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Danciu et al.

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(54) **NETWORK-BASED REMOTE CONTROL**

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G06F 15/177 (2006.01)
H04L 12/28 (2006.01)
H04L 29/12 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 12/2818*** (2013.01); ***H04L 29/1233*** (2013.01)

(58) **Field of Classification Search**
USPC 340/12.22, 12.23
See application file for complete search history.

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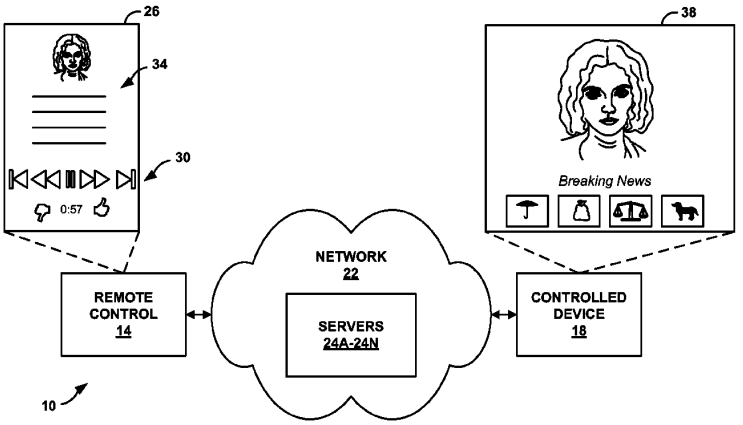
(57) **ABSTRACT**

The subject matter of the present disclosure can be implemented in, among other things a computer-readable storage medium encoded with instructions for causing a programmable processor to receive, by a server, a first message from a remote control that is distinct from and external to the server, wherein the first message includes a remote control identifier and control information for controlling one or more functions of at least one device other than the remote control. The instructions also cause the programmable processor to retrieve, by the server, a controlled device identifier that uniquely identifies a controlled device that is distinct from and external to the server. The instructions also cause the programmable processor to send a second message from the server to the controlled device identified by the controlled device identifier to control an operation of the controlled device.

18 Claims, 7 Drawing Sheets



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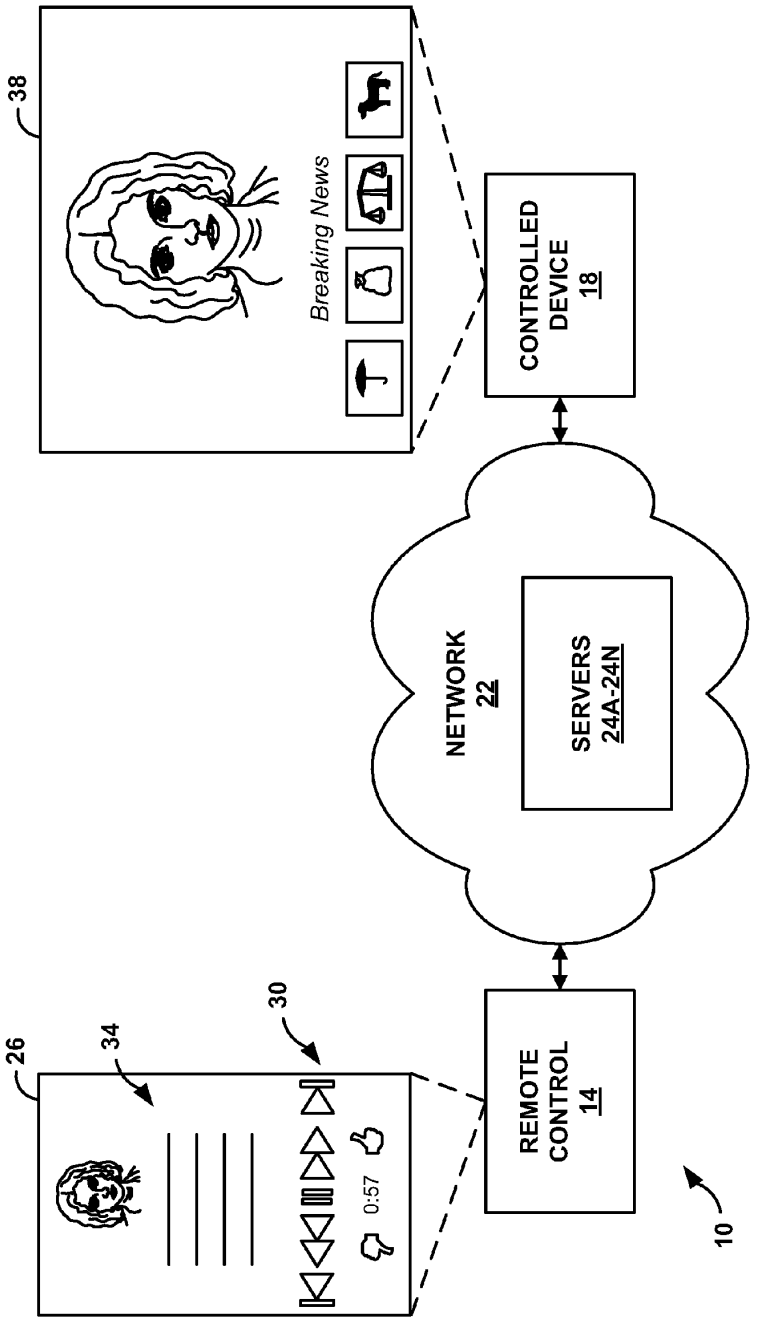
38
Breaking News
CONTROLLED DEVICE 18
NETWORK 22
SERVERS 24A-24N
REMOTE CONTROL 14
26
34
30
0:57
10

FIG. 1

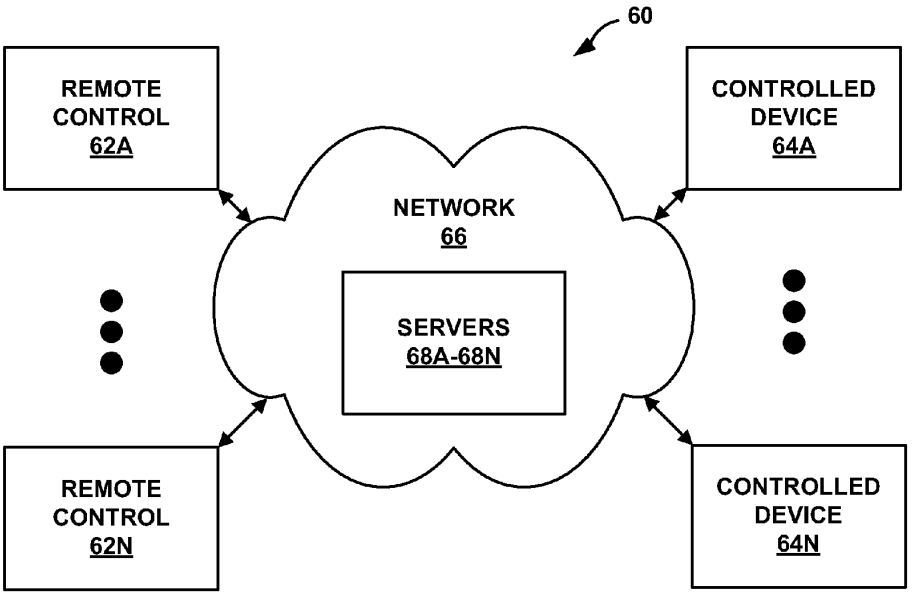
60
REMOTE CONTROL 62A
CONTROLLED DEVICE 64A
NETWORK 66
SERVERS 68A-68N
REMOTE CONTROL 62N
CONTROLLED DEVICE 64N

FIG. 2

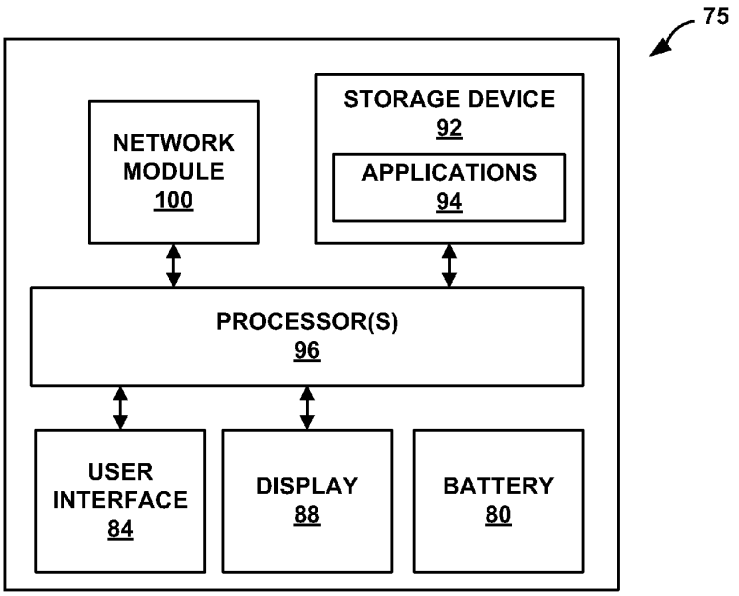
75
NETWORK MODULE 100
STORAGE DEVICE 92
APPLICATIONS 94
PROCESSOR(S) 96
USER INTERFACE 84
DISPLAY 88
BATTERY 80

FIG. 3

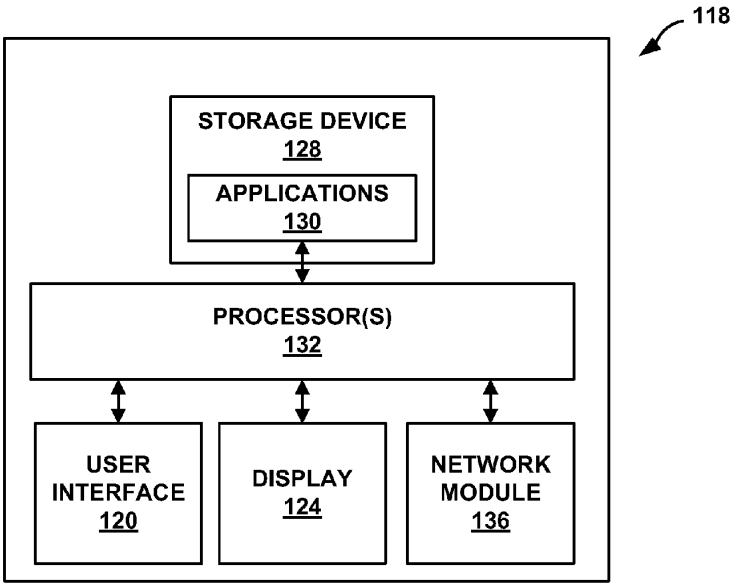
118
STORAGE DEVICE
128
APPLICATIONS
130
PROCESSOR(S)
132
USER INTERFACE
120
DISPLAY
124
NETWORK MODULE
136

FIG. 4

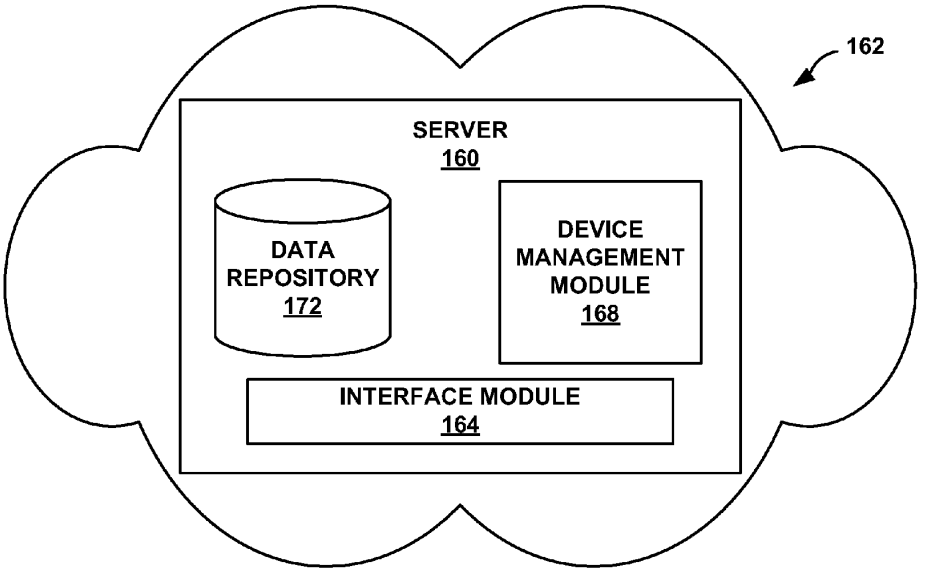
162
SERVER
160
DATA REPOSITORY
172
DEVICE MANAGEMENT MODULE
168
INTERFACE MODULE
164

FIG. 5

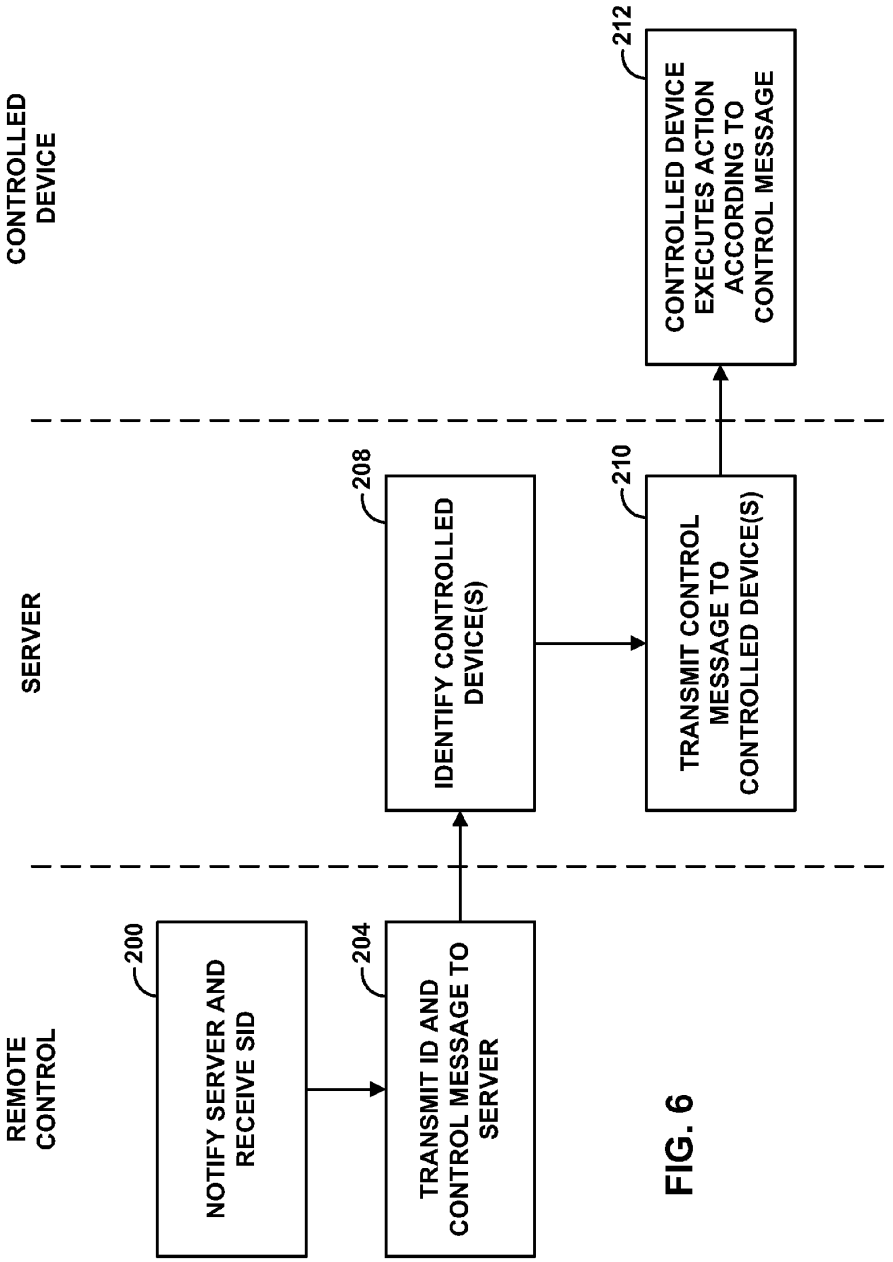
REMOTE CONTROL
SERVER
CONTROLLED DEVICE
200
NOTIFY SERVER AND RECEIVE SID
204
TRANSMIT ID AND CONTROL MESSAGE TO SERVER
208
IDENTIFY CONTROLLED DEVICE(S)
210
TRANSMIT CONTROL MESSAGE TO CONTROLLED DEVICE(S)
212
CONTROLLED DEVICE EXECUTES ACTION ACCORDING TO CONTROL MESSAGE

FIG. 6

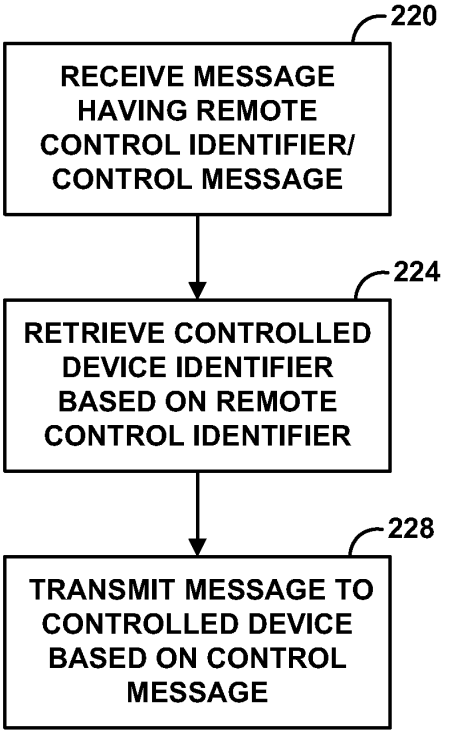
220
RECEIVE MESSAGE HAVING REMOTE CONTROL IDENTIFIER/ CONTROL MESSAGE
224
RETRIEVE CONTROLLED DEVICE IDENTIFIER BASED ON REMOTE CONTROL IDENTIFIER
228
TRANSMIT MESSAGE TO CONTROLLED DEVICE BASED ON CONTROL MESSAGE

FIG. 7

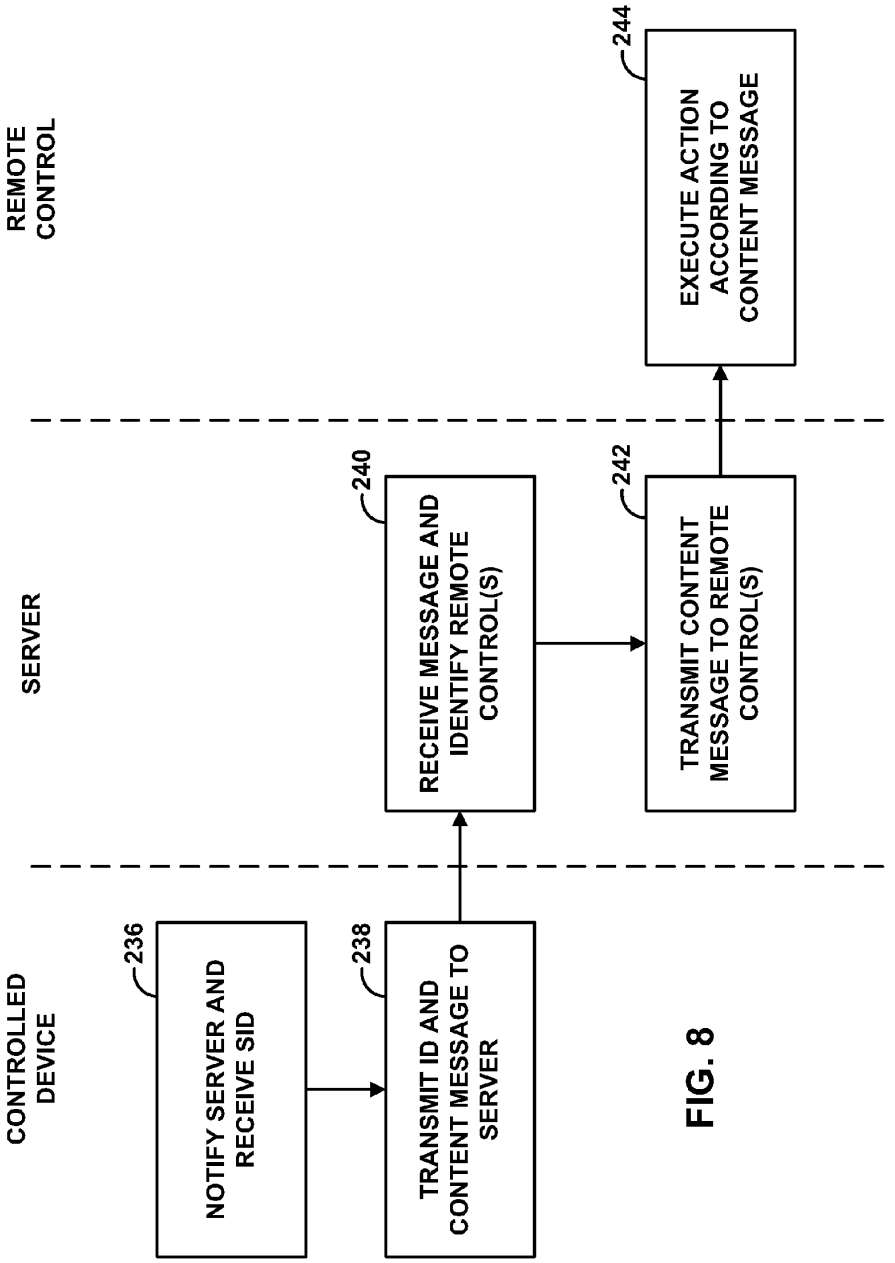
CONTROLLED DEVICE
SERVER
REMOTE CONTROL
236
NOTIFY SERVER AND RECEIVE SID
238
TRANSMIT ID AND CONTENT MESSAGE TO SERVER
240
RECEIVE MESSAGE AND IDENTIFY REMOTE CONTROL(S)
242
TRANSMIT CONTENT MESSAGE TO REMOTE CONTROL(S)
244
EXECUTE ACTION ACCORDING TO CONTENT MESSAGE

FIG. 8

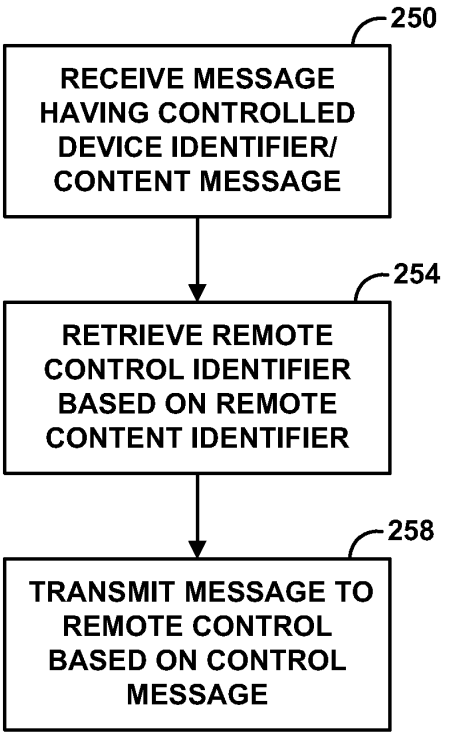
250
RECEIVE MESSAGE HAVING CONTROLLED DEVICE IDENTIFIER/ CONTENT MESSAGE
254
RETRIEVE REMOTE CONTROL IDENTIFIER BASED ON REMOTE CONTENT IDENTIFIER
258
TRANSMIT MESSAGE TO REMOTE CONTROL BASED ON CONTROL MESSAGE

FIG. 9

NETWORK-BASED REMOTE CONTROL

This application claims the benefit of U.S. Provisional Application No. 61/411,386, filed Nov. 8, 2010, the entire content of which is incorporated by reference herein.

TECHNICAL FIELD

The disclosure relates to techniques for controlling networked devices.

BACKGROUND

Various computing devices may be used to control a home electronic device such as a television, personal computer, tablet computer, stereo, or other computing device capable of outputting audio and/or video content. Remote controls typically communicate directly with the device being controlled. For example, a user may actuate buttons on the remote control, which causes the remote control to transmit a signal directly to the device being controlled. The device interprets the received signal and performs a corresponding action (e.g., altering the content being played on the device). For instance, a user may use a remote control to change the channel of a television.

In one conventional solution, a user may control the playback of video on a television via a web application displayed on the television using a keyboard and mouse. In another conventional solution, the user may pair a device that acts as a remote control directly with the device outputting the audio and video (e.g., a television or stereo), such that the device outputting the audio and video acts as a server to the remote control by, for example, communicating directly with the remote control and accepting incoming connections from the remote control.

SUMMARY

In general, this disclosure is directed to techniques for exchanging information between a networked device, such as a network-enabled television, and web-enabled device, such as a remote control, via a network service (e.g., a "cloud service"). In an example, the web-enabled device can transmit control information via the network service to the networked device to control playback of media content (e.g., audio and/or video content) on the networked device. In another example, the networked device can transmit content information via the network service to the web-enabled device, such as status information concerning the networked device.

In one example, the disclosure is directed to an article of manufacture comprising a computer-readable storage medium encoded with instructions for causing one or more programmable processors of a computing device to receive, by a server, a first message from a remote control, wherein the first message includes a remote control identifier that uniquely identifies the remote control, and wherein the first message further includes control information for controlling one or more functions of at least one device other than the remote control. The instructions also cause on or more programmable processors of the computing device to retrieve, by the server, at least one controlled device identifier from a data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device that is distinct from and external to the server. The instructions also cause on or more programmable processors of the computing device to send a second message from the server to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message includes the control information to control an operation of the at least one controlled device

In another example, the disclosure is directed to a method that includes receiving a first message from a remote control, wherein the first message includes a remote control identifier that uniquely identifies the remote control, and wherein the first message further includes control information. The method also includes retrieving at least one controlled device identifier from a data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device. The method also includes sending a second message to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message includes the control information to control an operation of the at least one controlled device.

In another example, a computing device includes one or more processors, a data repository configured to store data, a means for receiving a first message from a remote control, and a device management module. The first message received by the means includes a remote control identifier that uniquely identifies the remote control, and the first message further includes control information. The device management module retrieves at least one controlled device identifier from the data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device, and sends a second message to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message includes the control information to control an operation of the at least one controlled device.

The details of one or more examples of the disclosure are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the disclosure will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a block diagram illustrating an example networked environment with a remote control and controlled device, in accordance with one aspect of the present disclosure.

FIG. **2** is a block diagram illustrating an example networked environment having remote controls and controlled devices, in accordance with one aspect of the present disclosure.

FIG. **3** is a block diagram illustrating an example remote control, which may be an example of the remote control shown in FIG. **1** or one of the remote controls shown in FIG. **2**, in accordance with one aspect of the present disclosure.

FIG. **4** is a block diagram illustrating an example controlled device, which may be an example of the controlled device shown in FIG. **1** or one of the controlled devices shown in FIG. **2**, in accordance with one aspect of the present disclosure.

FIG. **5** is a block diagram illustrating an example server, which may be an example of the server shown in FIG. **1**, or included within the network shown in FIG. **2**, in accordance with one aspect of the present disclosure.

FIG. **6** is a flowchart illustrating an example operation of a remote control communicating with a network server, in accordance with one aspect of the present disclosure.

FIG. **7** is a flowchart illustrating an example operation of a network server communicating with a remote control, in accordance with one aspect of the present disclosure.

FIG. **8** is a flowchart illustrating an example operation of a controlled device communicating with a network server, in accordance with one aspect of the present disclosure.

FIG. **9** is a flowchart illustrating an example operation of a network server communicating with a controlled device, in accordance with one aspect of the present disclosure.

DETAILED DESCRIPTION

Techniques of this disclosure relate to a network service or "cloud service" that acts as an intermediary between a remote control device and a controlled device. For example, the network service may receive commands from a remote control and transmit the commands to a controlled device. The network service may also receive commands or other information from the controlled device and transmit those commands or other information to the remote control. The remote control may include a remote control application executing on a mobile device, such as a cellular telephone or a tablet computer. The controlled device may include any Internet-connected device capable of receiving commands, such as an Internet-connected television, a set top box, a personal video recorder, a gaming console, or other networked device. In one aspect, the remote control and the controlled device may operate as simple Hypertext Transfer Protocol HTTP clients of the network service. That is, the controlled device does not operate as a server to the remote control. Thus, any HTTP-enabled device may operate as a remote control or as a controlled device.

In general, the remote control and the controlled device are configured to both listen for messages from the network service and send messages to the network service. In some examples, the network service controls pairing one or more remote controls and one or more controlled devices, receives information or commands from remote controls and controlled devices, and sends information or commands to remote controls and controlled devices. The network service may direct received information and commands to the appropriate devices based on pairing information maintained by the network service. A remote control may be configured to send a message to a controlled device to perform a task, such as stopping playback of media content playing on the controlled devices or changing the media content playing on the controlled devices. To accomplish the task, the remote control first sends a message to the network service. The network service then determines the controlled device that is paired with the remote control and forwards the message to the appropriate controlled device. The controlled device receives the message from the network service and performs the task in response to receiving the message.

In addition, the controlled device may be configured to send a message to the remote control to notify the remote control of an event. For example, the controlled device may send a message to the remote control to notify the remote control device that playback of media content has completed. In this example, the controlled device sends a message to the network service. The network service determines the remote control that is paired with the controlled device and forwards the message to the remote control paired with the sending controlled device. The remote control receives the message and performs various actions in response to receiving the message. The remote control may, for example, update a user interface of the remote control or send a message to the controlled device to begin playback of another video.

According to some examples, the network service may assign each remote control and each controlled device a unique identifier. When pairing devices, the network service may utilize the unique identifier associated with each device to route communication signals properly. For example, the network service may initiate a session that includes each unique identifier of remote controls and controlled devices that are authorized to communicate with each other. The network service can then route messages to members of the session. Any number of remote controls may be paired with a single controlled device and one remote control may be paired to any number of controlled devices. When pairing multiple remote controls and multiple controlled devices associated with a single user, the user may identify a subset of the remote controls as paired to a subset of the controlled devices, and manage which remote controls control which controlled devices.

Remote controls and controlled devices may be paired using any one of several different techniques. As one example, a user may maintain a user account using the network service, and the remote controls and controlled devices may be associated with the user account. For example, upon connecting to a network service, the remote controls and controlled devices may notify the network service that the remote controls and controlled devices are connected to the network. The network service may, in some examples, determine whether the remote controls and controlled devices are authorized to be associated with the user account. If authorized, the network service initiates a session and assigns the remote controls and controlled devices unique identification numbers. The network service uses the unique identification numbers for pairing during a session. In another example, a user may be presented with a quick response ("QR") code via the controlled device that the user scans with the remote control (e.g., using a camera of the remote control). The QR code identifies a user account or previously initiated session maintained by the network service. Upon scanning the QR code, the remote control may send a message to the network service indicating that the network service should assign a unique identification number to the remote control and pair the remote control with the user account or session identified by the QR code.

In this manner, one or more remote controls may control one or more controlled devices via the network service. Using the network service to transmit and receive messages between a remote control and a controlled device may enable non-traditional devices having rich input and display capabilities to act as a remote control. In addition, by using the network service as an intermediary, the remote control and the controlled device, in various instances, may not need to be connected to the same local area network, nor in physical proximity to each other. The network service may also enable pairing of a nearly limitless number of remote controls and controlled devices.

FIG. **1** is a block diagram illustrating an example networked environment **10** with a remote control **14** and controlled device **18**, in accordance with one aspect of the present disclosure. According to an aspect of the disclosure, remote control **14** communicates with controlled device **18** via network **22** and servers **24**A-**24**N (collectively "servers **24**") in network **22**. As shown in FIG. **1**, according to some examples, remote control **14**, controlled device **18**, and servers **24** may be distinct components (e.g., physically distinct).

According to an aspect of the disclosure, remote control **14** is a web-enabled cellular phone. Other examples of the remote control **14** include, but are not limited to, portable or mobile devices such as cellular phones or other wireless communication devices, personal digital assistants (PDAs), laptop computers, tablets, portable gaming devices, portable media players, e-book readers, watches, as well as non-portable devices such as desktop computers. For purposes of illustration only in this disclosure, remote control **14** is described as a portable or mobile device that a user can carry, but aspects of this disclosure should not be considered limited to portable or mobile devices.

Remote control **14** may be configured to transmit signals to and receive signals from network **22**. In some examples, remote control **14** is configured to initiate contact with servers **24**. For example, remote control **14** may notify servers **24** that remote control **14** is connected to network **22**. Remote control **14** may notify servers **24**, for example, automatically upon being powered on. In another example, a user may log in to a user account maintained by the servers **24** using remote control **14**, thereby notifying servers **24** that remote control **14** is connected to network **22**. Remote control **14** may also be configured to transmit a message to servers **24** of network **22** that identifies remote control **14**, which can be used by servers **24** to pair remote control **14** with controlled device **18**. The message may also contain control information for controlling one or more functions of controlled device **18**.

In the example shown in FIG. **1**, remote control **14** includes a user interface **26** that may be used to present information to a user. For example, user interface **26** may display controls **30** and information **34** associated with content being played on controlled device **18**. Controls **30** may depend on the capability of remote control **14** or controlled device **18**, and include, for example, fast forward, reverse, skip ahead or back, play, stop, move to new content, etc. The type and quantity of information **34** may also depend on the capability of remote control **14** and controlled device **18**, and include, for example, playback information such as time remaining of content, playlist information, content rating information, etc.).

Controlled device **18** may include a variety of network-enabled devices, such as a network enabled television, set top box, personal video recorder, or other device capable of being network-connected and controlled remotely. In an example, controlled device **18** is an Internet-connected television that is configured to receive signals from and transmit signals to network **14**. For example, controlled device **18** may be configured to initiate contact with servers **24**. For example, controlled device **18** may notify servers **24** that controlled device **18** is connected to network **22**. Controlled device **18** may notify servers **24**, for example, automatically upon being powered on. In another example, a user may log in to a user account maintained by the servers **24** using controlled device **18**, thereby notifying servers **24** that controlled device **18** is connected to network **22**. Controlled device **18** can also be configured to transmit a message to servers **24** of network **22** that identifies controlled device **18**, which can be used by servers **24** to pair controlled device **18** with remote control **14**. The message may also contain notification or content data for updating a user interface of remote control (e.g., indicating completion of a task, such as completing playback of content).

As shown in FIG. **1**, controlled device **18** may include a display **38** for displaying content to a user. In some examples, controlled device **18** receives one or more messages from remote control **14** via network **22** and servers **24** to alter the content that is rendered on display **38** of controlled device **18**. In another example, controlled device **18** transmits a message to remote control **14** via network **22** and servers **24** to notify the user of remote control **14** that playback of content has been completed. Other messages can also be transmitted between controlled device **18** and remote control **14** via network **22** and servers **24**. For example, controlled device **18** may transmit content information such as a preview of the content that is being displayed on controlled device **18**, a playlist of future content to be displayed on controlled device **18**, rating information associated with the content being displayed on controlled device **18**, or the like.

As shown in FIG. **1**, network **22** and servers **24** are connected to remote control **14** and controlled device **18**. Network **22** may be connected to remote control **14** and controlled device **18** via wired and/or wireless links. For example, remote control **14** and controlled device **18** may be coupled to network **22** via a combination of any wireless or wired communication medium, such as a radio frequency (RF) spectrum or one or more physical transmission lines, or any combination of wireless and wired media. The links may form part of a packet-based network, such as a local area network, a wide-area network, or a global network such as the Internet. The links generally represent any suitable communication medium, or collection of different communication media, for transmitting signals from remote control **14** to network **22** and from controlled device **18** to network **22**, including any suitable combination of wired or wireless media. The links may include routers, switches, base stations, or any other equipment that may be useful to facilitate communication from remote control **14** and controlled device **18** to network **22**.

Network **22** may include a wide-area network such as the Internet, a local-area network (LAN), an enterprise network, or one or more other types of networks. Servers **24** may be any of several different types of network devices. For instance, servers **24** may be conventional web servers, specialized media servers, personal computers operating in a peer-to-peer fashion, or other types of network devices. As described in greater detail with respect to FIG. **5**, in some examples, servers **24** include one or more data repositories or databases for storing information, such as identification numbers, session identifiers, and any other information required to carry out data transfer between remote control **14** and controlled device **18**. In some examples, the data repositories of servers **24** may be structured as one or more tables, database systems, linked lists, radix trees, or other suitable data structure.

According to an aspect of the disclosure, network **22** and servers **24** facilitate an exchange of data between remote control **14** and controlled device **18**. For example, servers **24** associated with network **22** may operate as an intermediary between remote control **14** and controlled device **18** to relay data between remote control **14** and controlled device **18**. In some examples, servers **24** "pair" remote control **14** and controlled device **18** such that information and commands from remote control **14** can be transmitted to controlled device **18**, and information and commands can be transmitted from controlled device **18** to remote control **14**. For example, remote control **14** and controlled device **18** may initially notify servers **24** that remote control **14** and controlled device **18** are connected to network **22** and available for pairing. In some examples, servers **24** authenticate that remote control **14** and controlled device **18** are permitted to be paired. For example, servers **24** may maintain a user account that includes permissions for remote control **14** and

controlled device **18**, which allows remote control **14** and controlled device **18** to be paired. In some examples, the authorization of remote control **14** and controlled device **18** utilizes HTTP header information to identify remote control **14** and controlled device **18** as being associated with the user account. Servers **24** may assign unique identification numbers to each authorized remote control **14** and controlled device **18** connected to network **22**. To pair remote control **14** and controlled device **18**, servers **24** may create a session that includes all of the issued unique identification numbers.

After adding remote control **14** and controlled device **18** to the session, messages generated by remote control **14** and controlled device **18** include their unique identification numbers, so that the servers **24** recognize remote control **14** and controlled device **18** as being included in the session. Servers **24** receive messages from remote control **14** and controlled device **18** and route the messages to other members of the session. For example, a user may actuate one of controls **30** of remote control **14** to alter the content displayed on display **38** of controlled device **18**. Remote control **14** transmits a control message that includes the unique identifier of remote control **14** to servers **24** via network **22**. Servers **24** identify that remote control **14** is a member of a session based on the unique identification number of remote control **14**. Servers **24** then routes the control message to controlled device **18**, which is also a member of the session. Controlled device **18** receives the control message and performs the appropriate action.

Alternatively or additionally, controlled device **18** transmits information (e.g., data for updating content information **34** displayed on remote control **14**) that includes the unique identifier of controlled device **18** to servers **24** via network **22**. Servers **24** identify that controlled device **18** is a member of the session based on the unique identification number of controlled device **18**. A server then routes the information to remote control **14**, which is also a member of the session. Remote control **14** then receives the information and updates user interface **26** and information **34** according to the received information.

FIG. **2** is a block diagram illustrating an example networked environment **60** having remote controls **62**A-**62**N (collectively, "remote controls **62**") and controlled devices **64**A-**64**N (collectively, "controlled devices **64**") connected via network **66** and servers **68**A-**68**N (collectively, "servers **68**"), in accordance with one aspect of the present disclosure. In some examples, remote controls **62**, controlled devices **64**, network **66**, and servers **68** may be configured similarly to, or the same as remote control **14**, controlled device **18**, network **22**, and servers **24**, respectively, shown in FIG. **1**. Remote controls **62** and controlled devices **64** shown in FIG. **2** need not be configured in precisely the same way. For example, each remote control of remote controls **62** may be a different make or model of web-enabled mobile phone, according to one or more non-limiting examples. In addition, each of the controlled devices of controlled devices **64** may be a different make or model network-compatible television, according to one or more non-limiting examples.

Servers **68** of network **66** may be responsible for initiating sessions and enabling pairing any of remote controls **62** with any of controlled devices **64**. For example, servers **68** of network **66** may assign a unique identifier to each of the remote controls **62** and to each of the controlled devices **64**. As described in more detail with respect to FIG. **5**, servers **68** can utilize the unique identifiers to enable communication between the remote controls **62** and controlled devices **64**.

Any number of remote controls **62** may be paired with a single controlled device from the controlled devices **64**. In addition, a single remote control of the remote controls **62** may be paired with any number of the controlled devices **64**. When pairing multiple remote controls **62** and multiple controlled devices **64** associated with a single user, the user may manage permissions of the remote controls **62** and controlled devices **64**. For example, a user may identify a subset of the remote controls **62** as being paired with a subset of the controlled devices **64**.

Remote controls **62** and controlled devices **64** may be paired using a variety of techniques. In some examples, servers **68** may generate a session and pair any remote controls **62** and controlled devices **64** associated with the session. For example, servers **68** may issue each of remote controls **62** and controlled devices **64** connected to servers **68** unique identification numbers, and associate those assigned unique identification numbers as being members of the session. Remote controls **62** and controlled devices **64** include their unique identification numbers in messages sent to servers **68**, and servers pair the device sending the message with other members of the session.

In other examples, remote controls **62** and controlled devices **64** may be individually added to a session maintained by servers **68**. For example, a controlled device, such as controlled device **64**A may present a user with a QR code that identifies a session that has been created by servers **68**. The user may scan the QR code with one of remote controls **62** (e.g., remote control **62**A). Upon scanning the QR code, remote control **62**A transmits a message to servers **68** requesting that servers **68** issue remote control **62**A a unique identification number and add remote control **62**A to the session associated with the QR code, thereby pairing remote control **62**A with controlled device **64**A.

In some examples, more than one user of more than one of the remote controls **62** may be paired with a single controlled device, such as controlled device **64**A. For example, more than one user of more than one of the remote controls **62** may scan the same QR code displayed on controlled device **64**A. In such examples, servers **68** pair each of the remote controls **62** with controlled device **64**A by issuing each of remote controls **62** a unique identification number and adding remote controls **62** to the session, thereby allowing control messages to be sent from remote controls **62** to controlled device **64**A. Controlled device **64**A can also send information (e.g., information to updates user interfaces of remote controls **62**) to all of the paired remote controls **62** (e.g., all remote controls **62** that are members of the same session as controlled device **64**A) via servers **68**.

A remote control, such as remote control **62**A may also be paired with more than one of the controlled devices **64** via servers **68**. For example, a user may log into a user account maintained on servers **68** to associate devices (e.g., any of remote controls **62** or controlled devices **64**) with the user account. The user may then identify remote controls **62** as remote control devices and controlled devices **64** as controlled devices, and servers **68** can pair the devices according to the user's preferences.

FIG. **3** is a block diagram illustrating an example remote control **75**, which may be an example of, or the same as, remote control **14** shown in FIG. **1** or one of remote controls **62** shown in FIG. **2**. Remote control **75** may include battery **80**, user interface **84**, display **88**, storage device **92** having one or more applications **94**, one or more processors **96**, and network module **100**. Other implementations of remote control **75** are possible, having more or fewer components than those shown in FIG. **3**. For example, in examples where

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remote control **75** is a cellular phone or other wireless communication device, remote control **75** includes a microphone and speaker for voice communication.

Battery **80** provides power for the various units of remote control **75**, and may be rechargeable. Examples of battery **80** include a lithium polymer battery, a lithium ion battery, nickel cadmium battery, and a nickel metal hydride battery. User interface **84** allows a user of remote control **14** to interact with remote control **75**. Examples of user interface **84** include a keypad embedded on device **84**, a touch screen, a keyboard, a mouse, a roller ball, buttons, or other devices that allow a user to interact with remote control **75**. In some examples, user interface **84** may include a microphone to allow a user to provide voice commands. In some examples, user interface **84** generates a graphical user interface that allows a user to initiate commands. For example, user interface **84** may include a software module that generates a graphical user interface that is displayed on display **88**.

Display **88** may include one of a variety of display devices such as a liquid crystal display (LCD), an e-ink display, a cathode ray tube (CRT), a plasma display, an organic light emitting diode (OLED) display, or another type of display. Display **88** presents the content generated by remote control **75** (e.g., user interface **84** of remote control **75**) to a user of remote control **75**. For example, display **88** may present applications executed on remote control **75** such as a remote control application, a web browser, content retrieved from servers, and other functions that may need to be presented to the user. In some examples, display **88** may provide some or all of the functionality of user interface **84**. For example, display **88** may be a touch screen that allows a user to interact with remote control **75**.

Storage device **92** stores instructions for applications **94** that may be executed by one or more processors **96**. For purposes of illustration only, in the following description applications **94** that may be executed by one or more processors **96** are described below as being executed by one processor **96**. Applications **94** may be downloaded by a user via a network (e.g., downloaded from one or more of servers **24** via network **22** as shown in FIG. **1**) or may be preprogrammed within remote control **75**. Applications **94** may be executed by processor **96** in response to a user interacting with remote control **75** to execute the applications **94**. Applications **94** may also be executed by processor **96** when a user turns on remote control **75**.

Storage device **92** may also include instructions that cause processor **96** to perform various functions ascribed to processor **96** in this disclosure. Storage device **92** may comprise a computer-readable, machine-readable, or processor-readable storage medium that comprises instructions that cause one or more processors, e.g., processor **96**, to perform various functions. Storage device **92** may include any volatile, non-volatile, magnetic, optical, or electrical media, such as a random access memory (RAM), read-only memory (ROM), non-volatile RAM (NVRAM), electrically-erasable programmable ROM (EEPROM), flash memory, or any other digital media. In some embodiments, storage device **92** may comprise one or more of a non-transitory/tangible storage media, where the data stored in such media may or may not change (e.g., ROM, RAM).

A user may interact with user interface **84** and/or display **88** to execute one or more applications **94** stored on storage device **92**. Some applications may be executed automatically by remote control **75**, such as when remote control **75** is powered on or booted up. In response, processor **96** executes the one or more applications **94** selected by a user, or executes the one or more applications **94** executed by remote control **75**. Processor **96** may include any one or more of a microprocessor, a controller, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or equivalent discrete or integrated logic circuitry. Additionally, the functions attributed to processor **96**, in this disclosure, may be embodied as software, firmware, hardware or any combination thereof.

Processor **96** may execute one or more of applications **94** either alone or simultaneously. Examples of applications **94** include a remote control application, web browsers, e-mail, programs to retrieve stock quotes, programs to search for restaurants, programs that retrieve current and future weather information, games, a program to search the Internet, a program that provides news, a program that provides maps, and other programs executed by processor **96**. Applications **94** may be executed based on a request from a user, and may be terminated based on a request from a user. Some applications **94** may be running continuously in the background. Some applications **94** may be executed automatically by remote control **75** such as at power up and may be terminated automatically by remote control **75** such as at power down.

One or more applications **94** executed by processor **96** may require data from one or more of servers (e.g., such as servers **24** shown in FIG. **5**). Network module **100** may transmit data/requests to and receive data/responses from one or more servers via a network (such as network **22** shown in FIG. **1**). Network module **100** may also provide received data to processor **96** for further processing. Network module **100** may support wireless or wired communication, and includes appropriate hardware and software to provide wireless or wired communication. For example, network module **100** may include an antenna, modulators, demodulators, amplifiers, and other circuitry to effectuate communication between remote control **75** and one or more servers associated with a network. Network module **100** may communicate with one or more servers associated with a network according to a network communication protocol, such as, for example, hypertext transfer protocol (HTTP), HTTP secured by transport layer security or secure sockets layer (HTTPS), simple mail transfer protocol (SMTP), simple object access protocol (SOAP), or other communication protocols.

Remote control **75** may include a remote control application (e.g., a remote control application stored with applications **94** stored in storage device **92**) that allows a user to initiate commands being sent to a controlled device, such as controlled device **18** shown in FIG. **1**. A user may interact with user interface **84** and/or display **88** to execute the remote control application. Processor **96** then executes the remote control application and causes display **88** to display a remote control application user interface to the user. In another example, a remote control application may be stored on one or more servers on a network and be accessible via the network. For example, a user may interact with user interface **84** and/or display **88** to execute a web browser. Processor **96** then executes the web browser application and causes display **88** to display a web browser to the user. The user may then interact with user interface **84** and/or display **88** to utilize a website containing remote control application content.

A user may use the remote control application of remote control **75**, for example, to initiate contact with a server, such as server **24**, for pairing remote control **75** to one or more controlled devices, such as controlled device **18** shown in FIG. **1**. In some examples, the user may also utilize the

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remote control application of remote control **75** to select one or more previously paired controlled devices, and to send control messages to one or more paired controlled devices. For example, the user may interact with user interface **84** and/or display **88** to interact with and control any available controlled devices.

FIG. **4** is a block diagram illustrating an example controlled device **118**, which may be an example of, or the same as controlled device **18** shown in FIG. **1** or one of controlled devices **64** shown in FIG. **2**. According to one example of the present disclosure, controlled device **118** includes user interface **120**, display **124**, storage device **128**, one or more processors **132**, and network module **136**. Other example implementations of controlled device **118** are possible, having more or fewer components than those shown in FIG. **4**. For example, controlled device **118** may be a personal computer having additional components (e.g., an optical drive, a camera, etc.). In another example, controlled device **118** may be a personal media player having fewer components than those shown in FIG. **4** (e.g., a personal media player that lacks a display).

User interface **120** allows a user of controlled device **118** to interact with controlled device **118**. Examples of user interface **120** include an embedded keypad or other buttons. The user interface **120** may also include a detachable or otherwise independent device, such as a traditional remote control device having a keypad, a keyboard, a mouse, a roller ball, buttons, or other devices that allow a user to interact with controlled device **18**. A user may utilize user interface **120** to control media content being presented by controlled device **118** (e.g., audio or video content). In an example, a user may utilize user interface **120** to navigate to a web page on the Internet in order to display the content hosted by the web page (e.g., YouTube®, Hulu®, Netflix®, other subscription or non subscription based video content).

Display **124** may comprise a variety of display devices such as a liquid crystal display (LCD), an e-ink display, a cathode ray tube (CRT), a plasma display, an organic light emitting diode (OLED) display, or another type of display device. Display **124** presents content to a user of controlled device **118**. For example, display **124** may be configured to present audio and/or video content from a cable service provider, a satellite television provider, content accessible via the World Wide Web, or other content providers.

Although controlled device **118** is shown as including display **124**, aspects of this disclosure should not be considered limited to examples that include display **124**. In some examples of controlled device **118**, display **124** may be optional. For example, if controlled device comprises a web-enabled music player or a radio, controlled device **118** may not include display **124**. In other examples, controlled device **118** may include an external, independent display. For example, controlled device **118** may be configured as a set top box or other component that is connectable to a display.

Storage device **128** stores instructions for applications **130** that may be executed by one or more processors **132** associated with controlled device **118**. For purposes of illustration only in the following description, applications **130** that may be executed by one or more processors **132** are described below as being executed by one processor **132**. Applications **130** may be pre installed by a manufacturer of controlled device **118**, or may be downloaded by a user from a server via a network, such as servers **24** and network **22** shown in FIG. **1**. Applications **130** may be executed by processor **132** in response to a user interacting with controlled device **118** to execute the applications **130**.

Storage device **128** may also include instructions that cause processor **132** to perform various functions ascribed to processor **132** in this disclosure. Storage device **132** may comprise a computer-readable, machine-readable, or processor-readable storage medium that comprises instructions that cause one or more processors, e.g., processor **132**, to perform various functions. Storage device **132** may include any volatile, non-volatile, magnetic, optical, or electrical media, such as a random access memory (RAM), read-only memory (ROM), non-volatile RAM (NVRAM), electrically-erasable programmable ROM (EEPROM), flash memory, or any other digital media. In some embodiments, storage device **132** may comprise one or more of a non-transitory/tangible storage media, where the data stored in such media may or may not change (e.g., ROM, RAM).

A user may interact with user interface **120** and/or display **124** to execute one or more of applications **130** stored on storage device **128**. Some applications **130** may be executed automatically by controlled device **118** such as when controlled device **118** is turned on or booted up. In response, processor **132** executes the one or more applications **130** selected by a user, or executes the one or more applications **130** executed by controlled device **118**. Processor **132** may include any one or more of a microprocessor, a controller, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or equivalent discrete or integrated logic circuitry. Additionally, the functions attributed to processor **132**, in this disclosure, may be embodied as software, firmware, hardware or any combination thereof.

Processor **132** may execute one or more of applications **130** either alone or simultaneously. Examples of applications **130** include an application for displaying television content provided by a satellite or cable provider, an application for displaying content hosted on the World Wide Web, a web browser application, a social networking application, an e-mail application, programs to retrieve stock quotes, programs to search for restaurants, programs that retrieve current and future weather information, games, a program to search the Internet, a program that provides news, a program that provides maps, and other programs executed by processor **132**. Applications **130** may be executed based on a request from a user, and may be terminated based on a request from a user. Some applications **130** may be running continuously in the background. Some applications **130** may be executed automatically by controlled device **118** such as at power up and may be terminated automatically by controlled device **118** such as at power down.

In some examples, any application of applications **130** executed by processor **132** may require data from one or more of servers, such as servers **24** shown in FIG. **1**. Network module **136** is configured to transmit data/requests to and receive data/responses from one or more servers via network. Network module **136** may provide received data to processor **132** for further processing. Network module **136** may support wireless or wired communication, and includes appropriate hardware and software to provide wireless or wired communication. For example, network module **136** may include an antenna, modulators, demodulators, amplifiers, and other circuitry to effectuate communication between controlled device **118** and one or more servers associated with a network. Network module may **100** may communicate with one or more servers associated with the network according to a network communication protocol, such as, for example, hypertext transfer protocol (HTTP), HTTP secured by transport layer security or secure sockets

layer (HTTPS), simple mail transfer protocol (SMTP), simple object access protocol (SOAP), or other communication protocols.

Controlled device **118** may be used, in some examples, in conjunction with a remote control, such as remote control **14** shown in FIG. **1**, remote controls **62** shown in FIG. **2**, or remote control **75** shown in FIG. **3**. For example, storage device **92** may store application instructions associated with a video application or web browser for displaying video content from the World Wide Web (e.g., YouTube® content, Hulu® content, Netflix® content, etc.). A user may interact with user interface **120** to execute the video or web browser application. Processor **120** then executes the video or web browser application and causes display **124** to display content to the user.

A user may utilize the video application of applications **130** or web browser of controlled device **118** to facilitate pairing of controlled device **118** to one or more remote controls, such as remote control **14** shown in FIG. **1**. For example, controlled device **118** may notify a server, such as sever **24** shown in FIG. **1**, that it is available to be joined to a session maintained by server **24** upon powering on or executing a video or web browser application. In other examples, a controlled device **118** may provide an interface that allows a user to authorize one or more remote controls to send commands to controlled device **118** via a network. Additionally or alternatively, controlled device **118** may display a QR code using display **124** that can be scanned by a remote control. After scanning the QR code displayed using display **124** with the remote control, the remote control may be authorized to send control signals to controlled device **118** via the network.

FIG. **5** is a block diagram illustrating an example server **160** associated with network **162**, which may be an example of servers **24** of network **22** shown in FIG. **1**, or servers **68** of network **66** shown in FIG. **2**, in accordance with one aspect of the present disclosure. While described herein in relation to servers **68** of FIG. **2**, server **160** may also be implemented in a variety of other network environments having components other than those shown in FIG. **2**. As shown in FIG. **5**, server **160** may be comprised as a single unit with an interface module **164**, a device management module **168**, and a data repository **172**. While shown as a single unit in FIG. **5**, in other implementations, hardware and functions associated with server **160** may be spread among more than one server unit. In addition, sever **160** may include more modules shown in FIG. **5**.

Interface module **164** is configured to accept signals being received by the server **160** and transmit signals being transmitted by server **160**. In some examples, input and output network interfaces of the interface module **164** may be functionally integrated, while in other examples, input and output interfaces may be separate interfaces of interface module **164**. For example, network interfaces of interface module **164** may include one or more network interface cards (NICs) configured to communicate over, for example, Ethernet, Transmission Control Protocol (TCP), Internet protocol (IP), Asynchronous Transfer Mode (ATM), or other network communication protocols. In some examples, server **160** may include a plurality of either or both input and output interfaces.

Data repository **172** stores information such as user information, session information, unique identifier numbers, and any other information required to carry out data transfer between remote control **14** and controlled device **18**. In some examples, an entry within data repository **172** includes a unique identification number that has been assigned to a remote control or controlled device. Alternatively or additionally, an entry within data repository **172** may identify an association between a remote control and a controlled device. In some examples, data repository **172** may also be configured to store data from past sessions between remote control **14** and controlled device **18**. In some examples, data repository **172** may be structured as one or more tables, database systems, linked lists, radix trees, or other suitable data structure.

Device management module **168** generates messages, as well as controls messages being received from and messages being transmitted to remote controls **62** and controlled devices **64** of FIG. **2**. In some examples, device management module **168** receives messages from remote controls **62** and controlled devices **64** notifying device management module **168** that the devices are available for pairing. Device management module **168** may authorize devices according to permissions set by a user having a user account. After providing authorization, device management module **168** may generate an identification message to aid device management module **168** in managing a session. In the example of one of remote controls **62**, such as remote control **62**A, requesting authorization to join a session maintained by device management module **168**, device management module **168** assigns remote control **62**A a unique session identification number (SID). Device management module **168** may also store the SID associated with remote control **62**A in data repository **172**, and return the SID to remote control **62**A. Device management module **168** may also generate and store unique SIDs for controlled devices **64** in a similar manner. For example, device management module **168** may assign each connected controlled device **64** that requests authorization to join a session maintained by device management module with a unique SID which the controlled devices **64** can then use to identify itself in future communications.

After assigning SIDs to connected devices, device management module **168** can manage messages between remote controls **62** and controlled devices **64**. For example, device management module **168** may receive a message containing an SID and control information from one of remote controls **62**, such as remote control **62**A, for controlling on or more controlled devices **64**. Device management module **168** then identifies the session that includes the SID of remote control **62**A and determines the intended recipient(s) (e.g., one or more controlled devices **64**) based on the other members of the session that have been assigned SIDs. That is, device management module **168** queries data repository **172** to determine the SIDs of all devices included in the session. After determining which controlled devices **64** are associated with the session, device management module **168** transmits the control information to the intended controlled devices **64**. In some examples, device management module **168** transmits the control information to all devices having SIDs that are associated with the session. Devices receiving the control information that are not configured to execute the control information (e.g., other remote controls **62** of the session) can ignore the message. In other examples, device management module **168** determines which SIDs of the session are associated with controlled devices **64**, and transmits the control information to only the controlled devices **64**. The control messages can be used by the controlled devices **64** to alter playback of content of controlled devices **64**.

Device management module **168** may also control messages being transmitted from controlled devices **64** to remote controls **62**. For example, after assigning SIDs to

connected devices, device management module **168** may be configured to receive a message containing an SID from a controlled device, such as controlled device **64**A, as well as content information for updating a user interface associated with one or more connected remote controls **62**. Device management module **168** then identifies the session that includes the SID of controlled device **64**A and determines the indented recipient(s) (e.g., one or more remote controls **62**) based on the other members of the session that have been assigned SIDs. That is, device management module **168** queries data repository **172** to determine the SIDs of all devices included in the session. After determining which remote controls **62** are associated with the session, device management module **168** transmits the content information to the intended remote controls. In some examples, device management module **168** transmits the content information to all devices having SIDs that are associated with the session. Devices receiving the content information that are not configured to execute the content information (e.g., other controlled devices **64** of the session) can ignore the message. In other examples, device management module **168** determines which SIDs of the session are associated with remote controls **62**, and transmits the content information to only the remote controls **62**. The content information may be used by the remote controls **62** to update a user interface of remote controls **62** or update playlist information of remote controls **62**.

According to some aspects of the disclosure, device management module **168** carries out the routing of information between remote controls **62** and controlled devices by "pairing" the remote controls **62** and controlled devices **64** using the identification numbers described above. In some examples, device management module **168** pairs all authorized devices that have been issued an SID. In other examples, device management module **168** identifies and stores associations of remote controls **62** and controlled devices **64** to facilitate repeat communication between remote controls **62** and controlled devices **64**. Device management module **168** may pair devices in a variety of ways including, for example, utilizing QR codes or allowing a user to manage pairing via a user interface.

In some examples, device management module **168** may utilize a QR code to facilitate a device joining a session and being paired with other devices of the session. For example, device management module **168** may generate a unique session identification number that identifies a session. Upon scanning the QR code (e.g., the QR code being displayed on one or more of controlled devices **64**), a remote control, such as remote control **62**A, transmits a message to device management module **168** to request that remote control **62**A be included in the session identified in the QR code. In some examples, device management module **168** then authorizes remote control **62**A, issues remote control **62**A an SID, and adds the SID to the session. The process can be repeated by other remote controls **62**, such that device management module pairs multiple remote controls **62** with controlled device **64**A, thereby allowing controlled device **64**A to receive commands from multiple remote controls **62**.

In other examples, a user may access a user account stored, for example, in data repository **172** to enable device management module **168** to pair remote controls **62** and controlled devices **64**. For example, a user may log into a user account maintained on server **160** to associate devices (e.g., any of remote controls **62** or controlled devices **64**) with the user account. Unique identification numbers for each device may be stored, for example, in data repository **172**. The user may then identify remote controls **62** as remote control devices and controlled devices **64** as controlled devices, and device management module **168** can pair the devices according to the user's preferences. After pairing, device management module **168** can facilitate communication between remote controls **62** and controlled devices **64**.

According to some aspects of the disclosure, remote controls **62** and controlled devices **64** are HTTP clients of server **160**. That is, server **160** is configured to receive and transmit messages according to HTTP protocol. In other examples, however, server **160** may be configured to receive and transmit messages according to other protocols, such as Extensible Messaging and Presence Protocol (XMPP) or Remote Procedure Call (RPC) protocol.

FIG. **6** is a flowchart illustrating an example operation of a remote control communicating with a network server, in accordance with one aspect of the present disclosure. For purposes of illustration only, the method of FIG. **6** is described with respect to networked environment **10** of FIG. **1**, though various other systems and/or devices may be utilized to implement or perform the method shown in FIG. **6**.

According to some examples, remote control **14** notifies servers **24** that remote control is connected to network **22**, and servers **24** assign remote control **14** a remote control identifier (e.g., a unique SID) (**200**). Remote control **14** may notify servers **24**, for example, automatically upon being powered on. In another example, a user may log in to a user account maintained by the servers **24** using a remote control application on remote control **14**, thereby notifying servers **24** that remote control **14** is connected to network **22**. In another example, remote control **14** may notify servers **24** that it is connected to network **22** and request an SID by, for example, scanning a QR code displayed on controlled device **18**. The QR code may be associated with a user account or active session, and severs **24** may assign remote control **14** an SID associated with the user account or session. In some examples, prior to assigning remote control **14** an SID, server **24** verifies that remote control **14** is authorized to be assigned an SID. For example, a user may maintain an account on servers **24** that includes permissions regarding which remote controls and controlled devices can be associated with the user account and assigned SIDs. Upon authorization (e.g., HTTP authorization using HTTP header information), servers **24** assign remote control **14** an SID.

Remote control **14** also transmits a message to server **24** that includes a remote control identifier and control information. For example, the remote control identifier may include the SID issued by severs **24** that identifies remote control **14** as being part of a session maintained by servers **24** (**204**). The control information may include data intended to alter the operation of controlled device **18** (e.g., stop playback of content, move to other content, etc.).

Server **24** then identifies controlled device **18** that is intended to receive the control information. For example, server **24** may query a database of stored identification numbers to determine which controlled device is associated with the session that includes the remote control identifier. Server then transmits the control information to the intended controlled device **18** (**210**). In some examples, server **24** forwards the control information from the message directly to one or more controlled devices **18**. In other examples, server **24** may process and/or repackage the control information of the message into a new message. After receiving the control information, controlled device **18** executes an action in accordance with the control information (**212**).

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In some examples, multiple remote controls **14** can be paired with a single controlled device **18**. For example, a plurality of remote controls **14** may be used by one or more users to scan the same QR code displayed on a single controlled device **18**. In this example, the server may transmit a control message from each of the plurality of remote controls **14** to controlled device **18**. Server **24** may also maintain a priority list that provides certain remote controls **14** with a higher priority than other remote controls. Upon receiving conflicting commands simultaneously, then, server **24** can refer to the priority list to determine which control information to send to controlled device **18**.

FIG. **7** is a flowchart illustrating an example operation of a network server handling communication between a remote control and a controlled device, in accordance with one aspect of the present disclosure. For purposes of illustration only, the method of FIG. **7** is described with respect to networked environment **10** of FIG. **1**, though various other systems and/or devices may be utilized to implement or perform the method shown in FIG. **7**.

In some examples, server **24** receives a message from remote control **14** having a remote control identifier and control information (**220**). For example, the message from remote control **14** may contain an SID issued by servers **24** that identifies remote control **14** as being part of a session. In addition, the message may contain control information intended to alter the operation of one or more controlled devices **18** (e.g., stop playback, begin next payback item, etc.). After receiving the message from remote control **14**, server **24** retrieves a controlled device identifier that identifies one or more controlled devices **18** intended to receive the control information (**224**). For example, server **24** may query a database of stored identification numbers to determine which controlled device is associated with the session that includes the remote control identifier. Server **24** then transmits a message to the intended recipients (one or more controlled devices **18**) of the control information (**228**). In some examples, server **24** forward the control information from the first message directly to one or more controlled devices **18**. In other examples, server **24** may process and/or repackage the control information of the message from remote control **14** into a new message, which can be sent to the intended recipients of the control information.

Server **24** may, in some examples, initialize a group session upon receiving the message from remote control **14**. For example, server **24** may maintain a session that includes the identifiers for all of the components sending and receiving messages (e.g., remote control(s) **14** and controlled device(s) **18**). The session may be maintained by a device management module (such as device management module **168** shown in FIG. **5**) of server **24** in order to efficiently route the messages from remote control **14** to controlled device **18**, as well as messages from controlled device **18** to remote control **14** (e.g., as discussed below with respect to FIGS. **8** and **9**). Server **24** may store identifiers associated with a session in a data repository (such as data repository **172** shown in FIG. **5**).

FIG. **8** is a flowchart illustrating an example operation of a network server handling communication between a controlled device and a remote control, in accordance with one aspect of the present disclosure. For purposes of illustration only, the method of FIG. **8** is described with respect to networked environment **10** of FIG. **1**, though various other systems and/or devices may be utilized to implement or perform the method shown in FIG. **8**.

According to some examples, controlled device **18** notifies servers **24** that controlled device **18** is connected to network **22**, and servers **24** assign controlled device **18** a controlled device identifier (e.g., a unique SID) (**236**). Controlled device **18** may notify servers **24**, for example, automatically upon being powered on. In another example, a user may log in to a user account maintained by the servers **24** using an application on controlled device **18** (e.g., a web browser application), thereby notifying servers **24** that controlled device **18** is connected to network **22**. In some examples, prior to assigning controlled device **18** an SID, server **24** verifies that controlled device **18** is authorized to be assigned an SID. For example, a user may maintain an account on servers **24** that includes permissions regarding which remote controls and controlled devices can be associated with the user account and assigned SIDs. Upon authorization (e.g., HTTP authorization using HTTP header information), servers **24** assign controlled device **18** an SID.

Controlled device **18** also transmits a message to server **24** that includes a controlled device identifier and content information. For example, the controlled device identifier may include the SID issued by severs **24** that identifies controlled device **18** as being part of a session (**238**). The content information may include data intended to update a user interface of remote control **14** (e.g., update playlist information, request user to take action regarding content playback, notify user that playback of new content has begun, and the like).

Server **24** then receives the message from controlled device **18** and identifies remote control **14** that is intended to receive the content information (**240**). For example, server **24** may query a database of stored identification numbers to determine which remote control **14** is associated with the session that includes the controlled device identifier. Server **24** then transmits the control information to the intended controlled device **18** (**242**). In some examples, server **24** forwards the content information from the message directly to one or more remote controls **14**. In other examples, server **24** may process and/or repackage the content information of the message into a new message. After receiving the content message from server **24**, remote control executes an action in accordance with the message (e.g., update a user interface of remote control **14**) (**244**)).

Messages other than those specifically described with respect to FIG. **8** may also be exchanged between controlled device **18** and server **24**. According to some aspects of the disclosure, controlled device **18** may complete a preliminary identification process, during which server **24** supplies controlled device **18** with an identification number. For example, prior to transmitting a message to remote control **14**, controlled device **18** may initiate contact with server **24** to request an identification number. Server **24** may then generate an identification number and transmit the identification number to controlled device **18**. Controlled device **18** can then incorporate that identification number into the identifier portion of the message described above.

FIG. **9** is a flowchart illustrating an example operation of a controlled device communicating with a network server, in accordance with one aspect of the present disclosure. For purposes of illustration only, the method of FIG. **9** is described with respect to networked environment **10** of FIG. **1**, though various other systems and/or devices may be utilized to implement or perform the method shown in FIG. **9**.

In some examples, server **24** receives a message from controlled device **18** having a controlled device identifier and content information (**250**). For example, the message from controlled device **18** may contain an SID issued by servers **24** that identifies controlled device **18** as being part

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of a session. In addition, the message may contain content information intended to notify a user of an event regarding controlled device **18**, or to prompt a user of remote control **14** to take an action (e.g., notification that playback has stopped, notification that playback of new content has begun, and the like). The content information may be used, for example, to update a user interface of remote control **14**.

After receiving the message from controlled device **18**, server **24** retrieves a remote control identifier that identifies one or more remote controls **14** intended to receive the content information (**224**). For example, server **24** may query a database of stored identification numbers to determine which remote control **14** is associated with the session that includes the remote control identifier. Server **24** then transmits a message to the indeed recipients (one or more remote controls **14**) of the content information (**258**). In some examples, server **24** forwards the content information from the first message directly to one or more remote controls **14**. In other examples, server **24** may process and/or repackage the content information of the message from controlled device **18** into a new message, which can be sent to the intended recipients of the content information.

The messages described with respect to FIGS. **5-9** may be may be transmitted according to HTTP protocol. Other protocols, however, may also be implemented. For example, Extensible Messaging and Presence Protocol (XMPP) or Remote Procedure Call (RPC) protocols can also be implemented.

The techniques described herein may be implemented in hardware, software, firmware, or any combination thereof. Various features described as modules, units or components may be implemented together in an integrated logic device or separately as discrete but interoperable logic devices or other hardware devices. In some cases, various features of electronic circuitry may be implemented as one or more integrated circuit devices, such as an integrated circuit chip or chipset.

If implemented in hardware, this disclosure may be directed to an apparatus such a processor or an integrated circuit device, such as an integrated circuit chip or chipset. Alternatively or additionally, if implemented in software or firmware, the techniques may be realized at least in part by a computer-readable data storage medium comprising instructions that, when executed, cause a processor to perform one or more of the methods described above. For example, the computer-readable data storage medium may store such instructions for execution by a processor. In various aspects, an article of manufacture may comprise one or more computer-readable media.

A computer-readable medium may form part of a computer program product, which may include packaging materials. A computer-readable medium may comprise a computer data storage medium such as RAM, ROM, NVRAM, EEPROM, FLASH memory, magnetic or optical data storage media, and the like. The techniques additionally, or alternatively, may be realized at least in part by a computer-readable communication medium that carries or communicates code in the form of instructions or data structures and that can be accessed, read, and/or executed by a computer.

The code or instructions may be software and/or firmware executed by processing circuitry including one or more processors, such as one or more DSPs, general purpose microprocessors, ASICs, FPGAs, or other equivalent integrated or discrete logic circuitry. Accordingly, the term "processor," as used herein may refer to any of the foregoing structure or any other structure suitable for implementation of the techniques described herein. In addition, in some aspects, functionality described in this disclosure may be provided within software modules or hardware modules.

Various examples of the disclosure have been described. These and other embodiments are within the scope of the following claims.

The invention claimed is:

1. A method comprising:

receiving a request from a remote control to establish a session for communication with one or more controlled devices, wherein the remote control comprises an electronic device;

responsive to receiving the request from the remote control, assigning, by a server, a remote control identifier that uniquely identifies the remote control, wherein the remote control identifier is associated with the session;

transmitting, by the server, the remote control identifier to the remote control;

receiving, by the server, from a first controlled device of the one or more controlled devices, a request to join the session for communication with the remote control;

responsive to receiving the request from the first controlled device, assigning, by the server, a controlled device identifier to the first controlled device, wherein the controlled device identifier uniquely identifies the first controlled device and is associated with the session;

prior to receiving messages containing the controlled device identifier, sending, by the server, to the first controlled device, the controlled device identifier;

receiving, by the server, a first message from the remote control, wherein the first message includes the remote control identifier and control information for controlling one or more functions of at least one of the one or more controlled devices;

retrieving, by the server, at least one controlled device identifier associated with the session from a data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device; and

sending a second message from the server to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message is based on the first message and includes the control information to control an operation of the at least one controlled device.

2. The method of claim **1**, wherein the second message sent to the at least one controlled device manages playback of at least one of audio content and video content on the at least one controlled device.

3. The method of claim **2**, wherein the second message sent to the at least one controlled device causes the at least one controlled device to perform one or more of the following actions: 1) stop playback of content; 2) start playback of content; 3) change content; 4) rate content; and 5) alter a volume associated with content.

4. The method of claim **1**, further comprising:

receiving a third message from a controlled device comprising one of the at least one controlled devices, wherein the third message includes a controlled device identifier that uniquely identifies the controlled device;

retrieving a remote control identifier from the data repository based on the controlled device identifier, wherein the remote control identifier uniquely identifies the remote control; and

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sending a fourth message to the remote control identified by the remote control identifier, wherein the fourth message is based on the third message received from the controlled device.

5. The method of claim **1**, further comprising:

receiving a third message from a controlled device comprising one of the at least one controlled devices, wherein the third message includes a controlled device identifier that uniquely identifies the controlled device;

retrieving a plurality of remote control identifiers from the data repository based on the controlled device identifier, wherein each the plurality of remote control identifiers uniquely identifies one remote control, and wherein one of the plurality of remote control identifiers uniquely identifies the remote control; and

sending a fourth message to each remote control of the plurality of remote controls identified by the plurality of remote control identifiers, wherein the fourth message is based on the third message received from the controlled device.

6. The method of claim **5**,

wherein the fourth message sent to each remote control causes each remote control to perform one or more of the following actions: 1) update a user interface of the respective remote control; 2) send a fifth message to the controlled device from which the third message was received to manage playback of audio and video on the controlled device; 3) update a playlist based on the third message received from the controlled device; and 4) send a sixth message to other remote controls identified by the plurality of remote control identifiers.

7. The method of claim **1**, further comprising:

receiving a request from a second remote control to join the session, wherein the request comprises a message that identifies the session;

assigning, by the server in response to the request, a second remote control identifier that uniquely identifies the second remote control;

transmitting, by the server, the second remote control identifier to the second remote control; and

storing, in the data repository, an association between the second remote control identifier and the session.

8. The method of claim **7**, wherein the message that identifies the session was generated by the second remote control based on a quick reference (QR) code associated with the session, the QR code being displayed by one of the at least one controlled devices.

9. The method of claim **1**, wherein the remote control sends and receives messages via a network, and wherein the at least one controlled device sends and receives messages via a different network.

10. The method of claim **1**, wherein the controlled device is a network-enabled television.

11. The method of claim **1**, wherein the controlled device is a set-top box connected to a television.

12. The method of claim **1**, wherein the remote control is a web-enabled cellular telephone.

13. The method of claim **1**, wherein the first message and second message follow Hypertext Transfer Protocol (HTTP) protocol.

14. The method of claim **1**, wherein the server is a cloud based network server.

15. A non-transitory computer-readable storage medium encoded with instructions for causing one or more programmable processors of a computing device to:

receive a request from a remote control to establish a session for communication with one or more controlled devices, wherein the remote control comprises an electronic device;

responsive to receiving the request from the remote control, assign a remote control identifier that uniquely identifies the remote control, wherein the remote control identifier is associated with the session;

transmit the remote control identifier to the remote control;

receive, from a first controlled device of the one or more controlled devices, a request to join the session for communication with the remote control;

responsive to receiving the request from the first controlled device, assign a controlled device identifier to the first controlled device, wherein the controlled device identifier uniquely identifies the first controlled device and is associated with the session;

prior to receiving messages containing the controlled device identifier, send, to the first controlled device, the controlled device identifier;

receive, a first message from the remote control, wherein the first message includes the remote control identifier, and control information for controlling one or more functions of at least one of the one or more controlled devices;

retrieve at least one controlled device identifier associated with the session from a data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device; and

send a second message to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message is based on the first message and includes the control information to control an operation of the at least one controlled device.

16. A computing device, comprising:

a data repository configured to store data; and

one or more processors configured to:

receive a request from a remote control to establish a session for communication with one or more controlled devices, wherein the remote control comprises an electronic device;

responsive to receiving the request from the remote control, assign a remote control identifier that uniquely identifies the remote control, wherein the remote control identifier is associated with the session;

transmit the remote control identifier to the remote control;

receive, from a first controlled device of the one or more controlled devices, a request to join the session for communication with the remote control;

responsive to receiving the request from the first controlled device, assign a controlled device identifier to the first controlled device, wherein the controlled device identifier uniquely identifies the first controlled device and is associated with the session;

prior to receiving messages containing the controlled device identifier, send, to the first controlled device, the controlled device identifier;

receive a first message from the remote control, wherein the first message includes the remote control identifier, and control information for controlling one or more functions of at least one of the one or more controlled devices;

retrieve at least one controlled device identifier associated with the session from the data repository based on the remote control identifier, wherein the at least one controlled device identifier uniquely identifies at least one controlled device; and

send a second message to the at least one controlled device identified by the at least one controlled device identifier, wherein the second message is based on the first message and includes the control information to control an operation of the at least one controlled device.

17. The method of claim **1**, further comprising:

determining, by the sever upon receiving the first message, whether the remote control is an authorized member of the session.

18. The method of claim **17**, wherein the server determines whether the remote control is an authorized member of the session based on Hypertext Transfer Protocol header information.

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