TSG-RAN Meeting #14 *RP-010770*
Kyoto, Japan, 11 - 14 December 2001

Title: **Agreed CRs (Rel-4 and Rel-5 category A) to TS 25.305**

Source: **TSG-RAN WG2**

Agenda item: **8.2.4**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio	Workite
R2-012474	agreed	25.305	061		Rel-4	Correction of RTD usage in TDD	F	4.1.0	4.2.0	LCS1-UEpos-enh
R2-012761	agreed	25.305	062		Rel-5	Correction of RTD usage in TDD	A	5.2.0	5.3.0	LCS1-UEpos-enh

3GPP TSG-RAN WG2 Meeting #25 ***R2-012474***
Makuhari, Japan, 26th – 30th November 2001

CR-Form-v4

CHANGE REQUEST

⌘ **25.305** **CR** **061** ⌘ ev **-** ⌘ Current version: **4.1.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network ☐

Title:	⌘	Correction of RTD usage in TDD
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	LCS1-UEpos-enh
Date:	⌘	20.11.2001
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	UTRAN SFN-SFN observed time difference type 2 measurement was introduced for TDD in Release 4 in order to estimate the RTD between cells. Therefore the "FDD only" occurences in context with the RTD is removed.
Summary of change:	⌘	"FDD only" in context with RTD is removed.
Consequences if not approved:	⌘	Misleading information in the stage 2 description.

Clauses affected:	⌘	9, 9.6		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.305 v5.2.0, CR 062
Other comments:	⌘			

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9 OTDOA positioning method

The primary standard OTDOA measurement is the "SFN-SFN observed time difference" observed at the UE (see [15] and [16]). These measurements, together with other information concerning the surveyed geographic position of the transmitters and the RTD ~~(FDD only)~~ of the actual transmissions of the downlink signals may be used to calculate an estimate of the position of the UE. Each OTDOA measurement for a pair of downlink transmissions describes a line of constant difference (a hyperbola (see note 1)) along which the UE may be located. The UE's position is determined by the intersection of these lines for at least two pairs of Node Bs. The accuracy of the position estimates made with this technique depends on the precision of the timing measurements, the relative position of the Node Bs involved (see note 2), and is also subject to the effects of multipath radio propagation. This is illustrated in the figure 9.1.

NOTE 1: This is really a figure in three dimensions, a hyperboloid. For convenience here, this will be simplified to the hyperbola representing the intersection of this surface with the surface of the earth. For location service in three dimensions the hyperboloid must be considered.

NOTE 2: The geometry of the Node B positions may affect the accuracy of the position estimate. The best results are when the Node Bs equally surround the UE. If they do not, there is a reduction in accuracy, which is sometimes termed the Geometric Dilution of Position (GDP).

The primary OTDOA measurements (made by the UE) are sent to the SRNC. These measures are sent via signalling over the Uu, Iub (and Iur) interfaces between the UE and the SRNC. The calculation function makes use of the measurements, the known positions of the transmitter sites and the RTD of the transmissions ~~(FDD only)~~ to estimate the UE's position.

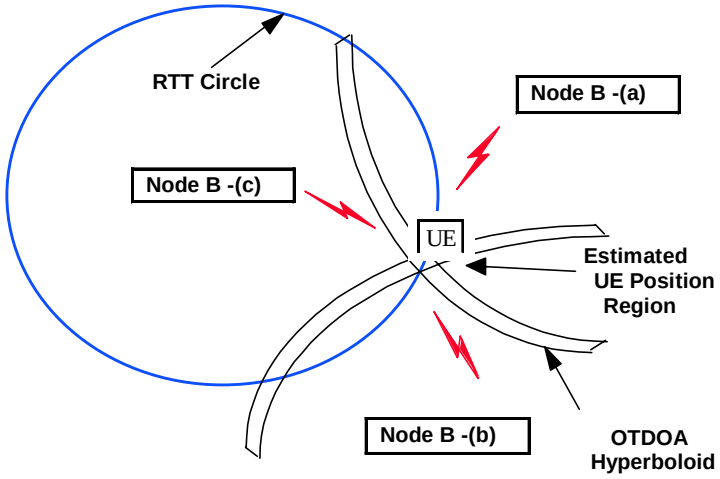

Figure 9.1: OTDOA Positioning Method

The OTDOA method may be operated in two modes: UE-assisted OTDOA and UE-based OTDOA. The two modes differ in where the actual position calculation is carried out.

In the *UE-assisted* mode, the UE measures the difference in time of arrival of several cells and signals the measurement results to the network, where the SRNC carries out the position calculation.

In the *UE-based* mode, the UE makes the measurements and also carries out the position calculation, and thus requires additional information (such as the position of the measured Node Bs) that is required for the position calculation.

The signalling requirements for the two OTDOA modes are described in subclause 9.6. As the UE Positioning involves measurements, there is always uncertainty in the results. Physical conditions, errors and resolution limits in the apparatus all contribute to uncertainty. To minimise the uncertainty in the UE Positioning result, it is important that as many measurements of OTDOA (and assistance data as RTT in FDD and Rx Timing Deviation in TDD) as are possible for a UE are provided to the UE. Thus it is important that the standard UE Positioning method not be restricted to rely on a single measure. The UE thus provides SFN-SFN observed time difference measurements for as many cells as it can receive. The cells to be measured shall include those in the active set and the monitored set.

In order to support the OTDOA method, the positions of the UTRAN transmitters needs to be accurately known by the calculation function in SRNC (for UE-assisted method) or UE (for UE-based method). This information may be measured by appropriate conventional surveying techniques (see note 3). The surveyed position should be the electrical centre of the transmitting antenna (and not the position of the radio equipment building). The use of antenna diversity, beamforming or beam steering techniques may cause the effective antenna position to change with time and this information is also needed to perform calculations. The methods of measuring the position of the UTRAN transmitters are outside the scope of the present document.

NOTE 3: These surveying methods may, for example, make use of a GPS receiver.

In order to support the OTDOA method ~~in FDD~~, the RTD of the DL transmissions must also be known to perform the calculation. If the UTRAN transmitters are unsynchronised, the RTD will change over time as the individual clocks drift. Thus, RTD estimations may need to be made regularly and the calculation function updated appropriately.

One convenient method is to make use of an LMU at a fixed position. This unit performs timing measurements (e.g. UTRAN GPS timing of cell frames or SFN-SFN Observed Time Difference) of all the local transmitters. The CRNC then may convert these measures into the actual (absolute) relative time difference for each of the transmitters by making use of the known position of the LMU and the transmitters.

In some conditions a sufficient number of cells may not be available for measure at the UE. This may occur, for example, if the UE is located quite close to the UTRAN transmitter and its receiver is blocked by the strong local transmissions. This is referred to as the "hearability" problem.

9.6 OTDOA network positioning procedures

The following diagram illustrates the operations for the OTDOA method for UE Positioning when the request for positioning information is initiated by an LCS application from the CN.

This illustration only includes the information flow related to UE Positioning operations and does not indicate other operations that may be required, for example, to establish a signalling connection between the UE and the SRNC. Also not illustrated is the signalling used to initiate the location service request from the CN or a UE-based application.

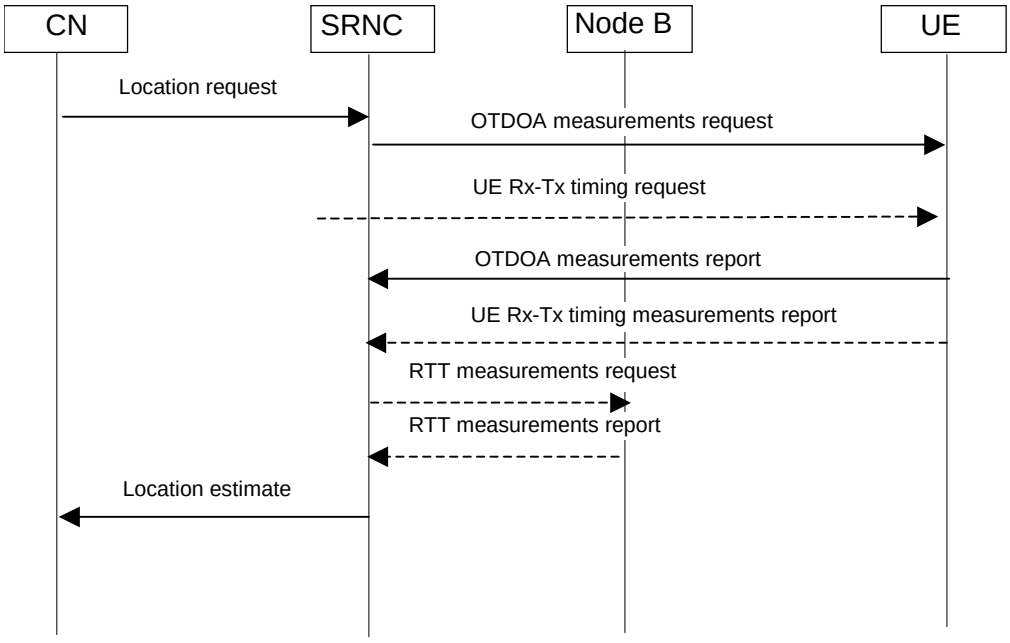

Figure 9.2: OTDOA Signalling Operations

1. The operation begins with an authenticated request for positioning information about a UE from an application in the CN being received at the SRNC. The SRNC considers the request and the UTRAN and UE capabilities.

2. The SRNC requests from the UE the measurement of the OTDOA for the signals in the active and neighbourhood sets. These measurements are made while the UE is in connected mode CELL_DCH state.

3. If it is considered advantageous to do so, the SRNC requests the UE Rx-Tx timing difference (FDD only) information from the UE.

4. The UE returns the OTDOA measures to the SRNC. The SRNC receives the OTDOA information and co-ordinates obtaining other information to support the calculation request.

5. The UE returns the UE Rx-Tx timing difference information to the SRNC, together with a time stamp of when the value was obtained.

6. If there are insufficient OTDOA measures, or it is otherwise considered advantageous to do so, the SRNC requests the RTT (in FDD) or Rx timing deviation (in TDD) measure for the UE from the serving Node B.

7. In FDD, the SRNC requests the RTD values for the associated transmitters from the associated database. These may be stored locally if they are constant over time, otherwise they must be updated to represent the RTD timing at the time-of-day the OTDOA measurements were made.

8. The Node B returns the RTT (in FDD) or Rx Timing Deviation (in TDD) measures to the SRNC if they were requested.

9. The SRNC performs a position calculation using the OTDOA, RTD ~~(FDD only)~~ and, if necessary, RTT (in FDD) or Rx timing deviation and UE timing advance (in TDD) information. The calculation may include a co-ordinate transformation to the geographic system requested by the application. The position estimate includes the position, the estimated accuracy of the results and the time of day of the estimate.

10. The SRNC passes the position estimate to the CN.

3GPP TSG-RAN WG2 Meeting #25 ***R2-012761***
Makuhari, Japan, 26th – 30th November 2001

CR-Form-v4

CHANGE REQUEST

⌘ **25.305 CR 062** ⌘ ev **-** ⌘ Current version: **5.2.0** ⌘

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Date:	⌘	20.11.2001
Category:	⌘	**A**
Release:	⌘	REL-5

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Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.305 v4.1.0, CR 061
Other comments:	⌘			

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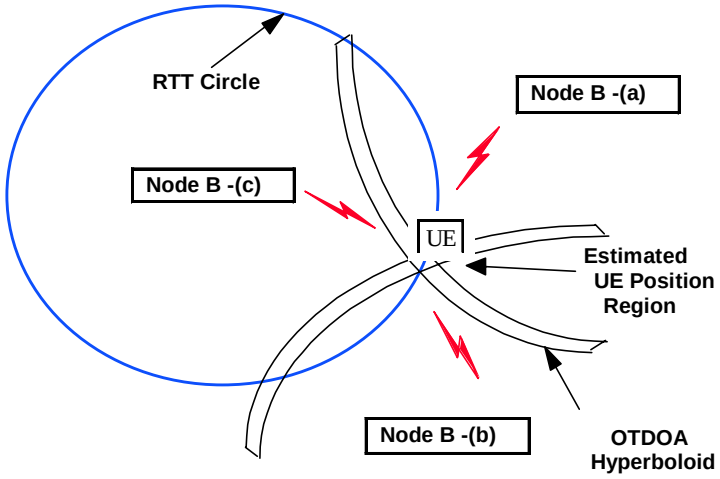

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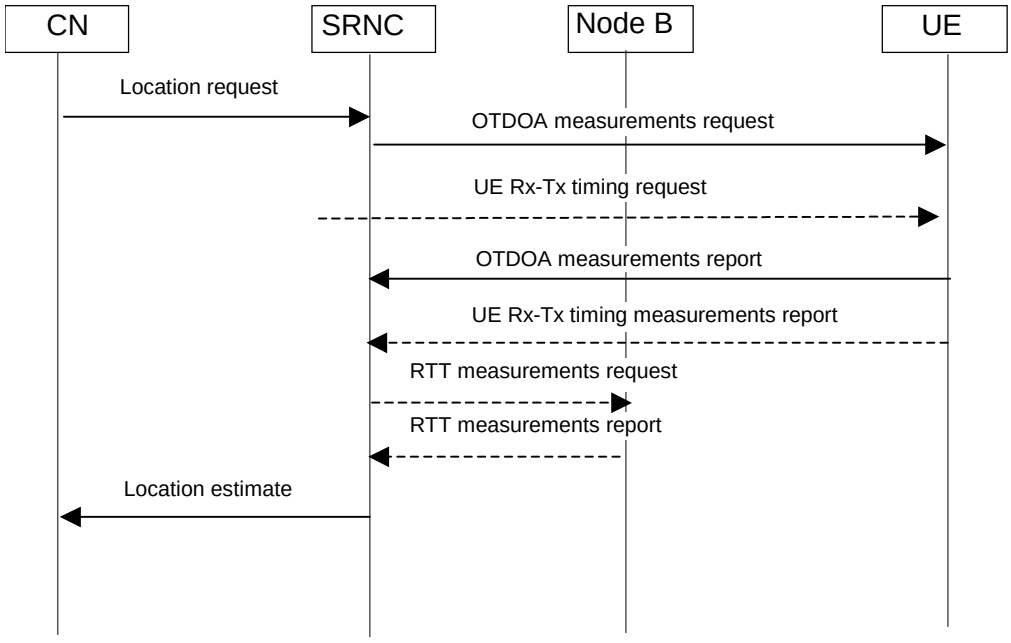

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