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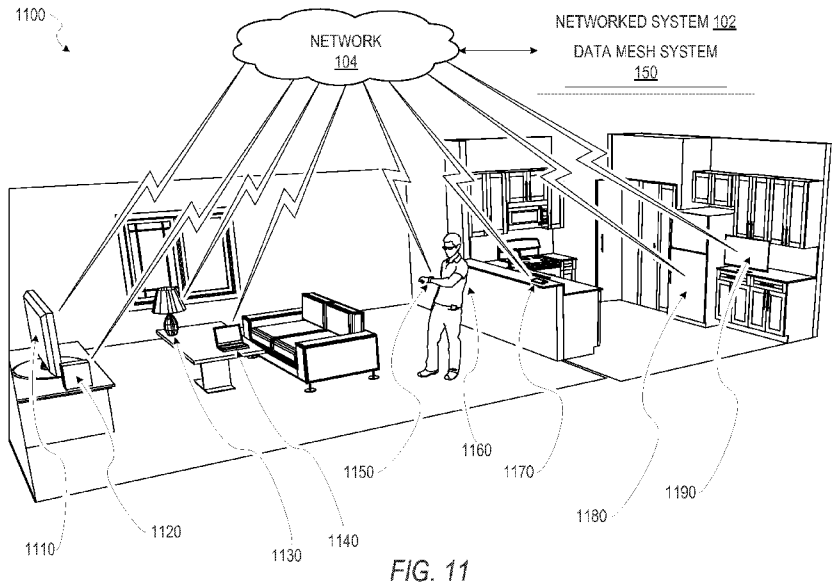


FIG. 11

(57) Abstract: In various example embodiments, a system and method for a data mesh platform are presented. Attribute data associated with a user is accessed from a plurality of attribute sources. An analysis of the attribute data is performed. Based on the analysis, an action corresponding to the user is performed.

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DATA MESH PLATFORM

RELATED APPLICATIONS

[0001] This international application claims the benefit of priority to U.S. Provisional Application No. 61/970,263, filed March 25, 2014, U.S. Patent Application No. 14/459,115, filed August 13, 2014, U.S. Patent Application No. 14/449,113, filed July 31, 2014, U.S. Patent Application No. 14/449,126, filed July 31, 2014, and to U.S. Patent Application No. 14/498,326, filed September 26, 2014, the entire contents of which are hereby incorporated by reference herein in their entirety.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate generally to a data mesh platform.

BACKGROUND

[0003] In recent years, mobile devices, wearable devices, smart devices, and the like have pervaded nearly every aspect of modern life. Such devices are increasingly incorporating sensors to monitor everything from the moisture level of houseplants to the dribbling of a basketball. Network-connected devices like these are capable of providing a near real-time and constant data feed. These trends have provided a vast amount of rich, constantly updated data.

EXAMPLES

[0004] To better illustrate the apparatus and methods disclosed herein, a non-limiting list of examples is provided here:

[0005] Example 1. A system comprising: an attribute module to receive attribute data associated with a user from a plurality of attribute sources; an item module to extract demand indications from the attribute data, the demand indications being indicative of anticipatory demand by the user for a particular item; an analysis module, implemented by a hardware processor of a

machine, to identify a pertinent item from the attribute data based on the extracted demand indications; a characteristic module to infer user characteristics pertaining to the user from the attribute data; and an order module to determine transaction parameters for a suggested transaction associated with the pertinent item based, at least in part, on the user characteristics and facilitating the suggested transaction according to the determined transaction parameters.

[0006] Example 2. The system of example 1, wherein the at least one order parameter includes at least one of a quantity, a delivery time, a payment time, a delivery method, a delivery destination, a merchant, or a product.

[0007] Example 3. A method comprising: receiving attribute data associated with a user from a plurality of attribute sources; extracting demand indications from the attribute data, the demand indications being indicative of anticipatory demand by the user for a particular item; identifying, using a hardware processor of a machine, a commerce item from the attribute data based on the extracted demand indications; inferring user characteristics pertaining to the user from the attribute data; determining order parameters for a user purchase associated with the commerce item based, at least in part, on the inferred user characteristics; and facilitating the user purchase according to the determined order parameters.

[0008] Example 4. The method of example 3, wherein the at least one order parameter includes at least one of a quantity, a delivery time, a payment time, a delivery method, a delivery destination, a merchant, or a product.

[0009] Example 5. The method of example 3, further comprising: extracting a current inventory level of the commerce item from the attribute data; determining an inventory threshold for the commerce item by modeling usage of the commerce item based on the extracted current inventory level and the inferred user characteristics; identifying a mismatch between the inventory threshold and the current inventory level; and based on the mismatch, automatically performing the user purchase on behalf of the user.

[0010] Example 6. The method of example 3, further comprising: identifying a purchase motive of the user for the commerce item by analyzing the inferred user characteristics, the purchase motive corresponding to a motive time; determining temporal order parameters, included in the order parameters,

based on the motive time; and facilitating the user purchase according to the determined temporal order parameters.

[0011] Example 7. The method of example 3, further comprising: identifying similar users, from among a plurality of other users, that are similar to the user based on the inferred user characteristics and respective user characteristics of the plurality of other users; and determining the order parameters based on the user characteristics of the identified similar users.

[0012] Example 8. The method of example 3, further comprising: accessing purchase criteria corresponding to the user; and automatically purchasing the commerce item on behalf of the user according to the purchase criteria.

[0013] Example 9. The method of example 8, wherein the purchase criteria include at least one criterion corresponding to a budget; and wherein the automatically purchasing the commerce item on behalf of the user is based, at least in part, on the budget.

[0014] Example 10. The method of example 8, further comprising: determining an item category for the commerce item, the purchase criteria including criteria corresponding to the item category; and facilitating the user purchase of the commerce item according to the purchase criteria corresponding to the determined item category.

[0015] Example 11. The method of example 3, further comprising: generating a notification that includes an option to make the user purchase, the notification including the determined order parameters; causing presentation of the notification to the user; receiving a user selection of the option to make the user purchase; and responsive to receiving the user selection, performing the user purchase according to the determined order parameters.

[0016] Example 12. The method of example 11, further comprising: identifying presentation parameters for presentation of the notification to the user based on the inferred user characteristics, the presentation parameters including a presentation time and a presentation device; and causing presentation of the notification according to the presentation parameters.

[0017] Example 13. The method of example 11, further comprising: adapting the presentation of the notification to the user based, at least in part, on the inferred user characteristics.

[0018] Example 14. The method of example 11, further comprising: detecting a trigger action of the user based on real-time data included in the attribute data; and based on the detected trigger action, causing presentation of the notification to the user.

[0019] Example 15. The method of example 3, further comprising: calculating a demand metric for the commerce item based on the demand indications corresponding to the commerce item; and facilitating the user purchase associated with the commerce item based, at least in part, on the demand metric.

[0020] Example 16. The method of example 15, further comprising: automatically performing the user purchase on behalf of the user based on the demand metric exceeding a threshold.

[0021] Example 17. The method of example 15, further comprising: based on demand metric exceeding a threshold, generating a notification providing the user an option to purchase the commerce item, the notification including the determined order parameters; and causing presentation of the notification to the user.

[0022] Example 18. A machine readable medium storing instructions that, when executed by at least one processor of a machine, cause the machine to perform operations comprising: receiving attribute data associated with a user from a plurality of attribute sources; extracting demand indications from the attribute data, the demand indications being indicative of anticipatory demand by the user for a particular item; identifying an item from the attribute data based on the extracted demand indications; inferring user characteristics pertaining to the user from the attribute data; determining order parameters for a user purchase associated with the commerce item based, at least in part, on the inferred user characteristics; and facilitating the user purchase according to the determined order parameters.

[0023] Example 19. The machine-readable medium of example 18, wherein the at least one order parameter includes at least one of a quantity, a delivery time, a payment time, a delivery method, a delivery destination, a merchant, or a product.

[0024] Example 20. The machine-readable medium of example 18, wherein the operations further comprise: extracting a current inventory level of

the commerce item from the attribute data; determining an inventory threshold for the commerce item by modeling usage of the commerce item based on the extracted current inventory level and the inferred user characteristics; identifying a mismatch between the inventory threshold and the current inventory level; and based on the mismatch, automatically performing the user purchase on behalf of the user.

[0025] Example 21. A system comprising: an attribute module to receive attribute data associated with a user from a plurality of attribute sources, the attribute data including real-time data; an authentication module, implemented by a hardware processor of a machine, to identify a portion of the real-time data indicative of user identification, and to authenticate the user identification with respect to the real-time data based on an analysis of the identified portion of the real-time data; and an activity module to, in response to the analysis of the portion of the real-time data authenticating the user identification, identify a user objective being advanced by the user based on the real-time data, and to augment an environment of the user based on a user setting to facilitate advancement towards the user objective.

[0026] Example 22. The system of example 21, wherein the authentication module is further to: calculate an identity likelihood metric based on the real-time data, the identity likelihood metric indicating a likelihood of authentication of the user identification with respect to the real-time data; and authenticate the user identification based on the identity likelihood metric exceeding a threshold.

[0027] Example 23. The system of example 22, wherein the authentication module is further to identify, from the real-time data, a portable device that corresponds to the user, wherein the identity likelihood metric is based on the identified portable device.

[0028] Example 24. The system of example 22, wherein the real-time data includes sensor data corresponding to the user and wherein the identity likelihood metric is based in part on the sensor data.

[0029] Example 25. The system of example 22, wherein the authentication module is further to: extract past identification indications from past attribute data that corresponds to the user, wherein the attribute data includes the past attribute data; extract real-time identification indications from

the real-time data corresponding to the user; and calculate the identity likelihood metric by correlating the real-time identification indications with the past identification indications.

[0030] Example 26. A method comprising: receiving attribute data associated with a user from a plurality of attribute sources, the attribute data including real-time data; identifying a portion of the real-time data indicative of an identity of the user; authenticating, using a hardware processor of a machine, the identity of the user with respect to the real-time data by analyzing the identified portion of the real-time data; based on the authenticating of the identity of the user, identifying a user activity being performed by the user based on the real-time data; and augmenting the user activity according to a user setting.

[0031] Example 27. The method of example 26, further comprising: calculating an identity likelihood metric based on the identified portion of the real-time data, the identity likelihood metric indicating a likelihood of authentication of the identity of the user with respect to the real-time data; and authenticating the identity of the user based on the identity likelihood metric exceeding a threshold.

[0032] Example 28. The method of example 27, further comprising: identifying, from the real-time data, a portable device corresponding to the user, wherein the identity likelihood metric is based on the identified portable device.

[0033] Example 29. The method of example 27, wherein the real-time data includes sensor data corresponding to the user and wherein the identity likelihood metric is based, at least in part, on the sensor data.

[0034] Example 30. The method of example 27, further comprising: extracting past identification indications from past attribute data corresponding to the user, wherein the attribute data includes the past attribute data; extracting real-time identification indications from the real-time data corresponding to the user; and calculating the identity likelihood metric by correlating the real-time identification indications with the past identification indications.

[0035] Example 31. The method of example 27, further comprising: adjusting a security level of an authorization task based on the identity likelihood metric, the user activity including the authorization task.

[0036] Example 32. The method of example 31, wherein the adjusting

the security level of the authorization task includes automatically performing the authorization task on behalf of the user.

[0037] Example 33. The method of example 26, further comprising: determining the user setting based on the attribute data and the user activity; and augmenting the user activity according to the determined user setting.

[0038] Example 34. The method of example 33, further comprising: inferring user characteristics based on an analysis of a portion of the attribute data; determining the user setting based on the inferred user characteristics and the user activity; and augmenting the user activity according to the determined user setting.

[0039] Example 35. The method of example 34, further comprising: identifying similar users that are similar to the user based on the inferred user characteristics and respective user characteristics of the similar users; and determining the user setting based on the user characteristics of the identified similar users.

[0040] Example 36. The method of example 26, further comprising: determining the user activity includes presentation of a user interface to the user; identifying presentation devices available to the user based on the attribute data, the presentation devices being capable of presenting the user interface to the user; determining an alternate presentation device from among the identified presentation devices based on the user setting; and causing presentation of the user interface to the user on the alternate presentation device.

[0041] Example 37. The method of example 26, further comprising: determining a current location of the user based on the real-time data; accessing device location data included in the attribute data; identifying user devices within an operating distance of the user based on the current location of the user and the device location data; and augmenting operation of the identified user devices according to the user setting.

[0042] Example 38. The method of example 26, further comprising: identifying a user action of the user based on the real-time data, the user action being in response to the augmented user activity; inferring an augmentation result of employing the user setting to augment the user activity; and storing the augmentation result to be used subsequently to determine the user setting.

[0043] Example 39. A machine readable medium having no transitory

signals and storing instructions that, when executed by at least one processor of a machine, cause the machine to perform operations comprising: receiving attribute data associated with a user from a plurality of attribute sources, the attribute data including real-time data; identifying a portion of the real-time data indicative of an identity of the user; authenticating the identity of the user with respect to the real-time data by analyzing the identified portion of the real-time data; based on the authenticating of the identity of the user, identifying a user activity being performed by the user based on the real-time data; and modifying the user activity according to a user setting.

[0044] Example 40. The machine-readable medium of example 39, wherein the operations further comprise: calculating an identity likelihood metric based on the identified portion of the real-time data, the identity likelihood metric indicating a likelihood of authentication of the identity of the user with respect to the real-time data; and authenticating the identity of the user based on the identity likelihood metric exceeding a threshold.

[0045] Example 41. A system comprising: an attribute module to receive attribute data associated with a user from a plurality of attribute sources; a characteristic module to infer user characteristics based on an analysis of at least a portion of the attribute data; a visualization module, implemented by a hardware processor of a machine, to generate a visualization based at least in part on the user characteristic, the visualization being representative of the attribute data; and a presentation module to cause presentation of the visualization to the user.

[0046] Example 42. The system of example 41, wherein the presentation module is further to receive user input indicating a change to the visualization, the visualization module further to update the visualization according to the change indicated by the user input, and the characteristic module further to infer subsequent user characteristics based, at least in part, on the user input.

[0047] Example 43. The system of example 42, wherein the user input comprises a user interaction with the visualization.

[0048] Example 44. The system of example 41, further comprising: an analysis module to identify similar users from among a plurality of other users that are similar to the user based on the inferred user characteristics and

respective user characteristics of the plurality of other users; and the visualization module further to generate the visualization based on the user characteristics of the identified similar users.

[0049] Example 45. The system of example 41, further comprising an analysis module to: determine satisfaction of a reward criteria associated with the attribute data; and provide a reward to the user based on the determined satisfaction of the reward criteria, wherein the reward comprises a visualization feature.

[0050] Example 46. The system of example 45, wherein the analysis module is further to: calculate a completeness metric based on the attribute data, the reward criteria including a criterion based on the completeness metric.

[0051] Example 47. The system of example 46, wherein the completeness metric indicates a quantity of a specified type of data included in the attribute data and wherein the criterion based on the completeness metric is satisfied by the user providing the specified type of data.

[0052] Example 48. The system of example 45, wherein the analysis module is further to: calculate a quality metric based on the attribute data, the reward criterion including a criterion based on the quality metric.

[0053] Example 49. The system of example 48, wherein the quality metric indicates a recentness of the attribute data and wherein the criterion based on the quality metric is satisfied by the user providing recent data.

[0054] Example 50. A method comprising: receiving attribute data associated with a user from a plurality of attribute sources; inferring user characteristics pertaining to the user from the attribute data, the user characteristics including a physical characteristic of the user; generating, using a hardware processor of a machine, an avatar representative of the user based on the inferred user characteristics, the avatar including an avatar trait corresponding to the physical characteristic of the user; and causing presentation of the visualization to the user.

[0055] Example 51. The method of example 50, further comprising: receiving user input indicating a change to the avatar; and updating the avatar according to the change indicated by the user input, subsequent inferred user characteristics being inferred based, at least in part, on the user input.

[0056] Example 52. The method of example 51, wherein the user input

comprises a user interaction with the avatar.

[0057] Example 53. The method of example 50, further comprising: identifying similar users, from among a plurality of other users, that are similar to the user based on the inferred user characteristics and respective user characteristics of the plurality of other users; and determining the avatar trait based on the user characteristics of the identified similar users.

[0058] Example 54. The method of example 50, further comprising: determining satisfaction of a reward criteria associated with the attribute data; and providing a reward to the user based on the determined satisfaction of the reward criteria, wherein the reward comprises an avatar feature.

[0059] Example 55. The method of example 54, further comprising: calculating a completeness metric based on the attribute data, the reward criteria including a criterion based on the completeness metric.

[0060] Example 56. The method of example 55, wherein the completeness metric indicates a quantity of a specified type of data included in the attribute data and wherein the criterion based on the completeness metric is satisfied by the user providing the specified type of data.

[0061] Example 57. The method of example 54, further comprising: calculating a quality metric based on the attribute data, the reward criterion including a criterion based on the quality metric.

[0062] Example 58. The method of example 57, wherein the quality metric indicates a recentness of the attribute data and wherein the criterion based on the quality metric is satisfied by the user providing recent data.

[0063] Example 59. The method of example 54, further comprising: identifying similar users from among a plurality of other users that are similar to the user based on the inferred user characteristics and respective user characteristics of the plurality of other users; and determining satisfaction of the reward criteria based on the attribute data associated with the identified similar users.

[0064] Example 60. A machine readable medium storing instructions that, when executed by at least one processor of a machine, cause the machine to perform operations comprising: receiving attribute data associated with a user from a plurality of attribute sources; inferring user characteristics from the attribute data, the user characteristics pertaining to the user; generating a user

interface including an avatar representative of the user based on the inferred user characteristics, the user characteristics including a physical characteristic of the user, the avatar including an avatar trait corresponding to the physical characteristic of the user; and causing presentation of the user interface in a device of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0065] Various ones of the appended drawings merely illustrate example embodiments of the present disclosure and should not be considered as limiting its scope.

[0066] FIG. 1 is a block diagram illustrating a networked system, according to some example embodiments.

[0067] FIG. 2 is a block diagram illustrating an example embodiment of a data mesh system, according to some example embodiments.

[0068] FIG. 3 is a block diagram illustrating an example embodiment of an ancillary activity system, according to some example embodiments.

[0069] FIG. 4 illustrates an example of generating ancillary activity for a secondary user device, according to some example embodiments.

[0070] FIG. 5 is a flow diagram illustrating an example method for generating ancillary activity for a secondary user device, according to some example embodiments.

[0071] FIG. 6 is a flow diagram illustrating further operations for inferring a user preference from the attribute data, according to some example embodiments.

[0072] FIGS. 7 and 8 are flow diagrams illustrating further operations for facilitating identifying a secondary user device, according to some example embodiments.

[0073] FIGS. 9 and 10 are flow diagrams illustrating further operations for generating an ancillary activity for a secondary user device, according to some example embodiments.

[0074] FIG. 11 illustrates an example scene showing a presentation of ancillary activity to the user, according to some example embodiments.

[0075] FIGS. 12 and 13 depict example user interfaces that present ancillary activity, according to some example embodiments.

[0076] FIG. 14 is a block diagram illustrating an example embodiment of a user analytics system, according to some example embodiments.

[0077] FIG. 15 is a flow diagram illustrating an example method for identifying an item and facilitating a purchase associated with the identified item, according to some example embodiments.

[0078] FIG. 16 is a flow diagram illustrating further operations for facilitating the purchase based, at least in part, on an evaluation of an inventory level, according to some example embodiments.

[0079] FIG. 17 is a flow diagram illustrating further operations for facilitating the purchase including operations to determine parameters for the purchase, according to some example embodiments.

[0080] FIG. 18 is a flow diagram illustrating further operations for determining order parameters including operations to determine a temporal parameter associated with the purchase, according to some example embodiments.

[0081] FIG. 19 is a flow diagram illustrating further operations to facilitate the purchase based, at least in part, on purchase criteria, according to some example embodiments.

[0082] FIG. 20 is a flow diagram illustrating a further example method for identifying an item and facilitating a purchase, according to some example embodiments.

[0083] FIG. 21 is a flow diagram illustrating an alternative example method for identifying an item and facilitating a purchase, according to some example embodiments.

[0084] FIG. 22 is a flow diagram illustrating further operations to facilitate the purchase based, at least in part, on a demand metric, according to some example embodiments.

[0085] FIG. 23 is a flow diagram illustrating further operations to facilitate the purchase using a notification, according to some example embodiments.

[0086] FIGS. 24 and 25 are flow diagrams illustrating further operations for presenting a notification, according to some example embodiments.

[0087] FIG. 26 is a flow diagram illustrating communication between various devices in relation to presenting a notification to the user, according to some example embodiments.

[0088] FIG. 27 depicts an example user interface to facilitate the purchase, according to some example embodiments.

[0089] FIGS. 28 and 29 illustrate examples of identifying an item and facilitating a purchase associated with the identified item, according to some example embodiments.

[0090] FIG. 30 is a block diagram illustrating an example embodiment of an augmentation system, according to some example embodiments.

[0091] FIG. 31 is a flow diagram illustrating an example method for authenticating a user and augmenting a user activity, according to some example embodiments.

[0092] FIGS. 32 and 33 are flow diagrams illustrating further example operations of the method of FIG. 31, according to some example embodiments.

[0093] FIG. 34 depicts communication between a device of the user and the data mesh system, according to some example embodiments.

[0094] FIGS. 35-38 are flow diagrams illustrating further example operations of the method of FIG. 31, according to some example embodiments.

[0095] FIG. 39 illustrates augmenting an example user activity, according to some example embodiments.

[0096] FIG. 40 depicts an example user interface to facilitate augmentation of a user activity, according to some example embodiments.

[0097] FIG. 41 is a flow diagram illustrating various communications to facilitate the method of FIG. 31, according to some example embodiments.

[0098] FIG. 42 is a block diagram illustrating an example embodiment of a visualization system, according to some example embodiments.

[0099] FIG. 43 is a flow diagram illustrating an example method for generating a visualization, according to some example embodiments.

[00100] FIG. 44 is a flow diagram illustrating further example operations of the method of FIG. 43, according to some example embodiments.

[00101] FIG. 45 is a flow diagram illustrating an example method for determining satisfaction of reward criteria, according to some example embodiments.

[00102] FIG. 46 is a flow diagram illustrating further example operations of the method of FIG. 43, according to some example embodiments.

[00103] FIG. 47 is a flow diagram illustrating various communications to

facilitate the method of FIG. 43, according to some example embodiments.

[00104] FIGS. 48, 49, 50A and 50B depict example user interfaces including example visualizations, according to some example embodiments.

[00105] FIGS. 51A and 51B depict example configurations for communicatively coupling attribute sources, according to some example embodiments.

[00106] FIG. 52 depicts various example attribute sources, according to some example embodiments.

[00107] FIG. 53 depicts various components that provide attribute data, according to some example embodiments.

[00108] FIG. 54 is a block diagram of an example data structure for example attribute data associated with a user, according to some example embodiments.

[00109] FIG. 55 is a block diagram of an example data structure for example attribute data associated with a device, according to some example embodiments.

[00110] FIG. 56 is a block diagram illustrating an example of a software architecture that may be installed on a machine, according to some example embodiments.

[00111] FIG. 57 illustrates a diagrammatic representation of a machine in the form of a computer system within which a set of instructions may be executed for causing the machine to perform any one or more of the methodologies discussed herein, according to an example embodiment.

DETAILED DESCRIPTION

[00112] The description that follows includes systems, methods, techniques, instruction sequences, and computing machine program products that embody illustrative embodiments of the disclosure. In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide an understanding of various embodiments of the inventive subject matter. It will be evident, however, to those skilled in the art, that embodiments of the inventive subject matter may be practiced without these specific details. In general, well-known instruction instances, protocols, structures, and techniques are not necessarily shown in detail.

[00113] Modern users of technology typically have a variety of devices to perform various tasks such as laptop computers, smart televisions, smart phones, and wearable devices. Traditionally, a user of such devices operates a single device to perform a task at one time. The discussion below describes systems and methods that, in some embodiments, utilize multiple devices to perform, in real time, an ancillary, complementary, or supplemental activity associated with a particular activity or task. In some embodiments, the systems and methods distribute a portion of a particular activity or task across multiple devices. The ancillary or supplemental activity associated with a particular device activity may be determined based on a variety of factors including an inferred user preference, device functionality, and the device activity. Thus, the ancillary activity is dynamically determined and performed for the user in real time to assist the user with the device activity.

[00114] In various example embodiments, a device activity being performed in real time by a user device of a user is detected. For example, the user may be browsing a website on a mobile device or a laptop computer. Once the device activity is detected, attribute data associated with the user from a plurality of attribute sources is accessed. In various example embodiments, the attribute data is received or accessed from a broad range of attribute sources such as, for example, from mobile devices, smart devices, smart homes, social network services, user profiles, browsing histories, purchase histories, and so forth.

[00115] A user preference is inferred indicating a preference or desire of the user for performing on a secondary user device an ancillary, supplemental, complementary, or companion activity corresponding to the device activity. For example, an analysis of the attribute data can indicate the user would like to view supplemental content corresponding to the device activity. In this example, the ancillary activity comprises presenting the supplemental content to the user on the secondary user device.

[00116] Based on the inferred user preference, the secondary user device can be identified according to a device status of the secondary user device, according to some example embodiments. In various implementations, the device status indicates a device capability to perform the ancillary activity in real time. For example, if the ancillary activity comprises presenting content to the user, the secondary user device may be incapable of performing such a task if the

secondary user device is not within a vicinity of the user (e.g., within a presentation distance of the user).

[00117] Once the secondary user device is identified, the ancillary activity, to be performed in real time on the secondary user device, is generated by analyzing the device activity, a device functionality of the secondary user device, and the user preference. For example, if the device activity comprises providing directions to the user, the ancillary activity may comprise providing content associated with providing directions such as a current heading or distance to destination readout. In various implementations, the ancillary activity is caused to be performed on the secondary user device or transmitted to the secondary user device with instruction to perform in real time the ancillary activity.

[00118] According to further embodiments, the objective of zero effort shopping is to reduce or eliminate effort by a consumer user to purchase various products. To this end, the systems and methods described herein may, among other functions, access a wealth of attribute data associated with a user, analyze the attribute data to identify items that the user may have demand for, and facilitate a purchase associated with the identified items. For instance, the user may be characterized based on an analysis of the attribute data, and the user characterization may be used as a basis for identifying items and order parameters for a purchase associated with identified items. The collective, aggregated attribute data may be referred to as a "data mesh."

[00119] In various example embodiments, the attribute data is received or accessed from a broad gamut of attribute sources such as, for example, mobile devices, smart devices, smart homes, social network services, user profiles, browsing histories, purchase histories, and so forth. Demand indications that are indicative of anticipatory demand by the user for a particular item are extracted from the attribute data. For example, purchase histories may indicate prior purchases for coffee products, location data (e.g., as determined by a Global Positioning System (GPS) component of a mobile device, beacon detections, or other location services) may indicate frequent trips to coffee shops, or social media data such as check-ins or user postings may indicate an affinity for coffee. Subsequent to extracting the demand indications, a commerce item may be identified from the attribute data based on the extracted demand indications. In continuing with the example above, the identified commerce item may comprise

coffee beans, coffee filters, or other coffee-related items.

[00120] In further example embodiments, user characteristics pertaining to the user are inferred based on an analysis of a portion of the attribute data. The user characteristics include, for instance, a trait, quality, action, activity, attitude, health condition, habit, behavior, and the like. For example, the user characteristics may include a particular medical condition of that user associated with diet restrictions. The systems and methods described herein may facilitate a purchase associated with the commerce item based, at least in part, on the user characteristics. In an example embodiment, a notification, including an option to make the purchase, is presented to the user. In some instances, the notification is personalized to the user based on the user characteristics (e.g., the notification may be presented on a preferred device of the user at a time of day corresponding to user availability such as after the user is done working). In some example embodiments, the purchase is made automatically on behalf of the user. For instance, a demand metric is calculated based on the demand indications, and if the demand metric exceeds a threshold, the purchase may be performed automatically. Thus, the systems and methods described herein may facilitate commerce on behalf of the user to increase convenience and reduce time and effort of the user to conduct commerce. In some cases, the systems and methods analyze the attribute data to simulate decisions of the user regarding various shopping or purchasing-related activities.

[00121] According to still further embodiments, attribute data, including real-time data, may be received from a plurality of attribute sources; a user may be authenticated based on an analysis of the attribute data; a user activity may be identified based on the attribute data; and the user activity may be augmented according to a user setting. The attribute data may include data received from a broad gamut of attribute sources such as, for example, mobile devices, smart devices, smart homes, social network services, user profiles, browsing histories, purchase histories, and so forth.

[00122] Subsequent to receiving the attribute data, a portion of the real-time data indicative of an identity of the user may be identified. For example, the real-time data may include a location of a mobile device of the user, sensor data from a device of the user, and so on. In an example embodiment, the identity of the user may be authenticated based on an analysis of the identified portion of

the real-time data. For instance, the location of the user's mobile device may be indicative of the location of the user, and if the location of the user device is within a distance of an Internet device currently being used, it may be inferred that the user may be currently using the Internet device. Many other indications of the user's identity may be employed to authenticate the identity of the user. In further example embodiments, an identity likelihood metric may be calculated based on an analysis of the attribute data. In some example embodiments, the identity of the user may be authenticated when the identity likelihood metric exceeds a threshold.

[00123] In still further example embodiments, based on authenticating the identity of the user, a user activity being performed by the user may be identified based on the real-time data. For example, the user may be using a website, jogging, entering a room (e.g., walking from a living room to a kitchen), and so on. The user activity may be augmented according to the user setting. In a specific example, the user may be using a website that implements a login, and based on the authentication of the user's identity, the security for the website login may be reduced or the user is automatically logged in. In another specific example, the user may be streaming media in the living room to an Internet-connected device (e.g., a media entertainment system presenting to a display), and the streaming may be continued in the kitchen (e.g., to a smart refrigerator that includes a display) when the user moves from the living room to the kitchen. Many other user activities may be augmented in a variety of ways.

[00124] According to yet further embodiments, a visualization may be generated based, at least in part, on attribute data associated with a user. In an example embodiment, attribute data may be received from a broad gamut of attribute sources. For instance, the attribute data may include data associated with the user received from mobile devices, smart devices, smart homes, social network services, user profiles, browsing histories, or purchase histories. The collective, aggregated attribute data may be referred to as a "data mesh." Subsequent to receiving the attribute data, a user characteristic may be inferred based on an analysis of at least a portion of the attribute data. In various example embodiments, the user characteristic may be a trait, quality, action, activity, attitude, health condition, habit, behavior, and the like. For example, physical characteristics of the user such as height, weight, fitness level, and so

on, may be inferred or measured directly from the attribute data. In an example embodiment, a visualization may be generated based, at least in part, on the user characteristic. The visualization may be representative of the attribute data. For example, the visualization may be an avatar that includes physical characteristics similar to the user's. In this example, the visualization may be representative of the user. The visualization may be caused to be presented to the user.

[00125] In further example embodiments, the user may provide user input indicating a change to the visualization. The visualization may be updated according to the change indicated by the user input. Subsequent inferred user characteristics may be based, at least in part, on the user input. For example, if the visualization does not accurately reflect the user or the attribute data, the user may modify the visualization. The modification may then be used as a basis to more accurately generate the visualization or more accurately infer the user characteristics.

[00126] In still further example embodiments, a reward may be provided to the user based on a determined satisfaction of reward criteria. For instance, the reward criteria may include a criterion to complete a physical activity such as a certain number of steps taken as determined by a pedometer (e.g., an application executing on a mobile device of the user that may determine steps taken). Based on exceeding a threshold number of steps taken, the user may satisfy the reward criteria. In an example embodiment, the reward may include an additional feature for the visualization (e.g., an additional accessory or function for the visualization). In another instance, the reward criteria may be associated with completeness of a profile. In this instance, the more information the user provides or provides permission to access, the closer the user may be to satisfying the reward criteria.

[00127] With reference to FIG. 1, an example embodiment of a high-level client-server-based network architecture 100 is shown. A networked system 102 provides server-side functionality via a network 104 (e.g., the Internet or wide area network (WAN)) to a client device 110. A user (e.g., user 106) may interact with the networked system 102 using the client device 110. FIG. 1 illustrates, for example, a web client 112 (e.g., a browser, such as the INTERNET EXPLORER® browser developed by MICROSOFT® Corporation of Redmond, Washington State), client application(s) 114, and a programmatic client 116

executing on the client device 110. The client device 110 can include the web client 112, the client application(s) 114, and the programmatic client 116 alone, together, or in any suitable combination. Although FIG. 1 shows one client device 110, multiple client devices can be included in the network architecture 100.

[00128] The client device 110 can comprise a computing device that includes at least a display and communication capabilities that provide access to the networked system 102 via the network 104. The client device 110 comprises, but is not limited to, a remote device, work station, computer, general purpose computer, Internet appliance, hand-held device, wireless device, portable device, wearable computer, cellular or mobile phone, personal digital assistant (PDA), smart phone, tablet, ultrabook, netbook, laptop, desktop, multi-processor system, microprocessor-based or programmable consumer electronic, game consoles, set-top box, network PC, mini-computer, and the like. In further example embodiments, the client device 110 comprises one or more of a touch screen, accelerometer, gyroscope, biometric sensor, camera, microphone, global positioning system (GPS) device, and the like.

[00129] The client device 110 can communicate with the network 104 via a wired or wireless connection. For example, one or more portions of the network 104 can be an ad hoc network, an intranet, an extranet, a Virtual Private Network (VPN), a Local Area Network (LAN), a wireless LAN (WLAN), a Wide Area Network (WAN), a wireless WAN (WWAN), a Metropolitan Area Network (MAN), a portion of the Internet, a portion of the Public Switched Telephone Network (PSTN), a cellular telephone network, a wireless network, a Wireless Fidelity (WI-FI®) network, a Worldwide Interoperability for Microwave Access (WiMax) network, another type of network, or a combination of two or more such networks.

[00130] The client device 110 can include one or more of the applications (also referred to as "apps") such as, but not limited to, web browsers, book reader apps (operable to read e-books), media apps (operable to present various media forms including audio and video), fitness apps, biometric monitoring apps, messaging apps, electronic mail (email) apps, e-commerce site apps (also referred to as "marketplace apps"), and so on. The client application(s) 114 can include various components operable to present information to the user and

communicate with the networked system 102. In some embodiments, if the e-commerce site application is included in the client device 110, then this application can be configured to locally provide the user interface and at least some of the functionalities with the application configured to communicate with the networked system 102, on an as-needed basis, for data or processing capabilities not locally available (e.g., access to a database of items available for sale, to authenticate a user, to verify a method of payment). Conversely, if the e-commerce site application is not included in the client device 110, the client device 110 can use its web browser to access the e-commerce site (or a variant thereof) hosted on the networked system 102.

[00131] In various example embodiments, the users (e.g., the user 106) can be a person, a machine, or other means of interacting with the client device 110. In some example embodiments, the users may not be part of the network architecture 100, but may interact with the network architecture 100 via the client device 110 or another means. For instance, the users can interact with client device 110 operable to receive input information from (e.g., using touch screen input or alphanumeric input) and present information to (e.g., using graphical presentation on a device display) the users. In this instance, the users may, for example, provide input information to the client device 110 to be communicated to the networked system 102 via the network 104. The networked system 102, in response to the received input information, communicates information to the client device 110 via the network 104 to be presented to the users. In this way, the user may interact with the networked system 102 using the client device 110.

[00132] An Application Program Interface (API) server 120 and a web server 122 may be coupled to, and provide programmatic and web interfaces respectively to, one or more application server(s) 140. In various implementations, the application server(s) 140 hosts one or more publication system(s) 142, payment system(s) 144, and a data mesh system 150, each of which comprises one or more modules or applications and each of which is embodied as hardware, software, firmware, or any combination thereof. The application server(s) 140 are, in turn, shown to be coupled to one or more database server(s) 124 that facilitate access to one or more information storage repositories or database(s) 126. In an example embodiment, the database(s) 126

are storage devices that store information to be posted (e.g., publications or listings) to the publication system(s) 142. The database(s) 126 stores digital goods information in accordance with some example embodiments.

[00133] Additionally, a third party application 132, executing on third party server(s) 130, is shown as having programmatic access to the networked system 102 via the programmatic interface provided by the API server 120. For example, the third party application 132, utilizing information retrieved from the networked system 102, supports one or more features or functions on a website hosted by the third party. The third party website, for example, provides one or more promotional, marketplace, or payment functions that are supported by the relevant applications of the networked system 102.

[00134] The publication system(s) 142 provides a number of publication functions and services to the users that access the networked system 102. The payment system(s) 144 likewise provide a number of functions to perform or facilitate payments and transactions. While the publication system(s) 142 and payment system(s) 144 are shown in FIG. 1 to both form part of the networked system 102, it will be appreciated that, in alternative embodiments, each system 142 and 144 may form part of a payment service that is separate and distinct from the networked system 102. In some example embodiments, the payment system(s) 144 may form part of the publication system(s) 142.

[00135] The data mesh system 150 provides functionality to receive, retrieve, or store a broad spectrum of data associated with the users, according to various embodiments. It will be noted that the collective, aggregated attribute data is sometimes referred to as a "data mesh." The data mesh system 150 stores, for example, received data in storage devices such as the database(s) 126. In some example embodiments, the data mesh system 150 communicates with the client device 110, the third party server(s) 130, the publication system(s) 142 (e.g., retrieving listings), and the payment system(s) 144 (e.g., purchasing a listing). In an alternative example embodiment, the data mesh system 150 can be a part of the publication system(s) 142.

[00136] Further, while the client-server-based network architecture 100 shown in FIG. 1 employs a client-server architecture, the present inventive subject matter is, of course, not limited to such an architecture, and can equally well find application in a distributed, or peer-to-peer, architecture system, for

example. The various systems of the applications server(s) 140 (e.g., the publication system(s) 142 and the payment system(s) 144) can also be implemented as standalone software programs, which do not necessarily have networking capabilities.

[00137] The web client 112 can access the various systems of the networked system 102 (e.g., the publication system(s) 142) via the web interface supported by the web server 122. Similarly, the programmatic client 116 and client application(s) 114 can access the various services and functions provided by the networked system 102 via the programmatic interface provided by the API server 120. The programmatic client 116 can, for example, be a seller application (e.g., the Turbo Lister application developed by EBAY® Inc., of San Jose, California) to enable sellers to author and manage listings on the networked system 102 in an off-line manner, and to perform batch-mode communications between the programmatic client 116 and the networked system 102.

[00138] FIG. 2 is a block diagram of the data mesh system 150, which can provide functionality to receive, retrieve, or access attribute data from attribute sources, analyze the attribute data, manage the attribute data, and so forth. In an example embodiment, the data mesh system 150 can include a presentation module 210, a communication module 220, an attribute module 230, a characteristic module 240, a management module 250, an ancillary activity system 260, a user analytics system 270, an augmentation system 280, and a visualization system 290. All, or some, of the modules 210-290 of FIG. 2, can communicate with each other, for example, via a network coupling, shared memory, and the like. It will be appreciated that each module of modules 210-290 can be implemented as a single module, combined into other modules, or further subdivided into multiple modules. Other modules not pertinent to example embodiments can also be included, but are not shown.

[00139] Referring to FIG. 2, the presentation module 210 provides various presentation and user interface functionality operable to interactively present and receive information from users. For example, the presentation module 210 causes presentation of various notifications or user interfaces that provide the user an option to make a purchase associated with the identified items. The presentation module 210 presents or causes presentation of information using a variety of means, including visually displaying information and using other

device outputs (e.g., acoustic, haptic). Interactively presenting is intended to include the exchange of information between a device and a user. The user can provide input to interact with the user interface in a variety of ways, including alphanumeric input, cursor input, tactile input, or other input (e.g., one or more of touch screen, camera, tactile sensors, light sensors, infrared sensors, biometric sensors, microphone, gyroscope, accelerometer, or other sensors). It will be appreciated that the presentation module 210 provides many other user interfaces to facilitate functionality described herein. Further, it will be appreciated that "presenting" as used herein is intended to include communicating information to another device with functionality operable to perform presentation using the communicated information.

[00140] The communication module 220 provides various communications functionality and web services. For example, the communication module 220 provides network communication such as communicating with the networked system 102, the client device 110, and the third party server(s) 130. In various example embodiments, the network communication operates over wired or wireless modalities. Web services are intended to include retrieving information from the third party server(s) 130, the database(s) 126, and the application server(s) 140. Information retrieved by the communication module 220 comprises data associated with the user (e.g., user profile information from an online account, social network service data associated with the user), data associated with one or more items listed on an e-commerce website (e.g., images of the item, reviews of the item, item price), other data to facilitate the functionality described herein, and so on.

[00141] The attribute module 230 can receive, access, or retrieve a wide variety of attribute data from many different attribute sources. For example, the attribute module 230 receives, retrieves, or accesses the attribute data from user devices or machines (e.g., the client device 110), social network services, the third party server(s) 130, the publication system(s) 142, the payment system(s) 144, other applications servers, or other attribute sources. The attribute data, as used herein, is intended to include raw data such as sensor data, profile data, social network content, and so on.

[00142] In some example embodiments, the attribute module 230 extracts the attribute data from various sources. For instance, a payment history log of

the user can include a tremendous amount of extraneous data. The attribute module 230 can extract purchase information such as item purchased, time, purchase price, seller, location, brand, and so forth from the payment history log of the user.

[00143] In further example embodiments, the attribute module 230 performs various functions to prepare or condition the attribute data for analysis. For instance, the attribute module 230 standardizes the attribute data to facilitate analysis of the attribute data (e.g., determine a normal form for the data to allow for comparison and other mathematical analysis). The attribute module 230 performs many other functions to prepare the attribute data for analysis.

[00144] In various example embodiments, the attribute module 230 stores the attribute data in association with the user for subsequent analysis. For example, the attribute module 230 stores the attribute data in the database(s) 126. The attribute data can be stored in conjunction with a user identifier such that the attribute module 230 subsequently uses the user identifier to access the attribute data corresponding to a particular user. The attribute module 230 accesses the stored attribute data using other schemes. For instance, the attribute module 230 accesses a portion of the attribute data associated with a time, an item, a user, a type of user, a particular attribute source, and so forth. In this way, the attribute module 230 accesses a portion of attribute data according to various parameters from among a large quantity of the attribute data to access, identify, or find pertinent and relevant data.

[00145] The characteristic module 240 infers a user characteristic or multiple user characteristics corresponding to the user based on an analysis of at least a portion of the attribute data. Many schemes and techniques can be employed to infer the characteristics from the attribute data. For example, a particular user characteristic can be a work location of the user. The attribute data can include a plurality of locations (e.g., as determined by a GPS component of a user device used by the user) that include time stamps. The work location of the user can be inferred based on the consistency and timing of the locations included in the attribute data (e.g., during normal working hours, the user is typically at a particular office building). Many different portions of attribute data and combinations of portions of attribute data can be analyzed to infer a wide variety of characteristics.

[00146] In various example embodiments, characteristics (e.g., the user characteristics), as used herein, are intended to include traits, qualities, actions, activities, attitudes, habits, behaviors, and the like pertaining to a person or people. Inasmuch as the attribute data may not necessarily pertain to a person (e.g., raw data such as coordinates of a particular location), a characteristic (e.g., current location of the user, disliking spicy food, having young children, being a Star Trek fanatic) can be distinct from the attribute data.

[00147] The management module 250 provides management functions associated with the attribute data. For example, the management module 250 provides the user with functionality to edit, modify, update, or otherwise control the attribute data. For instance, the user removes undesired attribute data via the functionality provided by the management module 250. In a further instance, the user specifies permissions for portions of the attribute data using the functionality provided by the management module 250. The permissions allow or prohibit certain access or uses for the attribute data (e.g., the permission prohibits access to the attribute data by third parties). Various levels of access and abilities can be granted. In some example embodiments, the permissions persist for a period of time, and after expiration of the time period, the permissions are revoked.

[00148] In further example embodiments, the management module 250 requests consent from the user to access portions of the attribute data or to request permission for certain uses of the attribute data. For example, the management module 250 requests consent from the user to allow third parties to access portions of the attribute data. The management module 250 requests a variety of other consents associated with various actions corresponding to the attribute data.

[00149] In still further example embodiments, the management module 250 provides functionality to allow third parties to access the attribute data or user characteristics. For example, the management module 250 provides a set of APIs that can be invoked by third parties to access the attribute data or user characteristics. As discussed above, in some example embodiments, permission or consent of the user is determined prior to providing access to the attribute data.

[00150] FIG. 3 is a block diagram of the ancillary activity system 260,

which can provide functionality to generate ancillary activities based on various triggers and information. The ancillary activity system 260 includes an activity module 310, a preference module 320, and a device module 330, according to an example embodiment.

[00151] The activity module 310 in the ancillary activity system 260 provides functionality to generate the ancillary, supplemental, complementary, or companion activity corresponding to the device activity. For example, the user can be browsing a website and the activity module 310 generates the ancillary activity comprising providing the user interactive content such as an option to share, like, post (e.g., tweet), and so forth the website. The activity module 310 generates many other ancillary activities corresponding to the device activity based on various triggers and information.

[00152] The preference module 320 provides functionality to infer a user preference, from the attribute data, indicating a preference of the user associated with performing on the secondary user device the ancillary activity corresponding to the device activity. For example, the preference module 320 infers that the user desires or prefers a particular type of content associated with a particular device activity. The preference module 320 also identifies other users that are similar to the user and infer the user preference based on the identified similar users. The preference module 320 employs a variety of schemes and techniques using a wide range of data to infer the user preference.

[00153] The device module 330 provides functionality to identify the secondary user device according to a device status of the secondary user device. In various implementations, the device status indicates a device capability to perform the ancillary activity in real-time. The device module 330 retrieves, derives, determines, or otherwise obtains a variety of information associated with the user device and the secondary user device to facilitate the functionality herein. For example, the device module 330 determines available functionality of the secondary user device.

[00154] FIG. 4 illustrates a diagram 400 showing an example of generating ancillary activity for a secondary user device, according to some example embodiments. User 410 may be using wearable computing devices such as wearable device 420 (e.g., GOOGLE GLASS®) or wearable device 430 (e.g., a smart watch). In this example, the wearable device 430 is communicatively

coupled to user device 450 via wireless signals such as signal 440. In various implementations, the user device 450 is communicatively coupled, via coupling 460, to the network 104, which is in turn communicatively coupled to the networked system 102 including the data mesh system 150 (discussed above in connection with FIG. 2) and the ancillary activity system 260 (discussed above in connection with FIG. 3).

[00155] The user 410 may be operating or using the user device 450. The terms "operating," "using," "in service," or "in use" as used herein are intended to include a particular user physically interacting with a particular device, being capable of operating the particular device within a short time period such as dormant device or a device in standby (e.g., a particular user carrying a mobile device on their person without presently physically interacting with the device is included in the terms "operating," "using," or "in use"), or otherwise utilizing the particular device (e.g., a smart refrigerator, that is not within a vicinity of the user, configured to track inventory levels and provide inventory data).

[00156] In the example diagram 400, the user 410 is carrying the user device 450 that is communicatively coupled to the ancillary activity system 260. The activity module 310 detects the device activity of the user device 450. For instance, the user 410 can be browsing a web page, receiving directions to a particular location, monitoring fitness activity such as a number of steps taken, and so forth using the user device 450.

[00157] Once the activity module 310 detects the device activity, the preference module 320 infers the user preference from the attribute data accessed by the attribute module 230. The user preference indicates a preference of the user or desire of the user for performing, on a particular user device, a particular ancillary activity corresponding to the device activity. For example, the preference module 320 infers that the user 410 would like an option, presented on a particular wearable device, to favorite, share, post (e.g., tweet) associated with a webpage the user 410 is browsing on the user device 450.

[00158] Based on the inferred user preference, the device module 330 identifies the secondary user device according to the device status of the secondary user device. The device status indicates that the device is capable of performing the ancillary activity. For example, the device module 330 identifies the wearable device 430 as the secondary user device based on the device status

corresponding to the wearable device 430. In this example, the device module 330 determines the device status of the wearable device 430 as being in use by the user 410 (e.g., the user 410 wearing the wearable device 430). Thus, the wearable device 430 is operable to perform the ancillary activity since providing the option for the user 410 to select can be effectuated by the wearable device 430 as the user 410 is within an operating distance of the wearable device 430.

[00159] After the device module 330 identifies the secondary user device, the activity module 310 generates the ancillary activity to be performed in real time on the secondary user device. The activity module 310 generates the ancillary activity by analyzing the device activity, a device functionality of the secondary user device, the user preference, and other data. The device functionality indicates options available for input and output on the secondary user device. For example, the identified secondary user device is the wearable device 430 that has a small screen area to display user interfaces or has reduced options for output (e.g., no speakers). In a specific instance, the activity module 310 generates the ancillary activity to include abridged activity content according to the device functionality (e.g., small display size). After the activity module 310 generates the ancillary activity, the activity module 310 transmits or otherwise communicates to the secondary user device to perform the ancillary activity in real time.

[00160] FIG. 5 is a flow diagram illustrating an example method 500 for generating ancillary activity for the secondary user device, according to some example embodiments. At operation 510, the activity module 310 detects the device activity being performed in real time by the user device of a user. The term "real-time data," as used herein, is intended to include data associated with an event currently happening. For example, the device activity being performed in real time includes a particular device activity detected at the activity module 310 after a delay interval (e.g., due to transmission delay or other delays such as being temporarily stored at an intermediate device) between the instant of the particular device activity occurring and the activity module 310 detecting the particular device activity. Thus, in some instances, the device activity being performed in real time is intended to include activities that have occurred a short time in the past. This discussion of real time applies equally throughout the specification in relation to other uses of the term "real time."

[00161] In various embodiments, the device activity includes a wide variety of activities such as browsing a webpage, monitoring fitness activity (e.g., steps the user has taken), heart rate monitoring, inventory level monitoring (e.g., a smart refrigerator that monitors inventory), and so on. In some implementations, the activity module 310 detects the device activity being performed by monitoring devices of the user. For instance, a smart appliance of the user provides a continuous or periodic stream of data indicating various device activities.

[00162] At operation 520, the attribute module 230 accesses the attribute data associated with the user from the plurality of attribute sources. In various example embodiments, at least a portion of the attribute data includes real-time data or near real-time data. For example, the real-time data includes user input data or sensor data communicated to the attribute module 230 after a delay interval (e.g., due to transmission delay or other delays such as being temporarily stored at an intermediate device) between capturing the data and the attribute module 230 receiving the data.

[00163] As will be discussed in connection with FIGS. 52 and 53, the attribute data is received from a broad spectrum of attribute sources (e.g., devices, sensors, servers, databases, and other sources). Additionally, the attribute module 230 receives or accesses the attribute data via many pathways resulting from an assortment of configurations of the attribute sources as further discussed in connection with FIGS. 51A and 51B. In an example embodiment, the attribute module 230 receives the attribute data directly from the attribute sources. In other example embodiments, the attribute module 230 receives the attribute data from a central device that receives attribute data from a plurality of user devices. In still other example embodiments, various user devices are communicatively coupled in a decentralized device-to-device mesh, and the attribute module 230 receives the attribute data corresponding to a particular device in the mesh from any of the devices in the mesh. The attribute module 230 receives the attribute data from the attribute sources in many other configurations including various suitable combinations of configurations.

[00164] In various example embodiments, the attribute module 230 stores the attribute data in association with the user (e.g., indexed based on a user identifier) for subsequent analysis. The attribute module 230 stores the attribute

data in a storage device such as the database(s) 126, for example. The attribute module 230 accesses the stored attribute data using a variety of search or find schemes. For instance, the attribute data associated with a particular user is accessed using a user identifier that corresponds to the particular user. It will be noted that the collective, aggregated attribute data is sometimes referred to as a "data mesh."

[00165] At operation 530, the preference module 320 infers the user preference or desired user setting, from the attribute data, indicating a preference of the user for performing on the secondary user device the ancillary activity corresponding to the device activity. For example, the attribute data includes engagement data of the user (e.g., particular websites the user visits, taps, clicks, or other interactions with various notifications) indicative of the types of information the user is interested in. In a specific example, the preference module 320 infers the user preference for receiving notifications associated with a particular sporting event based on the engagement data.

[00166] In this specific example, the activity module 310 detects from the user device (e.g., a smart television) that the device activity includes watching a sporting event. In continuing with this example, the preference module 320 infers the user preference to indicate the user has an affinity for notification associated with watching a sporting event on a particular secondary device based on past notifications the user showed interest in that are included in the attribute data.

[00167] Referring now to FIG. 6, a flow diagram is shown illustrating further operations for inferring a user preference from the attribute data, according to some example embodiments. As discussed above, subsequent to the operation 520, at the operation 530, the preference module 320 infers the user preference from the attribute data.

[00168] At operation 610, the characteristic module 240 infers or directly measures user characteristics pertaining to the user from the attribute data. In some example embodiments, the characteristic module 240 stores the inferred user characteristics for subsequent analysis, for example, in a storage device such as database(s) 126. The characteristic module 240 infers a vast spectrum of the user characteristics from the attribute data. A few specific examples of user characteristics include demographic data (e.g., age, gender, marital status,

number of children), user preferences (e.g., being a morning person, favorite locations, enjoying spicy food), idiosyncrasy (e.g., being forgetful, such as draining the battery on a mobile device; or being impatient, such as a line breaker that will leave a store if the line is too long), qualities (e.g., being athletic, being tall, having a large vocabulary), personality traits (e.g., being a risk taker), actions, activities (e.g., working for a non-profit), attitudes, habits (e.g., being a coffee drinker), behaviors, beliefs, biases, demeanor, and physical characteristics of the user (e.g., height, weight, garment sizes, eye color, hair color). The specificity of the characteristics ranges from very narrow (e.g., drinks a particular brand of soda) to very broad (e.g., being generally philanthropic). To illustrate inferring the user characteristic from the attribute data in an example, the attribute data includes user location data that indicates frequent visits to a local school, local soccer fields, and the like. In this example, the characteristic module 240 infers that the user has children based on the types of locations the user may be frequently visiting.

[00169] In some instances, the characteristic module 240 performs varying degrees of inferential analysis of the attribute data to derive the user characteristics. For example, the characteristic module 240 infers the user's wake-up time based on user device activity or other activity (e.g., connected alarm clock settings, logins to accounts, and various other user activities that indicate a wake-up time). In this example, the characteristic module 240 infers a particular user characteristic that can be of a larger inferential jump such as the user being a morning person or liking to sleep in. The degree of inferential jump can be configurable. In some example embodiments, the characteristic module 240 employs various techniques to minimize or otherwise control incorrect inferences (e.g., machine-learning, other learning algorithms).

[00170] In further example embodiments, the characteristic module 240 learns, adapts, or evolves as more of the attribute data is received (e.g., via machine learning techniques or other learning algorithms). For example, the attribute data includes location data of the user. The characteristic module 240 infers a favorite location of the user based on a pattern (e.g., frequently visited locations) in the location data. However, the characteristic module 240 subsequently receives employment data of the user that indicates a current employer including an employer location. The characteristic module 240 learns,

updates, or otherwise adapts to account for the new attribute data. Thus, in this example, the characteristic module 240 may not infer a favorite location of the user if the location is a work location of the user. In some instance, the user may provide input directly (e.g., via a user interface configured to receive inferential guidance from the user) to facilitate the characteristic module 240 in inferring characteristics from the attribute data (e.g., user input indicating that a particular inferred characteristic is incorrect or providing input to be used as a basis for future inferences).

[00171] In other instances, the characteristic module 240 performs very little or no analysis to derive the user characteristic from the attribute data. For example, the attribute data includes an alarm time setting from a connected alarm clock (e.g., a smart phone with an alarm clock app). The alarm time setting can directly indicate a wake-up time. Since the attribute data directly relates to a particular user characteristic, the characteristic module 240 need not perform analysis to derive the user characteristic.

[00172] In some example embodiments, the user characteristic comprises predefined characteristics or dynamically determined characteristics. For instance, a particular set of characteristics is predefined (e.g., work location, home location, marital status, socio-economic level). In this instance, the characteristic module 240 determines that particular predefined characteristics are associated with the user based on an analysis of the attribute data. In other instances, the characteristic module 240 dynamically determines characteristics based on the attribute data. For example, the attribute data indicates that the user owns a particular exotic pet. Although there may not be a predefined characteristic associated with the particular exotic pet, the characteristic module 240 determines the user characteristic of owning an exotic pet from the attribute data.

[00173] At operation 620, the preference module 320 identifies similar users that are similar to the user based on the inferred user characteristics and respective user characteristics of a plurality of other users. The preference module 320 identifies similar users that are similar to the user based on a variety of factors. In some example embodiments, the preference module 320 accesses the attribute data or stored user characteristics corresponding to the plurality of other users. For example, the preference module 320 identities the similar users

from among the plurality of other users that are similar to the user based on the inferred user characteristics of the user and respective user characteristics of the plurality of other users. The preference module 320 correlates, matches, or otherwise compares the inferred user characteristics with respective user characteristics of the plurality of other users to identify the similar users. In various example embodiments, the preference module 320 identifies the similar users based on same or similar demographic data (e.g., same or similar age, marital status, gender, geographic location, etc.), same or similar user characteristics (e.g., same or similar brand purchases), same or similar attribute data, and so on.

[00174] At operation 630, the preference module 320 infers the user preference or desired user setting based on the identified similar users. For example, the preference module 320 analyzes the user characteristics of the identified similar users to determine the user preference. In a specific example, if the user characteristics of the identified similar users indicate a preference for viewing particular content on a particular secondary user device, the preference module 320 infers that the user also has the same or a similar preference for viewing the particular content on the particular secondary user device. In this way, the preference module 320 infers the user preference based on the identified similar users.

[00175] Referring back to FIG. 5, at operation 540, the device module 330 identifies the secondary user device according to the device status of the secondary user device. The device status indicates a device capability to perform the ancillary activity in real time. The device capability includes various metrics and features associated with the secondary user device. In various implementations, the device module 330 identifies the secondary user device based on the device status that includes various combinations of factors discussed below. For example, the device status can be based on the device capability including a distance of the secondary user device to the user as further discussed in connection with FIG. 7, below. For instance, the secondary user device is capable of presenting information or notification to the user if the secondary user device is within a vicinity of the user.

[00176] In another example, the device status is based on a particular functionality of the device. The device module 330 queries the secondary user

device to determine the functionality of the secondary user device. In other instances, the device module 330 determines the functionality of the secondary user device via a lookup of functionality for the same or similar device as the secondary user device. For instance, if the secondary user device is a particular type of wearable device, the device module 330 can look up available functions for the particular type of wearable device from the third party servers(s) 130. For instance, if the secondary user device has an audio output, then the device module 330 identifies the secondary user device as capable of performing a particular ancillary activity that includes audio output (e.g., voice directions for hands-free navigation). Thus, in some cases, the device module 330 determines the device status in conjunction with a particular ancillary activity.

[00177] In still another example, the device status is based on whether the secondary user device is active as further discussed in connection with FIG. 8, below. For example, if the secondary user device is not currently being used (e.g., as determined via a sensor on the device such as an accelerometer that indicates the device is perfectly still), then the device module 330 determines that the device is not active and does not identify the inactive secondary user device as being capable of performing the ancillary activity.

[00178] Referring now to FIG. 7, a flow diagram illustrates further operations for identifying a secondary user device, according to some example embodiments. Specifically, FIG. 7 is directed to the device module 330 identifying the secondary user device by determining that the device status of the secondary user device includes the secondary user being within a distance of the user. Subsequent to the operation 530, the device module 330 receives sensor data from the secondary user device at operation 710. The sensor data includes, for example, data received from any of the sensors discussed in connection with FIG. 53, below. In a specific example, the sensor data includes location data as determined by a GPS component of the secondary user device. The sensor data represents a real-time physical environment of the secondary user device. As discussed below, the device module 330 determines the device status of the secondary user device based on the sensor data received from the secondary user device.

[00179] At operation 720, the characteristic module 240 or the device module 330 infers the current user location based on location data received from

the user device. For example, the attribute data includes real-time data, from the user device, corresponding to the location of the user (e.g., location data as determined by a GPS component of a mobile device corresponding to the user).

[00180] At operation 730, the device module 330 extracts a current device location from the sensor data received from the secondary user device. For instance, the secondary user device can be equipped with a GPS component that provides location data. In other instances, the device module 330 extracts the current device location based on WI-FI® triangulation, NFC beacon detection, or other location services.

[00181] At operation 740, the device module 330 compares the current user location and the current device location to determine that the secondary user device is within a distance (e.g., an operating distance) of the current user location. The distance may be a short distance such as a reasonable distance to allow the user to physically operate the secondary user device (e.g., an arm's length).

[00182] Although FIG. 7 is directed to determining that the secondary user device is within a distance of the user location based on an inferred location of the user and the secondary user device, the device module 330 employs other schemes to determine whether the user is within an operating distance of the secondary user device. For instance, if the secondary user device is equipped with biometric identification sensors and the device module 330 receives biometric sensor data from the secondary user device indicating the identity of the user, the device module 330 can, in that situation, infer that the user is within an operating distance of the secondary user device.

[00183] Referring now to FIG. 8, a flow diagram illustrates further operations for identifying the secondary user device, according to some example embodiments. Subsequent to the operation 530, the device module 330 receives sensor data from the secondary user device at operation 810, similar to the operation 710 described above. The sensor data represents a real-time physical environment of the secondary user device. For instance, the sensor data includes thermal data (e.g., data that indicates a current temperature), motion data (e.g., as determined by an accelerometer component), position data (e.g., as determined by a GPS component), biometric data (e.g., heart rate data or fingerprint identifications), communication data (e.g., NFC beacon detections or

BLUETOOTH® device detections), and other sensor data (see FIG. 53 below for additional sensors and data).

[00184] At operation 820, the device module 330 calculates an active metric from the sensor data. In various implementations, the active metric indicates the secondary user device is in use by the user. In some implementations, the active metric comprises a probability or likelihood that the secondary user device is active. In these implementations, a higher value for the active metric is associated with a higher probability that the secondary user device is active. In a specific instance, if the secondary user device is a wearable device such as a smart watch, the sensor data indicates that a particular user is wearing the wearable device based on a heart rate sensor (when the user is not wearing the wearable device the heart rate sensor indicates no heart rate).

[00185] Similarly, if the secondary user device is a smart phone that provides ambient temperature data, the device module 330 calculates the active metric based on the temperature data. For example, if the temperature data is fluctuating or is above an expected ambient temperature, this indicates that the user is carrying the smart phone in their pocket. Conversely, if the temperature is near expected ambient temperature and there is little fluctuation in the temperature, the device module 330 calculates a low probability, corresponding to a lower active metric, indicating that the particular device is not active or in use by the user.

[00186] At operation 830, the device module 330 determines that the secondary user device is active based on the active metric. For example, if the calculated active metric exceeds a threshold value, the device module 330 determines that the secondary user device is active. The threshold value can be predetermined or dynamically determined by the device module 330. For example, the device module 330 employs various statistical models based on historical values of the active metric to determine whether the current active metric is anomalous. In a simple non-limiting example, the device module 330 determines the threshold value to be an average of historical values for the active metric, and the device module 330 determines that the secondary user device is active if the active metric exceeds the average of the historical values of the active metric. The device module 330 employs many other schemes and techniques to determine that the device is active based on the active metric.

[00187] At operation 840, the device module 330 identifies the secondary user device as being capable of performing the ancillary activity in real time based on the secondary user device being active. That is to say, the device module 330 identifies a particular secondary user device based on the particular secondary user device being active. The reasoning being that if the secondary user device is inactive, the secondary user device is not capable of presenting information to or receiving input from the user and therefore is not capable of performing the ancillary activity, in some cases.

[00188] Referring again to FIG. 5, at operation 550, the activity module 310 generates the ancillary activity, to be performed in real time on the secondary user device, by analyzing the device activity, a device functionality of the secondary user device, the user preference, and other factors and data. The ancillary activity can include a wide range of tasks, content, and functionality. For example, the ancillary activity comprises a notification that includes notification content associated with the device activity. For instance, if the device activity is viewing a sporting event on a smart TV, the ancillary activity comprises a notification including notification content associated with the sporting event (e.g., information about the players, the current score, sporting statistics).

[00189] In some implementations, the ancillary activity includes a portion of the device activity. For example, if the device activity comprises browsing a particular website, the activity module 310 generates the ancillary activity to include content that is a portion of the website. Thus, in these implementations, the activity module 310 is distributing a portion of the device activity to the secondary user device.

[00190] FIG. 9 is a flow diagram illustrating further operations for generating the ancillary activity of the secondary user device, according to some example embodiments. Subsequent to the operation 540, at the operation 550, the activity module 310 generates the ancillary activity. The operation 550 can further include operations 910, 920, and 930.

[00191] At operation 910, the device module 330 determines a display size corresponding to the secondary user device. For example, the device module 330 queries the secondary user device directly to retrieve data associated with the display size. In another example, the device module 330 queries a particular

third party server (e.g., the third party server(s) 130) using an identifier associated with the secondary user device to determine the display size of the secondary user device. In a specific example, the device module 330 determines a particular device model for the secondary user device and performs a lookup of the display size for the particular device model.

[00192] At operation 920, the device module 330 determines the display size corresponding to the secondary user device is below a threshold size. For example, the display size may be too small for particular content of the ancillary activity. In this situation, the device module 330 determines that the display size is below the threshold size.

[00193] At operation 930, the activity module 310 generates the ancillary activity to include abridged activity context according to the display size corresponding to the secondary user device. For instance, the device module 330 shortens or reduces content or functionality of the ancillary activity to accommodate the display size of the secondary user device.

[00194] FIG. 10 is a flow diagram illustrating further operations for generating the ancillary activity of the secondary user device, according to some example embodiments. Subsequent to the operation 540, at the operation 550, the activity module 310 generates the ancillary activity. The operation 550 further includes operations 1010 and 1020.

[00195] At operation 1010, the device module 330 compares the device functionality of the secondary user device with a device functionality of the user device to identify non-mutual functionality of the secondary user device that is not available on the user device. For example, the user device comprises a mobile computer that the user is browsing a website on. The secondary user device can be a wearable device affixed to the user. In this example, the device module 330 identifies haptic output, for instance, of the secondary user device as being non-mutual functionality as the mobile computer may not have haptic output functionality. In another example, a particular wearable device may not include a GPS component while a smart phone device of the user may include a GPS component to determine current location. In this example, the device module 330 identifies use of the GPS component as non-mutual functionality.

[00196] At operation 1020, the activity module 310 generates the ancillary activity to include an activity component that utilizes the non-mutual

functionality of the secondary user device. In the examples discussed above, if the device module 330 determines that the secondary user device includes a GPS component while the user device does not include a GPS component, the activity module 310 utilizes location data from the secondary user device in generating the ancillary activity. In a specific example, if the user is browsing a particular webpage associated with a particular merchant or location, the activity module 310 generates the ancillary activity to include mapping directions to the particular location using the GPS component of the secondary user device to access the user's current location. Thus, the activity module 310 receives the particular location from the user device and communicates, to the secondary user device, the location and instructions to map directions to that location from the current location.

[00197] Turning again to FIG. 5, at operation 560, the activity module 310 transmits or otherwise communicates, to the secondary user device, instructions to perform in real time the complementary activity. For example, the activity module 310 communicates instructions to the secondary user device to present a user interface that facilitates or effectuates the ancillary activity (e.g., a user interface including functionality to carry out the ancillary activity). In a specific example, if the ancillary activity comprises a notification including notification content, the activity module 310 transmits the notification including the notification content to the secondary user device to be presented to the user. Thus, in this example, the activity module 310 causes presentation of the notification on the secondary user device.

[00198] Although the operations 540 – 560 are directed to performing a single ancillary activity on a single secondary user device, other embodiments include identifying multiple secondary devices and generating multiple ancillary activities to be performed in real time on one or more of the identified secondary user devices. For example, if the user is carrying a smart watch and wearing smart glasses, the generated ancillary activities can be distributed among the identified ancillary activities. For instance, haptic-based notifications can be directed to the user's smart watch while visual notification is directed to the user's smart glasses. In this instance, the activity module 310 distributes the multiple ancillary activities among the multiple secondary user devices based on respective device functionalities of the multiple secondary user devices. The

activity module 310 employs other factors to distribute the multiple ancillary activities such as the user preference.

[00199] To help illustrate the concepts described above, FIG. 11 illustrates non-limiting examples of generating the ancillary activity for the secondary user device, according to some example embodiment. FIG. 11 includes a scene 1100 that depicts a living room attached to an open kitchen. The scene 1100 includes a smart television (TV) 1110, a media entertainment device 1120, a lamp 1130, a mobile computer 1140, a wearable device 1150, a user 1160, a mobile device 1170, a smart refrigerator 1180, and a kitchen display 1190. Each of the devices of FIG. 11 can be attribute sources coupled to a network (e.g., the network 104) and operable to communicate with the data mesh system 150. In various example embodiments, the user 1160 may be carrying or wearing a smart device such as the wearable device 1150 (e.g., a mobile device, a wearable device, a NFC enable smart ring) on their person that provides real-time data corresponding to the user 1160. For instance, the user 1160 may be carrying a mobile device that provides real-time location data (e.g., as determined by a GPS component, beacon location detect, or other location services).

[00200] In an example embodiment, the user 1160 may be browsing a webpage using the mobile computer 1140. The mobile computer 1140 can be coupled to the network 104, and the activity module 310 detects the device activity of browsing a particular webpage. The preference module 320 infers a user preference associated with the device activity of browsing a particular webpage. For instance, the activity module 310 infers that the user has a preference for viewing supplemental content associated with the particular webpage the user is browsing or supplemental functionality associated with the particular webpage (e.g., liking, favoriting, or sharing the particular webpage).

[00201] Based on the inferred user preference, the device module 330 identifies the secondary user device such as the wearable device 1150 that is capable of performing the ancillary activity. The device module 330 identifies the wearable device 1150 based on the wearable device 1150 being within an operating distance of the user 1160 (the reasoning being that if the wearable device 1150 is within a short distance of the user 1160, then the wearable device 1150 is capable of providing information or receiving input from the user 1160). For example, the device module 330 determines the user 1160 is wearing the

wearable device 1150 based on various sensor data received from the wearable device 1150 (e.g., biometric data that indicates a particular user is wearing the device, accelerometer data that indicates the device is in use, BLUETOOTH® device detections that indicates the wearable device 1150 is within short range communication range of another user device that the device module 330 has inferred the user is using).

[00202] Once the device module 330 identifies the wearable device 1150, the activity module 310 generates the ancillary activity based on the device functionality of the identified secondary user device, the device activity, the user preference, and other data. For example, the wearable device 1150 may not have an audio output; in that case, content including an audio component can be altered or modified to accommodate the functionality of the wearable device 1150. In continuing with the example above, the activity module 310 generates the ancillary activity to include options to favorite, like, share (e.g., tweet) the particular webpage the user 1160 is browsing. In some instances, the activity module 310 generates the ancillary activity based on the device activity. For example, if the device activity of browsing a particular webpage already includes options to favorite or share the webpage, the activity module 310 generates the ancillary activity to include functionality not already available at the user device (the mobile computer 1140 in this case). After the activity module 310 generates the ancillary activity, the activity module 310 transmits or otherwise communicates to the wearable device 1150 to perform the ancillary activity. In this example, the activity module 310 transmits instructions to the wearable device 1150 to present a user interface including the options to favorite, like, or share the particular webpage the user 1160 is browsing on the mobile computer 1140.

[00203] FIGS. 12 and 13 depict example user interfaces for interactively presenting information to the user. Although FIGS. 12 and 13 depict specific example user interfaces and user interface elements, these are merely non-limiting examples, and many other alternate user interfaces and user interface elements can be generated by the presentation module 210 and presented to the user. It will be noted that alternate presentations of the displays of FIGS. 12 and 13 can include additional information, graphics, options, and so forth; other presentations include less information, or provide abridged information for easy

use by the user.

[00204] FIG. 12 depicts an example device 1200 (e.g., smart watch) displaying an example user interface 1210 that includes ancillary or supplemental functionality. For example, the user interface 1210 includes user interfaces elements 1220, 1230, and 1240 that provide the user with options to like (e.g., like a particular webpage or a particular location), share (e.g., tweet a link to a particular location or a webpage), or return to home (e.g., navigate a particular webpage on the user device using the secondary user device) respectively. For example, activating the user interface element 1220 causes the secondary user device to "like" an item associated with the device activity (e.g., a particular webpage) on a social network service the user is a member of. The user interface 1210 includes a wide variety of other functionality.

[00205] In some cases, the ancillary activity comprises a notification. In these cases, the activity module 310 causes presentation of the notification to the user. For instance, the activity module 310 communicates, to the device 1200, instructions to present the notification. In some instances, the instructions include notification content, generated by the activity module 310, such as a message (e.g., pertinent information) to be presented to the user. In example embodiments, the notification comprises a text message, such as Short Message Service (SMS) messages, Multimedia Messaging Service (MMS), Enhanced Messaging Service (EMS), and so forth. In other example embodiments, the notification comprises a push notification or another similar type of notification. In further example embodiments, the notification comprises interactive user interface elements.

[00206] FIG. 13 depicts an example device 1300 displaying an example user interface 1310 that includes ancillary or supplemental content. For example, the user interface 1310 includes supplemental content associated with directions to a particular location. For instance, if the user is attempting to physically locate a particular place using a smart phone, the ancillary activity includes providing additional or supplemental content on a wearable device the user may be wearing. In the example of FIG. 13, the user interface 1310 includes a heading determined via sensors included in the wearable device or from data received from the smart phone. The supplemental content can also include pertinent information such as a distance to the specified location. In this

way, the wearable device performs the ancillary activity associated with the device activity being performed in real time by the user device of the user.

[00207] Turning now to another example embodiment, FIG. 14 is a block diagram of the user analytics system 270, which may provide functionality to identify items that the user has demand for and facilitate a purchase associated with the identified items. The user analytics system 270 may include an item module 1410, an analysis module 1420, and an order module 1430.

[00208] The item module 1410 in the user analytics system 270 may provide functionality to facilitate identifying items from the attribute data. For example, the item module 1410 extracts demand indications, from the attribute data, that may indicate anticipatory demand by the user for a particular item. In a specific example, the demand indications may indicate use of a particular item by the user, a user supply of a particular item, a user activity indicative of a particular item (e.g., frequent visits to a beach may be indicative of demand for sunscreen products and other beach related products), and other indications of demand for various items. The item module 1410 extracts the demand indications from many different portions of attribute data and combinations of portions of attribute data using a variety of schemes and techniques.

[00209] The analysis module 1420 provides functionality to identify items from the attribute data. For example, the analysis module 1420 identifies the commerce item or a pertinent item based on the demand indications, the user characteristics, the attribute data, or any suitable combination thereof. In further example embodiments, the analysis module 1420 calculates a demand metric based on the demand indications. In some implementations, the user analytics system 270 performs a variety of tasks and functions based on the demand metric, such as various aspects of facilitating the purchase associated with the commerce item.

[00210] The order module 1430 provides functionality to facilitate the user purchase associated with the commerce item. For example, the order module 1430 determines order parameters or transaction parameters for the user purchase based on the user characteristics, the attribute data, the demand indications, or other data. In some example embodiments, the order module 1430 automatically (e.g., without intervention or action of the user) performs the user purchase on behalf of the user based on various triggers or analyses.

[00211] FIG. 15 is a flow diagram illustrating an example method 1500 for identifying the commerce item from the attribute data and facilitating the user purchase associated with the commerce item. At operation 1510, the attribute module 230 receives attribute data associated with the user from a plurality of attribute sources. In various example embodiments, at least a portion of the attribute data includes real-time data or near real-time data. The term "real-time data," as used herein, is intended to include data associated with an event currently happening. For example, the real-time data may include user input data or sensor data communicated to the attribute module 230 after a delay interval (e.g., due to transmission delay or other delays such as being temporarily stored at an intermediate device) between capturing the data and the attribute module 230 receiving the data.

[00212] As will be discussed in connection with FIGS. 52 and 53, the attribute data is received from a broad spectrum of attribute sources (e.g., devices, sensors, servers, databases, and other sources). Additionally, the attribute module 230 may receive the attribute data via many pathways resulting from an assortment of configurations of the attribute sources as further discussed in connection with FIGS. 51A and 51B. In an example embodiment, the attribute module 230 receives the attribute data directly from the attribute sources. In other example embodiments, the attribute module 230 receives the attribute data from a central device that receives attribute data from a plurality of user devices. In still other example embodiments, various user devices are communicatively coupled in a decentralized device-to-device mesh, and the attribute module 230 receives the attribute data corresponding to a particular device in the mesh from any of the devices in the mesh. In still other examples, the attribute module 230 receives the attribute data from the attribute sources in many other configurations including various suitable combinations of configurations.

[00213] In various example embodiments, the attribute module 230 stores the attribute data in association with the user (e.g., indexed based on a user identifier) for subsequent analysis. The attribute module 230 may store the attribute data in a storage device such as the database(s) 126, for example. In some implementations, the attribute module 230 accesses the stored attribute data using a variety of search or find schemes. For instance, the attribute data

associated with a particular user is accessed using a user identifier that corresponds to the particular user. It will be noted that the collective, aggregated attribute data may be referred to as a "data mesh."

[00214] At operation 1520, the item module 1410 extracts demand indications from the attribute data. In some example embodiments, the demand indications are indicative of anticipatory demand by the user for a particular item. For instance, a particular demand indication may indicate that the user may want, desire, or have an affinity for a particular product or commerce item. It is noted that the terms "item," "product," "commerce item," and the like are intended to include a wide variety of products (e.g., items corresponding to item listings published on an e-commerce website) and services (e.g., a particular activity such going to a restaurant). It is also noted that the terms "anticipatory" and "predictive" as used herein are intended to pertain to future events, or activity, including events that are in the immediate future (e.g., events within a short time period, such as minutes or seconds, of the present) as well as events further in the future (e.g., months or years from the present).

[00215] The item module 1410 extracts the demand indications from a wide variety of data included in the attribute data, such as purchase histories, location data (e.g., as determined by a GPS component of a mobile device, beacon detections, or other location services), social media data (e.g., check-ins or postings by the user), as well as other data included in the attribute data as discussed herein. The demand indications include, for example, inventory level indications (e.g., a food supply of the user as indicated by a smart refrigerator), item usage indications (e.g., user purchase history may indicate certain item usage patterns), item activity indications, activity related to an item (e.g., the user spending time on the ski slopes may indicate a demand for ski equipment), user engagement data (e.g., the user clicking on particular links associated with various products or activities), and so forth. For instance, location data included in the attribute data may indicate frequent trips to coffee shops. In this instance, the item module 1410 extracts the location data from the attribute data since it may be indicative of demand for coffee or coffee related products by the user. In another example, social media data, such as check-ins to a gym or postings about fitness activities, may indicate demand for fitness-related items or activities.

[00216] In a specific example, the user may currently possess a sufficient

supply of bottled water, but based on indications of consumption rates of bottled water by the user, the user may have future demand for the bottled water. Thus, in this example, the item module 1410 extracts supply indications for the bottled water (e.g., purchase history data of the user) or consumption indications for the bottled water (e.g., inventory activity data as retrieved or accessed from a smart refrigerator) from the attribute data. That is to say, the demand indications, extracted by the item module 1410, may include the supply indications, inventory level indications, or inventory activity indication for the bottle water.

[00217] At operation 1530, the analysis module 1420 identifies the commerce item, product, or pertinent item from the attribute data based on the extracted demand indications. For instance, the analysis module 1420 determines that there may be a high likelihood that the user is interested in or has demand for a particular item. In other words, the analysis module 1420 identifies the commerce item or multiple commerce items from among a plurality of commerce items associated with the demand indications based on user demand for respective commerce items included in the plurality of commerce items.

[00218] The analysis module 1420 identifies the commerce item based on the demand indications using a variety of schemes and techniques. For example, the analysis module 1420 may calculate the demand metric based on the demand indications. The demand metric may indicate a likelihood that the user has a demand for a particular item. For instance, the demand metric may be based on an occurrence count of demand indications that correspond to a particular item (e.g., a particular item with multiple corresponding demand indications may be associated with a higher demand metric than a particular item with a single corresponding demand indication). In some example embodiments, the analysis module 1420 may identify the commerce item based on the calculated demand metric exceeding a threshold (e.g., a predefined or dynamically determined value).

[00219] In another example embodiment, the analysis module 1420 ranks, sorts, or otherwise orders at least a portion of the plurality of commerce items associated with the demand indications based on the demand metric. In this example embodiment, the analysis module 1420 identifies the first, a predefined number, or a dynamically determined number of the highest-ranking commerce

items included in the plurality of commerce items associated with the demand indications, either alone or in any suitable combination. For instance, the analysis module 1420 identifies the commerce item from among the plurality of commerce items associated with the demand indications based on a statistical analysis such as a percentage (e.g., top ten percent of the ranked plurality of commerce items), analysis based on standard deviations away from a mean, or other statistical methods.

[00220] In further example embodiments, the demand indications are weighted such that higher weighted demand indications may be more influential in the analysis module 1420 identifying the commerce item based on the demand indications. The weighting can be pre-defined or dynamically determined based on a user feedback data (e.g., data that indicates whether the user actually had demand for the commerce item identified by the analysis module 1420). In some implementations, the feedback data is included in the attribute data subsequent to the analysis module 1420 identifying the commerce item. In this way, the analysis module 1420 can adapt, learn, or evolve as more of the attribute data is received. In some example embodiments, the analysis module 1420 employs various machine-learning techniques to enhance identifying the commerce item based on the demand indications. Similar techniques may be applied by the item module 1410 to extract the demand indications in the previous operation.

[00221] At operation 1540, the characteristic module 240 infers or directly measures user characteristics pertaining to the user from the attribute data. As discussed above in connection with operation 610, the characteristic module 240 can infer a variety of user characteristics from the attribute data using a variety of data. It will be understood that the discussion of operation 610 regarding the characteristic module 240 applies equally to operation 1540.

[00222] At operation 1550, the order module 1430 facilitates the user purchase or suggested transaction, for the user, associated with the commerce item based, at least in part, on the user characteristics. Facilitating a particular purchase is intended to include actions such as automatically (e.g., without intervention or action of the user) performing the particular purchase on behalf of the user, causing presentation of a notification that includes the option to make the particular purchase, or other actions associated with facilitating the

particular purchase (e.g., causing presentation of an advertisement, adjusting item listing search results of the user to emphasize item listings associated with a particular item). In further example embodiments, the order module 1430 determines various parameters associated with the user purchase (e.g., order parameters or transaction parameters) based on the attribute data, the user characteristics, the demand indications, or other data. In the discussion below, additional aspects of facilitating the user purchase are described.

[00223] FIG. 16 is a flow diagram illustrating further operations for facilitating the user purchase based, at least in part, on an evaluation of an inventory level, according to some example embodiments. At operation 1610, the item module 1410 extracts a current inventory level of the commerce item from the attribute data. For example, the item module 1410 extracts a quantity of the commerce item from the attribute data that includes inventory data received from a smart refrigerator. In other examples, the attribute data includes inventory indications from sensors that directly monitor or measure the commerce item. In a specific example, brake pads in an automobile of the user can be monitored via a sensor operable to indicate a condition of the brake pads (e.g., needing replacement). In another example, another user that may be associated with the user may purchase a particular item for which the user has demand. In this example, the user may no longer have demand for the particular item based on the purchase by the other user (e.g., shared shopping list between family members).

[00224] At operation 1620, the analysis module 1420 determines an inventory threshold for the commerce item by modeling usage of the commerce item based on the extracted current inventory level and the inferred user characteristics. In an example embodiment, the analysis module 1420 determines the inventory threshold such that when the current inventory level may be below the threshold, the inventory may need to be reordered to avoid depletion. For instance, the analysis module 1420 calculates a usage rate corresponding to the commerce item based on the attribute data, the user characteristics, or other data and applies the usage rate to determine the inventory threshold for the commerce item to avoid depletion of a supply of the commerce item. For example, the analysis module 1420 determines the usage rate for a particular item based on historical purchase history data and infers

usage rate based on a frequency of purchase of the particular item. In a specific example, the commerce item may be coffee beans and the analysis module 1420 determines that based on the user's current supply of coffee beans and the user's rate of consumption (e.g., the usage rate) corresponding to coffee beans, the user may run out in fourteen days. In this specific example, the analysis module 1420 determines the inventory threshold to be a value, such as a quantity of the coffee beans, that may be the current inventory level several days prior to depletion of the supply of coffee beans.

[00225] At operation 1630, the analysis module 1420 identifies a mismatch between the inventory threshold and the current inventory level. For example, if the analysis module 1420 determines that the current inventory level is below the inventory threshold, the analysis module 1420 identifies the mismatch on that basis.

[00226] At operation 1640, the order module 1430 automatically (e.g., without intervention or action of the user) performs the user purchase on behalf of the user based on the mismatch, according to some implementations. In some example embodiments, the order module 1430 accounts for shipping delays and other delays so as to avoid the current inventory level of the commerce item falling below the inventory threshold. For instance, the analysis module 1420 increases the inventory threshold to account for delays in receiving an order for a particular item.

[00227] FIG. 17 is a flow diagram illustrating further operations for facilitating the purchase including operations to determine parameters for the purchase, according to some example embodiments. At operation 1710, the order module 1430 determines at least one order parameter based, at least in part, on the user characteristics. The order parameter may include at least one of a quantity, a delivery time, a payment time, a delivery method, a delivery destination, a merchant, a brand, a price, an item color, an item style, and so on. For example, the user characteristics may indicate that the user may wear a certain garment size. In this example, the order module 1430 specifies order parameters for clothing or apparel according to the garment size. Similarly, the order module 1430 may specify a brand for the user purchase based on the user characteristics (e.g., historical brand purchases by the user or an analysis of the user's style and the brands that conform to that style). In another example, the

user characteristics may indicate that the user may be minimizing cost above other considerations. In this example, the order module 1430 identifies a lower cost option as opposed to a speedier option (e.g., wait for a sale for a particular item or use the cheapest shipping). In another example, the user characteristics may indicate that the shipping speed may be important for certain items (e.g., a trendy new mobile device that the user may want right away). In this example, the order module 1430 determines the delivery method parameter based on how fast the order may be delivered. In another example embodiment, the order module 1430 specifies the delivery location for the user purchase based on the user characteristics (e.g., if the user purchase relates to items for the user's work, the delivery location may be the user's work location rather than a home address). The order module 1430 may determine many other order parameters based on the user characteristics.

[00228] At operation 1720, the order module 1430 facilitates the purchase according to the determined order parameters. For example, the order module 1430 may recommend the user purchase to the user, with the recommendation including the determined order parameters (e.g., providing the user with a notification including the option to make the user purchase). In another example, the order module 1430 automatically makes the user purchase on behalf of the user. For instance, if the order module 1430 determines that the user purchase may be urgent (e.g., to avoid depletion of a supply of a certain item), routine (e.g., purchasing bottled water), or specified by the user as a permissible automatic purchase in advance, the user purchase may be made automatically to avoid burdening the user with the decision to make the user purchase.

[00229] FIG. 18 is a flow diagram illustrating further operations for determining order parameters including operations to determine a temporal parameter associated with the purchase, according to some example embodiments. At operation 1810, the analysis module 1420 identities a purchase motive of the user for the commerce item by analyzing the user characteristics. In various example embodiments, the purchase motive corresponds to a motive time. For example, the user may be planning a vacation that includes a beach destination. The vacation may be indicative of the purchase motive of the user for items associated with the vacation (e.g.,

sunscreen for a beach type vacation, snacks for a road trip type vacation, Broadway tickets for a New York city trip). In this example, the motive time corresponds to the beginning of the vacation (e.g., as determined by user calendar information included in the attribute data or purchase history data such as plane ticket information).

[00230] At operation 1820, the order module 1430 determines temporal order parameters based on the motive time. In the example above, where the user may be planning a vacation, the order module 1430 determines the temporal order parameters so that the items corresponding to the user purchase arrive prior to the vacation. In another example, if the purchase motive is associated with an event, such as a graduation party, the order module 1430 may determine the temporal order parameters such that the items associated with the user purchase are delivered prior to the graduation party, since the user may no longer have demand for the particular item after a certain time.

[00231] At operation 1830, the order module 1430 facilitates the purchase according to the determined temporal order parameters. For example, the order module 1430 schedules the items corresponding to the user purchase to arrive at a certain time.

[00232] FIG. 19 is a flow diagram illustrating further operations to facilitate the purchase based, at least in part, on purchase criteria, according to some example embodiments. At operation 1910, the analysis module 1420 accesses purchase criteria corresponding to the user. The purchase criteria, for example, include predefined criteria, user-specified criteria, dynamically determined criteria, either alone or any suitable combination thereof. For example, the purchase criteria may include temporal-based criteria (e.g., criteria that specifies making the user purchase with certain time periods), budget criteria (e.g., spending limits associated with particular items or categories of items), context-based criteria (e.g., adjusting the budgeting criteria based on the user's current location), among other purchase criteria. In a specific example, the user specifies a budget for a particular category or good (e.g., transportation, food, utilities, housing, entrainment, travel, health), a total budget, or a monthly budget. In addition, the user can specify rules-based criteria such as a particular time to make certain purchases (e.g., after paycheck is deposited).

[00233] In further example embodiments, the analysis module 1420

identifies, and includes, in the purchase criteria, patterns in the user's purchasing habits, objectives, goals, or dynamically generated criterion. In a specific example, the analysis module 1420 determines that the user may be afflicted with a medical condition, such as a peanut allergy. In this scenario, the analysis module 1420 includes a criterion in the purchase criteria to avoid items that contain peanuts. In another example, the analysis module 1420 determines that the user may be attempting to maintain a vegan diet and the analysis module 1420 may avoid food items that are contrary to the goal of maintaining a vegan diet.

[00234] At operation 1920, the order module 1430 automatically purchases the commerce item on behalf of the user according to the purchase criteria. In an example embodiment, the order module 1430 determines satisfaction of the purchase criteria prior to facilitating the user purchase for the user. For example, the order module 1430 determines that a particular budget criterion included in the purchase criteria has been exceeded and the order module 1430 may not perform the user purchase on that basis. In other words, the order module 1430 facilitates the user purchase based on the determined satisfaction of the purchase criteria.

[00235] Turning now to FIG. 20, the data mesh system 150 may implement various suitable combinations of the operations discussed above to identify the commerce item and facilitate the user purchase. This applies equally to the operations discussed above as well as the operations in the following discussion. FIG. 20 is a flow diagram illustrating an example method 2000 of one such combination of the operations, although many other suitable combinations may be employed. At the operation 1510, the attribute module 230 receives the attribute data associated with the user. At the operation 1520, the item module 1410 extracts the demand indications from the attribute data. At the operation 1530, the analysis module 1420 identifies the commerce item from the attribute data based on the demand indications. At the operation 1540, the characteristic module 240 infers the user characteristics from the attribute data. As shown in FIG. 20, various combinations of the above operations may be employed to facilitate the user purchase at the operation 1550.

[00236] In the example method 2000, to facilitate the user purchase, the item module 1410 extracts the current inventory level of the commerce item at

the operation 1610. As described above, at the operation 1620, the analysis module 1420 determines the inventory threshold for the commerce item. Subsequently, at the operation 1630, the analysis module 1420 identifies the mismatch between the inventory threshold and the current inventory level. At the operation 1640, if the analysis module 1420 identifies the mismatch, the user analytics system 270 may proceed to the operation 1710. Alternatively, if the analysis module 1420 does not identify the mismatch, no subsequent operation may be performed.

[00237] Subsequent to determining the mismatch, at the operation 1710, the order module 1430 determines the order parameters of the user purchase based on the user characteristics, in an example embodiment. In some example embodiments, this may involve the operations 1810, 1820, and 1830, respectively, to determine the temporal order parameters that may be included in the order parameters. At the operation 1720, the order module 1430 facilitates the user purchase according to the order parameters.

[00238] Finally, at the operation 1910, the analysis module 1420 accesses the purchase criteria, and at the operation 1920, the order module 1430 facilitates the user purchase according to the purchase criteria. Thus, FIG. 20 shows an example embodiment where various ones of the above operations may be employed in conjunction with each other to facilitate the user purchase.

[00239] FIG. 21 is a flow diagram illustrating an alternative example method 2100 for identifying the commerce item and facilitating the user purchase, according to some example embodiments. The example method 2100 may involve similar operations as those described above. At operation 2110, similar to the operation 1510, the attribute module 230 receives or accesses the attribute data associated with the user. At operation 2120, similar to the operation 1540, the characteristic module 240 infers the user characteristics pertaining to the user from the attribute data.

[00240] At operation 2130, the analysis module 1420 identifies similar users that are similar to the user based on the inferred user characteristics and respective user characteristics of a plurality of other users. The analysis module 1420 identifies similar users that are similar to the user based on a variety of factors. In some example embodiments, the analysis module 1420 accesses the attribute data or stored user characteristics corresponding to the plurality of other

users. For example, the analysis module 1420 identities the similar users from among the plurality of other users that are similar to the user based on the inferred user characteristics of the user and respective user characteristics of the plurality of other users. The analysis module 1420 may correlate, match, or otherwise compare the inferred user characteristics with respective user characteristics of the plurality of other users to identity the similar users. In various example embodiments, the analysis module 1420 identifies the similar users based on the same or similar demographic data (e.g., same or similar age, marital status, gender, geographic location, etc.), same or similar user characteristics (e.g., same or similar brand purchases), same or similar attribute data, and so on.

[00241] At operation 2140, the analysis module 1420 identifies the commerce item from the attribute data based on the user characteristics of the similar users and the demand indications. For example, the demand indications may indicate a particular item that may not be particularly significant based on the demand indications (e.g., the demand metric may be particularly low for the particular item). However, the analysis module 1420 may identify this particular item based on the user characteristics of the similar users indicating that the particular item may be of significance. In other words, although the demand indications did not show a strong demand for the particular item, the user characteristics of the similar users indicated that the user may have strong demand for the particular item.

[00242] In a specific example, the demand indications may indicate the user has demand for a pair of sunglasses. The demand indications in this example may further indicate the user may be interested in brands X, Y, and Z with a particular emphasis on brand X. The user characteristics of the similar users (e.g., user of the same or similar age, location, gender, other demographic information, or similar purchasing preferences) may indicate that brand Z may be in high demand for the users similar to the user. On that basis, the analysis module 1420 may identify brand Z sunglasses as the commerce item.

[00243] At operation 2150, the order module 1430 determines the order parameters or transaction parameters based on the user characteristics of the similar users. For example, the delivery method may be determined based on the user characteristics of the similar users. For instance, if the similar users

frequently choose a speedy delivery method for a particular item (e.g., new electronics), the order module 1430 may determine a speedy delivery method corresponding to the user purchase for the commerce item that may be the same or similar to the particular item.

[00244] Similarly, the purchase criteria may include dynamically determined criterion based on the user characteristics of the similar users. That is to say, the analysis module 1420 may dynamically generate a portion of the purchase criteria based on the similar users. For example, a default budget for particular categories of items may be determined based on an analysis of the user characteristics of the similar users (e.g., other users with similar demographic information as the user may on average spend a certain amount per category of good).

[00245] At operation 2160, the order module 1430 facilitates the user purchase associated with the commerce item according to the determined order parameters. As discussed above, the order module 1430 facilitates the user purchase in a variety of manners including automatically performing the user purchase on behalf of the user or causing presentation of a notification to the user that includes the option to make the user purchase according to the order parameters.

[00246] FIG. 22 is a flow diagram illustrating further operations to facilitate the purchase based, at least in part, on the demand metric, according to some example embodiments. At operation 2210, the analysis module 1420 calculates the demand metric of the identified item based on the demand indications corresponding to the identified item.

[00247] At operation 2220, the order module 1430 facilitates the user purchase based on the demand metric. For example, if the order module 1430 determines that the demand metric is high (e.g., exceeds a predefined or dynamically determined threshold) then the order module 1430 may facilitate the user purchase with more urgency than for a lower demand metric. For instance, the order module 1430 automatically performs the user purchase for the user based on a high demand metric or more frequently causes presentation to the user of the notification that includes the option to make the user purchase (or with more emphasis such as a more conspicuous notification such as a larger user interface presentation to the user). In some instance, the order module 1430

determines the order parameters based on the demand metric. For instance, if the order module 1430 determines that the demand metric is high, then the order module 1430 may subsequently determine a speedier delivery option for the commerce item.

[00248] FIG. 23 is a flow diagram illustrating further operations to facilitate the purchase using a notification, according to some example embodiments. At operation 2310, the presentation module 210 generates the notification that includes an option to make the user purchase. The notification may include a user interface, a text message (Short Message Service (SMS), Multimedia Messaging Service (MMS), Enhanced Messaging Service (EMS), other messaging modalities), and so on. In some example embodiments, the presentation module 210 may generate the content of the notification based on the commerce item, the user characteristics, the user characteristics of the similar users, the attribute data, and so forth. In various example embodiments, the notification may include the order parameters for the user purchase.

[00249] At operation 2320, the presentation module 210 causes presentation of the generated notification to the user. For example, the presentation module 210 may communicate instructions to present a user interface that includes the notification to a device of the user. In some example embodiments, the presentation module 210 may determine the device of the user to present the notification of the user based on the user characteristics. For example, if the user has a preference for a particular device (e.g., a mobile device of the user), the presentation module 210 may cause presentation of the notification to that device. In further example embodiments, the notification may provide the user the option to specify or modify the order parameters of the user purchase.

[00250] At operation 2330, the presentation module 210 receives a user selection of the option to make the purchase. For example, if the user chooses to make the user purchase, the presentation module 210 may receive the user selection of the option to make the purchase and communicate the selection to the order module 1430 to perform the user purchase.

[00251] At operation 2340, the order module 1430 performs the purchase, according to some example embodiments. For example, the order module 1430 may make the user purchase according the order parameters on behalf of the user.

[00252] FIG. 24 is a flow diagram illustrating further operations for presenting a notification, according to some example embodiments. At operation 2410, the presentation module 210 identifies presentation parameters for presentation of the notification. For example, the presentation module 210 may identify the presentation parameters based on the user characteristics, the user characteristics of the similar users, the attribute data, the demand indications, or other data. The presentation parameters may include a preferred device of the user to present the notification, preferred time of day to present the notification, content preferences (e.g., do not present notifications regarding particular item categories), and so on. In a specific example, the user characteristics may indicate a work time period for the user. In this example, the notification may not be presented to the user during the work time period as the user may not respond. In another example, the analysis module 1420 may identity a device status of a particular user device and, based on the device status, the presentation module 210 may route the notification to another device. For instance, if the device status indicates that the device is inactive (e.g., being charged), the presentation module 210 may cause presentation of the notification to another device (e.g., an active device as determined by device sensors).

[00253] At operation 2420, the presentation module 210 causes presentation of the notification according to the presentation parameters. For instance, the presentation module 210 may cause presentation of the notification to a preferred device of the user at a time of day that the user is likely to respond to the notification as determined based on an analysis of the user characteristics.

[00254] FIG. 25 is a flow diagram illustrating further operations for presenting a notification, according to some example embodiments. At operation 2510, the analysis module 1420 detects a trigger action of the user based on the real-time data included in the attribute data. For example, the analysis module 1420 may determine that the user may be moving into the kitchen (e.g., as determined by a BLUETOOTH® handshake between a mobile device the user may be wearing and a smart appliance located in the user's kitchen), which may be a good time to notify the user regarding food supplies.

[00255] At operation 2520, the presentation module 210 causes presentation of the notification to the user in response to detecting the trigger action. In other words, based on the analysis module 1420 detecting the trigger action of the

user, the presentation module 210 may cause presentation of the notification to the user.

[00256] FIG. 26 is a flow diagram illustrating an example method 2600 showing communication between various devices in relation to presenting a notification to the user, according to some example embodiments. At operation 2610, attribute source 2602 communicates the attribute data to the data mesh system 150. As described above, at the operation 1510, the attribute module 230 may receive the attribute data associated with the user. At the operation 1520, the item module 1410 extracts the demand indications from the attribute data. At the operation 1530, the analysis module 1420 may identify the commerce item from the attribute data based on the demand indications. At the operation 1540, the characteristic module 240 infers the user characteristics from the attribute data.

[00257] In the example method 2600, the order module 1430 facilitates the user purchase by generating the notification at the operation 2620. The presentation module 210 communicates the notification from the data mesh system 150 to the user device 2606. At operation 2630, the user device 2606 may receive the notification and present the notification to the user. Subsequently, the user may select an option to make the user purchase. The user device 2606 may communicate an indication of the user selection to make the user purchase at the operation 2640. At operation 2650, the data mesh system 150 may receive the user selection to make the user purchase. Finally, the order module 1430 may perform the user purchase in response to receiving the user selection to make the user purchase at operation 2660.

[00258] FIG. 27 depicts an example user interface 2700 to facilitate the purchase, according to some example embodiments. It will be noted that alternate presentations of the displays of FIG. 27 may include additional information, graphics, options, and so forth; other presentations may include less information, or may provide abridged information for easy use by the user. Notification 2710 may be text messages, such as Short Message Service (SMS) messages, Multimedia Messaging Service (MMS), Enhanced Messaging Service (EMS), and other messaging modalities, which may be provided to notify the user of the user purchase including the order parameters. In other example embodiments, the notification 2710 may be a push notification or similar type of

notification. Some notifications may be interactive, enabling the user to make a selection through the SMS system, mobile application, or other method. For instance, the user may interact with the notification 2710 using user interface element 2720.

[00259] To help illustrate the concepts described above, FIGS. 28 and 29 illustrate non-limiting examples of identifying the commerce item and facilitating the user purchase associated with the commerce item, according to some example embodiment. Referring now to FIG. 28, a scene 2800 depicts a living room attached to an open kitchen. In the example of FIG. 28, the scene 2800 includes a media entertainment device 2810, a smart television (TV) 2820, a lamp 2830, a mobile computer 2840, a mobile device 2850, a user 2860, a smart refrigerator 2870, and a kitchen display 2880. Each of the devices 2810-2850, 2870, and 2880 may be attribute sources coupled to a network (e.g., the network 104) and operable to communicate with the data mesh system 150. In various example embodiments, the user 2860 is carrying a smart device (e.g., a mobile device, a wearable device, a near field communication (NFC) enabled smart ring) on their person that may provide real-time data corresponding to the user 2860. For instance, the user 2860 may be carrying a mobile device that may provide real-time location data (e.g., as determined by a GPS component, beacon location detect, or other location services). In this way, the analysis module 1420 tracks, monitors, or otherwise observes the location of the user 2860 via a particular device the user is wearing, or the location of the user 2860 may be derived from various real-time data associated with the user's location included in the attribute data (e.g., BLUETOOTH® handshakes between a device the user is wearing and another device with a known or fixed location).

[00260] In an example embodiment, the lamp 2830 is a smart lamp operable to communicate various operating data to the data mesh system 150 or connected to a smart outlet operable to monitor the functionality of the lamp 2830. In this example embodiment, the item module 1410 extracts demand indications from portions of the attribute data corresponding to the lamp 2830. For example, the demand indications may indicate use of the lamp 2830 in a particular way (e.g., the user 2860 may use a low brightness setting on the lamp 2830) or that the light bulb of the lamp 2830 has burned out. The analysis module 1420 identifies the commerce item as a light bulb that needs to be replaced based on the demand

indications (e.g., detected via sensors of the lamp 2830 or derived via data from a smart outlet such as reduced power consumption indicating a burnt-out light bulb). Subsequently, the order module 1430 may notify the user of the burnt-out light bulb with an option to reorder a particular light bulb based on the user characteristics (e.g., purchase history of the user). In some instance, the order module 1430 may automatically reorder the light bulb without notifying the user. In various example embodiments, the order module 1430 automatically performs the user purchase based on the purchase criteria (e.g., for this particular category of goods, simply place an automatic order).

[00261] In another example embodiment, the smart refrigerator 2870 communicates inventory data to the data mesh system 150. For example, the smart refrigerator 2870 may communicate food supply data. In this example embodiment, the item module 1410 extracts demand indications from the food supply data. Subsequently, the analysis module 1420 identifies the commerce item based on the demand indications. For instance, the analysis module 1420 may identify milk as the commerce item based on a low inventory level of milk. The order module 1430 determines a quantity of milk to order based on the user characteristics (e.g., historical purchase data for milk during the current season of the year). The order module 1430 may then generate a notification that includes an option to purchase milk. The order module 1430 causes presentation of the notification based on the user characteristics. For instance, the real-time data included in the attribute data may indicate the user 2860 is currently in the kitchen, which may be a good time to provide the user 2860 the option to reorder milk (the reasoning being that the user 2860 may be able to inspect the food supply first). In a further instance, the order module 1430 may determine that the status of the mobile device 2850 is inactive (e.g., turned off or not in use based on a lack of movement detected from device accelerometers). In this scenario, the order module 1430 may cause presentation of the notification to the user on another device such as display 2880.

[00262] FIG. 29 illustrates an example of identifying an item and facilitating a purchase associated with the identified item, according to some example embodiments. The scene 2900 depicts a city including the user 2910 driving in a car. In this example, the item module 1410 extracts demand indications such as a location of the user 2910 or a route of the user 2910 that

may be indicative of a destination 2950 and thus, the commerce item. In continuing with this example, the analysis module 1420 determines the destination 2950 of the user 2910 from the demand indications or based on, for example, a route 2930 the user 2910 is taking, a time of day, and a day of the year. In other words, the analysis module 1420 may determine the destination 2950 of the user 2910 based on the demand indications and the user characteristics or real-time context data included in the attribute data (e.g., location as determined by a GPS component of a mobile device). In some example embodiments, the analysis module 1420 or the characteristic module 240 determines the real-time location of the user 2910 based on BLUETOOTH® or other close range communication detections within a radius such as radius 2920. For instance, the analysis module 1420 determines that the user 2910 may be at the destination 2950 if the user 2910 is within the radius 2940 of the destination 2950. In this scenario, the destination 2950 may be a coffee shop and the commerce item may be a cup of coffee. In some example embodiments, the order module 1430 automatically places an order for the cup of coffee, or presents a notification with the option to place the order for the coffee, while the user 2910 may be en route. In further example embodiments, the order module 1430 determines the order parameters based on the user characteristics such as past orders for coffee included in a purchase history of the user 2910. In still further example embodiments, the presentation module 210 determines the presentation parameters based on the user 2910 being in the car (e.g., present an audio alert for the option to place the order and receive a vocal command from the user 2910 to place the order).

[00263] Turning now to another example embodiment, FIG. 30 is a block diagram of the augmentation system 280, which may provide functionality to authenticate the identity of the user, identify the user activity, and augment the user activity. The augmentation system 280 may include an authentication module 3010, an activity module 3020, and a settings module 3030.

[00264] The authentication module 3010 in the augmentation system 280 may provide functionality to facilitate authenticating a user's identity. For example, the authentication module 3010 may identify a portion of the attribute data indicative of the identity of the user. Subsequently, the authentication module 3010 may authenticate the identity of the user by analyzing the identified

portion of the attribute data. In further example embodiments, the authentication module 3010 may calculate an identity likelihood metric based on real-time data included in the attribute data. The identity likelihood metric may indicate the likelihood of authenticating the identity of the user (e.g., a higher identity likelihood metric may indicate a strong probability that the user's identity may be authenticated). The authentication module 3010 may analyze a variety of portions of the attribute data using many different schemes and techniques to authenticate the identity of the user.

[00265] The activity module 3020 may provide functionality associated with user activities. For example, the activity module 3020 may identify a user activity being performed by the user based on the attribute data included in the real-time data. In a further example, the activity module 3020 may facilitate augmentation of the identified user activity according to a user setting or user preference. For instance, the user setting may be associated with presenting information to the user (e.g., the user may have a desire to use a larger screen for presenting information if available). In this instance, the activity module 3020 may augment presentation of information to the user based on the user setting.

[00266] The settings module 3030 may provide functionality to access or determine one or more user settings. For example, the settings module 3030 may determine the user setting based on the attribute data and the identified user activity. In some example embodiments, the settings module 3030 may access the user setting from a storage device (e.g., the database(s) 126). In further example embodiments, the settings module 3030 may determine the user setting based on an analysis of the user characteristics, similar users, an augmentation result from augmenting the user activity, and so forth.

[00267] FIG. 31 is a flow diagram illustrating an example method 3100 for authenticating the user and augmenting the user activity, according to some example embodiments. The operations of the method 3100 may be performed by components of the data mesh system 150 and the augmentation system 280. At operation 3110, the attribute module 230 may receive the attribute data associated with the user from a plurality of attribute sources. In various example embodiments, at least a portion of the attribute data may include real-time data or near real-time data. The term "real-time data," as used herein, is intended to include data associated with an event currently happening. For example, the

real-time data may include user input data or sensor data communicated to the attribute module 230 after a delay interval (e.g., due to transmission delay or other delays such as being temporarily stored at an intermediate device) between capturing the data and the attribute module 230 receiving the data.

[00268] As will be discussed in connection with FIGS. 52 and 53, the attribute data may be received from a broad spectrum of attribute sources (e.g., devices, sensors, servers, databases, and other sources). Additionally, the attribute module 230 may receive the attribute data via many pathways resulting from an assortment of configurations of the attribute sources as further discussed in connection with FIGS. 51A and 51B. In an example embodiment, the attribute module 230 may receive the attribute data directly from the attribute sources. In other example embodiments, the attribute module 230 may receive the attribute data from a central device that receives attribute data from a plurality of user devices. In still other example embodiments, various user devices may be communicatively coupled in a decentralized device-to-device mesh, and the attribute module 230 may receive the attribute data corresponding to a particular device in the mesh from any of the devices in the mesh. The attribute module 230 may receive the attribute data from the attribute sources in many other configurations including various suitable combinations of configurations.

[00269] In various example embodiments, the attribute module 230 may store the attribute data in association with the user (e.g., indexed based on a user identifier) for subsequent analysis. The attribute module 230 may store the attribute data in a storage device such as the database(s) 126, for example. The attribute module 230 may access the stored attribute data using a variety of search or find schemes. For instance, the attribute data associated with a particular user may be accessed using a user identifier that corresponds to the particular user. It will be noted that the collective, aggregated attribute data may be referred to as a "data mesh."

[00270] At operation 3120, the authentication module 3010 may identify a portion of the real-time data indicative of an identity of the user. The attribute data including the real-time data may comprise a vast amount of data associated with the user. All or various portions (e.g., segments or pieces) of the real-time data may be indicative of the identity of the user. The authentication module

3010 may identify, extract, parse, or otherwise obtain data from the real-time data that is pertinent, relevant, or otherwise useful in authenticating the identity of the user.

[00271] In an example embodiment, various devices that provide the real-time data to the attribute module 230 may correspond to the user. For instance, one or more user devices (e.g., mobile device, wearable device) may provide at least a portion of the real-time data. The user devices and the real-time data provided by the user devices may be identified via a device identifier such as an Internet Protocol (IP) address, a Media Access Control (MAC) address, other unique identifies, an International Mobile Station Equipment Identity (IMEI), a Mobile Equipment Identifier (MEID), and so forth. In various example embodiments, the authentication module 3010 may identify portions of the real-time data indicative of the identity of the user by matching device identifiers corresponding to the user with respective device identifiers associated with the real-time data. In a specific example, location data (e.g., as determined by a GPS component of a mobile device) may be identified by the authentication module 3010 as indicative of the identity of the user if the location data originated from a device having a device identifier corresponding to the user (e.g., the location data originated from the user's mobile device). To be clear, data that originates from a device corresponding to the user may merely be indicative of the identity of the user rather than identify the user as another user that may be operating the device. The identity of the user may be authenticated with respect to the real-time data in subsequent operations discussed below.

[00272] In various example embodiments, the attribute data and the real-time data may include sensor data. In an example embodiment, the authentication module 3010 may identify portions of the sensor data that may be indicative of the identity of the user. For instance, the sensor data may include biometric data such as a fingerprint scan, vocal sample, electroencephalogram, or retinal scan (refer to FIG. 53 for additional sensor data). In this instance, the authentication module 3010 may identify the biometric data as being indicative of the identity of the user (e.g., matching fingerprints included in the sensor data with fingerprints of the user or matching another sensor signature with a sensor signature of the user). In these particular example embodiments and the following example embodiments, the real-time data need not necessarily have

originated from a device corresponding to the user.

[00273] In further example embodiments, the authentication module 3010 may identify portions of the attribute data indicative of the identity of the user based on various analyses or patterns. For example, a particular device may provide location data (e.g., as determined by a GPS component of a mobile device). The authentication module 3010 may determine that the location data may be indicative of the user identity based on past location data of the user. In a specific example, if the user has, in the past, exhibited a particular pattern of travel or has frequently visited a particular location (e.g., a particular route home, or spent a particular amount of time in certain locations) then the authentication module 3010 may identify the real-time data corresponding to the particular device providing the location data as indicative of the user identity.

[00274] In still further example embodiments, the authentication module 3010 may employ many other analyses to identify the attribute data indicative of the identity of the user. For example, the user may be a member of various websites (e.g., e-commerce websites, social website.). If the user logs into a particular website using a particular device, the authentication module 3010 may identify the particular device and the attribute data received from the particular device as indicative of the user identity.

[00275] At operation 3130, the authentication module 3010 may authenticate the identity of the user with respect to the real-time data by analyzing the identified portion of the real-time data and the attribute data. In some example embodiments, authenticating the identity of the user with respect to the real-time data may establish that the real-time data resulted from an action of the user. For instance, if the authentication module 3010 authenticates the identity of the user with respect to location data included in the real-time data, the location data may indicate the current location of the user. The authentication module 3010 may analyze many different portions of the attribute data using a variety of analysis schemes and techniques to authenticate the identity of the user. The following discussion merely provides non-limiting examples of the authentication module 3010 authenticating the identity of the user based on the attribute data.

[00276] In an example embodiment, the authentication module 3010 may identify a portable device (e.g., mobile device, wearable device) corresponding

to the user from the real-time data, and use the identified portable device as a basis for authenticating the identity of the user with respect to the real-time data. For example, the authentication module 3010 may calculate the identity likelihood metric based on the identified portable device. The identity likelihood metric may indicate the likelihood that the identified portion of the attribute data identifies the user. In a specific example, the user may be operating a computer, carrying a mobile device, and wearing a smart watch. In this example, the attribute module 230 may receive the real-time data from each of the devices. If the authentication module 3010 determines that the mobile device and the smart watch correspond to the user (e.g., by matching respective device identifiers with device identifiers corresponding to the user), then the authentication module 3010 may authenticate the identity of the user with respect to the real-time data received from those devices, the reasoning being that if a person is determined to be carrying one or more devices belonging to the user, the person may be the user (e.g., the identified portable devices implicate or suggest the person may be the user). The more devices of the user that the person may be carrying, the stronger the basis may be that the person is the user.

[00277] In continuing with the above example, the authentication module 3010 may authenticate the identity of the user with respect to the real-time data corresponding to the computer based on the authentication with respect to the mobile device and wearable device. The authentication module 3010 may perform this authentication, for example, based on the location of the computer relative to the location of the portable devices of the user. For example, if the location of the computer is the same or within a short distance (e.g., an arm's length) of the location of the portable devices of the user, the authentication module 3010 may infer that the user is using the computer. The location of the computer may be established based on sensor data included in the real-time data such as near field, BLUETOOTH®, or other interactions between the portable devices and the computer. In other words, the location of a particular portable device may be known based on a GPS component of the particular portable device, and the location of a device in communication with the particular portable device may be inferred based on short-range communications that operate over short distances. Thus, in this example, the authentication module 3010 may authenticate the identity of the user with respect to the real-time data

received from the computer. The above is merely a non-limiting example, and many other techniques may be employed by the authentication module 3010 to authenticate the identity of the user with respect to the real-time data of various devices.

[00278] In further example embodiments, the authentication module 3010 may use other indications of the identity of the user to authenticate the identity of the user with respect to the real-time data. For example, the authentication module 3010 may use sensor data, at least in part, to authenticate the identity of the user. For instance, the sensor data may include biometric data that the authentication module 3010 may use to authenticate the identity of the user. In a specific example, the biometric data may include biometric identification data such as fingerprint scans, vocal samples, retinal scans, facial scans, or electroencephalogram data (see FIG. 53 for additional biometric identification data). The authentication module 3010 may match, correlate, or otherwise determine that the biometric data corresponds to the user to authenticate the identity of the user with respect to the real-time data.

[00279] In still further example embodiments, the authentication module 3010 may use location data to authenticate the identity of the user with respect to the real-time data. For example, the location data (e.g., as determined by a GPS component of a mobile device) may indicate a location pattern that the authentication module 3010 may use to authenticate the identity of the user. In this example, the location pattern may comprise being at a particular location at a particular time or a particular route at a particular time. In a specific example, the location data may indicate a location that may be the home of the user. Given that the location may be the home of the user, it may be probable that the real-time data provided by the mobile device may correspond to the user. Thus, in some example embodiments, the authentication module 3010 may authenticate the identity of the user with respect to the real-time data based on a location corresponding to the real-time data that may be indicative of the user (e.g., a location that may be typically access-restricted for which the user has access such as a home or office).

[00280] In continuing with the discussion of the operation 3130, FIG. 32 is a flow diagram illustrating further example operations of the method 3100 of FIG. 31, according to some example embodiments. As described above,

subsequent to the operation 3120, at the operation 3130, the authentication module 3010 may authenticate the identity of the user by analyzing the identified portion of the real-time data. In addition, at operation 3210, the authentication module 3010 may calculate the identity likelihood metric based on the identified portion of the attribute data. The identity likelihood metric may indicate the likelihood that the identified portion of the attribute data identifies the user (e.g., the probability that the identified portion of the real-time data identifies the user).

[00281] The authentication module 3010 may calculate the identity likelihood metric using a variety of schemes and techniques. In an example embodiment, the authentication module 3010 may weight various portions of the real-time data indicative of the identity of the user. For example, the authentication module 3010 may more heavily weight the real-time data that strongly indicates the identity of the user (e.g., a fingerprint scan that matches a fingerprint scan of the user). Conversely, the authentication module 3010 may weight less heavily the real-time data that does not strongly indicate the identity of the user (e.g., real-time data indicating a user device in a particular location at a particular time may be indicative of the identity of the user but may not as strongly implicate the identity of the user as biometric identification data). In some example embodiments, the authentication module 3010 may use a combination of the real-time data to calculate the identity likelihood metric.

[00282] Subsequent to calculating the identity likelihood metric, at decision 3220, the authentication module 3010 may determine whether the identity likelihood metric exceeds an authentication threshold. In an example embodiment, when the identity likelihood metric exceeds the authentication threshold, the authentication module 3010 may authenticate the identity of the user. Conversely, if the identity likelihood metric does not exceed the threshold, the authentication module 3010 may not authenticate the identity of the user, and no further operations may be performed in method 3100.

[00283] At operation 3230, the authentication module 3010 may authenticate the identity of the user. As discussed above, the authentication module 3010 may use the identity likelihood metric exceeding the authentication threshold as a factor in authenticating the identity of the user with respect to the real-time data. The authentication module 3010 may use the identity likelihood

metric alone or in conjunction with other factors to authenticate the identity of the user. Once the identity of the user is authenticated with respect to the real-time data, subsequent operations of the method 3100 may be performed.

[00284] In further discussing the operation 3130, FIG. 33 is a flow diagram illustrating a further embodiment for authenticating the identity of the user, according to some example embodiments. Subsequent to the operation 3120, at the operation 3130, the authentication module 3010 may authenticate the identity of the user by analyzing the identified portion of the attribute data. In addition, at operation 3310, the authentication module 3010 may derive, extract, or otherwise obtain past identification indications from past attribute data. For example, if the past attribute data includes location data, the authentication module 3010 may extract favorite or frequent locations corresponding to the user.

[00285] At operation 3320, the authentication module 3010 may derive, extract or otherwise obtain real-time identification indications from the real-time data. For instance, the real-time data may include location data. In some example embodiments, the real-time identification indications may be derived. For example, the authentication module 3010 may derive location information based on short-range communications with devices of a known or fixed location.

[00286] At operation 3330, the authentication module 3010 may calculate the identity likelihood metric by correlating, matching, or otherwise comparing the real-time identification indications with the past identification indications. For example, if the real-time data indicates a particular location, the authentication module 3010 may match the particular location with a frequent location of the user to authenticate the identity of the user. Although the discussion of FIG. 33 is mostly directed to location data, the authentication module 3010 may, in a similar manner, use many other types of data included in the attribute data to calculate the identity likelihood metric.

[00287] Referring back to FIG. 31, at operation 3140, the activity module 3020 may identify or infer a user activity being performed by the user based on the real-time data. In other words, the activity module 3020 may identify a user objective (e.g., logging into a website) being advanced by the user based on the real-time data. The user activity may include a wide variety of activities such as, for example, operating a computer (e.g., logging into a website), jogging in the

park, walking toward the refrigerator, and streaming video or other media content. In an example embodiment, the activity module 3020 may identify the user activity based on sensor data and status data received from one or more user devices. The status data may indicate activity associated with a particular device. For example, the user devices may include a mobile device that provides location data and a variety of other user devices that may provide the status data (e.g., a smart TV that indicates current operating status such as streaming a particular piece of media). In this example, the activity module 3020 may infer the user activity by analyzing the location data in conjunction with the status data (e.g., the user may be proximate to the smart TV based on the location data, and the smart TV may indicate that it is streaming a video).

[00288] In another example, the activity module 3020 may infer, extract, or derive the status data for a particular device based on an analysis of sensor data corresponding to the particular device. For example, a mobile device may be equipped with accelerometers that measure motion and provide motion data. If the motion data indicates that the device is not moving, the activity module 3020 may infer that a person may not be carrying the particular device. In this scenario, the activity module 3020 may not infer the user activity based on a device that is not currently being carried by the user. The above examples are merely non-limiting examples of the activity module 3020 identifying or inferring the user activity based on the real-time data. The activity module 3020 may use many other portions of the real-time data in a variety of schemes to identify or infer the user activity.

[00289] At operation 3150, the activity module 3020 may augment, adapt, or otherwise modify the user activity according to a user setting or user preference. In other words, the activity module 3020 may augment an environment of the user based on a user preference to facilitate the user's advancement towards the user objective. The environment of the user is intended to include, for example, user devices within the vicinity of the user. For example, if the user activity includes an authorization task (e.g., logging into a website), the activity module 3020 may augment the user activity by adjusting a security level of the authorization task. In some example embodiments, the activity module 3020 may adjust the security level of the authorization task based on the identity likelihood metric. For example, if the identity likelihood

metric indicates strongly that the identity of the user is authenticated, then the security level may be reduced more than if the identity likelihood metric did not strongly indicate the identity of the user is authenticated. In some example embodiments, adjusting the security level of the authorization task may include automatically performing the authorization task on behalf of the user. For example, if the authentication module 3010 has authenticated the identity of the user and the user activity includes accessing a particular website, then the activity module 3020 may automatically log the user into the particular website.

[00290] In a further specific example, the identified user activity may comprise making a payment (e.g., an electronic payment to an e-commerce website corresponding to an item listing listed on the e-commerce website or a electronic payment to a merchant at a physical store). The activity module 3020 may augment the user activity associated with making a particular payment by facilitating the payment between the user and the payee. For instance, based on the authentication of the identity of the user, the user may not need to provide a security credential or provide fewer security credentials to make the payment.

[00291] To assist in illustrating the above discussion, FIG. 34 depicts communication between a device of the user and the data mesh system 150, according to some example embodiments. In the illustration of FIG. 34, a user 3410 may be wearing one or more smart devices such as a smart watch 3420. The smart watch 3420 may be communicatively coupled to the network 104 via various modalities. For example, the smart watch 3420 may be communicatively coupled to a network interface 3440, which, in turn, is communicatively coupled to the network 104. For instance, the smart watch 3420 may send signals 3430 that are received at the network interface 3440. In another example, the smart watch 3420 may be communicatively coupled to the network 104 without the network interface 3440. In addition, the networked system 102, including the data mesh system 150 and the augmentation system 280, may be communicatively coupled to the network 104.

[00292] Thus, the smart watch 3420 of the user 3410 may be communicatively coupled to the data mesh system 150 including the augmentation system 280. The data mesh system 150, including the augmentation system 280, may receive or access the attribute data corresponding to the smart watch 3420 via the network 104. Similarly, the data mesh system

150, including the augmentation system 280, may communicate or exchange data with the smart watch 3420 to facilitate augmentation of the user activity such as communicating instructions to present a user interface. Although the example of FIG. 34 depicts an example smart watch 3420, it will be appreciated that a wide variety of other devices may similarly be configured to interact with the data mesh system 150.

[00293] FIGS. 35-38 are flow diagrams illustrating further example operations of the method 3100 of FIG. 31, according to some example embodiments. Subsequent to the operation 3140, at the operation 3150, the activity module 3020 may augment the user activity according to the user setting. Each of the flow diagrams of FIGS. 35-38 illustrates additional operations of the operation 3150. The additional operations of the operation 3150 include various example embodiments of augmenting the user activity according to the user setting. The following discussion merely describes non-limiting examples, and many other schemes and techniques may be employed by the augmentation system 280 to augment the user activity using the user setting.

[00294] In the flow diagram of FIG. 35, subsequent to the operation 3140, the settings module 3030 may determine the user setting based on the attribute data and the user activity at operation 3510. For example, the settings module 3030 may store a plurality of user settings in a storage device such as the database(s) 126. Subsequent to determining the user activity, the settings module 3030 may determine the user setting associated with or pertaining to the user activity. For instance, the user activity may include the user streaming a movie to a particular user device. Based on the activity module 3020 identifying the activity of streaming the movie, the settings module 3030 may determine the user setting associated with augmenting the user activity of streaming the movie such as, for example, automatically pausing the streaming when the user leaves a vicinity of the particular user device presenting the movie to the user.

[00295] At operation 3520, the activity module 3020 may augment the user activity according to the determined user setting. In continuing with the example above, the user activity may include streaming the movie. The activity module 3020 may augment the user activity according to the determined user setting. For example, the activity module 3020 may automatically pause or otherwise halt the movie based on a trigger (e.g., the user leaving the vicinity or answering

a phone call), present the streaming movie to another display based on the user setting and a location of the user, and so on. Although the above discussion is directed to streaming the movie, the activity module 3020 may augment the user activity that includes many other activities and based on many different types or kinds of user settings.

[00296] In the flow diagram of FIG. 36, subsequent to the operation 3140, the characteristic module 240 may infer or measure directly user characteristics based on an analysis of at least a portion of the attribute data at operation 3610. As discussed above in connection with operation 610, the characteristic module 240 can infer a variety of user characteristics from the attribute data using a variety of data. It will be understood that the discussion of operation 610 regarding the characteristic module 240 applies equally to operation 3610.

[00297] At operation 3620, the settings module 3030 may determine the user setting based on the inferred user characteristics and the user activity. For example, the inferred user characteristics may indicate the user has an affinity to view user interfaces on a largest screen available. In this example, the settings module 3030 may determine that the user setting includes presenting user interfaces to the largest screen available.

[00298] In further example embodiments, the settings module 3030 may identify similar users to the user based on the attribute data or the user characteristics. For instance, the settings module 3030 may identify users associated with the same or similar demographic data as that of the user. In an example embodiment, the settings module 3030 may determine the user setting based on attribute data or characteristics corresponding to the similar users. For example, the settings module 3030 may access the user characteristics corresponding to other users and correlate, match, or otherwise compare the user characteristics of the user with the user characteristics of other users to identify the similar users.

[00299] At operation 3630, the activity module 3020 may augment the user activity according to the determined user setting. For example, if the user is viewing a particular user interface on a mobile device and the user is within a distance of a larger screen, such as a computer or smart TV, the activity module 3020 may augment the user activity by presenting the particular user interface on the larger screen.

[00300] In the flow diagram of FIG. 37, subsequent to the operation 3140, the activity module 3020 may determine that the user activity includes a presentation of a user interface to the user at operation 3710. For example, the presentation of the user interface may include the user viewing a movie, using a website, or reading an email. The activity module 3020 may determine that the user activity includes the presentation of the user interface based on the real-time data. For instance, the status data of a particular device of the user may indicate that the particular device may be presenting the user interface to the user.

[00301] At operation 3720, the activity module 3020 may identify presentation devices available to the user based on the attribute data that are capable of presenting the user interface to the user. For instance, the user may be in a room that includes several user devices such as a smart TV, a laptop computer, and a mobile device. The activity module 3020 may identify these devices based on the real-time data. For example, if the smart TV is active and connected to a network, the activity module 3020 may query the smart TV to determine whether it may be capable of presenting the user interface.

[00302] At operation 3730, the activity module 3020 may determine an alternate presentation device from among the identified presentation devices based on the user setting. The activity module 3020 may determine the alternate presentation device based on a number of factors. For example, the user setting may indicate the user has an affinity to view a larger screen when available. Based on this user setting, the activity module 3020 may identify a presentation device with a larger display. In another example, the activity module 3020 may determine that the alternate presentation device should be within a close vicinity of the user. For example, a particular presentation device that is out of view of the user may not be the best choice for the alternate presentation device. The activity module 3020 may make this determination based on location data included in the real-time data. In still another example, the activity module 3020 may identity a presentation device that is portable. For example, the activity module 3020 may determine that the user is viewing a movie and that the user is leaving the vicinity, and may determine that a portable device to continue playing the movie is a desirable choice for the alternate presentation device.

[00303] At operation 3740, the activity module 3020 may cause presentation of the user interface to the user with the alternate presentation

device. In a specific example, the user may be viewing a live sporting event on a smart TV. When the user leaves the vicinity of the smart TV, the activity module 3020 may cause presentation of the live sporting event to the alternate presentation device such as another smart TV that is viewable to the user or a portable device of the user to allow the user to continue view the live sporting event despite being out of view of the initial presentation device.

[00304] In the flow diagram of FIG. 38, subsequent to the operation 3140, the activity module 3020 or the characteristic module 240 may determine a current location of the user based on the real-time data at operation 3810. For example, the real-time data may include location data as determined by a GPS component of a mobile device, near-field beacon detections, and other location services.

[00305] At operation 3820, the activity module 3020 or the characteristic module 240 may access device location data included in the attribute data that includes the real-time data. Similar to the operation 3810, the activity module 3020 may access, receive, or otherwise obtain the device location data based on GPS, near-field beacon detections, and other location services. Although FIG. 38 illustrates performing the operation 3810 prior to operation 3820, in alternative example embodiments, the operation 3810 may be performed concurrently or after the operation 3820. For instance, the current location of the user and the device location data may be received, accessed, retrieved, derived, or otherwise obtained by the activity module 3020 at the same time in any order and the subsequent operations illustrated in FIG. 38 performed.

[00306] At operation 3830, the activity module 3020 may identify user devices within an operation distance of the user based on the current location of the user and the device location data. The operation distance may be configurable or dynamically determined. In some example embodiments, the operation distance may vary from device to device. For example, the operation distance corresponding to a smart TV may be a reasonable distance such that the user may view the smart TV. In other examples, the operation distance corresponding to a mobile device may be a reasonable distance (e.g., arm's length) such that the user may touch the mobile device.

[00307] At operation 3840, the activity module 3020 may augment the operation of the identified user devices according to the user setting. In some

example embodiments, the activity module 3020 may augment the operation of the identified user device according to the user setting and the user activity. For example, if the user activity includes the user moving into a smart kitchen, the user activity module 3020 may augment the operation of various user devices according to the user setting based on moving into the smart kitchen. For instance, relevant notifications may be pushed to a mobile device of the user based on the user moving into or being in the smart kitchen (e.g., a notification regarding the status of a smart kitchen appliance). In another instance, the activity module 3020 may cause the smart appliance of the smart kitchen to perform a task on behalf of the user automatically based on the user moving into the smart kitchen (e.g., automatically brew a cup of coffee).

[00308] To help illustrate the concepts described above, FIG. 39 illustrates non-limiting examples of augmenting the user activity, according to some example embodiment. A scene 3900 depicts a living room attached to an open kitchen. The scene 3900 may include a media entertainment device 3910, a smart TV 3920, a lamp 3930, a mobile computer 3940, a mobile device 3950, a user 3960, a smart refrigerator 3970, and a kitchen display 3980. Each of the devices 3910-3950, 3970, and 3980 may be attribute sources coupled to a network (e.g., the network 104) and operable to communicate with the data mesh system 150. In various example embodiments, the real-time data may include location data corresponding to the user. For instance, the user 3960 may be carrying a mobile device or another smart device (e.g., smart watch, NFC enable smart ring) that may provide real-time location data (e.g., as determined by a GPS component, beacon location detect, or other location services). In this way, the location of the user 3960 may be tracked, monitored, or observed via a particular device the user 3960 is wearing, or the location of the user 3960 may be derived from various real-time data associated with the user's location included in the attribute data (e.g., BLUETOOTH® handshakes between a device the user 3960 is wearing and a another device with a known or fixed location). The activity module 3020 may infer the user activity based on the real-time data and augment the user activity based on the user setting.

[00309] In an example embodiment, the activity module 3020 may determine that the user 3960 may be streaming media content to the smart TV 3920 and may be moving away from the smart TV 3920 towards the kitchen. In

this example, the activity module 3020 may identify the mobile computer 3940 and the display 3980 as alternate presentation devices. The activity module 3020 may further determine that the kitchen display 3980 may be a desirable alternate presentation device as it may be within viewing distance of the user 3960. The activity module 3020 may then augment the activity of the user 3960 by presenting the streaming media content on the kitchen display 3980 and halting the presentation to the smart TV 3920. In further example embodiments, the activity module 3020 may further determine that the user 3960 has opened the smart refrigerator 3970 and may pause the streaming of the media content while the user 3960 may be using the smart refrigerator 3970.

[00310] In another example embodiment, the authentication module 3010 may authentication the identity of the user 3960 by detecting a mobile device or wearable device the user 3960 may be carrying in proximity to the kitchen display 3980 (e.g., detected from the attribute data that may include a data feed from the mobile device, the wearable device, and the kitchen display 3980). Subsequently, the activity module 3020 may detect that the user 3960 is walking within an operating distance (e.g., a reasonable distance such as a distance that would place the user 3960 within the same room as a particular device) of a particular user device such as the kitchen display 3980. The activity module 3020 may detect the user 3960 within the operating distance of the kitchen display 3980 via a GPS component of a mobile device the user 3960 may be carrying, short range communication detections (e.g., BLUETOOTH® or near-field communication handshakes between the mobile device of the user 3960 and the kitchen display 3980), and so on.

[00311] The activity module 3020 may then present a personalized message to the user 3960 on the kitchen display 3980 that may be pertinent or relevant to the user 3960 with respect to the context or environment of the user 3960 as determined by the settings module 3030 via an analysis of the attribute data (e.g., the attribute data may include calendar information corresponding to the user 3960 or food inventory information as provided by the smart refrigerator 3970). For instance, the personalized message may be a reminder regarding an upcoming appointment or a reminder to purchase a particular product the user 3960 may be running low on. For a particular user other than the user 3960, the activity module 3020 may present a different personalized message or perform a

different augmentation of the user activity. Thus, in this example, the augmentation system 280 has received the attribute data associated with the user (e.g., the user 3960), authenticated the identity of the user with respect to the real-time data (e.g., by detecting a portable device corresponding to the user 3960), identified the user activity (e.g., walking near the kitchen display 3980), and augmented the activity of the user according to the user setting (e.g., presenting the personalized message to the user 3960 on the kitchen display 3980).

[00312] In yet another example embodiment, the activity module 3020 may detect the user may be in a vicinity of the lamp 3930 (e.g., the user 3960 is in the same room as the lamp 3930) via location tracking of the user 3960 (e.g., a wearable device on the user's person). In response to the activity module 3020 detecting the user 3960 near the lamp 3930, the activity module 3020 may augment the environment of the user 3960 by switching on the lamp 3930 or changing a brightness of the lamp 3930 (e.g., the lamp 3930 may be a smart lamp operable to execute various commands, or the lamp 3930 may be coupled to a smart outlet operable to control various functions of the lamp 3930). The activity module 3020 may adjust the operation of the lamp 3930 according to the user setting corresponding to the lamp 3930 as determined by the settings module 3030 (e.g., adjusting the brightness of the lamp 3930 according to historical brightness of the lamp 3930 corresponding to the user 3960).

[00313] FIG. 40 depicts an example user interface to facilitate augmentation of a user activity, according to another embodiment. In example embodiments, the activity module 3020 may identify the user activity, such as the user moving into a particular location (e.g., the kitchen). In some embodiments, the activity module 3020 may augment the activity of the user by presenting a user interface to the user. An example mobile device 4000 displaying an example notification 4010 is shown. The activity module 3020 may present notifications, such as the notification 4010, to the user that are relevant within the context of the user activity. For instance, if the user has just entered the kitchen, it may be a good time to provide the user with information relevant to the kitchen, such as kitchen supplies. In an example embodiment, the attribute data may include data received from a smart refrigerator (e.g., smart refrigerator 3970) indicating a food supply. The activity module 3020 may augment the activity of the user by

presenting a notification 4010 to the user regarding the food supply. In this example embodiment, the user may interact with the notification 4010 using user interface elements 4020 (e.g., place an order for the item or dismiss the notification).

[00314] FIG. 41 is a flow diagram 4100 illustrating various communications to facilitate the method of FIG. 31, according to example embodiments. At operation 4110, attribute source 4102 may communicate attribute data to the data mesh system 150. As described above with reference to FIG. 31, the data mesh system 150 may receive the attribute data at operation 3110, authenticate the identity of the user at the operation 3130, identify the user activity at operation 3140, and augment the user activity at the operation 3150.

[00315] The data mesh system 150 may augment the user activity by communicating with a user device 4106. At operation 4120, the user device 4106 may facilitate augmentation of the user activity. For instance, the data mesh system 150 may communicate instructions to the user device 4106 to present a particular user interface (e.g., a notification), and the user device 4106 may present the user interface in response.

[00316] At operation 4130, the user device 4106 may communicate data associated with a user action responsive to the user activity. The data associated with the user action responsive to the augmentation of the user activity may indicate whether the augmentation is desired by the user. For instance, if the augmentation included presenting a notification to the user and the user dismisses the notification, then the settings module 3030 may use that as a basis for determining the user setting in subsequent analysis.

[00317] Similarly, at operation 4140, the attribute source 4102 may communicate attribute data associated with the user action responsive to the augmentation of the user activity. For instance, the data mesh system 150 may request, retrieve, or otherwise obtain the attribute data associate with the user action from the attribute source 4102 responsive to the augmentation of the user. The attribute source 4102 may communicate the attribute data that indicates whether the augmentation was desired by the user.

[00318] At operation 4150, the settings module 3030 may infer an augmentation result from the data received from the user device 4106 and the attribute source 4102. The settings module 3030 or characteristic module 240

may identify a user action of the user based on the real-time data, the user action being in response to the augmented user activity or environment. For instance, the user action may include dismissing a notification or interacting with a user interface. The augmentation result may indicate whether the augmentation was desired by the user. For instance, the attribute data may include engagement data that indicates the user's engagement in a particular activity, such as clicking on user interface elements. The settings module 3030 may infer the augmentation result based on the engagement data or other data. In further example embodiments, the activity module 3020 may store the augmentation result in a storage device such as the databases 126 to be used subsequently to determine the user setting. Thus, the settings module 3030 may evolve the user settings to better fit the user over time as more data associated with augmentations is received.

[00319] Turning now to another example embodiment, FIG. 42 is a block diagram of the visualization system 290, which may provide functionality to analyze the attribute data and generate a visualization based on the attribute data. The visualization system 290 may include an analysis module 4210, a commerce module 4220, and a visualization module 4230.

[00320] The analysis module 4210 in the visualization system 290 may perform various analyses to facilitate the functionality described herein. For example, the analysis module 4210 may determine satisfaction of a reward criteria associated with the attribute data. In this example, the reward criteria may include a fitness goal and the analysis module 4210 may determine whether the user has satisfied the fitness goal based on an analysis of the attribute data. Many other rewards and analyses may be performed by the analysis module 4210.

[00321] The commerce module 4220 may identify items from an e-commerce platform (e.g., the publication system 142). The items (e.g., item listings on an e-commerce website) are intended to include products, services, activities, and the like. The commerce module 4220 may also retrieve item data associated with the identified items such as item price, seller, item location, seller location, item images, item description, and so on. In some example embodiments, the commerce module 4220 may facilitate the purchase, by the user, of the identified items.

[00322] The visualization module 4230 may generate a visualization based, at least in part, on the attribute data. The visualization may be representative of the attribute data. For example, the visualization module 4230 may generate an avatar that is representative of the attribute data. For example, the attribute data may indicate demographic data corresponding to the user such as gender, age, height, and so on. The visualization module 4230 may generate the avatar based on the demographic data such as an avatar of the same gender and similar age, height, and so forth. The presentation module 210 may subsequently cause presentation of the generated visualization to the user.

[00323] FIG. 43 is a flow diagram illustrating an example method 4300 for generating the visualization, according to some example embodiments. The operations of the method 4300 may be performed by components of the data mesh system 150 and the visualization system 290. At operation 4310, the attribute module 230 may receive the attribute data associated with the user from a plurality of attribute sources. As will be discussed in connection with FIGS. 52 and 53, the attribute data may be received from a broad spectrum of attribute sources (e.g., devices, sensors, servers, databases, and other sources). Additionally, the attribute module 230 may receive the attribute data via many pathways resulting from an assortment of configurations of the attribute sources as further discussed in connection with FIGS. 51A and 51B. In an example embodiment, the attribute module 230 may receive the attribute data directly from the attribute sources. In other example embodiments, the attribute module 230 may receive the attribute data from a central device that receives attribute data from a plurality of user devices. In still other example embodiments, various user devices may be communicatively coupled in a decentralized device-to-device mesh, and the attribute module 230 may receive the attribute data corresponding to a particular device in the mesh from any of the devices in the mesh. The attribute module 230 may receive the attribute data from the attribute sources in many other configurations including various suitable combinations of configurations.

[00324] In various example embodiments, the attribute module 230 may store the attribute data in association with the user (e.g., indexed based on a user identifier) for subsequent analysis. The attribute module 230 may store the attribute data in a storage device such as the database(s) 126, for example. The

attribute module 230 may access the stored attribute data using a variety of search or find schemes. For instance, the attribute data associated with a particular user may be accessed using a user identifier that corresponds to the particular user. It will be noted that the collective, aggregated attribute data may be referred to as a "data mesh."

[00325] In various example embodiments, at least a portion of the attribute data may include real-time data or near real-time data. The term "real-time data," as used herein, is intended to include data associated with an event currently happening. For example, the real-time data may include user input data or sensor data communicated to the attribute module 230 after a delay interval (e.g., due to transmission delay or other delays such as being temporarily stored at an intermediate device) between capturing the data and the attribute module 230 receiving the data.

[00326] At operation 4320, the characteristic module 240 may infer or measure directly a user characteristic or multiple user characteristics based on an analysis of at least a portion of the attribute data. As discussed above in connection with operation 610, the characteristic module 240 can infer a variety of user characteristics from the attribute data using a variety of data. It will be understood that the discussion of operation 610 regarding the characteristic module 240 applies equally to operation 4320.

[00327] In a specific example, the characteristic module 240 may infer the user's physical dimensions based on the attribute data that may include purchase history. For instance, the characteristic module 240 may use demographic information such as age, gender, or location to filter clothing purchases included in the purchase history (e.g., filtering to identify clothing purchase intended for the user). Based on the filtered clothing purchase history, the characteristic module 240 may identify the user's physical dimensions based on the garment sizes of the clothing purchases. In another specific example, the characteristic module 240 may infer the user's fitness level based on fitness tracking software included in a mobile device of the user. Thus, in these specific examples, the characteristic module 240 may infer various physical characteristics or traits of the user based on the attribute data.

[00328] At operation 4330, the visualization module 4230 may generate a visualization based, at least in part, on the user characteristic. In some cases, the

term "visualization" as used herein is intended to include visual and non-visual components of a presentation (e.g., an animation including audio cued to the animation). The term "visualization" is also intended to include static images, animations, and other forms of visual presentation.

[00329] In an example embodiment, the visualization may comprise a chart or graph that may indicate a metric associated with the attribute data. For instance, the metric associated with the attribute data may be a completeness metric that indicates completeness of the attribute data associated with the user. That is to say, the completeness metric may indicate a quantity of attribute data versus a goal quantity of attribute data or attainable quantity of attribute data (e.g., the completeness metric may indicate a quantity of the attribute data associated with the user is sixty percent of the way to a goal quantity of attribute data).

[00330] In another example embodiment, the visualization may comprise an avatar that is representative of the user. For example, the avatar may be a person-like animation or image that may be intended to represent the user. The avatar does not necessarily need to resemble the user's physical qualities or personality traits. However, in some example embodiments, the avatar may be intended to include qualities or traits that are similar or the same as qualities or traits of the user. In other words, the avatar may be visually analogous to the user. The visualization module 4230 may determine an avatar trait based, at least in part, on the inferred user characteristic and include the avatar trait when generating the avatar. In some example embodiments, the user characteristic may comprise a physical characteristic of the user, and the avatar trait may comprise a representation of the physical characteristic. For example, the characteristic module 240 may infer various user characteristics such as physical dimensions of the user, demographic information, personality traits and the like. In this example, the physical dimensions may indicate a person who may be six feet tall, the demographic information may indicate a gender of female and an age of twenty two, and the personality traits may indicate an outlandish tendency. As such, the avatar in this example may resemble a six foot tall woman and may include apparel that is congruent with having an outlandish tendency. Thus, the avatar may visually exemplify various characteristics of the user.

[00331] In various example embodiments, the visualization module 4230 may employ a variety of schemes and techniques to determine an avatar trait based, at least in part, on the inferred user characteristic. In an example embodiment, the analysis module 4210 may identify similar users that are similar to the user based on a variety of factors. In some example embodiments, the analysis module 4210 may access the attribute data or stored user characteristics corresponding to a plurality of other users. For example, the analysis module 4210 may identity the similar users from among the plurality of other users that are similar to the user based on the inferred users characteristics of the user and respective user characteristics of the plurality of other users. The analysis module 4210 may correlate, match, or otherwise compare the inferred user characteristics with respective user characteristics of the plurality of other users to identity the similar users. In various example embodiments, the analysis module 4210 may identify the similar users based on same or similar demographic data (e.g., same or similar age, gender, location, etc.), same or similar user characteristics (e.g., same or similar brand purchases), same or similar attribute data, and so on. For instance, the analysis module 4210 may correlate the inferred user characteristics with respective user characteristics of other user to identify the similar users.

[00332] Subsequent to the analysis module 4210 identifying the similar users, the visualization module 4230 may extract common characteristics from among the identified similar users. The visualization module 4230 may generate the visualization based on the extracted common characteristics. In the example above, the analysis module 4210 may identify particular similar users that are associated with being outlandish. Continuing with this example, the visualization module 4230 may extract the common characteristics (e.g., a particular style of clothing or brand) from among the identified plurality of users. For instance, the common characteristic may be wearing a particular clothing color, style, brand, and so on. The visualization module 4230 may generate or render the avatar to include a particular avatar trait that corresponds to the common characteristic (e.g., wearing a particular clothing brand).

[00333] In further example embodiments, the visualization module 4230 may apply weighting the inferred user characteristics and the extracted common characteristics in various schemes to generate the visualization based on the

inferred user characteristics or the extracted common characteristics. For example, a particular user characteristic that may be inferred from particular attribute data that correspond to a time further in the past may be weighted less heavily than a particular user characteristics interred from particular attribute data that is more recent, the reasoning being that more recent data may be more relevant or pertinent to the objective of generating the visualization in a manner that accurately reflects the user or the attribute data. The visualization module 4230 may apply weighting using many other schemes, and the above is merely a non-limiting example.

[00334] In still further example embodiments, the visualization module 4230 may generate the visualization based, at least in part, on the real-time data included in the attribute data. For example, the characteristic module 240 may infer the user characteristics based, at least in part, on the real-time data, and the visualization module 4230 may generate the visualization based on the user characteristics inferred from the real-time data. Thus, the visualization may be reflective of a current status of the user. In a specific example, the characteristic module 240 may infer that the user may currently be jogging vigorously at a park. The visualization module 4230 may, for example, generate the visualization, such as the avatar, to include a feature of perspiration indicative of the user currently performing a vigorous physical activity. Thus, the visualization may be representative of a real-time status of the user. In a further example, the characteristic module 240 may infer an outfit the user is currently wearing (e.g., inferred from attribute data that may include detections from smart tags embedded into the user's clothing) and the visualization module 4230 may generate the avatar to include a representation of the inferred outfit.

[00335] At operation 4340, the presentation module 210 may cause presentation of the visualization to the user. For example, the visualization may comprise an avatar and the presentation may be displaying the avatar on a screen. The presentation module 210 causing presentation of the visualization may include communicating the visualization, or instructions to present the visualization, to a device of the user operable to present the visualization to the user. In further example embodiments, the presentation module 210 may cause the presentation of the visualization to other users. For instance, the user may be associated with a profile, and viewers of the user's profile may also view the

visualization. In other example embodiments, the user may be associated with contact users that have a connection with the user such as a social media-based relationship. In this example embodiment, the visualization may be presented to the contact users.

[00336] FIG. 44 is a flow diagram illustrating further example operations 4400 of the example method 4300 of FIG. 43, according to some example embodiments. Subsequent to the operation 4340, at operation 4410, the presentation module 210 may receive user input indicating a change to the visualization. For example, the user input may indicate that the visualization is based on user characteristics or attribute data that is not reflective of the user. In this example, the visualization may be an avatar, and the physical characteristics of the avatar may not be reflective of the user (e.g., the avatar is too short as compared to the user).

[00337] At the operation 4420, the visualization module 4230 may update the visualization according to the change indicated by the user input. In the example above, if the user input indicated that the avatar was too short, the visualization module 4230 may generate or render the avatar with a taller height.

[00338] In further example embodiments, the attribute module 230 may update or modify the attribute data according to the user input. For instance, if the user input indicates demographic data (e.g., age) other than that currently associated with the user, the attribute module 230 may update the demographic information according to the user input.

[00339] In still further example embodiments, the characteristic module 240 may infer the user characteristics based on an analysis of the attribute data and the user input. For instance, if the user input indicates a particular clothing style, color, brand, and so forth, the characteristic module 240 may use that user input as a basis for inferring the user characteristics in conjunction with the attribute data.

[00340] FIG. 45 is a flow diagram illustrating an example method 4500 for determining satisfaction of a reward criteria and providing a reward to the user according to some example embodiments. The operations of the method 4500 may be performed by components of the data mesh system 150 and the visualization system 290. At operation 4510, the analysis module 4210 may determine satisfaction of the reward criteria associated with the attribute data.

The reward criteria may include a variety of criteria.

[00341] In an example embodiment, the reward criteria may include a criterion based on the completeness metric. In an example embodiment, the analysis module 4210 may determine the completeness metric based on an analysis of the attribute data. The completeness metric may indicate a quantity of attribute data available to the data mesh system 150. In some example embodiments, the completeness metric may indicate the quantity of attribute data in comparison to a goal quantity of attribute data or attainable quantity of attribute data (e.g., the completeness metric may indicate a quantity of the attribute data associated with the user is sixty percent of the way to a goal quantity of attribute data). For instance, the user may have provided the attribute data, permission to access portions of the attribute data, or consent to access portions of the attribute data via the management module 250 (e.g., the user may have provided permission to the management module 250 to allow the attribute module 230 to access mobile sensor data but not social networking data). In this instance, the completeness metric may indicate that portions of the attribute data may not be available to the attribute module 230. The analysis module 4210 may determine satisfaction of the criterion based on the completeness metric if the completeness metric exceeds a threshold. The threshold may be predefined or dynamically determined by the analysis module 4210 based on various statistical analyses.

[00342] In a further example embodiment, the completeness metric may be associated with a specified type of attribute data. In this further example embodiment, the analysis module 4210 may determine the criterion based on the completeness metric being satisfied if the user provides the specified type of attribute data or permission to access the specified type of attribute data.

[00343] In another example embodiment, the reward criteria may include a criterion based on a quality metric. In this example embodiment, the analysis module 4210 may determine the quality metric based on an analysis of the attribute data. The quality metric may indicate a relevance or pertinence of the attribute data. For instance, older attribute data may be less relevant than newer attribute data. In an example embodiment, the quality metric may be higher for new attribute data and lower for older attribute data. Thus, a particular user associated with attribute data that is constantly updated may be associated with a

higher quality metric. The analysis module 4210 may determine satisfaction of the reward criteria that includes the criterion based on the quality metric exceeding a threshold. That is to say, the analysis module 4210 may determine satisfaction of the reward criteria that includes a particular criterion based on the quality metric by providing recent data, for example. The threshold may be predefined or dynamically determined by the analysis module 4210 based on various statistical analyses.

[00344] In yet another example embodiment, the reward criteria may include a criterion associated with completing a task. For instance, the task may include the user recommending or communicating (e.g., email, text message) to other users regarding a product or application. The presentation module 210 may facilitate the user in performing the task (e.g., automatically determining available contact that may be contacted and providing a predetermined message that may be sent via a user interface provided by the presentation module 210). In other instances, the task may include a specified goal. In this instance, the goal may, for example, be a fitness goal such as a number of steps taken in a day (e.g., as determined a pedometer app executing on a mobile device of the user). Continuing with this instance, the analysis module 4210 may determine satisfaction of the reward criteria including a criterion based on a number of steps taken if the user exceeds a threshold number of steps.

[00345] In further example embodiments, the analysis module 4210 may determine satisfaction of the reward criteria including various criteria (e.g., criterion based on the completeness metric or the quality metric) by comparing metrics associated with the user to other users. As described above, the analysis module 4210 may identify the similar users that are similar to the user based on a variety of factors. The analysis module 4210 may determine satisfaction of the reward criteria by comparing the various metrics associated with the user to the various metrics associated with the similar users. In a specific example, the similar users may include users that may have the same or similar demographic data (e.g., age, gender, location). Among these similar users, the analysis module 4210 may determine an average completeness metric or another statistic-based value. The analysis module 4210 may compare the completeness metric of the user to the average completeness metric or another statistic-based value to determine satisfaction of a particular criterion associated with the completeness

metric of the user (e.g., the user may satisfy the reward criteria by being above average as compared to similar users). Similarly, the analysis module 4210 may compare a fitness goal of a user to the similar users that may be of a similar fitness level to the user. The analysis module 4210 may employ many other comparisons of the similar users or other users to determine satisfaction of the reward criteria. Thus, in some example embodiments, the analysis module 4210 may determine satisfaction of the reward criteria based on the attribute data associated with the identified similar users.

[00346] At the operation 4520, the analysis module 4210 may provide a reward to the user based on the determined satisfaction of the reward criteria. The reward may include additional visualization features or functions. For instance, the reward may include providing the user the ability to further customize the visualization (e.g., modify apparel of the avatar). In another instance, the reward may provide the user with additional features such as the ability to share the visualization with other users. The reward may include many other features and functions related to the visualization.

[00347] In further example embodiments, the reward may include a coupon, deal, or other incentive. The reward may incentivize the user to provide consent, permission, or access to additional attribute data, provide higher quality, more relevant attribute data, complete various marketing tasks, complete various goals (e.g., a fitness goal), and so forth.

[00348] FIG. 46 is a flow diagram illustrating additional operations of the method 4300 according to some example embodiments. Subsequent to the operation 4320, at the operation 4330 the visualization module 4230 may generate the visualization based at least in part on the user characteristics. In addition, at operation 4610, the commerce module 4220 may identify an item listing based on the user characteristics. For instance, the user characteristics may indicate the user's preferences for clothing, electronics, and so on. Further, the attribute data may include purchase history data that the commerce module 4220 may use to determine products already owned by the user. By analyzing this information, the commerce module 4220 may identify an item listing of interest to the user (e.g., an item listing on an e-commerce website). The commerce module 4220 may employ a variety of schemes and techniques using the user characteristics and the attribute data to identify the item listing.

[00349] At the operation 4620, the visualization module 4230 may generate the visualization including the identified item associated with the identified item listing. For example, the visualization generated by the visualization module 4230 may include the avatar that may be representative of the user. In this example, the visualization module 4230 may generate the avatar to include the avatar wearing or using a suitable item associated with the identified item listing. The commerce module 4220 may access item data associated with the identified item associated with the identified item listing. For example, the commerce module 4220 may access the item data that may include images of the item, physical dimensions of the item (e.g., garment sizes), and so forth. Based on the item data, the visualization module 4230 may generate the visualization to include a representation of the identified item. The representation may be similar to the item in that it may include similar characteristics to the identified item. For example, the identified item may be a particular piece of apparel. In this example, the visualization module 4230 may render a representation of the piece of apparel that is of the same or similar dimensions, color, pattern, and so forth.

[00350] In further example embodiments, the item associated with the identified item listing may be highlighted or otherwise emphasized in the rendering of the avatar. In some example embodiments, the user may interact with the generated item rendering associated with the identified item listing included in the avatar (e.g., interacting with the item may cause recommendation for sale of the item listing).

[00351] FIG. 47 is a flow diagram illustrating an example method 4700 for generating the visualization based on the attribute data according to some example embodiments. The operations of the method 4700 may be performed by components of the data mesh system 150 and the visualization system 290. In an example, embodiment, at operation 4710, attribute source 4702 may communicate the attribute data to the attribute source 4704. At the operation 4715, the attribute source 4704 may receive the attribute data from the attribute source 4702. At operation 4720, the attribute source 4704 may communicate the attribute data to the data mesh system 150. As discussed above in connection with FIG. 43, at the operation 4310, the data mesh system 150 may receive the attribute data from the attribute source 4704. In this example embodiment, the

attribute data may be exchanged between the attribute source 4702 and the attribute source 4704. In this way, the data mesh system 150 may access various attribute data corresponding to a particular attribute source without directly communicating with the particular attribute source.

[00352] As discussed above in connection with FIG. 43, at the operation 4320, the characteristic module 240 may infer a user characteristic. At the operation 4330, the visualization module 4230 may generate the visualization based, at least in part, on the user characteristic. At the operation 4340, the presentation module 210 may cause presentation of the visualization to the user. The presentation module 210 may cause presentation of the visualization by communicating the visualization to the user device 4706. At operation 4725, the user device 4706 may present the visualization to the user. For example, the user device 4706 may be a mobile device of the user, and the presentation may be displaying the visualization on a screen of the mobile device. Subsequent to presenting the visualization to the user, at operation 4730, the user device 4706 may receive user input from the user. In some example embodiments, the user input may result from an interaction with the presented visualization. At the operation 4735, the user device 4706 may communicate the user input to the data mesh system 150. For example, the user input may be received by the presentation module 210 of the data mesh system 150.

[00353] As discussed above in connection with FIG. 44, at the operation 4410, the presentation module 210 may receive the user input indicating a change to the visualization. At the operation 4420, the visualization module 4230 may update the visualization according to the change indicated by the user input. Thus, FIG. 47 has shown various communications or interactions between devices according to some example embodiments.

[00354] FIGS. 48, 49, 50A, and 50B depict example user interfaces for presenting the visualization to the user. Although FIGS. 48, 49, 50A, and 50B depict specific example visualization and user interface elements, these are merely non-limiting examples and many other alternate visualization and user interface elements may be generated by the presentation module 210 and presented to the user. It will be noted that alternate presentations of the displays of FIGS. 48, 49, 50A, and 50B may include additional information, graphics, options, and so forth; other presentations may include less information, or may

provide abridged information for easy use by the user.

[00355] FIG. 48 depicts an example device 4800 displaying an example user interface 4810 to present the visualization to the user. In an example embodiment, the visualization may be an avatar 4820 that is based on the inferred user characteristics. In a specific example, the approximate physical size of the user may be derived from purchase history data such as clothing sizes, user input (e.g., user input to a fitness app that requests the user's size to make various calculations), and so on. The user characteristics may include style characteristics extracted, derived, or inferred from the attribute data (e.g., type of clothing purchased, types of activities the user engages in, and so on). In other example embodiments, the avatar 4820 may be used as a virtual fitment gauge to determine how particular apparel may appear on the person. Although the visualization of FIG. 48 depicts the avatar 4820, many other varieties of visualization may be rendered by the visualization module 4230 and presented to the user by the presentation module 210.

[00356] In some example embodiments, the user may have provided interests and other information to the data mesh system 150, as depicted by user interface element 4830. In some example embodiments, the user may modify access permission to the user information, for example, by activating user interface element 4840. The user may also edit or modify the attribute data, for example, by activating user interface element 4850. In further example embodiments, the user may be provided with recommendations that are based on an analysis of the attribute data or the user characteristics. For example, activating user interface element 4860 may display various personalized recommendations.

[00357] FIG. 49 depicts an example device 4900 displaying an example user interface 4910 that may present the visualization to the user. The example user interface 4910 may include recommended items or allow the user to provide the user input to alter the visualization. For example, user interface element 4930 may include a plurality of recommended items such as user interface element 4940. The user may activate (e.g., dragging a user interface element onto the area occupied by the avatar 4920) a particular recommended item to indicate an interest in the particular recommended item. The visualization may be updated or otherwise modified responsive to the user activating the particular

recommended item. For example, the recommended item may be visually incorporated into the visualization such as the avatar 4920 may be shown to wear the recommended item when suitable. In further example embodiments, the user may provide indications interests and other information. For instance, user interface element 4950 may include a plurality of user interests such as interest 4960. In an example embodiment, the user may select an interest from a plurality of interests. Based on the selected interest, the visualization module 4230 may modify the visualization. In still further example embodiments, the characteristic module 240 may incorporate the selected interest into the analysis to determine the user characteristics.

[00358] FIG. 50A depicts an example device displaying an example user interface 5010 to present the visualization to the user. Similarly, FIG. 50B depicts an example device displaying an example user interface 5050 to present the visualization to the user. In an example embodiment, as more attribute data is provided to the data mesh system 150, the more detailed and accurate the visualization module 4230 may render the visualization representative of the attribute data. For example, the user may be a college aged male with an athletic build. In this example, avatar 5020 of FIG. 50A may be a less detailed and less accurate representation of the user than avatar 5060 of FIG. 50B. The avatar 5020 may be an initial representation of the attribute data and the avatar 5060 may be a subsequent representation of the attribute data after the data mesh system 150 receives more attribute data from the user allowing the visualization system 290 to more accurately represent the user.

[00359] FIGS. 51A and 51B depict example configurations for communicatively coupling attribute sources, according to some example embodiments. The example embodiments described herein can access a vast and rich "Internet of Things" (IoT) dataset that is predominantly provided via connected, interconnected, or otherwise communicatively coupled machines and devices that can include a multitude of sensors. In example embodiments, devices and machines that provide the attribute data, such as the attribute sources, can be communicatively coupled in many different configurations. For instance, each attribute source is communicatively coupled to the networked system 102 independently to provide the networked system 102 access to the attribute data corresponding to each of the communicatively coupled attribute

sources. FIGS. 51A and 51B depict alternative example attribute source configurations. It will be appreciated that FIGS. 51A and 51B are merely non-limiting examples of attribute source configurations and many other configurations or suitable combinations of configurations can be employed.

[00360] FIG. 51A depicts an example embodiment that includes attribute sources 5110 communicatively coupled in a decentralized device-to-device mesh. In this example embodiment, the attribute data corresponding to a particular device in the mesh may be received from any one or more of the devices in the mesh. For instance, the networked system 102 may access the attribute data corresponding to attribute source E via attribute source H or a combination of attribute sources H and I in FIG. 51A. In an example embodiment, the attribute source H or I may aggregate and store the attribute data corresponding to attribute sources A-F in FIG. 51A. In some example embodiments, the networked system 102 may access the attribute data associated with attribute source E by communicating with attribute source H or I in FIG. 51A.

[00361] FIG. 51B depicts another example embodiment that may include attribute sources 5120 communicatively coupled to a central attribute source (e.g., attribute source H in FIG. 51B). The networked system 102 may access the attribute data associated with attribute sources A-G via the central attribute source in FIG. 51B. In some embodiments, the central attribute source may aggregate and store the attribute data received or accessed from the attribute sources A-G and provide a centralized access point for the attribute data associated with all, or some, of the communicatively coupled attribute sources A-G in FIG. 51B.

[00362] FIG. 52 depicts example sources 5200 including attribute sources 5210, according to some example embodiments. In various example embodiments, the attribute data may include data received, retrieved, or accessed from the attribute sources 5210. For example, the attribute sources 5210 may provide data including everything from a moisture level of a houseplant to a dribbling rhythm of a basketball. In some embodiments, the attribute data corresponding to the attribute sources 5210 may be received or accessed in real time or near real time. For instance, the attribute sources 5210 may communicate or otherwise provide access to the attribute data as it becomes

available. In example embodiments, the attribute sources 5210 may include user device sources 5220, user data sources 5230, transportation sources 5240, materials sources 5250, third party sources 5260, home sources 5270, and a variety of other sources. As will be discussed in connection with FIG. 53, the attribute sources 5210 may be associated with a wide variety of sensors, gauges, measurement components, and other components.

[00363] In an example embodiment, the attribute data may include data corresponding to the user device sources 5220. The user device sources 5220 may include such non-limiting examples as a personal computer (PC), a tablet computer, a laptop computer, a netbook, a set-top box (STB), a personal digital assistant (PDA), an entertainment media system, a cellular telephone, a smart phone, a mobile device, a wearable device (e.g., a smart watch), a smart home device (e.g., a smart appliance), and other smart devices. As will be discussed further in connection with FIG. 53, the attribute data corresponding to the user device sources 5220 may include data associated with sensors, gauges, or other measurement components such as environmental sensor data (e.g., ambient temperature data associated with an environment of the user), biometric sensor data (e.g., heart rate data of the user), detection data (e.g., detection of a Near Field Communication (NFC) beacon), motion data (e.g., acceleration data), position data (e.g., location as determined by a GPS of a mobile device), and so forth.

[00364] In further example embodiments, the attribute data corresponding to the user device sources 5220 includes data such as device type, device model, device name, a unique device identifier, and other device parameters. In some example embodiments, the device type data provides a basis for an inference associated with the attribute data. For instance, if the device type data indicates that the device is a mobile device of the user, location data corresponding to the mobile device may indicate the location of the user. Similarly, if the device type is a media entertainment system, the attribute data corresponding to the media entertainment system may be associated with a home of the user.

[00365] The user data sources 5230 include, for example, calendars (e.g., user calendar events such as birthdays, trips, exams), user profiles (e.g., demographic information such as age, gender, income level), purchase histories, browse histories (e.g., search terms), social media content (e.g., check-ins, posts,

connections), or other user data (e.g., bookmarked websites, preferences or settings for various applications, application usage data such as time spent using a particular application). The attribute data corresponding to the user data sources 5230 is stored, for example, by the user device sources 5220 (e.g., a mobile device that includes a mobile browser with browse history of the user), application server(s) 140 (e.g., payment history of the user stored in payment system(s) 144, user profiles stored by an e-commerce website), or the third party server(s) 130 (e.g., social media data stored in a social networking service). For instance, the attribute data corresponding to the user device sources 5220 includes device resource data. In some implementations, the device resource data includes files stored on the devices (e.g., digital media or apps) or metadata associated with the files (e.g., the number of times a particular song has been played or usage time corresponding to a particular app).

[00366] As cars and other forms of transportation become increasingly equipped with sensors and the ability to communicate, a vast amount of data may be provided by the transportation sources 5240. For example, the attribute data corresponding to the transportation sources 5240 may include acceleration data, velocity data, and other sensor data (e.g., brake pad wear data, gear shifting data, miles driven). In this example, the attribute data corresponding to the transportation sources 5240 may provide indications of a user's driving patterns and styles (e.g., comes to a complete stop at a stop sign, speeds, or finicky use of the brakes).

[00367] The materials sources 5250, such as clothing and structures, are also increasingly gaining the ability to capture data. In various example embodiments, the attribute data may include data corresponding to the materials sources 5250. For example, clothing may be embedded with sensors to detect motion. Data from these sensors may provide indications of whether the user is active or inactive. In another example, clothing may be embedded with biometric sensors that may provide a continuous feed of biometric data corresponding to the user. The biometric data may provide indications of the user's health, athletic ability, and many other characteristics corresponding to the user. Similarly, structures may be equipped with sensors to passively or actively monitor the surrounding environment (e.g., street cameras, traffic cameras, and other sensors).

[00368] In example embodiments, the attribute data may include data associated with the third party sources 5260. The third party sources 5260 may also provide an abundance of data associated with the user. For instance, the attribute data may include data accessed from government websites or other public records that may provide criminal histories, civil citation histories, credit histories, or other publicly available information.

[00369] In various embodiments, a smart home is a house, office, or other environment of the user with one or more smart devices integrated throughout. Nearly every facet of the smart home may provide data associated with the user (e.g., via the smart device acting as sensors to provide various data). In some implementations, the attribute data includes data corresponding to the home sources 5270. For instance, the home sources 5270 may include smart appliances, consumables, utilities, and many other smart devices. In a few specific instances, the attribute data may include consumable inventories and consumption rates of various consumable goods (e.g., perishables such as milk or bread) tracked, monitored, or otherwise observed by smart refrigerators. In another instance, the attribute data may include utility usage data (e.g., electricity, water). Analysis of the utility usage data may indicate patterns or a status of the user, such as the user being on vacation, the user being ill (e.g., increasing house thermostat set temperature to cope with a cold), the user being an energy conscious consumer, and so on.

[00370] Referring now to FIG. 53, example diagram 5300 depicts non-limiting example I/O components 5310 that may provide attribute data, according to some example embodiments. In example embodiments, the I/O components 5310 include input components 5320, output components 5330, environmental components 5340, motion components 5350, position components 5360, biometric components 5370, communication components 5380, detection components 5390, and a wide gamut of other sensors, gauges, and measurement components not shown in FIG. 53. The I/O components 5310 or a suitable combination of the I/O components 5310 may be included in any suitable device or machine such as those included in the attribute sources 5210 depicted in FIG. 52 to facilitate the functionality described herein.

[00371] The I/O components 5310 may receive, detect, measure, capture, or otherwise obtain sensor data associated with physical properties, attributes, or

characteristics. The I/O components 5310 may provide, produce, transmit, or otherwise communicate the sensor data or other indications associated with the physical properties, attributes, or characteristics (e.g., a sensor included in a device operable to communicate the sensor data to the networked system 102). In some implementations, a combination of devices may be employed to provide the sensor data (e.g., a first device that includes a sensor and is communicatively coupled to a second device that communicates sensor data received from the first device to the networked system 102). As a result, the sensor data provided by the I/O components 5310 may be accessible to all, or some, of the modules described above on a real-time or near real-time basis. The I/O components 5310 are grouped according to functionality merely for simplifying the following discussion and the grouping is in no way limiting.

[00372] The input components 5320 include alphanumeric input components (e.g., a keyboard, a touch screen configured to receive alphanumeric input, a photo-optical keyboard, or other alphanumeric input components), point-based input components (e.g., a mouse, a touchpad, a trackball, a joystick, a motion sensor, or other pointing instrument), tactile input components (e.g., a physical button, a touch screen that provides location and force of touches or touch gestures, or other tactile input components), audio input components (e.g., a microphone), and the like. In some implementations, the input components 5320 receive input from the user to facilitate the functionalities described herein. For instance, the user may interact with a user interface using the input components 5320.

[00373] The output components 5330 include visual components (e.g., a display such as a plasma display panel (PDP), a light emitting diode (LED) display, a liquid crystal display (LCD), a projector, or a cathode ray tube (CRT)), acoustic components (e.g., speakers), haptic components (e.g., a vibratory motor), other signal generators, and so forth. The output components 5330 may present information to the user. For example, the output components 5330 may present a user interface to the user or present media files to the user.

[00374] The environmental components 5340 include illumination sensors (e.g., photometer), temperature sensors (e.g., one or more thermometers that detect ambient temperature), humidity sensors, pressure sensors (e.g., barometer), acoustic sensors (e.g., one or more microphones that detect

background noise), proximity sensors (e.g., an infrared sensor that detects nearby objects), gas sensors (e.g., machine olfaction detection sensors, gas detection sensors to detect concentrations of hazardous gases for safety or to measure pollutants in the atmosphere), and so on. The environmental components 5340 may measure various physical parameters to provide an indication or signal corresponding to the physical environment surrounding the environmental components 5340.

[00375] The motion components 5350 include acceleration sensors (e.g., accelerometer), gravitation sensors, rotation sensors (e.g., gyroscope), and so forth. The motion components 5350 may provide motion data such as velocity, acceleration, or other force measurements along x, y, and z axes. In some implementations, the motion data is provided at a regular update rate or sampling rate (e.g., 10 updates per second) that may be configurable.

[00376] The position components 5360 include location sensors (e.g., a Global Positioning System (GPS) receiver component), altitude sensors (e.g., altimeters or barometers that detect air pressure from which altitude may be derived), orientation sensors (e.g., magnetometers that provide magnetic field strength along the x, y, and z axes), and the like. In an example embodiment, the position components 5360 may provide position data such as latitude, longitude, altitude, and a time stamp. Similar to the motion components 5350, the position components 5360 may provide the motion data at a regular update rate that may be configurable.

[00377] The biometric components 5370 include components to detect expressions, measure biosignals, or identify people, among other functions. For example, the biometric components 5370 include expression components to detect expressions (also referred to as "kinesics") such as hand gestures (e.g., an optical component to detect a hand gesture or a Doppler component to detect hand motions), vocal expressions (e.g., a microphone to detect changes in voice pitch that may indicate tension), facial expressions (e.g., a camera to detect expressions or micro-expressions of a person such as a smile), body gestures, and eye tracking (e.g., detecting the focal point of a person's eyes or patterns in eye movement). The biometric components 5370 may also include, for example, biosignal components to measure biosignals such as blood pressure, heart rate, body temperature, perspiration, and brain waves (e.g., as determined by a

electroencephalogram). In further examples, the biometric components 5370 include identification components to identify people such as retinal scanners (e.g., a camera component), vocal detectors (e.g., a microphone to receive audio data for voice identification), facial detectors, fingerprint detectors, and electroencephalogram sensors (e.g., to identify a person via unique brainwave patterns).

[00378] Communication may be implemented using a wide variety of technologies. The I/O components 5310 may include communication components 5380 operable to communicatively couple machines or devices. For example, the communication components 5380 may include a network interface component or other suitable device to interface with a network (e.g., the network 104). In further examples, the communication components 5380 may include wired communication components, wireless communication components, cellular communication components, Near Field Communication (NFC) components, BLUETOOTH® components (e.g., BLUETOOTH® Low Energy), WI-FI® components, and other communication components to provide communication via other modalities. In addition, a variety of information may be derived using the communication components 5380 such as location via Internet Protocol (IP) geo-location, location via WI-FI® signal triangulation, location via detecting a NFC beacon signal that may indicate a particular location, and so forth.

[00379] The detection components 5390 provide functionality to detect a variety of identifiers. For example, the detection components 5390 include Radio Frequency Identification (RFID) tag reader components, Near Field Communication (NFC) smart tag detection components, optical reader components (e.g., an optical sensor to detect one-dimensional bar codes such as Universal Product Code (UPC) bar codes, multi-dimensional bar codes such as a Quick Response (QR) code, Aztec code, Data Matrix, Dataglyph, MaxiCode, PDF417, Ultra Code, Uniform Commercial Code Reduced Space Symbology (UCC RSS)-2D bar code, and other optical codes), or acoustic detection components (e.g., microphones to identify tagged audio signals). In additional, a variety of information may be derived via various communication components such as location via Internet Protocol (IP) geo-location, location via WI-FI® signal triangulation, location via detecting a NFC beacon signal that may

indicate a particular location, and so forth.

[00380] FIG. 54 is a block diagram 5400 of an example data structure for the attribute data associated with a particular user according to example embodiments. In embodiments, the attribute data is associated with a plurality of users such as user 5402, 5404, 5406, 5408, 5410, 5412, and 5414. In an embodiment, the attribute data is accessed for a particular user via a lookup using a user identifier. The attribute data includes, for example, profile data 5420, device data 5422, calendar data 5424, list data 5426, list type data 5428, interest data 5430, fitment data 5432, garment type data 5434, preference data 5436, measured dimension data 5438, fitness goal data 5440, reward data 5442, location data 5444, and other data not shown in FIG. 54. In some embodiments, the attribute data may be structured such that various portions of the attribute data are associated with other portions of the attribute data via relationships. For instance, the calendar data 5424 may include a calendar event associated with an event name, an event data, and an event location for the calendar event.

[00381] FIG. 55 is a block diagram 5500 of an example data structure for data associated with a device according to some example embodiments. In an example embodiment, the device data 5422 of FIG. 54 may include a device identifier, a device name, device resources data (e.g., files stores on the devices such as browser cookies, media files), I/O component data, and so forth. In example embodiments, the device identifier comprises, for example, an Internet Protocol (IP) address, a Media Access Control (MAC) address, other unique identifiers, an International Mobile Station Equipment Identity (IMEI), or a Mobile Equipment Identifier (MEID). In an embodiment, the I/O component data includes standard device parameters 5502, position data 5504, location data 5506, motion data 5508, environmental data 5510, biometric data 5512, among other data. FIG. 55 merely depicts example attribute data that may correspond to a particular device, and a variety of other data not shown in FIG. 55 may be included in the device data. In various embodiments, the standard device parameters 5502 include parameters that are standard across multiple devices included in the IoT. In some embodiments, standardized parameters and protocols facilitate access and utilization of the attribute data corresponding to such devices. For example, the attribute data available on an unknown device may be accessed and utilized without the need to discover or otherwise

determine which parameters are available and which units of measure are associated with the parameters. Many other schemes may be employed to discover or otherwise determine available parameters accessible on a particular device.

[00382] Certain embodiments are described herein as including logic or a number of components, modules, or mechanisms. Modules can constitute either software modules (e.g., code embodied on a machine-readable medium or in a transmission signal) or hardware modules. A "hardware module" is a tangible unit capable of performing certain operations and can be configured or arranged in a certain physical manner. In various example embodiments, one or more computer systems (e.g., a standalone computer system, a client computer system, or a server computer system) or one or more hardware modules of a computer system (e.g., a processor or a group of processors) is configured by software (e.g., an application or application portion) as a hardware module that operates to perform certain operations as described herein.

[00383] In some embodiments, a hardware module is implemented mechanically, electronically, or any suitable combination thereof. For example, a hardware module can include dedicated circuitry or logic that is permanently configured to perform certain operations. For example, a hardware module can be a special-purpose processor, such as a Field-Programmable Gate Array (FPGA) or an Application Specific Integrated Circuit (ASIC). A hardware module may also include programmable logic or circuitry that is temporarily configured by software to perform certain operations. For example, a hardware module can include software encompassed within a general-purpose processor or other programmable processor. It will be appreciated that the decision to implement a hardware module mechanically, in dedicated and permanently configured circuitry, or in temporarily configured circuitry (e.g., configured by software) can be driven by cost and time considerations.

[00384] Accordingly, the phrase "hardware module" should be understood to encompass a tangible entity, be that an entity that is physically constructed, permanently configured (e.g., hardwired), or temporarily configured (e.g., programmed) to operate in a certain manner or to perform certain operations described herein. As used herein, "hardware-implemented module" refers to a hardware module. Considering embodiments in which hardware modules are

temporarily configured (e.g., programmed), each of the hardware modules need not be configured or instantiated at any one instance in time. For example, where a hardware module comprises a general-purpose processor configured by software to become a special-purpose processor, the general-purpose processor may be configured as respectively different special-purpose processors (e.g., comprising different hardware modules) at different times. Software can accordingly configure a particular processor or processors, for example, to constitute a particular hardware module at one instance of time and to constitute a different hardware module at a different instance of time.

[00385] Hardware modules can provide information to, and receive information from, other hardware modules. Accordingly, the described hardware modules can be regarded as being communicatively coupled. Where multiple hardware modules exist contemporaneously, communications can be achieved through signal transmission (e.g., over appropriate circuits and buses) between or among two or more of the hardware modules. In embodiments in which multiple hardware modules are configured or instantiated at different times, communications between such hardware modules may be achieved, for example, through the storage and retrieval of information in memory structures to which the multiple hardware modules have access. For example, one hardware module performs an operation and stores the output of that operation in a memory device to which it is communicatively coupled. A further hardware module can then, at a later time, access the memory device to retrieve and process the stored output. Hardware modules can also initiate communications with input or output devices, and can operate on a resource (e.g., a collection of information).

[00386] The various operations of example methods described herein can be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors constitute processor-implemented modules that operate to perform one or more operations or functions described herein. As used herein, "processor-implemented module" refers to a hardware module implemented using one or more processors.

[00387] Similarly, the methods described herein can be at least partially

processor-implemented, with a particular processor or processors being an example of hardware. For example, at least some of the operations of a method can be performed by one or more processors or processor-implemented modules. Moreover, the one or more processors may also operate to support performance of the relevant operations in a "cloud computing" environment or as a "software as a service" (SaaS). For example, at least some of the operations may be performed by a group of computers (as examples of machines including processors), with these operations being accessible via a network (e.g., the Internet) and via one or more appropriate interfaces (e.g., an Application Program Interface (API)).

[00388] The performance of certain of the operations may be distributed among the processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the processors or processor-implemented modules are located in a single geographic location (e.g., within a home environment, an office environment, or a server farm). In other example embodiments, the processors or processor-implemented modules are distributed across a number of geographic locations.

[00389] FIG. 56 is a block diagram 5600 illustrating an architecture of software 5602, which can be installed on any one or more of the devices described above. FIG. 56 is merely a non-limiting example of a software architecture, and it will be appreciated that many other architectures can be implemented to facilitate the functionality described herein. In various embodiments, the software 5602 is implemented by hardware such as a machine 5700 of FIG. 57 that includes processors 5710, memory 5730, and I/O components 5750. In this example architecture, the software 5602 can be conceptualized as a stack of layers where each layer may provide a particular functionality. For example, the software 5602 includes layers such as an operating system 5604, libraries 5606, frameworks 5608, and applications 5610. Operationally, the applications 5610 invoke application programming interface (API) calls 5612 through the software stack and receive messages 5614 in response to the API calls 5612, consistent with some embodiments.

[00390] In various implementations, the operating system 5604 manages hardware resources and provides common services. The operating system 5604 includes, for example, a kernel 5620, services 5622, and drivers 5624. The

kernel 5620 acts as an abstraction layer between the hardware and the other software layers consistent with some embodiments. For example, the kernel 5620 provides memory management, processor management (e.g., scheduling), component management, networking, and security settings, among other functionality. The services 5622 can provide other common services for the other software layers. The drivers 5624 are responsible for controlling or interfacing with the underlying hardware, according to some embodiments. For instance, the drivers 5624 can include display drivers, camera drivers, BLUETOOTH® drivers, flash memory drivers, serial communication drivers (e.g., Universal Serial Bus (USB) drivers), WI-FI® drivers, audio drivers, power management drivers, and so forth.

[00391] In some embodiments, the libraries 5606 provide a low-level common infrastructure utilized by the applications 5610. The libraries 5606 can include system libraries 5630 (e.g., C standard library) that can provide functions such as memory allocation functions, string manipulation functions, mathematic functions, and the like. In addition, the libraries 5606 can include API libraries 5632 such as media libraries (e.g., libraries to support presentation and manipulation of various media formats such as Moving Picture Experts Group-4 (MPEG4), Advanced Video Coding (H.264 or AVC), Moving Picture Experts Group Layer-3 (MP3), Advanced Audio Coding (AAC), Adaptive Multi-Rate (AMR) audio codec, Joint Photographic Experts Group (JPEG or JPG), or Portable Network Graphics (PNG)), graphics libraries (e.g., an OpenGL framework used to render in two dimensions (2D) and three dimensions (3D) in a graphic context on a display), database libraries (e.g., SQLite to provide various relational database functions), web libraries (e.g., WebKit to provide web browsing functionality), and the like. The libraries 5606 can also include a wide variety of other libraries 5634 to provide many other APIs to the applications 5610.

[00392] The frameworks 5608 provide a high-level common infrastructure that can be utilized by the applications 5610, according to some embodiments. For example, the frameworks 5608 provide various graphic user interface (GUI) functions, high-level resource management, high-level location services, and so forth. The frameworks 5608 can provide a broad spectrum of other APIs that can be utilized by the applications 5610, some of which may be specific to a

particular operating system or platform.

[00393] In an example embodiment, the applications 5610 include a home application 5650, a contacts application 5652, a browser application 5654, a book reader application 5656, a location application 5658, a media application 5660, a messaging application 5662, a game application 5664, and a broad assortment of other applications such as a third party application 5666. According to some embodiments, the applications 5610 are programs that execute functions defined in the programs. Various programming languages can be employed to create one or more of the applications 5610, structured in a variety of manners, such as object-oriented programming languages (e.g., Objective-C, Java, or C++) or procedural programming languages (e.g., C or assembly language). In a specific example, the third party application 5666 (e.g., an application developed using the ANDROID™ or IOS™ software development kit (SDK) by an entity other than the vendor of the particular platform) may be mobile software running on a mobile operating system such as IOS™, ANDROID™, WINDOWS® PHONE, or another mobile operating system. In this example, the third party application 5666 can invoke the API calls 5612 provided by the operating system 5604 to facilitate functionality described herein.

[00394] FIG. 57 is a block diagram illustrating components of a machine 5700, according to some embodiments, able to read instructions from a machine-readable medium (e.g., a machine-readable storage medium) and perform any one or more of the methodologies discussed herein. Specifically, FIG. 57 shows a diagrammatic representation of the machine 5700 in the example form of a computer system, within which instructions 5716 (e.g., software, a program, an application, an applet, an app, or other executable code) for causing the machine 5700 to perform any one or more of the methodologies discussed herein can be executed. In alternative embodiments, the machine 5700 operates as a standalone device or can be coupled (e.g., networked) to other machines. In a networked deployment, the machine 5700 may operate in the capacity of a server machine or a client machine in a server-client network environment, or as a peer machine in a peer-to-peer (or distributed) network environment. The machine 5700 can comprise, but not be limited to, a server computer, a client computer, a personal computer (PC), a tablet computer, a laptop computer, a netbook, a set-

top box (STB), a personal digital assistant (PDA), an entertainment media system, a cellular telephone, a smart phone, a mobile device, a wearable device (e.g., a smart watch), a smart home device (e.g., a smart appliance), other smart devices, a web appliance, a network router, a network switch, a network bridge, or any machine capable of executing the instructions 5716, sequentially or otherwise, that specify actions to be taken by the machine 5700. Further, while only a single machine 5700 is illustrated, the term "machine" shall also be taken to include a collection of machines 5700 that individually or jointly execute the instructions 5716 to perform any one or more of the methodologies discussed herein.

[00395] In various embodiments, the machine 5700 comprises processors 5710, memory 5730, and I/O components 5750, which can be configured to communicate with each other via a bus 5702. In an example embodiment, the processors 5710 (e.g., a Central Processing Unit (CPU), a Reduced Instruction Set Computing (RISC) processor, a Complex Instruction Set Computing (CISC) processor, a Graphics Processing Unit (GPU), a Digital Signal Processor (DSP), an Application Specific Integrated Circuit (ASIC), a Radio-Frequency Integrated Circuit (RFIC), another processor, or any suitable combination thereof) include, for example, a processor 5712 and a processor 5714 that may execute the instructions 5716. The term "processor" is intended to include multi-core processors that may comprise two or more independent processors (also referred to as "cores") that can execute instructions contemporaneously. Although FIG. 57 shows multiple processors, the machine 5700 may include a single processor with a single core, a single processor with multiple cores (e.g., a multi-core processor), multiple processors with a single core, multiple processors with multiples cores, or any combination thereof.

[00396] The memory 5730 comprises a main memory 5732, a static memory 5734, and a storage unit 5736 accessible to the processors 5710 via the bus 5702, according to some embodiments. The storage unit 5736 can include a machine-readable medium 5738 on which are stored the instructions 5716 embodying any one or more of the methodologies or functions described herein. The instructions 5716 can also reside, completely or at least partially, within the main memory 5732, within the static memory 5734, within at least one of the processors 5710 (e.g., within the processor's cache memory), or any suitable

combination thereof, during execution thereof by the machine 5700. Accordingly, in various embodiments, the main memory 5732, the static memory 5734, and the processors 5710 are considered machine-readable media 5738.

[00397] As used herein, the term "memory" refers to a machine-readable medium 5738 able to store data temporarily or permanently and may be taken to include, but not be limited to, random-access memory (RAM), read-only memory (ROM), buffer memory, flash memory, and cache memory. While the machine-readable medium 5738 is shown in an example embodiment to be a single medium, the term "machine-readable medium" should be taken to include a single medium or multiple media (e.g., a centralized or distributed database, or associated caches and servers) able to store the instructions 5716. The term "machine-readable medium" shall also be taken to include any medium, or combination of multiple media, that is capable of storing instructions (e.g., instructions 5716) for execution by a machine (e.g., machine 5700), such that the instructions, when executed by one or more processors of the machine 5700 (e.g., processors 5710), cause the machine 5700 to perform any one or more of the methodologies described herein. Accordingly, a "machine-readable medium" refers to a single storage apparatus or device, as well as "cloud-based" storage systems or storage networks that include multiple storage apparatus or devices. The term "machine-readable medium" shall accordingly be taken to include, but not be limited to, one or more data repositories in the form of a solid-state memory (e.g., flash memory), an optical medium, a magnetic medium, other non-volatile memory (e.g., Erasable Programmable Read-Only Memory (EPROM)), or any suitable combination thereof. The term "machine-readable medium" specifically excludes non-statutory signals per se.

[00398] The I/O components 5750 include a wide variety of components to receive input, provide output, produce output, transmit information, exchange information, capture measurements, and so on. In general, it will be appreciated that the I/O components 5750 can include many other components that are not shown in FIG. 57. The I/O components 5750 are grouped according to functionality merely for simplifying the following discussion, and the grouping is in no way limiting. In various example embodiments, the I/O components 5750 include output components 5752 and input components 5754. The output

components 5752 include visual components (e.g., a display such as a plasma display panel (PDP), a light emitting diode (LED) display, a liquid crystal display (LCD), a projector, or a cathode ray tube (CRT)), acoustic components (e.g., speakers), haptic components (e.g., a vibratory motor), other signal generators, and so forth. The input components 5754 include alphanumeric input components (e.g., a keyboard, a touch screen configured to receive alphanumeric input, a photo-optical keyboard, or other alphanumeric input components), point based input components (e.g., a mouse, a touchpad, a trackball, a joystick, a motion sensor, or other pointing instruments), tactile input components (e.g., a physical button, a touch screen that provides location and force of touches or touch gestures, or other tactile input components), audio input components (e.g., a microphone), and the like.

[00399] In some further example embodiments, the I/O components 5750 include biometric components 5756, motion components 5758, environmental components 5760, or position components 5762, among a wide array of other components. For example, the biometric components 5756 include components to detect expressions (e.g., hand expressions, facial expressions, vocal expressions, body gestures, or eye tracking), measure biosignals (e.g., blood pressure, heart rate, body temperature, perspiration, or brain waves), identify a person (e.g., voice identification, retinal identification, facial identification, fingerprint identification, or electroencephalogram based identification), and the like. The motion components 5758 include acceleration sensor components (e.g., an accelerometer), gravitation sensor components, rotation sensor components (e.g., a gyroscope), and so forth. The environmental components 5760 include, for example, illumination sensor components (e.g., a photometer), temperature sensor components (e.g., one or more thermometers that detect ambient temperature), humidity sensor components, pressure sensor components (e.g., a barometer), acoustic sensor components (e.g., one or more microphones that detect background noise), proximity sensor components (e.g., infrared sensors that detect nearby objects), gas sensor components (e.g., machine olfaction detection sensors, gas detection sensors to detect concentrations of hazardous gases for safety or to measure pollutants in the atmosphere), or other components that may provide indications, measurements, or signals corresponding to a surrounding physical environment. The position components

5762 include location sensor components (e.g., a Global Positioning System (GPS) receiver component), altitude sensor components (e.g., altimeters or barometers that detect air pressure from which altitude may be derived), orientation sensor components (e.g., magnetometers), and the like.

[00400] Communication can be implemented using a wide variety of technologies. The I/O components 5750 may include communication components 5764 operable to couple the machine 5700 to a network 5780 or devices 5770 via a coupling 5782 and a coupling 5772, respectively. For example, the communication components 5764 include a network interface component or another suitable device to interface with the network 5780. In further examples, communication components 5764 include wired communication components, wireless communication components, cellular communication components, Near Field Communication (NFC) components, BLUETOOTH® components (e.g., BLUETOOTH® Low Energy), WI-FI® components, and other communication components to provide communication via other modalities. The devices 5770 may be another machine or any of a wide variety of peripheral devices (e.g., a peripheral device coupled via a Universal Serial Bus (USB)).

[00401] Moreover, in some embodiments, the communication components 5764 detect identifiers or include components operable to detect identifiers. For example, the communication components 5764 include Radio Frequency Identification (RFID) tag reader components, NFC smart tag detection components, optical reader components (e.g., an optical sensor to detect one-dimensional bar codes such as a Universal Product Code (UPC) bar code, multi-dimensional bar codes such as a Quick Response (QR) code, Aztec Code, Data Matrix, Dataglyph, MaxiCode, PDF417, Ultra Code, Uniform Commercial Code Reduced Space Symbology (UCC RSS)-2D bar codes, and other optical codes), acoustic detection components (e.g., microphones to identify tagged audio signals), or any suitable combination thereof. In addition, a variety of information can be derived via the communication components 5764, such as location via Internet Protocol (IP) geo-location, location via WI-FI® signal triangulation, location via detecting a BLUETOOTH® or NFC beacon signal that may indicate a particular location, and so forth.

[00402] In various example embodiments, one or more portions of the

network 5780 can be an ad hoc network, an intranet, an extranet, a virtual private network (VPN), a local area network (LAN), a wireless LAN (WLAN), a wide area network (WAN), a wireless WAN (WWAN), a metropolitan area network (MAN), the Internet, a portion of the Internet, a portion of the Public Switched Telephone Network (PSTN), a plain old telephone service (POTS) network, a cellular telephone network, a wireless network, a WI-FI® network, another type of network, or a combination of two or more such networks. For example, the network 5780 or a portion of the network 5780 may include a wireless or cellular network, and the coupling 5782 may be a Code Division Multiple Access (CDMA) connection, a Global System for Mobile communications (GSM) connection, or another type of cellular or wireless coupling. In this example, the coupling 5782 can implement any of a variety of types of data transfer technology, such as Single Carrier Radio Transmission Technology (1xRTT), Evolution-Data Optimized (EVDO) technology, General Packet Radio Service (GPRS) technology, Enhanced Data rates for GSM Evolution (EDGE) technology, third Generation Partnership Project (3GPP) including 3G, fourth generation wireless (4G) networks, Universal Mobile Telecommunications System (UMTS), High Speed Packet Access (HSPA), Worldwide Interoperability for Microwave Access (WiMAX), Long Term Evolution (LTE) standard, others defined by various standard-setting organizations, other long range protocols, or other data transfer technology.

[00403] In example embodiments, the instructions 5716 are transmitted or received over the network 5780 using a transmission medium via a network interface device (e.g., a network interface component included in the communication components 5764) and utilizing any one of a number of well-known transfer protocols (e.g., Hypertext Transfer Protocol (HTTP)). Similarly, in other example embodiments, the instructions 5716 are transmitted or received using a transmission medium via the coupling 5772 (e.g., a peer-to-peer coupling) to the devices 5770. The term "transmission medium" shall be taken to include any intangible medium that is capable of storing, encoding, or carrying the instructions 5716 for execution by the machine 5700, and includes digital or analog communications signals or other intangible media to facilitate communication of such software.

[00404] Furthermore, the machine-readable medium 5738 is non-transitory

(in other words, not having any transitory signals) in that it does not embody a propagating signal. However, labeling the machine-readable medium 5738 "non-transitory" should not be construed to mean that the medium is incapable of movement; the medium should be considered as being transportable from one physical location to another. Additionally, since the machine-readable medium 5738 is tangible, the medium may be considered to be a machine-readable device. A carrier medium comprises a tangible machine readable medium storing machine readable instructions and a transient medium, such as a signal, carrying machine readable instructions.

[00405] Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter herein.

[00406] Although an overview of the inventive subject matter has been described with reference to specific example embodiments, various modifications and changes may be made to these embodiments without departing from the broader scope of embodiments of the present disclosure. Such embodiments of the inventive subject matter may be referred to herein, individually or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single disclosure or inventive concept if more than one is, in fact, disclosed.

[00407] The embodiments illustrated herein are described in sufficient detail to enable those skilled in the art to practice the teachings disclosed. Other embodiments may be used and derived therefrom, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. The Detailed Description, therefore, is not to be taken in a limiting sense, and the scope of various embodiments is defined only by the

appended claims, along with the full range of equivalents to which such claims are entitled.

[00408] As used herein, the term "or" may be construed in either an inclusive or exclusive sense. Moreover, plural instances may be provided for resources, operations, or structures described herein as a single instance. Additionally, boundaries between various resources, operations, modules, engines, and data stores are somewhat arbitrary, and particular operations are illustrated in a context of specific illustrative configurations. Other allocations of functionality are envisioned and may fall within a scope of various embodiments of the present disclosure. In general, structures and functionality presented as separate resources in the example configurations may be implemented as a combined structure or resource. Similarly, structures and functionality presented as a single resource may be implemented as separate resources. These and other variations, modifications, additions, and improvements fall within a scope of embodiments of the present disclosure as represented by the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

CLAIMS

1. A system comprising:

an activity module to detect a device activity being performed in real time by a user device of a user;

an attribute module to access attribute data associated with the user from a plurality of attribute sources;

a preference module to infer a user preference, from the attribute data, indicating a preference of the user for performing on a secondary user device an ancillary activity corresponding to the device activity;

based on the inferred user preference, a device module to identify the secondary user device according to a device status of the secondary user device that indicates a device capability to perform the ancillary activity in real time; and

the activity module to generate the ancillary activity, to be performed in real time on the secondary user device, by analysis of at least one of the device activity, a device functionality of the secondary user device, and the user preference, and further to cause performance of the ancillary activity on the secondary user device in real time.

2. The system of claim 1, wherein:

the device module is adapted to receive, from the secondary user device, sensor data that represents a real-time physical environment of the secondary user device and further to determine the device status of the secondary user device by analysis of the sensor data.

3. A method comprising:

detecting a device activity being performed in real time by a user device of a user;

accessing attribute data associated with the user from a plurality of attribute sources;

inferring a user preference, from the attribute data, indicating a preference of the user for performing on a secondary user device a complementary activity corresponding to the device activity;

based on the inferred user preference, identifying, using a hardware processor of a machine, the secondary user device according to a device status of the secondary user device indicating a device capability to perform the complementary activity in real time;

generating the complementary activity, to be performed in real time on the secondary user device, by analyzing at least one of the device activity, a device functionality of the secondary user device, and the user preference; and

transmitting, to the secondary user device, instructions to perform in real time the complementary activity.

4. The method of claim 3, further comprising:

receiving, from the secondary user device, sensor data representing a real-time physical environment of the secondary user device; and

determining the device status of the secondary user device by analyzing the sensor data.

5. The method of claim 4, further comprising:

inferring a current user location based on location data received from the user device;

extracting a current device location from the sensor data received from the secondary user device;

comparing the current user location and the current device location to determine that the secondary user device is within a distance of the current user location; and

based on the secondary user device being within the distance of the current user location, identifying the secondary user device as being capable of performing the complementary activity in real time.

6. The method of claim 4, further comprising:

calculating an active metric from the sensor data, the active metric being indicative of the secondary user device being in use by the user;

determining that the secondary user device is active based on the active metric exceeding a threshold value; and

based on the secondary user device being active, identifying the secondary user device as being capable of performing the complementary activity in real time.

7. The method of claim 3, further comprising:

augmenting the device activity being performed in real time by the user device based on the generated complementary activity.

8. The method of claim 3, wherein the secondary device comprises a wearable computing device.

9. The method of claim 3, wherein the complementary activity comprises a portion of the device activity.

10. The method of claim 3, wherein the complementary activity comprises a notification including notification content that corresponds to the device activity.

11. The method of claim 3, further comprising:

wherein the device functionality includes a display size corresponding to the secondary user device;

determining the display size corresponding to the secondary user device is below a threshold size; and

generating the complementary activity to include abridged activity content according to the display size corresponding to the secondary user device.

12. The method of claim 3, further comprising:

comparing the device functionality of the secondary user device with a device functionality of the user device to identify non-mutual functionality of the secondary user device that is not available on the user device; and

generating the complementary activity to include an activity component that utilizes the non-mutual functionality of the secondary user device.

13. The method of claim 12, wherein the non-mutual functionality of the secondary user device includes functionality to capture data from a sensor not available on the user device.

14. The method of claim 3, further comprising:

identifying a plurality of user devices based on respective device statuses of the plurality of user devices, each device status of the device statuses indicating capability to perform a particular complementary activity in real time; and

determining a suitable user device from among the plurality of user devices based on the user preference, the suitable user device being capable of performing the complementary activity in real time.

15. The method of claim 3, further comprising:

inferring user characteristics pertaining to the user from the attribute data;

identifying similar users, from among a plurality of other users, that are similar to the user based on the inferred user characteristics and respective user characteristics of the plurality of other users; and

inferring the user preference based on the user characteristics of the identified similar users and the inferred user characteristics.

16. A machine-readable medium having storing instructions that, when executed by at least one processor of a machine, cause the machine to perform operations comprising:

detecting a device activity being performed in real time by a user device of a user;

accessing attribute data associated with the user from a plurality of attribute sources;

inferring a user setting, from the attribute data, indicating a preference of the user for performing on a secondary user device a companion activity corresponding to the device activity;

based on the inferred user setting, identifying, using a hardware processor of a machine, the secondary user device according to a device status of the secondary user device indicating a device capability to perform the companion activity in real time;

generating the companion activity, to be performed in real time on the secondary user device, by analyzing at least one of the device activity, a device functionality of the secondary user device, and the user setting; and

causing performance of the companion activity on the secondary user device in real time.

17. The machine-readable medium of claim 16, further comprising:

receiving, from the secondary user device, sensor data representing a real-time physical environment of the secondary user device; and

determining the device status of the secondary user device by analyzing the sensor data.

18. The machine-readable medium of claim 17, further comprising:

inferring a current user location based on location data received from the user device;

extracting a current device location from the sensor data received from the secondary user device;

comparing the current user location and the current device location to determine that the secondary user device is within a distance of the current user location; and

based on the secondary user device being within the distance of the current user location, identifying the secondary user device as being capable of performing the companion activity in real time.

19. The machine-readable medium of claim 17, further comprising:

calculating an active metric from the sensor data, the active metric being indicative of the secondary user device being in use by the user;

determining that the secondary user device is active based on the active metric exceeding a threshold value; and

based on the secondary user device being active, identifying the secondary user device as being capable of performing the companion activity in real time.

20. A carrier medium carrying machine readable instructions that, when executed by at least one processor of a machine, cause the machine to carry out the method of any one of claims 3 to 15.

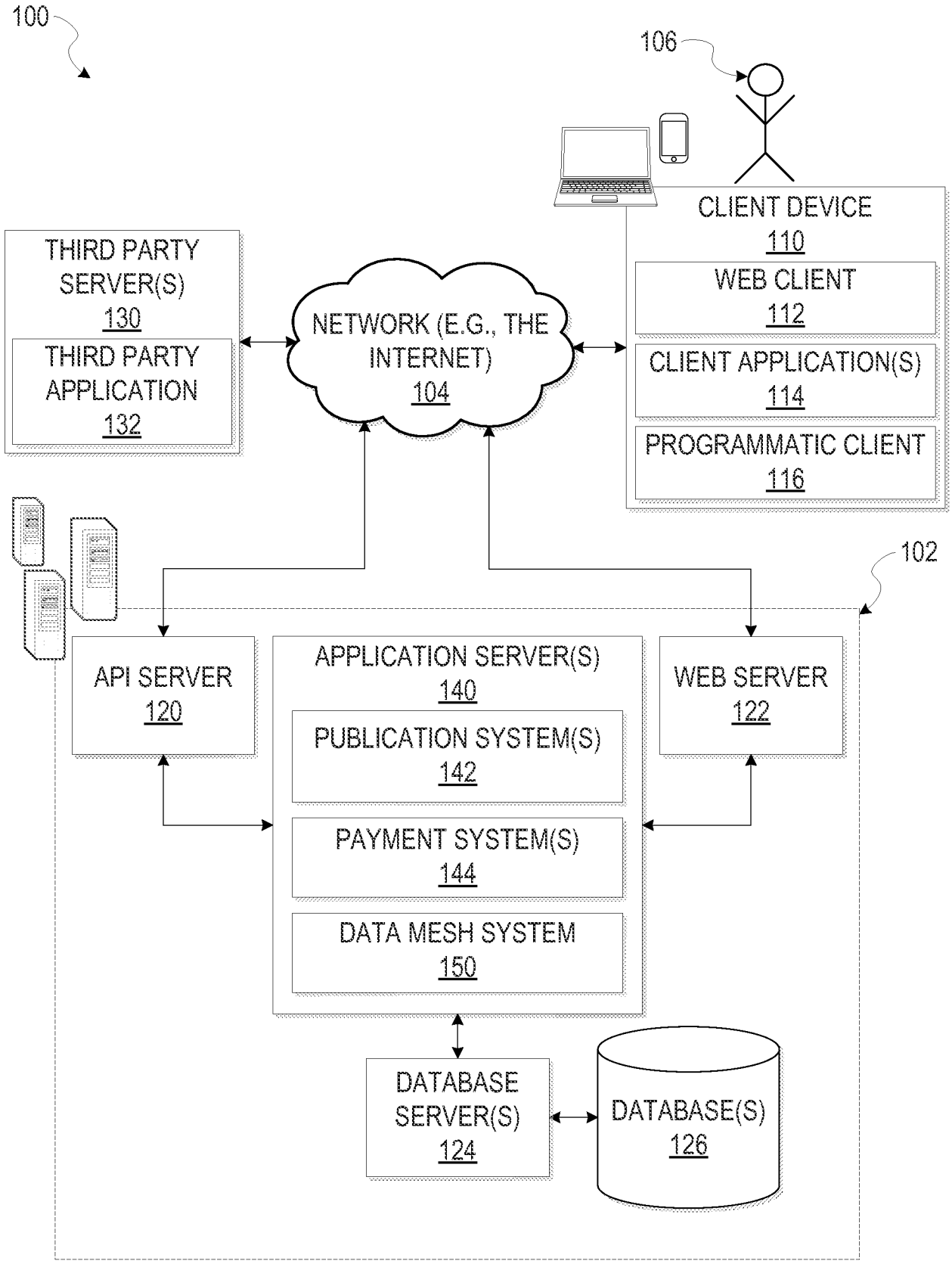

100
106
CLIENT DEVICE
110
WEB CLIENT
112
CLIENT APPLICATION(S)
114
PROGRAMMATIC CLIENT
116
THIRD PARTY SERVER(S)
130
THIRD PARTY APPLICATION
132
NETWORK (E.G., THE INTERNET)
104
102
API SERVER
120
APPLICATION SERVER(S)
140
PUBLICATION SYSTEM(S)
142
PAYMENT SYSTEM(S)
144
DATA MESH SYSTEM
150
WEB SERVER
122
DATABASE SERVER(S)
124
DATABASE(S)
126

FIG. 1

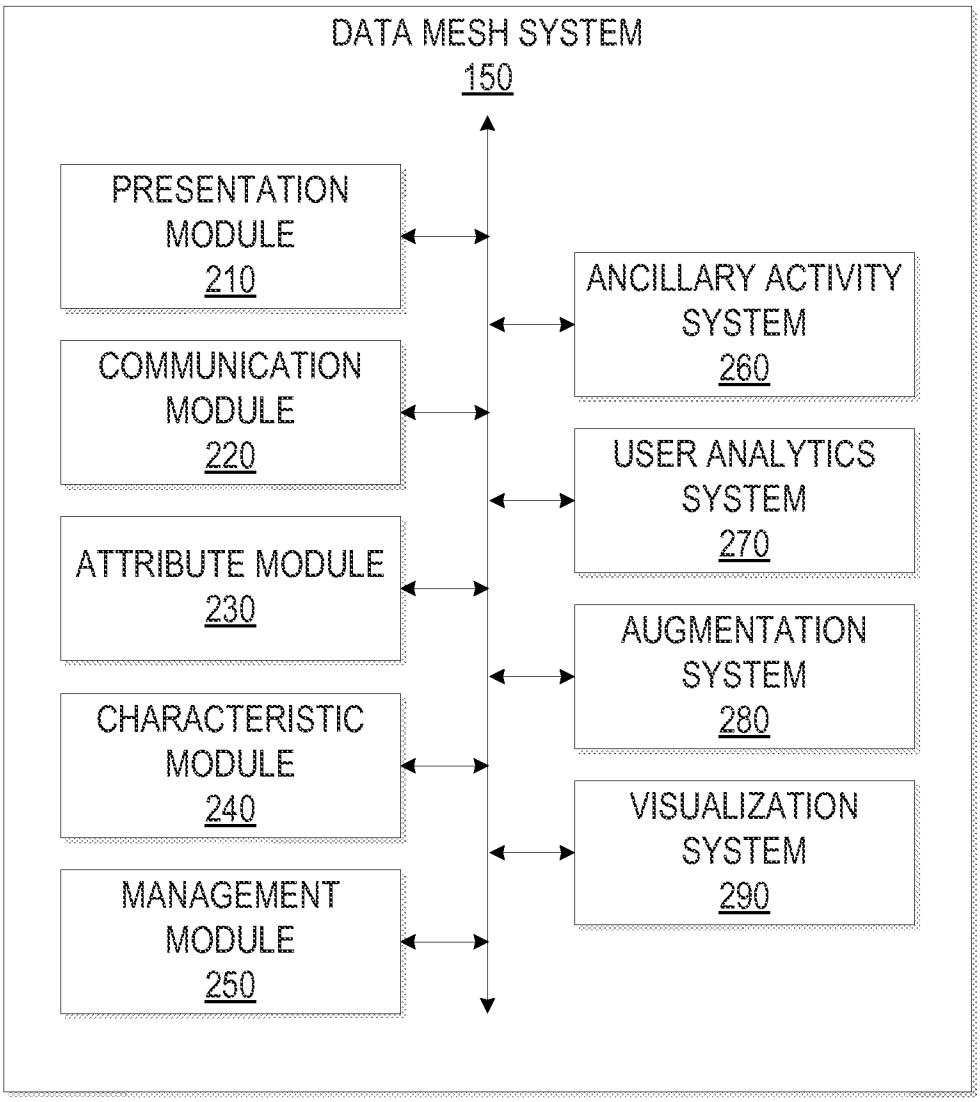

DATA MESH SYSTEM
150
PRESENTATION MODULE
210
COMMUNICATION MODULE
220
ATTRIBUTE MODULE
230
CHARACTERISTIC MODULE
240
MANAGEMENT MODULE
250
ANCILLARY ACTIVITY SYSTEM
260
USER ANALYTICS SYSTEM
270
AUGMENTATION SYSTEM
280
VISUALIZATION SYSTEM
290

FIG. 2

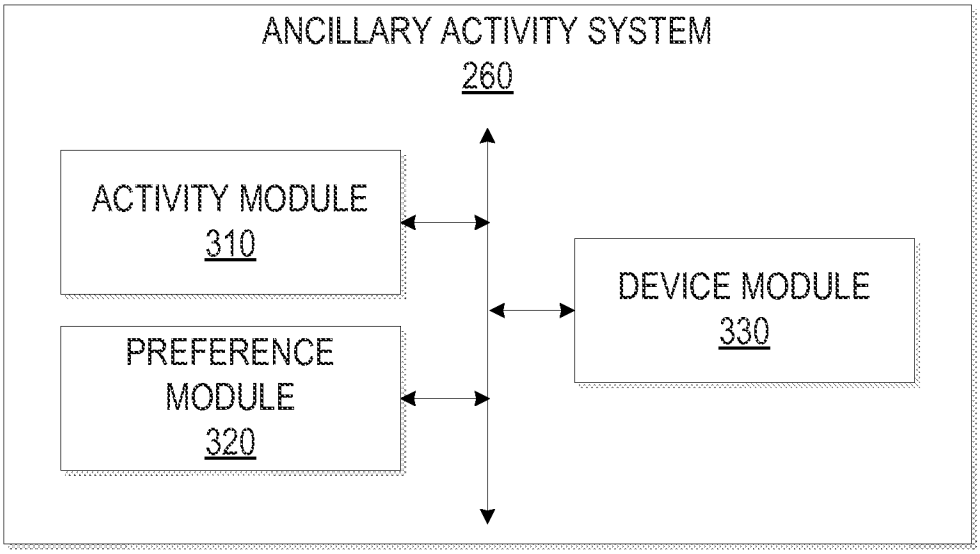

ANCILLARY ACTIVITY SYSTEM
260
ACTIVITY MODULE
310
PREFERENCE MODULE
320
DEVICE MODULE
330

FIG. 3

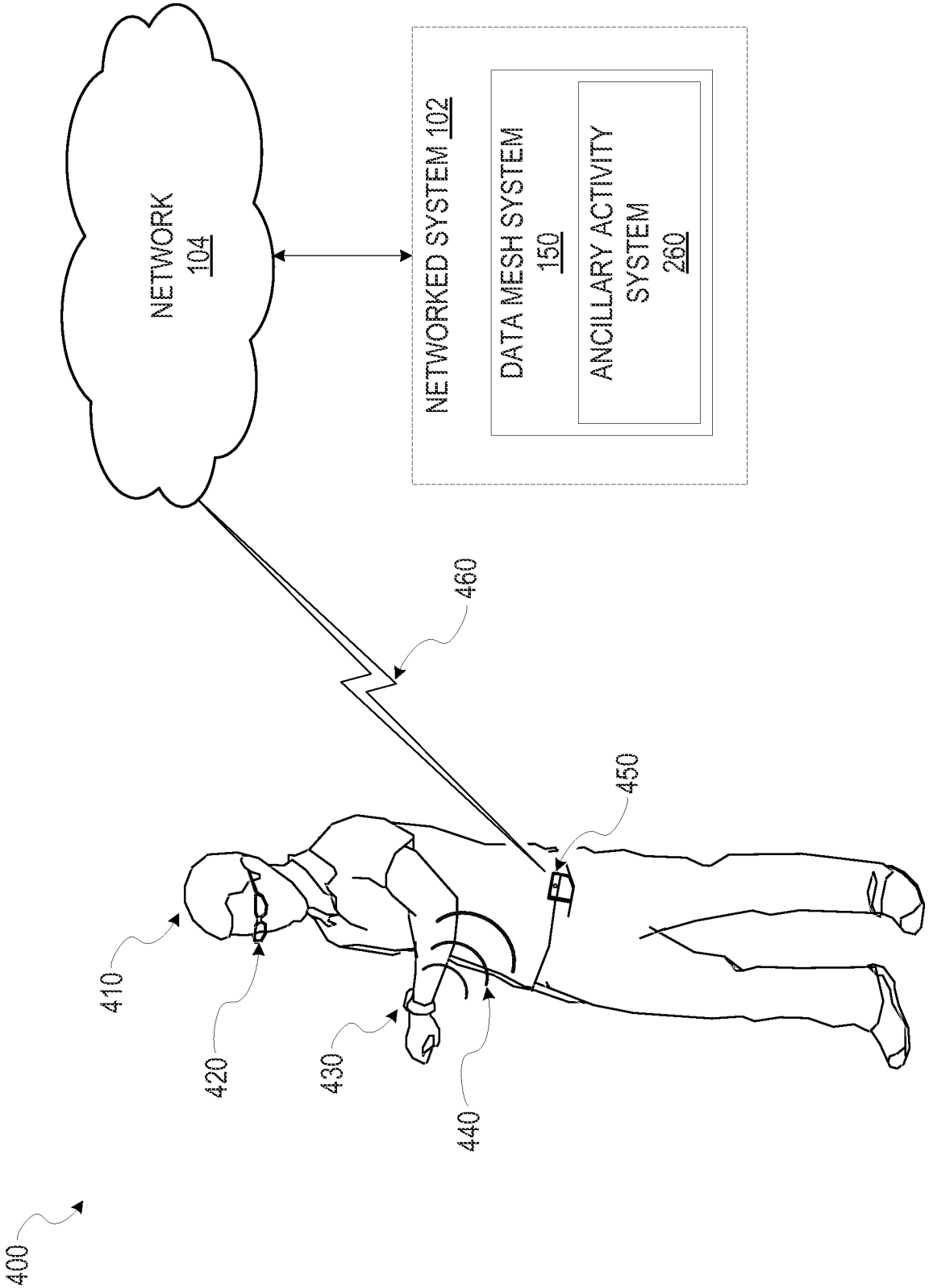

NETWORK
104
NETWORKED SYSTEM 102
DATA MESH SYSTEM
150
ANCILLARY ACTIVITY
SYSTEM
260
460
450
410
420
430
440
400

FIG. 4

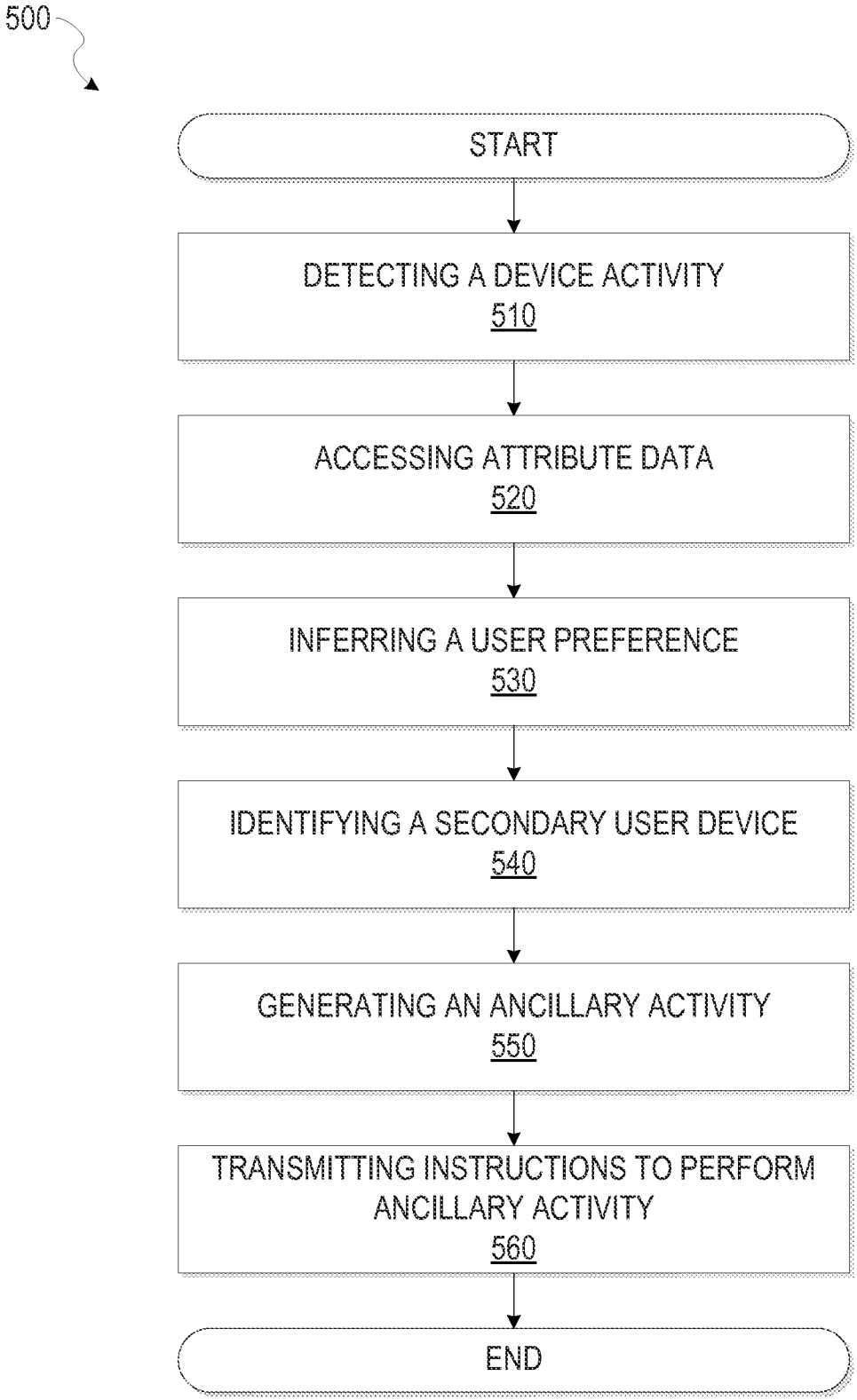

500
START
DETECTING A DEVICE ACTIVITY
510
ACCESSING ATTRIBUTE DATA
520
INFERRING A USER PREFERENCE
530
IDENTIFYING A SECONDARY USER DEVICE
540
GENERATING AN ANCILLARY ACTIVITY
550
TRANSMITTING INSTRUCTIONS TO PERFORM ANCILLARY ACTIVITY
560
END

FIG. 5

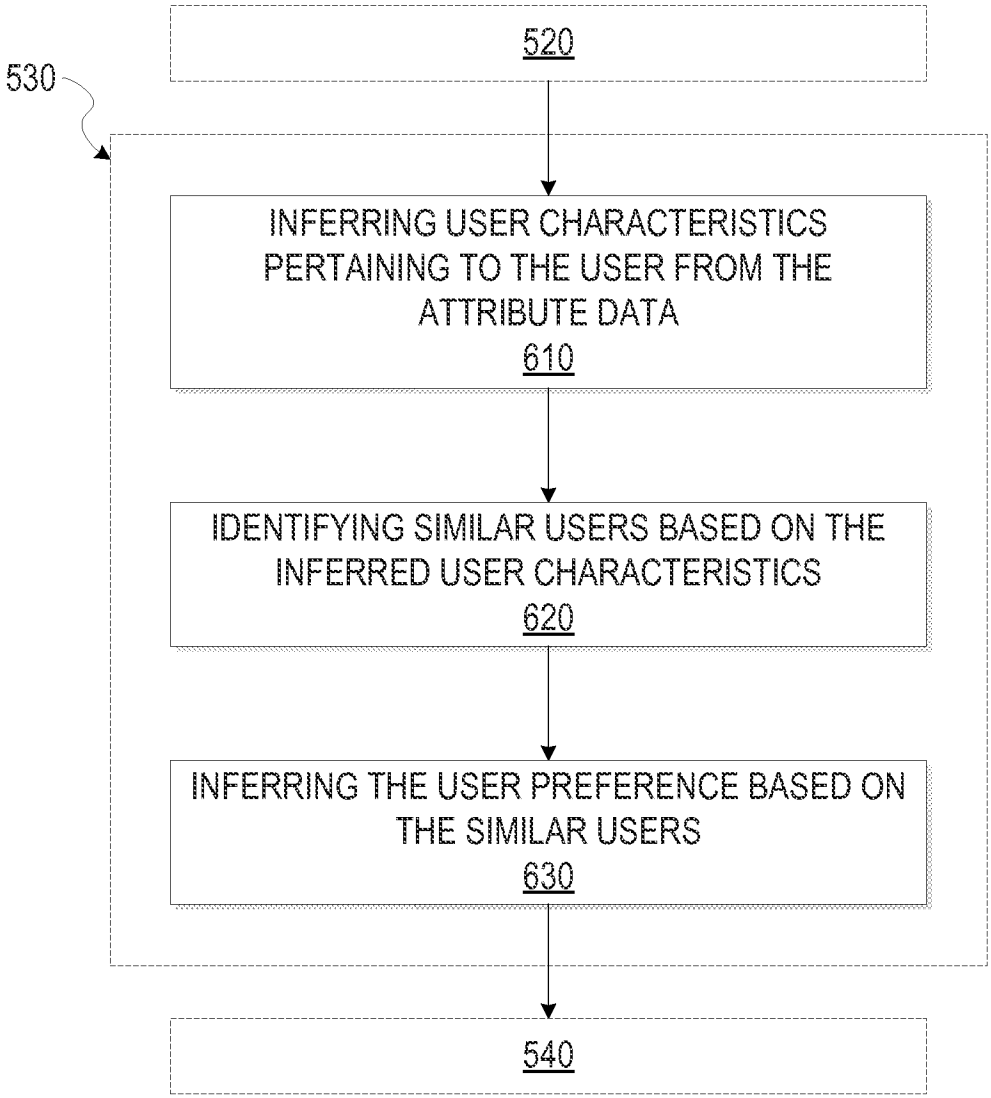

520
530
INFERRING USER CHARACTERISTICS PERTAINING TO THE USER FROM THE ATTRIBUTE DATA
610
IDENTIFYING SIMILAR USERS BASED ON THE INFERRED USER CHARACTERISTICS
620
INFERRING THE USER PREFERENCE BASED ON THE SIMILAR USERS
630
540

FIG. 6

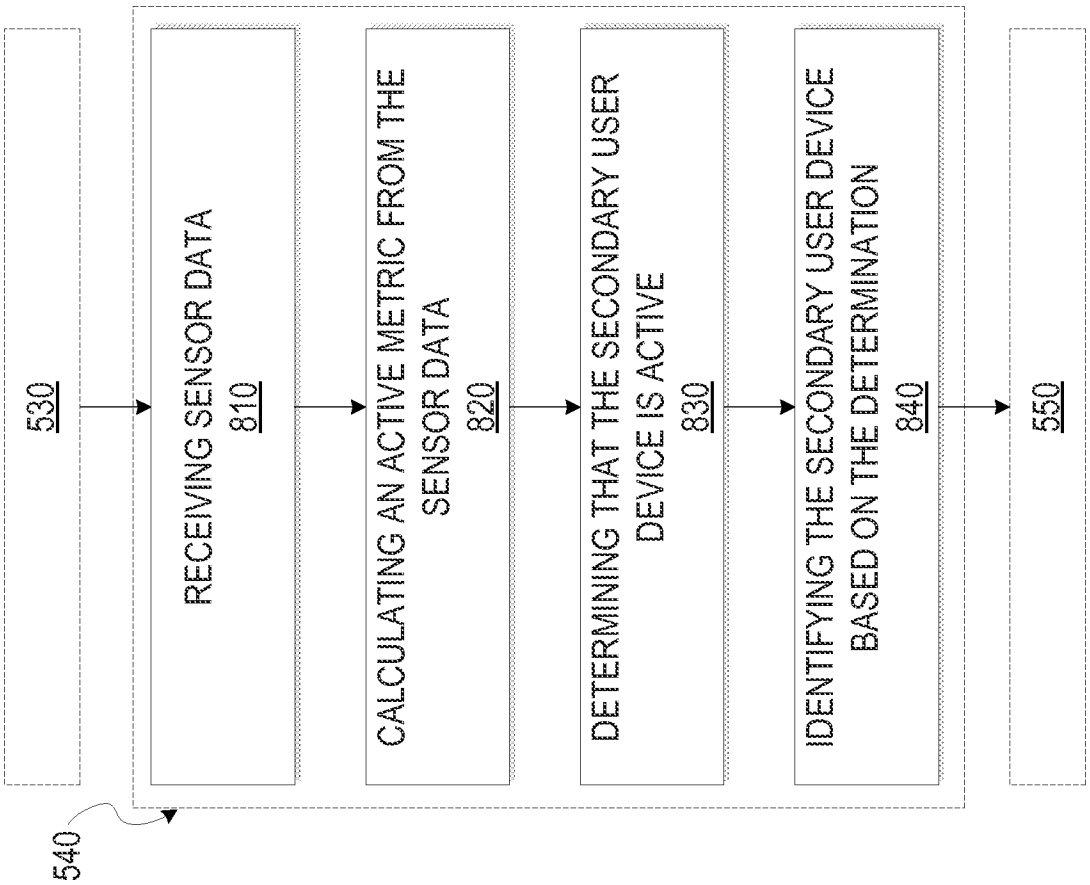

530
RECEIVING SENSOR DATA
810
CALCULATING AN ACTIVE METRIC FROM THE SENSOR DATA
820
DETERMINING THAT THE SECONDARY USER DEVICE IS ACTIVE
830
IDENTIFYING THE SECONDARY USER DEVICE BASED ON THE DETERMINATION
840
550
540

FIG. 8

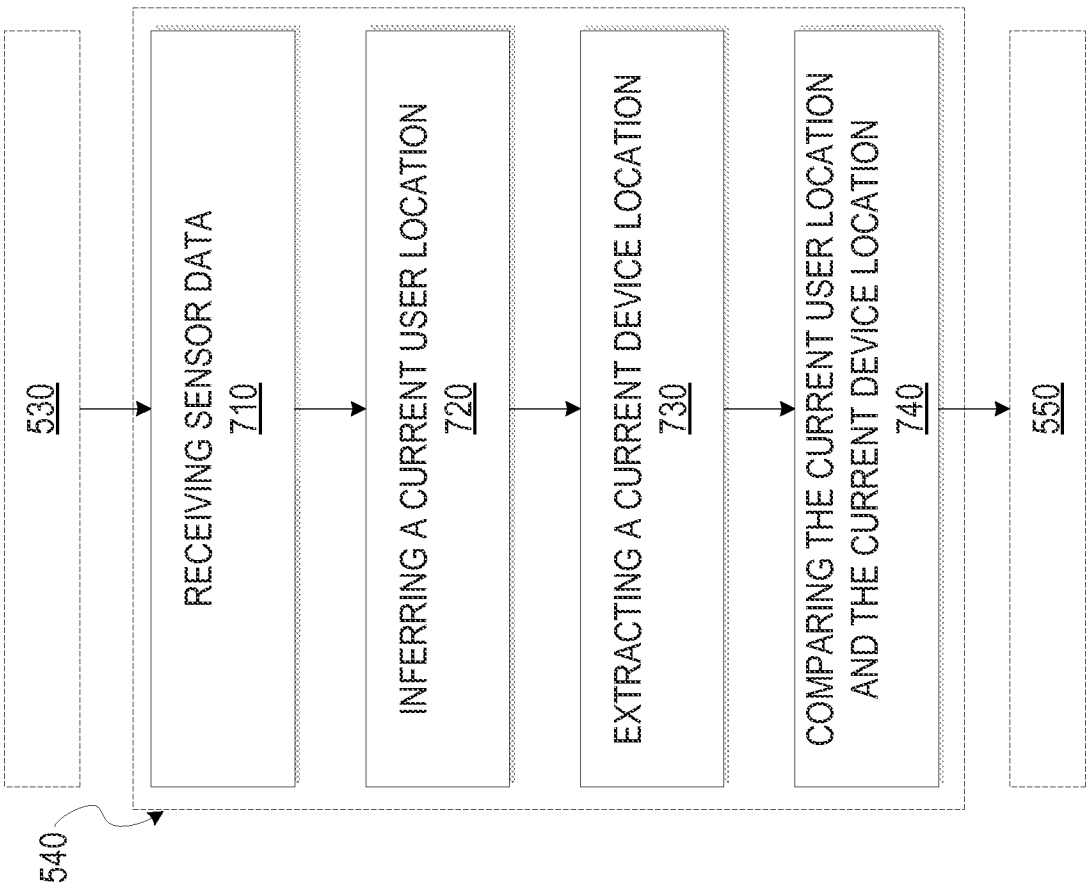

530
RECEIVING SENSOR DATA
710
INFERRING A CURRENT USER LOCATION
720
EXTRACTING A CURRENT DEVICE LOCATION
730
COMPARING THE CURRENT USER LOCATION AND THE CURRENT DEVICE LOCATION
740
550
540

FIG. 7

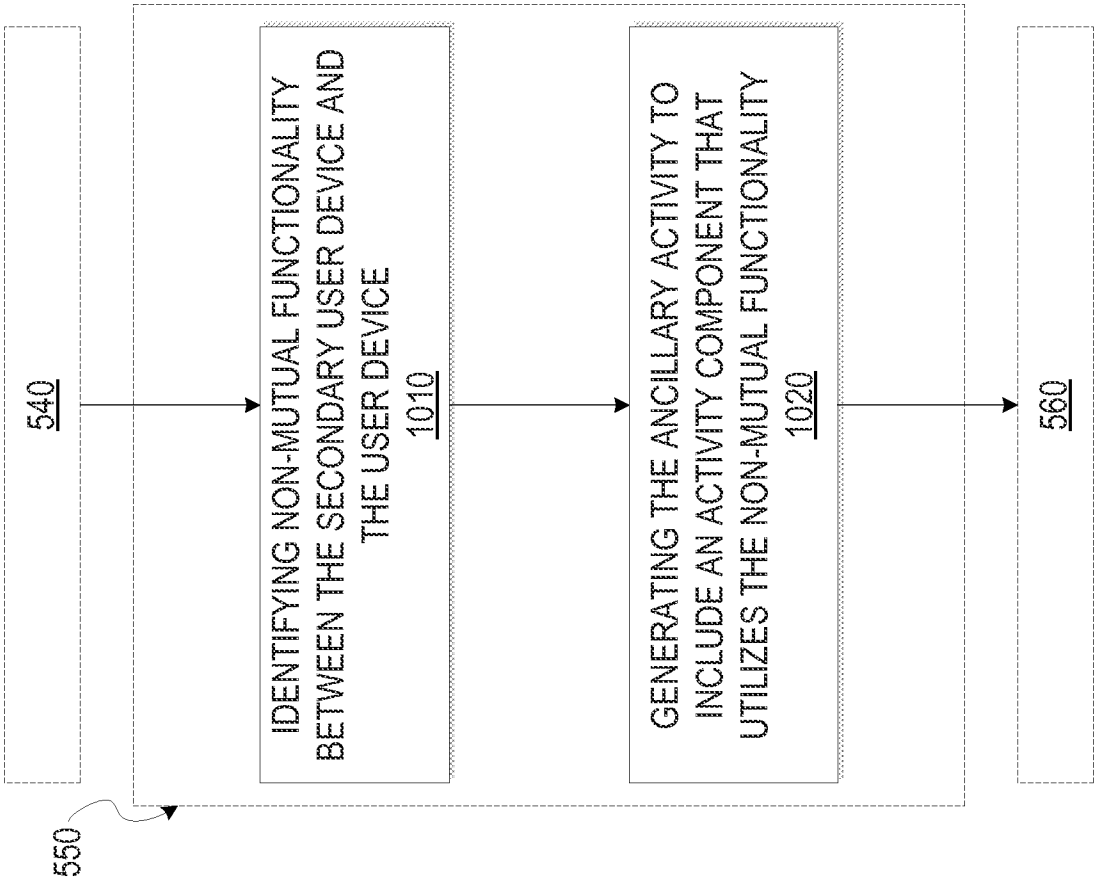

540
IDENTIFYING NON-MUTUAL FUNCTIONALITY BETWEEN THE SECONDARY USER DEVICE AND THE USER DEVICE
1010
GENERATING THE ANCILLARY ACTIVITY TO INCLUDE AN ACTIVITY COMPONENT THAT UTILIZES THE NON-MUTUAL FUNCTIONALITY
1020
560
550

FIG. 10

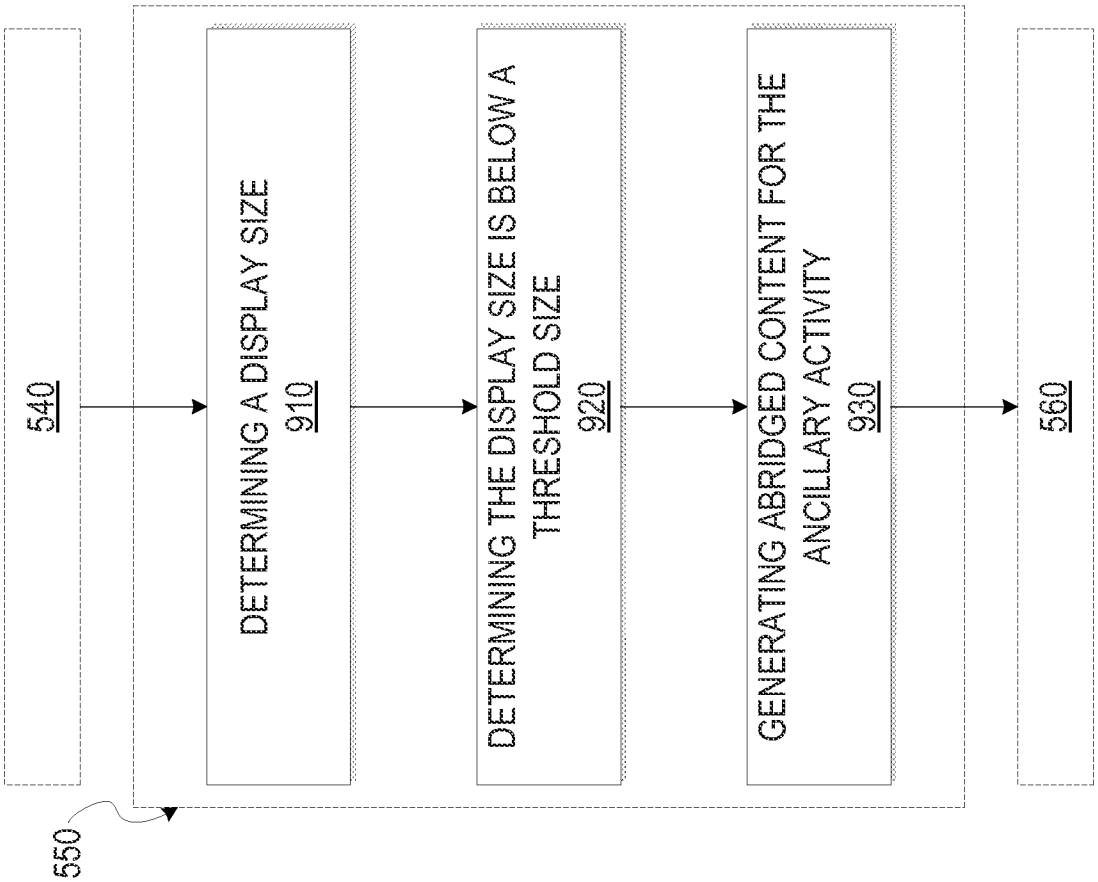

540
DETERMINING A DISPLAY SIZE
910
DETERMINING THE DISPLAY SIZE IS BELOW A THRESHOLD SIZE
920
GENERATING ABRIDGED CONTENT FOR THE ANCILLARY ACTIVITY
930
560
550

FIG. 9

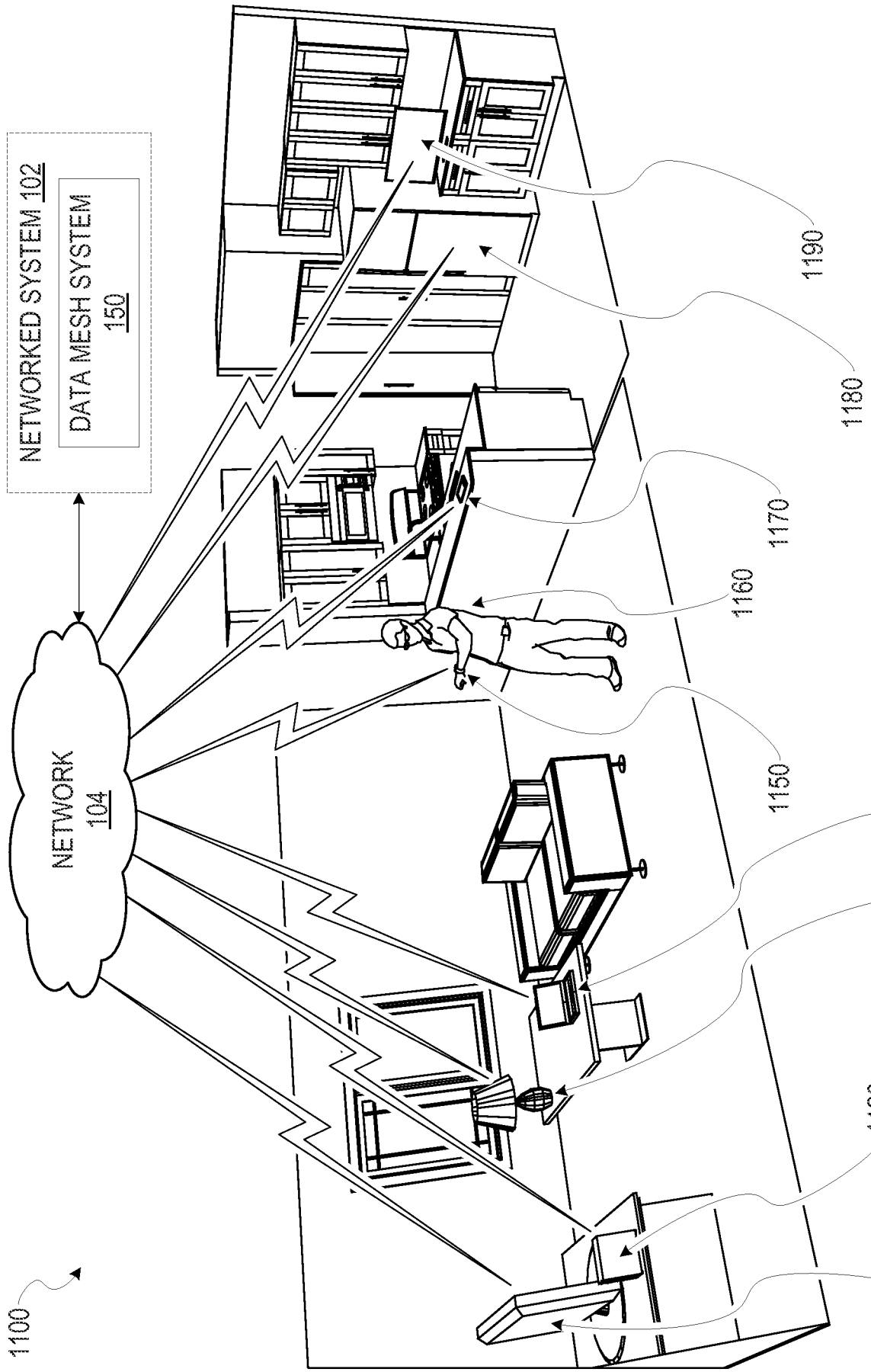

NETWORKED SYSTEM 102
DATA MESH SYSTEM 150
NETWORK 104
1100
1110
1120
1130
1140
1150
1160
1170
1180
1190

FIG. 11

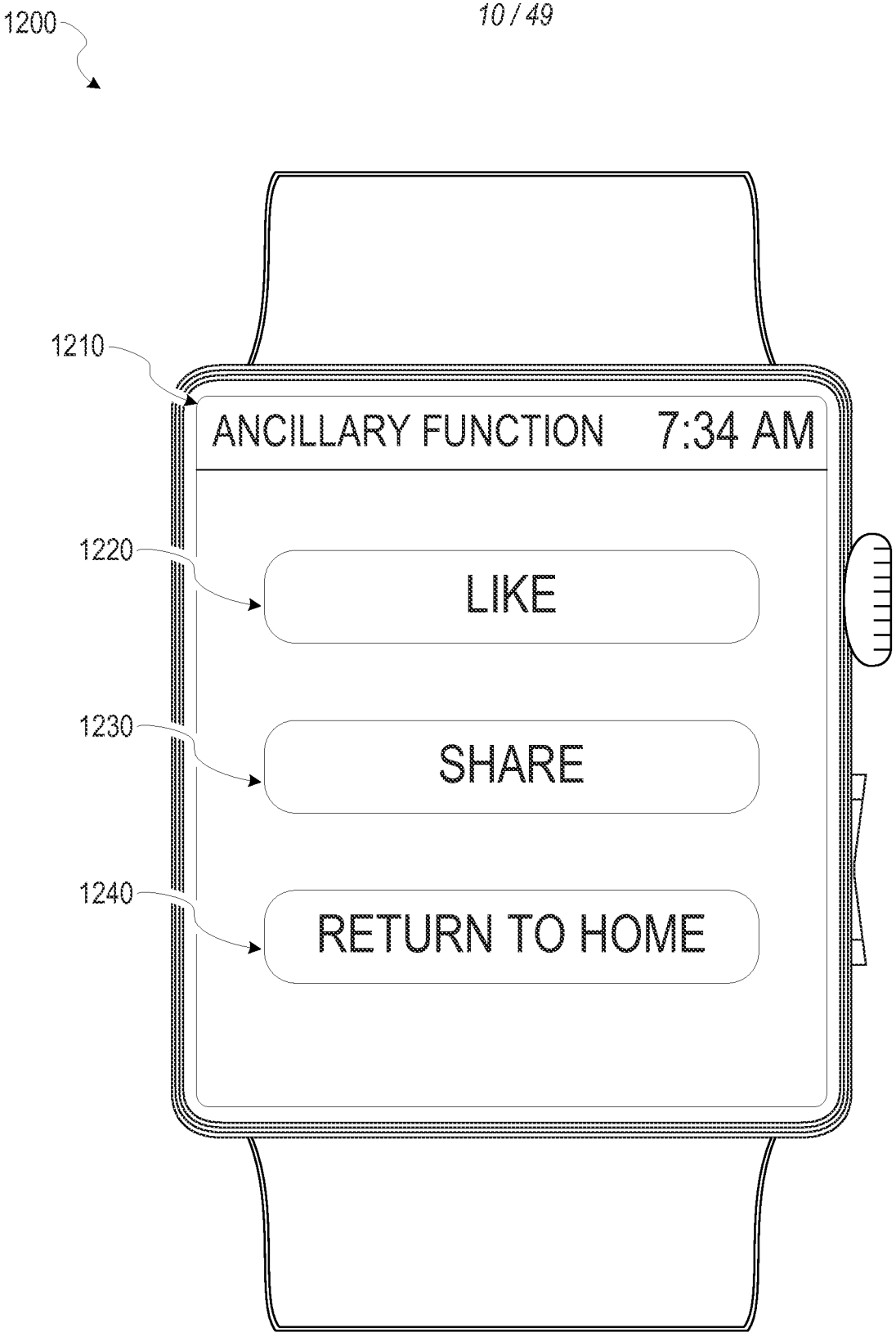

1200
1210
ANCILLARY FUNCTION
7:34 AM
1220
LIKE
1230
SHARE
1240
RETURN TO HOME

FIG. 12

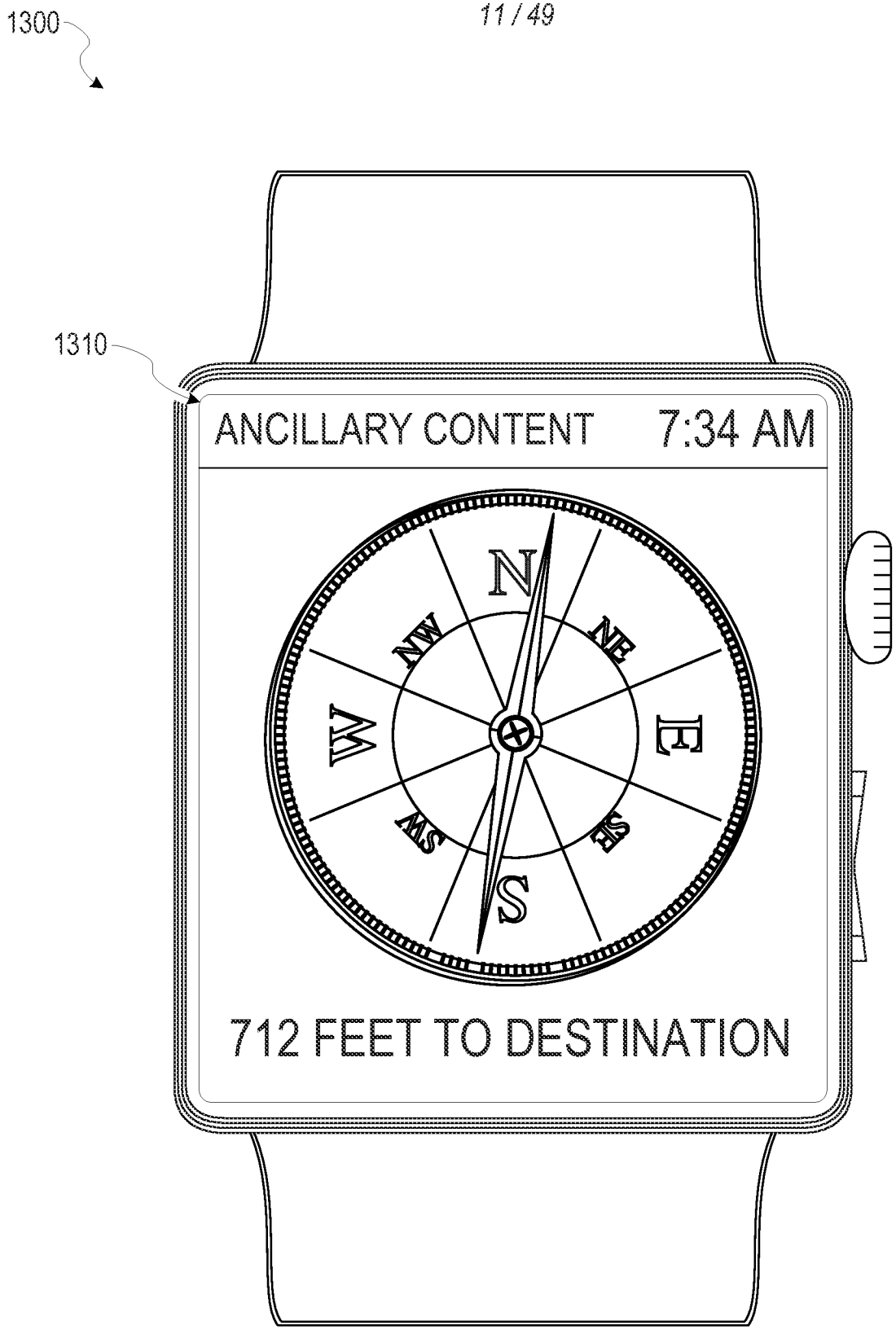

1300
1310
ANCILLARY CONTENT
7:34 AM
N
NW
NE
W
E
SW
SE
S
712 FEET TO DESTINATION

FIG. 13

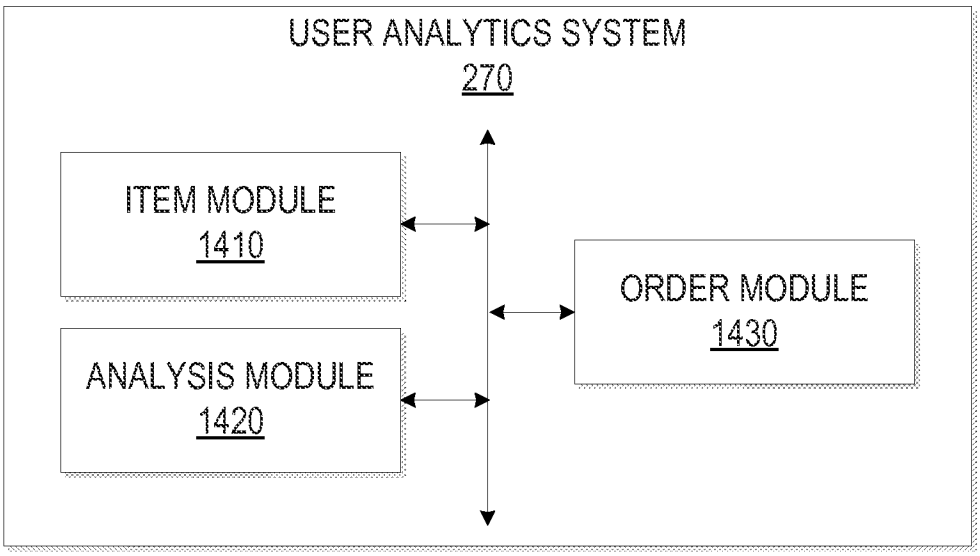

USER ANALYTICS SYSTEM
270
ITEM MODULE
1410
ANALYSIS MODULE
1420
ORDER MODULE
1430

FIG. 14

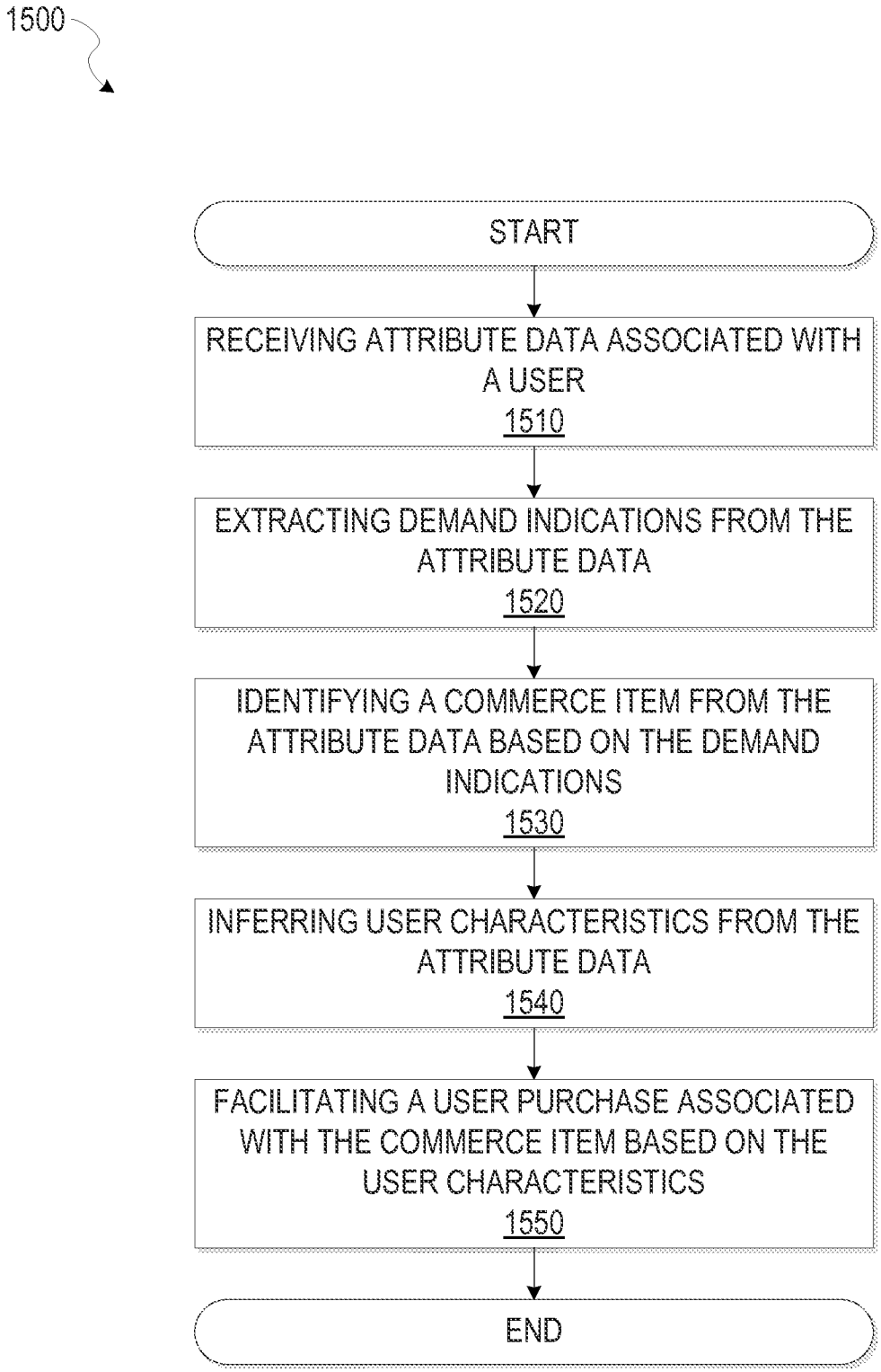

1500
START
RECEIVING ATTRIBUTE DATA ASSOCIATED WITH A USER
1510
EXTRACTING DEMAND INDICATIONS FROM THE ATTRIBUTE DATA
1520
IDENTIFYING A COMMERCE ITEM FROM THE ATTRIBUTE DATA BASED ON THE DEMAND INDICATIONS
1530
INFERRING USER CHARACTERISTICS FROM THE ATTRIBUTE DATA
1540
FACILITATING A USER PURCHASE ASSOCIATED WITH THE COMMERCE ITEM BASED ON THE USER CHARACTERISTICS
1550
END

FIG. 15

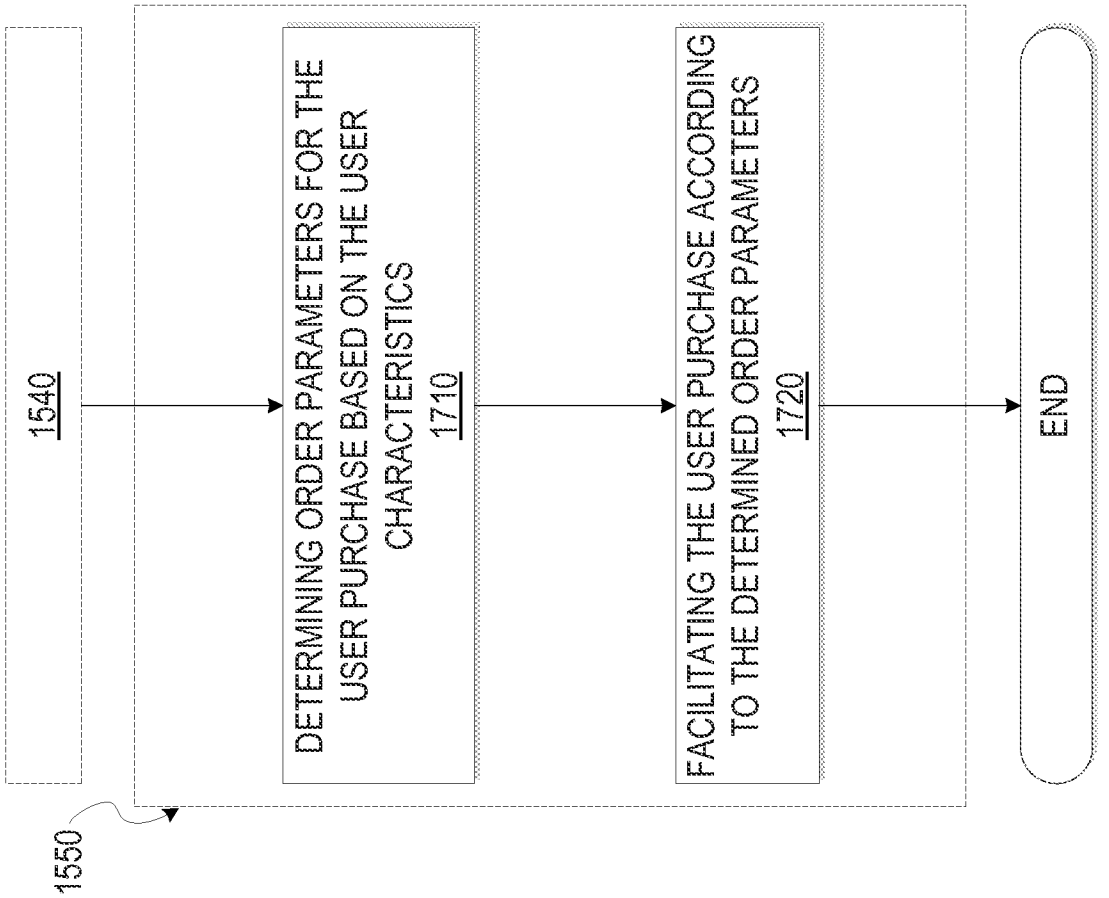

1540
DETERMINING ORDER PARAMETERS FOR THE USER PURCHASE BASED ON THE USER CHARACTERISTICS
1710
FACILITATING THE USER PURCHASE ACCORDING TO THE DETERMINED ORDER PARAMETERS
1720
END
1550

FIG. 17

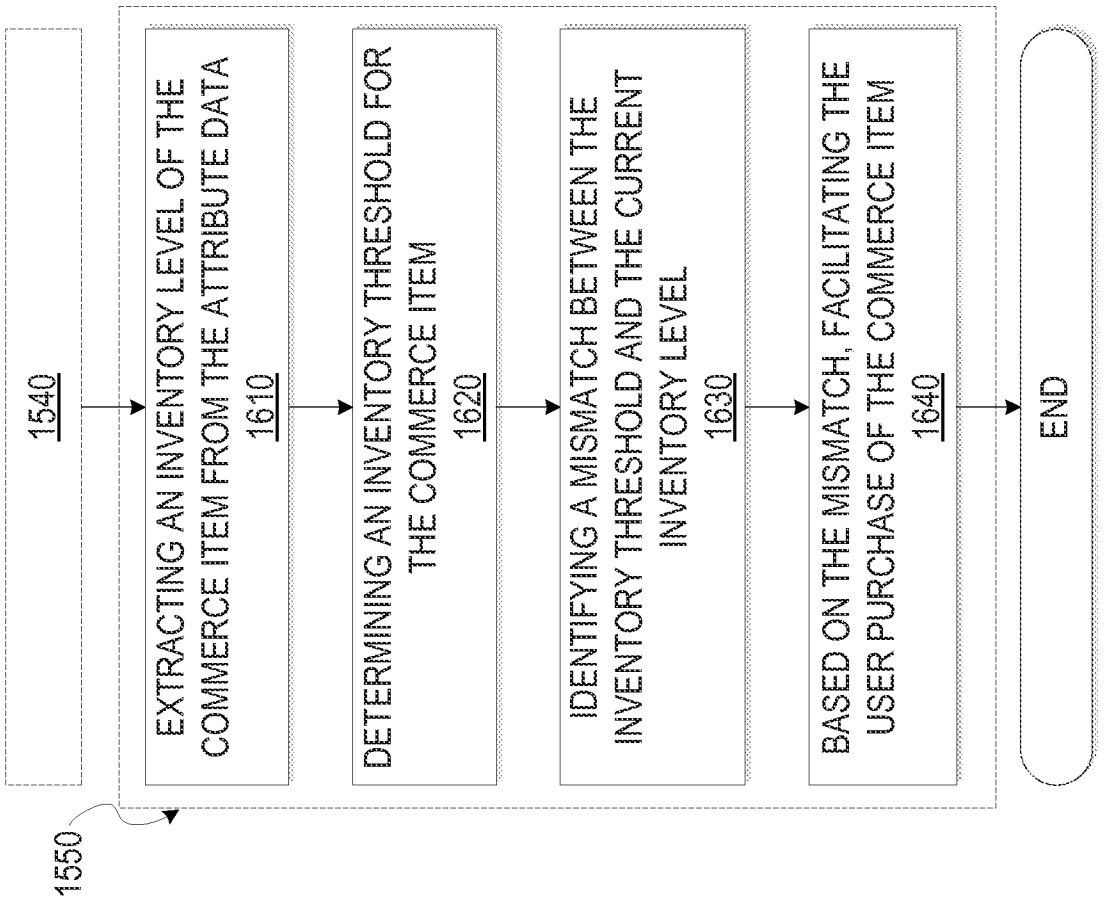

1540
EXTRACTING AN INVENTORY LEVEL OF THE COMMERCE ITEM FROM THE ATTRIBUTE DATA
1610
DETERMINING AN INVENTORY THRESHOLD FOR THE COMMERCE ITEM
1620
IDENTIFYING A MISMATCH BETWEEN THE INVENTORY THRESHOLD AND THE CURRENT INVENTORY LEVEL
1630
BASED ON THE MISMATCH, FACILITATING THE USER PURCHASE OF THE COMMERCE ITEM
1640
END
1550

FIG. 16

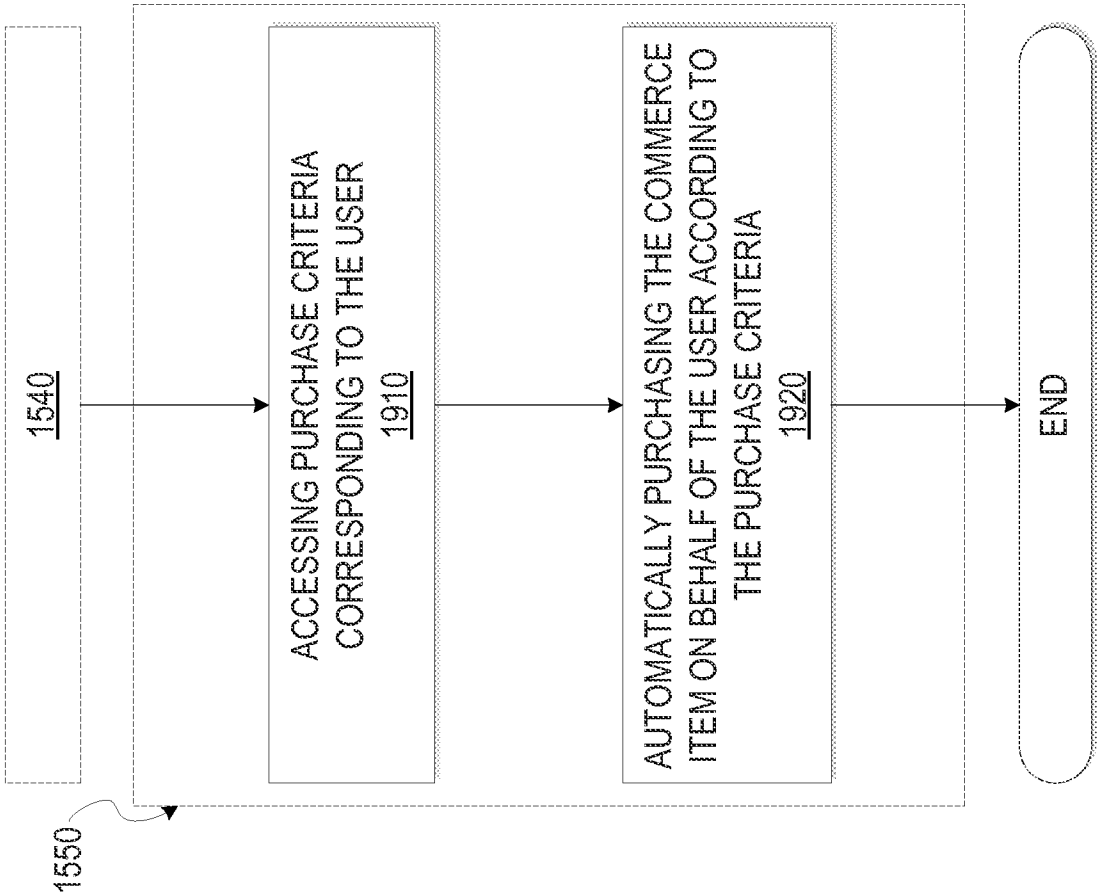

1540
ACCESSING PURCHASE CRITERIA CORRESPONDING TO THE USER
1910
AUTOMATICALLY PURCHASING THE COMMERCE ITEM ON BEHALF OF THE USER ACCORDING TO THE PURCHASE CRITERIA
1920
END
1550

FIG. 19

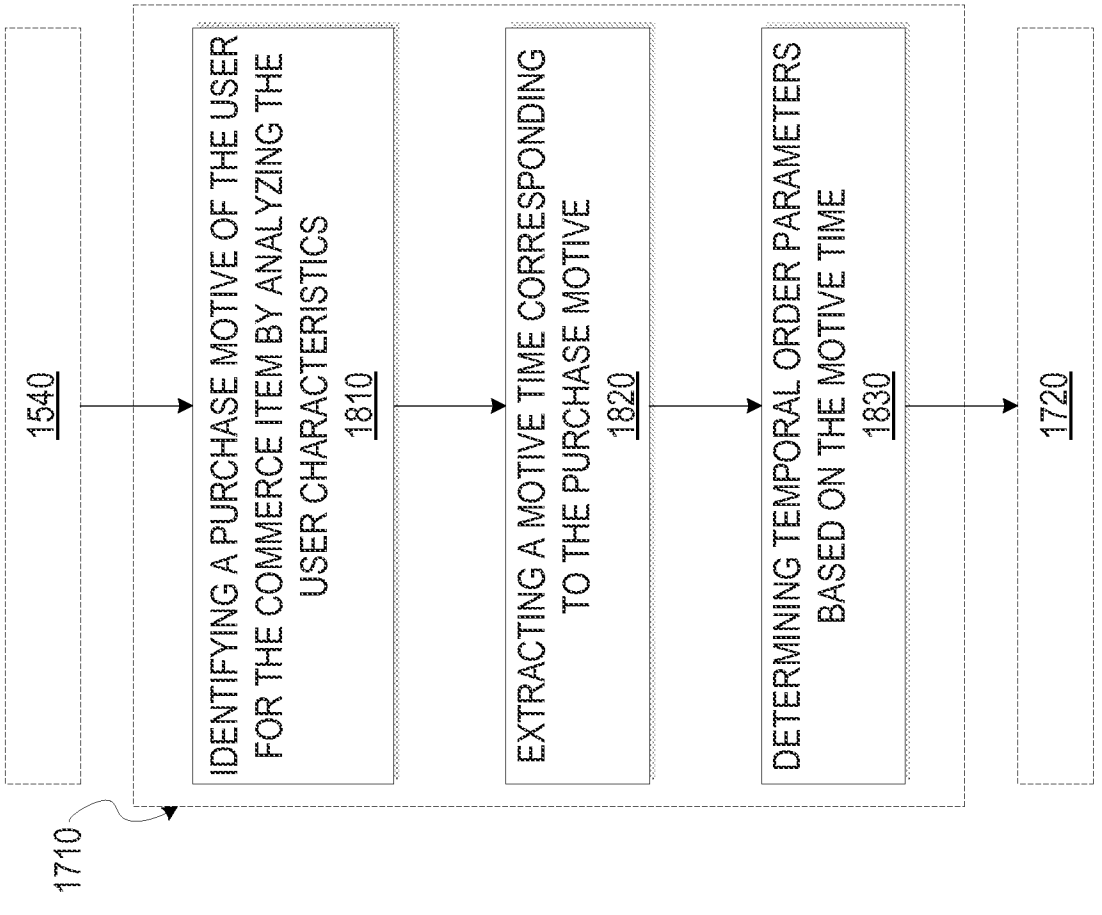

1540
IDENTIFYING A PURCHASE MOTIVE OF THE USER FOR THE COMMERCE ITEM BY ANALYZING THE USER CHARACTERISTICS
1810
EXTRACTING A MOTIVE TIME CORRESPONDING TO THE PURCHASE MOTIVE
1820
DETERMINING TEMPORAL ORDER PARAMETERS BASED ON THE MOTIVE TIME
1830
1720
1710

FIG. 18

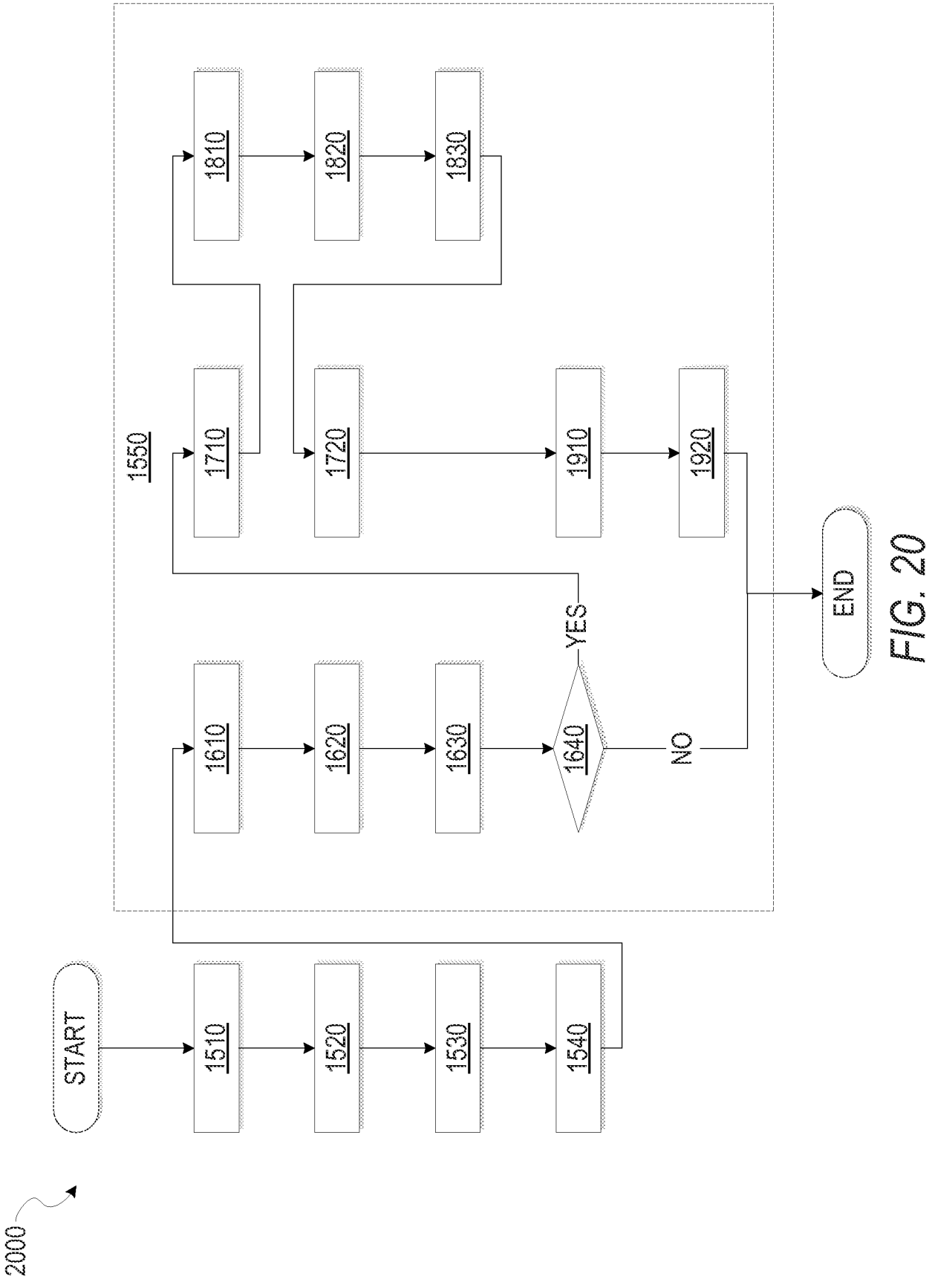

2000
START
1510
1520
1530
1540
1550
1610
1620
1630
1640
YES
NO
1710
1720
1810
1820
1830
1910
1920
END

FIG. 20

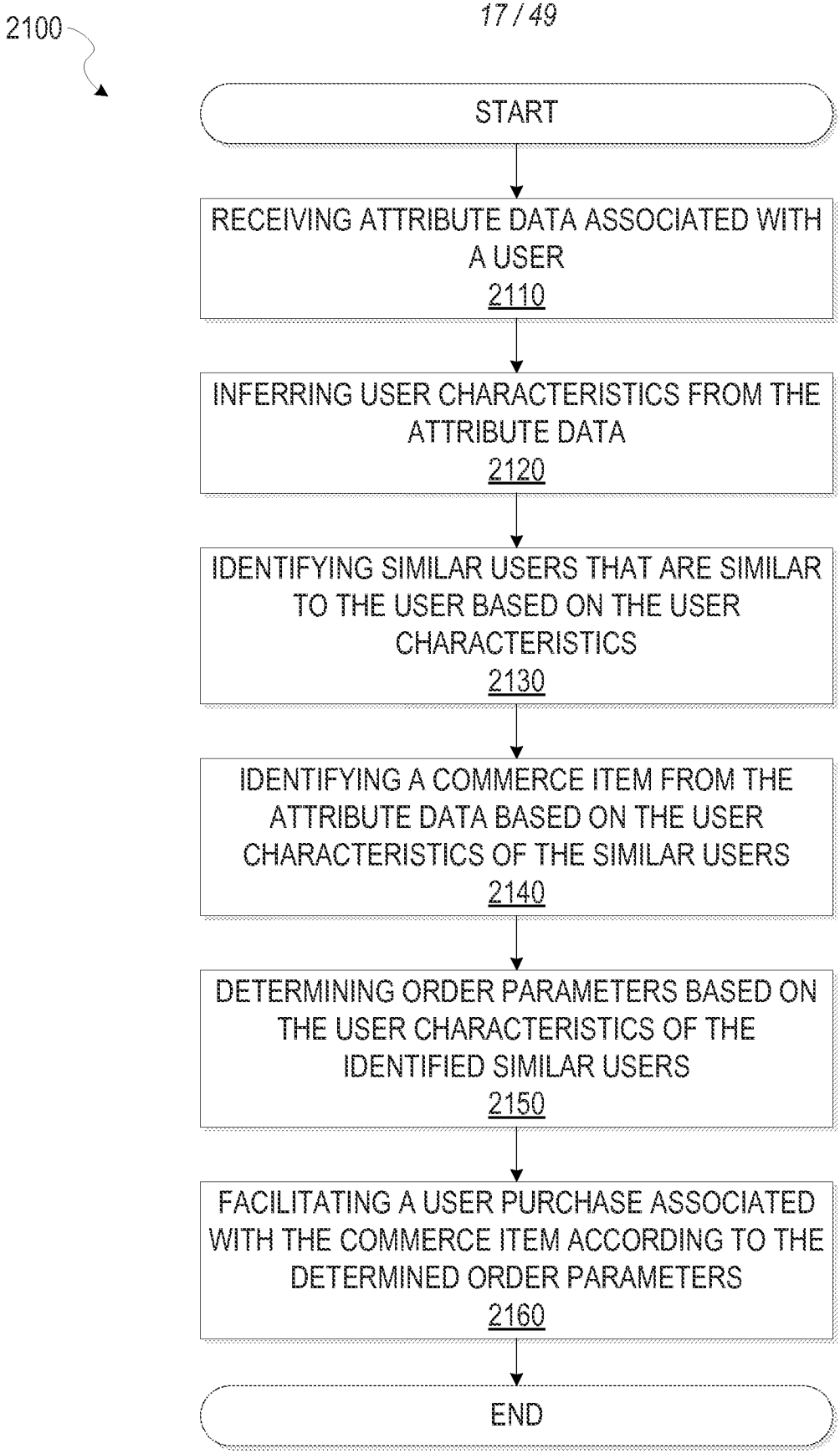

2100
START
RECEIVING ATTRIBUTE DATA ASSOCIATED WITH A USER
2110
INFERRING USER CHARACTERISTICS FROM THE ATTRIBUTE DATA
2120
IDENTIFYING SIMILAR USERS THAT ARE SIMILAR TO THE USER BASED ON THE USER CHARACTERISTICS
2130
IDENTIFYING A COMMERCE ITEM FROM THE ATTRIBUTE DATA BASED ON THE USER CHARACTERISTICS OF THE SIMILAR USERS
2140
DETERMINING ORDER PARAMETERS BASED ON THE USER CHARACTERISTICS OF THE IDENTIFIED SIMILAR USERS
2150
FACILITATING A USER PURCHASE ASSOCIATED WITH THE COMMERCE ITEM ACCORDING TO THE DETERMINED ORDER PARAMETERS
2160
END

FIG. 21

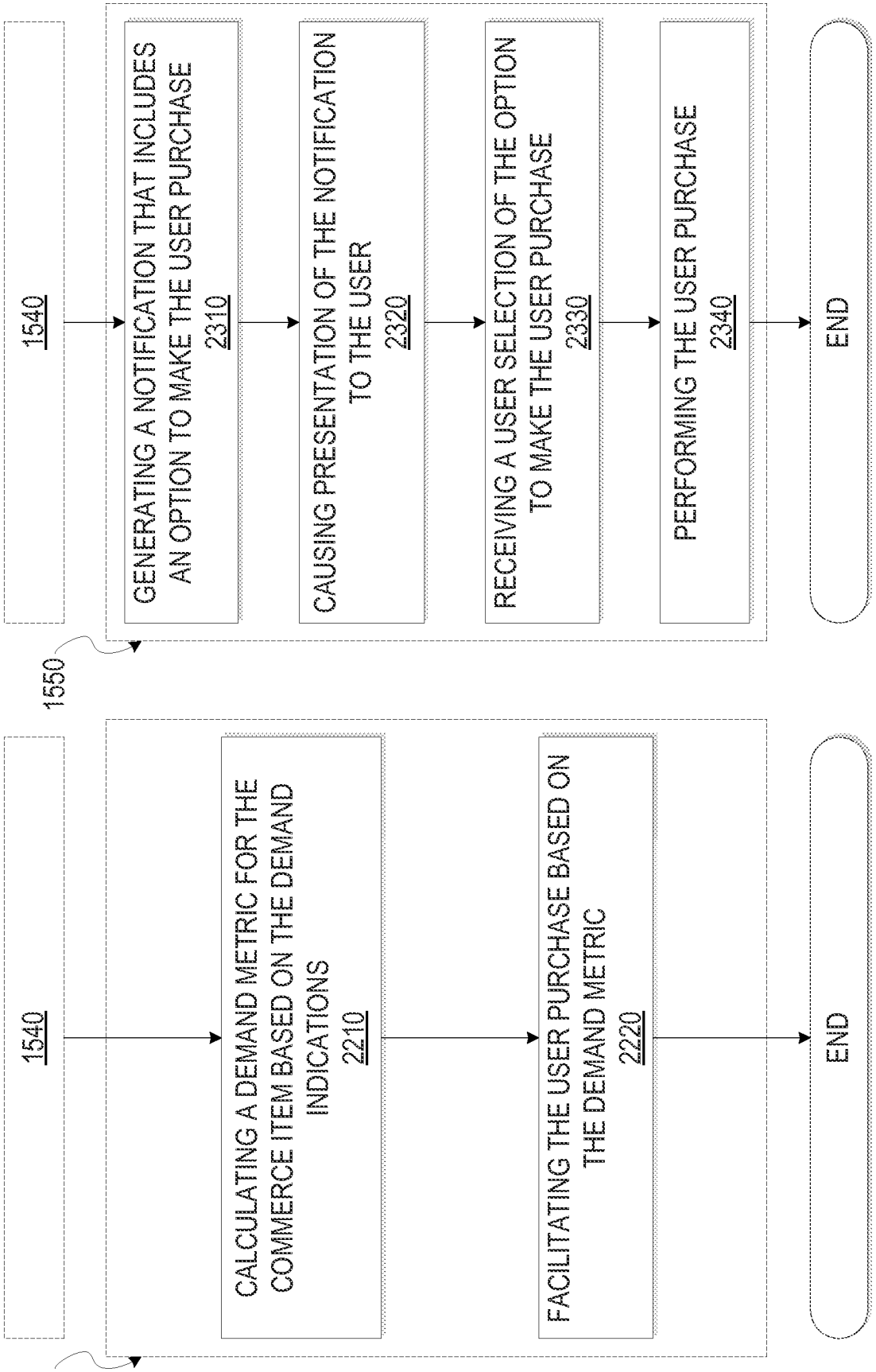

1540
1550
CALCULATING A DEMAND METRIC FOR THE COMMERCE ITEM BASED ON THE DEMAND INDICATIONS
2210
FACILITATING THE USER PURCHASE BASED ON THE DEMAND METRIC
2220
END

FIG. 22

1540
1550
GENERATING A NOTIFICATION THAT INCLUDES AN OPTION TO MAKE THE USER PURCHASE
2310
CAUSING PRESENTATION OF THE NOTIFICATION TO THE USER
2320
RECEIVING A USER SELECTION OF THE OPTION TO MAKE THE USER PURCHASE
2330
PERFORMING THE USER PURCHASE
2340
END

FIG. 23

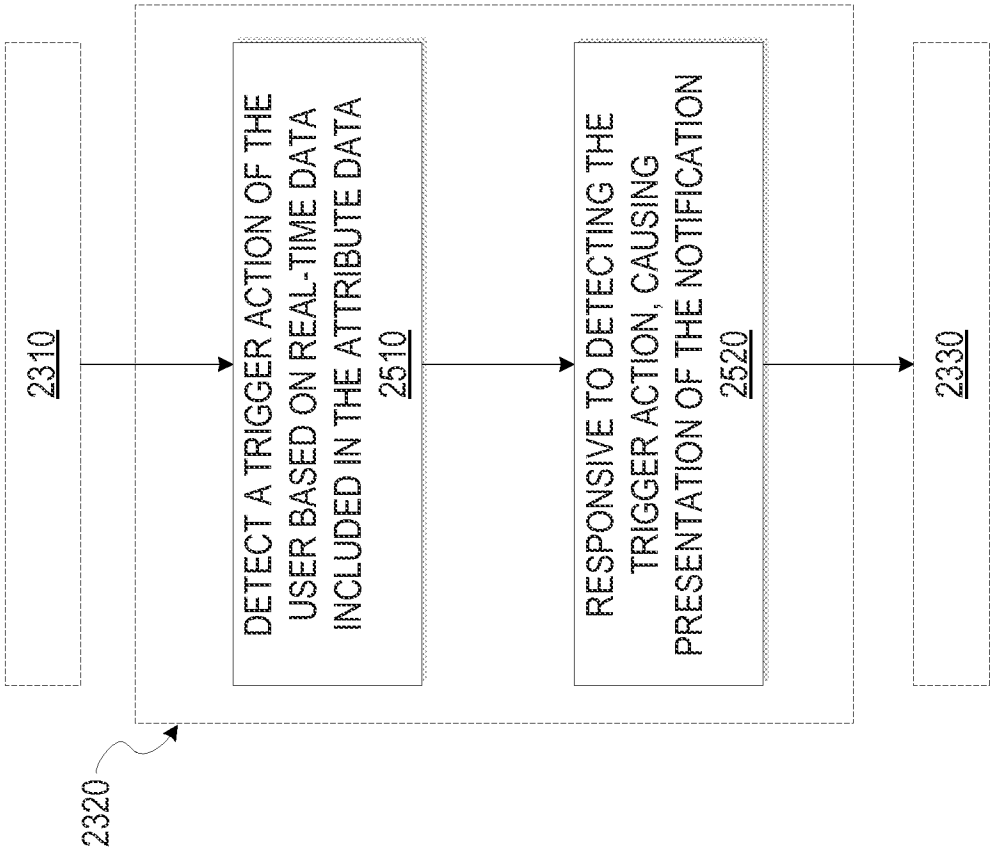

2310
DETECT A TRIGGER ACTION OF THE USER BASED ON REAL-TIME DATA INCLUDED IN THE ATTRIBUTE DATA
2510
RESPONSIVE TO DETECTING THE TRIGGER ACTION, CAUSING PRESENTATION OF THE NOTIFICATION
2520
2330
2320

FIG. 25

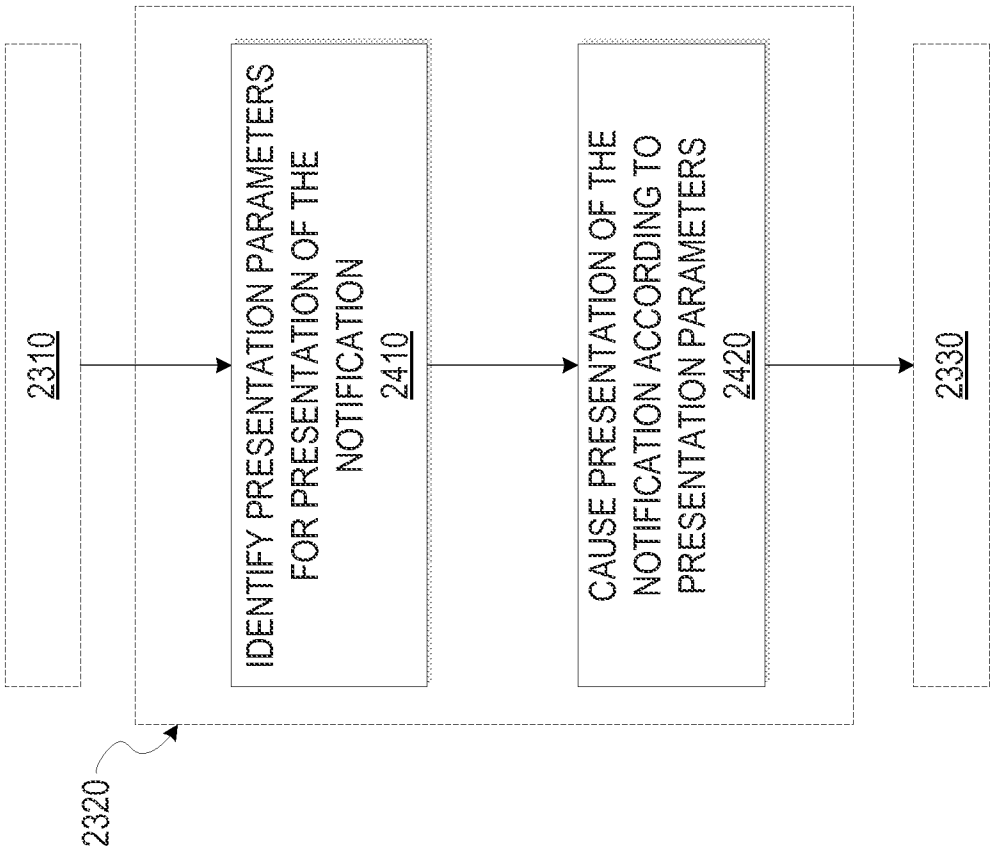

2310
IDENTIFY PRESENTATION PARAMETERS FOR PRESENTATION OF THE NOTIFICATION
2410
CAUSE PRESENTATION OF THE NOTIFICATION ACCORDING TO PRESENTATION PARAMETERS
2420
2330
2320

FIG. 24

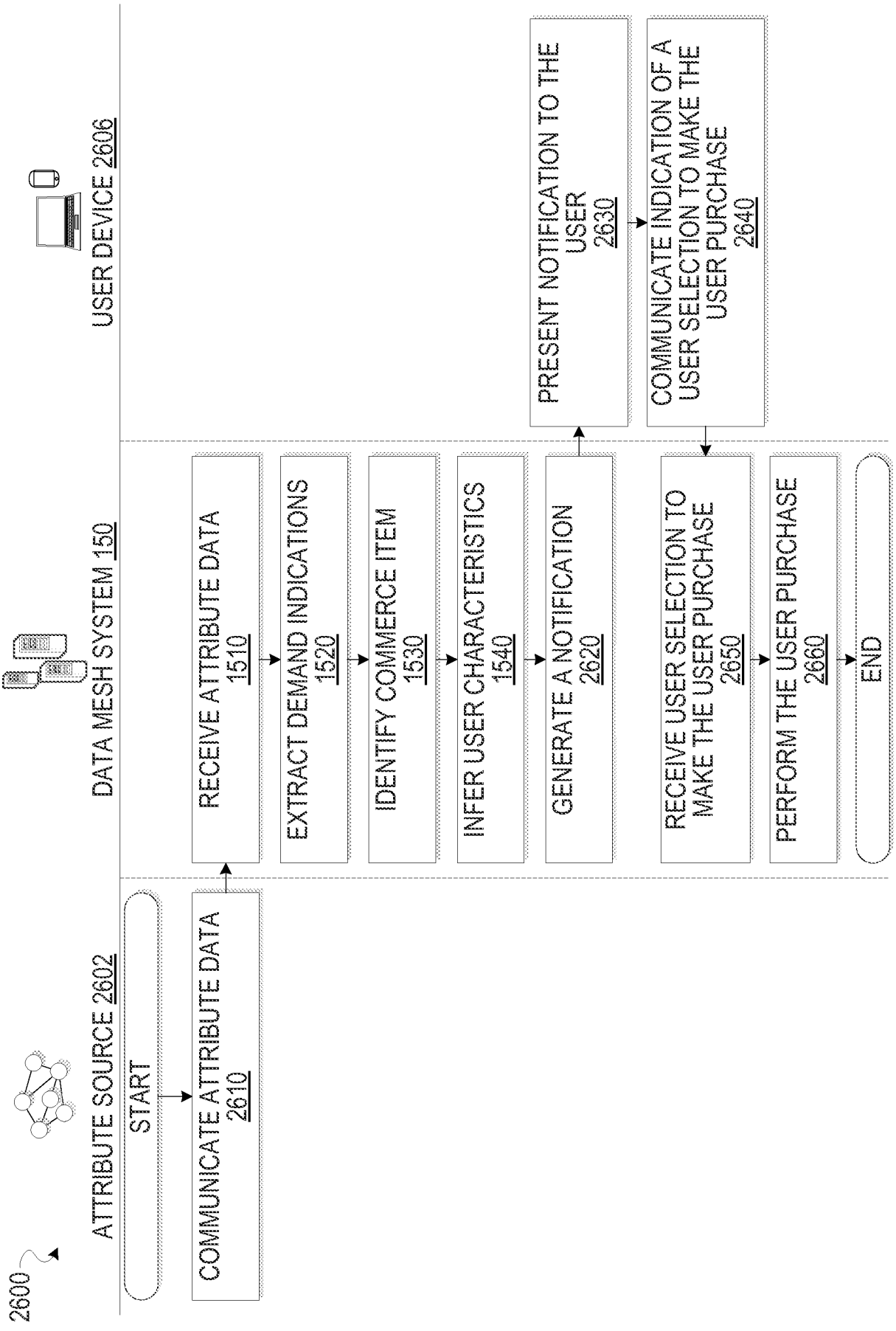

2600
ATTRIBUTE SOURCE 2602
DATA MESH SYSTEM 150
USER DEVICE 2606
START
COMMUNICATE ATTRIBUTE DATA 2610
RECEIVE ATTRIBUTE DATA 1510
EXTRACT DEMAND INDICATIONS 1520
IDENTIFY COMMERCE ITEM 1530
INFER USER CHARACTERISTICS 1540
GENERATE A NOTIFICATION 2620
PRESENT NOTIFICATION TO THE USER 2630
COMMUNICATE INDICATION OF A USER SELECTION TO MAKE THE USER PURCHASE 2640
RECEIVE USER SELECTION TO MAKE THE USER PURCHASE 2650
PERFORM THE USER PURCHASE 2660
END

FIG. 26

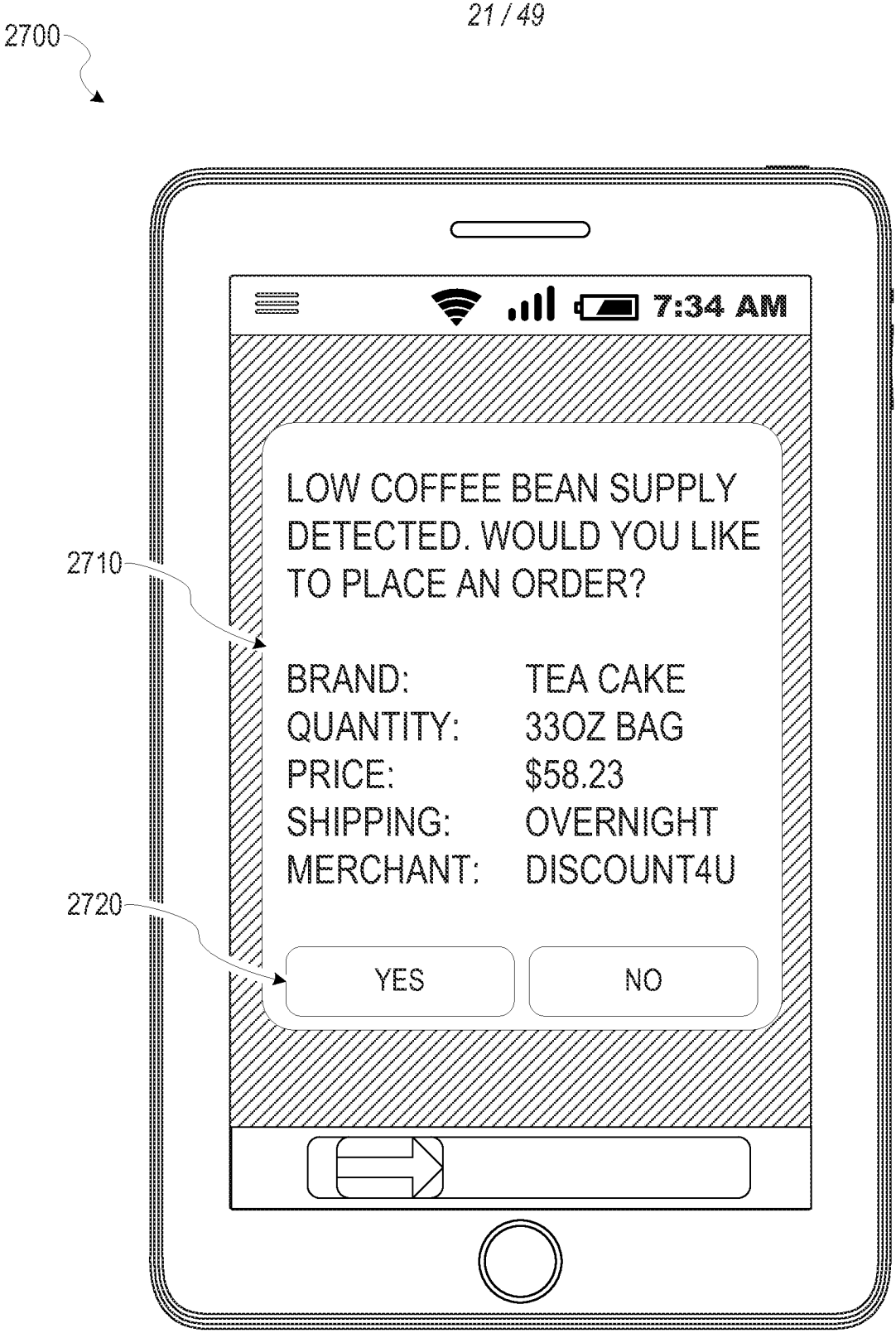

2700
7:34 AM
LOW COFFEE BEAN SUPPLY DETECTED. WOULD YOU LIKE TO PLACE AN ORDER?
2710
BRAND: TEA CAKE
QUANTITY: 33OZ BAG
PRICE: $58.23
SHIPPING: OVERNIGHT
MERCHANT: DISCOUNT4U
2720
YES
NO

FIG. 27

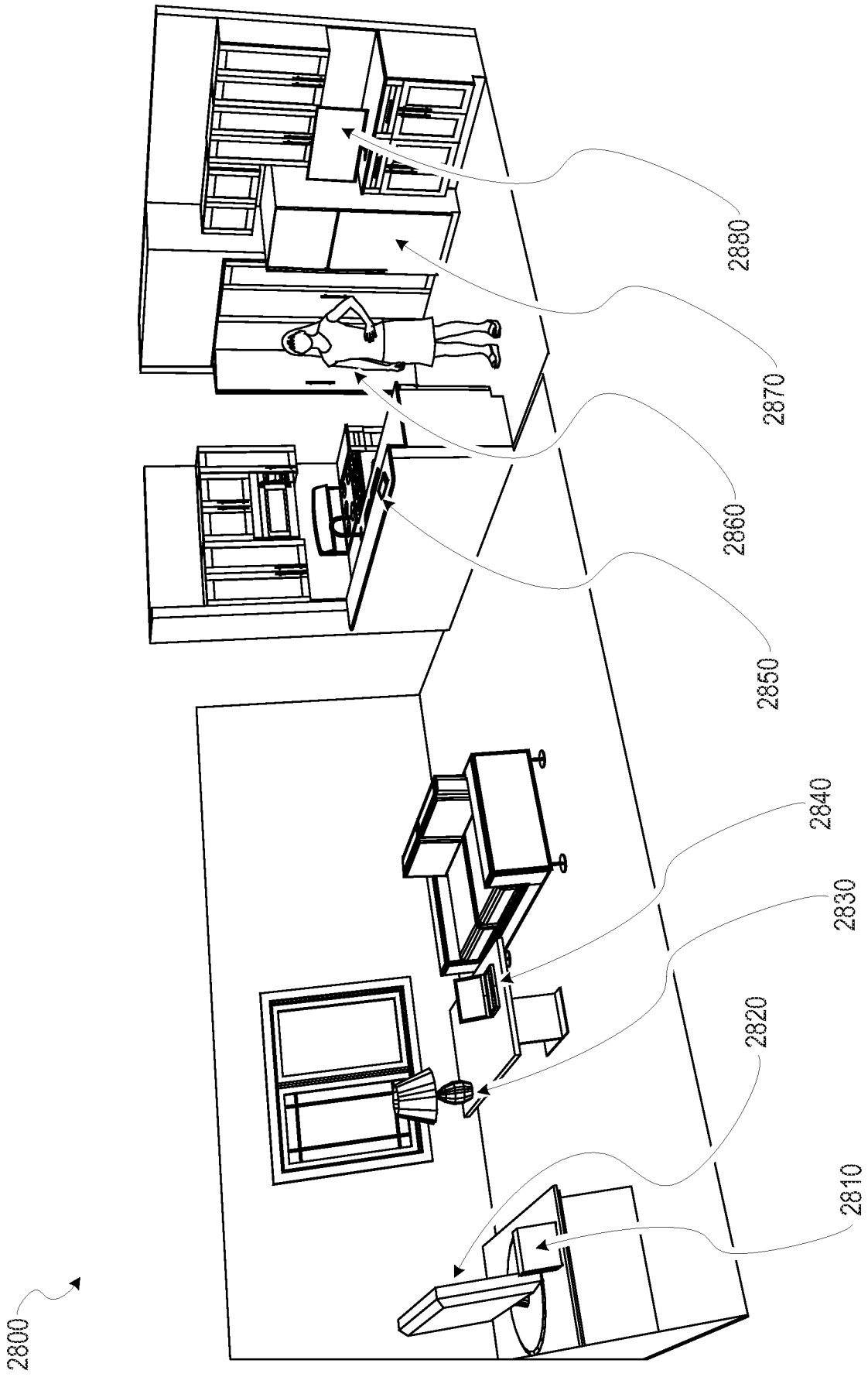


FIG. 28

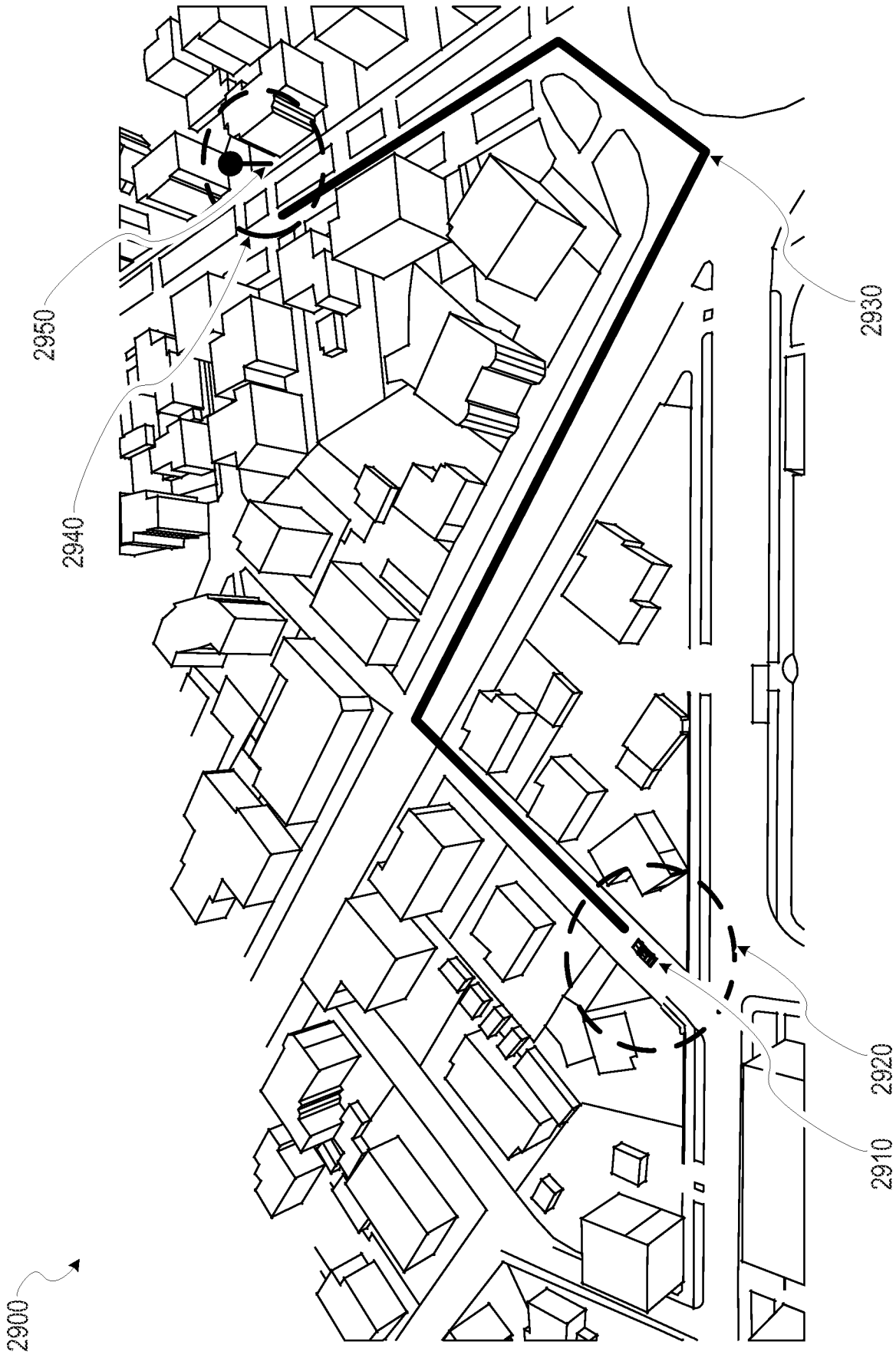


FIG. 29

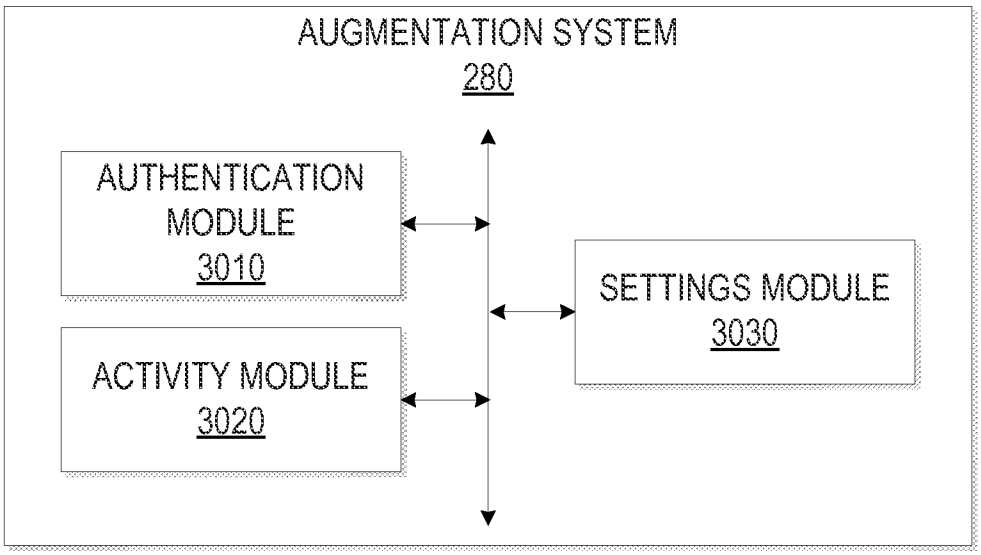

AUGMENTATION SYSTEM
280
AUTHENTICATION MODULE
3010
ACTIVITY MODULE
3020
SETTINGS MODULE
3030

FIG. 30

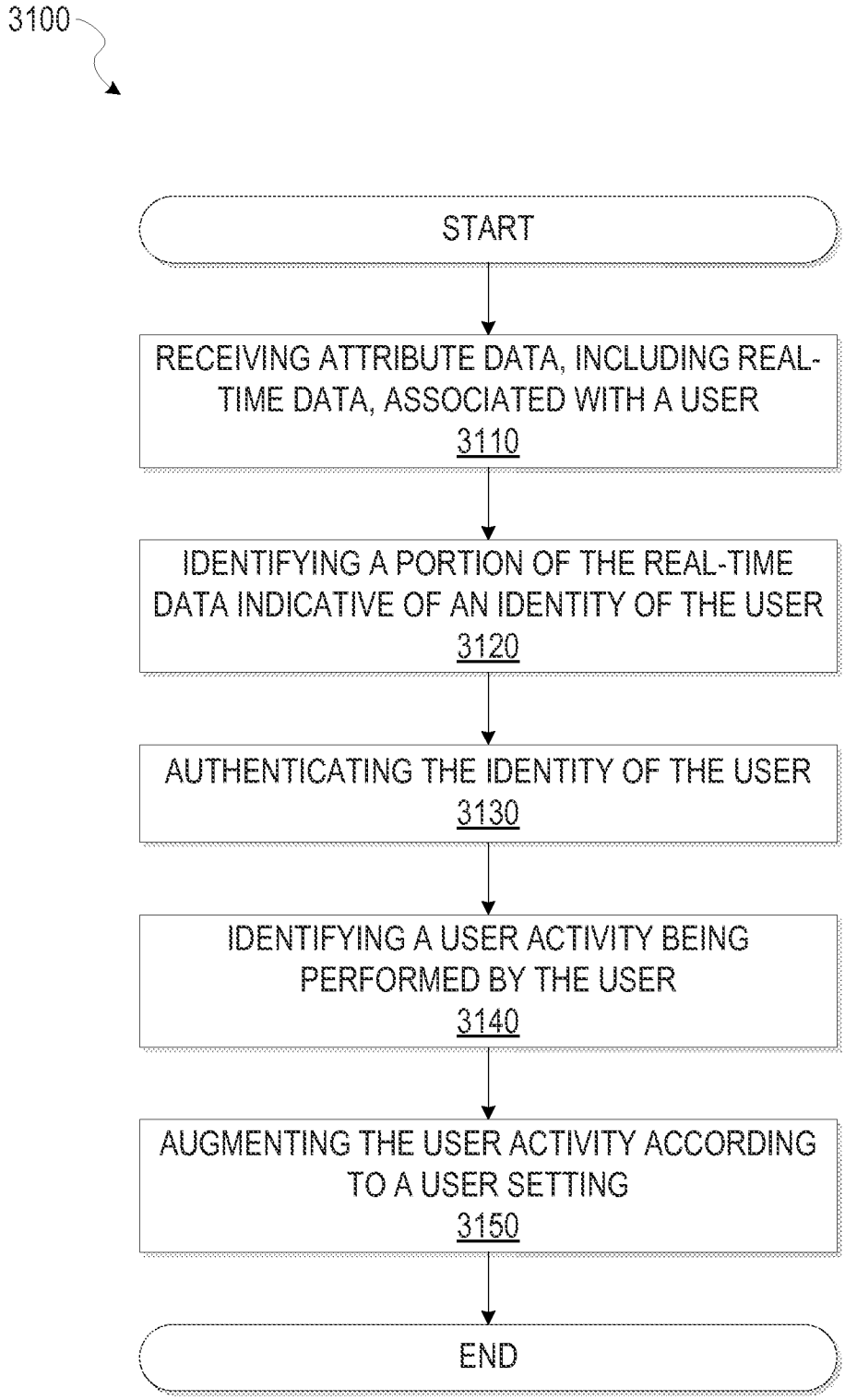

3100
START
RECEIVING ATTRIBUTE DATA, INCLUDING REAL-TIME DATA, ASSOCIATED WITH A USER
3110
IDENTIFYING A PORTION OF THE REAL-TIME DATA INDICATIVE OF AN IDENTITY OF THE USER
3120
AUTHENTICATING THE IDENTITY OF THE USER
3130
IDENTIFYING A USER ACTIVITY BEING PERFORMED BY THE USER
3140
AUGMENTING THE USER ACTIVITY ACCORDING TO A USER SETTING
3150
END

FIG. 31

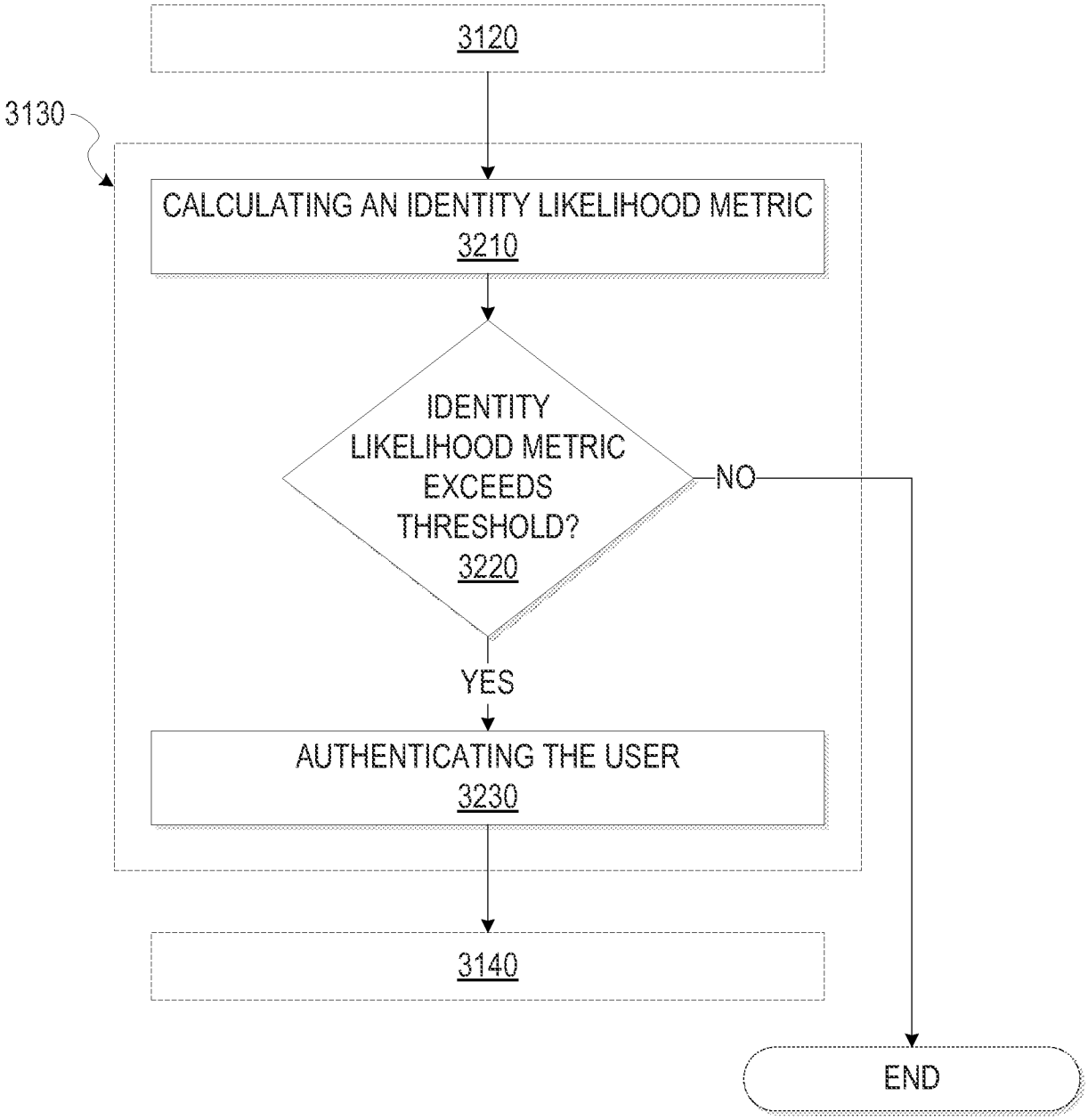

3120
3130
CALCULATING AN IDENTITY LIKELIHOOD METRIC
3210
IDENTITY LIKELIHOOD METRIC EXCEEDS THRESHOLD?
3220
NO
YES
AUTHENTICATING THE USER
3230
3140
END

FIG. 32

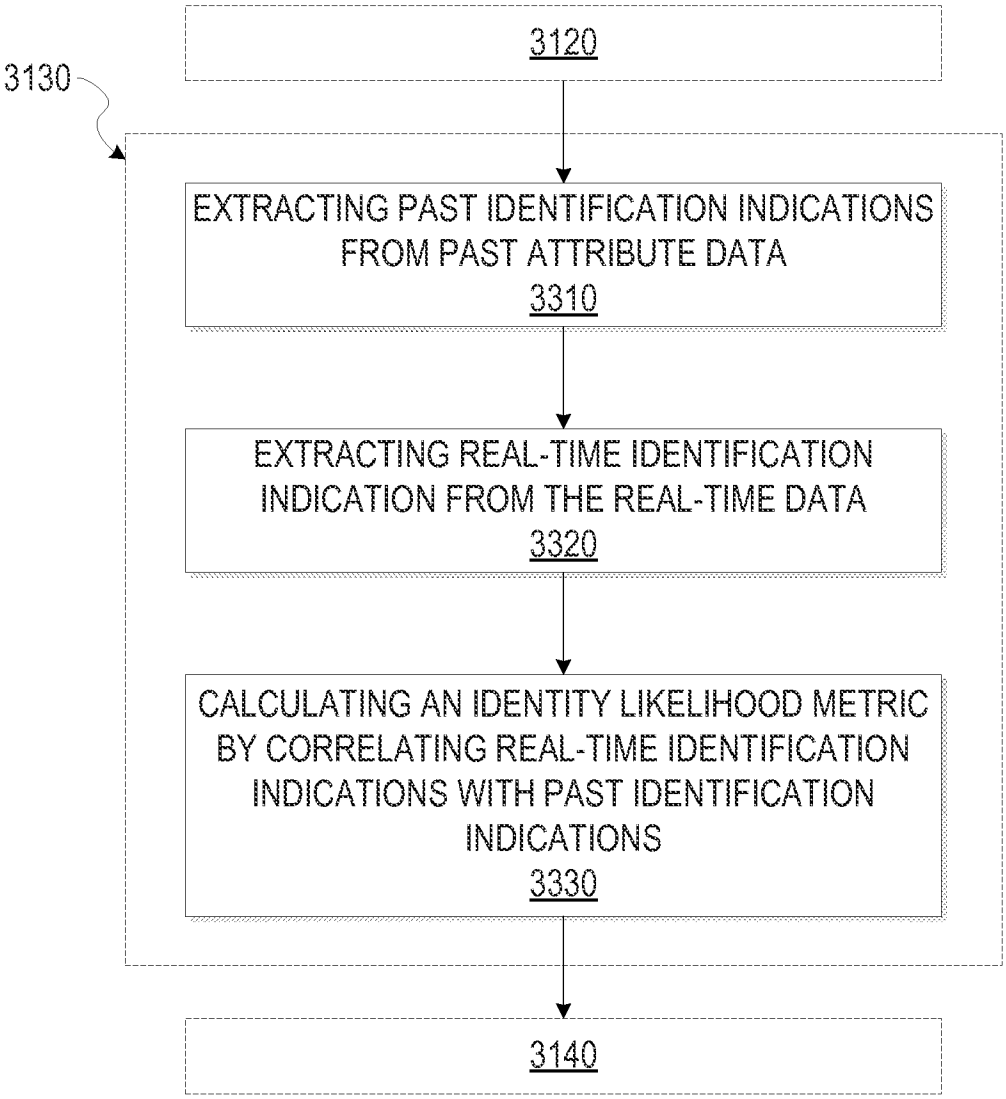

3120
3130
EXTRACTING PAST IDENTIFICATION INDICATIONS FROM PAST ATTRIBUTE DATA
3310
EXTRACTING REAL-TIME IDENTIFICATION INDICATION FROM THE REAL-TIME DATA
3320
CALCULATING AN IDENTITY LIKELIHOOD METRIC BY CORRELATING REAL-TIME IDENTIFICATION INDICATIONS WITH PAST IDENTIFICATION INDICATIONS
3330
3140

FIG. 33

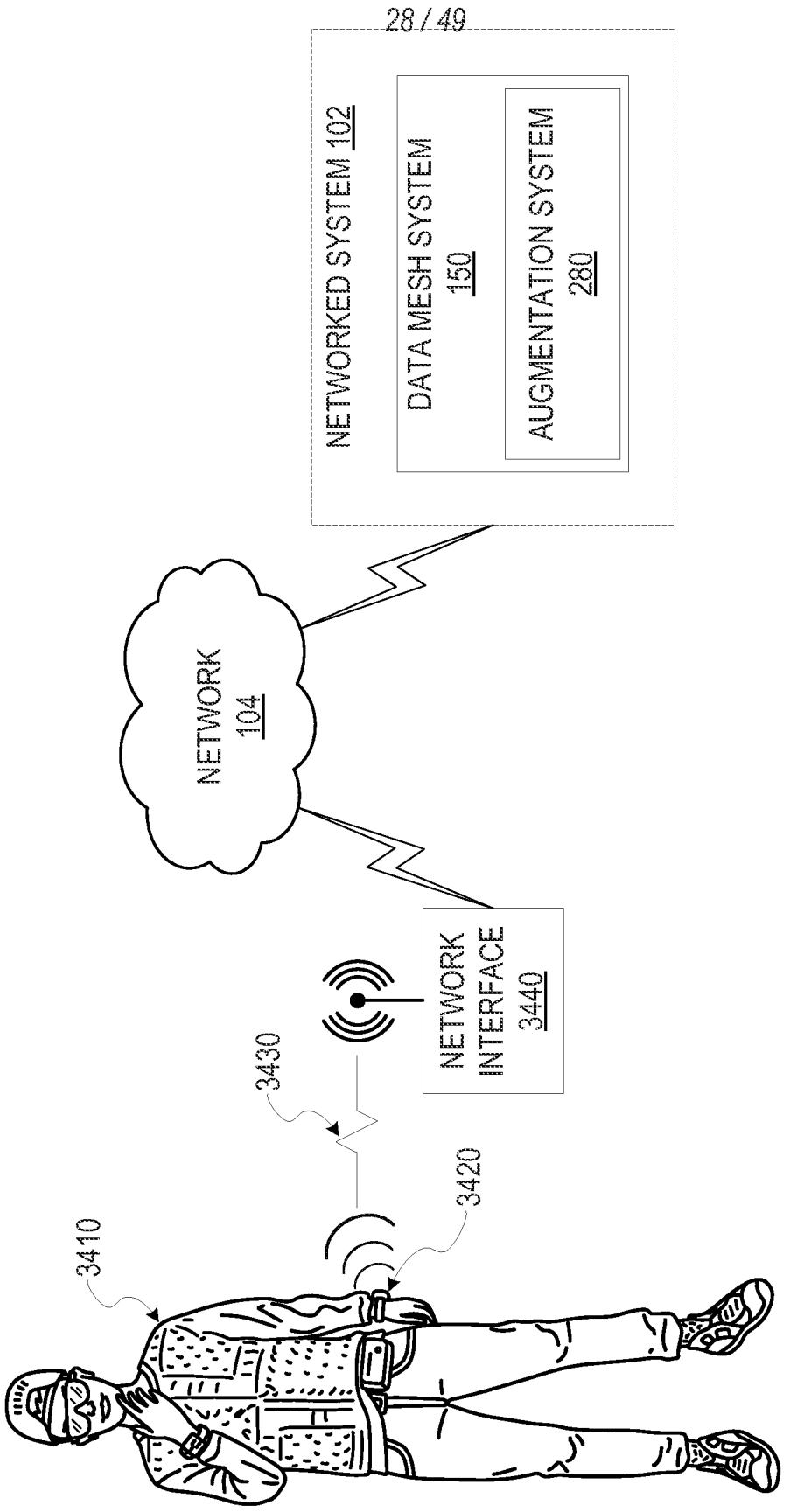

NETWORKED SYSTEM 102
DATA MESH SYSTEM 150
AUGMENTATION SYSTEM 280
NETWORK 104
NETWORK INTERFACE 3440
3430
3420
3410

FIG. 34

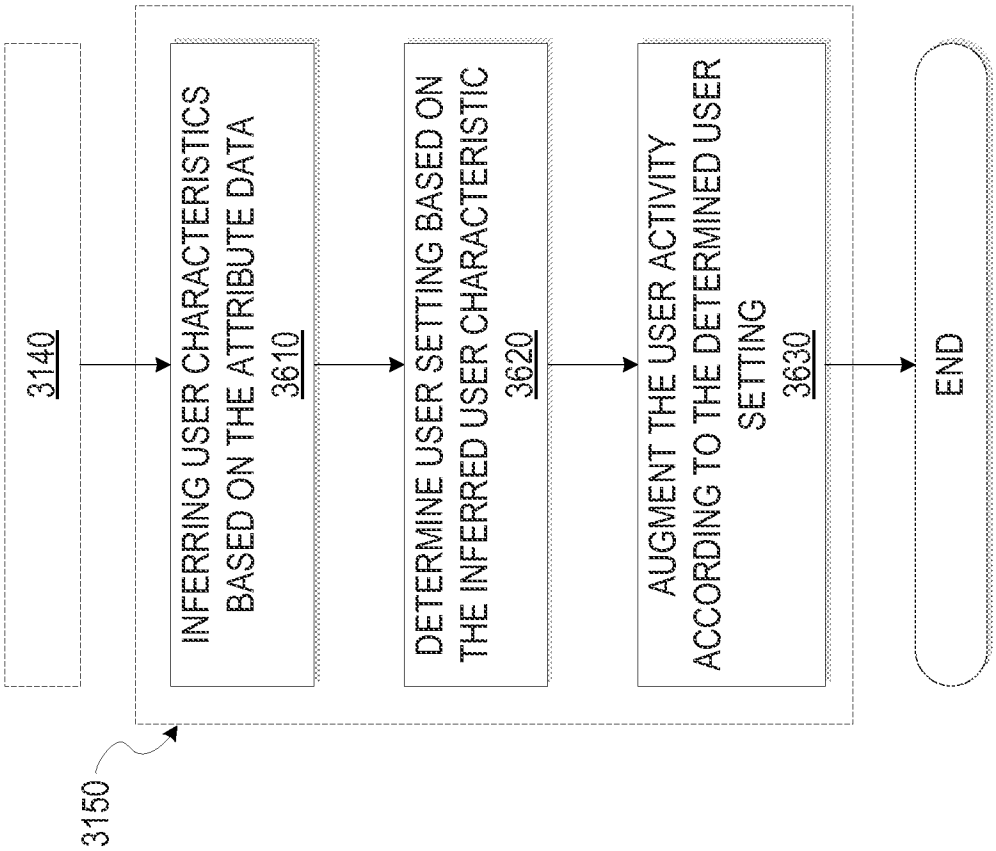

3140
INFERRING USER CHARACTERISTICS BASED ON THE ATTRIBUTE DATA
3610
DETERMINE USER SETTING BASED ON THE INFERRED USER CHARACTERISTIC
3620
AUGMENT THE USER ACTIVITY ACCORDING TO THE DETERMINED USER SETTING
3630
END
3150

FIG. 36

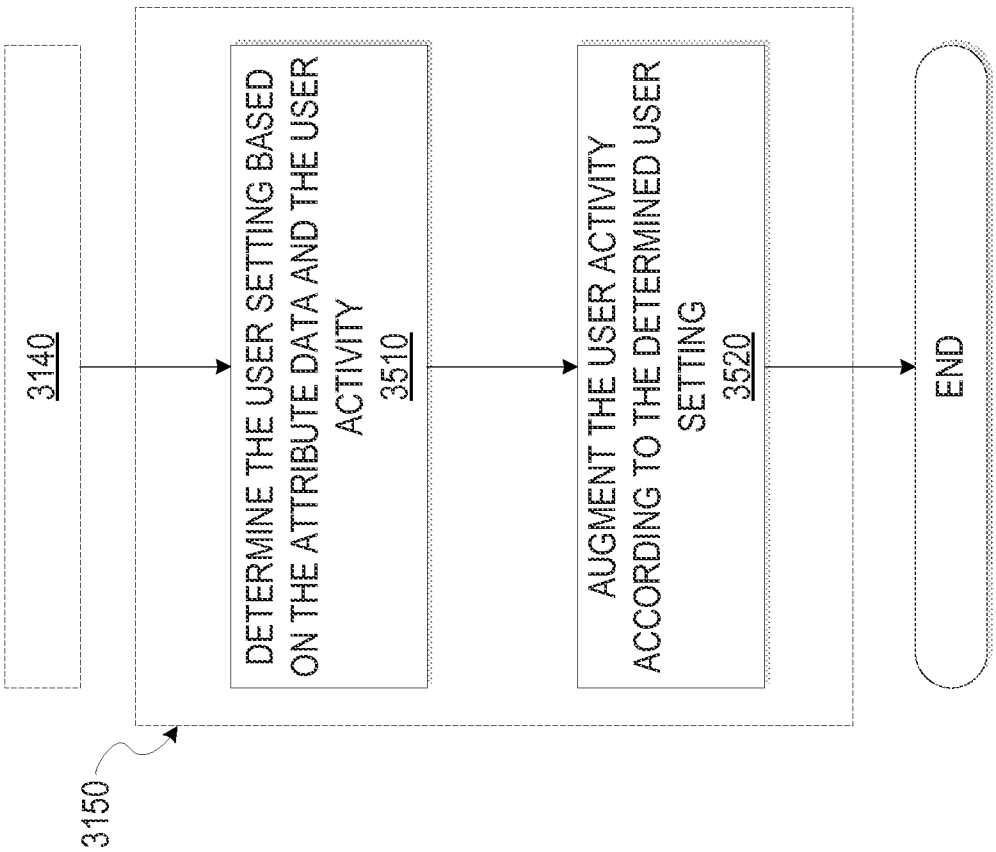

3140
DETERMINE THE USER SETTING BASED ON THE ATTRIBUTE DATA AND THE USER ACTIVITY
3510
AUGMENT THE USER ACTIVITY ACCORDING TO THE DETERMINED USER SETTING
3520
END
3150

FIG. 35

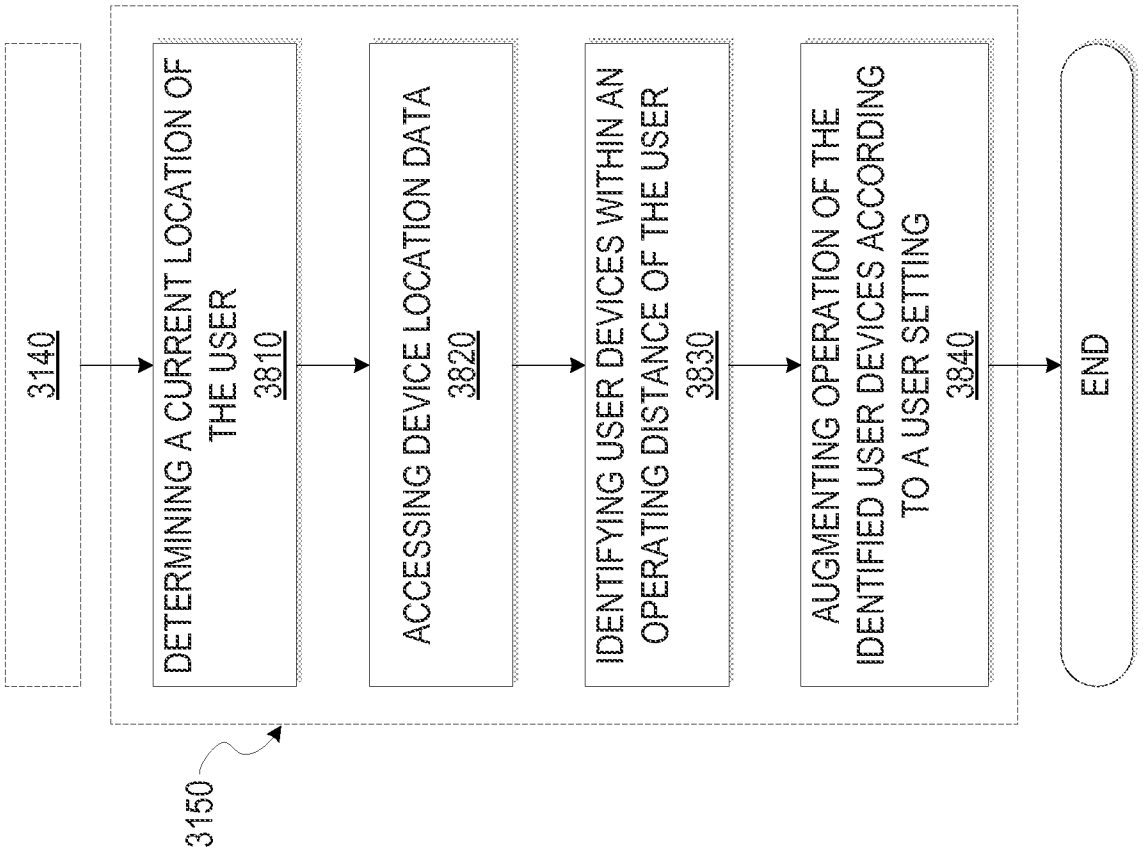

3140
DETERMINING A CURRENT LOCATION OF THE USER
3810
ACCESSING DEVICE LOCATION DATA
3820
IDENTIFYING USER DEVICES WITHIN AN OPERATING DISTANCE OF THE USER
3830
AUGMENTING OPERATION OF THE IDENTIFIED USER DEVICES ACCORDING TO A USER SETTING
3840
END
3150

FIG. 38

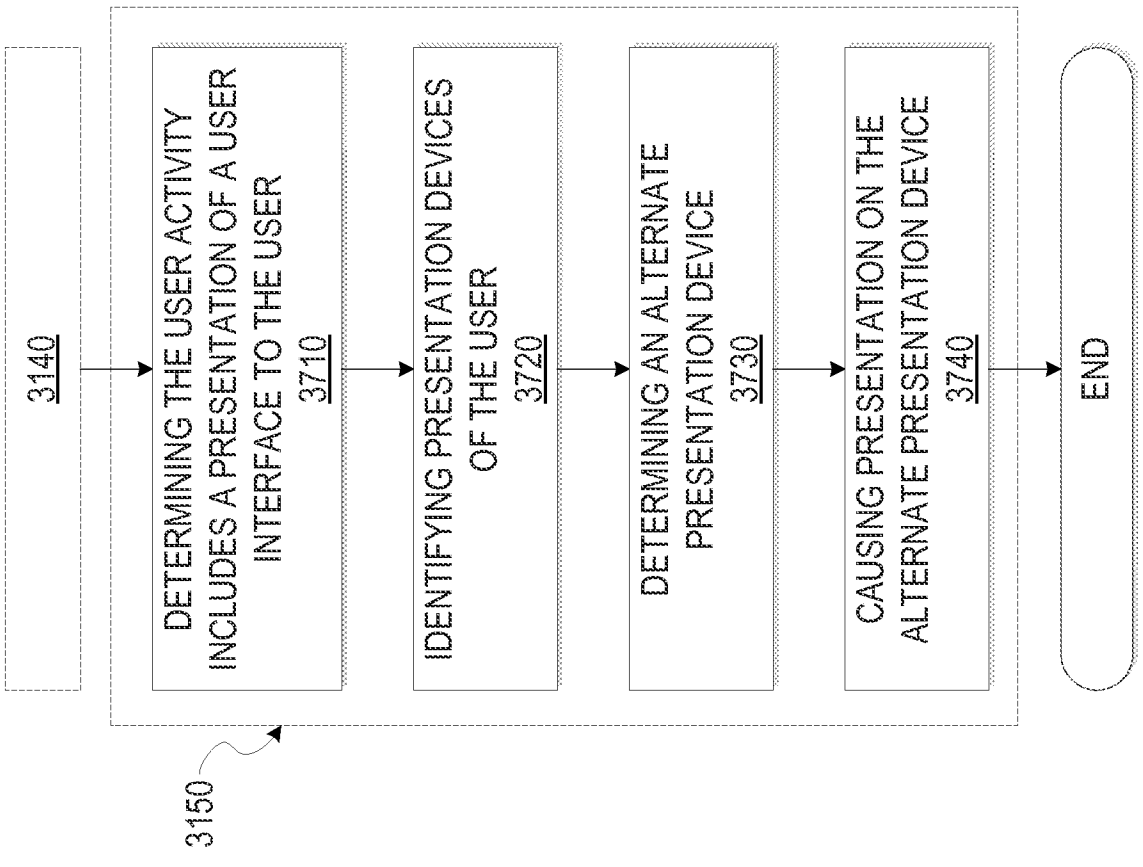

3140
DETERMINING THE USER ACTIVITY INCLUDES A PRESENTATION OF A USER INTERFACE TO THE USER
3710
IDENTIFYING PRESENTATION DEVICES OF THE USER
3720
DETERMINING AN ALTERNATE PRESENTATION DEVICE
3730
CAUSING PRESENTATION ON THE ALTERNATE PRESENTATION DEVICE
3740
END
3150

FIG. 37

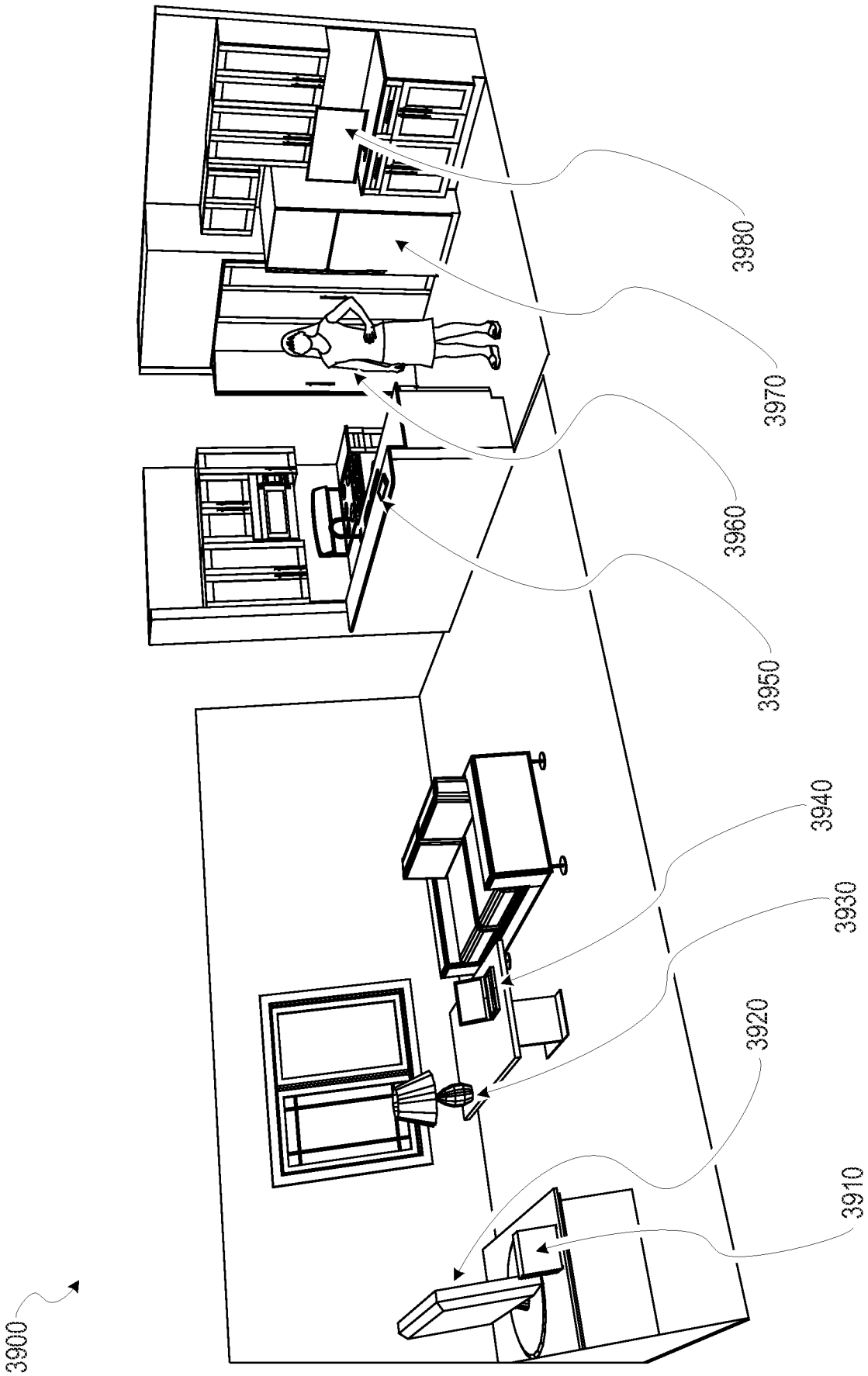


FIG. 39

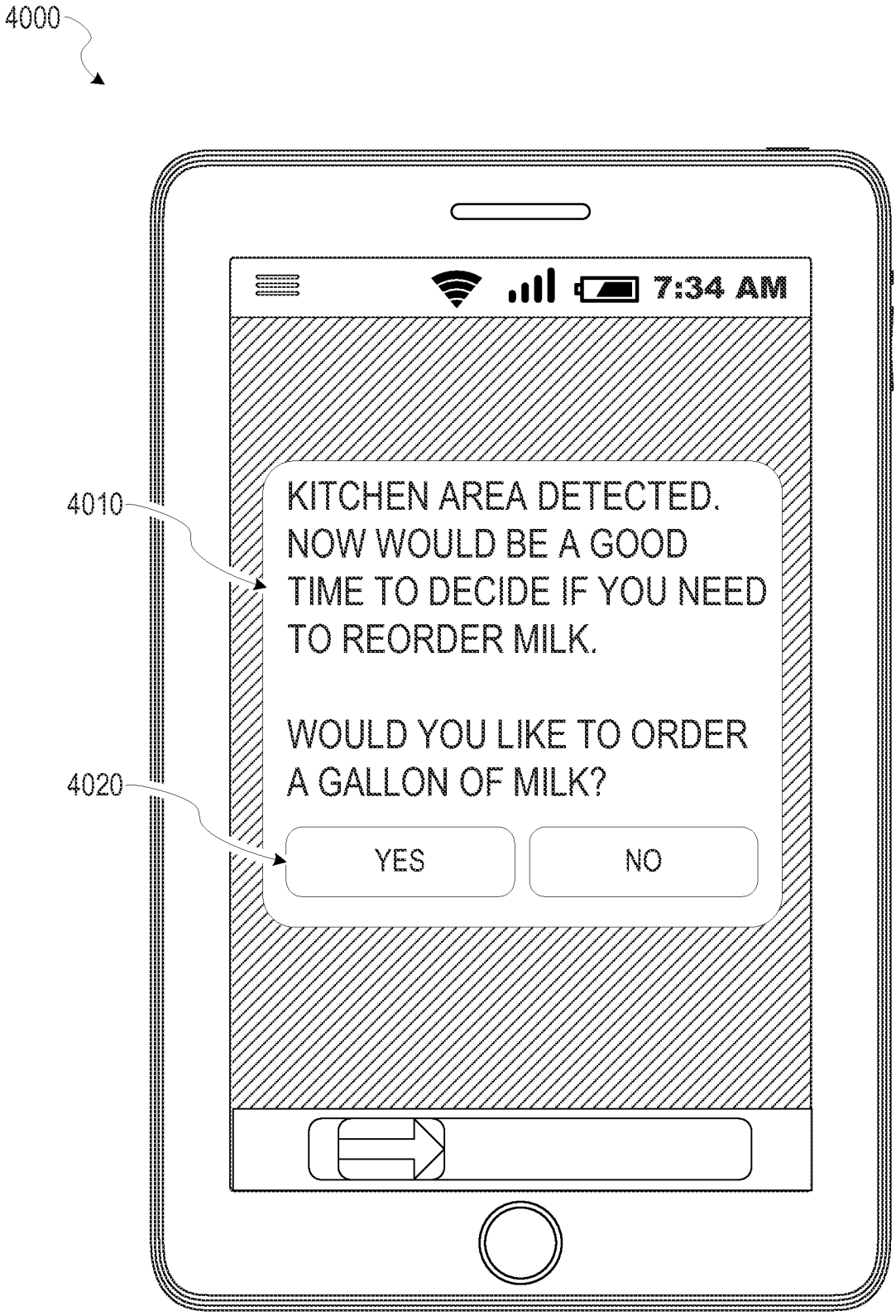

4000
7:34 AM
4010
KITCHEN AREA DETECTED. NOW WOULD BE A GOOD TIME TO DECIDE IF YOU NEED TO REORDER MILK.
WOULD YOU LIKE TO ORDER A GALLON OF MILK?
4020
YES
NO

FIG. 40

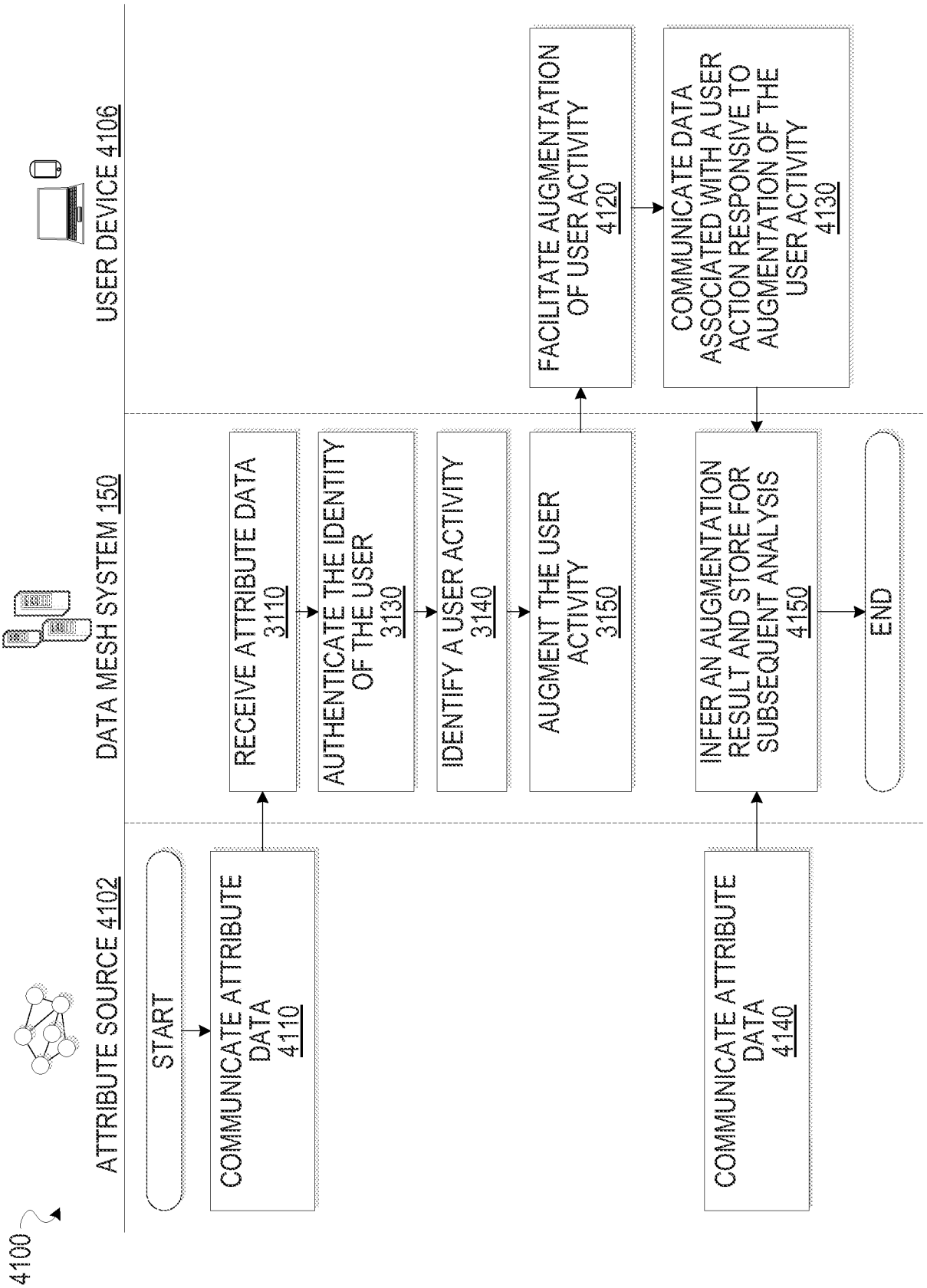

4100
ATTRIBUTE SOURCE 4102
DATA MESH SYSTEM 150
USER DEVICE 4106
START
COMMUNICATE ATTRIBUTE DATA 4110
RECEIVE ATTRIBUTE DATA 3110
AUTHENTICATE THE IDENTITY OF THE USER 3130
IDENTIFY A USER ACTIVITY 3140
AUGMENT THE USER ACTIVITY 3150
FACILITATE AUGMENTATION OF USER ACTIVITY 4120
COMMUNICATE DATA ASSOCIATED WITH A USER ACTION RESPONSIVE TO AUGMENTATION OF THE USER ACTIVITY 4130
COMMUNICATE ATTRIBUTE DATA 4140
INFER AN AUGMENTATION RESULT AND STORE FOR SUBSEQUENT ANALYSIS 4150
END

FIG. 41

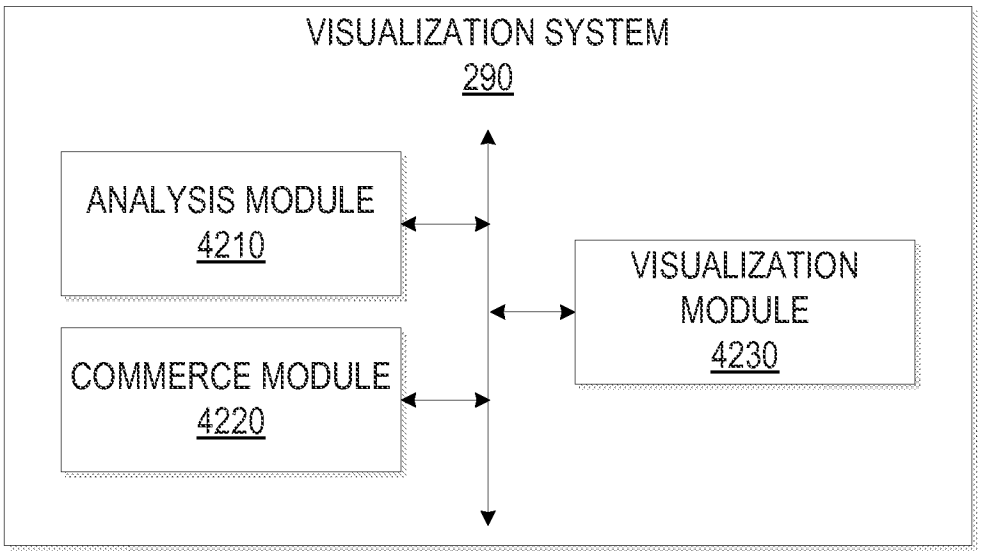

VISUALIZATION SYSTEM
290
ANALYSIS MODULE
4210
COMMERCE MODULE
4220
VISUALIZATION
MODULE
4230

FIG. 42

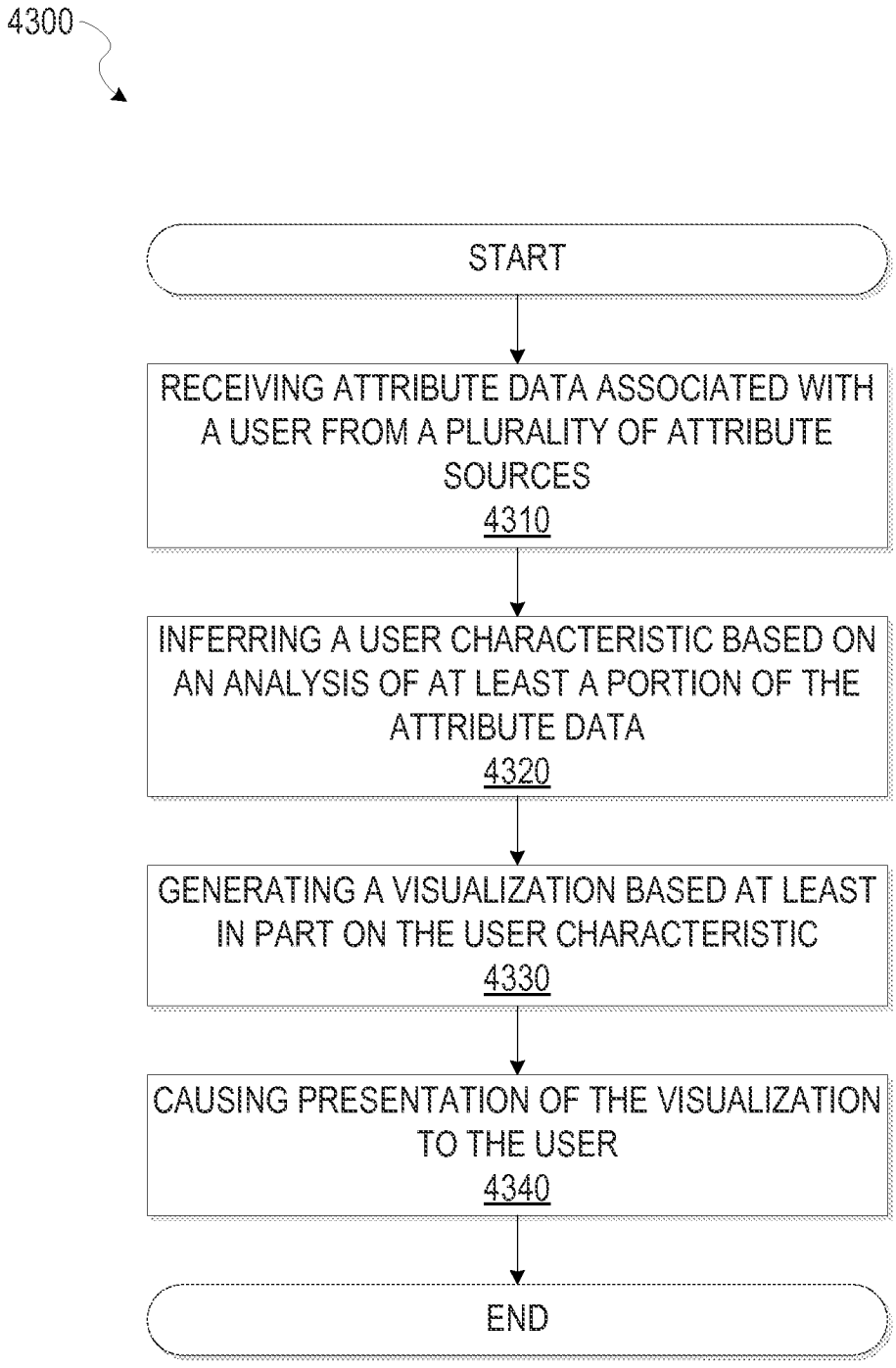

4300
START
RECEIVING ATTRIBUTE DATA ASSOCIATED WITH A USER FROM A PLURALITY OF ATTRIBUTE SOURCES
4310
INFERRING A USER CHARACTERISTIC BASED ON AN ANALYSIS OF AT LEAST A PORTION OF THE ATTRIBUTE DATA
4320
GENERATING A VISUALIZATION BASED AT LEAST IN PART ON THE USER CHARACTERISTIC
4330
CAUSING PRESENTATION OF THE VISUALIZATION TO THE USER
4340
END

FIG. 43

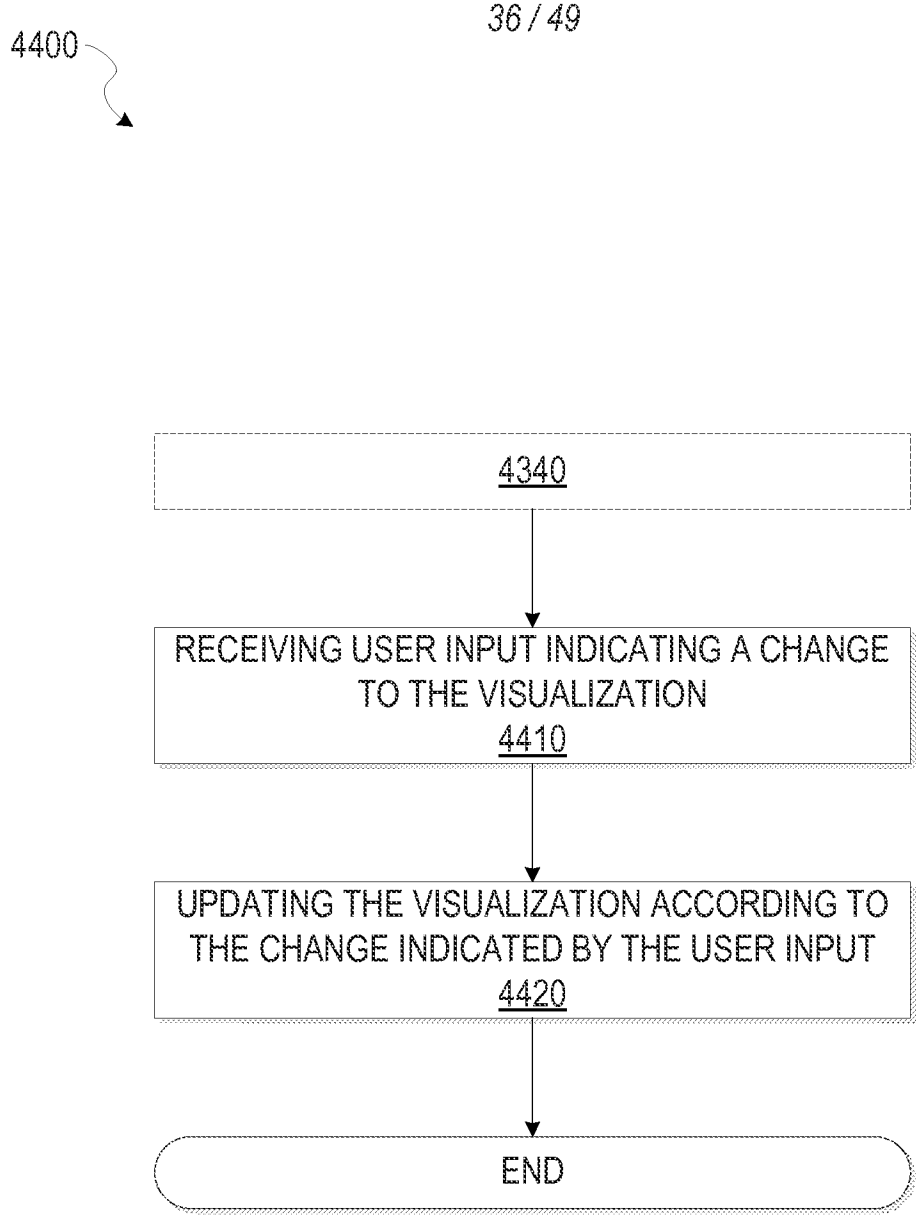

4400
4340
RECEIVING USER INPUT INDICATING A CHANGE TO THE VISUALIZATION
4410
UPDATING THE VISUALIZATION ACCORDING TO THE CHANGE INDICATED BY THE USER INPUT
4420
END

FIG. 44

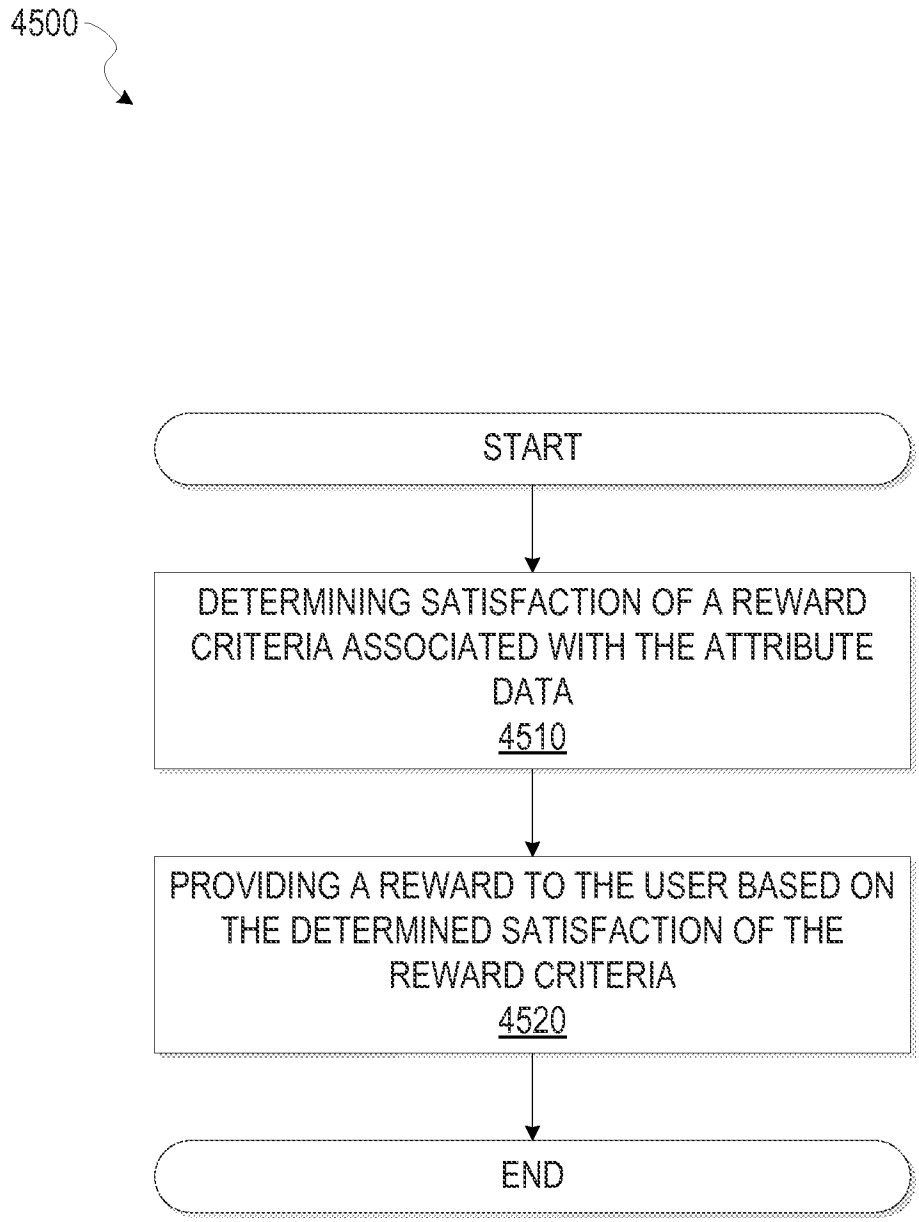

4500
START
DETERMINING SATISFACTION OF A REWARD CRITERIA ASSOCIATED WITH THE ATTRIBUTE DATA
4510
PROVIDING A REWARD TO THE USER BASED ON THE DETERMINED SATISFACTION OF THE REWARD CRITERIA
4520
END

FIG. 45

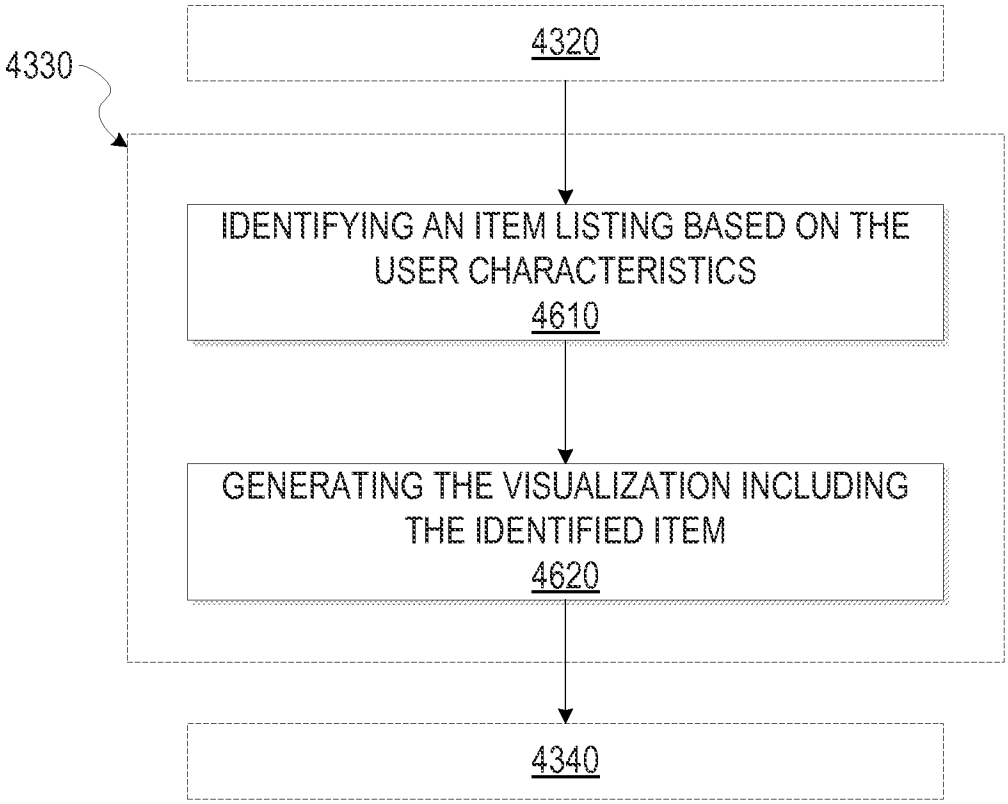

4320
4330
IDENTIFYING AN ITEM LISTING BASED ON THE USER CHARACTERISTICS
4610
GENERATING THE VISUALIZATION INCLUDING THE IDENTIFIED ITEM
4620
4340

FIG. 46

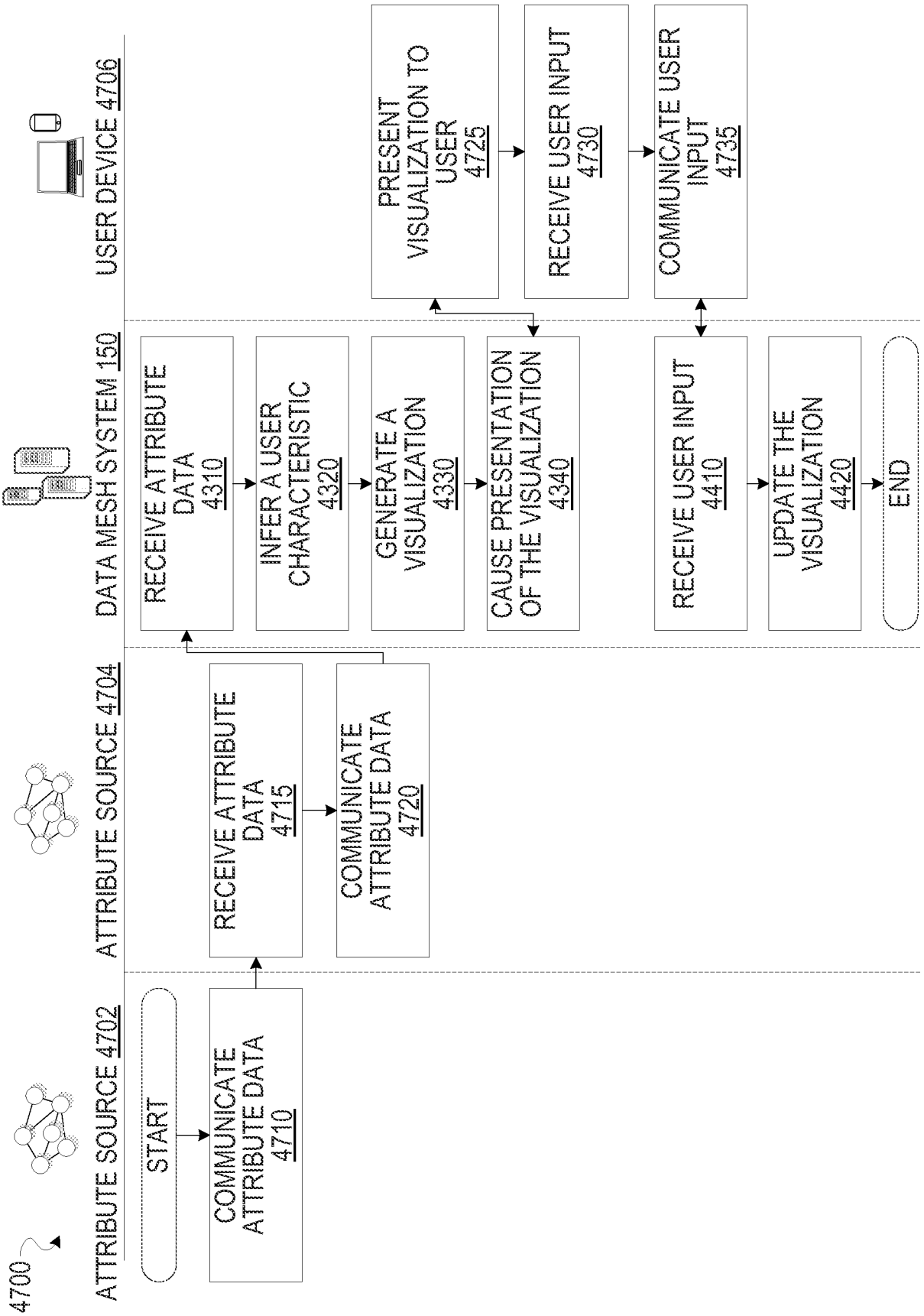

4700
ATTRIBUTE SOURCE 4702
ATTRIBUTE SOURCE 4704
DATA MESH SYSTEM 150
USER DEVICE 4706
START
COMMUNICATE ATTRIBUTE DATA 4710
RECEIVE ATTRIBUTE DATA 4715
COMMUNICATE ATTRIBUTE DATA 4720
RECEIVE ATTRIBUTE DATA 4310
INFER A USER CHARACTERISTIC 4320
GENERATE A VISUALIZATION 4330
CAUSE PRESENTATION OF THE VISUALIZATION 4340
PRESENT VISUALIZATION TO USER 4725
RECEIVE USER INPUT 4730
COMMUNICATE USER INPUT 4735
RECEIVE USER INPUT 4410
UPDATE THE VISUALIZATION 4420
END

FIG. 47

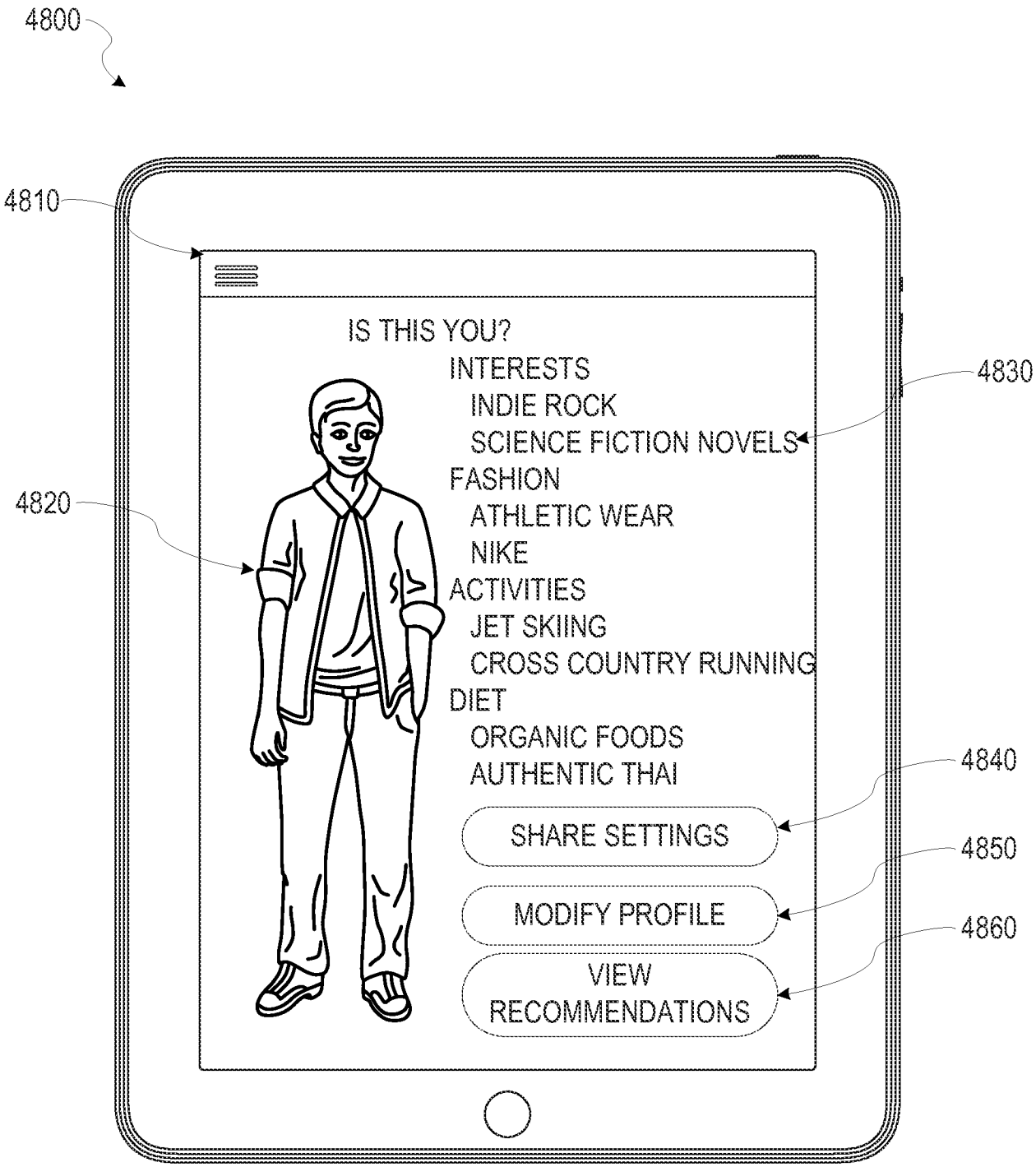

4800
4810
IS THIS YOU?
INTERESTS
INDIE ROCK
SCIENCE FICTION NOVELS
FASHION
ATHLETIC WEAR
NIKE
ACTIVITIES
JET SKIING
CROSS COUNTRY RUNNING
DIET
ORGANIC FOODS
AUTHENTIC THAI
SHARE SETTINGS
MODIFY PROFILE
VIEW RECOMMENDATIONS
4820
4830
4840
4850
4860

FIG. 48

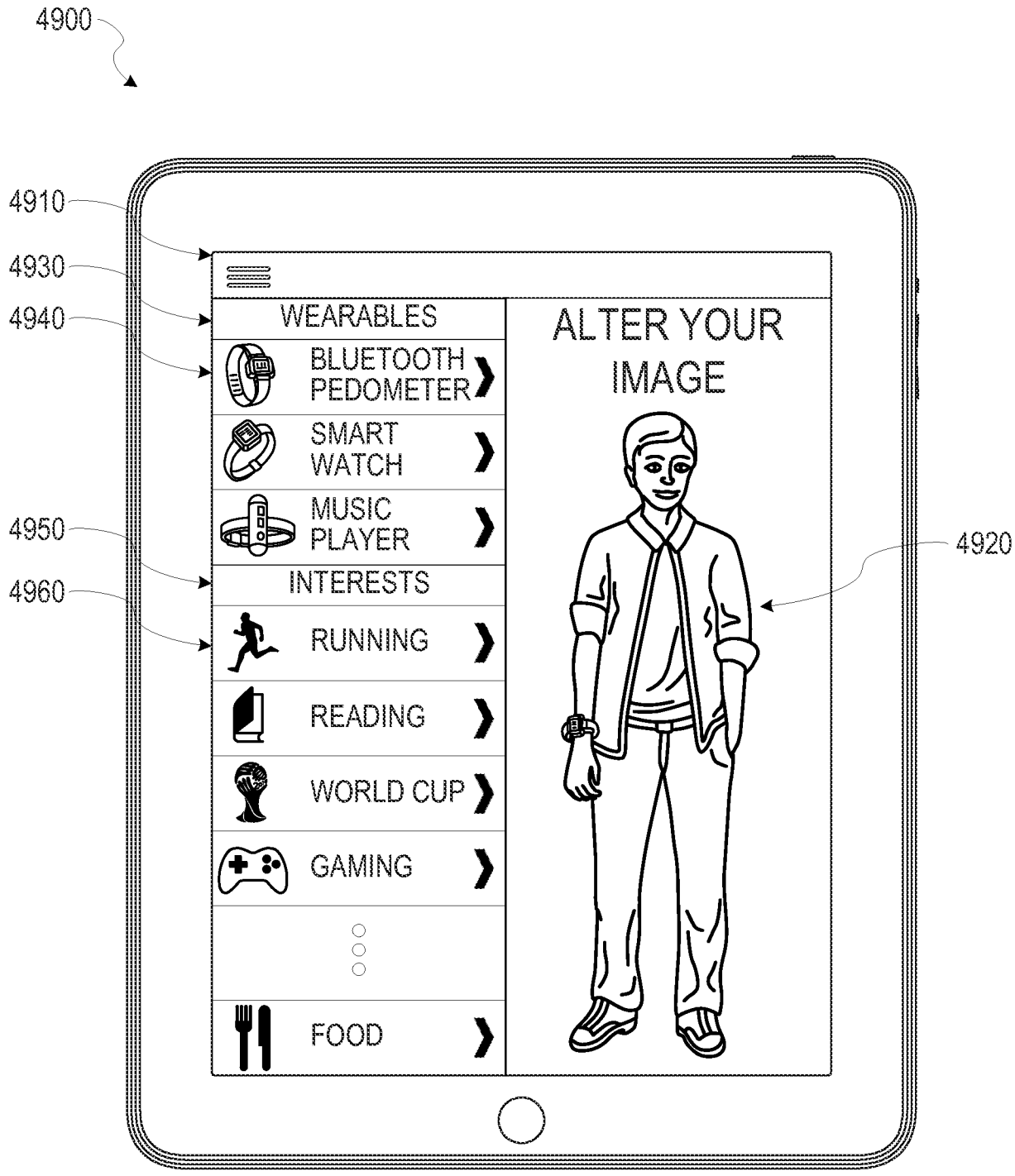

4900
4910
4930
4940
4950
4960
4920
WEARABLES
BLUETOOTH PEDOMETER
SMART WATCH
MUSIC PLAYER
INTERESTS
RUNNING
READING
WORLD CUP
GAMING
FOOD
ALTER YOUR IMAGE

FIG. 49

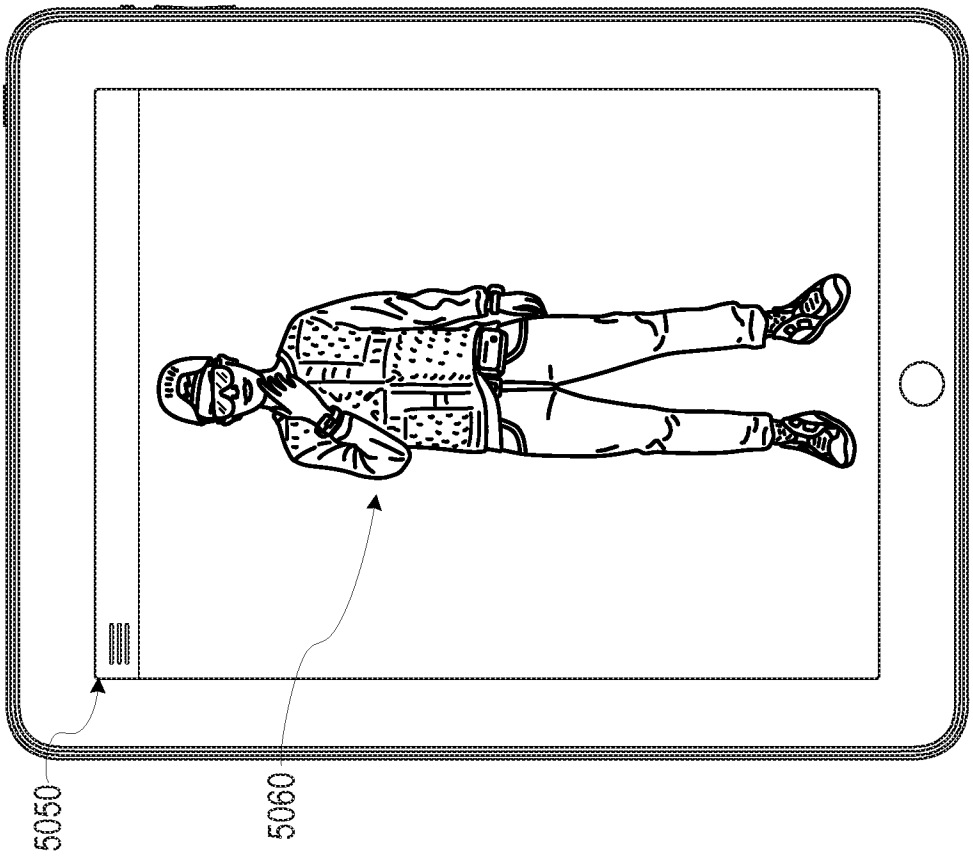


FIG. 50B

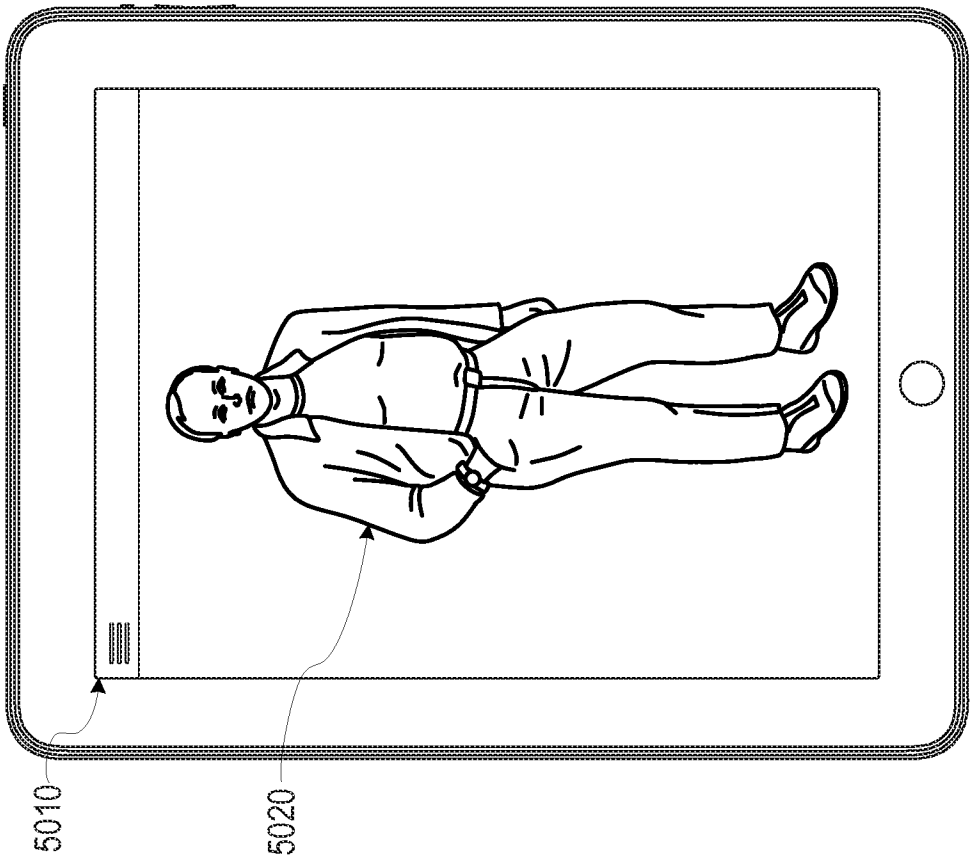


FIG. 50A

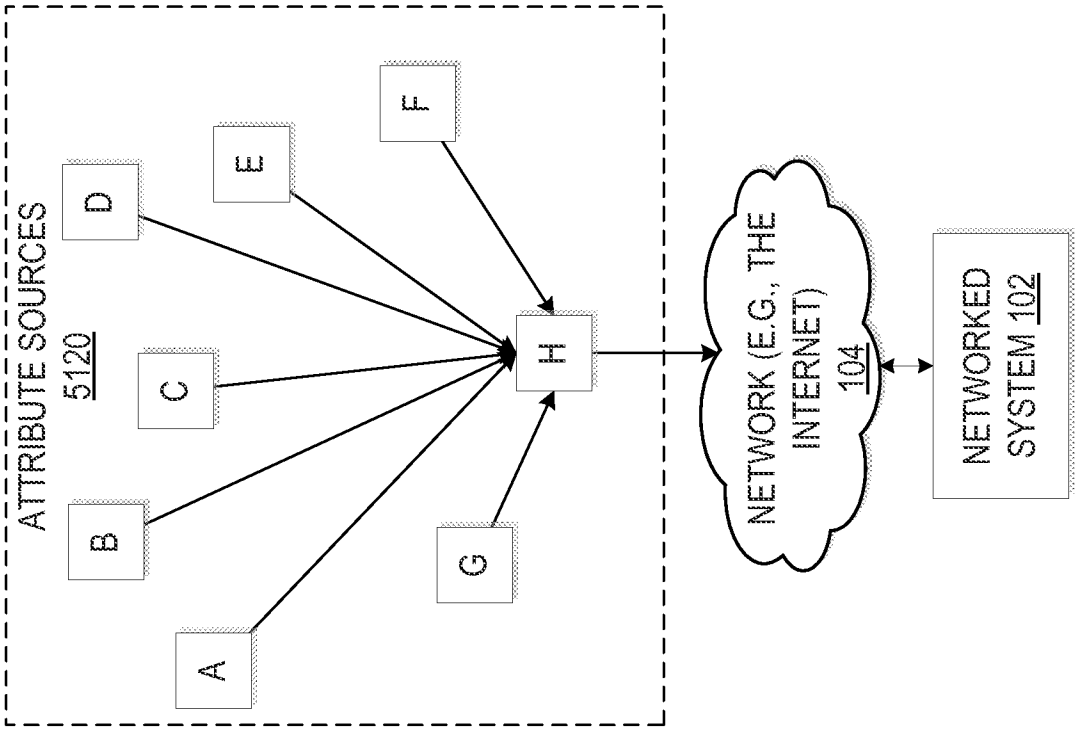


FIG. 51B

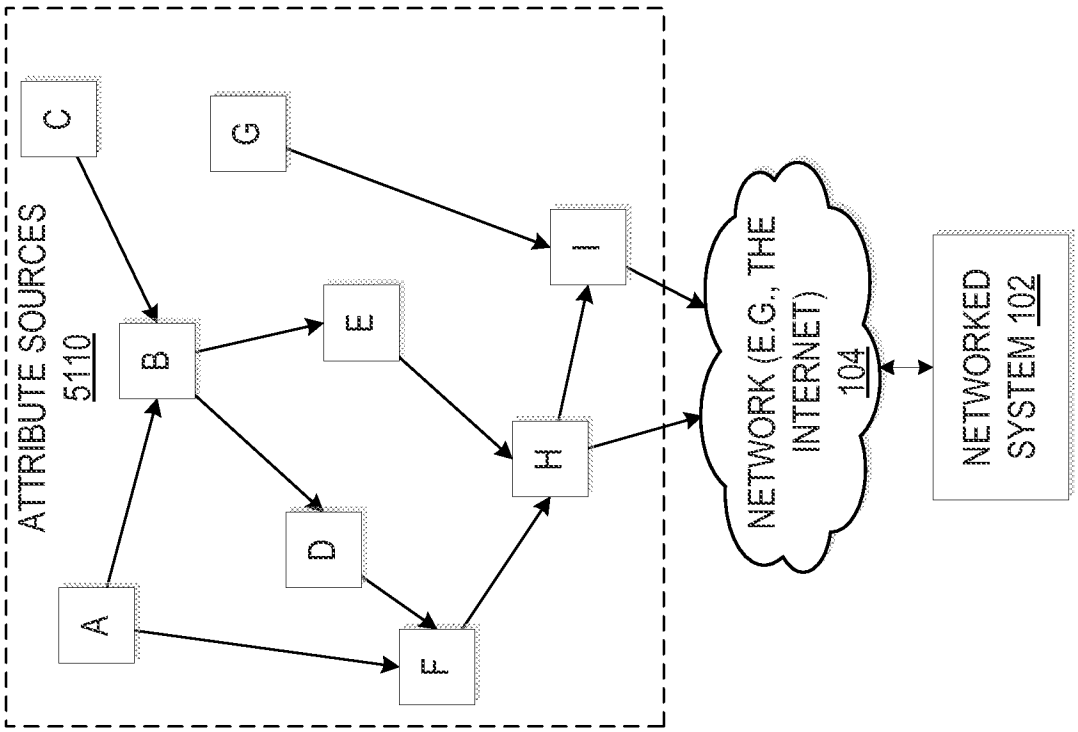


FIG.51A

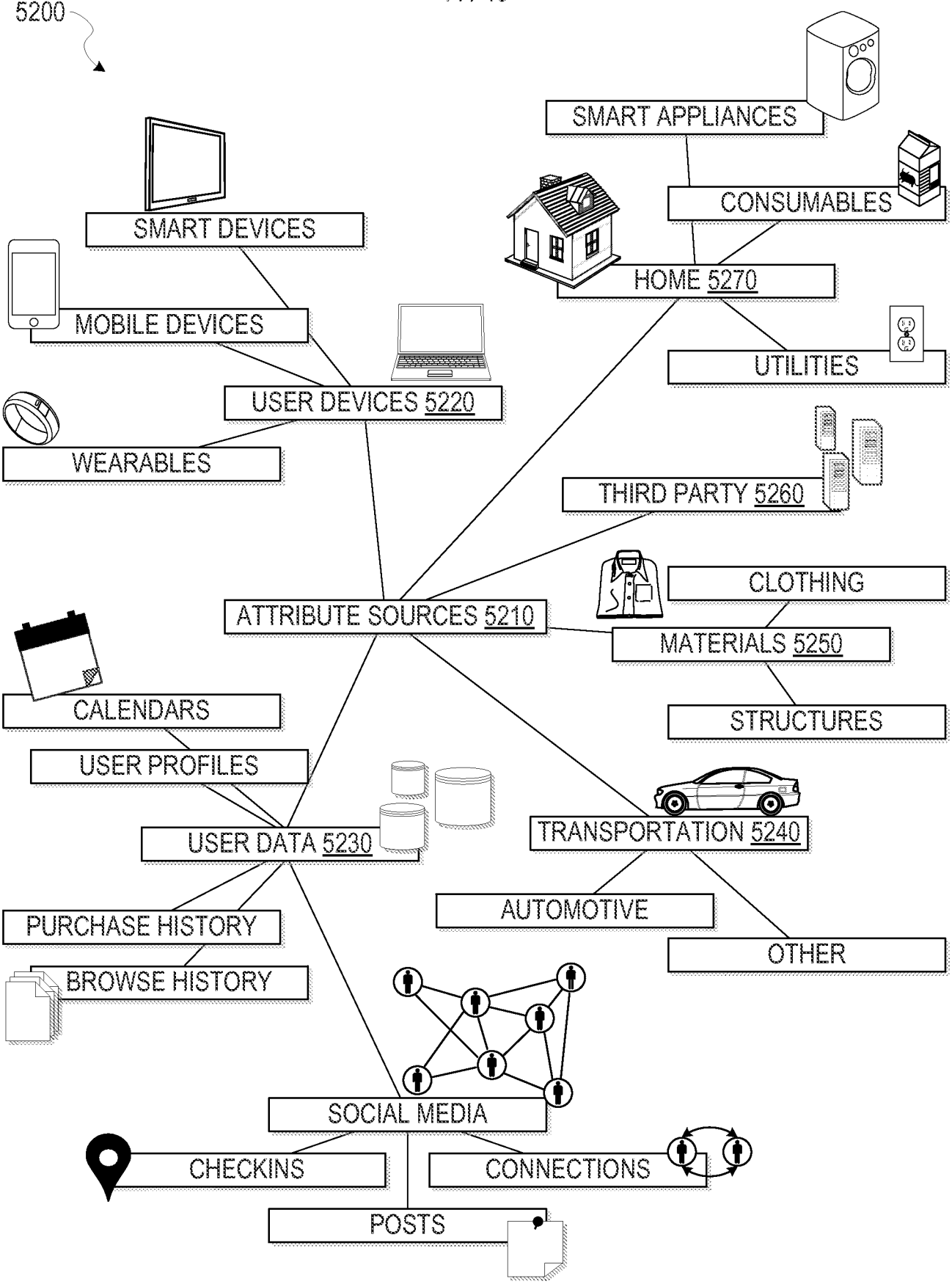

5200
SMART APPLIANCES
SMART DEVICES
CONSUMABLES
HOME 5270
MOBILE DEVICES
UTILITIES
USER DEVICES 5220
WEARABLES
THIRD PARTY 5260
CLOTHING
ATTRIBUTE SOURCES 5210
MATERIALS 5250
CALENDARS
STRUCTURES
USER PROFILES
TRANSPORTATION 5240
USER DATA 5230
AUTOMOTIVE
PURCHASE HISTORY
OTHER
BROWSE HISTORY
SOCIAL MEDIA
CHECKINS
CONNECTIONS
POSTS

FIG. 52

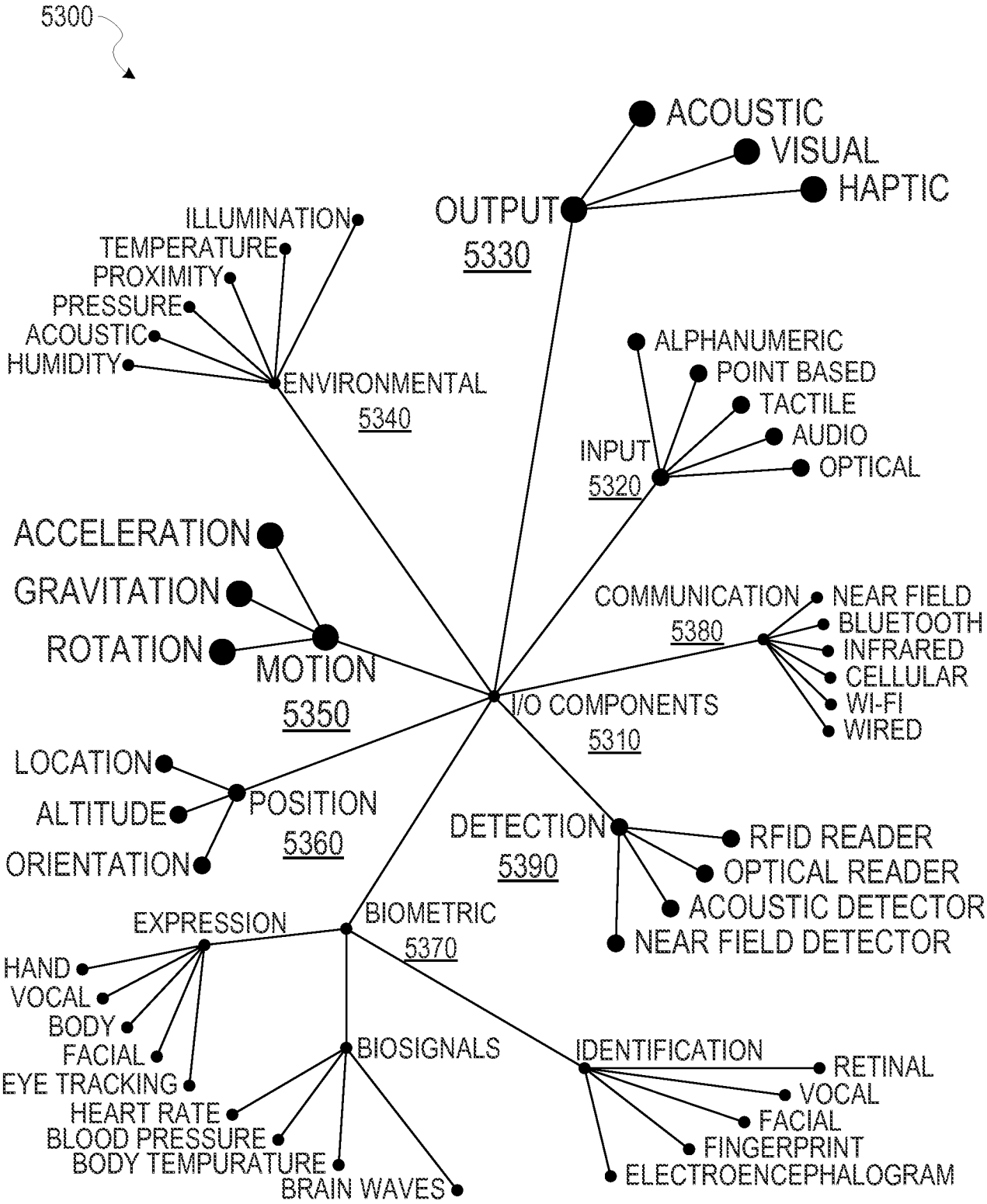

5300
I/O COMPONENTS
5310
OUTPUT
5330
ACOUSTIC
VISUAL
HAPTIC
ENVIRONMENTAL
5340
ILLUMINATION
TEMPERATURE
PROXIMITY
PRESSURE
ACOUSTIC
HUMIDITY
INPUT
5320
ALPHANUMERIC
POINT BASED
TACTILE
AUDIO
OPTICAL
MOTION
5350
ACCELERATION
GRAVITATION
ROTATION
COMMUNICATION
5380
NEAR FIELD
BLUETOOTH
INFRARED
CELLULAR
WI-FI
WIRED
POSITION
5360
LOCATION
ALTITUDE
ORIENTATION
DETECTION
5390
RFID READER
OPTICAL READER
ACOUSTIC DETECTOR
NEAR FIELD DETECTOR
BIOMETRIC
5370
EXPRESSION
HAND
VOCAL
BODY
FACIAL
EYE TRACKING
BIOSIGNALS
HEART RATE
BLOOD PRESSURE
BODY TEMPURATURE
BRAIN WAVES
IDENTIFICATION
RETINAL
VOCAL
FACIAL
FINGERPRINT
ELECTROENCEPHALOGRAM

FIG. 53

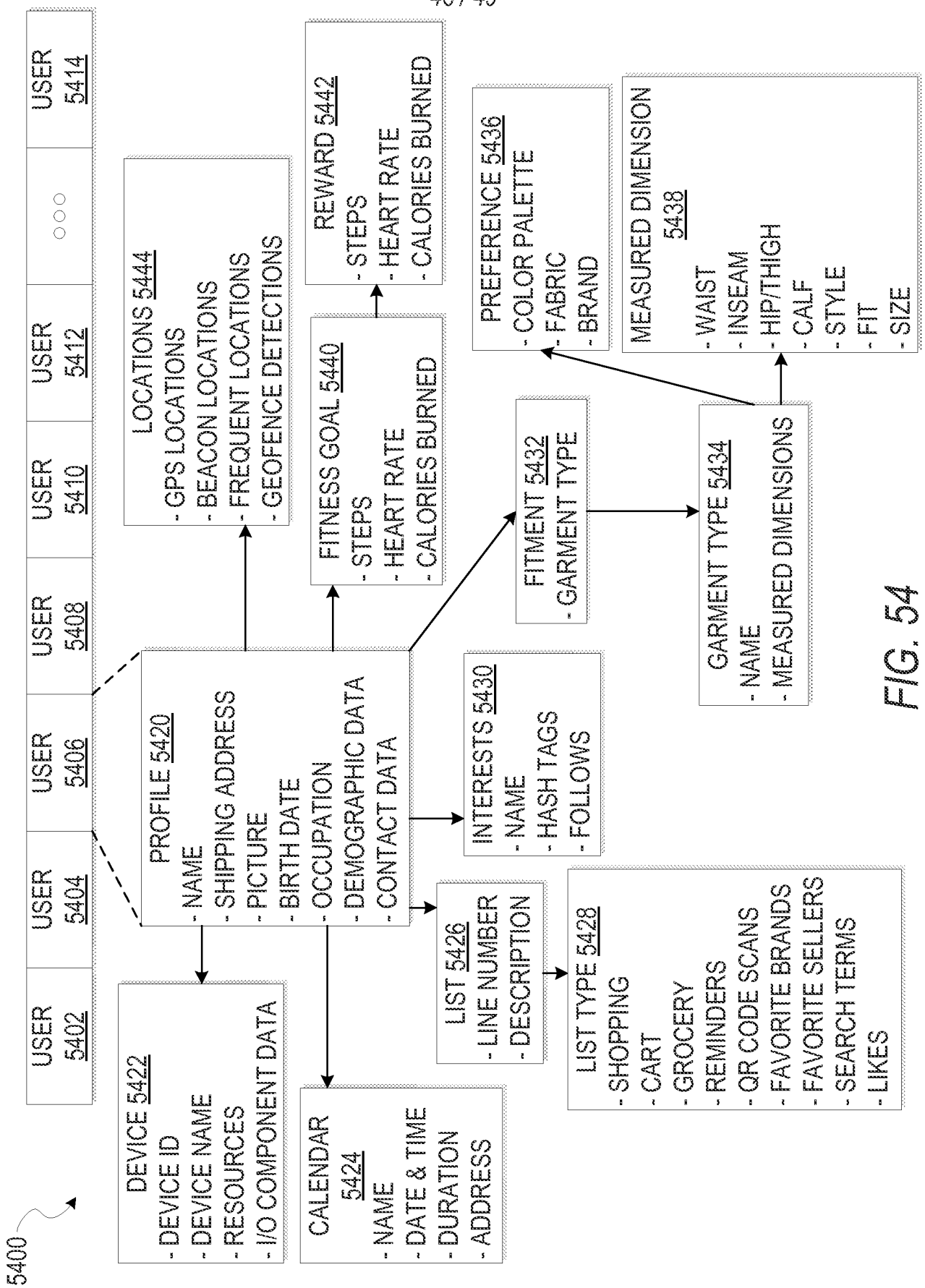

5400
USER 5402
USER 5404
USER 5406
USER 5408
USER 5410
USER 5412
USER 5414
PROFILE 5420
- NAME
- SHIPPING ADDRESS
- PICTURE
- BIRTH DATE
- OCCUPATION
- DEMOGRAPHIC DATA
- CONTACT DATA
DEVICE 5422
- DEVICE ID
- DEVICE NAME
- RESOURCES
- I/O COMPONENT DATA
CALENDAR 5424
- NAME
- DATE & TIME
- DURATION
- ADDRESS
LIST 5426
- LINE NUMBER
- DESCRIPTION
LIST TYPE 5428
- SHOPPING
- CART
- GROCERY
- REMINDERS
- QR CODE SCANS
- FAVORITE BRANDS
- FAVORITE SELLERS
- SEARCH TERMS
- LIKES
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- NAME
- HASH TAGS
- FOLLOWS
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- GPS LOCATIONS
- BEACON LOCATIONS
- FREQUENT LOCATIONS
- GEOFENCE DETECTIONS
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- STEPS
- HEART RATE
- CALORIES BURNED
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- STEPS
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- GARMENT TYPE
GARMENT TYPE 5434
- NAME
- MEASURED DIMENSIONS
PREFERENCE 5436
- COLOR PALETTE
- FABRIC
- BRAND
MEASURED DIMENSION 5438
- WAIST
- INSEAM
- HIP/THIGH
- CALF
- STYLE
- FIT
- SIZE

FIG. 54

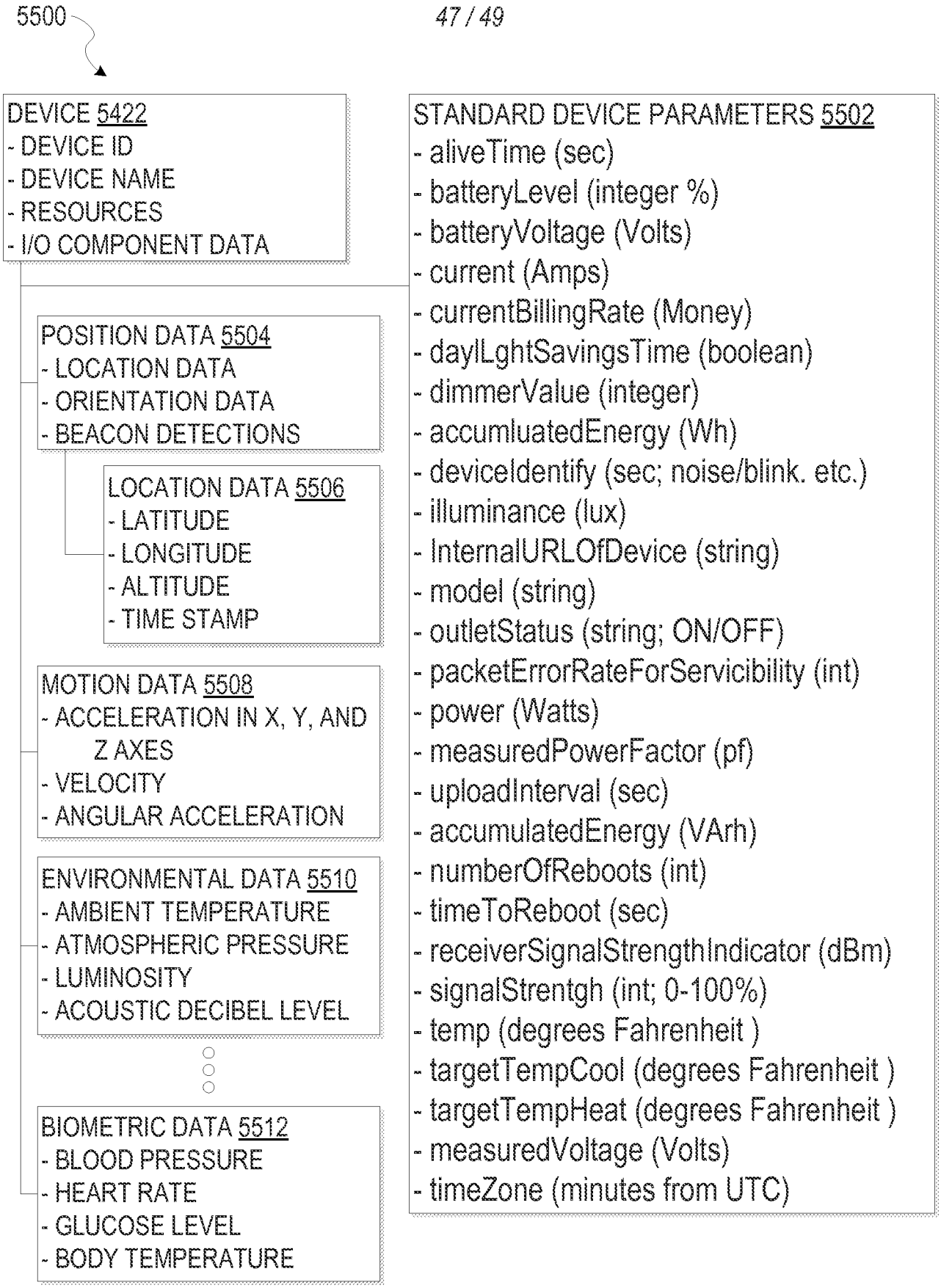

5500
DEVICE 5422
- DEVICE ID
- DEVICE NAME
- RESOURCES
- I/O COMPONENT DATA
POSITION DATA 5504
- LOCATION DATA
- ORIENTATION DATA
- BEACON DETECTIONS
LOCATION DATA 5506
- LATITUDE
- LONGITUDE
- ALTITUDE
- TIME STAMP
MOTION DATA 5508
- ACCELERATION IN X, Y, AND Z AXES
- VELOCITY
- ANGULAR ACCELERATION
ENVIRONMENTAL DATA 5510
- AMBIENT TEMPERATURE
- ATMOSPHERIC PRESSURE
- LUMINOSITY
- ACOUSTIC DECIBEL LEVEL
BIOMETRIC DATA 5512
- BLOOD PRESSURE
- HEART RATE
- GLUCOSE LEVEL
- BODY TEMPERATURE
STANDARD DEVICE PARAMETERS 5502
- aliveTime (sec)
- batteryLevel (integer %)
- batteryVoltage (Volts)
- current (Amps)
- currentBillingRate (Money)
- daylLghtSavingsTime (boolean)
- dimmerValue (integer)
- accumluatedEnergy (Wh)
- deviceIdentify (sec; noise/blink. etc.)
- illuminance (lux)
- InternalURLOfDevice (string)
- model (string)
- outletStatus (string; ON/OFF)
- packetErrorRateForServicibility (int)
- power (Watts)
- measuredPowerFactor (pf)
- uploadInterval (sec)
- accumulatedEnergy (VArh)
- numberOfReboots (int)
- timeToReboot (sec)
- receiverSignalStrengthIndicator (dBm)
- signalStrentgh (int; 0-100%)
- temp (degrees Fahrenheit)
- targetTempCool (degrees Fahrenheit)
- targetTempHeat (degrees Fahrenheit)
- measuredVoltage (Volts)
- timeZone (minutes from UTC)

FIG. 55

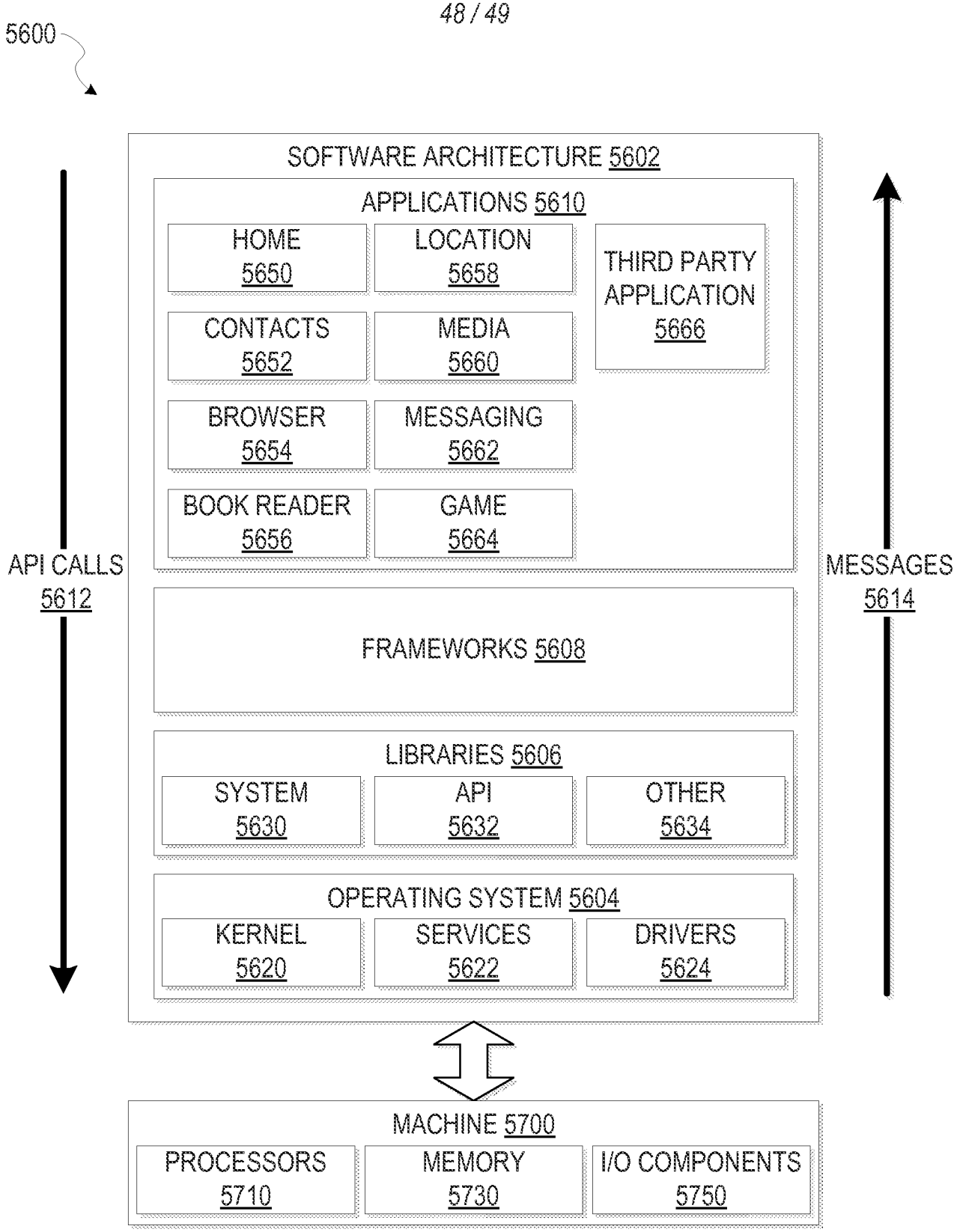

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SOFTWARE ARCHITECTURE 5602
APPLICATIONS 5610
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THIRD PARTY APPLICATION 5666
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MEDIA 5660
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API 5632
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OPERATING SYSTEM 5604
KERNEL 5620
SERVICES 5622
DRIVERS 5624
MACHINE 5700
PROCESSORS 5710
MEMORY 5730
I/O COMPONENTS 5750

FIG. 56

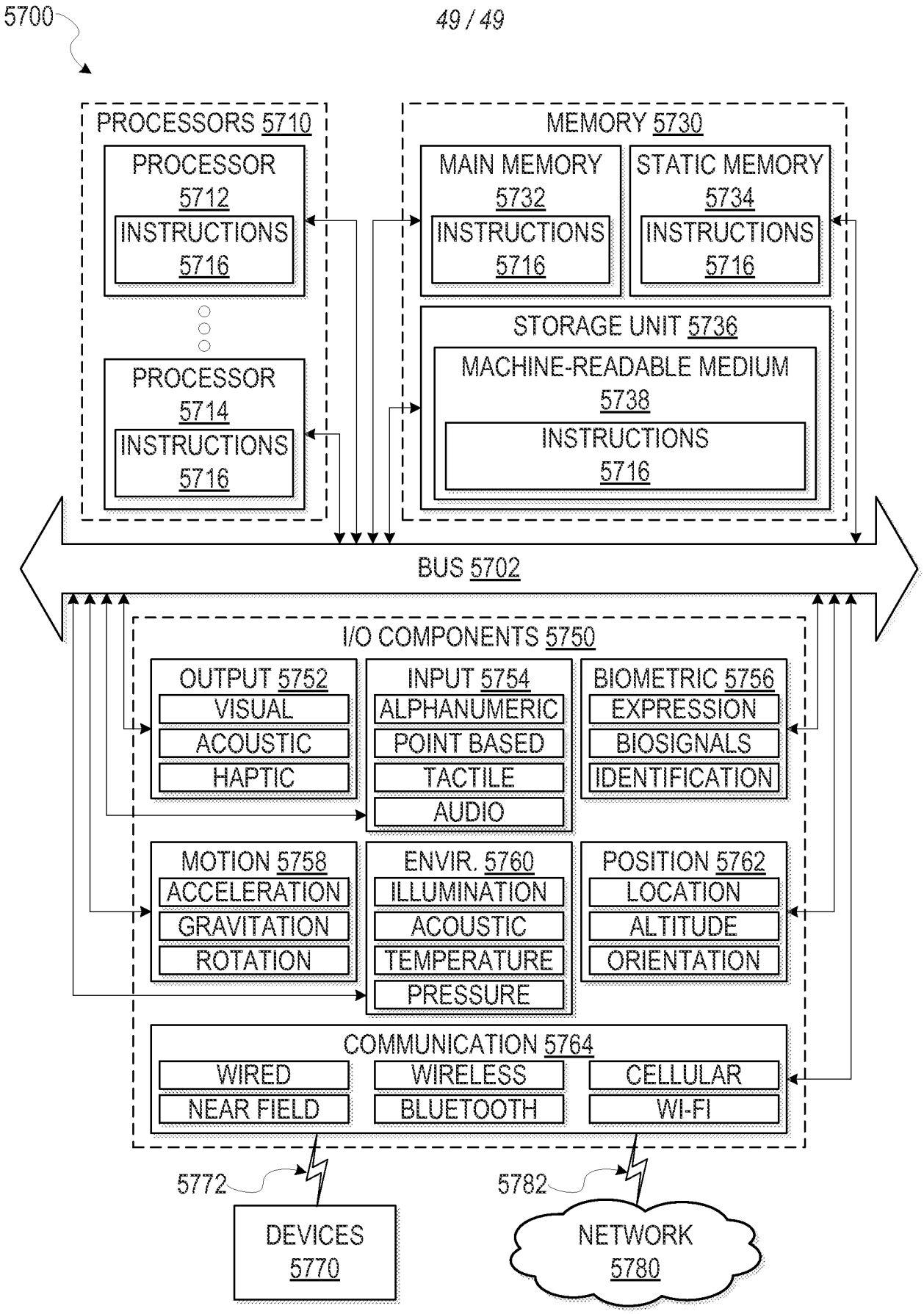

5700
PROCESSORS 5710
PROCESSOR 5712
INSTRUCTIONS 5716
PROCESSOR 5714
INSTRUCTIONS 5716
MEMORY 5730
MAIN MEMORY 5732
INSTRUCTIONS 5716
STATIC MEMORY 5734
INSTRUCTIONS 5716
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MACHINE-READABLE MEDIUM 5738
INSTRUCTIONS 5716
BUS 5702
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ACOUSTIC
TEMPERATURE
PRESSURE
POSITION 5762
LOCATION
ALTITUDE
ORIENTATION
COMMUNICATION 5764
WIRED
NEAR FIELD
WIRELESS
BLUETOOTH
CELLULAR
WI-FI
5772
DEVICES 5770
5782
NETWORK 5780

FIG. 57

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/022318

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06Q 10/10 (2015.01)
CPC - G06Q 10/101 (2015.04)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - G06F 15/18; G06Q 10/00; 10/10 (2015.01)
USPC - 706/14; 718/106

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - G06Q 10/00; 10/10; 10/101 (2015.04) (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar, Google.
Search terms used: activity, secondary user device

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0299796 A1 (MACBETH et al) 27 December 2007 (27.12.2007) entire document	1-20
A	US 2012/0096076 A1 (CHAN) 19 April 2012 (19.04.2012) entire document	1-20
A	US 2013/0275994 A1 (UOLA et al) 17 October 2013 (17.10.2013) entire document	1-20
A	US 2012/0096076 A1 (CHAN) 19 April 2012 (19.04.2012) entire document	1-20

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* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 June 2015	01 JUL 2015

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774