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(54) **EFFICIENT AND SECURE COMMUNICATION USING WIRELESS SERVICE IDENTIFIERS**

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(63) Continuation of application No. 16/817,896, filed on Mar. 13, 2020, now Pat. No. 11,074,615, which is a (Continued)

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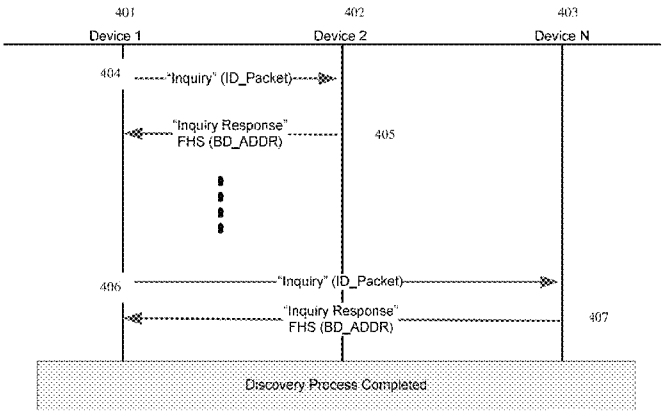
(57) **ABSTRACT**

Systems and methods are provided for reducing communications between servers and a mobile device and providing enhanced security and privacy to wireless beacon services. This can involve a broadcast device transmitting a beacon transmission using a short range wireless radio, such a Bluetooth or WiFi, and including a MAC address, a first unique identifier, and a beacon service identifier. The mobile device then selects one or more unique identifiers from received beacon transmissions, by filtering (that is, select-
(Continued)



802.15.1-2002 (Bluetooth V1.2) Device Discovery

ing) those beacon transmissions which include the beacon service identifier. The wireless device then takes further action, if the first unique identifier is present among the selected one or more unique identifiers, using stored information from the server. The stored information may be delivered to the wireless device in response to the wireless device sending the first unique identifier to a server, or the stored information may have been previously downloaded.

30 Claims, 14 Drawing Sheets

Related U.S. Application Data

continuation of application No. 15/271,410, filed on Sep. 21, 2016, which is a continuation of application No. 14/861,563, filed on Sep. 22, 2015, now abandoned, which is a continuation of application No. 14/472,477, filed on Aug. 29, 2014, now Pat. No. 9,161,164, which is a continuation of application No. 13/775,435, filed on Feb. 5, 2013, now Pat. No. 8,849,698, which is a continuation of application No. 13/212,723, filed on Aug. 18, 2011, now Pat. No. 8,385,896, which is a continuation of application No. 12/364,828, filed on Feb. 3, 2009, now Pat. No. 8,090,359.

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G06Q 30/06	(2012.01)
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H04L 67/54	(2022.01)
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G06Q 20/40	(2012.01)
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(58) **Field of Classification Search**

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See application file for complete search history.

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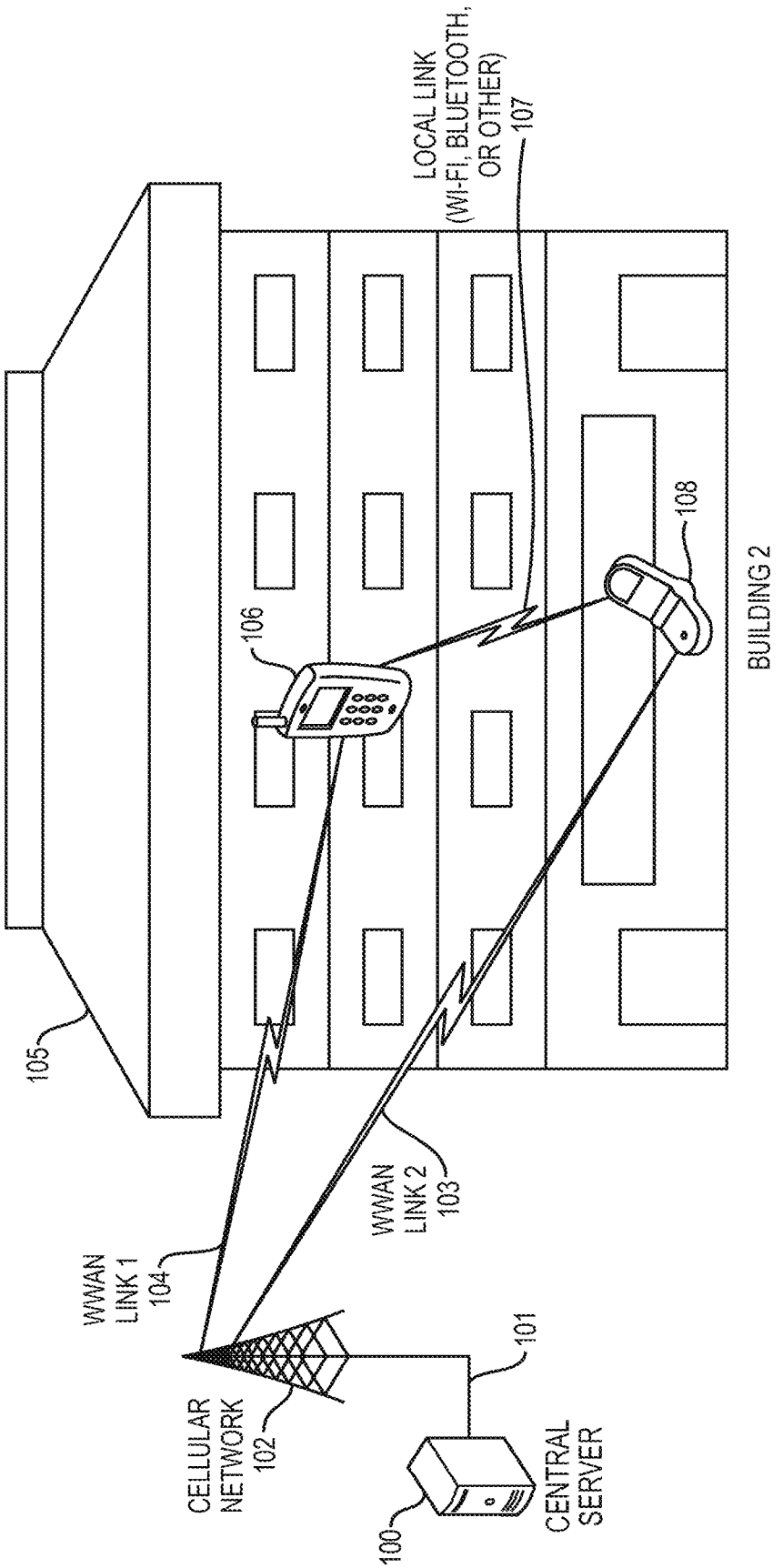

LOCAL LINK
(WI-FI, BLUETOOTH,
OR OTHER)
107
108
BUILDING 2
106
105
WWAN
LINK 2
103
WWAN
LINK 1
104
101
CELLULAR
NETWORK
102
CENTRAL
SERVER
100

Figure 1

Figure 2

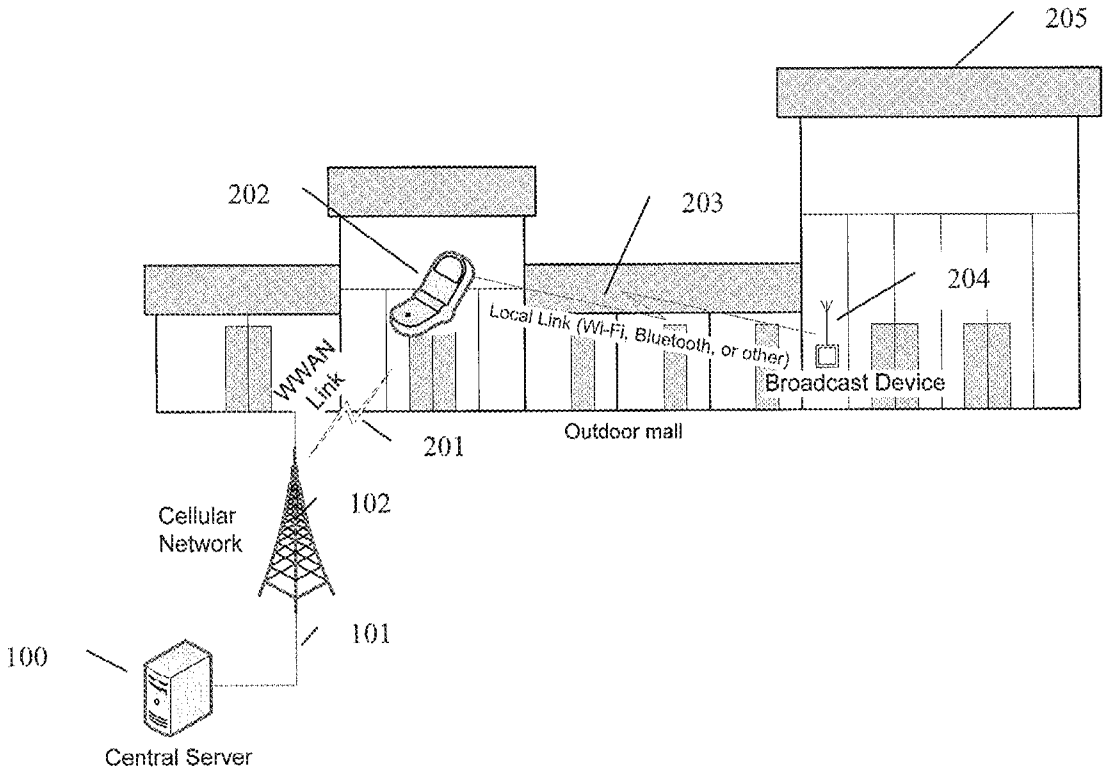
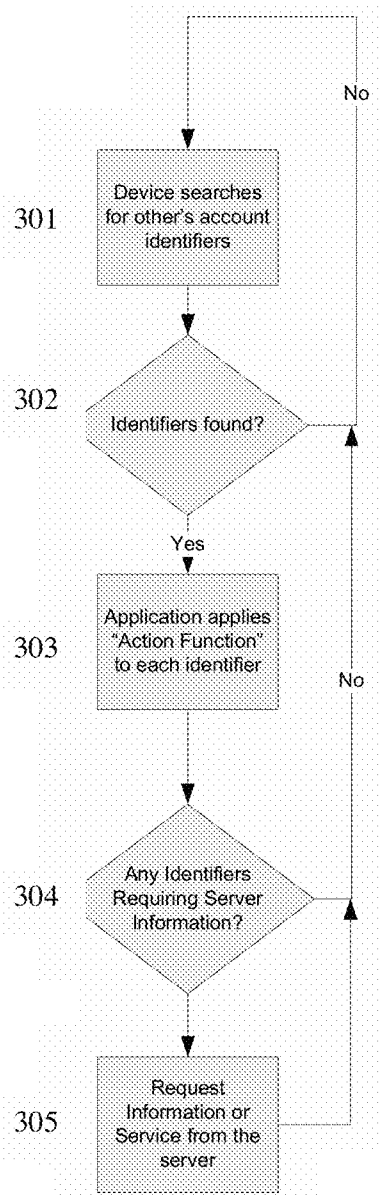

205
202
203
204
Local Link (Wi-Fi, Bluetooth, or other)
WWAN Link
Broadcast Device
Outdoor mall
201
Cellular Network
102
101
100
Central Server

Figure 3


No
301
Device searches for other's account identifiers
302
Identifiers found?
Yes
303
Application applies "Action Function" to each identifier
No
304
Any Identifiers Requiring Server Information?
305
Request Information or Service from the server

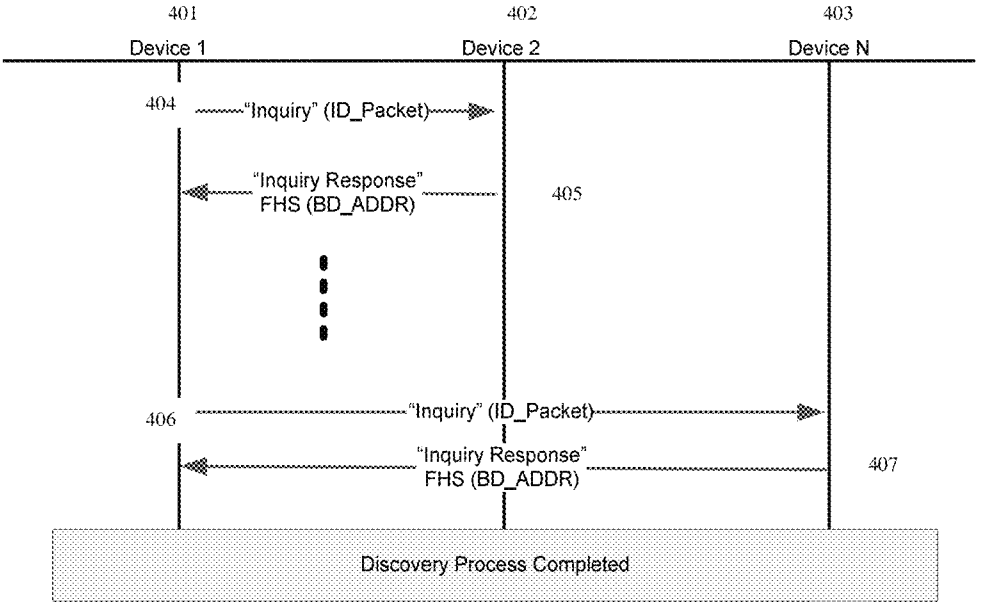


Figure 4 – 802.15.1-2002 (Bluetooth V1.2) Device Discovery

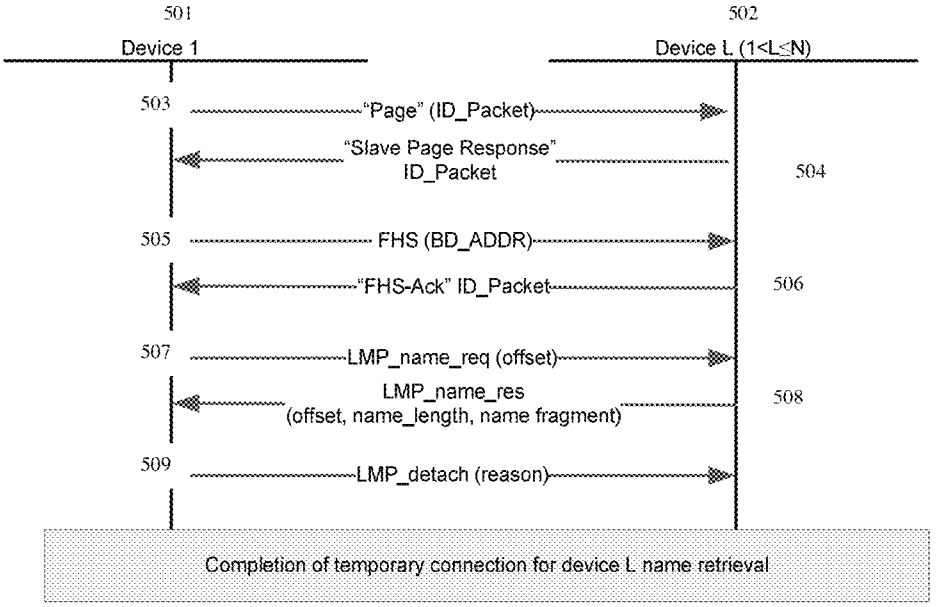


Figure 5 – 802.15.1-2002 (Bluetooth V1.2) Remote Name Request

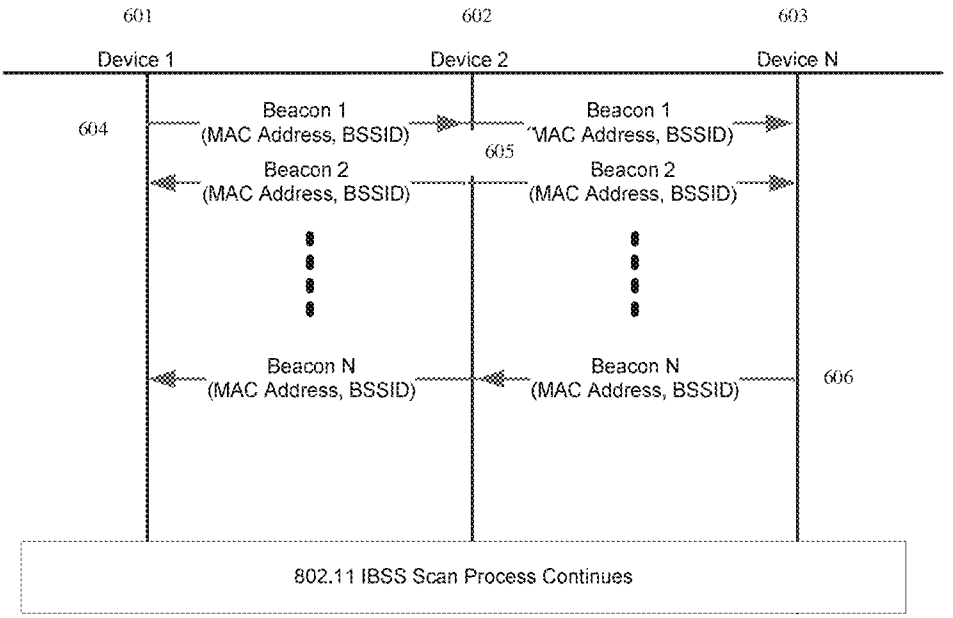


Figure 6 - 802.11 IBSS Beacon Process

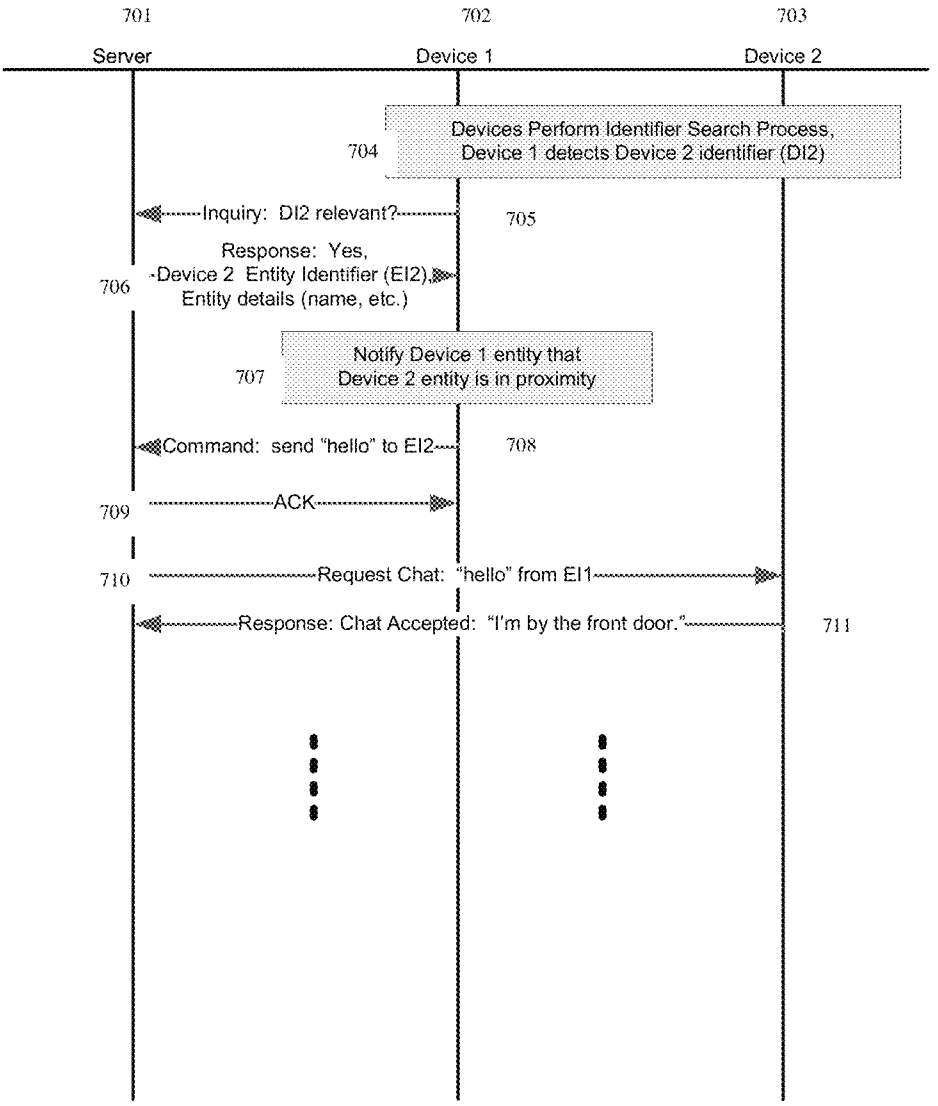


Figure 7 – Process of Detection and entering a Chat Session

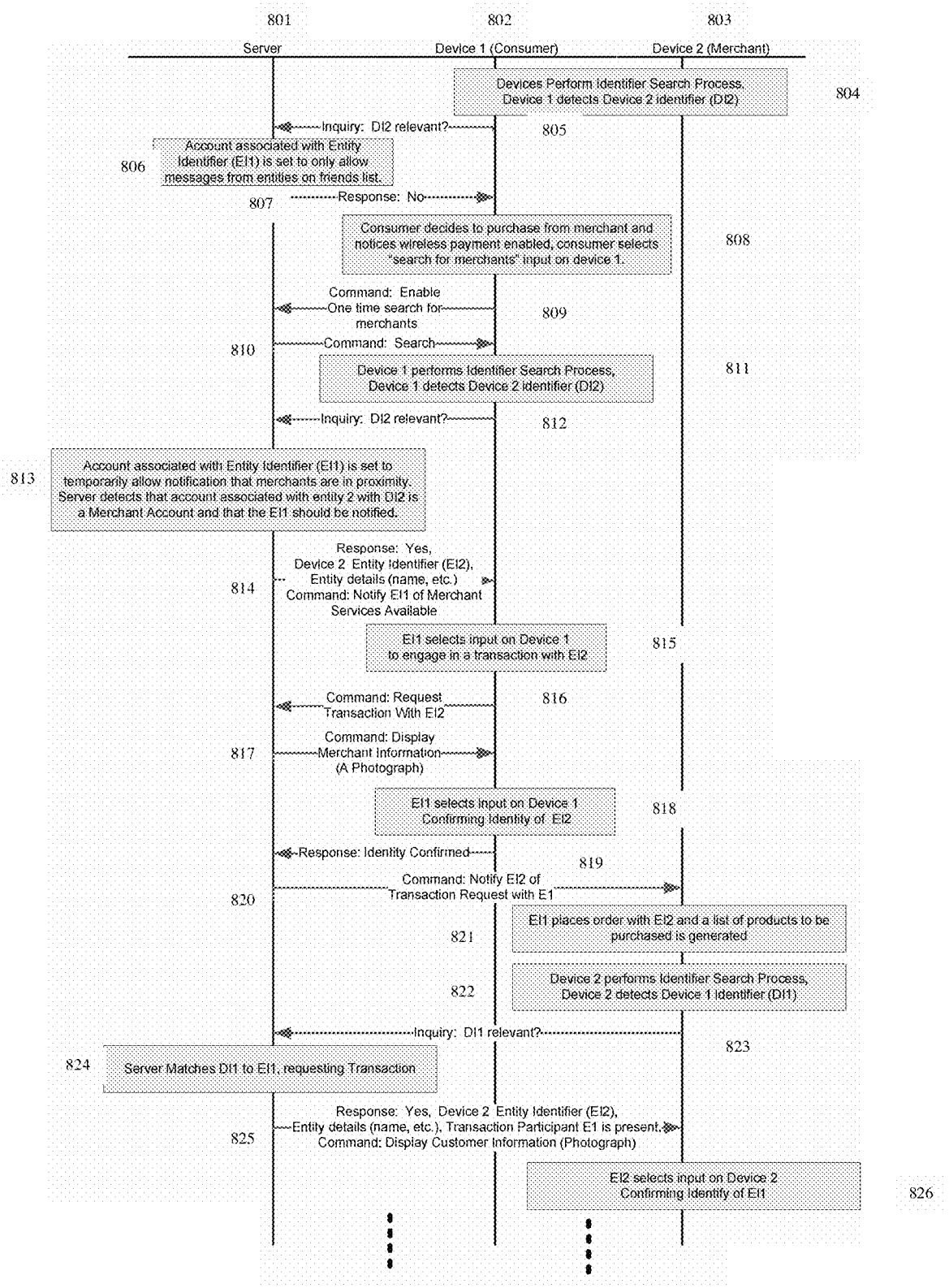
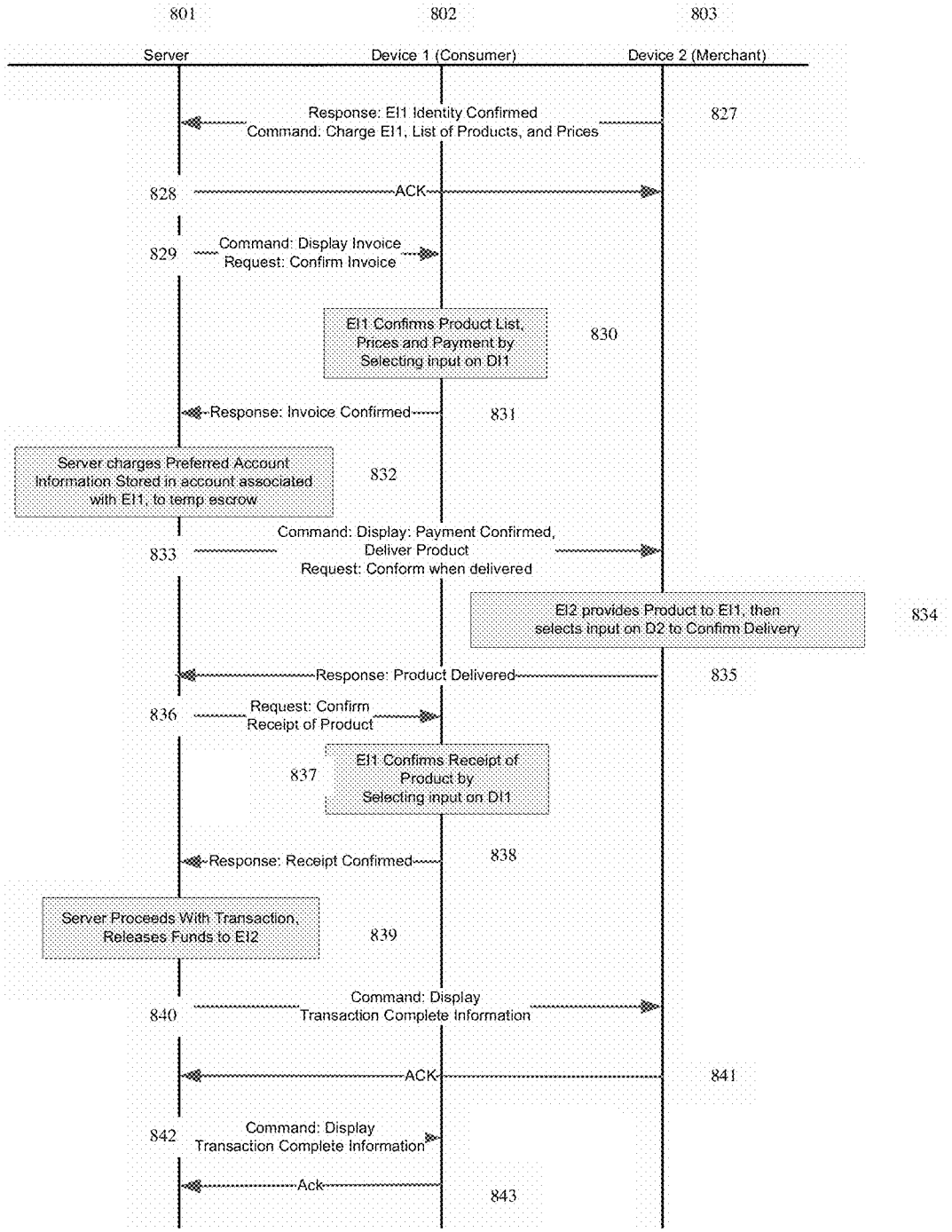


Figure 8A – E Commerce Process

Figure 8B – E Commerce Process Continued



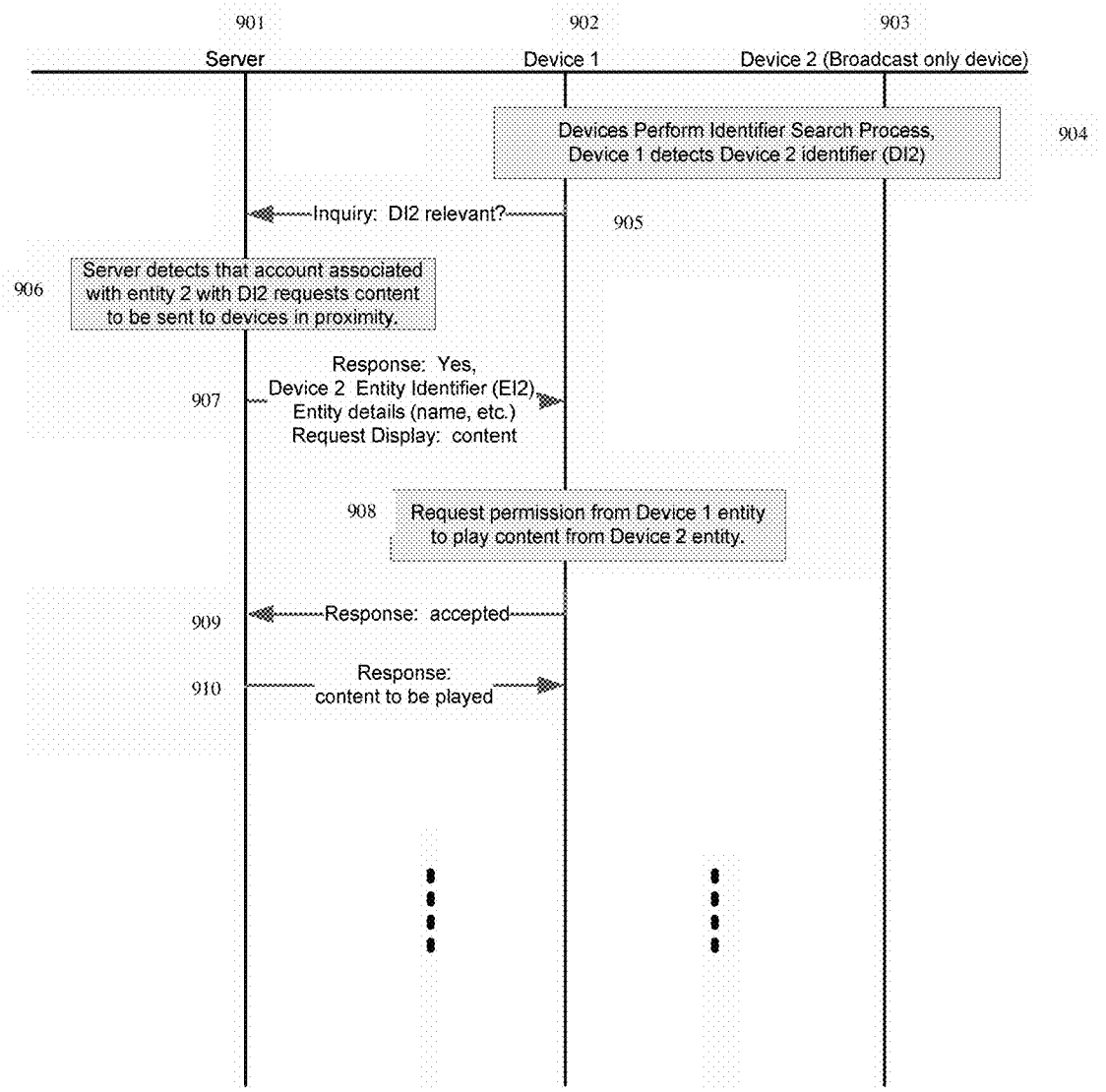


Figure 9 Broadcast and mobile device interaction

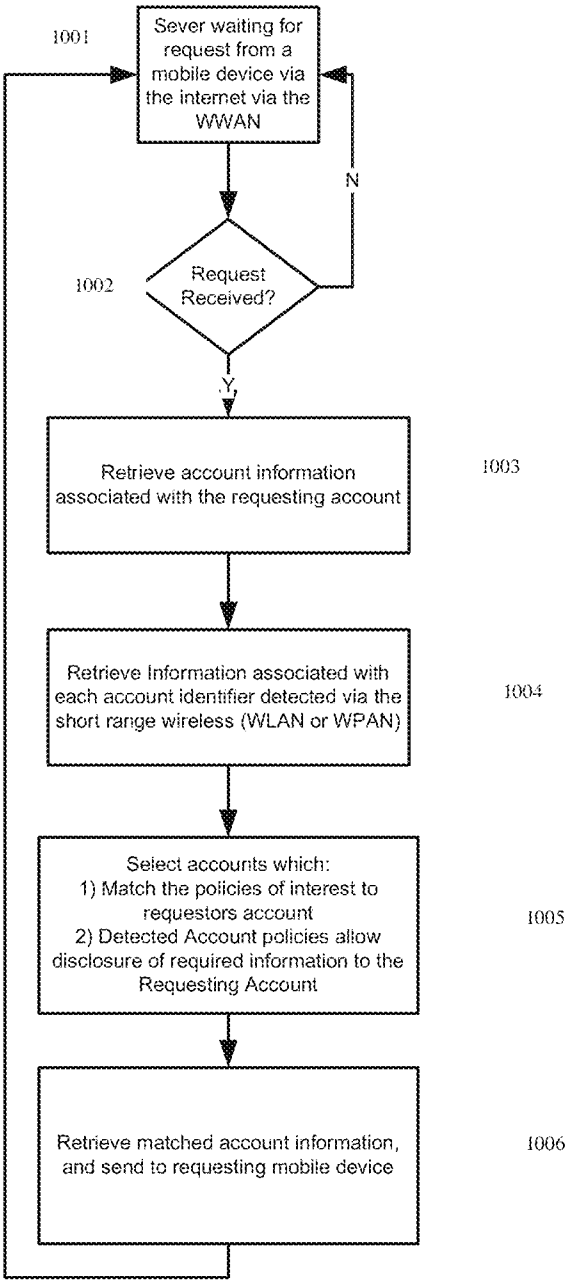


Figure 10 – Server Processing Example for Detected Device

Figure 11 – Example Individual Account Record associated with an Entity Stored in the Server

Record Index	Field	Field Information Group Disclosure Policy Assignments List
1	Account Number	[All, Explicit Approval, NONE, 1..N]
2	Identifier	
3	Identifier Type [Fixed MAC Address, Dynamic MAC Address, BSSID, Device Name]	
4	Number of Fields	
5	Field List	
6	Account User Name	NONE
7	Account Password	NONE
8	Entity Name	
9	Entity Address	
10	Entity Type [Individual, Merchant, Broadcast Entity]	
11	Billing Information	
12	Device Type	
13	Device IP Address	
14	Device SMS Phone Number	
15	Device Capabilities	
16	Entity AutoPlay Script 1	
17	Entity AutoPlay Script 2	
18	Detected AutoPlay Script 1	
19	Detected AutoPlay Script 2	
20	Entity Instant Message Address List	
21	Information Group Disclosure Policy 1 (IGDP#) [Characteristic 1 (C1), C2... CN, Friend List 1 (FL1), FL2, .. FLN, etc]	
22	Information Group Disclosure Policy 2	
23	Information Group Disclosure Policy 3	
24	Information Group Disclosure Policy 4	
25	Additional Personal Information Field 1 (APIF#) [Content Type/Content] (Picture, mp3, xml/AJAX, Text, Contact List, URL (MySpace, Facebook, Loopt), Login Credentials (MySpace, Facebook, Loopt, Itunes, etc.), Payment Information (Credit Card Information, PayPal Information, etc.), IM Credentials List (Username/Password))	
26	Additional Personal Information Field 2	
27	Additional Personal Information Field 3	
...		

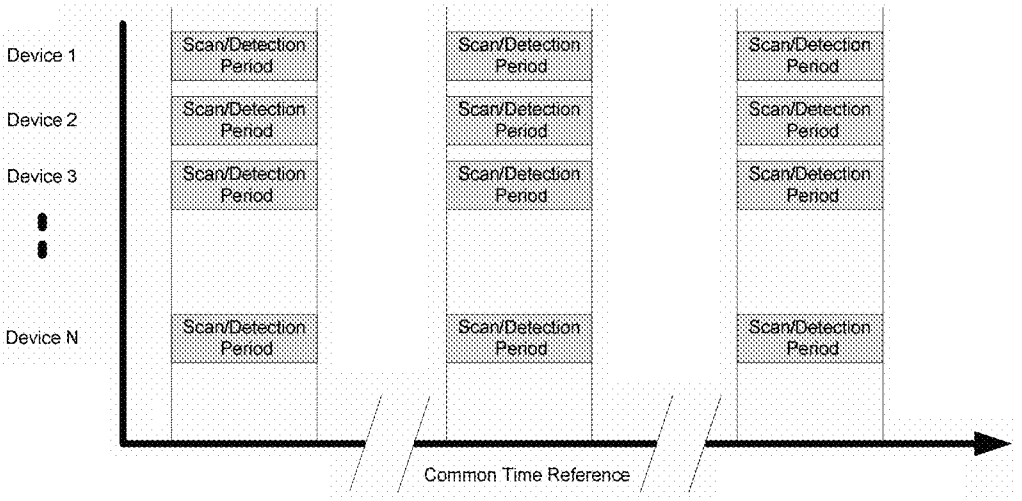


Figure 12 Use of common time reference for intermittent detection intervals

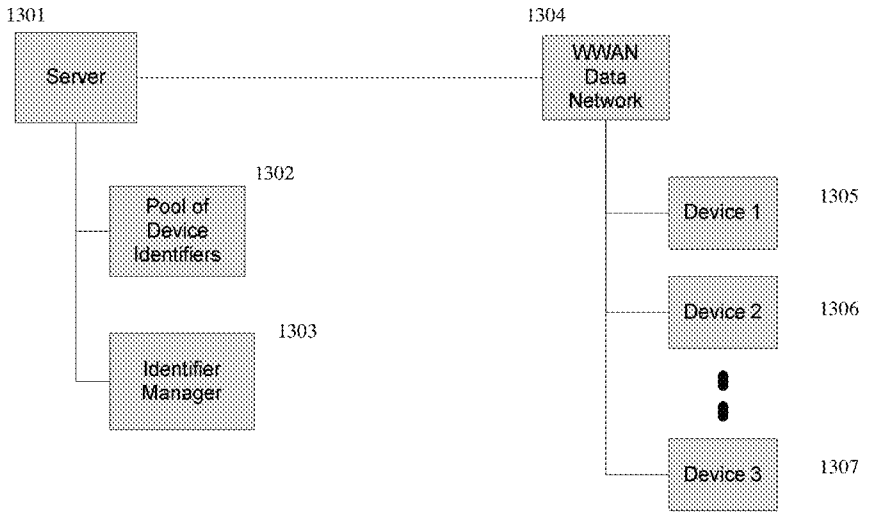


Figure 13 - Management of Device Identifiers by Identifier Manager in the Server

EFFICIENT AND SECURE COMMUNICATION USING WIRELESS SERVICE IDENTIFIERS

BACKGROUND

This patent application relates to wireless communication, and more particularly to efficient and secure communication using wireless service identifiers, such as Bluetooth or WiFi beacon service identifiers.

Most mobile phones on the market today support at least two wireless standards; one for the cellular wireless wide area network connection (WWAN) and one for a wireless personal or local area network (WPAN, WLAN). The cellular connection or WWAN is utilized for voice and data and can adhere to many different standards such as CDMA (IS-2000), GSM, W-CDMA, 1×EV-DO, HSDPA, EDGE, GPRS, WiMax, etc. The WPAN or WLAN connection is typically for short range communications and is often used for wireless hands free devices, such as headsets, peripherals, or higher speed internet connections. The typical standards used for the sort range wireless communications include Bluetooth, Wi-Fi, and in some cases Ultra-Wide-Band (UWB).

In another approach to mobile networking some services have attempted to utilize short range wireless capabilities often available on phones such as IEEE802.11 (Wi-Fi) or Bluetooth to facilitate peer to peer communications. These are also referred to a MANETs or Mobile Ad-hoc Networks. These services typically consist of a software application operating on a mobile phone using peer to peer networks to facilitate communication between wireless devices. Examples of such existing applications include Mobile-Cheddar, Peer-2-Me, and Flobbi. Published US Patent application US 2008/0182591 A1 filed Dec. 13, 2007 describes one such peer to peer approach.

One issue with these approaches is that all information to be exchanged must be stored locally on each of the peer devices as the communication occurs directly between the two devices and any policy for the delivery of locally stored content is difficult to enforce without the potential for fraud such as spoofing identities between the peers. Such fraud may lead to concerns of personal safety or privacy allowing the identity of an individual to be determined when it is not desired.

SUMMARY

Preferred embodiments are generally concerned with facilitating the exchange of information between two entities associated with two wireless devices. In one embodiment, this can be accomplished by a first device using a first short range wireless capability to detect an identifier transmitted from a second device, ideally using existing short range radio communication standard capabilities such as Bluetooth (IEEE802.15.1-2002) or Wi-Fi (IEEE802.11). The detected identifier, being associated with the device, is also associated with an entity. Rather than directly exchanging application data flow between the two devices using the short range wireless capability, a second wireless capability then allows for one or more of the devices to communicate with a central server via the internet, and perform an exchange of application data flow. By using a central server to draw on stored information and content associated with the entity or entities, the server can manage the subsequent exchange of information between the entities and the devices. In a preferred embodiment, this exchange may be comprised of information stored on the server associated with a detected entity, and it may be comprised of information received from the detected device via the second wireless capability and facilitated by the server.

In addition, the server can also allow for a brokering service, ideally independent of the entities, to enable the application of policy based on the identity of the two entities for the disclosure of stored information associated with the entities, the flow in information between the devices and the entities, and the enablement of procedures such as security verification between the entities.

In one embodiment, a method is provided for reducing communications between one or more servers and a wireless device, as well as providing enhanced security and privacy to wireless beacon services.

The method involves transmitting, by at least one beacon transmitter using a short range wireless radio, a first beacon transmission in a first time period. The beacon, which may be a short range wireless protocol such a Bluetooth or WiFi service beacon, comprises a first MAC address, a first unique identifier, and a beacon service identifier.

Using a second radio, the one or more servers also transmit stored information relating to an entity or object associated with the first unique identifier.

A first plurality of beacon transmissions are received by the wireless device during the first time period.

The wireless device then selects one or more unique identifiers from the first plurality of beacon transmissions, by filtering (that is, selecting) only those beacon transmissions which include the beacon service identifier.

The wireless device then takes further action, if the first unique identifier is present among the selected one or more unique identifiers, using the stored information, which includes at least the identity of the entity or object associated with the first unique identifier.

Other embodiments may transmit, by the same beacon transmitter using the short range wireless radio, a second beacon transmission in a second time period. The second beacon transmission also includes a second MAC Address, a second unique identifier, and the same beacon service identifier. In this embodiment, the wireless device also receives, using the short range wireless radio, a second plurality of beacon transmissions during the second time period, as well as second stored information relating to the entity or object associated with the second unique identifier, from the one or more servers using a second radio.

In those embodiments, a second set of one or more unique identifiers are selected from the second plurality of beacon transmissions, by filtering the second plurality of beacon transmissions which include the same beacon service identifier. Further action taken is taken related to the second stored information, if the second unique identifier is present among the selected second set of one or more unique identifiers.

In some embodiments, the further action may include preventing the sending of the first or second unique identifier by the first wireless device to the one or more servers.

In some embodiments, the MAC address is a randomly generated 48 bit number matching a format of a Bluetooth BD_ADDR.

In some embodiments, the further action may include determining that at least one beacon transmitter is a broadcast device having a predetermined location.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing will be apparent from the following more particular description of example embodiments, as illus-

trated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the embodiments.

FIG. **1** is a block diagram of two mobile devices utilizing a preferred embodiment.

FIG. **2** is a block diagram of a fixed broadcast device and a mobile device.

FIG. **3** is a flow diagram of the operation of an application on the mobile devices.

FIG. **4** is a message sequence chart showing the Bluetooth discovery process using in one embodiment.

FIG. **5** is a message sequence chart showing the Bluetooth Remote Name Request Process.

FIG. **6** is a message sequence chart showing the IBSS beacon process.

FIG. **7** is a message sequence chart showing the interaction between the server and two devices performing a detection and entering a chat application.

FIG. **8**A is a message sequence chart showing an E-commerce example.

FIG. **8**B is a continued example message sequence chart showing an E-commerce example.

FIG. **9** is a message sequence chart showing an example of a mobile device and a fixed broadcast device interaction.

FIG. **10** is a flow diagram for the server processing associated with the detection process.

FIG. **11** is an example individual account record stored in the server associated with an Entity.

FIG. **12** illustrates a timing reference for intermittent active and dormant times.

FIG. **13** shows a diagram of functional blocks associated with management of dynamically assigned device identifiers.

DETAILED DESCRIPTION

A description of example embodiments follows.

The teachings of all patents, published applications and references cited herein are incorporated by reference in their entirety.

FIG. **1** is a block diagram of two mobile devices utilizing a preferred embodiment.

Referring to FIG. **1**, a central server **100** is connected to devices **106** and **108** by an internet protocol (IP) based network, carried over a series of connections, at least one of which is a wireless connection. For example, the server **100** has a connection allowing IP based communications to a cellular network **102** using connection **101**. The cellular network is connected to devices **106** and **108** by wide area wireless links **104** and **103** respectively, allowing for IP based communications between the devices (**106** and **108**) and the server **100**.

Devices **106**, **108** can be considered "client(s)" of the server **100**. The clients **106**, **108** and server **100** provide processing, storage, and input/output devices for executing wireless system protocols, interfaces, and application level programs according to several embodiments. Client devices **106**, **108** can also be linked through various communications networks to other computing devices, including other client devices/processes and other server computer(s). Communications network(s) providing the connection **101** can typically be part of a remote access network, a global network (e.g., the Internet), a worldwide collection of computers, Local area or Wide area networks, and gateways that currently use respective protocols (TCP/IP, 3G Wireless, Bluetooth, etc.). Other electronic device/computer network architectures are suitable.

The internal structure of devices **106**, **108** or server **100** includes one or more data processors (not shown in detail) that are well known in the art to include a system bus for data transfer among the other internal components of a computer system (e.g., processor, disk storage, memory, input/output ports, network ports, etc.). Attached to the bus are other input/output devices (e.g., keyboard, mouse, displays, printers, speakers, network interfaces, etc.). Network interfaces allow the computer to connect to various other devices attached to a network. Memory provides volatile storage for computer software instructions and data used to implement an embodiment (e.g., applications programs and the like). Disk storage can provide non-volatile storage for computer software instructions and data used to implement the embodiments.

One embodiment may include a computer program product including a computer readable medium (e.g., a removable storage medium such as one or more DVD-ROM's, CD-ROM's, diskettes, tapes, etc.) that provides at least a portion of the software instructions for the system. Computer program product can be installed by any suitable software installation procedure, as is well known in the art. In another embodiment, at least a portion of the software instructions may also be downloaded over a cable, communication and/or wireless connection. In other embodiments, the programs are a computer program propagated signal product **107** embodied on a propagated signal on a propagation medium (e.g., a radio wave, an infrared wave, a laser wave, a sound wave, or an electrical wave propagated over a global network such as the Internet, or other network(s)). Such carrier medium or signals provide at least a portion of the software instructions.

More particularly, a given device **106**, **108** uses a short range wireless link **107** such as a Bluetooth (IEEE802.15.1) or Wi-Fi (IEEE802.11) link to detect the presence of other devices such as device **108**, and uses the wide area wireless network connections **103**, **104** such as IS-2000, WCDMA, GPRS, EDGE, LTE, Wi-Max (IEEE802.16), or the like to perform communications to central server **100**, and to perform the actual substantive communications between the wireless devices **106** and **108**. Device **108** typically uses the short range wireless link **107** and wide area wireless link **103** in a similar manner to locate and initiate communicate with device **106**. One distinction relative to prior art is that the short range wireless **107** is only used for the detection process, or to advertise a device's presence. In this embodiment, specific information called "wireless identifier" or simply "identify" (described in more detail below) is passed between devices **106** and **108** over the short range link **107**. By transmitting a wireless identifier using the short range Wi-Fi, Bluetooth or other short range wireless link **107** and receiving wireless identifiers from other devices, this short range wireless link **107** will allow for a proximity detection process.

The support for IP based networking is standard for WWAN or 3G connections such as 1×EV-DO or HSPA, and as a result, communication between one device to another using the WWAN is currently supported in many devices with no modification. The use of simple detection of one or more identifiers requires significantly less resources in a phone than performing a complete peer to peer based communication network protocol, which accommodates dynamic configuration of nodes being added and dropped continuously. It is noted that the IP address on the WWAN

interface is not location dependent in the present embodiment, but is addressing approaches are location dependent when true Peer to Peer topologies are used. The present embodiment has the advantage that communication between two devices may continue after the devices have left proximity of each other, but in the same manner as they had been communicating previously. As a result, a user who detects a short range transmission of an identifier, then begins a conversation or some other interaction with that device via the wireless wide area network may continue that conversation even in the case where the two devices move out of the proximity of the each other, and are no longer within the reception range of the short range wireless communication protocol. Further, since it is contemplated that the wireless identifiers transmitted on the short range wireless link from the devices would occasionally change, for security reasons, the present embodiment has the advantage that ongoing communications between mobile devices will not be interrupted despite a change in one of the device's identifier. In the case where the identifier is a MAC address of the short range wireless network adapter for one of the devices, it is not otherwise possible to change this address and easily maintain on going communications in a true peer to peer topology.

Referring to FIG. **2**, central server **100** is connected to the cellular network **101**, and is able to communicate information to and from wireless device **202** using a wide area wireless link such as IS-2000, WCDMA, GPRS, EDGE, LTE, Wi-Max (IEEE802.16), or the like within structure **205**. Device **204** does not have a wide area wireless or cellular link, but transmits identifying information using short range wireless link **203**. Device **202** is capable of receiving the identifying information and requesting information related to that device from server **100**.

An example of an application using this infrastructure follows. The device **204** will simply broadcast an identifier, with no WWAN connection but may facilitate advertising or local information. For instance, an account associated with one or more identifiers may belong to a museum. As a museum patron walks to an exhibit, the patron's device **202** will receive an identifier sent from museum broadcast device **204** operated by the museum. The patron device **202** passes the identifier or museum device **204** to the central server **100**, which in-turn recognizes it as being associated with that exhibit within that museum and passes relevant information back to the user's device **202**. A distinguishing feature of this approach relative to prior art is that the patron device **202** in this example may move out of proximity of broadcast device **204**, yet continue to view the content being provided by the server **100** related to the detected broadcast device **204**. Content may include text, pictures, web pages, application software such as games, informative display applications, or other content such as audio or video to be offered to the user's device as well. Other examples might include electronic coupons (such as in a grocery store), menus or special offers in a restaurant.

FIG. **3** is a block diagram with further detail of this operation. A device **106**, **108**, or **202** after performing a search (FIG. **3**, step **301**) for identifiers on the WPAN or WLAN, will subsequently use the WWAN link to communicate with the central server **100**. If the device does not find identifiers **302** it will either continue to search, or search at a later time **301**. If identifiers are found in **302**, the device may employ an action function **303**, which would act as a filter that determines which of the detected identifiers should be passed to the server. This function may instead be omitted and all identifiers passed to the server **100**. The idealized effect of the action function would be to reduce the number of requests to the server by not re-requesting recently requested identifiers which have already been passed to the server, for some period of time. In step **304**, if no identifiers require server information, searching is continued in step **301**.

Assuming there are identifiers which are new to the device, the device will pass along a list of currently detected identifiers and request **305** that the server return information related to any other local device. The server will return the information related to any identifier that meets certain policy requirements. For instance, information is returned which is 1) relevant to that device, and 2) that the device is authorized to receive.

As an example of the overall process, a detected identifier may be relevant to the receiving device if the user associated with the detected identifier is listed in a "friends list" for the owner of the receiving device. If the identifiers for the individuals within the friends list have been passed to the device, the action function **303** may make this determination. In the preferred embodiment, the server would determine the identity and the relevance of the detected identifiers, and the action function **303** would work to reduce frequency of re-requests to the server. FIG. **7** describes an example of how to use this for messaging associated with the device and server interaction during the detection and identifier inquiry process, with a more detailed explanation to follow.

To enable server **100** to associate an identifier with an entity, each device or entity (such as the museum) associated with an identifier has an account on server **100** or a related server as is common in information technology. The account is associated with the entity and the device and the current identifier.

As used herein, an "entity" may be a legal entity, such as an individual person or a business.

An "object" is intended to include a physical thing, such as a product that is being offered for sale, and may include a tangible article or intangible such as an electronic music or video file or photograph.

There is various information associated with each account. An example data record for an account is shown in FIG. **11**. When the account is associated with an individual or (other entity), there may be personal information such as the individual's name, contact information, information regarding allowed communication, such as chat or IM, links to their other social networking services, and the like. When the account is associated with a broadcast device **204** the account may contain content to be displayed to the detecting device **202**. By utilizing the central server **100**, broadcast devices may be tied to a location or product thereby providing relevant information about the location such as in the museum tour example previously discussed. In this situation, the content delivered to device **202** may be informative information about an exhibit including pictures, text, audio, or video and the like. In the case of a broadcast device being in a supermarket and near a specific product, advertisement or discounts with electronic coupons my be stored in the account and provided to device **202**.

There can also be policy based permissions associated with each account and applied to any information associated with that account. The stored policy permissions can be used to determine what information and under which situations information may be disclosed to another device or user associated with another account. For example, the entity (person in this case) associated with device **202** may have set a policy in their account to not receive any unsolicited

information from a broadcast device so as to not be disturbed. However, the person associated with **202** may see the broadcast device and a sign stating a discount is available, and provide input to their device to request any broadcast information on a one time exception basis. The messaging associated with an example mobile and broadcast device process will be described in more detail to follow associated with FIG. **9**.

As already mentioned above, in step **301** of FIG. **3**, each device performs a search function looking for identifiers sent from other devices utilizing a short range wireless capability. The following describes the process of devices detecting identifiers from other devices in more detail.

The identifiers themselves may be a hardware address such as the MAC address of the wireless device, or they may be another label such as the SSID for a IEEE802.11 device, or the device name for a Bluetooth device. Referring to FIG. **4**, in the case where a Bluetooth wireless personal area network device is utilized, a first device **401** transmits an inquiry (ID Packet) message **404**, and any proximal Bluetooth devices **402**, **403** respond with messages identifying the MAC address, called BD_ADDR in IEEE802.15.1 of each device using a message referred to as an "Inquiry Response" FHS message **405** containing the BD_ADDR or Bluetooth device address of the detected device. In the Bluetooth standard all devices **402**, **403** are required to respond in this manner assuming they are enabled to be discoverable. To enable this, an application on the mobile device ensures the Bluetooth device is set to discoverable mode. Device **1** (**401**) will attempt to locate Devices on different channels by scanning the channels and transmitting multiple Inquiry (ID Packet) messages. Such an example is shown with inquiry exchange **406** and **407** to discover Device N (**403**).

In one embodiment the BD_ADDR or MAC address of the Bluetooth device can be used as the Identifier and no further Bluetooth interaction is required until the next scan process is performed.

In another embodiment, the Bluetooth "Device Name" is used as the identifier. FIG. **5** shows the process of a first device "Device **1**" (**501**) determining another Bluetooth enabled device's (**502**) Bluetooth Device Name. Following the device discovery process completion from FIG. **4**, Device **1 501** sends a Page message **503** to another device (Device L **502**). Message **504** is sent in response to create a temporary Asynchronous Connectionless Link (ACL) to be established between Device **1 501** and Device L **502**, without an explicit connection request. Not having an explicit connection request indications the Entity associated with Device L would not have to provide explicit approval for a connection from their user input on the device, as would be the case if other services were requested from the device such as might be the case with a wireless headset or remotely connected GPS receiver to a phone. An ACL connection allows link management packets to be exchanged, and following interchanges of messages **505** and **506** to determine features of the devices, a temporary connection is established between the two devices. A name request message (**507**) is then sent by Device **1** to Device L, and Device L responds with at least one LMS_name_res message **508** containing the Bluetooth device name of Device L **502**. If the name is longer than that allowed within the LMS_name_res message, additional messages follow to allow for the entire name to be delivered. Finally the connection is ended with message **509**, LMP detach.

The transmitted identifiers associated with any given device are only known to the central server and the device transmitting the identifiers. These identifiers may change from time to time, making a user's or a device's identity anonymous over time. The central server and any particular device must be coordinated such that the identifier and any device transmitting it, remains identifiable by the central server. This process is coordinated between the wireless device, and the central server utilizing the WWAN or cellular data link, carrying messaging between them and using an identifier manager **1303** to maintain a list of device identifiers **1302** in a central but secure location. This is shown in more detail in FIG. **13**.

Referring to FIG. **6**, an example of using on IEEE802.11 link as the short range wireless capability is discussed. Generally, Wi-Fi devices operation in a so-called infrastructure mode which utilizes a BSS or basic service set. One component of a infrastructure network based wireless LAN is the use of a central access point or AP. In a mobile network the use of a central AP is not practical, as only the AP transmits an identifier, which does not meet the requirements of the preferred embodiment. The second topology for Wi-Fi networks is the so-called Ad-Hoc mode of operations, referred to as an independent basic service set or IBSS. In an IBSS all devices participating or advertising their interest in participating in an ad-hoc network transmit identifiers called beacons. These beacons contain the MAC address of the transmitting network adapter, the basic service set identifier (BSSID), and ad-hoc network name or service set identity (SSID). The BSSID in a typical ad-hoc network is generated by the first station to enter the BSSID and is locally administered, typically a randomly generated 48 bit number matching the format of a MAC address. In an ad-hoc network, each device **601**, **602**, **603** participating or desiring to participate transmits a beacon. There are several embodiments related using the IBSS beacons and the identifiers. First the identifier may be used as the MAC address of the station device or network adapter, and one or both the BSSID and the SSID may be used to indicate these particular beacons are associated with a service. In other embodiments, one or more of the BSSID and the SSID may be used as the identifier. In any of the embodiments for delivery of the identifier in an IBSS beacon, it is possible to coordinate the change of those identifiers with the server **100**. As the MAC address is always broadcast in any operation of a Bluetooth or Wi-FI link, the use of a MAC address as an identifier provides for an additional level of security for the device **601**, **602**, **603**, when identifier is changed from time to time as devices may be detected and identities tracked using a constant MAC address. In the preferred embodiment, where the MAC address is used for the identifier, all the devices participating would likely have the same network name and SSID to aid in the identification of the device as being enabled, although not necessarily required. Examples using an 802.11 network in ad-hoc mode transmitting beacons are showed as messages **604**, **605**, and **606**.

Chat Example Between Two Mobile Devices

FIG. **7** shows an example of a message flow diagram for an embodiment where an individual is in a library for example, and a friend arrives. The individual is notified by their device receiving an identifier that their friend is present and they enter a chat session. Each person has a device (FIG. **1**, **106** and **108** respectively) that implements the preferred embodiments described above. The first individual associated with Device **1** (**702**) referred to as Entity **1** (EI**1**) performs a detection process as described in FIGS. **4**, **5**, and **6** previously (step **704**). The device identifier associated with Device **2** (**703**), DI**2** is thereby detected. Device **1** (**702**) then transmits an inquiry message **705** using the WWAN (cellular

data link such as GPRS, EDGE, 1×EV-DO, IS-2000, Wi-Max, LTE, or the like) to the server **701** inquiring if information related to the account and entity associated with DI**2** is relevant, and available to the entity EI**1** associated with Device **1** (**702**). The server **701** retrieves the account information related to EI**1** and determines that EI**2** is listed in a friends list in the account associated with EI**1** and that EI**1** should be notified when EI**2** is detected. Next the server retrieves the account information associated with EI**2** and determines that EI**1** is on a list of entities which are allowed to be notified of EI**2** being present and personal information such a the name of the individual, their phone number and the like. The server having determined that EI**1** wants to be notified and is allowed to be notified responds in Step **706** to Device **1** (**702**) with a message indicating the DI**2** is relevant to EI**1** and including information such as Entity Identifier EI**2** and associated details. A user application on Device **1** (**702**) notifies the user that the entity associated with Device **2** is in proximity in step **707**. The user of Device **1** provides input to the device directing it to request a chat session with the entity associated with Device **2** (**703**), and a message **708** is sent the server **701** commanding "send 'Hello' to EI**2**". The server acknowledges reception of the message with a "ACK" message **709**, in return. Next server **701** sends "Request Chat: 'Hello' from EI**1**" to Device **2** **703**. The user of Device **2** accepts the chat and returns a message "I'm by the front door" with message **711**, sending it to the server to be relayed to device **1** (**702**).

E-Commerce Between Two Mobile Devices

FIGS. **8**A and **8**B show a message flow diagram for an embodiment where two individuals are performing a financial transaction on the street (for example, a customer and a street vendor). Each has a device (FIG. **1**, **106** and **108** respectively) enabled with the preferred embodiments described above. In this example, an individual's device would see a vendor and the vendor's device (enabled with various embodiments) would notify them that the vendor was also enabled with a device supporting the identifier search and other protocols described above, as well as being capable of electronic payments. These steps are performed in the following way. In step **804** the customer's device **802** (Device **1**) performs an identifier search process as previously described, and detects a device identifier **2** (DI**2**) sent from Device **2** (**803**) belonging to the merchant. Device **1** will send a message to the server **801** (also represented by **100** in FIG. **1**) using the WWAN (cellular data link such as GPRS, EDGE, 1×EV-DO, IS-2000, Wi-Max, LTE, or the like) **104** requesting information related to DI**2** and its relevance to the entity related to device **1** **802**. The server **801** then determines the relevance of DI**2** based on the account properties stored in the account associated with the consumer Device **1**. In this case, the account settings only allow messages from or notifications of entities on a friends list stored in the account record (represented in FIG. **10**) associated with the consumer. Server **801** responds to device **802** with "no" indicating that DI**2** is not relevant to the Consumer.

The customer, having an account enabled with electronic payments, and wanting an item the vendor has, would press a button or make other input to his phone (or other device) which would indicate they would like to make a purchase and pay using their device (**808**). In this case the input selection would be "search for merchants." The customer's device would then send a message (**809**) to the central server directing the server to perform a one time search for merchants, despite the current account settings. In one embodiment, the server would then direct the consumer's device **802** to initiate another search (**809**). Other embodiments may not include the server commanding Device **1** (**802**) to perform the search, but rather the search may be performed automatically, or use results from a recent search. In Step **811**, Device **1** (**802**) performs another search and detects the identifier from Device **2** (**803**), DI**2**. Device **1** then sends a message **812** to the server again requesting information for all relevant devices detected, which will include at least DI**2**. In Step **813** the server, having received the request and list including DI**2**, looks up account information associated with DI**2** and determines that the associated entity is a merchant. As the settings of the account associated Device **1** now allow for the notification of the user when a merchant is detected in proximity, DI**2** is determined to be relevant to Device **1** and the Entity **1** (EI**1**) should be notified. The server then sends a message **814** to Device **1** (**802**) stating merchant services are available in proximity with a list of available merchant's information including information related to the entity (EI**2**). The user of device **1**, Entity **1** (EI**1**) then provides input in step **815**, (pressing a soft key on a touch screen for instance), selecting the specific merchant EI**2** to engage with in a transaction. Device **1** (**802**) will then send a message (**816**) to the server requesting a transaction with EI**2** associated with Device **2** (**803**). The server (**801**) will then respond in this embodiment with a message **817** to Device **1** confirming receipt of the requested transaction and providing information to allow the EI**1** associated with Device **1** to independently confirm the identity of EI**2** associated with Device **2** (**803**). In this embodiment the identifying information can include the name of the merchant, the merchant's logo, a picture of the vendor, or their mobile shopping cart. In other embodiments, the picture may be of a specific unattended vending machine in the location it is currently operating. It may also include other information such as the address of the merchant in cases where a fixed store location is provided. As this particular merchant in this example is a street vendor, an address may not be used. GPS information stored in the account associated with Device **2** may be used as further confirmation in some instances. However, in this example, GPS coordinates are not be available on Device **2** due to lack of capability, or Device **2** being indoors and without sufficient signal to determine a location. Further GPS information from Device **1** (**802**) may be used to provide further confirmation information. In this embodiment the photograph sent in message **817** shows a picture of the particular merchant and also his city issued business license in text and as a picture of where it is displayed on the cart. The consumer entity EI**1** provides input to Device **1** in step **818** confirming the identity of EI**2**, the merchant entity associated with Device **2** (**803**). Device **1** then sends a message **819** to the server **801** confirming the identity of the merchant.

Server **801** then sends a message **820** to the merchant's device **803** notifying them of the request for a transaction with EI**1**. Device **2** (**803**) then indicates to the merchant that a customer with the capability and desire to pay electronically is in proximity. In step **821** the customer associated with Device **1** (**802**) places an order with the merchant associated with Device **2** (**803**) and a list of products to be purchased is generated and the merchant provides input to Device **2** (**803**) to proceed with a electronic transaction. In step **822** Device **2** performs a scan of identifiers and DI**1** associated with device **1** (**802**) and the Consumer is detected. A request is sent to the server **801** with a list of identifiers which were detected to determine if any of them are relevant to the merchant. Note that while the merchant device **803**, (and the merchant) have now been notified of the desire for

EI1 to enter a transaction, they do not necessarily know the identifier for EI1 yet. In other embodiments, the identifier associated with EI1 and Device 1 (802) may be sent in message 819, and a confirmation that this identifier is detected during the scan process 821 may be performed at the device. In the preferred embodiment, further security may be provided by the having the server perform this function independently. The server performs this confirmation in step 824 may matching the device 1 identifier DI1 with the information stored in the account associated with Entity 1 (EI1) also referred to as the Consumer.

The server than generates a message 825 to Device 2 (803) indicating that EI1 is relevant, and the transaction participant is present. The message in the preferred embodiment can also include a picture of the Consumer. Additionally, the message could also include other pictures of other individuals allowed to use this device for purchases. If more than one identifier was detected in step 822 and matched in step 824 to entities having requested transactions previously which are pending for that merchant, a list of information for each entity involved with a pending transaction request can be provided in message 825. The merchant then selects the correct consumer using the picture of that consumer, confirming the identity of the part to the transaction in step 826. The consumer information provided in message 825 in another embodiment may simply be the name of the customer and the merchant may either ask their name, or request identification such as a driver's license. In the preferred embodiment, where a picture is passed in message 825, it is not necessary that the individual's name be passed to the merchant for the merchant to be able to provide confirmation of the identity of the Consumer thus providing a level of anonymity to the transaction such as may be present when cash is used.

Following the confirmation by the merchant of the identity of the Consumer participating in the current transaction in step 826, Device 2 sends a message 827 to the server confirming the identity of the Consumer as Entity 1 (E1), and with information required for the transaction including the list of products to be purchased, their prices, the total price, and a request to charge E1 this total amount. Server 801 then confirms receipt of this message in step 828. The server then sends a message 829 to Device 1 requesting the Consumer to confirm the list of goods to be purchased and the total price to be paid. In step 830, the Consumer (Entity 1) reviews the list and amount to be paid and provides input to device 1 confirming the accuracy of the information and they the authorizing the server to pay. In step 832 the server charges E1 utilizing stored preferred charge card information, stored credit, or other payment method such as a PalPal™ user name (PayPal is a trademark of Ebay, Inc.) and password stored in the account associated with E1, and charges the consumer. In the case where a stored credit is used, the Consumer's account can be debited, and the credits not applied to the merchants account until a later step. In the case of a credit card, or PalPal™ transaction, the server provides payment to E2 (the merchant) utilizing information stored in the account associated with Device 2. The server then indicates payment is made to the merchant, and instructing the merchant to deliver the goods with message 833. E2 (the Merchant) then provides the goods and provides input to Device 2 that the goods have been delivered in step 834. Message 835 is generated by Device 2 (803) to the server confirming product delivery, and acknowledging the receipt of the payment confirmation message 833. The server can then send message 836 requesting the Consumer to confirm they received the goods. If a confirmation is not received in response to this request, this information may later be used to settle any dispute that might arise. In step 837 the consumer confirms receipt of the products, and message 838 is generated to the server confirming the receipt of goods by the consumer. In Step 839 the server concludes the transaction by completing any steps required to credit the Merchant with the payment amount from the Consumer, if required. The server then sends a message 840 to the Merchant indication the transaction is complete, which is acknowledges in message 841. The Consumer is notified of the completed transaction with message 842, which is acknowledged with message 843.

Finally, the transaction details may be stored by the server, or sent to a thirdly party server for tracking spending habits of that account holder, or customers of that merchant allowing the merchant to track that specific customer's behavior and cater to them in the future with various specials delivered via email, or during their next visit via their device in the form of an electronic coupon. This process can be performed with a goal to help the merchant expose the customer to other products or services the merchant believes the customer might find desirable.

The apparatus, systems and methods can be extended to facilitate other types of transactions as well. In one specific application, consider use of the invention to facilitate a transaction such as the rental of an automobile. A well known business called ZipCar™, presently operating in several major urban areas in the United States, makes available a fleet of vehicles for shared use by their club members who pay a monthly fee plus a per use charge. Using the embodiments herein, the club member would have a wireless device that serves as the "Consumer device" (Device 1) and the ZipCar vehicle would be equipped with a wireless device serving as the "Merchant" device (Device 2). The consumer would walk up to an available ZipCar vehicle and, using their wireless device, start an initial exchange of identifiers with the desired Merchant device, for example, using the short range local wireless network. The Consumer device and/or Merchant device would send a message to an application running on the Server requesting that a person associated with an account for the Consumer be granted access to a specific vehicle (e.g., an "object") that is in the vicinity of and associated with the Merchant device. A set of confirmatory messages (such as to exchange access codes, to confirm the location of the vehicle, the per-use fee due, and payment for the same, etc.), are then typically also exchanged between the Consumer and the Merchant device with the assistance of the Server and the long range wireless network. Upon confirmation of the necessary transaction information, the Server sends a message to the Merchant device to unlock the vehicle requested (which may be sent over the second long range wireless network or a yet another network, such as a satellite network).

Example of a Mobile Device and a Broadcast Device.

FIG. 9 shows a message flow diagram for an embodiment where an individual is in the presence of a broadcast device, such as for the museum example of FIG. 2. As with FIG. 2, the individual device 202 and the broadcast device 204 are present and enabled. In this example, an individual 902 is in a grocery store and their device 902 (Device 1) performs a scan for identifiers in step 904, as described previously. DI2 is detected having been transmitted from device 2 (903). Device 1 (902) sends a message to server 901 inquiring if DI2 is relevant to the entity associated with Device 1 and if the information associated with that device identifier (DI2) is available to be returned. In step 906, the server retrieves the accounts associated with both DI2 and Device 1 (EI1).

The server detects that the entity associated with DI2 is an advertisement company, and that this device is a broadcast device only, and that there is an electronic coupon available for download to Device **1**, and multimedia content available to be played if desired. Additionally, the account settings associated with EI**1** allow for the notification of broadcast devices in proximity.

Server **901** then transmits a Response message **907** indicated the presence of the detected device and the content available. The device **902** requests input from the entity associated with the device **901** for permission to download the coupon, and the availability to play content such as video about how to prepare a recipe using the vendors product. In this case the individual associated with Device **1** accepts the content, and a message **909** is sent to the server accepting the content. Response message **910** begins the delivery of the content.

As previously mentioned, several key distinctions of this embodiment include that the user of device **902** may walk away out of range form the broadcast device **903** and continue to receive the content using their cellular link, or may choose to play the content at a later time having stored the detected like in a favorites list. Additionally, the content stored in the account associated with the broadcast device **2** (**903**) is relevant to the placement of the device and the products near it. Further, as the content is stored in the server **901** rather than in the broadcast device **903**, the content may be updated, modified, or deleted at anytime. For example the server **901** knowing that the consumer has never been detected previously, may customize the electronic coupon to provide a deeper discount than a regularly detected consumer. In the case where the devices are used for electronic commerce as in FIG. **8**, knowledge of the user's past purchases may be used to induce the consumer to try a new product. Alternatively if the consumer is a regular purchaser a loyalty program may provide a coupon upon a particular number of repeated purchases.

FIG. **10** is a processing flow chart performed by the server receiving a request from a device inquiring about the relevant and availability of information associated with detected device identifiers. In step **1001** the server is waiting for a request from a device. When a request is received in decision **1002**, step **1003** is performed. In this step the account information associated with the requesting device is retrieved. In step **1004** the information associated with the accounts for each of the detected device identifiers is retrieved. In step **1005** the server performs a matching process between the policies of the requesting account and each of the policies for each account associated with each detected device identifier. In step **1006** the information related to the matched policies for the associated entities will be sent to the requesting mobile device.

Just as in the previous example of an identifier being deemed relevant to a user based on a friends list, permission for disclosing a device's presence may require being on a friends list as well. For example, when a server receives an inquiry from a device with a list of identifiers, it may only respond with information for users associated with the identifiers that are on that device's friends list, and on each of the individual's friend lists as well. These friends' lists and policies can be stored within a user account which allows for disclosure of a user's presence only to individuals on this list, such as described in FIG. **11** (to be described below.)

It is contemplated that the permissions not be an "all or nothing" decision, but that different classes of information may be assigned different permissions and mechanisms. An example of this might be a user's presence, identity, and cart services being made available to only one set of other accounts (or users), while the presence of an anonymous individual being made available to anyone, but with other classes services available such as multi-player games being treated differently. Additionally multiple contacts may be included in the account, each given customized permissions. An example can be that any user may be notified of an anonymous user or other information based on additional policies.

As only the server contains personal information, and performs the association of an account with a particular identifier, it can inherently enforce the security of the policies as a distinct advantage relative to true peer to peer services. In this way, the central server controls the process of passing information related to an account to a particular requesting device.

FIG. **11** shows an example account record to be associated with an entity and at least one device. The columns of the account record can consist of a Record Index which will be used to described the account, a Field which is a descriptive name for the contents stored in the record, and a Field Information Group Disclosure Policy Assignment List (PAL). The PAL provides rules for the disclosure of the information in the associated row in the Field column. The following list are possible PAL entries:

ALL: may be disclosed to any requesting entity

EXPLICIT APPROVAL: the Entity associated with the account must provide input approving the disclosure of the information

NONE: Do not disclose this information to any other entity

M: where M is a integer from 1 to N indicating a Information Group Disclosure Policy which may consist of a list of contacts, friends, groups, characteristics, and the like.

Most of the fields in FIG. **11** are self explanatory and typical in the industry such as the account number, however a few fields are worth a clarifying discussion. The Device identifier is in record index **2**, with a Identifier type in record **4**. The identifier type can define what type of identifier the device associated with this account would use. Record index **10** is the Entity Type Field. This describes is the entity is a Merchant, Individual, or if the device associated with this account is a broadcast only device.

Referring now to FIG. **12** a timing map reference for scanning times and dormant times for devices is shown. In one embodiment, it is desired that the power consumption and scan timing for the devices in a cellular network be reduced. Since the server and the WWAN is involved with all mobile devices, coordination of the broadcasting periods and the searching periods for the short range radios is possible. This can be based on a common reference time such as that provided by most cellular systems, any the time of day clocks inherently within mobile devices. This allows for reduced power consumption and other resource consumption in the devices. If no coordination is achieved, then the short range receivers in each device must be scanning for transmitted identifiers much more often and for longer durations. Utilizing a common timing base, and the central server to notify the devices of a coordination approach for "active times" and "non-active times" and will allow for the devices to minimize the power consumption in the transmission of and scanning for identifiers. This approach also allows for synchronizing the update of each device's identifier (as described previously) to enhance anonymity and security, coordinated with the central server. The "non-

active times" may be used as "boundaries" over which the changing identifiers may be updated. This update may be based on either direct communication with the server, or rule and algorithm based updates previously coordinated with the central server so as to minimize server messaging, but allowing the updates to remain synchronized to the server such that the device and the server are always associating the same identifier between them.

As will be recognized by an individual skilled in the area of information technology, the concept of a central server may well be implemented as a collection of servers to allow for load balancing, redundancy, and the like in a manor common to the information technology industry.

FIG. **13** shows a diagram of functional blocks associated with the management of dynamically assigned device identifiers. The Server **1301** has an application agent called an Identifier Manager (**1303**) which has access to a pool of device identifiers (**1302**). The Identifier Manager monitors timing information and determines when it is time to update a particular device's identifier. This time may be a regular interval, or a random generated time period by an algorithm such as a pseudo-random sequence generator, or a combination of both. When it is time to update a device identifier, Manager **1303** retrieves a new identifier form the pool **1302**. The pool of identifiers may be a list or range of identifiers, or generated algorithmically. The new identifier is stored in the account associated with the entity determined to require updating and a message sent to the device **1305** associated with that account commanding it to update its device identifier with the new one. This message is sent over the WWAN Data network **1304** such as IS-2000, HSPA, GPRS, IS-95, Edge, Wi-Max, and the like. All devices **1305** to **1307** will eventually all be updated in a similar manner. This update process does not disrupt ongoing communication and interaction between devices despite the update as the communications are preformed based on the identity of the entities following the detection of the device identifiers which are no longer utilized. This unique capability allows for the updating process to be implemented and not impact the applications being utilized concurrently.

Other example applications utilizing still other embodiments follow below.

Requiring the brokering of the communication via a central server can also allow a mobile device to receive information associated with a "broadcast only" device, such as in the museum example discussed previously. This is important, as such broadcast devices can enable a vast set of new applications built upon the infrastructure developed in this application, beyond the museum application. Some of these applications may involve an electronic commerce aspect, for example.

Electronic Commerce Applications

Ecommerce Between a Fixed Broadcast Device and a Mobile Device

Football Stadium Example

An embodiment of a transaction model, enabled by the infrastructure described above can be an event such as a concert, or sporting event (particularly when it is an indoor venue where no GPS is available). A number of the broadcast only devices are placed through out the seating areas. The devices are very short range, and only transmit intermittently and as a result may be battery powered and to remain active over a very long time period. Each device can be placed in a known location, in a predicable manner.

An attendee at the event has his or her device enabled with the identifier protocol and other embodiments described above. The device detects a broadcast device, and interacts over the internet with the server via the WWAN connection (as already described above). The server receives an indication of the broadcast device's identifier and the identifier of the account associated with the device which detected the broadcast device. The server retrieves content associated with the service provider's account and provide that content to the application on the requesting mobile device. The content may indicate that the venue has a product delivery service. The user may then press an indication on their device that they would like to see a menu or list of items for sale from the merchant(s) in the venue. The application on the user's device would then allow them to see a menu, for instance, and select items to purchase. The user then would be asked to confirm the purchase. The server would then indicate to the merchant that a user located near a specific broadcast device has ordered something. In this case, it is expected that a delivery fee could also be charged for the enhanced service. The server would facilitate the purchasing of the goods or services from the merchant and payment from customer's account, and provide confirmation to each. Such confirmation can include an electronic receipt provided to the customer, for user upon arrival of the delivery person of the good or service. The customer can then select an indication on their device confirming receipt of the good or service via the mobile device, thereby completing the transfer of funds and the transition. Optionally, the delivery person of the good or service may have an enabled mobile device as well. In this case the identifiers may be detected by the customer's device and reported to the server to confirm that the provider's delivery person was present. Further, the delivery person's device can be able to detect the broadcast device's identifier and reported to the server confirming the delivery person was in the correct area independently. Even further proximity confirmation may be achieved by the customer's device's transmitted identifier being detected by the delivery person's device and reported to the central server further confirming the physical proximity of the parties involved in the transaction. Upon arrival of the delivery person, the customer may be notified that the delivery person is looking for them, and has arrived. These cross confirmations can allow for the central server evidence to justify payments both in completed transactions and in disputed or failed transactions. Further, the delivery person may receive a picture of the requesting customer assisting to identify the customer to whom the food is to be delivered. Once the customer is found, the delivery person can confirm the delivery of the good or service to the customer via the user input on their mobile device, and that confirmation being reported to the central server. The customer can have the option to report confirmation or denial of the reception of the product or service as well, as in the last example.

In another embodiment, the merchant device may be fixed, but have an internet connection (wireless or otherwise). Further, in some embodiments, the merchant may be an automated device such as a vending machine. In such a model, a customer may use their enabled cell phone to purchase an item such as a beverage from the machine without the need to insert currency into the machine. This can be accomplished by the customer's cell phone detecting the vending machine transmission of the identifier or visa-versa. Following the detection of either the customer's identifier by the vending machine, or the customer detecting the vending machine identifier, the respective device notifies the server, which in turn provides notification (assuming the account settings allow for notification) to the potential customer via their device. Assuming the customer selects to purchase an item from the vending machine using their

account associated with their device, the customer may be presented a menu as in the example above. The customer may further be presented information to ensure the identity of the vending machine, such as a description of the machine, a machine identification number, or a (most likely) a picture of the machine where it is located. The customer can then confirm this is the machine they are interfacing with, and select to pay via their account. The customer may in one model select the item to dispense by input to their phone, or they may simply select to provide payment to the machine allowing them to make the selection manually as is the typical mode of operation today. The vending machine can then interact with the server via its own internet connection, and participate in the transaction in a manner similar to the mode described above allowing for step by step confirmation as previously described.

Electronic Opinion Polling, Tied to a Known Location.

In a much simpler example, such a capability might be used to tie a survey to a known location in such a way as to provide an e-coupon to the survey taker on their device in return for completion of the survey. Alternatively, this type of interaction can enable a very large crowd to interact with a Jumbo-Tron like display to provide input to polls or to participate in group activities. Users at different locations in a audience may form teams and interact with other teams for group activities.

Other Preferred Embodiments

Applications running on a device may also interact with the server to perform various functions, for example retrieving information associated with an entity or device, by utilizing a detected identifier. Such information may include stored content associated with the entity's account record such as music, pictures, links to social networking sites, instant messaging addresses, advertising content, and even executable scripts or application such as in AJAX. An example of such an application may include the detection of a device's identifier in a fixed location allowing for tour guide like information to be provided for that location.

As the server may be running applications which perform more function than just the retrieval of content, a pre-defined interaction process may also be applied by the server to the devices such as allowing the approval to share private content with the entity associated with the detected device. This process may eventually allow or disallow the sharing of information and to facilitate the interacting with another entity.

As a more complex example, in other embodiments, the devices may utilize the server as a third party to provide for new capabilities such as a secure three way e-commerce transaction between two entities. In this more complex process, the server may require confirmation of each party's identity with visual cross verification of the parties using pictures or other unique identifiers. The server may use this visual cross verification in conjunction with detecting that the individuals are in proximity with each other. The server may verify the proximity using GPS or using the peer to peer detection process in another embodiment. Further, the server may facilitate a process requiring each party to perform a step by step confirmation during the transaction including the stages of: the request for purchase, the payment, the receipt of goods and services, and the providing of payment receipt.

This differs from the approaches employed by prior art location aware mobile social networking techniques in that no GPS is needed to determine when one device is in proximity to another. Many wireless devices in use are not GPS-capable, and even when they are, GPS will often not operate indoors or where the GPS signal is weak. Using a peer to peer detection process to locate nearby devices allows for the operation of proximity detection indoors.

Preferred embodiments can also differ from known peer to peer based social networking in that the information flow between the devices running the applications are over the wide area network via a central server, rather than carried over the peer to peer network itself. An example of this is a service called Flobbi, as discussed previously, where community members can identify each other via Bluetooth transmissions, then interact with chat. The messaging in this case is carried over Bluetooth itself. A distinction from such peer to peer approaches is the use of a central server to "broker" the transactions between peers, enhancing the ability to manage security and information disclosure. Such use allows for the opportunity to customize delivered content to include elements such as advertising or other content customized to the recipient based on additional information such as known personal purchasing history, or interests.

A further distinction of the preferred embodiment is the use of a central server to determine identities of detected peer devices, which additionally allows for secure and fraud resistant application of policies for the disclosure of information and content. An issue with the existing pure peer to peer approaches is that they are not capable of enforcing policy associated with the disclosure of information to unknown entities in a secure and fraud resistant manor. One reason for this is that information related to a user's device must be disclosed in the process of detection in the form of a static identifier. By the nature of the identifier, it must be static or peers would not be able to directly determine the identity of a friend over time with the information stored on their device. By using a central server, the system may coordinate the change of the identifiers from time to time such that the disclosure of an identifier by one device to another does not compromise the identity of the device. In this case the identifier may be assigned from a central server and such server coordinate the identifier's change from time to time.

Reliance on a central server also allows the secure and fraud resistant application of disclosure policy. Such policy might include the verification of the identity of the party to which information (identity and presence for instance) or content (pictures of the account owner) is to be provided. Such verification is performed in an anonymous way such that in the process of verifying information associated with each party, no personal information is disclosed between the parties prior to satisfaction of some pre-set policy such as inclusion on a friend list or belonging to a specific group or organization. Another important policy required for such services would be the determination of any past negative feed back ratings by other past peers for behavior for the particular user to which the information is to be provided. An individual with significant poor ratings having detected a peer, may be denied access to personal information or even notification of arrival of the detected peer based on the server policy setting by the detected peer or the server in general.

A further distinction is to enable electronic payments for individuals who are in close proximity to each other. The central server can act as a third trusted party to help facilitate the electronic transaction between the individuals. Secondly, the server allows for a convenient, electronically secure, personally secure and anonymous method for each of the individuals to specify the party with which they wish to engage in a transaction. Thirdly, participants in a transaction can cross validate the identities of the individuals engaged in

the transaction. Finally, because this method is proximity based it will also work indoors or in other situations where GPS location information is not available.

Feature Summary of Preferred Embodiments

1. In a first embodiment:

One device is transmitting a wireless identifier using a wireless protocol capable of peer to peer communication;

The wireless identifier being associated with a specific account on a server connected to the internet;

A second device receiving the wireless identifier

The second device capable of communicating with the server over an internet connection;

The second device requesting information from the service associated with the first identifier

The second device having a second identifier associated with a second account on the server; and/or

The server providing different amounts of information related to the first account based on the parameters associated with one or both of the first and second accounts

The identifiers associated with the accounts being updated such that the identifiers would no longer be recognized as being associated with specific accounts without past or current interaction with the server;

Using one or more of Cellular network timing information, and information form the central server to coordinate the broadcast and search times amongst the devices. (to reduce power and resource consumption); and/or

Data necessary to engage in an E-commerce transaction may be exchanged as well such as the identity verification such as via a picture and/or mutual identifier detection.

2. In a second embodiment,

A device is capable of operating two wireless protocols simultaneously, utilizing a first wireless protocol in the device to detect the proximity of another wireless device and using the second wireless protocol to communicate with a remote server, where:

One or more of the devices are mobile devices;

Where the first wireless protocol is a local, or personal area network wireless protocol such as 802.11, Bluetooth, UWB or other local connectivity protocol;

Where the first wireless capability used for detecting the presence of another device, or advertising the presence or a device;

Utilizing a wireless wide area data link from one or more of the wireless devices to, optionally:

Connect to a central server;

Perform user authorization functions;

Perform download of information associated with account identifiers utilizing the short range wireless capability;

Request forwarding of messages/packets to the other active account;

Utilizing the messaging with a mobile proximity based social networking capability; and optionally,

The messaging being performed via the WWAN; and/or

The server providing a centrally assigned user identity, with relationship brokering or identification capability.

3. In another embodiment,

A central serving capability is provided to mobile devices utilizing a wireless WAN connection to provide and exchange information between one or more application on one or more wireless devices and the central server where

the information passed to the central server is collected by one wireless device from another wireless device via a separate local wireless reception from the other wireless device;

the separate local wireless reception from the second wireless device contains information directly assigned by, derived from, or known to the central server associated with the identity of the second wireless device;

this identity is related to certain information and preferences of an account holder associated with an application operating on the second wireless device;

the application is operating on both wireless devices;

the application operating on the first device also provides its own identifying information to the central server as well as detected identifiers from devices with applications on them;

The central server contains account information registered to the applications running on each wireless device;

The preferences associated with the account information also contain policies related to the disclosure of one account's stored information to other accounts and hence to their application on their devices;

These policies including a classification of other accounts each classification having different policies some of these policies being one of:

no not allow notification of my presence

allow notification of my presence

disclose my name/do not disclose my name

disclose age/do not disclose age

disclose personal details;

Where an application running on each device can optionally perform point of sale transitions coordinated via the central server, over the WWAN, utilizing user input on each device as confirmation of successive steps in the transition;

Further, where at least one of the confirmation steps additionally involves displaying an identifying picture related to one of the devices, on the other device;

Additionally the server performing an authorization for the transition to a third party;

Or, optionally, a device is interacting with a point of sale device to associate an itemized list of items with a detected second device;

The service performing a confirmation with the application on the second device requiring user input that the bill of goods list is correct; and/or

The server storing the information related to the second devices detected account identity and inventory in a database for later use

4. In still other embodiments, a device has a wireless capability with no WWAN capability, but only with the ability to broadcast a unique identifier, and

A central server stores having the broadcast device's details;

And when the first device provides these detail to the server, authorized and current information about the broadcast device are provided to the first wireless device;

Where this information optionally includes advertising information or information related to "e-coupons" for special offers for products or services; and/or

Where the content of the e-coupons might be customized based on the identity of the requesting device or account holder;

Where the content is further customized based on other information known by the server related to the user's account; or

Where the other information is related to the user's past purchasing practices or previous requests; and/or

A mobile device, upon detecting a broadcast device and if enabled to do so, will report that broadcast Id to the server over a WWAN, and retrieve the current content from the server associated with that device and:

Display it to the user on their device; or

Execute instructions associated with the information retrieved from the server.

5. In still further embodiments, a good or service delivery model utilizing the above described broadcast device, is placed in a known location, and further

A mobile device is for detecting the fixed device's identifier via the WPAM/WLAN;

The mobile device reporting this identifier and passing an identifier associated with itself, or the account associated with the user utilizing the device;

The server determining that the detected broadcast device is associated with the broadcast device with a known location;

The server further determining that the identifier is associated with a service, and further associated with an account or that service;

The server retrieving content associated with the service provider's account and providing that content to the application on the requesting mobile device;

Where that content may be a list of items for sale, services for sale, a opinion pole, food menu, or other menu style content which allows for user selection of items, which can be implemented in java code, xml, simple text, or other for example optionally including active code elements;

The application on the mobile device displaying the content to the user display with the itemized list of goods, services, or other selection items;

A user providing selection of one or more of the items, and confirming they wish to purchase said items, and take delivery at or near the location of the fixed broadcast device;

The server facilitating the purchasing of the goods or services from the merchant's account and the customer's account, and providing confirmation to each. Such confirmation including an electronic receipt provided to the customer, for user upon arrival of the deliverer of the good to or service;

The customer confirming receipt of the good or service via the mobile device, thereby completing the transfer of funds and the transition; and/or

The deliverer of the good or service optionally having a mobile device and optionally:

such that identifiers from that device may be detected by the customers device and reported to the server to confirm that the provider's delivery person was present;

such that the broadcast devices identifier is detected by the delivery person's mobile device and reported to the server confirming the deliver person was in the correct area

such that the customer's device's transmitted identifier is detected by the delivery persons device and reported to the central server further confirming the physical proximity of the parties involved in the transaction; and/or

The delivery person confirming the delivery of the good or service to the customer via the user input on their mobile device, and that confirmation being reported to the central server.

6. In another embodiment, a software program is arranged to operate at the application layer on a mobile device, which interfaces to a device driver interface:

Using wi-fi 802.11 to perform a WLAN local connection protocol; or

Using Bluetooth to perform the WLAN local connection;

Where the device driver interface is an NDIS driver or the like;

Using 1×EVDO, HSDPA, GPRS, EDGE or the like for a wide area WWAN interface;

The application then providing the reported identifiers to a server, which will make decisions regarding a users interest in these detected identifiers, and policy regard privacy other identifiers;

The decision process optionally based on priority of the identifier, the class an identifier belongs to, a list the identifier is, or is not included on;

Based on the result of the action function,

Sending at least one detected identifier to the network, potentially with additional information from the action function, and retrieving information back from the server related to that identifiers' account information stored on that server;

The server then receiving a request from a device's application, with a detected identifier

The server examining both the requesting and the requested identifier's identity and making a policy decision regarding the release of the requested identifiers information related to their account;

The server in some cases providing a continuously or periodically changing account or device identifier to a specific application on a device to enhance the privacy of the identity of that device;

The changing of the identifier may be effected by a rule based generation local to the application, or may be downloaded from the server directly; and/or

The update of the identifier being synchronized to such that it is coordinated with predetermined scanning and broadcasting periods allowing for a known update boundary;

7. In still another embodiment, a method uses the mobile device's time of day derived from the network or other reference for

synchronizing a PAN/WLAN discovery and advertisement times to save battery life;

doing the same in a synchronized way among multiple devices;

while coordinating the timing information utilizing the WWAN and a central server available commonly to the devices, such as by

Synchronizing identifier transmission timing to save power from WWAN network parameters obtained for the server;

Coordinating any identifier updates to this same timing source; and/or

Using a pool of identifiers available to the central server to assign identifiers to devices changing the identifiers at some time interval derived for the common time reference

8. In another embodiment,

A central server uses an identity manager to assign identifiers to devices using a WWAN cellular data link, and wherein

identifiers are occasionally changed

identifiers are assigned from a pool of identifiers available to the servers;

identifiers are used as 48 bit media access control (MAC) addresses of the short range wireless network adapter

identifiers are optionally used as

an SSID in a MSS in IEEE-802.11 network beacons

a BSSID of the IEEE802.11 network adapter;

in a IEEE802.15.1 Inquiry Response Message as the BD_ADDR

a device name in a Bluetooth name response packet; or

listed in a services list as provided in a LMP_features_req message or LMP_features_req_ext message for a Bluetooth device

While this invention has been particularly shown and described with references to example embodiments thereof, it will be understood by those skilled in the art that various

changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

The invention claimed is:

1. A method comprising:

receiving, at a wireless device, via a short range wireless protocol, a first plurality of beacon transmissions, each beacon transmission comprising three fields (a) a MAC address, (b) a unique identifier, wherein the unique identifier of each respective beacon transmission does not directly identify a location of a beacon transmitter, and (c) a beacon service identifier, wherein the beacon service identifier of each respective beacon transmission identifies a wireless beacon service as opposed to identifying a communication network or a device accessible using the short range wireless protocol;

receiving, at the wireless device via a second wireless protocol, stored information from one or more servers, the stored information relating to a particular entity or object associated with a first unique identifier, and wherein the second wireless protocol is different from the short range wireless protocol;

causing selection of one or more of the unique identifiers from the first plurality of beacon transmissions, by filtering the beacon transmissions which include a particular beacon service identifier indicating that a particular received beacon transmission is associated with a particular wireless beacon service; and

taking first further action relating to the stored information, if the first unique identifier is present among the selected one or more unique identifiers.

2. The method of claim **1**, wherein the receiving, at the wireless device, via a short range wireless protocol, of the first plurality of beacon transmissions occurs in a first time period, and wherein the method further comprises, during a second time period:

receiving, at the wireless device, via a short range wireless protocol, a second plurality of beacon transmissions, each of the second plurality of beacon transmissions comprising three fields (a) a MAC address, (b) a unique identifier, wherein the unique identifier of each respective beacon transmission does not directly identify a location of a beacon transmitter, and (c) a beacon service identifier, wherein the beacon service identifier of each respective beacon transmission identifies a wireless beacon service as opposed to identifying a communication network or a device accessible using the short range wireless protocol;

causing selection of one or more of the unique identifiers from the second plurality of beacon transmissions, by filtering the beacon transmissions which include the same particular beacon service identifier indicating that the particular received beacon transmission is associated with the same particular wireless beacon service; and

taking second further action relating to the stored information, if a second unique identifier is present among the one or more unique identifiers selected from the second plurality of beacon transmissions, wherein the first unique identifier and the second unique identifier is are both associated with the same particular entity or object, and wherein the second unique identifier is not equal to the first unique identifier, and further wherein the received beacon transmissions including the first and second unique identifiers are received from a same transmitting device.

3. The method of claim **2** wherein the MAC address received in a beacon transmission including the second unique identifier is different from the MAC address received in a beacon transmission including the first unique identifier, but each such beacon transmission includes the same beacon service identifier, and wherein a plurality of beacon transmissions including the particular service identifier and the first unique identifier are received in the first time period, and no beacon transmissions including the same service identifier and the second unique identifier are received in the first time period.

4. The method of claim **3** wherein the second further action is based upon a function currently being performed on a device associated with the wireless beacon service.

5. The method of claim **4** wherein the function is related to a current phone call,

music being played,

a video being played,

a multi-player game, or

a shared application.

6. The method of claim **2** wherein the first or the second further action is related to receiving advertising information for presentation to a user of the wireless device, based upon the first or the second unique identifiers, or information derived from the first or second unique identifier.

7. The method of claim **2** wherein the first further action includes retrieving content from a server based upon information derived from either the first unique identifier or the second unique identifier.

8. The method of claim **2**, wherein the first or second further action includes sending a message to another device associated with an account related to the first and the second unique identifiers.

9. The method of claim **2** wherein following the performance of the first or second further action, a server associated with an account for a user of the wireless device performs a step of sending a message to an email address associated with the account for the user, the email relating to the same particular entity or object associated with the first or second unique identifier.

10. The method of claim **2** wherein the second further action includes preventing sending of the second unique identifier or information derived from the second unique identifier by the wireless device to at least one of the one or more servers.

11. The method of claim **1** wherein the first further action comprises: determining, based upon at least a portion of the stored information, that at least one beacon transmitter is associated with a predetermined location.

12. The method of claim **2** wherein the step of taking first further action further includes, causing the wireless device to:

send the first unique identifier or information derived from the first unique identifier to at least one of the one or more servers, and

receive the stored information in response.

13. The method of claim **1**

wherein the stored information is received by at the wireless device from at least one of the one or more servers prior to the performing of the first further action.

14. The method of claim **2**

wherein the stored information is received at the wireless device from at least one of the one or more servers prior to the performing of the first further action.

15. The method of claim 1 further comprising:

using the stored information to determine if the first unique identifier is present among the first selected one or more unique identifiers.

16. The method of claim 2 wherein all beacon transmitter devices participating in the particular wireless beacon service have the same particular beacon service identifier.

17. The method of claim 2 wherein the second further action comprises:

determining, based upon at least a portion of the stored information, that the beacon

transmitter is associated with a predetermined location.

18. The method of claim 2 wherein one or more of the steps performed by at the wireless device are performed as a result of an application program executing on the wireless device.

19. The method of claim 2 wherein the second further action is related to either a product tied to a location or an advertisement tied to a location.

20. The method of claim 1 wherein the first further action includes determining an address or location associated with the wireless device based at least in part upon the first unique identifier being associated with a pre-determined location, and wherein the wireless device is located indoors where a GPS signal may not be available.

21. The method of claim 2 wherein the second further action includes determining an address or location associated with the wireless device based at least in part upon the second unique identifier being associated with a pre-determined location, wherein the wireless device is located indoors where a GPS signal may not be available.

22. The method of claim 2 wherein the second further action includes allowing a user associated with the wireless device to be provided access to an object or device associated with the wireless beacon service.

23. The method of claim 2 wherein the step of taking second further action additionally comprises:

controlling further communications between the wireless device and at least one device or server associated with an entity or object in proximity to the wireless device.

24. The method of claim 3 further comprising:

receiving, at the wireless device, timing notification information for coordination of active times for beacon transmissions.

25. The method of claim 24 wherein the receiving, the wireless device of the timing notification information is not directly from the beacon transmitter.

26. The method of claim 2 further comprising:

using the stored information to determine if the second unique identifier is present among the selected one or more of the unique identifiers from the second plurality of beacon transmissions.

27. The method of claim 1 wherein the MAC address is a randomly generated 48 bit number matching a format of a Bluetooth BD_ADDR.

28. The method of claim 3 wherein the short range protocol is derived from Bluetooth.

29. A mobile wireless device comprising:

one or more radios for providing reception and transmission for each of a Bluetooth wireless protocol and a second wireless protocol;

one or more processors; and

one or more memory devices coupled to the one or more processors, the one or more non-transitory memory devices storing a set of instructions that when executed by the one or more processors cause the one or more processors to perform operations including:

receiving from a beacon transmitter, using the Bluetooth wireless protocol, a first plurality of beacon transmissions during a first time period, each of the beacon transmissions including (a) a MAC address, (b) a unique identifier, wherein the first unique identifier does not directly identify a location of the beacon transmitter, and (c) a beacon service identifier, wherein the beacon service identifier of each respective beacon transmission identifies a wireless beacon service as opposed to identifying a communication network or a device accessible using the Bluetooth wireless protocol;

receiving from one or more servers, using the second wireless protocol, stored information related to a entity or object associated with a first unique identifier;

selecting one or more unique identifiers from the first plurality of beacon transmissions, by filtering the beacon transmissions which include a particular beacon service identifier indicating that a particular received beacon transmission is associated with the particular wireless beacon service;

taking first further action relating to the stored information, if the first unique identifier is present among the selected one or more unique identifiers;

receiving, by the wireless device, using the Bluetooth wireless protocol, during a second time period, a second plurality of beacon transmissions, each of the second plurality of beacon transmissions comprising three fields (a) a MAC address, (b) a unique identifier, wherein the unique identifier of each respective beacon transmission does not directly identify a location of a beacon transmitter, and (c) the beacon service identifier, wherein the beacon service identifier of each respective beacon transmission identifies a wireless beacon service as opposed to identifying a communication network or a device accessible using the Bluetooth wireless protocol;

selecting one or more of the unique identifiers from the second plurality of beacon transmissions, by filtering the beacon transmissions which include the same particular beacon service identifier indicating that a particular received beacon transmission is associated with the same particular wireless beacon service;

taking second further action relating to the stored information, if a second unique identifier is present among the one or more unique identifiers selected from the second plurality of beacon transmissions, wherein the second unique identifier is associated with the same entity or object, and wherein the second unique identifier is not equal to the first unique identifier, and further wherein the received beacon transmissions including the first and second unique identifiers are received from a same transmitting device; and

wherein the MAC address received in a beacon transmission including the second unique identifier is different from the MAC address received in a beacon transmission including the first unique identifier, but each such beacon transmission includes the same particular beacon service identifier.

30. A computer program product for installation in a non-transitory medium in a wireless device, the computer program product comprising computer program instructions that, when executed by one or more processors in the wireless device, cause the wireless device to:

process a first plurality of beacon transmissions, received at the mobile wireless device via a Bluetooth protocol, each beacon transmission comprising three fields (a) a

MAC address, (b) a unique identifier, wherein the unique identifier of each respective beacon transmission does not directly identify a location of a beacon transmitter, and (c) a beacon service identifier, wherein the beacon service identifier of each respective beacon transmission identifies a wireless beacon service as opposed to identifying a communication network or a device accessible using the Bluetooth wireless protocol;

process stored information transferred from one or more servers to the mobile wireless device via a second wireless protocol, wherein the stored information relates to an entity or object associated with a first unique identifier, and wherein the second wireless protocol is different from the Bluetooth wireless protocol;

select one or more of the unique identifiers from the first plurality of beacon transmissions, by filtering the beacon transmissions which include a particular beacon service identifier indicating that a particular received beacon transmission is associated with the a particular wireless beacon service; and

perform a further action, the further action relating to the stored information, if the first unique identifier is present among the selected one or more unique identifiers.

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