

DEVICE, SYSTEM AND METHOD FOR ALLOCATING RESOURCES TO SERVICE REQUESTS

TECHNICAL FIELD

[0001] Various aspects of this disclosure relate to devices, systems and methods for allocating resources to service requests. The resources may include on-demand resources such as transport and delivery resources.

BACKGROUND

[0002] Currently, allocating resources to on-demand services, such as food delivery services, is based on various factors.

[0003] One particular factor is resource availability, for example, transport resource in the form of vehicle/driver availability. Other factors to consider include estimated travel times to the merchant (source) premises, and time to travel to the end-customer. Accurate predictions of time parameters such as travel time, arrival time, preparation time for a food order, are therefore crucial in meeting service standards.

[0004] In a prediction model, different predictions based on one or more software-based algorithms may be used to estimate drivers' arrival to merchants, and also merchants' food preparation time. In an example, a suitable driver may be allocated by the software-based algorithm to match the order, thereby maximizing efficiency.

[0005] However, real life implementation will often differ from predicted models, leading to delays. Delays in deliveries may happen for several reasons, two of which may be related to an allocated vehicle driver's difficulty in finding the merchant, which leads to longer traveling

time than predicted, and also the time that may be spent waiting for an order to be ready due to preparation time delay.

[0006] Delays may be amplified or cumulated when dealing with batched orders, causing end consumer experience to be less than desirable and dissatisfaction with food delivery services. Such negative impact on consumers may reduce the cost advantages associated with batching orders.

[0007] In addition, inefficiencies may also negatively impact drivers' experience in terms of increased effort in certain jobs, and also an increase in cost incurred (parking fees/opportunity costs).

[0008] The aforementioned factors may lead to an increase in reluctance of delivery drivers doing deliveries, which may lead to relatively higher incentives to do the delivery work, and impacting the ability to provide consumers with more affordable delivery options.

[0009] Accordingly, the disclosure seeks to address the aforementioned needs at least in part.

SUMMARY

[0010] The disclosure seeks to provide a system, server apparatus and method for allocating resources to service requests. The disclosure enables allocation of resources to be "switched" or changed according to real-world changes, when such allocations depart from the predictions or estimations. The disclosure provides a technical solution in the form of two-tier allocation process comprising a tentative allocation and a final allocation mechanism. The tentative or soft allocation of resources will enable tentative allocations to be changed with minimal disruption to the resources' itinerary whenever new and updated data are received.

[0011] In some aspects, the resources, in the form of on-demand vehicles, may be tentatively allocated to the service requests (orders), and the final allocation of the resources may be determined based on a first-come, first-served basis when the vehicles are on-site or in proximity of the merchant.

[0012] Such an arrangement advantageously reduces the wait time of delivery personnel (resources) and potentially increases the trips completed over a period of time.

[0013] One aspect of the invention relates to a device (for example a communications server apparatus) for allocating resources to service requests in a shared economy on-demand service or asset provision. Another aspect of the invention relates to a method, performed in a communications server for allocating resources to service requests in a shared economy on-demand service or asset provision. Another aspect of the invention relates to a computer program product comprising instructions therefor. Another aspect of the invention relates to a computer program comprising instructions therefor. Another aspect of the invention relates to a non-transitory storage medium storing instructions therefor. Another aspect of the invention relates to a communications system for allocating resources to service requests in a shared economy on-demand service or asset provision.

[0014] According to an aspect of the disclosure there is provided a server apparatus for allocating resources to service requests of a shared economy on-demand service, the server apparatus comprising a processor and a memory, the processor is configured to execute instructions stored in the memory to receive a first service request, the first service request comprising a first data indicative of a good or service of the first service request; tentatively allocate a first available resource to the first service request; receive a second service request, the second service request comprising a second data indicative of a good or service of the second service request; tentatively allocate a second available resource to the second service

request; obtain or estimate a first availability parameter of the first available resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and determine a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

[0015] In some embodiments, the processor is configured to determine the final allocation of the first available resource and the second available resource based on a first-come, first-served basis to minimize a delay parameter, wherein at least one of the first data and the second data comprises a location data of a provider of the respective good or service.

[0016] In some embodiments, if the first ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is earlier than the second availability parameter or if the second availability parameter is not obtained, the final allocation of the first available resource is determined to be the first service request.

[0017] In some embodiments, if the first ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the first available resource is determined to be the second service request.

[0018] In some embodiments, if the second ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is earlier than the second availability parameter

or if the second availability parameter is not obtained, the final allocation of the second available resource is determined to be the first service request.

[0019] In some embodiments, if the second ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the second available resource is determined to be the second service request.

[0020] In some embodiments, if the first availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is earlier than the second ready parameter or if the second ready parameter is not obtained, the final allocation of the first available resource is determined to be the first service request.

[0021] In some embodiments, if the first availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the first available resource is determined to be the second service request.

[0022] In some embodiments, if the second availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is earlier than the second ready parameter or if the second ready parameter is not obtained, the final allocation of the second available resource is determined to be the first service request.

[0023] In some embodiments, if the second availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready

parameter, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the second available resource is determined to be the second service request.

[0024] In some embodiments, after the first available resource and/or the second available resource is tentatively allocated to the first service request and/or the second service request, a masked first data and/or a masked second data is sent to the first available resource and/or the second available resource, wherein the masked first data and the masked second data is a subset of the first data and the second data.

[0025] In some embodiments, the first data and the second data is sent to the first available resource and the second available resource respectively after the final allocation of the first available resource and the second available resource.

[0026] In some embodiments, the processor is configured to tentatively allocate the first available resource and the second available resource based on a system batch of multiple service requests including the first service request and second service request.

[0027] According to another aspect of the disclosure there is provided a system for allocating resources to service requests of a shared economy on-demand service comprising the described server apparatus, wherein the system forms part of an e-commerce platform.

[0028] In some embodiments, the first service request and the second service request are requests for food or beverage products from at least one merchant location, and the first available resource and the second available resource are first and second on-demand vehicles for allocation to pick-up the food or beverage products from the at least one merchant location for delivery to respective destinations.

[0029] In some embodiments, the processing unit comprises an input module configured to receive the first service request and the second service request; a tentative allocation module configured to tentatively allocate the first available resource to the first service request and the second available resource to the second service request; a broadcast module configured to receive the tentatively-allocated data from the tentative allocation module and broadcast the tentatively-allocated data to the first available resource and the second available resource for their acceptance; a monitoring module configured to obtain or estimate the first availability parameter of the first available resource, the first ready parameter of the first service request, the second availability parameter of the second available resource, and the second ready parameter of the second service request; and a final allocation module configured to determine the final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

[0030] In some embodiments, the first availability parameter and the second availability parameter are respective arrival times of the first and second on-demand vehicles at the merchant location.

[0031] According to another aspect of the disclosure there is provided a computer-implemented method for allocating resources to service requests of a shared economy, the method comprises the steps of: receiving a first service request, the first service request comprising a first data indicative of a good or service of the first service request; tentatively allocating a first available resource to the first service request; receiving a second service request, the second service request comprising a second data indicative of a good or service of the second service request; tentatively allocating a second available resource to the second service request; obtaining or estimating a first availability parameter of the first available

resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and determining a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

[0032] In some embodiments, the computer-implemented method further comprises a step of determining the final allocation of the first available resource and the second available resource based on a first-come, first-served basis.

[0033] According to another aspect of the disclosure there is provided a non-transitory computer-readable medium storing computer executable code comprising instructions for allocating resources to service requests of a shared economy according to the method as described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] The disclosure will be better understood with reference to the detailed description when considered in conjunction with the non-limiting examples and the accompanying drawings, in which:

- FIG. 1 is a schematic block diagram of a server apparatus for allocating resources to service requests;
- FIG. 2 is a schematic block diagram comprising the server apparatus of FIG. 1, implemented in an on-demand delivery system comprising at least one source and a plurality of resources in the form of delivery vehicles and drivers;
- FIG. 3 is a schematic block diagram of a processor of the server apparatus; and

- FIG. 4 is a flow chart of a process for allocating resources to service requests.

DETAILED DESCRIPTION

[0035] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the disclosure may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosure. Other embodiments may be utilized and structural, and logical changes may be made without departing from the scope of the disclosure. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0036] Embodiments described in the context of one of the enclosure systems, devices, or methods are analogously valid for the other systems, devices, or methods. Similarly, embodiments described in the context of a system are analogously valid for a device or a method, and vice-versa.

[0037] Features that are described in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments. Features that are described in the context of an embodiment may correspondingly be applicable to the other embodiments, even if not explicitly described in these other embodiments. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments.

[0038] In the context of various embodiments, the articles “a”, “an” and “the” as used with regard to a feature or element include a reference to one or more of the features or elements. Furthermore, as used in the present disclosure and the appended claims, the term “by” may also mean “from,” depending on the context. Furthermore, as used in the present disclosure and the

appended claims, the term "if" may also mean "when" or "upon," depending on the context. Furthermore, as used in the present disclosure and the appended claims, the words "and/or" may refer to and encompass any and all possible combinations of one or more of the associated listed items.

[0039] As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0040] As used herein, the term “data” may be understood to include information in any suitable analogue or digital form, for example, provided as a file, a portion of a file, a set of files, a signal or stream, a portion of a signal or stream, a set of signals or streams, waveforms, and the like. The term data, however, is not limited to the aforementioned examples and may take various forms and represent any information as understood in the art.

[0041] As used herein, the term “allocating resources to service requests” broadly includes various mechanisms, methods of matching, linking, and/or assigning resources to service requests. In some non-limiting examples, a "service request" may be associated with a product or service offered by one or more merchants. Each merchant may also have more than one offering (e.g., multiple products and/or services), and the techniques or algorithm disclosed herein may evaluate each product or service separately. In some example, a product may include food and/or beverages.

[0042] As used herein, the term “service request” includes electronic requests send to and received by/from an e-commerce platform, such as a food delivery e-commerce platform.

[0043] As used herein, the term “availability parameter” of a resource broadly refers to any parameters such as time or status that may be used as an indication of a resource availability. For example, an arrival time of a resource at a provider of service or merchant may indicate its

availability. An availability parameter may also be a prediction or estimation based on historical data.

[0044] As used herein, the term “ready parameter” of a service request broadly refers to any parameters such as time or status that may be used as an indication that a product or service associated with the service request is ready to be dispatched or sent to an end customer. For example, a provider of service or merchant may send a notification to a server indicating that a food product, other perishables, or a non-perishable good is ready to be dispatched or sent to an end customer. A ready parameter may also be a prediction or estimation based on historical data.

[0045] As used herein, the term “first” and “second” are used to distinguish one element/feature from another, and, unless otherwise stated, may not denote order, priority or sequence.

[0046] As used herein, the term “module” refers to, forms part of, or includes an Application Specific Integrated Circuit (ASIC); an electronic circuit; a combinational logic circuit; a Field Programmable Gate Array (FPGA); a processor (shared, dedicated, or group) that executes code; other suitable hardware components that provide the described functionality; or a combination of some or all of the above, such as in a system-on-chip. The term module may include memory (shared, dedicated, or group) that stores code executed by the processor. A single module or a combination of modules may be regarded as a device. A processor may include one or more modules. For example, multiple modules described in this disclosure may form a processor.

[0047] As used herein, the term “associate”, “associated”, and “associating” indicate a defined relationship (or cross-reference) between two items.

[0048] As used herein, “memory” may be understood as a non-transitory computer-readable medium in which data or information can be stored for retrieval. References to “memory” included herein may thus be understood as referring to volatile or non-volatile memory, including random access memory (“RAM”), read-only memory (“ROM”), flash memory, solid-state storage, magnetic tape, hard disk drive, optical drive, etc., or any combination thereof. Furthermore, it is appreciated that registers, shift registers, processor registers, data buffers, etc., are also embraced herein by the term memory. It is appreciated that a single component referred to as “memory” or “a memory” may be composed of more than one different type of memory, and thus may refer to a collective component including one or more types of memory. It is readily understood that any single memory component may be separated into multiple collectively equivalent memory components, and vice versa. Furthermore, while memory may be depicted as separate from one or more other components (such as in the drawings), it is understood that memory may be integrated within another component, such as on a common integrated chip.

[0049] According to an aspect of the disclosure and with reference to FIG. 1, there is provided a server apparatus for allocating resources to service requests. The service requests may be of a shared economy on-demand service or asset provision. Examples of such on-demand service include on-demand taxi service, food delivery service, and/or on demand logistic service where resources may be shared.

[0050] The server apparatus may comprise a processor and a memory, the processor is capable of being configured to execute instructions stored in the memory to receive a first service request, the first service request comprising data indicative of a first service or asset requested. In the embodiment illustrated in FIG. 1, the server apparatus may be a communications server apparatus. The communications server apparatus may be in the form

of a server computer 100, the server computer 100 may be a single server as illustrated schematically in FIG. 1, or have the functionality performed distributed across multiple server components.

[0051] In some embodiments, the server computer 100 includes a communication interface 102 (e.g. configured to receive data, i.e. service requests). The communication interface 102 may include a transmitter module and/or a receiver module allowing the server apparatus 100 to communicate over a communications network. The communication interface 102 may include one or more user-interfaces configured to provide users for user control and may include, for example, one or more computing peripheral devices such as display monitors, computer keyboards and the like.

[0052] The server computer 100 may further include a processor in the form of processing unit 104 and a memory 106. The memory 106 may be used by the processing unit 104 to store, for example, data to be processed, such as the service requests.

[0053] The processing unit 104 may configured to receive a first service request, the first service request comprising a first data indicative of a good or service of the first service request; tentatively allocate a first available resource to the first service request; receive a second service request, the second service request comprising a second data indicative of a good or service of the second service request; tentatively allocate a second available resource to the second service request; obtain or estimate a first availability parameter of the first available resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and determine a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

[0054] The processor may be configured to determine the final allocation of the first available resource and the second available resource based on a first-come, first-served basis to minimize a delay parameter. The delay parameter may be associated with waiting times of the first and/or second available resources, and a waiting time of the end-user or customer making the service request.

[0055] It is contemplated the configured tentative allocation and the final allocation provide for a flexibility for the server apparatus to react to changes in real-world situations and allow for dynamic allocation or optimization in order to achieve efficiency.

[0056] FIG. 2 shows a system 200 comprising the server apparatus 100 of FIG. 1. The system 200 may be at least part of an on-demand delivery system for the purposes of delivering perishable or non-perishable goods. The perishables may include food and/or beverages. The non-perishable goods may include household items or furniture. The system 200 may comprise at least one merchant source 201 and a plurality of available resources comprising a first available resource and a second available resource. The first and second available resources may be delivery vehicles 208, 212 operated by drivers. The system 200 may be configured to allocate each delivery vehicle to a first and second service request (also referred to as orders) using the server apparatus 100 to provide tentative and final allocations. The merchant source 201, the resources 208, 212, and the server apparatus 100 may be connected via a network 202. The network 202 may be an internet or intranet network.

[0057] In one operating scenario, a user uses a computer device 204a, such as a mobile smart phone, a laptop device, a desktop computer, etc. to send a service request in the form of placing a first order 206 for a food or beverage item from merchant source 201. The service request may be termed “first service request” for clarity and for distinguishing other service

requests sent by other computer device. The first service request may comprise a first data indicative of a good or service of the first order 206.

[0058] In some embodiments, the service request may be encoded using a communications protocol. In some embodiments, first data comprises at least two types of data content: a user level information content, indicative of the user, and a user request level information, indicative of the service request being made. In some embodiments, the user level information content may include at least one of a user identifier (ID), a user type, for example, a new user or a premium user. The user type may be used to differentiate users by level of importance or priority. In some embodiments, the user request level information content may include at least one of a product or service, a start location, a destination, a merchant information, a service type, a time of pick up, a fare/fee, a promotion, a payment type, or a booking type, for example immediate booking or advance booking. In some embodiments, other deeper level information may be mined from data stored in one or more historical databases for inference of behaviour of one or more users based on the historical databases. An example of an inference of a user may be used to determine if a user is “a promotion-driven user”. It is appreciable the computer device 204a may include input-output module(s) to receive the user input, and may include one or more user interfaces to receive the first order 206. The first order 206 may then be sent as a data packet to the server computer 100. In some embodiments, the first order 206 may be an encrypted data packet.

[0059] Once the first order 206 is received by the server computer 100, the server computer 100 operates to allocate, tentatively, a first available resource in the form of a first vehicle 208 with an assigned driver to the first order 206. The first vehicle 208 may be an automobile, a personal mobility device, a bicycle, a motorcycle, a boat, a plane or any other vehicles capable of picking up a ready order from the merchant 201 for delivery to the user of device 204a. The

tentative allocation of the first available resource to the first order 206 may be implemented as an intermediate data value within a database of the processing unit 104 of the server computer 100. The intermediate data value may be flagged as an “intermediate state” corresponding to the tentative allocation, the intermediate state capable of being updated or change to a “final state” corresponding to the final allocation.

[0060] The server computer 100 may also receive a second service request in the form of a second order 210 from another computer device 204b, for the same merchant 201. The second service request may comprise a second data indicative of the good or service of the second order 210. In some embodiments, the second order 210 may be tentatively allocated to a second vehicle 212. The second data may be encoded using a communications protocol and may comprise at least two types of data content similar to that as described for the first data.

[0061] After the tentative allocation is assigned to the first vehicle 208 and the second vehicle 212, data signals associated with the tentative allocation may be sent to the respective vehicles and/or drivers 208, 212. The vehicles 208, 212 may then travel to the merchant 201.

[0062] In some embodiments, after the first vehicle 208 is tentatively allocated to the first order 206, the data sent to the first vehicle 208 relating to the first order 206 is a filtered or masked data. For example, the data may not include the order details and destination. The filtered or masked data may merely include the merchant 201 location for pick-up, and an approximate earning for the first vehicle 208. In other words, the masked data may be a subset of the first data and the second data.

[0063] In some embodiments, after the second vehicle 212 is tentatively allocated to the second order 210, the data sent to the second vehicle 212 relating to the second order 210 is a filtered or masked data. For example, the data may not include the order details and destination.

The filtered or masked data may include the merchant location for pick-up, and an approximate earning for the second vehicle 212.

[0064] The server apparatus 100 is configured to monitor the resource availability parameter, i.e. an arrival time of the first vehicle 208 and the second vehicle 212 at the merchant. The monitoring of the arrival times may be based on location signals sent periodically from at least one of the first vehicle 208 and the second vehicle 212. It is appreciable that the location signals may be sent from one or more computer devices, such as mobile smart phone devices, located within the first vehicle 208 and the second vehicle 212. In some embodiments, location-based sensors may be installed on the first vehicle 208 and/or the second vehicle 212, such location-based sensors may be configured to periodically send location signals to the server apparatus 100. A non-limiting example of a location-based sensor is a global positioning system (GPS) sensor.

[0065] In some embodiments, the arrival time of at least one of the first vehicle 208 and the second vehicle 212 may be estimated based on an artificial intelligence (AI) algorithm trained using historical records of the route taken by first vehicle 208 and/or second vehicle 212 in various traffic and environmental conditions. Such AI algorithm may be configured to receive an input dataset comprising information such as a route taken by the first or second vehicle to travel to the merchant location, a traffic condition, and a type of vehicle, to predict or estimate the arrival time.

[0066] Concurrently, the server apparatus 100 also operates to monitor the ready states or statuses of the first order 206 and the second order 210. The monitoring of the ready statuses may be based on a ready data signal sent by the merchant 201 to the server apparatus 100. In some embodiments, the system 200 may operate to predict the ready statuses of the first order 206 and the second order 210 based on an AI algorithm or other stochastic based algorithms.

[0067] Based on the arrival times of the first vehicle 208, the second vehicle 212, and the ready statuses of the first order 206 and the second order 210, the tentative or soft allocation of the first vehicle 208 and the second vehicle 212 may be confirmed.

[0068] In one embodiment, at least one of the first vehicle 208 and the second vehicle 212 is determined to have arrived at the merchant 201, the server apparatus 100 monitors for the ready status (ready parameter) of the first order 206 and the second order 210 and the final allocation of the first order 206 and the second order 210 is determined according to the following operation logic.

[0069] Logic 1- Where the first availability parameter is known, for example the first vehicle 208 has arrived at the merchant 201, the processing unit 104 is configured to compare the first ready parameter of the first order 206 with the second ready parameter of the second order 210 or check for ready status/state of the second order 210, and if the first ready parameter is earlier than the second ready parameter or the second ready parameter is not obtained, the final allocation of the first vehicle 208 is determined to be the first order 206.

[0070] Logic 2- Where the first availability parameter is known, for example the first vehicle 208 has arrived at the merchant 201, the processing unit 104 is configured to compare the first ready parameter of the first order 206 or check for ready status/state of the first order 206 with the second ready parameter of the second order 210 or check for ready status/state of the second order 210, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the first vehicle 208 is determined to be the second order 210.

[0071] Logic 3- Where the second availability parameter is known, for example the second vehicle 212 has arrived at the merchant 201, the processing unit 104 is configured to compare the first ready parameter of the first order 206 or check for ready parameter of the first order

206 with the second ready parameter of the second order 210 or check for ready parameter of the second order 210, and if the first ready parameter is earlier than the second ready parameter or if the second ready parameter is not obtained, the final allocation of the second vehicle 212 is determined to be the first order 206.

[0072] Logic 4- Where the second availability parameter is known, for example the second vehicle 212 has arrived at the merchant 201, the processing unit 104 is configured to compare the first ready parameter of the first order 206 or check for ready status/state of the first order 206 with the second ready parameter of the second order 210 or check for ready status/state of the second order 210, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the second vehicle 212 is determined to be the second order 210.

[0073] In the various operating scenarios, after final allocation, the full data of the first order 206 or second order 210, including the order details and destination, may then be released to the first vehicle 208 or second vehicle 212.

[0074] It is appreciable that any unallocated available vehicles continue to wait for a next order to be ready. It is appreciable that any ready order not assigned to a vehicle continue to wait for a next available vehicle.

[0075] In another embodiment, when at least one of the first order 206 and the second order 210 is ready, i.e. the server apparatus receives a ready status from the merchant 201 or estimates that a ready parameter of the first order 206 and second order 210, the server apparatus 100 monitors for the availability parameters (e.g. arrival times) of the first vehicle 208 and second vehicle 212, and the final allocation of the first vehicle 208 and the second vehicle 212 is determined according to the following logic.

[0076] Logic 5- Where the first ready parameter is known, the processing unit 104 is configured to compare the first availability parameter of the first vehicle 208 with the second availability parameter of the second vehicle 212, and if the first availability parameter is earlier than the second availability parameter or if the second availability parameter is not obtained, the final allocation of the first vehicle 208 is determined to be the first order 206.

[0077] Logic 6- Where the first ready parameter is known, the processing unit 104 is configured to compare the first availability parameter of the first vehicle 208 with the second availability parameter of the second vehicle 212, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the first vehicle 208 is determined to be the second order 210.

[0078] Logic 7- Where the second ready parameter is known, the processing unit 104 is configured to compare the first availability parameter of the first vehicle 208 with the second availability parameter of the second vehicle 212, and if the first availability parameter is earlier than the second availability parameter or if the second availability parameter is not obtained, the final allocation of the second vehicle 212 is determined to be the first order 206.

[0079] Logic 8- Where the second ready parameter is known, the processing unit 104 is configured to compare the first availability parameter of the first vehicle 208 with the second availability parameter of the second vehicle 212, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the second vehicle 212 is determined to be the second order 210.

[0080] In general, the server apparatus 100 operates to minimize the waiting time of each vehicle 208, 212 to pick up the first order 206 and second order 210, or minimize the waiting time for the first order 206 and the second order 210 to be picked up, and, if necessary, swaps the allocations according to the described operation logic. The order swaps will tend towards a

first-come, first-served allocation of resources to reduce the vehicle wait time spent at the merchant 201 location, which may be determined based on estimation of an arrival time of the vehicle and/or when the vehicle sends a data signal indicating it is on-site at the merchant location.

[0081] The solution may also be understood as implementing a soft allocating status for all orders based on “offline” scheduling, and fine-tuning the offline scheduling using swapping drivers and their orders, if necessary.

[0082] Although the aforementioned examples are described with reference to a single merchant, it is appreciable the disclosure may be applied to a group of merchants within proximity from one another, for example, within a mall or within a predetermined or predefined geographical area. In some embodiments, the geographical area may be predefined or predetermined with reference to a centre location and a distance from the centre location.

[0083] Although the delivery resources have been described as vehicles, it is appreciable that manual labour may be used without vehicles for delivery.

[0084] The server apparatus 100 may be applied to additional vehicles and merchants.

[0085] The allocation of drivers or resources to a service request, such as an order, may be based on various algorithms.

[0086] In one embodiment, the server apparatus 100 is configured to execute a greedy algorithm for the tentative allocation of vehicle to the order. The greedy algorithm searches for a most suitable or best driver/vehicle for every order and tentatively allocates the order to the vehicle.

[0087] In another embodiment, the server apparatus 100 is configured to execute an algorithm to system batch a set of service requests (orders) of similar type (for example orders

originating from the same merchant) within a specific duration. The system then forms an order-vehicle pair in the batch so that the overall cost is minimal.

[0088] In another embodiment, the orders can be received from different verticals that share supply. The service requests or orders may be configurable or configured to aggregate one or more orders received and/or requested, directly or indirectly, from one or more users. This may also be regarded as a “batch allocation” process. The system then forms an order-vehicle pair in the batch so that the system tentatively allocates the order to that driver.

[0089] In an example of a batch allocation process for tentative allocation of available resources to service requests, the server computer 100 may comprise a service aggregator module, the service aggregator module may be configurable or configured to execute the following:

[0090] Aggregate orders (including the first order 206 and the second order 210): collect orders created in a predetermined time period (e.g. last X seconds, minutes, hours, or other time period) originating from a merchant or a group of merchants within the same area and create a batch dataset of orders. The collection of orders may be based on one or more criteria, such as geographical region. In some embodiments, the service aggregator may comprise a service request aggregator to perform the collection of orders. In some embodiments, the service request aggregator may include a service request prioritization module configured to prioritize orders based on user-type. The service request aggregator may be configurable or configured to aggregate one or more orders received (and/or requested), directly or indirectly, from one or more user computing devices 100. In an example embodiment, the service request aggregator may be configurable or configured to receive (and/or request) and aggregate service requests based on one or more criteria, such as by geographical region, time or period of time (e.g., years, months, weeks, days, hours, minutes, seconds, etc.), type of service requested (e.g.,

taxi, private car, public transportation, shuttle, limousine, ride share, delivery, etc.), location (e.g., current location, initial location, origin location, starting location, desired destination, etc.), user-specific criterion (e.g., new user, existing user, VIP user, frequent user, etc.), preferences of service provider (e.g., new service provider, experienced service provider, high rating service provider, user profile, etc.), etc.

[0091] Aggregate service providers (e.g. vehicles)- For each order in the created batch, find nearby available resources, e.g. vehicles, and filter the nearby vehicles based on one or more criteria, for example availability, and update the batch with eligible vehicles for the order; In some embodiments, the service aggregator may comprise a service provider aggregator module. The service provider aggregator module may be configurable or configured to aggregate, directly or indirectly, one or more available resources based on one or more criteria, such as by geographical region, period of time (e.g., years, months, weeks, days, hours, minutes, seconds, etc.), types of services available (e.g., taxi, private car, public transportation, shuttle, limousine, ride share, delivery, etc.), location (e.g., current location, initial location, origin location, starting location, projected/estimated/predicted/expected location, etc.), availability status (e.g., available or not available to provide services, will be available or will not be available to provide services, predicted or expected availability or unavailability to provide services, etc.), service provider- specific criterion (e.g., new service provider, existing service provider, low activity service provider, etc.), preferences of user and/or service request (e.g., new users, loyal users, frequent users, VIP users, high rating users, etc.), etc. In respect to geographical region, the service provider aggregator module may be configurable or configured to aggregate available resources based on country, region, province, state, city, county, district, specific area (e.g., within certain city blocks, on certain roads, within a geometric shape drawn on a map, etc.), etc. In respect to time periods, the service provider

aggregator module may be configurable or configured to aggregate available resources based on year, month, week, day, specific hour(s) and/or minutes (e.g., for each hour or each running hour), etc. As an example, the service provider aggregator module may be configurable to aggregate some or all taxi available resources currently located (or projected, predicted, estimated, or expected to be located) in one predetermined or dynamically generated area of the central business district (CBD) of a city for each 15 minute period. In such an example, the service provider aggregator module may also be configurable to aggregate taxi available resources in other (e.g., adjacent) predetermined or dynamically generated areas of that city (and other cities) for the same or different time period. It is recognized in the present disclosure that the one or more criteria and/or parameters thereof, including geographical region, period of time, etc., used by the service provider aggregator module may be any criterion and/or parameter thereof (e.g., any amount, duration, and/or type) without departing from the teachings of the present disclosure.

[0092] Send the batch of orders for prioritization to the server apparatus 100. The server apparatus 100 soft allocates optimal order-vehicle pairs. Some order(s) may not have the vehicle soft-allocated. In some embodiments, the service request aggregator may comprise a service request prioritization module. The service request prioritization module may be configurable or configured to control, manage, and/or select service requests from among the selected service requests. The service request prioritization module may prioritize the service requests based on one or more criteria, such as likelihood of cancellation, likelihood of fraud, one or more other prioritization criteria, etc. In some embodiments, the service request prioritization module may include one or more service request cancellation predictors, one or more service request fraud predictors, one or more service request/user prioritizations, etc.

[0093] In some embodiments, the service provider aggregator module may comprise a service provider prioritization module. The service provider prioritization module may be configurable or configured to control, manage, and/or select vehicles (e.g., for further matching or comparison) from among the filtered vehicles. The service provider prioritization module may select from the filtered vehicles the first vehicle 208 and/or the second vehicle 212 based on criteria such as likelihood of cancellation, likelihood of fraud, or one or more other prioritization criteria, etc. In some embodiments, the service provider prioritization module may include one or more service provider cancellation predictors, one or more service provider fraud predictors.

[0094] In some embodiments, the batch allocation (for use with the tentative allocation) may be expressed as a method of managing a plurality of service requests in the form of orders, the method comprising establishing a first time period; identifying one or more orders received during the first time period, each identified order having an origin location; identifying one or more service providers including the first vehicle 208 and the second vehicle 212, from among a plurality of vehicles, each identified vehicle having a current service provider location and an availability status, each identified vehicle having its availability status indicating that it is currently available to be matched with or allocated to an order; establishing an order geographical region and vehicle geographical region; selecting one or more candidate orders from a plurality of identified orders, each candidate order having its origin location within the service request geographical region; selecting one or more vehicles from the plurality of identified vehicles, each candidate vehicle having its current service provider location within the service provider geographical region; and performing a matching process to match one or more of the orders with one or more of the vehicles, the matching process based on at least a likelihood that a cancellation will occur.

[0095] For the orders that are allocated with a vehicle, broadcast the allocation to the vehicle(s) selected by the server apparatus 100. If the vehicle accepts, soft-allocate the order to the vehicle. If the vehicle ignores the soft allocation, the server apparatus 100 may be configured to broadcast for another fixed determined number of tries, after which the server apparatus 100 stops broadcasting and the soft-allocation is unsuccessful.

[0096] In another embodiment, artificial intelligence (AI) or machine learning (ML) algorithms may be used in the allocation process.

[0097] It is contemplated that the aforementioned algorithms may be combined to form hybrid allocation algorithms that may be used to soft/tentative allocation of the vehicle to the order.

[0098] FIG. 3 is an example of a processing unit 104 of the server apparatus 100. The processing unit may comprise an input module 302, a tentative allocation module 304, a broadcast module 306, a monitoring module 308, and a final allocation module 310.

[0099] The input module 302 may be arranged in data communication with the communication interface 102 to receive service requests to form input dataset comprising an order type data, a merchant ID data, and expected delivery cost/earning data, a destination data.

[00100] The tentative allocation module 304 is configured to receive the input dataset and provide a soft-allocation data of a vehicle/service provider based on the aforementioned algorithms. It is appreciable the tentative allocation module 304 may include the batch allocation process and may include the service aggregator module, service request aggregator module, service provider aggregator module, service request prioritization module, and service provider prioritization module.

[00101] The broadcast module 306 is configured to receive the soft-allocation data from the tentative allocation module 304 and broadcast the same to the vehicles for their acceptance.

When a vehicle accepts the tentative allocation, the broadcast module 306 may filter the order type data and the destination data before broadcasting the order details to the vehicle.

[00102] The monitoring module 308 is configured to determine the ready status of each order and the arrival time of each vehicle to pick up the order. The monitoring module 308 may be configured to receive the ready statuses and arrival times from direct feedback from the merchants, vehicles, and may comprise estimation algorithms to supplement or validate the direct feedback.

[00103] The final allocation module 310 is configured to determine a final allocation of the order and the vehicle based on the arrival times and the ready states/statuses. The final allocation may be broadcast to the hard or final-allocated vehicle by the broadcast module 306.

[00104] In some embodiments, one or more of the modules 302, 304, 306, 308, 310 may comprise one or more databases for storage of the candidate solutions. In some embodiments, the databases may include at least one static database and at least one dynamic database.

[00105] In another aspect of the disclosure, the server apparatus 100 or system 200 may be arranged to access or interact with an online platform hosting offerings for sale, where users may request for recommendation for a product or service.

[00106] According to another aspect, there is a method 400 for allocating resources to service requests of a shared economy. The method 400 may be a computer-implemented comprises the steps of:

Step 402: receiving a first service request, the first service request comprising a first data indicative of a good or service of the first service request;

Step 404: tentatively allocating a first available resource to the first service request;

Step 406: receiving a second service request, the second service request comprising a second data indicative of a good or service of the second service request;

Step 408: tentatively allocating a second available resource to the second service request;

Step 410: obtaining or estimating a first availability parameter of the first available resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and

Step 412: determining a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

[00107] It is appreciable that one or more of the aforementioned method steps may be combined. For example, steps 402 and 406 may be combined, and steps 404 and 408 may be combined.

[00108] The methods described herein may be performed and the various processing or computation units and the devices and computing entities described herein may be implemented by one or more circuits. In an embodiment, a "circuit" may be understood as any kind of a logic implementing entity, which may be hardware, software, firmware, or any combination thereof. Thus, in an embodiment, a "circuit" may be a hard-wired logic circuit or a programmable logic circuit such as a programmable processor, e.g. a microprocessor. A "circuit" may also be a software being implemented or executed by a processor, e.g. any kind of computer program, e.g. a computer program using a virtual machine code. Any other kind of implementation of the respective functions which are described herein may also be understood as a "circuit" in accordance with an alternative embodiment.

[00109] While the disclosure has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the

disclosure as defined by the appended claims. The scope of the disclosure is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

1. A server apparatus for allocating resources to service requests of a shared economy on-demand service, the server apparatus comprising a processor and a memory, the processor is configured to execute instructions stored in the memory to:

receive a first service request, the first service request comprising a first data indicative of a good or service of the first service request;

tentatively allocate a first available resource to the first service request;

receive a second service request, the second service request comprising a second data indicative of a good or service of the second service request;

tentatively allocate a second available resource to the second service request;

obtain or estimate a first availability parameter of the first available resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and

determine a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

2. The server apparatus of claim 1, wherein the processor is configured to determine the final allocation of the first available resource and the second available resource based on a first-come, first-served basis to minimize a delay parameter, wherein at least one of the first data and the second data comprises a location data of a provider of the respective good or service.

3. The server apparatus of claim 2, wherein if the first ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is earlier than the second availability parameter or if the second availability parameter is not obtained, the final allocation of the first available resource is determined to be the first service request.
4. The server apparatus of claim 2, wherein if the first ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the first available resource is determined to be the second service request.
5. The server apparatus of claim 2, wherein if the second ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is earlier than the second availability parameter or if the second availability parameter is not obtained, the final allocation of the second available resource is determined to be the first service request.
6. The server apparatus of claim 2, wherein if the second ready parameter is obtained or estimated, the processor is configured to compare the first availability parameter with the second availability parameter, and if the first availability parameter is later than the second availability parameter or if the first availability parameter is not obtained, the final allocation of the second available resource is determined to be the second service request.

7. The server apparatus of claim 2, wherein if the first availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is earlier than the second ready parameter or if the second ready parameter is not obtained, the final allocation of the first available resource is determined to be the first service request.

8. The server apparatus of claim 2, wherein if the first availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the first available resource is determined to be the second service request.

9. The server apparatus of claim 2, wherein if the second availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is earlier than the second ready parameter or if the second ready parameter is not obtained, the final allocation of the second available resource is determined to be the first service request.

10. The server apparatus of claim 2, wherein if the second availability parameter is obtained or estimated, the processor is configured to compare the first ready parameter with the second ready parameter, and if the first ready parameter is later than the second ready parameter or if the first ready parameter is not obtained, the final allocation of the second available resource is determined to be the second service request.

11. The server apparatus of any one of the preceding claims, wherein after the first available resource and/or the second available resource is tentatively allocated to the first service request and/or the second service request, a masked first data and/or a masked second data is sent to the first available resource and/or the second available resource, wherein the masked first data and the masked second data is a subset of the first data and the second data.

12. The server apparatus of claim 11, wherein the first data and the second data is sent to the first available resource and the second available resource respectively after the final allocation of the first available resource and the second available resource.

13. The server apparatus of any one of the preceding claims, wherein the processor is configured to tentatively allocate the first available resource and the second available resource based on a system batch of multiple service requests including the first service request and second service request.

14. A system for allocating resources to service requests of a shared economy on-demand service comprising the server apparatus of any one of claims 1 to 13, the system forming part of an e-commerce platform.

15. The system of claim 14, wherein the first service request and the second service request are requests for food or beverage products from at least one merchant location, and the first available resource and the second available resource are first and second on-demand vehicles for allocation to pick-up the food or beverage products from the at least one merchant location for delivery to respective destinations.

16. The system of claim 14 or 15, wherein the processing unit comprises
- an input module configured to receive the first service request and the second service request;
 - a tentative allocation module configured to tentatively allocate the first available resource to the first service request and the second available resource to the second service request;
 - a broadcast module configured to receive the tentatively-allocated data from the tentative allocation module and broadcast the tentatively-allocated data to the first available resource and the second available resource for their acceptance;
 - a monitoring module configured to obtain or estimate the first availability parameter of the first available resource, the first ready parameter of the first service request, the second availability parameter of the second available resource, and the second ready parameter of the second service request; and
 - a final allocation module configured to determine the final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.
17. The system of claim 15, wherein the first availability parameter and the second availability parameter are respective arrival times of the first and second on-demand vehicles at the merchant location.
18. A computer-implemented method for allocating resources to service requests of a shared economy, the method comprises the steps of:

receiving a first service request, the first service request comprising a first data indicative of a good or service of the first service request;

tentatively allocating a first available resource to the first service request;

receiving a second service request, the second service request comprising a second data indicative of a good or service of the second service request;

tentatively allocating a second available resource to the second service request;

obtaining or estimating a first availability parameter of the first available resource, a first ready parameter of the first service request, a second availability parameter of the second available resource, and a second ready parameter of the second service request; and

determining a final allocation of the first available resource and the second available resource based on the first availability parameter, the first ready parameter, the second availability parameter, and the second ready parameter.

19. The computer-implemented method of claim 18, further comprising the step of determining the final allocation of the first available resource and the second available resource based on a first-come, first-served basis.

20. A non-transitory computer-readable medium storing computer executable code comprising instructions for allocating resources to service requests of a shared economy according to the method of claim 18 or 19.