(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 December 2010 (23.12.2010)

PCT

(10) International Publication Number
WO 2010/146095 A1

(51) International Patent Classification:
H04W 36/36 (2009.01)

(21) International Application Number:
PCT/EP2010/058491

(22) International Filing Date:
16 June 2010 (16.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09 54130 18 June 2009 (18.06.2009) FR

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: QUALITY CONTROL FOR INTER-CELL HANDOVER

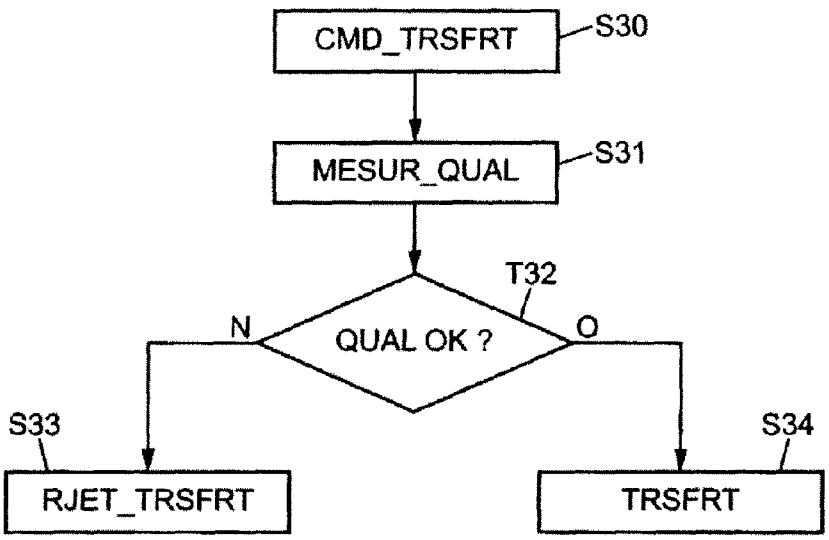

FIG. 3

(57) Abstract: A method and apparatus for deciding whether the handover has to be done or not, where the decision is taken by the mobile unit. The mobile unit can reject the command from the base station if the quality of the communication might not be maintained in the second network. This decision is taken measuring some quality parameters of the second network and comparing them with a predefined threshold.

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QUALITY CONTROL FOR INTER-CELL HANDOVER

Technical Domain

The present invention generally relates to the domain of integrated circuits used in the domain of wireless communications.

More particularly, it concerns the functionality of transferring a communication (handover) between two cells of a wireless communications network.

The invention has applications particularly in the integrated circuits equipping wireless mobile telephones.

Technological Background

In cellular communications, the communication network is divided into cells. For example, in the GSM network each cell is covered by a Base Transceiver Station (BTS) which is controlled by a Base Station Controller (BSC).

A mobile communication device at a given location may be within the coverage of multiple cells. In such cases, it is possible to select the best base station to use. The change from the current cell to another cell is called an inter-cell handover or handoff. This handover is controlled by network management units.

There can be several reasons for such a handover, including:

- when the transmission quality between the mobile communication device and the current base station weakens, which is the case for example when the device is moving from the current cell to another,

- when the mobile communication device is subject to interference from other devices located in the current cell, and

- when the communication traffic is too high for the current base station.

Prior Art

In order to detect the possibility of performing an inter-cell handover, a certain number of measurements must be made.

Some of these measurements are made by the mobile communication device, which sends them on to the network management units. The relevance of these measurements then depends on the radio reception conditions, the mobility of the device, and the delay between the moment of the measurement and the triggering of the handover.

In order to guarantee good quality of service on the network, the measurements for a handover should be done as often as possible in order to be able to trigger the handover at the right moment.

For example, in the GSM 3GPP standard, the measurements consist of identifying the base station to which the communication will be transferred by reading the Base Station Identity Code (BSIC) message, then reading the Received Signal Strength Information (RSSI) message indicating the intensity of the signal between the mobile communication device and the base station. Thus the BSIC is only used to identify the base station.

The measurement is done at a high frequency (multiple measurements at 480 ms intervals). However, this type of measurement is not always sufficient to ensure communication quality within a cell.

Section 7.2 of the 3GPP 45.008 standard specifies that the mobile communication device must retrieve information from BSIC messages as often as possible, and at least every 10 seconds.

If holding to the minimum required by the standard, 10 seconds could pass between a measurement made for the purposes of a handover and the handover itself. This lapse of time, particularly under poor radio reception conditions, could result in an incorrect handover decision, for example changing from the current cell to a cell in which the communication is of a lower quality. This could even result in the loss of the current communication.

In the prior art, the required handovers are therefore always performed, ignoring the communication quality in the cell to which the communication will be transferred.

If it is impossible to obtain the RSSI and BSIC from the cell to which the communication is to be transferred, mechanisms exist for detecting a handover failure.

However, this procedure can take too long to reestablish the link to the initial cell and avoid losing the current communication.

In one particular case, the 3GPP standard allows for inter-cell handover to a cell with which the mobile communication device is not synchronized. This type of handover is sometimes called a blind handover.

In such a procedure, the communication device which receives a handover request will attempt to synchronize with the cell to which the communication is to be transferred. If the synchronization fails, the device notifies the network of a handover failure, otherwise it transfers the communication.

In this procedure, however, the decision to hand over the communication remains the responsibility of the network and the mobile communication device can only give notification of a handover failure if synchronization is impossible.

Summary of the Invention

There is a need for a technique to allow an inter-cell handover that is effective in the large majority of cases, meaning a handover which does not lose the current communication, and to avoid a handover from a current cell to a new cell in which the communication quality will be lower, meaning a handover which takes into account the continuity of the quality of service.

For this purpose, a circuit is proposed for a communication terminal adapted to communicate via a telecommunication network divided into cells. This circuit is configured to:

- receive a command to hand over a communication in progress from a first cell to a second cell,
- obtain a measurement of the communication quality in the second cell,
- compare the measurement obtained with a reference threshold value, and
- perform the handover if the measurement obtained is greater than or equal to the threshold value or reject the handover request if the obtained measurement is less than the threshold value,

and wherein the quality measurement is obtained by decoding information issuing from the second cell.

In this manner, when the network orders an inter-cell handover, the terminal can contribute to the transfer decision by measuring the quality.

Unlike the prior art where the terminal cannot refuse an inter-cell handover once it is synchronized with the cell, the invention allows maintaining a communication quality in spite of changing cells.

The quality measurement is obtained by decoding information issuing from the second cell.

In this manner the quality measurement does not require the implementation of additional means within the network.

In some embodiments, the quality measurement is obtained by reading the information characterizing the second cell available on the network.

Therefore the advantages offered by the invention are obtained without adding further complexity to the network.

Also proposed is a mobile telecommunications terminal comprising a circuit as presented above, a control method for such a circuit, and a computer program comprising instructions for implementing said method when it is loaded into a processor and executed.

These objects present at least the same advantages as those associated with the circuit of the invention.

Brief Description of the Drawings

Other features and advantages of the invention will become apparent from the following description. This description is purely illustrative and is to be read in light of the attached drawings, in which:

- Figure 1 illustrates a general context for implementing embodiments of the invention;
- Figure 2 illustrates a mobile terminal according to embodiments of the invention;
- Figure 3 is a general flow chart of an implementation of the method according to embodiments of the invention.

Detailed Description of Embodiments

Figure 1 illustrates a general context for implementing embodiments of the invention.

In this figure, three base stations BTS_A, BTS_B, and BTS_C are arranged such that their radio coverage areas A, B, and C, or cells, overlap. A region covered by three cells exists in this example. It is assumed that there is a mobile communication terminal MS (for Mobile Station) within this zone.

For the example, the terminal is considered to be moving from zone A where it initiated a communication involving the base station BTS_A, towards zone B.

The network management entities used for the communication (not represented) will trigger a handover of the communication from cell A to cell B in order to ensure continuity of the communication in spite of the change of cell.

An embodiment of a mobile terminal according to embodiments of the invention is now described with reference to Figure 2.

This terminal TERM comprises a communication unit COM for communicating via the communication network comprising in particular the network management units and the base stations mentioned above.

The terminal also comprises a control unit PROC and a memory MEM for performing the necessary processing, particularly for the communication, and for the inter-cell handover.

In particular, the control unit comprises a circuit configured to perform the operations which are described below with reference to Figure 3.

First, during the step S30, the circuit receives an inter-cell handover command to transfer from cell A to cell B.

This command is issued by the network management units, for example according to the 3GPP standard. This command is received via the communication unit.

Upon receipt of this command, the circuit obtains a measurement of the communication quality in cell B, in the step S31.

This measurement is intended to verify that the communication conditions in cell B are suitable for maintaining the quality of the communication initiated in cell A.

This measurement is described in more detail below.

When the quality measurement has been obtained, in the step T32 the circuit compares the obtained measurement to a threshold value for the quality necessary for allowing an inter-cell handover which maintains the communication quality.

If the quality measurement is sufficient, the handover is performed in the step S34. The details of implementing such a handover can, for example, be found in the 3GPP standard.

However, if the quality measurement is insufficient, in the step S33 the circuit sends a handover rejection to the network management units.

Rejection notifications can be made in compliance with the ones existing in the 3GPP standard.

The processing of such notifications can also be performed according to this standard.

In this manner these units can react, for example, by selecting another cell for the handover. In the example illustrated in Figure 1, the management units can for example choose cell C, which partially covers cell B.

The quality measurement as described above will then be measured once again.

If there is no relevant cell of sufficient quality to hand the terminal over to, the network can force the handover to a given cell in a manner independent of the method described above.

The quality measurement can consist of reading information, concerning the cell to which the handover is to be made, which is directly or indirectly representative of the communication quality in the cell.

For example, this can involve reading information made available on the network for this purpose.

It is also possible to use information already available on the network for another purpose. In such case, this information is processed in order to deduce the

communication quality in the cell. Several examples of such information are given below.

In one embodiment in a 2G network, the quality measurement is obtained by reading the two pieces of information RxLev and BSIC.

In this embodiment, and unlike the prior art, the two pieces of information are processed in order to produce a measurement of the quality within the cell. RxLev gives information on the intensity of the signals exchanged between the terminal and the base station, while this information is independent of the communication conditions in the cell. As for the BSIC, it is encoded and sent over the network, and so the circuit which decodes this message can deduce the communication quality in the cell, for example by determining a decoding failure rate for this message.

In one embodiment in a 3G network, the quality is measured by reading the two pieces of information RSCP (Received Signal Code Power) and CPICH (Common Pilot Channel). This set of information offers at least the same advantages as those provided by the RxLev- BSIC pair.

The threshold value to which the quality measurement is compared can be determined as a function of the quality of service that one wants to maintain for communications. This threshold value can therefore be configured according to the requirements one wants to apply.

In one embodiment, this threshold value corresponds to the communication quality measured in the original cell A.

A computer program for implementing the circuit control method can be realized as shown in the general flow chart in Figure 3. Such a program can be implemented by the control unit PROC of a terminal TERM according to the embodiment described above.

Of course, the invention is not limited to the embodiments described above. It extends to all equivalent variations.

CLAIMS

1. A circuit for a communication terminal adapted to communicate via a telecommunications network where said network is divided into cells, with said circuit being configured to:
- receive (S30) an instruction to hand over to a second cell a communication in progress in a first cell,
- measure (S31) the communication quality in the second cell,
- compare (T32) the obtained measurement to a reference threshold value,
- perform (S34) the handover if the obtained measurement is greater than or equal to the threshold value, or
- reject (S33) the handover request if the obtained measurement is less than the threshold value,
and wherein the quality measurement is obtained by decoding information issuing from the second cell.

2. A circuit according to claim 1, wherein the quality measurement is made by reading information available on the network characterizing the second cell.

3. A method for controlling a circuit according to any one of claims 1 or 2, comprising the steps:
- receive (S30) an instruction to hand over to a second cell a communication in progress in a first cell,
- measure (S31) the communication quality in the second cell,
- compare (T32) the obtained measurement to a reference threshold value,
- perform (S34) the handover if the obtained measurement is greater than or equal to the threshold value, or
- reject (S33) the handover request if the obtained measurement is less than the threshold value,
and wherein the quality measurement is obtained by decoding information issuing from the second cell.

4. A method according to claim 3, further comprising:

- read information available on the network characterizing the second cell in order to deduce the quality measurement.

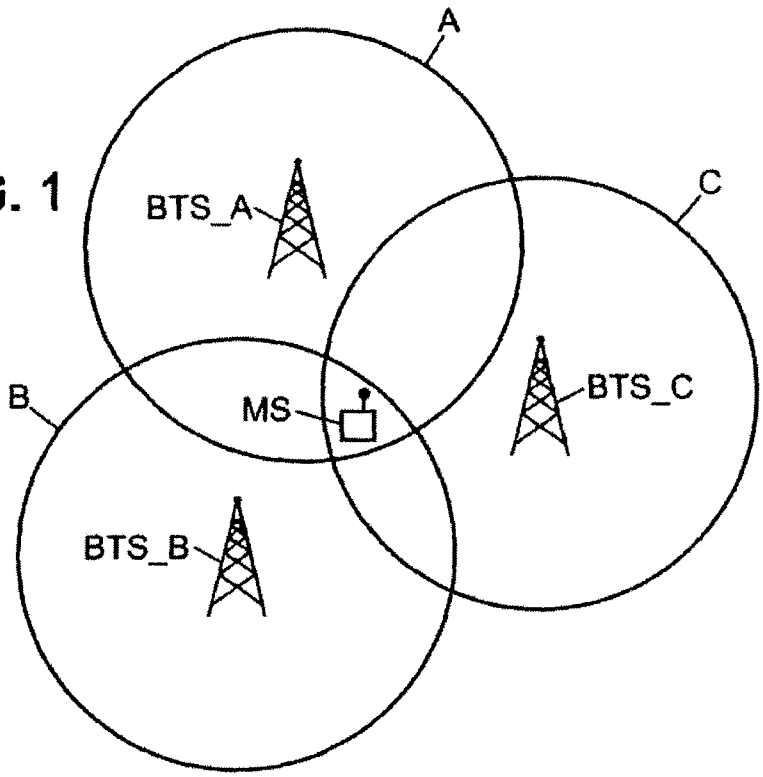
5. A computer program comprising instructions for implementing the method according to any one of claims 3 or 4 when the program is executed by a processor of a control unit of a circuit according to any one of claims 1 or 2.

6. A mobile communication terminal (TERM) comprising:

- a communication unit (COM),
- a memory (MEM), and
- a control unit (PROC),

with said control unit comprising a circuit according to any one of claims 1 or 2.

FIG. 1



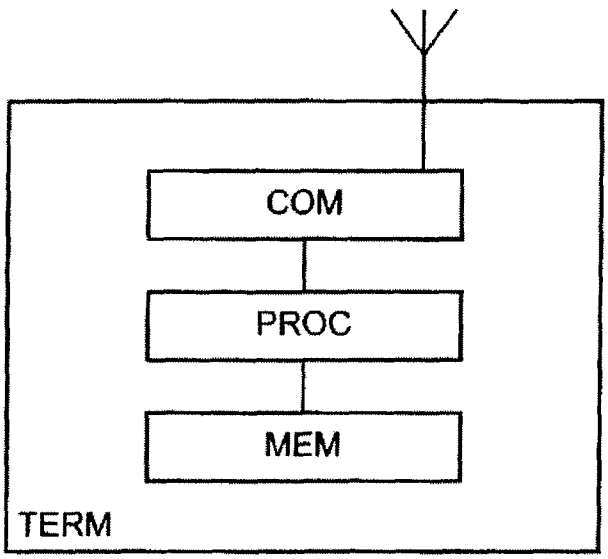


FIG. 2

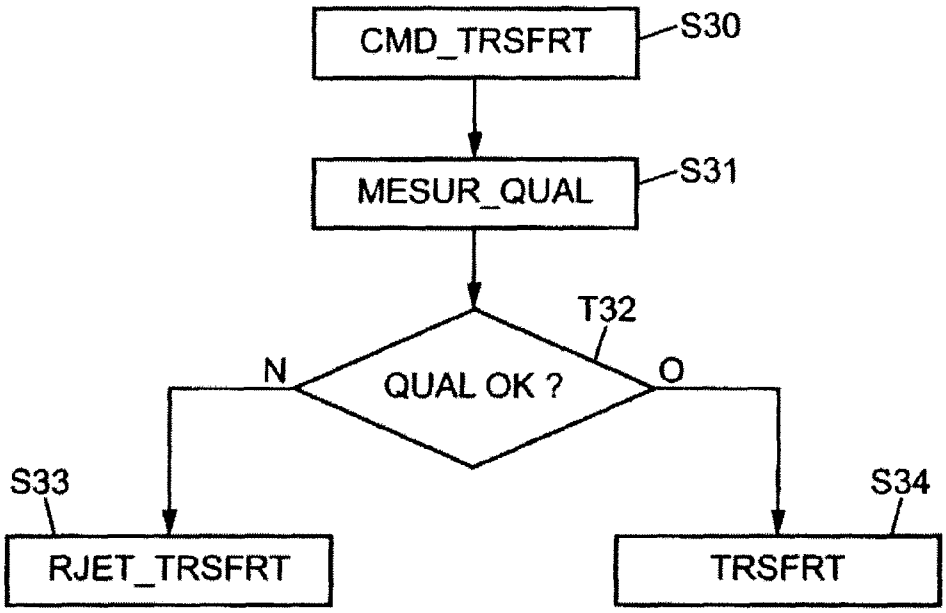

CMD_TRSFRT
S30
MESUR_QUAL
S31
T32
QUAL OK ?
N
O
S33
RJET_TRSFRT
S34
TRSFRT

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/058491

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W36/36
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 791 385 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 30 May 2007 (2007-05-30) page 25, paragraph 169 - paragraph 173 page 12, paragraph 61 page 26, paragraph 175 figure 13	1-6
X	EP 1 513 364 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 9 March 2005 (2005-03-09) page 25, paragraph 170 - page 26, paragraph 176 page 12, paragraph 61 figure 13	1-6
X	EP 1 816 794 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 8 August 2007 (2007-08-08) page 18, paragraph 58	1,3,5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2010	30/07/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marín Saldaña, I

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/058491

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SUNGJIN LEE ET AL: "IEEE 802.16e HO options for forcing and suggesting HO" IEEE C802.16E-03/48, XX, XX, 4 September 2003 (2003-09-04), page COMPLETE, XP002333440 the whole document	1-6

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/058491

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