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[Continued on next page]

(54) Title: PROCESSING NICKNAME CONFLICT IN TRILL NETWORK

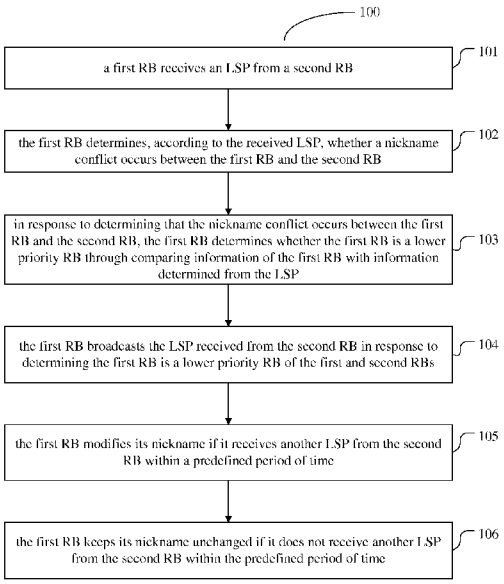


FIG. 1

(57) Abstract: A first routing bridge (RB) according to an example determines whether there is a nickname conflict between nicknames of the first RB and a second RB. If there is a nickname conflict, the first RB determines whether it is a lower priority RB and may modify its nickname if it is lower priority and based on a broadcast of link state packet from the second RB.

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PROCESSING NICKNAME CONFLICT IN TRILL NETWORK

BACKGROUND

[0001] Transparent Interconnection of Lots of Links (TRILL) is a Layer 2 (L2) network standard recommended by Internet Engineering Task Force (IETF), and may make up for the lack of Spanning Tree Protocol (STP) in a large data center.

[0002] In a TRILL network, a device running TRILL protocol is called a Routing Bridge (RB), and each RB has a unique nickname. The first RB that a unicast frame encounters in a campus in the TRILL network encapsulates the frame with a TRILL header that specifies the last RB where the frame is decapsulated. To save room in the TRILL header and simplify forwarding lookups, a dynamic nickname acquisition protocol is run among the RBs to select 2-octet nicknames for RBs. The nicknames are used to specify the ingress and egress RBs in the TRILL header.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Features of the present disclosure are illustrated by way of example and not limited in the following figure(s), in which like numerals indicate like elements, in which:

[0004] Figure 1 is a flowchart illustrating a method for processing a nickname conflict in a TRILL network according to an example of the present disclosure.

[0005] Figure 2 is a flowchart illustrating a method for processing a nickname conflict in a TRILL network according to another example of the present disclosure.

[0006] Figure 3 is a diagram illustrating the structure of a device for processing a nickname conflict in a TRILL network according to an example of the present disclosure.

[0007] Figure 4 is a diagram illustrating the structure of a device for processing a nickname conflict in a TRILL network according to another example of the present disclosure.

DETAILED DESCRIPTION

[0008] For simplicity and illustrative purposes, the present disclosure is described by referring mainly to an example thereof. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be readily apparent however, that the present disclosure may be practiced without limitation to these specific details. In other instances, some methods and structures have not been described in detail so as not to unnecessarily obscure the present disclosure. Throughout the present disclosure, the terms “a” and “an” are intended to denote at least one of a particular element. As used herein, the term “includes” means includes but not limited to, the term “including” means including but not limited to. The term “based on” means based at least in part on.

[0009] Figure 1 is a flowchart illustrating a method 100 for processing a nickname conflict in a TRILL network according to an example of the present disclosure.

[0010] At block 101, a first RB receives a link state packet (LSP) from a second RB.

[0011] At block 102, the first RB determines, according to the received LSP, whether a nickname conflict occurs between the first RB and the second RB. The LSP for example includes the nickname of the second RB. A conflict occurs for example if the first RB and the second RB have the same nickname.

[0012] At block 103, in response to determining that the nickname conflict occurs between the first RB and the second RB, the first RB determines whether the first RB is a lower priority RB through comparing information of the first RB with information contained in the LSP. Examples of determining a lower priority RB are described below.

[0013] At block 104, the first RB broadcasts the LSP received from the second RB in response to determining the first RB is a lower priority RB of the first and second RBs.

[0014] At block 105, the first RB modifies its nickname if it receives another

LSP from the second RB within a predefined period of time.

[0015] At block 106, the first RB keeps its nickname unchanged if it does not receive another LSP from the second RB within the predefined period of time.

[0016] In an example, the process for determining whether the first RB is the lower priority RB through comparing the information of the first RB with the information contained in the LSP may be implemented as follows. The first RB determines priorities of the first RB and the second RB. The priority is the priority of the nickname. For example, priorities may be assigned by a system administrator or machine. A priority may be adjusted over time. For example, an RB may increase its nickname priority after holding the same nickname for a period of time. The nicknames and their priorities may be distributed through a dynamic nickname acquisition protocol. The TRILL protocol specifies that the nickname selection protocol may be piggybacked on TRILL IS-IS using an IS-IS TLV (type-length-value data element) along with a priority of use value, which specifies the priority of the nickname. An RB that has been configured with one or more nickname values may have a higher priority for those nickname values over all RBs with non-configured nicknames.

[0017] The first RB receives the LSP of the second RB and determines the priority of the second RB, which may be stored by the first RB along with the nickname of the second RB. The first RB compares the priorities of the first and second RBs to determine which one is higher. In one example, a predetermined scale of priorities (e.g., in a simplistic example, the scale is low, medium, high) may be known to the RBs and used to prioritize the RBs, so the first RB can determine which RB has a higher priority on the scale. Also, if the first RB determines that it has a lower priority on the scale than the second RB, the first RB determines that it is a loser (i.e., the lower priority RB of the first RB and the second RB) which may invoke other operations to resolve nickname conflict and network instability. For example, the nickname of the first RB may be changed.

[0018] The first RB and the second RB may have the same priority. For example, the first RB determines the priorities of the first and second RB and determines the priorities are the same. In response to determining the priority of

the first RB is the same as the priority of the second RB, the first RB determines whether a system identity of the first RB is smaller (e.g., lower) than a system identity of the second RB contained in the LSP. The system ID for example is the unique IS-IS system ID (e.g., six-octet) of an RB in a campus in the TRILL network. The nickname is provided for the system ID. In response to determining the system identity of the first RB is smaller than the system identity of the second RB, the first RB determines that it is the lower priority RB.

[0019] Figure 2 is a flowchart illustrating a method 200 for processing a nickname conflict in a TRILL network according to another example of the present disclosure.

[0020] At block 201, a first RB receives an LSP from a second RB.

[0021] For example, each of the RBs in the TRILL network periodically sends an LSP, so as to provide topology information. Any RB receiving the LSP updates its Link State Data Base (LSDB) with information in the received LSP, and checks whether a nickname conflict occurs.

[0022] At block 202, the first RB determines, according to the received LSP, whether a nickname conflict occurs between the first RB and the second RB. In response to determining the nickname conflict occurs between the first RB and the second RB, block 203 is performed. If the nickname conflict does not occur between the first RB and the second RB, block 209 is performed.

[0023] In an example, the process for determining, according to the received LSP, whether the nickname conflict occurs between the first RB and the second RB may be implemented as follows. If the nickname of the second RB contained in the LSP is the same as the nickname of the first RB, the first RB determines that the nickname conflict occurs. If the nickname of the second RB contained in the LSP is different from the nickname of the first RB, the first RB determines that no nickname conflict occurs.

[0024] At block 203, the first RB compares the priority of the first RB with the priority of the second RB. In response to determining the priority of the first RB is lower than the priority of the second RB, block 205 is performed. In response to determining the priority of the first RB is the same as the priority of the second RB,

block 204 is performed. In response to determining the priority of the first RB is higher than the priority of the second RB, block 209 is performed.

[0025] The priority refers to priority of the nickname of the RB.

[0026] At block 204, the first RB determines whether a system identity of the first RB is smaller than a system identity of the second RB. In response to determining the system identity of the first RB is smaller than the system identity of the second RB, block 205 is performed. In response to determining the system identity of the first RB is not smaller than a system identity of the second RB, block 209 is performed.

[0027] At block 205, the first RB broadcasts the LSP received from the second RB.

[0028] If the priority of the first RB is lower than the priority of the second RB, or the priority of the first RB is the same as the priority of the second RB and the system identity of the first RB is smaller than the system identity of the second RB, the first RB determines whether the second RB is in the same TRILL network or the same campus as the first RB in the TRILL network. In response to determining the second RB is in the TRILL network or campus, the first RB modifies its nickname.

[0029] For example, the first RB adds 1 to a sequence number of the LSP received from the second RB at block 201, and broadcasts the modified LSP of the second RB. In response to the first RB broadcasting the modified LSP, the first RB records the sequence number of the broadcasted LSP.

[0030] At block 206, the first RB determines whether the first RB receives another LSP from the second RB within a predetermined period of time. In response to determining the first RB receives another LSP from the second RB within the predetermined period of time, block 207 is performed. In response to determining the first RB does not receive another LSP from the second RB within a predetermined period of time, block 208 is performed.

[0031] In an implementation, if the second RB receives its own LSP and the sequence number of the received LSP is larger than the sequence number of the previously sent LSP, the second RB immediately broadcasts an LSP. The sequence number of the broadcasted LSP is larger than the sequence number of

the received LSP.

[0032] And thus, after the first RB broadcasts the modified LSP of the second RB, the second RB immediately broadcasts another LSP if the second RB is still in the TRILL network. Accordingly, if the first RB receives another LSP from the second RB within the predefined period of time after broadcasting the modified LSP of the second RB, it is indicated that the second RB is still in the TRILL network.

[0033] If the first RB receives another LSP from the second RB within the predefined period of time after broadcasting the modified LSP of the second RB, the first RB determines whether the sequence number of the received another LSP is larger than the sequence number of the broadcasted LSP, thereby accurately determining whether the second RB is still in the TRILL network.

[0034] At block 207, the first RB modifies its nickname.

[0035] If the first RB finds that the second RB is still in the TRILL network through broadcasting the modified LSP of the second RB, the first RB modifies its nickname, thereby solving the nickname conflict.

[0036] At block 208, the first RB keeps its nickname unchanged, and broadcasts an LSP for aging for the second RB.

[0037] If the first RB finds that the second RB is not in the TRILL network through broadcasting the modified LSP of the second RB, the first RB keeps its nickname unchanged. In order to make all RBs in the TRILL network accurately calculate routing information, the first RB sends the LSP for aging for the second RB, and thus each RB in the TRILL network removes the LSP of the second RB from the LSDB according to the LSP for aging. The live time of the LSP for aging is 0.

[0038] At block 209, the flowchart of processing the nickname conflict ends.

[0039] The foregoing describes the method for processing the nickname conflict in the TRILL network. A device for processing a nickname conflict in the TRILL network is illustrated with reference to an example.

[0040] Figure 3 is a diagram illustrating the structure of a device for processing a nickname conflict in a TRILL network according to an example of the present disclosure. The device may be applied to a RB, referred to as a first RB. The device includes a receiving module 301, a conflict checking module 302, a conflict

processing module 303 and a sending module 304.

[0041] The receiving module 301 receives an LSP from a second RB.

[0042] The conflict checking module 302 determines, according to the LSP received by the receiving module 301, whether a nickname conflict occurs between the first RB and the second RB.

[0043] In response to the conflict checking module 302 determines that the nickname conflict occurs between the first RB and the second RB, the conflict processing module 303 determines whether the first RB is a lower priority RB through comparing information of the first RB with information contained in the LSP. In response to determining the first RB is a lower priority RB, the conflict processing module 303 notifies the sending module 304 to broadcast the LSP received from the second RB. In response to determining the receiving module 301 receives another LSP from the second RB within a predefined period of time, the conflict processing module 303 modifies the nickname of the first RB. If the receiving module 301 does not receive another LSP from the second RB within the predefined period of time, the conflict processing module 303 keeps the nickname of the first RB unchanged.

[0044] In an example, the conflict processing module 303 determines whether the priority of the first RB is lower than the priority of the second RB contained in the LSP. In response to determining the priority of the first RB is lower than the priority of the second RB, the conflict processing module 303 determines that the first RB is the lower priority RB.

[0045] In an example, the conflict processing module 303 is to determine whether the priority of the first RB is lower than the priority of the second RB contained in the LSP. In response to determining the priority of the first RB is the same as the priority of the second RB, the conflict processing module 303 is to determine whether a system identity of the first RB is smaller than a system identity of the second RB contained in the LSP. In response to determining the system identity of the first RB is smaller than the system identity of the second RB, the conflict processing module 303 is to determine that the first RB is the lower priority RB.

[0046] If the nickname of the second RB contained in the LSP received by the receiving module 301 is the same as the nickname of the first RB, the conflict checking module 302 is to determine that nickname conflict occurs. In response to determining the nickname of the second RB contained in the LSP received by the receiving module 301 is different from the nickname of the first RB, the conflict checking module 302 is to determine that no nickname conflict occurs.

[0047] After receiving the notification of the conflict processing module 303, the sending module 304 is to add 1 to a sequence number of the LSP received by the receiving module 301, and broadcast the modified LSP.

[0048] The sending module 304 is further to record the sequence number of the broadcasted LSP in response to broadcasting the modified LSP.

[0049] After the receiving module 301 receives another LSP from the second RB within the predefined period of time and before the conflict processing module 303 modifies the nickname of the first RB, the conflict processing module 303 determines whether the sequence number of another LSP received by the receiving module 301 within the predefined period of time is larger than the recorded sequence number. In response to determining the sequence number of another LSP received by the receiving module 301 within the predefined period of time is larger than the recorded sequence number, the conflict processing module 303 modifies the nickname of the first RB. In response to determining the sequence number of another LSP received by the receiving module 301 within the predefined period of time is not larger than the recorded sequence number, the conflict processing module 303 keeps the nickname of the first RB unchanged.

[0050] After keeping the nickname of the first RB unchanged, the conflict processing module 303 is further to notify the sending module 304 to broadcast an LSP for aging for the second RB. In this way, each of RBs in the TRILL network removes the LSP of the second RB from the LSDB.

[0051] Figure 4 is a diagram illustrating the structure of a device for processing a nickname conflict. The device may be a device in the network. The device may be a layer 2 network switch. The device may be an RB in a TRILL network, such as the first RB or the second RB described in the examples above. As shown in

Figure 4, the device at least includes a memory 401 and a processor 402 communicating with the memory 401. The memory 401 for example stores machine readable instructions that are executed to perform the method 100 and 200 and other functions described herein. The machine readable instructions for example include receiving instructions 410, conflict checking instructions 411, conflict processing instructions 412 and sending instructions 413 which can be executed by the processor 402. The instructions shown in figure 4 may embody the modules shown in figure 3. The memory 401 for example is a non-transitory computer storage readable medium. The device may include multiple storage mediums, including non-transitory storage 420, a forwarding chip 422 and other hardware 421.

[0052] The receiving instructions 410 are executed to receive LSPs from RBs.

[0053] The conflict checking instructions 411 determine, according to the received LSPs, whether any nickname conflict occurs between RBs. Examples of conflict checking are described in the methods above. The conflict processing instructions 412 determine RB priorities and determine whether a first RB has a lower priority than a second RB sending an LSP. Furthermore, the conflict processing instructions 412 can invoke and/or execute operations to rectify nickname conflicts such as described in the methods above. The sending instructions 413 send LSPs. For example, if the first RB is a loser (e.g., lower priority RB), he sending instruction 413 broadcast the LSP received from the second RB In another example, the sending instructions 413 to add 1 to a sequence number of the LSP received by the receiving instruction, and broadcast the modified LSP.

[0054] The sending instruction is further to record the sequence number of the broadcasted LSP in response to broadcasting the modified LSP.

[0055] After the receiving instruction receives another LSP from the second RB within the predefined period of time and before the conflict processing instruction modifies the nickname of the first RB, the conflict processing instruction is further to determine whether the sequence number of another LSP received by the receiving instruction within the predefined period of time is larger than the

recorded sequence number. In response to determining the sequence number of another LSP received by the receiving instruction within the predefined period of time is larger than the recorded sequence number, the conflict processing instruction is to modify the nickname of the first RB. In response to determining the sequence number of another LSP received by the receiving instruction within the predefined period of time is larger than the recorded sequence number, the conflict processing instruction is to keep the nickname of the first RB unchanged.

[0056] After keeping the nickname of the first RB unchanged (i.e., not changing the nickname), the conflict processing instruction is further to notify the sending instruction to broadcast an LSP for aging for the second RB. In this way, each of RBs in the TRILL network removes the LSP of the second RB from the LSDB.

[0057] In the examples, in response to the first RB determines that the nickname conflict occurs between the first RB and the second RB, the first RB determines whether the second RB is still in the TRILL network through broadcasting the LSP received from the second RB. In response to determining the second RB is not in the TRILL network, the first RB keeps its nickname unchanged, thereby avoiding the temporary interruption of data traffic forwarding and the recalculation of large number of routing items, and further ensuring the stability of the TRILL network.

[0058] Although described specifically throughout the entirety of the instant disclosure, representative examples of the present disclosure have utility over a wide range of applications, and the above discussion is not intended and should not be construed to be limiting, but is offered as an illustrative discussion of aspects of the disclosure.

WHAT IS CLAIMED IS:

1. A method for processing a nickname conflict in a TRILL network, comprising:

receiving, by a first Routing Bridge (RB), a Link State Packet (LSP) from a second RB;

determining, according to the received LSP, whether nicknames for the first RB and the second RB conflict;

in response to determining that the nicknames conflict, determining whether the first RB is a lower priority RB than the second RB based on comparing information of the first RB with information determined from the LSP;

broadcasting the LSP received from the second RB in response to determining the first RB is the lower priority RB;

modifying the nickname of the first RB if the first RB receives another LSP from the second RB within a predefined period of time of receiving the LSP; and

keeping the nickname of the first RB unchanged if the first RB does not receive another LSP from the second RB within the predefined period of time.

2. The method of claim 1, wherein the determining of whether the first RB is the lower priority RB comprises:

determining a priority of the first RB;

determining a priority of the second RB based on the LSP;

comparing the priorities of the first and second RBs; and

determining the first RB is the lower priority RB if the priority of the first RB is determined to be lower than the priority of the second RB based on the comparing.

3. The method of claim 2, comprising:

determining whether the priorities are the same based on the comparing;

in response to determining the priorities are the same, determining whether a system identity of the first RB is smaller than a system identity of the second RB

contained in the LSP; and

if the system identity of the first RB is smaller than the system identity of the second RB, determining that the first RB is the lower priority RB.

4. The method of claim 1, wherein the determining of whether the nicknames for the first RB and the second RB conflict comprises:

if the nickname of the second RB contained in the LSP is the same as the nickname of the first RB, determining that the nickname conflict occurs; otherwise, determining that no nickname conflict occurs.

5. The method of claim 4, wherein the broadcasting the LSP received from the second RB comprises:

adding 1 to a sequence number of the LSP received from the second RB, and broadcasting the modified LSP of the second RB;

in response to broadcasting the modified LSP of the second RB, the method further comprises:

recording the sequence number of the broadcasted LSP;

after receiving another LSP from the second RB within the predefined period of time and before modifying the nickname of the first RB, determining whether the sequence number of another LSP received from the second RB within the predefined period of time is larger than the recorded sequence number; and

if the sequence number of another LSP received from the second RB within the predefined period of time is larger than the recorded sequence number, modifying the nickname of the first RB; otherwise, keeping the nickname of the first RB unchanged.

6. The method of claim 5, after keeping the nickname of the first RB unchanged, further comprising:

broadcasting an LSP for aging for the second RB, so that each of RBs in the TRILL network removes the LSP of the second RB from a Link State Data Base (LSDB).

7. A first routing bridge (RB) to process a nickname conflict in a TRILL network, the RB comprising:

a processor; and

a memory storing machine readable instructions executable by the processor to:

receive a Link State Packet (LSP) from a second RB;

determine, according to the received LSP, whether nicknames for the first RB and the second RB conflict;

in response to determining that the nicknames conflict, determine whether the first RB is a lower priority RB than the second RB based on comparing information of the first RB with information determined from the LSP;

broadcast the LSP received from the second RB in response to determining the first RB is the lower priority RB;

modify the nickname of the first RB if the first RB receives another LSP from the second RB within a predefined period of time of receiving the LSP; and

keep the nickname of the first RB unchanged if the first RB does not receive another LSP from the second RB within the predefined period of time.

8. The first RB of claim 7, wherein the machine readable instructions to determine whether the first RB is the lower priority RB comprise instructions to:

determine a priority of the first RB;

determine a priority of the second RB based on the LSP;

compare the priorities of the first and second RBs; and

determine the first RB is the lower priority RB if the priority of the first RB is determined to be lower than the priority of the second RB based on the comparing.

9. The first RB of claim 8, wherein the machine readable instructions comprise instructions to:

determine whether the priorities are the same based on the comparing;

in response to determining the priorities are the same, determine whether a

system identity of the first RB is smaller than a system identity of the second RB contained in the LSP; and

if the system identity of the first RB is smaller than the system identity of the second RB, determine that the first RB is the lower priority RB.

10. The first RB of claim 7, wherein in response to determining the nickname of the second RB is the same as the nickname of the first RB, the machine readable instructions are to determine that the nickname conflict occurs; otherwise, determine that no nickname conflict occurs.

11. The first RB of claim 10, wherein to broadcast the LSP received from the second RB, the machine readable instructions are to:

add 1 to a sequence number of the LSP received from the second RB, and broadcasting the modified LSP of the second RB;

in response to broadcasting the modified LSP of the second RB, the machine readable instructions are executable to:

record the sequence number of the broadcasted LSP;

after receiving another LSP from the second RB within the predefined period of time and before modifying the nickname of the first RB, determine whether the sequence number of another LSP received from the second RB within the predefined period of time is larger than the recorded sequence number; and

if the sequence number of another LSP received from the second RB within the predefined period of time is larger than the recorded sequence number, modify the nickname of the first RB; otherwise, keeping the nickname of the first RB unchanged.

12. The first RB of claim 11, wherein after keeping the nickname of the first RB unchanged, the machine readable instructions are to:

broadcast an LSP for aging for the second RB, so that each of RBs in the TRILL network removes the LSP of the second RB from a Link State Data Base (LSDB).

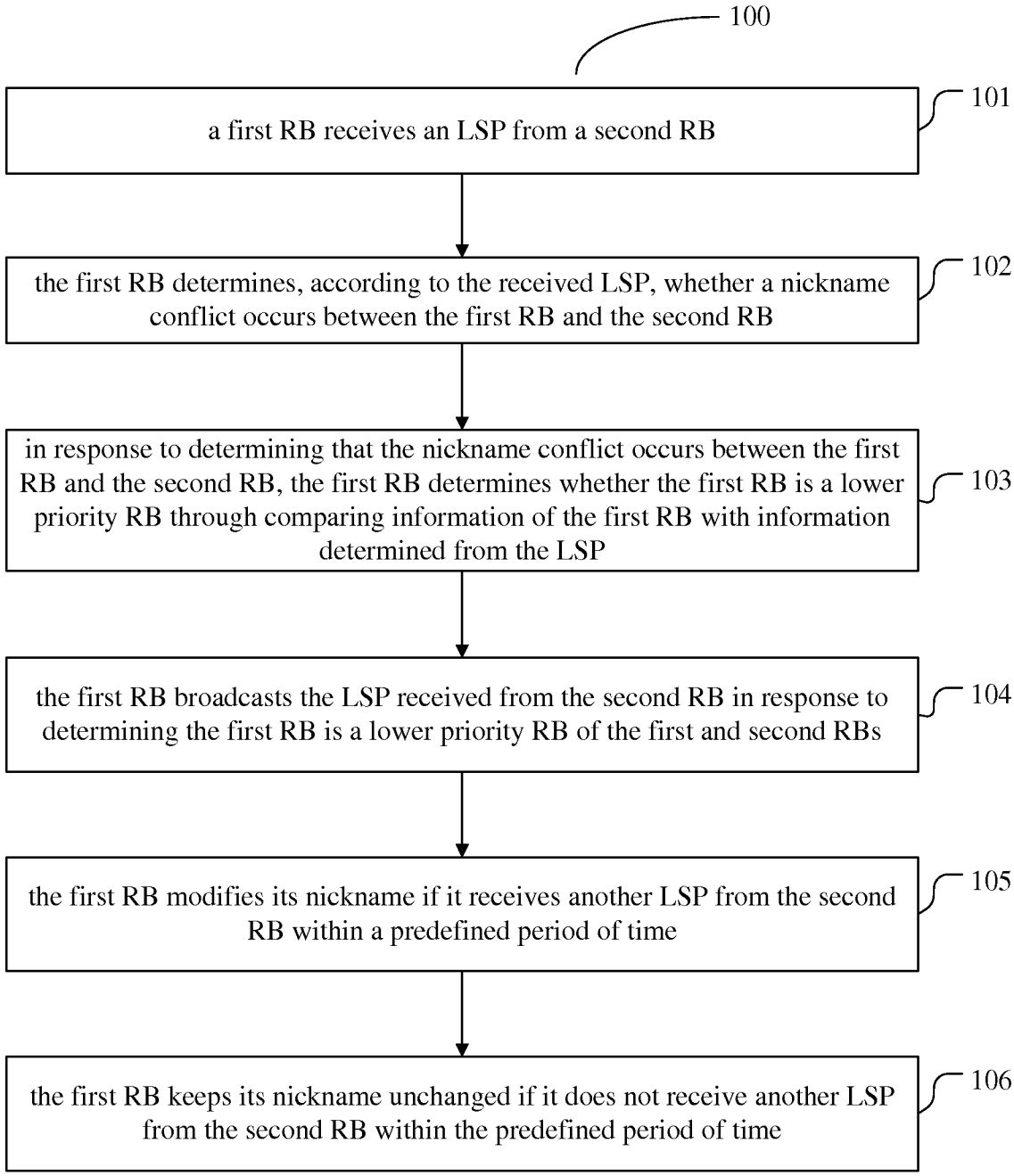

100
a first RB receives an LSP from a second RB
101
the first RB determines, according to the received LSP, whether a nickname conflict occurs between the first RB and the second RB
102
in response to determining that the nickname conflict occurs between the first RB and the second RB, the first RB determines whether the first RB is a lower priority RB through comparing information of the first RB with information determined from the LSP
103
the first RB broadcasts the LSP received from the second RB in response to determining the first RB is a lower priority RB of the first and second RBs
104
the first RB modifies its nickname if it receives another LSP from the second RB within a predefined period of time
105
the first RB keeps its nickname unchanged if it does not receive another LSP from the second RB within the predefined period of time
106

FIG. 1

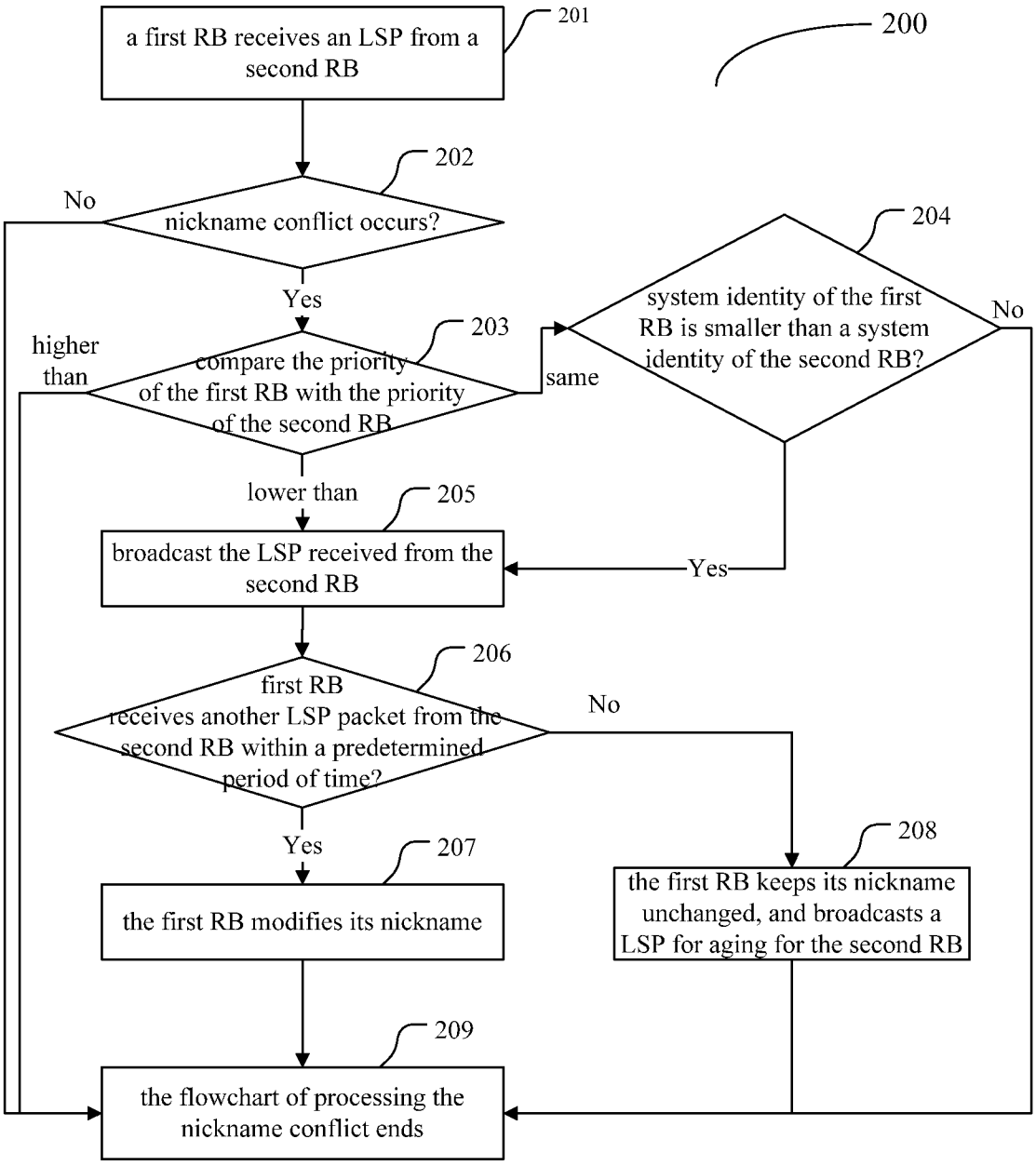

200
a first RB receives an LSP from a second RB
201
nickname conflict occurs?
202
No
Yes
compare the priority of the first RB with the priority of the second RB
203
higher than
same
lower than
system identity of the first RB is smaller than a system identity of the second RB?
204
No
Yes
broadcast the LSP received from the second RB
205
first RB receives another LSP packet from the second RB within a predetermined period of time?
206
No
Yes
the first RB modifies its nickname
207
the first RB keeps its nickname unchanged, and broadcasts a LSP for aging for the second RB
208
the flowchart of processing the nickname conflict ends
209

FIG. 2

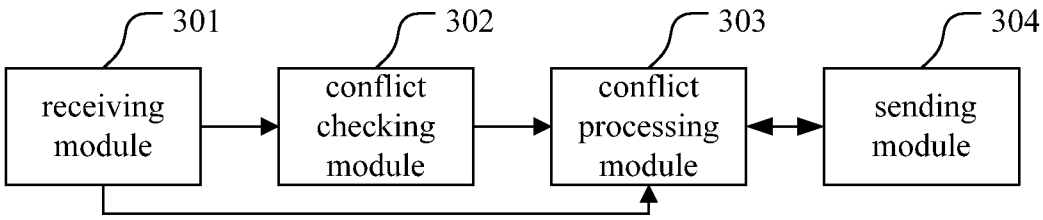

301
302
303
304
receiving module
conflict checking module
conflict processing module
sending module

FIG. 3

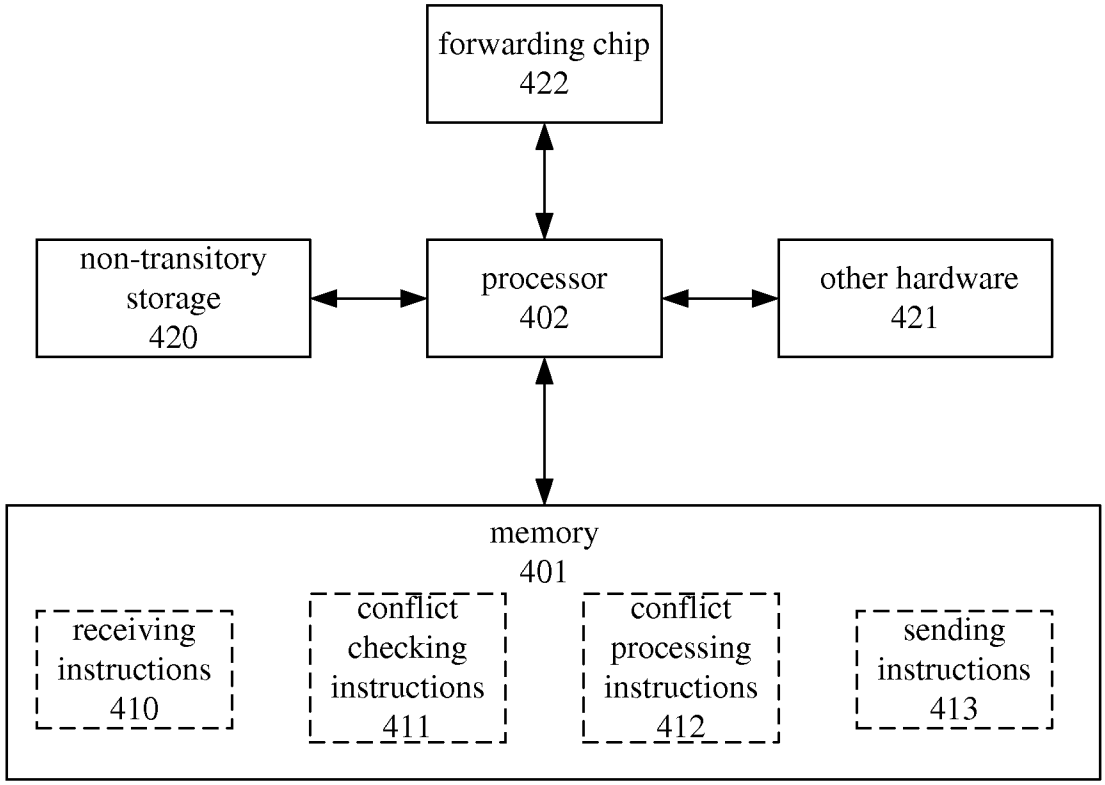

forwarding chip 422
non-transitory storage 420
processor 402
other hardware 421
memory 401
receiving instructions 410
conflict checking instructions 411
conflict processing instructions 412
sending instructions 413

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/071448

A. CLASSIFICATION OF SUBJECT MATTER

H04L 12/705(2013.01)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)

H04L

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)

CNABS;VEN:RB，conflict，路由桥，nickname，冲突RB，conflict，路由桥，路由交换机，昵称，nickname，标识，冲突RB，conflict，路由桥，nickname，冲突路由桥，网络标识，修改，nickname，冲突，RB，conflict，老化，优先级，路由交换机，昵称，ID，优化，标识

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 102123091A (FUJIAN STAR-NET RUIJIE NETWORK CO., LTD..) 13 July 2011 (2011-07-13) the whole document	1-12
A	CN 101977123A (BEIJING RUIJIE NETWORKS CO., LTD..) 16 February 2011 (2011-02-16) the whole document	1-12

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

* Special categories of cited documents:

"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

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 April 2014	**28 April 2014**

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/071448

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 102123091A	13 July 2011	CN 102123091B	21 November 2012
CN 101977123A	16 February 2011	CN 101977123B	30 May 2012