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(54) Title: PACKET SHARING BASED ON IDENTIFIED NEEDS OF DISPARATE USERS

(57) Abstract: A shared packet transaction amongst disparate users is provided that preserves user data security. A packet unbundling and distribution system is provided that collects packet data associated with packets comprised of divisible packet elements and understands user needs and user preferences of disparate users based on collected user signals. They system identifies a virtual group of disparate users whose user needs and user preferences match at least a portion of the packet's packet elements and satisfy a threshold associated with a packet, and facilitates a shared transaction of the packet that benefits each of the disparate users.

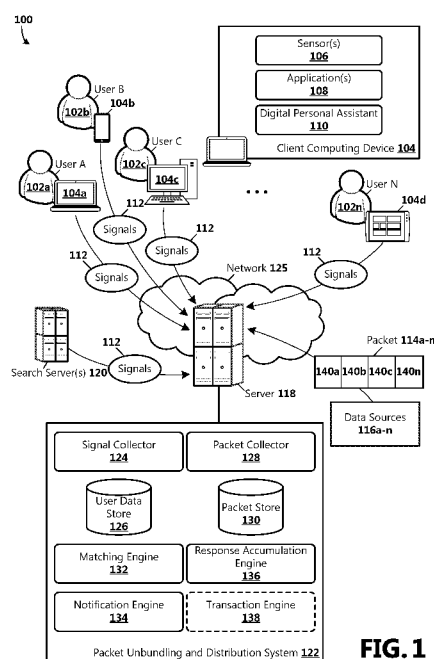


FIG. 1

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
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PACKET SHARING BASED ON IDENTIFIED NEEDS OF DISPARATE USERS

BACKGROUND

[0001] Through computing device users' interactions with their computing devices, systems are able to explicitly and implicitly understand the users' needs. Additionally, various online retailers and service providers offer benefits to users who purchase products and services as a quantity-based bundle or as a batched product or service-based bundle. However, users are limited in ways of assembling groups of users with related needs, and user data security is susceptible to theft when sharing a transaction with disparate users.

SUMMARY

[0002] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description section. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended as an aid in determining the scope of the claimed subject matter.

[0003] Aspects are directed to an automated system, method, and computer readable storage device for identifying and apportioning a packet amongst disparate users based on each user's needs. For example, a packet unbundling and distribution system is provided that is operative or configured to understand user needs, identify a virtual group of disparate users whose needs can be bundled, match bundled user needs to packet elements, and coordinate a shared transaction of a packet that benefits each of the disparate users. Examples are implemented as a computer process, a computing system, or as an article of manufacture such as a device, computer program product, or computer readable medium. According to an aspect, the computer program product is a computer storage medium readable by a computer system and encoding a computer program of instructions for executing a computer process.

[0004] The details of one or more aspects are set forth in the accompanying drawings and description below. Other features and advantages will be apparent from a reading of the following Detailed Description and a review of the associated drawings. It is to be understood that the following Detailed Description is explanatory only and is not restrictive of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate various aspects. In the drawings:

FIGURE 1 is a block diagram showing an example operating environment

and computing architecture for implementing aspects of the present disclosure;

FIGURE 2A shows an example use case where a virtual group is assembled for collaborative sharing of a bundled offer;

FIGURE 2B is an illustration of an example user interface display for notifying users of a virtual group of a bundled offer collaboration opportunity that meets the users' needs;

FIGURE 3A shows an example use case where a virtual group is assembled for collaborative sharing of a bundled offer;

FIGURE 3B is an illustration of an example user interface display for notifying users of a virtual group of a finalized transaction for a bundled offer;

FIGURE 4 is a flow chart showing general stages involved in an example method for identifying and apportioning a packet amongst disparate users based on each user's needs;

FIGURE 5 is a block diagram illustrating example physical components of a computing device;

FIGURES 6A and **6B** are simplified block diagrams of a mobile computing device; and

FIGURE 7 is a simplified block diagram of a distributed computing system.

DETAILED DESCRIPTION

[0006] The following Detailed Description refers to the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the following description refers to the same or similar elements. While examples may be described, modifications, adaptations, and other implementations are possible. For example, substitutions, additions, or modifications may be made to the elements illustrated in the drawings, and the methods described herein may be modified by substituting, reordering, or adding stages to the disclosed methods. Accordingly, the following Detailed Description is not limiting, but instead, the proper scope is defined by the appended claims. Examples may take the form of a hardware implementation, or an entirely software implementation, or an implementation combining software and hardware aspects. The following Detailed Description is, therefore, not to be taken in a limiting sense.

[0007] Aspects of the present disclosure are directed to a method, system, and computer readable storage device for identifying and apportioning a packet amongst disparate users based on each user's needs. With reference now to **FIGURE 1**, a block diagram is provided showing an example operating environment **100** and computing

architecture in which aspects of the present disclosure can be employed. It should be understood that this and other arrangements described herein are provided as examples. Other arrangements and elements can be used in addition to or instead of those shown in **FIGURE 1**. Various functions described herein as being performed by one or more elements or components can be carried out by hardware, firmware, and/or software. For example, some functions can be carried out by a processor executing instructions stored in memory. As illustrated, the example operating environment **100** includes a plurality of client computing devices **104a-n** (generally **104**), a number of data sources **116a-n** (generally **116**), at least one server **118**, and network **125**. Each of the components illustrated in **FIGURE 1** can be implemented via any type of computing device, such as the computing devices described in reference to **FIGURES 5, 6A, 6B, and 7**.

[0008] As an example, the one or more client computing devices **104** can be one or more of various types of computing devices, such as tablet computing devices, desktop computers, mobile communication devices, laptop computers, laptop/tablet hybrid computing devices, large screen multi-touch displays, vehicle computing systems, gaming devices, smart televisions, wearable devices, internet of things (IoT) devices, etc. A user **102** can use an application **108** on a client computing device **104** for a variety of tasks, which can include, for example, to write, calculate, draw, take and organize notes, organize and prepare presentations, search for and obtain information, send and receive electronic mail, make music, and the like. Examples of suitable applications **108** include, but are not limited to, word processing applications, spreadsheet applications, slide presentation applications, electronic mail applications, drawing applications, note-taking applications, web browser applications, game applications, and mobile applications. Applications **108** can include thick client applications, which are stored locally on the client computing device **104**, or can include thin client applications (i.e., web applications) that reside on a remote server and accessible over a network **125** or a combination of networks. A thin client application can be hosted in a browser-controlled environment or coded in a browser-supported language and can rely on a common web browser to render the application executable on the client computing device **104**. In some examples, an application **108** is operative or configured to generate and provide a graphical user interface (GUI) that allows a user **102** to interact with application functionality and electronic content.

[0009] In some examples, the client computing device **104** includes or is communicatively attached to a digital personal assistant **110**. Digital personal assistant functionality can be provided as or by a stand-alone digital personal assistant application,

part of an application **108**, or part of an operating system of the client computing device **104**. In some examples, the digital personal assistant **110** employs a natural language user interface (UI) that can receive spoken utterances from a user **102** that are processed with voice or speech recognition technology. For example, the natural language UI can include an internal or external microphone, camera, and various other types of sensors **106**. The digital personal assistant **110** can support various functions, which can include interacting with the user **102** (e.g., through the natural language UI or GUIs); performing tasks (e.g., making note of appointments in the user's calendar, sending messages and emails, etc.); providing services (e.g., answering questions from the user **102**, mapping directions to a destination, other application **108** or service functionalities that are supported by the digital personal assistant **110**, etc.); gathering information (e.g., finding information requested by the user **102** about a book or movie, locating the nearest Italian restaurant, etc.); operating the client computing device **104** (e.g., setting preferences, adjusting screen brightness, turning wireless connections on and off); and various other functions. The functions listed above are not intended to be exhaustive and other functions may be provided by the digital personal assistant **110**. In examples, the applications **108** or digital personal assistant **110** receive input from the user **102** via various input methods, such as those relying on mice, keyboards, and remote controls, as well as Natural User Interface (NUI) methods, which enable a user **102** to interact with a device in a “natural” manner, such as via speech recognition, touch and stylus recognition, gesture recognition both on screen and adjacent to the screen, air gestures, head and eye tracking, voice and speech, vision, touch, hover, gestures, and machine intelligence.

[0010] The components can communicate with each other via network **125**, which can include, without limitation, one or more local area networks (LANs) or wide area networks (WANs). In some examples, network **125** comprises the Internet and/or a cellular network, amongst any of a variety of possible public or private networks. As should be appreciated, any number of client computing devices **104**, data sources **116**, and servers **118,120** can be employed within the example operating environment **100** within the scope of the present disclosure. Each can comprise a single device or a plurality of devices cooperating in a distributed environment. For example, the server **118** can be provided via multiple devices arranged in a distributed environment that collectively provide various functionalities described herein. In some examples, other components not shown can be included within the distributed operating environment **100**.

[0011] The example operating environment **100** can be used to implement one or

more of the components of a packet unbundling and distribution system **122**, including components for collecting user signals **112**, identifying user needs **202**, identifying packets **114**, recognizing divisible packet elements **140**, matching disparate users' needs to packet elements **140**, and coordinating a shared purchase of a packet **114** amongst disparate users **102** based on the users' needs. The packet unbundling and distribution system **122** illustrated in **FIGURE 1** represents only one example of a suitable computing system architecture. Other arrangements and elements can be used in addition to or instead of the elements shown. As should be appreciated, elements described herein are functional entities that can be implemented as discrete or distributed components, or in conjunction with other components, and in any suitable combination or location. In some examples, the packet unbundling and distribution system **122** is exposed to users **102** via an API (Application Programming Interface).

[0012] As illustrated, the example packet unbundling and distribution system **122** includes a signal collector **124**, a user data store **126**, a packet collector **128**, a packet store **130**, a matching engine **132**, a notification engine **134**, a response accumulation engine **136**, and a transaction engine **138**. The components of the packet unbundling and distribution system **122** can operate on one or more servers **118**, can be distributed across one or more client computing devices **104** and servers **118**, or can be implemented in the cloud. In some examples, one or more of the components of the example system are distributed across network **125**.

[0013] According to an aspect, the signal collector **124** is illustrative of a software module, software package, system, or device operative or configured to receive or collect various signals **112** from the client computing devices **104** and one or more search servers **120**. The signal collector **124** is operative or configured to apply machine learning, statistical analysis, behavioral analytics, and data mining techniques to the signals **112** to derive user needs **202** for each user **102**. According to an aspect, the signal collector **124** stores the user needs **202**, as well as other collected user data (e.g., explicitly-defined or implicitly inferred user preferences), in one or more data stores, such as user data store **126**, where the data can be available to other components of the packet unbundling and distribution system **122**. For example, a user **102** can explicitly specify specific product or service preferences or features (e.g., brands, hotel star ratings, locations, amenities), or product or service preferences or features can be inferred based on, for example, the user's past purchases or searches.

[0014] In some examples, the user data are stored in or associated with a user profile. In some examples, the user data are stored in a relational knowledge graph illustrative of a

repository of entities and relationships between entities. In a knowledge graph, entities are represented as nodes, and attributes and relationships between entities are represented as edges connecting the nodes. Thus, a knowledge graph provides a structured schematic of entities and their relationships to other entities. According to examples, edges between nodes can represent an inferred relationship or an explicit relationship. According to an aspect, the user data store **126** is continually updated with data from collected signals **112**.

[0015] In some examples, the digital personal assistant **110** is present across a plurality of client computing devices **104**, and collects and passes various signals **112** to the signal collector **124**. In some examples, a user **102** explicitly defines a user need. For example, the user **102** can submit a query (e.g., via the digital personal assistant **110**, via a search engine) for a particular product or service (e.g., cameras for sale, “Personal Assistant, I want to buy a new camera”), wherein “camera” is identified as an entity associated with a user need for the user **102**. In other examples, the signal collector **124** is operative or configured to infer user needs **202**, for example, based on another purchase made by the user **102**, based on knowing the user’s location and schedule, based on the user’s communications, search history, etc. In some examples, the user data received by the signal collector **124** are collected by one or more sensors **106** integrated with or communicatively attached to one or more computing devices, such as one or more client computing devices **104**, servers **118**, or search servers **120**. The one or more sensors **106** can be embodied as hardware, software, or a combination of hardware and software operative or configured to sense, detect, or otherwise obtain user data. By way of example and not limitation, signals **112** can include data that are sensed or determined from the one or more sensors **106**, such as location information of a client computing device **104**, properties or characteristics of the computing device(s) (such as device state, charging data, date/time, or other information derived from the computing device) and user interaction information (e.g., application usage; online activity; searches; voice data such as automatic speech recognition; activity logs; communications data including calls, texts, instant messages, and emails; website posts; and other user data associated with communication events). In some examples, user interaction information includes information associated with user interactions that occur over more than one computing device. User interaction information can further include user histories, session logs, application data, contacts data, calendar and schedule data, notification data, social-network data, news (including popular or trending items on search engines or social networks), online gaming data, ecommerce activities, user-account(s) data (which can include data from user preferences or settings associated with an application **108**

or a digital personal assistant **110**), home-sensor data, appliance data, global positioning system (GPS) data, vehicle signal data, traffic data, weather data, wearable device data, other user device data (which may include device settings, profiles, network-related information (e.g., network name or ID, domain information, workgroup information, connection data, wireless network data, or configuration data, data regarding the model number, firmware, or equipment, device pairings, or other network-related information), gyroscope data, accelerometer data, payment or credit card usage data, purchase history data, or other sensor data that may be sensed or otherwise detected by a sensor **106** (or other detector) component(s). For example, other sensor data can include data derived from a sensor component associated with the user **102** (including location, motion, orientation, position, user-access, user interactions, network-access, user device charging, or other data that is capable of being provided by one or more sensors **106**), and other sources of data that can be sensed or determined as described herein.

[0016] With reference still to **FIGURE 1**, the packet collector **128** is illustrative of a software module, software package, system, or device operative or configured to identify and collect packets **114a-n** (generally **114**) available to users **102**, for example, provided via from a variety of data sources **116** (e.g., product or service providers). According to an aspect and as used herein, the term packet **114** describes goods or services (i.e., packet elements **140a-n** (generally **140**)) that are offered as a bundle. By way of example and not limitation, packets **114** can include products (e.g., clothing, jewelry, equipment, electronics, tickets, or other products) or services (e.g., taxi or ride shares, travel-related services, moving services, shipping services, rental services, or other services) available for purchase via online retailers or service providers.

[0017] In some examples, packet elements **140**, when bundled together as a packet **114**, are provided at a discounted rate. In some examples, a packet **114** is a bulk purchase of a single product or service, for example, where the packet **114** is comprised of at least a minimum quantity of a particular packet element **140**, and a discount is applied based on quantity (e.g., X quantity of product Y will discount each packet element **140** by Z). In other examples, a packet **114** is comprised of a combination of particular packet elements **140**, and a discount is applied based on quantity (e.g., X quantity of products A, B, and C will discount each packet element **140** by Z). In other examples, a packet **114** is comprised of particular packet elements **140**, and a discount is applied when all or a predetermined portion of specified products in the packet **114** are purchased (e.g., a purchase of product X and product Y triggers a discount Z applied to each packet element **140** or to the whole packet

114).

[0018] In some examples, the packet collector **128** includes a data and/or text mining engine to mine, discover, and extract Web-based packet-related content from various Web-based content or data sources **116**, such as Web pages. The data sources **116** can be
5 discovered by the packet collector **128** or can be known retailer or service provider sites. In other examples, the packet collector **128** includes a submissions interface that is operative or configured to accept packet-related content from online retailers or service providers.

[0019] According to an aspect, the packet collector **128** is further operative or configured to recognize divisible elements of a packet **114**. For example, the packet
10 collector **128** analyzes a packet **114**, and identifies packet elements **140** that can be distributed amongst a plurality of users **102**. For example, a ride-share service can be identified as a packet **114** that can be divided amongst two or more users **102** needing a ride along a similar route. As another example, a packet **114** comprised of five printers can be identified as a packet **114** that can be divided amongst two to five users **102** needing a
15 printer. As another example, a packet **114** comprised of various travel services (e.g., flight, hotel, car rental) can be divided amongst users **102** needed the various travel services. According to an aspect, the packet collector **128** stores packet-related data in the packet store **130**, where the data can be available to other components of the packet unbundling and distribution system **122**. In some examples, the packet-related data are stored in a
20 relational knowledge graph.

[0020] The matching engine **132** is illustrative of a software module, software package, system, or device operative or configured to match user needs **202** associated with a plurality of disparate users **102** to a packet **114**. For example, the matching engine **132** maps explicitly-defined or inferred user needs **202** to a packet's packet elements **140**. The
25 users **102** whose user needs **202** satisfy at least a minimum threshold of a packet **114** are associated with a virtual group **204**. That is, the matching engine **132** establishes a virtual group **204** of disparate users **102** who can benefit from a shared transaction of a packet **114**. For example, a benefit can be in the form of a discount or in the availability of a packet element **140** that would otherwise not be feasibly available to a user **102** if not shared
30 amongst a plurality of users **102**. According to an example, in establishing a virtual group **204** of disparate users **102**, the matching engine **132** is operative or configured to identify users **102** who share a common or similar user need **202**, and whose user needs **202** can be bundled together as a shared transaction. According to an example, as used herein, the term "transaction" is used to describe a purchase of a divisible or shareable packet **114**.

According to an aspect, the matching engine **132** detects common or related user needs **202** that can be combined and mapped to a packet **114**.

[0021] According to an aspect, the matching engine **132** is further operative or configured to use explicitly-defined or implicitly inferred user preferences for mapping user needs **202** to packet elements **140**. In some examples, the matching engine **132** assembles virtual groups **204** of disparate users **102** based in part on common or similar user preferences. For example, users **102** who share a common preference for a particular product brand or who only purchase products or services that meet a minimum rating can be assembled into a virtual group **204**.

[0022] In some examples, the matching engine **132** ranks packet elements **140** based on a level of relatedness between a packet element **140** and an identified user need and user preferences. For example, a particular packet element **140** (e.g., a refrigerator) of a packet **114** (e.g., an appliance set including a refrigerator, stove, and a dishwasher) can be determined to match a user need for a particular user **102**; however, the user **102** may have certain explicitly-defined or inferred user preferences associated with the packet element **140** that are not closely related to the particular packet element **140**. For example, the particular user **102** may explicitly define a preference for a stainless steel refrigerator with a touchscreen, or an inference can be made that the user **102** has a preference for a stainless steel refrigerator with a touchscreen, for example, based on the user's previous searches, previous purchases, communications, etc. Accordingly, the matching engine **132** can determine that a mapping between a black refrigerator that does not include a touchscreen (packet element **140**) that is batched in a packet **114** with other appliances is not closely related, and thus not a strong match for the user **102**. In some examples, a match between a user need and a packet element **140** is determined according to a calculated relatedness score. Mapping user needs **202** to packet elements **140** for assembling a virtual group **204** of disparate users **102** for sharing a packet **114** is described in further detail below with reference to examples illustrated in **FIGURES 2A-B** and **3A-B**.

[0023] With reference still to **FIGURE 1**, the notification engine **134** is illustrative of a software module, software package, system, or device operative or configured to notify each user **102** of an assembled virtual group **204** about a proposal of a shared transaction of a packet **114** that the virtual group **204** is associated with and of the one or more packet elements **140** with which the particular user **102** is matched. In some examples, the notification **206** is an offer that users **102** of a virtual group **204** are enabled to respond to for opting into the shared packet transaction. For example, a notification **206** sent to

identified users **102** of a virtual group **204** matched to packet elements **140** of a packet **114** can prompt each user **102** to respond to an offer to participate in a shared packet transaction (e.g., whether the user **102** would like to purchase item X as a bundle with another user **102**). In some examples, the notification **206** can further include information associated with the benefit to the user **102** (e.g., a discount). Further, the notification **206** can include a selectable option **208** to participate in the shared packet transaction. The notification **206** can be provided via the digital personal assistant **110**, via an application **108**, or exposed via an API.

[0024] According to an aspect, the packet unbundling and distribution system **122** comprises a response accumulation engine **136** illustrative of a software module, software package, system, or device operative or configured to accumulate responses to the notifications from users **102**. For example, when a user **102** selects to participate in a shared packet transaction, the response accumulation engine **136** collects the response and makes a determination as to whether a threshold for the packet **114** has been satisfied (e.g., at least a minimum number of users **102** have selected to participate or whether each packet element **140** of a packet **114** has been matched to and accepted by a user **102**). In some examples, the threshold is associated with the benefit or profitability to the users **102** of a virtual group **204**.

[0025] In some examples, responsive to satisfying the threshold, the notification engine **134** is further operative or configured to notify the users **102** that the shared packet transaction has been successfully approved (i.e., the threshold has been satisfied) such that each of the user **102** can finalize their pieces of the shared packet transaction. According to an example, packet transaction capabilities are exposed to the user **102** via the notification **206**. In other examples, responsive to satisfying the threshold, an optional transaction engine **138**, illustrative of a software module, software package, system, or device, is operative or configured to facilitate the shared packet transaction on behalf of one or more of the users **102** of the virtual group **204**. For example, using known or stored user payment or credit card data, the transaction engine **138** can perform the purchase of the packet **114** and collect or facilitate payment for each user's portion of the packet **114**. As another example, the transaction engine **138** can secure a reservation for a product or service on behalf of a user **102**. In some examples, an interface is provided for enabling users **102** to enter payment, shipping, and other required transaction data.

[0026] Advantageously, the disclosed aspects enable the benefit of technical effects that include, but are not limited to, improved individual user data security and reductions in

bandwidth while providing an improved user experience. According to an aspect, the packet unbundling and distribution system **122** improves user data security in shared packet transaction scenarios by enabling disparate users **102** who are not located in a same location to collaborate on a transaction securely, for example, without requiring the users **102** to share sensitive user data (e.g., payment data, bank data, credit card data, personal information) and without requiring the users **102** to be in direct communication with each other. Further, by automatically retrieving packet-related data from various data sources **116** that are relevant to users' needs and preferences, additional processing and bandwidth usage associated with searches for products or services that satisfy the users' needs and preferences are reduced.

[0027] Various examples are described below with reference to **FIGURES 2A-B** and **FIGURES 3A-B**. With reference now to **FIGURE 2A**, an example packet **114** is shown, wherein the example packet is comprised of a plurality of packet elements **140**. In the illustrated example, the packet element **140** comprises a pair of ski gloves that when quantity-batched (e.g., purchased in a quantity of two or more pairs), provide a benefit (e.g., discount) to the client. Further as illustrated, two users, User A **102a** and User B **102b** are shown grouped together in a virtual group **204**. For example, a pair of ski gloves is identified by the signal collector **124** as a user need **202a** for User A **102a**, and the identified (e.g., explicitly or implicitly) user need is stored in the user data store **126** in association with User A. Likewise, a pair of ski gloves is identified (e.g., explicitly or implicitly) by the signal collector **124** as a user need **202b** for User B **102b**, and stored in the user data store **126** in association with User B. Further, a quantity-bundled packet **114** of ski gloves (packet element **140**) is identified and collected by the packet collector **128**. The packet **114** data is stored in the packet store **130**, where it is available to the matching engine **132** for mapping the packet's packet elements **140** to user needs **202** stored in the user data store **126**. As illustrated, matches are determined between User A's identified user need **202a** of a pair of ski gloves and a packet element **140** (a pair of ski gloves) and between User B's identified user need **202b** of a pair of ski gloves and a packet element **140** (a pair of ski gloves). According to an aspect, explicitly-defined or inferred user preference data can be used in determining the matches. In the example, the threshold of the packet **114** is a quantity of two pairs of ski gloves. Accordingly, upon identifying the matches, the threshold is determined to be satisfied, and the users are notified.

[0028] With reference now to **FIGURE 2B**, an example notification **206** is shown displayed on User A's client computing device **104a** and on User B's client computing

device **104b**. As should be appreciated, the example notification **206** is for illustrative purposes only. Other types of notifications can be provided in a variety of formats and modes, and are within the scope of the present disclosure. In the illustrated example, a selectable option **208** is provided for enabling the users **102a,b** to opt into the shared packet transaction. Upon selections by both users **102a,b** to opt into the shared packet transaction, the transaction is finalized, and the users **102** are provided the benefit of the bundled packet **114**.

[0029] With reference now to **FIGURE 3A**, another example packet **114** is shown, wherein the example packet **114** is travel-related and comprised of a plurality of packet elements **140**. In the illustrated example, the packet **114** is comprised of a combination of four packet elements **140**: plane ticket packet elements **140a**, hotel accommodation packet elements **140b**, a car rental packet element **140c**, and event ticket packet elements **140d**. For example, when purchased as a bundle, a benefit of a 20% discount is provided. As illustrated, User A **102a** has a user need **202a** of plane ticket packet elements **140a** to Paris, France, User **102b** has a user need **202b** of hotel accommodation packet elements **140b** in Paris, and User C **102c** has a user need **202c** of a car rental packet elements **140c** and event ticket packet elements **140d** in Paris are obtained, identified, and stored in the user data store **126** in association with the particular users **102a-c**. Further, the travel-related packet **114** is identified and stored in the packet store **130**. The matching engine **132** maps the users' user needs **202a-d** to the packet elements **140a-d**, and detects the users' common user needs **202** that can be combined to satisfy the threshold (e.g., batched purchase of flight, hotel, car, and event tickets) associated with the travel-related packet **114**. Further, the matching engine **132** assembles a virtual group **204** comprised of User A **102a**, User B **102b**, and User C **102b** whose combined user needs **202a-d** satisfy the packet threshold.

[0030] With reference now to **FIGURE 3B**, an example notification **210** is shown displayed on User A's client computing device **104a**, on User B's client computing device **104b**, and on User C's client computing device **104c**. In the illustrated example, the example notification **210** is a notification provided to the users **102a-c** responsive to the finalized shared packet transaction. For example, prior to receiving the example notification **210**, the users **102a-c** can be notified of the batched offer in another notification **210** and opt into the transaction. As can be appreciated, the users' private user data (e.g., payment data, bank data, credit card data, personal information) is not shared with the other users **102**, thus providing a secure transaction of a shared packet **114**.

[0031] Having described an operating environment **100**, example packet unbundling

and distribution system **122**, and examples with respect to **FIGURES 1-3B**, **FIGURE 4** is a flow chart showing general stages involved in an example method **400** for identifying and apportioning a packet **114** amongst disparate users **102** based on each user's identified user needs **202**. With reference now to **FIGURE 4**, the method **400** begins at start OPERATION **402**, and proceeds to OPERATION **404**, where user signals **112** associated with various disparate users **102** are collected based on the users' interactions with their client computing devices **104**. For example the user signals **112** can include data that are sensed or determined from the one or more sensors **106** and user interactions (e.g., searches, queries, communications, purchase histories, browsing histories).

[0032] At OPERATION **406**, machine learning, statistical analysis, behavioral analytics, and data mining techniques are applied to the signals **112** to derive user needs **202** for each user **102**. According to an aspect, the identified user needs **202**, as well as other collected user data (e.g., explicitly-defined or implicitly inferred user preferences, payment information, billing and shipping address information), are stored in the user data store **126**, where the data can be available to other components of the packet unbundling and distribution system **122**.

[0033] The method **400** proceeds to OPERATION **408**, where packets **114** provided via one or more data sources **116** are identified, collected, analyzed, and stored in the packet store **130**. For example, identified packets **114** are analyzed for identifying divisible elements of a packet **114** that can be apportioned to various disparate users **102** in a shared transaction.

[0034] The method **400** continues to OPERATION **410**, where the identified user needs **202** are mapped to packet elements **140**, and matches are made between various user needs **202** and packet elements **140** based on a relatedness factor. In some examples, user preference data are used in determining the relatedness score of a match between a user need **202** and a packet element **140**. Packet elements **140** of a packet **114** are mapped to user needs **202** at least until a minimum threshold associated with the packet **114** are satisfied.

[0035] At OPERATION **412**, a determination is made that a threshold associated with a packet **114** is satisfied (e.g., at least a minimum quantity or combination of packet elements **140** are matched with users' user needs **202**), and the users **102** whose user needs **202** satisfy the packet threshold are identified as a virtual group **204**.

[0036] The method **400** proceeds to OPERATION **414**, where the users **102** of the virtual group **204** are notified of a match between the user's identified user need(s) **202** and at least one packet element **140** of a packet **114** that is able to be apportioned amongst a

group of disparate users **102** who can benefit from a shared transaction of the packet **114**.

[0037] The method **400** continues to OPERATION **416**, where responses to the notification **206** are collected, and at DECISION OPERATION **418**, a determination is made as to whether the responses of users **102** who have decided to opt in satisfy a threshold
5 for the packet **114**. When a determination is made that the responses do not satisfy the packet threshold, the method **400** optionally proceeds to OPERATION **420**, where the users **102** are notified, or returns to OPERATION **410**, where the packet elements **140** are mapped to other users' user needs **202** for identifying a match to another user **102**.

[0038] When a determination is made that the responses satisfy the packet threshold,
10 the method **400** proceeds to OPERATION **422**, where the packet **114** is unbundled. For example, the packet elements **140** are apportioned amongst the users **102** of the virtual group **204** based on the users' identified user needs **202**, and the shared packet transaction is finalized. In some examples, the packet unbundling and distribution system **122** facilitates the transactions of the matched packet elements **140**. For example, the packet unbundling
15 and distribution system **122** can transmit payment to a product or service provider on behalf of the users **102**, or can secure a reservation for a product or service on behalf of the users **102**.

[0039] The method **400** continues to OPERATION **424**, where the packet elements **140** are transmitted. In some examples, the transmission of the packet elements **140**
20 comprises a transmission of notifications, receipts, or of transaction details. In other examples, the transmission of the packet elements **140** comprises a transmission of physical entities or provision of services. The method **400** ends at END OPERATION **498**.

[0040] While implementations have been described in the general context of program modules that execute in conjunction with an application program that runs on an
25 operating system on a computer, those skilled in the art will recognize that aspects can also be implemented in combination with other program modules. Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types.

[0041] The aspects and functionalities described herein may operate via a multitude
30 of computing systems including, without limitation, desktop computer systems, wired and wireless computing systems, mobile computing systems (e.g., mobile telephones, netbooks, tablet or slate type computers, notebook computers, and laptop computers), hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, and mainframe computers.

[0042] In addition, according to an aspect, the aspects and functionalities described herein operate over distributed systems (e.g., cloud-based computing systems), where application functionality, memory, data storage and retrieval and various processing functions are operated remotely from each other over a distributed computing network, such as the Internet or an intranet. According to an aspect, user interfaces and information of various types are displayed via on-board computing device displays or via remote display units associated with one or more computing devices. For example, user interfaces and information of various types are displayed and interacted with on a wall surface onto which user interfaces and information of various types are projected. Interaction with the multitude of computing systems with which implementations are practiced include, keystroke entry, touch screen entry, voice or other audio entry, gesture entry where an associated computing device is equipped with detection (e.g., camera) functionality for capturing and interpreting user gestures for controlling the functionality of the computing device, and the like.

[0043] FIGURES 5-7 and the associated descriptions provide a discussion of a variety of operating environments in which examples are practiced. However, the devices and systems illustrated and discussed with respect to FIGURES 5-7 are for purposes of example and illustration and are not limiting of a vast number of computing device configurations that are used for practicing aspects, described herein.

[0044] FIGURE 5 is a block diagram illustrating physical components (i.e., hardware) of a computing device 500 with which examples of the present disclosure may be practiced. In a basic configuration, the computing device 500 includes at least one processing unit 502 and a system memory 504. According to an aspect, depending on the configuration and type of computing device, the system memory 504 comprises, but is not limited to, volatile storage (e.g., random access memory), non-volatile storage (e.g., read-only memory), flash memory, or any combination of such memories. According to an aspect, the system memory 504 includes an operating system 505 and one or more program modules 506 suitable for running software applications 550. According to an aspect, the system memory 504 includes the one or more components of the packet unbundling and distribution system 122. The operating system 505, for example, is suitable for controlling the operation of the computing device 500. Furthermore, aspects are practiced in conjunction with a graphics library, other operating systems, or any other application program, and is not limited to any particular application or system. This basic configuration is illustrated in FIGURE 5 by those components within a dashed line 508. According to an aspect, the computing device 500 has additional features or functionality. For example,

according to an aspect, the computing device **500** includes additional data storage devices (removable and/or non-removable) such as, for example, magnetic disks, optical disks, or tape. Such additional storage is illustrated in **FIGURE 5** by a removable storage device **509** and a non-removable storage device **510**.

5 **[0045]** As stated above, according to an aspect, a number of program modules and data files are stored in the system memory **504**. While executing on the processing unit **502**, the program modules **506** (e.g., one or more components of the packet unbundling and distribution system **122**) perform processes including, but not limited to, one or more of the stages of the method **400** illustrated in **FIGURE 4**. According to an aspect, other program
10 modules are used in accordance with examples and include applications such as electronic mail and contacts applications, word processing applications, spreadsheet applications, database applications, slide presentation applications, drawing or computer-aided application programs, etc.

[0046] According to an aspect, aspects are practiced in an electrical circuit
15 comprising discrete electronic elements, packaged or integrated electronic chips containing logic gates, a circuit using a microprocessor, or on a single chip containing electronic elements or microprocessors. For example, aspects are practiced via a system-on-a-chip (SOC) where each or many of the components illustrated in **FIGURE 5** are integrated onto a single integrated circuit. According to an aspect, such an SOC device includes one or more
20 processing units, graphics units, communications units, system virtualization units and various application functionality all of which are integrated (or “burned”) onto the chip substrate as a single integrated circuit. When operating via an SOC, the functionality, described herein, is operated via application-specific logic integrated with other components of the computing device **500** on the single integrated circuit (chip). According to an aspect,
25 aspects of the present disclosure are practiced using other technologies capable of performing logical operations such as, for example, AND, OR, and NOT, including but not limited to mechanical, optical, fluidic, and quantum technologies. In addition, aspects are practiced within a general purpose computer or in any other circuits or systems.

[0047] According to an aspect, the computing device **500** has one or more input
30 device(s) **512** such as a keyboard, a mouse, a pen, a sound input device, a touch input device, etc. The output device(s) **514** such as a display, speakers, a printer, etc. are also included according to an aspect. The aforementioned devices are examples and others may be used. According to an aspect, the computing device **500** includes one or more communication connections **516** allowing communications with other computing devices **518**. Examples of

suitable communication connections **516** include, but are not limited to, radio frequency (RF) transmitter, receiver, and/or transceiver circuitry; universal serial bus (USB), parallel, and/or serial ports.

[0048] The term computer readable media as used herein include computer storage media. Computer storage media include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, or program modules. The system memory **504**, the removable storage device **509**, and the non-removable storage device **510** are all computer storage media examples (i.e., memory storage.) According to an aspect, computer storage media include RAM, ROM, electrically erasable programmable read-only memory (EEPROM), flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other article of manufacture which can be used to store information and which can be accessed by the computing device **500**. According to an aspect, any such computer storage media is part of the computing device **500**. Computer storage media do not include a carrier wave or other propagated data signal.

[0049] According to an aspect, communication media are embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery medium. According to an aspect, the term “modulated data signal” describes a signal that has one or more characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared, and other wireless media.

[0050] **FIGURES 6A** and **6B** illustrate a mobile computing device **600**, for example, a mobile telephone, a smart phone, a tablet personal computer, a laptop computer, and the like, with which aspects may be practiced. With reference to **FIGURE 6A**, an example of a mobile computing device **600** for implementing the aspects is illustrated. In a basic configuration, the mobile computing device **600** is a handheld computer having both input elements and output elements. The mobile computing device **600** typically includes a display **605** and one or more input buttons **610** that allow the user to enter information into the mobile computing device **600**. According to an aspect, the display **605** of the mobile computing device **600** functions as an input device (e.g., a touch screen display). If included, an optional side input element **615** allows further user input. According to an aspect, the

side input element **615** is a rotary switch, a button, or any other type of manual input element. In alternative examples, mobile computing device **600** incorporates more or less input elements. For example, the display **605** may not be a touch screen in some examples. In alternative examples, the mobile computing device **600** is a portable phone system, such as a cellular phone. According to an aspect, the mobile computing device **600** includes an optional keypad **635**. According to an aspect, the optional keypad **635** is a physical keypad. According to another aspect, the optional keypad **635** is a “soft” keypad generated on the touch screen display. In various aspects, the output elements include the display **605** for showing a graphical user interface (GUI), a visual indicator **620** (e.g., a light emitting diode), and/or an audio transducer **625** (e.g., a speaker). In some examples, the mobile computing device **600** incorporates a vibration transducer for providing the user with tactile feedback. In yet another example, the mobile computing device **600** incorporates input and/or output ports, such as an audio input (e.g., a microphone jack), an audio output (e.g., a headphone jack), and a video output (e.g., a HDMI port) for sending signals to or receiving signals from an external device. In yet another example, the mobile computing device **600** incorporates peripheral device port **640**, such as an audio input (e.g., a microphone jack), an audio output (e.g., a headphone jack), and a video output (e.g., a HDMI port) for sending signals to or receiving signals from an external device.

[0051] **FIGURE 6B** is a block diagram illustrating the architecture of one example of a mobile computing device. That is, the mobile computing device **600** incorporates a system (i.e., an architecture) **602** to implement some examples. In one example, the system **602** is implemented as a “smart phone” capable of running one or more applications (e.g., browser, e-mail, calendaring, contact managers, messaging clients, games, and media clients/players). In some examples, the system **602** is integrated as a computing device, such as an integrated personal digital assistant (PDA) and wireless phone.

[0052] According to an aspect, one or more application programs **650** are loaded into the memory **662** and run on or in association with the operating system **664**. Examples of the application programs include phone dialer programs, e-mail programs, personal information management (PIM) programs, word processing programs, spreadsheet programs, Internet browser programs, messaging programs, and so forth. According to an aspect, one or more components of the packet unbundling and distribution system **122** are loaded into memory **662**. The system **602** also includes a non-volatile storage area **668** within the memory **662**. The non-volatile storage area **668** is used to store persistent information that should not be lost if the system **602** is powered down. The application

programs **650** may use and store information in the non-volatile storage area **668**, such as e-mail or other messages used by an e-mail application, and the like. A synchronization application (not shown) also resides on the system **602** and is programmed to interact with a corresponding synchronization application resident on a host computer to keep the information stored in the non-volatile storage area **668** synchronized with corresponding information stored at the host computer. As should be appreciated, other applications may be loaded into the memory **662** and run on the mobile computing device **600**.

[0053] According to an aspect, the system **602** has a power supply **670**, which is implemented as one or more batteries. According to an aspect, the power supply **670** further includes an external power source, such as an AC adapter or a powered docking cradle that supplements or recharges the batteries.

[0054] According to an aspect, the system **602** includes a radio **672** that performs the function of transmitting and receiving radio frequency communications. The radio **672** facilitates wireless connectivity between the system **602** and the “outside world,” via a communications carrier or service provider. Transmissions to and from the radio **672** are conducted under control of the operating system **664**. In other words, communications received by the radio **672** may be disseminated to the application programs **650** via the operating system **664**, and vice versa.

[0055] According to an aspect, the visual indicator **620** is used to provide visual notifications and/or an audio interface **674** is used for producing audible notifications via the audio transducer **625**. In the illustrated example, the visual indicator **620** is a light emitting diode (LED) and the audio transducer **625** is a speaker. These devices may be directly coupled to the power supply **670** so that when activated, they remain on for a duration dictated by the notification mechanism even though the processor **660** and other components might shut down for conserving battery power. The LED may be programmed to remain on indefinitely until the user takes action to indicate the powered-on status of the device. The audio interface **674** is used to provide audible signals to and receive audible signals from the user **102**. For example, in addition to being coupled to the audio transducer **625**, the audio interface **674** may also be coupled to a microphone to receive audible input, such as to facilitate a telephone conversation. According to an aspect, the system **602** further includes a video interface **676** that enables an operation of an on-board camera **630** to record still images, video stream, and the like.

[0056] According to an aspect, a mobile computing device **600** implementing the system **602** has additional features or functionality. For example, the mobile computing

device **600** includes additional data storage devices (removable and/or non-removable) such as, magnetic disks, optical disks, or tape. Such additional storage is illustrated in **FIGURE 6B** by the non-volatile storage area **668**.

[0057] According to an aspect, data/information generated or captured by the mobile computing device **600** and stored via the system **602** is stored locally on the mobile computing device **600**, as described above. According to another aspect, the data is stored on any number of storage media that are accessible by the device via the radio **672** or via a wired connection between the mobile computing device **600** and a separate computing device associated with the mobile computing device **600**, for example, a server computer in a distributed computing network, such as the Internet. As should be appreciated such data/information is accessible via the mobile computing device **600** via the radio **672** or via a distributed computing network. Similarly, according to an aspect, such data/information is readily transferred between computing devices for storage and use according to well-known data/information transfer and storage means, including electronic mail and collaborative data/information sharing systems.

[0058] **FIGURE 7** illustrates one example of the architecture of a system for identifying and apportioning a packet **114** amongst disparate users **102** based on each user's identified user needs **202** as described above. Content developed, interacted with, or edited in association with the one or more components of the packet unbundling and distribution system **122** is enabled to be stored in different communication channels or other storage types. For example, various documents may be stored using a directory service **722**, a web portal **724**, a mailbox service **726**, an instant messaging store **728**, or a social networking site **730**. One or more components of the packet unbundling and distribution system **122** are operative or configured to use any of these types of systems or the like for identifying and apportioning a packet **114** amongst disparate users **102** based on each user's identified user needs **202**, as described herein. According to an aspect, a server **720** provides the one or more components of the packet unbundling and distribution system **122** to clients **705a,b,c**. As one example, the server **720** is a web server providing one or more components of the packet unbundling and distribution system **122** over the web. The server **720** provides one or more components of the packet unbundling and distribution system **122** over the web to clients **705** through a network **740**. By way of example, the client computing device is implemented and embodied in a personal computer **705a**, a tablet computing device **705b** or a mobile computing device **705c** (e.g., a smart phone), or other computing device. Any of these examples of the client computing device are operable to obtain content from the

store 716.

[0059] Implementations, for example, are described above with reference to block diagrams and/or operational illustrations of methods, systems, and computer program products according to aspects. The functions/acts noted in the blocks may occur out of the order as shown in any flowchart. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

[0060] The description and illustration of one or more examples provided in this application are not intended to limit or restrict the scope as claimed in any way. The aspects, examples, and details provided in this application are considered sufficient to convey possession and enable others to make and use the best mode. Implementations should not be construed as being limited to any aspect, example, or detail provided in this application. Regardless of whether shown and described in combination or separately, the various features (both structural and methodological) are intended to be selectively included or omitted to produce an example with a particular set of features. Having been provided with the description and illustration of the present application, one skilled in the art may envision variations, modifications, and alternate examples falling within the spirit of the broader aspects of the general inventive concept embodied in this application that do not depart from the broader scope.

CLAIMS

1. A system for preserving user data security in a shared packet transaction, the system comprising:
 - at least one processing device; and
 - at least one computer readable data storage device storing instructions that, when executed by the at least one processing device, cause the system to:
 - responsive to collecting user signals associated with a plurality of disparate users, determine user needs of the disparate users based on the collected user signals;
 - collect packet data associated with offered packets comprised of a plurality of divisible packet elements;
 - map the user needs of the disparate users to packet elements;
 - determine matches between the user needs and the packet elements;
 - upon determining that a threshold associated with a packet is satisfied, generate a virtual group of disparate users whose user needs match at least a portion of the packet elements of the packet;
 - transmit a notification to each of the disparate users of the virtual group, wherein the notification informs a given user of the match between one or more user needs and one or more packet elements for the given user;
 - receive responses to the notification; and
 - responsive to determining that the received responses meet the threshold associated with the packet, facilitate transactions of the matched packet elements.
2. The system of claim 1, wherein in determining user needs of the disparate users, the system is configured to infer a user need for a particular user based at least in part on at least one from a group of user signals comprising:
 - a search history for the particular user;
 - a purchase history for the particular user;
 - schedule and calendar data for the particular user;
 - social-network data for the particular user;
 - communications for the particular user; and
 - data sensed via one or more sensors of one or more client computing devices associated with the particular user.
3. The system of claim 1, wherein in determining the user needs of the disparate users, the system is further configured to determine user preferences for a particular user based on the collected user signals.

4. The system of claim 3, wherein in determining matches between the user needs and the packet elements, the system is configured to rank the packet elements based on a level of relatedness between a given packet element and an identified user need and the user preferences.
5. The system of claim 1, wherein the threshold associated with the packet is one of:
 - a minimum quantity of packet elements; or
 - a combination of all or a predetermined portion of particular packet elements.
6. The system of claim 5, wherein in determining that the threshold associated with the packet is satisfied, the system is configured to:
 - identify, from the collected packet data, the threshold associated with the packet;
 - and
 - determine whether identified matches between the user needs and the packet elements meet the threshold.
7. The system of claim 1, wherein in facilitating the transactions of the matched packet elements, the system is configured to:
 - transmit payment to a product or service provider on behalf of a particular user of the virtual group; or
 - secure a reservation for the product or service on behalf of an individual user of the virtual group.
8. A computer-implemented method for preserving user data security when sharing a packet amongst disparate users, comprising:
 - collecting user signals associated with a plurality of disparate users;
 - based on the collected user signals, inferring user needs and user preferences and identifying explicitly-defined user needs and user preferences;
 - collecting packet data associated with offered packets, wherein the offered packets are comprised of a divisible plurality of packet elements;
 - mapping the user needs to the packet elements;
 - determining matches between the user needs and the packet elements;
 - upon determining that a threshold associated with a packet is satisfied, generating a virtual group of disparate users whose user needs match at least a portion of the packet elements of the packet;
 - transmitting a notification to each of the disparate users of the virtual group, wherein the notification informs a given user of the match between one or more of the user needs for the given user and one or more packet elements;

receiving responses to the notification; and
responsive to determining that the received responses meet the threshold associated with the packet, facilitating transactions of the matched packet elements.

9. The method of claim 8, wherein inferring the user needs and the user preferences comprises inferring the user needs and the user preferences based at least in part on at least one from a group of user signals comprising:

- a user search history;
- a user purchase history;
- user schedule and calendar data;
- user social-network data;
- user communications; and
- data sensed via one or more sensors of one or more client computing devices associated with the given user.

10. The method of claim 8, wherein determining that the threshold associated with the packet is satisfied comprises:

identifying, from the collected packet data, the threshold associated with the packet, wherein the threshold is one of:

- a minimum quantity of packet elements; or
- a combination of all or a predetermined portion of particular packet elements;

and

determining whether identified matches between the user needs and the packet elements meet the threshold.

11. The method of claim 8, wherein transmitting the notification to each of the disparate users of the virtual group comprises providing a selectable option, which when selected by the given user, transmits a response that opts the given user into a shared transaction of an associated packet.

12. The method of claim 8, wherein facilitating the transactions of the matched packet elements comprises at least one of:

transmitting payment to a product or service provider on behalf of an individual user of the virtual group; and

securing a reservation for the product or service on behalf of the individual user of the virtual group.

13. A computer readable storage device including computer readable instructions, which when executed by a processing unit is configured to:

collect user signals associated with a plurality of disparate users;
determine user needs and user preferences based on the collected user signals for the disparate users;
collect packet data associated with offered packets comprised of a divisible plurality of packet elements;
map the user needs of the disparate users to the packet elements;
determine matches between the user needs and the packet elements;
upon determining that a threshold associated with a packet is satisfied, generate a virtual group of disparate users whose user needs match at least a portion of the packet elements of the packet;
transmit a notification to each of the disparate users of the virtual group, wherein the notification informs a given user of the match between one or more of the user needs of the given user and one or more packet elements;
receive responses to the notification; and
responsive to determining that the received responses meet the threshold associated with the packet, facilitate the transactions of the matched packet elements.

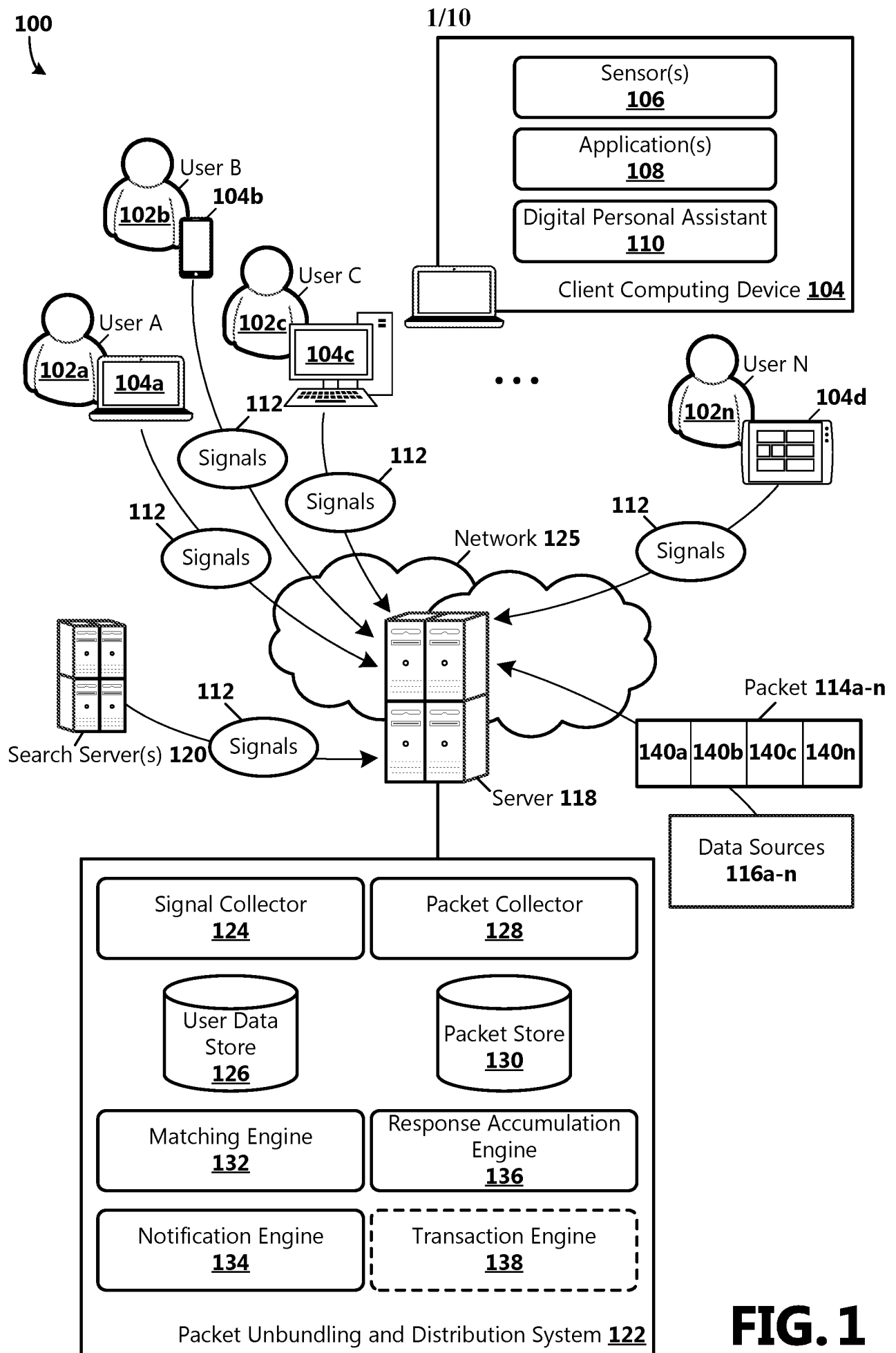
14. The computer readable storage device of claim 13, wherein in determining the user needs and the user preferences for the disparate users, the computer readable storage device is further configured to:

identify an explicitly-defined entity in a collected user signal as a user need; and
infer a user need for a user based at least in part on the collected user signals.

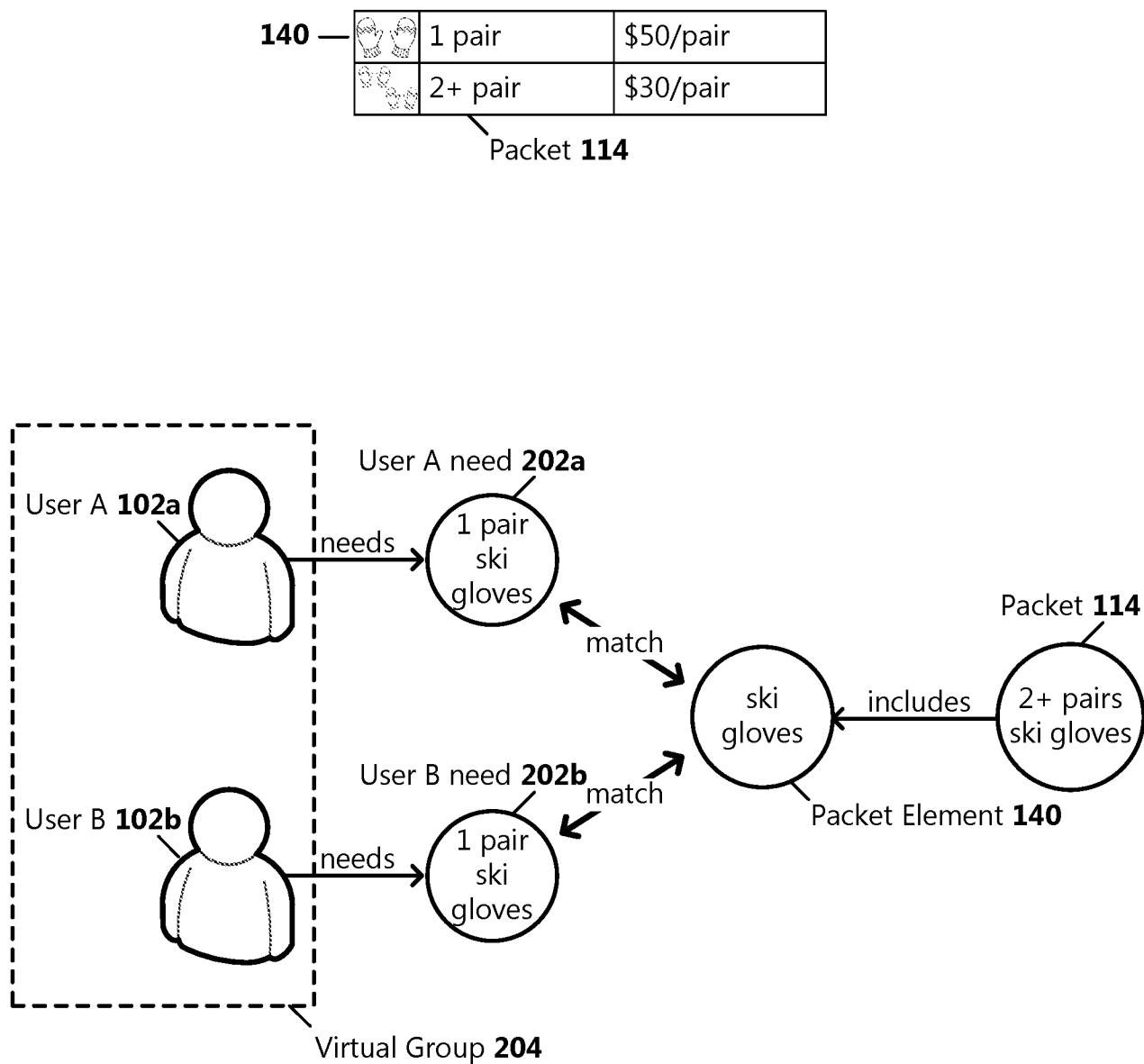
15. The computer readable storage device of claim 14, wherein the collected user signals comprises at least one of:

search history;
purchase history;
schedule and calendar data;
social-network data;
communications; and

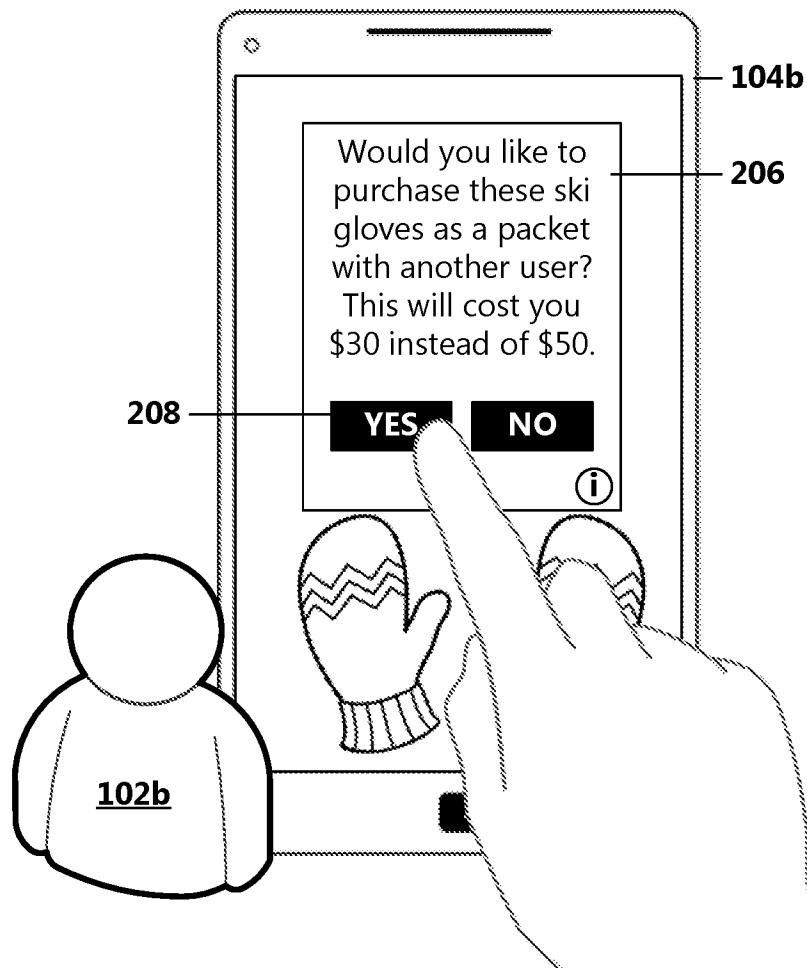
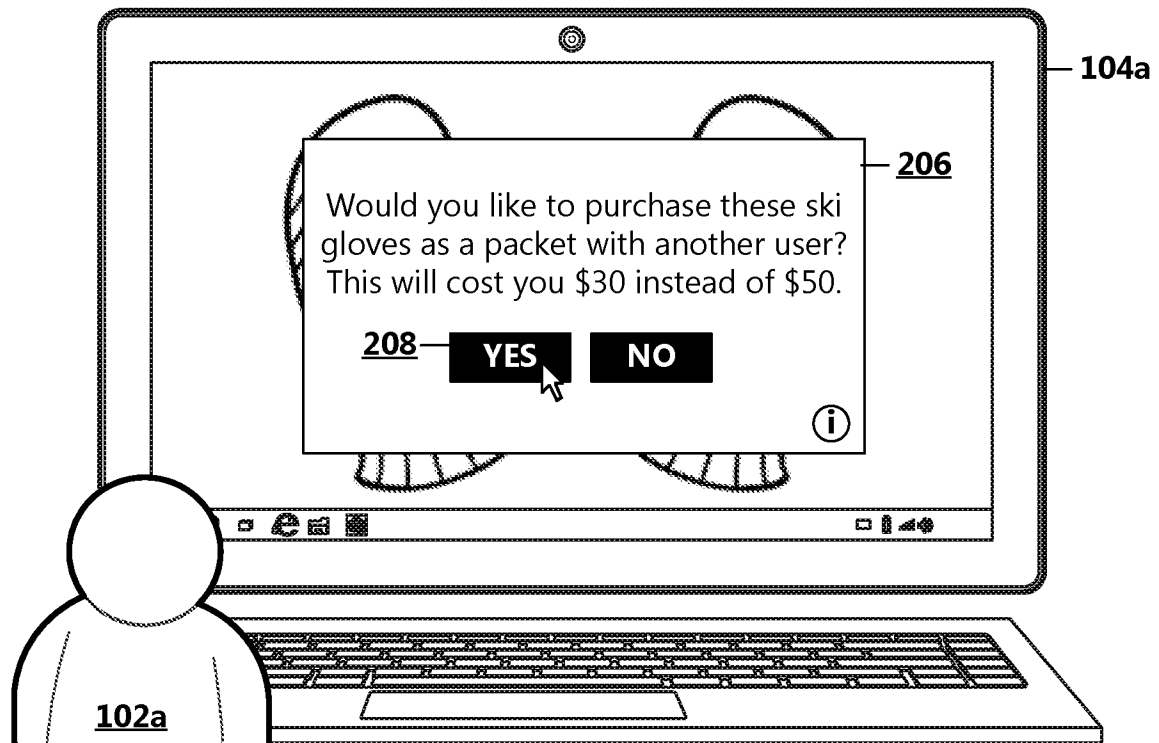
data sensed via one or more sensors of one or more client computing devices associated with the disparate users.

**FIG. 1**

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**FIG. 2A**

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**FIG. 2B**

140a		Flight	\$500 roundtrip
140b		Hotel	\$200/night
140c		Car Rental	\$50/day
140d		Event Tickets	\$50/each
114		Packet	Save 20% on flight, hotel, car, and event tickets when you purchase all 4

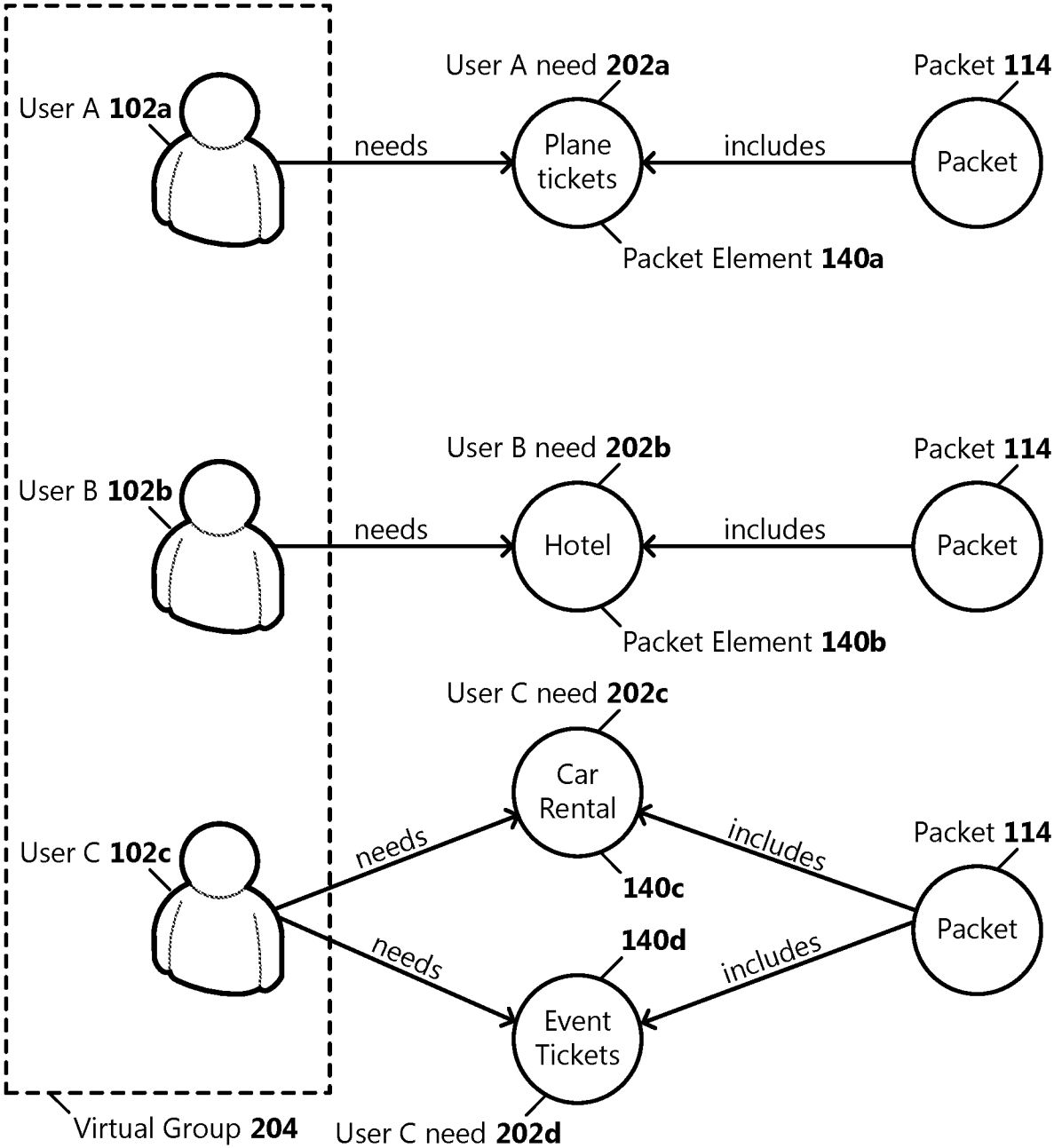
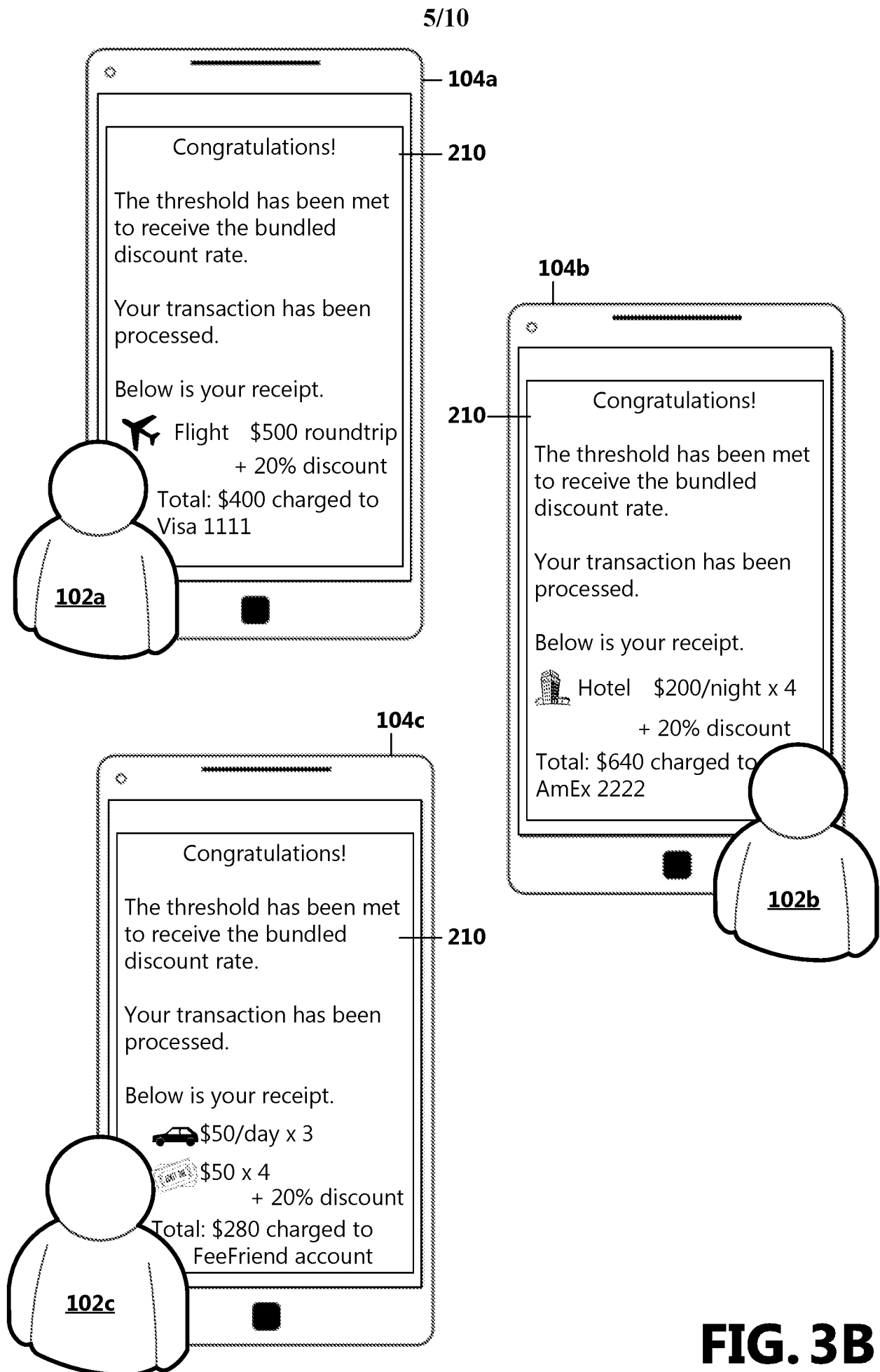
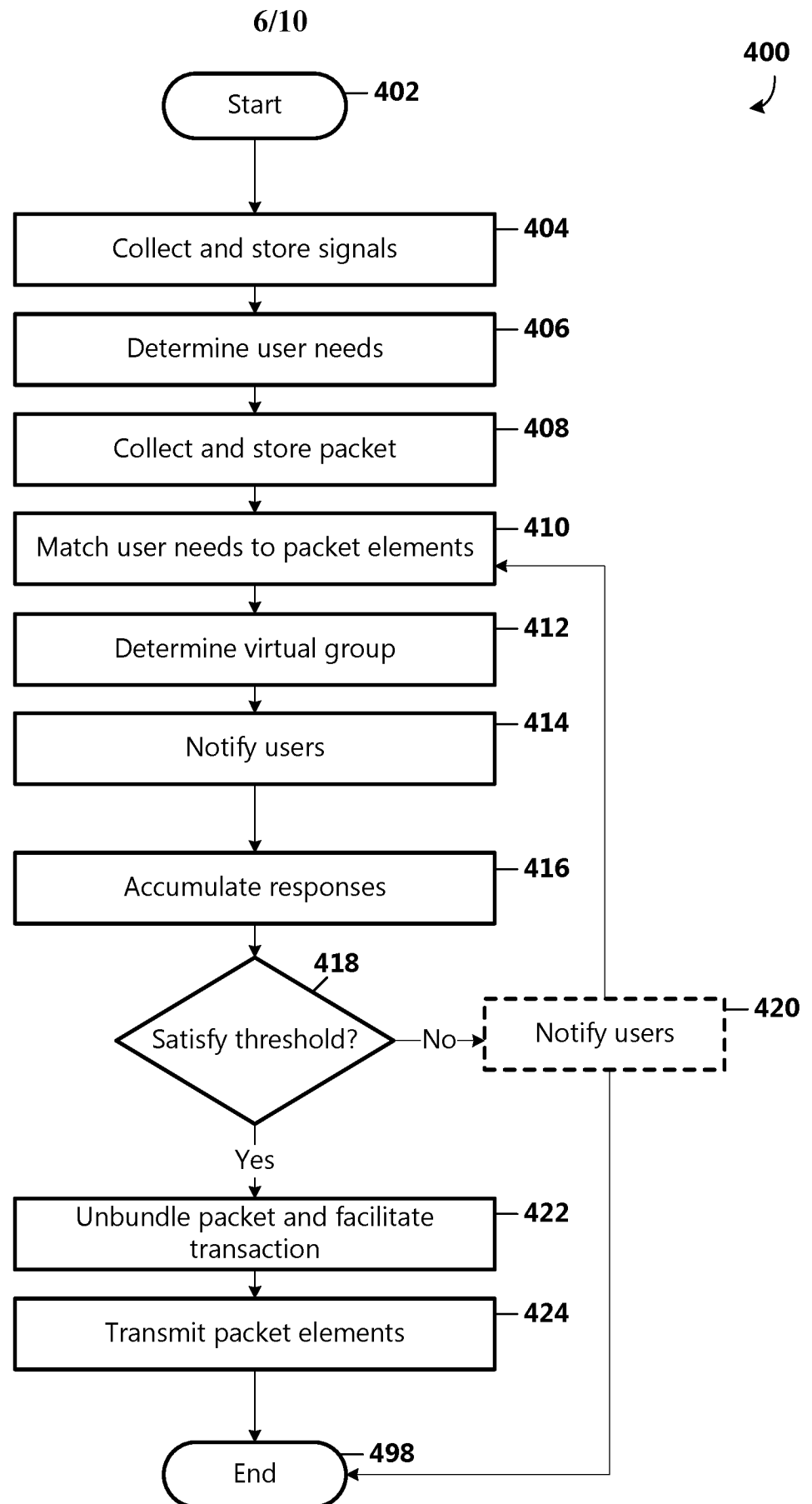


FIG. 3A

**FIG. 3B**

**FIG. 4**

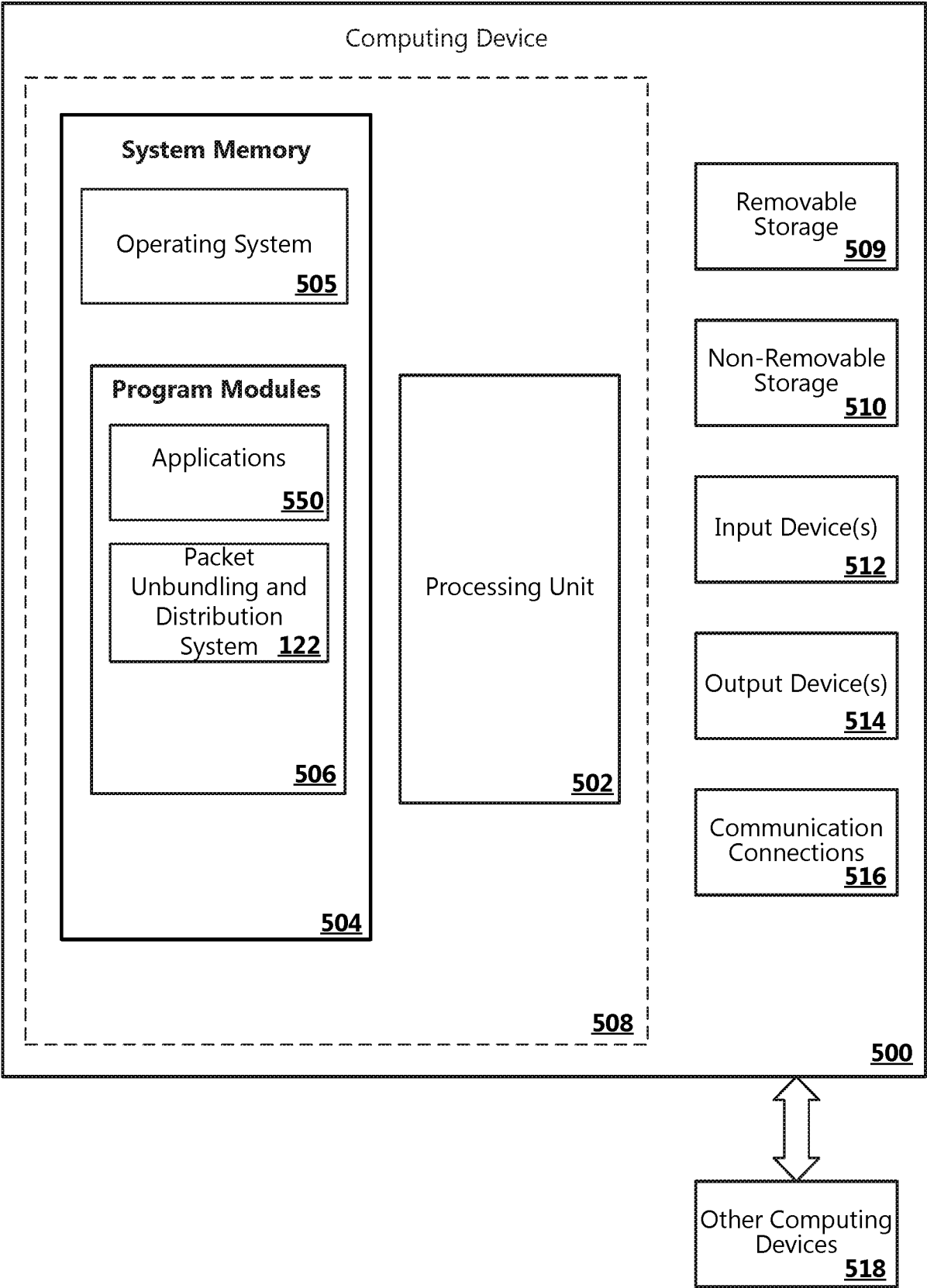
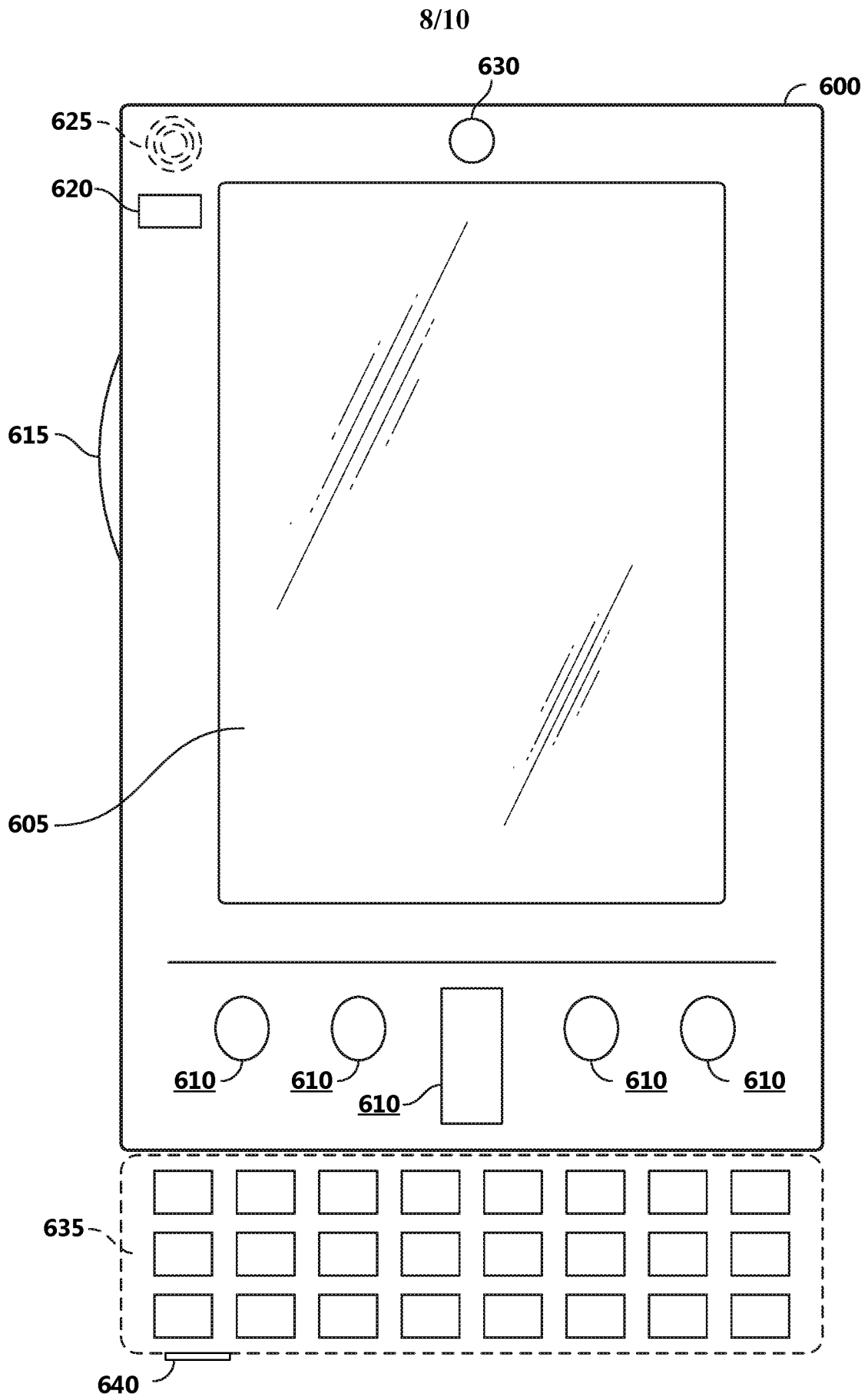
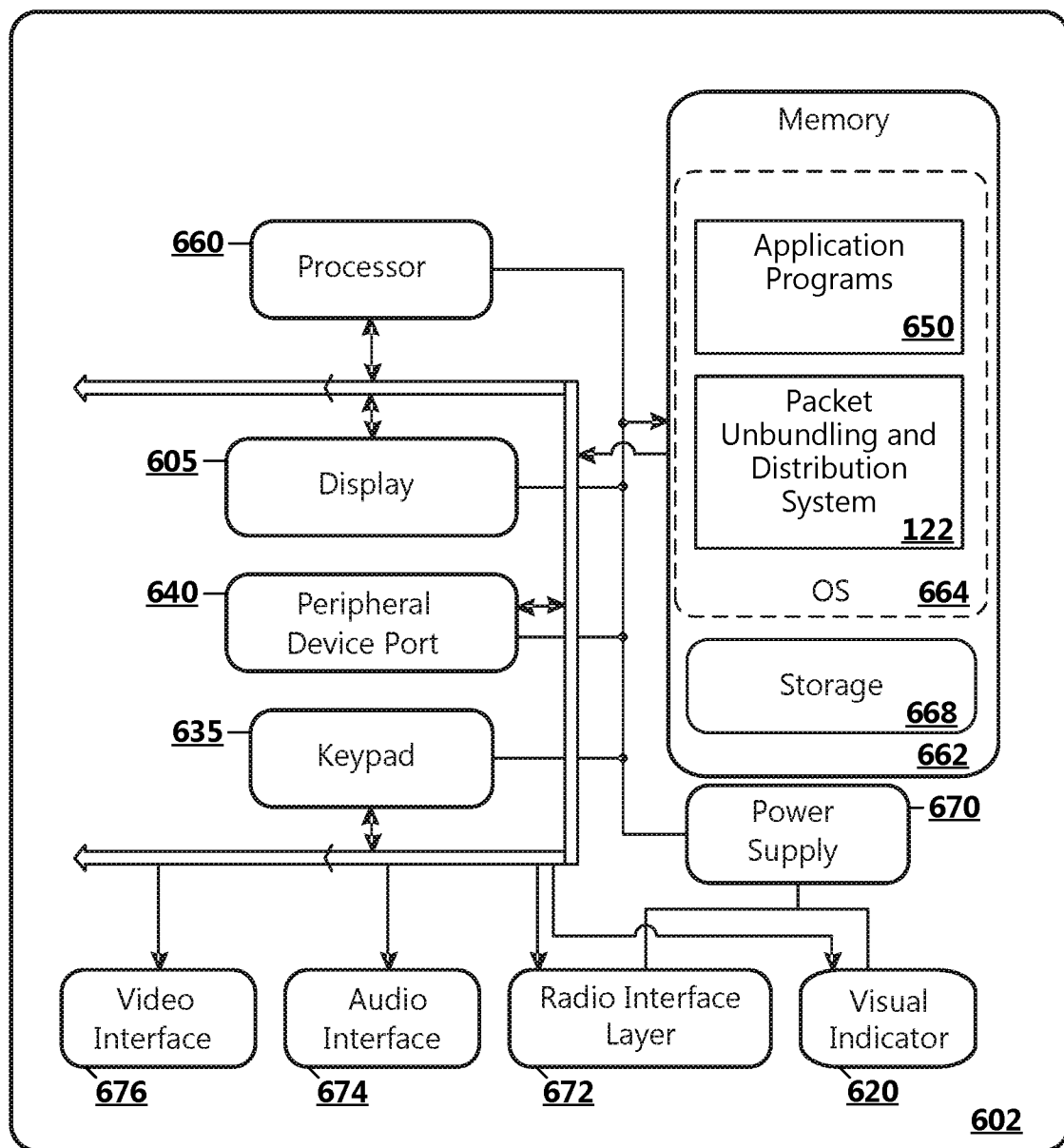


FIG. 5

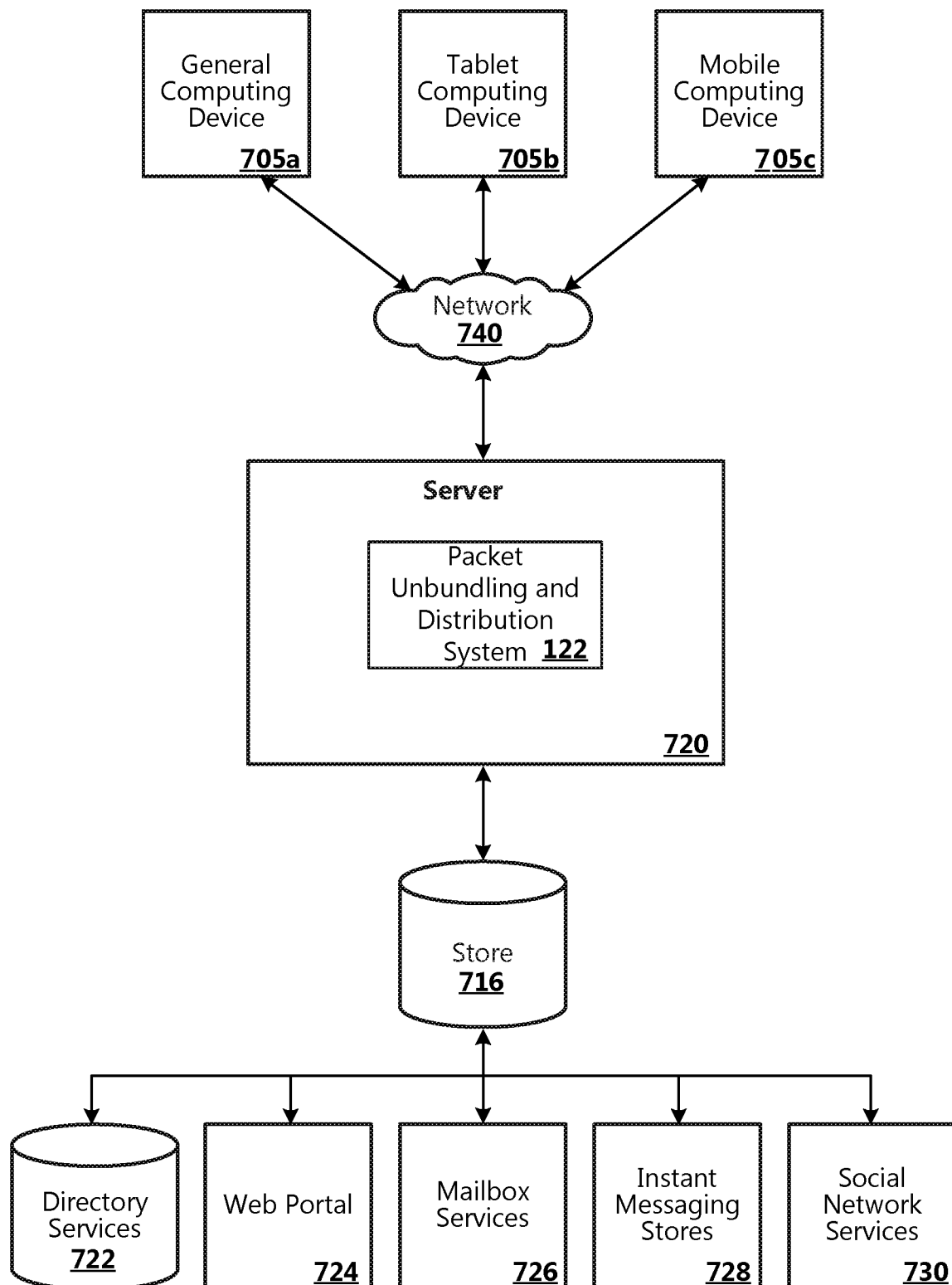


MOBILE COMPUTING DEVICE

FIG. 6A

**FIG. 6B**

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**FIG. 7**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/038659

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L29/08 H04W4/08 H04W4/38 G06F17/30 G06N5/04
G06N5/02 G06Q30/02

ADD.

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)

H04L H04W G06F G06N G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8 554 694 B1 (WARD CHARLES L [US] ET AL) 8 October 2013 (2013-10-08)	1-3,5-15
Y	column 2, line 24 - line 47 column 3, line 20 - column 4, line 7 column 7, line 59 - column 8, line 17 column 8, line 44 - column 9, line 48 column 11, line 43 - column 12, line 20; figures 3,22 column 13, line 20 - column 14, line 5 column 14, line 26 - column 15, line 6 column 18, line 19 - line 39 column 19, line 41 - line 61 column 23, line 8 - line 36 column 25, line 51 - column 26, line 27; figure 11 column 32, line 42 - column 33, line 5 column 39, line 44 - line 65 column 40, line 53 - column 42, line 33 column 44, line 24 - line 49 -/--	4

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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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

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"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

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Date of the actual completion of the international search

11 September 2018

Date of mailing of the international search report

19/09/2018

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Fax: (+31-70) 340-3016

Authorized officer

Losseau, Dominique

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/038659

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	column 47, line 24 - column 49, line 49 column 50, line 13 - line 48 column 51, line 9 - column 53, line 6; figure 26 column 56, line 36 - column 57, last line column 60, line 18 - line 56 column 6, line 11 - line 21 -----	
Y	US 2015/120386 A1 (SHERMAN CORINNE ELIZABETH [US] ET AL) 30 April 2015 (2015-04-30)	4
A	paragraph [0014] - paragraph [0015] paragraph [0023] - paragraph [0025] paragraphs [0030], [0032], [0034] paragraph [0041] - paragraph [0047] paragraph [0055] - paragraph [0067]; figures 5-7 -----	1-3,5-15
Y	US 2016/189253 A1 (ZAMER KAMAL [US]) 30 June 2016 (2016-06-30)	4
A	paragraph [0016] paragraph [0051] - paragraph [0069]; figure 2 paragraph [0071] - paragraph [0084]; figures 4,5 -----	1-3,5-15
A	US 9 172 738 B1 (DACOSTA FRANCIS [US]) 27 October 2015 (2015-10-27) column 2, line 46 - column 3, line 11 column 14, line 48 - column 15, line 38; figure 4 column 18, line 11 - line 20 column 22, line 1 - last line column 26, line 28 - column 27, line 40 column 29, line 1 - page 30, line 17; figure 12 column 31, line 47 - column 33, line 20 column 34, line 30 - column 36, line 14; figure 14 column 39, line 44 - column 41, line 63 column 44, line 11 - column 45, line 7 column 51, line 25 - column 52, line 39; example 44 column 59, line 48 - column 60, line 41 column 61, line 58 - column 64, line 3 column 65, line 54 - column 66, line 60 column 69, line 1 - line 23 -----	1-15
A	US 2005/010496 A1 (HOFFMAN GEORGE HARRY [US] ET AL) 13 January 2005 (2005-01-13) the whole document paragraph [0043] - paragraph [0056]; figure 2 -----	1-15
	-/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/038659

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013/151381 A1 (KLEIN GREGORY W [US]) 13 June 2013 (2013-06-13) paragraph [0046] - paragraph [0050]; figures 2,3 paragraph [0032] - paragraph [0040] paragraph [0007] - paragraph [0008] paragraph [0021] - paragraph [0024] -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/038659

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