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United States Patent	12389572
Kind Code	B2
Date of Patent	August 12, 2025
Inventor(s)	Jing; Tangbo et al.

Container based data center with air cooling equipments

Abstract

The disclosure relates to a data center, including: an IT equipment container provided with a server rack therein, an air-cooling equipment container, the IT equipment container having IT coolant inlet and outlet ports, and IT air inlet and outlet ports, the IT equipment container being prefabricated with a coolant inlet pipe connecting the IT coolant inlet port to a coolant inlet of a server rack, a coolant outlet pipe connecting the IT coolant outlet port to a coolant outlet of the server rack, and an air duct connecting the IT air outlet port to an air outlet of the server rack, and the IT air inlet port being in communication with interior of the IT equipment container; and having air-cooling air inlet and outlet ports, the air-cooling air inlet port and outlet ports being docked with the IT air outlet port and the IT air inlet port, respectively.

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Appl. No.:	18/759193
Filed:	June 28, 2024

Prior Publication Data

Document Identifier	Publication Date
US 20240357776 A1	Oct. 24, 2024

Foreign Application Priority Data

CN	202111658727.5	Dec. 30, 2021
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Related U.S. Application Data

Publication Classification

Int. Cl.: H05K7/20 (20060101)

U.S. Cl.:

CPC H05K7/2079 (20130101); H05K7/20263 (20130101); H05K7/20272 (20130101); H05K7/20745 (20130101);

Field of Classification Search

CPC: H05K (7/2079); H05K (7/20263); H05K (7/20272); H05K (7/20745)

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
9345173	12/2015	Czamara	N/A	H05K 7/1488
9763365	12/2016	Stöcker	N/A	H05K 7/2079
10231358	12/2018	Gillooly	N/A	H05K 7/20381
2012/0258654	12/2011	Peng et al.	N/A	N/A
2013/0163185	12/2012	Gilges et al.	N/A	N/A
2016/0021792	12/2015	Minegishi	165/281	H05K 7/20745
2018/0324976	12/2017	Gao	N/A	H05K 7/20836

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
102436292	12/2011	CN	N/A
102736683	12/2011	CN	N/A
205610336	12/2015	CN	N/A
205657361	12/2015	CN	N/A
109247082	12/2018	CN	N/A
109496112	12/2018	CN	N/A
109974374	12/2018	CN	N/A
111726964	12/2019	CN	N/A
212362291	12/2020	CN	N/A
213521301	12/2020	CN	N/A
213934644	12/2020	CN	N/A
215187964	12/2020	CN	N/A
114745900	12/2021	CN	N/A
102019127752	12/2020	DE	N/A
2019-518252	12/2018	JP	N/A
20180132029	12/2017	KR	N/A
WO 2013/070104	12/2012	WO	N/A

OTHER PUBLICATIONS

English translation of the written opinion of the international searching authority for PCT/CN2022/139017 (2023). cited by examiner

International Patent Application No. PCT/CN2022/139017; Int'l Search Report; dated Mar. 3, 2023; 3 pages. cited by applicant

China Patent Application No. 202111658727.5; Office Action; dated Dec. 30, 2024; 21 pages. cited by applicant

European Patent Application No. 22914264.1; Extended European Search Report dated Feb. 28, 2025, 11 pages. cited by applicant

Japanese Patent Application No. 2024-539663, Office Action dated Jun. 3, 2025, 12 pages with machine translation. cited by applicant

Junzhi Y., "Warehouse-style, Micro-module, Container-style Data Center," Intelligent Buildings, Issue 182, 2015, 6 pages. cited by applicant

Second Office Action for Chinese Application No. 202111658727.5, mailed May 30, 2025, 22 pages with English language translation. cited by applicant

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Background/Summary

CROSS-REFERENCE OF RELATED APPLICATIONS (1) This application is a continuation of International Patent Application No. PCT/CN2022/139017, filed on Dec. 14, 2022, which claims the priority of a Chinese patent application submitted on Dec. 30, 2021, with application No. 202111658727.5 and entitled "DATA CENTER", both of which are incorporated in the present application by reference.

FIELD

(1) The present disclosure relates to the technical field of a data center, in particular to a data center.

BACKGROUND

(2) With the rapid rise of cloud computing, big data, the Internet of Things, and artificial intelligence, the demand for large data centers is surging, and their size is also increasing rapidly. Data centers typically comprise servers, network equipment, cooling systems, power supply and distribution systems, etc. The construction of data centers is complex, time-consuming, and costly. The long construction time and the use of large amounts of construction materials, such as reinforced concrete, in the construction process will also increase the carbon emissions associated with data center construction, which is not conducive to reducing the overall carbon emissions.

SUMMARY

(3) The purpose of the disclosure is to provide a data center to solve the technical problems of related technologies.

(4) In order to achieve the above purpose, the disclosure provides a data center. The data center comprises: an IT equipment container provided with a server rack therein, the IT equipment container having an IT coolant inlet port, an IT coolant outlet port, an IT air inlet port and an IT air outlet port, and the IT equipment container being prefabricated with a coolant inlet pipe connecting the IT coolant inlet port to a coolant inlet of the server rack, a coolant outlet pipe connecting the IT coolant outlet port to a coolant outlet of the server rack, and an air duct connecting the IT air outlet

port to an air outlet of the server rack, and the IT air inlet port being in communication with interior of the IT equipment container.

(5) An air-cooling equipment container is provided with air-cooling equipment therein, the air-cooling equipment container has an air-cooling air inlet port and an air-cooling air outlet port, the air-cooling air inlet port is docked with the IT air outlet port, the air-cooling air outlet port is docked with the IT air inlet port, and the air-cooling equipment is adapted to cool air flowing in from the air-cooling air inlet port, so that a temperature of air flowing out of the air-cooling air outlet port is lower than a temperature of the air flowing in from the air-cooling air inlet port.

(6) Optionally, the air-cooling equipment comprises an air-liquid heat exchanger and a fan, the air-cooling equipment container has an air-cooling coolant inlet port and an air-cooling coolant outlet port, and the air-cooling equipment container is prefabricated with a heat exchange inlet pipe connecting the air-cooling coolant inlet port to a coolant inlet of the air-liquid heat exchanger, and a heat exchange outlet pipe connecting the air-cooling coolant outlet port and a coolant outlet of the air-liquid heat exchanger, the fan is adapted to cause air flowing in from the air-cooling inlet port to flow out of the air-cooling outlet port after passing through the air-liquid heat exchanger.

(7) Optionally, the data center further comprises a heat dissipation equipment container, wherein the heat dissipation equipment container is provided with heat dissipation equipment therein, the heat dissipation equipment container has a heat dissipation coolant inlet port and a heat dissipation coolant outlet port, and the heat dissipation equipment container is prefabricated with a heat dissipation pipe connecting the heat dissipation equipment with the heat dissipation coolant inlet port and the heat dissipation coolant outlet port.

(8) The heat dissipation coolant inlet port is connected to the IT coolant outlet port and the air-cooling coolant outlet port, the heat dissipation coolant outlet port is connected to the IT coolant inlet port and the air-cooling coolant inlet port, and the heat dissipation equipment is adapted to cause a temperature of coolant flowing out of the heat dissipation coolant outlet port to be lower than a temperature of coolant flowing in from the heat dissipating coolant inlet port.

(9) Optionally, the heat dissipation equipment comprises a cooling tower and/or a first air conditioning unit.

(10) Optionally, the heat dissipation equipment comprises a cooling tower which is an open cooling tower.

(11) The data center further comprises a hydraulic equipment container, which is provided with a first liquid-liquid heat exchanger, a first water pump and a second water pump therein; the hydraulic equipment container has a first hydraulic coolant inlet port, a second hydraulic coolant inlet port, and a first hydraulic coolant outlet port and a second hydraulic coolant outlet port, wherein the hydraulic equipment container is prefabricated with a first pipe connecting a first coolant inlet of the first liquid-liquid heat exchanger with the first hydraulic coolant inlet port, a second pipe connecting a first coolant outlet of the first liquid-liquid heat exchanger with the first hydraulic coolant outlet port, a third pipe connecting a second coolant inlet of the first liquid-liquid heat exchanger with the second hydraulic coolant inlet port, and a fourth pipe connecting a second coolant outlet of the first liquid-liquid heat exchanger with the second hydraulic coolant outlet port.

(12) The first hydraulic coolant inlet port is connected to the heat dissipation coolant outlet port, the first hydraulic coolant outlet port is connected to the heat dissipation coolant inlet port, the second hydraulic coolant inlet port is docked with the IT coolant outlet port and the air-cooling coolant outlet port, and the second hydraulic coolant outlet port is docked with the IT coolant inlet port and the air-cooling coolant inlet port.

(13) The first water pump is arranged on the first pipe and/or the second pipe; the second water pump is arranged on the third pipe and/or the fourth pipe.

(14) Optionally, the heat dissipation equipment comprises a cooling tower which is a closed cooling tower.

(15) The data center further comprises a hydraulic equipment container, which is provided with a

water pump therein, the hydraulic equipment container has a hydraulic coolant inlet port and a hydraulic coolant outlet port, the hydraulic equipment container is prefabricated with a fifth pipe connecting the water pump with the hydraulic coolant inlet port and the hydraulic coolant outlet port.

(16) The hydraulic coolant inlet port is connected to the heat dissipation coolant outlet port, and the hydraulic coolant outlet port is docked with the IT coolant inlet port and the air-cooling coolant inlet port.

(17) Optionally, the IT equipment container is further provided with a cooling capacity distribution unit therein, the cooling capacity distribution unit comprises a second liquid-liquid heat exchanger, the coolant inlet pipe comprises a first sub coolant inlet pipe and a second sub coolant inlet pipe, and the coolant outlet pipe comprises a first sub coolant outlet pipe and a second sub coolant outlet pipe, the first sub coolant inlet pipe connects the IT coolant inlet port with a first coolant inlet of the second liquid-liquid heat exchanger, the second sub coolant inlet pipe connects a first coolant outlet of the second liquid-liquid heat exchanger and the coolant inlet of the server rack, and the first sub coolant outlet pipe connects the IT coolant outlet port with a second coolant outlet of the second liquid-liquid heat exchanger, and the second sub coolant outlet pipe connects a second coolant inlet of the second liquid-liquid heat exchanger and the coolant outlet of the server rack.

(18) Optionally, the IT equipment container further has a smoke vent.

(19) Optionally, the IT equipment container is provided with a power distribution cabinet therein, the IT equipment container has an IT power input port, and the IT equipment container is prefabricated with a first cable connecting the IT power input port with the power distribution cabinet.

(20) The data center further comprises a power distribution equipment container and a transformer equipment container, the power distribution equipment container is provided with power distribution equipment therein, the power distribution equipment container has a first power distribution input port and a power distribution output port, and the power distribution equipment container is prefabricated with a second cable connecting the power distribution equipment with the first power distribution input port and the power distribution output port, the transformer equipment container is provided with a transformer equipment therein, and the transformer equipment container has a third cable connecting the transformer equipment with a transformer input port and a transformer output port.

(21) The first power distribution input port is adapted to be connected to a municipal power grid, the power distribution output port is connected to the transformer input port, and the transformer output port is connected to the IT power input port.

(22) Optionally, the data center further comprises a standby power equipment container, wherein the standby power equipment container is provided with a generator therein, the standby power equipment container has a standby output port, and the standby power equipment container is prefabricated with a fourth cable connecting the generator and the standby output port.

(23) The power distribution equipment container has a second power distribution input port, the second cable connects the second power distribution input port with the power distribution equipment, and the standby power output port is connected to the second power distribution input port.

(24) Optionally, the data center further comprises a network equipment container, wherein the network equipment container is provided with a network cabinet, a column head power distribution cabinet, and a second air conditioning unit therein, the network equipment container has a network power input port, and the network equipment container is prefabricated with a fifth cable connects the column head power distribution cabinet with the network cabinet, the second air conditioning unit and the network power input port, and the network power input port is connected to the transformer output port.

(25) Optionally, the data center further comprises an administrative and auxiliary equipment

container, in which at least one of fire-fighting equipment, a weak current room, a central control room and an office is provided.

(26) Other features and advantages of the present disclosure will be described in detail in the subsequent specific embodiments.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The drawings are used to provide a further understanding of the disclosure and form a part of the specification. They are used to explain the disclosure together with the following specific embodiments, but do not constitute a limitation on the disclosure. In the attached figure:

(2) FIG. 1 is a schematic diagram of liquid cooling connection of an IT equipment container, an air-cooling equipment container, a hydraulic equipment container and a heat dissipation equipment container in the data center provided by an example embodiment of the present disclosure;

(3) FIG. 2 is a schematic diagram of liquid cooling connection of an IT equipment container, an air-cooling equipment container, a hydraulic equipment container and a heat dissipation equipment container in the data center provided by another example embodiment of the present disclosure;

(4) FIG. 3 is a schematic diagram of air-cooling connection between an IT equipment container and an air-cooling equipment container in the data center provided by an example embodiment of the present disclosure;

(5) FIG. 4 is a schematic diagram of circuit connection of an IT equipment container, an air-cooling equipment container, a hydraulic equipment container, a heat dissipation equipment container, a power distribution equipment container, a transformer equipment container, a standby power equipment container, a network equipment container, an administrative and auxiliary equipment container of a data center provided by an example embodiment of the disclosure;

(6) FIG. 5 is the layout diagram of each container in a data center provided by an example embodiment of the present disclosure;

(7) FIG. 6 is a plan diagram of the IT equipment container in a data center provided by an example embodiment of the present disclosure;

(8) FIG. 7 is a plan diagram of an air-cooling equipment container in a data center provided by an example embodiment of the present disclosure;

(9) FIG. 8 is a plan diagram of a heat dissipation equipment container in a data center provided by an example embodiment of the present disclosure;

(10) FIG. 9 is a plan diagram of a hydraulic equipment container in a data center provided by an example embodiment of the present disclosure;

(11) FIG. 10 is a plan diagram of a hydraulic equipment container in a data center provided by another example embodiment of the present disclosure;

(12) FIG. 11 is a plan diagram of a power distribution equipment container in a data center provided by an example embodiment of the present disclosure;

(13) FIG. 12 is a plan diagram of a transformer equipment container in a data center provided by an example embodiment of the present disclosure;

(14) FIG. 13 is a plan diagram of the standby power equipment container in the data center provided by an example embodiment of the present disclosure;

(15) FIG. 14 is a plan diagram of a network equipment container in a data center provided by an example embodiment of the present disclosure;

(16) FIG. 15 is a plan diagram of an administrative and auxiliary equipment container in a data center provided by an example embodiment of the present disclosure.

DESCRIPTION OF SYMBOLS

(17) **1**—Data center; **10**—IT equipment container; **11**—server rack; **12**—IT coolant inlet port; **13**—

IT coolant outlet port; **14**—IT air inlet port; **15**—IT air outlet port; **16**—Coolant inlet pipe; **161**—First sub coolant inlet pipe; **162**—Second sub coolant inlet pipe; **17**—Coolant outlet pipe; **171**—First sub coolant outlet pipe; **172**—Second sub coolant outlet pipe; **180**—Air duct; **181**—Smoke vent; **182**—IT power input port; **1820**—First cable; **183**—Power distribution cabinet; **19**—Second liquid-liquid heat exchanger; **20**—Air-cooling equipment container; **21**—Air-cooling equipment; **210**—Air-liquid heat exchanger; **220**—fan; **22**—Air-cooling air inlet port; **23**—Air-cooling air outlet port; **24**—Air-cooling coolant inlet port; **25**—Air-cooling coolant outlet port; **26**—Heat exchange liquid inlet pipe; **27**—Heat exchange outlet pipe; **28**—Air-cooling power input port; **280**—Sixth cable; **30**—Heat dissipation equipment container; **300**—Heat dissipation power input port; **31**—Heat dissipation equipment; **310**—Open cooling tower; **320**—Closed cooling tower; **330**—First air conditioning unit; **340**—Supplementary cooling machine; **32**—Heat dissipation coolant inlet port; **33**—Heat dissipation coolant outlet port; **34**—Heat dissipation pipe; **40**—Hydraulic equipment container; **410** Hydraulic power input port; **400**—First liquid-liquid heat exchanger; **401**—First water pump; **402**—Second water pump; **41**—First hydraulic coolant inlet port; **42**—Second hydraulic coolant inlet port; **43**—First hydraulic coolant outlet port; **44**—Second hydraulic coolant outlet port; **45**—First pipe; **46**—Second pipe; **47**—Third pipe; **48**—Fourth pipe; **49**—Fifth pipe; **50**—water pump; **51**—Hydraulic coolant inlet port; **52**—Hydraulic coolant outlet port; **60**—Power distribution equipment container; **600**—Power distribution equipment; **61**—First power distribution input port; **62**—Second power distribution input port; **63**—Power distribution output port; **70**—Transformer equipment container; **700**—Transformer equipment; **701**—Transformer input port; **702**—Transformer output port; **80**—Standby power equipment Container; **81**—Generator; **82**—Standby power output port; **90**—Network equipment container; **91**—Network power input port; **100**—Administrative and auxiliary equipment container; **101**—Fire-fighting equipment; **102** weak current room; **103**—Central control room; **104**—Office; **105**—Administrative power input port.

DETAILED DESCRIPTION

(18) The specific embodiments of the present disclosure are described in detail below in combination with the accompanying drawings. It should be understood that the specific implementation mode described here is only used to explain and interpret the disclosure and is not used to limit the disclosure.

(19) In the present disclosure, without any explanation to the contrary, “connection” means that the corresponding devices can be connected directly or indirectly, “dock” means that the corresponding devices can be connected directly, and “inside” or “outside” means the inside or outside of the corresponding structure or component outline; “far” and “near” indicate the relative distance of the respective structures or components being far or near.

(20) Referring to FIGS. **1** to **15**, to achieve the above purpose, the present disclosure provides a data center **1**, including an IT equipment container **10** and an air-cooling equipment container **20**, wherein the IT equipment container **10** is provided with a server rack **11** therein, the IT equipment container **10** has an IT coolant inlet port **12**, an IT coolant outlet port **13**, an IT air inlet port **14** and an IT air outlet port **15**, and the IT equipment container **10** is prefabricated with a coolant inlet pipe **16** connecting the IT coolant inlet port **12** to a coolant inlet of the server rack **11**, a coolant outlet pipe **17** connecting the IT coolant outlet port **13** to a coolant outlet of the server rack **11**, and an air duct **180** connecting the IT air outlet port **15** to an air outlet of the server rack **11**, and the IT air inlet port **14** is connected to inside of the IT equipment container **10**; an air-cooling equipment container **20** is provided with air-cooling equipment **21** therein, the air-cooling equipment container **20** has an air-cooling air inlet port **22** and an air-cooling air outlet port **23**, the air-cooling air inlet port **22** is docked with the IT air outlet port **15**, the air-cooling air outlet port **23** is docked with the IT air inlet port **14**, and the air-cooling equipment **21** is for cooling air flowing in from the air-cooling air inlet port **22**, so that a temperature of air flowing out of the air-cooling air outlet port **23** can be lower than a temperature of the air flowing in from the air-cooling air inlet port **22**.

(21) Through the above technical solution, the IT equipment container **10** and the air-cooling equipment container **20** can be prefabricated in advance at the factory prior to constructing the data center. That is, server racks **11** are integrated into the IT equipment container **10**, and air-cooling equipment **21** is integrated into the air-cooling equipment container **20**. During construction phase of the data center **1**, the prefabricated IT equipment container **10** and air-cooling equipment container **20** can be directly transported to the designated construction site, Installation for the IT equipment container **10** and air-cooling equipment container **20** is achieved by directly connecting the air-cooling air inlet port **22** outside the air-cooling equipment container **20** to the IT air outlet port **15** outside the IT equipment container **10**, connecting the air-cooling air outlet port **23** outside the air-cooling equipment container **20** to the IT air inlet port **14** outside the IT equipment container **10**, and connecting the IT coolant inlet port **12** and IT coolant outlet port **13** to the corresponding coolant supply equipment, Consequently, the deployment and delivery of the data center **1** can be swiftly and efficiently executed, thereby reducing the construction period, and mitigating the associated carbon emissions caused during the construction of the data center **1**.

(22) Additionally, in the prior art, the data center's machine room is typically provided with both server racks and air-cooling equipment, such as air conditioning units, which achieve cooling by circulating air to the server racks through the cooling equipment. However, when both the server racks and air-cooling equipment occupy the same space, the installation area of the server racks is occupied by the air-cooling equipment, leading to a reduced density of server rack placements and reduced number of the server racks provided therein. Furthermore, the cooling capacity of air-cooling equipment for the server racks is limited. As the number and density of server racks increase, the air-cooling equipment becomes insufficient to effectively cool the server racks. Consequently, there might be a need to boost the power of the air-cooling equipment or increase their quantity, resulting in a higher Power Usage Effectiveness (PUE).

(23) In the present disclosure, firstly, the air-cooling equipment **21** and the server rack **11** are respectively set in separate containers. That is, the air-cooling equipment **21** and the server rack **11** are not integrated in the same container. Therefore, the issue of the air-cooling equipment **21** encroaching upon the installation space of the server rack **11** is circumvented. This facilitates the accommodation of a larger number of server rack **11** within the IT equipment container **10**, realizing the high-density layout of the server rack **11**.

(24) Secondly, since the IT equipment container **10** not only has the IT air inlet port **14** and the IT air outlet port **15**, but also has IT coolant inlet port **12** and IT coolant outlet port **13**. This allows for simultaneous liquid cooling and air-cooling of the server rack **11** within IT equipment container **10** during cooling and heat dissipation of the server rack **11**.

(25) Specifically, cryogenic coolant can enter the coolant inlet pipe **16** from the IT coolant inlet port **12**, and enter the server rack **11** through the coolant inlet pipe **16**. After heat exchange with the servers in the server rack **11**, the coolant flows from the coolant outlet of the server rack **11** into the coolant outlet pipe **17**, and then flows out through the IT coolant outlet port **13**, thereby to dissipate heat generated by the servers outside of the IT equipment container **10**. At the same time of liquid cooling the server through coolant, the air-cooling equipment **21** in the air-cooling equipment container **20** operates, and the cold air flows from the air-cooling air outlet port **23** on the air-cooling equipment container **20** to the IT equipment container **10** through the IT air inlet port **14** on the IT equipment container **10**. When the cold air flows through the server rack **11**, it exchanges heat with the server rack **11** and turns into hot air. The hot air enters the air duct **180** and flows back to the air-cooling equipment container through the IT air outlet port **15** and the air-cooling inlet port **22**. After the hot air flowed back into the air-cooling equipment container **20** is cooled by the air-cooling equipment **21**, it turns into cold air and is blown back to the server rack **11** again to cool the server. In this way, the server rack **11** can be cooled and dissipated by the above two ways of air-cooling and liquid cooling, which has higher cooling efficiency and better cooling effect. It can allow more server rack **11** to be provided in the IT equipment container **10**, that is, it can allow

high-density server rack **11** to be arranged in the IT equipment container **10**.

(26) Here, it should be noted that the IT coolant inlet port **12** and the IT coolant outlet port **13** of the IT equipment container **10** can be connected to any coolant supply equipment that can provide low-temperature coolant, for example, the IT coolant inlet port **12** and the IT coolant outlet port **13** can be connected to a cooling tower, an air conditioning refrigeration unit, a cold water source, etc. In short, as long as low-temperature coolant can be provided, the present disclosure does not limit this.

(27) In addition, in order to further reduce the cooling cost of the data center **1**, the coolant mentioned above can be water, which is cheap, easy to supply, and will not pollute the atmospheric environment during the heat exchange process. Of course, the above coolant can also be any other suitable coolant (such as refrigerant), which is not limited by the present disclosure.

(28) Optionally, to facilitate the docking (that is, direct connection) of the IT air inlet port **14**, the IT air outlet port **15** with the air-cooling air inlet port **22**, air-cooling air outlet port **23**, so as to improve construction speed of the data center **1**, the IT air inlet port **14**, the IT air outlet port **15** can be provided on the same side of the IT equipment container **10**. The air-cooling air inlet port **22** and the air-cooling air outlet port **23** can also be provided on the same side of the air-cooling equipment container **20**, so as to facilitate docking of the IT air inlet port **14**, the IT air outlet port **15** with air-cooling air inlet port **22** and air-cooling air outlet port **23**.

(29) The above air-cooling equipment **21** can be any suitable air-cooling equipment that can provide cold air, for example, an air conditioning cooling unit. For embodiments where the air-cooling equipment is an air conditioning cooling unit, the air flow from the air-cooling inlet port **22** can flow through an evaporator in the air conditioning cooling unit and then flow out of the air-cooling outlet port **23**. The low-temperature refrigerant in the evaporator can absorb the heat of the air flowing in from the air-cooling inlet port **22** and reduce the air temperature.

(30) In another embodiment provided by the present disclosure, as shown in FIGS. **1** to **4** and **7**, optionally, the air-cooling equipment **21** may comprise an air-liquid heat exchanger **210** and a fan **220**. The air-cooling equipment container **20** has an air-cooling coolant inlet port **24** and an air-cooling coolant outlet port **25**. The air-cooling equipment container **20** is prefabricated with a heat exchange inlet pipe **26** connecting the air-cooling coolant inlet port **24** and a coolant inlet of the air-liquid heat exchanger **210**, and a heat exchange outlet pipe **27** connecting the air-cooling coolant outlet port **25** and a coolant outlet of the air-liquid heat exchanger **210**. The fan **220** is used to causing the air flowing in from the air-cooling inlet port **22** to pass through the air-liquid heat exchanger **210** and flows out from the air-cooling outlet port **23**. During the cooling of the server rack **11**, the cooler coolant flows into the air-liquid heat exchanger **210**. When the fan **220** is running, the hot air flowing out of the IT equipment container **10** enters the air-cooling equipment container **20** through the air-cooling air inlet port **22**, and is blown to the air-liquid heat exchanger **210** by the fan **220**. The hot air exchanges heat with the coolant in the air-liquid heat exchanger **210**, so that the temperature of the hot air that absorbs heat in the IT equipment container **10** decreases, and the air that turns into low-temperature air is blown from the air-cooling air outlet port **23** to the server rack **11** in the IT equipment container **10** again to continue cooling the server and realize air-cooling of the server. The low-temperature coolant after absorbing the heat of the server turns into high temperature coolant, and flows out from the air-cooling coolant outlet port **25** of the air-cooling equipment container **20** to realize the continuous cooling of the server.

(31) Since the air-liquid heat exchanger **210**, the fan **220**, the heat exchange inlet pipe **26** and the heat exchange outlet pipe **27** have been integrated into the air-cooling equipment container **20** in the factory, during construction of the data center **1**, there is no need to assemble the air-liquid heat exchanger **210**, the fan **220**, the heat exchange inlet pipe **26** and the heat exchange outlet pipe **27** at the construction site, only the air-cooling coolant inlet port **24** and air-cooling coolant outlet port **25** need to be connected to the coolant supply equipment (such as the cooling tower) used to supply coolant to the air-liquid heat exchanger **210**, so that flexible and rapid deployment of the data

center **1** can be achieved.

(32) Here, the present disclosure does not limit the coolant supply equipment connected to the air-cooling coolant inlet port **24** and the air-cooling coolant outlet port **25**, as long as it can provide low-temperature coolant to the air-liquid heat exchanger **210**.

(33) Optionally, to provide cryogenic coolant to the air-liquid heat exchanger **210** and the server rack **11**, and further improve construction speed of the data center **1** on this basis, as shown in FIG. **8**, the data center **1** may also comprise a cooling equipment container **30**, in which cooling equipment **31** is provided. The cooling equipment container **30** has a heat dissipation coolant inlet port **32** and a heat dissipation coolant outlet port **33**. The cooling equipment container **30** is prefabricated with a cooling pipe **34** connecting the cooling equipment **31** to the heat dissipation coolant inlet port **32** and the heat dissipation coolant outlet port **33**. The heat dissipation coolant inlet port **32** is connected to the IT coolant outlet port **13** and the air-cooling coolant outlet port **25**, the heat dissipation coolant outlet port **33** is connected to the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**, and the heat dissipation equipment **31** is used to cause a temperature of the coolant flowing out of the heat dissipation coolant outlet port **33** to be lower than a temperature of the coolant flowing in from the heat dissipation coolant inlet port **32**.

(34) In this way, the high-temperature coolant flowing through the server rack **11** and the high-temperature coolant flowing out of the air-liquid heat exchanger **210** enter the cooling equipment **31** through the heat dissipation coolant inlet port **32** of the cooling equipment container **30**. After the cooling equipment **31** dissipates the heat of the high-temperature coolant into the low-temperature coolant, a part of the low-temperature coolant flows back into the server rack **11** from the heat dissipation coolant outlet port **33** through the IT coolant inlet port **12**, and the other part of the low-temperature coolant flows back into the air-liquid heat exchanger **210** from the heat dissipation coolant outlet port **33** through the air-cooling coolant inlet port **24**, realizing the uninterrupted cooling and heat dissipation of the server rack **11**.

(35) Since the heat dissipation equipment **31** is also integrated into the heat dissipation equipment container **30** in the factory manufacturing phase, when constructing the data center **1**, the heat dissipation equipment container **30** can be directly transported to the designated construction site, and the heat dissipation equipment container **30** can be directly connected to the IT equipment container **10** and the air-cooling equipment container **20**, so that the rapid deployment and delivery of the data center **1** can be achieved, the construction cycle can be shortened, and the related carbon emissions caused during the construction of the data center **1** can be reduced.

(36) The heat dissipation equipment **31** may be any device that can reduce the temperature of the coolant and provide low-temperature coolant for the server rack **11** and the air-liquid heat exchanger **210**. For example, the heat dissipation equipment **31** may comprise a cooling tower and/or the first air conditioning unit **330**.

(37) For embodiments of the heat dissipation equipment **31** including a cooling tower, the cooling tower may be an open cooling tower **310**, a closed cooling tower **320**, a natural draft cooling tower, a mechanical draft cooling tower, a mixed draft cooling tower, a wet cooling tower, a dry cooling tower, a dry wet cooling tower, etc. The specific type, quantity, size, shape, etc. of the cooling tower are not limited in the present disclosure. Since the cooling tower is an apparatus that discharges absorbed heat into the atmosphere to reduce the temperature of the coolant, its cooling principle is to reduce the water temperature by making use of the principle of cold and heat exchange to generate steam after the coolant contacts the air flow, and the steam volatilization takes away heat to achieve evaporative heat dissipation, convective heat transfer, radiation heat transfer and other principles. Therefore, for the condition that the cooling tower provides low-temperature coolant to the server rack **11** and the air-liquid heat exchanger **210**, the setting of the cooling tower can help reduce the total energy consumption of the data center, thereby reducing the PUE of the data center, and thus reducing carbon emissions. Moreover, since the cooling temperature of the cooling tower is related to the wet bulb temperature of the environment in which the cooling tower

is located, rather than the dry bulb temperature (i.e. the ambient temperature) of the environment in which the cooling tower is located, and the wet bulb temperature in most regions of the world can meet the demand for the temperature of the coolant flowing out of the cooling tower's coolant outlet, the cooling system of the data center provided by the present disclosure can be applied to most regions of the world without being easily restricted by the regional ambient temperature.

(38) For embodiments of the heat dissipation equipment **31** including the first air conditioning unit **330**, the first air conditioning unit **330** can comprise a compressor, a condenser, an expansion valve and a heat exchanger which are connected in series to form a circuit in turn. The coolant inlet and outlet of the heat exchanger are respectively connected to the heat dissipation coolant inlet port **32** and the heat dissipation coolant outlet port **33**. In this way, the low-temperature refrigerant after throttling and depressurizing by the expansion valve can flow into the heat exchanger to exchange heat with the coolant in the heat exchanger to absorb the heat of the coolant, so that the coolant with reduced temperature flows out of the heat dissipation coolant outlet port **33** and flows to the server rack **11** and the air-liquid heat exchanger **210**.

(39) For embodiments where the heat dissipation equipment **31** comprises a cooling tower and/or the first air conditioning unit **330**, it can be understood that according to the current temperature or cooling demand of the server rack **11**, the cooling capacity of the coolant flowing to the server rack **11** and the air-liquid heat exchanger **210** can be provided by the cooling tower, or by the first air conditioning unit **330**, or by the cooling tower and the first air conditioning unit **330** together.

(40) For embodiments where the cooling tower is an open cooling tower **310**, optionally, the data center **1** may also comprise a hydraulic equipment container **40**, as shown in FIG. **9**, the hydraulic equipment container **40** is provided with a first liquid-liquid heat exchanger **400**, a first water pump **401**, and a second water pump **402** therein. The hydraulic equipment container **40** has a first hydraulic coolant inlet port **41**, a second hydraulic coolant inlet port **42**, a first hydraulic coolant outlet port **43** and a second hydraulic coolant outlet port **44**. The hydraulic equipment container **40** is prefabricated with a first pipe **45** connecting the first coolant inlet of the first liquid-liquid heat exchanger **400** to the first hydraulic coolant inlet port **41**, a second pipe **46** connecting the first coolant outlet of the first liquid-liquid heat exchanger **400** to the first hydraulic coolant outlet port **43**, a third pipe **47** connecting the second coolant inlet of the first liquid-liquid heat exchanger **400** to the second hydraulic coolant inlet port **42**, and a fourth pipe **48** connecting the second coolant outlet of the first liquid-liquid heat exchanger **400** to the second hydraulic coolant outlet port **44**. The first hydraulic coolant inlet port **41** is connected to the heat dissipation coolant outlet port **33**, and the first hydraulic coolant outlet port **43** is connected to the heat dissipation coolant inlet port **32**, the second hydraulic coolant inlet port **42** is docked with the IT coolant outlet port **13** and the air-cooling coolant outlet port **25**, the second hydraulic coolant outlet port **44** is docked with the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**. The first water pump **401** is arranged on the first pipe **45** and/or the second pipe **46**; the second water pump **402** is arranged on the third pipe **47** and/or the fourth pipe **48**.

(41) Since the coolant of the open cooling tower **310** will be exposed to the external environment during operation, which will affect the cleanliness of the coolant, in order to prevent the coolant with lower cleanliness from entering the server rack **11**, the first liquid-liquid heat exchanger **400** is provided in the hydraulic equipment container **40** above. In this way, if the cooling tower is an open cooling tower **310**, the low-temperature coolant flows into the first liquid-liquid heat exchanger **400** from the heat dissipation coolant outlet port **33** through the first hydraulic coolant inlet port **41**, and returns to the open cooling tower **310** from the first coolant outlet of the first liquid-liquid heat exchanger **400** through the heat dissipation coolant inlet port **32**. At the same time, the high-temperature coolant flows out from the coolant outlet of the server rack **11** and the coolant outlet of the air-liquid heat exchanger **210**, and flows into the first liquid-liquid heat exchanger **400** from the IT coolant outlet port **13** and the air-cooling coolant outlet port **25** through the second hydraulic coolant inlet port **42**, respectively. After the high-temperature coolant flowing

into the first liquid-liquid heat exchanger **400** exchanges heat with the low-temperature coolant in the first liquid-liquid heat exchanger **400**, it flows, from the second hydraulic coolant outlet port **44**, into the IT equipment container **10** through the IT coolant inlet port **12** and into the air-cooling equipment container **20** through the air-cooling coolant inlet port **24**, respectively. While after the low-temperature coolant flowing out of the open cooling tower **310** exchanges heat with the high-temperature coolant, it turns into the high-temperature coolant and flows back to the open cooling tower **310** through the heat dissipation coolant inlet port **32**, and discharges the heat to the atmosphere. That is to say, by setting the first liquid-liquid heat exchanger **400**, it is possible to prevent the coolant with lower cleanliness flowing out of the open cooling tower **310** from directly entering the server rack **11** and the air-liquid heat exchanger **210**, so as to avoid affecting the server rack **11** and the air-liquid heat exchanger **210**.

(42) In the above cycle heat exchange process, the first water pump **401** can provide driving force for the flow of coolant between the open cooling tower **310** and the first liquid-liquid heat exchanger **400**, so that the coolant can circulate between the first liquid-liquid heat exchanger **400** and the open cooling tower **310**. The second water pump **402** can provide driving force for the flow of coolant between the first liquid-liquid heat exchanger **400** and the server rack **11** and the air-liquid heat exchanger **210**, so that the coolant can circulate between the first liquid-liquid heat exchanger **400**, the server rack **11** and the air-liquid heat exchanger **210**.

(43) Here, the rotational speeds of the first water pump **401** and the second water pump **402** can be adjusted to match the cooling and heat dissipation requirements of the server rack **11**. Specifically, when the heat dissipation requirements of the server rack **11** increase, the rotational speeds of the first water pump **401** and the second water pump **402** can be correspondingly increased. In this way, a larger amount of coolant can be exchanged with the server rack **11** per unit time to improve the heat exchange efficiency with the server rack **11**. When the heat dissipation requirements of the server rack **11** decrease, the rotational speeds of the first water pump **401** and the second water pump **402** can be correspondingly reduced, which can meet the heat dissipation requirements of the server rack **11**, and reduce the energy consumption of the first water pump **401** and the second water pump **402**. The number of the first water pump **401**, the second water pump **402** and the first liquid-liquid heat exchanger **400** can be one or more, and the present disclosure does not specifically limit this.

(44) In addition, when the second hydraulic coolant inlet port **42** is docked with the IT coolant outlet port **13** and the air-cooling coolant outlet port **25**, and the second hydraulic coolant outlet port **44** is docked with the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**, the second hydraulic coolant inlet port **42** and the second hydraulic coolant outlet port **44** may be three-way connections, so that the second hydraulic coolant inlet port **42** can be directly docked with the IT coolant outlet port **13** and the air-cooling coolant outlet port **25**, and the second hydraulic coolant outlet port **44** can be directly docked with the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**.

(45) For embodiments where the cooling tower is a closed cooling tower **320**, optionally, as shown in FIG. **10**, the data center **1** may also comprise a hydraulic equipment container **40**, which is provided with a water pump **50**. The hydraulic equipment container **40** has a hydraulic coolant inlet port **51** and a hydraulic coolant outlet port **52**. The hydraulic equipment container **40** is prefabricated with a fifth pipeline **49** connecting the water pump **50** to the water coolant inlet port **51** and the water coolant outlet port **52**. The hydraulic coolant inlet port **51** is connected to the heat dissipation coolant outlet port **33**, and the hydraulic coolant outlet port **52** is docked with the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**. In this way, during the cooling of the server rack **11**, the water pump **50** can provide driving force for the coolant, so that the coolant flowing from the hydraulic coolant outlet port **52** can flow to the IT coolant inlet port **12** and the air-cooling coolant inlet port **24**. As the closed cooling tower **320** is fully enclosed during the process of cooling coolant, the coolant is not easy to be contaminated by sundries, and the

cleanliness of the coolant is high. The coolant from the closed cooling tower **320** can directly flow into the server rack **11** and the air-liquid heat exchanger **210**.

(46) In the above embodiment with the hydraulic equipment container **40**, the water pump **50** or the first liquid-liquid heat exchanger **400** is integrated into the hydraulic equipment container **40** in advance in the factory. When constructing the data center **1**, it is only necessary to connect the hydraulic equipment container **40** with the IT equipment container **10**, the air-cooling equipment container **20**, and the heat dissipation equipment container **30**.

(47) In addition, optionally, the IT equipment container **10** may also be provided with a cooling capacity distribution unit, as shown in FIG. **1**, FIG. **2**, FIG. **3** and FIG. **6**. The cooling capacity distribution unit comprises a second liquid-liquid heat exchanger **19**, the coolant inlet pipe **16** comprises a first sub coolant inlet pipe **161** and a second sub coolant inlet pipe **162**, and the coolant outlet pipe **17** comprises a first sub coolant outlet pipe **171** and a second sub coolant outlet pipe **172**. The first sub coolant inlet pipe **161** connects the IT coolant inlet port **12** to the first coolant inlet of the second liquid-liquid heat exchanger **19**. The second sub coolant inlet pipe **162** connects the first coolant outlet of the second liquid-liquid heat exchanger **19** to the coolant inlet of the server rack **11**. The first sub coolant outlet pipe **171** connects the IT coolant outlet port **13** to the second coolant outlet of the second liquid-liquid heat exchanger **19**. The second sub coolant outlet pipe **172** connects the second coolant inlet of the second liquid-liquid heat exchanger **19** to the coolant outlet of the server rack **11**.

(48) By providing the second liquid-liquid heat exchanger **19**, the coolant flowing out of the heat dissipation equipment **31** will not directly flow into the interior of the server rack **11**, so it will not pollute the operating environment of the server rack **11** to ensure the operating environment of the server rack **11**.

(49) In addition, since the server rack **11** has high requirements for the cleanliness of the coolant, optionally, the cooling capacity distribution unit may also comprise at least one of a filtering device, a sterilization device, and a descaling device. The filtering device, the sterilization device, or the descaling device can be arranged on the second sub coolant inlet pipe **162**. By providing a filtering device, a sterilization device, or a descaling device at the second sub coolant inlet pipe **162**, the cleanness of the coolant circulating in the server rack **11** can be improved, the blockage and unsmooth flow of the coolant in the pipe can be avoided or reduced, and the heat dissipation efficiency and effect of the server rack **11** can be further improved.

(50) Optionally, as shown in FIG. **6**, the server rack **11** may be multiple in number, and multiple server racks **11** can be connected in parallel with each other, so that the coolant flowing out of the second sub coolant inlet pipe **162** can be divided into multiple strands and flow to different server racks **11**.

(51) In addition, in the case of multiple server racks **11**, the air outlet of one server rack **11** can be set opposite to the air outlet of the other server rack **11**, and the air outlets of the two server racks **11** are located between the air inlets of the two server racks **11**, so as to facilitate the layout of the air duct **180** connected to the air outlets of the server racks **11**.

(52) Optionally, as shown in FIG. **6**, the IT equipment container **10** may also have a smoke vent **181**. By providing smoke vent **181**, in case of fire, the smoke vent **181** can exhaust smoke and heat generated in IT equipment container **10** to the outside through the smoke vent **181**, and can form negative pressure in the fire area to prevent smoke from spreading to other areas.

(53) In addition, to supply power to server racks **11** and other equipment, a distribution equipment container **60** and a transformer equipment container **70** can be prefabricated in advance in the factory.

(54) As an implementation, the IT equipment container **10** is also provided with a power distribution cabinet **183** therein. The IT equipment container **10** has an IT power input port **182**, and the IT equipment container **10** is prefabricated with a first cable **1820** connecting the IT power input port **182** to the power distribution cabinet **183**. The data center **1** further comprises a power

distribution equipment container **60** and a transformer equipment container **70**. The power distribution equipment container **60** is provided with a power distribution equipment **600** therein. The power distribution equipment container **60** has a first power distribution input port **61** and a power distribution output port **63**. The power distribution equipment container **60** is prefabricated with a second cable connecting the power distribution equipment **600** to the first power distribution input port **61** and the power distribution output port **63**. The transformer equipment container **70** is provided with a transformer equipment **700**. The transformer equipment container **70** has a transformer input port **701** and a transformer output port **702**. The transformer equipment container **70** is prefabricated with a third cable connecting the transformer equipment **700** to the transformer input port **701** and the transformer output port **702**. The first distribution input port **61** is used to be connected to a municipal power grid. The distribution output port **63** is connected to the transformation input port **701**, and the transformation output port **702** is connected to the IT power input port **182**. The municipal power grid is connected to the first power distribution input port **61** on the power distribution equipment container **60**. The current can be introduced to the power distribution equipment **600** through the second cable and exported from the power distribution output port **63** through the second cable. The power distribution output port **63** is connected to the transformer input port **701**.

(55) In this way, current provided by the municipal power grid can enter the transformer equipment **700** after being distributed by the power distribution equipment **600**, and then enter the IT equipment container **10** through the transformer output port **702** and IT power input port **182** after voltage reduction by the transformer equipment **700**, so as to realize the power supply to the server rack **11**.

(56) Since the power distribution equipment **600** and the transformer equipment **700** have been prefabricated into the power distribution equipment container **60** and the transformer equipment container **70** in the factory in advance, when constructing the data center **1**, only the electrical connection relationship between the power distribution equipment container **60**, the transformer equipment container **70** and the equipment requiring power supply (such as the IT equipment container **10**) needs to be established to complete the power supply layout, greatly reducing construction time of the data center **1**.

(57) It can be understood that in the case of multiple IT equipment containers **10**, a plurality of transformer output ports **702** can be formed on the transformer equipment container **70**, and each IT equipment container **10** can be connected to the corresponding transformer output port **702**.

(58) Optionally, the power distribution equipment **600** may comprise a medium voltage power distribution cabinet, and the transformer equipment **700** may comprise a transformer, an UPS, a battery, a power distribution cabinet, etc.

(59) In addition, to ensure that the data center **1** can still operate normally when the municipal power grid is cut off, the data center **1** can optionally comprise a standby power equipment container **80**, as shown in FIGS. **4** and **13**. The standby power equipment container **80** is equipped with a generator **81** therein. The standby power equipment container **80** has a standby output port **82**, and the standby power equipment container **80** is prefabricated with a fourth cable connecting the generator **81** to the standby output port **82**. The power distribution equipment container **60** has a second power distribution input port **62**, the second cable connects the second power distribution input port **62** to the power distribution equipment **600**, and the standby power output port **82** is connected to the second power distribution input port **62**. When the municipal power grid is cut off, the standby power equipment container **80** can be used to supply power to each electrical equipment in the data center **1**. Specifically, the generator **81** in the standby power equipment container **80** generates power and transmits the generated current to the standby output port **82** through the fourth cable. Since the second distribution input port **62** is connected to the standby output port **82**, the power generated by the generator **81** can be transmitted to the power distribution equipment **600** through the second cable, and then output to each electrical equipment

(for example, the IT equipment container **10**) through the transformer equipment **700**.

(60) Optionally, as shown in FIG. **4** and FIG. **14**, the data center **1** may also comprise a network equipment container **90**, in which a network cabinet therein, a column head power distribution cabinet, a second air conditioning unit are provided. The network equipment container **90** has a network power input port **91**, and the network equipment container **90** is prefabricated with a fifth cable connecting the column head distribution cabinet to the network cabinet, the second air conditioning unit and the network power input port **91**. The network power input port **91** is connected to the transformer output port **702**. Thus, it is possible to supply power to the network cabinet, the column head distribution cabinet, the second air conditioning unit and other electric devices in the network equipment container **90**.

(61) In addition, as shown in FIG. **4**, a heat dissipation power input port **300** can be provided on the heat dissipation equipment container **30**, and connected to the transformer output port **702** to provide power for the cooling tower. The hydraulic equipment container **40** can be provided with a hydraulic power input port **410**, which is connected to the transformer output port **702** to provide power for the first pump **401** and the second pump **402**. An air-cooling power input port **28** can be provided on the air-cooling equipment container **20**, and connected to the transformer output port **702** to provide power for the fan **220** in the air-cooling equipment container **20**.

(62) Optionally, as shown in FIG. **4** and FIG. **15**, the data center **1** further comprises an administrative and auxiliary equipment container **100**, in which at least one of fire-fighting equipment **101**, a weak current room **102**, a central control room **103** and an office **104** is provided. Similarly, an administrative power input port **105** is also provided on the administrative and auxiliary equipment container **100**. The administrative power input port **105** can be connected to the transformer output port **702** to realize the power supply to the administrative and auxiliary equipment container **100**.

(63) Through the above technical solution, according to embodiments of the present disclosure, by integrating the server racks **11** into the IT equipment container **10**, integrating the equipment needed for cooling the server racks **11** into the air-cooling equipment container **20**, the hydraulic equipment container **40**, the heat dissipation equipment container **30**, integrating the equipment providing power into the power distribution equipment container **60**, the transformer equipment container **70**, the standby power equipment container **80**, and integrating the equipment providing network into the network equipment container **90**, etc, when constructing the data center **1**, it is only need to connect and install the respective containers to complete construction of the data center **1**, which can realize rapid deployment and flexible deployment of the data center **1**, shorten the construction cycle and the delivery time, and reduce the related carbon emissions generated during construction of the data center **1**. During the layout of respective containers in the data center **1**, as shown in FIG. **5**, the respective containers can be combined in any appropriate way. For example, as shown in FIG. **5**, the IT equipment container **10** can be multiple in number, and multiple IT equipment containers **10** are arranged in rows. The air-cooling equipment container **20**, the hydraulic equipment container **40**, the heat dissipation equipment container **30** can be located on one side of multiple IT equipment containers **10**, and the power distribution equipment container **60**, the transformer equipment container **70**, the standby power equipment container **80** and the administrative and auxiliary equipment container **100** are located on the other side of multiple IT equipment containers **10**. The network equipment container **90** can be located at both ends of multiple IT equipment containers **10**, and the air-cooling equipment container **20**, the hydraulic equipment container **40** and the IT equipment container **10** can be directly docked to each other to reduce the floor area. In addition, the transformer equipment container **70** can be arranged closer to the IT equipment container **10** than the power distribution equipment container **60**, the standby power equipment container **80**, and the administrative and auxiliary equipment container **100** to facilitate power supply to the server racks **11** in the IT equipment container **10**. The administrative and auxiliary equipment container **100** can be located between the transformer

equipment container **70** and the power distribution equipment container **60** and between the standby power equipment container **80** and the administrative and auxiliary equipment container **100**, so that it is convenient for the management personnel to inspect the IT equipment container **10**, the transformer equipment container **70**, the power distribution equipment container **60**, the standby power equipment container **80** and the administrative and auxiliary equipment container **100**.

(64) The preferred embodiments of the present disclosure are described in detail above in combination with the accompanying drawings. However, the present disclosure is not limited to the specific details of the above embodiments. Within the scope of the technical concept of the present disclosure, a variety of simple modifications can be made to the technical solution of the present disclosure, which all fall within the protection scope of the present disclosure.

(65) In addition, each specific technical feature described in the above specific embodiment can be combined in any suitable way without contradiction. In order to avoid unnecessary repetition, the disclosure will not describe various possible combination modes separately.

(66) In addition, various embodiments of the present disclosure can also be arbitrarily combined, and as long as they do not violate the ideas of the present disclosure, they should also be regarded as the contents disclosed by the present disclosure.

Claims

1. A data center, comprising: an IT equipment container provided with a server rack therein, the IT equipment container having an IT coolant inlet port, an IT coolant outlet port, an IT air inlet port and an IT air outlet port, and the IT equipment container being prefabricated with a coolant inlet pipe connecting the IT coolant inlet port to a coolant inlet of the server rack, a coolant outlet pipe connecting the IT coolant outlet port to a coolant outlet of the server rack, and an air duct connecting the IT air outlet port to an air outlet of the server rack, and the IT air inlet port being in communication with interior of the IT equipment container; an air-cooling equipment container provided with air-cooling equipment therein, the air-cooling equipment container having an air-cooling air inlet port and an air-cooling air outlet port, the air-cooling air inlet port being docked with the IT air outlet port, the air-cooling air outlet port being docked with the IT air inlet port, and the air-cooling equipment being adapted to cool air flowing in from the air-cooling air inlet port, so that a temperature of air flowing out of the air-cooling air outlet port is lower than a temperature of the air flowing in from the air-cooling air inlet port, wherein the air-cooling equipment comprises an air-liquid heat exchanger and a fan, the air-cooling equipment container has an air-cooling coolant inlet port and an air-cooling coolant outlet port, and the air-cooling equipment container is prefabricated with a heat exchange inlet pipe connecting the air-cooling coolant inlet port to a coolant inlet of the air-liquid heat exchanger, and a heat exchange outlet pipe connecting the air-cooling coolant outlet port and a coolant outlet of the air-liquid heat exchanger, the fan is adapted to cause air flowing in from the air-cooling inlet port to flow out of the air-cooling outlet port after passing through the air-liquid heat exchanger.

2. The data center according to claim 1, wherein the data center further comprises a heat dissipation equipment container, wherein the heat dissipation equipment container is provided with heat dissipation equipment therein, the heat dissipation equipment container has a heat dissipation coolant inlet port and a heat dissipation coolant outlet port, and the heat dissipation equipment container is prefabricated with a heat dissipation pipe connecting the heat dissipation equipment to the heat dissipation coolant inlet port and the heat dissipation coolant outlet port; wherein the heat dissipation coolant inlet port is connected to the IT coolant outlet port and the air-cooling coolant outlet port, the heat dissipation coolant outlet port is connected to the IT coolant inlet port and the air-cooling coolant inlet port, and the heat dissipation equipment is adapted to cause a temperature of coolant flowing out of the heat dissipation coolant outlet port to be lower than a temperature of

coolant flowing in from the heat dissipating coolant inlet port.

3. The data center according to claim 2, wherein the heat dissipation equipment comprises a cooling tower and/or a first air conditioning unit.

4. The data center according to claim 3, wherein the heat dissipation equipment comprises a cooling tower which is an open cooling tower; wherein the data center further comprises a hydraulic equipment container, which is provided with a first liquid-liquid heat exchanger, a first water pump and a second water pump therein; the hydraulic equipment container has a first hydraulic coolant inlet port, a second hydraulic coolant inlet port, and a first hydraulic coolant outlet port and a second hydraulic coolant outlet port, wherein the hydraulic equipment container is prefabricated with a first pipe connecting a first coolant inlet of the first liquid-liquid heat exchanger to the first hydraulic coolant inlet port, a second pipe connecting a first coolant outlet of the first liquid-liquid heat exchanger to the first hydraulic coolant outlet port, a third pipe connecting a second coolant inlet of the first liquid-liquid heat exchanger to the second hydraulic coolant inlet port, and a fourth pipe connecting a second coolant outlet of the first liquid-liquid heat exchanger to the second hydraulic coolant outlet port; wherein the first hydraulic coolant inlet port is connected to the heat dissipation coolant outlet port, the first hydraulic coolant outlet port is connected to the heat dissipation coolant inlet port, the second hydraulic coolant inlet port is docked with the IT coolant outlet port and the air-cooling coolant outlet port, and the second hydraulic coolant outlet port is docked with the IT coolant inlet port and the air-cooling coolant inlet port; wherein the first water pump is arranged on the first pipe and/or the second pipe; the second water pump is arranged on the third pipe and/or the fourth pipe.

5. The data center according to claim 3, wherein the heat dissipation equipment comprises a cooling tower which is a closed cooling tower; wherein the data center further comprises a hydraulic equipment container, which is provided with a water pump therein, the hydraulic equipment container has a hydraulic coolant inlet port and a hydraulic coolant outlet port, the hydraulic equipment container is prefabricated with a fifth pipe connecting the water pump to the hydraulic coolant inlet port and the hydraulic coolant outlet port; wherein the hydraulic coolant inlet port is connected to the heat dissipation coolant outlet port, and the hydraulic coolant outlet port is docked with the IT coolant inlet port and the air-cooling coolant inlet port.

6. The data center according to claim 1, wherein the IT equipment container is further provided with a cooling capacity distribution unit therein, the cooling capacity distribution unit comprises a second liquid-liquid heat exchanger, the coolant inlet pipe comprises a first sub coolant inlet pipe and a second sub coolant inlet pipe, and the coolant outlet pipe comprises a first sub coolant outlet pipe and a second sub coolant outlet pipe, the first sub coolant inlet pipe connects the IT coolant inlet port to a first coolant inlet of the second liquid-liquid heat exchanger, the second sub coolant inlet pipe connects a first coolant outlet of the second liquid-liquid heat exchanger to the coolant inlet of the server rack, and the first sub coolant outlet pipe connects the IT coolant outlet port to a second coolant outlet of the second liquid-liquid heat exchanger, and the second sub coolant outlet pipe connects a second coolant inlet of the second liquid-liquid heat exchanger to the coolant outlet of the server rack.

7. The data center according to claim 1, wherein the IT equipment container further has a smoke vent.

8. The data center according to claim 1, wherein the IT equipment container is provided with a power distribution cabinet therein, the IT equipment container has an IT power input port, and the IT equipment container is prefabricated with a first cable connecting the IT power input port to the power distribution cabinet; wherein the data center further comprises a power distribution equipment container and a transformer equipment container, the power distribution equipment container is provided with power distribution equipment therein, the power distribution equipment container has a first power distribution input port and a power distribution output port, and the power distribution equipment container is prefabricated with a second cable connecting the power

distribution equipment to the first power distribution input port and the power distribution output port, the transformer equipment container is provided with a transformer equipment therein, the transformer equipment container has a transformer input port and a transformer output port, and the transformer equipment container is prefabricated with a third cable connecting the transformer equipment to the transformer input port and the transformer output port; wherein the first power distribution input port is adapted to be connected to a municipal power grid, the power distribution output port is connected to the transformer input port, and the transformer output port is connected to the IT power input port.

9. The data center according to claim 8, wherein the data center further comprises a standby power equipment container, wherein the standby power equipment container is provided with a generator therein, the standby power equipment container has a standby output port, and the standby power equipment container is prefabricated with a fourth cable connecting the generator to the standby output port; wherein the power distribution equipment container has a second power distribution input port, the second cable connects the second power distribution input port to the power distribution equipment, and the standby power output port is connected to the second power distribution input port.

10. The data center according to claim 8, wherein the data center further comprises a network equipment container, wherein the network equipment container has a network power input port, and wherein the network power input port is connected to the transformer output port.

11. The data center according to claim 1, wherein the data center further comprises an administrative and auxiliary equipment container, in which at least one of fire-fighting equipment, a weak current room, a central control room and an office is provided.
