(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. AU 200071868 B2
(10) Patent No. 751417

(54) Title
Improved mobile to mobile calls

(51)[6] International Patent Classification(s)
H04Q 007/38

(21) Application No: 200071868

(22) Application Date: 2000 .11 .28

(30) Priority Data

(31) Number	(32) Date	(33) Country
99309989	1999 .12 .10	EP

(43) Publication Date : 2001 .06 .14
(43) Publication Journal Date : 2001 .06 .14
(44) Accepted Journal Date : 2002 .08 .15

(71) Applicant(s)
Lucent Technologies Inc.

(72) Inventor(s)
Mauro Costa; Andrew William Jarvis; Michael Roberts; Sutha Sivagnanasundaram

(74) Agent/Attorney
SPRUSON and FERGUSON,GPO Box 3898,SYDNEY NSW 2001

(56) Related Art
GB 2316272
US 5761195

IMPROVED MOBILE TO MOBILE CALLS

Abstract

In a call between mobiles (18, 19) located in the same UTRAN (24), and in which at least one mobile has an IMSI, a method of providing local switching in which the RNC (22) sends on an uplink from the first mobile (18) to the CN (10) information related to the first mobile, such as its IMSI, and stores at least a part of that information; when the RNC (22) receives the same information on a downlink from the CN (10) to the second mobile (19), it recognises that the mobiles are within the same UTRAN (14) and performs local switching. Delay is reduced and the call can be charged at local rates. Instead of the IMSI, data frames from the first mobile (18) can be stored by the RNC (22) for comparison.

S&F Ref: 529900

AUSTRALIA

PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name and Address of Applicant :	Lucent Technologies Inc. 600 Mountain Avenue Murray Hill New Jersey 07974-0636 United States of America
Actual Inventor(s):	Mauro Costa Andre William Jarvis Michael Roberts Sutha Sivagnanasundaram
Address for Service:	Spruson & Ferguson St Martins Tower 31 Market Street Sydney NSW 2000
Invention Title:	Improved Mobile to Mobile Calls

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

IP Australia
Documents received on:
28 NOV 2000
Sydney
Batch No:

IMPROVED MOBILE TO MOBILE CALLS

This invention relates to improvements in arrangements for mobile to mobile calls in a mobile radio telecommunications system such as Universal Mobile Telephone System (UMTS) or Global System for Mobile communications (GSM).

With the rapid increase in the use of mobile systems, it is now often the case that mobile to mobile calls originate within the same locality, such as within the same UTRAN (UMTS Terrestrial Radio Access Network), or even within the same building. This can be the case even when one or both of the mobiles has an International Mobile Subscriber Identifier (IMSI). In UMTS, the transcoder/Inter- Working Function is placed in the core network, in which case routing in current arrangements will always involve the home network. This involves connection of signalling and data over considerable distances, which can introduce difficulties and delays; this is especially so when transmission links include satellite hops, or when the transmission network passes through an Internet Protocol network where it will be difficult to guarantee the delay.

An obvious solution is to allow for local switching in the UTRAN under the control of the core network, which would allow the transmission and transcoding resources to be made available for other applications. However, in some circumstances local switching may not be appropriate, for example when a conference call is involved, so an arrangement must be provided which allows for local switching, but only when the circumstances of the connection are appropriate. It is desired to provide such an arrangement.

There has been proposed a method of providing switching between first and second mobile user terminals within the same radio access network of a mobile radio telecommunications system, the radio access network comprising a radio network controller controlling base stations serving both of the mobile user terminals, the method comprising supplying to the radio network controller information related to the connection between the first and second mobile user terminals, whereby the radio network controller identifies that the first and second mobiles, are within the radio access network.

In accordance with one aspect of the present invention, there is provided a method of providing switching between first and second mobile users within the same radio access network of a mobile radio telecommunications system, the radio access network comprising a radio network controller controlling base stations serving both of the mobile user terminals, the method comprising supplying to the radio network controller information related to the connection between the first and second mobile user

AUSTRALIAN PATENT OFFICE

terminals, whereby the radio access network controller identifies that the first and second mobiles are within the radio access network, wherein the radio network controller dependent upon the identification undertakes the local switching.

Significantly in the present invention, the radio network controller dependent on the identification, undertakes the local switching.

In accordance with another aspect of the present invention, there is provided a radio network controller of a radio access network of a mobile radio telecommunications system characterised by means to receive information related to a connection between first and second mobile user terminals in the system; to identify whether the first and second mobile user terminals are within the same radio access network; and, if so, to initiate local switching.

In accordance with another aspect of the present invention, there is provided a mobile switching centre in a Core Network of a mobile radio telecommunications system characterised by being operative to send to the radio network controllers associated with each mobile user terminal in a connection between two mobile user terminals the International Mobile Switching Identifier of the other mobile user terminal; and to inform the core network when local switching by at least one radio access network component is possible.

The invention will now be described by way of example only with reference to the accompanying drawings in which :-

Figure 1 illustrates schematically a part of a packet switched mobile radio telecommunications network (the UMTS);

Figure 2 illustrates how the UTRAN detects that, in a mobile to mobile call, both mobiles are within the UTRAN;

Figure 3 illustrates how the UTRAN switches the user plane paths; and

Figure 4 illustrates switching with two RNCs

In Figure 1, a Core Network (CN) 10 has an interface 12, the Iu interface, to the UMTS Terrestrial Radio Access Network (UTRAN) 14, and the UTRAN 14 has an interface 16, the Uu interface, to a number of Mobile Systems (MSs) 18, 20.

Within the UTRAN 14 are a number of Radio Network Controllers (RNC) 22, 24, two only being illustrated, each RNC. RNC 22 controls the MSs 18 and RNC 24 controls the MSs 20.

In the Figure, the network is the UMTS network; in a GSM network the equivalent building block to an RNC is termed a Base Station Controller (BSC); a Node B

AUSTRALIAN PATENT OFFICE

is termed a Base Transceiver Station (BTS); and the Uu interface is termed the radio interface.

The RNCs 22, 24 build frames containing data, send the frames to a Node B 26, 28 and control a mobile system as it moves over the ground. A Node B receives frames from an RNC, and modulates the data for passage to the radio interface Uu 16 and thence to a mobile.

The UMTS is arranged to have a control plane and a user plane; the control plane is arranged to control signalling between Node Bs and RNCs, to control the allocation of requests for resources, and to control handover requests. The user plane is responsible for handling the actual data.

Suppose now that both of the mobiles 18, 19 have an International Mobile Subscriber Identifier (IMSI) which will be referred to as UE 1 and UE 2 respectively, and that mobile 18 initiates a call to mobile 19. In the arrangement shown in Fig. 2, the RNC 22 provides on the uplink to the CN 10 when setting up the call from the mobile 18 its own identifier RNC ID, and the mobile identifier IMSI UE 1, as indicated as reference 30. The RNC 22 also stores this information. The CN 10 sends this information on the downlink, reference 32, and it is received by the same RNC 22. Similarly, data related to mobile 19, i.e. the identity of RNC 10, RNC ID, and the identifier of the mobile 19, IMSI UE 2, are also sent by the RNC 22 to the CN 10, reference 34, and are received from the CN, reference 36.

The RNC 22 can now compare the information about the call which it receives from the CN 10 on the downlink with the information about that call which is stored as a record of what it sent on the uplink. For both mobiles 18, 19, the stored and downlink information is identical. The RNC 22 now knows that both mobiles 18, 19 are within its UTRAN 14. The RNC 22 has then the information to perform local switching. This is operated via short-circuiting, at the RNC 22, the communication path between RNC 22 and the mobile users UE1 and UE2, as indicated by the broken line connections 40, 42 in Figure 3. The connections 40, 42 pass through the RNC 22, but the CN 10 and network resources beyond the CN 10 are no longer involved; the user plane connection has been removed from the core network.

More generally, the short circuit of the communication paths is done locally at the RNC 22 when the user mobiles 18 and 19 are both served by the same RNC 22. Otherwise, when for example the user mobile 18 is served by the RNC 22 and mobile 19 is

AUSTRALIAN PATENT OFFICE

served by RNC 24, the shortcircuiting is carried out within the radio access network 14. If the radio access network provides local physical connectivity between RNC 22 and RNC24, this local physical connectivity can be used to perform user plane traffic switching between RNC22 and RNC 24, as indicated by the broken line connections 30 in Figure 4.

Otherwise, physical connectivity provided by CN 10 can be used.

Preferably a transparent field or embedded channel is set up which is transported in band, from the RNC 22 to any other RNCs involved in the connection. This transparent field is transported within in band user plane frames. The CN 10 is required to forward on the information.

With the direct connection according to the invention, delays are reduced and quality of service is improved. An advantage for the user is that the call can now be charged at a local rate even when one or both callers have an international home radio network controller.

Instead of sending the user equipment IMSI and its own ID, the RNC 22 can in a variation send out other information associated with the connection and bearer, for example the Mobile Network Coder or the Radio Access Bearer identity.

In another variation, instead of sending out identity information, the RNC 22 can store a small number of the data frames which it sends out, and compare them with received frames; a perfect match indicates a local call within the UTRAN 14.

The invention has been described with reference to the RNC 22 making the decision to perform local switching; in some circumstances, it may be appropriate to ask the CN 10 for permission to do so before setting up the local link.

The invention has been described with reference to only one radio network controller within the UTRAN 14; it is also possible to involve two or more RNCs in setting up local switching, provided they are within the same UTRAN.

Whatever the arrangements, in each case the UTRAN 14 or an element within it such as RNC 22 receives back the same information that it sent out, and therefore knows that local switching is permissible. In the case of a conference call arrangement or the like, the same information will not be received as was sent out, so local switching

is contra-indicated.

In a major variation, not illustrated, a Mobile Switching Centre (MSC) in the CN 10 is arranged to send to each of the originating and terminating legs of the connection the IMSI of the other leg; the RNC 22 can then perform local switching as described above. However, it is not always possible for the core network to identify a link between the outgoing and incoming legs, in which case the IMSI information cannot be supplied. Further, in such an arrangement, it is essential to inform the CN before local switching is performed, because the CN may have inserted some inbound processing, such as voice announcements or bridges; the UTIM will be unaware of this, but local switching will then not be permissible, therefore the CN 10 must be involved in the decision.

The claims defining the invention are as follows:

1. A method of providing switching between first and second mobile user terminals within the same radio access network of a mobile radio telecommunications system, the radio access network comprising a radio network controller controlling base stations serving both of the mobile user terminals, the method comprising supplying to the radio network controller information related to the connection between the first and second mobile user terminals, whereby the radio network controller identifies that the first and second mobiles are within the radio access network, wherein the radio network controller dependent upon the identification undertakes the local switching.

2. A method according to claim 1 in which the mobile radio telecommunications system is a Universal Mobile Telecommunications System (UMTS) mobile radio telecommunications system.

3. A method according to claim 1 or 2 in which the radio network controller transmits on an uplink from the first mobile user terminal to the core network information related to said first mobile user terminal and stores at least a part of that information; the radio network controller receives information on a downlink to the second mobile user terminal from the core network and compares it with the stored information; and on finding a match, the radio network controller initiates local switching.

4. A method according to claim 3 in which said information relates to the identity of the radio network controller and the identity of the first mobile user terminal.

5. A method according to claim 3 in which the information relates to the Radio Access Bearer or the Mobile Network Coder.

6. A method according to claim 3 in which the radio network controller transmits data frames from the first mobile and stores some of said frames.

7. A method according to claim 1 in which a core network of the system is arranged to supply to the radio access network the identity of an originating connection

AUSTRALIAN PATENT OFFICE

leg for transmission to a terminating connection leg, and the identity of the terminating connection leg for transmission to the originating connection leg.

8. A method according to any one of the preceding claims in which one mobile user terminal is associated with a first radio network controller and the second mobile user terminal is associated with a second radio network controller, both controllers being within the same radio access network, and in which local physical connectivity between the two controllers is used to perform user plane traffic switching.

9. A method according to any of the preceding claims in which the information related to the end-to-end connection between the first and second mobile user terminals is transported within in-band user plane frames.

10. A method according to claim 9 in which before performing local switching, the radio network controller requests from the core network permission to perform said switching.

11. A radio network controller of a radio access network of a mobile radio telecommunications system, said radio network controller comprising:

means to receive information related to a connection between first and second mobile user terminals in the system,

and means to identify whether the first and second mobile user terminals are within the same radio access network, and if so, to initiate local switching.

12. A radio network controller according to claim 11 operative to transmit on an uplink from the first mobile user terminal to a core network of the telecommunications system information related to said first mobile system and to store at least a part of that information; to receive information on a downlink to the second mobile system from the core network; to compare the received information with the stored information; and on finding a match, to undertake local switching between the first and second mobile systems.

13. A radio network controller according to claim 12 operative such that when the first and second mobile user terminals are served by the controller, the controller provides a short circuit for the switching path.

AUSTRALIAN PATENT OFFICE

14. A radio network controller according to claim 12 operative such when the first mobile system is served by the controller and the second mobile user terminal is served by a second radio network controller, the controller is arranged to co-operate with the second controller to provide a short circuit for the switching path.

15. A radio network controller according to claim 14 arranged so that information related to the connection between the first and second mobile user terminals is transported within in-band user plane frames.

16. A mobile switching centre in a Core Network of a mobile radio telecommunications system, said mobile switching centre being operative to send to the radio network controllers associated with each mobile user terminal in a connection between two mobile user terminals the International Mobile Switching Identifier of the other mobile user terminal, and to inform the core network when local switching by at least one radio access network controller is possible.

17. A method of providing switching between first and second mobile users, said method being substantially as described herein in relation to any one embodiment with reference to Figs. 1-4.

18. A radio network controller substantially as described herein in relation to any one embodiment with reference to Figs. 1-4.

19. A mobile switching centre substantially as described herein in relation to any one embodiment with reference to Figs. 1-4.

DATED this fourteenth Day of May, 2002

Lucent Technologies Inc.

Patent Attorneys for the Applicant

SPRUSON & FERGUSON



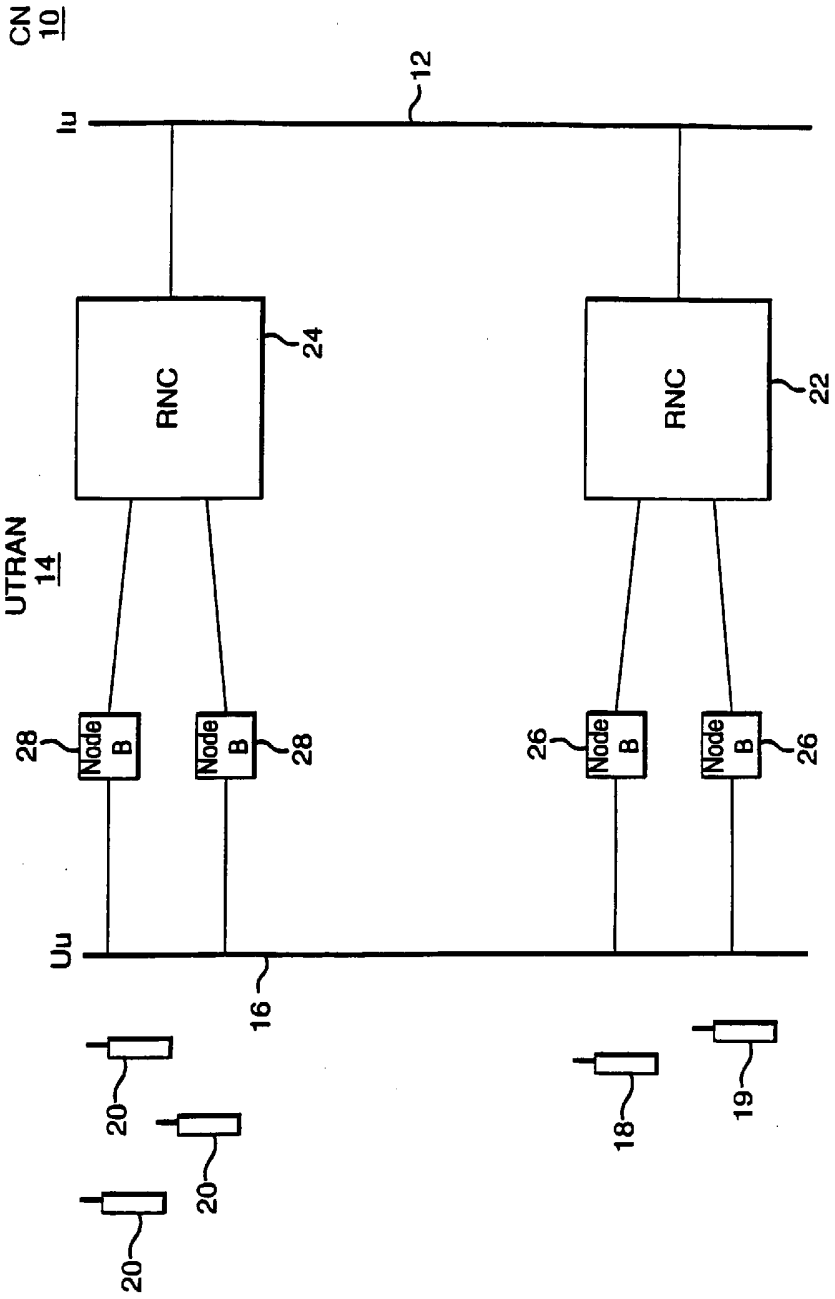

CN
10
12
Iu
RNC
24
RNC
22
UTRAN
14
28
Node B
28
Node B
26
Node B
26
Node B
Uu
16
20
20
20
18
19

FIG. 1

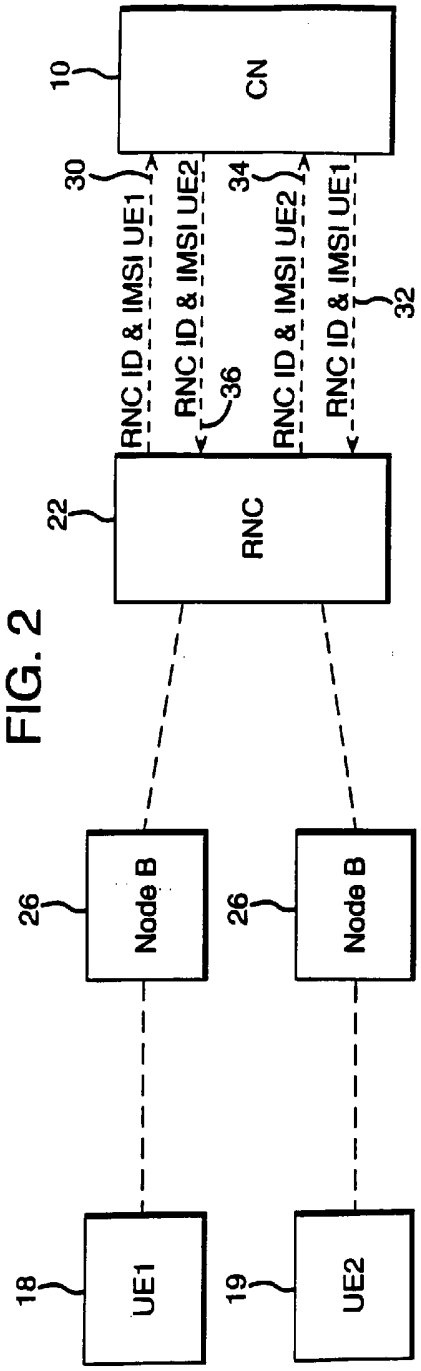

10
CN
30
RNC ID & IMSI UE1
34
RNC ID & IMSI UE2
RNC ID & IMSI UE2
RNC ID & IMSI UE1
32
36
RNC ID & IMSI UE2
22
RNC
26
Node B
26
Node B
18
UE1
19
UE2

FIG. 2

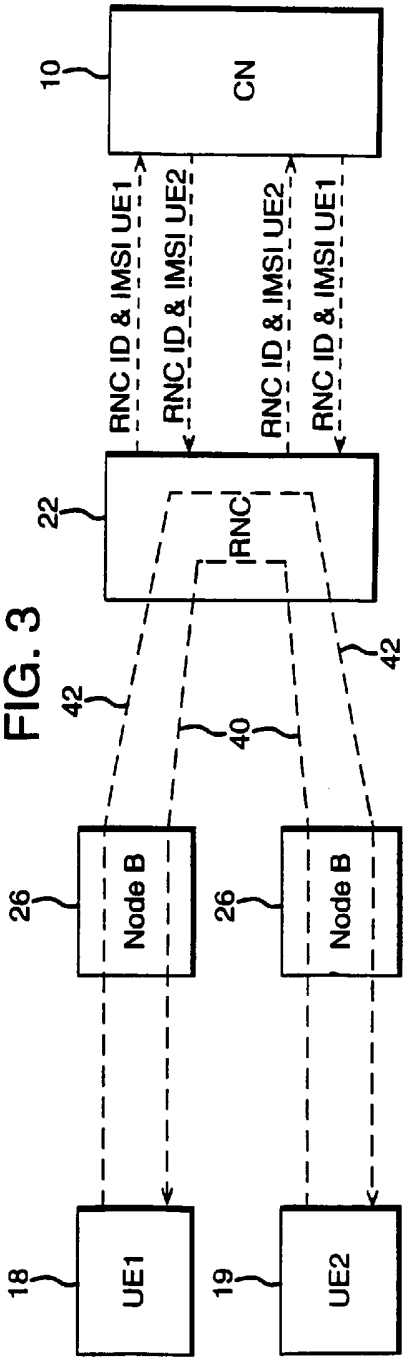

10
CN
RNC ID & IMSI UE1
RNC ID & IMSI UE2
RNC ID & IMSI UE2
RNC ID & IMSI UE1
22
RNC
42
40
42
26
Node B
26
Node B
18
UE1
19
UE2

FIG. 3

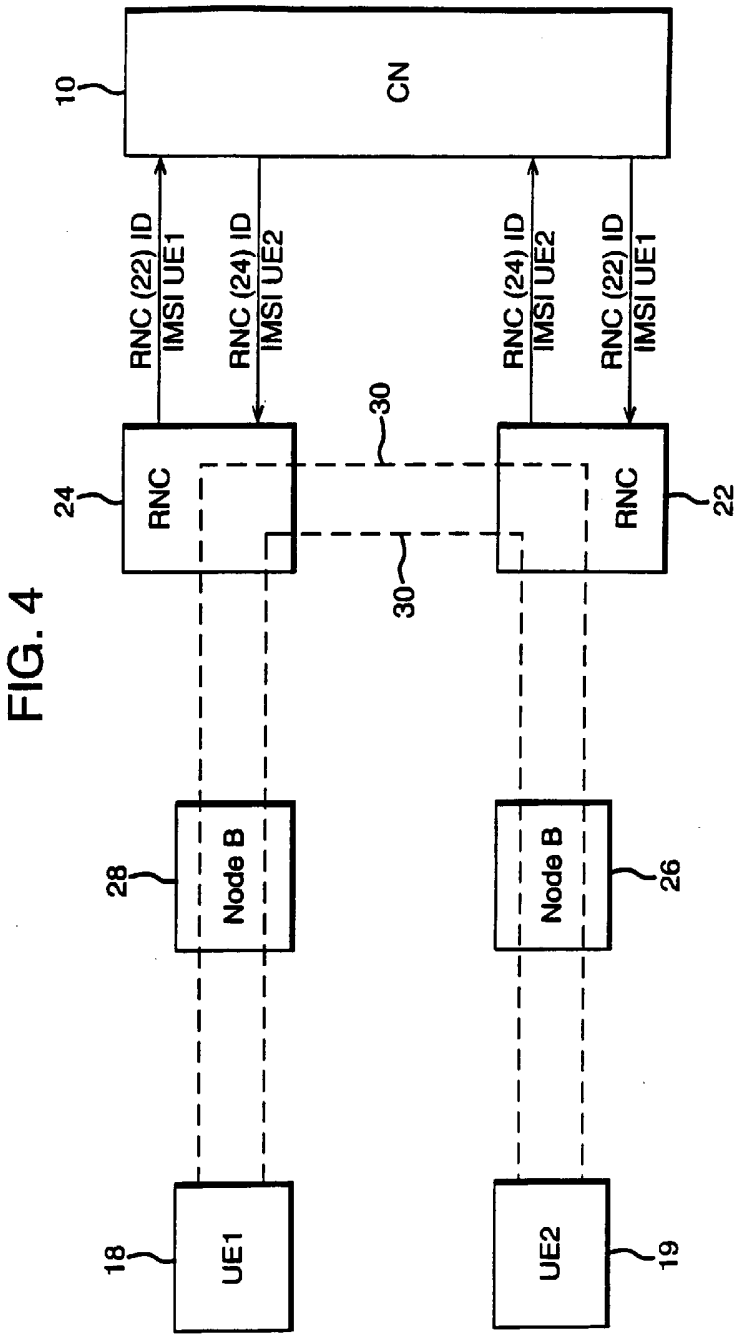

10
CN
RNC (22) ID
IMSI UE1
RNC (24) ID
IMSI UE2
RNC (24) ID
IMSI UE2
RNC (22) ID
IMSI UE1
30
24
RNC
RNC
22
30
28
Node B
Node B
26
18
UE1
UE2
19

FIG. 4