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Canadian Intellectual Property Office
An agency of Industry Canada

CA 2709651 A1 2010/12/29

(21) 2 709 651

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 2010/06/07

(41) Mise à la disp. pub./Open to Public Insp.: 2010/12/29

(51) Cl.Int./Int.Cl. *H04W 12/08* (2009.01), *H04W 4/00* (2009.01), *H04W 84/12* (2009.01), *H04L 12/28* (2006.01)

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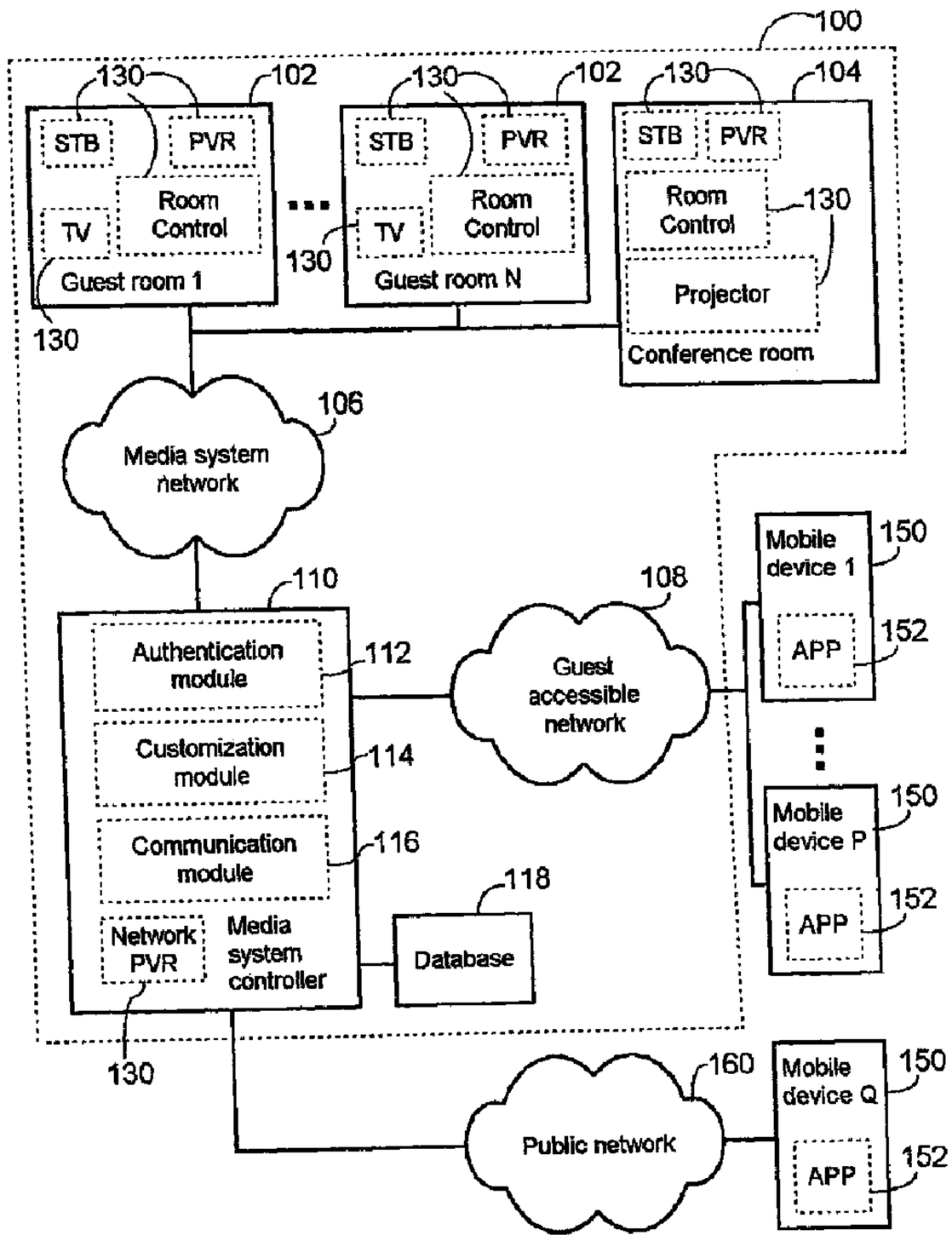
(54) Titre : SYSTEME MULTIMEDIA A FLEXIBILITE EXPLOITE PAR UN APPAREIL MOBILE
(54) Title: HOSPITALITY MEDIA SYSTEM OPERATED BY MOBILE DEVICE



(57) Abrégé/Abstract:
A hospitality media system includes a media system controller and a plurality of controllable devices. A communication module establishes a connection to a mobile device and performs data transfer between the media system controller and the mobile

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(57) Abrégé(suite)/Abstract(continued):
device. An authentication module coupled to the communication module determines an authorized subset of the controllable devices for which the mobile device is authorized to operate. The media system controller thereafter operates the authorized subset of the controllable devices in dependence upon commands received from the mobile device. The mobile device may automatically detect the media system through any number of available networks and may have a control application running thereon customized after connection to the media system. The mobile device may remotely control the authorized subset of controllable devices while away from the room, and more than one mobile device may operate a single controllable device.

ABSTRACT OF THE DISCLOSURE

A hospitality media system includes a media system controller and a plurality of controllable devices. A communication module establishes a connection to a mobile device and performs data transfer between the media system controller and the mobile device. An authentication module coupled to the communication module determines an authorized subset of the controllable devices for which the mobile device is authorized to operate. The media system controller thereafter operates the authorized subset of the controllable devices in dependence upon commands received from the mobile device. The mobile device may automatically detect the media system through any number of available networks and may have a control application running thereon customized after connection to the media system. The mobile device may remotely control the authorized subset of controllable devices while away from the room, and more than one mobile device may operate a single controllable device.

HOSPITALITY MEDIA SYSTEM OPERATED BY MOBILE DEVICE

TECHNICAL FIELD

The invention pertains generally to hospitality media and entertainment systems. More specifically, the invention relates to operating a hospitality media system from a mobile device.

BACKGROUND OF THE INVENTION

In order to meet guest expectations, hotels must provide increasingly sophisticated media entertainment systems. However, the increased sophistication inevitably results in increased complexity, and thus the systems become "scary" to new users who may be unfamiliar with the operation of many remotes and other equipment such as set-top boxes (STBs) and personal digital recorders (PVRs) that may be found in the rooms.

To solve this problem, hotel media systems are designed to be "user-friendly". This generally means control elements such as menus and control buttons be as intuitive as possible such that a guest can easily figure out how to use the system without first having to read instructions. However, regardless of how user-friendly a system may actually be, it will still be regarded as new and therefore troublesome by a guest who is unfamiliar with the system but who needs to learn it in order to enjoy their stay. Also, because the hardware vendors for different hotels (even of the same hotel chain) may differ, the physical appearance and other control aspects of in-room media and entertainment systems may also differ from hotel to hotel. Therefore, even if each system is itself user-friendly, frequent travelers who stay at many hotels may need to learn many different media systems. The process of learning to use yet another hotel media system can detract from the overall guest experience.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a hospitality media system such as a hotel entertainment system being controlled from a guest's own mobile device. Four exemplary benefits of this configuration include allowing guests to utilize a familiar hardware platform and user interface, enabling one mobile application to control the media systems at different hotels, allowing guests and other users such as staff members to operate in-room

controllable devices while not in the room, and allowing multiple authorized mobile devices to control a single piece of hotel equipment.

According to another aspect of the invention there is provided a hospitality media system including a media system controller and a plurality of controllable devices. A communication module establishes a connection to a mobile device and performs data transfer between the media system controller and the mobile device. An authentication module coupled to the communication module determines an authorized subset of the controllable devices for which the mobile device is authorized to operate. The media system controller thereafter operates the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

According to another aspect of the invention there is provided a mobile device for operating a hospitality media system. A communication module in the mobile device establishes a connection to the hospitality media system and performs data transfer between the hospitality media system and the mobile device. An identification module identifies the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate. A user interface displays status information received from the hospitality media system and transmits commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

According to another aspect of the invention there is provided a method of operating a plurality of controllable devices in a hospitality media system. The method is performed by the hospitality media system and includes utilizing a communication module for establishing a connection to a mobile device and performing data transfer between the hospitality media system and the mobile device. Determining an authorized subset of the controllable devices for which the mobile device is authorized to operate is then performed. The method further includes, operating the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

According to another aspect of the invention there is provided a method of operating a plurality of controllable devices in a hospitality media system by a mobile device. The method

comprises steps being performed by the mobile device including utilizing a communication module for establishing a connection to a hospitality media system and performing data transfer between the hospitality media system and the mobile device. The method then includes identifying the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate. The method further involves using a user interface for displaying status information received from the hospitality media system and transmitting commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

According to another aspect of the invention there is provided a hospitality media system having a plurality of controllable devices. A means is provided for establishing a connection to a mobile device and performing data transfer between the hospitality media system and the mobile device; and a means is provided for determining an authorized subset of the controllable devices for which the mobile device is authorized to operate. Additionally, a means is provided for operating the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

According to another aspect of the invention there is provided a mobile device having a means for establishing a connection to a hospitality media system and for performing data transfer between the hospitality media system and the mobile device. A means is provided for identifying the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate. A means is also provided for displaying status information received from the hospitality media system and for transmitting commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail with reference to the accompanying drawings which represent preferred embodiments thereof, wherein:

FIG. 1 is a block diagram of a hotel media system having controllable devices being operated by mobile devices according to an exemplary configuration of the present invention;

FIG. 2 is an operational flowchart of the hotel media system of FIG. 1;

FIG. 3 is a block diagram of a mobile phone being one of the mobile devices of FIG. 1;

FIG. 4 is an operational flowchart of the mobile phone of FIG. 3;

FIG. 5 illustrates a hotel floor plan having multiple controllable devices being remotely operated by various mobile devices according to another exemplary configuration of the present invention;

FIG. 6 shows one exemplary data structure of a database for performing authentication of the mobile devices of FIG. 5;

FIG. 7 illustrates the media system controller of FIG. 1 being divided into a central controller and a plurality of local controllers according to another configuration of the present invention;

FIG. 8 illustrates how commands received from a mobile device may be passed from the media system controller to a set-top box in a guest room in order to thereby control other controllable devices 130 in the room; and

FIG. 9 illustrates how commands from a mobile device may be received directly by an in-room STB in order to control other controllable devices 130 in the room.

DETAILED DESCRIPTION

FIG. 1 is a block diagram of a hotel media system 100 having controllable devices 130 being operated by a plurality of mobile devices 150 according to an exemplary configuration of the present invention. In this configuration, a media system controller 110 includes an authentication module 112, a customization module 114, and a communication module 116, and is coupled through a media system network 106 to each guest room 102 and to a conference room 104. The media system controller 110 communicates with the controllable devices 130 and delivers media and entertainment content through the media system network 106. Each room 102, 104 includes several controllable devices 130 such as a set-top box (STB), personal video recorder (PVR), television (TV), projector, and room control box. The room control box may allow electronic control of elements in the room 102, 104 such as air conditioning, lighting, heating, fans, doors, windows, blinds, etc. Additionally, the media

system controller 110 itself includes a networked personal video controller (network PVR) being a further controllable device 130. Any number and types of controllable devices 130 may be positioned throughout the hotel media system 100 in other configurations.

Guests of a hotel often have their own mobile devices 150 such as laptop computers, tablet computers, cell phones, music players, personal digital assistants (PDAs), digital cameras, global positioning systems (GPSs), and all other kinds of personal electronic gadgets. These mobile devices 150 may be coupled to the media system controller 110 through a guest accessible network 108 that is installed throughout the hotel and available to guests of the hotel, or through a public network 160 that may be available outside the hotel such as the Internet. In another configuration, the media system network 106 and the guest accessible network 108 may be the same network. Once connected to the media system controller 110, the mobile devices 150 may operate one or more of the controllable devices 130.

In one configuration, a custom application 152 may be pre-included on each mobile device 150 or may be downloaded and installed from the media system controller 130 or another source if it is not already present on the mobile device 150. According to the type of connecting network 108, 160, the application 152 automatically detects the hotel media system 100 and establishes a two-way data connection with the communication module 116. The customization module 114 may then provide customization information specific to this particular hotel media system 100 to the application 152. Examples of the information specific to a particular hotel media system 100 may include hotel name, branding logos, colour schemes, welcome messages, authentication methods, etc. The application 152 utilizes this information to customize itself for this particular hotel and then identifies itself or its operator to the authentication module 112. Authorization limits implemented by the authentication module 112 in conjunction with a database 118 such as the hotel's property management system (PMS) determine which controllable device(s) 130 may be operated by a particular mobile device 150. After determining an authorized subset of the controllable devices 130 for which a particular mobile device 150 is authorized to operate, the media system controller 110 transfers status information for the authorized controllable devices 130 to the particular mobile device 150 and operates the controllable devices 130 in the authorized subset in dependence upon commands received from the particular mobile device 150. For example, in

FIG. 1, a first mobile device 150 (Mobile device 1 in FIG. 1) may be authorized to operate the STB, PVR, TV, and room control devices in a first guest room (Guest room 1 in FIG. 1), and a second mobile device (Mobile device Q in FIG. 1) may be authorized to operate the STB, PVR, room control, and projector in the conference room 104. Therefore, the first mobile device will only be able to see status information from and send commands to the controllable devices 130 in the first guest room, and the second mobile device will only be able to see status information from and send commands to the controllable devices 130 in the conference room 104.

FIG. 2 is an exemplary operational flowchart 200 of the hotel media system of FIG. 1. The steps of flowchart 200 are not restricted to the exact order shown, and, in other configurations, shown steps may be omitted or other intermediate steps added. In this configuration, the hotel media system 100 performs the following operations:

Step 202: A connection is established between the hotel media system 100 and a mobile device 150 in order to pass data between the media system 100 and the mobile device 150. To ensure privacy, the data flowing through the connection may be encrypted in both directions such that a third party will not be able to read or understand any of the information. The connection may be established via wired access ports such as USB, FireWire, Ethernet, etc or wireless access ports such as using Bluetooth, Wi-Fi, WLAN, etc, and, as previously mentioned, a computer network used to make the connection may be a guest accessible network 108 available only on the hotel premises or via any public network 160 such as the Internet available from other locations such as a wireless hotspot at a local coffee shop. The connection to the mobile device 150 may be dynamically established through any computer network access ports, and the ports utilized may change as the mobile device 150 moves to new locations. In general, any type of connection may be established between the hotel media system 100 and the mobile device 150.

Step 204: The hotel media system 100 detects whether a media system control application 152 is running on the mobile device 150. This detection may be performed by

attempting a connection to the mobile device 150 utilizing a predetermined handshake protocol that is known only to the application 152. Alternatively, the mobile device may simply identify itself and include a version number of the media system control application 152 if it is installed and running on the mobile device 150 at the time the connection is established.

Step 206: Assuming the mobile device 150 is running the application 152, the hotel media system 100 may next transfer customization information specific to this particular hotel media system 100 to the mobile device 150. By way of example, this customization information may provide any required information and data to properly brand the user interface (UI) of the application 152 and to enable or disable various features according to what is supported by this specific hotel media system 100. Transferring customization information to the mobile device 150 is useful because different hotel chains may all support the same mobile application 152 but will place their own logos on the application 152 for branding purposes. Also, some hotels may allow remote control of particular in-room elements as part of the media system 100 and others may not. Rather than transferring all the customization data, a customization token corresponding to a specific hotel may be transferred instead. In this configuration, customization information for the hotel corresponding to the token is already stored within the mobile device 150 and will be utilized by the application 152. Transferring only a hotel specific token speeds connection time for subsequent connections by the same mobile device 150 when the full customization information has already been downloaded.

Step 208: Because the media control application 152 was not detected, the hotel media system 100 offers the application 152 for download by the mobile device 150. In one configuration, the hotel media system 100 may automatically detect the type of the mobile device 150 and offer a compatible application 152. In another configuration, the media system 100 may provide a web interface allowing an operator of the mobile device 150 to select and chose a desired application from a list of supported device platforms. In yet another configuration, the application 152 may be stored and made available from a third-party site such as an application

store. In this case, the hotel media system may provide a link to where the application 152 may be retrieved.

Step 210: If the user has downloaded the application 152 or at least indicated they plan to use the application 152 (if the application is available from a third-party), the hotel media system will return to step 204 and continue trying to detect the application 152. However, in some cases, the user of the mobile device 150 may not wish to use a custom media control application 152 and will instead opt to continue without installing the media application 152. Some aspects of controlling the hotel media system 100 are facilitated and enhanced by running a media control application 152 on the mobile device 150. One reason is the required data to be transmitted will be minimized if the device 150 already has the control application 152 installed. Another reason is automatic detection, connection, and authentication with the hotel media system 100 can be performed by an application but may need to be performed manually by a user of a web interface. Also, better integration with the UI of the mobile device 150 and background operation are both possible with a custom application 150. However, there is an advantage to not requiring users to install and run the media control application 152. For example, by providing a web interface to the hotel media system 100, full compatibility with any device that is able to browse the web is achieved. This may be useful to users who are unwilling or unable to install a custom application 152 on their mobile device 150.

Step 212: Because the mobile device is not running the media control application 152, the communication module 116 acts as a web server and a web interface is provided to the mobile device 150. Again, to ensure privacy and prevent unauthorized access from third parties, the web interface may be encrypted using a secure sockets layer (SSL).

Step 214: At this step, the hotel media system 100 determines an authorized subset of controllable devices for which the mobile device 150 is authorized to operate. Generally speaking, the authentication module 112 receives some identification

information from the mobile device 150 or an operator of the mobile device 150 and then looks up in a database 108 to determine which controllable devices 130 are permitted to be operated by this mobile device or operator. For example, the authentication module 110 may query the hotel's property management system (PMS) to make sure the guest's name, MAC address, GSM SIM card number, passkey, and / or reservation number are correct for a particular hotel room and authorize the user. In this configuration, the authorized subset may include in-room controllable devices that are accessible from the room(s) for which the operator of the mobile device is currently registered. Steps 216 and 218 may also both be utilized, alone or in combination to extract the identification information and/or a unique identifier.

Step 216: The authentication module 110 may automatically detect a unique identifier from the hardware or software of the mobile device 150. Some examples of unique identifiers include Global System for Mobile Communications (GSM) subscriber identity module (SIM) card number, media access control (MAC) address, internet protocol (IP) address, web browser identification from a previously stored cookie, media control application 152 serial number, etc. The unique identifier of this mobile device 150 can be mapped in the database 108 to the authorized subset of controllable devices.

Step 218: The authentication module 110 may receive identification information for an operator of the mobile device 150 such as guest name, room number, company name, address, phone numbers, credit card number, etc. However, identification information received from the mobile device 150 need not be of a personal nature and may also be implemented using usernames, pass codes, or token numbers. For example, upon check-in, a guest may be provided with a password for use when authenticating their mobile device(s) 150 with the hotel media system 100. In this way, no personal identification information need be supplied by the guest either at check-in or when authenticating their mobile device(s) 150. Alternately, the authentication module 110 may automatically display a passkey on an interface such as a TV in the guest's room and ask the guest to enter this passkey to confirm

the guest is the registered for the particular room. This may similar to the process used to pair Bluetooth devices, except in this case the medium for transport of data could be wired, wireless, Bluetooth, cell, etc. Additionally, receiving the identification information may only need to be performed once per mobile device 150. Once received, the unique identifier from the mobile device 150 as automatically detected at step 216 can be stored in the database 108, and, for any subsequent authentications by this particular mobile device 150, the automatic detection of the unique identifier at step 216 may be sufficient to authenticate the mobile device 150.

Step 220: Once the mobile device 150 is authenticated, the hotel media system 100 transfers any status information from the authorized subset of the controllable devices 130 to the mobile device 150, and controls the authorized subset of the controllable devices 130 according to commands received from the mobile device 150. For example, the status information may include UI menus for each of the controllable devices 130 in the authorized subset, and the commands received from the mobile device 150 may include UI selections for operating each of the controllable devices 130 in the authorized subset. At this step, the operation of the authorized subset of controllable devices 130 is dependent upon the commands received from the mobile device 150.

Other steps may also be included such as if a user is not authorized at step 214, actions such as providing an error message or other assistance to the guest may be provided by the hotel's media system 100. Because the user of the mobile device is not authenticated, the hotel media system 100 may provide only general services and information to the mobile device 150 but no specific room control services until the mobile device 150 tries to re-authenticate. Control may proceed back to step 214 when the mobile device tries to re-authenticate.

FIG. 3 is an exemplary block diagram of a mobile phone 300 being one of the mobile devices 150 of FIG. 1. In this configuration, the mobile phone 300 includes a user interface (UI) 312, a customization module 302, a communication module 304, an identification module 306, and a unique identification (ID) 308. The communication module 304 may be implemented in

hardware as a part of the mobile phone. For example, the phone 300 may be equipped with Bluetooth, Wi-Fi, and WLAN capabilities. Any of these may therefore be utilized to establish a connection to the hotel media system 100 via either a guest accessible network 108, public network 160, or other available access port. In this configuration, it is assumed that the control of the mobile phone 300 is being performed by a custom media control application 152 having been previously installed. However, as mentioned above, the present invention may alternatively operate utilizing a web interface or the application 152 may be downloaded and installed as a part of the connection procedure. Compiled, semi-compiled code such as a Java or interpreted code such as JavaScript may also be utilized to perform the role of the media control application 152.

As an example of beneficial usage, as shown in FIG. 2, the authorized subset of the controllable devices 150 for the mobile phone 300 maybe include at least a PVR of a hotel room (hotel room 101 in FIG. 3). Therefore, the UI 312 of the mobile phone 300 shows an interactive program guide (IPG) of content available on the hotel's media system 100 as recordable by the PVR of room 101. Note that different rooms in the hotel may have different available content, and part of the status information sent from the hotel media system 100 to the mobile phone 300 included the content that was actually recordable by the PVR in room 101. An operator of the mobile phone 300 may schedule the PVR of room 101 to record content listed on the IPG by interacting with the UI 312 of the mobile phone 300. Corresponding commands will be sent from the mobile phone 300 to the hotel media system 100 and the hotel media system 100 will utilize these commands to operate the PVR of room 101. Additional status messages such as confirmation of the recording or conflict messages will be passed back to the UI 312 as required. In this way, the mobile phone 300 may operate the PVR of room 101 from any location as long as a connection to the media system 100 is available. Of course, the mobile phone 300 may also be authorized to operate other controllable devices 130 and these other controllable devices 130 could be selected and controlled using the UI 312 in a similar way.

Regarding additional features of the phone 300, the customization module 304 of the mobile phone 300 receives the customization information sent from the customization module 114 of the media system controller 110. For example, a hotel branded logo 310 may be utilized by

the mobile phone 300 to customize the UI 312 when operating the media system 100 at a particular hotel. The ID module 306 is responsible for identifying the mobile phone 300 to the hotel media system 100 and may also store identification information that needs to be remembered for authentication purposes. For example, a pass code that a guest was given at check-in for authenticating their mobile device(s) 150 may be stored within the ID module. The ID module may also automatically pass a unique ID 308 such as the GSM SIM card number, MAC address, software serial number, or browser cookie to the authentication module 112 of the hotel's media system controller 110 to allow determination of the authorized controllable devices.

FIG. 4 is an exemplary operational flowchart 400 of the mobile phone 300 of FIG. 3. The mobile phone 300 of FIG. 3 is taken as an example but similar steps may also apply to the other mobile devices 150 of FIG. 1. The steps of flowchart 400 are not restricted to the exact order shown, and, in other configurations, shown steps may be omitted or other intermediate steps added. In this configuration, the mobile phone 300 performs the following operations:

Step 402: The mobile phone 300 may automatically detect the existence of the hotel media system by recognizing a hotel Wi-Fi access point by service set identifier (SSID), recognizing a cell tower identification that is near the hotel, determining the mobile phone 300 is physically located near a predetermined GPS coordinate corresponding to the geographic location of the hotel as detected by a GPS unit (not shown) of the mobile phone 300, detecting a hotel's Bluetooth network or infrared signal, establishing a wired connection with the hotel's Ethernet or DSL system, or by simply recognizing broadcast packets from the hotel that are received on one of the mobile phone's 300 network interfaces at communication module 304. The SSIDs, cell tower IDs, GPS coordinates, and formats of broadcast packets of various hotels may be preprogrammed as a part of the media control application 152 or may be stored remotely such as at a publically accessible Internet site that is periodically accessed by the application 152. In a manual configuration, an operator of the mobile phone 300 may manually specify or select the network interface and destination hotel name or address such as a domain name that corresponds to the hotel. This may be beneficial if the guest is not physically near

the hotel and is instead accessing the hotel media system 100 through a public network 160 such as the Internet.

Step 404: Once the hotel's media system 100 is detected, in one configuration, the communication module 304 of the mobile phone 300 establishes a two-way data connection with the communication module 116 of the hotel's media system controller 110. Again, this connection and the data transferred through the connection may be encrypted for privacy.

Step 406: The mobile phone 300 then customizes its user interface according to the particular hotel and any customization information that is received from the hotel. This may include branding information such as the hotel logo 310, colour schemes or other elements.

Step 408: The ID module 306 then identifies the mobile phone 300 to the authentication module 112 of the hotel's media system controller 100. Because the goal may actually be to identify the user of the mobile phone 300, one method may be to query the user of the mobile phone 300 to enter, via a UI prompt, their name and room number and then pass this information to the hotel media system 100. This information could already be known by the application so it could be done automatically without requiring user interaction. (User had already entered their name on the device and the room number was known at the time of reservation.) For privacy and security reasons, it is not necessary that any personal information be transmitted to the media system 100 to perform authentication. Another method to authenticate the mobile phone 300 would be via a MAC address or GSM SIM card number of the user's device that was associated with the guest during the reservation process. A registration confirmation number could also be utilized. Another method may be to authenticate with the media system 100 through a passkey given out by an interface in the room (ie. through the TV). Sub steps 410 and 412 contain more information about identification techniques and may be performed together in either order or only one may be performed according to different configurations.

Step 410: The ID module 306 transmits a unique identifier such as the mobile phone's GSM SIM card number or MAC address to the authentication module 112.

Step 412: The ID module 306 transmits identification information to the authentication module 112. The ID module 306 may first utilize the UI 312 to query a user of the mobile phone for the identification information and store it within the ID module 306, or the identification information may already be stored within the ID module 306.

Step 414: The mobile phone 300 now displays the status information received from the authorized subset of controllable devices 150 and transmit commands to operate the authorized subset of controllable devices 150. Each of the authorized controllable devices 150 may be operated using a separate screen on the UI 312 of the mobile phone if space is limited. Alternatively, on a mobile device 150 such as a laptop computer, all of the (or multiple) authorized controllable devices 150 may be visible on a single screen.

FIG. 5 illustrates a hotel floor plan 500 having multiple controllable devices 506, 508, 510, 512, 514 being remotely operated by various mobile devices 530, 532, 534 according to another exemplary configuration of the present invention. As shown in FIG. 5, the hotel includes a plurality of guest rooms including a particular room 502 being shown with an expanded view. As shown in the expanded view, room 502 includes a STB 506, TV 508, PVR 510, and room control box 512 being part of the hotel's media and entertainment system 100; and a conference room 501 includes a projector 514, which is another part of the hotel's media and entertainment system 100. Access ports for a guest accessible computer network 108 are distributed throughout the hotel including wireless access points (APs) 520 and a wired Ethernet connection 522. In this example, there are three mobile devices illustrated including a cell phone 530, a laptop computer 532, and a tablet computer 534.

FIG. 6 shows one exemplary data structure of a database 118 for performing authentication of the mobile devices 530, 532, 534 of FIG. 5. The database structure 600 includes authentication data for each mobile device 530, 532, 534 organized in rows with a first column (Mobile Device) indicating the particular mobile device name, a second column

(MAC Address) indicating a unique ID being associated with the hardware of the mobile device, a third column (Registered Rooms) indicating identification information corresponding to an operator of the mobile device, and a fourth column (Authorized Subset of Controllable Devices) indicating the subset of the possible controllable devices 506, 508, 510, 512, 514 that are authorized to be operated. Each mobile device 520, 532, 534 may operate the subset of the controllable devices for which it is authorized even when it is not located in the same room as the controllable device it is trying to operate. For example, as illustrated in FIG. 5, the cell phone 530 may operate the PVR 510 even while the cell phone 530 is located in the dining hall. Also, as shown in FIG. 6, in this example, all mobile devices 530, 532, 534 may operate the projector 514 in the conference room 501. This could be the situation because the operator of the cell phone 530 is a registered guest of room 502 and also a speaker of a conference, the operator of the laptop 532 may also be a speaker of the conference but is not staying at the hotel, and the tablet 534 may be carried by hotel staff to assist guests as needed and therefore is authorized to operate all controllable devices 506, 508, 510, 512, 514 in the hotel.

De-authorization of one or more controllable devices 506, 508, 510, 512, 514 may be performed by modifying the database accordingly. For example, to de-authorize the cell phone 530 from controlling the STB 506, the STB 506 may be removed from the authorized subset of controllable devices column in the FIG. 6. In one configuration, de-authorization may coincide with when the guest checks out. In another configuration, it may also be useful to de-authorize a particular controllable device 130 or mobile device 150 when a conference or other hotel event ends, when a specific time period or time duration ends, during a specific time interval such as to disable staff users from controlling devices during the evening or early morning so they don't accidentally disturb the guest, etc. Allowing a user to de-authorize themselves may also be useful in some instances such as when a guest wants to lend their mobile device 150 to a third party.

Furthermore, de-authorization of a controllable device may occur on a device-level or a feature-level. For example when a guest checks out of a hotel their mobile device 150 may be de-authorized to control the TV and other in-room devices 130 but may still be authorized to

review their portfolio, message inbox, etc. In another example a mobile device 150 may be de-authorized to watch or record certain TV channels due to parental lock control settings.

FIG. 7 illustrates the media system controller 110 of FIG. 1 being divided into a central controller 710 and a plurality of local controllers 720 according to another configuration of the present invention. In this configuration, the central controller 710 includes a central authentication module 712, a central customization module 714, and a central communication module 716; and each of the local controllers 720 includes a local authentication module 722, a local customization module 724, and a local communication module 726. The central controller 710 may be located at an off-site location such as a media system vendor server room, and each of the local controllers 720 may be located on-site at the various hotels incorporating the media system 100. Communication between the central controller 710 and the local controllers 720 may be via a direct link or may be through the public network 160. Encryption and / or virtual private network (VPN) links may be utilized to ensure secure communication between the central controller 710 and the various local controllers 720.

When a mobile device 150 connects to the media system controller 110 via the public network 160, communication is first established with the central communication module 716. Customization and authentication may be performed by the central controller 710 using the central customization module 714 and the central authentication module 712 according to techniques similar to what was already described above for FIG. 1. In this configuration, information in the database 118 in FIG. 1 may also be located at the central location. Alternately, the modules 712, 714, 716 in the central controller 710 may each operate in tandem with the corresponding modules 722, 724, 726 in the local controller 720 at the hotel for which the mobile device 150 is associated. Information that may be stored at the central controller may include a mapping of each known mobile device 150 to a particular local controller 720. In the event that an unknown mobile device 150 connects to the central controller 710, the central controller 710 may query the mobile device 150 to identify to which hotel it is associated. This would allow the central controller 710 to create the mapping to the correct local controller 720 and then the appropriate customization and authentication would occur utilizing the local customization module 724 and the local authentication module 722 at the local controller 720 in that hotel.

FIG. 8 illustrates how commands received from a mobile device 150 may be passed from the media system controller 110 to a set-top box 831 in a guest room in order to thereby control other controllable devices 130 in the room. In FIG. 8, the arrows on the lines correspond to the direction of controlling commands received from the mobile device 150. In this configuration, the STBs 831 operate as in-room controllers of the other controllable devices 130. The STB 831 also passes back status information from each of the controllable devices 130 to the media system controller 110, which forwards it back to the mobile devices 150. A benefit of this configuration is that an older generation media system may already have an existing network (or other available connections) 850 in the hotel that can be utilized to connect a central location housing the media system controller 110 to all the various in-room STBs 831. In this way, the media system controller 110 may perform the authentication for all the mobile devices 150 and pass commands to in-room STBs. It should also be noted that the functions of STB 831 may also be integrated with one or more of the other controllable devices 130. For example, a television or PVR may include STB functionality embed therein.

FIG. 9 illustrates how commands from a mobile device 150 may be received directly by an in-room STB 931 in order to control other controllable devices 130 in the room. The arrows in FIG. 9 again correspond to the direction of controlling commands received from the mobile device 150. In this configuration, a STB 931 in a guest room includes an authentication module 912, customization module 914, and a communication module 916. The communication module 916 in the STB 931 may support any number of data modes including ports for a direct wired connection such as USB, Ethernet, or Firewire; a wireless connection such as Wi-Fi or Bluetooth, or any other type of connection. Mobile devices 150 connect to the STB 931 via a data connection 950 which could be either a networked, direct, or indirect connection according to the modes supported by the communication module 916. Once connected the customization module 914 and authentication module 912 operate similar to as described above for FIG. 1 to perform customization and authentication functions. In some configurations, the STB 931 may communicate to a media system controller 110 (see FIG. 1) to support the customization and authentication functions. In other configurations, the STB 931 may perform these functions itself. For example, authentication may be performed via a passkey that is generated and displayed on a TV 130 by the STB 931. The mobile device 150 then transmits the same passkey back to the STB 931 to thereby prove its operator is

authorized to operate all the in-room devices 130, 931. In this way, in-room authentication may be performed without requiring assistance from the media system controller 110. Customization information may be pre-stored in the STB 931, and may also be determined automatically by the STB 931 according to which other controllable devices 130 are coupled to the STB 931. In this way, a plurality of authentication modules 912, customization modules 914, and communication modules 916 may be distributed in the STBs 931 of the various guest rooms in the hotel.

According to the present invention, guests may operate the hotel's media system from the guest's own mobile device. In doing so, there are at least four major benefits:

1. Familiar hardware platform and user interface

Guests often bring their own laptops, mobile phones, tablet computers, music players and other mobile devices with them as they travel. Such guests are typically also very familiar and comfortable with the user interface and operation of their own devices, and since they carry the equipment with them, there are no new hardware systems to learn as they stay in different hotels.

2. One mobile / web application for multiple hotels

A media system control application 152 for controlling the hotel media systems 100 may be provided for users to install on the mobile platform 150 of their choice. The application 152 may appear and operate the same at all hotels. Alternatively, different hotels or chains may vary certain elements of the application related to branding such as logos and color schemes, or enable additional features and functions. Because one mobile application 152 may be used to control multiple hotels, basic functionality may be substantially the same or at least very similar at multiple hotels. This allows the user to reuse their already-learned knowledge to operate different media systems 100 at different hotels. Similarly, a consistent web interface may be provided across hotels.

Additionally, the mobile application and web interface may also provide device-specific Help information to the guest. Having 1-click Help functionality built into the mobile or web app ensures users always have a quick resource available to answer their "how does this device

work?" or "how do I use this?" questions. For example, the media system 100 may include a general overview of how a PVR system works that would be available at any time, as well as a PVR-specific help button available on the IPG page that would lead the guest through the specific steps to record and watch TV shows on a particular system.

3. Guest can operate in-room devices even when not in room

Because most users' mobile devices 150 include some kind of wireless or wired communication technology, once authorized by a hotel's media system 100, there is nothing stopping the guest from operating the media system 100 even when the guest is outside of their registered room. That is, no matter where the guest is physically located, as long as some kind of a connection to the hotel media system 100 is available, the guest may control in-room and other hotel equipment 130 from their mobile device 150. One example is, while eating dinner in the hotel's restaurant, the guest may view the IPG for the television in the guest's room and choose programs to record for later viewing when they are finished eating. The recording could take place on a PVR installed within the guest's room, or may be done at a network-PVR installed anywhere in the hotel's media system 100. Recorded programs may then be viewed later in the guest's room or even via the mobile device itself if bandwidth and multimedia capabilities of the network and mobile device are sufficient. Any menus or other control elements for devices of the hotel media system 100 in the guest's room may also be controlled from the guest's mobile device. Examples include in-room STB, PVR, television, audio system, room lights, AC/heater, etc.

4. Multiple authorized devices and controllers

There can be more than one authorized mobile device 150 that is allowed to control a single controllable device 130. For example, a conference or meeting room 104 will often have multiple "guests" and the hotel media system 100 may allow more than one person to control something in the room. One mobile device 150 may be able to do everything, one may only do the audio, one may only do the lights, etc. In other words, there can be more than one authorized user per controllable device at a time. Another example would be a Hotel staff member or Support Agent authorizing a device in order to assist a customer/guest if necessary.

Once the state of a particular controllable device 130 changes, updated status information will be sent to all mobile devices authorized to operate that controllable device.

In another configuration, the invention may be utilized to interface with other hotel functions that are not a part of the entertainment system. For example, with reference to FIG. 1, the hotel media system 100 may also be for allowing a guest to perform check-in and check-out functions from their mobile device 150. In this configuration, the media system controller 110 may update the information in the database 118 when the guest either checks in or checks out from their mobile device. The database 118 may be a part of the hotel's PMS and therefore the guest's mobile device 150 is in effect operating the PMS. In general, the mobile devices 150 may be authorized by the media system controller to operate any type of controllable device 130. User authentication may play a role on what operations are available for particular controllable devices 130.

Another benefit is either a media system vendor or a particular hotel can push automatic updates to the guest using the mobile application. For example, the hotel could push out ads or information about upcoming sales, etc. This could be as either a content update of the app, or even a new software version that would automatically trigger the mobile device to inform the user that an update is available. Messages and announcements may also be transferred to user's mobile devices.

In summary, a hospitality media system includes a plurality of controllable devices, a communication module for establishing a connection to a mobile device, and an authentication module coupled to the communication module for determining an authorized subset of the controllable devices for which the mobile device is authorized to operate. The hospitality media system transfers status information corresponding to the authorized subset of the controllable devices to the mobile device and operates the authorized subset of the controllable devices according to commands received from the mobile device. The mobile device may automatically detect the media system through any number of available networks and may have a control application running thereon customized after connection to the media system. The mobile device may remotely control the authorized subset of controllable devices

while away from the room, and more than one mobile device may operate a single controllable device.

In the above description, the word "guest" actually means current guests in the hotel, people who are attending a conference or meeting in the hotel, staff members at the hotel, or any other person who may need or want to operate hotel media systems. Future guests that have reservations, potential future guests that don't yet have reservations, and other users may also be given access for certain in-room functions. For example, a demonstration of the technology may be available in the hotel lobby and all users would be able to utilize their own mobile devices 150 to control the controllable devices 130 included in the lobby demonstration in order to try out the system 100. Additionally, it is not necessary that the guest bring their own mobile device 150. In another configuration, the mobile device 150 may be provided to the guest by the hotel. It should also be noted that the term "mobile" is utilized to mean the device is portable in some way and can be easily carried as this is anticipated by the inventors as being useful; however, it is not a strict requirement that the mobile devices be easily carried. Other devices such as desktop computers that are of a more permanent nature may also act as "mobile" devices within the scope of the present invention.

Although the invention has been described in connection with a preferred embodiment, it should be understood that various modifications, additions and alterations may be made to the invention by one skilled in the art without departing from the spirit and scope of the invention as defined in the appended claims. For example, although the description of the invention has been described as being utilized at a hotel, the present invention is equally applicable to any hospitality related location or service wishing to provide users with a media system including but not limited to hotels, motels, resorts, hospitals, apartment/townhouse complexes, restaurants, retirement centres, cruise ships, busses, airlines, shopping centres, passenger trains, etc. The invention may also be utilized to control other systems and services outside a hotel's media system. For example, hotel's PMS, reporting, or administration systems. The various separate elements, features, and modules of the invention described above may be integrated or combined into single units. Similarly, functions of single units may be separated into multiple units. Unless otherwise specified, features described may be implemented in hardware or software according to different design requirements. Additionally, all

combinations and permutations of the above described features and configurations are within the scope of the invention.

WE CLAIM:

1. A hospitality media system comprising:

a media system controller;

a plurality of controllable devices;

a communication module for establishing a connection to a mobile device and for performing data transfer between the media system controller and the mobile device; and

an authentication module coupled to the communication module for determining an authorized subset of the controllable devices for which the mobile device is authorized to operate;

wherein the media system controller is for operating the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

2. The hospitality media system of claim 1, wherein the media system controller is further for transferring status information corresponding to the authorized subset of the controllable devices to the mobile device.

3. The hospitality media system of claim 2, wherein the authorized subset of the controllable devices includes a personal video recorder, the status information includes an interactive program guide of content available from the hospitability media system, and the commands received from the mobile device include scheduling the personal video recorder to record content listed on the interactive program guide.

4. The hospitality media system of any one of claims 1 to 3, wherein the communication module is further for detecting whether a predetermined application is running on the mobile device and establishing the connection and transferring data with the predetermined application on the mobile device.

5. The hospitality media system of any one of claims 1 to 4, further comprising a customization module coupled to the communication module for transferring customization

information specific to the hospitality media system to the mobile device, after the connection to the mobile device has been established.

6. The hospitality media system of any one of claims 1 to 5, further comprising a computer network coupled to the communication module; wherein the communication module is further for dynamically establishing the connection to the mobile device and for receiving commands from the mobile device via an access port of the computer network.

7. The hospitality media system of any one of claims 1 to 6, wherein the authorization module is for determining the authorized subset of the controllable devices for which the mobile device is authorized to operate by automatically detecting a unique identifier of the mobile device and querying a database to determine which of the controllable devices are authorized to be controlled according to the unique identifier.

8. The hospitality media system of any one of claims 1 to 6, wherein the authorization module is for determining the authorized subset of the controllable devices for which the mobile device is authorized to operate by receiving, from the mobile device, identification information corresponding to an operator of the mobile device and querying a database to determine which of the controllable devices are authorized to be controlled according to the identification information.

9. The hospitality media system of any one of claims 1 to 8, wherein the authorized subset of the controllable devices includes in-room controllable devices that are accessible from a room for which a user of the mobile device is registered.

10. The hospitality media system of claim 9, wherein the media system controller is for operating the authorized subset of the controllable devices in dependence upon the commands received from the mobile device even when the mobile device is not in the room for which the operator of the mobile device is registered.

11. The hospitality media system of any one of claims 1 to 10, wherein the authentication module is further for authorizing a plurality of mobile devices to operate a single controllable device.

12. A mobile device comprising:

a communication module for establishing a connection to a hospitality media system and for performing data transfer between the hospitality media system and the mobile device;

an identification module coupled to the communication module for identifying the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate; and

a user interface for displaying status information received from the hospitality media system and for transmitting commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

13. The mobile device of claim 12, wherein the status information received from the hospitality media system corresponds to the authorized subset of the controllable devices.

14. The mobile device of claim 13, wherein the authorized subset of the controllable devices includes a personal video recorder, the status information includes an interactive program guide of content available on the hospitability media system, and the commands transmitted from the mobile device to the hospitality media system include scheduling the personal video recorder to record content listed on the interactive program guide.

15. The mobile device of claim 13, wherein the status information includes user interface menus for each of the authorized subset of the controllable devices, and the commands transmitted from the mobile device include user interface selections for operating each of the authorized subset of the controllable devices.

16. The mobile device of any one of claims 12 to 15, further comprising a customization module coupled to the communication module for receiving customization information from

the hospitality media system after the connection to the hospitality media system has been established, and for customizing the user interface according to the customization information.

17. The mobile device of any one of claims 12 to 16, wherein the communication module further includes a networking module for dynamically establishing the connection to the hospitality media system via a compatible access port of a computer network.

18. The mobile device of any one of claims 12 to 17, wherein the identification module is for identifying the mobile device to the hospitality media system by transmitting a unique identifier of the mobile device to the hospitality media system.

19. The mobile device of any one of claims 12 to 17, wherein the identification module is for identifying the mobile device to the hospitality media system by transmitting identification information corresponding to an operator of the mobile device to the hospitality media system.

20. The mobile device of any one of claims 12 to 19, wherein the communication module is further for automatically detecting the hospitality media system and establishing the connection.

21. The mobile device of any of one of claims 12 to 20, wherein the user interface is for transmitting commands to operate the authorized subset of the controllable devices even when the mobile device is not in a room for which a user of the mobile device is registered.

22. A method of operating a plurality of controllable devices in a hospitality media system, the method comprising the following steps being performed by the hospitality media system:

utilizing a communication module for establishing a connection to a mobile device and performing data transfer between the hospitality media system and the mobile device;

determining an authorized subset of the controllable devices for which the mobile device is authorized to operate; and

operating the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

23. The method of claim 22, further comprising transferring status information corresponding to the authorized subset of the controllable devices to the mobile device.

24. The method of claim 23, wherein the authorized subset of the controllable devices includes a personal video recorder, the status information includes an interactive program guide of content available from the hospitability media system, and the commands received from the mobile device include scheduling the personal video recorder to record content listed on the interactive program guide.

25. The method of any one of claims 22 to 24, further comprising detecting whether a predetermined application is running on the mobile device and establishing the connection and transferring data with the predetermined application on the mobile device.

26. The method of any one of claims 22 to 25, further comprising transferring customization information specific to the hospitality media system to the mobile device, after the connection to the mobile device has been established.

27. The method of any one of claims 22 to 26, further comprising:

providing a computer network being coupled to the communication module; and

dynamically establishing the connection to the mobile device and receiving commands from the mobile device via an access port of the computer network.

28. The method of any one of claims 22 to 27, wherein determining the authorized subset of the controllable devices for which the mobile device is authorized to operate further comprises automatically detecting a unique identifier of the mobile device and querying a database to determine which of the controllable devices are authorized to be controlled according to the unique identifier.

29. The method of any one of claims 22 to 27, wherein determining the authorized subset of the controllable devices for which the mobile device is authorized to operate further comprises receiving, from the mobile device, identification information corresponding to an operator of the mobile device and querying a database to determine which of the controllable devices are authorized to be controlled according to the identification information.

30. The method of any one of claims 22 to 29, wherein the authorized subset of the controllable devices includes in-room controllable devices that are accessible from a room for which a user of the mobile device is registered.

31. The method of claim 30, further comprising operating the authorized subset of the controllable devices in dependence upon the commands received from the mobile device even when the mobile device is not in the room for which the user of the mobile device is registered.

32. The method of any one of claims 22 to 31, further comprising authorizing a plurality of mobile devices to operate a single controllable device.

33. A method of operating a plurality of controllable devices in a hospitality media system by a mobile device, the method comprising the following steps being performed by the mobile device:

utilizing a communication module for establishing a connection to a hospitality media system and performing data transfer between the hospitality media system and the mobile device;

identifying the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate;

displaying on a user interface status information received from the hospitality media; and

transmitting commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

34. The method of claim 33, wherein the status information corresponds to the authorized subset of the controllable devices.

35. The method of claim 34, wherein the authorized subset of the controllable devices includes a personal video recorder, the status information includes an interactive program guide of content available on the hospitality media system, and the commands transmitted from the mobile device to the hospitality media system include scheduling the personal video recorder to record content listed on the interactive program guide.

36. The method of claim 34, wherein the status information includes user interface menus for each of the authorized subset of the controllable devices, and the commands transmitted from the mobile device include user interface selections for operating each of the authorized subset of the controllable devices.

37. The method of any one of claims 33 to 36, further comprising:

receiving customization information from the hospitality media system after the connection to the hospitality media system has been established; and

customizing the user interface according to the customization information.

38. The method of any one of claims 33 to 37, further comprising providing a networking module in the communication module for dynamically establishing the connection to the hospitality media system via any compatible access port of a computer network.

39. The method of any one of claims 33 to 38, wherein identifying the mobile device to the hospitality media system further comprises transmitting a unique identifier of the mobile device to the hospitality media system.

40. The method of any one of claims 33 to 38, wherein identifying the mobile device to the hospitality media system further comprises transmitting identification information corresponding to an operator of the mobile device to the hospitality media system.

41. The method of any one of claims 33 to 40, further comprising automatically detecting the hospitality media system and establishing the connection.

42. The method of any of one of claims 33 to 41, further comprising transmitting commands to operate the authorized subset of the controllable devices even when the mobile device is not in a room for which a user of the mobile device is currently registered.

43. A hospitality media system comprising:

a plurality of controllable devices;

a means for establishing a connection to a mobile device and performing data transfer with the mobile device;

a means for determining an authorized subset of the controllable devices for which the mobile device is authorized to operate; and

a means for operating the authorized subset of the controllable devices in dependence upon commands received from the mobile device.

44. A mobile device comprising:

a means for establishing a connection to a hospitality media system and performing data transfer with the hospitality media system;

a means for identifying the mobile device to the hospitality media system to allow determination of an authorized subset of controllable devices of the hospitality media system for which the mobile device is authorized to operate; and

a means for displaying status information received from the hospitality media system and for transmitting commands to the hospitality media system to thereby operate the authorized subset of the controllable devices.

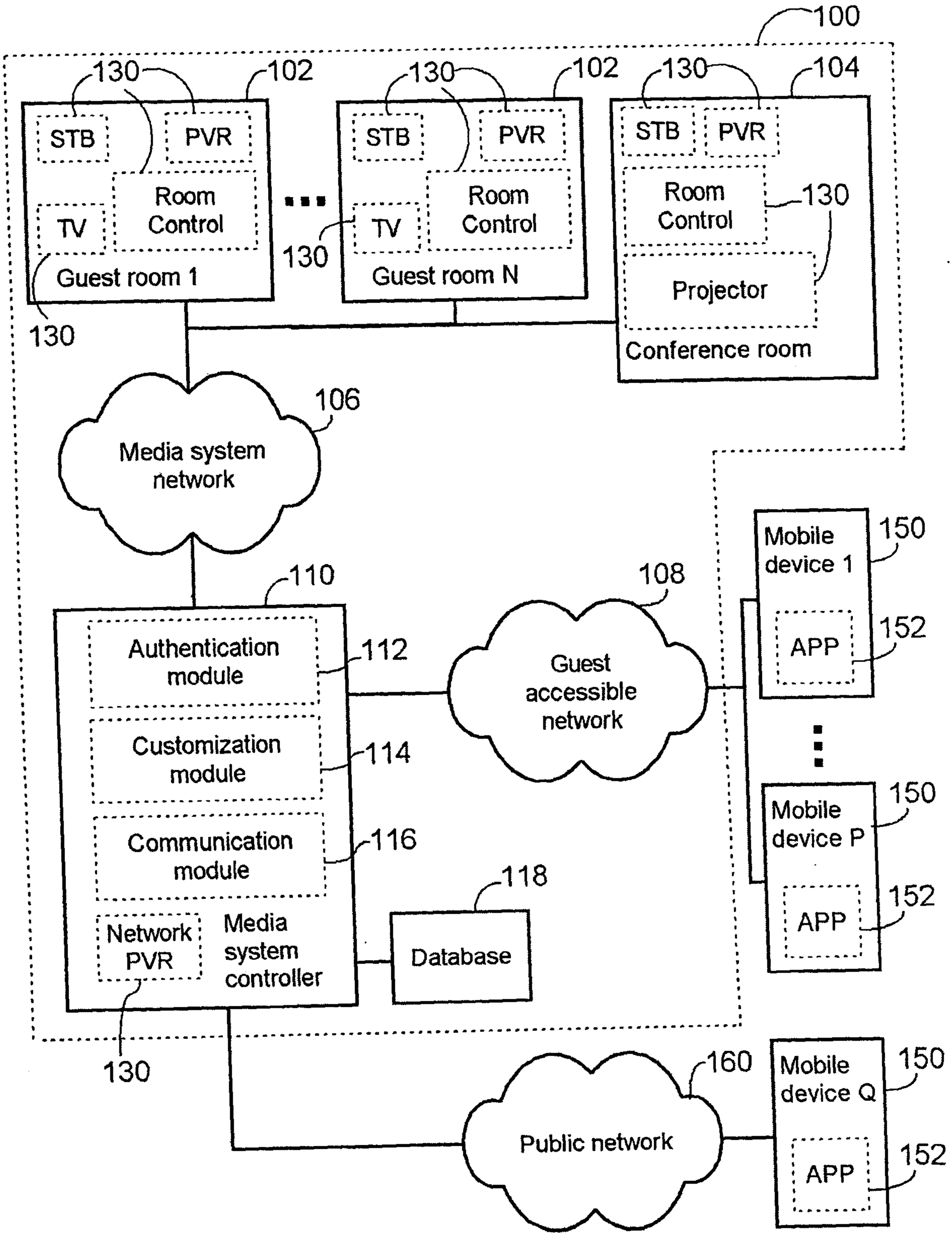
100
130
102
STB
PVR
Room Control
TV
Guest room 1
130
130
102
STB
PVR
Room Control
TV
Guest room N
130
130
104
STB
PVR
Room Control
130
Projector
Conference room
106
Media system network
110
Authentication module
112
Customization module
114
Communication module
116
Network PVR
Media system controller
118
Database
130
108
Guest accessible network
150
Mobile device 1
APP
152
150
Mobile device P
APP
152
160
Public network
150
Mobile device Q
APP
152

FIG. 1

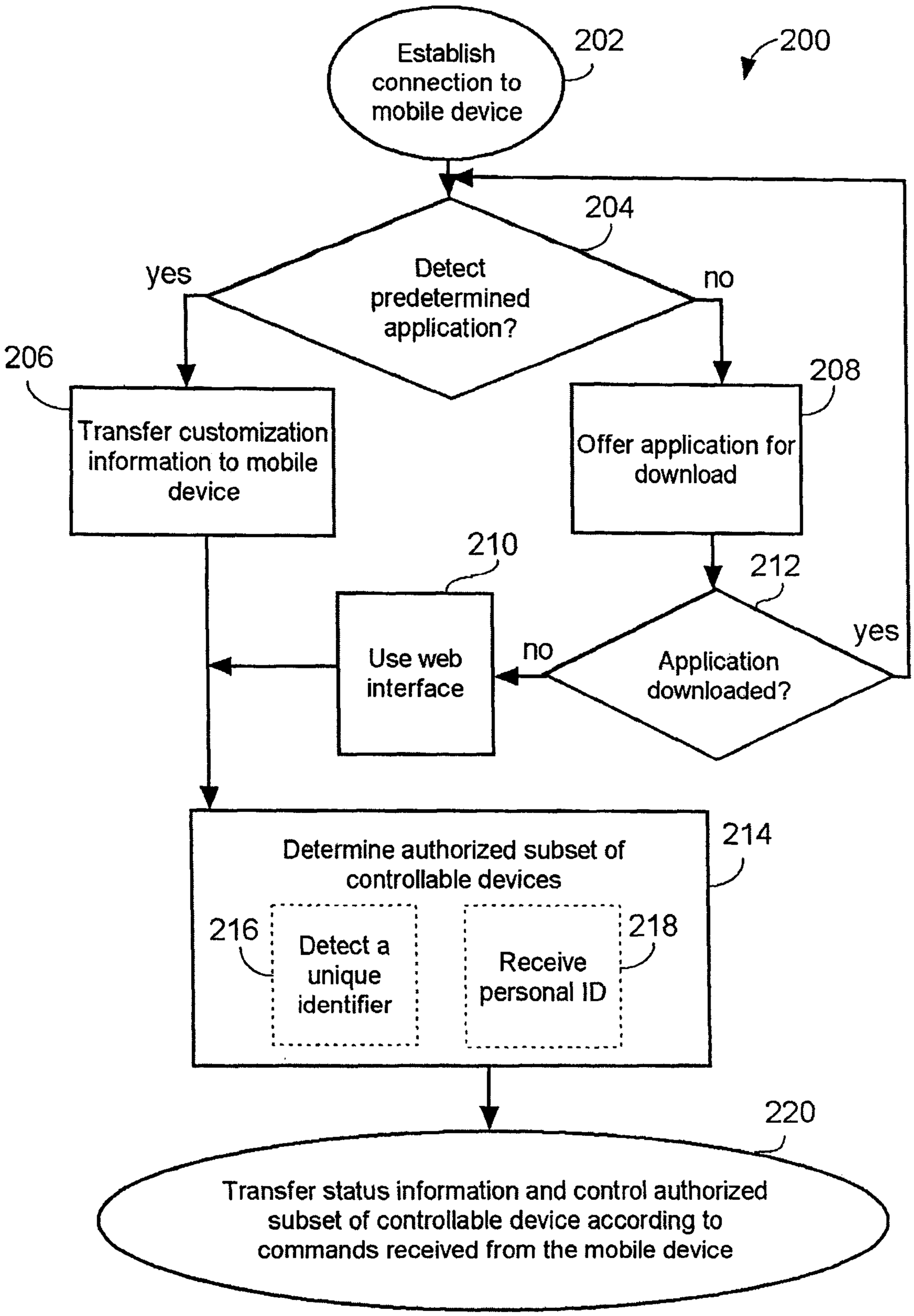
Establish connection to mobile device
202
200
204
Detect predetermined application?
yes
no
206
Transfer customization information to mobile device
208
Offer application for download
210
Use web interface
212
Application downloaded?
no
yes
214
Determine authorized subset of controllable devices
216
Detect a unique identifier
218
Receive personal ID
220
Transfer status information and control authorized subset of controllable device according to commands received from the mobile device

FIG. 2

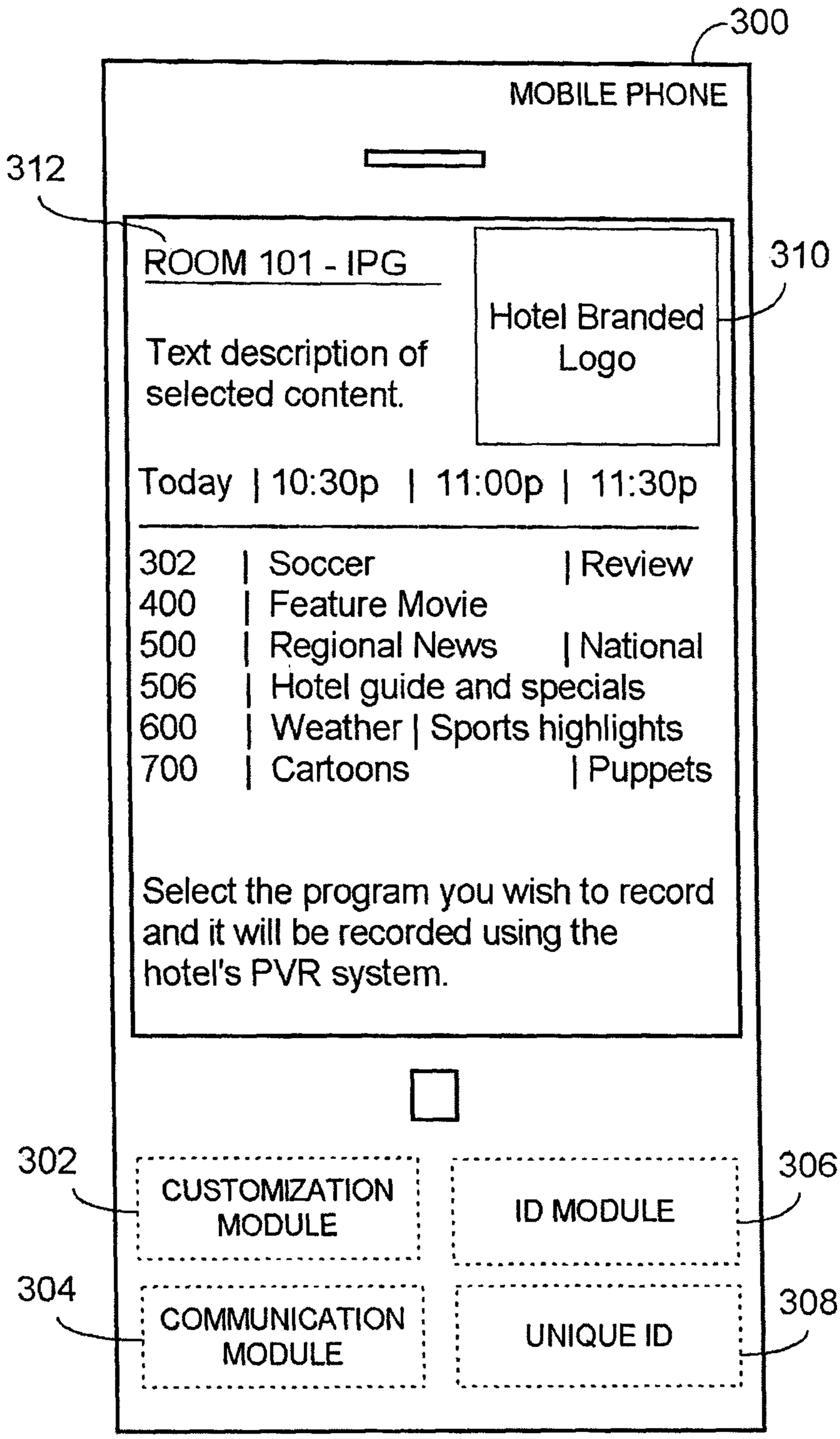
300
MOBILE PHONE
312
ROOM 101 - IPG
310
Hotel Branded Logo
Text description of selected content.
Today | 10:30p | 11:00p | 11:30p
302 | Soccer | Review
400 | Feature Movie
500 | Regional News | National
506 | Hotel guide and specials
600 | Weather | Sports highlights
700 | Cartoons | Puppets
Select the program you wish to record and it will be recorded using the hotel's PVR system.
302
CUSTOMIZATION MODULE
306
ID MODULE
304
COMMUNICATION MODULE
308
UNIQUE ID

FIG. 3

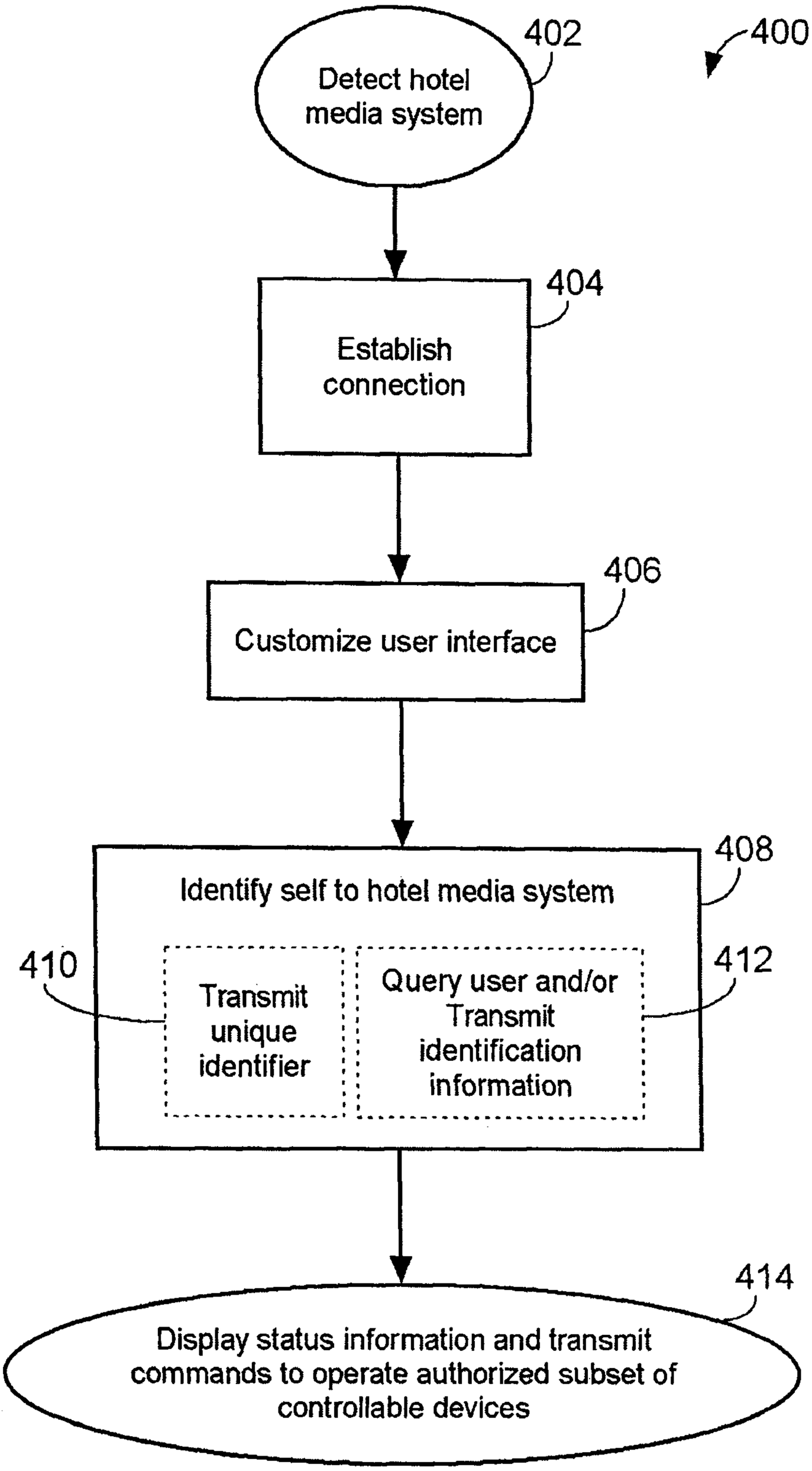
400
402
Detect hotel media system
404
Establish connection
406
Customize user interface
408
Identify self to hotel media system
410
Transmit unique identifier
412
Query user and/or Transmit identification information
414
Display status information and transmit commands to operate authorized subset of controllable devices

FIG. 4

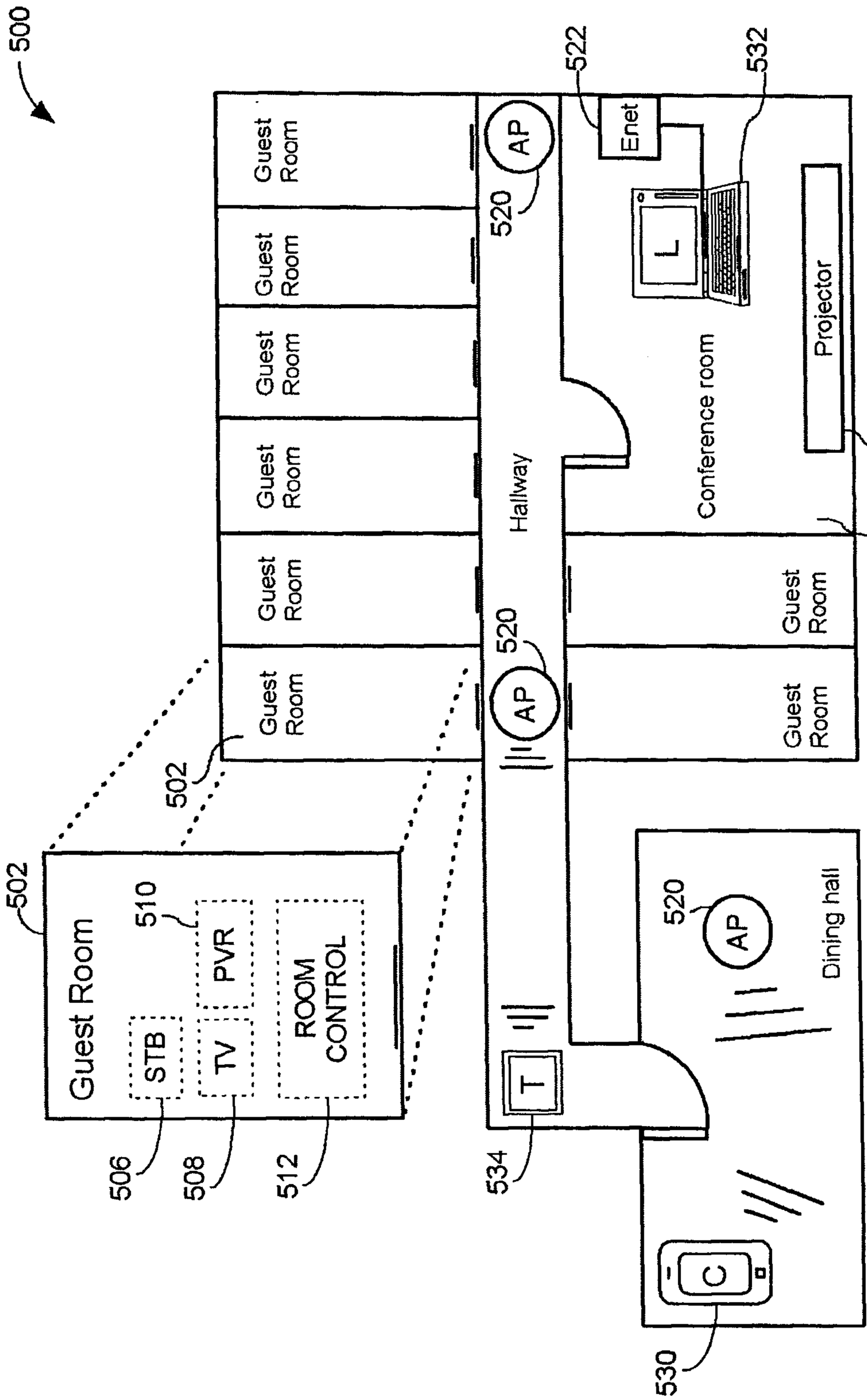
500
522
532
Enet
AP
520
Guest Room
Guest Room
Guest Room
Guest Room
Guest Room
Hallway
L
Conference room
Projector
514
501
Guest Room
Guest Room
520
AP
502
Guest Room
510
STB
PVR
TV
ROOM CONTROL
506
508
512
T
534
520
AP
Dining hall
C
530

FIG. 5

600

Mobile Device	MAC Address	Registered Rooms	Authorized Subset of Controllable Devices
Cell Phone (530)	01:23:45:67:89:AB	Conference room (501), Room (502)	STB (506), TV (508), PVR (510), Room Control (512), Projector (514)
Laptop (532)	32:10:89:67:89:BC	Conference room (501)	Projector (514)
Tablet (534)	47:34:98:34:32:EF	All	All

FIG. 6

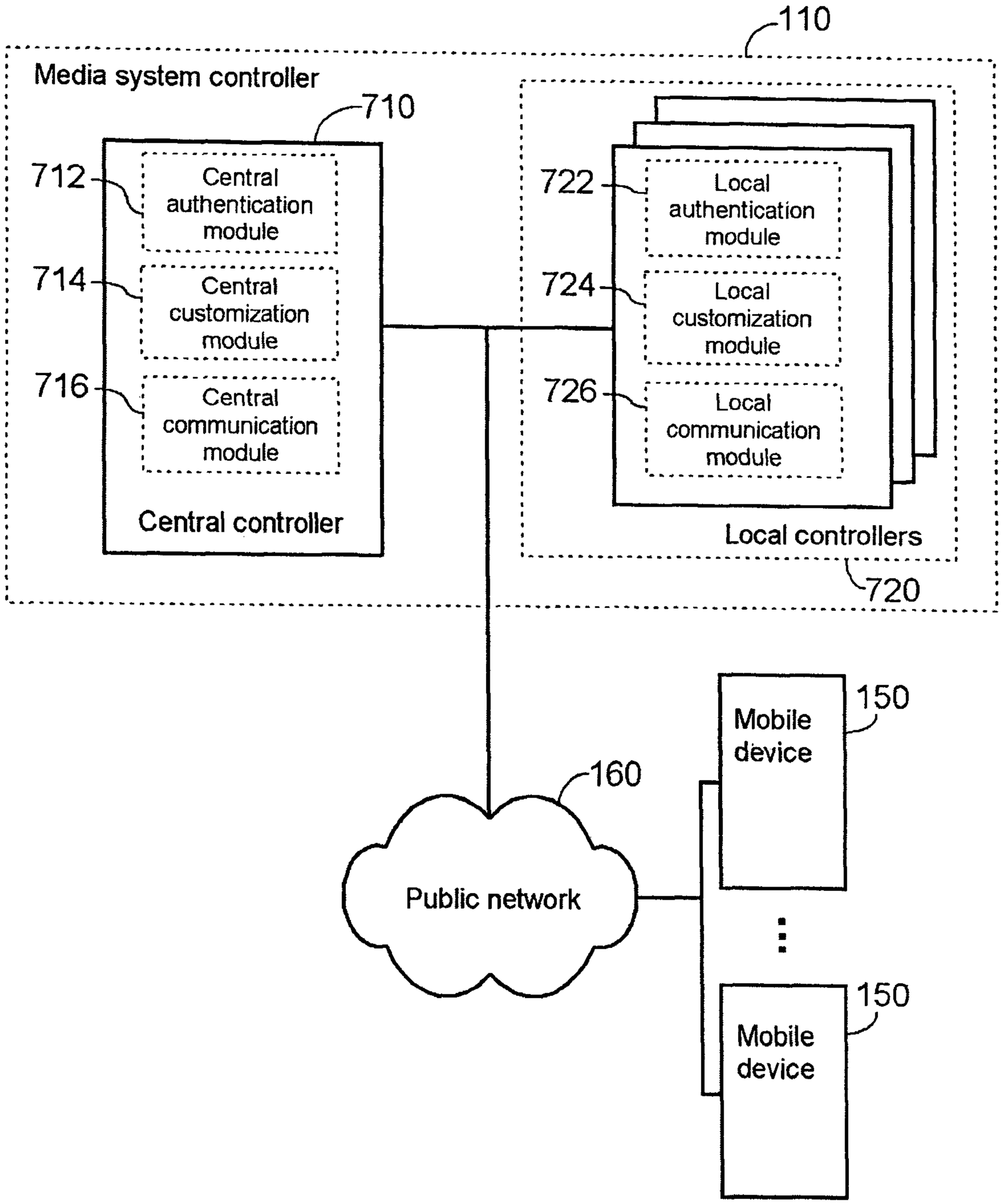
110
Media system controller
710
712
Central authentication module
714
Central customization module
716
Central communication module
Central controller
722
Local authentication module
724
Local customization module
726
Local communication module
Local controllers
720
160
Public network
150
Mobile device
150
Mobile device

FIG. 7

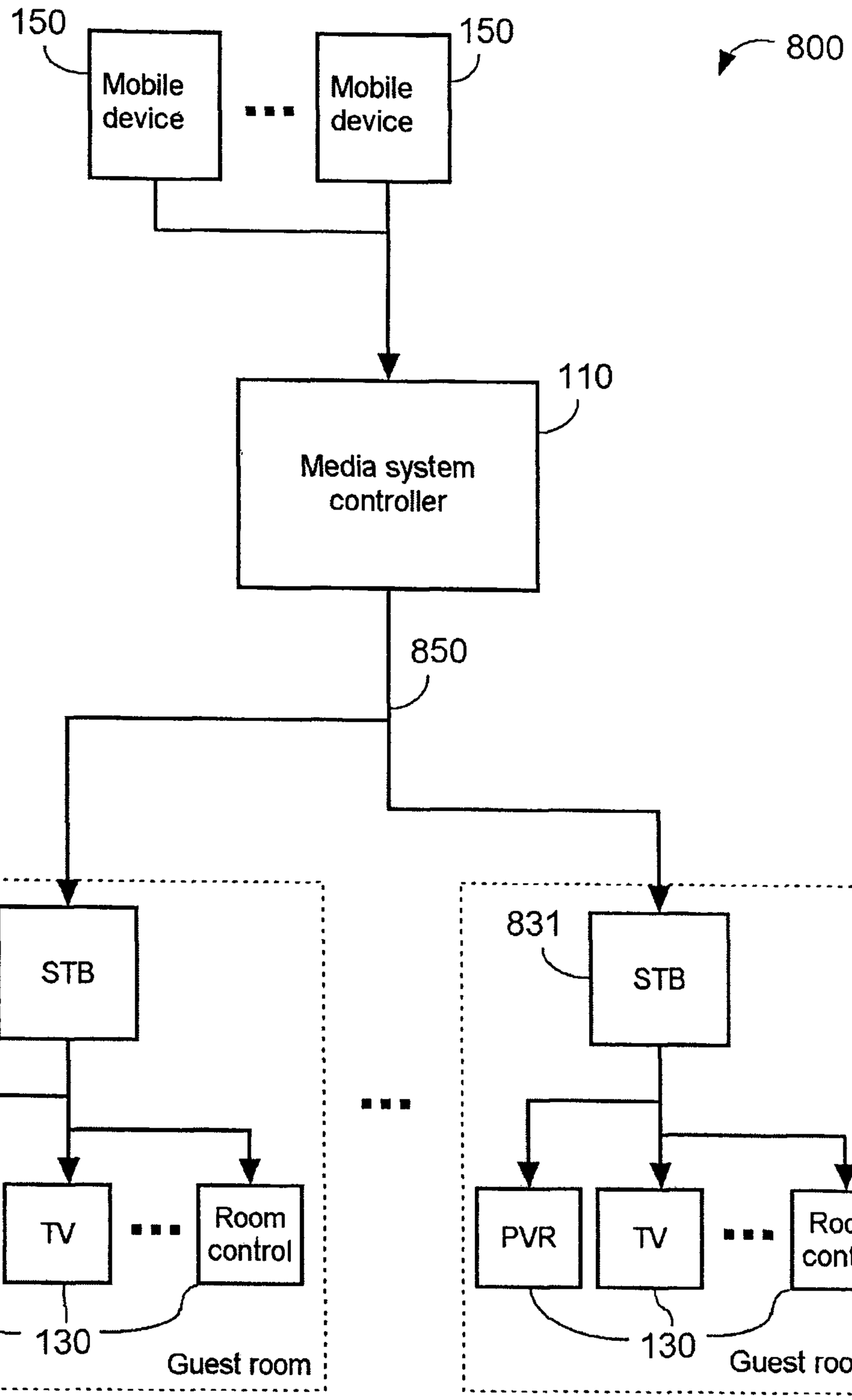
150
Mobile device
150
Mobile device
800
110
Media system controller
850
831
STB
831
STB
PVR
TV
Room control
130
Guest room
PVR
TV
Room control
130
Guest room

FIG. 8

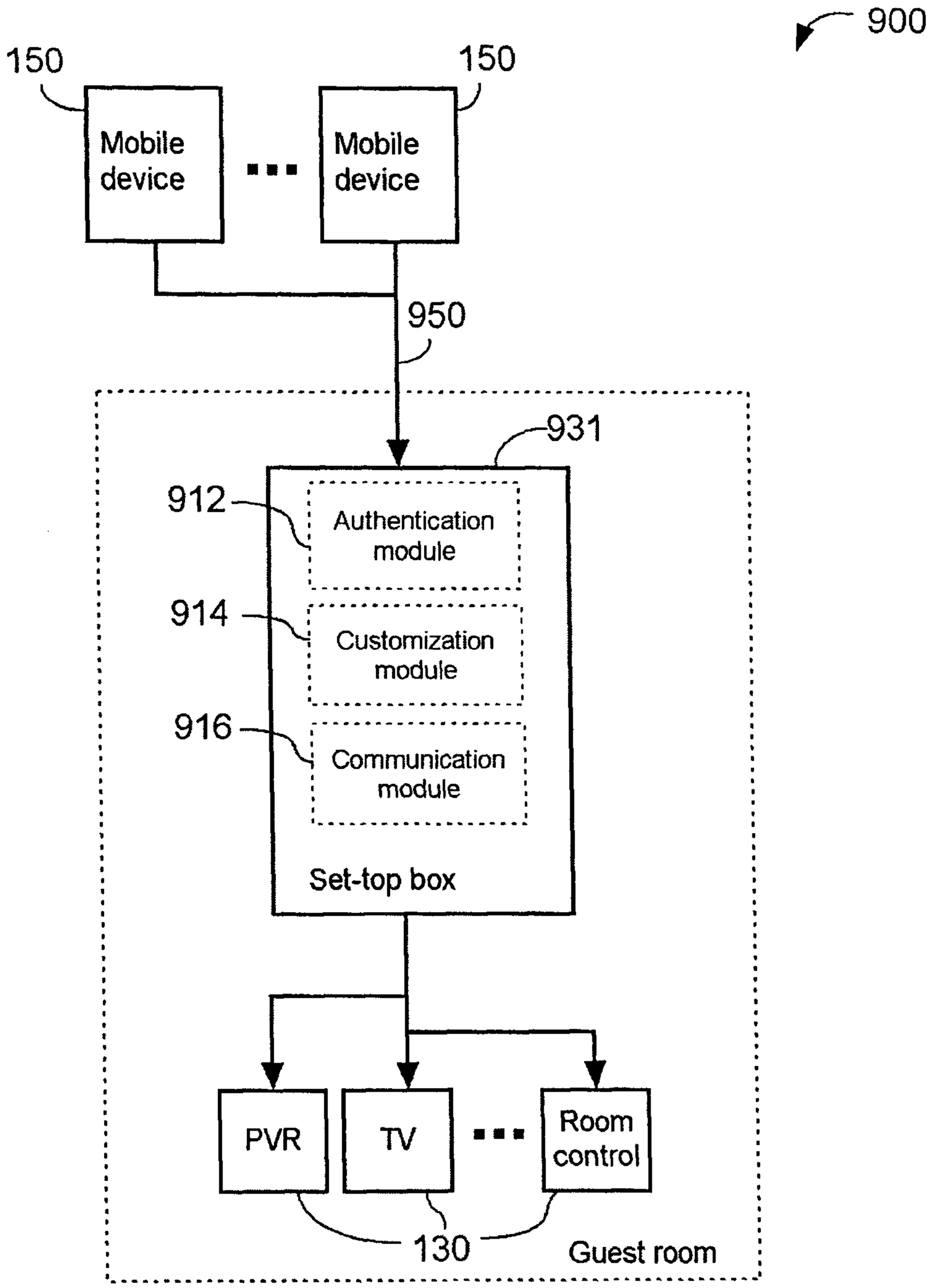
900
150
150
Mobile device
Mobile device
950
931
912
Authentication module
914
Customization module
916
Communication module
Set-top box
PVR
TV
Room control
130
Guest room

FIG. 9

100
130
102
130
102
130
104
STB
PVR
STB
PVR
STB
PVR
Room Control
TV
Room Control
TV
Room Control
130
130
Guest room 1
Guest room N
Projector
130
Conference room
106
Media system network
110
108
Mobile device 1
150
Authentication module
112
Guest accessible network
APP
152
Customization module
114
Mobile device P
150
Communication module
116
APP
152
118
Network PVR
Media system controller
Database
130
160
Mobile device Q
150
Public network
APP
152