

Agenda Item: 10.3
Source: Nokia
Title: **Location Information in RANAP messages**
Document for: Decision

1 Introduction

Different kind of location information parameters are currently defined for RANAP specifications e.g. Location Identifier and Location Information. The usage of these parameters is not clearly defined. Also procedures to report location information and to control this reporting are included in RANAP specifications. This contribution discusses the usage of these different location related procedures and parameters.

2 Discussion

2.1 Initial UE message

2.1.1 Location Updating

RANAP Initial UE message may be used to carry MM protocol Location Update Request or Routing Area Update request from UE to CN. For these messages UTRAN shall indicate the new LAC (CS domain) or LAI+RAC (PS domain) for the core network. Based on this information CN determines the new location or routing area to be stored in VLR and to be told to the UE by MM protocol messages.

When UE is in communication with the UTRAN, then the new LAC and RAC are told to UE by dedicated RRC messages not by broadcasting. This is required because the LAC and RAC to be indicated have to point to the serving RNC independently of the UEs real location. This means that sometimes the LAC and RAC told to UE are not the same as those that are broadcasted in the location of the UE.

UTRAN shall naturally provide the same LAC and RAC information for the CN with the Initial UE message as is provided for the UE by RRC.

For CS domain UTRAN shall add to INITIAL UE MESSAGE the same LAC which was the last LAC indicated to the UE by UTRAN.

For PS domain UTRAN shall add INITIAL UE MESSAGE the same LAI+RAC which was the last LAI+RAC indicated to the UE by UTRAN.

2.1.2 Cell Identifier

In GSM the BSS includes the current cell in the Initial UE message. This information can be used in CN for routing of emergency calls or e.g. for charging purposes. To achieve the similar functionality in UMTS similar information is required to be included in RANAP Initial UE message.

The Cell-ID is an robust presentation of UEs geographical location. It is foreseen that in future this information can be given by geographical coordinates providing more accurate information for CN. The methods to define the geographical coordinates of the UE are not yet defined for UMTS and depending on the solution to be selected that information might not always be available at the time of transmission of RANAP Initial UE message.

UTRAN shall add to the Initial UE message the UMTS Cell ID indicating one of the cells from which the UE is consuming radio resources.

2.2 Direct Transfer

In GSM no location information is added to the DTAP messages. In GSM Location Update messages are never carried over A interface by DTAP.

UMTS RANAP Direct Transfer messages may be used to carry the MM protocol Location Update messages over the lu interface, therefore the new LAC or RAC information shall be added to the Direct Transfer messages similarly as for Initial UE message (see ch. 2.1.1)

For CS domain UTRAN shall add to the DIRECT TRANSFER message the same LAC which was the last LAC indicated to the UE by UTRAN.

For PS domain UTRAN shall add to the DIRECT TRANSFER message the same LAI+RAC which was the last LAI+RAC indicated to the UE by UTRAN.

2.3 Handovers

2.3.1 Cell Identifier

In GSM, during execution of handover or after the handover is done, BSS informs the CN the new cell that is used by the UE. In BSS internal handovers the new cell ID is given by BSSMAP message after the handover by Handover Performed message and in case of BSS external handover the new cell ID is given by the messages used for the handover itself.

This information can be used in CN e.g. for charging purposes. To achieve the similar functionality in UMTS similar information is required to be included in RANAP Initial UE message.

The Cell-ID is also here a robust presentation of UEs geographical location. It is foreseen that in future this information can be given by geographical coordinates providing more accurate information for CN. Since the methods to define the geographical coordinates of the UE are not yet defined for UMTS it is seen that the UMTS Cell ID should be indicated until a better presentation of the UEs location is available.

Due to the possibility of macrodiversity the UE may be connected to UTRAN via several cells which makes the cell-ID to be given ambiguous. The macrodiversity is however usually a temporary state for the UE. Also already in GSM two mobiles being in the same location can be connected to different cells, so the ambiguity is already present in GSM.

To avoid extensive handover reporting and questionable definitions of a master cell without major benefits, it is seen that it is enough if the UTRAN indicates to CN only one cell-ID indicating one of the cells from which the UE is consuming radio resources.

In current version of the RANAP specification a procedure for Location report is defined. Since the UMTS Cell ID is a robust presentation of UEs location this procedure should be used to transfer also this information from UTRAN to CN.

CN shall be able to command UTRAN to report the UMTS Cell-ID to CN always when the information is changed.

UTRAN shall be able to send Location Report message to CN indicating the UMTS Cell ID which indicates one of the cells from which the UE is consuming radio resources.

2.4 RAB Assignment

In GSM the Assignment Complete includes Cell Identifier. This information element indicates to CN the current cell of the UE. Normally this information is given to CN by handover performed message but if the change of the cell happens simultaneously with Assignment then Assignment message is used.

RANAP RAB assignment is not directly related to UEs movement and there is no specific reason why the coincidental simultaneous change of location should be reported together with RAB ASSIGNMENT RESPONSE instead of normal message LOCATION REPORT.

RAB ASSIGNMENT RESPONSE shall not therefore include any location information.

3 Proposal

3.1 Initial UE message

Following addition to the RANAP message Initial UE procedure description are proposed:

In addition to the received NAS-PDU, RNC shall add following information to the INITIAL UE MESSAGE:

- For CS domain, the same LAI which was the last LAI indicated to the UE by UTRAN.
- For PS domain, the same LAI+RAC which were the last LAI+RAC indicated to the UE by UTRAN
- UMTS Cell ID indicating one of the cells from which the UE is consuming radio resources

Message Contents:

Information element	Reference	Type
Message type		M
Location Information		M
NAS Layer 3 Information		M
<u>LAI</u>		<u>M</u>
<u>RAC</u>		<u>C(1)</u>
<u>UMTS Cell Identifier</u>		<u>M</u>
<u>NAS-PDU</u>		<u>M</u>

C(1):Only for PS domain

3.2 Direct Transfer

Following additions are proposed for the procedure description of Direct Transfer procedure:

In addition to the received NAS-PDU, RNC shall add following information to the DIRECT TRANSFER message:

- For CS domain, the same LAI which was the last LAI indicated to the UE by UTRAN.
- For PS domain, the same LAI+RAC which were the last LAI+RAC indicated to the UE by UTRAN

Message Contents:

DOWNLINK DIRECT TRANSFER

Information element	Reference	Type
Message type		M
NAS PDU		M

UPLINK DIRECT TRANSFER

Information element	Reference	Type
Message type		M
NAS PDU		M
<u>LAI</u>		<u>M</u>
<u>RAC</u>		<u>C(1)</u>

C(1):Only for PS domain.

3.3 Location Reporting Control

Following additions to the description of Location Reporting Control procedure shall be made:

The Request type parameter is used to indicate what kind of location reporting is desired from UTRAN

Following request types are defined:

1. Report the UMTS Cell Identifier of the UE always when changed

3.4 Location Report

Following additions to the description of Location Report procedure shall be made:

In case the reporting of UMTS Cell Identifier is requested by CN, then RNC shall issue Location report always when the information given in the previous LOCATION REPORT or INITIAL UE MESSAGE is not anymore valid. In this case RNC shall include to the LOCATION REPORT message the UMTS Cell Identifier which indicates one of the cells from which the UE is consuming radio resources

Message Contents:

Information element	Reference	Type
Message type		M
Location Information		M
UMTS Cell Identifier		O

3.5 Other proposals

- Remove the Location Identifier IE from RAB ASSIGNMENT RESPONSE
- Delete the information element Location Information since it is not anymore used in RANAP messages
- Delete the Location Identifier Information Element since it is not used in RANAP messages