

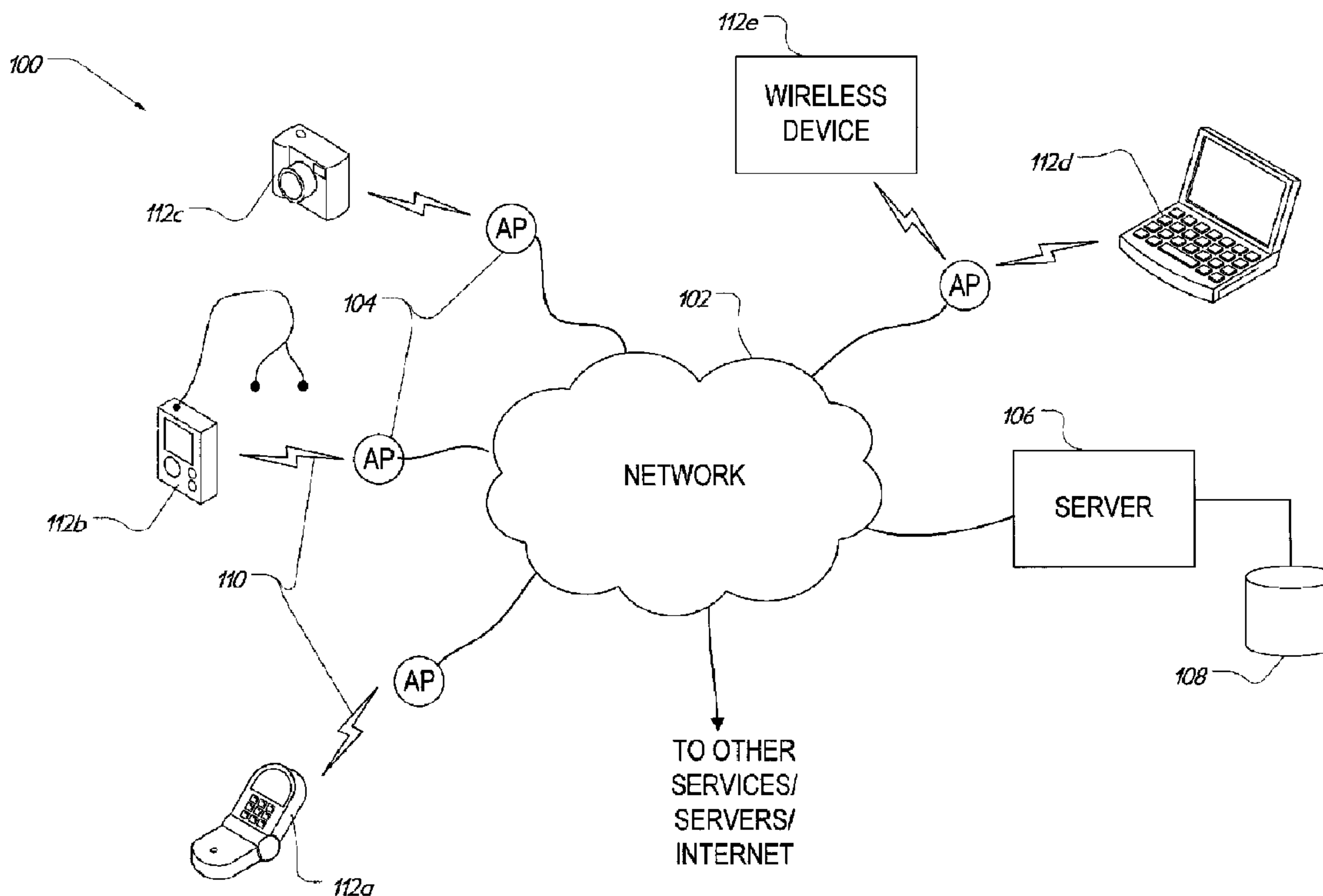


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(54) **Titre : ENREGISTREMENT DE DISPOSITIF SANS FIL, TEL QU'UN ENREGISTREMENT AUTOMATIQUE D'UN DISPOSITIF WI-FI**

(54) **Title: WIRELESS DEVICE REGISTRATION, SUCH AS AUTOMATIC REGISTRATION OF A WI-FI ENABLED DEVICE**



(57) **Abrégé/Abstract:**

A system for providing a wireless device with access to a computer network includes an access point that sets up a radio link with the wireless device and couples the wireless device to the network. The system also includes a server that receives data packets from the access point through the computer network. The data packets include at least one data packet that has a first identifier that uniquely identifies the wireless device and a second identifier that corresponds to at least one of a manufacturer code or a vendor code of the wireless device. The system further includes a database that is coupled to the server and stores data for associating a service plan with the first and second identifiers and basing the service plan, at least in part, on the second identifier. Other features and systems are also disclosed.

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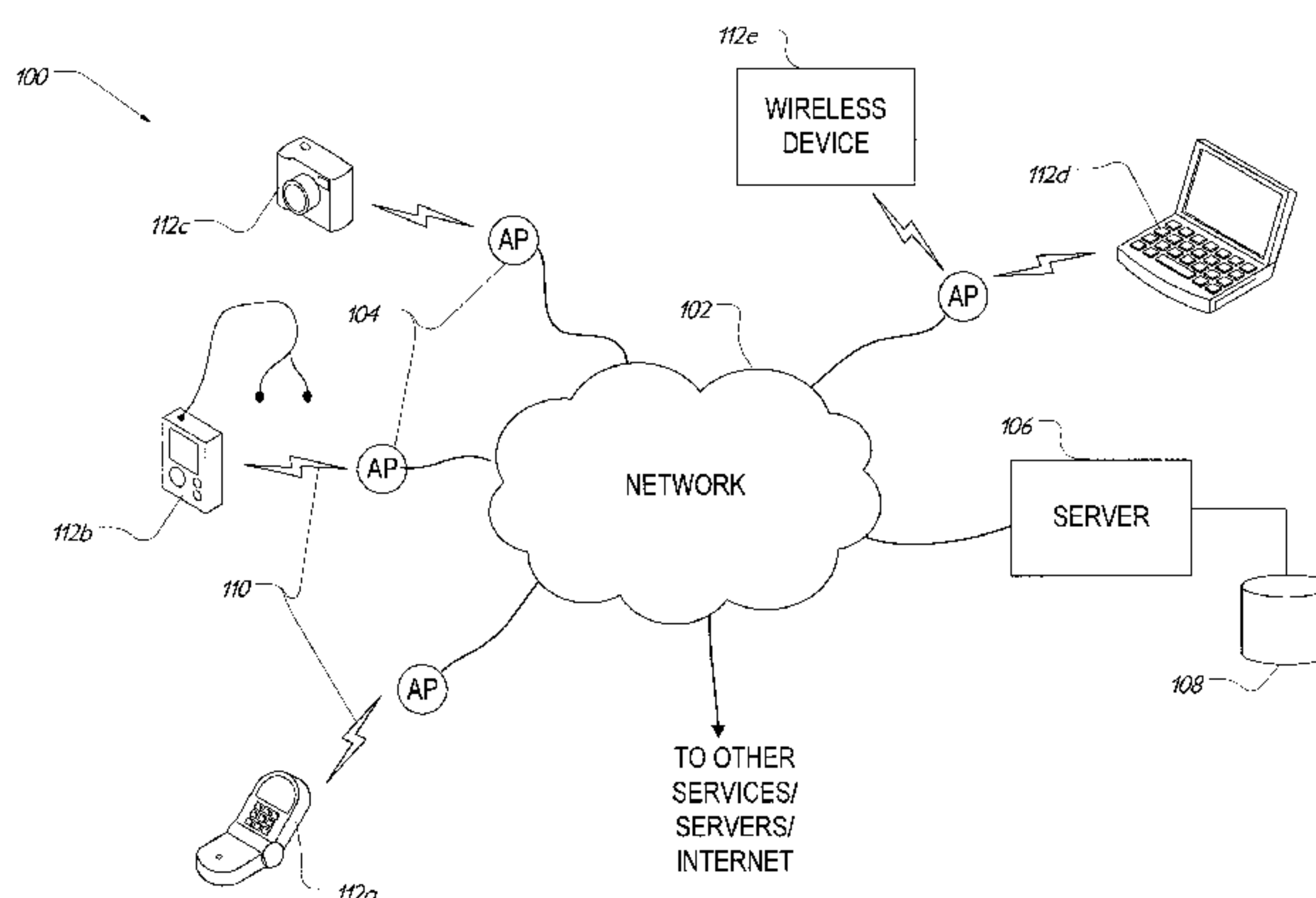
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## WIRELESS DEVICE REGISTRATION, SUCH AS AUTOMATIC REGISTRATION OF A WI-FI ENABLED DEVICE

### BACKGROUND

**[0002]** Wireless local area networks (WLAN), and wireless wide area networks (WWAN), are becoming increasingly available in most metropolitan and some suburban areas. These wireless networks operate under a variety of standards, including IEEE 802.11 (including 802.11(a), (b) and (g), often referred to as "Wi-Fi") and IEEE 802.16 (often referred to as "WiMax"). A user with a laptop and wireless connection can readily gain access the Internet or other networks via such hot spots.

**[0003]** A laptop must typically register with a WLAN or WWAN service provider, Wireless Internet Service Provider (WISP), or other service providers so as to gain desired network access. To do so, the user provides a user name and password which identifies the user. However, this information does not identify the wireless device accessing the network. Prior systems have used http clients or user agents to identify devices, such as by type of browser. These methods are not secure. Further, they may not positively identify the device connected to the network. For example, identifiers such as Media Access Control (MAC) addresses often have arbitrary (yet unique) values that cannot be readily looked up (e.g., in a database) due to a multitude of component sources and further, are readily changeable in most devices. Moreover, if multiple rate plans are associated with the user or device, these plans cannot be readily associated with the user or device without additional information, and if so, could be prone to

being hacked or otherwise compromised by malicious activity. For example, the IP address of a particular device can be "spoofed."

**[0002]** The above examples of some related systems and associated limitations are intended to be illustrative and not exclusive. Other limitations of existing prior systems will become apparent to those skilled in the art upon reading the following Detailed Description. Overall, there is a need for a system that overcomes the above problems as well as provides additional benefits.

## SUMMARY

**[0004a]** In accordance with an aspect of an embodiment, there is provided a system for providing a wireless device with access to an Internet Protocol (IP) based computer network, the system comprising: an access point that sets up, at least in part, a radio link with a wireless device, wherein the radio link couples the wireless device to the computer network through the access point, and wherein the setup being performed without user input at the wireless device; a server that receives data packets from the access point through the computer network, wherein the receiving is performed without user input at the wireless device, and wherein the data packets including at least one data packet that has a first identifier that uniquely identifies the wireless device and a second identifier that corresponds to 1) a manufacturer code of the wireless device, 2) a vendor code of the wireless device, or 3) both 1) and 2); and, a computer readable medium having stored thereon a database coupled to communicate with the server and store data that associates a service plan with the first and second identifiers, wherein the communicating and storing are performed without user input at the wireless device, wherein the service plan is based, at least in part, on the second identifier, wherein the service plan is for wireless access to the IP based computer network and not to a cellular phone network, wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan and wherein the association of the service plan is not performed based on use of a subscriber identity module (SIM) associated with the wireless device.

**[0004b]** In accordance with another aspect of an embodiment, there is provided a method for providing a wireless device with Wi-Fi access to a computer network, the method comprising: receiving a message regarding a request from a wireless device for access to the computer network, wherein the message includes a device identifier and a Wi-Fi service identifier, wherein the Wi-Fi service identifier is based on an embedded code in a memory of the wireless device; associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein the associating is initiated automatically, and wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan; automatically associating the device identifier with the Wi-Fi service plan; and authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and wherein the authenticating is performed without user input at the wireless device.

**[0004c]** In accordance with yet another aspect of an embodiment there is provided a tangible computer-readable storage medium having stored therein instructions which cause at least one computer to perform a method for activating a service plan for accessing a wireless packet-switched computer network, including a wireless local area network (WLAN), a wireless wide area network (WWAN), and/or a wireless metropolitan area network (WMAN), the method comprising: receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein the first data packet includes a wireless service identifier corresponding to an embedded code of a wireless device that is in wireless communication with the first access point, and wherein the first data packet also includes a unique device identifier corresponding to the wireless device; identifying a wireless service plan based on the service identifier, wherein the identifying is initiated without user input at the wireless device, and wherein the service plan is a temporary wireless service plan; associating the identified wireless service plan with the device identifier, wherein the associating is initiated without user input at the wireless device; and communicating to the first access point a second data packet that enables the

wireless device to access the WLAN, WWAN, and/or WMAN under the identified wireless service plan, wherein the WLAN, WWAN, and WMAN are not mobile telephone networks, and wherein the communicating is initiated without user input at the wireless device.

**[0004d]** In accordance with yet another aspect of an embodiment there is provided a wireless device, comprising: a wireless communication component configured to communicate over a wireless packet-based computer network; a memory storing a group identifier, wherein the group identifier is associated with a manufacturer of the wireless device, a resell of the wireless device, a vendor of the wireless device, a model of the wireless device, or a service plan, wherein the associating is initiated without user input at the wireless device, wherein the service plan is for wireless access to the IP based computer network and not to a cellular phone network, wherein the service plan is a temporary wireless service plan; and at least one processor coupled to communicate with the wireless communication component and the memory, wherein the communication is initiated without user input at the wireless device, wherein the memory stores processing instructions executable by the processor to initiate a set-up wireless data transmission that includes the unique device identifier and the group identifier, wherein the set-up wireless data transmission requests access to the wireless packet-based computer network, and wherein access to the wireless packet-based computer network is based at least in part on the group identifier.

**[0004e]** In accordance with yet another aspect of an embodiment there is provided an apparatus configured for activating a service plan for accessing a wireless packet-switched computer network, including a wireless local area network (WLAN), a wireless wide area network (WWAN), and/or a wireless metropolitan area network (WMAN), the apparatus comprising: means for receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein the first data packet includes a wireless service identifier corresponding to an embedded code of a wireless device that is in wireless communication with the first access point, and wherein the first data packet also includes a unique device identifier corresponding to the wireless device; means, coupled to the means for receiving, for identifying a wireless service plan based on the service identifier, wherein the identifying a

wireless service plan is performed without user input at the wireless device, and wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan; means, coupled to the means for identifying, for associating the identified wireless service plan with the device identifier, wherein the associating the identified wireless service plan with the device identifier is performed without user input at the wireless device; and means, coupled to the means for associating, for communicating to the first access point a second data packet that enables the wireless device to access the WLAN, WWAN, and/or WMAN under the identified wireless service plan, wherein the communicating to the first access point is performed without user input at the wireless device, and wherein the WLAN, WWAN, and WMAN are not mobile telephone networks.

**[0004f]** In accordance with yet another aspect of an embodiment there is provided a system for providing a wireless device with access to an Internet Protocol (IP) based computer network, the system comprising: a server that receives data packets from an access point through the computer network, wherein a radio link couples the wireless device to the computer network through the access point, wherein the receiving is performed without user input at the wireless device, and wherein the data packets include at least one data packet that has a first identifier that uniquely identifies the wireless device and a second identifier that corresponds to 1) a manufacturer code of the wireless device, 2) a vendor code of the wireless device, 3) a type of data or a data payload type associated with the wireless device, 4) a model or device code associated with the wireless device, 5) a location or venue currently associated with the wireless device, or 6) two or more of 1) through 5); and, a computer readable medium having stored thereon a database coupled to communicate with the server and store data that associates a service plan with the first and second identifiers, wherein the communicating and storing are performed without user input at the wireless device, wherein the service plan is based, at least in part, on the second identifier, wherein the service plan is for wireless access to the IP based computer network and not to a cellular phone network, wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan, and wherein the association of the service plan is not

association of the service plan is not performed based on use of a subscriber identity module (SIM) associated with the wireless device.

**[0004g]** In accordance with yet another aspect of an embodiment there is provided a method for providing a wireless device with Wi-Fi access to a computer network, the method comprising: receiving a message regarding a request from a wireless device for access to the computer network, wherein the message includes a device identifier and a Wi-Fi service identifier, wherein the Wi-Fi service identifier corresponds to a variable characteristic associated with the wireless device; associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein the associating is initiated automatically, wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan, and wherein the service plan is for wireless access to the IP based computer network and not to a cellular phone network; automatically associating the device identifier with the Wi-Fi service plan; and authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and wherein the authenticating is performed without user input at the wireless device.

**[0004h]** In accordance with yet another aspect of an embodiment there is provided a non-transitory computer-readable storage medium whose contents cause at least one computer to perform a method for activating a service plan for accessing a wireless packet-switched computer network, including a wireless local area network (WLAN), a wireless wide area network (WWAN), and/or a wireless metropolitan area network (WMAN), the method comprising: receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein the first data packet includes a wireless service identifier corresponding to a variable characteristic associated with a wireless access device; and wherein the first data packet also includes a unique device identifier corresponding to the wireless device; identifying a wireless service plan based on the service identifier, wherein the identifying is initiated without user input at the wireless device, and wherein the service plan is a temporary wireless

service plan; associating the identified wireless service plan with the device identifier, wherein the associating is initiated without user input at the wireless device; and communicating to the first access point a second data packet that enables the wireless device to access the WLAN, WWAN, and/or WMAN under the identified wireless service plan, wherein the WLAN, WWAN, and WMAN are IP based computer networks and are not mobile telephone networks, and wherein the communicating is initiated without user input at the wireless device.

**[0004i]** In accordance with yet another aspect of an embodiment there is provided a method for providing a wireless device with Wi-Fi access to a computer network, the method comprising: receiving a message regarding a request from a wireless device for access to the computer network, wherein the message includes a device identifier and a Wi-Fi service identifier; associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein the associating is initiated automatically, wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan, and wherein the service plan is a common rate plan for allowing two or more wireless devices that belong to a predefined group of wireless devices to wirelessly access the IP based computer network and not to wirelessly access a cellular phone network; automatically associating the device identifier with the Wi-Fi service plan; and authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and wherein the authenticating is performed without user input at the wireless device.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0005]** Figure 1 is a block diagram illustrating a system for providing various wireless devices with access to a wireless network under aspects of the invention.

**[0006]** Figure 2 is a block diagram illustrating an example of a wireless device for use in the system of Figure 1.

**[0007]** Figure 3 is a flow diagram illustrating an example of a routine performed by a wireless device and network server for providing wireless network access under the system of Figure 1.

**[0008]** Figure 4 is an example of a data structure or table employed by the network server under the system of Figure 1.

**[0009]** Figure 5 is a table showing an example of header fields that may be employed in one or more data packets communicated to the network server under the system of Figure 1.

## DETAILED DESCRIPTION

**[0010]** As described in detail below, systems and associated methods embed or provide one or more codes within wireless enabled or wireless access devices, where the codes identify a vendor or manufacturer and/or a device or model. The codes may be transmitted securely to a wireless access point and used by a network server (with associated database) to authorize and establish wireless service under an appropriate account. Any of a variety of wireless devices or wireless enabled components can be employed, for example, as a Wi-

Fi enabled camera, wireless MP3/audio device, as well as traditional wireless devices such as laptops or mobile phones.

**[0011]** Notably, various classes of service can be associated with each device, manufacturer, venue, or data payload. For example, devices from a particular manufacture may receive a preferred service plan having a preferred rate. Alternatively or additionally, all wireless cameras owned by a particular individual may receive a preferred rate plan regardless of the manufacturer. Alternatively or additionally, users may receive different rate plans depending upon the venue or location, such as a per minute plan in airports, train stations, and the like, but different rate plans, such as hourly or daily at hotels, convention centers, etc. Alternatively or additionally, different types of data or data payload type may receive different rate plans, such as voice traffic (e.g., voice over IP (VoIP)) receiving a different rate plan than wirelessly accessed video or audio/music content.

**[0012]** Under the suitable system described in detail herein, a Wi-Fi-, WiMax- or similarly-enabled device and compatible access point (AP) employ known communication protocols, such as Wireless Internet Service Provider (WISP) roaming, and a smart client interface, to permit secure transfer of information between the device and the AP. For example, HTTPS is used to encrypt or secure the manufacturer and model codes provided by the wireless device. The manufacturer and model codes can be securely stored in tamper-resistant memory of the device, and transmitted in header information provided by the device to the AP.

**[0013]** The network server employs the manufacturer and model codes, as well as possibly other information, to establish an appropriate WISP access account and rate plan. A unique Media Access Control (MAC) address uniquely identifies each device, and helps to uniquely identify each account in the database. (Of course, other unique identifiers or globally unique identifiers (GUID) may be used.) A timestamp can be added, which may be used to identify a starting point for trial access that may be provided for a limited time period, as well as identifying time for periodic automatic billings.

**[0014]** While “Wi-Fi” is used herein as an example, the system may employ any type of wireless protocol, including wireless local, wide and metropolitan area network (WLAN, WWAN, WMAN, respectively) access protocols. For example, wireless protocols can be based on any of the 802.11 IEEE standards. Some embodiments the system can employ Bluetooth, Ultra-wideband, WiMAX, or ZigBee protocols. Further, while a particular system employing wireless devices communicating with a network server via an AP and network (e.g. the Internet), other system configurations are possible. For example, a system can include a computer that provides a physical network link to the Internet and also provides a wireless bridge to a peripheral device (e.g., a wireless device or another computer).

**[0015]** Various examples of the invention will now be described. The following description provides specific details for a thorough understanding and enabling description of these examples. One skilled in the art will understand, however, that the invention may be practiced without many of these details. Additionally, some well-known structures or functions may not be shown or described in detail, so as to avoid unnecessarily obscuring the relevant description.

**[0016]** The terminology used in the description presented below is intended to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain specific examples of the invention. Certain terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this Detailed Description section.

**[0017]** Figure 1 and the following discussion provide a brief, general description of a suitable environment in which the invention can be implemented. Although not required, aspects of the invention are described in the general context of computer-executable instructions, such as routines executed by a general-purpose computer, e.g., a server computer, wireless device or personal computer. Those skilled in the relevant art will appreciate that the invention can be practiced with other communications, data processing, or computer system configurations, including: Internet appliances, hand-held devices (including

personal digital assistants (PDAs)), wearable computers, all manner of cellular or mobile phones, multi-processor systems, microprocessor-based or programmable consumer electronics, set-top boxes, network PCs, mini-computers, mainframe computers, and the like. Indeed, the terms "computer," "server," "host," "host system," and the like are generally used interchangeably herein, and refer to any of the above devices and systems, as well as any data processor.

**[0018]** Aspects of the invention can be embodied in a special purpose computer or data processor that is specifically programmed, configured, or constructed to perform one or more of the computer-executable instructions explained in detail herein. Aspects of the invention can also be practiced in distributed computing environments where tasks or modules are performed by remote processing devices, which are linked through a communications network, such as a Local Area Network (LAN), Wide Area Network (WAN), or the Internet. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

**[0019]** Aspects of the invention may be stored or distributed on computer-readable media, including magnetically or optically readable computer discs, hard-wired or preprogrammed chips (e.g., EEPROM semiconductor chips), nanotechnology memory, biological memory, or other data storage media. Indeed, computer implemented instructions, data structures, screen displays, and other data under aspects of the invention may be distributed over the Internet or over other networks (including wireless networks), on a propagated signal on a propagation medium (e.g., an electromagnetic wave(s), a sound wave, etc.) over a period of time, or they may be provided on any analog or digital network (packet switched, circuit switched, or other scheme).

**[0020]** Referring to Figure 1, a system 100 for providing a wireless device 112 with access to a computer network is shown. The system 100 includes a computer network 102, one or more APs 104, a server 106, and a database 108. While a single computer network 102 is shown in Figure 1, two or more networks may well be interposed between the wireless devices and the server 106, such as wireless LANs between the wireless devices and the APs, and one or more a wired networks between the APs and the server. The APs 104

set up, at least in part, radio links 110 between wireless devices 112a-d and the network 102. The server 106 (e.g., a Radius server or other type of authentication server) receives data packets from the APs 104 through the network 102. These data packets can be used, for example, to authenticate network access of one or more of the wireless devices 112a-e at an individual AP 104. Such packets can include a first identifier or unique device identifier for uniquely identifying a wireless device, such as a MAC address. In many embodiments, these packets also include at least a second identifier or a Wi-Fi service identifier that corresponds to a manufacturer or vendor code, model code, or both, embedded in the wireless device, as described herein. The database 108, in operation, stores data that associates a Wi-Fi service plan with the device and service identifiers. For example, the database 108 can associate a MAC address, vendor/model code, or both (or portions thereof) with a specific service plan that should be provided to any device made by a particular manufacturer. The server 102 can later identify the service plan that should be provided to each wireless device by looking up the MAC address in the database 108. Of course, as will be described below, other examples are possible.

**[0021]** In many embodiments, the wireless devices are Wi-Fi enabled devices without the capability to operate full function browsers. For example, Wi-Fi enabled devices can include a VoIP phone 112a, an mp3 player 112b, a digital camera 112c, a laptop computer 112d, or any other wireless device 112e. Of course any other types of Wi-Fi or wireless enabled devices are possible, such as those that include a card or other type of peripheral adapter for communicating with an AP and over the network 102. Also, in other embodiments, two or more Wi-Fi enabled devices can communicate at a common AP. For example, the laptop 110e and the other wireless device 110e are shown in Figure 1 as communicating with the same AP.

**[0022]** Referring to Figure 2, a simplified block diagram of wireless enabled device 212 is shown. The device 212 may be any wireless device, such as devices 112 of Figure 1. The device 212 includes one or more CPUs 220 (e.g., a processor), an input/output component 222, a Wi-Fi communication component 224, and a memory 230. The CPU 220 can coordinate

communications between the input/output component 222, the Wi-Fi component 224, and the memory 230. The input/output component 222 can include input devices such as keypads, touch screens, and other types of user input devices. The output component 222 can also include a graphical display or other type of output device for displaying data to a user, and/or audio output. The Wi-Fi component 224, in operation, can exchange data over a radio link with an AP. In many embodiments, the Wi-Fi component can also communicate with other devices that are configured to act as an AP or a Wi-Fi bridge (e.g., in an ad-hoc configuration).

**[0023]** In many embodiments, the memory 230 stores one or more unique device identifiers 232 and one or more Wi-Fi service identifiers 234. The device identifiers 232 can include, for example, a MAC address, a GUID or serial number, and/or a dynamically assigned IP address. In general, the unique identifier is an arbitrary yet unique value that is distinctive only to the particular device 206. The device identifiers can have values that are established by the manufacturer or vendor of the device 206 or by the manufacturer of a particular component within the device 112e. For example, manufacturers or vendors of the device 206 can program a unique identifier into the memory 230. Alternatively, a different manufacture who produces the memory 230 (e.g., before the device 212 is assembled) may set the value of the unique identifier.

**[0024]** The service identifiers 234, on the other hand, are not unique to the device 206. A service identifier is an embedded code that is programmed by the manufacturer or vendor of the device 212. In many embodiments, this code can directly correspond to the manufacturer or vendor of the device. Alternatively or additionally, the service identifier can be indicative of a device type (e.g., an mp3 player, a digital camera, or a VoIP phone) as well as a model type provided by a specific manufacturer or vendor. For example, the service identifier can refer to a specific model of digital camera, such as a 5 MegaPixel model or an 8 MegaPixel model.

**[0025]** The memory 230 can also store processing instructions that enable the CPU 220 to transmit the device and service identifiers over the Wi-Fi component 224. For example, the processing instructions may instruct the device

212 to identify a particular service set identifier (SSID) before establishing a radio link with an AP. Alternatively, the processing instructions may cause the device 212 to associate any Wi-Fi communications with an unbroadcasted SSID. In either of these examples, the SSID may be associated with a vendor of the device 212 and may only enable network access at APs that are provisioned by the vendor. The device 212 can transmit the Wi-Fi service identifier(s) in a secure or encrypted fashion, such as using secure socket layers (SSL), or other secure method.

**[0026]** Referring to Figure 3, a method 300 for providing a wireless device with access to computer network is shown. The depicted example, the method 300 can be used to set up a temporary account, such as a trial evaluation of a Wi-Fi service. In the method 300, network access is initiated by limited or virtually no user input of the wireless device. For example, a wireless device may automatically create a network connection when it is brought into range of an AP. Additionally or alternatively, the wireless device may create such a connection when it is powered on or when the user acknowledges a confirmation screen on a display of the wireless device.

**[0027]** Referring again to Figure 3, the method 300 first includes receiving a request from a wireless device that has a unique device identifier and a service identifier (block 302). The wireless device may first transmit these identifiers to an AP via a radio link. The AP may in turn transmit the device and service identifiers in a data packet to a server that is coupled to the AP (via a computer network). In many embodiments, the device and services identifier can be included in one or more header fields of such a data packet. If the device identifier is a MAC address, for example, it is automatically included in the header field.

**[0028]** After receiving a data packet, a server can determine whether the wireless device has an existing Wi-Fi service plan (block 304). For example, a server may use the device identifier to look up in a database whether the user of a particular wireless device has previously activated a service plan (or account) of the device. If a service plan has been activated, the server can determine whether this account is still active or if the account has expired (block 306). If the

account has not expired, the server can authorize the network access of the wireless device (block 308).

**[0029]** In contrast to conventional methods of wireless authentication, the authentication of method 300 is based, at least in part, on both the device and service identifiers of the wireless device. For example, the authentication process of mobile phone networks may use a device-swappable subscriber identify module (SIM) card. As a result, the same subscriber may be authenticated to a cellular network on one cell phone today, but later swap the SIM out and place it into another phone the next day. The authentication of method 300, however, uses a device identifier which is embedded into the permanent (e.g. non-removable and alterable) memory of the wireless device. In addition, because the wireless device is accessing an IP network and not a mobile phone network, the method 300 can also employ well established encryption techniques of IP based networks. For example, the header fields and the payload of the data packet may be encrypted (e.g., via HTTPS). In many examples, the data packet can also include the local IP address and/or a physical location of the wireless device. Accordingly, when the wireless device is authorized at the server, these measures may prevent spoofing and surreptitious access to a network. For example, the server can prevent playback attacks by receiving a locally and dynamically assigned TCP/IP address as a key within the service identifier (or other data field of a data packet). This key can be compared with another TCP/IP address that is conventionally associated with data packets as they are transmitted to the server from an AP near the wireless device. Such conventional TCP/IP addresses, for example, can also be located in a header field and could correspond to the physical location of a wireless device. If the dynamic TCP/IP address of the key does not correspond with an expected physical location of the conventional TCP/IP address (e.g. the conventional TCP/IP address of the wireless device indicates that it is in Los Angeles, but instead should be associated with Seattle), the server can deny authentication or access to a wireless service plan. In additional or alternative examples, the method 300 may also use known Wi-Fi based encryption techniques.

**[0030]** If the service plan has expired, the server can indicate to an AP that a wireless device should not have access to the network (block 310). Additionally or alternatively, the server can also provide instructions to the wireless device as to how to re-activate the account or create a new account. For example, the instructions can cause a display of a wireless device to display a customer service phone number or link to a web address to obtain a new account. If the service plan is initially a trial evaluation, the user may access customer services to set up a fee-based account.

**[0031]** Referring to block 312, if the wireless device does not have a service plan, the server identifies a service plan based on the service identifier. In many embodiments, the service plan and corresponding identifier can be based on the manufacturer or vendor of the wireless device. For example, a particular manufacturer or vendor of a digital camera may offer the free trial network access as an incentive to purchase the digital camera or as an incentive to later purchase wireless network access (as under block 310). The service provider can also work out an agreement with the manufacturer or vendor to include such a service identifier. In other examples, the service identifier includes a model or device type that is used in lieu of or in combination with manufacturer or vendor information. Further, in many examples, a fee structure and/or a level of quality of service may be based on a particular manufacture, vendor, model type, or device type. For example, a Wi-Fi enabled digital camera may have a lower rate service plan than a higher bandwidth consuming VoIP device.

**[0032]** Upon identifying a service plan, the service plan can be activated for the wireless device (block 314) and the server can authorize the network access of wireless device access at the AP (block 308). In many embodiments, activating the account includes associating the device identifier with the service plan (block 316). Activating the account may also include associating other types of identifiers with the account, such as a phone number, a user name, a billing address, etc. A user may be able to access the activated account, such as via an online browser. Accordingly, the user can view the service plan and/or modify features of the plan (e.g., billing rate, data plan, etc.). For example, a manufacturer or vendor can provide the user instructions for looking up the MAC

address (a device identifier) within a wireless address. This MAC address can then be used by the user or by customer service to access the particular service plan corresponding to the wireless device. Activating the account may also include storing a time stamp corresponding to the activation day in a database (block 318). Such a time stamp may correspond to the time and/or date at which the account was activated. When a predetermined amount of time elapses after this activation time, the service plan can be at least temporarily discontinued.

**[0033]** Referring to Figure 4, an example is shown of a table 400 with various fields as stored in a database in communication with the server. While the term "field" and "table" are used herein, any type of data structure or data object can be employed. For example, relevant data can have preceding headers, or other overhead data preceding (or following) the relevant data. Alternatively, relevant data can avoid the use of any overhead data, such as headers, and simply be recognized by a certain byte or series of bytes within a serial data stream. Data structures may conform to conventions of object oriented programming and/or to other types of programming techniques. Any number of data structures and types can be employed herein.

**[0034]** Table 400 shows a unique device identifier field 402, a Wi-Fi service identifier field 404, a Wi-Fi service plan field 406, and other credentials field 408, all of which can correspond to wireless devices 412a-g. For example, the unique identifier field 402 shows the type of identifier that a server uses to identify the wireless devices 412a-g. These fields also have sub-fields that may also store service plan specific values. The other credentials field 408, for example, includes values that correspond to whether an IP address should be used to prevent spoofing and other types of surreptitious access to a network. In one specific example, the digital camera 412a is manufactured by an electronics company that offers a trial 6 month service plan. The digital camera 412b, on the other hand, is not manufactured by this company and therefore its user does not qualify for the free trial user plan. In another example, the mp3 player 412c qualifies for a 3 month trial service plan based on its device type (and not its manufacturer or vendor). In yet another example, a service plan bases its quality of service on device type. In this example, the VoIP phone 412d receives a

higher quality of service than the laptop 412e. In yet another example, a service plan bases its rate on the type of vendor that supplies a wireless device. Accordingly, because the VoIP phone 412f is provided by a particular vendor that supplied the phone (i.e., Cellular Service Provider B), the service plan has a reduced rate relative to the VoIP phone 412g.

**[0035]** Referring to Figure 5, an example is shown of a table 500 that includes header fields 502, 504 corresponding to a data packet that may be sent to a server for Internet Service Provider roaming (WISPr) authentication. The header field 502 is a WISPr username having a default account identifier that can be stored, for example, in the memory of the wireless device. The header field 504 is a WISPr password that is an aggregate of a Wi-Fi service identifier, a flag parameter, a locally and/or dynamically network assigned IP address, a MAC address (i.e., a device identifier), and a default account password. In many examples, the default account and password can be updated to correspond with a user upon activation of a new account. Table 500 also shows example values that may be associated with the WISPr username and password fields 502, 504.

**[0036]** Many alternatives may be employed. In general, alternatives and alternative embodiments described herein are substantially similar to previously described embodiments, and common elements and functions are identified by the same reference numbers. Only significant differences in construction or operation are described in detail.

**[0037]** Under one alternative, a user may purchase a rate plan that allows that user to use any wireless device in a given set, category, class or family. For example, a user may purchase a rate plan that allows that user to use any Wi-Fi-enabled camera within the network. Near-field communications, such as Bluetooth, can be used to exchange manufacturer/model codes or other identifiers or keys between Wi-Fi devices, all of which would be usable under the common plan for that category of devices. The database and network server would track (and confirm) each device within the category.

**[0038]** Under another alternative, a mobile phone or similar device could be used to exchange device codes between authorized Wi-Fi devices. Therefore,

rather than use a manufacturer code among similar devices within a category (e.g., Wi-Fi cameras category), the mobile phone exports its phone number to each Wi-Fi device in the category. Those devices in turn add that phone number to their embedded manufacturer and model codes, which are then provided to the APs. The network server receives the manufacturer and model codes along with the phone number to associate those devices with a common plan and thereby enable a user to receive a single rate plan for multiple devices in a given category.

**[0039]** Under yet another alternative, a wireless device can include a peripheral attachment that associates device and service identifiers for a particular device. For example, a laptop can be coupled to a USB memory 'stick' for enabling VoIP communication. The USB stick may use the device identifier of the laptop (e.g., a MAC address) and associate its own service identifier with a Wi-Fi transmission that it communicates to an AP. It is also contemplated that such peripheral attachments could be exchanged to provide additional or alternative features. For example, a USB memory 'stick' could be swapped out with another USB memory 'stick' that offers a different quality of service or a different rate plan. The use of the peripheral attachment is an example only, and the above functionality can be implemented solely in software with appropriate security measure, such as encryption.

**[0040]** Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense, as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to." As used herein, the terms "connected," "coupled," or any variant thereof, means any connection or coupling, either direct or indirect, between two or more elements; the coupling of connection between the elements can be physical, logical, or a combination thereof. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application. Where the context permits, words in the above Detailed Description using the singular or plural number may also include the plural or singular number respectively. The

word "or," in reference to a list of two or more items, covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

**[0041]** The above detailed description of embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise form disclosed above. While specific embodiments of, and examples for, the invention are described above for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize. For example, while processes or blocks are presented in a given order, alternative embodiments may perform routines having steps, or employ systems having blocks, in a different order, and some processes or blocks may be deleted, moved, added, subdivided, combined, and/or modified to provide alternative or subcombinations. Each of these processes or blocks may be implemented in a variety of different ways. Also, while processes or blocks are at times shown as being performed in series, these processes or blocks may instead be performed in parallel, or may be performed at different times. Further any specific numbers noted herein are only examples: alternative implementations may employ differing values or ranges.

**[0042]** The teachings of the invention provided herein can be applied to other systems, not necessarily the system described above. The elements and acts of the various embodiments described above can be combined to provide further embodiments.

**[0043]** Aspects of the invention can be modified, if necessary, to employ the systems, functions, and concepts of the various references described above to provide yet further embodiments of the invention.

**[0044]** These and other changes can be made to the invention in light of the above Detailed Description. While the above description describes certain embodiments of the invention, and describes the best mode contemplated, no matter how detailed the above appears in text, the invention can be practiced in many ways. Details of the system may vary considerably in its implementation details, while still being encompassed by the invention disclosed herein. As noted

above, particular terminology used when describing certain features or aspects of the invention should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features, or aspects of the invention with which that terminology is associated. In general, the terms used in the following claims should not be construed to limit the invention to the specific embodiments disclosed in the specification, unless the above Detailed Description section explicitly defines such terms. Accordingly, the actual scope of the invention encompasses not only the disclosed embodiments, but also all equivalent ways of practicing or implementing the invention under the claims.

## CLAIMS

What is claimed is:

1. A method for providing a wireless device with Wi-Fi access to a computer network, the method comprising:

receiving a message regarding a request from a wireless device for access to the computer network, wherein the message includes a device identifier and a Wi-Fi service identifier, wherein the Wi-Fi service identifier is based on an embedded code in a memory of the wireless device;

associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein the associating is initiated automatically, and wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan;

automatically associating the device identifier with the Wi-Fi service plan; and

authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein:

the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and

the authenticating is performed without user input at the wireless device.

2. The method of claim 1 wherein the service identifier includes at least one of a manufacturer code, a vendor code, a model type, and a device type.

3. The method of claim 1 or 2, further comprising:

producing a time stamp corresponding to an activation time of the service plan; and

at least temporarily discontinuing the service plan when a predetermined amount of time elapses after the activation time.

4. A tangible computer-readable storage medium having stored therein instructions which cause at least one computer to perform a method for activating a service plan for accessing a wireless packet-switched computer network, including at

least one of a wireless local area network (WLAN), a wireless wide area network (WWAN), and a wireless metropolitan area network (WMAN), the method comprising:

receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein the first data packet includes a wireless service identifier corresponding to an embedded code of a wireless device that is in wireless communication with the first access point, and wherein the first data packet also includes a unique device identifier corresponding to the wireless device;

identifying a wireless service plan based on the service identifier, wherein the identifying is initiated without user input at the wireless device, and wherein the service plan is a temporary wireless service plan;

associating the identified wireless service plan with the device identifier, wherein the associating is initiated without user input at the wireless device; and

communicating to the first access point a second data packet that enables the wireless device to access the at least one of WLAN, WWAN, and WMAN under the identified wireless service plan, wherein the WLAN, WWAN, and WMAN are not mobile telephone networks, and wherein the communicating is initiated without user input at the wireless device.

5. The tangible computer-readable storage medium of claim 4 wherein at least one of the device identifier and the service identifier is located in one or more header fields of the first data packet.

6. The tangible computer-readable storage medium of claim 5 wherein at least a portion of the one or more header fields is encrypted.

7. The tangible computer-readable storage medium of any one of claims 4 to 6 wherein the method further includes:

comparing a locally and dynamically assigned TCP/IP address embedded as a key in the first data packet with another TCP/IP address associated with the first data packet and corresponding to a physical location of the wireless device; and

authenticating use of the identified wireless service plan based on the comparison of the locally and dynamically assigned TCP/IP address and the TCP/IP address corresponding to the physical location of the wireless device.

8. The tangible computer-readable storage medium of any one of claims 4 to 7 wherein the method further includes:

receiving a third data packet from a second access point coupled to the computer network, the third data packet including the device identifier, and being transmitted at a time when the wireless device is no longer accessing the computer network through the first access point;

identifying the identified wireless service plan based at least in part on the device identifier; and

communicating a fourth data packet to the second access point, the fourth data packet enabling the wireless device to re-access the computer network through the second access point.

9. The tangible computer-readable storage medium of any one of claims 4 to 8 wherein the method further comprises:

at least temporarily discontinuing the identified wireless service plan when a predetermined amount of time elapses after an activation of the identified wireless service plan; and

communicating to the wireless device a third data packet that includes at least one of an indication that the identified wireless service plan is discontinued, and an indication with instructions corresponding to re-activating the identified wireless service plan or activating a new wireless service plan.

10. The tangible computer-readable storage medium of any one of claims 4 to 9 wherein the temporary wireless service plan is a no-cost temporary wireless service plan.

11. An apparatus configured for activating a service plan for accessing a wireless packet-switched computer network, including at least one of a wireless local area network (WLAN), a wireless wide area network (WWAN), and a wireless metropolitan area network (WMAN), the apparatus comprising:

means for receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein the first data packet includes a wireless service identifier corresponding to an embedded code of a wireless device that is in wireless communication with the first access point, and wherein the first data packet also includes a unique device identifier corresponding to the wireless device;

means, coupled to the means for receiving, for identifying a wireless service plan based on the service identifier, wherein the identifying a wireless service plan is performed without user input at the wireless device, and wherein the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan;

means, coupled to the means for identifying, for associating the identified wireless service plan with the device identifier, wherein the associating the identified wireless service plan with the device identifier is performed without user input at the wireless device; and

means, coupled to the means for associating, for communicating to the first access point a second data packet that enables the wireless device to access the at least one of the WLAN, WWAN, and WMAN under the identified wireless service plan,

wherein the communicating to the first access point is performed without user input at the wireless device, and wherein the WLAN, WWAN, and WMAN are not mobile telephone networks.

12. The apparatus of claim 11 wherein the apparatus further comprises storage means for storing data structures that associate wireless service identifiers to wireless service plans.

13. A method for providing a wireless device with Wi-Fi access to a computer network, the method comprising:

receiving a message regarding a request from a wireless device for access to the computer network, wherein:

the message includes a device identifier and a Wi-Fi service identifier,  
and

the Wi-Fi service identifier corresponds to a variable characteristic associated with the wireless device,

associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein:

the associating is initiated automatically,

the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan, and

the service plan is for wireless access to the IP based computer network and not to a cellular phone network;

automatically associating the device identifier with the Wi-Fi service plan; and

authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein:

the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and

the authenticating is performed without user input at the wireless device.

14. The method of claim 13 wherein the variable characteristic is one of a device type, a location, a data type, and a data payload type associated with the wireless device.

15. The method of claim 14 wherein the variable characteristic is one of a data type and a data payload type corresponding to one of voice traffic, wirelessly accessed video, and audio content.

16. The method of any one of claims 13 to 15 wherein the service identifier is further based on at least one of a model type, a device type, a manufacturer code and a vendor code.

17. The method of any one of claims 13 to 16, further comprising:

producing a time stamp corresponding to an activation time of the service plan; and

at least temporarily discontinuing the service plan when a predetermined amount of time elapses after the activation time.

18. A non-transitory computer-readable storage medium whose contents cause at least one computer to perform a method for activating a service plan for accessing a wireless packet-switched computer network, including at least one of a wireless local area network (WLAN), a wireless wide area network (WWAN), and a wireless metropolitan area network (WMAN), the method comprising:

receiving a first data packet from a computer network that is coupled to the server and a first wireless access point, wherein:

the first data packet includes a wireless service identifier corresponding to a variable characteristic associated with a wireless access device, and

the first data packet also includes a unique device identifier corresponding to the wireless device;

identifying a wireless service plan based on the service identifier, wherein the identifying is initiated without user input at the wireless device, wherein the service plan is a temporary wireless service plan;

associating the identified wireless service plan with the device identifier, wherein the associating is initiated without user input at the wireless device; and

communicating to the first access point a second data packet that enables the wireless device to access the at least one of WLAN, WWAN, and WMAN under the identified wireless service plan, wherein the WLAN, WWAN, and WMAN are IP based computer networks and are not mobile telephone networks, and wherein the communicating is initiated without user input at the wireless device.

19. The non-transitory computer-readable storage medium of claim 18 wherein the variable characteristic is one of a device type or location, a data type and a data payload type, wherein the data type or data payload type correspond to voice traffic, wirelessly accessed video, or audio content.

20. The non-transitory computer-readable storage medium of claim 18 or 19 wherein at least one of the device identifier and the service identifier is located in one or more header fields of the first data packet.

21. The non-transitory computer-readable storage medium of any one of claims 18 to 20 wherein the method further includes:

comparing a locally and dynamically assigned TCP/IP address embedded as a key in the first data packet with another TCP/IP address associated with the first data packet and corresponding to a physical location of the wireless device; and

authenticating use of the identified wireless service plan based on the comparison of the locally and dynamically assigned TCP/IP address and the TCP/IP address corresponding to the physical location of the wireless device.

22. The non-transitory computer-readable storage medium of any one of claims 18 to 21 wherein the method further includes:

receiving a third data packet from a second access point coupled to the computer network, the third data packet including the device identifier, and being transmitted at a time when the wireless device is no longer accessing the computer network through the first access point;

identifying the identified wireless service plan based at least in part on the device identifier; and

communicating a fourth data packet to the second access point, the fourth data packet enabling the wireless device to re-access the computer network through the second access point.

23. The non-transitory computer-readable storage medium of any one of claims 18 to 22 wherein the method further comprises:

at least temporarily discontinuing the identified wireless service plan when a predetermined amount of time elapses after an activation of the identified wireless service plan; and

communicating to the wireless device a third data packet that includes at least one of an indication that the identified wireless service plan is discontinued, and an indication with instructions corresponding to re-activating the identified wireless service plan or activating a new wireless service plan.

24. A method for providing a wireless device with Wi-Fi access to a computer network, the method comprising:

receiving a message regarding a request from a wireless device for access to the computer network, wherein the message includes a device identifier and a Wi-Fi service identifier;

associating a Wi-Fi service plan with the wireless device based on at least the Wi-Fi service identifier, wherein:

the associating is initiated automatically,

the service plan is based on an amount of bandwidth that is consumable by the wireless device under the service plan, and

the service plan is a common rate plan for allowing two or more wireless devices that belong to a predefined group of wireless devices to wirelessly access the IP based computer network and not to wirelessly access a cellular phone network;

automatically associating the device identifier with the Wi-Fi service plan; and

authenticating wireless access between the wireless device and a Wi-Fi access point coupled to the computer network based on the Wi-Fi service plan, wherein:

the authenticating of the wireless access is not performed based on use of a subscriber identity module (SIM) associated with the wireless device, and

the authenticating is performed without user input at the wireless device.

25. The method of claim 24 wherein each of the wireless devices in the predefined group of wireless devices is owned by a common user, and wherein the predefined group of wireless devices includes at least a camera or an audio device.

26. The method of claim 24 or 25 wherein the wireless devices in the predefined group of wireless devices exchange one or more codes or identifiers to enable wireless access under the common rate plan.

27. The method of claim 26 wherein at least one code or identifier is a telephone number.

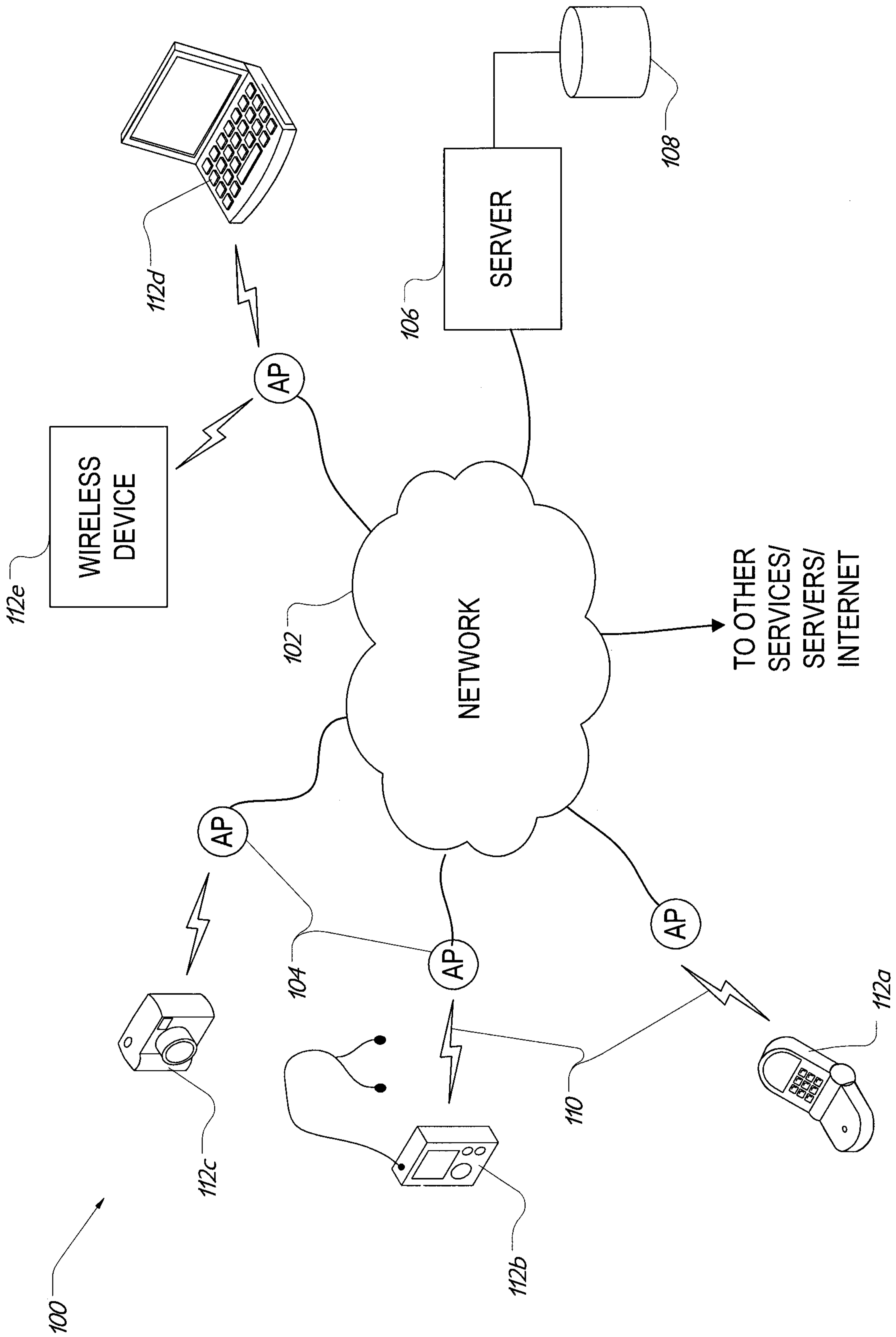


Fig. 1

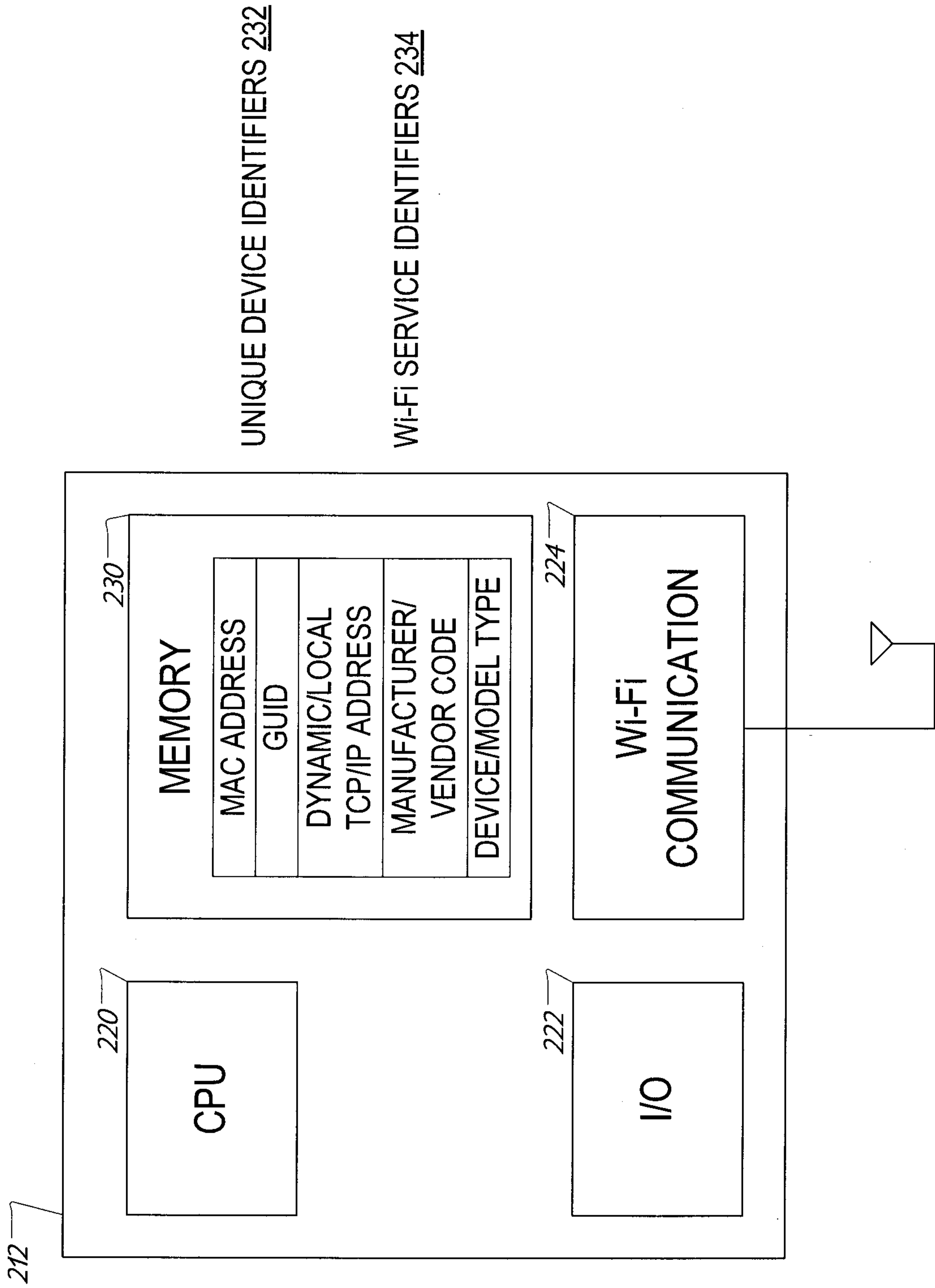
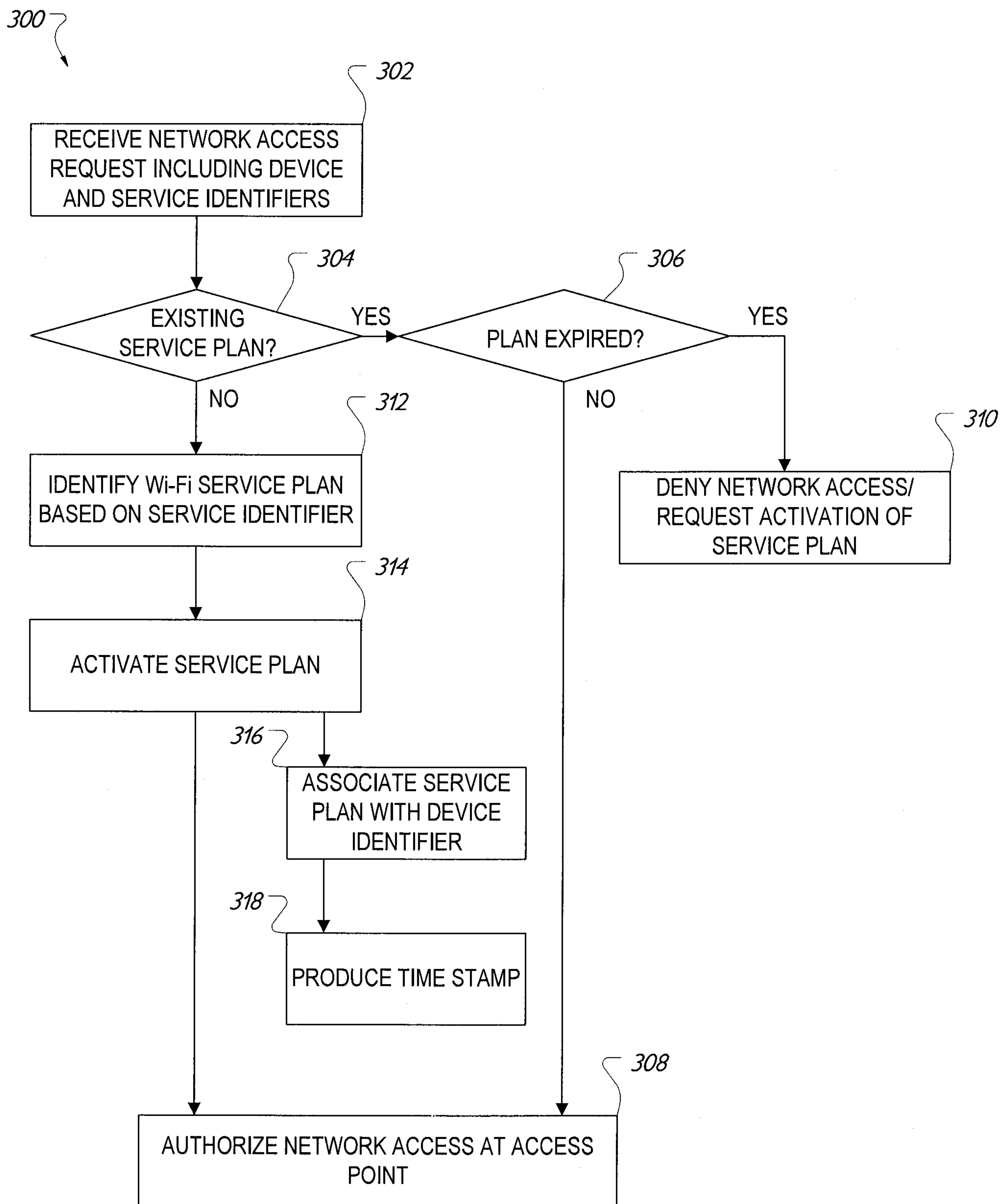


Fig. 2

*Fig. 3*

| UNIQUE DEVICE IDENTIFIER | WI-FI SERVICE IDENTIFIER       |                   | WI-FI SERVICE PLAN |      |                 | OTHER CREDENTIALS      |            |
|--------------------------|--------------------------------|-------------------|--------------------|------|-----------------|------------------------|------------|
|                          | MANUFACTURER/<br>VENDOR        | DEVICE/<br>MODEL  | RATE               | QoS  | OTHER           | TIME STAMP             | IP ADDRESS |
| MAC ADDRESS              | ELECTRONICS<br>COMPANY A       | DIGITAL<br>CAMERA | TRIAL              | -    | -               | 6 MONTH<br>TIME PERIOD | -          |
| MAC ADDRESS              | -                              | DIGITAL<br>CAMERA | FLAT               | -    | -               | -                      | -          |
| MAC ADDRESS              | -                              | .MP3 PLAYER       | TRIAL              | -    | -               | 3 MONTH<br>TIME PERIOD | -          |
| MAC ADDRESS              | -                              | VoIP PHONE        | FLAT               | HIGH | -               | -                      | -          |
| MAC ADDRESS              | -                              | LAPTOP            | FLAT               | MED  | -               | -                      | -          |
| GUID                     | CELLULAR SERVICE<br>PROVIDER B | VoIP PHONE        | FLAT               | -    | REDUCED<br>RATE | -                      | IDENTIFIED |
| GUID                     | -                              | VoIP PHONE        | FLAT               | -    | STAND.<br>RATE  | -                      | IDENTIFIED |

Fig. 4

500 ↗

502 ↗

504 ↗

| WISPr PASSWORD CONTENT   |  |                         |  |   |   |
|--|--|-------------------------|--|---|---|
| WISPr USER NAME  | SERVICE ID   | FLAG                    | IP ADDRESS   | MAC   | USER PASSWORD   |
| USERNAME<br><br>DEFAULT ACCOUNT NAME STORED AT THE DEVICE OR GENERATED BY THE SERVER | MANUFACTURER, VENDOR, DEVICE, AND/OR MODEL IDENTIFIER  | MAY HAVE VARIOUS VALUES | THE "DOT NOTATION" EXPRESSION OF THE IP ADDRESS CURRENTLY ASSIGNED TO THE DEVICE | ADDRESS CURRENTLY USED BY THE DEVICE EXPRESSED AS 12 HEXADECIMAL CHARACTERS | DEFAULT PASSWORD EITHER STORED OR MANUALLY ENTERED AT A PROMPT    |
| <u>EXAMPLE:</u><br><br><default>@provider.com  | <u>EXAMPLE:</u><br>SERVICE ID = 0123ABCDFGH<br>FLAG = ABC<br>IP ADDRESS = 10.1.2.3<br>MAC = 0123456789AB<br>PASSWORD = my password |                         |  |   |   |
|  |  |                         |  |   | WISPr PASSWORD = 0123ABCDFGH/ABC/10.1.2.3/0123456789AB/mypassword |

Fig. 5

