TSG-RAN Meeting #20 ***RP-030300***
Hämeenlinna, Finland, 03-06 June 2003

Title: **CR (Rel-5) to TS 25.305**

Source: **TSG-RAN WG2**

Agenda item: **7.2.5**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.305	089	-	Rel-5	Addition of Position Method Used, to attributes returned with position estimate	F	5.5.0	5.6.0	R2-031472	TEI5

3GPP TSG-RAN2 Meeting #36
Paris, France, 19th-23rd May 2003

Tdoc R2-031472

CR-Form-v7

CHANGE REQUEST

⌘ **25.305** **CR** **089** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network [X] Core Network [X]

Title:	⌘	Addition of Position Method Used, to attributes returned with position estimate.
Source:	⌘	RAN WG2
Work item code:	⌘	TEI5
Date:	⌘	19-05-2003
Category:	⌘	**F**
Release:	⌘	REL-5

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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	In the LS received from SA2 in Tdoc R2-031217 it is explained that SA2 agreed to add Position Method Used, to attributes returned with location estimate. The reason for it is explained in the CR to 23.271, i.e. When reporting location information for emergency and other calls, there is no way for the location services client to know what type of positioning method was used to obtain the longtitude and latitude that has been returned. This information would be useful as it would give an indication as to the relative accuracy of that information to the emergency and other location client services, should they have to rely on it. This information could also be used to provide the ability for operators to provide value add services based on accurate location reporting.
Summary of change:	⌘	Text is added at appropriate parts of the TS to indicate that the positioning method or the list of methods used to determine the location estimate is also returned with the position estimate.
Consequences if not approved:	⌘	There would be no indication of the positioning method used to obtain a location estimate. Location clients would not be able to accurately and fully interpret the significance of the position information available in the network, resulting in misinterpretation of the reported position, as has been observed in actual field trials.

Clauses affected:	⌘	4, 4.3.1, 5.2.1, 7.1, 9.6, 10.6

		Y	N			
Other specs affected:	⌘		X	Other core specifications	⌘	23.271, 25.413
			X	Test specifications		
			X	O&M Specifications		

Other comments: ⌘

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

4 Main concepts and requirements

The stage 1 LCS description providing an overall service description and the core requirements for the LCS at the service level is given in [5]. The stage 2 LCS description providing a system functional model for the whole system, the LCS system architecture, state descriptions and message flows are described in [13].

By measuring radio signals the capability to determine the geographic position of the UE shall be provided. The position information may be requested by and reported to a client (application) associated with the UE, or by a client within or attached to the CN. The position information may also be utilised internally by UTRAN, for example, for location-assisted handover or to support other features such as home location billing. The position information shall be reported in standard formats, such as those for cell based or geographical co-ordinates, together with the time-of-day and the estimated errors (uncertainty) of the position of the UE and, if available, the positioning method (or the list of the methods) used to obtain the position estimate. Restrictions on the geographic shape encoded within the 'position information' parameter may exist for certain LCS client types. The SRNC shall comply with any shape restrictions defined in GSM/UMTS and, in a particular country, with any shape restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in [11].

It shall be possible for the majority of the UE (active or inactive) within a network to use the feature without compromising the radio transmission or signalling capabilities of the UTRAN.

The uncertainty of the position measurement shall be network implementation dependent at the choice of the network operator. The uncertainty may vary between networks as well as from one area within a network to another. The uncertainty may be hundreds of metres in some areas and only a few metres in others. In the event that the position measurement is also a UE-assisted process, the uncertainty may also depend on the capabilities of the UE. In some jurisdictions, there is a regulatory requirement for location service accuracy that is part of an emergency service. Further details of the accuracy requirements can be found in [5].

The uncertainty of the position information is dependent on the method used, the position of the UE within the coverage area and the activity of the UE. Several design options of the UTRAN system (e.g. size of cell, adaptive antenna technique, path loss estimation, timing accuracy, Node B surveys) shall allow the network operator to choose a suitable and cost effective UE Positioning method for their market.

There are many different possible uses for the positioning information. The positioning functions may be used internally by the UTRAN, by value-added network services, by the UE itself or through the network, and by "third party" services. The feature may also be used by an emergency service (which may be mandated or "value-added"), but the location service is not exclusively for emergencies.

The UTRAN is a new radio system design without a pre-existing deployment of UE operating according to the radio interface. This freedom from legacy equipment enables the location service feature design to make use of appropriate techniques to provide the most accurate results. The technique must also be a cost-effective total solution, must allow evolution to meet evolving service requirements and be able to take advantage of advances in technology over the lifetime of UTRAN deployments.

4.3.1 Cell ID Based Method

In the cell ID based (i.e. cell coverage) method, the position of an UE is estimated with the knowledge of its serving Node B. The information about the serving Node B and cell may be obtained by paging, locating area update, cell update, URA update, or routing area update.

The cell coverage based positioning information can be indicated as the Cell Identity of the used cell, the Service Area Identity or as the geographical co-ordinates of a position related to the serving cell. The position information shall include a QoS estimate (e.g. regarding achieved accuracy) and, if available, the positioning method (or the list of the methods) used to obtain the position estimate.

When geographical co-ordinates are used as the position information, the estimated position of the UE can be a fixed geographical position within the serving cell (e.g. position of the serving Node B), the geographical centre of the serving cell coverage area, or some other fixed position within the cell coverage area. The geographical position can also be obtained by combining information on the cell specific fixed geographical position with some other available information, such as the signal RTT in FDD ([14]) or Rx Timing deviation measurement and knowledge of the UE timing advance, in TDD ([15]).

The operation of the cell ID based positioning method is described in clause 8.

5.2 Functional Description of UTRAN UE Positioning related elements

5.2.1 Radio Network Controller (RNC)

5.2.1.1 Serving RNC

The SRNC is a network element of UTRAN and contains functionality required to support LCS in one PLMN.

The SRNC provides the following functionality:

- request of information from other RNC:
  The SRNC may request information regarding UE Positioning from other RNCs;

- flow control of positioning requests:
  If several simultaneous positioning requests are present within one SRNC, the SRNC co-ordinates the positioning requests taking into account priority of the requests (e.g. for Emergency Clients);

- positioning method selection:
  The positioning method selection is based on the location request, QoS, capabilities of UE Positioning elements and UE positioning capabilities;

- position calculation:
  The SRNC may calculate the position of a UE and may also support conversion of the position estimate between different geographic reference systems. In case RNC estimates the UE position, it is also responsible to estimate the accuracy of the position estimate. This accuracy estimate should include, for example, the effect of geometric dilution of precision (GDOP), the capabilities of the signal measuring hardware, the effects of multipath propagation and the effects of timing and synchronisation unknowns. The accuracy should be returned as a measure of distance in the same units as the position estimate. The accuracy zone may be reported as the axis and orientation of an ellipse surrounding the position estimate.~~:~~ If available, the positioning method (or the list of the methods) used to obtain the position estimate may also be returned to the CN with the position information.

- provide UE Positioning assistance data:
  The SRNC may provide assistance data in the support of the various positioning methods;

- Overall UE Positioning coordination and control:
  If both an SAS and an SRNC with SMLC internal functionality are available, the SRNC is responsible for the overall coordination and control of UE Positioning. For example, although the SAS has a position calculation function, the SRNC may also have a position calculation function. The SRNC is responsible for managing the co-ordination and control of these multiple resources.

The SRNC, of course, also provides CRNC functionality regarding UE Positioning for its associated Node Bs and LMUs.

7 General UTRAN UE Positioning procedures

7.1 General procedures in UTRAN for UE Positioning

The General UE positioning procedure in UTRAN starts with a request over Iu from the CN. UTRAN then determines the UE position by selecting a suitable positioning method. UTRAN then responds to the request with the estimated position, ~~and~~ possible an associated accuracy and if available, the positioning method (or the list of the methods) used to obtain the position estimate .

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.

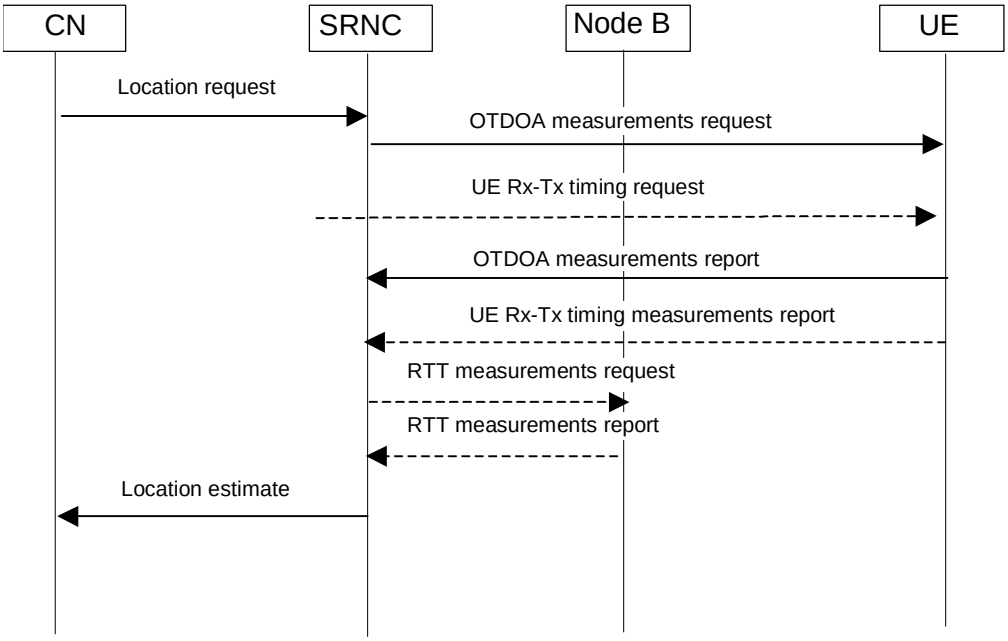

Figure 9.2: OTDOA Signalling Operations

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) or UE timing advance, $T_{ADV,}$ (1.28 Mcps TDD) 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 (FDD only) or UE timing advance, $T_{ADV,}$ (1.28 Mcps TDD) 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) and/or angle of arrival (in 1.28 Mcps 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) and/or angle of arrival (in 1.28 Mcps TDD) measures to the SRNC if they were requested.

9. The SRNC performs a position calculation using the OTDOA, RTD and, if necessary, RTT (in FDD) or Rx timing deviation and UE timing advance (in TDD) information and angle of arrival information (1.28 Mcps TDD). 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. In

networks that include the SAS, the SAS may perform the position calculation and then pass the position estimate to the SRNC.

10. The SRNC passes the position estimate to the CN including if available, the positioning method (or the list of the methods) used to obtain the position estimate.

10.6 Network Assisted GPS positioning Procedure

The diagram in Figure 10.3 and Figure 10.2 illustrate the operations for the network assisted GPS when the request for position information is initiated by a LCS application signalled from the Core Network. A detailed description of the positioning procedure is given as follows. Note that the procedure is for illustration purpose and actual implementations may vary.

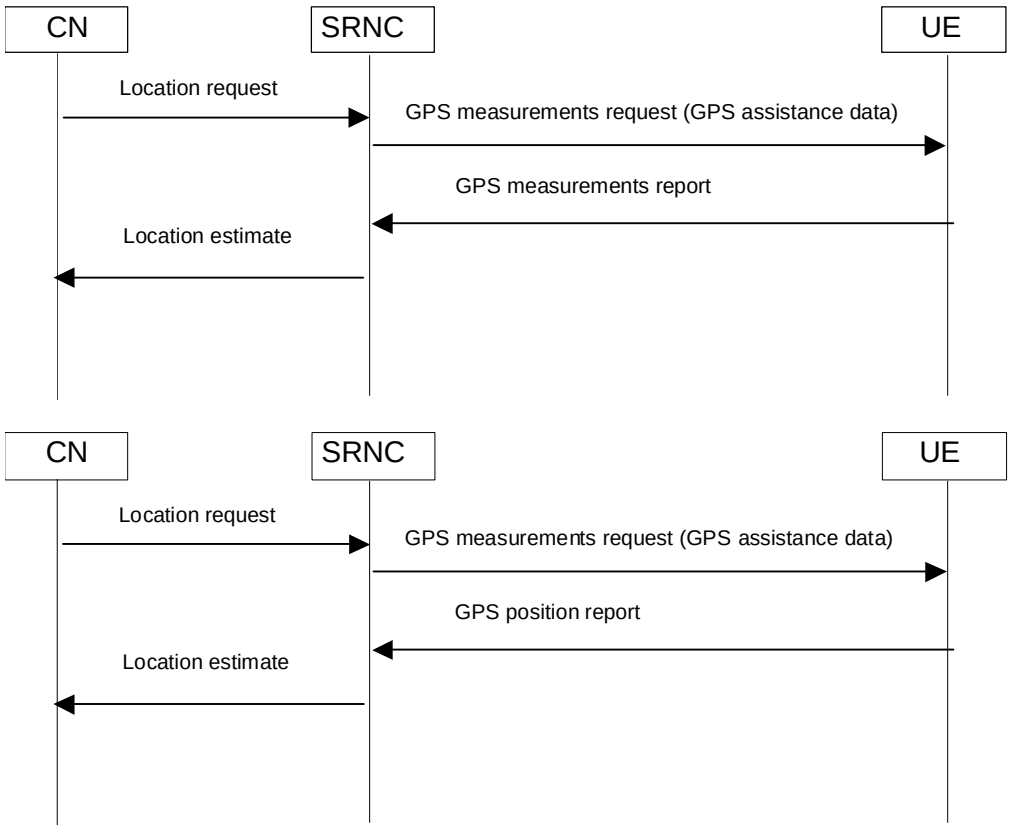

Figure 10.3: Network-assisted GPS methods

1. The operation begins with an authenticated request for positioning information about a UE from an application in the core network being received at the SRNC. The SRNC acts as interface between the Core Network and the UE Positioning entities in the UTRAN. The SRNC considers the request and the capabilities of the UE and the UTRAN. In networks that include the SAS, the SRNC may invoke the SAS via the Iupc interface.

2. Depending on the UE capabilities, the network sends to the UE certain GPS assistance information. This information may include: the reference time for GPS, the satellite IDs, the Doppler frequency, the search window and its centre, the ephemeris and clock corrections, the almanac, and other information specified in 10.5.1.

   For UE-based method, jump to step 8.

   For UE-assisted method, the SRNC may optionally request the following information before the assistance message(s) is (are) sent to the UE: the LMU update*, the RTT measurements (from the Node Bs in the active set) to compensate for the one-way propagation delays. The LMU (associated or stand-alone) returns the information containing the time difference between the Node B and the GPS (e.g. UTRAN GPS timing of cell frames or SFN-SFN Observed Time Difference) to the CRNC. The Node B returns its RTT measurement to the CRNC. If the CRNC is not the SRNC, the CRNC forwards these information to SRNC.

4. The network requests from the UE the measurement of GPS satellite pseudoranges and other information specified in 10.5.1. These measurements may be made while the UE is in RRC connected mode CELL_DCH state. The SRNC may request SFN-SFN Observed Time Difference measurements and Rx-Tx timing difference information from the UE to support the processing related to the RTT measurements.

5. The UE returns to the network the measurement of GPS satellite pseudoranges and other information specified in 10.5.1. If requested, the UE returns to the SRNC SFN-SFN measurements and the Rx-Tx time difference information, together with a time stamp of when these values were obtained.

6 The UE position is calculated in the network.

7. If there is insufficient information to yield a UE positioning estimate, the SRNC may start a new process from step 3.

8. In case of UE based method, UE returns the position estimate to the SRNC. This estimate includes the position, the estimated accuracy of the results and the time of the estimate.

9. In networks that include the SAS, the SAS passes the position estimate to the SRNC.

10. The SRNC passes the position estimate to the CN including if available, the positioning method (or the list of the methods) used to obtain the position estimate.

NOTE: The LMU update (of the time difference between the GPS and the Node B) may be performed on a per-request basis (with respect to each UE Positioning request) or be performed timely that is independent of individual UE Positioning request. The latter is preferable when there is a large volume of UE Positioning requests.