

**3GPP TSG-SA WG2 meeting #35**  
**Bangkok, 27<sup>th</sup> – 31<sup>st</sup> October 2003**

**Tdoc S2-033806**  
**rev of S2-033623**

**Title:** Reply to Response on "Work following the joint SA2/RAN2/CN1 meeting on paging"  
**Response to:** S2-033326 = R3-031236  
**Source:** TSG SA2  
**To:** TSG RAN3  
**Cc:** TSG RAN2, TSG CN1, TSG RAN, TSG SA

**Contact Person:**

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**Attachments:** S2-033697

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**1. Overall Description:**

SA 2 is pleased to provide the following answers to RAN 3's questions.

- (1) RAN3 has identified impacts on their specification. According to the text in TS23060, after the RNC has performed the normal PCH paging, it should check all further incoming Common-id received from the CS domain in order to match the included IMSI to an existing IMSI of RRC connected UE. This is new in RANAP because currently RANAP only performs this for incoming paging but not for Common-id. This is also more processing for the RNC.

SA 2 have updated the 23.060 CR (see S2-033697) to make it optional for the RNC as to whether it checks the Common ID messages. In the event that the RNC does not check the Common ID messages, then, the timer based mechanisms identified by RAN 3 in question 2, below, apply. SA 2 leave the decision as to whether to raise any CRs against 25.413 to RAN 3.

- (2) In the scenario where an LA spans over more than one RNC (RNC1 and RNC2) and there is still an luPS connection with RNC1, the mobile may have moved to RNC2 so that after the CS paging it becomes lu-CS connected in RNC2 where the IMSI is unknown. UE will continue to have an lu-ps connection towards the old RNC1. However, RAN3 understanding is that this will eventually be released after expiration of RRC periodic update timers and no additional functionality is required.

SA 2's understanding is the same as RAN 3's.

- (3) Similarly, if the paging coordination is done in the SGSN by Gs interface, the CS originating paging will come only to RNC1 via the SGSN and will miss the RNC2 where the UE may have moved in idle mode. Currently no procedure exists for paging using CN ids over lur. However, it is RAN3's understanding that there is no requirement to add this functionality.

SA 2 agree with RAN 3 on this. However it can be noted that, for operational reasons, cells in different RNCs are very frequently in different Location Areas and hence the need to solve this problem is less. SA 2 will consider whether any updates to eg, release 6, 23.060 and 29.018 are needed.

**2. Actions:**

**To RAN 3 :** SA 2 kindly ask TSG RAN 3 to note the above answers.

**To TSG RAN and SA:** To note that SA 2 have handled RAN 3's comments.

**3. Date of Next RAN3 Meetings:**

SA2 #36                      24-28 November 2003

New York

SA2 #37                      12-16 January 2004

Innsbruck, Austria

CR-Form-v7	
<b>CHANGE REQUEST</b>	
⌘ <b>23.060 CR 444</b> ⌘ rev <b>4</b> ⌘	Current version: <b>3.15.0</b> ⌘

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  Core Network

<b>Title:</b>	⌘	Paging with RNTI followed by CN identity to solve issues of UTRAN-UE RRC mis-synchronisation causing lost CS domain calls
<b>Source:</b>	⌘	Vodafone Ltd
<b>Work item code:</b>	⌘	TEI
		<b>Date:</b> ⌘ 30/10/03
<b>Category:</b>	⌘	<b>F</b>
		Use <i>one</i> of the following categories:
		<b>F</b> (correction)
		<b>A</b> (corresponds to a correction in an earlier release)
		<b>B</b> (addition of feature),
		<b>C</b> (functional modification of feature)
		<b>D</b> (editorial modification)
		Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .
		<b>Release:</b> ⌘ R99
		Use <i>one</i> 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)

<b>Reason for change:</b>	⌘	Temporary loss of coverage can lead to the UE entering RRC-IDLE while the UTRAN remains for a long period in RRC-CONNECTED mode. During this time all MT voice calls and CS domain MT SMSs are lost.
<b>Summary of change:</b>	⌘	It is suggested that, following no response to RNTI paging, the UTRAN repages with the Core Network identity for CS domain calls and SMSs.
<b>Consequences if not approved:</b>	⌘	MT voice calls and MT SMSs can be lost for long periods of time.

<b>Clauses affected:</b>	⌘	6.1.2.4.1, 8.2.4, 8.2.5										
<b>Other specs affected:</b>	⌘	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">Y</td> <td style="width: 20px; text-align: center;">N</td> </tr> <tr> <td style="width: 20px; text-align: center;">?</td> <td style="width: 20px; text-align: center;">?</td> </tr> <tr> <td style="width: 20px; text-align: center;"> </td> <td style="width: 20px; text-align: center;"> </td> </tr> <tr> <td style="width: 20px; text-align: center;"> </td> <td style="width: 20px; text-align: center;">N</td> </tr> <tr> <td style="width: 20px; text-align: center;"> </td> <td style="width: 20px; text-align: center;">N</td> </tr> </table> Other core specifications	Y	N	?	?				N		N
Y	N											
?	?											
	N											
	N											
		⌘ A note may be needed in RAN2 specifications (see LS from RAN 2 in R2-031458 =S2-032327), <a href="#">25.413 ? (see LS in S2-033326 = R3-031236)</a> .										
<b>Other comments:</b>	⌘	Following the LS from RAN 3 in S2-033326 (=R3-031236), the following change has been made to the last sentence of the new text added in section 6.1.2.4.1.2  “To resolve this, when the RNC receives the Common ID message from the MSC, the RNC <b>may</b> request the release of the Iu-PS connection associated with any different RNTI previously associated with that IMSI.”										

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.

#### 6.1.2.4.1 Handling of Un-synchronous ~~PMM~~-States in the UE and the Network

##### 6.1.2.4.1.1 Un-synchronous PMM states in the UE and the SGSN

In case of RRC connection release with cause "Directed Signalling connection re-establishment" or in case of an error, the PMM state of the MS and the 3G-SGSN may lose synchronisation. In this case the MS may be in the PMM-IDLE state while the 3G-SGSN is in the PMM-CONNECTED state.

NOTE: The opposite (MS in the PMM-CONNECTED state and SGSN in the PMM-IDLE state) shall never happen because the 3G-SGSN may not have the RAI where the MS is really located, so downlink transfer is impossible until the periodic URA update timer expires.

This situation is recovered by a successful RAU moving the MS to the PMM-CONNECTED state, or by a failed downlink transfer with cause "IMSI unknown in RNC", triggering a paging procedure from the 3G-SGSN.

The UE shall also perform a RAU procedure immediately on entering PMM-IDLE state when it has received a RRC Connection Release message with cause "Directed Signalling connection re-establishment" even if the RA has not changed since the last update.

The UE shall perform a subsequent Service request procedure after successful completion of the RA Update procedure to re-establish the radio access bearer when it has pending user data to send.

NOTE: The RNC will send a RRC CONNECTION RELEASE message with cause "Directed Signalling Connection re-establishment" when it is unable to contact the SRNC to validate the UE due to lack of Iur connection (see TS 25.331).

##### 6.1.2.4.1.2 Un-synchronous states in the UE and the UTRAN

In abnormal cases, the UTRAN can believe the UE is in the RRC-CONNECTED state while the UE is actually in the RRC-IDLE state.

Symptoms of this condition are that the UTRAN has an Iu interface connection to the SGSN and the UTRAN pages with the RNTI but receives no answer from the UE.

For UTRAN paging triggered by CS domain pages, the RNC should take the responsibility to recover this situation by re-paging with the Core Network Identity in the cells of that RNC which are in the Location Area indicated by the CN. A consequence of this re-paging is that it may lead to the RNC having two RRC connections for one UE but different RNTIs. To resolve this, when the RNC receives the Common ID message from the MSC, the RNC may request the release of the Iu-PS connection associated with any different RNTI previously associated with that IMSI.

## 8.2.4 Paging Initiated by CN

A CN node requests paging only for MSs in CMM-IDLE state or PMM-IDLE state. In the separate CN architecture, paging from a CN node is done independently from the state of the MS in the other CN service domain.

In this alternative with paging co-ordination in the UTRAN, the MS does not need to listen to the PCH (Paging Channel) in the RRC Connected mode, at least not when MS is allocated a dedicated channel.

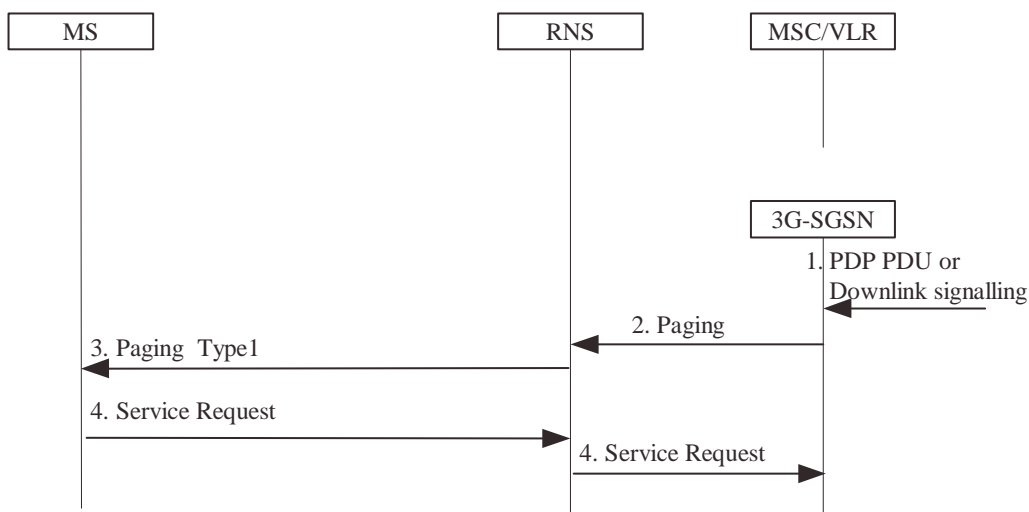
For each paging request received from a CN node, the RNC determines whether the MS has an established RRC connection or not. In order to achieve this, the context that is prepared within the SRNC for MS in RRC Connected mode must contain the IMSI, which is the common MS identity for the two CN domains.

If no context is found for the MS, "normal PCH paging" is performed. The paging message is transferred on the paging channel, and it includes the MS paging identity received from the CN and a CN service domain type indication.

If a context is found, a "CN paging message" is transferred using the existing RRC connection. This message includes a CN service domain type indication. If, potentially after repetition, this transfer is unsuccessful and if the CS domain originally triggered the paging, the RNC should decide whether to attempt "normal PCH paging" as described in sub-clause "Unsynchronous states in the UE and the UTRAN".

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### 8.2.4.1 PS Paging Initiated by 3G-SGSN without RRC Connection for CS



**Figure 1: PS Paging Without RRC Connection for CS**

- 1) The 3G-SGSN receives a PDP PDU or downlink signalling for an MS in PMM Idle state.
- 2) The 3G-SGSN sends a RANAP Paging (IMSI, P-TMSI, Area, CN Domain Indicator, DRX parameters) message to each RNS belonging to the routing area in which the MS is located. IMSI is needed by the RNS in order to calculate the MS paging group, and to identify the paged MS. If 3G-SGSN assigned the P-TMSI to the MS, P-TMSI is also included. Area indicates the routing area in which the MS is paged. CN Domain Indicator indicates which domain (MSC or 3G-SGSN) initiated the paging message, and it represents "SGSN" in this case. DRX Parameters indicates whether or not the MS uses discontinuous reception and the DRX cycle length.
- 3) The RNS controls whether the MS has an established RRC connection or not. In this case, MS has no RRC connection, so a "normal PCH paging" is performed. Paging Type 1 (IMSI or P-TMSI, Paging originator, CN domain ID) is transferred on the Paging channel, IMSI or P-TMSI identifies the MS. Paging originator indicates whether this is core network originated paging or UTRAN originated paging, so it represents "CN" in this case. And CN domain ID indicates whether this paging message is for CS service or PS service, so it represents "PS" in this case.
- 4) The paging request triggers the Service Request procedures in the MS. The service request procedures are described in subclause "Service Request Procedure (UMTS only)".

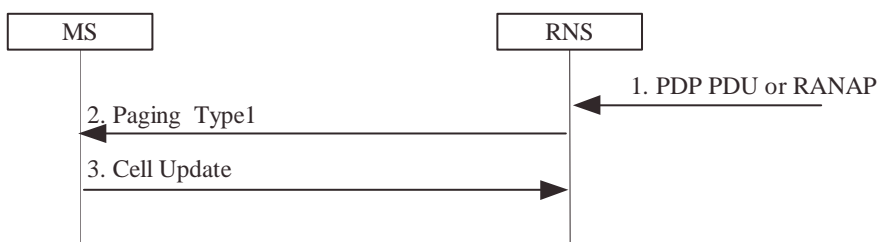
Optionally, 3G-SGSN may include "Non Searching Indication" in RANAP Paging message in this case. If a "Non Searching Indication" parameter is present, the RNC will not search the established RRC connection, and just initiate "normal PCH paging".

## 8.2.5 Paging Initiated by UTRAN

An MS in RRC URA connected state is paged by the RNC before a downlink transfer to that MS. The URA paging procedure shall move the RRC state to Cell Connected to allow the RNC to forward downlink data or signalling message to the radio resource. Therefore, the RRC: Cell Update message from the MS that moves the RRC State at the RNC to Cell Connected state is a valid response to URA paging.

The RNC supervises the paging procedure with a timer. If the RNC receives no response from the MS to the URA Paging Request message, it shall repeat the paging. The repetition strategy is implementation dependent. If it is unsuccessful and if the paging was originally triggered by the CS domain, it is the RNC's responsibility to recover this situation by following the "normal PCH paging" mechanism (see sub-clause "Paging Initiated by CN"). For more information see TS 25.303.

The URA Paging procedure is illustrated in Figure 2.



**Figure 2: URA Paging Procedure**

- 1) The RNS receives a downlink PDP PDU for an MS in RRC URA connected state. Downlink signalling to an MS in RRC URA connected state initiates URA paging as well.
- 2) The RNS pages the MS with one Paging Type 1 (RNTI, Paging originator) message in each cell belonging to the UTRAN routing area where the MS exists. RNTI is the identifier by which the MS is paged. Paging originator indicates whether this is the core network originated paging or UTRAN originated paging, so it represents "UTRAN" in this case.
- 3) The paging request triggers the Cell Update procedures in the MS. The Cell Update procedures are described in TS 25.331.