DESCRIPTION

DEVICE MANAGEMENT SYSTEM

TECHNICAL FIELD

A device management system that manages devices

BACKGROUND ART

In the related art, there are device management systems that manage devices such as outdoor units and indoor units of air conditioners. For example, a device management system presented in PTL 1 (Japanese Patent No. 6160789) includes a management apparatus connected to a device via a communication network. A participant terminal that issues a processing request relating to monitoring or an operation of the device is connected to the management apparatus.

SUMMARY OF THE INVENTION

<Technical Problem>

The management apparatus acquires various pieces of data from the device serving as a management target and stores the various pieces of data as a device data model. The device data model has a structure in which all the pieces of data are arranged at an equal level directly under the device. The participant terminal has a program for issuing, to the management apparatus, a processing request relating to monitoring or an operation of the device. When the program is executed in the participant terminal, in response to the processing request from the participant terminal (external program), the management apparatus performs processing of reading a piece of data of the device or processing of rewriting a piece of data of the device. In this manner, the device management system can monitor or operate the device.

However, as described above, the device data model handled by the device management system has a structure in which all the pieces of data of the device are arranged at an equal level directly under the device. Thus, when accessing a piece of data in response to the processing request from the program, the management apparatus needs to search all the pieces of data and thus takes some time to access the desired piece of data.

<Solution to Problem>

According to an aspect of the present invention, there is provided a device management system that manages a device serving as a management target the device being one or both of an outdoor unit and an indoor unit of an air conditioner, and that includes a

storage unit and a processing unit. The storage unit stores data of the device as a device data model having a hierarchical structure in which ~~at least one of~~ information relating to a component of the device~~, information relating to a function of the device, and information relating to a specification of the device~~ is associated with the device, the device data model includes, as a layer associated with the device, a component entity based on the information relating to the component of the device. In response to a processing request from an external program, the processing unit reads or rewrites the data stored as the device data model in the storage unit.

The device management system according to the above aspect employs the above-described hierarchical structure as the device data model and thus can quickly access desired data when accessing the data in response to the processing request from the external program.

~~In an embodiment of the above device management system, the device data model includes, as a layer associated with the device, at least one of a component entity, a function entity, and a specification entity. The component entity is an entity based on the information relating to the component of the device. The function entity is an entity based on the information relating to the function of the device. The specification entity is an entity based on the information relating to the specification of the device.~~

In an embodiment of the above device management system, the device data model includes the component entity as the layer associated with the device. For each of the components, the component entity is associated with at least one of information relating to a state of the component and information relating to control of the component.

In an embodiment of the above device management system, in a case where the device includes a sensor for use in common in control of a plurality of the components, information relating to the sensor is treated as information relating to an independent component including the sensor. That is, the information relating to the sensor is not associated with each of the components in the component entity but another independent component including the sensor is defined.

In an embodiment of the above device management system, for each of the components, the component entity is associated with information indicating a relationship between the components.

In an embodiment of the above device management system, the device data model further includes ~~the~~a function entity based on the information relating to the function of the device as ~~the~~a layer associated with the device. The function entity is associated with at least one of information relating to an operation of the device, information relating to control of the device, and information relating to environment information measured by the device.

In an embodiment of the above device management system, the function entity has the information relating to the operation of the device at an identical hierarchical level irrespective of a type of the device.

In an embodiment of the above device management system, the device data model further includes ~~the~~a specification entity based on the information relating to the specification of the device as ~~the~~a layer associated with the device. The specification entity is associated with at least one of information relating to unique information of the device, information relating to identification information of the device, and information relating to installation information of the device.

In an embodiment of the above device management system, the device data model defines a data type for each piece of data of the device. The data type includes a readable state value and a rewritable setting value. In a case where rewriting of the data having the readable state value alone as the data type is attempted in response to the processing request from the external program, the processing unit transmits, to the external program, information indicating that rewriting of the data is inappropriate.

The device management system according to the above embodiment can inform the external program that there is a data type error in the processing request from the external program.

In an embodiment of the above device management, the device data model defines a data type for each piece of data of the device. The data type includes a readable state value and a rewritable setting value. The processing unit transmits the rewritten rewritable setting value to the device in a case where the processing unit rewrites, in response to the processing request from the external program, the rewritable setting value of the data having the rewritable state value and the rewritable setting value as the data types. The processing unit transmits, to the external program, information indicating that the device has failed to operate in accordance with the rewritable setting value in a case where the processing unit does not receive the rewritable state value corresponding to the rewritable setting value from the device within a predetermined period since the transmission of the rewritable setting value to the device.

The device management system according to the above embodiment can inform the external program that the device has failed to operate in accordance with the setting value.

In an embodiment of the above device management system, the device data model defines attribute information for each piece of data of the device. In response to the processing request from the external program, the processing unit transmits, to the external program, information indicating whether the processing request conforms to the attribute

information of the data for which the processing request is made.

The device management system according to the above embodiment can inform the external program whether the processing request from the external program conforms to the attribute information of the data.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram illustrating a configuration of a device management system.

Fig. 2 is a schematic diagram illustrating a configuration of an air conditioner.

Fig. 3 is a schematic diagram illustrating functional blocks of each of apparatuses included in the device management system.

Fig. 4 is a schematic diagram illustrating a structure of a device data model (for an outdoor unit) handled by the device management system.

Fig. 5 is a schematic diagram illustrating a structure of a device data model (for an indoor unit) handled by the device management system.

Fig. 6 is a schematic diagram illustrating sensors located near an outdoor heat exchanger and an indoor heat exchanger.

Fig. 7 is a schematic diagram illustrating sensors located near a compressor.

Fig. 8 is a schematic diagram illustrating a specific example of data (including data types and attribute information) on a device.

DESCRIPTION OF EMBODIMENTS

(1) Overall Configuration

Fig. 1 is a schematic diagram illustrating a configuration of a device management system 1. In the description below, when a common description is given of a plurality of apparatuses having substantially the same functions, the description is given by using the same reference signs. When description is given of one apparatus among the plurality of apparatuses having substantially the same functions in a distinguished manner, the description is given by using a lower-case alphabet as an index. For example, indoor units 12a and 12b are apparatuses having substantially the same functions. When common description is given, the indoor units 12a and 12b are denoted as indoor units 12 by omitting the indices a and b.

The device management system 1 is a system in which a management apparatus 40 manages a plurality of devices. In this embodiment, the management apparatus 40 is installed

CLAIMS

1. A device management system (1) that manages a device (11, 12) serving as a management target, the device being one or both of an outdoor unit and an indoor unit of an air conditioner, the device management system comprising:

a storage unit (41) that stores data of the device as a device data model having a hierarchical structure in which ~~at least one of~~ information relating to a component of the device~~, information relating to a function of the device, and information relating to a specification of the device~~ is associated with the device,

the device data model includes, as a layer associated with the device, a component entity based on the information relating to the component of the device; and

a processing unit (43) that, in response to a processing request from an external program, reads or rewrites the data stored as the device data model in the storage unit.

~~2. The device management system according to Claim 1, wherein~~

~~the device data model includes, as a layer associated with the device, at least one of a component entity based on the information relating to the component of the device, a function entity based on the information relating to the function of the device, and a specification entity based on the information relating to the specification of the device.~~

~~3~~2. The device management system according to Claim ~~2~~1, wherein

the device data model includes the component entity as the layer associated with the device, and

for each of the components, the component entity is associated with at least one of information relating to a state of the component and information relating to control of the component.

~~4~~3. The device management system according to Claim ~~3~~2, wherein

in a case where the device includes a sensor for use in common in control of a plurality of the components, information relating to the sensor is not associated with each of the components in the component entity but is associated with an independent component including the sensor.

~~5~~4. The device management system according to Claim ~~3~~2 or ~~4~~3, wherein

for each of the components, the component entity is associated with information indicating a relationship between the components.

~~6~~5. The device management system according to Claim ~~2~~1, wherein

the device data model further includes ~~the~~ a function entity based on the information relating to the function of the device as ~~the~~ a layer associated with the device, and

the function entity is associated with at least one of information relating to an operation of the device, information relating to control of the device, and information relating to environment information measured by the device.

~~7~~6. The device management system according to Claim ~~6~~5, wherein

the function entity has the information relating to the operation of the device at an identical hierarchical level irrespective of a type of the device.

~~8~~7. The device management system according to Claim ~~2~~1, wherein

the device data model further includes ~~the~~ a specification entity based on the information relating to the specification of the device as ~~the~~ a layer associated with the device, and

the specification entity is associated with at least one of information relating to unique information of the device, information relating to identification information of the device, and information relating to installation information of the device.

~~9~~8. The device management system according to any one of Claims 1 to ~~8~~7, wherein

the device data model defines a data type for each piece of data of the device,

the data type comprises a readable state value and a rewritable setting value, and

in a case where rewriting of the data having the readable state value alone as the data type is attempted in response to the processing request from the external program, the processing unit transmits, to the external program, information indicating that rewriting of the data is incorrect.

~~10~~9. The device management system according to any one of Claims 1 to ~~8~~7, wherein

the device data model defines a data type for each piece of data of the device,

the data type comprises a readable state value and a rewritable setting value, and

the processing unit transmits the rewritten rewritable setting value to the device in a case where the processing unit rewrites, in response to the processing request from the external program, the rewritable setting value of the data having the readable state value and the rewritable setting value as the data types, and

the processing unit transmits, to the external program, information indicating that the device has failed to operate in accordance with the rewritable setting value in a case where the processing unit does not receive the readable state value corresponding to the rewritable setting value from the device within a predetermined period since the transmission of the rewritable setting value to the device.

~~11~~10. The device management system according to any one of Claims 1 to ~~10~~9, wherein

the device data model defines attribute information for each piece of data of the device, and

in response to the processing request from the external program, the processing unit transmits, to the external program, information indicating whether the processing request conforms to the attribute information of the data for which the processing request is made.