可向移动设备116提供识别信息和/或钥匙。与作出访问控制决定有关而使用的任何其他类型的信息可经由通信信道136(在任一方向上)在两设备之间交换。

[0070] 基于在步骤520交换的信息,读取器128,132和/或移动设备116可作出关于是否允许移动设备116的持有者访问读取器128,132保护的资产的决定(步骤524)。如果该询问得到否定回复,那么读取器128,132可更新其使用记录312(步骤528)。读取器128,132然后可结束交换或允许重试(步骤516)。

[0071] 如果步骤524的询问得到肯定回复,那么读取器128,132将确定这是否是移动设备116与访问控制系统的首次交互(例如,确定这次是否对应于首次进入事件)(步骤532)。该确定可对应于确定特定移动设备116与读取器128,132之间的交互是否是一般而言的首次交互。该确定也可包含确定移动设备所使用的钥匙是否对应于该钥匙的首次使用事例,无论全局(例如,在访问控制系统的所有读取器之间)或局部(例如,特定于当前读取器128,132)。正如上文所讨论的,读取器128,132可分析钥匙的性质以确定钥匙是否先前使用过,例如,通过对首次使用的一些指示(或借助钥匙中的使用旗标的标识的随后使用的指示)分析钥匙。与移动设备116相反的是钥匙的分析可能是有用的,尤其对于物业常客来说。例如,客人一年间可留宿在特定酒店内数次,但客人的移动设备116在这些留宿的各次中将使用不同的钥匙。如果首次交互时分析移动设备116本身,那么,该年中所有随后的留宿将不被登记为登记入住事件。另一方面,如果特定留宿使用的钥匙被分析,那么可对每次留宿事例确定合适的登记入住。

[0072] 应理解,当移动设备116被拒绝访问时,可在步骤528执行步骤532的分析。为了易于理解和简化,步骤532示出为仅在肯定的访问控制决定开始,但是不应被理解为限制本公开的实施方式。

[0073] 如果该交互对应于首次交互(或移动设备116的钥匙首次使用),那么,读取器128,132可生成一堆首次交互数据且试图向(多个)访问控制服务器140和/或物业管理系统144回报首次交互数据。如果读取器为联网读取器128,那么首次交互数据可经由访问控制网络108简单地发送到访问控制服务器140和/或物业管理系统144。另一方面,如果读取器对应非联网读取器132,那么读取器132将向移动设备116提供首次交互数据(步骤536)。在一些实施方式中,在用于交换访问控制信息的通信信道136上向移动设备116提供首次交互数据。如果在步骤532足够快地做出决定,非联网读取器132甚至能在用于传送访问控制信息的同一呈现实例期间,将首次交互数据提供回移动设备136。换句话说,用户无需为了促进步骤520和步骤536的通信而将移动设备116向读取器132呈现两次。相反地,当移动设备116被保持在读取器132的前面且等待访问控制决定时,可高效地将首次交互数据传回移动设备116。

[0074] 在首次交互数据中可提供的信息的类型的非限制性实例包括读取器132的身份或识别号、钥匙或客人的标志符、交易的时间、交易的日期、访问控制决定是肯定还是否定、当前温度、读取器132状态信息(例如,低电量)等等。

[0075] 此后,读取器128,132授权移动设备116和其持有者访问读取器128,132保护的资产(步骤540)。

[0076] 现在参考图6,将根据本公开的实施方式描述分发首次交互数据的方法。当移动设

备116从读取器132接收到首次交互数据时开始该方法(步骤604)。可经由认证期间和/或访问控制信息交换期间使用的通信信道136接收首次交互数据。

[0077] 当移动设备116接收到首次交互数据时,移动设备116则确定首次交互数据的收件人地址(步骤608)。该信息可包含在首次交互数据内,可作为单独指令从读取器132提供给移动设备116,或移动设备116可包括做出这种决定的只能(如其可被包括为访问控制逻辑308的一部分)。移动设备116也可作出关于哪个通信信道或路径应用来向收件人地址传输首次交互数据的决定(步骤612)。在一些实施方式中,移动设备116可确定首次交互数据沿钥匙递送路径的相反路径传播。换句话说,移动设备116可简单向从中接收其电子钥匙的同一实体发送首次交互数据,并且移动设备116可利用相同的通信信道/网络发送首次交互数据。在其他实施方式中,访问控制系统的管理员可指示首次交互数据直接被递送给物业管理系统144且该信息可经由信赖网络112递送路径进行递送而非沿钥匙递送路径的相反路径传播。

[0078] 一旦确定收件人地址和合适的通信信道,移动设备116生成包含首次交互数据在内的合适的消息或一组消息(步骤616)。移动设备116然后向所确定的收件人地址发送(多个)消息(步骤620)。

[0079] 现在参考图7,将根据本公开的至少一些实施方式描述用于递送电子钥匙和首次交互数据的通信路径的额外细节。当物业管理系统144向(多个)访问控制服务器140发送电子钥匙请求时,图7中描述的处理开始(步骤S701)。响应于接收到请求,(多个)访问控制服务器140向目标移动设备116发送一个或多个电子钥匙(步骤S702)。在一些实施方式中,步骤S702中电子钥匙的递送使用通信网络,并且可包含使用多种网络类型(例如,互联网和蜂窝通信网)。因此,由携带电子钥匙的(多个)消息传播的路径可遍历多个网络边界和多个网络边界元件。

[0080] 移动设备116然后接收电子钥匙且将钥匙存储在其访问控制应用120或存储器204内。移动设备116保存钥匙直到将其呈现给非联网读取器132(或联网读取器128),在该点,可在两设备间开始通信并且会发生认证(步骤S703)。如果能够建立信赖关系,那么可使用通信信道136向非联网读取器132递送电子钥匙(步骤S704)。然后,非联网读取器132可基于(至少部分基于)电子钥匙的内容作出访问控制决定。非联网读取器132还可确定其从移动设备116对电子钥匙的接收对应于电子钥匙的首次使用,在这种情况下,非联网读取器132可生成且再次经由通信信道136递送回首次交互数据给移动设备116(步骤S705)。在一些实施方式中,可在单次将移动设备116呈现给读取器132时执行步骤S703、步骤S704和步骤S705。当然,这些步骤不用恰好同时进行,但对于持有移动设备116的用户来说,可在用户感知为同时的时间量内执行这些步骤。在其他实施方式中,在移动设备116首次向读取器132呈现并且读取器132可提示移动设备116的持有人再次将移动设备116呈现给读取器132后,步骤S705可发生,使得可完成登记入住处理且读取器132可向移动设备116递送回首次交互数据。

[0081] 移动设备116然后向(多个)访问控制服务器140提供在读取器132上实施的访问控制决定的结果的指示(步骤S706)。此外,移动设备116在步骤S706期间可向(多个)访问控制服务器140递送回首次交互数据。然后,(多个)访问控制服务器140可向物业管理系统144提供首次交互数据(步骤S707)。作为选择或另外地,移动设备116可直接向物业管理系统144

递送首次交互数据(步骤S708)。作为可理解的,钥匙递送路径和首次交互数据递送路径可大体彼此匹配,但顺序相反。在其他实施方式中,通信信道136的使用可对应于钥匙递送路径和首次交互数据递送路径的唯一共性。

[0082] 现参考图8,将根据本公开的实施方式来描述响应于在物业管理系统接收到首次进入的指示而执行登记入住过程的方法。当在物业管理系统144接收到客人首次进入的指示时,该方法开始(步骤804)。该指示可响应于物业管理系统从(多个)访问控制服务器140或移动设备116接收到首次交互数据而被接收。首次交互数据可表明特定客人(或者与客人相关的钥匙)已经到达特定读取器128,132且读取器128,132已完成针对该特定留宿而与客人移动设备116进行的首次交互事例。

[0083] 一旦接收到首次进入的指示,物业管理系统发起客人登记入住进程,其中为该用户创建新的用户账户,其中该账户特定于该特定客人的留宿和被分配给客人的房间(步骤808)。如果客人具有常客账户,那么,新生成的账户可与常客账户在顾客关系管理数据库中相关联。在一些实施方式中,首次交互数据中的至少一些信息用于填入新生成的账户(步骤812)。例如,如果首次交互数据包括与移动设备116首次交互的读取器128,132的标识符且读取器128,132对应所分配或可分配给客人的房间(例如,空房间),那么包含在首次交互数据内的读取器标识符可被包括在新生成的账户内以识别已分配给客人的房间。作为另一实例,如果客人首次向与业务点(PoS)机器关联的读取器呈现移动设备116,那么,读取器的标识符以及客人的交易数据可合并到新生成的账户中。

[0084] 物业管理系统144确定客人留宿是否需要护照后,继续执行该方法(步骤816)。如果该询问得到否定回复,那么,通过最后确定用户账户的其他登记入住项目(例如,确认客人信用卡存档,为客人的旅程排队等等)继续该方法。

[0085] 然而,如果步骤816的询问得到肯定回复,那么客人可能被请求提供额外信息以确认其身份以及他们持有有效护照(步骤820)。在一些实施方式中,客人能经由读取器和/或移动设备116输入其护照信息。在一些实施方式中,客人可提供其护照照片并传输照片到物业管理系统144。在一些实施方式中,酒店的客户服务代表被指派在已知地点(例如,朝向首次交互发生的读取器的位置)同客人会面以核实护照信息。

[0086] 护照分析完成(步骤824)后,方法可继续到步骤828,在该步骤中,完成客人的其他登记入住项目。

[0087] 现在参考图9,将根据本公开的实施方式描述生成直接去房间登记入住报告的方法。该方法通过确定已请求远程酒店登记入住而开始(步骤904)。可在客人对其房间购买期间,具体提供该请求。另外地,购买完成后可向用户提供选择,用户可接受和拒绝该选择。

[0088] 当物业管理系统144确定客人希望远程登记入住,从而允许用户绕过前台,物业管理系统144在登记入住或预期达到之前为客人分配房间(步骤908)。分配的房间可对应于客人选择的对客人可获得的特定房间或一套房间。分配给客人的房间的认识可由向客人的移动设备116传送的消息来传达。

[0089] 物业管理系统144然后在客人抵达前创建客人账户(步骤912)。然后,该方法等待直到检测到户首次进入或抵达。一旦检测到用户抵达,与首次抵达相关联的首次交互数据从读取器128发送给物业管理系统144(步骤924)。然后,物业管理系统144在酒店前台生成直接去房间登记入住报告,犹如正常登记入住一样。

[0090] 要注意,这些实施方式被描述为描绘为流程表、流程图、数据流程图、结构图或方框图的处理。尽管流程表可将操作描述为顺序处理,但许多操作可并行或同时执行。此外,操作的顺序在不偏离本公开的范围的情况下可重新安排。这些操作完成后,过程结束,但还能有未包括在图中的额外的步骤。

[0091] 虽然在文中详细描述了本公开的说明性实施方式,但应理解的是,发明构思可另外不同地体现出来和以另外各种不同方式被使用,除了现有技术所限定的之外,所附权利要求旨在解释为包括这些变型。

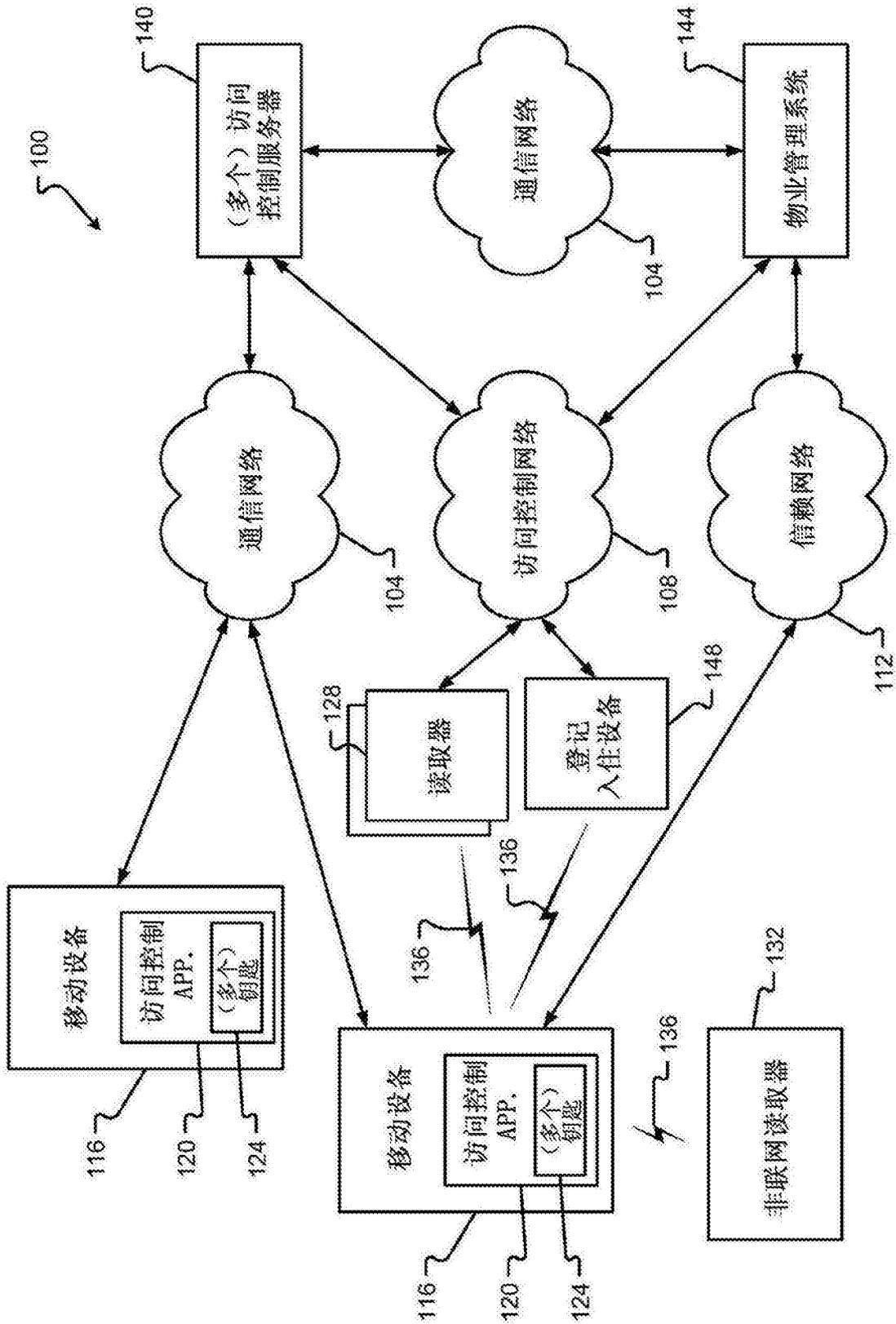


图1

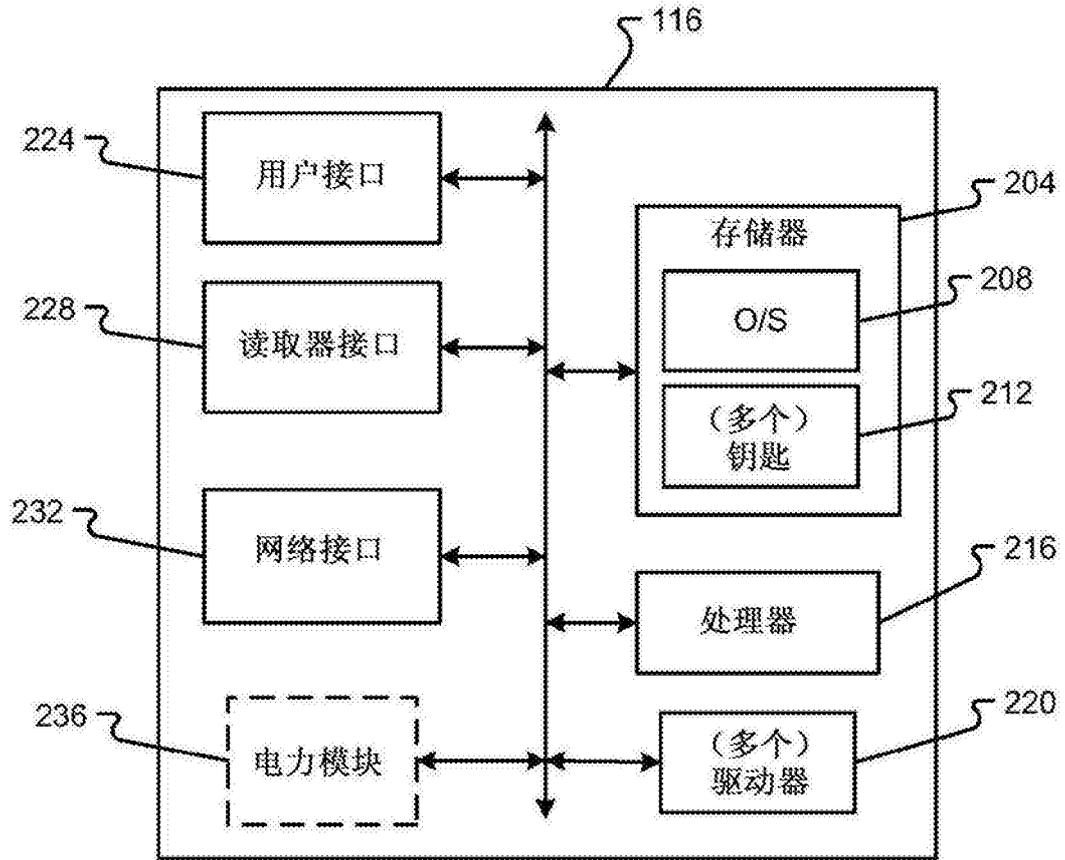


图2

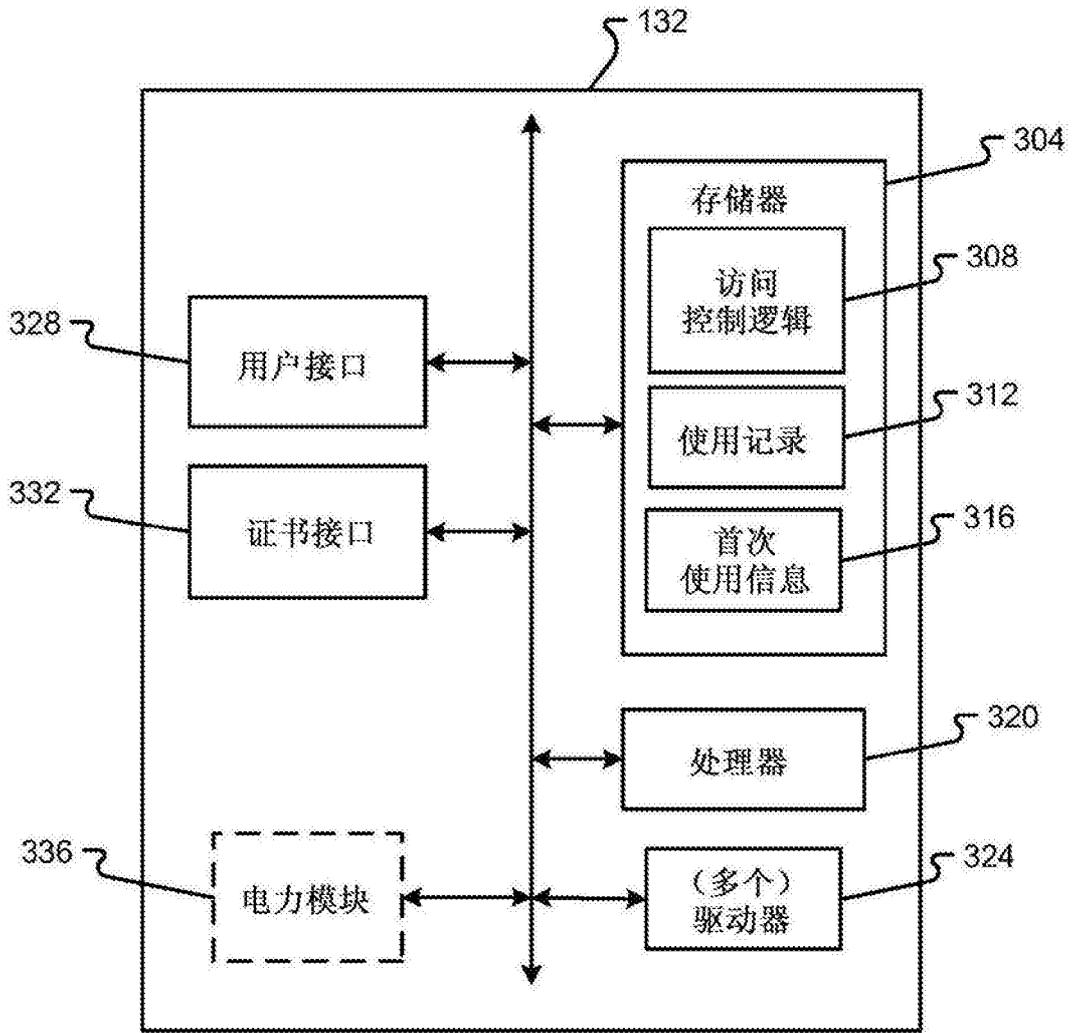


图3

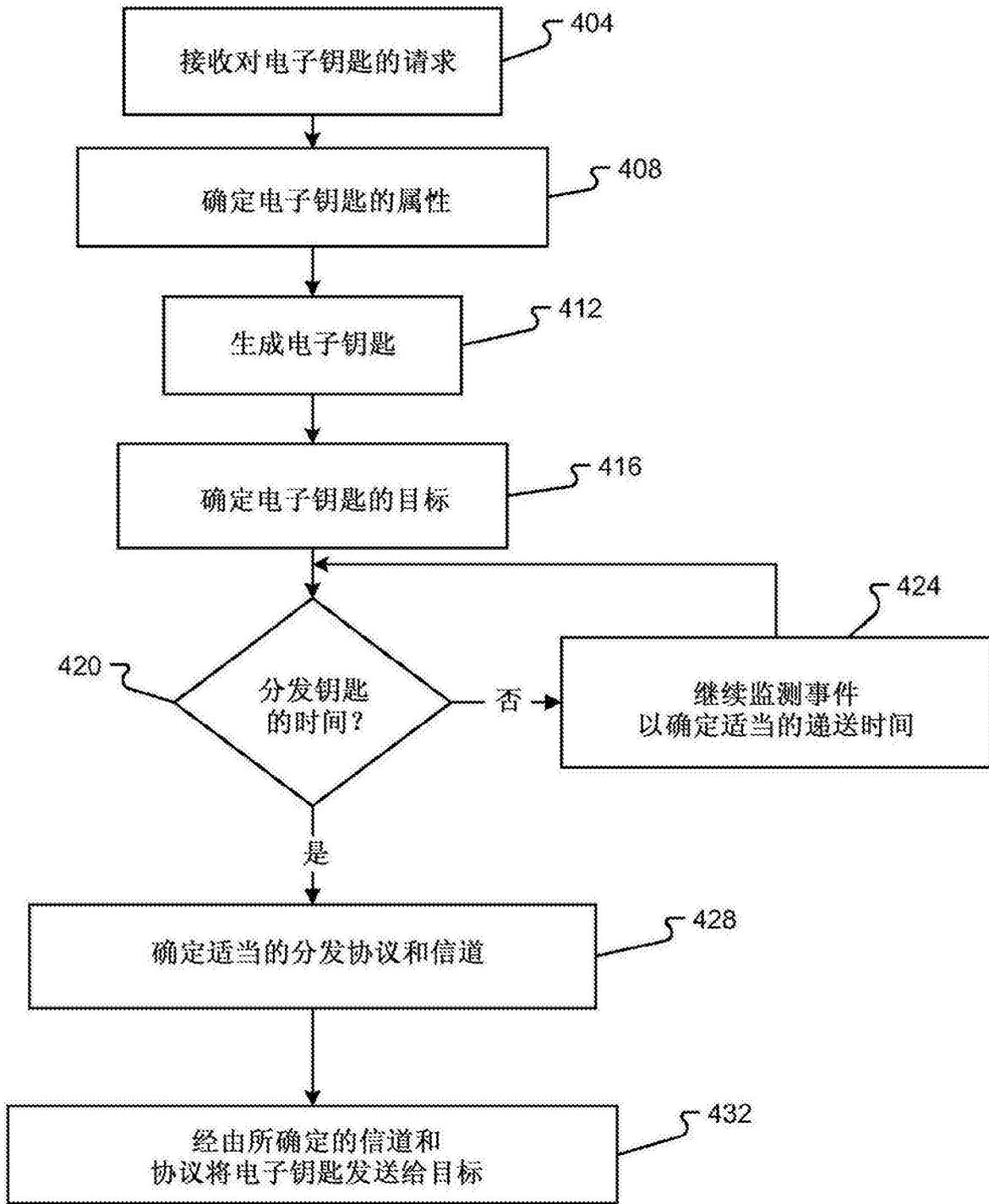


图4

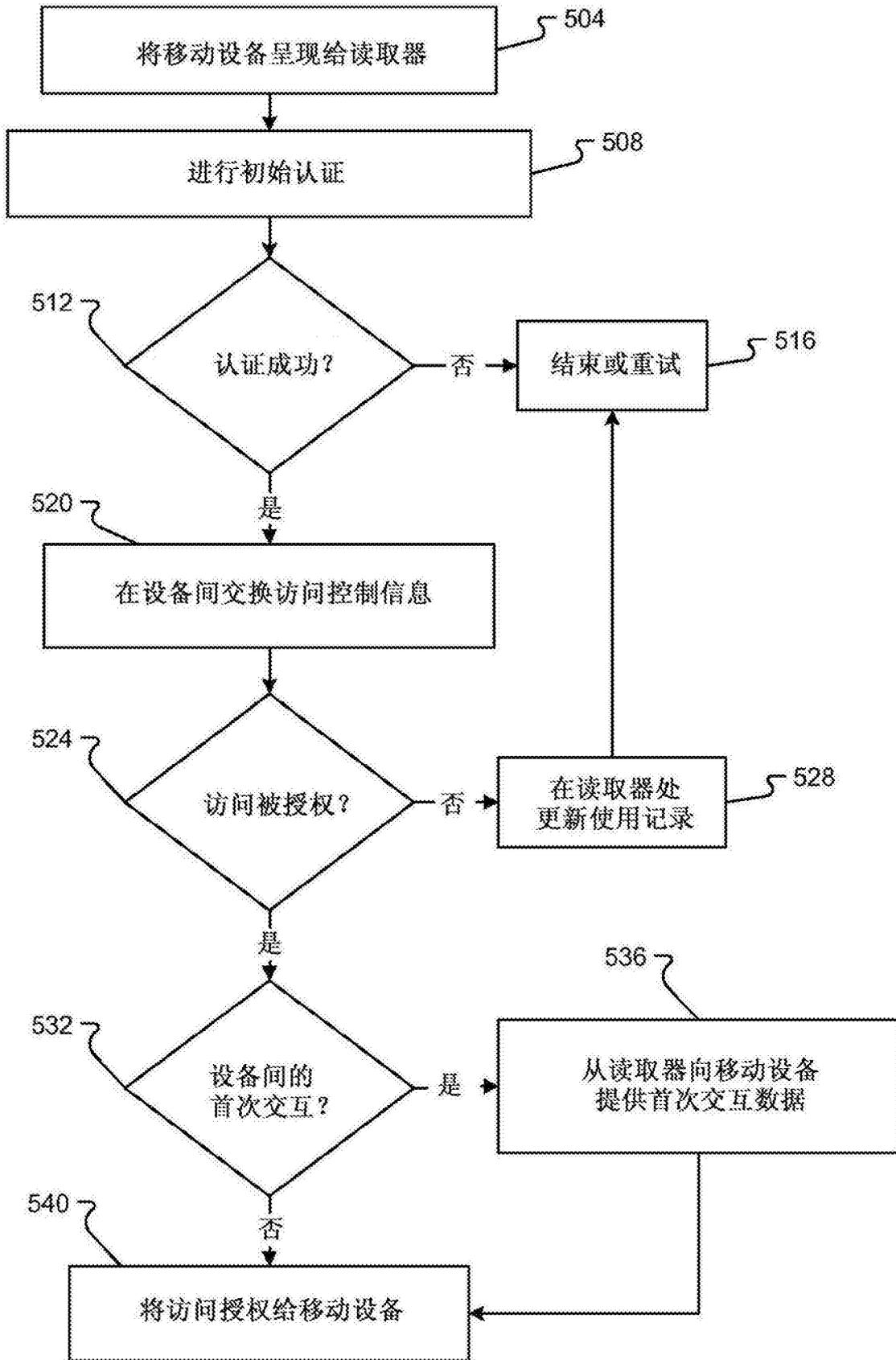


图5

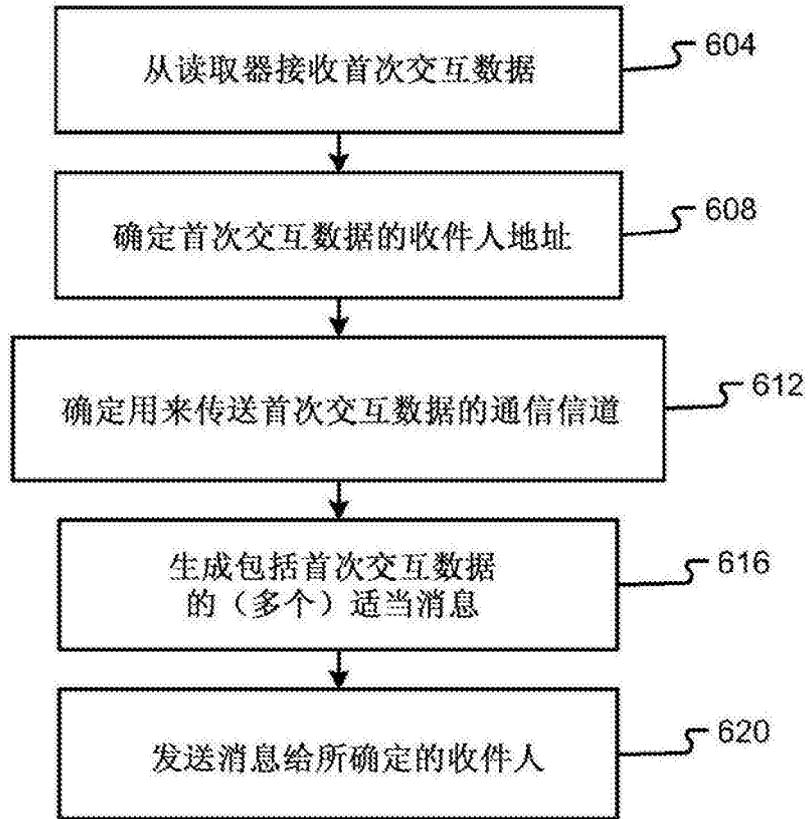


图6

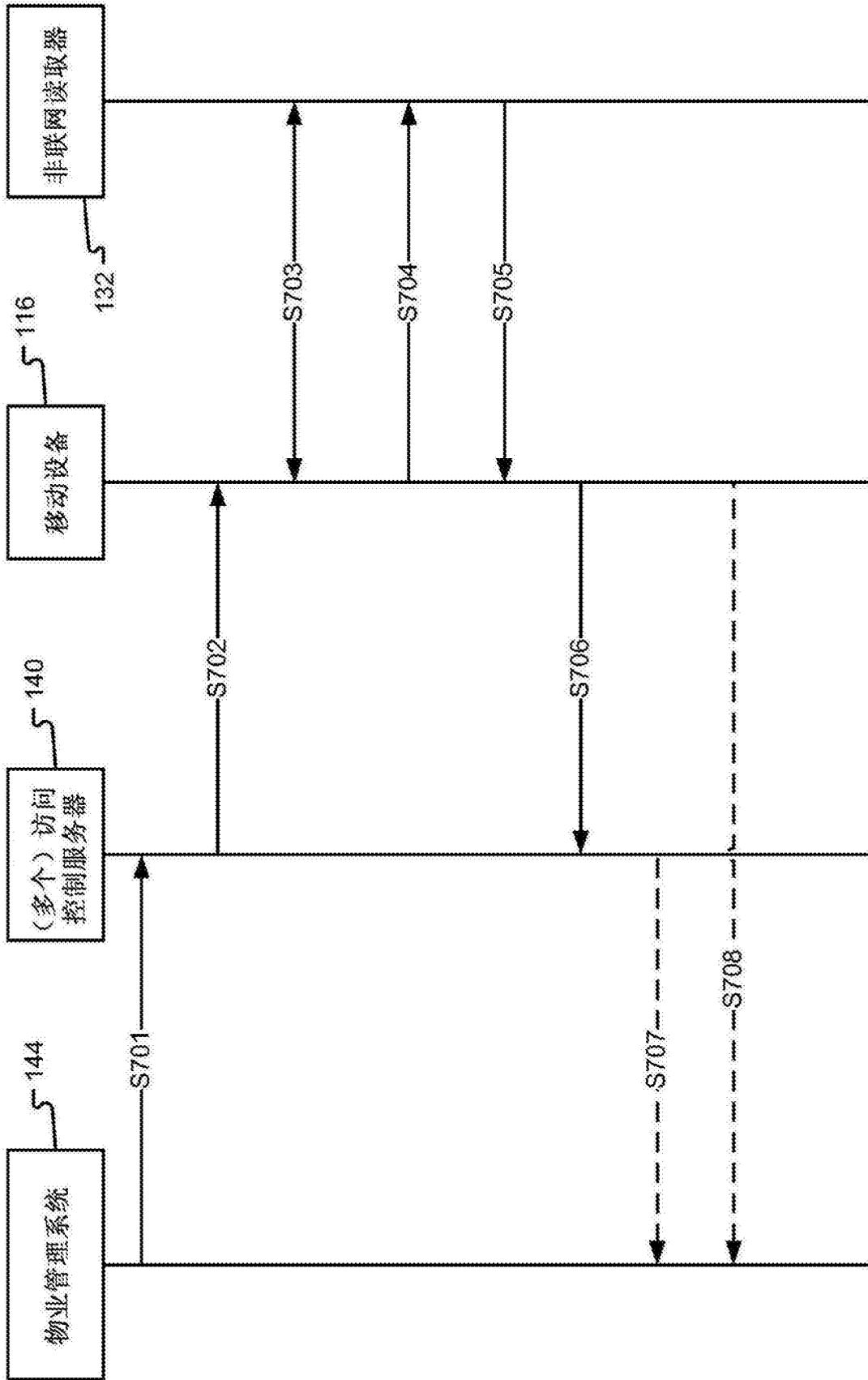


图7

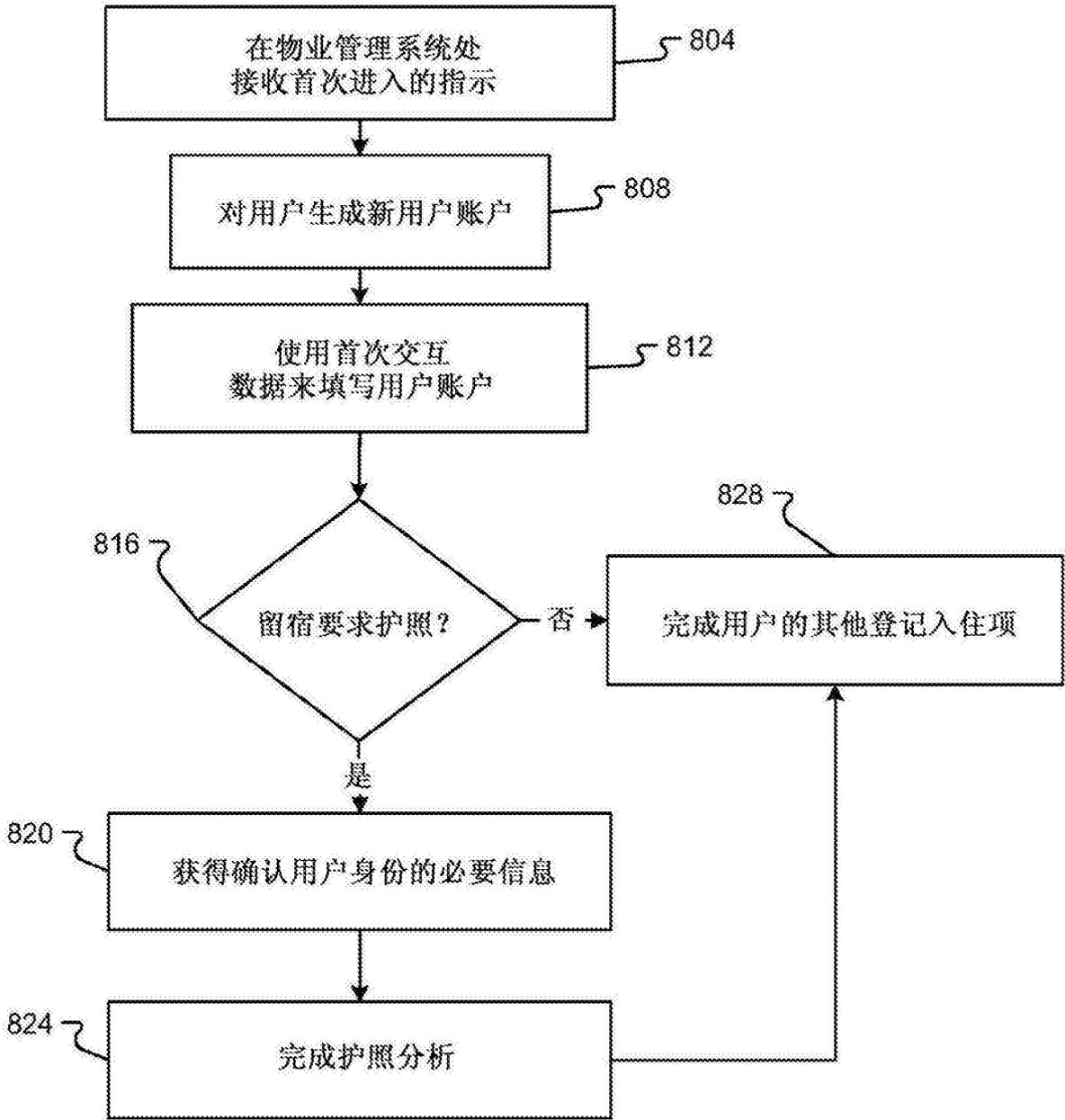


图8

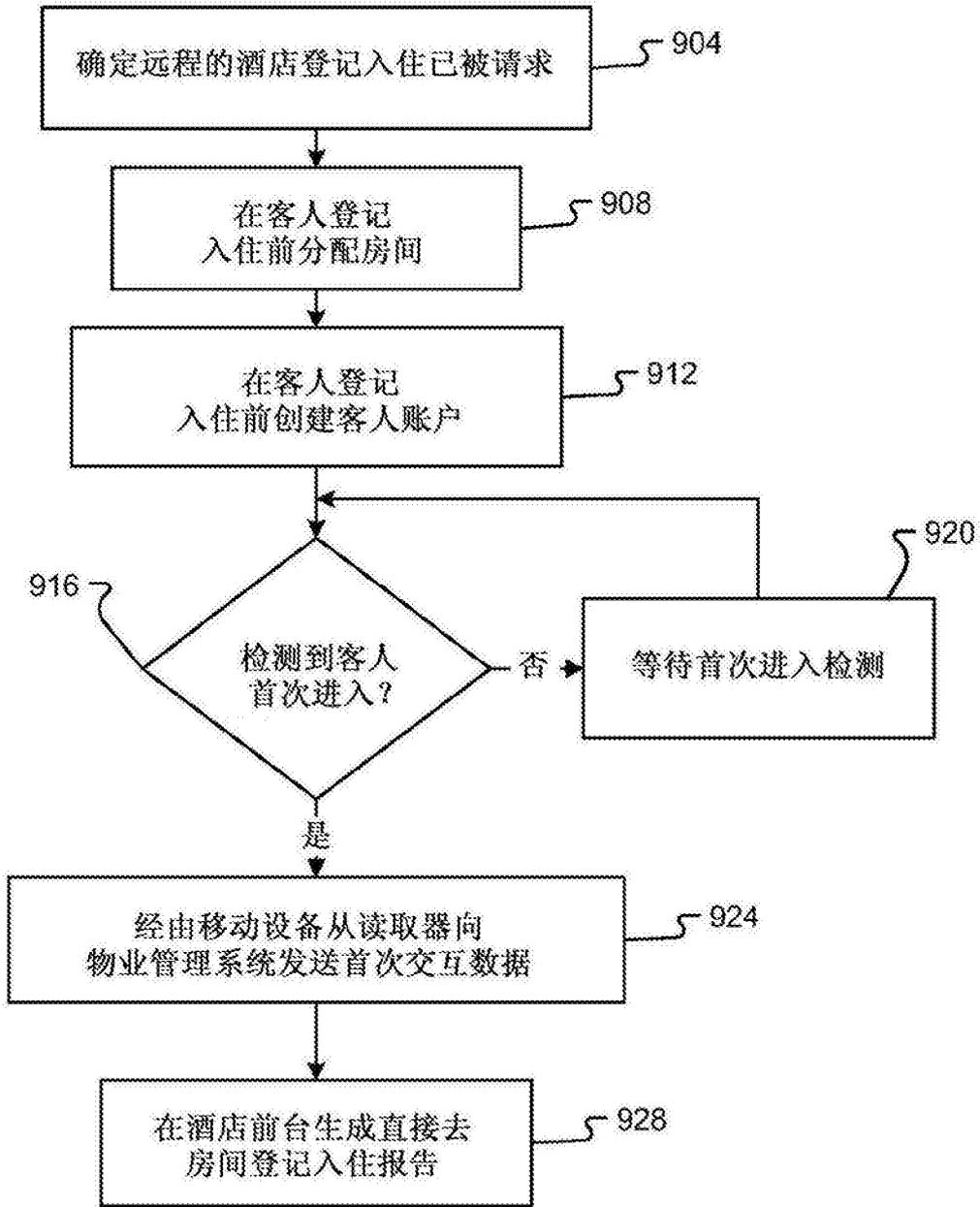


图9