[Description]

[Title of the Invention]

EQUIPMENT SERVER, DEVICE SERVER, COMMUNICATION SYSTEM, AND STORAGE MEDIUM

[Technical Field]

[0001]

The present disclosure relates to an equipment server, a device server, a communication system, and a data structure.

[Background Art]

[0002]

PTL 1 discloses an example of an access control system. In the system, a portable terminal carried by a user transmits, by wireless communication, specification information specifying the user to an authentication apparatus provided at a door.

[Prior Art]

[Patent Literature]

[0003]

[PTL 1] JP 2019-120015 A

[Summary of the Invention]

[Problems to be Solved by the Invention]

[0004]

Here, in a facility such as a building, plural kinds of devices may operate, the plural kinds of devices including a device such as a portable terminal or a wireless tag which moves while being carried by a user and a movable device such as a robot or a mobility device. In this case, in an access control system of PTL 1, when the plural

devices operate in the facility such as a building, a format of communication with the access control system has to be defined for each of kinds of the plural devices. Thus, cooperation between the access control system and the devices moving in the facility is not easy.

[0005]

The present disclosure relates to solutions for such problems. The present disclosure provides a communication system with which an access control system applied to a facility and devices moving in the facility easily cooperate, an equipment server and a device server in the communication system, and a data structure to be communicated in the communication system.

[Means to Solve the Problem]

[0006]

An equipment server according to the present disclosure includes: a first communication unit that communicates a message in a common data format with plural device servers which communicate a control signal with at least any one device among plural devices moving in a facility; and an equipment control unit that controls equipment in the facility based on a message which is received by the first communication unit, wherein the equipment includes one or more passage restriction units which are provided in the facility so as to be capable of restricting passage of the plural devices, when a passing device among the plural devices, the passing device communicating a control signal with a passing device server which is any one of the plural device servers, passes through a place where a target passage restriction unit is provided, the target passage restriction unit being one of the one or more passage restriction units, the equipment control unit determines whether or not a passage message is invalid based on the passage message, which is the message received by the first

communication unit, and outputs an authentication request, when the passage message is determined to be valid, to an access control system which includes the one or more passage restriction units.

[0007]

A device server according to the present disclosure includes: a second communication unit that communicates a message in a common data format with an equipment server communicating with an access control system including one or more passage restriction units which are provided in a facility so as to be capable of restricting passage of plural devices moving in the facility; and a device control unit that communicates a control signal with a passing device which is any one of the plural devices based on a message received by the second communication unit, wherein in a case where the passing device passes through a place where a target passage restriction unit as one of the one or more passage restriction units is provided, the second communication unit transmits a passage message, which is a message in the common data format, to the equipment server such that the equipment server is capable of outputting an authentication request to the access control system when the equipment server determines whether or not the passage message is invalid based on the passage message and the passage message is determined to be valid.

[0008]

A communication system according to the present disclosure includes: an equipment server; and plural device servers, wherein the equipment server includes a first communication unit that communicates a message in a common data format with the plural device servers and an equipment control unit that controls one or more passage restriction units which are provided in a facility so as to be capable of restricting passage of plural devices moving in the facility, each of the plural device servers includes a

second communication unit that communicates a message in the data format with the equipment server and a device control unit that communicates a control signal with at least any device of the plural devices, in a passing device server among the plural device servers which communicates a control signal with a passing device as any one of the plural devices, the second communication unit transmits a passage message, which is a message in the common data format, to the equipment server in a case where the passing device passes through a place where a target passage restriction unit as one of the one or more passage restriction units is provided, and when the first communication unit receives the passage message from the passing device server, the equipment control unit determines whether or not the passage message is invalid based on the passage message and outputs an authentication request, when the passage message is determined to be valid, to the access control system including the one or more passage restriction units.

[0009]

A storage medium according to the present disclosure stores a message that is communicated in a common data format between plural device servers, the plural device servers communicating a control signal with at least any device among plural devices moving in a facility, and an equipment server, the equipment server communicating with an access control system including one or more passage restriction units which are provided in the facility so as to be capable of restricting passage of the plural devices, the equipment server controlling the access control system, and the message includes device specification information specifying a passing device, the device specification information being used for a determination about whether or not a message is invalid, the message being transmitted from a passing device server which communicates a control signal with the passing device to the equipment server in a case where the passing device as any one of the plural devices passes through a place where a

[Claims]

[Claim 1]

An equipment server comprising:

a first communication unit that communicates a message in a common data format with plural device servers which communicate a control signal with at least any one device among plural devices moving in a facility; and

an equipment control unit that controls equipment in the facility based on a message which is received by the first communication unit, wherein

the equipment includes one or more passage restriction units which are provided in the facility so as to be capable of restricting passage of the plural devices,

when a passing device among the plural devices, the passing device communicating a control signal with a passing device server which is any one of the plural device servers, passes through a place where a target passage restriction unit is provided, the target passage restriction unit being one of the one or more passage restriction units, the equipment control unit determines whether or not a passage message is invalid based on the passage message, which is the message received by the first communication unit, and outputs an authentication request, when the passage message is determined to be valid, to an access control system which includes the one or more passage restriction units.

[Claim 2]

The equipment server according to claim 1, wherein

the equipment control unit outputs a result of the determination to the access control system.

[Claim 3]

The equipment server according to claim 1 or 2, wherein

the equipment control unit determines whether or not the passing device has passage authorization instead of outputting the authentication request to the access control system when the passage message is determined to be valid.

[Claim 4]

The equipment server according to claim 1 or 2, wherein

the equipment control unit skips outputting of the authentication request to the access control system when the passage message is determined to be invalid.

[Claim 5]

The equipment server according to any one of claims 1 to 4, wherein

the passage message which is received from the passing device server by the first communication unit includes device specification information which specifies the passing device, and

when the first communication unit receives the passage message from the passing device server, the equipment control unit determines whether or not the passage message is invalid based on the device specification information and outputs a result of the determination to the access control system which includes the one or more passage restriction units.

[Claim 6]

The equipment server according to any one of claims 1 to 5, wherein

the first communication unit receives a message for requesting passage as the passage message from the passing device server.

[Claim 7]

The equipment server according to any one of claims 1 to 5, wherein

the first communication unit transmits a message for inquiring whether or not passage through a place where any one of the one or more passage restriction units is provided is performed to each of the plural device servers and receives a message, which is an answer of the passing device server to the message of query and indicates passage of the passing device, as the passage message.

[Claim 8]

The equipment server according to any one of claims 1 to 7, wherein

in a case where plural passage restriction units are provided as the one or more passage restriction units in the facility,

the passage message includes target specification information which specifies the target passage restriction unit from the plural passage restriction units.

[Claim 9]

The equipment server according to claim 8, wherein

position information of each of the plural devices is synchronized between the equipment control unit and the passing device server, and the equipment control unit specifies the target passage restriction unit from the plural passage restriction units by the target specification information included in the passage message and determines whether or not the passage message is invalid based on whether or not a position of the passing device which is specified by device specification information included in the passage message is included in an acceptance range which is set in advance while corresponding to the specified target passage restriction unit.

[Claim 10]

The equipment server according to any one of claims 1 to 7, wherein

in a case where plural passage restriction units are provided as the one or more passage restriction units in the facility,

position information of each of the plural devices is synchronized between the equipment control unit and the passing device server, and the equipment control unit specifies the target passage restriction unit from the plural passage restriction units based on the position information of the passing device which is specified by device specification information included in the passage message and determines whether or not the passage message is invalid based on whether or not a position of the passing device is included in an acceptance range which is set in advance while corresponding to the specified target passage restriction unit.

[Claim 11]

The equipment server according to any one of claims 1 to 10, wherein

in a case where the equipment control unit determines that the passage message is valid and the passing device has passage authorization for a place where the target passage restriction unit is provided, the first communication unit transmits a message for notifying that passage is allowed to the passing device server, and in a case where the equipment control unit determines that the passage message is invalid or a case where the passing device does not have the passage authorization for the place where the target passage restriction unit is provided, the first communication unit transmits a message for notifying that passage is not allowed to the passing device server.

[Claim 12]

The equipment server according to claim 11, wherein

in a case where when the passage message is received, another device of the passing device among the plural devices is passing through the place where the target

passage restriction unit is provided, the first communication unit transmits the message for notifying that passage is not allowed to the passing device server.

[Claim 13]

The equipment server according to claim 11 or 12, wherein

in a case where when the passage message is received, use of the target passage restriction unit is stopped, the first communication unit transmits the message for notifying that passage is not allowed to the passing device server.

[Claim 14]

The equipment server according to any one of claims 11 to 13, wherein

when the passing device starts passage through the place where the target passage restriction unit is provided after the message for notifying that passage is allowed is transmitted to the passing device server, the first communication unit receives a message for notifying a start of passage from the passing device server.

[Claim 15]

The equipment server according to claim 14, wherein

when the message for notifying the start of passage is not received from the passing device server before a time set in advance elapses after the message for notifying that passage is allowed is transmitted to the passing device server, the first communication unit transmits a message for requesting a stop of passage to the passing device server.

[Claim 16]

The equipment server according to any one of claims 11 to 15, wherein

when the passing device completes passage through the place where the target passage restriction unit is provided after the message for notifying that passage is allowed

is transmitted to the passing device server, the first communication unit receives a message for notifying completion of passage from the passing device server.

[Claim 17]

The equipment server according to claim 16, wherein

when the message for notifying the completion of passage is not received from the passing device server before a time set in advance elapses after the message for notifying that passage is allowed is transmitted to the passing device server, the first communication unit transmits a message for requesting a stop of passage to the passing device server.

[Claim 18]

The equipment server according to claim 15 or 17, wherein

when the passing device completes a process for the stop of passage through the place where the target passage restriction unit is provided after the message for requesting the stop of passage is transmitted to the passing device server, the first communication unit receives a message for notifying completion of the stop of passage from the passing device server.

[Claim 19]

The equipment server according to claim 18, wherein

when the message for notifying the completion of the stop of passage is not received from the passing device server before a time set in advance elapses after the message for requesting the stop of passage is transmitted to the passing device server, the first communication unit issues an alarm to an alarm destination which is registered in advance.

[Claim 20]

The equipment server according to any one of claims 1 to 19, wherein

in a case where the passing device passes through the place where the target passage restriction unit is provided from a first side to a second side in a passage direction, the equipment control unit determines whether or not the passage message is invalid, and in a case where the passing device passes from the second side to the first side of the place where the target passage restriction unit is provided, the equipment control unit does not determine whether or not the passage message is invalid.

[Claim 21]

The equipment server according to claim 20, wherein

in a case where the passing device passes from the second side to the first side of the place where the target passage restriction unit is provided, the equipment control unit causes the access control system to store a passage history of the passing device.

[Claim 22]

The equipment server according to any one of claims 1 to 21, wherein

the first communication unit communicates a message in the data format with at least any one of the plural devices.

[Claim 23]

The equipment server according to claim 1, wherein

in accordance with whether or not device specification information, which is included in the passage message and specifies the passing device, is information which specifies the device having the passage authorization for a place where the target passage restriction unit is provided, the target passage restriction unit being specified from the plural passage restriction units, the equipment control unit determines whether or not the

passing device has the passage authorization for the place where the target passage restriction unit is provided.

[Claim 24]

The equipment server according to claim 9 or 10, wherein

when the first communication unit receives the passage message from the passing device server, the first communication unit receives another message including information which specifies another device than the passing device among the plural devices, the other device moving in the place where the target passage restriction unit is provided,

the equipment control unit determines that both of the passage message and the other message are valid in a case where both of a position of the passing device and a position of the other device are included in the acceptance range corresponding to the specified target passage restriction unit, and the equipment control unit determines that both of the passage message and the other message are invalid in a case where either one of the position of the passing device and the position of the other device is not included in the acceptance range.

[Claim 25]

The equipment server according to claim 9 or 10, wherein

when the first communication unit receives the passage message from the passing device server, the first communication unit receives another message including information which specifies another device than the passing device among the plural devices, the other device moving in the place where the target passage restriction unit is provided,

the equipment control unit determines that the passage message is invalid in a case where a position of the other device is included in a tailgating monitoring range which is set in advance while corresponding to the specified target passage restriction unit.

[Claim 26]

The equipment server according to claim 9 or 10, wherein

when the first communication unit receives the passage message from the passing device server, the first communication unit receives another message including information which specifies a user in addition to the passing device among the plural devices, the user moving in the place where the target passage restriction unit is provided,

the equipment control unit determines that both of the passage message and the other message are invalid in a case where both of a position of the passing device and a position of the user are included in a tailgating monitoring range which is set in advance while corresponding to the specified target passage restriction unit.

[Claim 27]

The equipment server according to any one of claims 1 to 26, wherein

the first communication unit receives a message for requesting registration from the passing device server and transmits a message for notifying a result of the registration for the message to the passing device server.

[Claim 28]

The equipment server according to any one of claims 1 to 27, wherein

the first communication unit receives a message for notifying a position state of the passing device from the passing device server.

[Claim 29]

The equipment server according to claim 28, wherein

the first communication unit transmits a message for requesting correction of the position state of the passing device to the passing device server.

[Claim 30]

The equipment server according to any one of claims 1 to 29, wherein

a message communicated by the first communication unit includes direction information which indicates a transmission direction of the message.

[Claim 31]

A device server comprising:

a second communication unit that communicates a message in a common data format with an equipment server communicating with an access control system including one or more passage restriction units which are provided in a facility so as to be capable of restricting passage of plural devices moving in the facility; and

a device control unit that communicates a control signal with a passing device which is any one of the plural devices based on a message received by the second communication unit, wherein

in a case where the passing device passes through a place where a target passage restriction unit as one of the one or more passage restriction units is provided, the second communication unit transmits a passage message, which is a message in the common data format, to the equipment server such that the equipment server is capable of outputting an authentication request to the access control system when the equipment server determines whether or not the passage message is invalid based on the passage message and the passage message is determined to be valid.

[Claim 32]

The device server according to claim 31, wherein

the second communication unit transmits the passage message to the equipment server such that the equipment server is capable of outputting a result of the determination to the access control system.

[Claim 33]

The device server according to claim 31 or 32, wherein

the equipment server determines whether or not the passing device has passage authorization instead of outputting the authentication request to the access control system when the passage message is determined to be valid.

[Claim 34]

A communication system comprising:

an equipment server; and plural device servers, wherein

the equipment server includes

a first communication unit that communicates a message in a common data format with the plural device servers and

an equipment control unit that controls one or more passage restriction units which are provided in a facility so as to be capable of restricting passage of plural devices moving in the facility,

each of the plural device servers includes

a second communication unit that communicates a message in the data format with the equipment server and

a device control unit that communicates a control signal with at least any device of the plural devices,

in a passing device server among the plural device servers which communicates a control signal with a passing device as any one of the plural devices, the second

communication unit transmits a passage message, which is a message in the common data format, to the equipment server in a case where the passing device passes through a place where a target passage restriction unit as one of the one or more passage restriction units is provided, and

when the first communication unit receives the passage message from the passing device server, the equipment control unit determines whether or not the passage message is invalid based on the passage message and outputs an authentication request, when the passage message is determined to be valid, to the access control system including the one or more passage restriction units.

[Claim 35]

The communication system according to claim 34, wherein

the equipment control unit outputs a result of the determination to the access control system.

[Claim 36]

The communication system according to claim 34 or 35, wherein

the equipment control unit determines whether or not the passing device has passage authorization instead of outputting the authentication request to the access control system when the passage message is determined to be valid.

[Claim 37]

A storage medium storing

a message that is communicated in a common data format between plural device servers, the plural device servers communicating a control signal with at least any device among plural devices moving in a facility, and an equipment server, the equipment server communicating with an access control system including one or more passage restriction

units which are provided in the facility so as to be capable of restricting passage of the plural devices, the equipment server controlling the access control system, and

the message comprises

device specification information specifying a passing device, the device specification information being used for a determination about whether or not a message is invalid, the message being transmitted from a passing device server which communicates a control signal with the passing device to the equipment server in a case where the passing device as any one of the plural devices passes through a place where a target passage restriction unit as one of the one or more passage restriction units is provided.