[CLAIMS]

[Claim 1]

A communication system comprising:

a transport vehicle for transporting an object to be transported;

a communication device connected to a transfer apparatus to which the object to be transferred from the transport vehicle is to be transferred and from which the object to be transferred to the transport vehicle is to be transferred; and

a communication apparatus that relays communication between the transport vehicle and the communication device,

wherein the communication apparatus includes:

a wide-area wireless communicator that transmits and receives information to and from the transport vehicle via a wide-area wireless communication base station through wide-area wireless communication;

a short-range wireless communicator that transmits and receives information to and from the communication device through short-range wireless communication having a communication range narrower than a communication range of the wide-area wireless communication; and

a controller that (i) converts the information received by the wide-area wireless communicator from wide-area wireless communication information into short-range wireless communication information, and outputs the short-range wireless communication information to the short-range wireless communicator, and (ii) converts the information received by the short-range wireless communicator from short-range wireless communication information into wide-area wireless communication information, and outputs the wide-area wireless communication information to the wide-area wireless communicator,

(i) when the transport vehicle transmits information to the communication device while the transport vehicle is traveling in a direction approaching the transfer apparatus before the object is transferred to or from the transfer apparatus or while the transport vehicle is traveling in a direction away from the transfer apparatus after the object is transferred to or from the transfer apparatus:

the wide-area wireless communicator receives information from the transport vehicle via the wide-area wireless communication base station through the wide-area wireless communication;

the controller converts the information received by the wide-area wireless communicator from wide-area wireless communication information into short-range wireless communication information, and outputs the short-range wireless

communication information to the short-range wireless communicator; and

the short-range wireless communicator transmits the information converted by the controller to the communication device through the short-range wireless communication; and

(ii) when the communication device transmits information to the transport vehicle while the transport vehicle is traveling in a direction approaching the transfer apparatus before the object is transferred to or from the transfer apparatus or while the transport vehicle is traveling in a direction away from the transfer apparatus after the object is transferred to or from the transfer apparatus:

the short-range wireless communicator receives information from the communication device through the short-range wireless communication;

the controller converts the information received by the short-range wireless communicator from short-range wireless communication information into wide-area wireless communication information, and outputs the wide-area wireless communication information to the wide-area wireless communicator; and

the wide-area wireless communicator transmits the information converted by the controller to the transport vehicle via the wide-area wireless communication base station through the wide-area wireless communication.

[Claim 2]

The communication system according to claim 1 wherein,

the communication apparatus further comprises an obtainer that obtains, while the transport vehicle is traveling, communication status information indicating a communication status between an other transport vehicle other than the transport vehicle and the communication device, and

the wide-area wireless communicator transmits, via the wide-area wireless communication base station through the wide-area wireless communication, the communication status information obtained by the obtainer to the transport vehicle that is traveling.

[Claim 3]

The communication system according to claim 1 wherein,

the communication apparatus further comprises an obtainer that obtains, while the transport vehicle is traveling, position information indicating a position of an other transport vehicle other than the transport vehicle, and

the wide-area wireless communicator transmits, via the wide-area wireless

communication base station through the wide-area wireless communication, the position information obtained by the obtainer to the transport vehicle that is traveling.

[Claim 4]

A communication method used in a communication system that includes a transport vehicle for transporting an object to be transported a communication device connected to a transfer apparatus to which the object to be transferred from the transport vehicle is to be transferred and from which the object to be transferred to the transport vehicle is to be transferred, and a communication apparatus that relays communication between the transport vehicle and the communication device,–the communication method comprising:

(a) receiving information from the transport vehicle via a wide-area wireless communication base station through wide-area wireless communication;

(b) converting the information received in (a) from wide-area wireless communication information into short-range wireless communication information;

(c) transmitting the information converted in (b) to the communication device through the short-range wireless communication having a communication range narrower than a communication range of the wide-area wireless communication;

(d) receiving information from the communication device through the short-range wireless communication;

(e) converting the information received in (d) from short-range wireless communication information into wide-area wireless communication information; and

(f) transmitting the information converted in (e) to the transport vehicle via the wide-area wireless communication base station through the wide-area wireless communication,

wherein (i) when the transport vehicle transmits information to the communication device while the transport vehicle is traveling in a direction approaching the transfer apparatus before the object is transferred to or from the transfer apparatus or while the transport vehicle is traveling in a direction away from the transfer apparatus after the object is transferred to or from the transfer apparatus,

the communication apparatus:

receives information from the transport vehicle via the wide-area wireless communication base station through the wide-area wireless communication;

converts the information received from wide-area wireless communication information into short-range wireless communication information; and

transmits the information converted to the communication device through the short-range wireless communication, and

(ii) when the communication device transmits information to the transport vehicle while the transport vehicle is traveling in a direction approaching the transfer apparatus before the object is transferred to or from the transfer apparatus or while the transport vehicle is traveling in a direction away from the transfer apparatus after the object is transferred to or from the transfer apparatus,

the communication apparatus:

receives information from the communication device through the short-range wireless communication;

converts the information received from short-range wireless communication information into wide-area wireless communication information; and

transmits the information converted to the transport vehicle via the wide-area wireless communication base station through the wide-area wireless communication.