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(54) **TRANSMITTING METHOD AND DETECTING METHOD FOR PACKET INFORMATION PACKAGE, GROUND SIGNAL SYSTEM AND RADIO BLOCK CENTER (RBC)**

(57) A sending method for a packet information package includes: carrying, by a ground signal system, information group information in a to-be-sent packet information package, where the information group information includes packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group; and sending, by the ground signal system, the to-be-sent packet information package to a radio block center RBC,

so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information. The present invention further discloses a ground signal system, a detecting method for a packet information package, and an RBC. In embodiments of the present invention, the RBC can accurately detect whether package loss occurs or whether a transmission sequence of a packet information package is correct.

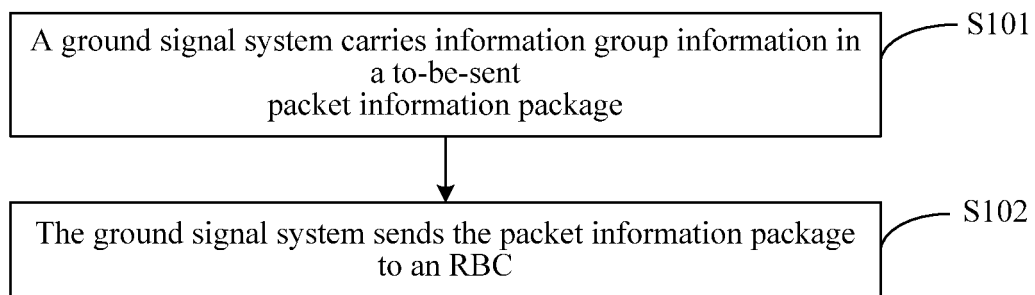


FIG. 1

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Description**TECHNICAL FIELD**

5 **[0001]** The present invention relates to packet information package processing technologies, and in particular, to a sending method and a detecting method for a packet information package, a ground signal system, and a radio block center (RBC, Radio Block Center).

BACKGROUND

10 **[0002]** An RBC is a very important signal device in a China Train Control System 3 (CTCS-3, China Train Control System 3) train control system. Through data interaction with a ground signal system, a train equipped with a CTCS-3 on-board equipment receives a train control message sent by the ground signal system, and controls train operation according to the train control message.

15 **[0003]** Sometimes, a complete train control message transmitted between an RBC and a ground signal system needs to be formed by multiple packet information packages, that is, sometimes a ground signal system needs to send multiple packet information packages to an RBC to send a complete train control message to the RBC.

20 **[0004]** To be convenient for an RBC to detect package loss or a transmission sequence of an information package, a packet information package may carry location information of the packet information package in an information group (that is, a complete message), and the RBC detects the package loss or the transmission sequence of an information package by parsing the location information of the packet information package in the information group.

[0005] However, during existing network transmission, an RBC cannot accurately detect package loss and a transmission sequence of a packet information package in many cases.

SUMMARY

25 **[0006]** In view of this, a technical problem to be solved in the present invention is to provide a sending method and a detecting method for a packet information package, a ground signal system, and an RBC, so that the RBC can accurately detect package loss or a transmission sequence of a packet information package.

30 **[0007]** Accordingly, embodiments of the present invention adopt the following technical solutions:

 A sending method for a packet information package includes: carrying, by a ground signal system, information group information in a to-be-sent packet information package, where the information group information includes packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group; and sending, by the ground signal system, the to-be-sent packet information package to an RBC, so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

40 **[0008]** A ground signal system includes: a generating unit, configured to carry information group information in a to-be-sent packet information package, where the information group information includes packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group; and a sending unit, configured to send the to-be-sent packet information package to an RBC, so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

45 **[0009]** A detecting method for a packet information package includes: receiving, by an RBC, a packet information package that carries information group information, where the information group information includes packet information package number information and/or location information of a next packet information package in the information group, and the information group is an information group to which the received packet information package belongs; and detecting, by the RBC, package loss or a transmission sequence of the packet information package according to the information group information.

50 **[0010]** An RBC includes: a receiving unit, configured to receive a packet information package that carries information group information, where the information group information includes packet information package number information in an information group and/or location information of a next packet information package in the information group, and the information group is an information group to which the received packet information package belongs; and a detecting unit, configured to detect package loss or a transmission sequence of the packet information package according to the information group information.

55 **[0011]** A packet information package sent by a ground signal system carries packet information package number information in an information group to which the packet information package belongs and/or location information of a

next packet information package in the information group. In this way, an RBC can accurately detect, according to the packet information package number information and/or the location information of the next packet information package, whether package loss occurs or whether a transmission sequence of the packet information package is correct.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

FIG. 1 is a flowchart of a sending method for a packet information package according to an embodiment of the present invention;

FIG. 2 is a logical structural diagram of a ground signal system according to an embodiment of the present invention;

FIG. 3 is a flowchart of a detecting method for a packet information package according to an embodiment of the present invention;

FIG. 4 is a logical structural diagram of an RBC according to an embodiment of the present invention;

FIG. 5 is a logical structural diagram of a detecting unit in an RBC according to an embodiment of the present invention; and

FIG. 6 is another logical structural diagram of a detecting unit in an RBC according to an embodiment of the present invention

DESCRIPTION OF EMBODIMENTS

[0013] At present, to be convenient for an RBC to detect package loss or a transmission sequence of an information package, a packet information package may carry location information of the packet information package in an information group. The RBC detects the package loss or the transmission sequence of the information package by parsing the location information of the packet information package in the information group, where the information group includes at least one packet information package, and all packet information packages in the information group may form a complete train control message. However, because of network transmission, a sequence that a packet information package reaches the RBC may be inconsistent with a sequence when the packet information package is sent by a ground signal system, so that the RBC cannot accurately detect package loss or a transmission sequence of the packet information package. For example, a last packet information package in a certain information group may reach the RBC prior to a penultimate packet information package in the information group. When receiving the last packet information package in the information group, the RBC may consider that a complete train control message has been already received, and therefore cannot accurately detect package loss and a transmission sequence of the packet information package. Therefore, embodiments of the present invention provide a sending method and a detecting method for a packet information package, a ground signal system, and an RBC, so that the RBC can accurately detect package loss or a transmission sequence of a packet information package. The following describes the embodiments of the present invention in detail with reference to the accompanying drawings.

[0014] As shown in FIG. 1, a sending method for a packet information package according to an embodiment of the present invention includes:

S101: A ground signal system carries information group information in a to-be-sent packet information package.

[0015] The information group information may include packet information package number information in an information group to which the packet information package belongs or location information of a next packet information package in the information group; or the information group information may include both packet information package number information and location information of a next packet information package in the information group.

[0016] The packet information package number information is used to identify the number of packet information packages included in the information group to which the packet information package belongs; and the location information of the next packet information package in the information group is used to identify a location of the next packet information package of the packet information package in the information group.

[0017] S102: The ground signal system sends the packet information package to an RBC.

[0018] Specifically, the information group sent to the RBC by the ground signal system is formed by at least one packet information package, and all packet information packages in the information group may form a complete train control message.

[0019] The ground signal system may carry, in any one packet information package, packet information package number information in an information group to which the packet information package belongs, or may carry, in any one packet information package, packet information package number information in an information group to which the packet information package belongs and location information of a next packet information package in the same information

group. In this way, when receiving a last packet information package in an information group, the RBC may determine whether package loss occurs or whether a transmission sequence of the packet information package is correct by determining whether the number of packet information packages that have been received in the information group is consistent with the number of packet information packages in the information group that is carried in the packet information package.

[0020] Optionally, the ground signal system may carry, only in a last packet information package at a location of one information group, packet information package number information in the information group; or carry, only in a last packet information package at a location of one information group, packet information package number information in the information group and location information of a next packet information package in the information group. That is to say, the to-be-sent packet information package mentioned in steps S101 and S102 may only mean that a location of one information group is in a last packet information package. An advantage of such processing is to reduce a signaling overhead. It should be noted that, location information of a next packet information package in the information group that is carried in a last packet information package may be empty or an invalid value.

[0021] The ground signal system may carry, in each packet information package of an information group, location information of a next packet information package in the information group, or carry packet information package number information in the information group and location information of a next packet information package in the information group. In this way, the RBC can determine whether package loss occurs or whether a transmission sequence of a packet information package is correct by determining whether location information of a next packet information package in the information group is consistent with location information of an actually received next packet information package in the information group that is carried in the actually received next packet information package. It should be noted that, the location information of the next packet information package in the information group that is carried in the last packet information package may be empty or an invalid value.

[0022] During specific implementation, the packet information package mentioned in steps S101 and S102 may be a general application layer (GAL, General Application Layer) information package. For example, in each period, at most 3 GAL information packages are allowed to be transmitted, and the total length of each GAL information package does not exceed 450 bytes. When a GAL information package is specifically designed, packet information package number information in an information group and/or location information of a next packet information package in the information group may be carried between a group location field and an application data package field in the GAL information package, and specific formats are as shown in Table 1 and Table 2. Table 1 shows formats of a GAL information package that carries packet information package number information in an information group. As shown in Table 1, the packet information package number information in the information group may occupy two bytes. Table 2 shows formats of a GAL information package that carries location information of a next packet information package in an information group. As shown in Table 2, the location information of the next packet information package in the information group may occupy two bytes. Table 3 shows the specific description of a group location field in Table 1 and Table 2.

[0023] Definitely, Table 1 to Table 3 in the following are only examples. In an actual application, the packet information package number information in the information group and/or the location information of the next packet information package in the information group may be set in any location of the packet information package, which is not limited herein.

Table 1

Field	Length	Description
Message type	2 bytes	=0x8004 and an RBC interface
Version control information	12 bytes	
Information package number	2 bytes	Total number of information packages in an application data package of this frame
Group location	2 bytes	Indicate a location sequence in an information group
Group message number	2 bytes	Indicate the number of GAL information packages in an information group
Application data package	Getting longer	One or more consecutive information packages

Table 2

Field	Length	Description
Message type	2 bytes	=0x8004 and an RBC interface
Version control information	12 bytes	
Information package number	2 bytes	Total number of information packages in an application data package of this frame
Group location	2 bytes	Indicate a location sequence in an information group
Group location of next GAL information package	2 bytes	Indicate the number of next GAL information packages in an information group
Application data package	Getting longer	One or more consecutive information packages

Table 3

Value	Description
0xFFFF	An information group includes only one packet information package
0x0000	First packet information package in an information group
0x0001-0xFFFF0	Packet information packages other than a first packet information package and a last packet information package in an information group
0xFFFF1	Last packet information package in an information group

[0024] Corresponding to the foregoing sending method for a packet information package, an embodiment of the present invention further provides a ground signal system. As shown in FIG. 2, the ground signal system may include:

a generating unit 201, configured to carry information group information in a to-be-sent packet information package, where
the information group information may include packet information package number information in an information group to which the packet information package belongs or location information of a next packet information package in the information group;
or packet information package number information and location information of a next packet information package in the information group; and
a sending unit 202, configured to send the to-be-sent packet information package to an RBC, so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

[0025] During specific implementation, the packet information package may be a GAL information package.

[0026] The generating unit 201 may be specifically configured to carry packet information package number information in an information group to which the to-be-sent packet information package belongs and/or location information of a next packet information package in the information group between a group location field and an application data package field in the to-be-sent packet information package.

[0027] During specific implementation, the ground signal system in the embodiment of the present invention may be a temporary speed restriction server (TSRS, Temporary Speed Restriction), a decentralized self-discipline centralized traffic control system (CTC, Centralized Traffic Control), an interlocking system (IL, InterLocking), or the like.

[0028] The foregoing ground signal system may be used to implement the embodiments of the sending method for a packet information package, and for some descriptions of the foregoing ground signal system, reference may be made to the descriptions of the sending method for a packet information package, which is not described herein again.

[0029] After the packet information package sent by the ground signal system reaches the RBC, the RBC may detect package loss or a transmission sequence of the packet information package. Therefore, an embodiment of the present invention further provides a detecting method for a packet information package. As shown in FIG. 3, the method includes:

S301: An RBC receives a packet information package that carries information group information.

[0030] The information group information includes packet information package number information in an information group, or location information of a next packet information package in the information group, or packet information package number information and location information of a next packet information package in the information group, where the information group is an information group to which the received packet information package belongs.

[0031] S302: The RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

[0032] Specifically, the packet information package may be a GAL information package.

[0033] The packet information package number information in the information group and/or the location information of the next packet information package in the information group may be located between a group location field and an application data package field in the received packet information package.

[0034] The received packet information package may carry location information of the received packet information package in the information group.

[0035] If the received packet information package carries packet information package number information in an information group to which the received packet information package belongs, that is, the information group information includes packet information package number information, or the information group information includes packet information package number information and location information of a next packet information package in the information group, the RBC may detect package loss or a transmission sequence of the packet information package in the following manner: parsing, by the RBC, the location information of the received packet information package in the information group that is carried in the received packet information package; if it is determined that the received packet information package is a packet information package at a last location of the information group, determining whether the number of packet information packages that have been received is the number corresponding to the packet information package number information in the information group that is carried in the received packet information package, if yes, determining that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determining that package loss occurs or the transmission sequence of the packet information package is false; and if it is determined that the received packet information package is not a packet information package at a last location of the information group, counting received packet information packages to make a preparation for detecting the number of packet information packages when a last packet information package in the information group is received.

[0036] If the received packet information package carries location information of a next packet information package in an information group to which the received packet information package belongs, that is, the information group information includes location information of a next packet information package in the information group, or the information group information includes packet information package number information and location information of a next packet information package in the information group, the RBC may detect package loss or a transmission sequence of the packet information package in the following manner: recording, by the RBC, the location information of the next packet information package in the information group; after the RBC receives a next packet information package, determining whether location information of the received next packet information package in the information group that is carried in the received next packet information package is consistent with the recorded location information of the next packet information package in the information group, if yes, determining that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determining that package loss occurs or the transmission sequence of the packet information package is false.

[0037] The foregoing detecting method for a packet information package is described from the perspective of an RBC, and some processing manners of the RBC are corresponding to some processing manners of a ground signal system, and therefore, for some detailed descriptions of the foregoing detecting method for a packet information package, reference may be made to detailed descriptions of the foregoing sending method for a packet information package, for example, formats of a GAL information package that carries packet information package number information in an information group or location information of a next packet information package in an information group, and for another example, a received GAL information package that carries packet information package number information in an information group may be a last packet information package in the information group, which is not described herein again. Corresponding to the foregoing detecting method for a packet information package, an embodiment of the present invention further provides an RBC. As shown in FIG. 4, the RBC may include:

a receiving unit 401, configured to receive a packet information package that carries information group information, where the packet information package may include packet information package number information in an information group, or a packet information package of location information of a next packet information package in the information group, or packet information package number information and location information of a next packet information package in the information group, where the information group is an information group to which the received packet information package belongs; and

a detecting unit 402, configured to detect package loss or a transmission sequence of the packet information package according to the information group information.

[0038] During specific implementation, the packet information package may be a GAL information package.

[0039] The information group information may be located between a group location field and an application data package field in the received packet information package.

[0040] The received packet information package may carry location information of the received packet information package in the information group.

[0041] If the received packet information package carries packet information package number information in an information group to which the received packet information package belongs, that is, the information group information includes packet information package number information, or the information group information includes packet information package number information and location information of a next packet information package in the information group, a logical structure of the detecting unit 402 is shown in FIG. 5, and the detecting unit 402 includes: a parsing subunit 4021, a first determining subunit 4022, and a counting subunit 4023, where the parsing subunit 4021 is configured to parse the location information of the received packet information package in the information group that is carried in the received packet information package; the first determining subunit 4022 is configured to determine, when the parsing subunit 4021 determines that the received packet information package is a packet information package at a last location of the information group, whether the number of packet information packages that have been already received by the receiving unit 401, which is counted by the counting subunit 4023, is the number corresponding to the packet information package number information in the information group that is carried in the received packet information package, if yes, determine that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determine that package loss occurs or the transmission sequence of the packet information package is false; and the counting subunit 4023 is configured to, when the parsing subunit 4021 determines that the received packet information package is not a packet information package at a last location of the information group, count received packet information packages.

[0042] If the received packet information package carries location information of a next packet information package in an information group to which the received packet information package belongs, that is, the information group information includes location information of a next packet information package in the information group, or the information group information includes packet information package number information and location information of a next packet information package in the information group, a logical structure of a detecting unit 402 is shown in FIG. 6, and the detecting unit 402 includes: a recording subunit 4024, configured to record the location information of the next packet information package in the information group; a second determining subunit 4025, configured to determine whether location information of a received next packet information package in the information group that is carried in the next packet information package received by the receiving unit 401 is consistent with the recorded location information of the next packet information package in the information group, if yes, determine that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determine that package loss occurs or the transmission sequence of the packet information package is false.

[0043] The foregoing RBC is corresponding to the foregoing detecting method for a packet information package, and therefore, for specific descriptions of the RBC, reference may be made to specific descriptions in the detecting method for a packet information package, which is not described herein again.

[0044] To enable a person of ordinary skill in the art to understand the embodiment of the present invention more clearly, that a ground signal system is a TSRS, the TSRS sends, to an RBC, information group A formed by N (N is an integer greater than 1) packet information packages, and a sending sequence of the packet information packages is 1, 2...N-1, N is taken as an example in the following to describe the embodiment of the present invention.

[0045] Embodiment 1: Packet information packages carry the number N of the packet information packages in information group A.

[0046] A TSRS sends the packet information packages to an RBC successively. The TSRS carries, only in an Nth packet information package, the number N of the packet information packages in information group A, but does not carry, in other packet information packages, the number N of the packet information packages in information group A. Starting from receiving a first packet information package in information group A, each time the RBC receives a packet information package in information group A, the RBC counts the information group A once. After receiving a certain packet information package, through location information of the packet information package in information group A that is carried in the packet information package, the RBC finds that the packet information package is a last packet information package in information group A, the RBC counts information group A once again, and determines whether the total count of information group A is the number N of the packet information packages in information group A that is carried in the last packet information package in information group A, if yes, determines that no package loss occurs, or determines that the transmission sequence of the packet information package is correct, and otherwise, determines that package loss occurs, or determines that the transmission sequence of the packet information package is false. Embodiment 2: Packet information packages carry location information of a next packet information package in information group A.

[0047] A TSRS sends the packet information packages to an RBC successively. The TSRS carries, in each packet information package in information group A, the location information of the next packet information package in information

group A, where the location information of the next packet information package in information group A that is carried in an N^{th} packet information package in information group A is empty or an invalid value. After receiving a first packet information package in information group A, the RBC records location information of a second packet information package in information group A that is carried in the first packet information package in information group A. After receiving a packet information package in information group A again, the RBC analyzes whether location information of the currently received packet information package in information group A that is carried in the currently received packet information package is consistent with the previously recorded location information of the second packet information package in information group A. If consistent, it indicates that the currently received packet information package is the second packet information package in information group A, and therefore, it may be determined that the second packet information package in information group A is not lost, or determined that the transmission sequence of the packet information package is correct, and otherwise, it is determined that the second packet information package in information group A is lost, or determined that the transmission sequence of the packet information package is false. The rest can be deduced by analogy. After receiving an $(N-1)^{\text{th}}$ packet information package in information group A, the RBC records location information of the N^{th} packet information package in information group A that is carried in the $(N-1)^{\text{th}}$ packet information package in information group A. After receiving a packet information package in information group A again, the RBC analyzes whether location information of the currently received packet information package in information group A that is carried in the currently received packet information package is consistent with the previously recorded location information of the N^{th} packet information package in information group A. If consistent, it indicates that the currently received packet information package is the N^{th} packet information package in information group A, and therefore, it may be determined that the N^{th} packet information package in information group A is not lost, or determined that the transmission sequence of the packet information package is correct, and otherwise, it is determined that the N^{th} packet information package in information group A is lost, or determined that the transmission sequence of the packet information package is false.

[0048] To sum up, in the embodiment of the present invention, a packet information package sent by a ground signal system carries packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group. In this way, an RBC can accurately detect, according to the packet information package number information and/or the location information of the next packet information package, whether package loss occurs or whether a transmission sequence of the packet information package is correct.

[0049] In the embodiments of the present invention, the packet information package may be a GAL information package, the ground signal system and the RBC may accurately detect, according to packet information package number information and/or location information of a next packet information package, whether package loss occurs or whether a transmission sequence of the packet information package is correct, thereby eliminating a traffic hazard.

[0050] It may be understood by a person of ordinary skill in the art that: the processes of implementing the methods in the foregoing embodiments may be completed through a program instructing related hardware. The program may be stored in a readable storage medium. When the program is run, the steps corresponding to the foregoing methods are performed. The storage medium may be: a ROM/RAM, a magnetic disk, an optical disk, or the like.

[0051] The foregoing descriptions are merely exemplary implementation manners of the present invention. It should be pointed out that a person of ordinary skill in the art may also make some improvements and modifications without departing from the principle of the present invention, and these improvements and modifications may also be subject to the protection scope of the present invention.

Claims

1. A sending method for a packet information package, comprising:

carrying, by a ground signal system, information group information in a to-be-sent packet information package, wherein the information group information comprises packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group; and
sending, by the ground signal system, the to-be-sent packet information package to a radio block center RBC, so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

2. The method according to claim 1, wherein the packet information package comprises a general application layer GAL information package.

3. The method according to claim 2, wherein the carrying, by a ground signal system, information group information in a to-be-sent packet information package comprises:

carrying, by the ground signal system, the information group information between a group location field and an application data package field in the to-be-sent packet information package.

4. A ground signal system, comprising:

a generating unit, configured to carry information group information in a to-be-sent packet information package, wherein the information group information comprises packet information package number information in an information group to which the packet information package belongs and/or location information of a next packet information package in the information group; and

a sending unit, configured to send the to-be-sent packet information package to a radio block center RBC, so that the RBC detects package loss or a transmission sequence of the packet information package according to the information group information.

5. The ground signal system according to claim 4, wherein the packet information package comprises a general application layer GAL information package.

6. The ground signal system according to claim 5, wherein the generating unit is specifically configured to carry the information group information between a group location field and an application data package field in the to-be-sent packet information package.

7. A detecting method for a packet information package, comprising:

receiving, by a radio block center RBC, packet information package that carries information group information, wherein the information group information comprises packet information package number information and/or location information of a next packet information package in the information group, wherein the information group is an information group to which the received packet information package belongs; and

detecting, by the RBC, package loss or a transmission sequence of the packet information package according to the information group information.

8. The method according to claim 7, wherein the packet information package comprises a general application layer GAL information package.

9. The method according to claim 8, wherein the information group information is located between a group location field and an application data package field in the packet information package.

10. The method according to claim 7, 8 or 9, wherein the packet information package further carries location information of the packet information package in the information group;

the information group information comprises packet information package number information; or the information group information comprises packet information package number information and location information of a next packet information package in the information group; and

the detecting, by the RBC, package loss or a transmission sequence of the packet information package according to the information group information comprises:

parsing, by the RBC, the location information of the received packet information package in the information group that is carried in the received packet information package;

if the RBC determines that the received packet information package is a packet information package at a last location of the information group, determining whether the number of packet information packages that have been received is the number corresponding to the packet information package number information in the information group that is carried in the received packet information package, if yes, determining that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determining that package loss occurs or the transmission sequence of the packet information package is false; and if the RBC determines that the received packet information package is not a packet information package at a last location of the information group, counting received packet information packages.

11. The method according to claim 7, 8 or 9, wherein the packet information package further carries location information

of the packet information package in the information group;
 the information group information comprises location information of a next packet information package in the information group; or the information group information comprises packet information package number information and location information of a next packet information package in the information group; and
 5 the detecting, by the RBC, package loss or a transmission sequence of the packet information package according to the information group information comprises:

recording, by the RBC, the location information of the next packet information package in the information group;
 and

10 after the RBC receives a next packet information package, determining whether location information of the received next packet information package in the information group that is carried in the received next packet information package is consistent with the recorded location information of the next packet information package in the information group, if yes, determining that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determining that package loss occurs or the transmission
 15 sequence of the packet information package is false.

12. A radio block center RBC, comprising:

20 a receiving unit, configured to receive a packet information package that carries information group information, wherein the information group information comprises packet information package number information in an information group and/or location information of a next packet information package in the information group, wherein the information group is an information group to which the received packet information package belongs; and

25 a detecting unit, configured to detect package loss or a transmission sequence of the packet information package according to the information group information.

13. The RBC according to claim 12, wherein the packet information package comprises a general application layer GAL information package.

30 **14.** The RBC according to claim 13, wherein the information group information is located between a group location field and an application data package field in the received packet information package.

15. The RBC according to claim 12, 13 or 14, wherein the packet information package further carries location information of the packet information package in the information group;

35 the information group information comprises packet information package number information; or the information group information comprises packet information package number information and location information of a next packet information package in the information group; and the detecting unit comprises:

a parsing subunit, a first determining subunit, and a counting subunit, wherein

40 the parsing subunit is configured to parse the location information of the received packet information package in the information group that is carried in the received packet information package;

the first determining subunit is configured to, when the parsing subunit determines that the received packet information package is a packet information package at a last location of the information group, determine whether the number of packet information packages that have been received by the receiving unit, which is counted by the counting subunit, is the number corresponding to the packet information package number information in the information group that is carried in the received packet information package, if yes, determine that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determine that package loss occurs or the transmission sequence of the packet information package is false; and

45 the counting subunit is configured to, when the parsing subunit determines that the received packet information package is not a packet information package at a last location of the information group, count received packet information packages.
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16. The RBC according to claim 12, 13 or 14, wherein the received packet information package further carries location information of the received packet information package in the information group;

55 the information group information comprises location information of a next packet information package in the information group; or the information group information comprises packet information package number information and location information of a next packet information package in the information group; and the detecting unit comprises:

a recording subunit, configured to record the location information of the next packet information package in the

information group; and

a second determining subunit, configured to determine whether location information of a received next packet information package in the information group that is carried in the next packet information package received by the receiving unit is consistent with the recorded location information of the next packet information package in the information group, if yes, determine that no package loss occurs or the transmission sequence of the packet information package is correct, and otherwise, determine that package loss occurs or the transmission sequence of the packet information package is false.

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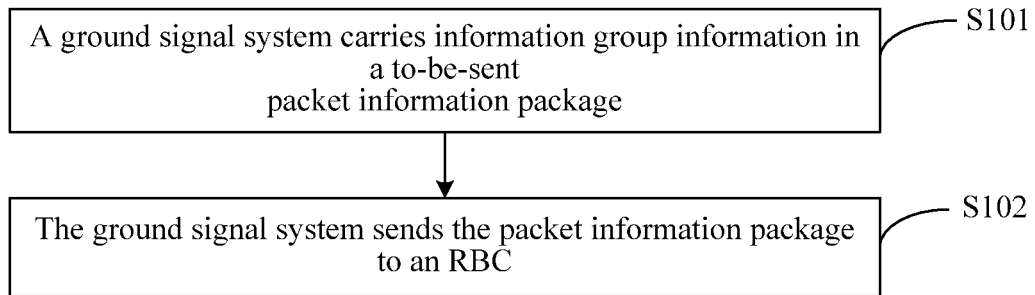


FIG. 1

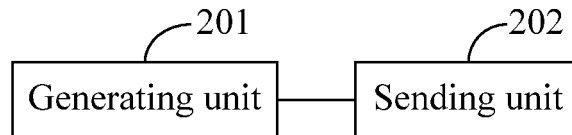


FIG. 2

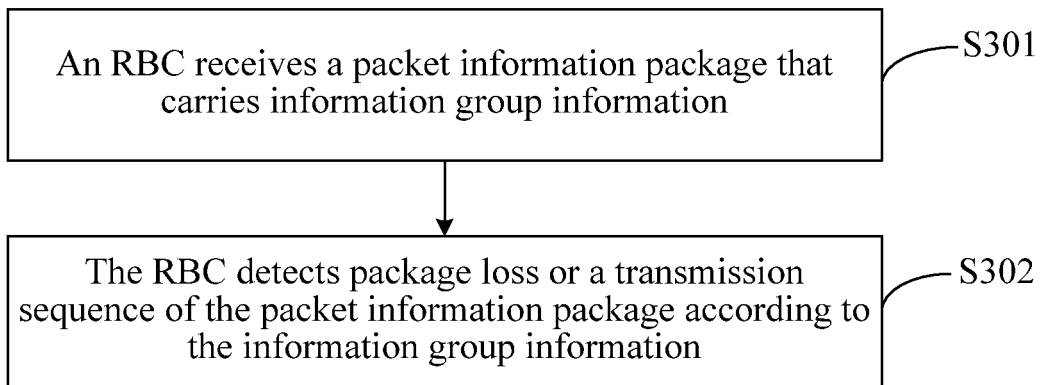


FIG. 3

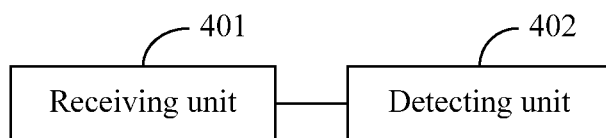


FIG. 4

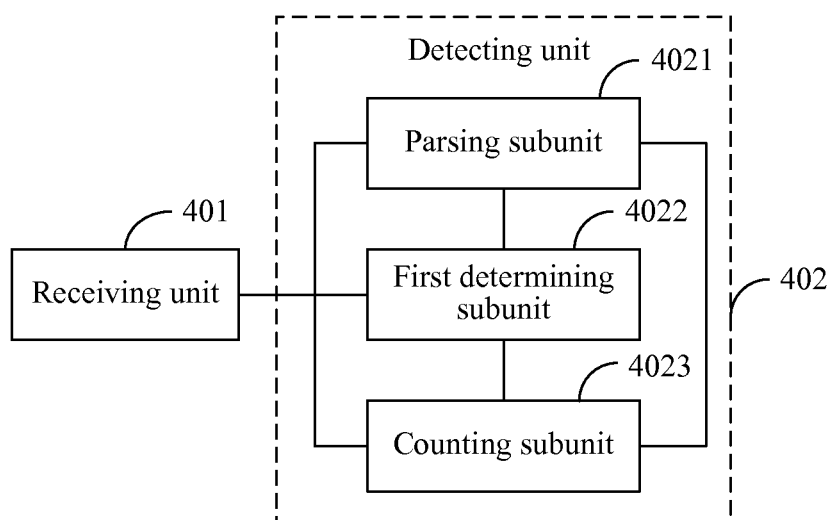


FIG. 5

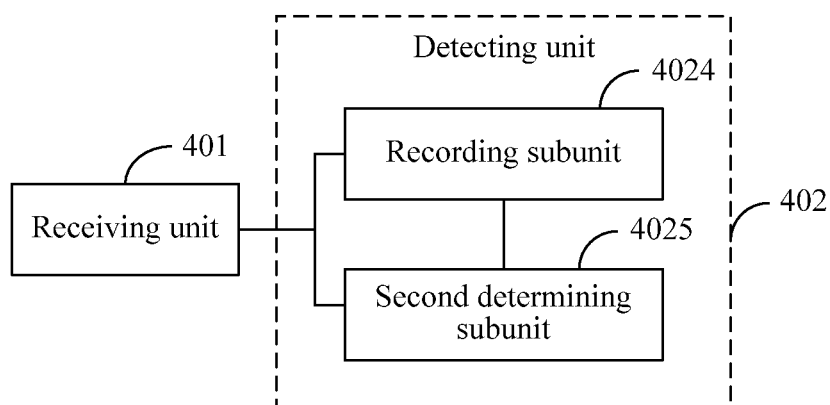


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/075872

A. CLASSIFICATION OF SUBJECT MATTER

H04L 12/56(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04L H04B H04Q H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPRSABS,CNXTX,CNKI, VEN: packet?, package, data, location, sequence, order, block, train?, carr+, information

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN102064962A (NANJING NRIET IND. CO., LTD.) 18 May 2011(18.05.2011) the whole document	1-16
A	CN101663590A (CISCO TECHNOLOGY INC.) 03 Mar. 2010(03.03.2010) the whole document	1-16
A	CN101834700A (UNIV. BEIJING POSTS & TELECOM.) 15 Sep. 2010(15.09.2010) the whole document	1-16

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search
02 Mar. 2012(02.03.2012)Date of mailing of the international search report
22 Mar. 2012 (22.03.2012)Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/075872

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN102064962A	18.05.2011	None	
CN101663590A	03.03.2010	EP2140279A1	06.01.2010
		US7864771B2	04.01.2011
		WO2008130965A1	30.10.2008
		US2008259926A1	23.10.2008
CN101834700A	15.09.2010	None	

Form PCT/ISA /210 (patent family annex) (July 2009)