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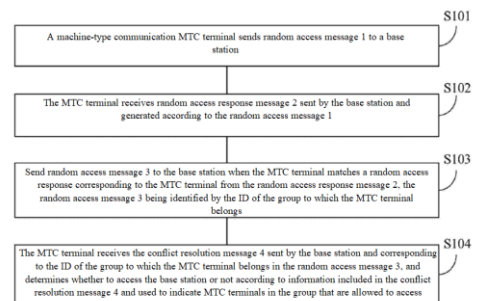
3 pages of claims, 13 pages of description, and 8 pages of drawings

(54) Title of the Invention

ACCESS METHOD FOR MACHINE-TYPE
COMMUNICATION TERMINAL, BASE STATION, AND
TERMINAL

(57) Abstract

The present invention provides an access method for a machine-type communication terminal, a base station and a terminal, which solve the problem that a large number of MTC (machine-type communication) terminals perform random access to cause excessively heavy signaling load on the base station. The access method for the machine-type communication (MTC) terminal comprises: the machine-type communication (MTC) terminal sending random access message 1 to the base station; the MTC terminal receiving random access response message 2 generated according to the random access message 1 and sent by the base station; the MTC terminal sending random access message 3 to the base station when it matches a random access response corresponding to the MTC terminal from the random access



response message 2; and the MTC terminal receiving conflict resolution message 4 sent by the base station and corresponding to an ID of a group to which the MTC terminal belongs in the random access message 3, and determining whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access. In the present invention, the network load is reduced, and the occurrence of network congestion is avoided.

1. An access method for a machine-type communication terminal, characterized in that it comprises:

the machine-type communication MTC terminal sending random access message 1 to a base station;

the MTC terminal receiving random access response message 2 sent by the base station and generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group;

sending random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

the MTC terminal receiving conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and determining whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

2. The method according to claim 1, characterized in that:

the random access response message 2 includes a message header and a message body;

wherein the message header includes group indication information of at least two groups of MTC terminals, each piece of group indication information being used to indicate a corresponding group; and

the message body includes first information and second information of at least two groups of MTC terminals, each group corresponding to one piece of first information and one piece of second information, wherein the first information is a content of the random access response message, and the second information includes an ID of each MTC terminal in the group and its RI flag bit, the RI flag bit being used to indicate whether the first information corresponding to the group is of the MTC terminal.

3. The method according to claim 2, characterized in that the MTC terminal receiving the random access response message 2 comprises:

step 1, by reading the group indication information in the random access response message 2, the MTC terminal determining whether the group indication information includes the group

indication information of the group where the MTC terminal is located, and if so, executing step 2, otherwise the matching being failed;

step 2, by reading the second information in the random access response message 2, the MTC terminal determining whether an RI value corresponding to the ID of the MTC terminal included in the second information is a first preset value, and if so, determining that the MTC terminal matches the random access response corresponding to the MTC terminal from the random access response message 2, and the reception being successful, otherwise the matching being failed.

4. The method according to claim 3, characterized in that

the message header of the random access response message 2 further includes BI used to indicate a backoff time parameter; and when the random access response message 2 fails to match, the MTC terminal performs backoff, the backoff comprising: performing backoff according to the backoff time parameter indicated by the BI.

5. The method according to claim 1, characterized in that the random access message 3 being identified by the ID of the group to which the MTC terminal belongs comprises:

scrambling the random access message 3 through the ID of the group to which the MTC terminal belongs, so that after the base station receives the random access message 3, it performs descrambling using the ID of the group to which the MTC terminal belongs.

6. The method according to claim 1, characterized in that the determining whether to access the base station or not according to the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access comprises:

when a value of a conflict flag bit CI corresponding to the ID of the MTC terminal in the conflict resolution message 4 is a second preset value, determining that the MTC terminal accesses the base station; otherwise, the access being failed and the MTC terminal performing backoff, wherein the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access is a conflict flag bit CI corresponding to an ID of each MTC terminal in the group, the conflict flag bit CI being used to indicate whether the corresponding MTC terminal is allowed to access.

7. The method according to claim 6, characterized in that

before the determining whether to access the base station or not according to the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access, the method further comprises:

the MTC terminal descrambling the conflict resolution message 4 using ID of a group corresponding thereto, wherein the conflict resolution message 4 sent by the base station and

corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3 is scrambled by the base station through the group ID of the group.

8. The method according to claim 1, characterized in that:

the random access message 1 includes a random access preamble sequence Preamble, and the random access preamble sequence Preamble is selected by the MTC terminal from random access preamble sequences of the group to which it belongs, so that the base station determines the group to which the MTC terminal belongs according to the random access preamble sequence Preamble, and includes a random access response corresponding to the group in the random access response message 2.

9. A machine-type communication terminal, characterized in that it comprises:

a message 1 sending module configured to send random access message 1 to a base station;

a message 2 receiving module configured to receive random access response message 2 sent by the base station and generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group;

a message 3 sending module configured to send random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

a message 4 receiving module configured to receive conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

10. The terminal according to claim 9, characterized in that:

the random access response message 2 received by the message 2 receiving module includes a message header and a message body;

wherein the message header includes group indication information of at least two groups of MTC terminals, each piece of group indication information being used to indicate a corresponding group; and

the message body includes first information and second information of at least two groups of MTC terminals, each group corresponding to one piece of first information and one piece of second information, wherein the first information is a content of the random access response

message, and the second information includes an ID of each MTC terminal in the group and its RI flag bit, the RI flag bit being used to indicate whether the first information corresponding to the group belongs to the MTC terminal.

11. The terminal according to claim 10, characterized in that the message 2 receiving module comprises:

a first determination submodule configured to: by reading the group indication information in the random access response message 2, determine whether the group indication information includes the group indication information of the group where the MTC terminal is located, wherein if so, a second determination submodule is entered, otherwise the matching is failed;

the second determination submodule configured to: by reading the second information in the random access response message 2, determine whether an RI value corresponding to the ID of the MTC terminal included in the second information is a first preset value, wherein if so, it is determined that the MTC terminal matches the random access response corresponding to the MTC terminal from the random access response message 2, and the reception is successful, otherwise the matching is failed.

12. The terminal according to claim 9, characterized in that:

the message 4 receiving module is specifically configured to: when a value of a conflict flag bit CI corresponding to the ID of the MTC terminal in the conflict resolution message 4 is a second preset value, determine that the MTC terminal accesses the base station; otherwise, the access is failed and the MTC terminal performs backoff, wherein the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access is a conflict flag bit CI corresponding to an ID of each MTC terminal in the group, the conflict flag bit CI being used to indicate whether the corresponding MTC terminal is allowed to access.

13. A machine-type communication base station, characterized in that it comprises:

a message 1 receiving module configured to receive random access message 1 sent by a terminal;

a message 2 sending module configured to send to the terminal random access response message 2 generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group;

a message 3 receiving module configured to receive random access message 3 sent by the terminal when the MTC terminal matches a random access response corresponding to the MTC

terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

a message 4 sending module configured to send to the terminal conflict resolution message 4 corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

ACCESS METHOD FOR MACHINE-TYPE COMMUNICATION TERMINAL, BASE STATION, AND TERMINAL

Technical Field

[0001] The present invention relates to the technical field of testing, and in particular to an access method for a machine-type communication terminal, a base station, and a terminal.

Background Art

[0002] With the development of communication technology, machine-type communication (MTC) technology has received extensive attention. The MTC communication technology integrates data acquisition, remote monitoring, telecommunication and information technology, so that business processes may be automated, the real-time states of information technology (IT) systems and non-IT equipment of companies are integrated, and value-added services are created. In the MTC communication system, the terminal equipment is called MTC terminal.

[0003] With the continuous maturity of the MTC communication technology, a large number of MTC terminals will be added to the MTC communication system. If the access operation of the MTC terminals is not optimized, the performance of the wireless network will undoubtedly be affected.

[0004] Random access is a basic function in wireless communication. The number of terminals in the MTC network is numerous. When a large number of MTC terminals perform random access at the same time, it is bound to have a huge impact on the network, resulting in insufficient network resources. Therefore, a large number of MTC terminals will fail to access. Moreover, due to a large number of signaling shocks, the base station will crash or the network load will become heavier, causing network congestion.

Summary of the Invention

[0005] The present invention provides an access method for a machine-type communication terminal, a base station and a terminal, which solve the problem that a large number of MTC terminals perform random access to cause excessively heavy signaling load on the base station.

[0006] In order to solve the above problem, the present invention discloses an access method for a machine-type communication terminal, comprising:

[0007] the machine-type communication MTC terminal sending random access message 1 to a base station;

[0008] the MTC terminal receiving random access response message 2 sent by the base station and generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the

random access responses of each group include a random access response of at least one MTC terminal in the group;

[0009] sending random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

[0010] the MTC terminal receiving conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and determining whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0011] The present invention further discloses a machine-type communication terminal, comprising:

[0012] a message 1 sending module configured to send random access message 1 to a base station;

[0013] a message 2 receiving module configured to receive random access response message 2 sent by the base station and generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group;

[0014] a message 3 sending module configured to send random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

[0015] a message 4 receiving module configured to receive conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0016] The present invention further discloses a machine-type communication base station, comprising:

[0017] a message 1 receiving module configured to receive random access message 1 sent by a terminal;

[0018] a message 2 sending module configured to send to the terminal random access response message 2 generated according to the random access message 1, wherein the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group;

[0019] a message 3 receiving module configured to receive random access message 3 sent by the terminal when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the MTC terminal belongs; and

[0020] a message 4 sending module configured to send to the terminal conflict resolution message 4 corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0021] Compared with the prior art, the present invention comprises the following advantages:

[0022] The present invention provides a group-based terminal access process. In the above access process, the MTC terminal receives the random access response message 2 sent by the base station and generated according to the random access message 1 sent by the above MTC terminal to the base station, the random access response message 2 sent by the above base station including random access responses of at least two groups of MTC terminals. Assuming that one random access response message 2 in a traditional method includes random access responses of 10 terminals, the random access responses of 2 groups of 20 terminals in total require the base station to send two random access response messages 2. However, using the above method of the present invention, one random access response message may include the random access responses of 2 groups of 20 terminals in total, and the random access responses of each group include the random access responses of 10 terminals. It can be seen that the base station needs to send two random access response messages before, but now it only needs to send one random access response message to achieve the same purpose. Therefore, the base station saves a lot of signaling overhead, and also reduces the signaling load on the base station side. When a large number of MTC terminals perform the random access process at the same time, it can be ensured that more MTC terminals successfully access, reducing the network load, and avoiding the occurrence of network congestion.

Brief Description of the Drawings

[0023] Fig. 1 is a flowchart of an access method for a machine-type communication terminal according to an embodiment of the present invention;

[0024] Fig. 2 is a flowchart of an access method for a machine-type communication terminal according to another embodiment of the present invention;

[0025] Fig. 3 is a structural diagram of random access response message 2 in a group-based random access process according to an embodiment of the present invention;

[0026] Fig. 4 is a flowchart of a random access response message 2 receiving process according to an embodiment of the present invention;

[0027] Fig. 5 is a structural diagram of conflict resolution message 4 according to an embodiment of the present invention;

[0028] Fig. 6 is a flowchart of a conflict resolution message 4 receiving process according to an embodiment of the present invention;

[0029] Fig. 7 is a flowchart of an interaction process of a terminal and a base station according to an embodiment of the present invention;

[0030] Fig. 8 is a structural block diagram of a machine-type communication terminal according to an embodiment of the present invention;

[0031] Fig. 9 is a structural block diagram of a message 2 receiving module according to an embodiment of the present invention;

[0032] Fig. 10 is a structural block diagram of a message 4 receiving module according to an embodiment of the present invention; and

[0033] Fig. 11 is a structural block diagram of a machine-type communication base station according to an embodiment of the present invention.

Detailed Description of the Preferred Embodiments

[0034] In order to make the above objectives, features and advantages of the present invention more obvious and understandable, the present invention will be further described in detail below with reference to the accompanying drawings and specific embodiments.

[0035] Embodiment 1:

[0036] Referring to Fig. 1 in which a flowchart of an access method for a machine-type communication terminal according to this embodiment is shown, this embodiment may specifically comprise the following steps:

[0037] S101: The machine-type communication MTC terminal sends random access message 1 to a base station.

[0038] In this embodiment, MTC terminals are grouped. One Group ID is allocated for each group of MTC terminals, and one Group ID and one MTC UE ID are allocated for each MTC terminal in each corresponding group, wherein the Group ID is a group ID, the same group ID indicates that MTC equipment belongs to one group, and the MTC UEID is an ID of each MTC terminal in a group to which it belongs. The ID of each UE in the group is unique and allocated in advance, so there will be no conflict.

[0039] In this embodiment, the random access message 1 includes a random access preamble sequence Preamble, and the random access preamble sequence Preamble is selected by the MTC terminal from random access preamble sequences of the group to which it belongs, so that the base station determines the group to which the MTC terminal belongs according to the random access preamble sequence Preamble, and includes a random access response corresponding to the group in the random access response message 2.

[0040] For example, the Group ID of a first group of MTC terminals is 001, and the corresponding first group of random access preamble sequences Preamble are 1-10.

[0041] Each group of MTC terminals corresponds to a group of Preambles, and the random access preamble sequence Preamble included in the random access message 1 is sent by the MTC terminal in each group selecting a Preamble from a group of Preambles corresponding to the group to which they belong.

[0042] After receiving the random access preamble sequence Preamble sent by the MTC terminal, the base station determines which group of MTC terminals sends the above preamble sequence Preamble, and then obtains the Group ID of the group of MTC terminals.

[0043] For example, the random access preamble sequence Preamble received by the base station is 5. According to the situation where the MTC terminals are grouped in this embodiment, the Preambles of 1-10 belong to a first group, and then the Group ID of this group of MTC terminals is obtained as 001.

[0044] After the MTC terminal sends the Preamble, it needs to wait for a random access response of a network side. If the response of the network side is not correctly received in a given time (which is determined according to a parameter ra-ResponseWindowSize configured in a high layer), then within the configured maximum number of Preamble sending times (which is determined by a parameter preambleTransMax configured in the high layer), the MTC terminal can repeatedly send the Preamble.

[0045] S102: The MTC terminal receives random access response message 2 sent by the base station and generated according to the random access message 1.

[0046] In an embodiment of the present invention, the base station may generate random access response message 2 for random access messages 1 of two or more groups of MTC terminals.

Therefore, the random access response message 2 includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group.

[0047] Specifically, the random access response message is generated by a MAC layer of the base station, and is sent in a semi-synchronized manner with the random access message 1 (that is, the feedback time window is flexible and configurable), in which HARQ is not used (because the MTC terminal generally only has a very small buffer, and MTC data is generally relatively small, the delay requirement is not very high, which is not suitable for the HARQ process). It is scheduled by PDCCHFormat1A scrambled by RA-RNTI, sent to a physical layer through an MAC layer user packet data unit MAC PDU and carried by a downlink shared channel (DL-SCH). When the base station detects a preamble sequence sent by the MTC terminal, it will send a response on the DL-SCH.

[0048] In this embodiment, a random access response message may include random access responses of multiple groups, and the main content of the random access response message includes group indication information of a detected preamble sequence (which is used to indicate a corresponding group), time adjustment information for uplink synchronization, initial uplink resource allocation (which is used to send subsequent message 3), and a temporary C-RNTI. This temporary C-RNTI will be converted into a permanent C-RNTI in step 4 (conflict resolution).

[0049] The MTC terminal needs to use a random access RNTI (RA-RNTI) on a PDCCH to monitor an RAR message. RA-RNTIs correspond to time-frequency positions of the preamble sequence Preamble sent by the MTC terminal one by one. The MTC terminal and the base station can separately calculate an RA-RNTI value corresponding to the preamble sequence. The MTC terminal monitors the random access response message 2 represented by the RA-RNTI on the PDCCH channel, and decodes the corresponding PDSCH channel. If a group indicated by RAPID in the random access response message 2 is the same as the group to which the above MTC terminal belongs, then the MTC terminal uses the uplink time adjustment information in the random access response message 2, and a corresponding conflict adjustment process is started.

[0050] S103: Send random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the MTC terminal from the random access response message 2, the random access message 3 being identified by the ID of the group to which the MTC terminal belongs.

[0051] In this embodiment, the random access response message 2 includes random access responses of two or more groups of MTC terminals, and it can be searched in the random access response message 2 whether it includes the random access response corresponding to the above MTC terminal. If it does, then it is determined that the MTC terminal matches the random access response corresponding to the above MTC terminal from the random access response message 2,

that is, the MTC terminal successfully receives the random access response message 2, and can send random access message 3 to the base station.

[0052] The so-called random access message 3 is actually a third message. In the process of random access, the content of these messages is not fixed, sometimes it may carry an RRC connection request, and sometimes it may carry some control messages or even service data packets, so it is called random access message 3 in this embodiment.

[0053] If different MTC terminals receive the same random access response message 2, then these different MTC terminals will obtain the same uplink resource, and send the random access message 3 at the same time. In order to distinguish different groups of MTC terminals, in this embodiment, the random access message 3 is identified by the group ID to which the above MTC terminal belongs. Specifically, the random access message 3 is scrambled by the group ID to which the above MTC terminal belongs. It is stated in S101 that each MTC terminal has a corresponding group ID, and in this embodiment, the random access message 3 is scrambled by using the corresponding group ID. Correspondingly, after receiving the random access message 3, the base station uses the group ID to which the above MTC terminal belongs to perform descrambling.

[0054] After receiving the random access response message 2 fed back by the base station, the MTC terminal sends the random access message 3 on an UL-SCH according to a scheduling grant. For the MTC terminal, the random access message 3 does not use HARQ (because the MTC terminal generally has only a very small buffer, and the MTC data is generally relatively small, and the delay requirement is not very high, which is not suitable for the HARQ process). The random access message 3 includes an RR connection request, track area update, a schedule request, C-RNTI, and MSG3, and is scrambled by the Group ID.

[0055] The MTC terminal will immediately start a conflict resolution timer mac-Contention Resolution Timer after sending the random access message 3 (and then the timer is restarted every time the message 3 is retransmitted). The MTC terminal needs to monitor the conflict resolution message 4 returned by the base station to itself within this time.

[0056] S104: The MTC terminal receives the conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and determines whether to access the base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0057] In this embodiment, the random access message 3 sent by the above MTC terminal to the base station is scrambled by using the group ID corresponding to the above MTC terminal. Correspondingly, after receiving the random access message 3, the base station uses the group ID to which the above MTC terminal belongs to perform descrambling, and sends to the MTC terminal the conflict resolution message 4 corresponding to the ID of the group to which the

above MTC terminal belongs in the above random access message 3. The above conflict resolution message 4 is still scrambled by using the ID of the group to which the above MTC terminal belongs.

[0058] If the MTC terminal receives the conflict resolution message 4 returned by the base station within the time of the mac-Contention Resolution Timer, before the above MTC terminal determines whether to access the base station or not according to the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access, the above MTC terminal uses its corresponding group ID to descramble the conflict resolution message 4 of the group to which it belongs. If the descrambling is successful, it is determined whether to access the base station according to the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0059] In this embodiment, through the group-based access process, the random access response message 2 sent by the base station includes random access responses of multiple groups of MTC terminals. The conflict resolution message sent by the base station includes conflict resolution messages of multiple groups of MTC terminals. The base station can save a lot of signaling overhead and reduce the signaling load on the base station side. When a large number of MTC terminals perform the random access process at the same time, it can be ensured that more MTC terminals successfully access, reducing the network load, and avoiding the occurrence of network congestion.

[0060] For example, assuming that one random access response message 2 in a traditional method includes random access responses of 10 terminals, random access responses of 2 groups of 20 terminals in total require the base station to send two random access response messages 2. However, using the above method of the present invention, one random access response message may include random access responses of 2 groups of 20 terminals in total, and the random access responses of each group include the random access responses of 10 terminals. It can be seen that the base station needs to send two random access response messages before, but now it only needs to send one random access response message to achieve the same purpose. Therefore, the base station saves a lot of signaling overhead, and reduces the signaling load.

[0061] Embodiment 2:

[0062] In this embodiment, on the basis of Embodiment 1, the random access response message 2 and the conflict resolution message 4 received by the MTC terminal will be described in detail. Referring to Fig. 2 which is a flowchart of an access method for a machine-type communication terminal according to this embodiment, this embodiment may specifically comprise the following steps:

[0063] S201: The machine-type communication MTC terminal sends random access message 1 to a base station. The random access message 1 includes a random access preamble sequence

Preamble, and the random access preamble sequence Preamble is selected by the MTC terminal from random access preamble sequences of the group to which it belongs.

[0064] S202: The MTC terminal receives random access response message 2 sent by base station. The random access response message 2 includes random access responses corresponding to multiple groups of MTC terminals, and the random access responses corresponding to each group include random access responses of a plurality of MTC terminals in the group.

[0065] The random access response message 2 includes a message header and a message body.

[0066] The message header includes group indication information of at least two groups of MTC terminals. Each piece of group indication information is used to indicate a corresponding group.

[0067] In this embodiment, the group indication information may be RAPIDs, each RAPID being used to indicate a corresponding group. According to the RAPIDs, the MTC terminal determines whether the above random access response message 2 corresponds to the group to which the above MTC terminal belongs.

[0068] The RAPID being used to indicate the corresponding group comprises:

[0069] the RAPID indicating a preamble index, wherein the MTC terminal determines whether the preamble index is an index of the group to which it belongs, and if so, then above random access response message 2 is a response of the group to which above MTC terminal belongs; and

[0070] the RAPID indicating a group ID, wherein the MTC terminal determines whether the group ID is a group ID of the group to which it belongs, and if so, the above random access response message 2 is a response corresponding to the group to which the above MTC terminal belongs.

[0071] The message body includes first information and second information of at least two groups of MTC terminals, each group corresponding to one piece of first information and one piece of second information, wherein the first information is a content of the random access response message, and the second information includes an ID of each MTC terminal in the group and its RI flag bit, the RI flag bit being used to indicate whether the first information corresponding to the group is of the above MTC terminal.

[0072] In this embodiment, the first information is MAC RAR, and the second information is RAR padding. That is, in this embodiment, the message body includes MAC RAR and RAR padding corresponding to multiple groups of MTC terminals, and each group corresponds to one MAC RAR and one RAR padding, wherein the MAC RAR is a content of the random access response message, the RAR padding includes the ID of each MTC terminal in the group and its RI flag bit, and the RI flag bit is used to indicate whether the MAC RAR corresponding to the group is of the above MTC terminal. After determining according to the RAPID that the random access response message 2 is a response corresponding to the group to which the MTC terminal

belongs, the above MTC terminal can then find the ID corresponding to the MTC terminal according to the information in the RAR padding. If the RI flag bit is a first preset value, it indicates that the information included in this RAR is of the above MTC terminal. It needs to be noted that in this embodiment, in at least two groups of RAR paddings included in the random access response message 2, there may be RI flag bits corresponding to multiple MTC terminals as 1, and conflict resolution may be performed in the conflict resolution message 4.

[0073] The message header of the random access response message 2 further includes BI used to indicate a backoff time parameter, and when the random access response message 2 fails to match, the above MTC terminal performs backoff, the backoff comprising: performing backoff according to the backoff time parameter indicated by the BI.

[0074] The meanings of parameters in the random access response message 2 are shown in Table 1 below:

[0075]

Message field		Number of bits	Description
BI (Backoff Indicator)		4	This parameter optionally appears in the random access response, and is used to indicate the overload condition of the cell and to configure the backoff time parameter for the random access of UE.
RAPID		6	Indicating a preamble index to determine whether the random access response is sent to the group where the terminal is located
Timing Advance Command		11	Indicating a TA index value in a value range of (0, 1, 2...1282), which is used to control the UE uplink timing adjustment
UL Grant	Hopping flag	1	Frequency hopping flag, wherein when it is set to 1, it is used to instruct the UE to use frequency hopping when sending PUSCH, and when it is set to 0, there is no frequency hopping

[0076]

	Fixed size resource Block assignment	10	Indicating a PRB resource used by the PUSCH carrying MSG3
	Truncated modulation and coding scheme	4	A modulation and coding scheme used when sending MSG3, in which according to this field and a Fixed Size resource block assignment field, the UE can determine TBS that can be used for uplink transmission. The transport block size that can be allocated by the scheduling grant cannot be less than 80 bits
	TPC	3	Power for the PUSCH when sending MSG3
	UL delay	1	It is used to indicate whether to send the PUSCH with a delay; 0: the UE sends the PUSCH at $n+k1$, where n is a subframe $k1 \in \{6, 7, 8, 9\}$ in which the UE detects the PDCCH carrying the corresponding RA-RNTI; 1: UE delays to the next available uplink subframe frame to send the PUSCH
Temporary C-RNTI		16	This field is used to assign a temporary ID to the UE for use during random access

[0077] Table 1 Meanings of parameters in the random access response message 2

[0078] It needs to be noted that, if the MTC terminal does not receive any random access response message 2 within a specified time range, or if the preambleindex in the RAPID in the random access response message 2 does not belong to the group where the above MTC terminal is located, then it is considered that this preamble access fails, and the MTC terminal needs to delay for a period of time before entering the next preamble access.

The range of the delay time is indicated by BI, and the MTC terminal can randomly select a value between 0 and the backoff value indicated by BI, which can reduce the probability of the MTC terminal sending the preamble sequence again at the same time.

[0079] The MTC terminal receiving random access response message 2 comprises steps 1 and 2.

[0080] Step 1: By reading group indication information in the random access response message 2, the MTC terminal determines whether the group indication information includes the group indication information of the group where the above MTC terminal is located, wherein if so, step 2 is executed, otherwise the matching is failed.

[0081] Step 2: By reading the second information in the random access response message 2, the MTC terminal determines whether an RI value corresponding to the ID of the above MTC terminal included in the second information is a first preset value, wherein if so, it is determined that the above MTC terminal matches the random access response corresponding to the above MTC terminal from the random access response message 2, and the reception is successful, otherwise the matching is failed.

[0082] In this embodiment (Embodiment 2), the group indication information is RAPID, the second information is RAR padding, and the first preset value may be 1. In this embodiment, step S202 comprises S2021 and S2022.

[0083] S2021: By reading the RAPID in the random access response message 2, the MTC terminal determines whether the RAPID includes the group indication information of the group where the above MTC terminal is located, and if so, step S2022 is executed, otherwise the matching is failed.

[0084] According to the RAPID in the message header, the MTC terminal determines that above random access response message 2 is a response corresponding to the group to which above MTC terminal belongs (the RAPID indicates a preamble index, according to the preamble index, the MTC terminal can determine whether it is an index of the group to which it belongs, and if so, the above random access response message 2 is the response corresponding to the group to which the above MTC terminal belongs; the RAPID indicates a group ID, the MTC terminal determines whether the group ID is a group ID of the group to which it belongs, and if so, the above random access response message 2 is the response corresponding to the group to which the above MTC terminal belongs). If so, S2022 is executed, otherwise the matching is failed, and the MTC terminal performs backoff.

[0085] S2022: By reading the RAR padding in the random access response message 2, the MTC terminal determines whether the RI value corresponding to the ID of the above MTC terminal included in the above RAR padding is 1, and if the RI value is 1, the reception is successful, otherwise the matching is failed.

[0086] After determining according to the RAPID that the above random access response message 2 is the response corresponding to the group to which the MTC terminal belongs, the above MTC terminal can then find the ID corresponding to the above MTC terminal according to the information in the RAR padding. If the RI flag bit is 1, it indicates that the information

included in this RAR is of the above MTC terminal, and the reception is successful, otherwise the matching is failed, and the MTC terminal performs backoff.

[0087] Of course, the first preset value may also be 0, and may be set according to the actual situation, which is not limited in this embodiment.

[0088] A process of receiving the random access response message 2 will be further described below with reference to Fig. 4. As shown in Fig. 4,

[0089] S401: Start to receive the random access response message 2, and then execute S402.

[0090] S402: Determine whether the window of the random access response message 2 ends, and if not, execute S403, otherwise execute S416.

[0091] In this embodiment, determining whether the window of the random access response message 2 ends comprises: determining whether the number of windows reaches a preset number, and the preset number is generally set to 10.

[0092] S403: The MTC terminal monitors a PDCCH window.

[0093] S404: Determine whether the random access response message 2 is determined, and if so, execute S405, otherwise return to S402.

[0094] S405: Determine whether the random access response message 2 is successfully descrambled with the RA-RNTI, and if so, execute S406, otherwise return to S403.

[0095] S406: Determine whether a downlink receives TB correct decoding, and if so, then execute S407, otherwise return to S403.

[0096] S407: Determine whether BI is included in the random access response message 2, and if so, execute S408, otherwise execute S409.

[0097] S408: Set a backoff parameter, and then execute S408.

[0098] For example, the value of BI is 1, then the backoff is set to 0.01 seconds, and the value of BI is 2, then the value of backoff is set to 0.02 seconds.

[0099] S409: The value of backoff is set to 0 seconds, and then S410 is executed.

[0100] S410: Determine whether the Preamble of this group is included in the random access response message 2, and if so, then execute S411, otherwise execute S414.

[0101] According to whether the Preamble index indicated in the RAPID in the random access response message 2 belongs to the index of the group where the above MTC terminal is located, it is determined whether the random access response message 2 includes the Preamble of this group.

[0102] S411: Determine whether the RI value of the corresponding MTC terminal ID in this group is 1, and if so, execute S412, otherwise execute S414.

[0103] S412: Process a TA command to indicate a power-related parameter to a lower layer, and process a UL grant to indicate the lower layer, and then execute S413.

[0104] S413: The random access response message 2 is successfully received.

[0105] S414: The random access response message 2 fails to match, and then S415 is executed.

[0106] S415: The MTC terminal performs backoff, the above backoff comprising randomly selecting one from 0 to a backoff value to perform backoff.

[0107] S416: The random access response message 2 fails to be received, and then S417 is executed.

[0108] S417: The MTC terminal performs backoff, the above backoff comprising performing backoff according to the configured time.

[0109] It needs to be noted that after the random access response message 2 is successfully received, the MTC terminal is ready to send a random access message 3. If the random access response message 2 fails to be received, the MTC terminal performs backoff and then resends the Preamble. After the random access response message 2 is received, the MTC terminal performs backoff according to a set backoff parameter. The MTC terminal directly selects a value from 0 to backoff to perform backoff and re-send the Preamble, which can reduce the probability of different MTC terminals sending the preamble sequence again at the same time.

[0110] S203: The MTC terminal sends the random access message 3 to the base station, the above random access message 3 being identified by the ID of the group to which the above MTC terminal belongs.

[0111] S204: The MTC terminal receives conflict resolution message 4 sent by the base station and corresponding to the group to which the MTC terminal belongs, the conflict resolution message 4 including information used to indicate MTC terminals in the group that are allowed to access.

[0112] In this embodiment, a PDCCH SDU of the conflict resolution message 4 may include conflict resolution messages of multiple groups. As shown in Fig. 5, the PDCCH SDU for each group includes IDs of multiple MTC terminals and corresponding CI values. Among them, the MTC UE ID occupies 7 bits, the CI occupies 1 bit, and the ID and CI of each MTC terminal occupy 1 byte.

[0113] In this embodiment, the information included in the above conflict resolution message 4 and used to indicate the MTC terminals in the group that are allowed to access may be the value of the above CI.

[0114] In this embodiment, specifically, when the value of the conflict flag bit CI corresponding to the ID of the above MTC terminal in the conflict resolution message 4 is a second preset value, it is determined that the MTC terminal accesses the base station; otherwise, the access is failed and the MTC terminal performs backoff, wherein the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access is a conflict flag bit CI corresponding to the ID of each MTC terminal in the group, the conflict flag bit CI being used to indicate whether the corresponding MTC terminal is allowed to access.

[0115] When the value of CI is 1, it indicates that the corresponding MTC terminal has obtained an access grant, and it is determined to access the above base station. When the value of CI is 0, it indicates that access is not allowed, the access is failed, and the above MTC terminal performs backoff according to the value of BI in the group to which it belongs.

[0116] It needs to be noted that, before determining whether to access the above base station according to the information included in the conflict resolution message 4 and used to indicate the MTC terminals in the group that are allowed to access, the above MTC terminal uses its corresponding group ID to descramble the conflict resolution message 4 of the group to which it belongs, and if the descrambling is successful, then it proceeds to the above determination step; wherein the conflict resolution message 4 sent by the above base station and corresponding to the ID of the group to which the above MTC terminal belongs in the above random access message 3 is scrambled by the base station through the group ID of the group.

[0117] In this embodiment, the second preset value may be 1, and in this embodiment, the MTC terminal receiving the conflict resolution message 4 in S204 comprises S2041 and S2042.

[0118] S2041: The MTC terminal uses its corresponding group ID to descramble the conflict resolution message 4 of the group to which it belongs, and if the descrambling is successful, then S2042 is executed. The conflict resolution message 4 sent by the base station to the MTC terminal is scrambled by the group ID of the group to which the MTC terminal belongs. The corresponding MTC terminal descrambles the conflict resolution message 4 with the group ID to which it belongs, and if the descrambling is successful, it indicates that the above conflict resolution message 4 is a conflict resolution message of the group to which the MTC terminal belongs.

[0119] S2042: When the value of the conflict flag bit CI corresponding to the ID of the MTC terminal in the above conflict resolution message 4 is 1, it is determined that the above MTC terminal accesses the base station, otherwise, the access is failed, and the MTC terminal performs backoff.

[0120] Of course, the second preset value may also be 0, and may be set according to the actual situation, which is not limited in this embodiment.

[0121] After the MTC terminal sends the random access message 3, it starts to monitor the PDCCH until a conflict resolution timer times out or stops. Specifically, the MTC terminal will immediately start the conflict resolution timer mac-Contention Resolution Timer after sending the random access message 3 (and then the timer is restarted every time the message 3 is retransmitted), and the MTC terminal needs to monitor the conflict resolution message 4 returned by the base station to itself within this time.

[0122] A process of receiving the conflict resolution message 4 will be further described below with reference to Fig. 6. As shown in Fig. 6,

[0123] S601: The MTC terminal starts to receive the conflict resolution message 4.

[0124] S602: The MTC terminal determines whether the timer times out or stops, if not, then S603 is executed, and if so, S611 is executed.

[0125] S603: Detect a PDCCH, and then execute S604.

[0126] S604: Determine whether the MTC terminal successfully descrambles the conflict resolution message 4 with the Group ID, and if so, execute S605, otherwise, return to S602.

[0127] S605: Determine whether the MAC PDU is decoded successfully, and if so, execute S606, otherwise execute S611.

[0128] S606: Determine whether the CI value corresponding to the ID of the above MTC terminal in the conflict resolution message 4 is 1, and if so, execute S607, otherwise execute S609.

[0129] S607: Stop the conflict resolution timer, and then execute S608.

[0130] S608: Determine that the above MTC terminal accesses the above base station.

[0131] In this embodiment, it is determined that the above MTC terminal accesses the above base station, indicating that the conflict resolution message 4 is successfully received.

[0132] S609: The above MTC terminal fails to access, and then S610 is executed.

[0133] S610: The MTC terminal performs backoff, the above backoff comprising generating a random number according to the BI and terminal ID to perform backoff, and the Preamble is retransmitted.

[0134] A random number is generated according to the BI and terminal ID as described above, wherein a way to obtain the random number is to carry out XOR with the BI and terminal ID to obtain a random number.

[0135] S611: The MTC terminal discards the MAC PDU, and then S612 is executed.

[0136] S612: The conflict resolution message 4 fails to receive, and then S613 is executed.

[0137] S613: The MTC terminal performs backoff, the backoff comprising performing backoff according to the configured time.

[0138] It needs to be noted that, in S608, it is determined that the above MTC terminal accesses the above base station, that is, the above MTC terminal has obtained an access grant, and continues to complete the unpacking and demultiplexing of the MAC PDU.

[0139] Embodiment 3:

[0140] An interaction process between a terminal and a base station is described in this embodiment with reference to Fig. 7. Fig. 7 is a flowchart of the interaction process between the terminal and the base station in this embodiment, where UE represents the terminal, and eNB is an abbreviation of eNodeB, which refers to the base station.

[0141] Referring to Fig. 7, the interaction between the terminal and the base station in the random access process comprises several processes of MSG1, MSG2, MSG3, and MSG4, which are specifically as follows:

[0142] MSG1: The terminal sends random access message 1 to the base station.

[0143] The random access message 1 includes a random access preamble sequence Preamble, and the access preamble sequence Preamble is selected by the MTC terminal from random access preamble sequences of the group to which it belongs.

[0144] MSG2: The terminal receives random access response message 2 sent by the base station.

[0145] The random access response message 2 includes random access responses corresponding to multiple groups of MTC terminals, and the random access responses corresponding to each group include random access responses of a plurality of MTC terminals in the group.

[0146] MSG3: The terminal sends random access message 3 to the base station.

[0147] The above random access message 3 is identified by the ID of the group to which the above MTC terminal belongs.

[0148] MSG4: The terminal receives conflict resolution message 4 sent by the base station.

[0149] The above conflict resolution message 4 includes information used to indicate the MTC terminals in the group that are allowed to access.

[0150] The receiving processes of the message 3 and the message 2 have been described in detail in Embodiment 2, and this embodiment can be understood with reference to the description in Embodiment 2.

[0151] Embodiment 4:

[0152] Fig. 8 is a structural block diagram of a machine-type communication terminal according to this embodiment. Referring to Fig. 8, this embodiment specifically comprises a message 1 sending module 801, a message 2 receiving module 802, a message 3 sending module 803 and a message 4 receiving module 804.

[0153] The message 1 sending module 801 is configured to send random access message 1 to a base station.

[0154] The message 2 receiving module 802 is configured to receive random access response message 2 sent by a base station and generated according to the random access message 1.

[0155] In this embodiment, the base station may generate random access response message 2 for random access messages 1 of two or more groups of MTC terminals. Therefore, the random access response message 2 received by the message 2 receiving module includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group.

[0156] The random access response message 2 received by the message 2 receiving module includes a message header and a message body.

[0157] The message header includes group indication information of at least two groups of MTC terminals. Each piece of group indication information is used to indicate a corresponding group.

[0158] The above message body includes first information and second information of at least two groups of MTC terminals, each group corresponding to one piece of first information and one piece of second information, wherein the first information is a content of the random access response message, and the second information includes an ID of each MTC terminal in the group and its RI flag bit, the above flag bit being used to indicate whether the first information corresponding to the group is of the above MTC terminal.

[0159] The message header of the above random access response message 2 further includes BI used to indicate a backoff time parameter.

[0160] The message 3 sending module 803 is configured to send random access message 3 to the base station when the MTC terminal matches a random access response corresponding to the above MTC terminal from the random access response message 2, the random access message 3 being mentioned by an ID of a group to which the above MTC terminal belongs.

[0161] The message 4 receiving module 804 is configured to receive conflict resolution message 4 sent by the base station and corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access the base station or

not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0162] In a preferred embodiment of this embodiment, the message 4 receiving module is specifically configured to: when a value of a conflict flag bit CI corresponding to the ID of the MTC terminal in the above conflict resolution message 4 is a second preset value, determine that the above MTC terminal accesses the base station; otherwise, the access is failed and the MTC terminal performs backoff, wherein the information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access is a conflict flag bit CI corresponding to an ID of each MTC terminal in the group, the above conflict flag bit CI being used to indicate whether the corresponding MTC terminal is allowed to access.

[0163] The conflict resolution message 4 of the group to which the MTC terminal belongs, which is received by the above message 4 receiving module, includes the ID of each MTC terminal in the group and a corresponding conflict flag bit CI, the above conflict flag bit CI being used to indicate whether the corresponding MTC terminal is allowed to access.

[0164] When the value of the conflict flag bit CI corresponding to the ID of the MTC terminal in the conflict resolution message 4 which is received by the above message 4 receiving module, is 1, it is determined that the above MTC terminal accesses the base station, otherwise, the access is failed, and the MTC terminal performs backoff.

[0165] In a preferred embodiment of this embodiment, as shown in Fig. 9, the message 2 receiving module 802 comprises:

[0166] a first determination submodule 8021 configured to: by reading group indication information in the random access response message 2, determine whether the group indication information includes the group indication information of the group where the above MTC terminal is located, wherein if so, a second determination submodule is entered, otherwise the matching is failed; and

[0167] the second determination submodule 8022 configured to: by reading the second information in the random access response message 2, determine whether an RI value corresponding to the ID of the above MTC terminal included in the second information is a first preset value, and if so, determine that the above MTC terminal matches the random access response corresponding to the above MTC terminal from random access response message 2, the reception is successful, otherwise the matching is failed.

[0168] In a preferred embodiment of this embodiment, as shown in Fig. 10, the message 4 receiving module 804 comprises a descrambling submodule 8041 and a CI determination submodule 8042.

[0169] The descrambling submodule 8041 is configured to descramble the conflict resolution message 4 of the group to which it belongs using the group ID corresponding to the MTC terminal, wherein if the descrambling is successful, then the CI determination submodule is entered.

[0170] The conflict resolution message 4 sent by the base station to the MTC terminal is scrambled by the group ID of the group to which the above MTC terminal belongs. The corresponding MTC terminal descrambles the conflict resolution message 4 with the ID of the group to which it belongs. If the descrambling is successful, it indicates that the above conflict resolution message 4 is a conflict resolution message of the group to which the MTC terminal belongs.

[0171] The CI determination submodule 8042 is configured to determine whether the value of the conflict flag bit CI corresponding to the ID of the above MTC terminal in the conflict resolution message 4 is 1, wherein if so, it is determined that the above MTC terminal accesses the base station, otherwise, the access is failed, and the MTC terminal performs backoff.

[0172] In a preferred embodiment of this embodiment, a machine-type communication terminal may further comprise:

[0173] a first backoff module configured to perform backoff after the random access response message 2 is received, the above backoff comprising performing backoff according to the backoff time parameter indicated by the BI;

[0174] a second backoff module configured to perform backoff after the random access response message 2 fails to be received, the above backoff comprising performing backoff according to the configured time; and

[0175] a third backoff module configured to perform backoff after the conflict resolution message 4 is received, the above backoff comprising carrying out XOR according to the BI and the ID of the MTC terminal to generate a random number for backoff.

[0176] As for the terminal embodiment, since it is basically similar to the method embodiment, the description is relatively simple, and for related parts, refer to the partial description of the method embodiment.

[0177] Embodiment 5:

[0178] Referring to Fig. 11 in which a structural block diagram of a machine-type communication base station according to this embodiment is shown, this embodiment specifically comprises a message 1 receiving module 1101, a message 2 sending module 1102, a message 3 receiving module 1103 and a message 4 sending module 1104.

[0179] The message 1 receiving module 1101 is configured to receive random access message 1 sent by a terminal.

[0180] The message 2 sending module 1102 is configured to send the random access response message 2 generated according to the random access message 1 to the terminal. In this embodiment, the base station may generate random access response message 2 for random access messages 1 of two or more groups of MTC terminals. Therefore, the random access response message 2 received by the message 2 receiving module includes random access responses of at least two groups of MTC terminals, and the random access responses of each group include a random access response of at least one MTC terminal in the group.

[0181] The message 3 receiving module 1103 is configured to receive random access message 3 sent by the terminal when the MTC terminal matches a random access response corresponding to the above MTC terminal from the random access response message 2, the random access message 3 being identified by an ID of a group to which the above MTC terminal belongs.

[0182] The message 4 sending module 1104 is configured to send to the terminal conflict resolution message 4 corresponding to the ID of the group to which the MTC terminal belongs in the random access message 3, and to determine whether to access base station or not according to information included in the conflict resolution message 4 and used to indicate MTC terminals in the group that are allowed to access.

[0183] As for the base station embodiment, since it is basically similar to the terminal embodiment, the description is relatively simple, and for related parts, refer to the partial description of the terminal embodiment.

[0184] It needs to be noted that the relationships such as first and second in the present invention are used merely to distinguish one entity or operation from another entity or operation, and do not necessarily imply that there are any such actual relationships or orders between these entities or operations.

[0185] Various embodiments in this description are all described in a progressive manner, and each embodiment focuses on the differences from other embodiments, and the same or similar parts between various embodiments may be referred to each other.

[0186] It would be easily conceivable for a person skilled in the art that: any combination of the above various embodiments is feasible, so any combination between the above various embodiments is an implementation of the present invention. However, due to space limitations, they will not be described in detail here in this description.

[0187] The access method for the machine type communication terminal, the base station, and the terminal provided by the present invention are described above in detail. The principles and embodiments of the present invention are described herein by using the specific examples. The

description of the above embodiments is only used to help understand the method and the core idea of the present invention. Meanwhile, for an ordinary person skilled in the art, according to the idea of the present invention, there will be changes in the specific embodiments and application scopes. In summary, the content of the present description should not be construed as limiting the present invention.

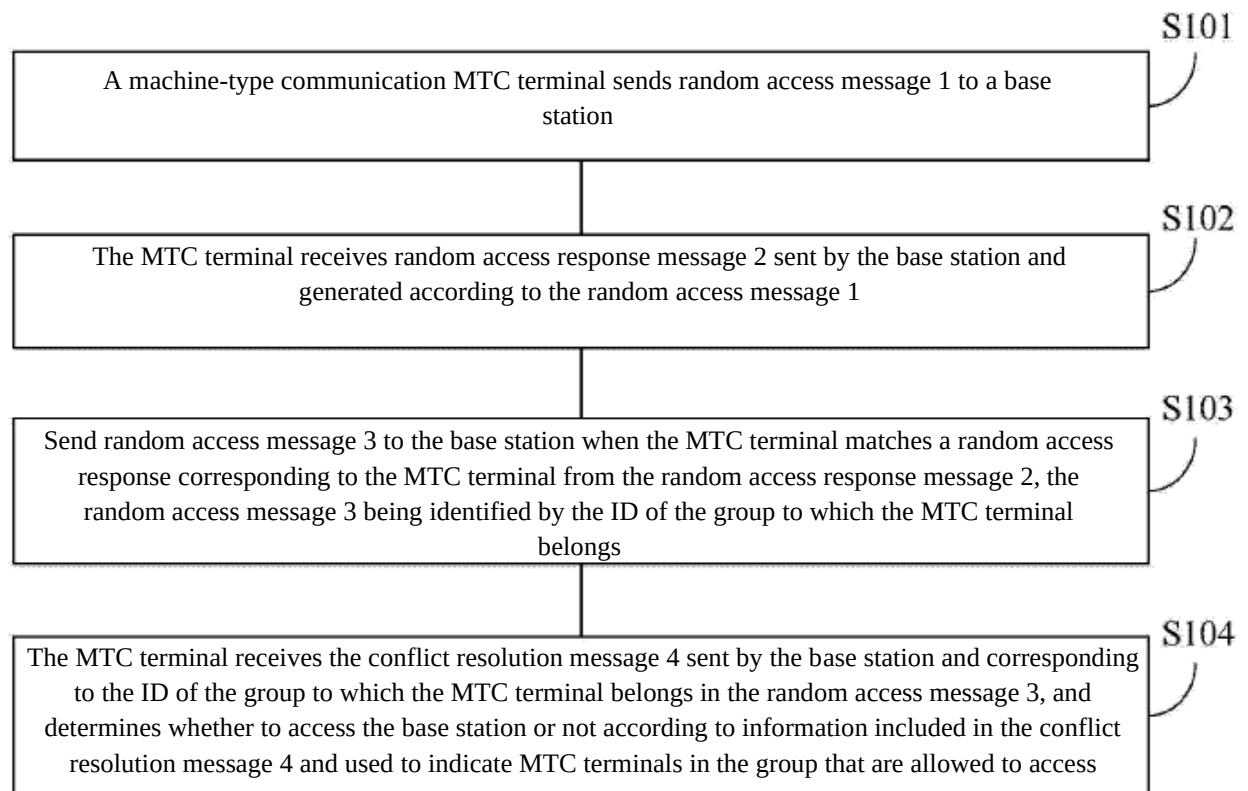


Fig. 1

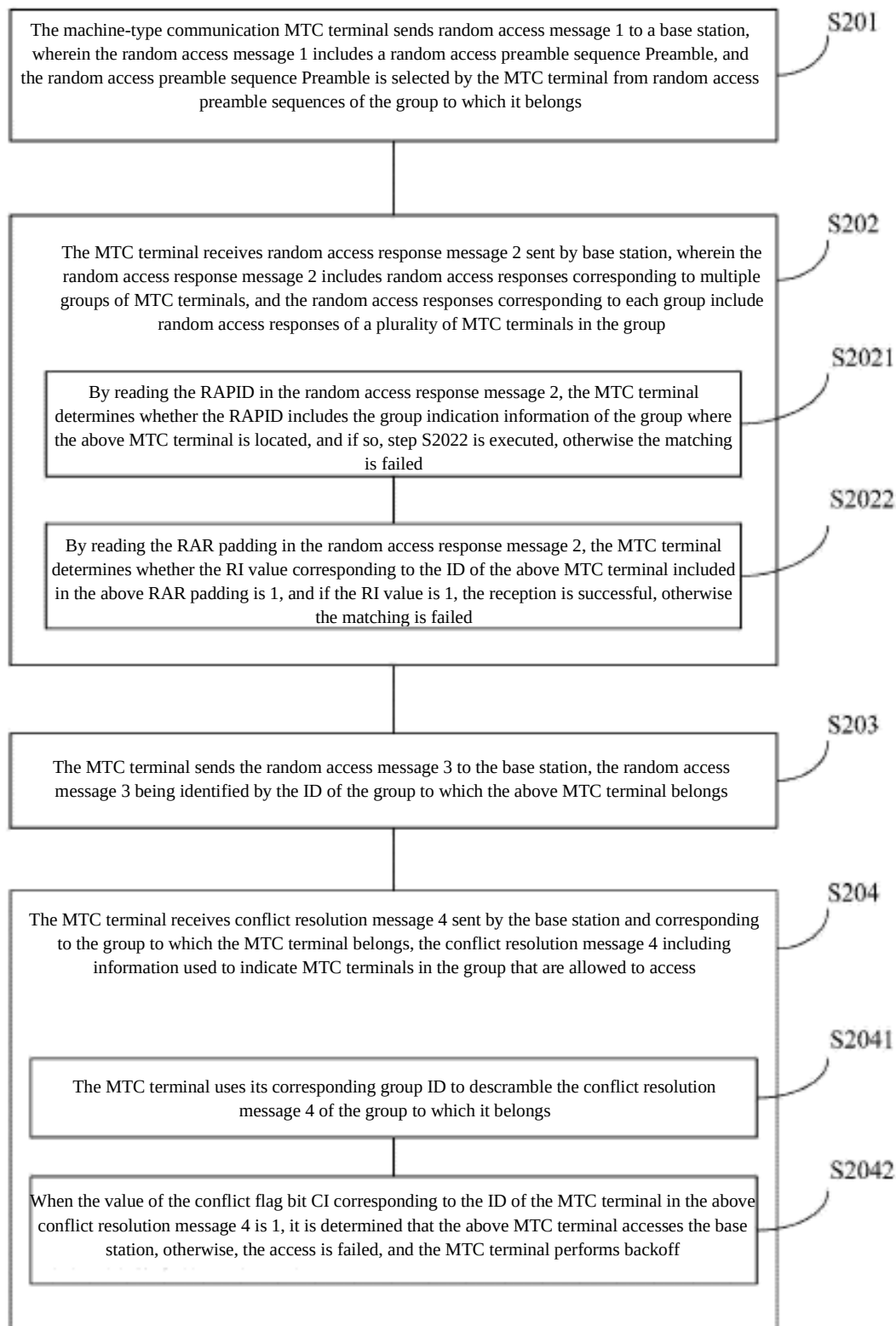


Fig. 2

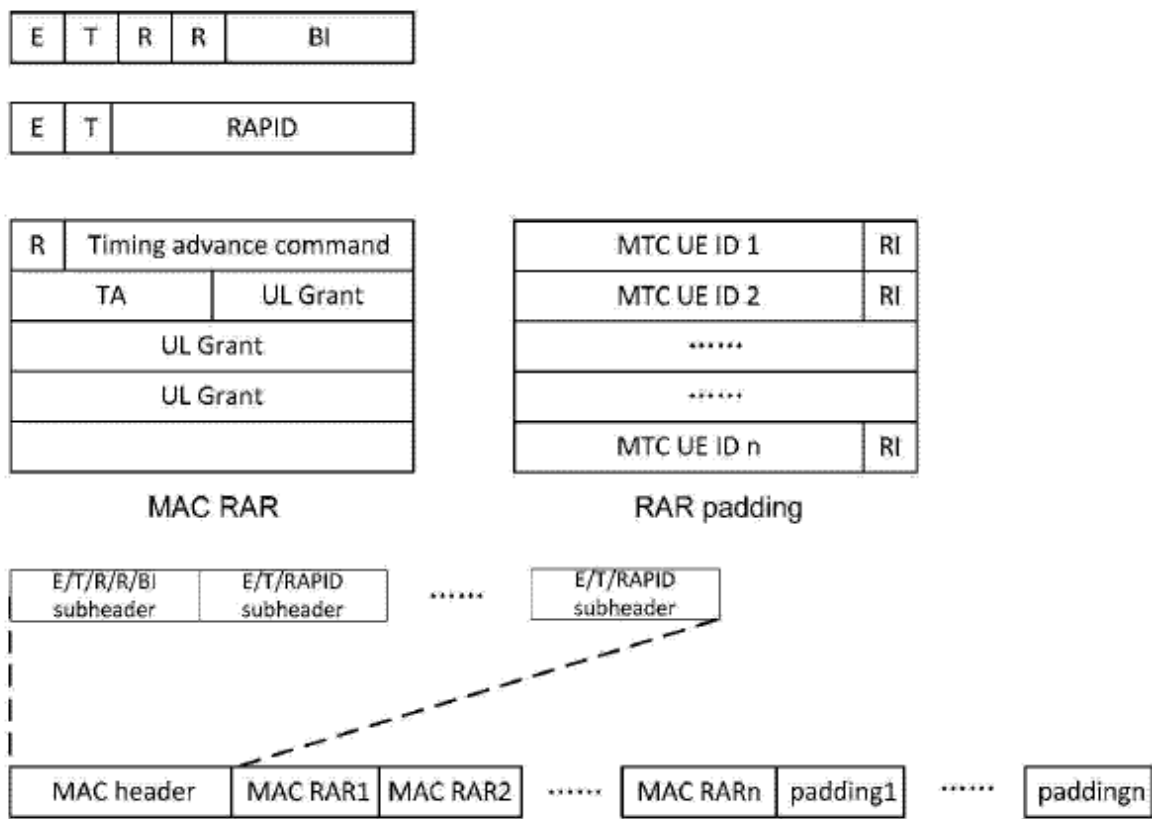


Fig. 3

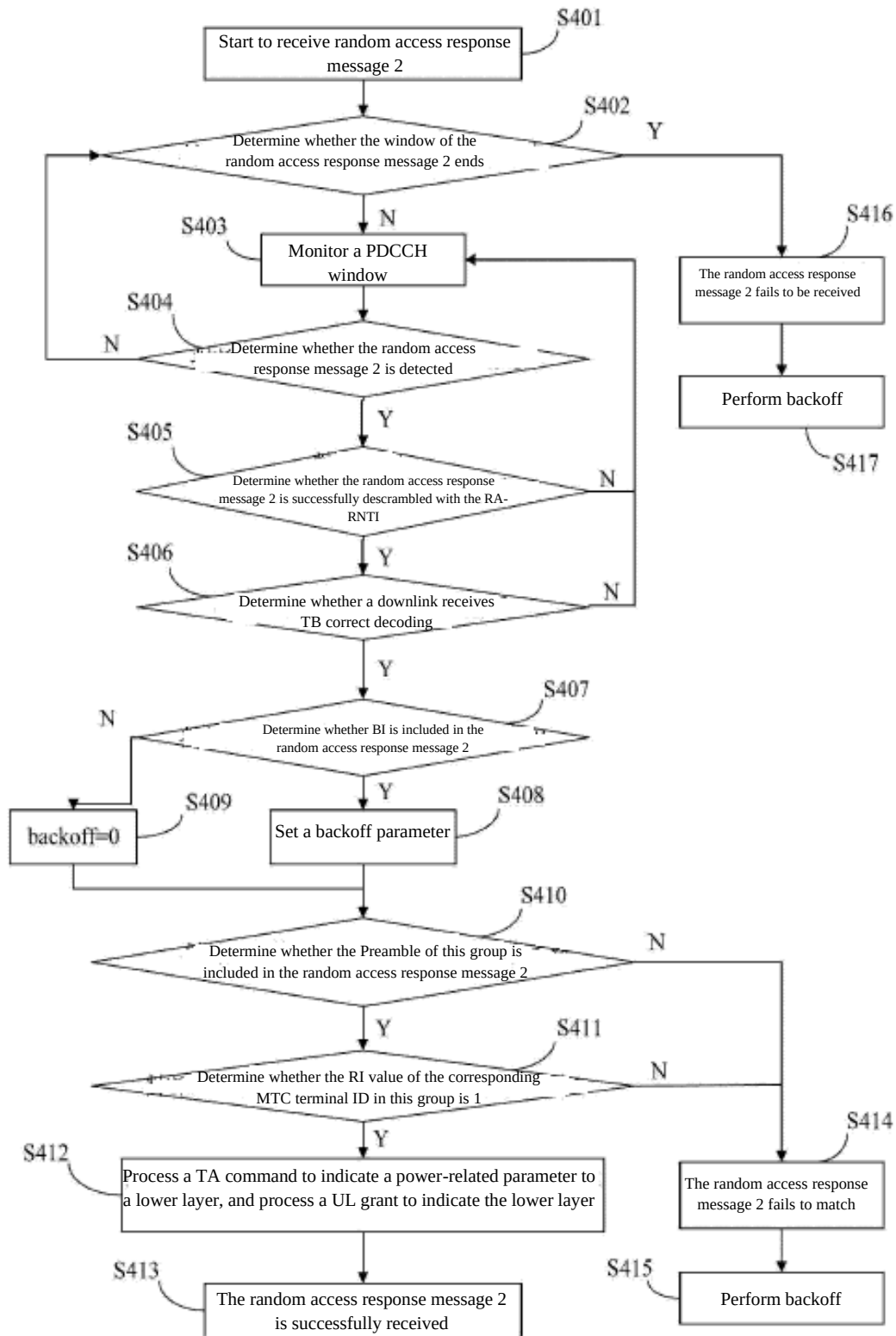


Fig. 4

8 bits	1bit	
MTC UE ID 1	CI	OCT 1
MTC UE ID 2	CI	OCT 2
.....		
MTC UE ID n	CI	OCT n

Fig. 5

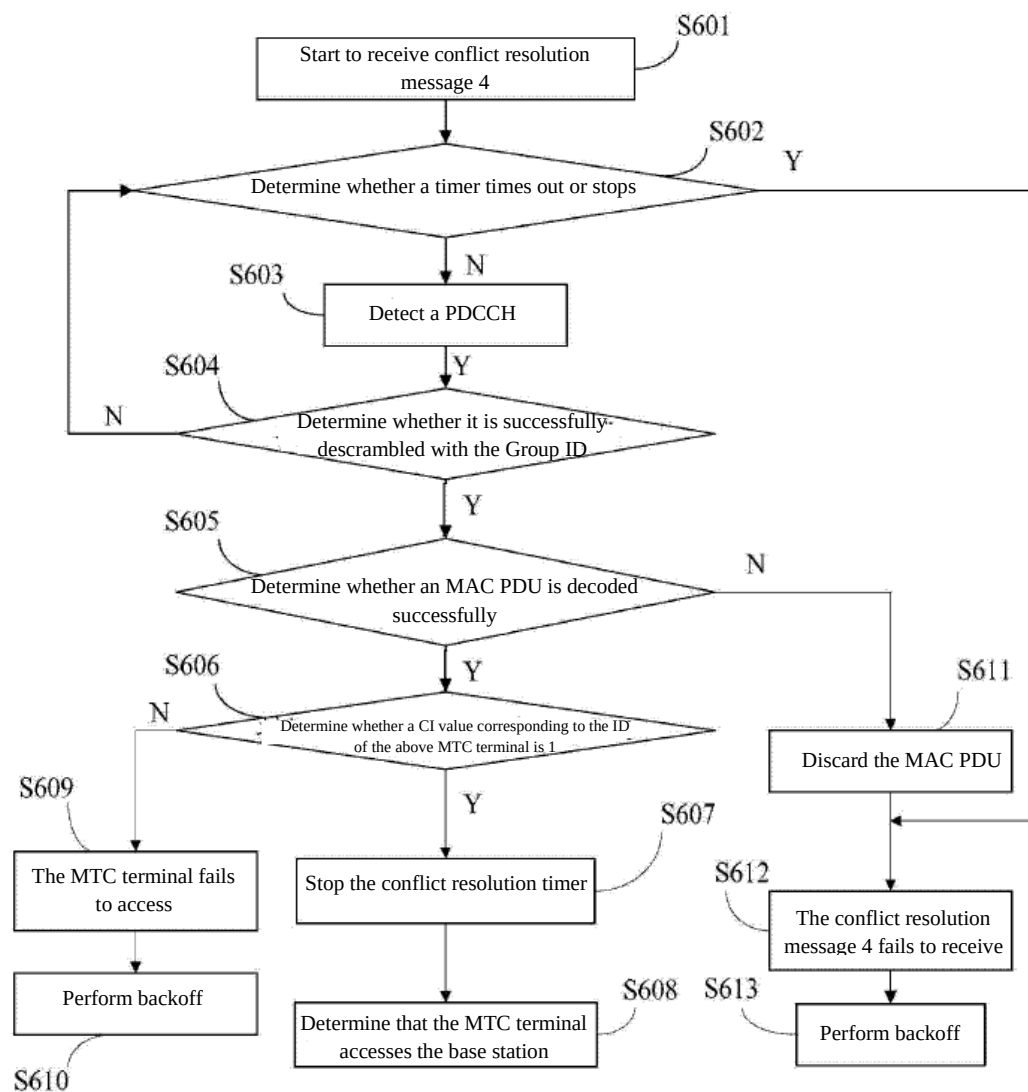


Fig. 6

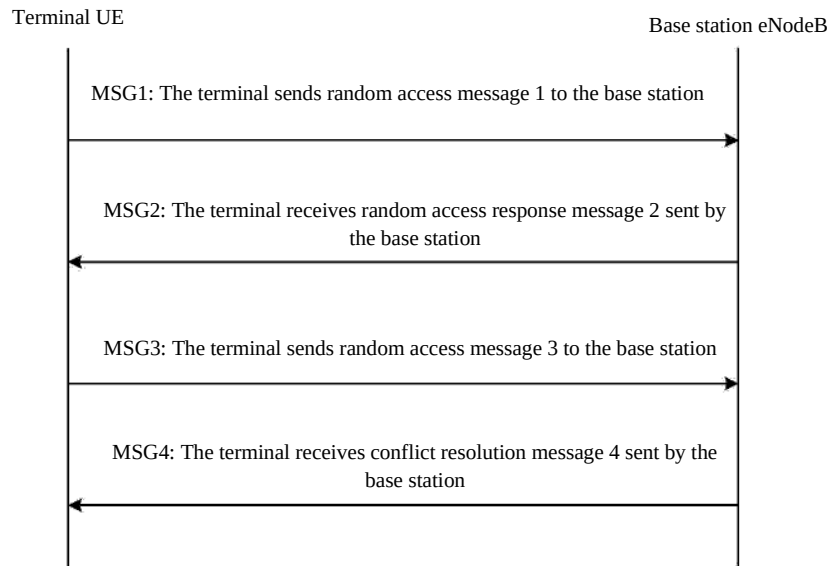


Fig. 7

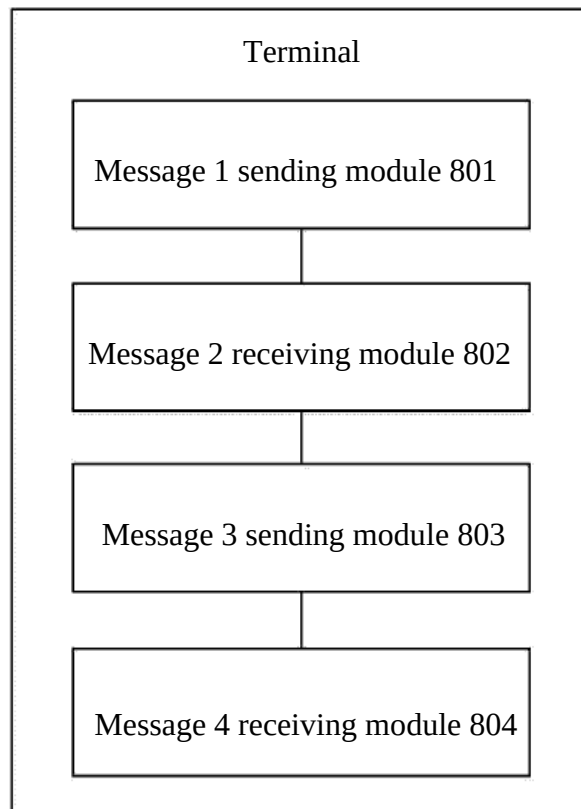


Fig. 8

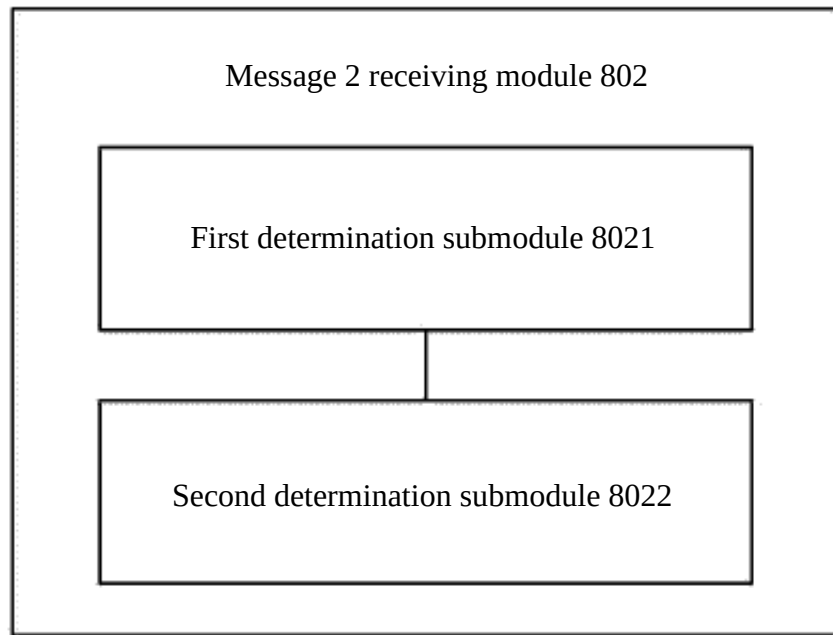


Fig. 9

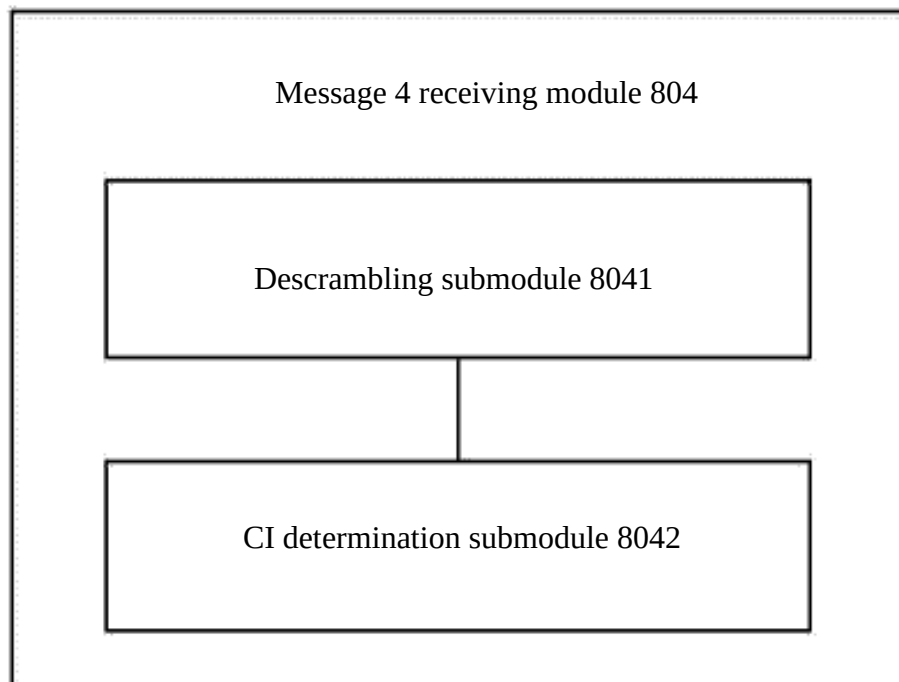


Fig. 10

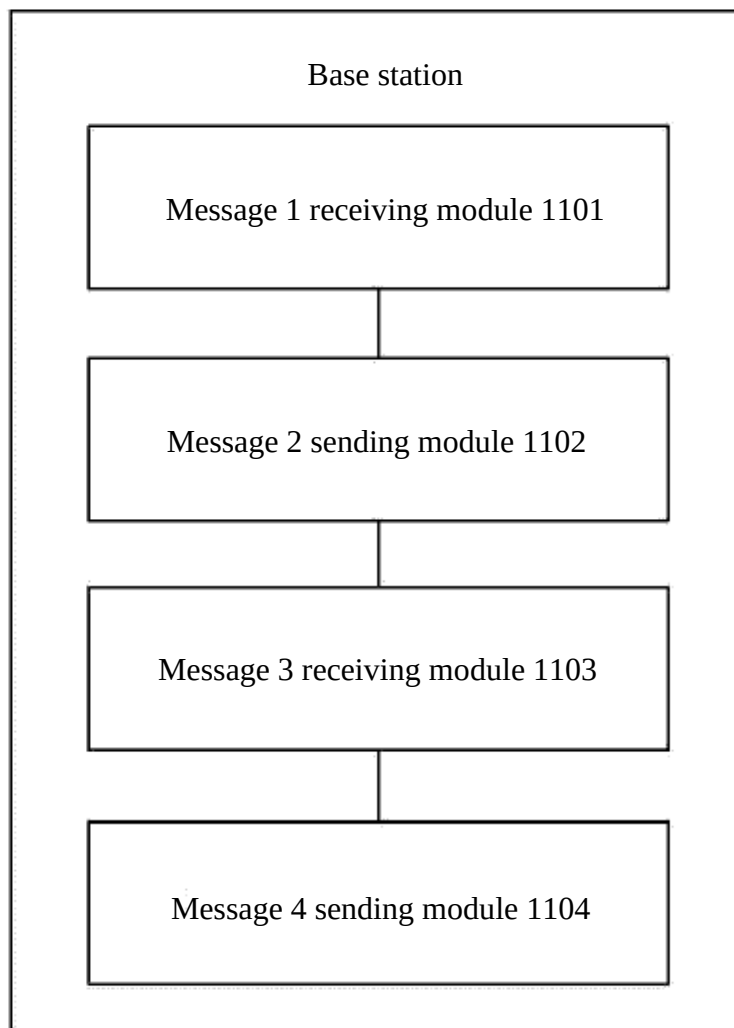


Fig. 11



TRANSLATOR CERTIFICATION

Date: August 6, 2022

To whom it may concern:

I, FANG CHEN, a translator fluent in the Chinese and English languages, on behalf of Morningside Translations, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

The document is designated as:

- Chinese Patent Number: CN 102917433 A

Signature

FANG CHEN

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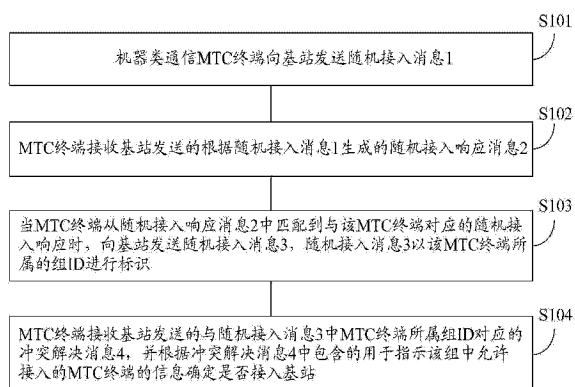
权利要求书 3 页 说明书 13 页 附图 8 页

(54) 发明名称

一种机器类通信终端的接入方法及基站、终端

(57) 摘要

本发明提供了一种机器类通信 MTC 终端的接入方法及基站、终端,以解决 MTC 终端大量随机接入,导致基站信令负荷过重的问题。其中,所述一种机器类通信 MTC 终端的接入方法包括:机器类通信 MTC 终端向基站发送随机接入消息 1;MTC 终端接收基站发送的根据所述随机接入消息 1 生成的随机接入响应消息 2;当 MTC 终端从随机接入响应消息 2 中匹配到与 MTC 终端对应的随机接入响应时,向基站发送随机接入消息 3;MTC 终端接收基站发送的与随机接入消息 3 中 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入基站。本发明减少了网络负荷,避免了网络拥塞的发生。



1. 一种机器类通信终端的接入方法,其特征在于,包括:

机器类通信 MTC 终端向基站发送随机接入消息 1;

所述 MTC 终端接收所述基站发送的根据所述随机接入消息 1 生成的随机接入响应消息 2,其中,所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应;

当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应时,向所述基站发送随机接入消息 3,所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识;

所述 MTC 终端接收所述基站发送的与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

2. 根据权利要求 1 所述的方法,其特征在于:

所述随机接入响应消息 2 包含:消息头和消息体;

其中,所述消息头中包含至少两组 MTC 终端的组指示信息,每个组指示信息用于指示对应的组;

所述消息体中包含至少两组 MTC 终端的第一信息和第二信息,每组对应一个第一信息和一个第二信息;其中所述第一信息为随机接入响应消息的内容,所述第二信息包括该组中每个 MTC 终端的 ID 及其 RI 标志位,所述 RI 标志位用于指示对应该组的第一信息是否为该 MTC 终端的。

3. 根据权利要求 2 所述的方法,其特征在于,所述 MTC 终端接收随机接入响应消息 2 包括:

步骤一,所述 MTC 终端通过读取随机接入响应消息 2 中的组指示信息,判断所述组指示信息中是否包含所述 MTC 终端所在组的组指示信息,若是执行步骤二,否则匹配失败;

步骤二,所述 MTC 终端通过读取随机接入响应消息 2 中的第二信息,判断所述第二信息中包含的所述 MTC 终端的 ID 对应的 RI 值是否为第一预设值,若是,则确定所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应,接收成功,否则匹配失败。

4. 根据权利要求 3 所述的方法,其特征在于,

所述随机接入响应消息 2 的消息头中还包括用于指示回退时间参数的 BI;

当随机接入响应消息 2 的匹配失败时,所述 MTC 终端进行回退,所述回退包括:根据 BI 指示的回退时间参数进行回退。

5. 根据权利要求 1 所述的方法,其特征在于,所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识包括:

通过所述 MTC 终端所属的组 ID 对所述随机接入消息 3 进行加扰,以供基站接收到随机接入消息 3 后,使用所述 MTC 终端所属的组 ID 进行解扰。

6. 根据权利要求 1 所述的方法,其特征在于,所述根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站包括:

当所述冲突解决消息 4 中与所述 MTC 终端的 ID 对应的冲突标志位 CI 的值为第二预设值时,确定所述 MTC 终端接入所述基站,否则,接入失败,所述 MTC 终端进行回退;其中,所

述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息为对应该组中每个 MTC 终端 ID 的冲突标志位 CI, 所述冲突标志位 CI 用于指示对应的 MTC 终端是否允许接入。

7. 根据权利要求 6 所述的方法, 其特征在于,

所述根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站之前, 还包括:

所述 MTC 终端使用其对应的组 ID 对所述冲突解决消息 4 进行解扰; 其中, 所述基站发送的与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4 由基站通过该组的组 ID 进行加扰。

8. 根据权利要求 1 所述的方法, 其特征在于:

所述随机接入消息 1 中包含随机接入前导序列 Preamble, 所述随机接入前导序列 Preamble 由 MTC 终端从所属组的随机接入前导序列中选择得到, 以使基站根据所述随机接入前导序列 Preamble 确定所述 MTC 终端所属的组, 并将对应该组的随机接入响应包含在随机接入响应消息 2 中。

9. 一种机器类通信终端, 其特征在于, 包括:

消息 1 发送模块, 用于向基站发送随机接入消息 1;

消息 2 接收模块, 用于接收所述基站发送的根据所述随机接入消息 1 生成的随机接入响应消息 2, 其中, 所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应, 且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应;

消息 3 发送模块, 用于当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应时, 向所述基站发送随机接入消息 3, 所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识;

消息 4 接收模块, 用于接收所述基站发送的与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4, 并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

10. 根据权利要求 9 所述的终端, 其特征在于:

消息 2 接收模块接收的随机接入响应消息 2 包含消息头和消息体;

其中, 所述消息头中包含至少两组 MTC 终端的组指示信息, 每个组指示信息用于指示对应的组;

所述消息体中包含至少两组 MTC 终端的第一信息和第二信息, 每组对应一个第一信息和一个第二信息; 其中所述第一信息为随机接入响应消息的内容, 所述第二信息包括该组中每个 MTC 终端的 ID 及其 RI 标志位, 所述 RI 标志位用于指示对应该组的第一信息是否为该 MTC 终端的。

11. 根据权利要求 10 所述的终端, 其特征在于, 所述消息 2 接收模块包括:

第一判断子模块, 用于通过读取随机接入响应消息 2 中的组指示信息, 判断所述组指示信息中是否包含所述 MTC 终端所在组的组指示信息, 若是进入第二判断模块, 否则匹配失败;

第二判断子模块, 用于通过读取随机接入响应消息 2 中的第二信息, 判断所述第二信息中包含的所述 MTC 终端的 ID 对应的 RI 值是否为第一预设值, 若是, 则确定所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应, 接收成功, 否则

匹配失败。

12. 根据权利要求 9 所述的终端,其特征在于:

所述消息 4 接收模块具体用于当所述冲突解决消息 4 中与所述 MTC 终端的 ID 对应的冲突标志位 CI 的值为第二预设值时,确定所述 MTC 终端接入所述基站,否则,接入失败,所述 MTC 终端进行回退;其中,所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息为对应该组中每个 MTC 终端 ID 的冲突标志位 CI,所述冲突标志位 CI 用于指示对应的 MTC 终端是否允许接入。

13. 一种机器类通信基站,其特征在于,包括:

消息 1 接收模块,用于接收终端发送的随机接入消息 1;

消息 2 发送模块,用于向所述终端发送根据所述随机接入消息 1 生成的随机接入响应消息 2,其中,所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应;

消息 3 接收模块,用于当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应时,接收所述终端发送的随机接入消息 3,所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识;

消息 4 发送模块,用于向所述终端发送与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

一种机器类通信终端的接入方法及基站、终端

技术领域

[0001] 本发明涉及测试技术领域，特别是涉及一种机器类通信终端的接入方法及基站、终端。

背景技术

[0002] 随着通信技术的发展，机器类型通信 (MTC, Machine-TypeCommunication) 技术得到了广泛关注。MTC 通信技术综合了数据采集、远程监控、电信和信息技术，可使业务流程自动化，集成公司资讯科技 (IT) 系统和非 IT 设备的实时状态，并创造了增值服务。在 MTC 通信系统中，终端设备称为 MTC 终端。

[0003] 随着 MTC 通信技术的不断成熟，将会有大量的 MTC 终端添加到 MTC 通信系统中，如果不对 MTC 终端的接入操作进行优化，无疑将会影响无线网络的性能。

[0004] 随机接入是无线通信中的一个基本功能，MTC 网络中的终端数量众多，大量的 MTC 终端同时进行随机接入的时候，势必会对网络产生巨大的冲击，致使网络的资源不够用，大量的 MTC 终端接入会失败；而且，基站由于大量的信令冲击，会造成死机或者网络负荷变重，使网络产生拥塞。

发明内容

[0005] 本发明提供一种机器类通信 MTC 终端的接入方法及基站、终端，以解决 MTC 终端大量随机接入，导致基站信令负荷过重的问题。

[0006] 为了解决上述问题，本发明公开了一种机器类通信终端的接入方法，包括：

[0007] 机器类通信 MTC 终端向基站发送随机接入消息 1；

[0008] 所述 MTC 终端接收所述基站发送的根据所述随机接入消息 1 生成的随机接入响应消息 2，其中，所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应，且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应；

[0009] 当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应时，向所述基站发送随机接入消息 3，所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识；

[0010] 所述 MTC 终端接收所述基站发送的与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4，并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

[0011] 本发明还公开了一种机器类通信终端，包括：

[0012] 消息 1 发送模块，用于向基站发送随机接入消息 1；

[0013] 消息 2 接收模块，用于接收所述基站发送的根据所述随机接入消息 1 生成的随机接入响应消息 2，其中，所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应，且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应；

[0014] 消息 3 发送模块，用于当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所

述 MTC 终端对应的随机接入响应时,向所述基站发送随机接入消息 3,所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识;

[0015] 消息 4 接收模块,用于接收所述基站发送的与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

[0016] 本发明还公开了一种机器类通信基站,包括:

[0017] 消息 1 接收模块,用于接收终端发送的随机接入消息 1;

[0018] 消息 2 发送模块,用于向所述终端发送根据所述随机接入消息 1 生成的随机接入响应消息 2,其中,所述随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应;

[0019] 消息 3 接收模块,用于当所述 MTC 终端从所述随机接入响应消息 2 中匹配到与所述 MTC 终端对应的随机接入响应时,接收所述终端发送的随机接入消息 3,所述随机接入消息 3 以所述 MTC 终端所属的组 ID 进行标识;

[0020] 消息 4 发送模块,用于向所述终端发送与所述随机接入消息 3 中所述 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据所述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入所述基站。

[0021] 与现有技术相比,本发明包括以下优点:

[0022] 本发明提供了基于组的终端接入过程,在上述接入过程中,MTC 终端接收基站发送的根据上述 MTC 终端向基站发送的随机接入消息 1 生成的随机接入响应消息 2,上述基站发送的随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应。假设传统方法的一条随机接入响应消息 2 包括 10 个终端的随机接入响应,则 2 组共 20 个终端的随机接入响应需要基站发送 2 条随机接入响应消息 2;而采用本发明的上述方法,一条随机接入响应消息就可以包括 2 组共 20 个终端的随机接入响应,每组随机接入响应包含 10 个终端的随机接入响应。由此可见,基站之前需要发送两条随机接入响应消息,现在只需要发送一条随机接入响应消息就可以达到同样的目的,因此基站节省了大量的信令开销,同时也减小了基站侧的信令负荷。当大量 MTC 终端同时进行随机接入过程的时候,可以保证更多的 MTC 终端成功接入,减少网络负荷,避免了网络拥塞的发生。

附图说明

[0023] 图 1 是本发明实施例一种机器类通信终端的接入方法的流程图;

[0024] 图 2 是本发明另一实施例一种机器类通信终端的接入方法的流程图;

[0025] 图 3 是本发明实施例基于组的随机接入过程中随机接入响应消息 2 的结构图;

[0026] 图 4 是本发明实施例随机接入响应消息 2 接收过程的流程图;

[0027] 图 5 是本发明实施例冲突解决消息 4 的结构图;

[0028] 图 6 是本发明实施例冲突解决消息 4 接收过程的流程图;

[0029] 图 7 是本发明实施例终端和基站交互过程的流程图;

[0030] 图 8 是本发明实施例一种机器类通信终端的结构框图;

[0031] 图 9 是本发明实施例消息 2 接收模块的结构框图;

[0032] 图 10 是本发明实施例消息 4 接收模块的结构框图;

[0033] 图 11 是本发明实施例一种机器类通信基站的结构框图。

具体实施方式

[0034] 为使本发明的上述目的、特征和优点能够更加明显易懂,下面结合附图和具体实施方式对本发明作进一步详细的说明。

[0035] 实施例一:

[0036] 参照图 1,示出了本实施例一种机器类通信终端的接入方法的流程图,本实施例具体可以包括以下步骤:

[0037] S101,机器类通信 MTC 终端向基站发送随机接入消息 1;

[0038] 本实施例中将 MTC 终端进行分组,每组 MTC 终端分配一个 Group ID,对应的每组中的每个 MTC 终端都会分配一个 Group ID 和 MTC UE ID,其中 Group ID 是组 ID,相同的组 ID 表明 MTC 设备属于一个组,而 MTC UEID 是每个 MTC 终端在所属组内的 ID,每个 UE 在组内的 ID 是唯一的,并且是提前分配好的,不会发生冲突。

[0039] 本实施例中随机接入消息 1 中包含随机接入前导序列 Preamble,随机接入前导序列 Preamble 由 MTC 终端从所属组的随机接入前导序列中选择得到,以使基站根据随机接入前导序列 Preamble 确定 MTC 终端所属的组,并将对应该组的随机接入响应包含在随机接入响应消息 2 中。

[0040] 例如,第一组 MTC 终端的 Group ID 为 001,对应的第一组随机接入前导序列 Preamble 为 1-10。

[0041] 每组 MTC 终端对应一组 Preamble,随机接入消息 1 中包含的随机接入前导序列 Preamble 由每组内的 MTC 终端在所属组对应的一组 Preamble 中选择一个 Preamble 发送。

[0042] 基站接收到 MTC 终端发送的随机接入前导序列 Preamble 后,判断上述前导序列 Preamble 是由哪组 MTC 终端发送的,然后获得该组 MTC 终端的 Group ID。

[0043] 例如,基站接收到的随机接入前导序列 Preamble 为 5,根据本实施例对 MTC 终端进行分组的情况,Preamble 为 1-10 属于第一组,然后获得该组 MTC 终端的 Group ID 为 001。

[0044] MTC 终端发送 Preamble 后,需要等待网络侧的随机接入响应,如果在给定的时间(根据高层配置的参数 ra-ResponseWindowSize 来判断)内没有正确收到网络侧的响应,则在配置的 Preamble 最大发送次数(由高层配置的参数 preambleTransMax 确定)内,MTC 终端可以重复发送 Preamble。

[0045] S102,MTC 终端接收基站发送的根据随机接入消息 1 生成的随机接入响应消息 2;

[0046] 本发明实施例中,基站可针对两组或多组 MTC 终端的随机接入消息 1 生成一个随机接入响应消息 2,因此,随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应。

[0047] 具体地,随机接入响应消息由基站的 MAC 层产生,与随机接入消息 1 间采用半同步的方式发送(即反馈时间窗灵活可配),不采用 HARQ(因为 MTC 终端一般只有很小的缓存,而且 MTC 数据一般都比较小,时延要求也不是很高,这样就不适合用 HARQ 过程),通过由 RA-RNTI 加扰的 PDCCHFormat1A 来调度,通过 MAC 层用户分组数据单元 MAC PDU 发送给物理层,由下行共享信道(DL-SCH,Downlink Shared Channel)承载。当基站检测到 MTC 终端发送的前导序列 Preamble,就会在 DL-SCH 上发送一个响应。

[0048] 本实施例中一个随机接入响应消息可以包括多个组的随机接入响应,随机接入响应消息主要包括:检测到的前导序列的组指示信息(用于指示对应的组)、用于上行同步的时间调整信息、初始的上行资源分配(用于发送随后的消息3),以及一个临时 C-RNTI,此临时的 C-RNTI 将在步骤四(冲突解决)中决定是否转换为永久的 C-RNTI。

[0049] MTC 终端需要在 PDCCH 上使用 RA-RNTI(Random Access RNTI)来监听 RAR 消息。RA-RNTI 与 MTC 终端发送的前导序列 Preamble 的时频位置一一对应,MTC 终端和基站可以分别计算出前导序列对应的 RA-RNTI 值。MTC 终端监听 PDCCH 信道以 RA-RNTI 表征的随机接入响应消息 2,并解码相应的 PDSCH 信道,如果随机接入响应消息 2 中的 RAPID 指示的组和上述 MTC 终端所属的组相同,那么 MTC 终端就采用随机接入响应消息 2 中的上行时间调整信息,并启动相应的冲突调整过程。

[0050] S103,当 MTC 终端从随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应时,向基站发送随机接入消息 3,随机接入消息 3 以上述 MTC 终端所属的组 ID 进行标识;

[0051] 本实施例中,随机接入响应消息 2 中包含了两组或多组 MTC 终端的随机接入响应,可在随机接入响应消息 2 中查找是否包括有与上述 MTC 终端对应的随机接入响应,若有,则确定 MTC 终端从随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应,即 MTC 终端接收随机接入响应消息 2 成功,可向基站发送随机接入消息 3。

[0052] 所谓随机接入消息 3,其实就是第三条消息,因为在随机接入的过程中,这些消息的内容不固定,有时候可能携带的是 RRC 连接请求,有时候可能会带一些控制消息甚至业务数据包,因此本实施例称为随机接入消息 3。

[0053] 如果不同的 MTC 终端接收到相同的随机接入响应消息 2,那么这些不同的 MTC 终端就会获得相同的上行资源,同时发送随机接入消息 3。为了区分不同组的 MTC 终端,本实施例以上述 MTC 终端所属的组 ID 对随机接入消息 3 进行标识,具体地,通过上述 MTC 终端所属的组 ID 对随机接入消息 3 进行加扰;在 S101 中陈述过每个 MTC 终端由一个对应的组 ID,在本实施例中就采用这个对应的组 ID 对随机接入消息 3 进行加扰。相应的,基站接收到随机接入消息 3 后,使用上述 MTC 终端所属的组 ID 进行解扰。

[0054] MTC 终端接收到基站反馈的随机接入响应消息 2 后,根据调度许可,在 UL-SCH 上发送随机接入消息 3,对于 MTC 终端来说,随机接入消息 3 不采用 HARQ(因为 MTC 终端一般只有很小的缓存,而且 MTC 数据一般都比较小,时延要求也不是很高,这样就不适合用 HARQ 过程)。随机接入消息 3 包括:RR connection request, track area update, schedule request, C-RNTI, MSG3 通过 Group ID 加扰。

[0055] MTC 终端在发完随机接入消息 3 后就要立刻启动冲突解决定时器 mac-Contention Resolution Timer(而随后每一次重传消息 3 都要重启这个定时器),MTC 终端需要在此时间内监听基站返回给自己的冲突解决消息 4。

[0056] S104,MTC 终端接收基站发送的与随机接入消息 3 中 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入基站。

[0057] 在本实施例中上述 MTC 终端发送给基站的随机接入消息 3 采用上述 MTC 终端对应的组 ID 进行加扰。相应的,基站接收到随机接入消息 3 后,使用上述 MTC 终端所属的组 ID

进行解扰,并向 MTC 终端发送与上述随机接入消息 3 中上述 MTC 终端所属组 ID 对应的冲突解决消息 4,上述冲突解决消息 4 仍然使用上述 MTC 终端所属组的组 ID 进行加扰。

[0058] 如果在 mac-ContentionResolutionTimer 时间内,MTC 终端接收到基站返回的冲突解决消息 4,上述 MTC 终端根据冲突解决消息 4 中包含的用于指示上述组中允许接入的 MTC 终端的信息确定是否接入上述基站之前,上述 MTC 终端使用其对应的组 ID 对所属组的冲突解决消息 4 进行解扰,若解扰成功,则根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入基站。

[0059] 本实施例通过基于组的接入过程,基站发送的随机接入响应消息 2 中包括多组 MTC 终端的随机接入响应,基站发送的冲突解决消息中包含多组 MTC 终端的冲突解决消息,基站可以节省大量的信令开销,减小基站侧的信令负荷。当大量 MTC 终端同时进行随机接入过程的时候,可以保证更多的 MTC 终端成功接入,减少网络负荷,避免了网络拥塞的发生。

[0060] 例如,假设传统方法的一条随机接入响应消息 2 包括 10 个终端的随机接入响应,则 2 组共 20 个终端的随机接入响应需要基站发送 2 条随机接入响应消息 2;而采用本发明实施例的上述方法,一条随机接入响应消息就可以包括 2 组共 20 个终端的随机接入响应,每组随机接入响应包含 10 个终端的随机接入响应。由此可见,基站之前需要发送两条随机接入响应消息,现在只需要发送一条随机接入响应消息就可以达到同样的目的,因此基站节省了大量的信令开销,减小了信令负荷。

[0061] 实施例二:

[0062] 本实施例在实施例一的基础上对 MTC 终端接收随机接入响应消息 2 和冲突解决消息 4 进行详细说明,参照图 2 是本实施例一种机器类通信终端的接入方法的流程图,本实施例具体可以包括如下步骤:

[0063] S201,机器类通信 MTC 终端向基站发送随机接入消息 1,随机接入消息 1 中包含随机接入前导序列 Preamble,随机接入前导序列 Preamble 由 MTC 终端从所属组的随机接入前导序列中选择得到;

[0064] S202,MTC 终端接收基站发送的随机接入响应消息 2,随机接入响应消息 2 中包含对应多组 MTC 终端的随机接入响应,对应每组的随机接入响应中包含该组多个 MTC 终端的随机接入响应;

[0065] 随机接入响应消息 2 包含:消息头和消息体;

[0066] 其中,消息头中包含至少两组 MTC 终端的组指示信息,每个组指示信息用于指示对应的组。

[0067] 在本实施例中,组指示信息可以为 RAPID,每个 RAPID 用于指示对应的组,MTC 终端根据 RAPID 判断上述随机接入响应消息 2 是不是对应上述 MTC 终端所属组的响应。

[0068] RAPID 用于指示对应的组包括:

[0069] RAPID 指示 preamble 索引,MTC 终端判断 preamble 索引是否为自己所属的组的索引,如果是,则上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应;

[0070] RAPID 指示组 ID,MTC 终端判断组 ID 是否为自己所属组的组 ID,如果是,则上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应。

[0071] 消息体中包含至少两组 MTC 终端的第一信息和第二信息,每组对应一个第一信

息和一个第二信息 ;其中第一信息为随机接入响应消息的内容,第二信息包括该组中每个 MTC 终端的 ID 及其 RI 标志位, RI 标志位用于指示对应该组的第一信息是否为上述 MTC 终端的。

[0072] 本实施例中第一信息为 MAC RAR,第二信息为 RAR padding,即本实施例中消息体中包含对应多组 MTC 终端的 MAC RAR 和 RAR padding,每组对应一个 MAC RAR 和一个 RAR padding ;其中 MAC RAR 为随机接入响应消息的内容, RAR padding 包括该组中每个 MTC 终端的 ID 及其 RI 标志位, RI 标志位用于指示对应该组的 MAC RAR 是否为上述 MTC 终端的。MTC 终端在根据 RAPID 判断上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应后, 然后可以根据 RAR padding 里面的信息,找到上述 MTC 终端对应的 ID,如果 RI 标志位为第一预设值,标示这个 RAR 包含的信息是上述 MTC 终端的。需要说明的是,本实施例中随机接入响应消息 2 包含的至少两组 RAR padding 中可以有多组 MTC 终端对应的 RI 标志位为 1, 可以在冲突解决消息 4 中进行冲突解决。

[0073] 随机接入响应消息 2 的消息头中还包括用于指示回退时间参数的 BI,当随机接入响应消息 2 匹配失败时,上述 MTC 终端进行回退,回退包括 :根据 BI 指示的回退时间参数进行回退。

[0074] 随机接入响应消息 2 中各参数的含义如下表 1 所示 :

[0075]

消息字段		比特数	说明
BI (Backoff Indicator)		4	该参数在随机接入响应中可选出现,用于指示小区过载情况,用于配置UE 随机接入的回退时间参数。
RAPID		6	指示preamble 索引以便判断随机接入响应是否是发送给终端所在的组的
Timing Advance Command		11	指示TA 索引值,取值范围(0,1,2...1282),用于控制UE 上行定时调整
UL Grant	Hopping flag	1	跳频标志,取1时用于指示UE 发送 PUSCH 时采用跳频,取0时不跳频

[0076]

Fixed size resource Block assignment	10	指示承载MSG3 的PUSCH 使用的PRB 资源
Truncated modulation and coding scheme	4	发送MSG3 时采用的调制和编码方案， 根据该字段和Fixed Size resource block assignment 字段 UE可确定上行发送时可 采用的TBS。调度许可分配的传输块大小 不能少于80bits
TPC	3	用于发送MSG3 时PUSCH 的功率
UL delay	1	用于指示是否延迟发送PUSCH; 0: UE 在n+k1 时发送PUSCH, 其中n 为UE 检测 到携带对应RA-RNTI 的PDCCH 的子帧， k1 ∈{0,1,2,3,4,5,6,7}; 1: UE 延迟到下一个可用的上行子帧 发送PUSCH
Temporary C-RNTI	16	该字段用于为UE 分配一个在随机接入 期间使用的一个临时ID

[0077] 表 1 随机接入响应消息 2 中各参数的含义

[0078] 需要说明的是,如果 MTC 终端在规定的时间内,没有收到任何随机接入响应消息 2,或者如果随机接入响应消息 2 中的 RAPID 中的 preambleindex 不属于上述 MTC 终端所在的组,则认为此次前导接入失败, MTC 终端需要推迟一段时间,才能进入下一次的前导接入。推迟时间的范围,就由 BI 来指示,MTC 终端可以在 0 到 BI 指示的 backoff 值之间随机取值,这样可以减少 MTC 终端在相同时间再次发送前导序列的几率。

[0079] MTC 终端接收随机接入响应消息 2 包括：

[0080] 步骤一,MTC 终端通过读取随机接入响应消息 2 中的组指示信息,判断组指示信息中是否包含上述 MTC 终端所在组的组指示信息,若是执行步骤二,否则匹配失败；

[0081] 步骤二,MTC 终端通过读取随机接入响应消息 2 中的第二信息,判断上述第二信息中包含的上述 MTC 终端的 ID 对应的 RI 值是否为第一预设值,若是,则确定上述 MTC 终端从随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应,接收成功,否则匹配失败。

[0082] 在本实施例二中,组指示信息为 RAPID,第二信息为 RAR padding,第一预设值可以为 1。本实施例中步骤 S202 包括：

[0083] S2021,MTC 终端通过读取随机接入响应消息 2 中的 RAPID,判断 RAPID 是否包含上述 MTC 终端所在组的组指示信息,若是执行 S2022,否则匹配失败；

[0084] MTC 终端根据消息头中的 RAPID 判断上述随机接入响应消息 2 是不是对应上述 MTC 终端所属组的响应 (RAPID 指示 preamble 索引, MTC 终端可以判断根据 preamble 索引

是否为自己所属的组的索引,如果是,则上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应;RAPID 指示组 ID, MTC 终端判断组 ID 是否为自己所属组的组 ID,如果是,则上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应)。如果是执行 S2022,否则匹配失败, MTC 终端进行回退。

[0085] S2022, MTC 终端通过读取随机接入响应消息 2 中的 RAR padding,判断上述 RAR padding 中包含的上述 MTC 终端的 ID 对应的 RI 值是否为 1,若 RI 值为 1,则接收成功,否则匹配失败。

[0086] MTC 终端在根据 RAPID 判断上述随机接入响应消息 2 是对应上述 MTC 终端所属组的响应后,然后可以根据 RAR padding 里面的信息,找到上述 MTC 终端对应的 ID,如果 RI 标志位为 1,标示这个 RAR 包含的信息是上述 MTC 终端的,接收成功,否则,匹配失败, MTC 终端进行回退。

[0087] 当然,第一预设值也可以为 0,可以根据实际情况设定,本实施例对此不做限定。

[0088] 下面结合附图 4,对随机接入响应消息 2 的接收过程进行进一步的说明。如图 4 所示,

[0089] S401,开始接收随机接入响应消息 2,然后执行 S402;

[0090] S402,判断随机接入响应消息 2 窗口是否结束,若否,执行 S403,否则执行 S416;

[0091] 在本实施例中,判断随机接入响应消息 2 窗口是否结束包括:判断窗口数是否达到预设个数,预设个数一般设置为 10 个。

[0092] S403, MTC 终端监听 PDCCH 窗口;

[0093] S404,判断是否检测到随机接入响应消息 2,如果是则执行 S405,否则返回 S402;

[0094] S405,判断用 RA-RNTI 对随机接入响应消息 2 是否成功解扰,若是,则执行 S406,否则返回 S403;

[0095] S406,判断下行是否收到 TB 正确解码,若是,则执行 S407,否则返回 S403;

[0096] S407,判断随机接入响应消息 2 中是否包含 BI,若是执行 S408,否则执行 S409;

[0097] S408,设定 backoff 参数,然后执行 S408;

[0098] 例如 BI 的值为 1,则将 backoff 设定为 0.01 秒, BI 的值为 2,则将 backoff 的值设定为 0.02 秒。

[0099] S409,将 backoff 的值置为 0 秒,然后执行 S410;

[0100] S410,判断随机接入响应消息 2 中是否包含本组的 Preamble,若是,则执行 S411,否则执行 S414;

[0101] 根据随机接入响应消息 2 中的 RAPID 中指示的 Preamble 索引是否属于上述 MTC 终端所在的组的索引来判断随机接入响应消息 2 中是否包含本组的 Preamble。

[0102] S411,判断本组中对应的 MTC 终端 ID 的 RI 值是否为 1,若是执行 S412,否则执行 S414;

[0103] S412,处理 TA command 指示功率相关参数给低层,处理 UL grant 指示低层,然后执行 S413;

[0104] S413,随机接入响应消息 2 接收成功;

[0105] S414,随机接入响应消息 2 匹配失败,然后执行 S415;

[0106] S415, MTC 终端进行回退,上述回退包括从 0 到 backoff 值之间随机选取一个进行

回退；

[0107] S416,随机接入响应消息 2 接收失败,然后执行 S417；

[0108] S417,MTC 终端进行回退,上述回退包括根据配置的时间进行回退。

[0109] 需要说明的是,随机接入响应消息 2 接收成功后,MTC 终端准备发送随机接入消息 3。若随机接入响应消息 2 接收失败,MTC 终端进行回退然后重新发送 Preamble。而随机接入响应消息 2 接收结束后 MTC 终端进行回退是根据设定的 backoff 参数,MTC 终端从 0 到 backoff 直接随机选取一个值进行回退,重新发送 Preamble,这样可以减少不同 MTC 终端在相同时间再次发送前导序列的几率。

[0110] S203,MTC 终端向基站发送随机接入消息 3,上述随机接入消息 3 以上述 MTC 终端所属的组 ID 进行标识；

[0111] S204,MTC 终端接收基站发送的对应上述 MTC 终端所属组的冲突解决消息 4,上述冲突解决消息 4 中包含用于指示该组中允许接入的 MTC 终端的信息。

[0112] 本实施例中冲突解决消息 4 的 PDCCH SDU 可以包括多个组的冲突解决消息,如图 5 所示,针对每个组的 PDCCH SDU 包括多个 MTC 终端的 ID 和对应的 CI 值。其中,MTC UE ID 占 7bits,CI 占 1bit,每个 MTC 终端的 ID 和 CI 占用 1 字节。

[0113] 本实施例中上述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息可以为上述 CI 的值。

[0114] 本实施例中具体地当上述冲突解决消息 4 中与上述 MTC 终端的 ID 对应的冲突标志位 CI 的值为第二预设值时,确定接入上述基站,否则,接入失败,上述 MTC 终端进行回退；其中,上述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息为对应该组中每个 MTC 终端 ID 的冲突标志位 CI,上述冲突标志位 CI 用于指示对应的 MTC 终端是否允许接入。

[0115] 当 CI 值为 1 时,表明对应的 MTC 终端获得了接入许可,确定接入上述基站。当 CI 值为 0 时,表明不允许接入,接入失败,上述 MTC 终端根据所属组内的 BI 值进行回退。

[0116] 需要说明的是,上述根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入上述基站之前,上述 MTC 终端使用其对应的组 ID 对所属组的冲突解决消息 4 进行解扰,若解扰成功,则进入上述确定步骤；其中,上述基站发送的与上述随机接入消息 3 中上述 MTC 终端所属组 ID 对应的冲突解决消息 4 由基站通过该组的组 ID 进行加扰。

[0117] 本实施例中,第二预设值可以为 1,本实施例中 S204MTC 终端接收冲突解决消息 4 包括：

[0118] S2041,MTC 终端使用其对应的组 ID 对所属组的冲突解决消息 4 进行解扰,若解扰成功,则执行 S2042。基站发送给 MTC 终端的冲突解决消息 4 通过上述 MTC 终端所属组的组 ID 进行加扰；相应的 MTC 终端用其所属的组 ID 对冲突解决消息 4 进行解扰,如果解扰成功,说明上述冲突解决消息 4 为 MTC 终端所属组的冲突解决消息。

[0119] S2042,当上述冲突解决消息 4 中与上述 MTC 终端的 ID 对应的冲突标志位 CI 的值为 1 时,确定上述 MTC 终端接入基站,否则,接入失败,MTC 终端进行回退。

[0120] 当然,第二预设值也可以为 0,可以根据实际情况设定,本实施例对此不做限定。

[0121] 当 MTC 终端发送了随机接入消息 3 后,开始监听 PDCCH,直到冲突解决计时器

超时或停止,具体的 MTC 终端在发完随机接入消息 3 后就要立刻启动冲突解决定时器 mac-Contention Resolution Timer(而随后每一次重传消息 3 都要重启这个定时器),MTC 终端需要在此时间内监听基站返回给自己的冲突解决消息 4。

- [0122] 下面结合附图 6,对冲突解决消息 4 的接收过程进行进一步的说明。如图 6 所示,
- [0123] S601, MTC 终端开始接收冲突解决消息 4;
- [0124] S602, MTC 终端判断定时器是否超时或停止,若否,则执行 S603,若是,则执行 S611;
- [0125] S603,检测 PDCCH,然后执行 S604;
- [0126] S604,判断 MTC 终端用 Group ID 对冲突解决消息 4 是否成功解扰,若是则执行 S605,否则,返回 S602;
- [0127] S605,判断 MAC PDU 是否成功解码,若是执行 S606,否则执行 S611;
- [0128] S606,判断冲突解决消息 4 中上述 MTC 终端的 ID 对应的 CI 值是否为 1,若是,执行 S607,否则执行 S609;
- [0129] S607,停止冲突解决定时器,然后执行 S608;
- [0130] S608,确定上述 MTC 终端接入上述基站;
- [0131] 本实施例中确定上述 MTC 终端接入上述基站表明冲突解决消息 4 接收成功。
- [0132] S609,上述 MTC 终端接入失败,然后执行 S610;
- [0133] S610,MTC 终端进行回退,上述回退包括根据 BI 和终端 ID 生成一个随机数进行回退,重新发送 Preamble;
- [0134] 上述根据 BI 和终端 ID 生成一个随机数,其中随机数的一种方式为将 BI 和终端 ID 进行异或得到一个随机数。
- [0135] S611, MTC 终端舍弃 MAC PDU,然后执行 S612;
- [0136] S612,冲突解决消息 4 接收失败,然后执行 S613;
- [0137] S613, MTC 终端进行回退,回退包括根据配置的时间进行回退。
- [0138] 需要说明的是, S608,确定上述 MTC 终端接入上述基站,即上述 MTC 终端获得了接入许可,继续完成 MAC PDU 的拆包和解复用。
- [0139] 实施例三:
- [0140] 本实施例结合图 7 来说明终端和基站之间的交互过程。参照图 7 是本实施例终端和基站交互过程的流程图,其中,UE 表示终端,eNB 是 eNodeB 的简称,指代基站。
- [0141] 随机接入过程中终端和基站的交互包括 MSG1、MSG2、MSG3、MSG4 几个过程,具体如下:
- [0142] MSG1,终端向基站发送随机接入消息 1;
- [0143] 上述随机接入消息 1 中包含随机接入前导序列 Preamble,上述随机接入前导序列 Preamble 由 MTC 终端从所属组的随机接入前导序列中选择得到;
- [0144] MSG2,终端接收基站发送的随机接入响应消息 2;
- [0145] 上述随机接入响应消息 2 中包含对应多组 MTC 终端的随机接入响应,对应每组的随机接入响应中包含该组多个 MTC 终端的随机接入响应;
- [0146] MSG3,终端向基站发送随机接入消息 3;
- [0147] 上述随机接入消息 3 以上述 MTC 终端所属的组 ID 进行标识;

- [0148] MSG4,终端接收基站发送的冲突解决消息 4。
- [0149] 上述冲突解决消息 4 中包含用于指示该组中允许接入的 MTC 终端的信息。
- [0150] 消息 3 和消息 2 的接收过程在实施例二中已经进行了详细说明,可以参考实施例二中的说明来理解本实施例。
- [0151] 实施例四:
- [0152] 参照图 8,是本实施例一种机器类通信终端的结构框图,本实施例具体包括:
- [0153] 消息 1 发送模块 801,用于向基站发送随机接入消息 1;
- [0154] 消息 2 接收模块 802,用于接收基站发送的根据随机接入消息 1 生成的随机接入响应消息 2;
- [0155] 本实施例中,基站可以针对两组或多组 MTC 终端的随机接入消息 1 生成一个随机接入响应消息 2,因此消息 2 接收模块接收到的随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应。
- [0156] 消息 2 接收模块接收的随机接入响应消息 2 包含:消息头和消息体;
- [0157] 其中,消息头中包含至少两组 MTC 终端的组指示信息,每个组指示信息用于指示对应的组;
- [0158] 上述消息体中包含至少两组 MTC 终端的第一信息和第二信息,每组对应一个第一信息和一个第二信息;其中第一信息为随机接入响应消息的内容,第二信息包括该组中每个 MTC 终端的 ID 及其 RI 标志位,上述 RI 标志位用于指示对应该组的第一信息是否为上述 MTC 终端的。
- [0159] 上述随机接入响应消息 2 的消息头中还包括用于指示回退时间参数的 BI;
- [0160] 消息 3 发送模块 803,用于当 MTC 终端从随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应时,向基站发送随机接入消息 3,随机接入消息 3 以上述 MTC 终端所属的组 ID 进行标识;
- [0161] 消息 4 接收模块 804,用于接收基站发送的与随机接入消息 3 中 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否接入上述基站。
- [0162] 在本实施例的一种优选实施例中,上述消息 4 接收模块具体用于当上述冲突解决消息 4 中与上述 MTC 终端的 ID 对应的冲突标志位 CI 的值为第二预设值时,确定上述 MTC 终端接入上述基站,否则,接入失败,上述 MTC 终端进行回退;其中,上述冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息为对应该组中每个 MTC 终端 ID 的冲突标志位 CI,上述冲突标志位 CI 用于指示对应的 MTC 终端是否允许接入。
- [0163] 上述消息 4 接收模块接收的 MTC 终端所属组的冲突解决消息 4 中包含该组中每个 MTC 终端的 ID 和对应的冲突标志位 CI,上述冲突标志位 CI 用于指示对应的 MTC 终端是否允许接入。
- [0164] 上述消息 4 接收模块接收到的冲突解决消息 4 中与上述 MTC 终端的 ID 对应的冲突标志位 CI 的值为 1 时,确定上述 MTC 终端接入基站,否则,接入失败,MTC 终端进行回退。
- [0165] 在本实施例的一种优选实施例中,如图 9 所示消息 2 接收模块 802 包括:
- [0166] 第一判断子模块 8021,用于通过读取随机接入响应消息 2 中的组指示信息,判断

组指示信息中是否包含上述 MTC 终端所在组的组指示信息,若是进入第二判断模块,否则匹配失败;

[0167] 第二判断子模块 8022,用于通过读取随机接入响应消息 2 中的第二信息,判断上述第二信息中包含的上述 MTC 终端的 ID 对应的 RI 值是否为第一预设值,若是,则确定上述 MTC 终端从随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应,接收成功,否则匹配失败。

[0168] 在本实施例的另一种优选实施例中,如图 10 所示消息 4 接收模块 804 包括:

[0169] 解扰子模块 8041,用于使用 MTC 终端对应的组 ID 对所属组的冲突解决消息 4 进行解扰,若解扰成功,则进入 CI 判断子模块。

[0170] 基站发送给 MTC 终端的冲突解决消息 4 通过上述 MTC 终端所属组的组 ID 进行加扰;相应的 MTC 终端用其所属的组 ID 对冲突解决消息 4,如果解扰成功,说明上述冲突解决消息 4 为 MTC 终端所属组的冲突解决消息。

[0171] CI 判断子模块 8042,用于判断冲突解决消息 4 中上述 MTC 终端的 ID 对应的冲突标志位 CI 的值是否为 1,若是,确定上述 MTC 终端接入基站,否则,接入失败, MTC 终端进行回退。

[0172] 在本实施例的一种优选实施例中,一种机器类通信终端还可以包括:

[0173] 第一回退模块,用于随机接入响应消息 2 接收结束后进行回退,上述回退包括根据 BI 指示的回退时间参数进行回退;

[0174] 第二回退模块,用于随机接入响应消息 2 接收失败后进行回退,上述回退包括依据配置的时间进行回退;

[0175] 第三回退模块,用于冲突解决消息 4 接收结束后进行回退,上述回退包括根据 BI 和 MTC 终端的 ID 进行异或生成一个随机数进行回退;

[0176] 对于终端实施例而言,由于其与方法实施例基本相似,所以描述的比较简单,相关之处参见方法实施例的部分说明即可。

[0177] 实施例五:

[0178] 参照图 11,示出了本实施例一种机器类通信基站的结构框图,本实施例具体包括:

[0179] 消息 1 接收模块 1101,用于接收终端发送的随机接入消息 1;

[0180] 消息 2 发送模块 1102,用于向终端发送根据随机接入消息 1 生成的随机接入响应消息 2;本实施例中,基站可以针对两组或多组 MTC 终端的随机接入消息 1 生成一个随机接入响应消息 2,因此消息 2 接收模块接收到的随机接入响应消息 2 中包含至少两组 MTC 终端的随机接入响应,且每组的随机接入响应中包含该组至少一个 MTC 终端的随机接入响应。

[0181] 消息 3 接收模块 1103,用于当 MTC 终端从上述随机接入响应消息 2 中匹配到与上述 MTC 终端对应的随机接入响应时,接收终端发送的随机接入消息 3,随机接入消息 3 以上述 MTC 终端所属的组 ID 进行标识;

[0182] 消息 4 发送模块 1104,用于向终端发送与随机接入消息 3 中上述 MTC 终端所属组 ID 对应的冲突解决消息 4,并根据冲突解决消息 4 中包含的用于指示该组中允许接入的 MTC 终端的信息确定是否允许接入基站。

[0183] 对于基站实施例而言,由于其与终端实施例基本相似,所以描述的比较简单,相关

之处参见终端实施例的部分说明即可。

[0184] 需要说明的是,本发明中诸如第一和第二等之类的关系属于仅仅用来将一根实体或者操作与另一个实体或操作区分开来,并不暗示这些实体或操作之间存在任何这种实际的关系或者顺序。

[0185] 本说明书中的各个实施例均采用递进的方式描述,每个实施例重点说明的都是与其他实施例的不同之处,各个实施例之间相同相似的部分互相参见即可。

[0186] 本领域技术人员易于想到的是:上述各个实施例的任意组合应用都是可行的,故上述各个实施例之间的任意组合都是本发明的实施方案,但是由于篇幅限制,本说明书在此就不一一详述了。

[0187] 以上对本发明所提供的一种机器类通信终端的接入方法及基站、终端进行了详细介绍,本文中应用了具体个例对本发明的原理及实施方式进行了阐述,以上实施例的说明只是用于帮助理解本发明的方法及其核心思想;同时,对于本领域的一般技术人员,依据本发明的思想,在具体实施方式及应用范围上均会有改变之处,综上所述,本说明书内容不应理解为对本发明的限制。

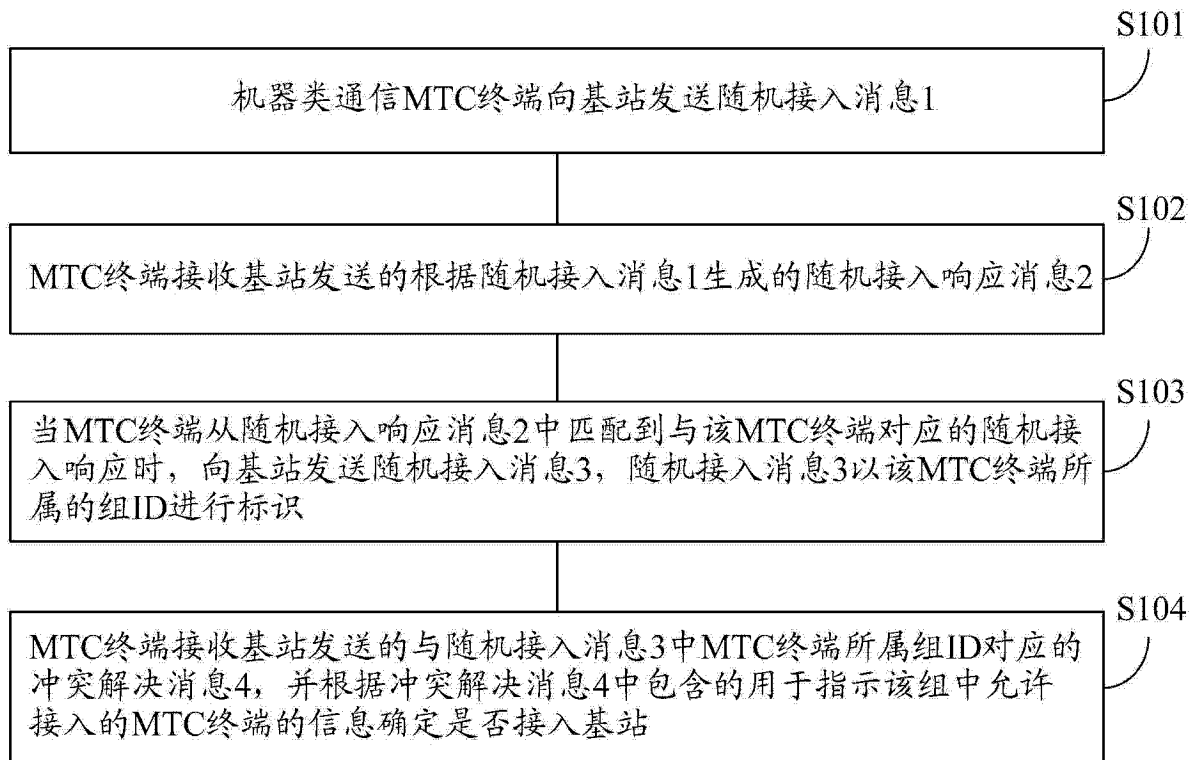


图 1

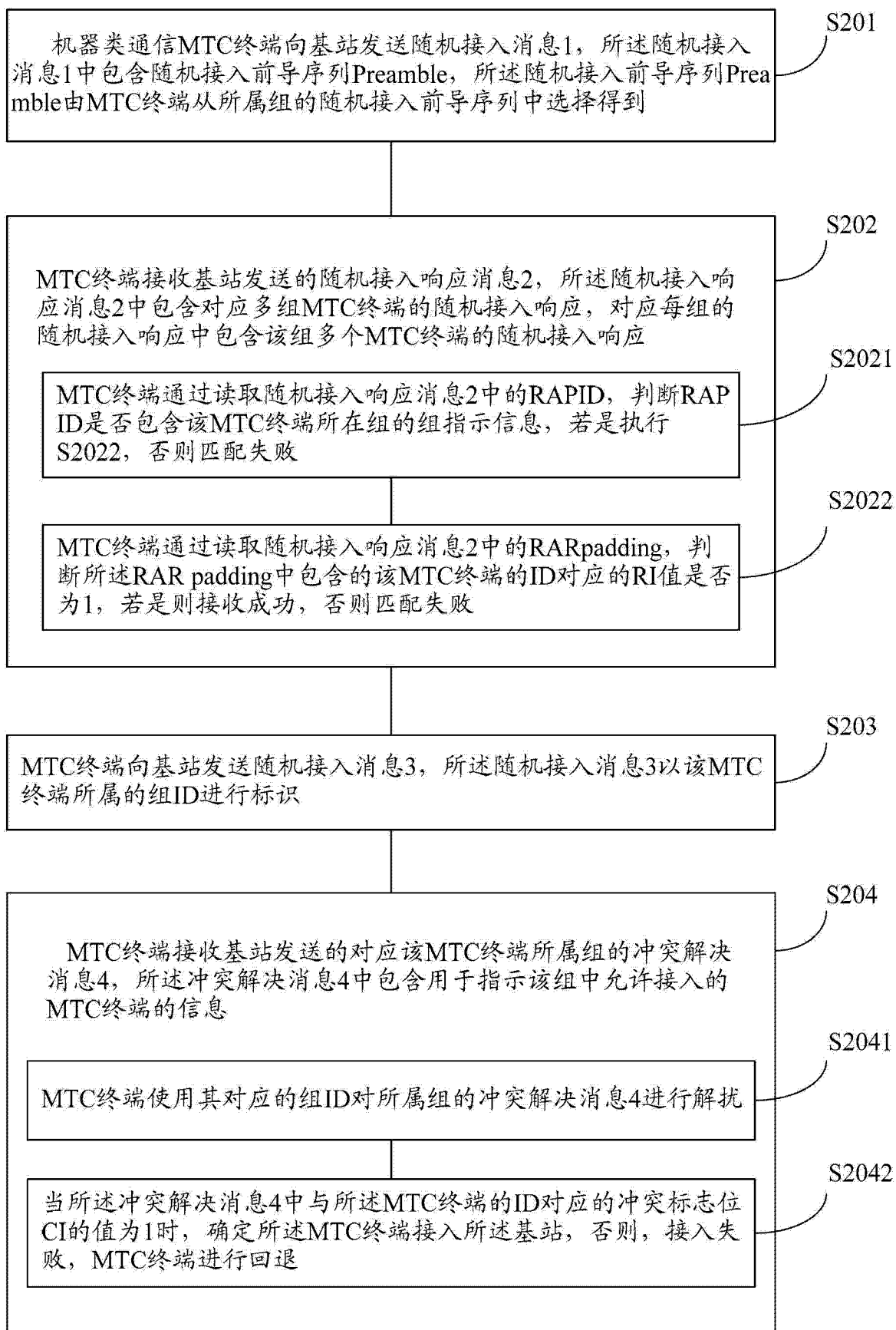


图 2

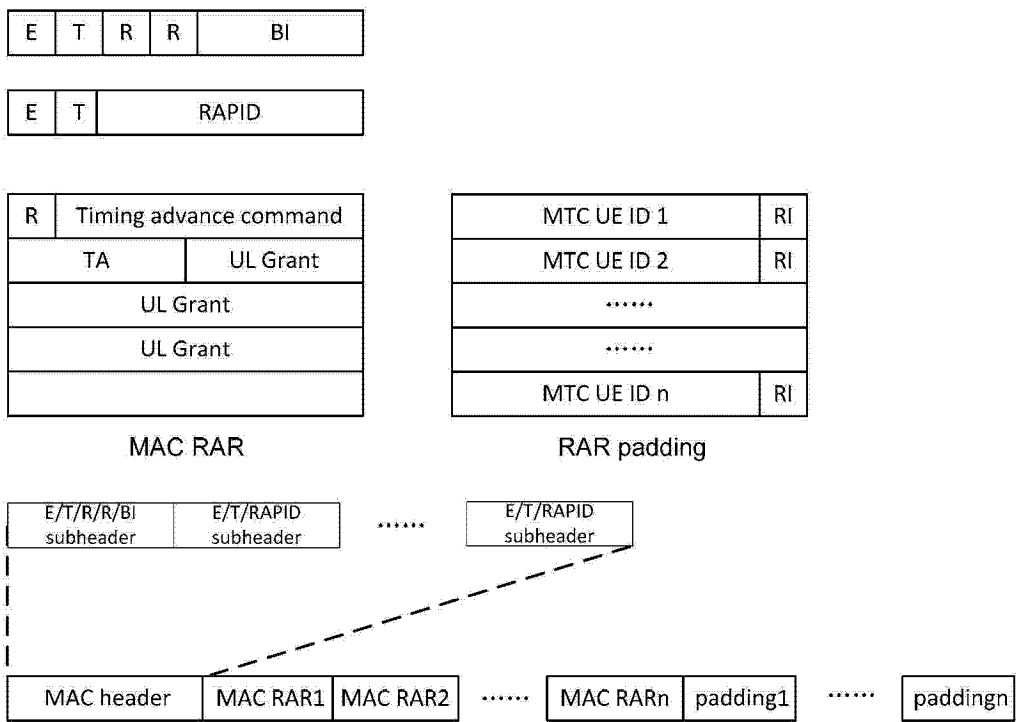


图 3

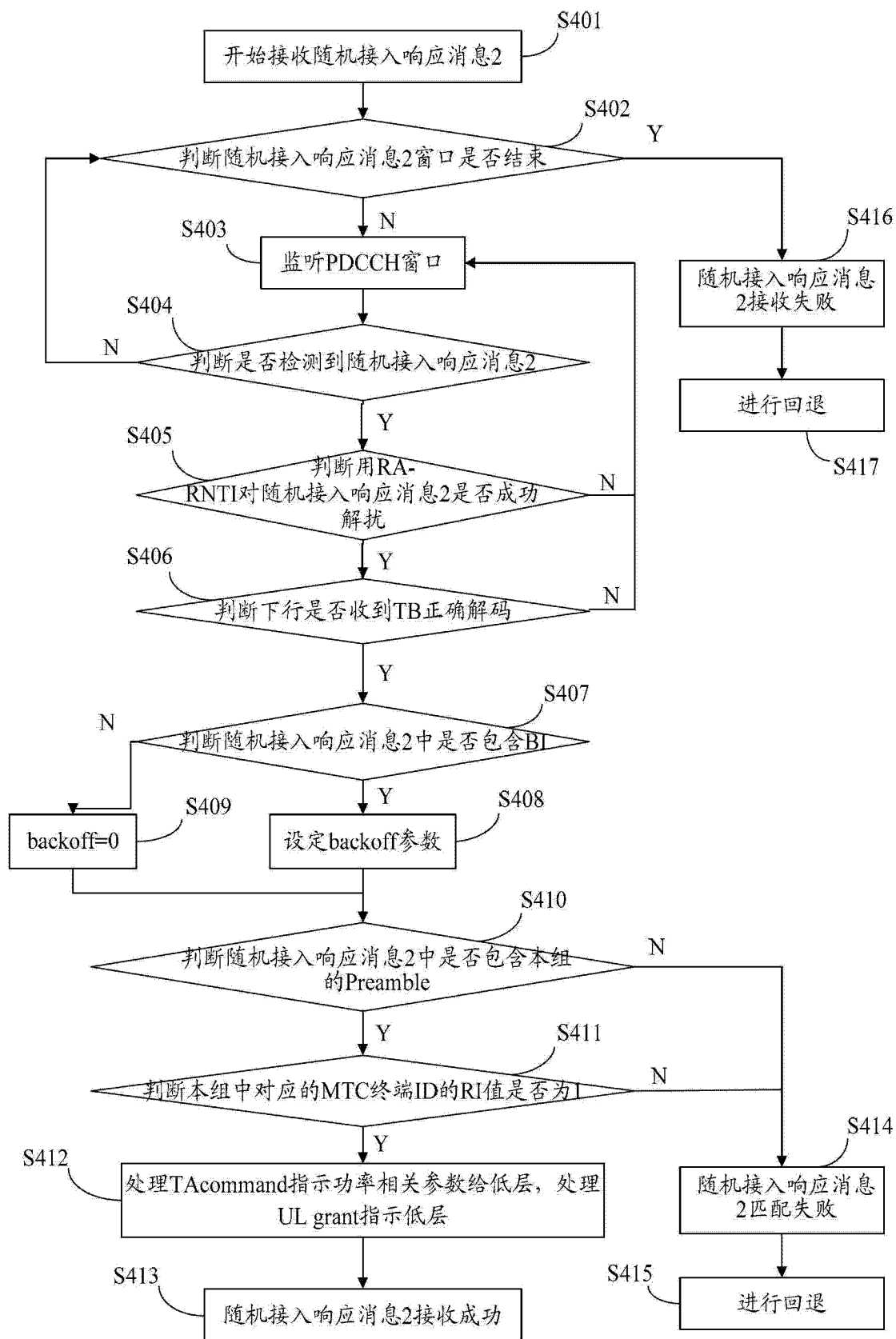


图 4

8 bits	1bit	
MTC UE ID 1	CI	OCT 1
MTC UE ID 2	CI	OCT 2
.....		
MTC UE ID n	CI	OCT n

图 5

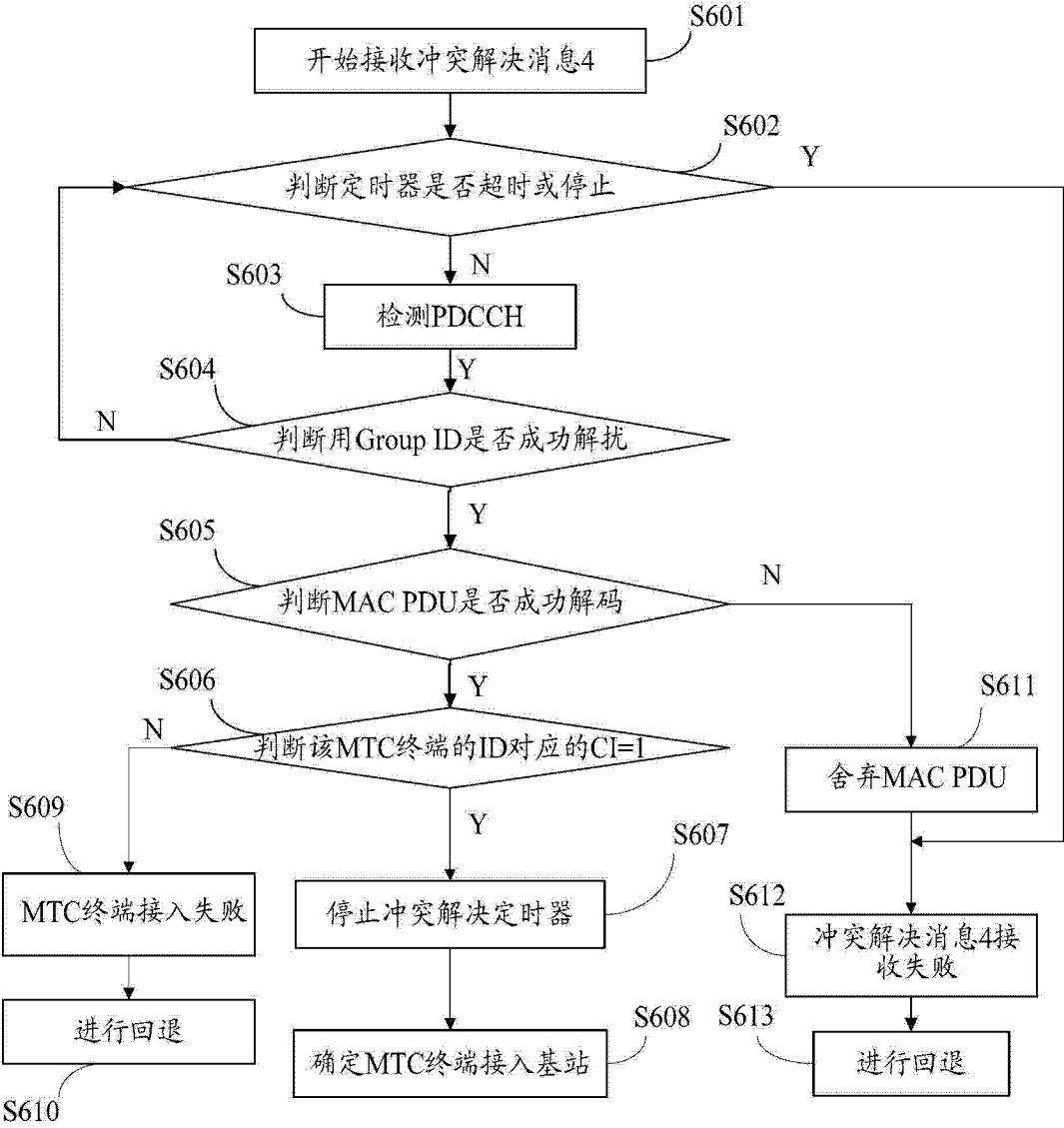


图 6

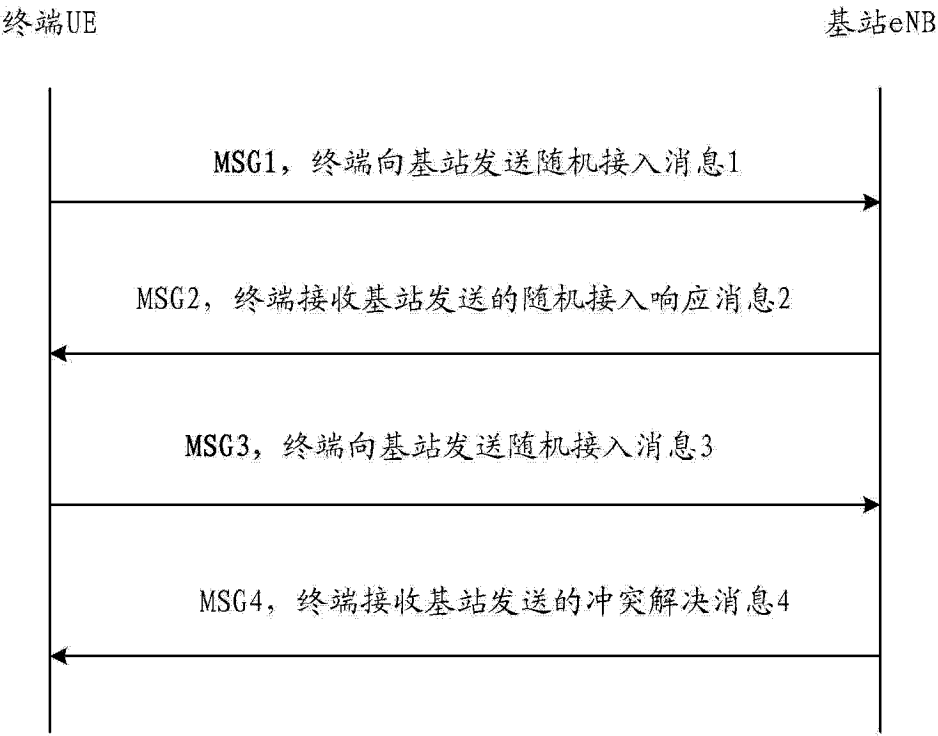


图 7

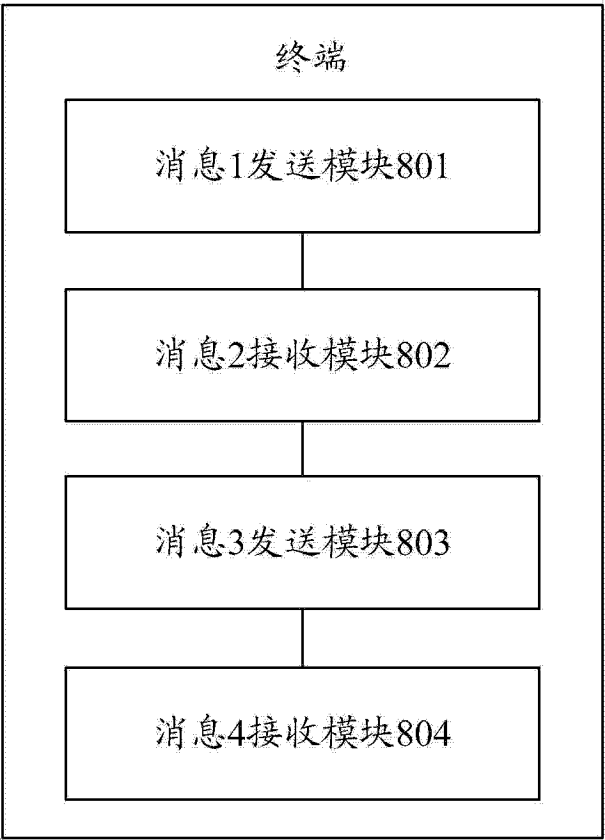


图 8



图 9



图 10

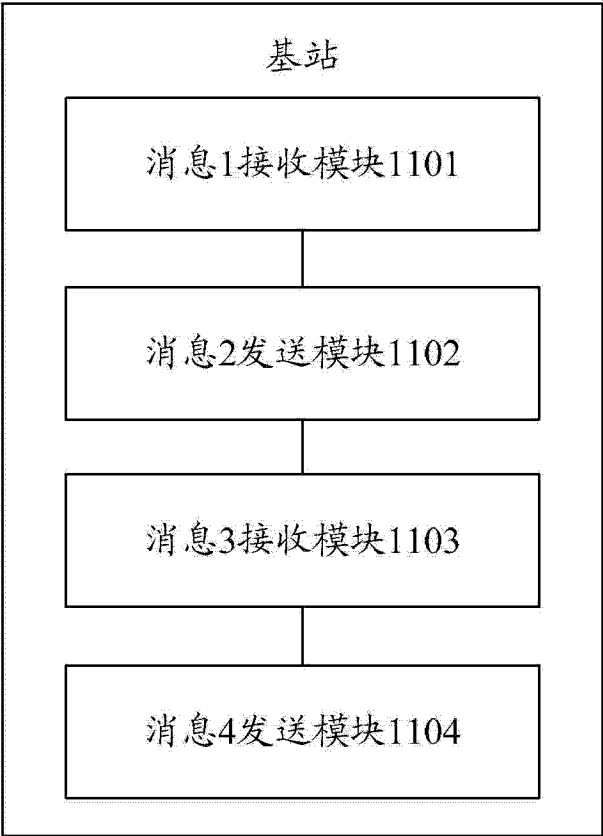


图 11