(54) Title: COMMERCE AND SERVICES IN A FEMTOCELL NETWORK

(57) Abstract:
System(s) and method(s) are provided for commerce and services through a set of networked femto access points (APs) and served devices. Incentive(s) and advertisement are delivered to a device based at least in part upon at least one of a location of the
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device within a coverage area spanned by the set of networked femto APs. Commercial transaction(s) can be implemented based at least in part on a commercial profile associated with a mobile device. Order(s) for a product can be issued remotely and a related transaction can be effected at a point-of-sale linked to the product; transaction's billing charges can be adjusted based at least in part on available incentive(s). Navigation from a point of entry to a destination can afford delivery service(s) or locale or product identification or discovery. Revenue sharing and generation of business intelligence is provided.
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**FIG. 1**

Published:

— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
COMMERCE AND SERVICES IN A FEMTOCELL NETWORK

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This subject application claims the benefit of U.S. Provisional Patent application Serial No. 61/052,813 entitled “MANAGEMENT OF ACCESS TO FEMTO CELL COVERAGE” and filed on May 13, 2008. The subject application is related to co-pending U.S. Patent Application Serial No. __, entitled “LOCATION-BASED SERVICES IN A FEMTOCELL NETWORK,” and filed on __, co-pending U.S. Patent Application Serial No. __ entitled “INTRA-PREMISES CONTENT AND EQUIPMENT MANAGEMENT IN A FEMTOCELL NETWORK,” filed on __, and co-pending U.S. Patent Application Serial No. __ entitled “FEMTOCELL ARCHITECTURE FOR INFORMATION MANAGEMENT” and filed on __. The entireties of these applications are incorporated herein by reference.

TECHNICAL FIELD

[0002] The subject innovation relates to wireless communications and, more particularly, to commerce and services enabled by a femtocell network that serves a confined area or nearly confined area.

BACKGROUND

[0003] Femtocells—building-based wireless access points interfaced with a wired broadband network—are generally deployed to improve indoor wireless coverage and to offload a mobility radio access network (RAN) operated by a wireless network and service provider. Femtocells typically operate in licensed portions of the electromagnetic spectrum, and generally offer plug-and-play installation. Improved indoor coverage includes stronger signal and improved reception (e.g., voice or data), ease of session or call initiation and session or call retention as well. Offloading a RAN can reduce operational and transport costs for a service provider since a lesser number of end users utilizes over-the-air (OTA) radio resources (e.g., radio frequency bands and channels), which are typically limited.

[0004] Coverage of a femtocell, or femto access point (AP), is generally intended to be confined within the bounds of an indoor compound (e.g., a residential or commercial building) in order to mitigate interference among mobile stations covered by a macrocell and terminals covered by the femto AP. Additionally,
confined coverage can reduce cross-talk among terminals serviced by disparate, neighboring femtocells as well. Indoor wireless coverage improvements through femtocell also can mitigate customer attrition as long as a favorable subscriber perception regarding voice coverage and other data services with substantive delay sensitivity, or otherwise, is attained. In addition, a richer variety of wireless voice and data services can be offered to customers through a femtocell since such service offerings do not rely primarily on mobility RAN resources.

Various commercial transactions and services can be effected via mobile devices. Typically, such transactions and service utilization is conducted through a wireless wide area network served primarily by a macrocell network. Accordingly, consumer experience is generally limited since customization of commercial transaction(s) and service(s) consumption can demand substantive radio resources of the macrocell. Transacted or consumed digital content that is commercially relevant, such as gaming applications with rich audiovisual content, typically includes a large volume of information and thus it can employ a significant amount of over-the-air bandwidth. In addition, delivery of such digital content can incur significant signaling and related network congestion since packets of information generally need to be re-delivered. With respect to customization, service(s) or content(s) are typically segmented in broadly defined groups since highly granular segmentation can result in substantive consumption of radio resources and signaling in the macrocell network in order to meet customized delivery and billing features. Moreover, content consumption and service utilization through macrocell does not satisfactorily integrate mobility and location of a mobile device since. Capabilities of femtocell deployments to offload RAN resources have marginally employed to integrate digital content and service(s) consumption with mobility.

SUMMARY

The following presents a simplified summary of the specification in order to provide a basic understanding of some aspects of the specification. This summary is not an extensive overview of the specification. It is intended to neither identify key or critical elements of the specification nor delineate the scope of the specification. Its sole purpose is to present some concepts of the specification in a simplified form as a prelude to the more detailed description that is presented later.
The subject innovation provides system(s) and method(s) to route traffic and signaling between a set of networked femto access points (APs) and enable commerce and services. A femto AP in the set of networked femto APs is functionally linked to a routing platform that manages traffic and signaling, and is functionally connected to a controller component that relays at least part of data and control to a femto network platform. The femto network platform allows access to one or more external networks. Routing platform assesses billing charges associated with a call session served at least in part through one or more femto APs in the set of networked femto APs and the routing platform. Call sessions can include intra-network or inter-network communication, wherein intra-network communication can include push-to-point delivery of traffic and signaling, while inter-network communication can include exchange of data and control among a device served through an external network and a device served through a femto AP linked to the routing platform. In addition, routing platform can effect soft handover of call sessions amongst two femto APs in the set of femto APs, and it can implement hard handover of a call session between a femto AP and a component in an external network that can serve the call session.

Monetary incentive(s) or advertisement are delivered to a device, wherein the incentive(s) or advertisement are customized at least in part on at least one of location of the device within an enterprise femto network coverage area spanned through the set of networked femto APs. In an aspect, the recipient mobile device can accept or reject reception of incentive(s) or advertisement. Commercial transaction(s) also can be implemented based at least in part on a commercial profile associated with a unique identifier of the mobile device. A commerce profile can be configured autonomously by a commerce component that delivers incentive(s) and enables one or more commercial transaction(s). Alternatively or additionally, a consumer associated with the mobile device can configure the commerce profile through an external network. A marketing component can exploit advertisement campaign(s) and response thereto to generate business intelligence and adjust advertisement content and delivery as well as an advertised service.

In addition, order(s) for a product can be placed remotely and a related transaction, e.g., purchase, can be effected at a time of pick-up of the ordered product within a point-of-sales (POS) that is provided wireless service through a femto AP in the set of network femto APs. Billing charges associated with the transaction can be
adjusted based at least in part on available incentives to a mobile device or a subscriber associated therewith. Moreover, delivery service(s) or directed purchase or inquiry can be automatically navigated from a point of entry to a destination location within the enterprise femto network. Navigation directives or instructions can be generated based at least in part on a set of access lists that regulate access rights of a mobile device to a set of respective networked femto APs. Navigation directions can be conveyed to the mobile device in various formats such as a short message service (SMS) communication, a multimedia message service (MMS) communication, and instant message (IM), or an email communication. In an aspect, a transaction component within the mobile device can exploit a display interface thereof and one or more application(s) retained in a memory within the mobile device to consume, e.g., render or process, received navigation directions.

[0010] Revenue sharing also can be configured amongst an operator that manages a business in which the enterprise femto network is deployed and a set of advertisers; revenue sharing can be based at least in part upon exchange of service unit(s) for exposure to advertisement. The set of advertisers can include at least one of advertisers internal to the business operator or a service provider, or advertisers external thereto.

[0011] Aspects, features, or advantages of the subject innovation can be exploited in substantially any wireless telecommunication, or radio, technology; for example, Wi-Fi, Worldwide Interoperability for Microwave Access (WiMAX); Enhanced General Packet Radio Service (Enhanced GPRS); Third Generation Partnership Project (3GPP) Long Term Evolution (LTE); Third Generation Partnership Project 2 (3GPP2) Ultra Mobile Broadband (UMB); 3GPP UMTS; High Speed Packet Access (HSPA); High Speed Downlink Packet Access (HSDPA); High Speed Uplink Packet Access (HSUPA), or LTE Advanced. Additionally, substantially all aspects of the subject innovation can include legacy telecommunication technologies.

[0001] It is noted that various aspects, features, or advantages of the subject innovation are illustrated in connection with femto access point(s) and associated femto network platform, such aspects or features also can be exploited in indoor-based base stations (e.g., home-based access point(s), enterprise-based access point(s)) that provide wireless coverage through substantially any, or any, disparate
telecommunication technologies such as for example Wi-Fi (wireless fidelity) or picocell telecommunication.

[0002] To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described. The following description and the annexed drawings set forth in detail certain illustrative aspects of the invention. However, these aspects are indicative of but a few of the various ways in which the principles of the invention may be employed. Other aspects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 illustrates a diagram of an example enterprise femto network in accordance with aspects of the subject specification.

[0013] FIGs. 2A-2C illustrate, respectively, a block diagram of an example multi-coverage-area femto mesh network, a block diagram of an example femto mesh network in which routing in a multi-loci environment is decentralized, and an example femto mesh network wherein various routing platforms related to various enterprise deployments are multiplexed in accordance with aspects described herein.

[0014] FIG. 3 displays a block diagram of an example embodiment of a routing platform that is part of an enterprise femto network architecture in accordance with aspects disclosed herein.

[0015] FIG. 4 illustrates an example embodiment of a femto access point that can be deployed in a femto enterprise network in accordance with aspects described herein.

[0016] FIG. 5 illustrates a diagram of an example embodiment of a femto enterprise network architecture that enables collection of location data in accordance with aspects of the subject innovation.

[0017] FIG. 6 illustrates a block diagram of an example embodiment of a routing platform that is part of an enterprise femto network architecture in accordance with aspects disclosed herein.

[0018] FIGs. 7A and 7B illustrates diagrams of example embodiments of a femto enterprise network architecture that enables collection of location data of a mobile in accordance with aspects of the subject innovation.
[0019] FIG. 8 illustrates an example embodiment of a routing platform that can be part of an enterprise femto network architecture in accordance with aspects of the disclosure.

[0020] FIG. 9 represents an example system that enables customized item navigation at least in part through an example enterprise femto network in accordance with aspects described herein.

[0021] FIG. 10 illustrates an example embodiment of a routing platform that can operate within an enterprise femto network in accordance with aspects described herein.

[0022] FIG. 11 is a block diagram of an example system that enables commercial transactions in an enterprise femto network in accordance with aspects described herein.

[0023] FIG. 12 is a block diagram of an example embodiment of an incentive component that enables one or more aspects of a commerce component that operates within an enterprise femto network.

[0024] FIG. 13 illustrates a block diagram of an example system that enables marketing within an enterprise femto network in accordance with aspects described herein.

[0025] FIGs. 14A-14B illustrate example embodiments of an example system that enables a commercial transaction within an enterprise femto network in accordance with aspects described herein.

[0026] FIGs. 15A-15B illustrate exchange of signaling and data to complete a delivery or effect a commercial transaction in accordance with aspects described herein.

[0027] FIG. 16 is a block diagram of an example embodiment of a mobile device that can enable and exploit various aspects of the subject innovation described herein.

[0028] FIG. 17 displays a flowchart of an example method for communicating within a femto mesh network according to aspects disclosed in the subject specification.

[0029] FIG. 18 represents a flowchart of an example method for delivering content within a femto mesh network according to aspects described herein.

[0030] FIG. 19 is a flowchart of an example method for locating a mobile device that operates within a femto network according to aspects described herein.
[0031] FIG. 20 displays a flowchart of an example method for identifying a location of an entity according to aspects described herein.

[0032] FIG. 21 displays a flowchart of an example method for tracking a location estimate for selected mobile device(s) according to aspects described herein.

[0033] FIG. 22 displays a flowchart of an example method for associating an item with a mobile device according to aspects described herein.

[0034] FIG. 23 is a flowchart of an example method for navigating a device from a first location to a destination location according to aspects described herein.

[0035] FIG. 24 is a flowchart of an example method for supplying custom content according to aspects described herein.

[0036] FIG. 25 is a flowchart of an example method for effecting a commercial transaction at least in part through an enterprise femto network according to aspects described herein.

[0037] FIG. 26 displays a flowchart of an example method developing business intelligence through advertisement within an enterprise femto network according to aspects described herein.

[0038] FIG. 27 displays a flowchart of an example method for conducting a commercial transaction within an enterprise femto network according to aspects described herein.

[0039] FIG. 28 displays a flowchart of an example method for consuming promotional content(s) according to aspects described herein.

[0040] FIG. 29 displays a flowchart of an example method for reaching a destination location within an enterprise femto network according to aspects described herein.

[0041] FIG. 30 illustrates a flowchart of an example method for conducting a commercial transaction within an enterprise femto network according to aspects described herein.

[0042] FIG. 31 represents a flowchart of an example method for handing off a mobile device within coverage areas within a femto enterprise network according to aspects described herein.

[0043] FIG. 32 displays a flowchart of an example method for signaling to a routing platform an attachment of a wireless device to a femto access point in a femto enterprise network according to aspects described herein.
FIG. 33 is a flowchart of an example method for assisting localization of a mobile device that operates in the femto enterprise according to aspects described herein.

FIG. 34 illustrates an example wireless communication environment with associated components that can enable operation of a femtocell enterprise network in accordance with aspects described herein.

FIG. 35 illustrates a schematic deployment of a macro cell and a femto cell for wireless coverage in accordance with aspects of the subject specification.

DETAILED DESCRIPTION

The subject innovation is now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present innovation. It may be evident, however, that the subject invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing the present invention.

As used in this application, the terms “component,” “system,” “architecture,” “platform,” “node,” “layer,” “selector,” “interface,” “module,” and the like are intended to refer to a computer-related entity or an entity related to an operational apparatus with one or more specific functionalities, wherein the entity can be either hardware, a combination of hardware and software, software, or software in execution. As an example, a component may be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of non-limiting illustration, both an application running on a server and the server can be a component. One or more components may reside within a process and/or thread of execution and a component may be localized on one computer and/or distributed between two or more computers. These components also can execute from various computer readable media having various data structures stored thereon. The components may communicate via local and/or remote processes such as in accordance with a signal having one or more data packets (e.g., data from one component interacting with another component in a local system, distributed system, and/or across a network such as the Internet with other systems via
the signal). As another example, a component can be an apparatus with specific functionality provided by mechanical parts operated by electric or electronic circuitry that is operated by a software or firmware application executed by a processor, wherein the processor can be internal or external to the apparatus and executes at least a part of the software or firmware application. As yet another example, a component can be an apparatus that provides specific functionality through electronic components without mechanical parts, the electronic components can include a processor therein to execute software or firmware that confers at least in part the functionality of the electronic components. An interface can include input/output (I/O) components as well as associated processor, application, and/or API components.

[0049] In addition, the term “or” is intended to mean an inclusive “or” rather than an exclusive “or.” That is, unless specified otherwise, or clear from context, “X employs A or B” is intended to mean any of the natural inclusive permutations. That is, if X employs A; X employs B; or X employs both A and B, then “X employs A or B” is satisfied under any of the foregoing instances. Moreover, articles “a” and “an” as used in the subject specification and annexed drawings should generally be construed to mean “one or more” unless specified otherwise or clear from context to be directed to a singular form.

[0050] Moreover, terms like “user equipment,” “mobile station,” “mobile,” “mobile device,” “subscriber station,” “subscriber equipment,” “access terminal,” “terminal,” “handset,” and similar terminology, refer to a wireless device utilized by a subscriber or user of a wireless communication service to receive or convey data, control, voice, video, sound, gaming, or substantially any data-stream or signaling-stream. The foregoing terms are utilized interchangeably in the subject specification and related drawings. Likewise, the terms “access point,” “base station,” “Node B,” “evolved Node B (eNode B),” “home Node B (HNB),” “home access point (HAP),” or the like, are utilized interchangeably in the subject specification and drawings, and refer to a wireless network component or apparatus that serves and receives data, control, voice, video, sound, gaming, or substantially any data-stream or signaling-stream from a set of subscriber stations. It is noted that in the subject specification and drawings, context or explicit distinction provides differentiation with respect to access points or base stations that serve and receive data from a mobile device in an outdoor environment, and access points or base stations that operate in a confined,
primarily indoor environment. Data and signaling streams can be packetized or frame-based flows.

[0051] Furthermore, the terms "user," "subscriber," "customer," "consumer," "prosumer," "agent," "owner" and the like are employed interchangeably throughout the subject specification, unless context warrants particular distinction(s) among the terms. It should be appreciated that such terms can refer to human entities or automated components supported through artificial intelligence (e.g., a capacity to make inference based on complex mathematical formalisms) which can provide simulated vision, sound recognition and so forth. As utilized herein, the term "prosumer" indicate the following contractions: professional-consumer and producer-consumer.

[0052] Further yet, the terms "wireless network" and "network" are used interchangeably in the subject application, when context wherein the term is utilized warrants distinction for clarity purposes such distinction is made explicit. Likewise, the terms "femtocell access point", "femto access point", "femtocell," "femto" and the like also are utilized interchangeably.

[0053] FIG. 1 illustrates a diagram of an example enterprise femto network architecture 100 in accordance with aspects of the subject specification. A set of femto access points 1041-104N, with N a natural number, can be functionally connected to a routing platform 110 that can be functionally coupled to a controller component 120, which can be operationally linked to a femto network platform 130. It should be appreciated that a single backhaul pipe 118 operationally connects routing platform 110 and controller component 120. Likewise, a single backhaul pipe 118 connects controller component 120 and femto network platform 130. In an aspect, femto network platform 130 can be functionally coupled, via one or more reference link(s) 135, to external network(s) 140 which can include service network(s) such as an internet protocol (IP) multimedia subsystem (IMS). In another aspect, in 3GPP UMTS radio technology, controller component 120 can be embodied in a radio network controller. It is noted that in one or more alternative or additional embodiments, controller component 120 can reside within femto network platform 130 or within one of external network(s) 140, in such an embodiment, femto network platform 140 can connect to routing platform 110 via the one external network among external network(s) 140. It should further be appreciated that example enterprise femto network architecture 100 enables femto APs 1041-104N to be mutually
connected, via routing platform 110, in a mesh network configuration, also termed herein as a mesh femto network. The portion of the enterprise femto network within the coverage area spanned by femto APs 104_1-104_N is private as opposed to public such as a macrocell network.

[0054] The number of femto APs 104_λ, with λ=1,2 ... N, connected to the routing platform 110 can be based at least in part on at least one of a number of ports on or bandwidth available to routing platform 110. Femto APs 114_λ are functionally connected to routing platform 110 through links 114_λ, which can be broadband, backhaul wired links (e.g., optical fiber backbone, twisted-pair line, T1/E1 phone line, a digital subscriber line (DSL) either synchronous or asynchronous, an asymmetric ADSL, or a coaxial cable ...) or a wireless (line-of-sight (LOS) or non-LOS) links. Backhaul link(s) 118 also can be wired or wireless. In an aspect, in 3GPP UMTS radio technology, a link 114_λ can be embodied in at least one of an Iur interface or an Iuh interface. It is noted that the number of channel elements of a link 114_λ can be lower that the number of channel elements in backhaul link 118. Thus, the plurality of femto APs 104_1-104_N can be served via femto network platform 130, through single backhaul pipes 118, with less backhaul resources than in a conventional system in which a backhaul pipe 118 is functionally connected to each femto AP.

[0055] Femto APs 104_1-104_N are deployed within a confined coverage area which can include either a single-floor or multi-floor facility or enterprise. Deployment plan generally minimizes dead spots and includes a number of femto APs sufficient to achieve operational redundancy, such that if one or more of the provisioned femto APs fails, disparate additional femto AP(s) functionally connected to routing platform 110 can be employed for communication. Thus, the mesh femto network can be self-healing. An enterprise can include, but is not limited to including, one of an office building; a residential complex, a business building such as department store, a bank, a restaurant, or a warehouse; a government facility; a school; a hospital; a hotel; a factory; an airport; a recreation or city park; or the like.

[0056] As an illustration of multi-floor networked embodiments, FIG. 2A displays a block diagram of an example multi-coverage-area femto mesh network 200 in accordance with aspects described herein. Coverage areas, 205_μ (μ=1,2 ... P) can include indoor environments such as floors in a building and, at least partially, outdoor environments such as parking lots; terraces, decks, or verandas; or sports
fields or courts. In each coverage area 205ₜₐ, a network interface device (NID) 210ₜₐ centralizes broadband link(s), illustrated as thick lines without arrowheads (for clarity), from each deployed femto AP. NIDs 210ₜₐ are functionally connected to routing platform 110. Deployed femto APs can be further connected to a single backhaul pipe 116 through routing platform 220. Routing platform 220 can direct traffic among wireless devices located in disparate coverage areas. It is noted that routing functionality provided by routing platform 220 is centralized. As an example, consider a scenario in which the example enterprise femto network architecture 200 is deployed in a multi-floor building wherein multiple femto APs can be deployed on each floor, e.g., coverage area 205ₜₐ of the building. In this example, a mobile device on a first floor, e.g., 205ₜ₂, connected to a femto AP on the first floor can establish communication (e.g., voice or data) with another mobile device on a second floor, e.g., 205ₜ₃, connected to a femto AP therein, without accessing a femto network platform linked to controller component 120.

Alternatively or additionally, FIG. 2B displays a block diagram of an example femto mesh network 250 in which routing in a multi-coverage-area environment is decentralized, effected by a set of routing platforms 260₁₋₂₆₀ₜₐ, U is a natural number, and each coverage area 255ₜₐ, with ₁,₂ ... U, linked to each routing platform in the set. An aggregator component 260 interfaces the multi-area femto enterprise network architecture 250 with controller component 120. The multiple routing platforms 260ₜₐ can communicate with each other such that configuration information with respect to femto APs associated with each routing platform and devices operationally connected to the femto APs is available to each routing platform 260ₜₐ; configuration information can enable, at least in part, internal routing of traffic. An aggregator component 270 can operate as at least one of a pass-through element or as a traffic shaping component, preserving QoS in accordance with predetermined QoS profile(s) for various types of traffic or signaling. In an aspect, aggregator component 270 also can effect routing functionality, and can act as a PBX to allow inter-enterprise communication. As illustrated, one routing platform 260ₜₐ is deployed on each coverage area 220ₜₐ, with ₁,₂ ... U, wherein each coverage area can be a floor of a building (e.g., an office building, a school, a department store) and routing platforms 260ₜₐ on each floor can be mutually functionally connected to create an enterprise femto mesh network structure that can cover the entire building. It is noted
that based at least in part on the size of a coverage area $255_r$, more than a single routing platform can be deployed in the coverage area $255_r$. Multiple femto APs can be functionally connected to a single routing platform $260_r$, and multiple routing platforms $220_1$-$220_U$ can be connected together to create a larger mesh femto network.

**[0058]** Processor(s) (not shown) can provide at least part of the functionality of aggregator component 260. To operate or confer at least in part functionality to the aggregator component 260, the processor(s) can store information in, and retrieve information from, a memory (not shown). The information can include at least one of code instructions, data structures, program modules, or the like.

**[0059]** Further, FIG. 2C illustrates an example femto mesh network 280 wherein various routing platforms related to various enterprise deployments can be multiplexed by employing a single controller component 120. According to an aspect, controller component 120 can receive information from a set of routing platforms, $282_1$-$282_N$, wherein $N$ is a natural number. Each of the routing platforms $282_1$-$282_N$ can be connected to respective sets of multiple femto APs $284_1$-$284_N$, which facilitate connectivity to/from mobile device 102$_i$ connected, e.g., to a respective set of femto APs $284_i$. Each routing platform $282_1$-$282_N$ can receive data from a mobile device attached to a set of femto APs $284_1$-$284_N$ within the enterprise femto architecture or network. Moreover, routing platforms $282_1$-$282_N$ can perform an analysis to determine information associated with routing of the received data (e.g. source address, destination address, etc.). Further, a route can be determined for transferring the packet from the routing platform based in part on the analysis and/or user defined rules or policies and/or user preferences. In particular, routing platforms $282_1$-$282_N$ can determine whether a soft- (indicated with dashed lines in FIG. 1) or hard-handover can be performed. When a hard handover is to be performed, routing platforms $282_1$-$282_N$ can route the data to the femto network platform 130 controller component 120. It is noted that controller component 120 can typically include functionality of a second RNC or most any other network management component associated with the femto network platform 130, which can be embodied at least in part in a FGW. It is noted, however, that in the subject innovation controller component 120 does not effect any RNC function(s) or operation(s). In an aspect, as illustrated in example mesh femto network 280, controller component 130 can
multiplex the set of routing platforms \(282_1-282_N\) related to various enterprise deployments.

[0060] Connections amongst backhaul links \(114_i\), and routing platform 110, NIDs \(210_m\) and routing platform 110, and routing platform 110 and aggregator component 270 can be effected through a port component 315 within routing platform 110, as illustrated in example embodiment 300 shown in FIG. 3. Port component 315 can include port interface(s) 317 to configure one or more of ports 319, which can include parallel ports (e.g., GPIB, IEEE-1284), serial ports (e.g., RS-232, V.11, USB, FireWire or IEEE-1394...), Ethernet ports, V.35 ports, X.21 ports, or dry contacts, or the like. Port interface(s) 317 can include a wireless interface such as a wireless card and associated circuitry to implement telecommunication. In addition, port interface(s) 319 can include one or more physical docks that support physical connectors for respective ports 319. Routing platform 110 can be configured, or programmed, to communicate wirelessly with one or more femto AP 104\(i\) rather than through routing cables. Configuration can be accomplished through a display interface (not shown) that enables data entry in routing platform 110, or through a device such as a computer, mobile or otherwise, connected to port component 315.

[0061] As illustrated in FIG. 1, each femto AP 104\(i\), or femto APs illustrated in embodiments 200 and 250, that is connected to routing platform 110 can include a radio controller (RC) node 105 that includes at least part of the functionality of a radio network controller. Routing platform 110 can functionally connect RC nodes 105 between two or more femto APs deployed within example femto enterprise network system 100. As indicated supra, link(s) 114, can include at least an l1r interface that can route packet stream(s) between the functionally connected two or more femto APs. An RC node 105 can have substantially the same functionality as that controller component 120. However, in one or more architecture(s) or embodiment(s), RC node 105 can have less complexity than controller component 120. Having an RC node 105 in each femto AP 104\(i\) can result in an optimal (e.g., sub-linear) or nearly optimal (e.g., linear) scaling of processing demand at routing component with respect to the number of provisioned femto APs in the femto enterprise network architecture.

Processing demand in the femto enterprise network increases due to increased routing or scheduling processing. It is noted that scheduling relates to scheduling of packet delivery rather than scheduling of radio resources, which is implemented by routing
platform 110. When a femto AP is added to the femto mesh network 100, the RC node 105 associated with the femto AP can provide RNC functionality thereto and thus the mesh network. However, demand for backhaul resources, e.g., backhaul link 118, and controller component 120 does not grow with an increase in the number of femto APs functionally connected to routing component 110. Accordingly, built-in RNC functionality can improve scalability with respect to a networked configuration in which routing platform also acts as a radio network controller.

Routing platform 110 can enable user plane connections directly, and can establish communication, e.g., exchange of voice or data and signaling, between two or more femto APs, e.g., femto AP 104$_1$ and 104$_N$. Moreover, routing platform 110 can enable communication between mobile devices, e.g., 102$_1$ and 102$_2$, attached to disparate femto APs, through a wireless link 136, for example, wherein traffic and signaling associated with the communication is routed within the example femto enterprise network 100 without delivery of data or management packets to femto network platform 130. For example, routing platform 110 can direct traffic generated by mobile device 102$_1$ served through femto AP 104$_N$ to wireless device 102$_2$ served by femto AP 104$_4$. Communication amongst mobile device 102$_1$ and wireless device 102$_2$ can be push-to-talk communication. Alternatively or additionally, routing platform 110 can allow push-to-talk communication between a mobile device and a pseudo-stationary tethered device such as 102$_3$. It is noted that, in an aspect, routing platform 110 is traffic agnostic in that a first device, mobile or otherwise, can operate in a first radio technology disparate from a second radio technology employed by a second device, mobile or otherwise, that communicates with the first device through routing platform 110 and via respective femto APs. In an example embodiment 300, illustrated in FIG. 3, routing component 110 can include push-to-talk driver(s) 307 to enable at least in part point-to-point communication among one or more devices, mobile or otherwise in the femto mesh network 100. In view of such internal communication, for outgoing communication(s) off the example mesh femto network 100, routing platform 110 can allocate bandwidth primarily for control, or signaling, and thus traffic on the backhaul network can be substantially reduced. In addition, such communication internal to example enterprise femto network system 100 can reduce communication delay, with ensuing improvement of perceived QoS for latency-sensitive content such as multiplayer gaming, banking transactions and the like.
In an aspect, routing platform 110, via router component 305, can receive carrier-frequency information associated with channels employed for telecommunication within the coverage area of an enterprise femto network 100. Router component 305 can aggregate carrier-frequency data to form a carrier-frequency map. In an aspect, the carrier-frequency map can enable load balancing of traffic within the enterprise femto network 100 through dynamic allocation of bandwidth to specific femto APs functionally connected to the routing platform. Scheduler component 309 can signal a bandwidth allocation to a femto AP within the enterprise femto network 100.

Routing platform 110 can direct a packet received from a femto AP, e.g., 104_{N-1}, based in part on routing information. In an aspect, routing platform 110 can receive a communication packet from one of the multiple femto APs 104_1-104_N and can determine routing information associated with the communication packet. In an aspect, the routing information can indicate that the communication packet is to be transferred to femto network platform 130. Accordingly, routing platform 110 can perform a hard handover and direct the packet to femto network platform 110 through controller component 120. In another aspect, the routing information can indicate that the packet can be transferred internally from a first femto AP, e.g., 104_N, to a second femto AP, e.g., 104_2, functionally connected to routing platform 110. Moreover, in such case, routing platform 110 can perform a soft handover between a first femto AP (104_2) and a second femto AP (e.g., 104_3) and establish communication such that dead spots or issue scenarios can be avoided or mitigated. Furthermore, routing platform 110 can determine control information, or signaling, for traffic routed directly between femto APs and route the control information, or signaling, to femto network platform via controller component 120 through backhaul pipe 118.

In an example embodiment 300, routing platform 110 includes a router component 305 that can direct traffic and signaling among a set of deployed femto APs, e.g., femto APs 104_1-104_N. Traffic can be routed in accordance at least in part with a set of one or more algorithm(s) retained in memory element 349. Router component 305 can determine a near-optimal or optimal route for a received data or management packet, to avoid network congestion within mesh femto network 100. In addition, router component 305 also can configure point-to-point communication as part of routing functions based at least in part on channel conditions. Moreover,
router component 305 can utilize configured access list(s) 353 to route traffic and
signaling and ensure data integrity or self-healing routing.

[0066] Access list(s) 353 can regulate, at least in part, a level of service
provided to user equipment through a femto AP, e.g., 104N,1. Access list(s) can
comprise at least one of whitelist(s) that at least in part identify a set of devices that
can be provided wireless service through a femto AP, or blacklist(s) that can explicitly
exclude one or more wireless devices from femto service. In addition, wireless
devices in blacklist(s) can prompt exception handling procedures that include issuance
of alarm(s), notification to authorities, tracking of device location within the
enterprise femto network 100, or the like. In an aspect, access list(s) 353 can be
received from femto network platform 130, in which access list(s) 353 can resided
within a subscriber database and can be configured through at least one of external
network(s) 140. In another aspect, routing platform 110 can include access list
management component 338 which can generate or modify, at least in part, access
list(s) 353 (e.g., whitelist(s) or blacklist(s)) based at least in part on signaling received
from one or more femto APs within the set of femto APs deployed as part of the
femto enterprise network 100. Access list(s) 353 generated through access list
management component 338 can be active for a predetermined period, and after such
period elapses can be deleted, either logically or physically, based at least in part on
signaling received from one or more network components. Signaling can include
mobile device identifier attribute(s). Access list management component 338 can
either accept or reject such attribute(s) based at least in part on a set of criteria (not
shown) which can be retained within memory 349. Further, for accepted mobile
device identifier attribute(s), a default or initial level of access; for instance, almost all
or all femto APs deployed as part of enterprise femto network 100 can provide service
to an identified mobile device. Default or initial level of access can be modified
subsequently based at least in part on additional signaling received by routing
platform 110. As an illustration, the set of acceptance or rejection criteria can include
at least one of the following. (i) Valid mobile device identifier, e.g., wireless device
numbers such as IMSIs, MSISDNs, or other codes or tokens. (ii) Active mobile
device identifier or identifier flagged for update; e.g., an identifier that corresponds to
an old phone number that is to be updated to a current number. (iii) Status of election
(e.g., opt in) or non-election (e.g., opt out) flags for inclusion in a whitelist, wherein
status is conveyed, for example, via a K-bit word (K is a natural number) within an
entry for the mobile device in a subscriber database. (iv) Operational capabilities of
the identified mobile device (e.g., wireless technology utilized by the device such as
second generation (2G), third generation (3G), or fourth generation (4G) technologies,
radio frequency bands in which the mobile device can receive communications ...).
(v) Commercial standing of the identified mobile device; e.g., good standing or
outstanding bill payments, hotlined mobile device in view of recurring lack of timely
payments for service, stolen device ...; or the like.

Furthermore, router component 305 can include a scheduler
component 309 to establish quality of service (QoS) for communication among two or
more devices in accordance at least in part with at least one of traffic priority profile
or QoS class (e.g., best effort, maximum bit-error-rate (BER), guaranteed data rate).
In an aspect, during provisioning of a femto AP, which can be effected by a
provisioning server within femto network platform 130, scheduler component 309 can
determine or configure at least one of quality of service (QoS) or one or more queuing
functions that can facilitate management of content(s), e.g., traffic or signaling.
Scheduler component 309 also can employ load-balancing techniques, which can be
implemented through algorithms retained in algorithm storage 351, to enable efficient
network or resource(s) utilization.

In addition, scheduler component 309 can utilize access list(s) 347 that
control access to one or more femto APs by one or more mobile device to route
traffic, e.g., a data packet, and signaling, e.g., a management packet, amongst femto
APs in the enterprise femto architecture. In an aspect, access list(s) 347 can allow
access to a femto AP, e.g., the access list is a white list, or can include black list(s),
which can explicitly determine mobile devices that are denied access to service
through one or more femto APs and trigger an exception handling subsequent to
attachment attempt(s) effected by black listed mobile devices. In an aspect, exception
handling can include authorization of attachment to a femto AP and notification of an
authority, as discussed below.

To perform almost any or any handover (e.g., soft handover) internal to
example mesh femto network 100 without accessing femto network platform 130,
e.g., delivering signaling or traffic thereto, routing platform 110 also can configure
and exploit user-plane connection(s). In an aspect, routing component 110 can exploit
links 114, e.g., Iur interfaces, between femto APs 104, to enable soft handover. As
illustrated in example embodiment 300, routing platform 110 can include a handover component 325 to administer handoff of a wireless device served by a first femto AP to a second femto AP in the femto enterprise network architecture 100. Handover component 325 can implement hard handoff or soft handoff in accordance at least in part with a set of handover criteria (not shown), which can be configurable by a wireless service provider on an event basis or as a function of time. In an aspect, soft handover can be effected at least in part based on at least one or more RF boundaries, which can be configured through a timing component, as discussed below. In example embodiment 300, memory 349 can retain handover criteria (not shown in FIG. 3).

Routing platform 110 also can enable communication of content(s), or traffic, among a device 102 served primarily via a network that is part of external network(s) 140, such as one of a non-mobile broadband internet service network, a broadband digital cable network, or a macrocell network and mobile devices served through a femto AP 104. In an aspect, device 102 can be an IP television (IPTV) tuner that can receive caller identification information when a call directed to a mobile device 102 is received by routing platform 110. Such a feature can advantageous to alert a subscriber in a residence wherein the subscriber is associated with the mobile device 102 and separated there from while the subscriber utilizes device 102. In another aspect, when the enterprise is a wholesale store, or big-box store, device 102 can be a voice-over-IP (VoIP) transceiver in a customer service platform which routing platform 110 can connect to a mobile device, e.g., 102, served through a femto AP, e.g., 104, within the enterprise femto network system 100 in order to provide customer assistance to a consumer associated with the mobile device. User equipment (UE) that operates within example enterprise femto network system 100 can include almost any or any electronic device that can connect wirelessly to a femto AP or can be linked operationally to a port within routing platform 110. In addition to example UEs provided supra, user equipment can include mobile phones; media players; digital cameras; digital media recorders such as digital video recorders (DVRs); laptop computers; personal digital assistants (PDAs); personal computers; printers; scanners; digital photo frames; navigation device such as a global positioning system (GPS) module; gaming modules; and so
forth. Further, it can be appreciated the UEs can be mobile, stationary, or pseudo-
stationary, and wireless or tethered.

[0071] In an aspect, during internal communication within the enterprise
femto architecture 100, routing platform 110 can establish and retain a control link to
femto network platform 130, e.g., to gateway node(s) therein, that can be employed
by femto network platform 130, via a billing server, to process billing charges; it
should be appreciated that billing processing can be effected by an application layer
within one of external network(s) 140 such as an IMS network. In example
embodiment 300, billing component 335 can allow to establish the control link and
convey it to femto network platform 130 to update a billing database associated with a
billing server that can apply, for example, different charges for internal
communication within the enterprise femto network architecture 100 and external
communication with femto network platform 130. Charges associated with internal
communication can be lower than charges associated with external communication.
The control link also can be retained in a memory, e.g., a buffer, within routing
platform 110 such that if a failure occurs in femto network platform 130, internal
communication within the mesh femto network 100 can continue uninterruptedly.
Retained control data can be transferred to femto network platform 130 for billing
purposes when it resumes operation(s).

[0072] Example enterprise femto network system 100 also can afford multiple
billing schemes associated with a wireless service provider that administers the
example femto network architecture 100. In example embodiment 300, billing
schemes can be retained in memory 249. In an aspect, the one or more billing
schemes can be dictated, at least in part, by access configuration(s) retained in access
list(s) 347. In an example billing scheme, the wireless service provider can charge a
fixed rate for external communication, for example, when traffic received at the router
platform 102 is conveyed to the femto network platform 130 through backhaul link(s)
118, e.g., Iuh interface, whereas internal communication within the example
enterprise femto network architecture 100 can be free of charge. It is noted that in
such example billing scheme, the wireless service provider can charge a fee directed
to operation and maintenance associated with the mesh femto network. In another
example billing scheme, the wireless service provider can implement maintenance of
the mesh femto network 100 free of charge, but can charge a high rate for external
communication with femto network platform 130 and a low rate for internal
communication within the mesh femto network. It is to be appreciated that the subject specification is not limited to the aforementioned illustrative billing scheme(s) and most any or any billing scheme can be configured and employed. The wireless service provider can configure or redefine billing charges based at least in part on criteria such as served customer segment, an implemented promotional campaign, marketplace, operational costs, or the like. In example embodiment 300, billing component 335 can configure, at least in part, and implement one or more billing schemes for served traffic within femto enterprise femto network architecture 100 or for traffic delivered to or received from a femto network platform. In addition, billing component 335 can modify such configured billing charges dynamically, e.g., as a function of time, based at least in part on operational conditions such as available network bandwidth, load of one or more deployed femto APs within an enterprise femto network system, volume of traffic manipulated by routing platform 110, or the like.

[0073] In an aspect, routing platform 110 can manage different virtual local area network(s) (VLAN(s)) such as one or more of a VLAN for voice or data traffic on user plane; a VLAN for control signaling transported through at least a portion of link(s) 114l, which can be embodied in an Iur interface; a VLAN for control signaling conveyed to femto network platform 130; or the like. In an example, routing platform 110 can enable bandwidth management for the different VLANs.

[0074] As illustrated in example embodiment 300, routing platform 110 includes processor(s) 345 configured to confer, and that confers, at least in part, functionality to substantially any or any component within routing platform 110 in accordance with one or more aspects of the subject innovation. Processor(s) 345 is illustrated as external to the various functional elements or components of routing platform 110; however, processor(s) 345 can be distributed amongst such various functional elements or components. Processor(s) 345 is functionally coupled to each functional element or component and to memory 349 through bus 357, which can be embodied in at least one of a memory bus, a system bus, an address bus, or one or more reference link(s) or interface(s). Processor(s) 345 can store information in, and retrieve information from, memory 349 necessary to operate and/or confer at least in part functionality to each of the components that reside within routing platform 110. The information can include at least one of code instructions, data structures, program modules, or the like.
At least an advantage of example femto enterprise architecture 100 is that it reduces at least one of backhaul network traffic or signaling among provisioned femto APs that are part of the femto enterprise network and a femto network platform, which can include controller node 120.

At least another advantage of example femto enterprise architecture 100 is that routing can be self-healing; for instance, traffic can be routed via an alternative femto AP when an intended femto AP is non-functional or radio communication thereby is otherwise impaired. In addition, data and signaling can be cached or recorded for subsequent utilization to mitigate, at least in part, communication disruption.

At least a further advantage of example enterprise femto network architecture 100 is that it can mitigate utilization of private branch exchange (PBX), or internet protocol (IP)-PBX, resources for intra-premises communication, or communication among a mobile device served through a femto wide radio access network, or a wide area network, which can be mobile or otherwise.

FIG. 4 illustrates an example embodiment 400 of a femto access point that can be deployed in a femto enterprise network in accordance with aspects described herein. Femto AP 410 can embody one or more of femto APs 1041-104N. In example embodiment 400, femto AP 410 can receive and transmit signal(s) from and to wireless devices like femto access points, access terminals, wireless ports and routers such as routing platform 110 and port(s) therein, or the like, through a set of antennas 4141-414Q, with Q a natural number. The antennas 4141-414Q are part of communication platform 405, which comprises electronic components and associated circuitry that provide for processing and manipulation of received signal(s) and signal(s) to be transmitted. The electronic components and circuitry can include a set of one or more chipsets, e.g., multimode chipset(s) 413, that enable at least in part at least one of decoding, or deciphering, signal(s) conveyed to femto AP 410 in various disparate radio technologies, or coding of signal(s) delivered from femto AP 410 in accordance with various radio technology standards. In an aspect, communication platform 405, via at least in part multimode chipset(s) 413, can decode (i) GPS signaling such as timing messages generated, for example, by one or more deployed global navigation satellite systems (GNSSs) and relayed to femto AP 410 through a routing platform, e.g., 110 in accordance with aspects described herein; or (ii)
signal(s) received from a radio frequency identification (RFID) tag upon actuation thereof.

[0079] In an aspect, communication platform 405 includes a receiver/transmitter 407 that can convert signal from analog to digital upon reception, and from digital to analog upon transmission. In addition, receiver/transmitter 407 can divide a single data stream into multiple, parallel data streams, or perform the reciprocal operation. Coupled to receiver/transmitter 407 is a multiplexer/demultiplexer 409 that facilitates manipulation of signal in time and frequency space. Electronic component 409 can multiplex information (data or traffic and control or signaling) according to various multiplexing schemes such as time division multiplexing (TDM), frequency division multiplexing (FDM), orthogonal frequency division multiplexing (OFDM), code division multiplexing (CDM), space division multiplexing (SDM). In addition, mux/demux component 409 can scramble and spread information (e.g., codes) according to substantially any code known in the art; e.g., Hadamard-Walsh codes, Baker codes, Kasami codes, polyphase codes, and so on. A modulator/demodulator component 411 also is a part of communication platform 405, and can modulate information according to multiple modulation techniques, such as frequency modulation, amplitude modulation (e.g., M-ary quadrature amplitude modulation (QAM), with M a positive integer), phase-shift keying (PSK), and the like. In an aspect, multimode chipset(s) 413 can configure and enable mux/demux component 409 and mod/demod component to operate in accordance with protocols or standards associated various radio technologies. Processor(s) 485 also is functionally connected to communication platform 405 and can enable operations on data (e.g., symbols, bits, or chips) for multiplexing/demultiplexing, such as effecting direct and inverse fast Fourier transforms or Hadamard transforms; or modulation/demodulation of data streams.

[0080] Femto access point 410 also includes RC node 105, which can allocate radio resources, e.g., resource blocks, to a mobile device served through femto AP 410, and schedule traffic among mobile devices, and device with wireless capability, served via femto AP 410. In an aspect, RC node 105 can schedule traffic in accordance with at least one of semi-persistent scheduling, round robin, or proportional fair scheduling. Consistent with allocated radio resources, RC node 425 can select format(s) of data packet(s) and management packet(s) for traffic and signaling exchange amongst femto AP 410 and a served mobile device. In addition,
RC node 105 can select a radio technology and modulation formats and coding schemes compatible therewith. In an aspect, RC node 105 can configure operation of femto AP 410 in multiple-input multiple-output (MIMO) mode of operation. Moreover, RC node 105 can determine and configure transmit power for communication effected via femto AP 410. Furthermore, RC node 105 can configure one or more of antennas 4141-4146 in order to attain directionality of EM radiation employed for communication, or to shape coverage area in the vicinity of femto AP 410, which can mitigate of dead-spots or weakly covered regions. Traffic and signaling can exchanged with a routing platform, e.g., 110, through RC node 105.

In embodiment 400, scanner component 415 can decode received wireless signals and thus determine at least an index that identifies a mobile device (e.g., 1021) attached to, or that attempts attachment to, femto AP 410 can be extracted and access can be granted or denied based at least in part on access list(s) 498. In addition, scanner component 415 can decode wireless signal(s) received as part of time-of-flight (TOF) measurements that can be employed to estimate range of a mobile device or device with wireless capability from femto AP 410. In an aspect, femto AP 410 can receive signaling that configures clock layer(s) 445 in order to conduct TOF measurements; configuration can include selection of a clock source (not shown) within clock layer(s) 425. It is noted that clock layer(s) 445 also can be configured to relay timing messages or timing information generated through an external clock. TOF measurements assess wireless signal propagation timing between a femto AP and an apparatus with wireless capability(ies); the TOF measurements can include at least one of round trip time (RTT) measurements, time or arrival (TOA) measurements, time difference of arrival (TDOA) measurements, angle of arrival (AOA) measurements, or the like.

It is noted that through at least in part communication platform 405, and multimode chipset(s) 413 therein, scanner component 415 can survey wireless signal(s) within a set of EM frequency bands that can include all EM frequency bands licensed by the service provider (e.g., personal communication services (PCS), advanced wireless services (AWS), general wireless communications service (GWCS), and so forth), all unlicensed frequency bands currently available for telecommunication (e.g., the 2.4 GHz industrial, medical and scientific (IMS) band or one or more of the 5 GHz set of bands), and all EM frequency bands in operation and not licensed to the service provider. In addition, scanner component 415 can survey
wireless signal(s) over a configurable and upgradable set of radio technologies that includes one or more of the following Wi-Fi, BlueTooth, IS-95, WiMAX, 3GPP2 UMB, Enhanced GPRS, 3GPP UMTS, 3GPP LTE, HSPA, HSDPA, HSUPA, or LTE Advanced. Processor(s) 485 can enable communication platform 405 to switch amongst radio technologies (e.g., IS-95, WiMAX ...) in order to effect telecommunication and enable a scan in accordance with configured demodulation and demultiplexing protocols associated with a radio technology; instructions necessary for implementation of such protocols can reside in memory 495. Such radio technology agility can afford to serve mobile devices, e.g., 102₁ or 102₂, that operate in disparate radio technologies, or collect pilot signal(s) modulated and coded in accordance to various technologies.

[0083] To conduct a scan, scanner component 415 exploits at least in part communication platform 405 and electronic components therein. In an aspect, scanner component(s) 212 can configure transceiver 407 to collect signal in a specific frequency carrier, e.g., frequency channel. Such configuration can allow determination of uplink (UL) carrier frequency, or channel number, associated with communication of mobile device(s) within the enterprise femto network 100 and in the vicinity of femto AP 410; and carrier frequency of downlink (DL) of disparate femto APs in the vicinity of femto AP 410. RC node 425 can deliver information that identifies carrier frequencies extracted through scanning the wireless environment of femto AP 410. Such carrier-frequency information is delivered to a routing platform, e.g., 110, which can aggregate it to form a carrier-frequency map of telecommunications within the coverage area of an enterprise femto network.

[0084] Scanner component 415 also can gather data on uplink (UL) signal strength and quality associated with a served mobile device, e.g., 102₁, to effect, at least in part, handover from femto AP 410 to a disparate target femto AP. To at least that end, scanner component 415 can gather UL sounding signal(s) and analyze such signal(s) to determine DL channel quality or strength; analysis can be enabled at least in part via processor(s) 485. In an aspect, signal strength can be determined through received signal strength indicators (RSSIs) or received signal code power (RSCP), while quality can be assessed through metrics such as signal-to-noise ratio (SNR), signal-to-noise-and-interference ratio (SNIR), or energy per chip over total received power (E_c/N₀).
In addition, femto AP 410 includes display interface 455, which can render functions that control functionality of femto AP 410 or reveal operational conditions thereof. In addition, display interface 1812 can include a screen to convey information to an end user. In an aspect, display interface 455 can be embodied in a liquid crystal display (LCD), a plasma panel, a monolithic thin-film based electrochromic display, or the like. Moreover, display interface 455 also can include a component (e.g., speaker(s)) that facilitates communication of aural indicia, which can be employed in connection with messages that convey operational instructions to an end user or consumer. Display interface 1812 also can enable data entry (e.g., through a linked keypad or via touch gestures), which can allow femto AP 410 to receive external commands, such as restart operation, flush a memory or buffer, configure an access list, etc.

Broadband network interface 475 enables connection of femto AP 410 to a routing platform, as described herein, through broadband link(s) such as link(s) 114z, which can enable incoming and outgoing data and signaling flow. In an aspect, broadband network interface 475 can include a port component with substantially the same or the same functional aspects or features as port component 315. Broadband network interface 1814 can be internal or external to femto AP 1805, and it can utilize display interface 1812 for at least one of end-user interaction or status information delivery. Processor(s) 485 can configure at least in part operation of one or more port(s), e.g., switching voltages in a dry contact or assignment of a logical address such as an IP address to a port, that can reside within broadband network interface 475. It is noted that RC node 425 can conduct at least part of the assignment of logical address(es) to a port within broadband network interface.

Femto AP 410 also includes an RFID actuation component 465, also termed herein RFID actuator 465, which can convey through communication platform 405 specific control packets within a pilot signal in order to stimulate an RFID tag and retrieve information therein by decoding RF packet(s) received from the RFID tag in response. Actuation protocol(s) and code sequence hypotheses for decoding information retained in an RFID tag can be included in actuation logic 496 stored in memory 495.

Memory 495 can retain data structures, code instructions and program modules, or substantially any type of software or firmware; system or device
information; code sequences hypotheses, and modulation and multiplexing hypotheses; spreading and pilot transmission; femto AP floor plan configuration; and so on. Additionally, memory 495 can retain content(s) (e.g., multimedia files, subscriber-generated data); security credentials (e.g., passwords, encryption keys, digital certificates, biometric reference indicators like voice recordings, iris patterns, fingerprints); or the like.

[0089] Processor(s) 485 is functionally connected, through bus 411 to component(s), platform, interface(s), layer(s) and substantially any or any functional element that resides within femto AP 410. Bus 411 can be embodied in at least one of a memory bus, a system bus, an address bus, or one or more reference link(s) or interface(s). In an aspect, processor(s) 485 is functionally coupled, e.g., via a memory bus within at least a portion of bus 411, to memory 495 in order to store therein and retrieve there from information to operate or confer functionality to the components, platform, interface(s), layer(s) and substantially any or any functional element that reside within femto AP 410.

[0090] FIG. 5 illustrates a diagram of an example embodiment 500 of an enterprise femto network that enables collection of location data and utilization thereof in accordance with aspects of the subject innovation. Location data can include location estimate(s) of a mobile device or an entity linked to an apparatus with wireless capability. Routing platform 510 can configure, e.g., synchronize, a clock layer in each of femto APs 520₁-520₄, and control, e.g., trigger or initiate, terminate, etc., time-of-flight (TOF) measurements of propagation timing of wireless signal(s), such as control signal(s), that can enable estimate(s) of distance of a mobile device (e.g., mobile 430) or an apparatus with wireless capability (e.g., 542) from one or more of femto APs 520₁-520₄. Such distance, or range, estimates can allow routing platform 510 to resolve a location estimate for mobile device 530 or an apparatus 542 with wireless capability. As an example, routing platform 510 can triangulate a position of mobile device 530—dotted lines near and through mobile 530 indicate triangulation effected through femto APs 520₁, 520₂, and 520₃. In addition, routing platform 510 can triangulate a position of apparatus 542 and thus produce an estimate of the position of an entity 540 linked spatially with the apparatus; for instance, the entity can be a vehicle and a navigation device thereof can be apparatus 542. A memory within routing platform 510 can retain criteria to determine whether the entity 540 spatially linked to the apparatus 542. It is noted that in a femto enterprise
network that is deployed within multiple coverage areas, see example embodiment 250, a location estimate can be generated through range estimates generated via timing measurements performed by at least four femto APs. As an illustration, TOF measurements performed at least in part via femto AP 520, can result in a set of TOF-bands or fringes 532, 534. The width Δ 532 of a TOF band is determined primarily through a timing advance (TA) established by a clock source that determines chip structure linked to the pilot wireless signal(s). It is noted that while not displayed, other femto APs also can generate a TOF-band structure as the one related to femto AP 520.

[0091] Location estimate(s) can be conveyed to a consumer layer 580, which can utilize the location estimate(s) as part of a navigation or location-based service. Routing platform can deliver the location estimate(s) as at least one of a short message service (SMS) communication, a multimedia message service (MMS) communication, an unstructured supplementary service data (USSD) message, an email communication, or an instant message. In addition, location estimate(s) can be delivered through lower-level signaling such as a set of one or more bits in a packet header or in one or more control frames. In an aspect, delivery of a location estimate proceeds at least in part as described supra in connection with communication of content to femto network platform 130. A gateway node that is part of gateway node(s) 545 can communicate the location estimate to a gateway node within the external network(s) 570, which can relay the location estimate to a serving node therein in order to deliver the location estimate to the consumer layer 580. In an aspect, external network(s) 570 can be an IMS network or almost any or any packet-switched network.

[0092] Consumer layer 580 can include one or more devices operated by one or more subscribers or prosumers. As an example, consumer layer can be a mobile device associated with an owner or lessee of entity 540. In a scenario, coverage area 505 can be a parking lot, either multi-floor or single-floor, and entity 540 can be a vehicle for which routing platform 510 generates a location estimate at the time the vehicle is parked. The location estimate for the parked vehicle can be provided to consumer layer based upon various criteria such as when a registered mobile device re-enters the parking lot after the vehicle has been parked. Alternatively or additionally, the location estimate can be supplied upon demand from a subscriber
associated with the vehicle and that operates a mobile device, demand for the location estimate of the vehicle can be effected by dialing a specific phone number extension for routing platform 510, delivering a SMS message or an email message, or a USSD code. As another example, consumer layer 580 can be equipment of a law enforcement agency and location estimate(s) can be supplied as part of the Communications Assistance to Law Enforcement Act (CALEA). In a scenario, a black list consisting of one or more unique identifiers for respective wireless devices can be supplied through an interface (not shown) in consumer layer 580. Routing component 510 can retain the black list in a memory, e.g., in access list(s) in example embodiment 600. When a black listed mobile device attempts attachment to a femto AP that is part of femto enterprise network, routing component 510 can alert the law enforcement equipment in consumer layer 580, for example, by delivering the location estimate of the detected blacklisted mobile device. In addition or as an alternative, when the blacklisted mobile device is detected, routing platform 510 can track location of the blacklisted mobile device within coverage area 505.

[0093] In an aspect of the subject innovation, to utilize high pilot transmit power to increase the number of femto APs that generate range estimates to implement triangulation, routing platform 510 can configure delivery and transport of control signal(s) employed at least in part in TOF measurements in channel(s), or frequency carrier(s), disparate from those utilized for traffic. It should be appreciated that utilization of dedicated carriers for triangulation that are disparate, e.g., orthogonal, to carriers employed for voice and data can mitigate interference that may be incurred through generation of location estimates. As an example, femto APs can convey pilot signal(s) for TOF measurements in a carrier within unlicensed electromagnetic (EM) radiation bands, whereas the femto APs can convey voice and data in a channel within a licensed EM radiation band.

[0094] In an example embodiment of routing platform 510, illustrated in FIG. 6, location engine 605 can generate location estimate(s) through triangulation. To at least that end, timing component 607 enable routing component 510 to configure and control the TOF measurements, and analysis component 609 exploits data collected through the timing measurements to compute a location estimate through triangulation; algorithm storage 351 can retain code instructions that, when executed, implement triangulation. In an aspect, analysis component 419 can select a propagation model, retained within algorithm storage to include stochastic aspects of
propagation such as multipath or other scattering, shadowing, or path loss, in a computation of a location estimate. Location estimate(s) can be retained in location intelligence 615.

Routing component 510 also can control complexity of timing configuration(s), e.g., selection of clock sources adequate for coarse resolution or fine resolution of location estimates, based at least in part on a hierarchy of resolution of generated location estimate(s) and aspects of an associated location service. (1) For specific content routing, e.g., offloaded content from a wide area network (WAN) to the enterprise femto coverage area 505, association of a unique identifier (ID) for the serving femto AP with mobile device 530 or a unique ID thereof can be sufficient; one or more of external network(s) 570 can embody the WAN. In example embodiment 600, location intelligence 615 can include a mapping of unique femto ID(s) linked to each provisioned femto AP and a deployment configuration of femto APs such as 520₁,520₄. (2) To implement, at least in part, location-based handover from a first femto AP to a second femto AP, routing component 510 can select a clock source that provides a TOF-band width Δ 534 that is smaller than a characteristic spacing Δ' among provisioned femto APs that can enable the handover; for instance, \( \frac{\Delta'}{\Delta} = 0.1 \) can be utilized. In example embodiment 600, selection of the clock source can be implemented at least in part through timing component 607. As an example, Δ' can be determined as an average of nearest-neighbor distances among femto APs. In addition, azimuth resolution can be implemented to further refine a location estimate to a specific tile in order to distinguish among substantially equally or equally close femto APs that are candidate for handover. Azimuth-resolved timing measurements, e.g., AOA in combination with RTT, can determine a tile such as 536 (indicated with thick lines) rather than a TOF-band, e.g., 532₃. It should be appreciated that a set of two or more antennas in a femto AP, such as 520₁, can be configured, by routing component 510, and employed to afford azimuth resolution; timing component 607 can enable at least in part such configuration. (3) For tracking of a mobile device 530 or an entity 540 associated to an apparatus 540 with wireless capabilities, finer resolution is necessary in order to enable triangulation of the mobile device 530 or the apparatus 540 to extract a location estimate that is highly accurate, e.g., with a resolution of the order of 1 m. To allow high-resolution triangulation, routing platform 510 can select a clock source that provides timing advance (TA)
such that $\Delta$ 534 is sufficiently narrow, e.g., 1 m, to afford highly-resolved triangulation. In example embodiment 600, timing component 607 can select the clock source. Location estimate(s) can be retained in a memory that is part of routing component 510, and can be conveyed within the bounds of the coverage area of the enterprise femto network or outside such bounds.

Routing component 510 can exploit artificial intelligence (AI) or machine learning methods to infer (e.g., reason and draw a conclusion based upon a set of metrics, arguments, or known outcomes in controlled scenarios) a satisfactory or optimal timing resolution to generate a location estimate with a spatial resolution suitable to a predetermined location service. Inference can be based at least in part upon cost-utility analysis that determines the trade off between signaling cost, e.g., clock selection, triggering signaling, carrier selection and communication, versus the benefit of accurately knowing position of mobile device. In embodiment 600, timing component 607 can implement the cost-utility analysis. Machine learning methods can be retained in algorithm storage 351.

Artificial intelligence or machine-learning techniques typically apply advanced mathematical algorithms—e.g., decision trees, neural networks, regression analysis, principal component analysis (PCA) for feature and pattern extraction, cluster analysis, genetic algorithm, or reinforced learning—to a data set. In particular, handover component 254 or any component(s) therein can employ one of numerous methodologies for learning from data and then drawing inferences from the models so constructed. Such methodologies can be retained in memory 260. For example, Hidden Markov Models (HMMs) and related prototypical dependency models can be employed. General probabilistic graphical models, such as Dempster-Shafer networks and Bayesian networks like those created by structure search using a Bayesian model score or approximation can also be utilized. In addition, linear classifiers, such as support vector machines (SVMs), non-linear classifiers like methods referred to as “neural network” methodologies, fuzzy logic methodologies can also be employed. Moreover, game theoretic models (e.g., game trees, game matrices, pure and mixed strategies, utility algorithms, Nash equilibria, evolutionary game theory, etc.) and other approaches that perform data fusion, etc., can be exploited.
FIG. 7A illustrates a diagram 700 of a femto enterprise network architecture that enables collection of location data of a mobile in accordance with aspects of the subject innovation. Routing platform 610 receives timing messages, or timing reference(s), from a global navigation satellite system (GNSS) receiver component 620, also termed herein as GNSS receiver 620, which can collect timing messages from one or more satellites through one or more antenna(s) 625. In an aspect, GNSS receiver 620 can be exposed to open sky, and at least a part thereof can reside within a NID, e.g., NID 210. Femto APs 5201-5204 can time-stamp control message(s) or sounding signal(s) conveyed by mobile device 430 and thus generate range estimate(s) that allow generation of location estimates based at least in part on triangulation.

FIG. 7B displays a diagram of an embodiment 650 of a femto enterprise network architecture that enables collection of location data of a mobile in accordance with aspects of the subject innovation. In an aspect, timing message(s) GNSS receiver 620 is functionally connected to femto network platform 660, which can relay the timing message(s) via gateway node(s) 545. It should be appreciated that GNSS receiver 620 can be part of assisted GPS (AGPS) infrastructure provided by a network operator that administer femto network platform 660 and femto APs 5201-5204.

In embodiments 700 and 750, routing platform 710 exhibits less complexity than routing platform 510. As illustrated in FIG. 8, location engine 805 does not include a timing component, but rather location engine 805 operates as a pass-through of timing message(s) received from GNSS receiver 720. Analysis component 807 can operate in substantially the same manner as analysis component 809. In particular, analysis component 807 can receive timing signaling, e.g., records of time-stamped messages, originated at a plurality of femto APs and utilize such signaling to perform triangulation and associated location estimate(s) of mobile device 530.

FIG. 9 represents an example system 900 that enables customized item navigation at least in part through an example femto network architecture in accordance with aspects described herein. Interface component 950 enables a subscriber or prosumer to configure wish list(s) 955 of items to be identified within a remote site 905 that includes an enterprise femto network architecture. Interface component can deliver wish list 955 through link(s) 965, which can be broadband.
backhaul link(s), to external network(s) 940. For instance, external network(s) can be a broadband non-mobile network that provides internet service. External network(s) 940 can convey wish list(s) 955 to femto network platform 130, which can relay the wish list(s) 955 to controller node 120—e.g., a radio network controller in a 3GPP UMTS telecommunication architecture.

Controller component 120 can deliver the wish list(s) 955 to routing component 910, which can generate a set of locations of item(s) listed in wish list(s) 955 for which RFID tag(s), e.g., 925₁₋₉₂₅₁₀, are contacted to the item(s). Accordingly, the generated set of location estimate(s) can be mapped to the tagged item(s). In an aspect, routing component 910 can resolve location estimates for the item(s) in the wish list(s) 955 in response to entrance, illustrated with a black arrow FIG. 9, of mobile device 930 into the coverage area 905 of the enterprise femto network and attachment of the mobile device 930 to a femto AP therein; wherein mobile device 930 is linked to the subscriber or prosumer that configured the wish list(s) 955. Alternatively or additionally, routing component 910 can generate the set of location estimate(s) in accordance with at least one of a schedule, retained as part of location intelligence, e.g., 615, within routing platform 910; or an event such as a relocation or RFID tags 925₁₋₉₂₅₁₀ within coverage area 905.

Generation of location estimates for items within wish list 955 can be accomplished at least in part through RFID actuator 465, which can remotely probe the RFID tag(s) 925₁₋₉₂₅₁₀ via pilot signal(s) delivered through a set of femto APs, e.g., 92₀₆, 92₀₇, and 92₀₈. Probing of RFID tag(s) can enable triangulation of each tag and thus generation of respective location estimate(s); triangulation can be implemented via a location engine within routing component 910 in accordance at least in part with aspects described herein. In an example embodiment 1000 of routing platform 910, illustrated in FIG. 10, a multi-mode location engine 1005 can perform triangulation of location of an RFID tag. Multi-mode location engine 1005 includes a switch component 1008 that can toggle functionality of the multi-mode location engine based at least in part on timing capabilities of routing platform 910. In an aspect, when routing platform 910 can supply timing configuration to one or more femto APs, switch component 1008 can configure operation of multi-mode location engine in a mode of operation substantially the same or the same as location engine 605. Alternatively, when routing platform 910 exploits external timing information to configure timing of a set of femto APs that provide wireless service to
the enterprise femto network, switch component 1008 can set multi-mode location engine to operation that is substantially the same or the same as location engine 805. It should be appreciated that that multi-mode location engine 1005 includes analysis component 807 (not shown in FIG. 10), and timing component 607 and analysis component 609 (neither one shown in FIG. 10).

[00104] Femto AP(s) 9201-9209 can include RFID actuation logic, e.g., 496, retained in a memory therein, that enables delivery of a pilot signal to an RFID tag and performs TOF measurement(s) to collect timing data and allow triangulation. The pilot signal can be conveyed in a frequency carrier disparate from a band of EM radiation employed for communication through the femto AP(s); thus, RFID tag(s) 9251-92510 can be interrogated without inflicting substantive interference. Femto AP(s) also can decode information retained in the interrogated RFID tag(s), and relay such information to routing platform 810, which can perform at least one of the following: retain the information in memory, e.g., memory 349, or adjust the information. It is noted that the information can include at least one of product identification or pricing point of the product. In an aspect, adjustment of information can be directed to adjusting pricing of the item(s) identified through the probed RFID tag(s).

[00105] FIG. 11 is a block diagram of an example system 1100 that enables commercial transactions in an enterprise femto network in accordance with aspects described herein. Routing platform 1110 is functionally linked to a set of one or more femto APs 1120, which span a coverage area that can be a single-floor or multi-floor confined or nearly confined space. Based on at least one of location within the coverage area or access privilege(s) or right(s) established through access list(s), e.g., 353 or 498, a femto AP within the set of femto APs 1120 can serve mobile device 1130 through wireless link 1135. Routing platform 1110 also is functionally coupled to a commerce component 1140 through link(s) 1136, which can be a reference link or interface, or a conventional wired or wireless link. The commerce component 1140 can enable, at least in part, commercial transaction(s) or service(s) consumption. In addition, commerce component 1140 can supply, e.g., deliver or credit, monetary incentive(s) to a device, mobile or otherwise, wherein the monetary incentive(s) can be utilized in at least one of the commercial transaction(s) or service(s) consumption. It is noted that routing platform 1110 has substantially the same, or the same functionality as routing platform 910 described herein.
Commerce component 1140 includes a profile generator 1142 that configures a commerce profile 1159, which is linked to a single subscriber or a group of multiple subscribers, e.g., a consumer segment, and to a mobile device employed by the single subscriber or a subscriber within a consumer segment. Configuration can include generation of attributes and persistence of the same in memory 1150. In an aspect, a commerce profile 1159 can include at least one of billing account(s) to which charges related to commercial transactions or service(s) consumption are authorized to be billed; incentive program(s) associated with a subscriber for which the commerce profile is configured; or preferred brands or product features. Profile generator 1142 can receive, e.g., via data 1139, commercial information associated with the single subscriber or the consumer segment. In addition, profile generator 1142 can exploit machine learning methodologies, as those described supra, in order to generate autonomously a commerce profile 1159 based at least in part on historical commercial transactions effected by devices, mobile or otherwise, served through one or more of the femto APs within the set of femto AP(s).

Transaction component 1144 can enable, at least in part, the commercial transaction(s) via the femto enterprise network. In addition, transaction component 1144 can monitor and record commercial transactions; records can be retained in transaction database 1156. Moreover, transaction component 1144 can deliver monetary incentive(s) or coupon(s) to mobile device 1130, through at least in part data 1139; the incentive(s) or coupon(s) relayed by routing platform 1110 to a femto AP in the set 1120 that serves mobile device 1130. It is noted that incentive(s) also can be delivered to a non-mobile device or apparatus with wireless capabilities. Delivery of the incentive(s) or coupon(s) also can be directed towards a coupon storage 1153 and linked, e.g., logically associated, or credited to a recipient device of the incentive(s) or coupon(s) for subsequent utilization in a commercial transaction. In an aspect, incentive(s) or coupon(s) can be delivered or credited based at least in part on at least one of location of mobile device 1130 within the coverage area of an enterprise femto network. As an example, in a scenario in which the femto enterprise network is deployed within a supermarket store, when a mobile device 1130 attaches to a femto AP that provides wireless service to a portion of the supermarket, e.g., the meat section, coupon(s) for specific meat(s) can be supplied, e.g., delivered or credited, to mobile 1130 or a consumer linked therewith.
To deliver or credit incentive(s) or coupon(s), transaction component 1144 can instruct incentive component 1146 to generate a set of incentive(s) or coupon(s). Generation of incentive(s) or coupon(s) can be based at least in part on the location of the mobile device 1130 or any other device that receive(s) coupons. In an aspect, as part of the directive to generate incentive(s) or coupon(s), transaction component 1144 can supply location estimate(s) of mobile device 1130. In addition, transaction component 1144 can process, at least in part, billing charges for purchases or services incurred through mobile device 1130. The processing of billing charges can include redemption of coupon(s) presented, via mobile device 1130, at the time of purchase or credited to the mobile device 1130. In an aspect, point of sales (POS) device(s) 1170 can provide with proof of transaction to commerce component 1140. Alternatively or additionally, POS device(s) 1170 can convey proof of transaction signaling to a femto AP within the set of femto APs 1120 that serves the area of the femto enterprise network wherein POS device(s) 1170 reside; for instance, in a supermarket store, such femto AP would be the one that serves the area where cash registers are located. In an aspect, POS device(s) 1170 can be deployed by a service provider that manages the enterprise femto network. Alternatively or additionally, a subset of POS device(s) 1170 can be deployed by a business operator that exploits, e.g., contracts, wireless service through the enterprise femto network.

It is noted that in one or more additional or alternative embodiments, commerce component 1140 can reside within routing platform 1110. In such scenario, link(s) 1136 can be part of a bus, e.g., 1163, that functionally couples component or any other functional elements or circuitry within routing platform 1110.

In example system 1100, commerce component 1140 includes processor(s) 1148 configured to confer, and that confers, at least in part, functionality to substantially any or any component within commerce component 1140 in accordance with one or more aspects of the subject innovation. Processor(s) 1148 is illustrated as external to the various functional elements or components of commerce component 1140; however, processor(s) 1148 can be distributed amongst such various functional elements or components. Processor(s) 1148 is functionally coupled to each functional element or component and to memory 1150 through bus 1163, which can be embodied in at least one of a memory bus, a system bus, an address bus, or one or more reference link(s) or interface(s). Processor(s) 1148 can store information in, and retrieve information from, memory 1150 necessary to operate and/or confer at least in
part functionality to each of the components that reside within commerce component 1140. The information can include at least one of code instructions, data structures, program modules, or the like. It is noted that in one or more alternative embodiments, processor 1148 can be external to commerce component 1140; for instance, such processor 1148 can reside within routing platform 1110.

[00111] FIG. 12 is a block diagram of an example embodiment 1200 of an incentive component 1146 that enables one or more aspects of a commerce component that operates within an enterprise femto network. A coupon generator 1202 issues one or more type of incentive(s) based at least in part on at least one of location of a recipient device or subscriber associated therewith. In aspect, at least three classes of incentive(s) can be produced: (i) Loyalty-program incentives; (ii) brand development coupons; and (iii) consumer base development. With respect to (i), loyalty-program incentives can be based at least in part on a selection effected by a consumer linked to user equipment, e.g., mobile device 1130. In an aspect, loyalty programs can be based at least in part on historical data on commercial transactions retained in transaction database 1156. It is noted that utilized historical data can be directed to transactions associated with a pool of consumers, wherein the pool of consumers spans disparate scope of customers. For example, historical data can include transactions effected by a set of consumers in a predetermined period of time; a segment of consumer grouped in accordance with a set of commercial metrics such as level of expenditure on a quarterly basis, demographics, etc.; consumers in a specific access list; or a single consumer.

[00112] In connection with (ii), coupon(s) or incentive(s) are directed to raise awareness of a product or service, and can be part of a promotional campaign for the product or service. In an aspect, coupon(s) or incentive(s) can be issued to a subscriber associated with a mobile device upon attachment of the mobile to a femto AP in the set of femto APs 1120.

[00113] In connection with (iii), coupon(s) or incentive(s) are directed to elicit a direct response from a consumer; e.g., increase consumer traffic or consumer interaction with a retailer or department within a store, wherein consumer interaction can include return of one or more subscriber to one or more retailers within an enterprise femto network. Coupon(s) or incentive(s) can be issued based at least in part of on a pool of consumers such as all or nearly all consumers, a segment of consumers, or a single consumer. In an aspect, value or rate of issuance of coupon(s)
or incentive(s) can be based at least in part on commercial desirability of a segment of subscribers or a single subscriber, wherein commercial desirability can include predetermined, solid credit history, high-volume of purchases, high loyalty as revealed through longevity of commercial relationship, etc. In addition, a coupon or incentive can be issued based at least in part on the time a subscriber station attaches to a femto AP in the set of femto APs 1120. For instance, in a scenario in which the femto enterprise network is deployed in a shopping mall, coupon generator 1202 can issue coupon(s) or incentive(s) for one or more restaurants in a food court within the shopping mall between the hours of 11:30a-1:00p, or any lunchtime hours.

[00114] Coupon(s) or incentive(s) generated through incentive component 1146 can be subscriber centric and can be customized to various granularities, as described above in connection with loyalty programs. In an aspect, coupon(s) or incentive(s) can customized at a single subscriber level based at least in part on historical data on commercial transaction(s) or extracted pattern(s) thereof. It is noted that, in an aspect, pattern(s) of commercial transaction(s) can be identified by transaction component 1144 through machine learning methodologies discussed supra.

[00115] Security component 1204 can mitigate fraud in coupon(s) or incentive(s) consumption or redemption. In an aspect, security component 1204 can provide security features to issued coupon(s) wherein the features can include encryption, password protection, biometric-based protection, or substantially any security mechanism for digital content(s). Security component 1204 can generate security credentials such as passwords; encryption keys; digital certificates; biometric keys, e.g., voice recordings, iris patterns, fingerprints; or the like. Security credentials can be retained in memory 1150. To provide security features or credentials, security component 1204 can exploit one or more algorithms retained in algorithm storage 1220, which can be part of memory 1150.

[00116] In embodiment 1200, incentive component 1146 also can include an accounting component 1206 that can enable, at least in part, billing processing and redemption of issued coupon(s) or incentive(s). Accounting component 1206 can record coupon(s) or incentive(s) collection or utilization, and such record(s) can be retained as part of transaction database 1156. In an aspect, accounting component 1206 can monitor coupon(s) or incentive(s) associated with an access list and subscribers related thereto.
Conversion component 1208 can exchange a first type of issued coupon(s) or incentive(s) to a second type of coupon(s) or incentive(s). The first and second type of coupon(s) can be extracted from a commercial profile retained in memory element 1159 and associated with a set of one or more subscribers. Exchange rate(s) can be dictated at least in part on a segment of consumers or a single consumer that can be issued the first and second type of coupon(s) or incentive(s). In addition, exchange rate(s) can be adjusted dynamically or based upon specific events. Conversion of coupon(s) or incentive(s) can be signaled by accounting component 1206 as part of billing processing or coupon(s) or incentive(s) redemption.

FIG. 13 illustrates a block diagram of an example system 1300 that enables marketing within an enterprise femto network in accordance with aspects described herein. Routing platform 1110 is functionally coupled with marketing component 1301 through link(s) 1306, which can allow exchange of signaling 1307 and data 1309. Link(s) 1306 can be a reference link or interface, or a conventional wired or wireless link. Marketing component 1301 allows delivery of advertisement to mobile device 1130 based at least in part on at least one of location thereof or a subscriber associated with the mobile device 1130. In addition, marketing component 1301 can exploit pattern(s) of commercial transaction associated with a subscriber linked to mobile device 1130. Advertisement can be conveyed as part of data 1309, and routing platform 1110 can be relayed to a femto AP that serves mobile device 1130; accordingly, advertisement delivery can be implemented without cost to a subscriber associated with mobile device 1130. Advertisement can be delivered as an SMS communication, an MMS communication, an email communication, an IM communication, a USSD message, or the like.

To deliver advertisement, marketing component 1301 can utilize advertisement driver component 1302, also herein referred to as ad driver 1302, which can extract advertisement content in accordance with a location estimate of mobile device 1130, the location estimate delivered by routing platform 1110 via data 1309. In addition, ad driver 1302 can convey advertisement based at least in part on the time mobile device 1130 attaches to a femto AP within the set of femto APs 1120. As an example, when enterprise femto network is deployed within a supermarket store, ad driver 1302 can deliver a frozen-dinner advertisement to a mobile device 1130 that attaches to a femto AP within the set of femto APs 1120 at dinnertime or a later time.
Ad driver 1302 can deliver advertisement in accordance with advertisement impression criteria 1319, also termed herein impression criteria 1319, which can include opt-out indicator(s), which can be configured through signaling delivered by mobile device 1130. Such signaling can be received by a femto AP that serves the mobile device 1130 and relayed, via signaling 1307, to marketing component 1301 by routing platform 1110. Opt-out indicators or flags can be embodied in at least one of a logical variable or a set of bits retained in impression criteria 1319. In addition, ad driver 1302 can deliver advertisement based at least in part on a list of items, e.g., wish list 955, received from a subscriber associated with a mobile device 1130. Routing platform 1110 can convey the list of items via data 1309.

Marketing component 1301 also can exploit advertisement to generate business intelligence and design customized advertisement campaign(s) or service(s) for consumers that conduct commercial transactions within business in which the enterprise femto network is deployed. Design component 1304 can receive signaling to implement a specific advertisement campaign in accordance with specific impression criteria 1319. In addition, data mining component 1306 can identify response(s) to specific advertisement and generate information related to advertised product(s) or service(s), the information can be retained in memory element (e.g., a register, one or more files, a database or portion thereof) business intelligence 1316.

Design component 1304 can exploit business intelligence 1316 to adjust autonomously the advertisement campaign or advertised product(s) or service(s); adjusted advertisement(s) can be retained in ad(s) storage 1313. Autonomous adjustment can be implemented through utilization of machine learning techniques described supra. The adjusted advertisement campaign or product(s) or service(s) can be delivered through ad driver 1302 for further collection of business intelligence. In an aspect, upon completion of an adjustment cycle, which can be defined as at least one of a set of advertisement campaigns, a predetermined time of advertisement, at least one of a business that utilizes the enterprise femto network or a network operator that administers the enterprise femto network can employ collected business intelligence 1316.

In example system 1300, marketing component 1301 includes processor 1308 configured to confer, and that confers, at least in part, functionality to substantially any or any component within marketing component 1301 in accordance
with one or more aspects of the subject innovation. Processor 1308 is illustrated as external to the various functional elements or components of marketing component 1301; however, processor 1308 can be distributed amongst such various functional elements or components. Processor 1308 is functionally coupled to each functional element or component and to memory 1301 through bus 1321, which can be embodied in at least one of a memory bus, a system bus, an address bus, or one or more reference link(s) or interface(s). Processor 1308 can store information in, and retrieve information from, memory 1310 necessary to operate and/or confer at least in part functionality to each of the components that reside within marketing component 1301. The information can include at least one of code instructions, data structures, program modules, or the like. It is noted that in one or more alternative embodiments, processor 1308 can be external to marketing component 1301; for instance, such processor 1308 can reside within routing platform 1110 or commerce component 1140.

[00124] FIG. 14A illustrates a block diagram of an example system 1400 that enables a commercial transaction within an enterprise femto network in accordance with aspects described herein. In an aspect, the commercial transaction can be at least one of delivery of an order for a consumable product or identification of a location associated with a delivery service or a desired product. It is noted that other commercial transactions also can be implemented through example system 1400. To effect the commercial transaction, at least in part, mobile device 1130 attaches to femto AP J 104, upon entrance to a coverage area associated with an enterprise femto network. Signaling 1407 can enable attachment and prompt routing component 1110, via an access list management component 338, to include the mobile device 1130 in access lists associated with a set of femto APs, e.g., femto APs 1120, that serve the coverage area. In an aspect, inclusion of mobile device 1130 within the access lists can be based at least in part on a level of security clearance linked to the mobile device 1130 or a subscriber associated therewith. In addition, routing platform 1110 can request a destination task or an order for a product, e.g., a consumable product; such request(s) can be directed to femto AP J 104, which relays the request(s) to mobile device 1130. In response to received request(s), the mobile device 1130 can deliver, through data 1409, at least one of destination task 1412 or order 1415. Destination task 1412 can include a desired or intended location with the coverage area associated with the enterprise femto network; an identifier of a reference item
associated with the intended destination, the identifier can include a universal product code (UPC), an international standard book number (ISBN), a stock keeping unit (SKU), or the like; or identification information of an end-user associated with the mobile device 1130. As an example, mobile device 1130 can be a device that supports delivery of correspondence (e.g., a wireless notepad) carried by a delivery clerk of a delivery or postal service that intends to deliver correspondence to an office or occupant thereof. In such scenario, destination task 1412 can convey the intended location of the office or identify its occupant. Femto AP 104₁ can relay destination task 1412 and routing platform 1110 can acknowledge the intended destination location or identified individual, and supply navigation coordinates, e.g., directions from the location wherein mobile device 1130 attached to femto AP 104₁ to the intended destination or a known location linked to the identified individual. Alternatively, or in addition, routing platform 1110 can deliver navigation instructions to mobile device 1130 based at least in part on locations that mobile device 1130 is allowed to visit within the enterprise femto network, as revealed, for example, by access lists and related access rights, or security clearance level of the delivery clerk associated with the mobile device 1130.

[00125] When mobile device 1130 conveys an order 1415 for a product, e.g., a consumable product, routing platform 1110 directs the order to a femto AP, e.g., femto AP Q 104₂, that serves a POS location within the enterprise femto network, the POS is enabled to fulfill the order. In an aspect, routing platform 1110 can extract routing information from a commerce profile(s) 1159 based at least in part on at least one of a business identifier conveyed as part of order 1415, or a floor plan configuration for the set of femto APs that form the femto enterprise network. As an example, order 1415 can request a coffee-based beverage and be directed to a POS embodied in a coffee shop within the premises of an office building wherein the enterprise femto network is deployed. It is noted that order 1415 also can include one or more custom features of the requested coffee-beverage.

[00126] In example system 1400, a monitor device 1420 that can communicate with femto AP Q 104₂, which serves an area that includes destination location or a POS associated with a placed order 1415, can signal when mobile device 1130 has reached the intended location or completed the delivery. As an example, monitor device 1420 can be a barcode reader, a cash register, an RFID tag, or the like. In an aspect, monitor component 1420 can possess wireless capabilities and can be
deployed by the POS associated with the placed order 1415. Monitor component 1420 also can signal when the mobile device 1130 has completed a commercial transaction associated with the placed order 1415. In an alternative or additional embodiment 1450 illustrated in FIG. 14B, a POS device 1460 associated, as illustrated by connector 1565, with femto AP Q 104Q can signal completion of a commercial transaction related to order 1415.

[00127] FIG. 15A illustrates a block diagram 1500 of example system 1400 in which mobile device 1130 reaches an intended destination location as specified in destination task 1412 and completes a delivery, or effects a purchase associated with order 1415. To issue proof of transaction and communicate the same, monitor device 1420 can exchange signaling with mobile device 1130 through wireless link 1510, which can be a short-range line-of-sight link. Monitor device 1420 can relay the signaling through wireless link 1425 to femto AP 104Q to indicate a delivery has been completed, or a transaction related to order 1415 has been effected. In an aspect, proof of transaction can be a digital token or lightweight file such as a cookie file that uniquely identifies the transaction. The digital token or lightweight file can be communicated to at least one of mobile device 1130, or a femto AP, e.g., femto AP Q 104Q, associated with a destination location or a POS related to order 1415. In an alternative or additional aspect, when femto AP Q 104Q receives the signaling that conveys proof of transaction, the femto AP Q 104Q can request information, through signaling 1512, related to the delivery such as billing charges, description of delivered package, electronic signature(s) of a recipient of the delivered package, or the like. The information can be conveyed to femto AP Q 104Q as part of data 1514; femto AP Q 104Q can relay such information to routing platform 1110, which can process, at least in part, the billing charges assessed as part of a delivery. It is noted that communication, via data 1514, of information associated with the delivery of a package or correspondence can maintain low complexity of monitor device 1420 since payload associated with signaling and traffic implemented by monitor device 1420 can be maintained at a low level; e.g., of the order of a few kilobytes.

[00128] In an alternative or additional embodiment, illustrated in diagram 1550 in FIG. 15B, mobile device 1130 can exchange signaling 1552 with POS device 1460 to effect a commercial transaction associated with order 1415, and data 1554 to process at least in part billing charges or redeem coupons available to a subscriber linked to mobile device 1130. Signaling 1552 and data 1554 can be exchanged.
through a short-range LOS wireless link among mobile device 1130 and POS device 1460. In addition, exchange of data 1554 can allow provisioning of coupon(s) or incentive(s) associated with loyalty program(s) or any other incentive promotional campaign that a subscriber linked to mobile device 1130 is affiliated with. In an aspect, POS device 1460 can supply such coupon(s) or incentive(s) via, at least in part, commerce component 1140 or one or more components therein. POS device 1460 can generate a proof of transaction associated with a delivery or a purchase.

FIG. 16 is a block diagram of an example embodiment 1600 of a mobile device 1602 that can enable and exploit various aspects of the subject innovation described herein. Mobile device 1602 can embody, and operate in substantially the same or the same manner as, mobile device 1130 or any other mobile device described herein. Mobile device 1602 includes a transaction component 1615 that can receive and convey, through communication platform 1604, signaling and data that enables at least in part commercial transaction(s) or service(s) consumption. Transaction component 1615 can communicate control information, as part of signaling, to effect or complete a commercial transaction, e.g., a purchase. In an aspect, transaction component 1615 can exploit technology selector 1625 to configure, at least in part, communication platform 1604 to operate in a predetermined frequency band or carrier and in accordance with a specific radio technology. For instance, transaction component 1615 can set communication platform 1604 to deliver wireless signal(s) in an infrared (IR) portion of the electromagnetic (EM) spectrum to communicate signaling and traffic within a point-to-point (PTP) short-range mode of operation. Such PTP communication can enable delivery of purchase or service request(s) to a POS device, e.g., 1460. In addition, transaction component 1615 can deliver purchase or service request(s) to a femto AP; e.g., delivery of a destination task 1412 or an order 1415. Transaction component 1615 can exploit at least one of display interface 1635, which can include a data entry component (not shown), or an application within application(s) storage 1679, to generate a destination task or an order. For packet-based communication, access intelligence 1683 can include logical address(es), e.g., an internet protocol (IP) address, and related PDP context(s) associated with the mobile device 1602 and the utilized application.

Transaction component 1615 also can include switch component 1617 that accepts or rejects prompt(s) to receive promotional content(s) such as advertisement or coupon(s) or other type of incentive(s). A prompt to receive
promotional content(s) can be received by communication platform 1604, which can relay the prompt, after decoding thereof, to transaction component 1615. In an aspect, switch component 1617 can exploit at least one of display interface 1635 and an application within application(s) storage 1679 to convey the prompt to an end-user and to collect a response to the prompt. Switch component 1617 can configure an opt-in flag or variable in accordance with a received response to the prompt. In an aspect, switch component 1617 can retain the opt-in flag within a configuration file (not shown) that is part of access intelligence 1683.

Additionally, when a prompt to receive promotional content(s) is accepted, transaction component 1615 via at least one of display interface or an application within application(s) storage 1679 can convey a response to received advertisement(s) or incentive(s). Such response can be delivered through communication platform 1604, and can be collected by a recipient, such as marketing component 1301, to generate business intelligence as discussed supra. In an aspect, switch component 1617 can exploit machine learning techniques, indicated supra, to perform a cost-utility analysis to determine a financial gain, or utility, from receiving a predetermined volume of coupons or incentives with respect to a cost, e.g., battery drain, of receiving the predetermined volume of coupons.

In mobile device 1602, which can operate in multi-technology multimode, a set of antennas 16091-1609K (K is a natural number) can receive and transmit signal(s) from and to network elements such as femto access points, access terminals, wireless ports and routers, or the like, within an enterprise femto network. It is noted that antennas 16091-1609K also can allow communication with base stations within a macrocell radio access network. Antennas 16091-1609K are a part of communication platform 1604, which can comprise electronic components and associated circuitry that enable processing and manipulation of received wireless signal(s) and wireless signal(s) to be transmitted. Wireless signal(s) can include traffic, e.g., at least a portion of data 1512 or 1554, and signaling such as at least a portion of signaling 1514 or 1552. In an aspect, communication platform 1604 can receive and deliver signaling that allows commercial transactions or navigation throughout a coverage area of an enterprise femto network in accordance with aspects described herein.

In an aspect, communication platform 1604 includes receiver(s)/transmitter(s) 1606 that can convert signal from analog to digital upon
reception, and from digital to analog upon transmission. Receiver/transmitter 1606 also can divide a single data stream into multiple, parallel data streams, or perform the reciprocal operation; such operations typically conducted in various multiplexing schemes. Functionally coupled to receiver(s)/transmitter(s) 1606 is a multiplexer/demultiplexer (mux/demux) component 1607 that facilitates manipulation of signal in time and frequency space or domain. Electronic mux/demux component 1607 can multiplex information (data/traffic and control/signaling) according to various multiplexing schemes such as time division multiplexing (TDM), frequency division multiplexing (FDM), orthogonal frequency division multiplexing (OFDM), code division multiplexing (CDM), space division multiplexing (SDM). In addition, mux/demux component 1607 can scramble and spread information (e.g., codes) according to substantially any code; e.g., Hadamard-Walsh codes, Baker codes, Kasami codes, polyphase codes, and so on. A modulator/demodulator (mod/demod) component 1608 also is a part of communication platform 1604, and can modulate information according to various modulation techniques, such as frequency modulation (e.g., frequency-shift keying), amplitude modulation (e.g., M-ary quadrature amplitude modulation (QAM), with M a positive integer; amplitude-shift keying (ASK)), phase-shift keying (PSK), and the like. In an aspect of embodiment 1600, mod/demod component 1608 is functionally coupled to mux/demux component 1607.

[00134] In addition, it is noted that a network operator that manages at least one of a macrocell network platform, which can be embodied in one of external network(s) 140, or femtocell network platform 130 can configure, e.g., a part of provisioning of mobile device 1602, a set of electromagnetic (EM) frequency bands and a set of radio technologies that communication platform 1604 and components therein can exploit for communication. The set of EM frequency bands can comprise radio frequency (RF) portion(s) and microwave portion(s) of the EM spectrum, although other spectral regions such as infrared (IR) can be included. It is noted that as part of over-the-air upgrades, the service provider can add frequency bands, or frequency carriers therein, to the set of EM frequency bands as such bands or carriers become available for communication, e.g., auctioned for utilization or authorized for free-of-charge utilization. Similarly, as new radio technologies become standardized, or available, the network operator can introduce such technologies in the set of radio of technologies that can be utilized for communication.
In embodiment 1600, processor(s) 1665 enables, at least in part, mobile device 1602 to process data (e.g., symbols, bits, or chips) for multiplexing/demultiplexing, modulation/demodulation, such as implementing direct and inverse fast Fourier transforms, selection of modulation rates, selection of data packet formats, inter-packet times, etc.

Additionally, in embodiment 1600, multimode chipset(s) 1645 can allow mobile device 1602 to operate in multiple communication modes through various radio network technologies (e.g., second generation (2G), third generation (3G), fourth generation (4G)) or deep-space satellite-based communication in accordance with disparate technical specifications, or standard protocols, for the radio network technologies or satellite communication. In an aspect, multimode chipset(s) 1645 can utilize communication platform 1604 in accordance with standard protocols specific to a mode of operation, e.g., GNSS-based communication or LTE-based communication. In another aspect, multimode chipset(s) 1645 can be scheduled to operate concurrently (e.g., when K > 1) in various modes or within a multitask paradigm in which the multimode chipset(s) 1645 operate in a dedicated mode for a specific time interval.

Technology selector 1625 can drive operation of multimode chipset(s) 1645 through configuration of one or more radio network technologies for communication in a specific telecommunication mode. In an aspect, when mobile device 1602 is enabled with GNSS service, which can be effected through execution of an application retained in application(s) storage 1679, technology selector 1625 can exploit multimode chipset(s) 1645 and communication platform 1604 to receive and process GNSS timing messages to extract a location estimate for the mobile device 1602. Processing of GNSS timing messages includes implementation of a triangulation procedure of available or “visible” satellites to generate the location estimate. In another aspect, technology selector 1625 can switch operation of mobile device 1602 to deliver and receive, via communication platform 1604, at least one of short-range infrared (IR), RF, or microwave wireless signal(s). To switch to such mode of operation, technology selector 1625 can receive signaling from at least one of a femto AP or a device with wireless capabilities, e.g., monitor device 1420 or POS device 1460, near mobile device 1602.

Mobile device 1602 also includes a functional platform 1655 that comprises a set of components (not shown) that provide, at least in part, one or more
specific functionalities that complement or supplement wireless communication. As an example, when mobile device 1602 is a telephone, functional platform 1655 can include functional elements such as a data entry interface (e.g., a touch screen, a keyboard, a biometric pad for biometric-based access, a microphone, a loud speaker), a camera, peripheral connectors (e.g., a universal serial bus (USB) port or an IEEE 1394 port for transferring data to a disparate device), a voice coder-decoder; intelligent component(s) that can respond to voice activated command(s); and so on. It should be appreciated that functional platform 1655 can exploit applications retained, e.g., in application(s) storage 1679 within memory 1675 in order to provide one or more functionalities of mobile device 1602. In an aspect, application(s) storage 218 also can include an application that when executed by at least processor(s) 1665 can interface a subscriber with GNSS-based location estimates and associated data such as maps, landmarks, related businesses, etc. In another aspect, application(s) storage 218 can include an application that when executed by at least processor(s) 1665 can process navigation instruction(s) received from a routing platform, e.g., 1110, within an enterprise femto network, and supply such instructions in a format, e.g., a floor plan with visual or aural indicia that indicate at least origin and destination locations, that can be rendered in a graphic user interface (GUI) that can be implemented through display interface 1635. In yet another aspect, an application within application(s) storage 1679 also can supply at least one of received advertisement(s) or coupon(s) to display interface 1635 for rendition thereof; processor(s) 1665 can enable, at least in part, such rendition of advertisement(s) or coupon(s).

[00139] Display interface 1635, which in one or more disparate or additional embodiments of mobile device 1602 can reside within functional platform 1655, allows gestures for subscriber-device interaction via at least one of a touch-responsive screen or otherwise such as a liquid crystal display (LCD), a plasma panel, a monolithic thin-film based electrochromic display; a sound interface; or the like. Additionally, display interface 1635 can render content(s) that control functionality of mobile device 1602 as available in functional platform 555, or reveal operational conditions of the mobile device 1602.

[00140] Mobile device 1602 also can retain access intelligence 1683, e.g., navigation instructions; configuration file(s) that contain one or more variable(s) that regulate reception of at least one of advertisement(s) or incentive(s); access list(s),
handover log(s), or the like, in memory 1675. At least a portion of such access intelligence 1683 can be collected by the mobile device 1602, or can be received as part of provisioning proceeding(s).

[00141] In addition, mobile device 1602 includes processor(s) 1665 configured to confer, and that confer, at least in part, functionality to substantially any or any component, platform, interface, selector, and so forth within mobile device 1602 in accordance with one or more aspects of the subject innovation. In embodiment 1600, processor(s) 1665 is illustrated as external to the various functional elements (e.g., component, interface, platform, selector) of mobile device 1602; however, processor(s) 1665 can be distributed amongst such various functional elements. Processor(s) 1665 is functionally coupled to each functional element and to memory 1675 through bus 1683, which can be embodied in at least one of a memory bus, a system bus, an address bus, or one or more reference link(s) or interface(s). Processor(s) 1665 can store information in and retrieve information from memory 1675 necessary to operate and/or confer functionality, at least in part, to communication platform 1604, transaction component 1615, technology selector 1625, display interface 1635, multimode chipset(s) 1645, functional platform 1655 and component(s) therein, as well as other operational components (not shown) of multi-mode mobile device 1604. The information can include at least one of code instructions, code structure(s), data structures, or the like.

[00142] Memory 1675 can retain, at least in part in application storage(s) 1679, at least one of data structures (e.g., objects, classes, metadata); code structure(s) (e.g., modules, procedures) or instructions; or substantially any type of software or firmware that processor(s) 1665 can execute to provide functionality associated with substantially any or any component, platform, interface, selector, and so forth, within mobile device 1602 in accordance with aspects of the subject innovation. Moreover, memory 1675 can include coupon storage 1677 which can retain coupon(s) or other digital incentive(s) or indicators of availability thereof. Coupon(s) or incentive(s) can be received when an opt-in flag or variable has a logic value, e.g., ‘coupon.receive = TRUE’, that indicates that coupon(s) or incentive(s) can be received. In an aspect, the opt-in flag or variable can be an entry in a configuration file (not shown) retained in access intelligence 1683 or data cache 1681. Similarly, an advertisement opt-in flag or variable, e.g., ‘ads.receive’ can dictate if advertisement can be received by mobile device 1602; such opt-in flag also can be retained within the configuration file stored
in access intelligence 1683 or data cache 1681. It is noted that data cache 1681 also can retain received advertisement(s); data cache 1681 can be flushed, by transaction component 1615, for example, on at least one of a schedule basis or an event basis, such as handover from enterprise femto network to macrocell coverage.

[00143] Furthermore, memory 1675 can retain network or device information (not shown) such as encoded pilot signal(s) (e.g., encoded sounding reference signal(s)); one or more communication protocol(s) or technical specification(s); code sequences for scrambling or spreading; blind decoding hypotheses; semi-persistent scheduling parameters; frequency offsets, macrocell identifiers (IDs); address book(s); or the like. Moreover, memory 1675 can retain content(s) such as multimedia files or subscriber-generated data; security credentials (e.g., passwords, encryption keys, digital certificates, biometric keys such as voice recordings, iris patterns, fingerprints); hardware identifying tokens or codes such as at least one of an international mobile subscriber identity (IMSI), a temporary mobile subscriber identity (TMSI), packet TMSI (P-TMSI), an international mobile equipment identifier (IMEI), a mobile directory number (MDN), a mobile identification number (MIN), a Telecommunications Industry Association (TIA) electronic serial number (ESN), or a multi-bit identification number like the mobile identity number (MEID). It is noted that memory 1675 can include stationary or removable elements such as a subscriber identification module (SIM) card storage, a universal integrated circuit card (UICC) storage, or a removable user identity module (RUIM).

[00144] Mobile device 1602 also includes power supply 1685, which can power up components or functional elements within mobile device 1602. Power supply 1685 can be a rechargeable power supply, e.g., a rechargeable battery, and it can include one or more transformers to achieve power level(s) that can operate mobile device 1602 and components, functional elements, and related circuitry therein. In an aspect, power supply 1685 can attach to a conventional power grid to recharge and ensure mobile device 1602 is operational; power supply 1685 can include an I/O interface (not shown) to connect operationally to the conventional power grid. Moreover, power supply 1685 can include an energy conversion component (not shown), such as a solar panel, to provide additional or alternative power resources or autonomy to mobile device 1602.

[00145] In view of the example systems described above, example methods that can be implemented in accordance with the disclosed subject matter can be better
appreciated with reference to flowcharts in **FIGs. 17-33**. For purposes of simplicity of explanation, example methods disclosed herein are presented and described as a series of acts; however, it is to be understood and appreciated that the claimed subject matter is not limited by the order of acts, as some acts may occur in different orders and/or concurrently with other acts from that shown and described herein. For example, one or more example methods disclosed herein alternatively or additionally can be represented as a series of interrelated states or events, such as in a state diagram. Moreover, interaction diagram(s) may represent methods in accordance with the disclosed subject matter when disparate entities enact disparate portions of the methodologies. Furthermore, not all illustrated acts may be required to implement a described example method in accordance with the subject specification. Further yet, two or more of the disclosed example methods can be implemented in combination with each other, to accomplish one or more features or advantages herein described. It should be further appreciated that the example methods disclosed throughout the subject specification are capable of being stored on an article of manufacture to facilitate transporting and transferring such methodologies to computers for execution, and thus implementation, by a processor or for storage in a memory.

**FIG. 17** displays a flowchart of an example method 1700 for communicating within a femto mesh network according to aspects disclosed in the subject specification. A routing platform or one or more component therein can enact, or implement, the subject example method 1700. Alternatively or additionally, one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 1700. At act 1710, a call session is established, at least in part, amongst a first device and a second device. At least one of the first device or the second device communicates through an enterprise femto network. In an aspect, the first device or the second device can be mobile device(s); however, either the first device or the second device can be a stationary device with wireless capabilities, such as a printer, a digital video recorder (DVR) box, an IPTV tuner, a fridge, or the like. In another aspect, the call session can be a push-to-talk session; and intra-network assistance session, wherein either the first of second device is an apparatus that enables customer support; or an inter-network communication. At act 1720, the call session is conducted at least in part, wherein at least a portion of at least one of traffic or signaling amongst the first device and second device is routed within the enterprise femto network. At act 1730, the call session is terminated.
Termination can include releasing radio resources allocated within one or more femto APs that enabled, at least in part, the communication amongst the first and second device. In addition, reassigning routing path configuration(s) such as logical addresses, and deactivating radio bearers and packet data protocol (PDP) context(s) also can be included in termination of the call session. Moreover, data buffers or caches can be flushed as part of termination of the call session. At act 1740, billing charges are assessed for the call session based at least in part on at least one of the first device and the second device, or a portion of the traffic or signaling routed within the enterprise femto network amongst the first device and the second device. Billing charges also can be assessed at least in part based on at least one of customer segments associated, respectively with the first and second device; or promotional campaign(s) related to utilization of enterprise femto network.

[00147] FIG. 18 represents a flowchart of an example method 1800 for delivering content within a femto mesh network according to aspects described herein. A routing platform or one or more component therein can enact, or implement, the subject example method 1800. Alternatively or additionally, at least one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 1800. At act 1810, an indication of attachment attempt of a device to a femto AP in a mesh femto network is received. At act 1820, it is determined if the device is authorized to access the femto AP. In the negative case, the subject example method ends. Conversely, buffered content is pushed to the femto AP at act 1830. The content is configured for delivery to the device; as an example, the content can be a set of digital item(s) such as song album(s), games, books, collection(s) of published articles, or movies, which can be resource-intensive to download OTA. Content can be tagged for delivery to the device by a network operator that administers the femto mesh network at the time of sale of the content(s).

[00148] FIG. 19 is a flowchart of an example method 1900 for locating a mobile device that operates within an enterprise femto network according to aspects described herein. One or more network components within a routing platform can enact, or implement, the subject example method 1900. Alternatively or additionally, at least one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 1900. At act 1910, timing configuration for a set of femto APs is supplied. Timing configuration can be based
on at least one of a set of clock sources selected, for example, through a timing component (e.g., component 407); or timing message(s) generated via a GNSS receiver (e.g., receiver 720). At act 1920, timing data, or propagation timing data, from the set of femto APs is collected for a common ground truth associated with a mobile device. At act 1930, a location estimate for the mobile device is generated based at least in part on the collected timing information, or timing data. At act 1940, the generated location estimate for the mobile device is retained. At act 1950, the location estimate is conveyed.

[00149] FIG. 20 displays a flowchart of an example method 2000 for location identification of an entity according to aspects described herein. One or more network components within a routing platform can enact, or implement, the subject example method 2000. Alternatively or additionally, at least one or more processor(s) that confer at least part of the functionality of the routing platform can effect the subject example method 2000. At act 2010, a location estimate of an entity spatially linked to an apparatus with wireless capability(ies) is triangulated. Criteria to determine if the entity is spatially linked to the apparatus can be established by the one or more networks that can enact the subject example method. At act 2020, the location estimate of the entity is recorded. At act 2030, the location estimate of the entity is conveyed to a mobile device associated with a subscriber related to the entity. The location estimate can be delivered as at least one of a short message service (SMS) communication, an unstructured supplementary service data (USSD) message, or as part of a navigation or location-service application executed in the mobile device.

[00150] FIG. 21 displays a flowchart of an example method 2100 for tracking a location estimate for selected mobile device(s) according to aspects described herein. A routing platform or one or more component therein can enact, or implement, the subject example method 2100. Alternatively or additionally, at least one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 2100. In an aspect, the subject example method can be part of mechanism for information delivery associated with the Communications Assistance to Law Enforcement Act (CALEA). At act 2110, a black list of mobile device(s) is received. As an example, the mobile device(s) can be an ankle shackle with wireless capability attached to an individual that is a fugitive. As another example, mobile device can be user equipment of a person restricted from
accessing the coverage area of an enterprise femto network. As a further example, mobile device(s) can be a subscriber station associated with one or more assailant(s) in a hostage situation within the coverage area of the enterprise femto network. At act 2120, an attempt by a blacklisted device to attach to a femto AP that is part of an enterprise femto network is recorded. Attempted attachment can be part of pilot signal(s) transmission while the blacklisted device is in idle mode, and detection of the pilot signal(s) by the femto AP. At act 2130, the record is retained and conveyed to authority(ies). In an aspect, the authority(ies) can be at least one of one or more law enforcement agencies, or a set of emergency first responders (e.g., paramedics, police officers, special weapons and tactic (SWAT) units).

At act 2140, location of the blacklisted device within the enterprise femto network is generated. In an aspect, generation of the location estimate can proceed in accordance with example subject method 1000. At act 2150, location estimate of the blacklisted device is delivered. As an example, location can be delivered to one or more wearable devices, e.g., a helmet-mounted display, that are part of law-enforcement officers or first emergency responders operations gear or equipment. As another example, location estimate can be provided to an operation control center related to the authority(ies). At act 2160, it is determined if location tracking is to be continued. Various criteria can be employed to determine continuation of location tracking. In the affirmative case, flow is directed to act 2140. Conversely, the subject example method is terminated.

FIG. 22 is a flowchart of an example method 2200 for associating an item with a mobile device according to aspects described herein. The subject example method can be effected by at least one of a femto AP or routing platform. In an aspect, one or more processors that confer functionality to the femto AP or the routing platform can implement, at least in part, the subject example method. At act 2210, a list of one or more items is received. At act 2220, position of an RFID tag linked to an item in the list of one or more items is triangulated. Triangulation of the position can be performed through TOF measurements based on at least one of a predetermined configurable timing advance, or timing information received through a GNSS receiver. At act 2230, a location extracted through triangulation is mapped to the item labeled through the RFID tag. At act 2240, the location of the mapped RFID tag is conveyed to a mobile device associated with the received list of one or more items; for instance, the mobile device can be linked to a subscriber that generated the
list. In an aspect, a femto network platform relaying the list or a network external the femto network platform can exploit subscriber information to link unique identifier of the mobile device to credentials, e.g., password(s) or passkey(s), employed by the subscriber to access a service or application that enables generation of the list of one or more items. At act 2250, content of the mapped RFID tag is delivered to the mobile device. Delivering the content can include adjusting the content prior to delivery, such adjustment can allow to customize features of the content such as pricing of the item labeled through the RFID tag.

[00153] FIG. 23 is a flowchart of an example method 2300 for navigating a device from a first location to a destination location according to aspects described herein. A routing platform or one or more component therein can enact, or implement, the subject example method 2300. Alternatively or additionally, one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 2300. At act 2310, and indication of an attachment attempt to a first femto AP within a femto enterprise network (see, e.g., FIGs. 1 and 2A-2B) by a device linked to at least one of a service provider or a prospective customer is received. At act 2320, it is evaluated if the device is a blacklisted device. In the affirmative case, exception handling is implemented at act 2330. Conversely, at act 2340, the device is included in one or more access lists associated with a set of femto APs within the femto enterprise network. At act 2350, a destination task related to at least one of a service event or a commercial transaction is received. A service event can be at least one of a delivery of a package or other type of goods; pick-up of an item for maintenance or repair; rendering of an on-site service such as repair of an apparatus, e.g., a photocopier, or delivery of a presentation, which can include training material(s); or the like. A prospective transaction can include location of a product for sale, e.g., a book, a DVD, a CD, or a blu-ray disc; a display monitor, a desktop computer, a television set; or the like. At act 2360, the device is navigated from a first location to a destination location extracted from the destination task. Navigation form the first location to the destination location can include delivery of at least one of navigation instructions or a navigation map; navigation instructions can be conveyed statically or in a streamed manner and through at least one of a SMS communication, a MMS communication, a USSD message, an IM communication, or an email message. In addition, navigation
can include identification of one or more objects and location thereof via RFID technology, as discussed in connection with example system 900.

[00154] FIG. 24 is a flowchart of an example method 2400 for supplying custom promotional content according to aspects described herein; the promotional content can include at least one of monetary incentive(s) or coupon(s), or advertisement. One or more network components such as a routing platform or a commerce component 1140, or one or more components therein, can implement the subject example method 2400. Alternatively or additionally, one or more processors that confer at least part of the functionality of the routing platform can implement the subject example method 2400. At act 2410, an indication of an attachment attempt of a mobile device to a femto AP in a mesh femto network, or enterprise femto network, is received. At act 2420, the mobile device is included in access list(s) associated with a set of femto APs in the mesh femto network. In an aspect, an access list management component within a routing platform that can enact, at least in part, the subject example method, can configure or populate the access list(s). At act 2430, a location of the mobile device is identified. Identification of the location can proceed in accordance at least in part with example method 1900 described herein. At act 2440, content customized at least in part in accordance with at least one of the identified location or a commerce profile linked to the mobile device is conveyed to the mobile device.

[00155] FIG. 25 is a flowchart of an example method 2500 for effecting a commercial transaction at least in part through an enterprise femto network according to aspects described herein. A commerce component or one or more component therein can enact, or implement, the subject example method 2500. Alternatively or additionally, one or more processors that confer at least part of the functionality of the routing platform can effect the subject example method 2500. At act 2510, a unique identifier of a mobile device that attaches to a femto AP in a mesh femto network deployed in an enterprise. At act 2520, retrieve a commerce profile associated with the unique identifier of the mobile device. At act 2530, a transaction effected at least in part through the mobile device is identified. At act 2540, charges for the transaction are assessed to a service account linked to the mobile device based at least in part on the retrieved commerce profile and information therein. The assessment of charges includes accounting for accrued monetary incentives or coupon(s) associated with the mobile device.
FIG. 26 displays a flowchart of an example method 2600 developing business intelligence through advertisement within an enterprise femto network according to aspects described herein. One or more network components such as commerce component 1140 or routing platform 1110 can enact the subject example method 2600. In an aspect, at least one or more processor(s) that confer functionality to the network component can implement, at least in part, the subject example method 2600. At act 2610, trade of service unit(s) for exposure to advertisement(s) is configured. Configuration can include rate of exchange of service unit(s) for advertisement(s) type. For instance, direct response advertisement can provide a higher volume of traded service units than advertisement directed to brand development or product penetration. At act 2620, response to exposed advertisement(s) is monitored. In an aspect, monitoring can be accomplished through collection of transaction information directly related to the exposed advertisement(s). At act 2630, the service unit(s) are supplied based at least in part on at least one of the exposed advertisement(s) or the configured trade. Service unit(s) can be credited to an service account associated with a subscriber exposed to the advertisement(s) or can be redeemed as coupons or vouchers when a commercial transaction related at least in part to the advertisement(s) is effected.

At act 2640, based at least in part on response to the exposed advertisement(s), service intelligence is collected. At act 2650, service(s) associated with the service unit(s) is adjusted in accordance at least in part with the collected service intelligence. For instance, if a rate of action linked to a specific class of advertisement(s) and related first type of service unit(s), e.g., text message(s), ringtone(s), song(s), is higher compared to action elicited through the specific class of advertisement(s) when linked to a second type of service unit(s), e.g., stock-market trade instance, a service provider can generate a service or a product based at least in part on the first type of service unit(s). At act 2660, revenue sharing with a set of advertisers is assessed in accordance at least in part with the configured trade. Advertisers can be internal or external, or a combination thereof, to a network operator that administers the enterprise femto network. In an example, an internal advertiser can be a business department or a portion thereof that develops new product(s) or researches subscriber commercial behavior. In another example, external advertisers can include clients, vendors, or business partners of the network operator.
FIG. 27 displays a flowchart of an example method 2700 for conducting a commercial transaction within an enterprise femto network according to aspects described herein. One or more network components such as commerce component 1140 or routing platform 1110 can enact the subject example method 2700. In an aspect, at least one or more processor(s) that confer functionality to the network component can implement, at least in part, the subject example method 2700. At act 2710, an order for a product, such as a consumable product, associated with a point-of-sale (POS) within an enterprise is received from an originating device located in a remote position with respect to the location of the POS within the enterprise. Alternatively or additionally, in an aspect, the originating device can be located within the POS location. The product includes consumable products or one or more services that can be transacted according the subject example method. The POS can be at least a part of a first coverage area, e.g., 205₁, and the device can be located within a second coverage area, e.g., 205ₚ. As an example, the POS can be a retailer such as a coffee shop, a restaurant, a clothing retailer, or the like. At act 2720, the order is routed to a femto AP that provides wireless service to the POS within the enterprise. In an aspect, the femto AP can convey the order to an order tracking terminal, or device, that operates within the POS for processing therein. At act 2730, the originating device or a mobile device linked thereto can be included in an access list that regulates access rights to service through the femto AP that provides wireless service to the POS within the enterprise.

At act 2740, it is verified if proof of transaction is received. Verification can be implemented as part of a monitoring cycle that spans a predetermined, configurable period that can start at substantially the time when the order is complete. In the negative case, exception handling is implemented at act 2770. Exception handling can include at least one of classification of a subscriber linked to the originating device as a hotlined consumer; revocation of at least part of access privileges of the subscriber to an ordering system that manipulates, at least in part, the received order; or the like. Conversely, at act 2750, billing charges are assessed based at least in part on at least one of the product; the originating device or a mobile device linked thereto; or a commercial profile associated therewith. At act 2760, the transaction is recorded.

FIG. 28 displays a flowchart of an example method 2800 for consuming promotional content(s) according to aspects described herein.
Promotional content(s) can include advertisement or incentive(s) such as coupon(s). A mobile device can enact the subject example method 2800. In an aspect, at least one or more processor(s) that confer functionality to the mobile device can implement, at least in part, the subject example method 2800. At act 2810, attachment to a femto AP within an enterprise network is effected. For instance, the femto AP can be an access point that covers at least in part a point of entry entrance to a coverage area of the enterprise femto network (see FIG. 9). At act 2820, a prompt to opt in for promotional content(s) delivery is received. In an aspect, the prompt can be embodied in at least one of a SMS communication, an MMS communication, a USSD message, an email message, or an IM message. At act 2830, a response to the received prompt is effected. Responding to the received prompt can include conducting a cost-utility analysis to determine a financial gain from receiving a predetermined volume of promotional content(s), e.g., coupons or monetary incentives, with respect to a cost of receiving the predetermined volume of promotional content(s). The cost can include a battery drain or battery charge consumption level of the mobile device that enacts the subject example method. At act 2840 it is determined if it has been elected to receive promotional content(s). Such determination can be enabled by at least one of a variable, logic or otherwise, or an entry in a configuration file retained in memory of the mobile device that enacts the subject example method. At act 2850, promotional content(s) are received, wherein the promotional content(s) are customized based at least in part on at least one of a commerce profile or a location within the enterprise femto network.

[00161] FIG. 29 displays a flowchart of an example method 2900 for reaching a destination location within an enterprise femto network according to aspects described herein. A mobile device can enact the subject example method 2900. In an aspect, at least one or more processor(s) that confer functionality to the mobile device can implement, at least in part, the subject example method 2900. In another aspect, example method 2900 can be implemented as part of a dedicated navigation application executed by the mobile device or a processor therein that enacts the subject example method. It is noted that the subject example method 2900 can enable seamless outdoor-to-indoor navigation. At act 2910, attachment to a femto AP within an enterprise femto network is effected. For instance, the femto AP can be an access point that covers at least in part a point of entry to a coverage area of the enterprise femto network (see FIG. 9). At act 2920, a destination task that includes an intended
destination is conveyed; the intended destination is location within the enterprise femto network. Destination task also can include a label or an identifier of a reference item associated with the intended destination; the identifier can include a universal product code (UPC), an international standard book number (ISBN), a stock keeping unit (SKU), or the like. For instance, when the intended destination is a location within a bookstore in which the femto enterprise network is deployed, the identifier can be the ISBN of a procured book. Delivery of the destination task can be part of delivery of an item to the intended destination. Alternatively or additionally, delivery of the destination task can be part of a search of a specific item within a business premises in which the enterprise femto network is deployed; for instance, the destination task can be a specific section of a supermarket store; a bookstore; a music store; a school library or a public library; or the like. Moreover, delivery of the destination task can be part of a scheduled meeting such as a job interview, or a seminar or sales presentation in a specific location. Furthermore, a destination task can be delivered as part of social interaction such as identification of a “blind date” or specific party within a restaurant, bookstore, or entertainment location.

At act 2930, navigation instructions to the intended destination are received. Instructions can be received in at least one of a static manner; or a streaming fashion, particularly for a moving intended location such as a specific party within a venue in which the femto enterprise network is located. At act 2940, an indication that the intended destination has been reached is conveyed. The indication can be embodied in high-level signaling such as a USSD code, a SMS communication, a MMS communication or an email communication to a femto AP that serves an area that encompasses the intended destination. Alternatively or additionally, the indication can be embodied in low-level signaling such as a set of one or more bits delivered in an in-band management packet or one or more frames in a control channel.

FIG. 30 illustrates a flowchart of an example method 3000 for conducting a commercial transaction within an enterprise femto network according to aspects described herein. One or more devices, wireless or tethered, with wireless capabilities can enact the subject example method 3000. In an aspect, at least one or more processor(s) that confer functionality to the one or more devices can implement, at least in part, the subject example method 3000. At act 3010, it is probed if a connection to a routing platform (e.g., routing platform 1110) is active; the routing
platform is a network component of the enterprise femto network. In the affirmative case, an order for a product is conveyed through the active connection to the routing platform at act 3020. In an aspect, an application executed by a device with wireless capabilities can enable, at least in part, to convey the order. At act 3030, the order is linked to a mobile device, and flow is directed to act 3070. Linkage to the mobile device can be accomplished as part of conveying the order for the product. Conversely, when the connection to the routing platform is inactive, attachment to a femto AP within the enterprise femto network is effected at act 3040. At act 3060, an order for a product is conveyed through the femto AP. At act 3070, signaling that effects a commercial transaction, e.g., a purchase, linked to the ordered product is delivered.

[00164] It is noted that traffic, e.g., data, and signaling associated with the subject example method 3000 is communicated within a private network, e.g., the femto enterprise network, as opposed to a public wide area network such as a internet. Accordingly, as discussed supra, traffic and signaling linked to enacting the subject example method 3000 can occur free of charge, and can mitigate utilization of communication resources, such as bandwidth, associated with a WAN or an external network.

[00165]  **FIG. 31** is a flowchart of an example method 3100 for handing off a mobile device within coverage areas within a femto enterprise network according to aspects described herein. The subject example method can be effected by at least one of a femto AP or routing platform. In an aspect, at least one or more processor(s) that confer functionality to the femto AP or the routing platform can implement, at least in part, the subject example method 3100. At act 3110, it is evaluated if channel quality is below threshold. Channel quality can include FL and RL signal strength. In the negative case, evaluation is re-enacted. In the affirmative case, flow is directed to act 3120, in which it is probed whether an RF boundary is reached. A negative outcome results in flow being directed to act 3110. Conversely, a positive outcome results in conveying a handover request at act 3130. The RF boundary can be configurable and established in accordance at least in part with at least one of a schedule or one or more operation condition(s) of the femto enterprise network, wherein operation condition(s) can include at least one of network load such as number of served mobile devices; other-femto interference; available bandwidth; or channel quality. At act 3140, an
indication to HO to a target femto AP is received based at least in part on an access list that regulated attachment to the target femto AP.

[00166] FIG. 32 displays a flowchart of an example method 3200 for signaling to a routing platform an attachment of a wireless device to a femto access point in a femto enterprise network according to aspects described herein. A femto AP (e.g., femto 104;) functionally linked to a routing platform (e.g., 110 or 510) in a femto enterprise network as described herein can enact, or implement the subject example method. In an aspect, at least one or more processor(s) that confer functionality to the femto AP can implement, at least in part, the subject example method 3200. At act 3210 attachment signaling is received from a mobile device, the attachment signaling can include wireless pilot signal(s) which can be conveyed when the mobile device operates in idle mode. At act 3220, it is determined if the mobile device is authorized to access service through a femto AP, which can be the femto AP that enacts the subject example method. Authorization or access privilege(s) can be determined by an access list, e.g., access list(s) 353, that regulates at least a level of service provide to user equipment through the femto AP. When the mobile device is authorized, the attachment is recorded, e.g., as part of access record(s) 355, and an attachment report is conveyed at act 3240. In an aspect, the attachment report can deliver registration information such as a time stamp, UE identifier codes or tokens, or the like. A conveyed attachment report can be aggregated at the routing platform functionally linked to the femto AP that can enact the subject example method. Conversely, when the mobile device is not authorized, flow is directed to act 3230 in which it is established whether the mobile device is a blacklisted device. In the affirmative case, exception handling is implemented at act 3250. Exception handling can include delivering an alarm, e.g., a SMS communication, a USSD code, an email message, an instant message, etc., to an authority such as a law-enforcement agency. In the negative case, the mobile device is served in emergency-mode only at act 3260.

[00167] FIG. 33 is a flowchart of an example method 3300 for assisting localization of a mobile device that operates in the femto enterprise network according to aspects described herein. A femto AP (e.g., femto 104;) functionally linked to a routing component (e.g., 110 or 510) in a femto enterprise network as described herein can enact, or implement the subject example method 3300. Alternatively or additionally, at least one or more processor(s) that confer functionality to the femto AP can implement, at least in part, the subject example
method. At act 3310, a timing configuration is received. The timing configuration can synchronize time amongst a set of femto APs in a femtocell mesh network. In addition, the timing configuration can enable selection of a clock source, which can be part of a clock layer, e.g., 445, that determines a spatially resolution that can be attained through triangulation based at least in part on TOF measurements that can be effected by the femto AP the implements the subject example method. At act 3320, a set of propagation timing measurements is collected. The set includes one or more measurements. At act 3330, the set of timing measurements is conveyed to a routing platform. In an aspect, the routing platform can exploit timing data to generate a location estimate of a mobile device or an entity linked to an apparatus with wireless capability.

[00168] To provide further context for various aspects of the subject specification, FIG. 34 illustrates an example wireless communication environment 3400, with associated components that can enable operation of a femtocell enterprise network in accordance with aspects described herein. Wireless communication environment 3400 includes two wireless network platforms: (i) A macro network platform 3410 that serves, or facilitates communication) with user equipment 3475 via a macro radio access network (RAN) 3470. It should be appreciated that in cellular wireless technologies (e.g., 4G, 3GPP UMTS, HSPA, 3GPP LTE, 3GPP UMB), macro network platform 3410 is embodied in a Core Network. (ii) A femto network platform 3480, which can provide communication with UE 3475 through a femto RAN 3490, linked to the femto network platform 3480 through a routing platform 102 via a backhaul pipe(s) 3485, wherein backhaul pipe(s) are substantially the same a backhaul link 1240. It should be appreciated that femto network platform 3480 typically offloads UE 3475 from macro network, once UE 3475 attaches (e.g., through macro-to-femto handover, or via a scan of channel resources in idle mode) to femto RAN.

[00169] It is noted that RAN includes base station(s), or access point(s), and its associated electronic circuitry and deployment site(s), in addition to a wireless radio link operated in accordance with the base station(s). Accordingly, macro RAN 3470 can comprise various coverage cells like cell 1205, while femto RAN 3490 can comprise multiple femto access points. As mentioned above, it is to be appreciated that deployment density in femto RAN 3490 is substantially higher than in macro RAN 3470.
[00170] Generally, both macro and femto network platforms 3410 and 3480 include components, *e.g.*, nodes, gateways, interfaces, servers, or platforms, that facilitate both packet-switched (PS) (*e.g.*, internet protocol (IP), frame relay, asynchronous transfer mode (ATM)) and circuit-switched (CS) traffic (*e.g.*, voice and data) and control generation for networked wireless communication. In an aspect of the subject innovation, macro network platform 3410 includes CS gateway node(s) 3412 which can interface CS traffic received from legacy networks like telephony network(s) 3440 (*e.g.*, public switched telephone network (PSTN), or public land mobile network (PLMN)) or a SS7 network 3460. Circuit switched gateway 3412 can authorize and authenticate traffic (*e.g.*, voice) arising from such networks. Additionally, CS gateway 3412 can access mobility, or roaming, data generated through SS7 network 3460; for instance, mobility data stored in a VLR, which can reside in memory 3430. Moreover, CS gateway node(s) 3412 interfaces CS-based traffic and signaling and gateway node(s) 3418. As an example, in a 3GPP UMTS network, gateway node(s) 3418 can be embodied in gateway GPRS support node(s) (GGSN).

[00171] In addition to receiving and processing CS-switched traffic and signaling, gateway node(s) 3418 can authorize and authenticate PS-based data sessions with served (*e.g.*, through macro RAN) wireless devices. Data sessions can include traffic exchange with networks external to the macro network platform 3410, like wide area network(s) (WANs) 3450; it should be appreciated that local area network(s) (LANs) can also be interfaced with macro network platform 3410 through gateway node(s) 3418. Gateway node(s) 3418 generates packet data contexts when a data session is established. To that end, in an aspect, gateway node(s) 3418 can include a tunnel interface (*e.g.*, tunnel termination gateway (TTG) in 3GPP UMTS network(s); not shown) which can facilitate packetized communication with disparate wireless network(s), such as Wi-Fi networks. It should be further appreciated that the packetized communication can include multiple flows that can be generated through server(s) 3414. It is to be noted that in 3GPP UMTS network(s), gateway node(s) 3418 (*e.g.*, GGSN) and tunnel interface (*e.g.*, TTG) comprise a packet data gateway (PDG).

[00172] Macro network platform 3410 also includes serving node(s) 3416 that convey the various packetized flows of information or data streams, received through
gateway node(s) 3418. As an example, in a 3GPP UMTS network, serving node(s) can be embodied in serving GPRS support node(s) (SGSN).

As indicated above, server(s) 3414 in macro network platform 3410 can execute numerous applications (e.g., location services, online gaming, wireless banking, wireless device management ...) that generate multiple disparate packetized data streams or flows, and manage (e.g., schedule, queue, format ...) such flows. Such application(s), for example can include add-on features to standard services provided by macro network platform 3410. Data streams can be conveyed to gateway node(s) 3418 for authorization/authentication and initiation of a data session, and to serving node(s) 3416 for communication thereafter. Server(s) 3414 can also effect security (e.g., implement one or more firewalls) of macro network platform 3410 to ensure network’s operation and data integrity in addition to authorization and authentication procedures that CS gateway node(s) 3412 and gateway node(s) 3418 can enact. Moreover, server(s) 3414 can provision services from external network(s), e.g., WAN 3450, or Global Positioning System (GPS) network(s) (not shown). It is to be noted that server(s) 3414 can include one or more processor configured to confer at least in part the functionality of macro network platform 3410. To that end, the one or more processor can execute code instructions stored in memory 3430, for example.

In example wireless environment 3400, memory 3430 stores information related to operation of macro network platform 3410. Information can include business data associated with subscribers; market plans and strategies, e.g., promotional campaigns, business partnerships; operational data for mobile devices served through macro network platform; service and privacy policies; end-user service logs for law enforcement; and so forth. Memory 3430 can also store information from at least one of telephony network(s) 3440, WAN(s) 3450, or SS7 network 3460, enterprise NW(s) 3465, or service NW(s) 3467.

Femto gateway node(s) 3484 have substantially the same functionality as PS gateway node(s) 3418. Additionally, femto gateway node(s) 3484 can also include substantially all functionality of serving node(s) 3416. In an aspect, femto gateway node(s) 3484 facilitates handover resolution, e.g., assessment and execution. Further, control node(s) 3420 can receive handover requests and relay them to a handover component (not shown) via gateway node(s) 3484. According to an aspect, control node(s) 3420 can support RNC capabilities and can be substantially similar to the control component 320 (FIG. 3) and can include functionality thereof.
Server(s) 3482 have substantially the same functionality as described in connection with server(s) 3414. In an aspect, server(s) 3482 can execute multiple application(s) that provide service (e.g., voice and data) to wireless devices served through femto RAN 3490. Server(s) 3482 can also provide security features to femto network platform. In addition, server(s) 3482 can manage (e.g., schedule, queue, format ...) substantially all packetized flows (e.g., IP-based, frame relay-based, ATM-based) it generates in addition to data received from macro network platform 3410. It is to be noted that server(s) 3482 can include one or more processor configured to confer at least in part the functionality of macro network platform 3410. To that end, the one or more processor can execute code instructions stored in memory 3486, for example.

Memory 3486 can include information relevant to operation of the various components of femto network platform 3480. For example operational information that can be stored in memory 3486 can comprise, but is not limited to, subscriber information; contracted services; maintenance and service records; femto cell configuration (e.g., devices served through femto RAN 3490; access control lists, or white lists); service policies and specifications; privacy policies; add-on features; and so forth.

It is noted that femto network platform 3480 and macro network platform 3410 can be functionally connected through one or more reference link(s) or reference interface(s). In addition, femto network platform 3480 can be functionally coupled directly (not illustrated) to one or more of external network(s) 3440, 3450, 3460, 3465 or 3467. Reference link(s) or interface(s) can functionally link at least one of gateway node(s) 3484 or server(s) 3486 to the one or more external networks 3440, 3450, 3460, 3465 or 3467.

FIG. 35 illustrates a wireless environment that includes macro cells and femtocells for wireless coverage in accordance with aspects described herein. In wireless environment 3550, two areas 3505 represent “macro” cell coverage, each macro cell is served by a base station 3510. It can be appreciated that macro cell coverage area 3505 and base station 3510 can include functionality, as more fully described herein, for example, with regard to system 3500. Macro coverage is generally intended to serve mobile wireless devices, like UE 3520A, 3520B, in outdoors locations. An over-the-air wireless link 115 provides such coverage, the wireless link 1215 comprises a downlink (DL) and an uplink (UL), and utilizes a
predetermined band, licensed or unlicensed, of the radio frequency (RF) spectrum. As an example, UE 3520_A, 3520_B can be a 3GPP Universal Mobile Telecommunication System (UMTS) mobile phone. It is noted that a set of base stations, its associated electronics, circuitry or components, base stations control component(s), and wireless links operated in accordance to respective base stations in the set of base stations form a radio access network (RAN). In addition, base station 3510 communicates via backhaul link(s) 3551 with a macro network platform 3560, which in cellular wireless technologies (e.g., 3rd Generation Partnership Project (3GPP) Universal Mobile Telecommunication System (UMTS), Global System for Mobile Communication (GSM)) represents a core network.

[00179] In an aspect, macro network platform 3560 controls a set of base stations 3510 that serve either respective cells or a number of sectors within such cells. Base station 3510 comprises radio equipment 3514 for operation in one or more radio technologies, and a set of antennas 3512 (e.g., smart antennas, microwave antennas, satellite dish(es) ...) that can serve one or more sectors within a macro cell 3505. It is noted that a set of radio network control node(s), which can be a part of macro network platform; a set of base stations (e.g., Node B 3510) that serve a set of macro cells 3505; electronics, circuitry or components associated with the base stations in the set of base stations; a set of respective OTA wireless links (e.g., links 3515 or 3516) operated in accordance to a radio technology through the base stations; and backhaul link(s) 3555 and 3551 form a macro radio access network (RAN). Macro network platform 3560 also communicates with other base stations (not shown) that serve other cells (not shown). Backhaul link(s) 3551 or 3553 can include a wired backbone link (e.g., optical fiber backbone, twisted-pair line, T1/E1 phone line, a digital subscriber line (DSL) either synchronous or asynchronous, an asymmetric ADSL, or a coaxial cable ...) or a wireless (e.g., line-of-sight (LOS) or non-LOS) backbone link. Backhaul pipe(s) 3555 link disparate base stations 3510. According to an aspect, backhaul link 3553 can connect multiple femto access points 3530 and/or controller components (CC) 120 to the femto network platform 130. In one example, multiple femto APs can be connected to a routing platform (RP) 110, which in turn can be connect to a controller component (CC) 120. Typically, the information from UEs 3520_A can be routed by the RP 102, for example, internally, to another UE 3520_A connected to a disparate femto AP connected to the RP 110, or,
externally, to the femto network platform 130 via the CC 120, as discussed in detail supra.

[00180] In wireless environment 3550, within one or more macro cell(s) 3505, a set of femtocells 3545 served by respective femto access points (APs) 3530 can be deployed. It can be appreciated that, aspects of the subject innovation are geared to femtocell deployments with substantive femto AP density, e.g., $10^4$-$10^7$ femto APs 3530 per base station 3510. According to an aspect, a set of femto access points 3530$_1$-3530$_N$, with $N$ a natural number, can be functionally connected to a routing platform 110, which can be functionally coupled to a controller component 120. The controller component 120 can be operationally linked to the femto network platform 330 by employing backhaul link(s) 3553. Accordingly, UEs UE 3520$_A$ connected to femto APs 3530$_1$-3530$_N$ can communicate internally within the femto enterprise via the routing platform (RP) 110 and/or can also communicate with the femto network platform 130 via the RP 110, controller component 120 and the backhaul link(s) 3553. It can be appreciated that although only one femto enterprise is depicted in FIG. 35, multiple femto enterprise networks can be deployed within a macro cell 3505.

[00181] It is noted that while various aspects, features, or advantages described herein have been illustrated through femto access point(s) and associated femto coverage, such aspects and features also can be exploited for home access point(s) (HAPs) that provide wireless coverage through substantially any, or any, disparate telecommunication technologies, such as for example Wi-Fi (wireless fidelity) or picocell telecommunication. Additionally, aspects, features, or advantages of the subject innovation can be exploited in substantially any wireless telecommunication, or radio, technology; for example, Wi-Fi, Worldwide Interoperability for Microwave Access (WiMAX), Enhanced General Packet Radio Service (Enhanced GPRS), 3GPP LTE, 3GPP2 UMB, 3GPP UMTS, HSPA, HSDPA, HSUPA, or LTE Advanced. Moreover, substantially all aspects of the subject innovation can include legacy telecommunication technologies.

[00182] Various aspects or features described herein can be implemented as a method, apparatus, or article of manufacture using standard programming and/or engineering techniques. In addition, various aspects disclosed in the subject specification can also be implemented through program modules stored in a memory and executed by a processor, or other combination of hardware and software, or hardware and firmware. The term “article of manufacture” as used herein is intended
to encompass a computer program accessible from any computer-readable device, carrier, or media. For example, computer readable media can include but are not limited to magnetic storage devices (e.g., hard disk, floppy disk, magnetic strips...), optical disks (e.g., compact disc (CD), digital versatile disc (DVD), blu-ray disc (BD) ...), smart cards, and flash memory devices (e.g., card, stick, key drive...).

Additionally it should be appreciated that a carrier wave can be employed to carry computer-readable electronic data such as those used in transmitting and receiving electronic mail or in accessing a network such as the internet or a local area network (LAN). Of course, those skilled in the art will recognize many modifications may be made to this configuration without departing from the scope or spirit of the claimed subject matter.

[00183] As it employed in the subject specification, the term “processor” can refer to substantially any computing processing unit or device comprising, but not limited to comprising, single-core processors; single-processors with software multithread execution capability; multi-core processors; multi-core processors with software multithread execution capability; multi-core processors with hardware multithread technology; parallel platforms; and parallel platforms with distributed shared memory. Additionally, a processor can refer to an integrated circuit, an application specific integrated circuit (ASIC), a digital signal processor (DSP), a field programmable gate array (FPGA), a programmable logic controller (PLC), a complex programmable logic device (CPLD), a discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. Processors can exploit nano-scale architectures such as, but not limited to, molecular and quantum-dot based transistors, switches and gates, in order to optimize space usage or enhance performance of user equipment. A processor also can be implemented as a combination of computing processing units.

[00184] In the subject specification, terms such as “store,” “data store,” “data storage,” “database,” “repository,” and substantially any other information storage component relevant to operation and functionality of a component, refer to “memory components,” or entities embodied in a “memory” or components comprising the memory. It will be appreciated that the memory components described herein can be either volatile memory or nonvolatile memory, or can include both volatile and nonvolatile memory. In addition, memory components or memory elements can be removable or stationary. Moreover, memory can be internal or external to a device or
component, or removable or stationary. Memory can include various types of media that are readable by a computer, such as hard-disc drives, zip drives, magnetic cassettes, flash memory cards or other types of memory cards, cartridges, or the like.

By way of illustration, and not limitation, nonvolatile memory can include read only memory (ROM), programmable ROM (PROM), electrically programmable ROM (EPROM), electrically erasable ROM (EEPROM), or flash memory. Volatile memory can include random access memory (RAM), which acts as external cache memory. By way of illustration and not limitation, RAM is available in many forms such as synchronous RAM (SRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), enhanced SDRAM (ESDRAM), Synchlink DRAM (SLDRAM), and direct Rambus RAM (DRRAM). Additionally, the disclosed memory components of systems or methods herein are intended to comprise, without being limited to comprising, these and any other suitable types of memory.

What has been described above includes examples of systems and methods that provide advantages of the subject innovation. It is, of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the subject innovation, but one of ordinary skill in the art may recognize that many further combinations and permutations of the claimed subject matter are possible. Furthermore, to the extent that the terms “includes,” “has,” “possesses,” and the like are used in the detailed description, claims, appendices and drawings such terms are intended to be inclusive in a manner similar to the term “comprising” as “comprising” is interpreted when employed as a transitional word in a claim.
CLAIMS

What is claimed is:

1. A method for providing location-based services, comprising:
   employing one or more processors to execute code instructions stored in a
   computer-readable medium, the code instructions when executed by the one or more
   processor implement the following acts:
   receiving an indication of an attachment attempt to a first femto access
   point (AP) within a femto enterprise network by a device linked to at least one of a
   service provider or a prospective customer;
   when the device is not blacklisted, including the device in one or more
   access lists associated with a set of femto APs within the enterprise femto network;
   receiving a destination task related to at least one of a service event or
   a commercial transaction;
   navigating the device from a first location to a destination location
   extracted from the destination task; and
   receiving billing information related at least in part to the service event
   or the commercial transaction.

2. The method of claim 1, further comprising:
   identifying a location of the device; and
   conveying customized content to the device, wherein the content is
   customized in accordance at least in part with the identified location or a commerce
   profile linked to the device, the content includes at least one of monetary incentives or
   advertisement.

3. The method of claim 2, wherein the device is one of a mobile device or a
   tethered device with wireless capability, the tethered device functionally connected to
   a routing platform that is part of the femto enterprise network.

4. The method of claim 2, further comprising:
   receiving a unique identifier or a mobile device that attaches to a femto AP in
   the enterprise femto network;
retrieving a commerce profile associated with the unique identifier of the mobile device;

identifying a transaction effected at least in part through the mobile device;

and

assessing charges for the transaction to a service account linked to the mobile device based at least in part on the retrieved commerce profile, wherein the assessing act includes accounting for accrued monetary incentives associated with the mobile device.

5. The method of claim 2, further comprising:

configuring trade of a service unit for exposure to advertisement, wherein exposure to advertisement is dictated at least in part through advertisement impression criteria;

monitor response to exposed advertisement;

collect service intelligence based at least in part on the response to the exposed advertisement; and

adjust a service associated with the service unit in accordance at least in part with collected service intelligence.

6. The method of claim 5, further comprising supplying the service unit based at least in part on at least one of the exposed advertisement or the configured trade.

7. The method of claim 5, further comprising assessing revenue sharing with a set of advertisers in accordance at least in part with the configured trade.

8. The method of claim 7, wherein the set of advertisers can include at least one of advertisers internal to a business operator that exploits the enterprise femto network or a network operator that administers the same; or external to the business operator or the network operator.
9. The method of claim 2, further comprising:
   receiving an order for a product associated with a point of sale (POS) within
   an enterprise from an originating device located in a remote position with respect to
   the location of the POS;
       routing the order to a femto AP that provides wireless service to the POS;
       including the originating device or a mobile device linked thereto in an access
   list that regulates access rights to the femto AP that provides wireless service to the
   POS within the enterprise;
       when proof of transaction is received, assessing billing charges based at least
   in part on at least one of the product; the originating device or a mobile device linked
   thereto; or a commerce profile associated therewith.

10. The method of claim 9, when proof of transaction is not received after a
    configurable monitoring cycle elapses, exception handling is implemented, wherein
    exception handling can include at least one of classification of a subscriber linked to
    the originating device as a hotlined consumer; or revocation of at least part of access
    privileges of the subscriber to an ordering system that manipulates, at least in part, the
    received order.

11. The method of claim 1, wherein the customized content is directed to an item
    disclosed in a received list of one or more items.

12. A system, comprising:
    a set of routing platforms;
    a commerce component that enables at least in part at least one of a
    commercial transaction or service consumption through a device, wherein the
    commerce component supplies monetary incentive(s) to the device to effect at least in
    part the commercial transaction;
    a plurality of femto access points (APs) functionally connected to a routing
    platform in the set of routing platforms, wherein each femto AP in the plurality of
    femto APs includes a radio control (RC) node that performs at least one of traffic and
    signaling exchange with the routing platform; and
a backhaul trunk that transports data and control among the routing platform and a controller component functionally linked to a femto network platform that interfaces with one or more external networks.

13. The system of claim 12, wherein at least one of the routing platforms generates a location estimate of the device to enable at least one of a delivery service or a directed purchase or inquiry.

14. The system of claim 13, to enable at least one of the delivery service or the directed purchase or inquiry, the at least one of the routing platforms request and receives a destination task that identifies at least one of a destination location; an identifier of a reference item associated with the intended destination, the identifier can include a universal product code (UPC), an international standard book number (ISBN), a stock keeping unit (SKU); or identification information of an end-user associated with a mobile device that affords, at least in part, the delivery service or the directed purchase or inquiry.

15. The system of claim 14, wherein the at least one of the routing platforms delivers navigation directives based at least in part on at least one of the destination location included in the destination task and a point of entry into a coverage area spanned by the plurality of femto APs.

16. The system of claim 12, wherein at least one of the routing platforms performs the following:

   receives an order for a product;
   routes the order to a femto AP in the plurality of femto APs that serves a point-of-sale (POS) associated with the product; and
   receives proof of transaction and assesses billing charges to a service account linked to a device that originates the order, the billing charges account for monetary incentive(s) available to the device

17. The system of claim 12, wherein the commerce component includes a transaction component that monitors and records commercial transactions, records can
be retained in a transaction database to generate business intelligence or extract patterns of commercial transaction.

18. The system of claim 17, wherein the transaction component delivers monetary incentive to the device, the monetary incentive are relayed by at least one of the routing platforms to a femto AP in the plurality of femto APs that serves the device.

19. The system of claim 18, wherein delivery of the monetary incentive is directed towards a memory and credited to the device for subsequent utilization in a commercial transaction.

20. The system of claim 19, the monetary incentive is delivered or credited based at least in part on a location within the coverage area spanned by the plurality of femto APs.

21. The system of claim 12, further comprising a marketing component that delivers advertisement directed to the device based at least in part on at least one of a location thereof or a commerce profile of a subscriber associated with the device.

22. The system of claim 21, to deliver advertisement, the marketing component conveys the advertisement to at least one of the routing platforms in the set of routing platforms, the at least one of the routing platforms relays the advertisement to a femto AP in the plurality of femto APs that serves the device, and the femto AP conveys the advertisement.

23. The system of claim 22, wherein the marketing component exploits advertisement to at least one of generation of business intelligence or design of customized advertisement campaign(s) or service(s) for consumers that conduct commercial transactions within a business served through one or more of the femto APs in the plurality of femto APs.

24. The system of claim 12, wherein one or more routing platforms in the set of routing platforms establish a point-to-point call session amongst a device within the coverage area spanned though the plurality of femto APs and a customer service
agent, the call session initiated at least in part through a predetermined service number.

25. The system of claim 12, wherein the at least one of the routing platforms in the set of routing platforms delivers buffered content intended to a specific mobile device when the mobile device attaches to a femto AP in the plurality of femto APs that is authorized to provide service to the mobile device, wherein the buffered content is purchased in an external network.

26. The system of claim 25, wherein an access list that identifies at least one mobile device and regulates access to femto AP and services there from authorizes the femto AP to provide service to the mobile device.

27. A method, comprising:
   employing at least one or more processor to execute code instructions stored in a computer-readable medium, the code instructions when executed by the one or more processors implement the following acts:
   attaching to a femto access point (AP) within an enterprise femto network;
   receiving a prompt to opt in for promotional content delivery, wherein promotional content includes at least one or a monetary incentive or advertisement;
   responding to the received prompt; and
   when promotional content delivery is elected in response to the received prompt, receiving promotional content customized based at least in part on at least one of a commerce profile or a location within the enterprise femto network.

28. The method of claim 27, responding to the received prompt includes conducting a cost-utility analysis to determine a financial gain from receiving a predetermined volume of promotional content with respect to a cost of receiving the predetermined volume of promotional content.

29. The method of claim 27, further comprising:
   conveying a destination task that includes at least an intended destination within the enterprise femto network;
receiving navigation instructions to the intended destination; and
conveying an indication that the intended destination has been reached

30. The method of claim 28, wherein the destination task further includes an
identifier of a reference item associated with the intended destination, the identifier
can include a universal product code (UPC), an international standard book number
(ISBN), or a stock keeping unit (SKU).

31. The method of claim 27, further comprising:
conveying an order for a product through the femto AP; and
delivering signaling that effects a commercial transaction linked to the ordered
product.

32. A mobile device, comprising:
a configurable communication platform that can receive wireless signal within
a set of frequency carriers and a set of radio technologies; and

delivering signaling and data that enables at least in part a commercial
transaction or service consumption.

33. The mobile device of claim 32, wherein the transaction component
communicates control information to effect the commercial transaction.

34. The mobile device of claim 32, wherein the transaction component configures
the communication platform to deliver wireless signal in an infrared (IR) portion of
the electromagnetic (EM) spectrum to communicate signaling and traffic within a
point-to-point (PTP) short-range mode of operation, the PTP communication enables
delivery of at least one of a purchase or service request to a point-of-sale device.

35. The mobile device of claim 32, wherein the transaction component delivers a
purchase or service request to a femto AP in an enterprise femto network, the
purchase request includes an order for a product and the service request includes a
destination task.
36. The mobile device of claim 33, to generate at least one of an order or a destination task, the transaction component exploits at least one of a display interface or an application retained in a memory.

37. The system of claim 32, wherein the transaction component includes a switch component that accepts or rejects a received prompt to elect delivery of monetary incentives or advertisement.

38. The system of claim 37, to accept or reject the received prompt, the switch component performs a cost-utility analysis to determine a financial gain from reception of monetary incentives with respect to a cost of reception thereof.

39. The system of claim 37, when the received prompt is accepted, the transaction component conveys a response to received monetary incentives or advertisement, wherein the response is collected by a recipient to generate business intelligence.
FIG. 1
FIG. 2B
FIG. 3
FIG. 6
FIG. 8
FIG. 10
FIG. 12
FIG. 14A
FIG. 15B
ESTABLISH AT LEAST IN PART A CALL SESSION AMONGST A FIRST DEVICE AND A SECOND DEVICE, AT LEAST ONE OF THE FIRST DEVICE OR THE SECOND DEVICE COMMUNICATES THROUGH AN ENTERPRISE FEMTO NETWORK

- PUSH-TO-TALK
- INTRA-NETWORK ASSISTANCE
- INTER-NETWORK COMMUNICATION

CONDUCT AT LEAST IN PART THE CALL SESSION, WHEREIN AT LEAST A PORTION OF AT LEAST ONE OF TRAFFIC OR SIGNALING AMONGST THE FIRST DEVICE AND THE SECOND DEVICE IS ROUTED WITHIN THE ENTERPRISE FEMTO NETWORK

TERMINATE THE CALL SESSION


FIG. 17
FIG. 18

1810 RECEIVE AN INDICATION OF ATTACHMENT ATTEMPT OF A DEVICE TO A FEMTO ACCESS POINT (AP) IN A MESH FEMTO NETWORK

1820 DEVICE AUTHORIZED TO ACCESS THE FEMTO AP?

1830 PUSH BUFFERED CONTENT TO THE FEMTO AP, THE CONTENT CONFIGURED FOR DELIVERY TO THE DEVICE

FIG. 19

1910 SUPPLY A TIMING CONFIGURATION FOR A SET OF FEMTO ACCESS POINTS (APs)

1920 COLLECT TIMING DATA FROM A PLURALITY OF FEMTO APs IN THE SET OF FEMTO APs FOR A COMMON GROUND TRUTH ASSOCIATED WITH A MOBILE DEVICE

1930 GENERATE A LOCATION ESTIMATE FOR THE MOBILE DEVICE BASED AT LEAST IN PART ON THE COLLECTED TIMING INFORMATION

1940 RETAIN THE GENERATED LOCATION ESTIMATE FOR THE MOBILE DEVICE

1950 CONVEY THE GENERATED LOCATION ESTIMATE
TRIANGULATE A LOCATION ESTIMATE OF AN ENTITY SPATIALLY LINKED TO AN APPARATUS WITH WIRELESS CAPABILITY (IES)

RECORD THE LOCATION ESTIMATE OF THE ENTITY

CONVEY THE LOCATION ESTIMATE TO A MOBILE DEVICE ASSOCIATED WITH A SUBSCRIBER RELATED TO THE ENTITY

FIG. 20

RECEIVE A BLACK LIST OF MOBILE DEVICE(S)

RECORD ATTEMPT BY A BLACK-LISTED MOBILE DEVICE TO ATTACH TO A FEMTO AP THAT IS PART OF AN ENTERPRISE FEMTO NETWORK

RETAIN THE RECORD AND CONVEY SUCH RECORD TO AUTHORITY (IES)

GENERATE A LOCATION ESTIMATE FOR THE BLACK-LISTED MOBILE DEVICE WITHIN THE ENTERPRISE FEMTO NETWORK

DELIVER THE LOCATION ESTIMATE OF THE BLACK-LISTED MOBILE DEVICE

END

CONTINUE TRACKING?

YES

NO
2200

2210  RECEIVE A LIST OF ONE OR MORE ITEMS

2220  TRIANGULATE POSITION OF A RADIO FREQUENCY IDENTIFICATION (RFID) TAG LINKED TO AN ITEM IN THE LIST OF ONE OR MORE ITEMS

2230  MAP A LOCATION EXTRACTED THROUGH TRIANGULATION WITH THE ITEM LABELED THROUGH THE RFID TAG

2240  CONVEY THE LOCATION OF MAPPED RFID TAG TO A MOBILE DEVICE ASSOCIATED WITH THE RECEIVED LIST OF ONE OR MORE ITEMS

2250  DELIVER CONTENT OF THE MAPPED RFID TAG TO THE MOBILE DEVICE

[ADJUST CONTENT PRIOR TO DELIVERY]

FIG. 22
2310
RECEIVE AN INDICATION OF AN ATTACHMENT ATTEMPT TO A FIRST FEMTO AP WITHIN A FEMTO ENTERPRISE NETWORK BY A DEVICE LINKED TO AT LEAST ONE OF A SERVICE PROVIDER OR A PROSPECTIVE CUSTOMER

2320
BLACKLISTED DEVICE?

2330
YES
IMPLEMENT EXCEPTION HANDLING

2340
NO
INCLUDE THE DEVICE IN ONE OR MORE ACCESS LISTS ASSOCIATED WITH A SET OF FEMTO APs WITHIN THE ENTERPRISE FEMTO NETWORK

2350
RECEIVE A DESTINATION TASK RELATED TO AT LEAST ONE OF A SERVICE EVENT OR A COMMERCIAL TRANSACTION

2360
NAVIGATE THE DEVICE FROM A FIRST LOCATION TO A DESTINATION LOCATION EXTRACTED FROM THE DESTINATION TASK

2370
RECEIVE BILLING INFORMATION RELATED AT LEAST IN PART TO THE SERVICE EVENT OR THE COMMERCIAL TRANSACTION

FIG. 23
2400

2410
RECEIVE AN INDICATION OF AN ATTACHMENT ATTEMPT OF A MOBILE DEVICE TO A FEMTO ACCESS POINT (AP) IN A MESH FEMTO NETWORK

2420
INCLUDE THE MOBILE DEVICE IN ACCESS LIST(S) ASSOCIATED WITH A SET OF FEMTO APs IN THE MESH FEMTO NETWORK

2430
IDENTIFY A LOCATION OF THE MOBILE DEVICE

2440
CONVEY CUSTOMIZED CONTENT TO THE MOBILE DEVICE, THE CONTENT CUSTOMIZED AT LEAST IN PART IN ACCORDANCE WITH AT LEAST ONE OF THE IDENTIFIED LOCATION OR A COMMERCE PROFILE LINKED TO THE MOBILE DEVICE

FIG. 24
FIG. 25

2510 RECEIVE A UNIQUE IDENTIFIER OF A MOBILE DEVICE THAT ATTACHES TO A FEMTO AP IN A MESH FEMTO NETWORK DEPLOYED IN AN ENTERPRISE

2520 RETRIEVE A COMMERCE PROFILE ASSOCIATED WITH THE UNIQUE IDENTIFIER OF THE MOBILE DEVICE

2530 IDENTIFY A TRANSACTION EFFECTED AT LEAST IN PART THROUGH THE MOBILE DEVICE

2540 ASSESS CHARGES FOR THE TRANSACTION TO A SERVICE ACCOUNT LINKED TO THE MOBILE DEVICE BASED AT LEAST IN PART ON THE RETRIEVED COMMERCE PROFILE
CONFIGURE TRADE OF SERVICE UNIT(S) FOR EXPOSURE TO ADVERTISEMENT(S)

MONITOR RESPONSE TO EXPOSED ADVERTISEMENT(S)

SUPPLY THE SERVICE UNIT(S) BASED AT LEAST IN PART ON AT LEAST ONE OF THE EXPOSED ADVERTISEMENT(S) OR THE CONFIGURED TRADE

COLLECT SERVICE INTELLIGENCE BASED AT LEAST IN PART ON THE RESPONSE TO THE EXPOSED ADVERTISEMENT(S)

ADJUST SERVICE(S) ASSOCIATED WITH THE SERVICE UNIT(S) IN ACCORDANCE AT LEAST IN PART WITH COLLECTED SERVICE INTELLIGENCE

ASSESS REVENUE SHARING WITH A SET OF ADVERTISERS IN ACCORDANCE AT LEAST IN PART WITH THE CONFIGURED TRADE

INTERNAL TO A BUSINESS OPERATOR OR A NETWORK OPERATOR

EXTERNAL TO A BUSINESS OPERATOR OR A NETWORK OPERATOR

FIG. 26
RECEIVE AN ORDER FOR A PRODUCT ASSOCIATED WITH A POINT OF SALE (POS) WITHIN AN ENTERPRISE FROM AN ORIGINATING DEVICE LOCATED IN A REMOTE POSITION WITH RESPECT TO THE LOCATION POS WITHIN THE ENTERPRISE

ROUTE THE ORDER TO A FEMTO AP THAT PROVIDES WIRELESS SERVICE TO THE POS WITHIN THE ENTERPRISE

INCLUDE THE ORIGINATING DEVICE OR A MOBILE DEVICE LINKED THERETO IN AN ACCESS LIST THAT REGULATES ACCESS RIGHTS TO SERVICE THROUGH THE A FEMTO AP THAT PROVIDES WIRELESS SERVICE TO THE POS WITHIN THE ENTERPRISE

PROOF OF TRANSACTION RECEIVED?

ASSESS BILLING CHARGES BASED AT LEAST IN PART ON AT LEAST ONE OF THE PRODUCT, THE ORIGINATING DEVICE, OR A COMMERCE PROFILE ASSOCIATED THEREWITH

RECORD THE TRANSACTION

IMPLEMENT EXCEPTION HANDLING

FIG. 27
31/36

2810
ATTACH TO A FEMTO ACCESS POINT (AP) WITHIN AN ENTERPRISE FEMTO NETWORK

2820
RECEIVE A PROMPT TO OPT IN FOR PROMOTIONAL CONTENT(S) DELIVERY

2830
RESPOND TO THE RECEIVED PROMPT TO OPT IN FOR PROMOTIONAL CONTENT(S) DELIVERY

2840
ELECTED TO RECEIVE PROMOTIONAL CONTENT(S)?

2850
RECEIVE PROMOTIONAL CONTENT(S) CUSTOMIZED BASED AT LEAST IN PART ON AT LEAST ONE OF A COMMERCE PROFILE OR A LOCATION WITHIN THE ENTERPRISE FEMTO NETWORK

FIG. 28

2900

2910
ATTACH TO A FEMTO ACCESS POINT (AP) WITHIN AN ENTERPRISE FEMTO NETWORK

2920
CONVEY A DESTINATION TASK THAT INCLUDES AN INTENDED DESTINATION

2930
RECEIVE NAVIGATION INSTRUCTIONS TO THE INTENDED DESTINATION

2940
CONVEY AN INDICATION THE INTENDED DESTINATION HAS BEEN REACHED

FIG. 29
3010 CONNECTION TO A ROUTING PLATFORM ACTIVE?

3020 YES

CONVEY AN ORDER FOR A PRODUCT THROUGH THE ACTIVE CONNECTION TO THE ROUTING PLATFORM

3030

LINK THE ORDER TO A MOBILE DEVICE

3040

ATTACH TO A FEMTO ACCESS POINT (AP) WITHIN AN ENTERPRISE FEMTO NETWORK

3060

CONVEY AN ORDER FOR A PRODUCT THROUGH THE FEMTO AP

3070

DELIVER SIGNALING THAT EFFECTS A COMMERCIAL TRANSACTION LINKED TO THE ORDERED PRODUCT

FIG. 30
FIG. 31

3210
RECEIVE ATTACHMENT SIGNALING FROM A MOBILE DEVICE

3220
AUTHORIZED MOBILE DEVICE?

3230
BLACK-LISTED MOBILE DEVICE?

3240
YES
RECORD THE ATTACHMENT AND CONVEY AN ATTACHMENT REPORT

3250
IMPLEMENT EXCEPTION HANDLING

3260
SERVE DEVICE IN EMERGENCY-ONLY MODE

FIG. 32
FIG. 33

3300

3310 RECEIVE A TIMING CONFIGURATION

3320 COLLECT A SET OF PROPAGATION TIMING MEASUREMENTS FOR A MOBILE DEVICE

3330 CONVEY THE SET OF PROPAGATION TIMING MEASUREMENTS TO A ROUTING PLATFORM