

SPECIFICATION

TITLE OF THE INVENTION

CONTAINER-TYPE DATACENTER

5

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims priority from Japanese Patent Application No. 2011-120028 filed on May 30, 2011, the content of which is hereby incorporated by reference into this application.

10

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a technique regarding a configuration of a datacenter. More particularly, the present invention relates to a technique effectively applied to a so-called container-type datacenter in which a device such as a server is installed in a transportable structure such as a cargo-transport container.

15

BACKGROUND OF THE INVENTION

In recent years, as development of use of IT techniques by companies or others, modes have been taken in many cases, in which a lot of IT devices such as a computer device such as a server, a network device, or others regarding an information processing system for business use are intensively arranged in a datacenter, and are collectively operationally managed. These modes include, for example, : a mode of independent operational management by a company itself; a mode of outsourcing operational management to an IT vendor or others; a mode of a cloud computing service which provides an IT resource owned and operationally managed by an IT vendor or others to a user as required; and others. Also, regarding a datacenter, there are modes including: a mode of owning the datacenter by a company itself; a mode of rooming a space in a

20

25

30

datacenter owned and operationally managed by an IT vendor or others; and others.

As a datacenter used in various modes as described above, a dedicated large-scale establishment is mainly used for storing various facilities (for example, a redundant power supply facility, a network line, a cooling and heat exhausting facility such as an air conditioner, a floor layout suitable for arranging devices, an aseismic structure, a security facility, and others) for stably operating a lot of IT devices.

On the other hand, in order to satisfy the needs such as desirably installing the datacenter more simply and quickly, use of a small/transportable datacenter such as a so-called container-type datacenter has been expanded, the container-type datacenter being able to function as a datacenter with one container by installing a server device, a network device, and facility components in a datacenter such as a power supply device and an air conditioner in a cargo-transport container or others. For example, US Patent No. 7278273 (Patent Document 1) describes a module-type datacenter configured with one or more modules on which a plurality of computers are mounted and an air-conditioning system for cooling in a cargo-transport container or others.

Also, for example, Japanese Patent Application Laid-Open Publication No. 2003-177836 (Patent Document 2) describes a transportable computer room which is configured with a cuboid-shaped room box and various devices in the room box, and which includes: an electromagnetic shield provided on a sidewall and a top panel of the room box; a vibration suppressing leg attached to a back surface of a floor of the room box; an entry system attached to a lateral side of a door for room-entering/leaving management and security management; a power supply device which provides a direct-current power supply for operating a server; a wiring panel to which a terminal device is connected; an optical access device

which converts an optical signal inputted from an outside via an optical fiber into an electrical signal and outputs the signal to the server; and a video monitoring device which always takes an image of the room inside, so that the computer room can be easily installed and can be immediately used from a day of the installation.

Such a transportable datacenter (hereinafter, totally referred to as "container-type datacenter") has advantages that it can be easily and quickly constructed in a short period of time at a low cost, and that there is less limitation of an installing location or others because of the portability. Further, it also has an advantage that, by adopting a building block method of combining a plurality of containers, additional installation and removal in each container unit can be easily performed to result in the improvement of expandability/flexibility as avoiding the wasteful investment.

SUMMARY OF THE INVENTION

In a conventional container-type datacenter, regarding the arrangement of the server device and others therein, it has been mainly required to arrange the server device and others as many as possible for efficiently using a limited space of the cargo-transport container or others. Therefore, the server device and others in the container (normally, each stored in a rack) are normally arranged to be aligned in one row or a plurality of rows along a long-side direction of the floor surface of the container (length/depth direction of the container).

However, when various racks are arranged in this manner, work spaces of a maintenance worker or others on a front side and a back side of each rack depend on a short-side direction length of the floor surface of the container (width of the container). A width of a general cargo-transport container is standardized by 8 feet (about 2.4 meters). Therefore, for example, if racks each having

a depth of 1 meter are arranged in one row, at most only about 80 to 90 centimeters are ensured as the work space (for example, the work space on the rack back side is 50 centimeters, and the work space on the rack front side is 90 centimeters).

5 That is, a main aim of the conventional container-type datacenter has been to improve a storage capacity for the server device and others even if comfort and ease of maintenance of the maintenance worker or others are sacrificed. However, in a case of such a narrow work space, it is impossible or difficult to perform
10 the working such as carry-in and installation into the rack for a device such as a general-purpose server whose size (depth of about 1 meter) requires an entire depth of the rack. Therefore, in some cases such that the designing for a dedicated server device or others is required, the feature of the container-type datacenter such as
15 the simple and quick construction of the datacenter at the low cost cannot be utilized.

 Accordingly, a preferred aim of the present invention is to provide a container-type datacenter capable of sufficiently ensuring a work space on a front side and a back side of a rack.
20 The above and other preferred aims and novel characteristics of the present invention will be apparent from the description of the present specification and the accompanying drawings.

 The typical ones of the inventions disclosed in the present application will be briefly described as follows.

25 In a container-type datacenter according to a typical embodiment of the present invention, a power supply facility and an air-conditioning facility are provided inside a transportable structure having a cuboid shape, and a plurality of racks for storing various devices including a server device and a network device are
30 arranged in rows, and the datacenter has the following features.

 That is, in the container-type datacenter, the plurality of rows of the racks are arranged along a short-side direction of a

floor surface of the structure, each row of the racks is arranged so that, if a second row of the racks is adjacent to a front side of a first row of the racks, the front side of the first row of the racks is opposed to a front side of the second row of the racks, and so that, if a third row of the racks is adjacent to a back side of the first row of the racks, the back side of the first row of the racks is opposed to a back side of the third row of the racks, and a dimension of at least one of work spaces on the front side and the back side of each row of the racks is larger than a depth of the rack.

The effects obtained by typical aspects of the present invention will be briefly described below.

According to the typical embodiment of the present invention, in the container-type datacenter, the work spaces on the front side and the back side of the rack can be sufficiently ensured, and therefore, comfort and ease of maintenance can be significantly improved.

BRIEF DESCRIPTIONS OF THE DRAWINGS

FIG. 1 is a top view showing an outline of an arrangement example of racks and others in a container-type datacenter according to an embodiment of the present invention;

FIG. 2 is a perspective view three-dimensionally showing the outline of the arrangement example of the racks and others in the container-type datacenter according to the embodiment of the present invention;

FIG. 3 is a top view showing an outline of another arrangement example of the racks and others in the container-type datacenter according to the embodiment of the present invention;

FIG. 4 is a top view showing an outline of an arrangement example of racks and others in a conventional container-type datacenter; and

FIG. 5 is a perspective view three-dimensionally showing the outline of the arrangement example of the racks and others in the conventional container-type datacenter.

5

DESCRIPTIONS OF THE PREFERRED EMBODIMENTS

Hereinafter, embodiments of the present invention will be described in detail based on the accompanying drawings. Note that the same components are denoted by the same reference symbols throughout the drawings for describing the embodiments, and the repetitive description thereof will be omitted. Also, hereinafter, in order to easily understand the features of the present invention, they are described as compared with a conventional technique.

FIG. 4 is a top view showing an outline of an arrangement example of racks and others in a conventional container-type datacenter. Also, FIG. 5 is a perspective view three-dimensionally showing the outline of the arrangement example of the racks and others in the conventional container-type datacenter as shown in FIG. 4. As shown in FIGS. 4 and 5, in a conventional container-type datacenter 2, generally, a plurality of racks 21 and an equipment panel 22 are arranged inside a container 20 in one row along a long-side direction of a floor surface of the container 20 (length/depth direction of the container) as described above.

Here, each of the racks 21 is a structure capable of collectively storing one or more various devices and equipment such as a server device, a network device, a UPS (Uninterruptible Power Supply), and air-conditioning device required for operation as a datacenter, and each size of the racks is generally standardized. Also, the equipment panel 22 is an interface for managing/controlling and using various devices such as a power supply device and a network.

The container-type datacenter 2 further has an entrance 24 on one short side of the floor surface of the container 20, and has

a previous room 23, which is a region separating an outside of the container 20 from a region for storing the racks 21, at a part in contact with the entrance 24. By the previous room 23, for example, when the container-type datacenter 2 is installed outdoors in a summer season, it is avoided that the region for storing the racks 21 is aired out, and therefore, cooling efficiency of the inside can be retained.

Here, as described above, for example, when each depth of the racks 21 is 1 meter, if 60 centimeters are ensured as a back-side work space 27 of the racks 21, only about 75 centimeters are ensured as a front-side work space 26. Therefore, it is impossible or difficult to perform the working such as carry-in and installation into the rack 21 for a server device or others such as a general-purpose server whose size (depth of about 1 meter) requires an entire depth of the rack 21, and therefore, the general-purpose server cannot be used, and the designing and manufacturing of a dedicated-size server device or others may be required in some cases.

Accordingly, in a container-type datacenter according to an embodiment of the present invention, various racks are arranged in a plurality of rows along the short-side direction of the container, so that work spaces on the front side and the back side of the racks are sufficiently ensured. FIG. 1 is a top view showing an outline of an arrangement example of the racks and others in the container-type datacenter according to the embodiment of the present invention. Also, FIG. 2 is a perspective view three-dimensionally showing the outline of the arrangement example of the racks and others in the container-type datacenter according to the present embodiment as shown in FIG. 1.

As shown in FIGs. 1 and 2, in the container-type datacenter 1 according to the present embodiment, the plurality of racks 11 are arranged inside the container 10 in two rows along the short-side direction of the floor surface of the container 10 (width direction

of the container). Note that, in each of the racks 11 in each row, the front surfaces or the back surfaces are arranged in the same direction.

A general cargo-transport container 10 has a length of 20 feet (about 6 meters) or 40 feet (about 12 meters), and therefore, when the racks 11 each having a depth of 1 meter are arranged as shown in FIG. 1 with using the container 10 whose length is, for example, 20 feet, the front-side work space 16 having a sufficient dimension of about 170 centimeters can be ensured on the front side of the racks 11 (in the present embodiment, regarding the work space of the racks 11, a length in a direction perpendicular to the row of the racks 11 is expressed as "dimension"). Therefore, for example, even when the equipment panel 12 is arranged at the shown position in the front-side work space 16, a sufficient space remains, and therefore, the comfort and ease of maintenance can be significantly improved. Further, since the front-side work space 16 having the dimension equal to or larger than the depth of the rack 11 can be ensured, even the server device or others such as a general-purpose server whose size requires the entire depth of the rack 11 can be easily carried-in/stored.

Note that, in the present embodiment, the front-side work space 16 of the racks 11 is configured to be larger than the back-side work space 17. However, conversely, the back-side work space 17 may be configured to be larger.

Here, by arranging the racks 11 in the two rows so as to be opposed to each other on their back sides as shown in the figure, the back-side work space 17 can be shared by the two rows, and therefore, a space can be efficiently used as compared with the case in which the back-side work space 17 is provided individually for each row (in the example of FIG. 1, the back-side work space 17 of 70 centimeters is shared by the racks 11 in the two rows). A frequency of the working performed by the maintenance worker or

others for the server device and others stored in the racks 11 is not so high (particularly on the back side), and therefore, even when the back-side work space 17 is shared by the racks 11 in the two rows, there is practically no problem.

5 Further, in the present embodiment, as shown in the figure, the previous room 13 and the entrance 14 are provided on one long side of the floor surface of the container 10 so as to be in contact with ends of a pair of the racks 11 in the two rows opposed to each other on their back sides, so that the work space on the front side
10 in each row of the racks 11 is separated into the two front-side work spaces 16 together with the pair of the racks 11 in the two rows, and besides, so that the entering/leaving to/from the two front-side work spaces 16 and the back-side work space 17 is enabled from the previous room 13 through a door or others. In this manner,
15 the cooling efficiency of the inside is retained, and besides, the ease of maintenance working can be retained.

 Still further, in the present embodiment, as shown in FIG. 2, a space is provided between a ceiling of the container 10 and the rows of the racks 11 and the previous room 13, and besides, for
20 example, a ceiling-suspended-type air conditioner 18 generally used for business use or others instead of the rack-type air-conditioning device generally used in the conventional container-type datacenter 2 is arranged as the air-conditioning device on the ceiling part above the front-side work space 16. In this manner, the work spaces
25 can be further efficiently used. Note that, in the configuration as shown in FIG. 2, the back-side work space 17 is a hot area to which heat from the devices in the racks 11 is released, and the two front-side work spaces 16 are cold areas to which cold air from the ceiling-suspended-type air conditioner 18 is supplied.

30 Note that, in order to ensure the ease of the carry-in of the device or others, a carry-in entrance 15 may be provided on each short side of the floor surface of the container 10 as shown in the

figure. Also, in the examples of FIGs. 1 and 2, the length of the container 10 is 20 feet. However, the container 10 having the length of 40 feet can be also used. In this case, the rows of the racks 11 may be two or more rows. At this time, the rows of the racks 11 are arranged so that a front side of one row is opposed to a front side of another row of the racks 11 adjacent on their front sides and so that a back side thereof is opposed to a back side of still another row of the racks 11 adjacent on their back sides. In this manner, among the rows of the adjacent racks 11 to each other, not only the back-side work space 17 but also the front-side work space 16 can be shared, and therefore, the space can be efficiently used. Depending on the number of the rows of the racks 11, a plurality of the previous rooms 13 and entrances 14 may be provided.

Still further, in the present embodiment, the case in which the container-type datacenter 1 is used as a normal "datacenter" which operationally manages the server device and others is described as the example. However, by using a structure in which the front-side work spaces 16 of the racks 11 in the rows are separated, for example, either of the front-side work spaces 16 can be used as a simple office.

FIG. 3 is a top view showing an outline of another arrangement example of the racks 11 and others in the container-type datacenter 1 according to the present embodiment. In an example of FIG. 3, by not arranging one of the rows of the racks 11 in FIG. 1 and arranging, for example, a work space having furniture such as a desk and a chair, a client terminal 19 such as a PC (Personal Computer), and a peripheral device such as a printer instead, an office area such as a simple reception using the carry-in entrance 15 as an entrance is configured. Also, a part between the office area and the back-side work space 17 of the other row of the racks 11 is separated by a partition or others. In this manner, for example, a simple/temporary satellite office, mobile office, or others such

as a government office in a disaster or others can be simply and quickly constructed.

Generally, the server device and others are weak against fine dirt and dust such as toner exhausted from a printer, and may be
5 affected in some cases when it is installed for use at a place close to the dirt and dust or an open place. However, in the container-type datacenter 1 according to the present embodiment, the front-side work spaces 16 are separated as different from the conventional container-type datacenter 2. Therefore, by using the separating,
10 either of the spaces can be easily used as the simple office, and besides, the server device and others stored in the racks 11 can be parallelly operationally managed.

As described above, according to the container-type datacenter 1 of the embodiment of the present invention, the
15 front-side and back-side work spaces of the racks 11 can be sufficiently ensured, and therefore, the comfort and the ease of maintenance can be significantly improved. Also, since the work spaces are large, even general-purpose servers can be easily carried in and stored in the racks 11.

20 Further, as keeping the function as the datacenter, a part of the separated work spaces can be easily used as the simple office or others, and therefore, the feature of the portability of the container-type datacenter 1 can be more effectively utilized.

In the foregoing, the invention made by the inventors has been
25 concretely described based on the embodiments. However, it is needless to say that the present invention is not limited to the foregoing embodiments and various modifications and alterations can be made within the scope of the present invention.

For example, in the present embodiment, the case in which the
30 server device or others is stored in the cargo-transport container is described as the example. However, the invention is not limited to the cargo-transport container, and a structure can be

appropriately used as long as the structure is transportable, has a cuboid shape, and has a capacity capable of storing the server device or others therein.

5 The present invention can be used for a so-called container-type datacenter in which a device such as a server is installed in a transportable structure such as a cargo-transport container.

What is claimed is:

1. A container-type datacenter which has a power supply facility and an air-conditioning facility inside a transportable structure having a cuboid shape and in which a plurality of racks for storing
5 various devices including a server device and a network device are arranged in a row,

the row of the racks being arranged in plural rows along a short-side direction of a floor surface of the structure,

each row of the racks being arranged so that, if a second row
10 of the racks is adjacent to a front side of a first row of the racks, the front side of the first row of the racks is opposed to a front side of the second row of the racks, and so that, if a third row of the racks is adjacent to a back side of the first row of the racks, the back side of the first row of the racks is opposed to a back
15 side of the third row of the racks, and

at least one of dimensions of front-side and back-side work spaces of each row of the racks being larger than a depth of the racks.

20 2. The container-type datacenter according to claim 1, wherein a previous room and an entrance are provided on one long side of the floor surface of the structure so as to be in contact with ends of a pair of two rows of the racks opposed to each other on their front sides or their back sides, and

25 the previous room is configured so that entering/leaving to/from the front-side and back-side work spaces of each row of the racks in contact with the previous room is enabled.

3. The container-type datacenter according to claim 1 or 2,
30 wherein

a ceiling-suspended-type air conditioning device is provided at a ceiling part above the front-side or back-side work space of

the row of the racks in the structure.

4. The container-type datacenter according to any one of claims 1 to 3, wherein

5 an entrance is provided on one short side of the floor surface of the structure to partition a part between a fourth row of the racks adjacent to the entrance and a fifth row of the racks adjacent to the fourth row of the racks, and besides, the fourth row of the racks is replaced by a work space having a client terminal and a
10 peripheral device so as to provide a simple reception or office space.

5. The container-type datacenter according to any one of claims 1 to 4, wherein

15 the structure is a cargo-transport container.