CONTAINER PLANNING METHOD, APPARATUS, SERVER, AND COMPUTER-READABLE STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to Chinese Patent Application No. 202210594840.X, filed on May 27, 2022, entitled "CONTAINER PLANNING METHOD AND APPARATUS, SERVER, AND COMPUTER-READABLE STORAGE MEDIUM", the entire contents of the disclosure are hereby incorporated by reference in its entireties.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of logistics transportation, and in particular, to a container planning method and apparatus, a server, and a computer-readable storage medium.

BACKGROUND

[0003] Maritime transportation, also referred to as "International Maritime cargoes Transportation" and briefly referred to as maritime transportation, is the most main transportation method in the international logistics. It refers to a method of cargo transportation between ports of different countries and regions through maritime channels by ships, and is most widely used in international cargo transportation. However, in many marine demand processes, there are container requirements of multi-stage transport.

[0004] Existing container requirements of multi-stage transport are usually manually matched, based on container requirements, with actual available containers of current maritime transportation. However, an actual matching effect is poor, problems are easy to occur, and a cost is relatively high.

SUMMARY

[0005] The present disclosure provides a container planning method and apparatus, a server, and a computer-readable storage medium, and aims to solve a technical problem of how to implement automatic container planning, improve container planning efficiency, and reduce planning costs.

[0006] For this purpose, following technical solutions are provided by the present disclosure.

[0007] According to a first aspect, the present disclosure provides a container planning method, including:

[0008] acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes;

[0009] acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes;

[0010] acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes;

[0011] determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

[0012] determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0013] According to a second aspect, the present disclosure provides a container planning apparatus, including:

[0014] a first acquiring unit, configured to acquire a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes;

[0015] a second acquiring unit, configured to acquire an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes;

[0016] a third acquiring unit, configured to acquire an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes;

[0017] a first determining unit, configured to determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers

and a holder target corresponding to each container in each of the combinations of selected containers; and

[0018] a second determining unit, configured to determine a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0019] According to a third aspect, the present disclosure further provides a server, including:

[0020] one or more processors;

[0021] a memory; and

[0022] one or more applications, where the one or more applications are stored in the memory and configured to be executed by the processor to implement the container planning method.

[0023] According to a fourth aspect, the present disclosure further provides a computer-readable storage medium, on which a computer program is stored, and the computer program is loaded by a processor to perform steps in the container planning method.

[0024] The container planning method provided by the present disclosure includes: acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set. Compared with a conventional method, in a context of high workload, inability to consider all aspects, and high costs when selecting and deciding maritime containers of a plurality of transport nodes manually, the present disclosure

creatively proposes to consider availability of in-transit containers at each freight node as a category of available-container information, thereby enlarging a selection range of available-container information, effectively improving container planning efficiency and a cost of usage of container at the plurality of transport nodes by restricting the preset container parameter and the preset holder target parameter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 is a schematic diagram of a scenario of a container planning system provided by one of the embodiments of the present disclosure.

[0026] FIG. 2 is a schematic flowchart of one embodiment of a container planning method provided by an embodiment of the present disclosure.

[0027] FIG. 3 is a schematic flowchart of one embodiment of determining a planning scheme set for usage of containers in a target journey provided by an embodiment of the present disclosure.

[0028] FIG. 4 is a schematic structural diagram of one embodiment of a container planning apparatus provided by an embodiment of the present disclosure.

[0029] FIG. 5 is a schematic structural diagram of one embodiment of a server provided by an embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0030] Technical solutions in the embodiments of the present disclosure will be clearly and completely described below with reference to the accompanying drawings in the embodiments of the present disclosure. Apparently, the described embodiments are merely some but not all of the embodiments of the present disclosure. Based on the embodiments of the present disclosure, all other embodiments obtained by a person skilled in the art without creative efforts shall fall within the protection scope of the present disclosure.

[0031] In the description of the present disclosure, it should be understood that the terms "center", "longitudinal", "transverse", "length", "width", "thickness", "upper", "lower", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer" and the like are merely used to facilitate describing the present disclosure and simplify the description, rather than indicating or implying that the device or element referred to has to have a specific orientation and is constructed and operated in a specific orientation, and therefore cannot be understood as a limitation to the present disclosure. In addition, the terms "first" and "second" are used for descriptive purposes only and cannot be understood as indicating or implying relative importance

or implicitly indicating the number of indicated technical features. Thus, the features defined with "first" and "second" may explicitly or implicitly include one or more of the features. In the description of the present disclosure, "a plurality of" means two or more, unless otherwise specifically defined.

[0032] In the present disclosure, the term "exemplary" is used to mean "used as an example, instance, or description". Any embodiment described as "exemplary" in the present disclosure is not necessarily to be construed as preferred or advantageous over other embodiments. The following description is presented to enable any person skilled in the art to make and use the disclosure. In the following description, details are set forth for purposes of explanation. It should be understood by those of ordinary skill in the art that the present disclosure may be implemented without using these specific details. In other instances, well-known structures and processes are not described in detail to avoid obscuring the description of the present disclosure with unnecessary details. Accordingly, the present disclosure is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

[0033] Embodiments of the present disclosure provide a container planning method and apparatus, a server, and a computer-readable storage medium, which are described in detail below.

[0034] As shown in FIG. 1, FIG. 1 is a schematic diagram of a scenario of a container planning system provided by one of the embodiments of the present disclosure, the container planning system may include a plurality of terminals 100 and a server 200. The terminal 100 is in network connection with the server 200, a container planning apparatus is integrated in the server 200 as shown in FIG. 1. The terminal 100 may access the server 200.

[0035] In the embodiment of the present disclosure, the server 200 is mainly configured to acquire a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquire an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquire an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected

containers; and determine a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0036] In the embodiment of the present disclosure, the server 200 may be an independent server, or may be a server network or a server cluster composed of servers. For example, the server 200 described in the embodiments of the present disclosure, may include but is not limited to a computer, a network terminal, a single network server, a plurality of network server sets, or a cloud server composed of a plurality of servers. Therein, the cloud server is composed of a large number of computers or network servers based on Cloud Computing. In the embodiments of the present disclosure, communication between the server and the terminals may be implemented by any communication method, including but not limited to, computer network communication based on the 3rd Generation Partnership Project (3GPP), Long Term Evolution (LTE), Worldwide Interoperability for Microwave Access (WiMAX), TCP/IP Protocol Suite (TCP/IP), User Datagram Protocol (UDP), or the like.

[0037] It may be understood that the terminal 100 used in the embodiments of the present disclosure may be a device that includes both receiving and transmitting hardware, that is, a device includes both receiving and transmitting hardware that capable of performing bidirectional communication on a bidirectional communication link. Such a terminal may include a cellular or other communication device having a single line display or a multi-line display, or a cellular or other communication device without a multi-line display. Specifically, the terminal 100 may be a desktop terminal or a mobile terminal, and the terminal 100 may be specifically one of a mobile phone, a tablet computer, a notebook computer, or the like.

[0038] Those skilled in the art may understand that an application environment shown in FIG. 1 is merely an application scenario of the solution of the present disclosure, and does not constitute a limitation on the application scenario of the solution of the present disclosure, and other application environments may further include more or fewer terminals than those shown in FIG. 1, or more or fewer network connection relationship of the server. For example, only one server and two terminals are shown in FIG. 1. It may be understood that the container planning system may further include one or more other servers, or/and one or more terminals connected to the server network, which are not limited herein.

[0039] In addition, as shown in FIG. 1, the container planning system may further include a memory 300, configured to store data, for example, freight demand data and container planning

data of a target journey, or the container planning data when the container planning system is running.

[0040] It should be noted that the schematic diagram of the scenario of the container planning system shown in FIG. 1 is merely an example, and the container planning system and scenario described in the embodiments of the present disclosure are intended to describe the technical solutions of the embodiments of the present disclosure more clearly, and do not constitute a limitation on the technical solutions provided in the embodiments of the present disclosure. A person of ordinary skill in the art would know that the technical solutions provided by embodiments of the present disclosure are also applicable to similar technical problems with evolution of the container planning system and appearance of new business scenarios.

[0041] A container planning method according to embodiments of the present disclosure is described below.

[0042] In the present embodiment of the container planning method provided by the embodiments of the present disclosure, a container planning apparatus is used as an execution body. In order to simplify and facilitate description, in subsequent embodiments of the method, the execution body is omitted, and the container planning apparatus is applied to a server. The method includes: acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0043] Referring to FIGS. 2 to 5, FIG. 2 is a schematic flowchart of one embodiment of a container planning method provided by an embodiment of the present disclosure, and the container planning method includes steps 201 to 205.

[0044] 201: acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes.

[0045] The plurality of freight nodes included in the target journey in the embodiments of the present disclosure include at least three freight nodes. The container demand information of each of the plurality of freight nodes may be the same or different, and may be determined based on actual situations. For example, a user in the field of paper industry may purchase a raw material from A and ship the raw material to a factory located at B for processing, and then ship processed semi-finished/finished products to C from B.

[0046] It should be noted that the target journey in the embodiments of the present disclosure is a maritime transportation journey and is not a land transportation journey, where the maritime transportation is also referred to as "International Maritime cargoes Transportation" and briefly referred to as maritime transportation, which is the most main transportation method in the international logistics. It refers to a method of cargo transportation between ports of different countries and regions through maritime channels by ships. Specifically, there are two main types of maritime transportation: liner transportation and chartered transportation. The liner transportation is also referred to as a regular ship transportation, and the chartered transportation is also known as irregular ship transportation. The present disclosure is mainly directed to the regular ship transportation, but in special circumstances, it is not excluded that chartered transportation may be selected. Therein, the liner transportation refers to a mode of transportation in which a ship sails regularly and repeatedly on specific routes and between established ports in accordance with a pre-specified schedule in order to engage in the business of cargo transportation and to collect freight charges in accordance with a pre-published tariff schedule. Objects of this service are numerous cargo owners who are non-specific and distributed. A liner company has a nature of a public carrier. The chartered transportation refers to a mode that a charterer leases a ship from a ship owner for cargo transportation, which is usually applicable to bulk cargo transportation. Relevant routes and ports, types of cargoes to be transported, time of navigation, and the like are all confirmed by the ship owner in accordance with requirements of the charterer. The rights and obligations between the charterer and the lessor are determined by a charter party signed by both parties.

[0047] The container demand information may generally include container models, available transportation time period (for example, a week), and the like. The container model depends on factors such as types, volume, and weight of cargoes to be transported. Specifically, the freight demand information set of the target journey may be provided by a user. The user may provide relevant information of the cargoes to be transported, such as types and quantities of the cargoes, and a transportation time period. The transportation time period is generally an interval, that is, a time interval in which the cargoes should be delivered to their destination.

[0048] 202: acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes.

[0049] In the embodiments of the present disclosure, the available-container information is container information currently available in a plurality of ports corresponding to each freight node. The container information may include models of the containers, a quantity and a price corresponding to each model, and the like. It should be noted that different containers also have unused holder targets, which are ship companies.

[0050] In some embodiments of the present disclosure, the acquiring an available-container information set of the target journey may specifically include: acquiring a service constraint table preset for the target journey; acquiring initial available-container information of each of the plurality of freight nodes; and determining, based on the service constraint table and the initial available-container information of each of the plurality of freight nodes, the available-container information set of the target journey, where each available-container information in the available-container information set includes an available container set and a quantity limiting interval of the available container set. Therein, the service constraint table is a constraint table formed by integrating all service constraint conditions, and each service constraint condition corresponds to a service constraint scenario (for example, a requirement of a port on quantity and size of containers to be used, a requirement on routes, and the like), which includes a set of all available containers related to the scenario, and upper and lower limits of an overall usage quantity of the set. Specifically, the service constraint table is preset according to different journeys. The initial available-container information of each freight node is available-container information of a plurality of ports corresponding to each freight node. It can be understood that since the cargoes of the user have special requirements for the model of the container, not all available-container information is within the range that may be selected.

[0051] In some embodiments of the present disclosure, the determining, based on the service constraint table and the initial available-container information of each of the plurality of freight

nodes, the available-container information set of the target journey may include: screening, based on each service constraint condition in the service constraint table, the initial available-container information corresponding to each of the plurality of freight nodes to obtain the available-container information of each of the plurality of freight nodes, so as to determine the available-container information set of the target journey.

[0052] According to the embodiment of the present disclosure, the service constraint condition may be converted into a quantity limit of candidate available containers by the service preset table, thereby improving efficiency of the planning scheme set for usage of the containers in the target journey effectively.

[0053] 203: acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes.

[0054] In the embodiments of the present disclosure, the in-transit container information is information about containers that have been utilized at ports corresponding to each freight node and are specified with a return date to the port. For example, currently, there are 100 in-transit containers at a port. Therein, 20 containers in the 100 in-transit containers will return to the port next day, 30 containers in the 100 in-transit containers will return to the port three days later, and 50 containers in the 100 in-transit containers will return to the port five days later. Then the 100 in-transit containers may be predetermined in advance.

[0055] Specifically, the in-transit container information set of the target journey may be acquired by organizing in-transit containers at each port through in-transit container information at a corresponding port provided by a shipping company of each freight node to obtain the in-transit container information set of the target journey.

[0056] 204: determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers.

[0057] In the embodiments of the present disclosure, it can be seen from the above that the holder target is a shipping company. Specifically, how to determine, based on the container demand information set, the available-container information set and the in-transit container information set, the planning scheme set for usage of the containers in the target journey may be referred to following embodiments, which will not be repeated herein.

[0058] 205: determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0059] In the embodiments of the present disclosure, the preset container parameter may specifically be a preset cost, and an optimal preset cost corresponds to a lowest preset cost. That is, a cost of the combinations of selected containers in the target container planning scheme is the lowest in the planning scheme set. The preset holder target parameter may specifically be a performance score of a preset shipping company, and an optimal performance score of the preset shipping companies preferably corresponds to a highest performance score of the preset shipping companies. That is, a performance score of the preset shipping companies of the holder target corresponding to the combinations of selected containers is optimal in the planning scheme set. It should be noted that the performance score of the preset shipping companies may be obtained from a performance score table, formed from a cumulative score of experience of the users after use, of each shipping company. Specifically, how to determine the target container planning scheme in the planning scheme set may be referred to following embodiments, which will not be repeated herein.

[0060] The present disclosure provides the container planning method. Compared with a conventional method, in a context of high workload, inability to consider all aspects, and high costs when selecting and deciding maritime containers of a plurality of transport nodes manually, the present disclosure creatively proposes to consider availability of in-transit containers at each freight node as a category of available-container information, thereby enlarging a selection range of available-container information, effectively improving container planning efficiency and a cost of usage of container at the plurality of transport nodes by restricting the preset container parameter and the preset holder target parameter

[0061] In some embodiments of the present disclosure, as shown in FIG. 3, the step of determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey may specifically include steps 301 to 303.

[0062] 301: determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes.

[0063] Therein, the first freight node is a first freight node in the plurality of freight nodes, that is, an initial freight node.

[0064] In some embodiments of the present disclosure, the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes includes: performing initial sorting, based on a preset requirement, to a first container demand information set, corresponding to the first freight node in the plurality of freight nodes, in the container demand information set and a first available-container information set, corresponding to the first freight node, in the available-container information set; determining, based on the first container demand information set, a first reusing container information set corresponding to reusing containers available at the first freight node in the in-transit container information set; and determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

[0065] The preset requirement in this embodiment refers to that orders (container requirements) with smaller departure time window and earlier departure deadline are ranked first, and available containers with lower price and longer container-free period are ranked first. The initial sorting is to optimize a quality of an initial solution (the planning scheme set for usage of the containers in the target journey). After comparison, it is found that the quality of the initial solution constructed after sorting is much better than a result of random initialization of a model, so that subsequent optimization search time of the model is greatly improved.

[0066] In some embodiments of the present disclosure, the step of determining, based on the first container demand information set, a first reusing container information set corresponding to reusing containers available at the first freight node in the in-transit container information set may specifically include: comparing and screening, based on the first freight demand information (which may include using time of a container, a model of a container, a quantity, and the like) corresponding to the first freight node in the first container demand information set, first in-transit container information corresponding to the first freight node in the in-transit container information set to obtain the first reusing container information set corresponding to the reusing containers available at the first freight node.

[0067] In some embodiments of the present disclosure, the step of determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first

container at the first freight node in the plurality of freight nodes includes: matching, based on a departure time parameter of each available-container information in the first available-container information set and a correspondence between a ship-from address and a ship-to address, target container demand information in the first container demand information set with the first available-container information set to obtain a plurality of first matching results; respectively matching, based on a preset requirement, each of the plurality of first matching results with the first reusing container information to obtain a plurality of second matching results of combinations of selected containers; acquiring a scoring function set corresponding to the plurality of second matching results of the combinations of selected containers, where each scoring function includes a constraint score and a target score, the constraint score is a sum of differences between a quantity of available containers and an upper and a lower limit constraint, and the target score is the preset container parameter and the preset holder target parameter corresponding to the second matching results; performing sorting to the constraint score and the target score of each scoring function in the scoring function set to obtain a sorting result; and determining, based on the sorting result, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

[0068] The preset requirement in this embodiment includes a time requirement, a container model requirement, and a shipping company requirement. Specifically, the time requirement may be explained as that there is an intersection between a time window of the container requirement and a time window of a reusing container, a container model of the reusing container meets a container model in the container requirement, and a shipping company needs to be the same as a current shipping company to be selected. It can be understood that, assuming that currently available shipping companies are A, B and C, if a shipping company corresponding to the reusing container is A, which is in the current shipping companies to be selected, it means that the shipping company A meets the preset requirement; if the shipping company corresponding to the reusing container is D, that is, which is not in the current shipping companies to be selected, it means that the shipping company D does not meet the preset requirement.

[0069] In some embodiments of the present disclosure, according to embodiments mentioned above, it can be known that the preset container parameter corresponds to the preset cost, and the preset holder target parameter corresponds to the performance score of the preset shipping company. The step of performing sorting to the constraint score and the target score of each scoring function in the scoring function set to obtain a sorting result may specifically include: acquiring the sorting result by performing sorting to constraint scores (a high priority) and the target score.

[0070] In some embodiments of the present disclosure, the step of determining, based on the sorting result, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes may specifically include: selecting an optimal matching result by sorting of the constraint scores (a high priority) and the target score.

[0071] 302: determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node.

[0072] In the embodiment of the present disclosure, the planning scheme for usage of containers at the first freight node may affect a container scheme for usage of containers corresponding to a subsequent freight node.

[0073] Specifically, the step of determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node includes: updating, based on the container usage information in the planning scheme for usage of the first container, in-transit container information of the second freight node after the first freight node to obtain updated target in-transit container information, where the container usage information is container information selected by the planning scheme for usage of the first container; performing initial sorting, based on a preset requirement, to a second container demand information set, corresponding to the second freight node in the plurality of freight nodes, in the container demand information set and a second available-container information set, corresponding to the second freight node, in the available-container information set; determining, based on the second container demand information set, a second reusing container information set corresponding to reusing containers available at the second freight node in the target in-transit container information; and determining, based on the second container demand information set and the second available-container information set after the initial sorting and the second reusing container information, the planning scheme for usage of the second container at the second freight node in the plurality of freight nodes.

[0074] 303: determining, based on the planning scheme for usage of the first container and the planning scheme for usage of the second container, the planning scheme set for usage of the containers in the target journey.

[0075] According to the solution disclosed in the embodiments of the present disclosure, container planning efficiency of a plurality of freight nodes is effectively improved and a cost of usage of containers is effectively improved, and configuration of the planning scheme for usage of the containers between the plurality of freight nodes is realized.

[0076] In some embodiments of the present disclosure, the target journey in the foregoing embodiments may include three freight nodes, and the present embodiment of the present disclosure are specific to a situation including a fourth freight node and even more freight nodes. Specifically, after the determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node, the method further includes: determining, based on container usage information in the planning scheme for usage of the second container, a planning scheme for usage of a third container, corresponding to the third freight node after the second freight node; and determining, based on the planning scheme for usage of the first container, the planning scheme for usage of the second container, and the planning scheme for usage of the third container, the planning scheme set for usage of the containers in the target journey.

[0077] It should be noted that, a principle of the step of determining, based on container usage information in the planning scheme for usage of the second container, a planning scheme for usage of a third container, corresponding to the third freight node after the second freight node is the same as a principle of the step of determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node, and details are not described herein again.

[0078] In some embodiments of the present disclosure, the determining a target container planning scheme in the planning scheme set may specifically include: inputting the planning scheme set into a preset local search model, and taking a solution output by the local search model as the target container planning scheme.

[0079] In a process of local search, a solution is optimized by a model through a single-chain search, and specific steps are as follows.

[0080] 1: acquiring an initial solution S after initialization of the model, where both a current solution Swork and an optimal solution Sbest are set to S.

[0081] 2: trying, by the model, a plurality of neighborhood movement modes based on the current solution Swork, where the neighborhood movement refers to changing the container requirement corresponding to each available container in various ways, and searching for an optimal combination mode in the process.

[0082] 3: updating, based on a plurality of neighborhood structures {S1, S2, ..., Sn} of the current solution, a reusing container candidate list (adding a newly selected available container to the list, and removing a released available container from the list), re-determining, based on a greedy algorithm, reusing containers for a container requirement that changed in each structure,

and updating order information corresponding to the available containers and a reusing container list (which is a design of shadow variables, and is an optimization innovation point).

[0083] 4: evaluating a constraint score and a target score of each structure for updated {S1, S2, ..., Sn}, selecting SX with a highest score as a result of this neighborhood selection, setting Swork = SX, and adding SX to a tabu list, which is mainly used for avoiding these objects as much as possible in following iterative search, thereby ensuring exploration of different effective search routes.

[0084] 5: comparing SX with the optimal solution Sbest; and setting Sbest = SX if SX is better.

[0085] Determining whether a suspend condition is reached, if yes, exiting the optimization and outputting Sbest, if not, repeating steps 2 to 5.

[0086] Suspension of the model: during the process of local search, if the model does not find a better solution within a certain period of time, the optimization is exited, and a current optimal solution is output; alternatively, when a running time of the model reaches an upper limit of time, the model exits the optimization, and the current optimal solution is output.

[0087] According to the embodiments of the present disclosure, after a construction of the initial solution is completed, that is, after completion of the step of determining, based on the container demand information set, the available-container information set and the in-transit container information set, the planning scheme set for usage of containers in the target journey, the model starts the local search. When the local search is performed by the model, the model searches based on an optimal matching relationship between the container demand and the available containers, that is, the model searches only based on a solution space of this decision variable of selection of available containers, but another variable, selection of reusing containers, is not in an optimization scope of the search. The main reason is to make the model to provide optimal optimization effect within a limited time. By designing decision of the reusing containers as a shadow variable of decision of the available containers, the model solves a problem that when the model optimizes and searches a matching of the container demand and the available containers and a matching of the container demand and the reusing containers at the same time, a range of the solution space of the two variables will be searched at the same time, and a search range is large, which will lead to a long model optimization time with difficulty in ensuring optimization effect.

[0088] In order to better implement the container planning method in the embodiments of the present disclosure, embodiments of the present disclosure further provide a container planning apparatus based on the container planning method. As shown in FIG. 4, the container planning apparatus 400 includes:

[0089] a first acquiring unit 401, configured to acquire a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes;

[0090] a second acquiring unit 402, configured to acquire an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes;

[0091] a third acquiring unit 403, configured to acquire an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes;

[0092] a first determining unit 404, configured to determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

[0093] a second determining unit 405, configured to determine a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0094] In some embodiments of the present disclosure, the second acquiring unit 402 is specifically configured to:

[0095] acquire a service constraint table preset for the target journey;

[0096] acquire initial available-container information of each of the plurality of freight nodes; and

[0097] determine, based on the service constraint table and the initial available-container information of each of the plurality of freight nodes, the available-container information set of the target journey, where each available-container information in the available-container information set includes an available container set and a quantity limiting interval of the available container set.

[0098] In some embodiments of the present disclosure, the first determining unit 404 specifically includes:

[0099] a third determining unit, configured to determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes;

[0100] a fourth determining unit, configured to determine, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node; and

[0101] a fifth determining unit, which is configured to determine, based on the planning scheme for usage of the first container and the planning scheme for usage of the second container, the planning scheme set for usage of the containers in the target journey.

[0102] In some embodiments of the present disclosure, the third determining unit specifically includes:

[0103] a first initial sorting unit, configured to perform initial sorting, based on a preset requirement, to a first container demand information set, corresponding to the first freight node in the plurality of freight nodes, in the container demand information set and a first available-container information set, corresponding to the first freight node, in the available-container information set;

[0104] a sixth determining unit, configured to determine, based on the first container demand information set, a first reusing container information set corresponding to reusing containers available at the first freight node in the in-transit container information set; and

[0105] a seventh determining unit, configured to determine, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

[0106] In some embodiments of the present disclosure, the seventh determining unit is specifically configured to:

[0107] match, based on a departure time parameter of each available-container information in the first available-container information set and a correspondence between a ship-from address and a ship-to address, target container demand information in the first container demand information set with the first available-container information set to obtain a plurality of first matching results;

[0108] respectively match, based on a preset requirement, each of the plurality of first matching results with the first reusing container information to obtain a plurality of second matching results of combinations of selected containers;

[0109] acquire a scoring function set corresponding to the plurality of second matching results of the combinations of selected containers, where each scoring function includes a constraint score and a target score, the constraint score is a sum of differences between a quantity of available containers and an upper and a lower limit constraint, and the target score is the preset container parameter and the preset holder target parameter corresponding to the second matching results;

[0110] perform sorting to the constraint score and the target score of each scoring function in the scoring function set to obtain a sorting result; and

[0111] determine, based on the sorting result, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

[0112] In some embodiments of the present disclosure, the fourth determining unit is specifically configured to:

[0113] update, based on the container usage information in the planning scheme for usage of the first container, in-transit container information of the second freight node after the first freight node to obtain updated target in-transit container information, where the container usage information is container information selected by the planning scheme for usage of the first container;

[0114] perform initial sorting, based on a preset requirement, to a second container demand information set, corresponding to the second freight node in the plurality of freight nodes, in the container demand information set and a second available-container information set, corresponding to the second freight node, in the available-container information set;

[0115] determine, based on the second container demand information set, a second reusing container information set corresponding to reusing containers available at the second freight node in the target in-transit container information; and

[0116] determine, based on the second container demand information set and the second available-container information set after the initial sorting and the second reusing container information, the planning scheme for usage of the second container at the second freight node in the plurality of freight nodes.

[0117] In some embodiments of the present disclosure, after executing the step of determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node, the apparatus is further configured to:

[0118] determine, based on the container usage information in the planning scheme for usage of the second container, a planning scheme for usage of a third container, corresponding to the third freight node after the second freight node; and

[0119] determine, based on the planning scheme for usage of the first container, the planning scheme for usage of the second container, and the planning scheme for usage of the third container, the planning scheme set for usage of the containers in the target journey.

[0120] In some embodiments of the present disclosure, the second determining unit 405 is specifically configured to:

[0121] input the planning scheme set into a preset local search model, and taking a solution output by the local search model as the target container planning scheme.

[0122] The container planning apparatus 400 provided by the present disclosure includes: a first acquiring unit 401, configured to acquire a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; a second acquiring unit 402, configured to acquire an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; a third acquiring unit 403, configured to acquire an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; a first determining unit 404, configured to determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and a second determining unit 405, configured to determine a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set. Compared with a conventional apparatus, in a context of high workload, inability to consider all aspects, and high costs when selecting and deciding maritime containers of a plurality of transport nodes manually, the present disclosure creatively proposes to consider availability of in-transit containers at each freight node as a category of available-container information, thereby enlarging a selection range of available-container information, effectively improving container planning efficiency and a cost of usage of container at the plurality of transport nodes by restricting the preset container parameter and the preset holder target parameter.

[0123] In addition to the container planning method and the container planning apparatus, embodiments of the present disclosure further provides a server, which integrates any container planning apparatus provided by the embodiments of the present disclosure. The server includes:

[0124] one or more processors, where the processor is configured to execute following application programs stored in a memory;

[0125] a memory; and

[0126] one or more application programs, where the one or more application programs are stored in the memory and configured to be executed by the one or more processors to perform operations of any method in any one of the embodiments of the container planning method. In the technical solution of the present disclosure, the server implements the following steps: acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set. Compared with a conventional apparatus, in a context of high workload, inability to consider all aspects, and high costs when selecting and deciding maritime containers of a plurality of transport nodes manually, the present disclosure creatively proposes to consider availability of in-transit containers at each freight node as a category of available-container information, thereby enlarging a selection range of available-container information, effectively improving container planning efficiency and a cost of usage of container at the plurality of transport nodes by restricting the preset container parameter and the preset holder target parameter.

[0127] Embodiments of the present disclosure further provides a server, which integrates any container planning apparatus provided by the embodiments of the present disclosure. Referring to FIG. 5, FIG. 5 is a schematic structural diagram of one embodiment of a server provided by an embodiment of the present disclosure.

[0128] As shown in FIG. 5, FIG. 5 illustrates a schematic structural diagram of a container planning apparatus designed provided by an embodiment of the present disclosure.

[0129] Specifically, the container planning apparatus may include components such as a processor 501 with one or more processing cores, a storage unit 502 with one or more computer-readable storage mediums, a power supply 503, and an input unit 504. A person skilled in the art may understand that a structure of the container planning apparatus shown in FIG. 5 does not constitute a limitation on the container planning apparatus, and which may include more or fewer components than those shown in the figure, or a combination of some components, or a different component arrangement of the components.

[0130] The processor 501 is a control center of the container planning apparatus. Various parts of an entire container planning apparatus are connected by using various interfaces and lines. Various functions and processing data of the container planning apparatus are executed by running or executing software programs and/or modules stored in the storage unit 502 and invoking data stored in the storage unit 502, so as to perform an overall monitoring on the container planning apparatus. Optionally, the processor 501 may include one or more processing cores; preferably, the processor 501 may integrate an application processor and a modulation and demodulation processor, where the application processor mainly processes an operating system, a user interface, an application, and the like, and the modulation and demodulation processor mainly processes wireless communications. It may be understood that the foregoing modulation and demodulation processor may not be integrated into the processor 501.

[0131] The storage unit 502 may be configured to store a software program and a module, and the processor 501 executes various functional applications and data processing by running the software program and the module stored in the storage unit 502. The storage unit 502 may mainly include a program storage area and a data storage area, where the program storage area may store an operating system, an application program (for example, a sound playing function or an image playing function) required by at least one function, and the like. The data storage area may store data created based on usage of the container planning apparatus. In addition, the storage unit 502 may include a high-speed random access memory, and may further include a non-volatile memory, for example, at least one magnetic disk storage device, a flash memory device, or another volatile

solid-state storage device. Correspondingly, the storage unit 502 may further include a memory controller to provide access to the storage unit 502 by the processor 501.

[0132] The container planning apparatus further includes a power supply 503 for supplying power to each component, and preferably, the power supply 503 may be logically connected to the processor 501 by using a power management system, so as to implement functions such as charging, discharging, and power consumption management through the power management system. The power supply 503 may further include one or more DC or AC power supplies, a recharging system, a power failure detection circuit, a power converter or an inverter, a power status indicator, and the like.

[0133] The container planning apparatus may further include an input unit 504, which may be configured to receive input digit or character information, and generate signal input related to user setting and function control by a keyboard, mouse, joystick, optical or trackball.

[0134] Although not shown, the container planning apparatus may further include a display unit, and the like, which will not be described herein. Specifically, in the embodiments of the present disclosure, loads executable files corresponding to processes of one or more application programs may be loaded into the storage unit 502 according to following instructions by the processor 501 in the container planning apparatus, and the application programs stored in the storage unit 502 may be run by he processor 501, so as to implement various functions. The instructions are as follows:

[0135] acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is

optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0136] The present disclosure provides the container planning method. Compared with a conventional method, in a context of high workload, inability to consider all aspects, and high costs when selecting and deciding maritime containers of a plurality of transport nodes manually, the present disclosure creatively proposes to consider availability of in-transit containers at each freight node as a category of available-container information, thereby enlarging a selection range of available-container information, effectively improving container planning efficiency and a cost of usage of container at the plurality of transport nodes by restricting the preset container parameter and the preset holder target parameter.

[0137] For this purpose, embodiments of the present disclosure provide a computer-readable storage medium, which may include a Read-Only Memory (ROM), a Random Access Memory (RAM), a magnetic disk, an optical disk, and the like. The computer-readable storage medium stores a plurality of instructions, and the instructions can be loaded by a processor to perform steps of any container planning method provided in the embodiments of the present disclosure. For example, the instructions may perform following steps:

[0138] acquiring a freight demand information set of a target journey, where the target journey includes a plurality of freight nodes, and the freight demand information set includes container demand information of each of the plurality of freight nodes; acquiring an available-container information set of the target journey, where the available-container information set includes available-container information of each of the plurality of freight nodes; acquiring an in-transit container information set of the target journey, where the in-transit container information set includes in-transit container information of each of the plurality of freight nodes; determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, where each planning scheme for the usage of containers in the planning scheme set includes combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, where a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

[0139] In the foregoing embodiments, the description of each embodiment has its own focus, and parts not detailed in a certain embodiment may refer to relevant descriptions of other embodiments.

[0140] The container planning method and apparatus, the server, and the computer-readable storage medium provided in the embodiments of the present disclosure are described in detail above, and specific examples are used herein to describe the principles and embodiments of the present disclosure, and the descriptions of the above embodiments are only used to help understand the method of the present disclosure and a core idea thereof; meanwhile, for those skilled in the art, based on the idea of the present disclosure, there will be changes in specific embodiments and application scope, and in summary, the contents of the present specification should not be construed as a limitation of the present disclosure.

CLAIMS

1. A container planning method, comprising:

acquiring a freight demand information set of a target journey, wherein the target journey comprises a plurality of freight nodes, and the freight demand information set comprises container demand information of each of the plurality of freight nodes;

acquiring an available-container information set of the target journey, wherein the available-container information set comprises available-container information of each of the plurality of freight nodes;

acquiring an in-transit container information set of the target journey, wherein the in-transit container information set comprises in-transit container information of each of the plurality of freight nodes;

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, wherein each planning scheme for the usage of containers in the planning scheme set comprises combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, wherein a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

2. The container planning method according to claim 1, wherein the acquiring an available-container information set of the target journey comprises:

acquiring a service constraint table preset for the target journey;

acquiring initial available-container information of each of the plurality of freight nodes; and

determining, based on the service constraint table and the initial available-container information of each of the plurality of freight nodes, the available-container information set of the target journey, wherein each available-container information in the available-container information set comprises an available container set and a quantity limiting interval of the available container set.

3. The container planning method according to claim 1, wherein the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey

comprises:

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes;

determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node; and

determining, based on the planning scheme for usage of the first container and the planning scheme for usage of the second container, the planning scheme set for usage of the containers in the target journey.

4. The container planning method according to claim 3, wherein the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes comprises:

performing initial sorting, based on a preset requirement, to a first container demand information set, corresponding to the first freight node in the plurality of freight nodes, in the container demand information set and a first available-container information set, corresponding to the first freight node, in the available-container information set;

determining, based on the first container demand information set, a first reusing container information set corresponding to reusing containers available at the first freight node in the in-transit container information set; and

determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

5. The container planning method according to claim 4, wherein the determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes comprises:

matching, based on a departure time parameter of each available-container information in the first available-container information set and a correspondence between a ship-from address and a ship-to address, target container demand information in the first container demand information set with the first available-container information set to obtain a plurality of first matching results;

respectively matching, based on a preset requirement, each of the plurality of first matching

results with the first reusing container information to obtain a plurality of second matching results of combinations of selected containers;

acquiring a scoring function set corresponding to the plurality of second matching results of the combinations of selected containers, wherein each scoring function comprises a constraint score and a target score, the constraint score is a sum of differences between a quantity of available containers and an upper and a lower limit constraint, and the target score is the preset container parameter and the preset holder target parameter corresponding to the second matching results;

performing sorting to the constraint score and the target score of each scoring function in the scoring function set to obtain a sorting result; and

determining, based on the sorting result, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

6. The container planning method according to claim 3, wherein the determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node comprises:

updating, based on the container usage information in the planning scheme for usage of the first container, in-transit container information of the second freight node after the first freight node to obtain updated target in-transit container information, wherein the container usage information is container information selected by the planning scheme for usage of the first container;

performing initial sorting, based on a preset requirement, to a second container demand information set, corresponding to the second freight node in the plurality of freight nodes, in the container demand information set and a second available-container information set, corresponding to the second freight node, in the available-container information set;

determining, based on the second container demand information set, a second reusing container information set corresponding to reusing containers available at the second freight node in the target in-transit container information; and

determining, based on the second container demand information set and the second available-container information set after the initial sorting and the second reusing container information, the planning scheme for usage of the second container at the second freight node in the plurality of freight nodes.

7. The container planning method according to claim 3, wherein after the determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first

freight node, the method further comprises:

determining, based on the container usage information in the planning scheme for usage of the second container, a planning scheme for usage of a third container, corresponding to the third freight node after the second freight node; and

determining, based on the planning scheme for usage of the first container, the planning scheme for usage of the second container, and the planning scheme for usage of the third container, the planning scheme set for usage of the containers in the target journey.

8. The container planning method according to claim 1, wherein the determining a target container planning scheme in the planning scheme set comprises:

inputting the planning scheme set into a preset local search model, and taking a solution output by the local search model as the target container planning scheme.

9. A container planning apparatus, comprising:

a first acquiring unit, configured to acquire a freight demand information set of a target journey, wherein the target journey comprises a plurality of freight nodes, and the freight demand information set comprises container demand information of each of the plurality of freight nodes;

a second acquiring unit, configured to acquire an available-container information set of the target journey, wherein the available-container information set comprises available-container information of each of the plurality of freight nodes;

a third acquiring unit, configured to acquire an in-transit container information set of the target journey, wherein the in-transit container information set comprises in-transit container information of each of the plurality of freight nodes;

a first determining unit, configured to determine, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, wherein each planning scheme for the usage of containers in the planning scheme set comprises combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

a second determining unit, configured to determine a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, wherein a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

10. A server, comprising:

one or more processors;

a memory; and

one or more application programs, wherein the one or more application programs are stored in the memory and configured to be executed by the processors to perform following steps:

acquiring a freight demand information set of a target journey, wherein the target journey comprises a plurality of freight nodes, and the freight demand information set comprises container demand information of each of the plurality of freight nodes;

acquiring an available-container information set of the target journey, wherein the available-container information set comprises available-container information of each of the plurality of freight nodes;

acquiring an in-transit container information set of the target journey, wherein the in-transit container information set comprises in-transit container information of each of the plurality of freight nodes;

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, wherein each planning scheme for the usage of containers in the planning scheme set comprises combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, wherein a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

11. The server according to claim 10, wherein the acquiring an available-container information set of the target journey comprises:

acquiring a service constraint table preset for the target journey;

acquiring initial available-container information of each of the plurality of freight nodes; and

determining, based on the service constraint table and the initial available-container information of each of the plurality of freight nodes, the available-container information set of the target journey, wherein each available-container information in the available-container information set comprises an available container set and a quantity limiting interval of the available container set.

12. The server according to claim 10, wherein the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey comprises:

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes;

determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node; and

determining, based on the planning scheme for usage of the first container and the planning scheme for usage of the second container, the planning scheme set for usage of the containers in the target journey.

13. A computer-readable storage medium, wherein a computer program is stored on the computer-readable storage medium, and the computer program is loaded by a processor to perform following steps:

acquiring a freight demand information set of a target journey, wherein the target journey comprises a plurality of freight nodes, and the freight demand information set comprises container demand information of each of the plurality of freight nodes;

acquiring an available-container information set of the target journey, wherein the available-container information set comprises available-container information of each of the plurality of freight nodes;

acquiring an in-transit container information set of the target journey, wherein the in-transit container information set comprises in-transit container information of each of the plurality of freight nodes;

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey, wherein each planning scheme for the usage of containers in the planning scheme set comprises combinations of selected containers and a holder target corresponding to each container in each of the combinations of selected containers; and

determining a target container planning scheme in the planning scheme set as a container planning scheme of the target journey, wherein a preset container parameter of combinations of selected containers in the target container planning scheme is optimal in the planning scheme set, and a preset holder target parameter of a holder target corresponding to the combinations of selected containers is optimal in the planning scheme set.

14. The computer-readable storage medium according to claim 13, wherein the acquiring an available-container information set of the target journey comprises:

acquiring a service constraint table preset for the target journey;

acquiring initial available-container information of each of the plurality of freight nodes; and

determining, based on the service constraint table and the initial available-container information of each of the plurality of freight nodes, the available-container information set of the target journey, wherein each available-container information in the available-container information set comprises an available container set and a quantity limiting interval of the available container set.

15. The computer-readable storage medium according to claim 13, wherein the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme set for usage of containers in the target journey comprises:

determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes;

determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node; and

determining, based on the planning scheme for usage of the first container and the planning scheme for usage of the second container, the planning scheme set for usage of the containers in the target journey.

16. The computer-readable storage medium according to claim 15, wherein the determining, based on the container demand information set, the available-container information set and the in-transit container information set, a planning scheme for usage of a first container at a first freight node in the plurality of freight nodes comprises:

performing initial sorting, based on a preset requirement, to a first container demand information set, corresponding to the first freight node in the plurality of freight nodes, in the container demand information set and a first available-container information set, corresponding to the first freight node, in the available-container information set;

determining, based on the first container demand information set, a first reusing container information set corresponding to reusing containers available at the first freight node in the in-transit container information set; and

determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

17. The computer-readable storage medium according to claim 16, wherein the determining, based on the first container demand information set and the first available-container information set after the initial sorting and the first reusing container information set, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes comprises:

matching, based on a departure time parameter of each available-container information in the first available-container information set and a correspondence between a ship-from address and a ship-to address, target container demand information in the first container demand information set with the first available-container information set to obtain a plurality of first matching results;

respectively matching, based on a preset requirement, each of the plurality of first matching results with the first reusing container information to obtain a plurality of second matching results of combinations of selected containers;

acquiring a scoring function set corresponding to the plurality of second matching results of the combinations of selected containers, wherein each scoring function comprises a constraint score and a target score, the constraint score is a sum of differences between a quantity of available containers and an upper and a lower limit constraint, and the target score is the preset container parameter and the preset holder target parameter corresponding to the second matching results;

performing sorting to the constraint score and the target score of each scoring function in the scoring function set to obtain a sorting result; and

determining, based on the sorting result, the planning scheme for usage of the first container at the first freight node in the plurality of freight nodes.

18. The computer-readable storage medium according to claim 15, wherein the determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node comprises:

updating, based on the container usage information in the planning scheme for usage of the first container, in-transit container information of the second freight node after the first freight node to obtain updated target in-transit container information, wherein the container usage information is container information selected by the planning scheme for usage of the first container;

performing initial sorting, based on a preset requirement, to a second container demand information set, corresponding to the second freight node in the plurality of freight nodes, in the container demand information set and a second available-container information set, corresponding to the second freight node, in the available-container information set;

determining, based on the second container demand information set, a second reusing

container information set corresponding to reusing containers available at the second freight node in the target in-transit container information; and

determining, based on the second container demand information set and the second available-container information set after the initial sorting and the second reusing container information, the planning scheme for usage of the second container at the second freight node in the plurality of freight nodes.

19. The computer-readable storage medium according to claim 15, wherein after the determining, based on container usage information in the planning scheme for usage of the first container, a planning scheme for usage of a second container, corresponding to a second freight node after the first freight node, the method further comprises:

determining, based on the container usage information in the planning scheme for usage of the second container, a planning scheme for usage of a third container, corresponding to the third freight node after the second freight node; and

determining, based on the planning scheme for usage of the first container, the planning scheme for usage of the second container, and the planning scheme for usage of the third container, the planning scheme set for usage of the containers in the target journey.

20. The computer-readable storage medium according to claim 13, wherein the determining a target container planning scheme in the planning scheme set comprises:

inputting the planning scheme set into a preset local search model, and taking a solution output by the local search model as the target container planning scheme.