METHOD FOR MANAGING TIME DIFFERENCE INFORMATION BETWEEN MICRO CELL AND MACRO CELL

VERFAHREN ZUR VERWALTUNG VON ZEITDIFFERENZINFORMATIONEN ZWISCHEN MIKROZELLEN UND MAKROZELLEN

PROCÉDÉ DE GESTION D’INFORMATIONS DE DIFFÉRENCE DE TEMPS ENTRE UNE MICROCELLULE ET UNE MACROCELLULE

Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Priority: 21.01.2012 CN 201210019829

Date of publication of application: 17.09.2014 Bulletin 2014/38

Divisional application: 16162614.8

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The present invention relates to the field of communications technologies, and in particular to a method, a
convergent node, and a micro cell base station for managing a timing difference between a micro cell and a macro cell.

To meet a seamless coverage requirement of a communications network, the prior art proposes a heterogeneous
network (Hetnet). The Hetnet is a network formed by cells of various sizes and types, such as a macro cell (Macro cell),
a micro cell (Micro cell), and a pico cell (Pico Cell). A base station of a macro cell manages multiple cells. A base station
of a micro cell or of a pico cell manages only one cell.

In a WCDMA communications network system, a downlink of a WCDMA system has totally 512 scrambling
codes (Primary scrambling code, PSC). Each cell is allocated with a PSC used as one of identification parameters of
the cell. However, the number of PSCs used by a micro cell in the WCDMA communications system is limited. In this
case, for micro cells having overlapping coverage with a macro cell, multiple micro cells share a PSC. Further, when
performing measurement on a neighboring cell, a UE is incapable of reading identification parameters other than PSC
information of the neighboring cell. To ensure that a user equipment (UE) successfully hands over from a macro cell to
a target micro cell having overlapping coverage with the macro cell, after sending a handover message to a gateway
managing the target micro cell, an RNC (radio network controller) managing the macro cell manages the gateway of the
target micro cell to select the target micro cell by using information such as uniqueness of a timing difference between
a micro cell and the macro cell that have the same PSC when only PSC information of the target micro cell and information
of a timing difference between the target micro cell and the macro cell can be acquired, so as to hand over the UE.

However, frame timings of base stations of the target micro cell and the macro cell may drift, so a timing
difference between the frame timing of the base station (BS) of the target micro cell and the frame timing of the base
station of the macro cell may also change, in which case the timing differences between the macro cell and micro cells
having the same PSC may be the same. When a target micro cell is determined by using information such as a PSC of
the target micro cell and a timing difference between the target micro cell and a macro cell, because information of the
timing difference between the micro cell having the same PSC and the macro cell which a UE is in is not unique, a
gateway of a micro cell cannot determine the target micro cell, in which case the UE cannot hand over to the target
micro cell.

EP 1 675 279 A2 discloses a method and an apparatus for synchronizing base stations employing an inde-
dependent synchronizing source or identifying a base station as a master source. An RNC (C-RNC) or a base station may
designate one base station or a UE to acquire measurements derived from base stations to achieve synchronization.
Synchronization activities may be regularly scheduled or may be undertaken when periodic measurements indicate that
a drift value exceeds a given threshold.

EP 2 389 027 A1 discloses a mobile communication method that includes the steps of: (A) measuring, at a
mobile station (MUE) that is in communication in a first cell under the control of a first radio base station (MBS), a
reception timing difference between a timing of receiving a downlink signal from the first cell and a timing of receiving a
downlink signal from a second cell under the control of a second radio base station (FBS); (B) reporting, from the mobile
station (MUE) to the first radio base station, the measured reception timing difference; and (C) transmitting, from the
first radio base station (MBS) to the second radio base station (FBS), an adjustment instruction instructing to adjust a
timing of transmitting a downlink signal in the second cell, based on the reception timing difference.

Embodiments of the present invention provide methods and an apparatuses for managing a timing difference
between a micro cell and a macro cell according to claims 1, 4, 8 and 11, respectively, examples adopt the following
technical solutions:

A method for managing information of a timing difference between a micro cell and a macro cell includes:

- receiving, by a convergent node, information of a timing difference between the micro cell and a neighboring macro
cell of the micro cell, where the information of the timing difference is sent by a micro cell base station and includes
the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of
the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the
micro cell; and
- if the timing difference is greater than a preset first threshold value of the timing difference, sending, by the convergent


A method for managing information of a timing difference between a micro cell and a macro cell includes:

acquiring, by a micro cell base station, information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell; and

sending, by the micro cell base station, the information of the timing difference to a convergent node;

receiving, by the micro cell base station, instruction information for adjusting a frame clock value of the micro cell or reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell when the timing difference is greater than a preset first threshold value of the timing difference, where the instruction information or the reconfiguration information is sent by the a convergent node; and

adjusting, by the micro cell base station, the frame clock value of the micro cell according to the instruction information, or reconfiguring at least part of the timing difference parameters of the micro cell according to the reconfiguration information.

A convergent node for managing information of a timing difference between a micro cell and a macro cell includes a receiving unit, a sending unit, and a control unit, where:

the receiving unit is configured to receive information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, and the information of the timing difference is sent by a micro cell base station and includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell; and

if the timing difference is greater than a preset first threshold value of the timing difference, the control unit is configured to control the sending unit to send instruction information for adjusting a frame clock value of the micro cell.
cell or send reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell; and
the sending unit is configured to, according to control by the control unit, send the micro cell base station the instruction information for adjusting the frame clock value of the micro cell or the reconfiguration information for reconfiguring at least part of the timing difference parameters of the micro cell.

[0013] A micro cell base station for managing information of a timing difference between a micro cell and a macro cell includes an acquiring unit, a receiving unit, a sending unit, and a control unit, where:

- the acquiring unit is configured to acquire information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, and the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell;
- the sending unit is configured to send the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to a convergent node;
- the receiving unit is configured to, when the timing difference is greater than a preset first threshold value of the timing difference, receive instruction information for adjusting a frame clock value of the micro cell or reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell, where the instruction information or the reconfiguration information is sent by the a convergent node; and
- the control unit is configured to adjust the frame clock value of the micro cell according to the instruction information received by the receiving unit, or reconfigure at least part of the timing difference parameters of the micro cell according to the reconfiguration information.

[0014] A micro cell base station for managing information of a timing difference between a micro cell and a macro cell includes an acquiring unit and a control unit, where:

- the acquiring unit is configured to acquire information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, and the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell; and
- if the timing difference is greater than a preset first threshold value of the timing difference, the control unit is configured to adjust a frame clock value of the micro cell.

[0015] A system for managing information of a timing difference between a micro cell and a macro cell includes the convergent node and the micro cell base station.

[0016] According to a method, a convergent node, a micro cell base station, and a system for managing information of a timing difference between a micro cell and a macro cell provided in the embodiments of the present invention, a convergent node receives information of a timing difference between a micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is reported by a micro cell base station, and if the timing difference is greater than a preset first threshold value of the timing difference, instruction information for adjusting a frame clock of the micro cell is sent to the micro cell, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference, and reconfiguration information is sent to the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the threshold value of the timing difference, where the threshold value of the timing difference is reconfigured according to the reconfiguration information, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

BRIEF DESCRIPTION OF DRAWINGS

[0017] To illustrate the technical solutions according to the embodiments of the present invention or in the prior art more clearly, the following briefly introduces accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following descriptions merely show some of the embodiments of the present invention, and persons of ordinary skill in the art can obtain other drawings according to the accompanying drawings without creative efforts.

FIG. 1 is a flow chart of a method for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 1 of the present invention;
FIG. 2 is a flow chart of a method for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 2 of the present invention;

FIG. 3 is a flow chart of a method for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 3 of the present invention;

FIG. 4 is a flow chart of a method for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 4 of the present invention;

FIG. 5 is a structural block diagram of a convergent node for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 5 of the present invention;

FIG. 6 is a structural block diagram of a micro cell base station for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 6 of the present invention; and

FIG. 7 is a structural block diagram of a micro cell base station for managing information of a timing difference between a micro cell and a macro cell according to Embodiment 7 of the present invention.

DESCRIPTION OF EMBODIMENTS

[0018] The technical solutions of the present invention will be clearly described in the following with reference to the accompanying drawings. It is obvious that the embodiments to be described are only a part rather than all of the embodiments of the present invention. All other embodiments obtained by persons of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0019] In each embodiment of the specification, timing difference parameters of a micro cell and a neighboring macro cell of the micro cell may include: a frame clock value of the micro cell, a threshold value of a timing difference between the micro cell and the macro cell, a detection cycle, a reporting cycle, a gap offset, a clock drift speed of the macro cell, and a clock drift speed of the micro cell. The parameters have the following relationships:

\[ \text{the threshold value of the timing difference} = \text{the reporting cycle} \times (\text{a maximum timing offset rate of the macro base station} + \text{a maximum timing offset rate of a micro cell base station}) + \text{the gap offset} \]

[0020] In each embodiment of this specification, a convergent node may pre-configure all or a part of the timing difference parameters. According to the number of micro cells sharing a PSC, the convergent node may further reconfigure all or a part of the timing difference parameters.

[0021] Alternatively, the timing difference parameters pre-configured by the convergent node may be timing difference parameters configured directly on the convergent node by a network administrator.

[0022] Alternatively, the timing difference parameters pre-configured by the convergent node may be some of the timing difference parameters configured on the convergent node by a network administrator. Then, these parameters are used to calculate other timing difference parameters according to Formula (1). For example, the network administrator configures parameters such as the detection cycle, the reporting cycle, the gap offset, the clock drift speed of the macro cell, and the clock drift speed of the micro cell, and the clock drift speed of the micro cell on the a convergent node, so as to acquire the threshold value of the timing difference between the micro cell and the neighboring macro cell of the micro cell.

[0023] In each embodiment of the specification, a micro cell base station may pre-configure the timing difference parameters. The micro cell base station may also reconfigure the timing difference parameters according to a reconfiguration message sent by the convergent node. The pre-configured timing difference parameters include: a preset frame clock value of the micro cell, a preset first threshold value of the timing difference between the micro cell and the neighboring macro cell of the micro cell, a preset detection cycle, a preset reporting cycle, a preset gap offset, a preset clock drift speed of the macro cell, and a preset clock drift speed of the micro cell.

[0024] Alternatively, the timing difference parameters pre-configured by the micro cell base station may be timing difference parameters configured directly on the micro cell base station by a network administrator.

[0025] Alternatively, the timing difference parameters pre-configured by the micro cell base station may be some of the timing difference parameters configured on the micro cell base station by a network administrator. Then, these parameters are used to calculate, according to Formula (1), other timing difference parameters required by the micro cell base station. For example, the network administrator configures parameters such as the detection cycle, the reporting cycle, the gap offset, the clock drift speed of the macro cell, and the clock drift speed of the micro cell in the micro cell, so as to acquire a threshold value of a timing difference between the micro cell base station and a macro cell base station, or configure some other parameters to calculate the reporting cycle.

[0026] Alternatively, the timing difference parameters pre-configured by the micro cell base station may be timing...
difference parameters sent by the convergent node.

Alternatively, the timing difference parameters pre-configured by the micro cell base station may be some of
the timing difference parameters configured on the micro cell base station by a network administrator. Then, other timing
difference parameters required by the micro cell base station are received from the convergent node. For example, the
network administrator configures the frame clock value in the micro cell, and then receives, from the a convergent node,
parameters such as the threshold value of the timing difference, the detection cycle, the reporting cycle, the gap offset,
the clock drift speed of the macro cell, and the clock drift speed of the micro cell.

Alternatively, the timing difference parameters pre-configured by the micro cell base station may be some of
the timing difference parameters configured on the micro cell base station by a network administrator. Then, some other
timing difference parameters are received from the convergent node, and then these parameters are used to calculate,
according to Formula (1), other timing difference parameters required by the micro cell base station. For example, the
network administrator configures the frame clock value in the micro cell, and receives, from the convergent, parameters
such as the detection cycle, the reporting cycle, the gap offset, the clock drift speed of the macro cell, and the clock drift
speed of the micro cell, and then calculates the threshold value of the timing difference according to Formula (1).

**Embodiment 1**

An embodiment of the present invention provides a method for managing information of a timing difference
between a micro cell and a macro cell, and the method is a method on the side of a convergent node. The convergent
node involved in this embodiment may be a micro cell gateway, for example, a home NodeB gateway (HNB GW), or
may be a radio network controller. As shown in FIG. 1, the method according to this embodiment includes the following
steps:

S101. A convergent node receives information of a timing difference between the micro cell and a neighboring macro
cell of the micro cell, where the information of the timing difference is sent by a micro cell base station and includes
the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of
the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of
the micro cell.

The information of the timing difference may further include information of the micro cell, for example, a cell
identifier or a scrambling code of the micro cell. The information of the timing difference may further include information
of the macro cell, for example, a cell identifier or a scrambling code of the macro cell. In this embodiment, the micro cell
base station may send the information of the timing difference to the convergent node through a registration request
message, a common measurement report message, an audit response message, or a dedicated reporting message.

S102. If the timing difference is greater than a preset first threshold value of the timing difference, the convergent
node sends the micro cell base station instruction information for adjusting a frame clock value of the micro cell, or sends
the micro cell base station reconfiguration information for reconfiguring at least part of the timing difference parameters
of the micro cell.

Alternatively, the instruction information sent by the convergent node to the micro cell base station is reset
instruction information, and the reset instruction information is used to instruct the micro cell base station to reset the
frame clock value of the micro cell to a preset frame clock value; alternatively, the instruction information sent by the
convergent node to the micro cell base station includes an offset for adjusting the frame clock value of the micro cell, and
the instruction information is used to instruct the micro cell base station to adjust the frame clock value of the micro
cell according to the offset.

Alternatively, the offset for adjusting the frame clock value of the micro cell includes an offset of a system frame
number of the micro cell and/or a chip offset of a system frame.

Alternatively, the reconfiguration information sent by the convergent node to the micro cell base station includes
at least part of a reconfigured frame clock value, a reconfigured detection cycle, a reconfigured reporting cycle, a
reconfigured threshold of the timing difference, a reconfigured gap offset, a reconfigured clock drift speed of the macro
cell, and a reconfigured clock drift speed of the micro cell.

Alternatively, before the convergent node receives the information of the timing difference between the micro
cell and the neighboring macro cell of the micro cell, where the information of the timing difference is sent by the micro
cell base station, the convergent node sends a request message to the micro cell base station, and the request message
is used to instruct the micro cell base station to send the information of the timing difference between the micro cell and
the neighboring macro cell of the micro cell to the convergent node.

Alternatively, after the convergent node sends the micro cell base station the instruction information for adjusting
the frame clock value of the micro cell or sends the micro cell base station the reconfiguration information for reconfiguring
at least timing parameters of the micro cell, the convergent node receives a response message sent by the micro cell
base station, and the response message may further carry the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell or information that the frame clock value is adjusted successfully or at least part of the timing parameters are reconfigured successfully after the frame clock value is adjusted or after at least part of the timing parameters are reconfigured.

[0037] Alternatively, if the convergent node receives a deregistration request message sent by the micro cell base station, the convergent node deletes the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell, where the information of the timing difference is recorded in the convergent node.

[0038] Alternatively, the timing difference parameters include the frame clock value of the micro cell, a threshold value of a timing difference between the micro cell base station and a macro cell base station, the detection cycle, the reporting cycle, the gap offset, the clock drift speed of the macro cell, and the clock drift speed of the micro cell.

[0039] According to the method for managing information of a timing difference between a micro cell and a macro cell provided in this embodiment, a convergent node receives information of a timing difference between a micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is reported by a micro cell base station, and if the timing difference is greater than a preset first threshold value of the timing difference, instruction information for adjusting a frame clock of the micro cell is sent to the micro cell, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference; alternatively, reconfiguration information is sent to the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the threshold value of the timing difference, where the threshold value of the timing difference is reconfigured according to the reconfiguration information, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

Embodiment 2

[0040] An embodiment of the present invention provides a method for managing information of a timing difference between a micro cell and a macro cell. A convergent node involved in this embodiment may be a micro cell gateway, for example, a home NodeB gateway, or may be a radio network controller. As shown in FIG 2, the method according to this embodiment includes the following steps:

S201. A micro cell base station acquires information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

[0041] The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

[0042] Alternatively, the micro cell base station may acquire the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a UE.

[0043] Alternatively, the micro cell base station may also detect the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell according to a preset detection cycle.

[0044] S202. The micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to a convergent node.

[0045] The micro cell base station may send the information of the timing difference to the convergent node through a registration request message, a common measurement report message, an audit response message, or a dedicated reporting message.

[0046] Alternatively, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node in each preset reporting cycle.

[0047] Alternatively, if the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than a preset first threshold value of the timing difference, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node.

[0048] Alternatively, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell when registering with the convergent node.

[0049] Alternatively, for the micro cell base station in each preset reporting cycle, if the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than the preset first threshold value of the timing difference, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node.
[0050] Alternatively, the convergent node sends a request message to the micro cell base station in each preset reporting cycle to request the micro cell base station to report the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell. Upon receiving the request from the convergent node, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node. The request message may include information of the macro cell, for example, the scrambling code or the identifier of the macro cell. The request message sent by the convergent node may be a common measurement request message, an audit request message, or a dedicated reporting request message.

[0051] S203. The convergent node receives the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell, where the information of the timing difference is sent by the micro cell base station.

[0052] S204. If the timing difference is greater than the preset first threshold value of the timing difference, the convergent node sends the micro cell base station instruction information for adjusting a frame clock value of the micro cell, or sends the micro cell base station reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell.

[0053] Alternatively, the instruction information may be reset instruction information used to instruct the micro cell base station to reset the frame clock value of the micro cell to a preset frame clock value.

[0054] Alternatively, the instruction information includes an offset for adjusting the frame clock value of the micro cell. For example, the instruction information may include an offset of a system frame number (SFN) of the micro cell and/or a chip (chips) offset of a system frame of the micro cell, and the instruction information may further include an absolute value of the system frame number and/or an absolute value of the chip offset of the system frame. The instruction information may be changed into another form according to an actual need, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

[0055] Alternatively, the reconfiguration information of the timing difference parameters of the micro cell is determined by the convergent node according to the number of micro cells sharing a PSC. For example, when the number of micro cells sharing a PSC decreases, the threshold value of the timing difference in the reconfiguration information may increase. The reconfiguration information may include at least part of a reconfigured frame clock value, a reconfigured detection cycle, a reconfigured reporting cycle, a reconfigured threshold of the timing difference, a reconfigured gap offset, a reconfigured clock drift speed of the macro cell, and a reconfigured clock drift speed of the micro cell that are among the timing difference parameters, for example, the frame clock value of the micro cell and/or the threshold value of the timing difference.

[0056] S205. The micro cell base station receives the instruction information for adjusting the frame clock value of the micro cell or the reconfiguration information for reconfiguring at least part of the timing difference parameters of the micro cell, where the instruction information or the reconfiguration information is sent by the convergent node.

[0057] S206. The micro cell base station adjusts the frame clock value of the micro cell according to the received instruction information, or reconfigures at least part of the timing difference parameters of the micro cell according to the received reconfiguration information.

[0058] Alternatively, if the instruction information received by the micro cell base station is the reset instruction information, the micro cell base station resets the frame clock value of the micro cell to the preset frame clock value, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

[0059] Alternatively, if the instruction information received by the micro cell base station includes the offset for adjusting the frame clock value of the micro cell, the micro cell base station adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

[0060] Alternatively, if the micro cell base station receives the reconfiguration information, the micro cell base station reconfigures, according to the reconfiguration information, at least part of the timing difference parameters of the micro cell, for example, the frame clock value of the micro cell and/or the first threshold value of the timing difference, or the reporting cycle, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the reconfigured threshold value of the timing difference.

[0061] Alternatively, after the convergent node sends the micro cell base station the instruction information for adjusting the frame clock value of the micro cell or sends the micro cell base station the reconfiguration information for reconfiguring at least timing parameters of the micro cell, the convergent node receives a response message sent by the micro cell base station, and the response message may further carry the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell or information that the frame clock value is adjusted successfully or at least part of the timing parameters are reconfigured successfully after the frame clock value is adjusted or after at least part of the timing parameters are reconfigured.

[0062] In this embodiment, after the convergent node receives the information of the timing difference that is sent by the micro cell base station, if the micro cell base station already establishes a connection to another user equipment, to
ensure that communication between the micro cell base station and the another user equipment is not interrupted, the convergent node may send the instruction information for adjusting the frame clock value or send the reconfiguration information for reconfiguring at least part of the timing difference parameters to another micro cell base station having a same timing difference range (for example, a micro cell base station with a low load is selected), so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique.

[0063] According to the method for managing information of a timing difference between a micro cell and a macro cell provided in this embodiment, a convergent node receives information of a timing difference between a micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is reported by a micro cell base station, and if the timing difference is greater than a preset first threshold value of the timing difference, instruction information for adjusting a frame clock value of the micro cell is sent to the micro cell, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference; alternatively, reconfiguration information is sent to the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the threshold value of the timing difference, where the threshold value of the timing difference is reconfigured according to the reconfiguration information, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

**Embodiment 3**

[0064] An embodiment of the present invention provides a method for managing a timing difference between a micro cell and a neighboring macro cell. A convergent node involved in this embodiment may be a micro cell gateway, for example, a home NodeB gateway, or may be a radio network controller. As shown in FIG. 3, the method according to this embodiment includes the following steps:

S301. A micro cell base station acquires information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

[0065] The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

[0066] Alternatively, the micro cell base station may acquire the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a UE.

[0067] Alternatively, the micro cell base station may also detect the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell according to a preset detection cycle.

[0068] S302. If the timing difference is greater than a preset first threshold of the timing difference, the micro cell base station sends the information of the timing difference and information that the timing difference is greater than the preset first threshold value of the timing difference to a convergent node.

[0069] The micro cell base station may send the information of the timing difference and the information that the timing difference is greater than the preset first threshold value of the timing difference to the convergent node through a registration request message, a common measurement report message, an audit response message, or a dedicated reporting message.

[0070] Alternatively, for the micro cell base station in each preset reporting cycle, if the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than the preset first threshold value of the timing difference, the micro cell base station sends the information of the timing difference and information that the timing difference is greater than the preset first threshold value of the timing difference to the convergent node.

[0071] Alternatively, after the micro cell base station acquires the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell, if the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than the preset first threshold value of the timing difference, the micro cell base station sends the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node.

[0072] S303. The convergent node receives the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell and the information that the timing difference is greater than the preset first threshold value of the timing difference, which are sent by the micro cell base station.

[0073] S304. The convergent node sends the micro cell base station instruction information for adjusting a frame clock value of the micro cell or reconfiguration information for reconfiguring at least part of timing difference parameters of the
The instruction information or the reconfiguration information is sent by the convergent node. In this embodiment, after the convergent node receives the information of the timing difference and the information that the frame clock value is adjusted successfully, the instruction information or the reconfiguration information is sent by the convergent node. Alternatively, if the convergent node receives the instruction information, the convergent node may send the instruction information, or reconfigures at least part of the timing difference parameters of the micro cell according to the received reconfiguration information.

Alternatively, if the instruction information received by the micro cell base station is the reset instruction information, the micro cell base station resets the frame clock value of the micro cell to the preset frame clock value, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, if the instruction information received by the micro cell base station includes the offset for adjusting the frame clock value of the micro cell, the micro cell base station adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, the instruction information may be reset instruction information used to instruct the micro cell base station to reset the frame clock value of the micro cell to a preset frame clock value.

Alternatively, the instruction information includes an offset for adjusting the frame clock value of the micro cell.

For example, the instruction information may include an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell, and the instruction information may further include an absolute value of the system frame number and/or an absolute value of the chip offset of the system frame. The instruction information may be changed into another form according to an actual need, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, if the instruction information received by the micro cell base station includes the offset for adjusting the frame clock value of the micro cell, the micro cell base station adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, if the instruction information received by the micro cell base station includes the offset for adjusting the frame clock value of the micro cell, the micro cell base station adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, if the instruction information received by the micro cell base station includes the offset for adjusting the frame clock value of the micro cell, the micro cell base station adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, the instruction information includes an offset for adjusting the frame clock value of the micro cell.

For example, the instruction information may include an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell, and the instruction information may further include an absolute value of the system frame number and/or an absolute value of the chip offset of the system frame. The instruction information may be changed into another form according to an actual need, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

Alternatively, the instruction information includes an offset for adjusting the frame clock value of the micro cell.

For example, the instruction information may include an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell, and the instruction information may further include an absolute value of the system frame number and/or an absolute value of the chip offset of the system frame. The instruction information may be changed into another form according to an actual need, so that a timing difference between the adjusted micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.
threshold value of the timing difference, the convergent node sends reset instruction information to the micro cell base station, so that the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

Embodiment 4

[0085] An embodiment of the present invention provides a method for managing a timing difference between a micro cell and a neighboring macro cell. A convergent node involved in this embodiment may be a micro cell gateway, for example, a home NodeB gateway, or may be a radio network controller. As shown in FIG. 4, the method according to this embodiment includes the following steps:

S401. A micro cell base station acquires information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

[0086] The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

[0087] Alternatively, the micro cell base station may acquire the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a UE.

[0088] Alternatively, the micro cell base station may also detect the information of the timing difference between the micro cell and the neighboring macro cell according to a preset detection cycle.

[0089] S402. If the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than a preset first threshold value of the timing difference, the micro cell base station adjusts a frame clock value of the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.

[0090] Alternatively, that the micro cell base station adjusts the frame clock value of the micro cell may specifically be that the micro cell base station adjusts the frame clock value of the micro cell to a preset frame clock value.

[0091] Alternatively, that the micro cell base station adjusts the frame clock value of the micro cell may specifically be that an offset of a frame clock of the micro cell is adjusted. For example, an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell is adjusted.

[0092] After the micro cell base station adjusts the frame clock value of the micro cell, alternatively, the micro cell base station may send a response message to a convergent node. The response message may further carry the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell or information that a frame clock value is adjusted successfully after the frame clock value is adjusted.

[0093] In this embodiment, after the convergent node receives the information of the timing difference that is sent by the micro cell base station, if the micro cell base station already establishes a connection to another user equipment, to ensure that communication between the micro cell base station and the another user equipment is not interrupted, upon determining that the number of users is lower than a threshold, another micro cell base station having a same timing difference range sends the instruction information for adjusting the frame clock value, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique.

[0094] Further, when a communication line is not busy and user call quality is not affected, the micro cell base station may also automatically reset a timing difference parameter of the micro cell to the preset frame clock value within a certain cycle.

[0095] According to the method for managing information of a timing difference between a micro cell and a macro cell provided in this embodiment, if the timing difference between the micro cell and a neighboring macro cell of the micro cell is greater than a preset first threshold value of the timing difference, a micro cell base station adjusts a frame clock value of the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

[0096] Certainly, the methods for managing the information of the timing difference between the micro cell and the macro cell provided in the embodiments of the present invention are used to ensure uniqueness of the timing difference between the micro cell and the macro cell. To achieve the uniqueness of the timing difference between the micro cell and the macro cell, the following method may also be used: During a handover process of the user equipment, if a convergent node receives the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a radio network controller of the macro cell, and the convergent node can uniquely determine,
according to the received information of the timing difference, the target micro cell among candidate micro cells having a same scrambling code, after the user equipment successfully hands over from the macro cell to the target micro cell, the convergent node updates information of a timing difference between the target micro cell and the macro cell with the received information of the timing difference.

[0097] The convergent node receives the information of the timing difference between the macro and micro cells from a macro network side. If the convergent node cannot uniquely determine the target micro cell according to the received information of the timing difference, the convergent node notifies a candidate target micro cell of detecting the user equipment. If the candidate micro cell detects that uplink signal quality of the user equipment exceeds a predefined threshold, the candidate cell is determined as the target cell, and the rest of the handover process is performed.

[0098] After a user hands over successfully or after the candidate micro cell detects that uplink quality of the user exceeds the predefined threshold, the convergent node may update the information of the timing difference between the target micro cell and the macro cell with the received information of the timing difference.

[0099] In Embodiments 1, 2, 3, and 4, when the micro cell base station is ineffective or turned off, a deregistration request message is sent to the convergent node. The deregistration request message includes information of the micro cell, for example, an identifier of the micro cell. Upon receiving the deregistration request message, the convergent node deletes the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell, where the information of the timing difference is recorded in the convergent node. After deleting the recorded information of the timing difference, the convergent node sends the micro cell base station a message in response to the deregistration request.

Embodiment 5

[0100] An embodiment of the present invention provides a convergent node 50 for managing information of a timing difference between a micro cell and a macro cell. The convergent node 50 may be a micro cell gateway, for example, a home NodeB gateway, or may be a radio network controller. As shown in FIG 5, the convergent node 50 includes: a receiving unit 51, a sending unit 52, and a control unit 53.

[0101] The receiving unit 51 is configured to receive information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is sent by a micro cell base station and includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

[0102] The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

[0103] If the timing difference is greater than a preset first threshold value of the timing difference, the control unit 53 is configured to control the sending unit 52 to send instruction information for adjusting a frame clock value of the micro cell or send the micro cell base station reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell.

[0104] The sending unit 52 is configured to, according to control by the control unit 53, send the micro cell base station the instruction information for adjusting the frame clock value of the micro cell or send the micro cell base station the reconfiguration information for reconfiguring at least part of the timing difference parameters of the micro cell.

[0105] Alternatively, the timing difference parameters include the frame clock value of the micro cell, a threshold value of the timing difference between the micro cell and the macro cell, a detection cycle, a reporting cycle, a gap offset, a clock drift speed of the macro cell, and a clock drift speed of the micro cell.

[0106] Alternatively, the instruction information sent by the sending unit 52 to the micro cell base station is reset instruction information. The reset instruction information is used to instruct the micro cell base station to reset the frame clock value of the micro cell to a preset frame clock value.

[0107] Alternatively, the instruction information sent by the sending unit 52 to the micro cell base station includes an offset for adjusting the frame clock value of the micro cell. The instruction information is used to instruct the micro cell base station to adjust the frame clock value of the micro cell according to the offset. The offset for adjusting the frame clock value of the micro cell may include an offset of a system frame number of the micro cell and/or a chip offset of a system frame.

[0108] Alternatively, the reconfiguration information includes at least part of a reconfigured frame clock value, a reconfigured detection cycle, a reconfigured reporting cycle, a reconfigured threshold of the timing difference, a reconfigured gap offset, a reconfigured clock drift speed of the macro cell, and a reconfigured clock drift speed of the micro cell, for example, the frame clock value of the micro cell and/or the threshold value of the timing difference.

[0109] Alternatively, the control unit 53 is further configured to generate the reconfiguration message according to the number of micro cells sharing a PSC. For example, when the number of micro cells sharing a PSC decreases, the control
Alternatively, the control unit 53 is further configured to determine whether the received timing difference is greater than the preset first threshold value of the timing difference.

According to the determination result, the control unit 53 is configured to adjusting micro cell instruction information or reconfiguration information to the micro cell base station. According to the instruction information, the control unit 53 is further configured to receive information that the timing difference is recorded in the convergent node.

Alternatively, the control unit 53 is further configured to determine whether the received timing difference is greater than the preset first threshold value of the timing difference, where the information is sent by the micro cell base station.

Alternatively, the receiving unit 51 is further configured to receive a deregistration request message sent by the micro cell base station. According to the deregistration request message, the control unit 53 is further configured to delete the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell, where the information of the timing difference is recorded in the convergent node.

Alternatively, the sending unit 52 is further configured to send a request message to the micro cell base station. The request message is used to instruct the micro cell base station to send the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node.

According to the convergent node 50 for managing information of a timing difference between a micro cell and a macro cell provided in this embodiment, the receiving unit 51 receives information of a timing difference between a micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is reported by a micro cell base station, and if the timing difference is greater than a preset first threshold value of the timing difference, the sending unit 52 sends the micro cell instruction information for adjusting a frame clock of the micro cell, or sends reconfiguration information to the micro cell, so that the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target macro cell.

**Embodiment 6**

**[0115]** An embodiment of the present invention provides a micro cell base station 60 for managing information of a timing difference between a micro cell and a macro cell. As shown in FIG 6, the micro cell base station 60 includes an acquiring unit 61, a receiving unit 63, a sending unit 62, and a control unit 64.

**[0116]** The acquiring unit 61 is configured to acquire information of a timing difference between the micro cell and a neighboring macro cell of the micro cell. The information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

**[0117]** The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

**[0118]** Alternatively, the acquiring unit 61 may acquire the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a UE.

**[0119]** Alternatively, the acquiring unit 61 may also detect the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell according to a preset detection cycle.

**[0120]** The sending unit 62 is configured to send the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to a convergent node.

**[0121]** Alternatively, the sending unit 62 sends the information of the timing difference to the convergent node in each preset reporting cycle.

**[0122]** Alternatively, the sending unit 62 sends the information of the timing difference to the convergent node when the micro cell base station registers with the convergent node.

**[0123]** Alternatively, if the micro cell base station is ineffective or turned off, the sending unit 62 is further configured to send a deregistration request message to the convergent node.

**[0124]** The receiving unit 63 is configured to, when the timing difference is greater than a preset first threshold value of the timing difference, receive instruction information for adjusting a frame clock value of the micro cell or reconfiguration information for reconfiguring at least part of timing difference parameters of the micro cell, where the instruction information or the reconfiguration information is sent by the convergent node.

**[0125]** Alternatively, the timing difference parameters include the frame clock value of the micro cell, a threshold value of the timing difference between the micro cell and the macro cell, a detection cycle, a reporting cycle, a gap offset, a clock drift speed of the macro cell, and a clock drift speed of the micro cell.

**[0126]** Alternatively, the reconfiguration information includes at least one of a reconfigured frame clock value, a reconfigured detection cycle, a reconfigured reporting cycle, a reconfigured threshold of the timing difference, a reconfigured gap offset, a reconfigured clock drift speed of the macro cell, and a reconfigured clock drift speed of the micro cell.

**[0127]** Alternatively, the receiving unit 63 is further configured to receive a reporting request message sent by the
The control unit 64 is configured to adjust the frame clock value of the micro cell according to the instruction information received by the receiving unit 63 or reconfigure at least part of the timing difference parameters of the micro cell according to the reconfiguration information, so that the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique.

Alternatively, if the instruction information is reset instruction information, the control unit 64 resets the frame clock value of the micro cell to a preset frame clock value.

Alternatively, if the instruction information includes an offset for adjusting the frame clock value of the micro cell, the control unit 64 adjusts the frame clock value of the micro cell according to the offset. The offset for adjusting the frame clock value of the micro cell may include an offset of a system frame number of the micro cell and/or a chip offset of a system frame.

Alternatively, the control unit 64 reconfigures the frame clock value of the micro cell and/or the threshold value of the timing difference according to the reconfiguration information.

Alternatively, the control unit 64 is further configured to determine whether the timing difference is greater than the preset first threshold value of the timing difference, and if the timing difference is greater than the preset first threshold value of the timing difference, the sending unit 62 sends the information of the timing difference to the convergent node.

Alternatively, the control unit 64 is further configured to determine whether the timing difference is greater than the preset first threshold value of the timing difference, and if the timing difference is greater than the preset first threshold value of the timing difference, the sending unit 62 sends the information of the timing difference to the convergent node, and the sending unit 62 is further configured to send information that the timing difference is greater than the preset first threshold value of the timing difference.

According to the micro cell base station 60 for managing information of a timing difference between a micro cell and a macro cell provided in this embodiment, the acquiring unit 61 acquires information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, the sending unit 62 sends the information of the timing difference to the convergent node, and the control unit 64 adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully hands over to a target micro cell.

Embodiment 7

An embodiment of the present invention provides a micro cell base station 70 for managing information of a timing difference between a micro cell and a macro cell. As shown in FIG. 7, the micro cell base station 70 includes an acquiring unit 71 and a control unit 72.

The acquiring unit 71 is configured to acquire information of a timing difference between the micro cell and a neighboring macro cell of the micro cell. The information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

The information of the timing difference may further include information of the micro cell, for example, a cell identifier or a scrambling code of the micro cell. The information of the timing difference may further include information of the macro cell, for example, a cell identifier or a scrambling code of the macro cell.

Alternatively, the acquiring unit 71 may acquire the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a user equipment.

Alternatively, the acquiring unit 71 may also detect the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell according to a preset detection cycle.

If the timing difference is greater than a preset first threshold value of the timing difference, the control unit 72 is configured to adjust a frame clock value of the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset threshold value of the timing difference, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique.

Alternatively, the control unit 72 resets the frame clock value of the micro cell to a preset frame clock value.

Alternatively, the control unit 72 obtains, according to the timing difference and the preset first threshold value of the timing difference, an offset for adjusting the frame clock value of the micro cell, and the control unit 72 adjusts the frame clock value of the micro cell according to the offset, so that the timing difference between the micro cell and the
According to the micro cell base station 70 for managing information of a timing difference between a micro cell and a neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference. The control unit 72 adjusts a frame clock value of the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference, and the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell is unique, thereby ensuring that a UE successfully handovers to a target micro cell.

An embodiment of the present invention further provides a system for managing information of a timing difference between a micro cell and a macro cell, which includes the convergent node described in Embodiment 5 and the micro cell base station described in Embodiment 6 or Embodiment 7. The detailed working method of the system is not repeated herein.

Those of ordinary skill in the art should understand that all or a part of the steps of the method according to the embodiments of the present invention may be implemented by a program instructing relevant hardware. The program may be stored in a computer readable storage medium. When the program is run, the steps of the method according to the embodiments of the present invention are performed. The storage medium may be any medium that is capable of storing program codes, such as a ROM, a RAM, a magnetic disk or an optical disk.

The foregoing descriptions are merely specific embodiments of the present invention, but not intended to limit the protection scope of the present invention. Any variation or replacement readily figured out by persons skilled in the art within the technical scope disclosed in the present invention shall fall within the protection scope of the present invention. Therefore, the protection scope of the present invention is subject to the appended claims.

Claims

1. A method for managing information of timing differences between micro cells and a macro cell, comprising:

   receiving (S101), by a convergent node, information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, wherein the information of the timing difference is sent by a micro cell base station and comprises a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell; and

   if the timing difference is greater than a preset first threshold value of the timing difference, sending (S102), by the convergent node to the micro cell base station, instruction information for adjusting a frame clock value of the micro cell, wherein the instruction information includes an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell, so that information of timing differences between micro cells that have a same primary scrambling code and are adjacent to a same macro cell and the macro cell is unique.

2. The method according to claim 1, wherein the instruction information sent by the convergent node to the micro cell base station is reset instruction information, and the reset instruction information is used to instruct the micro cell base station to reset the frame clock value of the micro cell to a preset frame clock value; or,

   the instruction information sent by the convergent node to the micro cell base station comprises an offset for adjusting the frame clock value of the micro cell, wherein the instruction information includes an offset of a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell, so that information of timing differences between micro cells that have a same primary scrambling code and are adjacent to a same macro cell and the macro cell is unique.

3. The method according to claim 1 or 2, before the receiving, by the convergent node, the information of the timing difference between the micro cell and a neighboring macro cell of the micro cell, wherein the information of the timing difference is sent by the micro cell base station, comprising:

   sending, by the convergent node, a request message to the micro cell base station, wherein the request message is used to instruct the micro cell base station to send the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to the convergent node.

4. A method for managing information of timing differences between micro cells and a macro cell, comprising:

   acquiring (S401), by a micro cell base station, information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, wherein the information of the timing difference comprises a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell;
sending, by the micro cell base station, the information of the timing difference to a convergent node;
receiving, by the micro cell base station, instruction information for adjusting a frame clock value of the micro
cell when the timing difference is greater than a preset first threshold value of the timing difference, wherein the
instruction information is sent by the convergent node, wherein the instruction information includes an offset of
a system frame number of the micro cell and/or a chip offset of a system frame of the micro cell; and
adjusting (S402), by the micro cell base station, the frame clock value of the micro cell according to the instruction
information, so that information of timing differences between micro cells that have a same primary scrambling
code and are adjacent to a same macro cell and the macro cell is unique.

5. The method according to claim 4, wherein the acquiring, by the micro cell base station, the information of the timing
difference between the micro cell and the neighboring macro cell of the micro cell comprises:
acquiring, by the micro cell base station, the information of the timing difference between the micro cell and the
neighboring macro cell of the micro cell from a measurement report sent by a user equipment; or,
detecting, by the micro cell base station, the information of the timing difference between the micro cell and the
neighboring macro cell of the micro cell according to a preset detection cycle.

6. The method according to claim 4 or 5, wherein the sending, by the micro cell base station, the information of the
timing difference to the convergent node comprises:
sending, by the micro cell base station, the information of the timing difference to the convergent node in each
preset reporting cycle; or,
when the timing difference comprised in the information of the timing difference is greater than the preset first
threshold value of the timing difference, sending, by the micro cell base station, the information of the timing
difference to the convergent node; or,
sending, by the micro cell base station, the information of the timing difference to the convergent node when
the micro cell base station registers with the convergent node; or,
for the micro cell base station in each preset reporting cycle, when the timing difference comprised by the
information of the timing difference is greater than the preset first threshold value of the timing difference,
sending, by the micro cell base station, the information of the timing difference to the convergent node; or,
for the micro cell base station, sending, by the micro cell base station, the information of the timing difference
to the convergent node according to a reporting request message sent by the convergent node.

7. The method according to claim 4 or 5 or 6, wherein the adjusting, by the micro cell base station, the frame clock
value of the micro cell according to the instruction information comprises:
resetting, by the micro cell base station, the frame clock value of the micro cell to a preset frame clock value
according to the instruction information; or, adjusting, by the micro cell base station, the frame clock value of
the micro cell according to an offset of the frame clock value of the micro cell, wherein the offset is comprised
in the instruction information; or;
reconfiguring, by the micro cell base station, the frame clock value of the micro cell and/or a threshold value of
the timing difference according to reconfiguration information.

8. A convergent node for managing information of timing differences between micro cells and a macro cell, comprising
a receiving unit (51), a sending unit (52), and a control unit (53), wherein:
the receiving unit is configured to receive information of a timing difference between the micro cell and a
neighboring macro cell of the micro cell, and the information of the timing difference is sent by a micro cell base
station and comprises a frame timing of the micro cell and a frame timing of the neighboring macro cell of the
micro cell;
if the timing difference is greater than a preset first threshold value of the timing difference, the control unit is
configured to control the sending unit to send instruction information for adjusting a frame clock value of the
micro cell, wherein the instruction information includes an offset of a system frame number of the micro cell
and/or a chip offset of a system frame of the micro cell; and
the sending unit is configured to, according to control by the control unit, send the micro cell base station the
instruction information for adjusting the frame clock value of the micro cell, so that information of timing differences
between micro cells that have a same primary scrambling code and are adjacent to a same macro cell and the
macro cell is unique.
9. The convergent node according to claim 8, wherein the control unit is further configured to determine whether the received timing difference is greater than the preset first threshold value of the timing difference, if the timing difference is greater than the preset first threshold value of the timing difference, the receiving unit is further configured to receive information that the timing difference is greater than the preset first threshold value of the timing difference, and the information is sent by the micro cell base station.

10. The convergent node according to claim 8 or 9, wherein the sending unit is further configured to send a request message to the micro cell base station, and the request message is used to instruct the micro cell base station to send the information of the timing difference to the convergent node.

11. A micro cell base station for managing information of timing differences between micro cells and a macro cell, comprising an acquiring unit (61), a receiving unit (63), a sending unit (62), and a control unit (64), wherein:

- the acquiring unit is configured to acquire information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, and the information of the timing difference comprises a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell;
- the sending unit is configured to send the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell to a convergent node;
- the receiving unit is configured to, when the timing difference is greater than a preset first threshold value of the timing difference, receive instruction information for adjusting a frame clock value of the micro cell, wherein the instruction information is sent by the convergent node; and
- the control unit is configured to adjust the frame clock value of the micro cell according to the instruction information received by the receiving unit, so that information of timing differences between micro cells that have a same primary scrambling code and are adjacent to a same macro cell and the macro cell is unique.

12. The micro cell base station according to claim 11, wherein the acquiring unit acquires the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell from a measurement report sent by a user equipment; or, the acquiring unit detects the information of the timing difference between the micro cell and the neighboring macro cell of the micro cell according to a preset detection cycle.

13. The micro cell base station according to claim 11 or 12, wherein the sending unit sends the information of the timing difference to the convergent node in each preset reporting cycle; or,

- the sending unit sends the information of the timing difference to the convergent node when the micro cell base station registers with the convergent node; or,
- the receiving unit is further configured to receive a reporting request message sent by the convergent node, and the sending unit sends the information of the timing difference to the convergent node according to the reporting request message; or,
- the control unit is further configured to determine whether the timing difference is greater than the preset first threshold value of the timing difference, and if the timing difference is greater than the preset first threshold value of the timing difference, the sending unit sends the information of the timing difference to the convergent node.

14. The micro cell base station according to any one of claims 11 to 13, wherein the control unit is further configured to determine whether the timing difference is greater than the preset first threshold value of the timing difference, and if the timing difference is greater than the preset first threshold value of the timing difference, the sending unit is further configured to send information that the timing difference is greater than the preset first threshold value of the timing difference to the convergent node.

15. The micro cell base station according to any one of claims 11 to 14, wherein if the instruction information is reset instruction information, the control unit resets the frame clock value of the micro cell to a preset frame clock value; or, if the instruction information comprises an offset for adjusting the frame clock value of the micro cell, the control unit adjusts the frame clock value of the micro cell according to the offset; or, the control unit reconfigures the frame clock value of the micro cell and/or a threshold value of the timing difference according to reconfiguration information.

Patentansprüche

1. Verfahren zum Managen von Informationen über Zeitsteuerungsdifferenzen zwischen Mikrozellen und einer Ma-
krozelle, das Folgende umfasst:

Empfangen (S101) durch einen Konvergenzknoten von Informationen über eine Zeitsteuerungsdifferenz zwischen der Mikrozelle und einer benachbarten Makrozelle der Mikrozelle, wobei die Informationen über die Zeitsteuerungsdifferenz durch eine Mikrozellenbasisstation gesendet werden und eine Rahmenzeitsteuerung der Mikrozelle und eine Rahmenzeitsteuerung der benachbarten Makrozelle der Mikrozelle umfassen; und falls die Zeitsteuerungsdifferenz größer ist als ein voreingestellter erster Schwellenwert der Zeitsteuerungsdifferenz, Senden (S102) durch den Konvergenzknoten zu der Mikrozellenbasisstation von Befehlsinformationen zum Anpassen eines Rahmentaktwerts der Mikrozelle, wobei die Befehlsinformationen einen Versatz einer Systemrahmennummer der Mikrozelle und/oder einen Chip-Versatz eines Systemrahmens der Mikrozelle enthalten, so dass Informationen über Zeitsteuerungsdifferenzen zwischen Mikrozellen, die einen selben primären Verwürfelungscode aufweisen und einer selben Makrozelle benachbart sind, und der Makrozelle eindeutig sind.

2. Verfahren nach Anspruch 1, wobei die Befehlsinformationen, die durch den Konvergenzknoten zu der Mikrozellenbasisstation gesendet werden, Rücksetzungsbefehlsinformationen sind und die Rücksetzungsbefehlsinformationen verwendet werden, um die Mikrozellenbasisstation anzuweisen, den Rahmentaktwert der Mikrozelle auf einen vor eingestellten Rahmentaktwert zurückzusetzen; oder die Befehlsinformationen, die durch den Konvergenzknoten zu der Mikrozellenbasisstation gesendet werden, einen Versatz zum Anpassen des Rahmentaktwerts der Mikrozelle umfassen und die Befehlsinformationen verwendet werden, um die Mikrozellenbasisstation anzuweisen, den Rahmentaktwert der Mikrozelle gemäß dem Versatz anzupassen.

3. Verfahren nach Anspruch 1 oder 2, das vor dem Empfangen durch den Konvergenzknoten der Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle, wobei die Informationen über die Zeitsteuerungsdifferenz durch die Mikrozellenbasisstation gesendet werden, Folgendes umfasst:

Senden durch den Konvergenzknoten einer Anforderungsnachricht zu der Mikrozellenbasisstation, wobei die Anforderungsnachricht verwendet wird, um die Mikrozellenbasisstation anzuweisen, die Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle zu dem Konvergenzknoten zu senden.

4. Verfahren zum Managen von Informationen von Zeitsteuerungsdifferenzen zwischen Mikrozellen und einer Makrozelle, das Folgendes umfasst:

Erfassen (S401) durch eine Mikrozellenbasisstation von Informationen über eine Zeitsteuerungsdifferenz zwischen der Mikrozelle und einer benachbarten Makrozelle der Mikrozelle, wobei die Informationen über die Zeitsteuerungsdifferenz eine Rahmenzeitsteuerung der Mikrozelle und eine Rahmenzeitsteuerung der benachbarten Makrozelle der Mikrozelle umfassen; Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu einem Konvergenzknoten; Empfangen durch die Mikrozellenbasisstation von Befehlsinformationen zum Anpassen eines Rahmentaktwerts der Mikrozelle, wenn die Zeitsteuerungsdifferenz größer ist als ein voreingestellter erster Schwellenwert der Zeitsteuerungsdifferenz, wobei die Befehlsinformationen durch den Konvergenzknoten gesendet werden, wobei die Befehlsinformationen einen Versatz einer Systemrahmennummer der Mikrozelle und/oder einen Chip-Versatz eines Systemrahmens der Mikrozelle enthalten; und Anpassen (S402) durch die Mikrozellenbasisstation des Rahmentaktwerts der Mikrozelle gemäß den Befehlsinformationen, so dass Informationen über die Zeitsteuerungsdifferenzen zwischen Mikrozellen, die denselben primären Verwürfelungscode aufweisen und derselben Makrozelle benachbart sind, und der Makrozelle eindeutig sind.

5. Verfahren nach Anspruch 4, wobei das Erfassen durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle Folgendes umfasst:

Erfassen durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle aus einem Messbeuchter, der durch ein Anwendergerät gesendet wird; oder
Detektieren durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle gemäß einem voreingestellten Detektionszyklus.

6. Verfahren nach Anspruch 4 oder 5, wobei das Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten Folgendes umfasst:

Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten in jedem voreingestellten Berichtszyklus; oder

Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten, wenn sich die Mikrozellenbasisstation in dem Konvergenzknoten einträgt; oder

für die Mikrozellenbasisstation in jedem voreingestellten Berichtszyklus, wenn die Zeitsteuerungsdifferenz, die in den Informationen über die Zeitsteuerungsdifferenz enthalten ist, größer ist als der voreingestellte erstes Schwellenwert der Zeitsteuerungsdifferenz, Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten; oder

für die Mikrozellenbasisstation Senden durch die Mikrozellenbasisstation der Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten gemäß einer Berichtsanforderungsnachricht, die durch den Konvergenzknoten gesendet wird.

7. Verfahren nach Anspruch 4 oder 5 oder 6, wobei das Anpassen durch die Mikrozellenbasisstation des Rahmentaktwerts der Mikrozelle gemäß den Befehlsinformationen Folgendes umfasst:

Zurücksetzen durch die Mikrozellenbasisstation des Rahmentaktwerts der Mikrozelle auf einen voreingestellten Rahmentaktwert gemäß den Befehlsinformationen; oder

Anpassen durch die Mikrozellenbasisstation des Rahmentaktwerts der Mikrozelle gemäß einem Versatz des Rahmentaktwerts der Mikrozelle, wobei der Versatz in den Befehlsinformationen enthalten ist; oder

Neukonfigurieren durch die Mikrozellenbasisstation des Rahmentaktwerts der Mikrozelle und/oder eines Schwellenwerts der Zeitsteuerungsdifferenz gemäß Neukonfigurationsinformationen.

8. Konvergenzknoten zum Managen von Informationen über Zeitsteuerungsdifferenzen zwischen Mikrozellen und einer Makrozelle, die eine Empfangseinheit (51), eine Sendeeinheit (52) und eine Steuereinheit (53) umfasst, wobei:

die Empfangseinheit konfiguriert ist, Informationen über eine Zeitsteuerungsdifferenz zwischen der Mikrozelle und einer benachbarten Makrozelle der Mikrozelle zu empfangen und die Informationen über die Zeitsteuerungsdifferenz durch eine Mikrozellenbasisstation gesendet werden und eine Rahmenzeitsteuerung der Mikrozelle und eine Rahmenzeitsteuerung der benachbarten Makrozelle der Mikrozelle umfassen; falls die Zeitsteuerungsdifferenz größer ist als ein voreingestellter erster Schwellenwert der Zeitsteuerungsdifferenz, die Steuereinheit konfiguriert ist, die Sendeeinheit zu steuern, Befehlsinformationen zum Anpassen eines Rahmentaktwerts der Mikrozelle zu senden, wobei die Befehlsinformationen einen Versatz einer Systemrahmennummer der Mikrozelle und/oder einen Chip-Versatz eines Systemrahmens der Mikrozelle enthalten; und

die Sendeeinheit konfiguriert ist, gemäß der Steuerung durch die Steuereinheit zu der Mikrozellenbasisstation die Befehlsinformationen zum Anpassen des Rahmentaktwerts der Mikrozelle zu senden, so dass Informationen über Zeitsteuerungsdifferenzen zwischen Mikrozellen, die denselben primären Verwürfelungscode aufweisen und derselben Makrozelle benachbart sind, und der Makrozelle eindeutig sind.

9. Konvergenzknoten nach Anspruch 8, wobei die Steuereinheit ferner konfiguriert ist zu bestimmen, ob die empfangene Zeitsteuerungsdifferenz größer ist als der voreingestellte erster Schwellenwert der Zeitsteuerungsdifferenz, falls die Zeitsteuerungsdifferenz größer ist als der voreingestellte erster Schwellenwert der Zeitsteuerungsdifferenz, die Empfangseinheit ferner konfiguriert ist, Informationen, dass die Zeitsteuerungsdifferenz größer ist als der voreingestellte erster Schwellenwert der Zeitsteuerungsdifferenz, zu empfangen, und die Informationen durch die Mikrozellenbasisstation gesendet werden.

10. Konvergenzknoten nach Anspruch 8 oder 9, wobei die Sendeeinheit ferner konfiguriert ist, eine Anforderungsnachricht zu der Mikrozellenbasisstation zu senden, und die Anforderungsnachricht verwendet wird, die Mikrozellenbasisstation anzuweisen, die Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten zu senden.
11. Mikrozellenbasisstation zum Managen von Informationen über Zeitsteuerungsdifferenzen zwischen Mikrozellen und einer Makrozelle, die eine Erfassungseinheit (61), eine Empfangseinheit (63), eine Sendeeinheit (62) und eine Steuereinheit (64) umfasst, wobei:

- die Erfassungseinheit konfiguriert ist, Informationen über eine Zeitsteuerungsdifferenz zwischen der Mikrozelle und einer benachbarten Makrozelle der Mikrozelle zu erfassen, und die Informationen über die Zeitsteuerungsdifferenz eine Rahmenzeitsteuerung der Mikrozelle und eine Rahmenzeitsteuerung der benachbarten Makrozelle der Mikrozelle umfassen;
- die Sendeeinheit konfiguriert ist, Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle zu einem Konvergenzknoten zu senden;
- die Empfangseinheit konfiguriert ist, wenn die Zeitsteuerungsdifferenz größer ist als ein erster voreingestellter Schwellenwert der Zeitsteuerungsdifferenz, Befehlsinformationen zum Anpassen eines Rahmentaktwerts der Mikrozelle zu empfangen, wobei die Befehlsinformationen durch den Konvergenzknoten gesendet werden; und
- die Steuereinheit konfiguriert ist, den Rahmentaktwert der Mikrozelle gemäß den durch die Empfangseinheit empfangenen Befehlsinformationen anzupassen, so dass Informationen über die Zeitsteuerungsdifferenzen zwischen Mikrozellen, die denselben primären Verwürfelungscode aufweisen und derselben Makrozelle benachbart sind, und der Makrozelle eindeutig sind.

12. Mikrozellenbasisstation nach Anspruch 11, wobei die Erfassungseinheit die Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle aus einem Messbericht, der durch ein Anwendergerät gesendet wird, erfasst; oder die Erfassungseinheit die Informationen über die Zeitsteuerungsdifferenz zwischen der Mikrozelle und der benachbarten Makrozelle der Mikrozelle gemäß einem voreingestellten Detektionszyklus detektiert.

13. Mikrozellenbasisstation nach Anspruch 11 oder 12, wobei die Sendeeinheit die Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten in jedem voreingestellten Berichtszyklus sendet; oder die Sendeeinheit die Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten sendet, wenn sich die Mikrozellenbasisstation in dem Konvergenzknoten einträgt; oder die Empfangseinheit ferner konfiguriert ist, eine Berichtsanforderungsnachricht, die durch den Konvergenzknoten gesendet wird, zu empfangen, und die Sendeeinheit die Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten gemäß der Berichtsanforderungsnachricht sendet; oder die Steuereinheit ferner konfiguriert ist zu bestimmen, ob die Zeitsteuerungsdifferenz größer ist als ein voreingestellter erster Schwellenwert der Zeitsteuerungsdifferenz, und falls die Zeitsteuerungsdifferenz größer ist als der voreingestellte erste Schwellenwert der Zeitsteuerungsdifferenz, die Sendeeinheit die Informationen über die Zeitsteuerungsdifferenz zu dem Konvergenzknoten sendet.

14. Mikrozellenbasisstation nach einem der Ansprüche 11 bis 13, wobei die Steuereinheit ferner konfiguriert ist zu bestimmen, ob die Zeitsteuerungsdifferenz größer ist als der voreingestellte erste Schwellenwert der Zeitsteuerungsdifferenz, und falls die Zeitsteuerungsdifferenz größer ist als der voreingestellte erste Schwellenwert der Zeitsteuerungsdifferenz, die Sendeeinheit ferner konfiguriert ist, Informationen, dass die Zeitsteuerungsdifferenz größer ist als der voreingestellte erste Schwellenwert der Zeitsteuerungsdifferenz, zu dem Konvergenzknoten zu senden.

15. Mikrozellenbasisstation nach einem der Ansprüche 11 bis 14, wobei dann, wenn die Befehlsinformationen Rücksetzungsbefehlsinformationen sind, die Steuereinheit den Rahmentaktwert der Mikrozelle auf einen voreingestellten Rahmentaktwert zurücksetzt; oder, dann, wenn die Befehlsinformationen einen Versatz zum Anpassen des Rahmentaktwertes der Mikrozelle umfassen, die Steuereinheit den Rahmentaktwert der Mikrozelle gemäß dem Versatz anpasst; oder die Steuereinheit den Rahmentaktwert der Mikrozelle und/oder einen Schwellenwert der Zeitsteuerungsdifferenz gemäß Neukonfigurationsinformationen neu konfiguriert.

Reverdicaions

1. Procédé de gestion d’informations de différences de synchronisation entre des microcellules et une macro-cellule, comprenant :

- la réception (S101), par un noeud convergent, d’une information d’une différence de synchronisation entre la microcellule et une macro-cellule voisine de la microcellule,
dans lequel l’information de la différence de synchronisation est envoyée par une station de base des micro-cellules et comprend une synchronisation de trame de la microcellule et une synchronisation de trame de la macro-cellule voisine de la microcellule ; et si la différence de synchronisation est supérieure à une première valeur limite préétablie de la différence de synchronisation, l’envoi (S102), par le noeud convergent à la station de base des microcellules, d’une information d’instruction pour ajuster une valeur d’horloge de trame de la microcellule, dans lequel l’information d’instruction comporte un décalage d’un numéro de trame système de la microcellule et/ou un décalage de bribes d’une trame système de la microcellule, de telle sorte que l’information de différences de synchronisation entre les microcellules qui ont un même code de brouillage primaire et sont adjacentes à une même macro-cellule et la macro-cellule soit unique.

2. Procédé selon la revendication 1, dans lequel l’information d’instruction envoyée par le noeud convergent à la station de base des microcellules est une information d’instruction de réinitialisation, et l’information d’instruction de réinitialisation est utilisée pour ordonner à la station de base des microcellules de réinitialiser la valeur d’horloge-de-trame de la microcellule sur une valeur d’horloge de trame préétablie ; ou, l’information d’instruction envoyée par le noeud convergent à la station de base des microcellules comprend un décalage pour ajuster la valeur d’horloge de trame de la microcellule, et l’information d’instruction est utilisée pour ordonner à la station de base des microcellules d’ajuster la valeur d’horloge de trame de la microcellule en fonction du décalage.

3. Procédé selon la revendication 1 ou 2, comprenant, avant la réception, par le noeud convergent, de l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule, l’information de la différence de synchronisation étant envoyée par la station de base des microcellules :

- l’envoi, par le noeud convergent, d’un message de requête à la station de base des microcellules, dans lequel le message de requête est utilisé pour ordonner à la station de base des microcellules d’envoyer l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule au noeud convergent.

4. Procédé de gestion d’informations de différences de synchronisation entre des microcellules et une macro-cellule, comprenant :

- l’acquisition (S401), par une station de base des microcellules, d’une information d’une différence de synchronisation entre la microcellule et une macro-cellule voisine de la microcellule, dans lequel l’information de la différence de synchronisation comprend une synchronisation de trame de la microcellule et une synchronisation de trame de la macro-cellule voisine de la microcellule ; et l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation à un noeud convergent ;
- la réception, par la station de base des microcellules, d’une information d’instruction pour ajuster une valeur d’horloge de trame de la microcellule quand la différence de synchronisation est supérieure à une première valeur limite préétablie de la différence de synchronisation, dans lequel l’information d’instruction est envoyée par le noeud convergent, dans lequel l’information d’instruction comporte un décalage d’un numéro de trame système de la microcellule et/ou un décalage de bribes d’une trame système de la microcellule ; et l’ajustement (S402), par la station de base des microcellules, de la valeur d’horloge de trame de la microcellule conformément à l’information d’instruction, de telle sorte que l’information de différences de synchronisation entre des microcellules qui ont un même code de brouillage primaire et sont adjacentes à une même macro-cellule et la macro-cellule soit unique.

5. Procédé selon la revendication 4, dans lequel l’acquisition, par la station de base des microcellules, de l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule comprend :

- l’acquisition, par la station de base des microcellules, de l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule à partir d’un rapport de mesure envoyé par un équipement utilisateur ; ou
- la détection, par la station de base des microcellules, de l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule en fonction d’un cycle de détection préétabli.
6. Procédé selon la revendication 4 ou 5, dans lequel l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent comprend :

l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent dans chaque cycle de signalement préétabli ; ou,

quand la différence de synchronisation comprise dans l’information de la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent ; ou, l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent quand la station de base des microcellules s’enregistre auprès du noeud convergent ; ou,

pour la station de base des microcellules dans chaque cycle de signalement préétabli, quand la différence de synchronisation comprise par l’information de la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent ; ou,

pour la station de base des microcellules, l’envoi, par la station de base des microcellules, de l’information de la différence de synchronisation au noeud convergent conformément à un message de requête de signalement envoyé par le noeud convergent.

7. Procédé selon la revendication 4 ou 5 ou 6, dans lequel l’ajustement, par la station de base des microcellules, de la valeur d’horloge de trame de la microcellule conformément à l’information d’instruction comprend :

la réinitialisation, par la station de base des microcellules, de la valeur d’horloge de trame de la microcellule sur une valeur d’horloge de trame préétablie conformément à l’information d’instruction ; ou,

l’ajustement, par la station de base des microcellules, de la valeur d’horloge de trame de la microcellule conformément à un décalage de la valeur d’horloge de la microcellule, dans lequel le décalage est compris dans l’information d’instruction ; ou, la reconfiguration, par la station de base des microcellules, de la valeur d’horloge de trame de la microcellule et/ou d’une valeur limite de la différence de synchronisation conformément à une information de reconfiguration.

8. Noeud convergent pour la gestion d’informations de différences de synchronisation entre des microcellules et une macro-cellule, comprenant une unité de réception (51), une unité d’envoi (52) et une unité de commande (53), dans lequel :

l’unité de réception est configurée pour recevoir une information d’une différence de synchronisation entre la microcellule et une macro-cellule voisine de la microcellule, et l’information de la différence de synchronisation est envoyée par une station de base des microcellules et comprend une synchronisation de trame de la microcellule et une synchronisation de trame de la macro-cellule voisine de la microcellule ; si la différence de synchronisation est supérieure à une première valeur limite préétablie de la différence de synchronisation, l’unité de commande est configurée pour commander à l’unité d’envoi d’envoyer une information d’instruction pour ajuster une valeur d’horloge de trame de la microcellule, dans lequel l’information d’instruction comporte un décalage d’un numéro de trame système de la microcellule et/ou un décalage de bribes d’une trame système de la microcellule ; et l’unité d’envoi est configurée pour, conformément à une commande par l’unité de commande, envoyer à la station de base des microcellules l’information d’instruction pour ajuster la valeur d’horloge de trame de la microcellule, de telle sorte que l’information de différences de synchronisation entre les microcellules qui ont un même code de brouillage primaire et sont adjacentes à une même macro-cellule et la macro-cellule soit unique.

9. Noeud convergent selon la revendication 8, dans lequel l’unité de commande est configurée en outre pour déterminer que la différence de synchronisation reçue est supérieure ou non à la première valeur limite préétablie de la différence de synchronisation,

si l’information de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, l’unité de réception est configurée en outre pour recevoir une information que la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, et l’information est envoyée par la station de base des microcellules.

10. Noeud convergent selon la revendication 8 ou 9, dans lequel l’unité d’envoi est configurée en outre pour envoyer un message de requête à la station de base des microcellules, et le message de requête est utilisé pour ordonner
à la station de base des microcellules d’envoyer l’information de la différence de synchronisation au noeud convergent.

11. Station de base de microcellules pour la gestion d’informations de différences de synchronisation entre des microcellules et une macro-cellule, comprenant une unité d’acquisition (61), une unité de réception (63), une unité d’envoi (62) et une unité de commande (64), dans laquelle :

l’unité d’acquisition est configurée pour acquérir une information d’une différence de synchronisation entre la microcellule et une macro-cellule voisine de la microcellule, et l’information de la différence de synchronisation comprend une synchronisation de trame de la microcellule et une synchronisation de trame de la macro-cellule voisine de la microcellule ;

l’unité d’envoi est configurée pour envoyer l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la macro-cellule à un noeud convergent ;

l’unité de réception est configurée pour envoyer l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la macro-cellule à un noeud convergent ;

12. Station de base de microcellules selon la revendication 11, dans laquelle l’unité d’acquisition acquiert l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule à partir d’un rapport de mesure envoyé par un équipement utilisateur ; ou

l’unité d’acquisition détecte l’information de la différence de synchronisation entre la microcellule et la macro-cellule voisine de la microcellule en fonction d’un cycle de détection préétabli.

13. Station de base de microcellules selon la revendication 11 ou 12, dans lequel l’unité d’envoi envoie l’information de la différence de synchronisation au noeud convergent dans chaque cycle de signalisation préétabli ; ou,

l’unité d’envoi envoie l’information de la différence de synchronisation au noeud convergent quand la station de base des microcellules s’enregistre auprès du noeud convergent ; ou,

l’unité de réception est configurée en outre pour recevoir un message de requête de signalisation envoyé par le noeud convergent, et l’unité d’envoi envoie l’information de la différence de synchronisation au noeud convergent conformément au message de requête de signalisation ; ou,

l’unité de commande est configurée en outre pour déterminer que la différence de synchronisation est supérieure ou non à la première valeur limite préétablie de la différence de synchronisation, et si la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, l’unité d’envoi envoie l’information de la différence de synchronisation au noeud convergent.

14. Station de base de microcellules selon l’une quelconque des revendications 11 à 13, dans laquelle l’unité de commande est configurée en outre pour déterminer que la différence de synchronisation est supérieure ou non à la première valeur limite préétablie de la différence de synchronisation, et si la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation, l’unité d’envoi est configurée en outre pour envoyer l’information que la différence de synchronisation est supérieure à la première valeur limite préétablie de la différence de synchronisation au noeud convergent.

15. Station de base de microcellules selon l’une quelconque des revendications 11 à 14, dans laquelle si l’information d’instruction est une information d’instruction de réinitialisation, l’unité de commande réinitialise la valeur d’horloge de trame de la microcellule sur une valeur d’horloge de trame préétablie ; ou

si l’information d’instruction comprend un décalage pour l’ajustement de la valeur d’horloge de trame de la microcellule, l’unité de commande ajuste la valeur d’horloge de trame de la microcellule conformément au décalage ; ou

l’unité de commande reconfigure la valeur d’horloge de trame de la microcellule et/ou une valeur limite de la différence de synchronisation conformément à une information de reconfiguration.
A convergent node receives information of a timing difference between a micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference is sent by a micro cell base station and includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

If the timing difference is greater than a preset first threshold value of the timing difference, the convergent node sends the micro cell base station instruction information for adjusting a frame clock value of the micro cell, or sends the micro cell base station reconfiguration information for reconfiguring timing parameters of the micro cell.

FIG. 1

Micro cell base station

Acquire information of a timing difference

Send the information of the timing difference

Send adjustment instruction information or reconfiguration information

Receive the instruction information or the reconfiguration information

Adjust a frame clock value or reconfigure timing parameters

convergent node

Receive the information of the timing difference

FIG. 2
A micro cell base station acquires information of a timing difference between the micro cell and a neighboring macro cell of the micro cell, where the information of the timing difference includes the timing difference between the micro cell and the neighboring macro cell of the micro cell, or the information of the timing difference includes a frame timing of the micro cell and a frame timing of the neighboring macro cell of the micro cell.

If the micro cell base station determines that the timing difference between the micro cell and the neighboring macro cell of the micro cell is greater than a preset first threshold value of the timing difference, the micro cell base station adjusts a frame clock value of the micro cell, so that the timing difference between the micro cell and the neighboring macro cell of the micro cell is less than the preset first threshold value of the timing difference.
REFERENCES CITED IN THE DESCRIPTION

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