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(54) **Title:** IDENTIFICATION OF UNIQUE CELL IDENTITY FOR BUILDING NEIGHBOUR CELL RELATION

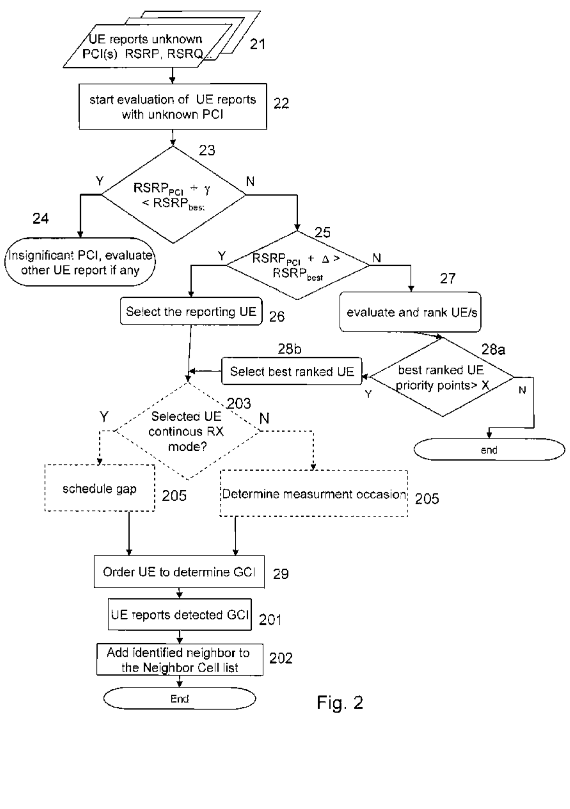

Fig. 2

(57) **Abstract:** The present invention relates to cellular communications networks and in particular to a method for determining the unique identity of a neighbouring cell as reported by a mobile terminal for the autonomous establishment of neighbour cell C1, C2 relations by the radio base stations (12). For a neighbour cell relation to be established, the unique cell identity of the cell is needed in addition to the physical cell identity as is included in the reports from an active mode terminal. It is cumbersome for an active mode mobile terminal to determine the unique cell identity, and it impacts the traffic service to the mobile terminal. The present invention present a method for finding a mobile terminal capable of determining the unique cell identity with as little impact on its service as possible. Also, the need for selecting a mobile terminal for detecting the unique cell identity is adapted to how urgent it is to establish the cell relation.

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IDENTIFICATION OF UNIQUE CELL IDENTITY FOR BUILDING NEIGHBOUR CELL RELATION

TECHNICAL FIELD OF THE INVENTION

The present invention relates to cellular communications systems that are arranged to be self organizing in terms of operational information, and especially to a method for building neighbour cell relations.

BACKGROUND

E-UTRAN is a cellular radio network standardized by 3GPP. E-UTRAN is often also referred to as LTE, Long Term Evolution of 3G cellular systems.

In cellular systems preceding E-UTRAN, it is a cumbersome task for the network operator to provide system information and parameters to make the nodes of the system inter-operable.

In E-UTRAN system it is considered important that network parameters and nodes are tuned automatically and swiftly. This simplifies the task of network management, planning and tuning.

Figure 1 discloses a E-UTRAN network comprising of 3 base stations 12 that are connected via X2 interfaces. Each base station 12 has one or more cells, C1-C6 for serving mobile terminals with communication. A cell is a set of logical resources that are physically provided by the base station. In practice a cell can be seen as providing services to mobile terminals within a geographical area, comprising the coverage area of logical resources such as radio channels. In the LTE system the mobile terminal is named UE (User Equipment), the base station eNodeB and that will be used in the further description. In all cellular systems each cell has a set of defined neighbour cells, provided in a cell specific neighbour cell list.

A UE, when in active mode, frequently measure the radio quality of the radio link in the serving cell, ie. the radio link providing communication service. The UE also measure the quality of a broadcast channel in the neighbour cells. For LTE the UE measures broadcasted pilot signals and reports those found to have a signal quality above a predefined threshold, irrespective of the cell being defined as neighbour or not. The UE send a report on measured cells frequently to the serving cell. The purpose of these measurements and reports is to evaluate which cell is the best for providing the radio link and make handover to a new cell if it is better cell than the serving cell. Thereby overall system interference can be reduced and requested QoS provided to the UE user.

Self Organizing Network

In E-UTRAN there is considerable emphasis on developing the frame work for self organizing network (SON). The idea is to allow for network nodes to autonomously plan and tune network parameters.. The conventional method is based on manual tuning, which consumes enormous amount of time, resources and requires considerable involvement of work force.

Due to network complexity, large number of system parameters, IRAT technologies etc., it is very attractive to have reliable schemes to perform the test of self organization in the network whenever necessary.

The present invention will be described with example in the E-UTRAN because it is the first cellular system for which efforts are mode for easing the burden of network management, albeit the same problem and solution is applicable also to other cellular systems such as GSM and 3G WCDMA if their operations should be simplified from the operators point of view.

Establishment of Automatic Neighbour Cell Relation

An operator can add or delete a cell or an entire eNodeB with multiple cells. Especially new cells are added more frequently during an early phase of network deployment. In the later stages an operator can still upgrade the network by adding more carriers or more eNodeBs on the same carrier. It can also add cells related to another technology.

When a new cell is added a relation between the existing cells and the new cell has to be established. This is called as neighbour cell relation and is recoded in the neighbour cell list. This relation can either be established manually in a conventional manner or via a self organizing methodology. The automatic neighbour cell relation (ANR) establishment is part of the self organizing network (SON).

Since UE performs measurements on the neighbour cells (cell identification and downlink measurements) on regular basis therefore UE reports are considered to be used for establishment of ANR. In E_UTRA the eNodeB decides on the handover and instructs the target eNodeB of an incoming handover taking place. The serving cell/eNodeB needs information not only on the neighbour cell but also on eNodeB providing the cell and the IP address for the eNodeB to be able to contact it over the X2 interface. If the serving cell has a unique identity of the neighbour cell it will contact a server and receive information on the eNodeB serving the cell and IP address of the eNodeB.

Physical Layer Cell ID (PCI)

When a UE measures and reports on cells other that the serving cell, the UE also has to report on the identity of respective cell and for this purpose the physcial cell identity is used. The physical layer cell ID is detected by the UE during the synchronization process i.e. while decoding the SCH channels in E-UTRAN. In WCDMA the UE has to decode the cell specific scrambling code to acquire the PCI.

There is only limited number of PCI, which therefore have to be reused. In E-UTRAN and WCDMA there are 510 and 256 unique PCI. In small cells they may soon run out causing ambiguity regarding the actual cell.

The UE reports only PCI to the serving cell for handover purposes.

The time required to decode PCI depends upon the synchronization channel (SCH) design and received level of the SCH. In E-UTRA and WCDMA the PCI may take few 10's of ms if the signal is strong or moderately week. On the other hand it may take several 100's of ms or even few seconds to decode PCI if receive SCH signal is very week.

Global Cell ID (GCI)

The global cell ID (GCI) is unique in the entire network (e.g. PLMN). It is sent using higher layer signalling via the system information. Thus in order to get the GCI the UE has to decode the system information of that cell.

In E-UTRAN the UE has to first read the primary BCH (P-BCH) to get the scheduling information e.g. resource blocks where D-BCH appears. The second step is to read the D-BCH to get the GCI. It may take the UE less than 10 ms to decode the GCI of a target cell provided the radio conditions are good and the measurement occasion is scheduled at the correct time instance by the serving cell. Typically, it will take considerably more time to decode the GCI than the PCI, because the GCI is available at spread occasions transmitted more sparesly than the PCI. Due to UE complexity reason there is no requirement on the UE to concurrently receive data and D-BCH since they are both mapped on two different downlink shared channel. This implies that the UE cannot concurrently receive data from the serving cell when it is reading GCI. In order to prevent the interruption of data reception from the serving cell the time to read GCI should be minimized.

Problems with existing solutions

The main problem is the decoding of the GCI may take very long time for the UE. The UE may need to monitor several occasions when the GCI is transmitted until the GCI can be detected. Moreover, during the period the UE monitors the P-BCH and D-BCH for the GCI, it cannot receive data from the serving cell. This causes interruption in the DL traffic.

SUMMARY OF THE INVENTION

The object of the present inventions is to enable identification of neighbour cell Global Cell Identity when a cell neighbour relation need be built, with as little impact on downlink traffic as possible.

A solution is provided with a method relating to a first cell that receives a respective measure from one or more of its active mobile terminals, were the measure includes the physical cell identity of a second cell of which the first cell has no cell relationship. For at least one the reports received, the radio quality of the second cell is compared according to:

- if the radio quality is less than a first threshold the measure is ignored; else if,
- if the radio quality is higher than a second threshold the reporting mobile terminal is selected, else
- it is estimated which of the reporting mobile terminals that would have the least impact on its data service, and if the impact is extimated to be within a third threshold, the least impacted mobile terminal is selected.

Provided a mobile terminal is selected it is instructed to determine the unique cell identity of the second cell. When the unique cell identity is received from the mobile terminal it is included in the record of cell relations with the non-unique cell identity of the second cell.

The Invention provides the advantages of;

- The methods minimize data interruption when UE is requested to measure the global cell ID.
- Allows an appropriate establishment of neighbour cell relations.
- For an embodiment that takes account of data reception mdoe in the mobile terminal the methods minimize UE power consumption when GCI is requested to be measured.
- An embodiment of the invention allows for shorter and fewer gaps or measurement occasions can be used for GCI decoding.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a view of a E-UTRAN cellular system (prior art).

Figure 2 is a flowchart disclosing a inventive method

Figure 3 is a flowchart disclosing a inventive method.

DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 discloses a E-UTRAN system with 3 eNodeBs 12, each providing a number of cells C1-C6. In each cell there are a number of UEs. In figure 1 is however, only one UE 11 disclosed. It is in active mode and the first cell C1 is providing the radio communication with the UE11, and acts serving cell C1 when a new cell C2 is introduced into the system.

In all cellular systems the active mode UE 11, reports to the serving cell C1 on the radio quality it measures from other cells C2-C6. The neighbour cell measurements are typically performed by the UE over 200 ms period. The network can in addition configure UE to perform additional time domain averaging of these measurements. The measurements can be reported in event triggered or periodic manner, which is set by the network. The serving eNodeB requests a UE to report one or more types of measurements e.g. signal strength, physical layer cell ID (PCI) etc from at most N and M best cells on the serving carrier frequency (intra-frequency) and inter-frequency carriers respectively; typically N = 6-8 and M = 4-6, also N < M. The UE detects which cells are the best and report these to the serving cell/eNodeB C1. Similar mechanism is also employed in UTRAN system.

Accordingly a cell serving plural active mode UEs receives a plurality of reports on other cells during a period corresponding to a UE reporting interval, at least one report from each active mode UE. When the new cell C2 is introduced and because it is not far from the UE in the first cell C1 the first cell will receive measurement reports including PCI of teh second cell C2 from one or more of the active mode UEs that have the second cell C2 as serving cell. The absence of established neighbour cell relation will in the future description be referred to the cell is missing in neighbour cell list. The PCI is a non unique cell identity in the network.

The global cell ID is unique in the whole network and is sent on higher layer signalling via the system information. Thus in order to decode global cell ID the UE has to decode system information. The UE can be requested to measure GCI when it is in continuous reception or DRX modes.

Figure 2 is a flowchart of a method for identifying a cell and establish the neighbour cell relationship. In the fist step, 21, the serving cell C1 and serving eNodeB receives a measurement report including an PCI of the second cell. The measurement report, including non identified PCI, is received from one or more UEs, illustrated by overlapping boxes in step 21. The second step 22, illustrates the process of evaluation is for a first of the one or more reports on the second cell. All the reports considered arereceived within an evaluation period with a typical length of the period the UE 11 will send a new report and that is about 200 ms. A first evaluation, 23, of the second cell as measured by the UE11, is for determining whether it is of interested to include in neighbour cell list at all. If the reported quality is below threshold level, i.e. yes in step 23, the information on the cell with unknown PCI is ignored, 24, and no further action is taken. In the first evaluation the quality of the unknown cell, typically in form of the RSRP (Reference Signal Received Power) is compared to the RSRP of the best cell. The best cell is probably the serving cell C1 but may also be another cell C3-C6. If the second cell RSRP plus a predefined offset value γ is is at least as good as the best cell then possible detection of the GCI for the second cell shall be further evaluated, in step 25. The predefined value γ is considerably lower than the quality of the best cell, typically 10 dB.

In step 25 is checked whether it is likely the reporting UE need to make a handover to the unknown cell ~~within short~~ shortly, and if so, yes in step 25, it is urgent to include the unknown cell in the neighbour cell list. The Evaluation is performed in the same way as in step 23, albeit with another predefined offset value Δ, that is typically 3dB. Thus, on condition the second cell has a RSRP that is better than 3 dB below the RSRP of the best cell, then it is decided, in step 26, that the UE reporting the PCI shall detect the GCI of the second cell.. If, however, the RSRP of the second cell is less than that of the best RSRP minus 3 dB , the UEs that have reported on the PCI during the report period are evaluated, 27, to find out the best suited, if any, for determining the GCI of the second cell. The evaluation could simply be to find out if the reporting UE is suitable for detecting the GCI.. The evaluating step 27, can be further refined as will be described below with reference to figure 3.

After step 27, follows 28a, and that controls if the best suited UE is classified for determining GCI. If not, it is decided not to make any GCI determination. In a next reporting and evaluation period, starting again from step 21, the outcome may be different. If, however, a UE is found for determining the GCI, i.e. yes in step 28b or in step 25, the selected UE is ordered to determine the GCI of the cell with unknown PCI, see step 29. The GCI report is received from UE in step 201, and the PCI and GCI is included in the neighbour list in the last step 202. Thereby the method is ended. It will be repeated if a further PCI is reported that is not included in the neighbour list.

Steps 32, 33, and 34 are optional and will be described further down. If not performed the step 29 will follow on step 26 and on step 28 if its condition is met.

The neighbour list is further updated with information on the IP address of the eNodeB newly found neighbour cell when the serving eNodeB has requested and received the IP address from a server, typically a DNS server. 3GPP standard provided information on how the serving eNodeB receives information on the IP address of eNodeB with reference to the GCI and is not part of this invention.

If the inventive method had been described from the newly introduced cell C2, the cell would receive reports on a plurality of new cells as soon as there is an active mode mobile terminal in the second cell. The method of figure 2 would then be performed in parallel for each of the unknown cell reported.

Figure 3 discloses the step of evaluating all the UEs that have reported on the second cell, within the evaluation period. Each UE has its respective points updated in the steps 32,34,36,38 assigning priority points. It may though be only one reporting UE that is evaluated. In the first step 31, the priority points of each UE are set to zero.

Next, 32 is checked whether each UE is in DRX mode, i.e. discontinuous transmission mode, if it is the priority points are updated with first weight W_1. in step 33 otherwise the priority points are not updated. Next, 34, is checked if the downlink data rate transmitted to the respective UE is below a threshold of being low. If it is a second weight w_2 with points is added to the UE in step 5, otherwise no further points are added.

Next, 36, the velocity of each UE is estimated and compared to a threshold level for being low. If low, further a third weight w3 with points is added to the total sum of points for the UE, otherwise no further points are added.

In the next step, 38, a fourth weight w_4 of points are added to the respective UE and the point added being a function of the signal quality the UE has measured from the second cell, the function can for example be expressed as:

$$\boldsymbol{P} = \boldsymbol{P} + w4\ (1 - |\ RSRP_{best}\ -\ RSRP_{PCI}\ |\ /\ \alpha\ )$$

If the RSRP measured by the UE on the second cell is the highest RSRP of any cell measure in the same report, the UE priority points is updated with the total weight w_4, available unless α scaling factor is set to higher value than 1. α will typically be set to the value of Δ.

Thereby all the points available are added to respective UE and in the step 39, the UEs are ranked according to their priority points, and last the procedure retuns back to figure 2, step 28a.

Any or all of the first three weight factors, w1 – w3 may be set to zero and the controlling of DRX mode, low data rate and UE velocity in steps 32-36 are optional. If all of them are excluded, selection of a UE for detecting the GCI of the second cell, will only be based on the signal quality measured by the UE in the second cell. Sufficient signal quality is needed for the UE to be able to correctly detect the GCI within a short time span. It is though preferred that any of the parameters DRX mode, data rate for DL data to the UE and the UE velocity is included in the evaluation, because, they all are important for how the transmission of data is impacted when the UE determine the GCI of the second cell. If UE is in DRX mode there are intervals between periods of data reception, and that can be used for determining the GCI.

Also if the rate of data to the UE is low, it is easier to scheduled a gap in the data flow, for the UE to be able to determine the GCI during the gap. The serving eNodeB has information on the data rate to the UE as well as of any DRX mode, and thus the information is available for the method since it is intended to be performed mainly by the serving eNodeB.

If the UE is moving with a high speed the signal strength of a received a radio channel often varies rapidly and this may negatively impact the detection of the GCI. For that reason a UE with high velocity should be avoided for detecting the GCI. The UE velocity can simply be estimated by the variations in signal strength as received by the serving eNodeB from the UE. Alternatively the velocity is determined from the frequency of Doppler shifts in the signal received from the UE, or by the UE informing of its speed as detected by a GPS receiver.

In figure 2, the steps 203, 204, 205 are optional. In 203 is checked whether the DL data reception mode of the UE is continuous or discontinuous, ie. DRX. If continuous mode, then the serving eNodeB may schedule a transmission gap, in step 204, when it does not transmit any data to the selected UE. The eNode informs of when the gap occurs, and when the UE is to detect the GCI in the order transmitted in step 29.

If in step 32, the UE is in DRX mode, it is determined when the UE shall detect the GCI, this will be further described below.

Use of Timing Information to schedule gap (step 204)

The network can make use of any timing information related to the second cell to schedule the gap at the most appropriate time instance for instance just prior to the start of D-BCH transmission, which broadcasts the GCI. The advantage is that the gap length can be shortened and therefore network can speed up GCI detection process. The timing information may comprise of frame timing of the second cell. In addition the combination of frame timing and propagation delay between the UE and the second cell can especially be useful in scheduling the gap at the correct time.

Reference timing of Second Cell

Timing of the gap is optionally further improved when the serving cell directly or indirectly acquires the reference timing of the second cell whose GCI is to be decoded by the UE. The reference timing can be the frame timing or occurrence of BCH etc.

The advantage of this method is that by using this timing knowledge the serving cell will schedule the gap or measurement occasion window during the time when the P-BCH and especially D-BCH appears. The advantage is that serving cell can schedule very short gap. In case radio conditions are good the UE can decode the GCI in single measurement occasion or gap. Otherwise it may require few gaps to decode the GCI. Nevertheless each gap whether single or periodic can be set to smallest possible length in time, which is sufficient enough to get the required GCI. This type of precision in the gap length cannot be scheduled without the second cell reference timing information.

The reference timing of the second cell can be attained by any means including any state of the art techniques.

One option is to get the timing directly from the second cell over some fixed interface. Since the neighbour relation with this second cell does not exists, therefore advanced information such as reference timing may not be available at the first place i.e. before neighbour relation is well established. Nevertheless if the timing information is available to the serving cell then it can schedule the measurement gap at an instant and of length which are most appropriate for measuring the GCI.

Another possibility is that when a UE reports PCI of an second cell, the network requests the UE to report time difference between the serving and the known cell. The network can approximately retrieve the reference timing of the second cell as explained below.

Let the reported time difference between the serving cell and second cell is represented by state of the art technique in (1):

$$\Delta\mu = (\Gamma_1 + \delta\tau_1) - (\Gamma_2 + \delta\tau_2) \qquad (1)$$

Γ_1; is the absolute transmission time of serving cell
Γ_2; is the absolute transmission time of second cell
$\delta\tau_1$; is one way propagation delay between the UE and the serving cell.
$\delta\tau_2$; is one way propagation delay between the UE and the second cell.

The

$$\Gamma_2 = \Gamma_1 - \Delta\mu + \delta\tau_1 - \delta\tau_2 \quad (2)$$

The serving cell knows Γ_1, $\Delta\mu$ and can estimate $\delta\tau_1$. If cells are not very large then $\delta\tau_2$ can be neglected or assumed same as $\delta\tau_1$ leading to (3):

$$\Gamma_2 \approx \Gamma_1 - \Delta\mu + \delta\tau_1 \quad (3)$$

Thus using (3) the serving cell can get the reference (e.g. frame timing) of the second cell and schedule the measurement occasion at the right occasion.

In synchronized cells since frame timings are the same therefore gap activation can easily be scheduled at the right occasion. But there might still be some drift in timing of the serving and the second cells. Thus reference timing of an second cell used for gap activation for GCI decoding can be refined by using any time difference measurements reported by the UE.

Propagation delay between UE and second cell

By knowing the propagation delay between the serving and second cell ($\delta\tau_2$), the serving cell can infer whether the UE is closer to an second cell or not. The serving cell will can measure the propagation delay of UE:s that report PCI of one or more second cell.

The delay for the signal to propagate from the UE to the second cell can be a further parameter to be assigned weights in the evaluation made in figure 3. A UE with low propagation delay to the second cell is preferred over a UE with high propagation delay.

In synchronized network the propagation delay for a UE w.r.t. the second cell can be calculated using the following state of the art method expressed in (4), i.e. based on (1), which in turn relies on time difference reported by the UE to the seving cell:

$$\delta\tau_2 = \delta\tau_1 - \Delta\mu \qquad (4)$$

In unsynchronized network the propagation delay estimation requires absolute timing information from the second cell as expressed in (5):

$$\delta\tau_2 = \Gamma_1 + \delta\tau_1 - \Gamma_2 - \Delta\mu \qquad (5)$$

Measurement Occasions for GCI in DRX Mode (Step 32)

A gap in the DL transmission is created for the UE 11 to be able to measure the GCI from the second cell during the gap. Gaps are created when UE is in continuous reception mode (non DRX). The gaps cause interruption in data reception. In DRX mode a measurement opportunity is typically called measurement occasion.

A measurement occasion for requesting UE to measure GCI of the second cell can also be created when UE is operating in DRX (preferably in active mode DRX). In DRX UE does not receive data or receives it very infrequently. Therefore creation of measurement occasion will not cause any significant interruption in data reception. This concept of requesting UE to track GCI in DRX is well known. However unnecessary longer measurement occasion will increase UE power consumption since in that case the UE will have to remain active for a longer time.

GeneralizationsThe present invention can be applied in previously employed systems such as GSM or WCDMA, as well as in future systems. The UE and eNodeb of the present inventions shall be understood to be a mobile terminal and a radio base station in any cellular network. The invention is also applicable when a neighbour cell relation need to be established with a cell in a radio access network employing another radio access technology than that of the serving cell C1. For example a UE in served by the E-UTRA second cell C1, reports on the physical cell identity of a second cell provided by a WCDMA base station, then the serving cell eNodeB evaluates which UE to determine the unique identity of the WCDMA second cell and if the reporting UE is selected it determines the unique identity of the WCDMA cell and reports to the serving cell.

Abbreviations and acronyms

UE: User Equipment

eNodeB: evolved NodeB

UTRAN: UMTS Terrestrial Radio Access Network

E-UTRAN: Evolved UTRAN

WCDMA: Wideband code division multiple access

BCH: Broadcast channel

SCH: Synchronization channel

PCI: Physical layer cell identification

GCI: Global cell identification

DRX: Discontinuous reception

RSRP: Reference Symbol Received Power

RSRQ: Reference Symbol Received Quality

CLAIMS

1.Method relating to a first cell (C1) for identifying a second cell (C2) for building neighbour cell relation, the first cell serving a plurality of active mode mobile terminals (UE) , the method comprising the steps of,

- receiving from one or more of said plurality of mobile terminals a respective report including a non-unique identity of the second cell, (C2) a quality measure of the radio quality from the second cell, and including non-unique identity of, and quality measure from, one or more further cells (C3 –C6) ,
- identifying information on a unique cell identity of the second cell is missing in a record of cell relations, **characterised by** for at least one of the reports received performing the further steps of:
- comparing the reported DL radio quality of the second cell to threshold; and if,
  - the second cell DL radio quality is less (23) than a predefined offset value γ , then ignore (24) the report, else if,
  - the second cell DL radio quality is better (25) than a predefined offset value Δ, then select (26) the mobile terminal (UE) that has provided the compared report; else,
  - estimating (27) which of said one or more terminals that would experience the least service impact on downlink transmission if to determine the unique cell identity of the second cell, and provided (28a) the service impact is estimated to be within a predefined limitation, selecting (28b) the mobile terminal estimated to have the least service impact;

and if the comparing step results in a mobile terminal being selected perform the further steps of,

- ordering the selected mobile terminal to determine the unique cell identity of the second cell (C2) ;
- receiving the second cell unique cell identity;
- including the non-unique and the unique cell identities and their association in the record of cell relations.

2. Method according to claim 1, wherein the report/s from one or more mobile terminals is/are received within an evaluation period that is related to an interval of the mobile terminal providing reports.

3. The method of claim 1 or 2 wherein in the comparing step the comparison is made between the reported DL radio quality of the second cell and the best reported DL radio quality of any of said further cell/s; and if,

  - the second cell DL radio quality plus the predefined offset value γ is less (23) than that of the best reported DL radio , then ignore (24) the report, else if,

  - the second cell DL radio quality plus the predefined offset value Δ is better (25) than that of the best reported DL radio quality, wherein $\Delta < \gamma$, then select (26) the mobile terminal (UE) that has provided the compared report.

4. Method according to claim 1 or 2, wherein if the report is ignored due to the comparison of the offset value γ, the method is repeated for another report received if any.

5. Method according to claim 1 or 2 wherein in the estimating step the signal strength of the second cell as provided from all reporting mobile terminals are compared.

6. The method of claim 1, 2 or 3, wherein in the estimating steps the service impact is estimated as a function of the signal strength received by the mobile terminal from the second cell.

7. The method of claim 1, 2, 3 or 6 wherein in the estimating step if the mobile terminal is in DRX mode the service impact is estimated to be low.

8. The method of claim 1, 2, 3, 6 or 7 wherein in the estimating step if the data rate to mobile terminal is below a threshold level the service impact is estimated to be low.

9. The method of claim 1, 2, 3, 6, 7 and 8 wherein in the estimating step if the data rate to mobile terminal is below a threshold level the service impact is estimated to be low.

10. The method of claim 1, 2, 3, 6, 7 and 8 wherein in the estimating step if a velocity of any movements of the mobile terminal is below a threshold level the service impact is estimated to be low.

11. The method of claim 1 or 2 wherein if a data reception mode of the selected mobile terminal is continuous mode, a gap is scheduled in the downlink transmission and the mobile terminal is informed of the gap scheduling for the purpose of determining the unique identity of the second cell.

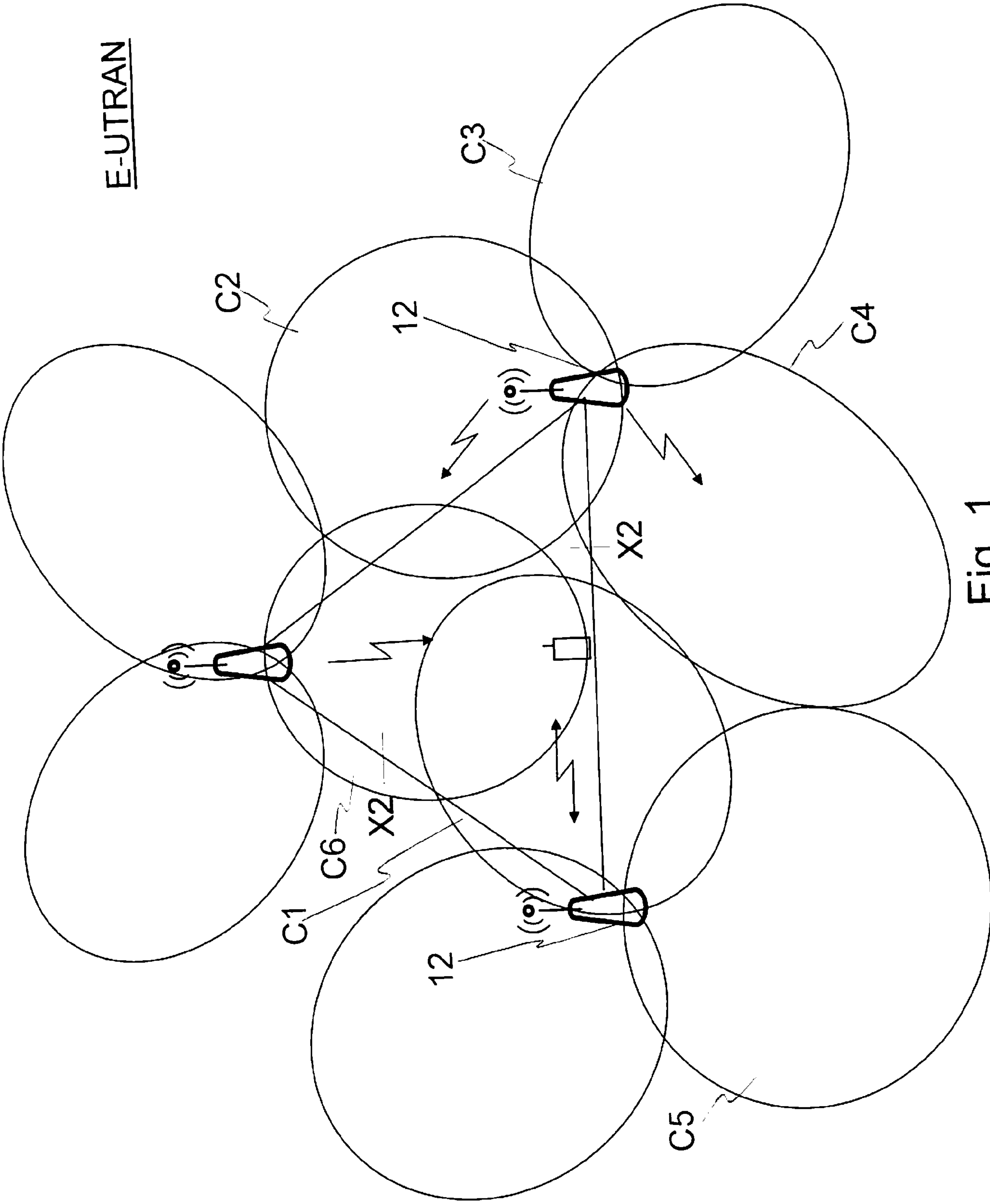

Fig. 1

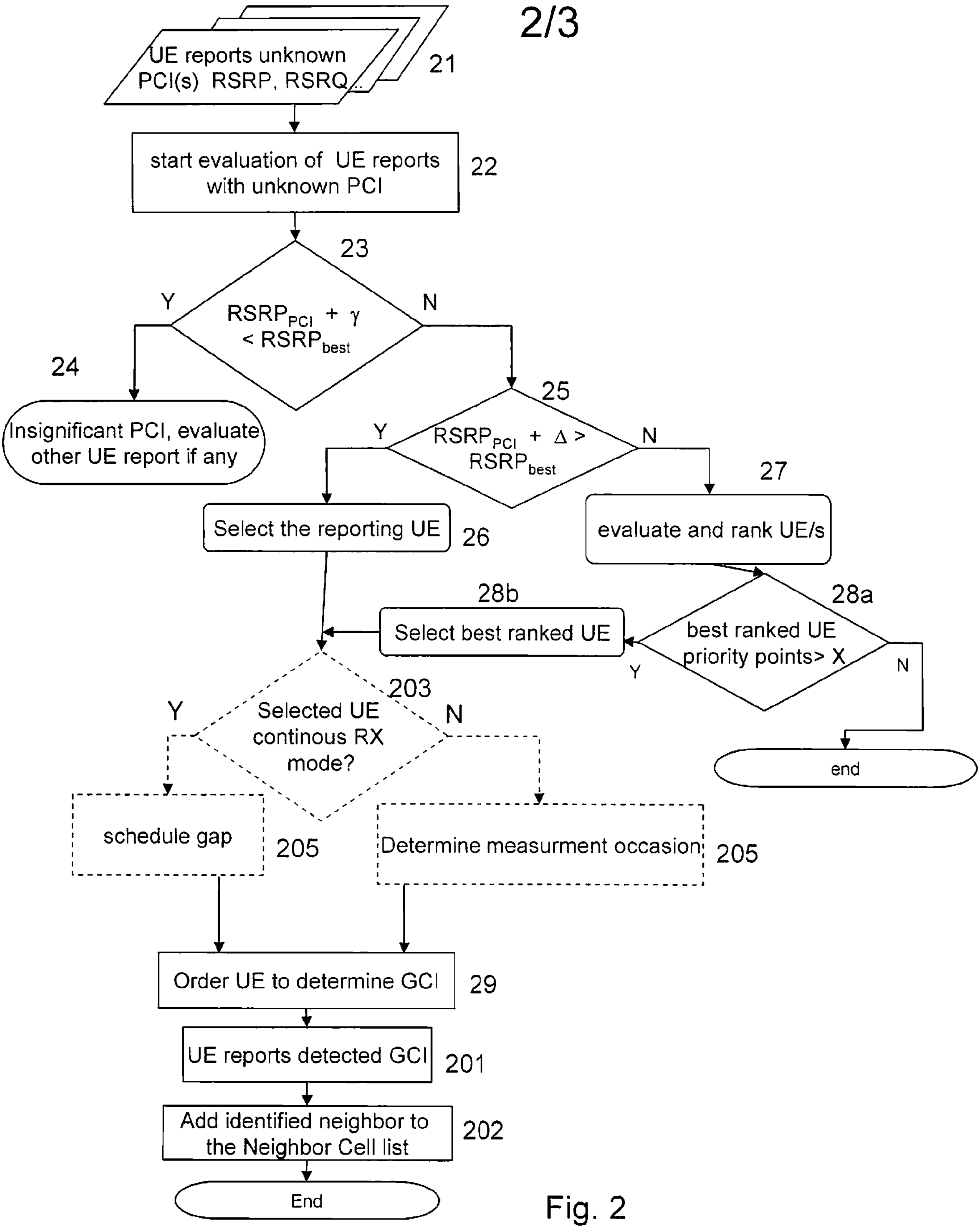
UE reports unknown PCI(s) RSRP, RSRQ..
21
start evaluation of UE reports with unknown PCI
22
23
Y
N
RSRP$_{PCI}$ + γ < RSRP$_{best}$
24
Insignificant PCI, evaluate other UE report if any
25
Y
RSRP$_{PCI}$ + Δ > RSRP$_{best}$
N
27
Select the reporting UE
26
evaluate and rank UE/s
28b
28a
Select best ranked UE
best ranked UE priority points> X
Y
N
203
Y
Selected UE continous RX mode?
N
end
schedule gap
205
Determine measurment occasion
205
Order UE to determine GCI
29
UE reports detected GCI
201
Add identified neighbor to the Neighbor Cell list
202
End

Fig. 2

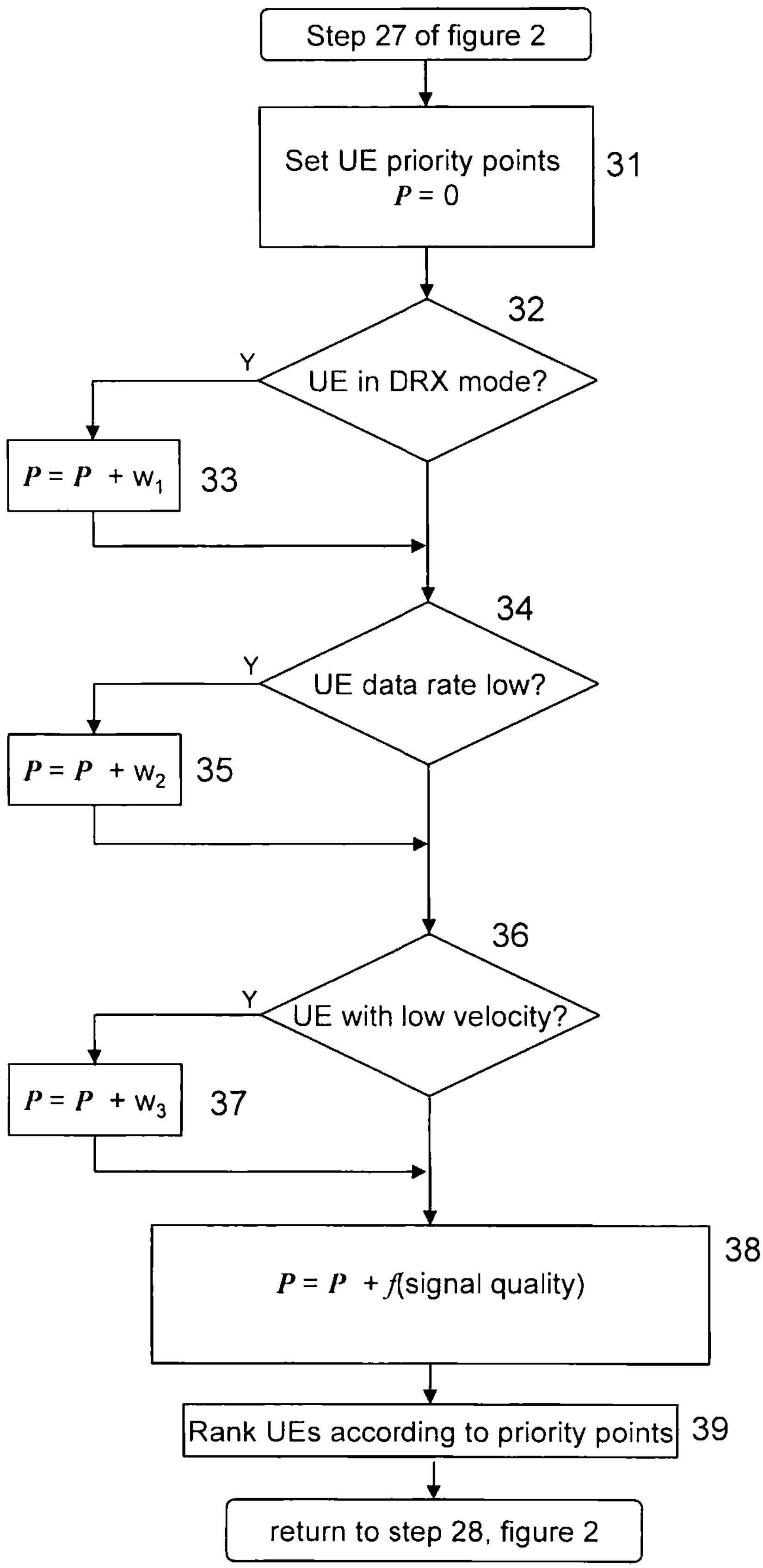
Step 27 of figure 2
Set UE priority points
$P = 0$
31
32
UE in DRX mode?
Y
$P = P + w_1$
33
34
UE data rate low?
Y
$P = P + w_2$
35
36
UE with low velocity?
Y
$P = P + w_3$
37
$P = P + f(\text{signal quality})$
38
Rank UEs according to priority points
39
return to step 28, figure 2

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050139

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04Q, H04W

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	R2-074930; 'Mechanism for UE measurements and reporting of global cell identity'; 3GPP TSG-RAN WG2 #60; Cheju, Korea, Novemebr 5th - 9th, 2007; Ericsson, [retrieved on 2008-11-24] Retrieved from the Internet: http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_60/R2-074930.zip Whole document --	1-11

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 November 2008	25 -11- 2008

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050139

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	S5A071030; 'Requirements for Automatic Neighbour Relation Lists'; 3GPP TSG-SA5; Meeting SA5 Ad-Hoc LTE Meeting, 17 - 19 October 2007, Hong Kong, CHINA; Meeting SA5#56, 22 - 26 Oct 2007, Guangzhou, CHINA; Ericsson, [retrieved on 2008-11-24], Retrieved from the Internet: http://www.3gpp.org/ftp/tsg_sa/WG5_TM/Ad-hoc_meetings/2007-10- Whole document --	1-11
A	US 20050148368 A1 (SCHEINERT ET AL), 7 July 2005 (07.07.2005), abstract -- --------	1-11

International patent classification (IPC)
H04Q 7/36 (2006.01)

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Cited literature, if any, will be enclosed in paper form.

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				WO	2004040938	A	13/05/2004
				CN	1894979	A	10/01/2007
				EP	1661413	A	31/05/2006
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